



STEPPER MOTOR EXPANSION VALVES



The Castel control valve has been designed to work with a reduced number of steps.

Thanks to this feature, the valve is able to quickly react to system fluctuations. The quick response time enables the valve to keep the superheat in the order of 0,5°C.

Thanks to the easy installation and composition, Castel expansion valves are compatible with all drivers available on the market and managed by any logic of the command system.

Castel stepper motor expansion valves regulate the flow of refrigerant liquid into evaporators, by modulating the opening and closure of the shutter into a calibrated orifice, allowing a wide range of power variation.

These are angle valves that permit the bidirectional flow of the refrigerant, ensuring a high precision and reliable control in both directions and contribute to increase the efficiency of the entire refrigerating system.

The valves are available in three size that are related to the size of the valve body.

Each "Body Size" has different calibrated orifices covering three ranges of power gradually increasing; the overall range of power is from 22 to 90 kW, taking as reference the refrigerant R410A.

Stepper motor expansion valves can be used in a wide range of applications as listed below:

- Refrigeration systems (supermarkets)
- Air conditioning systems
- Heat pump systems

Operation

Castel stepper motor expansion valves are lamination devices that receive the liquid from the condenser and inject it into the evaporator, operating the necessary pressure drop across the expansion orifice by adjusting the value of the superheat in the evaporator itself.

Continuously adjustable valves are equipped with a linear stepper motor, whose positioning is controlled by an external electronic device called a "driver".

This device carries out the calculation of superheat by the reading of the pressure and temperature transducers at the evaporator outlet and in turn generates a signal sent to the stepper motor that is transformed into movement/positioning of the valve stem. For this reason the stepper motor expansion valve is able to provide a very accurate regulation of refrigerant flow and is, therefore, able to control the value of superheat even under strong thermal load changes, or under large power variation of the refrigeration cycle.

Stepper drive

A stepper motor is an electromechanical device that converts electrical pulses into discrete mechanical movements. The shaft or spindle of a stepper motor rotates in discrete increments when electrical command pulses are applied to it in the correct sequence. The sequence of the pulses is directly related to the direction of rotation of the motor shaft. While the frequency of the input pulses is directly related to the speed of rotation of the same. The rotation of the motor shaft causes the rotation of the nut screw integrated with the shaft itself, inside which moves the threaded screw of the shutter. This system of screw/nut screw ensures the transformation from rotary motion into a translational movement, whose positioning precision depends either on the pitch angle of the screw, or from the coupling precision of the system for converting the motion.

Control system

Each motorized valve, in order to operate as an expansion valve, must be equipped with a control system. This system must be composed of both hardware and software control. It is precisely the efficiency of this control system, the design of the internal algorithm that generates an efficient or not so efficient expansion valve system.

The motor of the Castel motorized valve can be powered by both 12 volts and 24 volts with phase currents ranging from 150 to 600/900 mA. It is able to support both full-step and half-step control logics, and is capable of operating up to drive speeds of 20mm/s (500 step/s) with the 24 volt drive.

A stepper motor is subject to the loss of steps during continuous operation.

The driving driver of a stepper valve, to ensure correct operation of the valve over time, must implement an algorithm capable of estimating the recovery of steps lost during operation.

This guarantees the necessary precise adjustment during the entire adjustment time.

Download the 2020 General Catalogue from our web site: castel.it to see our complete expansion valve range (and not only!).