HVAC & R machine control solutions

Catalog

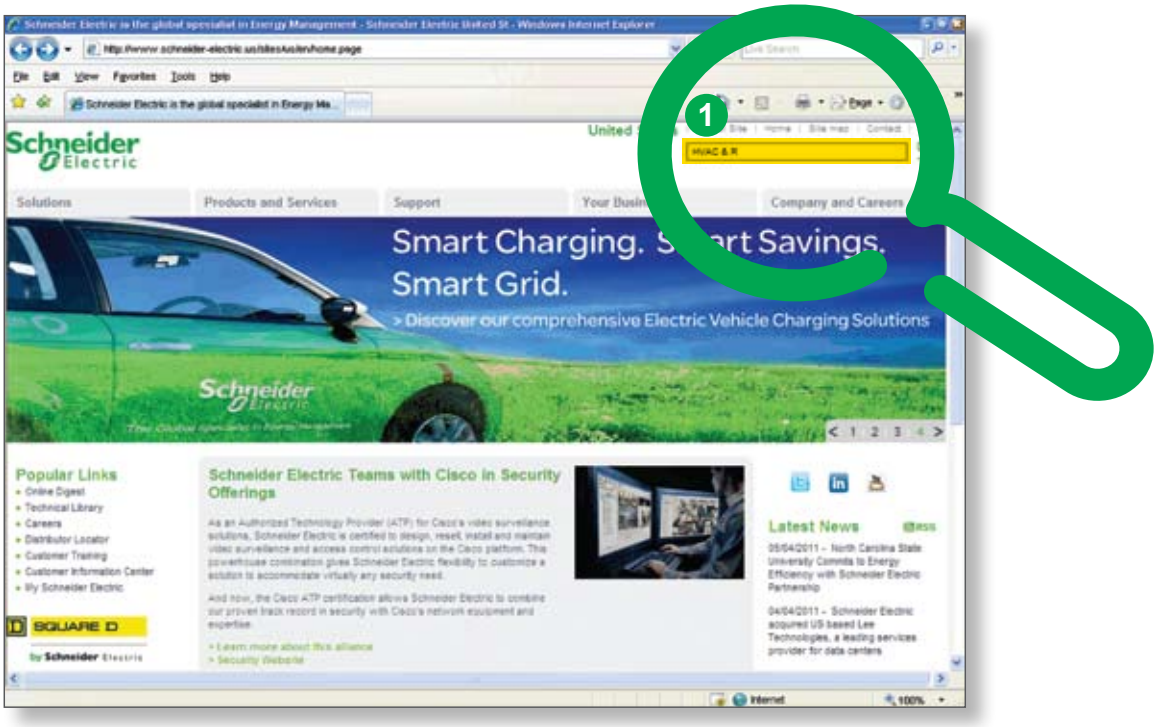
2011

Make the most of your energy℠

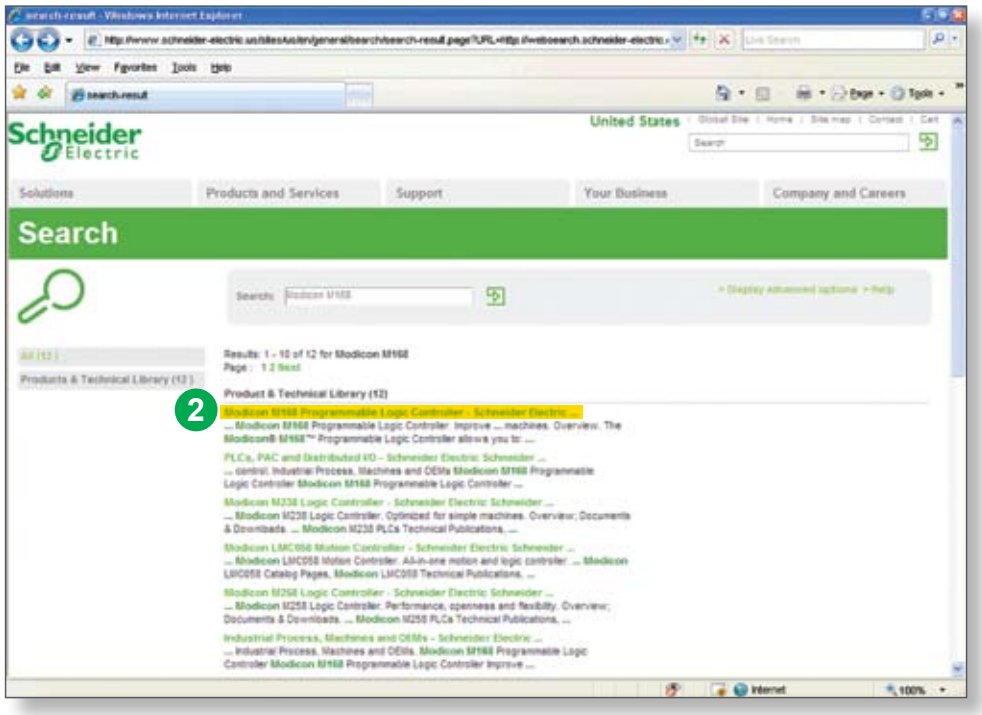
Schneider Electric™

Go online to www.schneider-electric.us for technical information about products listed in this catalog, including:

To learn more about HVAC & R machine control solutions, follow these steps...

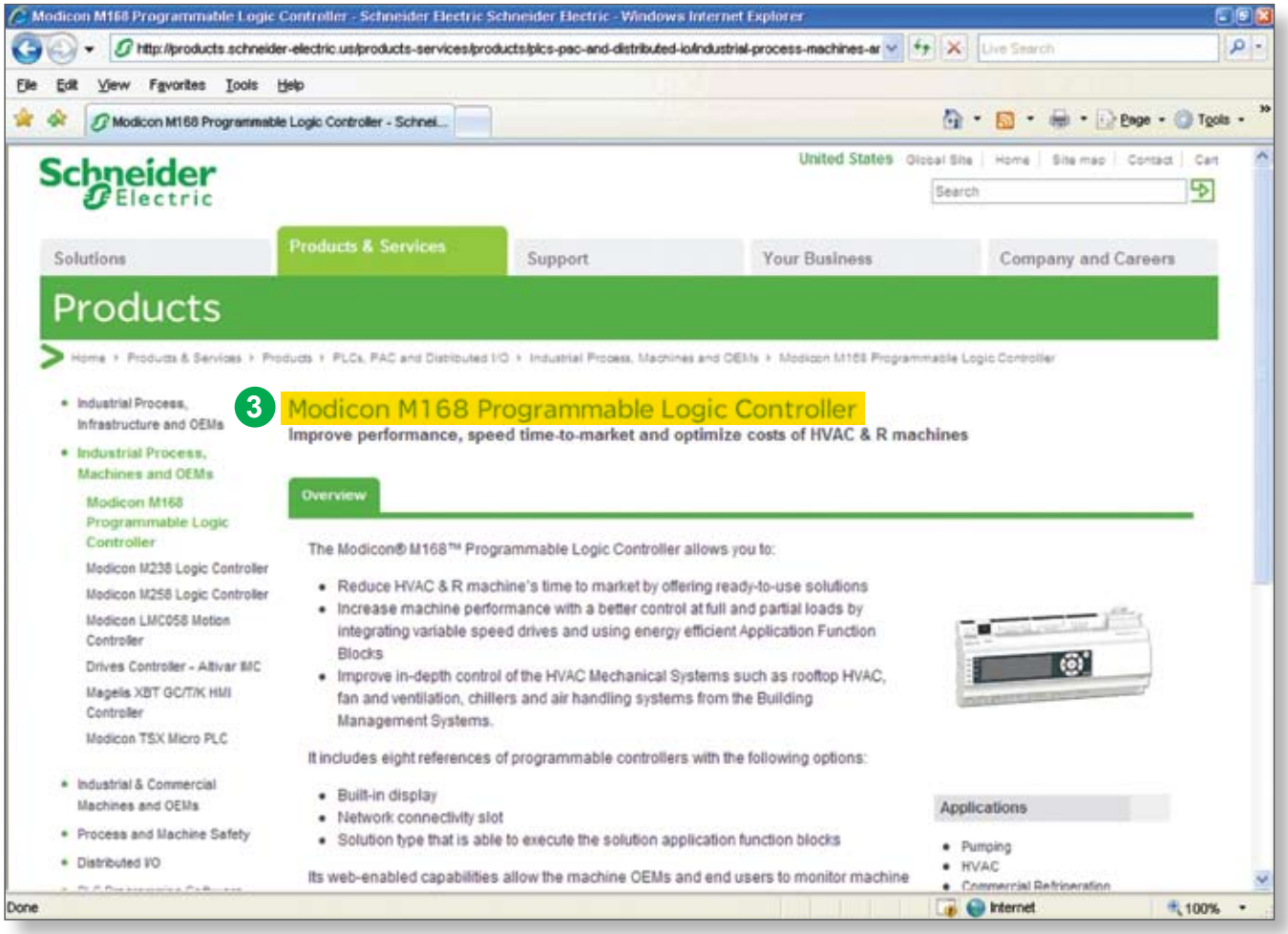


1 On the home page, type "HVAC & R" in the "Search" box.



2 From the Search results page select "Modicon M168 Programmable Logic Controller - Schneider Electric...".

> Specifications > Dimensions > References
> Curves > Links to user guides and CAD files



3 The Product "Overview" page provides information on Capabilities, Options, Commissioning and Applications.

*** Please see the Inside Back Cover of this catalog for valuable information on the Schneider Electric Packaged Roof-Top Unit TVDA - a comprehensive, ready-to-use application with a tested, validated, documented architecture.**

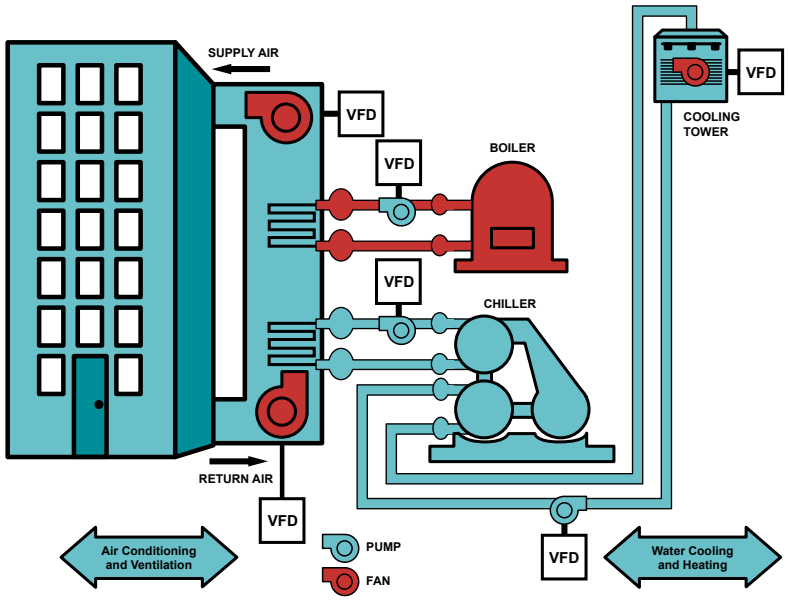
HVAC & R machine control solutions

Reliable, energy-efficient HVAC & R* systems are valuable, high-demand components in the design, construction, and operation of industrial and commercial buildings - and in providing optimum comfort to their occupants. Therefore, it's absolutely essential to Original Equipment Manufacturers (OEMs) that the HVAC & R machines they build are:

- Robust
- Energy-efficient
- Easy to maintain
- Excellent value in terms of functionality and design

This catalog will introduce you to a complete family of Schneider Electric automation products that will help you optimize the design, functionality, and reliability of your HVAC & R machines. And, in addition to these products, Schneider Electric offers comprehensive machine control solutions based on Tested, Validated, Documented Architectures, as well as service and support throughout the complete machine life cycle. This end-to-end product, solution, service and support allows you to:

- Reduce your machine's time-to-market with proven, ready-to-use solutions.
- Increase your machine's performance with better control at full and partial loads – by integrating Variable Speed Drives and energy-efficient Application Function Blocks with innovative solutions.
- Gain a competitive advantage with proven, documented architectures that allow you to reduce production time and costs.



Choose your HVAC & R machine control solution according to your requirements:

Schneider Electric HVAC & R machine control solutions are based on two types of Modicon™ M168™ logic controllers, depending on your specific requirements. These logic controllers are dedicated to targeted machines (i.e. Chiller, AHU), or to generic HVAC & R applications.

Ready-to -use control solutions

No control expertise required

Parametric logic controller† + main dedicated machines with control functionalities embedded

- Quick commissioning: set-up and program modification directly on the display, without PC
- Ready to plug-in and start the machine
- Customization possible (SoHVAC software required)

† Dedicated to chillers and AHU. Other applications available soon.

See page 26

Fully customized control solutions

Control expertise required

Programmable logic controller + machine program templates

- For all types of HVAC & R machines
- Speeds up design: machine program templates ready to be used or customized
- Full customization with SoHVAC software

See page 12

Application programmable logic controller + Application Function Blocks

- Speeds up design: pre-written Application Function Blocks ready to be used or customized
- Energy-efficient control
- Full customization with SoHVAC software

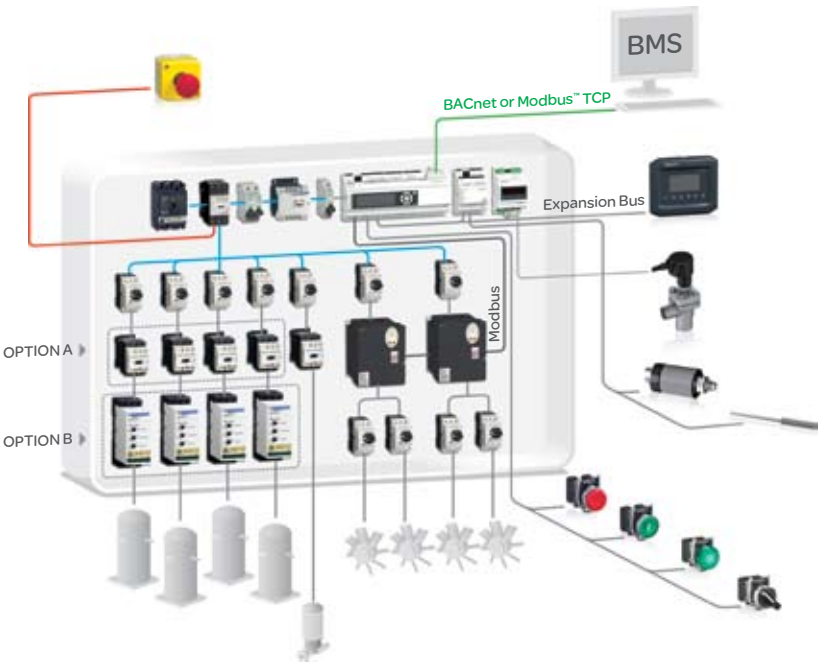
Consult your Customer Care Center

** Heating, Ventilation, Air-Conditioning and Refrigeration*

How can you reduce your HVAC & R machine's time-to-market ?

- Pre-determined equipment lists
- **Tested**: for proper function relative to performance.
- **Validated**: in regards to functional compatibility of devices.
- **Documented**: with a
- system user guide, pre-defined CAD panel design and wiring diagrams.

Fast-track the building of your automation solution with ready-to-use Tested, Validated, Documented Architectures.



Simplify HVAC & R machine programming and commissioning with SoHVAC software…

- Dedicated OEM HVAC software for developing, configuring and using your HVAC & R machines, regardless of your programming ability.

Use a single software to program and commission your complete automation system, including:

- Modicon™ M168™ logic controllers and remote displays.
- FB, AFB and application machine programs, I/O, Variable Speed Drives and communication networks.

Reduce your program design and implementation times with:

- Application and standard function blocks, machine program templates and Tested, Validated, Documented Architectures.
- Compile and debug functions.
- Hardware configuration tool.

Simplify the management of your customized solutions…

- Modify, reuse or create your own function blocks or machine application programs.
- Building Management System (BMS) open and standard: BACnet IP/WEB, BACnet MS/TP, Modbus TCP/WEB, LONWorks and KNX.

> Discover innovative HVAC & R machine control solutions at **www.schneider-electric.com**.

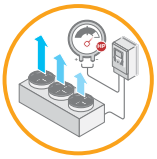
HVAC & R machine control solutions

How can you improve your HVAC & R machine's performance?

Energy Efficiency

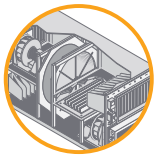
Increase control at full and partial loads, and save up to 30% on your machine energy consumption…

…using energy-efficient Application Function Blocks* available in Application programmable logic controllers. For example:


Floating high pressure with Variable Speed Drives

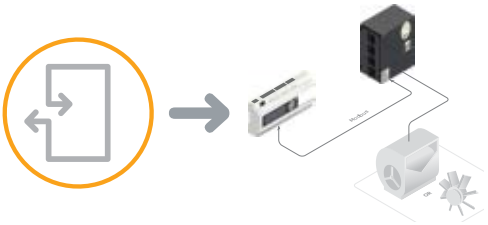

AHU temperature control


Water temperature control


Plant mode control

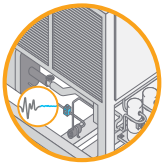
…using Variable Speed Drives

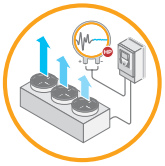
> For fan ventilation applications, solutions based on Altivar™ drives can save up to 50% in energy consumption, compared to a conventional motor starter.


Drive communication control

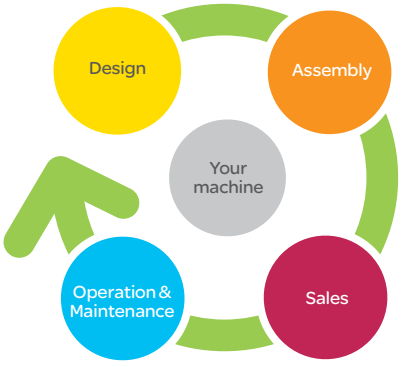
…using innovative, advanced control Application Function Blocks* on the key functions (superheat control, high pressure control) of an air-cooled chiller, featuring:

> A high performance control algorithm (better performance than PID regulation)
> Savings in machine energy consumption using the high-performance, robust algorithm


SuperHeat Advanced control


Floating, high pressure Advanced control

How can you grow your business?



Turnkey control panel
a complete customized solution for HVAC & R machines

By streamlining your production, and reducing your machine costs. Schneider Electric supplies service and support throughout the complete machine life cycle.

Increasing customer satisfaction, sales and profitability means achieving excellence in each stage of your machine's life cycle. From design through customer service and support, you can count on Schneider Electric for:

> Smart design, plus tested, energy-efficient solutions with the help of a top-flight design engineering team.

> Reductions in production time. You can call on us for custom control panel solutions as well.

> Pre-sales support, plus tested, proven architectures means faster time-to-market, with machines compliant with (all international) global standards.

> Worldwide customer assistance and post-sales support.

** Energy Efficient Application Function Blocks are dedicated for Air/Water cooled chillers & AHU. Other applications will be available soon.*

HVAC & R machine control solutions

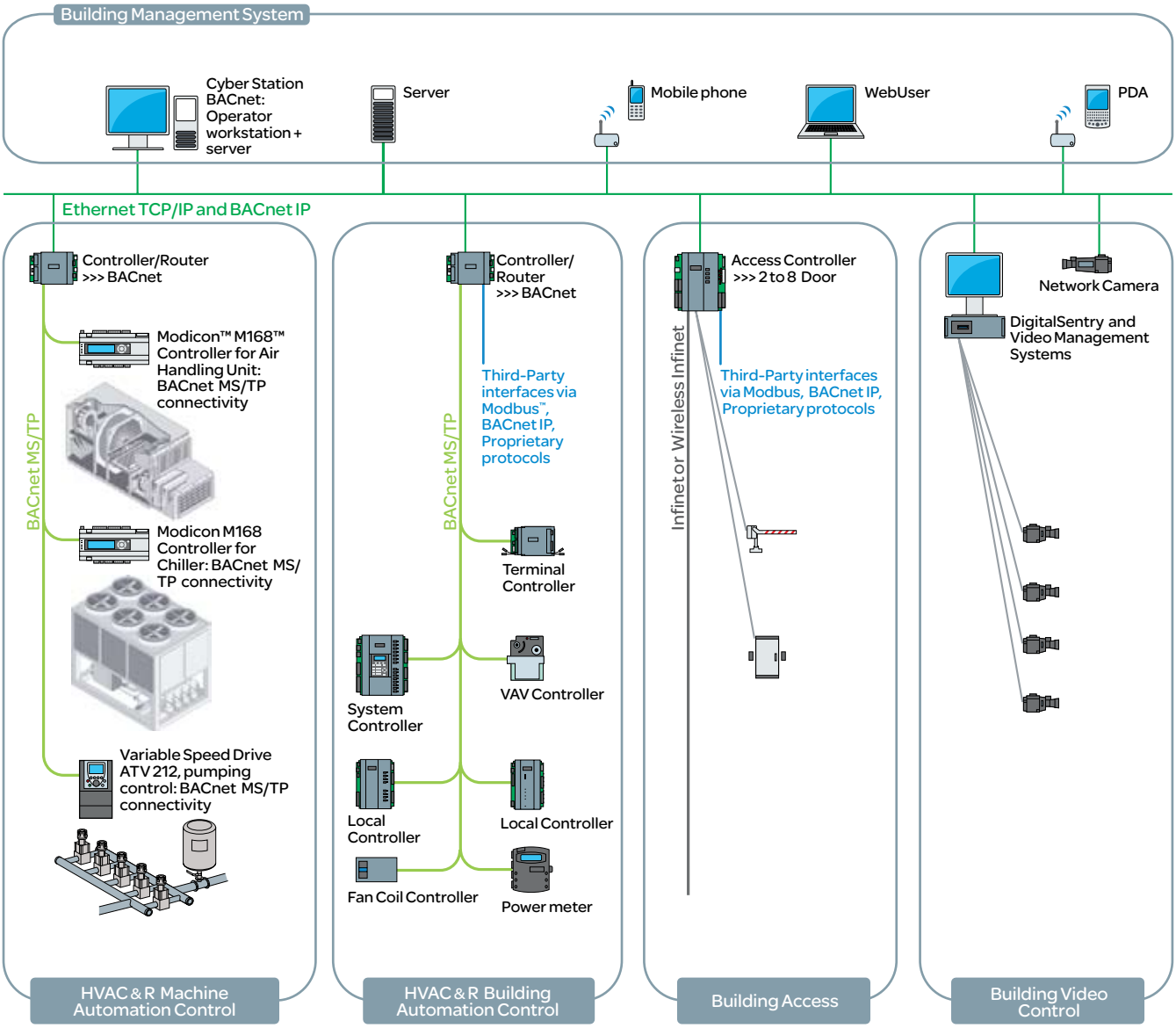
Schneider Electric…
Your Solutions Partner

From simple stand-alone control products to global building management systems, Schneider Electric HVAC solutions can save you up to 30% on energy consumption.

Schneider Electric is a leading global supplier of complete building solutions. Utilizing the company's integrated solutions across multiple systems can provide you with savings ranging from 15% to 30% of energy costs…

- Building Automation and Control Systems contribute to equipment availability and energy savings, because they can control all building functions, including:
  - Mechanical and electrical equipment for heating, ventilation, air conditioning, lighting, shutters/blinds, and power distribution
  - Access control and CCTV for security
- Engineering services enable customers to realize optimum energy utilization

Modicon™ M168™ controllers can be easily integrated in Building Management System platforms. Building Management System (BMS) connectivity is provided by an optional communication module.



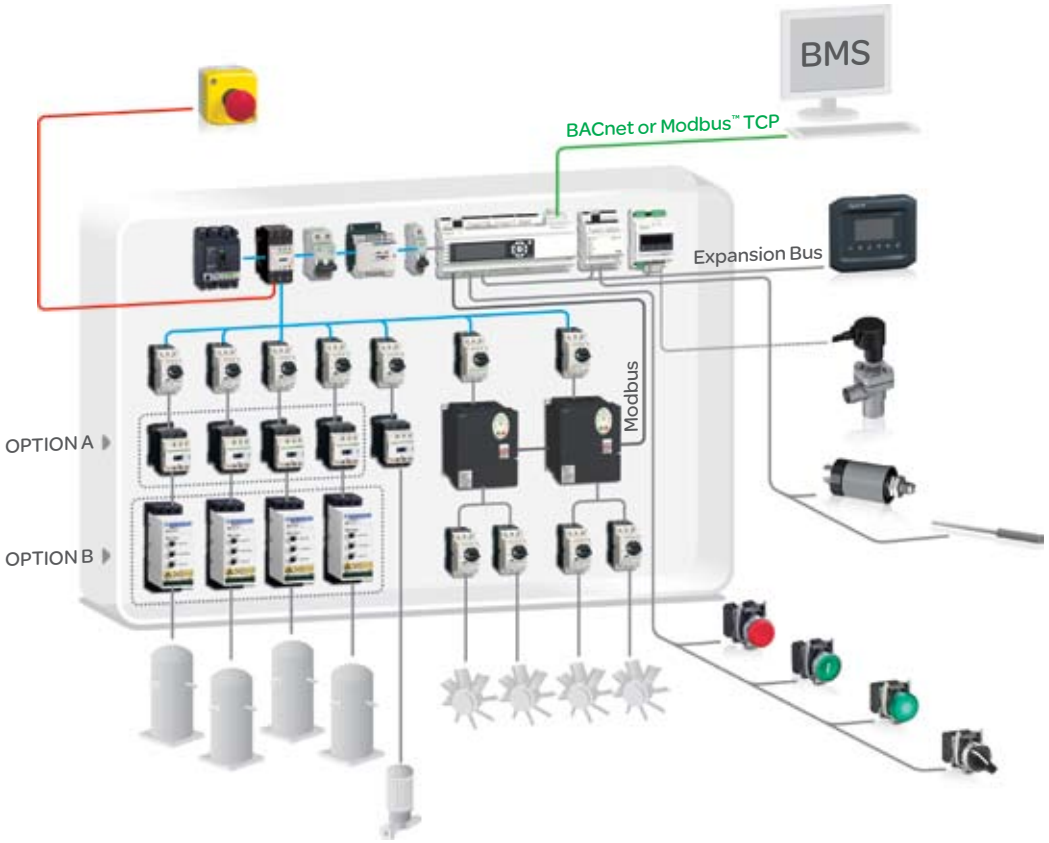
Schneider Electric: delivering outstanding value to you – our HVAC & R OEM customer by...

1. **Reducing your machine's time-to-market** by using our ready-to-use solutions.

2. **Increasing your machine's performance** with better control at full and partial loads: by integrating our variable speed drives, using energy efficient Application Function Blocks and our innovative solutions.

3. **Reducing your build costs** for your machine control panels using our complete customized solution offer.

4. **Providing you a complete, comprehensive solution** from HVAC & R control to Building Management Systems.



50%

> Save up to 50% on design and implementation time

> Reduce your machine's energy consumption up to 30%

up to 30% energy saving

$$$

> Save up to 15% on panel build costs

> Easily integrate your machine with your customer's BMS

BMS

HVAC & R machine control solutions
Modicon™ M168™ programmable logic controllers

Applications		■ Water chiller ■ Packaged RTU ■ Heat pumps ■ Compact air/air roof-top unit ■ Air handling system, twin-flow enclosure ■ Precision air conditioners ■ Refrigerated display windows	■ Pumping stations ■ Booster stations ■ Circulators ■ Condensate/boiler feed pumps ■ Cooling tower pumps
Used for		Programming logic controllers with SoHVAC software	
Programmable inputs	Discrete inputs	7 discrete inputs, 24 V z	
	Analog inputs	5 configurable analog inputs: □ 0 - 5 V ratio □ 0 - 10 V □ 0 - 20 mA □ 4 - 20 mA □ NTC □ Pt1000 □ PTC	
Programmable outputs	Discrete outputs	8 discrete relay outputs (7 with N/C contact and 1 with C/O contact)	
	Analog outputs	2 configurable analog outputs: □ 0 - 10 V □ 0 - 20 mA □ 4 - 20 mA	
	Dedicated output	1 PWM output	
Communication	Built-in	Modbus™ slave serial link by means of connection on integrated RJ45 port Modbus master/slave serial link on integrated RJ45 port	
	Optional	–	BACnet MS/TP or BACnet IP with external communication modules (1) in dedicated slot on controller
Power supply		24 V ⎓/∿	
Display	Built-in	No	No
	Remote	Yes (optional)	Yes (optional)
Type of programmable base		**TM168 B23S**	**TM168 B23CS**
Page		15	15

(1) To be ordered separately

- Water chiller
- Heat pumps
- Compact air/air roof-top unit
- Air handling system, twin-flow enclosure
- Precision air conditioners
- Refrigerated display windows
- Pumping stations
- Booster stations
- Circulators
- Condensate/boiler feed pumps
- Cooling tower pumps

Programming logic controllers with SoHVAC software
Parameters set via the built-in display

7 discrete inputs, 24 V z

5 configurable analog inputs:
- 0 - 5 V ratio
- 0 - 10 V
- 0 - 20 mA
- 4 - 20 mA
- NTC
- Pt1000
- PTC

8 discrete relay outputs (7 with N/C contact and 1 with C/O contact)

2 configurable analog outputs:
- 0 - 10 V
- 0 - 20 mA
- 4 - 20 mA

1 PWM output

Modbus™ slave serial link by means of connection on integrated RJ45 port
Modbus master/slave serial link on integrated RJ45 port

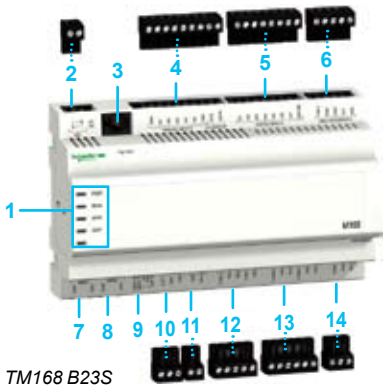
–	BACnet MS/TP or BACnet IP with external communication modules (1) in dedicated slot on controller

24 V ⎓/∿

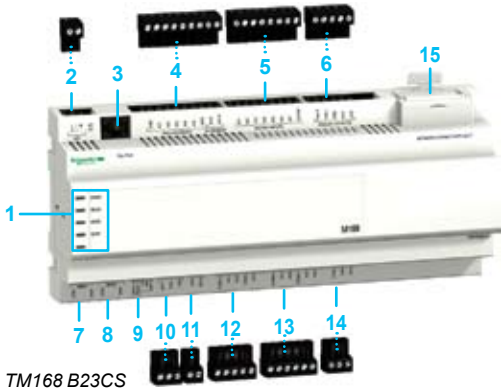
Yes	Yes
Yes (optional)	Yes (optional)

TM168 D23S	TM168 D23CS
15	15

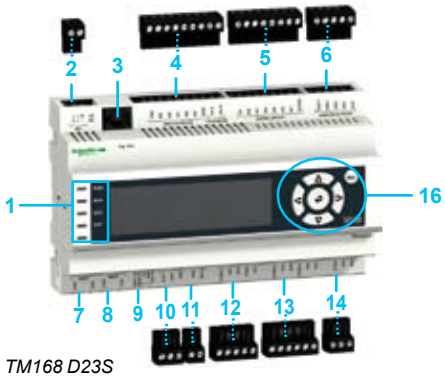
(1) To be ordered separately



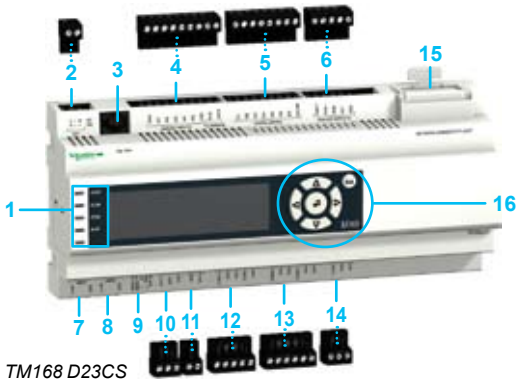
TM168 B23S



TM168 B23CS



TM168 D23S



TM168 D23CS

Introduction

Modicon™ M168™ programmable logic controllers

Modicon M168 programmable logic controllers have been developed to manage discrete and analog inputs and outputs, and offer multiple options for connection to different Building Management System communication networks. Four different Modicon M168 logic controllers are available, all of which can be programmed with SoHVAC software, providing customized applications designed to control:

- Water chiller
- Heat pumps
- Compact air/air roof-top unit
- Air handling system, twin-flow enclosure
- Precision air conditioners
- Refrigerated display windows
- Compressor racks
- Pumping stations
- Booster stations
- Circulators
- Condensate/boiler feed pumps
- Cooling tower pumps

Description

All TM168 ●23●S programmable logic controllers include:

1 Display block for displaying the controller status: 4 LEDs (PWR, RUN, ERR and EXP) and 1 LED that can be used in the application.
2 Connector for a removable terminal block *(1)* (2 terminals) for connecting the 24 V ⎓/∿ supply.
3 RJ11 connector marked Prg. Port for connecting a programming port
4 Connector for a removable terminal block *(1)* (9 terminals), for connecting analog inputs.
5 Connector for a removable terminal block *(1)* (8 terminals), for connecting discrete inputs.
6 Connector for a removable terminal block *(1)* (5 terminals), for connecting analog outputs.
7 RJ45 connector, marked MBS1, for connection to the Modbus™ bus.
8 RJ45 connector, marked MBS2, for connection to the Modbus bus.
9 Five Modbus bus and expansion bus polarization and line terminator adjustment switches.
10 Connector for a removable terminal block *(1)* (3 terminals), for connecting the expansion bus.
11 Connector for a removable terminal block *(1)* (2 terminals) to connect the power supply for a remote display unit TM168 GDB● *(2)*.
12 Connector for a removable terminal block *(1)* (5 terminals), for connecting 3 discrete relay N/C outputs.
13 Connector for a removable terminal block *(1)* (6 terminals), for connecting 4 discrete relay N/C outputs.
14 Connector for a removable terminal block *(1)* (3 terminals), for connecting the discrete relay C/O output.

TM168 B23CS and TM168 D23CS programmable logic controllers include:

15 Slot for optional communication module TM168BAC●.

TM168 D23S and TM168 D23CS programmable logic controllers include:

16 Display with 6 command buttons for setting the controller parameters

(1) Removable terminal blocks (screw or spring), included in kit TM168 SCTB●●, to be ordered separately.
(2) The remote display unit TM168 GDB● can be supplied directly by an M168 controller if the distance between the controller and the display unit is less than 30 meters.

Note: M168 logic controllers are mounted as standard on a 35 mm DIN rail.

HVAC & R machine control solutions
Modicon™ M168™ programmable logic controllers


TM168 B23S


TM168B23CS


TM168 D23S


TM168D23CS


TM168 E17


TM168 SCTB23


TM168 BACS


TM168 GDB


TM168 GDTS


TM168 DEVCM


TM168 APARAKEY

Programmable logic controllers

Power supply 24 V ≂
Removable terminal kit to be ordered separately

No. of I/O	Number and type of channels		Communication ports	Display	Reference	Weight kg
	Inputs	Outputs				
23 I/O	7 discrete inputs, 24 V ≂ 5 configurable analog inputs: □ 0 - 5 V ratio □ 0 - 10 V □ 0 - 20 mA □ 4 - 20 mA □ NTC □ Pt1000 □ PTC	8 discrete relay outputs (7 with N/C contact and 1 with C/O contact) 2 configurable analog outputs: □ 0 - 10 V □ 0 - 20 mA □ 4 - 20 mA 1 dedicated PWM output	□ 1 RJ45 port: Modbus™ slave serial link □ 1 RJ45 port: Modbus master/slave serial link	Remote (optional)	**TM168 B23S**	0.585
			□ same as TM168 B23S + □ 1 slot for optional communication module TM168 BAC● *(2)*	Remote (optional)	**TM168 B23CS**	0.723
			□ 1 RJ45 port: Modbus slave serial link □ 1 RJ45 port: Modbus master/slave serial link	Built-in	**TM168 D23S**	0.576
			□ same as TM168 D23S + □ 1 slot for optional communication module TM168 BAC● *(2)*	Built-in	**TM168 D23CS**	0.790

Separate parts for programmable logic controllers

I/O expansion module

No. of I/O	Number and type of channels		Reference	Weight kg
	Inputs	Outputs		
17 I/O	5 discrete volt-free contact inputs 3 configurable analog inputs: □ 0 - 5 V ratio □ 0 - 10 V □ 0 - 20 mA □ 4 - 20 mA □ NTC □ Pt1000 □ PTC	6 discrete relay outputs (5 with N/C contact and 1 with C/O contact) 2 configurable analog outputs: □ 0 - 10 V □ 0 - 20 mA □ 4 - 20 mA 1 dedicated PWM output	**TM168 E17**	0.372

Removable terminal kits

Used for	Type	For use with	Reference	Weight kg
Connecting the: □ Power supply □ I/O □ Expansion bus	Screw	TM168 E17	**TM168 SCTB17**	0.059
		TM168 D23●●●●●	**TM168 SCTB23**	0.073
	Spring	TM168 E17	**TM168 SPTB17**	0.060
		TM168 D23●●●●●	**TM168 SPTB23**	0.076

Communication modules

Description	Protocol	Reference	Weight kg
BACnet network communication modules	BACnet MS/TP	**TM168 BACS**	0.035
	BACnet IP	**TM168 BACW**	0.044

Remote display units

Description	Type	Reference	Weight kg
Graphic displays	Display with 6 command buttons	**TM168 GDB**	0.240
	Touch screen display with 6 command buttons	**TM168 GDTS**	0.268

Expansion valve module

Application	Display	Reference	Weight kg
Control of electronic expansion valve	Integrated	**TM168 DEVCM**	0.323

Parameter transfer key

Description	For use with	Reference	Weight kg
Parameter transfer key	Any programmable controller	**TM168 APARAKEY**	0.395

HVAC & R machine control solutions

I/O expansion module / expansion valve module

for Modicon™ M168™ parametric logic controllers or programmable logic controllers

Introduction

I/O expansion module

The I/O expansion module **TM168 E17** communicates via the expansion bus. It is used for data acquisition and exchange in a decentralized architecture with:

- 5 discrete inputs
- 3 analog inputs
- 5 discrete relay outputs with N/C contact
- 1 discrete relay output with C/O contact
- 2 configurable analog outputs (0 - 10 V or 0 - 20 mA or 4 - 20 mA)
- 1 dedicated PWM output

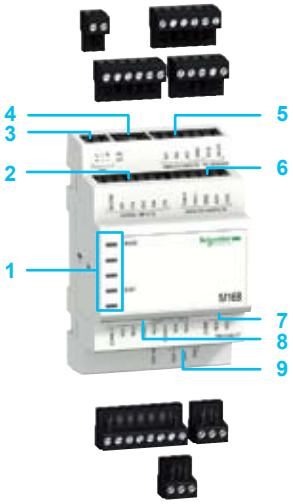
Expansion valve module

For controlling an electronic expansion valve…

The electronic expansion valve control module **TM168 DEVCM** is used to control the electronic expansion valve to prevent overheating when the refrigerant is drawn out. It operates independently, but as an option can be connected to the communication interface **TM168 AVCMCOM**.

Battery charger for the electronic expansion valve control module…

In the event of a power outage, the battery charger **TM168 AVCM** temporarily maintains the power supply to the expansion valve module **TM168 DEVCM** in order to ensure the electronic expansion valve remains closed.

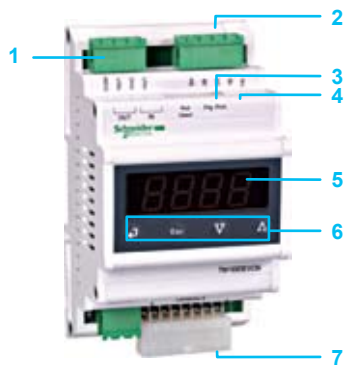


Description

I/O expansion module

I/O expansion module TM168 E17 includes:

1 Display block for displaying the module status: two LEDs: PWR and EXP.
2 Connector for a removable terminal block *(1)* (6 terminals), for connecting discrete inputs.
3 Connector for a removable terminal block *(1)* (2 terminals) for connecting the 24 V ⎓/∿ supply.
4 RJ11 connector for connecting a programming port.
5 Connector for a removable terminal block *(1)* (6 terminals), for connecting analog inputs.
6 Connector for a removable terminal block *(1)* (5 terminals), for connecting analog outputs.
7 Connector for a removable terminal block *(1)* (3 terminals), for connecting the discrete relay C/O output.
8 Connector for a removable terminal block *(1)* (8 terminals), for connecting discrete relay N/C outputs.
9 Connector for a removable terminal block *(1)* (3 terminals), for connecting the expansion bus.



Expansion valve module

The expansion valve module TM168 DEVCM includes

1 Connector for a removable terminal block *(1)* (4 terminals), for connecting high voltage discrete inputs and discrete outputs.
2 Connector for a removable terminal block *(1)* (5 terminals), for connecting the electronic expansion valve.
3 Connector for a removable terminal block *(1)* (6 terminals) (marked Prg. Port) for connecting to the programming PC or supervision system using Modbus™ protocol.
4 Two address setting switches.
5 4-digit control display.
6 Four command buttons.
7 Connector for a removable terminal block *(2)* (16 terminals) to connect the 24 V ⎓ supply, for the low voltage discrete I/O.

(1) Removable terminal blocks (screw or spring), included in kit TM168 SCTB17, to be ordered separately
Note: The expansion modules are mounted as standard on a 35 mm DIN rail.

HVAC & R machine control solutions

I/O expansion module / expansion valve module

for Modicon™ M168™ parametric logic controllers or programmable logic controllers

TM168 E17

References

I/O expansion module

Power supply 24 V ⏦
Removable terminal kit to be ordered separately

No. of I/O	Number and type of channels		Reference	Weight kg
	Inputs	Outputs		
17 I/O	5 discrete volt-free contact inputs 3 configurable analog inputs: □ 0 - 5 V ratio □ 0 - 10 V □ 0 - 20 mA □ 4 - 20 mA □ NTC □ Pt1000 □ PTC	6 discrete relay outputs (5 with N/C contact and 1 with C/O contact) 2 configurable analog outputs: □ 0 - 10 V □ 0 - 20 mA □ 4 - 20 mA 1 dedicated PWM output	**TM168 E17**	0.372

Removable terminal kits

Used for	Type	For use with	Reference	Weight kg
Connecting the: □ Power supply □ I/O □ Expansion bus	Screw	TM168 E17	**TM168 SCTB17**	0.059
	Spring	TM168 E17	**TM168 SPTB17**	0.060

TM168 DEVCM

Expansion valve module

Application	Display	Connection	Reference	Weight kg
Control of electronic expansion valve	Built-in	Supplied with connection terminal blocks	**TM168 DEVCM**	0.323

Communication interface

Function	For use with	Reference	Weight kg
TTL 485 converter Used to control the electronic expansion valve controller TM168 DEVCM via Modbus™ communication	Expansion valve module TM168 DEVCM	**TM168 AVCMCOM**	0.321

Battery charger

Function	For use with	Reference	Weight kg
Continuity of service of the electronic expansion valve TM168 DEVCM if the power supply circuit fails	Expansion valve module TM168 DEVCM Requires the use of a 12 V/7.2 Ah lead battery (not supplied)	**TM168 AVCM**	0.542

(1) Removable screw terminal blocks supplied.
(2) Removable terminal block supplied.
Note: Expansion valve module are mounted as standard on a 35 mm DIN rail.

HVAC & R machine control solutions

Displays for Modicon™ M168™ parametric logic controllers or programmable logic controllers

Introduction

Remote graphic display units for Modicon™ M168™ logic controllers communicate via the expansion bus. They can be powered electrically via the controllers or from an external source *(1)*. These display units can be flush-mounted or surface-mounted, and feature integrated backlighting.

There are 2 types of display units:

- Monochrome display **TM168 GDB**: 128 x 64 pixels, LCD graphic screen, 6 buttons
- Monochrome display **TM168 GDTS**: 240 x 140 pixels, LCD graphic touch screen, 6 buttons

TM168 GDTS and **TM168 GDTS** display units have a buzzer" for handling acoustic alarms.

SoHVAC programming software can be used to define and develop pages to be displayed in tandem with the application program.

In the case of configurations containing several items of equipment, a single display unit can be used to visualize more than one of these items.

Description

Remote graphic display unit TM168 GDB

1 LCD graphic screen
2 Six command buttons

Remote graphic display unit TM168 GDTS

1 LCD graphic touch screen
2 Six command buttons

Common rear view:

1 RJ11 connector for updating firmware
2 Power supply connector *(1)*
3 Connector for expansion bus
4 Four adjustment switches for expansion bus line terminators.

Command buttons

Button	Primary function	Secondary function
Esc	Escape	Delete the data value/return to the previous menu System command (if pressure > 3 s)
<	Scroll to the left	Programmable secondary function
∧	Scroll up	Programmable secondary function
∨	Scroll down	Programmable secondary function
>	Scroll to the right	Programmable secondary function
↵	Enter	Confirms the data value/sends the command System command (if pressure > 3 s)

(1) In cases where a display unit is located less than 30 meters from a Modicon M168 controller, it can be supplied directly with 24 V ⎓ by this controller.

HVAC & R machine control solutions

Displays for Modicon™ M168™ parametric logic controllers or programmable logic controllers

TM168 GDB

TM168 GDTS

TM168 AGDIP65

TM168 AGD1

References

Remote graphic displays

Description	Characteristics	Reference	Weight kg
Remote graphic displays	□ Monochrome LCD graphic screen □ 128 x 64 pixels □ 6 command buttons □ Clock □ Acoustic alarm	**TM168 GDB**	0.240
	□ Monochrome LCD graphic touch screen □ 240 x 140 pixels □ 6 command buttons □ Clock □ Acoustic alarm	**TM168 GDTS**	0.268

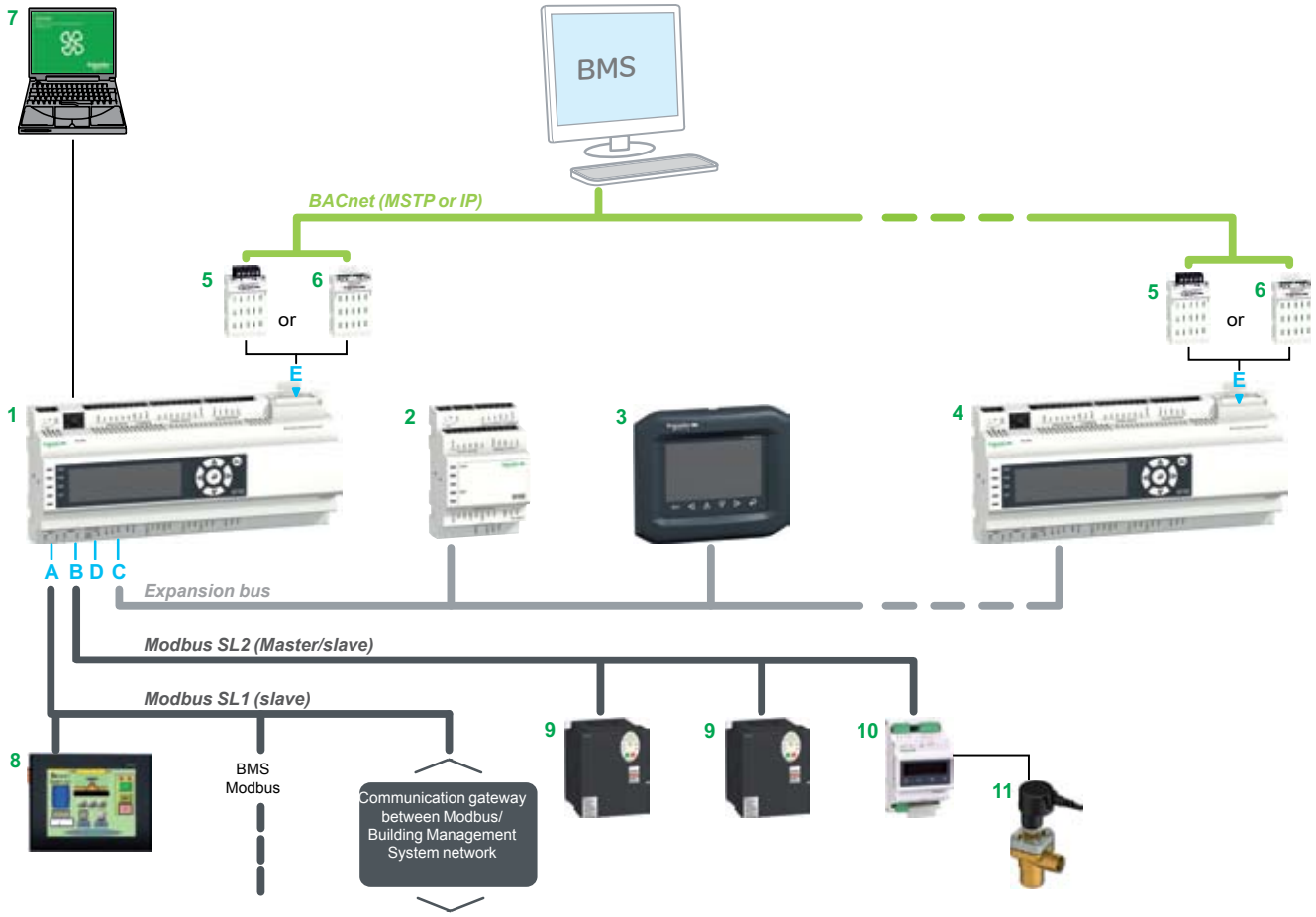
Accessories for remote displays

Description	Characteristics	Reference	Weight kg
Faceplate	□ Degree of protection: IP 65 □ 133 (W) x 112 (H) mm	**TM168 AGDIP65**	0.003
Box for surface mounting	4 mounting screws included	**TM168 AGD1**	0.131

HVAC & R machine control solutions
Communication buses and networks

Introduction

Modicon™ M168™ parametric logic controllers and programmable logic controllers offer multiple connection options to different communication networks.



All Modicon M168 logic controllers are designed to simplify connections to communication buses and networks, and feature as standard:

- Two RJ45 communication ports:
  - Slave Modbus™ port (A) marked MBS1
  - Master/slave Modbus port (B) marked MBS2
- Connector (C) for a removable terminal block *(1)* (3 terminals), for connecting the expansion bus.
- Five switches (D) for adjusting Modbus bus and expansion bus polarization and line terminators.

TM168 ●●●●●●●●C logic controllers are designed to match Building Management System (BMS) configurations and have been enhanced with BACnet communication protocols (MSTP or IP). They have a slot (E) dedicated to communication modules (5 and 6) for access to the BACnet network. Two communication modules (TM168 BAC●) must be ordered separately.

1 Controller TM168 D23DC
2 I/O expansion module TM168 E17
3 Remote display TM168 GDB●
4 TM168 D23DC controller: Multi-master
5 Communication module TM168 BACS
6 Communication module TM168 BACW
7 PC: SoHAVC configuration software
8 Magelis™ terminal
9 ATV 212 variable speed drives
10 Expansion valve module: for controlling electronic expansion valve TM168 DEVCM
11 Electronic expansion valve: third-party product

(1) Removable terminal blocks (screw or spring), included in kit TM168 SCTB●●, to be ordered separately.

Introduction (continued)

Modbus™ serial links

Modbus serial links are dedicated to connecting dialog tools, variable speed drives, and Building Management Systems (BMS) in Modbus or any other protocol via gateways.

- MBS1 (Modbus slave): Magelis™ operator dialog terminals, Building Management System (BMS).
- MBS2 (Modbus master/slave), to be configured with SoHVAC as…
  Slave: same as MBS1
  Master: variable speed drive controlled by Modbus (reducing the number of analog outputs and wiring time)

Setup is made easier thanks to AFB function blocks which send commands directly to the drives.

Expansion bus

The expansion bus is the physical link for transmitting incoming and outgoing data between Modicon™ M168™ logic controllers and the I/O expansion module, remote graphic display units and expansion valve module.
Each of the above-mentioned components has a dedicated connector for the expansion bus.
The expansion bus supports the circulation and exchange of data sent by the various components which make up the control solution.
Multi-master: The expansion bus can be used to create a multi-master configuration in cases where a number of controllers are interconnected.

BACnet network

See page 22.

Modbus serial link references

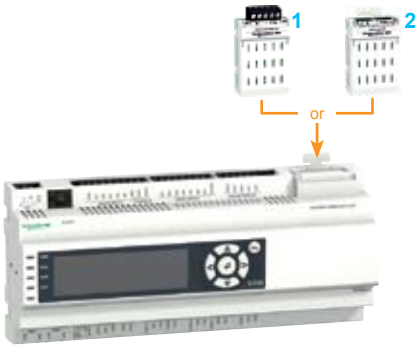
Connection accessories for remote Human-Machine Interface *(1)*

Description	Length m	Reference	Weight kg
Cordsets for Modbus serial link equipped with 2 RJ45 connectors	0.3	**VW3 A8 306 R03**	0.025
	1	**VW3 A8 306 R10**	0.060
	3	**VW3 A8 306 R30**	0.130

(1) For connecting a remote display terminal or a graphic display terminal.

HVAC & R machine control solutions

Communication modules for Modicon™ M168™ parametric or programmable logic controllers



Two optional communication modules for parametric or programmable logic controllers TM168 ●●●CS

Introduction

Building Management via BACnet communication modules

Two optional communication modules enable the TM168 ●●●CS logic controllers to access Building Management System (BMS) networks.
TM168 ●●●CS logic controllers take one single communication module at a time in the dedicated slot, which indicates the desired communication type chosen:

- TM168 BACS communication module (1): BACnet serial link, MS/TP protocol, Class B-ASC, with a removable screw connector (5 contacts for stripped wires) or…
- TM168 BACW communication module (2): BACnet IP Internet protocol, Class B-ASC, with two RJ11 network access connectors.

The communication modules are directly supplied by the logic controllers once inserted in the dedicated slot.
These communication modules link the TM168●●●CS logic controllers to one another and/or to other third-party BMS devices in a daisy chain topology.

The SoHVAC software solution is used to configure the setup of TM168 BAC●S communication modules and variables exported to the network. The SoHVAC software solution accesses the communication modules via the logic controllers.

Additional services

Additional services are available on the Web server by using the TM168 BACW communication module.
The Web server contains "ready-to-use" pages for water chiller and air handling unit control applications, as well as a Web page template, which can be customized for other applications. These Web pages are available in 5 languages.
During operation, parametric logic controllers automatically detect and select the appropriate “application” pages. The programmable controller user has to choose ready-to-use pages that are available on the Web server for water chiller or air handling unit control applications. They can also customize the Web page template provided by a Web browser, and upload it to an ftp site.
The Web browser can be used to configure the relative IP, SNMP parameters and register third-party devices on BACnet IP. The Web browser can also monitor and perform diagnostics on the IP network parameters by collecting and displaying the network statistics and providing a log file. Access to the Web server is protected by a password.

Description

The TM168BACS communication module is comprised of:

1 Insertion and removal tab.
2 Connector for a removable terminal block (5-way) *(1)* for connection to the BACnet network, using BACnet MS/TP protocol.
3 Three LEDs: one LED marked MS to indicate the module status, one LED marked Tx to indicate transmission of signals and one LED marked Rx to indicate reception of signals.
4 Connector (50-way) for the link with the TM168●●●●CS controller.

The TM168BACW communication module is comprised of:

1 Insertion and removal tab.
2 Two RJ45 connectors for connection to the BACnet network, using BACnet IP protocol.
3 Four LEDs, including one LED marked MS to indicate the module status, one LED marked NS to indicate the network status, one LED marked LNK to indicate the status of links on port 1 (RJ11) and one LED marked LNK to indicate the status of links on port 2 (RJ11).
4 Connector (50-way) for the link with the TM168●●●●CS controller.

(1) Removable terminal block (5-way), supplied with communication module TM168BACS.

HVAC & R machine control solutions

Communication modules for Modicon™ M168™ parametric or programmable logic controllers

TM168 BACS

TM168 BACW

References

Communication modules

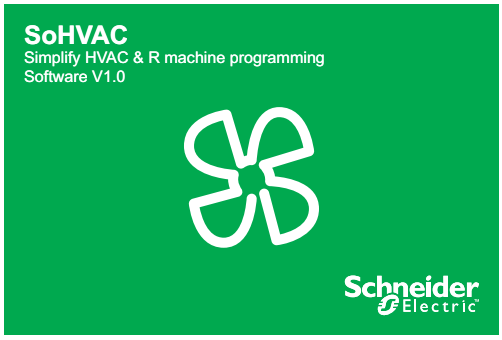
Description	Characteristics	Communication port	Reference	Weight kg
BACnet network communication modules	BACnet protocol MS/TP Class B-ASC Alarms	Removable terminal block (5-way), supplied with module	**TM168 BACS**	0.035
	BACnet IP protocol Class B-ASC with alarms Web server: □ Embedded Web pages in 5 languages □ Ready-to-use or customizable Web pages for parametric logic controllers □ On Web browser: startup of relative IP parameters, monitoring and diagnostics □ Log file display Third-party device functions	2 RJ 45 ports with 2 collision switches in a daisy chain topology	**TM168 BACW**	0.044

HVAC & R machine control solutions

SoHVAC™ software

For programming HVAC & R equipment

Introduction



Software solution

SoHVAC™ is the software solution for HVAC & R OEM applications. It can be used to develop, configure and commission entire HVAC & R systems.
It facilitates the:
- Programming of Modicon™ M168™ programmable logic controllers and remote display units
- Setting up expansion bus and Modbus™ networks
- Configuring BMS communication modules on BACnet MS/TP and IP, Lonworks

The following types of equipment can be programmed and configured with SoHVAC…

Programmable logic controllers:
- TM168 B23S
- TM168 B23CS
- TM168 D23S
- TM168 D23CS

Remote displays:
- TM168 GDB
- TM168 GTS

Communication modules:
- TM168 BACS
- TM168 BACW

SoHVAC software comes with a library of application function blocks and applications which have been tested, validated and documented (TVDA). The libraries are dedicated to HVAC & R applications.
Complete parametric application programs are available for the following types of equipment:
- Air handling system
- Water chiller

General specifications

Overview

Programming languages	ST (Structured Text in C within a dedicated window) FBD (Function Block Diagram)
Controller programming services	Multitasking ability Function blocks dedicated to HVAC & R applications Programming via Function Block Diagram or Structured Text Breakpoints, step-by-step execution Configuration of data to be exported for BMS communication
Services for displays	Tool for building display pages Tool for page simulation
General services	User profile and access Printing project documentation Comparison of projects (checking) Division of variables according to a publication/subscription mechanism Management of library versions
Communication bus configurators	Control networks: □ Modbus serial link Expansion bus fieldbus: □ Expansion bus BMS connectivity: □ BACnet MS/TP □ BACnet IP
Library of application function blocks	Function blocks for water chiller: Examples include: □ Control of water outflow temperature □ Compressor management □ Control of variable high pressure Function blocks for air handling systems: Examples include: □ Control of blow-out temperature □ Pilot control of operating modes for air handling system Complete parametric programs: □ Low-capacity water chiller □ Air handling system

Product information

SoHVAC™ software is supplied on a DVD. This product version offers all of the SoHVAC functions associated with programmable logic controllers and solution logic controllers.

References

System configuration:

Processor: Pentium® 1.6 GHz or higher
RAM: 1 GB; 2 GB recommended
Hard disk: 500 MB minimum
OS: 32-bit Windows®; XP Pro SP3 or Vista Pro SP3
Drive: DVD drive
Display: SVGA video card; 800×600, 128 MB; 1024×768, 256 MB recommended
Peripheral device: A mouse or compatible pointing peripheral device
Peripheral device: USB interface

SoHVAC software…

■ can be used to program the programmable logic controllers TM168 B23S, TM168 B23CS, TM168 D23S and TM168 D23CS.
■ has a library of application function blocks dedicated to application programmable logic controllers TM168 B23S, TM168 B23CS, TM168 D23S and TM168 D23CS.

SoHVAC software with library of application function blocks

Application programmable logic controllers *(1)*	Proposed library of application function blocks	Parametric programs	Reference	Weight kg
TM168 B23S **TM168 B23CS** **TM168 D23S** **TM168 D23CS**	**For water chiller:** Control of variable high pressure with variable speed drives Managing compressors Control of water outflow temperature Managing fans **Advanced control:** Advanced control of overheating Advanced control of variable high pressure with variable speed drives	Low-capacity water chiller	**TM168 SOFT**	0.100
	For air handling systems: Temperature control Factory control Modbus™ communication module (Altivar 212)	Air handling system		

TM168 APROG

Programming cable

Description	Characteristics	Length (m)	Reference	Weight kg
Programming cable	□ Connects to the PC USB socket and the RJ11 socket of M168 logic controllers □ Consists of a case, an RJ11/RJ11 cable and a mini-USB/USB cable	4	**TM168 APROG**	0.231

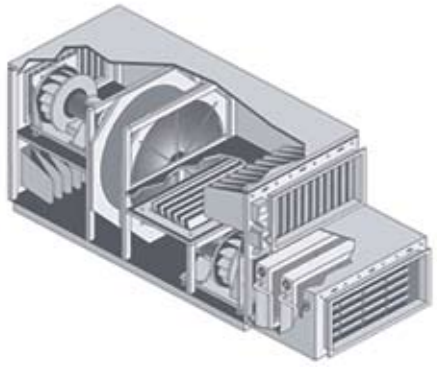
TM168 APARAKEY

Parameter transfer key

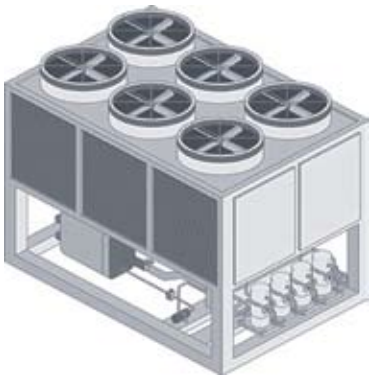
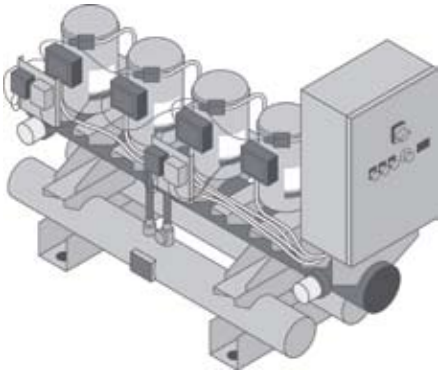
Description	Characteristics	Reference	Weight kg
Parameter transfer key	□ Transfer of parameters written to PC, from one controller to another controller □ Consists of a case and an RJ11/RJ11 cable	**TM168 APARAKEY**	0.395

(1) Solution controllers: please consult our Customer Care Center.

HVAC & R machine control solutions
Modicon™ M168™ parametric logic controllers

Applications		**Control of air handling unit**	
			
Equipment configuration		■ Up to 2 fans ■ 1 hot/cold water battery ■ Air humidification ■ Damper for fresh air and air recycling ■ Energy regeneration exchanger	■ Up to 2 fans ■ 1 cooling battery ■ 1 heating battery ■ 1 reheating battery ■ 1 electrical resistor, up to 3 stages ■ Air humidification ■ Damper for fresh air and air recycling ■ Heat recovery exchanger
Setup		Pre-programmed parametric logic controllers Parameters set via the built-in display	
Inputs	Type	■ 7 discrete inputs ■ 5 configurable analog inputs	■ 7 discrete inputs ■ 5 configurable analog inputs + ■ 7 discrete inputs ■ 3 configurable analog inputs
Outputs	Type	■ 8 discrete relay outputs ■ 2 configurable analog outputs	■ 8 discrete relay outputs ■ 2 configurable analog outputs + ■ 6 discrete relay outputs ■ 2 configurable analog outputs
Communication	Type and support	Modbus™ slave serial link by means of connection on integrated RJ45 port Modbus master/slave serial link on integrated RJ45 port	
		BACnet MS/TP or BACnet IP with external communication modules (1) in dedicated slot on controller	
Power supply		24 V ⎓/∿	
Display	Built-in	Yes	Yes (2)
	Remote	Yes (optional)	Yes (optional)
Type of parametric configuration (controller + expansion module combination)		**TM168 D23AHU101●**	**TM168 D23AHU101●** **+** **TM168 E17**
Page	Modicon™ M168™ logic controllers	29	29
	Expansion modules	–	17

(1) Compatible with TM168 D23AHU101C, to be ordered separately
(2) With controller TM168 D23AHU101.

Control of low-capacity water chiller (< 100 kW)			
Air-cooled condenser		**Water-cooled condenser**	
			
■ 1 refrigerant circuit ■ Up to 2 scroll type compressors ■ 1 fan for each condenser	■ 2 refrigerant circuits ■ Up to 2 evaporators ■ Up to 4 scroll type compressors ■ Up to 2 condensers (1 fan for each condenser)	■ 1 refrigerant circuit ■ Up to 2 scroll type compressors ■ 1 water-cooled condenser	■ 2 refrigerant circuits ■ Up to 2 evaporators ■ Up to 4 scroll type compressors ■ Up to 2 water-cooled condensers
Pre-programmed parametric logic controllers Parameters set via the built-in display			
■ 7 discrete inputs ■ 5 configurable analog inputs	■ 7 discrete inputs ■ 5 configurable analog inputs + ■ 7 discrete inputs ■ 3 configurable analog inputs	■ 7 discrete inputs ■ 5 configurable analog inputs	■ 7 discrete inputs ■ 5 configurable analog inputs + ■ 7 discrete inputs ■ 3 configurable analog inputs
■ 8 discrete relay outputs ■ 2 configurable analog outputs ■ 1 dedicated PWM output	■ 8 discrete relay outputs ■ 2 configurable analog outputs ■ 1 dedicated PWM output + ■ 6 discrete relay outputs ■ 2 configurable analog outputs ■ 1 dedicated PWM output	■ 8 discrete relay outputs ■ 2 configurable analog outputs	■ 8 discrete outputs ■ 2 configurable analog outputs + ■ 6 discrete relay outputs ■ 2 configurable analog outputs
Modbus™ slave serial link by means of connection on integrated RJ45 port Modbus master/slave serial link on integrated RJ45 port			
BACnet MS/TP or BACnet IP with external communication modules *(1)* in dedicated slot on controller			
24 V ⎓/∼			
Yes	Yes *(2)*	Yes	Yes *(2)*
Yes (optional)	Yes (optional)	Yes (optional)	Yes (optional)
TM168 D23CHL101●	**TM168 D23CHL101● + TM168 E17**	**TM168 D23CHL101●**	**TM168 D23CHL101● + TM168 E17**
31	31	31	31
–	17	–	17

(1) Compatible with TM168 D23CHL101C, to be ordered separately.
(2) With controller TM168D23CHL.

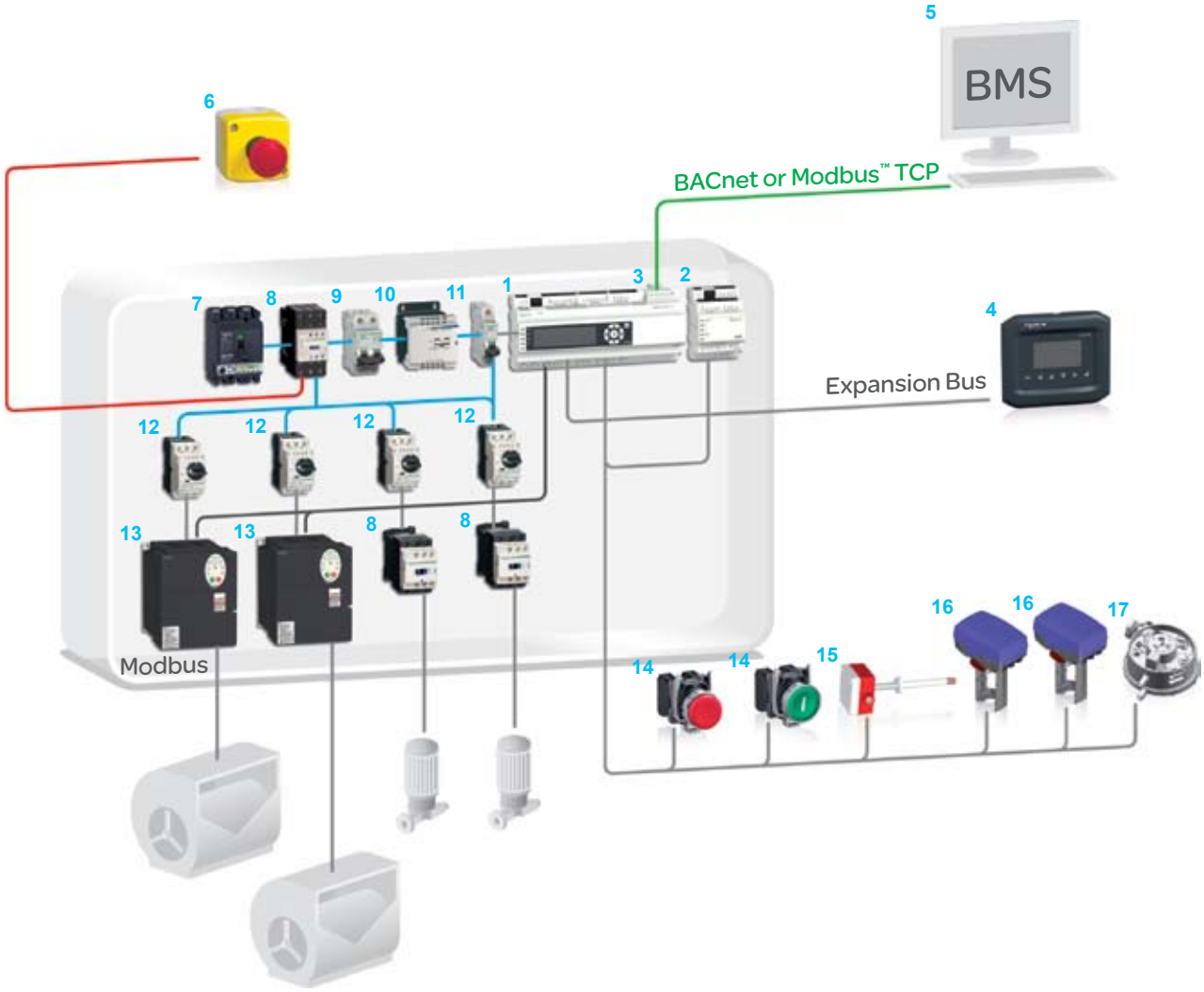
HVAC & R machine control solutions

Modicon™ M168™ parametric logic controllers

For air handling unit

Introduction

Control solution for air handling unit



1 Logic controller M168 D23AHU101C
2 I/O expansion module TM168 E17
3 Communication module TM168 BAC●
4 Remote display unit TM168 GDB
5 Monitoring: Building Management Systems
6 XALK box for Emergency stop function
7 PowerPact circuit-breaker
8 Square D contactors
9 Square D circuit-breaker
10 Control transformer
11 DC circuit-breaker
12 TeSys™ GV2 motor protectors
13 Altivar 212 variable speed drives
14 XB4 push-buttons
15 Temperature sensor
16 Air pressure sensors
17 Pressure sensor

Control functions

- Start/stop control for fan (controlling room temperature)
- Temperature control for blown-out air
- Temperature control for room (cascade)
- Humidification/dehumidification control for blown-out air
- Static pressure control for blown-out air
- Free cooling and Free heating functions for temperature of blown-out air
- Heat recovery exchanger control (wheel, twin-battery)

Description

Same as Description of Programmable logic controllers, see page 14.

HVAC & R machine control solutions

Modicon™ M168™ parametric logic controllers

For air handling unit

TM168 D23AHU101

TM168 D23AHU101C

TM168 E17

TM168 BACS TM168 BACW

TM168 GDB

TM168 GDTS

TM168 APARAKEY

Parametric logic controllers for air handling unit

Power supply 24 V ≂
Built-in display
Removable terminal kit to be ordered separately

Parametric logic controllers for air handling unit

No. of I/O	Number and type of channels		Communication ports	Item no.	Reference	Weight kg
	Inputs	Outputs				
23 I/O	7 discrete inputs, 24 V ≂ 5 configurable analog inputs	8 discrete relay outputs (7 with N/C contact and 1 with C/O contact) 2 configurable analog outputs	□ 1 RJ45 port: Modbus™ slave serial link □ 1 RJ45 port: Modbus master/slave serial link	–	**TM168 D23AHU101**	0.576
			□ same as TM168 D23AHU101 + □ 1 slot for optional communication module TM168 BAC● *(1)*	1	**TM168 D23AHU101C**	0.790

Separate parts for parametric logic controllers

I/O expansion module (see page 16)

No. of I/O	Number and type of channels		Communication ports	Item no.	Reference	Weight kg
	Inputs	Outputs				
17 I/O	5 discrete volt-free contact inputs 3 configurable analog inputs	6 discrete relay outputs (5 with N/C contact and 1 with C/O contact) 2 configurable analog outputs	–	2	**TM168 E17**	0.372

Removable terminal kits

Used for	Type	For use with	Reference	Weight kg
Connecting the: □ Power supply □ I/O □ Expansion bus	Screw	TM168 E17	**TM168 SCTB17**	0.059
		TM168 D23●●●●●	**TM168 SCTB23**	0.073
	Spring	TM168 E17	**TM168 SPTB17**	0.060
		TM168 D23●●●●●	**TM168 SPTB23**	0.076

Communication modules (see page 22)

Description	Protocol	Item no.	Reference	Weight kg
BACnet network communication modules	BACnet MS/TP	3	**TM168 BACS**	0.035
	BACnet IP	3	**TM168 BACW**	0.044

Remote displays (see page 18)

Description	Type	Item no.	Reference	Weight kg
Graphic displays	Display with 6 command buttons	4	**TM168 GDB**	0.240
	Touch screen display with 6 command buttons	–	**TM168 GDTS**	0.268

Parameter transfer key (see page 33)

Description	For use with	Reference	Weight kg
Key for transferring parameters to PC	Any parametric controller	**TM168 APARAKEY**	0.395

(1) To be ordered separately.

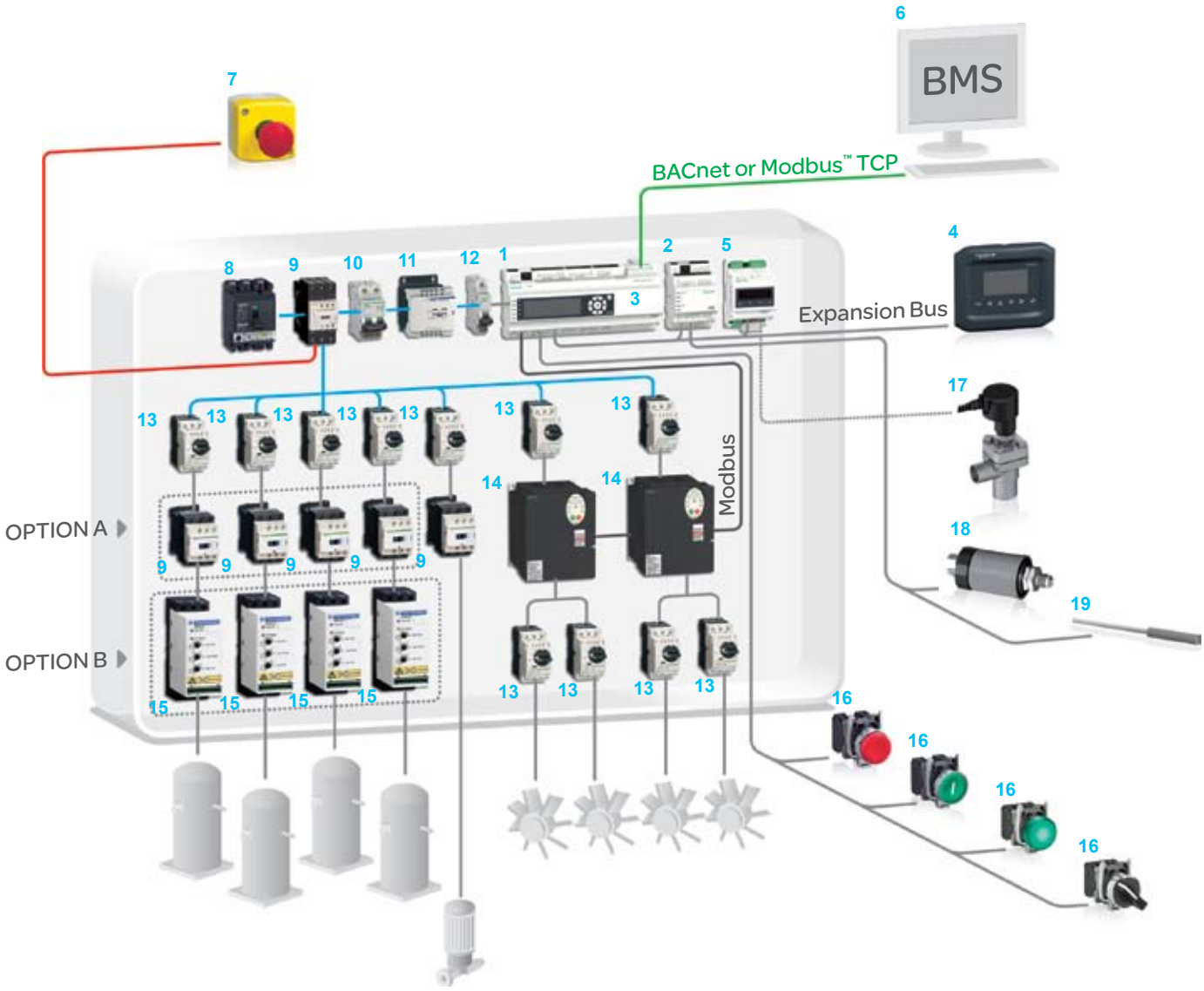
HVAC & R machine control solutions

Modicon™ M168™ parametric logic controllers

For low-capacity water chiller

Introduction

Control solution for low-capacity water chiller



1 Logic controller TM168 D23AHU101C
2 I/O expansion module TM168 E17
3 Communication module TM168 BAC●
4 Remote display TM168 GDB
5 Expansion valve module: for controlling electronic expansion valve TM168 DEVCM
6 Monitoring: Building Management Systems
7 XALK box for Emergency stop function
8 PowerPact circuit-breaker
9 Square D contactors
10 Square D circuit-breaker
11 Control transformer
12 DC circuit-breaker
13 TeSys GV2 motor protectors
14 Altivar 212 variable speed drives
15 Altistart 01 soft start/soft stop unit
16 XB4 push-buttons, selector switches and pilot lights
17 Electronic expansion valve *(third-party product)*
18 Pressure transmitter
19 Temperature probe

Control functions

- Temperature control for water tap-off
- Variable setpoint for measuring changes in outside temperature
- Fixed or variable high pressure
- Management of primary pumps
- Management of defrosting in accordance with changes in outside temperature

Description

Same as Description of programmable logic controllers, see page 14.

HVAC & R machine control solutions

Modicon™ M168™ parametric logic controllers

For low-capacity water chiller

TM168 D23CHL101

TM168 D23CHL101C

TM168 E17

TM168 BACS

TM168 BACW

TM168 GDB

TM168 GDTS

TM168 APARAKEY

Parametric logic controllers for low-capacity water chiller

Power supply 24 V ≂
Built-in display
Removable terminal kit to be ordered separately

No. of I/O	Number and type of channels		Communication ports	Item no.	Reference	Weight kg
	Inputs	Outputs				
23 I/O	7 discrete inputs, 24 V ≂ 5 configurable analog inputs	8 discrete relay outputs (7 with N/C contact and 1 with C/O contact) 2 configurable analog outputs 1 dedicated PWM output	□ 1 RJ45 port: Modbus™ slave serial link □ 1 RJ45 port: Modbus master/slave serial link	–	**TM168 D23CHL101**	0.576
			□ same as TM168 D23CHL101 + □ 1 slot for optional communication module TM168 BAC● *(1)*	1	**TM168 D23CHL101C**	0.790

Separate parts for parametric logic controllers

I/O expansion module (see page 16)

No. of I/O	Number and type of channels		Item no.	Reference	Weight kg
	Inputs	Outputs			
17 I/O	5 discrete volt-free contact inputs 3 configurable analog inputs	6 discrete relay outputs (5 with N/C contact and 1 with C/O contact) 2 configurable analog outputs 1 dedicated PWM output	2	**TM168 E17**	0.372

Removable terminal kits

Used for	Type	For use with	Reference	Weight kg
Connecting the: □ Power supply □ I/O □ Expansion bus	Screw	TM168 E17	**TM168 SCTB17**	0.059
		TM168 D23●●●●●	**TM168 SCTB23**	0.073
	Spring	TM168 E17	**TM168 SPTB17**	0.060
		TM168 D23●●●●●	**TM168 SPTB23**	0.076

Communication modules (see page 22)

Description	Protocol	Item no.	Reference	Weight kg
BACnet network communication modules	BACnet MS/TP	3	**TM168 BACS**	0.035
	BACnet IP	3	**TM168 BACW**	0.044

Remote display units (see page 18)

Description	Type	Item no.	Reference	Weight kg
Graphic displays	Display with 6 command buttons	4	**TM168 GDB**	0.240
	Touch screen display with 6 command buttons	–	**TM168 GDTS**	0.268

Expansion valve module (see page 16)

Application	Display	Item no.	Reference	Weight kg
Control of electronic expansion valve	Built-in	5	**TM168 DEVCM**	0.323

Parameter transfer key (see page 33)

Description	For use with	Reference	Weight kg
Parameter transfer key	Any parametric controller	**TM168 APARAKEY**	0.395

(1) To be ordered separately

HVAC & R machine control solutions

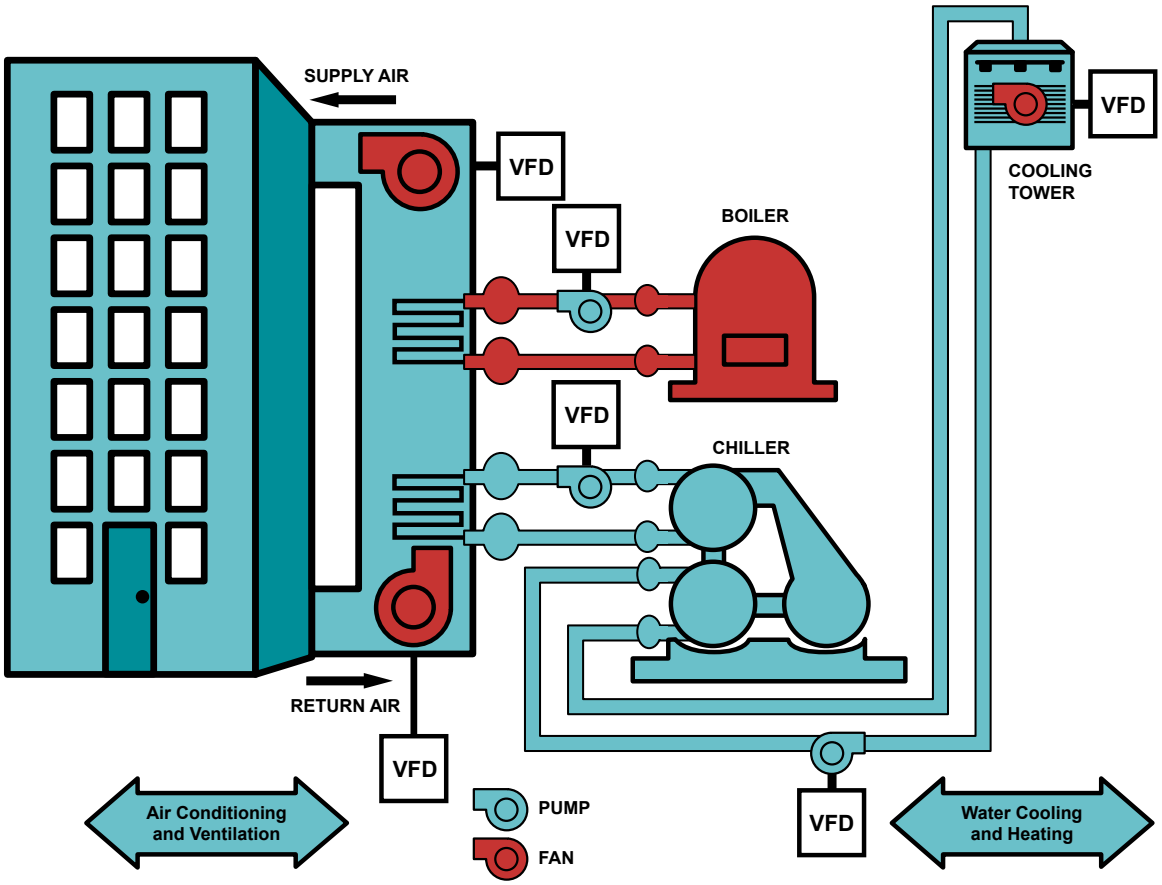
Modicon™ M168™ programmable logic controllers

Intelligent commercial pumping systems

Introduction

Control solution for intelligent commercial pumping systems

While the term HVAC & R is generically used to describe the systems in a building that provide heating, ventilation, cooling and refrigeration, the two primary applications supporting these technologies are pumps and fans. The figure below shows how pumps and fans are typically incorporated into building structures.



Electrical energy management is key factor in the success of many HVAC & R Solutions, and pumps play a major role in optimizing the efficiencies of these HVAC systems. Due to the nature of their application, design and operation, pumps provide an excellent opportunity to reduce costs and increase reliability. With enhanced controls are at the center of these solutions, supported by intelligent management systems, major improvements in energy utilization can be realized in commercial buildings.

Pump system design and operation

The way that the HVAC & R pump system is sized and operated is key. In many cases, the daily/weekly pump operating cycle varies greatly, resulting in less than optimum operating conditions—with reduced system efficiency and increased energy consumption. In other applications, pump systems may be oversized to allow for future expansion, which again reduces system efficiency and increases energy consumption. One example in commercial buildings may be simple differences in HVAC loading in the daytime (building occupied) versus nighttime (building empty).

AC Intelligent Drive

Introduction (continued)

The benefits of Variable Frequency Drives to HVAC & R applications

Another key element of the pump system design is the driver, which may include a variable frequency drive (VFD). VFDs offer several benefits in HVAC & R pumping system applications:

- If the pump is variable pressure and/or flow, then a VFD can provide more enhanced energy savings than mechanical means and potentially reduce total system costs.
- If the pump is a constant speed pump that is oversized, then reducing the pump speed can correct for the over sizing. This reduction in speed will also save energy due to the affinity laws.
- If the application is variable loading and has an oversized motor, the VFD can solve both challenges simultaneously.

In addition to energy savings, a number of additional benefits are realized by using VFDs in HVAC & R pumping applications:

- They reduce mechanical stress on the pumps and pump systems, resulting in longer life and reduced downtime/reliability issues.
- Less maintenance is required on the pump systems—valves and inlet guide vanes for example.
- Reduced inrush currents lower overall demand and reduce the likelihood of incurring peak power demand charges.

Adding intelligence to the pump system controls

Beyond using basic VFDs, adding intelligence to HVAC & R pump control solutions provides additional benefits with energy efficiency gains, some of which include:

- Management of multi-pump systems to measure and optimize their operating cycle
- Linkage to building management systems, typically via BACnet or LonWorks, to provide real-time feedback and operational optimization
- Enhanced HVAC & R pump protection, resulting in longer life, increased operational efficiency and high reliability
- More closely matched pump/VFD operating parameters—the intelligence can ultimately be pump specific should the pump manufacturer elect to customize specifically to its equipment
- The intelligence could monitor pump operating parameters and conditions—such as vibration, leak detection, increased pressure, current draw and temperatures to name a few, and predictive maintenance could then be applied, which would reduce downtime

Several configurations of intelligent drives are available, the most simple being a VFD with embedded intelligence. Think of it as a mini programmable logic controller (PLC) embedded in the drive. All the benefits noted above can be provided in a simple, clean VFD package.

Adding an intelligent controller

Another option for intelligent pumping is to incorporate a separate controller. This provides the ability to control not only the pumps but the associated fans and equipment that make up the entire HVAC & R system in which the pump is operating.

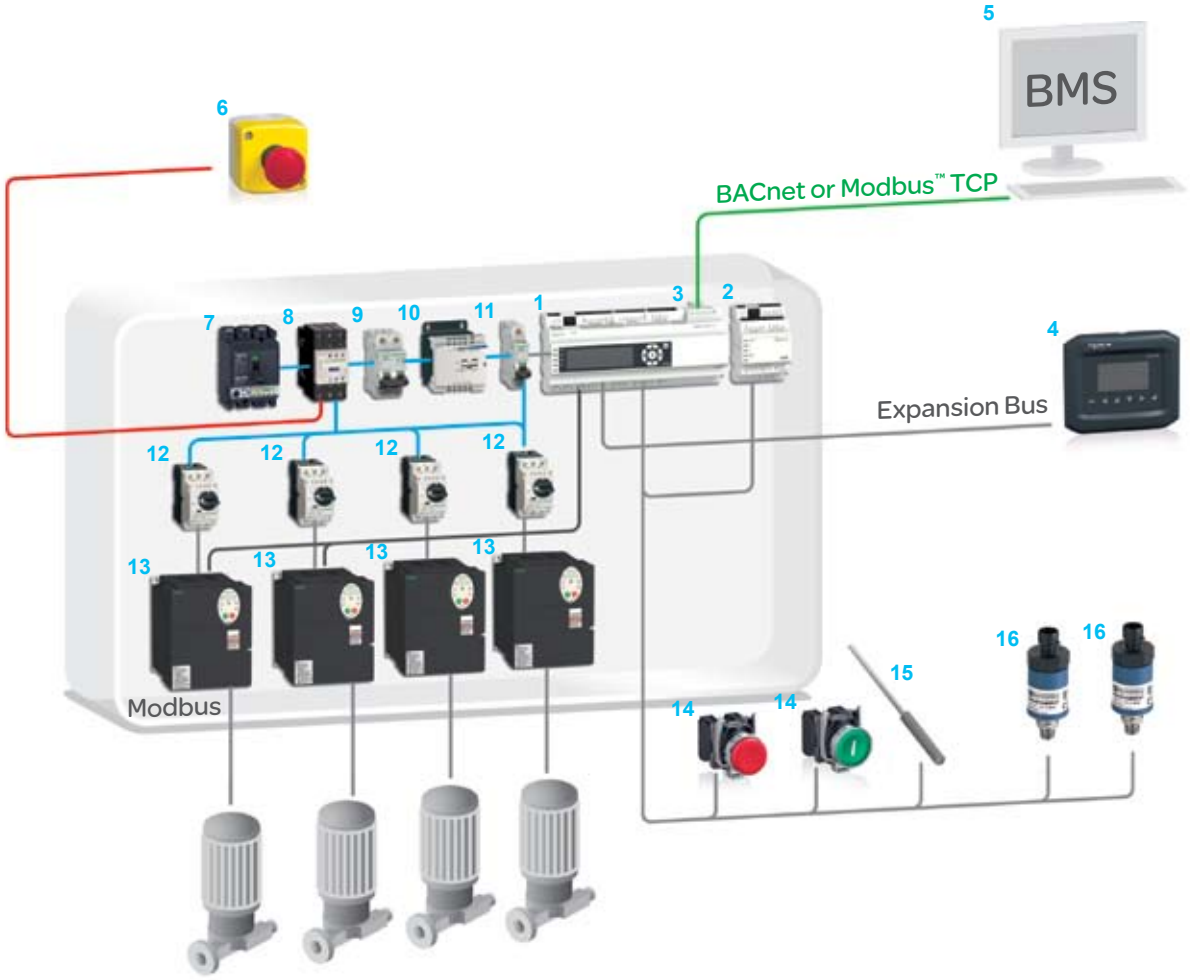
An example of this would be the cooling tower system. This system includes condenser water pumps, cooling tower fan(s) and the cooling tower itself. One controller can monitor and control the entire system to maintain peak system energy efficiency. The controller can determine the load on the system at any given time. The delta T of the condenser water is monitored by the controller and the proper signals are then sent to the cooling tower fan VFD(s) and condenser pump VFD(s). This signal represents the minimum operation required for the fan and pump motors in relation to the building load on the system. This information can then be shared with the building automation system (BAS) through BacNet or another communication protocol.

In a multiple-pump system that is connected to a single intelligent controller, the controller communicates with a human machine interface (HMI), shown at left. The operator sees a graphical representation of the pumping system. From the HMI, the operator can receive an abundance of information about the pumping system in an easy to understand format. Should a problem within the system arise, alarms will be generated at the HMI. When the HMI is linked to the BAS through BacNet or another communication protocol, the operator can monitor and control the entire HVAC system of the building from this point. This saves the operator a lot of time going up and down elevators and ladders.

Multiple-pump system connected to a single intelligent controller and HMI

Introduction (continued)

Control solution for intelligent commercial pumping systems



1 Logic controller M168 D23AHU101C
2 I/O expansion module TM168 E17
3 Communication module TM168 BAC●
4 Remote display unit TM168 GDB
5 Monitoring: Building Management Systems
6 XALK box for Emergency stop function
7 PowerPact circuit-breaker
8 Square D contactors
9 Square D circuit-breaker
10 Control transformer
11 DC circuit-breaker
12 TeSys GV2 motor protectors
13 Altivar 212 variable speed drives
14 XB4 push-buttons
15 Temperature sensor
16 XMLK pressure transducers

Description

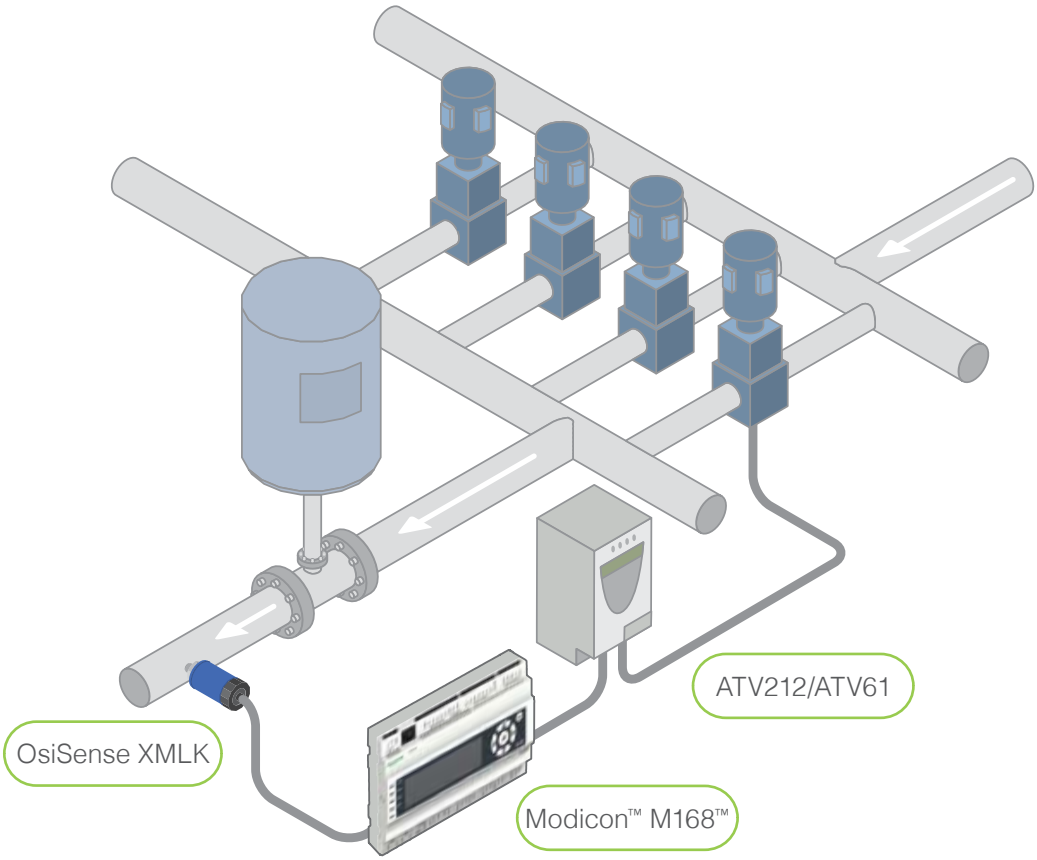
Same as Description of Programmable logic controllers, see page 14.

HVAC & R machine control solutions

Electronic pressure sensors
OsiSense™ XM
For control circuits, type XMLK

Tested and validated solution

Used in combination with Altivar™ variable speed drives – **OsiSense XMLK** pressure sensors enable constant control of pressure within the network – regardless of flow rate. They provide real-time information that enables the drive to control an entire installation.



Available globally

> Comprehensive product range

XMLK

> Economical
> Compact
> Simple installation

XMLG

> High precision
> Metal body
> Pressure controlled 0–600 bar

XMLF

> Display screen
> Adjustable differential

9012G

> Robust performance
> Specifically designed for industrial control circuits
> Adjustable thresholds

XMLA/XMLB

> Robust performance
> Specifically designed for industrial control circuits
> Adjustable thresholds

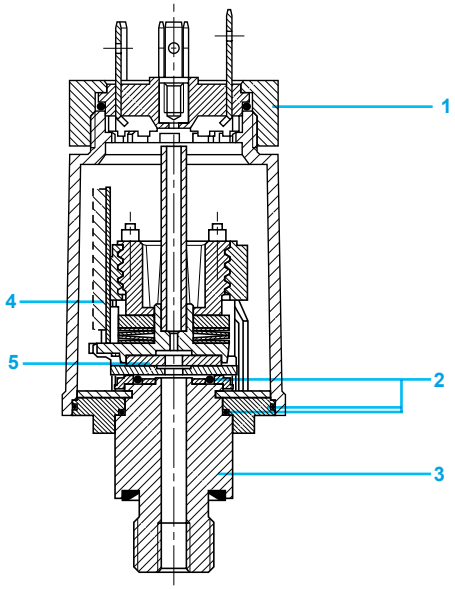
Find all these pressure sensors on www.sesensors.com.

HVAC & R machine control solutions

Electronic pressure sensors

OsiSense™ XM

For control circuits, type XMLK



Introduction

Type XMLK pressure transmitters are designed using a ceramic pressure-measuring cell. Deformation, caused by pressure, changes the resistance of the resistors in a Wheatstone bridge silk-screened on the ceramic. The change in resistance is then processed by the integrated electronics to provide an analog output signal.

1 Electrical connection: for example, DIN EN 175301-803-A connector
2 Seals
3 Threaded fluid connection
4 Hybrid electronics
5 Ceramic measuring cell

Functions

XMLK pressure transmitters have an analog output, 4–20 mA or 0–10 V, which is proportional to the measuring range.

These compact products are available with various types of electrical connectors and fluid connections.

Standard versions are available calibrated in both bar and psi.
The bulk packaging alternative offers an excellent price/performance ratio.
XMLK electronic pressure sensors are designed for simple pumping applications and are well suited for pump equipment manufacturers.

HVAC & R machine control solutions

Electronic pressure sensors
OsiSense™ XM
For control circuits, type XMLK

Environmental specifications

Conformity to standards			CE IEC/EN 60947-1, IEC/EN 60947-5-1 EN 50081-1, EN 50082-2, EN 61000-6-2
Product certifications			UL: File E97729, CCN NKPZ CSA: File 240515, Class 3211-03
Rated supply voltage		**V**	24 V ⎓
Voltage limits			4–20 mA: 8–33 V ⎓ 0–10 V: 16.2–33 V ⎓
Current consumption			4–20 mA: < 20 mA 0–10 V: < 6 mA
Output signal			4–20 mA, 0-10 V
Protective treatment			Standard version "TC"
Ambient air temperature	For operation	**°C (°F)**	0 to + 80 (32 to 176**)**
	For storage	**°C (°F)**	–25 to + 85 (13 to 185**)**
Fluids or products controlled			Air, fresh water (0 to + 80 °C / 32 to 176 **°F**)
Component materials in contact with fluid			Steel, type AISI 303 (stainless steel) nitrile (NBR)
Operating position			All positions
Vibration resistance			20 gn (9–2000 Hz) conforming to IEC 60068-2-6
Shock resistance			25 gn (half sine wave 11 ms) conforming to IEC 60068-2-27
Resistance to electromagnetic interference	Electrostatic discharges		Standard EN 61000-4-2, 8 kV in air, 6 kV on contact
	Radiated electromagnetic fields		Standard EN 61000-4-3, >10 V/m, 80–.1000 MHz
	Fast transients		Standard EN 61000-4-4, 2 kV
	Surges		Standard EN 61000-4-5, 500 V 12 Ω, 1 kV 42 Ω
	Conducted disturbances, induced by radio frequency fields		Standard EN 61000-4-6, 10 V 0.15–80 MHz
	Magnetic fields		Standard EN 61000-4-8, 30 A/m, 50 Hz
Electrical protection			Protected against reverse polarity and load short-circuit. For use on Class 2 circuit.
Rated impulse withstand voltage		**kV**	0.5
Degree of protection			IP 65 conforming to IEC/EN 60529, NEMA 4
Output response time		**ms**	< 2
Repeat accuracy			± 0.3% of the measuring range
Precision (resolution)			Combined sum of linearity, hysteresis, and repeat accuracy <± 0.5% of the measuring range
			Setting tolerance of zero point and measuring range limit < ± 1% of the measuring range
Drift	Of the zero point		< ± 0.04% of the measuring range/°K
	Of the sensitivity		< ± 0.03% of the measuring range/°K
Service life	Operating cycles		> 10 million (varies based on application and environment)
Fluid connection			G 1/4 A (male) conforming to ISO 7, or 1/4"-18 NPT male
Electrical connection			Connector, either M12, DIN 43650A (DIN EN 175301-803-A) or Packard® Metri-Pack

Interpretation of the reference number

Note: Use this table only to interpret the reference number. Some combinations are not available.

XMLK	**100**			**P**	**2**	**D**	**2**	**3**	**TQ**
Units without display	Rated pressure			**Unit of pressure**	**O-Ring**	**Electrical connection**	**Output**	**Fluid connection**	**Bulk pack**
36 mm (1.42 in.) diameter	**Code**	**psi**	**bar**						
	006		0–6	B: bar	2: NBR (Nitrile)	C: DIN 43650A	2: Analog, 4–20 mA	1: G 1/4 A (male)	
	010		0–10	P: psi		D: M12	7: Analog, 0-10 V	3: 1/4"-18 NPT (male)	
	016		0–16			P: Packard Metri-Pack			
	025		0–25						
	100	0–100							
	150	0–150							
	200	0–200							
	300	0–300							

HVAC & R machine control solutions

Electronic pressure sensors

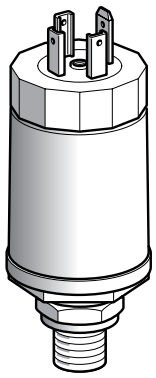
OsiSense™ XM

Pressure transmitters type XMLK, bar version

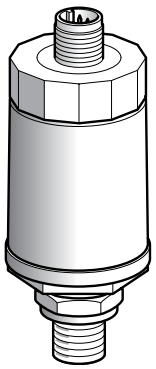
With analog output 4–20 mA

Pressure transmitters type XMLK, bar version, DIN 43650A connector or M12 connector *(1)*

DIN 43650A connector



M12 connector



Pressure range		**0–6 bar (0–87 psi)**	**0–10 bar (0–145 psi)**	**0–16 bar (0–232 psi)**	**0–25 bar (0–362.5 psi)**
Selection					
Pressure transmitters XMLK, DIN 43650A connector					
Sold in packs of:	1	**XMLK006B2C21**	**XMLK010B2C21**	**XMLK016B2C21**	**XMLK025B2C21**
	bulk *(2)*	**XMLK006B2C21TQ**	**XMLK010B2C21TQ**	**XMLK016B2C21TQ**	**XMLK025B2C21TQ**
Pressure transmitters XMLK, M12 connector					
Sold in packs of:	1	**XMLK006B2D21**	**XMLK010B2D21**	**XMLK016B2D21**	**XMLK025B2D21**
	bulk *(2)*	**XMLK006B2D21TQ**	**XMLK010B2D21TQ**	**XMLK016B2D21TQ**	**XMLK025B2D21TQ**
Fluid connection *(3)*		G 1/4 A (male)			
Weight, kg (lb)		0.110 (.25)	0.110 (.25)	0.110 (.25)	0.110 (.25)

Additional specifications not shown under general specifications

Rated supply voltage		√2 4 V ⎓			
Voltage limits		8–33 V ⎓			
Output *(4)*		4–20 mA, 2-wire technique			
Current consumption		< 20 mA			
Maximum permissible accidental pressure		12 bar (174 psi)	20 bar (290 psi)	32 bar (464 psi)	50 bar (725 psi)
Destruction pressure		18 bar (261 psi)	30 bar (435 psi)	48 bar (696 psi)	75 bar (1087.5 psi)
Electrical connection	**DIN 43650A connector**	EN 175301-803-A (male). For suitable female connector see accessories on page 42.			
	M12 connector	M12, 3-pin male. For suitable female connectors, including pre-wired versions, see accessories on page 42.			

(1) For other types of electrical connections, consult the Sensor Competency Center at www.sesensors.com.

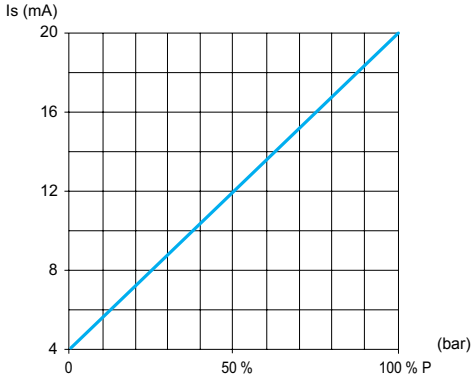
(2) Sold in lots of 25, minimum quantity 50.

(3) For other types of fluid connections, consult the Sensor Competency Center.

(4) For other types of output, consult the Sensor Competency Center.

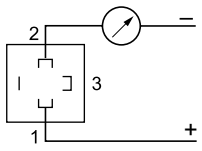
Output curve

XMLK0●●B2●21

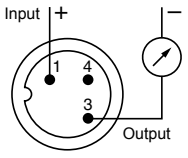


Connector wiring: 2-wire technique (4–20 mA)

DIN



M12

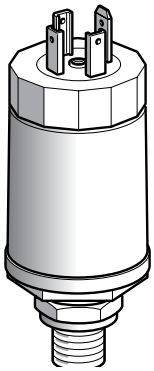


HVAC & R machine control solutions

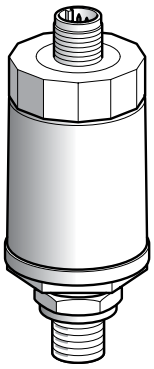
Electronic pressure sensors
OsiSense™ XM
Pressure transmitters type XMLK, bar version
With analog output 0–10 V

Pressure transmitters type XMLK, bar version, DIN 43650A connector or M12 connector *(1)*

DIN 43650A connector



M12 connector

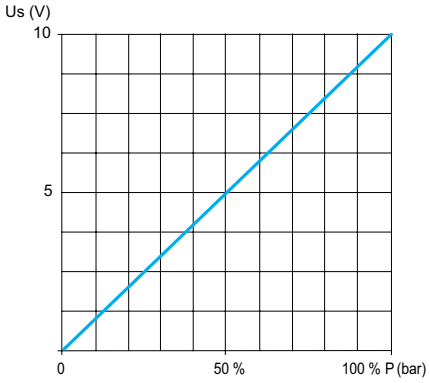


Pressure range		**0–6 bar (0–87 psi)**	**0–10 bar (0–145 psi)**	**0–16 bar (0–232 psi)**	**0–25 bar (0–362.5 psi)**
Selection					
Pressure transmitters XMLK, DIN 43650A connector					
Sold in packs of:	1	**XMLK006B2C71**	**XMLK010B2C71**	**XMLK016B2C71**	**XMLK025B2C71**
	bulk *(2)*	**XMLK006B2C71TQ**	**XMLK010B2C71TQ**	**XMLK016B2C71TQ**	**XMLK025B2C71TQ**
Pressure transmitters XMLK, M12 connector					
Sold in packs of:	1	**XMLK006B2D71**	**XMLK010B2D71**	**XMLK016B2D71**	**XMLK025B2D71**
	bulk *(2)*	**XMLK006B2D71TQ**	**XMLK010B2D71TQ**	**XMLK016B2D71TQ**	**XMLK025B2D71TQ**
Fluid connection *(3)*		G 1/4 A (male)			
Weight, kg (lb)		0.110 (.25)	0.110 (.25)	0.110 (.25)	0.110 (.25)
Additional specifications not shown under general specifications					
Rated supply voltage		24 V ⎓			
Voltage limits		16.2–33 V ⎓			
Output *(4)*		0–10 V, 3-wire technique			
Current consumption		< 6 mA			
Maximum permissible accidental pressure		12 bar (174 psi)	20 bar (290 psi)	32 bar (464 psi)	50 bar (725 psi)
Destruction pressure		18 bar (261 psi)	30 bar (435 psi)	48 bar (696 psi)	75 bar (1087.5 psi)
Electrical connection	**DIN 43650A connector**	EN 175301-803-A (male) . For suitable female connector see accessories on page 42.			
	M12 connector	M12, 3-pin male. For suitable female connectors, including pre-wired versions, see accessories on page 42.			

(1) For other types of electrical connections, consult the Sensor Competency Center at www.sesensors.com.
(2) Sold in lots of 25, minimum quantity 50.
(3) For other types of fluid connections, consult the Sensor Competency Center.
(4) For other types of output, consult the Sensor Competency Center.

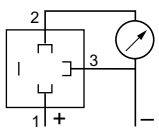
Output curve

XMLK0●●B2●71

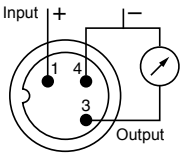


Connector wiring: 3-wire technique (0–10 V)

DIN



M12



HVAC & R machine control solutions

Electronic pressure sensors

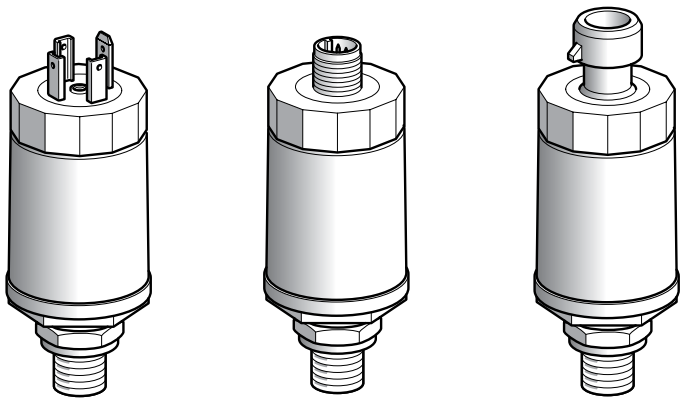
OsiSense™ XM

Pressure transmitters type XMLK, psi version

With analog output 4–20 mA

Pressure transmitters type XMLK, psi version, DIN 43650A, M12 or Packard connector *(1)*

DIN 43650A connector | **M12 connector** | **Packard connector**



Pressure range		**0–100 psi (0–6.9 bar)**	**0–150 psi (0–10.3 bar)**	**0–200 psi (0–13.8 bar)**	**0–300 psi (0–.20.7 bar)**
Selection					
Pressure transmitters XMLK, DIN 43650A connector					
Sold in packs of:	1	**XMLK100P2C23**	**XMLK150P2C23**	**XMLK200P2C23**	**XMLK300P2C23**
	bulk *(2)*	**XMLK100P2C23TQ**	**XMLK150P2C23TQ**	**XMLK200P2C23TQ**	**XMLK300P2C23TQ**
Pressure transmitters XMLK, M12 connector					
Sold in packs of:	1	**XMLK100P2D23**	**XMLK150P2D23**	**XMLK200P2D23**	**XMLK300P2D23**
	bulk *(2)*	**XMLK100P2D23TQ**	**XMLK150P2D23TQ**	**XMLK200P2D23TQ**	**XMLK300P2D23TQ**
Pressure transmitters XMLK, Packard connector					
Sold in packs of:	1	**XMLK100P2P23**	**XMLK150P2P23**	**XMLK200P2P23**	**XMLK300P2P23**
	bulk *(2)*	**XMLK100P2P23TQ**	**XMLK150P2P23TQ**	**XMLK200P2P23TQ**	**XMLK300P2P23TQ**
Fluid connection *(3)*		1/4"-18 NPT male			
Weight, kg (lb)		0.110 (.25)	0.110 (.25)	0.110 (.25)	0.110 (.25)

Additional specifications not shown under general specifications

Rated supply voltage		24 V ⎓			
Voltage limits		8–33 V ⎓			
Output *(4)*		4–20 mA, 2-wire technique			
Current consumption		< 20 mA			
Maximum permissible accidental pressure		200 psi (13.8 bar)	300 psi (20.7 bar)	400 psi (27.5 bar)	600 psi (41 bar)
Destruction pressure		300 psi (20.7 bar)	450 psi (31 bar)	600 psi (41 bar)	900 psi (62 bar)
Electrical connection	**DIN 43650A connector**	EN 175301-803-A (male) . For suitable female connector see accessories on page 42			
	M12 connector	M12, 3-pin male. For suitable female connectors, including pre-wired versions, see accessories on page 42.			
	Packard connector	3-pin Delphi® (Packard) Metri-Pack 150 series.			

(1) For other types of electrical connections, consult the Sensor Competency Center at www.sesensors.com.

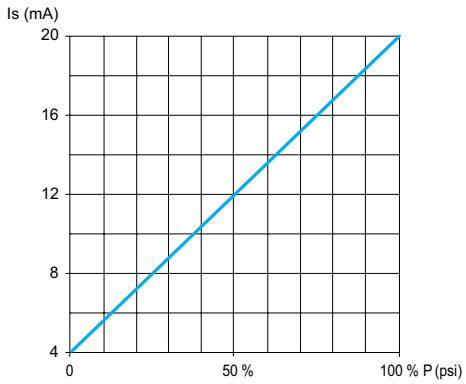
(2) Sold in lots of 25, minimum quantity 50.

(3) For other types of fluid connections, consult the Sensor Competency Center.

(4) For other types of output, consult the Sensor Competency Center.

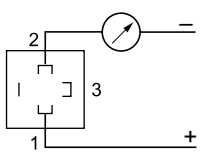
Output curve

XMLK1●●P2●23

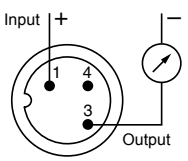


Connector wiring: 2-wire technique (4–20 mA)

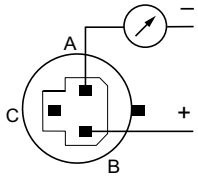
DIN



M12



Packard



HVAC & R machine control solutions

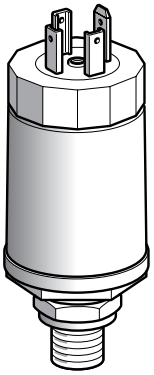
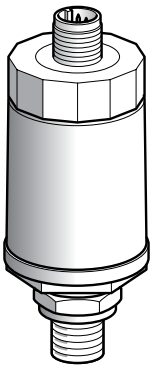
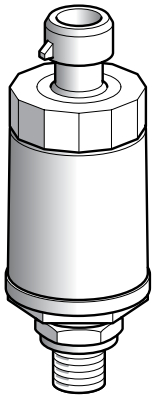
Electronic pressure sensors

OsiSense™ XM

Pressure transmitters type XMLK, psi version

With analog output 0–10 V

Pressure transmitters type XMLK, PSI version, DIN 43650A, M12 or Packard connector *(1)*

	DIN 43650A connector	M12 connector	Packard connector
			

Pressure range		**0–100 psi (0–6.9 bar)**	**0–150 psi (0–10.3 bar)**	**0–200 psi (0–13.8 bar)**	**0–300 psi (0–20.7 bar)**
Selection					
Pressure transmitters XMLK, DIN 43650A connector					
Sold in packs of:	1	**XMLK100P2C73**	**XMLK150P2C73**	**XMLK200P2C73**	**XMLK300P2C73**
	bulk *(2)*	**XMLK100P2C73TQ**	**XMLK150P2C73TQ**	**XMLK200P2C73TQ**	**XMLK300P2C73TQ**
Pressure transmitters XMLK, M12 connector					
Sold in packs of:	1	**XMLK100P2D73**	**XMLK150P2D73**	**XMLK200P2D73**	**XMLK300P2D73**
	bulk *(2)*	**XMLK100P2D73TQ**	**XMLK150P2D73TQ**	**XMLK200P2D73TQ**	**XMLK300P2D73TQ**
Pressure transmitters XMLK, Packard connector					
Sold in packs of:	1	**XMLK100P2P73**	**XMLK150P2P73**	**XMLK200P2P73**	**XMLK300P2P73**
	bulk *(2)*	**XMLK100P2P73TQ**	**XMLK150P2P73TQ**	**XMLK200P2P73TQ**	**XMLK300P2P73TQ**
Fluid connection *(3)*		1/4"-18 NPT male			
Weight, kg (lb)		0.110 (.25)	0.110 (.25)	0.110 (.25)	0.110 (.25)

Additional specifications not shown under general specifications

Rated supply voltage		24 V ⎓			
Voltage limits		16.2–33 V ⎓			
Output *(4)*		0–10 V, 3-wire technique			
Current consumption		< 6 mA			
Maximum permissible accidental pressure		200 psi (13.8 bar)	300 psi (20.7 bar)	400 psi (27.5 bar)	600 psi (41 bar)
Destruction pressure		300 psi (20.7 bar)	450 psi (31 bar)	600 psi (41 bar)	900 psi (62 bar)
Electrical connection	**DIN 43650A connector**	EN 175301-803-A (male) . For suitable female connector see accessories on page 42.			
	M12 connector	M12, 3-pin male. For suitable female connectors, including pre-wired versions, see accessories on page 42.			
	Packard connector	3-pin Delphi (Packard) Metri-Pack 150 series.			

(1) For other types of electrical connections, consult the Sensor Competency Center at www.sesensors.com.

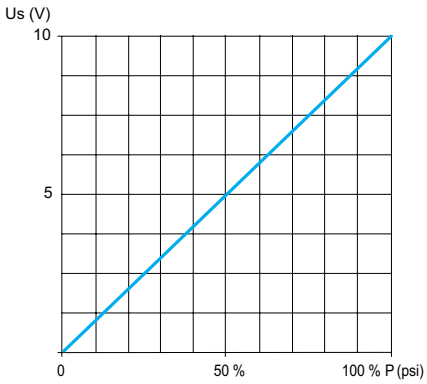
(2) Sold in lots of 25, minimum quantity 50.

(3) For other types of fluid connections, consult the Sensor Competency Center.

(4) For other types of output, consult the Sensor Competency Center.

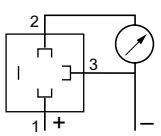
Output curve

XMLK1●●P2●73

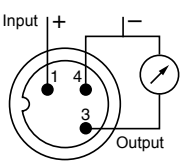


Connector wiring: 3-wire technique (0–10 V)

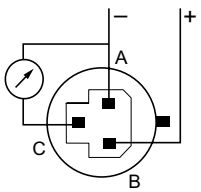
DIN



M12



Packard



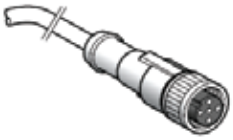
HVAC & R machine control solutions

Electronic pressure sensors
OsiSense™ XM
Pressure transmitters type XMLK
Accessories

XZ CC12FDM40B

XZ CC12FCM40B

XZ CC43FCP40B



XZ CP1141L10

XZ CP1241L5

Connection accessories

Description	Type	Reference	Weight kg (lb)
M12 female connector, metal clamping ring *(1)*	Straight	**XZCC12FDM40B**	0.020 (0.04)
	Elbowed	**XZCC12FCM40B**	0.020 (0.04)
DIN 43650A female connector *(1)*		**XZCC43FCP40B**	0.035 (0.08)

Description	Cable Length	Reference	Weight kg (lb)
Pre-wired M12, straight female connectors	2 m	**XZCP1141L2**	0.090 (0.20)
	5 m	**XZCP1141L5**	0.190 (0.42)
	10 m	**XZCP1141L10**	0.370 (0.82)
Pre-wired M12, elbowed female connectors	2 m	**XZCP1241L2**	0.090 (0.20)
	5 m	**XZCP1241L5**	0.190 (0.42)
	10 m	**XZCP1241L10**	0.370 (0.82)

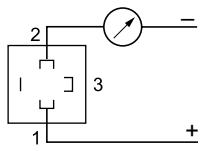
(1) Connector with screw terminal connections.

Connector wiring diagrams (pressure sensor connector pin view)

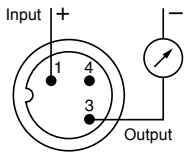
Pressure transmitters XMLK

2-wire technique (4–20 mA)

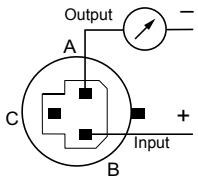
DIN



M12

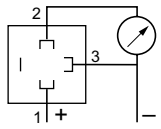


Packard

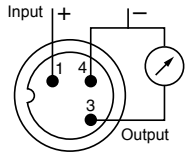


3-wire technique (0–10 V)

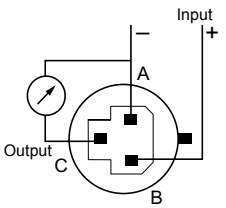
DIN



M12



Packard



HVAC & R machine control solutions

Electronic pressure sensors

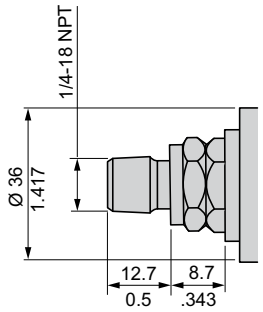
OsiSense™ XM

Pressure transmitters type XMLK

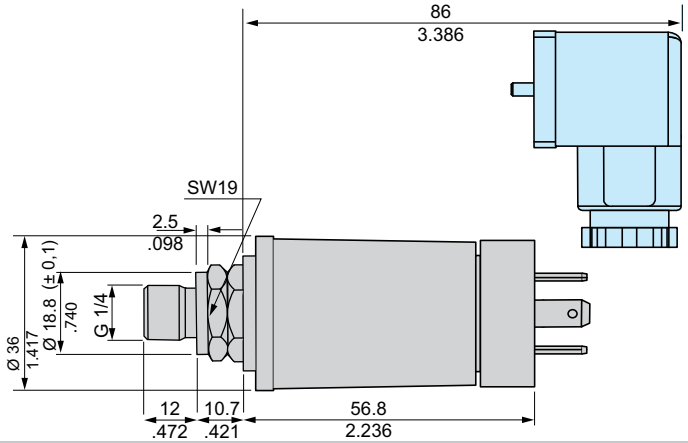
Dimensions

XMLK, DIN connector

NPT

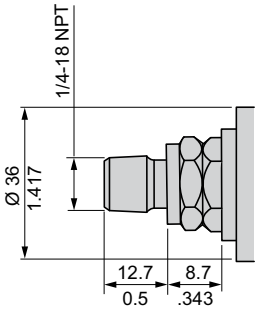


G 1/4 A (male)

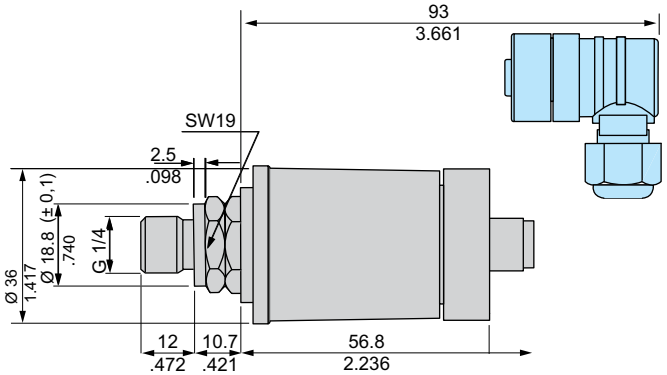


XMLK, M12 connector

NPT

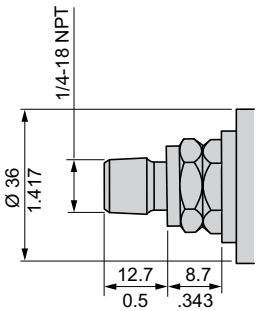


G 1/4 A (male)

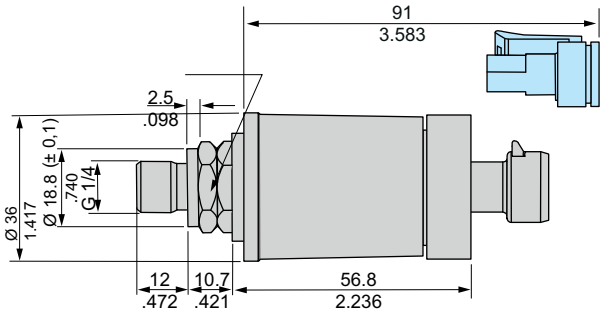


XMLK, Packard connector

NPT



G 1/4 A (male)



Dimensions = mm / in.

HVAC & R machine control solutions

Pressure sensors for refrigerant fluid
XMLP pressure transmitters

Available 4th Quarter 2011

Introduction

XML P0●●BD●9

XMLP pressure transmitters

XMLP pressure transmitters are designed using “thin film” technology. The stainless steel capsule holding the sensing element is welded directly onto the transmitter's stainless steel body – which prevents the seal from coming into contact with the fluid – as well as making it compatible with any type of fluid.

Made of 304 stainless steel, XMLP pressure transmitters are compact and rugged. These transmitters are utilized for applications such as:
- Fluid circuits on machines
- Refrigeration (HVAC)

Functions

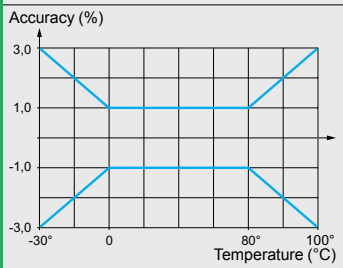
XML P0●●BD●9 pressure sensors have a 4 to 20 mA or 0.5 to 4.5 V analog output, proportional to the available pressure ranges (10 to 600 bar).

The **XML P0●●BD●9** model is available with:
- M12 electrical connection
- 7/16-20 UNF-2B fluid connection

Other versions

- 0 to 10 V analog output
- 18 mm DIN electrical connection
- G1/4 A and 7/16-20 UNF-2A fluid connections: please consult our website www.schneider-electric.com
- GSD 207 INDUSTRIAL STANDARD electrical connection (9.4 mm): please consult our Customer Care Center or our website www.schneider-electric.com

General specifications

Pressure transmitters			XML P0●●BD●9
Conformity to standards			CE RoHS, IEC/EN 60947-1, IEC/EN 60947-5-1, EN 50081, EN 50082-2, EN61000-6-2
Rated supply voltage	4-20 mA transmitters	V	12/24 ⎓
	0.5 to 4.5 V ratiometric transmitters	V	5
Voltage limits	4-20 mA transmitters	V	8 to 30 ⎓
	0.5 to 4.5 V ⎓ ratiometric transmitters	V	5 (± 5%)
Current consumption		mA	< 25
Protective treatment			Standard version “TC”
Ambient air temperature	For operation	°C	- 15 to + 85
	For storage	°C	- 30 to + 100°C
	For fluid	°C	- 30 to + 100 (125°C on request)
Fluids or products controlled			Refrigerant fluid
Component materials in contact with fluid	Fluid connection		304 stainless steel
	Sensor element		17-4PH stainless steel
	External seal		Depending on model: none or FKM fluorocarbon (viton)
Operating positions			All positions
Vibration resistance			20 gn (9 to 2000 Hz) conforming to IEC 60068-2-6
Resistance to electromagnetic interference	Electrostatic discharges		Standard EN 61000-4-2, ± 8 kV in air, 4 kV on contact
	Radiated electromagnetic fields		Standard EN 61000-4-3, >10 V/m, 80 to 1000 MHz
	Rapid transients		Standard EN 61000-4-4, 1 kV
	Surges		Standard EN 61000-4-5, 1 kV
	Conducted disturbances, induced by radio frequency fields		Standard EN 61000-4-6, 3 V 0.15 to 80 MHz
	Magnetic fields		–
Degree of protection			IP 65 and IP 67
Output response time		ms	< 5
Accuracy			
Service life			> 10 million operating cycles
Fluid connection			7/16-20 UNF-2B, male
Electrical connection			M12 - 4-pole

HVAC & R machine control solutions

Pressure sensors for refrigerant fluid
XMLP pressure transmitters

Available 4th Quarter 2011

XML P0●●BD●9

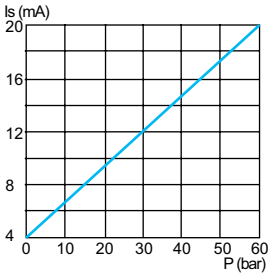
References

Fluid/electrical connection	Rating (bar)	Maximum permissible accidental pressure (bar)	Destruction pressure (bar)	Reference	Weight kg
Pressure transmitters, 4-20 mA output					
7/16-20 UNF 2B male/ M12	10 (14.5 psi)	20	30	**XML P010BD29**	0.050
	16 (232 psi)	32	48	**XML P016BD29**	0.050
	25 (362.5 psi)	50	75	**XML P025BD29**	0.050
	40 (580 psi)	80	120	**XML P040BD29**	0.050
Pressure transmitters, 0.5-4.5 V output					
7/16-20 UNF 2B male/ M12	10 (14.5 psi)	20	30	**XML P010BD19**	0.050
	16 (232 psi)	32	48	**XML P016BD19**	0.050
	25 (362.5 psi)	50	75	**XML P025BD19**	0.050
	40 (580 psi)	80	120	**XML P040BD19**	0.050

Note: *XMLP sensors are sold in individual packs or in packs of 40.*

Detection curve

4 to 20 mA output



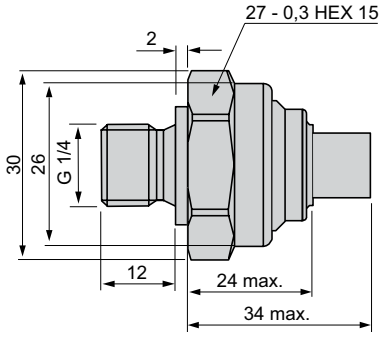
Electrical connections (pressure transmitter connector pin view)

M12

Output	Contacts			
	1	2	3	4
4-20 mA	Vsup	N/C	Iout	N/C
⎓ 0.5 to 4.5 V	Vsup	N/C	Vout	GND

Dimensions

7/16-20 UNF2B, male



HVAC & R machine control solutions

Altivar™ 212 and Altivar 61 variable speed drives

Applications			■ Building pumps and fans ■ HVAC equipment
Types of control			**Variable speed drives for asynchronous motors**

Standards and certifications			IEC/EN 61800-5-1, IEC/EN 61800-3 (environments 1 and 2, categories C1 to C3) EN 55011: Group 1, Class A and Class B with option. CE, UL, CSA, C-Tick, NOM
Drive	Output frequency		0.5 to 200 Hz
	Type of control	Asynchronous motor	Sensorless flux vector control Voltage/frequency ratio (2 points) Energy saving ratio
		Synchronous motor	–
	Transient overtorque		120% of nominal motor torque
Functions	Number of functions		50
Number of preset speeds			7
Speed range			1 to 10
No. of I/O	Analog inputs		2
	Digital inputs		3
	Analog outputs		1
	Digital outputs		–
	Relay outputs		2
Reduction in harmonic currents			–
Communication		Integrated	Modbus™, METASYS N2, APOGEE FLN, BACnet
		Available as an option	LonWorks
Cards (optional)			–
Dialog tools			IP 54 or IP 65 remote display terminal
Configuration tools			PCSoft setup software for ATV 212 Multi-Loader configuration tools

Supply voltage					**Three-phase 200 to 240 V**	**Three-phase 380 to 480 V**
Motor power for 50 to 60 Hz line supply					**0.75 to 75 kW**	**0.75 to 75 kW**
Motor power (kW-*HP*)	Line current (A)					
	200 V	240 V	380 V	480 V		
0.37 - *0.5*	6.9	5.8	–	–	–	–
0.75 - *1*	12	9.9	–	–	–	–
1.5 - *2*	18.2	15.7	–	–	–	–
2.2 - *3*	25.9	22.1	–	–	–	–
3	25.9	22	–	–	–	–
4 - *5*	34.9	29.9	–	–	–	–
5.5 - *7.5*	47.3	40.1	–	–	–	–
0.75 - *1*	*3.3/6.1*	2.7/5.3	1.7	1.4	**ATV 212H075M3X**	**ATV 212H075N4**
1.5 - *2*	6.1/11.3	5.1/9.6	3.2	2.5	**ATV 212HU15M3X**	**ATV 212HU15N4**
2.2 - *3*	8.7/15	7.3/12.8	4.6	3.6	**ATV 212HU22M3X**	**ATV 212HU22N4**
3	–/19.3	10/16.4	6.2	4.9	**ATV 212HU30M3X**	**ATV 212HU30N4**
4 - *5*	14.6/25.8	13/22.9	8.1	6.4	**ATV 212HU40M3X**	**ATV 212HU40N4**
5.5 - *7.5*	20.8/35	17.3/30.8	10.9	8.6	**ATV 212HU55M3X**	**ATV 212HU55N4**
7.5 - *10*	27.9/45	23.3/39.4	14.7	11.7	**ATV 212HU75M3X**	**ATV 212HU75N4**
11 - *15*	42.1/53.3	34.4/45.8	21.1	16.8	**ATV 212HD11M3X**	**ATV 212HD11N4**
15 - *20*	56.1/71.7	45.5/61.6	28.5	22.8	**ATV 212HD15M3X**	**ATV 212HD15N4**
18.5 - *25*	67.3/77	55.8/69	34.8	27.8	**ATV 212HD18M3X**	**ATV 212HD18N4**
22 - *30*	80.4/88	66.4/80	41.6	33.1	**ATV 212HD22M3X**	**ATV 212HD22N4**
30 - *40*	113.3/124	89.5/110	56.7	44.7	**ATV 212HD30M3X**	**ATV 212HD30N4**
37 - *50*	–/141	–/127	68.9	54.4	–	**ATV 212HD37N4**
45 - *60*	–/167	–/147	83.8	65.9	–	**ATV 212HD45N4**
55 - *75*	–/200	–/173	102.7	89	–	**ATV 212HD55N4**
75 - *100*	–/271	–/232	141.8	111.3	–	**ATV 212HD75N4**
90 - *125*	336	288	–	–	–	–

(1) Other voltages available (Three-phase 380 to 480 V or three-phase 500 to 690 V), please consult our "Altivar 61 variable speed drives" catalog or our website www.schneider-electric.com

(2) For motors with a higher rating than 90 kW, please consult our "Altivar 61 variable speed drives" catalog or our website www.schneider-electric.com

■ Industrial pumps and fans
■ HVAC equipment
■ Compressors

Variable speed drives for asynchronous motors

IEC/EN 61800-5-1, IEC/EN 61800-3 (environments 1 and 2, categories C1 to C3), IEC/EN 61000-4-2/4-3/4-4/4-5/4-6/4-11, CE, UL, CSA, DNV, C-Tick, NOM, GOST

0.1 to 500 Hz for the whole range
0.1 to 599 Hz up to 37 kW in 200 to 240 V ∼ and 380 to 480 V ∼

Sensorless flux vector control
Voltage/frequency ratio (2 or 5 points)
Energy saving ratio

Vector control without speed feedback

120% of nominal motor torque for 60 seconds

> 100

8

1 to 100 in open loop mode

2 to 4

6 to 20

1 to 3

0 to 8

2 to 4

DC choke integrated or supplied with the drive

Modbus™ and CANopen

Modbus TCP Daisy Chain, Modbus/Uni-Telway, EtherNet/IP, DeviceNet, PROFIBUS DP V0 and V1, INTERBUS, CC-Link, LONWORKS, METASYS N2, APOGEE FLN, BACnet

I/O expansion cards, Controller Inside programmable card, Altivar IMC integrated controller card, multi-pump cards, encoder interface cards *(2)*

IP 54 or IP 65 remote display terminal

SoMove™ setup software
Simple Loader and Multi-Loader configuration tools

Single-phase 200 to 240 V	**Three-phase 200 to 240 V** *(1)*	
0.37 to 630 kW *(2)*	**0.37 to 630 kW** *(2)*	**0.37 to 630 kW** *(2)*

References with integrated EMC filter, categories C1, C2 or C3	References with integrated EMC filter (up to 7.5 W), category C2	References (without EMC filter)
ATV 61H075M3	–	–
ATV 61HU15M3	–	–
ATV 61HU22M3	–	–
ATV 61HU30M3	–	–
ATV 61HU40M3	–	–
ATV 61HU55M3	–	–
ATV 61HU75M3	–	–
–	ATV 61H075M3	–
–	ATV 61HU15M3	–
–	ATV 61HU22M3	–
–	ATV 61HU30M3	–
–	ATV 61HU40M3	–
–	ATV 61HU55M3	–
–	ATV 61HU75M3	–
–	–	ATV 61HD11M3X
–	–	ATV 61HD15M3X
–	–	ATV 61HD18M3X
–	–	ATV 61HD22M3X
–	–	ATV 61HD30M3X
–	–	ATV 61HD37M3X
–	–	ATV 61HD45M3X
–	–	ATV 61HD55M3X
–	–	ATV 61HD75M3X
–	–	ATV 61HD90M3X

HVAC & R machine control solutions

Altistart™ 01, 22, and 48 soft starters for asynchronous motors

Applications	■ Single-phase scroll or spiral refrigeration compressors ■ Single-phase heat pumps ■ Fans (1)	■ Compressors ■ Fans ■ Pumps
Type of control	**Controlled starting of simple machines**	**Controlled starting and deceleration of simple machines**

Standards and certifications		IEC/EN 60947-4-2, CE, UL, CSA, C-Tick, GOST and CCC	
Drive	Number of controlled phases	1	2
	Adjustable starting time	1 to 5 s	1 to 10 s
	Adjustable deceleration time	No: freewheel stop	Yes: 1 to 10 s
	Type of control	–	–
	Operating cycle	–	–
Functions	By-pass	Integrated	
Number of I/O	Analog inputs	–	
	Digital inputs	–	3: start, stop and startup boost
	Analog outputs	–	
	Digital outputs	–	
	Relay outputs	–	
Dialog tools		–	
Configuration tools			
Communication	Integrated	–	
	Available as an option	Combined with TeSys U starter-controller:	

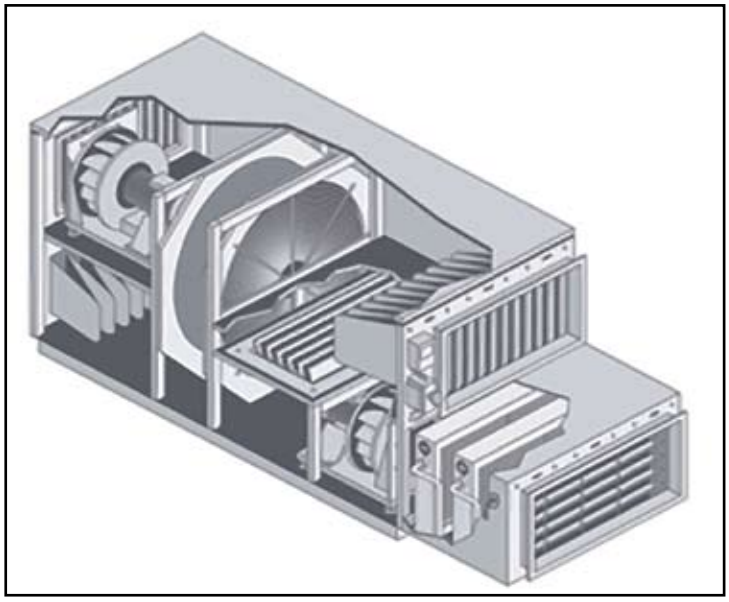
Supply voltage	**Single-phase 110 to 230 V**	**Three-phase 200 to 240 V**
Motor power for 50 to 60 Hz line supply (kW-*HP*)	**0.37 to 2.2 kW** *(3)*	**0.75 to 15 kW** *(3)*

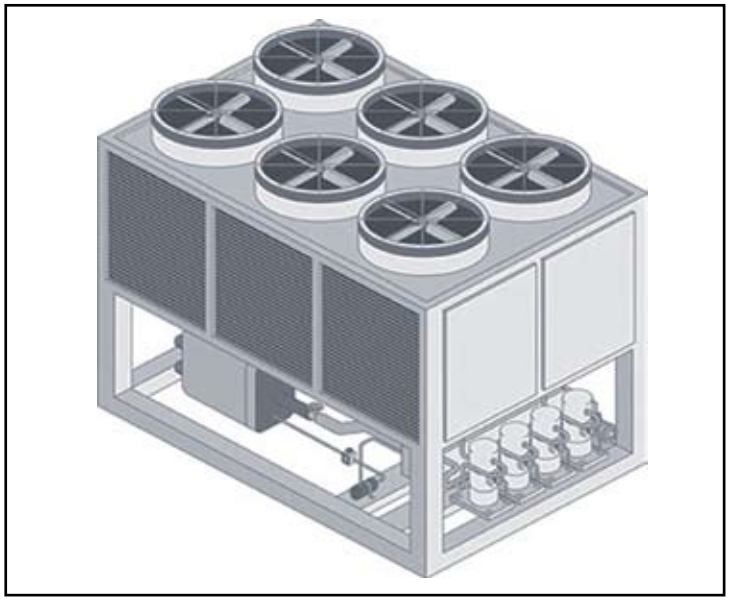
230 V	400 V	440 V	600 V	IcL nominal current (A)	References	
0.37	–	–	–	3	**ATS 01N103FT**	–
0.75	–	–	–	6	**ATS 01N106FT**	–
1.1	–	–	–	9	**ATS 01N109FT**	–
1.5	–	–	–	12	**ATS 01N112FT**	–
2.2	–	–	–	25	**ATS 01N125FT**	–
0.75/1.1 - *1/1.5*	2.2/3	–	*2/3*	6	–	**ATS 01N206LU**
1.5 - *2*	4	–	*5*	9	–	**ATS 01N209LU**
2.2/3, *3/55*	5.5	–	*7.5*	12	–	**ATS 01N212LU**
4/5.5, *5/7.5*	7.5/11	–	*10/15*	22	–	**ATS 01N222LU**
7.5 -*10*	15	–	*20*	32	–	**ATS 01N232LU**
4	7.5	7.5	–	17	–	–
5.5	11	–	–	22	–	–
7.5	15	15	–	32	–	–
9	18.5	–	–	38	–	–
11	22	22	–	47	–	–
15	30	30	–	62	–	–
18.5	37	37	–	75	–	–
22	45	45	–	88	–	–
30	55	55	–	110	–	–
37	75	75	–	140	–	–
45	90	90	–	170	–	–
55	110	110	–	210	–	–
75	132	132	–	250	–	–
90	160	160	–	320	–	–
110	220	220	–	410	–	–
132	250	250	–	480	–	–
160	315	355	–	590	–	–
–	355	–	–	660	–	–
220	400	–	–	790	–	–
250	500	–	–	1000	–	–
355	630	–	–	1200	–	–

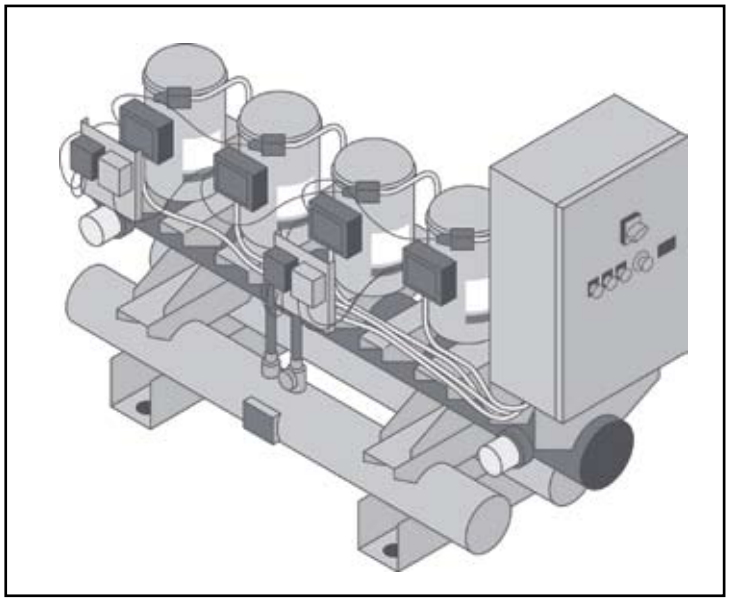
(1) For optimum fan control, use of a variable speed drive is recommended.
(2) Other voltages available: Three-phase 208 to 600 V, please consult our website www.schneider-electric.com
(3) For other motor ratings, please consult our website www.schneider-electric.com

■ Compressors
■ Fans
■ Pumps

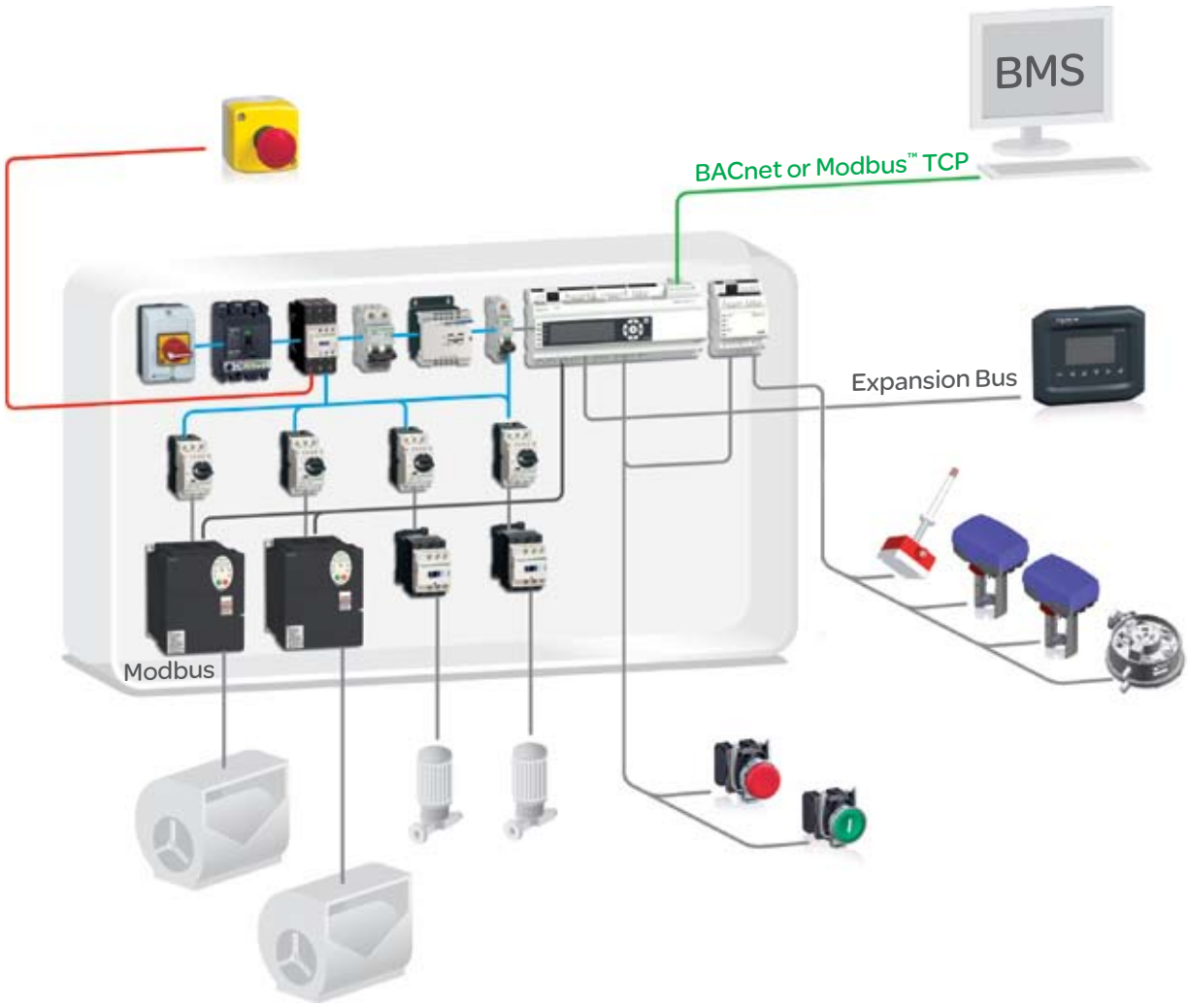
Controlled starting and deceleration of simple machines		Controlled starting and deceleration of simple and complex machines	
			
IEC/EN 60947-4-2, CE, UL, CSA, C-Tick, GOST and CCC		IEC/EN 60947-4-2, EMC class A, CE, UL, CSA, C-Tick, GOST, CCC	IEC/EN 60947-4-2, EMC classes A and B, CE, UL, CSA, DNV, C-Tick, GOST, CCC, NOM 117, SEPRO and TCF
2		3	3
1 to 10 s			
Yes: 1 to 10 s			
–		Configurable voltage ramp	TCS (Torque Control System)
–		Standard	Standard and severe
Integrated		Integrated	Available as an option
–		1 PTC probe	1 PTC probe
3: start, stop and startup boost		3 programmable	4
–		–	1
–		–	2
–		2 programmable (N/C or N/O)	3
–		Integrated display terminal	Integrated display terminal, optional remote display terminal
		SoMove™ Lite software workshop	PowerSuite™ software workshop
–		Modbus™	Modbus
Combined with TeSys U starter-controller:		–	Fipio™, PROFIBUS DP, DeviceNet, Modbus TCP
Three-phase 380 to 415 V	**Three-phase 440 to 480 V**	**Three-phase 230 to 440 V** *(2)*	**Three-phase 230 to 415 V** *(2)*
0.75 to 15 kW	**0.75 to 15 kW**	**4 to 355 kW** *(3)*	**3 to 630 kW** *(3)*
References			
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
ATS 01N206QN	**ATS 01N206RT**	–	–
ATS 01N209QN	**ATS 01N209RT**	–	–
ATS 01N212QN	**ATS 01N212RT**	–	–
ATS 01N222QN	**ATS 01N222RT**	–	–
ATS 01N232QN	**ATS 01N232RT**	–	–
–	–	**ATS 22D17Q**	**ATS 48D17Q**
–	–	–	**ATS 48D22Q**
–	–	**ATS 22D32Q**	**ATS 48D32Q**
–	–	–	**ATS 48D38Q**
–	–	**ATS 22D47Q**	**ATS 48D47Q**
–	–	**ATS 22D62Q**	**ATS 48D62Q**
–	–	**ATS 22D75Q**	**ATS 48D75Q**
–	–	**ATS 22D88Q**	**ATS 48D88Q**
–	–	**ATS 22C11Q**	**ATS 48C11Q**
–	–	**ATS 22C14Q**	**ATS 48C14Q**
–	–	**ATS 22C17Q**	**ATS 48C17Q**
–	–	**ATS 22C21Q**	**ATS 48C21Q**
–	–	**ATS 22C25Q**	**ATS 48C25Q**
–	–	**ATS 22C32Q**	**ATS 48C32Q**
–	–	**ATS 22C41Q**	**ATS 48C41Q**
–	–	**ATS 22C48Q**	**ATS 48C48Q**
–	–	**ATS 22C59Q**	**ATS 48C59Q**
–	–	–	**ATS 48C66Q**
–	–	–	**ATS 48C79Q**
–	–	–	**ATS 48M10Q**
–	–	–	**ATS 48M12Q**







Packaged Roof-Top Unit TVDA



The **Packaged Roof-Top Unit TVDA** provides complete control of the machine plus interfaces with the existing Building Automation System (BAS). The M168 directly interfaces with various Schneider Electric intelligent components such as variable speed drives (VSDs) and human/machine interfaces (HMIs).

Monitored and controlled machine functions include:

- Supply Air and Return Fans
- Compressors
- Dampers
- Heating and Cooling sections
- Remote HMI or machine-mounted

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