

# STEERING

4610-01/4610-06/4610-07/4620-02/4640-01/4711-01/

## INDEX

## STEERING

### GENERAL

1. OVERVIEW.....	3
2. SPECIFICATIONS.....	3

### OVERVIEW AND OPERATION PROCESS

1. SYSTEM LAYOUT.....	4
2. COMPONENTS.....	7

### REMOVAL AND INSTALLATION

4610-01 TROUBLE DIAGNOSIS.....	9
4610-01 INSPECTIONS OF POWER STEERING SYSTEM.....	10
4610-06 STEERING COLUMN SHAFT.....	14
4610-07 LOWER SHAFT.....	19
4620-02 STEERING GEAR BOX.....	20
4711-01 POWER STEERING PUMP.....	22
4640-01 POWER STEERING OIL PIPE.....	24



# دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



## STEERING

4610-01

## GENERAL

## 1. OVERVIEW

When a driver turns the steering wheel, the front wheels are steered and the vehicle moves to the desired direction. However, there is a certain limitation to increase the steering efficiency only with the mechanical methods. A steering system using hydraulic pressure has been introduced to decrease the driver's steering effort while using the normal gear ratio.

The power steering system consists of pump, oil reservoir, rack and gear box.

The power steering pump is a vane type and delivers hydraulic pressure to operate the power steering system. The pressure relief valve in the pump controls the discharging pressure.

The rotary control valve in the rack and pinion gear directs the oil from the power steering pump to one side of the rack piston. The integrated rack piston converts the hydraulic pressure to linear movement.

The operating force of the rack moves the wheels through the tie rod, the tie rod end and the steering knuckle. Even though the hydraulic pressure cannot be generated, a driver can steer the vehicle without power assist but it needs very high steering force.

In this case, the operating force of the steering wheel is conveyed to the pinion, and the movement of the pinion moves the rack through the pinion gear combined to the rack gear.

## 2. SPECIFICATIONS

Description		Specification
Steering wheel	Type	4-spoke type
	Outer diameter	390 mm
Steering gear box	Type	Rack and pinion
	Gear ratio	$\infty$
	Steering angle	Inner 36.2°
		Outer 32.4°
Oil pump	Type	Vane type
	Maximum pressure	86.5 ~ 93.5 kgf/cm <sup>2</sup>
	Displacement	9.3 cm <sup>3</sup> /rev
	Pulley size	115 mm
Tilt column adjusting angle	Up	4°
	Down	8°
Minimum turning radius		5.6
Oil	Specification	S-PSF3
	Capacity	1.0ℓ

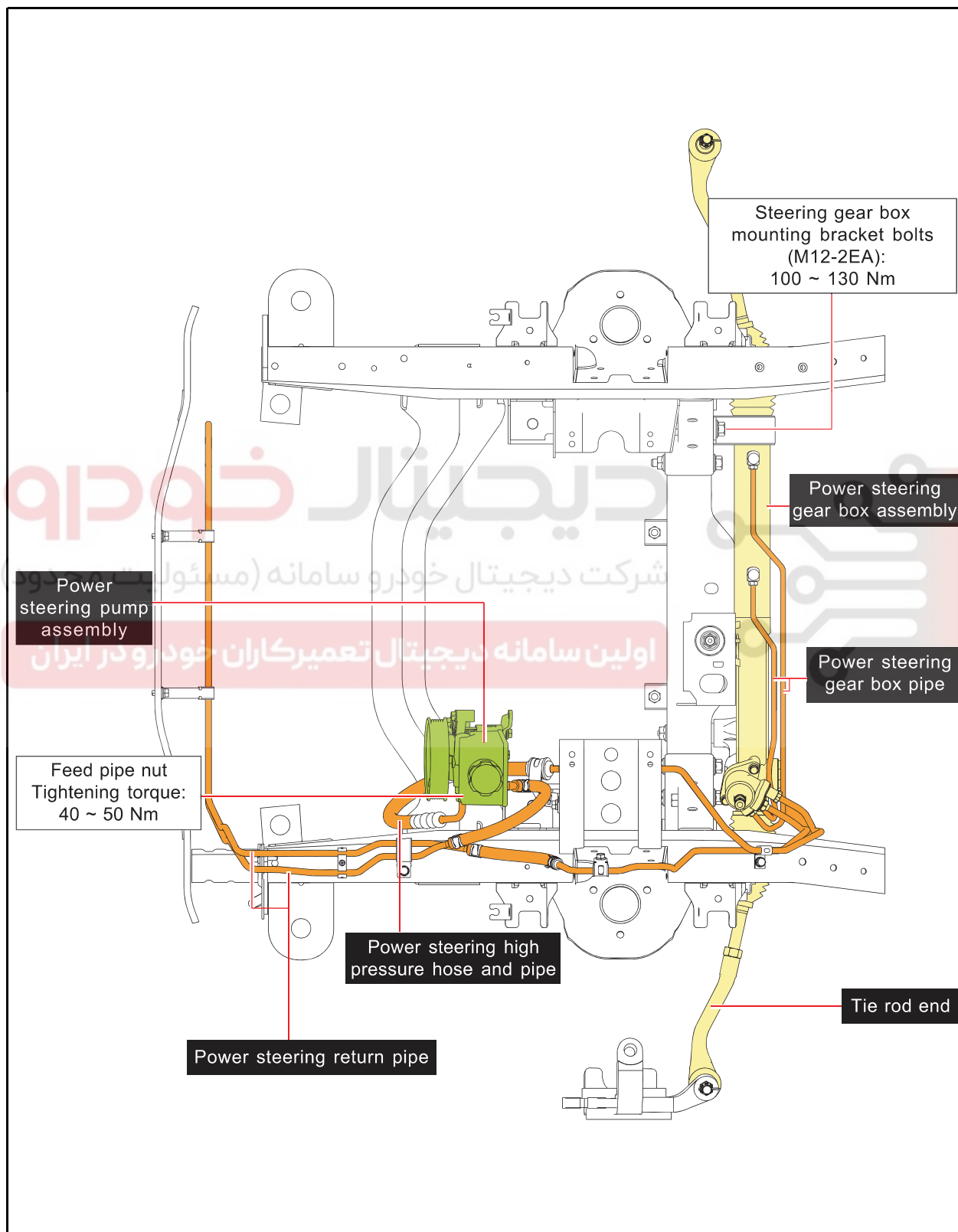
Modification basis	
Application basis	
Allocated VIN	

STEERING

ACTYON 2013.11

## OVERVIEW AND OPERATION

## 1. SYSTEM LAYOUT

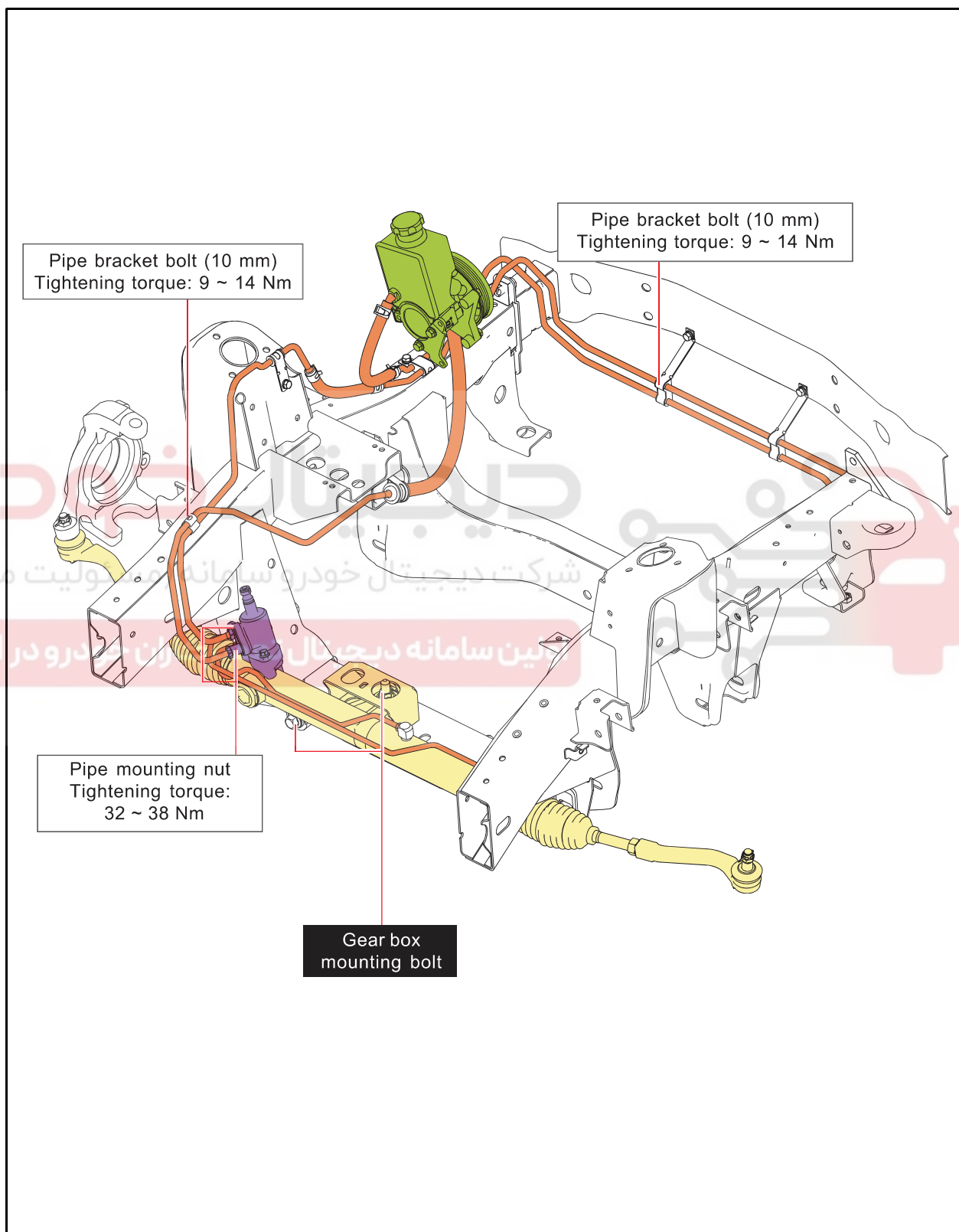


## STEERING

ACTYON 2013.11

Modification basis	
Application basis	
Affected VIN	021 62 99 92 92



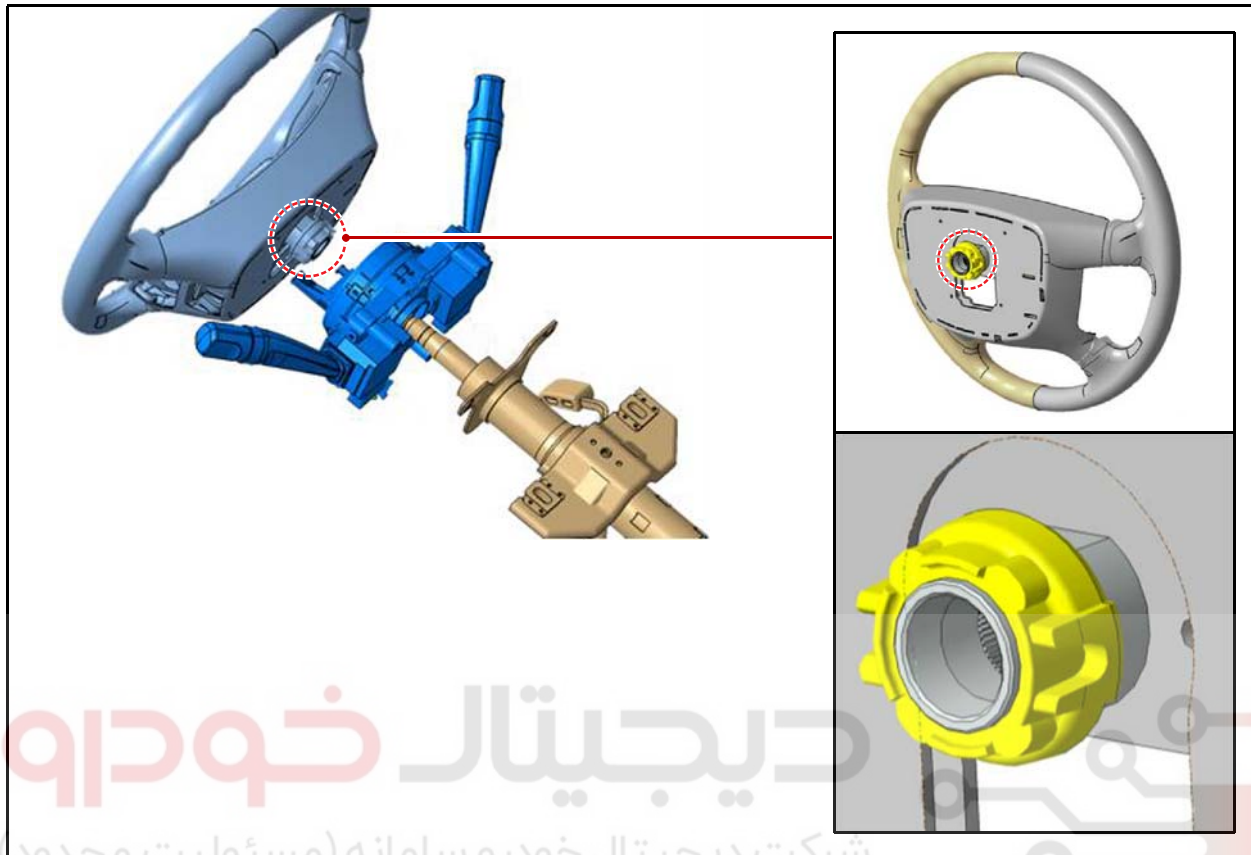


Modification basis	
Application basis	
Allocated VIN	

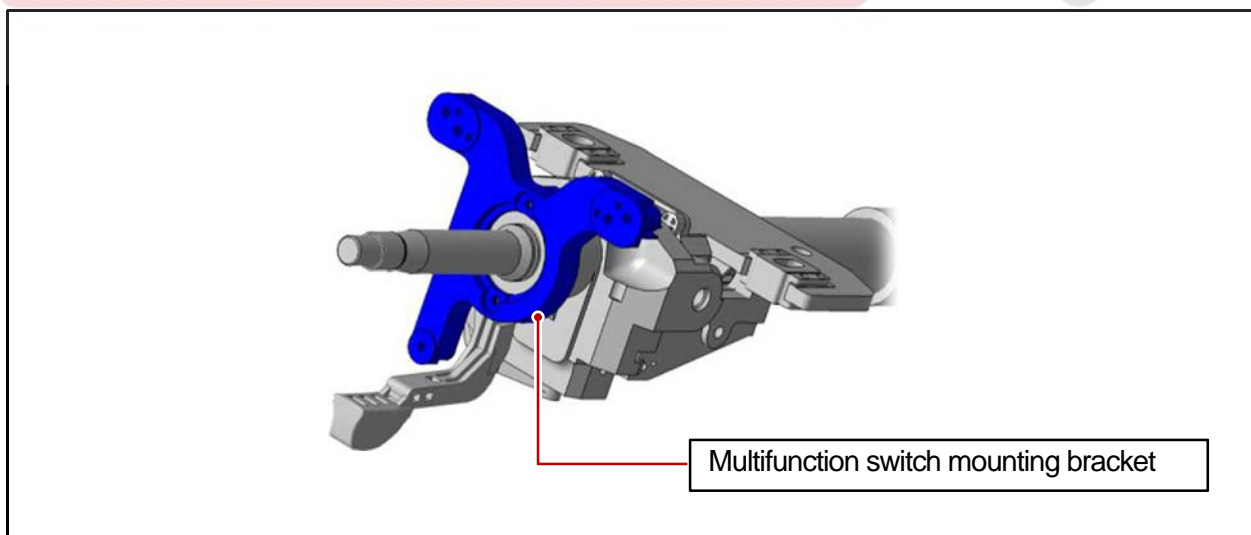
STEERING

ACTYON 2013.11

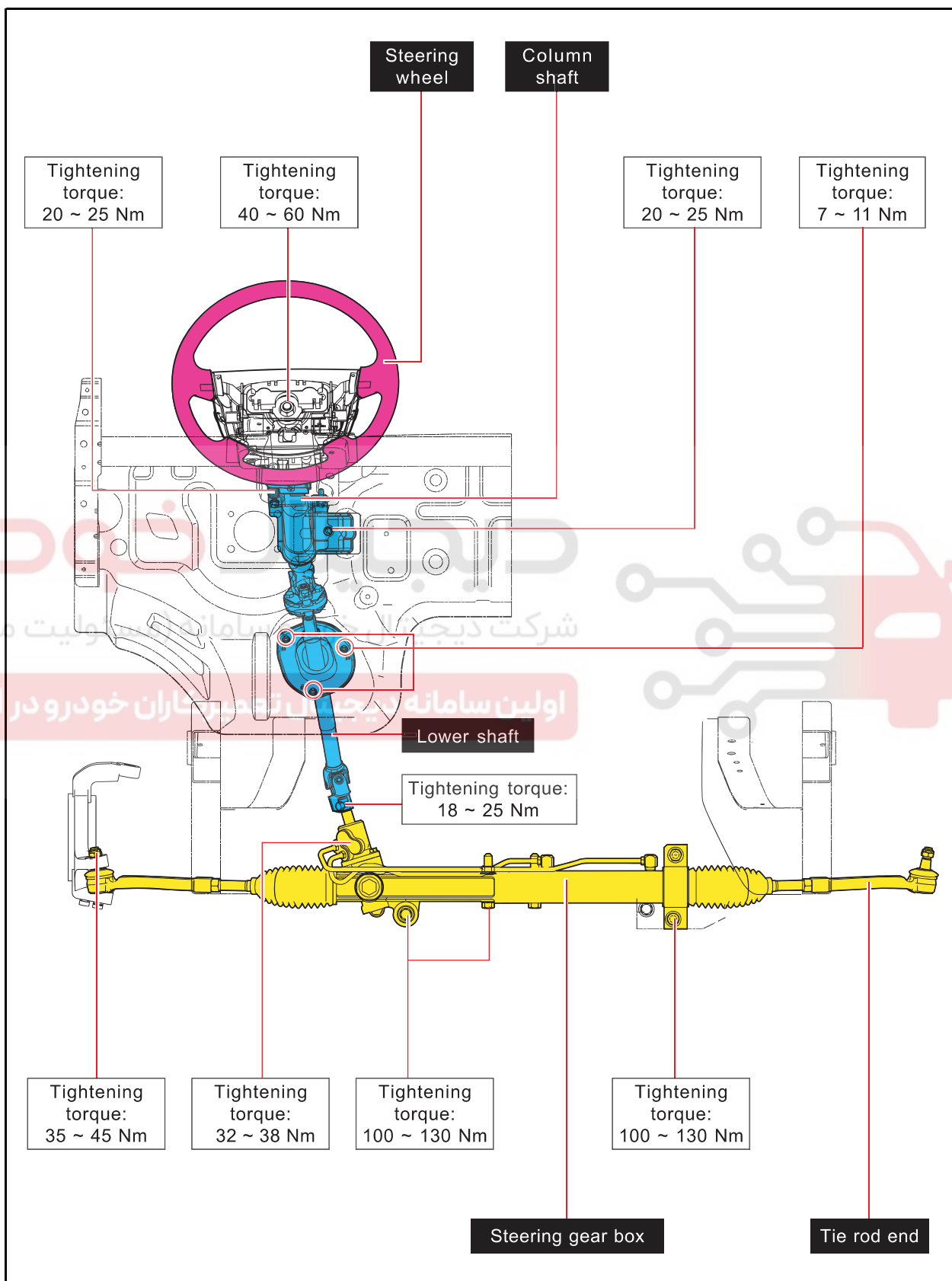
► Steering wheel assembly boss part



► Steering column shaft



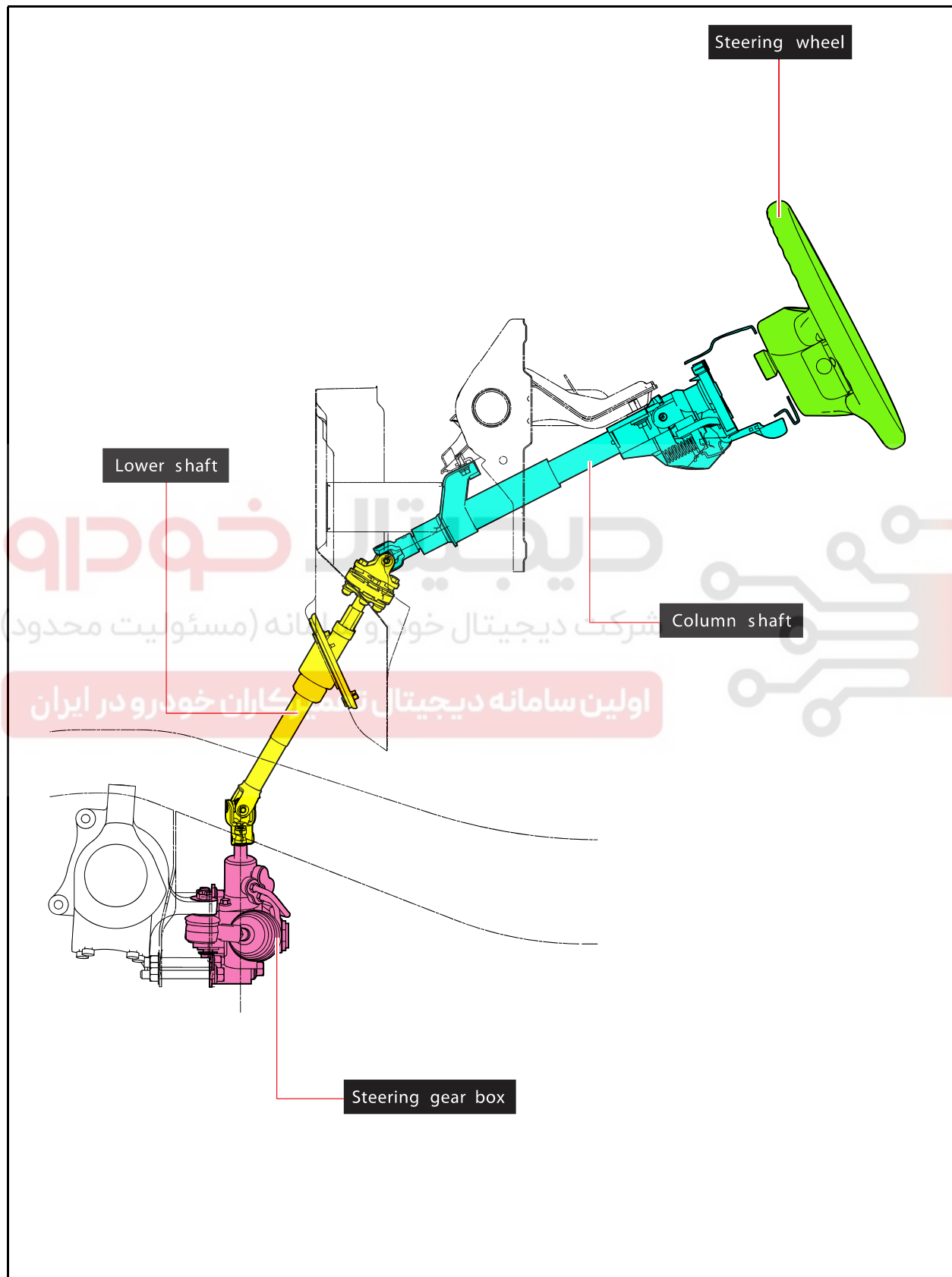
## 2. COMPONENTS



Modification basis	
Application basis	
Allocated VIN	

STEERING

ACTYON 2013.11



# STEERING

ACTYON 2013.11

Modification basis	
Application basis	
Affected VIN	021 62 99 92 92

## REMOVAL AND INSTALLATION

S.G.N.

4610-01

## TROUBLE DIAGNOSIS

Symptom	Cause	Action
Hard steering	Lack of lubrication, Abnormal wear or binding of steering ball joint due to intrusion of foreign material	Lubricate or replace
	Damaged or faulty steering gear	Replace gear assembly
	Improper preload of steering pinion	Adjust
	Faulty steering shaft joint	Replace
	Steering fluid leaks	Repair or replace
	Lack of fluid or air-in system	Replenish or bleed
	Faulty steering oil pump	Replace
	Damaged or loosened pump drive belt	Adjust or replace
	Clogging oil line	Repair or replace
	Damaged wheel or tire	Repair or replace
	Faulty suspension system	Repair or replace
Steering pulls to one side	Damaged steering linkage	Replace
	Damaged wheel or tire	Repair or replace
	Faulty brake system	Repair or replace
	Faulty suspension system	Repair or replace
Excessive wheel play	Worn steering gear	Replace gear assembly
	Worn or damaged steering ball joint	Replace
	Loosened steering gearbox mounting bolts	Retighten
Poor return of steering wheel	Damaged or binding steering ball joint	Replace
	Improper preload of steering pinion	Replace gear assembly
	Damaged wheel or tire	Repair or replace
	Faulty suspension system	Repair or replace
Steering wheel shimmy	Damaged steering linkage	Replace
	Loosened steering gearbox mounting bolt	Retighten
	Damaged or binding steering ball joint	Replace
	Worn or damaged front wheel bearing	Replace
	Damaged wheel or tire	Repair or replace
	Faulty suspension system	Repair or replace
Abnormal noise from steering system	Loosened steering gearbox mounting bolt	Retighten
	Faulty steering gear	Replace gear assembly
	Steering column interference	Repair
	Loosened steering linkage	Retighten
	Damaged or loosened oil pump drive belt	Adjust or replace
	Loosened oil pump bracket	Retighten
	Loosened oil pump mounting bolt	Retighten
	Air-in system	Bleed
	Faulty oil pump	Replace

Modification basis	
Application basis	
Allocated VIN	

STEERING

ACTYON 2013.11

S.G.N.

**4610-01 INSPECTIONS OF POWER STEERING SYSTEM****1) Power Steering Wheel Free Play Check**

1. Start the engine and place the wheels at straight ahead direction.
2. Turn the steering wheel until the tires starts to move and measure the distance on the circumference (free play) of the steering wheel.

Specified value	30mm
-----------------	------

**⚠ CAUTION**

If the free play is out of the specified value, check the free play in steering column shaft connection and steering linkage. Replace or repair if necessary.

**2) Steering Effort Check**

1. Park the vehicle on a paved and flat ground and place the front wheels at straight ahead direction.
2. Start the engine and let it run around 1,000 rpm.
3. Install the spring scale on the circumference of the steering wheel and measure the steering effort in both directions.

Steering effort	below 3.0kg
-----------------	-------------

**⚠ CAUTION**

The difference between both sides should be within 0.6 kg.





### 3) Steering Angle Check

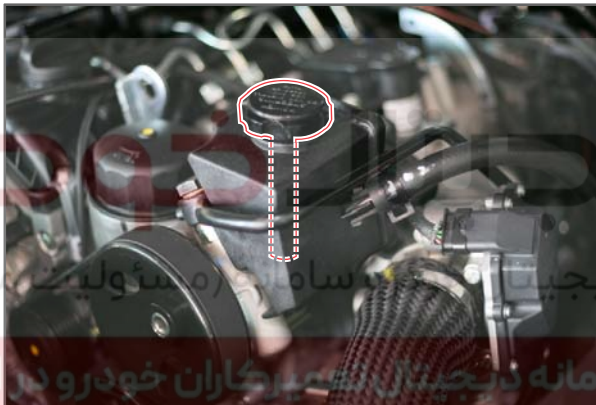
1. Place the front wheel on a turning radius measuring tool.
2. Turn the steering wheel to the its both ends and measure the maximum steering angle.

Specified value	Inner	36.2°
	Outer	32.4°

#### CAUTION

If the free play is out of the specified value, check and adjust the toe-in.

### 4) Oil Pump Pressure and Oil Level Check



#### CAUTION

To prevent internal damage, do not close the gauge valve over 10 seconds.

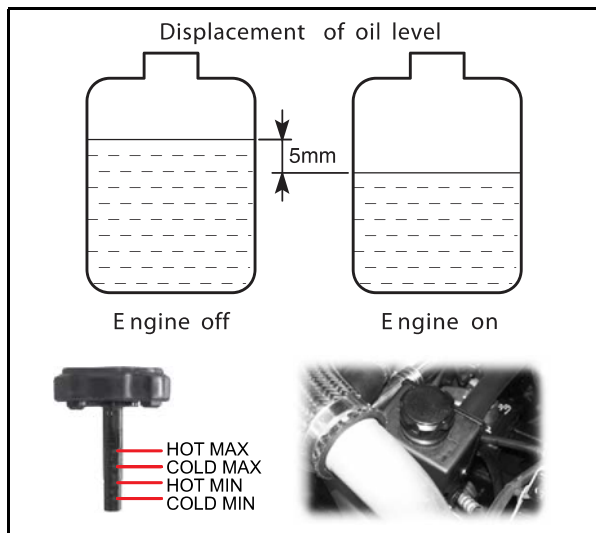
#### (1) Oil Pump Pressure

Check the oil pump pressure to locate any defect in oil pump.

1. Unscrew the pressure line fitting in power steering pump.
2. Install the pressure gauge between the power steering pump and the power steering oil pressure line.
3. Place the shift lever to neutral position.
4. Apply the parking brake.
5. Fully open the valve in pressure gauge.
6. Start the engine and let it run at idle speed.
7. Turn the steering wheel several times so that the oil temperature reaches to normal operating level (oil temperature: 50 ~ 80°C).  
Fully close the valve in pressure gauge and
8. measure the oil pressure (pump relief valve pressure).
9. Measure the oil pressure with the gauge valve fully open (with no load).
10. If the pump pressure is in specified range, the pump is normal. If not, replace the power steering pump.

Pump relief valve pressure	86.5 ~ 93.5kgf/cm <sup>2</sup>
Pump pressure at no load	3 ~ 5kgf/cm <sup>2</sup>

Modification basis	
Application basis	
Allocated VIN	



## (2) Oil Level Check

The power steering oil level have to be checked by two conditions; one is checked at normal operating temperature, and the other one is checked when it is cooled.

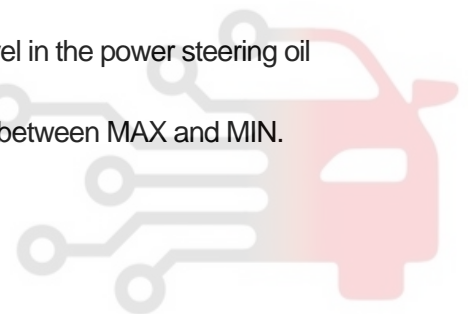
If the difference between two measurements is below 5 mm and the level is between MAX and MIN level, it's normal. If it is over 5 mm, bleed air from the system.

### ► Checking

1. Place the vehicle on a flat ground and start the engine and let it run at idle speed.
2. Turn the steering wheel several times so that the oil temperature reaches to normal operating level (oil temperature: 50 ~ 80°C).
3. Place the steering wheel at straight ahead direction.
4. Measure the oil level in the power steering oil reservoir.
5. Adjust the oil level between MAX and MIN.

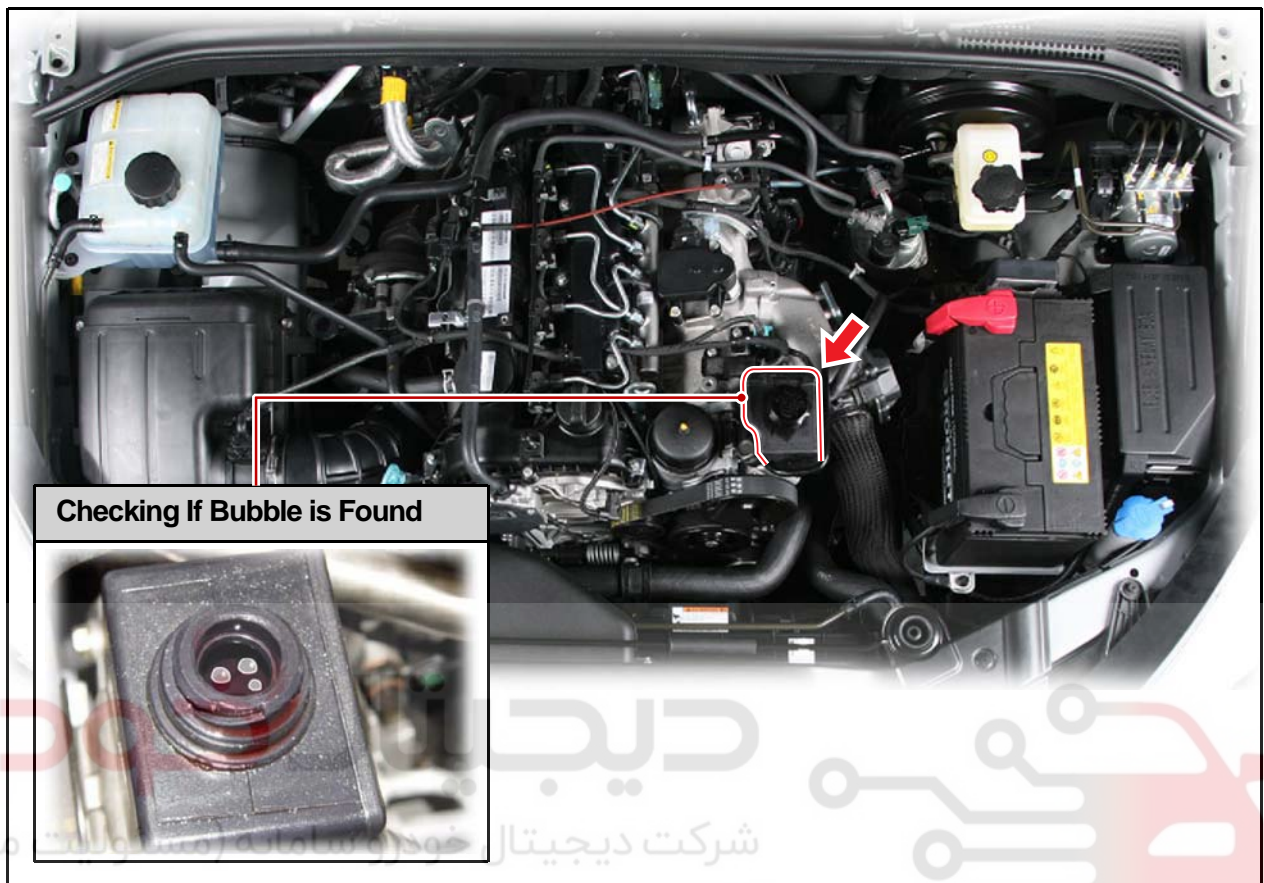
دیجیتال خودرو  
شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران





## 5) Air Bleeding From Power Steering System



Checking If Bubble is Found



### اولین سامانه دیجیتال تعمیرکاران ایران ▶ Air Bleeding

1. Lift up the vehicle with the steering wheel in straight ahead direction (No-load to tires).
2. Add the specified oil into reservoir up to the max level.
3. Turn the steering wheel to its both ends for 2 to 3 times.
4. Repeat step 3 until any bubble cannot be seen in the reservoir.
5. If any bubble is not found, add the specified oil into the reservoir to the specified level.

### ▶ Checking

1. Start the engine and repeat step 2 and step 3 after bleeding.

### ⚠ CAUTION

Position the gear shift lever to "N (M/T)" or "P (A/T)", and apply the parking brake before starting the engine.

2. This process should be performed to check if air still exists in the power steering system.

Modification basis	
Application basis	
Allocated VIN	

S.G.N.

**4610-06 STEERING COLUMN SHAFT****Preceding work**

1. Disconnect the negative battery cable and place the tires to straight ahead direction.

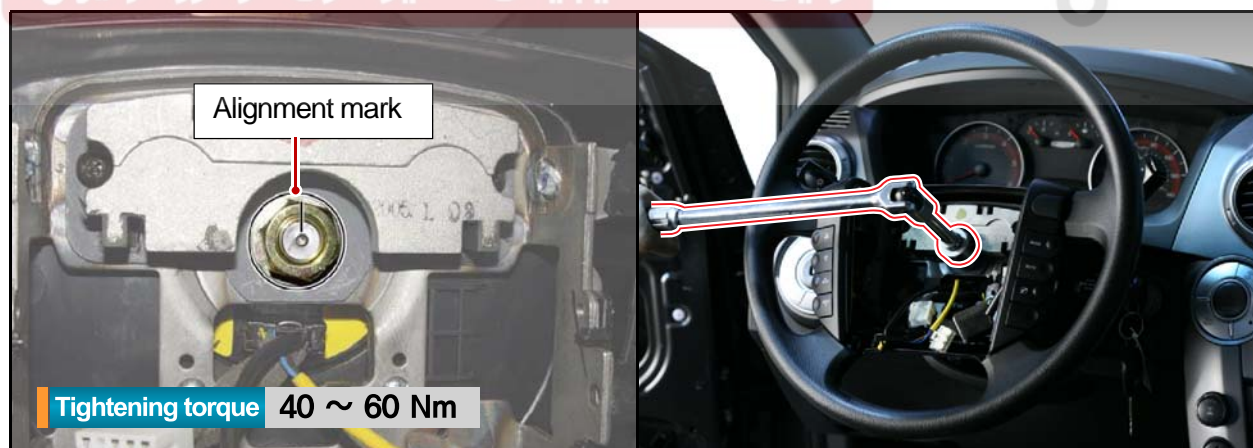
1. Unscrew the screws at both sides of steering wheel and remove the horn pad (air bag module assembly). Disconnect the airbag module connector.



2. Unscrew the steering wheel lock nut and remove the wheel with special tool.

**CAUTION**

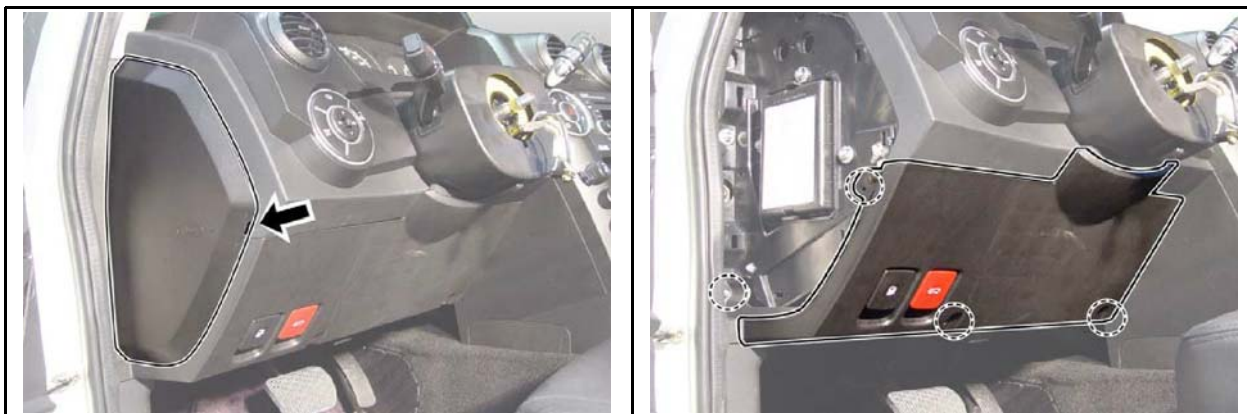
- Make an alignment marks on the column shaft and steering wheel for correct installation.
- Disconnect the remote control connectors for each component (airbag and horn).



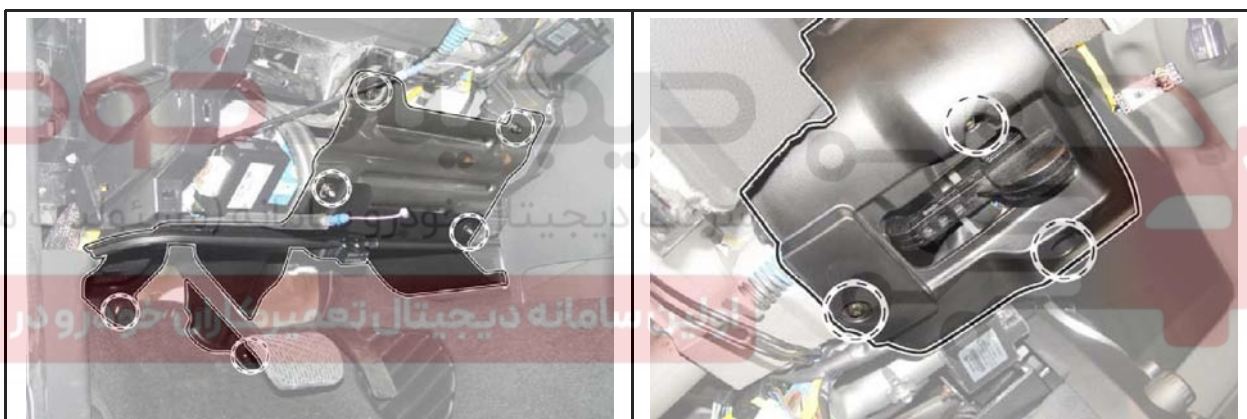
Modification basis	
Application basis	
Affected VIN	021 62 99 92 92



3. Remove the instrument panel side cover and unscrew the side lock bolt and screws to remove the instrument lower panel (refer to "Body" section).



4. Remove the protective panel and lower undercover from the lower panel. Unscrew three column cover mounting bolts from the steering column shaft and remove the upper/lower column covers.



MB 5 AT

DSI 6 AT

MANUAL  
TRANSMIMANUAL  
TRANSMITGS  
LEVER

CLUTCH

PROPELL  
ER

AXLE

TRANSFE  
R CASESUSPENS  
IONBRAKE  
SYSTEMESP &  
ABS

STEERING

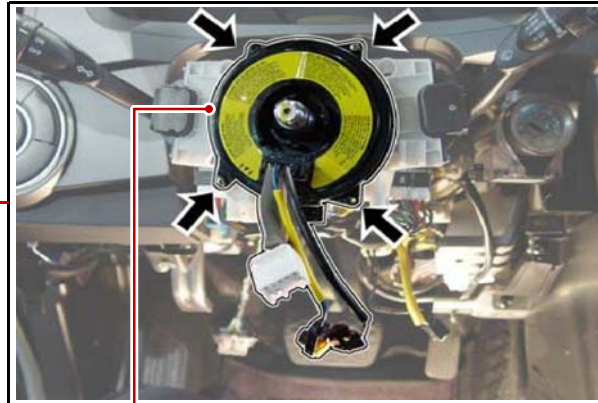
WHEEL  
TIRE

Modification basis	
Application basis	
Allocated VIN	

STEERING

ACTYON 2013.11

5. Disconnect the contact coil and connector from the column shaft and unscrew four contact coil mounting screws to remove the contact coil assembly.



Contact coil mounting screw

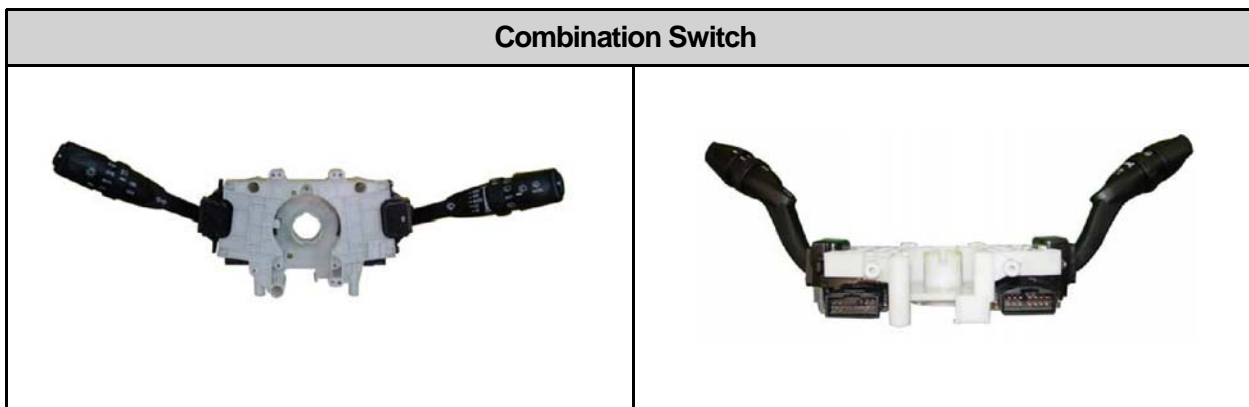


Connectors



Alignment marks

6. Disconnect the connector and unscrew the mounting screws to remove the combination switch.



Modification basis	
Application basis	
Allocated VIN	

STEERING

ACTYON 2013.11



7. Unscrew the bolts and nuts and remove the steering column shaft assembly while pulling it down.

**Mounting Bolts (3 EA)**



**Mounting Bolts (2 EA)**



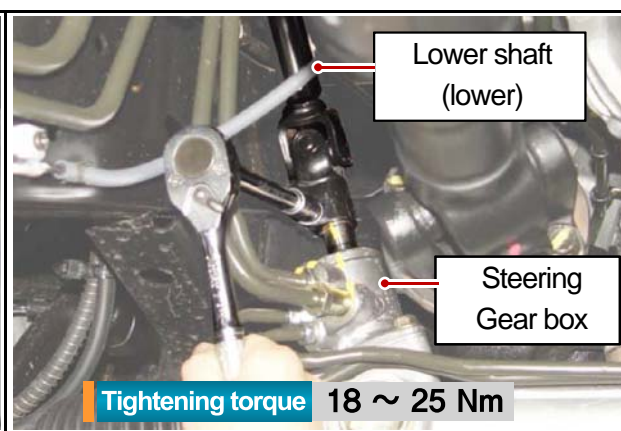
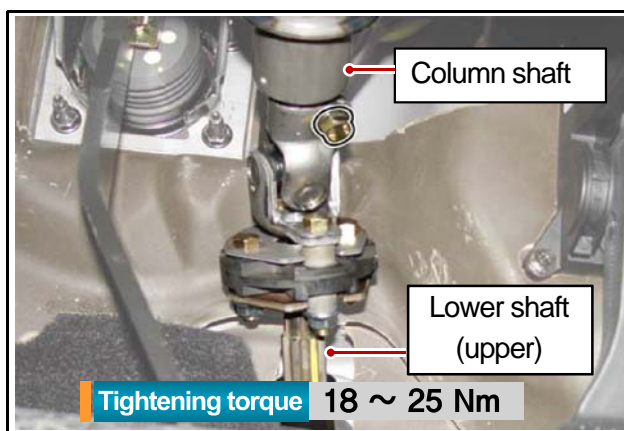
**Lower Shaft Mounting Bolt (1 EA)**



S.G.N.

## 4610-07 LOWER SHAFT

1. Remove the upper and lower lock bolts of lower shaft inside of the vehicle.



2. Remove the lower shaft mounting nuts on the floor at driver's side.

Tightening torque 7 ~ 11 Nm

3. Remove the lower shaft by pulling it up.

**CAUTION**

- Install the lower shaft so that the lock bolt can be inserted into the point without spline. Be cautious of the alignment marks.
- 

## Lower Shaft



Modification basis	
Application basis	
Allocated VIN	

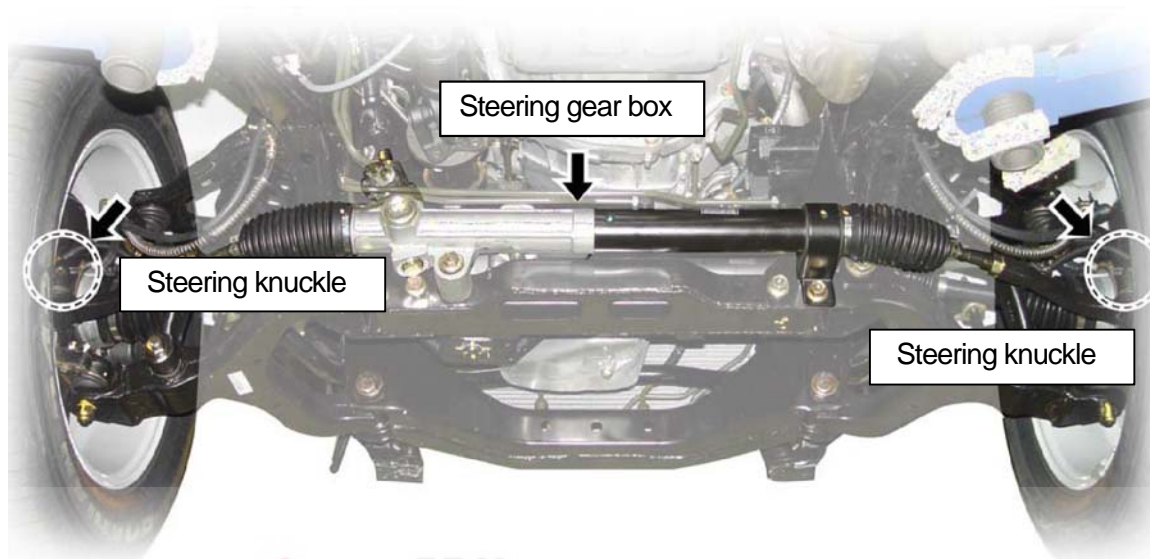
STEERING

ACTYON 2013.11

S.G.N.

**4620-02 STEERING GEAR BOX****Preceding work**

1. Disconnect the negative battery cable.
2. Remove the tire.



1. Remove the tie rod from steering knuckle.  
Remove the cotter pin and lock nut to remove the tie rod using a tool.

**STEERING**

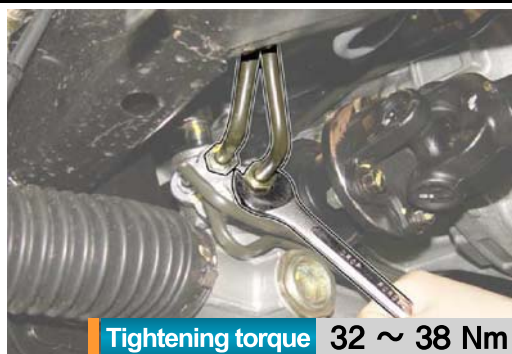
ACTYON 2013.11

Modification basis	
Application basis	
Affected VIN	021 62 99 92 92



3. Disconnect the power steering pipes and remove the steering gearbox mounting bolts.

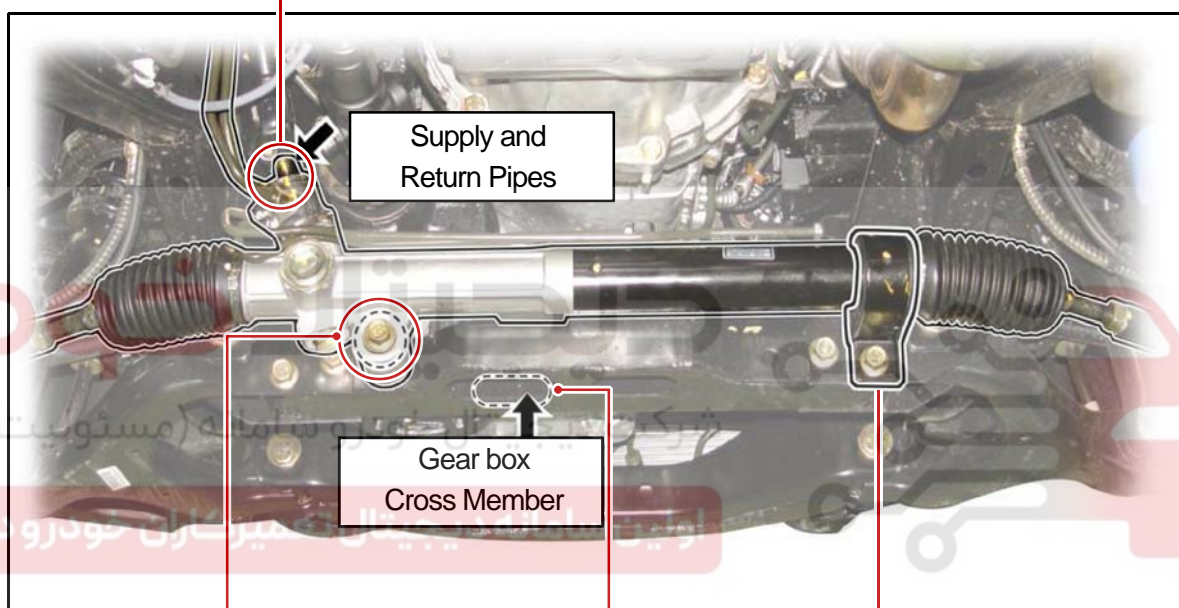
#### Supply and Return Pipes



Tightening torque 32 ~ 38 Nm

#### CAUTION

- Plug the pipe openings with caps.
- Be careful not to spill the oil on the floor and vehicle body.
- Be careful of O-ring from being off the position.



#### Gear Box Mounting/Gear box Cross Member

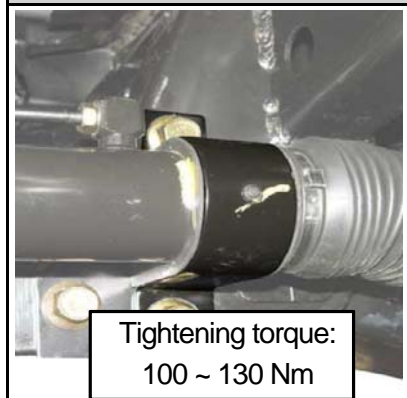


Tightening torque:  
100 ~ 130 Nm



Tightening torque:  
100 ~ 130 Nm

#### Gear box Mounting Clamping Bolt



Tightening torque:  
100 ~ 130 Nm

#### CAUTION

Tighten the center bolt/nut first, and then tighten the left mounting bolt with the specified tightening torque.

Modification basis	
Application basis	
Allocated VIN	

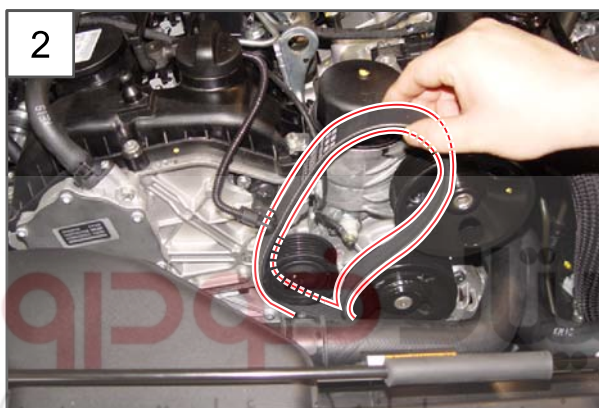
## 4711-01 POWER STEERING PUMP



1. Collect the power steering oil from the power steering reservoir using an oil suction device.

### CAUTION

Make sure that no power steering oil contacts to other objects.

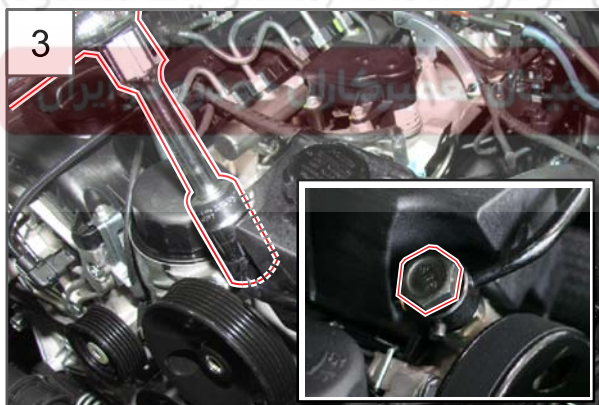


2. Remove the fan belt.



### NOTE

Remove the fan belt.



3. Unscrew the eye bolt (24 mm) for oil supply pipe.

**Tightening torque** 53.9 ~ 63.7Nm



### CAUTION

- Make sure that no power steering oil contacts other objects when disconnecting the pipe and hose.
- Cover the pump with a sealing cap.



4. Release the clamp and remove the return hose.



### CAUTION

Cover the inlets of the pipe and steering gear box with sealing caps.

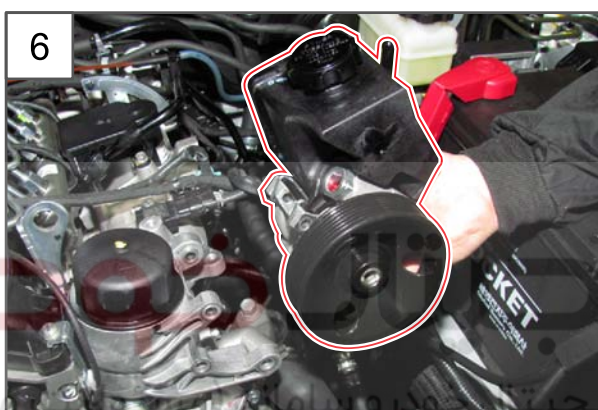






5. Unscrew three bolts (13 mm) from the power steering pump.

**Tightening torque** 20 ~ 23Nm



6. Remove the power steering pump.



**NOTE**

After reinstallation, add the oil with the same specifications and bleed the air from the system.



**CAUTION**

Check for oil leaks at the connection part of the pipe and hose.

**Steering gear pump**

**Pump**

**Reservoir**



High pressure pipe

Oil from reservoir



to power steering pump

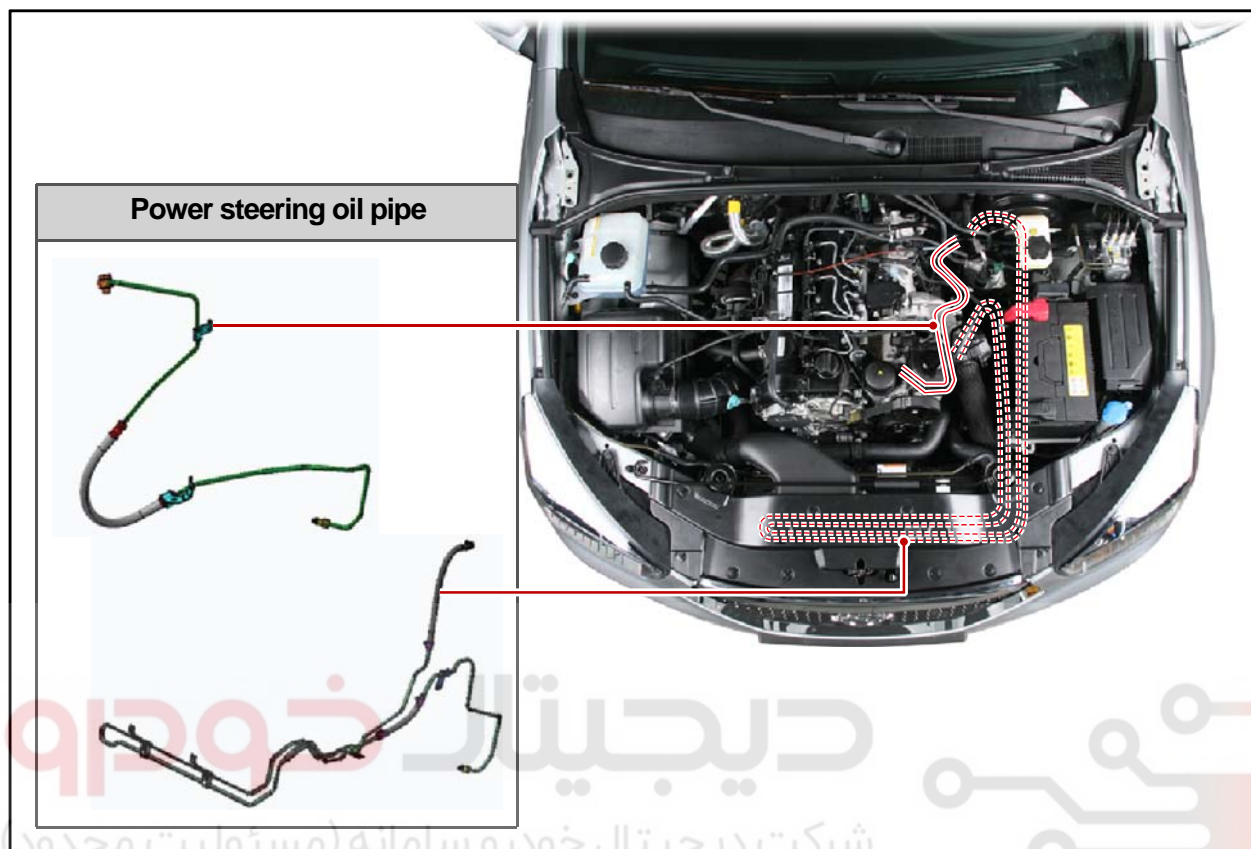
Modification basis	
Application basis	
Allocated VIN	

STEERING

ACTYON 2013.11

S.G.N.

## 4640-01 POWER STEERING OIL PIPE



1. Remove the front bumper.

**NOTE**

Refer to Chapter "Body Exterior".

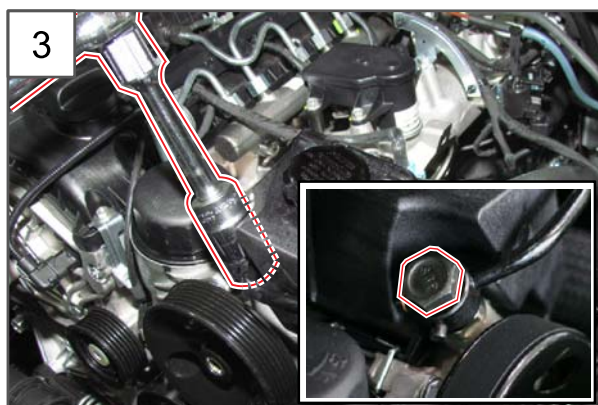


2. Open the power fluid reservoir cap and drain the fluid completely with oil suction device.

**CAUTION**

Make sure that no power steering oil contacts to other objects.





3. Unscrew the eye bolt (24 mm) for oil supply pipe.

**Tightening torque** 53.9 ~ 63.7Nm

**CAUTION**

- Make sure that no power steering oil contacts other objects when disconnecting the pipe and hose.
- Cover the pump with a sealing cap.



4. Release the clamp and remove the return hose.

**CAUTION**

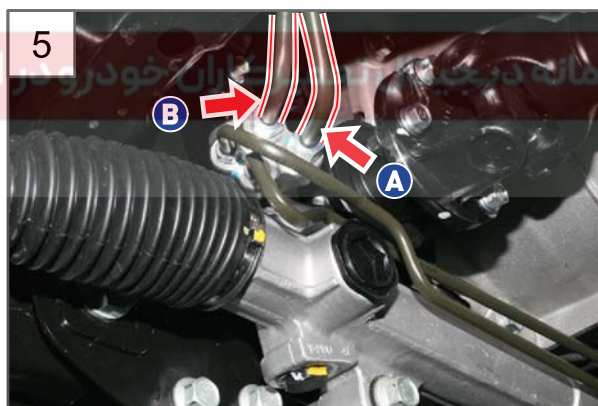
Cover the inlets of the pipe and steering gear box with sealing caps.



5. Remove the supply pipe (A) and the return pipe (B).

**Tightening torque** (A) 31.4 ~ 37.3Nm

**Tightening torque** (B) 31.4 ~ 37.3Nm



**CAUTION**

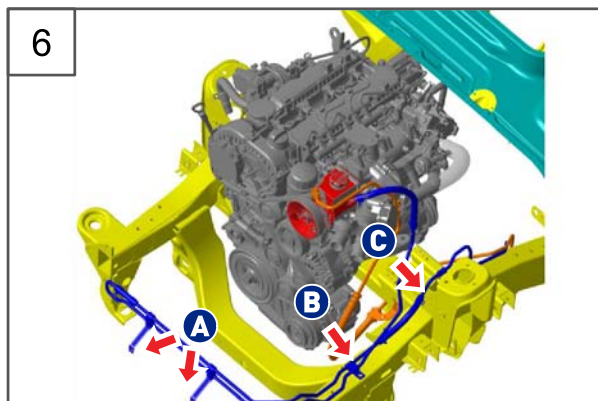
Cover the inlets of the pipe and steering gear box with sealing caps.



Modification basis	
Application basis	
Allocated VIN	

STEERING

ACTYON 2013.11

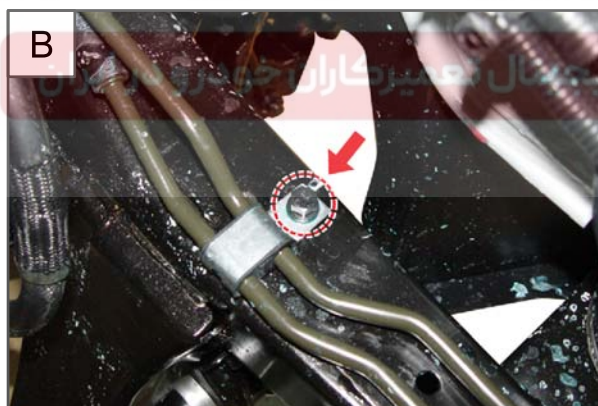


6. Remove the oil return pipe.



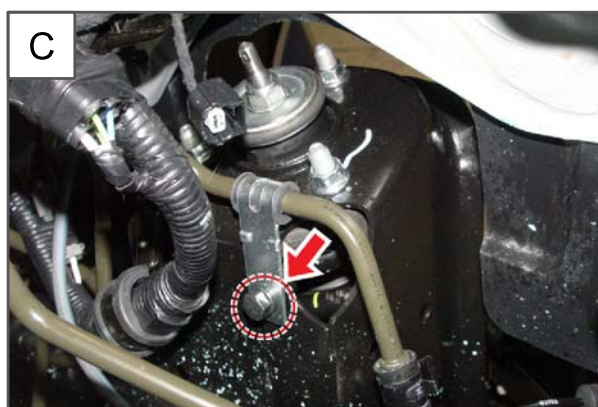
A. Unscrew two bolts (10 mm) from the return pipe mounting clamp on the front bumper.

**Tightening torque** 10 ~ 12Nm



B. Unscrew one bolt (M8) from the return pipe mounting clamp on left side of sub frame (over the stabilizer bar).

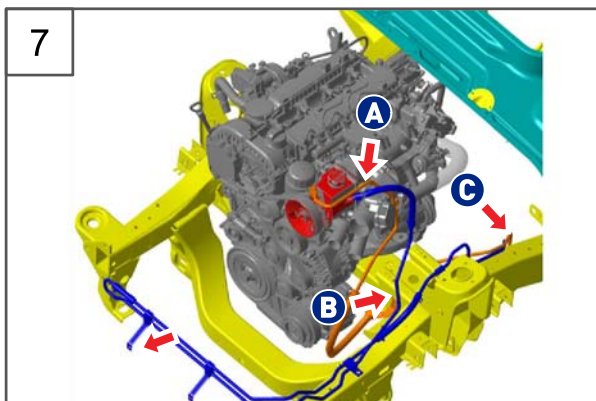
**Tightening torque** 10 ~ 12Nm



C. Unscrew one bolt (M8) from the return pipe mounting clamp on left side of sub frame (suspension upper mounting) and remove the return oil pipe.

**Tightening torque** 10 ~ 12Nm





7. Remove the oil supply pipe.



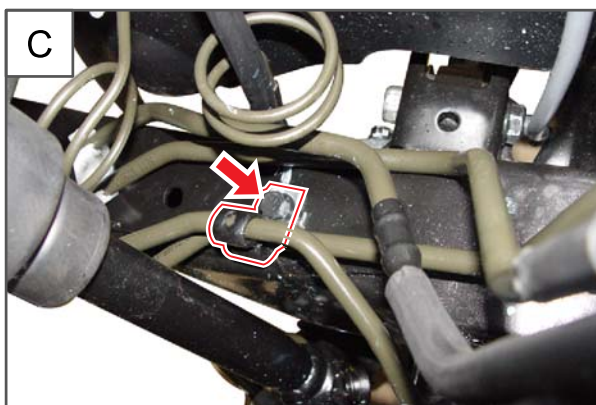
A. Unscrew one bolt (10 mm) from the intake manifold.

**Tightening torque** 10 ~ 12Nm



B. Unscrew one bolt from the high pressure pipe mounting clamp on the left side of sub frame (air bleeder hose for differential).

**Tightening torque** 10 ~ 12Nm





C. Release the clamp on the left side of sub frame (lower shaft) and remove the oil supply pipe.

**Tightening torque** 10 ~ 12Nm

Modification basis	
Application basis	
Allocated VIN	

STEERING

ACTYON 2013.11

Oil supply pipe	Oil return hose & pipe
	

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

