HVAC & R machine control solutions

Improve your system and business performance
What can Schneider Electric do for your HVAC & R machine control?

Reduce time to market .................................................. 4–7
- Quickly build your automation solution
- Tested, Validated and Documented Architectures

Improve machine performance and energy efficiency ...................................................... 8–11
- Design green HVAC & R machines
- Energy-efficient application function blocks and variable speed drives

Simplify monitoring and maintenance .................. 12–14
- Improve machine management by remote control
- Simplify maintenance through mobile applications

Develop your business ............................................... 15–19
- Easy integration into Building Management Systems architectures
- Services and support throughout the machine life cycle
- Retrofit service for refrigeration machines
We know your challenges...

HVAC & R systems are at the very heart of comfort and energy performance in buildings and industry. Your challenge as a builder of HVAC & R equipment is to find innovative ways to build more and more energy-efficient and cost-effective machines.

Your customers want HVAC & R systems that have:
> Increased reliability
> Energy efficiency
> Easy maintenance
> Excellent functionality/price ratio

....and we have the solution to meet them!

MachineStruxure™ architecture helps you design more energy efficient and cost-effective machines whilst maximising their performance. MachineStruxure architecture proposes Tested, Validated and Documented Architectures with dedicated HVAC & R application function block libraries. Open, they offer maximum flexibility and easy integration into Building Management Systems (BMS).

MachineStruxure architecture, one of the mainstays of EcoStruxure architecture. EcoStruxure™ system architecture enables the convergence of five key domains of our expertise: management of Power, Processes and Machines, the IT Room, Buildings, and Security. EcoStruxure architecture takes multiple, siloed systems and adapts them to an integrated solution, reducing redundancy in equipment, software, and personnel.
How can you reduce your HVAC & R machine’s time to market?

MachineStruxure architectures help you save up to 50% of your time.
Quickly build your automation solution

Base your HVAC & R solution on what you need

Integrated with the SoMachine™ software suite, MachineStruxure solutions provide a solid base of Tested, Validated and Documented Architectures with dedicated application function blocks that can help you optimize cost and performance and simplify implementation into your applications.

Ready-to-use control solutions
(no control expertise required)

- Parametric logic controller and main dedicated machine functions.
- Quick commissioning and programming directly on the display (no PC required)
- Plug in the display and start the machine

Fully customized control solutions
(for those with control expertise)

- Programmable logic controller and application function blocks.
- Speed up design with pre-written application function blocks
- Energy-efficient control
- Fully customizable with SoHVAC™ software

Tested, Validated and Documented Architectures
for optimized results

Our ready-to-use architectures are designed to achieve optimized results. Created from suggested equipment lists, they are:

- Tested: to ensure that the architectures function in each possible configuration
- Validated: full functional device compatibility
- Documented: complete system user guide for easy installation and assembly, including CAD drawings.

Simplify HVAC & R machine programming and commissioning

With SoHVAC software you can develop, configure, and commission your machines in a single environment.

- Program and commission your entire automation system
  – Modicon™ M168 logic controllers and remote displays, application and standard function blocks, application machine programs, I/O, variable speed drives, communication networks.

- Reduce the complexity of your program design and implementation time
  – Application and standard function blocks, machine program templates, and proven architectures
  – Compile and debug functions
  – Hardware configuration tool.

- Simplify management of your customized solutions
  – Modify, reuse, or create your own function blocks or machine application programs
  – Comply with global, open standards for maximum flexibility.

Reduce control system design and installation time by up to 50%
Schneider Electric has a comprehensive range of PLCs for the HVAC & R industry. The Modicon™ M168 in our examples is specifically designed for small and medium air-cooled chillers and air-handling units and is available as a programmable logic controller with application function blocks or as a parametric logic controller with pre-loaded application programs.

**Programmable logic controller**

Application function blocks to customize your solution:

1. Water temperature control
2. Drive communication control
3. Floating high-pressure advanced control
4. Superheat advanced control
5. Fan management
6. Floating high-pressure control with variable speed drives
7. Compressor management

**Optimized HVAC & R / air-cooled chiller architecture**

Compact / Hardwired / Programmable Logic controller / Modicon M168

**Parametric logic controller**

Main embedded control functions allow you to:

- Manage up to two scroll compressors
- Leave water temperature in heating or cooling mode
- Manage fans with phase-cut module
- Control condensing pressure with linear or stepped condensation
- Use one, two, or no circulating pumps
- Enable double set point
- Compensate for dynamic set point
- Manage pump-down system
- Provide built-in scheduler with two programs per day

For other applications please contact our experts – see pages 17 and 18 to find out how
Air Handling Unit (AHU)

Optimized HVAC & R / AHU architecture
Compact / Hardwired / Programmable Logic controller / Modicon M168

Parametric logic controller
Main embedded control functions:
- Heating, dampers, and cooling valve control
- Supply and exhaust fan control
- Discharge air temperature control with summer/winter compensation
- Humidification and dehumidification control
- Air static pressure control
- Hot-water heating or electrical heating coil control
- Chilled-water cooling coil or DX cooling control
- Heat recovery including heat exchanger control

Programmable logic controller
Application function blocks to customize your solution:
1. Drive communication control
2. Plant mode control
3. AHU temperature control

Consult our HVAC & R machine control solutions at www.schneider-electric.com/hvacmachines
How can you improve your machine performance at full and partial loads?

Save up to 30% on your machine energy consumption.
Design green HVAC & R machines

Schneider Electric is on the leading edge of energy efficiency in HVAC & R solutions. From variable speed drives to power monitoring and dedicated application function blocks, we provide smart strategies to improve the energy efficiency of your machines.

Energy efficiency – it’s easy, just follow the four steps (compliant with ISO50001)

1. **Measure** energy use with expert auditing and our Acti9 energy meters to identify potential savings on the machine.
2. **Fix the basics** and reduce energy consumption by choosing the right devices.
3. **Optimize** your machine’s power consumption with energy operation modes or application function blocks designed for energy efficiency.
4. **Monitor** electrical energy consumption with power meters and correlate with thermal energy.

Predictive control loop – an innovative new source of energy efficiency

Supply your customers with machines that are better controlled, use less energy, and are more reliable using our advanced control solutions based on predictive control.

The benefits of this algorithm include:
- Better performance than PID regulation
- Higher stability
- Better resistance to disturbances
- Enhanced results in lower machine energy consumption

The classical PID can be out-performed by a predictive control loop when algorithms are integrated into the programming system, with potential savings of more than 10%.

Passive energy efficiency
Active energy efficiency

Compliant with the ISO50001 standard

Related application function blocks

- **Superheat advanced control**
  - Reduce the superheat set point value from 8°C to 5°C.
- **Floating high pressure advanced control**
  - Improve accuracy and eliminate overshoots to reach the high pressure set point.

Advanced control solutions: potential savings of more than 10%
Improve your energy efficiency with application function blocks

Heating, ventilation, and air conditioning can represent over 40% of energy consumption in many buildings and facilities depending on the business. Improved control and management of ventilation, temperature, and system usage will reduce energy consumption and sustain it at the optimal level.

- **Floating high pressure control with variable speed drives**
  - Energy saving of up to 10%
  - > Excellent association of drive and Modicon M168 controller to modulate air flow.

- **Temperature control of air handling unit**
  - Reduced cooling energy costs
  - > economiser control function
  - > summer compensation function.

- **Water temperature control**
  - Increase machine energy efficiency thanks to more accurate water temperature control with less overshoot.

- **Plant mode control**
  - The night purge function cools down the building during unoccupied periods to reduce cooling energy consumption.

- **Compressor management with speed drives**
  - Limitation of the working areas of the compressor (evaporation and condensing temperature) and operating frequency.

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Improve energy efficiency with dedicated application function blocks
Save energy with variable speed drives

For fan ventilation applications, solutions based on dedicated Altivar variable speed drives can save up to 50% in energy consumption compared to conventional motor starter and flow regulation control.

30% efficiency improvement achieved on a central air-handling unit in a production plant

The solution which was based on four 90kW Altivar™ drives, provided 30% energy savings and an investment payback of 13 months.

Altivar 212: the expert drive for HVAC & R applications

Ventilation:
> Less noise pollution (airdraulic noise, motor noise, etc.)
> Detection of transmission component breakage
> Smoke extraction and forced start with fault inhibition
> Automatic restart
> Register management

Heat and air conditioning
> Optimized fluid process control
> PID regulation (temperature, flow rate, pressure, etc.)
> Adjustable flow rates for better energy management
> Suppression of mechanical resonance

Protection and monitoring
> Fire mode, damper monitoring, mechanical protection, etc.
> Integrated EMC filter
> Anti-harmonic technology (THDI ≈ 30%)
> Energy consumption monitoring

Up to 50% savings in energy consumption with drive technology
How can you simplify monitoring and maintenance?

MachineStruxure solutions provide you with powerful connectivity.
Improve machine management through our M2M remote control

With OptiM2M™, a web-based machine-to-machine monitoring application, you can remotely view and analyze incoming machine data at any time, from anywhere in the world, using only your smartphone, laptop, or another web-connected device with a browser. The communication capabilities of the Modicon M168 controller associated with the OptiM2M solution for remote monitoring of machines allow an unrivalled quality of machine service for your customers, with reduced reaction times and attractive maintenance plans.

Machine-to-Machine (M2M) applications

Compressor racks
Air handling units
Rooftop units
Chillers

Just connect the modem to the power supply and to the controller of every machine.

Server

Internet

GPRS

GSM

GSM

Internet

To manage and monitor data, you will need a device with browser and web access.

In the event of a machine alert, you will receive notifications with additional diagnosis information.

Install

Configure and deploy

Enter the specifics of the new monitored machine, modify parameters of your monitoring application, and easily copy the configuration to all your machines of the same type.

Get constant visibility into your machine data
Simplify maintenance through powerful applications for mobile devices

SCADA and HMI applications* enable your maintenance personnel to monitor and control installations from anywhere, using just a smart phone or a tablet. In addition, smart phone applications* enable Modbus communication with Modbus slave devices such as our Modicon M168 controllers. This means that you can now – in real time – monitor variables, make adjustments on the fly, track alarms and events, display trend graphs and much more.

* SCADA and HMI mobile applications are available on the web (not the propriety of Schneider Electric).

User benefits

> Improved control of remote equipment
> Enhanced reaction time and productivity: detailed reports on equipment use (usage statistics, machine energy consumption, etc.)
> New services for your established customers

All your machines are only one touch away!
How can you develop your business?

MachineStruxure solutions keep you one step ahead
Your customers demand comprehensive solutions that include enterprise-wide management of power, IT, HVAC & R, and security and with a level of efficiency that includes system dynamics across segments, platforms, and providers. That’s why MachineStruxure architectures can be easily integrated into BMS architectures through simple communications.

**Easy integration into BMS architectures**

Your customers demand comprehensive solutions that include enterprise-wide management of power, IT, HVAC & R, and security and with a level of efficiency that includes system dynamics across segments, platforms, and providers. That’s why MachineStruxure architectures can be easily integrated into BMS architectures through simple communications.

**Your benefits**

- The Modicon M168 makes it easy to integrate your machines into your customers’ BMS architectures
- Full compliance with open BMS standards:
  - BACnet/IP, BACnet MS/TP, Modbus TCP, Modbus RTU, LONWorks, KNX, oBIX
  - BACnet/IP & Modbus TCP Ethernet modules offering easy maintenance through embedded switches and web server (4MB)
- Late-point configuration with Modicon M168 interchangeable communication modules
- Alarms and trends clearly displayed

From HVAC & R machines to global building management systems, Schneider Electric provides a single, fully coherent system.
Service and support throughout the lifecycle of your machine

MachineStruxure solutions include more than just products and architectures, you also get a complete range of service and support at every stage of the product life cycle.

Our unparalleled HVAC & R and control experts will help you minimize your global machine costs, increase sales and profitability, and deliver total customer satisfaction.

From design to commissioning to maintenance, we’re ready to help you wherever you are with our worldwide network of training programmes, solution design centres, distribution, and aftersales services.

Design

We find the best solution for your needs
• Based on your needs, our Solution Application Experts and Application Design Experts (SAE/ADE) work out innovative technical solutions including:
  > Co-engineering
  > Tests
  > Validation

We understand your challenges
• Consulting
• Audits

We execute the solution with a full service agreement
• Our solution design and delivery centres (Flex Centers) are committed to quality and results and provide:
  > Project and program management
  > Software and hardware engineering
  > Tests, validation, and commissioning

We improve your team’s competencies
• In class training
• On site training

Make your machines stand out from the beginning
We provide international sales and after-sales services for you and your customers

- Maintenance contracts
- Spare parts and repairs
- Just-in-time delivery
- Return of goods
- Service expertise:
  - Error diagnosis and repair
  - Environmental measurements (EMC, field bus, thermography, power quality analyses, etc.)
  - Customer International Support (CIS) as a single point of contact:
    - A network of dedicated local country experts
    - A web-based collaborative platform for efficient communication

We improve your customers’ competencies

- In-class customer training and on-site training
- Customer service and commissioning training

We improve your machine ranges

- Consulting

We improve your customers’ machines in their production line

- Audits
- Training
- Migration and upgrade
- Service expertise:
  - Consultancy
  - Retrofitting
Discover the CoolVerter HP, our award-winning retrofit solution for energy efficiency in refrigeration

The CoolVerter™ HP is an energy-saving solution designed for retrofitting into existing refrigeration systems. In October 2012, the CoolVerter HP solution won the «Grand Prix du Froid» award for the Best of Innovations for measurement and optimization of energy consumption in the cold chain.

Ready-to-use complete solution

Along with its user-friendliness, the simplicity of integrating the CoolVerter HP solution into existing refrigeration systems makes it unique. It is ready to use as everything is integrated in an independent, electrical panel.

Customer benefits
- Up to 40% energy savings
- Proven results
- Return on investment in less than 2 months
- Less condenser noise and fouling

Machine builder benefits
- Pre-wired and ready-to-install cabinet:
  - instruction sheet
  - operating document
- Installation takes less than one day
- Parameterization only, no programming
- Easy switch to historical regulation

Floating HP

Targeted applications

Comprehensive product and offer solutions for every segment in the HVAC & R market