



# Application software libraries for chillers

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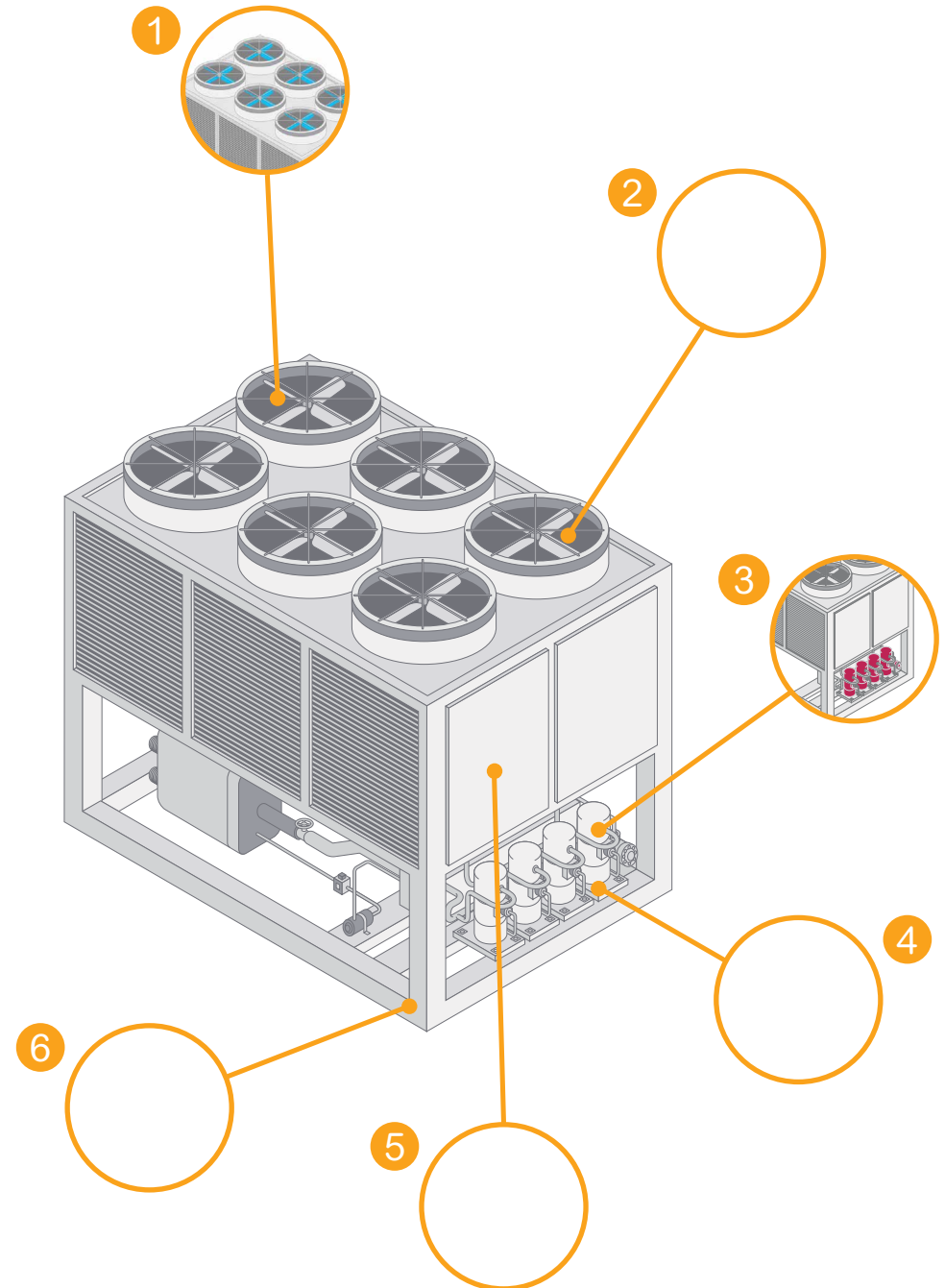


# Application software libraries for chillers

Shorten your engineering time with extensively tested application software! SoMachine™ libraries provide software functionality in the form of ready-to-use function blocks (AFBs = Application Function Blocks), which are supplied for many basic, common automation tasks and machine functionalities. They can be easily configured, customized, and implemented in your machine program.

Discover the built-in intelligence with chiller-specific functions for more systems' energy efficiency, operational reliability, and availability:

1. Fan management
2. Floating high-pressure control with variable-speed drives
3. Compressor management
4. Drive communication control
5. Energy management
6. PID

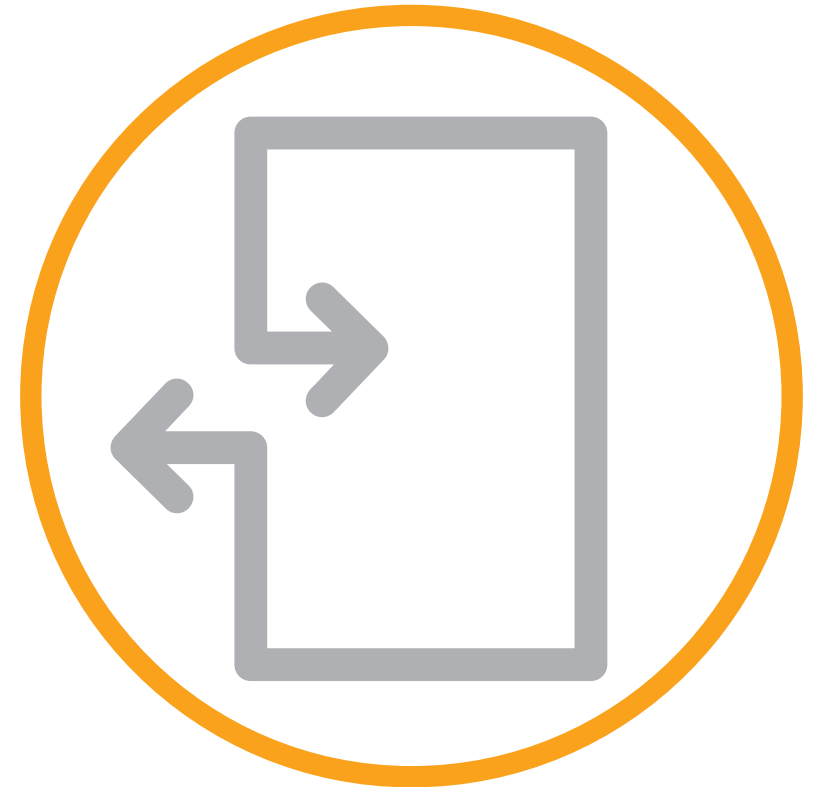


# Monitor and manage the drive permanently

This function block provides an easy and efficient way to integrate one or several Altivar™ variable-speed drives connected, via modbus SL fieldbus, in the Modicon™ M171 system. The function blocks manage communication with the drives and provide control and monitoring capabilities.

## Benefits

- **Easy integration**
  - Easy and efficient integration of Altivar variable-speed drives in the Modicon M171 system.
- **Complete drive control**
  - Control and monitoring of Altivar variable-speed drives on a Modicon M171 controller without any additional development.



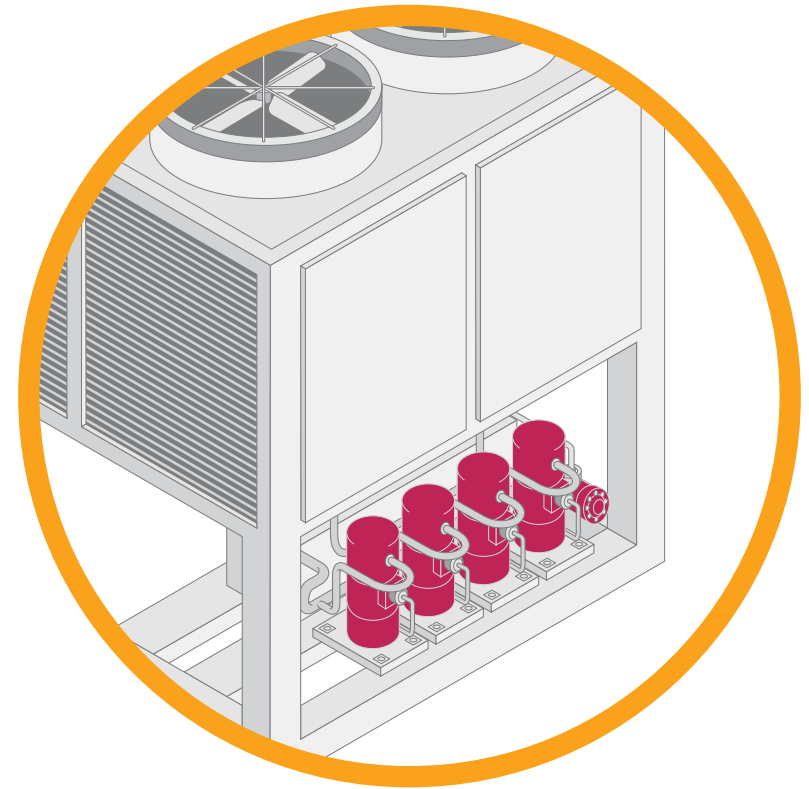
Drive communication  
control

# Optimize chiller system operation by switching compressors

The main objective of this function block is to perform control and switching of multiple compressors to maintain a predefined temperature or pressure in a chiller system. The temperature and pressure are measured through sensors while the setpoints are entered through the HMI. Using intelligent algorithms, the function is managing the switching by defining priorities to the compressors by detecting availability and principle of energy optimization.

## Benefits

- **Performance**
  - Maintains the required temperature or pressure by controlling the capacity of the compressors in a system with a variable-speed drive or the number of compressors.
- **Reactivity**
  - Makes the system energy efficient by controlling compressor capacity prior to switching on/off compressors.
  - Ensures a smooth operation, checking the availability of the compressors and in case of faulted compressor detection, changes over to the next available compressor.



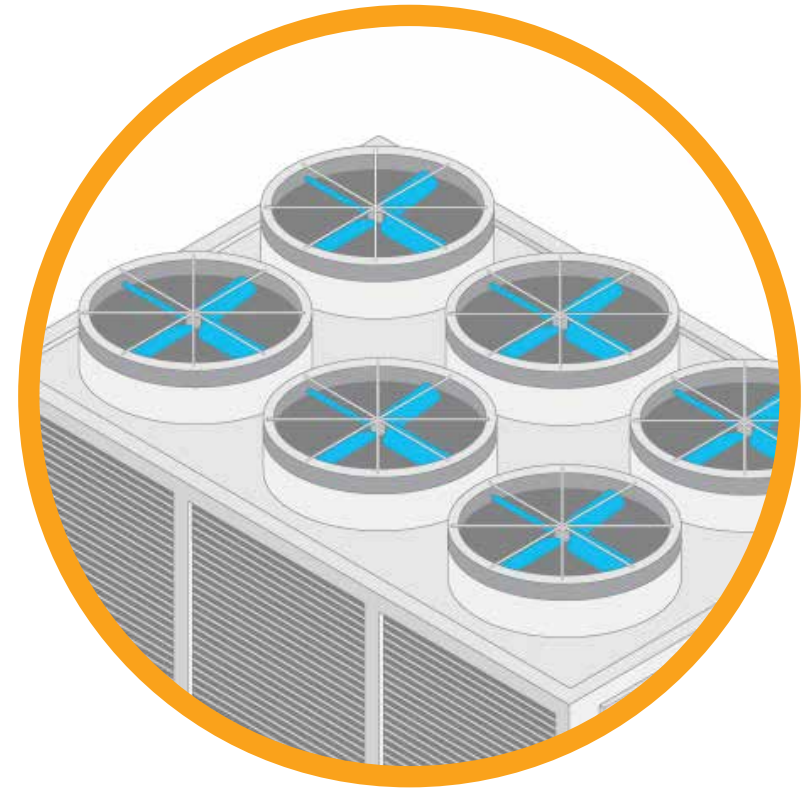
Compressor management

# Monitor and control fans by using the maximum surface of the condenser

In order to control the condensing pressure of air-cooled condensers, this function block controls the frequency, starting, and stopping of the fans in a predetermined order to optimize their energy consumption, operating time, and availability.

## Benefits

- **Reliability**
  - Fans with detected errors are automatically replaced in the sequence by operational fans.
  - Fan service life is optimized through operation sequences (FIFO, balancing hours, LIFO).
- **Performance**
  - Fan switch-on and operating frequency are optimized in order to reduce the energy consumption of the air-cooled condenser.



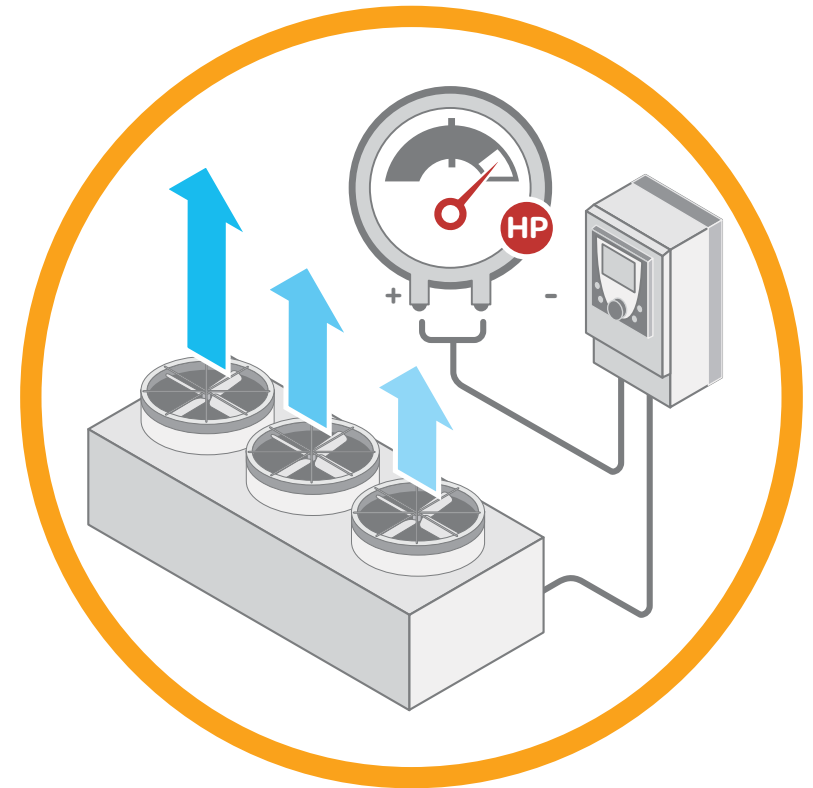
Fan management

# Calculate a high pressure setpoint based on the outside temperature evolution

This AFB controls the condensing pressure of the air-cooled condenser. It manages the high-pressure setpoint and provides the information to the fan management AFB. The setpoint is defined so as to be able to reduce the energy consumption of the system.

## Benefits

- Energy performance
  - Energy saving of up to 40% by combining variable-speed drives with floating high-pressure control.



Floating high-pressure control with variable-speed drives

# Retrieve energy information and energy efficiency calculations

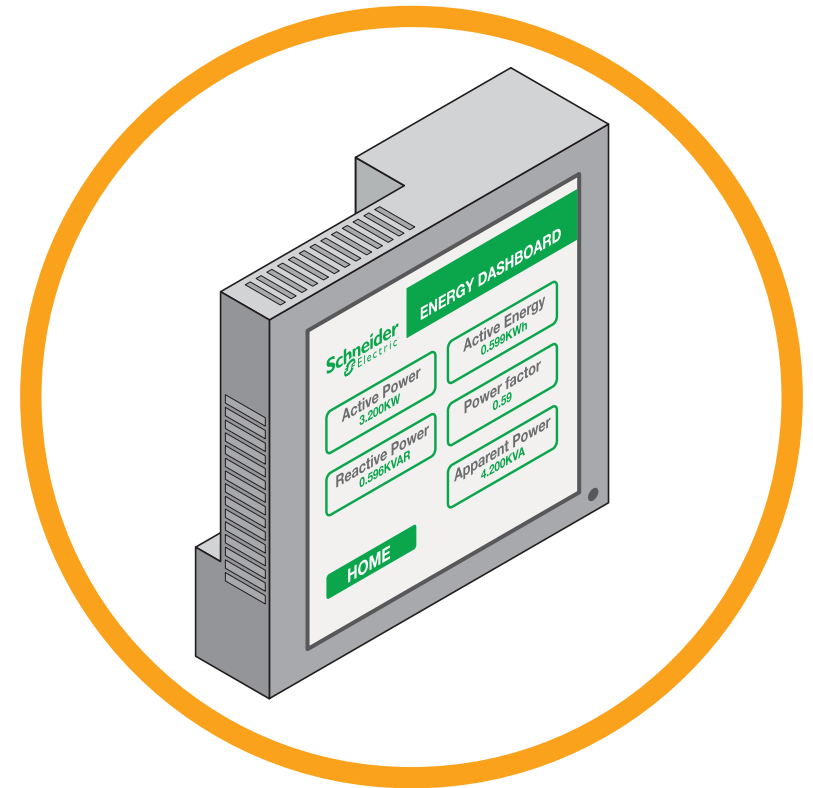
The energy management function blocks are designed for applications where the machine energy consumption needs to be metered and energy-efficiency information is required. The function blocks provide an easy integration of metering devices into the system and offer calculation methods to determine the machine efficiency, COP<sup>1</sup> or ESEER<sup>2</sup>.

## Benefits

- Quick and easy integration
  - Preprogrammed and fully tested metering functions are provided for a quick and easy integration of energy metering devices and machine efficiency calculation methods.
  - The function blocks provide an efficient integration of electrical metering devices either connected via modbus SL or hard-wired by using pulses.
  - A thermal energy calculation function block is embedded to determine the produced thermal energy. With dedicated trending and COP calculation functions, machine efficiency can be monitored and analysed in detail.
  - The function block allows the cooling capacity to be calculated without adding a flow meter.

1 - COP = Coefficient of Performance

2 - ESEER = European Seasonal Energy Efficiency Ratio



## Energy management

# Maintain the actual value and adjust the output value in automatic or manual operating mode

The advanced PID function blocks are optimized for temperature or pressure control in chiller systems. With the additional PID autotune function, the control system is capable of analysing the response time of the control loop and calculating the correct PID parameter settings.

## Benefits

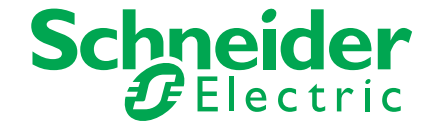
- Precision
  - PID control maintains the required controlled variable through adjustment.
  - It minimizes the deviation of the actual process value from the setpoint to optimize system control.
  - Efficient setup
  - Various loop control interactions available to manage different required machine operating modes.
  - Automatic detection of PID control loop parameter with autotuning.



PID



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