

## Sales Application Note

# Compressor's Control in Refrigeration Units

### APPLICATION

In refrigeration equipment, the compressor has two main functions in the refrigerant cycle. First, it extracts the vapor from evaporator, thus reducing the pressure to a proper value for keeping the evaporating temperature constant. Additionally, the compressor rises refrigerant vapor temperature, allowing the correct heat exchange with the cooling medium for condensing the refrigerator.



Using Fuji Electric frequency inverters for controlling the speed of the compressor in the refrigeration unit, energy efficiency can be increased. Adapting compressor speed to operating conditions will reduce energy consumption of the compressor, but will also help to increase the efficiency of the heat exchangers on the cooling outlets.

### APPLICATION REQUIREMENTS

Basic control strategy is based on a PID control of the pressure at the output of the evaporator circuit (inverse PID operation). Fast control response for keeping the input pressure constant regardless of operating conditions is mandatory. Timer control between motor start-ups might be also required. Multi-compressor control is a must in some applications.

### FUJI ELECTRIC SOLUTION

Basic Fuji Electric solution for one compressor systems is based on FRENIC-HVAC inverter, using the inverter built-in PID control. Pressure transducer is connected to current analog input (0 to 20mA or 4 to 20mA selectable).





For more complex applications, where multi-compressor schematics are implemented, recommended Fuji Electric solution is based on FRENIC-AQUA inverter, using the inverter built-in PID control (several multi-compressor strategies available). Pressure transducer is connected to current analog input (0 to 20mA or 4 to 20mA selectable).

### ADVANTAGES OF FUJI ELECTRIC SOLUTION

- Powerful PID control built in the inverter (1 main PID, 2 gains set and 3 auxiliary PID). With multi-compressor complete controls and compressor working time balancing functions available in FRENIC-AQUA inverter.
- Automatic energy savings function, reaching higher energy savings' rates at low speeds.
- 3 values of jump frequency selectable, for avoiding mechanical and gas resonance frequencies. Easy and fast tool integrated in inverter's keypad to set these frequencies during commissioning.
- Possible setting of start-up timer for compressor, ensuring proper lubrication and protecting mechanics. Maximum starts-per-hour function also available.
- An increase in compressor capacity might be possible by increasing compressor maximum speed.
- DC Reactor and EMC filter built-in up to 90kW (C2 supported, 2<sup>nd</sup> environment supported), EMC filter built-in 110kW to 710kW (C3 supported, 2<sup>nd</sup> environment).
- Protective structure IP21 or IP55 can be selected with the model up to 90kW.
- Lower pressure differences reduce mechanical stress for valves and pipes and reducing starting currents help cost reduction of the installation.