DENSO

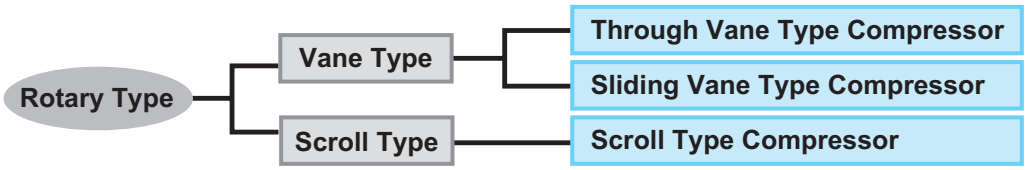
Basic Technology Series

Compressor Fundamentals

2009
Compressor
#003

Rotary Type Compressors

There are two types of rotary compressor, a vane type and a scroll type. Further, there are two vane types, a through vane type and a sliding vane type.

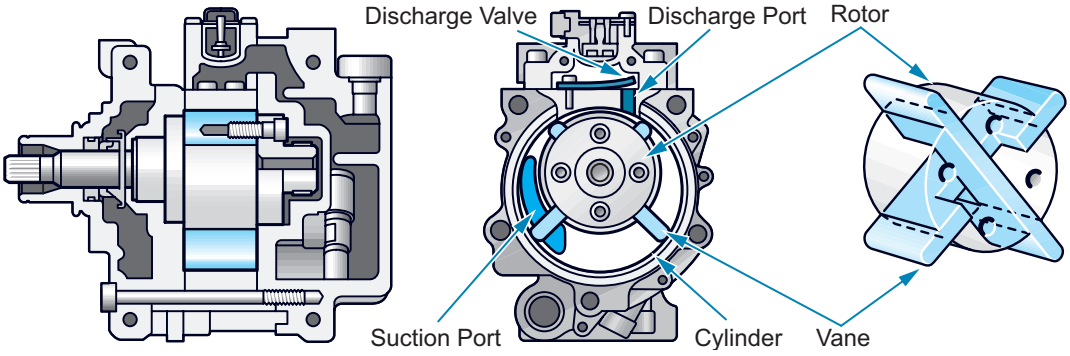


Through Vane Type Compressor

■ Construction and Characteristics

The through vane type compressor is constructed from a rotor, two vanes that transect the rotor, and a cylinder. As the rotor turns, the two vanes slide in the groove of the rotor so that they always rotate with both ends making contact with the inner face of the cylinder. This creates an operation chamber between the rotor, which moves as one with the shaft, and the vane and inside surface of the housing. As the capacity of this chamber is increased and then decreased, a refrigerant gas suction-compression-discharge cycle takes place.

The characteristic of this system is that the rotation of the vane ensures smooth movement and good balance. This results in low friction loss between the vane and the cylinder and high cooling performance per unit of horse power consumed.



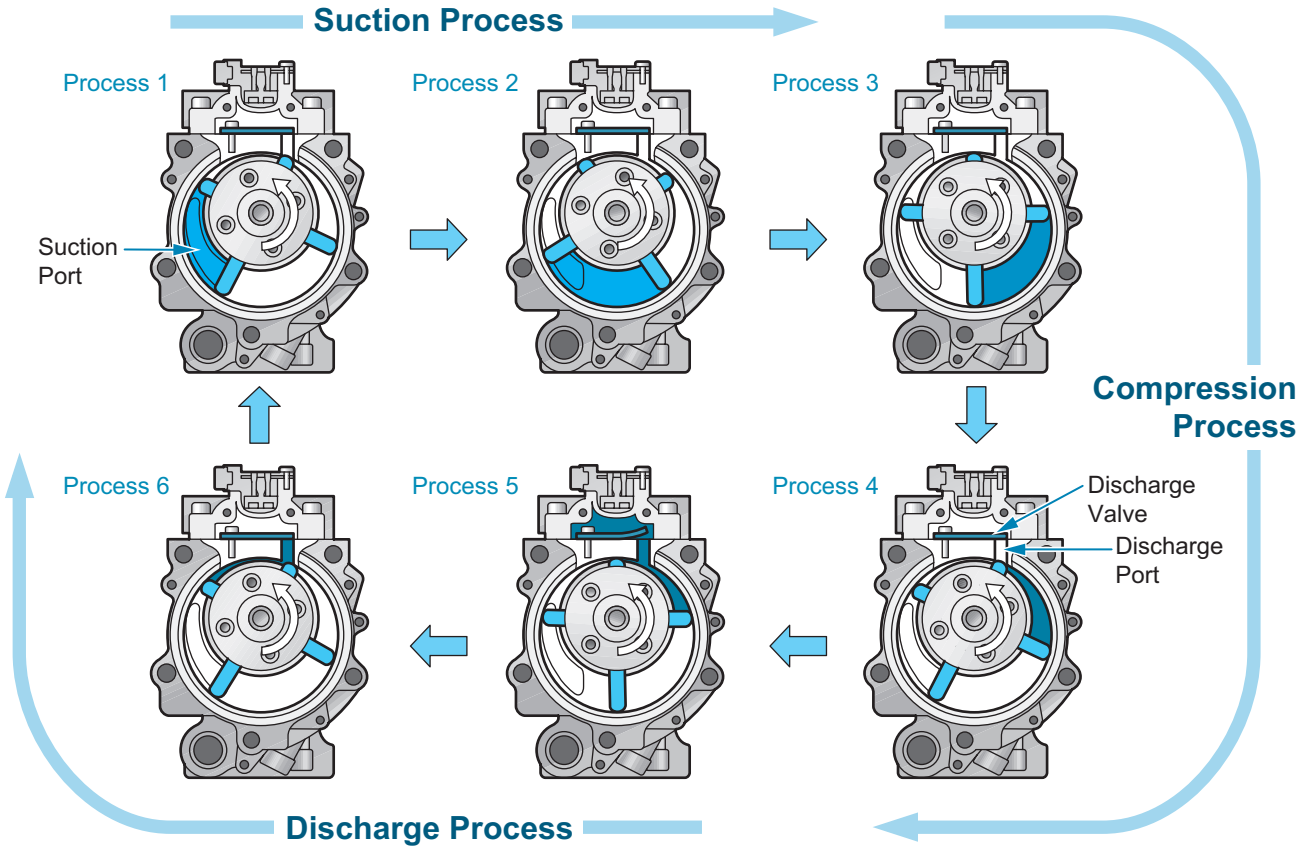
■ Operation

- **Suction** (Process 1, 2): As the rotor rotates, so do the two through vanes. This causes capacity of the space enclosed by the vane and the cylinder inside surface to increase, which sucks in refrigerant gas from the suction port.
- **Compression** (Process 3): As the rotor rotates further, the capacity of the space enclosed by the vane decreases, and the refrigerant gas is compressed.

IN THIS ISSUE

Through Vane Type Compressor (continued)

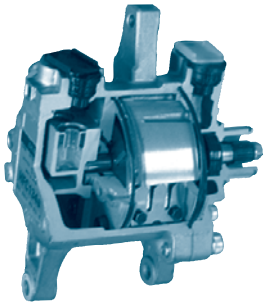
- **Compression to Discharge** (Process 4, 5): When the vane rotates to the discharge port, the highly compressed refrigerant gas pushes open the discharge valve, and is discharged.
- **Discharge** (Process 6): When the second vane passes the discharge port, the capacity of the space enclosed by the vanes begins to increase, and the suction-compression-discharge process starts again.

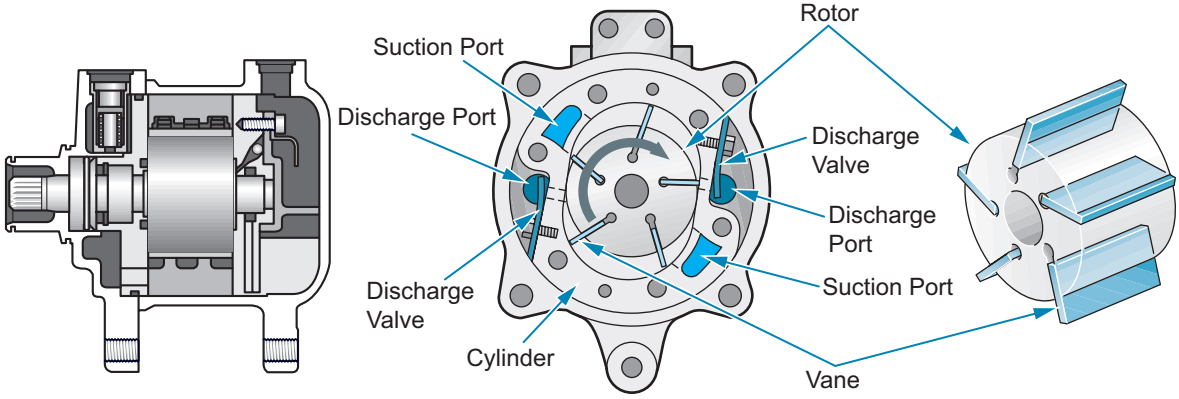


Sliding Vane Type Compressor

■ Construction and Characteristics

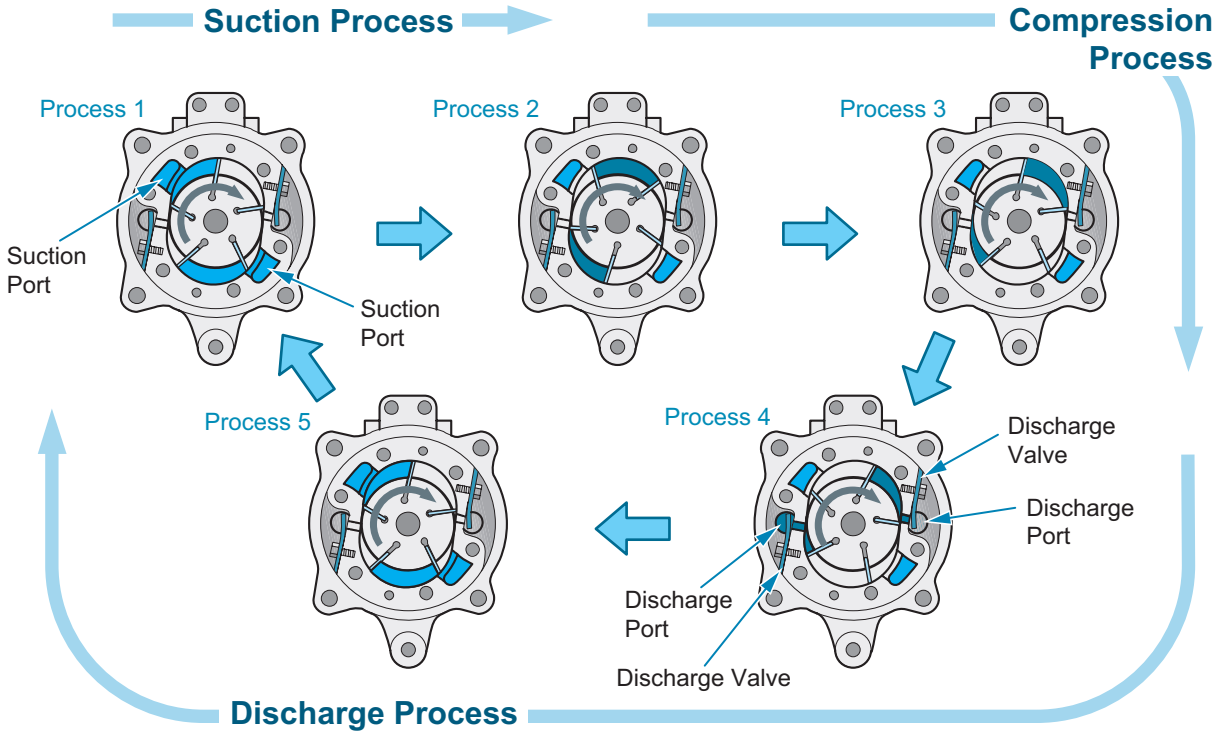
The sliding vane type compressor is constructed from a cylinder with an oval cross section and a rotor with vanes attached. As the rotor rotates the vanes are pushed out to the inner surface of the cylinder. This rotates the inside of the cylinder and causes a refrigerant gas suction-compression-discharge cycle. Compared with the swash type compressor, the small number of parts allows a small and lightweight design.





■ Operation

- **Suction** (Process 1): As the vanes rotate together with the rotor, the cubic volume of the cylinder chamber divided by the vanes increases, and refrigerant gas is sucked in from the suction port.
- **Compression** (Process 2 to 3): After suction is completed and the vanes rotate further, the chamber capacity decreases, and the refrigerant gas is compressed.
- **Discharge** (Process 4 to 5): As the vanes rotate further, the refrigerant gas is compressed to a high pressure. This pressure forces open the discharge valve and the refrigerant gas is discharged. The inside of the cylinder is divided into five chambers by the vanes, and each chamber performs two suction-compression-discharge cycles for each rotation of the rotor.

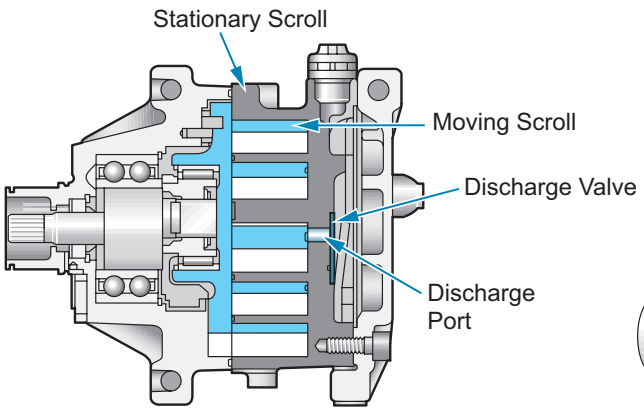


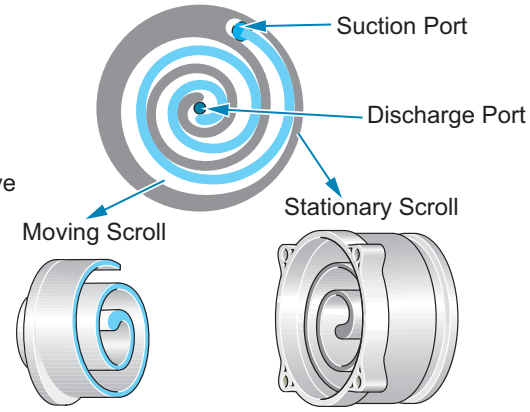
Scroll Type Compressor

■ Construction and Characteristics

The scroll type compressor is constructed from a moving scroll and stationary scroll, both spiral-shaped. These are engaged together and the moving scroll makes a circular movement. This compresses the refrigerant gas by forcing it from the outer section to the inner section.

The compressed refrigerant gas is discharged from the discharge port at the center.





Scroll Type Compressor (continued)

Operation

- **Suction** (Process 1): As the moving scroll makes a circular movement, the cubic volume between it and the stationary scroll increases. This opens the suction port and sucks in refrigerant gas.
- **Compression** (Process 2 to 5): As the moving scroll moves further, the suction port closes and the refrigerant gas is compressed.
- **Discharge** (Process 6 to 8): After the moving scroll completes two and a half circular movements, the refrigerant gas is compressed to a high pressure. This pressure opens the discharge valve, and finally the refrigerant gas is discharged from the discharge port.