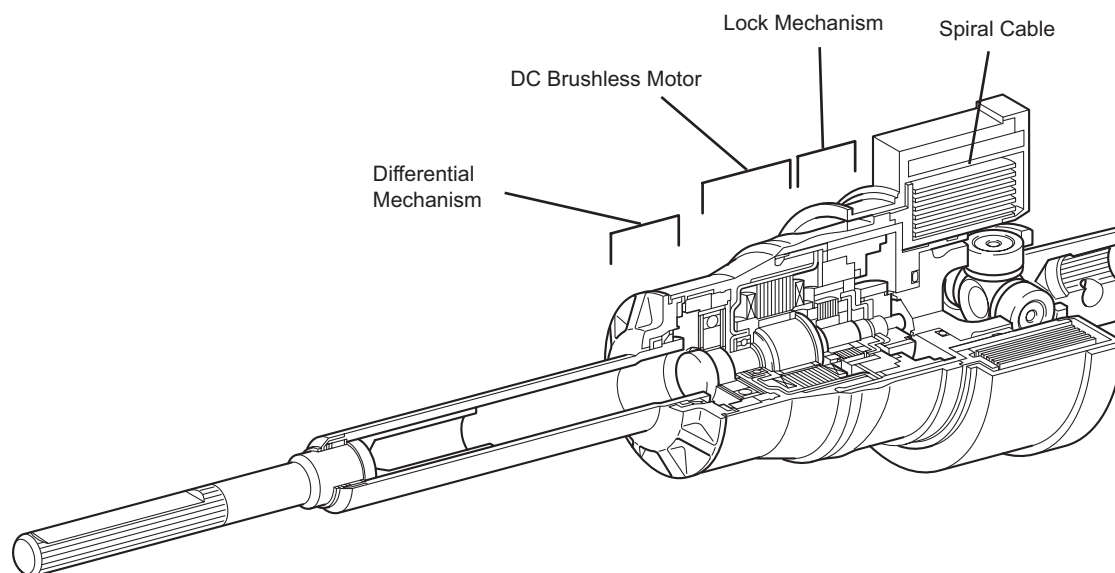
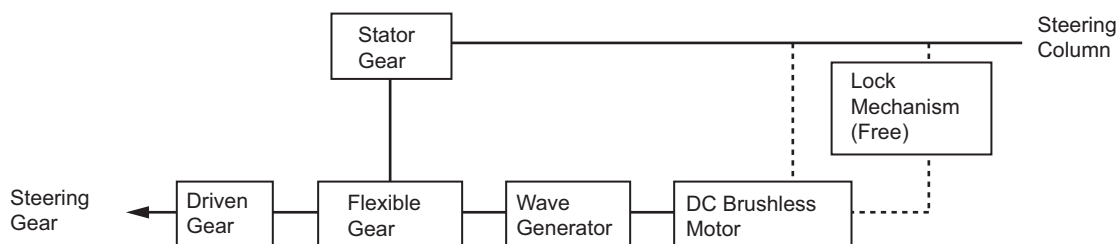
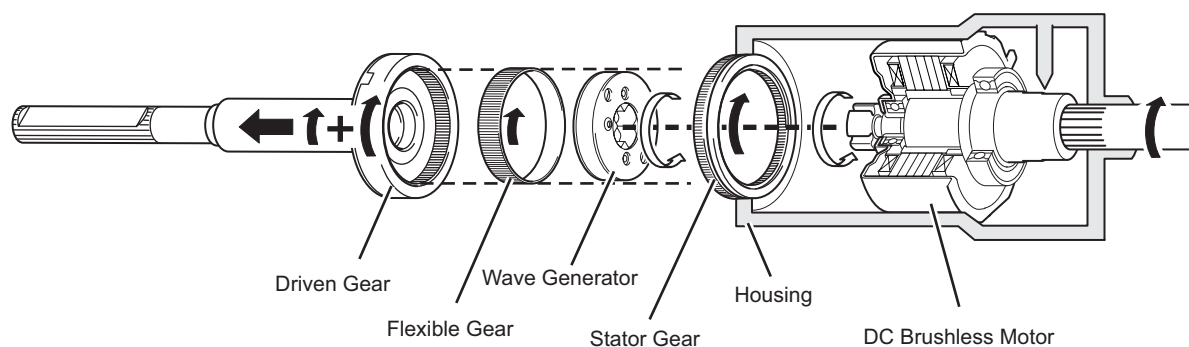


VGRS Actuator

- The VGRS actuator consists of a reduction mechanism, DC brushless motor, lock mechanism, and spiral cable.
- The rotational movement of the steering wheel travels via a rubber coupling to the housing of the VGRS actuator. The cases of the DC brushless motor and the stator gear are secured to the housing.
- The VGRS ECU outputs control signals and supplies power to the DC brushless motor, causing the motor to rotate. This causes the cam of the wave generator in the reduction mechanism to rotate, causing the flexible gear to rotate. The flexible gear rotates inside the stator gear and causes the driven gear, which is located coaxially, to rotate.
- Due to the foregoing operations, the VGRS actuator generates a wheel turning angle that is greater than the amount of steering effort.



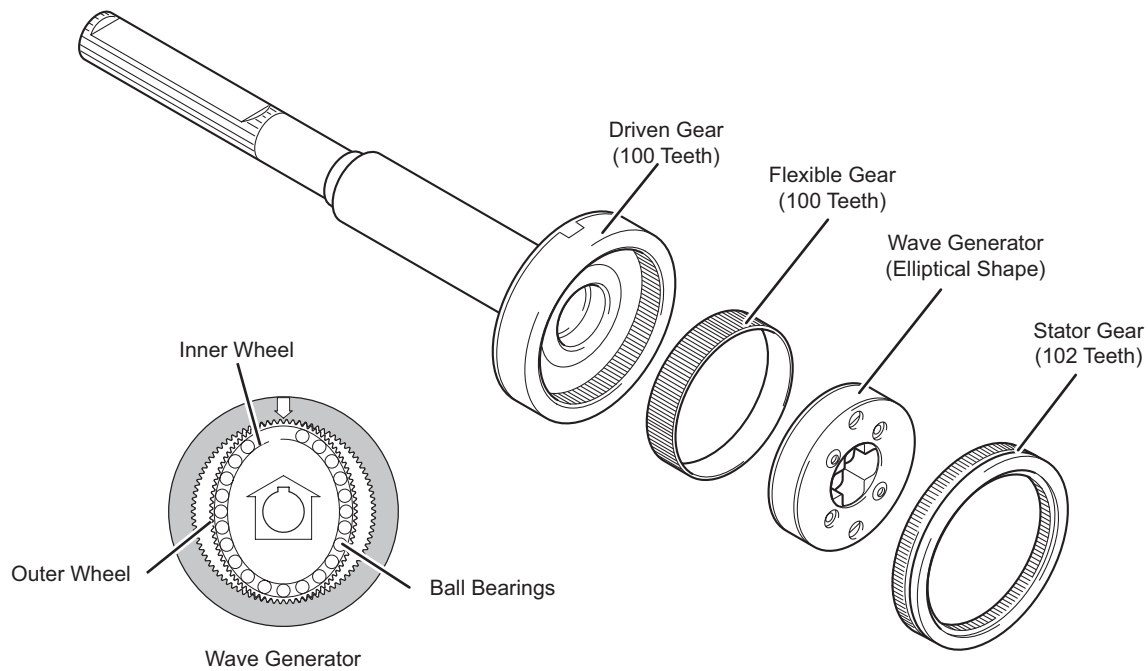
VGRS Actuator



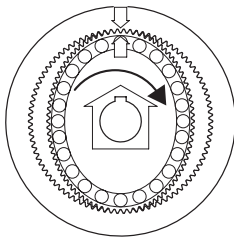
Transfer Course

Reduction Mechanism

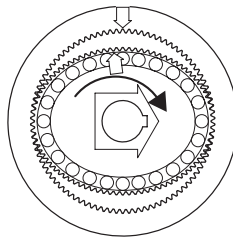
- The reduction mechanism uses Strain Wave Gearing, which is compact and highly accurate, and creates a large reduction ratio using a small number of components.
- The strain wave gearing consists of a stator gear, driven gear, flexible gear, and wave generator. The rotational movement of the wave generator causes the flexible gear to deform and create a rotational difference between the stator gear and the driven gear.
- The stator gear has 102 teeth, and the driven gear has 100 teeth, therefore, the stator gear has two more teeth than the driven gear.
- The flexible gear consists of an elastic metal body that is shaped into a thin belt.
- The wave generator consists of an oval cam, an inner ring that is secured to the cam, ball bearings, and an outer ring that can undergo elastic deformation.



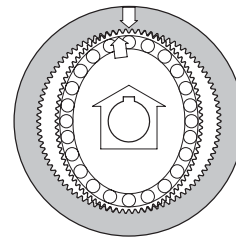
Speed Reduction Mechanism (Strain Wave Gearing)



The wave generator deforms the flexible gear into an oval shape. The teeth at the major axis of the oval shape mesh with the teeth of the stator gear. The minor axis is completely separated from the teeth of the stator gear.



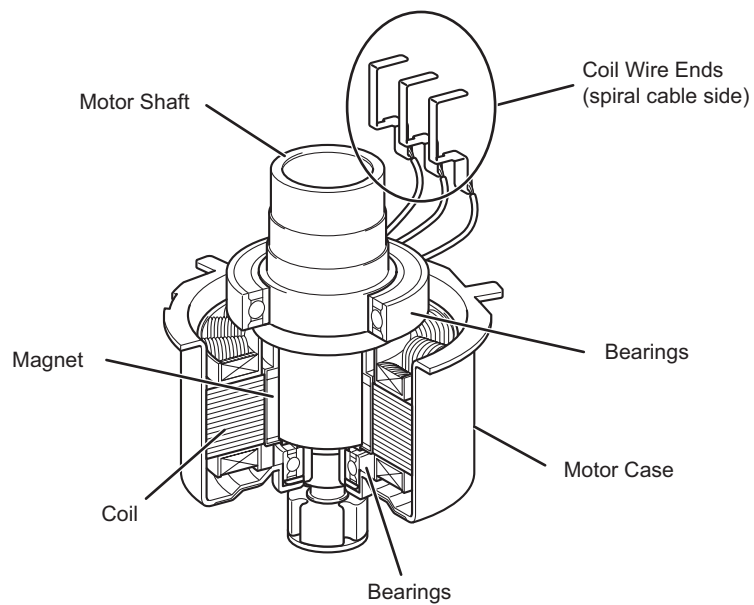
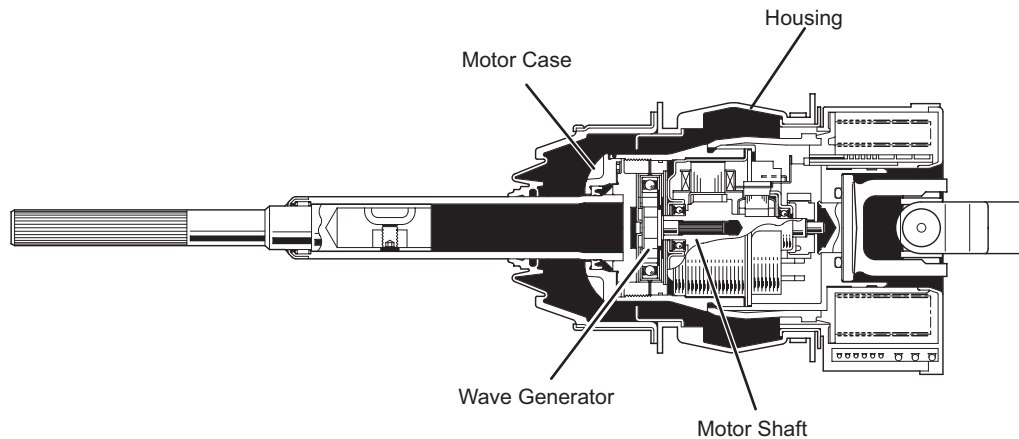
When the wave generator (input) rotates clockwise while the stator gear remains stationary, the flexible gear undergoes elasticity deformation. This causes the position in which it meshes with the teeth of the stator gear to move.



When the wave generator makes one complete revolution, the driven gear will rotate counterclockwise (opposite of the rotational direction of the wave generator) by two teeth. This is because the driven gear has two fewer teeth than the stator gear. The resulting rotational difference is produced as an output.

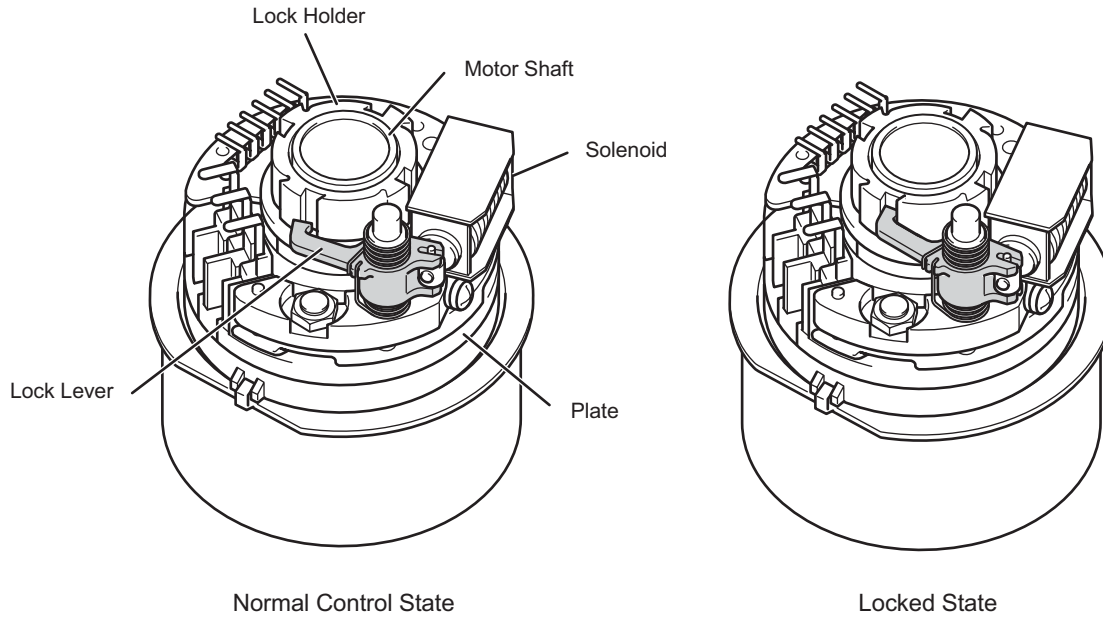
Structure of DC Brushless motor

- A DC motor that is compact, has high power output, generates less noise, and is brushless, is used.
- This DC motor mainly consists of a coil, magnet, and motor shaft.
- The DC brushless motor is installed in the steering wheel end of the housing. The motor shaft is coupled to the wave generator of the reduction mechanism.



Lock Mechanism

- The lock mechanism consists of a solenoid, lock lever, and lock holder, and is secured to the motor shaft.
- In case of a system failure, or when the ignition switch is OFF, the lock mechanism locks the motor shaft and prevents it from rotating, in order to enable the same steering operation as the conventional steering.

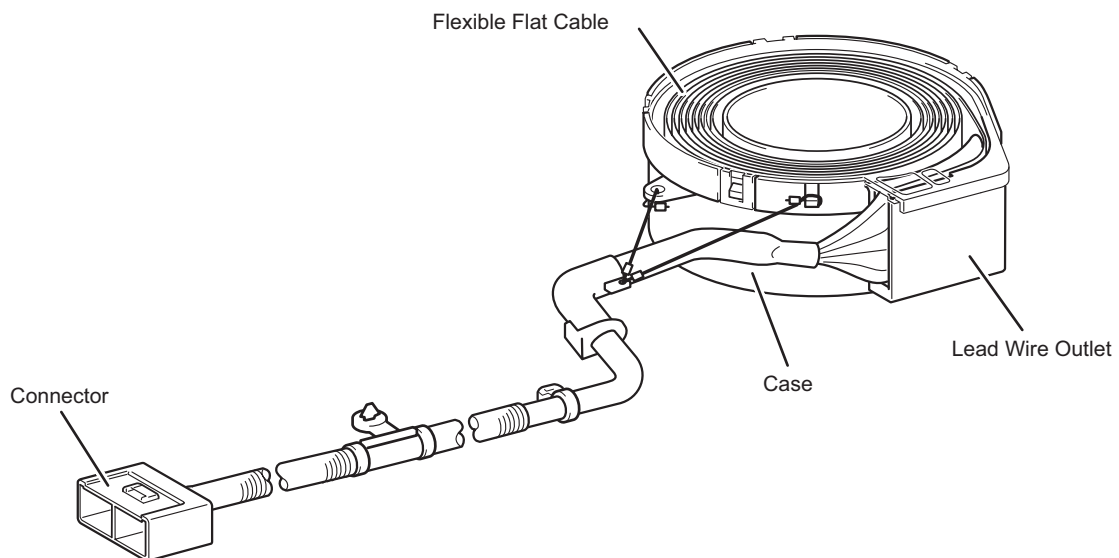


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Spiral Cable

- A dedicated spiral cable is used for the VGRS actuator.
- The flexible flat cable has a dual construction, consisting of a power supply system for driving the motor, and a signal system.



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