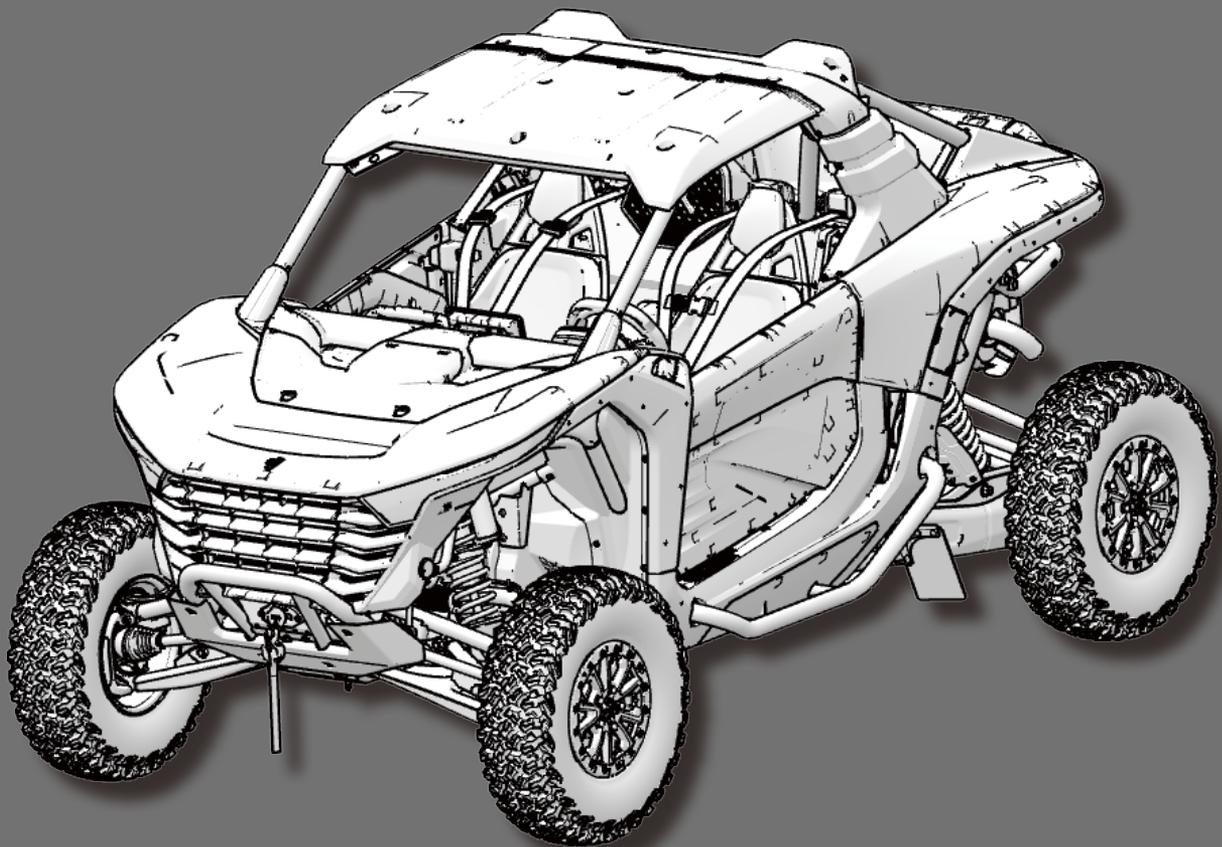




SUPER VILLAIN SX20T

SERVICE MANUAL



2025/09/28 V1.2

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SUMMARY

This manual provides information on the diagnosis, repair procedures, adjustments, and specifications of the SUPER VILLAIN SX20T for use by maintenance technicians.

All materials, illustrations, and product descriptions included in this manual are in accordance with the status at the time of publication. To ensure the efficiency, safety, and quality of vehicles, they are constantly being developed and improved. This may result in some descriptions in the manual not matching the actual situation of the vehicle. Therefore, the condition of the vehicle itself should prevail. When in doubt, it is recommended that you contact your Segway dealer to obtain the latest status of this manual or information about the part numbers or special tools of the products mentioned.

Without the permission of Segway Technology Co., Ltd., no part of this manual may be copied or stored in any form. The above statement applies to all text, graphics, and tables.

1. This manual is provided by Segway Technology Co., Ltd. and is written for qualified professional technicians. If repairs and maintenance are attempted without proper training, appropriate tools and equipment, it may harm the repairman or others, and may also damage the vehicle or cause it to malfunction.
2. Proper vehicle maintenance and upkeep are crucial for the personal safety of maintenance personnel and the safe and reliable operation of motor vehicles. If a part needs to be replaced, please use the same part or a part designated by Segway. Do not use parts that have not been approved by Segway for replacement.
3. The recommended maintenance procedures in this manual are effective methods for repair and maintenance, some of which require the use of specialized tools.

Therefore, if replacement parts, repair procedures or tools that are not approved or recommended by Segway Company are to be used, it is necessary to first confirm that there is no harm to personal safety or vehicle safety operation.



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TERMINOLOGY

A	ampere(s)	lb	pounds(s)
ABDC	after bottom dead center	m	meter(s)
AC	alternating current	mm	Millimeter(s)
ATDC	after top dead center	min	minute(s)
BBDC	before bottom dead center	N	newton(s)
BDC	bottom dead center	Nm	Newton meters
BTDC	before top dead center	Pa	pascal(s)
C	degree(s) Celcius	HP(PS)	horsepower
CVT	centrifugal variable Transmission	psi	pound(s) per square inch
DC	direct current	r	revolution
F	farad(s)	rpm	revolution(s) per minute
F	degree(s) Fahrenheit	TDC	top dead center
ft	foot, feet	TIR	total indicator reading
g	gram(s)	V	volt(s)
kg/cm ²	Kilograms per square centimeter	W	watt(s)
h	hour(s)	Ω	ohm(s)
L	liter(s)		

NOTES BEFORE MAINTENANCE

This manual includes a variety of "warnings", "attention", "tips", etc., which must be carefully followed in order to reduce the risk of injury during repair or maintenance. Improper repair or maintenance will damage the vehicle or bring safety hazards to the vehicle.

WARNING

WARNING indicates a potential hazard that may result in severe injury or death to the operator, bystander or person(s) inspecting or servicing the vehicle.

CAUTION

CAUTION indicates a potential hazard that may result in personal injury or damage to the vehicle.

TIPS

TIPS provide maintenance information to give the corresponding reminder, express and explanation.

IMPORTANT

IMPORTANT provides key reminders during disassembly, assembly, and inspection of components.

Please understand the construction, performance, repair methods and safety requirements of the vehicle being repaired before servicing.

Preparation of tools and gauges

Prepare the necessary tools and measuring instruments before the repair work.

Specialized tools

The disassembly of some parts requires the use of special tools, please do not use other tools instead.

Parts disassembly

Before repair work, first identify the cause of the malfunction and confirm whether disassembly or disassembly is required based on the actual condition of the malfunction.

Disassemble

If the disassembly process is complex and requires too many parts to be disassembled, take care that the performance or shape of all parts is not damaged.

Parts

When parts are damaged and need to be replaced, use parts approved or recommended by Segway.

Replacements

All components should be assembled with strict adherence to standard values such as torque and indeed adjustment values.

If disassembled, the following parts must be replaced with new ones:

- shims
- O-ring
- cotter pin

Use the recommended lubricant in the specified position before assembly

Rubber parts and hoses

Prevent rubber parts and hoses from coming into contact with gasoline or lubricating oil.

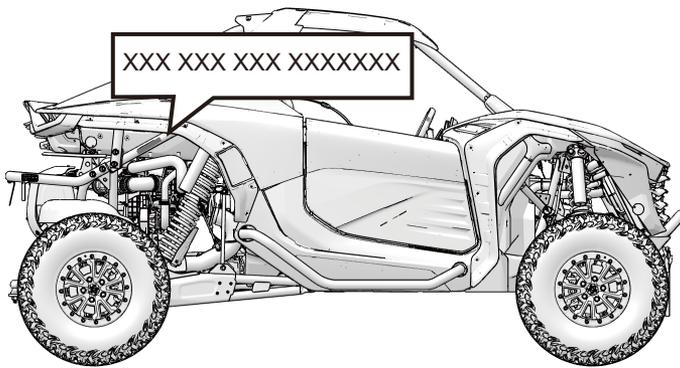
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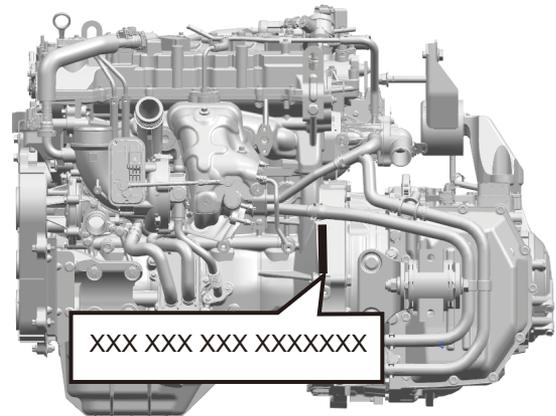
VEHICLE IDENTIFICATION NUMBER/ENGINE SERIAL CODE

VEHICLE IDENTIFICATION NUMBER

The Vehicle Identification Number (VIN) is located on the left rear frame of the vehicle, and the VIN is also on the vehicle nameplate. The engine number is stamped on the engine. Provide assistance when customers need to order spare parts from dealers or provide reference when the vehicle is stolen.



Vehicle Frame Identification Number (VFIN)



Engine Serial No.

VEHICLE IDENTIFICATION CODE COMPOSITION					
<p>*A0SAAPX1? X X X X X X X X *</p> <p style="margin-left: 100px;"> 1 2 3 4 5 6 7 8 9 10 </p>					
No.	Serial Number Meaning	Digits	No.	Serial Number Meaning	Digits
1	OEM CODE	3	6	INSPECTION	1
2	MODEL	1	7	DATE	1
3	ENGINE CODE	1	8	SERIAL NUMBER	1
4	DISPLACEMENT	1	9	FACTOR NUMBER	1
5	POWER	1	10	PRODUCTION NUMBER	6

TECHNICAL PARAMETERS OF VEHICLE

ITEM	SPECIFICATIONS	
	SGW2000F-S1	SGW2000F-S3
Vehicle		
Length×Width×Height (mm)	3560×1932×1891	3620×1949×1891
wheelbase (mm)	2654	
Front wheelbase (mm)	1678	
Rear wheelbase (mm)	1668	
Curb weight (kg)	1300	
Ground clearance (mm)	370 (32' Tire) ;405(35' Tire)	370 (32' Tire)
Steering wheel diameter/ specification (mm)	292	
Minimum turning diameter (m)	12.5	
Max load (kg)	336	286
Cargo max load (kg)	136	
Axle load, (curb weight)	Front (kg)	588
	Rear (kg)	712
Axle load (Full load weight)	Front (kg)	704
	Rear (kg)	932
Front suspension travel (mm)	510	
Rear suspension travel (mm)	533	
ramp angle (°)	33	
Approach angle (°)	80	
Departure angle (°)	80	
kingpin caster angle (°)	4.1	
wheel camber angle (°)	-0.15	
kingpin inclination angle (°)	4.8	
Scrub Radius (mm)	17.4	
Front wheel toe in (mm) /°	6.4mm/0.23°	
Rear wheel toe in (mm)	6.4mm/0.23°	
Front suspension (mm)	494	
Rear suspension (mm)	412	475
height of towing (mm)	630	
Reserve fuel capacity (L)	5	
Engine		
Engine type	Inline four cylinder, water-cooled, four stroke, eight valve, DOHC、GDI	
Engine model	486MYL	
Displacement (ml)	1998	
Compression ratio	10 : 1	

GENERAL INFORMATION

SUPER VILLAIN SX20T

ITEM	SPECIFICATIONS	
	SGW2000F-S1	SGW2000F-S3
Cylinder diameter x stroke (single cylinder) (mm xmm)	86x86	
Start mode	Electric start	
Ignition type	EFI	
Lubrication method	Pressure splatter	
Cooling method	Closed circulation cooling of coolant	
Coolant capacity (ml)	engine	15000
	intercooler	4000
Lubricating oil grade	engine	SN/GF-5 5W-30 Or higher level
	gearbox	DAE ATF-1 or DAE ATF-2
	Front and rear axles	SAE 80W-90
Lubricating oil capacity (ml)	engine	5000 (Maintenance)
	gearbox	4700 (Maintenance)
	front axle	610 (Maintenance)
	rear axle	520 (Maintenance)
generator power (W)	1700	
Fuel tank capacity (L)	46	
Maximum load of rear cargo box (kg)	136	
Fuel grade	92#or higher unleaded gasoline (GB) 、 87# (US)	
gear ratio	gear ratio 1	3.029
	gear ratio 2	1.95
	gear ratio 3	1.457
	gear ratio 4	1.221
	gear ratio 5	1.0
	gear ratio 6	0.809
	gear ratio 7	0.673
	gear ratio R	4.015
	gear ratio final	3.2
front and rear axles	2.307	

ITEM		SPECIFICATIONS	
		SGW2000F-S1	SGW2000F-S1
Tire			
1	im type and specifications	front wheel	Beadlock rim (15×7.0) /Beadlock rim (16×7.0)
		rear wheel	Beadlock rim (15×7.0) /Beadlock rim (16×7.0)
2	Tire type and specifications	front wheel	32×10R15 NHS/88R 35×10R16 NHS/88R
		rear wheel	32×10R15 NHS/88R 35×10R16 NHS/88R
3	Tire Pressure	front wheel	150Kpa (22PSI)
		rear wheel	150Kpa (22PSI)
4	service brake	type	Hydraulic, disc type
		Operation method	Foot brake
5	parking brake	type	Park in P gear
		Operation method	Button type
Suspension System			
6	Suspension type	front	double wishbone suspension
		rear	Multi link independent suspension
7	Shock absorber type	front	Hydraulic spring+airbag
		rear	Hydraulic spring+airbag
8	Frame type	Tube plate composite type	
9	Steering gear type	Gear rack type	
10	EPS type	P-EPS	
11	air filter type	pleated paper filter	
12	muffler type	Impedance type	
Electrical System			
13	Headlights	Specification x Illumination	LED/28.4W -30000cd
		Color/Specification/Model	LED/2.4W
		Rear lamp	LED/27.6W
		Color/Specification/Model	amber/LED/21.6W
14	Rear lamp	Rear brake light Color/Specification/Model	red //LED /9.1W
		Rear position light Color/Specification/Model	red /LED /1.6W
		Rear turn signal Color/Specification/Model	amber /LED /9.9W

GENERAL INFORMATION

SUPER VILLAIN SX20T

15	Rear license plate light	Color/Specification/Model	white /LED /2.5W
16	Reverse light	Rear turn signal	/
17	Rear fog lamp	Color/Specification/Model	/
18	Battery capacity (V/Ah)	12V32Ah (Maintenance free, lead-acid) ×2	
19	Shift operation mode	electronic	
20	Instrument form	TFT	
21	Steering wheel locking type	/	
22	Adjusting the steering wheel angle	45 °	
23	Adjustment distance of driver's seat front and rear position	152.4mm	
24	Rear cargo box flipping angle	Cannot be flipped	
25	Power transmission mode	Shaft transmission	
26	Boiling point/freezing point of coolant	107/-35	
27	Thermostat opening temperature	Initial opening	82±2°C
		Fully open	95°C

UNIT CONVERSION TABLE

TORQUE		
Unit	coefficient	Convert to
N·m	× 0.1020	kg·m
N·m	×0.7376	ft·lbs
N·m	×8.851	in·lbs
kg·m	×9.807	N·m
kg·m	×7.233	ft·lbs
kg·m	×86.80	in·lbs
in·lbs	×0.833	ft·lbs
in·lbs	×0.116	kg·m
PRESSURE		
kPa	× 0.01020	kg/cm ²
kPa	× 0.1450	psi
kPa	× 0.7501	cmHg
kg/cm ²	× 98.07	kPa
kg/cm ²	× 14.22	psi
cm Hg	× 1.333	kPa
POWER		
N	× 0.1020	kg
N	× 0.2248	lb
kg	× 9.807	N
kg	× 2.205	lb
VOLUME		
L	× 0.2642	gal (US)
L	× 0.2200	gal (imp)
L	× 1.057	qt (US)
L	× 0.8799	qt (imp)
L	× 2.113	pint (US)
L	× 1.816	pint (imp)
mL	0.03381	oz (US)
mL	0.02816	oz (imp)
mL	0.06102	cu in
SPEED		
km/h	× 0.6214	mph
POWER		
kW	× 1.360	PS
kW	× 1.341	HP
PS	× 0.7355	kW
PS	× 0.9863	HP
TEMPERATURE		
°C to °F : °C x 9/5 + 32 = °F		
°F to °C : °F - 32 x 5/9 = °C		

TORQUE

The following tables list the tightening torque for the major fasteners, and the parts requiring use of a non-permanent locking agent or liquid gasket.

Letters used in the "Remarks" column mean:

L: Apply a non-permanent locking agent.

Tightening torque of main engine bolts			
Item	Description	Assembly location	tightening method
1	Main bearing cover bolt	crankcase	
2	connecting-rod bolt	rod cap	Corner method: (30±2) N.m+ (90±2) ° monitor: (50-90) N.m
3	Cylinder head connecting bolt	cylinder cover	Corner method: (30±2) N.m+ (180±2) ° monitor: (55-110) N.m
4	Combination bolt of crankshaft pulley	crankshaft	Corner method: (120±2) N.m+ (120±2) ° monitor: (238-402) N.m
5	Drive bolt	crankshaft	Corner method: (40±2) N.m+ (30±2) ° monitor: (60-110) N.m

General bolt torque specifications for engines					
Item	Description	Assembly location	N•m	lb-ft	lb-in
1	Hollow bolt of turbocharger inlet pipe	crankcase	34±2	25	-
2	Turbocharger connecting screw	Turbocharger and cylinder head	15±1	11	-
3	Turbocharger connecting nut	Turbocharger and cylinder head	40±2	30	-
4	Turbocharger connecting screw	Turbocharger and catalyst	6±1	-	53
5	Turbocharger connecting nut	Turbocharger and catalyst	25	18	-
6	Connecting bolt between crankshaft and balance shaft	Balance shaft	45	33	-
7	Signal board screw	Eighth crankshaft plate	15±1	11	-
8	Process hole blockage	Rear end cover of crankshaft	40±2	30	-
9	Short bolt for cylinder head cover	head cover	13±1	10	-
10	Crankcase R3/8 plug	crankcase	40±2	30	-
11	R1/8 crankcase plug	cylinder cover	12±2	9	-
12	Cylinder head water channel plug	cylinder cover	75±5	55	-
13	Screw plug at cylinder head IEM	cylinder cover	56±3	41	-
14	Camshaft bearing cover bolt	Camshaft bearing cover	12±1	9	-
15	bolt	Fuel manifold	32±2	24	-

16	bolt	water pump	32±2	24	-
17	bolt	Front end wheel tensioning wheel	65±3	48	-
18	bolt	Front wheel system idler assembly	65±3	48	-
19	bolt	Engine Hook No.1	65±3	48	-
20	bolt	Engine Hook No.2	65±3	48	-
21	Self tapping screws				

Other general bolts of the engine						
Size	8.8 Level			10.9 Level		
	N•m	lb-ft	lb-in	Nm	lb-ft	lb-in
M6	10±1	-	89	13±1	10	-
M8	23±2	17	-	32±2	24	-
M10	50±3	37	-	65±3	48	-
M12	80±5	59	-	110±5	81	-

VEHICLE STANDARD FASTENER TORQUE					
System	Position	Description	Strength grade	TORQUE VALUE (N·M)	Thread adhesive
body	General position	M6	8.8	9-12	
		M8	8.8	22-30	
		M10	8.8	45-59	
		M12	8.8	78-104	
TORQUE OF VEHICLE SPECIFIC FASTENERS					
Engine	Engine and gearbox, suspension bracket and power	Hexagonal flange bolt M12×1.25×50	10.9	70±5	
	Rear suspension bracket	Hexagonal flange locking nut M12×1.25	10	100±10	
	Left suspension and frame	Hexagonal flange bolt M12×1.25×120	10.9	185±10	
	Right suspension bracket and rubber	Hexagonal flange bolt M14×1.25×130	10.9	185±10	
	Engine and gearbox	Hexagonal flange bolt M10×1.25×40	10.9	50±5	
	Engine and gearbox	Hexagonal flange bolt M12×1.25×40	10.9	70±5	
	Suspension and frame	Hexagonal flange bolt M12×1.25×25	10.9	100±10	
	Front suspension and bracket	Hexagonal flange bolt M12×1.25×90	10.9	100±10	
Front and rear axle, gearbox	Front and rear axles and frame (lower)	Hexagonal flange bolt M12×1.25×25	10.9	70±5	L
	Hybrid gearbox and frame (bottom)	Hexagonal socket head screw M12×1.25×25	10.9	70±5	L
	Gearbox and motor (hybrid)	Hexagonal flange bolt M10×1.25×55	10.9	50±5	
	Gearbox and motor (hybrid)	Hexagonal flange bolt M10×1.25×45	10.9	50±5	
	Front and rear axles and frame	Hexagonal flange bolt M12×1.25×247	10.9	70±5	
	Rear axle and rear axle bracket	Hexagonal flange bolt M12×1.25×145	10.9	70±5	
Suspension	Front upper rocker arm rear end bolt	Hexagonal flange bolt M14×1.5×80	10.9	185±10	
	Front rocker arm and frame connection bolt	Hexagonal flange bolt M14×1.5×105	10.9	185±10	
	Front wheel hub bearings and steering knuckles	Hexagonal socket head screw M12×45	12.9	110±10	L
	Rear wheel hub bearing and rear support	Hexagonal socket head screw M12×65	12.9	110±10	L
	Upper Main pin, front steering knuckles	Hexagonal socket head screw M10×1.25×60	10.9	70±5	
	Lower main pin, front steering knuckles	Hexagonal flange locking nut M14×1.5	10	60+90°	

Suspension	Shock absorber installation bolt	Hexagonal flange bolt M14×1.5×70	10.9	185±10	
	Front upper shock absorber installation bolt	Hexagonal flange bolt M14×1.5×160	10.9	185±10	
	Rear control lever, inner - frame bolt	Hexagonal flange bolt M14×1.5×70	10.9	185±10	
	Rear control lever outer, suspension bolt	Hexagonal flange bolt M14×1.5×85	10.9	185±10	
	Rear control rod adjustment nut	Hexagon thin nut M16×1.5	8	110±10	
	Front and rear stabilizer bar cover fixing bolts	Hexagonal flange bolt M10×1.25×20	10.9	70±5	
	Rear stabilizer bar connecting rod installation bolt	Hexagonal flange bolt M12×1.25×70	10.9	110±10	
	Front stabilizer bar connecting rod, upper fixing bolt	Hexagonal flange bolt M12×1.25×65	10.9	110±10	
	Front stabilizer bar connecting rod, lower fixing bolt	Hexagonal flange bolt M12×1.25×90	10.9	110±10	
	Rear arm - frame bolt	Hexagonal flange bolt M16×2.0×80	10.9	185±10	
	Rear wheel support bearing - support arm	Hexagonal flange bolt M16×2.0×105	10.9	185±10	
Steering	Steering wheel fixing bolt	Hexagonal flange locking nut M14×1.5	10	95±5	
	Steering rod - steering knuckle	Hexagonal flange locking nut M14×1.5	10	60+90°	
	Steering rod adjustment nut	Hexagon thin nut M16×1.5	8	110±10	
	Steering machine- frame	Hexagonal flange bolt M12×1.25×110	10.9	110±10	
	Steering column - frame	Hexagonal flange bolt M10×1.25×130	10.9	70±5	
	Installation bolts for steering bearing seat	Hexagonal flange bolt M8×25	8.8	28±2	
	Lower universal joint of steering shaft	Hexagonal flange bolt M8×30	10.9	33±3	
Drive system	Front and rear drive shaft fixing bolts	Hexagonal flange bolt M8×65	10.9	33±3	L
Brake	Front and rear caliper fixing bolts	Hexagonal flange bolt M12×1.25×35	10.9	70±5	L
	Brake master pump - frame	Hexagonal flange bolt M8×25	8.8	28±2	
	Brake pedal seat - frame	Hexagonal flange locking nut M8	8	28±2	
	Brake pedal pivot fixing screw	Hexagonal socket head screw M10×65	8.8	33±3	
Wheel	Beadlock rim bolt	Hexagonal flange bolt M8×25	8.8	28±2	
	lug nut	Hexagonal cap nut M12X1.5	10	120±5	
	Half shaft fixing nut	Hexagonal slotted flange nut M20X1.5	10	200+150	

GENERAL INFORMATION

SUPER VILLAIN SX20T

Top beam	Installation bolts for the middle of the top beam/ B-pillar	Hexagonal flange bolt M12x1.25x30	10.9	110±10	
	Installation bolts for A-pillar of top beam	Hexagonal flange bolt M12x1.25x55	10.9	110±10	
	Installation bolts for top beam C-pillar	Hexagonal flange bolt M10×1.25×20	10.9	70±5	
	Engine rear fixing bracket and frame (bottom)	Hexagonal flange bolt M10×1.25×20	10.9	70±5	
	Engine rear fixing bracket and frame (upper)	Hexagonal flange bolt M12x1.25x55	10.9	110±10	
	Rear axle bracket and frame fixing bolts	Hexagonal flange bolt M12x1.25x25	10.9	110±10	
	Left suspension bracket and frame fixing bolt	Hexagonal flange bolt M10×1.25×20	10.9	70±5	
	Front axle adapter bracket and frame fixing bolt	Hexagonal flange bolt M10×1.25×30	10.9	70±5	√
Safety belt	Seat belt bolt	Hexagonal flange bolt 7/16*30(British System)	8.8	70±5	
Door	Installation bolts for door hinges	Hexagonal flange bolt M8×20	8.8	28±2	√

MAINTENANCE

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VEHICLE LIFTING SUPPORT POSITION**LIFTING AND SUPPORTING VEHICLES****Front of the vehicle**

Place the vehicle on a flat and non slippery surface.

Enable 4WD mode.

Ensure that the vehicle is shifted to the PARK position.

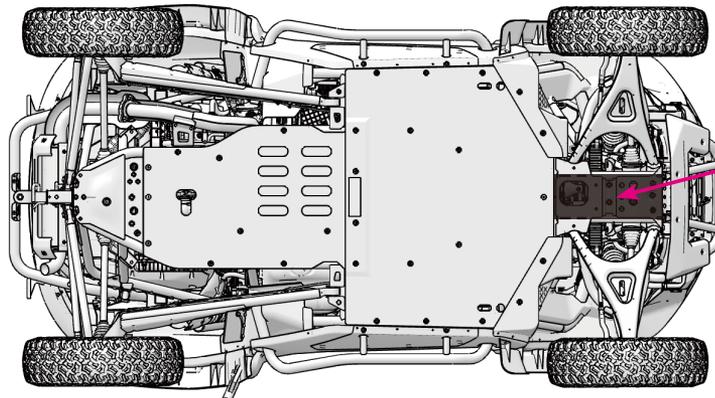


Diagram of the support position of the hydraulic jack at the front of the vehicle

Lift the front of the vehicle and install a jack bracket on each side under the frame.

Lower the hydraulic jack and ensure that the vehicle is firmly supported on the two jack brackets.

Rear of the vehicle

Place the vehicle on a flat and non slippery surface.

Activate 4WD mode.

Ensure that the vehicle is shifted to the PARK position.

Install hydraulic jacks under the vehicle.

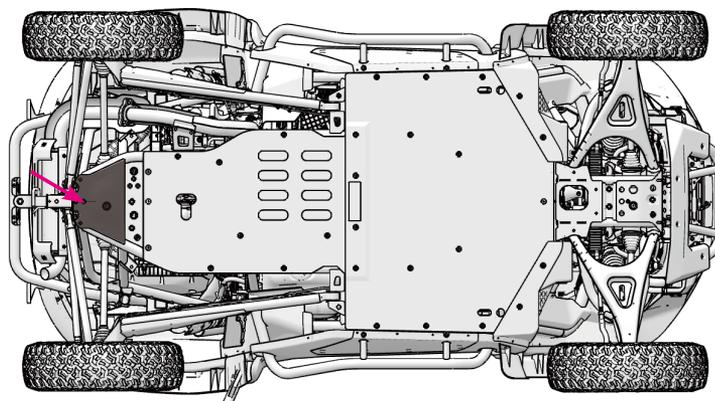


Diagram of the support position of the hydraulic jack at the rear of the vehicle

Lift the rear of the vehicle and install a jack bracket on each side under the frame.

Lower the hydraulic jack and ensure that the vehicle is firmly supported on the two jack brackets.

REGULAR MAINTENANCE

Careful regular maintenance will help keep your vehicle in the safest and most reliable condition. The inspection, adjustment, and lubrication of important components are explained in the regular maintenance chart. Inspect, clean, lubricate, adjust, and replace necessary parts. When replacement parts are found during inspection, please use original Segway parts, which can be purchased from authorized Segway dealers.

Maintenance and adjustment are crucial for vehicle operation. If you are not familiar with repair and adjustment procedures, please have your Segway dealer perform these operations. The maintenance intervals in the table are based on the average riding time condition, and vehicles that are heavily used must increase the frequency of inspection and service. Serious usage definition

- ◆ Frequently soaked in mud, water, or sand
- ◆ Frequent or prolonged operation in dusty environments
- ◆ Short distance cold weather operation
- ◆ Racing or racing style high-speed use
- ◆ Long term low-speed heavy-duty operation
- ◆ Long term idle vehicles

Maintain table icon

SYMBOL	DESCRIPTION
▶	Perform these procedures more often for vehicles subjected to severe use.
D	Have an authorized dealer or other qualified person perform these services.

WARNING

The D-marking process may cause component failure and result in serious injury or death. Have an authorized dealer or other qualified person perform these services.

BREAK-IN MAINTENANCE

ITEM	MAINTENANCE INTERVAL (WHICHEVER COMES FIRST)			REMARKS
	HOURS	CALENDAR	MILES (KM)	
Fuel System	25 H	1 M	200 (320)	Break-in check: cycle key to pressurize fuel pump. check lines and fittings for leaks and abrasion
Engine oil change	25 H	1 M	200 (320)	Break-in check: oil and filter change
Front gearcase oil	25 H	1 M	200 (320)	Break-in check: oil level check
Rear gearcase oil	25 H	1 M	200 (320)	Break-in check: oil level check

SUPER VILLAIN SX20T

PERIODIC MAINTENANCE

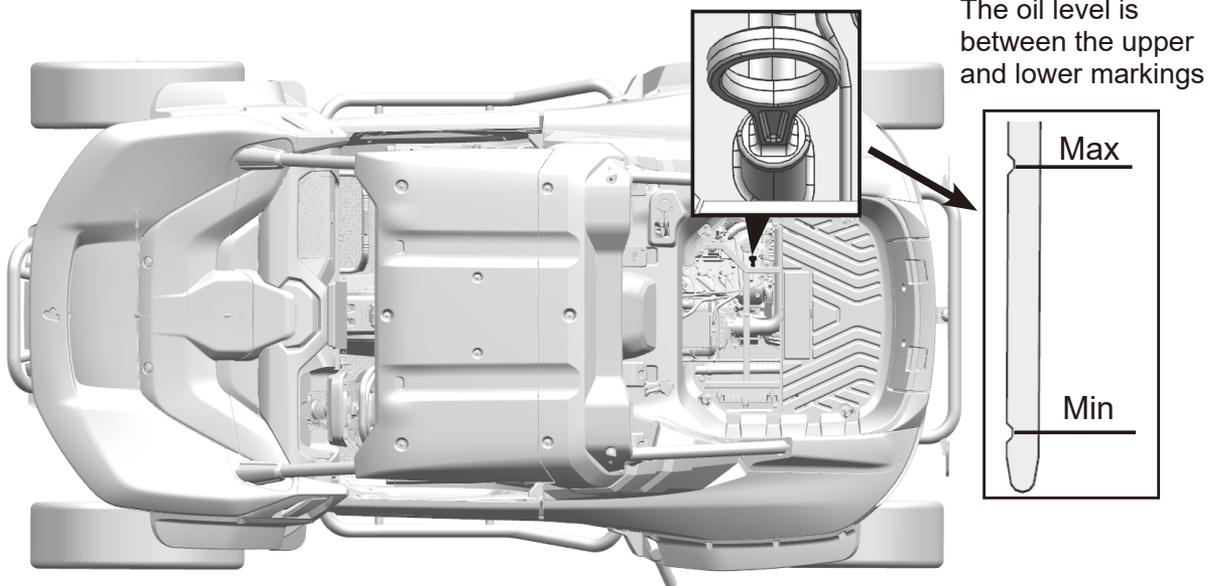
Make sure to perform proper maintenance at recommended intervals as indicated in the tables. Some items of the maintenance schedule must be performed in function of the calendar, regardless of the distance or time of operation.

ITEM	MAINTENANCE INTERVAL (WHICHEVER COMES FIRST)			REMARKS
	HOURS	CALENDAR	MILES (KM)	
▶ Brake pad wear	10 H	Monthly	100 (160)	Inspect periodically; replace as needed
Battery	20 H	Monthly	200 (320)	Check terminals; clean; test
▶ Air filter, main element	50H		500 (800)	Inspect; replace as needed; inspect frequently if subjected to severe use
▶ General lubrication	50 H	3 M	500 (800)	Lubricate all fittings, pivots, cables, etc.
Throttle Body Intake Duct	50 H	6 M	500 (800)	Inspect duct for proper sealing/air leaks
Front wheel belt	50 H	6 M	500 (800)	Check and, if necessary, replace
Cooling system	100 H	12 M	1000 (1600)	Inspect coolant strength seasonally; pressure test system yearly
▶ Engine oil change	100 H	12 M	1000 (1600)	Change the oil and filter
▶ Oil lines and fasteners	100 H	12 M	1000 (1600)	Inspect for leaks and loose fittings
▶ Front gearcase oil	100 H	12 M	1000 (1600)	Change fluid;
▶ Rear gearcase oil	100 H	12 M	1000 (1600)	Change fluid
Transmission self-learning			1000 (1600)	Execute transmission self-learning program
D Fuel system/filter	100 H	12 M	1000 (1600)	Cycle key to pressurize fuel pump; check for leaks at fill cap, fuel lines/rail and fuel pump; replace lines every two years
▶ Radiator (if applicable)	100 H	12 M	1000 (1600)	Inspect; clean external surfaces
▶ Cooling hoses (if applicable)	100 H	12 M	1000 (1600)	Inspect for leaks
▶ Engine mounts	100 H	12 M	1000 (1600)	Inspect
Exhaust muffler/pipe / Joints	100 H	12 M	1000 (1600)	Inspect; clean; replace worn parts
D Spark plug	100 H	12 M	1000 (1600)	Inspect; replace as needed
Spark arrester	100 H	12 M	1000 (1600)	Clean out
D Clutches (drive and driven)	100 H	12 M	1000 (1600)	Inspect; clean; replace worn parts
D Front wheel bearings	100 H	12 M	1000 (1600)	Inspect; replace as needed
D Brake fluid	200 H	24 M	2000(3200)	Change every two years
D Transmission fluid change		12 M	3100(5000)	Replace the fluid;
▶ Coolant		60 M		Replace coolant
D Valve clearance	500 H		5000(8000)	Inspect; adjust
Idle speed				Adjust as needed
D Toe adjustment				Inspect periodically; adjust when parts are replaced
Headlight aim				Adjust as needed

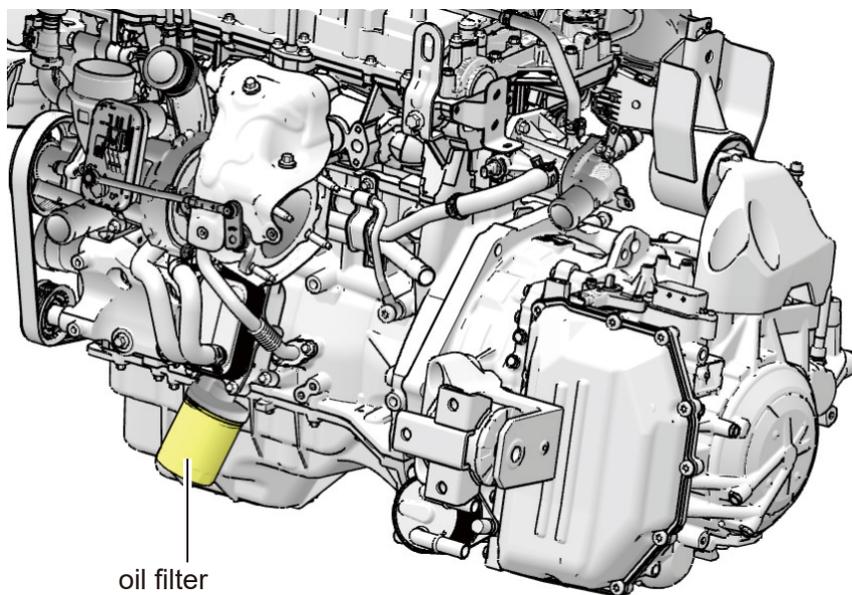
MAINTENANCE REFERENCE

Item	Recommended Model	Capacity	Inspection Method	Schedule
Engine	SN/GF-5, 5W-30 full season	5000 ml	Keep the oil level within a safe range	Refer to Maintenance Schedule

Engine oil inspection

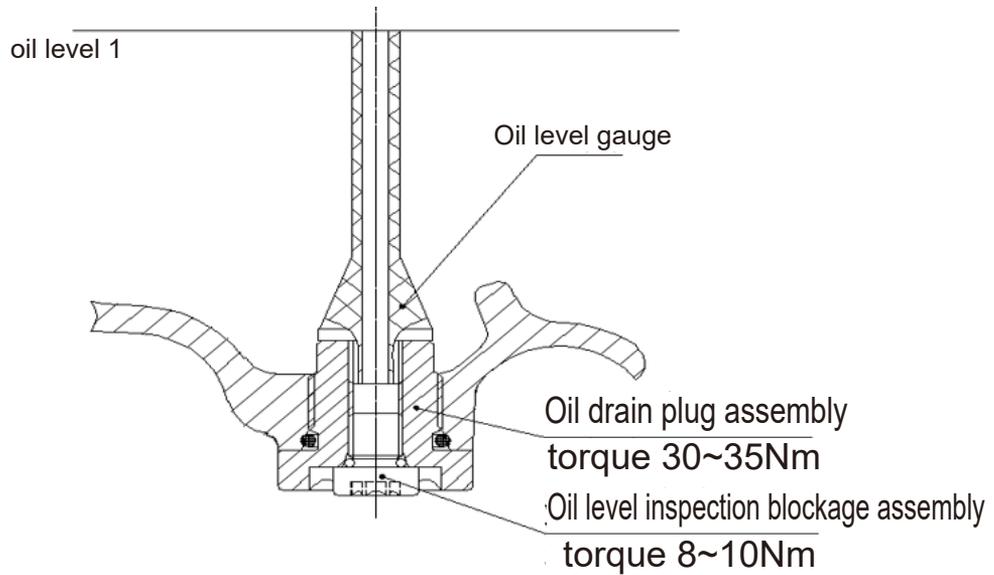


Oil filter replacement

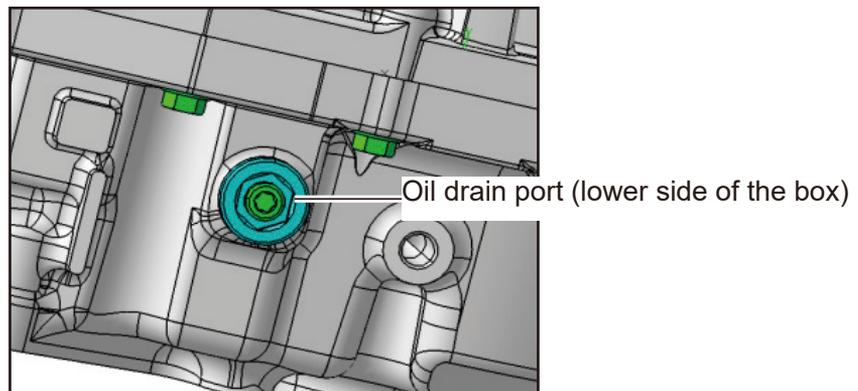
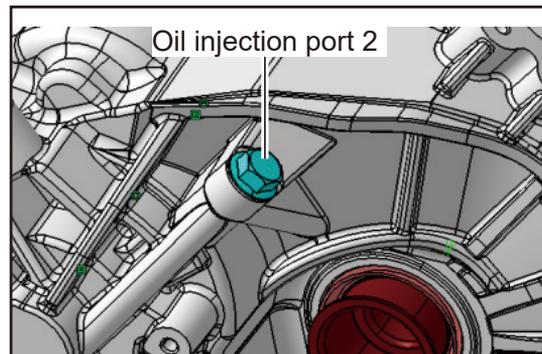
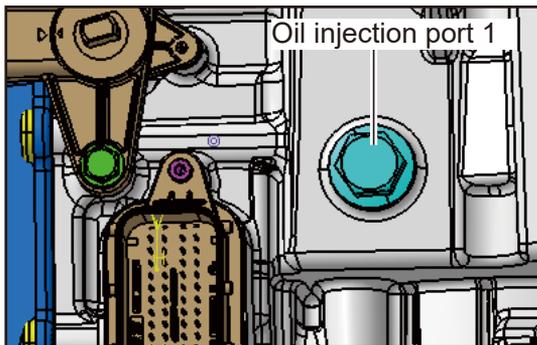


Item	Recommended Model	Capacity	Inspection Method	Schedule
Transmission oil	DAE ATF-1 or DAE ATF-2	4700mL	Page 2-22	1 year or 5000KM (Under harsh usage conditions, every 3000KM)

Transmission oil inspection

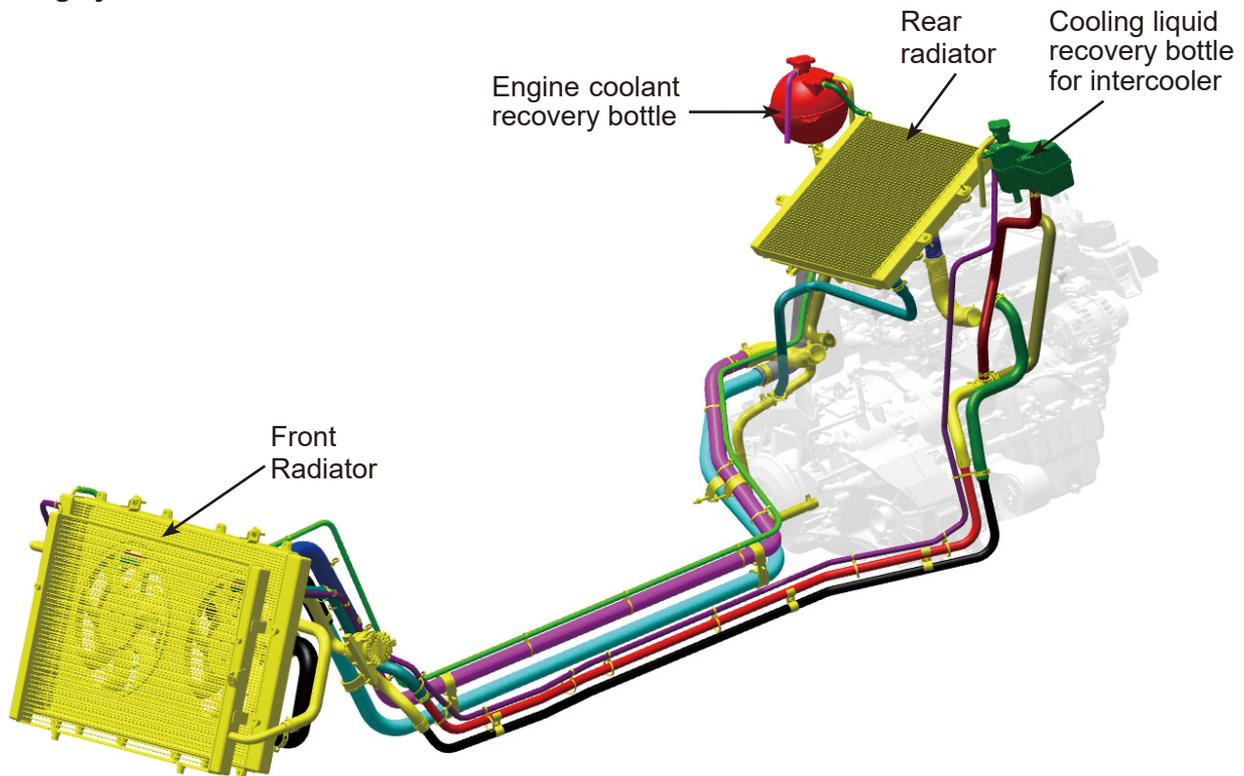


Transmission oil replacement

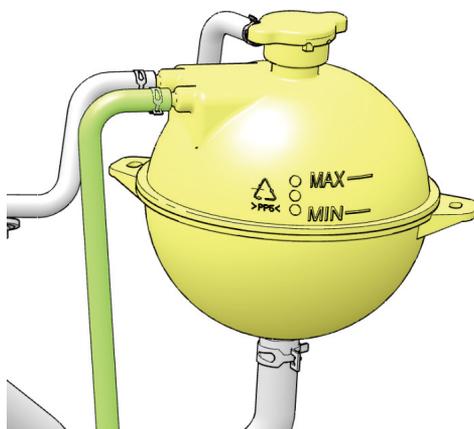


Item	Recommended Model	Capacity	Inspection Method	Schedule
Engine coolant	COOLELF ECO BS GR -35 °C green	15000 ml	Maintain the level between the filling lines	Refer to the maintenance schedule
Intercooler coolant	COOLELF ECO BS GR -35 °C green	4000 ml	Maintain the level between the filling lines	Refer to the maintenance schedule

Cooling system

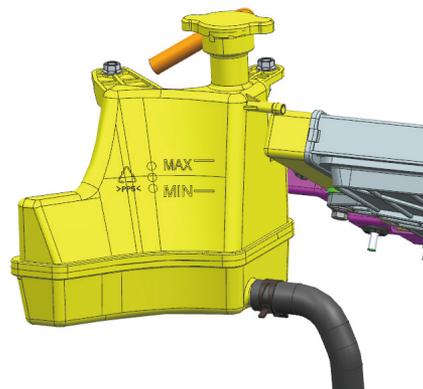


Engine coolant



Keep the coolant between the MAX and MIN markings on the coolant cup (when the fluid is cooled)

Intercooler coolant

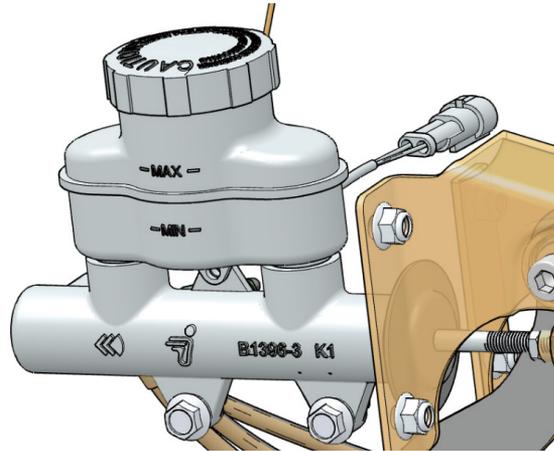


Keep the coolant between the MAX and MIN markings on the coolant cup (when the fluid is cooled)

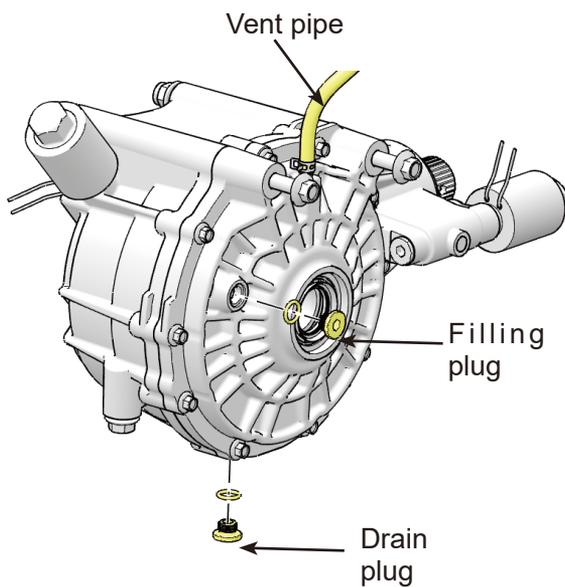
Item	Recommended Model	Capacity	Inspection Method	Schedule
brake fluid	MOTUL RBF 660 DOT4	—	Keep between the filling lines	Refer to the maintenance schedule
Front axle gear oil	SAE 75/80W-90 GL5	610 mL	—	Refer to the maintenance schedule
Rear axle gear oil	SAE 75/80W-90 GL5	520 mL	—	Refer to the maintenance schedule

brake fluid

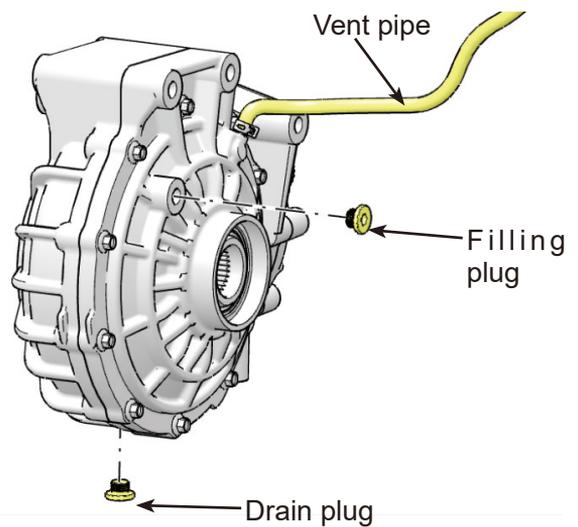
Keep the brake fluid between the MAX and MIN markings on the brake fluid cup



Front axle gear oil



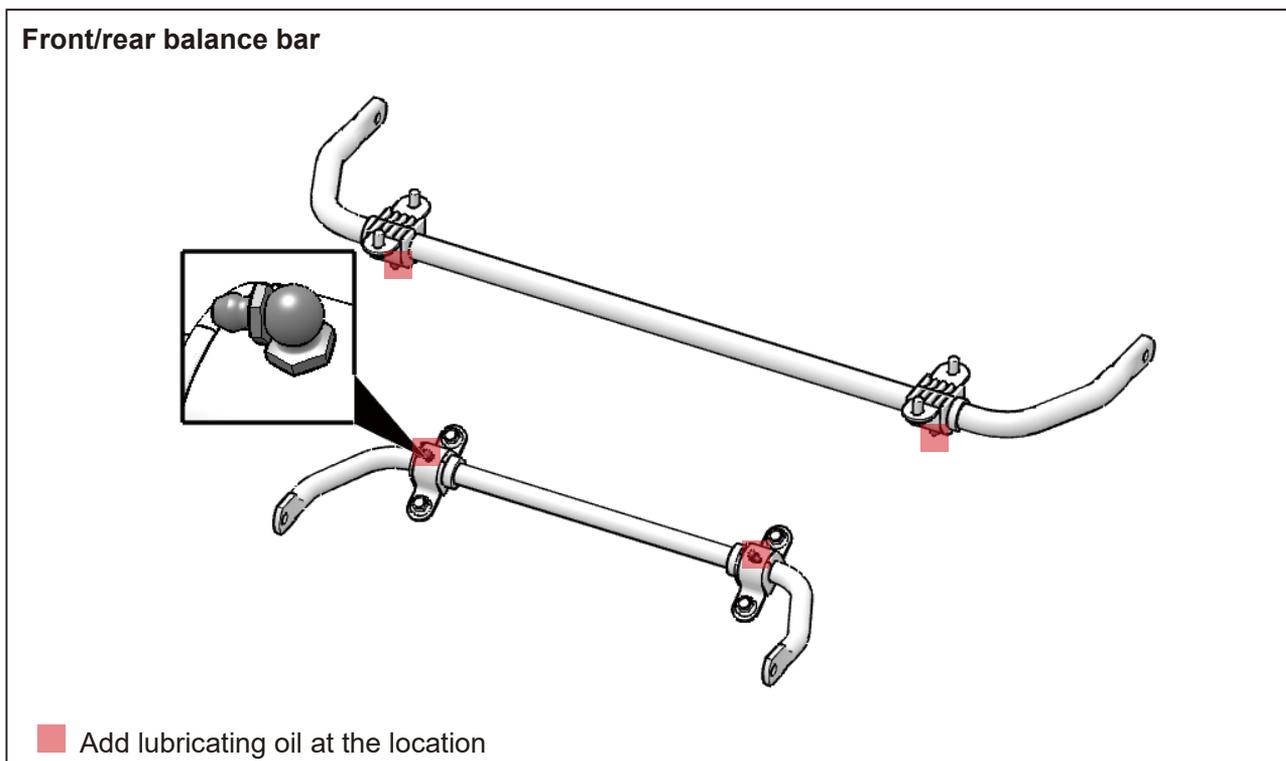
Rear axle gear oil



LUBRICATION POINT LUBRICATION

balance bars of the vehicle have fuel injectors. Regularly add lubricating oil to these parts and ensure that they are dry before filling.

Item	Recommended Model	Capacity	Inspection Method	Schedule
Front stabilizer bar	Semi synthetic waterproof lubricating grease	grease filing (maximum of 2 pumps)	grease filing (maximum of 2 pumps)	Every 1600 kilometers
Rear stabilizer bar	Semi synthetic waterproof lubricating grease	grease filing (maximum of 2 pumps)	grease filing (maximum of 2 pumps)	Every 1600 kilometers



GENERAL VEHICLE INSPECTION AND MAINTENANCE**PRE-RIDE / DAILY INSPECTION**

Perform the following pre-ride inspection daily, and when servicing the vehicle at each scheduled maintenance.

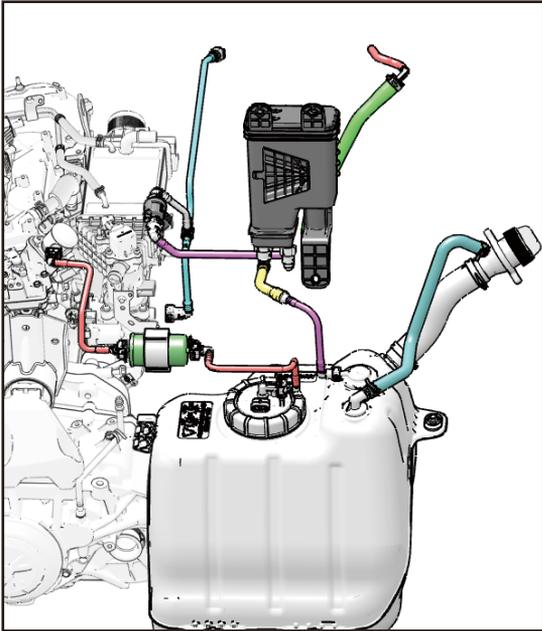
- ◆ Engine Oil - Check for proper level on dipstick located in oil tank (refer to “Engine Oil Level” procedure)
- ◆ Tires - check condition and pressures
- ◆ Fuel tank - fill to proper level
- ◆ All brakes - check operation and fluid level and adjustment (includes parking brake on INT’L Model)
- ◆ Throttle - check for free operation and closing
- ◆ Headlights/Taillights/Brakelights - also check operation of all indicator lights, instrument cluster and switches
- ◆ Ignition switch - check for proper function
- ◆ Wheels - check for tightness of wheel nuts and axle nuts. check to be sure axle nuts are secured by cotter pins
- ◆ Engine Intake Pre-Filter - Inspect pre-filter and clean with soapy water and compressed air if necessary
- ◆ Steering - check for free operation noting any unusual looseness in any area
- ◆ Loose parts - visually inspect vehicle for any damaged or loose nuts, bolts or fasteners
- ◆ Engine coolant - check for proper level at the recovery bottle
- ◆ Drive Shaft Boots - Inspect inner and outer boots for tears or damage on both front and rear drive shafts
- ◆ Check all front and rear suspension components for wear or damage.
- ◆ Frame, Nuts, Bolts, and Fasteners
- ◆ Periodically inspect the torque of all fasteners in accordance with the maintenance schedule. Check that all cotter pins are in place. Refer to specific fastener torques listed in each chapter.

FUEL SYSTEM AND INTAKE PORT

FUEL SYSTEM

⚠ WARNING

- ◆ Gasoline burns easily under certain conditions
- ◆ When dealing with these issues, you must be very careful with gasoline.
- ◆ When refueling, the engine must be turned off and must be done outdoors or in a well ventilated area.
- ◆ Smoking, open flames or sparks are prohibited during refueling or near gasoline storage.
- ◆ Do not overflow when refueling.
- ◆ If gasoline gets on your skin or clothes, immediately wash them with soap and water and change clothes.



FUEL FILTER

The problem of restricted fuel tank vents includes the following situations: fuel tank collapse, engine failure or delay, decreased engine performance, or high exhaust temperature.

【A】 Fuel filter

The fuel filter is located under the driver's seat and can be seen by removing the seat.

- ◆ Locate and inspect the inline filter. Pay attention to the direction of the "OUT" on the filter (if it has been removed).
- ◆ If there are visible debris in the filter, please replace it.

⚠ CAUTION

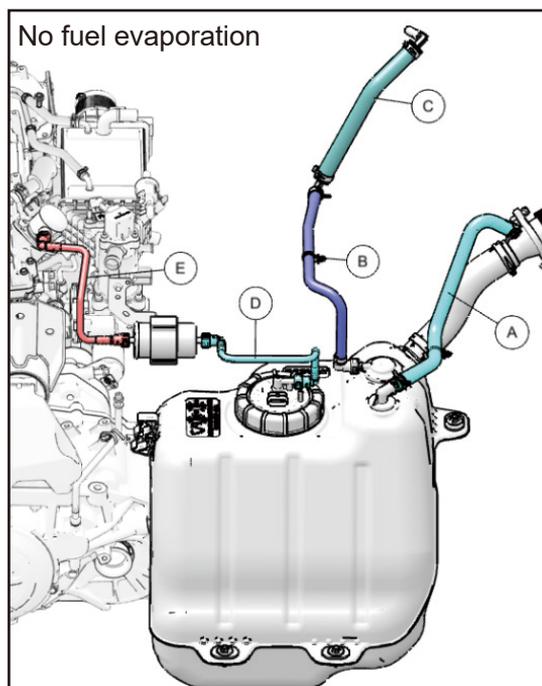
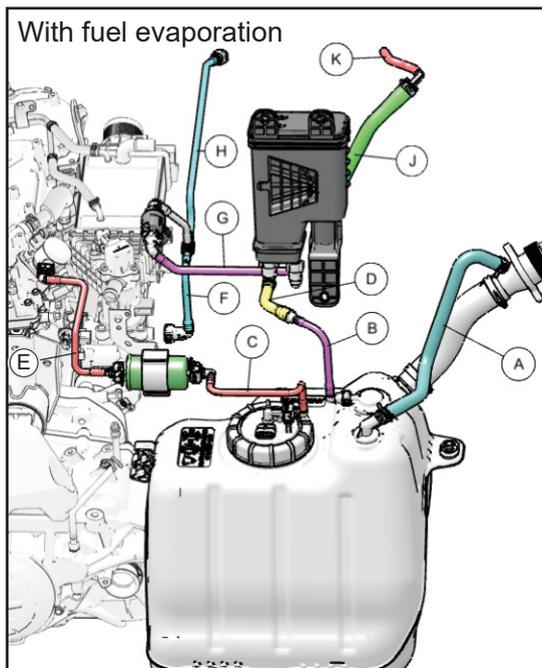
Be sure to install the filter in the direction shown in the diagram (see left figure)

- ◆ Check for signs of wear, cracks, or damage in the fuel tank vent pipe. If necessary, replace the vent pipe.
- ◆ Ensure proper arrangement of ventilation ducts and secure cable ties.

IMPORTANT

Ensure that the ventilation duct is not twisted or compressed.

FUEL LINE



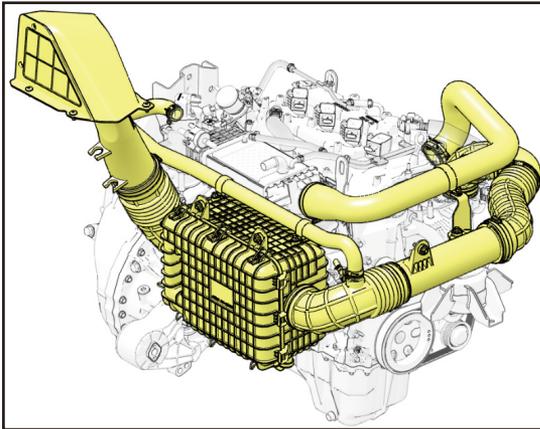
- 【A】 Fuel tank vent pipe
- 【B】 Front section of adsorption tube
- 【C】 Fuel pump end fuel pipe
- 【D】 Rear section of adsorption tube
- 【E】 Engine end fuel pipe
- 【F】 Bidirectional valve intake pipe
- 【G】 Carbon canister end detachment pipe
- 【H】 Throttle end intake pipe
- 【J】 Carbon canister vent pipe
- 【K】 Rear vent pipe

- ◆ Firstly, check if there is any leakage at the pipeline connection on the fuel tank, and inspect if the fuel pipeline connected to the fuel tank is worn, deteriorated, or damaged. Replace the fuel line if necessary.
- ◆ Find the high-pressure oil pipe [B] that connects the fuel pump and fuel filter under the driver's seat, and check the wiring and quick connect device for signs of malfunction, wear, deterioration, damage, or leakage. If necessary, please connect the pipeline for replacement.
- ◆ Find the high-pressure fuel pipe [C] located under the cargo box that connects the fuel filter to the engine, and check the wiring and quick connect device for signs of malfunction, wear, deterioration, damage, or leakage. If necessary, please connect the pipeline for replacement.
- ◆ Ensure the correct arrangement and fixation of fuel pipelines.

IMPORTANT

Ensure that the pipeline is not twisted or compressed.

- 【A】 Fuel tank vent pipe
- 【B】 Breathing valve airway
- 【C】 Connecting pipe
- 【D】 Fuel pump end fuel pipe assembly
- 【E】 Engine end oil pipe assembly



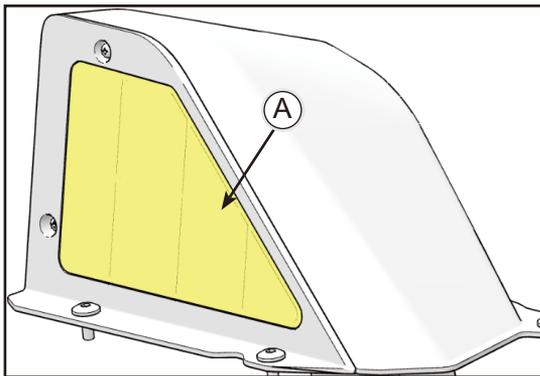
ENGINE INTAKE PRE FILTER MAINTENANCE

It is recommended to regularly check the engine intake primary filter, which should be checked according to the following procedure:

The engine intake primary filter is located on the left front of the rear cargo box, and can be seen by opening the filter cover.

【A】 Air filter inlet

- ◆ First, flip the cargo box open
- ◆ Clean the inlet cover of the air filter
- ◆ If it is necessary to replace the air filter intake cover with a new one



AIR FILTER

The air filter element is a paper air filter element. The air filter needs to be replaced after a period of use. Under extremely dusty conditions, air filters need to be replaced more frequently.

The air filter is located on the lower right side of the cargo box.

【A】 Air filter cover

【B】 Buckle

【C】 Air filter core

【D】 Leakage port of air filter

1. Press the buckle of the air filter cover and remove the air filter cover.

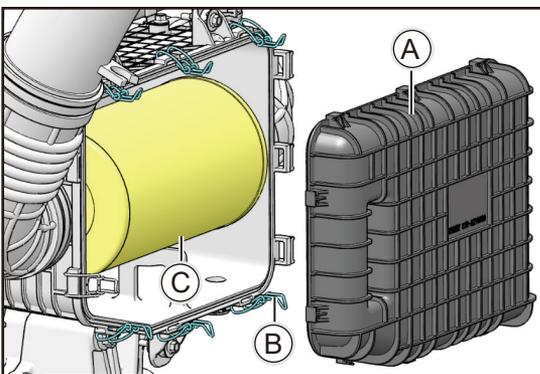
2. Remove the air filter core.

- ◆ Check whether the air filter element is blocked and damaged.
- ◆ Clean the dirt deposited on the filter element according to the following method.

Gently tap one side of the filter element.

Blow compressed air from the inside of the filter element.

- ◆ Scrape off the dirt inside the air filter.
- ◆ For gasoline vehicles, if the old filter element is reused, the oil contaminated part of the filter element should be located at the air inlet position during installation (to prevent oil contamination from spreading).

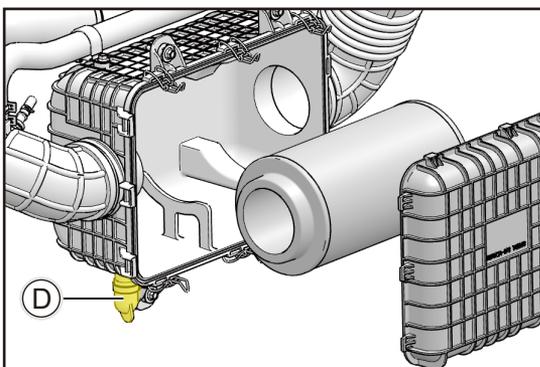


3. If there is filtered water inside the air filter, remove the leakage plug below the air filter, remove the accumulated water in the air filter, and clean the impurities inside the air filter.

4. Clean or replace the air filter according to its cleanliness level.

5. Install a new air filter.

6. Reinstall the air filter cover.

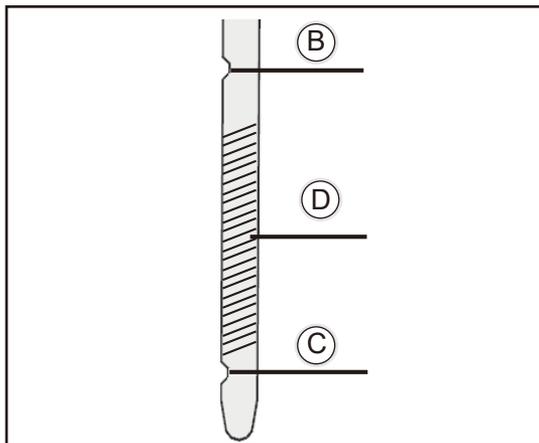
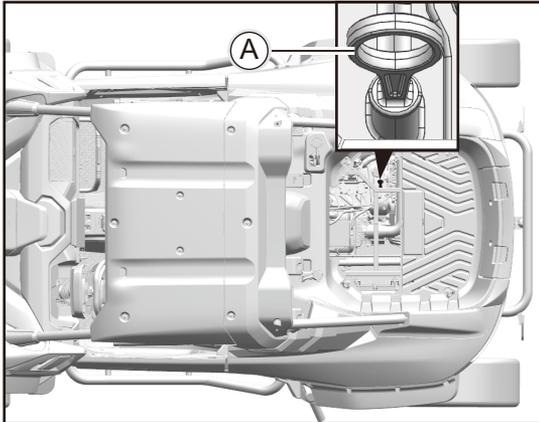


ENGINE

ENGINE OIL LEVEL

IMPORTANT

Running the engine with an incorrect oil level may result in severe engine damage.



- 【A】 Oil dipstick
- 【B】 Max line
- 【C】 Min line
- 【D】 Recommended oil level area

Remove the rear cargo box maintenance cover and place the oil dipstick below.

1. Park the vehicle on a level surface with the engine stopped.
2. Confirm that the vehicle is in a cold state.
3. Remove the dipstick and check if the oil level is between the MAX and MIN marks on the dipstick. Wipe the dipstick clean, then remove it and check the oil level.

The oil level check is shown in the following figure: the appropriate oil level is between the MAX and MIN positions. If the oil level is below MIN, it indicates that the oil level is too low. If it exceeds MAX, it indicates that the oil level is too full. Neither too low nor too full is suitable.

4. After cleaning the dipstick, pull it in again and tighten it.
5. If the oil level is close to or below the lower oil level mark, add an appropriate amount of engine oil.

ENGINE OIL CHANGE

It is essential to regularly replace the engine oil and filter. Listed in the regular maintenance table. Always replace the oil filter when changing the engine oil.

⚠ WARNING

When changing the oil, please replace the oil filter

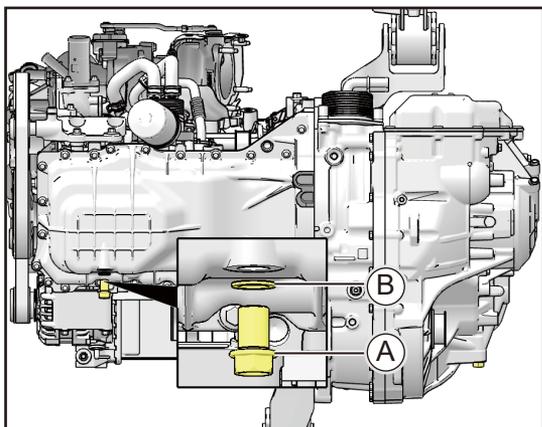
Perform the following procedure to change engine oil:

- 【A】 Oil pan drain plug
- 【B】 Oil drain bolt gasket
- 【C】 Oil injection cap

The oil drain plug for the engine oil pan is located at the bottom of the engine.

The engine filling port is located under the cargo box maintenance cover.

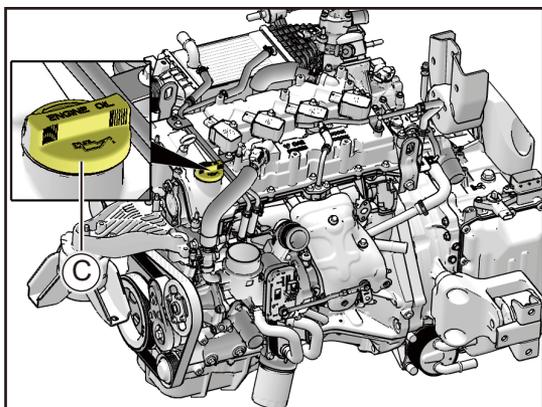
1. Remove the oil filler cap on the engine rocker arm chamber cover or the oil filler cap on the oil filler pipe.
2. Remove the oil pan drain plug from the engine oil pan and drain the oil.



⚠ WARNING

Hot oil can cause skin burns, keep it away from the skin.

3. Replace the gasket with a new oil drain bolt.
4. Tighten the drain plug of the oil pan.
5. Inject new engine oil into the crankcase through the oil injection port.
6. Pull out the oil dipstick from the engine and check if the oil level is between the MAX and MIN markings.
7. Install the oil filler cap.
8. Check the oil level after the road test



Oil pan drain plug torque

45 N.m (34 ft·lb)

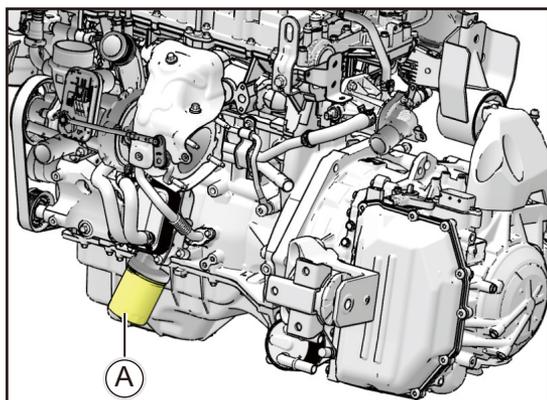
NOTE

Properly handle the discharged grease.

CHANGE OIL FILTER

IMPORTANT

Clean the filter screen every time the oil is changed



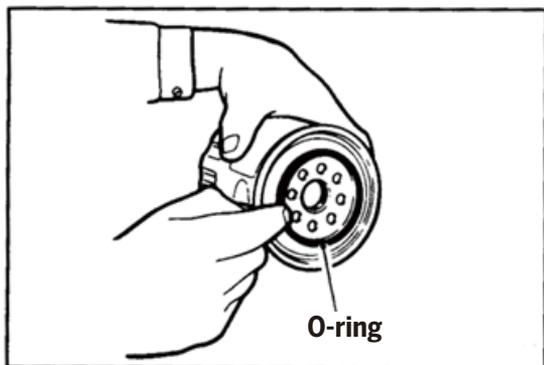
The oil filter is located on the inside of the left rear wheel of the vehicle. Refer to the fluid recommendations for capacity and torque. Change the oil every time the filter is changed.

【A】 Oil filter

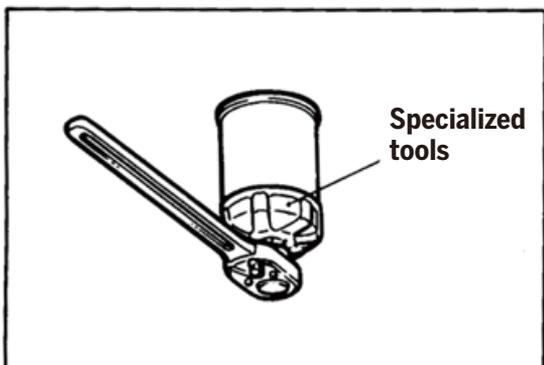
1. Start the engine and let it warm up until the engine coolant temperature reaches 80-90 °C.
2. Remove the oil filler cap on the engine rocker arm chamber cover or the oil filler cap on the oil filler pipe.
3. Remove the oil drain plug from the oil pan to drain the engine oil

⚠ WARNING

Hot oil can cause skin burns, keep it away from the skin.



4. Use the specialized tool shown in the table below to remove the engine oil filter.
5. Clean the installation surface on the side of the filter bracket.
6. Apply a small amount of engine oil on the O-ring of the oil filter.
7. When the O-ring of the oil filter comes into contact with the flange, please use the special tool shown in the diagram to tighten it to the specified torque.
8. Install the drain plug on the oil pan and inject oil from the oil inlet on the rocker arm chamber.
9. Run the engine at high speed 2-3 times, and then check that the installation surface of the filter is not permeable to oil.



Oil filter torque
30N.m

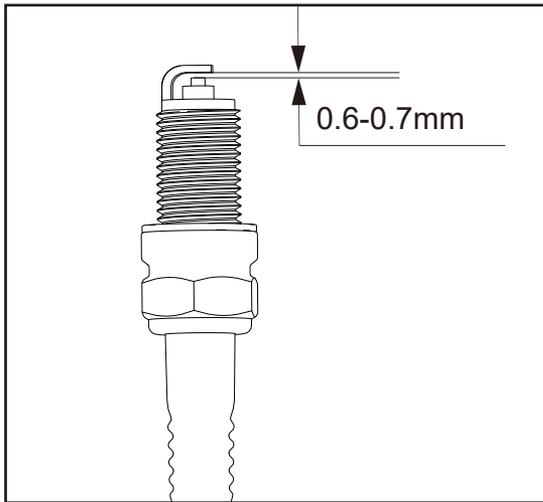
SPARK PLUG

Refer to the recommended spark plug types and clearance specifications. Spark plug torque specifications.

⚠ CAUTION

Using spark plugs that are not recommended can cause serious engine damage.

Always use recommended spark plugs or their equivalents. Replace all 4 spark plugs simultaneously during replacement

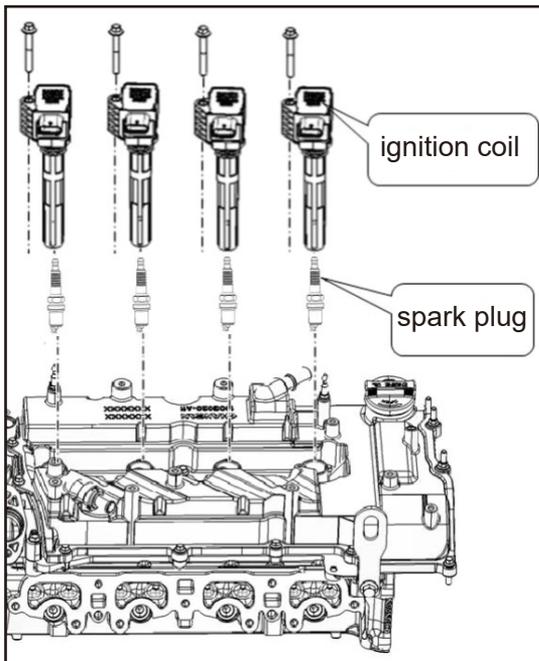


spark plugs	model number	spark plug gap	Spark Plug Torque
	SIFR6B7G	0.6-0.7mm	27.5±2.5 N.m

SPARK PLUG DISASSEMBLY

⚠ CAUTION

Hot exhaust systems and engines can cause burns. Wear protective gloves when disassembling spark plugs for inspection



The spark plug is located under the rear cargo box maintenance cover. First, remove the rear cargo box maintenance cover:

1. Disconnect the ignition coil connector.
2. Remove the fixing bolts of the ignition coil;
3. While pulling up the ignition coil, rotate it left and right to remove the ignition coil and gasket from the spark plug.
4. Use the spark plug wrench in the tool bag to rotate the spark plug counterclockwise and remove it.

SPARK PLUG INSPECTION

Initial gap between spark plug electrodes: 0.6-0.7mm.

Use a gap gauge to check if the electrode gap meets the specified range. If it is not within the specified range, replace the spark plug.

Whether there is carbon accumulation: If carbon is adsorbed on the spark plug, it can be idle for 5 minutes without load at 2000rpm to 2500rpm after the engine is warmed up.

If any of the following faults occur, the spark plug should be replaced.

- Ceramic body damage
- Electrode fracture

SPARK PLUG INSTALLATION

1. Before installation, ensure that the contact surface between the cylinder head and spark plug is free of dirt.
2. Screw the spark plug into the cylinder head by hand, and then tighten it with a torque wrench and a suitable socket.
3. Reinstall the ignition coil and connect the wire speed connector of the ignition coil

Spark plug torque

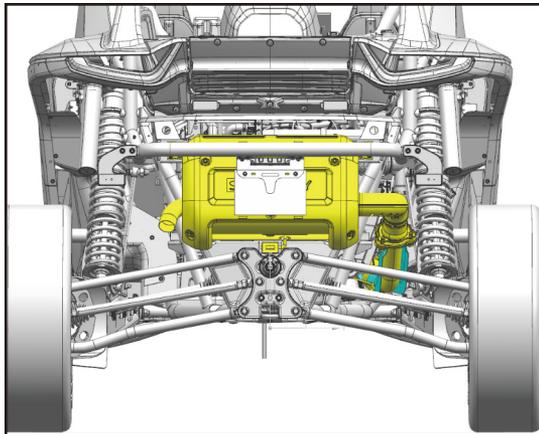
27.5 ± 2.5 N·m

Ignition coil fixing bolt

9 ± 1 N·m

SPARK ARRESTER

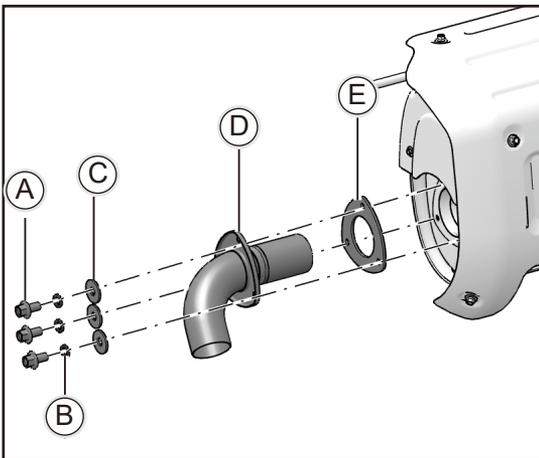
Spark eliminators prevent random sparks from entering other vehicle parts. Regular maintenance can prevent carbon accumulation, while delayed maintenance can reduce engine performance.



⚠ WARNING

- ◆ Ensure that the exhaust pipe is cooled. The engine has just stopped working and may burn the skin due to overheating of the exhaust pipe.
- ◆ To reduce the risk of fire and ensure that there are no combustible materials in the area during removal.
- ◆ It is recommended to use safety glasses in this program.

It is necessary to remove the scale in the exhaust pipe and conduct regular carbon emissions as follows:



- 【A】 Bolt M6 * 16 (3 pieces)
- 【B】 Bullet pads (3 pieces)
- 【C】 Flat washers (3 pieces)
- 【D】 Silencer spark eliminator
- 【E】 Gasket

Please cool down the engine and exhaust pipe first.

1. Remove 3 M8*16 bolts, spring washers, and flat washers, and remove the spark arrester and graphite washer.
2. Clean the spark arrester with soap and water, and if necessary, use a wire brush to remove all coal slag (it should be cleaned every 100 hours).
3. If the filter screen of the spark arrester is damaged, a new spark arrester must be provided by Segway.
4. Reinstall the graphite gasket spark arrester according to the reverse procedure of disassembly, and tighten the fixing screws.

Torque for tightening bolts

11N.m

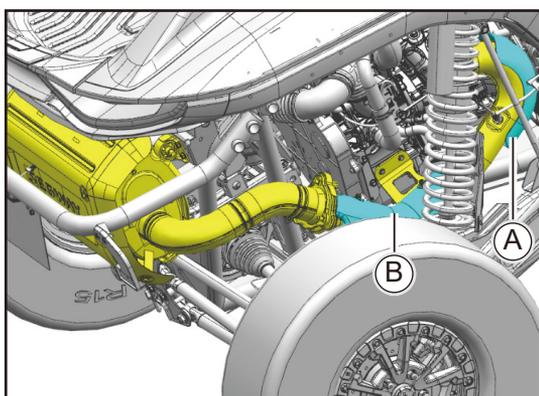
NOTE

If the gasket is damaged, replace it with a new gasket, which must be provided by Segway.

INSPECTION OF EXHAUST INSULATION PANEL

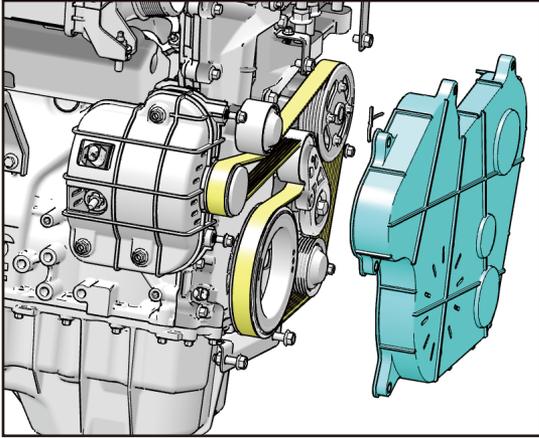
IMPORTANT

Check the exhaust heat shield to ensure it is in good condition and secured.



- 【A】 Front heat shield of exhaust pipe
- 【B】 Mid heat shield of the exhaust pipe

FRONT PULLEY SYSTEM

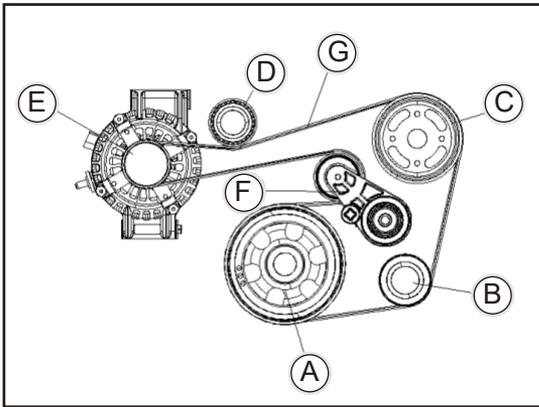


Disassemble

1. Remove the front pulley system cover.
2. Use a tool to turn the front tensioning pulley assembly counterclockwise.
3. Remove the belt and slowly loosen the tensioner.
4. Disassemble the front wheel system tensioner assembly, front pulley system slot idler assembly, water pump pulley, front wheel system idler assembly, integral AC generator assembly, and crankshaft torsion damper assembly in order.
5. Check whether each accessory pulley rotates flexibly, whether it is contaminated by oil, mud, etc., and whether there are any cracks or damages in the pulley wedge groove. If there are any abnormal situations, replace them.

Install

- 【A】 Crankshaft damping pulley assembly
- 【B】 Front idle pulley
- 【C】 Water pump pulley
- 【D】 Front idler assembly
- 【E】 Integrated AC generator assembly
- 【F】 Front tensioning wheel assembly
- 【G】 Belt



1. Install the crankshaft torsion damper assembly, integral AC generator assembly, front wheel system idler assembly, water pump pulley, front wheel system slot idler assembly, and front wheel system tensioner assembly in the corresponding positions of the engine in sequence, and tighten the bolts to the specified torque.

⚠ CAUTION

The crankshaft pulley combination bolt can only be reused once, and must be replaced after the second disassembly

2. As shown in the above figure, wrap the belt around the front wheel system side, use a tool to turn the front wheel system tensioner assembly counterclockwise, insert the belt, and slowly release the tensioner.

TENSION INSPECTION OF TRANSMISSION BELT

⚠ WARNING

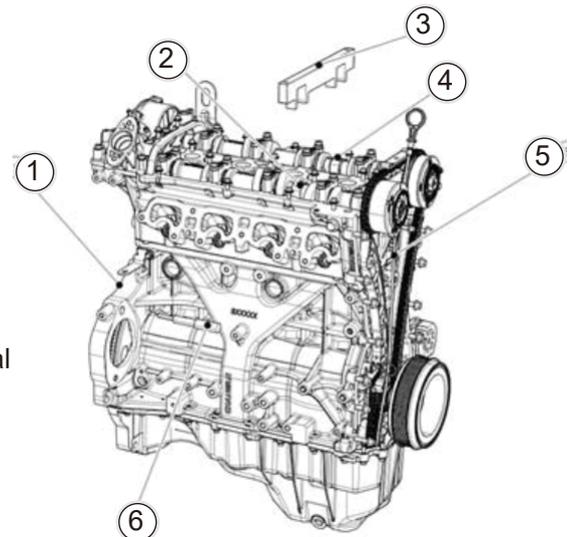
Before checking and adjusting the belt tension, disconnect the negative wire.

Read the "Warning" content of the cooling system.

1. Check the belt for cracks, cuts, deformations, wear, and dirt. If the belt needs to be replaced.
2. Check the belt tension. If the front wheel system belt is too loose, it will affect the generator voltage and cause overheating and early wear of the belt.
3. Connect the negative wire to the battery terminal.
4. Check if the belt is fully fitted into the wedge groove. If there is any abnormality, remove the belt and repeat step 2 for installation. Reinstall the front wheel system cover

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

- ① Rear end of engine
- ② Camshaft timing marks
- ③ Camshaft Timing Tooling
- ④ Camshaft timing marks
- ⑤ Front end of engine
- ⑥ Crankshaft Timing Tooling

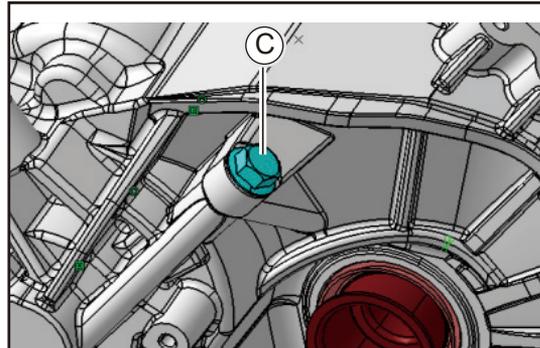
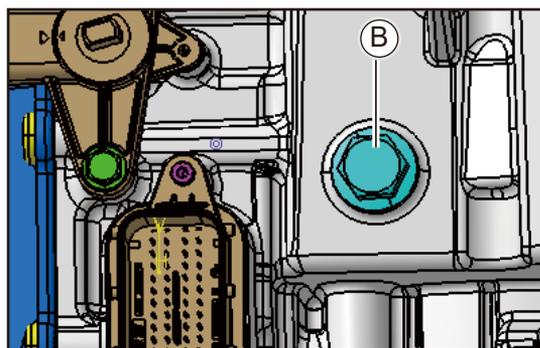
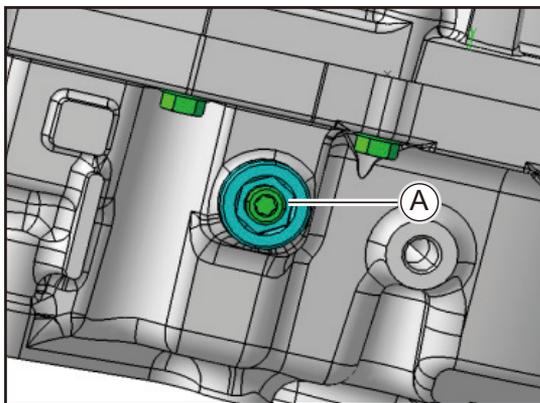
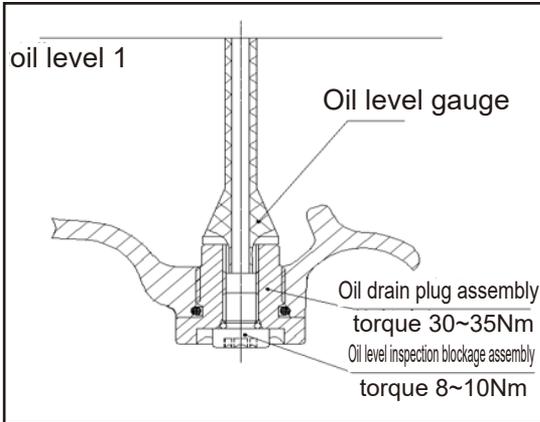


1. Disconnect the negative wire of the battery.
2. Remove the cylinder head cover.
3. Rotate the crankshaft clockwise to make the hexagonal markings on the two camshafts horizontal upwards. At the same time, align the positioning holes on the flywheel with the positioning pin holes on the cylinder block, and fix the camshaft and crankshaft with a special timing fixture. Measure the clearance between the intake valves of cylinders 1 and 2, as well as the clearance between the exhaust valves of cylinders 1 and 3, using a feeler gauge in sequence.
4. Rotate the crankshaft clockwise to make the hexagonal markings on the two camshafts horizontal downwards. At the same time, align the positioning holes on the flywheel with the positioning pin holes on the cylinder block, and use a special timing fixture to fix the camshaft and crankshaft. Measure the clearance between the intake valves of cylinders 3 and 4, as well as the clearance between the exhaust valves of cylinders 2 and 4, using a feeler gauge in sequence.
5. If the valve clearance exceeds the standard, the corresponding valve tappet should be replaced according to the clearance value to adjust the valve clearance, and then checked again to ensure that the valve clearance is within the specified standard. Tightening torque: $12 \pm 2 \text{ N} \cdot \text{m}$
6. After the inspection and adjustment of all valves are completed, install them in the reverse order of disassembly

TIMING MECHANISM INSPECTION

1. Remove the engine cylinder head cover, turn the crankshaft clockwise, and use the timing fixture card and timing pin to check if the timing position of the engine timing mechanism is aligned.
2. Check the timing chain assembly, timing chain fixed rail assembly, and timing chain moving rail assembly for wear and cracks, and replace them if necessary.
3. Check the timing chain tensioner assembly for any jamming, and replace it if necessary.

TRANSMISSION BOX



TRANSMISSION OIL LEVEL INSPECTION

1. Conduct an oil level check on a level road surface with a lift, trench, or equivalent inspection conditions;
2. Check that the gear inside the cab is in P or N, the vehicle is ignited, and the transmission is idling;
3. Switch the gear shift lever in the "P", "R", "N", and "D" positions in a cyclic sequence three times, stop at each position for 5-10 seconds, and finally return to the "N" position for normal operation (ensure that the transmission sensor oil temperature is between 40-50 °C, which can be read by a diagnostic tool).
4. Open the oil level inspection plug assembly to check the oil level:

① If there is ATF oil flowing out at this time, let the ATF oil flow naturally until it stops, tighten the oil level check plug assembly.

② If there is no ATF oil flowing out, it is necessary to add ATF oil until there is oil flowing out of the oil level check plug assembly, then tighten the oil drain screw plug assembly, add 0.2L ATF oil, complete the oil injection, and repeat the process of ①.

TRANSMISSION OIL REPLACEMENT

- 【A】 Oil drain port (lower side of the box)
- 【B】 Oil injection port 1
- 【C】 Oil injection port 2

1. The oil level check screw plug subassembly and oil drain screw plug subassembly shall be removed, and the residual oil shall be discharged on the level road at the place meeting the oil change conditions.
2. Tighten the oil drain plug assembly, inject oil from the oil injection hole until ATF oil flows out (refer to the refueling amount of 4.7L), and tighten the oil level check plug assembly.
3. Conduct an oil level check

⚠ CAUTION

When the theoretical total amount of ATF oil has been filled inside the transmission, there is no need for initial filling, and the oil level inspection can be directly carried out using 1-4 items in the transmission oil level inspection.

Oil injection port 1 screw plug torque

25~30Nm

Oil injection port 2 screw plug torque

38~46Nm

TRANSMISSION SELF-LEARNING PROGRAM

The main purpose of gearbox self-learning is to correct hardware differences and wear through self-learning, and improve the driving experience. Through self-learning functions, the gearbox can adapt to these hardware differences and optimize shifting strategies by analyzing shifting data, thereby improving driving smoothness and comfort.

In order to provide you with a more comfortable driving experience, the vehicle needs to undergo self-learning of the gearbox after every 1600 kilometers of driving.

Perform the following program for self-learning operations:

1. Study condition

The whole vehicle has completed the inspection and there is no TCU, ECU fault code, the vehicle is in Normal mode.

The transmission oil temperature in the "Vehicle Status" of the center control screen is between 40°C and 100°C.

Recommended for flat and straight sections of road, but also test chassis and loop flat roads.

Complete a self-learning session after each service on a new vehicle, a new transmission (or a 3-minute power-down after a transmission program update), and the entire vehicle.

2. Self-learning shift

Idle in N, apply brakes deeply, put in D, shift to N after 3 seconds, release brakes after 3 seconds. Repeat 4 more times.

Idle in N, press the brake deeply, put it in R, shift to N after 3 seconds, release the brake after 3 seconds. Repeat 4 more times.

3. Start self-study

Hang the D gear to start, when the car speed 5km/h, light brake to deep brake stop. Cycle 4 times.

Starting in R gear, speed 5km/h, light brake to deep brake stop. Cycle 4 times.

4. Self-learning for up and down gears

Smooth start in D. t 10km/h, step on about 1/4 throttle and hold throttle, move up to 5th gear and release throttle, coast without brake to D1. repeat 4 more times.

Start smoothly in D. When the vehicle speed is 10km/h, step on about 1/2 throttle and keep the throttle, then release the throttle after upgrading to 7th gear and coast to D1 without brake. repeat 4 times.

If the throttle opening is not easy to grasp, you can check the "vehicle status" in the center control screen.

If you can't go up to the target gear, you can slow down the accelerator. If the coasting distance is limited, brake lightly in the second half of the coasting.

NOTICE

If maintaining the precise throttle percentage is difficult, you can monitor the Throttle Position parameter in the center console's "Vehicle Status" display.

If unable to reach the target gear (5th or 7th): Apply throttle more gradually.

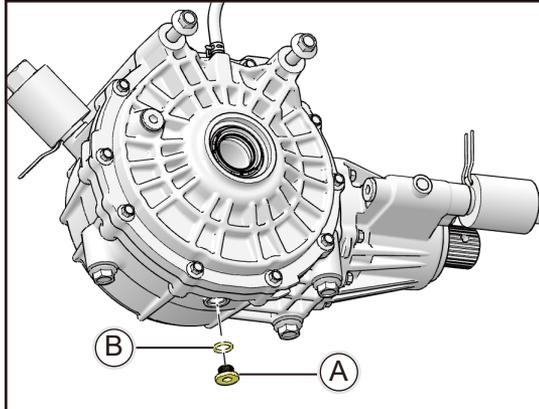
If insufficient space for coast-down: During the latter part of the coasting phase, you may apply light braking to bring the vehicle to a stop sooner. However, allow downshifting through as many gears as possible before braking.

FRONT AND REAR AXLES

FRONT GEARBOX OIL DISCHARGE

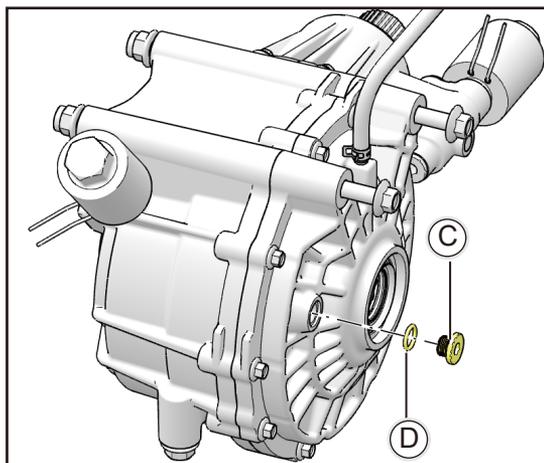
The oil drain plug of the front gearbox is located at the bottom of the front gearbox.

- 【A】 Oil drain plug
- 【B】 O-ring



- ◆ Place a container under the oil drain plug of the front gearbox to collect the discharged waste oil.
- ◆ Place the vehicle on a level surface
- ◆ Remove the oil drain plug and O-ring.
- ◆ After the gear oil is drained, clean and install the drain plug, and install a new O-ring. Torque reaches the required value:

Drain plug torque
16-20N.m(1.6-2.0 kgf·m, 11.8-14.8ft·lb)



ADDING GEAR OIL TO THE FRONT GEARBOX

The fuel plug for the front gearbox is located on the right side of the front gearbox and can be accessed through the right front wheel side.

- 【C】 Inject plug
- 【D】 O-ring

1. Disassemble the injection plug and O-ring.
2. Add an appropriate amount of recommended liquid

Gear oil model:

SAE 80W-90 GL5

Gear oil capacity:

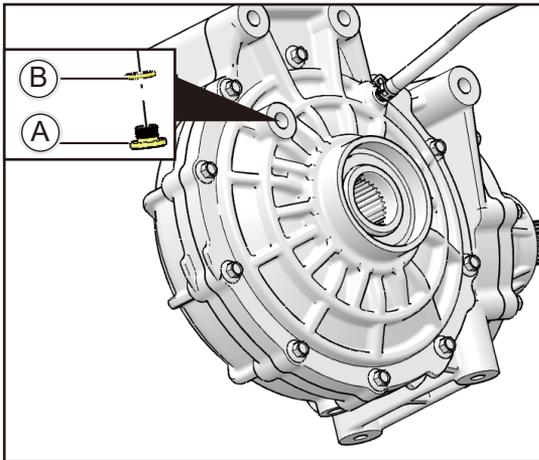
610 mL

3. Reinstall the injection plug. Tighten to the required torque value.

Filling plug torque
16-20N.m(1.6-2.0 kgf·m, 11.8-14.8ft·lb)

4. Check for leaks.
5. Dispose of the discharged waste oil reasonably according to local requirements.

REAR GEARBOX OIL DISCHARGE



The oil drain plug of the rear gearbox is located at the bottom of the rear gearbox.

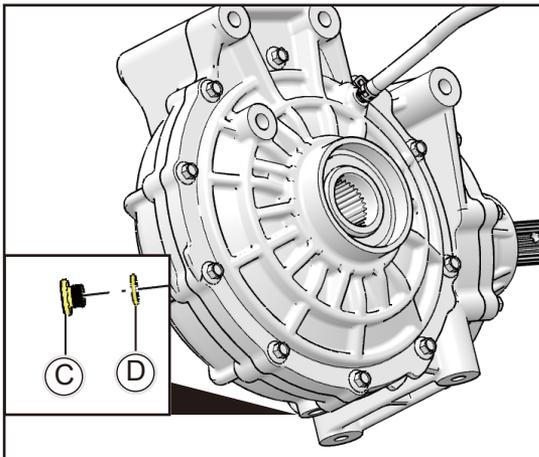
【A】 Oil drain plug

【B】 O-ring

- ◆ Place a container under the oil drain plug of the rear gearbox to collect the discharged waste oil.
- ◆ Place the vehicle on a level surface
- ◆ Remove the oil drain plug and O-ring from the rear gearbox.
- ◆ After the gear oil is drained, clean and install the drain plug, and install a new O-ring. Torque reaches the required value:

Drain plug torque

16-20N.m(1.6-2.0 kgf·m, 11.8-14.8ft·lb)



FILLING OF GEAR OIL FOR REAR GEARBOX

The fuel plug for the rear gearbox is located behind the rear gearbox.

【C】 Inject plug

【D】 O-ring

1. Disassemble the injection plug and O-ring.
2. Add an appropriate amount of recommended gear oil.

Gear oil model:

SAE 80W-90 GL5

Gear oil capacity:

520 mL

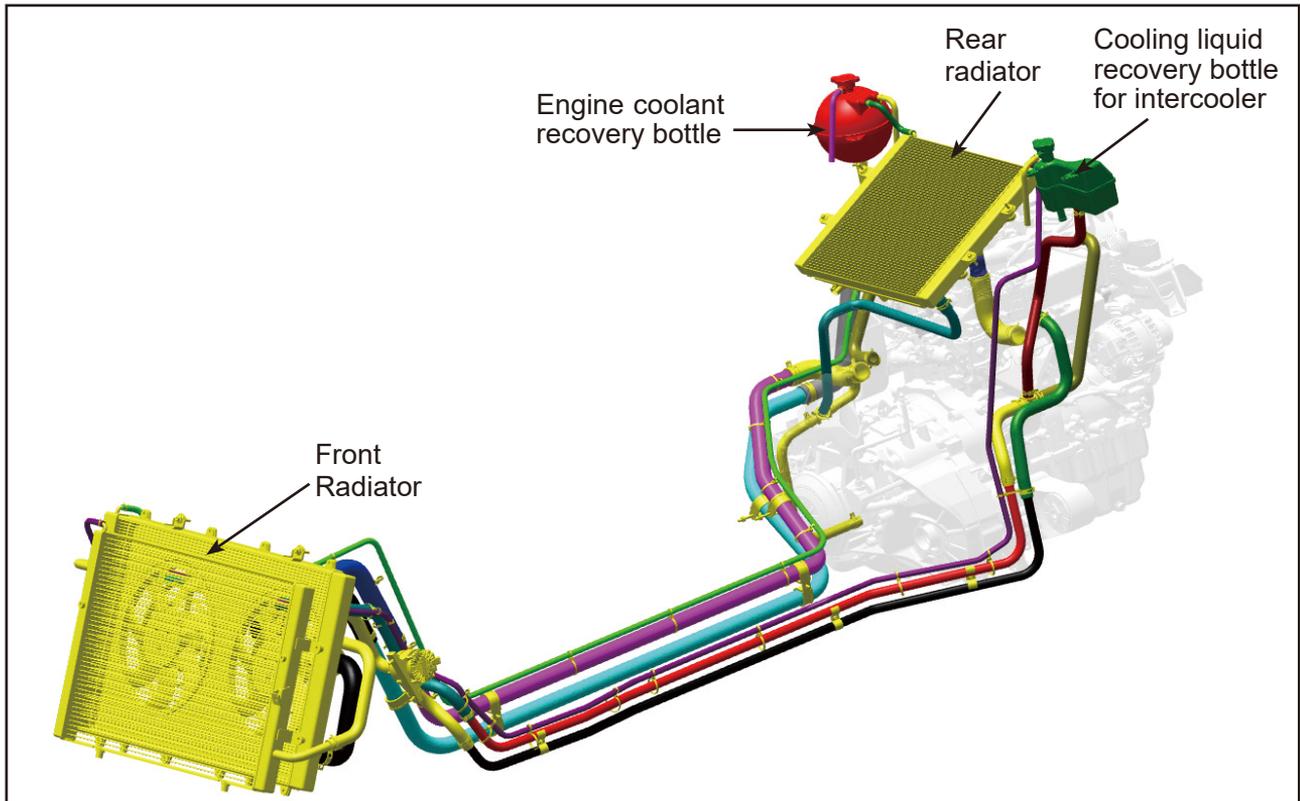
3. Reinstall the injection plug. Tighten to the required torque value.

Filling plug torque

16-20N.m(1.6-2.0 kgf·m, 11.8-14.8ft·lb)

4. Check for leaks.
5. Dispose of the discharged waste oil reasonably according to local requirements.

COOLING SYSTEM



⚠ WARNING

It is normal for the coolant level of a new car to drop because the system is clearing the air from the machine. Regularly observe the coolant level during the break in period.

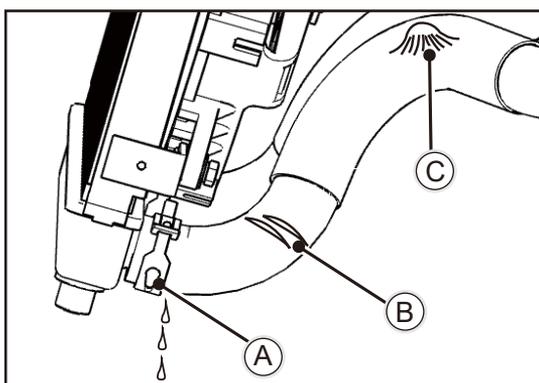
If the air is not completely expelled from the cooling system, the engine may overheat.

COOLING SYSTEM HOSE

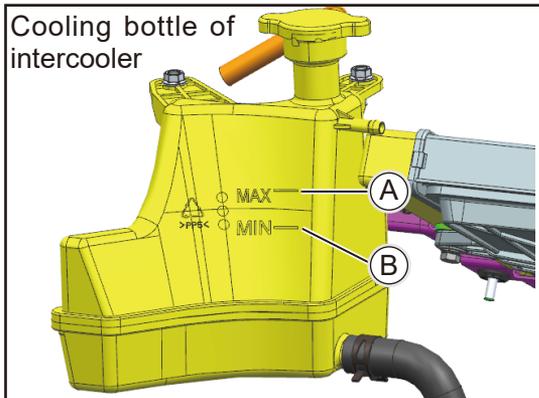
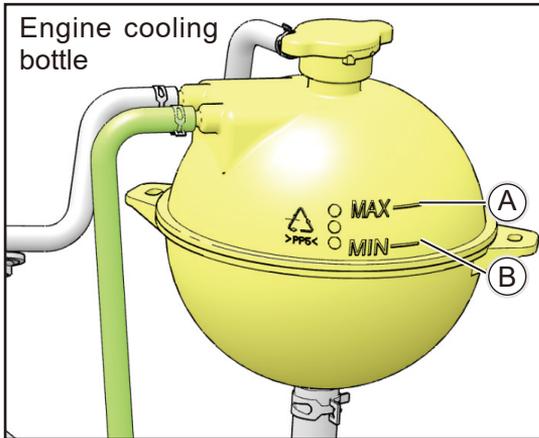
The high pressure inside the radiator hose can cause coolant leakage [A] or hose rupture (if the pipeline is not connected). Proper maintenance is necessary. Visually inspect the hose for any signs of deterioration. Squeeze the hose. Hoses should not be hard or brittle, nor should they be soft or swollen.

If there is wear, cracks [B] or bulging, replacing the hose [C] should be noticed.

Check if the hose is securely connected and the clamp is tightened correctly.



- ◆ Check all hoses of the vehicle for cracks, deterioration, wear, or leaks. Replace if necessary.
- ◆ Check the sealing and fixing of all hose clamps. Replace if necessary.
- ◆ Check all engine hoses for cracks, deterioration, wear, or leaks. Replace if necessary.
- ◆ Check the sealing and fixing of all hose clamps. Replace if necessary.



COOLING BOTTLE COOLANT

The engine coolant bottle and intercooler coolant are located on the left and right sides of the front of the cargo box.

- ◆ If the liquid level is low, add coolant. Keep the coolant level at the minimum and maximum markings on the bottle (liquid cooling).

【A】 MAX maximum

【B】 MIN minimum

- ◆ Remove the lid and pour in new coolant. Observe the position of the coolant during pouring and do not exceed the highest liquid level;

- ◆ Reinstall the cover

RADIATOR COOLANT

To ensure that the coolant maintains its ability to protect the engine, we recommend that the system be completely emptied every five (5) years and new antifreeze 50/50 premix be added.

⚠ CAUTION

Steam overflow can burn the skin. Do not remove the pressure cap when the engine is warm. Before disassembling the pressure cap, the engine must be allowed to cool down.

When any cooling system fluid is discharged for maintenance or repair, replace the coolant with a fresh 50/50 antifreeze premix. If the recycling bottle has dried up, check the liquid level in the radiator. Add coolant as needed.

REPLACE THE ENGINE COOLANT

1. Stop the engine after fully preheating it.
2. Add the detergent used to clean the engine cooling system into the engine coolant and start the engine.
3. After the engine has cooled down, remove the water storage cap. Press down and slowly rotate the water storage bottle cap counterclockwise until it reaches the first locking position. Slowly release the water storage bottle cap and remove it after the pressure is released.
4. After opening the water storage bottle cap, unscrew the drain valve and empty the coolant from the system.
5. Tighten the drain valve. Fill the system with water and run the engine until the upper hose of the radiator becomes hot and hard.
6. Repeat steps (3), (4), and (5) several times until the discharged liquid is close to colorless.
7. Drain the cooling system and tighten the radiator drain plug.
8. Disassemble the water storage bottle, remove the water storage bottle, pour out the liquid, clean the inside of the water storage bottle with soapy water, rinse thoroughly with clean water, drain, and install the water storage bottle and hose. Open the cap of the water storage bottle and fill it with coolant up to the MAX line.

⚠ CAUTION

Do not use alcohol or methanol antifreeze, and do not use engine coolant mixed with alcohol or methanol antifreeze. Using incorrect antifreeze may cause corrosion of aluminum parts

9. When the vehicle is idling, pay attention to the changes in the coolant level in the water storage bottle during the process. After the liquid level drops, replenish the coolant at any time. Tighten the water storage bottle cap, then run the engine at 2500 rpm to 3000 rpm until the fan runs, and then return to idle for 1 minute before turning off the vehicle. After the engine cools down, check if the coolant level has dropped. If it has, repeat the process several times until the coolant level in the reservoir no longer drops

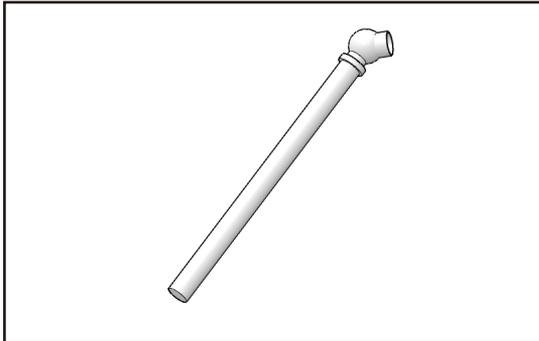
⚠ CAUTION

Do not open the coolant tank cap or radiator cap when the engine is hot. The cooling system in a hot state has a certain pressure, and if the lid is opened, hot coolant will spray out, which may burn people around it

WHEELS AND TIRES

TIRE PRESSURE CHECK

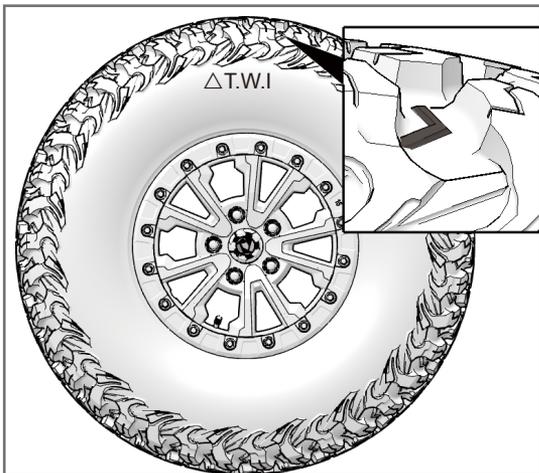
When checking tire pressure, please follow the following steps



Tire Pressure	front wheel	rear wheel
	22.0 psi (150 kPa)	22.0 psi (150 kPa)

Guidelines for Checking Tire Pressure: When checking tire pressure, please follow the following steps:

- ◆ Inspection can only be carried out after the tires have cooled down.
- ◆ If the vehicle has been parked for at least 3 hours or has not traveled more than 1.5 kilometers, an accurate reading of the cold tire inflation pressure can be obtained by checking at this time.
- ◆ Use the tire pressure gauge in the vehicle tool kit to check the tire pressure.
- ◆ It is normal for the tire pressure to increase after driving, do not lower the tire pressure.



TIRE TREAD DEPTH

Observe the tire shoulder and find the tire wear limit warning mark "T.W.I.",

Following the triangular symbol mark, it was found that the tire tread had corresponding protrusions. When the convex surface of the tread block wears to the raised position, the tire should be replaced, otherwise it may burst halfway due to insufficient strength.

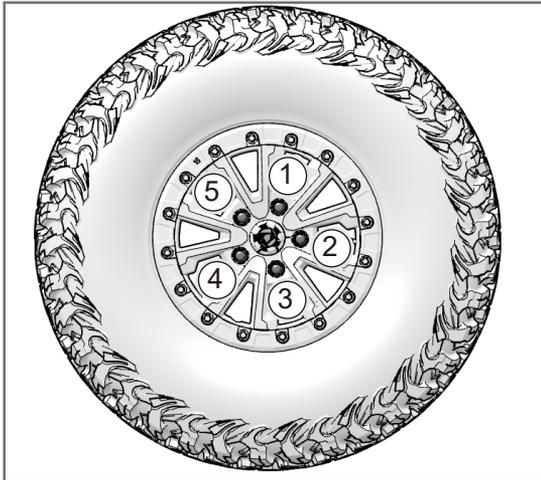
⚠ WARNING

Operating with worn tires increases the likelihood of vehicle slippage and may result in loss of control. Worn tires may cause accidents. When the tire tread wear reaches its limit, it is necessary to replace the tire

DISMANTLING OF WHEEL COMPONENTS

1. Stop the engine.
2. Place the gear shift in the (P) position.
3. Lock the parking brake.
4. Use the first tool to loosen the 5 wheel hub installation nuts, but do not remove them.
5. Lift the side of the vehicle by placing a suitable bracket under the tripod frame.
6. Loosen the wheel hub mounting nut.
7. Remove the entire wheel.

WHEEL INSTALLATION



1. First, place the tire in the installation position and tighten the 5 hub installation nuts onto the hub bolts in sequence.
2. Use tools to pre tighten the bolts diagonally.
3. Tighten to the specified torque with a torque wrench

Wheel hub installation nut
120-130N.m

⚠ CAUTION

Prohibit the use of tires with sizes different from those provided at the factory. Changing the transmission ratio may result in damage to the gearbox.

⚠ CAUTION

Do not lubricate bolts or nuts.

Tire factory size	Front wheel	Rear wheel
	32×10.00R15	32×10.00R15
	35×10.00R16	35×10.00R16

TIRE REPLACEMENT

⚠ WARNING

Please only replace tires with the same type and size as the original ones.

For unidirectional tread patterns, please ensure that the tire is installed in the correct rotation direction.

Tires should be replaced by experienced personnel using tools according to tire industry standards.

Install tires on beadlock ring wheels

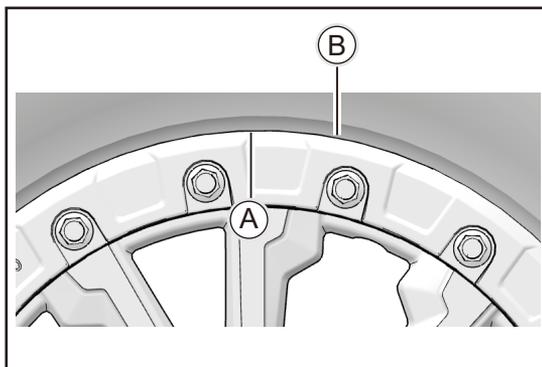
1. Install tires on the wheels.
 - ◆ On the opposite side of the beadlock ring, apply tire mounting lubricant to the inner tube ring and wheel of the tire to ensure that the tire is correctly positioned during inflation. Install the inner tube ring onto the wheel.

⚠ CAUTION

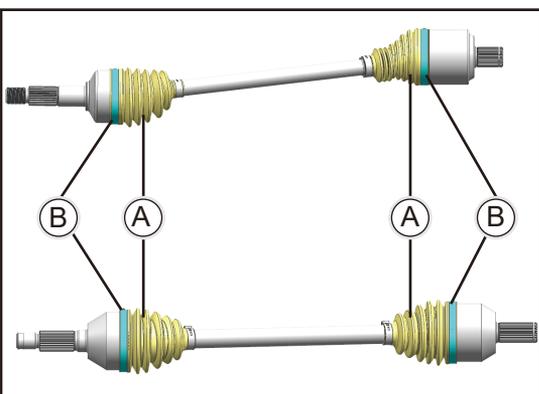
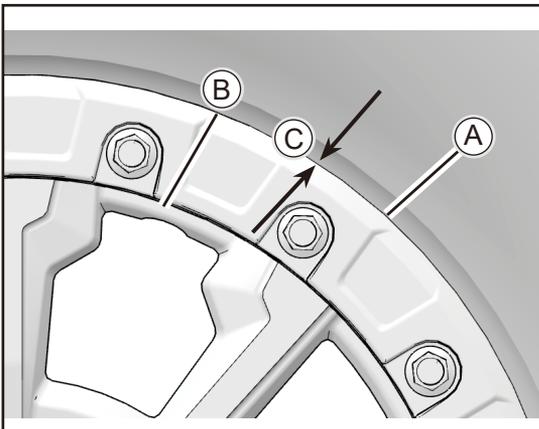
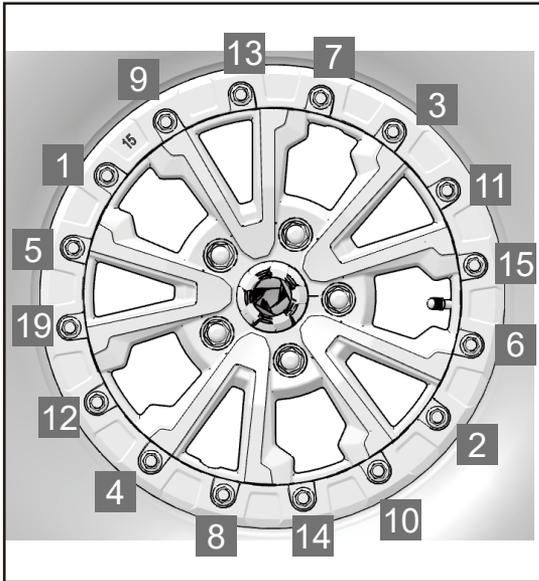
Install the tire only from one side of the beadlock ring.

Place the outer tire bead on the shoulder of the anti slip ring inner ring and the center of the tire.

- [A]** Tire outer bead **[B]** anti slip ring inner ring shoulder
2. Install all anti slip ring screws. To avoid accidental fastening, manually install all screws.



Tightening sequence



⚠ CAUTION

Do not use an impact wrench to install anti slip ring screws. When using an impact wrench, there is a higher risk of screw breakage or slippage.

3. Tighten the anti slip ring screws according to the instructions and sequence in the left figure.

NOTE

To ensure even force distribution on the anti loosening locking ring, only tighten the screw a few times at a time.

Beadlock screw (initial tightening torque)

14 N•m ± 1 N•m

4. Check if the tire is still in the middle of the wheel at this time. Reset if necessary.
5. Tighten the beadlock ring screws in the same order and with the second tightening torque.

Beadlock screw (second tightening torque)

25 N•m ± 1 N•m

Note: The locking ring of the anti detachment ring should be in contact with the inner ring of the beadlock ring. The anti slip locking ring can be slightly bent to match the tire bead. This is normal.

6. Check the gap between the tire and the beadlock ring locking ring. The gap around the locking ring should be roughly the same.

【A】 Tire 【B】 Beadlock ring edge

【C】 The gap around the locking ring is the same

If the gap is not qualified:

- Loosen all screws.
- Check the position of the tire on the wheel and reset it as needed.
- Re tighten in order according to the instructions.

7. Tighten the beadlock ring screws for the last time in the order described.

Beadlock screw (last tightening torque)

25 N•m ± 1 N•m

8. Inflate the tire to position the inner tube ring on the wheel. Always use safety measures, such as tire safety covers.

⚠ WARNING

Do not exceed the recommended maximum tire pressure when positioning the tire bead

INSPECTION OF DRIVE SHAFT DUST COVER

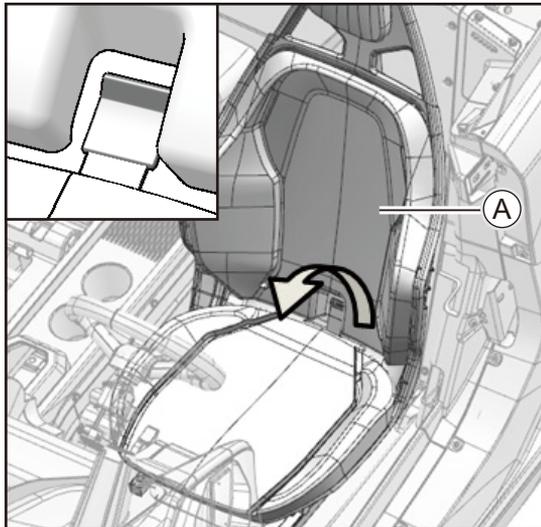
Check if there are any cuts, damages, or grease leaks in the front and rear drive shaft dust covers [A]. If any of the above symptoms occur with the dust cover, it should be replaced. Check if the dust cover clamp [B] is correctly positioned.

ELECTRICAL

BATTERY DISASSEMBLY

⚠ CAUTION

If the electrolyte overflows, immediately rinse a solution of one tablespoon of baking soda and one cup of water with clean water to prevent damage to the vehicle.



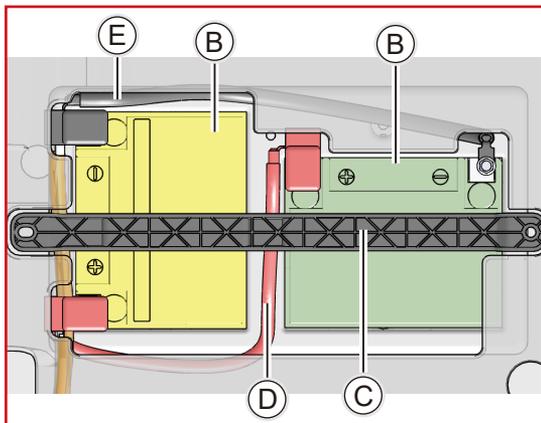
- 【A】 Passenger seat
- 【B】 Battery
- 【C】 Battery pressure plate
- 【D】 Battery positive wire
- 【E】 Battery negative wire

The vehicle is equipped with two sets of batteries, which are in parallel mode. If the batteries need to be replaced, both sets of batteries need to be replaced simultaneously.

The battery is located under the passenger seat. To replace or maintain the battery, please follow these steps:

Power off the vehicle before disassembling the battery.

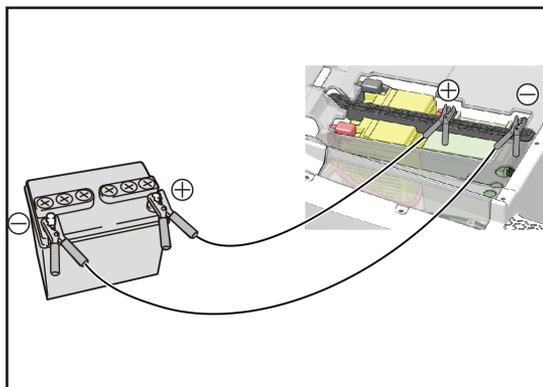
1. Remove the fixing bolts on the battery pressure plate.
2. Remove the battery pressure plate.
3. Flip up the positive and negative protective rubber sleeves.
4. Remove the negative screw and nut of the battery, and disconnect the black (negative) battery cable.
5. Remove the positive screw and nut of the battery, and disconnect the red (positive) battery cable.
6. Remove the battery from the vehicle.



BATTERY CHARGING

⚠ CAUTION

- ◆ When charging, the hydrogen gas generated by a 12V battery is a flammable explosive gas.
- ◆ Therefore, please follow the following precautions before charging:
- ◆ If charging the 12V battery still installed in the car, be sure to disconnect the grounding cable.
- ◆ When connecting and disconnecting the charger cable to the 12V battery, ensure that the power switch on the charger is turned off.
- ◆ Can only be charged slowly (5A or less). If charged quickly, the 12V battery may explode.



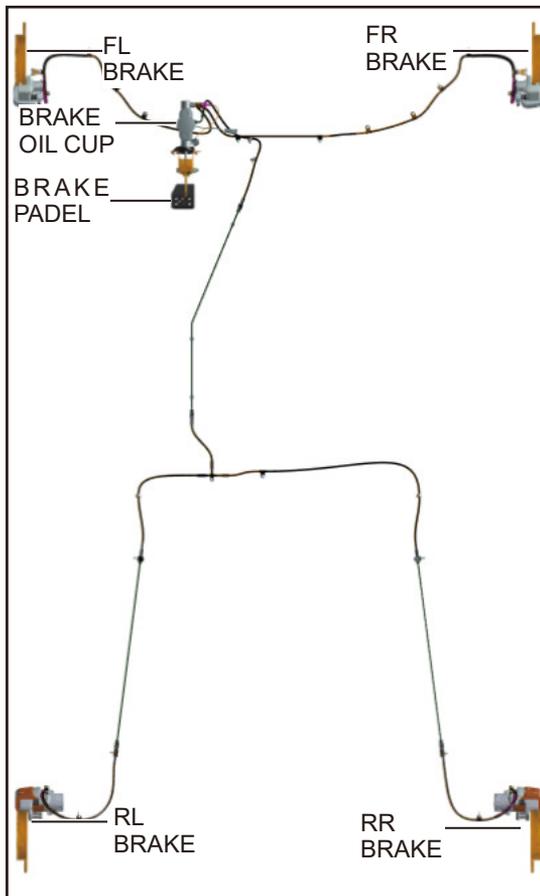
BATTERY INSTALLATION

CAUTION

Reduce the possibility of sparks: Every time the battery is removed, disconnect the black (negative) cable and reconnect it. When reinstalling the battery, finally install the black (negative) cable

1. Clean the battery cables and terminals with a hard wire brush. Corrosion can be removed with a solution of one cup of water and one tablespoon of baking soda. Rinse with clean water and thoroughly dry.
2. Place the battery in the tray.
3. Connect and tighten the red (positive) cable.
4. Connect and tighten the black (negative) cable.
5. Install the battery pressure plate;
6. Tighten the bolts of the battery pressure plate;
7. Verify if the cables are properly routed.

BRAKE SYSTEM



The front and rear brakes are hydraulic disc brakes activated by the brake pedal.

⚠ WARNING

Regularly check the brake fluid level:

Overloading the brake cylinder may cause braking resistance or lock up, which may result in serious injury or death. Keep the brake fluid at the recommended temperature and do not overfill it. It is necessary to check the regular wear of the brake disc: if the brake disc is worn, it should be replaced.

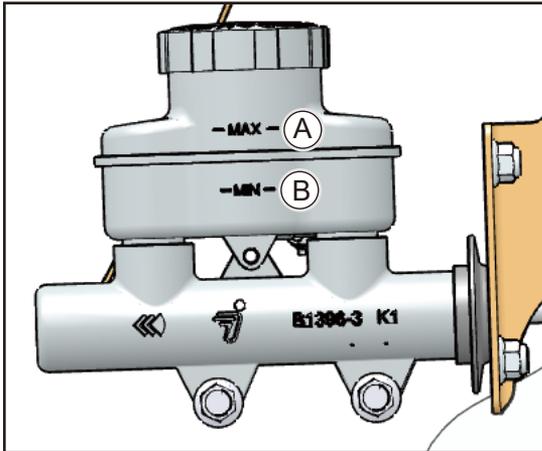
It is recommended to perform the following checks to maintain the proper functioning of the braking system. If the brake fails and is frequently used during normal operation, it should be checked regularly.

- ◆ Always keep the brake fluid at the appropriate level. For detailed information, please refer to the master cylinder/brake fluid section for details.
- ◆ Check for fluid leakage in the braking system.
- ◆ Check if the brake stroke is too long or if it feels uncomfortable or soft.
- ◆ Check if the friction pad is worn, damaged, or loose. When replacing the brake pad, the brake pad thickness must not be less than 1mm when the remaining limit is reached.
- ◆ Check the safety and surface condition of the brake disc. Use recommended brake cleaner or liqueur to remove all grease. Do not use spray lubricants or other petroleum products. If there is any damage (cracks, excessive corrosion, warping), please check the dealer's service before operation.

BRAKE FLUID

Use recommended brake fluid :

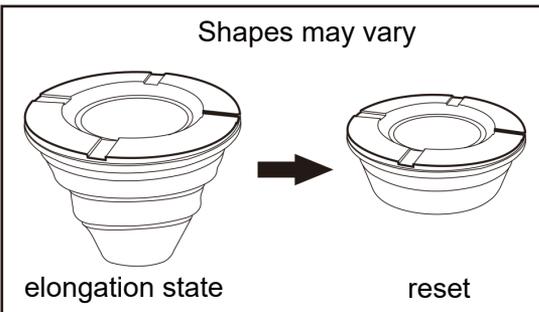
brake fluid	Use MOTUL RBF660 (boiling point 325°C, wet boiling point 204°C) motor vehicle brake fluid conforming to FMVSS 116 DOT4, SAE J1703A&1704, or DOT4 motor vehicle brake fluid of equivalent boiling point.
-------------	---



The hydraulic assisted braking system does not require adjustment. Regularly check the brake fluid level of the auxiliary braking system and observe the brake fluid from the front left brake fluid sight glass cover. If the liquid level is displayed as low, perform the following operations.

- 【A】 Upper level
- 【B】 Lower level

- ◆ Remove the front fluid cap (refer to the body and frame section)
- ◆ Remove the brake fluid cup cap and add an appropriate amount of brake fluid;
- ◆ The most suitable location for brake fluid is between the upper and lower planes. If it is lower than the lower plane, please add the recommended brake fluid and observe the liquid level position. Do not exceed the maximum liquid level.

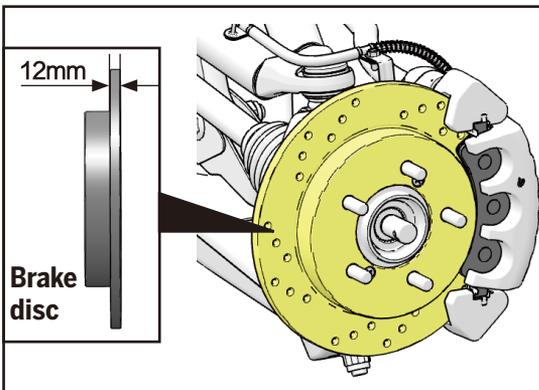


⚠ CAUTION

After replenishing or replacing the brake fluid, check whether the oil cup gasket under the oil cup cover is in an extended state. If the oil cup gasket is in an extended state, it is necessary to perform a reset operation on the oil cup gasket (as shown in the figure). If the oil cup gasket is not reset, the brake fluid will overflow from the oil cup when tightening the oil cup cover.

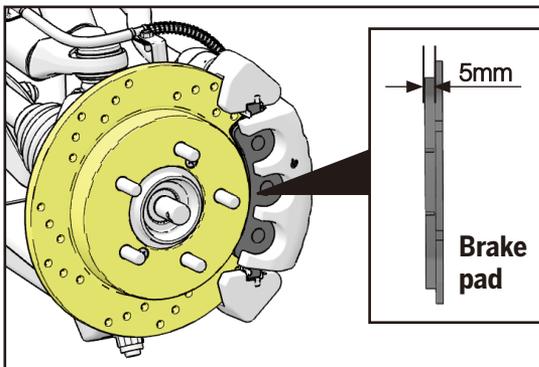
Brake fluid can damage plastic and painted surfaces, so be cautious when adding it.

If the brake fluid comes into contact with the skin or eyes, immediately rinse with plenty of water. If there is still discomfort, seek medical attention immediately.



BRAKE PADS AND BRAKE DISCS

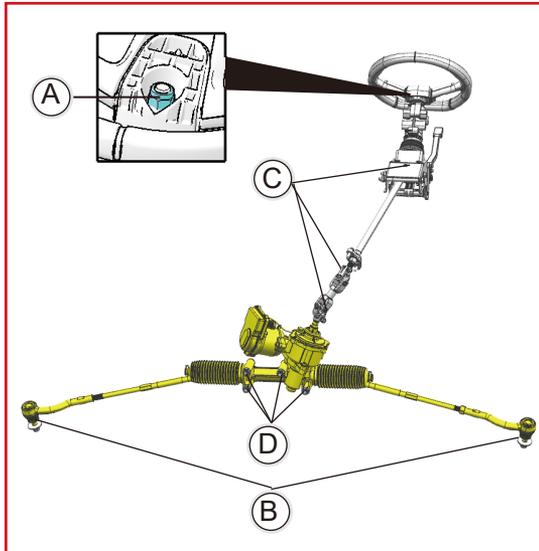
The wear of brake pads and brake discs will depend on the severity of usage and driving conditions. Brake pads wear out faster in wet and muddy conditions. Regularly check the wear of brake pads and brake discs according to the maintenance schedule. If the wear of brake pads and brake discs exceeds the required value, they must be replaced



Brake Lining Thickness	Standard thickness	5.0mm
	Minimum thickness	1.5mm
Brake Disc Thickness	Standard thickness	12.0mm
	Minimum thickness	10.0mm

STEERING MAINTENANCE

STEERING SYSTEM INSPECTION

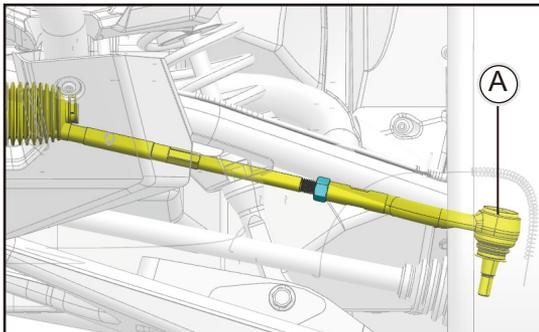


- 【A】 Steering wheel fasteners
- 【B】 Steering rod fasteners
- 【C】 Steering shaft universal joint fasteners
- 【D】 Installation fasteners for steering gear

Regularly (recommended every 800 kilometers) check the steering system components for loose fasteners [A], [B], [C], [D], wear on the end of the lateral tie rod/lateral tie rod fasteners [B], [C], tie rod ball joints, and other damages. Replace any worn or damaged steering components. The steering should move freely throughout the entire range of travel without any jamming. Check the wiring of all cables, hoses, and connections to ensure that the steering mechanism is not restricted.

NOTE

When replacing the steering components, check the front end positioning.

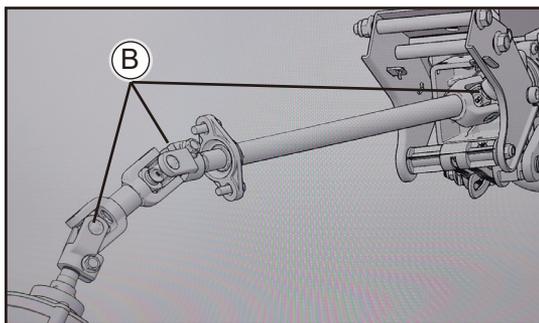


FREE CLEARANCE OF STEERING WHEEL

Check if the steering wheel has the prescribed freedom of movement and operation.

- ◆ Park the vehicle on a level surface.
- ◆ Gently turn the steering wheel left and right.
- ◆ There should be a free gap of approximately $\leq 10^\circ$.

If the free clearance is too large or the steering feeling is not precise, check the following components.



- 【A】 Horizontal pull rod ball head
- 【B】 Steering universal joint

OPERATION AND MAINTENANCE MANUAL FOR N20TG-S1 ENGINE

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FRONT VIEW OF ENGINE

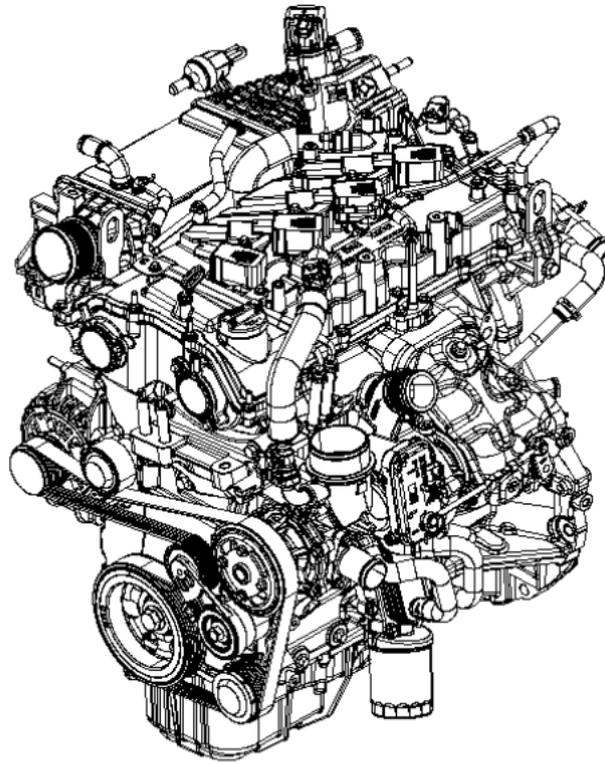


Figure 1 Main view of the engine

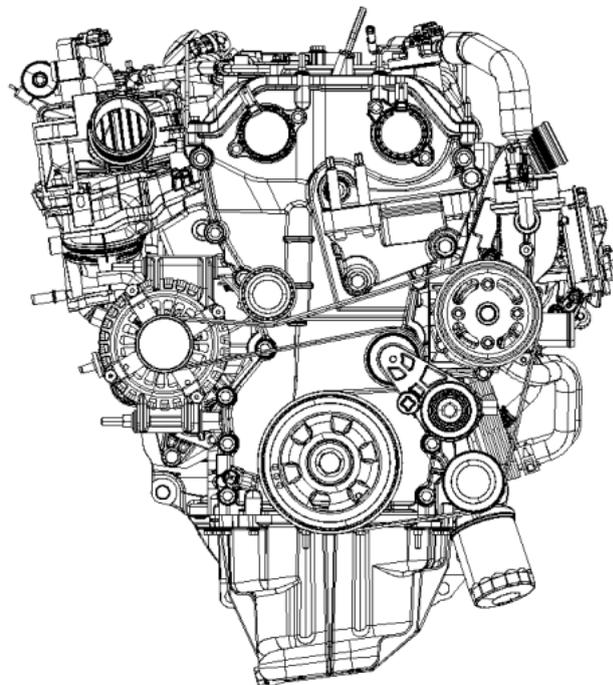


Figure 2 Front view of engine

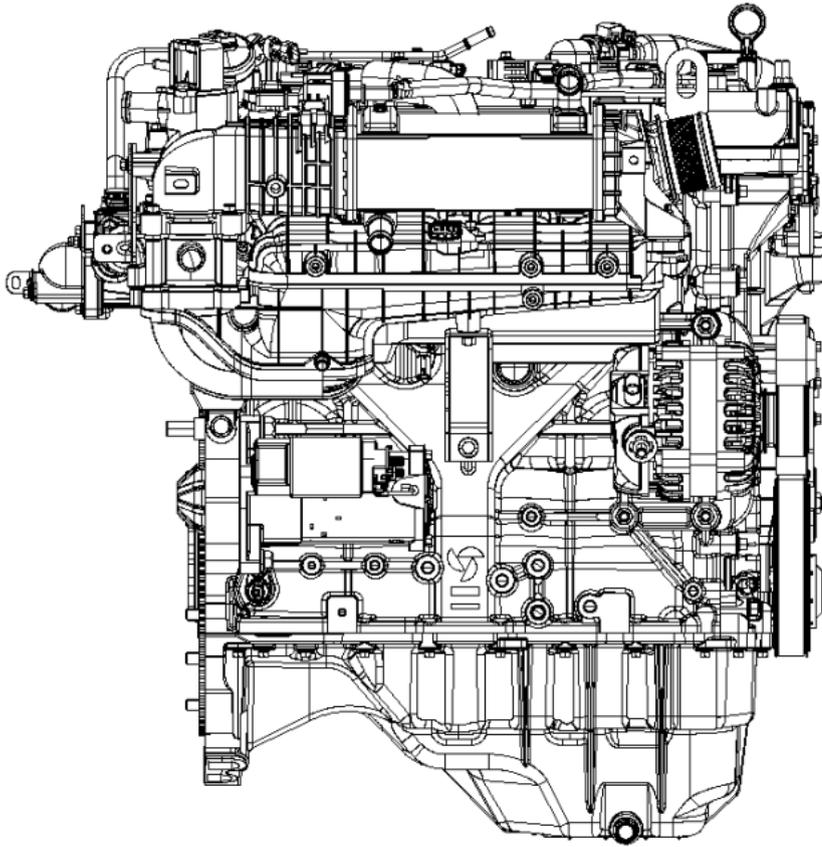


Figure 3 Engine left view

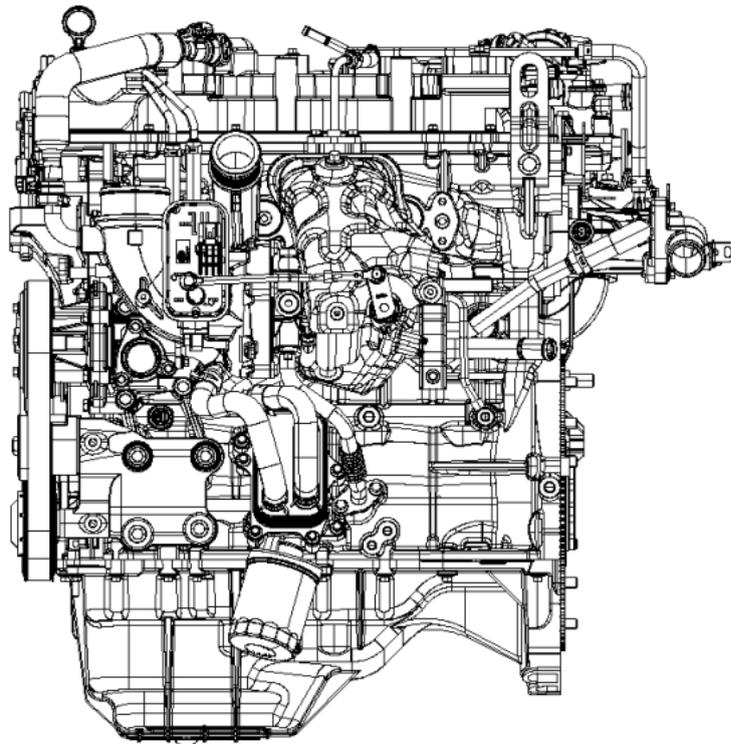


Figure 4 Right view of engine

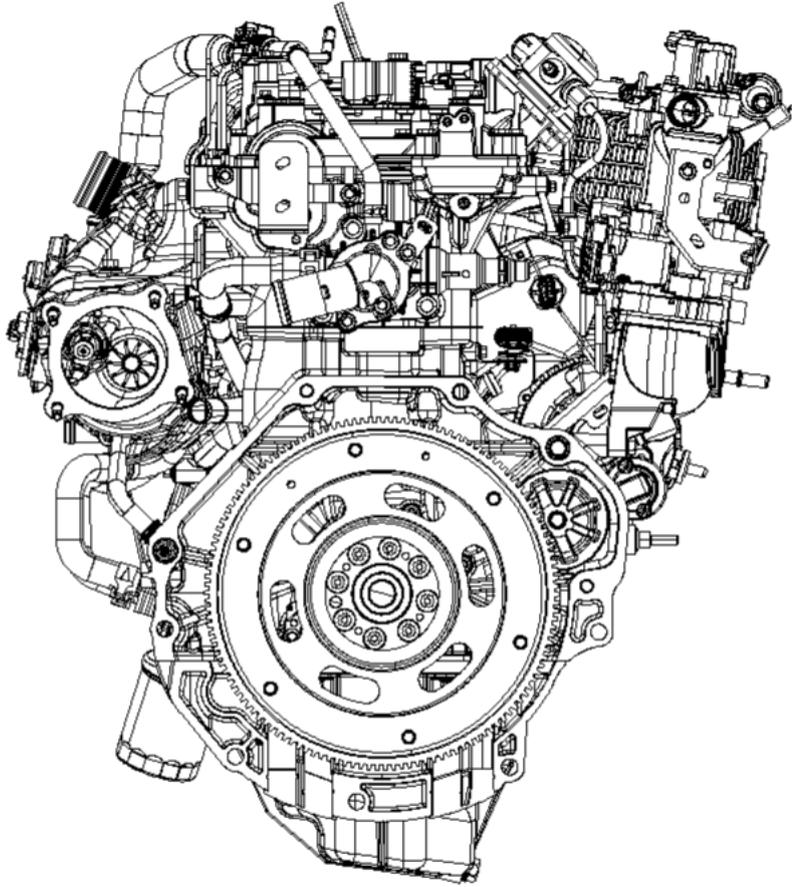


Figure 5 Rear view of engine

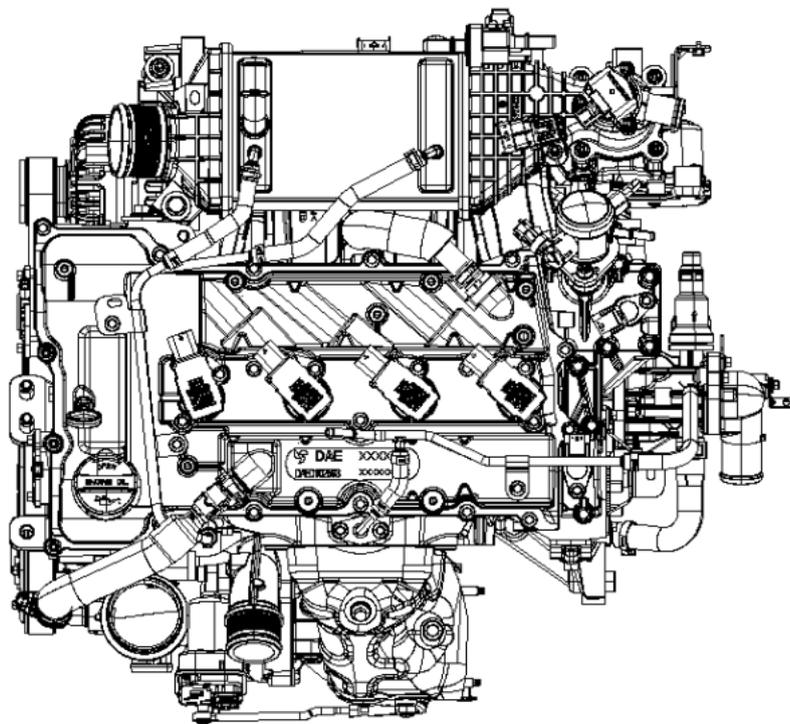


Figure 6 Top view of engine

CHAPTER I. TECHNICAL CHARACTERISTICS AND STRUCTURAL PARAMETERS OF ENGINES

Section I. Technical Performance and Structural Parameters of Engines

Table 1 Technical performance and structural parameters of the engine

Model number	N20TG-S1
Type	L4/ 16V、 DOHC、 GDI
Displacement	1998cm ₃
Cylinder diameter	86mm
stroke	86mm
Compression ratio	10
Maximum net power	167Kw /5500rpm
Maximum net torque	360N•m /1900~3000 rpm
lowest fuel consumption	235g/Kw•h
rated speed	5500r/min
idle speed	750±50r/min
change direction	Counterclockwise (from back to front)
ignition sequence	1-3-4-2
Profile Size	Total length x total width x total height =
Net weight	155 kg (含油)
Fuel	RON92#及 92#以上无铅汽油
Use of oil	SN/GF-5 5W-30
Meets emission regulations	US EPA certified (Euro 5)

Section II External Characteristic Curve of Engine

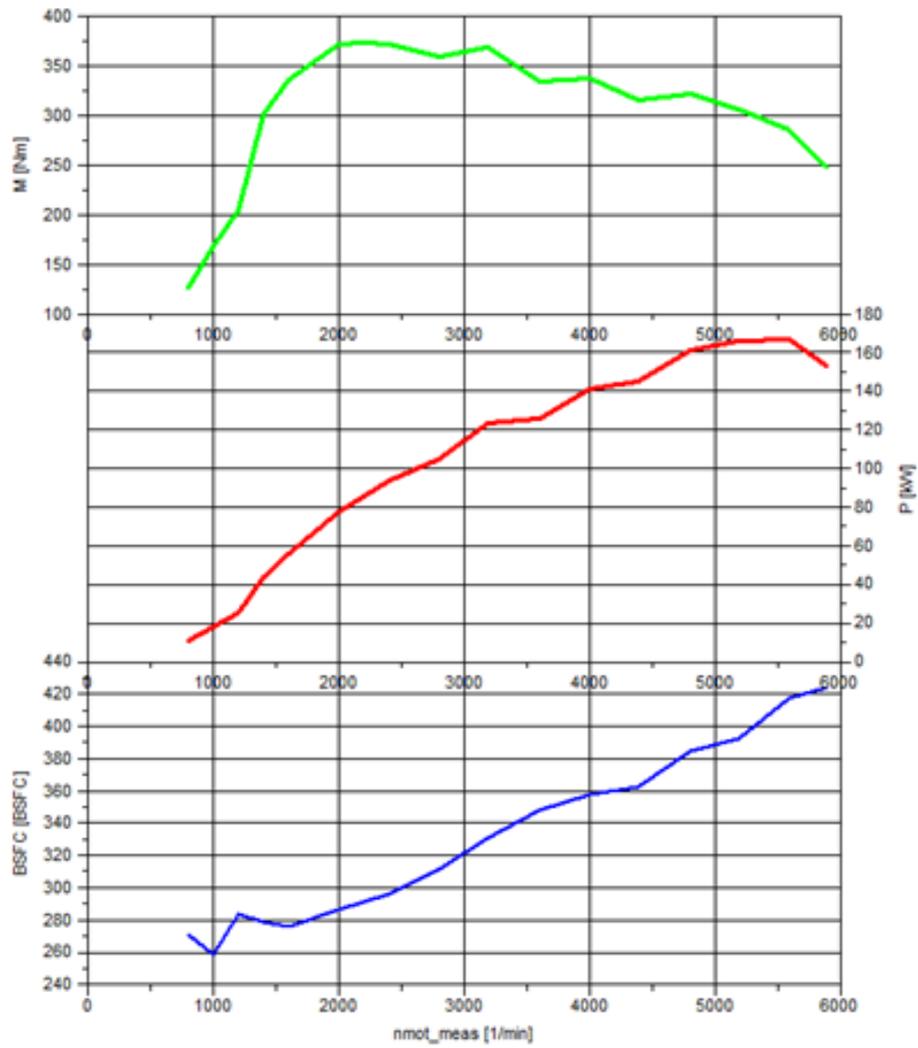


Figure 7 External characteristic curve of engine

CHAPTER 2 PRECAUTIONS FOR USING THE ENGINE

1. Preamble

When using the product, please read this manual carefully and follow the recommendations in this manual for use and maintenance.

Please read this manual carefully and follow the recommended instructions for use and maintenance.

2. Coolant

Check if the engine coolant is sufficient, if not, add enough coolant; it is strictly prohibited to contain any high silicate (Si 6) in the coolant; it is recommended that the silicate content is 0.07 (wt%) or less.

★★ Note: The cooling system includes water pump, water pipe, water jacket, etc., when the engine is running, there must be enough coolant in the cooling system to ensure the normal operation of the engine, or the car will "boil". Gasoline engine in the case of overheating work, will affect the service life. Seriously, it will cause cylinder pulling and other malicious failure.

3. Oil

Check the oil level of the engine and replenish the oil when it is insufficient. Due to the turbocharger

As the turbocharger on the lubrication and its own high cleanliness requirements, such as oil supply lag, throttling, lack of,

The oil supply lag, throttling, lack of oil, deterioration or impurities in the oil are the main causes of turbocharger failure.

★★★ Note: Insufficient oil will make the gasoline engine oil pressure too low, resulting in poor lubrication and

engine wear and poor cooling, prone to malfunction and affect the life of the gasoline engine.

4. Fuel Grade

RON 92# and above unleaded gasoline is used.

5. Starting the engine

To start the engine, turn the vehicle's ignition switch key to the start position and the engine is started by the starter. As soon as the engine fires, release the key and disconnect the starter.

NOTE: Do not operate the starter for more than 5 seconds at a time. If the gasoline engine fails to start, wait 30 seconds before starting a second time or the starter may be damaged. If the starter fails to start after several attempts, check the fuel system and electrical system, or have it repaired at the vehicle manufacturer's authorized service center or our service center.

6. Idle

The engine should be idled for a few minutes after starting to warm up the engine.

★★★Note: The idling emission indexes of our engines before leaving the factory are strictly controlled within the limits required by the national standards.

The idle speed of the N20TG-S1 model is 750 50r/min.

The idle speed of N20TG-S1 model gasoline engine is 750 50r/min. The idling mechanism of the gasoline engine has been adjusted at the factory and should not be changed by the user.

Users should not change the idling speed without authorization. If adjustment is necessary, please go to the authorized service department for assistance.

7. Driving

When the car is running, the coolant temperature should be kept at 80~95°C. When driving at medium speed, pay attention to the oil pressure should not be less than 150kPa.

8. Parking

After engine operation, especially after high speed and high load operation, the engine should not be turned off immediately.

The engine should be run at idle for 3~5 minutes, and then turn off the engine after the temperature of the engine body drops down.

9. Rain or wading

When passing through waterlogged roads on rainy days or when traveling through or wading in water in normal times, make sure the air filter is well sealed.

If the air filter is sealed properly, water may enter the engine cylinders and cause damage to the connecting rods and other parts.

★★★ Note: Water is an incompressible liquid, and the connecting rods are subjected to tens of times the pressure of the engine cylinders under the inertia of the automobile after water ingress.

When the cylinder is filled with water, the connecting rod will be subjected to tens of times the pressure, resulting in bending or breaking of the connecting rod.

10. Warming up the engine in winter

In winter, the temperature is low and the viscosity of the engine oil increases, so the lubrication effect of the engine is worse than that in summer.

Therefore, after starting the engine, the engine should not be operated under high speed and heavy load, but should be warmed up at idle for 7 minutes so that the oil temperature and coolant temperature will rise and the engine will be warmed up.

Therefore, after starting the engine, it should not be operated under high speed and heavy load, but should be warmed up at idle speed for 7 minutes, so that the temperature of the oil and coolant rises and the engine is fully lubricated.

lubricate the engine sufficiently before driving.

Note: Driving in winter without adequate lubrication of the gasoline engine may result in excessive damage to the camshaft and other parts of the gas distribution mechanism.

Note: Driving the gasoline engine without sufficient lubrication in winter may result in excessive wear of parts of the gas distribution mechanism, such as the camshaft, or even lock-up.

11. Electric injection system

When servicing the engine, do not arbitrarily change the electrical installation or wiring as this may cause

Do not alter the electrical equipment or wiring when servicing the engine, as this may cause electrical overloads, short circuits and sparks. When servicing the electrical system, disconnect the negative cable from the battery terminal.

Disconnect the negative cable from the battery terminal. Before connecting or disconnecting the negative cable, make sure the ignition switch and light switch are turned off. (Failure to turn them off may burn out semiconductor components.)

CHAPTER 3 PERIODIC INSPECTION AND MAINTENANCE OF ENGINES

Section I. Checklist for Periodic Inspection and Maintenance of Engines

SYMBOL	DESCRIPTION
▶	Perform these steps more frequently for vehicles that are used frequently.
D	Have an authorized dealer or other professional perform these services.



WARNING: Marking procedures may cause component failure and result in serious injury or death. Have an authorized dealer or other professional perform these services.

projects		Maintenance intervals (whichever comes first)			notes
		Cumulative working hours	time of use	Miles (KM)	
	throttle	50H	6M	800	Check pipes for proper sealing/air leakage
	Front End Wheel Tie Belt	50H	6M	800	Check and, if necessary, replace
	cooling system	50H	6M	1600	Seasonally check coolant strength Test pressure system annually
▶	Oil change	100H	6M	1600	
▶	Tubing and fasteners	100H	6M	1600	Change oil and filters Check for leaks and loose fittings
D	fuel system	100H	12M	1600	Cycle to pressurise fuel pump Check filler cap for leaks, fuel lines/rails and fuel pump; replace lines every two years
▶	Engine mounts	100H	12M	1600	inspections
D	spark plugs	100H	12M	1600	Inspection; replacement as required
▶	coolant		60M		Replacement of coolant
D	valve lash	500H		8000	Check; adjustment
	idling speed				Adjustment as required

Perform all services with the first arriving maintenance condition, record maintenance and services in the maintenance log.

Section II Internal Engine Inspection

1. Check the alternator

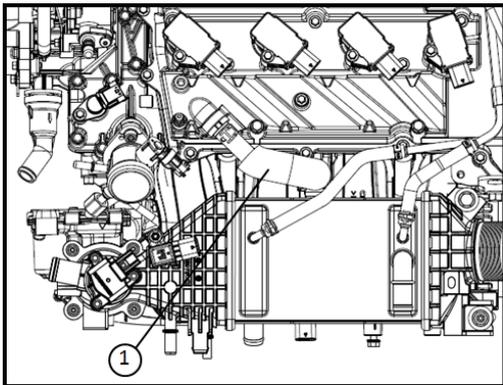
- (1) Check the drive belt of the alternator for cracks, flying chips, wear and adjust the tension.
- (2) Check the condition of the alternator drive belt for cracks, flying chips, and wear while turning the alternator drive belt.

2. Check ignition cable for damage.

- (1) Check ignition cable and rubber cover for damage or weakness, and check installation condition.
- (2) Check for dirt, dust, etc. at the joints of the ignition cable and the spark plug and ignition coil.
- (3) Clean if dirty; replace if damaged.

3. Check the crankcase oil and gas control system for proper functioning.

- (1) Check vent hose for cracks or damage.
- (2) Clean inside of vent hose if necessary.



Inspection of crankcase forced air ventilation

- 1) Remove vent hose from crankcase forced air valve.
- 2) Remove the crankcase forced air valve from the rocker cover.
- 3) Install the crankcase forced air valve to the air hose to the vent hose.

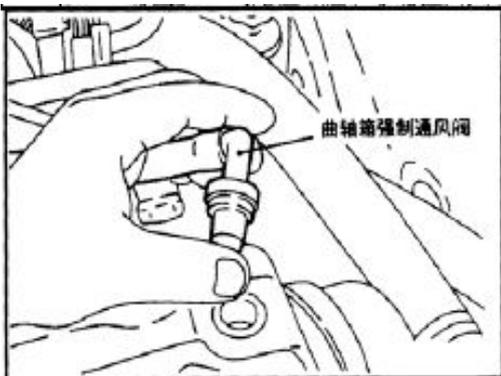
Note: ① Ventilation hose

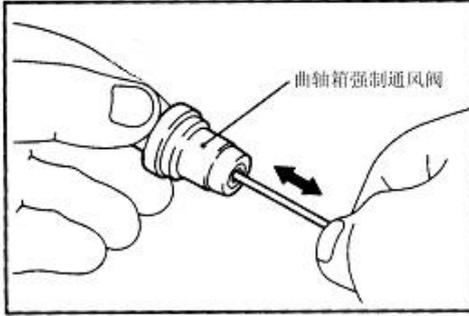
- 4) Start engine and run at idle.
- 5) Place your finger over the opening in the crankcase forced air valve and verify that you can feel a vacuum in the intake manifold. Verify that you can feel a vacuum in the intake manifold.

NOTE: At this point, the plunger in the crankcase forced air valve will move back and forth.

- 6) If no vacuum is felt, clean or replace crankcase forced air valve.

If no vacuum is felt, the crankcase forced air valve should be cleaned or replaced.





Inspection of PVC valve

(1) Insert a thin rod into the crankcase forced air valve from the side shown (rocker cover mounting side).

(1) Insert a thin rod into the crankcase forced air valve from the side shown (rocker cover mounting side) and move the rod back and forth to verify that the plunger is moving.

(2) If the plunger does not move, the crankcase

forced air valve is clogged, in which case it should be cleaned or replaced.

4. Spark plug replacement

Spark plug model SIFR6B7G, thread M141.25, to be replaced according to the maintenance schedule.

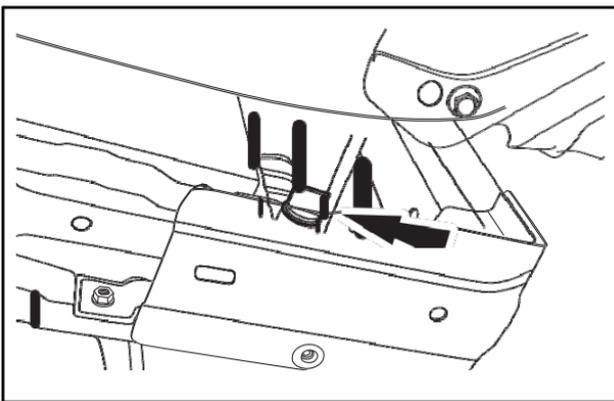
5. Replacing engine coolant

(1) Stop the engine after warming it up sufficiently.

(2) Add detergent for cleaning the engine cooling system to the engine coolant and start the engine.

Start the engine.

(3) When the engine has cooled down, remove the water reservoir cap. Slowly turn the water bottle cap in a counterclockwise direction by pressing down on it until the cap is removed.



Slowly turn the cap in a counterclockwise direction while pressing down on the cap, until it reaches the first stuck position, then slowly release the cap and wait until the pressure is released.

When the pressure is released, remove the cap.

(4) With the water reservoir cap open, unscrew the drain valve and drain the system of coolant.

(5) Tighten the drain valve. Fill the system to the top and run the engine until the upper radiator hose becomes hot and hard.

upper radiator hose becomes hot and stiff.

(6) Repeat steps (3), (4), and (5) several times until the drained fluid is nearly colorless.

(7) Drain cooling system and tighten radiator drain plug.

(8) Disassemble the water reservoir, remove the reservoir, pour out the fluid, wash the inside of the reservoir with soapy water, and rinse thoroughly with clean water.

Rinse thoroughly with clean water and drain thoroughly. Open the cap of the water bottle.

Fill the reservoir with coolant to the MAX line.

Caution:

Do not use alcohol or methanol antifreeze, or engine coolant mixed with alcohol or methanol antifreeze. Using incorrect antifreeze may cause corrosion of aluminum parts.

(9) Idle the vehicle and pay attention to the coolant level in the reservoir bottle during the process, and replenish the coolant at any time after the level drops.

After the level drops, replenish the coolant at any time. Tighten the cap on the reservoir bottle and run the engine at 2,500 rpm to 3,000 rpm.

Run the engine at 2,500 rpm to 3,000 rpm until the fan runs, then return to idle for 1 min. After the engine cools down, check if the coolant level drops, if it does, repeat the process several times until the coolant level in the reservoir bottle drops.

If it does, repeat the process several times until the coolant level in the reservoir bottle no longer drops.

Caution:

Do not open the coolant tank cap or radiator cap while the engine is hot.

If the cap is opened, hot coolant will spray out and may burn people around you.

6. Check for clogged and damaged air filter elements

(1) Check the air filter element for clogging and damage.

(2) Remove dirt deposited on the element as follows.

-Gently tap the side of the filter element.

-Blow compressed air from the inside of the filter element.

(3) Scrape off the dirt inside the air filter.

(4) For gasoline vehicles, if the old filter element is reused, install it in such a way that the oiled part of the filter element is located at the air inlet (the air inlet).

portion of the filter element is located at the inlet of the fugitive air (to prevent the oil from spreading).

7. Replacing the air filter element

Remove the air filter cover and element, scrape off the dirt inside the filter, and install a new air filter element.

Install a new air filter element.

Replacement procedure:

In the course of use, the air filter element becomes dirty and covered with dust, thus the filtering effect decreases significantly.

The air filter element should be replaced with a new one.

(1) Loosen the air filter cover catch.

(2) Remove the air filter element and install a new one.

(3) Make sure that the air filter cover is fully closed when it is snapped shut.

8. Oil change

(1) Remove the oil filler cap on the engine rocker cover or the oil filler cap on the oil filler tube.

(2) Remove the oil drain screw on the engine oil pan and drain the oil.

(3) Replace with a new oil drain screw gasket.

(4) Tighten the oil drain bolt.

(5) Fill the crankcase with new oil from the oil filler neck.

(6) Pull out the dipstick from the engine and check that the oil level is between the MAX and MIN

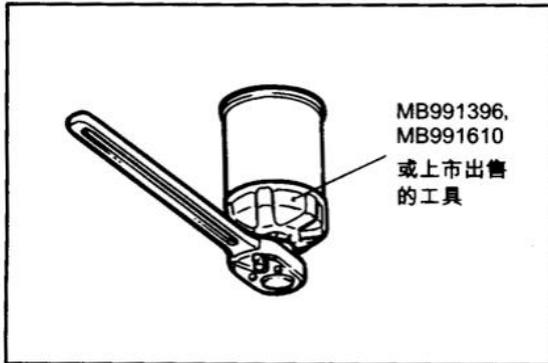
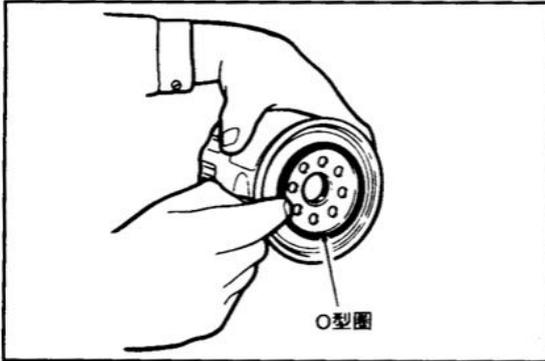
marks.

(7) Install the oil filler cap.

(8) Check the oil level again after the road test.

Oil Selection:

SN/GF-5, 5W-30 all season。



9. Changing the oil filter

(1) Start the engine and let it run warm until the engine coolant temperature reaches 80-90°C. (2) Remove the oil filler cap on the rocker housing or on the oil filler tube.

(2) Remove the oil filler cap on the engine rocker cover or the oil filler cap on the oil filler tube.

(3) Remove the oil drain plug from the oil pan to drain the oil.

NOTE: The oil may be hot.

Please note that the oil may be hot.

(4) Remove the engine oil filter using the special tool shown in the table below.

Remove the engine oil filter.

(5) Clean the mounting surface on the side of the filter bracket.

(6) Apply a small amount of oil to the o-ring of the oil filter.

(7) As soon as the o-ring of the oil filter touches the flange, tighten it to the specified torque with the special tool shown in the figure.

(8) Install the oil drain plug on the oil pan and fill the oil from the oil filler port on the rocker arm chamber.

(9) Run the engine at high speed 2-3 times, then check that the filter mounting surface is impermeable to oil.

10. Checking engine idle speed and carbon monoxide level

(1) Before checking and adjusting, bring the vehicle to the following conditions.

-Engine coolant temperature: 80-90°C

-All lights, electric cooling fan and accessories: OFF - Transmission: neutral

(2) Check the ignition timing and adjust if necessary.

(3) Install the tachometer after turning the ignition switch to the OFF position.

(4) Start engine and run at idle.

(5) Run engine at idle speed (750 r/min) for 2 minutes.

(6) Check idle speed and read engine idle speed according to tachometer.

Remarks:

The idle speed is automatically adjusted by the Idle Speed Control (ISC) system.

(7) If there is a deviation from the standard value, check the MPI assembly in the service manual.

- (8) Install carbon monoxide tester.
- (9) Run engine at 2500r/min for 10 seconds or more.
- (10) Recheck high and low idle mixture.

11. Checking ignition timing

- (1) Before checking and adjusting, bring the engine to the following conditions.

-Engine coolant temperature: 80-90°C. -All lights, electric cooling fan and accessories: OFFN20TG-S1 engine maintenance manual.

-All lights, electric cooling fan and accessories: OFF.

-Transmission: Neutral

- (2) Insert a paper clip from the wiring side into the connector between the primary side of the ignition coil and the tachometer.

connector between the primary side of the ignition coil and the tachometer.

- (3) Connect a primary voltage detection tachometer to the paper clip.

- (4) Install the timing light.

- (5) Start engine and run at idle.

- (6) Check that engine idle speed is within standard values.

12. Checking crankcase ventilation hoses

- (1) Check the entire periphery and length of each hose with a reflector, if necessary.

- (2) Check all clamps for tightness and joints for leaks.

- (3) Replace hoses immediately if they show obvious signs of deterioration or damage.

13. Check for air leaks at exhaust fittings

- (1) Verify that the exhaust pipe does not interfere with any component of the vehicle.

- (2) Check that the exhaust pipe has not been damaged by impact with debris, etc. (3) Start the engine and check that the exhaust pipe is not damaged.

- (3) Start the engine and check for air leaks at the exhaust pipe joints.

14. Water Pump Leakage Check

- (1) For the water pump in use, if there is a small amount of water in the drain hole of the water pump, this phenomenon is normal.

This phenomenon is normal. The pump is a mechanical seal, mechanical seals require cooling water on the sliding surface for lubrication, so under normal sealing conditions, the pump will not leak.

Mechanical seals require cooling water to lubricate the sliding surface, so under normal sealing condition, the coolant will be discharged in the form of vapor or mist. From the water

From the construction of the pump, it is necessary to discharge the coolant from the drain hole and vapor hole.

- (2) Causes of water leaks: Most leaks are temporary and do not last long. Such a leak

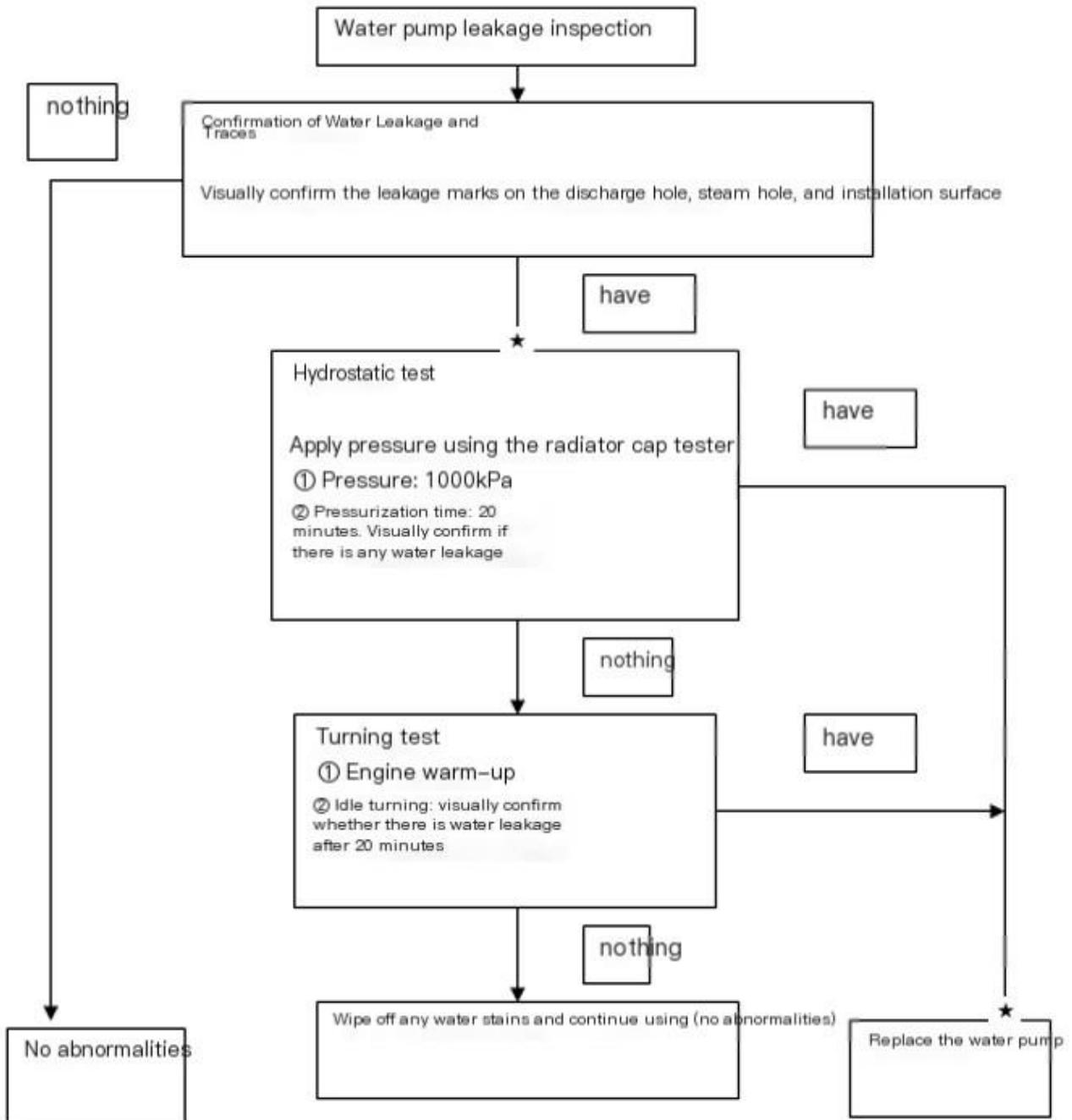
Coolant should be discharged from the drain hole or vapor hole of the water pump.

- (1) Also, in terms of the construction of the water pump (mechanical seal), water leakage for a short period of time will not cause a drop in cooling performance (overheating, etc.) (excessive reduction in cooling water, etc.).

- (2) The sales service judges whether the water pump is qualified in the following way to prevent

misjudgment of water pump leakage; if it really leaks, then replace the water pump.

(3) Whether the water pump leaks or not is judged according to the following judgment process.



Section III. Engine Main Bolt Tightening Torque

Specification for torque of critical bolts

Item	Name	mounting part	Tightening method
1	Main bearing cover bolts	crankcase	Corner method: (40±2) N.m+ (90±2) ° monitor: (70-130) N.m
2	connecting rod bolt	rod cover	Corner method: (30±2) N.m+ (90±2) ° monitor: (50-90) N.m
3	Cylinder head attachment bolts	cylinder head	Corner method: (30±2) N.m+ (180±2) ° monitor: (55-110) N.m
4	Crankshaft pulley combination bolt	crankshafts	Corner method: (120±2) N.m+ (120±2) ° monitor: (238-402) N.m
5	drive bolt	crankshafts	Corner method: (40±2) N.m+ (30±2) ° monitor: (60-110) N.m

General bolt torque specifications for engines

Item	Description	Assembly location	N•m	lb-ft	lb-in
1	Hollow bolt of turbocharger inlet pipe	crankcase	34±2	25	-
2	Turbocharger connecting screw	Turbocharger and cylinder head	15±1	11	-
3	Turbocharger connecting nut	Turbocharger and cylinder head	40±2	30	-
4	Turbocharger connecting screw	Turbocharger and catalyst	6±1	-	53
5	Turbocharger connecting nut	Turbocharger and catalyst	25	18	-
6	Connecting bolt between crankshaft and balance shaft	Balance shaft	45	33	-
7	Signal board screw	Eighth crankshaft plate	15±1	11	-
8	Process hole blockage	Rear end cover of crankshaft	40±2	30	-
9	Short bolt for cylinder head cover	head cover	13±1	10	-
10	Crankcase R3/8 plug	crankcase	40±2	30	-
11	R1/8 crankcase plug	cylinder cover	12±2	9	-
12	Cylinder head water channel plug	cylinder cover	75±5	55	-
13	Screw plug at cylinder head IEM	cylinder cover	56±3	41	-
14	Camshaft bearing cover bolt	Camshaft bearing cover	12±1	9	-
15	bolt	Fuel manifold	32±2	24	-

16	bolt	water pump	32±2	24	-
17	bolt	Front end wheel tensioning wheel	65±3	48	-
18	bolt	Front wheel system idler assembly	65±3	48	-
19	bolt	Engine Hook No.1	65±3	48	-
20	bolt	Engine Hook No.2	65±3	48	-
21	Self tapping screws				

Other general bolts of the engine (N.m)

Size	8.8 Level			10.9 Level		
	N.m	lb~ft	lb~in	N.m	lb~ft	lb~in
M6	10±1	—	89	13±1	10	—
M8	23±2	17	—	32±2	24	—
M10	50±3	37	—	65±3	48	—
M12	80±5	59	—	110±5	81	—

CHAPTER 4: MAIN ENGINE TROUBLES AND TROUBLESHOOTING METHODS

Section I. Engine Starting Difficulties

	Failure phenomenon and cause	Methods of elimination
Starter motor does not rotate	1 Loose or undercharged battery electrode connections	Tighten or charge
	2 Circuit has disconnections	Inspection and repair
	3 Damaged starter motor	Repair or replacement
Spark plug won't fire.	1 Ignition timing not adjusted properly	adapt
	2 Poor grounding	maintenance
	3 Damaged ignition coil	replacements
	4 Spark plug improperly gapped or burned	Adjustment or replacement
	5 Faulty electronic ignition system	Repair or replacement
Failure of the oil supply system	Insufficient fuel supply to the petrol pump	Repair or replacement
	Clogged petrol hose and petrol filter	clean
Reduced cylinder compression pressure	1 Cylinder gasket rupture	replacements
	2 Damaged valves.	Repair or replacement
	3 Loose intake manifold with air lowing in	tighten
	Piston, piston ring, cylinder wear	Repair or replacement

Section II. Insufficient power during operation

	Failure phenomenon and cause	Methods of elimination
Insufficient power during operation	Improperly adjusted throttle pedal and throttle valve body	adapt
	Cylinder compression pressure reduction	Check valves, spark plugs, cylinder gaskets for leakage
	Inaccurate ignition timing	adapt
	Insufficient supply of petrol	Adapt or maintenance
	air intake deficit	Check the air intake system
	Exhaust blockage	Checking the exhaust system and removing carbon deposits
	Improper or damaged spark plug gap	Adjustment or replacement

Section 3: Knocking sound inside the engine

Failure phenomenon and cause		Methods of elimination
Knocking sound inside the engine	Worn axial shims, worn camshaft cams and rocker arms	replacements
	Heavy wear on crankshaft, connecting rod bore and piston pins	Replacement or repair
	Damaged piston ring	replacements
	Crankshaft thrust clearance too large	adapt

Section IV Engine Overheating

Failure phenomenon and cause		Methods of elimination
Engine overheating	Ignition timing not adjusted properly	adapt
	Improper spark plug gap or carbon build-up	Clearance or adjustment
	Improper spark plug gap or carbon build-up	Tighten or clean
	Insufficient fan tape tension	adapt
	Insufficient coolant or clogged water pipes	Replenishment or liquidation
	Improper or damaged water pump clearance	Cleaning or replacement
	not enough oil	replenishment
	Clogged oil line or damaged oil pump	Cleaning or replacement
	Damaged cylinder gasket	replacements
	Clutch Slip	Cleaning or replacement
	Radiator clogged with scale	Cleaning or replacement

Section V. Excessive oil consumption

Failure phenomenon and cause		Methods of elimination
Excessive oil consumption	Worn or damaged valve guide oil seals	replacements
	Worn or damaged oil rings	replacements
	The piston ring alignment is not staggered according to regulations	adapt
	Damaged cylinder gasket	replacements

Section 6 Noise in the clutch

Number	Failure phenomenon and cause	Methods of elimination
1	Worn or damaged separation bearings	replacement
2	Output shaft bearing wear	replacement
3	Loose clutch hub	Repair
4	Cracked clutch pressure plate	replacement
5	The pressure plate and diaphragm spring are loose	Repair or replacement
6	Clutch friction disc soaked with oil	Cleaning or replacement
7	Broken clutch shock absorber rod or spring	replacement

Maintenance Manual for Segway N20TG-S1 Engine

PREFACE

This maintenance manual is intended for professionals engaged in automotive maintenance and repair operations. The book adopts a general system division method for engines (electrical system, timing system, fuel control system, etc.) using large assemblies.

In order to separately explain the various components belonging to the assembly, each assembly is further divided into several constituent parts. This manual provides brief descriptions, specifications, adjustments, disassembly and installation of each assembly component, as well as the essentials for disassembly and reassembly.

This manual only introduces the maintenance methods for the mechanical part of the engine. The maintenance methods for the electronic fuel injection control system are provided by the electronic fuel injection system supplier. For parts not mentioned in this manual, please refer to the "Operation and Maintenance Manual for Segway N20TG-S1 Engine".

The graphic diagrams provided in this maintenance manual are for reference only. If the graphics do not match the actual product, the actual product shall prevail.

Attention: During maintenance, please read this manual carefully and comply with relevant regulations. The company shall not be held responsible for any damages caused by non-compliance with this manual or unauthorized modifications.

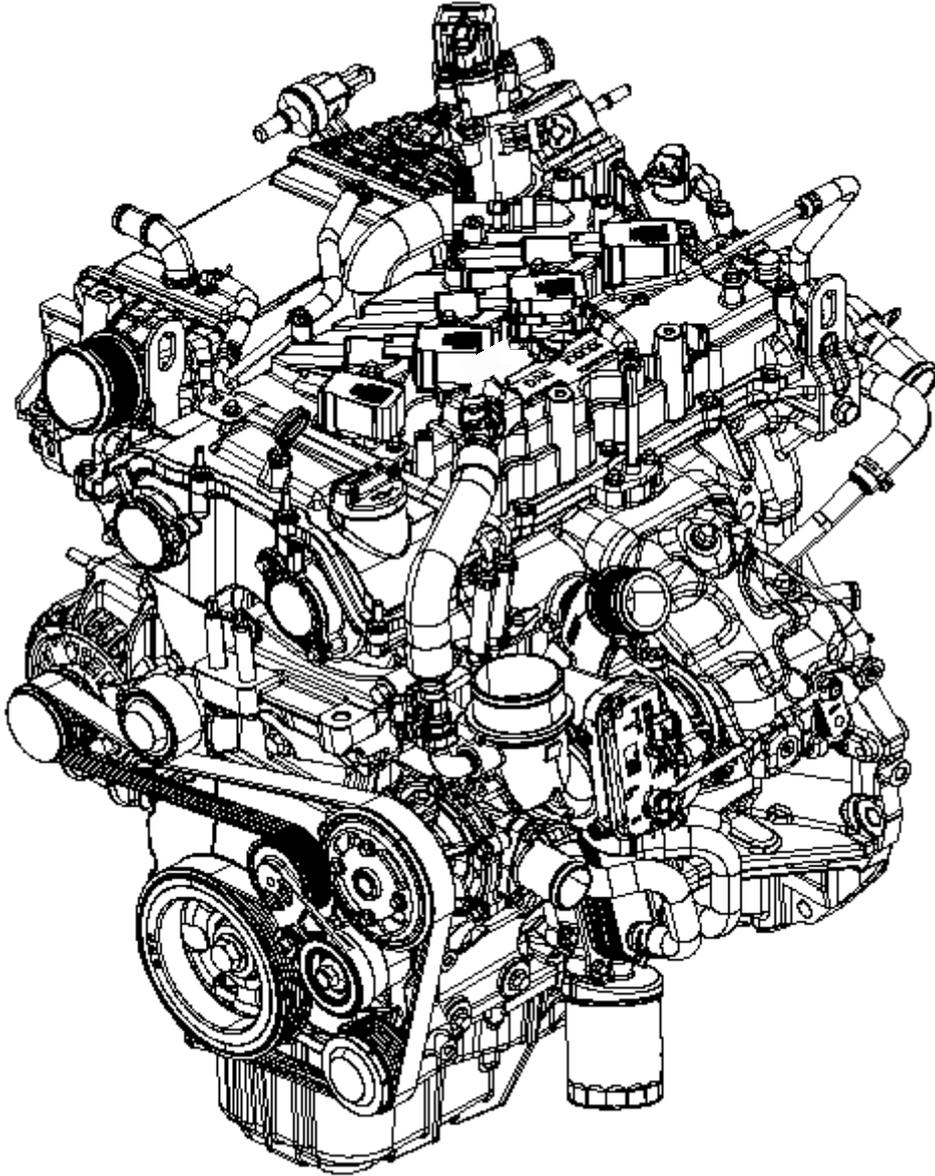
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CHAPTER I. OVERVIEW

1.1 Appearance

The exterior of the N20TG-S1 engine is shown below



Exterior View of Engine Assembly

1.2 Engine Overview

The N20TG-S1 engine is a front engine, which perfectly demonstrates the characteristics of 'Clean, Powerful and Quiet', and is an advantageous model to meet the competition in the Chinese market in the future. In order to ensure the excellent performance of the engine, advanced design, manufacturing and technology have been adopted in key systems to achieve outstanding fuel-saving performance, good dynamics, excellent NVH quality, high reliability and durability.

(1) Advanced technology:

- High-efficiency combustion system
- 35MPa Fuel Direct Injection System + Triple Injection
- Mid VVT + intermediate lock-up VVT + timing chain system
- Electronic control actuator + twin-scroll supercharger
- Atkinson cycle
- Low friction design
- Crankshaft offset
- Shaft tile, piston pin coating
- Fully variable displacement oil pumps
- Low viscosity oil
- Advanced thermal management system
- Cylinder block and head parallel cooling
- Thermostat outlet control + HVAC control valve
- Water-cooled intercooling system
- cylinder head integrated exhaust manifold (IEM)
- Lightweight design
- Plastic intake manifold
- Elimination of exhaust manifold
- Crankcase and crankshaft lightweight design

Excellent quality:

- N20TG-S1 engine, in addition to the use of advanced technology, has also gone through harsh bench tests and vehicle tests, and after repeated high-intensity road reliability tests, as well as high temperature, high plateau and other extremely poor working conditions of the road test to ensure the quality of the engine.
- After repeated high-intensity road reliability tests, as well as high temperature, high cold, plateau and other extremely poor working conditions of the road test, to ensure the quality of the engine. High performance: Maximum net power is 167KW, maximum net torque is 360N.m. The engine is designed to meet the requirements of the national standards;
- Low emission: meets National VI emission;
- Outstanding fuel-saving performance: low friction and shorter warm-up time (advanced engine heat management);
- Excellent NVH quality;
- Reliability and durability;
- Reduced manufacturing costs and high cost effectiveness;
- Compact dimensions, clean appearance (Packaging), leading structural design, modularity of components,
- Reduced number of parts;
- High maintenance performance and reduced maintenance costs.

 **WARNING:** Always disconnect the negative battery cable first before removing or installing any electrical device where tools or equipment can easily come in contact with exposed electrical terminals. Disconnecting this cable will prevent injury or damage to the vehicle. If not otherwise specified, you must stop the vehicle and turn off the engine.

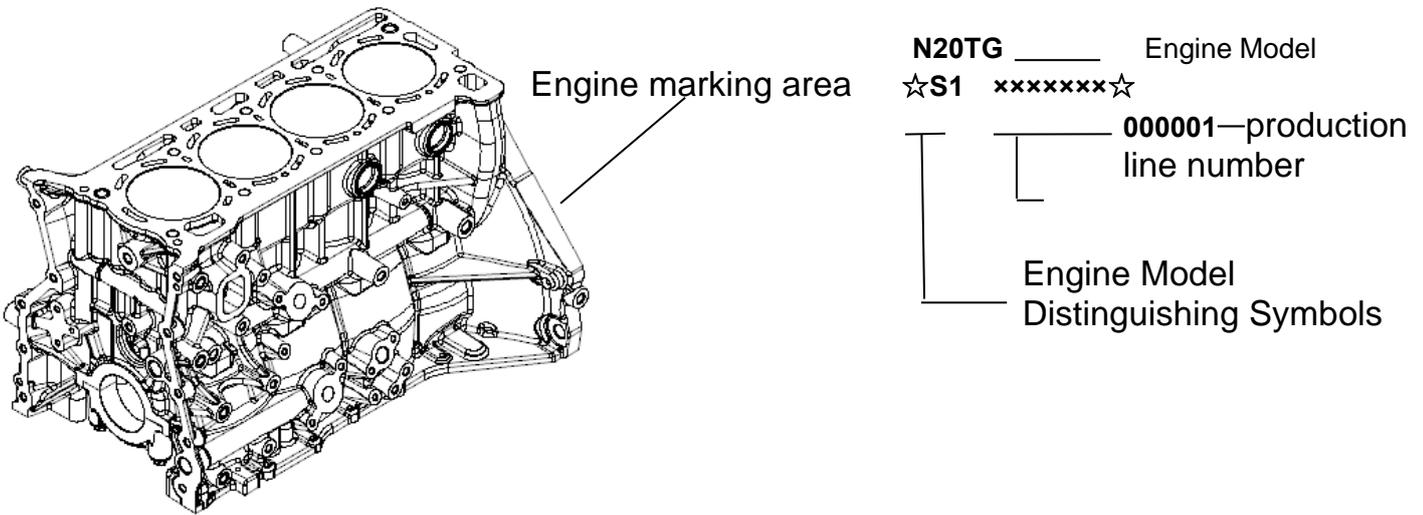
 **CAUTION:** Each time the air filter is removed, the air intake must be plugged to prevent foreign matter from entering. Foreign objects can block the cylinder air intakes and cause serious damage when starting.

 **NOTE:** For all repairs involving the removal of the 'water pump and hose above the generator', 'cover the generator with a rag or other aid to prevent liquid from entering the generator'.

1.3 Engine structural parameters

model number	N20TG-S1	
Number of cylinders	4	
combustion chambe	roof ridge type	
Total Displacement (cc)	1998cm ³	
Cylinder diameter mm	86mm	
Stroke mm	86mm	
compression ratio	10	
Cylinder centre distance mm	94	
Cylinder block height mm	215.8	
Connecting rod head centre distance	141	
Number of valves	inlet valve	8
	exhaust door	8
Output	Maximum net power	167Kw /5500rpm
	Maximum net torque	360N.m /1900~3000 rpm
fuels	87# US	
Meets emission regulations	US EPA certified (Euro 5)	
Profile size (without transmission)	Total length x Total width x Total height = 693mm×638mm×714mm	
Engine weight (Kg)	155kg	
Lubrication system	pressure oiling	
Fuel supply method	direct injection	
Oil pump type	Cycloidal Gear Pumps	
Cooling system	Forced Circulation Water Cooling	
Pump type	Centrifugal, Impeller	

1.4 Engine Number Location and Cylinder Block Number



1.5 Inspection Code

- (1) Prepare the parts box or parts rack to place the disassembled and decomposed parts, which must be placed in order, and marked if necessary, to avoid confusion and misplacement.
- 2) Be very careful when repairing aluminium alloy parts to avoid damage to the machined surfaces.
- (3) Prepare sufficient auxiliary materials for use at any time during the inspection.
- 4) Use special tools to tighten bolts and other fastening parts with standard tightening torque according to the required values.
- 5) After overhauling, disposable items should be scrapped and replaced with new parts.
- 6) Use correct disassembling tools to disassemble aluminium alloy parts.
- 6) Use the correct disassembly tools for disassembly and assembly.
- (7) Refer to the contents of this manual when working.
- 8) If you encounter any technical problems that are difficult to solve during the overhaul, we recommend that you consult our project sales department.

CHAPTER 2: ENGINE OVERHAUL

2.1 Mechanical system

2.1.1 Norm

name	specifications	capacity
sealing glue	Loctite 5900 (oil pan and crankcase, rear end cap lower all bonding surface, rear end cap and crankcase bonding surface, crankcase, the front of the cylinder head with the front cowling assembly bonding surface, cylinder gasket protrudes from the front, the reverse side of the adhesive, the front cowling assembly and the cylinder block, cylinder head T-type area, the front cowling assembly and cylinder block, the oil pan bonding T-type area, the cylinder head cover with the cylinder head, the front cowling assembly T-type areas, the cylinder head cover and 10 # camshaft cover, cylinder cover, 10 # camshaft cover and cylinder head bonding area, 10 # camshaft cover and T-type area) Cylinder head cover combined with 10# camshaft cover and cylinder head T-type area, 10# camshaft cover combined with cylinder head area, crankcase, crankshaft rear end cover combined with oil pan T-type area)	—
High-temperature anti-seize agent	Tensan 1767 (supercharger to exhaust pipe connection stud)	—
Thread sealing and fixing anaerobic adhesive	Loctite 243(Cylinder body screw plug, plug thread, bolt thread surface)	—
Thread sealing and fixing anaerobic adhesive	Loctite 263 (cylinder head screw plug, plug thread surface)	—
Cylindrical Fixed Anaerobic Adhesive	Loctite 962T (cylinder block, cylinder head bowl plug)	—
engine oil	SN/GF-5 5W-30	5.0L

Component size specifications

project		Standard value
Camshaft		
Camshaft height mm	intake	28.24
	exhaust	28.2
Cylinder head and valves		
Cylinder head surface flatness mm		0.05
Total height of cylinder head mm		215
Valve head diameter mm	Intake valve	35±0.1
	Exhaust valve	29±0.1
Valve stem diameter mm	Intake valve	5.5 (-0.020, -0.032)
	Exhaust valve	5.464±0.008
Clearance between valve stem and guide tube mm	Intake valve	0.020—0.044
	Exhaust valve	0.028—0.056
Thickness of valve head mm	Intake valve	3 (0.2, 0.6)
	Exhaust valve	3±0.2
Valve lash mm	Intake valve	0.22±0.02
	Exhaust valve	0.36±0.02
Valve spring free height mm (intake and exhaust valves)		46.1
Valve spring preload		220N
Valve spring verticality		1.3mm
Valve guide length mm		40±0.1
Inner diameter of valve guide mm		5.5(0, +0.012)
Valve guide extends out of cylinder head mm		12.5±0.2
Valve seat sealing band width mm	intake	1.3±0.1
	exhaust	1.5±0.1

project		Standard value
pistons and connecting rods		
Standard piston diameter mm		$\Phi 85.965 \pm 0.005$
Clearance to cylinder liner mm		0.030~0.054
Headspace mm	First ring	0.12~0.22
	Second ring	0.26~0.40
	Third ring	0.20~0.50
Piston pin diameter mm		$\Phi 22 (-0.005, 0)$
Clearance between piston pin and piston pin bore mm		0.006~0.015
Piston pin bore diameter mm		$\Phi 22 (+0.006, +0.010)$
Crankshafts and cylinder blocks		
Connecting rod journal diameter mm	1	47.994~48.000
	2	47.988~47.9939
	3	47.982~47.9879
Connecting rod journal out-of-roundness ~ large mm		0.005 (roundness)
Connecting rod bearing clearance (oil film thickness) mm		0.020~0.048
Connecting rod bearing axial clearance mm		0.1~0.3
Spindle journal radial runout limit mm		0.02
Spindle axial clearance mm		0.06~0.026
Standard thickness of crankshaft thrust plate mm		1.97~2.02
Clearance between main bearing and main journal mm		0.024~0.052
Main journal diameter	1	53.984~53.99
	2	53.978~53.9839
	3	53.972~53.9779
Cylinder diameter	1 group	$\Phi 86 (0, +0.014)$

Tightening torque specification

Item	Name	mounting part	Tightening method
1	Main bearing cover bolts	crankcase	Corner method: (40±2) N.m+ (90±2) ° monitor: (70-130) N.m
2	connecting rod bolt	rod cover	Corner method: (30±2) N.m+ (90±2) ° monitor: (50-90) N.m
3	Cylinder head attachment bolts	cylinder head	Corner method: (30±2) N.m+ (180±2) ° monitor: (55-110) N.m
4	Crankshaft pulley combination bolt	crankshafts	Corner method: (120±2) N.m+ (120±2) ° monitor: (238-402) N.m
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3	Turbocharger connecting nut	Turbocharger and cylinder head	40±2	30	-
4	Turbocharger connecting screw	Turbocharger and exhaust pipe	6±1	-	53
5	Turbocharger connecting nut	Turbocharger and exhaust pipe	25	18	-
6	Connecting bolt between crankshaft and balance shaft	Balance shaft	45	33	-
7	Signal board screw	Eighth crankshaft plate	15±1	11	-
8	Process hole blockage	Rear end cover of crankshaft	40±2	30	-
9	Short bolt for cylinder head cover	head cover	13±1	10	-
10	Crankcase R3/8 plug	crankcase	40±2	30	-
11	R1/8 crankcase plug	cylinder cover	12±2	9	-
12	Cylinder head water channel plug	cylinder cover	75±5	55	-
13	Screw plug at cylinder head IEM	cylinder cover	56±3	41	-
14	Camshaft bearing cover bolt	Camshaft bearing cover	12±1	9	-
15	bolt	Fuel manifold	32±2	24	-

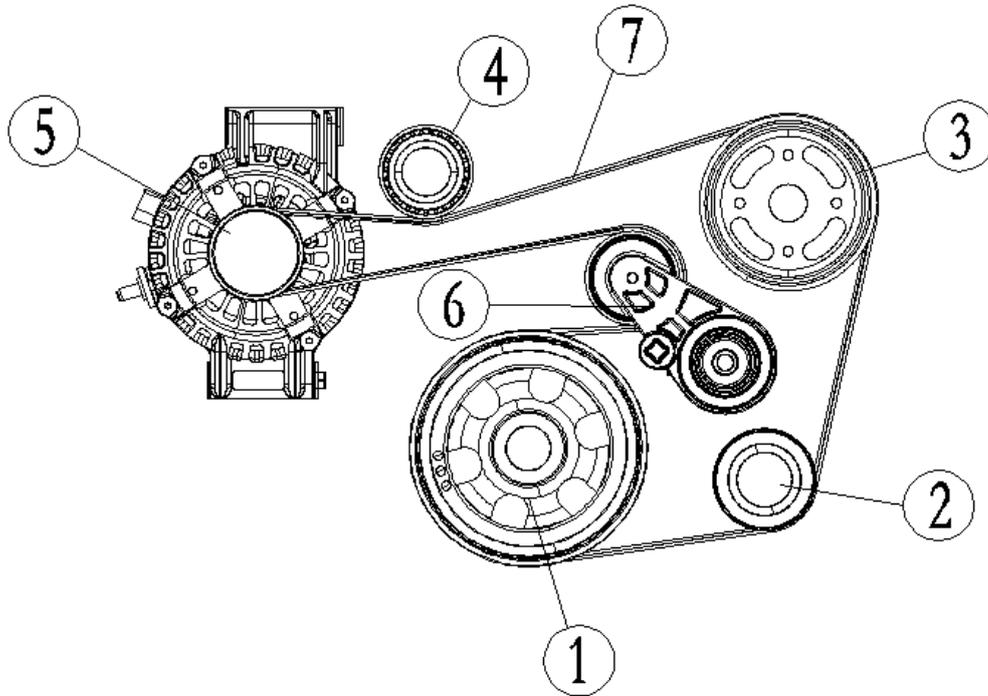
16	bolt	water pump	32±2	24	-
17	bolt	Front end wheel tensioning wheel	65±3	48	-
18	bolt	Front wheel system idler assembly	65±3	48	-
19	bolt	Engine Hook No.1	65±3	48	-
20	bolt	Engine Hook No.2	65±3	48	-
21	Self tapping screws				

Other general bolts of the engine (N.m)

Size	8.8 Level			10.9 Level		
	N.m	lb~ft	lb~in	N.m	lb~ft	lb~in
M6	10±1	—	89	13±1	10	—
M8	23±2	17	—	32±2	24	—
M10	50±3	37	—	65±3	48	—
M12	80±5	59	—	110±5	81	—

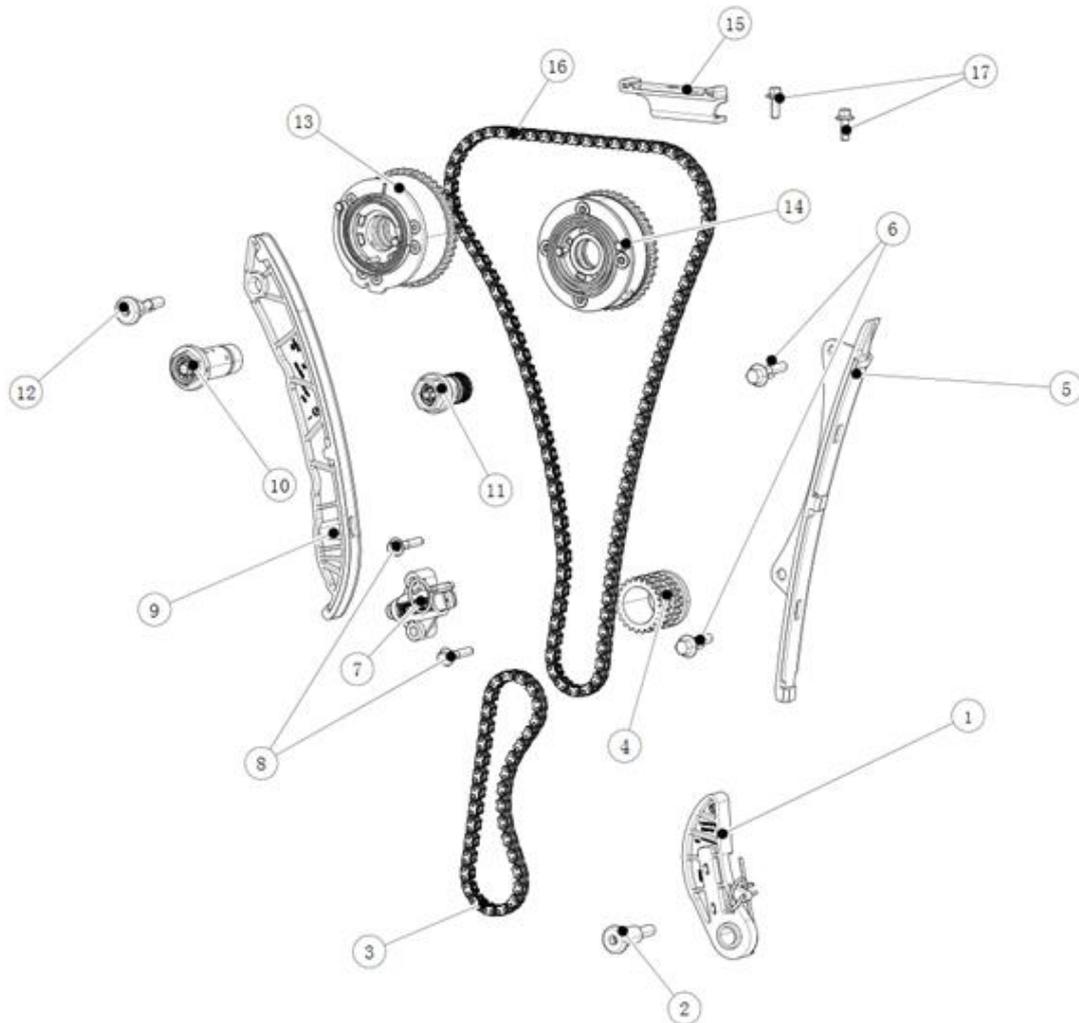
2.1.2 Component breakdown diagrams

Front End Wheel System



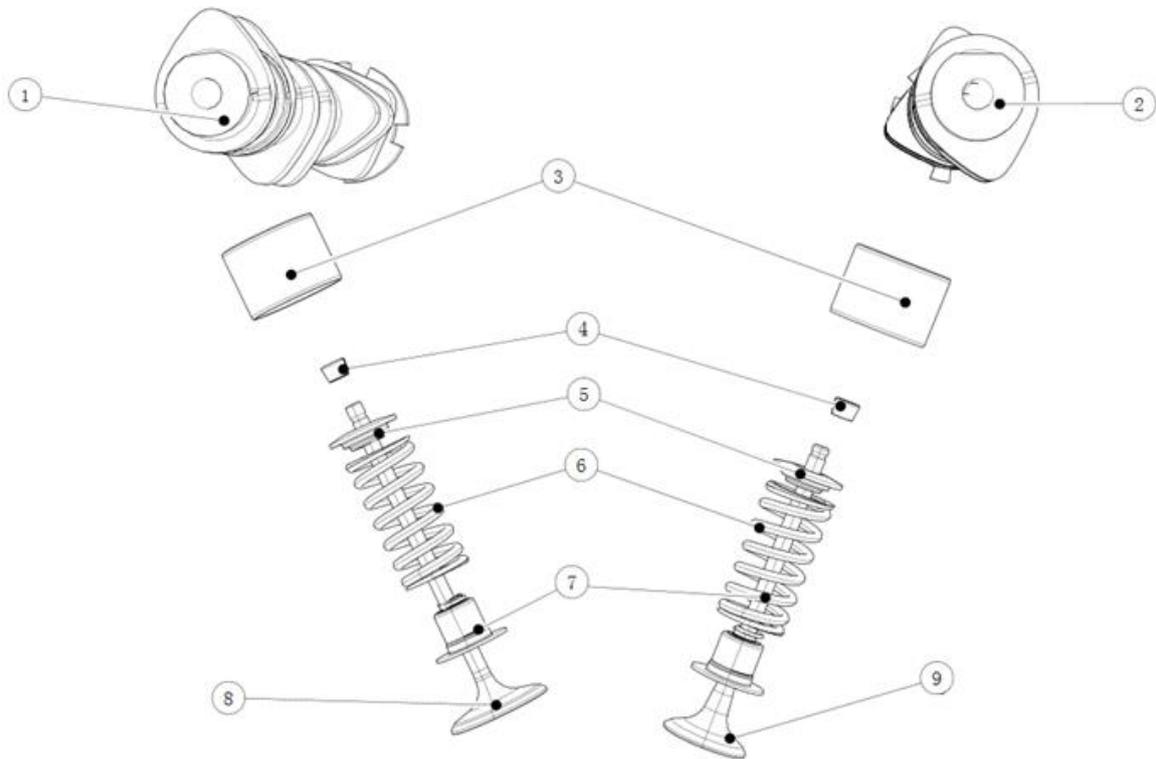
projects	clarification	projects	clarification
1	Crankshaft vibration reducing pulley assembly	5	Integral alternator assembly
2	Front end wheel train groove idler assembly	6	Front End Wheel Tensioner Assembly
3	Water pump pulley	7	Front End Wheel Tie Belt
4	Front end wheel train idler assembly		

Timing equipment



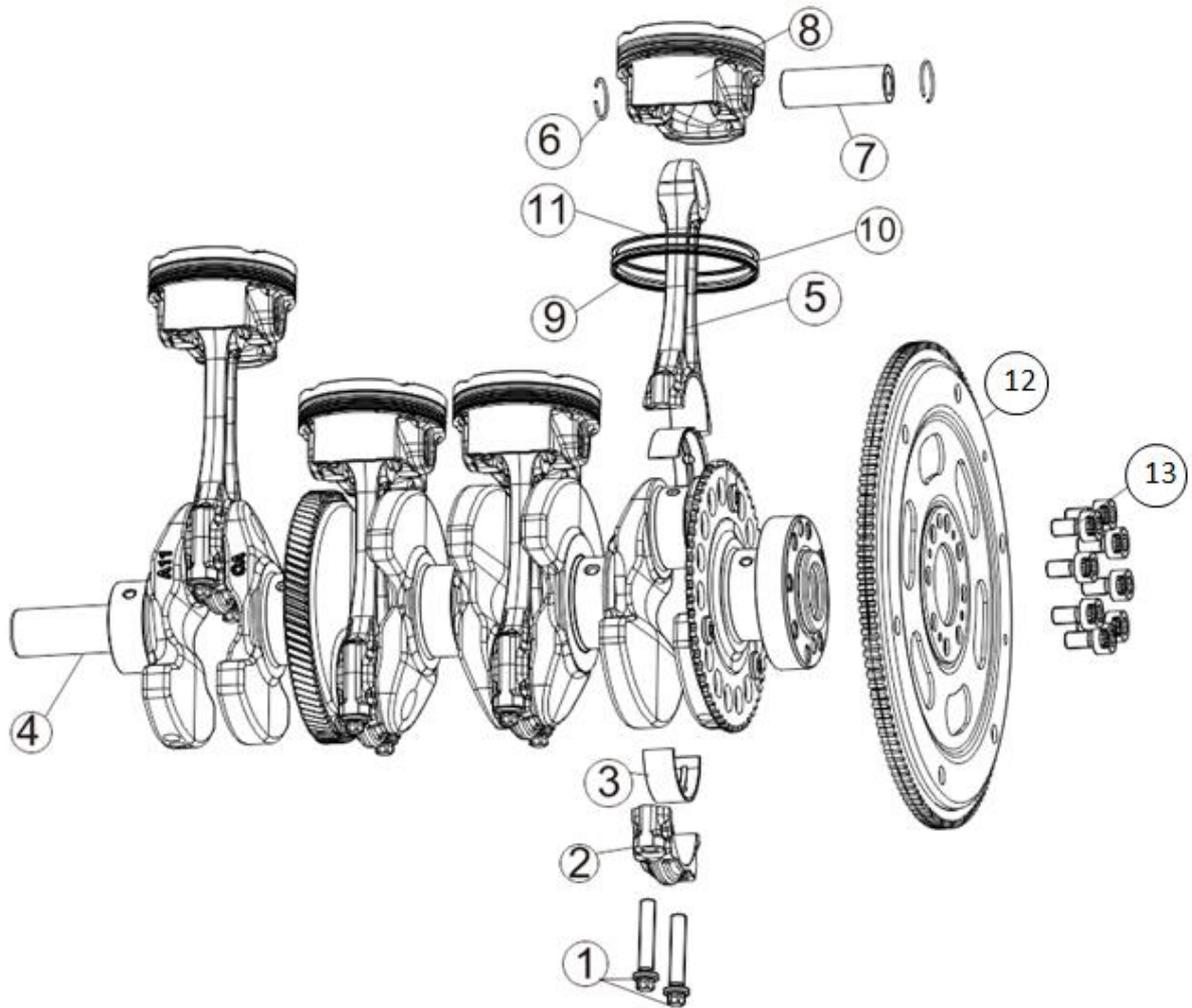
projects	clarification	projects	clarification
1	Oil pump chain tensioner assembly	10	Solenoid valve assembly for intake
2	Oil pump chain tensioner mounting bolts	11	Exhaust centre solenoid valve assembly
3	Oil Pump Chain Assembly	12	Timing Chain Rail Assembly Mounting Bolts
4	Crankshaft Timing Sprocket	13	Intake phaser assembly
5	Timing Chain Setting Rail Assembly	14	Exhaust phaser assembly
6	Timing Chain Track Mounting Bolt	15	Camshaft intermediate guide assembly
7	Timing Tensioner Assembly	16	Timing chain assembly
8	Timing chain tensioner assembly mounting bolts	17	Camshaft guide mounting bolts
9	Timing Chain Dynamic Rail Assembly		

Throttle mechanism



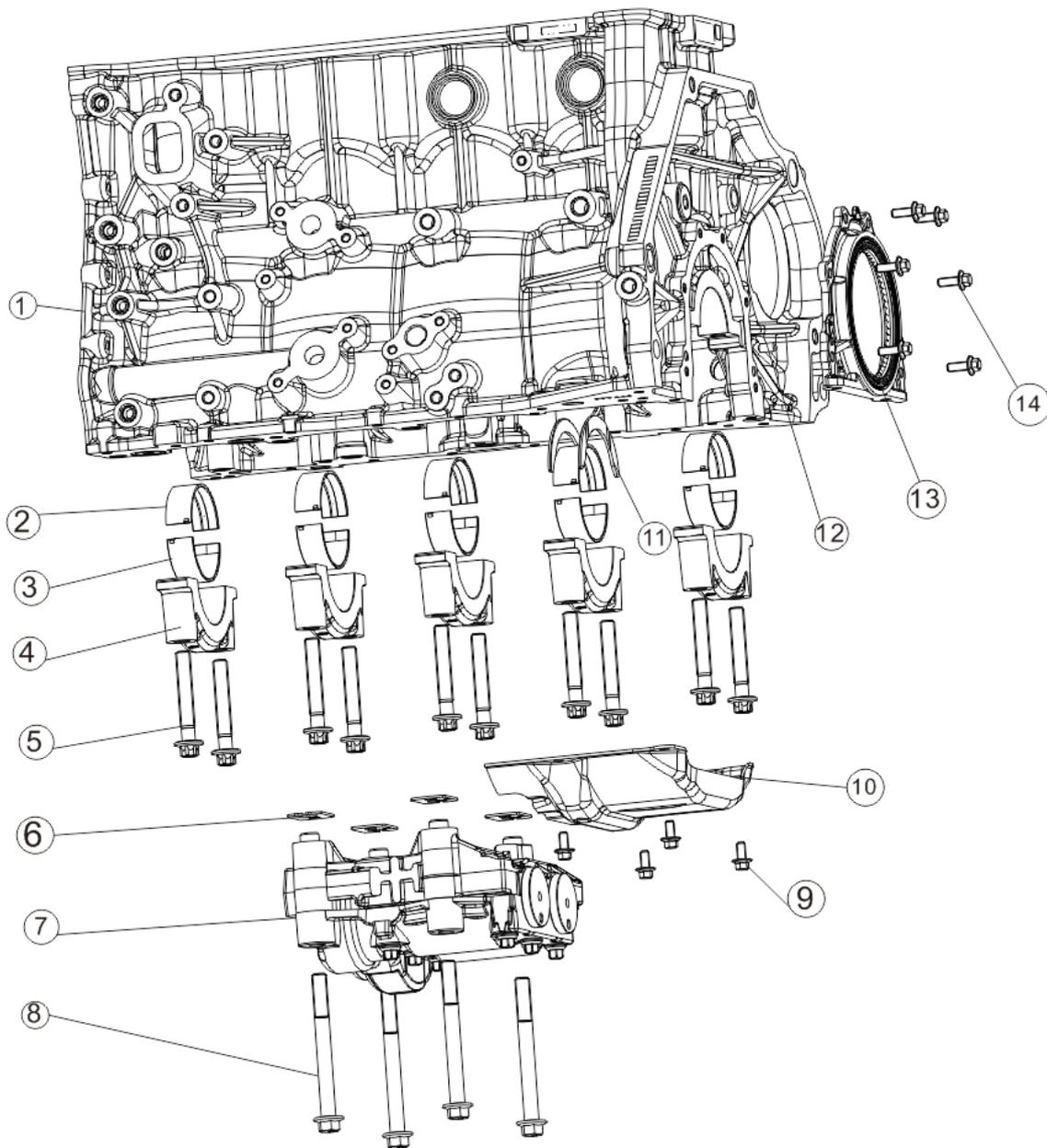
projects	clarification	projects	clarification
1	Intake Camshaft Assembly	6	Valve Spring
2	Exhaust Camshaft Assembly	7	Valve Oil Seal
3	Mechanical Tappet	8	Intake valves
4	Valve Locking Block	9	Exhaust valve
5	Valve Spring Block		

Crankshafts



projects	clarification	projects	clarification
1	Connecting rod bolts	8	Piston
2	Connecting rod cover	9	Combined oil ring
3	Connecting Rod Shaft Shoe	10	Wiper Rings
4	Crankshaft	11	Air ring
5	Connecting rod body	12	Drive disc
6	Piston pin retaining ring	13	Drive disc bolts
7	Piston pin		

Crankcase



projects	clarification	projects	clarification
1	Crankcase sub-assembly	8	Crankcase and Balance Shaft Connecting Bolts
2	Upper Main Shaft Shoe	9	Bolt
3	Lower Main Shaft Shoe	10	Crankcase lower reinforcement plate
4	Main bearing cover	11	Thrust plate
5	Main bearing cover bolts	12	Positioning pin
6	Balance shaft No.1 adjusting spacer	13	Crankshaft rear end cover assembly
7	Balance shaft assembly	14	Plugs

2.1.3 General inspections

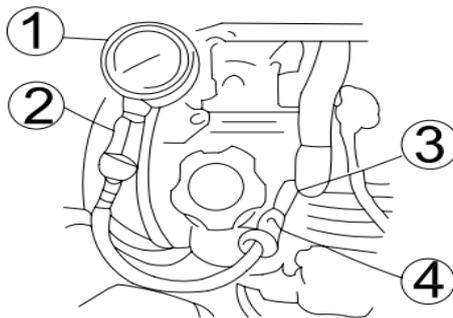
Special tool

Serial Number	Special tool
1	Valve Spring Locking Block Removal Tool
2	Crankshaft Front Oil Seal Tool
3	Crankshaft Rear Seal Tool

Cylinder Pressure Check

Check the compression pressure on all 4 cylinders as follows.

1. Warm up engine to below normal operating temperature.
2. Switch off the engine after warming up. After the engine has warmed up, place the transmission shift lever in the 'Neutral' position and secure the parking brake and drive wheels.
3. Disconnect the fuel injector wiring harness connector.
4. Remove the ignition coil assembly and all spark plugs.
5. Install special tool (compression gauge) into spark plug hole.



Serial Number	Special tool
1	pressure gauge
2	Fittings
3	Hose
4	Retainer

6. Place the transmission gearshift lever in the 'neutral' position (to reduce the starting load on the engine) and depress the accelerator pedal as far as it will go to fully open the throttle.

The throttle is fully opened by pressing the throttle pedal as far as it will go.

7. Start the engine with a fully charged battery and read the maximum pressure on the compression gauge.



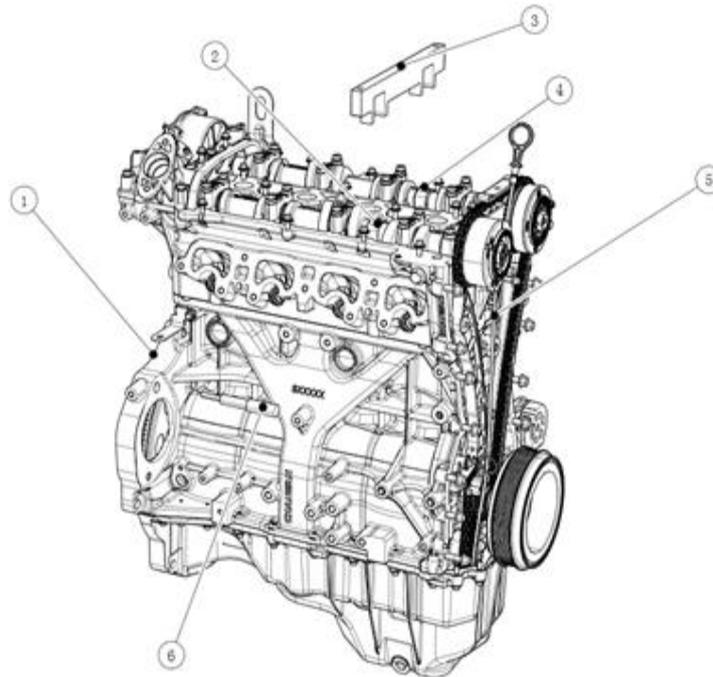
Note: To measure the compression pressure, the engine must be started with a fully charged battery to a speed of at least 250 rpm.

8. Follow steps 5 through 7 for each cylinder and record the cylinder compression pressure values.
9. Compare to the specifications in the table below:

compression pressure	
Limit (minimum)	1300kPa
Maximum pressure difference between two cylinders	100kPa

10. After inspection, install the spark plug and ignition coil assembly and connect the injector harness connectors.

Valve lash inspection and adjustment



Project	Describe
1	Rear end of engine
2	Camshaft timing marks
3	Camshaft Timing Tooling
4	Camshaft timing marks
5	Front end of engine
6	Crankshaft Timing Tooling

1. Disconnect the negative wire of the battery.
2. Remove the cylinder head cover.
3. Turn the crankshaft clockwise so that the two camshaft hexagonal markings are horizontal and upward, and at the same time, the locating holes on the flywheel are aligned with the locating pin holes on the cylinder block, and the camshaft and crankshaft are fixed with the special timing tool. Measure the intake valve clearance of 1 and 2 cylinders and the exhaust valve clearance of 1 and 3 cylinders in turn using the plug gauge.
4. Turn the crankshaft clockwise so that the two camshaft hexagonal markers are horizontal and downward, and at the same time, the positioning holes in the flywheel are aligned with the positioning pin holes in the cylinder block, and the camshaft and crankshaft are fixed with the special timing tool. Measure the 3 and 4 cylinder intake valve clearances and the 2 and 4 cylinder exhaust valve clearances in turn using a plug gauge.

5. If the valve lash exceeds the standard, replace the corresponding valve tappet to adjust the valve lash according to the lash value, and then check again to ensure that the valve lash is within the specified standard.

Valve lash standard (with high pressure oil pump and 10# camshaft cover)	Cold condition (coolant temperature 15-25°C)	
	air intake	0.20-0.24mm
	ventilate	0.34-0.38mm

Tightening torque: 12±2N·m

6. When all valve checks and adjustments are completed, install them in the reverse order of removal.

Timing mechanism check

1. Remove the cylinder head cover of the engine, turn the crankshaft clockwise, and check whether the timing position of the engine timing mechanism is correct or not by using the timing clamp and timing pin.

Check whether the timing position of the engine timing mechanism is correct or not.

2. Check the timing chain assembly, timing chain fixed rail assembly and timing chain moving rail assembly for wear and cracks.

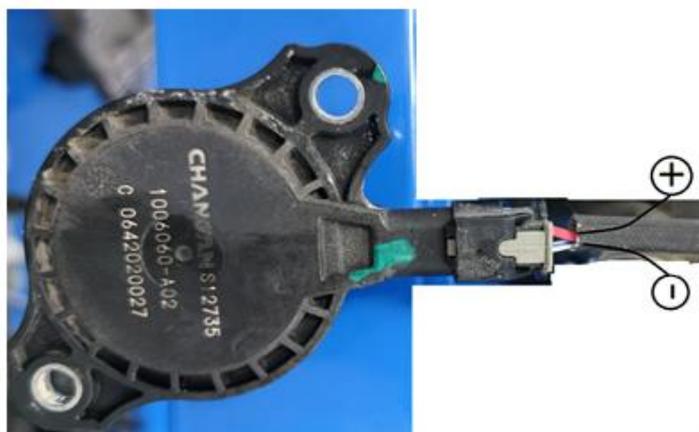
3. Inspect the timing chain tensioner assembly for any sticking phenomenon and replace if necessary.

VVT Troubleshooting

When the engine reports a VVT-related fault, refer to the following steps for troubleshooting.

1. Disassemble the centre-mounted solenoid assembly, observe whether there is any abnormality in the thimble of the centre-mounted solenoid assembly (scratches, deformation, cleanliness, etc.), and clean it with engine oil or cleaning fluid;

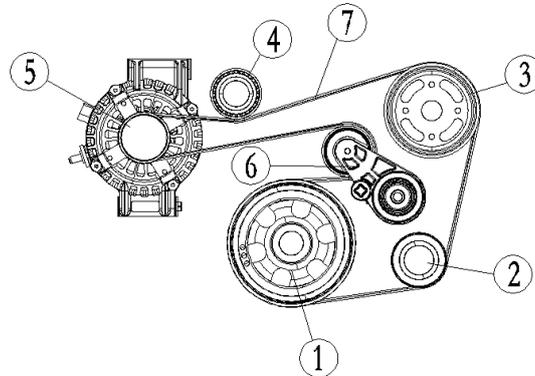
2. Pass the wiring harness of the centre-mounted solenoid assembly through 12-14V normal electricity (recommended use of car battery), and the wiring with the negative pole of the level to repeat the step of contact → disconnect → contact at a faster frequency, as shown in the figure below;



3. If the thimble can be extended normally when the power is on, and can be pushed in more easily by hand when the power is off, it indicates that the middle solenoid is normal, and it will be re-installed on the engine; on the contrary, it indicates that the middle solenoid assembly is invalid, and the middle solenoid assembly should be replaced to deal with the problem.

2.1.4 Removal and installation instructions

Front End Wheel System



Project	Describe
1	Crankshaft torsion damper assembly
2	Front end wheel train groove idler pulley assembly
3	Water Pump Pulley
4	Front End Pulley Idler Assembly
5	Integral Alternator Assembly
6	Front End Tensioner Pulley Assembly
7	Front End Pulley Belt

【Disassembly】

1. Use a tool to wrench the front end wheel train tensioner pulley assembly counterclockwise.
2. Remove the belt and slowly loosen the tensioner pulley.
3. Remove the front end pulley tensioner assembly, front end pulley groove idler assembly, water pump pulley, front end pulley idler assembly, integral alternator assembly, and crankshaft torsion pulley assembly in sequence.

pulley assembly, integral alternator assembly, and crankshaft torsion damper assembly.

4. Check whether each accessory pulley rotates flexibly, whether it is contaminated by oil, mud, water, etc., and whether there is any chipping or damage in the wedge groove of the pulley. Replace the pulleys if there is any abnormality.

【Installation】

Install the crankshaft torsion damper assembly, integral alternator assembly, front end pulley idler assembly, water pump pulley, front end pulley groove, and water pump pulley in order.



Note: The crankshaft pulley assembly bolts can only be reused once and must be replaced after the second disassembly.

Wrap the belt around the side of the front end pulley system as shown in the above diagram and use a tool to wrench the front end pulley system tensioner pulley

Check that the belt fits all the way into the wedge groove. If there is any abnormality, remove the belt and repeat step 2

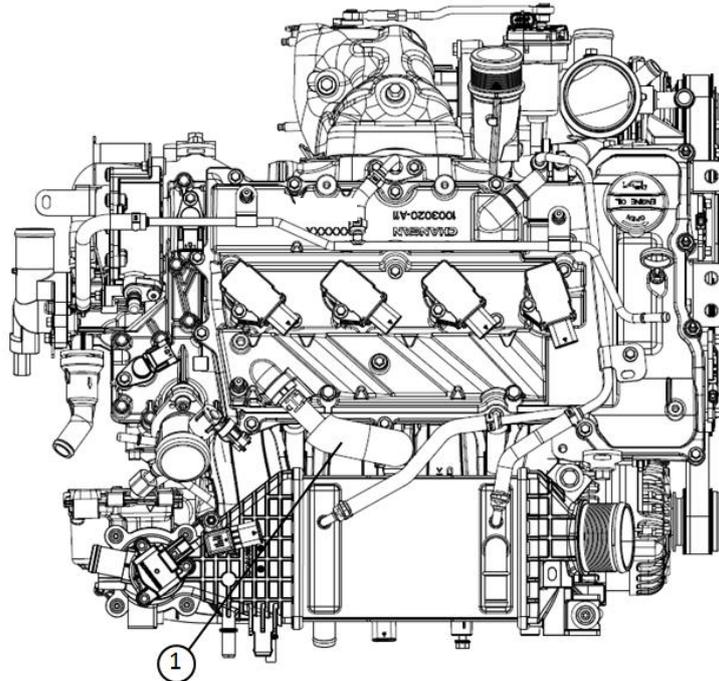
Cylinder head cover

【Disassembly】

Disconnect the positive and negative battery cables and remove the battery.

Remove the engine trim cover, as well as the ignition coil, oil dipstick, supercharger inlet and outlet hoses, and overflow hose.

Disconnect the vent hose from the cylinder head cover.



Project	Describe
1	Pressure regulating valve vent hose

4. Remove the cylinder head cover with the cylinder head cover gasket.

【Installation】

1. Install the cylinder head cover seal correctly into the cylinder head cover.

 **Note: Before installation, each part should be inspected for deterioration or damage and replaced if defects are found.**

2. Install the cylinder head cover on the cylinder head and tighten the bolts to the specified torque.

 **Note: When installing the cylinder head cover, care should be taken to prevent the cylinder head cover seal from shifting or falling off.**

3. Connect the vent hose to the cylinder head cover.

4. Install the ignition coil, oil dipstick, supercharger inlet and outlet pipes, and overflow pipe.

5. Connect positive and negative battery wires.

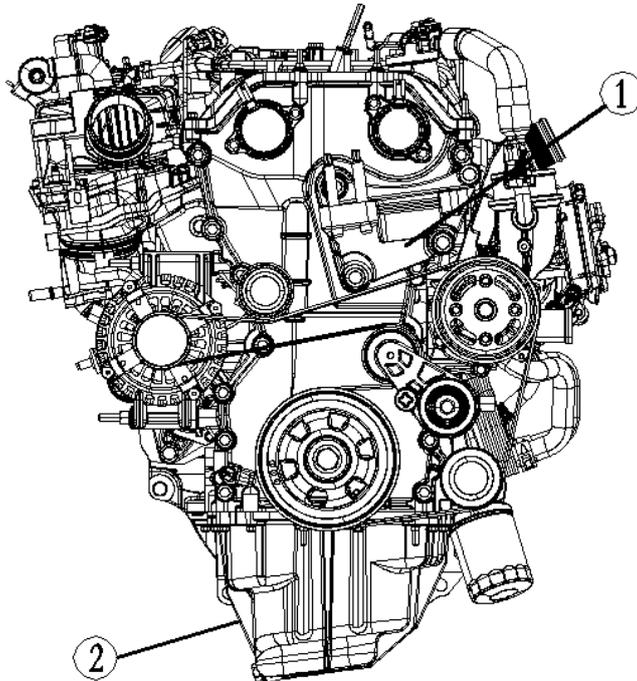
 **WARNING: Do not service the supercharger assembly when it is hot to avoid burns. Do not service until the system has cooled.**

Timing mechanism

【Disassembly】

Disconnect the negative battery cable.

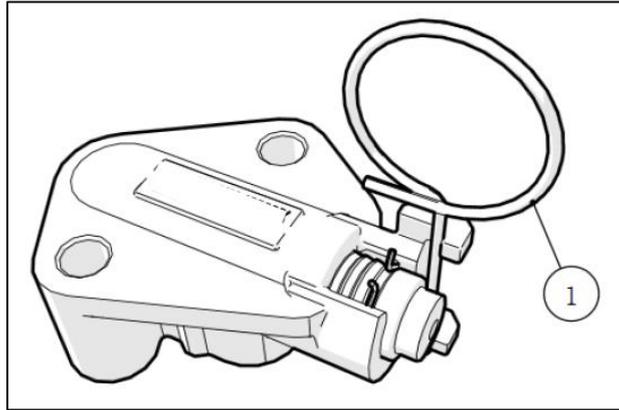
1. Drain engine coolant and engine oil.
2. Before removing the timing chain, the camshaft and flywheel need to be installed and positioned with special timing tooling to prevent rotation. Upper at the upper end, use the timing plate to position the hexagonal marking plane of the intake and exhaust camshaft assemblies in a horizontal upward position. At the lower end, use the timing pin to position the drive disc in the correct timing position.
3. Turn the front end pulley tensioner assembly counterclockwise, remove the front end pulley belt, and then disassemble the front end pulley groove idler assembly, water pump pulley, and water pump pulley. assembly, water pump pulley, front end wheel train idler pulley assembly, integral alternator assembly, and crankshaft torsion damper assembly, front end pulley idler assembly, integral alternator assembly, crankshaft torsion damper assembly.
4. Remove the right suspension bracket and oil pan assembly.



Project	Describe
1	Right Suspension Bracket
2	Oil pan assembly

6. Remove the front cowling assembly.

7. Use the pin to lock the timing chain tensioner piston, then remove the timing chain tensioner connecting bolt, and finally remove the timing chain tensioner.



Project	Describe
1	Tensioner pins

8. Remove the moving rail connecting bolts, fixed rail bolts, and inter-axis guide bolts in sequence, and then remove the moving rail, fixed rail, and inter-axis guide bolts.

Remove timing chain assembly.

9. Remove the timing chain assembly.

10. Remove the centre-mounted solenoid valve assembly, and then remove the intake and exhaust phaser assemblies.

【Cleaning】

Clean the mating surfaces between the front cowling assembly and the cylinder head, cylinder block, and oil pan, remove oil, old sealant, and dirt from the mating surfaces, and clean the tensioner assembly, guide rails, and timing chain.

【Installation】

1. Fixing the timing position

Before installing the timing chain, it is necessary to install and position the camshaft and flywheel with a special timing tool to prevent rotation. At the upper end, use the timing plate to position the hexagonal marking plane of the intake and exhaust camshaft assemblies in a horizontal upward position. At the lower end, use the timing pin to position the drive disc in the correct timing position.

2. Installation of VVT phasing

Before phasing installation, keep the camshaft timing phase positioned with the timing tooling; when phasing installation, make sure the phasing installation end face is well cleaned, the laser etching pattern is intact, and there are no problems such as scratches or crushing, make sure the threads of the centre solenoid valve assembly are not rotten or missing, etc., and push the thimble of the back end of the centre solenoid valve assembly by hand to make sure there are no problems such as stagnation or jamming. Firstly, bring the middle solenoid valve into the phasor without torque, and then tighten the middle solenoid valve of the intake phasor and the middle solenoid valve of the exhaust phasor after the installation of the timing chain assembly, the dynamic and stator rail assembly, and the timing chain tensioner assembly are all completed. Tighten the centre solenoid valve assembly to the torque specified in Table A.

3. Installing the crankshaft timing sprocket

When installing the crankshaft timing sprocket, install the sprocket with a large chamfer on the side of the hole and a full flange on the end face inward, and install the sprocket with the flange teeth facing outward.

4. Installing the timing chain assembly

Before installing the timing chain, keep the special timing tool to install and position the camshaft and flywheel to prevent rotation. Afterwards, hook the timing chain assembly to the intake and exhaust phasers and the crankshaft timing sprocket in the correct position.

5. Install the moving rail assembly, fixed rail assembly and inter-axle guide assembly.

Install the timing chain fixed rail assembly, timing chain movable rail assembly, and inter-axle guide assembly, and tighten the timing chain guide bolts according to the torque specified in Table A. Gently shake the movable rail assembly from side to side to ensure normal movement.

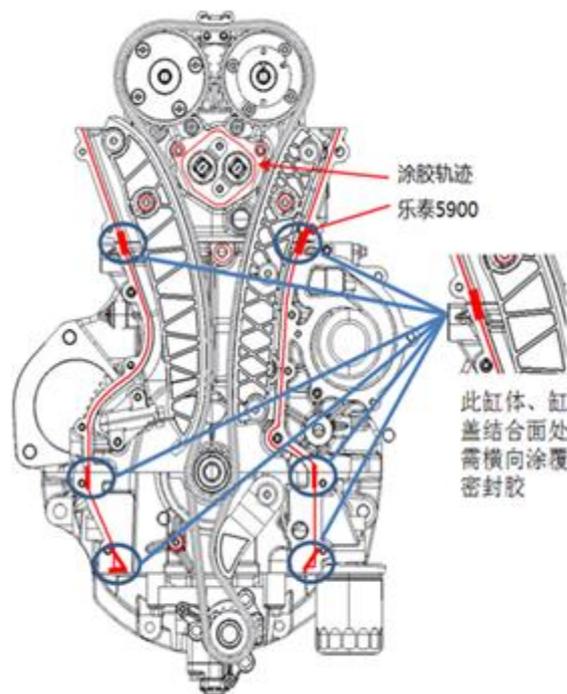
6. Install the timing chain tensioner assembly.

Before the timing chain tensioner assembly is assembled, it is forbidden to pull out the tensioner locking pin. After the timing mechanism is assembled, make sure that the chain assembly is in the guiding groove of the moving and fixed rail assembly, and then pull out the tensioner locking pin after making sure the accuracy is correct. After the timing mechanism chain system is assembled, it is prohibited to rotate the crankshaft in reverse (counterclockwise).

7. Installing the front cowling assembly

Before installing the engine front cover, use the oil seal press-fit tooling to press the crankshaft front oil seal assembly into the engine front cover oil seal hole, its oil seal end surface should be parallel to the oil seal hole end surface (can not be tilted), the oil seal concave down the hole end surface of 0.5mm or so, the oil seal spring shall not be shifted or fall off, and will be uniformly coated in the sealant on the engine front cover corresponding to the cylinder block, cylinder head, the coated track is shown in the figure.

Note: When assembling to ensure that the front oil seal clean, must not touch the lip of the oil seal, assembling the oil seal, the outer diameter of the oil seal can not be coated with sealant.



8. Install the right suspension bracket, etc.

9. Install the crankshaft torsion damper assembly.

When assembling the crankshaft pulley combination bolt, ensure that the timing tooling holds the camshaft and flywheel in the correct timing phase position. Assembly should be done in accordance with the process specified in Appendix Table A.



Note: When tightening, the bolts should be preloaded to (120 ± 2) N.m before rotating $(120\pm 2)^\circ$, with the angle calculated from $(120\pm 2)(\text{N.m})$.

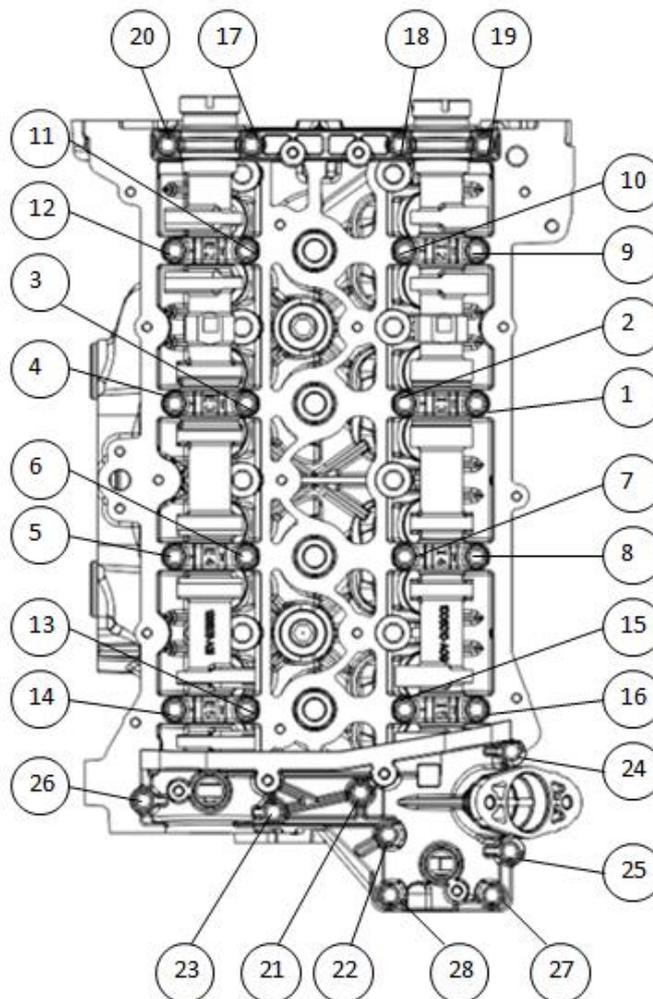
Camshafts, valves and cylinder heads

【Disassembly】

1. Disconnect the positive and negative battery wires and remove the battery.
2. Drain coolant and engine oil.
3. Remove the front end wheel system, solenoid, engine front cover, cylinder head cover, centre-mounted solenoid valve assembly, timing mechanism and other peripheral parts that need to be removed.

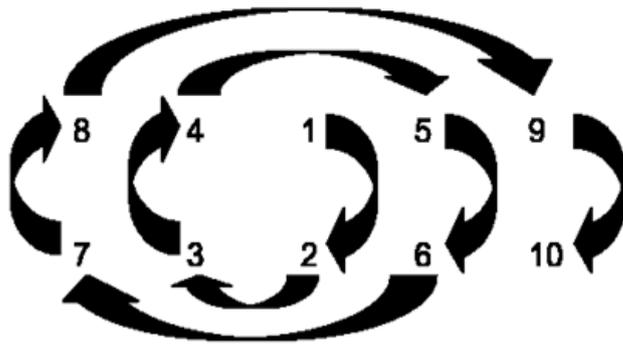


NOTE: To remove engine camshaft covers 1 through 10, loosen the bolts gradually in decreasing order from 28 to 1 as shown in the following figure.

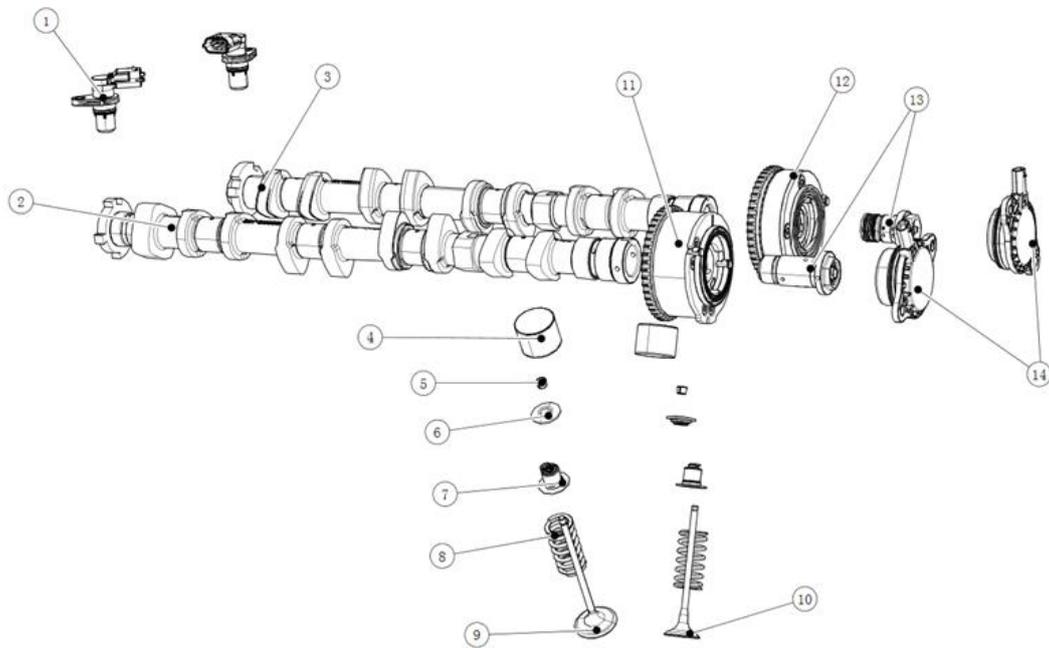


NOTE: Once removed, the cylinder gasket cannot be reused. When reassembling, be sure to use a new cylinder gasket assembly.

4. Remove the intake and exhaust camshaft assemblies and remove the mechanical tappet.
5. When removing the cylinder head bolts, loosen the bolts gradually in a decreasing order of 10 to 1 (from the ends to the centre) as shown in the figure below.



6. Remove the engine cylinder head subassembly and the cylinder gasket assembly.



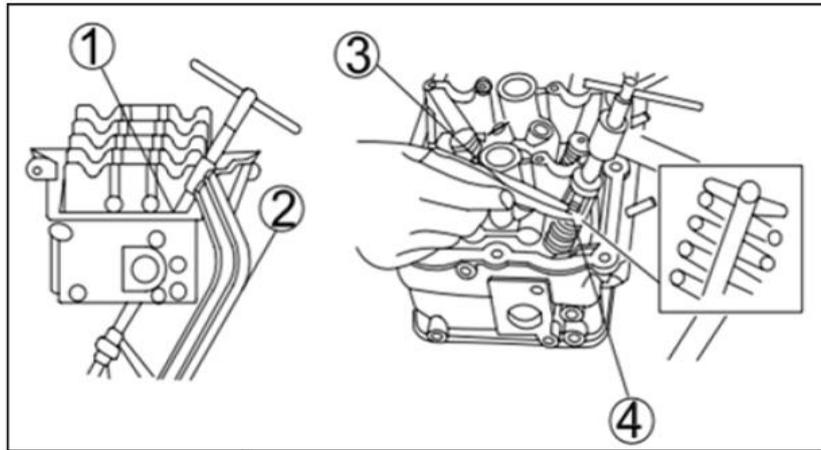
Project	Describe	Project	Describe
1	Camshaft Position Sensor	8	Valve oil springs
2	Intake Camshaft Assembly	9	Intake valve
3	Exhaust Camshaft Assembly	10	Exhaust valve
4	Mechanical Tappet	11	Intake phasers
5	Conical Locking Block	12	Exhaust phasers
6	Valve Spring Block	13	Centrally mounted solenoid valve assembly
7	Valve Oil Seal Assembly	14	Centre-mounted solenoid assembly

7. Using the valve lifter, squeeze the valve spring and then use tweezers to remove the valve locking block.

8. Release the valve lifter tool and remove the spring seat and valve spring

9. Remove the valve assembly from the combustion chamber side, and in turn, remove all valve assembly parts such as valve springs, valve locking blocks, valve spring seats, and valves.

10. Use a special tool to remove the valve oil seal from the valve guide side.



Project	Describe
1	Valve Spring Seat
2	Specialised Tools
3	Tweezers
4	Valve Lock Block



NOTE: Valve oil seals cannot be reused once removed. Always use new valve oil seals when assembling.

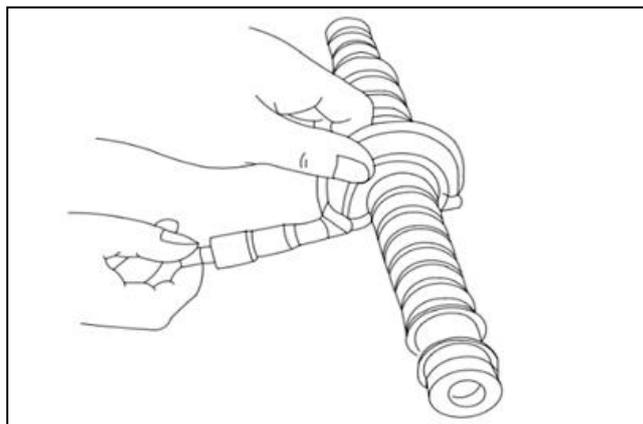
11. Place the removed valve assembly parts in order so that they can be assembled in their original positions.

【Inspection】

1. Cam wear

Using a micrometer, measure the cam height. If the measured height is below the limit, replace the camshaft.

Cam height	standard	extreme boundary
Intake cam	47.18mm~47.3mm	47.1mm
Exhaust cam	48.14mm~48.26mm	48.06mm

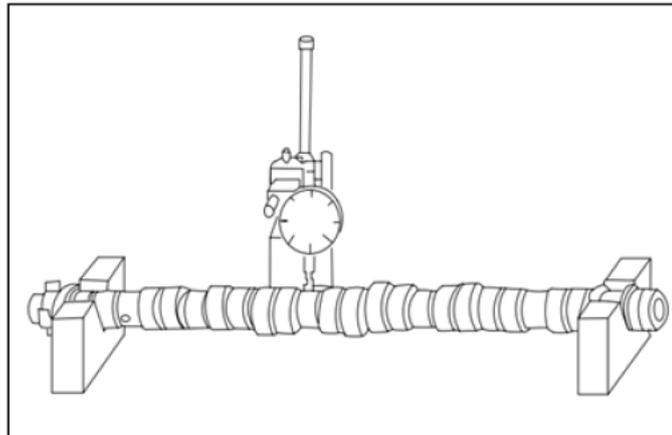


2. Camshaft radial runout

Place camshaft between two V-blocks and measure radial runout with a dial gauge. If the radial runout

exceeds the limit, replace the camshaft.

Radial runout limit: 0.10mm



3. Valve guide inspection

Valve guides: Using a micrometer and bore gauge, take diameter readings of the valve stems and guides to check valve stem to guide clearance. Be sure to take multiple diameter readings over the full length of the valve stem and valve guide. If the clearance exceeds the limit, replace the valve and valve guide. If a bore gauge is not available, use a dial gauge instead to check the valve stem end offset. Move the end of the valve stem in both directions 1 and 2 to check the end offset. If the offset exceeds the limit, replace the valve stem and valve guide.

Project		Standard	Limit
Valve stem diameter	Air intake	5.468~5.480mm	5.463mm
	Ventilate	5.456~5.472mm	5.451mm
Valve guide inner diameter	Air intake	5.500~5.512mm	5.592mm
	Ventilate	5.500~5.512mm	5.592 mm
Valve Stem and Guide	Air intake	0.020~0.044mm	0.129mm
Tube Clearance	Air intake	0.020~0.044mm	0.129mm
	Ventilate	0.028~0.056mm	0.141mm
Valve Stem to Guide	Air intake		0.02mm
	Ventilate		0.03mm

4. Valve inspection

4.1. Remove all carbon deposits from the valves.

4.2. Check the working surfaces of the valves and valve stems for wear, burns or deformation and replace the valves if necessary.

4.3 Measure the thickness of the valve head. If the measured thickness exceeds the limit, replace the valves.

Valve head thickness		
	Standard	Limit
Air intake	2.25~2.55	2.65mm
Ventilate	2.8~3.2	3.26mm

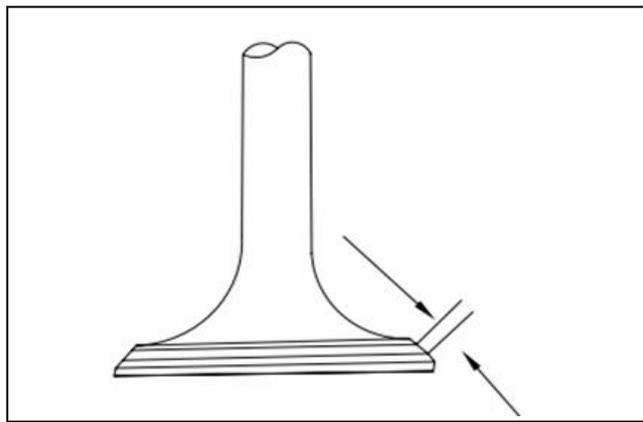
4.4. Check the end faces of the valve stems for dents and wear. If dents or wear are found, you can trim the valve stem

end face, but not so much that it has worn out its chamfers. If it is worn to the point where the chamfers are polished, the valve should be replaced.

4.5 Valve seat contact width:

It is usual to make a contact impression graphic on each valve, e.g. by applying an even film of the impression on the valve seat, then the valve seat and valve head are turned for inspection. A valve grinding tool must be used (this tool is used for valve grinding).

Shows the standard width of the imprint on the valve seat surface	Intake and exhaust valves	The intake valve has a 45 ° angle and a cone width of 1.6±0.2 Exhaust valve 45 °, cone width 1.6±0.2
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4.6 Valve seat repair: If the marks produced by the valve seat in contact with the valve are uneven, or if the width of the marks is not within the specified limits, they must be resurfaced, or cut and ground and polished to a fine finish.

If the marks from valve seat contact with the valve are uneven, or if the width of the marks is not within specification, they must be resurfaced, or cut, ground, and polished to a fine finish.

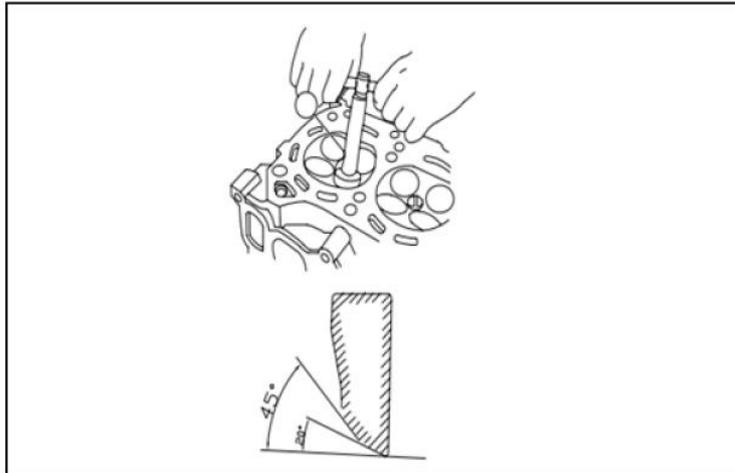
A. Exhaust Seat: Using a valve seat reamer, make two repairs as shown in the illustration. Two reamers must be used.

The repair must be made with two reamers: the first at an angle of 20° and the second at an angle of 60°. The second repair must be made to the required valve seat width. Exhaust valve seat width: 1.4mm~1.8mm

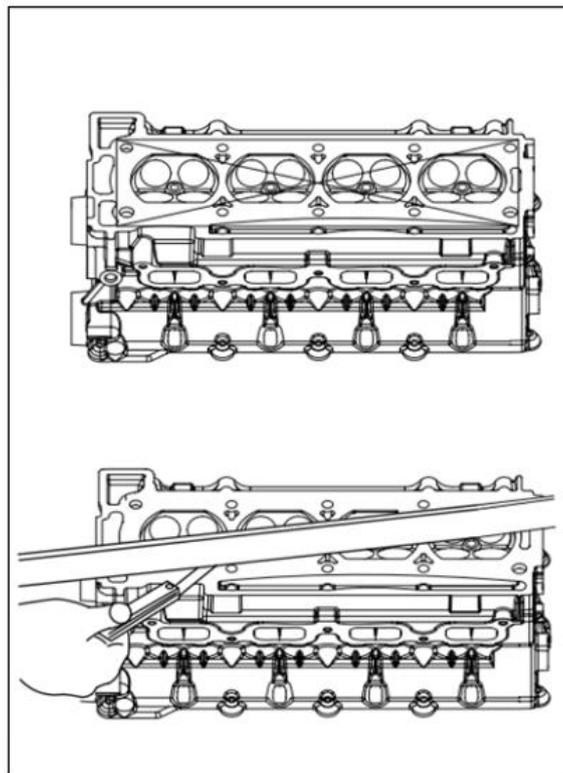
B. Intake valve seat: Repair procedure is the same as for exhaust valve seat.

Width of intake valve seat: 1.4mm~1.8mm

C. Valve Grinding: Grinding the valve seat is done in two steps, the first step is to add coarse grinding paste to the end face for grinding, the second step is to grind it with fine grinding paste, and each step is done with a valve grinding tool according to the usual grinding method.



Project	Describe
1	Valve Seat Reamer



5. Cylinder head inspection

Remove carbon deposits from the combustion chamber.

Inspect the cylinder head intake and exhaust ports, combustion chambers and head surfaces for scratches.

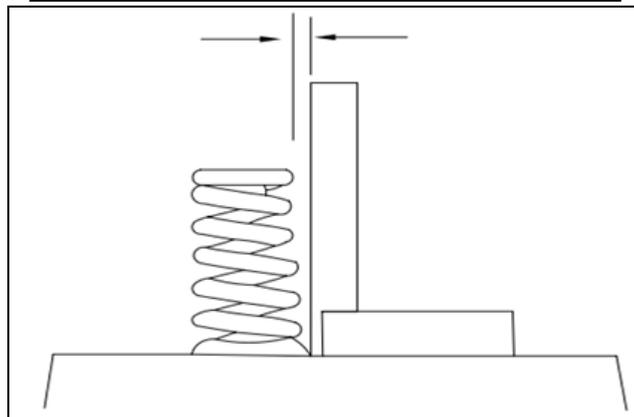
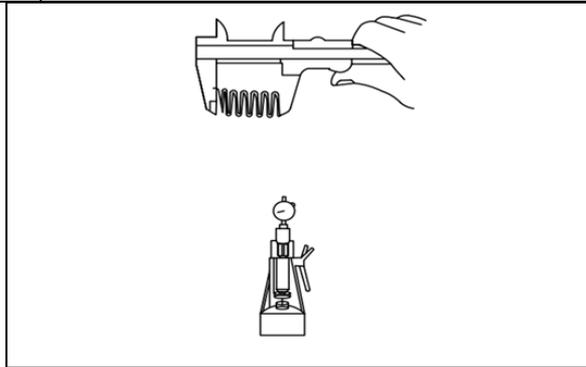
Cylinder head surface straightness: Check the surface in 6 places with a straightedge and a stopper. If the following distortion limits are exceeded flatten the cylinder head surface with a flat plate and approximately #400 sandpaper (waterproof emery paper); place the sandpaper on the flat plate and let the surface of the cylinder head run over the sandpaper. Place the sandpaper on a flat surface and allow the head surface to grind on the sandpaper to remove the high spots. If this does not bring the plug gauge reading down to the limit, replace the cylinder head. If this does not bring the plug gauge reading within

the limits, the cylinder head should be replaced. Leakage of combustion gases from the joint surface of the cylinder head is often caused by the deformation of the cylinder head surface wrinkles. The leakage of combustion gases from the head joints is often caused by a wrinkled surface of the cylinder head, which can lead to a reduction in power output and overheating of the engine due to high water temperatures. Deformation limit: 0.05 mm.

6. Valve Spring Inspection

Refer to the data in the table below and check that the springs are in good condition and show no signs of damage or weakness. Remember that a weak valve spring can cause vibration and air leakage due to reduced valve seat pressure, resulting in reduced power output.

Project	Standard
Valve spring free length	46.1mm
Valve spring load	Compression height 36mm, spring force $220 \pm 13.2\text{N}$
	Compression height 25.9mm, spring force $470 \pm 23.5\text{N}$
Valve spring free length	Compression height 36mm, spring force $220 \pm 13.2\text{N}$
	Compression height 25.9mm, spring force $470 \pm 23.5\text{N}$



VALVE SPRING PERPENETRATION: Using a straightedge and flat plate, check the perpendicularity of each spring based on the clearance between the end of the valve spring and the straightedge. If the clearance exceeds the limits given below, the valve springs must be replaced.

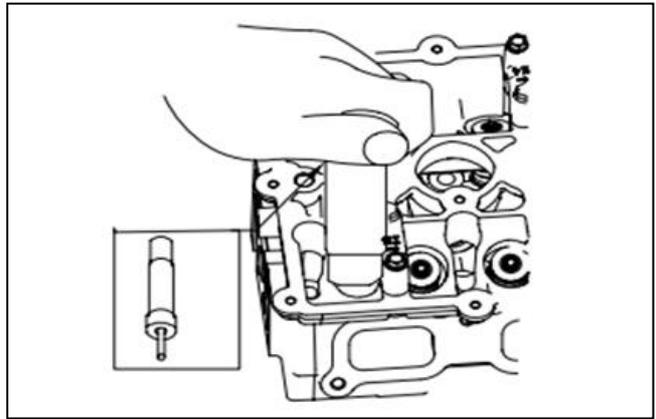
Valve spring perpendicularity limit: 1.44mm

【Installation】

1. Valve train assembly

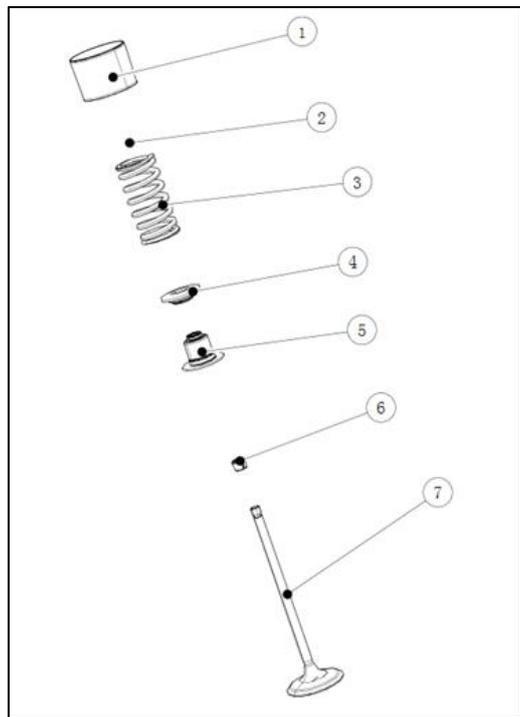
The bore of the valve spring seat should be free of foreign matter, and the valve oil seal should be assembled in place without deflection.

Apply petrol engine oil on the special tool mandrel (contact area with the valve oil seal), press the valve oil seal into the valve guide and make sure it is in place, the oil seal spring should not be shifted or dislodged during the installation and pressure, and the lips should be intact and not damaged.



When installing the valves, make sure that the 45° taper of the valve and the valve seat is clean and free of foreign matter, and that there is no sticking when the valve guides are installed after petrol engine oil has been applied to the valve stem and stem end.

The large pitch end of the valve spring with the blue colour marking should be placed on the top, and the small pitch end should fall into the seat hole correctly without tilting.



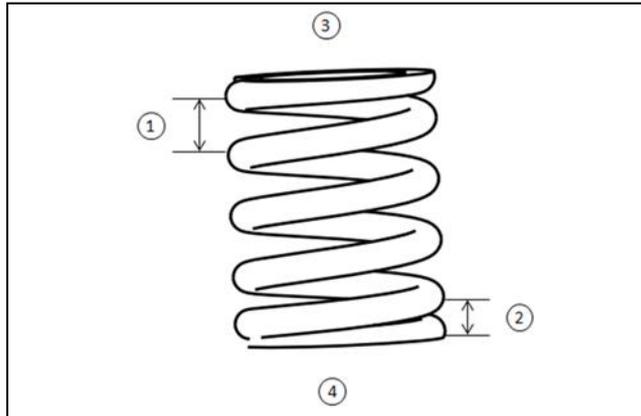
Project	Describe
1	Mechanical Tappet
2	Spring coloured ends
3	Valve springs
7	Valve



NOTE: When installing, never strike the valve oil seal mounting tooling with a hammer or anything else. To install the valve oil seal onto the guide tube, simply push on the special tooling by hand.

To install the valve seals on the tubes, simply push on the special tooling by hand.

The valve spring seat should be seated in the spring, the valve should be fixed with special equipment (valve lifter), and the conical valve locking block should be installed by pressing down the spring seat, and correctly clamped in the slot of valve locking block, and should not be omitted or dislodged.



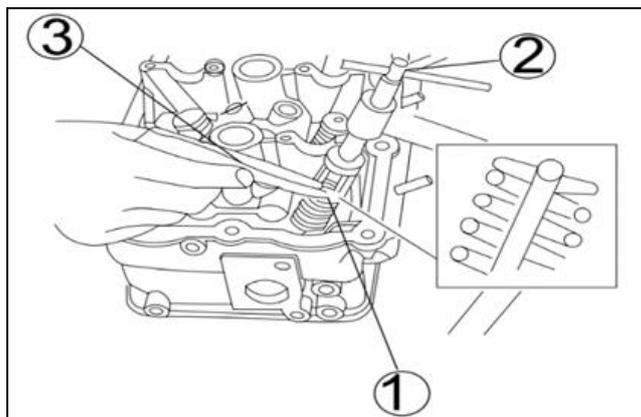
Project	Describe
1	Large Pitch
2	Small Pitch
3	Valve spring seat side
4	Valve oil seal assembly side

2. Mechanical tappet installation

Install the corresponding tappet in the tappet hole according to the valve lash selection group.

3. Cylinder Gasket Installation

Once the cylinder gasket is removed, it can not be reused again, make sure to use a new cylinder gasket when installing it. The high pressure oil hole of the cylinder gasket assembly should be correct with the oil hole on the crankcase sub-assembly and with the marking facing up, not installed in reverse.



Project	Describe
1	Valve Locking Block
2	Valve Lifter
3	Tweezers

4. Cylinder head subassembly installation

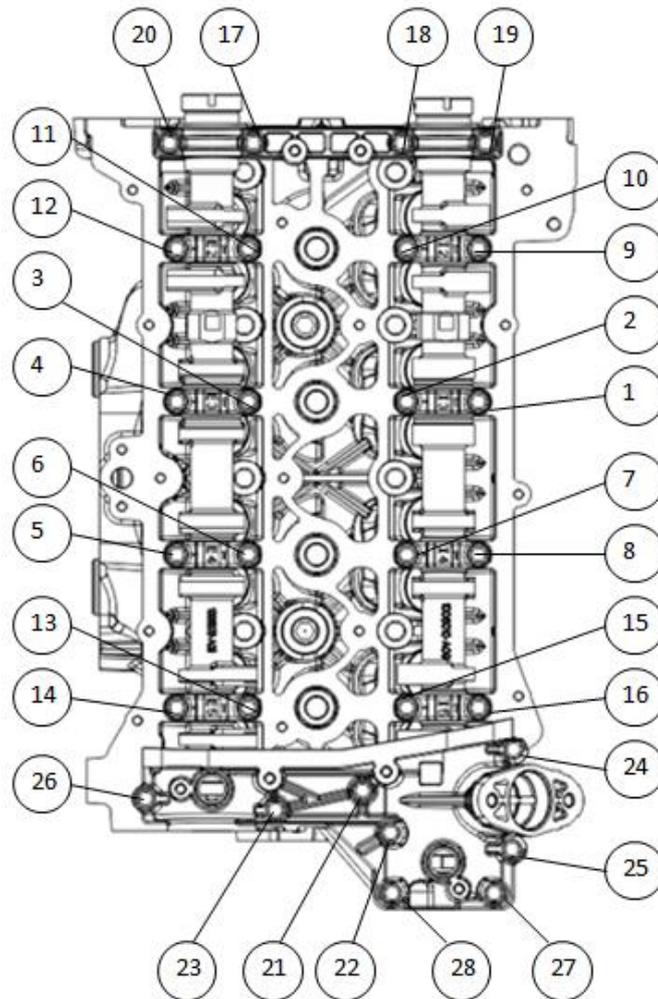
- Before installing the cylinder head sub-assembly, remove camshaft covers 1 to 10 and rotate the crankshaft so that the top surfaces of all four pistons are at approximately the same height. Clean the cylinder block and cylinder head combination surface with detergent, wipe dry with a rag to ensure that there is no oil residue, apply Loctite 5900 to the crankcase T-area and the position of the cylinder gasket to fit the T-area, and then install the cylinder head locating pins, cylinder gaskets and cylinder heads in turn, and seat them in place. Tighten the cylinder head bolts in the reverse order of disassembly (from 1 to 10 in increasing order) using the 'torque + corner method', in accordance with the technological requirements set out in Table A of the Appendix, using a tightening machine to synchronise the tightening or manually symmetrically tighten the cylinder head bolts in the order of the middle to the two sides.



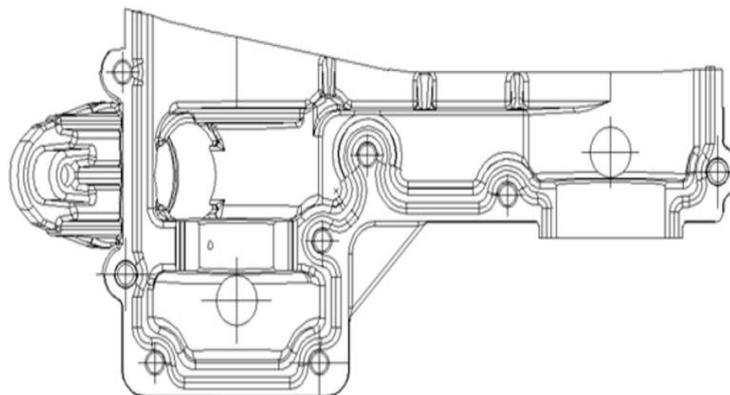
Note: Once removed, the cylinder head connecting bolts cannot be reused and must be replaced with new ones.

5. Camshaft Installation

- The camshaft and the joint surfaces of the shaft bore, bearing cap and bearing housing should be clean and free of foreign matter;
- Before placing the camshaft, apply petrol engine oil to the cylinder head camshaft bore and the mounting position on the mechanical tappet;
- After applying petrol engine oil, the camshaft should be correctly mounted on the bearing housing and the locating pins should be installed. During the installation of the camshaft, all camshaft and mechanical tappet working surfaces should not be touched or scratched;
- After placing the camshaft, apply petrol engine oil to the camshaft shaft diameter, then install the camshaft cover from 1# to 9# and tighten the bolts symmetrically from the middle to both sides or use a tightening machine to the torque specified in Table A. The bolt tightening sequence is shown in the following figure.



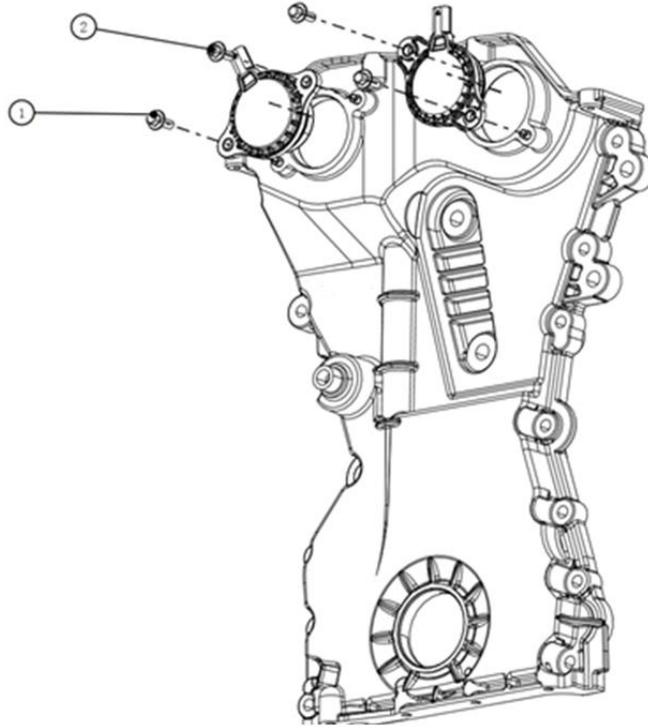
- Apply glue to the 10# camshaft cover according to the gluing track shown in the diagram and check that the glue is evenly applied with no broken bands, and make sure that the sealant does not adhere to the camshaft journals, oil holes and camshaft oil seal contact surfaces; if the sealant adheres, remove the spilled glue and then install it, and then symmetrically tighten the upper bolts in the order from the middle to the two sides, or tighten them at the same time with a tightening machine to the torque specified in Table A.



- From the time the camshaft is assembled until the chain is assembled in place, it is forbidden to rotate the crankshaft to avoid the piston being at the top stop in any cylinder and to prevent the valve from colliding with the piston.

6. Installation of the centre solenoid assembly

When installing the mid-mounted solenoid assembly, evenly coat the surface of the O-ring of the mid-mounted solenoid assembly with engine oil, align it with the mounting holes of the solenoid of the front cover, slowly push and press it into the mounting holes, and make sure that the mounting surface is completely close to each other, then tighten the bolts according to the torque stipulated in Table A.



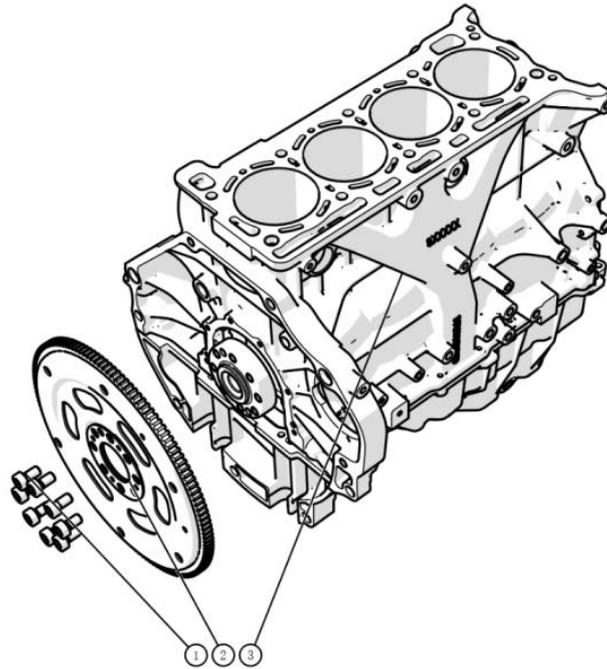
Project	Describe
1	Center-mounted solenoid assembly and cylinder head connecting bolt
2	Centre-mounted solenoid valve assembly

7. Install engine timing mechanism and engine front cowl cover as previously described.
8. install engine spark plug assembly and cylinder head cover assembly as previously described.
9. install engine oil pan assembly, as previously described.
10. install engine thermostat assembly, electronic thermostat assembly, ignition coil assembly and engine front end wheel train mechanism.
11. install the engine intake and exhaust systems as previously described.
12. Check to ensure that all parts removed have been fully installed back in place.
13. Refill the engine with engine oil.
14. Refill the cooling system with coolant and exhaust air from the system.
15. Connect the negative battery cable.
16. Check each connector for coolant and oil leaks.
17. Verify that the ignition timing is within the technical requirements.

Main shaft tile, crankshaft and cylinder block

【Disassembly】

1. Remove the engine assembly from the cabin and drain the engine coolant and oil as previously described.
2. Remove the starter motor and transmission assembly from the engine, then remove the drive disc assembly as shown below:



Project	Describe
1	Bolt
2	Drive Disc Assembly
3	Cylinder



NOTE: When removing the drive disc assembly bolts, follow the principle of diagonal loosening.

3. Remove the engine intake and exhaust system, oil pan and cylinder head cover assembly as previously described.
4. Remove the engine timing system as previously described.
5. remove the cylinder head from the cylinder block as previously described.
6. Remove the engine crank linkage as previously described. Using a pencil or quick-drying paint, mark the cylinder numbers on all pistons, connecting rods, and connecting rod tile covers.
7. Remove the engine oil pump assembly as previously described. 8.
8. Loosen the main bearing cap attaching bolts symmetrically, from side to side. 9.
9. Remove the crankshaft thrust plate, remove the engine crankshaft assembly, and remove the upper and lower main shaft shims.

【Cleaning】

Clean removed parts such as upper and lower main shaft shims and crankshaft assembly.

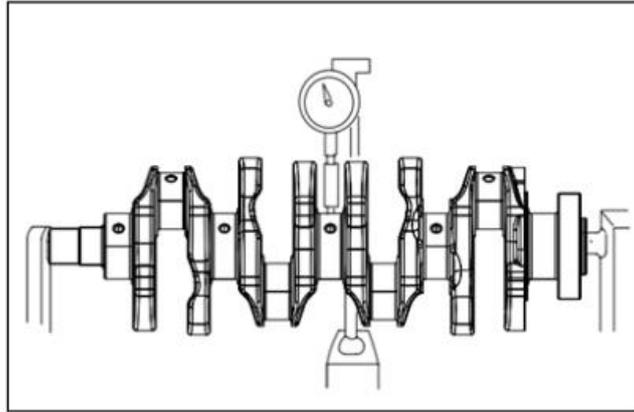
【Check】

1. Crankshaft

Crankshaft radial runout:

Measure the radial runout with a micrometer on the 2nd, 3rd, and 4th spindle journal upper journals, slowly rotate the crankshaft, and if the radial runout exceeds its limit value, the engine crankshaft assembly needs to be replaced.

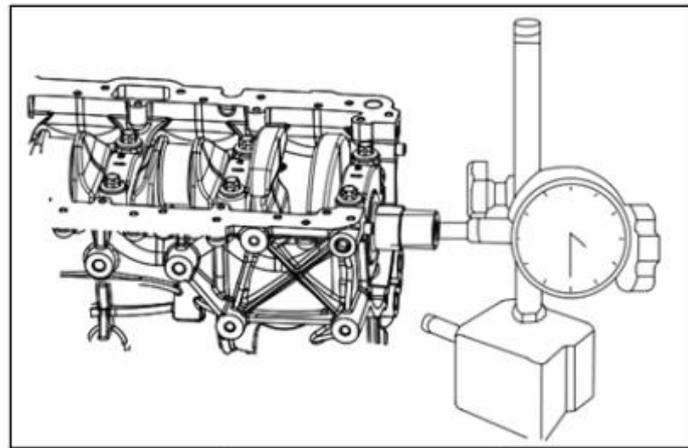
Radial runout limit value: 0.02mm



Crankshaft thrust clearance:

Measure the crankshaft thrust clearance in the usual way by positioning the crankshaft in the cylinder block with the thrust plates and main bearing caps fitted.

Read the displacement of the crankshaft in the axial (thrust) direction with a micrometer and, if it exceeds its limit, replace the thrust plate that exceeds the limit with a new and standardised one.

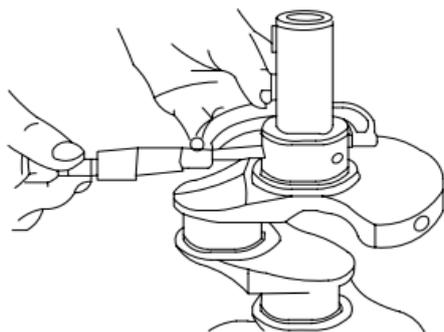


Name	Standard	Limit
Crankshaft thrust clearance	0.06~0.26 mm	0.26m

Ellipticity and taper of journals (uneven wear)

Unevenly worn crank journals indicate a difference within the cross sectional diameter or along its length (or both). Micrometer caliper readings can be used to determine this difference. If either of the journals is severely damaged or the amount of uneven wear exceeds the limit values listed below, the crankshaft assembly should be resharpened or replaced.

Ovality limit value and taper: 0.005mm



2. Main bearings

Check the surface of the main shaft tile for pitting, scoring, wear and damage, if any defects are found, both parts of the upper and lower main shaft tile must be replaced at the same time, never just one half of the shaft tile.

3. Main Shingle Clearance

Check the shaft tile clearance with a plastic plug gauge according to the following procedure.

Remove the main bearing cover.

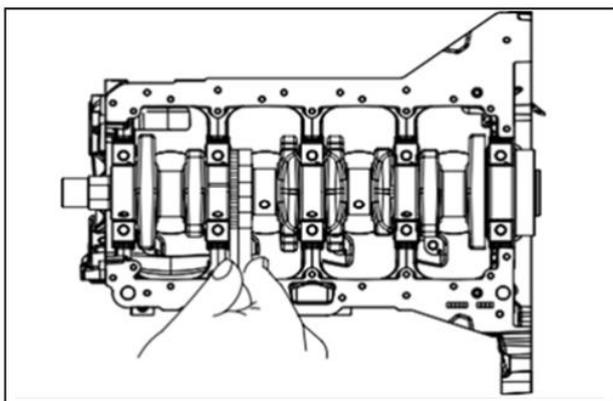
Clean the shaft shingles and main journal.

Place a piece of plastic plug gauge of the full width of the bearing (parallel to the crankshaft) on the main journal, avoiding the oil holes.

Install the main bearing cap as shown in the previous diagram and tighten the bolts evenly to the specified torque.

NOTE: The main bearing cap must be tightened to the required tightening torque in order to ensure a correct reading of the clearance. Do not rotate the crankshaft while installing the plastic plug gauge.

Remove the main bearing caps, measure the width of the plastic plug gauge with a ruler at its widest point and replace the main shaft shingles if the clearance exceeds its limit. Always replace the upper and lower main shingles as a unit, never just one half.



A new standardised shaft tile may produce the correct clearance. If this does not produce the correct clearance, it will be necessary to grind the crankshaft journal with a 0.25mm larger size of shim.

Recheck the clearance after selecting new upper and lower main shaft shims.。

shaft tile clearance	Standard	Limit
	0.024~0.052mm	0.052mm

4. Selection of main shaft shingles

Standard shaft shingles:

If the shaft shingles are incorrect, or if the clearance of the shingles exceeds the technical requirements, follow the procedure below to select a new standard shaft shingle and fit install it.

The first, second, third, fourth and fifth (left to right) numbers printed on the cylinder block represent the main bearing caps '1', '2', '3', '4' and '5' crankshaft bore diameters respectively.

The crankshaft bores are divided into 3 groups (1, 2 and 3) representing the following main bearing bore diameters.

There are five standard types of shingles, which differ in thickness. In order to differentiate them, '1', '2' and '3' are printed on the steel backside of the shingles, and the thicknesses of the shingles and the fit relationships are according to the following table.

Table A2 Crankshaft main journal, main bearing bore, main shaft tile size group fit table mm

assembly gap 0.024~0.052				Crankshaft main journal diameter grouping group					
				1		2		3	
				packet marker					
				1		2		3	
Crankcase main bore grouping markings	groups	mark	Grouping size range	$\Phi 54 \begin{smallmatrix} 0 \\ -0.016 \end{smallmatrix}$		$\Phi 54 \begin{smallmatrix} -0.0161 \\ -0.022 \end{smallmatrix}$		$\Phi 54 \begin{smallmatrix} -0.0221 \\ -0.028 \end{smallmatrix}$	
	1	1	$\Phi 58 \begin{smallmatrix} +0.006 \\ 0 \end{smallmatrix}$	3	$2.0 \begin{smallmatrix} -0.007 \\ -0.011 \end{smallmatrix}$	3	$2.0 \begin{smallmatrix} -0.007 \\ -0.011 \end{smallmatrix}$	2	$2.0 \begin{smallmatrix} -0.003 \\ -0.007 \end{smallmatrix}$
	2	2	$\Phi 58 \begin{smallmatrix} +0.012 \\ +0.0061 \end{smallmatrix}$	3	$2.0 \begin{smallmatrix} -0.007 \\ -0.011 \end{smallmatrix}$	2	$2.0 \begin{smallmatrix} -0.003 \\ -0.007 \end{smallmatrix}$	1	$2.0 \begin{smallmatrix} +0.001 \\ -0.003 \end{smallmatrix}$
	3	3	$\Phi 58 \begin{smallmatrix} +0.018 \\ +0.0121 \end{smallmatrix}$	2	$2.0 \begin{smallmatrix} -0.003 \\ -0.007 \end{smallmatrix}$	1	$2.0 \begin{smallmatrix} +0.001 \\ -0.003 \end{smallmatrix}$	1	$2.0 \begin{smallmatrix} +0.001 \\ -0.003 \end{smallmatrix}$

- Using a plastic plug gage, check the clearance of the newly selected standard axle shingles. If the clearance is still outside its limits, use the next thicker shim and check the clearance again.
- When replacing a crankshaft or block, select the new standard shingles to be fitted by referring to the numbers printed on the new crankshaft or the letters printed on the mating surfaces of the new block.
- Selection of connecting rod shingles
- View the sector plate connecting rod journal grouping number: e.g. 2223;
- Look at the connecting rod large head bore diameter grouping number: e.g. 2222;
- Follow the table below for connecting rod tile selection, corresponding to connecting rod tile grouping number 2221

Table A3 Crankshaft connecting rod necks, connecting rod bores, connecting rod shingles dimensions group fit table mm

assembly gap 0.020~0.048				Crankshaft connecting rod journal diameter grouping groups					
				1		2		3	
				Group Marking					
				1		2		3	
connec ting rod hole	groups	mark	Grouping size range	$\Phi 48 \begin{smallmatrix} 0 \\ -0.006 \end{smallmatrix}$		$\Phi 48 \begin{smallmatrix} -0.0061 \\ -0.012 \end{smallmatrix}$		$\Phi 48 \begin{smallmatrix} -0.0121 \\ -0.018 \end{smallmatrix}$	
	1	1	$\Phi 51 \begin{smallmatrix} +0.006 \\ 0 \end{smallmatrix}$	3	$1.5 \begin{smallmatrix} -0.010 \\ -0.014 \end{smallmatrix}$	3	$1.5 \begin{smallmatrix} -0.010 \\ -0.014 \end{smallmatrix}$	2	$1.5 \begin{smallmatrix} -0.006 \\ -0.010 \end{smallmatrix}$
	2	2	$\Phi 51 \begin{smallmatrix} +0.012 \\ +0.0061 \end{smallmatrix}$	3	$1.5 \begin{smallmatrix} -0.010 \\ -0.014 \end{smallmatrix}$	2	$1.5 \begin{smallmatrix} -0.006 \\ -0.010 \end{smallmatrix}$	1	$1.5 \begin{smallmatrix} -0.002 \\ -0.006 \end{smallmatrix}$
	3	3	$\Phi 51 \begin{smallmatrix} +0.018 \\ +0.0121 \end{smallmatrix}$	2	$1.5 \begin{smallmatrix} -0.006 \\ -0.010 \end{smallmatrix}$	1	$1.5 \begin{smallmatrix} -0.002 \\ -0.006 \end{smallmatrix}$	1	$1.5 \begin{smallmatrix} -0.002 \\ -0.006 \end{smallmatrix}$

● The connecting rod shaft tile clearances are shown in the table below:

assembly gap 0.020~0.048				Crankshaft connecting rod journal diameter grouping groups		
				1	2	1
				Group Marking		
				1	2	1
connec ting rod hole	groups	mark	Grouping size range	clearance		
	1	1	$\Phi 51 \begin{smallmatrix} +0.006 \\ 0 \end{smallmatrix}$	0.020~0.040	0.0262~0.046	0.0241~0.044
	2	2	$\Phi 51 \begin{smallmatrix} +0.012 \\ +0.0061 \end{smallmatrix}$	0.0261~0.046	0.0242~0.04	0.0222~0.042
3	3	$\Phi 51 \begin{smallmatrix} +0.018 \\ +0.0121 \end{smallmatrix}$	0.0241~0.044	0.0222~0.042	0.0282~0.048	

Use a plastic plug gauge to check the clearance between the big end of the connecting rod and the side of the crankshaft shaft handle plate, and the clearance value should be 0.10 to 0.30mm.

6. Crankshaft Rear Oil Seal

The crankshaft rear oil seal cannot be reused after disassembly and needs to be replaced with a new one. Before installing the seal, the crankshaft should be checked for scratches and burrs. Before installing the oil seal, check the crankshaft chamfering machine to see if there are scratches, burrs and other defects on the crankshaft, and if necessary, treat or replace the crankshaft.

When installing the rear oil seal of the crankshaft, the special tooling should be used and pressed in smoothly to ensure that the end face of the oil seal is parallel to the end face of the rear oil seal hole, and the concavity should be no more than 0.5mm. The oil seal surface should be parallel to the surface of the rear oil seal hole, the concavity should not be more than 0.5mm, and the spring of the oil seal should not

be shifted or dislodged, and the oil seal should be flat and not tilted after installation. After assembly, the crankshaft should be rotated flexibly without stagnation, and then the axial clearance of the crankshaft should be tested, and the clearance value should be between 0.06mm and 0.26mm.



Note: Ensure that the oil seal after the crankshaft is clean during assembly, and the lip of the oil seal must not be touched by hand, and the outer diameter of the oil seal must not be coated with sealant when assembling the oil seal.

7. Drive Discs

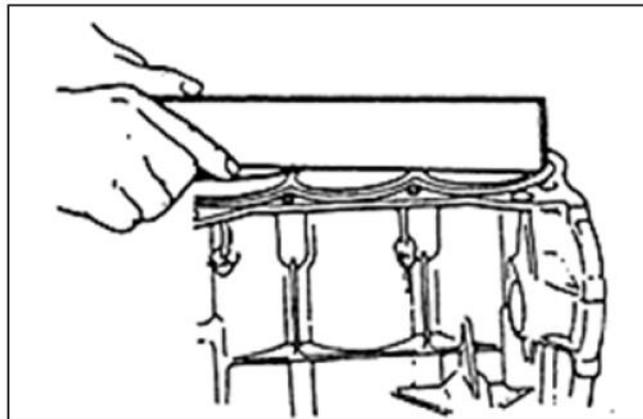
If the drive disc is damaged, cracked or worn, the drive disc assembly should be replaced. Drive Disc Description:

Drive disc (also called flex disc) consists of reinforcing plate, toothed ring and disc body, reinforcing plate is riveted to the disc body, toothed ring is welded to the disc body, supplied as an assembly, assembled on the engine crankshaft, and then connected to the torque converter (transmission) through 6 bolts to complete the power transfer from the engine to the transmission, and at the same time (toothed ring) cooperates with the starting motor to complete the starting of the vehicle.

8. Cylinder block sealing surface deformation

Check the deformation of the sealing surface with a straightedge and thickness gauge, if the flatness exceeds its limit, the cylinder block flatness needs to be trimmed.

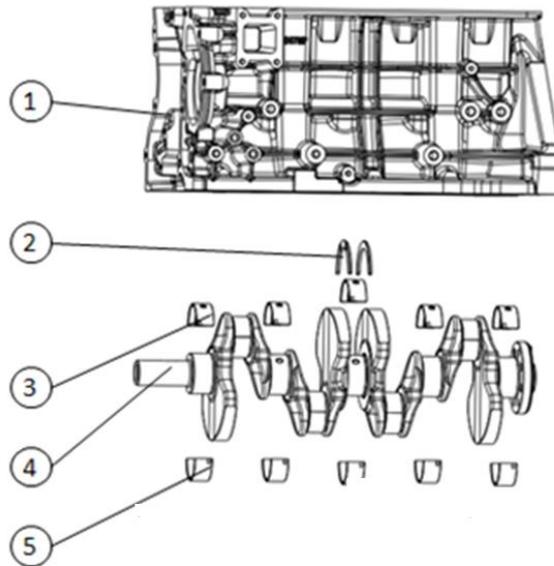
Name	Standard	Limit
flatness	0.03mm	0.05mm



【Installation】

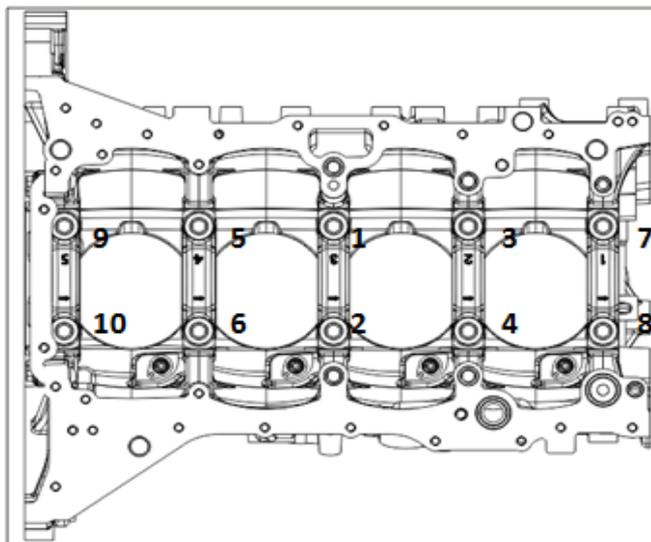
1. Install the crankshaft assembly and crankshaft thrust plate.

- As mentioned before, select the upper and lower main shaft shingles without misalignment.
- Apply petrol engine oil to the combined surface of each main shaft tile and crankshaft and the main journal surface of the crankshaft. The upper main shaft tile (with oil holes) is mounted in the crankcase bearing housing, and the lower main shaft tile (without oil holes) is mounted in the crankcase bearing housing, and the upper and lower main shaft tiles are not allowed to be mounted in reverse or incorrectly, and the backs of the tiles are closely adhered to the surfaces of the holes of the bearing housing, and the end surfaces are flush with the combined surfaces of the crankcase and bearing housing.
- The end surfaces should be flush with the crankcase and bearing housing.
- Keep the crankcase clean and free of metal shavings and other foreign objects. Install the crankshaft and thrust discs into the upper body of the crankcase, and the oil grooves on the crankshaft thrust discs should be orientated towards the crankshaft crank arms.



Name	Describe
1	Crankcase Assembly
2	Thrust Plate
3	Upper main shaft tile
4	Crankshaft
5	Lower main shaft tile

- Tighten the main bearing cap bolts according to the torque specified in Appendix Table A using the 'Torque + Angle Method' in the order shown below (1 to 10 increments), or use a tightening machine to tighten them at the same time.



NOTE: Main bearing cap bolts are not reusable once removed and must be replaced with new main bearing cap bolts.

- install the piston and connecting rod assemblies and engine cylinder head sub-assembly as previously described.
- install the engine timing system and front end wheel system as previously described.
- install the oil pan assembly and cylinder head cover assembly as previously described.
- Install intake and exhaust system, starter motor, and drive disc assembly as previously described.



NOTE: The drive disc bolts come with their own sealant (blue), make sure the sealant is continuous and unbroken before assembly.



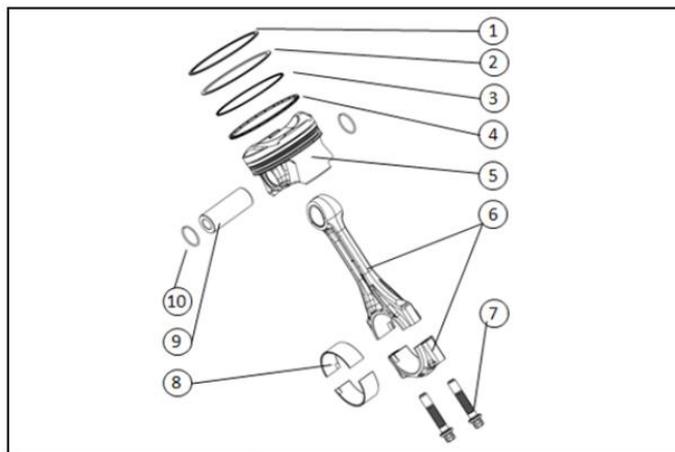
Note: The drive disc bolts can only be used once, once disassembled they must be replaced with new self adhesive bolts, before assembly it is necessary to clean the residual adhesive in the mounting holes. Clean up any residual adhesive in the mounting holes before assembly.

6. Install the engine transmission assembly.
7. Check to make sure all removed parts are back in place and reinstall any parts that were not reinstalled.
8. Refill engine oil according to the Engine Oil Change section.
9. Refill the engine coolant and bleed the air out of the system.
10. Connect the negative cable of the battery (accumulator).
11. Verify that all connectors are free of petrol, coolant, oil and air leaks.

Piston, piston ring, connecting rod and connecting rod

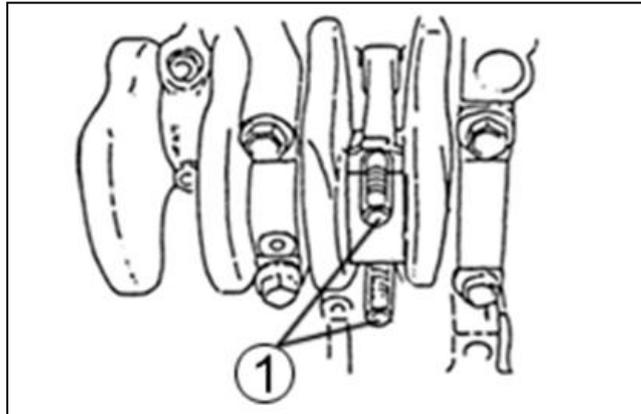
【Disassembly】

1. Disconnect the negative battery cable.
2. Drain engine coolant and petrol oil.
3. Remove the intake and exhaust system, oil pan and timing system as described previously.
4. Remove the cylinder head from the cylinder block as described previously.
5. Mark cylinder numbers on all pistons, connecting rods and connecting rod tile covers with pencil or quick-drying paint.
6. Remove the connecting rod tile cover.
7. Install rubber boots on the threads of the connecting rod bolts. This is to avoid damaging the journal bearings, cylinder bores, and connecting rod bolt threads when the connecting rods are removed.



Name	Describe
1	Air Rings
2	Wiper Rings
3	Scraper
4	Liner ring
5	Piston
6	Connecting rod assembly
7	Connecting rod bolt
8	Connecting Rod Shaft Shield

9	Piston pin
10	Piston pin retaining ring



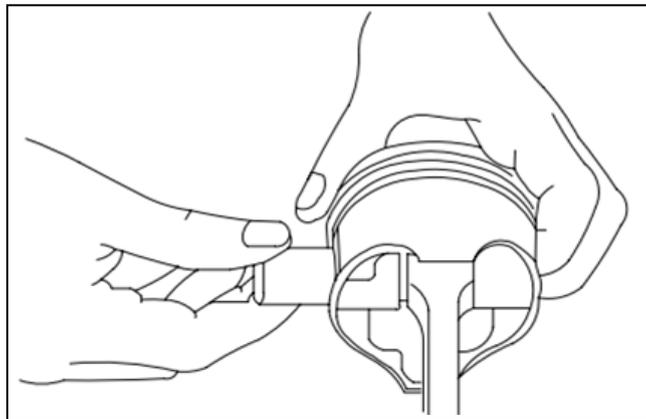
Name	Describe
1	rubber boot

Remove carbon from upper end of cylinder liner before removing piston from cylinder.

8. Push the piston and connecting rod out of the upper end of the cylinder bore, which must be accurately placed according to the cylinder bore cylinder number when removing it for proper installation during subsequent installations.

9. Using a piston ring spreader, remove the air ring, wiper, wiper, and backing ring from the piston.

10. Carefully loosen the piston pin retaining ring and press out the piston pin as shown.



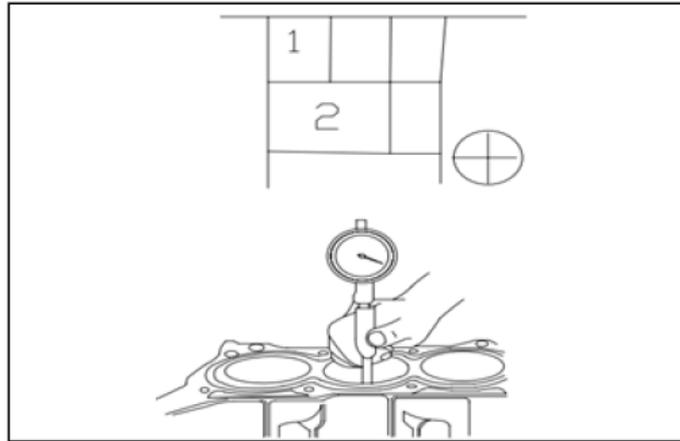
【Cleaning】

Clean the carbon, oil, and sealant from the piston head, ring grooves, and piston rings and cylinder block with a metal cleaner and suitable tools.

1. Observe the cylinder wall for deep scratches or bumps, if so replace the cylinder block.

2. Measure the cylinder in two directions (A direction on the intake and exhaust side and B direction on the front and rear ends) and at three locations (6.4mm, 57.2mm and 108mm from the top surface of the cylinder block) with an inside diameter micrometer as shown in the figure. If the following dimensions are out of tolerance, replace the cylinder block.

3. The cylinder bore diameter is out of tolerance.



- Roundness or cylindricity measurement difference in two positions exceeds the range.
- Thrust and axial measurement difference exceeds the roundness range.

Limit of cylinder bore diameter: $\Phi 86.014\text{mm}$;

Roundness limit: 0.008mm ;

Cylindricity limit: 0.01mm .

【Inspection】

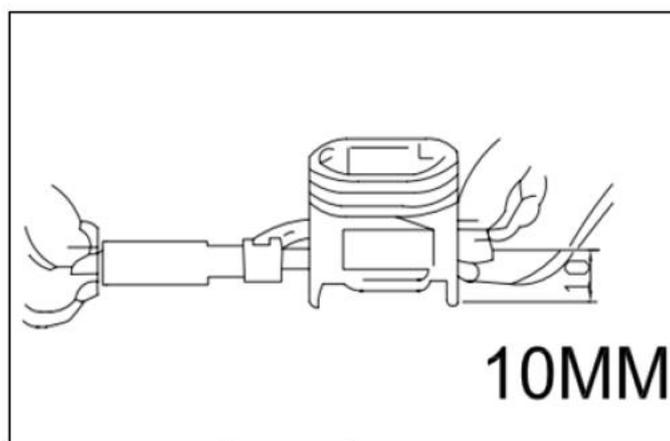
Piston

1. Inspect the piston

Check the piston for wear and tear, cracks or other damages, and replace the damaged or faulty piston if it exists.

2. Piston diameter:

As shown in the figure, the piston diameter should be measured at 12.5mm (without printed graphite) in the vertical direction from above the piston skirt bottom stop to the piston pin.

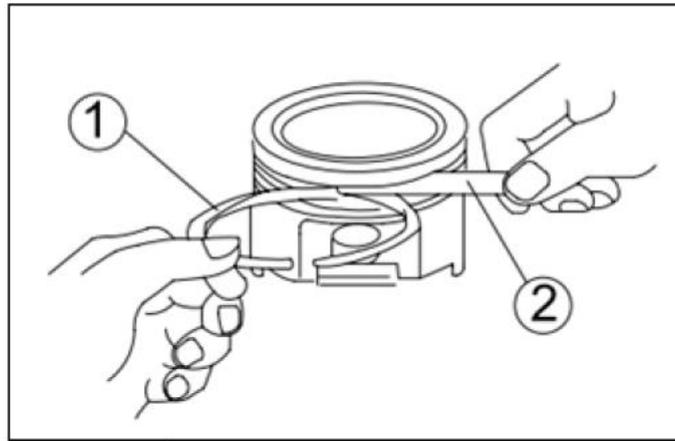


Piston Diameter	Standard	$\Phi 85.960\sim\Phi 85.970\text{mm}$
Piston pin hole diameter	Standard	$\Phi 22.006\sim\Phi 22.010\text{mm}$

3. Piston clearance:

Piston clearance is the difference between the cylinder diameter and the piston diameter. Piston

clearance should be within the following specifications. If it is out of specification, check the cylinder bore diameter or piston diameter size and replace the corresponding out of specification parts.



Name	Describe
1	piston ring
2	gauge

Piston clearance: 0.030~0.054mm (before printing graphite on piston skirt)

4. Piston ring groove clearance:

Piston ring grooves must be clean, dry and carbon free prior to inspection. Install the piston ring in the ring groove and measure the clearance between the ring and ring groove with a thickness gauge.

If the clearance is excessive, replace the piston ring groove width, piston ring height dimensions, and replace the corresponding excessive parts.

Piston ring groove side clearance:

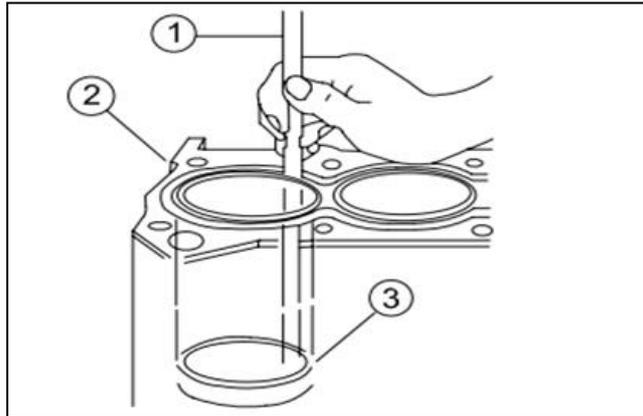
First ring: 0.03~0.08mm; Second ring: 0.03~0.07mm

Piston ring

1. Measure piston ring end opening clearance by embedding piston ring in cylinder and measuring clearance with a thickness gauge; if clearance is out of tolerance, replace piston ring.

NOTE: Before embedding the piston ring in the cylinder bore, the top of the cylinder must be cleaned of carbon deposits.

Name		Standard	Limit
Piston ring working clearance (after installation in cylinder bore)	first ring	0.12~0.22mm	0.22mm
	second ring	0.26~0.40mm	0.40mm



Name	Describe
1	Gap Gauge
2	Cylinder block
3	Piston ring

Piston pin

1. Inspect piston pin, connecting rod small end hole and piston pin hole for wear or damage. if piston pin, connecting rod small end hole or piston pin hole is severely worn and damaged, replace piston pin, connecting rod or piston.

2. Piston pin clearance:

Check the piston pin and connecting rod small head clearance at the small end, if the connecting rod small head hole, piston pin has been seriously worn or damaged; or the clearance value is too poor, then replace the connecting rod or piston pin.

Diameter of connecting rod small head hole: $\Phi 22.006 \sim \Phi 22.013 \text{mm}$

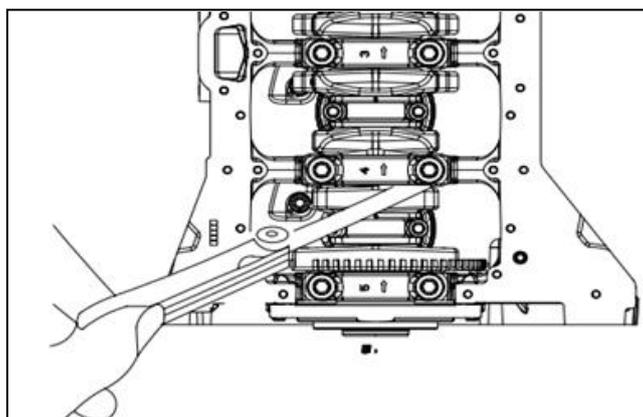
Piston pin diameter: $\Phi 21.995 \sim \Phi 22 \text{mm}$

Name	Describe
Connecting rod small head bore to piston pin clearance	0.006~0.018mm
Piston pin bore to piston pin clearance	0.006~0.015mm

Connecting rod assembly

1. Big end side clearance:

Under normal conditions, connect the large end of the connecting rod to the crank pin and check the large end side clearance of the connecting rod, if the clearance measurement is out of tolerance, the connecting rod assembly needs to be replaced.



Name	Standard	Limit
Large End Side Gap	0.10~0.30mm	0.30mm

2. Connecting rod straightening:

Install the removed connecting rod assembly to the connecting rod straightener and check it for bending or twisting, if it is out of specification, replace it.

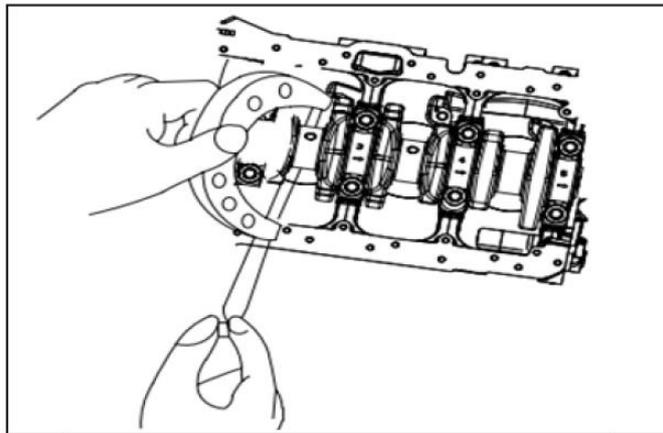
Bending limit value: 0.04mm/80mm Twisting limit value: 0.08mm/80mm

Crank pin and connecting rod shingles

1. Inspect crank pin for irregular wear or damage. Measure crank pin out-of-roundness or taper straightness with a micrometer. If the crank

pin is damaged, or out-of-roundness and taper straightness are excessive, replace crankshaft.

Crank pin roundness and straightness limit: 0.005mm.



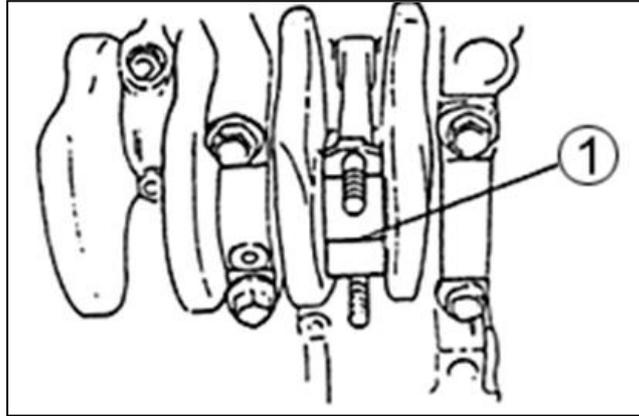
Connecting Rod Shaft Shoe Model	Crank pin diameter
standard size	Φ47.982~Φ48.000mm

2. Connecting rod shingles:

Check the axle shingles for melting, cratering, ablation or surface flaking, and observe the contact shape. If the connecting rod shaft tile has the above obvious conditions, the connecting rod shaft tile must be replaced.

3. connecting rod shaft tile clearance:

- Clean the removed connecting rod shingles and crank pin before checking shingle clearance.
- Install the connecting rod shingles on the connecting rods and caps.
- When connecting to the shingles, place a piece of plastic plug gauge parallel to the crankshaft axis on the full-width crank pin, avoiding the oil holes, as shown below.

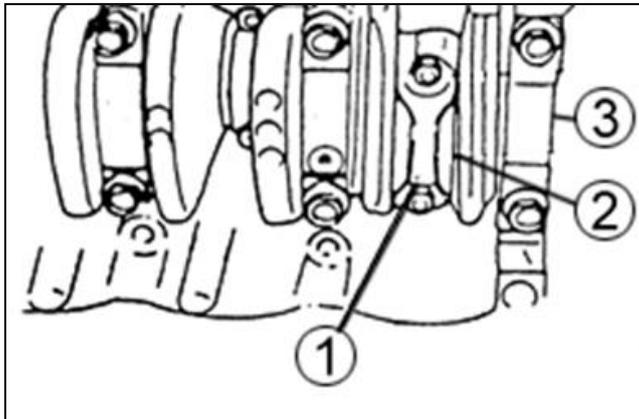


- When installing the connecting rod cover, the tab of the connecting rod cover should point to the front of the engine in the same direction as the arrow of the piston top. Tighten the connecting rod bolts according to Appendix Table A, and note that all the bolts should be pre-tightened to (30 ± 2) N.m before rotating $(90\pm 2)^\circ$ angle is calculated from (30 ± 2) N.m.

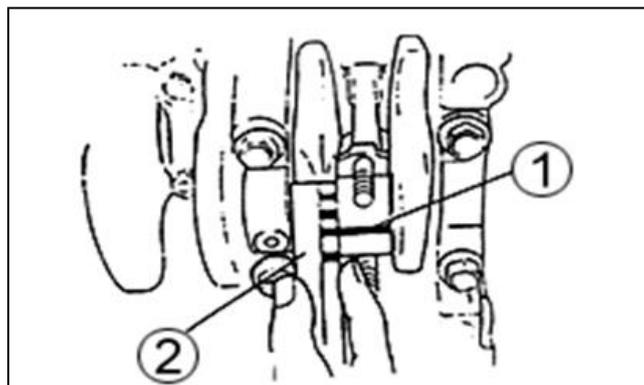


NOTE: Connecting rod bolts are not reusable once removed and must be replaced with new connecting rod cover bolts.

- Remove the tile cover, place the scale on the face of the plastic plug gauge and measure the width of the plastic plug gauge at the widest point of the gap. If the clearance is out of tolerance, use a new standard size shingle and re-measure the clearance.
- If a new standard size shingle is used and the clearance is still out of tolerance, replace the crankshaft.



Name	Describe
1	Connecting Rod Shaft Shield
2	Connecting rod big end tab
3	Front end of engine

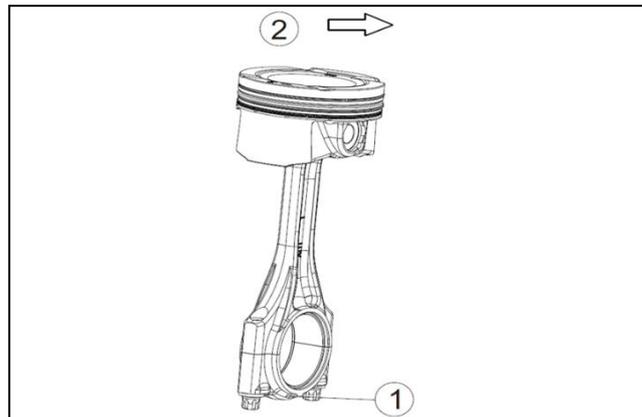


Name	Describe
1	Plastic Plug Gauges
2	Scale

【Installation】

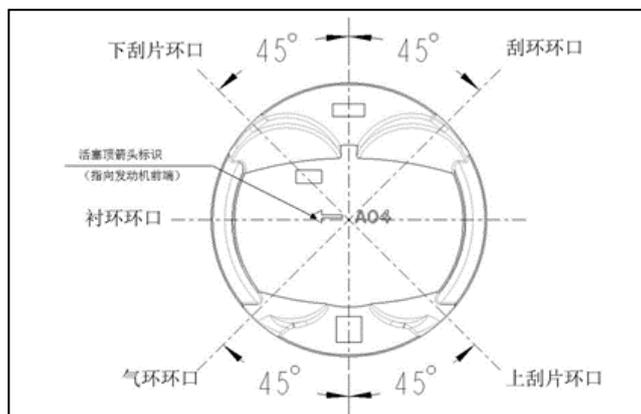
1. Installation of piston and piston ring

- Piston and cylinder bore assembly is not divided into groups; connecting rod shaft tile should be selected in accordance with Table A3 size group marking, and its matching clearance is 0.020 ~ 0.048mm and installed into the corresponding connecting rod body and connecting rod cover.
- Installation of piston rings, the installation of piston rings should meet the following requirements:
 - The air ring and wiper ring are installed into the corresponding ring groove of the piston, and assembled with their marked surfaces facing the top surface of the piston respectively;
 - The openings of the liner rings in the steel band combination oil ring shall be butted, not lapped, and the scrapers shall not be missed during assembly.
 - The openings in the piston rings are located as shown below



Name	Describe
1	Bump
2	Piston top arrow direction

- The connecting rod assemblies assembled in the same petrol engine shall be of the same mass group, and the mass difference between any two piston connecting rod assemblies shall not be more than 7g.





Note: When installing the piston pin retaining ring, make sure that it is all located in the ring groove, and the direction of its ring opening should be pointing to the top surface of the piston at the same time.

The connecting rod cover should be fitted to the connecting rod body of the same cylinder number before dismantling, and the tabs at the large end of the connecting rod should be fitted in the same direction as the arrow at the top of the piston, pointing towards the front of the petrol engine.

Apply petrol engine oil to the threads of the connecting rod bolts, and tighten the bolts according to the torque specified in Table A of the Appendix using the 'torque+turning angle method'. Tighten the bolts in the order of 1, 4, 2 and 3 cylinders or at the same time with a tightening machine.



Note: The connecting rod bolts cannot be reused once removed and must be replaced with new connecting rod cover bolts.

When installation is complete, the crankshaft should rotate with a torque of no more than 10N.m and should rotate smoothly with no sticking.

2. Install by reversing the disassembly procedure as previously described.
3. Check to make sure that all disassembled parts are returned to their original positions, and reinstall any parts that have not been reinstalled.
4. Refill engine oil according to the 'Engine Oil Change' section.
5. Refill the engine coolant and bleed the air out of the system.
6. Connect the negative cable of the battery (accumulator).
7. Verify that all fittings are free of petrol, coolant, oil and air leaks.
8. Verify that the ignition timing is within technical parameters

2.1.5 Precaution

The following parts must be replaced with new parts when reassembled

Name	Describe	Name	Describe
1	Shims	20	Pump support gasket
2	Upper main shaft tile	21	Inlet pipe gasket
3	Lower Main Shaft Shoe	22	Outlet Pipe O-Ring
4	Crankshaft rear end cover assembly	23	Thermostat Seat Gasket
5	Front cover assembly	24	Overflow pipe gasket
6	Crankshaft pulley combination bolt	25	Oil pump outlet o-ring
7	Signal disc screws	26	Oil Cooler Gasket
8	Connecting rod bolts	27	Oil Cooler Gasket
9	Camshaft bearing cover bolts	28	Oil Cooler Gasket
10	Camshaft #6 bearing cap bolts	29	Cylinder head and supercharger gasket assembly
11	Cylinder head cover gasket	30	Supercharger Inlet Tube Gasket
12	Piston pin retaining ring	31	Supercharger oil inlet pipe gasket
13	Connecting Rod Shims	32	Supercharger oil return pipe gasket
14	Connecting rod shingles	33	Supercharger oil return pipe gasket
15	Drive disc bolts	34	Supercharger inlet and return pipe gasket
16	Cylinder gasket assembly	35	Supercharger connecting studs
17	Cylinder head connecting bolt	36	Oil pressure sensor assembly
18	Valve Oil Seal Assembly	37	High-pressure oil pump outlet pipe assembly
19	Valve Tappet		

Note: Screw plugs and screw plugs are not disassembled, if disassembled they need to be replaced and reassembled.

2.2 Lubrication system

2.2.1 Norm

Material specifications

Name	Norm	Capacity
Sealant	乐泰 5900	-
Thread locking adhesive	乐泰 243	-

Component specifications

Name	Norm		
Oil Pump Type	Vane type oil pump		
Oil pressure	Engine speed	idle	3,000 rpm
	Oil pressure	≥80kPa	≥150kPa

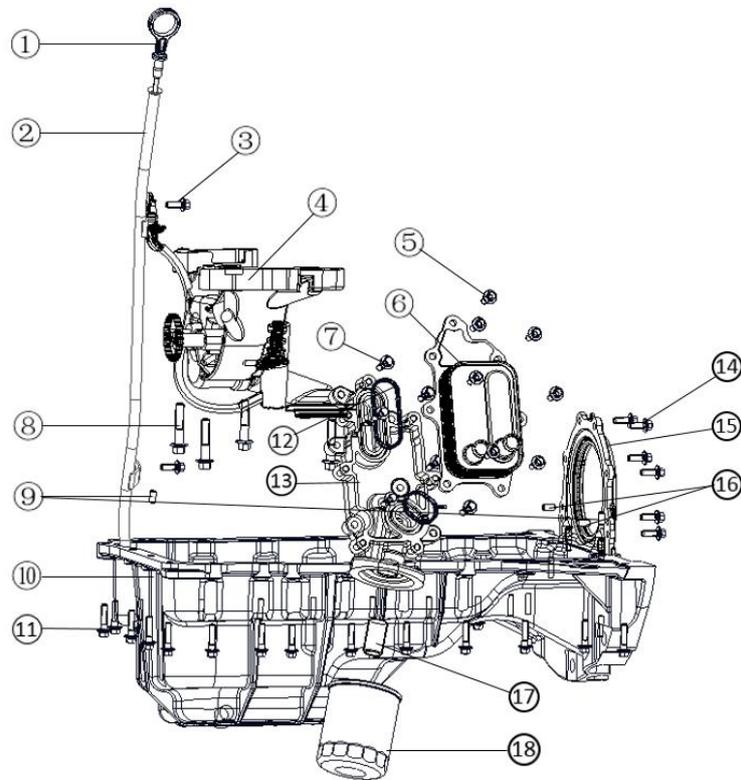
lubricant specifications

application	specifications
viscosity	5W-30(-30 °C and above)
Grade	SN level and above
Capacity	5.0L

Torque specifications

Name	N.m	lb-ft	lb-in
Oil pan drain plug	45	34	-
Oil pan fixing bolts and nuts	10	-	89
Oil pump fixing bolts	23	17	-
Oil filter tightening torque	30	22	-
Oil filter connecting pipe tightening torque	23	17	-
Piston cooling nozzle fixing bolt	25±2	18	-
Oil cooler assembly fixing bolts	10±1		89
Oil cooler support fixing bolt	13±1	10	
Crankcase lower reinforcement plate fixing bolt	10±1	-	89
Crankshaft rear end cover fixing bolt	10±1	-	89

2.2.3 Component Breakdown Diagram



project	describe	project	describe
1	Oil Level Gauge Assembly	10	Oil pan assembly
2	Oil Level Gauge Tube Assembly	11	Bolt
3	Bolt	12	Oil cooler seals
4	Oil cooler assembly	13	Oil cooler support
5	Bolt	14	Bolt
6	Oil cooler assembly	15	Crankshaft rear end cover assembly
7	Bolt	16	locating pin
8	Bolt	17	Oil Filter Connecting Hose
9	positioning pin	18	Oil Filter Assembly

⚠ Note: When replacing the oil filter, check if the oil filter connecting pipe is loose and check the oil filter connecting pipe torque according to $23\text{N.m} \pm 2\text{N.m}$. Calibrate the torque of the filter connecting pipe.

⚠ Note: Before fitting a new oil filter, apply a small amount of clean oil to the sealing surface.

2.2.4 General inspections

Oil Pressure Check

NOTE: Before checking the oil pressure, the following items should be checked first:

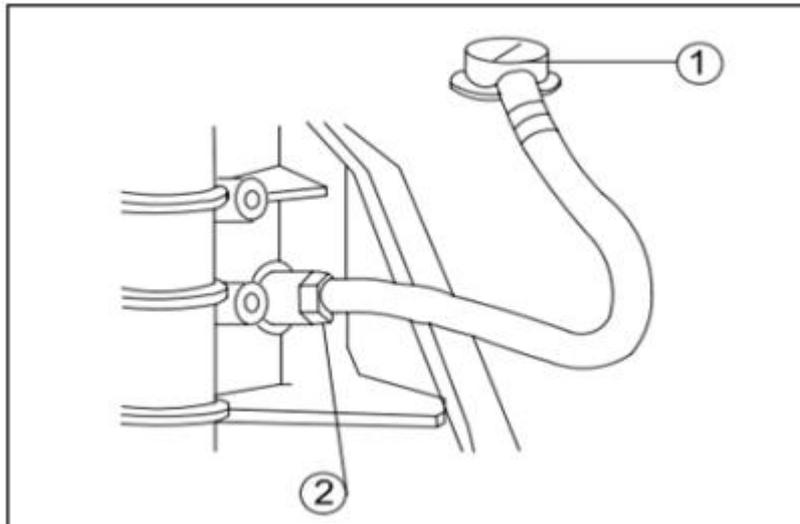
1. the oil level in the oil pan. If the oil level is low, add oil to the high level mark on the oil dipstick.
2. the quality of the oil.

If the oil is discoloured or deteriorated, it should be replaced.

3. oil leaks.

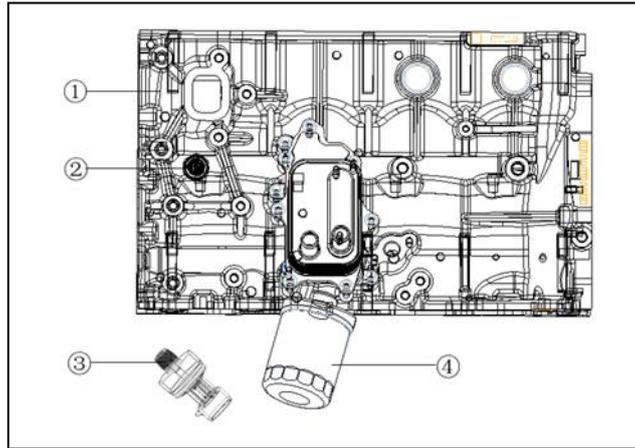
If an oil leak is found, it should be repaired.

1. Remove the oil pressure sensor.
2. Install the special tool (oil pressure gauge) into the empty threaded hole.
3. Secure the oil pressure gauge.
4. Start the engine and warm it up to normal operating temperature.
5. After warming up, increase the engine speed to 3000 rpm and measure the oil pressure.



project	Dedicated tools
1	09915-77310 Oil Pressure Gauge
2	09915-78211 Oil pressure gauge retainer

Engine speed	Standard Oil Pressure
Engine Speed	Standard oil pressure
Idle speed	≥80kpa
At 3000r/min	≥150kPa

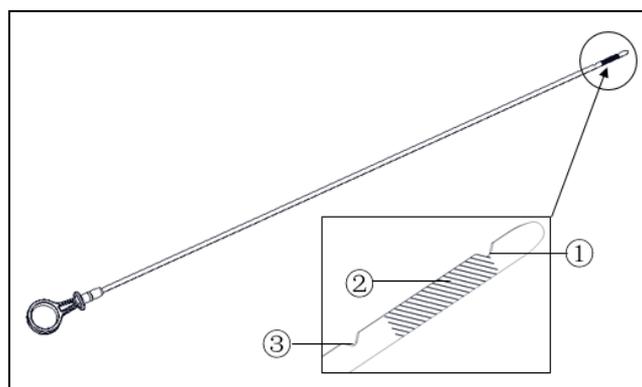


Project	Describe
1	Crankcase
2	Oil Pressure Sensor
3	Self-adhesive
4	Oil filter assembly

6. After checking the oil pressure, switch off the engine and remove the oil pressure gauge.
7. Replace the oil pressure sensor again and tighten the oil pressure sensor to the specified torque.
Tightening torque: $14 \pm 1 \text{N.m}$.
8. Start the engine and check the oil pressure switch for oil leakage.
9. Switch off the engine and connect the harness terminals to the oil pressure sensor.

Oil level check

1. Place the vehicle on a level surface.
2. Make sure the vehicle is cold.
3. Remove the dipstick and check that the oil level is between the MAX and MIN marks on the dipstick.



Project	Describe
1	Low Oil Level Marker
2	Recommended Oil Level Area
3	High Oil Level Marker

If the oil level is below the MIN mark, add engine oil.

2.2.5 Removal and installation instructions

Oil pan

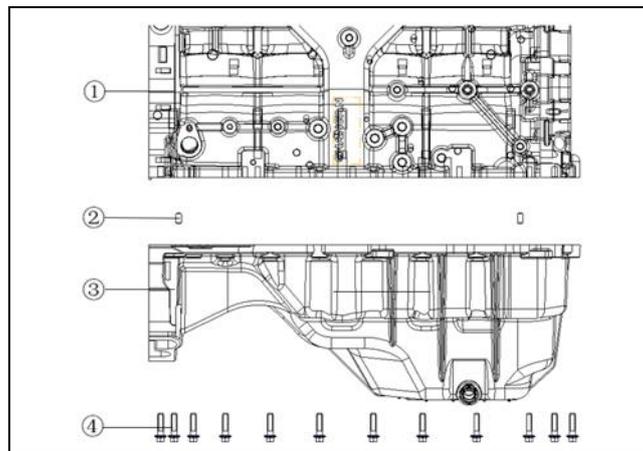
【DISASSEMBLY】

1. Remove the oil drain plug and drain the engine oil.
2. Remove the oil pan bolts and then remove the oil pan.

【Cleaning】

Clean the mating surface between the oil pan and the cylinder block.

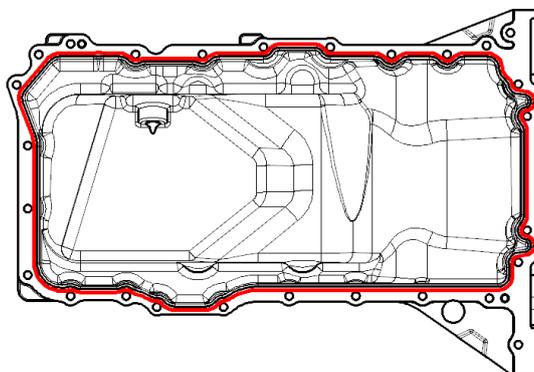
Remove oil, old sealant and dirt from the mating surface and clean the inside of the oil pan.



Project	Describe
1	Crankcase Assembly
2	Positioning pin
3	Oil Pan Assembly
4	Hexagonal Flange Bolt
1	Crankcase Assembly

【Installation】

1. Before installing the oil pan, apply adhesive to the cylinder surface (surface that meets the oil pan) in the position as shown in the figure below. Make sure to install before the sealant hardens, and tighten the bolts immediately to the torque specified in Table A, either crosswise or simultaneously with a tightening machine.



Install an oil drain plug on the oil pan and tighten to a torque of 40~50N-m.

2. Refill the engine with oil and check each joint, there should be no oil leakage.

Oil pump

【Disassembly】

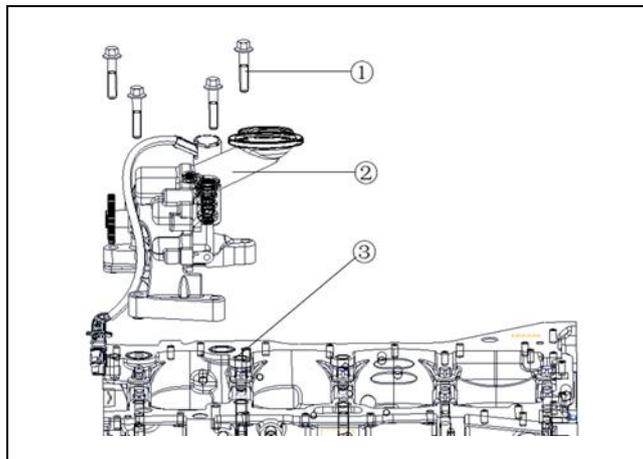
1. Disconnect the negative battery cable.
2. Drain the engine oil.
3. Remove the oil pan as described above. 4.
4. Remove the oil pump wiring harness as described previously. 5.
5. Remove the oil pump chain tensioner.
6. Remove the oil pump and crankcase attachment bolts.
7. Remove the oil pump assembly.

【INSPECTION】

1. Remove the engine oil pump assembly for inspection and replace if needed if the oil pump assembly is defective.

【Installation】

1. Replace the oil pump seal.
2. Mount the oil pump assembly as shown in the figure below, tighten the mounting bolts to the torque specified in Table A, and install the oil pump chain assembly before tightening the oil pump assembly bolts.



Project	Describe
1	Oil pump to crankcase assembly attachment bolt
2	Oil Pump Assembly
3	Crankcase assembly

3. Install the oil pump harness connector to the front cowling.
4. Install the oil pan assembly as previously described.
5. Check to make sure that all parts removed have been put back in place.
6. Refill the engine with engine oil.
7. Connect the negative battery cable.
8. Check each connector to make sure there is no oil leakage.
9. After installation, start the engine and check the oil pressure.

2.3 Cooling system

2.3.1 Specification

Component Specification

Name	Specification
Type of thermostat	Wax
Thermostat start °	82± 2°C
Fully start °	95°C
Pump type	Centrifugal impeller pump
Number of pump blades	6 pc

General specification

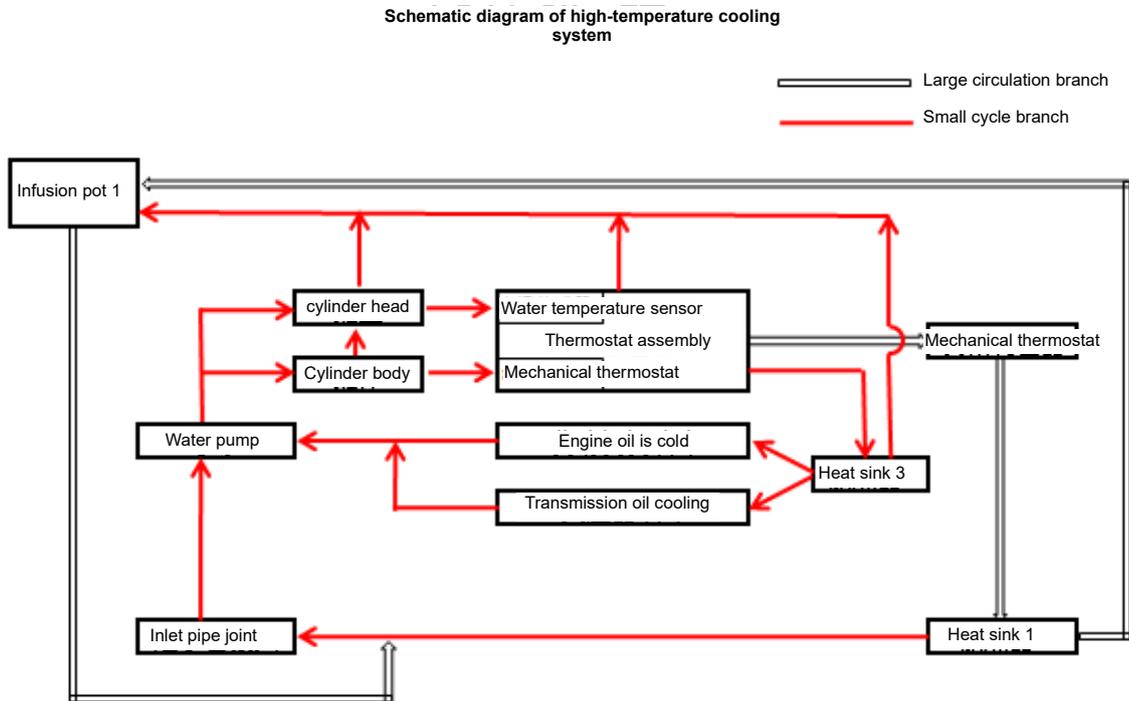
Application	specification
Coolant type	Q/JD 1028LEC- II -40engine cooling
Cooling mode	water coolig

Torque

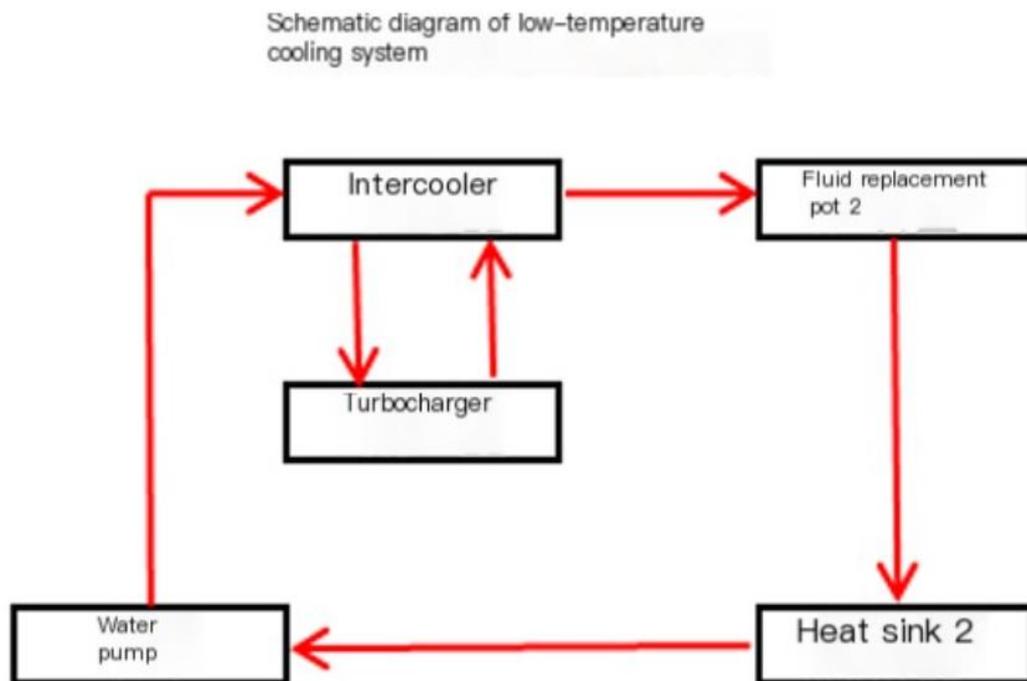
Name	N.m	lb-ft	lb-in
Water pump fastening bolts	32±2	24	
Pump fixed short bolt	32±2	24	
Fixing bolt for wanter pump pulley	10±1		89
Electronic thermostat fixing bolt	10±1		89
Mechanical thermostat fixing bolt	23±2	17	
water inlet bolt	10±1		89

2.3.2 Coolant Flow diagram

High temperature cooling system



Low temperature cooling system



2.3.3 System Description System

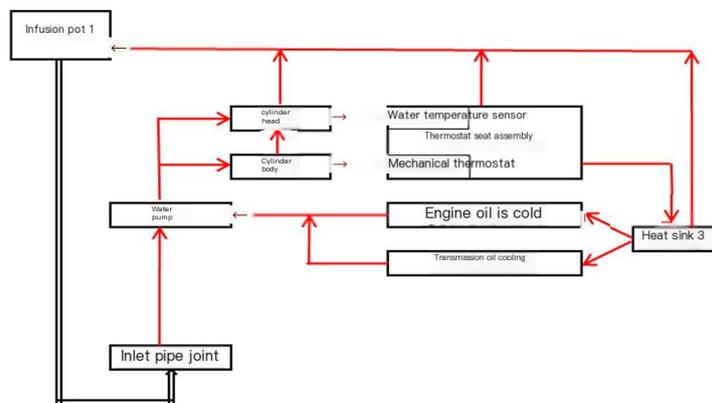
System Overview

The cooling system is divided into high temperature cooling system and low temperature cooling system. High temperature cooling system includes high temperature radiator, water bottle, hose, water pump, electronic fan and thermostat. Low temperature cooling system includes: intercooler, electronic auxiliary pump, low temperature radiator, hose, water storage bottle

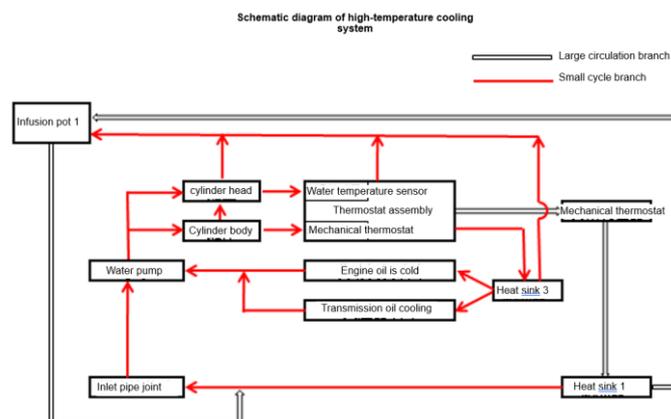
Engine cooling machine: the normal working temperature of the engine is generally about 95 ° C (203 ° F), in this temperature range, all parts of the engine match the state is ideal, if the engine cannot reach the ideal working temperature for a long time, will aggravate the wear of the body. Because of the low temperature, the mixed gas is not fully burned in the combustion chamber, and serious carbon accumulation will be formed. So when the engine is low temperature, it is required to work.

The coolant temperature should reach the normal operating temperature in a short period of time as much as possible, requiring the engine to generate as little heat exchange with the outside world as possible. At this time, the electronic temperature regulator controls the engine coolant in the body only circulates inside the engine block, takes the heat generated around the cylinder wall to other parts of the engine, so that its temperature rises rapidly, the water pump circulates the engine coolant in the cylinder block, and then the engine coolant circulates in the water jacket of the engine block, the warm air water tank assembly and the cylinder head. This state is called the "little loop". When the antifreeze temperature reaches the target temperature, the ECU issues instructions to control the heating unit of the electronic temperature regulator according to the engine load, speed, intake air temperature, and coolant temperature to control the opening of the temperature regulator valve, and the engine coolant is pumped to the water jacket of the engine body, the cylinder head, and the high temperature radiator, which is called "large circulation"

1. When the engine is warmed (the thermostat is off), the antifreeze circulation is as follows:



2. When the coolant heats up to the normal temperature, the coolant circulates through the radiator according to the following line:



3. low temperature cooling system: low temperature cooling system mainly for the pressurized gas and supercharger cooling, intercooler and supercharger cooling in parallel, driven by electronic auxiliary water pump. Ensure that the engine intake air temperature is within a reasonable range.

Automotive antifreeze

When the engine reaches the normal operating temperature: with the operation of the engine, the water storage bottle provides water to the water pump, the engine antifreeze inside the body rapidly heats up, and the large cycle is opened when the opening temperature of the thermostat is reached. The antifreeze in the radiator expands w

hen heated, and the overflow is collected into the water storage bottle. The cooling system has been filled with high-quality antifreeze with a freezing point of -40°C before leaving the factory. When the antifreeze needs to be replaced, use a glycol antifreeze that meets the requirements of LEC-II-40 to meet the antifreeze temperature of -40°C .

When the antifreeze needs to be supplemented, a glycol antifreeze that meets the requirements of LEC-II-40 should be added to ensure that the antifreeze temperature is lower than -40°C .



Note: Alcohol or methanol antifreeze or the use of water alone as antifreeze should not be used in the cooling system, otherwise it will cause the cooling system failure.



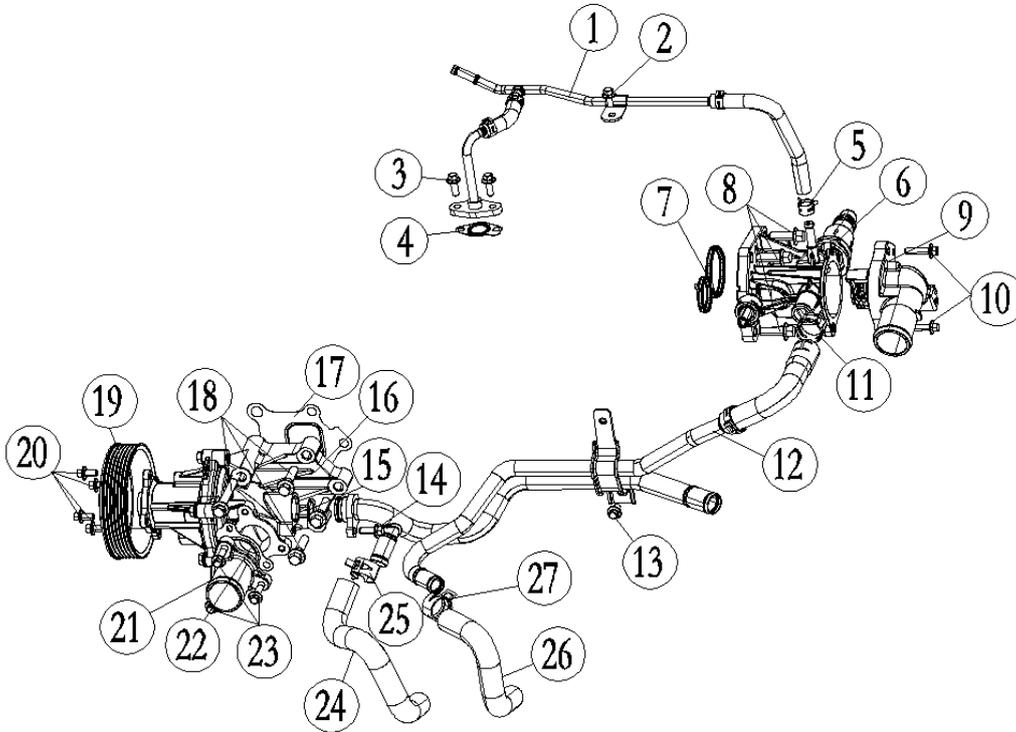
Note: Even if the ambient temperature is expected to reach the freezing point, an antifreeze with a freezing point of -40°C as required by LEC-II-40 should be used to prevent cooling system failure.

Antifreeze information:

freezing point and model	Freezing point ($^{\circ}\text{C}$)	-40
	Type	Q/JD 1028LEC- II -40engine cooling

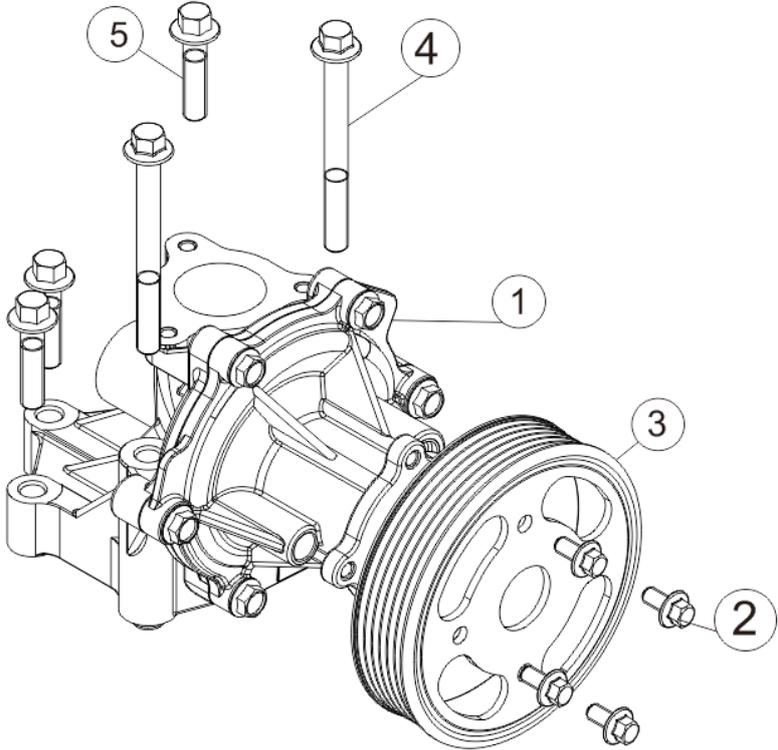
2.3.4 waterway diagram

Waterway



Item	Instructions	Item	Instructions
1	Intake pipe aasy	15	Outlet pipe O-ring
2	Bolt	16	Pump assy
3	Bolt	17	Pump seal
4	Pipe gasket	18	Bolt
5	Clamp	19	Water pump pulley
6	Thermostat bracket Assy	20	Bolt
7	ermostat testt seal	21	Inlet pipe
8	Bolt	22	Inlet pipe gasket
9	Thermostat test Assy	23	Bolt
10	Bolt	24	Oil cooling outlet pipe
11	Clamp	25	Clamp
12	Water pipe Assy	26	Oil cooling water pipe
13	Bolt	27	Clamp
14	Bolt		

Water Pump



Item	Instructions	Item	Instructions
1	Water pump Assy	4	Bolt
2	Pulley bolt	5	Bolt
3	Pulley		

2.3.5 General inspection

 Alcohol or methanol coolants or the use of water alone as coolants cannot be used in the cooling system, otherwise the cooling system will fail

 Even when the ambient temperature is expected to be below freezing, use 45% water and 55% glycol antifreeze (antifreeze/rust anticoolant) as the coolant to prevent rust and lubrication.

 All parts should be disassembled while the engine is cooling, otherwise they can cause serious burns or personal injury.

 Turn off the engine and wait for it to cool. Even then, be very careful when removing the cap from the water bottle. Wrap a thick cloth around it and slowly turn it counterclockwise, backing away as the pressure is released.

 The engine has aluminum components and must be protected by a glycol based coolant to prevent corrosion and freezing.

 Use only soft water (demineralized) in the coolant mixture. Water with minerals reduces the effectiveness of the coolant.

Coolant level inspection

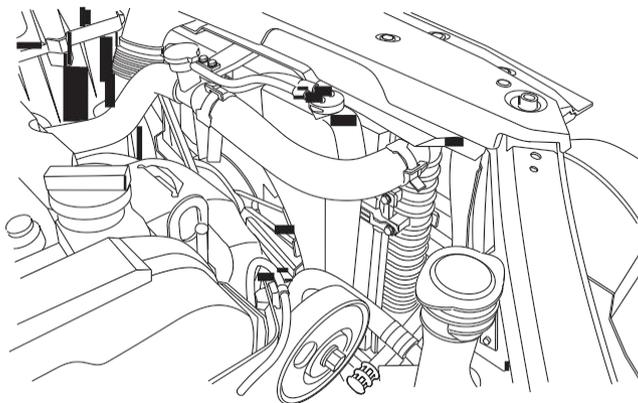
 To avoid the risk of burns, do not open the water bottle cap while the coolant is "boiling". avoid the risk of burns, do not open the water bottle cap while the engine and radiator are still hot.

 Boiling liquids and vapors may be ejected under pressure by opening the water bottle cap too early.

 Repairs involving the removal of the "water pump and the water pipe above the generator" are required to "cover the generator with rags or other auxiliary items to prevent liquid from entering the generator".

Check the water tank coolant level while the engine is cooling. The normal coolant level should be between the "MAX" and "MIN" marks of the water bottle

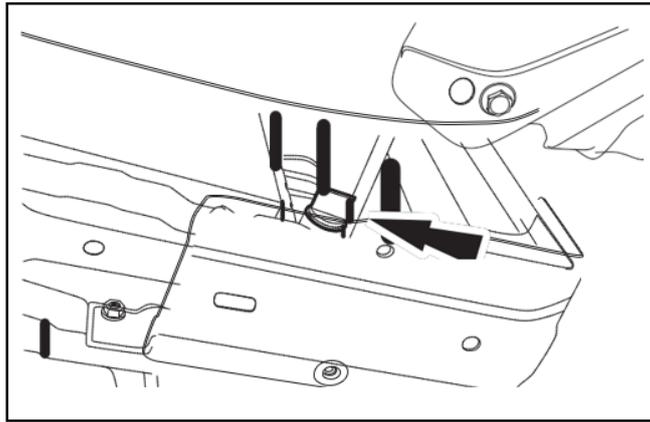
When the coolant level is lower than the "MIN" mark, open the water storage bottle and add the appropriate amount of coolant, so that the water level rises to the "MAX" mark. Then, reinstall the water bottle cap.



Coolant discharge and filling

 To avoid the risk of burns, do not remove the water bottle cap while the engine and radiator are still hot. Boiling liquid and steam may be expelled under pressure by opening the lid of the water storage bottle too early.

1. When the engine is cool, remove the water bottle cap. When pressing down, slowly turn the water storage bottle cap in the counterclockwise direction to the first stuck position, slowly release the water storage bottle cap, and remove the water storage bottle cap after the pressure is released.



2. After the water bottle cap is opened, open the water valve and drain the coolant in the system.
3. Tighten the discharge valve. Add water to the system fill up and run the engine until the hose above the radiator is hot and hard.
4. Repeat steps (1), (2), and (3) several times until the discharged liquid is nearly colorless.
5. Drain the cooling system and tighten the radiator drain plug.
6. Remove the water storage bottle, remove the water storage bottle, pour out the liquid, clean the inside of the water storage bottle with soapy water, rinse thoroughly with clean water, and dry it together. Install the water storage bottle and hose.
7. Open the water bottle cap and fill the water bottle with coolant to the MAX line.
8. The vehicle idles, pay attention to the coolant level changes in the water storage bottle during the process, and replenish the coolant at any time after the liquid level drops. Tighten the water bottle cap, run the engine to the fan at 2,500 to 3,000 rpm, then return to idle for 1min and turn off the vehicle. After the engine cools, check whether the coolant level drops, and if it does, repeat the process several times until the coolant level in the water bottle no longer drops.。

leakage inspection

1. Check engine coolant level.
2. Install the tester to the filling port of the water storage bottle.
3. Use the tester to apply pressure so that the pressure reaches 160 kPa.

⚠ When checking, ensure that the cooling machine is in the state, the internal pressure of the cooling water tank must not exceed 200kpa, otherwise it will cause damage.

4. Observe the pressure change of the tester, pipe joints, and radiator core for leakage of antifreeze. Standard: When the pressure reaches 160 kPa, hold the pressure for 2 minutes, the pressure does not change, and the pipe joints and the radiator core do not leak. If the pressure indicated by the gauge pointer is reduced, this may indicate that a leak is present. Repair or replace corresponding parts.

Water storage bottle cap check

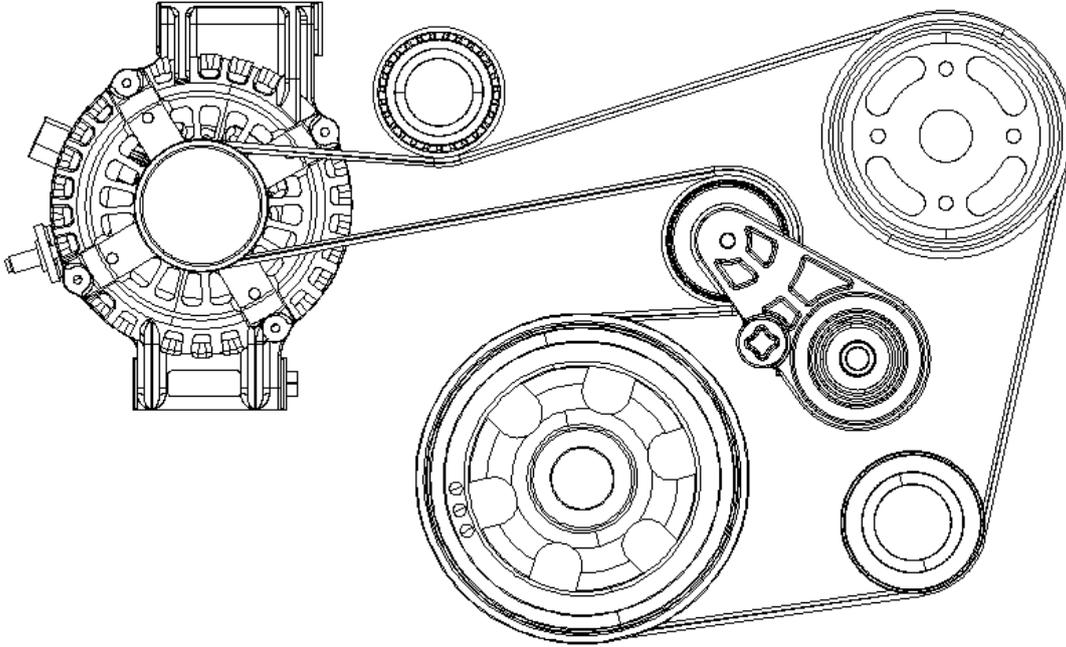
1. Clean the water bottle cap and seal.
2. Check whether the sealing rubber of the water storage bottle cap is damaged or rolled. If the water bottle cap does not meet the requirements, replace it.

Drive belt tension check

⚠ Disconnect the negative wire before checking and adjusting belt tension.

1. Check the belt for cracks, cuts, deformation, wear and dirt. Replace the belt if necessary. (Reference: Mechanical system)
2. Check the belt tension, the front wheel belt is too loose, will affect the generator voltage, and lead to overheating and early wear of the belt.

3.Connect the negative cable to the battery terminal.



Thermostat test

1· Remove the temperature regulator. (Ref: Cooling system)

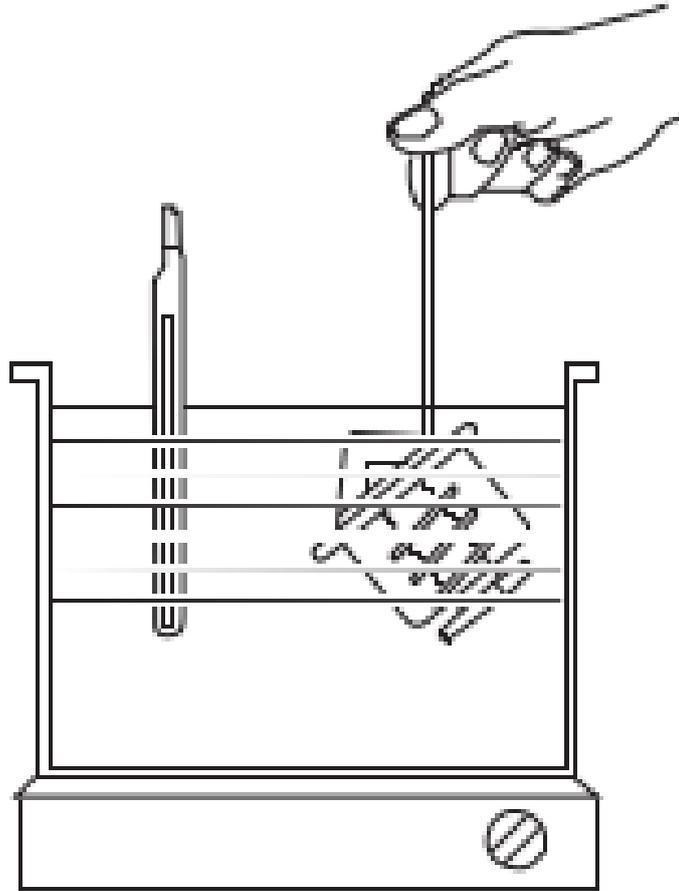
2·submerge the thermostat in heated water.

3·Place the thermometer in the water.

4·Heat the water, observe the status of the thermostat, and check that the valve starts to open at the specified temperature.

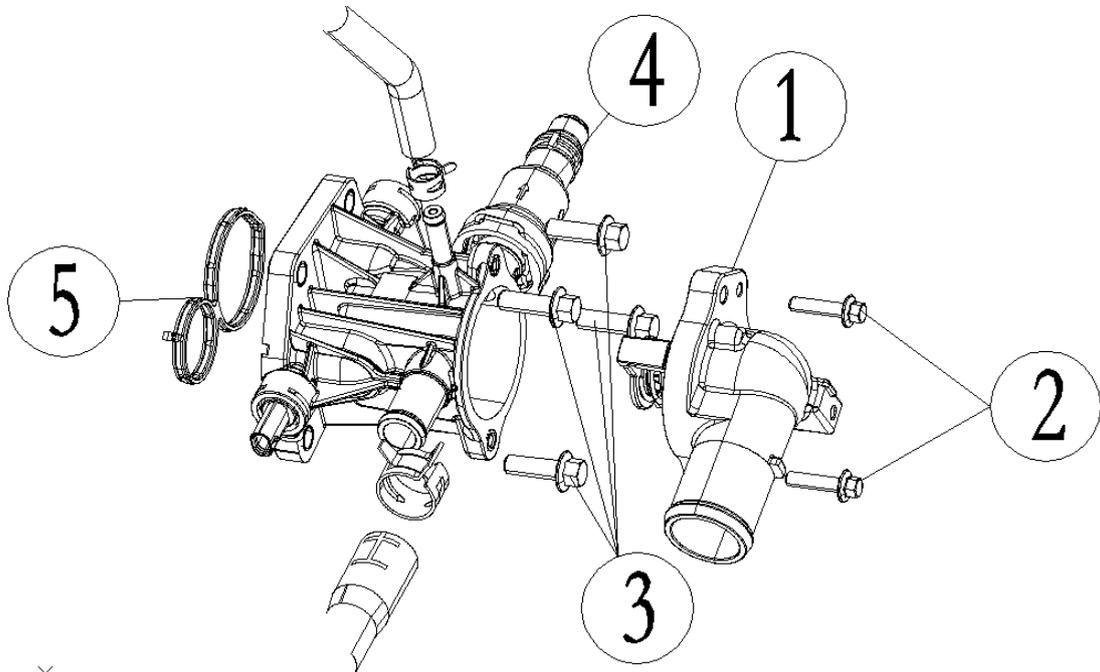
5· Test the resistance at both ends of the electronic temperature regulator to check whether the resistance is 9.5 ± 0.95 ohms, if it exceeds the limit, replace it. (Reference: cooling system)

6· If the valve starts to open at a temperature significantly lower or higher than the specified temperature, a new thermostat should be replaced. Using a thermostat that does not meet the specified temperature will cause a tendency to overcool or overheat. .



2.3.6 Remove and Assemble instruction

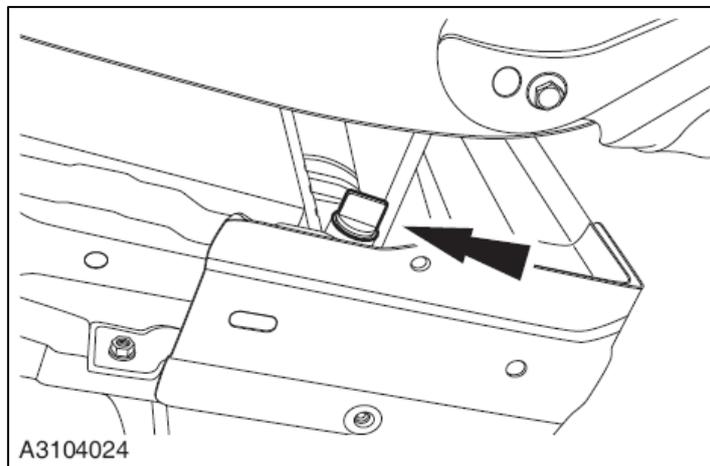
Thermostat



Item	Instruction
1	Thermostat Assy
2	Bolt
3	Bolt
4	Thermostat bracket
5	5 Thermostat seal

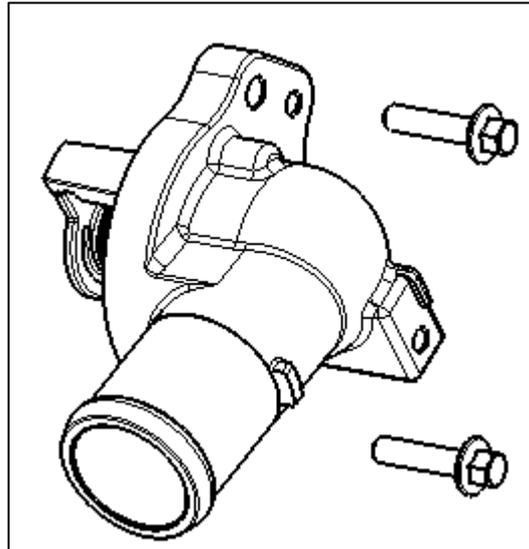
【Disassembly】

1. Remove the negative battery conductor.
2. Lift the vehicle.
3. Drain the coolant and tighten the drain plug.



4. Remove the thermostat base general synthesizer.

5. Remove the thermostat from the thermostat base assembly.



【Inspection】

1. Check whether the air exhaust valve of the temperature regulator is clean. If this valve is blocked, it will cause the engine to overheat.
2. Check whether there is foreign matter in the valve seat. There should be no foreign matter in the valve seat, otherwise the valve will not be installed tightly.
3. Check whether the seal of the thermostat is broken, deformed or otherwise damaged.
4. Check the constant temperature action of the wax ball as follows:
 - A. Immerse the thermostat in water and gradually heat the water.
 - B. Check whether the temperature when the valve starts to open is the specified temperature.
 - C. If the temperature at which the valve begins to open is significantly lower or higher than the specified temperature, a new thermostat should be replaced. Using a thermostat that does not meet the specified temperature will cause a tendency to overcool or overheat.。

【Assemble】

1. The installation sequence is the opposite of the removal sequence.
2. Fill the cooling system with coolant.
3. Connect the negative battery cable.
4. After installation, check whether there are leaks in each part.。

Functional specifications of mechanical thermostat	
Open temperature	82°C
Maximize open temperature	95°C

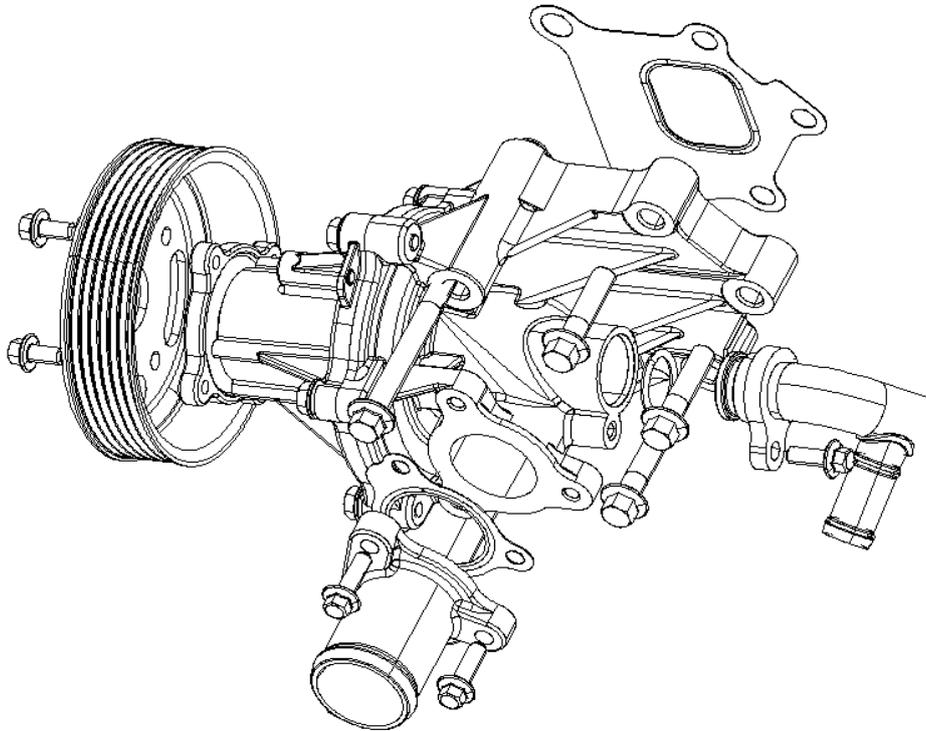
Water Pump

 Pump can not be disassembled

 If the pump need to repiar ,repalce Assy directly

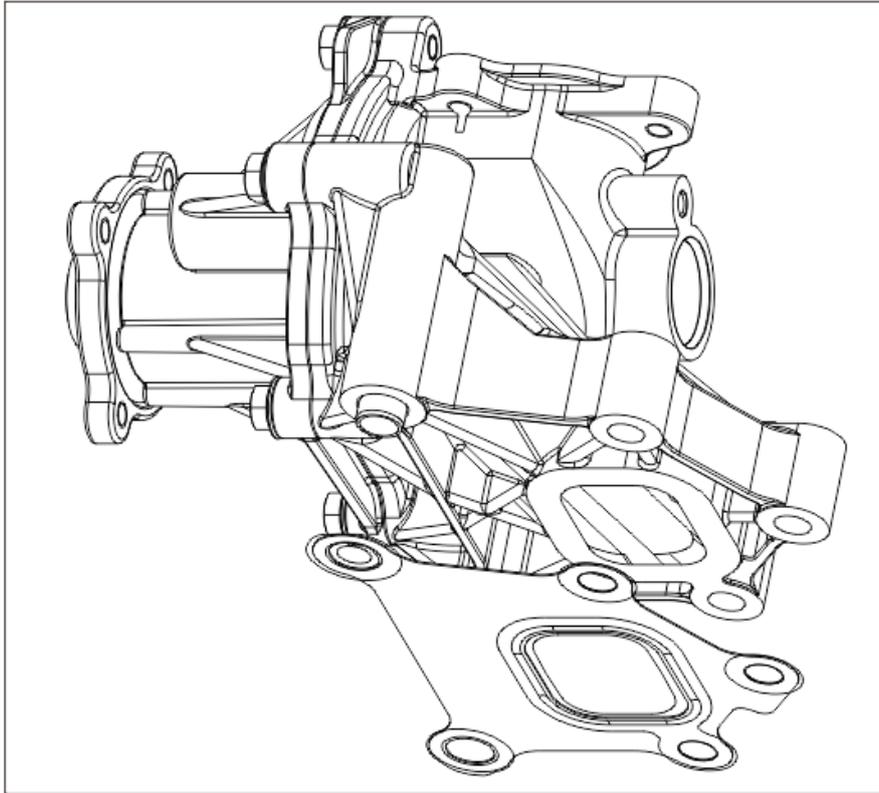
【Disasseble】

1. Disconnect the negative battery wiring harness.
2. Loosen the radiator drain plug to drain the cooling system.
3. Remove the front wheel belt.
4. Remove the tensioning mechanism, water pump pulley, HVAC return pipe asse mbly and water inlet pipe assembly.
5. Remove the bolts securing the water pump. Torque: 32 ± 2 N.m.
6. Remove the pump assembly.



【Inspection】

1. Check whether the water pump gasket is damaged. If so, replace the water pump gasket.。



2. Whether the pump is operated flexibly by turning it by hand. If the pump is not flexible or noisy, it should be replaced.
3. Separate the pump pump head and pump base, and check whether the pump impeller is damaged and needs to be replaced in time.
4. Clean the engine cylinder and water pump joint.。

【Assemble】

1. Install a new water pump gasket.
2. The installation sequence is the opposite of the removal sequence.
3. Refill the coolant.
4. Start the engine and check whether the cooling system is leaking and venting.

⚠ Note: After repairing any parts of the cryogenic cooling system, open the exhaust valve on the cryogenic radiator before refilling the antifreeze. Close the exhaust valve after the antifreeze to be filled overflows from the exhaust valve.

2.4 Intake System

2.4.1 General

General specifications

Application	specification
Vacuum degree of intake manifold under idle condition	>60 kPa

Torque

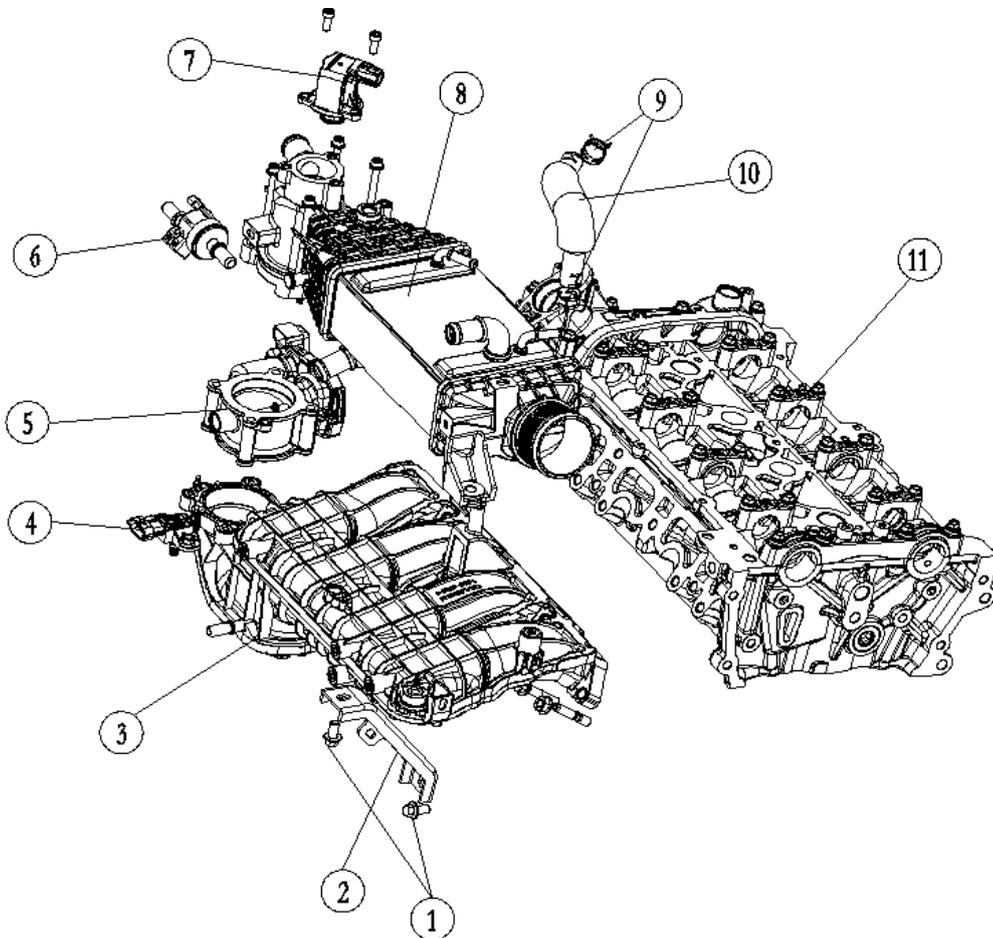
Name	N.m	lb-ft	lb-in
Intake tube Bolt	23±2	17	-
Throttle connection bolt	10±1	-	89
Air filter cover Bolt	10±1	-	89
Air filter assy Bolt	10±1	-	89
Airl filter assmeble bolt	10±1	-	89
Water cooled Bolt	10±1	-	89
Bolt	23±2	17	-
Intake pressure&temperature sensor	8±0.5	-	71
Pressure sensor	10±1	-	89

2.4.2 System Instruction

The ambient air enters the air filter, is filtered by the air filter element and pressurized by the supercharger, enters the water-cooled intercooler through the intake pipe assembly of the intercooler, and then enters the throttle body and the intake manifold into the cylinder. A crankcase vent pipe is connected to the intake manifold, through which the exhaust gas from the crankcase enters the cylinder with fresh air.

2.4.3 Component breakdown diagram

Intake Component



Item	Instruction	Item	Instruction
1	Bolt	7	Intake pressure valve Ass
2	Intake bracket	8	Water cooled intercooler Assy
3	Intake tube Assy	9	Clamp
4	Temperature sensor	10	Pressure regulating valve tube
5	Electronic throttle	11	Cylinder head Assy
6	Carbon tank control valve		

2.4.4 General Inspection

General Equipment

vacuum gauge

 **The temperature of the engine parts in operation is very high, and attention should be paid to the high temperature of the engine when disassembling all parts, otherwise it will lead to serious burns.**

Air intake system vacuum check

1. Turn the ignition switch to the "LOCK" position when the engine is turned off.
2. Disconnect the vacuum hose of the activated carbon tank blowdown solenoid valve on the intake manifold.
3. Connect the appropriate vacuum hose to the position plug of the activated carbon tank blowdown solenoid valve, connect the tee to the disconnected vacuum hose, the connected test vacuum hose, and the vacuum gauge test hose respectively.
4. Start the engine and measure the vacuum degree of the intake system at idle speed. Standard vacuum value: > 60kPa
5. Remove the vacuum gauge and reconnect the vacuum tube.

Daily maintenance of air filter element

The daily maintenance of the air filter element should be carried out in strict accordance with the daily maintenance cycle in the "Instruction Manual", and the detailed maintenance steps are shown in the "air filter element" in the disassembly and installation.

2.4.5 Assemble Instruction

Water cooled intercooler, throttle body and intake manifold

【Disassemble】

1. Remove the negative battery cable.
2. Remove the carbon tank control valve assembly, carbon tank control valve outlet pipe assembly, air intake pressure relief valve hose, intercooler inlet pipe assembly, water cooling intercooler inlet pipe, water cooling intercooler outlet pipe assembly, supercharger inlet and outlet pipe assembly, engine wire harness assembly guard box part.
3. Remove the temperature and pressure sensor assembly from the water-cooled intercooler. 4. Remove ECRV valve assembly from water cooled intercooler.
5. As shown in the figure above, remove the bolts securing the water-cooled intercooler, electronic throttle body, and intake manifold flange side, remove the bolts and nuts of the water-cooled intercooler integration bracket, and remove the water-cooled intercooler assembly.
6. Remove the electronic throttle body assembly.
7. Remove the intake manifold support.
8. Remove the boost pressure temperature sensor assembly from the intake manifold.
9. Remove intake manifold assembly.

【Assemble】

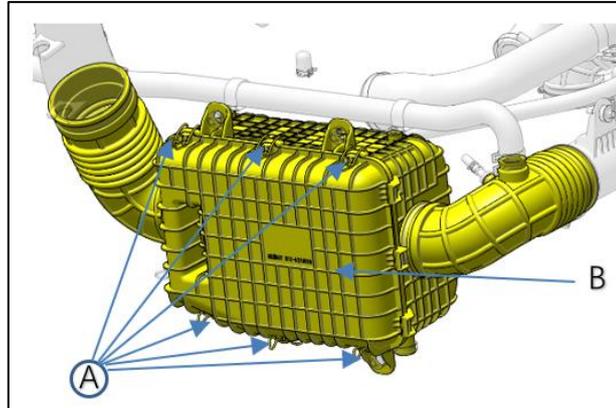
Install in the reverse order of disassembly and note the following;

1. Before installation, ensure that the inside of the water-cooled intercooler, the inside of the intake manifold, the throttle body assembly and the assembly of the intake manifold are clean and free of foreign bodies.
2. Assemble the temperature and pressure sensor assembly on the intake manifold according to the torque specified in Table A.
3. Tighten the bolts and nuts connecting the intake manifold to the cylinder head and block, as well as the bolts and nuts connecting to the electronic throttle and the water-cooled intercooler according to the torque specified in Table A.
4. Check to ensure that all disassembled parts have been installed back in place, and install the required parts that have not been installed.
5. Start the engine, check whether the idle speed of the engine is normal after the heat engine, and determine whether the intake system leaks.

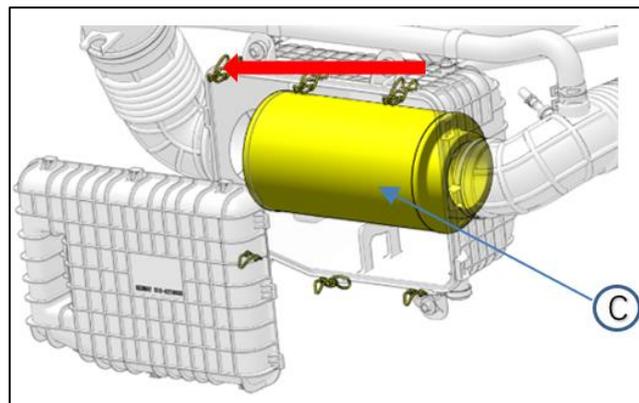
Air Filter

【Disassemble】

1. Open the 6 buckles on the upper cover of the air filter 【A】 .



2. Open the upper cover of the air filter 【 B 】 and remove the filter element 【 C 】 from the air filter housing.



3. Check whether there is dirt in the air filter element.
4. When needed, compressed air can be used to blow off the dirt from the clean side of the filter element. If it is too dirty, replace the filter element.



【Assemble】

Install according to the opposite order of disassembly, and pay attention to the following points:

1. Before installation, make sure that the inside of the upper cover of the air filter and the clean side of the filter element are clean and free of foreign bodies.
2. Ensure that the filter element is properly installed in the air filter housing.
3. Tighten the screws according to the torque specified in Table

Air Filter Assy

【Disassemble】

1. Release the clamp that secures the air filter inlet and outlet pipelines.
2. Remove the three fixing bolts that secure the air filter assembly..
3. Remove the air filter assembly.



【Assemble】

Install in the opposite order to disassemble, and pay attention to the following points:

1. Before installation, ensure that the air filter assembly, intake pipe, and output pipe are clean and free of foreign bodies.
2. Ensure that the air filter assembly, intake pipe and output pipe are properly installed.
3. Tighten the fixing bolts of the air filter assembly and the air filter output pipe collar according to the torque specified in Table A.

2.5 Exhaustion System

2.5.1 Specification

General specification

Application	specification
Engine 2,000 rpm out let pressure	$\leq 31\text{kPa}$

Torque

Name	N.m	lb-ft	lb-in
Turbo assemble stud	15	11	-
Turbo assemble nut	40	30	-
Turbo inlet pipe fixing bolt	34	25	-
Turbo return pipe fixing bolt	10	-	89
Turbo inlet&return fixing bolt	10	-	89
Turbo heat sheild fixing bolt	23	17	-
Turbo and catalyst fix bolt	25	18	-
Catalyst bracket strengthening bolt	23	17	-
Turbocharger and exhaust pipe connection bolts and nuts	25	18	-

2.5.2 System Instruction

System introduction

Poisoning of catalyst

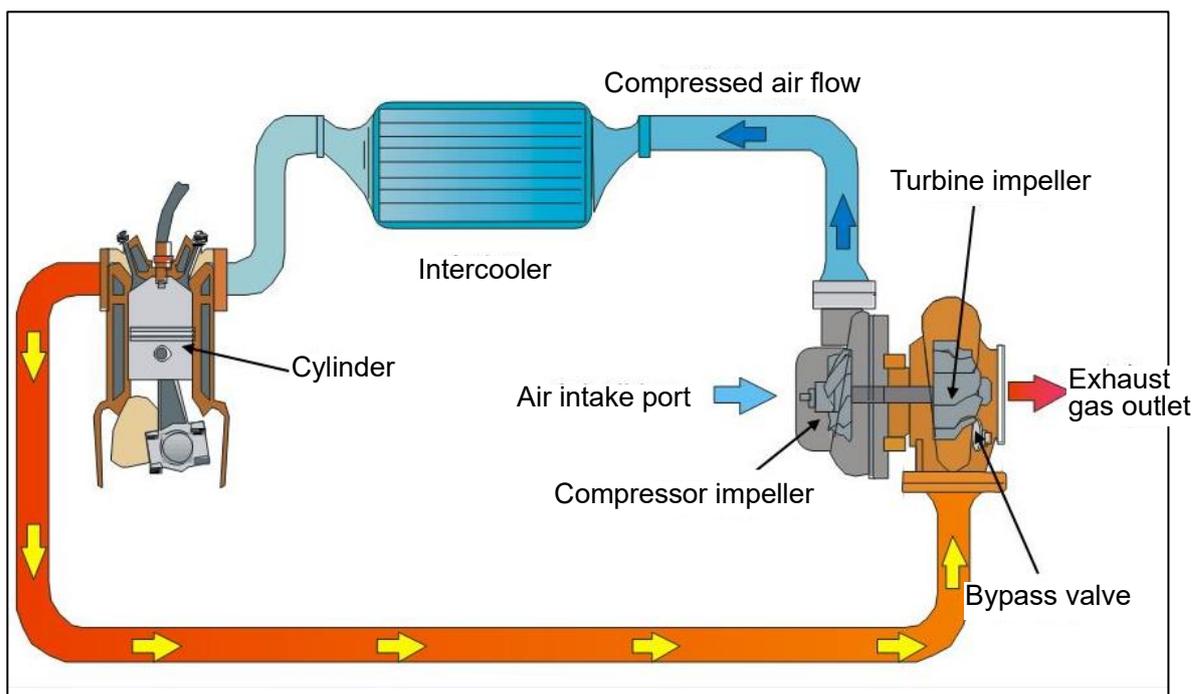
If the lead content in the fuel exceeds 5 mg/L, the catalyst will be seriously poisoned. Therefore, vehicles equipped with catalysts are strictly prohibited from using leaded gasoline.

If the oil consumption rate is too high, zinc and phosphorus in the oil will lead to catalytic poisoning. H₂S emissions are most easily detected from catalysts. The gas has a taste similar to rotten eggs. Replacing another brand of fuel can solve this problem. To reduce H₂S emissions, ensure that CO emissions at idle meet standards and that the engine exhaust system works properly.

Warning: If the temperature exceeds 900°C, the catalyst support will melt. In order to prevent this kind of failure, it is necessary to describe and repair the cause of the fault in detail. Due to excessive back pressure, the melting of catalyst is often accompanied by dynamic decline.

Due to excessive back pressure, the melting of catalysts is often accompanied by a decrease in power.

Turbo theory



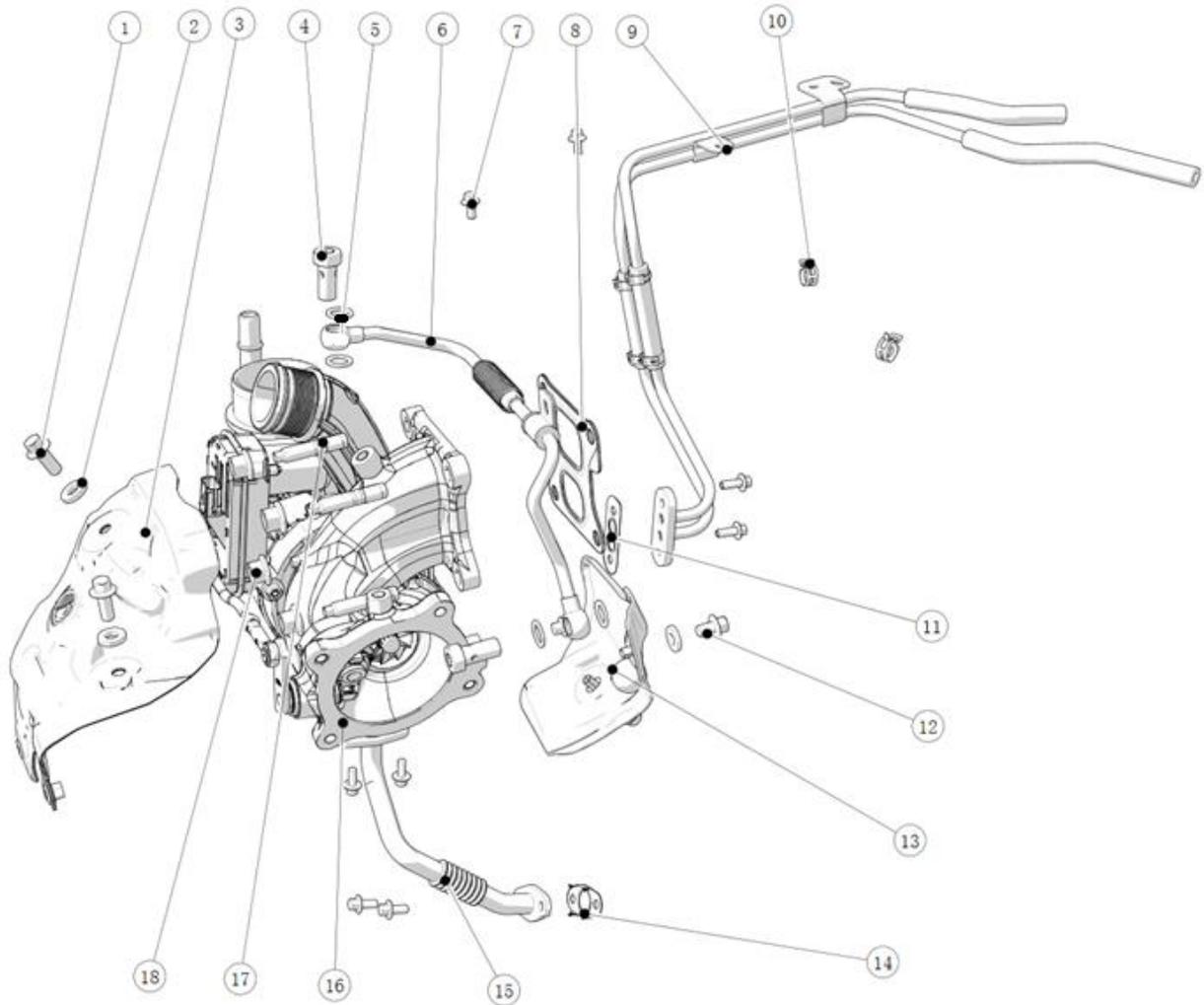
The exhaust gas from the engine exhaust manifold is used to drive the turbocharger to rotate, and the turbocharger then drives its coaxial pressure impeller to rotate. The impeller compresses fresh air through centrifugal force, thereby increasing the density of air entering the engine intake manifold, so that the engine can burn more fuel, so that the engine can produce more power.

System introduction

catalysts control three types of emissions: HC, CO and NO_x.

2.5.3 Explosive diagram

Turbo



Item	Instruction	Item	Instruction
1	Bolt	10	Clamp
2	Nut	11	Inlet and return gasket Assy
3	Turbo upper cover Assy	12	Bolt
4	Hollow bolt	13	Turbo lower cover Assy
5	Gasket	14	return oil line gasket Assy
6	inlet oil pipe Assy	15	Return oil pipe Assy
7	Bolt	16	Turbo Assy
8	Cylinder head gasket Assy	17	Cylinder head stud
9	inlet and return pipe Assy	18	Turbo nut with cylinder head

2.5.4 General Inspection

Daily Inspection



Note: The engine must be checked after it cools down, and the engine cannot be started during the inspection to avoid personnel injury.

1. Check the sealing and fastening of the connecting pipelines between the air filter and the turbocharger, as well as between the turbocharger and the engine intake and exhaust pipes. There should be no loose connections, broken pipelines, or improper installation of the air filter element.
2. Check whether the inlet and return oil pipes of the turbocharger are damaged or blocked, and whether the connection bolts at the joint are loose. The return pipe can not appear too large bend, aging, mud blockage and other phenomena.
3. Check the oil quality and replace the oil and oil filter regularly.
4. Check the air filter and clean or replace the filter element regularly.
5. Check whether the engine crankcase ventilation system is smooth, whether the engine exhaust pipe (that is, the crankcase ventilation pipe) is blocked and discounted, and ensure that the crankcase pressure is normal.

Supercharger Related Engine Troubleshooting.:

Failure								Diagnostic table of engine faults associated with the whole machine	
no power	Black smoke	Excessive	Blue smoke	The supercharger is noisy	The supercharger	Oil leaks	Turbocharger turbine side oil leakage	probable cause	Exhaustion methods
•	•	•	•			•		Air filter contaminated	Replace filter
	•	•	•	•	•	•		Pressurizer inlet line is not clear	Remove clogged lines as appropriate or replacement of damaged parts
•	•			•				The connecting line from the compressor outlet to the intake manifold is not clear	Remove debris blocking lines or replace damaged parts, as appropriate
				•				Air leak in line from air filter to compressor	Retighten fasteners or replace damaged parts, as appropriate
•	•	•	•	•				Air leak in line from compressor to engine intake manifold	Retighten fasteners or replace damaged parts, as appropriate
•	•					•		The exhaust pipe is not unobstructed	Remove clogged lines as appropriate or replacement of damaged parts
•	•			•		•		Air leakage from the supercharger-cylinder head bonding surface	Retighten fasteners or replace gaskets, as appropriate
•	•			•		•		Air leaks at the connection between the turbine inlet and the engine exhaust manifold	Retighten fasteners or replace gaskets, as appropriate
				•				Leak in the exhaust line after the turbine	Retighten fasteners or replace gaskets, as appropriate
		•	•			•	•	Overfilling of the engine crankcase with oil	Refer to 3.1.3-4 of this manual to check the engine oil
		•	•			•	•	engine crankcase ventilation system is not clear	Remove debris blocking lines or replace damaged parts, as appropriate
		•	•			•	•	The supercharger return line is not clear	Remove debris blocking lines or replace damaged parts, as appropriate

•	•	•	•			•	•	Abnormal wear of engine piston rings leading to outgassing, the	Refer to 3.1.2-19 of this manual for motor piston ring replacement
•	•	•	•	•	•	•	•	Damage to the supercharger	Replacing the supercharger

1. Please follow the above table to investigate the cause of the engine failure, and replace the supercharger if it is confirmed to be a supercharger failure.

2. The supercharger is a precision part, need to be repaired and tested by professionals. Replacement of the faulty supercharger should not be disassembled, so as not to affect the analysis of the cause of its failure. Only need to record the supercharger nameplate information and failure phenomenon, and the faulty supercharger to return to the factory testing can be dealt with.

2.5.5 Removal and installation instructions

supercharger, exhaust pipe

【Disassembly】

1. Disconnect the negative wire from the battery.
2. Disconnect the upstream oxygen sensor connection wire.
3. Remove the connecting nut between the exhaust pipe and the turbocharger.
4. Remove the exhaust pipe and idler bracket bolts.
5. Remove the upstream oxygen sensor plug.
6. Remove the turbocharger inlet and outlet pipe assembly, turbocharger inlet pipe and return pipe assembly.
7. Remove the lower cover assembly of the turbocharger.
8. Remove the turbocharger assembly.y.

Note: When disassembling the supercharger assembly, pay attention to protect the correct state of the actuator lever, the supercharger lubricating oil and cooling oil air must be clean, no impurities. When disassembling the supercharger oil return pipe assembly, do not allow oil leakage to the exhaust.

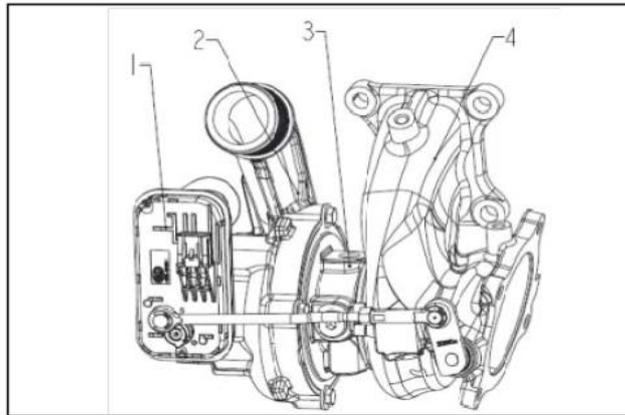
【Installation】

1. Connect the cylinder head and turbocharger, replace the turbocharger upper cover with sealing gasket assembly between the turbocharger and cylinder head, and perform a second torque check; Install the turbocharger lower cover assembly.
2. Install the turbocharger inlet and outlet pipe assembly, inlet pipe assembly, and return pipe assembly.
3. Install the exhaust pipe assembly, replace the turbocharger and exhaust pipe gasket with new ones, tighten the fasteners according to the specified torque, and perform a second torque check.
4. Connect the upstream oxygen sensor connector and firmly plug it in.
5. Connect the negative wire of the battery.
6. Check whether the exhaust system is leaking air or oil.

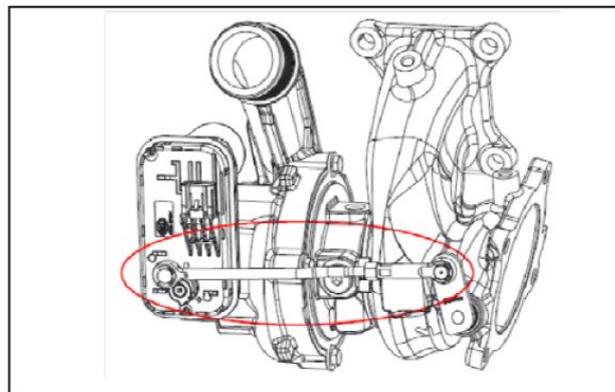


Note: When installing the exhaust manifold with supercharger assembly, attention must be paid to whether the supercharger oil inlet pipe and oil return pipe are correctly installed to prevent oil leakage

Turbo notice related

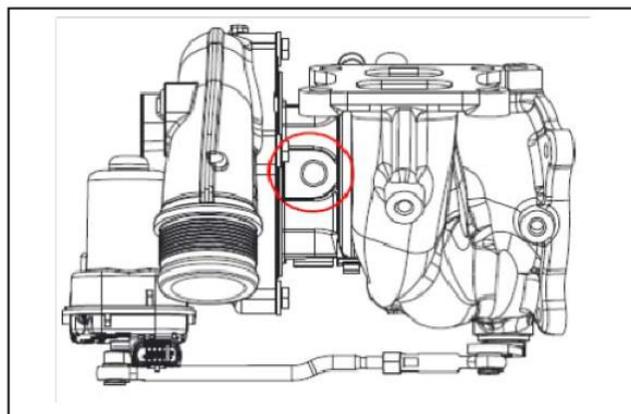


⚠ Warning: The entire supercharger consists of turbine 4, compressor 2, intermediate 3 and actuator assembly 1. Non-supercharger professional manufacturers can not split any part of the supercharger assembly. (The figure above indicates the state of the minimum split unit that can be dismantled for maintenance)



⚠ Warning: Do not use the actuator push rod in the red ring as a handle to move the supercharger assembly, and take care to avoid hitting or pressurizing the area in the ring, so as not to affect the sensitivity and reliability of the bypass valve actuator.

⚠ Warning: The voltage calibration of the bypass valve actuator assembly is done on the special equipment of the supercharger manufacturer. Do not adjust the nut in the above ring.



⚠ Note: During the maintenance and disassembly process of the supercharger and during the placement, the installation surface should be prevented from scratching and foreign matter should be prevented from falling into the open interface, especially the above oil inlet area should be kept clean.

2.6 Fuel system

2.6.1 Specifications

Component specifications

Name	Specifications
Injector Resistance	1.83 Ω \pm 5% at room temperature; 1. Resistance values will be out of tolerance at the rest of the temperature; 2. Multimeter accuracy is required to be 0.01 Ω .
Fuel Pump and Bracket Assembly Rated Fuel Supply Pressure	500kpa

Torque Specification

Name	N.m	lb-ft	lb-in
Fuel main assembly mounting bolts	32 \pm 2	24	

2.6.2 System description

System Overview

The fuel supply line consists of a fuel supply hose assembly, a fuel tank filler hose assembly to connect the fuel pump and engine oil rail for fuel delivery. The connectors include pipe clips and fixing brackets to secure the fuel supply line to the vehicle body. The fuel line and the fuel vapour line are arranged side by side and share the same connection.

Fuel Direct Injection (GDI)

1. The direct injection system uses multi-hole injectors to inject high-pressure fuel directly into the combustion chamber. The mist-like fuel injected through the multi-holes facilitates vapourisation, and the temperature of the air inside the combustion chamber is lowered as a result. The air temperature inside the combustion chamber is lowered as a result. This results in anti-explosion performance, higher compression ratios, and higher engine power output.

2. There is no time lag between the start of fuel injection and the time the fuel is injected into the combustion chamber, so high response performance can be obtained.

Structure and Principle

Fuel Master

(1) Function

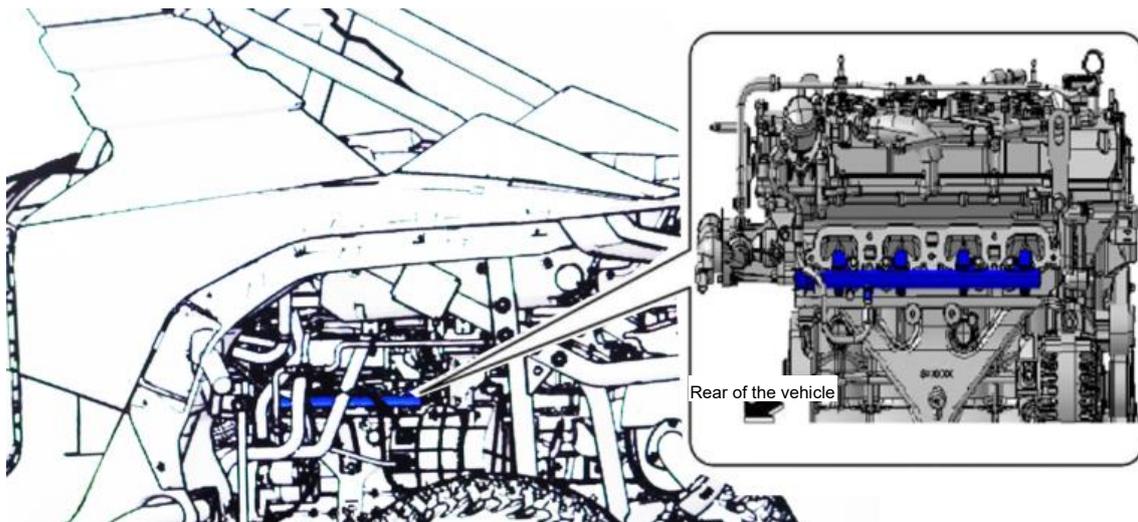
The fuel header distributes fuel from the high-pressure fuel pump to each injector, improves fuel atomisation through porous injection, atomises the mixture and mixes it with air and achieves an optimum fuel-air mixture for combustion. At this point, the combustion efficiency is improved by lowering the temperature in the combustion chamber and reducing the air density.

The injector injects fuel directly into the cylinder at the right time and in the right amount according to ECU signals.

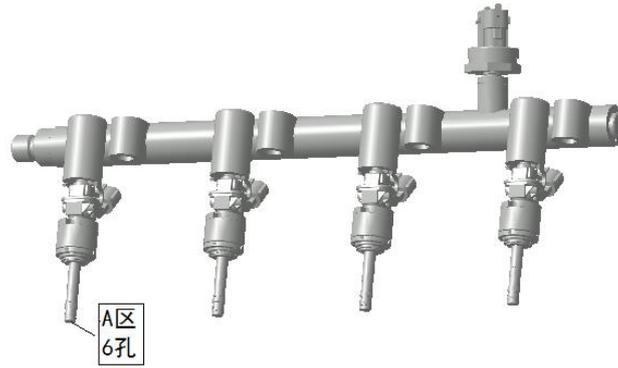
The injector has six injection holes in zone A as shown in the figure.

(2) Structure

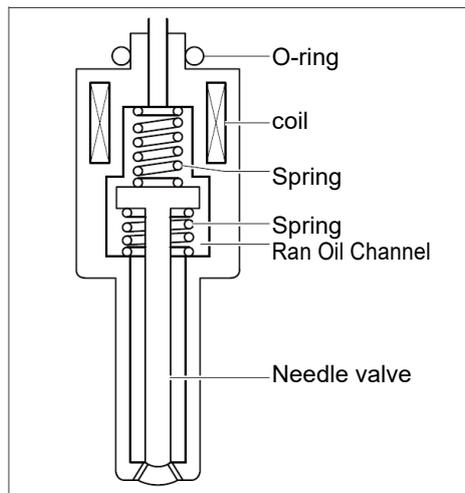
The fuel manifold assembly is mounted on the cylinder head.



The fuel manifold assembly consists of a fuel manifold integrated with a fuel pressure sensor and injectors. The injector has 6 injection holes in zone A as shown in the figure.

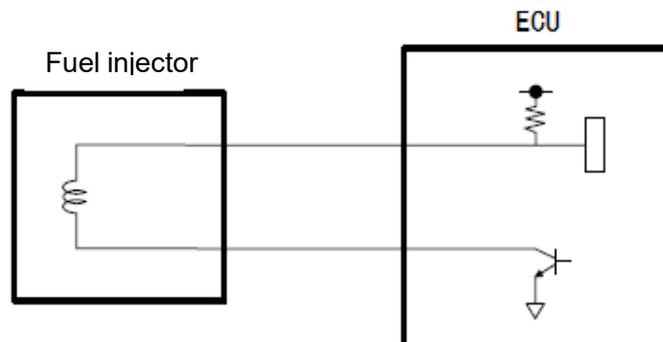


Injectors include needle valves, springs, coils, o-rings, etc



Principle of operation

The valve controls the moment of coil energisation according to the ECU signal to achieve fuel injection, and the fuel injection time is determined by the coil energisation time. The fuel injection time is determined by the coil energisation time. The injection time can be adjusted by intermittently energising the coil.

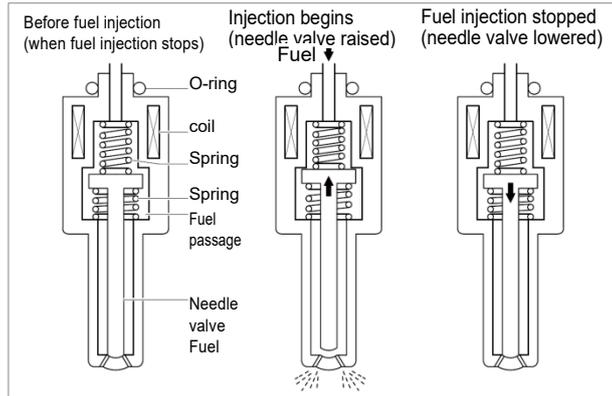


Before injection (when fuel is not injected)

When the coil is not energised, high-pressure fuel sent from the fuel main line is injected into the fuel line, and the needle valve is under pressure and does not inject. Injecting starts (needle valve opens)

A signal is sent from the ECU and an excitation current is generated in the coil, thereby opening the needle valve and starting fuel injection. Injection stops (needle valve closes)

When the current to the coil is stopped, the pressure in the oil passage increases and the needle valve is pressed down by the spring to close, stopping the injection.



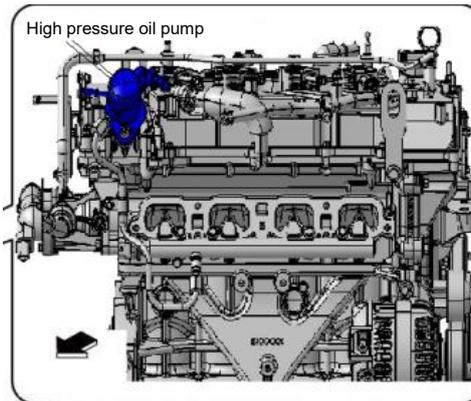
High pressure oil pump

(1) Function

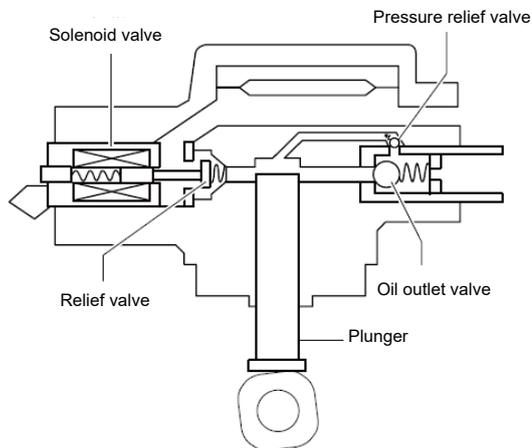
The high-pressure oil pump is connected to the engine ECU control circuit and system power supply through the engine wiring harness, and controls the opening and closing of the solenoid valve according to the ECU signals to provide fuel at the required pressure.

(2) Structure

The high-pressure oil pump for 2.0T is located diagonally below the intake camshaft at the rear end of the engine.



High-pressure oil pump consists of a solenoid valve, relief valve, plunger, outlet valve and pressure relief valve.

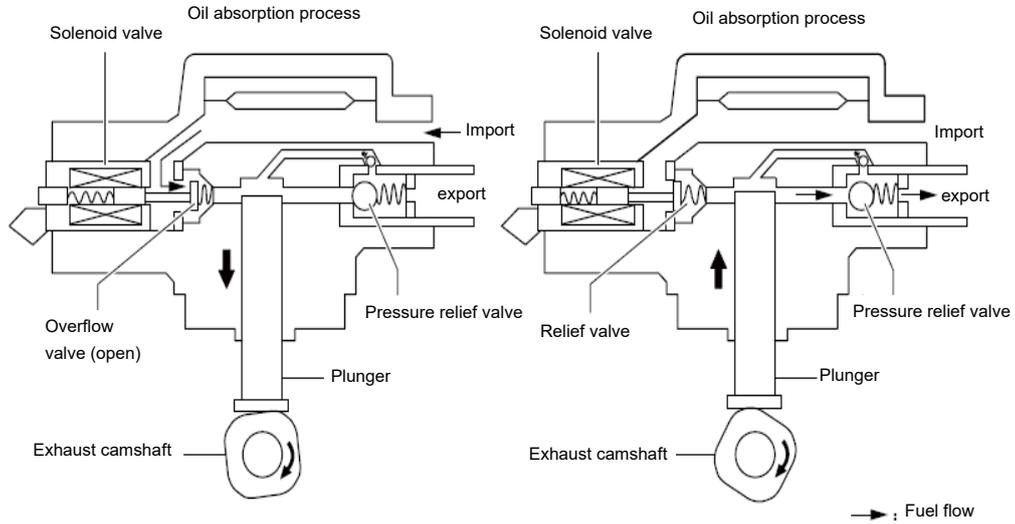


(3) Principle of operation

The cam at the rear end of the exhaust camshaft drives the plunger up and down to segment and pump

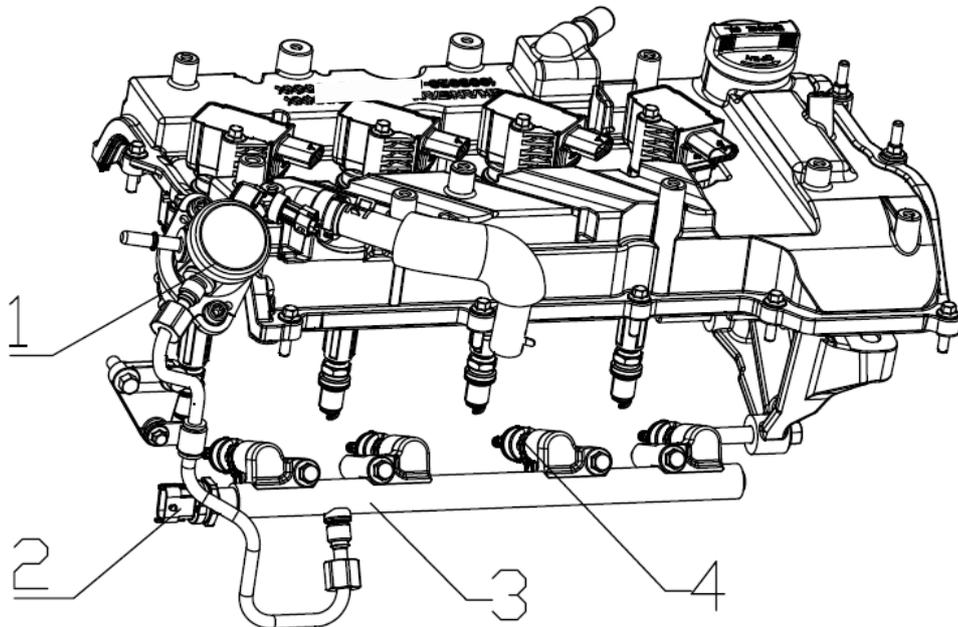
out the fuel. The solenoid valve of the high-pressure fuel pump opens or closes according to the control signal from the ECU.

If the solenoid valve fails and the fuel pressure exceeds the set value, the pressure relief valve opens for safety.



2.6.3 Component Breakdown Diagrams

Injector Assembly



Number	Part Name	quantity
1	High Pressure Fuel Pump Assembly	1
2	Fuel Pressure Sensor	1
3	Fuel Master	1

4	Fuel Injector	4
---	---------------	---

2.6.4 General inspections

General equipment

Diagnostics
Fuel Pressure Gauge

Specialised equipment

Smoke Leak Detector



WARNING: Fuel oil or fuel oil evaporated gases are highly flammable, to avoid the risk of fire or explosion, keep away from sources of ignition and prohibit the operator from using a mobile phone while performing this procedure. Do not use open containers for draining or storing fuel and keep a dry chemical fire extinguisher nearby before performing this procedure.

2.6.5 Removal and Installation Instructions

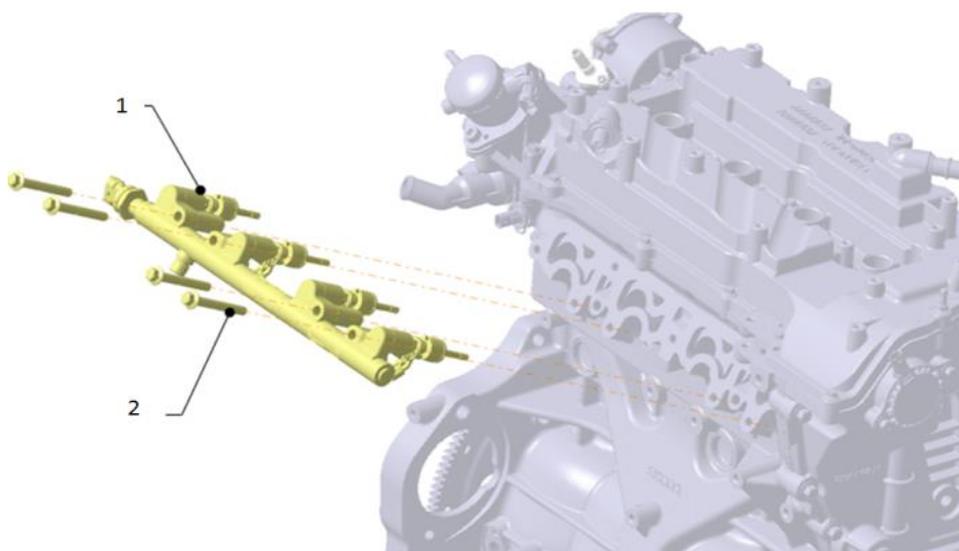
General equipment

National Six Fuel Pump Removal Tool

Specialised equipment

T-sleeve

Fuel Main Assembly



Project	Description
---------	-------------

1	Fuel main assembly
2	bolt

【Disassembly】

1. Remove the peripheral related parts;
2. Remove the fuel pressure sensor harness connector and injector connector;
3. Release the fuel system pressure;
 - a) If you stop the car for a long time for maintenance, you must ensure that the engine is off for more than 8h before removing the high-pressure fuel pump outlet pipe;
 - b) If you stop the car temporarily for checking, disconnect the plug of high pressure oil pump and idle for about 10s before disassembling the fuel master tube.

The connecting oil hose of the tube assembly;

4. Remove the high-pressure oil pump outlet pipe;

Note: Wear protective eyewear

Note: There may be residual fuel injection, which should be collected and disposed of centrally.

5. Remove the bolts securing the fuel manifold;
6. Disassemble the fuel header assembly. Normally, the fuel header can be easily separated from the injector when disassembling the assembly, which requires two steps to complete.
 - a) Disassemble the fuel header: Pull out the fuel header along the injector axis; when pulling out, the force should be applied to the metal part of the fuel header to avoid bending the injector.
 - b) Disassemble the injector; firstly, remove the injector compression ring from the injector, and then remove the injector from the cylinder head with a sliding hammer type tool.

【Assembly】

Note: Before installation, parts are inspected and should be replaced if defective or contaminated by dirt.

Note: Parts are directly scrapped once dropped and are strictly prohibited to be used again.

1. Before installation, make sure the fuel inlet, injectors and their mounting holes are clean, and do not allow grease or lubricant to be applied to the injector ends, Teflon seals and mounting holes.

2. Place the fuel manifold assembly into the cylinder head along the axis of the injector mounting holes and install the bolts;

(1) For manual assembly (no press-fit equipment, no tightening equipment)

- a) Pre-tighten by hand to make the bolt flange fit the fuel rail bracket block;
- (b) Screw the bolts step by step in the order from the two sides to the middle, repeat until the mounting surface of the oil rail and the supporting surface of the cylinder head are completely fitted, and cross-tighten the bolts from the two sides to the middle according to the specified torque.

(2) For automatic assembly (with press-fit equipment and tightening equipment)

- a) Along the direction of the injector axis, the pressure head acts on the top of the fuel-through seat (the allowable press-fitting part of the pressure head is directly above the injector seat), and the specified press-fitting force is applied in the specified range of force, and the bolts are affixed and then tightened at the same time according to the specified torque (the tightening procedure is recommended to be done in steps).

The method of fitting the fuel pipe and the mounting base: when there is no compression tooling, pre-tighten the bolts from the two sides to the middle in order until they fit.

3. Check for fuel leakage after installation of the fuel manifold assembly (a) Make sure the fuel manifold assembly is securely installed.

(b) Make sure there is no fuel leakage around the fuel manifold assembly. After checking and repairing or reinstalling the fuel main assembly, please make sure that there is no fuel leakage at the fuel main assembly after starting, and deliver the vehicle to the user only after confirming that there is no problem.



WARNING: The temperature of the working engine is very high, do not service the engine that has just been switched off to avoid burns. Repair only when the system has cooled down.



WARNING: This process includes the handling of fuel. Keep an eye out for fuel spills and observe fuel handling precautions, otherwise personal injury may result.



WARNING: Do not use any form of open flame and do not start the engine when working with fuel components. Highly flammable mixtures generated during operation may ignite. Improper handling can result in personal injury.

High Pressure Oil Pump

precautions before servicing



WARNING: Fuel vapours are dangerous and can easily catch fire, causing serious injury and damage. Always keep fuel away from sparks and flames.



WARNING: If fuel lines are disconnected, high pressure fuel may spray out. Always perform the Fuel Line Safety Procedure to prevent fuel from spraying due to the following hazards associated with fuel spraying.

-Fuel may cause irritation if it comes in contact with skin and eyes.

-If fuel ignites and causes a fire, serious injury or death may result, and parts and equipment may be damaged.



WARNING: A person with static electricity can cause a fire or even an explosion that could result in a major accident such as death or serious injury. Before working on the fuel system, touch the vehicle body to discharge static electricity.



WARNING: If a foreign object enters the fuel passages, it may cause damage to fuel supply/injection related parts. When removing/installing fuel supply/injection related parts, be careful not to allow foreign objects to enter the fuel passages.

【Disassembly】

1. Complete the 'Precautions before servicing'.
2. Disconnect the negative battery lead.
3. Remove the hood.
4. Disconnect the solenoid valve terminal connector of the high pressure oil pump.
5. Remove the low pressure fuel line.
6. Relieve fuel system pressure;
 - a) If the vehicle is parked for a long time for maintenance, the engine must be switched off for more than 8h before removing the high pressure oil pump outlet pipe;
pipe;
 - b) If stopping temporarily for inspection, disconnect the solenoid valve connector of the high-pressure oil pump and idle the engine for about 10s before removing the high-pressure oil pump outlet pipe;
7. Remove the high-pressure oil pump outlet pipe.



Note: Wear protective eyewear



NOTE: There may be residual fuel injection that needs to be collected and disposed of centrally.

8. Remove the high pressure fuel pump bolts, loosen each mounting bolt alternately, one turn at a time, until the plunger spring is fully released, after removing the bolts, remove the high pressure fuel pump from the mounting base in the direction of the plunger axis to avoid wobbling of the high pressure fuel pump.

【Installation】



NOTE: Before installation, inspect parts and replace if defective.

Note: Once the parts fall down, they are directly scrapped and are strictly prohibited to be used again.

1、 After installation, make sure the mounting seat hole, the inner surface of the tappet column of the high-pressure oil pump and the high-pressure oil pump are clean and free of foreign matter, the seal of the high-pressure oil pump is intact, and there are no sharp corners and burrs in the area of mounting and sealing.

2, rotate the crankshaft, so that the high pressure oil pump cam base circle surface towards the high pressure oil pump mounting holes, and lubricate the high pressure oil pump tappet with oil, the tappet will be installed into the high pressure oil pump mounting seat (rollers towards the camshaft), the high pressure oil pump tappet positioning cams should be matched with the high pressure oil pump base assembly positioning grooves.

3. Apply lubricant on the O-ring of the high-pressure oil pump, install the high-pressure oil pump into the high-pressure oil pump mounting seat, and then put the bolts into the high-pressure oil pump bolt mounting holes.

(1) With pressing machine + with tightening machine: press the top cover of the high-pressure oil pump with the press head, apply the specified force along the axis of the high-pressure oil pump in the specified force range, and tighten the bolts synchronously to the specified torque after fitting (step-by-step tightening procedure is recommended);

(2) Pressure tightening machine + no tightening machine: press the top cover of the high-pressure oil pump with the pressure head, apply the specified force in the direction of the axis of the high-pressure oil pump in the specified range of force, fit it and then tighten the two bolts sequentially in small steps (1 turn) and retighten them manually to the specified torque;

(3) No pressure tightening machine + no tightening machine: using manual alternating lap by lap pre-banding of two bolts to the flange fit, and then in small steps (1 lap) tighten two bolts in turn + manual retightening to the specified torque;

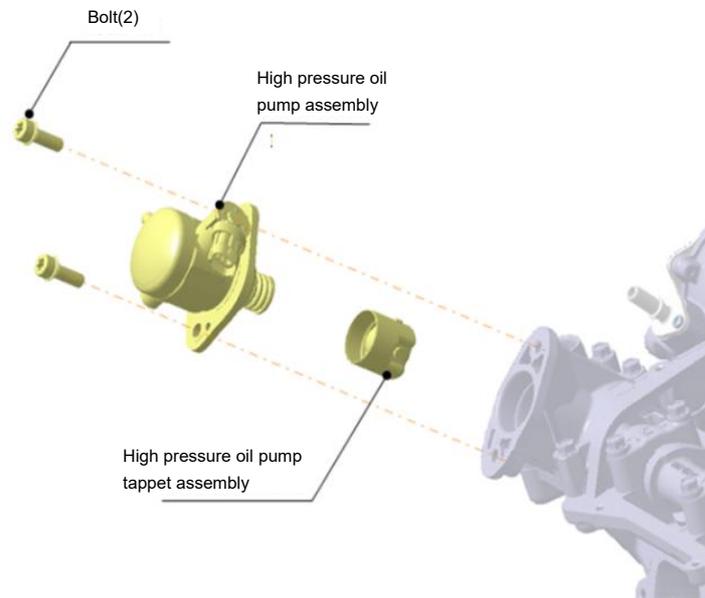
4、 Connect the connector, low-pressure oil pipe and high-pressure oil pump outlet pipe.

5、 After the installation of high-pressure oil pump, carry out the fuel leakage check.

(a) Confirm that the high-pressure oil pump has been firmly installed;

(b) Confirm that there is no fuel leakage around the high pressure oil pump;

【installation diagram】



WARNING: Working engines are very hot and should not be serviced with a freshly switched off engine to avoid burns. Repair only when the system has cooled down.



WARNING: When the engine has just been shut down, the fuel system pressure is very high and residual fuel may be injected, endangering personal safety, so please take care to release the pressure.

2.7 Ignition systems

2.7.1 Specification

Component specifications

Name	Specification
Spark Plug Model	SIFR6B7G
Spark Plug Part Number	S10-A119164-000-00
Spark Plug Gap	0.6~ 0.7 mm
Ignition Coil Model	42039917
Ignition Coil Part No.	3705010-NE01

General specifications

Application	Specification
Ignition Type	Independent ignition for each cylinder
Ignition sequence	1 - 3 - 4 - 2

Torque Specification

Name	N.m	lb-ft	lb-in
Spark Plug	27.5±2.5	16.5	-
<i>Ignition coil fixing bolt</i>	10±1	-	89

2.7.2 System Description

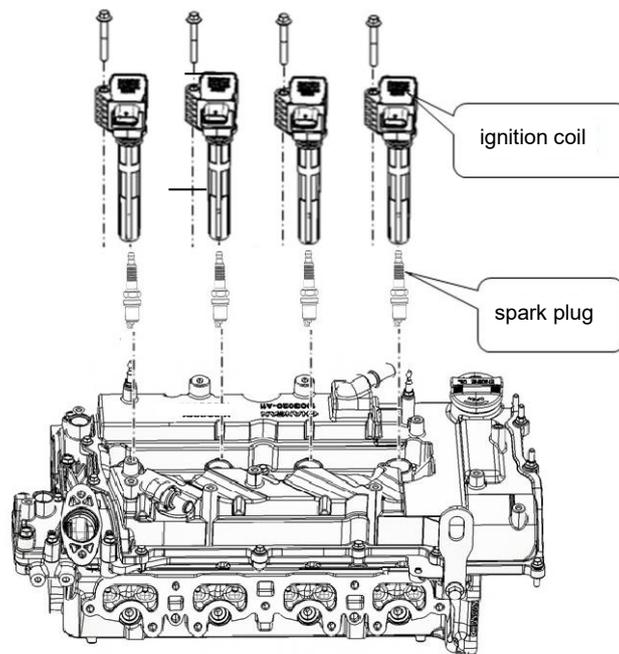
System Overview

The ignition system is the device used in a petrol engine to ignite the gas mixture in the cylinder. According to the ignition signal from the ECU, the ignition coil supplies a high voltage with sufficient energy to the spark plug at any engine speed and load, in accordance with the cylinder ignition sequence, to cause a spark between the spark plug electrodes.

The ignition coil provides high voltage with sufficient energy to the spark plug in accordance with the cylinder ignition sequence at any engine speed and load, so that a spark is generated between the spark plug electrodes to ignite the compressed mixture in the cylinder.

The ignition coil generates the high voltage required to ignite the mixture through electromagnetic induction and transmits the generated high voltage to the spark plug, which generates a spark between the spark plug electrodes to ignite the compressed mixture in the cylinder.

Installation position: The ignition coil is located on the upper part of the spark plug and is directly connected to the spark plug.



Number	Part Name	Quantity
1	ignition coil	4
2	Spark Plugs	4
3	bolt	4

2.7.3 General inspection

Ignition Spark Test

⚠ WARNING: Directly using a high voltage wire to test the jump starter may cause personal injury and module damage, it is strictly prohibited to use a high voltage wire directly to conduct the ignition spark test.

⚠ WARNING: The temperature of the engine is very high when it is in operation. Be careful of burns when operating on a freshly switched off engine.

1. shift the gearshift lever to 'Neutral', apply the parking brake reliably. 2.

2. disconnect the injectors without pressing the ignition switch.

⚠ WARNING: Disconnecting the injectors without disconnecting them may cause a fire.

3. Remove the ignition coil and remove the spark plug. 4.

4. Connect ignition coil to spark plug and ground spark plug at a reliable engine grounding point.

5. Start the engine and observe the spark condition of the spark plug. 6.

6. Switch off the engine without pressing the ignition switch.

7. Install spark plug and ignition coil;

⚠ NOTE: It is unlikely that all 4 ignition coils will not function properly. To avoid replacing the normal ignition coil, perform the above procedure to identify the defective ignition coil and then replace it.

Inspection of Ignition Coils

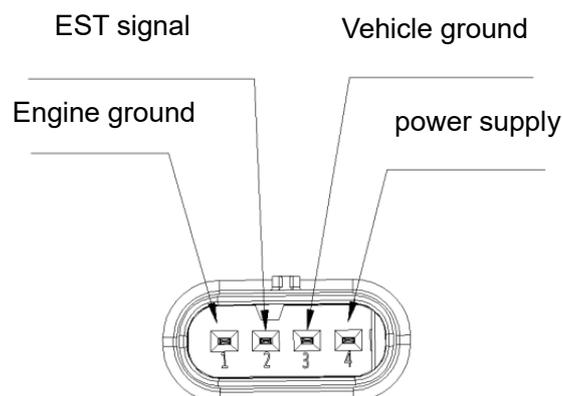
1. Ask the customer about the operating conditions of the vehicle in which the malfunction occurs.

2. Read the vehicle fault code and identify the cylinder with the 'Misfire' fault. 3.

3. Swap the ignition coil of the cylinder with the misfire fault with the ignition coil of the normal cylinder, and then run the vehicle under the faulty condition.

If the misfire fault code follows the ignition coil to the original normal operating cylinder, replace the ignition coil.

4. Ignition coil pins are defined as shown below.



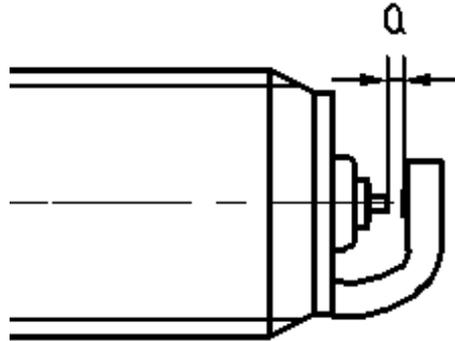
- It is unlikely that all 4 ignition coils will not function properly. To avoid replacing the normal ignition wires

Please perform the above procedure to identify the faulty ignition coil and replace it.

- This coil has its own internal ignition module, and a Howe meter cannot directly measure the primary resistance of the ignition coil.

Inspection of spark plugs

1. technical specifications: model and part number with the vehicle configuration.
2. Spark plug electrode initial gap 'a': 0.6 ~ 0.7mm.



3. Whether carbon is accumulated: If there is carbon adsorbed on the spark plug, after the engine is warmed up, it can be idled at 2000rpm to 2500rpm for 5 minutes without load.

Caution.

- Carbon may adsorb onto the electrode or ceramic volume of the spark plug during delivery of the vehicle to the 4S shop or during repetitive short distance driving in winter. If the spark plug electrode or ceramic volume is high in carbon (black in colour) and this causes malfunctions such as unstable idling or difficulty in starting, then the spark plug electrode or ceramic volume should be cleaned by carrying out the If there is a large amount of carbon (black colour) on the spark plug electrode or ceramic volume, which causes malfunctions such as unstable idling or difficulty in starting, the carbon should be burned off by performing a no-load engine idle.

- When performing no-load idling, pull up the parking brake and apply the foot brake, shift the gearshift lever to neutral (MT), or shift the gearshift lever to P (AT) to prevent accidents and serious injury.

4. Replace the spark plug if any of the following malfunctions occur.

- Broken ceramic body
- Broken electrode

5. Interchange check

Note: Perform when none of the spark plugs are abnormal in visual inspection.

1) Swap the spark plugs of the cylinder with misfire fault with the spark plugs of the normal cylinder, and then run the vehicle under the faulty condition.

If the misfire code follows the spark plug to the original normal cylinder, replace the spark plug.

2.7.4 Removal and installation instructions

Ignition Coil

1. Remove engine cylinder head cover.
2. Disconnect the connector connecting the ignition coil to the wiring harness.
3. Remove the ignition coil retaining bolt and remove the ignition coil.
4. Install in the reverse order of removal.



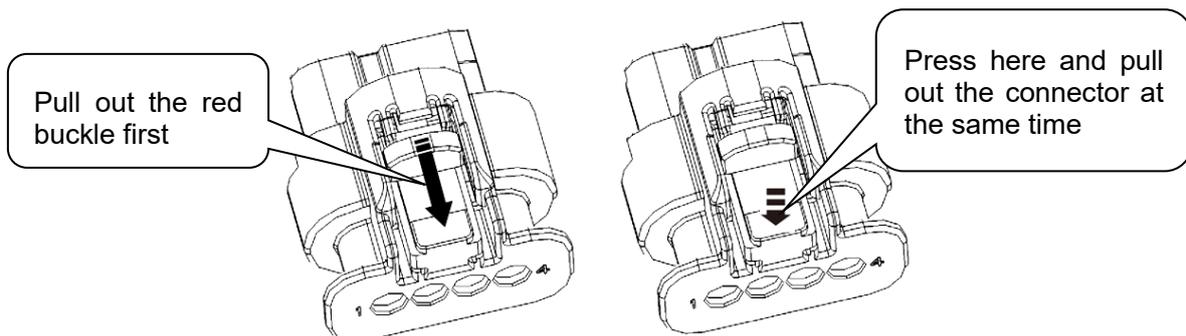
CAUTION:When removing the connector connecting the ignition coil to the wiring harness, follow the illustration below.

spark plugs



CAUTION:Engine performance will be reduced if non-compliant spark plugs are installed. When replacing, install only spark plugs that meet the vehicle configuration requirements.

1. Remove the engine cylinder head cover.
2. Remove the ignition coil.
3. Remove the spark plug using the spark plug socket and torque spanner.
4. Install in reverse order of removal.



2.8 Starting systems

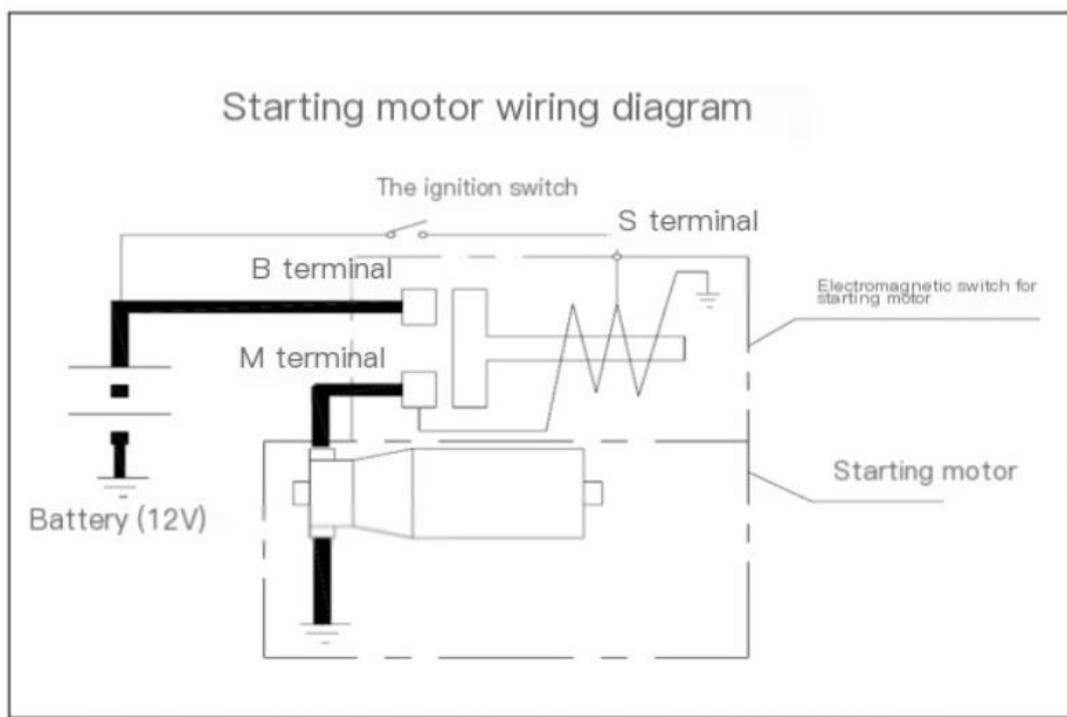
2.8.1 System description

System Overview

The starter system consists of the battery, ignition switch and starter motor related wiring, all of which are connected by wires. When the ignition switch is placed in the 'ST' position, the power supply is supplied to the starter motor electromagnetic switch, the electromagnetic switch coil generates a magnetic field that causes the moving iron core and gear lever to move, resulting in the pinion gear engaging with the engine flywheel gear ring, and the electromagnetic switch contacts are closed, and the starter starts.

When the engine starts, the pinion overspeed clutch protects the armature to avoid the flywheel driving the pinion to drive the armature until the switch is disconnected, at which time the return spring disengages the pinion.

Starter motor assembly working principle



Turn on the ignition switch of the vehicle with the vehicle key, the starter motor electromagnetic switch S terminal is energised, the electromagnetic switch is suctioned, and the starter motor checker is popped out to the position of engaging with the engine flywheel, at this time, the electromagnetic switch M and B terminals are conduction, the battery current flows into the starter motor, and the starter motor starts to run and drive the flywheel to start the engine; when the key switch is reset, the starter S terminal is de-energised, and the checker is returned to the position, and the electromagnetic switch M. B terminal is disconnected, and the starter motor stops working, B terminals are disconnected, and the starter motor stops working.

Basic Parameters of Starter Motor Assembly

targets	Conventional Starter Motors
Rated Voltage	12V
Wattage	1.2KW
Power Performance	12V、60Ah

2.8.2 General Inspection

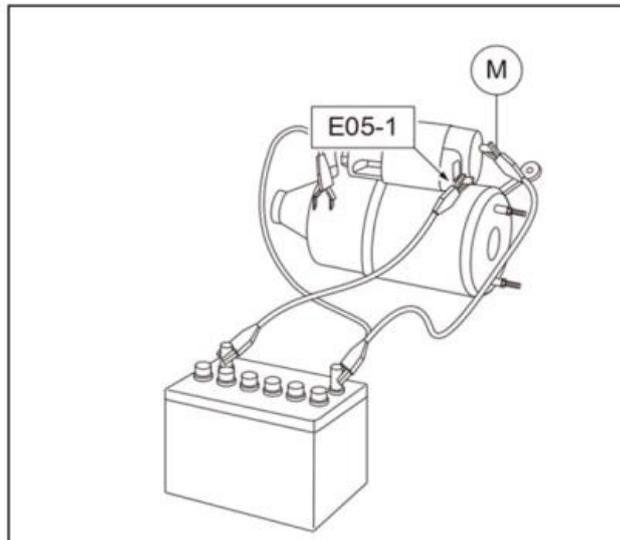
General equipment: Multimeter

⚠ WARNING: Each test must be completed within 3-5 seconds to avoid coil burnout.

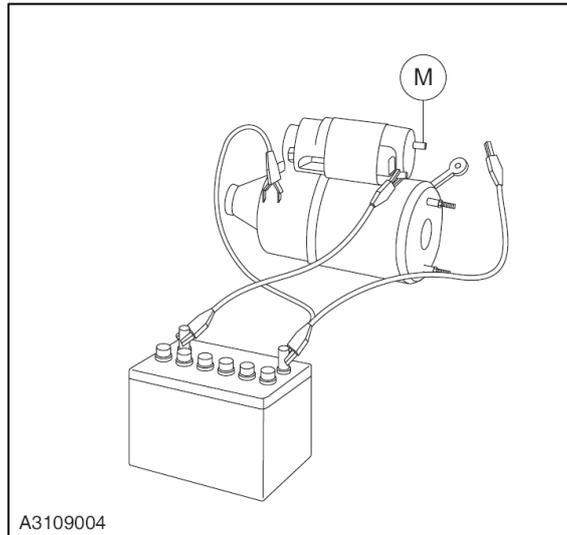
Electromagnetic switch test

⚠ NOTE: The excitation coil must be disconnected from terminal 'M' before testing.

1. Remove the starter motor armature wire from the solenoid switch.
2. Securely connect the starter motor housing and the solenoid switch housing to the negative battery terminal with a jumper wire.
3. Use another jumper cable to connect one end to the positive battery terminal and the other end to terminal 1 of starter motor harness connector E05.
4. The starter motor pinion should be removed.
5. Remove the negative terminal wire from the 'M' terminal, the starter pinion should not return.

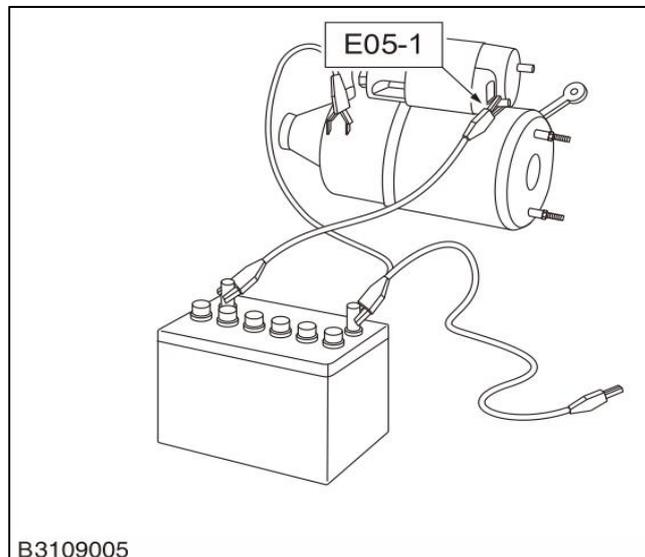


6. Connect the wire pinion as described above, then remove the negative wire from the 'M' terminal and check whether the pinion is turned outwards, otherwise the electromagnetic switch should be replaced.



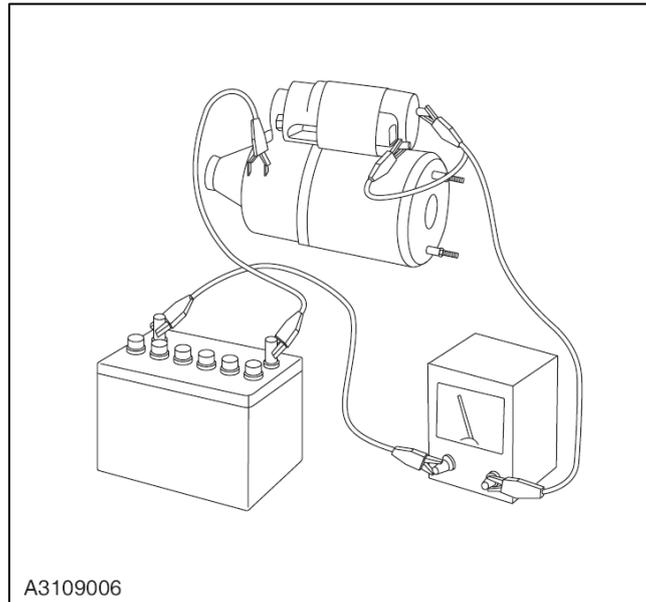
Pinion Return Test

1. Reliably connect the starter motor housing and solenoid switch housing to the negative battery terminal with a jumper wire.
2. Connect one end of another pivot jumper wire to positive battery terminal and the other end to terminal 1 of starter motor harness connector E05. 3.
3. The starter motor pinion should be removed. 4.
4. Disconnect the positive battery jumper cable and the pinion gear should return quickly.



No load test

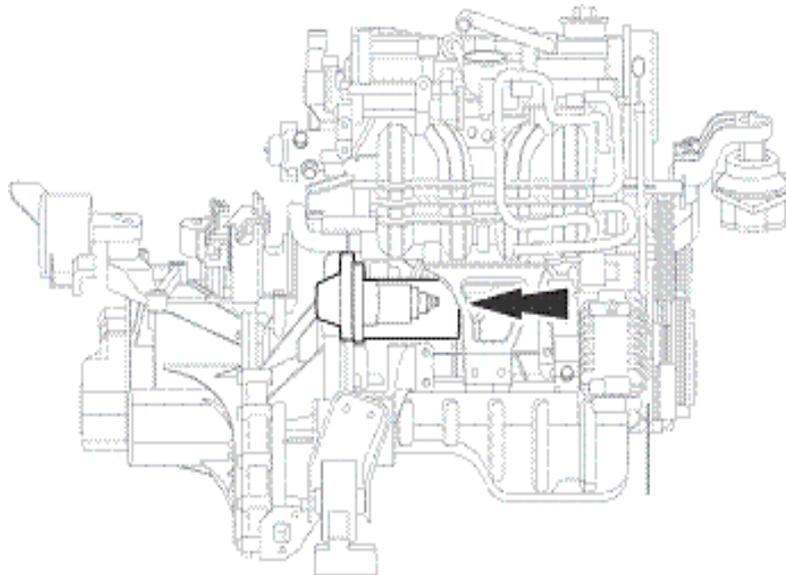
1. Make sure the battery is fully charged.
2. Connect the starter motor, battery and tester as shown.
3. Run the starter motor and make sure it turns smoothly. If the starter motor does not turn smoothly, check the starter motor unit.
4. With the starter motor running, measure the voltage and current.
5. Replace starter motor if not within specified limits.



2.8.3 Removal and installation instructions

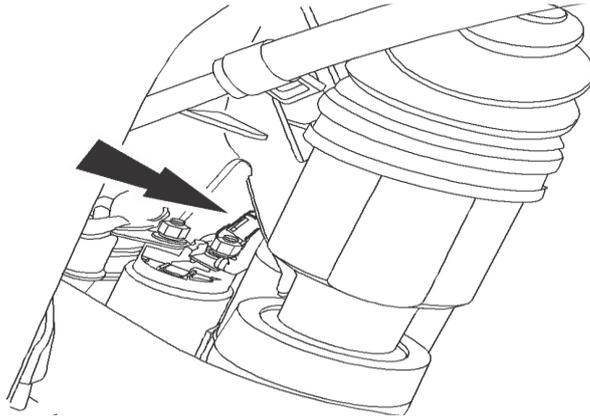
Starter motor assembly

The starter assembly is mounted on the engine as shown below:

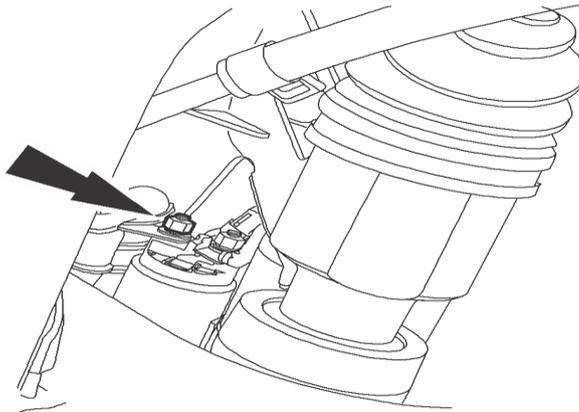


【Disassembly】

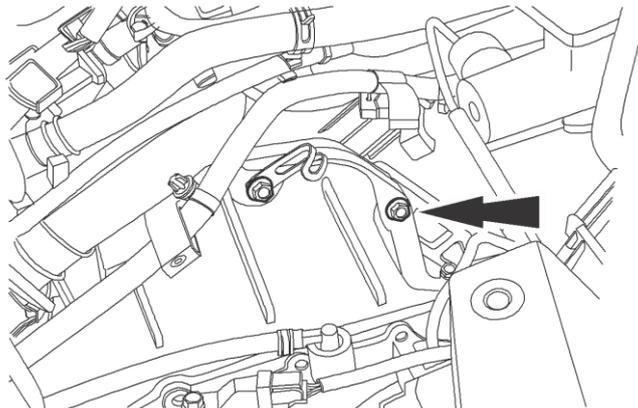
1. Disconnect the negative battery harness.
2. Jack up the vehicle and support it.
3. Disconnect the starter motor harness connector.



4. Remove the starter motor solenoid switch harness retaining nut.



5. Remove the starter motor upper and lower mounting bolts.
- Separate the wire harness from the harness retaining clips.
 - Remove the starter motor upper and lower retaining bolts.



6. Remove the starter motor from the vehicle.

【Installation】

The installation order is the reverse of the removal order.

2.9 Charging system

2.9.1 Specification

Component specifications

Battery specification

Indicator	Ordinary lead-acid batteries	AGM Batteries
Specification	L2	L2
Quality	16.5Kg	17.8kg
Nominal Voltage	DC12V	DC12V
20h Rated capacity	60Ah	60Ah
Reserve Capacity	≥94min	≥100min
Charge Acceptance	≥12A	≥15A
-18℃ Low Temperature Starting Capability	CCA(SAE)≥530A	CCA(SAE)≥680A

Specification of battery sensor

Indicator	specification
Operating Voltage Range	6-18V
Sensor wake-up current	>250mA(charge), <-250mA(discharge)
Sensor Rated Working Current	<22.5mA
Sensor quiescent current after vehicle sleep	<0.15mA
Measured battery current range	±1500 A
Continuous operating current	±155 A
Insulation material resistance	≥10MΩ

Generator cold working

Indicator	Conventional/weak hybrid generators
Rated working speed	6000rpm
Generation voltage specification	12V
Rated generating current	150A

Generator thermal performance

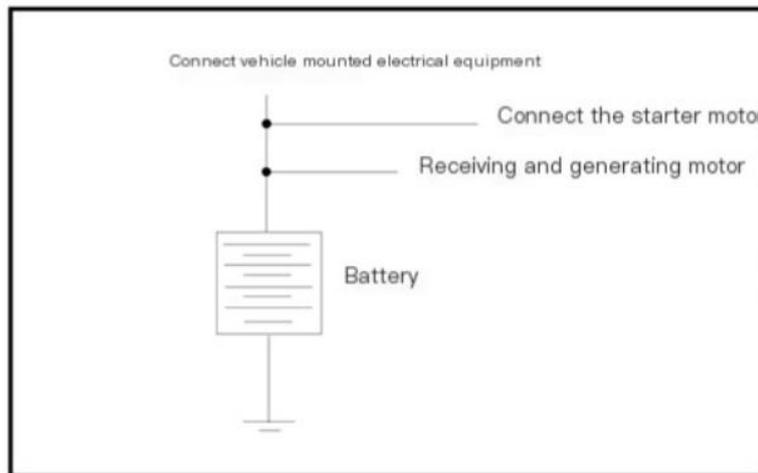
rotation speed r/min	Output Current A	Test Voltage V
1,800	Greater than or equal to 80	13.5
2,200	Greater than or equal to 103	
6,000	Greater than or equal to 150	

2.9.2 System description

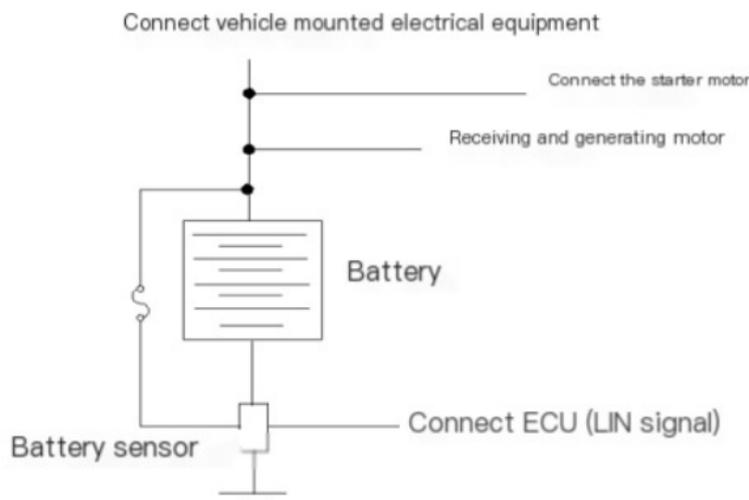
System overview

An ordinary charging system usually consists of a generator and a battery assembly, and the generator of the system usually generates a constant voltage value.

As the vehicle load increases, the generator increases its speed to increase the amount of power generated to meet the demands of the larger load.



The smart charging system is composed of a smart generator, a battery sensor, and a battery assembly. The smart generator is controlled by ECU, and the battery sensor collects the voltage, current, temperature, SOH and SOC value of the battery assembly and passes the information to ECU, which decides whether to give charging according to the battery status.



Component Description

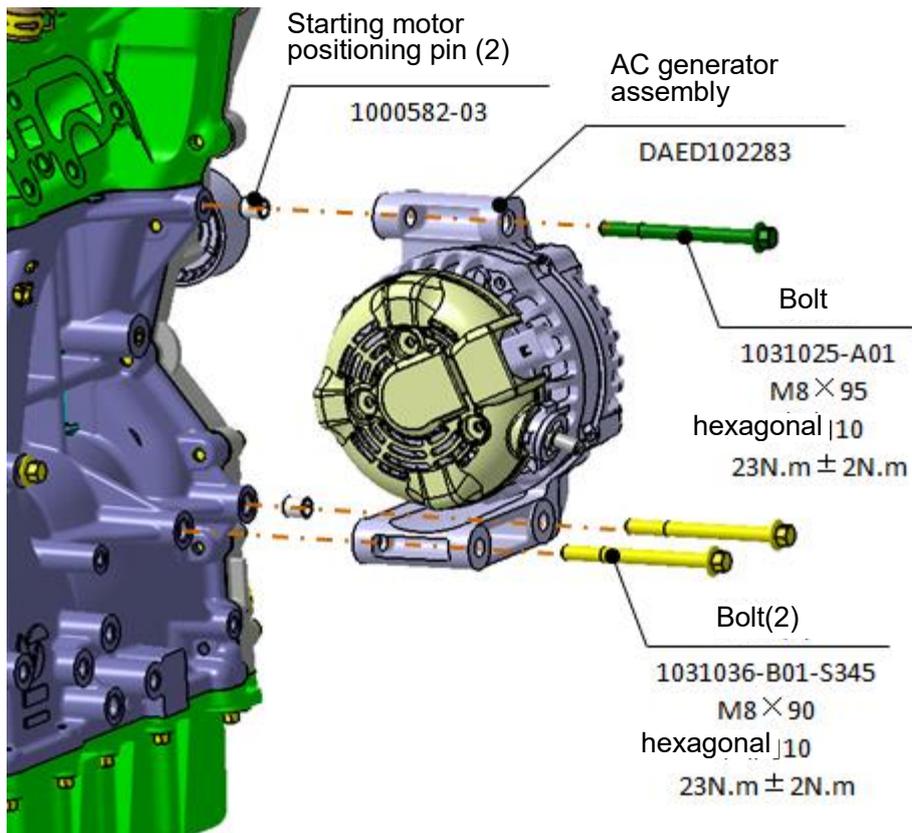
Generator

Generators are characterised by the presence of a solid state regulator inside. All parts of the regulator are housed in an airtight case. The regulator, together with the brush holder assembly, is mounted on slip rings and frames, and the set voltage of the generator cannot be adjusted. The generator rotor bearings contain sufficient grease to eliminate the need for periodic lubrication. The two brushes allow current to flow through the two slip rings to the rotor's excitation coils on the rotor. Under normal conditions, the brushes can be used for long periods without maintenance. The stator windings are assembled inside a laminated core, which is a generator frame element. The rectifier connected to the stator windings consists of six diodes, which convert the AC voltage at the stator to a voltage at the generator output

terminals. It converts the AC voltage at the stator into a DC voltage at the generator output terminals. The centre diode is used to convert fluctuations in the neutral voltage to DC, increasing the generator output. A capacitor mounted on the regulator assembly protects the diode from voltage and suppresses radio wave interference.

2.9.3 Component Location Diagram

Generator



Number	Name
1	Generator assembly
2	Generator fixing bolt
3	Generator locating pin

2.9.4 General inspections

Malfunction Symptom List

If a malfunction occurs but no Diagnostic Trouble Code (DTC) is stored in the ECM and the cause of the malfunction cannot be identified in the basic check, troubleshooting and diagnosis should be performed in the order listed in the table below.

symptomatic	Possible causes	initiative
Battery undercharged	-Front end pulley system belt -Generator regulator -Generator	Reference: Battery undercharge diagnostic process
Battery overcharge	-Generator Regulator -Generator	Reference: Battery undercharge diagnostic process
Charging indicator is always on	-Worn drive belts -Damaged front end pulley belt tensioner -Generator -Wiring failure	Reference: Diagnostic Procedure for Charging Indicator Light Always On
Charging indicator does not light up	-Instrument Light Emitting Diodes -Meter -Wiring faults -Brush and slip ring contact failure -Voltage regulator	Reference: Diagnostic Procedure for Charging Indicator Not Lighting
Generator noise	-Front end pulley system belt -Bearings -Stator and rotor	Reference: Generator Noise Diagnostic Process

Diagnostic Procedure for Charging Indicator Light Always On

test condition	Details / Results / Measures
1. Check front end pulley belts	<p>A. Check front end pulley belt installation. B. Check the tension on the front end pulley system belt. Reference: Mechanical Systems Is the generator belt normal? →Yes Go to step 2. →No Adjust or replace the front end pulley system belt or tensioner.</p>
2. Check the wiring from the instrument cluster to the generator	<p>A. Turn ignition switch to 'LOCK' position. B. Disconnect generator harness connector E24. C. Disconnect instrument harness connector P22. D. Measure resistance between terminal 16 of instrument harness connector P22 and a reliable ground. D. Measure the resistance between terminal 16 of the instrument harness connector P22 and a reliable ground. Standard resistance value: 10 MΩ or higher Is it confirmed that the resistance value complies with the standard value? →Yes Go to step 3. →No Repair a short-circuit in the line between terminal 1 of the generator harness connector E24 and terminal 16 of the instrument connector P22. Repair a short-circuit in the line between terminal 1 of the generator harness connector E24 and terminal 16 of the instrument connector P22 to the negative terminal.</p>
3. Check generator charging voltage	

	<p>A. Start engine and increase engine speed to 2000 rpm. B. Using a multimeter, measure voltage to ground at terminal 1 of generator output harness connector E23. to ground with a multimeter. Is the output voltage between 14.2 and 14.8 V? → Yes Repair the instrument wiring and replace the instrument if necessary. → No Go to step 4. → No Check the generator.</p>
<p>4. Check generator power lines</p>	
	<p>A. Turn ignition switch to 'LOCK' position. B. Disconnect generator harness connector E23. C. Turn ignition switch to 'ON' position. D. Measure between terminal 1 of generator harness connector E23 and a reliable ground. D. Measure the voltage between terminal 1 of the generator harness connector E23 and the reliable ground. Standard value of voltage: 11 ~ 14 V. Is it confirmed that the voltage value complies with the standard value? →Yes Replace the generator. →Replace the generator. 1. Repair the circuit between terminal 1 of the generator harness connector E23 and terminal 3 of the battery fuse box E01 (including fuse). Repair the circuit breakage between terminal 1 of the generator harness connector E23 and terminal 3 of the battery fuse box E01 (including the fuse). Malfunction. 2. Replace battery fuse box E01 if necessary.</p>

Charging indicator does not light up diagnostic process

test condition	Details / Results / Measures
1. Check the charging indicator light-emitting diode	<p>A. Turn ignition switch to 'ON' position. B. From the back of the instrument cluster, measure the wiring harness plug P22 on the back of the instrument cluster to see if the wiring harness is in the 'ON' position. terminal 16 of the combination instrument harness plug P22 to the body ground. Standard voltage value: 11 ~ 14 V Is the voltage normal? →Yes Go to step 2. →No Repair the instrument wiring or replace the instrument.</p>
2. Check the wiring from the instrument cluster to the generator	<p>A. Turn ignition switch to 'LOCK' position. B. Disconnect generator harness connector E24 and instrument cluster harness connector P22. C. Measure from terminal 1 of generator harness connector E24 to instrument harness connector P22. C. Measure the resistance between terminal 1 of generator harness connector E24 and terminal 16 of instrument harness connector P22. Standard resistance value: Less than 5 Ω Is the resistance value normal? →Yes Replace the generator. →Replace the generator. Repair the wiring.</p>

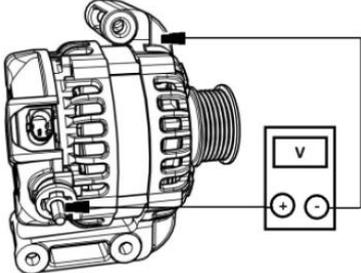
Generator noise diagnostic process

Diagnostic Tip: Generator noise can be caused by electrical or mechanical noise. Electrical noise (electromagnetic whine) usually with the electrical load added to the generator changes, which is the normal operating characteristics of all generators, in the maintenance and diagnosis of attention to distinguish, otherwise it will cause unnecessary customer complaints. When diagnosing a generator with mechanical noise, the first thing you should do is to check whether the parts around the generator are loose, interfering with each other and other abnormalities, and in some cases, even if the noise sounds very light in the cabin, it will be transmitted into the passenger compartment, and if this is the case, replacing the generator will not solve the problem, which will lead to a misjudgement.

test condition	Details / Results / Measures
1. Check front end wheel train belts	
	<p>A. Check front end pulley belt for missing teeth. B. Check front end pulley belt tension. Reference: Mechanical System Is the front end pulley system belt normal. →Yes Go to step 2. →No Repair the front end pulley belt.</p>
2. Checking generator noise	
	<p>A. Remove front end pulley belt. B. Start engine and run. Is the generator noise still present? →Yes. Replace the generator.</p>

Smart generator troubleshooting methods

Number	test item	Test Procedures and Measures
1	Return the ignition key to OFF and switch on the low beams. Test battery terminal voltage	<p>Read whether the battery terminal voltage is $\geq 12V$? →Yes Go to step 2 → No Charge or replace the battery before proceeding to step 2.</p>
2	Start the vehicle, open the hatch and check the wheel train	<p>Check whether the wheel train is slipping or jamming. →Yes Please take care of it. To step 3</p>
3	The vehicle was switched off, the ignition key was turned to ON, and the fault codes were read with a diagnostic instrument.	<p>Read whether there is a fault code in step '4'. →Yes Follow the repair method corresponding to the trouble code in step '4'. →No Go to step 5.</p>
4	error code	Countermeasures
	Smart Generator High Temperature Failure	Clear the fault code with a diagnostic and leave the vehicle stationary for 30 minutes. Start the vehicle, and if it continues to report Smart Generator High Temperature faults, replace the generator.
	Smart Generator Circuit Failure	Replacement of generators
	Smart Generator Circuit Failure	Check the generator B+ harness for looseness and rust, if there is any, please deal with it. Test the B+ wire with a multimeter. If the B+ wire is not loose, corroded and open, replace the generator.

	LIN bus readback error supporting communication between EMS and smart generator	Check the generator LIN cable connector for loose, bent, oxidised pins, etc., and deal with it. Use a multimeter to test the LIN line. If there is no abnormality in the signal line path
	Supports LIN bus response timeout for communication between EMS and smart generator	Check the generator LIN cable connector for loose, bent, oxidised pins, etc., and deal with it. Use a multimeter to test the LIN line. If there is no abnormality in the signal line path
	LIN bus frame error supporting communication between EMS and smart generator	Check the generator LIN cable connector for loose, bent, oxidised pins, etc., and deal with it. Use a multimeter to test the LIN line. If there is no abnormality in the signal line path
	Support for LIN bus checksum errors for communication between EMS and smart generators	Check the generator LIN cable connector for loose, bent, oxidised pins, etc., and deal with it. Use a multimeter to test the LIN line. If there is no abnormality in the signal line path
5	<p>Return the ignition key to OFF and disconnect the generator signal terminal connector. Start the vehicle, press the accelerator at idle speed, increase the engine speed to ≥ 3000 rpm for 5 seconds and switch on the headlights. Test the generator terminal voltage, i.e. test the generator B+ stud and the generator housing. The test method is shown in the figure below.</p> 	<p>Read whether the voltage at the generator end is $\geq 13V$. → Yes The smart generator is not faulty. Please troubleshoot the battery sensor, battery. Is the generator connector connection reliable. Whether the battery positive wire, transmission hitch wire, battery hitch wire is loose, rusted, etc. →No Please replace the generator Note: This step to read the voltage must read the generator B+ stud (multimeter test point should not be placed on the (the testing point of multimeter should not be put on the harness terminal and connecting nut) to the voltage between the generator case and the generator B+ stud. Do not read the voltage between the battery terminals.</p>

2.9.5 Removal and installation instructions

Alternators

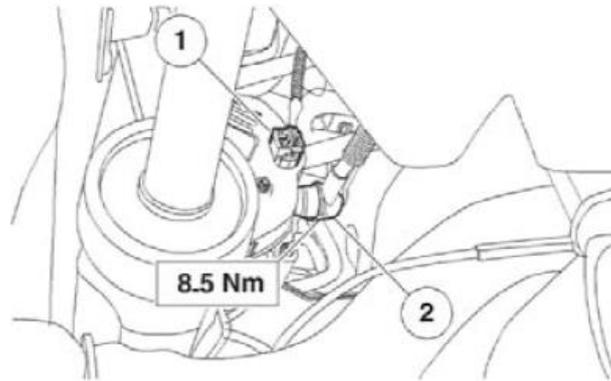
【Disassembly】

1. Disconnect the negative battery harness.

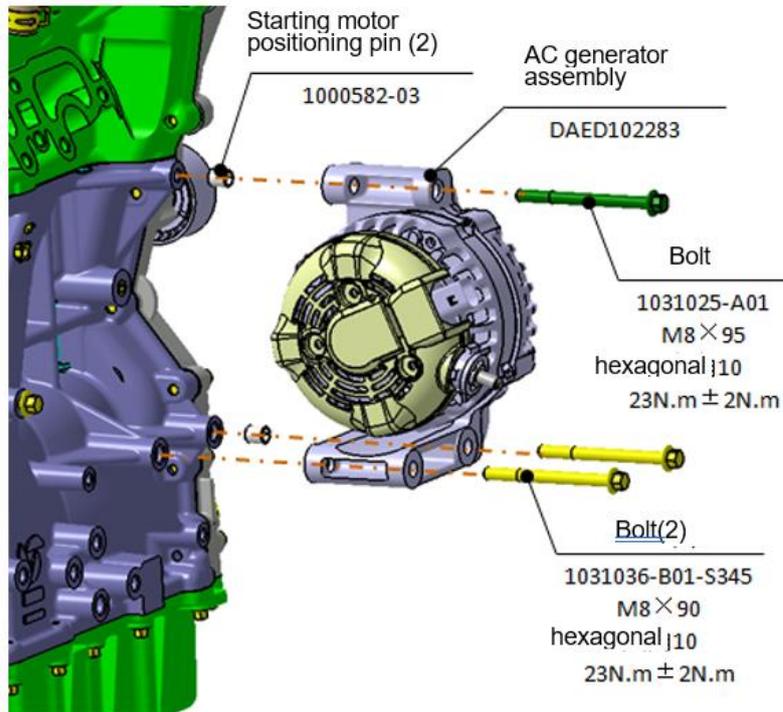
Note: Make sure that the negative battery harness stakes when performing the next step.

2. Jack up the vehicle and support it.

3. Disconnect the generator harness connector and the B+ end retaining nut.



4. Remove the upper and lower generator fixing bolts.



5. Remove the generator from the vehicle.



WARNING: Do not service the engine when it is hot to avoid burns. Do not service until the system has cooled.

【Installation】

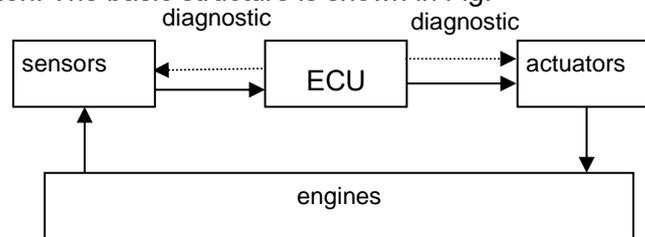
The installation order is the reverse of the removal order.

2.10 Engine Control Systems

2.10.1 System description

Overview

The engine management system usually consists of three main components: sensors, microprocessor (ECU), and actuators, which control the amount of air intake, fuel injection, and ignition advance angle of the engine during operation. The basic structure is shown in Fig.



In the engine electronic control system, the sensor is used as an input part to measure various physical signals (temperature, pressure, etc.) and convert them into corresponding electrical signals; the role of the ECU is to accept the input signals from the sensor and calculate and process them in accordance with the set procedures, and then generate corresponding control signals to be outputted to the power drive circuit, which drives the various actuators to perform different actions, so as to make the engine. At the same time, the fault diagnostic system of ECU monitors each component or control function in the system, and once a fault is detected and confirmed, the fault code is stored and the 'limp home' function is called, and when the detected fault is eliminated, the normal value will be resumed.

The basic components of the UP6 engine electronic control system are:

Electronic Controller (ECU)	Electronic Gas Pedal
Air Mass Flow Meter (depending on project)	Injector
Intake Air Pressure/Temperature Sensor (depending on project)	Electronic Fuel Pump
Coolant Temperature Sensor	Fuel Pressure Regulator
Electronic Throttle Body	Fuel pump bracket
Phase sensor	Fuel Distribution Hose
RPM Sensor	Carbon Tank Control Valve
Burst Sensor	Ignition Coil
Oxygen Sensor	

2.10.2 Principle of component structure and fault checking

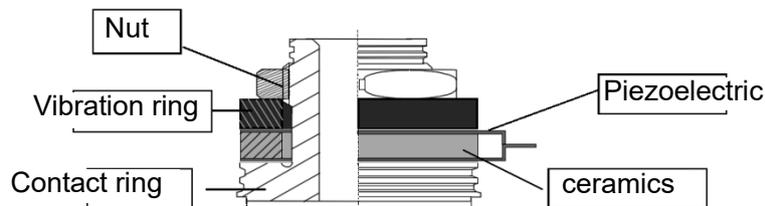
Burst Sensor Assembly

Function:

The shock sensor is installed close to the engine block, detecting the vibration of the engine in real time, and using the piezoelectric effect to convert the engine vibration into an electrical signal transmitted to the ECU for shock detection. When the engine burst, the cylinder block vibration acceleration will increase dramatically, the sensor electrical signals and then produce a drastic change, and then determine that the engine has a burst.

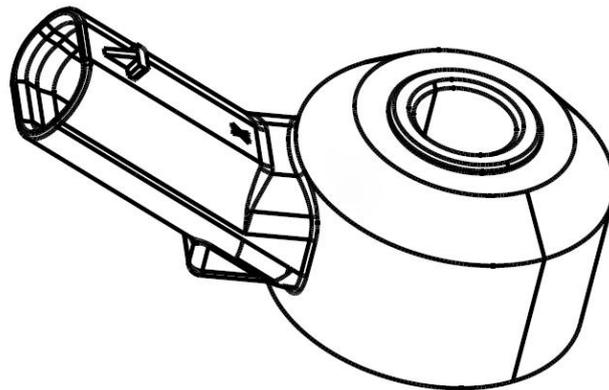
Principle of operation:

Burst sensor is a vibration acceleration sensor, installed in the engine cylinder block. The sensor's sensitive element is a piezoelectric element. The vibration of the engine cylinder block through the sensor within the mass block to the piezoelectric crystal. Piezoelectric crystal due to the pressure generated by the mass block vibration in the two pole surface voltage, the vibration signal into a variable voltage signal output. As the frequency of the vibration signal caused by engine blowout is much higher than the engine's normal vibration signal frequency, so the ECU can distinguish between blowout and non-blowout signals after filtering the signal from the blowout sensor.

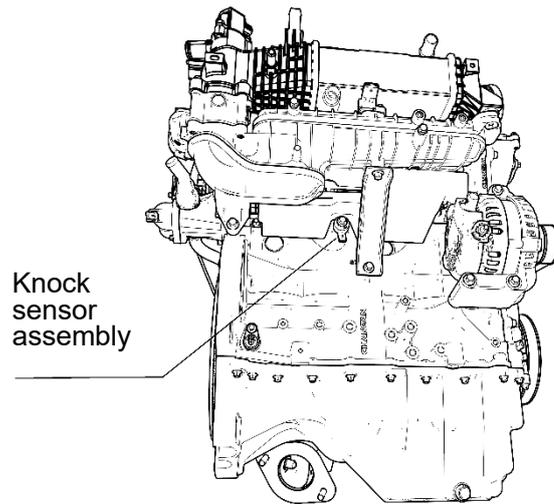


Product structure:

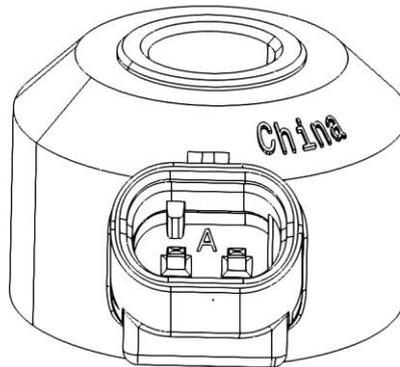
1. Monolithic structure



2. Layout structure



3. Interface definition:



Note: Both PINs have no polarity and are signal output pins.

characterisation:

1. Insulation resistance between 2PINs is greater than 1M Ω at room temperature.

2. Sensitivity:	5kHz:	23~34mV/g
	8kHz:	22~37mV/g
	13kHz:	22~40mV/g
	18kHz:	22~43mV/g

Product malfunction and troubleshooting:

Before conducting a single product inspection, it is necessary to first check the wiring harness connections and confirm that there are no issues before proceeding with the single product inspection.

When the engine malfunction light is on to report a knock sensor related fault, if there are other faults such as engine misfire, vehicle shaking, etc. that can cause abnormal engine vibration, other faults should be eliminated first before judging the knock sensor.

The steps for individual inspection are as follows:

1. Use a multimeter to check the resistance between the two terminals of the sensor terminal connector

(check terminals 1 # and 2 # for products with wiring harness). Under normal circumstances, the resistance should be between 3.95-5.85 megohms;

2. Set the multimeter to the millivolt range, use a metal hammer to strike the cylinder near the installation point of the detonation sensor, and check for any voltage changes between the sensor output terminals (1 # and 2 # terminals). If there is a voltage change, it proves that the sensor is normal and can recognize the vibration signal of the cylinder.



When in doubt, it is recommended that the ABA be interchanged for verification.

Oil Pressure Sensor Assembly

Function:

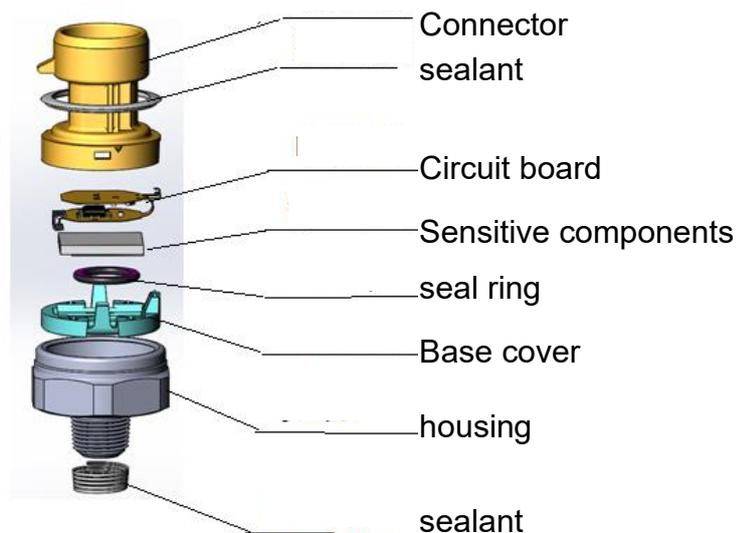
The oil pressure alarm assembly becomes an absolute pressure sensor that is mounted on the main engine oil passages and feeds back to the control system the pressure of the oil.

Principle of operation:

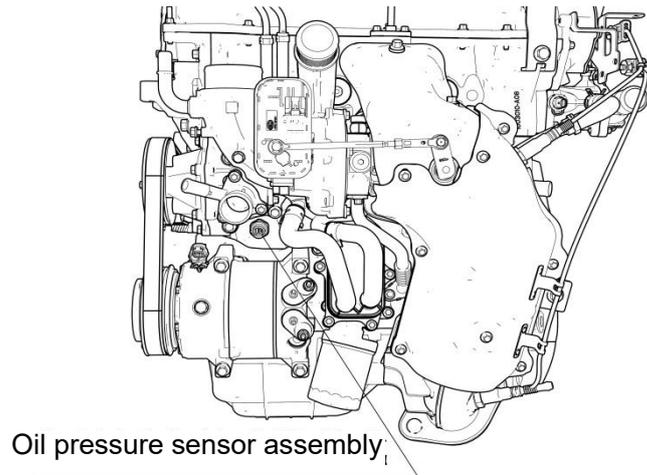
The oil pressure sensor consists of a pressure sensitive element and a signal processing circuit. The oil pressure acts on the sensitive element to produce a signal change, the signal is processed through the signal circuit to output a proportional voltage signal corresponding to the pressure input.

Product structure:

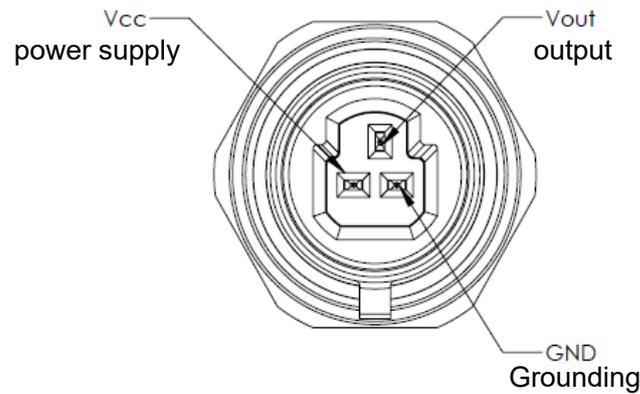
1. Monolithic structure



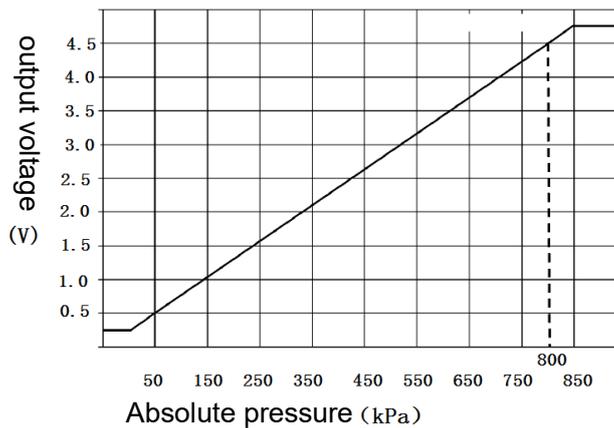
2. Layout structure



Interface definition:



characteristic:



The oil pressure outputs a voltage signal proportional to the oil pressure.

Product Troubleshooting and Troubleshooting:

Before carrying out a single product check, you should first carry out a check of the wiring harness link and confirm that there is no problem before carrying out a single product check.

Single-unit checking

1, (remove the connector) the digital multimeter to ohm gear, two pens were connected to the sensor 1 # pin and sensor metal shell, the engine is not started, the resistance is small (generally less than 50 Ω), start the engine, the resistance is larger for the open-circuit state.

2, view the instrumentation of the oil lamp is lit, when the engine is not running, the oil lamp should be lit state; engine running, oil pressure is normally established, the oil lamp goes out.



When in doubt, it is recommended that the ABA be interchanged for verification.

Crankshaft position sensor assembly

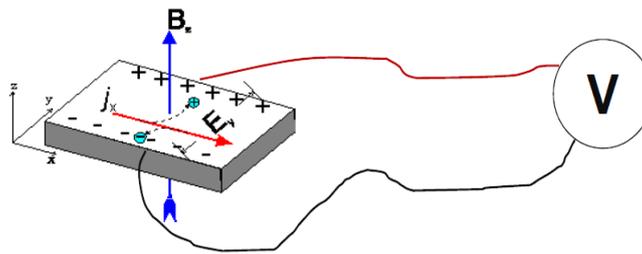
Function:

Crankshaft position sensor: generally mounted on the cylinder block or transmission.

It is used to detect the current position of the crankshaft, and then determine the crankshaft's 1-cylinder top stop.

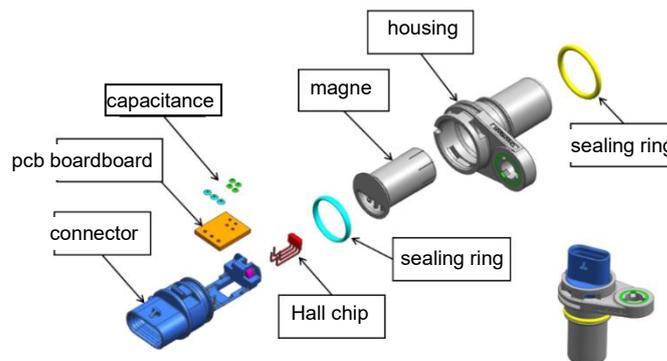
Principle of operation:

Hall effect principle: The use of the conductor if there is a current and perpendicular to the current of the magnetic field, then the voltage will be generated in the transverse direction.



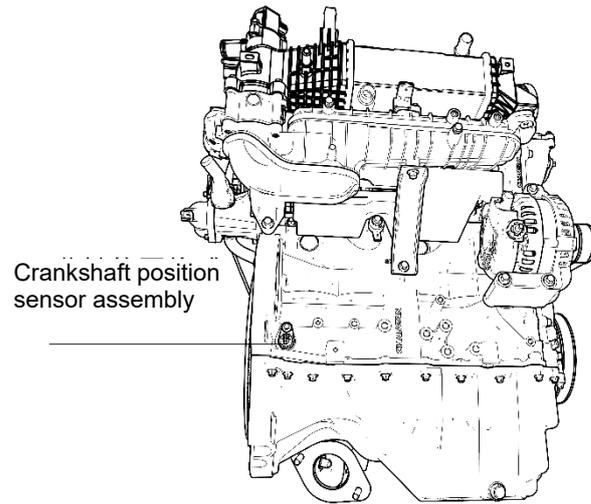
Product structure:

1. Monolithic structure

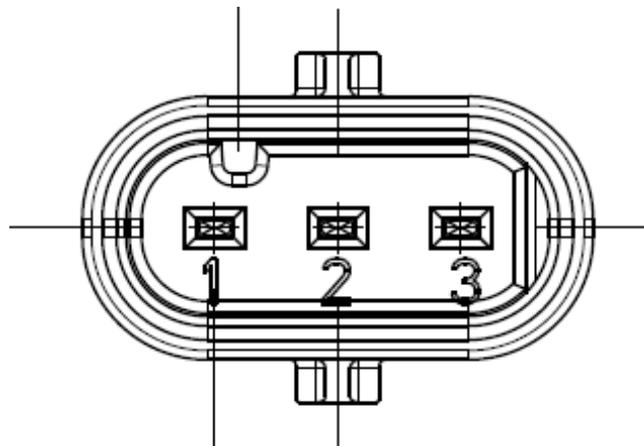


2. Layout structure

The crankshaft position sensor is located on the cylinder block.



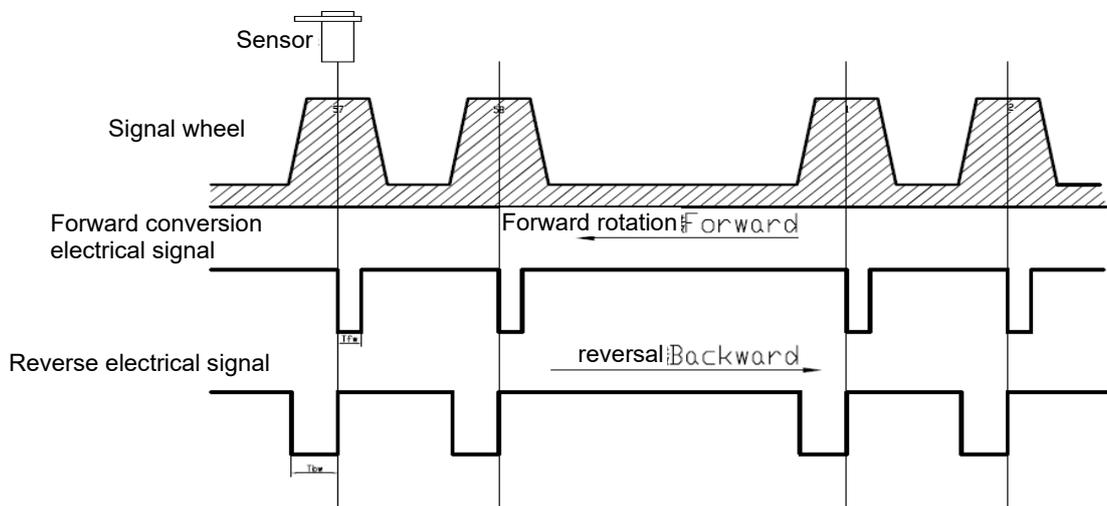
3. Interface Definition:



Remarks: 1 Power; 2 Ground; 3 Signal

Characteristics:

1. Voltage output curve:



2. Electrical parameters:

参数	符号	下限值	常规值	上限值	单位	备注
正转输出脉宽	T_{fr}	38.25	45	51.75	us	
反转输出脉宽	T_{br}	76.5	90	103.5	us	
供电电压	U_s	4.75		16	V	
输出信号电压	U_{so}	0		18	V	
输出信号低电压	U_{ol}			0.5	V	
输出信号高电压	U_{oh}	$U_{so}-0.5$	$U_{so}-0.3$		V	

Product failure and troubleshooting:



Note: Before carrying out the product single body troubleshooting, you should first carry out the wiring harness link related inspection to confirm that there is no problem before carrying out the

Check the appearance of the crankshaft position sensor for damage, shell cracks, connector terminals for corrosion, water inside the connector.

Crankshaft position sensor inspection:

Use an oscilloscope to check whether the output signal voltage of the crankshaft position sensor is within the range of electrical parameters, and whether the pulse width of the forward and reverse signals is normal.

Water temperature sensor assembly

Function:

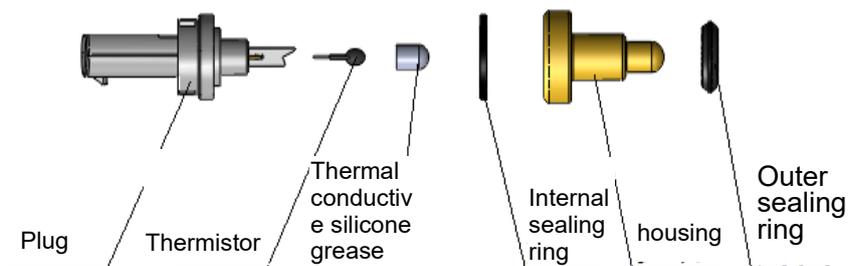
The role of the water temperature sensor is to monitor the engine coolant temperature and provide the engine ECU with coolant temperature information, thus enabling the engine to work more accurately.

Working Principle:

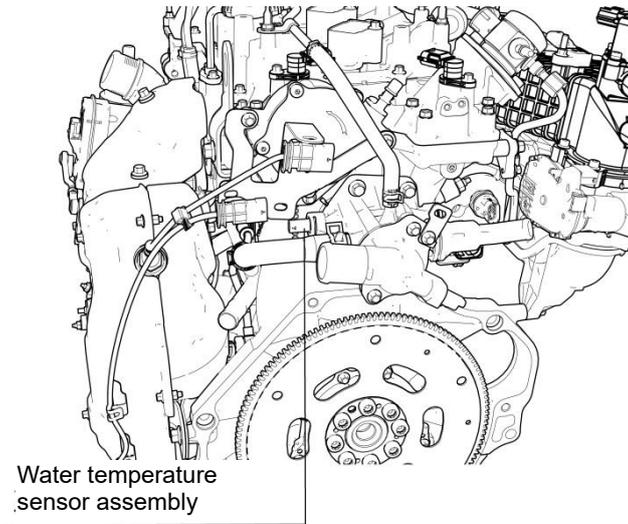
The temperature sensing element of the water temperature sensor is a negative temperature coefficient temperature sensor, the higher the temperature, the lower the resistance value.

Product Structure::

1. Monolithic structures



2. Layout structure



D20 Machine Layout

3. Interface definition:

Where 1 and 2 are interchangeable

Characteristics:

R-T Characteristics::

t (°C)	Rmin. (kΩ)	Rmax. (kΩ)
-40	40.66	47.57
-30	23.27	26.90
-20	13.82	15.79
-10	8.477	9.584
0	5.358	6.000
10	3.480	3.862
20	2.318	2.550
30	1.579	1.724
40	1.099	1.191
50	0.7796	0.8390
60	0.5631	0.6021
70	0.4135	0.4394
80	0.3084	0.3258
90	0.2333	0.2452
100	0.1789	0.1870
110	0.1389	0.1445
120	0.1086	0.1135
130	0.0859	0.0902

Product failure and troubleshooting:



Note: Before carrying out the product single body troubleshooting, should first carry out the wiring harness link related inspection, confirm that there is no problem before carrying out the product single body troubleshooting.

Single body troubleshooting

1. (Remove the connector) the digital multimeter to the ohm gear, two pens were connected to the sensor 1, 2 pins, 20 °C rated resistance of 2.3kΩ-2.5kΩ, other temperatures can be assessed by the above table. Cold start, let the water temperature rise gradually, observe the sensor resistance changes. Measurement can also be used to simulate the method, the sensor head in hot water, the sensor resistance should be gradually decreased with the rise in head temperature, the specific value depending on the temperature of the hot water.

2. Check the engine diagnostic instrument in the water temperature parameters, can be close to the water temperature at the time, and there are obvious changes, according to the data displayed to make a judgement.



Note: When there is a difficult problem, it is recommended that the ABA be interchanged for verification.



Special Note: For the water temperature has been in the middle of the line problem (the middle of the line shows a wide range of 50 °C -110 °C), you need to use the diagnostic instrument to read the water temperature data flow combined with the actual water temperature judgement, summer due to the high temperature of the cabin, easy to appear has been in the middle of the line phenomenon (this is a normal phenomenon).

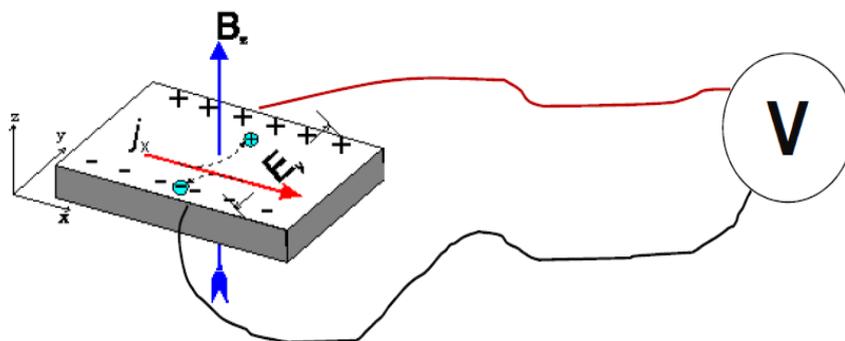
Camshaft Position Sensor Assembly

Function:

Camshaft position sensor: generally installed on the cylinder head or cylinder head cover, with the crankshaft position sensor signal to determine the current working stroke of each cylinder of the engine.

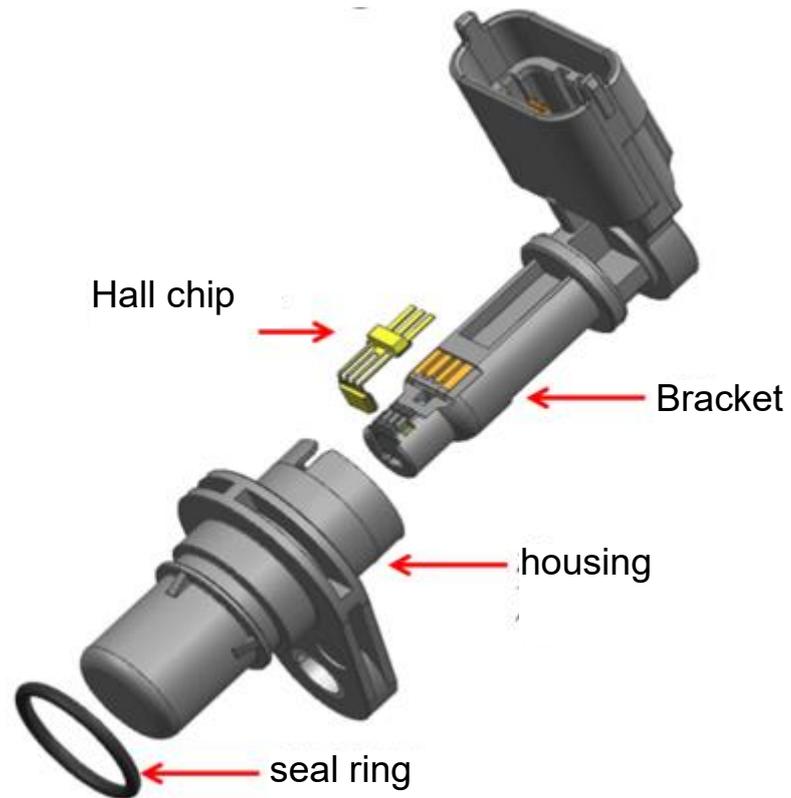
Principle of operation:

The Hall effect principle: utilises the fact that if there is a current in a conductor and a magnetic field perpendicular to the current, then a voltage will be generated in the transverse direction.

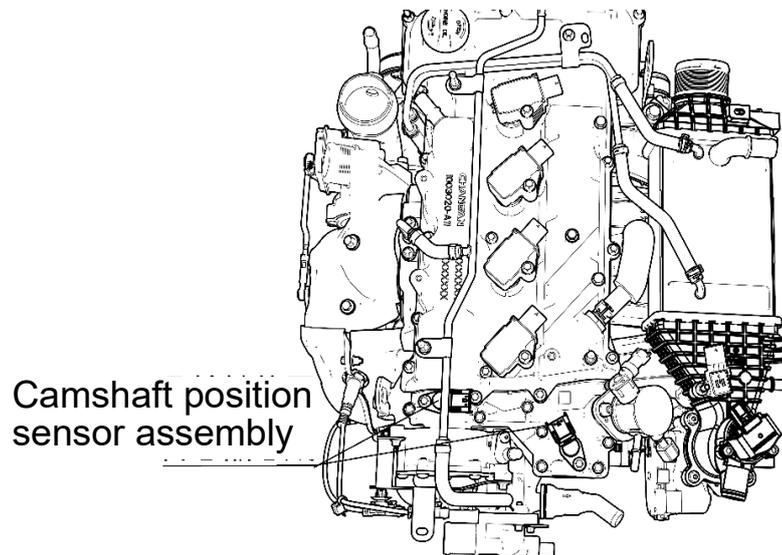


Product structure:

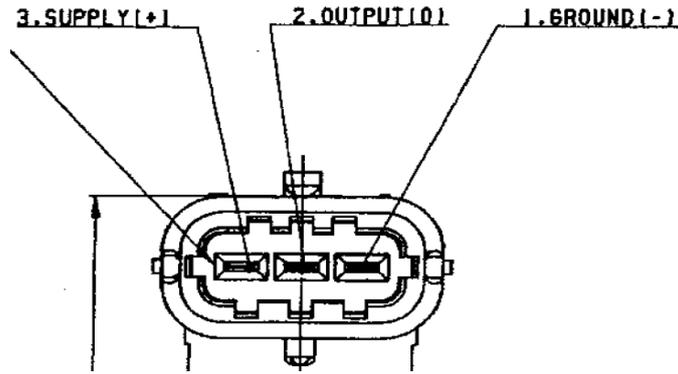
1. Monolithic structure



2. Layout structure



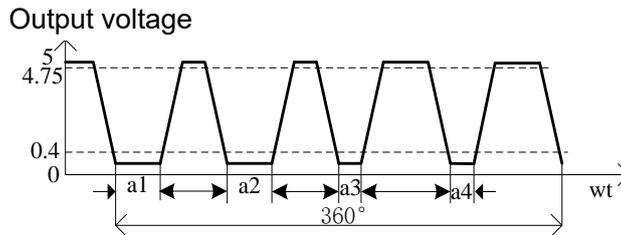
3.Interface Definition::



Remarks: 3 Power; 2 Outputs; 1 Ground Signal

Characteristics:

Voltage output curve:



Product failure and troubleshooting:



Note: Before carrying out the product single body troubleshooting, you should first carry out the wiring harness link related inspection to confirm that there is no problem before carrying out the product single body troubleshooting.

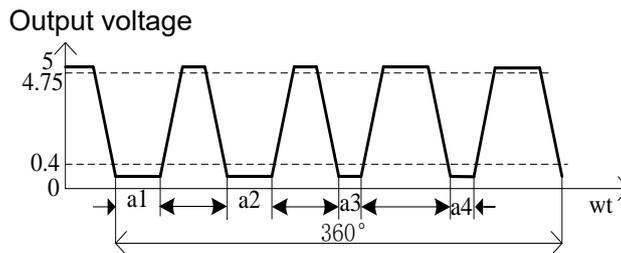
Check whether the camshaft position sensor is damaged or not, whether the shell is cracked or not, whether the connector terminal is corroded or not, whether there is water inside the connector or not.

Camshaft position sensor check:

4. NE1 is a dual VVT system fitted with two camshaft position sensors; the fault code will distinguish between an intake camshaft position sensing fault or an exhaust camshaft position sensor fault, align the camshaft position sensors and observe if the fault code follows the sensor;

5. If the following sensor reports a fault, you can judge that the camshaft position sensor is damaged; if it does not follow the camshaft position sensor, focus on checking the wiring harness condition

6. If the fault code does not determine the intake or exhaust fault, you need to use an oscilloscope to read the camshaft position sensor output voltage is normal, the normal signal is as follows:



Boost Pressure Temperature Sensor Assembly

Function:

Used in electronically controlled fuel injection unit system to provide pressure and temperature signals of intake air. It realises closed-loop control and improves the accuracy of ECU's control of the air-fuel ratio. There are two boost pressure and temperature sensors in a single vehicle, installed before and after the throttle, in which the boost pressure and temperature sensor in front of the throttle (intercooler pipe) is used for closed-loop control of the supercharger's boost, and the boost pressure and temperature sensor in the back of the throttle (intake manifold) is used for the computation of the charging model, and the intake volume is used to control the intake volume based on the torque and the throttle position in a closed-loop manner, so as to ensure the emission, power and fuel economy of the whole vehicle.

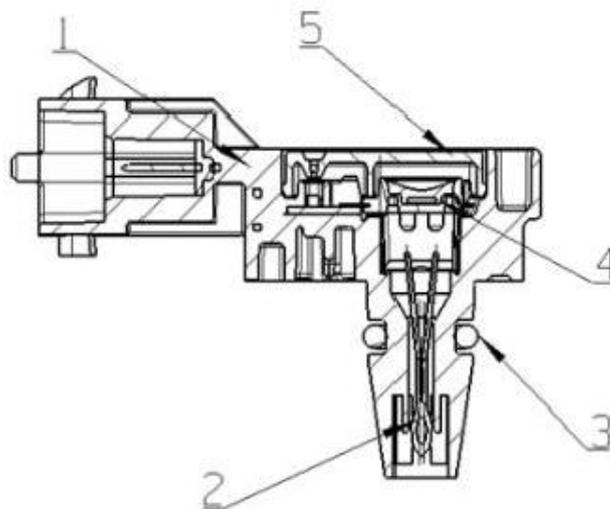
Principle of operation:

(1) Pressure measurement principle: there is a pressure-sensing element inside the sensor, which consists of a chip with a pressure diaphragm etched on it. There are 4 piezoelectric resistors on the pressure diaphragm, which act as strain elements to form a Wheatstone bridge. In addition to the pressure diaphragm, a signal processing circuit is integrated on the chip. The active surface of the silicon chip is subjected to a near-zero voltage and the pressure to be measured is applied to its surface. The thickness of the silicon chip is only a few microns, so changes in the measured pressure will cause mechanical deformation of the silicon chip, followed by the deformation of the four piezoelectric resistors, the resistance value changes, and through the signal processing circuitry of the silicon chip, the formation of a voltage signal that is linearly related to the pressure. After the signal processing circuit of the silicon chip, a voltage signal is formed which is linearly related to the pressure. The voltage signal is input to the ECU, which knows the size of the measured pressure according to the voltage signal and the characteristic curve of the pressure-voltage signal.

(2) Temperature Measurement Principle: The temperature measurement of the boost pressure temperature sensor is of NTC type, and the resistance value of the NTC original is different according to different temperatures, and the measured temperature is obtained according to the correspondence between the two.

Product structure:

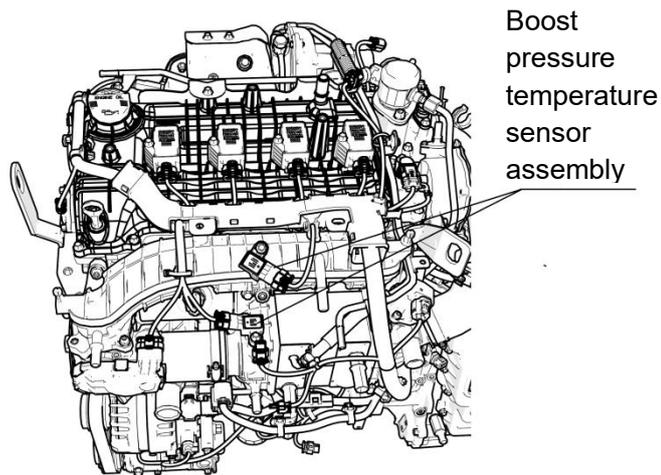
1. Monoblock structure: the main structure of the boost pressure temperature sensor assembly (3762020-MK01) is assembled from five parts: case, NTC, seal, pressure chip and cover, the detailed structure is shown in the following figure:



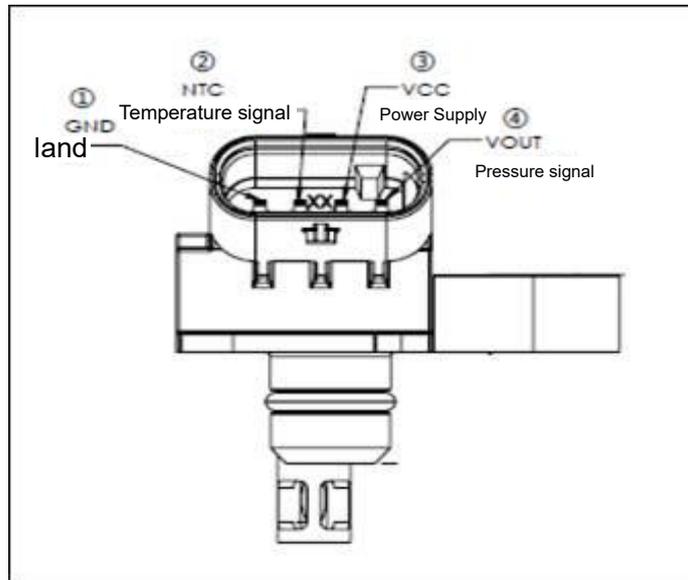
1- Housing 2-NTC 3-Seal 4-Pressure chip 5-Cover plate

2. Arrangement structure:

Boost pressure temperature sensor single car with 2, respectively, in front of and behind the throttle each one, which is located in front of the throttle on the intercooler tube, after the throttle is located in the intake manifold, the two positions of the layout structure shown in the following two figures:



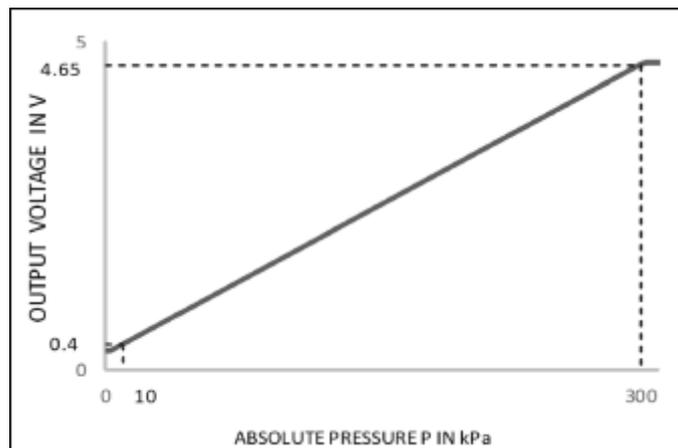
3. Interface Definition: This sensor is a 4-pin structure, integrating pressure measurement and temperature measurement in one unit, and the definition of each pin is shown in the figure below:



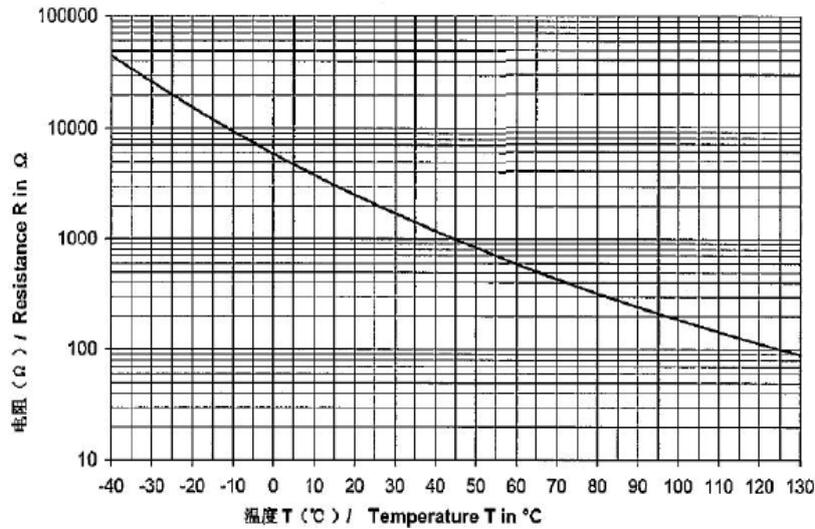
Product characteristics:

This sensor pressure range 10 ~ 300kpa, temperature range -40 ~ 130 °C °C

(1) pressure signal characteristic curve:



(2) Temperature signal characteristic curve:



Product failure and troubleshooting:



Note: Before carrying out the product single body troubleshooting, should first carry out the wiring harness link related inspection, confirm that there is no problem before carrying out the product single body troubleshooting.

Single unit troubleshooting:

1. If a sensor on the car reported a fault, the throttle before and after the installation of two sensors for the swap, observe whether the fault follows the parts, such as the fault does not follow the parts, then confirm that the parts of the monomer is not a problem. If the fault follows the parts, continue to investigate the sensor unit.

2. Simple measurement method:

Check whether the harness connector terminal of the booster pressure temperature sensor is corroded or not, if it is not corroded, then check whether it is corroded or not.

(1) temperature sensor part: the digital multimeter to ohm gear, two pens were contact sensor 1, 2 pins, in 20 °C when the rated resistance of $2.5K\Omega \pm 5\%$, the other corresponding resistance value according to the temperature characteristic curve measured, but also available in analogue method, specifically with a hot air blowing to the sensor to send the wind (pay attention to the reliable not too close), observe the sensor Observe the change of sensor resistance, the resistance should drop.

(2) pressure sensor part: in the case of connector assembly, with a fine wire or other methods to test the 3, 4 pin voltage output signal. In idle state, pin 3 should have a reference voltage of 5V, and pin 4 voltage is about 0.5V-1V (specific value is related to the model); in neutral state, slowly step on the accelerator, the voltage of pin 4 increases a little; quickly step on the accelerator, the voltage of pin 4 can instantly reach about 3V-4V (specific value is related to the model), and then drop to about 0.5V-1V (specific value is related to the model). The voltage at pin 4 can reach about 3V-4V instantly (the specific value depends on the model) and then drop to about 0.5V-1V (the specific value depends on the model).



NOTE: When in doubt, it is recommended that ABA performs reciprocal verification.

Electronic Throttle Body

Function:

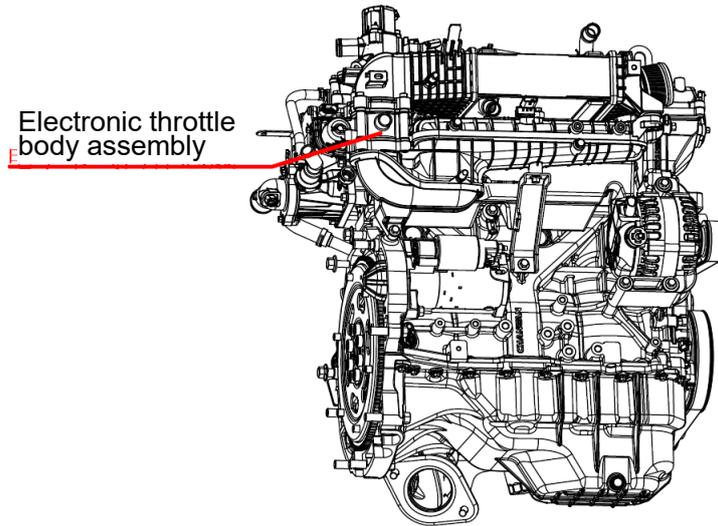
Throttle body is one of the main components of the engine intake system, and its main function is to adjust the intake channel area according to the driver's driving intention, so as to control the intake volume and meet the intake demand under different engine working conditions.

Working Principle:

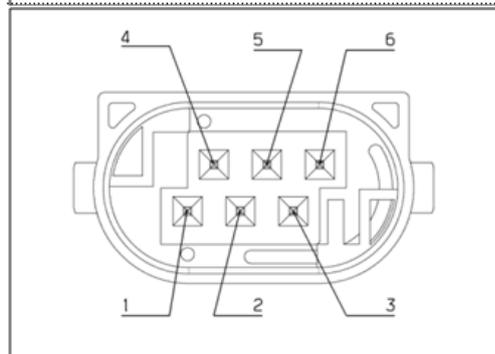
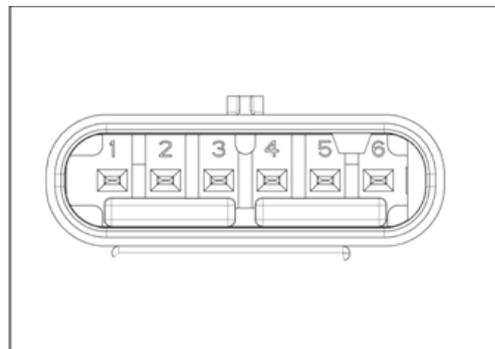
The actuator part applies force to the throttle body according to the PWM signal inputted by ECU, so that the throttle body opens to the specified angle; the sensor part, which is designed with two-way redundancy, is used to detect the actual opening angle of the throttle body, and feeds back the signal to the ECU to achieve precise control.

Structure and characteristics:

The throttle body is mounted on the intake manifold and consists of three parts: the body, the actuator and the sensor. The actuator part of the internal gear drive structure to achieve the control of the throttle body valve; sensor part of the different detection principles, divided into contact and non-contact two.



Interface Definition:



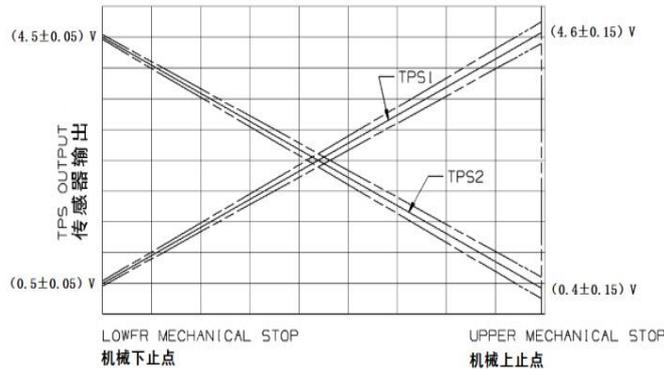
1 [↻]	2 [↻]	3 [↻]	4 [↻]	5 [↻]	6 [↻]
M [↻]	M+ [↻]	TPS2 [↻]	VCC [↻]	GND [↻]	TPS1 [↻]

TPS output characteristics:

Temperature: room temperature 23°C

Sensor operating voltage: VCC=5V

	TPS1 (V)	TPS2 (V)
Mechanical lower stop	0.5±0.05	4.5±0.05
mechanical upper limit	4.6±0.15	0.4±0.15



Troubleshooting:



Note: Wiring harness connection related checks should be carried out first to confirm that there is no problem before carrying out the product monoblock troubleshooting.



Note: Before carrying out the product single body troubleshooting, you should first observe whether there is any serious carbon/oil accumulation in the main channel of the throttle body, and if there is, you should first clean it according to the Throttle Body Cleaning Manual.

1. Throttle body sensor check

Press the accelerator pedal and use the EFI system diagnostic instrument to read the voltage value of the 1-way signal of the throttle body and the voltage value of the 2-way signal of the throttle body, and observe whether it is in accordance with the following output characteristics, and if it is not in accordance with the following output characteristics, the throttle body should be replaced.

Temperature: room temperature 23°C

Sensor operating voltage VCC=5V

V_{TPS1}: 0.45-4.75V

V_{TPS2}: 0.25V-4.55V

V_{TPS1} + V_{TPS2} = V_{CC}

2. Throttle body actuator check

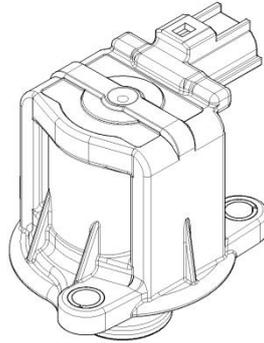
Remove the throttle body and push the throttle body valve plate by hand to see if there is any sticking, if so, the throttle body needs to be replaced. Use a digital multimeter to measure the resistance between M+ and M- of the throttle body, whether it is less than 100 ohms, if not, the throttle body motor may have a broken circuit fault, need to replace the throttle body.

Intake Pressure Relief Valve Assembly

Function:

The intake relief valve assembly is only applied to supercharged models, and is arranged on the intake system from after supercharging to in front of the throttle body, with a bypass line connecting to the front of supercharging. Generally open after the throttle is released, the relief valve can drain the boosted gas

back to the natural intake side when it is opened, to avoid the gas pressure in the intake system is too high and cause the supercharger to wheeze and other faults.

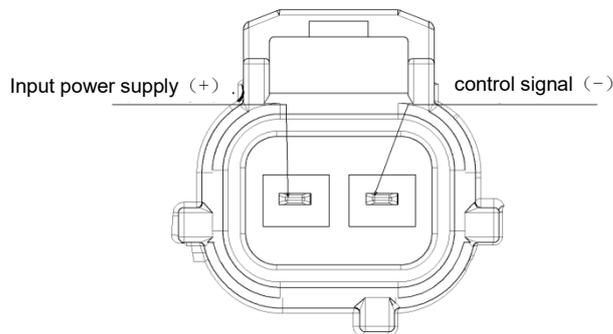


Principle of operation:

When the intake relief valve is not receiving a switch signal, the intake relief valve is normally closed, forming a sealed chamber with the counterpart, and all of the boosted gas enters the cylinder through the throttle to participate in combustion. When the switching signal is received, the valve head rises under the action of electromagnetic force, and the boost gas can flow back to the pre-boost through the bypass line. At the end of the pressure relief, the valve head returns to the closed state under the action of spring force and gravity.

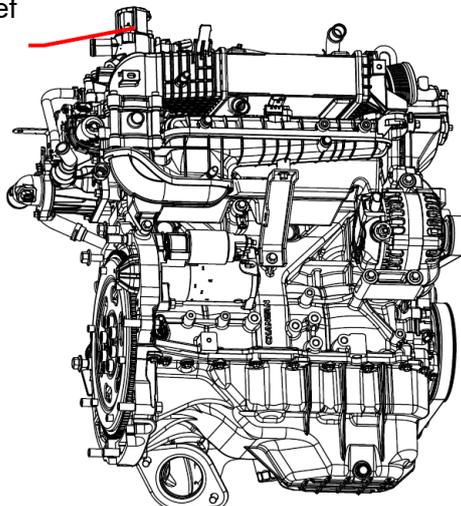
Structure and Characteristics:

The intake relief valve is a solenoid switching valve, which consists of a solenoid coil, a magnetic guide assembly, and a spool assembly, among others. The intake relief valve has only two pins, as shown in the figure below:



Layout structure

Intake pressure relief valve assembly



Characteristic parameters:

Coil resistance: $R_w = (12 \pm 1) \Omega \times (1 + (T_w - 23) \times 0.0039 /) \text{ } ^\circ\text{C} \text{ } ^\circ\text{C}$, i.e., at 23°C, the inlet relief valve coil resistance should be 11~13Ω.

Troubleshooting

Recommended troubleshooting method:

⚠ Note: Before checking the air intake pressure relief valve, please make sure that the wiring harness connectors are plugged in place, and that there is no water, corrosion, or defective contact inside the connectors, and that the entire wiring harness is conducting normally.

1. Use a multimeter to connect the 2 pins of the pressure relief valve and check if the resistance is normal (around 12 ohms).
2. Disassemble the intake relief valve and check for any internal breaks in the head.

⚠ When in doubt, ABA is recommended for interchange verification.

Maintenance tools (indicate in this section the tools that will be used in the troubleshooting process)

legend	Name and Function	legend	Name and Function
	EFI system diagnostic instrument: read/clear EFI system fault codes, observe data flow, parts action test, etc.		EFI system adapter: Check the electrical signals on each pin of the electronic control unit, check the condition of the wiring, etc.
	Ignition timing light: Check engine ignition timing, etc.		Digital multimeter: Checks characteristic parameters such as voltage, current and resistance in the EFI system.
	Fuel Pressure Gauge Checks the pressure of the fuel system and determines the operation of the fuel pump and fuel pressure regulator in the fuel system.		Exhaust Gas Analyser Checks the exhaust gas emission of the vehicle and helps to determine the fault of the EFI system.

2.10.3 Removal and Installation Instructions

Burst Sensor

【Disassembly】

1. Loosen the burst sensor connector.
2. Loosen the burst sensor bolt and remove the burst sensor.

【Installation】

1. Bolt the shock sensor to the mounting hole, make sure the mounting surface of the shock sensor is clean during installation, and tighten the torque $23\pm 1\text{N.M}$.
2. the shock sensor connector plug in place.

Note: Due to the majority of aftermarket failures and wiring harness connectors with the problem, there are occasional transient breaks lead to fault code reported, so the maintenance process should focus on checking whether the connectors are well-fixed, plugged in place, and re-plug the connectors to check whether the problem is solved.

Oil pressure sensor

【Disassembly】

1. De-energise the vehicle;
2. Disconnect the wiring harness connector;
3. Use a 24# spanner to disassemble the sensor assembly.

【Installation】



Note: Before installation, each part should be inspected for deterioration or damage, and should be replaced if defects are found.

1. Install the oil pressure sensor on the filter bracket (the oil pressure sensor is a self-adhesive product, theoretically not reusable, when reuse is required under special circumstances, glue should be applied to the threads to ensure sealing), and tighten the bolts according to the specified torque. ($14\text{Nm}\pm 1\text{Nm}$)
2. Match the connector with the end of the wiring harness.



WARNING: Do not service when the engine is running and when the oil is hot to avoid large spills and burns. Do not service until the engine has stopped running and the system has cooled.

Crankshaft position sensor

【Dismantling】

1. De-energise the vehicle;
2. Disconnect the wiring harness connector;
3. Disassemble the sensor assembly using a d-socket.

【Installation】



NOTE: Prior to installation, each part should be inspected for deterioration or damage and replaced if found to be defective.

1. Before installing the sensor into the mounting port, apply a small amount of lubricant to the seal, then gently screw the sensor into the mounting port without tapping.
2. The mounting torque should be within the range of $8\pm 2\text{Nm}$.
- 3.

3. Before installing the crankshaft position sensor, clean the mounting holes to prevent the presence of iron filings and other debris.



NOTE: Replacing the crankshaft position sensor requires attention to installation torque.



WARNING: Replacing the crankshaft position sensor is prohibited when the vehicle is energised.

Water temperature sensor

【Disassembly】

1. Power down the vehicle;
2. Disconnect the wiring harness connector;
3. Remove the clips and remove the water temperature sensor.

【Installation】



Note: Before installation, each part should be checked for deterioration or damage, and should be replaced if defects are found.

1. Install the water temperature sensor on the thermostat seat and install the carabiner. 2. Match the connector to the harness end.



WARNING: Do not service when coolant is hot to avoid burns. Do not service until the system has cooled.

Camshaft Position Sensor

【Disassembly】

1. Power down the vehicle;
2. Disconnect the wiring harness connector;
3. Remove the sensor assembly by using a thong socket.

【Installation】



Note: Before installation, each part should be inspected for deterioration or damage, and should be replaced if defects are found.

1. A small amount of lubricant should be smeared at the seal before the sensor is installed into the mounting port, after which the sensor should be gently screwed into the mounting port without tapping;
2. The mounting torque should be within $10\pm 2\text{Nm}$;
3. Clean the mounting holes before installing the camshaft position sensor to prevent the presence of iron filings and other debris.



NOTE: Dispose of the oil stains after replacing the camshaft position sensor.



WARNING: Replacing the camshaft position sensor is prohibited when the vehicle is energised.

Booster Pressure Temperature Sensor

【Disassembly】

1. Power down the vehicle;
2. Disconnect the harness connector;
3. Remove the bolts fastening the sensor with a socket;
4. Remove the sensor unit.

【Installation】



Note: Before installation, each part should be inspected for deterioration or damage, and should be replaced if defects are found.

1. Apply a little lubricant to the sensor O-ring seal before assembling the sensor, taking care not to enter the pressure probe hole;
2. Gently screw the sensor into the mounting hole;
3. Secure the boost pressure temperature sensor to the mounting protrusion with one of the specified hexagonal flange face bolts (torque: $10\pm 1\text{NM}$);
4. Connect the wiring harness assembly with the boost pressure temperature sensor assembly, and hear a 'click' indicating that the plug is in place; 5. Check the wiring harness plug.

Electronic throttle body

【Disassembly】

1. Do not press the ignition switch;
2. Unplug the throttle body connector;
3. Remove the throttle body and intake manifold, intercooler outlet pipe connecting bolts, and check whether the seal is intact;
4. Remove the throttle body.

【Installation】

1. Assemble the throttle body together with the sealing ring to the intake manifold and intercooler outlet pipe, and tighten the bolts according to the specified torque of (10 ± 2) m. 2;
2. Connect the throttle body connector and fix the wiring harness in its original state.

Throttle body self-learning

Turn the ignition switch to 'ON' and wait for 60s; start the vehicle and switch off the engine after the idle speed is stable; turn the ignition switch to 'OFF' and wait for 10s; the self-learning is completed.

Air intake relief valve

【Disassembly】

1. Unplug the wiring harness connector;
2. Loosen the three mounting bolts;
3. Remove the intake relief valve assembly from the counterpart.

【Installation】

The installation process is the reverse of the removal process.

Note: When installing, the direction of the connector must be noted; when installing, the tightening torque of the bolts must be noted to be 10 ± 1 (N-m); it is necessary to prevent foreign matter, such as particulate matter, etc., from entering into the interior of the pressure relief valve.

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1. Technical parameters of automatic transr

1.1 Basic parameters of autc

Transmission Model	A8F40DS11DLE	
Engine Model	7-speed automatic, front-wheel drive	
Transmission quality	95kg	
Gear ratios	1-speed	3.029
	2-speed	1.950
	3-speed	1.457
	4-speed	1.221
	5-speed	1.000
	6-speed	0.809
	7-speed	0.673
	R speed	4.015
final reduction ratio	3.2	
Input torque range	Within 400Nm	
ATF oil grades	DAE ATF-1 OR DAE ATF-2 Fill only with this fluid, use of other fluids will affect transmission	
Shell Sealant	TB1281B or LT5460 or Berson 3591	
Total amount of theoretical ATF oil in the transmission	6.4±0.1KG(20°C,7.5±0.15L)	
Transmission operating oil temperature requirements (temperature detected by oil temperature sensor)	Transmission normal operating oil temperature:80~100°C	
	Extreme minimum operating temperature:-30°C	
	Extreme maximum operating temperature:120°C (120°C requires the control system to activate the appropriate	
Transmission outlet (ATF cooler inlet)	Maximum temperature of 135°C for a short period of time (maximum permissible operating time of 30 minutes)	
Oil Change Mileage	General conditions of use	1 years 5000 km oil change
	severe conditions of use	3000 km

Harsh use conditions

1. The car is often driven in dusty areas or often exposed to air containing salt.
2. Driving on bumpy roads, roads with standing water or mountain roads.
3. Often driving in cold areas.
4. Frequently idling the engine for a long time or driving short distances in the cold season.
5. Frequent use of the brake, often braking sharply.
6. Driving in congested urban areas at temperatures above 30°C for more than 50% of the total driving time.
7. Driving at a speed of 120km/h or more in temperatures above 30°C for more thn 50% of the total driving time.
8. Frequently overloaded driving .

1.2 ATF oil temperature precautions

1. When high oil temperature occurs in the transmission (oil temperature warning light on, lack of power) in the case of mountain roads, slopes, heavy loads, etc., the driver needs to stop and cool down, and go to a dealer as soon as possible for inspection and repair.

1.3 Ventilator Precautions

1. Ventilator Precautions

1.5 Traction requirements

(1)When the entire vehicle malfunctions and cannot be driven due to other reasons and requires rescue, all four wheels need to be lifted off the ground.

1.6 Transmission Fit Precautions

1、 as shown in Figure A, when the transmission assembly is assembled with the engine, pay attention to the torque converter and flexure plate assembly bolts must be used in accordance with the requirements of the bolts, do not arbitrarily use other bolts.

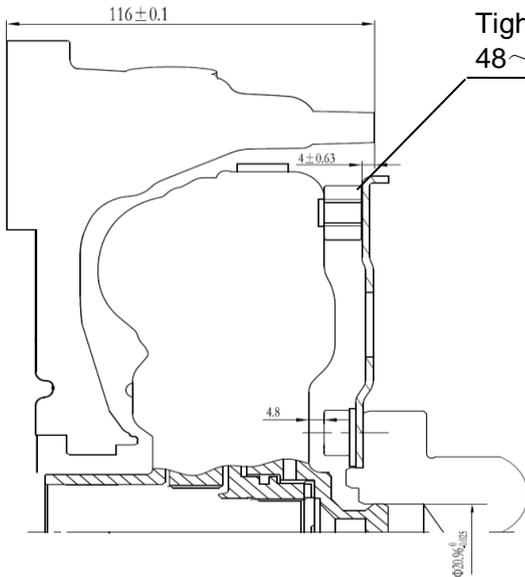


Figure A

Tightening torque of bolts
48~55N·m

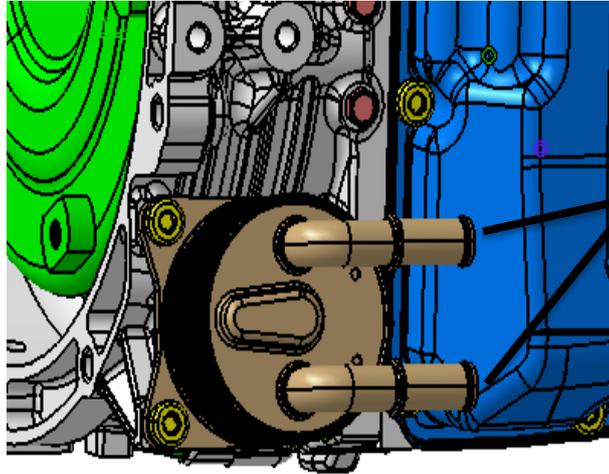


Figure B

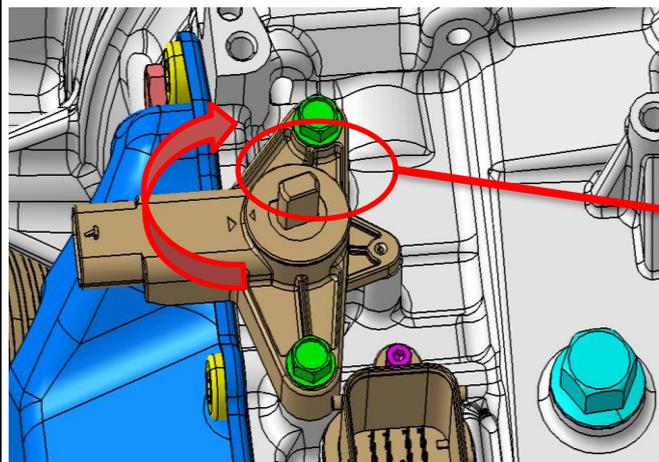
Connecting the cooling oil pipe of the whole vehicle

do not arbitrarily use other bolts, so as not to avoid damage to the torque converter, the tightening torque of 48~55Nm. The torque converter must be mounted on the transmission before it is fitted to the engine. If the torque converter is connected to the engine drive plate before it is fitted, it may cause damage to the internal parts of the transmission. When the transmission assembly is assembled with the engine, tighten the torque converter and the drive plate (flexure plate) to a torque of 48-55N-m in accordance with the principle of "diagonal tightening".

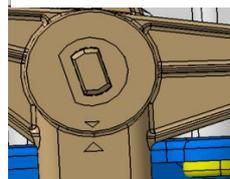
2, as shown in Figure B, after the transmission and engine are assembled, make sure that the two oil cooling pipes in the figure are connected reliably.

At the same time to avoid bumping caused by the transmission cooler damage.

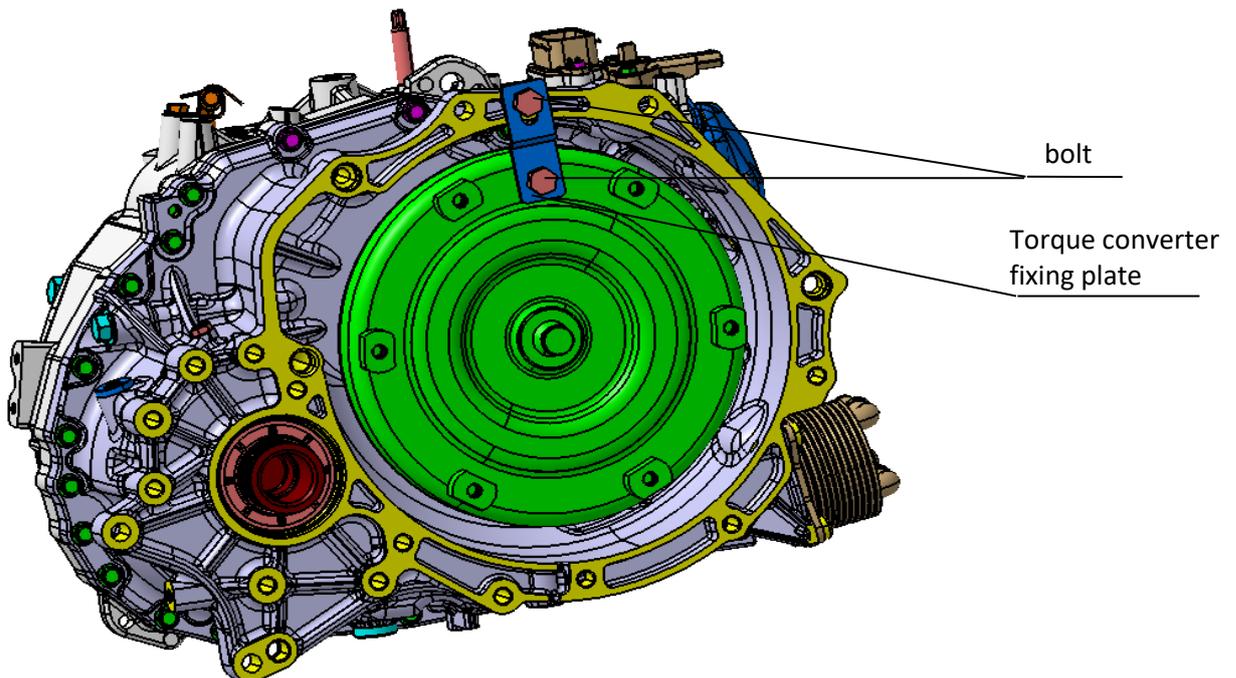
1.7 Method of lifting P-gear for electronic shift models



If the shifting mechanism does not work properly out of P-gear due to vehicle malfunction, use the tool shown in the illustration or a similar tool that can clamp the "flat side" of the transmission shift shaft and turn the shift shaft clockwise so that the transmission is in a non-P-gear.



The △ alignment shown in the illustration is for the position P, and the △ rotation angle must not exceed 40 degrees (relative to the P position).



Name	part number	number	Tightening torque	describe
bolt	DAED172695	2	10~15 Nm	Connection to torque converter
torque converter fixing	DAED335310	1	—	

Note: Full truck transportation requires that the handbrake must be engaged while the vehicle is being transported and not rely solely on the parking mechanism.

1.8 Stall test and its precautions

Test Methods		Test results		precaution	
Stall test	<p>1. The purpose of the test is to analyze and judge the performance of the torque converter, clutch and brake by measuring the maximum speed of the engine when the transmission is in D and R.</p> <p>2. Preparation Before conducting the stall test, the following preparations should be made: (1) For safety, make sure that there are no people standing at the front and rear of the vehicle. (2) Check the ATF oil level, ATF oil temperature and engine cooling water temperature: ATF oil level: check the oil level; ATF oil temperature: 70~80°C; engine cooling water temperature: 80~100°C. (3) Park the car on a wide horizontal ground and fix the rear wheels (left and right wheels) with a triangle wood.</p> <p>3. Test Steps (1) Pull up the handbrake and press the brake pedal firmly with your left foot. (2) Start the engine. (3) Put the gearshift into D gear. (4) While pressing the brake pedal firmly with your left foot, press the gas pedal to the floor with your right foot and quickly read the engine speed at this time. [! Note: The time from the time the gas pedal is depressed to the time it is released must not exceed 5 seconds.!] (5) Release the gas pedal immediately after reading the engine speed. (6) Pull the maneuvering handle into the P or N gear position and allow the engine to run at 1500-2000r/min for more than 3 minutes. (7) After confirming that the ATF is cool, put the gearshift into R and repeat</p>	D stall speed(rpm)			<p>NOTE: The stall test may damage the transmission, and should only be performed if the vehicle experiences weak acceleration when the ATF fluid is normal in colour, odour and volume, in order to determine whether the cause of the weak acceleration originates from the engine or the transmission.</p> <p>1. The duration of the whole process from pressing down the accelerator pedal to releasing it shall not exceed 5 seconds, and the number of tests shall not be more than two.</p> <p>2. The maximum upper limit of the stall speed is 4500 rpm. When the engine speed rises to 4500 rpm during the stall test, the stall test shall be stopped immediately, and the test step (6) shall be repeated until the transmission ATF oil temperature drops and cools down.</p> <p>3. After the completion of the test in one gear, do not immediately carry out the test in the next gear, but wait for the oil temperature to drop.</p> <p>4. After completing the test, do not carry out the test in the next gear immediately, but wait until the oil temperature has dropped.</p> <p>4. Do not turn off the engine immediately after the test is completed, but put the operating handle into N or P and let the engine run at 1500-2000r/min for more than 3 minutes in order to allow the ATF oil temperature to drop to normal.</p> <p>5. If the drive wheels are found to rotate due to insufficient braking power during the test, immediately Release the gas pedal and stop the test.</p>
		R stall speed (rpm)			
		<p>1. Stall speed standard value: 1800~2600 rpm</p> <p>2. Stall speed judgment: (1) D, R stall speed are high: - low main oil pressure - B2 brake slipping (2) Only D stall speed is high: - C1 clutch slipping (3) Only R stall speed is high: -C3 clutch slipping (4) Both D and R stall RPMs low: -Bad torque converter -Bad engine output</p>			

1.9 Notes on the use of P-gear

The order of putting the vehicle into P gear is as follows: after the vehicle is parked, first put the vehicle into N gear and pull up the handbrake, then release the footbrake to let the braking system take most of the force, and finally put the vehicle into P gear. If you don't follow the above order to put in P gear, the following phenomena may appear when you get out of P gear: 1. P gear pulling out force is big 2. P gear pulling out with "bang" sound 3. the whole car shaking.

Note: The above phenomena belong to the normal working condition of the automatic transmission parking mechanism, which does not affect the parking function and the service life of the transmission.

2. Automatic Transmission Maintenance and Inspection Items

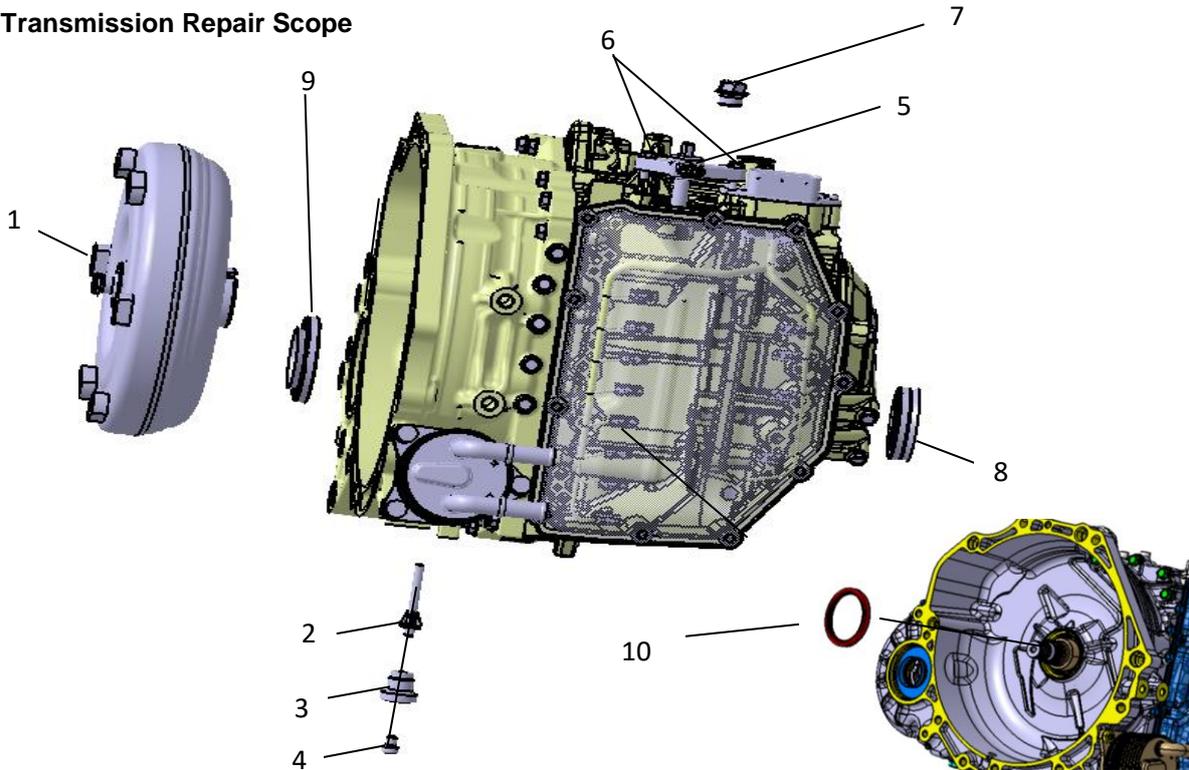
At each engine maintenance, the automatic transmission is inspected as shown in the table below:

Note: Tick in to confirm the fault information

No.	Inspection items		Inspection results	describe
1	transmission number			Automatic Transmission Number
2	Vehicle mileage			Meter shows actual mileage
3	Appearance inspection	Half Shaft Oil Seal	Y <input type="checkbox"/> N <input type="checkbox"/>	Check for oil, breakage and leakage points
4		Oil Drain Plug Assembly	Y <input type="checkbox"/> N <input type="checkbox"/>	
5		Case end faces (transmission-engine mating surfaces and other locations)	Y <input type="checkbox"/> N <input type="checkbox"/>	
6		Valve Body Cover	Y <input type="checkbox"/> N <input type="checkbox"/>	
7		ventilator	Y <input type="checkbox"/> N <input type="checkbox"/>	
8		Oil Cooling Pipe Installation Location	Y <input type="checkbox"/> N <input type="checkbox"/>	
9	ATF oil	Has the ATF oil been changed	Y <input type="checkbox"/> N <input type="checkbox"/>	Whether to change the specified lubricant grade, the specified lubricant grade is DAE ATF-1 or DAE ATF-2
10		Changing ATF oil grades	Manufacturer:	If ATF oil has been changed, please fill in the manufacturer and grade number
			Brand Name:	
		Replacement Date:	Replacement date	
11	Oil Change Mileage	Determining if ATF fluid needs to be changed based on mileage	General conditions of use	Regular inspection, replenishment (5 years 100,000 km oil change)
			severe conditions of use	40,000 kilometres
12	oil quantity of oil products	Determine whether there is any abnormality according to the oil colour, oil volume and odour	oils	Normal condition: transmission fluid is grey-green with no burnt taste
			oil quantity	Drain screw open, oil volume

3. Automatic transmission repair

3.1 Transmission Repair Scope



No.	Name	part number	number	describe	No.	Name	part number	number	describe
1	torque converter	DAED391510	1		9	Half shaft oil seal	DAED342848	1	Special tools
2	oil level	DAED311943	1	1~1.5Nm	10	oil seals	DAED323145	1	Torque converter oil seal
3	Oil drain screw plug sub-assembly	DAED371230	1	35~40Nm					
4	Oil level check plug sub-assembly	DAED370759	1	8~10Nm	11	Solenoid valve, speed sensor, valve cover, etc.	—	—	Attachment 3
5	Gear Sensor	DAED354201	1						
6	bolt	DAED339673	2	10~12Nm					
7	Transmission screw plug assembly	DAED308187	1	28~32Nm					
8	Half shaft oil seal	DAED310299	1	Special tools					

Note: 1. Except for the parts listed in the above table, disassembly and replacement of other parts are prohibited.

2. Long and short half shaft oil seal replacement must use special tools to ensure that the oil seal installation depth, see Annex 1.

3. The transmission screw plug assembly is a perishable part and needs to be replaced during inspection and maintenance.

4. The oil drain screw plug sub-assembly, oil level check screw plug sub-assembly, and oil level gauge are wearing parts and need to be replaced during inspection and maintenance.

5. Torque converter replacement requirements:

1. When the powertrain is disassembled, ensure that the torque converter is on the transmission assembly when the transmission assembly is separated from the engine side.

2. For torque converter replacement, see Note 2 for operation method.

⊙ When removing, be careful not to damage the oil pump oil seal and not to let the torque converter slip;

⊙ When assembling, use a screwdriver to adjust the oil pump driving gear spline so that it is in the centre of the oil pump, and position the oil pump spline and TC spline groove against , to complete the TC assembly. Be careful not to scratch the oil pump oil seal during assembly.

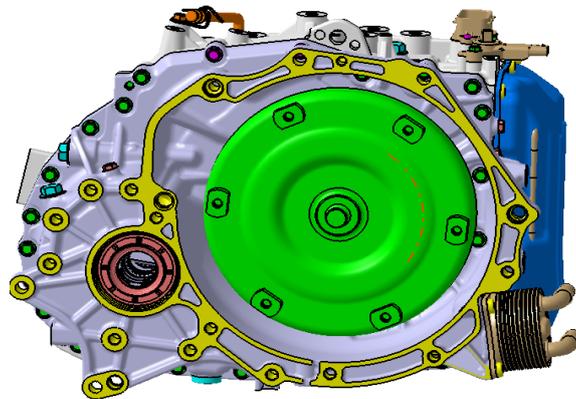
⊙ After assembly is completed, use calipers to measure the distance between the welded stud end face of the torque converter and the

Torque converter changeover method



1. Before placing the transmission assembly in an upright position and assembling the torque converter, check that the oil seal status of the oil pump meets the requirements, and clear the residual oil on the torque converter case.

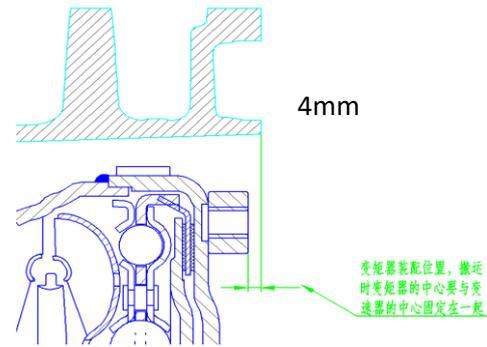
2. Select the torque converter model that corresponds to the transmission model.



3. Hold the torque converter shaft with your right hand and the torque converter drive nut with your left hand (available pre-installation of the fit bolts is easy to hold), and install the torque converter shaft slightly and slowly aligned with the oil seal hole.

4. When the torque converter shaft is installed inside the oil seal hole, hold the upper edge of the torque converter housing with both hands, use your thumbs to slowly rotate the torque converter, and force it forward into place. (Note: There is a dull rattling sound when it is in place)

When assembling the torque converter, if you use a method other than the one mentioned above, it is easy to cause the oil seal of the oil pump to break, and if you use brute force to assemble it, it is also easy to cause damage to the driving gear of the oil pump, which affects the performance and durability of the transmission.



Schematic diagram of torque converter installation and measurement

3.2 Transmission Repair Precautions

1. If the automatic transmission is damaged before disassembly, the cooling system will also be cleaned during disassembly and repair.
- 2, except for the parts listed in the table in the scope of repair, it is prohibited to disassemble and replace other parts.
- 3、 After the repair, note that the transmission shift handle and the vehicle shift cable should be fixed before confirming the N position.
- 4, bolt parts should be tightened according to the required tightening torque.
- 5、 When the transmission assembly is removed from the vehicle or needs to be transported, the torque converter and torque converter housing must be solidly connected together with the torque converter fixing plate.
- 6、 When the transmission is assembled with the engine, note that the torque converter and flexure plate must be assembled with bolts that meet the requirements.
7. The torque converter must be installed in the transmission before it is assembled with the engine.

3.3 Determination of Automatic Trans

When the transmission malfunction occurs, the fault information will be collected, the specific inspection items are shown in the table below, of which 1 to 26 items are checked at the same time for troubleshooting, if the fault still cannot be eliminated, please feed back the information table to the after-sales department of the car manufacturer in a timely manner, and then the car manufacturer will feed back to the after-sales department of the DAE, which will judge whether it is necessary to confirm the site or return to the factory for repair according to the specific situation, please tick in to the fault information for checking. Confirmation.

No.		Inspection items	Inspection results	instruction
1	Basic Information	transmission number		Automatic Transmission Number
2		engine number		engine number
3		Vehicle mileage		Meter shows actual mileage
4		Road conditions at the time of vehicle breakdown		Mountainous\Highway\Urban\Other
5		Vehicle travelling conditions for daily use		
6	warning message	Vehicle Dashboard Alarm Indicator Light	Oil temperature warning light <input type="checkbox"/> Fault light <input type="checkbox"/> MIL light <input type="checkbox"/> N gear blinking <input type="checkbox"/> No <input type="checkbox"/> Other <input type="checkbox"/>	Whether the vehicle has any alarm messages, whether the dashboard warning light is alerted, whether the TCU malfunction alert light is alerted, and whether any fault codes appear
7	TCU	Reading TCU fault codes		
		TCU fault code meaning confirmation		
		TCU data version number		
		TCU fault phenomenon		
8	ECU	Read ECU fault codes		
		ECU Fault Code Meaning Confirmation		

No.	Inspection items		Inspection results	describe	
9	change gear	Shifting gears with or without abnormal shocks	Normal shock <input type="checkbox"/> Abnormal shock <input type="checkbox"/>	Check for abnormalities in gear shifting, starting process, and fixed gear driving	
		Abnormal Shock Gear	N→D <input type="checkbox"/> D→N <input type="checkbox"/> N→R <input type="checkbox"/> R→N <input type="checkbox"/> 1→2 <input type="checkbox"/> 2→3 <input type="checkbox"/> 3→4 <input type="checkbox"/> 4→5 <input type="checkbox"/> 5→6 <input type="checkbox"/> 6→7 <input type="checkbox"/> 7→6 <input type="checkbox"/> 6→5 <input type="checkbox"/> 5→4 <input type="checkbox"/> 4→3 <input type="checkbox"/> 3→2 <input type="checkbox"/> 2→1 <input type="checkbox"/>		
		Operating sensation and force during gear shifting	Normal <input type="checkbox"/> Abnormal <input type="checkbox"/>		
		Abnormal vibration and shock during start-up.	Normal shock <input type="checkbox"/> Abnormal shock <input type="checkbox"/>		
		Is there any abnormal vibration or shock in the M stabilising gear	M1 <input type="checkbox"/> M2 <input type="checkbox"/> M3 <input type="checkbox"/> M4 <input type="checkbox"/> M5 <input type="checkbox"/> M6 <input type="checkbox"/> M7 <input type="checkbox"/>		
10	Appearance inspection	At half shaft oil seals (including half shafts)	Y <input type="checkbox"/> N <input type="checkbox"/>	1. Check for oil contamination, breakage, and oil leakage points. 2. Half-shaft splines for abnormal wear.	
11		Oil Drain Plug Assembly	Y <input type="checkbox"/> N <input type="checkbox"/>		
12		Transmission Engine Binding Face	Y <input type="checkbox"/> N <input type="checkbox"/>		
13		Transmission housing Torque converter housing bonding end face	Y <input type="checkbox"/> N <input type="checkbox"/>		
14		Valve Body Cover	Y <input type="checkbox"/> N <input type="checkbox"/>		
15		ventilator	Y <input type="checkbox"/> N <input type="checkbox"/>		
16		Mounting position of the oil cooling tube on the transmission side	Y <input type="checkbox"/> N <input type="checkbox"/>		
17		Oil cooler hose mounting position on the body side	Y <input type="checkbox"/> N <input type="checkbox"/>		
18		Appearance of other anomalies description			
19	ATF oil	Confirmation of ATF oil change	Replacement date and lubricant grade: Amount of ATF oil filled (L):	Check the maintenance information and ask the owner to confirm that the ATF oil is of the specified grade each time it is changed.	
		Confirmation of mixtures in ATF oil	Fine particulate matter <input type="checkbox"/> Lumpy particles <input type="checkbox"/> Other anomalies:	Describe the mixing of debris in ATF oils	
		Observe the colour of the ATF oil coming out of the drain screw plug mounting hole when draining the oil.	colour	Dark yellow <input type="checkbox"/> Black <input type="checkbox"/> Red <input type="checkbox"/> Others <input type="checkbox"/>	When filling the ATF fluid, beware of foreign objects falling into the automatic transmission.
			odours	Paste <input type="checkbox"/> Stench <input type="checkbox"/> Others <input type="checkbox"/>	
oil quantity					
20	Sensor and wiring harness inspection	gear switch	AT <input type="checkbox"/> / Loose <input type="checkbox"/> Waterlogged <input type="checkbox"/> Rusted <input type="checkbox"/> Deformed <input type="checkbox"/> No <input type="checkbox"/>	Check the body-side and transmission-side senso+AA749,C749:BF856r and wiring harness part interfaces for looseness, water accumulation, and pins for rust and deformation.	
21		TCU Wire Harness Connectors	AT <input type="checkbox"/> / Loose <input type="checkbox"/> Waterlogged <input type="checkbox"/> Rusted <input type="checkbox"/> Deformed <input type="checkbox"/> No <input type="checkbox"/>		

4. Self-learning operations required after replacing the automatic transmission

4.1 Self-learning value clearing

If the whole machine, gear sensor or TCU is needed due to transmission failure or other reasons, then it is necessary to clear the TCU self-learning value in the whole vehicle and carry out the TCU self-learning operation, the operation method is as follows:

1. clear the TCU internal self-learning value through the diagnostic instrument under the condition of powering on the keygate and engine not firing;
2. carry out the self-learning operation in accordance with the stipulated working condition until the transmission shifting feels good without impact.

4.2 Self-learning method of upshifting

4.2.1 Vehicle stationary, step on the brake, operate the gear lever into D, release the brake, step on the gas pedal (about 20% of the gas pedal opening), go up to 5th gear, release the gas pedal; lightly step on the brake (brake pedal pressed in 10%~20%), coasting until the vehicle stops; repeat the operation 2 times.

4.2.2 Vehicle stationary, step on the brake, operate the gear lever into D, release the brake, step on the gas pedal (throttle opening about 40%), go up to 5th gear, release the gas pedal; lightly step on the brake (brake pedal pressed in 10%~20%), coast until the vehicle stops; repeat the operation 2 times.

4.2.3 Vehicle standing still, step on the brake, operate the gear lever into D, release the brake, step on the gas pedal (throttle opening about 60%), go up to 5th gear, release the gas pedal; lightly step on the Brake (brake pedal into 10% ~ 20%), coasting to vehicle stop; repeat the operation 2 times.

4.3 Starting self-study

4.3.1 D-speed starting self-study

Vehicle idling, in-situ brakes deep, operate the shift lever into D, release the handbrake, release the brakes, and so the vehicle starting speed reaches 5km/h, brakes from light to deep into the brakes until the vehicle stops, stop to hold 2 seconds, the above is a set of actions

4.3.2 R gear start self-learning

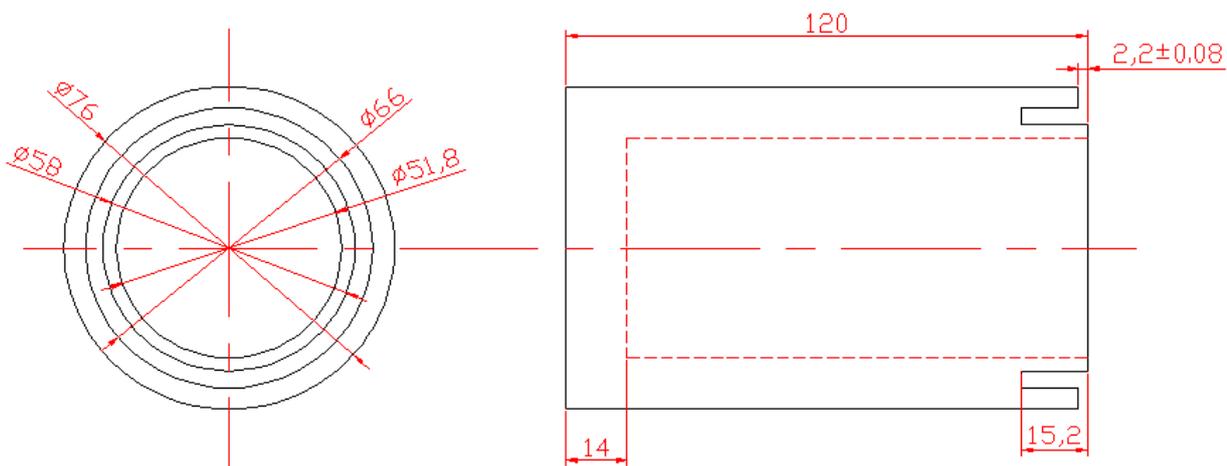
Vehicle idling, in situ brake deep, operate the shift lever into the R gear, release the handbrake, release the brake, such as the vehicle start speed reaches 5km/h, the brake from light to deep into the vehicle until the vehicle stops, before stopping to hold for 2 seconds, the above is a set of actions, repeated 5 times in a row.

4.4 Gear sensor self-learning

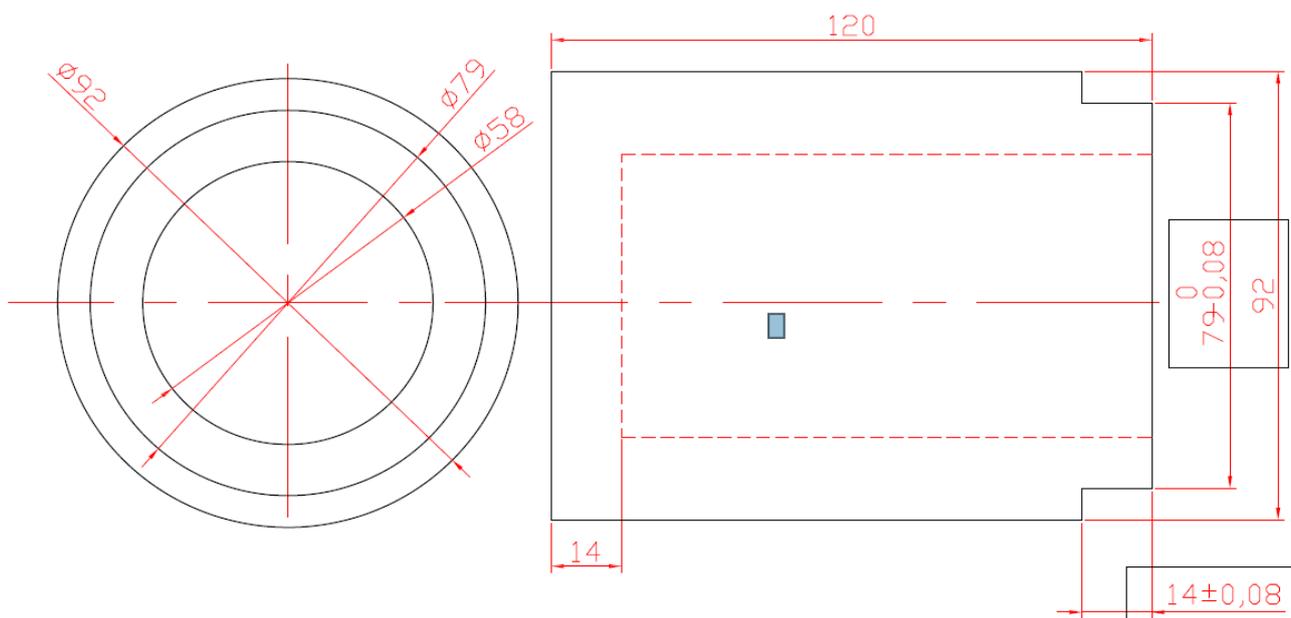
self-learning conditions: ① the entire vehicle Power on ② P gear ③ engine does not start ④ speed is 0 ⑤ gear sensor no electrical fault operation: after-sales service gear sensor, adjust the gear sensor for P gear, according to the self-learning conditions to prepare the vehicle state, with diagnostic equipment to perform gear self-learning.

1、 Oil Seal Repair Tools

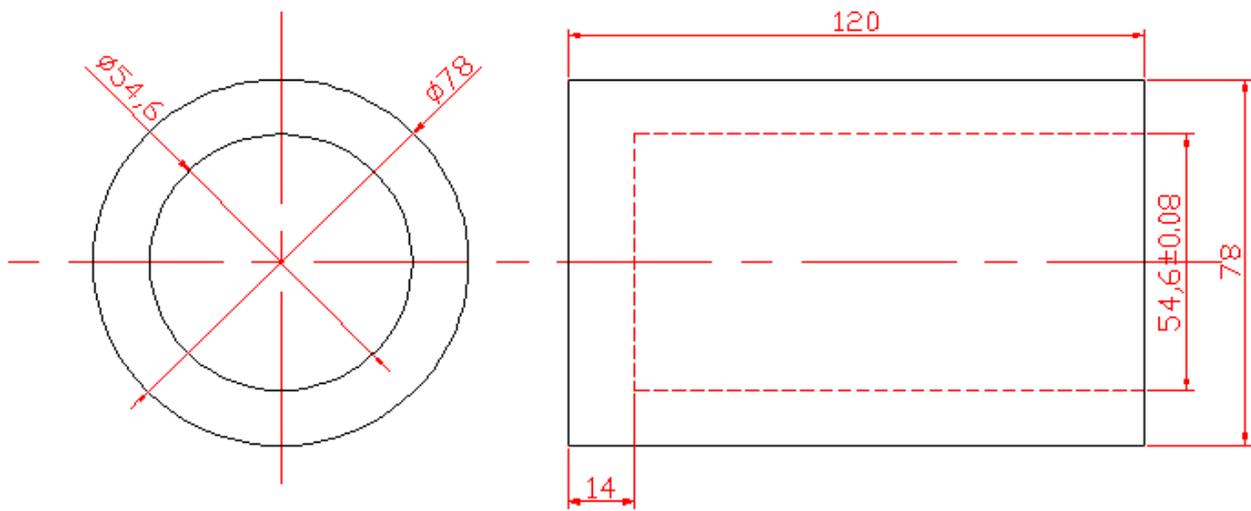
1.1 Short Half Shaft Oil Seal Repair Kit



1.2 Long Half Shaft Oil Seal Repair Kit



1.3 Torque converter oil seal repair tooling



2、 Oil Seal Installation Operation Instruction

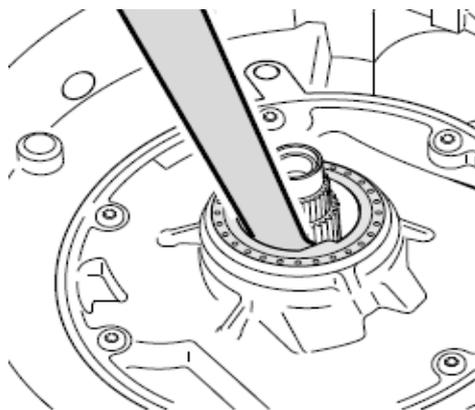
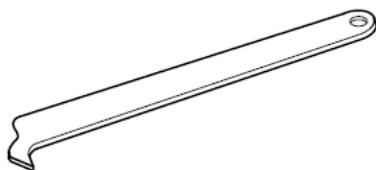
1、 Disassembly and installation

Tools needed:

- 1) Oil seal tooling

According to the repair location, use the special tooling to carry out the repair.

- 2) Pry bar



Disassembly

Pry out the oil seal with a pry bar or similar tool. Note: Do not damage the rest of the internal parts when removing the oil seal.

Installation

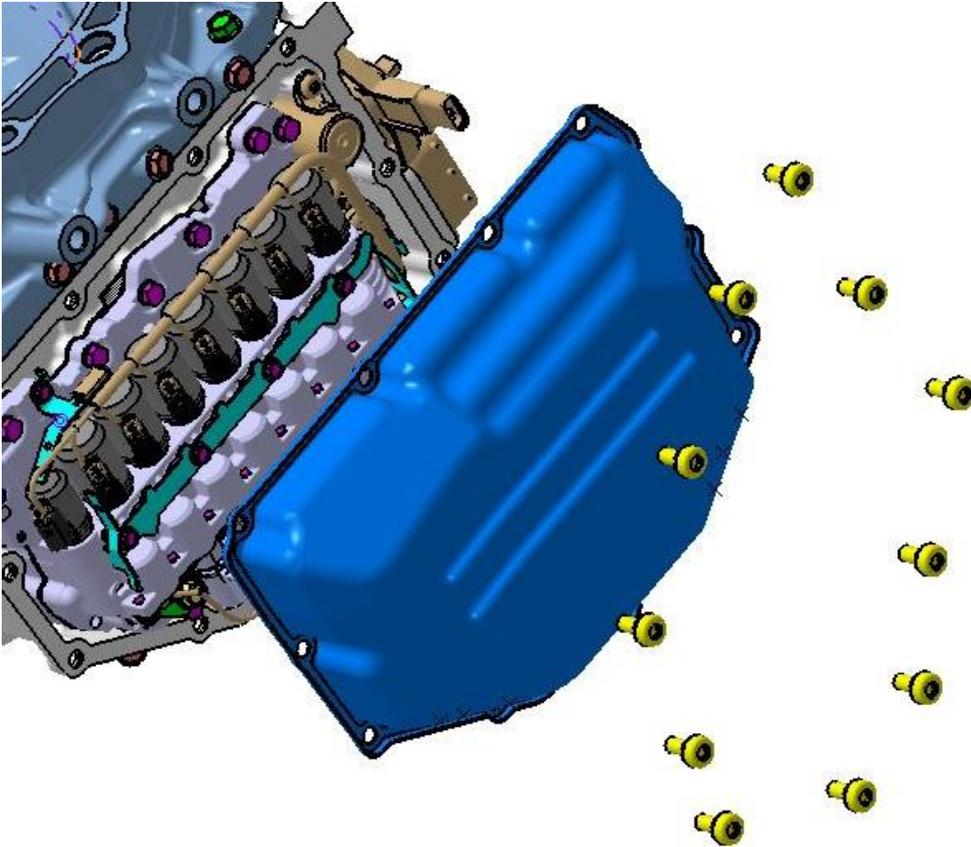
--- Apply ATF or grease to the sealing lip of the oil seal (no need to reapply grease if the lip comes with grease) --

- Pre-press the oil seal into the mounting holes as straight as possible by hand. ---Left half shaft: press in to the limit position with the special press-in tooling (tooling limit), the oil seal must not be skewed. --- Right half shaft: Press in to the limit position with the special press-in tooling (tooling limit), the oil seal must not be skewed. Press the oil seal flat with the oil seal tooling.

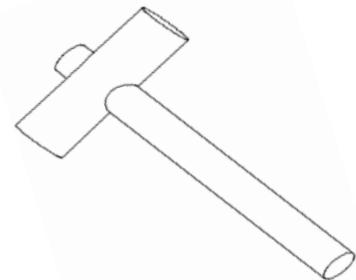
3、 Valve Body Assembly Repair

3.1 Valve body cover disassembly

No.	Name	part number	amount	note
1	Valve Body Cover	DAED320809	1	
2	Bolt	DAED311413	11	20~25Nm



Valve cover disassembly: 1. Remove the valve cover mounting bolts, tool T45. 2. Tap the valve cover with a rubber mallet to separate it from the shell, and then disassemble the valve cover. 3. Do not disassemble it violently, so as not to cause damage to the internal parts. 4. Precautions for valve cover installation: clean the residual sealant on the shell before installation, it is recommended to use “wallpaper cutter” and other tools to install the sealing surface of the valve cover should be coated with “Berson 3591” before installation, and then install the valve cover by aligning the bolt holes, and tighten the bolts diagonally .



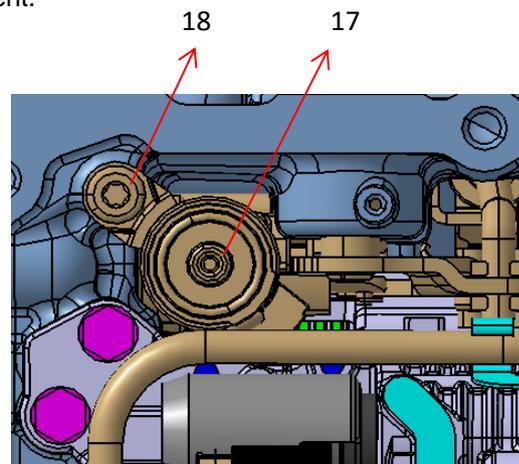
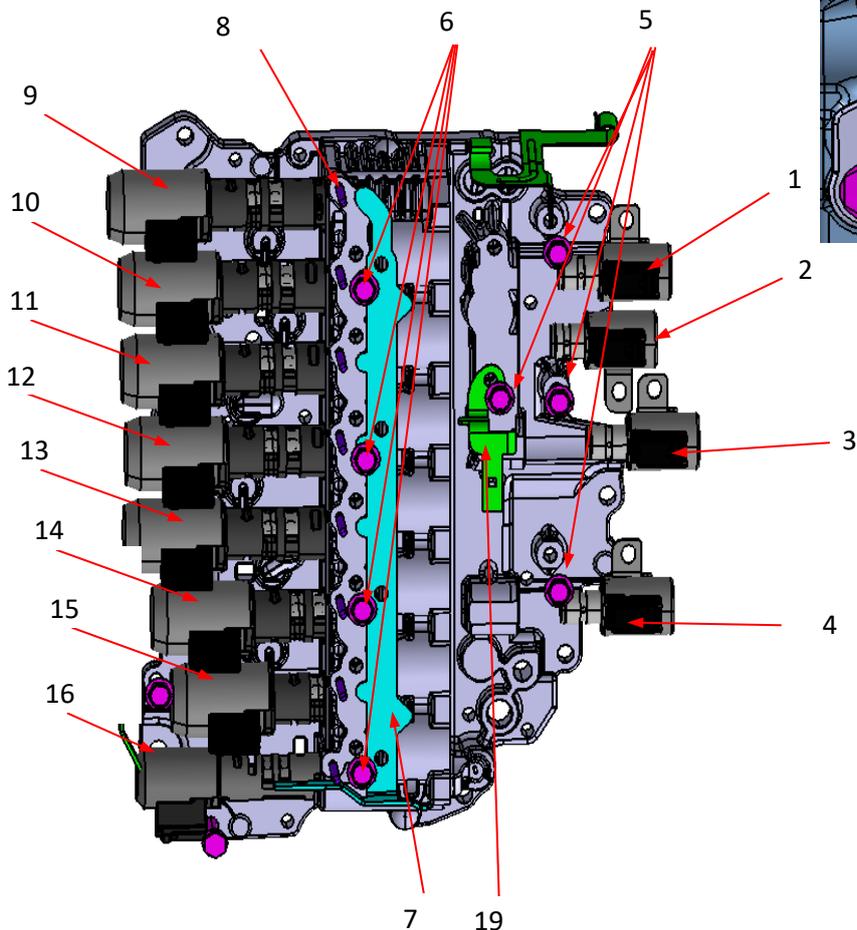
Translated with DeepL.com (free version)

3.2 Replacement of solenoid valve

No.	Name	part number	amount	note
1	Solenoid valve S5	DAED338743	1	
2	Solenoid valve S4	DAED325325	1	
3	Solenoid valve S3	DAED338743	1	
4	Solenoid valve S1	DAED357838	1	
5	Bolt	DAED330096	4	8~10Nm
6	Bolt	DAED330096	1	
7	Bracket	DAED390290	1	
8	Needle roller	DAED328683	8	
9	SLTC	DAED390499	1	
10	B1	DAED390721	1	
11	B2	DAED390721	1	
12	C4	DAED390721	1	
13	C3	DAED390721	1	
14	C2	DAED390721	1	
15	C1	DAED390721	1	
16	SLT	DAED390908	1	
17	parking Solenoid Val	DAED390186	1	
18	Bolt	DAED390507	1	10~12Nm
19	Bracket	DAED390007	1	

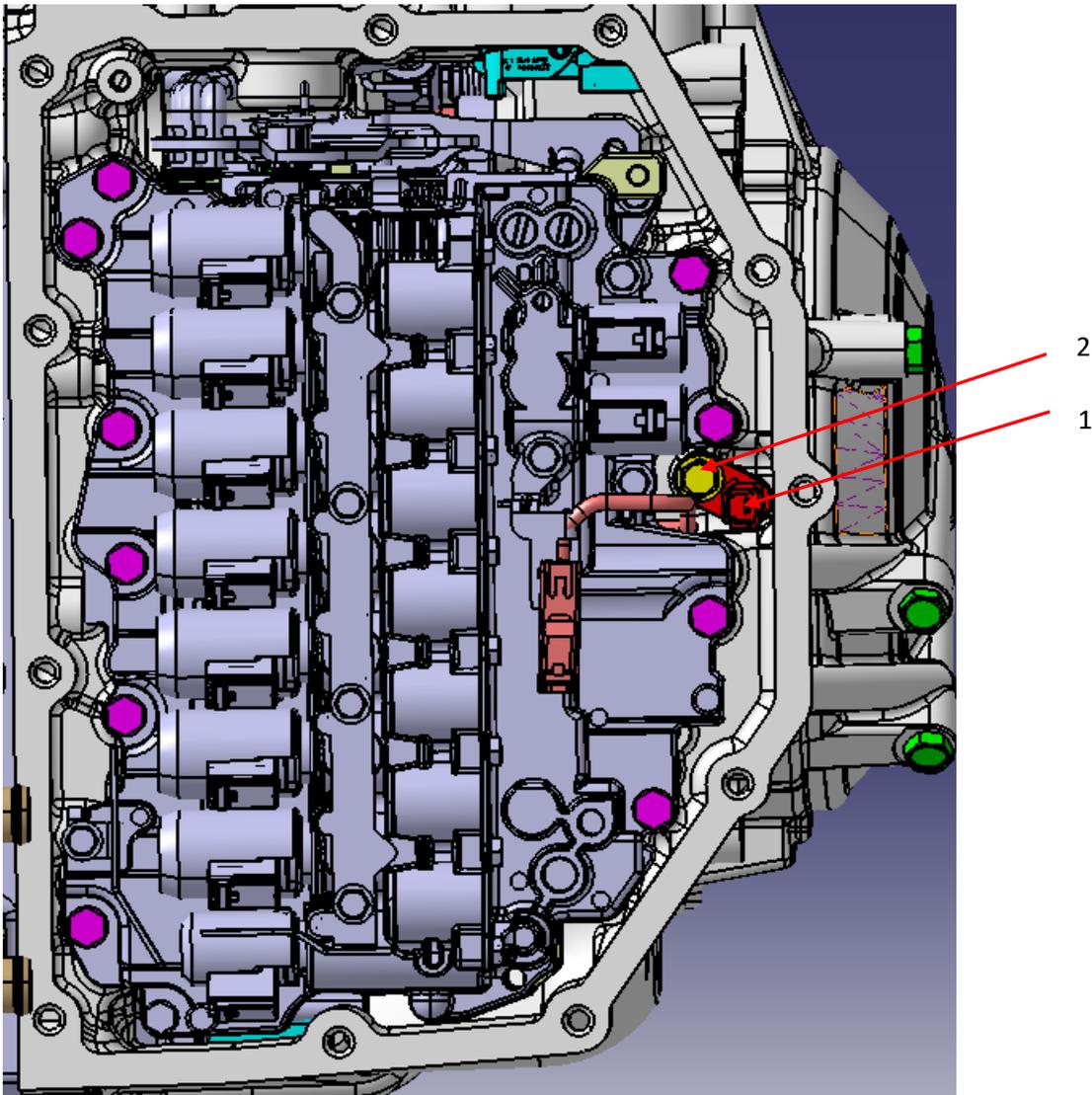
Solenoid valve disassembly method

1. solenoid valve serial number 1 to 4 solenoid valve disassembly, remove the solenoid valve mounting bolts, gently pull out the solenoid valve, for replacement.
2. serial number 9 to 16 solenoid valve disassembly, it is necessary to remove the bracket 7, with a magnet to suck out the rolling pin 6, gently pull out the solenoid valve, for replacement.
3. replacement of solenoid valve No. 17, remove solenoid valve mounting bolts (M6 inner hexagonal flower T30), gently pull out the solenoid valve, for Replacement.



3.3 Input Speed Sensor Replacement

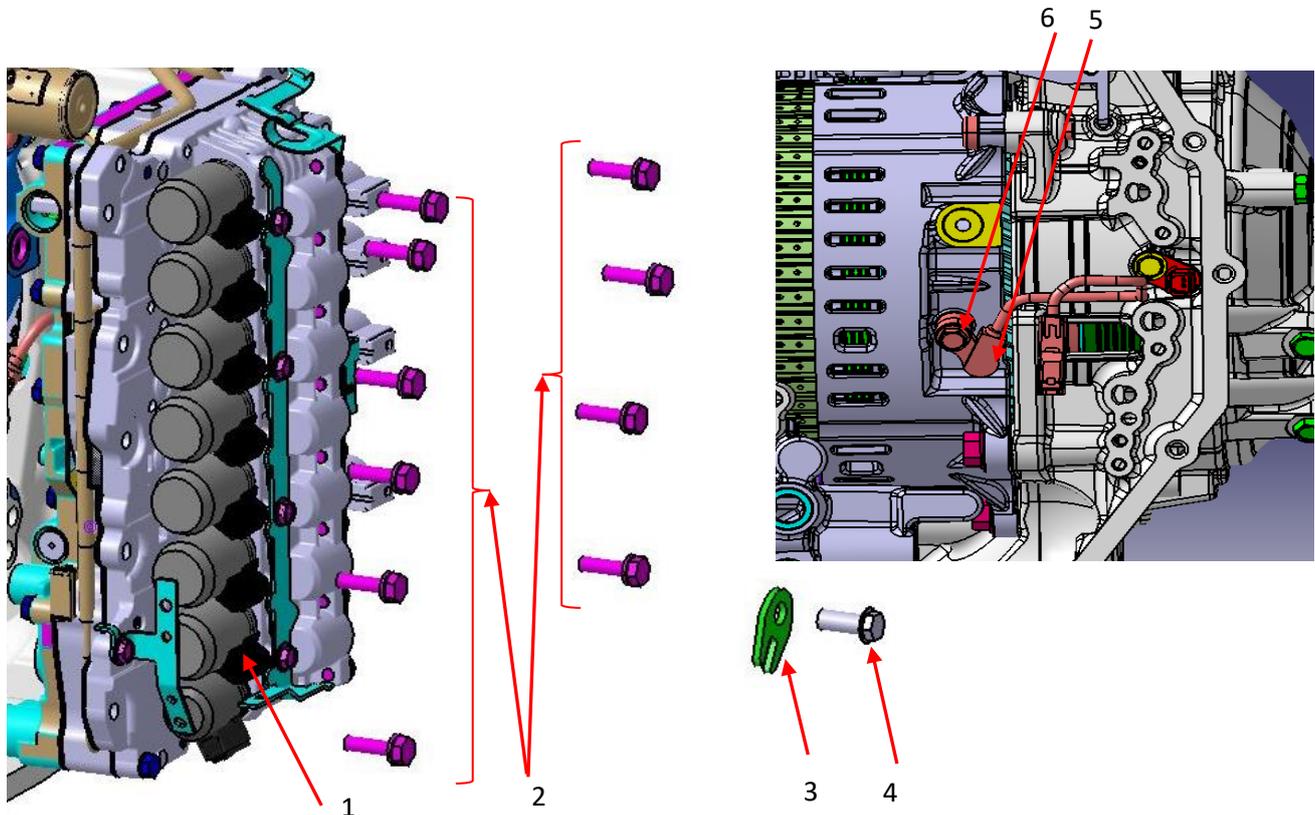
No.	Part Name	Name	Amount	Check specifications
1	DAED349093	Input speed sensor	1	
2	DAED338103	Bolt	1	Tightening torque of 10-12Nm



Note: Replacement of the output speed sensor requires removal of the valve body assembly, and replacement of the input speed sensor can be done by removing the valve body cover.

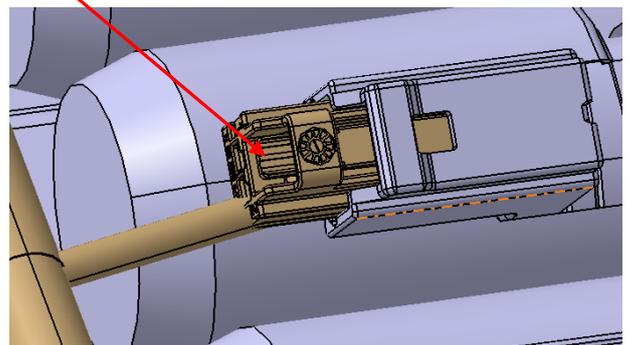
3.3 Input Speed Sensor Replacement

No.	Part Name	Name	Quantity	Inspection Specification
1	—	Valve Body Assembly	—	—
2	DAED318478	Bolt	10	Tightening torque of 10~12Nm
3	DAED390083	Oil temperature sensor bracket	1	—
4	DAED304850	Bolt	1	Tightening torque of 20~25Nm
5	DAED390564	Output Speed Sensor	1	—
6	DAED338103	Bolt	1	Tightening torque of 10~12Nm



DISASSEMBLY STEPS:

1. Disassemble the bolts (serial number 2), totaling 10.
2. Disassemble each solenoid insert as shown in the right figure to separate the wiring harness from the valve body. (Press the arrow position and gently pull the harness outward)



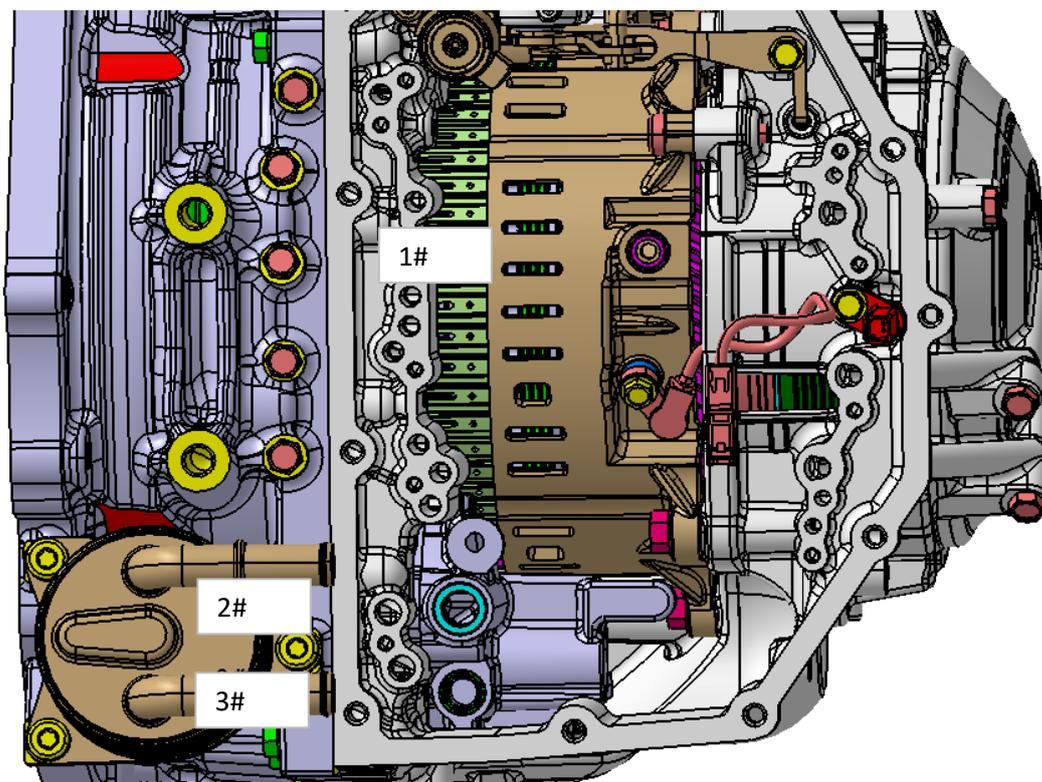
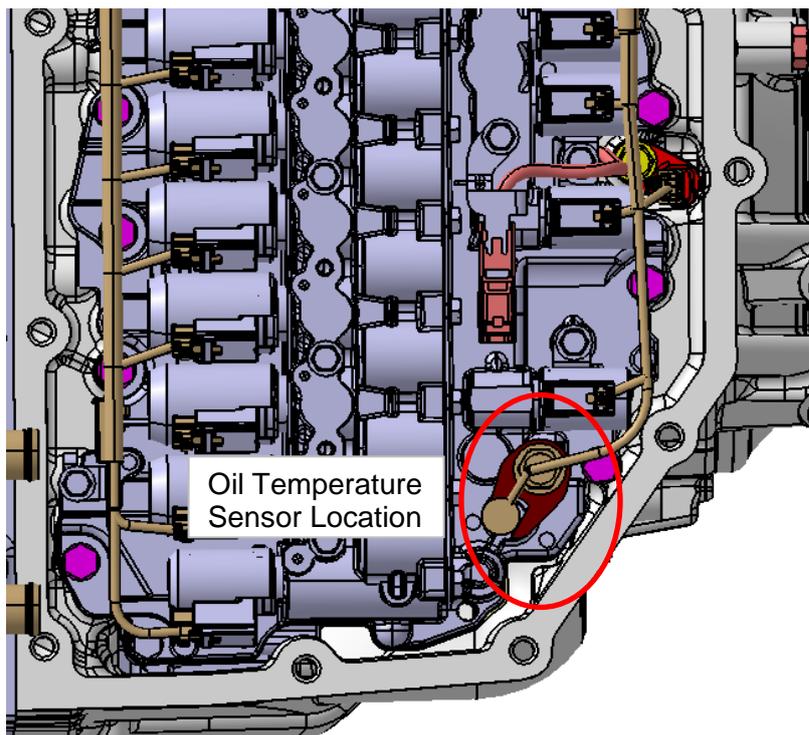
3.3 Output speed sensor

replacement

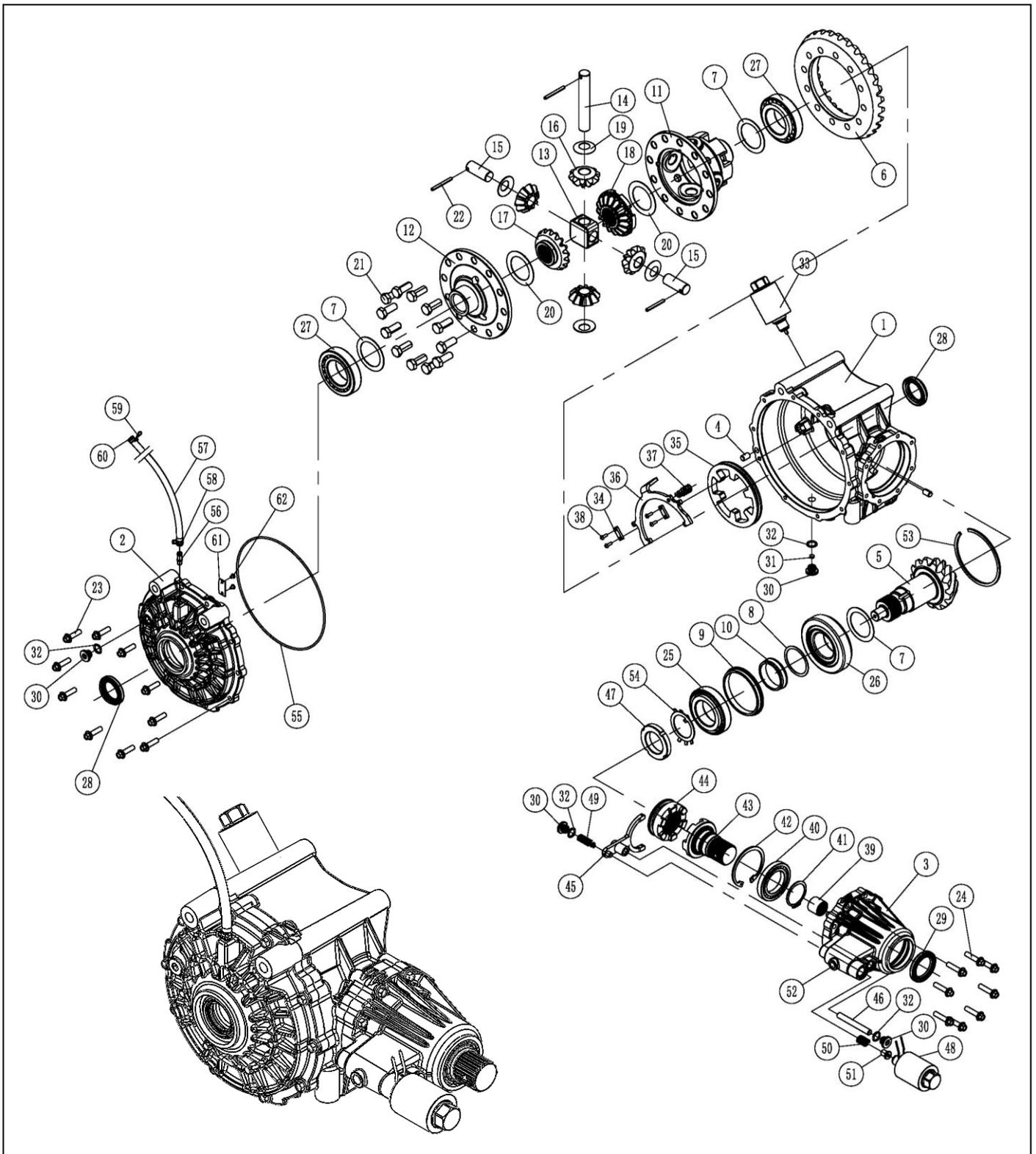
3. Disassemble bolt No. 4 to separate the oil temperature sensor from the valve body. (The position is shown on the right.)

4. Disassemble bolt #6

5. Replacement of output speed sensor Note: During disassembly and assembly, be careful not to drop any parts. The following figure 1#, 2# (inside and outside the two oil seals), 3# oil seals are easy to fall parts, installation, such as falling, it is recommended to apply a small amount of grease.



FRONT AXLE DIAGRAM



PART LIST

No	Part number	Part name	QTY	size	Torque N.m	Torque kgf.m	Torque ft.lb	Remark
1	2000S-SG-Q-B00101	Case box	1					
2	2000S-SG-Q-B00102	Case cover	1					
3	2000S-SG-Q-B00103	Bearing cover	1					
4	2000S-SG-Q-000104	pin	2	φ10×16				
5	2000S-SG-Q-B00201	Drive gear	1	13 gear				
6	2000S-SG-Q-B00202	Driven gear	1	30 gear				
7	Q401B500680040	Shim	On demand	φ50×φ68×0.4				
	Q401B500680050	Shim	On demand	φ50×φ68×0.5				
	Q401B500680060	Shim	On demand	φ50×φ68×0.6				
	Q401B500680070	Shim	On demand	φ50×φ68×0.7				
8	Q401B505600040	Shim	On demand	φ50.5×φ60×0.4				
	Q401B505600045	Shim	On demand	φ50.5×φ60×0.45				
	Q401B505600050	Shim	On demand	φ50.5×φ60×0.5				
	Q401B505600060	Shim	On demand	φ50.5×φ60×0.6				
	Q401B505600070	Shim	On demand	φ50.5×φ60×0.7				

9	2000S-SG-Q-000801	Sleeve	1	$\phi 82 \times \phi 95 \times 11$				
10	2000S-SG-Q-000802	Sleeve	1	$\phi 50 \times \phi 60 \times 14$				
11	2000S-SG-Q-B00301	Differential housing	1					
12	2000S-SG-Q-B00302	Differential cover	1					
13	2000S-SG-Q-000303	Planetary bracket	1	46×46×28				
14	2000S-SG-Q-000304	Planetary gear long shaft	1	$\phi 20 \times 142$				
15	2000S-SG-Q-000305	planetary gear, Short shaft	2	$\phi 20 \times 50$				
16	2000S-SG-Q-000306	planetary gear	4					
17	2000S-SG-Q-000307	Left half shaft gear	1					
18	2000S-SG-Q-000308	Right half shaft gear	1					
19	2000S-SG-Q-000310	Planetary gear gasket	4	$\phi 20 \times \phi 40 \times 1$				
20	Q401B470680090	Shim	On demand	$\phi 47 \times \phi 68 \times 0.9$				
	Q401B470680100	Shim	On demand	$\phi 47 \times \phi 68 \times 1$				
	Q401B470680110	Shim	On demand	$\phi 47 \times \phi 68 \times 1.1$				
	Q401B470680120	Shim	On demand	$\phi 47 \times \phi 68 \times 1.2$				
21	Q151B1230T32F38	Hex bolt	12	M12×1.25×30	140	14	190	
22	Q5280545	Pin	3	$\phi 5 \times 45$				
23	1000U-08-H-030107	Hex bolt	10	M8×1.25×30	26	2.6	35.3	
24	Q1820835T8F39-	Hex bolt(A	8	M8×35	26	2.6	35.3	

	T1	grade)						
25	30210-RB	Bearing 30210	1	φ50×φ90×20				
26	31310-RB	Bearing 31310	1	φ50×φ110×29.2 5				
27	32210-RB	Bearing 32210	2	φ50×φ90×24.75				
28	1000A-SG-Q- 030107	Oil seal	2	φ38×φ55×7.5 (11.5)				G
29	1000U-08-Q- 030102	Oil seal	1	φ42×φ60×7				G
30	1000A-SG-Q- 030105	plug	4	M14×1.5×9	18	1.8	24.4	
31	CT010803	magnet steel	1	φ8×3				
32	1000A-SG-Q- 030114	O- ring	4	φ13.8×φ2.5				G
33	D02-12-1883-060	solenoid valve	1	Stroke 6mm	35	3.5	47.5	
34	2000S-SG-Q- 000402	Fork plate	2					
35	2000S-SG-Q- 000403	Differentia l lock sleeve	1					
36	2000S-SG-Q- 000404	Differentia l lock fork	1					
37	2000S-SG-Q- 000405	Differentia l lock reset spring	1					
38	2000S-SG-Q- 000407	Screw	4	M4×12	2.5	0.25	3.4	
39	NK202823	Bearing NK20282 3	1	φ20×φ28×23				G
40	16009-RB	Bearing 16009	1	φ45×φ75×10				G
41	Q43145	Circlip	1	d0=45				
42	Q43075	Circlip	1	d0=75				
43	2000S-SG-Q- B00501	Input shaft	1					
44	2000S-SG-Q- 000502	Sliding sleeve	1					

45	2000S-SG-Q-000503	4WD Lock	1					
46	2000S-SG-Q-B00504	4WD Fork shaft	1	$\phi 10 \times 80$				
47	2000S-SG-Q-000506	Nut, drive gear	1	M45×1.5	500	50	677.9	L
48	D02-12-1883-100	solenoid valve	1	Stroke 10mm	35	3.5	47.5	
49	2000S-SG-Q-009507	4WD spring	1	$\phi 1.1 \times \phi 11 \times 40$				
50	2000S-SG-Q-009508	2WD spring	1	$\phi 1.5 \times \phi 12 \times 25$				
51	2000S-SG-Q-000401	Spring sleeve	1					
52	2000S-SG-Q-000604	Plug	1					
53	2000S-SG-Q-000701	Ring	1	$\phi 116 \times 3$				
54	2000S-SG-Q-000702	Shim	1	45				
55	2000S-SG-Q-B00611	O-ring	1	$\phi 215 \times \phi 3$				G
56	0700A-00-Q-030104	Vent	1					
57	TQG711-H	Vent hose	600	$\phi 7 \times \phi 11$				
58	0800U-00-H-030607	Clamp	1					
59	0700A-00-H-030503	clamp spring	1					
60	0700A-00-H-030504	Plug	1					
61	0450A-SG-0H-030118	Plate	1					
62	0450A-SG-0H-030119	Screw	2	M4×6	2	0.2	2.7	

Remark:

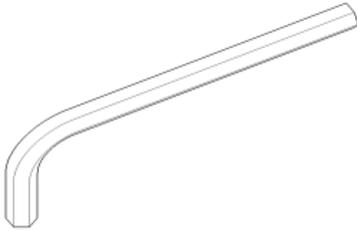
- G: Apply grease for oil seal and O-ring.
- L: Apply a non-permanent locking agent.
- O: Apply gear oil(SAE 80W/90/GL-5级).
- SS: Apply silicone sealant.
- R: Replacement Parts.

TECHNICAL SPECIFICATIONS

Item	Standard	Service Limit
lubrication oil	SAE 80W/90/GL-5	
Oil adding position	Side of case(Plug M14)	
	Bottom of case(Plug M14)	
Oil filling volume	600 mL (0.57 US qt) (no oil after internal cleaning)	
Drive and driven gear gap	550 mL (0.52 US qt) (only replace gear oil)	
Differential gear gap	0.15~0.25 mm(0.006~0.010 in.)	
	0.10~0.3 mm(0.004~0.010 in.)	

SPECIAL TOOLS

allen key 2.5mm、8mm



Hexagon socket wrench 10、18mm



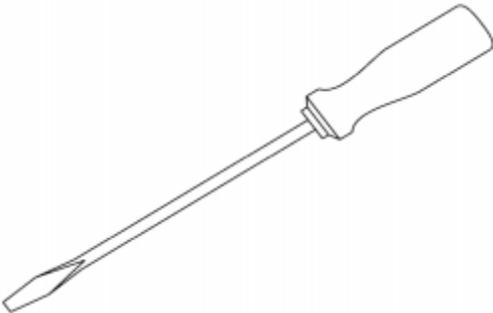
Internal clamp pliers



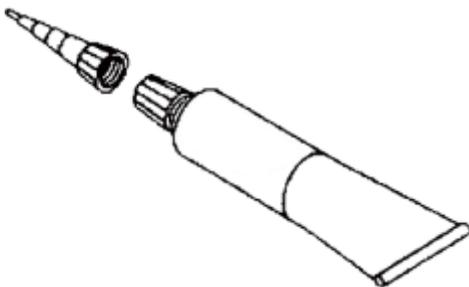
External clamp pliers



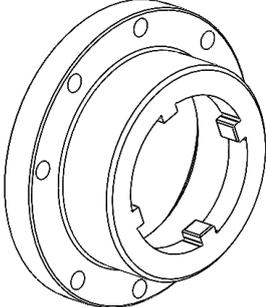
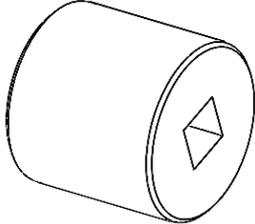
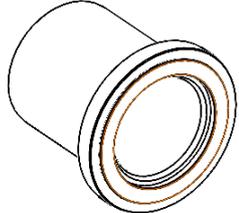
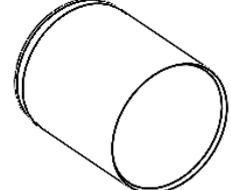
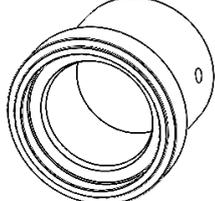
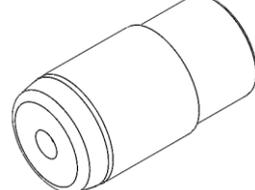
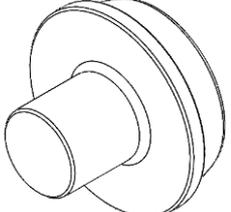
Large flat screwdriver 300mm



Silicone rubber flat sealant



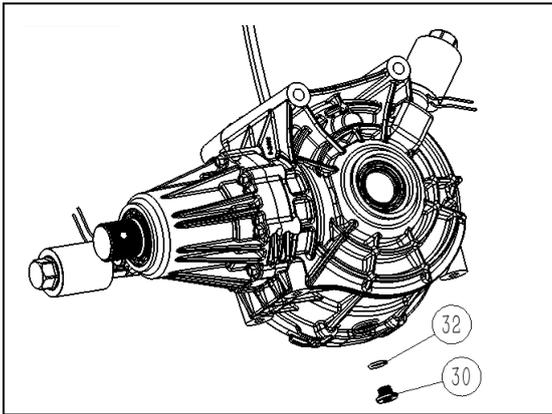
Thread locking agent 271、272

photo	Name and part number	Usage
	Name: nut fastening plate Part number: ZX-2000S-Q-000201-01A	disassembly and assembly
	Name: nut locking spline sleeve Part number: ZX-2000S-Q-000201-01B	disassembly and assembly
	Name: input oil seal installation tool Part number: ZX-2000S-Q-030008-01A	assembly
	Name: input oil seal installation sleeve Part number: ZX-2000S-Q-000501-02A	assembly
	Name: output oil seal installation sleeve Part number: ZX-2000S-Q-030107-03A	assembly
	Name: output oil seal pin Part number: ZX-2000S-Q-030107-02A	assembly
	Name: Bearing installation tool Part number ZX-2000S-Q-000101-02A	assembly

GEAR OIL CHANGE

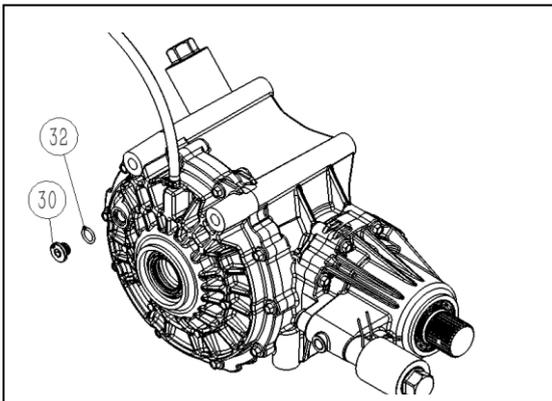
**WARNIN**

Operating a vehicle with insufficient, degraded, or contaminated gear oil can result in accelerated wear and can lead to gearbox damage, accidents, and personal injury.



Drain old gear oil

- ◆ Tool: 8mm Allen key
- ◆ Screw out the 32 counterclockwise, let the old gear oil flow out for 10 minutes (oil drain process, the oil drain port is placed at the lowest point), after the end of the oil drain will be 30 sets of 32 threaded end, clockwise tightening, will be spilled around the gear oil wipe clean.
- ◆ Please dispose of used gear oil in an environmentally friendly manner and take care of the environment.



Add new gear oil

- ◆ Tool: 8mm Allen key
- ◆ Unscrew 30 by turning it counterclockwise, add a dosage of new gear oil, then set 32 with the 30 threaded end, tighten it clockwise, and wipe up any spilled gear oil around it.

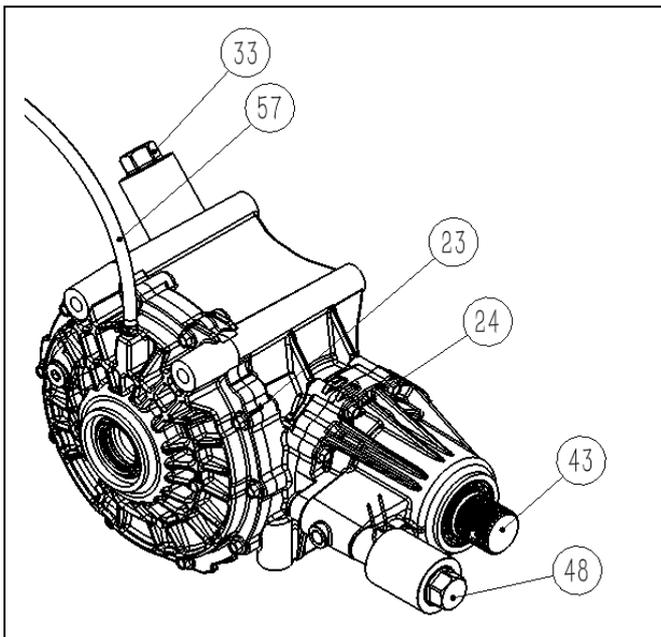
**CAUTION**

Check the O-ring during installation. Damage to the O-ring will result in poor sealing and leakage of gear oil, which will increase wear inside the gearbox and ultimately lead to damage to the gearbox, so replace the damaged O-ring promptly.

ROUTINE INSPECTION

**WARNIN**

Failure to replace abnormal parts in a timely manner will result in abnormal wear of other parts and an increase in the overall temperature of the gearbox, resulting in a shorter service life.

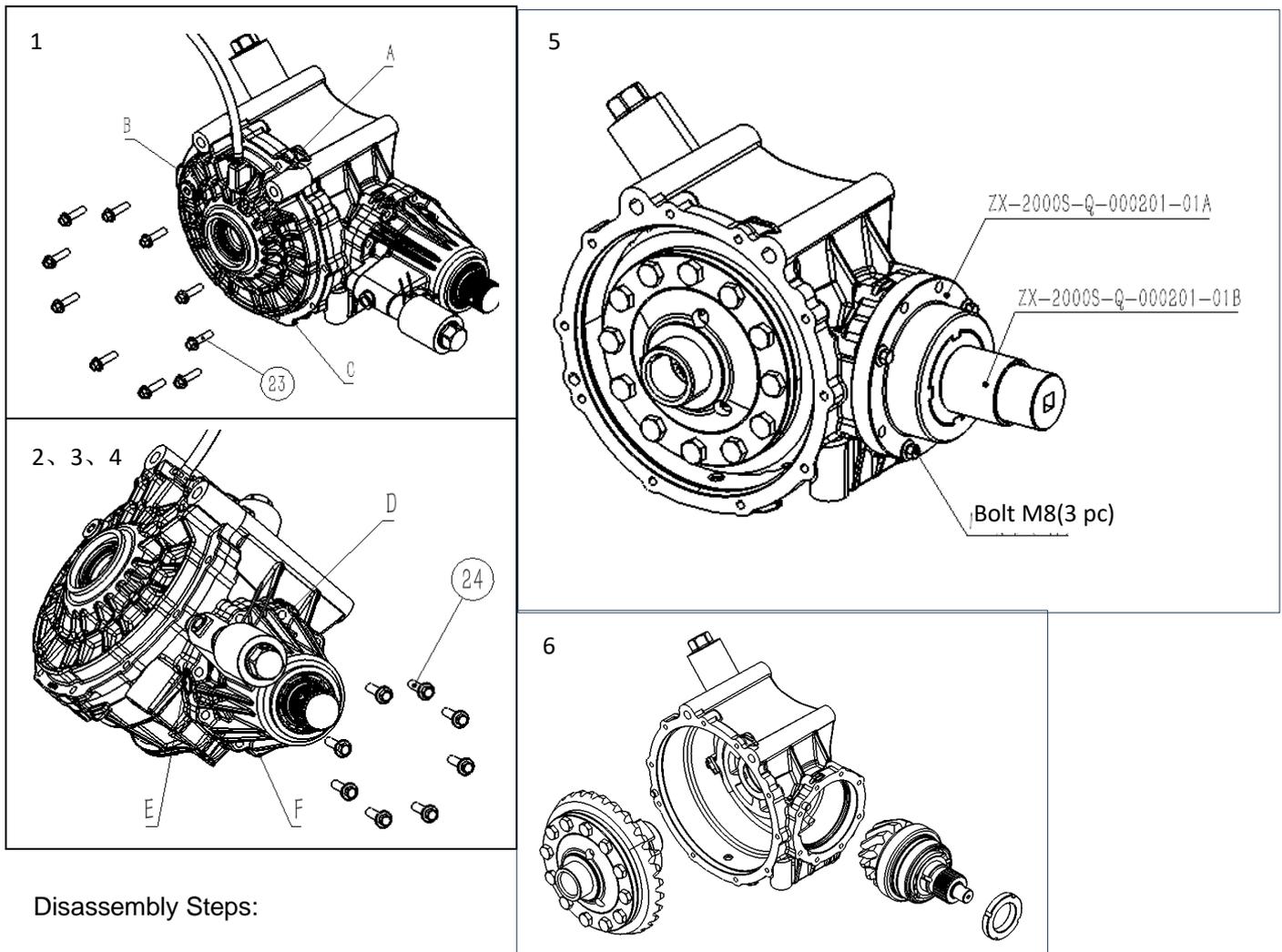


- ◆ Check item 1:
Rotate the input shaft 43, it should rotate evenly, with even damping, without abnormal sound and jamming, pull the input shaft 43, without obvious axial looseness and strange noise
- ◆ Check item 2:
Closed box surface, oil seal without oil leakage
- ◆ Check item 3:
Pieces 23, 24, 33, 48 not loose, 57 not broken
- ◆ Check item 4:
No cracks in the shell, no deformation or rupture of the mounting holes.

OPEN BOX INSPECTION



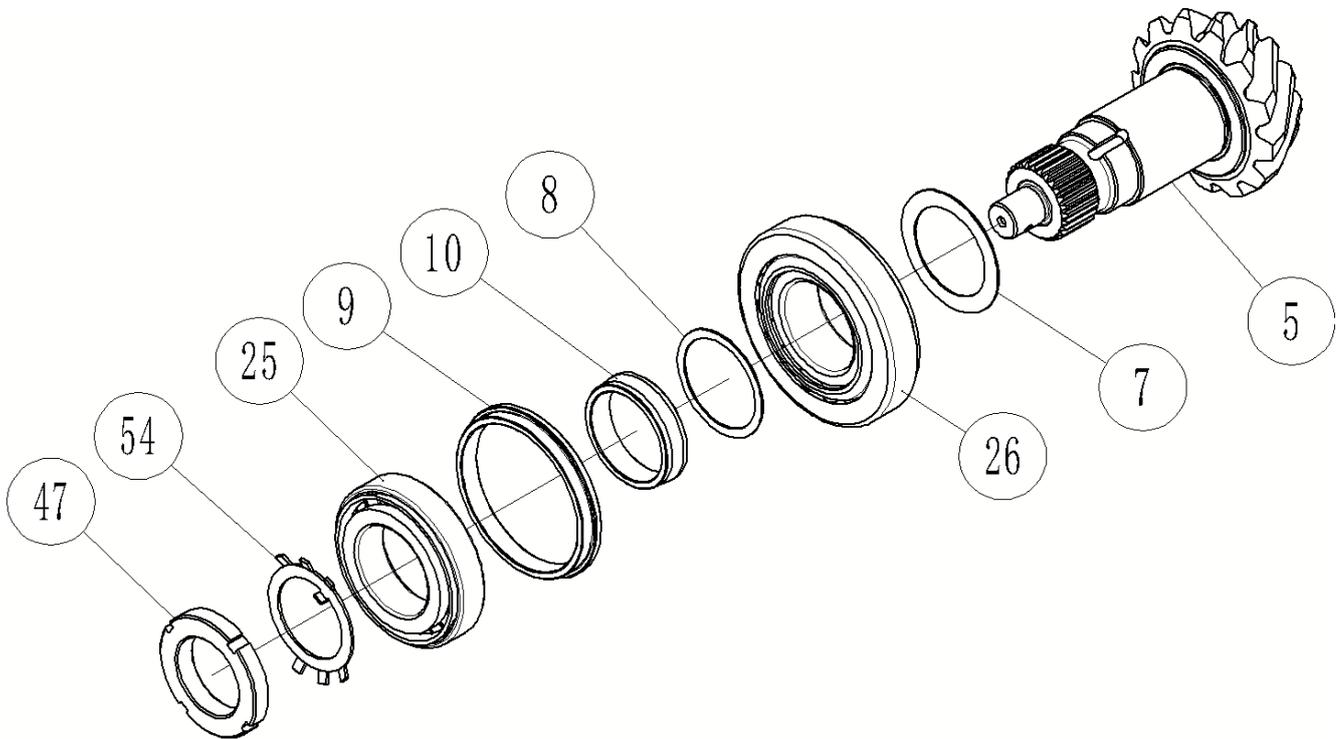
- ◆ Avoid opening the box if you are not sure of the internal faults.
- ◆ The operation should be guided by professional personnel before opening the box, unstandardized operation will lead to shorten the life of the front axle, and in serious cases, will lead to scrap and can not be used.



Disassembly Steps:

1. Remove part 23 with a 10mm hexagonal socket wrench.
2. Remove part 24 with a 10mm hexagonal socket wrench.
3. Tap or pry on points A, B and C in turn until the box is opened.
4. Tap or pry on points D, E and F in turn until the box is opened.
5. Set the tooling ZX-2000S-Q-000201-01A into the active tooth bearing, and lock it with no less than 3 pieces 24, then set the tooling ZX-2000S-Q-000201-01B, and screw the tooling ZX-2000S-Q-000201-01B in the counterclockwise direction.
6. The disassembled parts are shown in Fig. 6

REMOVAL OF MAIN GEAR ASSEMBLY



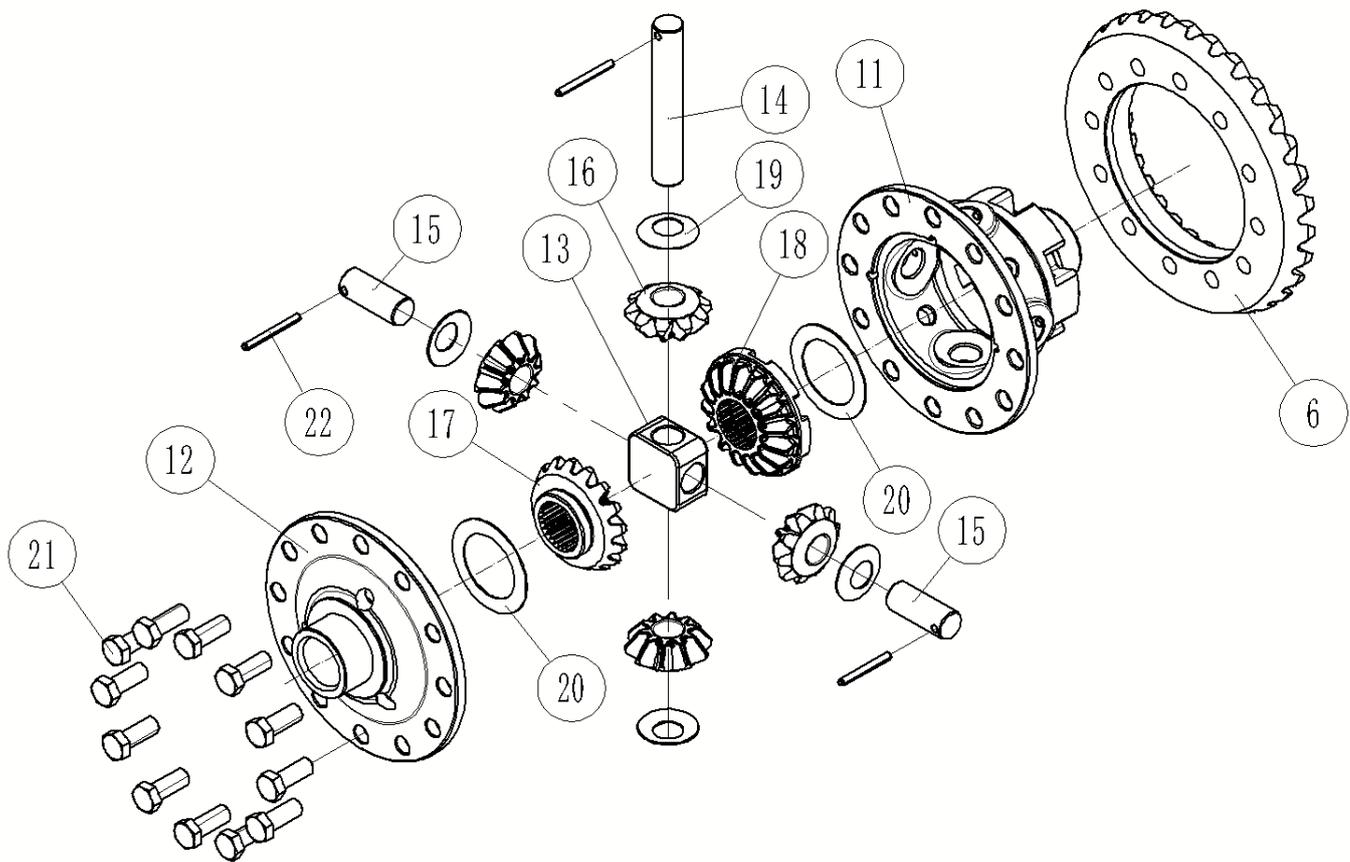
Disassembly Steps:

1. Remove part 47 with special tooling.
2. After removing part 54, remove the other parts as shown in the figure.

**CAUTION**

Before disassembling and assembling, check whether there is any looseness in piece 47, looseness is abnormal and needs to be tightened.

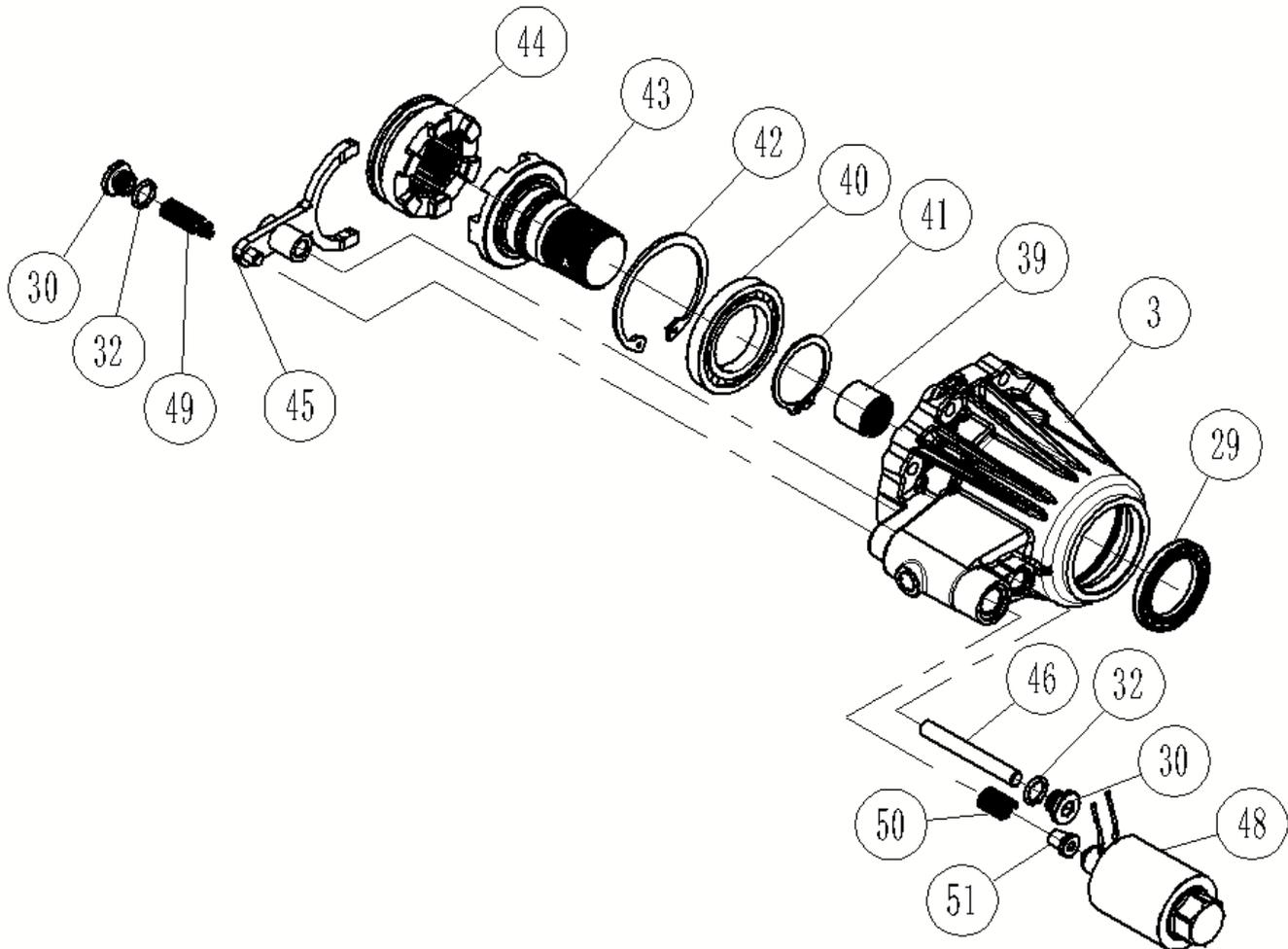
DIFFERENTIAL ASSEMBLY REMOVAL



Disassembly Steps:

1. Remove part 21 with an 18mm hex socket wrench.
2. Separators 11 and 12
3. Remove part 22 from part 11
4. Take out pieces 14 and 15 in turn.
5. Then remove the other pieces

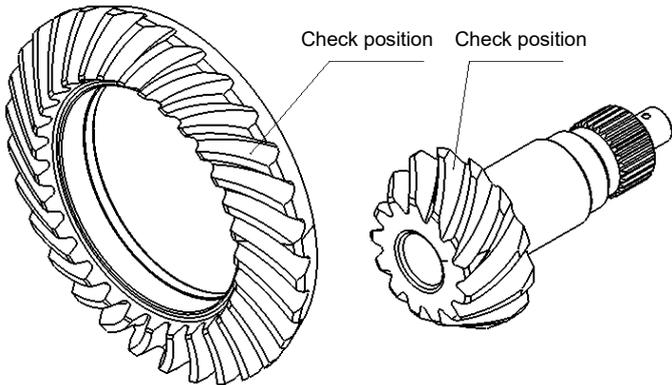
TWO FOUR-WHEEL DRIVE MECHANISM DISASSEMBLY



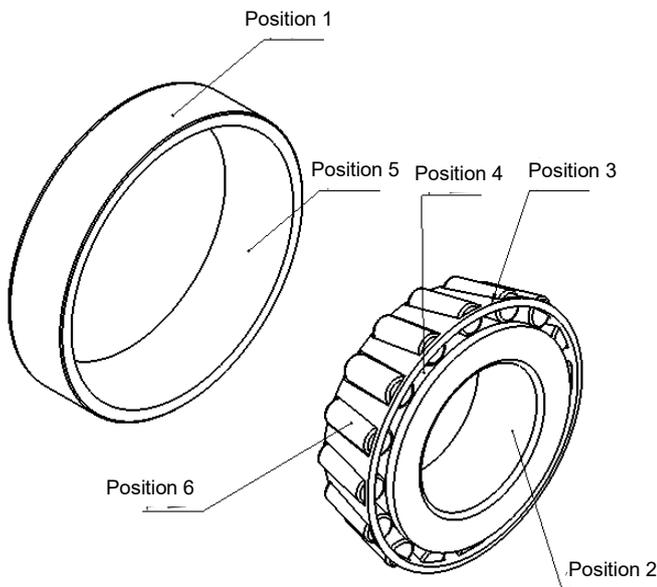
Disassembly Steps:

1. Removals 48
2. Removable parts 51, 50
3. Remove pieces 30 and 32 with an 8mm Allen wrench.
4. Remove Piece 46
5. Removal parts 44, 45
6. Use a flat blade screwdriver to pry out piece 29.
7. Remove part 41 with internal spring clamp
8. Tap out piece 43 with a rubber mallet
9. Remove part 42, then remove the other parts.

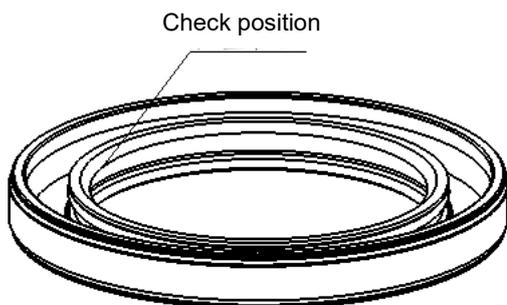
INSPECTING ITEMS



- ◆ Inspecting items
Complete tooth shape without popping teeth, no pits, grooves, cracks, deformation of the tooth surface, bright tooth surface without burns, churning

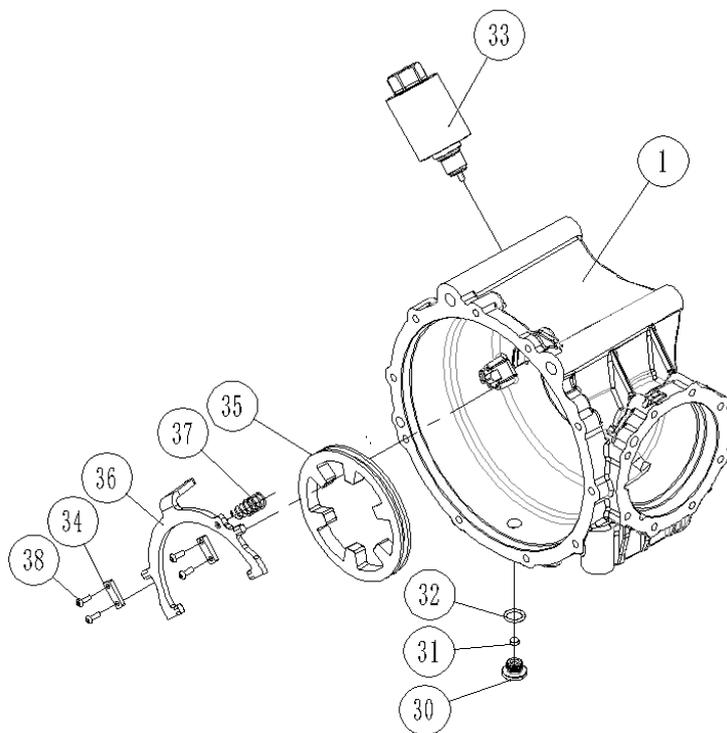
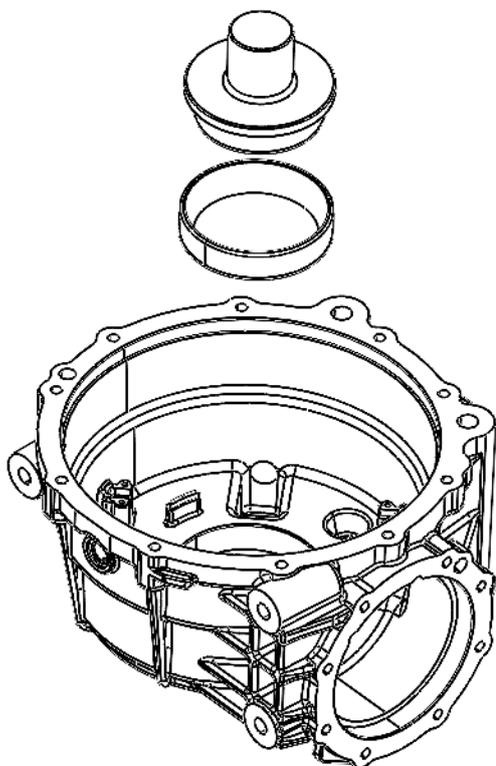


- ◆ Check item 1:
Positions 1 and 2, tapered roller/deep groove ball bearings with inner and outer rings intact, no deformation
- ◆ Check item 2:
Position 3, no wear and deformation of tapered roller/deep groove ball bearing cage
- ◆ Check item 3:
Positions 4 and 5, tapered roller/deep groove ball bearing inner and outer raceways without strain, groove marks, deformation, spalling
- ◆ Check item 4:
Position 6, tapered roller/deep groove ball bearing rollers are not deformed, strained, burned or spalled



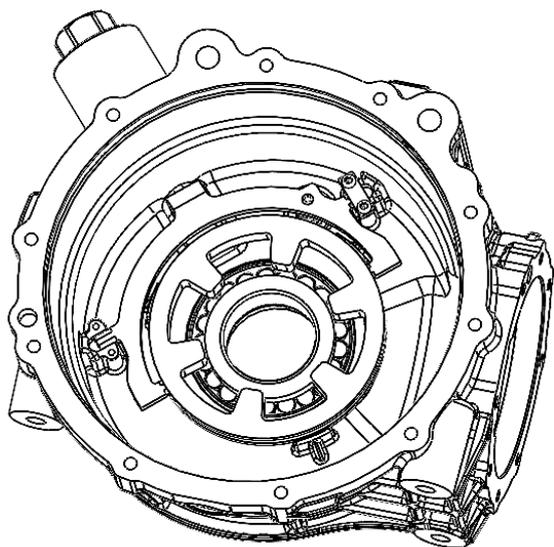
- ◆ Check items:
The main lip of the oil seal should be a small arc or a small flat ring belt, the radius of the arc or the width of the ring belt is not more than 1.5mm, and the wear of the main lip should be smooth without cracks.

COMPONENT INSTALLATION-CASE ASSEMBLY



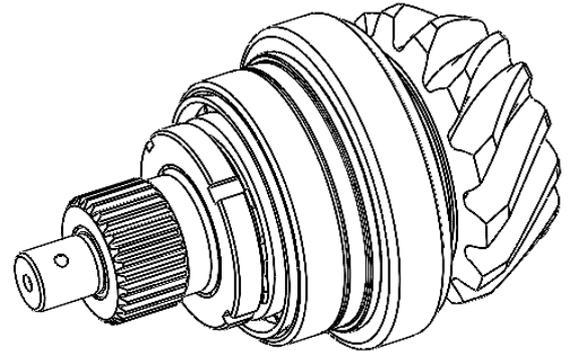
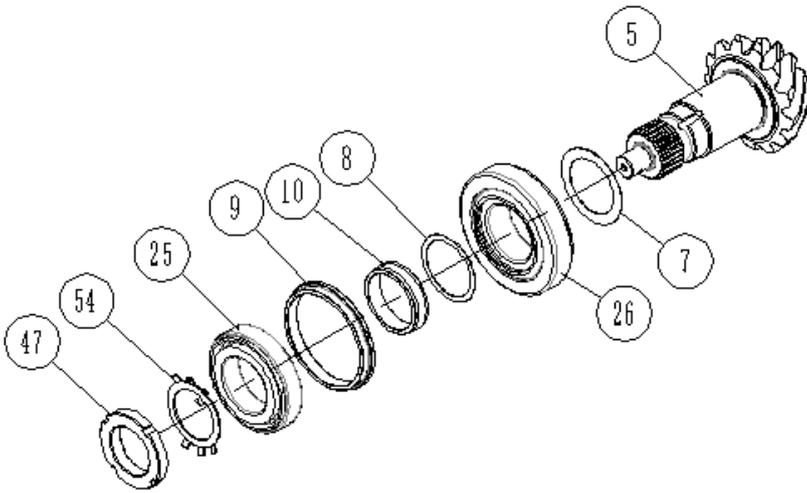
1. Knock the outer ring of the bearing (piece 27) into the box, use the tool ZX-2000S-Q-000101-02A.

2. Assemble the rest of the parts as shown above



3. After completing the assembly as shown in the left picture

COMPONENT INSTALLATION-ACTIVE GEAR ASSEMBLY



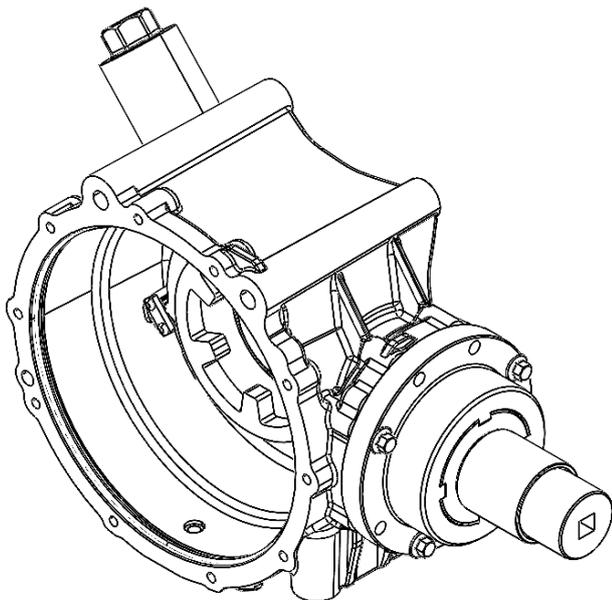
1. According to the order of the upper left figure, install the parts in turn, parts 47 threaded parts evenly coated with thread locking agent 272, and then pre-tighten to the upper right figure state.

2. Put the special tooling ZX-2000S-Q-000201-01A into the bearing of the active tooth assembly, the tooling and the nut (Piece 47) are in the right groove, and the tooling and the end face of the box are close to each other, and then lock the 3 M8 bolts to press the tooling.

3. Put the special tooling ZX-2000S-Q-000201-01B on the spline of the main gear.

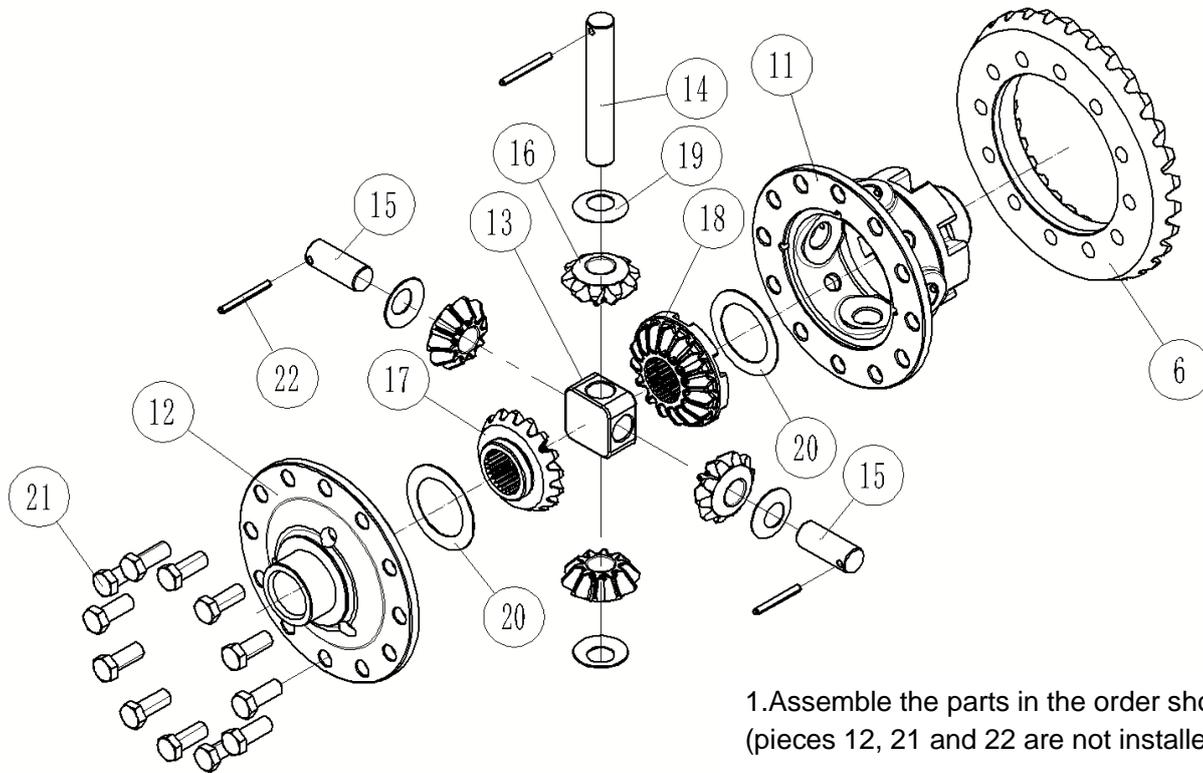
4. Use 12mm flat square wrench to tighten clockwise to 500N.m, remove the special tooling.

5. Manually rotate the active tooth (piece 5), check whether the bearing rotation damping feeling, manual radial toggle piece 9, to ensure that the piece 9 is not loose, if the bearing is not damping feeling or bearing can be free to rotate, or the piece 9 can not be pressed, loose piece 47, replace the thickness of the thinner specifications of the pieces of 8, the bearing can not rotate the bearing jammed is replaced with the thickness of the thicker specifications of the pieces of 8, repeat steps 1 - steps 4, until it meets the requirements



6. Rivet 54 to piece 47 in slot

PARTS INSTALLATION - DIFFERENTIAL ASSEMBLY ASSEMBLY



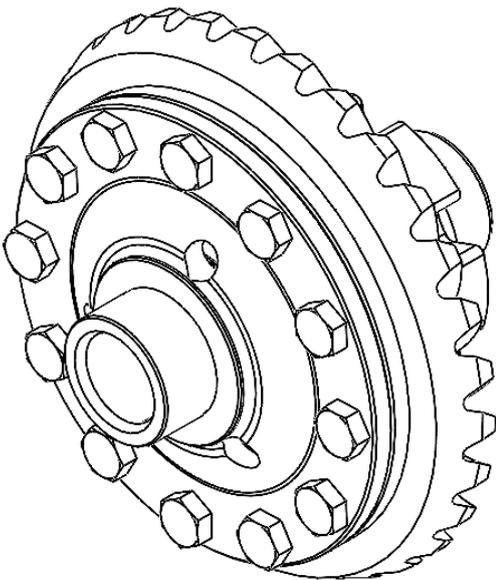
1. Assemble the parts in the order shown above (pieces 12, 21 and 22 are not installed).

2. Manual rotation parts 16, to ensure that the gear rotation is flexible without stagnation, and the gap in the range of 0.1-0.3, if the gap is not in the range, option 20 other thickness specifications until qualified

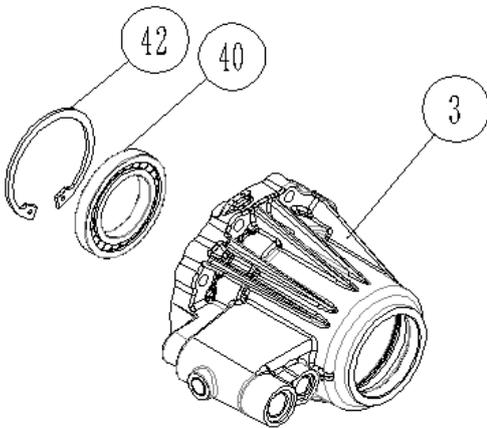
3. Load pieces 17 and 20, then load 3 pieces of piece 21 in an even arrangement and preload them.

4. Manual rotation parts 17 or 18, to ensure that the gear rotation is flexible without stalling, the gap in the range of 0.1-0.3, if the gap is not in the range, option 20 other thickness specifications until qualified

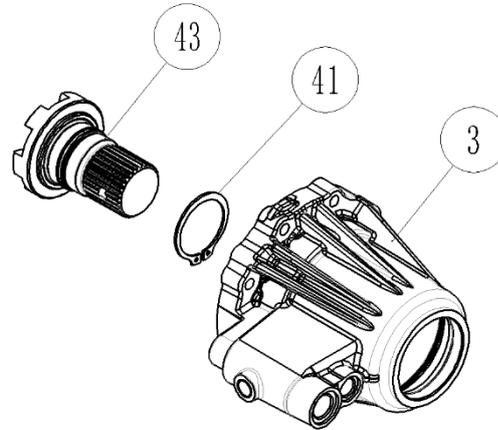
5. Remove the piece 21 and evenly apply an appropriate amount of thread locking agent 271 to the threaded portion, and diagonally tighten the 12 pieces 21 with a tightening torque of 140 N.m.



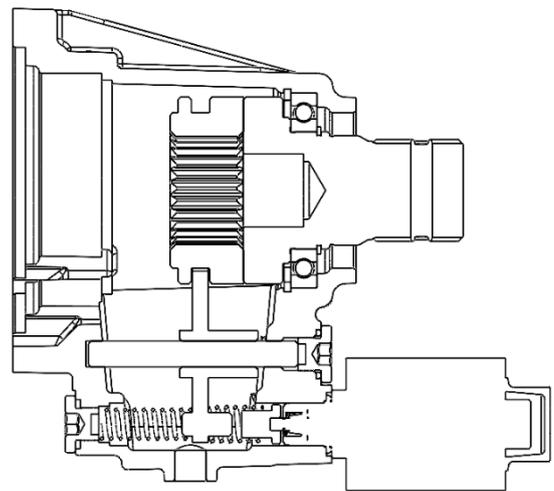
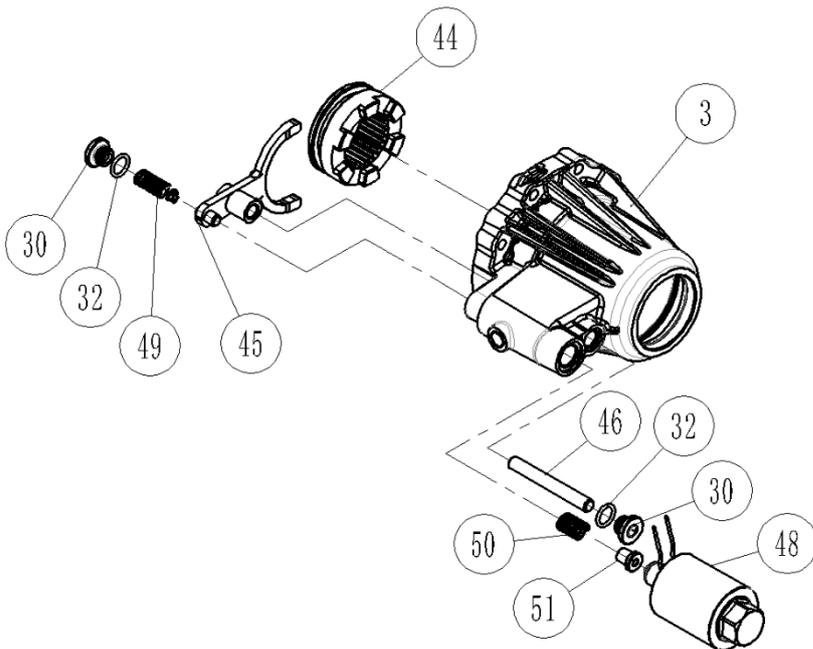
PARTS INSTALLATION - 2-4WD MECHANISM ASSEMBLY



1. Fit piece 40 into piece 3, then fit piece 42 into piece 3 with an internal circlip clamp

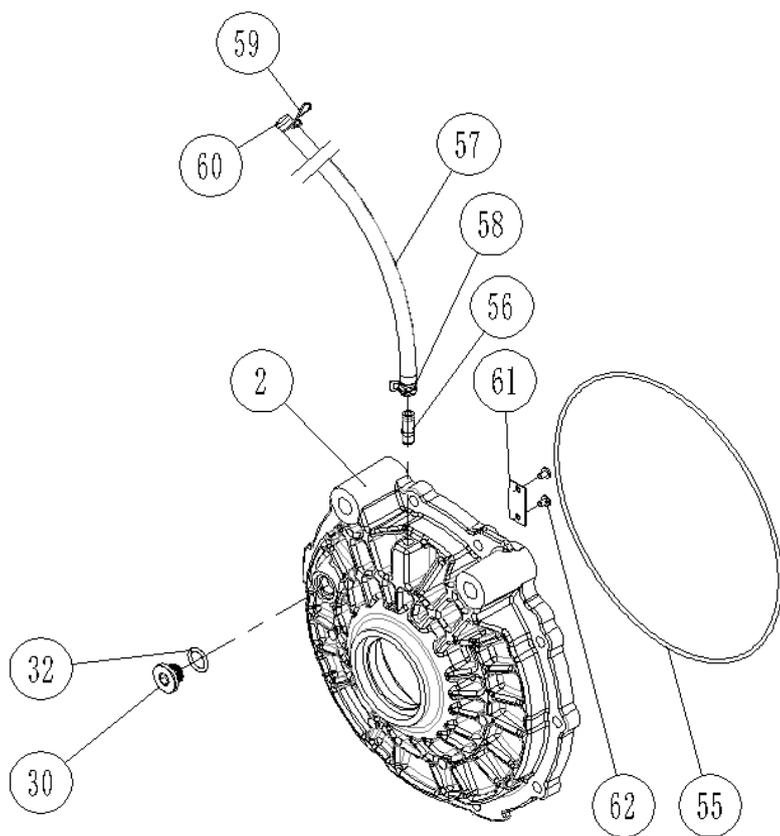


2. Fit piece 40 into piece 3, then fit piece 42 into piece 3 using internal spring clamps



3. Snap piece 45 into the slot of piece 44, then load piece 3
4. Insert piece 46 into the holes of piece 3 and piece 45, insert piece 32 into the groove of the back end of the thread of piece 30 and then install it into piece 3, tightening torque 18N.m
5. Insert piece 49 into the hole of piece 3, insert piece 49 into the raised part of piece 45, insert piece 32 into the groove at the rear end of the thread of piece 30 and then insert piece 3, tightening torque 18N.m
6. After the assembly is completed, check the position of each part as shown in the figure above.

PARTS INSTALLATION - LID ASSEMBLY

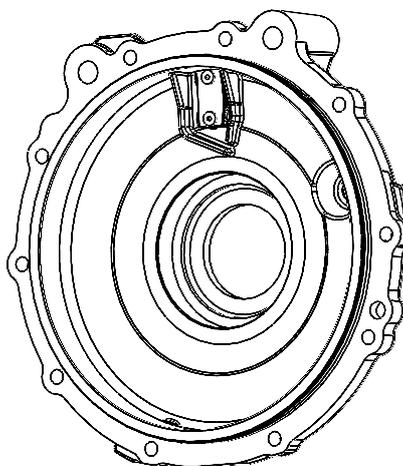
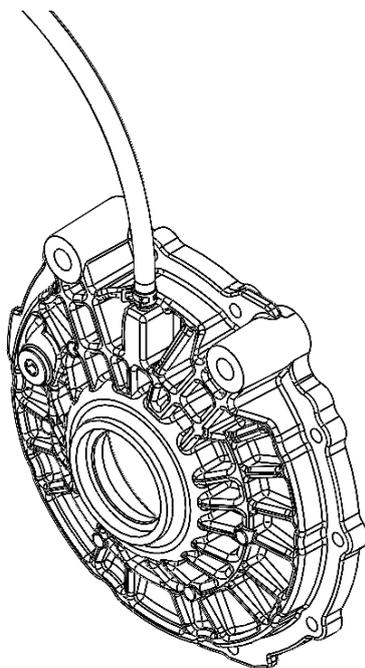


1. Piece 56 hammered into piece 2, pieces 58, 59, 60 over piece 57, then over piece 56

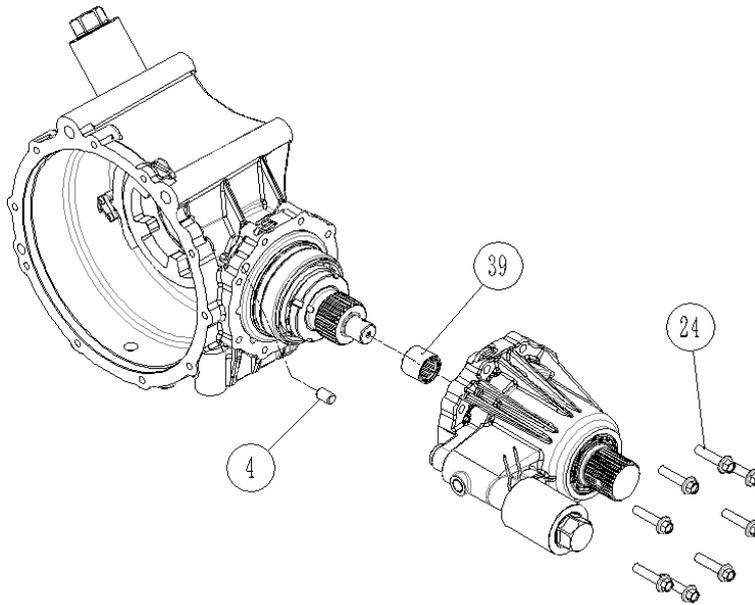
2. Piece 32 into the piece 30 threaded back end groove after loading the piece tightening torque of 18N.m, as shown in the figure below left

3. Pieces 61 and 62 are loaded into piece 2, and piece 62 is tightened with a torque of 2.5 N.m, as shown in the figure below.

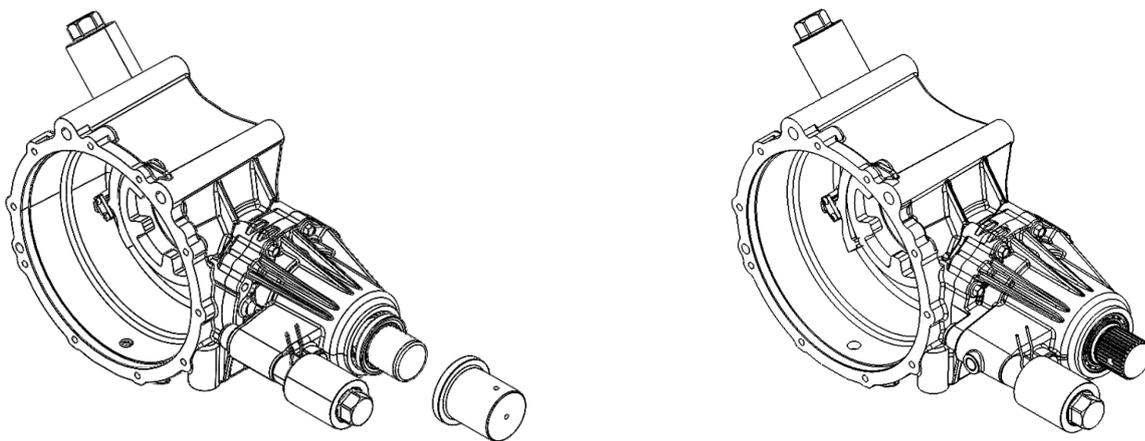
4. Piece 55 sits in the positioning stop groove of piece 2, as shown below



COMPONENT INSTALLATION-ACTIVE GEARBOX

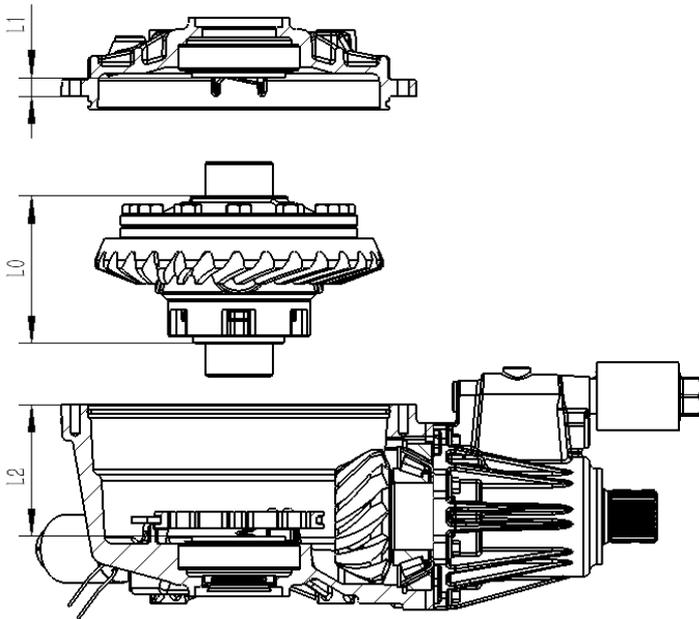


1. Apply a small amount of grease to the inner and outer rings of the roller bearing (piece 39) and install it in the 2x4 drive assembly housing.
2. Override the locating pin (piece 4) into the box hole.
3. Put the assembled active tooth assembly into the box, and then evenly apply the silicone rubber plane sealant on the surface of the hinged box, the application of glue should be uninterrupted and should not be too much
4. Install the bolts (part 24) and tighten them diagonally with a tightening torque of 26N.m. Press-fit the input oil seal into the positioning sleeve (ZX-2000S-Q-0005).

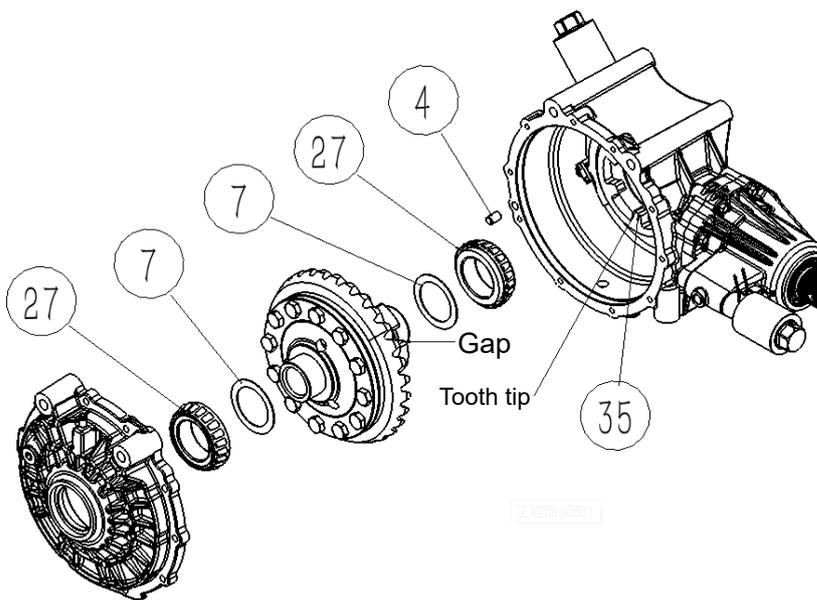


5. Put the input oil seal press-fit positioning slip (ZX-2000S-Q-000501-02A) on the input shaft spline, apply a small amount of grease evenly on the lip of the oil seal (Piece 29), and then put it on the oil seal positioning slip.
6. Put the rivet head (ZX-2000S-Q-030008-01A) of the input oil seal press-fit on the press-fit locating sleeve, and strike it with a rubber hammer until it contacts with the shell, and the oil seal installation is completed.

PARTS INSTALLATION - LID CLOSURE

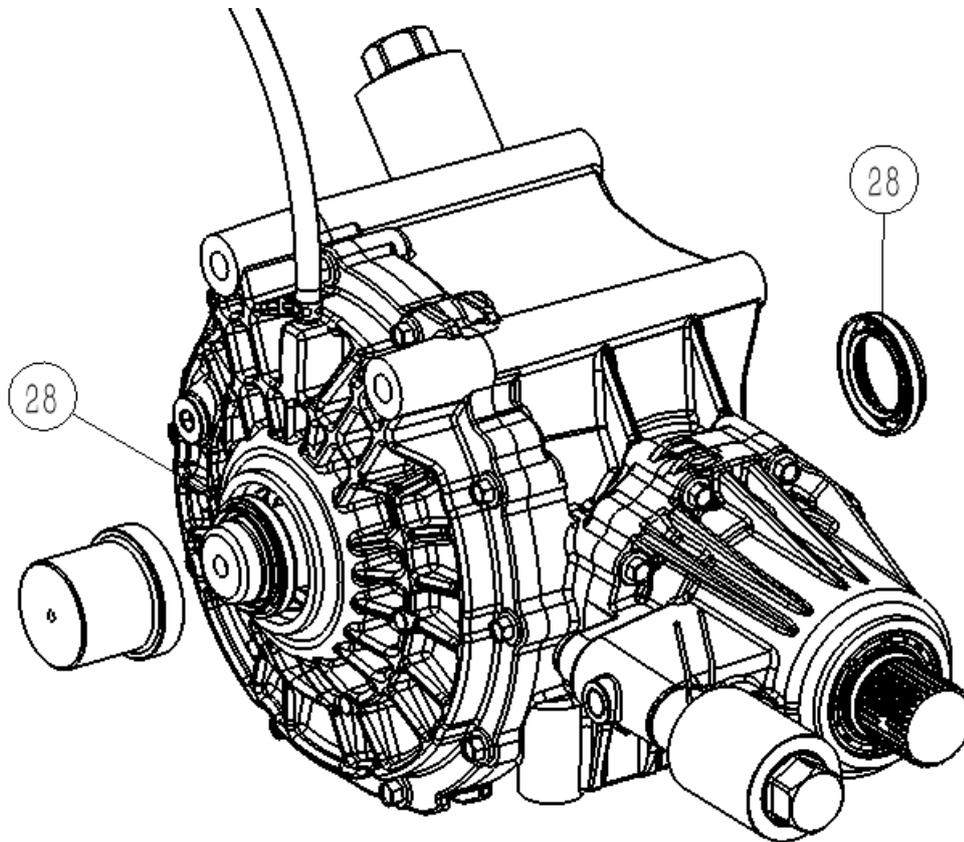


1. The inner ring of the bearing (piece 27) is placed in the cover of the box with the outer ring pressed in, and the distance from the closing surface of the cover to the inner ring of the bearing is measured L1.
2. The inner ring of the bearing (piece 27) is put into the box with the outer ring pressed, and the distance from the cover of the box to the inner ring of the bearing is measured, and the distance from the cover of the box to the inner ring of the bearing is measured, L2.
3. Measure the differential assembly bearing mounting dimension L0
4. Calculate the thickness of the adjustment shim (piece 7), the total thickness of $H = (L1 + L2) - L0$



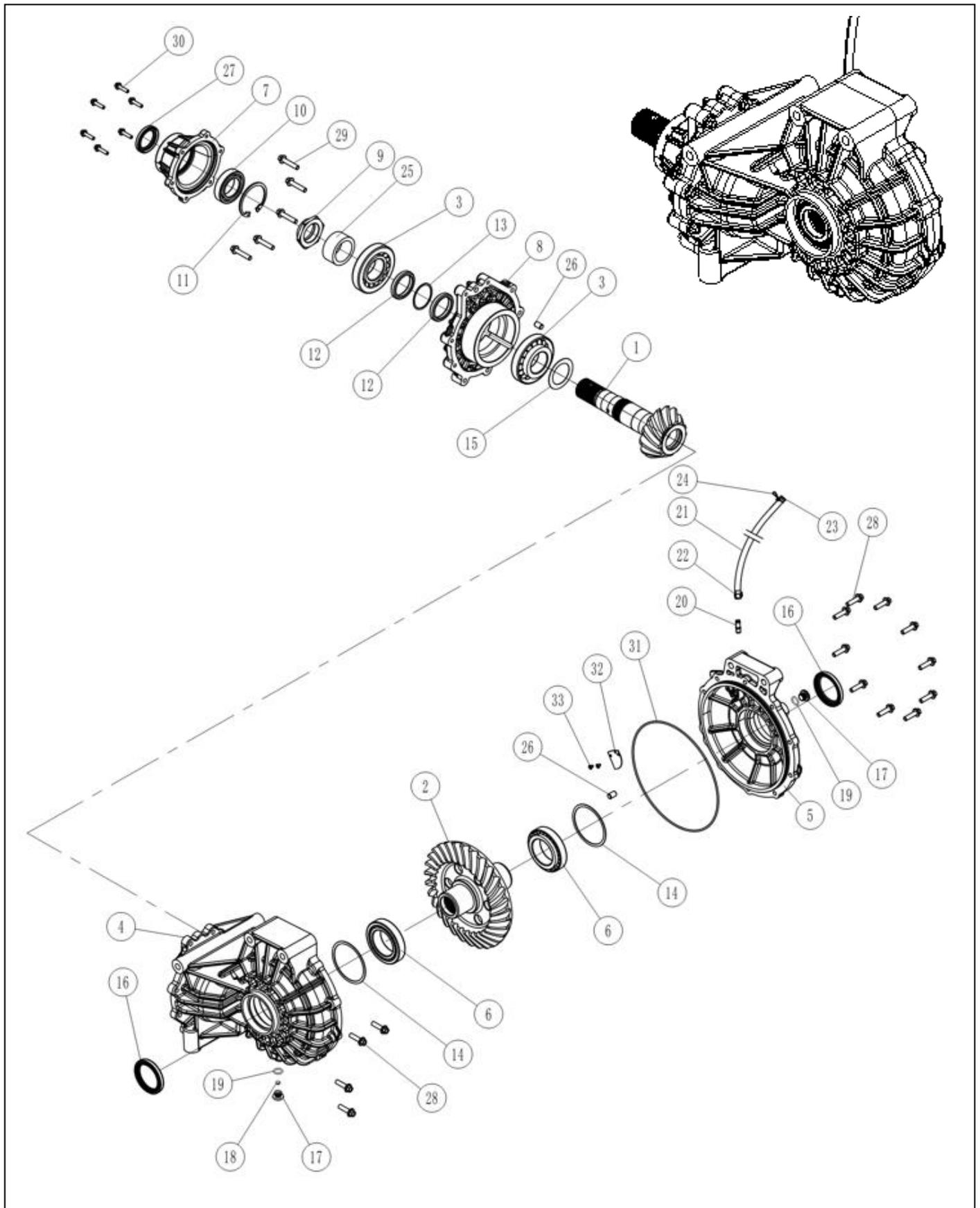
5. Install adjusting shims (piece 7) of thickness $H/2$ at each end of the differential assembly, then install the inner ring of the bearing (piece 27) and press the adjusting shims.
6. Install the differential assembly into the case, during assembly the differential assembly notch is aligned with the top of the 35 teeth, otherwise the differential assembly cannot be installed in place.
7. Installation of positioning pins 4
8. Load piece 23 and tighten it, torque 26N.m, check the gear side clearance and bearing preload, side clearance 0.15-0.3, bearing preload 0.05-0.1, starting torque 3-8N.m

PARTS INSTALLATION - LID CLOSURE



5. Insert the front axle output oil seal locating pin (ZX-2000S-Q-030107-02A) into the output gear hole.
6. Grease the lips of the output oil seal (part 28) and slide it into the ZX-2000S-Q-030107-02A.
7. Use the front axle output oil seal press-fit rivet head (ZX-2000S-Q-030107-03A) to set on ZX-2000S-Q-030107-02A, and then knock the oil seal press-fit rivet head until the workpiece fits the box cover oil seal can no longer move.

REAR AXLE DIAGRAM



PART LIST

No.	Number	Part name	QTY	Size	Torque N.m	Torque kgf.m	Torque ft.lb	Remark
1	2000S-SG-HH-000201	Drive gear	1					
2	2000S-SG-HH-000202	Driven gear	1					
3	31309-RB	Bearing 31309	2	$\phi 45 \times \phi 100 \times 27.25$				
4	2000S-SG-HH-010101	Axle Case	1					
5	2000S-SG-HH-010201	Case cover	1					
6	32011-RB	Bearing 32011	2	$\phi 55 \times \phi 90 \times 23$				
7	2000S-SG-YH-020102	Bearing cover	1					
8	2000S-SG-YH-020101	Bearing seat	1					
9	2000S-SG-HH-020001	Nut	1	M42x1.5	500	50	677.9	
10	6008-RB	Bering 6008	1	$\phi 40 \times \phi 68 \times 15$				
11	Q43068	Circlip	1	d0=68				
12	2000S-SG-HH-020002	Spacer sleeve	2	$\phi 45.2 \times \phi 52 \times 9.75$				
13	Q401B452520010	Shim	on-demand	$\phi 45.2 \times \phi 52 \times 0.1$				
	Q401B452520015	Shim	on-demand	$\phi 45.2 \times \phi 52 \times 0.15$				
	Q401B452520020	Shim	on-demand	$\phi 45.2 \times \phi 52 \times 0.2$				
14	Q401B800900040	Shim	on-demand	$\phi 80 \times \phi 90 \times 0.4$				
	Q401B800900050	Shim	on-demand	$\phi 80 \times \phi 90 \times 0.5$				
	Q401B800900060	Shim	on-demand	$\phi 80 \times \phi 90 \times 0.6$				
	Q401B800900070	Shim	on-demand	$\phi 80 \times \phi 90 \times 0.7$				

15	Q401B450650150	Shim	1	φ45×φ65×1.5				
16	2000S-SG-HH-010004	Oil seal	2	φ55×φ72×9				
17	0600A-SG-Q-030203	Plug	2	M14×1.5	18	1.8	24.4	
18	CT010803	magnet steel	1	φ8×3				
19	0700A-00-H-030206	O -ring	2	φ13×φ1.5				
20	0700A-00-Q-030104	air vent	1					
21	TQG711-H	Vent pipe	600	φ7×φ11				
22	0800U-00-H-030607	Clamp	1					
23	0700A-00-H-030504	Plug	1					
24	0700A-00-H-030503	Clamp spring	1					
25	2000S-SG-YH-020103	Spacer sleeve	1	φ45×φ60×27.25				
26	2000S-SG-Q-000104	Pin	2	φ10×16				
27	0ED01-00-H-010002	Oil seal	1	φ40×φ55×8				
28	1000U-08-H-030107	Hex bolt	14	M8×1.25×30	26	2.6	35.3	
29	0EA03-00-Q-030700	Hex bolt	5	M8×1.25×40	26	2.6	35.3	
30	Q1840625T1F39-T1	Hex bolt	6	M6×25	11	1.1	14.9	
31	2000S-SG-HH-010003	O-ring	1	φ225×φ3				
32	2000S-SG-Q-030118	plate	1					
33	0450A-SG-0H-030119	screw	2	M4×6	2	0.2	2.7	

Remark:

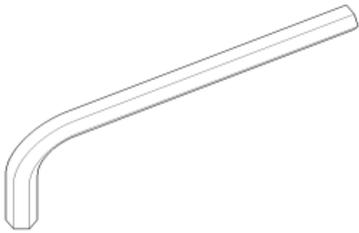
- G: Apply grease for oil seal and O-ring.
- L: Apply a non-permanent locking agent.
- O: Apply gear oil(SAE 80W/90/GL-5级).
- SS: Apply silicone sealant.
- R: Replacement Parts.

TECHNICAL SPECIFICATIONS

Item	Standard	Service Limit
Lubrication oil	SAE 80W/90/GL-5	
Oil adding position	Side of the case (plug M14) Bottom of the case (plug M14 component)	
Oil filling volume	550 mL (0.52 US qt) (no oil inside after cleaning) 520 mL (0.49 US qt) (only replace the oil)	
Drive and driven gear gap	0.15~0.25 mm(0.006~0.010 in.)	
Differential gear gap	0.10~0.3 mm(0.004~0.010 in.)	

SPECIAL TOOLS

allen key 2.5mm、8mm



Hexagon socket wrench 10、18mm



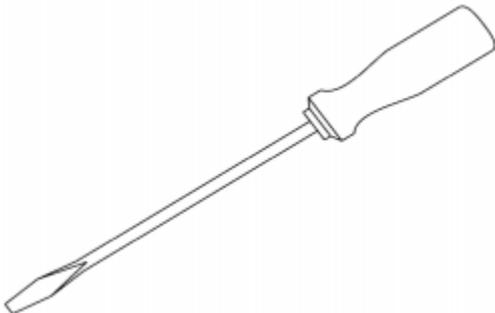
Internal clamp pliers



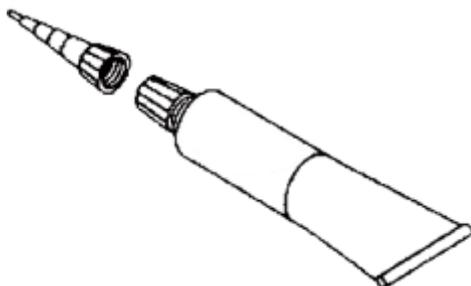
Outer clamp pliers



Large flat screwdriver 300mm

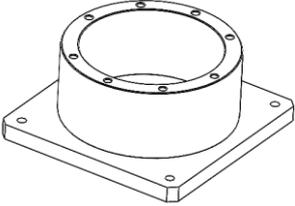
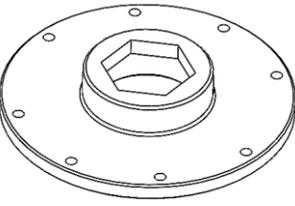
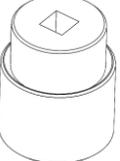
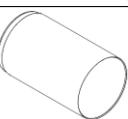
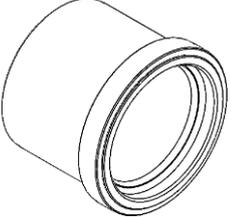
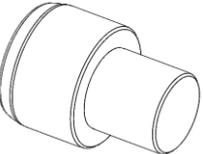


Silicone rubber flat sealant



Thread locking agent 271、272



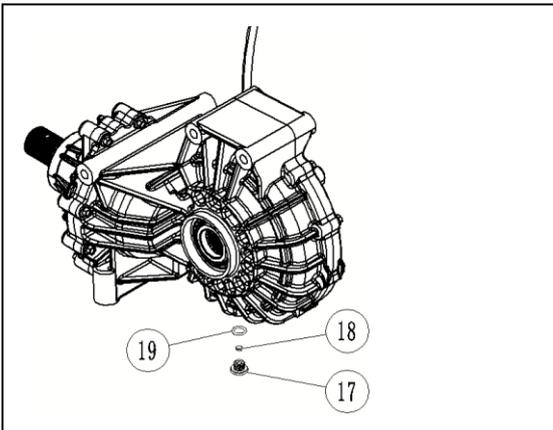
Picture	Name and part number	Usage
	Name: Tightening positioning seat Part number: 2000S-SG-HH-020001-01B	Disassembly, assembly
	Name: Fixing sleeve Part number: 2000S-SG-HH-020001-01C	Disassembly, assembly
	Name: spline sleeve Part number: 2000S-SG-HH-020001-01D	Disassembly, assembly
	Name: 31309 press tool Part number: 2000S-SG-YH-020102-01A	assembly
	Name: 31309 position tool Part number: 2000S-SG-YH-020102-01B	assembly
	Name: oil seal press tool Part number: ZX-0600A-SG-H-030110-02A	assembly
	Name: oil seal sleeve Part number: ZX-0600A-SG-H-030110-02B	assembly
	Name: oil seal press tool Part number: ZX-2000S-SG-HH-000000-01-06	assembly
	Name: oil seal pin Part number: ZX-2000S-SG-HH-000000-01-05	assembly

GEAR OIL CHANGE



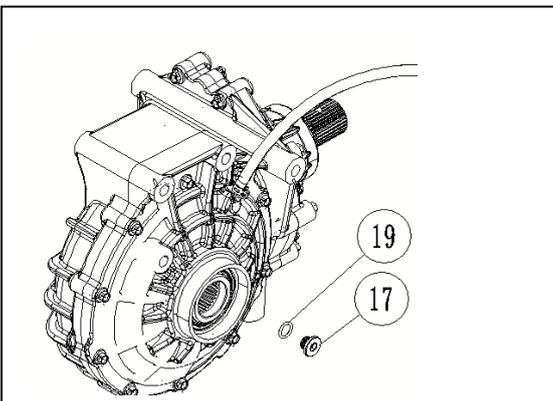
WARNING

Operating a vehicle with insufficient, degraded or contaminated gear oil can cause accelerated wear and may result in gearbox damage, accidents and personal injury.



Drain old gear oil

- ◆ Tool: 8mm Allen key
- ◆ Screw out the 17 counterclockwise, let the old gear oil flow out for 10 minutes (oil drain process, the oil drain port is placed at the lowest point), after the end of the oil drain will be 19 sets of 17 threaded end, clockwise tightening, will be spilled around the gear oil wipe clean.
- ◆ Please dispose of used gear oil in an environmentally friendly manner and take care of the environment.



Add new gear oil

- ◆ Tool: 8mm Allen key
- ◆ Unscrew 17 by turning it counterclockwise, add a dosage of new gear oil, then set 19 with the threaded end of 17, tighten clockwise, and wipe up any spilled gear oil around the perimeter.

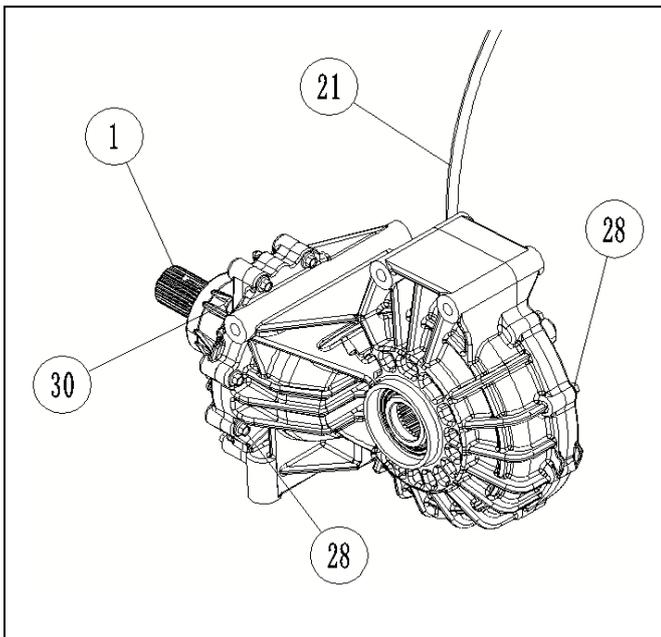


CAUTION

Check the O-ring during installation. Damage to the O-ring will result in poor sealing and leakage of gear oil, which will increase wear inside the gearbox and ultimately lead to damage to the gearbox, so replace the damaged O-ring promptly.

ROUTINE INSPECTION

Failure to replace abnormal parts in a timely manner will result in abnormal wear of other parts and an increase in the overall temperature of the gearbox, resulting in a shorter service life.

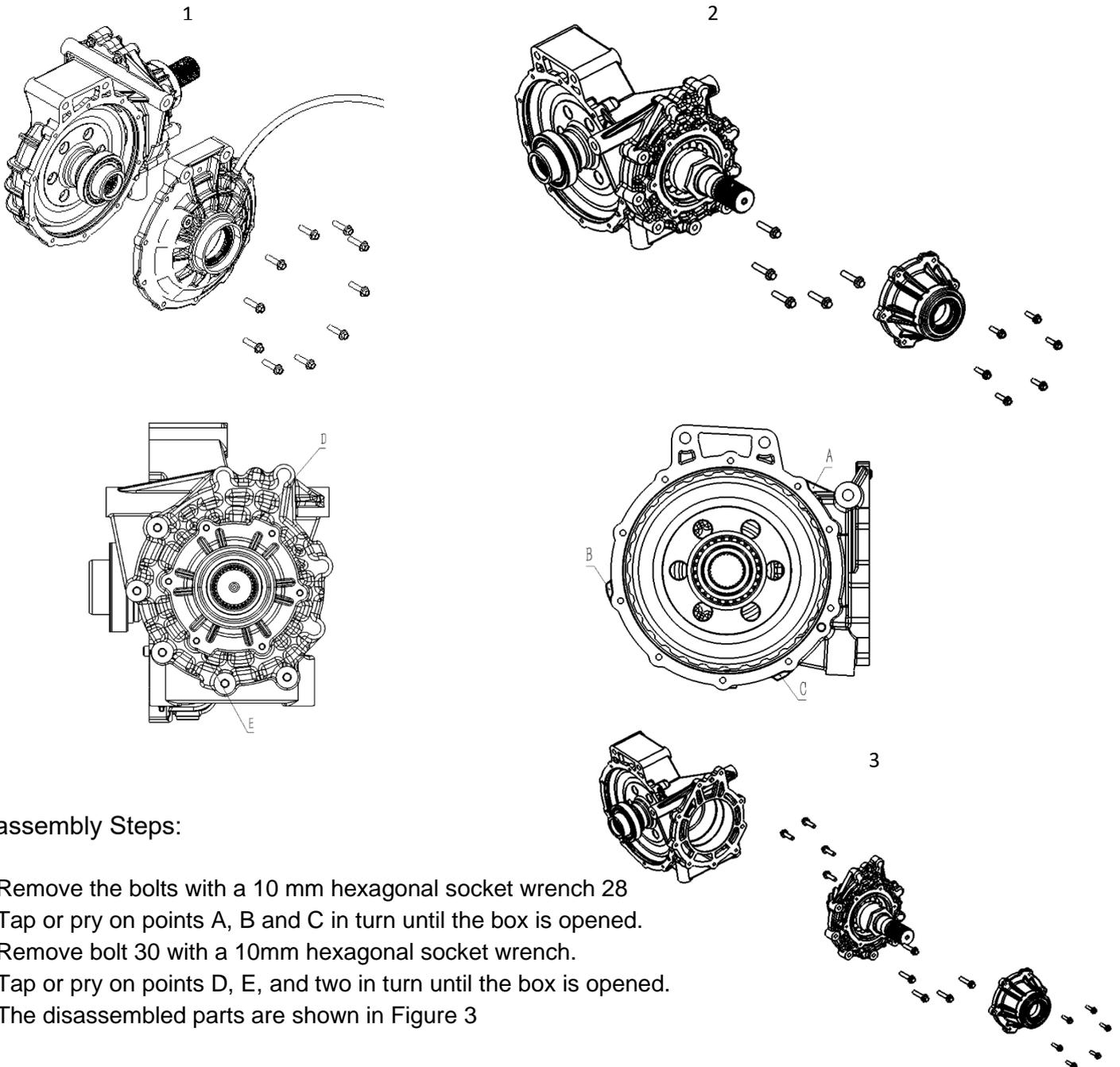


- ◆ Check item 1:
Rotate the active gear (piece 1), should be rotated evenly, uniform damping, no abnormal sound and jamming, pull the active gear (piece 1), there is no obvious axial loosening and abnormal noise
- ◆ Check item 2:
No oil seepage on the surface of the hinged box and oil seals
- ◆ Check item 3:
Pieces 28, 30 not loose, piece 21 not broken
- ◆ Check item 4:
No cracks in the shell, no deformation or rupture of the mounting holes.

OPEN BOX INSPECTION

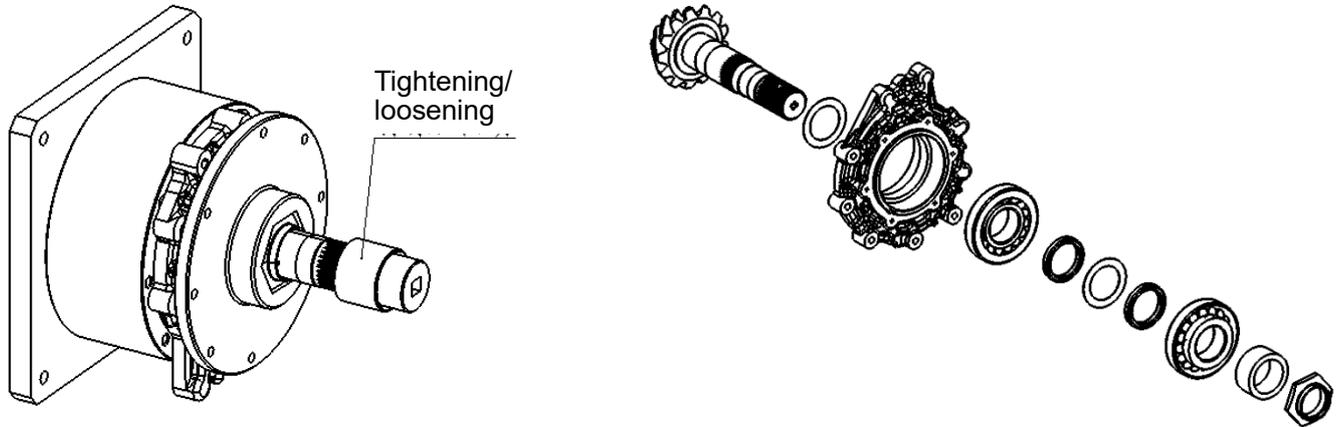
**WARNING**

- ◆ Avoid opening the box if you are not sure of the internal faults.
- ◆ The operation should be guided by professional personnel before opening the box, unstandardized operation will lead to shorten the life of the front axle, and in serious cases, will lead to scrap and can not be used.



Disassembly Steps:

1. Remove the bolts with a 10 mm hexagonal socket wrench 28
2. Tap or pry on points A, B and C in turn until the box is opened.
3. Remove bolt 30 with a 10mm hexagonal socket wrench.
4. Tap or pry on points D, E, and two in turn until the box is opened.
5. The disassembled parts are shown in Figure 3

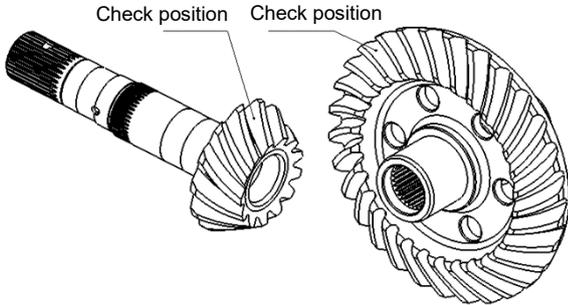
REMOVAL OF MAIN GEAR ASSEMBLY**Disassembly Steps:**

1. Install the special tool in the way shown
2. Remove part 9 with special tooling
3. After removing part 9, remove the other parts as shown in the figure.

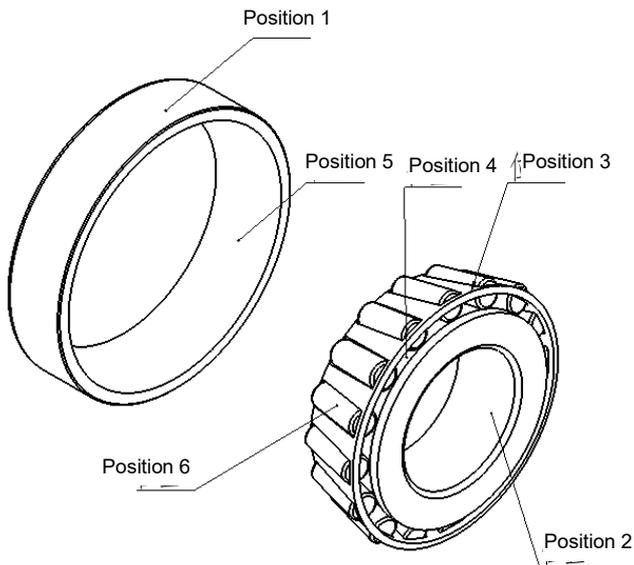
**CAUTION**

Before disassembling and assembling, check whether there is any looseness in part 9, looseness is abnormal and needs to be tightened.

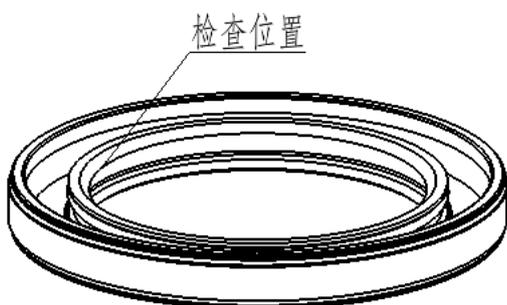
INSPECTION ITEMS



- ◆ Inspection items:
Complete tooth shape without popping teeth, no pits, grooves, cracks, deformation of the tooth surface, bright tooth surface without burns, churning

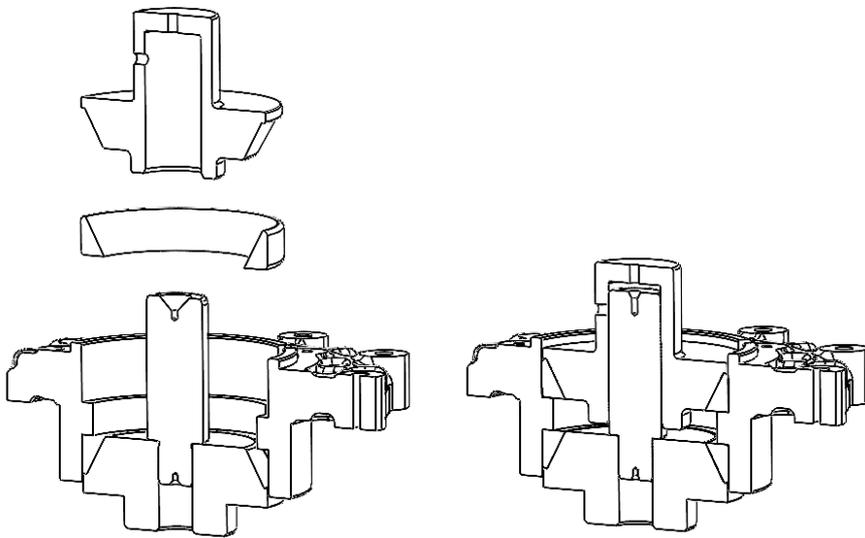


- ◆ Check item 1:
Positions 1 and 2, tapered roller/deep groove ball bearings with inner and outer rings intact, no deformation
- ◆ Check item 2:
Position 3, tapered roller/deep groove ball bearing cage without wear, deformation
- ◆ Check item 3:
Positions 4 and 5, tapered roller/deep groove ball bearing inner and outer raceways without strain, groove marks, deformation, spalling
- ◆ Check item 4:
Position 6, tapered roller/deep groove ball bearing rollers are not deformed, strained, burned or spalled

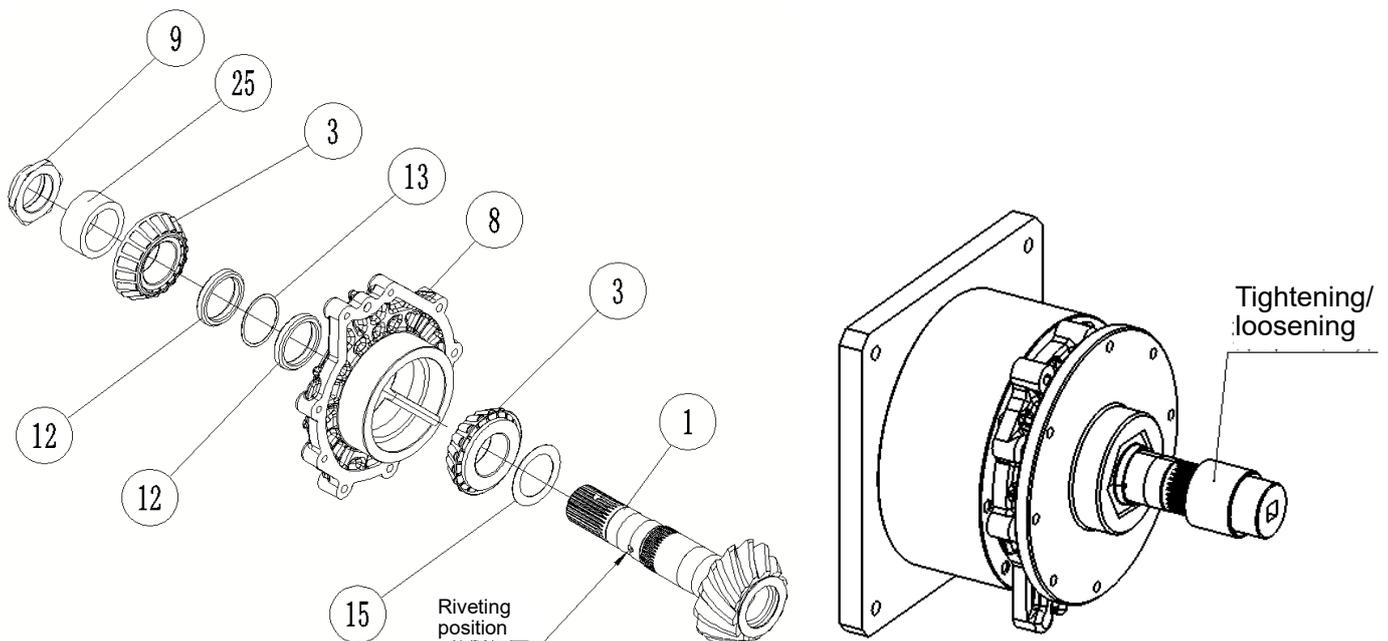


- ◆ Check item
The main lip of the oil seal should be a small arc or a small flat ring belt, the radius of the arc or the width of the ring belt is not more than 1.5mm, and the wear of the main lip should be smooth without cracks.

COMPONENT INSTALLATION-ACTIVE GEAR ASSEMBLY

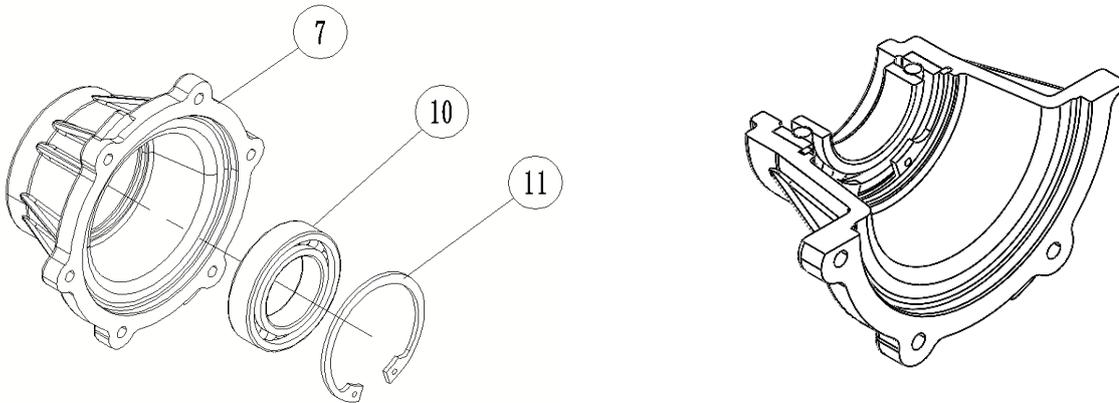


1. Use locating base 2000S-SG-YH-020102-01A and rivet head 2000S-SG-YH-020102-01B to tap the two 31309 bearing outer races (part 3) into the holes of the housing (part 8).

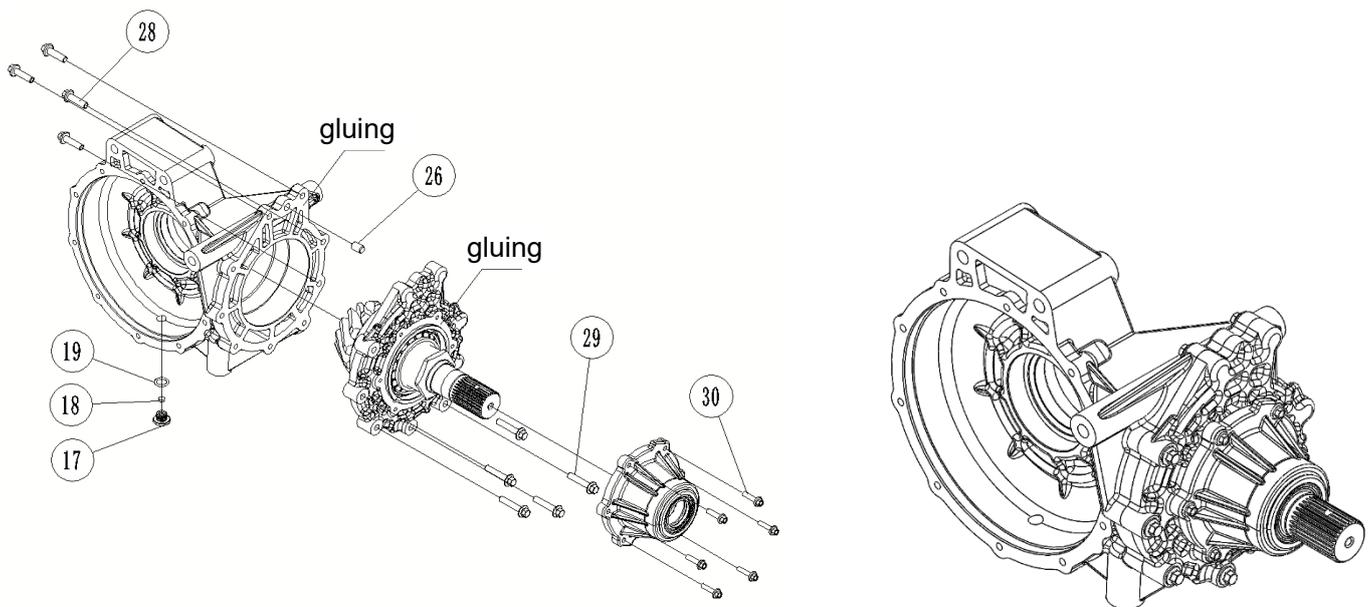


2. Assemble the parts in the direction and position shown in the illustration, then use the special tool 2000S-SG-HH-020001-01B/01C/01D for tightening the rear axle nut, piece 9 tightening torque 500N.m.
3. Check the starting torque of the bearing, 3-8N.m is qualified, otherwise re-select the adjustment of shim parts 13, locking parts 9 after re-testing, until qualified
4. After the bearings are adjusted, the threaded part of piece 9 is evenly coated with 272 thread fastening agent and riveted and fastened in the notched part of the threaded part of piece 1.

COMPONENT MOUNTING - BEARING CAP ASSEMBLY

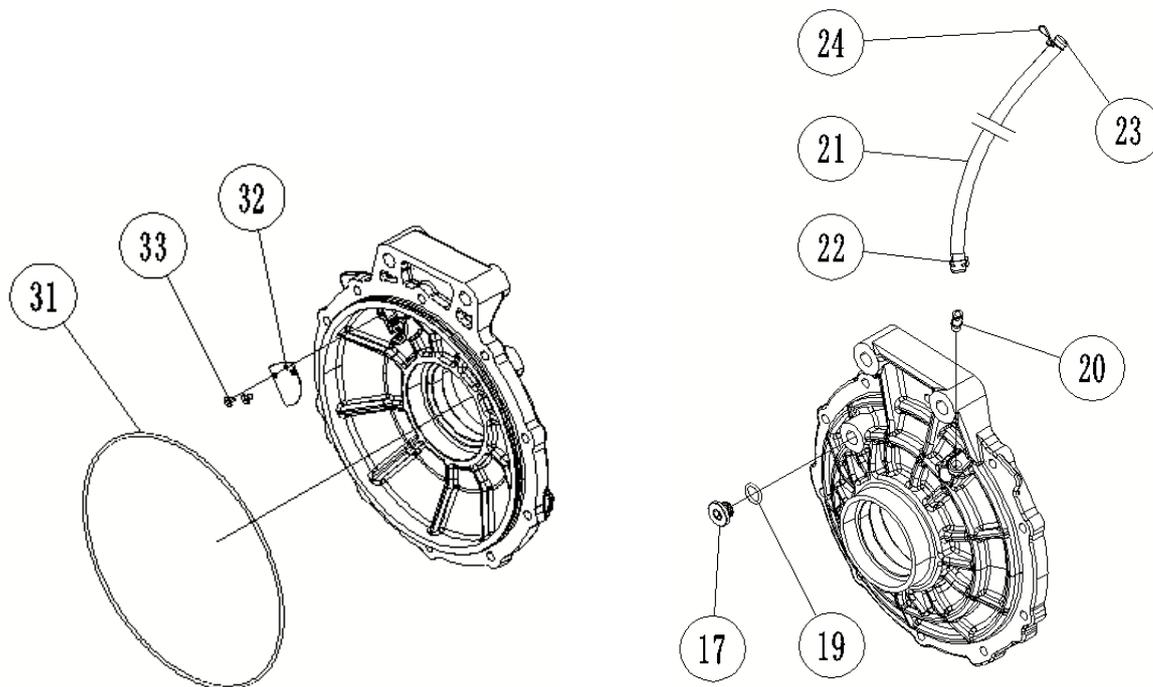


1. Fit piece 10 into piece 7, then fit piece 11 into the piece 7 circlip slot using internal circlip pliers
2. The completed assembly is shown above right



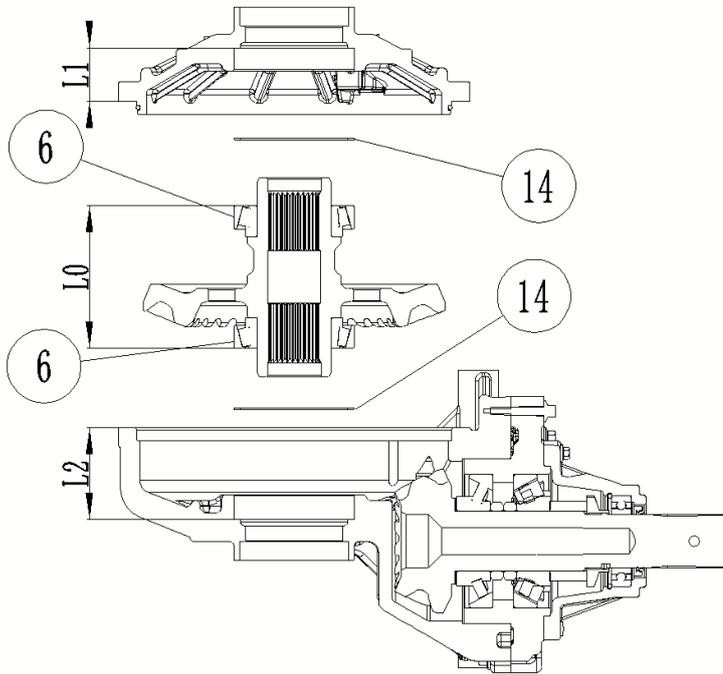
3. Fitting pieces 17, 18, 19 into the box
4. Install the locating pin (piece 26) into the housing and apply silicone rubber flat sealant to the hinge face
5. Install the active tooth assembly into the case and lock it with bolts, four M8 x 1.25 x 30 (piece 28) and five M8 x 1.25 x 40 (piece 29), tightening torque 26N.m
6. Silicone rubber flat sealant applied to the housings' hinged surfaces
7. Install the bearing cover assembly and lock with bolts, tightening torque of 11N.m, the completion of the effect as shown in the above figure

PARTS INSTALLATION - LID ASSEMBLY



1. Load pieces 32 and 33 into the box cover, and tighten piece 33 with a torque of 2N.m.
2. Install part 31 into the sealing groove of the lid.
3. Sleeve piece 19 into piece 17, and then fit it into the threaded hole of the box cover, and tighten piece 17 to a torque of 18N.m.
4. Assemble the rest of the pieces in place according to the position shown above.

PARTS INSTALLATION - LID CLOSURE



1. Measure the distance L1 from the closing surface of the cover to the end surface of the bearing hole.

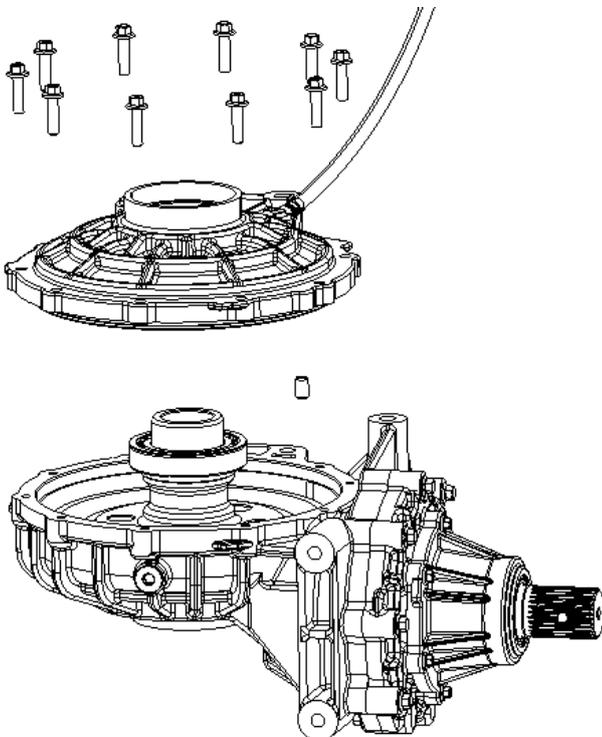
2. Measure the distance from the hinge surface of the box to the end surface of the bearing hole L2

3. 2 bearings 6 are mounted on the driven gear and the bearing outer ring dimensions L0 are measured.

4. Calculate the total thickness of the adjustment shim (piece 14), the total thickness of $H = (L1 + L2) - L0 + (0.05 - 0.1)$

5. Select the thickness of H / 2 gasket were installed in the box and cover bearing holes

6. Load the driven gear into the box to check the gear mesh clearance, adjust the appropriate thickness of the shims until the gear gap is appropriate.



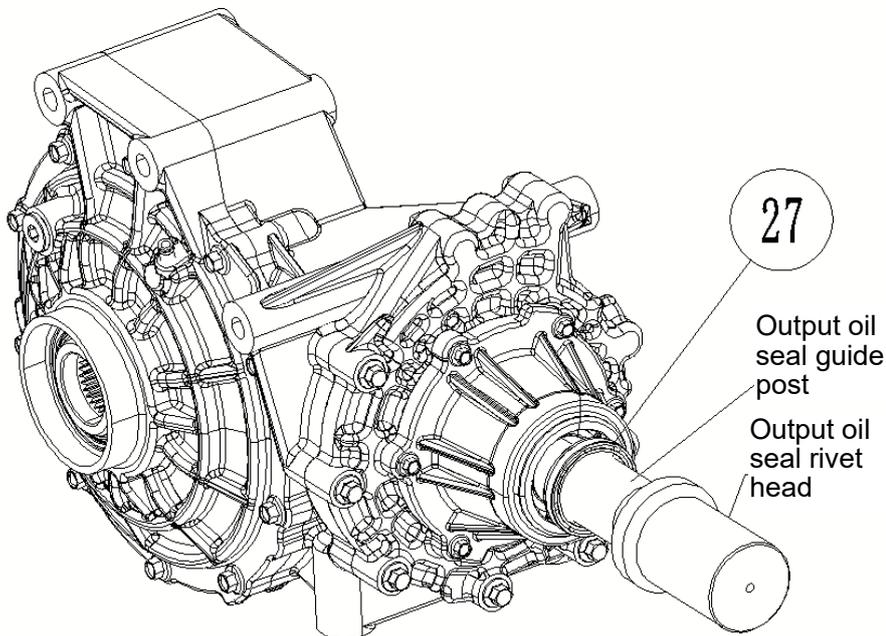
1. Installation of locating pins into the box

2. Apply silicone rubber flat sealant on the box closing surface

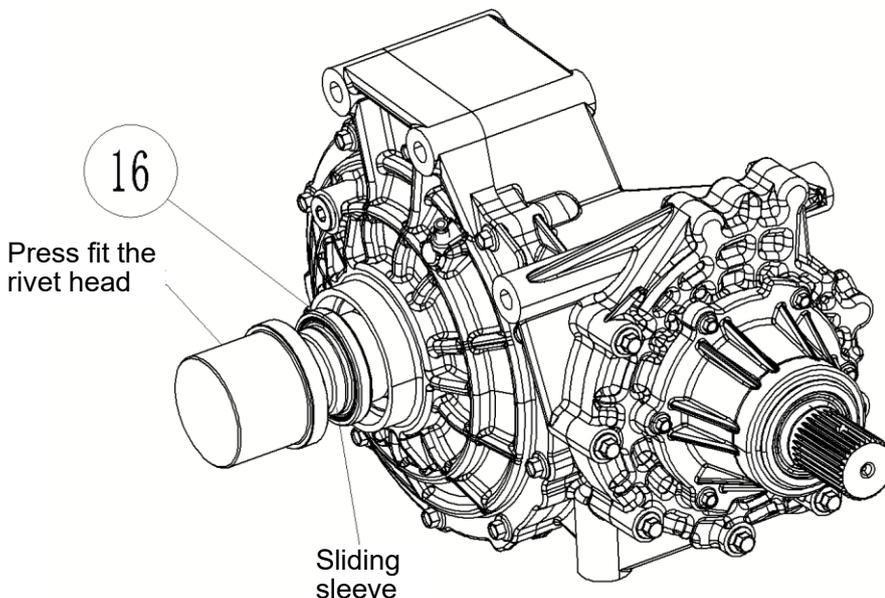
3. Locking bolts (piece 28) after the lid is closed on the box, tightening torque 26N.m.

4. Rotate the main gear and confirm that the starting torque is 3-8N.m.

PARTS INSTALLATION-OIL SEAL ASSEMBLY



1. Put the input oil seal slide sleeve(ZX-0600A-SG-H-030110-02B) on the active tooth spline.
2. Apply grease to the lip of the input oil seal (part 27) and put it on the oil seal sleeve.
3. Put the input oil seal rivet head (ZX-0600A-SG-H-030110-02A) on the oil seal sliding sleeve.
4. Tap the rivet head of the oil seal until the end face of the rivet head fits with the end face of the bearing housing, that is to say, the assembly of the input oil seal is completed.



1. Insert the output seal guide post(ZX-2000S-SG-HH-000000-01-05) into the spline hole of the driven tooth.
2. Apply grease to the lip of the output oil seal (piece 16) and put it on the oil seal guide post.
3. Put the output oil seal rivet head(ZX-2000S-SG-HH-000000-01-06) on the oil seal guide post.
4. Tap the rivet head of the oil seal until the end face of the rivet head fits with the end face of the box, that is to say, the assembly of the input oil seal is completed.
5. Repeat steps 1-4 to complete the assembly of the output oil seal at the other end.

FUEL SYSTEM

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GENERAL INFORMATION

FUEL SYSTEM MAINTENANCE CONSIDERATIONS

⚠ WARNING

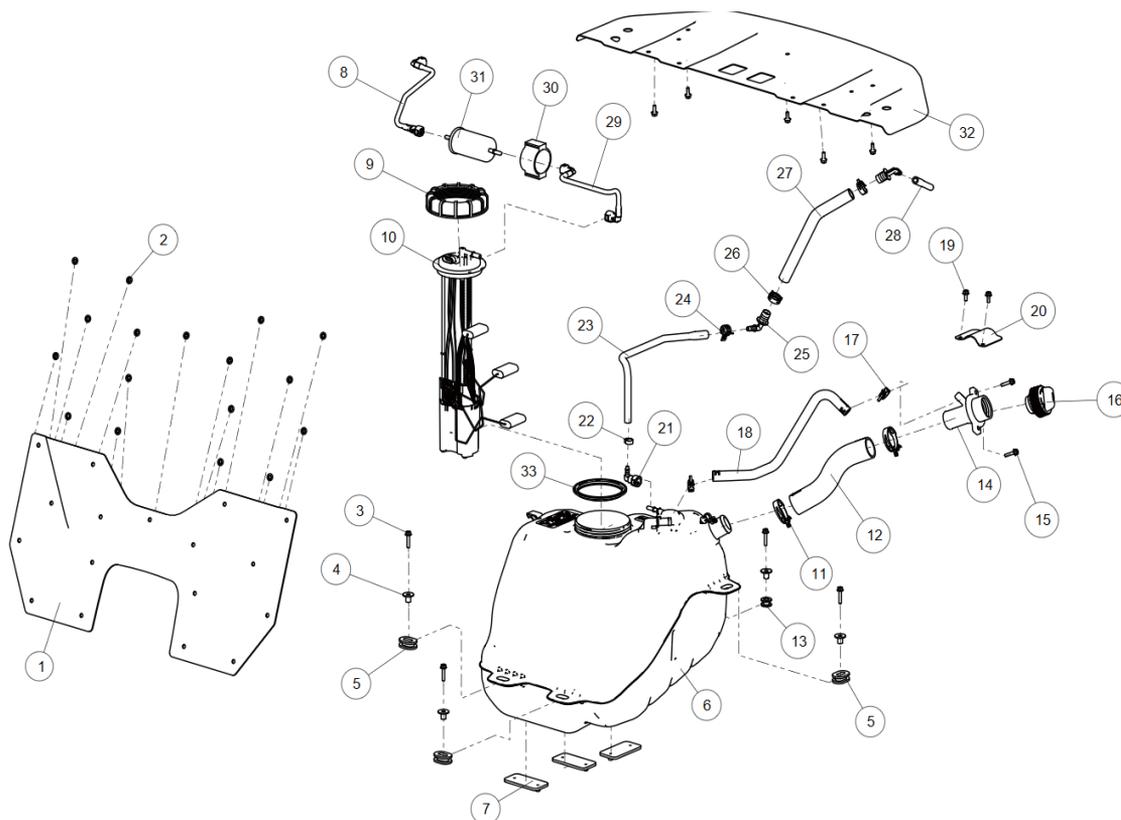
- ◆ Under certain conditions, gasoline is extremely flammable and explosive. Never disassemble the emissions fuel system while the engine is hot. Severe burns may result. Do not overfill the fuel tank. The tank is at full capacity when fuel reaches the bottom of the filler tube. Allow room for expansion of the fuel. Never start the engine or allow it to run in an enclosed area. Gasoline engines emit exhaust fumes that are toxic and can cause injury or death, consciousness and death in urban areas within a short period of time. Do not smoke or allow open flames or sparks in or near a fueling or gasoline storage de-oil. If you get gasoline in your eyes or if you accidentally swallow gasoline, get medical attention immediately.

FUEL SYSTEM

SUPER VILLAIN SX20T

15	ADSORPTION TUBE	
16	FUEL TANK BREATHER	22~30 (N·m)
17	HEXAGON FLANGE BOLT M8×20	
18	15.82 QUICK CONNECT PLUG	
19	CLAMP 23.5	
20	CARBON CANISTER VENT PIPE	
21	REAR BREATHER	
22	square elbow	
23	CLAMP 26	
24	CARBON CANISTER	
25	DETACHMENT TUBE	
26	CARBON CANISTER CONTROL VALVE	
27	DETACHMENT TUBE	75~85 (N·m)
28	FUEL PUMP	
29	FUEL PUMP SEALING RING	
30	FUEL PUMP RETAINER RING	
31	FUEL PIPE, FUEL PUMP	
32	FUEL FILTER	
33	FILTER SLEEVE	8~12 (N·m)
34	FUEL PIPE, ENGINE	
35	BOLT M6×16	
36	CARGO HEAT SHIELD	

No fuel evaporation



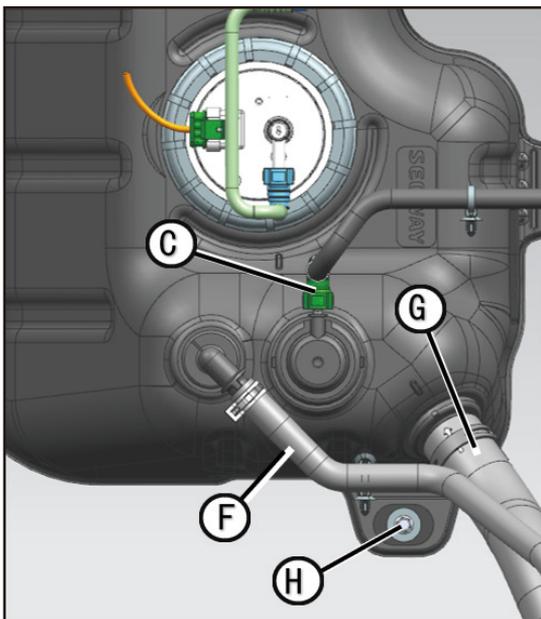
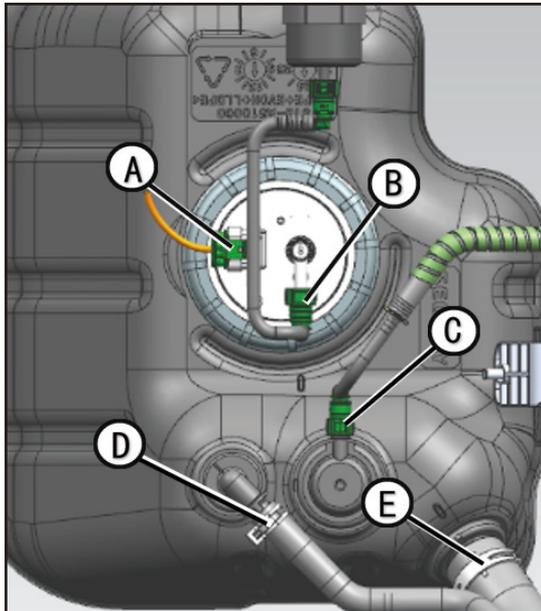
No.	Fastener	Torque
1	BACK PANEL HEAT SHIELD	
2	RING $\phi 8 \times 18$	
3	HEXAGON FLANGE BOLT M6 \times 30	8~12 (N·m)
4	T BUSHING	
5	TANK INSTALL RUBBER SLEEVE	
6	FUEL TANK ASSEMBLY	
7	FUEL TANK GASKET	
8	FUEL PIPE, ENGINE	
9	FUEL PUMP RETAINER RING	75~85 (N·m)
10	FUEL PUMP	
11	CLAMP 49	
12	FUEL FILLER CONNECTION HOSE	
13	FUEL TANK RUBBER GASKET	
14	FUEL FILLER	
15	HEXAGON FLANGE BOLT M6 \times 25	8~12 (N·m)
16	TANK COVER	
17	CLAMP 22	
18	FUEL TANK BREATHER	

FUEL SYSTEM

SUPER VILLAIN SX20T

19	BOLT M6×16	8~12 (N·m)
20	TRAILER POWER HEAT SHIELD	
21	7.89 QUICK CONNECTION PLUG	
22	CLAMP 16.5	
23	BREATHING VALVE PIPE	
24	CLAMP 20	
25	square elbow	
26	CLAMP 26	
27	CONNECTING PIPE	
28	REAR BREATHER	
29	FUEL PIPE, FUEL PUMP	
30	FILTER SLEEVE	
31	FUEL FILTER	
32	CARGO HEAT SHIELD	
33	FUEL PUMP SEALING RING	

FUEL TANK REMOVAL/INSTALLATION

**! WARNING**

- ◆ Whenever the gasoline line is removed, the battery connection must be disconnected to prevent the accidental startup of the fuel pump.
- ◆ Whenever any repairs or inspections are made to the fuel system, there is a possibility that a fuel leaks may occur. No welding, smoke, open flames, etc., should be allowed in the area.

DISASSEMBLY

- 【A】 Fuel pump cable plug
- 【B】 High-pressure hose plug
- 【C】 Adsorption hose assembly plug
- 【C】 7.89 quick connect coupling(90°)
- 【D】 Steel belt type elastic hose clamp 22
- 【E】 Steel belt type elastic hose clamp 49
- 【F】 Fuel tank vent hose
- 【G】 Fuel filler connection hose
- 【H】 Hexagon flange bolt (M6×30)

- ◆ Disconnect the battery cable
- ◆ Remove the seat and Interior and exterior body parts (see body section for details)
- ◆ Remove the seat frame
- ◆ Disconnect the fuel pump cable plug 【A】 .
- ◆ Pull out the high-pressure hose plug 【B】 and the adsorption hose assembly plug 【C】 or the 7.89 quick connect coupling (90°) 【C】 ..
- ◆ Remove the steel belt type elastic hose clamp 22 【D】 with appropriate tools, and then remove the fuel tank vent hose 【F】 .
- ◆ Remove the steel belt type elastic hose clamp 49 【E】 with appropriate tools, and then remove the fuel filler connection hose 【G】 .
- ◆ Remove the 4 hexagon flange bolt (M6×30) 【H】 with appropriate tools.
- ◆ Remove fuel tank

! CAUTION

During the process of disassembling any part of the fuel system, fuel leakage may occur. Wipe off the residual fuel with a cloth

INSTALLATION

- ◆ When assembling, assemble in the reverse order of disassembly.
- ◆ When assembling the high-pressure fuel pipe plug, make sure it is assembled correctly and reliably.

ASSEMBLY

- ◆ Confirm that the sealing ring is installed on the fuel tank port.
- ◆ Confirm the orientation of the fuel pump and install it on the fuel tank.
- ◆ Tighten the fuel pump installation screw cap clockwise.

Fuel pump mounting screw cap

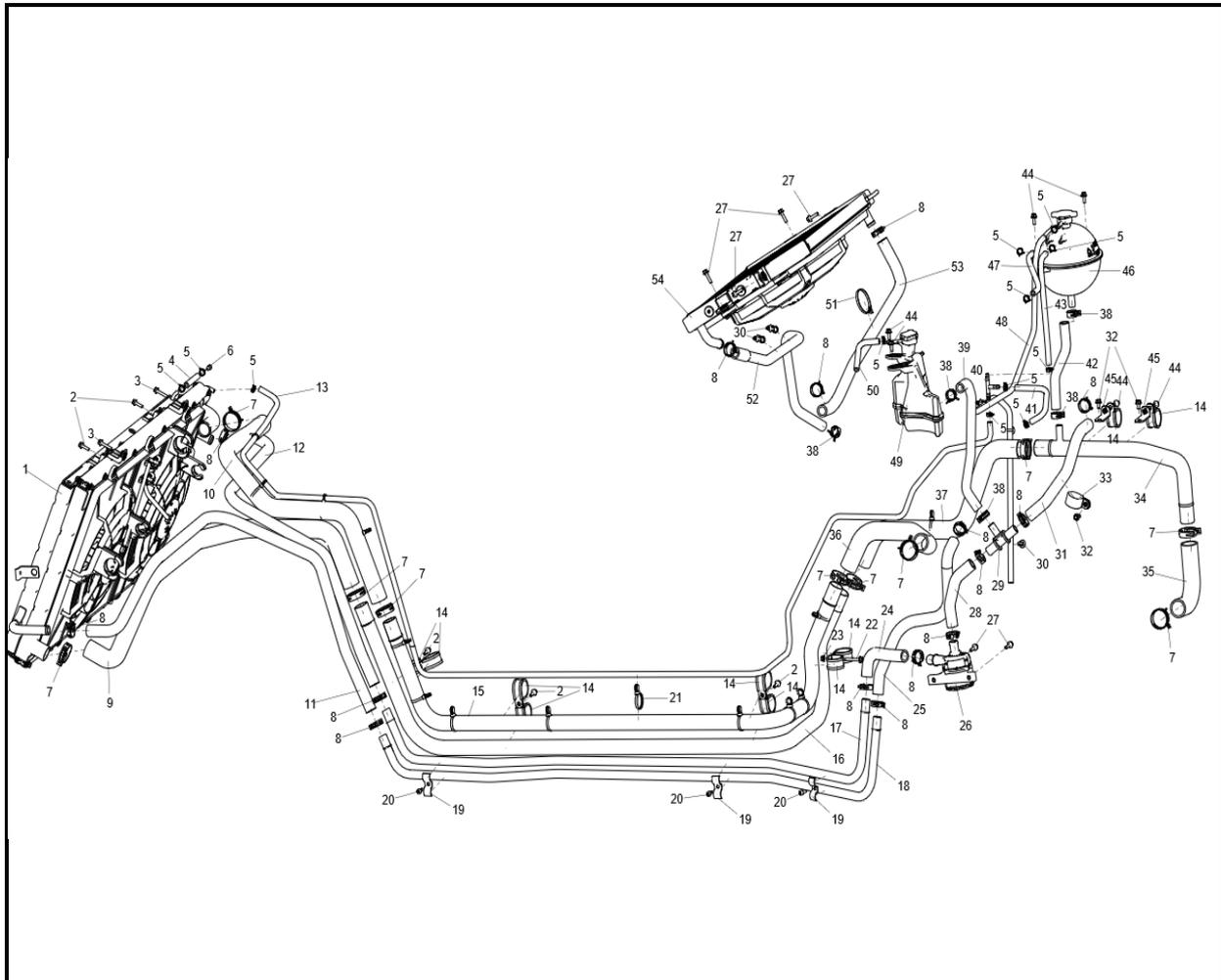
75 N·m (7.6 kgf·m , 55 ft·lb)

CAUTION

When disassembling the fuel pump, note that the vehicle must be turned off and left for more than 30min to ensure that the pressure of the high pressure fuel hose is relieved to avoid danger.

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EXPLODED VIEW

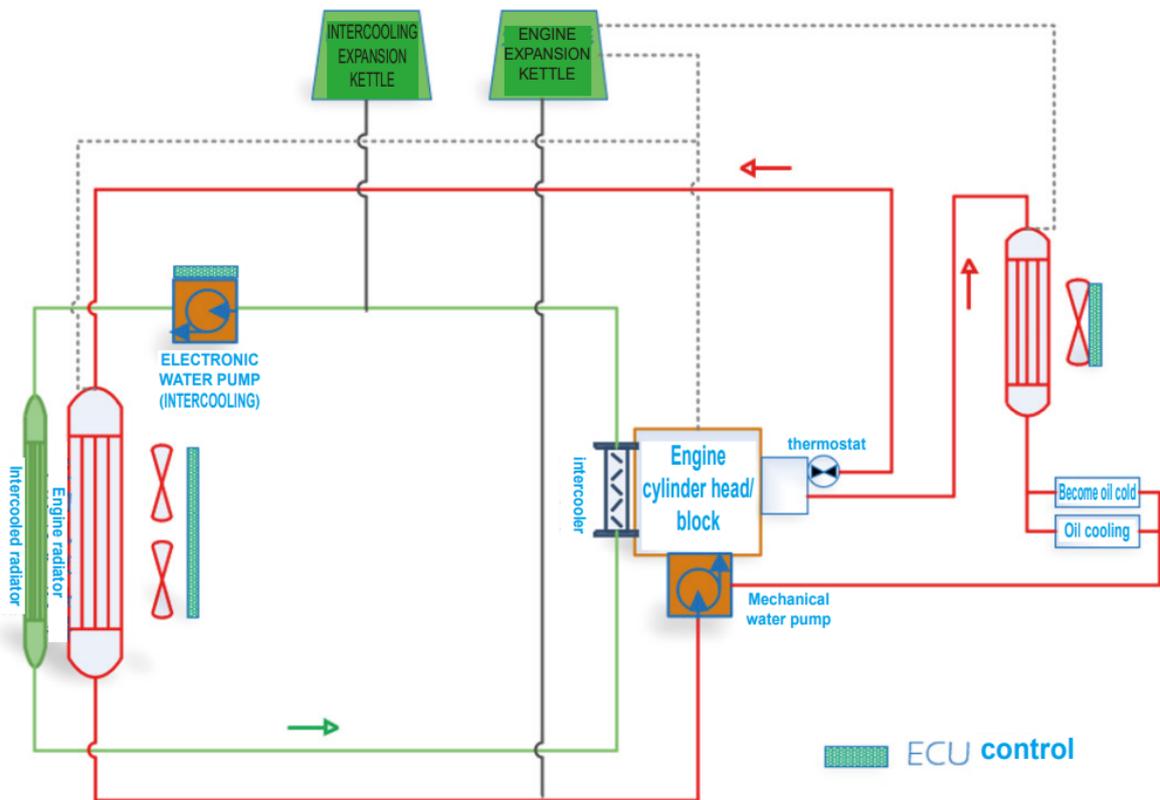


NO.	FASTENER	TORQUE
1	HIGH TEMPERATURE RADIATOR WITH	
2	HEXAGON FLANGE BOLT M6x20	5.9~8.8 ft-lbs (8~12 Nm)
3	HEXAGON FLANGE BOLT M6x30	5.9~8.8 ft-lbs (8~12 Nm)
4	BREATHER PIPE OF INTERCOOLER	
5	CLAMP 13	
6	CVT DRAIN PLUG	5.9~8.8 ft-lbs (8~12 Nm)
7	HOSE CLAMP 42	
8	STEEL BELT ELASTIC HOSE CLAMP 28	
9	RADIATOR OUTLET HOSE 1	
10	RADIATOR INLET HOSE 1	
11	INTERCOOLER RADIATOR OUTLET	
12	INTERCOOLER RADIATOR INLET HOSE	
13	ENGINE RADIATOR BREATHER HOSE	

14	35 STRIP	
15	RADIATOR INLET AL PIPE 2	
16	RADIATOR OUTLET AL PIPE 2	
17	RADIATOR INLET PIPE 2	
18	INTERCOOLER RADIATOR OUTLET	
19	CLIP $\phi 20$	
20	HEXAGON SOCKET HEAD SCREW	5.9~8.8 ft-lbs (8~12 Nm)
21	NYLON TIE, 5*300mm	
22	HEXAGON FLANGE BOLT M6x40	5.9~8.8 ft-lbs (8~12 Nm)
23	NUT M6	
24	INTERCOOLER RADIATOR WATER	
25	INTERCOOLER RADIATOR OUTLET	
26	ELECTRONIC WATER PUMP (80W)	
27	HEXAGON FLANGE BOLT M6x25	5.9~8.8 ft-lbs (8~12 Nm)
28	INLET HOSE 5 FOR INTERCOOLER	
29	TEE 20x20x16	
30	POSITIONING TIE $\phi 7 \times 180$	
31	INTERCOOLER RADIATOR WATER	
32	HEXAGON FLANGE BOLT M6x12	5.9~8.8 ft-lbs (8~12 Nm)
33	32 CLAMPS	
34	RADIATOR OUTLET AL PIPE 5	
35	ENGINE RADIATOR WATER OUTLET	
36	ENGINE RADIATOR WATER INLET HOSE	
37	ENGINE RADIATOR WATER OUTLET	
38	CLAMP 22	
39	INTERCOOLER WATER SUPPLY PIPE	
40	THREE-WAY PIPE	
41	ENGINE BREATHER PIPE	
42	WATER KETTLE REFILLING HOSE	
43	WATER KETTLE INTAKE HOSE	
44	BOLT M6x16	5.9~8.8 ft-lbs (8~12 Nm)
45	BOLT M6x16	
46	EXPANSION KETTLE	
47	TRANSMISSION RADIATOR BREATHER	
48	WATER KETTLE BREATHER PIPE	

49	Expansion kettle	
50	WATER KETTLE EXHAUST HOSE	
51	RIBBON 5x250	
52	WATER OUTLET HOSE	
53	TRANSMISSION RADIATOR WATER	
54	GEAR BOX RADIATOR	

THERMAL MANAGEMENT SYSTEM SCHEMATIC

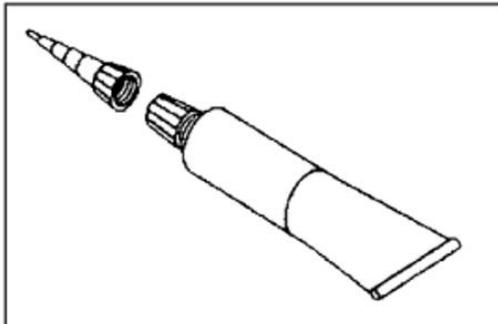


TECHNICAL PARAMETER

Item	Standard	Service limit
Coolant provided during transportation:	Permanent antifreeze (soft water and glycol for aluminum engines and radiators plus corrosion inhibitors and rust inhibitor chemicals)	
Type	Green	/
Color		
Mixing ratio	Soft water 50%, cooling water 50%	
Capacity	Single-cab: approx. 18.8 L (approx. 14.5 L for the entire cooling system of the engine; approx. 4.3 L for the entire)	
Expansion tank (engine, intercooler) cap pressure relief	93~123 kPa (0.95~1.25 kgf /cm ² , 14~18psi)	/
Thermostat:		
Valve opening temperature	82°C (179.6 °F)	/
Valve fully opening temperature	95°C (208.4 °F)	

SPECIAL TOOLS AND SEALANTS

Sealant

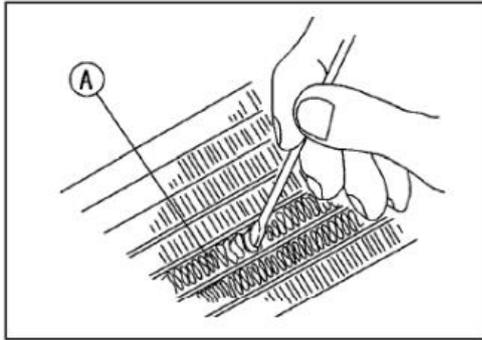


Pipe clamp pliers



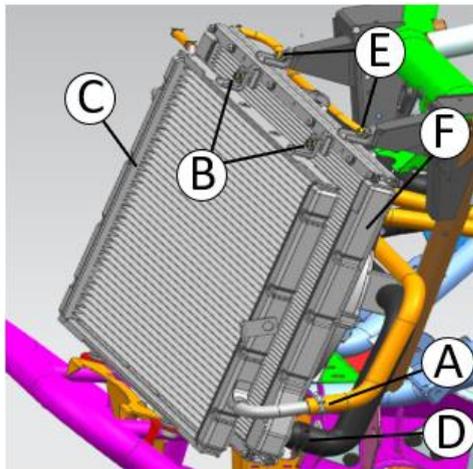
RADIATOR INSPECTION AND REMOVAL AND INSTALLATION

Radiator Inspection



- ◆ Check the radiator core.
- ◆ If there are obstructions to air flow, remove the radiator and remove obstructions.
- ◆ If the corrugated fins 【 A 】 are deformed, carefully straighten them.
- ◆ If the air passages of the radiator core are blocked more than 20% by unremovable obstructions or irreparably deformed fins, replace the radiator with a new one.

High Temperature Radiator With Fan Assembly Removal and Installation

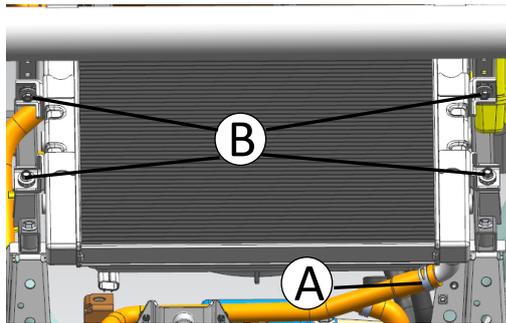


- ◆ Turn off the engine and power off the vehicle, Ensure that the coolant in the radiator tank and hoses is in a cool state.
- ◆ Remove the front panel and headlight cover assembly from the front of the vehicle.
- ◆ Remove the left and right inlet and outlet hose clamps [A] with the clamp pliers and pull out the 2 intercooler radiator front section hoses. ([A] Steel band elastic hose clamps 28)
- ◆ Remove the 2 mounting bracket bolts M6X20 [B] on the intercooler radiator. ([B] Hexagon flange bolts M6×20)
- ◆ Tilt the intercooler radiator [C] forward and pull out the intercooler radiator [C] from above.
- ◆ Remove the left and right inlet and outlet hose clamps [D] with the clamp pliers and pull out the 2 engine radiator front section hoses. ([D] Steel band elastic hose clamps 42)
- ◆ Remove the 2 mounting bracket bolts M6X30 [E] on the engine radiator. ([E] Hexagon flange bolts M6×30)
- ◆ Tilt the engine radiator [F] forward, pull out the connector on the fan, and pull out the engine radiator [F] upward.

⚠ WARNING

Do not touch the radiator core. This may damage the radiator, resulting in reduced cooling efficiency.

- ◆ Radiator installation and removal in reverse order.



Transmission Radiator With Fan Assembly Removal and Installation

- ◆ Turn off the engine and power off the vehicle, Ensure that the coolant in the radiator tank and hoses is in a cool state.
- ◆ Remove the plastic parts around the transmission radiator.
- ◆ Remove the left and right inlet and outlet hose clamps [A] with a clamp pliers and pull out the 2 transmission radiator hoses. ([A] Steel band elastic hose clamp 28)
- ◆ Remove the 4 mounting bracket bolts M6X25 [B] on the transmission radiator. ([B] Hexagon flange bolts M6×25)
- ◆ Remove the transmission radiator toward the front of the vehicle.

! WARNING

Do not touch the radiator core. This may damage the radiator, resulting in reduced cooling efficiency.

- ◆ Radiator installation and removal in reverse order

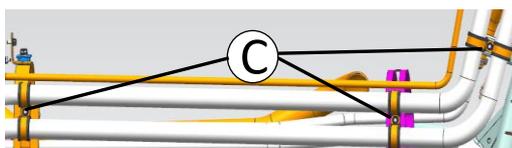
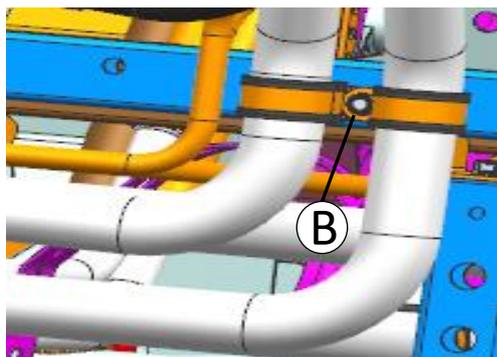
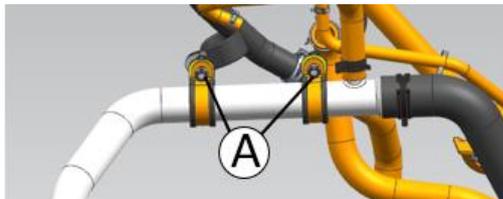
COOLING PIPE SYSTEM INSPECTION AND REMOVAL AND INSTALLATION

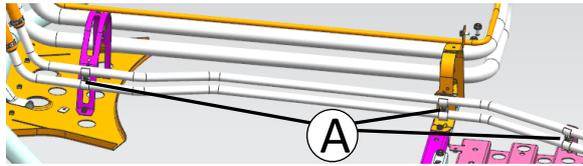
Cooling Pipe System Inspection

- ◆ Check hoses and aluminum tubes for defects such as rupture and expansion, and replace if found.

Engine Cooling Pipe System Removal And Inspection

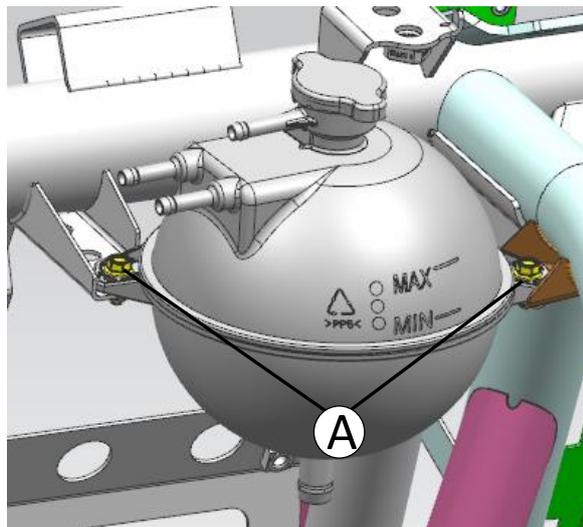
- ◆ Ensure that the coolant in the cooling pipe system is in a cool state.
- ◆ Remove the 2 mounting bracket bolts M6X16 [A] on the coolant expansion tank. ([A] Hexagon flange bolts M6×16)
- ◆ Remove the mounting bracket bolts M6X40 and nuts M6 [B] on the coolant hose. ([B] Hexagon flange bolts M6X40 and nuts M6)
- ◆ Remove the 3 mounting bracket bolts M6X20 [C] from the coolant hose. ([C] Hexagon flange bolts M6×20)
- ◆ Cooling pipe system installation and removal in reverse order





Disassembly and assembly of intercooler pipeline

- ◆ Remove the 3 mounting bracket bolts M6X12 [A] from the coolant hose. ([A] Hexagon socket head cap screw M6×12)
- ◆ Cooling pipe system installation and removal in reverse order



COOLANT EXPANSION TANK INSPECTION AND REMOVAL AND INSTALLATION

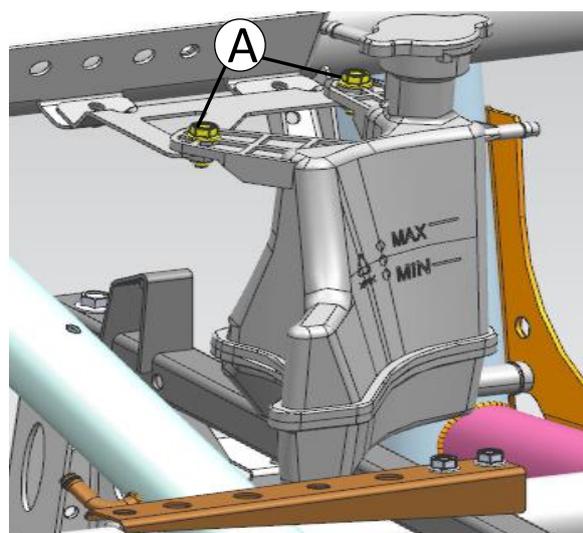
Coolant Expansion Tank (Engine) Inspection

- ◆ Check the coolant level in the coolant expansion tank (engine), the coolant should be maintained between the minimum MIN and maximum MAX marks, if the level is below the minimum MIN, coolant needs to be added to the required position.

Coolant Expansion Tank (Engine) Removal And installation

M6X12 [A] on the coolant expansion tank. ([A] Hexagon flange bolts M6×12)

- ◆ Coolant expansion tank installation and removal in reverse order



Coolant Expansion Tank (Intercooling) Inspection

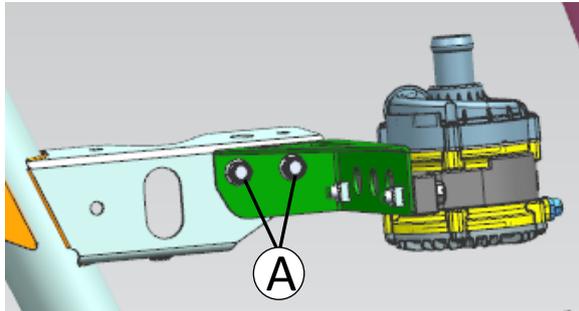
- ◆ Check the coolant level in the coolant expansion tank (intercooling), the coolant should be maintained between the minimum MIN and maximum MAX marks, if the level is below the minimum MIN, coolant needs to be added to the required position.

Coolant Expansion Tank (Intercooling) Removal And installation

- ◆ Remove the 2 mounting bracket bolts M6X12 [A] on the coolant expansion tank. ([A] Hexagon flange bolts M6×12)

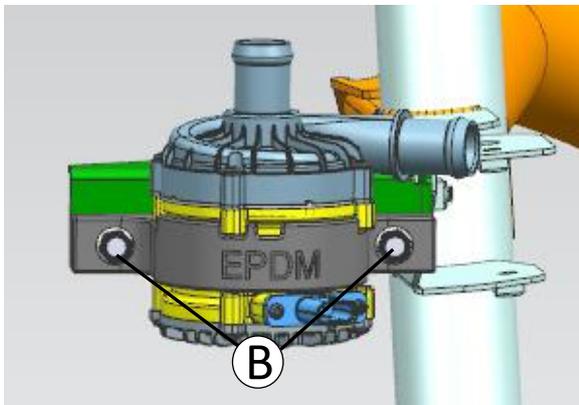
- ◆ Remove the 2 mounting bracket bolts

- ◆ Coolant expansion tank installation and removal in reverse order



ELECTRONIC WATER PUMP REMOVAL AND INSTALLATION

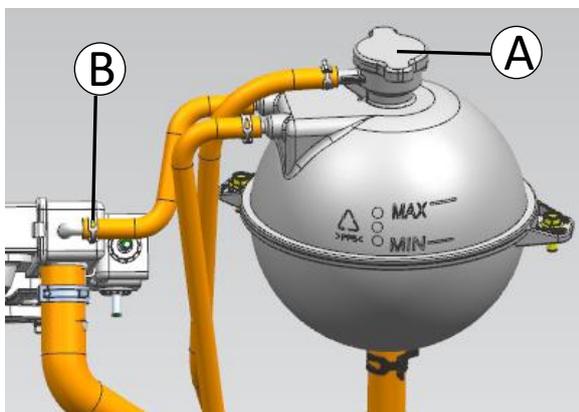
- ◆ Turn off the engine and power off the vehicle, Ensure that the coolant in the hoses is in a cool state, pull out the water inlet hose and the plug of the electronic water pump.
- ◆ Remove the 2 mounting bolts M6X12 [A] on the electronic water pump bracket. ([A] Hexagon flange bolts M6×12)



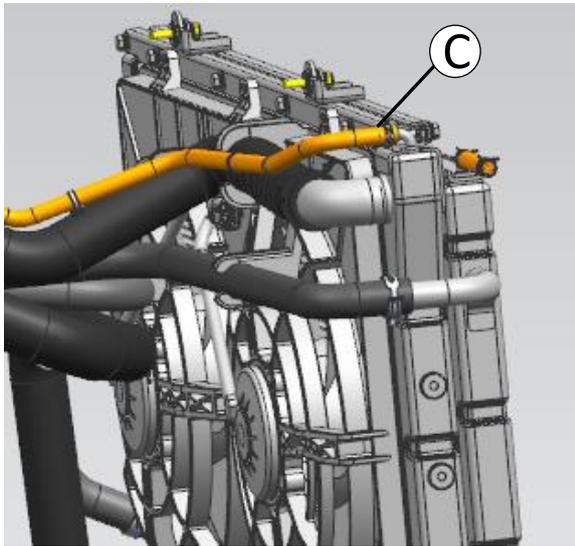
- ◆ Remove the 2 mounting bracket bolts M6X25 [B] on the electronic water pump. ([B] Hexagon flange bolts M6×25)
- ◆ Electronic water pump installation and removal in reverse order

PROCEDURE FOR MANUAL COOLANT FILLING

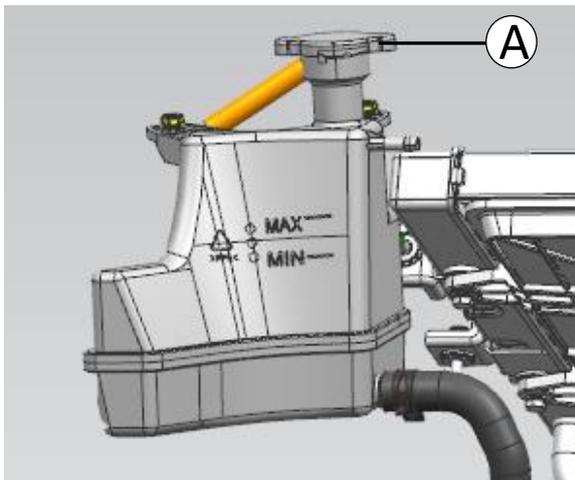
Engine Cooling System Coolant Filling



- ◆ Turn off the engine and power off the vehicle, Ensure that the coolant in the radiator, hoses and coolant expansion tank is in a cool state.
- ◆ Open the coolant expansion tank cap [A].
- ◆ Remove the clamp [B] of transmission cooling system air removal hose with a clamping pliers and pull out the transmission radiator air removal hose for air removal. ([B] Steel band elastic hose clamp hoop 13)
- ◆ Air removal hose installation and removal in reverse order

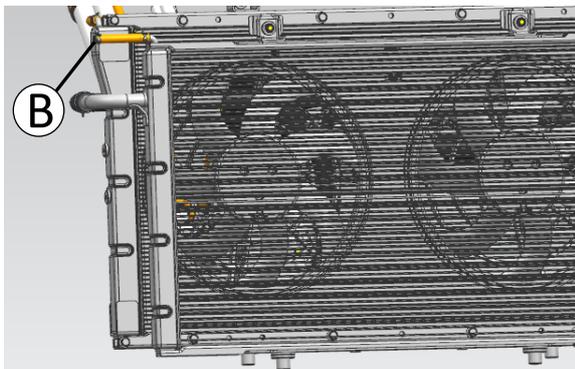


- ◆ Remove the engine radiator air removal pipe clamp [C] with clamp pliers and pull out the engine radiator air removal pipe for air removal. ([C] Steel band elastic hose clamp hoop 13)
- ◆ Air removal pipe installation and removal in reverse order
- ◆ [A], [B], [C] at the same time are open, the use of the same quality ratio of coolant or better quality of coolant to the expansion tank inside the filling, when the [B], [C] air removal pipe at the coolant outflow and outflow of coolant smooth and no bubbles will be [B], [C] air removal pipe inserted; close expansion tank cap [A] and screwed tight. (Note: [B], [C] either first out of coolant smooth and bubble-free, the first will be inserted into the air removal pipe, until both are inserted into the air removal pipe)



Intercooling System Coolant Filling

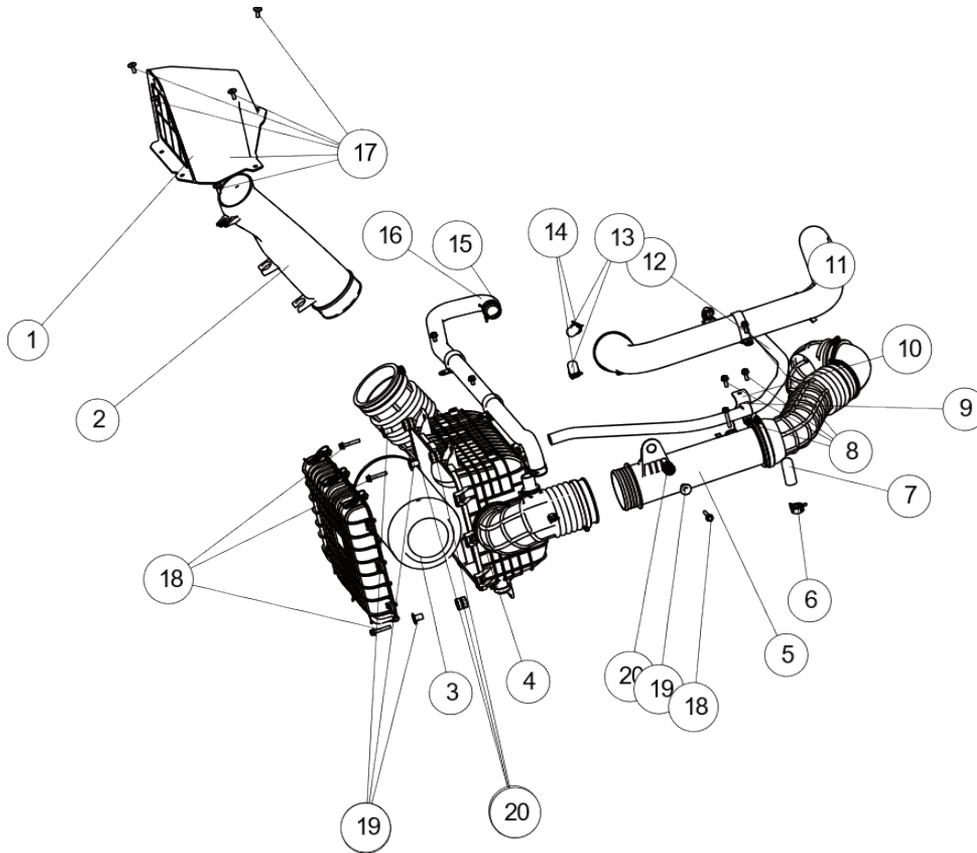
- ◆ Turn off the engine and power off the vehicle, Ensure that the coolant in the radiator, hoses and coolant expansion tank is in a cool state.
- ◆ Open the coolant expansion tank cap [A].
- ◆ Remove the intercooler radiator air removal hose clamp [B] with clamp pliers and pull out the plug for air removal. ([B] S05_CVT outlet pipe drain plug_PP_black_polished)
- ◆ Plug installation and removal in reverse order
- ◆ After [A] and [B] are opened at the same time, use the same quality ratio of coolant or better quality coolant to refill the expansion tank, and when the coolant flows smoothly without bubbles from the air removal pipe at [B], plug the plug [B]. Close the expansion tank cap and tighten [A].



INTAKE / EXHAUST SYSTEM

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REMOVAL	7-8

EXPLODED VIEW OF EXHAUST SYSTEM



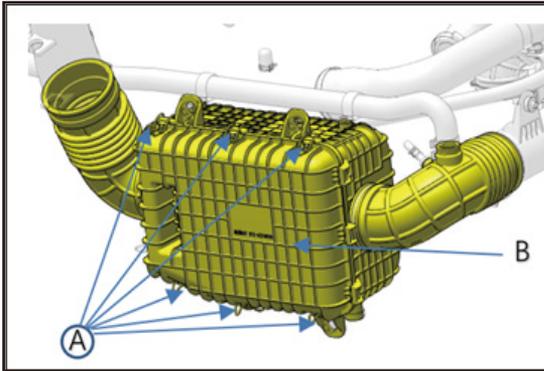
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	INTAKE PIPE MASK				
2	AIR FILTER INTAKE PIPE				
3	Air filter element				
4	AIR FILTER ASSY				
5	OUTLET PIPE	8 ~ 12	0.8~1.2	6~9	
6	CLAMP 22				
7	PLUG φ16	20 ~ 25	2.0~2.5	14.7~18.4	
8	LARGE PAN HEAD HEX SOCKET BOLT M6×16	10	1	7.5	
9	Pipe clamp Ø 22				
10	OUTLET PIPE BRACKET				
11	OUTLET PIPE				
12	BREATHER PIPE				

13	PLUG ϕ 13				
14	CLAMP,SPRINGBAND 19				
15	CLAMP,SPRINGBAND 32				
16	BREATHER PIPE				
17	LARGE PAN HEAD HEX SOCKET BOLT M6×16				
18	HEXAGON FLANGE BOLT M6×35				
19	FLANGING BUSH				
20	BUFFER RUBBER SLEEVE				

MUFFLERS AND EXHAUST PIPES

AIR FILTER ELEMENT REPLACEMENT

- 【A】 Buckle;
- 【B】 Cover;
- 【C】 Air filter element;



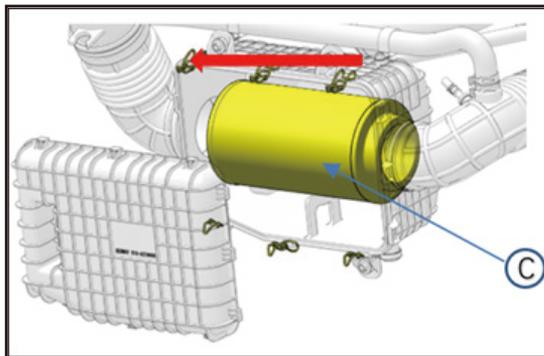
- ◆ Open the 6 pcs buckle [A]
- ◆ Remove the filter element [C] in the direction shown in the picture,
- ◆ Replace the filter element 【C】

⚠ WARNING

Make sure air filter element and end cover buckle are assembled in right position or it will cause engine failure or reduce lifetime.

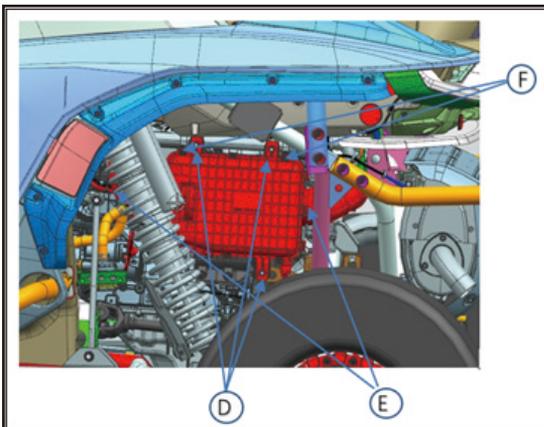
Please shorten interval to check air filter element if the vehicle is working in heavy dust environment.

If air filter is soaked or filter element is wet, please discharge water and replace air filter element.



AIR FILTER REMOVAL

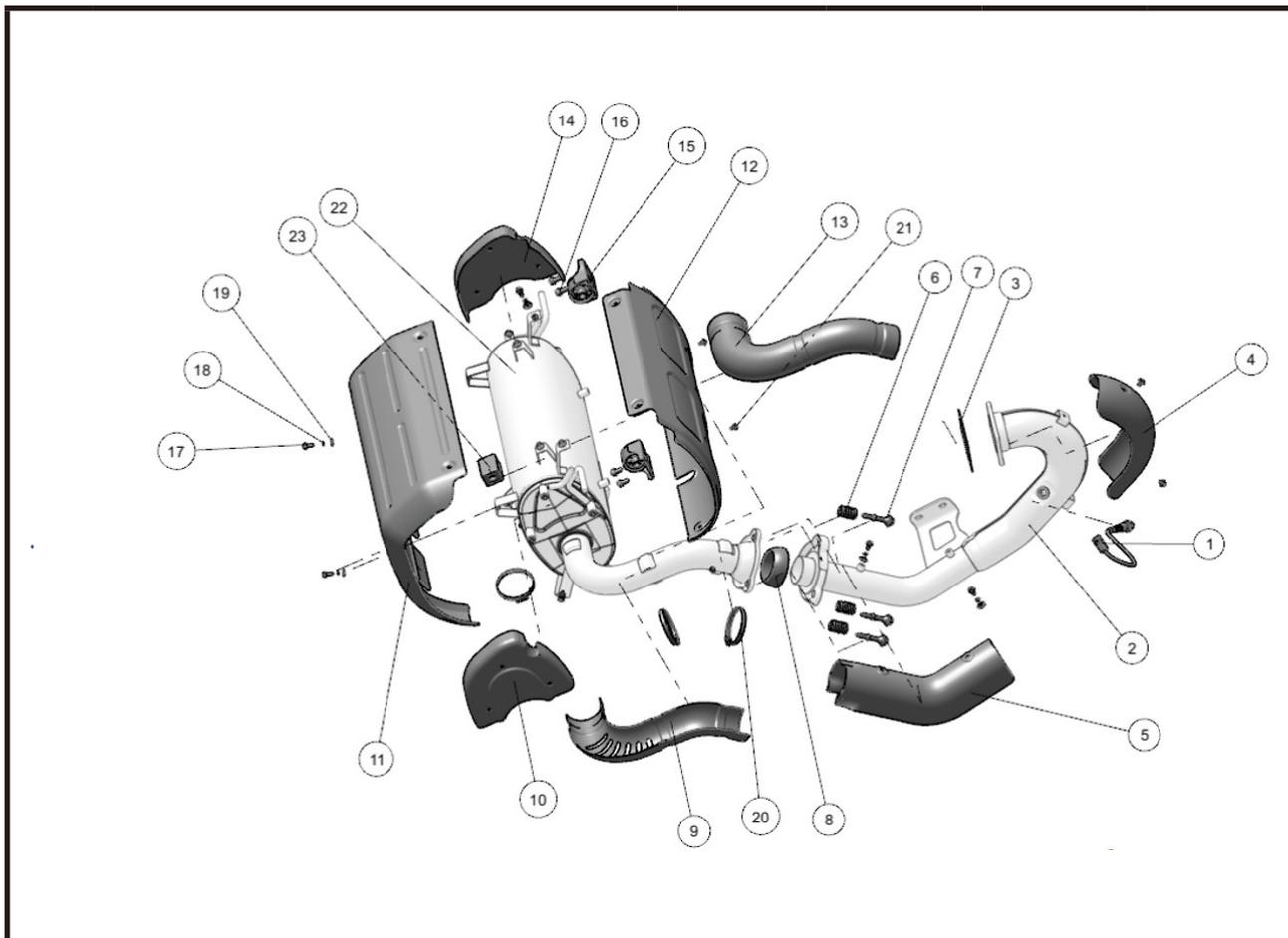
- ◆ Remove the 4 pcs bolts M6×35 【D】 ,
- ◆ Remove hoses 【E】 at both ends,
- ◆ Remove the 2 bolts M6×10 【F】 above the air filter
- ◆ Remove the air filter



INSTALLATION

- ◆ Installation in reverse order of removal

EXPLODED VIEW OF INTAKE SYSTEM



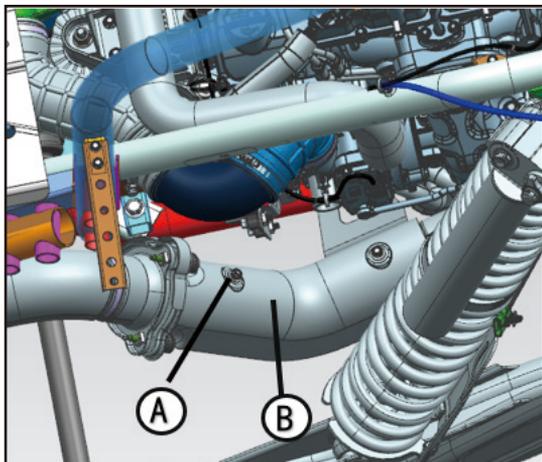
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	OXYGEN SENSOR				
2	EXHUAST PIPE ASSY				
3	SEALING GASKET				
4	FRONT PIPE HEAT SHIELD				
5	FRONT PIPE HEAT SHIELD				
6	EXHAUST PIPE INSTALLTION SPRING				
7	EXHAUST PIPE BOLT				
8	GRAPHITE SEALING SLEEVE				
9	LOWER HEAT SHIELD				
10	RIGHT END HEAT SHIELD				
11	EXTERNAL HEAT INSULATION COVER OF THE CYLINDER				
12	THERMAL INSULATION COVER INSIDE THE CYLINDER				
13	INSULATION COVER ON THE CURVED TUBE OF THE CYLINDER				

INTAKE / EXHAUST SYSTEM

SUPER VILLAIN SX20T

14	LEFT END HEAT SHIELD				
15	COMBINATION OF UPPER SHOCK ABSORBER SLEEVE AND LOWER MO				
16	HEXAGON FLANGE BOLT M8×16				
17	BOLT M6×16				
18	Spring washer Φ 6				
18	PLAIN WASHER 6				
20	A-BAND, TRANSMISSION HOSE 80				
21	BOLT M6×12	8 ~ 12	0.8~1.2	6~9	
22	MUFFLER				
23	SUPPORT BLOCK	8 ~ 12	0.8~1.2	6~9	

MUFFLER REMOVAL

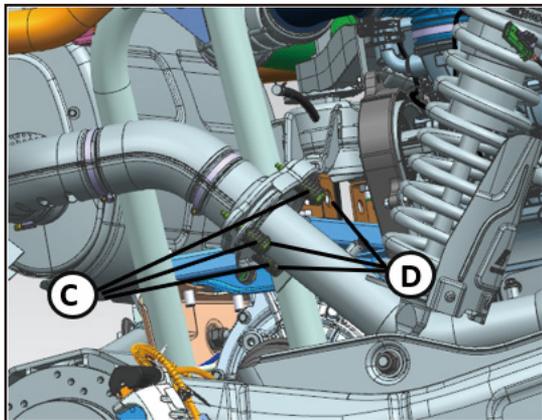
**⚠ WARNING**

Whenever the components of the exhaust system are inspected or maintained, the parts of the exhaust system must be checked for overheating to avoid being scalded by high temperatures.

【A】 2 pcs hexagon flange bolts (M6×16)

【B】 Front exhaust manifold heat shield

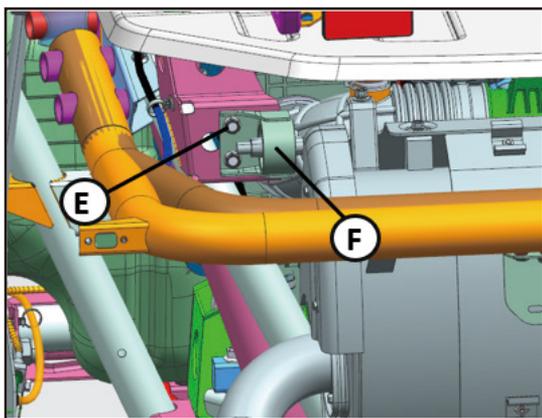
- ◆ Remove the bolts 【A】 , take off the front exhaust manifold heat shield 【B】



【C】 Exhaust pipe mounting springs

【D】 Exhaust pipe connecting bolts

- ◆ Remove the exhaust pipe connecting bolts 【D】 with tool, take off the exhaust pipe springs 【C】



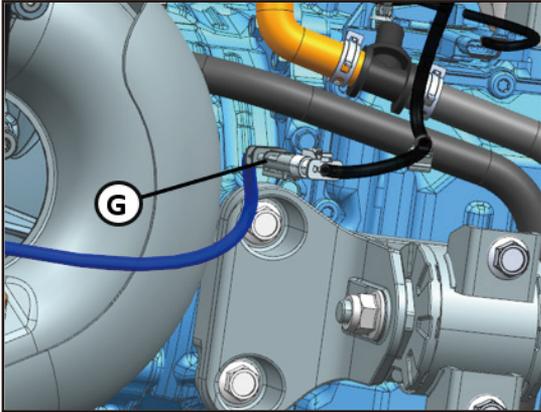
ENGINE UPPER BUFFER SLEEVE LOWER MOUNT ASSEMBLY REMOVAL

【E】 Hexagon flange bolts M8×16

【F】 Engine upper buffer sleeve lower

- ◆ Remove the fastening bolts [E] on the right and left sides above the muffler barrel with a tool respectively
- ◆ Remove the engine upper buffer sleeve lower mount assembly removal
- ◆ At this point, you can remove the muffler assembly as a whole.

EXHAUST MANIFOLD REMOVAL



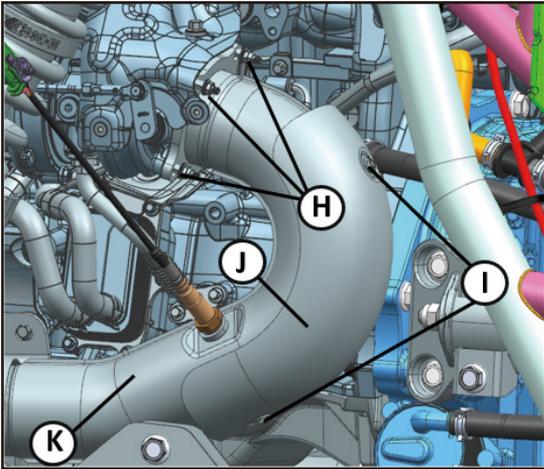
⚠ WARNING

Whenever the components of the exhaust system are inspected or maintained, the parts of the exhaust system must be checked for overheating to avoid being scalded by high temperatures.

- ◆ Unplug oxygen sensor harness plug 【G】

REMOVAL

- 【H】 Hexagonal nuts
- 【I】 Hexagon cap screws M6×14
- 【J】 Front exhaust manifold heat shield
- 【K】 Exhaust manifold assembly



- ◆ Remove the 4 pcs hexagonal nuts 【H】 with a tool
- ◆ Remove the 2 pcs front exhaust manifold heat shield mounting bolts 【I】
- ◆ Remove the front exhaust manifold heat shield 【J】
- ◆ Remove the exhaust manifold 【K】

EXHASUT SYSTEM INSPECTION

1. Externally inspect the muffler for cracks, holes or ruptures, which can affect engine performance and emissions, and replace the appropriate parts;
2. Check for looseness, noise, debris, etc. inside the muffler by rocking the muffler back and forth;
3. Check for air leakage at the connection between the exhaust pipe and the cylinder head, if so, tighten the nut or replace the gasket;
4. Check for air leaks at the connection between the exhaust pipe and the muffler, if so, tighten the bolts or replace the muffler spring and sealing sleeve.
5. Check for carbon deposits on the screen of the spark arrester [A], if so, clean it with a suitable brush, if the screen or gasket is damaged, it must be replaced.

EXPLODED VIEW OF DRIVESHAFT 8-2

REAR DRIVE SHAFT ASSEMBLY REMOVAL..... 8-4

 CENTER DRIVE SHAFT ASSEMBLY REMOVAL 8-4

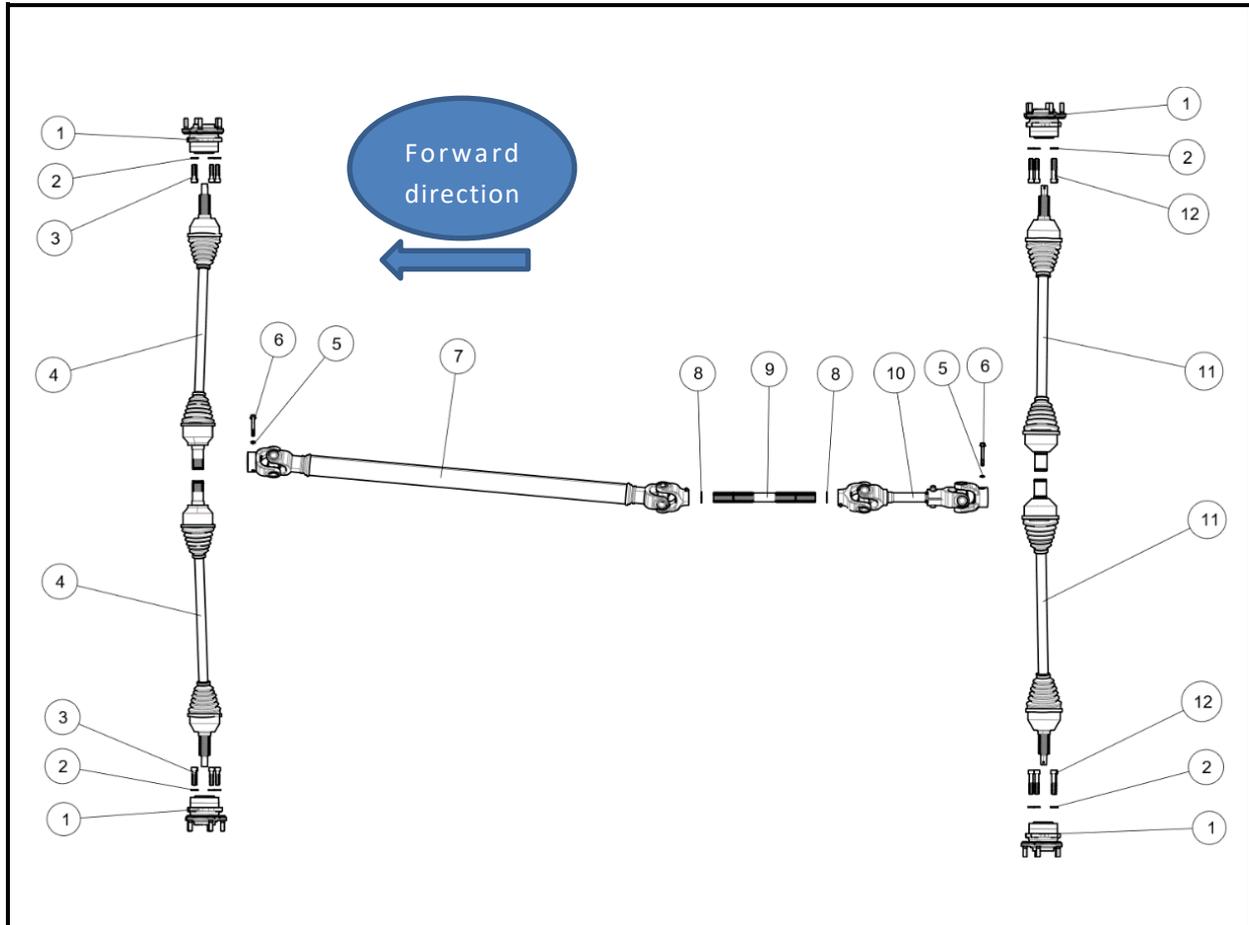
 FRONT DRIVE SHAFT REMOVAL 8-5

 DRIVE SHAFT MAINTENANCE..... 8-5

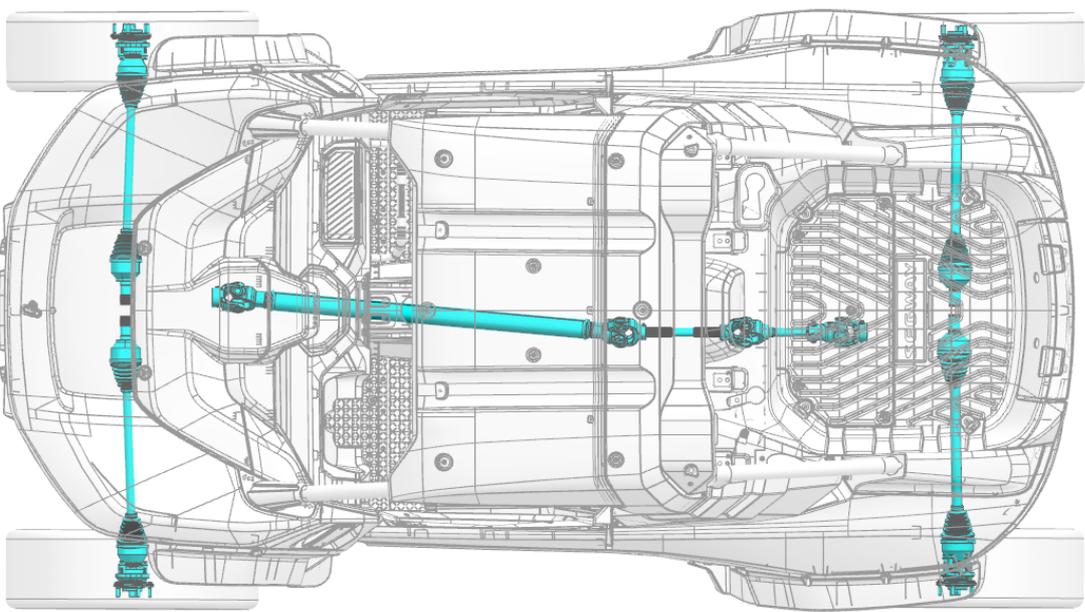
 DRIVE SHAFT REMOVAL 8-6

 HUB BEARING ASSEMBLY REMOVAL..... 8-7

EXPLODED VIEW OF DRIVESHAFT



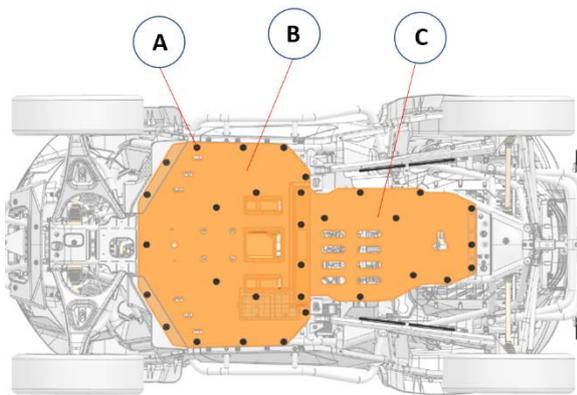
NO.	FASTENER	TORQUE
1	WHEEL BEARING DU2F11412441	
2	GASKET 12	
3	SCREW M12 x 1.5 x 45	81.1 ft-lb(110 Nm) Add thread fastening
4	FRONT CV DRIVE SHAFT	
5	WASHER 8	
6	HEXAGONAL FLANGE BOLT M8 x 65	25.8 ft-lb (35 Nm) Add thread fastening
7	FRONT DRIVE SHAFT	
8	RETAINING RING 32 x 1.5	
9	MID DRIVE SHAFT	
10	FRONT SECTION OF REAR DRIVE	
11	REAR CV DRIVE SHAFT	
12	SCREW M12 x 1.5 x 65	81.1 ft-lb (110 Nm) Add thread fastening



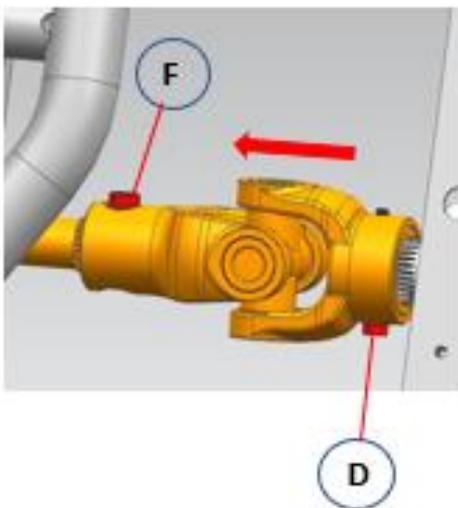
REAR DRIVE SHAFT ASSEMBLY REMOVAL

- 【A】 Screw;
- 【B】 Front skid plate;
- 【C】 Rear skid plate;
- 【D】 Bolt;
- 【E】 Bolt;
- 【F】 Rear drive shaft assembly;

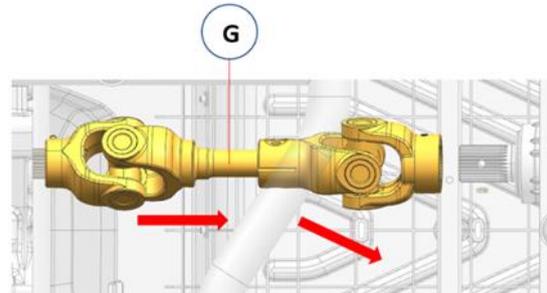
◆ From the bottom of the vehicle, remove the retaining screws [A], front skid plate [B] and rear skid plate [C];



◆ From the bottom of the vehicle, remove the retaining bolt [D], nut [E] and bolt [F], push the rear driveshaft assembly [G] out in the direction of the arrow until it disengages from the splined shaft;



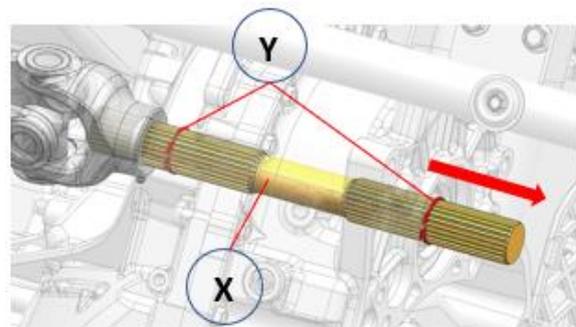
◆ From the bottom of the vehicle, push the rear driveshaft assembly [G] in the direction of the arrow until it disengages from the splined shaft;



CENTER DRIVE SHAFT ASSEMBLY REMOVAL

- 【X】 Center drive shaft assembly;
- 【Y】 Circlips for shaft;

◆ From the bottom of the vehicle, remove the 2 circlips from shaft [Y]; then push the center drive shaft [X] in the direction of the arrow until it disengages;



FRONT DRIVE SHAFT REMOVAL

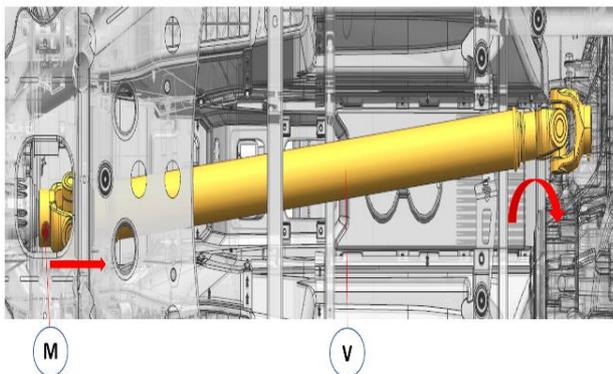
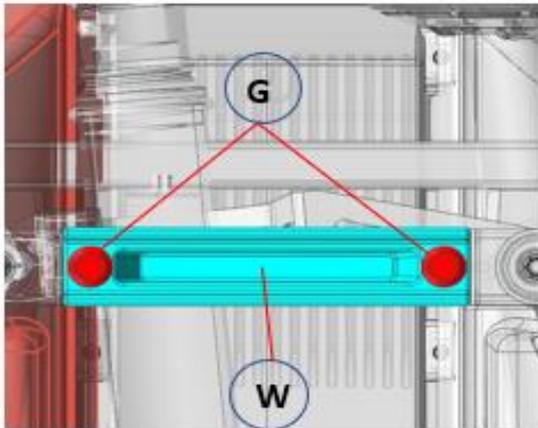
【G】 Bolt

【W】 Connecting base

【M】 Bolt

【V】 Front drive shaft assembly

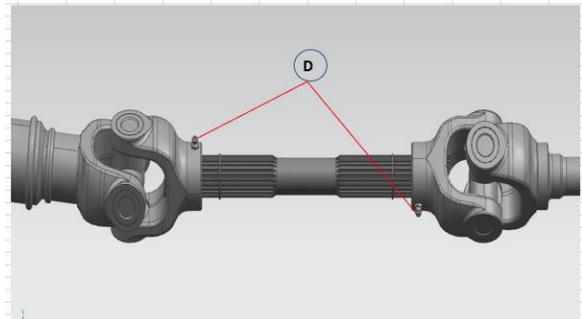
- ◆ From the bottom of the vehicle, remove the 2 bolts [G]; take off the connecting base [W]; Remove the bolt [M]; then push the front drive shaft assembly [V] in the direction of the arrow until it disengages to take it off;



DRIVE SHAFT MAINTENANCE

◆ Grease filling;

- ◆ When the inspection found that the grease in the drive shaft is reduced, or after every 2000Km of vehicle driving, you need to use a tool to add grease through the grease nipple [D];



DRIVE SHAFT REMOVAL

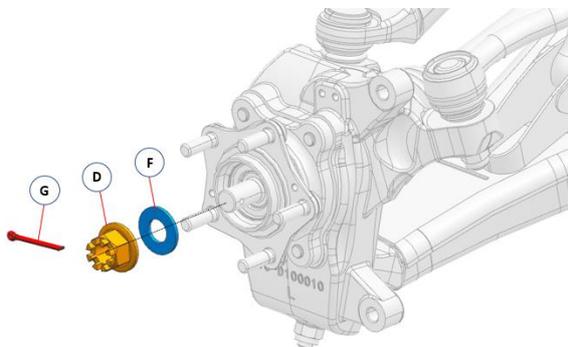
【G】 Split pin 【D】 Nut 【F】 Washer



Park the vehicle in a horizontal position and use a jack or support frame to support the vehicle so that the wheels do not touch the ground, and then remove the tires;

◆ Disassemble the split pin 【G】 and nut 【D】 , remove the washer 【F】 ;

Torque of nut 【D】: 200 N·m;



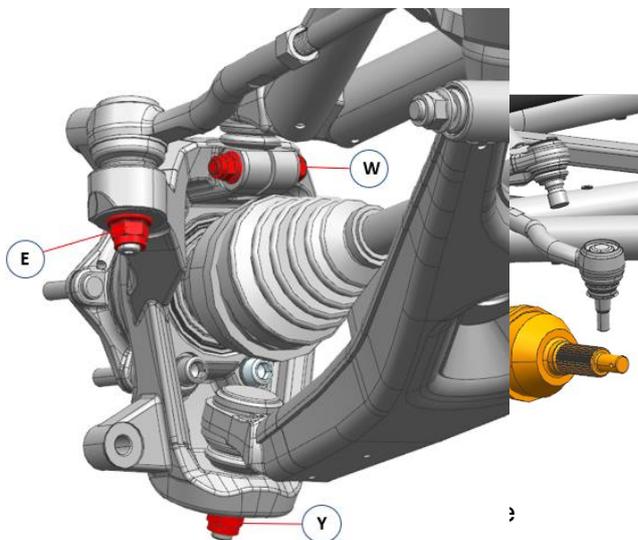
【W】 Bolt 【E】 Nut 【Y】 Nut

◆ Remove the fixing nut [Y] and bolt [W] of the upper and lower main pins to separate the upper and lower A-arms from the steering knuckle;

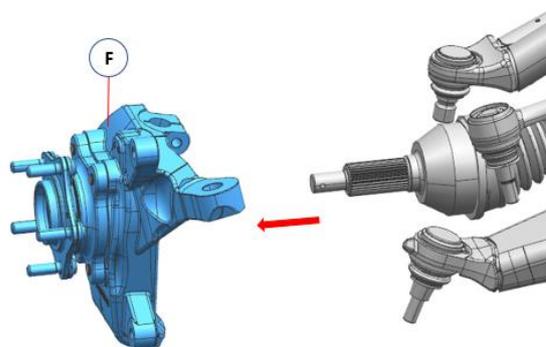
◆ Remove the track rod nut [E] to separate the track rod from the steering knuckle;

Torque of bolt 【W】: 70 N·m;

Torque of bolt 【E】 【Y】: 145 N·m;



direction of the arrow 【F】;



【E】 Balance bar bolt

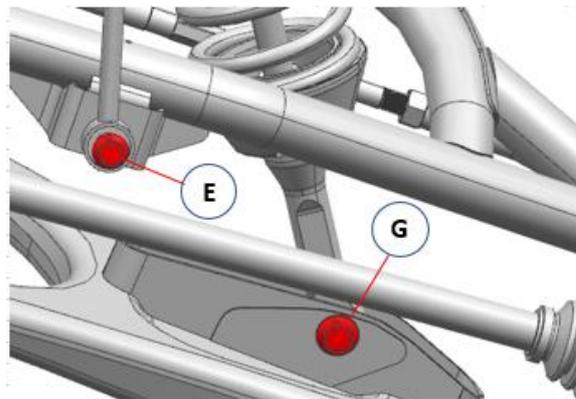
【G】 Shock absorber bolt

◆ Remove the lower shock absorber mounting bolt 【G】;

◆ Remove the balance bar mounting bolt 【E】;

Torque of bolt 【G】: 185 N·m;

Torque of bolt 【E】: 110 N·m;

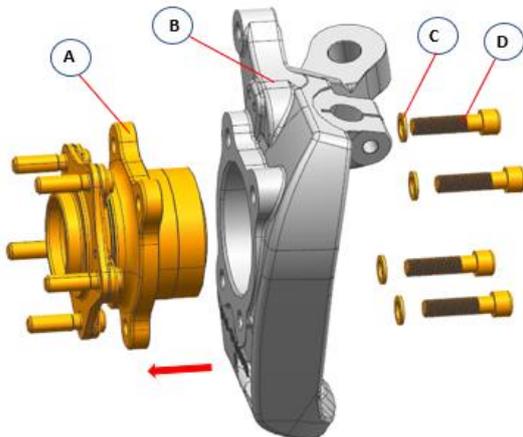


◆ Position the drive shaft parallel to the direction of the arrow and hold the center shaft of the drive shaft in the direction of the arrow and pull out the drive shaft outward;

HUB BEARING ASSEMBLY REMOVAL

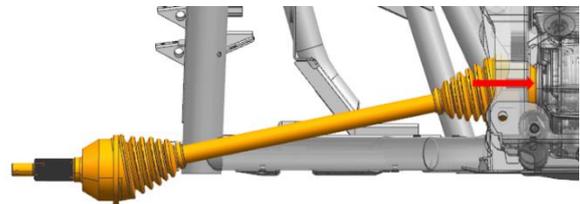
【A】 Hub bearing assembly 【B】 Bearing mount
 【C】 Small flat spacer 【D】 Bolt

- ◆ Remove 4 bolts【D】; Remove 4 small flat spacers【C】 , Simply remove the hub bearing assembly 【A】



and bearing mount [B] in the direction of the arrow.

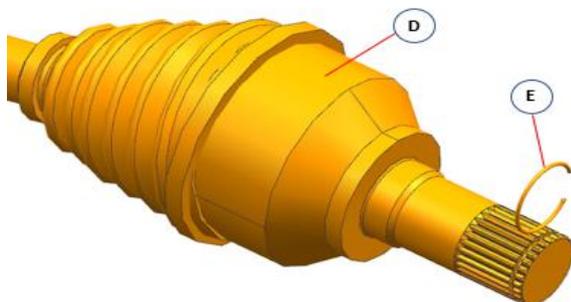
Torque of bolt 【D】: 110 N·m;



DRIVE SHAFT REMOVAL

【D】 Constant velocity joint 【E】 C-shaped retaining ring

- ◆ Install a new retaining ring [E] in the spline groove, apply anti-seize to the spline;



- ◆ Align the splines of the drive shaft with the differential splines and push inward in the direction of the horizontal arrow to install the drive shaft;

- ◆ If necessary, tap the outboard end of the drive shaft with a rubber mallet to install the drive shaft;

- ◆ Steering knuckles, A-arms, track rods, shock absorbers, etc. are assembled in reverse order of disassembly as described above.

CONSTANT VELOCITY JOINT REPAIR

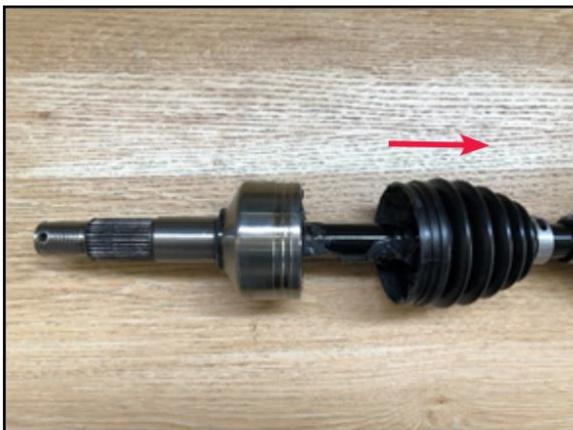
◆ Use clamp pliers to clamp the clamp, and then use a small screwdriver to place it on the clamp at the end, while lifting the clamp upwards, loosen the clamp and remove the clamp;

CAUTION

The drive shaft is a precision part, and cleanliness must be ensured when replacing and installing, and operate strictly in accordance with the instructions, do not use a hammer or sharp objects for disassembly and installation, which will affect the performance and service life of the half shaft.



◆ Remove the clamps at both ends of the dust cover and pull the dust cover out a distance in the direction of the center axis;



Remove the grease in the dust cover and on the universal joint;

◆ Find a hard workbench and knock the bottom of the universal joint hard on the workbench to

disengage the center shaft and universal joint;

CAUTION

Pay attention to the position of the dust cover during disassembly, do not hit the dust cover on the workbench to avoid damage. Padded nylon plates on the workbench to avoid damage to the universal joints.



◆ After disassembling the center shaft, pay attention to whether there is a retaining ring in the groove. Make sure that the retaining ring is not left inside the universal joint and replace it with a new one;



CONSTANT VELOCITY JOINT REPAIR

◆ Remove the grease on the center shaft spline, first put the small clamp on the center shaft, and then install the dust cover on the center shaft;



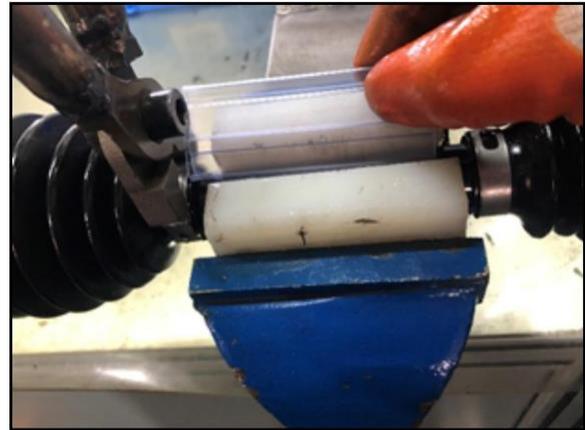
◆ Pour grease into the universal joint and the dust cover, then align the outer spline of the center shaft with the inner spline of the universal joint, and knock the center shaft into the universal joint on a hard workbench;

CAUTION

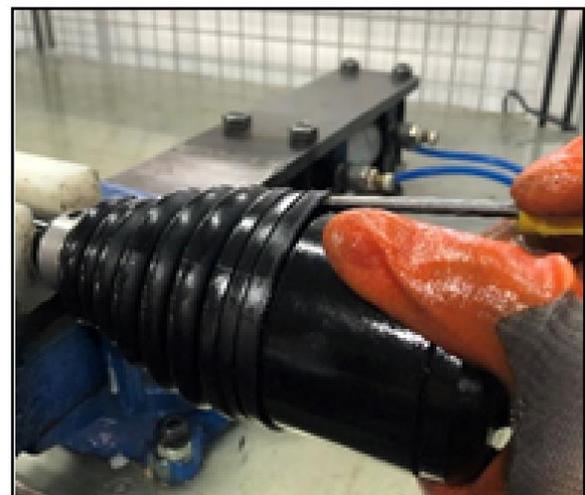
If you only replace the grease, you need to clean the remaining grease inside the universal joint, and it is forbidden to mix different greases or use other greases instead.



◆ First install the small clamp, adjust the position of the dust cover to ensure that the dust cover is stuck in the groove of the intermediate shaft, and then use clamp pliers to clamp the small clamp;



◆ When installing the large clamp, the dust cover is now stuck in the groove of the universal joint, and then the gas in the dust cover is discharged, and a corner of the dust cover is lifted with a screwdriver. Be careful not to puncture the dust cover, and then go back and forth. Push and pull the universal joint, you can hear the sound of gas flowing, stay the universal joint in the middle position, take out the screwdriver and clamp the big clamp;

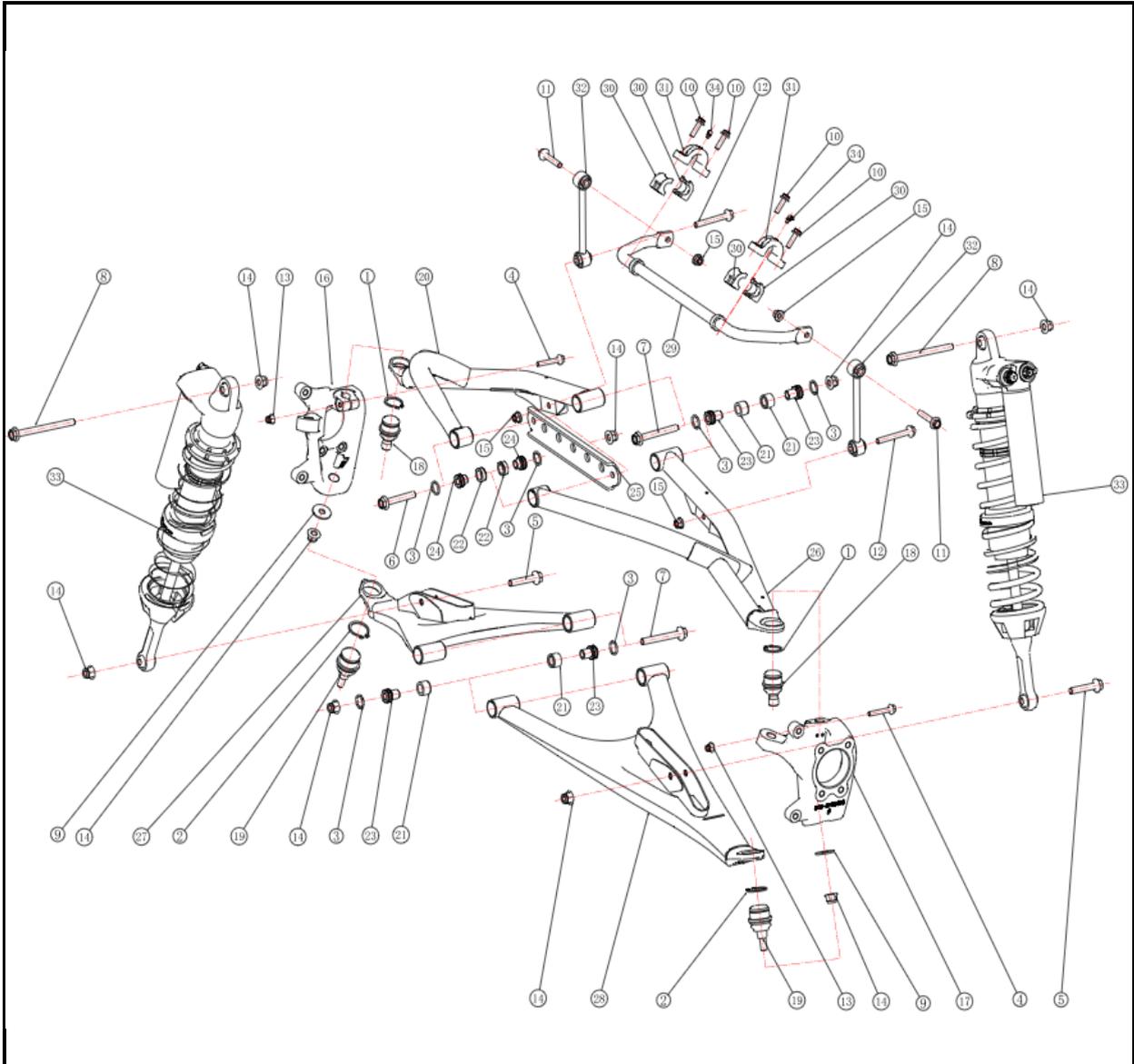


◆ Wipe clean the grease on the universal joint and the center shaft and then use it;

◆ The above maintenance procedures are applicable to the outer ball cage of the front drive shaft, and the inner and outer ball cages of the rear drive shaft.

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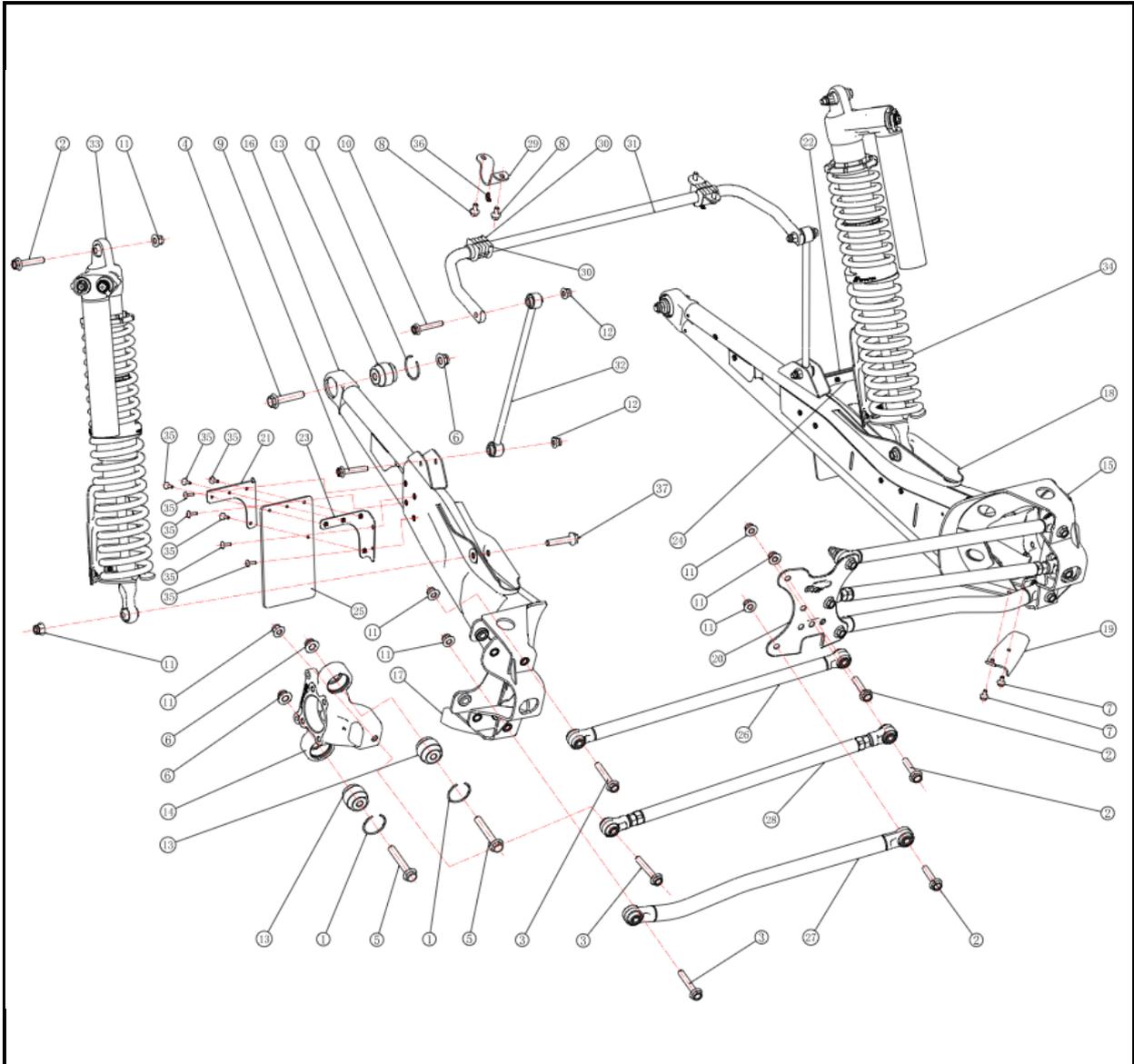
FRONT SUSPENSION EXPLOSIVE



No.	Material Name	Torque Value	Remarks
1	axis with elastic retaining ring 40×2.5		
2	Elastic retaining ring 45×2.5 for 2 shafts		
3	O-ring seal		
4	Hexagon flange bolts M10×1.25×60	65-75 Nm	
5	Hexagon flange bolt M14×1.5×70	175-195 Nm	
6	Hexagon flange bolts M14×1.5×80	175-195 Nm	
7	Hexagon flange bolts M14×1.5×105	175-195 Nm	
8	Hexagon flange bolt M14×1.5×160	175-195 Nm	

9	Large gasket Class A 14		
10	Hexagonal flange bolts M10×1.25×35	(47.9-55.3) ft · lb (65-75 Nm)	
11	Hexagonal flange bolts M12×1.25×65	(73.8-88.5) ft · lb (100-120 Nm)	
12	Hexagonal flange bolts M12×1.25×90	(73.8-88.5) ft · lb (100-120 Nm)	
13	Hexagonal flange locking nut M10×1.25	(47.9-55.3) ft · lb (65-75 Nm)	
14	Type 2 non-metal insert hexagon flange locking nut	(129.0-143.8) ft · lb (175-195 Nm)	
15	All metal hexagonal flange locking nut M12 x 1.25	(73.8-88.5) ft · lb (100-120 Nm)	
16	Front left turn knuckle assembly		
17	Front right steering knuckle assembly		
18	Lower kingpin assembly		
19	Upper kingpin assembly		
20	Front left upper rocker arm welded assembly _ Black		
	Front left upper rocker arm welded assembly _ Red		
21	Rocker arm bushing I		
22	Rocker arm bushing II		
23	Rocker arm T-sleeve I		
24	Rocker arm T-sleeve II		
25	Rocker arm mounting plate		
26	Front upper right rocker arm welded assembly _ Black		
	Front upper right rocker arm welded assembly _ Red		
27	Front left lower rocker arm welded assembly _ Black		
	Front left lower rocker arm welded assembly _ Red		
28	Front right lower rocker arm welded assembly _ Black		
	Front right lower rocker arm welded assembly _ Red		
29	Front stabilizer bar assy		
30	Stabilizer rod bushing		
31	Stabilizer rod mounting seat		
32	Front stabilizer rod connecting rod		
33	Front shock absorber assembly		
34	90° connector pressure filling cup (taper thread)		

REAR SUSPENSION EXPLOSIVE



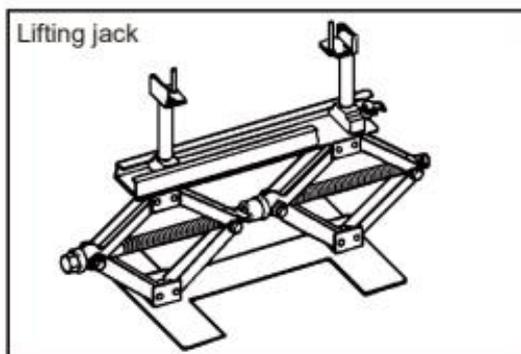
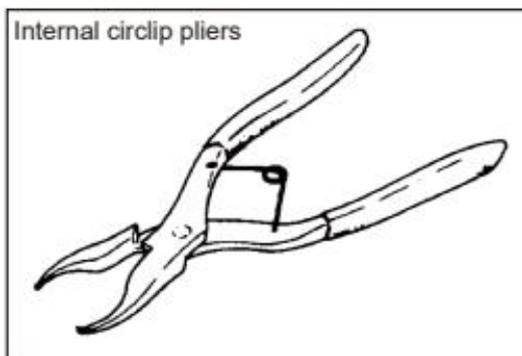
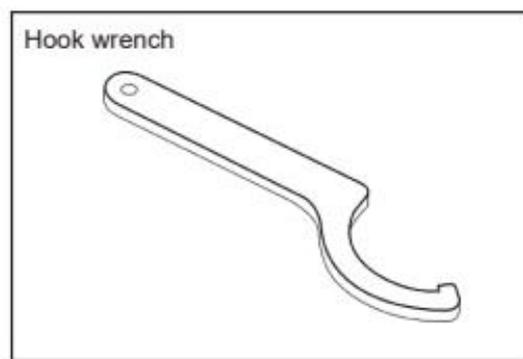
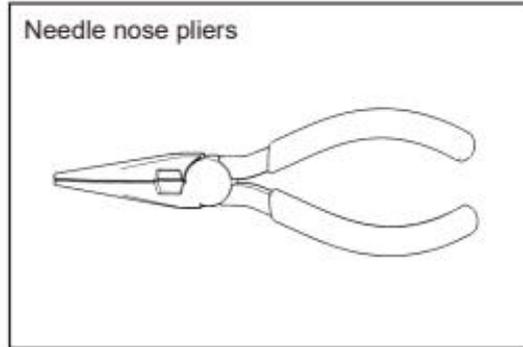
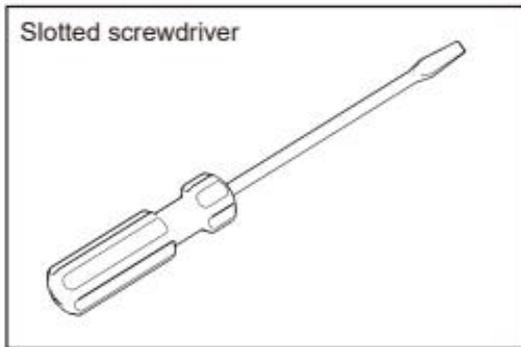
No.	Material Name	Torque Value	Remarks
1	Hole with steel wire ring 55		
2	Hexagon flange bolt M14×1.5×70	(129.0-143.8) ft · lb (175-195 Nm)	
3	Hexagonal flange bolts M14×1.5×85	(129.0-143.8) ft · lb (175-195 Nm)	
4	Hexagon flange bolt M16×2.0×80	(129.0-143.8) ft · lb (175-195 Nm)	
5	Hexagon flange bolt M16×2.0×105	(129.0-143.8) ft · lb (175-195 Nm)	
6	Non-metal insert hexagon flange locking nut	(129.0-143.8) ft · lb (175-195 Nm)	
7	Hexagonal flange bolt M8×16	(16.2-22.1) ft · lb (22-30 Nm)	
8	Hexagonal flange bolts M10×1.25×20	(47.9-55.3) ft · lb (65-75 Nm)	

9	Hexagonal flange bolts M12×1.25×65	(73.8-88.5) ft · lb (100-120 Nm)	
10	Hexagonal flange bolts M12×1.25×70	(73.8-88.5) ft · lb (100-120 Nm)	
11	Type 2 non-metal insert hexagon flange locking	(129.0-143.8) ft · lb (175-195 Nm)	
12	Type 2 Non-metal insert Hexagon flange locking	(73.8-88.5) ft · lb (100-120 Nm)	
13	Knuckle bearing		
14	Rear left axle support		
15	Rear right axle support		
16	Rear left arm welded assembly _ Black		
	Rear left arm welded assembly _ Red		
17	Left scraper		
18	Rear right arm welded assembly _ Black		
	Rear right arm welded assembly _ Red		
19	Right scraping board		
20	Control lever pressure plate		
21	Left fender bracket I		
22	Right fender bracket I		
23	Left fender bracket II		
24	Right fender bracket II		
25	Rocker arm fender		
26	Rear upper tie rod assembly		
27	Rear lower tie rod assembly		
28	Front bundle control rod assembly		
29	Rear stabilizer bar clamp plate		
30	Rear stabilizer rod bushing		
31	Rear stabilizer bar assy		
32	Rear stabilizer rod connecting rod		
33	Rear left shock absorber assembly		
34	Rear right shock absorber assembly		
35	Large pan head hexagon bolt M6x20	(6.6-8.9) ft · lb (9-12 Nm)	
36	90° connector pressure filling cup (taper thread)		
37	Hexagonal flange bolt M14×1.5×75	(129.0-143.8) ft · lb (175-195 Nm)	

TECHNICAL REFERENCE

Item	value	available range
Front shock absorber: Air pressure adjustable damping spring preload setting position (From bottom of upper mounting seat to adjusting nut position)	KMAN-2.5: 32mm (1.3in)	20~45mm (0.8~1.8in)
	KMAN-3.0: 32mm (1.3in)	20~45mm (0.8~1.8in)
Rear shock absorber: Air pressure adjustable damping spring preload setting position (From bottom of upper mounting seat to adjusting nut position)	KMAN-2.5: 104mm (4.1in)	90~120mm (3.5~4.7in)
	KMAN-3.0: 104mm (4.1in)	90~120mm (3.5~4.7in)
High-speed compression damping adjustment (from clockwise adjustment)	3	1~3
Low speed compression damping adjustment (from clockwise adjustment)	4	1~8
Reset damping adjustment (from clockwise adjustment)	4	1~8
Gas pressure	1MPa	

TOOLS



Rock maintenance and repairing

Rock check

Since the front shock absorber is a sealed unit, it cannot be removed and only needs to be carried out externally Check. If one unit is damaged, replace the two shock absorbers as a set.

If only one unit is replaced, and neither is balanced, it may lead Cause instability or poor overall comfort of the vehicle at high speed.

Rock pre-adjustment

The spring can be shortened on firmer roads and in uneven driving conditions or when carrying heavy loads.

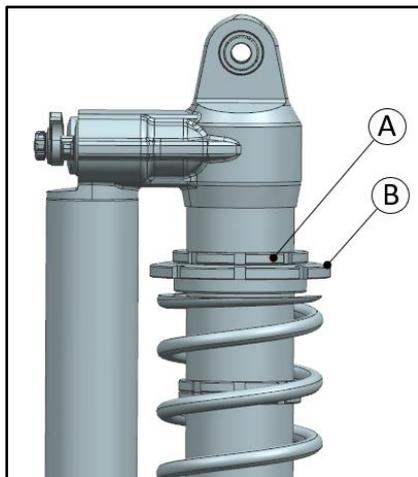
Stretch the spring on soft roads and in flat driving conditions. Note: When adjusting, the left and right sides of the spring should ensure that the length is the same in the case of no load (that is, the vehicle lifts the wheel off the ground), the specific adjustment method is shown in the following figure:

[A] Lock nut

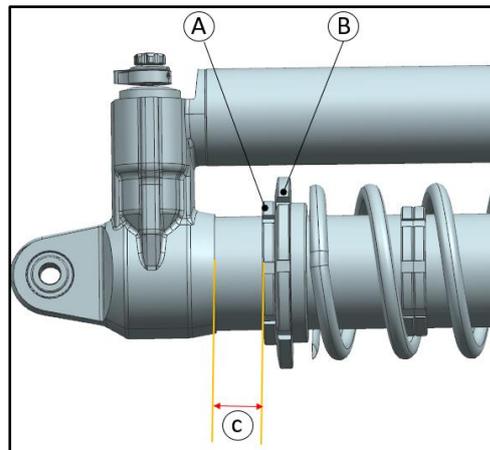
[B] Adjust the nut

Loosen the lock nut [A], turn the adjusting nut [B] as needed, and tighten the lock nut [A].

Note: Factory Settings are suitable for almost all situations. It should be considered that increased ground clearance may affect the operation of the vehicle.



Measure the length of spring



[A] Lock nut

[B] Adjust the nut

[C] Position of spring preload force

◆ Screw the adjusting nut [A] to the desired position, then tighten the locking nut [B], adjust the nut position [C] spring preload position [C] setting

Standard: Front shock absorber 32mm(1.3in.),

Use range 20mm(0.8in.) ~ 45mm(1.8in.)

Rear shock absorption 104mm(4.1in.),

Range 90mm(3.5in.) ~ 120mm(4.7in.)

Spring lock nut torque	
30 N · m	

If the spring action feels too soft or too hard, set it to:

位置	弹簧	环境	负载	地形	速度
↑	柔软	软	轻	平顺	低
标准位置	↑	↑	↑	↑	↑
	↓	↓	↓	↓	↓
↓	硬朗	硬	重	颠簸	高

Rock dampen adjustment

In order to adapt to various riding conditions, the preload of the spring can be adjusted by the shock absorber or spring change. Damping forces can also be easily adjusted without changing the oil viscosity.

Compression dampen adjustment

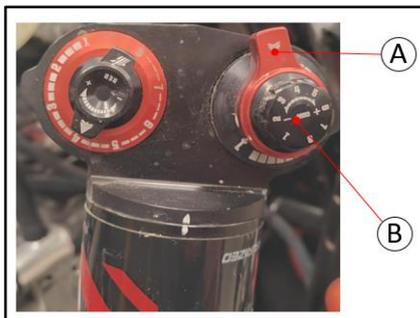
◆ Turn the upper high-speed compression damping regulator [A] by hand, increase the damping in the clockwise direction (gear 1→3), and decrease the damping in the counterclockwise direction (gear 3→1).

◆ Turn the upper low-speed compression damping regulator [B] by hand, increase the damping in the clockwise direction (gear 1→8), and decrease the damping in the counterclockwise direction (gear 8→1).

The high-speed compression damping regulator has 3 gears, and the factory setting gear is the first gear;

The low speed compression damping adjustment has a total of 8 gears, and the factory setting gear is the fourth gear.

A:



B:

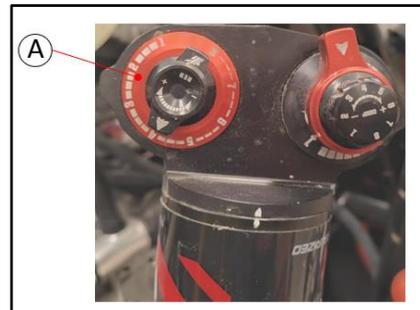


Resetting damping adjustment

Manually twist the damping regulator at the top or bottom [A] to increase the damping in the clockwise direction (gear 1 → 8) and reduce the damping in the counterclockwise direction (gear 8 → 1).

The recovery damping regulator has a total of 8 gears, and the factory setting gear is 4.

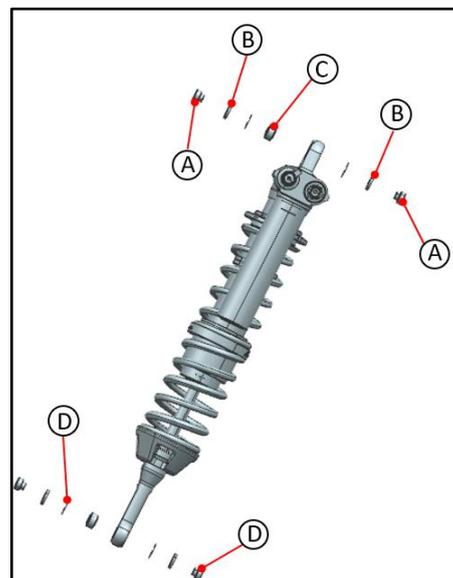
A:



B:



Adjustable rock check



- ◆ Check the upper and lower mounting seats
- ◆ If spacer ring, joint bearing combination and oil seal are damaged, replace them.

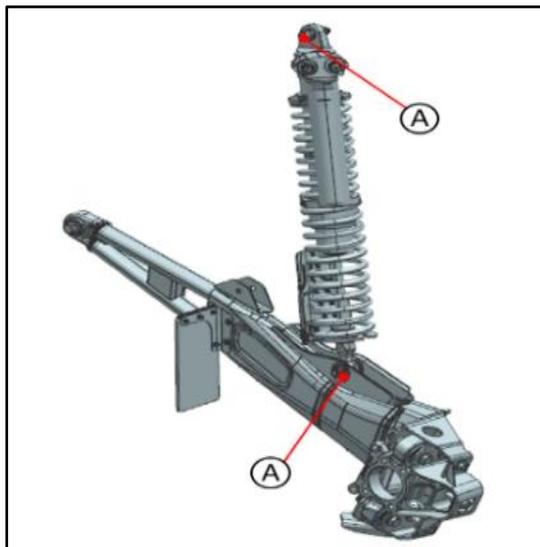
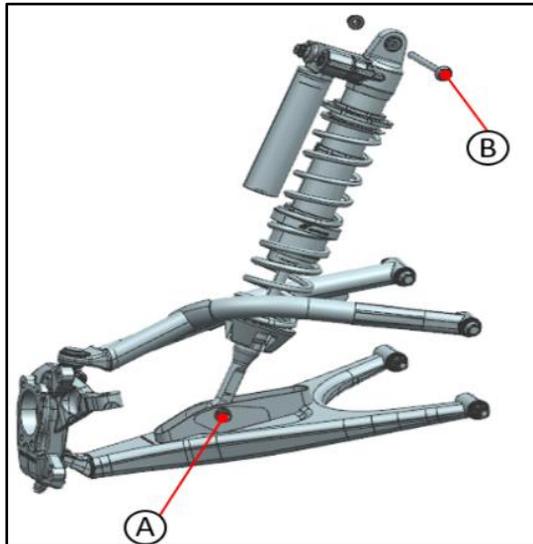
[A] Spacer ring

[B] Sponge sealing ring

[C] Joint bearing combination

[D] Steel wire stop ring

Rock removal



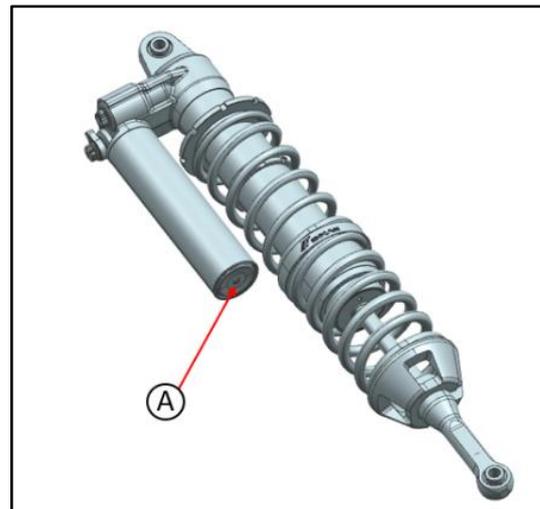
- ◆ Put the upper end of the front shock absorber into the frame mounting seat, and insert the bolts and nuts in the direction shown [B]
- ◆ Put the lower end of the front shock absorber into the frame mounting seat, and insert the bolts and nuts in the direction shown [A]
- ◆ Put the upper and lower end of the rear shock absorber into the frame mounting seat, and insert the bolts and nuts in the direction shown [A]
- ◆ Use tools to tighten bolts and nuts

Rock fixing Torque
(129.0-143.8) ft · lb (175-195 N · m)

Rock scrapping

警告

As the oil storage cylinder of the shock absorber contains nitrogen, do not burn the unfinished gas in the container tank, otherwise it may explode.



【A】 Valve cover

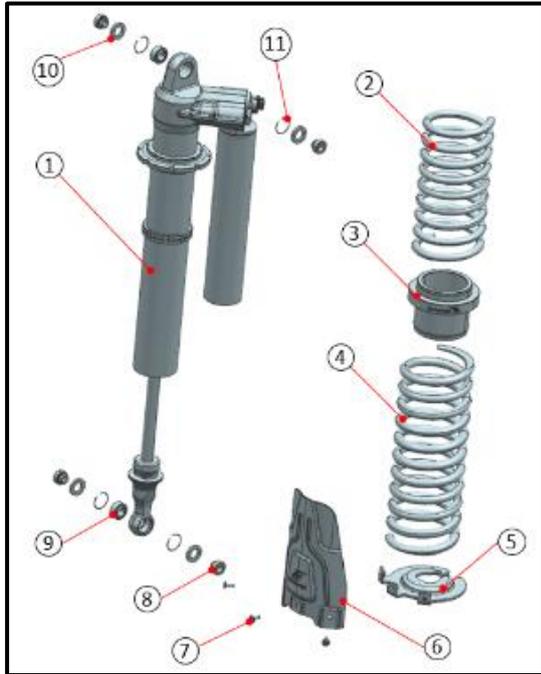
- ◆ Remove the shock absorber (please refer to shock absorber disassembly)
- ◆ Remove valve cover [A] and release nitrogen gas.
- ◆ Remove the valve

警告

As high pressure gas is dangerous, do not point the valve at your face or body to avoid injury.

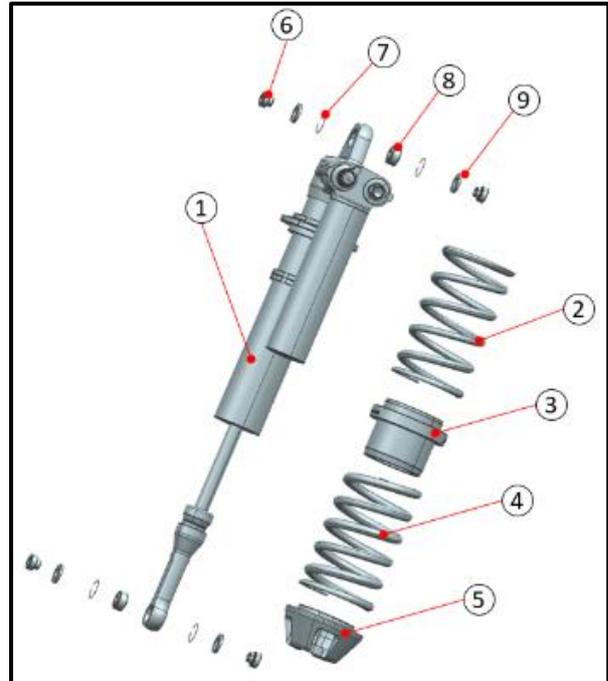
Rock diagram,

Front Rock explosive



No.	Name	Torque
1	Front damper assembly	
2	Front upper spring	
3	Spring spacer	
4	Front lower spring	
5	Front spring base	
6	Spacer ring	
7	Steel wire retaining ring	
8	Knuckle bearing assembly	
9	Sponge seal ring	

Rear rock explosive



No.	Name	Torque
1	Rear left and right damper assemblies	
2	Rear upper spring	
3	Spring spacer	
4	Rear lower spring	
5	Rear spring base	
6	Rear shock-absorbing fender	
7	Large pan head hexagon bolt M6x15	8~10NM
8	Spacer ring	
9	Knuckle bearing assembly	
10	Sponge seal ring	
11	Steel wire retaining ring	

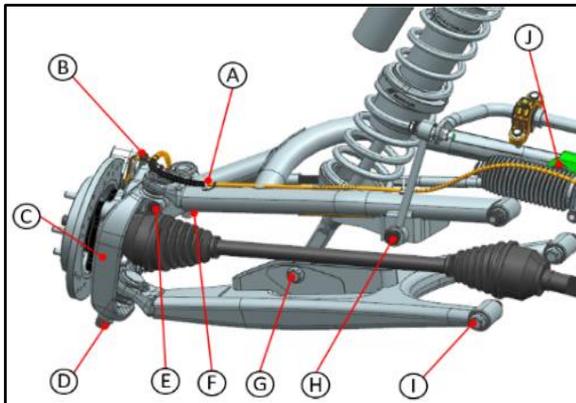
Front suspension removed

Remove front rocker arm

Pull the core rivet

- [B] brake tubing retaining bolt
- [C] Steering knuckle assembly
- [D] lower rocker arm kingpin fixing nut
- [E] Upper rocker arm kingpin mounting bolts and nuts
- [F] Steering tie rod nut
- [G] Shock absorber mounting bolts and nuts

- [H] Stabilizer rod tie rod mounting bolts and nuts
- [I] Lower rocker arm installation bolts and nuts
- [J] Install bolts and nuts on the upper rocker arm



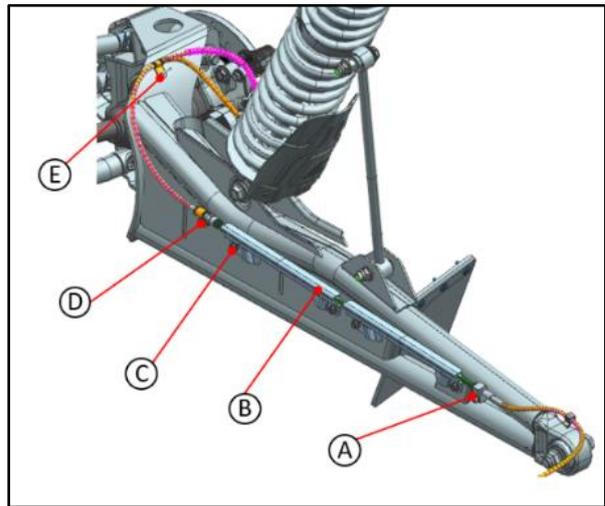
- ◆ Remove the core rivets fixing the tubing [A]
- ◆ Remove the brake tubing fixing bolt [B]
- ◆ Remove lower rocker arm kingpin fixing nut [D]
- ◆ Remove r rocker arm kingpin fixing bolts and nuts [E]
- ◆ Remove bolts and nuts of stabilizer rod tie rod [H]
- ◆ Remove steering tie rod nut [F]
- ◆ Remove swing knuckle assembly [C]
- ◆ Remove shock absorber mounting bolts and nuts [G]
- ◆ Remove upper rocker arm mounting bolts and nuts [I]
- ◆ Remove lower rocker arm mounting bolts and nuts [J]

Rear suspension removed

Rear arm removal

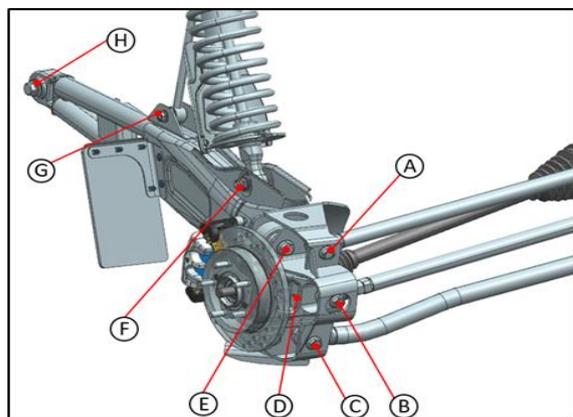
- [A] brake tubing support bolt
- [B] brake tubing plastic guard plate
- [C] Brake tubing guard mounting bolt
- [D] Brake tubing clamp retaining bolt

[E] Pull the core rivet



- ◆ Remove brake tubing support bolt [A]
- ◆ Remove mounting bolts of brake tubing guard plate [C]
- ◆ Remove the brake tubing plastic shield [B]
- ◆ Remove bolt of brake tubing guard [D]
- ◆ Remove the core rivet [E]

- [A] Rear upper cross tie rod assembly mounting bolts and nuts
- [B] Front bundle control rod assembly mounting bolts and nuts
- [C] Rear lower cross tie rod assembly mounting bolts and nuts
- [D] Rear axle support assembly
- [E] Rear axle support assembly mounting bolts and nuts
- [F] Shock absorber mounting bolts and nuts
- [G] Rear stabilizer rod connecting rod mounting bolts and nuts
- [H] Rear rocker arm installation bolts and nuts



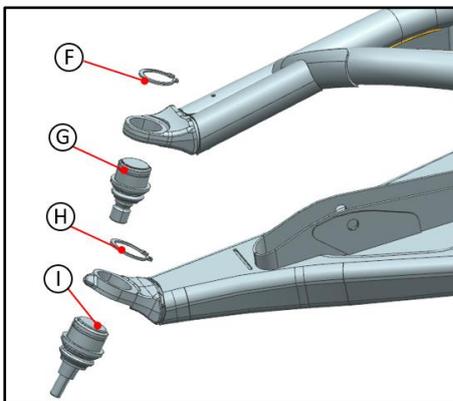
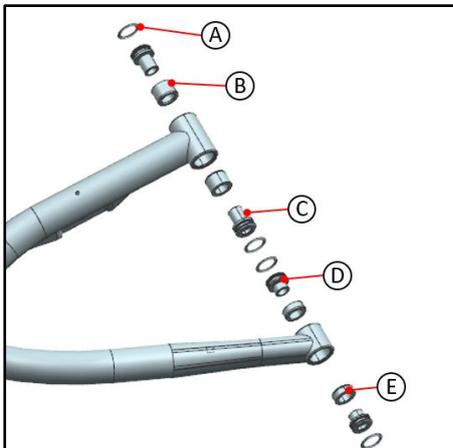
- ◆ removal of the upper tie rod assembly installation bolts nuts [A]

SUPER VILLAIN SX20T

- ◆ Remove bolts and nuts from front control rod assembly [B]
- ◆ After removing the lower tie rod assembly installation bolts and nuts [C]
- ◆ Remove the rear axle support assembly mounting bolts and nuts [E]
- ◆ Remove rear axle support assembly [D]
- ◆ Remove bolts and nuts for shock absorber installation [F]
- ◆ Remove the rear stabilizer rod connecting rod installation bolts and nuts [G]
- ◆ Rocker arm installation bolts and nuts after removal [H]

Front arm removal

- [A] O-ring seal
- [B] Rocker arm bushing
- [C] Rocker arm T-sleeve I
- [D] Rocker arm bushing II
- [E] Rocker arm T-sleeve II
- [F] Shaft with elastic retaining ring 40
- [G] Upper kingpin
- [H] Shaft with elastic retaining ring 45
- [I] lower kingpin

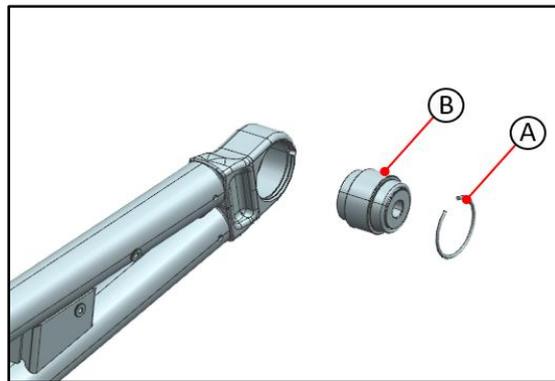


SUSPENSION SYSTEM

- ◆ Remove rocker arm T-sleeve I [C] and O-seal ring [A]
 - ◆ Remove rocker arm T-sleeve II [E] and O-seal ring [A]
 - ◆ Remove rocker arm bushing I [B]
 - ◆ Remove rocker arm bushing II [D]
 - ◆ Elastic retaining ring for shaft removal 40 [F]
 - ◆ Elastic retaining ring for shaft removal 45 [H]
 - ◆ Use the bearing driver to press out the kingpin assembly [G], [I]
- Special tools: circlip clamp, bearing driver

Front arm removal

- [A] Steel wire stopper for holes
- [B] joint bearing

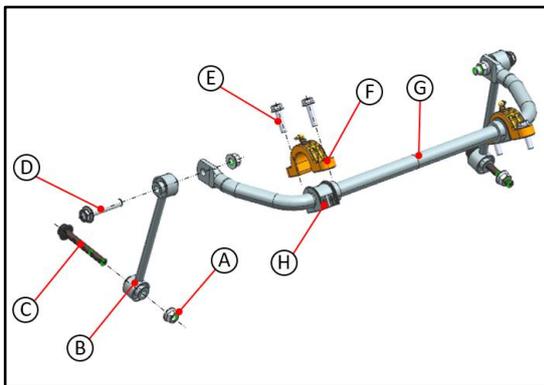


- ◆ Steel wire ring for hole removal [A]
 - ◆ Use the bearing driver, press out the joint bearing through the press [B]
- Special tools: circlip clamp, bearing driver

Front stabilizer bar assy maintenance

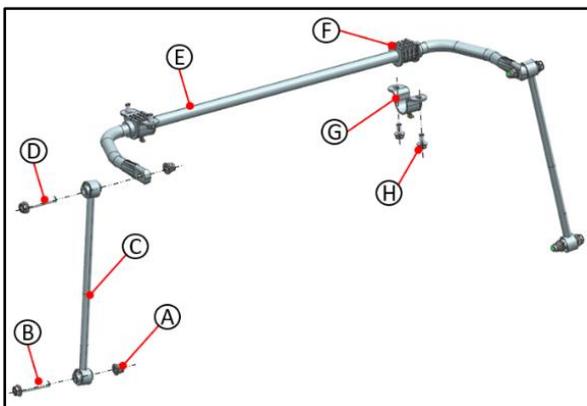
Front stabilizer bar assy decomposes

- [A] Front stabilizer rod connecting rod mounting nut
- [B] Front stabilizer rod connecting rod
- [C] Install bolts under the front stabilizer bar connecting rod
- [D] Install bolts on the front stabilizer rod connecting rod
- [E] Front stabilizer bar mounting bolt
- [F] Front stabilizer bar mounting seat
- [G] Front stabilizer rod assembly
- [H] Front stabilizer rod bushing



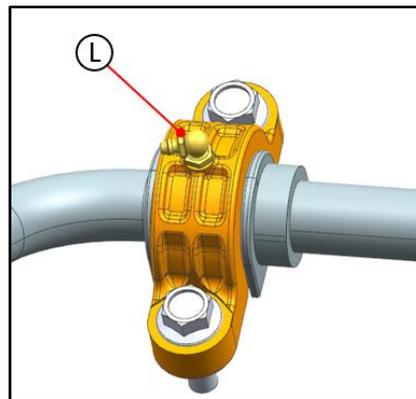
Rear stabilizer bar assy decomposes

- [A] Rear stabilizer rod connecting rod mounting nut
- [B] Install bolts under the connecting rod of the rear stabilizer bar
- [C] rear stabilizer rod connecting rod
- [D] Install bolts on the connecting rod of the rear stabilizer bar
- [E] Rear stabilizer rod assembly
- [F] rear stabilizer rod bushing
- [G] Rear stabilizer rod bushing press plate
- [H] Rear stabilizer bar mounting bolt



stabilizer bar maintenance

- 【L】 90° joint type pressure injection oil cup



When the vehicle travels 1000km, it is necessary to install the buffer sleeve on the stabilizer bar and inject appropriate grease through the 90° joint type pressure injection oil cup [L].

-- Special tools: oil gun

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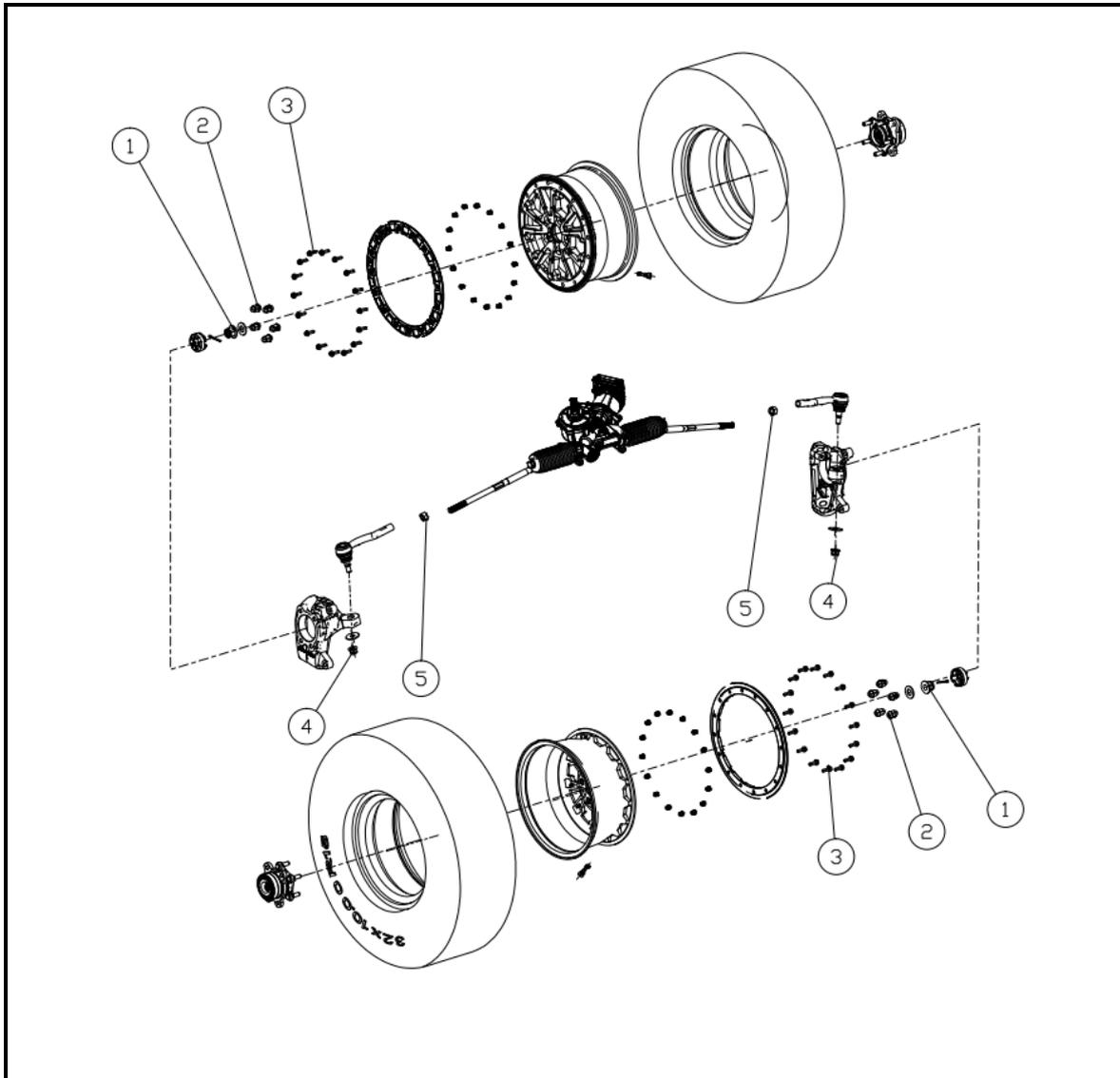
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EXPLOSIVE DIAGRAM

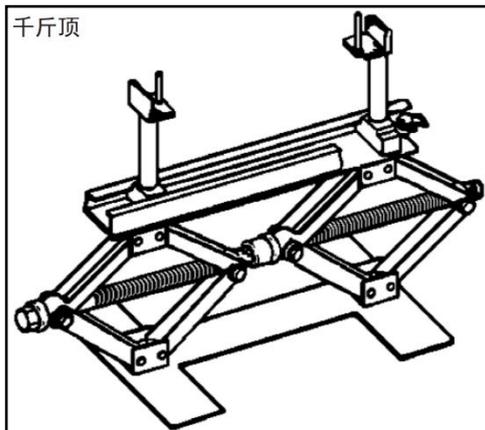


No.	Name	Torque			备注
		N·m	kgf·m	ft·lbs	
1	HALF-SHAFT MOUNTING NUT	300	30	221	
2	RIM MOUNTING NUT M12 X 1.5	120	12	88.4	
3-1	ANTI-TRIP RING MOUNTING	25	2.5	18	
3-2	ANTI-TRIP RING MOUNTING	25	2.5	18	
4	STEERING LINK LOCK NUT M14	135~155	13.5~15.5	100~114	
5	STEERING TIE ROD	14	1.4	10	

TECHNICAL REFERENCE

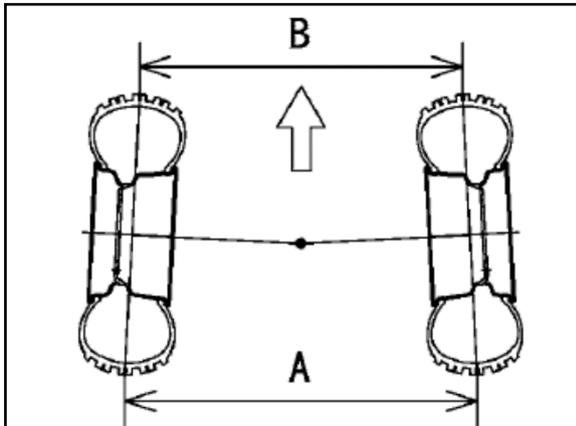
Item	Standard	Limitation
Tires:	32×10.00R15/35×10.00R16	
Single tire pressure (cold) :	150KPa/21.7psi	
Maximum tire pressure (cold) :	250KPa	
Tire tread pattern height:	14±0.5	
Wheel positioning:		
Front wheel front bundle:		
Kingpin back Angle (°)		
Wheel camber (°)		
Kingpin Angle (°)		
Kingpin offset (mm)		

TOOLS



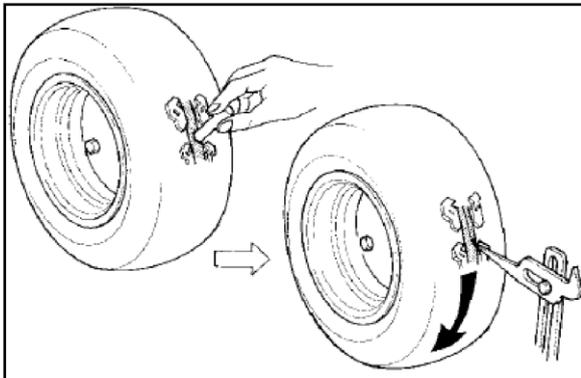
WHEEL ALIGNMENT

Front axle Examination



◆ Front bundle means that at axle height, the front end of the two front wheels is less than the rear end distance. The difference in distance is called the prebeam value. When there is A front beam, looking down from the top of the car, the distance A (rear) is greater than B (front), as shown in the figure.

◆ The role of the front beam is to prevent the front wheel from running off at any time and reduce the sliding friction between the tire and the ground. If the front harness is not correct, the front wheel will slide and rub against the ground, causing tread damage or abnormal wear.

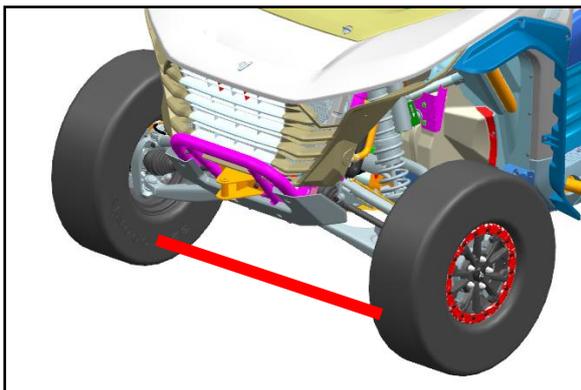


Kingpin back Angle and camber Angle are built-in and do not require adjustment. $A \text{ (rear)} - B \text{ (front)} = \text{front bundle value}$

(Distance A and B are measured at axle height when the vehicle is parked on a flat surface.)

◆ Apply a thick chalk or paint line near the center of the front tire.

◆ As you turn the wheel, make a small mark near the center of the chalk coating with a needle marker.

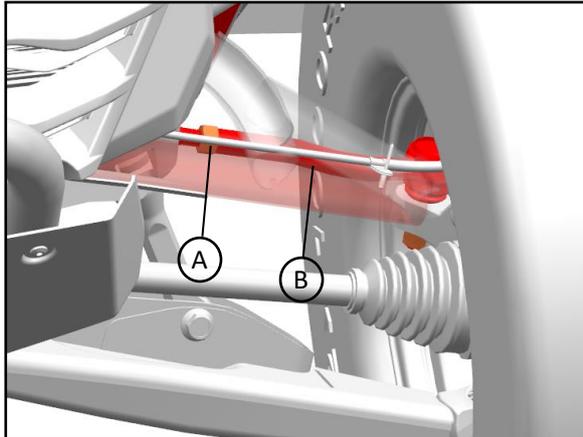


◆ Put the front wheel on the ground, and turn the steering wheel upright and fixed.

◆ At axle height, measure the distance between the front of the front tire and the rear scribed or painted line.

◆ Subtract the measured value of the front from the measured value of the rear to get the front beam. If the front beam is not within the specified range, continue the front beam adjustment procedure.

Standard: 4~10 mm (0.16~0.39 in)



Adjustment

- ◆ [A] Locknut
- ◆ [B] Pull rod

Loosen the lock nut [A] and turn the adjusting tie rod [B] on both sides for the same number of turns to reach the specified front bundle.

Warning

Adjust the length of the tie rod so that the visible thread length at both ends of the tie rod is uniform. Uneven thread length will cause the end of the tie rod to be damaged

- ◆ Check the front bundle.
- ◆ Tightening:
- ◆ Test drive the vehicle.

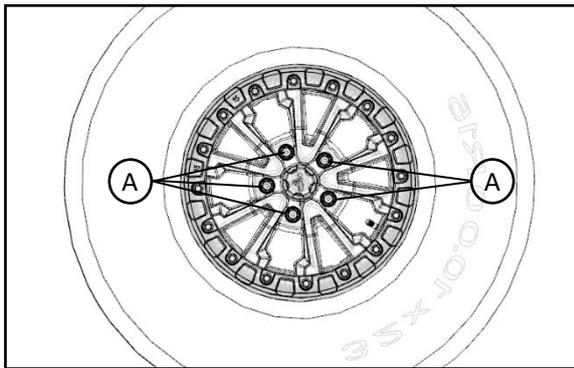
Pull rod to adjust lock nut torque

14 N·m

WHEEL

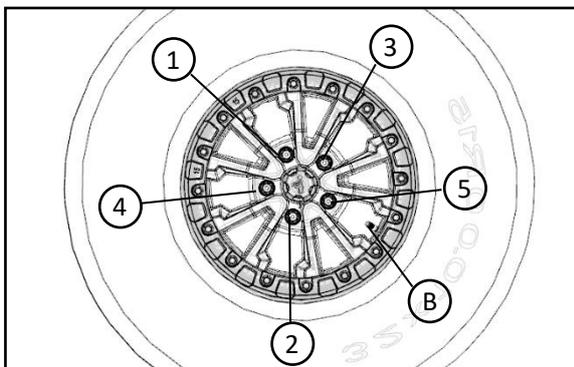
Wheel removal

- ◆ Loosen the wheel nut [A]
- ◆ Support the vehicle with a bracket or jack to make the wheels off the ground. Special tool: Jack.
- ◆ Remove:
wheel
nut
wheel



Wheel assemble

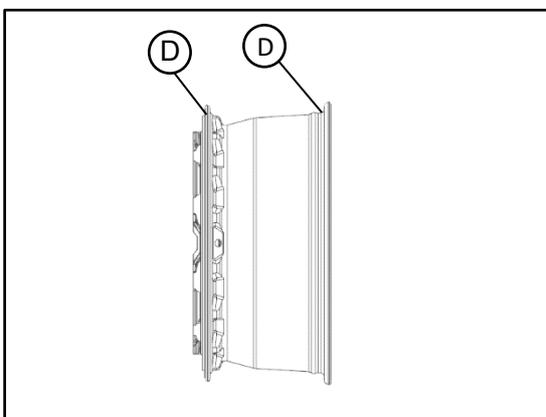
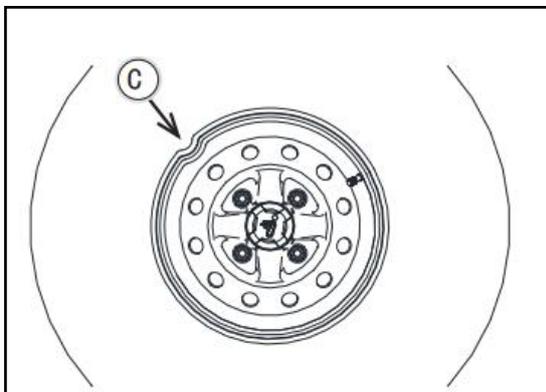
- ◆ Position the wheel so that the valve [B] faces the outside of the vehicle
- ◆ Tighten the wheel nuts in a cross way.

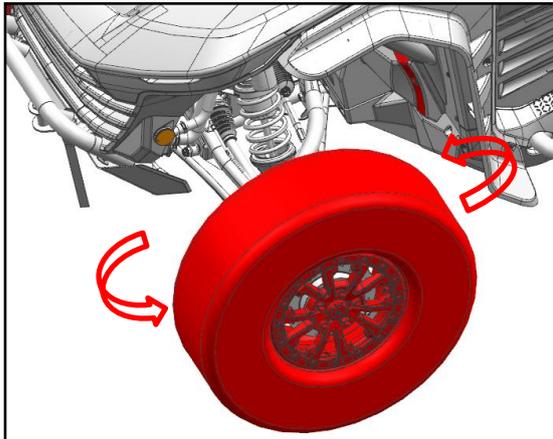


Lock Torque
120~130 N·m

Wheel (rim) inspection

- ◆ Check whether there is a dent on both sides of the rim [C], if there is a dent, please replace.
- ◆ Remove the tire, check the rim air seal surface [D] for scratches or scratches, if necessary, please polish the air seal surface with fine emery cloth.



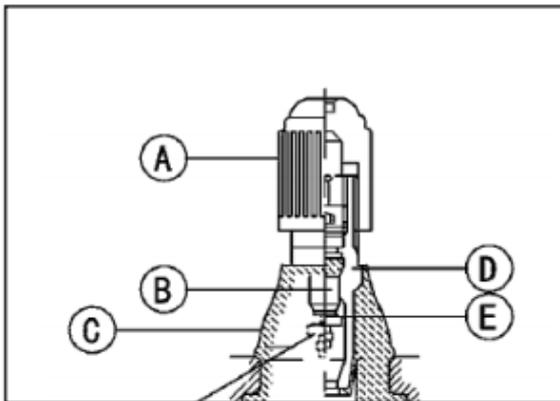


Wheel (rim) replacement

- ◆ Shake the wheel with both hands, check whether the hub bearing is loose or damaged, if necessary, please replace the hub bearing.
- ◆ Remove the wheel (see Wheel removal).
- ◆ Remove the tire from the rim (see Tire removal).
- ◆ Remove valve port assembly and throw away.

Warning

Replace the valve nozzle every time you change the tire. Do not reuse the valve nozzle.

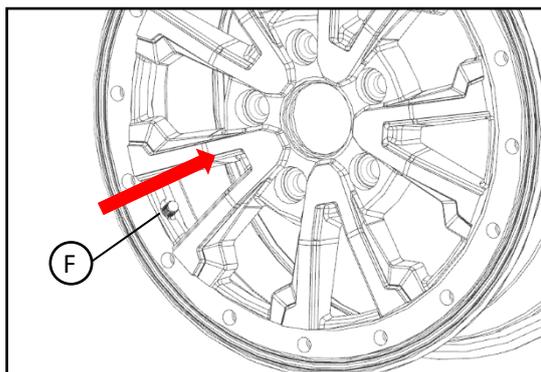


- [A] Plastic cover
- [B] Spool
- [C] Valve stem seal
- [D] Valve stem
- [E] Valve seat

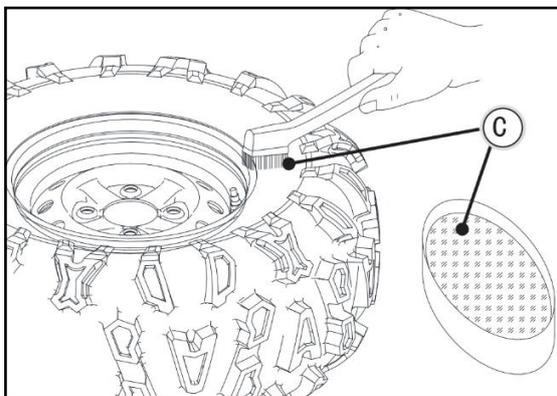
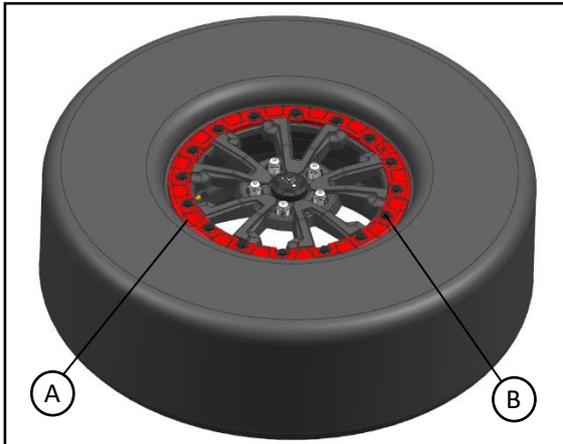
- ◆ Install new valve on new rim.
- ◆ Remove valve cover, moisten slide valve stem with soapy water solution, then pull stem [F] through rim from inside out until it snaps in place.

Warning

Do not use motor oil or petroleum fractions to lubricate the stem, as it will spoil the rubber.



- ◆ Install the tire on the new rim (see Tire mounting).
- ◆ Wheel installation (see Wheel installation)



WHEEL

Wheel removal

- ◆ Remove the wheel.
- ◆ Remove all bolts fastening the trip rings [A].
- ◆ Lubricate the bead and rim flange on both sides of the wheel with a soapy solution or water [C].
This helps the tire slide off the rim flange.

CAUTION

Do not lubricate the bead and rim flange with oil or petroleum fractions, as they can cause tire deterioration.

- ◆ Use a suitable commercial tire changer to remove the tire from the rim.

Remark

It is not possible to remove the tire with manual work because the tire fits closely with the rim.

Wheel inspection

- ◆ Check the rim (see Wheel (rim) Check).
- ◆ Replace the valve nozzle.

Warning

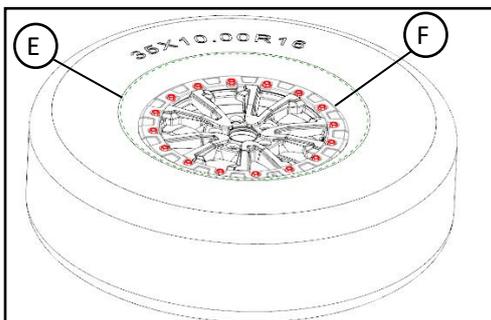
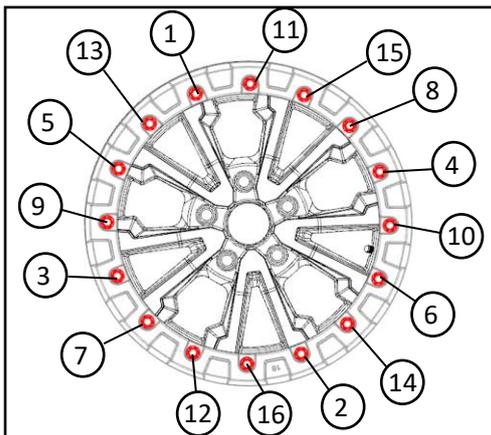
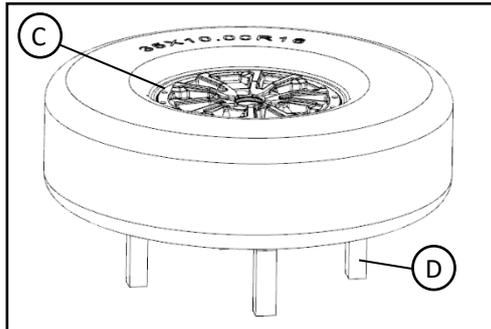
Replace the valve nozzle whenever you change the tire.

Do not reuse the valve nozzle.

- ◆ Check tires for wear and damage (see Tire inspection).
- ◆ Lubricate tire bead and rim flange with soap solution or water.

CAUTION

Do not use lubricants other than aqueous soap solutions, and do not lubricate the bead and rim with water, as this can cause the tire to separate



Wheel assemble

- ◆ Fasten the anti-trip screw sleeve [A] to the rim [B].
- ◆ If trip collar sleeve [A] is damaged, replace the trip collar sleeve or, if necessary, the rim [B] and

Torque
22~25 N·m

sleeve[A] as a whole

- ◆ Support the rim [C] on the appropriate support

First tightening torque of the bolt
14±N·m

[D] to prevent the tire from slipping off.

- ◆ On the opposite side of the anti-trip ring, apply tyre mounting agent to the inner tube of the tire

Second tightening torque of the bolt
25±1N·m

and the wheel to ensure that the tire is properly in place when inflated and the inner tube is installed on the wheel.

- ◆ Place the outer ring of the tire on the shoulder of the inner ring and in the center of the tire.
- ◆ Install all anti-trip ring bolts

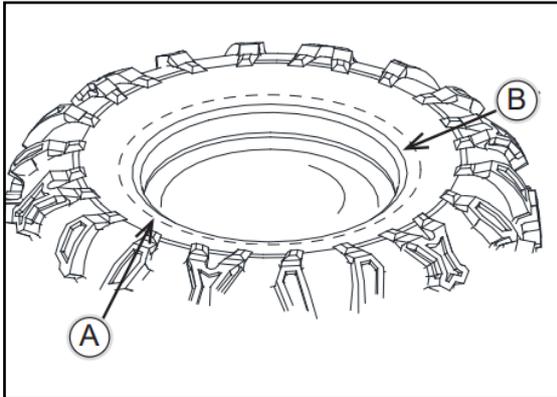
⚠ Warning

Do not use an impact wrench to install anti-trip bolts. When using an impact wrench, the bolt is at risk of slipping or breaking.

- ◆ Note: In order to ensure uniform force when the ring is locked, manually tighten the torque diagonally for the first time
- ◆ For the second time, use the constant torque wrench to tighten the bolts fastening the trip rings in a cross-stitch manner, as shown in the left figure.
- ◆ Check that the rim line [E] on both sides of the tire is parallel to the rim rim edge/rim flange [F] and has even clearance around the rim.
- ◆ If the rim line and the rim rim/rim rim are not parallel or there is uneven clearance around the rim, deflate the tire, re-lubricate the sealing surface, and re-inflate.
- ◆ Tighten the wrench clockwise for the last time using a constant torque wrench

Third tightening torque of the bolt

25±1N·m



CAUTION

Every 450Km, check the anti-trip ring bolt and tighten it again

- ◆ Inflate the tire until the bead is secured to the rim.

Tire maximum inflation pressure (can be fixed on the rim when cold) front and rear:
150kPa (1.5kgf /cm², 21 psi)

Warning

Do not inflate your tires above the maximum tire pressure. Overinflation can cause a tire to explode, potentially causing injury and death.

- ◆ Once the tires are properly in place, check for air leaks.
- ◆ Apply a soapy water solution around the tire bead and check for air bubbles.
- ◆ Deflate tyre to specified pressure.
- ◆ Use a barometer to check tire pressure.

Remark

Segway offers tire pressure gauges and user kits

Tire pressure (cooling)

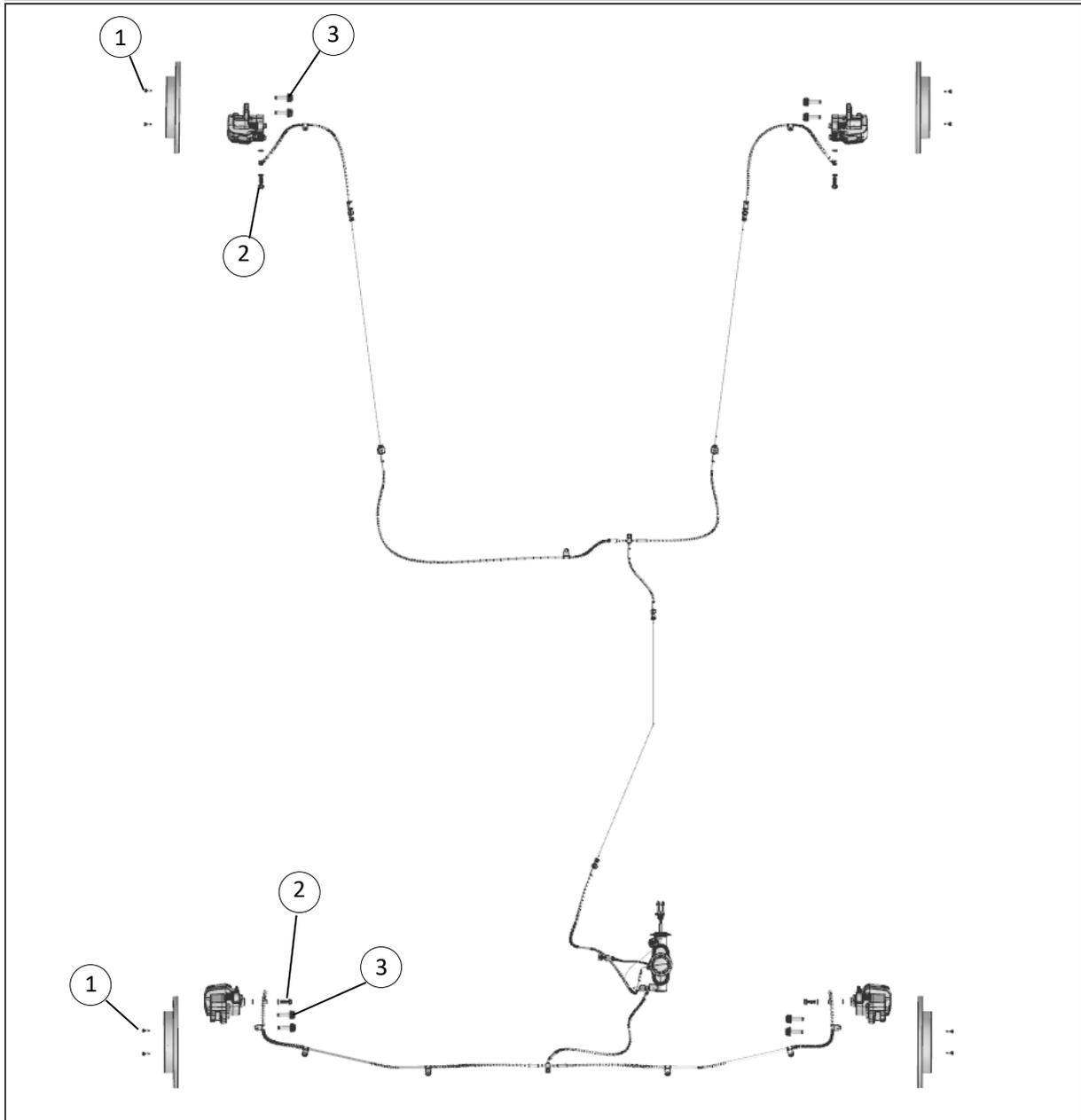
- ◆ Install the wheel (see Wheel installation).
- ◆ Wipe the soap and water solution off the tire and dry the tire before operation.

Warning

Do not operate the vehicle with soap and water solution still around the rims, it can cause the tires to separate and can lead to dangerous conditions.

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BRAKE SYSTEM EXPLOSIVE



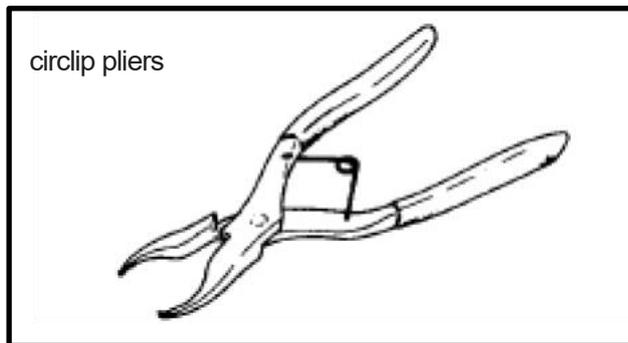
No.	Name	Torque			Remark
		N·m	kgf.m	Ft·lbs	
1	Brake disc positioning bolt	3.5	0.35	2.6	
2	Brake hose mounting bolt	25	2.5	18	
3	Brake fastening bolt	45	4.5	33	L

L: Use non-permanent locking agent.

1. Brake disc bolts, brake main pump bolts, brake fastening bolts, need to be checked and fastened regularly;
2. brake sliding rod dust jacket, need to be coated with silicone oil to ensure flexible movement.

TECHNICAL REFERENCE		
Item	Standard	Service limit
Brake fluid: type	DOT 4	---
Front and rear disc brakes:		
Brake pad thickness s	5.0 mm (0.2 in.) 11.9~12.1mm (0.47~ 0.48 in.)	1.5 mm (0.06 in.)
Disc thickness		10mm (0.39in.)
Brake disc runout	TIR 0.04 mm (0.0016in.) or less	TIR 0.1 mm (0.004 in.)

TOOL



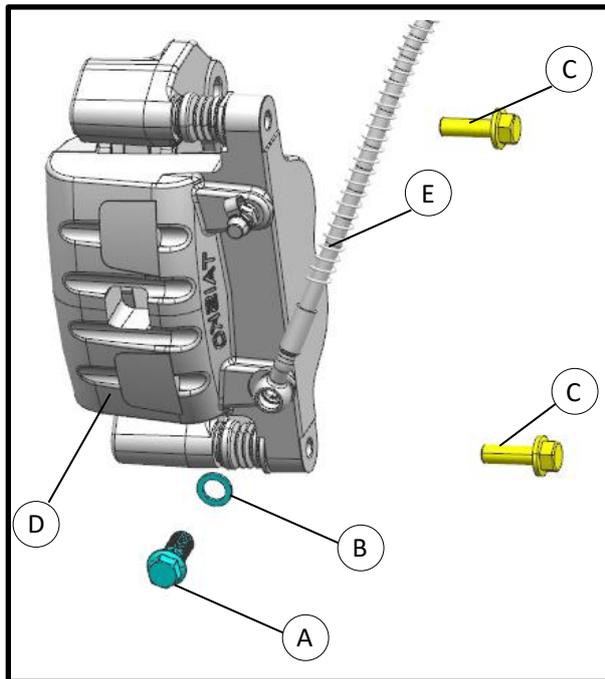
Brake fluid

⚠ Warning

When using disc brakes, please observe the following precautions.

1. Do not reuse old brake fluid.
2. Do not use brake fluid that is not sealed or opened for a long time.
3. Do not mix two brands of brake fluid. This reduces the boiling point of the brake fluid and may render the brakes ineffective. It can also cause deterioration of rubber brake components.
4. Do not open the brake fluid storage tank cover for a long time to avoid moisture contamination of the brake fluid.
5. Do not change the brake fluid when it is rainy or windy.
6. Except brake pads and discs, only isopropyl alcohol or ethanol can be used to clean brake parts. Do not use any other liquid to clean these parts. Gasoline, engine oil, or any other petroleum extract can cause rubber parts to deteriorate. The oil splashed on any part is difficult to completely clean, and eventually the rubber in the disc brake will deteriorate.
7. When handling brake pads and discs, be careful not to let brake fluid or any oil get on the brake pads and discs. Do not use products that leave an oily residue. If it cannot be cleaned, replace it with a new brake disc.
8. Brake fluid will quickly destroy the finish; Any spilled liquid should be rinsed immediately and completely.

FRONT BRAKE SYSTEM ASSY

**Brake assy bolt [A]**

25N·m (2.5kgf·m, 18.4ft·lb)

Brake assy bolt [C]

75N·m (7.5kgf·m, 56ft·lb)

Brake assy removal

- ◆ Remove the front wheel (see Wheels/Tires section).
- ◆ Loosen the fixing bolt [A] at the lower part of the brake hose [E], do not remove it completely.
- ◆ Unscrew the brake assembly mounting bolt [C].
- ◆ Remove the brake caliper body assembly [D].

⚠ Warning

Immediately rinse off spilled brake fluid

- ◆ Unscrew the brake tubing bolt [A] and remove the brake hose [E] from the caliper.

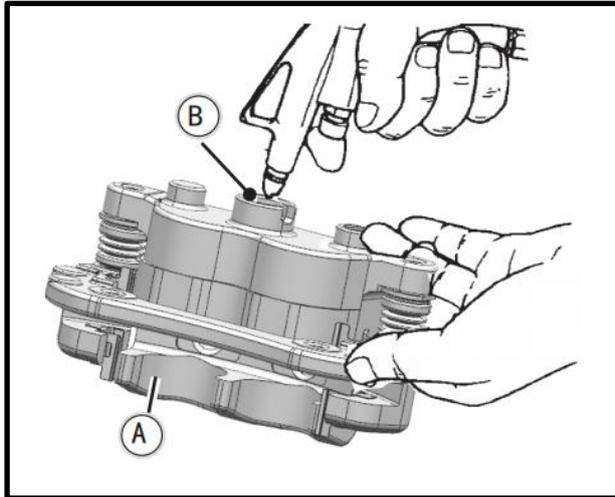
Brake assy installation

- ◆ Install brake assembly and lower end of brake tubing.
- ◆ Replace gaskets on both sides of brake hose when installing hose.
- ◆ Tightening:
- ◆ Check the fluid level in the brake oil cup.
- ◆ Exhaust the brake line.
- ◆ Check whether the brake has good braking force, the vehicle has no drag, and the brake pipeline has no leakage.

⚠ Warning

Before driving the vehicle, gently step on the brake pedal a few times, so that the brake disc and the brake disc are effectively fitted to reduce the empty travel during the initial braking.

FRONT CALIPER

**Brake caliper removal**

- ◆ Remove brake assembly first (see Brake Assembly removal 11-6)
- ◆ Remove brake disc (see brake disc removal 11-9)
- ◆ Use compressed air and remove piston.

Cover the caliper housing with A clean, thick cloth [A]. Gently press in compressed air and remove piston [B]

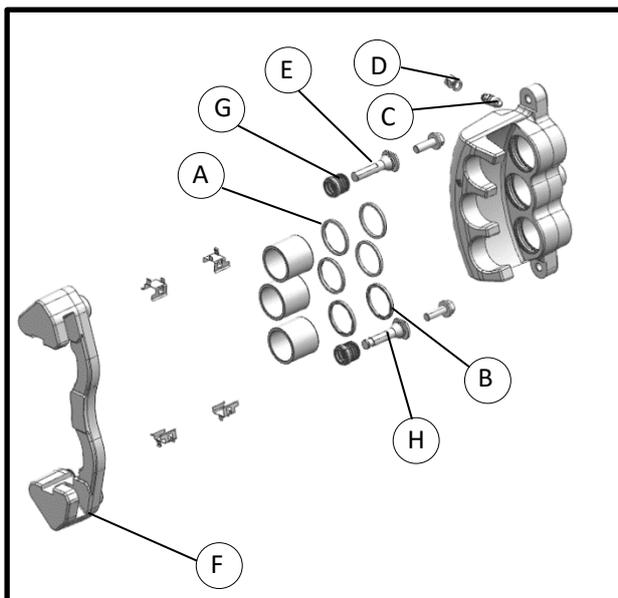
Warning

To avoid serious injury, do not place your finger or palm in the caliper opening to prevent the piston from crushing your hand or finger

CAUTION

If compressed air is not available, follow these steps:

- ◆ Brake hose is connected to calipers
- ◆ Prepare brake fluid container
- ◆ Take off



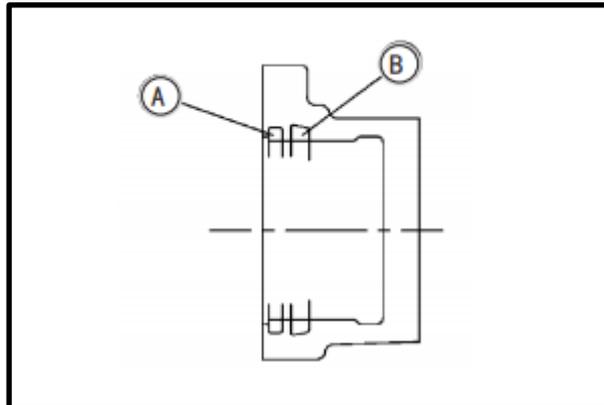
Removal in sequence:

Dust ring [A]

Rectangular ring [B]

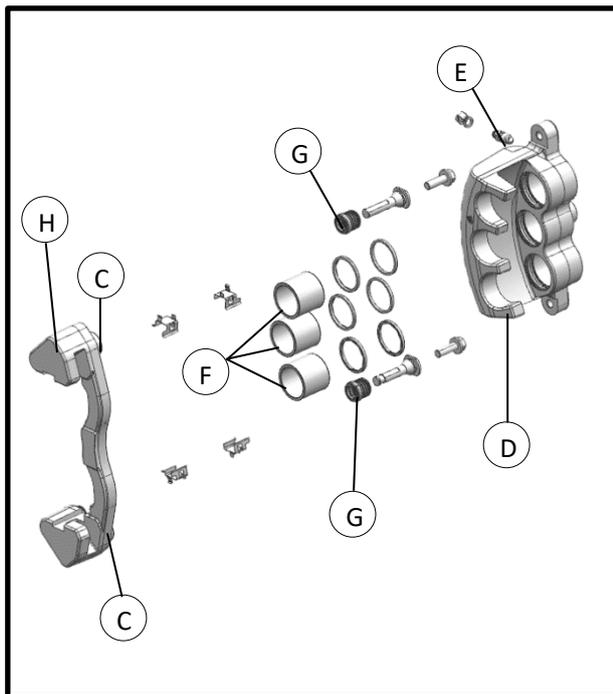
Exhaust nozzle [C] and rubber cover [D] Upper guide rod [E] and caliper bracket [F] dust jacket [G] and lower guide rod [H]

FRONT CALIPER



Brake caliper body installation

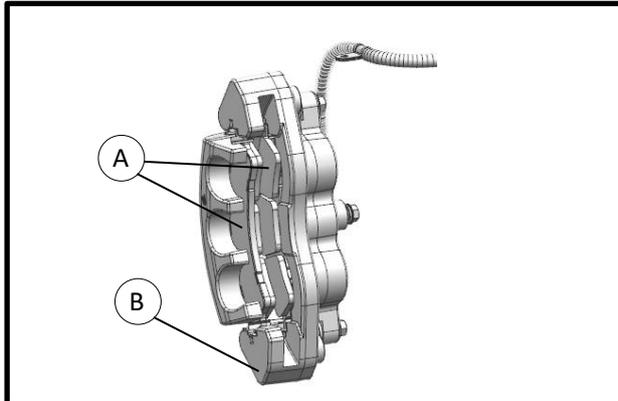
- ◆ Replace the new rectangular ring [B].
- ◆ Apply brake fluid to the rectangular ring and put it into the brake caliper.
- ◆ Replace the new dust ring [A],
- ◆ Apply brake fluid to the dust ring and put it into the brake caliper.



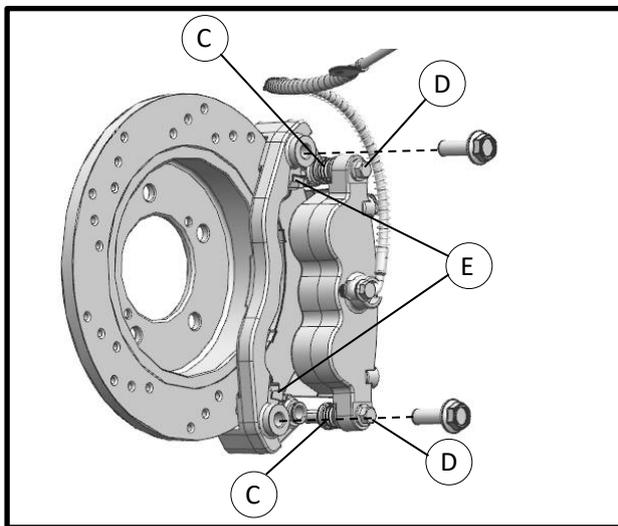
- ◆ Apply brake fluid to the outside of the piston [F] and push the piston into the brake caliper [D] with force. Beware of scratches on piston and skirt.
- ◆ If the dust jacket [G] is damaged, replace it with a new one.
- ◆ Apply a thin layer of silicone grease (silicone grease is a special high-temperature and water-resistant grease) to the inner hole [C] of the upper guide rod and the lower guide rod and the guide rod of the caliper support.
- ◆ Install caliper bracket [H] and exhaust nozzle [E]

Nozzle
7.9N·m

FRONT BRAKE PIECE

**Removal**

- ◆ Loosen the fastening bolt [D] from the brake assembly guide rod [C]. In the process of loosening the bolt [D], the head of [C] is required to be in the state of fitting and limiting with the brake caliper body [B], otherwise it will turn with [D] because [C] is not limited, resulting in the inability to disassemble [D].
- ◆ Rotate the brake caliper body at least 90 degrees so that the brake disc [A] can be easily removed from the spring holder [E] on the inside and outside of the brake disc.

**Installation**

- ◆ Push the caliper piston to the bottom with your hand.
- ◆ Install the brake disc in the spring holder [E] on the inner (or outer) side, and fit each brake disc.
- ◆ Turn the brake caliper down so that its mounting hole position coincides with the brake assembly guide rod [C] hole position, and the brake assembly guide rod [C] must be confined to the brake caliper [B] and fit with the brake caliper [B].
- ◆ Apply thread glue to the newly loosened fastening bolt [D].
- ◆ Tighten caliper mounting bolts [D]
- ◆ Torque: 25N·m(2.5kgf·m, 18ft·lb)

Bolt [D]

25N·m

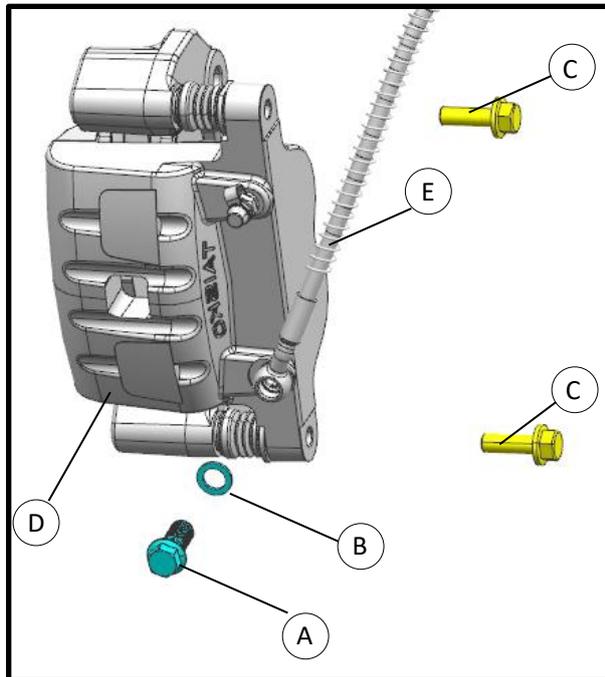
Warning

Do not attempt to drive the vehicle until the brakes are firmly in place, the brake lever is obtained by pumping the brake lever until the brake disc is against each brake disc. If this is not done, the brake will not work on the first application.

Abrasion Inspection

- ◆ Refer to the brake Pad maintenance section in Regular maintenance

REAR BRAKE SYSTEM ASSY

**Rear brake assy**

- ◆ Remove the rear rim assembly (see Wheels/Tires section).
- ◆ Loosen the fixing bolt [A] at the lower part of the brake hose [E], do not remove it completely.
- ◆ Unscrew the brake assembly mounting bolt [C].
- ◆ Remove the brake caliper body assembly [D].
- ◆ Unscrew the brake tubing bolt [A] and remove the brake hose [E] from the caliper.

Warning

Immediately rinse off spilled brake fluid

Rear brake assy installation

- ◆ Install brake assembly and lower end of brake tubing.

Fixing Bolt [A]

25N·m (2.5kgf·m, 18.4ft·lb)

Bolt [C]

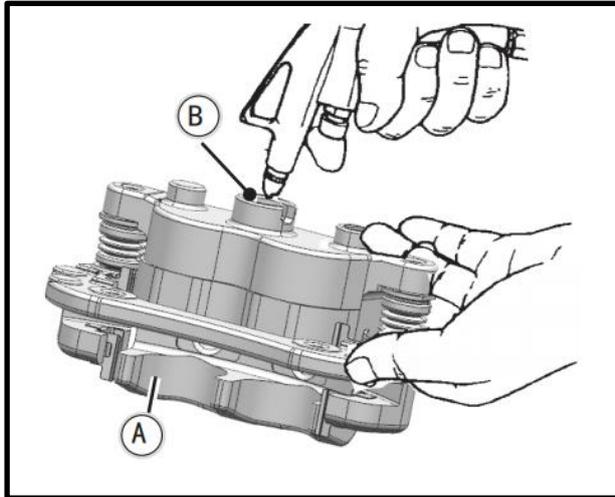
75N·m (7.5kgf·m, 55ft·lb)

- ◆ Replace gaskets on both sides of brake hose when installing hose.
- ◆ Tightening:
- ◆ Check the fluid level in the brake oil cup.
- ◆ Exhaust the brake line.
- ◆ Check whether the brake has good braking force, the vehicle has no drag, and the brake pipeline has no leakage.

Warning

Before driving the vehicle, gently step on the brake pedal a few times, so that the brake disc and the brake disc are effectively fitted to reduce the empty travel during the initial braking.

REAR BRAKE CALIPER



Brake caliper removal

- ◆ Remove brake assembly first (see Brake Assembly removal 11-6)
- ◆ Remove brake disc (see brake disc removal 11-9)

Warning

To avoid serious injury, do not place your finger or palm in the caliper opening to prevent the piston from crushing your hand or finger.

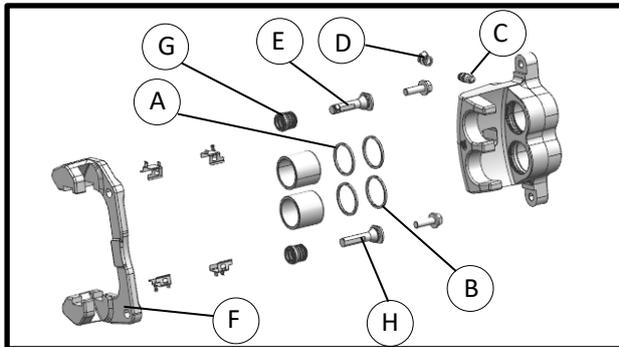
Use compressed air and remove piston.

Cover the caliper housing with A clean, thick cloth [A]. Gently press in compressed air and remove piston [B]

CAUTION

If compressed air is not available, follow these steps:

- ◆ Brake hose is connected to calipers
- ◆ Prepare brake fluid container
- ◆ Take off



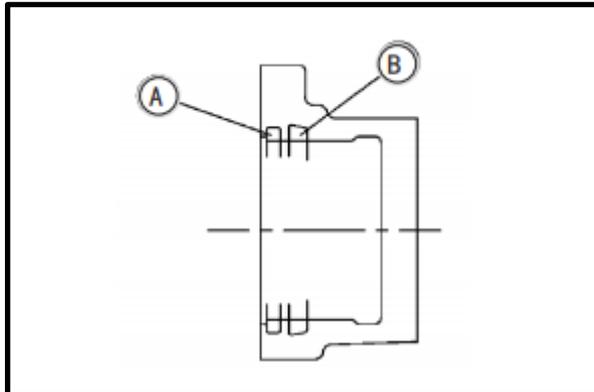
Removal in sequence:

Dust ring [A]

Rectangular ring [B]

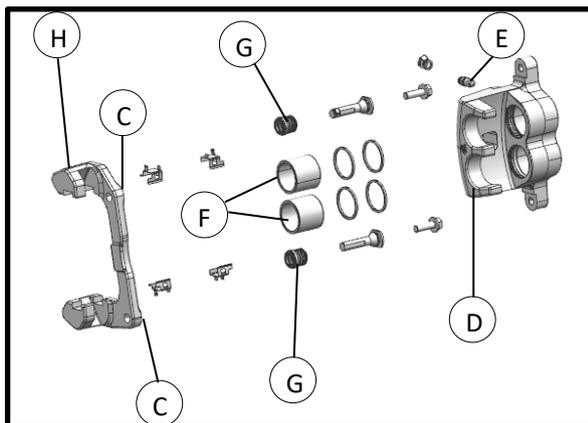
Exhaust nozzle [C] and rubber cover [D] Upper guide rod [E] and caliper bracket [F] dust jacket [G] and lower guide rod [H]

REAR BRAKE CALIPER



Brake caliper Installation

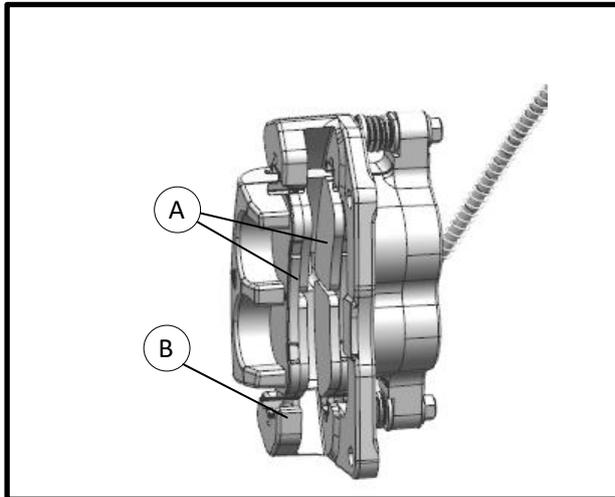
- ◆ Replace the new rectangular ring [B].
- ◆ Apply brake fluid to the rectangular ring and put it into the brake caliper.
- ◆ Replace the new dust ring [A],
- ◆ Apply brake fluid to the dust ring and put it into the brake caliper.



- ◆ Apply brake fluid to the outside of the piston [F] and push the piston into the brake caliper [D] with force. Beware of scratches on piston and skirt.
- ◆ If the dust jacket [G] is damaged, replace it with a new one.
- ◆ Apply a thin layer of silicone grease (silicone grease is a special high-temperature and water-resistant grease) to the inner hole [C] of the upper guide rod and the lower guide rod and the guide rod of the caliper support.
- ◆ Install caliper bracket [H] and exhaust nozzle [E]

Nozzle [E]
7.9N·m

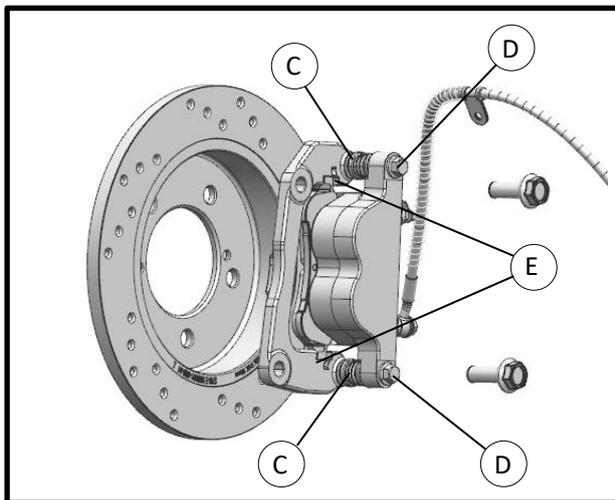
REAR BRAKE DISC



No EFP parking rear brake assembly rear brake disc removed

◆ Loosen the fastening bolt [D] from the brake assembly guide rod [C]. In the process of loosening the bolt [D], the head of [C] is required to be in the state of fitting and limiting with the brake caliper body [B], otherwise it will turn with [D] because [C] is not limited, resulting in the inability to disassemble [D].

◆ Rotate the brake caliper body at least 90 degrees so that the brake disc [A] can be easily removed from the spring holder [E] on the inside and outside of the brake disc.



No EFP parking rear brake assembly rear brake disc removed

◆ Push the caliper piston to the bottom with your hand.

◆ Install the brake disc in the spring holder [E] on the inner (or outer) side, and fit each brake disc.

◆ Turn the brake caliper down so that its mounting hole position coincides with the brake assembly guide rod [C] hole position, and the brake assembly guide rod [C] must be confined to the brake caliper [B] and fit with the brake caliper [B].

◆ Apply thread glue to the newly loosened fastening bolt [D].

◆ Tighten caliper mounting bolts [D]

◆ Torque: 25N·m(2.5kgf·m, 18ft·lb)

Bolt [D]
25N·m

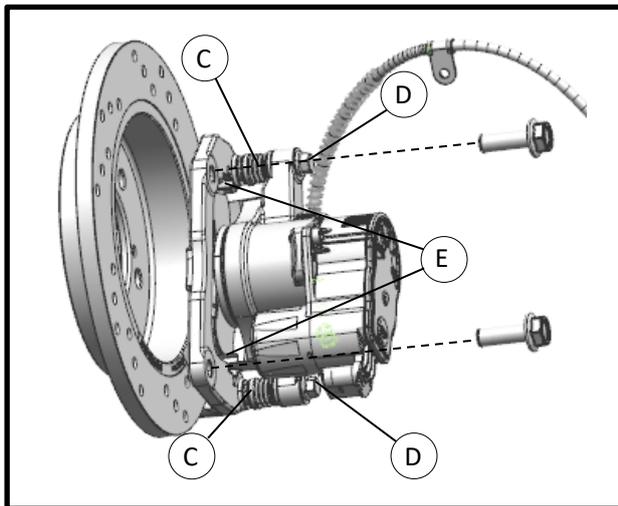
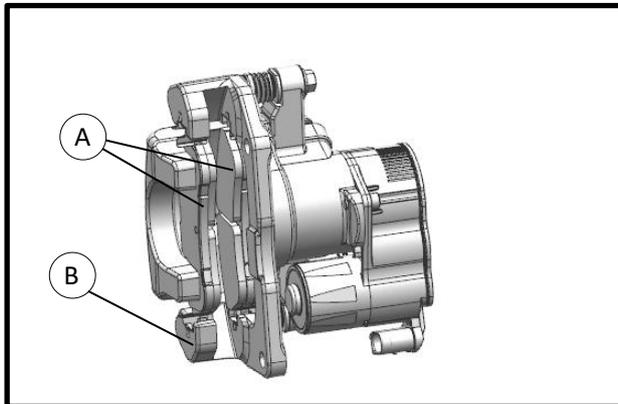
Warning

Do not attempt to drive the vehicle until the brakes are firmly in place, the brake lever is obtained by pumping the brake lever until the brake disc is against each brake disc. If this is not done, the brake will not work on the first application

Brake disc abrasion inspection

◆ Refer to the brake Pad maintenance section in Regular maintenance

REAR BRAKE DISC



- ◆ Rotate the brake caliper body at least 90 degrees so that the brake disc [A] can be easily removed from the spring holder [E] on the inside and outside of the brake disc

EFP Parking assy Rear brake disc replacement

When replacing a new disc or disc, the plunger needs to be returned to the end in order to install the new disc or disc, so a specialized pattern is required. You can enter or exit the maintenance mode with the diagnostic instrument, or you can enter and exit the maintenance mode with the EPB switch operation as follows:

- ◆ Enter (caliper piston back to the end, function indicator flashing) :
- ◆ Press the brake pedal and continue to press EPB switch (release direction), release EPB switch within 10 to 12 seconds;
- ◆ Press the EPB switch (release direction) again between 3 and 5 seconds after releasing the switch. The caliper will be released to the service state and the brake pedal will be released.
- ◆ exit (caliper clamp, return to normal, function indicator clamp is on, release function indicator is off) :
- ◆ When the EPB is in the maintenance release state, press the brake pedal and press the EPB switch (in the clamping direction) for more than 10 seconds, then release the switch;
- ◆ and press the EPB switch (clamping direction) again within 5 seconds, EPB performs clamping and restores all functions, releasing the brake pedal.

Note: In maintenance mode, press the EPB switch (clamping direction), in order to avoid clamping the piston completely out when the installation is not completed, the caliper will not perform the clamping action.

Or go to the designated dealer, use the diagnostic instrument for professional operation, replace the brake disc.

Remove front rim assembly or rear rim assembly.

- ◆ Loosen the fastening bolt [D] from the brake assembly guide rod [C]. In the process of loosening the bolt [D], the head of [C] is required to be in the

state of fitting and limiting the brake caliper body [B].

No

It will rotate with [D] because [C] is not limited, resulting in the inability to disassemble [D].

EFP Rear brake disc installation

- ◆ Push the caliper piston to the bottom with your hand.
 - ◆ Install the brake disc in the spring holder [E] on the inner (or outer) side, and fit each brake disc.
 - ◆ Turn the brake caliper down so that its mounting hole position coincides with the brake assembly guide rod [C] hole position, and the brake assembly guide rod [C]
- Be sure to be confined in the brake caliper [B] and fit with the brake caliper [B].
- ◆ Apply thread glue to the newly loosened fastening bolt [D].
 - ◆ Tighten caliper mounting bolts [D]
 - ◆ Torque: 25N·m(2.5kgf·m, 18ft ·lb)

⚠ Warning

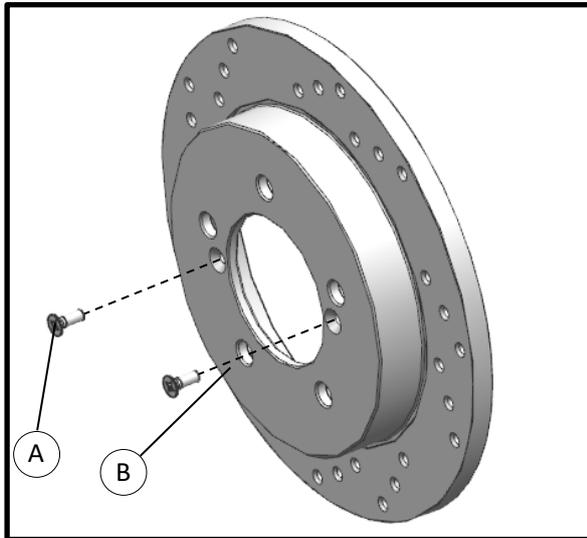
Do not attempt to drive the vehicle until the brakes are firmly in place, the brake lever is obtained by pumping the brake lever until the brake disc is against each brake disc. If this is not done, the brake will not work on the first application.

Bolt 【D】
25N·m

Brake disc abrasion inspection

- ◆ Refer to the brake pad maintenance chapter in regular maintenance

BRAKE DISC



Brake disc cleaning

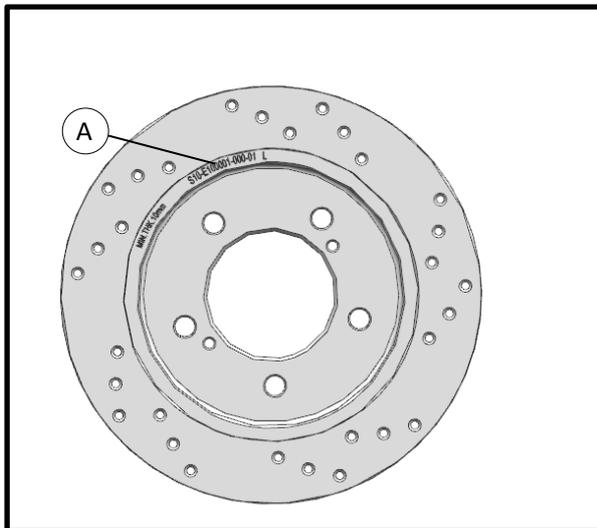
Poor braking may be caused by oil on the brake disc. The oil on the brake disc must be cleaned with an oil-free cleaning solution, such as trichloroethylene or acetone.

Warning

Such cleaning fluids are usually highly flammable and can be harmful if inhaled for a long time. Be sure to heed the manufacturer's warning

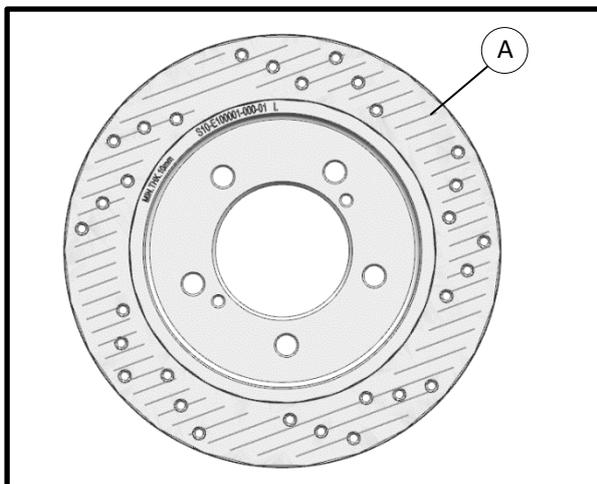
Brake disc removal

- ◆ Remove the front hub (see Wheels/Tires section)
- ◆ Remove the brake disc positioning bolt [A]
- ◆ Remove brake assembly (see Brake Assembly Removal 11-6)
- ◆ Remove brake disc [B]



Brake disc installation

- ◆ The brake disc must be mounted on the marked side [A] towards the steering knuckle.
- ◆ Non-permanent locking agent should be used:
- ◆ Tightening
- ◆ After installing the disc brake, check the disc brake beating. Thoroughly remove any grease and apply to both sides of the disc brake with an oil-free solvent. Do not use products that leave an oily residue.

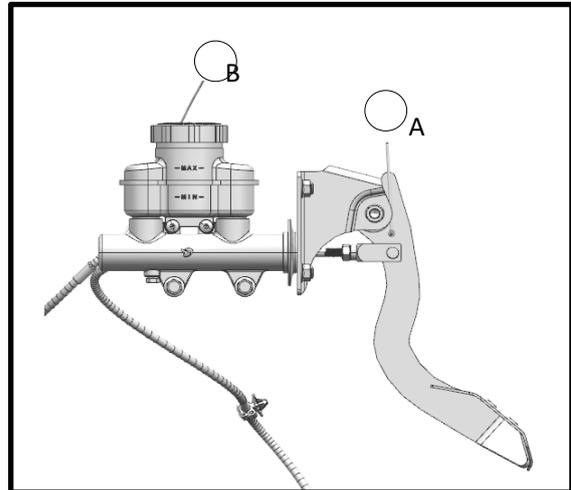


Brake disc abrasion

- ◆ Measure the thickness of each point [A] where the most wear occurs.
- ◆ If the disc brake wear exceeds the thickness limit, please replace the disc. Brake disc Standard thickness: 11.9~12.1mm (0.47 ~ 0.48in.)
Brake disc Limit thickness :10mm (0.39in.)

BRAKE DISC**Brake pedal position adjustment**

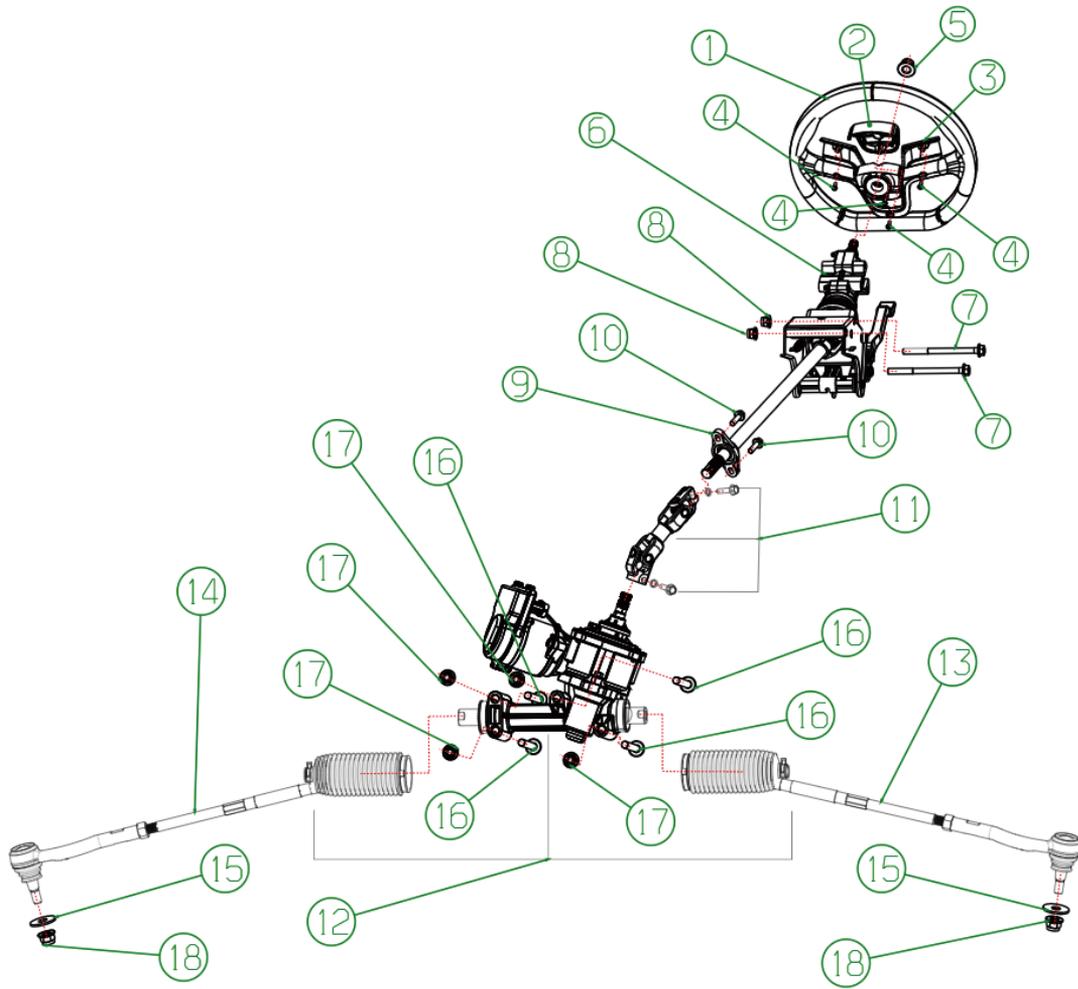
- ◆ Loosen the locking nut [A] and turn the adjusting bolt [B] until the brake pedal is positioned correctly.
- ◆ Tighten the lock nut.
- ◆ Check brake pedal free clearance



STEERING SYSTEM

EXPLODED VIEW OF STEERING SYSTEM	12-2
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EXPLODED VIEW OF STEERING SYSTEM



No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Steering Wheel				
2	Steering Wheel Logo Cover				
3	Steering wheel trim cover				
4	Cross recessed pan head tapping screws ST4.2×16				
5	Hexagonal flange face lock nut M14×1.5	90~100			
6	Steering column assembly				
7	Hexagonal flange face bolts M10×1.25×130	65~75			
8	Hexagonal flange face lock nut M10×1.25				
9	Steering shaft support assembly				

STEERING SYSTEM

SUPER VILLAIN SX20T

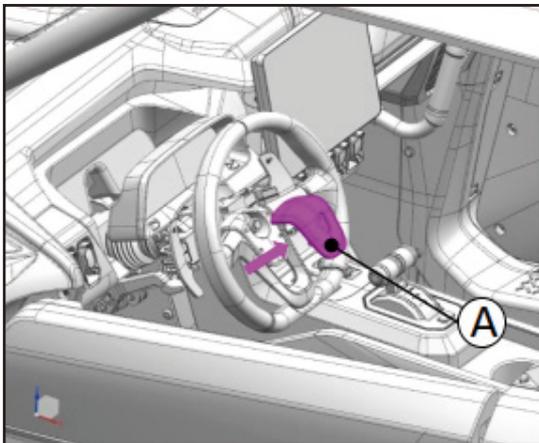
10	Hexagonal flange bolts M8×25N-m	26~30			
11	Steering lower shaft assembly				
	Hexagonal flange bolts M8×30	30~36			
	Spring washers M8				
12	P-EPS assembly				
13	Left steering tie rod assembly				
14	Right steering tie rod assembly				
15	Large washer A grade 14				
16	Hexagonal flange bolts M12× 1.25× 110				
17	2-type hexagonal flange face lock nuts M12×1.25	100~120			
18	Hexagonal flange face lock nut M14×1.5	135~155			

DISASSEMBLY OF STEERING ASSEMBLY

STEERING WHEEL REMOVAL

⚠ CAUTION

Improper tapping of the steering wheel or steering column may cause permanent damage to the EPS unit or power steering system, display gauge assembly.

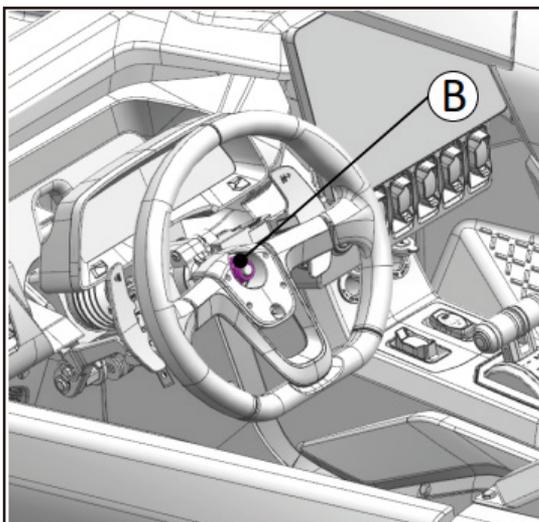


【A】 Steering wheel logo cover

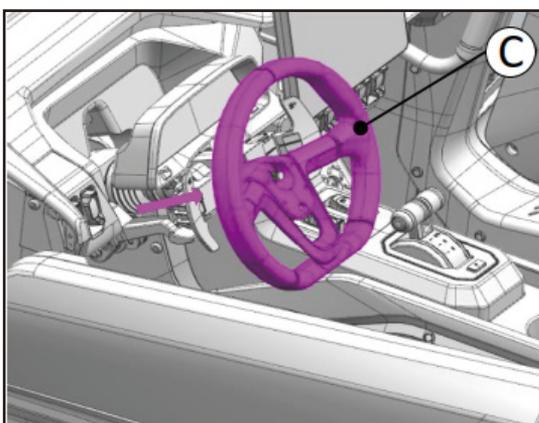
【B】 Hexagonal flange face lock nut M14× 1.5

【C】 Steering wheel

- ◆ Remove the S01_steering wheel logo cover (water-transferred fibre) in the direction of the arrow.

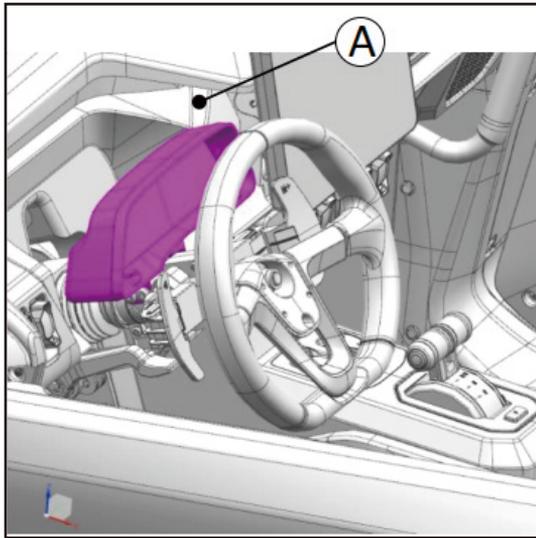


- ◆ Removal of hexagonal flange face lock nuts M14× 1.5 【B】



- ◆ Remove the steering wheel in the direction of the arrow 【C】 .
- ◆ If the steering wheel cannot be removed, continue to follow this procedure to remove the steering column

STEERING COLUMN ASSEMBLY REMOVAL



【A】 Display instrument assembly

【B】 Shift paddle assembly

【C】 Hexagonal flange bolts M10× 1.25× 130

【D】 Hexagonal flange bolts M8× 30

【E】 Steering column assembly

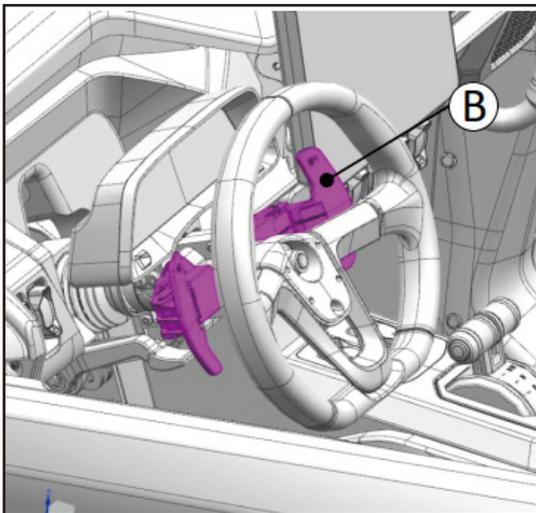
【F】 Steering wheel

◆ Remove the instrument panel and other interior parts, see 'Instrument Panel Removal'.

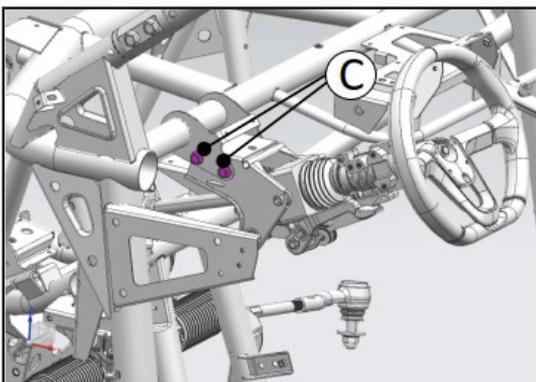
◆ See 'Instrument Panel Removal' for details.

◆ Disassemble the display instrument assembly **【A】**, see 'Display Instrument Assembly Disassembly'.

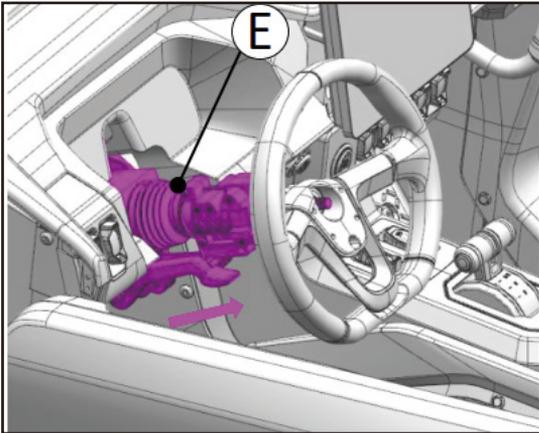
◆ Disassemble the display instrument assembly **【A】**, see 'Display Instrument Assembly Disassembly'.



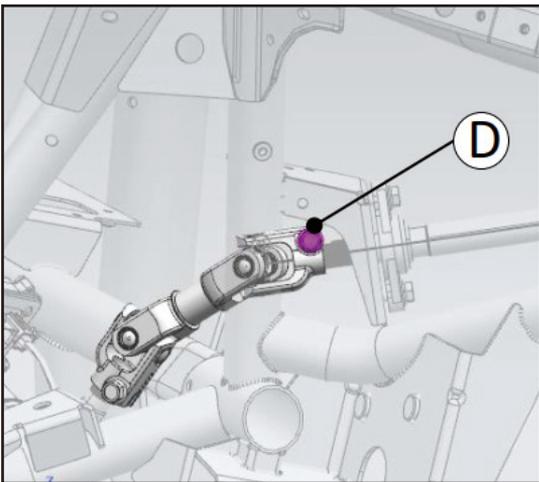
◆ Remove the shift paddle assembly **【B】**, see 'Shift Paddle Assembly Removal'.



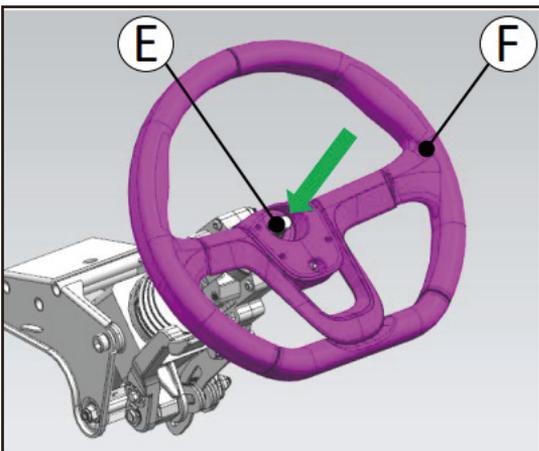
◆ Removal of hexagonal flange face bolts M10× 1.25× 130 **【C】**



- ◆ Removal of hexagonal flange face bolts M8× 30 【D】



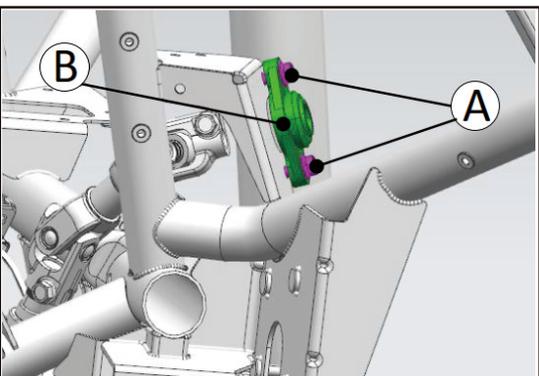
- ◆ Remove the steering column assembly in the direction of the arrow 【E】 .



- ◆ Secure the steering wheel in a vise and tap the steering column assembly 【E】 with a hammer to separate the steering wheel 【F】 from the taper of the steering column shaft.

⚠ CAUTION

- ◆ Be careful not to damage the threaded part when tapping the steering column shaft.



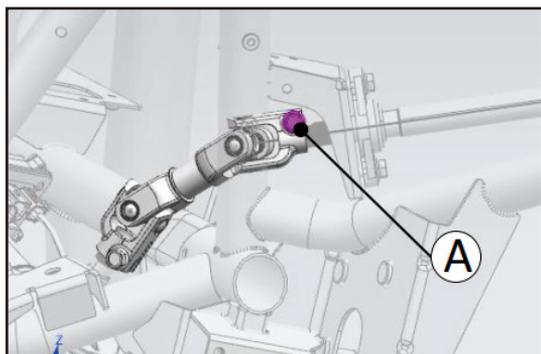
STEERING SHAFT SUPPORT ASSEMBLY DISASSEMBLY

【A】 Hexagonal flange bolts M8×25

【B】 Steering shaft support assembly

- ◆ Disassemble the steering column assembly, see 'Steering column assembly disassembly'.
- ◆ Disassemble the steering column assembly, see 'Steering column assembly disassembly'.
- ◆ Remove the steering shaft support assembly 【B】 .

REMOVAL OF STEERING SHAFT ASSEMBLY

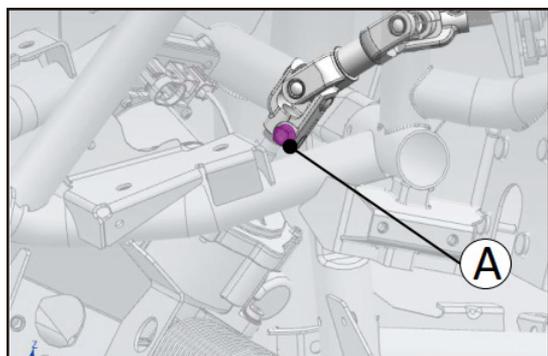


【A】 Hexagonal flange bolts M8× 30

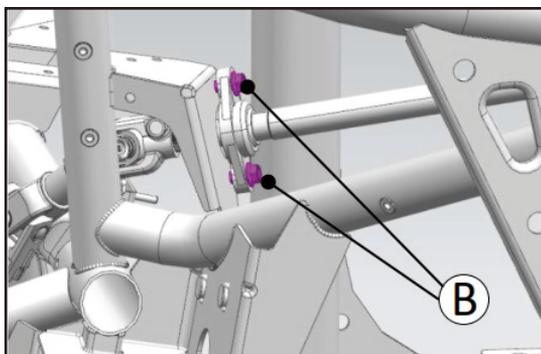
【B】 Hexagonal flange bolts M8× 25

【C】 Steering lower shaft assembly disassembly

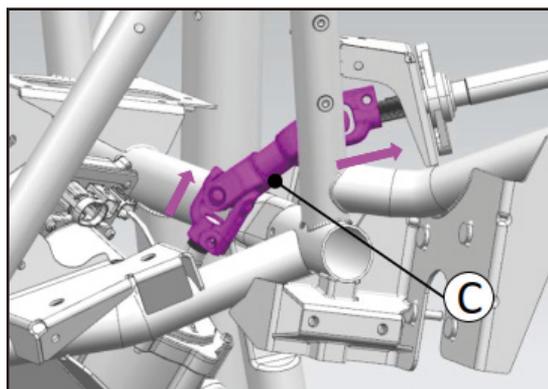
◆ Remove hexagonal flange face bolts M8× 25 【A】



◆ Removal of hexagonal flange face bolts M8× 30 【A】

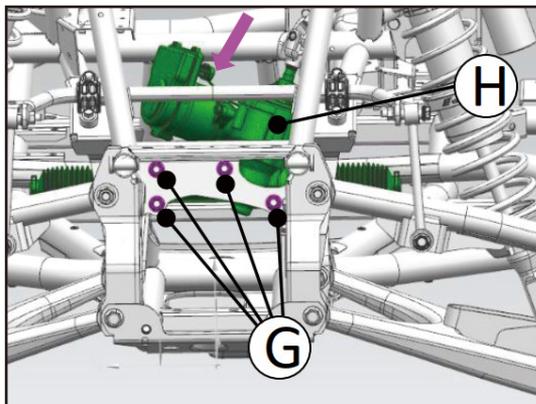
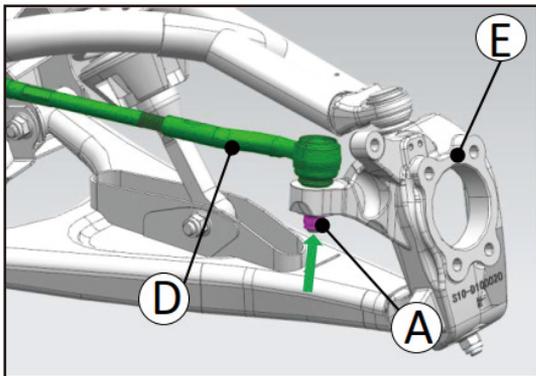
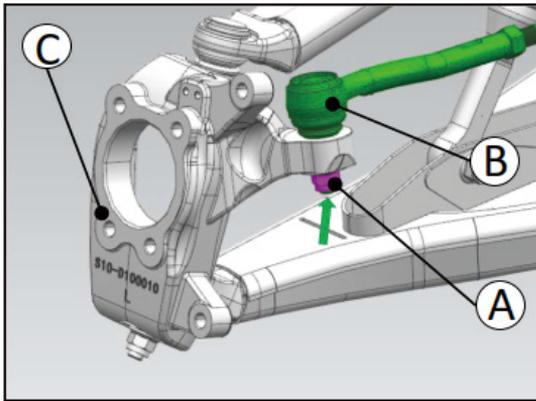


◆ Removal of hexagonal flange face bolts M8× 25 【B】



◆ Remove the steering lower shaft assembly in the direction of the arrow 【C】 .

P-EPS COMPONENT DISASSEMBLY



- 【A】 Hexagonal flange face lock nut M14×1.5
 - 【B】 Left steering tie rod assembly
 - 【C】 Steering knuckle (left)
 - 【D】 Right steering tie rod assembly
 - 【E】 Steering knuckle (right)
 - 【F】 Steering knuckle (left)
 - 【G】 Hexagonal flange face lock nut type 2 M12×1.25
 - 【H】 P-EPS assembly
- ◆ Disassemble the lower steering shaft assembly, see 'Disassembling the Lower Steering Shaft Assembly'.
 - ◆ Disassemble the steering lower shaft assembly, see 'Steering Lower Shaft Assembly Disassembly'.
 - ◆ Remove the hexagonal flange lock nut M14×1.5 【A】
 - ◆ Tap the left steering tie rod assembly 【B】 with a hammer to separate the left steering tie rod assembly 【B】 from the taper of the steering knuckle (left) 【C】 .

⚠ CAUTION

Be careful not to damage the threads when hammering the left steering tie rod assembly

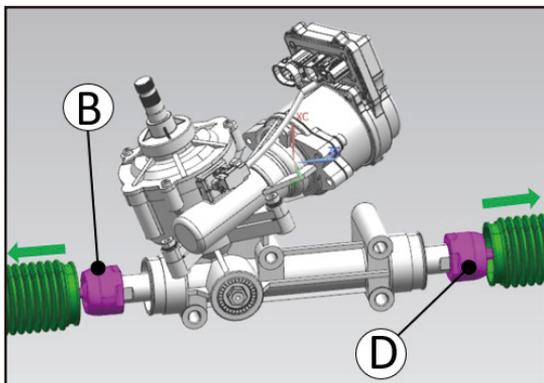
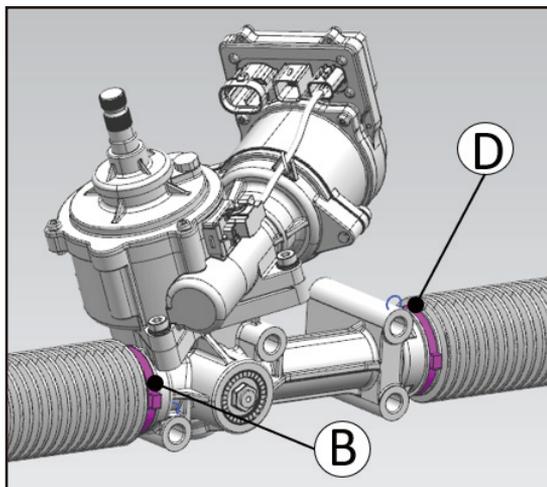
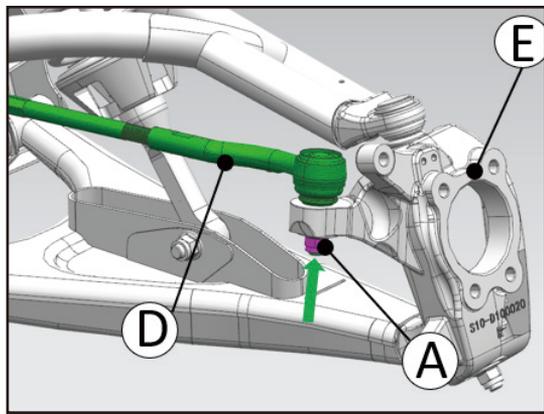
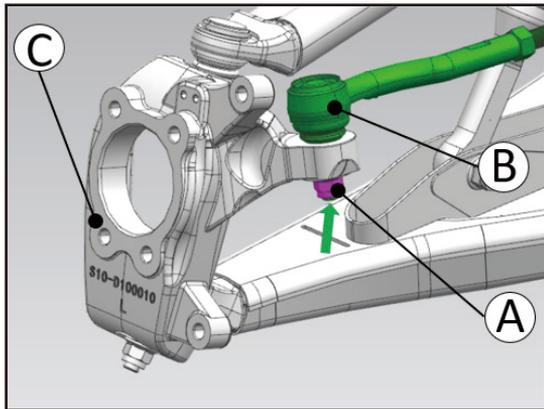
- ◆ Remove the hexagonal flange face locknut M14 x 1.5 【A】 .
- ◆ Tap the right steering tie rod assembly 【D】 with a hammer to separate the right steering tie rod assembly 【D】 from the taper of the steering knuckle (right) 【E】 .

⚠ CAUTION

Be careful not to damage the threads when tapping the right steering tie rod assembly.

- ◆ Remove the type 2 hexagonal flange face lock nut M12 x 1.25 【G】 .
- ◆ Remove the wire harness connector of the P-EPS assembly 【H】 .
- ◆ Remove the harness connector of the P-EPS assembly 【H】 .

REMOVAL OF LEFT/RIGHT STEERING TIE ROD ASSEMBLY



- 【A】 Hexagonal flange lock nut M14×1.5
- 【B】 Left steering tie rod assembly
- 【C】 Steering knuckle (left)
- 【D】 Right steering tie rod assembly
- 【E】 Steering knuckle (right)

- ◆ Remove the hexagonal flange face locknut M14× 1.5 【A】 .
- ◆ Tap the left steering tie rod assembly 【B】 with a hammer to separate the left steering tie rod assembly 【B】 from the taper of the steering knuckle (left) 【C】 .

⚠ CAUTION

Be careful not to damage the threads when tapping the left steering tie rod assembly.

- ◆ Remove the hexagonal flange face locknut M14 x 1.5 【A】 .
- ◆ □ Tap the right steering tie rod assembly 【D】 with a hammer to separate the right steering tie rod assembly 【D】 from the taper of the steering knuckle (right) 【E】 .

⚠ CAUTION

Be careful not to damage the threads when tapping the right steering tie rod assembly.

- ◆ Remove large clamp from left/right steering tie rod assembly
- ◆ Pull out the corrugated bushing of the left/right steering tie rod assembly outwards, use an open-end spanner to remove the ball head of the left/right steering tie rod assembly, and remove the left/right steering tie rod assembly 【B】 / 【D】 .

⚠ CAUTION

Assembly torque of the ball end of the left/right steering tie rod

bolt torque

75~85 N-m

INSTALLATION OF THE STEERING SYSTEM

- ◆ Assemble the P-EPS components in the reverse direction of the disassembly procedure.
- ◆ Check that the left and right steering tie rods are of equal length.
- ◆ Reverse assembly of the steering lower shaft assembly according to the disassembly procedure.
- ◆ Reverse assembly of the steering shaft support assembly according to the disassembly procedure.
- ◆ Reverse steering column assembly as per disassembly procedure.
- ◆ Ensure that both front wheels are facing forward before installing the steering column assembly or P-EPS assembly, and that the steering shaft is not rotated during assembly.
- ◆ Connect the power and signal harnesses of the P-EPS motor.
- ◆ Adjust the front beam parameters of the front wheels after assembly (see Front Suspension section for details) to ensure that the vehicle can drive in a straight line.
- ◆ Adjust the installation angle of the steering wheel so that the vehicle has the same number of left and right steering turns and the steering wheel is centred when driving in a straight line.
- ◆ Tighten the steering wheel nuts according to the torque requirement and install the steering wheel cover.
- ◆ Steering wheel for angle sensor neutral calibration

CAUTION

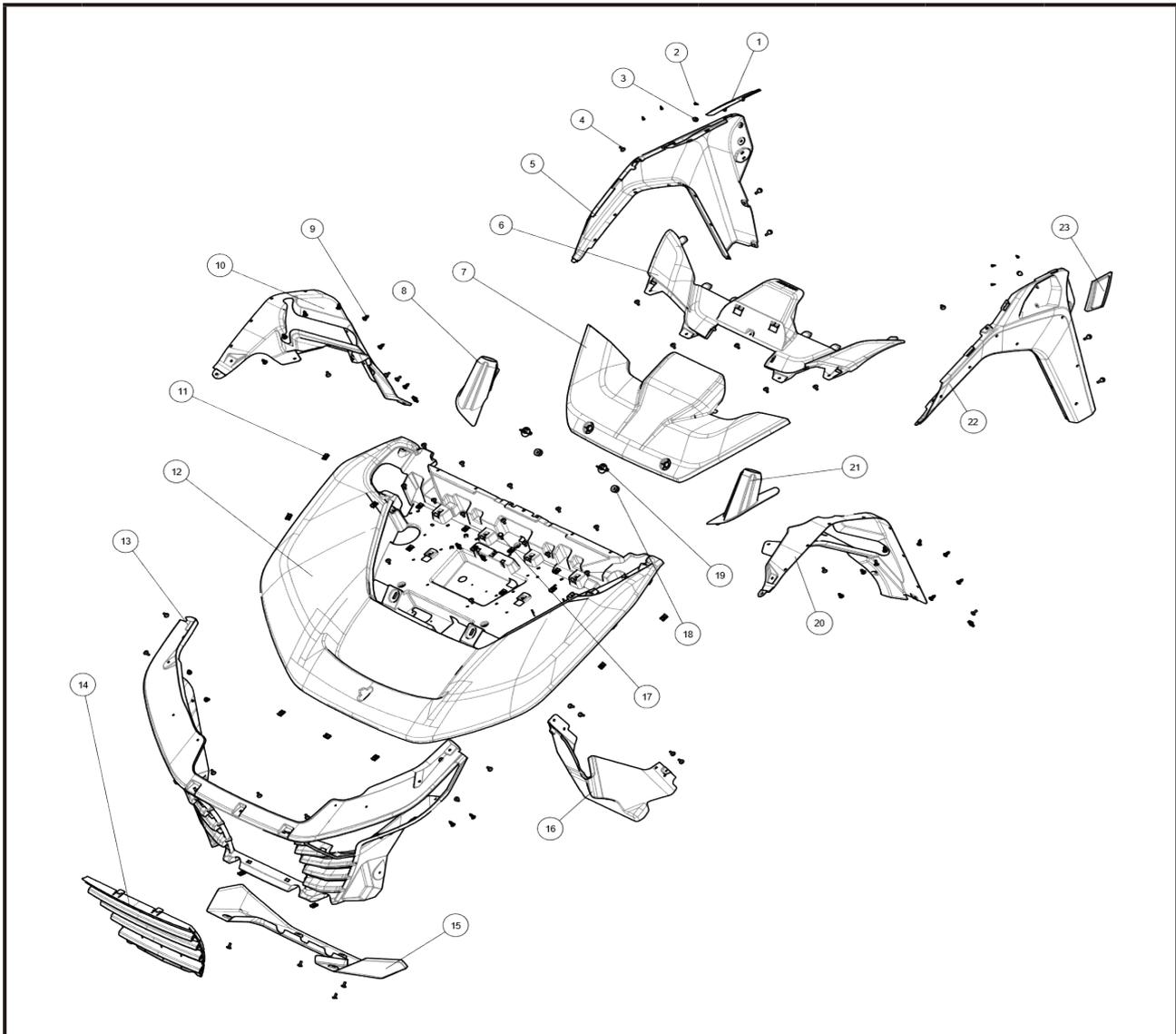
When performing the angle sensor neutral calibration, the vehicle is stationary, both front wheels are facing forward, the steering wheel is in neutral position and there is no steering torque.

-
- ◆ Check the function switches and test the P-EPS function.

BODY AND FRAME

EXPLOSION DIAGRAM OF FRONT PLASTIC.....	13-2
EXPLOSION DIAGRAM OF CENTRE FRONT GEAR ASSEMBLY	13-4
EXPLOSION DIAGRAM OF PEDAL CENTRE GUIDE ASSEMBLY.....	13-6
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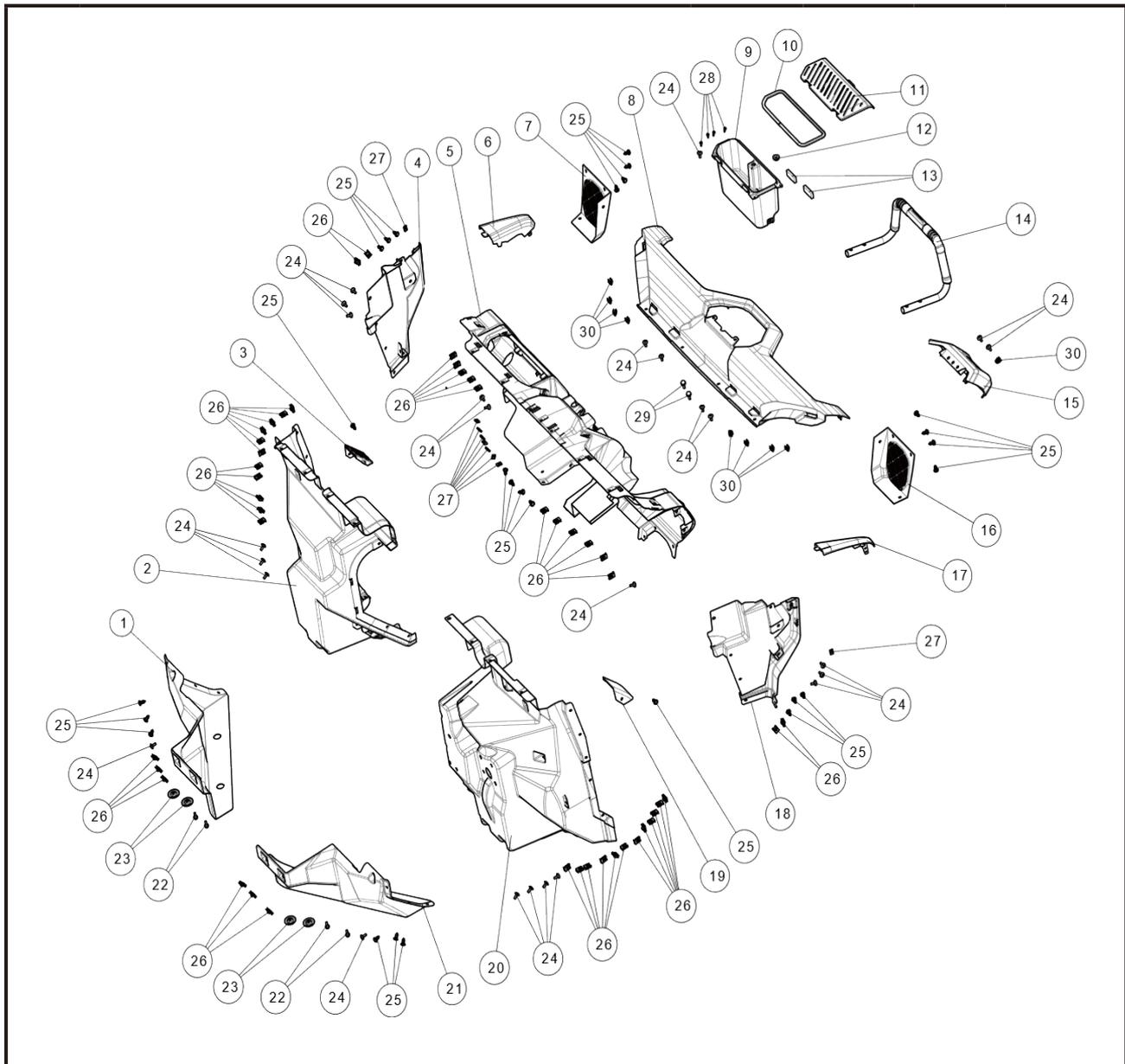
EXPLOSION DIAGRAM OF FRONT PLASTIC



No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	RIGHT FRONT TRIM COVER-RED				
2	BLACK SELF-TAPPING NAIL ST4.2×13				
3	DOOR CUSHION				
4	HEXAGON SOCKET HEAD CAP SCREW M6×16				
5	RIGHT FRONT GUARD PLATE				
6	REAR SECTION OF ACCESS COVER				
7	FRONT ACCESS COVER				
8	TOP BEAM FRONT PROTECTIVE RUBBER COVER RIGHT				
9	EXPANSION BUCKLE ASSEMBLY				
10	RIGHT FRONT MUDGUARD				
11	11 M6 NUT CLIP				

12	FRONT PANEL - PEARL BLACK				
13	FRONT HEADLIGHT COVER				
14	FRONT GRILLE				
15	FRONT LOWER FASCIA - SILVER GREY				
16	FRONT AIR DEFLECTOR				
17	HEXAGON SOCKET HEAD CAP SCREW M6×20				
18	KNOB RUBBER BASE				
19	KNOB HANDLE				
20	LEFT FRONT MUDGUARD				
21	HEADLINER FRONT PROTECTION RUBBER COVER LEFT				
22	LEFT FRONT GUARD				
23	LEFT FRONT TRIM COVER - PEARL BLACK				

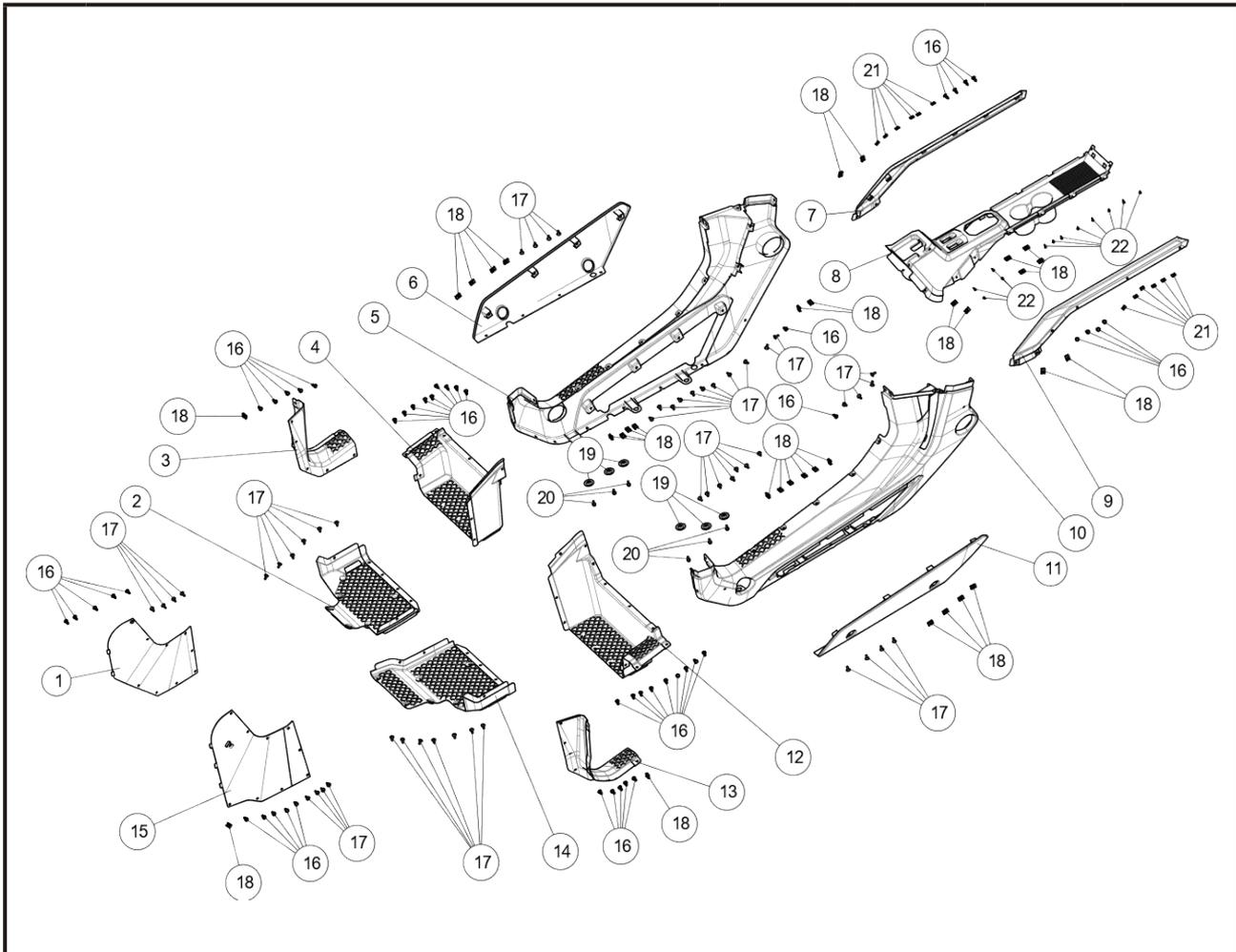
EXPLOSION DIAGRAM OF CENTRE FRONT GEAR ASSEMBLY



No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	FRONT RIGHT BOTTOM GUARD				
2	RIGHT FRONT PANEL				
3	RIGHT FOOT PEDAL REPAIR COVER				
4	RIGHT FRONT COCKPIT LINING				
5	INSTRUMENT PANEL				
6	RIGHT DECORATIVE PANEL - BLACK				
7	RIGHT SPEAKER COVER				
8	INSTRUMENT PANEL DECORATIVE PANEL				
9	STORAGE BOX				

10	STORAGE BOX COVER SEALING STRIP				
11	STORAGE BOX LID				
12	OVAL RUBBER SLEEVE				
13	USB ADHESIVE STRIP				
14	FRONT PASSENGER ARMREST				
15	INSTRUMENT PANEL DECORATIVE COVER				
16	LEFT SPEAKER COVER				
17	LEFT DECORATIVE PANEL - BLACK				
18	LEFT FRONT LINING OF COCKPIT				
19	LEFT FOOT PEDAL REPAIR COVER				
20	LEFT FRONT BAFFLE				
21	FRONT LEFT BOTTOM GUARD				
22	BOLT M6×16				
23	WASHER				
24	LARGE PAN HEAD HEX SOCKET BOLT M6×16				
25	EXPANSION BUCKLE COMPONENT				
26	M6 NUT CLAMP				
27	4.2 SELF-TAPPING SCREW				
28	CROSS HEAD SCREWS ST4.2×13				
29	LARGE PAN HEAD HEX SOCKET BOLT M6×20				
30	SPRING BUCKLE				

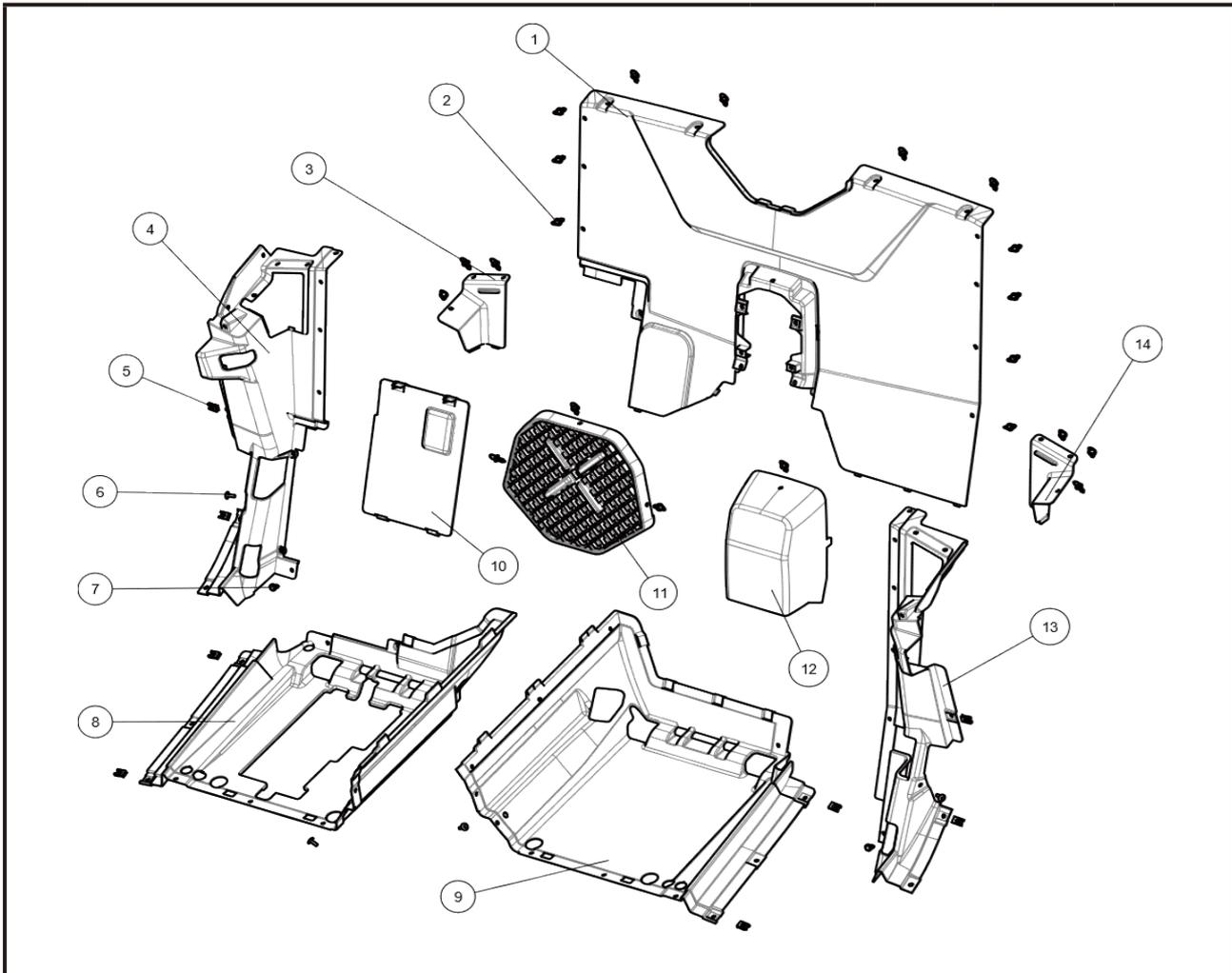
EXPLOSION DIAGRAM OF PEDAL CENTRE GUIDE ASSEMBLY



No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	RIGHT DRIVE SHAFT GUARD PLATE				
2	RIGHT FOOT PEDAL				
3	RIGHT CONNECTING PLATE				
4	RIGHT FOOT PEDAL CONNECTING PLATE				
5	RIGHT GUARD				
6	RIGHT GUARD DECORATIVE PANEL, SILVER				
7	RIGHT DECORATIVE STRIP				
8	MID PANEL COVER				
9	LEFT DECORATIVE STRIP				
10	LEFT GUARD				
11	LEFT GUARD DECORATIVE PANEL, SILVER				
12	LEFT FOOT PEDAL CONNECTING PLATE				
13	LEFT CONNECTING PLATE				
14	LEFT FOOT PEDAL				

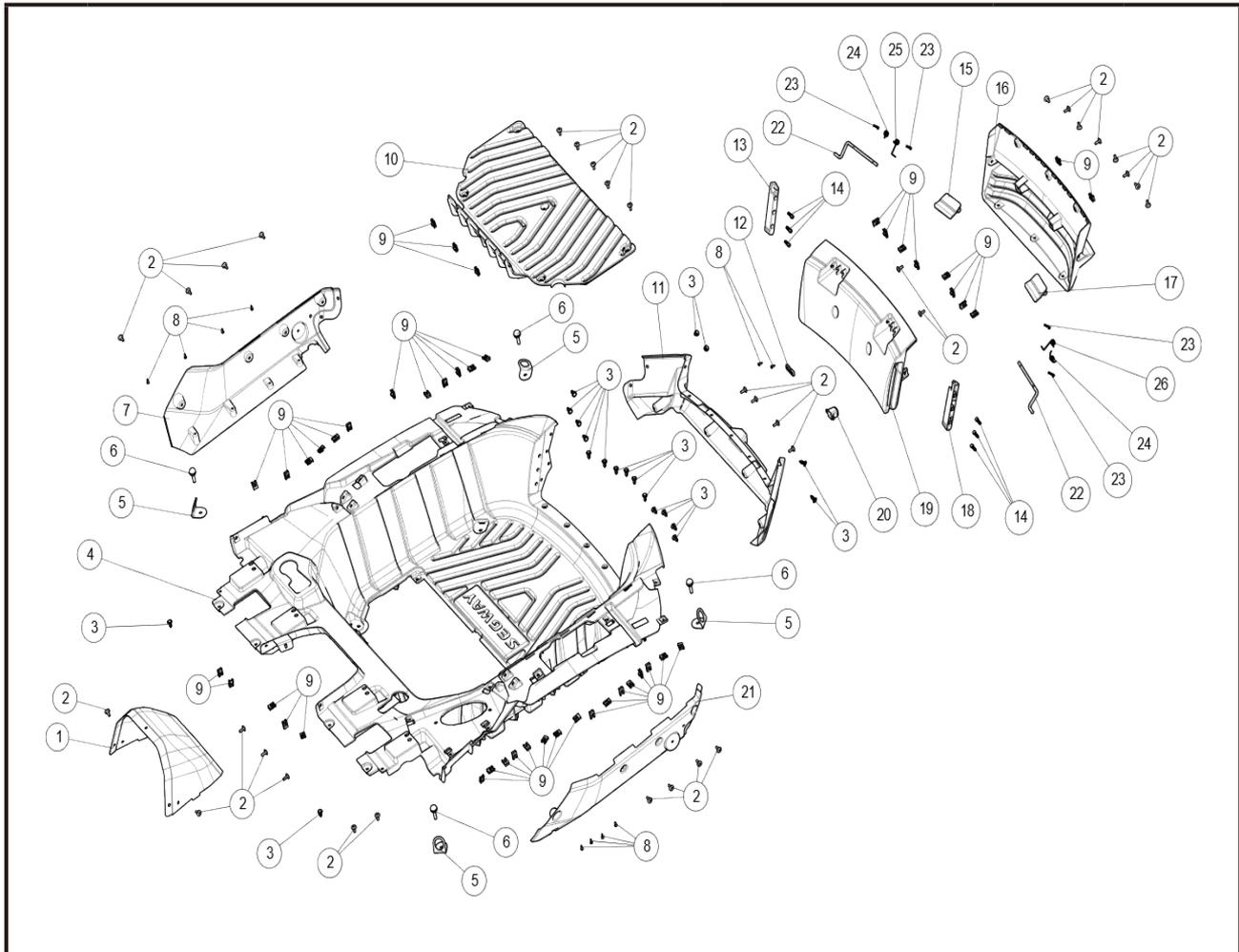
15	LEFT DRIVE SHAFT GUARD PLATE	8~12	0.8~1.2	69~103.6 in·lb	
16	EXPANSION BUCKLE COMPONENT				
17	LARGE PAN HEAD HEX SOCKET BOLT M6×16				
18	M6 NUT CLAMP				
19	WASHER				
20	BOLT M6×16				
21	4.2 SELF-TAPPING SCREW				
22	CROSS HEAD SCREWS ST4.2×13				

EXPLOSION DIAGRAM OF SEAT GUARD BACK PANEL ASSEMBLY



No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	BACK PANEL				
2	EXPANSION BUCKLE COMPONENT				
3	BACK PANEL RIGHT COVER				
4	RIGHT REAR COCKPIT LINING				
5	M6 NUT CLAMP				
6	LARGE PAN HEAD HEX SOCKET BOLT M6×16				
7	EXPANSION BUCKLE COMPONENT				
8	RIGHT SEAT LOWER GUARD				
9	LEFT SEAT LOWER GUARD				
10	BATTERY BOX COVER				
11	MIDDLE GRILLE				
12	MIDDLE INSPECTION COVER				
13	LEFT REAR COCKPIT LINING	8~12	0.8~1.2		
14	BACK PANEL LEFT COVER				

EXPLOSION DIAGRAM OF REAR CARGO BOX ASSEMBLY



No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	REAR CARGO BOX GRILLE				
2	LARGE PAN HEAD HEX SOCKET BOLT M6×16				
3	EXPANSION BUCKLE COMPONENT				
4	REAR CARGO BED				
5	CARGO BOX HOOK				
6	BOLT M8×35				
7	RIGHT DECORATIVE PANEL OF CARGO BOX				
8	CROSS HEAD SCREWS ST4.2×13				
9	M6 NUT CLAMP				
10	CARGO MAINTENANCE COVER				
11	LOWER DECORATIVE PANEL				
12	CAMERA PLATE				
13	RIGHT SLIDING RAIL	8~12	0.8~1.2		
14	SCREW M6×20				
15	RIGHT BUCKLE OF CARGO DOOR				

BODY AND FRAME

SUPER VILLAIN SX20T

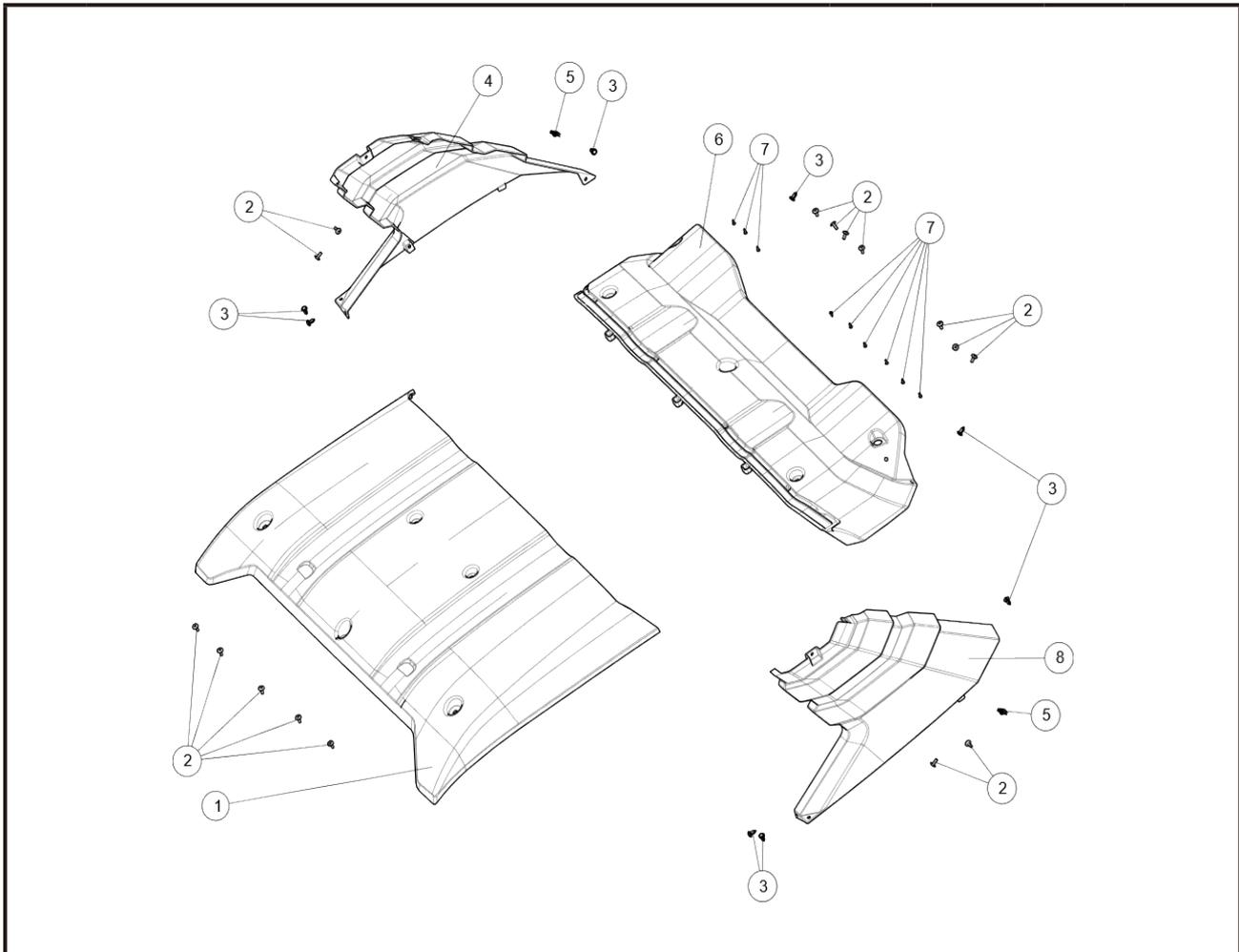
16	REAR COVER OF CARGO DOOR				
17	LEFT BUCKLE OF CARGO DOOR				
18	LEFT SLIDING RAIL				
19	FRONT COVER OF CARGO DOOR				
20	CAMERA PLUG				
21	LEFT DECORATIVE PANEL OF CARGO BOX				
22	LOCK ROD				
23	R PIN				
24	HANDLE TORSION SPRING				
25	LOCK ROD LEFT SPRING				
26	LOCK ROD RIGHT SPRING				

BODY AND FRAME

SUPER VILLAIN SX20T

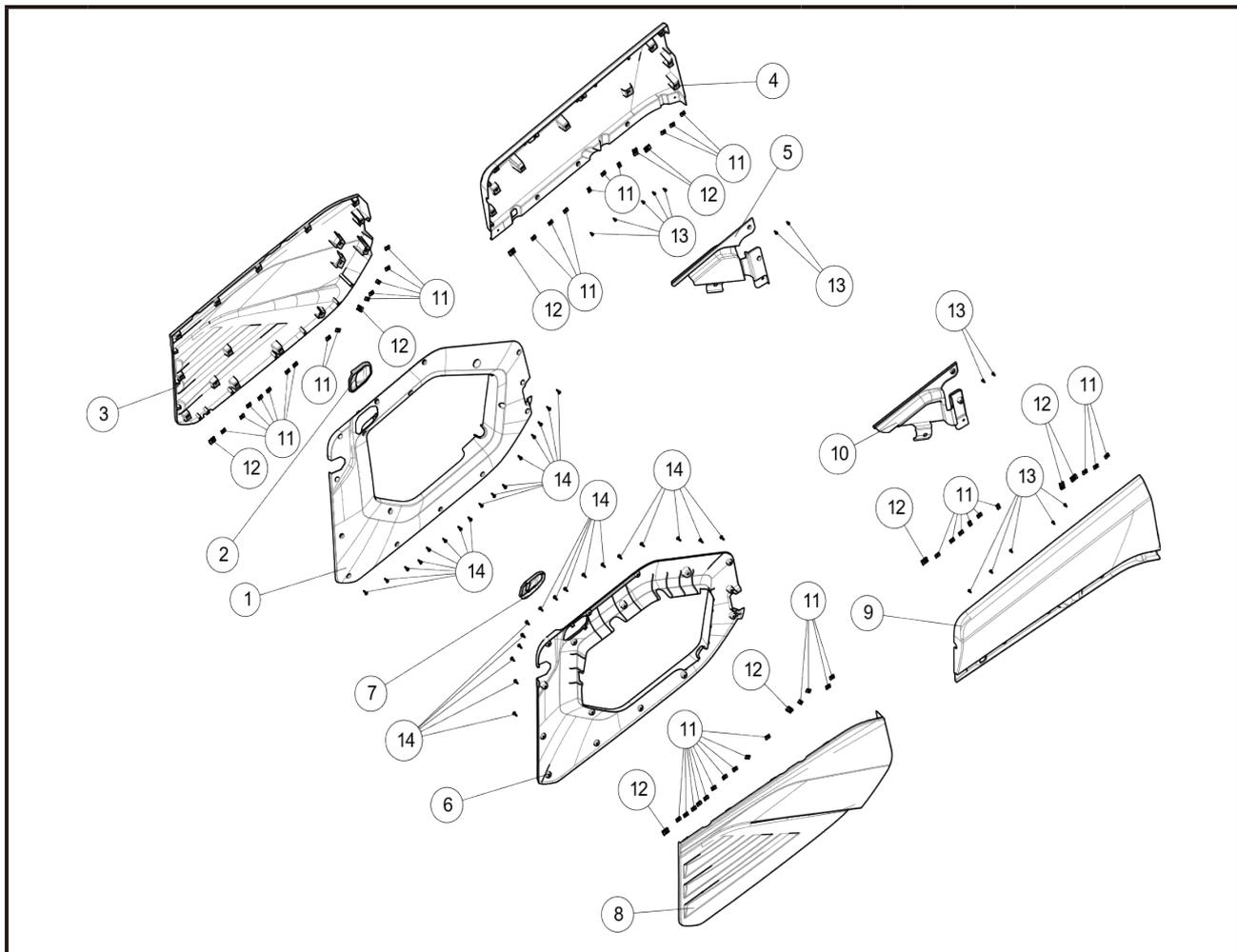
15	4.2 SELF-TAPPING NAIL CLIP PLATE				
16	LEFT REAR TAIL LIGHT COVER				
17	TOP BAR REAR COVER LEFT - BMW WHITE				
18	TOP BAR REAR COVER LEFT - PEARL BLACK				
19	REAR LEFT TRIM PANEL - BMW WHITE				
20	LEFT REAR TRIM PANEL - PEARL BLACK				
21	LEFT REAR TRIM PANEL - BMW WHITE				
22	FUEL FILLER CAP				
23	FUEL TANK GUARD				
24	RECTANGULAR MAGNET 20 X 10 X 5				

EXPLOSION DIAGRAM OF ROOF ASSEMBLY



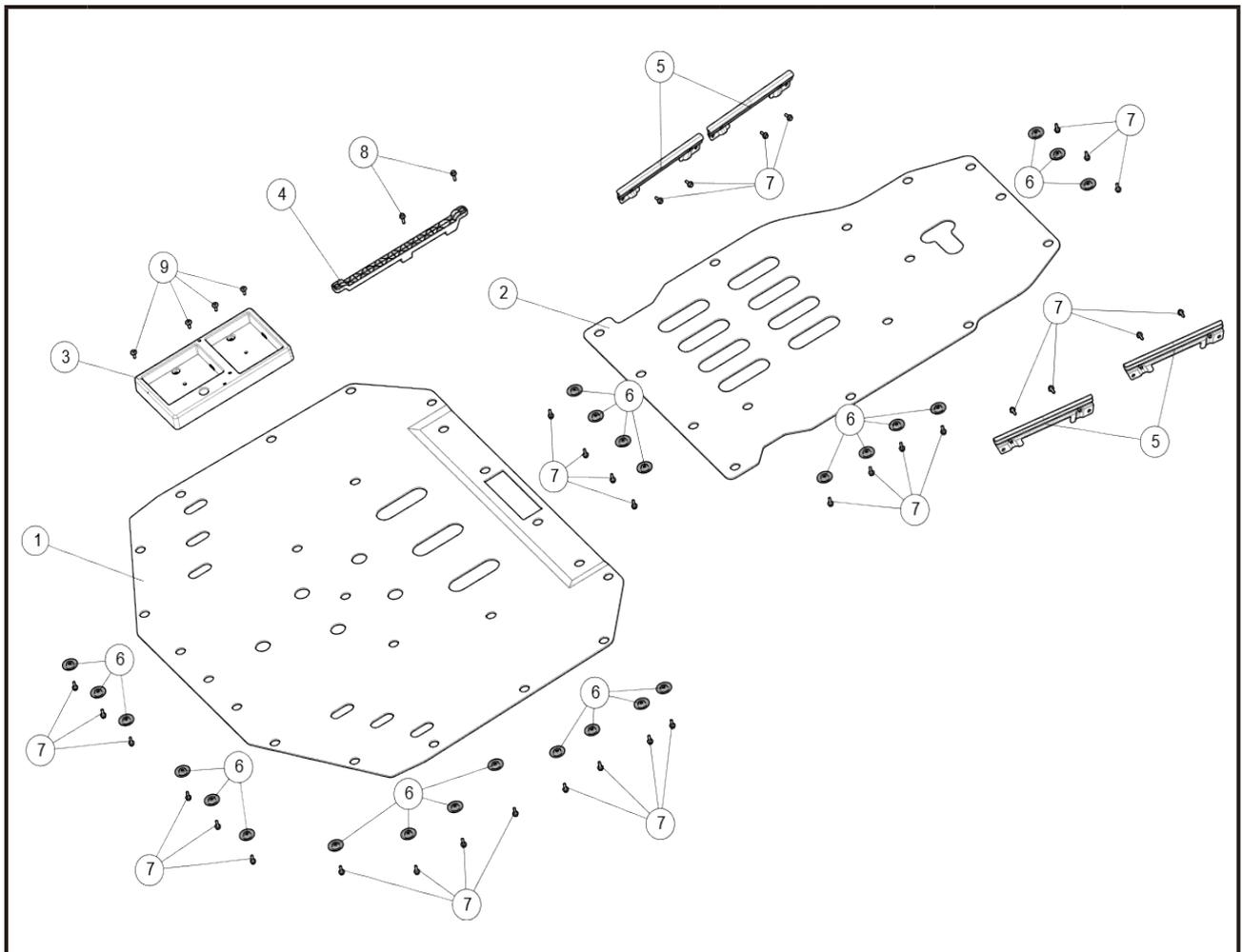
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	FRONT SECTION OF ROOF				
2	LARGE PAN HEAD SOCKET HEAD CAP SCREW M6× 16				
3	EXPANSION BUCKLE ASSEMBLY `				
4	TOP BEAM OUTER SHROUD RIGHT				
5	NUT CLIP M6				
6	REAR SECTION OF ROOF				
7	BLACK SELF-TAPPING SCREW ST4.2× 13				
8	HEADLINER OUTER SHROUD LEFT				

EXPLOSION DIAGRAM OF DOOR ASSEMBLY



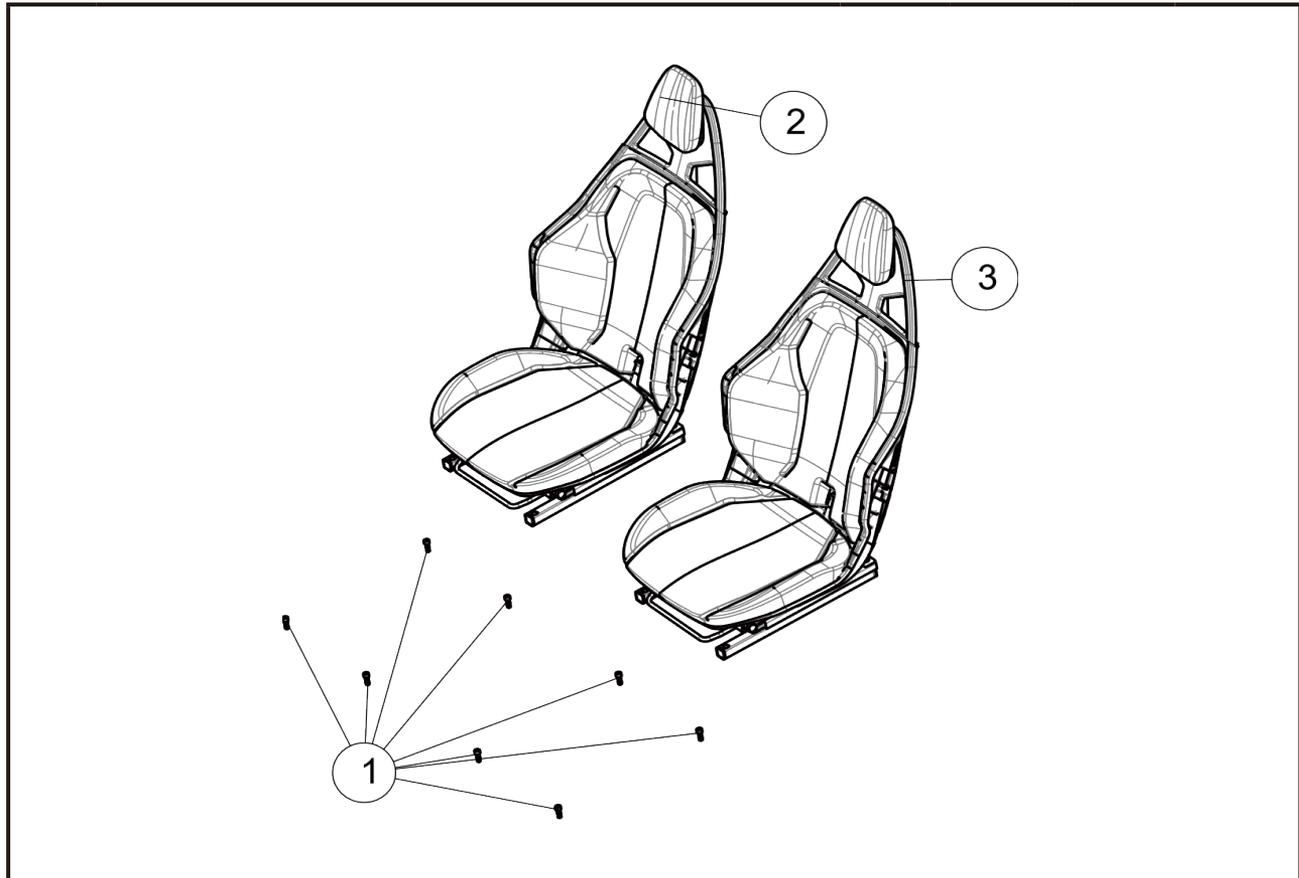
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	RIGHT DOOR LINING A-RED MATT				
2	RIGHT DOOR HANDLE TRIM COVER - MATTE SILVER				
3	LOWER RIGHT DOOR GUARD `				
4	RIGHT DOOR TRIM PANEL - BMW WHITE				
5	RIGHT DOOR LINER B				
6	LEFT DOOR TRIM A-RED MATT				
7	LEFT DOOR HANDLE TRIM COVER - BRUSHED SILVER				
8	LOWER LEFT DOOR TRIM PANEL				
9	LEFT DOOR TRIM PANEL - BMW WHITE				
10	LEFT DOOR INSERT B				
11	4.2 SELF-TAPPING CLIP PLATE				
12	NUT CLIP M6				
13	BLACK SELF-TAPPING SCREWS ST4.2 X 13				
14	CROSS RECESSED LARGE ROUND HEAD TAPPING SCREWS				

EXPLOSION DIAGRAM OF BOTTOM PLASTIC PARTS ASSEMBLY



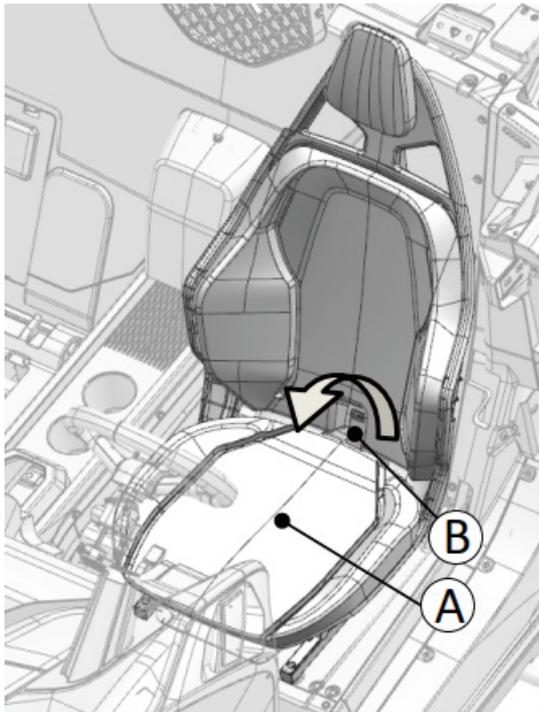
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	FRONT SECTION OF BASE PLATE				
2	REAR SECTION OF BASE PLATE				
3	BATTERY COMPARTMENT				
4	BATTERY PRESSURE PLATE				
5	BRAKE HOSE PROTECTION COVER				
6	REAR REFLECTOR BRACKET RIGHT				
7	REAR REFLECTOR BRACKET LEFT				
8	FISH-EYE WASHER				
9	HEXAGONAL FLANGE BOLTS M6×16				
10	HEXAGONAL FLANGE BOLTS M6×20				
11	HEXAGON SOCKET HEAD CAP SCREW M6×16				

EXPLOSION DIAGRAM OF SEAT

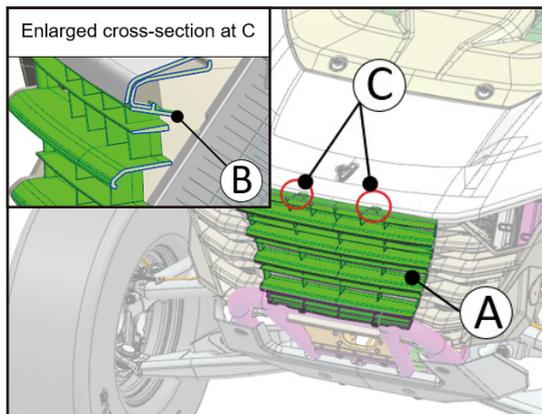


No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	HEXAGON SOCKET CHEESE HEAD SCREW M8× 25				
2	SECONDARY SEAT ASSEMBLY (FUEL)				
3	MAIN SEAT ASSEMBLY (FUEL)				

SEAT REMOVAL

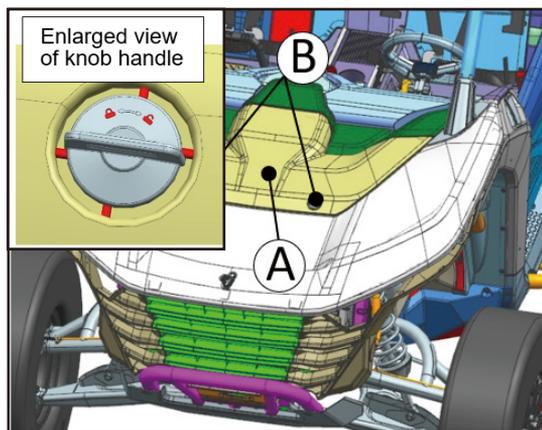


- ◆ Firstly, place the car body on the horizontal position.
- ◆ Use your hand to trigger the bayonet **【B】**, and then turn the seat in the direction of the arrow.
- ◆ Turn the seat in the direction of the arrow to remove the seat.



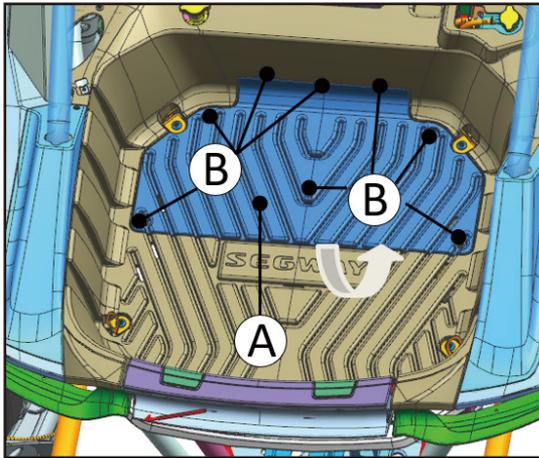
FRONT VENTILATION GRILLE

- ◆ Place the vehicle in a horizontal position.
- ◆ Use both hands to trigger the bayonet **【B】**, and then pull back hard to lower the front ventilation grille **【A】**.



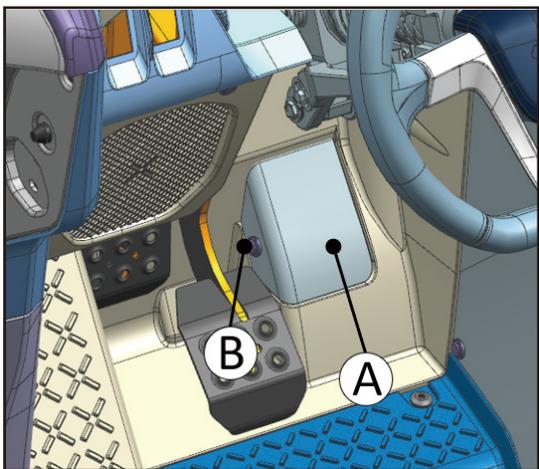
FRONT ACCESS COVER

- ◆ Place the vehicle in a horizontal position.
- ◆ Turn the knob handle **【B】** clockwise in order, and then pull it upwards to lower the front access cover **【A】**.



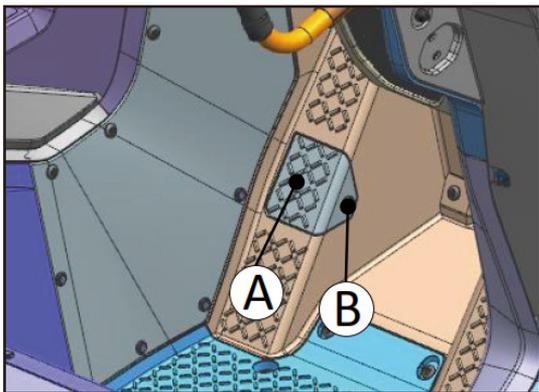
REAR CARGO BOX REPAIR COVER

- ◆ Place the vehicle in a horizontal position.
- ◆ Remove the 8 screws 【B】 with a suitable tool.
- ◆ Then pull in the direction of the up arrow to remove the front access cover 【A】 .



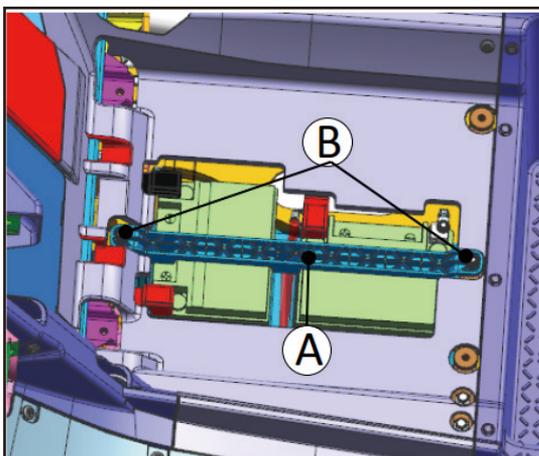
LEFT PEDAL REPAIR COVER

- ◆ Place the vehicle in a horizontal position.
- ◆ Remove the expansion latch assembly 【B】 with the appropriate tool.
- ◆ Remove the front access cover 【A】 by pulling it to the left.



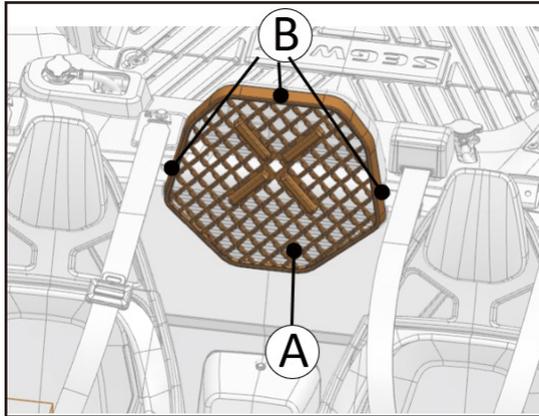
RIGHT FOOTREST REPAIR COVER

- ◆ Place the vehicle in a horizontal position.
- ◆ Remove the expansion latch assembly 【B】 with the appropriate tool.
- ◆ Remove the front access cover by pulling it to the right 【A】 .



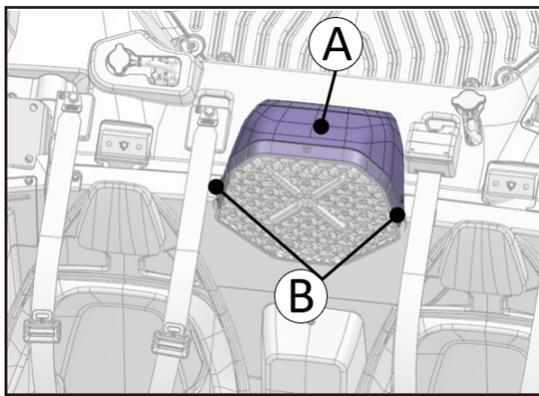
BATTERY PLATEN

- ◆ Place the vehicle body in a horizontal position first
- ◆ Remove the passenger seat.
- ◆ Remove the screws 【B】 with a suitable tool.
- ◆ Remove the battery pressure plate 【A】 by removing the screws 【B】 with a suitable tool.



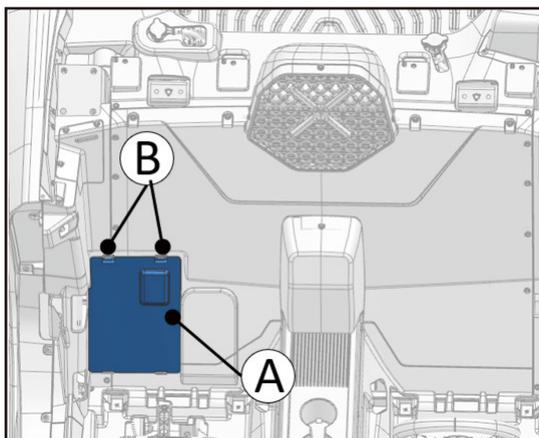
CENTRE GRILLE

- ◆ Place the vehicle in a horizontal position.
- ◆ Remove the expansion latch assembly B-shape **【B】** .
- ◆ Remove the centre grille **【A】** .



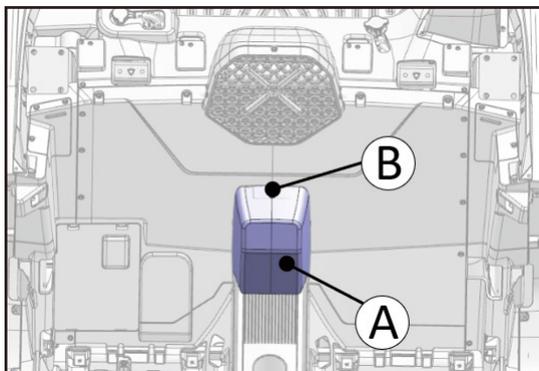
REAR CARGO BOX GRILLE

- ◆ Place the vehicle body in a horizontal position first
- ◆ Remove the centre grille.
- ◆ Remove the screws **【B】** with the appropriate tool.
- ◆ you can remove the rear cargo grille **【A】** .



BATTERY BOX COVER

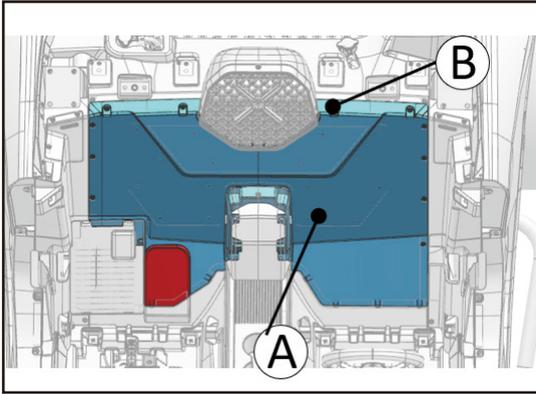
- ◆ Place the vehicle in a horizontal position first
- ◆ Remove the passenger seat.
- ◆ Remove the battery compartment cover **【A】** by pulling the tab **【B】** with both hands at the same time and then dragging it backwards.



CENTRE ACCESS COVER

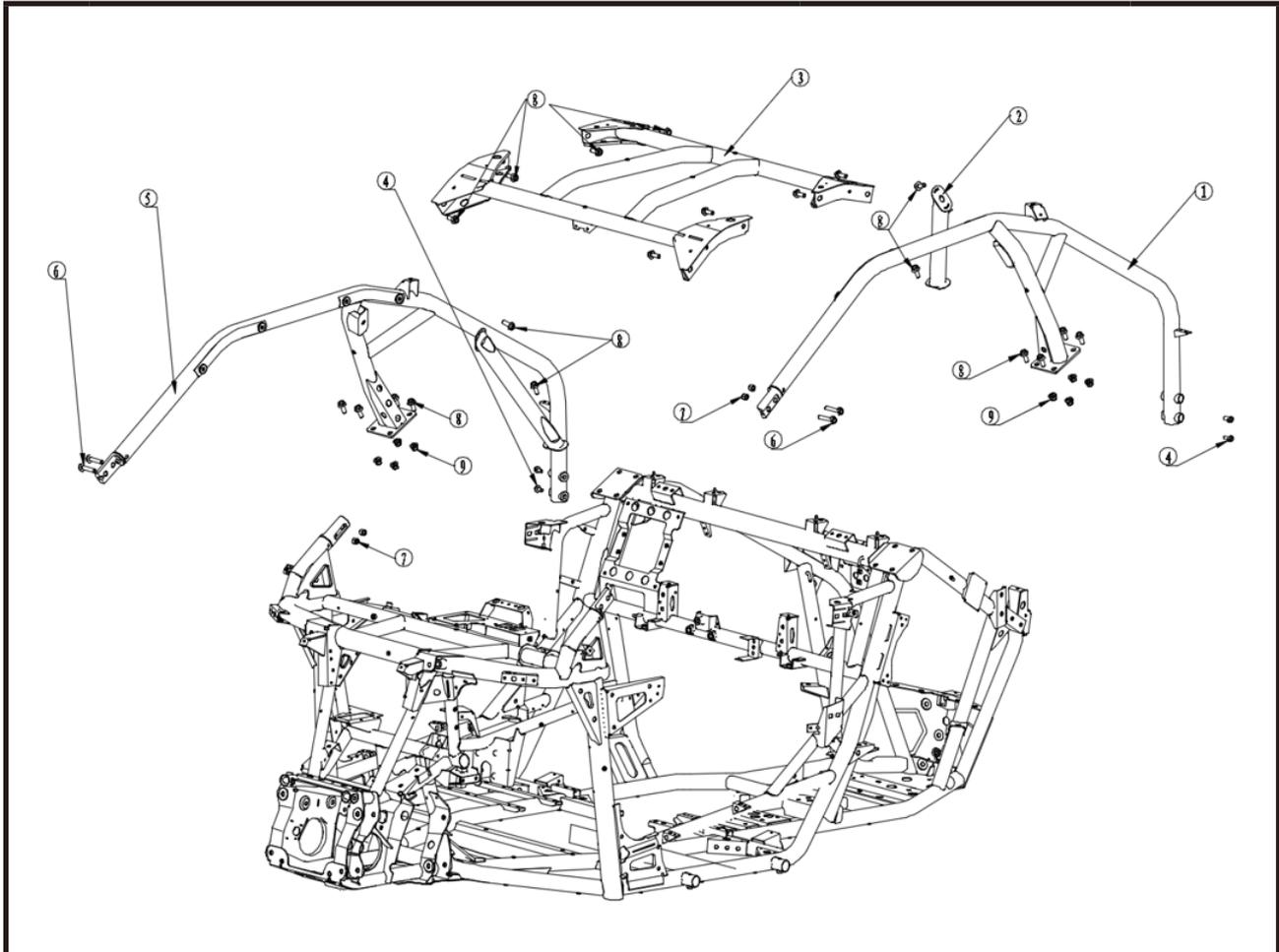
- ◆ Place the vehicle in a horizontal position.
- ◆ Remove the expansion latch assembly B-shape **【B】** .
- ◆ Remove the centre access cover **【A】** by dragging it backwards.

REAR BACK PANEL



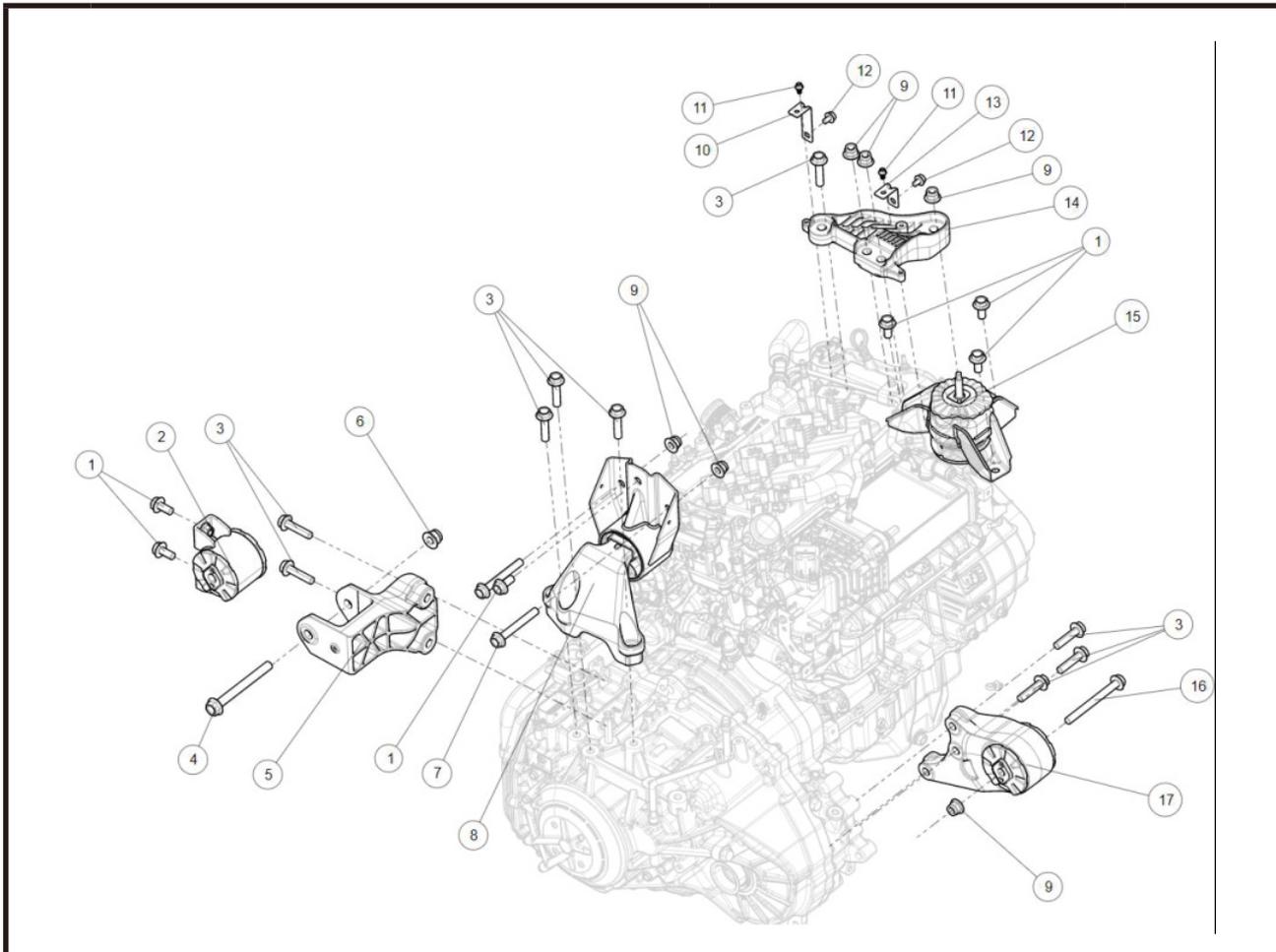
- ◆ Place the vehicle in a horizontal position first
- ◆ Remove the main seat.
- ◆ Remove the secondary seat.
- ◆ Remove the centre grille
- ◆ Remove the rear cargo compartment grille.
- ◆ Remove the battery compartment cover.
- ◆ Remove the battery compartment cover
- ◆ Remove the centre access cover
- ◆ Remove the 11 expansion clips B-shape **【B】**
- ◆ Remove the back panel by dragging it upwards **【A】**

EXPLODED VIEW OF ROLL CAGE



No.	Fastener	Torque (N·m)	Remarks
1	WELDED ASSEMBLY FOR THE LEFT SIDE OF THE ROOF BEAM		
2	WELDED ASSEMBLY FOR LOWER SUPPORT OF ROOF BEAM		
3	WELDING ASSEMBLY FOR THE UPPER PART OF THE ROOF BEAM		
4	HEXAGONAL FLANGE BOLTS M10×1.25×20 (BLACK ZINC)		
5	WELDING ASSEMBLY FOR THE RIGHT SIDE OF THE ROOF BEAM		
6	HEXAGONAL FLANGE BOLT M12×1.25×55	110±10	
7	ALL-METAL HEXAGONAL LOCK NUT M12×1.25	110±10	
8	HEXAGONAL FLANGE BOLT M12×1.25×30	110±10	
9	NON-METALLIC INSERT HEXAGONAL FLANGE LOCK NUT M12×1.25	110±10	

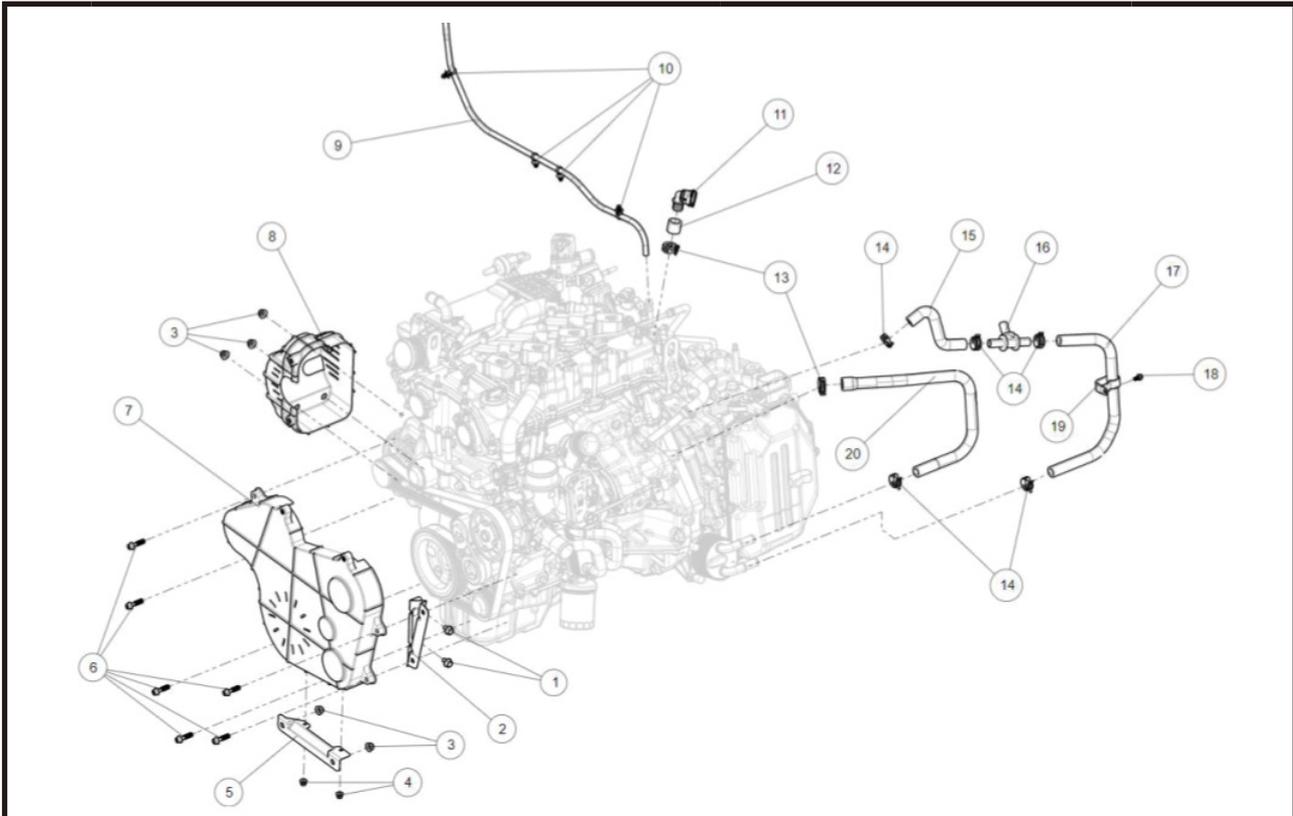
EXPLODED VIEW OF OVERHANG



No.	Fastener	Torque (N·m)	Remarks
1	HEXAGONAL FLANGE BOLT M12×1.25×25	(66.3-81)ft·lb (90-110 Nm)	
2	RIGHT SUSPENSION		
3	HEXAGONAL FLANGE BOLT M12×1.25×50	(66.3-81)ft·lb (90-110 Nm)	
4	HEXAGONAL FLANGE BOLT M14×1.5×130	(121.6-143.7)ft·lb (165-195 Nm)	
5	BRACKET ASSY,ENG.SUPPORT		
6	NUT M14×1.5	(121.6-143.7)ft·lb (165-195 Nm)	
7	HEXAGONAL FLANGE BOLT M12×1.25×90	(66.3-81)ft·lb (90-110 Nm)	
8	FRONT SUSPENSION		
9	NUT M12×1.25 (白锌)	(66.3-81)ft·lb (90-110 Nm)	
10	FRONT WHEEL SYSTEM COVER BRACKET 2		

11	BOLT M6×12	(5.9-8.8)ft·lb (8-12Nm)	
12	HEXAGONAL FLANGE BOLT M8×12	(19.2-22.1)ft·lb (26-30 Nm)	
13	FRONT WHEEL SYSTEM COVER BRACKET 1		
14	REAR SUSPENSION BRACKET		
15	REAR SUSPENSION		
16	HEXAGONAL FLANGE BOLT M12×1.25×120	(66.3-81)ft·lb (90-110 Nm)	
17	LEFT SUSPENSION		

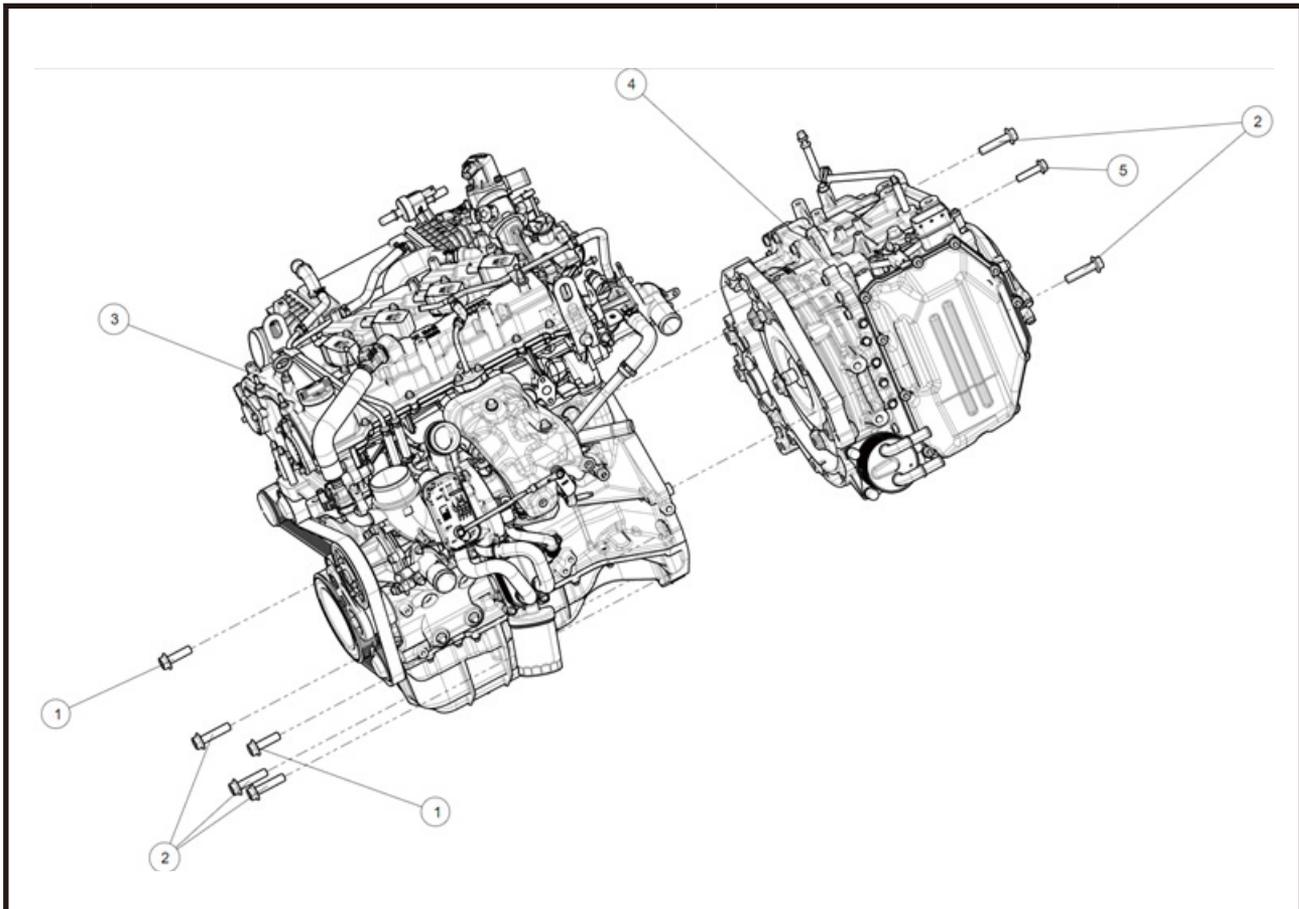
EXPLOSION DIAGRAM OF POWERTRAIN ACCESSORIES



No.	Fastener	Torque (N·m)	Remarks
1	HEXAGONAL FLANGE BOLT M8×12	(19.2-22.1)ft·lb (26-30 Nm)	
2	FRONT WHEEL SYSTEM COVER BRACKET 4		
3	NUT M8	(19.2-22.1)ft·lb (26-30 Nm)	
4	NUT M6	(5.9-8.8)ft·lb (8-12Nm)	
5	FRONT WHEEL SYSTEM COVER BRACKET 3		
6	BOLT M8×30	(19.2-22.1)ft·lb (26-30 Nm)	
7	FRONT WHEEL SYSTEM COVER		
8	GENERATOR COVER		
9	TRANSMISSION VENT PIPE		
10	TIE Φ7×180		
11	QUICK CONNECTOR NW12		
12	PLUG, WATER PIPE		

13	HOSE CLAMP 28		
14	HOSE CLAMP 24		
15	TRANSMISSION WATER INLET HOSE 1		
16	THREE-WAY PIPE, 16×16×16		
17	TRANSMISSION WATER INLET HOSE 2		
18	BOLT M6×12	(5.9-8.8)ft·lb (8-12Nm)	
19	WATER PIPE CLAMP Ø 22		
20	TRANSMISSION OIL COOLER OUTLET PIPE		

FRONT BUMPER EXPLOSION DIAGRAM

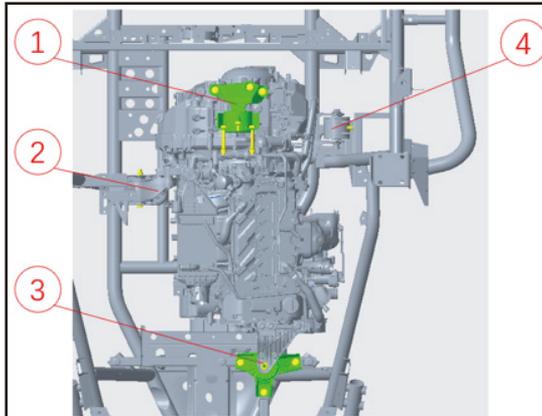


No.	Fastener	Torque (N·m)	Remarks
1	HEXAGONAL FLANGE BOLT M12×1.25×40	(44.2-59)ft·lb (60-80 Nm)	
2	HEXAGONAL FLANGE BOLT M12×1.25×50	(44.2-59)ft·lb (60-80 Nm)	
3	ENGINE ASSEMBLY		
4	TRANSMISSION ASSEMBLY		
5	HEXAGONAL FLANGE BOLT M10×1.25×40	(33.2-40.5)ft·lb (45-55 Nm)	

POWERTRAIN REMOVAL

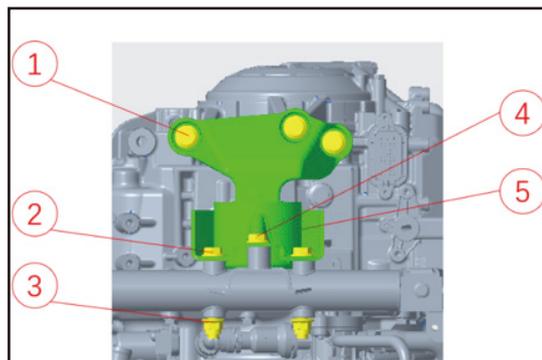
CAUTION

Finish installing the spreader with the powertrain lugs first, and keep the drop rope in a slightly loose condition to prevent the powertrain from falling when removing it from the frame.



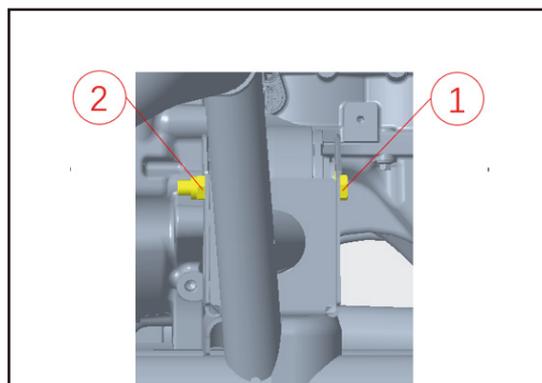
The suspension position is illustrated:

- ① Front suspension
- ② Left suspension
- ③ Rear suspension
- ④ Right suspension



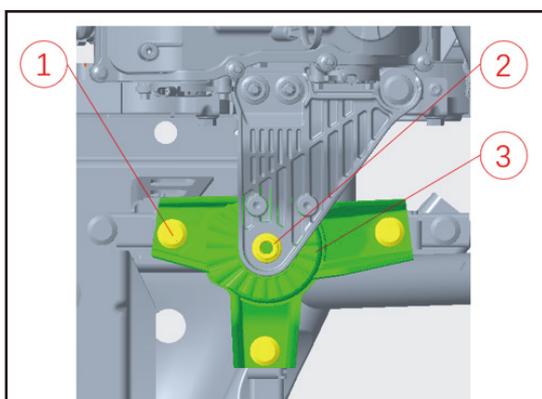
Suspend before removal:

- ◆ Step 1: Remove three serial number ① hexagonal flange bolts M12×1.25×50.
- ◆ Step 2: Remove two serial number ② hexagonal flange bolts M12×1.25×90 and serial number ③ hexagonal flange lock nuts M12×1.25.
- ◆ Step 3: Remove serial number ④ hexagonal flange bolts M12×1.25×25.
- ◆ Step 4: Remove the serial number ⑤ front suspension.



Remove the left suspension:

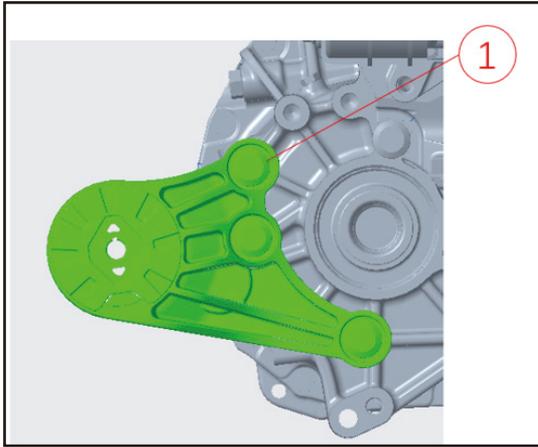
- ◆ Remove serial number ① hexagonal flange face bolts M12 x 1.25 x 120 and serial number ② hexagonal flange face lock nuts M12 x 1.25.



Remove the rear suspension

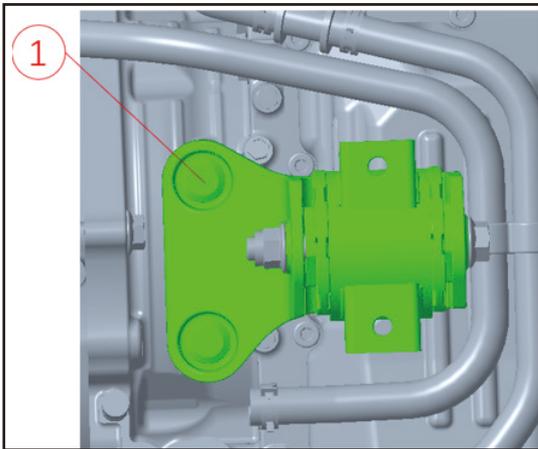
- ◆ Step 1: Remove three serial number ① hexagonal flange bolts M12×1.25×25.
- ◆ Step 2: Remove the serial number ② hexagonal flange face lock nut M12×1.25.
- ◆ Step 3: Remove the serial number ③ rear suspension.
- ◆ Step 4: Lift the powertrain out of the frame.

POWERTRAIN ACCESSORY REMOVAL



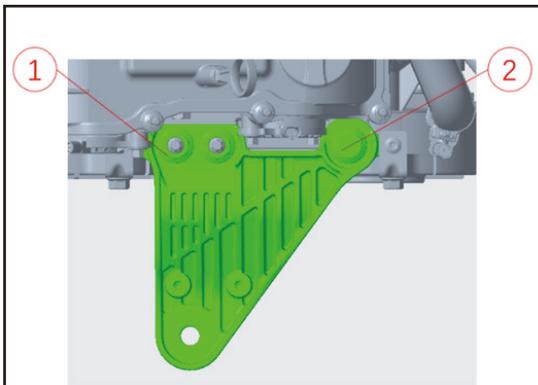
Remove the left overhang

- ◆ Remove three serial number ① hexagonal flange bolts M12× 1.25×50, and remove the left overhang.



Remove the right suspension bracket.

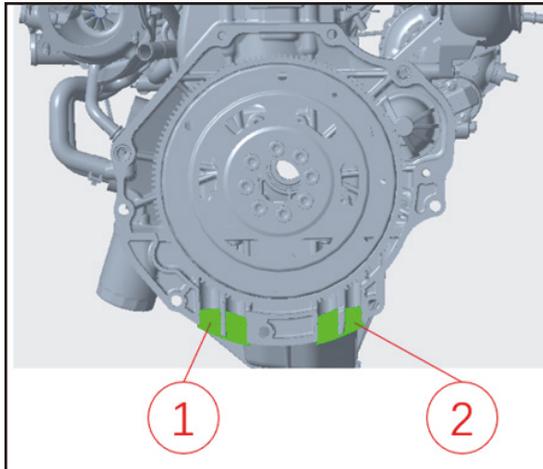
- ◆ Remove three serial number ① hexagonal flange bolts M12×1.25×50, and remove the left and right overhangs.



Removing the rear suspension bracket

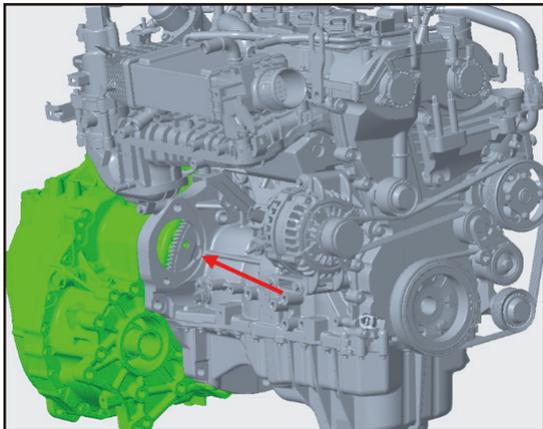
- ◆ Remove the rear suspension bracket by removing two serial number ① hexagonal flange face lock nuts M12×1.25 and one serial number ② hexagonal flange face bolt M12×1.25×50.

POWERTRAIN INSTALLATION

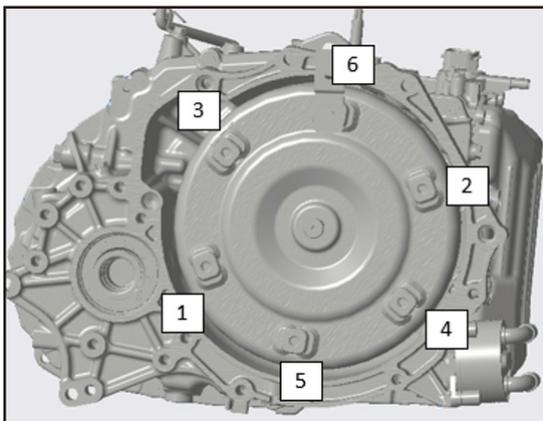


- ◆ Engine and Transmission Installation
- ◆ Step 1: Install Dust Cover ① and Dust Protection ②
- ◆ NOTE: Dust caps are included in the package.

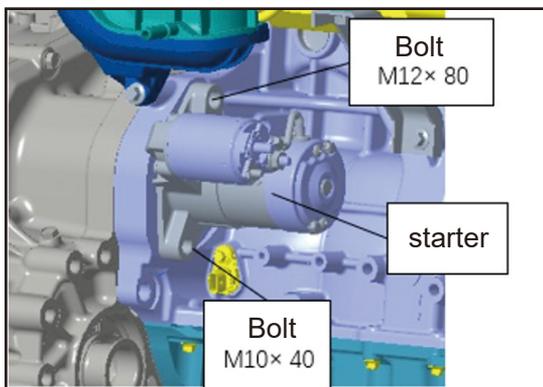
- ◆ Step 2: Align the engine with the gearbox on the platform and align the two locating pin bushings.
- ◆ Step 3: Install the ① ② ⑤ bolts into the mounting holes in the direction shown in the drawing. Torque the ① ② bolts to (44.2-59) ft-lb (60-80 Nm) and the ⑤ bolts to (33.2-40.5) ft-lb (45-55 Nm).



- ◆ Step 4: Assemble the Torque Converter
- ◆ Turn the torque converter and the engine crankshaft and tighten the 6 bolts that secure the engine flex disc to the transmission torque converter, one by one, at the arrows shown in the illustration.

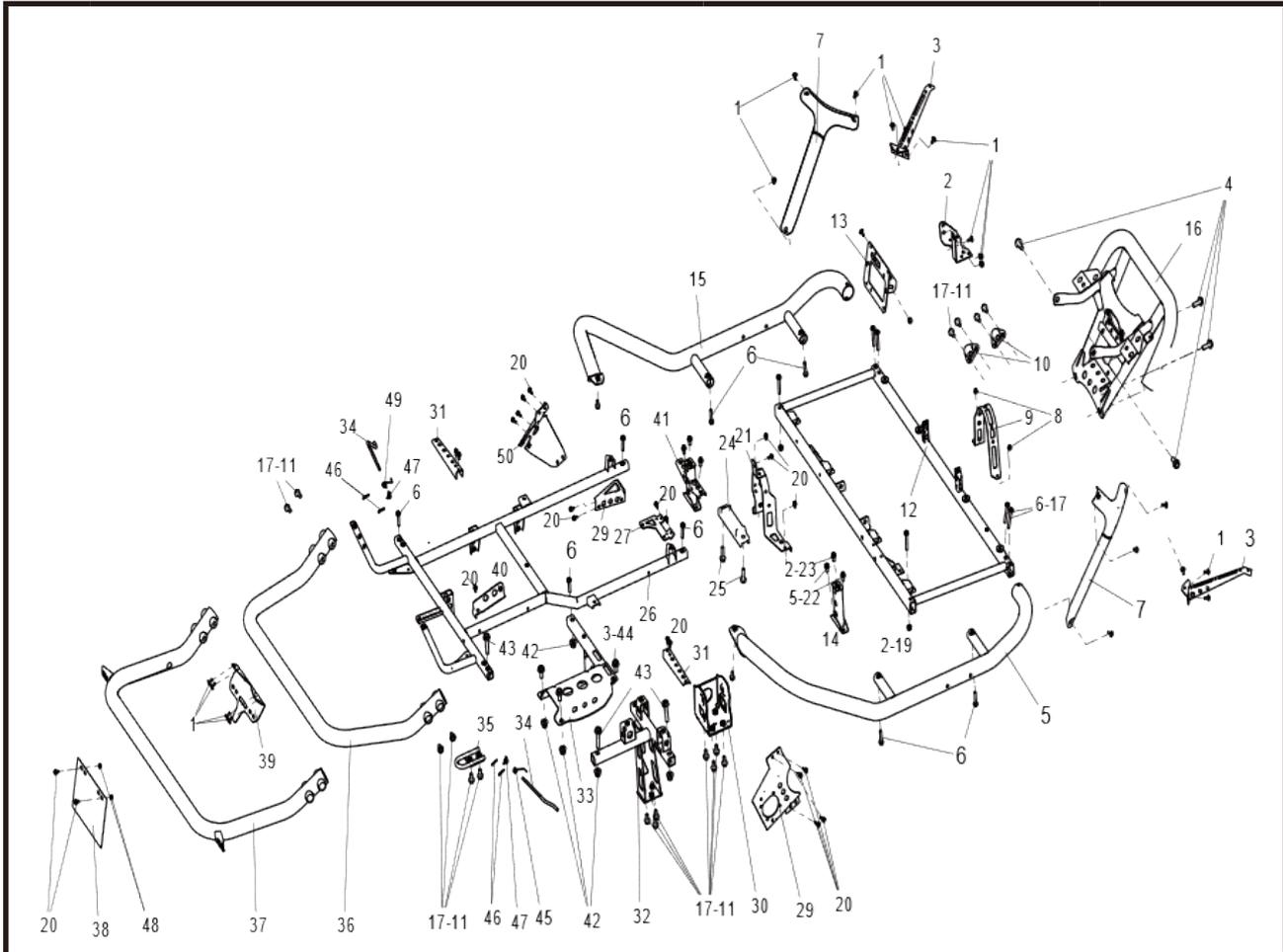


- ◆ Note: The bolts are tightened diagonally in the order shown in the drawing, the first pre-tightening torque is 20Nm, the second tightening torque is 48~55Nm, the fixing bolts are in the random accessories.



- ◆ Step 5: Mounting the starter motor
- ◆ Mount the starter motor to the engine with 1 bolt M12 x 80 and 1 bolt M10 x 40, M12 bolt triggering torque (70 ± 10) Nm, M10 bolt triggering torque (50 ± 5) Nm, both bolts in the supplied accessories.

EXPLOSION OF METAL STRUCTURAL ELEMENTS



No.	Fastener	Torque	Remarks
		N·m	
1	SCREW M6×16	8	
2	WINCH RELAY BRACKET		
3	HEADLIGHT BRACKET		
4	BOLT M12×1.25×30	110±10	
5	RIGHT GUARD BAR, BLACK	20	
5	RIGHT GUARD BAR, RED		
6	HEXAGON FLANGE BOLT M8×40		
7	FRONT TRIDENT BRACKET	8	
8	NUT M6		
9	WATER PIPE TRANSFER BRACKET	70±5	
10	FRONT AXLE RIGHT SEAT		
11	Hexagonal flange bolt M10 × 1.25 × 20		
12	SEAT BRACKET		
13	DISPLAY BRACKET		
14	SEAT RIGHT SUPPORT		

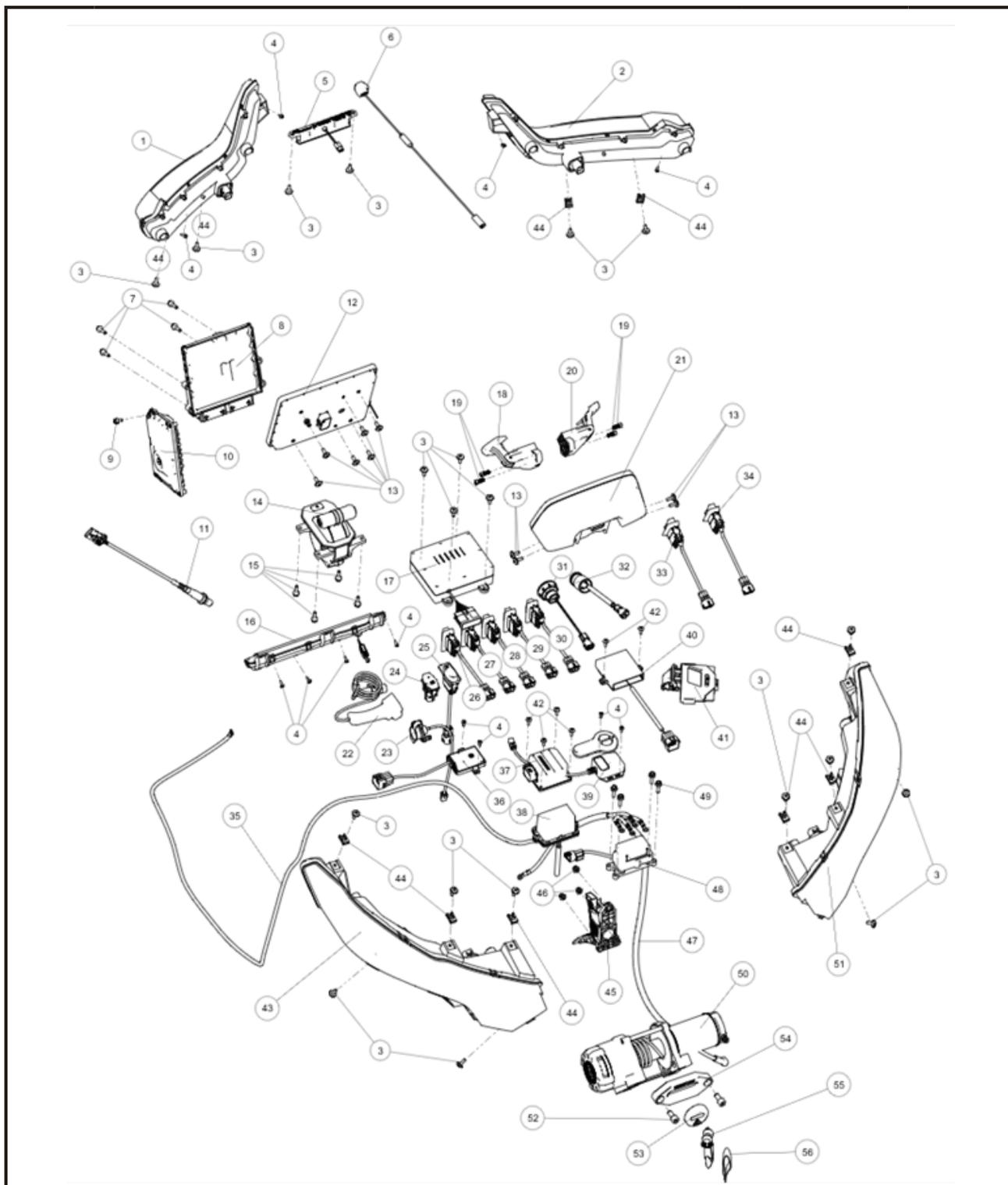
15	LEFT GUARD BAR		
16	FRONT BUMPER		
17	BOLT M8×55	20	
19	NUT M8	20	
20	HEXAGON FLANGE BOLT M6×12		
21	WATER PIPE BRACKET,REAR		
22	HEXAGON FLANGE BOLT M8×16	20	
23	FLANGE BOLT M10 × 1.25 × 16	70±5	
24	LOWER CONNECTION SEAT		
25	BOLT M10×1.25×35	70±5	
26	REAR SHELF BRACKET		
27	LEFT KETTLE BRACKET		
29	CHARGING SOCKET BRACKET		
29	WATER PUMP BRACKET		
30	ENGINE LEFT SUPPORT		
31	REAR LAMP BRACKET		
32	ENGINE REAR BRACKET		
33	REAR ALXE UPPER BRACKET		
34	CARGO DOOR LOCKING LEVER		
35	REAR TOWING - EPA		
36	REAR BUMPER		
37	REAR BUMPER		
40	AIR FILTER BRACKET		
41	SEAT LEFT SUPPORT		
42	NUT M12×1.25	110±10	
43	HEXAGON FLANGE BOLT M12×1.25×55	110±10	
44	HEXAGON FLANGE BOLT M12×1.25×25	110±10	
45	LOCK ROD RIGHT SPRING		
46	R PIN		
47	HANDLE TORSION SPRING		
48	NUT M6		
49	LOCK ROD LEFT SPRING		

ELECTRICAL SYSTEM

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EXPLODED VIEW



No.	Fastener	Torque (N·m)	Remarks
1	RIGHT COMBINATION TAIL LIGHT		
2	2 LEFT COMBINATION TAIL LIGHT	10~12	
3	3 LARGE PAN HEAD SOCKET HEAD CAP SCREW M6×16		
4	4 BLACK SELF-TAPPING SCREW ST4.2×13		

ELECTRICAL SYSTEM

SUPER VILLAIN SX20T

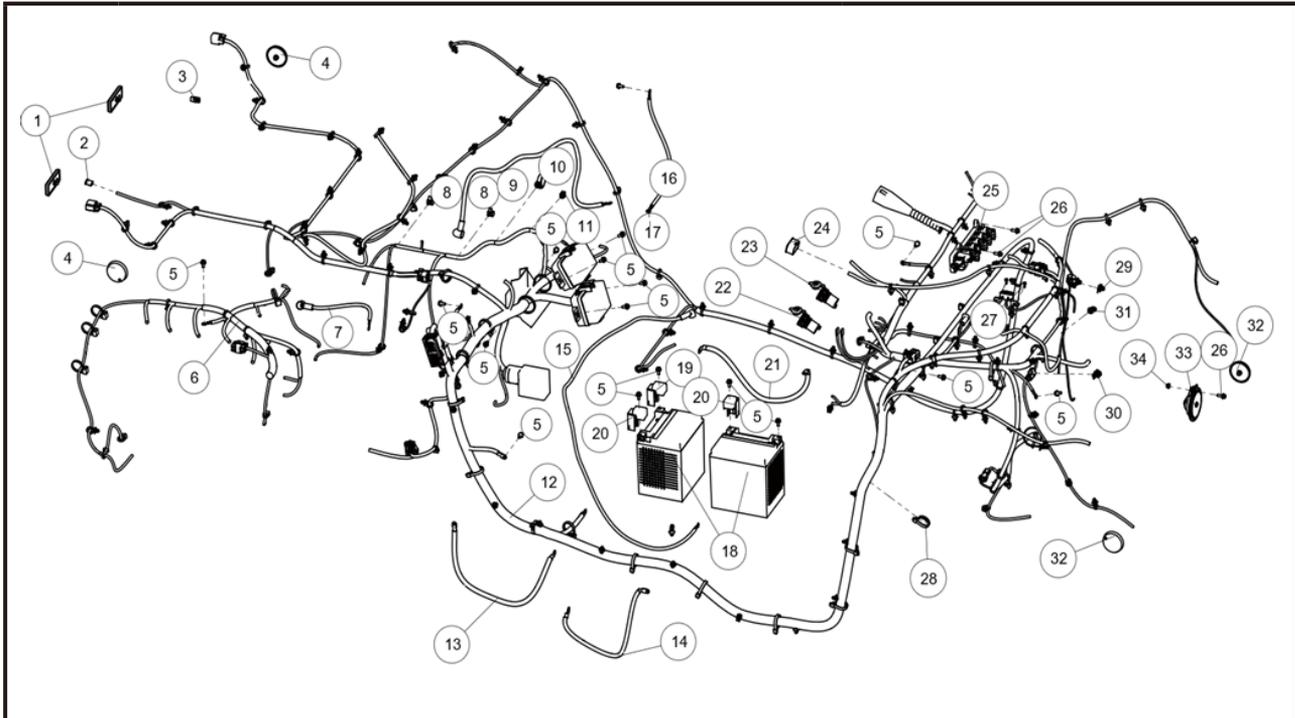
5	5 REAR LICENCE PLATE LIGHT		
6	6 SSV REAR CAMERA		
7	7 HEXAGONAL FLANGE BOLTS M6×25		
8	8 ECU		
9	9 HEXAGONAL FLANGE BOLTS M6×12_STAINLESS STEEL		
10	10 FUEL TCU		
11	11 OXYGEN SENSOR		
12	12 CENTRAL CONTROL ASSEMBLY	10~12	
13	13 HEXAGON SOCKET HEAD CAP SCREW M6×12		
14	14 ELECTRONIC SHIFTER		
15	15 HEXAGONAL FLANGE BOLT M6×20		
16	16 AMBIENT LIGHT		
17	17 SSV2.0 AUDIO AMPLIFIER	10~12	
18	18 RIGHT UPSHIFT PADDLE		
19	19 HEXAGON SOCKET CHEESE HEAD SCREW M6×16		
20	20 LEFT GEARSHIFT PADDLE		
21	21 SSV2.0 INSTRUMENT		
22	22 U01_WINCH SWITCH		
23	23 U01_WINCH SWITCH SOCKET		
24	24 EPB SWITCH		
25	25 ACCELERATION SWITCH		
26	26 DRIVE MODE SWITCH		
27	27 EPS MODE SWITCH		
28	28 EMERGENCY SWITCH		
29	29 2-4WD SWITCH		
30	30 TURN SIGNAL SWITCH		
31	31 U01_START PUSH BUTTON ASSEMBLY_WITH ENGINE OFF		
32	32 S01_POWER LOCK		
33	33 HORN SWITCH		
34	34 HEADLIGHT SWITCH		
35	35 POWER CABLE FOR WINCH		
36	36 AMBIENT LIGHT CONTROLLER		
37	37 T-BOX	10~12	
38	38 SSV2.0 ANTENNA ASSEMBLY		
39	39 U01_WIRELESS CONTROL MODULE FOR WINCHES (WITH WIRELESS SWITCH)	10~12	
40	40 SSV2.0 CONTROL MODULE		

ELECTRICAL SYSTEM

SUPER VILLAIN SX20T

41	41 BCM ASSEMBLY		
42	42 CROSS RECESSED LARGE ROUND HEAD TAPPING SCREWS ST4.8×19		
43	43 RIGHT COMBINATION HEADLIGHT		
44	44 M6 NUT CLIP		
45	45 U01_THROTTLE PEDAL ASSEMBLY		
46	46 TYPE 2 NON-METALLIC INSERT HEXAGONAL FLANGE FACE LOCKNUT M6		
47	47 WINCH MOTOR CABLE		
48	48 U01_WINCH RELAY		
49	49 HEXAGONAL FLANGE BOLT M6×25		
50	50 4500 WINCH MOTOR (NYLON ROPE)		
51	51 LEFT COMBINATION HEADLIGHT		
52	52 HEXAGON SOCKET CHEESE HEAD SCREW M10×1.25×20		
53	53 U01_RUBBER PAD FOR WINCH		
54	54 WINCH GUIDE WHEEL (NYLON ROPE)		
55	55 U01_WINCH HOOK		
56	56 U01_WINCH STRAP		

EXPLODED VIEW



No.	Fastener	Torque (N·m)	Remarks
1	1 SQUARE REFLECTOR (RED)		
2	2 REAR CAMERA COVER		
3	3 REAR LICENCE PLATE LIGHT COVER		
4	4 ROUND REFLECTOR (RED)		
5	5 HEXAGONAL FLANGE BOLTS M6×12		
6	6 SSV2.0 EFI SUB CABLE (FUEL)		
7	7 GENERATOR CABLE		
8	8 M6 CABLE TIE		
9	9 STARTER MOTOR POSITIVE CABLE		
10	10 ELLIPTICAL POSITIONING TIE $\Phi 7 \times 12 \times 250$		
11	11 SHEET METAL TIE		
12	12 SSV2.0 MAIN CABLE (FUEL)		
13	13 BATTERY GROUND CABLE		
14	14 BATTERY POSITIVE PARALLEL CABLE		
15	15 FUSE BOX POSITIVE CABLE		
16	16 ENGINE HITCH CABLE		
17	17 HEXAGONAL FLANGE FACE BOLT M8×12		

18	18 BATTERY 32AH		
19	19 BATTERY DOUBLE POST ASSEMBLY (BLACK SHEATH)		
20	20 BATTERY DOUBLE POST ASSEMBLY (RED SHEATH)		
21	21 BATTERY NEGATIVE PARALLEL CABLE		
22	22 USB OUTPUT HOLDER		
23	23 U01_12V POWER OUTPUT BLOCK		
24	24 CENTRAL CONTROL CONNECTOR PLUG COVER		
25	25 POWER DISTRIBUTOR		
26	26 HEXAGONAL FLANGE BOLTS M6×16_STAINLESS STEEL		
27	27 BLACK SELF-TAPPING SCREW ST4.2×13		
28	28 TIE TAPE 5×300		
29	29 CONNECTOR FIXING CLIP		
30	30 CONNECTOR FIXING CLIP		
31	31 FIR TREE TYPE POSITIONING TIE Φ7×180		
32	32 ROUND REFLECTOR (AMBER)		
33	33 U01_HORN		
34	34 HEXAGONAL FLANGE FACE NUT M6		

TECHNICAL PARAMETERS

Project	Standard	Use limit
Battery: Type Capacity	Sealed Battery 12 V 32 Ah	---
Charging System: Alternator type Charging voltage (Regulator/rectifier output voltage) Alternator output voltage Stator coil resistance	Three-phase DC 14 ~ 15 V AC 36 ~ 54 V 3 000 r/min (rpm) 0.33 ~ 0.49	---
Ignition System: Spark plug: Spark plug gap Spark plug cap resistance Ignition coil: Primary winding resistance Secondary winding resistance	0.6~0.8 mm 3~12kΩ 466~593mΩ 8.2~10.5kΩ	---
Electric Starter System: Starter motor: Commutator diameter Brush length	28mm 11.5mm	---
Fuel Pump: Fuel pump pressure	400±20KPa	---
Switch: Brake light switch timing of pedal travel Rising temperature	ON after 10 mm (0.4 in.) of pedal travel From OFF to ON at 88°C From ON to OFF at 83.5°C	---

SPECIAL TOOLS

Multimeter



⚠ CAUTION

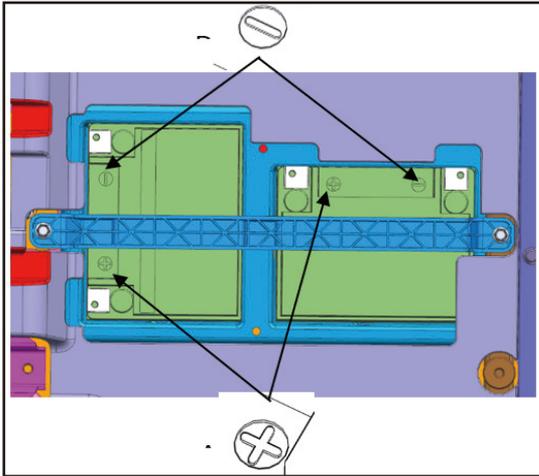
- ◆ When the multimeter is measuring voltage, the meter pen should not be inserted into the current measuring hole
- ◆ When measuring resistance, please be sure to disconnect the battery positive pole.

Fault diagnosis instrument



BATTERY

REMOVE THE BATTERY



【A】 Positive (+)

【B】 Negative terminal (-)

- ◆ Switch off the key switch.
- ◆ Remove the seat (see section on frame)
- ◆ Loosen the bolt of the battery pressure plate.
- ◆ Remove the battery pressure plate.
- ◆ Disconnect the negative (-) battery cable first, then the positive (+) cable.
- ◆ Remove the battery.

TURN OFF IGNITION SWITCH

- ◆ Place the battery in place with the battery box and retainer.
- ◆ First connect the battery positive (+) cable, then connect the negative (-) cable.
- ◆ Thin grease is applied to the terminals to prevent corrosion.
- ◆ Tighten the battery seat bolts. Match the model name of the battery. These names must be the same.

Battery model Name: GHD32HL-BS

⚠ CAUTION

This battery is a colloidal battery and does not need to add electrolyte.



BATTERY CHARGING

In the case shown in the following table, to start the vehicle fully to start the engine, and it should be charged before use. However, if the battery voltage is higher than 12.6V after 10 minutes of charging, no initial charge is required.

The conditions under which an initial charge is required	charging method
At low temperatures (below 0°C)	1.4 A x 2 _ 3 Hours
Batteries have been stored at high temperatures and in high humidity	1.4 A x 15 _ 20 Hours
The seal has been removed or cracked - flaked, torn or torn	
The battery life is more than 2 years after manufacture	

NOTE: Terminal voltage - To measure the terminal voltage of the battery, use a digital voltmeter. When measuring the terminal voltage after charging, the battery should stand still for more than 20 minutes.

Preventive measures:

1) Colloidal battery, no liquid filling is required

- ◆ Before normal use, there is no need to replenish the battery as long as it is not exhausted. It is very dangerous to pry open the sealing plug and add water. Never do that.

2) Recharge

- ◆ If the engine fails to start, the horn becomes weaker or the indicator light goes dark, it shows the battery is exhausted.
- ◆ Charge the battery for 5 to 10 hours according to the charging current as shown in the specification.
- ◆ When it is inevitable to need quick charging, please charge in strict accordance with the maximum charging current and the time conditions indicated on the battery.

WARNING

The battery is designed to withstand no abnormal damage if it is recharged as specified above. However, if charged under conditions other than those described above, the performance of the battery may degrade significantly. Do not remove the seal cover during recharging. If excess gas is generated due to overcharging, a safety valve ensures battery safety.

3) When you don't use the vehicle for months

- ◆ Charge your motorcycle before storing it and store it before removing the negative cable.
- ◆ Fully charged once a month while in storage.

4) Battery life time

- ◆ If the battery fails to start the engine after several charges, the battery has exceeded its useful life; replace it with a new one.

WARNING

Keep batteries away from sparks and open flames during charging.

Explosive gas mixtures that emit hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning it on. This procedure prevents sparking at the battery terminals, which may ignite any flammable gases.

Keep ignition sources away from the battery and do not loosen the terminals. The electrolyte contains sulfuric acid. Be careful not to let it come into contact with your skin or eyes. If touched, wash it off with plenty of water. If serious, seek medical attention.

Exchange service

- ◆ Sealed batteries can only perform to their fullest extent when used in conjunction with the proper vehicle electrical equipment.
- ◆ Therefore, sealed batteries can only be replaced on vehicles originally equipped with the tool.
- ◆ If a sealed battery is installed in a vehicle with a regular battery, beware of the equipment, the life of the sealed battery will be shortened.

CHARGING CONDITION CHECK

The battery state of charge can be checked by measuring to check the battery terminal voltage.

- ◆ Remove the battery (refer to the section on Removing the battery).



! WARNING

First, make sure to disconnect the negative (-)

- ◆ Measure the battery terminal voltage.

! CAUTION

Measure the voltage to one decimal place with a digital voltmeter 【A】 that can be read.

If the reading falls below the specified value, it needs to be recharged.

Battery terminal voltage

Standard: 12.6 V or higher

- ◆ **Remove the battery (see section Removing the Battery).**
- ◆ **Recharge the battery according to the following method.**

! WARNING

The battery is sealed. Do not open it. Do not add water when charging.

Charging current and time as described below.

**Charging current and time as described below.
Terminal Voltage: 11.5 _ below 12.5 V Standard Charge:**

3.2 A x 5 _ 10 hours (see schedule)

Fast Charge:

32 A x 1.0 hour

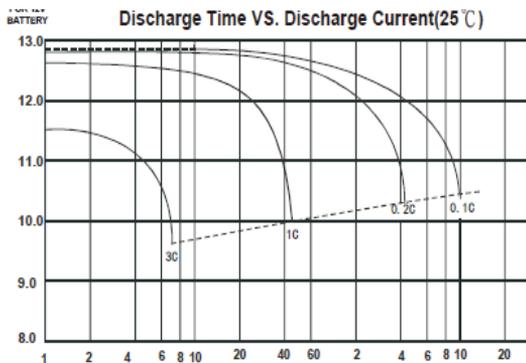
! WARNING

If possible, do not charge quickly. If an unavoidable situation occurs that requires rapid charging, pay attention to the ambient temperature.

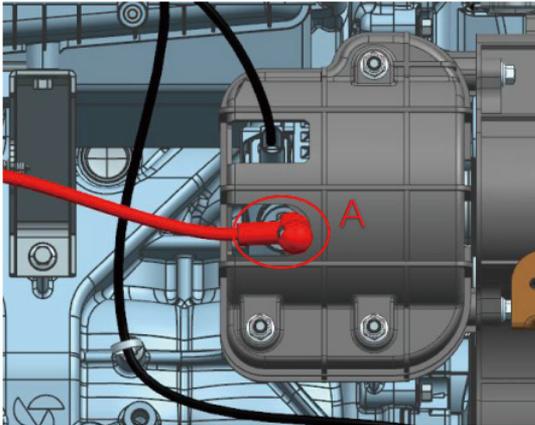
Test against the standard voltage later.

Terminal voltage: less than 11.5V

Charging method: 3.2 A x 20 hours



WHETHER THE GENERATOR IS GENERATING ELECTRICITY CHECK



Method one:

- ◆ Start the engine.
- ◆ Observe the voltage display value on the instrument, if the value is above 13.5V, it means the generator is generating electricity. If the value is lower than 13V, the generator is generating electricity abnormally.

Method two:

- ◆ Start the engine.
- ◆ Set the multimeter to DC voltage (pay attention to the range).
- ◆ Put the red pen of multimeter on terminal A in the left figure. Place the black pen of the multimeter on the engine case or frame hitch.
- ◆ Observe the value on the multimeter, if the value is above 13.5V, the generator is generating electricity. If the value is lower than 13V, the generator is generating electricity abnormally.

LAYOUT OF THE STARTING SYSTEM

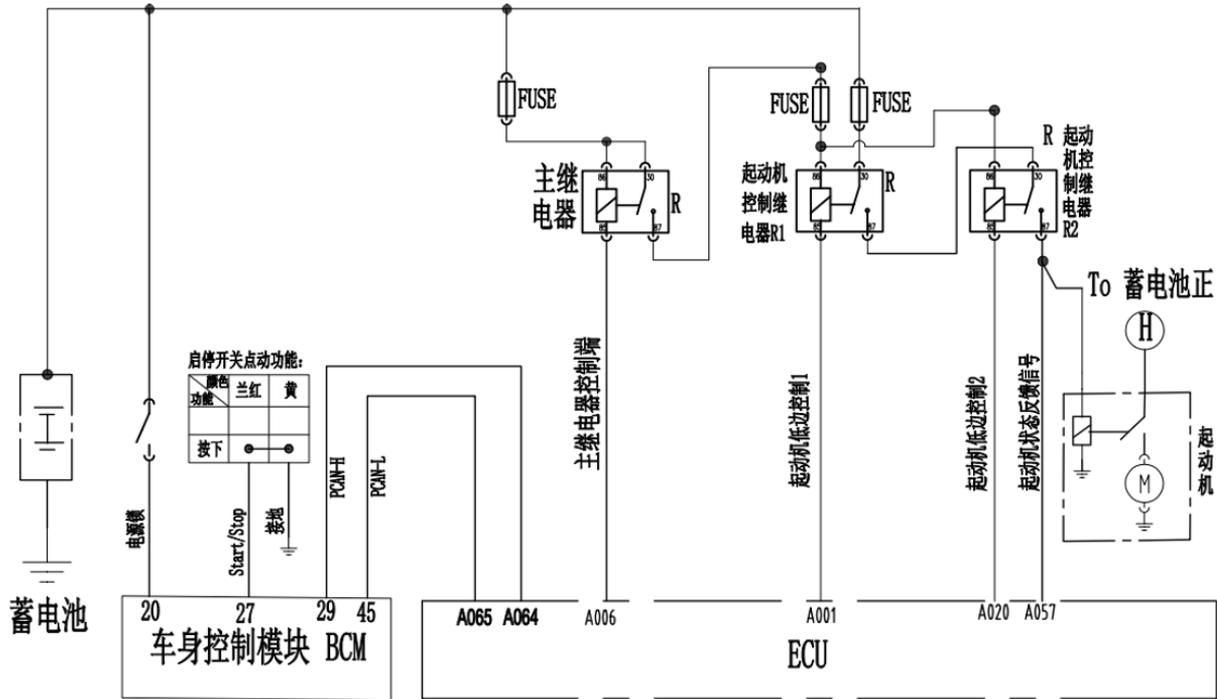


【A】 ECU **【B】** Battery **【C】** Start button **【D】** Fuse box
【E】 Fuel pump **【F】** Instrumentation **【G】** Power lock **【H】** BCM

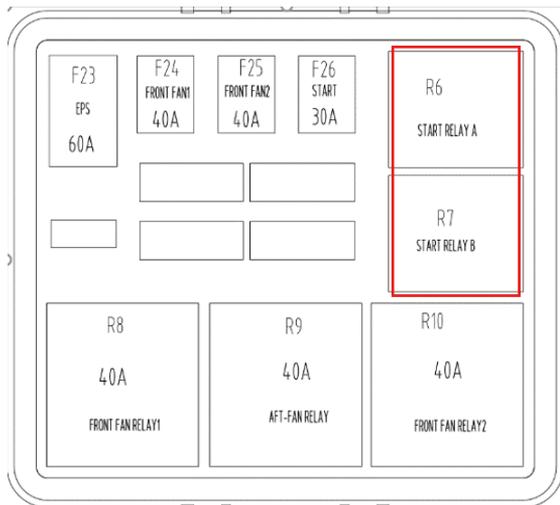
Description of the engine starting process:

1. open the power lock **【G】** , the whole vehicle is powered on, see whether the gear on the instrument **【F】** is in P gear;
2. ECU **【A】** judgement after the power, ECU on the control of the oil pump relay coil pin level is pulled down, the oil pump relay coil closure;
3. After the fuel pump relay works, the current is output to the fuel pump **【E】** , and the fuel pump starts to work to fill the fuel pipe with petrol;
4. Press and hold the start button **【C】** , the BCM receives the start signal and sends the start request to the ECU, and the pin level of the start relay coil is lowered, and the coil of the fuel pump relay is closed. The level of the pin controlling the coil of the starter relay on the ECU is pulled down, and the two starter relays in the fuse box **【D】** are closed;
5. After the starter relay is closed, the current is transferred to the pulling coil of the starter motor;
6. When the suction coil is closed, the current is transferred to the starter motor, which starts to work;
7. after the work of the starter motor, through the gear to drive the engine began to work, this time the engine began to start.

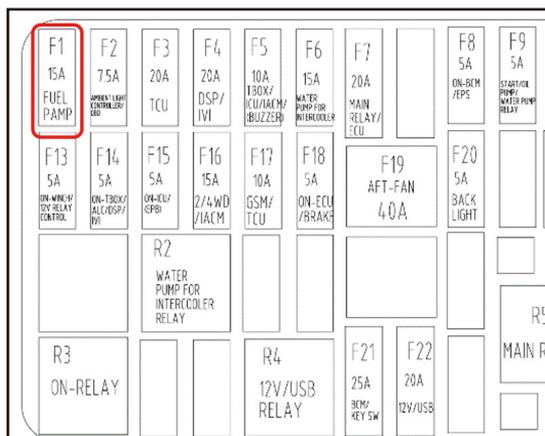
SCHEMATIC DIAGRAM OF THE STARTING SYSTEM



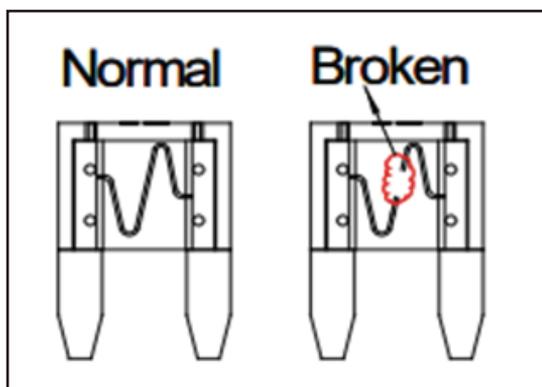
TROUBLESHOOTING THE STARTER SYSTEM



1. Press the starter button can not start the engine, first check whether the starter relay action. Check method: at the same time as pressing the starter button, touch the starter relay with your hand (marked in the red box on the left), if you press the starter button instantly, the starter relay has no reaction, it means that the starter relay is not working. Need to check whether the relay or cable is normal.
2. If there is obvious vibration in the starter relay at the moment of pressing the starter button, but the starter motor does not rotate, it is necessary to check whether the voltage of the battery is greater than 12.6V, and if the voltage is lower than 12.6V, it may not be able to start.



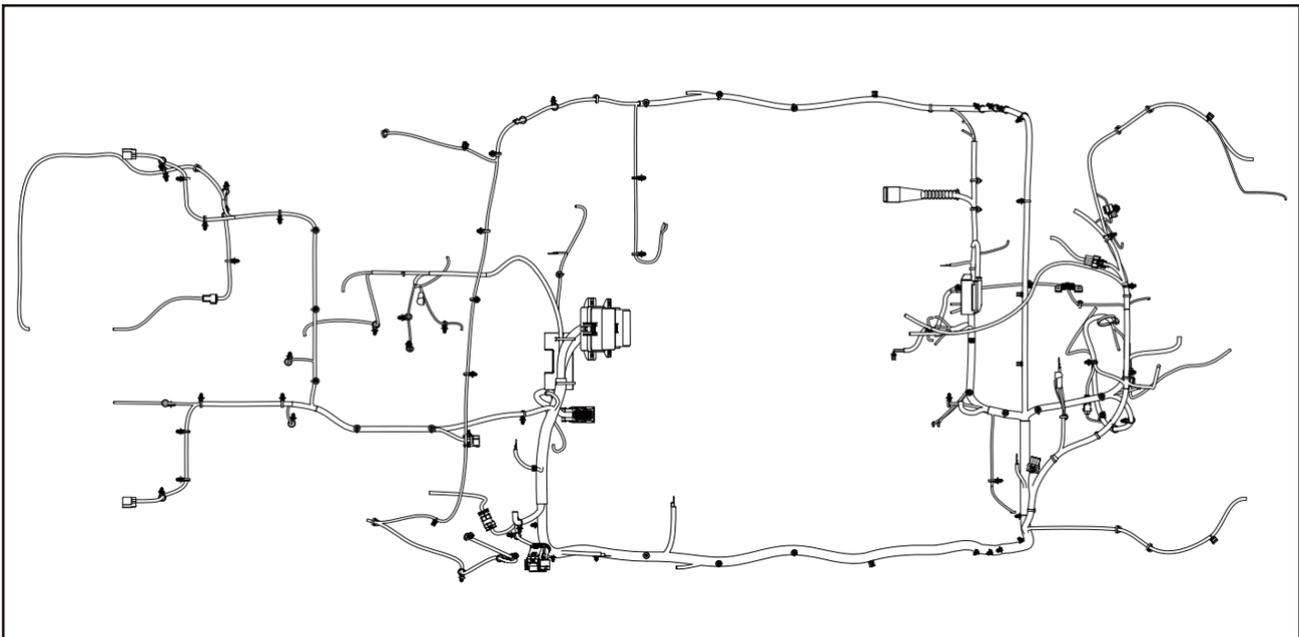
3. If the starter motor rotates normally when the starter button is pressed, but the engine fails to start, make sure that the oil pump fuse is not damaged, and the engine cannot be started if the oil pump fuse is damaged.



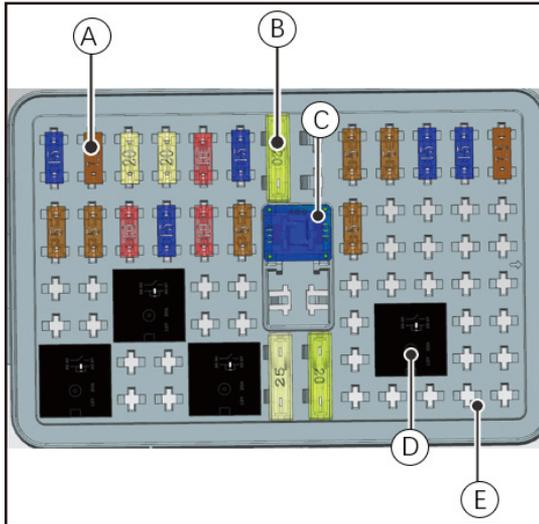
SCHEMATIC DIAGRAM OF THE STARTING SYSTEM

Wiring Inspection

- ◆ Visually check the wiring for signs of corrosion and wear.
- ☆ If any wire is defective, replace the damaged wire;
 - ◆ Remove each connector and check for corrosion, dirt and damage.
 - ◆ Check the conductivity of the wires.
- ☆ Refer to the electrical schematic diagram to locate the suspected defective wire ends;
- ☆ Connect a manual tester (multimeter) to both ends of the wires;
- ☆ Set the manual tester (multimeter) to the on/off position.
- ◆ If the manual tester (multimeter) does not read 0 or the buzzer does not work, the wire is defective; replace the wire or main harness again if necessary.

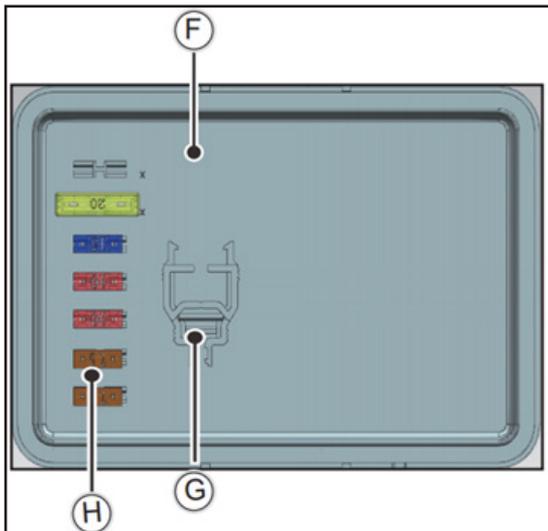


FUSE



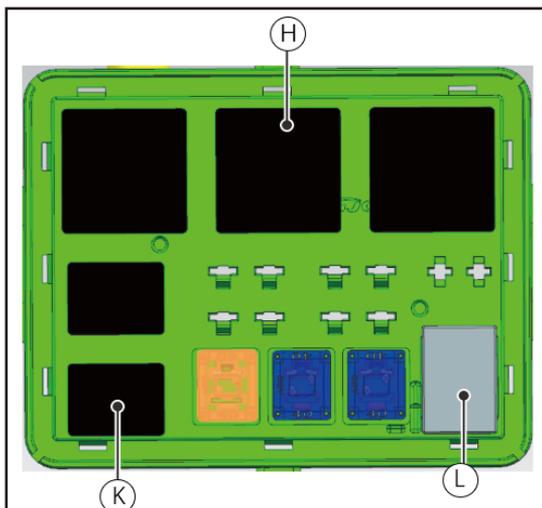
FUSE HOLDER A COMPONENTS

- 【A】 Micro fuse
- 【B】 Medium fuse
- 【C】 Fuse
- 【D】 Relay
- 【E】 Fuse Block Body



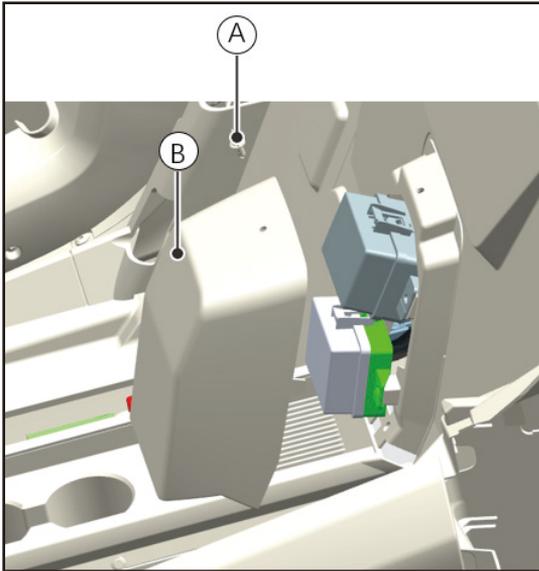
Fuse box cover components

- 【F】 Fuse box cover
- 【G】 Special tool for removing fuse blades
- ◆ Spare fuse



Fuse box B Component

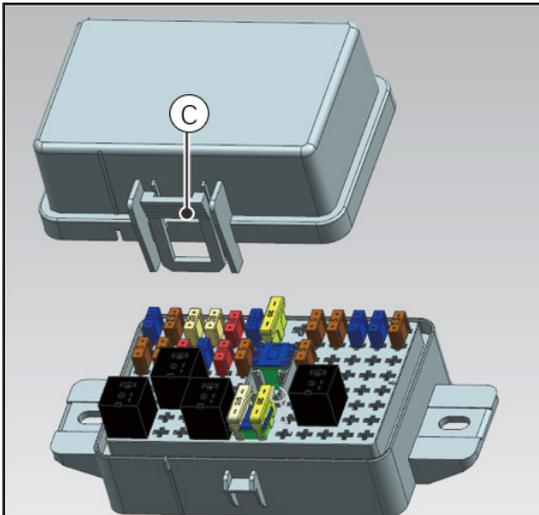
- 【H】 40A Relay
- 【K】 30A Relay
- 【L】 60A Fuses



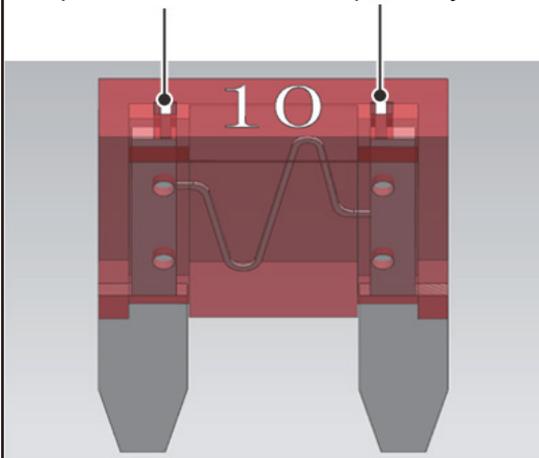
- ◆ When the power lock is switched on, if the instrument does not display, please check whether the fuse is damaged first;
- ◆ The fuse box is at the rear of the primary and secondary seats, first open the plastic rivets 【A】 , then open the electrical service cover 【B】 ;
- ◆ Press the fuse box cover latch 【C】 , remove the fuse box cover;
- ◆ Use a multimeter to test whether the fuse is on;

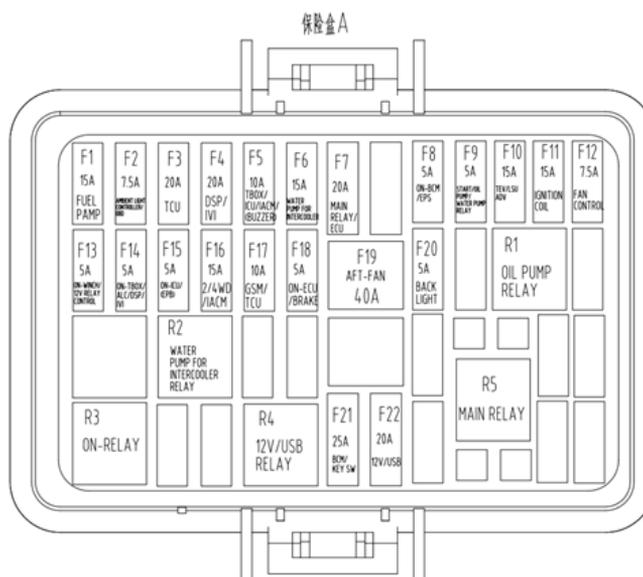
Fuse conduction test

- ◆ Disconnect the battery before testing;
- ◆ Place the multimeter in the on-state mode;
- ◆ Place the red and black pens of the multimeter at the two ends of the fuse;
- ◆ If the fuse can conduct, it means the fuse is OK; if it cannot conduct, it means the fuse is damaged;

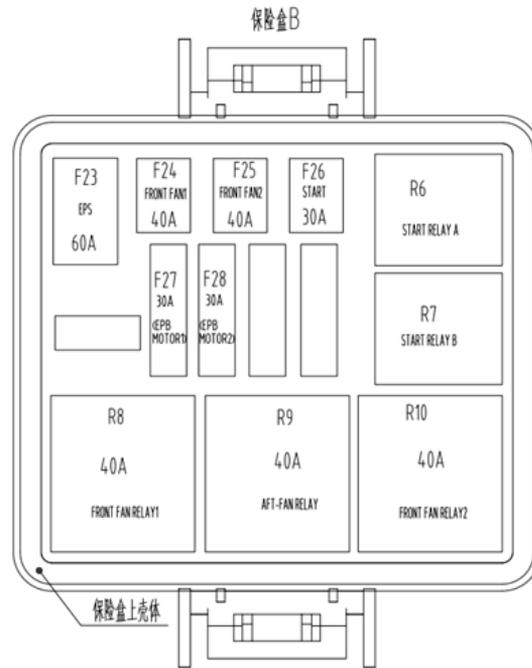


The red and black pens of the multimeter are placed at both ends respectively



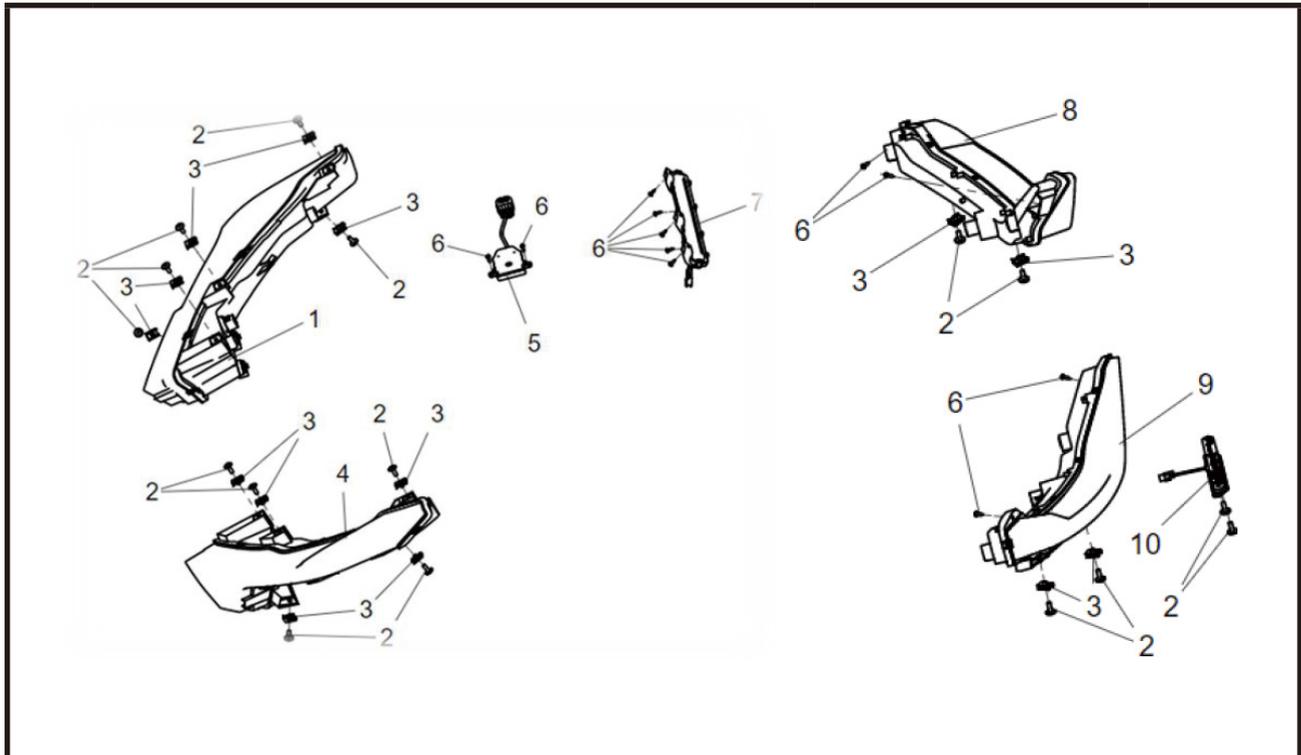


No.	Fuse/Relay	Type	No.	Fuse/Relay	Type
F1	Fuel pump	15A	R1	Oil pump relay	12V 20A
F2	Ambient light controller/OBD	7.5A	R2	Water pump for intercooler relay	12V 20A
F3	TCU	20A	R3	ON-Relay	12V 20A
F4	DSP/IVI	20A	R4	12V/USB Relay	12V 20A
F5	Tbox/ICU/IACM	10A	R5	Main relay	12V 20A
F6	Water pump for intercooler	15A			
F7	Main relay/ECU	20A			
F8	ON-BCM/EPS	5A			
F9	Start/Oil pump/Water pump relay	5A			
F10	TEV/LSU ADV	15A			
F11	Ignition coil	15A			
F12	Fan control	7.5A			
F13	ON-Winch/12V relay control	5A			
F14	ON-Tbox/ALC/DSP/IVI	5A			
F15	ON-ICU (EPB)	5A			
F16	2/4 WD/IACM	15A			
F17	GSM/TCU	10A			
F18	ON-ECU/BRAKE	5A			
F19	AFT-FAN	40A			
F20	Back light	5A			
F21	BCM/KEY SW	25A			
F22	12V/USB	20A			



No.	Fuse/Relay	Type	No.	Fuse/Relay	Type
F23	EPS	60A	R6	Start relayA	12V 30A
F24	Front fan1	40A	R7	Start relayB	12V 30A
F25	Front fan2	40A	R8	Front fan relay1	12V 40A
F26	Start	30A	R9	AFT-Fan relay	12V 40A
F27	(EPB MOTOR1)	30A	R10	Front fan relay1	12V 40A
F28	(EPB MOTOR2)	30A			

EXPLOSION DIAGRAM OF LIGHTING FIXTURES



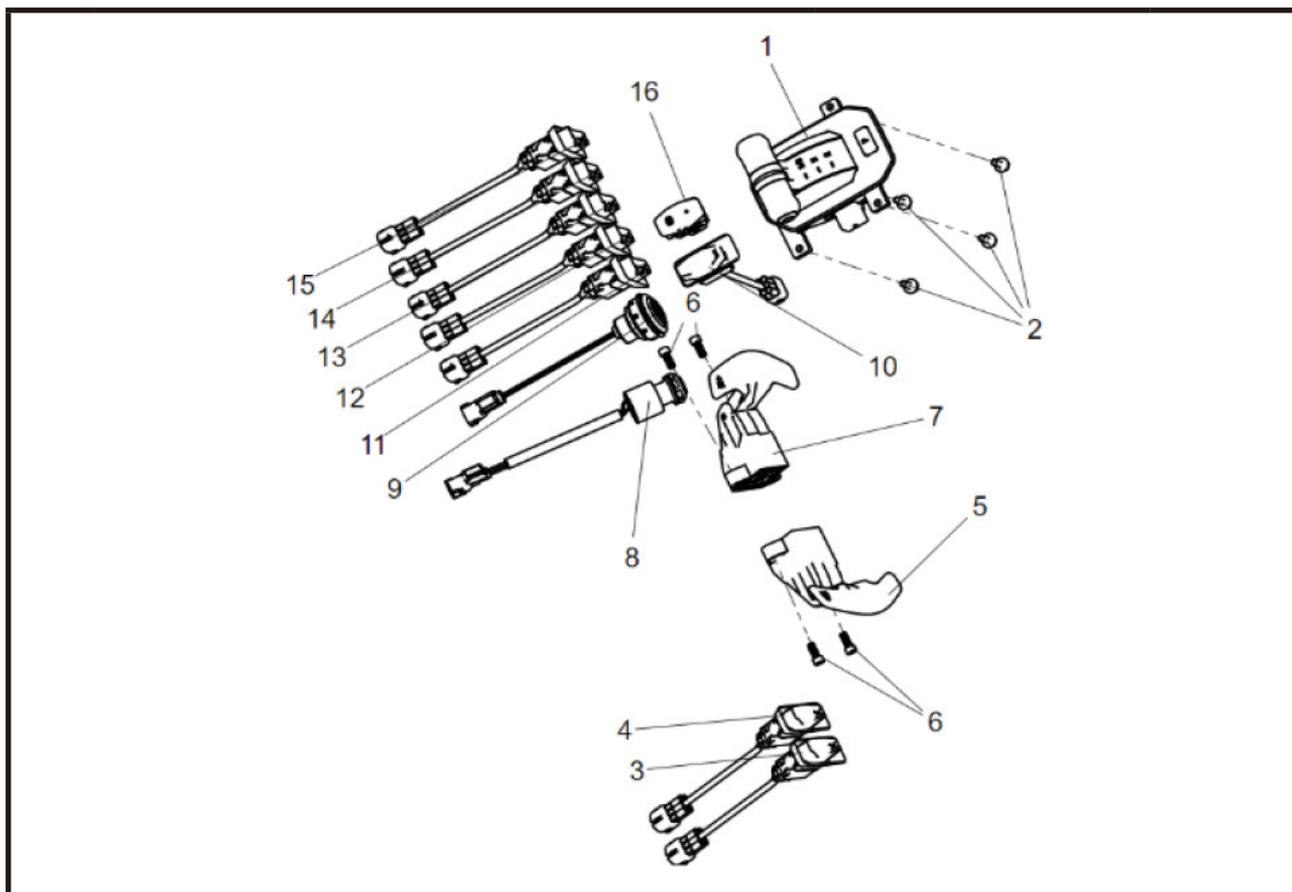
No.	Fastener	Torque (N·m)	Remarks
1	RIGHT COMBINATION HEADLIGHT		
2	HEXAGON SOCKET HEAD CAP SCREW M6×16 M6 NUT CLIP		
3	AMBIENT LIGHT CONTROLLER FOR LEFT COMBINATION HEADLIGHT		
4	BLACK SELF-TAPPING SCREW ST4.2×13		
5	AMBIENT LIGHT		
6	RIGHT COMBINATION TAIL LIGHT LEFT COMBINATION TAIL LIGHT REAR LICENCE PLATE LIGHT		
7	ALL-METAL HEXAGONAL LOCK NUT M12×1.25		
8	HEXAGONAL FLANGE BOLT M12×1.25×30		
9	NON-METALLIC INSERT HEXAGONAL FLANGE LOCK NUT M12×1.25		

TECHNICAL PARAMETERS

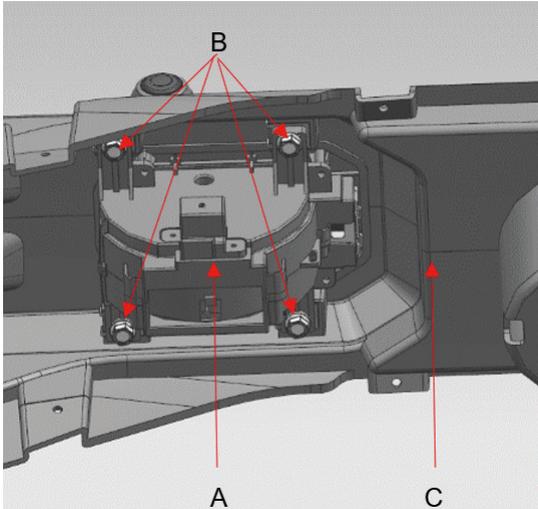
Rated voltage 12V

No.	name	functionality	power(W)	note
1	headlights	far	15	LED lighting
2		near	7.5	
3		day	25	
4		Forward	2	
5		Anterior	20	
6	tail light	Backward turn	10.5	
7		Position	2	
8		Brake	9	

EXPLOSION DIAGRAM OF LIGHTING FIXTURES

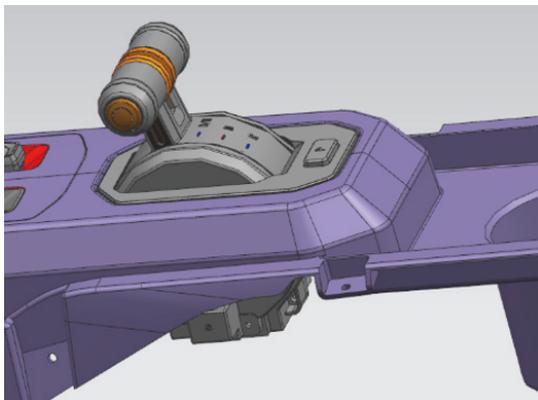


No.	Fastener	Torque (N·m)	Remarks
1	Electronic gear shifter		
2	Hexagonal flange face bolt M6×20		
3	Headlight switch		
4	Horn switch		
5	Left gearshift puller		
6	Hexagon socket cheese head screws M6×16		
7	Right gear shift pull tab		
8	Power lock		
9	Start-stop button assembly		
10	Power switch		
11	Turn signal switch		
12	2-4WD Switch		
13	Emergency switch		
14	EPS mode switch		
15	Drive Mode Switch		
16	EPB switch		



Removing and installing the electronic shift centre cover (refer to chapter 'Frame')

- 【A】 Electronic Shift
- 【B】 Electronic shift mounting bolts*4
- 【C】 Centre guide cover

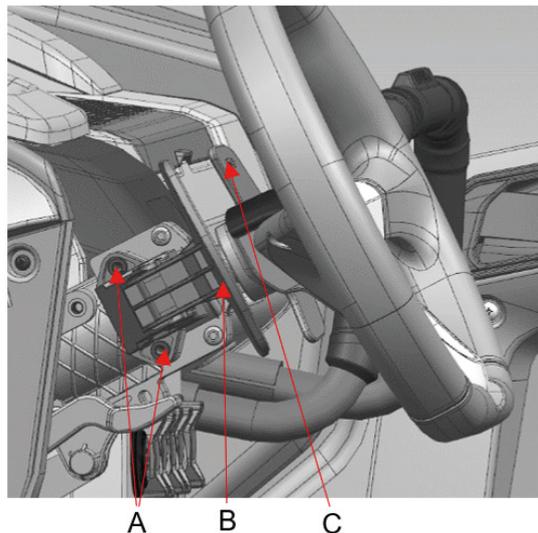


Test and replace:

Shift handle is damaged or the electrical signal is abnormal, please consult the fault code to confirm the fault point

Confirm that the problem is damaged or poorly working electronic gearshift, and replace it according to the following method:

- 【A】 Remove the centre guide cover, please refer to 【Plastic parts disassembly frame section】 .
- 【B】 Unplug the connector
- 【C】 Remove the electronic shift mounting bolts*4
- 【D】 Remove the electronic gearshift



Shift lever

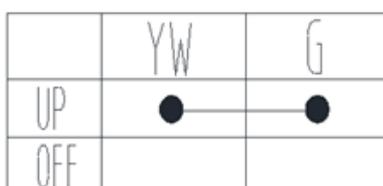
- A】 Shift lever mounting bolts *2 (2 each)
- B】 Downshift lever
- C】 Upshift lever

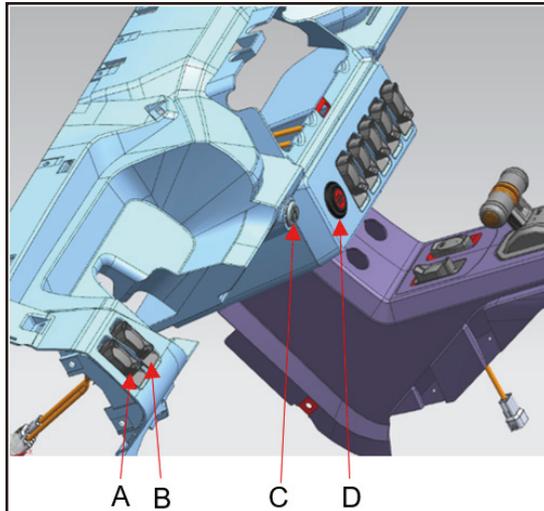
Test and replace:

If the shift lever is damaged or the electrical signal is abnormal, use a multimeter to test whether the on-off function is normal.

If it is confirmed that the problem is damage to the gearshift puller or that it is not working properly, replace it according to the following method:

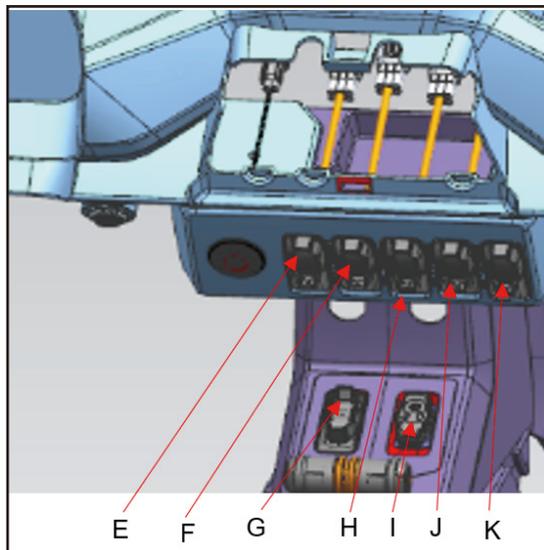
- A】 Remove the shift lever mounting bolts*2 (2 on each side).
- B】 Unplug the connector 【C】 Remove the gearshift puller.





FUNCTION SWITCH

- 【 A 】 Headlight switch
- 【 B 】 Horn switch
- 【 C 】 Power lock
- 【 D 】 Start-stop button
- 【 E 】 Steering switch
- 【 F 】 Two-Four Wheel Drive Switch
- 【 G 】 Accelerator switch
- 【 H 】 Emergency switch
- 【 I 】 EPB switch
- 【 J 】 EPS mode
- 【 K 】 Drive mode switch

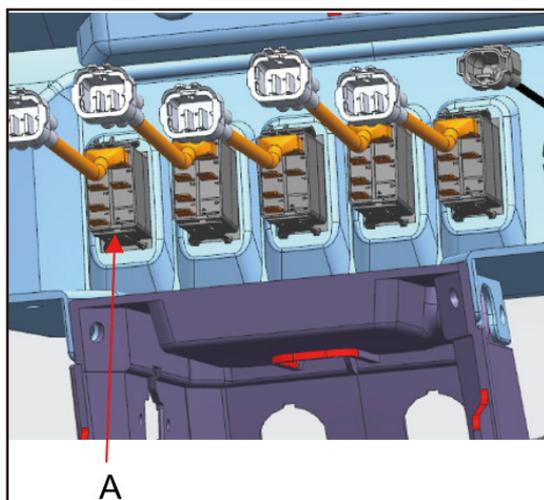


TESTING AND REPLACEMENT

To confirm that the problem is a damaged or malfunctioning function switch, replace the switch as follows

Replacement is carried out in the following way:

If each function switch is damaged or the signal is abnormal, use a multimeter to test whether the function is normal according to the on-off logic.



A】 Remove the front cover, please refer to 【Plastic parts disassembly frame section】 .

A】 Remove the front cover, please refer to 【Plastic parts disassembling frame part】 .

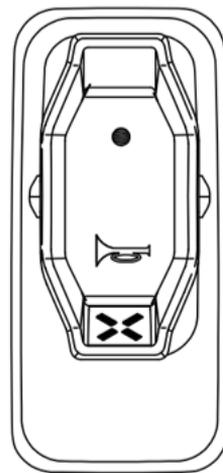
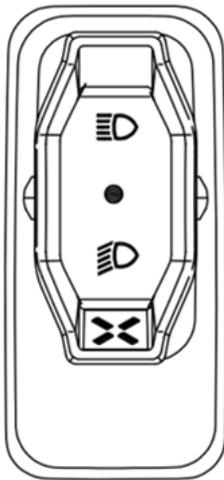
B】 Unplug the connector

C】 Test the function of each switch according to the following logic.

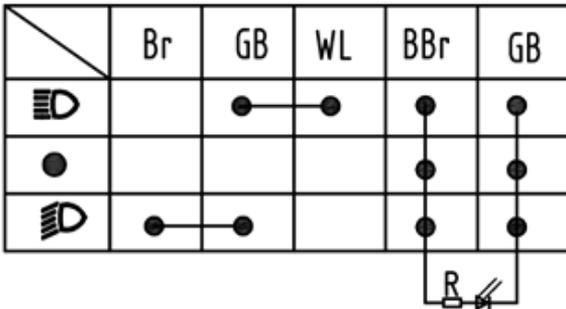
D】 Use a flat tool to press down the clips of the function switches (both top and bottom, see position A in Fig.) and remove the switches.

A. Headlight Switch Diagram and Function

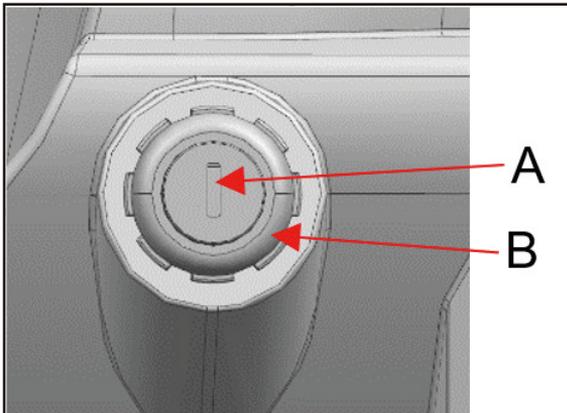
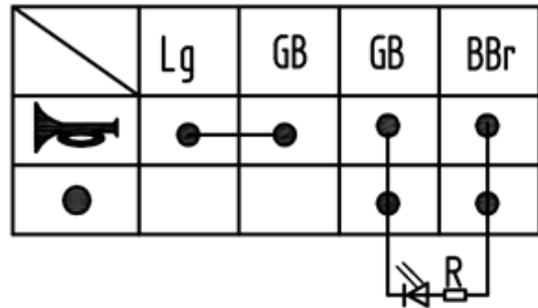
B. Horn Switch Diagram and Function



Headlight SFD



Horn SFD (click)

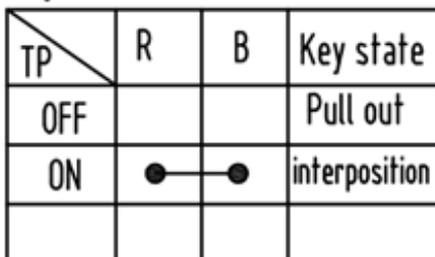


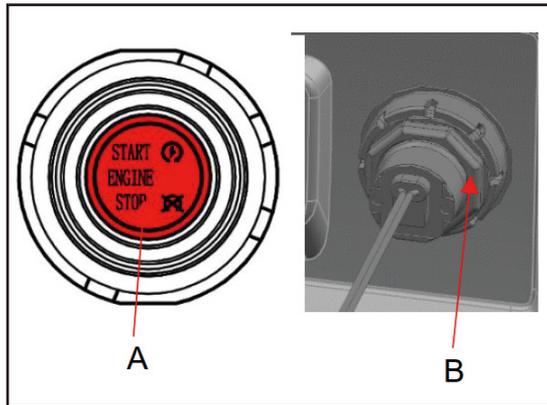
REMOVAL AND REPLACEMENT

To remove the power lock, hold the power lock **【A】** from the inside of the instrument panel, and with the other hand, use a tool to rotate the power lock cover **【B】** counterclockwise, then unscrew it to remove the power lock;

Before disassembling the power lock, start button, various switches, etc., it is necessary to disassemble at least part of the plastic parts of the instrument panel, see the steps for disassembling plastic parts.

Key SFD





D: Start-Stop Button and Function

When the key is turned on in ON gear and the brake is pressed, the brake signal is triggered and the brake light is lit, at this time you can press this button to start the engine.

If the starter does not move at this time, and confirm the problem of this button, use a multimeter to check the switch of the button, the switch is on when you press it, and the switch is off when you release your hand.

Removal and Replacement

When removing the start/stop button, press the start/stop button **【A】** from the outside of the instrument panel and use the other hand to rotate the start/stop button nut **【B】** counterclockwise with a tool to unscrew the start/stop button and then remove the start/stop button;

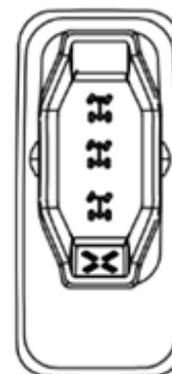
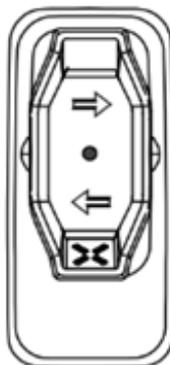
Before removing the power lock, start button, various types of switches, etc., it is necessary to dismantle at least part of the plastic parts of the instrument panel, see the steps for dismantling plastic parts.

SS SFD

	Color	LR	Y
Fun			
press		●—●	●—●

E:Steering Switch Diagram and Function

F:-4WD Switch Diagram and Function



TS SFD

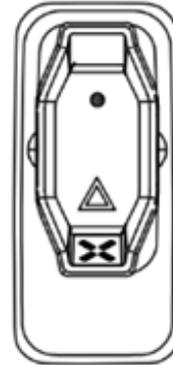
	0	Gr	LB	BBr	GB
➡		●—●		●	●
●				●	●
⬅	●—●			●	●

4WD SFD

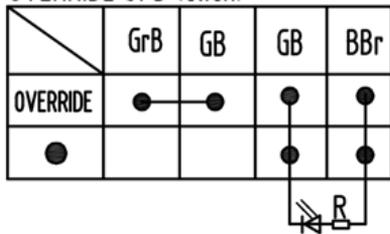
	BrG	G	BrR	GB	BBr
⚙️		●—●		●	●
⚙️				●	●
⚙️	●—●			●	●

E:Steering Switch Diagram and Function

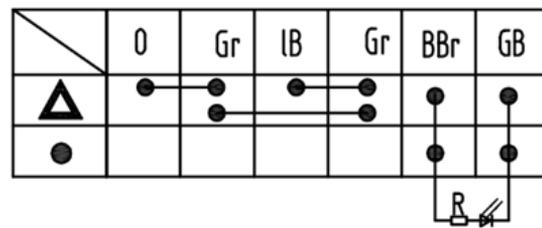
F:-4WD Switch Diagram and Function



OVERRIDE SFD (click)

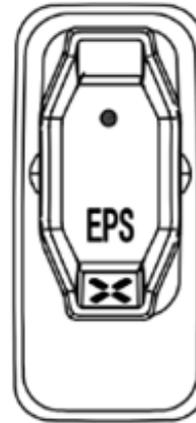


Emergency SFD

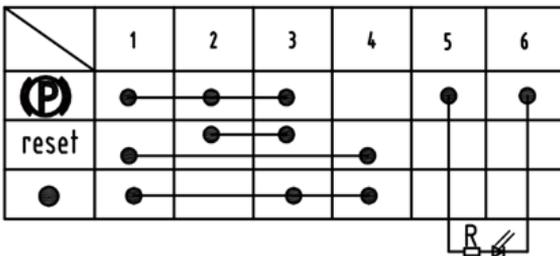


E:Steering Switch Diagram and Function

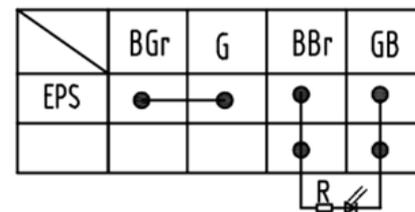
F:-4WD Switch Diagram and Function



EPB SFD (click)

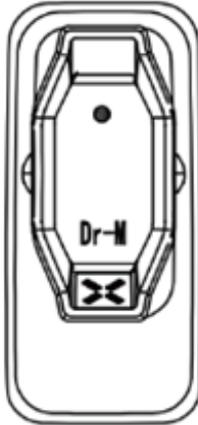


EPS M SFD (click)

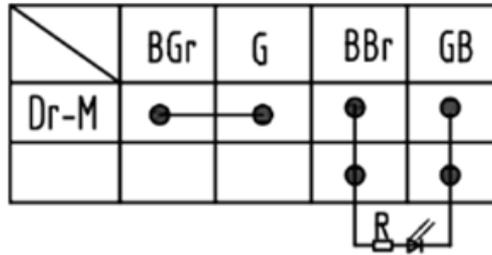


SUPER VILLAIN SX20T

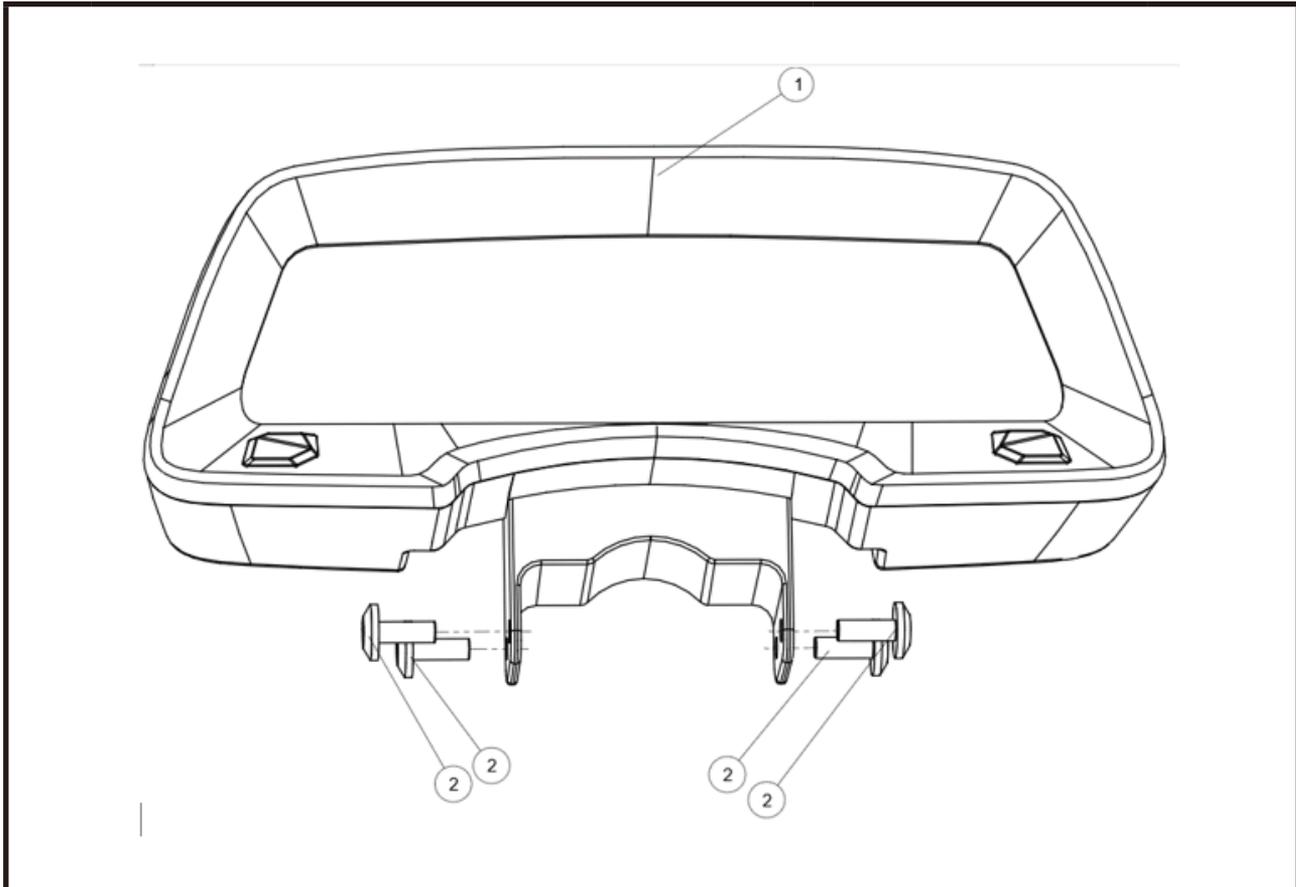
K: Drive mode switch



DM SFD (click)



INSTRUMENT EXPLOSION DIAGRAM



No.	Fastener	Torque (N·m)	Remarks
1	SSV2.0 Gauge		
2	Large pan head socket head cap screws M6×16	5~8 Nm	

SUPER VILLAIN SX20T

INSTRUMENT PANEL

The instrument provides the operator with vehicle operating parameter information. The driver should understand the meaning of various indicator lights, warning lights and displayed content information on the instrument so as to understand the vehicle status in a timely manner.

NOTICE

Using a high-pressure cleaner may damage the instrument. Do not use alcohol or corrosive detergents to clean the instrument, as corrosive liquids will corrode the instrument surface and cause damage to the instrument.

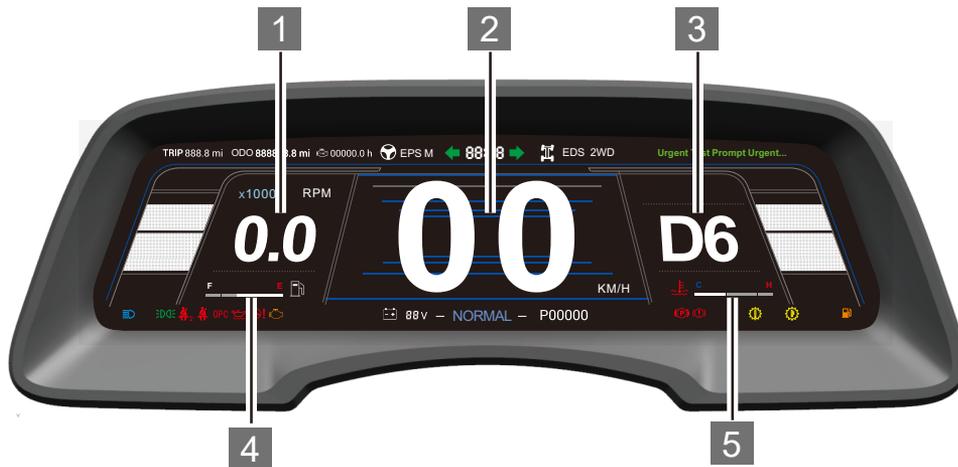
INSTRUMENT INDICATOR LIGHT/WARNING LIGHT

The vehicle may be equipped with different instruments with slightly different display status or display area, subject to the actual vehicle instrument.

When the ignition lock switch is in the "ON" mode, the instrument is turned on and all warning lights on the instrument will light up briefly.

INSTRUMENT INDICATOR LIGHT/WARNING LIGHT

Main interface 1



Main interface 2



1 Engine tachometer

Displays the real-time vehicle speed. (Displayed value × 1000 is the engine speed)

2 Speedometer

Displays the vehicle's real-time speed.

3 Gear display

R: Reverse N: Neutral P: Parking gear
M (1~7) : Manual mode D (1~7) : Automatic mode

4 Oil level indicator

E: Low fuel F: Full fuel

Displays the fuel level in the fuel tank. When the fuel level drops to the warning point, the fuel warning light will light up and you should refuel immediately.

5 Engine water temperature gauge

C: Low water temperature H: High water temperature

Displays the engine temperature. When the engine coolant temperature reaches the warning point, the water temperature warning light will light up, please turn off the engine.

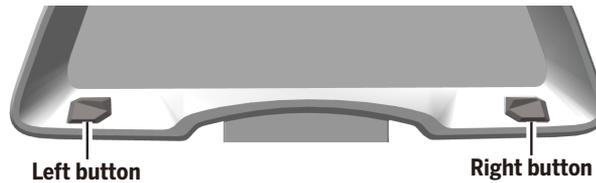
Light	Instructions	Status
Turn light (if equipped)		Turn on the turn signal switch or emergency light switch, and the indicator light will turn on and flash
High Beam		This lamp illuminates when the headlamp switch is set to high beam
Driving Lights		The front light, tail light, license plate light and instrument panel light are on
Check Engine		This indicator appears if an EFI-related fault occurs. Do not operate the vehicle if this warning appears. Serious engine damage could result.
Oil Pressure Warning		This light is on when oil pressure is too low
Fuel level		The lamp lights up when the fuel level is too low
Off-seat alarm (if equipped)	OPC	When the driver leaves his seat, the vehicle speed is "0" and the parking brake is not applied, the OPC indicator lights up and the buzzer sounds
Parking Brake (if equipped)		This indicator lights up (red indicator) when park gear is used. (Optional equipment, if equipped with EPB)
		EPB module offline (yellow indicator). (Optional equipment, if equipped with EPB)
Brake System		<ul style="list-style-type: none"> • Low brake fluid level • The braking system is faulty
EPS System		Indicates a failure in EPS system (optional equipment, if equipped)

ELECTRICAL SYSTEM

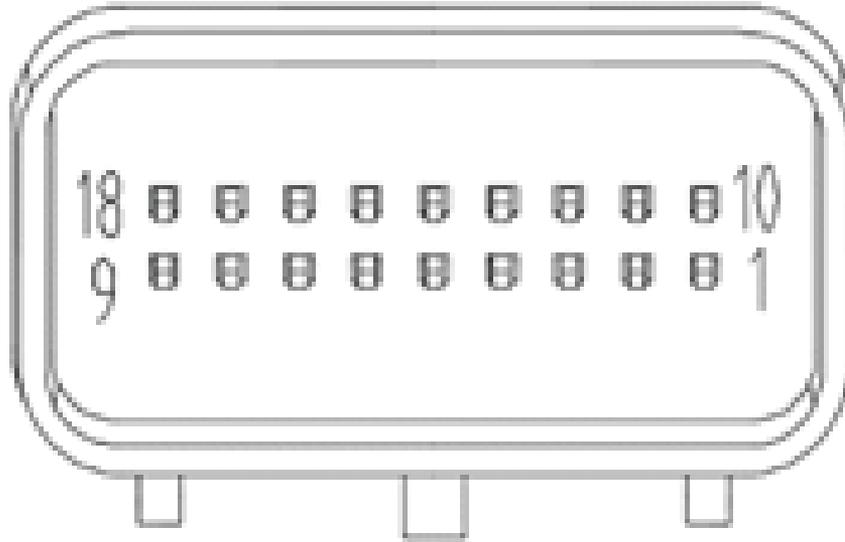
SUPER VILLAIN SX20T

Coolant temperature warning lamp		Indicator light showing excessive temperature of engine coolant. When it lights up and alarms, the engine should be stopped immediately and shut down. After cooling down to normal temperature, the engine should continue to run
Seat belt indicator		This light reminds the operator to ensure that all riders wear helmets and safety belts before work. The driver's seat belt is equipped with a seat belt interlocking device. If the seat belt is not secured, the vehicle speed will be limited to 15 MPH (24 km/h)
Transmission fault		This indicator lights up in the event of a transmission malfunction
Transmission overheating		This indicator lights up when the transmission temperature is too high
Subtotal Mileage	TRIP 888.8 kmi	Sub-total mileage can also be cleared through the Instrument setting buttons
Engine running time	 888.8 h	Display engine running time
Fault code display	P00000	In case of partial failure of the vehicle, the fault code is displayed in this area
Battery voltage	 00.0 V	Displays the current voltage of the vehicle battery
Battery alarm		When the engine is not started or when the voltage is lower than 9V or higher than 16.3V, the indicator lights up (red indicator)
Total Mileage	TOTAL 88888 kmi	Display the total mileage accumulated by the vehicle
Four-wheel drive full differential lock		"  " TWO-WHEEL DRIVE MODE "  " FOUR-WHEEL DRIVE MODE "  " FOUR-WHEEL DRIVE LOCK MODE
Diver mode	NORMAL RACE CLIMB	NORMA-Standard mode RACE-Racing mode CLIMB-Climbing mode
EPS On (Only brushless EPS is supported)	 EPS	 EPS M -Normal mode, power normal  EPS H -Comfort mode, power light  EPS L -Motion mode, booster weight

INSTRUMENT SETTING BUTTONS

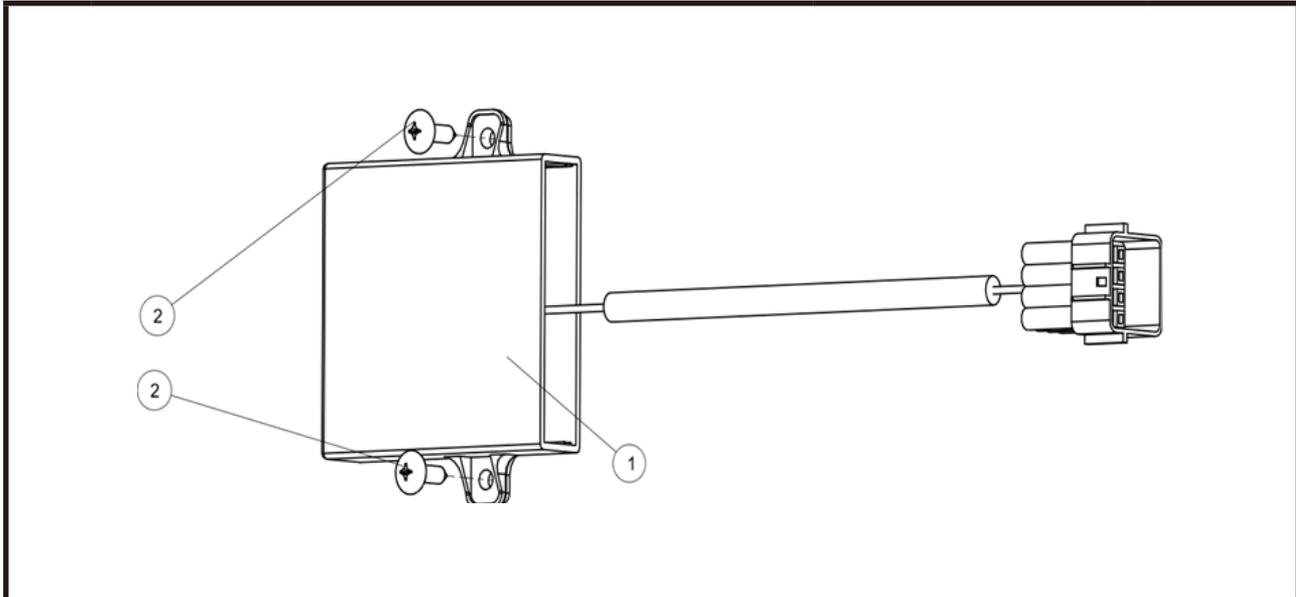


Function	Display	Left button	Right button	Display after action
Brightness adjustment	Main interface	Short press		Adjust backlight brightness (default brightest)
Subtotal clear	Main interface	Long press		Zeroing of subtotal mileage
topic switching	Main interface	Short press	Short press	Next topic
Metric or imperial units	Main interface		Short press	Metric and Imperial switching
chinese and english switching	Main interface		Long press	Short press left and right buttons at the same time to switch language (default english)
Clock settings (This function is not available when the vehicle has a T-BOX)	Main interface	Long press	Long press	Clock hour blinking
			Short press	Clock hour +1
			Long press	Clock hour continuous +1
		Short press		Clock minute blinking
			Short press	Clock minute +1
			Long press	Clock minute continuous +1
		Short press		Exit Clock
		or 15S without operation		



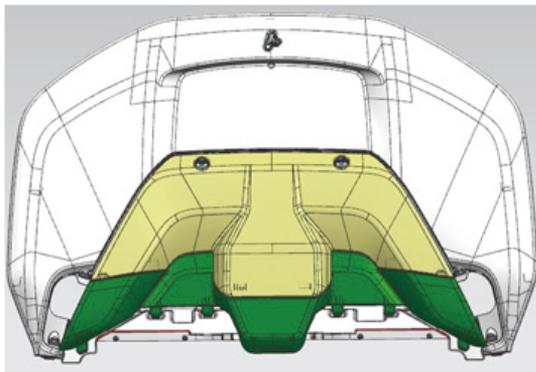
PIN	Function Declaration	SignalType	Comment	PIN	Function Declaration	SignalType	Comment
1	IGN			10			
2	BATTERY			11			
3	GND			12			
4				13			
5				14			
6	CANH			15	USB Power		
7	CANL			16	USB D+		
8	Buzzer Output	Low Level		17	USB D-		
9				18	USB_GND		

CONTROL MODULE EXPLOSION DIAGRAM



No.	Fastener	Torque (N·m)	Remarks
1	SSV2.0 Control Module		
2	Cross recessed large semi-circular head tapping screws ST4.8×19	5~8 Nm	

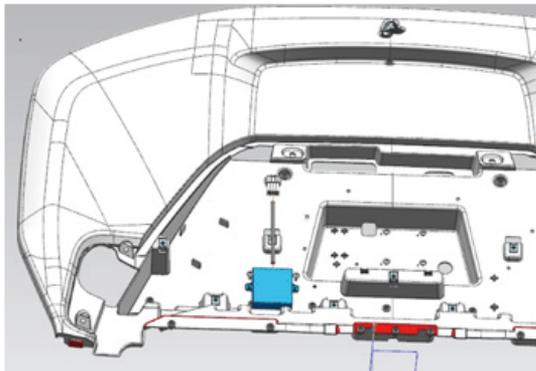
ALCHECK AND REPLACE

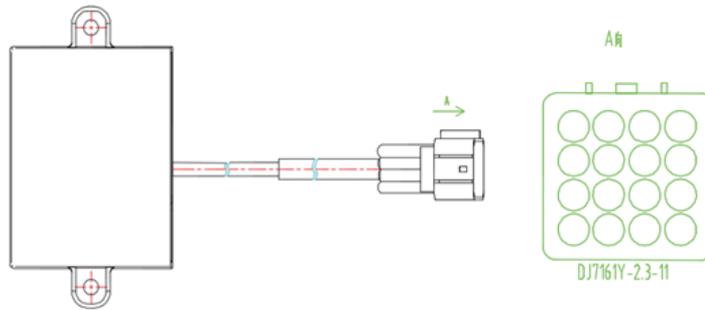


ways power down the vehicle before removing the control module.

Confirm that the problem is a damaged or malfunctioning control module and replace it as follows:

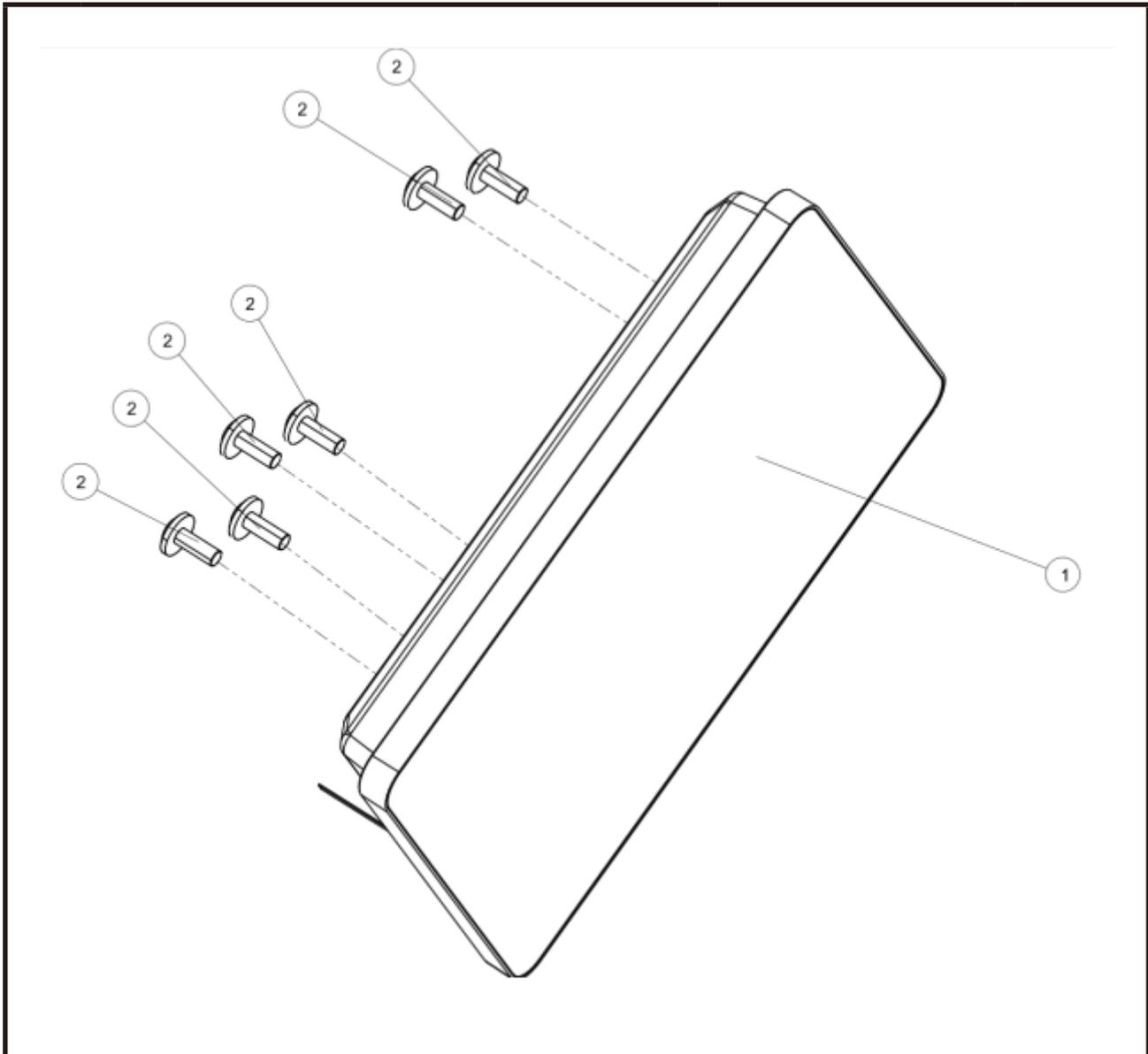
- ◆ Remove the 2 access cover swivel assemblies
- ◆ Remove the front inspection cover assembly
- ◆ Remove the front access cover assembly
Remove the front inspection cover rear end assembly
- ◆ Remove the 2 captive screws
- ◆ Unplug the control module insert and replace the module





PIN	Function Declaration	Signal Type	Comment	PIN	Function Declaration	Signal Type	Comment
1	IGN			13			
2	BATTERY			14			
3	GND			15			
4	CAN_H			16			
5	CAN_L						
6	EPS-mode switch	Low Level	input				
7	Two-drive	Low Level	input				
8	Four-wheel drive lock	Low Level	input				
9	Two four-wheel drive solenoid valve		Output				
10	Four-wheel drive lock solenoid valve		Output				
11							
12							

INSTRUMENT EXPLOSION DIAGRAM



No.	Fastener	Torque (N·m)	Remarks
1	SSV2.0 Centre		
2	Large pan head socket head cap screw M6×12	5~8 Nm	

SUPER VILLAIN SX20T

CENTRAL CONTROL CHECK

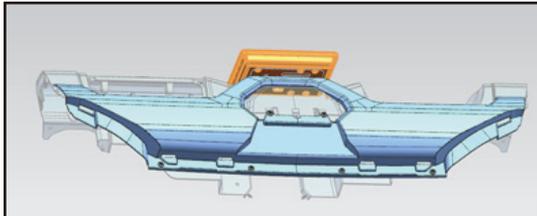
1. the central control of non-black screen failure, the central control can be switched on, but there is no response to the touch screen, application flashback, lag serious problems, etc., through the brush software reset the central control software system to deal with.
2. Central control black screen of death failure, can not boot, confirmed that the central control has been damaged, through the replacement of the central control to deal with.

SOFTWARE FLASHING

The central control software is divided into system software and MCU software, before software flashing, please prepare the upgrade USB flash drive, the file format of USB flash drive is FAT32, and the storage space is more than or equal to 8G, back up the files in the USB flash drive and format the USB flash drive, then copy the system software and the MCU software to the root directory of the USB flash drive respectively.

System software flashing: 1. Make sure the vehicle is powered down, open the glove box ①, look for the central control USB interface ②, and insert the upgrade USB flash drive. 2. Power on the mechanical key and wait for the upgrade progress bar to reach 100%. 3. Power down the mechanical key, unplug the USB flash drive, and then restart the vehicle and wait for the central control to power on successfully, the upgrade is complete.

MCU software flashing: 1. After the central control is normally switched on, open the glove box ①, look for the central control USB interface ②, and insert the upgrade USB flash drive. 2. Upgrade progress bar reaches 100% and automatically restart the central control, please unplug the upgrade USB flash drive during the restart process, after the central control restart is completed, the upgrade is complete.

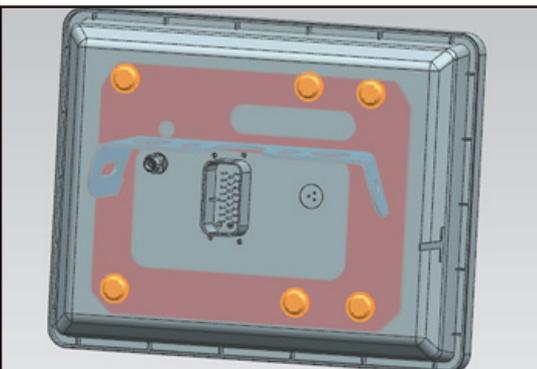
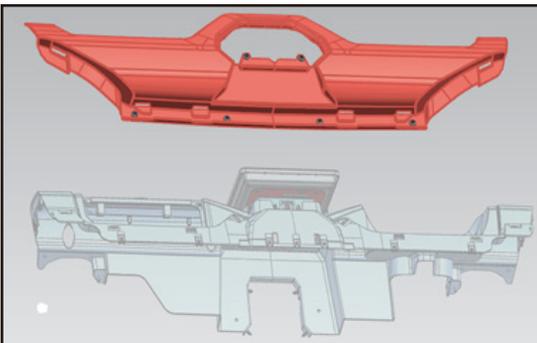


REMOVAL AND REPLACEMENT

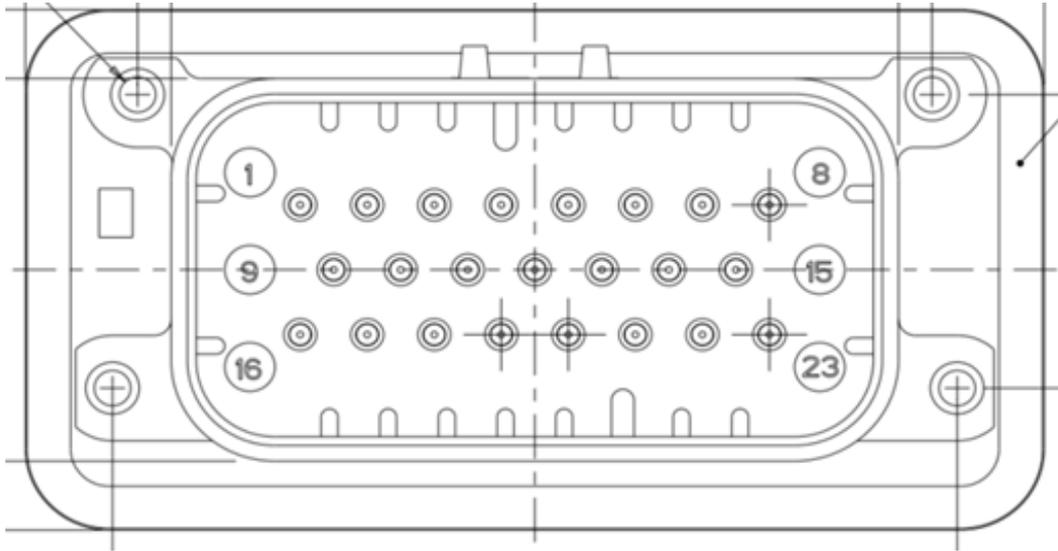
Before removing the central control, be sure to power down the vehicle.

Confirm that the problem is that the centre console has blacked out and died, or that software flashing still does not solve the problem. Replacement should be done as follows:

- ◆ Pull out the central control plug-in
- ◆ Remove the six bolts
- ◆ Remove the instrument panel assembly
- ◆ Remove three bolts , remove the centre control, the centre control bracket and the connecting bolts.
- ◆ Remove three bolts , remove the centre control, centre control bracket and the connecting bolts
- ◆ Remove six bolts and replace the centre console .



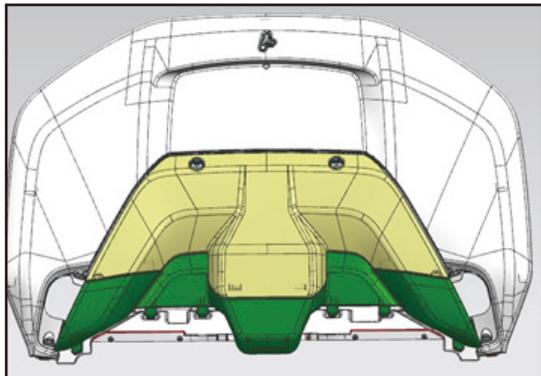
PIN ASSIGNMENT



No.	projects	functionality	I/O	Signal Properties
1	12V_IN	Battery power, constant power	IN	
2	GND	Vehicle ground	IN	
3	ACC	ACC Detection	IN	Digital, High Level
4	AMP-EN	Audio amplifier enable	OUT	Digital, Low Level
5	USB0_VBUS	USB stick VBUS power supply	OUT	
6	USB0-DM-CON	USB Stick Cable	IN/OUT	
7	USB0-DP-CON	USB Stick Data Cable	IN/OUT	
8	GND	USB memory stick GND	IN	
9	CAM-GND	Camera GND	IN	
10	CAM-VIDEO	Camera Signal Cable	IN	ana logue
11	CAM-12V	Camera power supply	OUT	
12	CAN1-L		IN	
13	CAN2-L		IN	

14	RES+	Fuel Level Detection	IN	Analogue
15	Mlgnition	Mechanical key detection	IN	Digital, High Level
16	LINEOUTL-SPK	Audio left channel output	OUT	Analogue
17	LINEOUTR-SPK	Audio right channel output	OUT	Analogue
18	GND	Audio ground	IN	
19	CAN1-H		IN	
20	CAN2-H		IN	
21	KEY-ADC	Multi-function steering wheel signalling	IN	analogue
22	Relay_OUT	Relay Control	OUT	Low Level
23	FEL	T5 Forced burn-in mode	IN	Digital, Low Level

T-BOX



⚠ CAUTION

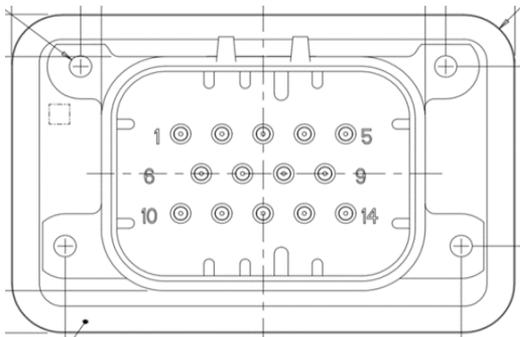
If multiple vehicles are repaired at the same time, do not exchange and install the T-BOX

Always power down the vehicle before removing the antenna assembly.

- ◆ Confirm that the problem is a damaged or malfunctioning antenna assembly and replace it as follows:
- ◆ Remove the 2 access cover screw assemblies
- ◆ Remove the front access cover assembly
- ◆ Remove the 2 screws
- ◆ Unplug the antenna assembly and replace the antenna

T-BOX FAULT CODE DISPLAY AREA

T0001	GPS module failure
T0002	4G module failure
T0003	Bluetooth module failure
T0004	Sensor failure
T0005	Power CAN failure
T0006	Body CAN failure



序号	项目	功能	I/O	信号属性	参数	备注
1	GND	整车地	IN		\	0V
4	CAN1+	BCAN	IN		\	
5	CAN1-	BCAN	IN		\	
7	ACC	ACC检测	IN	数字、高电平 (12V)	\	12V
10	POWER	蓄电池电、带电	IN		\	12V

ANTENNA, AUDIO AMPLIFIER, AUDIO SYSTEM, REAR CAMERA

AUDIO AMPLIFIER

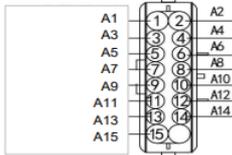
The antenna is located under the front maintenance cover.

SSV2.0 Hybrid Audio Amplifier Wiring Definition

Amplifier connector model: Male plug 15326085		
Car end connector model: Female plug 15326084		
PIN pin	definition	remarks
1	Main power supply constant positive pole	Vehicle end power supply
2	Main power supply constant negative pole	
3	Power amplifier switch control	
4	Speaker 1 positive input	Left horn - L
5	Speaker 1 negative input	
6	Speaker 2 positive input	Right horn - R
7	Speaker 2 negative input	
8	Speaker 3 positive input	reserve
9	Speaker 3 negative input	
10	Speaker 4 positive input	reserve
11	Speaker 4 negative input	
12	Left channel output	AUX IN connected to the central control screen
13	Right channel output	
14	Ground wire	
15	ACC	
16	empty	

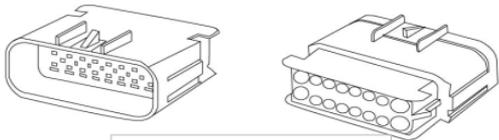


Schematic diagram of amplifier connector pins: male plug 15326085



A1: Positive pole of vehicle body power supply
A3: Power amplifier switch control
A5: Horn 1 negative pole
A7: Horn 2 negative pole
A9: Horn 3 negative pole
A11: Horn 4 negative pole
A13: Right channel

A2: Vehicle body power supply negative pole
A4: Horn 1 positive pole
A6: Horn 2 positive pole
A8: Horn 3 positive pole
A10: Horn 4 positive pole
A12: Left channel

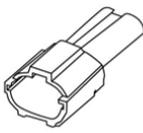


Public plug (connected to speaker)
Connector model: 15326085

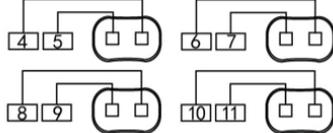
Note: PIN pins 1 and 2 are 12A power cords; Pin 15 is the ACC 12A power cord;

AUDIO SYSTEM

Speaker connector model: Male plug DJ7022Y-2-11		
Speaker connector model: Female plug DJ7022Y-2-21		
PIN pin	definition	remarks
4	Horn positive pole	Left horn - L
5	Horn negative pole	
6	Horn positive pole	Left horn - R
7	Horn negative pole	
8	Horn positive pole	Reserved speaker with no fixed socket for now
7	Horn negative pole	
8	Horn positive pole	Reserved speaker with no fixed socket for now
9	Horn negative pole	



Public plug (connected to speaker)
Connector model: DJ7022Y-2-11



REAR CAMERA

VCC+12V RED	GND BLACK	AV YELLOW
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Pin number	Line color	Function	remarks
1	Red	power line	12V
2	black	GND line	
3	yellow	Video line	

ANTENNA

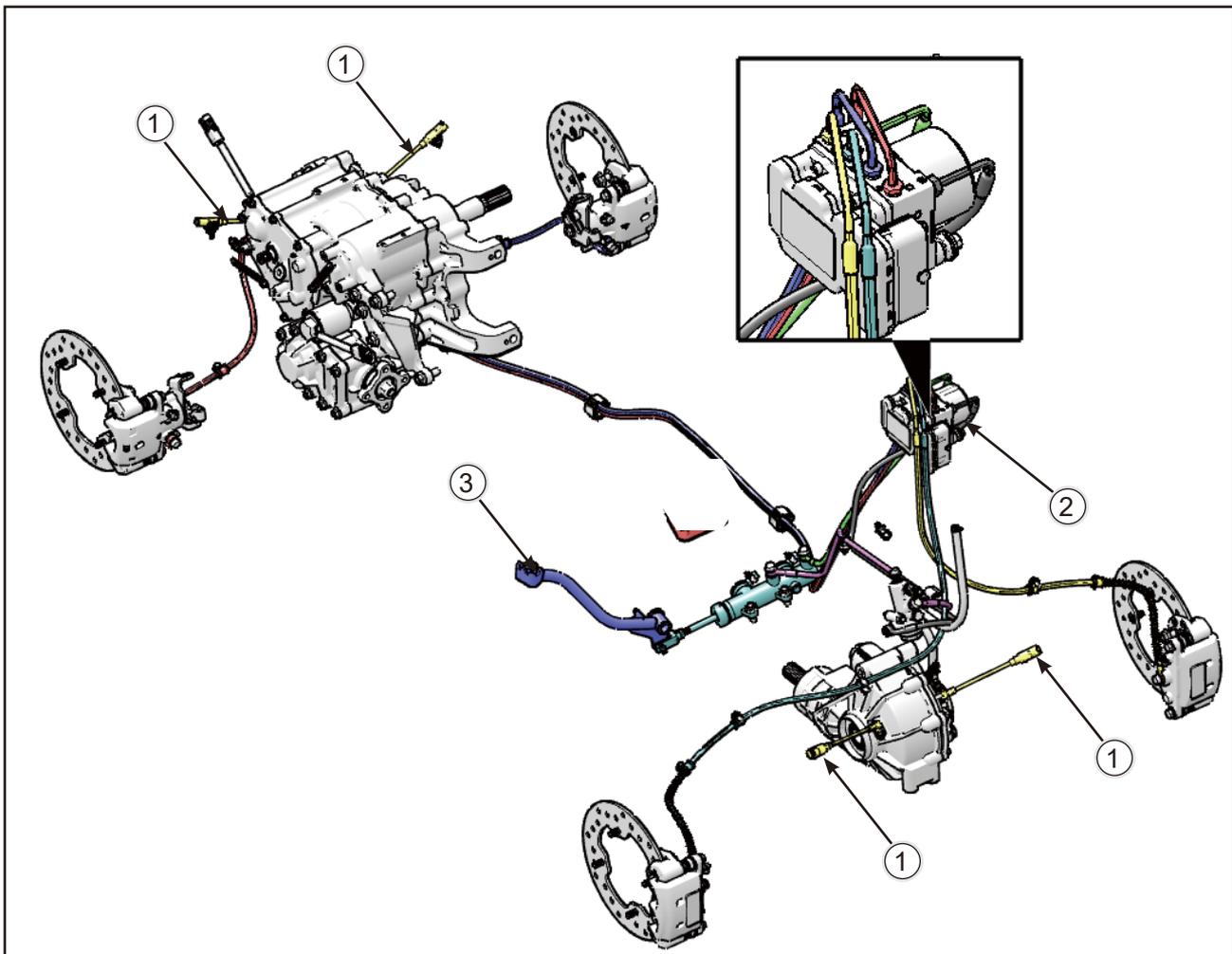
The antenna is located under the front maintenance cover.

ABS SYSTEM (APPLICABLE TO ABS MODELS)

FUNCTION DESCRIPTION

The main function of ABS (Anti-lock Braking System) is to prevent the wheels from locking up during emergency braking, so as to maintain the stability and control of the vehicle. During emergency braking, ABS can automatically adjust the braking force of the brakes to keep the wheels in a rolling and sliding state, ensuring that the adhesion between the wheels and the ground is at its maximum value, thus improving braking effect and driving safety.

ABS SYSTEM PARTS



1、 ABS Sensor

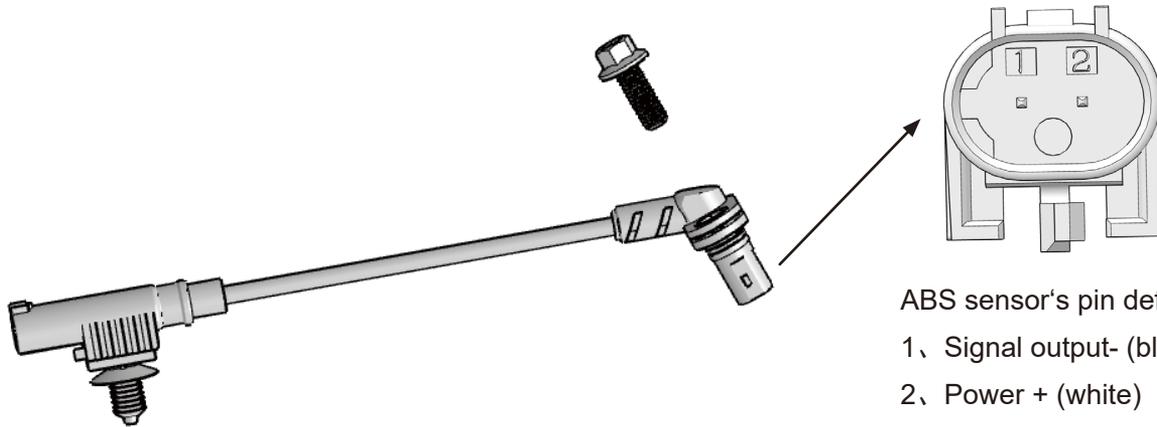
2、 ABS Control Unit

3、 Brake Pedal

SUPER VILLAIN SX20T

ABS SENSOR

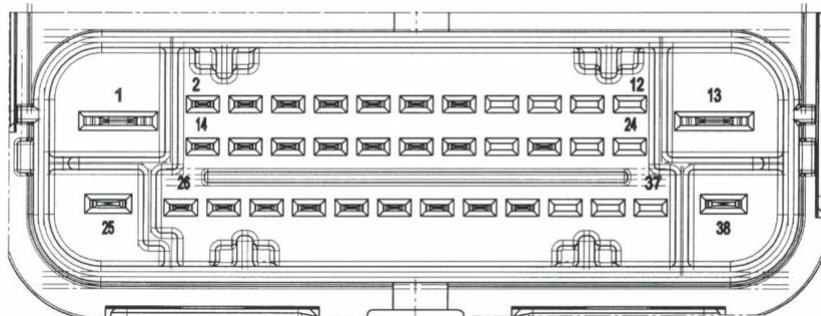
The vehicle is equipped with four ABS sensors, two of which are located on the left and right sides of the front axle gearbox, and the other two are located on the left and right sides of the rear axle gearbox. The ABS sensors can be replaced if they fail.



ABS sensor's pin definition:

- 1、 Signal output- (black)
- 2、 Power + (white)

ELECTRONIC CONTROL UNIT

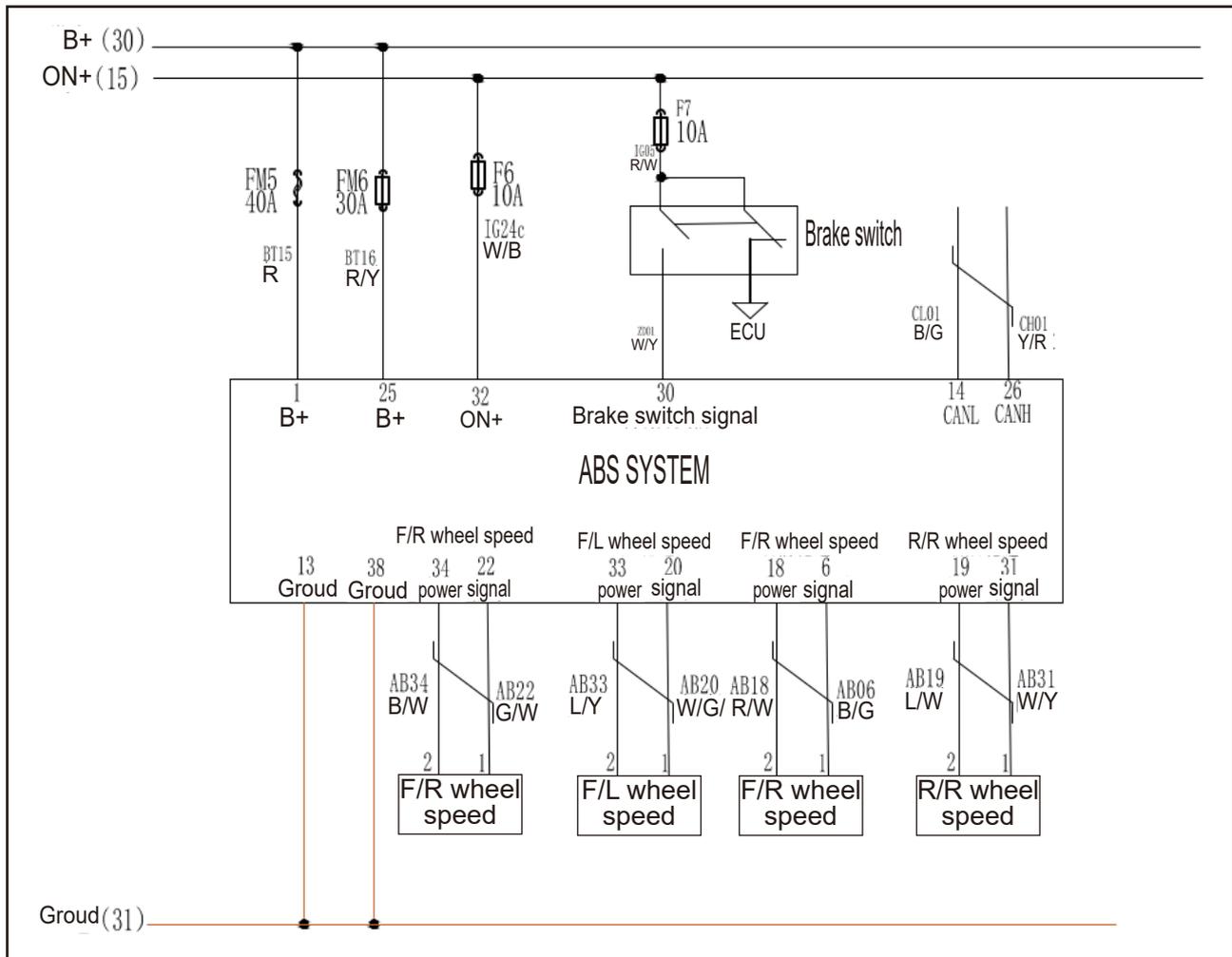


38-Pin Pin Definition			
1	Motor power supply	25	Valve relay sense power end (positive)
2	FR wheel speed signal output	26	High-level CAN bus
4	Active ABS	27	VSO
6	Wheel speed sensor signal end (FR)	28	EBD warning light
13	Motor Ground	30	Brake switch
14	Low-level CAN bus	31	Wheel speed sensor signal end (RR)
17	Diagnostic K-Line	32	ECU power end (ignition power cable)
18	Wheel speed sensor power end/ground (FR)	33	Wheel speed sensor power end/ground (RL)
19	Wheel speed sensor power end/ground (RR)	34	Wheel speed sensor power end/ground (FL)
20	Wheel speed sensor signal end (RL)	38	ECU Ground
22	Wheel speed sensor signal end (FL)		

ABS SYSTEM WORKING PRINCIPLE DIAGRAM

ABS works by monitoring the speed signal of each wheel through the wheel speed sensor (ABS sensor), which quickly determines the state of wheel lock-up. When it detects that a wheel is about to lock up, ABS quickly adjusts the braking pressure to prevent the wheel from locking up completely. In this way, ABS is able to maintain the optimum wheel slip rate (approx. 20%) during emergency braking, thereby maximising braking effect and reducing brake consumption, extending the service life of brake components.

In addition, ABS has the advantage of improving braking efficiency, enhancing vehicle stability and strengthening driving safety. By intelligently regulating the braking pressure on the wheels, ABS makes more efficient use of braking force, optimises energy recovery and reduces the risk of loss of control due to tyre lock-up.



ABS FAULT DIAGNOSIS CODE

Fault code	Explanation (UAES)
A0001	ECU Voltage:too high
A0002	ECU Voltage:too low
A0003	"Wheel-speed sensor, front left: Signal Line short to GND/Open; Supply Line open"
A0004	Wheel-speed sensor, front left: (signal failure) out of range, jitter, Intermittent
A0005	Wheel-speed sensor, front left:No signal
A0006	"Wheel-speed sensor, front right: Signal Line short to GND/Open; Supply Line open"
A0007	Wheel-speed sensor, front right: (signal failure) out of range, jitter, Intermittent
A0008	Wheel-speed sensor, front right: No signal from wheel speed sensor
A0009	"Wheel-speed sensor, rear left: Signal Line short to GND/Open; Supply Line open"
A0010	Wheel-speed sensor, rear left: (signal failure) out of range, jitter, Intermittent
A0011	Wheel-speed sensor, rear left: No signal from wheel speed sensor
A0012	"Wheel-speed sensor, rear right: Signal Line short to GND/Open; Supply Line open"
A0013	Wheel-speed sensor, rear right: (signal failure) out of range, jitter, Intermittent
A0014	Wheel-speed sensor, rear right: No signal from wheel speed sensor
A0015	Wheel-speed sensor generic error (General error of wheel speed sensor (frequency error, gear number error, tire error)
A0016	Valve relay error
A0017	valve fault, inlet valve FL
A0018	valve fault, outlet valve FL
A0019	valve fault, inlet valve FR
A0020	valve fault, outlet valve FR
A0021	valve fault, inlet valve RL
A0022	valve fault, outlet valve RL
A0023	valve fault, inlet valve RR
A0024	valve fault, outlet valve RR
A0025	valve fault(overheating,overcurrent,short circuit,signal error,hadware error)
A0026	Motor error
A0027	Motor relay error
A0028	ECU error (hardware error)
A0029	CAN hardware error
A0030	CAN Bus Off error

VEHICLE FAULT CODE



TROUBLESHOOTER OPERATION

When the engine is running, the instrument fault indicator is always on, indicating that the system is faulty. At present, use a dedicated fault diagnosis instrument (bottom left) to read the corresponding fault information. Use the OBD diagnostic interface to connect to the corresponding diagnostic interface of the vehicle, and connect the other end of the device to the computer (diagnostic software and corresponding drivers should be installed on the computer), and the key switch should be turned on. Specific steps:

- ◆ Connect the device, select "Open CAN", and press the OK button.
- ◆ Enter the main interface, you can view engine operating parameters and fault information

⚠ CAUTION

When the engine is not running, it is normal that the fault light is always on, and there is no need to deal with it

SUMMARY OF FAILURE CODES

Failure Code	Failure Description
ECU module	
P1500	System Voltage High
P1501	System Voltage Low
P1600	Brake Switch "A"/"B" Correlation
P1601	Brake Switch "A" Circuit
P1502	CAN Module Hardware Response Time Out
P1503	Engine Coolant Temperature Sensor 1 Circuit Intermittent
P1504	Engine Coolant Temperature Sensor 1 Circuit High
P1505	Engine Coolant Temperature Sensor 1 Circuit Low
P1506	Knock Control Signal Evaluation Check Diagnostic Fault Detected
P1620	Fuel Rail Pressure Sensor "A" Circuit Range/Performance
P1621	Fuel Rail Pressure Sensor Circuit Bank 1-Negative Offset
P1622	Fuel Rail Pressure Sensor Circuit Bank 1-Positive Offset
P1623	Fuel Rail Pressure Sensor Circuit Intermittent/Erratic Bank 1
P1507	Fuel Rail Pressure Sensor Circuit High Bank 1
P1508	Fuel Rail Pressure Sensor Circuit Low Bank 1
P1624	Fuel Rail Pressure Sensor Circuit Bank 1
P1509	Engine Oil Pressure Control Circuit High
P150A	Engine Oil Pressure Control Circuit Low
P150B	Engine Oil Pressure Control Circuit Open
P150C	Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor
P150D	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A
P150E	Camshaft Position Sensor "A" Circuit High Bank 1 or Single Sensor
P150F	Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor
P1625	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A
P1510	Camshaft Position Sensor "B" Circuit Range/Performance(Bank1)
P1511	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B
P1512	Camshaft Position Sensor "B" Circuit High(Bank1)
P1513	Camshaft Position Sensor "B" Circuit Low (Bank1)
P1626	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B
P1514	Crankshaft Position Sensor "A" Circuit Range/Performance
P1515	Crankshaft Position Sensor "A" Circuit Intermittent
P1516	Crankshaft Position Signal Output Circuit Open
P1627	System Too Lean Off Idle Bank 1
P1628	System Too Rich Off Idle Bank 1

Failure Code	Failure Description
P1517	Fan 1 Control Circuit
P1646	Fan 2 Control Circuit
P1519	Fan 1 Control Circuit High
P1647	Fan 2 Control Circuit High
P151A	Fan 1 Control Circuit Low
P1648	Fan 2 Control Circuit Low
P1521	"A" Camshaft Position Actuator Control Circuit Open Bank 1
P1522	"B" Camshaft Position Actuator Control Circuit Open Bank 1
P1523	"A" Camshaft Position Actuator Control Circuit High Bank 1
P1524	"B" Camshaft Position Actuator Control Circuit High Bank 1
P1525	"A" Camshaft Position Actuator Control Circuit Low Bank 1
P1526	"B" Camshaft Position Actuator Control Circuit Low Bank 1
P1629	"A" Camshaft Position Slow Response Bank 1
P162A	"B" Camshaft Position Slow Response Bank 1
P162B	"A" Camshaft Profile Control Performance/Stuck Off Bank 1
P162C	"B" Camshaft Profile Control Performance/Stuck Off Bank 1
P162D	Fuel Pressure Regulator 1 Performance-Pressure Too Low
P162E	Fuel Pressure Regulator 1 Performance -Pressure Too High
P1527	Fuel Rail/System Pressure – Too High
P1528	Fuel Rail/System Pressure – Too Low
P1529	Ignition Coil "A" Primary Control Circuit Open
P152A	Ignition Coil "C" Primary Control Circuit Open
P152B	Ignition Coil "D" Primary Control Circuit Open
P152C	Ignition Coil "B" Primary Control Circuit Open
P152D	Ignition Coil "A" Primary Control Circuit High
P152E	Ignition Coil "C" Primary Control Circuit High
P152F	Ignition Coil "D" Primary Control Circuit High
P1530	Ignition Coil "B" Primary Control Circuit High
P1531	Ignition Coil "A" Primary Control Circuit Low
P1532	Ignition Coil "C" Primary Control Circuit Low
P1533	Ignition Coil "D" Primary Control Circuit Low
P1534	Ignition Coil "B" Primary Control Circuit Low
P1535	Injector Circuit Open - Cylinder 1
P1536	Injector Circuit Open - Cylinder 3
P1537	Injector Circuit Open - Cylinder 4
P1538	Injector Circuit Open - Cylinder 2
P1539	Fuel Injector Group "A" Supply Voltage Circuit High

Failure Code	Failure Description
P153A	Fuel Injector Group "B" Supply Voltage Circuit High
P153B	Cylinder 1 Injector Circuit High
P153C	Cylinder 3 Injector Circuit High
P153D	Cylinder 4 Injector Circuit High
P153E	Cylinder 2 Injector Circuit High
P153F	Cylinder 1 Injector Circuit Range/Performance
P1540	Cylinder 3 Injector Circuit Range/Performance
P1541	Cylinder 4 Injector Circuit Range/Performance
P1542	Cylinder 2 Injector Circuit Range/Performance
P1543	Intake Air Temperature Sensor 1 Circuit Intermittent Bank 1
P1544	Intake Air Temperature Sensor 1 Circuit High Bank 1
P1545	Intake Air Temperature Sensor 1 Circuit Low Bank 1
P1546	Intake Air Temperature Sensor 2 Circuit Intermittent/Erratic Bank 1
P1547	Intake Air Temperature Sensor 2 Circuit High Bank 1
P1548	Intake Air Temperature Sensor 2 Circuit Low Bank 1
P1549	Fuel Pump "A" Control Circuit High
P154A	Fuel Pump "A" Control Circuit Low
P154B	Fuel Pump "A" Control Circuit Open
P154C	Knock/Combustion Vibration Sensor 1 Circuit Range/Performance Bank 1 or Single Sensor
P154D	Knock/Combustion Vibration Sensor 1 Circuit Bank 1 or Single Sensor
P154E	Knock/Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor
P154F	Knock/Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor
P1550	Knock/Combustion Vibration Sensor 1 Circuit High Bank 1 or Single Sensor
P1551	Knock/Combustion Vibration Sensor 1 Circuit Low Bank 1 or Single Sensor
P162F	Turbocharger/Supercharger "A" Overboost Condition
P1630	Turbocharger/Supercharger "A" Underboost Condition
P1552	Random/Multiple Cylinder Misfire Detected
P1553	Cylinder 1 Misfire Detected
P1554	Cylinder 3 Misfire Detected
P1555	Cylinder 4 Misfire Detected
P1556	Cylinder 2 Misfire Detected
P1557	Misfire Detected - Fueling Disabled
P1558	CPU0:MPU Error (Registers, DSPR, PSPR)
P1559	CPU0: Unified DCACHE/DSPR ECC Uncorrectable Error
P155A	CPU0: Unified DCACHE/DSPR Address Error
P155B	CPU0:DCACHE TAG SRAM ECC Uncorrectable Error
P155C	CPU0:DCACHE TAG SRAM Address Error

Failure Code	Failure Description
P155D	CPU0:PCACHE TAGRAM ECC Uncorrectable Error
P155E	CPU0:PCACHE TAGRAM Address Error
P155F	CPU0:Unified PCACHE/PSPR ECC Uncorrectable Error
P1560	CPU0:Unified PCACHE/PSPR Address Error
P1561	CPU1:Lockstep Comparator Error
P1562	CPU1:MPU Error (Registers, DSPR, PSPR)
P1563	CPU1:Unified DCACHE/DSPR ECC Uncorrectable Error
P1564	CPU1:Unified DCACHE/DSPR Address Error
P1565	CPU1:DCACHE TAGRAM ECC Uncorrectable Error
P1566	CPU1:DCACHE TAGRAM Address Error
P1567	CPU1:PCACHE TAGRAM ECC Uncorrectable Error
P1568	CPU1:PCACHE TAGRAM Address Error
P1569	CPU1:Unified PCACHE/PSPR ECC Uncorrectable Error
P156A	CPU1:Unified PCACHE/PSPR Address Error
P156B	LMU:SRAM ECC Monitor
P156C	LMU:SRAM ECC Uncorrectable Error
P156D	LMU:SRAM Address Error
P156E	SMU:Recovery Timer 0 Timeout
P156F	SMU: Recovery Timer 1 Timeout
P1570	PMU:PFLASH ECC Non Correctable Multiple Bit
P1571	PMU:PFLASH Addressing Error
P1572	PMU:PFLASH ECC Monitor Error (covers all ECC modules)
P1573	PMU:PFLASH EDC Comparator Error (covers all PFLASH instances)
P1574	SCU/CGU: System PLL OSC_WDT: Out Of Range Input Clock
P1575	SCU/CGU: System PLL VCO Loss-of-Lock Event
P1576	SCU/EVR: EVR 1.3V Digital Under Voltage
P1577	SCU/EVR: EVR 3.3V Over Voltage
P1578	SCU/EVR: External Supply Over Voltage
P1579	SCU/WDTs:Safety Watchdog Time-Out
P157A	SCU/WDTCPU0:Watchdog CPU0 Time-Out
P157B	SCU/WDTCPU1:Watchdog CPU1 Time-Out
P157C	SCU/CGU: PLL_ERAY VCO Loss-of-Lock Event
P157D	SCU/WDTCPU2:Watchdog CPU2 Time-Out
P157E	SCU/DTS: Die Temperature Sensor Overflow
P157F	Registers: Register Monitor Error Detection
P1580	SCU/LSCU: SCU configuration Error: Monitors the Dual-rail Property (inverted signals) from the Lockstep Comparator Unit (LSCU) Alarms
P1581	SCU/CGU: Clock monitoring: Out Of Range Frequency STM

Failure Code	Failure Description
P1582	SCU/CGU: Clock monitoring: Out Of Range Frequency PLL_ERAY
P1583	SCU/CGU: Clock monitoring: Out Of Range Frequency System PLL
P1584	SCU/CGU: Clock monitoring: Out Of Range Frequency SRI
P1585	SCU/CGU: Clock monitoring: Out Of Range Frequency SPB
P1586	SCU/CGU: Clock monitoring: Out Of Range Frequency GTM
P1587	SCU/CGU: Clock monitoring: Out Of Range Frequency ADC
P1588	GTM: SRAMs Non Correctable Error
P1589	FLEXRAY:SRAM Address Error
P158A	Misc SRAMs:SRAM ECC Uncorrectable Error
P158B	Misc SRAMs:SRAM Address Error
P158C	GTM: SRAMs Address Error
P158D	CAN: SRAM Uncorrected Error
P158E	CAN: SRAM Address Error
P158F	FLEXRAY:SRAM ECC Uncorrectable Error
P1590	CPU2:MPU Error (Registers, DSPR, PSPR)
P1591	CPU2:Unified DCACHE/DSPR ECC Uncorrectable Error
P1592	CPU2:Unified DCACHE/DSPR Address Error
P1593	CPU2:DCACHE TAG SRAM ECC Uncorrectable Error
P1594	CPU2:DCACHE TAG SRAM Address Error
P1595	CPU2:121 PCACHE TAGRAM ECC Uncorrectable Error
P1596	CPU2:PCACHE TAGRAM Address Error
P1597	CPU2:Unified PCACHE/PSPR ECC Uncorrectable Error
P1598	CPU2:Unified PCACHE/PSPR Address Error
P1599	ECM/PCM Power Relay Control Circuit/Open
P159A	ECM/PCM Power Relay Control Circuit High
P159B	ECM/PCM Power Relay Control Circuit Low
P159C	Injection Pump Fuel Metering Control "A" (Cam/Rotor/Injector)
P159D	Injection Pump Fuel Metering Control "A" High (Cam/Rotor/Injector)
P159E	Fuel Pressure Regulator "A" Control Circuit Open
P159F	Injection Pump Fuel Metering Control "B" High (Cam/Rotor/Injector)
P15A0	Function Monitoring: Fault of ECU ADC - Null Load Test Pulse
P15A1	Function Monitoring: Fault of ECU ADC - Test Voltage
P15A2	Function Monitoring:Powerstage and/or Communication Error During Shut Off Path Test
P1602	Internal Control Module Accelerator Pedal Position Performance
P15A3	Function Monitoring: Check of Predicted Air Mass Failed
P15A4	Function Monitoring: Fault of ECU Check of Injection Cut-off
P15A5	Function Monitoring: Fault of ECU in Check of Cylinder Individual Fuel Corrections

Failure Code	Failure Description
P15A6	Synchro Process Plausibility Check Based on Engine Speed and Synchro Counters
P15A7	Function Monitoring: Fault of ECU or Sensor in rl-comparison
P15A8	Function Monitoring: Fault of ECU or Sensor in Mixture Check
P15A9	Function Monitoring: Fault of ECU Comparison of Lambda and Operation Mode
P15AA	Internal Control Module Engine RPM Performance
P15AB	Function Monitoring: Fault of ECU Ignition Timing
P15AC	Function Monitoring: Monitoring of ICO From Level1
P15AD	Function Monitoring: Monitoring of ICO From Level2
P15AE	Function Monitoring: Fault of Starter Control
P15AF	Internal Control Module Torque Performance
P15B0	Status of ABE Line is Active and Normal Operation Voltage is Present
P15B1	WDA active Due to Errors in Query/Response Communication
P15B2	Error PIN is Active and No Query Response Communication Error is Active
P15B3	WDA active Due to Overvoltage Detection
P1631	Barometric Pressure Sensor "A" Circuit Range/Performance
P1632	Barometric Pressure Sensor "A" Circuit Range/Performance
P1633	Barometric Pressure Sensor "A" Circuit Range/Performance
P1634	Barometric Pressure Sensor "A" Circuit Range/Performance
P1635	Barometric Pressure Sensor "A" Circuit Range/Performance
P1636	Barometric Pressure Sensor "A" Circuit Range/Performance
P15B4	Barometric Pressure Sensor "A" Circuit High
P15B5	Barometric Pressure Sensor "A" Circuit Low
P1637	Barometric Pressure Sensor "A" Circuit
P15B6	Manifold Absolute Pressure Sensor Circuit High
P15B7	Manifold Absolute Pressure Sensor Circuit Low
P15B8	Engine Oil Pressure Sensor/Switch "A" High
P15B9	Engine Oil Pressure Sensor/Switch "A" Low
P1638	Manifold Absolute Pressure Sensor Circuit Range/Performance
P1639	Manifold Absolute Pressure Sensor Circuit Range/Performance
P15BA	Turbocharger/Supercharger Boost Sensor "A" Circuit High
P15BB	Turbocharger/Supercharger Boost Sensor "A" Circuit Low
P163A	Turbocharger/Supercharger Boost Sensor "A" Circuit Range/Performance
P163B	Turbocharger/Supercharger Boost Sensor "A" Circuit Range/Performance
P1603	Throttle/Pedal Position Sensor/Switch "D" Circuit High
P1604	Throttle/Pedal Position Sensor/Switch "E" Circuit High
P1605	Throttle/Pedal Position Sensor/Switch "D" Circuit Low

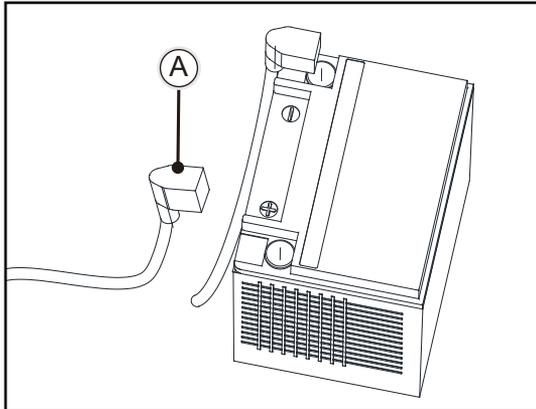
Failure Code	Failure Description
P1606	Throttle/Pedal Position Sensor/Switch "E" Circuit Low
P15BC	Sensor Reference Voltage A Circuit/Open
P15BD	Sensor Reference Voltage B Circuit/Open
P15BE	Sensor Reference Voltage "C" Circuit/Open
P163C	Starter Damaged or Wire Dropped
P163D	Engine Block or Starter is not Engaged
P15BF	KL50r Wire Short Circuit to Battery
P15C0	KL50r Wire Short Circuit to Ground
P163E	Starter Relay "A" Stuck On
P163F	Starter Relay "B" Stuck On
P1640	Starter Relay "A"/"B" Stuck Off
P1641	Turbocharger/Supercharger Bypass Valve "A" - Mechanical
P15C1	Starter Relay "B" Circuit
P15C2	Starter Relay "B" Circuit High
P15C3	Starter Relay "B" Circuit Low
P15C4	Starter Relay "A" Circuit
P1642	Control Module Internal Temperature "A" Too High
P15C5	Starter Relay "A" Circuit High
P15C6	Starter Relay "A" Circuit Low
P1607	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation
P15C7	Evaporative Emission System Purge Control Valve Circuit High
P15C8	Evaporative Emission System Purge Control Valve Circuit Low
P15C9	Evaporative Emission System Purge Control Valve Circuit Open
P15CA	Not Plausible Error of UMA Learning
P15CB	Break of DV-E Adapation Due to Ambient Conditions
P15CC	Max error of DV-E Fault during relearning of UMA
P15CD	Min error of DV-E Fault during relearning of UMA
P15CE	Not Plausible Error of DV-E Position Deviation
P15CF	Not Plausible Range of DV-E Control
P15D0	Not Plausible Offset of NLP Learning for First Learning
P15D1	Max Error of NLP Learning
P15D2	Not Plausible Offset of NLP Learning for Last Learning
P15D3	Min Error of NLP Learning
P15D4	Throttle Actuator "A" Control Motor Circuit/Open
P15D5	Throttle Actuator "A" Control Motor Current Range/Performance
P15D6	Max Error of DV-E Return Spring Check Failure
P15D7	Throttle Actuator Electrical Malfunction

Failure Code	Failure Description
P15D8	Throttle/Pedal Position Sensor/Switch "A" Circuit High
P15D9	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance
P15DA	Throttle/Pedal Position Sensor/Switch "B" Circuit High
P15DB	Throttle/Pedal Position Sensor/Switch "B" Circuit Low
P15DC	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/Performance
P15DD	Throttle Actuator "A" Control Motor Circuit High
P15DE	Throttle Actuator Control System Forced Limited Power
P15DF	Throttle/Pedal Position Sensor/Switch "A" Circuit Low
P1643	Turbocharger/Supercharger Wastegate Actuator "A" Range/Performance
P1644	Turbocharger/Supercharger Wastegate Actuator "A" Range/Performance
P15E0	Turbocharger/Supercharger Wastegate Solenoid "A"
P15E1	Turbocharger Boost Control Position Sensor "A" Circuit High
P15E2	Turbocharger Boost Control Position Sensor "A" Circuit Low
P15E3	Turbocharger/Supercharger Wastegate Actuator "A" High/Low
P15E4	Turbocharger/Supercharger Wastegate Actuator General Error
P15E5	HO2S Heater Resistance Bank 1 Sensor 1
P15E6	HO2S Heater Control Circuit High Bank 1 Sensor 1
P15E7	HO2S Heater Control Circuit Low Bank 1 Sensor 1
P15E8	HO2S Heater Control Circuit Bank 1 Sensor 1
P15E9	O2 Sensor Negative Current Control Circuit/Open Bank 1 Sensor 1
P15EA	O2 Sensor Reference Voltage Circuit/Open Bank 1 Sensor 1
P15EB	O2 Sensor Circuit High Voltage Bank 1 Sensor 1
P15EC	O2 Sensor Circuit Low Voltage Bank 1 Sensor 1
P15ED	O2 Sensor Exhaust Sample Error Bank 1 Sensor 1
P15EE	Turbocharger/Supercharger Bypass Valve Control Circuit High
P15EF	Turbocharger/Supercharger Bypass Valve Control Circuit Low
P15F0	Turbocharger/Supercharger Bypass Valve Control Circuit
P15F1	O2 Sensor Positive Current Control Circuit/Open Bank 1 Sensor 1
P1645	Vehicle Speed Sensor "A" Circuit Range/Performance
P15F2	Vehicle Speed Sensor "A" Circuit
P15F3	Auxiliary Water Pump Dry Run Error
P15F4	Coolant Pump "B" Control Circuit High
P15F5	Coolant Pump "B" Control Circuit Low
P15F6	Coolant Pump "B" Control Circuit Open
P15F7	Auxiliary Water Pump Low Speed Error
P15F8	Auxiliary Water Pump Over Temperature Error
P15F9	Auxiliary Water Pump Stall Error

Failure Code	Failure Description
P15FA	ECM/PCM Power Relay Control Circuit Low
P15FB	Internal Control Module Non-Volatile Random Access Memory (Nvram) Error
P15FC	Internal Control Module Non-Volatile Random Access Memory (Nvram) Error
Communication type fault	
U3003	Module supply voltage too high
U3004	Module supply voltage too low
U0073	PCAN Bus BUSOFF
U0101	TCU node loss fault
U0103	GSM node loss fault
U0100	ECU Node Loss Fault
U0198	T-Box node loss fault
U0245	IVI node loss fault
U0131	EPS node loss fault
U0140	BCM node loss fault
U0156	IACM node loss Fault
U024A	ALC node loss fault
U0155	ICU node loss fault
EPS module	
B1122	Main signal of the torque sensor faulty
B1124	Second signal of the torque sensor is faulty
B1125	The difference between main and secondary torque is too large
B1132	The motor has no power
B1168	Motor rotor signal fault
B1114	External EEPROM read / write failure
B1166	The rotor Angle SPI signal is disconnected
B1151	The steering wheel Angle is out of limit
B1161	Pinion Angle sensor disconnected
B1162	Center gear Angle sensor disconnected
B1163	Steering wheel angle not centered
BCM module	
B1206	LeftFrontTureLampBroken
B1207	LeftFrontTureLampShort
B1208	RightFrontTureLampBroken
B1209	RightFrontTureLampShort
B120A	LeftRearTureLampBroken
B120B	LeftRearTureLampShort

Failure Code	Failure Description
B120C	RightRearTureLampBroken
B120D	RightRearTureLampShort
B120E	LowerBeamBroken
B120F	LowerBeamShort
B1210	HighBeamBroken
B1211	HighBeamShort
B1216	PositionLampBroken
B1217	PositionLampShort
B1218	BrakeLampBroken
B1219	BrakeLampShort
B121C	HornBroken
B121D	HornShort
B121E	ECU/VCU node loss
EPB module(if equipped with)	
C1100	Controller main chip fault
C1101	Controller ASIC Failure
C1102	Ignition switch wire fault
C1103	End of line test fault
C1104	Left actuator power supply undervoltage fault
C1105	Left actuator power supply overvoltage fault
C1106	right actuator power supply undervoltage fault
C1107	right actuator power supply overvoltage fault
C1108	Actuator overload fault
C1109	Left drive circuit or actuator fault
C1110	Right drive circuit or actuator fault
C1111	Left motor or line fault
C1112	Right motor or line fault
C1113	Left or right motor status mode fault
C1114	EPB switch fault
C1115	Caliper temperature unknown
C1116	EPB switch clamping disabled
C1117	EPB caliper at full release
C1118	EPB abnormal power down

WINCH ASSEMBLY

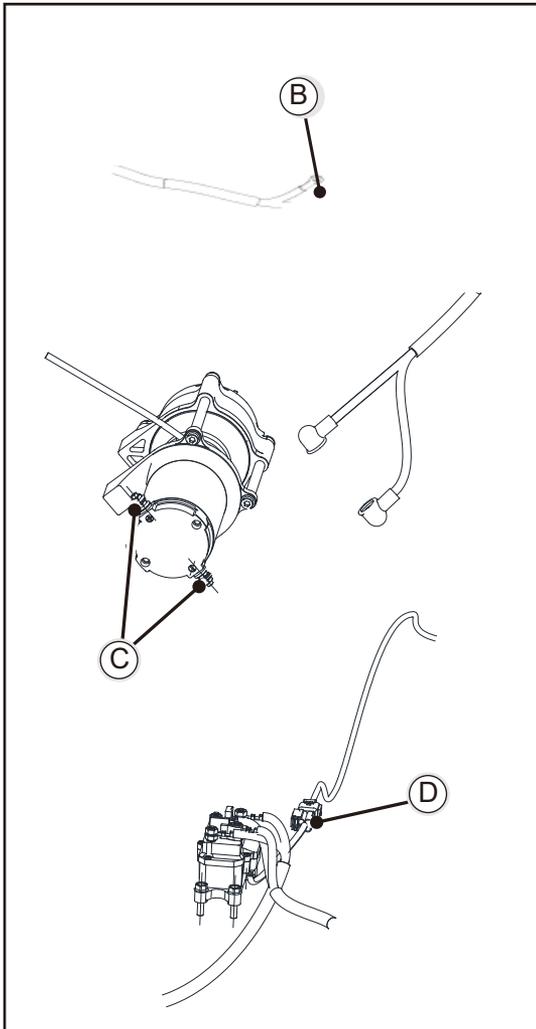


REMOVAL

⚠ CAUTION

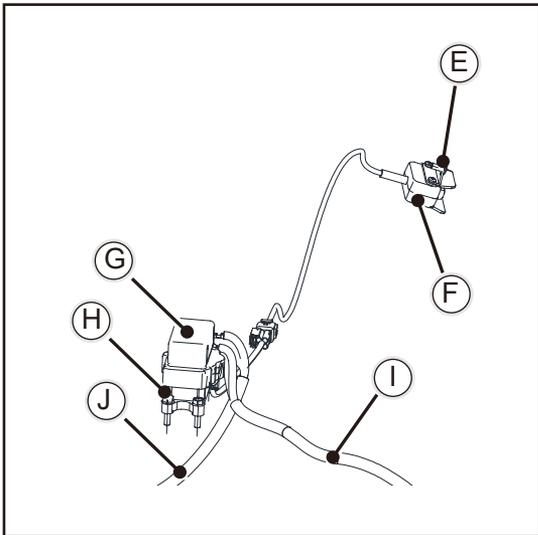
When removing the winch, first power off the vehicle power

- ◆ Remove external related plastic parts
- ◆ First remove the battery positive electrode **【A】**
- ◆ Remove the power cable of the winch **【B】**
- ◆ Remove the winch motor cable nut **【C】**
- ◆ Unplug the plug **【D】**
- ◆ Cut off the cable tie along the cable

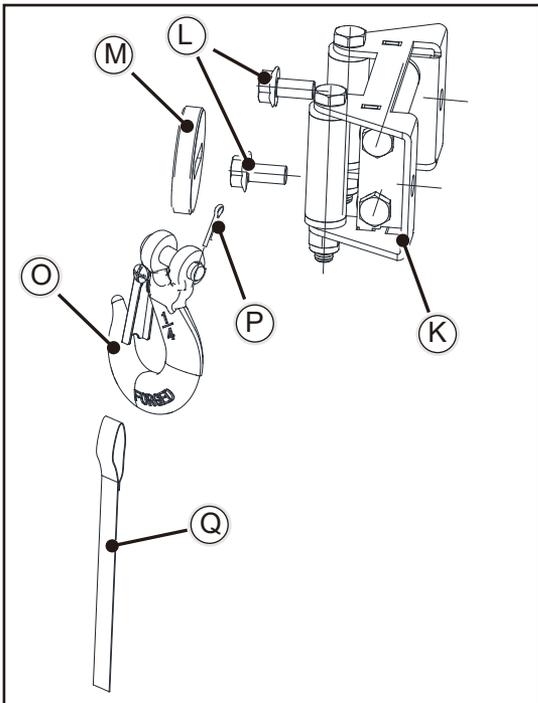


⚠ WARNING

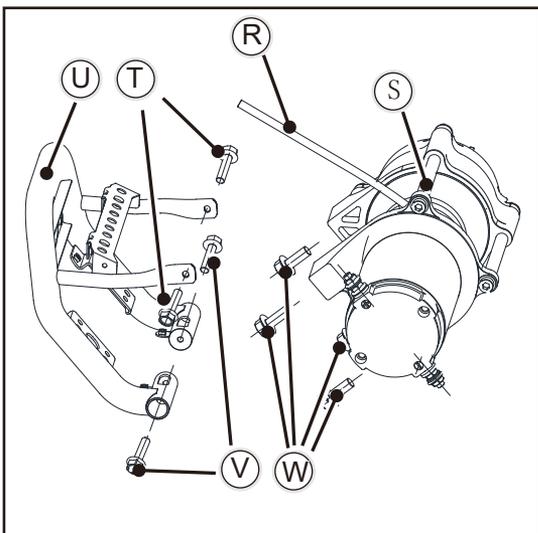
Be sure to disconnect the battery before disassembling the winch assembly to avoid short circuit



- ◆ Remove the bolt **【E】** , remove the winch switch **【F】**
- ◆ Remove the bolt **【H】** , then the winch power cord **【I】** , winch motor wire **【J】** and winch relay **【G】** can be removed together



- ◆ After disassembling the bolt **【P】** and the wire rope **【R】** , you can remove the strap **【Q】** , hook **【O】** , and rubber pad **【M】**
- ◆ Remove the bolt **【L】** , and remove the guide wheel **【K】**



- ◆ First remove bolt **【T】** and bolt **【V】**
- ◆ Disassemble the bolt **【W】** , and remove the motor **【S】**

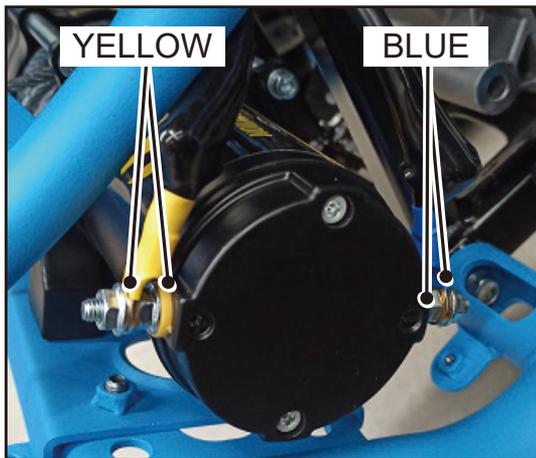
⚠ CAUTION

The winch work does not exceed 1min each time, and then works after an interval of 30S

- ◆ Rated working voltage DC12V
- ◆ Maximum working tension 2500LBS or 3000LBS
- ◆ The maximum working current ≤ 185 A, the maximum working current lasts for 1 min, and work after an interval of 30 seconds. Continue to work in this way
- ◆ The wire rope diameter is 4.8 and the wire rope length is 14.5

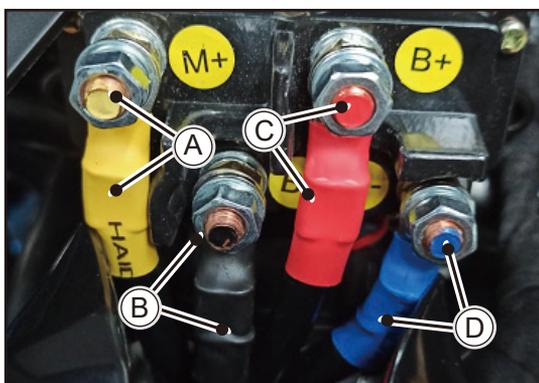
The color of the insulation pad of the winch motor terminal and the heat shrinkable tube of the cable is one-to-one correspondence

- 【A】 YELLOW
- 【B】 BLUE

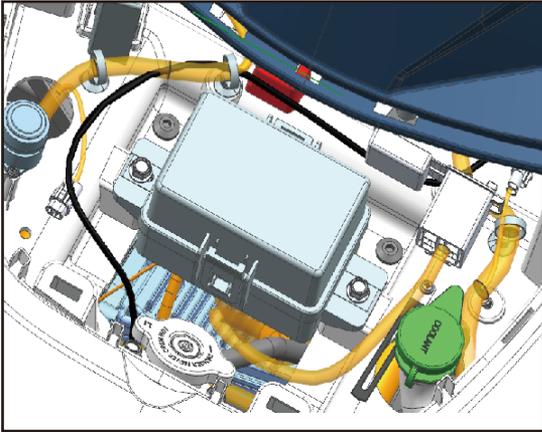


The color of the insulation pad of the winch motor terminal and the heat shrinkable tube of the cable is one-to-one correspondence

- 【C】 YELLOW
- 【D】 BLACK
- 【E】 RED
- 【F】 BLUE



FUSE BOX



All fuses for the vehicle are in the fuse box

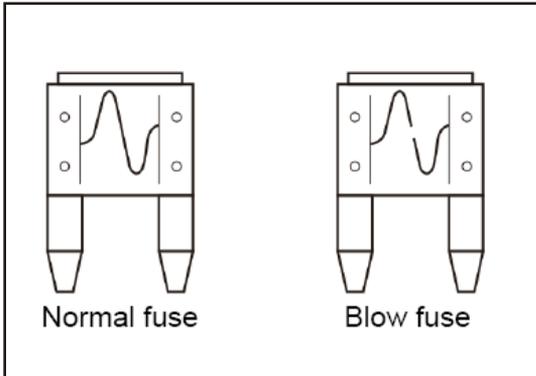
The fuse box is located under the front instrument mask.

Remove front panel repair cover

- ◆ After the front panel repair cover is removed, the fuse box located at the bottom can be seen.
- ◆ Move the clasp on the left and right sides of the fuse box cover to the outside. Loosen the clasp and open the fuse box.

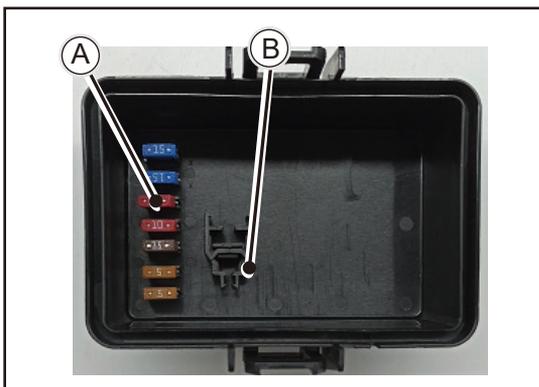
⚠ CAUTION

- ◆ Do not use a fuse above the rated ampere value or replace it with anything else.
- ◆ Please use the same product. Never use wires for fuses, even temporary replacements are not allowed.
- ◆ Do not modify fuses or fuse boxes.



Normal fuse

Blow fuse



- ◆ If a chip fuse is broken, you can replace it with a spare fuse **【A】** of the same specification in the fuse box cover. Please use a fuse clamp **【B】** to replace the fuse.

WIRING DIAGRAM

COLOR COMPARISON TABLE

CODE	R	R/B	R/W	R/G	R/Y	R/L	R/Br	R/O	
COLOUR	Red	Red/Black	Red/White	Red/Green	Red/Yellow	Red/Blue	Red/Brown	Red/Orange	
CODE	P	B	B/R	B/W	B/Y	B/L	B/V	B/Br	
COLOUR	Pink	Black	Black/Red	Black/White	Black/Yellow	Black/Blue	Black/Violet	Black/Brown	
CODE	W	W/R	W/B	W/G	W/Y	W/L	W/V	W/Gr	W/Br
COLOUR	White	White/Red	White/Black	White/Green	White/Yellow	White/Blue	White/Violet	White/Gray	White/Brown
CODE	Gr	Gr/R	Gr/B	Gr/W	BR	Br/R	Br/B	Br/Y	
COLOUR	Gray	Gray/Red	Gray/Black	Gray/White	Brown	Brown/Red	Brown/Black	Brown/Yellow	
CODE	O	O/R	O/B	O/W	O/G	O/L	O/Gr		
COLOUR	Orange	Orange/Red	Orange/Black	Orange/White	Orange/Green	Orange/Blue	Orange/Gray		
CODE	G	G/R	G/B	G/W	GY	GL	GV	G/Br	
COLOUR	Green	Green/Red	Green/Black	Green/White	Green/Yellow	Green/Blue	Green/Violet	Green/Brown	
CODE	Y	Y/R	Y/B	Y/W	Y/G	Y/L	Y/Gr	Y/Br	
COLOUR	Yellow	Yellow/Red	Yellow/Black	Yellow/White	Yellow/Green	Yellow/Blue	Yellow/Gray	Yellow/Brown	
CODE	L	L/R	L/B	LW	L/G	LY			
COLOUR	Blue	Blue/Red	Blue/Black	Blue/White	Blue/Green	Blue/Yellow			
CODE	V	V/R	V/B	VW	V/G	V/L	V/Br	V/O	
COLOUR	Violet	Violet/Red	Violet/Black	Violet/White	Violet/Green	Violet/Blue	Violet/Brown	Violet/Orange	
CODE	Lg	Lg/R	Lg/G	Lg/Y	Lg/Br	Lg/P			
COLOUR	Light Green	Light Green/Red	Light Green/Green	Light Green/Yellow	Light Green/Brown	Light Green/Pink			
CODE	Lb	Lb/R	Lb/B	Lb/W	Lb/Gr				
COLOUR	Light Blue	Light Blue/Red	Light Blue/Black	Light Blue/White	Light Blue/Gray				

Wire color instruction:

Wire color contains main color and secondary color:

For example:R/L means the main color is red and the secondary color is blue.

