SIEMENS

Climatix™
Controllers POL6XX and I/O modules POL9XX
Basic documentation

Edition 2.3
CB1P3903en
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Smart Infrastructure

Siemens Switzerland Ltd
Smart Infrastructure
Global Headquarters
Theilerstrasse 1a
CH-6300 Zug
Switzerland
Tel. +41 41-724 24 24
www.siemens.com/buildingtechnologies

Content

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It is, however, necessary to implement and maintain a comprehensive, state-of-the-art security concept that is customized to individual security needs. Such a security concept may result in additional site-specific preventive action to ensure that the building comfort, fire safety, security management or physical security system for your site are operated in a secure manner. These measures may include, but are not limited to, separating networks, physically protecting system components, user awareness programs, defense in depth, etc.

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http://www.siemens.com/cert/en/cert-security-advisories.htm

1 About this document

1.1 Revision history

Edition	Date	Changes	Section/Page
2.3	2019-07-12	Change the output current from 2 mA to 1 mA	p. 37 p. 56
2.2	2017-07-01	• Cyber security disclaimer • Default password modification	p. 6 p. 85-89
2.1	22.04.2015	Safety notes in section 11.3	
2.0	14.05.2013	POL96E.00, POL96U.00, POL98U.00, POL98E.00 related information added	
1.1	15.05.2010	"POL68X" corrected to "POL638 and POL687"	
1.0	09.02.2010	First edition	

1.2 Before you start

Document validity

This document applies to the following Climatix product type series:

Name	Type (ASN)	Description
Controllers	POL63X.00/XXX	See section 2.2
Controllers	POL68X.00/XXX	See section 2.2
Extension I/O modules	POL9XX	See section 2.3

Product versions

The descriptions and functionality of the products are based on Climatix Valid Version Set 8.0 or higher.

Target readers

This document is intended for the following audience:

- Instrumentation and control engineering staff at OEM companies
- Sales and commissioning staff at OEM organizations
- SIEMENS sales and support staff
- System integrators (for basic overview)

Use

This document assists the target audience to:

- Design instrumentation and control solutions using Climatix controllers.
- Create offers for instrumentation and control solutions using Climatix controllers.
- Engineer and commission ventilation and air conditioning plants equipped with the Climatix controllers.

Prerequisites

It is assumed that the above target audience has general technical knowledge on engineering and commissioning of HVAC instrumentation and control solutions.

This document does address information related to development tools.

A dedicated training session is required for engineers requiring programming skills.

1.3 Reference documents

Document title	Document type	Document No.
Climatix controller 63X	Data sheet	CB1Q3230en
Climatix controller 68X	Data sheet	CB1Q3903en
Climatix extension module 26 I/Os POL985.00/XXX	Data sheet	CB1N3921en
Climatix extension module 15 I/Os POL965.00/XXX	Data sheet	CB1N3922en
Climatix extension module 14 I/Os POL955.00/XXX	Data sheet	CB2N3262en
Climatix extension module 8 I/Os POL945.00/XXX	Data sheet	CB1N3923en
Climatix extension module 6 I/Os POL925.00/XXX	Data sheet	CB1N3924en
Climatix extension modules ECV POL94U /…94E	Data sheet	CB1Q3950en
Climatix extension modules ECV2 POL96U/…96E	Data sheet	CB1N3943en
Climatix extension modules ECV2 POL98U/…98E	Data sheet	CB1N3944en

1.4 Printing conventions

Symbols used

The following symbols are used in this document to indicate warnings and notes:

This symbol draws your attention to special **safety notes** and **warnings**. Ignoring such notes can lead to personal injury and/or major damage to property.

This symbol precedes notes that must be observed in order to prevent malfunctions or data loss.

Notes with this symbol provide important information that requires appropriate attention.

Paragraphs with this symbol provide tips.

Abbreviations

The following abbreviations are used in text and illustrations:

Abbreviation	Meaning
BACnet	**B**uilding **A**utomation and **C**ontrol **Net**work
BACS	**B**uilding **A**utomation and **C**ontrol **S**ystem
BSP	**B**oard **S**upport **P**ackage (operating system)
Climatix	Controller family with common tools
HMI	**H**uman **M**achine **I**nterface (operator unit)
HMI-DM	Climatix **D**ot **M**atrix HMI POL895.51
HMI-IB	Climatix **I**n-**B**uilt HMI on POL6XX.7X
HMI-SG	Climatix **Seg**mented HMI POL822.X
HMI-TP	Climatix **T**ouch **P**anel HMI POL8T7.X
HVAC	**H**eating, **V**entilating, **A**ir **C**onditioning
LON	**L**ocal **O**perating **N**etwork
MS	**M**anagement **S**tation
RU	**R**oom **U**nit (POL822X)
SAPRO	SAPRO programming tool
SCADA	**S**upervisory **C**ontrol **a**nd **D**ata **A**cquisition
SCOPE	SCOPE commissioning and service tool
SELV	**S**afety **E**xtra-**L**ow **V**oltage

1.5 Important safety notes

Field of use

The Climatix controllers are used exclusively in control and monitoring functions for ventilation, air-conditioning and refrigeration plants as well as district heating plants.

Correct use

The prerequisites for safe, trouble-free operation of the products mentioned above are: Correct transport, storage, installation and commissioning, as well as careful operation.

Electrical installation

⚠ Fuses, switches, wiring and grounding must comply with local safety regulations for electrical installations.

Wiring

⚠ AC 115/230 V must be strictly segregated from the AC 24 V safety extra low-voltage (SELV) when wiring the system to protect against electric shock hazard.

Commissioning and maintenance

Climatix products must be prepared for use and commissioned by qualified staff with appropriate training.

Maintenance

Climatix controllers are maintenance-free, apart from cleaning at regular intervals. Dust and dirt should be removed from system parts in the control panel as part of normal service visits.

Faults

⚠ Only authorized staff is permitted to perform diagnostics, to correct faults and restart the plant. This applies as well to work carried out on the control panel (e.g. safety checks or replacing fuses).

Storage and transport

Always observe limits provided in the relevant datasheets for storage and transport.
Contact your supplier for questions.

Disposal

The products contain electrical and electronic components and cannot be disposed of as household waste.
Observe local regulations.

1.6 Trademarks and copyright

Trademarks

The trademarks used in this document are listed together with their legal owners in the following table. The use of these trademarks is subject to international and national statutory provisions.

Trademarks	Legal owner
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KNX®	Konnex Association, B - 1831 Brussels-Diegem Belgium http://www.konnex.org/
LonLink™ LON® / LonManager® LonMark® LonTalk® LonWorks®	Echelon Corporation
Microsoft…	Microsoft Corporation see http://www.microsoft.com/TRADEMARKS/t-mark/nopermit.htm
MODBUS®	The Modbus Organization, Hopkinton, MA, USA
Neuron®	Echelon Corporation
Windows…	Microsoft Corporation
Windows NT®	Microsoft Corporation

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Copyright

1.7 Quality assurance

Document contents

These documents were prepared with great care.

- The contents of all documents are checked at regular intervals.
- All necessary corrections are included in subsequent versions.
- Documents are automatically amended as a consequence of modifications and corrections to the products described.

Please make sure that you have the latest documentation.

Suggestions

Please contact your Siemens representative if portions of the document are unclear or for any criticisms or suggestions. Addresses of the Siemens regional companies are available at www.siemens.com/sbt.

1.8 Document use / request to the reader

Request to the reader

Prior to using our products, it is important to carefully read in full the documents supplied with or ordered at the same time as the products (equipment, applications, tools etc.).
We assume that persons using our products and documents are authorized and appropriately trained and possess the requisite technical knowledge to properly use our products.

Additional information

Additional information on the products and applications is available:

- On the intranet (Siemens employees only) at https://workspace.sbt.siemens.com/content/00001123/default.aspx
- From the nearest Siemens branch office www.siemens.com/sbt or from your system supplier
- From the support team at headquarters fieldsupport-zug.ch.sbt@siemens.com if there is no local point of contact

Exemption from liability

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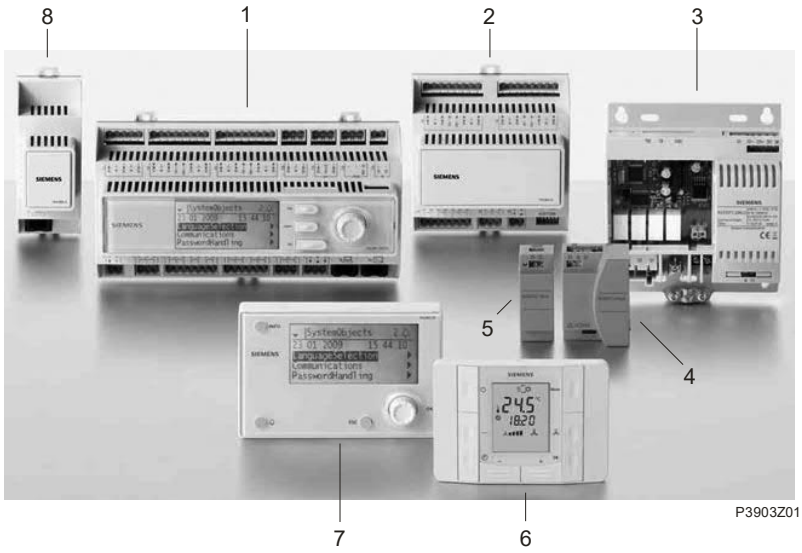
2 Summary

2.1 Range overview

Associated devices

The following picture illustrates the Climatix range of devices:



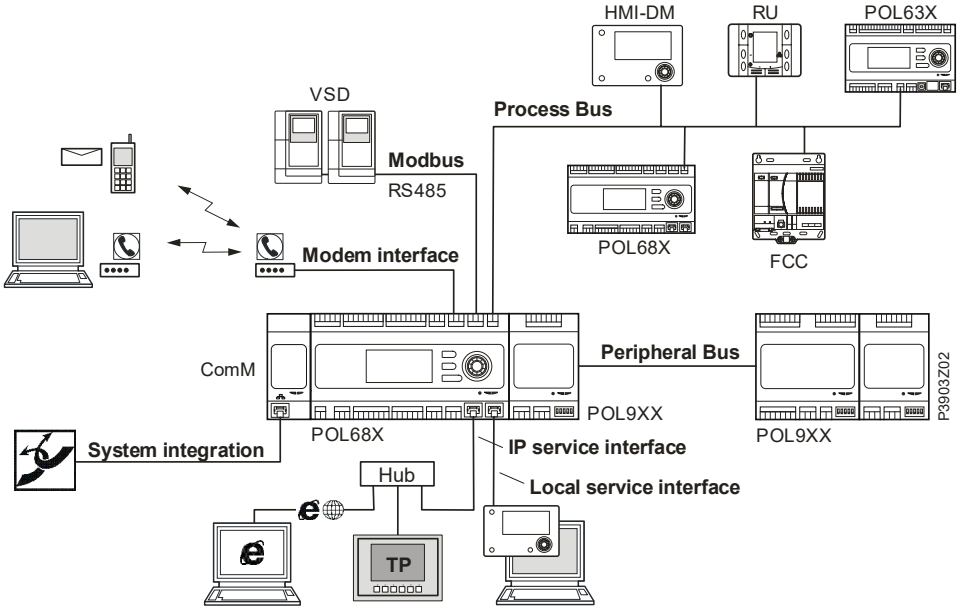
Brief description

Devices shown in the picture:

Pos.	Type (ASN)	Brief description
1	POL63X / POL68X	Programmable controllers: – Two type series, each with a number of versions. – Expandable with extension I/O modules.
2	POL9XX	Extension I/O modules: – Eight types from big to small with different I/O mixes. – Addressing using simple DIP switches.
3	ACC 071.X	Fan coil controller: – Range of factory mounted fan coil controllers – Versions for 2 pipes, with standard fan motors or DC motors
4	ACE 071.X	Range of fan coil extension I/O module for ACC071: – Extension for 4 pipes installation – Extensions for optimized electrical heater
5	ACE 072.1	Range of fan coil communication module for ACC071: – Process bus module (based on KNX technology) – Modbus RS485 module
6	POL822.X	Room units: – Modern and flat design, user friendly operation. – Connected over the process bus (KNX).
7	POL895.51	Operator units (HMI-DM): – Backlit, easy operation with push and turn knob. – Supports multi-language (Unicode)
8	POL90X	Communication modules: – Six types to connect controllers with various bus systems: Modbus, BACnet/IP, BACnet/MSTP, LON, M-bus, Advanced Web Servers

Communication concept

Basic possibilities using the POL68X controller:



HMI-DM	Dot matrix HMI	RU	Room unit
FCC	Fan coil controller	VSD	Variable speed drives
POL63X	Climatix controller	POL9XX	Extension I/O modules
POL68X	Climatix controllers	ComM	Communication module

Explanation

The communication channels shown in the picture:

Item	Explanation
Peripheral bus	Internal bus, used to connect up to 31 extension I/O modules (addresses form 1 to 31) to one controller. The extension I/O modules are intended to be localized in a short range from the controller, typically within the same unit panel. The maximum total length of the peripheral bus is 30 m. For details see section 7 "Use extension I/O modules".
Local service interface	Interface connects Human Machine Interfaces (HMI) for commissioning and servicing purposes and user operation as well. It is also used to connect the PC development tool SAPRO as well as the PC commissioning tool SCOPE (USB service cable POL0C2.40STD required).
IP service interface	Ethernet interface to connect PC engineering and service tools over Ethernet TCP-IP. It also provides a WEB based human machine interface (called HMI@web) to have the same access remotely as is available via local HMI for the unit. In other words, Climatix 6XX can be serviced using a standard browser.
System integration	Different options for Climatix communication modules allow higher level system integration on the left side of the controller. A max. of 3 communication modules can be added to the same Climatix 6XX controller at any one time. Specific modules are available for LON, BACnet, Advanced WEB servers, Modbus, M-bus.

Explanation, *cont.*

Item	Explanation
Modem interface	The full RS232 modem port is suitable when the IP port is not directly available for remote access, for example, due to IP security implemented on some plant installations, or whenever a LAN is not available (whatever the reason). In this case, the modem connection allows the operator to use the development and service tools (SAPRO and SCOPE) remotely via the modem connection.
Modbus RS485	The RS485 port is used to control other devices (Siemens or third party) required for the application, such as variable speed drives, soft starters, or special turbine compressors. The controller is typically the master on this Modbus network.
Process bus	The process bus connects the Climatix controller to other controllers and network human machine interfaces. The bus KNX-based and exchanges process information across different devices and human machine interfaces.

Controller POL63X

In addition to the opportunities illustrated above, this controller also includes:

- A USB tool interface, socket type B, specifically used for PC tools (SAPRO/SCOPE).
- LON bus interface (type POL 636.00/XXX only) for backward compatibility with POL6XX series.

I/O table

The table below lists all inputs/outputs for the various Climatix controllers, I/O extensions and communication modules:

CLIMATIX 6XX - Device Sortment

Communication Modules							Controllers					I/O Extensions (max 31)											
POL902	POL904	POL906	POL907	POL908	POL909		POL635	POL636	POL638	POL687.0	POL687.7	POL98E/U	POL96E/U	POL985	POL965	POL955	POL945	POL94U	POL94E	POL925	In / Out		
										3	3	3		3							I	NTC	
																	2				I I	NTC Digital In voltage free	Config. Inputs
																	2				I I	DC O-5V Digital In voltage free	Config. Inputs
							5	5	5	2	2	3		3						4	I	Digital In voltage free	
										2	2										I	Digital In 24V insulated	
										2	2	2	1	2	1			1	1	2	I	Digital In 115/230V insulated	
							8	8	8	8	8	12	12	8	8	8		3	3		I I I I I I I I O O O	Ni 1000 Pt 1000 NTC 0-2.5 kOhm DC 0-5V DC 0-10V DC 0-20mA Digital In Voltage free DC 0-10V Analog Out DC 4-20mA Analog Out DC output Digital Out	CIOA (Siemens Asic)
							2	2	2							2					O	DC 0-10V Analog Out	
												2	2					1	1		O	Bipolar Stepper Motor Out (4 wires)	
										2	2						4	1	1		O	Relay NO/NC	
							6	6	6	6	6	8	4	8	4	4					O	Relay NO	
										2	2	2	2	2	2						O	Triac 0.5A	
							21	**21**	**21**	**27**	**27**	**32**	**21**	**26**	**15**	**14**	**8**	**6**	**6**	**6**		**Total I/O amount**	
							2	2	2	2	2	3		2	2			1	1			24Vdc Out	Supply Sensors
										2	2	2		2	2		1	1	1			5Vdc Out	
																		1				UPS at Power Off	
										1	1											USB (on RJ45)	
							1	1	1													USB (on Standard cable)	
										1	1											HMI port (on RJ45)	
							1	1	1	1	1											SD card support	Tools & Commiss.
							1	1	1	1	1											Real Time Clock	
								1	1	1	1											Inbuilt HMI (164x44)	
									1	1	1											Ethernet IP with "HMI@Web"	
							1	1	1	1	1	1		1	1	1	1	1	1	1		Peripheral Bus	Expandibility
1	1	1	1	1	1	◄	1	1	1	1	1	►										System interface Bus	
							1	1	1	1	1											Process Bus (KNX TP1 insulated)	
							1	1	1	1	1											Internal KNX DPSU (max 50mA)	
2										1	1											RS485 insulated	
							1	1	1													RS485 not insulated	
		1						1														LON port	Communication
	1																					BACnet MSTP	
				1																		BACnet IP	
			1																			Mbus	
					1																	Advanced Web Server	
					1		1	1	1	1	1											Modem Out (RS232)	
Via addidional COMM module							On board communication																

2.2 Controllers

Two type series

There are two series of Climatix controllers – POL63X and POL68X – each with a number of versions as listed below:

Appearance	Series	Types (ASN)	Version
 P3903P01	POL63X	POL635.00/XXX	Basis version
		POL636.00/XXX	LON version
		POL638.00/XXX	Ethernet version
		POL638.70/XXX	Ethernet version with built-in HMI
 P3903P02	POL68X	POL687.00/XXX	Ethernet version
		POL687.70/XXX	Ethernet version with built-in HMI

Focus of application

Both series control:

- Air handling units
- Roof top units
- Chillers
- Heat pumps
- Close control air conditioning
- Shelters
- District heating

Common characteristics

Climatix controllers have the following common features:

- Freely programmable using the SAPRO graphical editor
- Can be extended via peripheral bus for local / remote Extension I/O modules
- Connect up to 3 additional modern communication modules
- SD card interface to upgrade application, operating system and parameters
- Power supply AC 24 V or DC 24 V
- Power supplies for active sensors on board
- Real-time clock buffered for at least 3 days without or at least 200 days with battery
- Local service connector for user interface (RJ45) and PC tools (USB)
- Full modem RS-232 port for remote service
- Process bus for network functionality (based on KNX protocol)

Individual characteristics

The two controller series POL63X and POL68X are equipped with the inputs/outputs and sensor power supplies needed for their field of application. As a consequence, the following characteristics vary depending on the series:

- I/O mix and nature of the inputs and outputs
- Sensor power supplies
- User and service interfaces

I/O mix / labeling

The inputs/outputs and labeling on housing:

Lbl.	63X	68X	Signal type
B..	–	3	Analog inputs NTC 10 k Ohm and NTC 100 k Ohm
D..	5	2	Digital inputs DC 24 V (binary) for potential-free contacts
DU..	–	2	Digital inputs, galvanically isolated, for AC/DC 24 V
DL..	–	2	Digital inputs, galvanically isolated, for AC 115/230 V
X..	8	8	Universal inputs/outputs, **configurable** via software as: *Analog inputs:* – Ni 1000 sensors – Pt 1000 sensors – NTC sensors 10 kΩ and 100 kΩ – Resistance transmitters 0…2500 Ω – DC 0…5 V (for ratiometric sensors) – DC 0…10 V signal – DC 0/4…20 mA signal *Digital inputs:* – 0/1 (binary) for potential-free contacts *Analog outputs:* – DC 0…10 V, output current 1 mA – DC 4…20 mA, **POL68X only!** *Digital outputs:* – DC 24 V, max. 25 mA, **4 outputs only!** **POL63X:** The first two X.. channels are universal **In**puts only!
Y..	2	–	Analog outputs DC 0…10 V, output current 2 mA
Q..	–	2	Relay outputs for AC 24 V… AC 230 V, NO/NC contact
Q..	6	6	Relay outputs for AC 24 V… AC 230 V, NO contact
DO..	–	2	Triac outputs AC 24 V … AC 230 V, 0.5 A
	21	**27**	**Total I/O amount**

Sensor power supplies

The sensor power supplies provided and labeling on housing:

Lbl.	63X	68X	Signal type
24V	2	2	DC 24 V power supply terminals
5V	–	2	DC 5 V ratiometric power supply terminals

User and service interfaces

The user and service interfaces provided and labeling on housing:

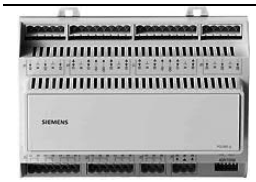
Lbl.	63X	68X	Signal type
T-HI	–	x	Tool interface / USB on RJ45 connector
T-SV	x	–	Tool interface / USB standard connector
T-IP	x *)	x	IP service interface

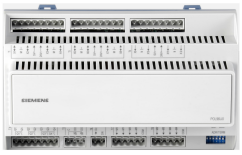
*) Ethernet version only!

2.3 Extension I/O modules

Types / features

There are six types of extension I/O modules:

Picture	Type	Features
 P3903P03	POL985.00/STD	Module with 26 I/Os: • 8 relays • 2 Triacs • 3 NTC inputs • 8 universal I/O • 3 digital Inputs, voltage free • 2 digital Inputs for AC 115/230 V • 2 x DC 24 V sensor power supply • 2 x DC 5 V ratiometric power supply
 P3903P04	POL965.00/STD	Module with 15 I/Os: • 4 relays • 2 Triacs • 8 universal I/O • 1 digital Input for AC 115/230 V • 2 x DC 24 V sensor power supply • 2 x DC 5 V ratiometric power supply
 P3903P05	POL955.00/STD	Module with 14 I/Os: • 4 relays • 8 universal IO • 2 analog outputs DC 0-10 V
 P3903P06	POL945.00/STD	Module with 8 I/Os: • 4 DI for potential-free contacts **or** 4 AI (2 NTC / 2 Ratiometric) • 4 relays • 1 x DC 5 V ratiometric power supply
 P3903P07	POL94U / …94E	Module with electronically controlled valve driver (ECV): • 1 relay • 3 universal IO • 4-wires Output for Bipolar stepper motor, current controlled • 1 x DC 24 V sensor power supply • 1 x DC 5 V ratiometric power supply • UPS for automatic driving to safe position at power off • Variant …E without UPS

 P3903P08	POL96U /…96E	• Power supply AC 24 V or DC 24 V • 2 channels support both unipolar and bipolar step motors • 12 universal I/Os • DC 24 V and DC 5 V power supply for active sensors on board • 4 relay outputs • 2 triac outputs (AC 24 V…230 V) • 1 digital input is galvanically isolated for AC 115/230 V • Peripheral bus interface for local / remote extension I/Os • LED indicator for Step driver
 P3903P09	POL98U /…98E	• Power supply AC 24 V or DC 24 V • 2 channels support both unipolar and bipolar • 3 Analog input: B1, B2, B3 • 12 Universal I/Os • 3 Digital input: D1, D2, D3 • DC 24 V and DC 5 V power supply for active sensors on board • 8 Digital Output: Q1 to Q8 • 2 Triact Output: DO1, DO2 • 2 Active 230V DI: DI1, DI2 • LED indicator for Step driver
 P3903P10	POL925.00/STD	Module with 6 I/Os: • 4 digital inputs voltage free • 2 digital inputs 115-230V

Common characteristics

Extension I/O modules have the following common characteristics:

- Power supply AC 24 V or DC 24 V
- Peripheral bus

Extension I/O modules, *continued*

Individual characteristics

Extension I/O modules **POL9..** have the following individual characteristics:
- I/O mix and nature of the inputs and outputs
- Sensor power supplies

I/O mix / labeling

Inputs/outputs provided and labeling on the housing:

Lbl.	.85	.65	.55	.45	.4U/E	.25	.6U/E	.8U/E	Signal type
B..	3				–			3	Analog inputs NTC 10 kΩ and 100 kΩ
D..	3					4		3	Digital inputs for potential-free contacts
DU..					–				Digital inputs, galvanically isolated, for AC/DC 24 V
DL..	2	1			1	2	1	2	Digital inputs, galvanically isolated, for AC 115/230 V
X..	8	8	8	4 *)	3		12	12	Universal inputs/outputs, **configurable** via software as: *Analog inputs* – Ni 1000 sensors – Pt 1000 sensors – NTC sensors 10 kΩ and 100 kΩ – Resistance transmitters 0…2500 Ω – DC 0…5 V (for ratiometric sensors) – DC 0…10 V signal – DC 0/4…20 mA signal *Digital inputs* – 0/1 (binary) for potential-free contacts *Analog outputs* – DC 0…10 V, output current 1 mA – DC 4…20 mA - **max. 4** on POL985/.65/.55 - **max. 1** on POL4U/E *Digital outputs* – DC 24 V/25 mA - **max. 4** on POL985/.65/.55 - **max. 1** on POL4U/E
Y..			2			–			Analog outputs DC 0…10 V / 2 mA
M +/-					1		2	2	Bipolar stepper motor output (4 wires)
Q..					1				Relay outputs for AC 24 V… AC 230 V, NO/NC contact
Q..	8	4	4	4			4	8	Relay outputs for AC 24 V… AC 230 V, NO contact
DO..	2	2					2	2	Triac outputs AC 24 V… AC 230 V / 0.5A
	26	**15**	**14**	**8**	**6**	**6**	**21**	**32**	**Total I/O amount**

*) The 4 universal inputs X.. for the POL945 module can be configured as:
4 digital inputs for potential-free contacts **or**
4 analog inputs (2 NTC and 2 ratiometric sensors)

Sensor power supplies

The sensor power supplies provided and labeling on the housing:

Lbl.	.85	.65	.55	.45	.4U/E	.25	.6U/E	.8U/E	Signal type
24V	2	2			1		3	3	DC 24 V power supply terminals
	2	2		1	1		3	3	DC 5 V ratiometric power supply terminals

See as well section 7.0 "Using extension I/O modules".

2.4 User interfaces

Built-in HMI

The following picture displays one of the Climatix controller types with built-in HMI (POL638.70):

P3903P11

Main features

Built-in HMI features the following:

- 64x144 screen resolution
- Text display plus editing capability
- White backlight
- One push and turn knob
- 3 standard buttons
- Different levels of password protection
- Programmable menu and operational structure
- Alarm management
- Multilanguage support
- UNICODE fonts

Dot matrix HMI POL895.51

The following is a picture of the Dot matrix HMI for the Climatix range:

P3903P12

Main features

The Dot matrix HMI features the following:

- Screen Resolution 96x208
- Text display plus graphical editing
- Select between white and blue background
- One push and turn knob
- 3 standard buttons
- Select blue or white backlight
- Different levels of password protection
- Programmable menu and operating structure
- Alarm management
- Multilanguage support
- UNICODE fonts
- Direct connection to Climatix 6XX via user interface port (RJ45 cable)
- Network connection to several controllers over the process bus, powered by the process bus (2 wire only)

Room unit POL822.X

The picture below is of the Climatix range room unit:

P3903P13

Main features

The room unit has the following features:

- Measures room temperature
- Buttons to adjust the room temperature set point, operating mode, fan control, louver control and time settings
- LCD for display of room temperature, time, fan steps, weekday, operating and energy modes
- Password protected service mode to edit predefined control parameters
- 2-wire interface to the controller via the Climatix process bus (KNX)
- Semi flush mount for all European recessed installation boxes
- Access to the controller's time scheduler (POL822.60/XXX only)

Touch panel HMIs POL8T7.XX

Three touch panels are available:

Type	Display
POL8T7.80	15" color
POL8T7.50	5.7" color
POL8T7.20	3.8" gray scale

Features

The individual panels feature:

Appearance	Type	Features
 P3903P14	POL8T7.80	• 15,0" TFT touch display • 256 colors • 1024 x 768 resolution • 1 MB user memory • 1 x Ethernet RJ45 • 600 data points accessible • 50 screens • Trend functionality • Language support
 P3903P15	POL8T7.50	• 5,7" TFT touch display • 256 colors • 320 x 240 resolution • 6 freely programmable buttons • 512 Kbyte user memory • 1 x Ethernet RJ45 • 600 data points accessible • 50 screens • Trend functionality • Language support
 P3903P16	POL8T7.20	• 3,8" STN touch display • 4 gray tones • 320 x 240 resolution • 4 freely programmable keys • 512 Kbyte user memory • 1 x Ethernet RJ45 • 600 data points accessible • 50 screens • Trend functionality • Language support

Common characteristics

The touch panels have the following common characteristics:

- Tool: WinCC Flexible 2008 (Compact or higher, for development)
  ProSafe tool (for servicing)
- Port: Ethernet, to connect to the POL6XX controller as well as servicing
- Protocol: Native Climatix protocol for full access to POL6XX data points

2.5 Communication modules

Types / features

The communication modules connect Climatix controllers to building automation and control systems or other bus systems, e.g. M-bus. The modules must be connected to the left side of the controllers using a board-to-board connector. The table below outlines the different types and features:

Appearance	Types	Features
 P3903P17	POL902.00/STD MODBUS RTU (RS485)	• Features 2 Modbus slave communication ports. • Galvanically isolated connection to the Modbus network. For details see document No. CB1P3934en.
 P3903P18	POL904.00/STD BACnet / MSTP	• Supports BACnet MS/TP (B-AAC profile) at different Baud rates. • Network parameters configurable via controller, HMI or SCOPE. • Preloaded generic BACnet server. • Supports alarms and time switch programs. For details see document No. CB1P3933en.
 P3903P19	POL906.00/STD LON	• Includes a LON network controller (Neuron chip) which handles the complete LON network protocol and user application. • Galvanically isolated connection to the LON network via TP/FT-10 transceiver. • User applications can be downloaded into the flash memory using standard LON tools. • Tooling via LON. For details see document No. CB1P3931en.
 P3903P20	POL907.00/STD M-bus	• Up to 6 M-bus slaves, such as heat, water or electricity meters, can be connected directly to the M-bus module (up to 30 slaves using an M-bus repeater). • Module and controller form the M-bus master; the module controls communication and the controller stores the data received from the slaves.
 P3903P21	POL908.00/STD BACnet / IP	• Supports BACnet/IP (B-AAC profile, BBMD). • Preloaded generic BACnet server. • Client communication to other BACnet devices. • Network parameters configurable via controller, HMI or SCOPE. • Supports alarms and time switch programs. For details see document No. CB1P3933en.
 P3903P22	POL 909.00/STD Advanced Web Module	• Complete Windows CE 5.0 with web server • Tree-viewer for data reading and writing. • SCADA-package with trend-viewer and plant-viewer function. • Modem connector

2.6 Tool set

Two application-oriented tools

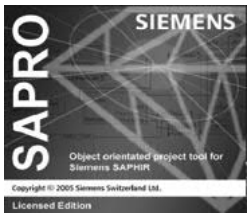
The Climatix controllers 6XX are generally freely programmable.
Siemens offers two powerful software tools to design and commission control programs:

- SAPRO programming tool (ACX93.000)
- SCOPE commissioning tool

Siemens provides "Standard Applications" and "HVAC Libraries", however, to allow customers to efficiently create control programs for HVAC plants: functions are easy to select and configure and customized modifications are possible as needed.

SAPRO

SAPRO is a graphical, object oriented programming tool per IEC 61131-3.



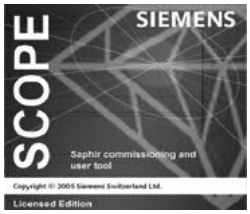
P3903P23

Main features

- Complete HVAC library for chiller and air-conditioning plants
- Online test to simulate and verify the application at the office
- Support of IEC-languages FBD, SFC and ST
- Graphical programming method using Function Block (FB) instances
- Sequential Function Chart (SFC) to program state machine.
- Structure text (ST) programming
- Workgroup, workflow support
- Archive and version management
- Proven and tested HAVC function blocks, all documented in the online help
- Application is independent of communication and user interface functions

SCOPE

SCOPE is the commissioning and servicing tool for Climatix controllers and HMIs.



P3903P24

Main features

Controller functions:

- Download program (application)
- Security function to prevent unauthorized applications
- Read and edit data point objects and their members
- Create schedules
- Upload and download parameters (objects and members)
- Log, store and present online trend data, read and present archival data

HMI functions:

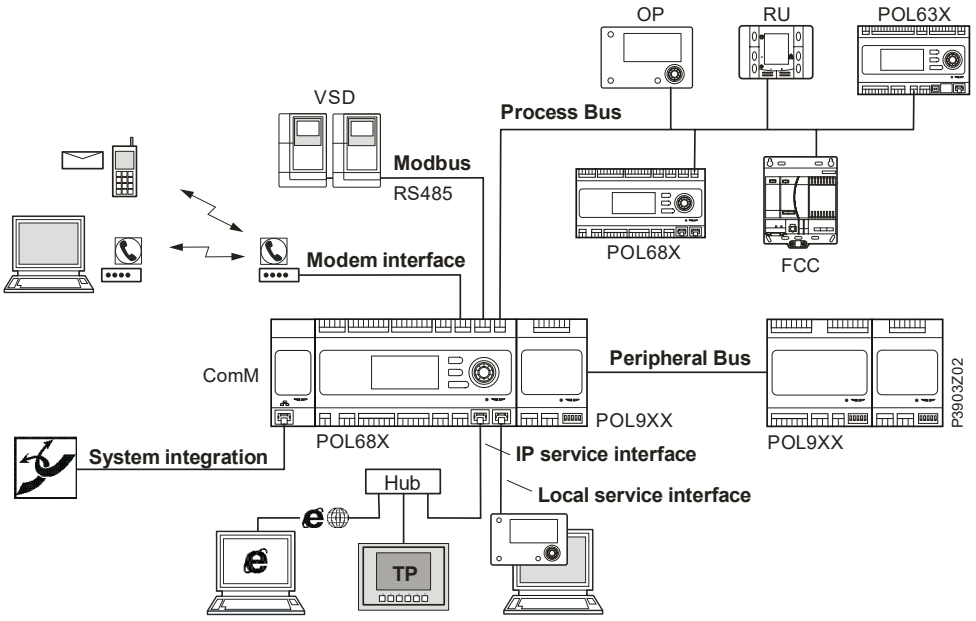
- Create and load the files for the layout and menu texts
- Create, read and download Unicode character sets
- Create and download the support files for the object texts and member names
- Create and download mapping files for integration

3 System topologies

3.1 General options

Common POL63X and POL68X options

The following illustrates general system topology as provided by both Climatix controller series:



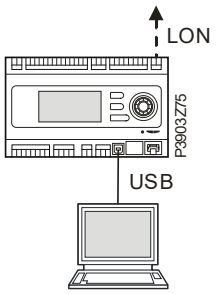
Explanation

The communication channels provide a rich variety of topologies:

Item	Explanation
Peripheral bus	Internal bus to connect up to 31 extension I/O modules.
Local service interface	To connect HMIs and SAPRO and SCOPE PC tools.
IP service interface	Ethernet interface to connect PC engineering and service tools, touch panels and WEB based HMIs (HMI@web).
System integration	Up to 3 communication modules can be added for LON, BACnet, Advanced WEB servers, Modbus, M-bus.
Modem interface	Full RS232 modem port to remotely operate SAPRO and SCOPE PC tools (e.g. when IP port is not available)
Modbus RS485	Used to control other devices (Siemens or third party) such as variable speed drivers, etc., typically as master.
Process bus	Based on KNX technology. Aimed to exchange process information across different devices and HMIs.

POL63X features only

The picture below illustrates two additional features for the POL63X series:



Explanation

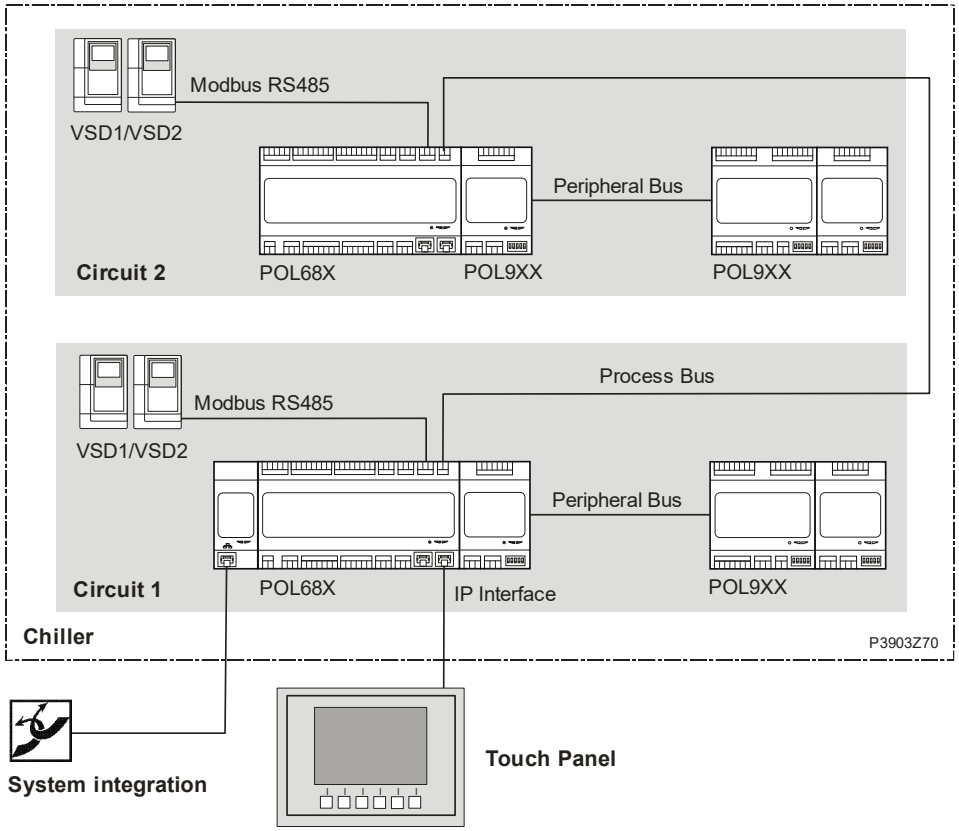
Items shown in the picture:

Item	Explanation
LON	LON bus for backward compatibility with ACX36 series (POL636 only)
USB	USB interface, socket type B, for use of PC tools (SAPRO / SCOPE)

3.2 Example: Large chiller

Picture

The picture illustrates the basic layout for a large chiller application:



POL68X Climatix controllers
POL9XX Extension I/O modules
VSD.. Variable speed drives

Explanation

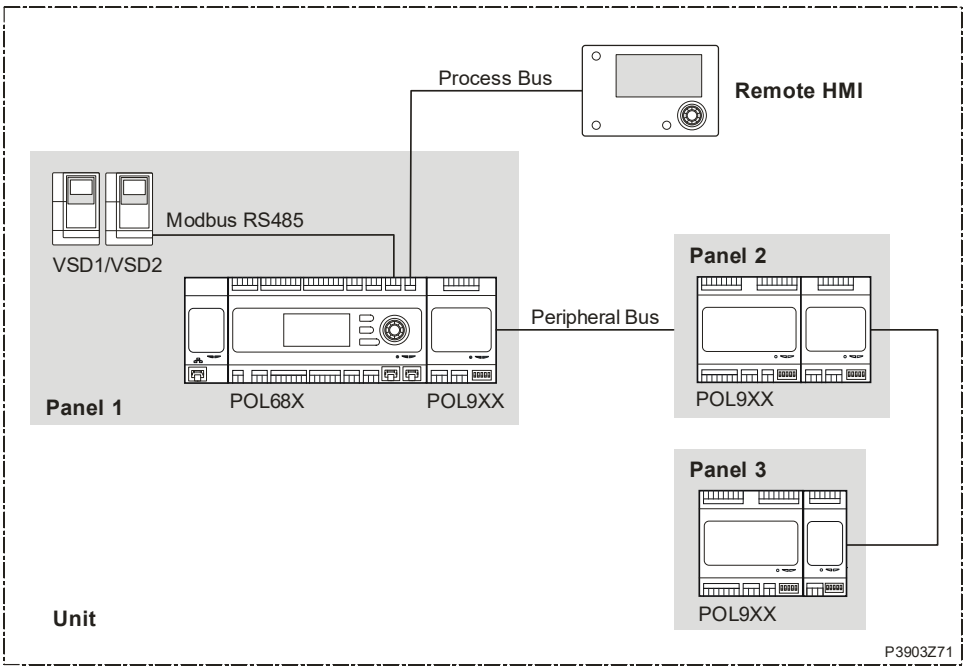
Items displayed in the picture:

Item	Explanation
Chiller	The chiller application consists of two modular units (circuit 1 and circuit 2) controlled by a twin cascade via the process bus. Circuit 1 contains the main controller.
Circuit 1, Circuit 2	A Climatix POL68X controller controls each circuit with extension I/O modules on the peripheral bus. Some extensions are connected directly (i.e. without wires) and others are connected remotely (with wires). There are two variable speed drives (VSD1, VSD2) each on the Modbus RS485, controlling e.g. the cooling towers.
Touch panel	One only touch panel is connected to the main controller on the IP port. It operates and monitors the overall chiller application.
System integration	A communication module is connected to the POL68X main controller in circuit 1 to integrate the application into the building automation and control system.

3.3 Example: Modular panels

Picture

The picture below illustrates a modular application in terms of electrical panel design:



POL68X Climatix controllers
POL9XX Extension I/O modules
VSD.. Variable speed drives

Explanation

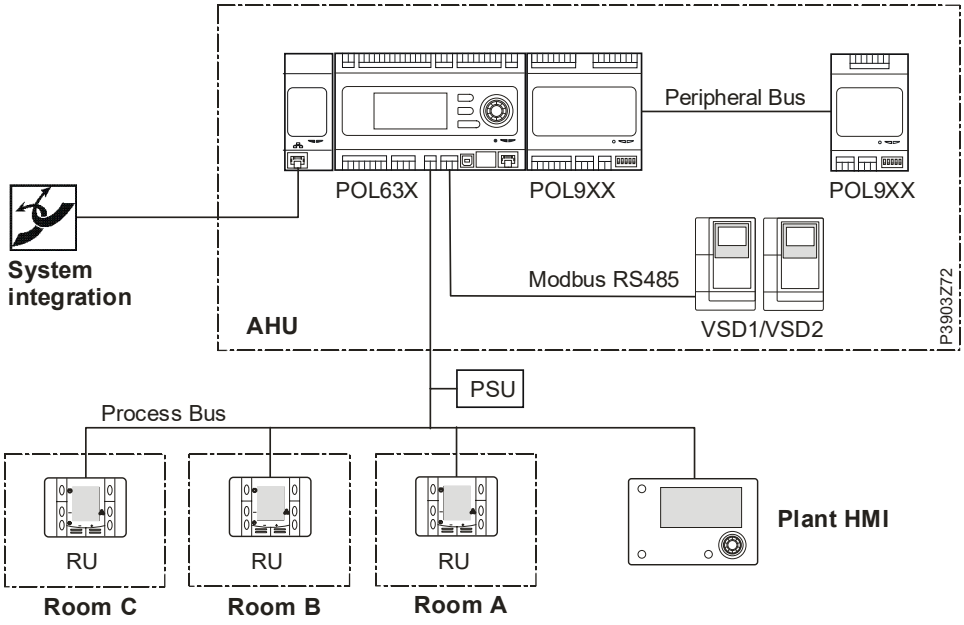
The picture describes for example a control solution for a self-contained rooftop unit that is internally designed to have different electrical panels.
It offers factory configurable units, taking advantage of specific panels for specific sub-assembled parts.

Item	Explanation
Panel 1	This panel drives one refrigeration circuit with two separate variable speed drivers for supply air fan and return air fan.
Panel 2	This panel drives compressors and the related oil control system.
Panel 3	This panel is optional for driving additional hydraulic pumps with rotation logic for balancing runtime.
Remote HMI	The unit offers a built-in HMI-DM on the main controller for commissioning purposes. The user can access the unit via this HMI (indoor installed) connected on the process bus.

3.4 Example: Air handling unit

Picture

The picture illustrate an AHU application with associated multi-zone room units:



POL63X	Climatix controllers	POL9XX	Extension I/O modules
VSD..	Variable speed drives	RU	Room units POL822.X
PSU	Power Supply Unit		

Explanations

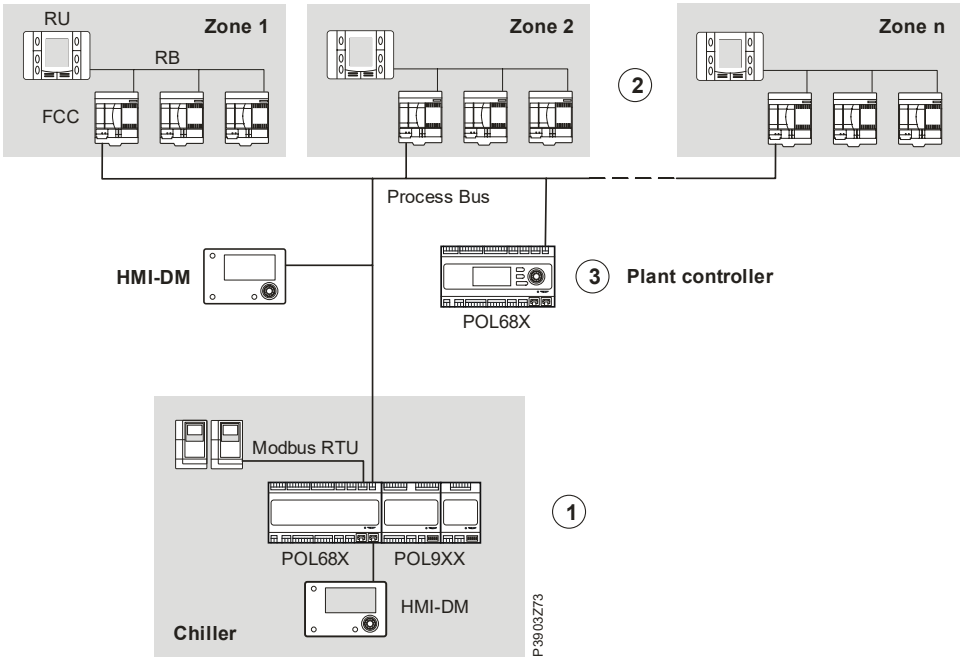
The items displayed in the picture:

Item	Explanation
AHU	A POL63X controller and two extension I/O modules control the air handling unit. Further, the fans are controlled and monitored via a double variable speed driver VSD1/VSD2 via Modbus RS485.
Room A …C	The control system comprises multiple zone room units. Their HMIs communicate via the process bus with the controller for the primary plant.
Plant HMI	A remote HMI-DM makes it easy to commission and provide an overview of the primary plant (AHU) via the process bus.
System integration	A communication module is connected to the POL63X controller to integrate the application into the building automation and control system.

3.5 Example: Hydronic system

Picture

The picture illustrate a Hydronic system application, combining one chiller on the primary side with several fan coil units on the secondary side (Zone 1, Zone N).



POL68X	Climatix controllers	POL9XX	Extension I/O modules
RU	Room units	RB	Room Bus
FCC	Fan coil controllers	HMI-DM	User interfaces

Explanation

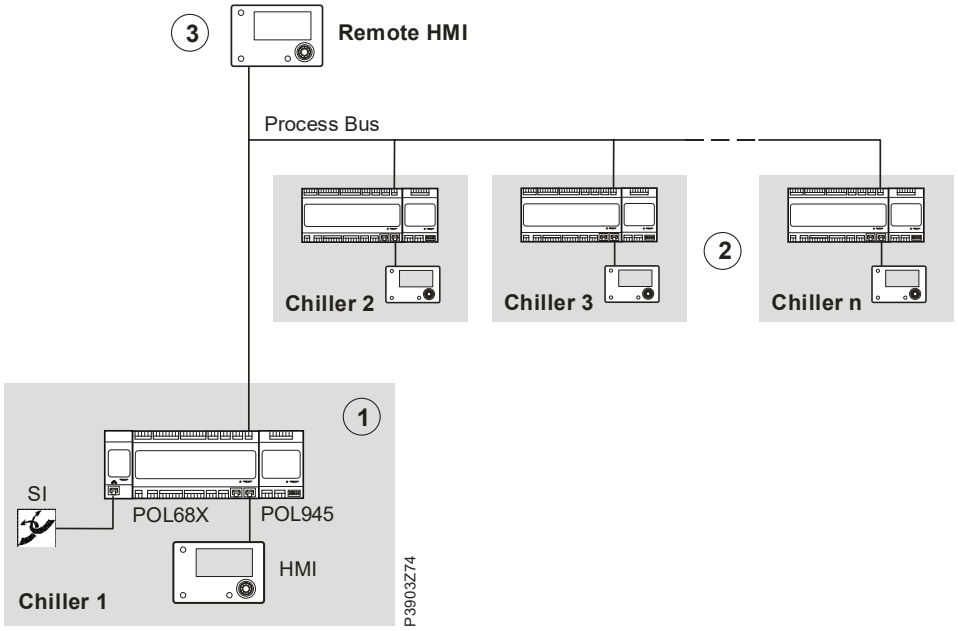
The items displayed in the picture:

Item	Explanation
Chiller ①	The chiller side (primary side) uses POL68X and extension I/Os, with a local user interface (HMI-DM) for easy unit servicing and commissioning. Via Modbus RTU the POL68X further controls one variable speed drive for the circulation pump and one for the condensing fan.
Zone 1 … n ②	Each fan coil zone is composed of several fan coils equipped with Climatix fan coil controllers ACC071, one each per fan coil. The controllers are connected via the room bus (plug and play bus). Each zone has independent room level comfort settings, accessible via the room unit. Each zone is then connected to the plant process bus via a communication module (based on KNX technology), sharing information and settings with the chiller controller on the primary side.
Plant controller / HMI ③	This controller governs the system application as a whole. The network user interface (HMI-DM) allows users to access all plant settings and status overview.

3.6 Example: Chiller plant

Chiller plant

The picture illustrates a chiller plant application using 4 identical chillers:



POL68X	Climatix controllers	POL9XX	Extension I/O modules
SI	System integration		

Explanation

The items displayed in the picture:

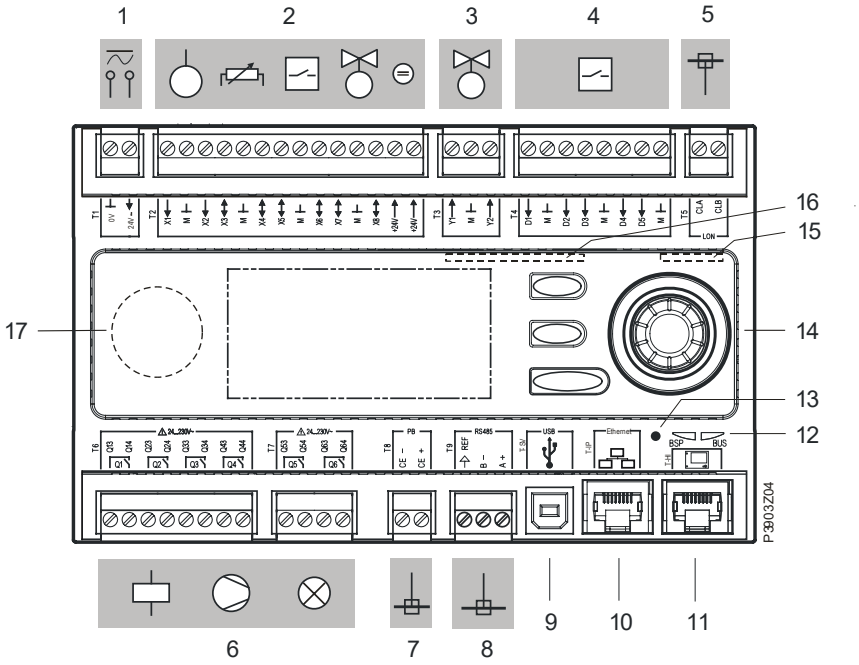
Item	Explanation
Chiller 1…n ① ②	Each chiller is controlled by one controller POL68X and one extension IO module. Each chiller has a local user interface (HMI) mounted on the panel for commissioning and servicing
Chiller 1 ①	The main controller also handles the cascade control and sequencing of all four chillers, so that working hours are balanced and the efficiency of the plant as a whole is optimized depending on the specific load conditions. It is also connected to a communications module to integrate the application into a building automation and control system.
Remote HMI ③	An additional user interface (HMI-DM) is remotely connected via the process bus, with access to all chillers and system data for monitoring and editing changes.

4 Controllers

4.1 Controller POL63X

Elements and connections

The following picture illustrates fully equipped controller POL63X (with elements), as well as examples of connectable peripheral devices:



Explanation

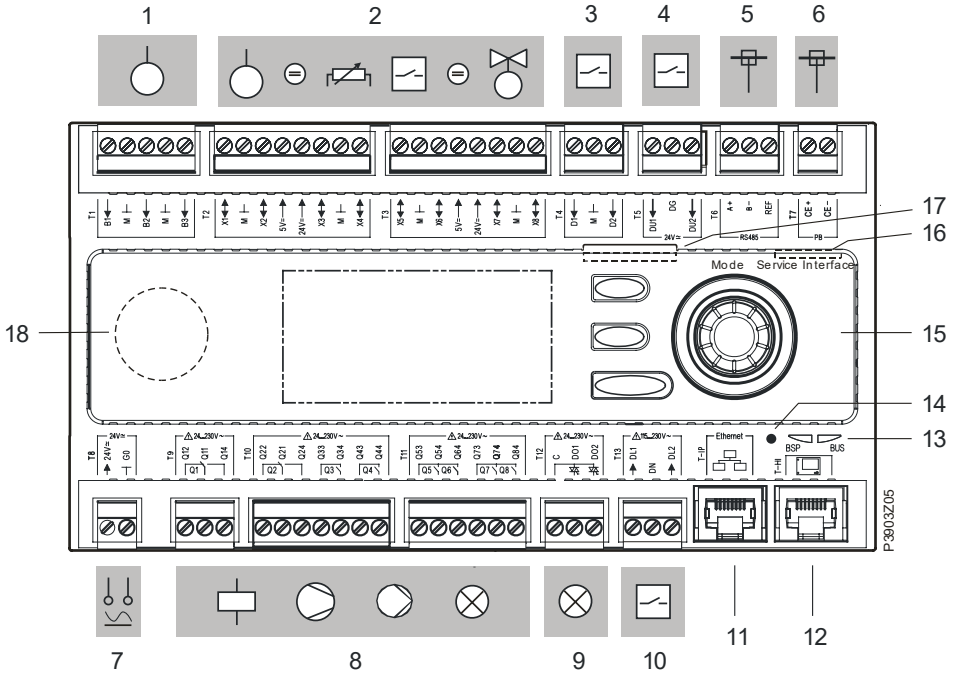
The elements and peripheral devices displayed in the picture:

Pos.	Labeling	Elements / peripheral devices (examples)
1	0V, 24V	AC/DC 24 V power supply: – 43 VA at AC 24 V (1.8 A) without Extension I/O modules. – 24 W at DC 24 V (1.0 A) without Extension I/O modules.
2	X1…X8 +24V	8 universal inputs/outputs: Configurable for sensors, resistance transmitters, relay contacts (floating), valves, dampers, etc. **X1/X2** configurable as universal **in**puts only! 2 power supplies DC 24 V for sensors
3	Y1, Y2	2 analog outputs DC 0…10 V / 2 mA: For valves, dampers, etc.
4	D1…D5	5 digital inputs with sampling voltage DC 24 V: For signaling elements with potential-free contacts.
5	CLA,CLB	LON interface. **POL636.00/XXX** only!
6	Q1…Q6	6 relay outputs for AC 24 V … AC 230 V, NO contacts: For contactors, fans, pumps, etc.
7	CE-, CE+	Process bus (PB) interface
8	A+, B-	RS485 interface: For applications with Modbus RTU communications protocol.
9	T-SV	Tool interface / USB standard connector (socket type B)
10	T-IP	Ethernet interface (TCP/IP) for tools, touch panels, web-browser. **POL638.00/XXX** only!
11	T-HI	Local service interface for HMI (RS485) and tool (USB).
12	BSP, BUS	Status displays for BSP and BUS status. See section 11.2.
13	–	Initialization button for BSP upgrade and application update.
14	–	HMI with LCD and navigation elements. **POL63X.70/…** only!
15	–	Modem interface (RJ45 jack / RS232) for remote service tool.
16	–	SD card reader for BSP upgrade and application update.
17	–	Battery compartment (under the cover)

4.2 Controller POL68X

Elements and connections

The following picture illustrates the POL68X control (with elements) as well as examples of connectable peripheral devices:



Explanation

The elements and peripheral devices displayed in the picture:

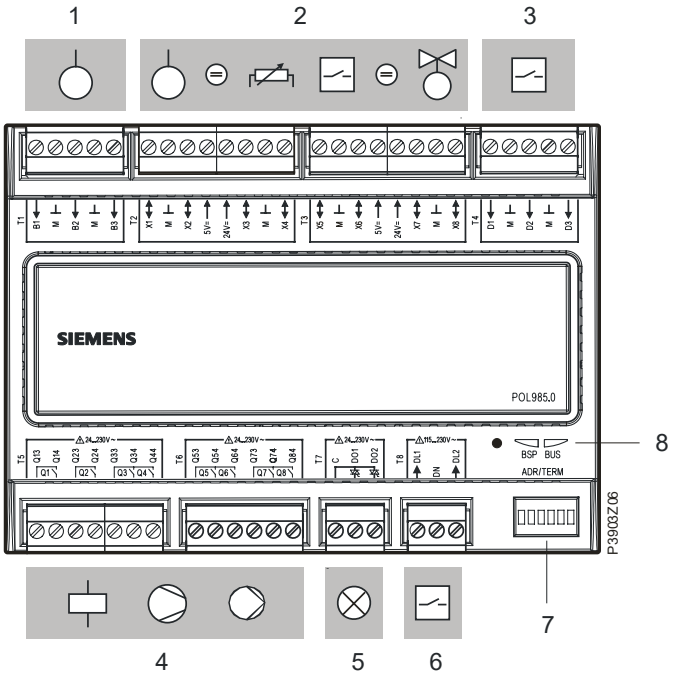
Pos.	Labeling	Elements / peripheral devices (examples)
1	B1…B3	3 analog inputs NTC: For sensors NTC 10 kΩ and NTC 100 kΩ
2	X1…X8 +24V +5V	8 universal inputs/outputs: Configurable for sensors, resistance transmitters, relay contacts (floating), valves, dampers, etc. 2 power supplies DC 24 V for sensors 2 power supplies DC 5 V for ratiometric sensor
3	D1, D2	2 digital inputs with sampling voltage DC 24 V: For signaling elements with potential-free contacts.
4	DU3, DU4	2 digital inputs, galvanically isolated: For signaling elements with voltage signal AC/DC 24 V.
5	A+, B-	RS485 interface: For applications with Modbus RTU communication protocol.
6	CE-, CE+	Process bus (PB) interface
7	G0, 24 V	AC/DC 24 V power supply: – 43 VA at AC 24 V (1.8 A) without Extension I/O modules. – 24 W at DC 24 V (1.0 A) without Extension I/O modules.
8	Q1…Q8	8 relay outputs for AC 24 V … AC 230 V: – Q1, Q2, NO/NC contacts: for valve and damper drives, etc. – Q3…Q8, NO contacts: for contactors, fans, lamps, etc.
9	DO1, DO2	2 Triac outputs / AC 24 V … AC 230 V: For lamps, relays, switching valves, etc.
10	DL5, DL6	2 digital inputs, galvanically isolated: For signaling elements with voltage signal AC 115V…AC 230V
11	T-IP	Ethernet interface (TCP/IP) for tools, touch panels, web-browser.
12	T-HI	Local service interface for HMI (RS485) and tool (USB).
13	BSP, BUS	Status displays for BSP and BUS status. See section 11.2.
14	–	Initialization button for BSP upgrade and application update.
15	–	HMI with LCD and navigation elements. **POL687.70/…** only!
16	–	Modem interface (RJ45 jack / RS232) for remote service tool.
17	–	SD card reader for BSP upgrade and application update.
18	–	Battery compartment (under the cover)

5 Extension I/Os

5.1 Extension I/O module POL985.00

Elements and connections

The following picture illustrates the POL985.00 extension I/O module (with elements) as well as examples of connectable peripheral devices:



Explanation

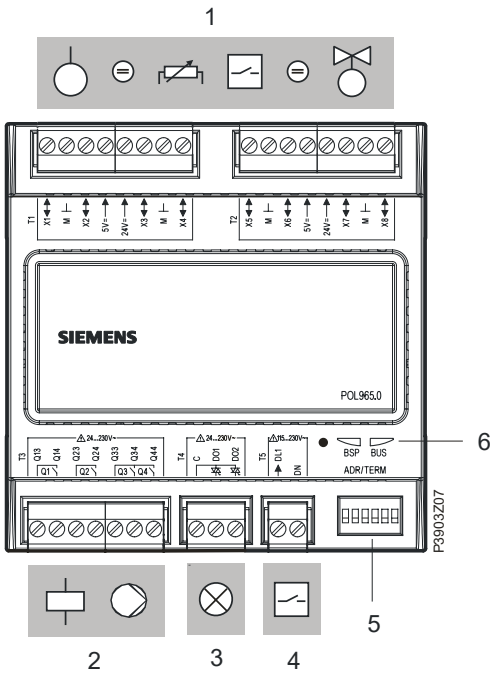
The elements and peripheral devices displayed are:

Pos.	Labeling	Elements / peripheral devices (examples)
1	B1…B3	3 analog inputs NTC: For sensors NTC 10 kΩ und NTC 100 kΩ
2	X1…X8 +24V +5V	8 universal inputs/outputs, configurable: For sensors, resistance transmitters, relay contacts (floating), valves, dampers, etc. 2 power supplies DC 24 V for sensors 2 power supplies DC 5 V for ratiometric sensors
3	D1…D3	3 digital inputs: Sampling voltage DC 24 V. For signaling elements with floating relay contacts.
4	Q1…Q8	8 relay outputs for AC 24 V … AC 230 V: – Q1, Q2, NO/NC contacts: for valve and damper drives, etc. – Q3…Q8, NO contacts: for contactors, fans, lamps, etc.
5	DO1, DO2	2 Triac outputs / AC 24 V … AC 230 V: For lamps, relays, switching valves, etc.
6	DL1, DL2	2 digital inputs / AC 115 V … 230 V: Galvanically isolated
7	ADR/TERM	DIP switch to set address and termination. See section 5.9 for function description.
8	BSP, BUS	Status LEDs BSP and BUS. See section 11.2 for function description.

5.2 Extension I/O module POL965.00

Elements and connections

The following picture illustrates the POL965.00 extension I/O module (with elements) as well as examples of connectable peripheral devices:



Explanation

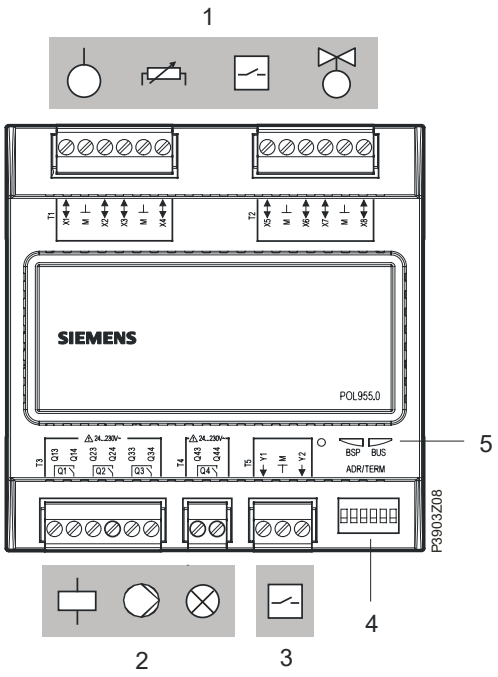
The elements and peripheral devices displayed in the picture:

Pos.	Labeling	Elements / peripheral devices (examples)
1	X1…X8	8 universal inputs/outputs, configurable: For sensors, resistance transmitters, relay contacts (floating), valves, dampers, etc.
	+24V	2 power supplies DC 24 V for sensors
	+5V	2 power supplies DC 5 V for ratiometric sensors
2	Q1…Q4	4 relay outputs (floating): NO contacts, switching voltage AC 24 V … AC 230 V. For contactors, fans, pumps, etc.
3	DO1, DO2	2 Triac outputs / AC 24 V … AC 230 V: For lamps, relays, switching valves, etc.
4	DL1	1 digital input / AC 115 V … 230 V: Galvanically isolated
5	ADR/TERM	DIP switch to set address and termination. See section 5.9 for function description.
6	BSP, BUS	Status LEDs BSP and BUS. See section 11.2 for function description.

5.3 Extension I/O module POL955.00

Elements and connections

The following picture illustrates the POL955.00 extension I/O module (with elements) as well as examples of connectable peripheral devices:



Explanation

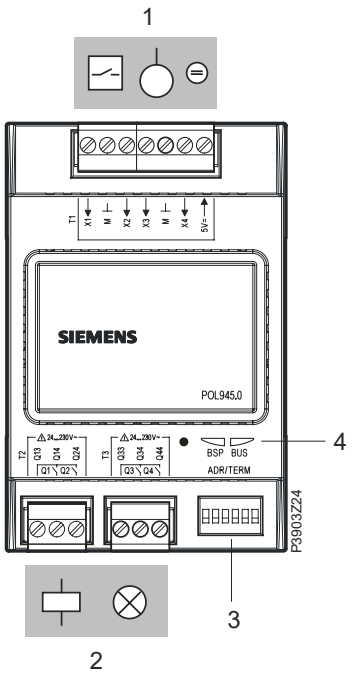
The elements and peripheral devices displayed in the picture:

Pos.	Labeling	Elements / peripheral devices (examples)
1	X1…X8	8 universal inputs/outputs, configurable: For sensors, resistance transmitters, relay contacts (floating), valves, dampers, etc.
2	Q1…Q4	4 relay outputs (floating): NO contacts, switching voltage AC 24 V … AC 230 V. For contactors, fans, pumps, etc.
3	Y1, Y2	2 analog outputs: DC 0…10 V / 1 mA. For valves, dampers, etc.
4	ADR/TERM	DIP switch to set address and termination. See section 5.9 for function description.
5	BSP, BUS	Status LEDs BSP and BUS. See section 11.2 for function description.

5.4 Extension I/O module POL945.00

Elements and connections

The following picture illustrates the POL945.00 extension I/O module (with elements) as well as examples of connectable peripheral devices:



Explanation

The elements and peripheral devices displayed in the picture:

Pos.	Labeling	Elements / peripheral devices (examples)
1	X1…X4	4 universal inputs/outputs, configurable: For sensors, resistance transmitters, relay contacts (floating), valves, dampers, etc.
	+5V	1 power supply DC 5 V for ratiometric sensors
2	Q1…Q4	4 relay outputs (floating): NO contacts, switching voltage AC 24 V … AC 230 V. For contactors, fans, pumps, etc.
3	ADR/TERM	DIP switch to set address and termination. See section 5.9 for function description.
4	BSP, BUS	Status LEDs BSP and BUS. See section 11.2 for function description.

5.5 Extension I/O modules POL94U / POL94E

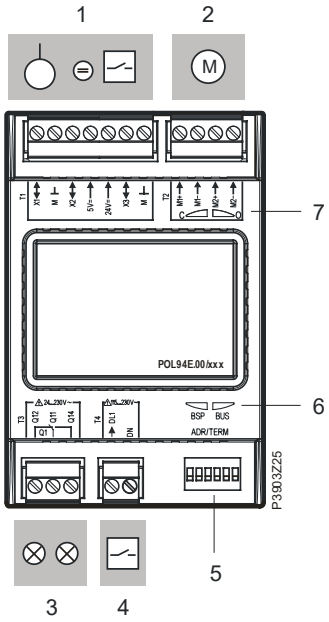
Introduction

The extension I/O modules POL94U.00 and POL94E.00 are designed to connect with ECV (Electronic Control Valve). They provide a driver for a wide range of bipolar stepper motors, with programmable values for current, speed, number of steps, synchronization of zero position and all required configurable options.

POL94U.00 is equipped with an uninterruptible power supply (UPS; battery back-up) to drive the valve to a safety position in the event of a power failure.

Elements and connections

The following picture illustrates the POL94U / POL94E extension I/O modules (with elements) as well as examples of connectable peripheral devices:



Explanation

The elements and peripheral devices displayed in the picture:

Pos.	Labeling	Elements / peripheral devices (examples)
1	X1…X3	3 universal inputs/outputs, configurable: For sensors, resistance transmitters, relay contacts (floating), valves, dampers, etc.
	+24V	1 power supply DC 24 V for sensors
	+5V	1 power supply DC 5 V for ratiometric sensors
2	M1…M2	1 motor actuator for bipolar stepper motors. UPS (battery back-up) POL94U.00 only
3	Q1	1 relay output (floating): NO/NC contact for switching voltage AC 24 V … AC 230 V.
4	DL	Digital input / AC 115 V … 230 V, galvanically isolated.
5	ADR/TERM	DIP switch to set address and termination. See section 5.9 for function description.
6	BSP, BUS	Status LEDs BSP and BUS. See section 11.2 for function description.
7	C, O	Close, open LEDs. Indicates the status of the connected stepper motor. See next page for details.

Feature

The main controller is fully capable to command the ECV module, and the ECV module itself just drives the valve according to the electrical characteristics.
In this way the control logic of the valve is totally programmable on the controller side, and not a separate task running on the ECV module (like for example conventional superheat controllers or drivers). The valve control algorithm is so fully integrated and programmable in the complete refrigeration system control loop. This allows a very high level of control and performance of the target application.

Close, Open LEDs

LED information is available directly on the POL95U/POL94E module to facilitate identification of the actuator status. The meaning of the close (C) and open (O) LED status is specified below.
The right direction Open or Close for the movement of the bipolar motor actuator is achieved by adequate wiring.

C and O LED

Status	Meaning
Green blinking at 2 Hz	Valve missing or not connected. Manual acknowledge and reboot required.
Unlit	The valve is ready and standby.

C LED only

Status	Meaning
Green blinking at 2 Hz	Valve closing
Green on	Valve fully closed

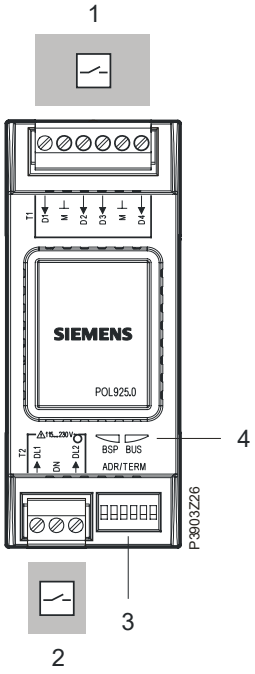
O LED only

Status	Meaning
Green blinking at 2 Hz	Valve opening
Green on	Valve fully open

5.6 Extension I/O module POL925.00

Elements and connections

The following picture illustrates the POL925.00 extension I/O module (with elements) as well as examples of connectable peripheral devices:



Explanation

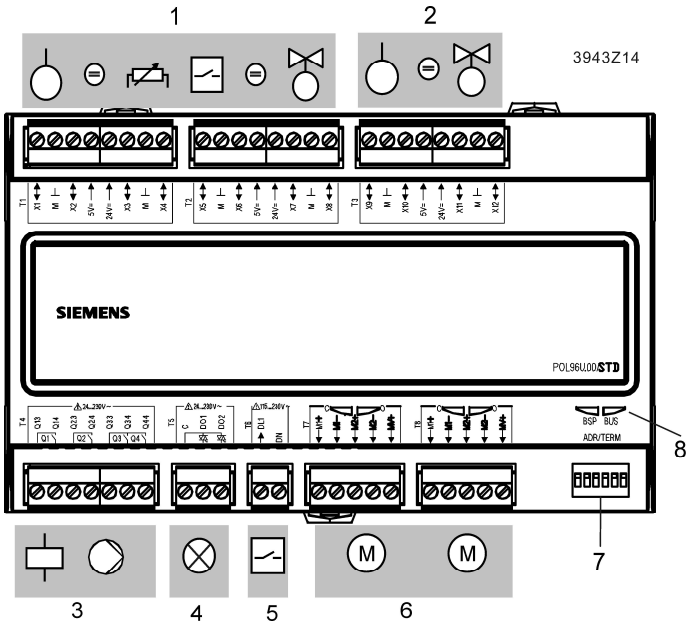
The elements and peripheral devices displayed in the picture:

Pos.	Labeling	Elements / peripheral devices (examples)
1	D1…D4	Digital inputs: Sampling voltage DC 24 V. For signaling elements with potential-free relay contacts.
2	DL1, DL2	Digital inputs / AC 115 V … 230 V: Galvanically isolated.
3	ADR/TERM	DIP switch to set address and termination. See section 5.9 for function description.
4	BSP, BUS	Status indication BSP and BUS. See section 11.2 for function description.

5.7 Extension I/O module POL96U /…96E

Elements and connections

The following picture illustrates the POL96U /…96E extension I/O module (with elements) as examples of connectable peripheral devices:



Explanation

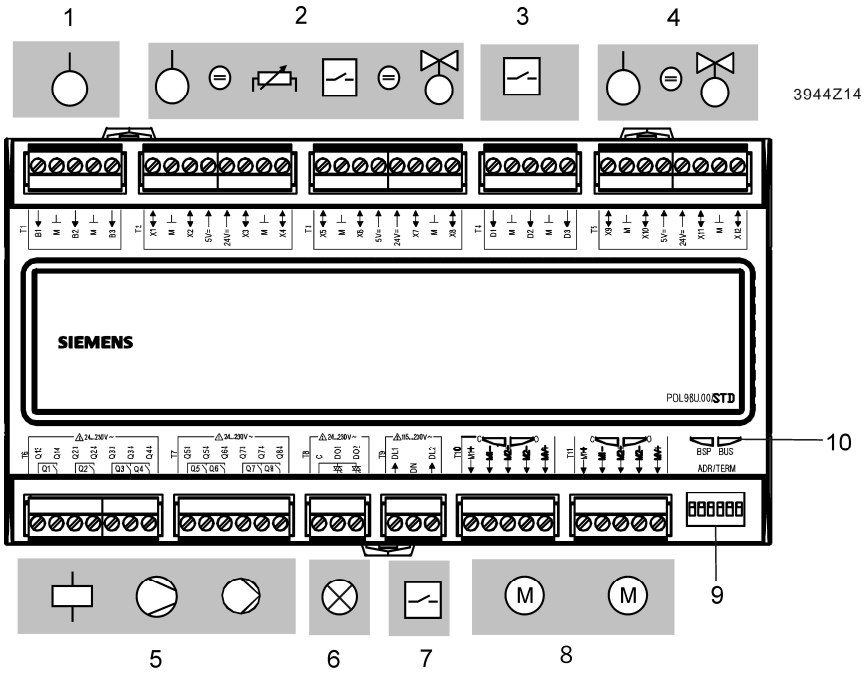
The elements and peripheral devices displayed in the picture:

Pos.	Labeling	Elements / peripheral devices (examples)
1	X1…X8	8 universal inputs/outputs, configurable: For sensors, resistance transmitters, relay contacts (floating), valves, dampers, etc.
	+24V	2 power supplies DC 24 V for sensors
	+5V	2 power supplies DC 5 V for ratiometric sensors
2	X9…X12	4 universal inputs, configurable
3	Q1…Q4	4 relay outputs (floating): NO contacts, switching voltage AC 24 V … AC 230 V. For contactors, fans, pumps, etc.
4	DO1, DO2	2 Triac outputs / AC 24 V … AC 230 V: For lamps, relays, switching valves, etc.
5	DL1	1 digital input / AC 115 V … 230 V: Galvanically isolated
6	M1…MV	Driver for bipolar/unipolar stepper motor
7	ADR/TERM	DIP switch to set address and termination. See section 5.9 for function description.
8	BSP, BUS	Status LEDs BSP and BUS. See section 11.2 for function description.

5.8 Extension I/O module POL98U /…98E

Elements and connections

The following picture illustrates the POL98U /…98E extension I/O module (with elements) as examples of connectable peripheral devices:



Explanation

The elements and peripheral devices displayed are:

Pos.	Labeling	Elements / peripheral devices (examples)
1	B1…B3	3 analog inputs NTC: For sensors NTC 10 kΩ und NTC 100 kΩ
2	X1…X8 +24V +5V	8 universal inputs/outputs, configurable: For sensors, resistance transmitters, relay contacts (floating), valves, dampers, etc. 2 power supplies DC 24 V for sensors 2 power supplies DC 5 V for ratiometric sensors
3	D1…D3	3 digital inputs: Sampling voltage DC 24 V. For signaling elements with floating relay contacts.
4	X9…X12	4 universal inputs, configurable.
5	Q1…Q8	8 relay outputs for AC 24 V … AC 230 V: – Q1, Q2, NO/NC contacts: for valve and damper drives, etc. – Q3…Q8, NO contacts: for contactors, fans, lamps, etc.
6	DO1, DO2	2 Triac outputs / AC 24 V … AC 230 V: For lamps, relays, switching valves, etc.
7	DL1, DL2	2 digital inputs / AC 115 V … 230 V: Galvanically isolated
8	M1…MV	Driver for bipolar/unipolar stepper motor
9	ADR/TERM	DIP switch to set address and termination. See section 5.9 for function description.
10	BSP, BUS	Status LEDs BSP and BUS. See section 11.2 for function description.

5.9 Status LEDs and slave addresses

Status LEDs

The status LEDs "BSP" and "BUS" are red, green and yellow.

BSP LED

State of the "Board Support Package" (BSP):

LED	Meaning
Green on	BSP running
Red flashing at 2 Hz	BSP error or slave address error

BUS LED

Indicates the status of communication to the controller.

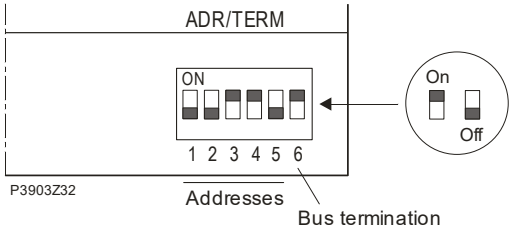
LED	Meaning
Green on	Communication ok
Red on	Communication error
Yellow	Communication running but parameter not successfully configured.

Slave address setting

The following pictures illustrates the location and setting on the DIP switch for the extension I/O module addresses and the termination of the peripheral bus.

Location

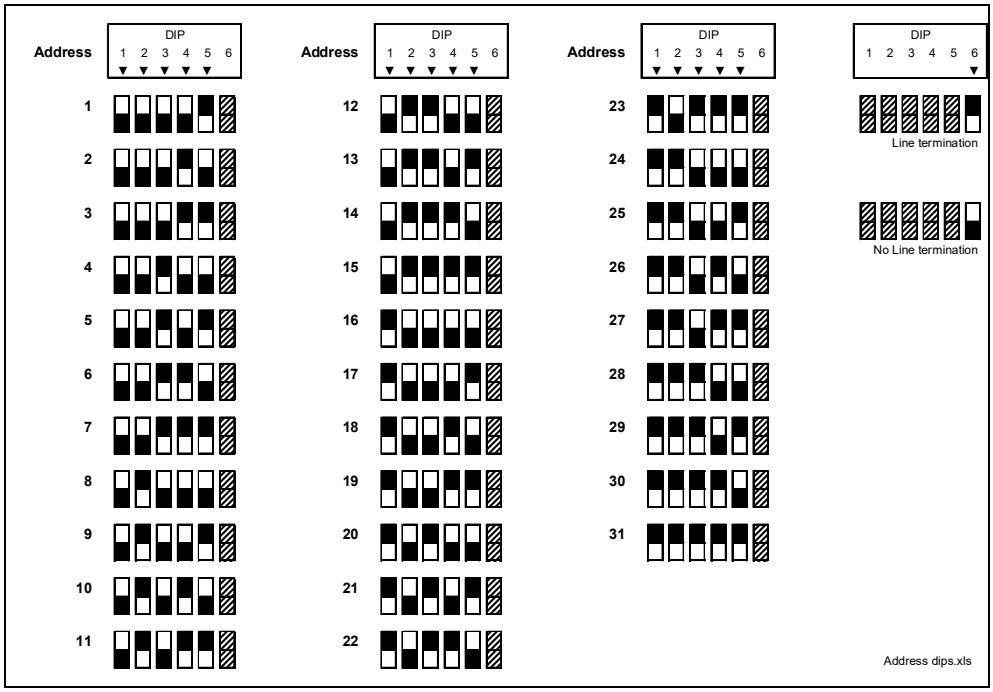
The DIP switch is positioned on the bottom right-hand corner of the extension I/O modules:



Switching elements 1 to 5 are available for the address setting; switching element 6 is reserved for the bus (line) termination setting.

Settings

The following picture illustrates addresses 1 to 31 as well as line termination:



6 Connect inputs / outputs

6.1 Analog inputs NTC (B..)

These inputs are only available on the following devices:
- Controller POL68X
- Extension I/O modules POL985 and POL945

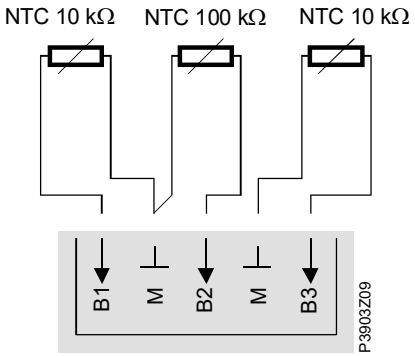
Use

The analog inputs are used to connect passive temperature sensors:
- NTC 10 kΩ
- NTC 100 kΩ

The inputs software configured (SAPRO).

Terminal assignment / connection example

The following picture illustrates the positioning and identification of the analog inputs on the housing for Climatix devices as well as three examples of connections:



Technical data

The following technical data applies to the analog inputs:

NTC 10 kΩ	
Measuring range	–50 °C … +100 °C
Sensor current	60 µA @ 25 °C
Accuracy and resolution	See datasheet for the respective devices
NTC 100 kΩ	
Measuring range	0 °C … +150 °C
Sensor current	15 µA @ 25 °C
Accuracy and resolution	See datasheet for the respective devices

6.2 Digital inputs for potential-free contacts (D..)

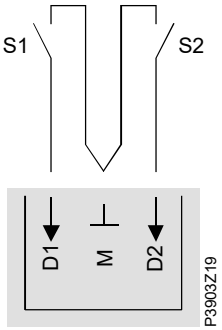
Use

Digital inputs D.. for binary signals from potential-free contacts are used for the following purposes:

- Polling switch states (e.g. pressure switches, motor thermal protection, remotely installed acknowledgement keys, voltage monitor devices, etc.)
- Pulse counting

Terminal assignment / connection example

The following picture illustrates positioning and identification of the digital inputs on the housing for Climatix devices as well as an example of a connection with two contacts:



D1, D2 Input signals
M Measuring neutral (reference voltage G0) for the input signals

⚠ Connect only potential-free contacts.

Technical data

The following technical data for digital inputs D.. apply:

0/1 digital signal (binary)	For potential-free contacts (floating signals)
Sampling voltage / current	DC 24 V / 5 mA
Contact resistance	Max. 200 Ω (closed) Min. 50 kΩ (open)
Delay *)	10 ms
Pulse frequency	Max. 30 Hz

*) Minimal pulse time for the controller to detect the pulse

6.3 Digital inputs for AC/DC 24 V (DU..)

These inputs available on the POL68X controller only.

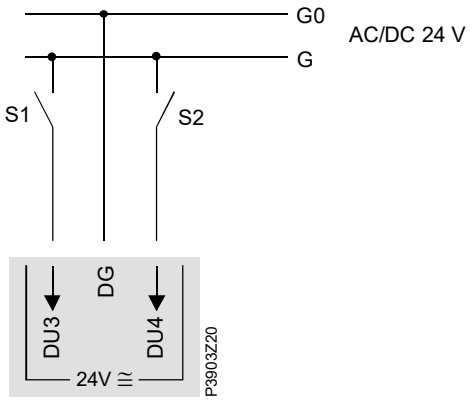
Use

The digital inputs DU.. for binary signals AC/DC 24 V are galvanically isolated.
They are used for example for:

- Remotely installed command keys
- Signals that may have a high level of electromagnetic interference

Terminal assignment / connection example

The following picture illustrates the positioning and identification of the digital inputs DU.. on the housing for Climatix devices as well as a connection example:



DU3, DU4 Input signals
DG Reference ground from contact

DU.. must be the positive pole if DC voltage is used.

Technical data

The following technical data applies to digital inputs DU..:

0/1 digital signal (binary)	Galvanically isolated
Nominal voltage	AC/DC 24 V
Input current	8 mA
Delay *)	20 ms
Pulse frequency	max. 5 Hz

*) Minimal pulse time for the controller to detect the pulse

6.4 Digital inputs for AC 115…230 V (DL..)

These inputs available on the POL68X controller only.

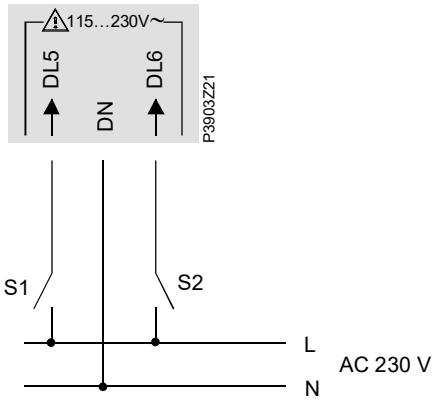
Use

The digital inputs DL.. for binary signals AC 115 V…230 V are galvanically isolated. They are especially useful for:

- Handling of high pressure switches via a hardware safe mode – additional to the normal SW mode (see next page under "Application example compressor safety")
- Any other similar application

Terminal assignment / connection example

The following picture illustrates the positioning and identification of the digital inputs DL.. on the housing for Climatix devices as well as an example of a connection:



DL5, DL6 Input signal
DN Galvanically separated. Different neutral from contact

Technical data

The following technical data applies to digital inputs DL..:

0/1 digital signal (binary)	Galvanically isolated
Nominal voltage	AC 115 V…230 V (-15 %, + 10 %)
Frequency range	45…65 Hz
Input current	3 mA @ AC 230 V
Delay *)	100 ms
Pulse frequency	max. 5 Hz

*) Minimal pulse time for the controller to detect the pulse

Application example: compressor safety

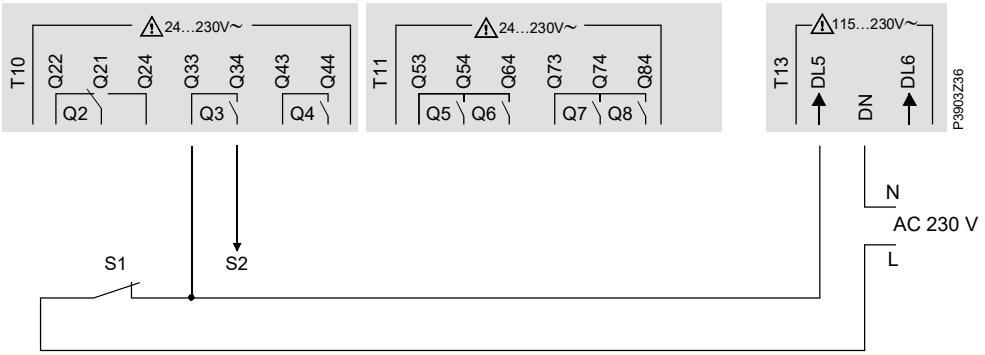
Digital Inputs AC 115-230 V (POL68X only) shut down the compressor via hardware during a dangerous event, including:

- A high-pressure contact opens, or
- Voltage monitor alarm signal.

The controller detects such events quickly on the digital inputs DL (delay 100 ms).

Connection example

The picture below illustrates an example for the high-pressure function:



S1 High-pressure switch
S2 Command for compressor relay coil

Explanation

The function runs as follows:

WHEN …	THEN …
S1 opens	• The compressor relay coil is no longer energized, so that the compressor shuts down independent of control action. • The controller detects the open status of S1 on DL5 and drops relay Q3, thereby switching off the command for the compressor relay coil.
S1 closes again	• The controller logic keeps the compressor off per programmed functionality in the application.

See section 6.7 "Relay outputs (Q..)" for an example using multiple compressors.

6.5 Universal I/Os (X..)

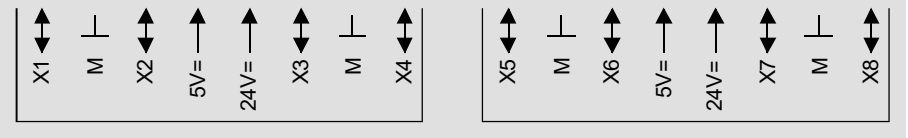
Use

The universal inputs/outputs X1.. are freely configurable via SAPRO / SCOPE software to adapt to a wide variety of uses, including:

- Passive temperature sensors
- Active measured value transmitters
- Digital (binary) signaling elements
- Control signals for analog control elements

Terminal assignment: example POL68X

The following picture exemplifies the positioning and identification of the universal inputs/outputs Xx on the housing for the Climatix controller POL68X:



Xx Input or output signals
M Measuring neutral (reference ground G0) for the input/output signals
5V= Power supply DC 5 V for ratiometric transmitters
24V= Power supply DC 24 V for active transmitters

Configuration possibilities

The following list outlines the broad range of configurable signal types and ranges for the POL68X controller as an example:

Input/output	Signal	Range
Analog inputs (X1…X8)	Ni 1000 sensor	-50…150°C
	Pt 1000 sensor	-40…120°C
	NTC 10 kOhm sensor	-50…100°C
	NTC 100 kOhm sensor	-25…100°C
	Resistance transmitter	0…2500 Ohm
	Voltage signal	DC 0…10 V
	Current signal	DC 0/4…20 mA
	Ratiometric sensor	DC 0…5 V
Digital inputs (X1…X8)	Voltage signal 0/1 (binary, non-floating)	DC 24 V / 8 mA
Analog outputs (X1…X4)	Voltage signal	DC 0…10 V
	Current signal	DC 4…20 mA
Analog outputs (X5…X8)	Voltage signal	DC 0…10 V
Digital outputs (X5…X8)	Voltage signal 0/1 (binary, non-floating)	DC 24 V / max. 25 mA

Information on available universal I/Os for other Climatix, see:

- For controllers POL63X Section 2.2 under "I/O mix / labeling".
- For extension I/O modules POL9.. Section 2.3 under "I/O mix / labeling".

Configuration principle

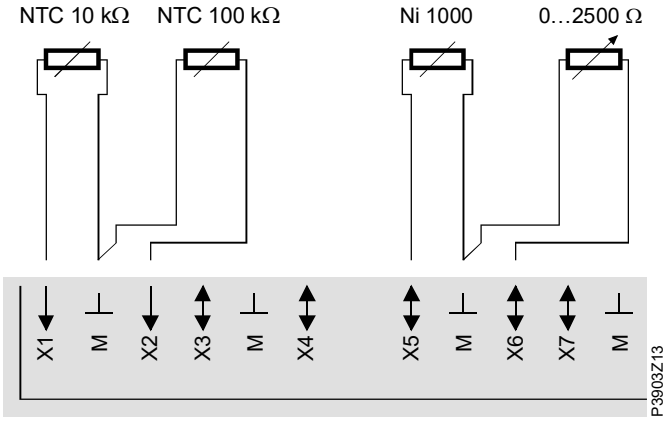
The inputs/outputs for Climatix devices are configured based on the peripheral devices for the ventilation plant to be controlled.

The SAPRO programming tool configures the device using the *POL6XX* function block.

SAPRO configurations can be changed later during operation. Restart the device to use and process the new input/output configurations accordingly.

Connection diagram, passive sensors

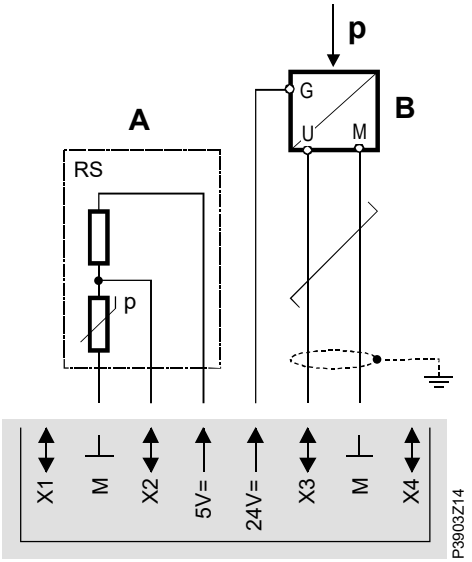
The following picture illustrates connecting passive sensors as well as a 0…2500 Ohm set point adjuster on the POL63X controller:



The universal I/Os applied are configured as analog inputs for the corresponding resistance ranges.

Connection diagram 1, active sensors

The following picture illustrates the wiring for a ratiometric sensor “A” powered with DC 5 V and a voltage transmitter “B” powered with DC 24 V:



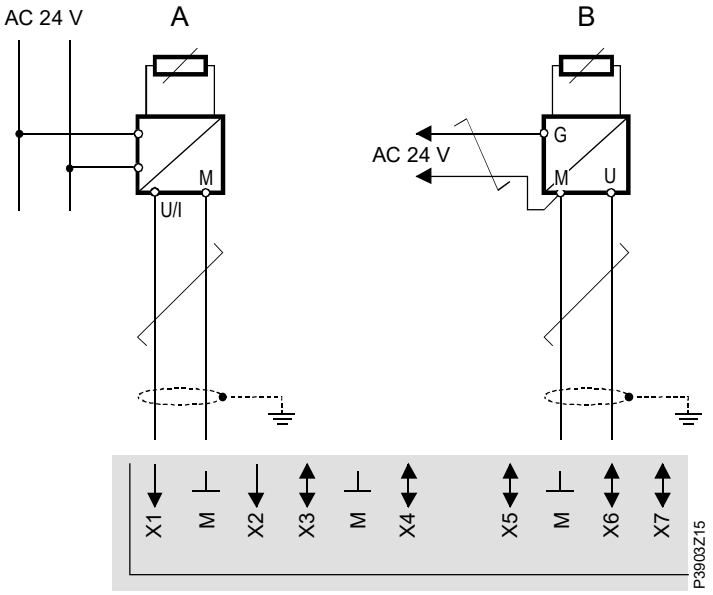
A Ratiometric pressure sensor, 3-wire connection
B Pressure sensor DC 0…10 V, 3-wire connection (e.g. SIEMENS, Type QBE2002-P…)

The universal I/Os applied are configured as analog inputs for ratiometric sensors DC 0…5 V and voltage signal DC 0…10 V respectively.

See section 6.10 for technical data on sensor power supplies.

Connection diagram 2, active sensors

The following picture illustrates the wiring of active sensors (measured value transmitters) with external AC 24 V power supply, connected to a controller POL63X:



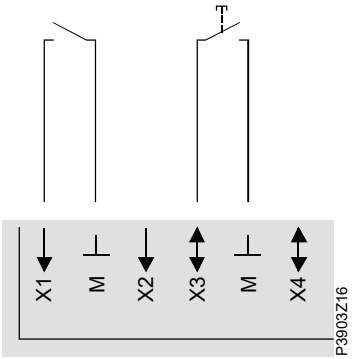
A DC 0…10 V or DC 4…20 mA sensor, 4-wire connection
B DC 0…10 V sensor, 3-wire connection

The universal I/Os applied are configured as analog inputs for current signal DC 4…20 mA and voltage signal DC 0…10 V respectively.

⚠ The AC 24 V power supply for the Climatix controller and measured value transmitters can be connected to the same AC 24 V transformer if the grounding concept for both devices (controllers and sensors) is the same.
The ground is connected to the earth for Climatix 6XX controllers and is the same potential for all M terminals, see section 7.1 "Basic concept for Climatix systems".

Connection diagram, 0/1 digital input signals

The following picture illustrates the connection for 0/1 digital input signals on the controller POL63X, such as relay contacts and acknowledgement keys:



The universal I/Os applied are configured as digital inputs 0/1 (binary) for potential-free contacts.

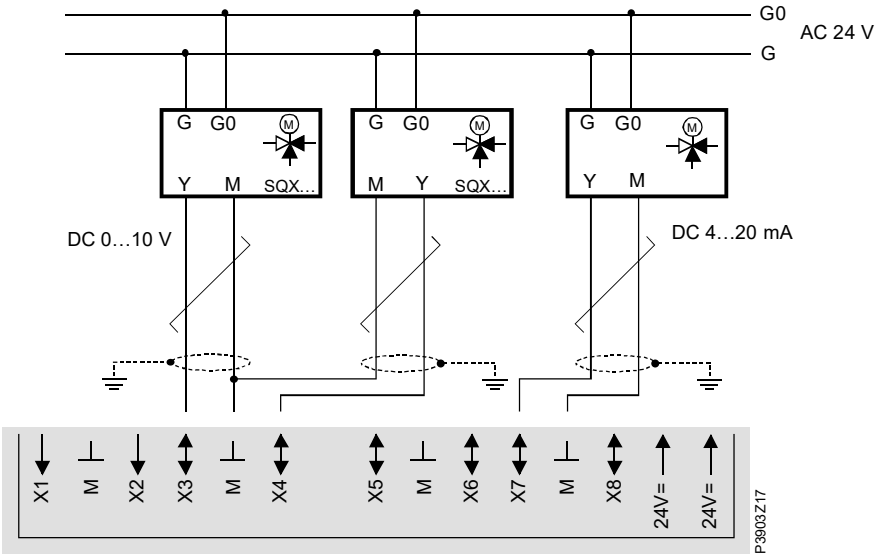
⚠ Connect only potential-free contacts.

Connection diagram, control elements DC 0…10 V / 4…20mA

The following picture illustrates a connection for valve control elements with signal input:

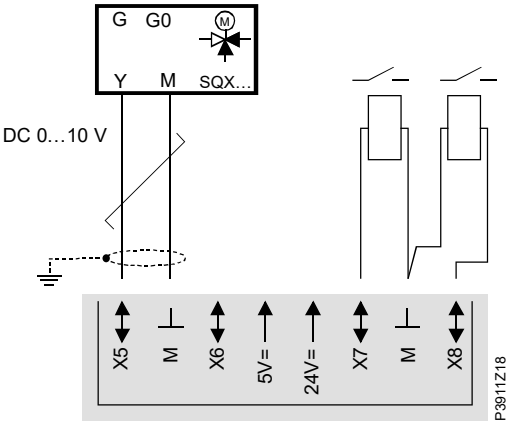
- DC 0…10 V (e.g. Siemens SQX…) and
- DC 4…20 mA

The universal I/Os applied are configured as analog outputs for DC 0…10 V voltage signal and DC 4…20 mA current signal respectively.



Connection diagram, external loads

The picture shows the connection of two external loads (relays DC 24V / max. 25 mA) in addition to a control element DC 0…10 V at the analog/digital outputs of the POL68X:



A free wheel diode is already integrated for inductive loads .

EMC measures for universal I/Os

Take the following precautions when connecting sensors, transducers and control elements to universal inputs/outputs:

- Use twisted-pair cables – use a separate pair for each input.
- In some cases shielded cables may be required depending on the application or the cabling layout.
- Connect shields on one side only (for the same cable) to earth
- The following recommendation applies to sensors (measured value transmitters) with 3-wire connections:
  Connect the measured value transmitter using two twisted pairs – one for the power supply, the other for the signal.

Technical data

The following section summarizes common technical data for universal inputs and outputs, as well as specific values for the configurable signal types.
Possible configurations may vary from device to device for each individual universal channel. Refer to the product datasheet for detailed descriptions.

Common data

Reference voltage	M terminals (⊥)
Contact voltage	Max. DC 24 V (SELV)
Surge voltage protection	Up to 40 V

Analog inputs

Ni1000		
Sensor current	1.4 mA	
Resolution	0.1 K	
Accuracy within the range -50…150 °C	0.5 K	
Pt1000		
Sensor current	1.8 mA	
Resolution	0.1 K	
Accuracy within the range -40…120 °C	0.5 K	
NTC 10k		
Sensor current	140 µA	
Temperature range	Accuracy	Resolution
-50…-26 °C	1 K	0.2 K
-25…74 °C	0.5 K	0.1 K
75…99 °C	1 K	0.3 K
100…124 °C	3 K	1 K
125…150 °C	6 K	2.5 K
NTC 100k		
Sensor current	140 µA	
Temperature range	Accuracy	Resolution
-25…-11 °C	3 K	0.2 K
-10…9 °C	1 K	0.1 K
10…99 °C	0.5 K	0.1 K
100…150 °C	1 K	0.2 K
0...2.5 kΩ		
Sensor current	1.8 mA	
Resolution	1 Ω	
Accuracy	4 Ω	
DC 0…5 V input for ratiometric sensors		
Resolution	1 mV	
Accuracy at 0 V	10 mV	
Accuracy at 5 V	25 mV	
Input resistance	100 kΩ	
DC 0...10 V input		
Resolution	1 mV	
Accuracy at 0 V	10 mV	
Accuracy at 5 V	25 mV	
Accuracy at 10 V	50 mV	
Input resistance	100 kΩ	
DC 0/4…20 mA input		
Resolution	1 µA	
Accuracy at 4 mA	40 uA	
Accuracy at 12 mA	70 uA	
Accuracy at 20 mA	120 uA	

Universal I/Os (X..), *continued*

Digital inputs	0/1 digital signal (binary)	For potential-free contacts
	Sampling voltage / current	DC 24 V / 8 mA
	Contact resistance	Max. 200 Ω (closed)
		Min. 50 kΩ (open)
	Delay	10 ms
	Pulse frequency	Max. 20 Hz
Analog outputs	DC 0…10 V output	
	Resolution	11 mV
	Accuracy at 0 V	66 mV
	Accuracy at 5 V	95 mV
	Accuracy at 10 V	124 mV
	Output current	1 mA (short-circuit-proof)
	DC 4…20 mA output	
	Resolution	22 µA
	Accuracy at 4 mA	150 µA
	Accuracy at 12 mA	196 µA
	Accuracy at 20 mA	243 µA
Digital outputs	DC output for off board loads	
	Switching voltage	DC 24 V
	Switching capacity	Max. 25 mA

These outputs are suitable for inductive loads as off board relays.

6.6 Analog outputs 0…10 V (Y..)

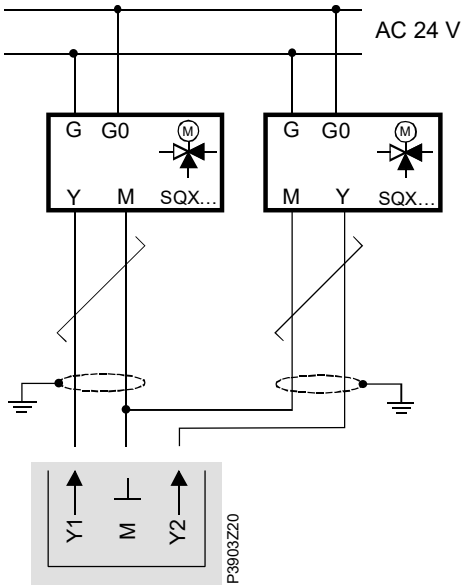
These inputs available on the following devices only:
- Controller POL63X
- Extension I/O module POL955

Use

The analog outputs Y.. are used to connect control elements to DC 0…10 V input signal, such as:
- Electromotoric and electro hydraulic valve actuators
- Variable speed drives to control fans and pumps

Terminal assignment / connection example

The following picture illustrates the positioning and identification of analog outputs on the housing for Climatix devices as well as the basic connection principle using two actuators (e.g. Siemens SQX…) for valves:



EMV measures:
- Use shielded cables as signal cables. Connect each analog output to a twisted pair.
- The shield must be connected broadly to a shield bus in front of the Climatix device.

Technical data

The following technical data applies to analog outputs:

Output voltage	DC 0…10 V	
Resolution	11 mV	
Accuracy	66 mV	at 0 V output signal
	95 mV	at 5 V output signal
	124 mV	at 10 V output signal
Output current	1 mA	

6.7 Relay outputs (Q..)

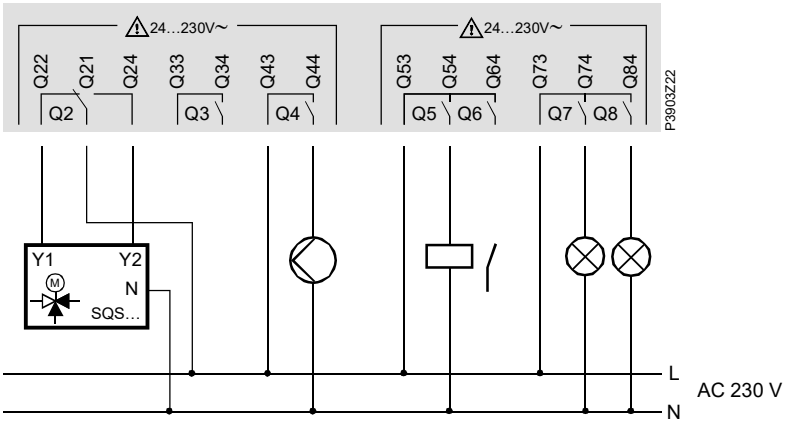
Use

The relay outputs Q.. are used to connect control elements and indicators, such as:

- Motors
- Electric air heaters
- Lamps
- etc.

Terminal assignment / connection example

The following picture illustrates the positioning and identification of the relay outputs Q.. on the housing for Climatix devices as well as connection examples for several field devices on thePOL68X controller:



Technical data

The following technical data applies to relay outputs:

Relay type, contact	Q..:	Monostable, NO/NC contact
	Q..:	Monostable, NO contact
Contact rating		
Switching voltage		AC 24V…230V (-20%, +10%)
Nominal current (res. / ind.)		Max. AC 3 A / 2 A (cosφ 0.6)
Switching current at AC 19 V		Min. AC 30 mA

The relays are combined in one or several groups depending on the device (the picture above has two groups).

⚠ Use only **one** working voltage within each group:
Either AC 115/230 V **or** safety extra-low voltage (SELV).
Do not mixing within a group!

⚠ Any suppressor circuit, interference suppression, etc., must be provided externally per the application.

⚠ No internal protection. The switching circuits must be externally fused (< 10 A).

⚠ AC 115/230 V cabling must have double insulation against cables carrying safety extra-low voltage (SELV). The cables have to be fixed by strain reliefs.

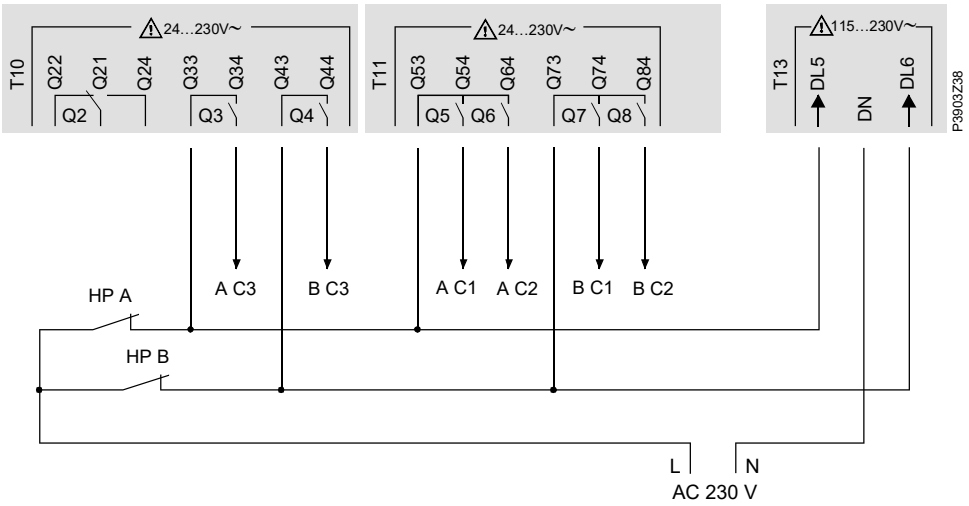
Application example: compressor safety

In this example, relay outputs Q.. for Climatix Controller 68X work together with digital inputs DL.. to ensure compressor safety prior to events, such as

- High-pressure switch or
- Voltage monitor.

Connection example

1, 2, 3 or even 4 compressors per circuit can be protected on the hardware side against some digital input change of status. Below is an example for two circuits with 3 compressors each:



HP A	High-pressure switch circuit A	A C1 … A C3	Commands for compressor relays circuit A
HP B	High-pressure switch circuit B	B C1 … B C3	Commands for compressor relays circuit B

Explanation

Digital Inputs DL.. for AC 115…230 V can ensure hardware shut down of compressors via hardware for 1, 2, 3 or even 4 compressors per refrigeration circuit, whenever a high-pressure event happens on one of the circuits.

The function runs as follows:

WHEN …	**THEN …**
HP X opens	• All compressor relay coils supplied by this high-pressure switch drop out. • The controller on the corresponding digital input DL detects the open status for this high-pressure switch HP. Depending on programmed functionality, the assigned controller relay Q.. drops and the commands for the compressor relays are switched off.
HP X closes again	• The controller logic keeps the compressor off per programmed functionalities for the application.

See also application example "compressor safety" in section 6.4, "Digital inputs for AC 115…230 V (DL..)"

6.8 Triac outputs (DO..)

These outputs available on the POL68X controller only.

Use

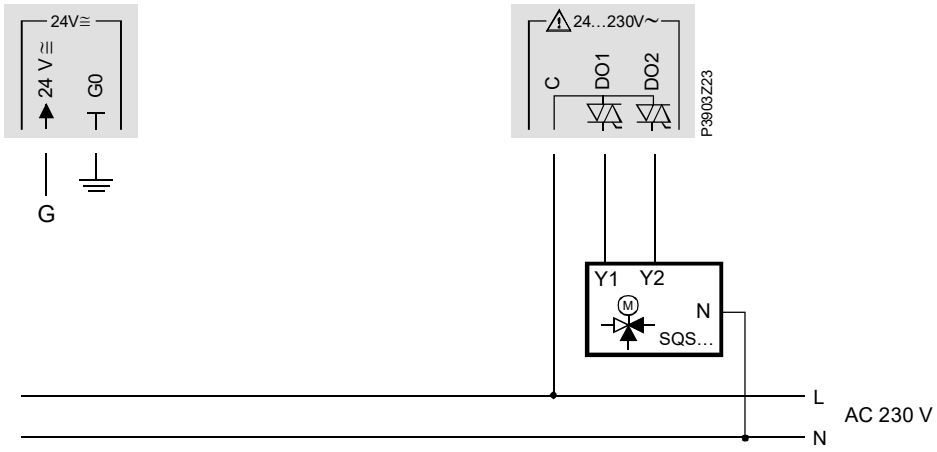
The Triac outputs DO.. are used to control digital outputs that switch often, when the normal relay life cycle does not suffice for the application.
Examples:

- Control digital scroll compressors unload valves, switching every 20 seconds for example
- Control a three-point valve, switching every minute
- Flashing warning lights

Normal relays can also be connected to Triac outputs within the rated values for voltage and current. In this case, the device switch off is synchronized with the zero crossing for the current on the load.

Terminal assignment / connection example

The following picture illustrates the positioning and identification of the Triac outputs DO.. on the housing for Climatix devices as well as a connection example for a three-point valve drive:



Technical data

The Triac outputs have the following technical data:

Switching voltage	AC 24V…230V (-20%, +10%)
Switching capacity	Max. 0.5 A / Min. 30 mA
Leakage current	less than 100 µA

The Triac outputs switch on at zero crossing voltage; they switch off at zero crossing current.

6.9 Bipolar motor outputs (M..)

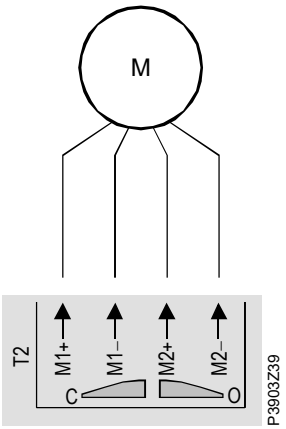
These outputs available on the Extension I/O modules POL94U / …94E, POL96U / …96E, POL98U / …98E.

Use

The bipolar motor outputs are used for:
- Bipolar stepper motors, current controlled
- With (U) or without (E) UPS

Terminal assignment / connection example

The following picture illustrates the positioning and identification of the bipolar motor outputs on the housing for the extension I/O modules as well as a connection example:



Explanation

M1 and M2 are the different poles for the motors. Inverting M1 and M2 invert the rotation direction for the connected motor.

Technical data

The following technical data applies to bipolar actuator outputs:

Constant-current mode	Short-circuit-proof
Switching frequency	15 kHz
Full-step mode	4 steps per revolution
Programmable current	0.1…2.8 A
Programmable hold current	0.0…0.5 A
Motor voltage	Max. 42 V
Programmable speed	Max. 500 steps per s
Programmable acceleration	Max. 500 steps per s^2
Programmable traverse path	200….60,000 steps
Programmable overdrive	0…5,000 steps
Thermal shutdown	
Programmable reference point	Zero or max. point
Diagnostics at startup and in operation	
UPS (POL94U.00/MCQ only)	
Energy storage	Ultracaps (6 x 10 F at 2.7 V)
Fully charged	200 Ws
Charging time	<2 min

6.10 Unipolar motor outputs (M..)

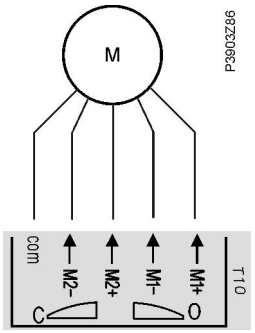
These outputs available on the Extension I/O modules POL94U / …94E, POL96U / …96E, POL98U / …98E.

Use

The unipolar motor outputs are used for:
- Unipolar stepper motors, current controlled
- With (U) or without (E) UPS

Terminal assignment / connection example

The following picture illustrates the positioning and identification of the unipolar motor outputs on the housing for the extension I/O modules as well as a connection example:



Explanation

M1 and M2 are the different poles for the motors. Inverting M1 and M2 invert the rotation direction for the connected motor.

Technical data

The following technical data applies to unipolar actuator outputs:

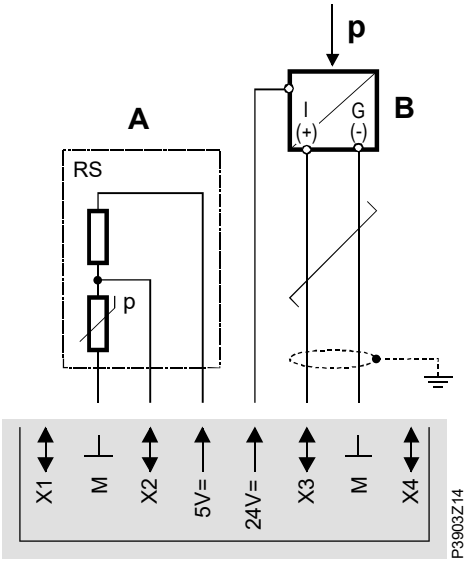
Driver for bipolar/unipolar stepper motor	
Constant-current mode	Short-circuit-proof
Switching frequency	50 kHz (variable)
Full-step mode	4 steps per revolution
Programmable current	0.1…0.5 A
Programmable hold current	0.0…0.5 A
Motor voltage	Max. 42 V
Programmable speed	Max. 500 steps per s
Programmable traverse path	0….30,000 steps
Programmable overdrive	0…2,500 steps
Thermal shutdown	
Programmable reference point	Zero or max. point
Diagnostics at startup and in operation	
Max. output power for each motor	10 W
Length of motor cable	< 10 m
UPS (POL98U.00)	
Energy storage	Ultracaps (8 x 10 F at 2.7 V)
Usable energy	175 Ws
Charging time	<3 min

6.11 Sensor power supplies (M..)

Example

The following picture illustrates wiring examples for the following sensor types:

- Ratiometric sensors for DC 5 V power supply
- Active sensors (measured value transmitters) for DC 24 V power supply



A Ratiometric pressure sensor for DC 5 V, 3-wire connection
B Pressure sensor with DC 4…20 mA output, 3-wire connection

Explanation

The position of sensor power supply optimizes cable preparation layout (3 wires are close to each other). This also improves immunity to radiated interference to the power supply and input signals.

Technical data

The following technical data applies to sensor power supplies:

DC 5 V

Voltage / current	DC 5 V ±2,5% / max. 20 mA
Reference potential	Terminals ⊥
Connection	Short-circuit-proof

DC 24 V

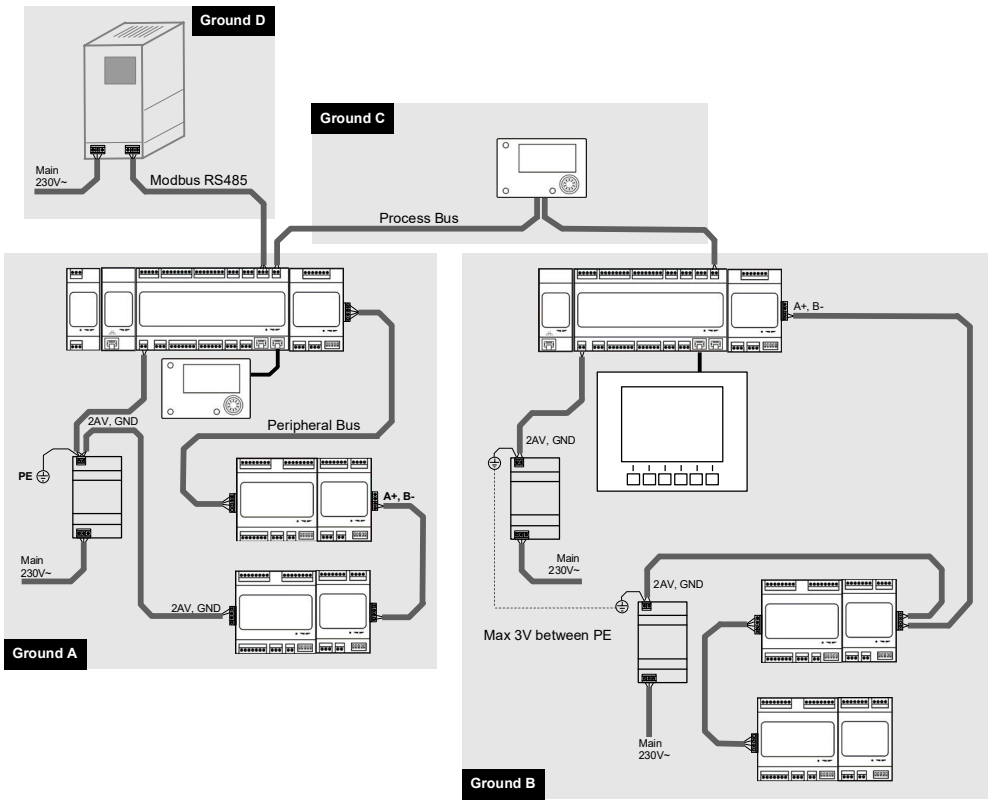
Voltage / current	DC 24 V +10 %, -25% / max. 40 mA
Reference potential	Terminals ⊥
Connection	Short-circuit-proof

7 Use extension I/O modules

7.1 Basic concept for Climatix systems

Overview

The picture below illustrates the basic concept for Climatix systems:



General rules

Note the following:

- Each colored area (Ground, A, B, C and D) can be grounded independently to its own earth.
- Ground C (Process Bus) and Ground D (Modbus RS485) are galvanically isolated up to 500V.
- Connect ground to the earth to improve immunity to external influences.

Special notes

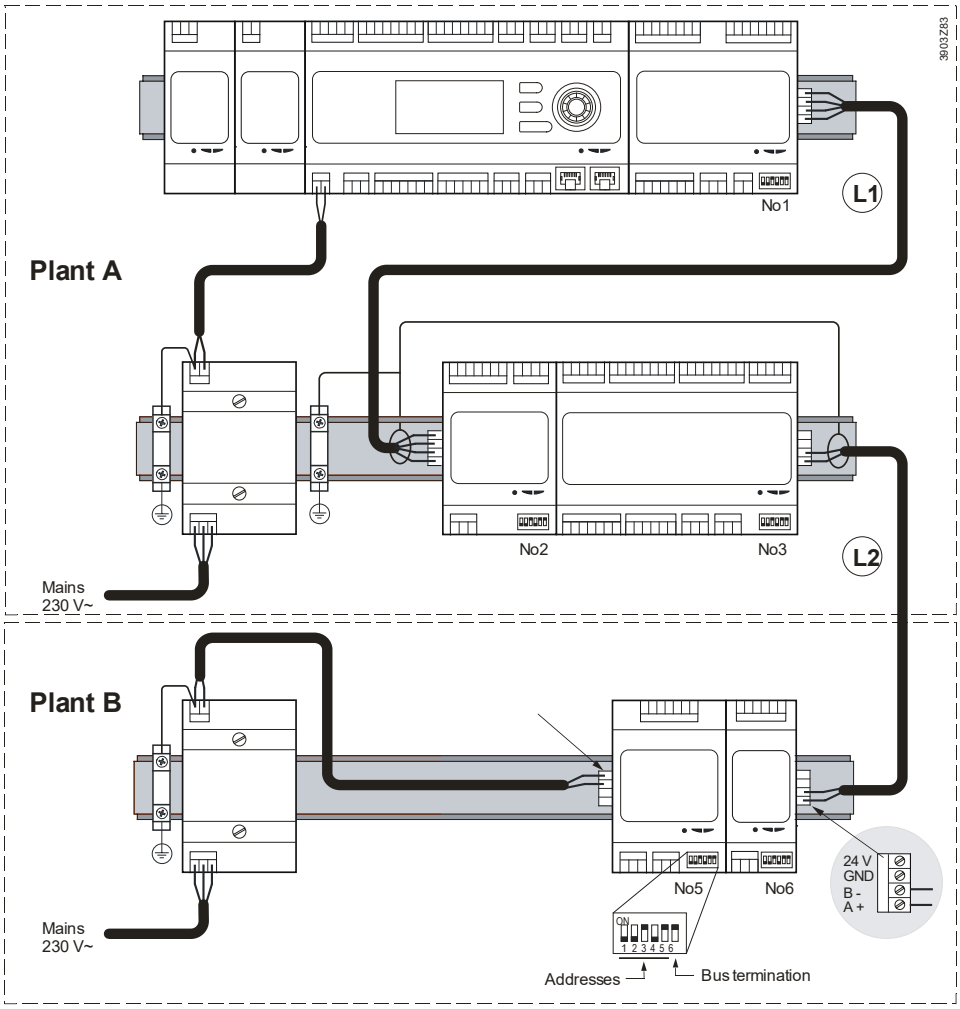
Please observe the following special notes:

Subject	Explanation
Modbus RS485 application ⚠	POL68X: Ground A and ground D can be different due to the galvanic isolation of the RS485 bus on POL68X. POL63X: Ground A and ground D must be the same since the Modbus RS485 interface is not galvanically isolated.
Extension I/O modules powered by **same** transformer	Inside ground A, some extension I/O modules are supplied directly by the transformer or the DC power supplies and not from the peripheral bus wires 24V / GND. This may be required to fulfill pass-through current rules (see section 7.3 "Pass-through current").
Extension I/O modules powered by **different** transformers	Inside Ground B, some extension I/Os are supplied by another transformer. This may be the result of a modular panel design approach. In this case, the power supplies must be connected to the earth, and ensure that the max difference between the two earths is less than 3 V (ensures the correct functionality of the system).

7.2 Cabling for extension I/O modules

Illustration

The following picture illustrates an example of extension I/O module cabling to demonstrate associated rules:



Topology, addressing, bus termination

The topology for extension I/O modules must be linear (see L1 and L2 above). Each module has to be assigned an individual address.
The bus termination must be configured to ON on the last module; all others to OFF. Refer to section 5.9 for details.

Cabling rules

STOP

Observe the following rules for cabling and grounding:

- Shielded cables are required for peripheral bus cable greater than 3 meters (L1 + L2 + Lx = > 3 m).
- Shielded cables are not required if the peripheral bus cable is less than 3 m.
- Ground each shield on one side only.
- Max. bus cable length is 30 meters (L1 + L2 + Ln = < 30 m).
- Use board-to-wire terminals to connect the bus cable to the modules.
- GND for the power supply must be grounded.
- Connections from one plant to another can be accomplished using a 2-wire bus cable (A+ and B-). In this case, modules must have a separate power supply. All plants must have the same GND and the GND for the power supply must be grounded at one location only.
- Refer to the pass-through current rules for limiting the current across each device within individual limits.

7.3 Pass-through current

Definition

The pass-through current is the current that flows across each individual device.

Apparent power limit

When Extension I/O modules are power supplied by a controller or by another Extension I/O module over the peripheral bus lines, then:
The total current for a group of devices must not exceed 4 A.

Apparent power calculation

Calculate apparent power by adding the pass-through currents for the individual devices and then calculating apparent power.

A group of controllers and extensions must be split in two or more sub-groups (blocks) if current exceeds 4 A , so that each sub-group is crossed by a current that is less than 4 A.

The "pass-through current calculator" makes it easy to calculate apparent power (see next pages).

AC 24 V power supply consumes more power than DC 24 V due to the improved power factor for the DC 24 V power supply.
As a consequence, more extensions can be connected to the same DC 24 V power supply than for an AC 24 V power supply.

Limits

Observe the following limits for extension I/O modules:

Item	Limit
Maximum no. of Extension I/O modules	31 (1…31)
Maximum pass-through current per block	4 A
Cable lengths	Max. 30 m total length

Calculation tools

The calculation tool located on the next page:

- Power consumption table
- Pass-through current calculator

Pass-through current, *continued*

Power consumption table

The table below outlines maximum consumption for controllers and extension I/O modules by considering the full load configuration for each device. As a result, other configurations may be less than reported below.

	Power supply type		
	AC 24 V	DC 24 V	
Device	I [mA]	I [mA]	Description
POL635.00	1800	1000	Climatix 635 - 21 I/Os
POL636.00	1800	1000	Climatix 636 - 21 I/Os
POL638.00	1800	1000	Climatix 638 - 21 I/Os
POL638.70	1800	1000	Climatix 638 - 21 I/Os - with built-in HMI
POL687.00	1800	1000	Climatix 687 – 27 I/Os
POL687.70	1800	1000	Climatix 687 – 27 I/Os - with built-in HMI
POL985.00	850	458	Extension 26 I/Os
POL965.00	750	416	Extension 15 I/Os
POL955.00	750	416	Extension 14 I/Os
POL94E.00	900	500	Extension 6 I/Os - ECV
POL94U.00	900	500	Extension 6 I/Os - ECV with built-in UPS
POL945.00	260	125	Extension 8 I/Os
POL925.00	150	63	Extension 6 I/Os
POL96U.00	2200	1900	ECV Extension 19 I/Os with UPS
POL96E.00	2200	1900	ECV Extension 19 I/Os
POL98U.00	2200	1900	ECV Extension 30 I/Os with UPS
POL98E.00	2200	1900	ECV Extension 30 I/Os

Power supply type	AC 24 V	DC 24 V
Maximum allowed supply current per controller	4 A	4 A

The HMIs and COMM modules are supplied from the controller. They do not effect the pass-through current. Therefore, focus only on the controller and the extension I/Os for calculating the pass-through current.

Pass-through current calculator

The following picture outlines the pass-through current calculator. You can easily calculate the total apparent power for a group of devices.

Pass-through current calculator for Power Supply AC 24 V or DC 24 V

Power supply type		AC 24 V	DC 24 V	
		I [mA]	I [mA]	
Required nr. of POL635.00		1800	1000	Climatix 635 - 21 IOs
Required nr. of POL636.00		1800	1000	Climatix 636 - 21 IOs
Required nr. of POL638.00		1800	1000	Climatix 638 - 21 IOs
Required nr. of POL638.70		1800	1000	Climatix 638 - 21 IOs - with inbuilt HMI
Required nr. of POL687.00		1800	1000	Climatix 687 - 27 IOs
Required nr. of POL687.70		1800	1000	Climatix 687 - 27 IOs - with inbuilt HMI
Required nr. of POL985.00		850	460	Extension 26 IOs
Required nr. of POL965.00		750	420	Extension 15 IOs
Required nr. of POL955.00		750	420	Extension 14 IOs
Required nr. of POL94E.00		900	500	Extension 6 IOs - ECV
Required nr. of POL94U.00		900	500	Extension 6 IOs - ECV with inbuilt UPS
Required nr. of POL945.00		260	130	Extension 8 IOs
Required nr. of POL925.00		150	70	Extension 6 IOs
Required nr. of POL902.00				Comm. Card Modbus RS485
Required nr. of POL904.00				Comm. Card BACnet MSTP
Required nr. of POL906.00				Comm. Card LON
Required nr. of POL908.00				Comm. Card BACnet IP
Required nr. of POL909.00				Comm. Card Advanced Web
Required nr. of POL895.50				Human Machine Interface

Power supply type	AC 24 V	DC 24 V	
Sum of Currents [A]	0.00	0.00	Max 4 A!!

You can download the calculator via Siemens SWANweb

7.4 Example 1: AC 24 V power supply

Pass-through current calculation

This example illustrates how to use one POL687.70 controller, together with 2 POL965, 2 POL945 and 2 POL94U extension I/O modules. Calculation:

Pass-through current calculator for Power Supply AC 24 V or DC 24 V

Power supply type		AC 24 V	DC 24 V	
		I [mA]	I [mA]	
Required nr. of POL635.00		1800	1000	Climatix 635 - 21 IOs
Required nr. of POL636.00		1800	1000	Climatix 636 - 21 IOs
Required nr. of POL638.00		1800	1000	Climatix 638 - 21 IOs
Required nr. of POL638.70		1800	1000	Climatix 638 - 21 IOs - with inbuilt HMI
Required nr. of POL687.00		1800	1000	Climatix 687 - 27 IOs
Required nr. of POL687.70	1	1800	1000	Climatix 687 - 27 IOs - with inbuilt HMI
Required nr. of POL985.00		850	460	Extension 26 IOs
Required nr. of POL965.00	2	750	420	Extension 15 IOs
Required nr. of POL955.00		750	420	Extension 14 IOs
Required nr. of POL94E.00		900	500	Extension 6 IOs - ECV
Required nr. of POL94U.00	2	900	500	Extension 6 IOs - ECV with inbuilt UPS
Required nr. of POL945.00	2	260	130	Extension 8 IOs
Required nr. of POL925.00		150	70	Extension 6 IOs
Required nr. of POL902.00				Comm. Card Modbus RS485
Required nr. of POL904.00				Comm. Card BACnet MSTP
Required nr. of POL906.00				Comm. Card LON
Required nr. of POL908.00				Comm. Card BACnet IP
Required nr. of POL909.00				Comm. Card Advanced Web
Required nr. of POL895.50				Human Machine Interface

Power supply type	AC 24 V	DC 24 V	
Sum of Currents [A]	5.62	3.10	Max 4 A!!

Split in two blocks

This combination not possible with one chain only, as the total value for the current is greater than 4 A. (Note, however, that it could be done using DC 24 V).
The chain must be split into two blocks.

Block 1

This block is composed of the controller and one extension I/O module each:

Pass-through current calculator for Power Supply AC 24 V or DC 24 V

Power supply type		AC 24 V	DC 24 V	
		I [mA]	I [mA]	
Required nr. of POL635.00		1800	1000	Climatix 635 - 21 IOs
Required nr. of POL636.00		1800	1000	Climatix 636 - 21 IOs
Required nr. of POL638.00		1800	1000	Climatix 638 - 21 IOs
Required nr. of POL638.70		1800	1000	Climatix 638 - 21 IOs - with inbuilt HMI
Required nr. of POL687.00		1800	1000	Climatix 687 - 27 IOs
Required nr. of POL687.70	1	1800	1000	Climatix 687 - 27 IOs - with inbuilt HMI
Required nr. of POL985.00		850	460	Extension 26 IOs
Required nr. of POL965.00	1	750	420	Extension 15 IOs
Required nr. of POL955.00		750	420	Extension 14 IOs
Required nr. of POL94E.00		900	500	Extension 6 IOs - ECV
Required nr. of POL94U.00	1	900	500	Extension 6 IOs - ECV with inbuilt UPS
Required nr. of POL945.00	1	260	130	Extension 8 IOs
Required nr. of POL925.00		150	70	Extension 6 IOs
Required nr. of POL902.00				Comm. Card Modbus RS485
Required nr. of POL904.00				Comm. Card BACnet MSTP
Required nr. of POL906.00				Comm. Card LON
Required nr. of POL908.00				Comm. Card BACnet IP
Required nr. of POL909.00				Comm. Card Advanced Web
Required nr. of POL895.50				Human Machine Interface

Power supply type	AC 24 V	DC 24 V	
Sum of Currents [A]	3.71	2.05	Max 4 A!!

Block 2

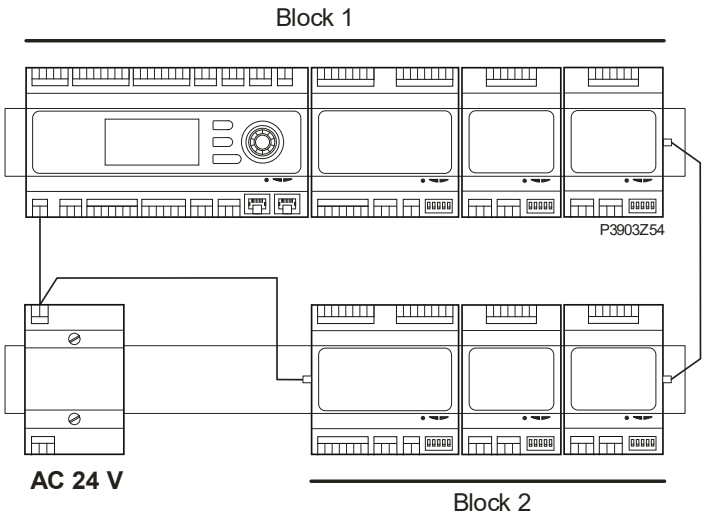
This block includes the remaining three extension I/O modules:

Pass-through current calculator for Power Supply AC 24 V or DC 24 V				
	Power supply type	AC 24 V	DC 24 V	
		I [mA]	I [mA]	
Required nr. of POL635.00		1800	1000	Climatix 635 - 21 IOs
Required nr. of POL636.00		1800	1000	Climatix 636 - 21 IOs
Required nr. of POL638.00		1800	1000	Climatix 638 - 21 IOs
Required nr. of POL638.70		1800	1000	Climatix 638 - 21 IOs - with inbuilt HMI
Required nr. of POL687.00		1800	1000	Climatix 687 - 27 IOs
Required nr. of POL687.70		1800	1000	Climatix 687 - 27 IOs - with inbuilt HMI
Required nr. of POL985.00		850	460	Extension 26 IOs
Required nr. of POL965.00	1	750	420	Extension 15 IOs
Required nr. of POL955.00		750	420	Extension 14 IOs
Required nr. of POL94E.00		900	500	Extension 6 IOs - ECV
Required nr. of POL94U.00	1	900	500	Extension 6 IOs - ECV with inbuilt UPS
Required nr. of POL945.00	1	260	130	Extension 8 IOs
Required nr. of POL925.00		150	70	Extension 6 IOs
Required nr. of POL902.00				Comm. Card Modbus RS485
Required nr. of POL904.00				Comm. Card BACnet MSTP
Required nr. of POL906.00				Comm. Card LON
Required nr. of POL908.00				Comm. Card BACnet IP
Required nr. of POL909.00				Comm. Card Advanced Web
Required nr. of POL895.50				Human Machine Interface

Power supply type	AC 24 V	DC 24 V	
Sum of Currents [A]	1.91	1.05	Max 4 A!!

Result

Result of the example using **AC 24 V** power supply:



7.5 Example 2: DC 24 V power supply

Pass-through current calculation

This example illustrates how to use one POL687.70 controller, together with 4 POL965, 2 POL945 and 2 POL94U extension modules. Calculation:

Pass-through current calculator for Power Supply AC 24 V or DC 24 V

Power supply type		AC 24 V	DC 24 V	
		I [mA]	I [mA]	
Required nr. of POL635.00		1800	1000	Climatix 635 - 21 IOs
Required nr. of POL636.00		1800	1000	Climatix 636 - 21 IOs
Required nr. of POL638.00		1800	1000	Climatix 638 - 21 IOs
Required nr. of POL638.70		1800	1000	Climatix 638 - 21 IOs - with inbuilt HMI
Required nr. of POL687.00		1800	1000	Climatix 687 - 27 IOs
Required nr. of POL687.70	1	1800	1000	Climatix 687 - 27 IOs - with inbuilt HMI
Required nr. of POL985.00		850	460	Extension 26 IOs
Required nr. of POL965.00	4	750	420	Extension 15 IOs
Required nr. of POL955.00		750	420	Extension 14 IOs
Required nr. of POL94E.00		900	500	Extension 6 IOs - ECV
Required nr. of POL94U.00	4	900	500	Extension 6 IOs - ECV with inbuilt UPS
Required nr. of POL945.00	2	260	130	Extension 8 IOs
Required nr. of POL925.00		150	70	Extension 6 IOs
Required nr. of POL902.00				Comm. Card Modbus RS485
Required nr. of POL904.00				Comm. Card BACnet MSTP
Required nr. of POL906.00				Comm. Card LON
Required nr. of POL908.00				Comm. Card BACnet IP
Required nr. of POL909.00				Comm. Card Advanced Web
Required nr. of POL895.50				Human Machine Interface

Power supply type	AC 24 V	DC 24 V	
Sum of Currents [A]	8.92	4.94	Max 4 A!!

Split in two blocks

This combination not possible with one chain only: The total value for the current is greater than 4 A. (AC and DC).
The chain must be split into two blocks.

Block 1

The first block is composed of the controller and some extension I/O modules:

Pass-through current calculator for Power Supply AC 24 V or DC 24 V

Power supply type		AC 24 V	DC 24 V	
		I [mA]	I [mA]	
Required nr. of POL635.00		1800	1000	Climatix 635 - 21 IOs
Required nr. of POL636.00		1800	1000	Climatix 636 - 21 IOs
Required nr. of POL638.00		1800	1000	Climatix 638 - 21 IOs
Required nr. of POL638.70		1800	1000	Climatix 638 - 21 IOs - with inbuilt HMI
Required nr. of POL687.00		1800	1000	Climatix 687 - 27 IOs
Required nr. of POL687.70	1	1800	1000	Climatix 687 - 27 IOs - with inbuilt HMI
Required nr. of POL985.00		850	460	Extension 26 IOs
Required nr. of POL965.00	2	750	420	Extension 15 IOs
Required nr. of POL955.00		750	420	Extension 14 IOs
Required nr. of POL94E.00		900	500	Extension 6 IOs - ECV
Required nr. of POL94U.00	2	900	500	Extension 6 IOs - ECV with inbuilt UPS
Required nr. of POL945.00	1	260	130	Extension 8 IOs
Required nr. of POL925.00		150	70	Extension 6 IOs
Required nr. of POL902.00				Comm. Card Modbus RS485
Required nr. of POL904.00				Comm. Card BACnet MSTP
Required nr. of POL906.00				Comm. Card LON
Required nr. of POL908.00				Comm. Card BACnet IP
Required nr. of POL909.00				Comm. Card Advanced Web
Required nr. of POL895.50				Human Machine Interface

Power supply type	AC 24 V	DC 24 V	
Sum of Currents [A]	5.36	2.97	Max 4 A!!

Example 2: DC 24 V power supply, *continued*

Block 2

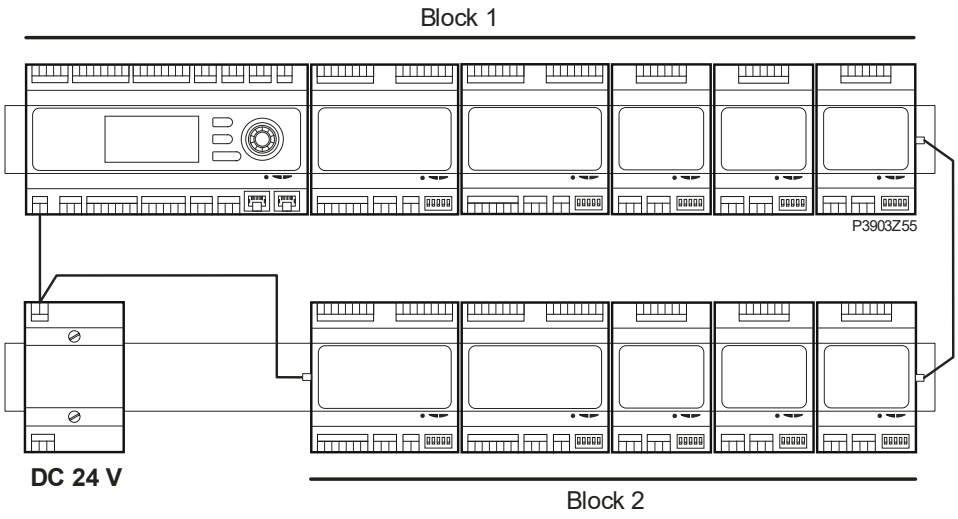
This block includes the remaining extension I/O modules:

Pass-through current calculator for Power Supply AC 24 V or DC 24 V				
	Power supply type	AC 24 V	DC 24 V	
		I [mA]	I [mA]	
Required nr. of POL635.00		1800	1000	Climatix 635 - 21 IOs
Required nr. of POL636.00		1800	1000	Climatix 636 - 21 IOs
Required nr. of POL638.00		1800	1000	Climatix 638 - 21 IOs
Required nr. of POL638.70		1800	1000	Climatix 638 - 21 IOs - with inbuilt HMI
Required nr. of POL687.00		1800	1000	Climatix 687 - 27 IOs
Required nr. of POL687.70		1800	1000	Climatix 687 - 27 IOs - with inbuilt HMI
Required nr. of POL985.00		850	460	Extension 26 IOs
Required nr. of POL965.00	2	750	420	Extension 15 IOs
Required nr. of POL955.00		750	420	Extension 14 IOs
Required nr. of POL94E.00		900	500	Extension 6 IOs - ECV
Required nr. of POL94U.00	2	900	500	Extension 6 IOs - ECV with inbuilt UPS
Required nr. of POL945.00	1	260	130	Extension 8 IOs
Required nr. of POL925.00		150	70	Extension 6 IOs
Required nr. of POL902.00				Comm. Card Modbus RS485
Required nr. of POL904.00				Comm. Card BACnet MSTP
Required nr. of POL906.00				Comm. Card LON
Required nr. of POL908.00				Comm. Card BACnet IP
Required nr. of POL909.00				Comm. Card Advanced Web
Required nr. of POL895.50				Human Machine Interface

Power supply type	AC 24 V	DC 24 V	
Sum of Currents [A]	3.56	1.97	Max 4 A!!

Result

Result of the example using a **DC 24 V** power supply:



7.6 System response time

Extension I/Os affect response time

This section describes the IO's response time of Climatix 6XX systems. This depends on:

- Extension I/O module type and
- Number of extension I/O modules

used in the application.

Response time, definition

The response time is the time between a generic event on an input signal and the corresponding action on an output signal.

Major factors

Communication over the peripheral bus to access I/O points effects overall response time when a controller is using extension IO modules. The performance primarily depends on

– the application cycle time on the controller (available by accessing system object using SCOPE tool, or On Line Test functionality in SAPRO tool)
– number of Extension modules used
– configuration of communication channels in the application

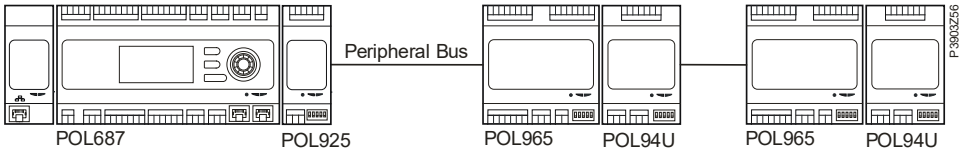
It also depends to a lesser extent on the number of communication modules operating at the same time.

Analog values

How each channel is used is relevant because analog values generate higher amounts of date over the peripheral bus which in turn affects the time needed to exchange the data.

Example 1

Below is an application example based on POL68X, POL965, POO94U and POL925 as the hardware base:



The tool "Pass-through current calculator" estimates the system response time as a worst-case scenario (with max. number of analog values used and for the worst combination of signal events). The tool calculates a value of 550 ms for the specific configuration, assuming an application cycle time on the controller of 200 ms.

	Input Area
Number of POL985	
Number of POL965/POL955	2
Number of POL945	
Number of POL925	1
Number of POL94U/E	2
Application Cycle Time on POL6XX	200

Fill in Application data

This is the POL6XX cycle time coming form the On Line Test

	Result
Total Digital IOs on Extnesions	24
Total Analogue Ios on Extensions	26
Peripheral bus Time [ms]	168
Total I/O using POL68X	77
Total I/O using POL63X	71
Total System Reaction time [ms]	**550**

Time needed to access all the I/O on the extension modules by peripheral bus

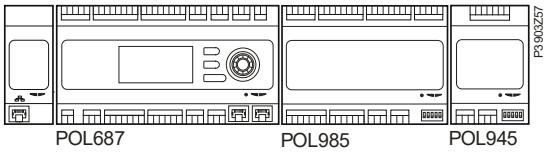
Total reaction time

The actual value is significantly lower based on actual channel usage. In other words, the tool provides safe estimates.

The "Pass-through current calculator" can be downloaded from SWANweb file support.

Example 2

The example below is based on POL68X, POL985 and POL945:



The simulation includes a worst case of 285 ms, assuming the application cycle time on the controller is 120 ms:

	Input Area
Number of POL985	1
Number of POL965/POL955	
Number of POL945	1
Number of POL925	
Number of POL94U/E	
Application Cycle Time on POL6XX	120

Fill in Application data

This is the POL6XX cycle time coming form the On Line Test

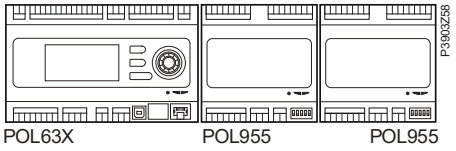
Result	
Total Digital IOs on Extnesions	19
Total Analogue Ios on Extensions	15
Peripheral bus Time [ms]	75
Total I/O using POL68X	61
Total I/O using POL63X	55
Total System Reaction time [ms]	**285**

Time needed to access all the I/O on the extension modules by peripheral bus

Total reaction time

Example 3

The example below is based on POL63X and POL955:



Assuming an application cycle time of 130 ms, the simulated response time is 297 ms:

	Input Area
Number of POL985	
Number of POL965/POL955	2
Number of POL945	
Number of POL925	
Number of POL94U/E	
Application Cycle Time on POL6XX	130

Fill in Application data

This is the POL6XX cycle time coming form the On Line Test

Result	
Total Digital IOs on Extnesions	14
Total Analogue Ios on Extensions	16
Peripheral bus Time [ms]	77
Total I/O using POL68X	57
Total I/O using POL63X	51
Total System Reaction time [ms]	**297**

Time needed to access all the I/O on the extension modules by peripheral bus

Total reaction time

The performance is more than sufficient for controller HVAC applications. Nevertheless, some special features are available to achieve even faster response times under certain circumstances.
These features include:

– Interlock between digital Inputs and digital outputs
– Output interlock
– Pulse function

You can achieve the required performance in the Climatix 6XX range for most significant HVAC applications by combining these features with the normal use of I/Os.

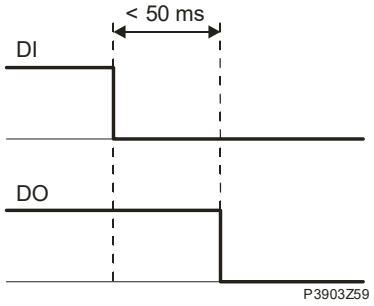
Interlock between DIs and DOs

A digital input status can directly switch ON or OFF the relay outputs and Triac outputs (with the exception of universal input/outputs), i.e. the outputs can be switched per the status of a predefined digital input level regardless of the application during runtime. It still must be configured at application start up. The controller BSP or firmware on extension I/O modules directly take care of it.

In other words it "overrules" the application state and allows relay and Triac output to react to one digital input change of state event in less than 50 milliseconds.

The digital input and relay or Triac outputs must belong to the same device to provide this functionality (same controller or same extension IO module).

Below is an example of an interlock configuration: The interlocked output is forced to switch off if a digital input switches off.



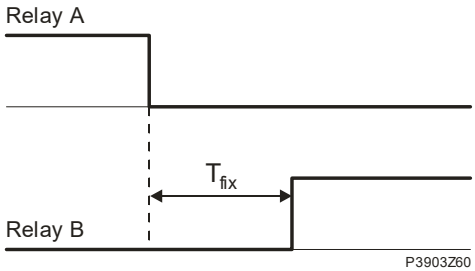
DI Digital input DO Digital output

Output group interlock

It is possible to program a fixed interlock time between two grouped digital outputs. This is required when one digital output A has to be switched off, and another output B has to be switched on after a predefined fixed time, making sure that both outputs A and B are off in between. The sequence is as follows:

– A on – B off
– A off – B off (for a fixed preprogrammed period)
– A off – B on

The sequence is executed independently of the application time (controlled directly by the BSP). This makes some switching actions very accurate.
The picture illustrates the function:

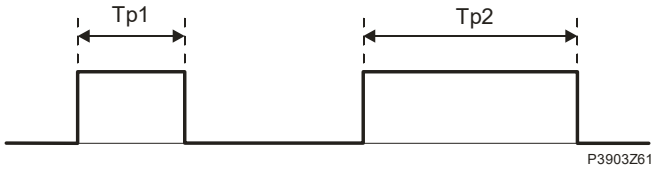


T fix Fixed pre-programmed period

The configuration of output interlock functionality has a higher priority than the input interlock function. In other words the input interlock function is ignored if you configure the input interlock functionality for a group.

Pulse function for Triac outputs

An accurate pulse function is available for the Triac outputs. This makes it possible to program precise pulses a Triac output, with a programmed period of 50 ms to 60 s at a resolution of 10 ms.

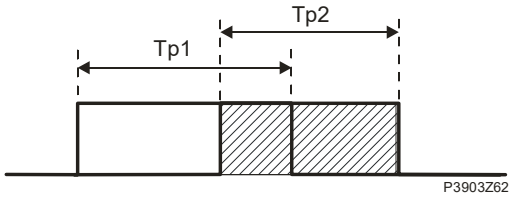


Tp1 Triac pulse with duration 1 Tp2 Triac pulse with duration 2

This pulse function is not available if you configure the outputs as output group interlock. The interlock between DIs and DOs function is also available for the output pulse function.

For the Triac properties, the off status can only be achieved if the current achieves zero. This results in additional uncertainty between 10 ms at 50 Hz power supply, or 8 ms at 60 Hz.

The last command has priority in the event of overlapping pulse commands, even if the previous one is not yet completed. The picture illustrates the actual behavior when two overlapping pulses are requested:



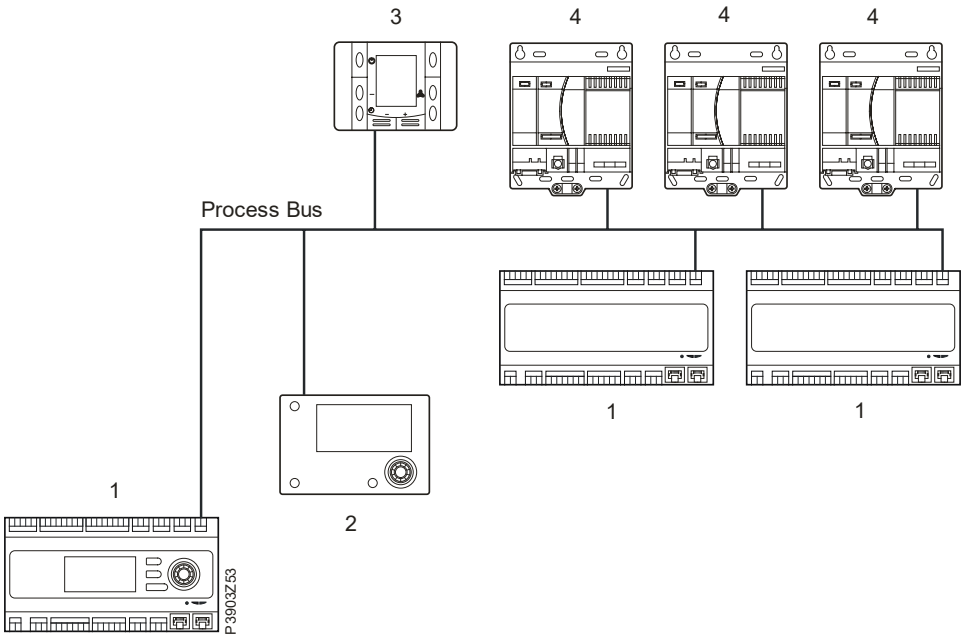
Tp1 Triac pulse with duration 1 Tp2 Triac pulse with duration 2

8 Communication ports

8.1 Climatix process bus

Application

The process bus connects the Climatix controller to other controllers and network human machine interfaces:



1 Controllers POL6XX
2 Dot matrix HMI POL895.51
3 Room unit POL822.X
4 Fan-coil controllers ACC 071.X

Brief description

The bus is based on KNX technology and exchanges process information across different devices and human machine interfaces.

Devices with process bus

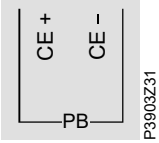
The Climatix devices listed below have a process bus connection:

- Programmable controllers: POL687.XX, POL687.7X, POL635.XX, POL636.XX, POL638.XX,
- Human Machine Interface: POL895.5X1
- Room units: POL822.XX

Climatix process bus, *continued*

Terminal assignment

The picture illustrates the position and identification of the terminals on the housing for Climatix controllers (here for example on the POL68X):



Technical data

Technical data information is as below:

Process bus	Transmission medium (bus cable)	TP (twisted pair)
	Baud rate	9.6 kbps (fixed for TP)
	Bus line polarity	CE+, CE– (not interchangeable)
	Bus terminating resistor	Not required
	Communication signal: The communication signal (information) is transferred symmetrically, i.e., as the difference in voltage between the two bus lines (and not as a voltage difference to the earth potential). The sign preceding the voltage between CE+ and CE– determines signal values 0 and 1.	
Process bus cable	Cable type	2-wire, stranded (one wire pair) or 2x2-wire, stranded or spiral quad
	Wire diameter	Min. 0.8 mm, max. 1.0 mm
	Wave resistance (ideal value)	120 Ω at 100 kHz
	Line resistance	20 Ω/km to max. 75 Ω/km
	Capacity, bus line to bus line	Max. 100 pF/m at 800 Hz Higher values require shorter cable line lengths accordingly.
	Shield	Not required / recommended. Climatix devices do not have a connection for bus cable screens.
Bus power supply	Bus power supply via Climatix device with DPSU	DC 30 V, 50 mA

For detailed information on the Climatix process bus see section 10.

8.2 Modbus RS485

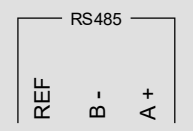
Features

The Climatix controller RS485 interface supports the Modbus RTU communications protocol to connect Modbus devices (examples):

- Control drives via variable speed drives (master mode)
- Exchange information with a monitoring system (slave mode).

Terminal assignment

This picture illustrates the position and identification of the terminals on the housing for Climatix controllers (here for example on the POL63X):



Technical data

RS-485 (EIA-485) Modbus RTU protocol	Master or Slave mode
Bus terminals	A+ / B- **not** interchangeable, REF
Bus connection / electronics	POL68X: galvanically isolated POL63X: **not** galvanically isolated
Bus cable	2-wire twisted pair, **with** shielding
Bus polarization (switched by software)	2 x 680 Ω
Bus termination (switched by software)	120 Ω +1 nF
Baud rates	600 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600 / 115200

⚠ The RS485 bus requires linear topology and terminating resistances on the first and the last device on the network. One only of these devices needs to provide polarization.

⚠ The Climatix POL6XX controllers offer software configurable termination and polarization at the Modbus RS485 port. They are both enabled or disabled at the same time, but not separately.

ℹ In case of the POL6XX controller the termination is SW programmable on the controller itself; the impedance and polarization can be enabled or disabled via SCOPE tool or operator unit (Examples: HMI-IB, HMI-DM).

Modbus function code support by Climatix

The following common Modbus function codes are supported by Climatix controller for Modbus communications:

Code	Description
01	Read coil status
02	Read input status
03	Read holding registers
04	Read input registers
05	Force single coil
06	Preset single register
15	Force multiple coils
16	Preset multiple registers

Cable guide

Observe the following when selecting RS485 cables:

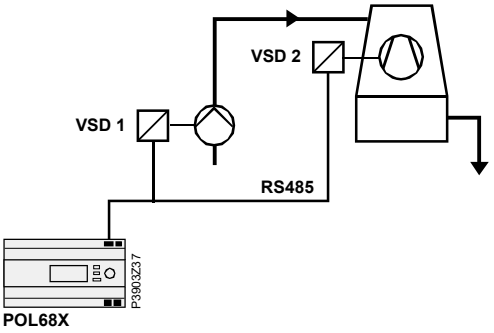
- Use 2-wire twisted pair cable with shielding
- Select the right cable diameter to ensure maximum cable length.
  Example: AWG24 at 9600 bps could reach 1,000 meters.
- Class 5 cable: The maximum length is 600 meters.

Examples

The following pages describe two application examples:
- Master mode
- Slave mode

Master mode

In this example, the Climatix controller POL68X is the Modbus master. It controls and monitors a water cooled screw chiller via variable speed drives VSD 1 and VSD 2:
- VSD1 controls the condenser pump.
- VSD2 controls the cooling tower fan.



POL68X Climatix controller
VSD.. Variable speed drives

Brief functional description

In the above example the condenser pump switches ON or OFF depending on the chiller unit status and its variable speed drive is modulated while the chiller is running at different capacity loads to optimize the refrigeration cycle.
The cooling tower fan is started/stopped based on condenser water temperature, and its variable speed drive is modulated according to the external air temperature conditions.

Advantage of the Modbus solution

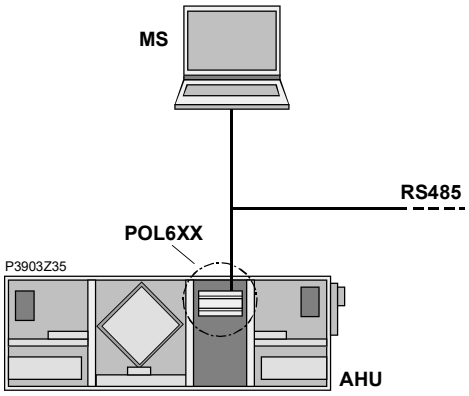
A conventional variable speed drive commanded via an analog signal (e.g. DC 4…20 mA) can only control the actual speed.
The Modbus solution, however, can also provide improved feedbacks on operations (alarms, diagnostics, troubleshooting) and start-up configuration, in addition to improved speed control.

Limitations

Observe these limitations for the Modbus RS485 master:
– Support 31 slaves
– On the controller side, the application software defines the limits on the number of requested registers per slave.

Slave mode example

This example illustrates integrating the Climatix controller as a slave into a simple building automation and control system to monitor and control the air handling unit:



MS	Management station.
AHU	Air handling unit.
POL6XX	Climatix controller

Explanation

The Climatix 6XX controller acts here as Modbus slave and controls the air handling unit. The management station (Master) polls the slave to get information on actual values such as set points, sensor measurements or even alarms to monitor air handling unit operation.
The management station can change certain set points or settings to optimize the unit.

Binding method for Slave mode

Although Climatix can integrate Modbus mapping for the device into the SAPRO program, Climatix may instead use a mapping table to map Climatix objects to Modbus registers
Advantages of using a mapping table:

- The functionality of the air handling unit (application) can be programmed and tested independently.
- Modbus can be mapped in a second step.

As a result, you can separate application from communication without reworking and retesting the application.
Only mapped data points are visible over Modbus.

Limitations

The following limitations apply to the Modbus RS485 slave:

– Limits for object handler mapping:
  Coils: 2,000
  Input bits: 2,000
  Holding registers: 125
  Input registers: 125
– One common server is available for both, Modbus RS485 and Modbus TCP/IP

Additional information

More detailed information is available on SAPRO online help.

8.3 Modbus TCP/IP

POL638 and POL687 controllers only.

Modbus TCP/IP

Modbus over TCP/IP on POL638 and POL687 controllers is mostly used, where:
- The built-in Modbus RS485 is used as master to drive variable speed drives
- A third-party touch panel requires Modbus data from the controller

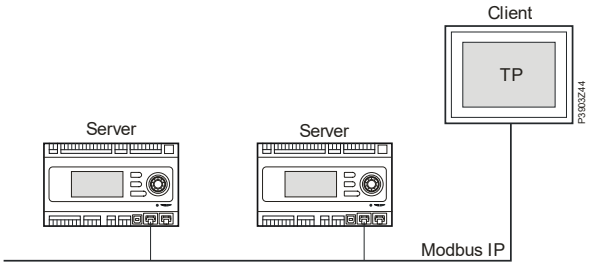
Modbus slave is supporting one only mapping of registers for both RS485 and TCP-IP ports, so that different clients can access to the same registers at the same time. Engineering of registers mapping is done using the Language Support File over the SCOPE tool.
Modbus master can support different registers mapping for RS485 and TCP-IP ports, and engineering of mapping is done in the controller software application.

Three functionalities

A Climatix controller can serve three possible functions:
- Server
- Client
- Server - Client

Climatix with server functionality (slave)

In this example the Climatix controllers supply a third-party touch panel with Modbus data:

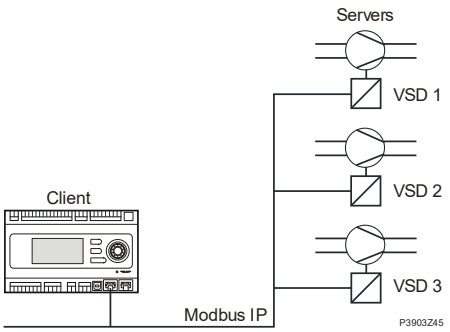


Limitations

The following limitations apply to engineering server applications:
- The controller can accommodate 3 Modbus IP connections: You can connect up to 3 touch panels to one controller at the same time.
- Port definitions: Client port is fixed as 1032
  Server port is fixed as 502
- The server accepts a maximum of 3 requests simultaneously: This is fixed and cannot be configured.
- Object handler mapping: 2,000 coils, 2,000 status, 125 holding, 125 input

Climatix with client functionality (master)

In this example the Climatix controller acts as client. It controls and monitors three fans (servers) via variable speed drives VSD1 to VSD 3:

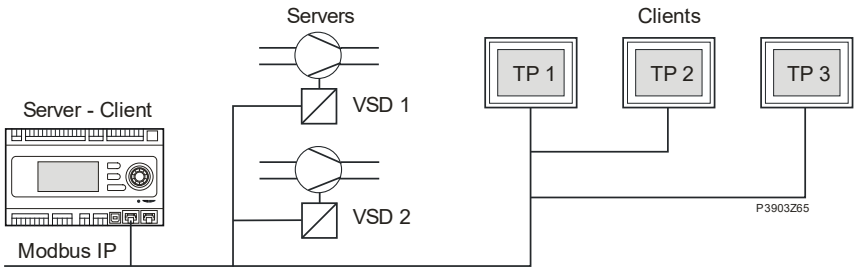


Limitations

One Climatix client controller is limited to 3 server devices (controllers or other devices).

Climatix with server-client functionality

In this example the Climatix controller act simultaneously as the server for touch panels TP1 to TP 3 and as client for the variable speed drives VSD1 and VSD 2:



Limitations

Maximal number of connected devices: 3 servers and 3 clients.

Supported Modbus functions

The following Modbus functions are supported for master and slave functionality on Climatix controllers POL68X.

Client (master) functionality

The functions are the same as the other communication channels (RS485).

Code	Description
1	Read coils
2	Read discrete inputs
3	Read holding registers
4	Read input register
5	Write single coil
6	Write single register
15	Write multiple coils
16	Write multiple registers

Server (slave) functionality

The following functions are supported:

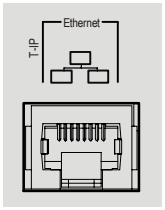
Code	Description
1	Read coils
2	Read discrete inputs
3	Read holding registers
4	Read input register
5	Write single coil
6	Write single register
8	Diagnostic; supported sub function: 0, 2, 10, 11-18, 20
15	Write multiple coils
16	Write multiple registers

SAPRO engineering:

Please consult the SAPRO online help for additional information on how to set up the Modbus IP.

Cable connection

IP service interface 10/100 Mbps (IEEE 802.3U).
RJ45 jack, 8 pins:



See section 15 "Appendix" for communications cable pin assignments.

8.4 Local service interface

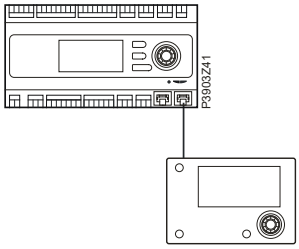
Connectable devices

The local service interface connects the following devices:

- User interface HMI-DM
- PC tools such as SCOPE
- Modbus RS 485 (non insulated)

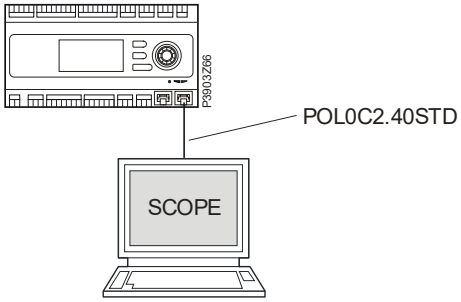
User interface HMI-DM

User interface HMI-DM (RS485) / POL895.51:



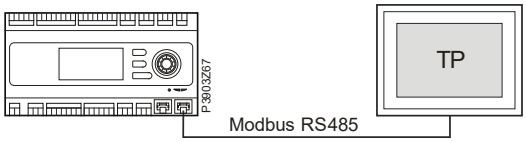
PC tools (SCOPE)

PC tools such as SCOPE, PC USB port and cable type POL0C2.40/STD:



Modbus RS485 (non insulated)

Normally used to connect touch panels using Modbus over RS485 protocol:

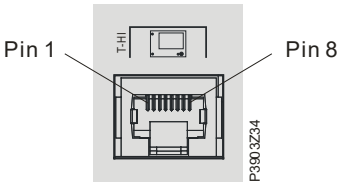


Limitations

Unshielded cable: max. 3 m. Shielded cable see section 8.2 "Technical data."

Cable connection

RJ45 jack, 8 pins (top view):



Pin-out for RJ45-connector

Pin	Signal
1	USB device, D+
2	USB device, D-
3	RS485, A+
4	Ground
5	Select 2
6	RS485, B-
7	Select 1
8	DC 24 V (Output)

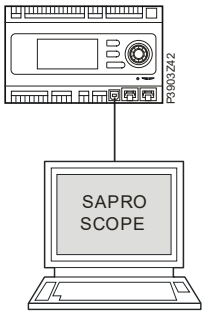
8.5 Local USB

POL63X controller only.

Connectable devices

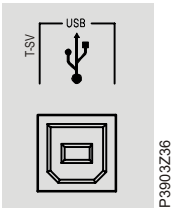
The USB interface is used for connecting the local service tools:

- SAPRO
- SCOPE



Cable connection

USB socket, type B:



Cable

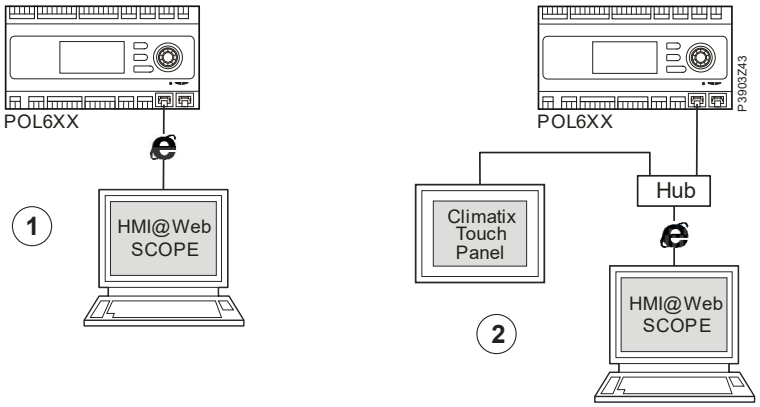
Standard USB male A to USB male B
Maximum cable length: 3 meters

8.6 IP service interface

Connectable devices

The Ethernet interface 10/100 Mbps (IEEE 802.3U) is used as the IP service interface for:

- HMI@Web (Web browser)
- PC tools (SCOPE)
- Climatix touch panels
- Remote OPC server (additional license required)
- Modbus TCP/IP



⚠ Supports a maximum of 3 clients and protocols at the same time.

HMI@WEB

The IP service interface provides access to the same information over WEB as on the local HMI.
The following are instructions on setting up HMI@WEB.

Set TCP/IP parameters

The TCP/IP controller parameters are set via the regular HMI. The following are the typical settings for a standard AHU application:

Main Index > **System overview** > **Communication** > **TCP/IP** > **Change settings**

Parameter	Range	Function
Given IP		Enter controller IP address if DHCP is set to passive.
Given Mask		Enter subnet mask.
Given Gateway		Enter gateway address.
DHCP	– Active – Passive	– Displays type of address assignment: DHCP server issues addresses. – IP address is fixed.
Name		Controller name.
100 Mbps	– Passive – Active	Change transmission rate: – 10 Mbps. – 100 Mbps.
Link	– Passive – Active	– No connection to Ethernet. – Connection to Ethernet exists.
Reset required !!	– 🗑 – Execute	As a rule, the controller must be reset after parameterization to assume the data.
User name		User name for logging onto to WEB HMI.
Password		Password for logging onto to WEB HMI.

⚠ The default password set by Siemens BT must be changed by the user either in the factory or when installed on site.

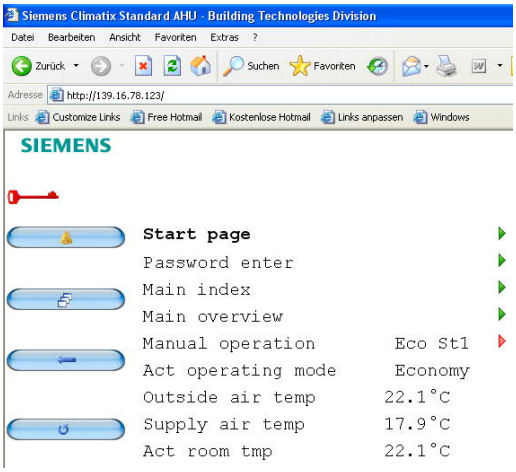
Prerequisite for connection

The following required to connect via Ethernet:

- Corresponding mapping file (HMI4WEB) is loaded.
- The controller is connected to the Ethernet.

Establish communication

The **first time** you establish communications to WEB HMI, proceed as follows:

Step	Action
1	Open web browser.
2	Enter address (Target name or IP address) / connect to dialog box:  P3903O13
3	Enter user name [ADMIN] (default)
4	Enter password [SBTAdmin!] (default).
5	Confirm with OK → HMI start page appears (Example: standard AHU application):  P3903O13

The WEB HMI is now ready for use like the regular HMI.

Default password modification

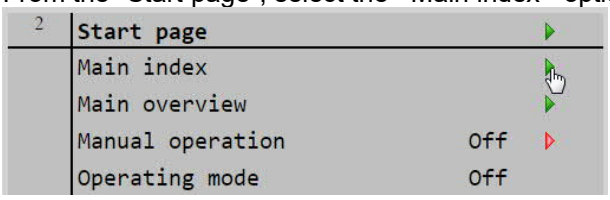
When a unit with a Climatix is installed and operational on a site and the controller is used for remote connectivity typically using the HMI@WEB, the IP access channels that are password protected should have the default passwords changed, either to the OEM or Installers requirements.

For example on the Climatix AHU application, the following default passwords should be changed: Administrator, HMI WEB, FTP, JSON.

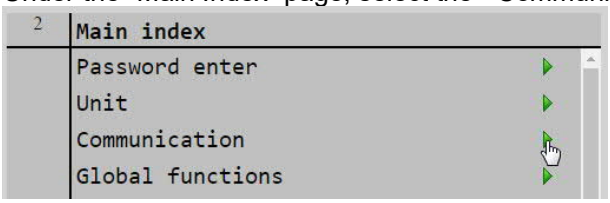
The following procedure can be used to change the default passwords.

1) Administrator default password change

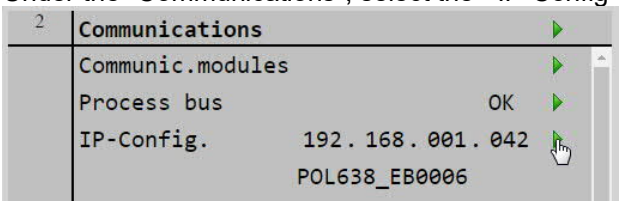
Navigate through the menu to the IP configuration page.
From the "Start page", select the <Main index> option.



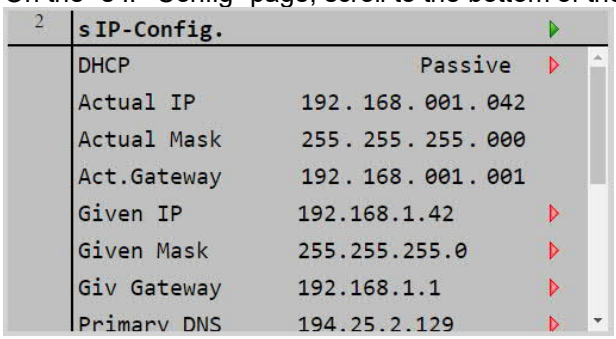
Under the "Main Index" page, select the <Communications> option.



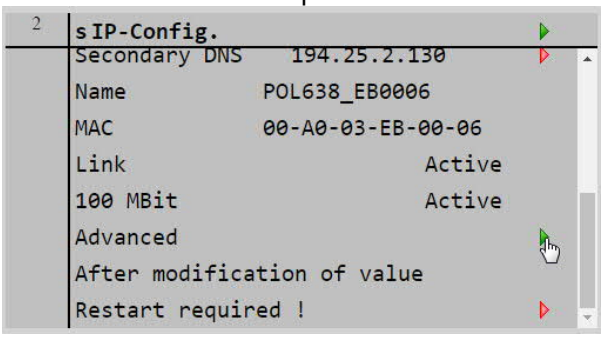
Under the "Communications", select the <IP-Config> option.



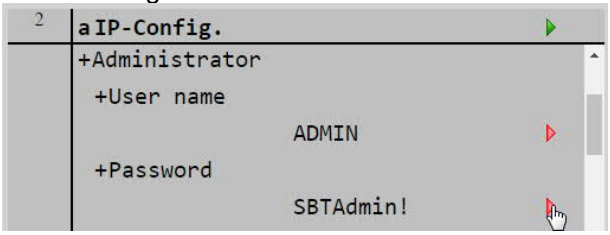
On the "s IP-Config" page, scroll to the bottom of the page.



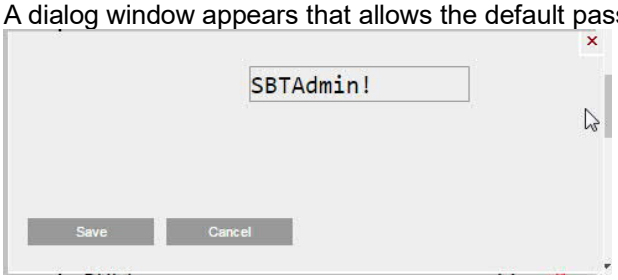
Select the <Advanced> option.



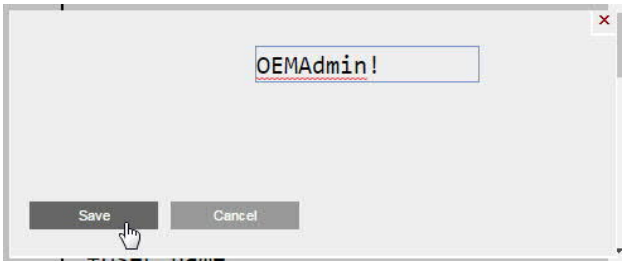
On the page "a IP-Config", scroll to the Administrator password option and press the red triangle button



A dialog window appears that allows the default password to be changed.

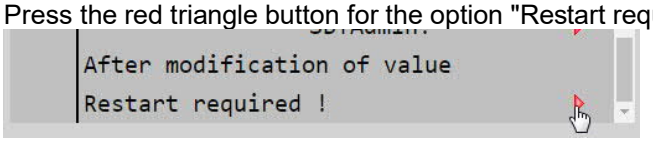


Change the password as required (e.g. OEMAdmin!). Record the new password in the safe and secure location. Press the <Save> button.



When a value is changed the controller must be restarted. Scroll to the bottom of this menu.

Press the red triangle button for the option "Restart required !".

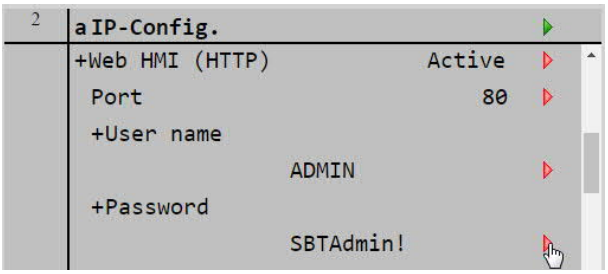


A dialog window appears for the controller restart. Select the option <Execute> from the drop down menu.

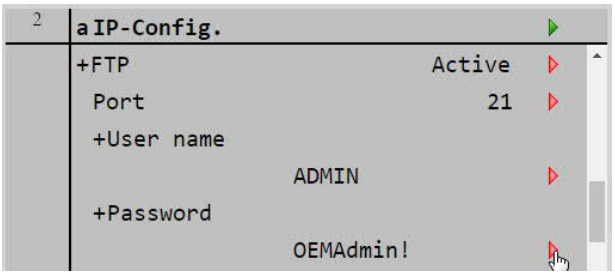
Press the <Save> button and the controller to be restarted.

The other function passwords can be changed with the same procedure.

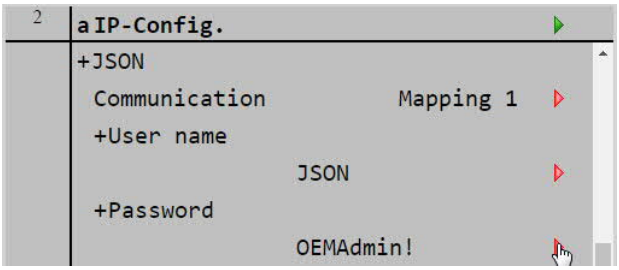
2) WEB HMI default password change



3) FTP default password change



4) JSON default password change



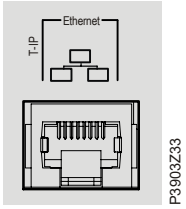
Onboard WEB functionality

Some Climatix controllers have a WEB Server for remote server using a standard web browser:

Controllers POL638 and POL687 only

Cable connection

The cable connection to the IP service interface is RJ45 jack, 8 pins:



8.7 Modem port

Remote service interface

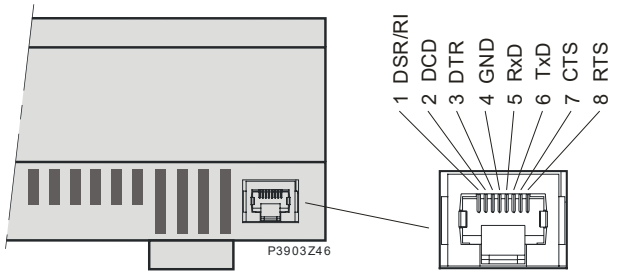
Climatix 6XX controllers have a modem interface to connect an external modem (supports remote servicing using the SCOPE tool).
You can connect:

- a normal (analog) modem on the fixed line telephone network **or**
- a GSM modem for mobile communications which also allows sending out alarm SMS from the controller.

The following sections describe the two options.

Connector type

RJ45 jack, 8 pins.
The connector is located on the right upper side of the controller:



The graphic on the right shows the connector pinout.

Adapter cable

Adapter cable required to connect a modem with the controller interface:

RJ45 at controller		**RS232 at modem**
Pin	*Signal*	*Pin*
1	DSR/RI	6
2	DCD	1
3	DTR	4
4	GND	5
5	RxD	2
6	TxD	3
7	CTS	8
8	RTS	7

Recommended modems

Siemens HQ has tested and used the modems listed below.
Essentially, any modem can operate with Climatix, but certain settings require data on modem type (Init string).

Vendor	**Type**
Siemens	TC35 terminal (GSM modem)
Siemens	TC65 terminal (GSM/GPRS modem)
Devolo	MicroLink 56k i (V.90-Highspeed-Modem)

8.8 Connect via fixed line network

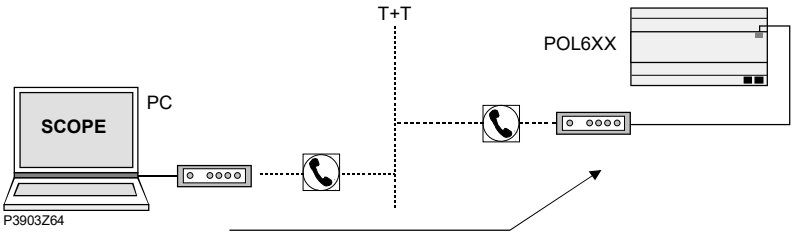
Purpose and functions

Communicating with the Climatix controller via a fixed-line network (analog modem) offers the installer and operator the following options:

- Periodic plant monitoring using PC/SCOPE for a given period after commissioning.
- Remote control of the plant using PC/SCOPE during operation.

Basic principle

This picture illustrates the basic principle of fixed-line network communication:



Note: The Climatix controller cannot establish a dialup connection to SCOPE.

Installation and commissioning

Proceed as follows to install and commission the modem link:

At the Climatix controller:

Step	Action
1	Switch power off
2	Connect modem
3	Switch power on
4	Verify the modem settings per section 8.9, paragraph A) "Set up the modem at the controller".

At the PC:

Step	Action
1	Set up the modem per section 8.9, paragraph C) "Set up modem on the PC".

8.9 Connect via mobile communications

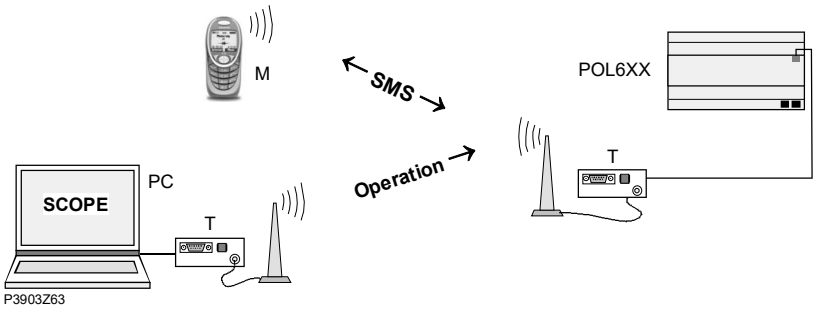
Purpose and functions

Connection to the Climatix controller via GSM mobile communications offers the installer or operator the following options:

- Remote control of the Climatix controller via PC/SCOPE
- Query and change data point values via mobile phone and SMS text messaging
- Receive event messages sent by the Climatix controller via SMS text message to a given phone number.

Basic principle

The picture illustrates the basic principle of GSM mobile communication:



T GSM modem/terminal (e.g. Siemens TC35i or MC35i)

Installation and commissioning

Install and commission the modem link via mobile communications as follows:

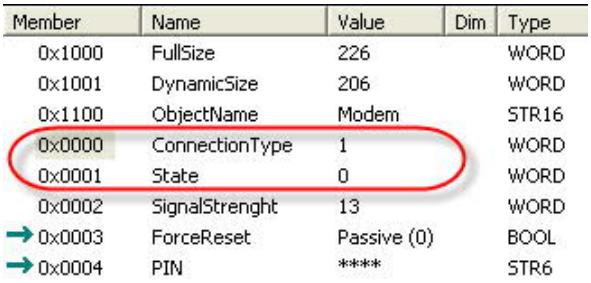
- A) Set up the modem at the controller
- B) Establish alarm SMS sending
- C) Set up the modem at the PC

A) Set up the modem at the controller

Use SCOPE (Tree view) for this task:

Step	Action
1	Connect a GSM or analog modem with the adapter to the controller Interface. (The required block for connecting to SCOPE is a system object so that no change is required to the application)
2	Open SCOPE (USB or IP) and choose the modem block to view the status of the modem: 

A) Set up the modem at controller, *cont.*

Step	Action
3	You now see some parameters as well as the modem state:  The modem is initialized and ready for a connection over modem if the "State" and the "Connection Type" are OK (see below).
4	Open **Settings** and choose **modem connection** to connect from another modem to this controller with SCOPE and then type in the correct telephone number; you will now see that the connection is OK.

Description of connection type:

Value	Meaning
0	No modem
1	GSM modem
2	Analog modem

Description of State

Value	Operating state
0	OK; SMS
1	OK; general
2	Modem is initializing
3	Modem is transferring data
4	Modem is not logged on at the provider
5	Searching for network
6	Provider prevented network logon
7	Unknown registration state
8	Modem is making connection
9	Modem is connected
10	General error, modem not responding, possibly no modem connected
11	Modem initialization failed

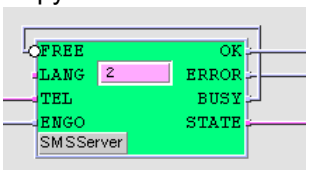
B) Establish alarm SMS

Objects with alarming and alarm server 0 must be enable for the Climatix controller to send alarm SMS.

VVS 8 only allows for sending SMS. You cannot send "read SMS" to the controller to change a set point, for example.

Workflow

Proceed as follows to setup alarm SMS:

Step	Action
1	Open the application in SAPRO
2	Copy the Block “SMS Server” to your application:  See SAPRO online help for a detailed description of this block.
3	Compile and download the application to the controller and connect a GSM modem (For state and communication info description, see Part A)
4	Open or read the object LANG using alarm handler configuration *Note:* Select this when you read out the ObjLang.csv file!
5	Define alarm text in this file. Go to alarm server 0 and configure the message in the same language selected for the SMS Server Block. Note: in the example, Language 2 is selected with the message Alarm!!! ObjType /... | Member Id | Appl.Lang. | Com 1 | Com 2 | English | German | Spanish | Fr 0xE000 0x2 | 0x0000 | Alarm Server 0 SMS 4COM | | | | | Alarm!!! |
6	You cannot use some tokens for alarm messages. Consult list below to see which tokens are available:
7	Using this file, create an OBH.bin file and load it to your controller.
8	Open the tree view and select the block modem under system objects: Member | Name | Value | Dim | Type 0x1000 | FullSize | 226 | | WORD 0x1001 | DynamicSize | 206 | | WORD 0x1100 | ObjectName | Modem | | STR16 0x0000 | ConnectionType | 1 | | WORD 0x0001 | State | 0 | | WORD 0x0002 | SignalStrenght | 14 | | WORD 0x0003 | ForceReset | Passive (0) | | BOOL 0x0004 | PIN | **** | | STR6 0x0005 | InitString1 | AT&FE0L0M0S0=0&S0 | | STR40 0x0006 | InitString2 | AT&FE0L0 | | STR40 0x0007 | TelephoneNr.1 | +41[illegible] | | STR20 0x0008 | TelephoneNr.2 | | | STR20 0x0009 | TelephoneNr.3 | | | STR20 0x000A | TelephoneNr.4 | | | STR20 0x000B | SendString | AT+CS | | STR6 0x000C | ReceiveString | □□+CS | | STR6 0x000D | Language | 0 | | WORD 0x000E | SMS-ActiveNumber | 0 | | WORD 0x000F | SMS-Language | 2 | | WORD 0x0010 | SMS-PDUMode | Passive (0) | | BOOL 0x0011 | SMS-PIN | **** | | STR6 0x0012 | Cell-Phone | Passive (0) | | BOOL 0x0013 | Baudrate(19200) | Passive (0) | | BOOL 0x0014 | Enable:COM-Led | Passive (0) | | BOOL – Enter the correct telephone number (the active number is also defined in the SMS server block). – Enter the correct initialization string (Init String 1) for your modem. – Also the PIN and SMS PIN as required!
9	Create an alarm on Server 0 and you will receive an alarm SMS at the number defined as the telephone number.

Available tokens

Token	Result
%a	Message class for the current alarm
%t	Block name for the alarm origin
%s	Alarm status (alarm pending, acknowledged)
%e	Error text from 'Member 0x8000': can also be entered in a row. Any text can be entered in the language columns (see Appendix for an example)
%A1...%A6	Application info from the diagnostic block
%y	Year the alarm was triggered
%m	Month the alarm was triggered
%d	Day the alarm was triggered
%H	Hour the alarm was triggered
%M	Minute the alarm was triggered
%S	Second the alarm was triggered

C) Set up the modem on the PC

Proceed as follows to install and commission the modem on the PC:

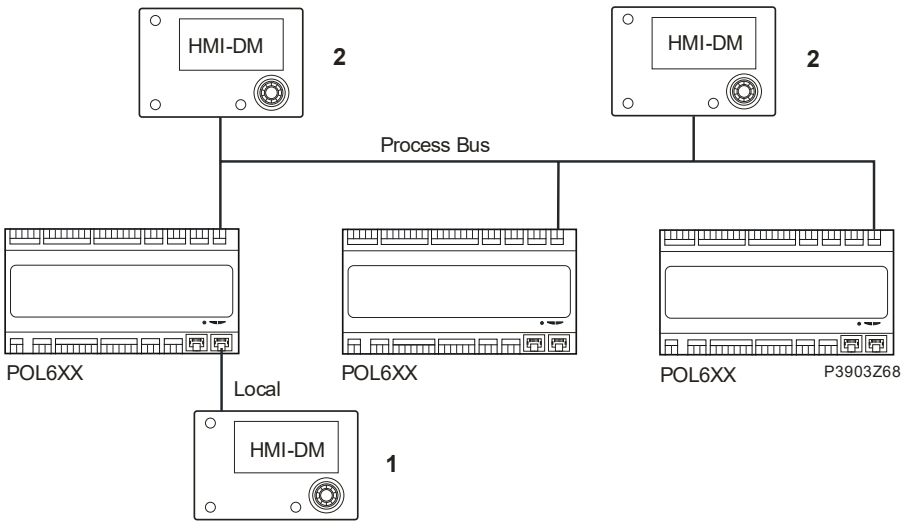
Step	Process
1	Connect the modem using a modem cable.
2	Start SCOPE, and in the **Configuration** menu, click **Settings...**, then select the **Communication** tab.
3	In the **Communication** tab, select the appropriate settings for **Target** (Climatix controller) and **Communication type** (modem), then select the modem, and enter the phone number for the Climatix controller.
4	Acknowledge the settings with **Apply**, or click **OK** to immediately establish a connection.

8.10 HMI connection

Application example

The picture illustrates two connection options for HMIs:

- Local connection
- Connection via process bus

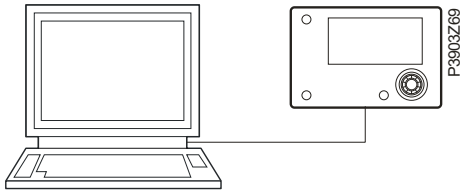


Explanation

Pos.	Explanation
1	One HMI-DM (POL895.51/STD) is connected directly to the local service interface for the controller using its cable – typically used on unit front panel.
2	Two HMI-DMs (POL895.51/STD) are connected to 3 controllers POL6XX over the process bus (for example, with remote installations). →See section 10 for more information on the process bus.

USB port

Use the USB port for firmware upgrades to HMI over USB port (using SCOPE tool):



9 Integration

9.1 Integration over Modbus RS485

Integrated as slave

The Modbus RS485 interface integrates Climatix controllers as slaves via Modbus RTU to:

- Building automation and control systems
  (example: Climatix standard application AHU).
- Individual monitoring systems for operation and display.

Options

Various Modbus RS485 integration options are available depending on the application and Climatix controllers in use:

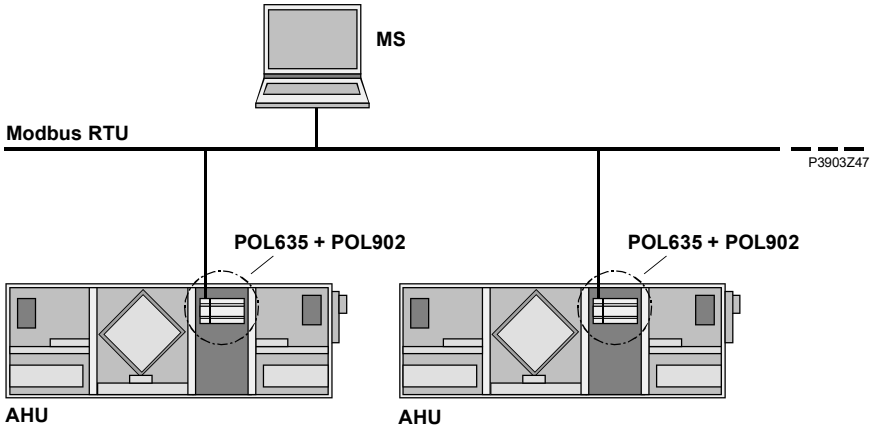
- On-board Modbus interface RS485 to control Modbus RTU
- Modbus module POL902 with two Modbus RS485 slave interfaces

The various options have certain limitations and restrictions, see:

– Section 8.2 "Modbus RS485", for the on-board interface
– Documentation on basics for the Modbus module POL902 (CB1P3934en)

Example: Modbus communications module

The picture illustrates an example for Climatix controller type POL635, individually controlling and monitoring a number or air handling units:



MS	Management station.
AHU	Air handling unit.
POL635	Climatix controller, basic version.
POL902	Climatix Modbus communication module.

Explanation

Integration provides all required controller data to the management station to allow it to change selected set points and stages.
A POL902 Modbus communication module is used in this example; the on-board Modbus interface can be used to control the fans. See section 8.2 "Modbus RS485" under "Master mode example".

Additional information

For detailed information on Modbus and Modbus communication module see:
CB1P3934en Modbus communication module Documentation on basics

9.2 Integration over LON

LON integration: Purpose

Today LON is in demand to integrate controllers for different vendors smoothly in a building automation and control system.

Possibilities

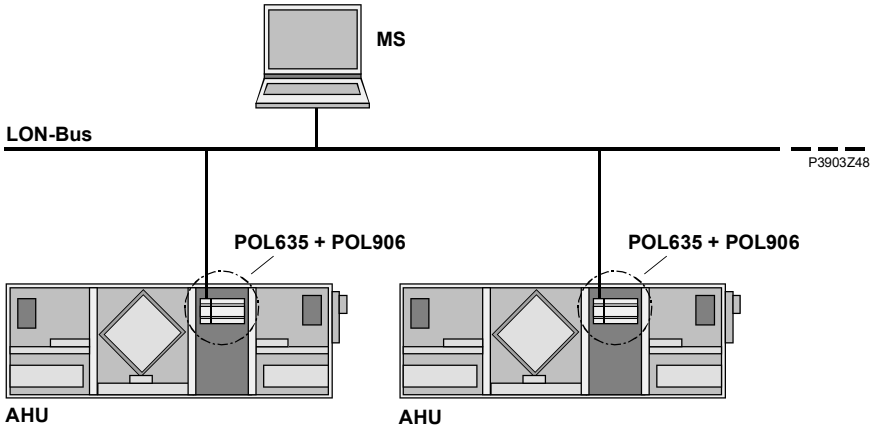
Climatix provides two different solutions for LON integration:

- POL636.XX controller with on-board LON node (Compact AHU)
- POL904 Climatix LON module with a POL6XX controller

The solutions above meet various market demands and are functionally identical.

Example: LON module

The picture illustrates an example for Climatix controller type POL635, individually controlling and monitoring a number of air handling units:



MS	Management station
AHU	Air handling unit.
POL635	Climatix controller, basic version.
POL906	Climatix communication module LON.

Purpose

Integration provides all required controller data to the management station to allow it to change selected set points and stages.

Additional information

Detailed information on LON and LON communication module, see:
CB1P3931en Documentation on basics

9.3 Integration over BACnet

BACnet definition and purpose

BACnet, an ASHRAE building automation and control networking protocol, was designed specifically to meet the communication needs of building automation and control systems for applications such as heating, ventilation and air conditioning control, lighting control, access control as well as fire detection systems and their associated equipment.
The BACnet protocol provides mechanisms by which computerized building automation devices can exchange information, regardless of the particular building service they perform.
As a result, the BACnet protocol may be used by head-end workstations, general-purpose direct digital controllers and application-specific or unitary controllers with equal effect.

Possibilities

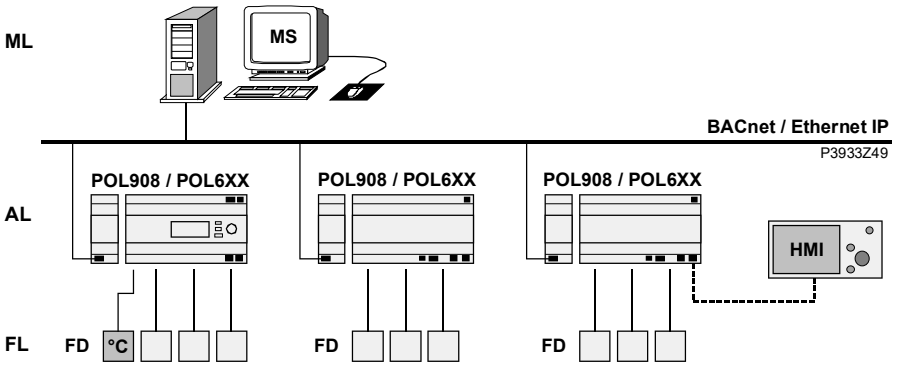
Climatix provides the following options for BACnet integration:

- POL908 BACnet IP module A-AAC device
- POL904 BACnet MSTP module A-AAC device

These BACnet modules support very high BACnet functionality, including time scheduling, alarming and trend functions.

Example: BACnet IP

The figure below illustrates a simple example for integration of Climatix controllers in a BACnet/IP network:



ML Management level
AL Automation level
FL Field level
FD Field devices

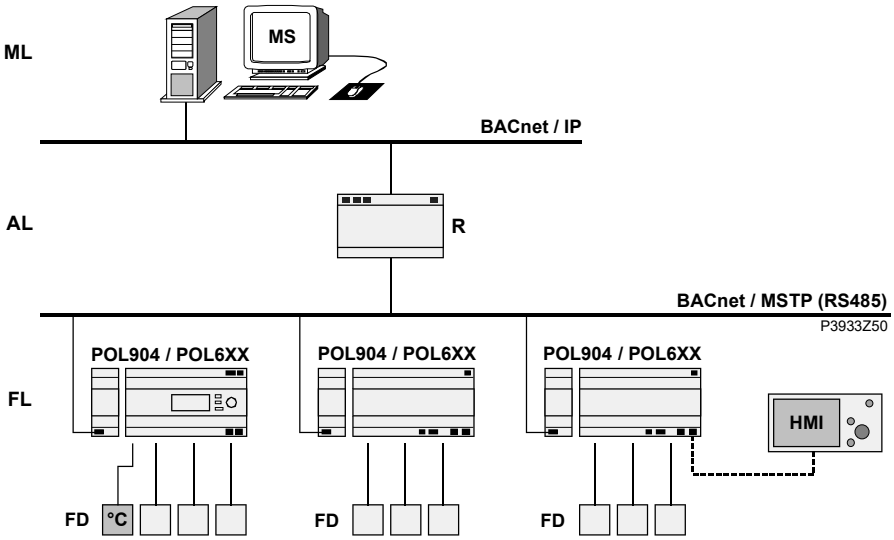
Explanation

The devices and functions in the figure:

Device	Designation / Functions
POL908	BACnet/IP communication module: – Convert data point values of Climatix controllers to BACnet objects.
POL6XX	Climatix controllers, types 63X and 68X: – Primary function: Measure and control via field devices. – Server function: Controllers send corresponding values upon individual request or change of value COV to clients. – Client function: Controllers subscribe to the desired data point values with a "colleague" (server).
HMI	Operating and parameterization unit HMI-DM, type POL895XX: – Set the most important BACnet parameters such as Device-ID and BACnet Device Name. – Operate Climatix controllers.
MS	Management station: – Read and write integrated (mapped) controller data points (BACnet objects).

Example: BACnet MS/TP

The picture below illustrates a simple example for integrating Climatix controllers in a BACnet MS/TP network:



ML	Management level	R	MSTP/IP router
AL	Automation level	FL / FD	Field level / Field devices

Explanation

The devices and functions in the figure:

Device	Designation / Functions
POL904	BACnet MS/TP communication module: – Convert data point values of Climatix controllers to BACnet objects.
POL6XX	Climatix controllers, types 63X and 68X: – Primary function: Measure and control via field devices. – Server function: Controllers send corresponding values upon individual request or change of value COV to clients. – Client function: Controllers subscribe to the desired data point values with a "colleague" (server).
HMI	Operating and parameterization unit HMI-DM, type POL895XX: – Set the most important BACnet parameters such as Device-ID and BACnet Device Name. – Operate Climatix controllers.
R	BACnet MSTP/IP router (e.g. LOYTEC LIP-ME201).
MS	Management station: – Read and write integrated (mapped) controller data points (BACnet objects).

Additional information

For detailed information on BACnet and BACnet communication modules, see:
CB1P3933en Documentation on basics

9.4 M-bus module POL907

M-bus purpose

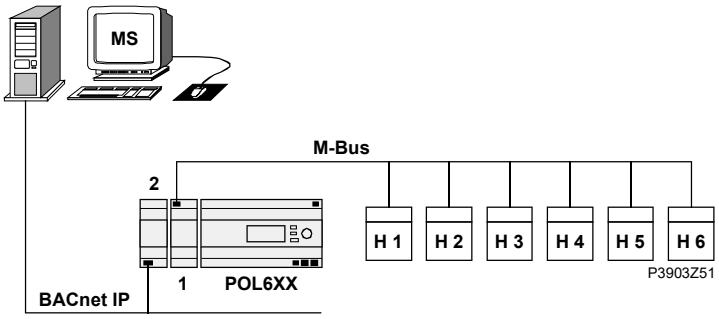
The M-bus (Meter bus) is a European standard for remote readout of heat meters. It is also suited for use with all other types of consumption meters plus various sensors and actuators.
This bus is becoming increasingly important to the energy industry with its standardization as a galvanically isolated interface to remotely read heat meters.
For more information on M-bus, visit www.MBus.com.

M-bus master

POL907 M-bus acts as the M-bus master module and can supply up to 6 M-bus devices (and up to 64 M-bus devices with the M-bus repeater).
It periodically queries data points from M-bus devices such as heat, water, energy or electricity meters.

M-bus example

The figure below illustrates a simple example:



1	POL907 communication module	MS	Management station
2	POL908 communication module	H 1…6	Heat meters

Explanation

Climatix controllers can periodically read the M-bus meter data to the controller and provide the data via BACnet IP to a building automation and control system, where billing and energy consumption can be managed or executed.

Meter setting

The following meter settings required to connect the M-bus to the Climatix M-bus module:

- Primary address from 1 to 250 (physical address)
- Baud rate 300 / 600 / 1200 / 2400 /4800 / 9600 baud
- Enable required data, storage no. = 0, tariff = 0
  - Energy in kWh
  - Volume in m3
  - Power in W
  - Flow rate in l/h
  - Flow temperature in °C
  - Return temperature in °C
- Enable required data, storage no. = 1, tariff = 0
  - Date of set day: Day, month, (year)
  - Energy in kWh on the set day
  - Volume in m3 on the set day

Tested meters

Although standardized, each M-bus device must be approved.
Below is a list of some approved M-bus devices that work with Climatix:

Description	Manufacturer	Type
Heat meter	Siemens	SONOHEAT 2WR5, 2WR6
Heat meter	Siemens	SONOGYR energy WSF
Heat meter	Landis+Gyr	Ultraheat XS
Heat meter	Siemens	Siemeca, e.g. WFM21.D111
Cold meter	Siemens	Siemeca, e.g. WFN21.D111
Pulse adapter	Siemens	Siemeca AEW21.2

Check with Siemens Climatix field support for the most current list.

9.5 Remote OPC

OPC integration purpose

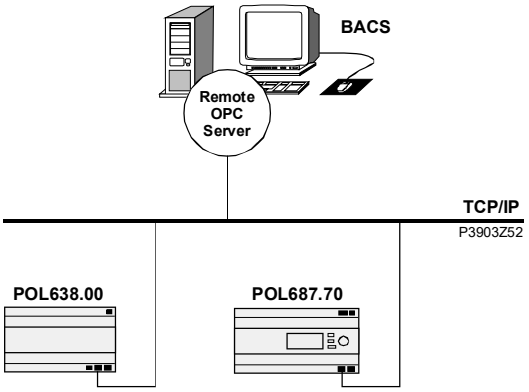
Although BACnet, LON and Modbus are the most common interfaces, OPC integration is often requested for SCADA systems with an OPC Client to integrate certain data from a air handling unit or a chiller machine.

Remote OPC

Climatix provides Climatix "Remote OPC Server" software that connects all POL6XX controllers with onboard TCP and integrates OPC data points into a building automation and control system.

Ethernet TCP/IP example

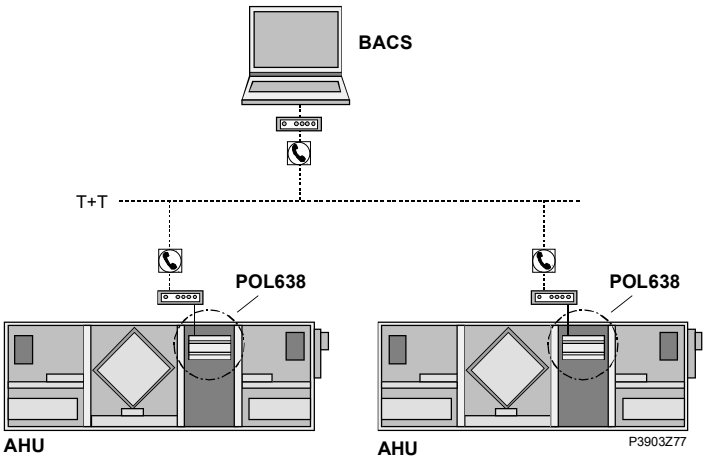
The following picture illustrates a remote OPC server example via TCP/IP:



BACS Building Automation and Control System
POL6XX Climatix controllers, Ethernet version

Modem example

The same solution can also use a modem instead of Ethernet. The set up is different but the functionality is the same.



BACS Building automation and control system
AHU Air handling unit
POL6XX Climatix controllers, Ethernet version

Limitation

The following limitations apply to remote OPC integration:

- Win32 system (NT, XP)
- A maximum of 200 controllers can be connected to one remote OPC server.
- Change of values (COV) must be carefully defined to avoid unnecessary traffic.

License needed

Climatix "RemoteOPC" requires a license. After installation, the user is requested to enter a code (available by ordering Climatix remote OPC license POL0L9.00).

9.6 Web server module POL909

Web server purpose

Today's market requires simple Web visualization to control certain air handling units, district heating plants, refrigeration machines or other HVAC applications. Generally, simple visualization without the need for additional software is requested.

Advanced web module

The Climatix Advanced Web Module (AWM) provides powerful Web server functionality based on the Win CE5.0 platform.
The module must be connected to the left side of the POL6XX controller.
You can create customized web pages or use the Siemens standard web solution.

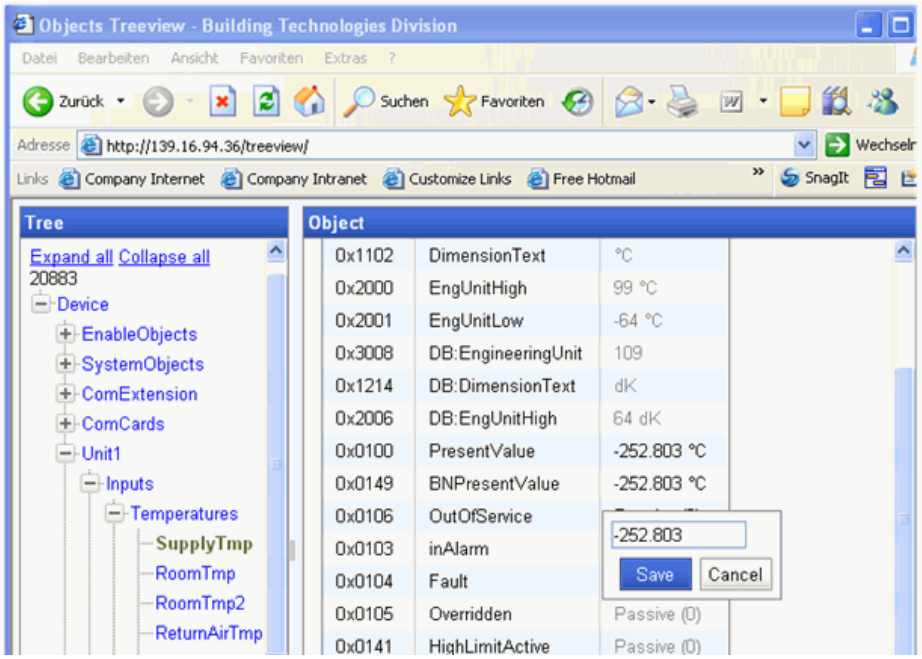
Functionality overview

Internet-based device powered by Intel® XSCALE processor:

- Embedded WindowsCE® platform with Web server application
- Generic tree view to read and write data points
- Platform to program Web applications
- Network parameters configurable via controller, HMI, SCOPE or Web
- Alarm server for SMS / mail
- Peer-to-peer communication
- RAS server
- FTP server
- Full modem RS-232 port
  – GSM / GPRS support
  – Dial in and dial out

Tree view

Tree view is available on every POL909 web server module to read and write the complete data structure from the Climatix controller:



FTP file access

The POL909 module supports FTP to transfer necessary web pages, documents, pictures or any other file.

Additional information

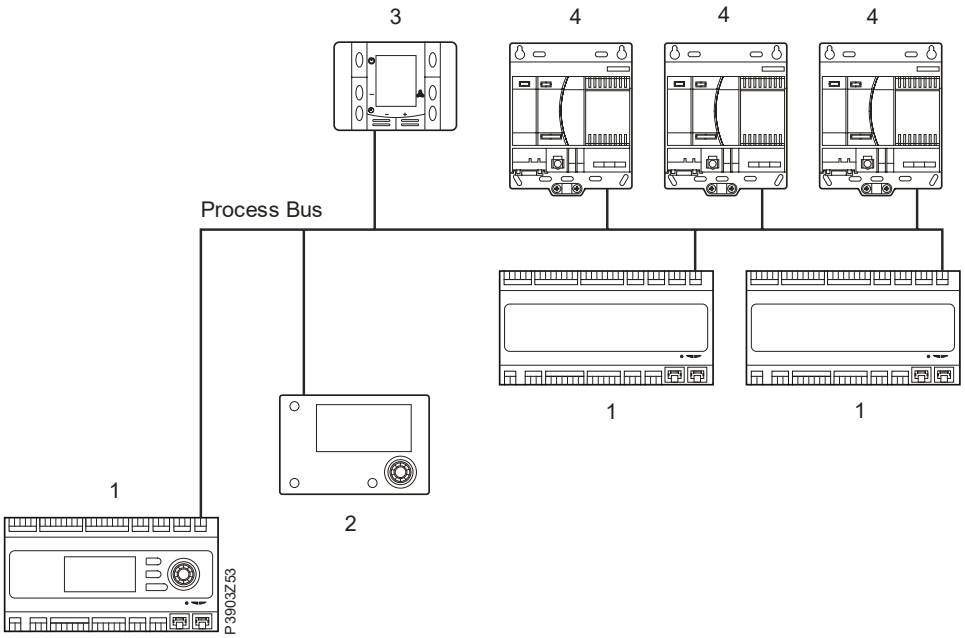
For detailed information refer to Documentation No. CB1P3904en, "Remote OPC Server".

10 Climatix process bus

10.1 Application overview

Application

The process bus connects Climatix controllers to other Climatix controllers and network Human Machine Interfaces:



1 Controllers POL6XX
2 Dot matrix HMI POL895.51
3 Room unit POL822.X
4 Fan-coil controllers ACC 071.X

Brief description

The bus is based on KNX technology and exchanges process information across different devices and human machine interfaces.

Devices with process bus

The Climatix devices listed below have a process bus connection:

- Programmable Controllers: POL687.XX, POL687.7X, POL635.XX, POL636.XX, POL638.XX,
- Human machine interface: POL895.5X1
- Room units: POL822.XX

10.2 Process bus description

Abstract

The main characteristics of the Climatix process bus:
- Based on KNX TP1 technology and allows Climatix devices to communicate among each other and, with some restrictions, even with third-party products (interworking).
- The basic version of the process bus comprises a cable with one stranded wire pair.
- Area/line couplers (use Siemens products, with LTE mode support)

Transmission medium

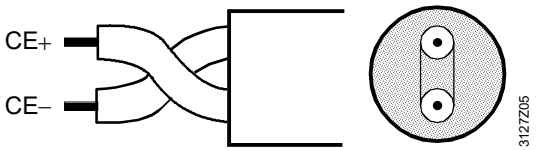
The process bus sends data using TP (twisted pair, stranded wire pair) as the transmission medium. The following data is sent via the bus:
- Configuration data and operator entries.
- Fault and acknowledgement messages.
- Process values and history data.

Process bus cable

The basic version of the process bus is the same as KNX-TP1 bus, and comprises a cable with one stranded wire pair and a jacket.

Bus lines

The bus lines are connected via CE+ (red) and CE– (black).



Bus cable selection

Choose the bus cable based on country and comply with the values listed in this section under "Technical data".
Recommended bus cables and associated specifications:

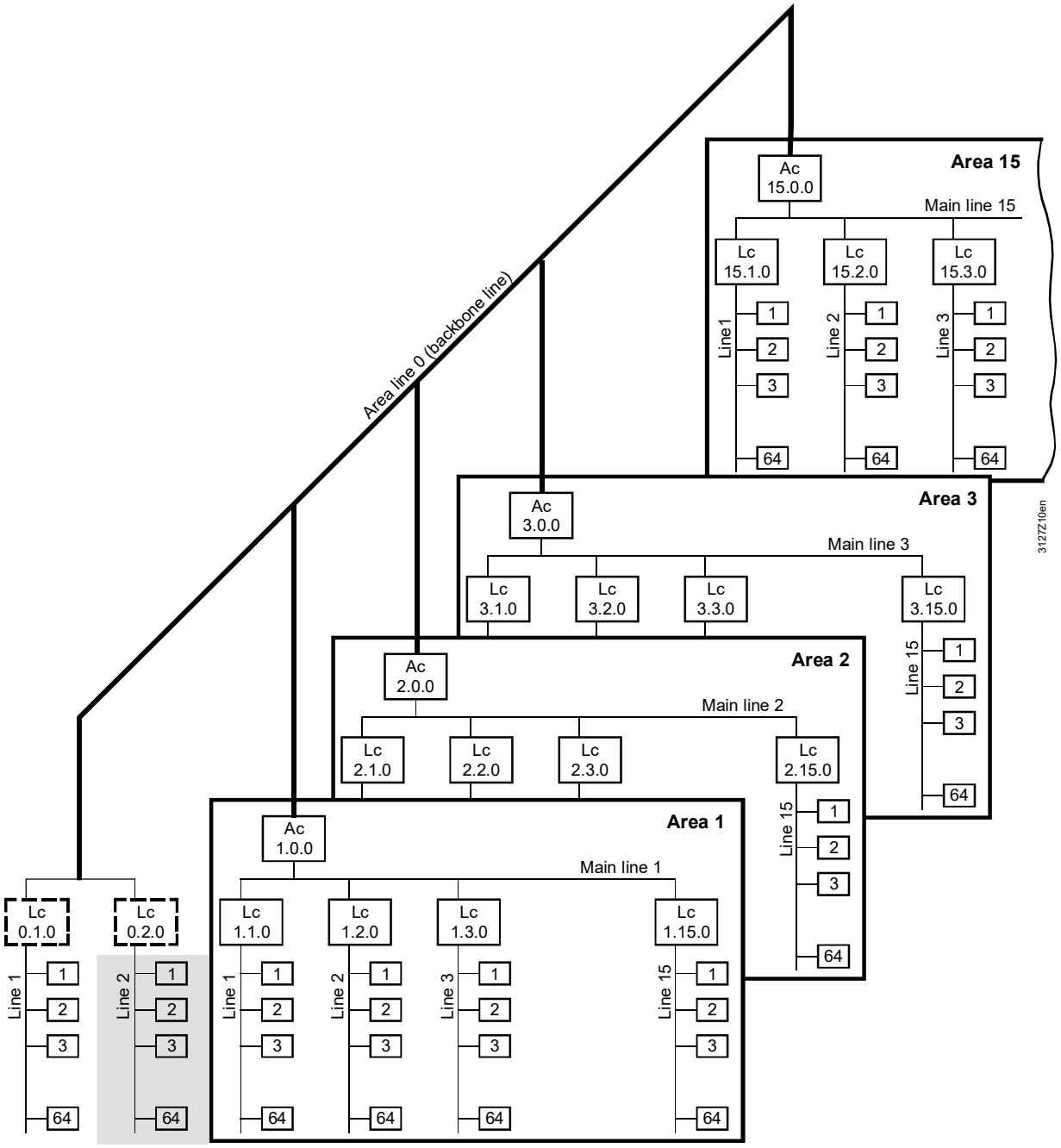
Cable (n = 1 or 2)	**Specifications**
YCYM nx2x0.8	Fixed installation. Dry, humid, wet rooms. Surface-mounted, flush mounted, in pipes. Installation outdoors (do not expose to sunlight).
J-Y(St)Y nx2x0.8	Fixed installation. Indoors only. Surface mounted, in pipes.
J-H(St)H nx2x0.8	Halogen-free conductor, laid separately.
A-2Y(L)2Y nx2x0.8	Outdoor cabling.
A-2YF(L)2Y nx2x0.8	Outdoor cabling. Body cavity filling: Petroleum jelly.

Bus cable shield

You can use bus cables without shields on plants using Climatix devices. The shields available for bus cables are not required. Using cables with shields is recommended (but not required)
Use a shielded cable if interference is expected on the KNX bus.

KNX network

A complete process bus network is comprised of three tiers. Area line 0 represents the network backbone.
15 main lines branch off from the area line via area couplers Ac (area 1…15), and 15 lines (lines 1...15) branch off from each main line via line couplers Lc.



Notes (figure)

Climatix devices with process bus connections are also referred to as bus devices and have a network address.

In the illustration above, the devices are arranged on a three-tier process bus network, with the factory-set area/line address 0.2 on the Climatix devices (corresponding to the grayed area).

The network structure (due to the given area/line address 0.2) is limited to area 0, line 2 without area and line couplers (thus to one line).

Addressing, network address

The network address is composed of the area, line, and device address (A.L.D) even if no area and line couplers are used.

The network address reflects the bus device's unique position on a process bus network and is unique within the related network.

Area and line coupler addressing must already be laid out during engineering in accordance with the network structure.

64 bus devices on one line

Up to 64 bus devices can be installed on one line (area line 0 as well and main lines 1…15).

Climatix extension I/O modules POL92X.XX, POL94X.XX, POL95X.XX, POL96X.XX, POL98X.XX and communications module POL90X.XX do not have a process bus interface and therefore are not counted as bus devices (they use the peripheral bus).

Power supply unit PSU

Power supply units establish a "central bus power supply". Commercially available power supply units (for KNX) feature power outputs of **160, 320** and **640 mA**.
Note: DC 29 V voltage for the bus supply requires a voltage source **with choke**.

Calculate power consumption of process bus devices to determine the PSU for the bus power supply.

Several power supply units featuring different power outputs may be required on a complex process bus network depending on the bus topology and the number of bus devices (per line).

Area and line couplers

Complex, large networks require area and line couplers for two reasons:

- KNX network comprises more than 64 bus devices.
- Permissible network size exceeded without couplers.

A network with area and line couplers allows for establishing "communication islands" keeping any cross-area or cross-line data traffic to a minimum.

Siemens area/line coupler

Ordering: 5WG1 140-1AB13

⚠ Comply with local regulations on **lightning protection** and equipotent bonding.

Consider complex **overvoltage protection** measures covering bus devices and supply and signal lines (e.g. for outdoor sensors) based on the probability of exposure to lightning or overvoltage.

Installation notes

Comply with the instructions on the following pages for project engineering and installation.

Bus cables

⚠ Local regulations on **insulation against mains voltage** (SELV as per EN 60730) apply if the bus cable is laid in parallel to lines from a three-phase network (3 x AC 400 V).

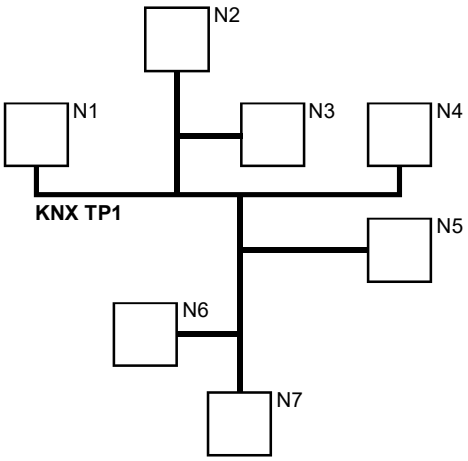
Bus topologies

Permissible bus topologies are: Tree, line, and star topologies and they can be mixed as needed. Ring topologies, however, are not allowed.

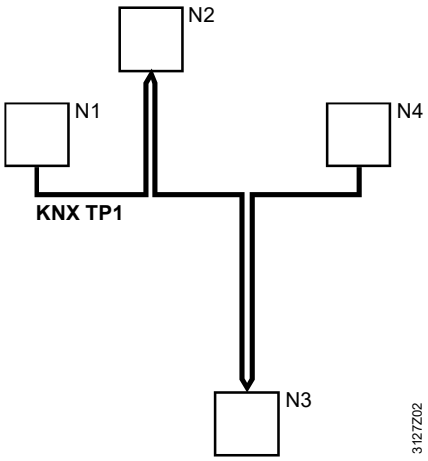
Advantageous: Tree topology

The tree topology is advantageous if a large KNX network is created.

Tree topology (with stub lines)



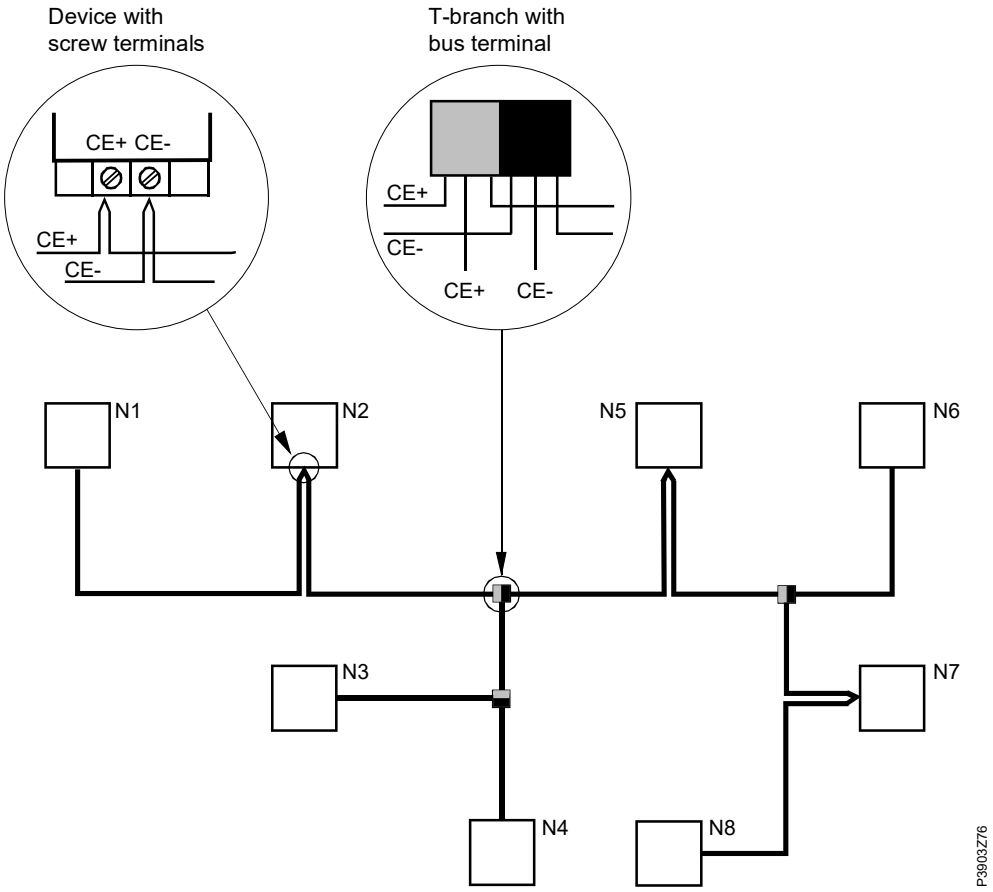
Line topology (with loops)



N1…N7 Bus devices

Branching and connection variants

The following picture illustrates the two options:



N1…N8 Bus devices

Bus connection

For Climatix devices, the bus lines are connected to terminals CE+ and CE–. Observe the polarity of the bus lines CE+ and CE– and do not interchange them.

Terminating resistor

KNX networks do **not** require bus terminating resistors.

Introduction

A bus power supply is required for bus communications. We differentiate between a “decentralized bus power supply unit DPSU” and “centralized bus power supply unit PSU” (PSU = power supply unit).

Decentralized bus power supply DPSU

Climatix 6XX programmable controllers are able to supply power to the bus. In this case, a network line may contain a maximum of eight supplying control devices.

Central bus supply PSU

A power supply unit supplies power to the bus.

Allowed PSU and DPSU

The permissible combinations of PSU and DPSU per line are:

- **Max. 2 PSU**s and **no DPSU**
- **1 PSU** and **max. 4 DPSUs**
- **Max. 8 DPSUs**

Distances and line lengths

Bus devices can be integrated anywhere in the KNX network (but must comply with requirements on distance between bus devices and maximum network size).
The following distances and line lengths are designed for KNX-specified bus cables. See Example 1 and Example 2 on the next page.

Network with DPSU

On a process bus network with "decentralized bus power supply DPSU", the distances depending on the number of devices featuring DPSU.

Number of devices with DPSU	Maximum distance		Total length of all lines on one line
	Device with DPSU to bus device [1)]	Bus device to bus device	
1	350 m	350 m	max. 350 m
2	350 m	700 m	max. 700 m
3 to 8	350 m	700 m	max. 1000 m
There is no minimum distance between devices with DPSU.			

[1)] Bus device without power supply

Network with PSU

Comply with the following distances for a KNX network with "centralized bus power supply PSU":

- Distance between two power supply units PSU min. 200 m
- Distance bus device to next neighboring PSU max. 350 m
- Distance between bus devices max. 700 m
- Total length of all lines on one line max.1,000 m

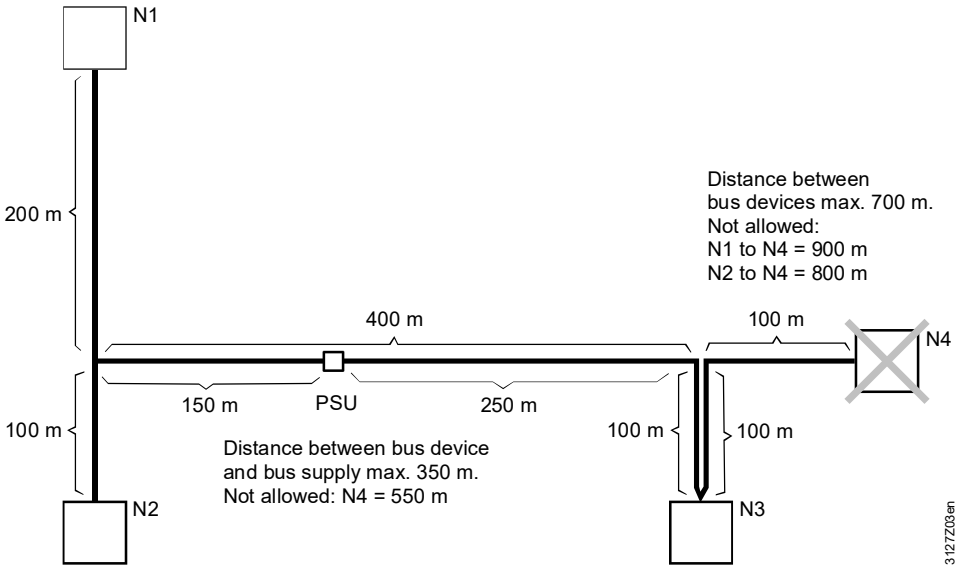
Rules for DPSU and PSU installation:

- Install the bus supply as close to the network center as possible to achieve maximum network size.
- The distance between the bus device and the next neighboring PSU may not exceed 350 meters. Therefore:
  – Depending on the line size, two PSUs may be required or a network featuring several lines and
  – PSUs may need to be established even if the bus device power consumption does not require it.

Distances and line lengths (examples)

Below are two examples on the topic.

Example 1: Distances



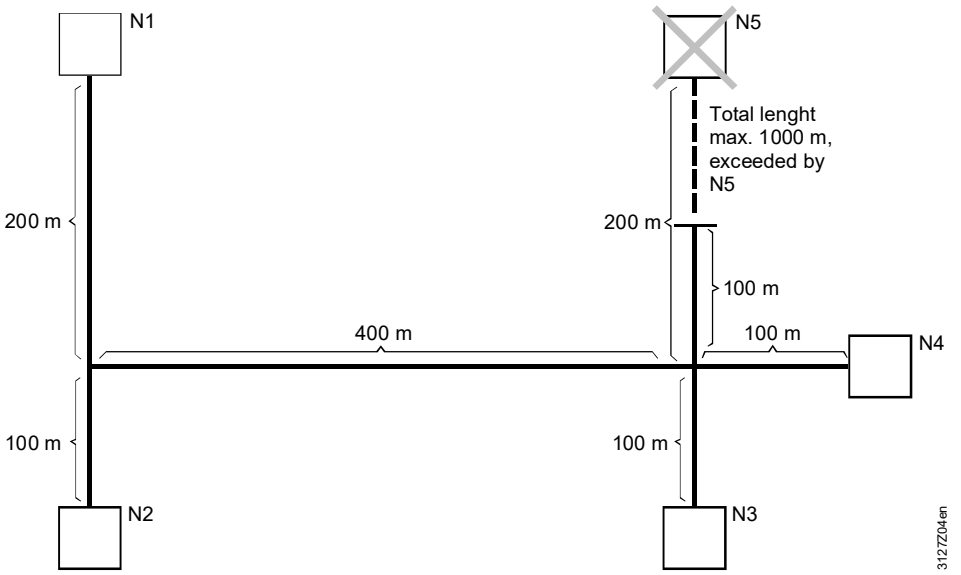
N1…N4 Bus devices

Explanation

Bus device N4, by adhering to the maximum distance of 700 m between bus devices, cannot be integrated in the bus if bus device N3 is integrated with a loop (instead of sub-line).

The bus supply must be placed at 150 m / 250 m on the 400 meter line if the maximum distance between the centralized bus supply PSU and the bus device (without bus supply) is 350 meters.

Example 2: Total length



N1…N5 Bus devices

Explanation

The permissible total length of 1,000 m in the line is exceeded, if device N5 is integrated in the bus at the given bus wiring.

Commissioning aspects

Comply with the following to commission a process bus network as intended.

Wiring KNX bus

Check bus wiring prior to commissioning, and make sure that the bus line polarity is not interchanged (terminals CE+ and CE–).
Important: Do not interchange bus line polarity.

Operating voltage

Check the operating voltage wiring to make sure that the devices are connected to AC 24 V or AC 230 V (as per the technical device information). Apply operating voltage only after this check.

Bus power supply

Check to ensure that power is supplied to the bus after applying operating voltage.
Supply via:

- DPSU Climatix devices set to "ProcessBus/PowerSupply = On".
- PSU Central bus power supply from power supply unit(s).

Addressing

The network address is composed of the area, line, and device address (A.L.D). This is true as well if no area or line coupler is used.
Begin by setting the area or line address in the couplers if area and line couplers are installed on the KNX network.

Address	**Ranges**
Area	Set the area address A (A.0.0, with A = 1…15) for each area coupler.
Line	Set the line address L (A.L.0, with L = 1…15) for each line coupler.
Device	**Important:** Climatix devices assume area and line coupler addresses from the preceding couplers. If there is no coupler, network address 0.2.D (with D = 1…64) applies. The device address may be used only once within a line. The permissible device addresses are 1 to 255. Address 254 remains reserved for service tool if OCI700.1. is used

Zone addresses, LTE mode

Set the zone addresses during commissioning per the plant functions.
Set the zone addresses in Climatix 6XX devices via the human machine interface or using SCOPE tool for programmable controllers.

10.3 Provide power to the process bus

Devices with DPSU

In a process bus network some devices can provide power over the bus (these devices are called DPSU (Decentralized Power Supply Units). These devices can have DPSU functionality set to ON or OFF based on need.

ASN	Description	Current provided with DPSU = ON
POL687.XX	Climatix controller 27 I/Os	Nominal 45 mA / Maximal 90 mA
POL63X.XX	Climatix controller 21 I/Os	Nominal 45 mA / Maximal 90 mA

ASN	Description	Current consumption with DSPU = ON or OFF
POL687.XX	Climatix controller 27 I/Os	5 mA
POL63X.XX	Climatix controller 21 I/Os	5 mA

Devices without DPSU

Other devices cannot provide power supply, and need to get power from external sources. These devices are:

ASN	Description	Current consumption
POL822.XX/STD	Room unit	7 mA
POL895.51/STD	Climatix HMI-DM	45 mA
ACE072.1/ALG	Hydronic system interface	5 mA

Calculate current consumption over the process bus

Additional Power Supply Units (PSU) must be added to the process bus net if the power available from devices with DPSU = ON is insufficient. Workflow:

Step	Action
1	Calculate the sum of nominal current available from all controllers with DPSU = ON (The reserve from maximal current is needed as communication current). The nominal current is the current available for supplying all devices on the process bus line.
2	Calculate how much current is needed by all devices

The process bus can operate if the current from all DPSUs is enough to supply all devices.

Proceed as follows if the current is not enough:

Step	Action
1	Add external centralized power supply units (PSU) to the process bus Example: use N125/11 with power output 320 mA.
2	In case 2 PSU are needed, then disable the DPSU on all controllers (Set DPSU = OFF)
3	Consider the all needed current (all controllers with DPSU=OFF and all devices without DPUS). The PSU needs to provide enough current for all these devices.

You can also use one power supply unit (PSU) and a maximum of four decentralized power supply units (DPSU).

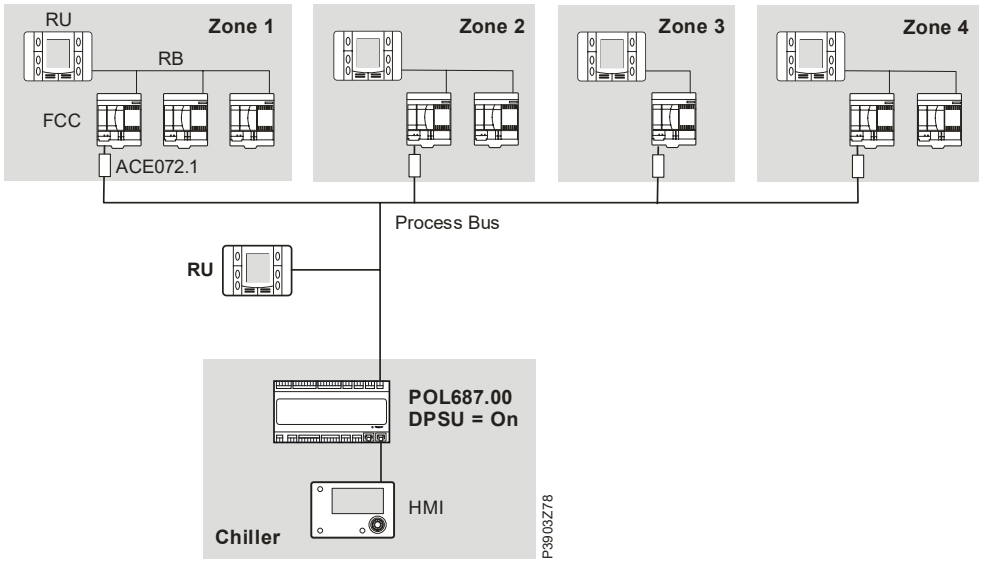
Siemens power supply units

Power supply units N125/11 for KNX networks:

Order No.:	5WG+ 125-1AB11	Power output **320 mA**.
Data:	Operating voltage	AC 230 V, 50…60 Hz.
	Bus supply output	DC 29 V (28…30 V, with choke).
Notes:	For restrictions on distances see page 111 under paragraph "Distances and line lengths".	

Example 1

Hydronic system with one chiller controller, 4 zones each one with Hydronic system interface, and one central plant room unit with time scheduling:



RU	Room units	FCC	Fan coil controllers
RB	Room bus	ACE072.1	Hydronic system interfaces

Current consumption

45 mA are available if DPSU is set to ON in POL687.00:

Cimatix controller POL687.00	1 x 45 mA

Devices without bus power supply:

Hydronic system interface ACE072.1	4 x 5 mA
Room unit POL822.60	1 x 7 mA

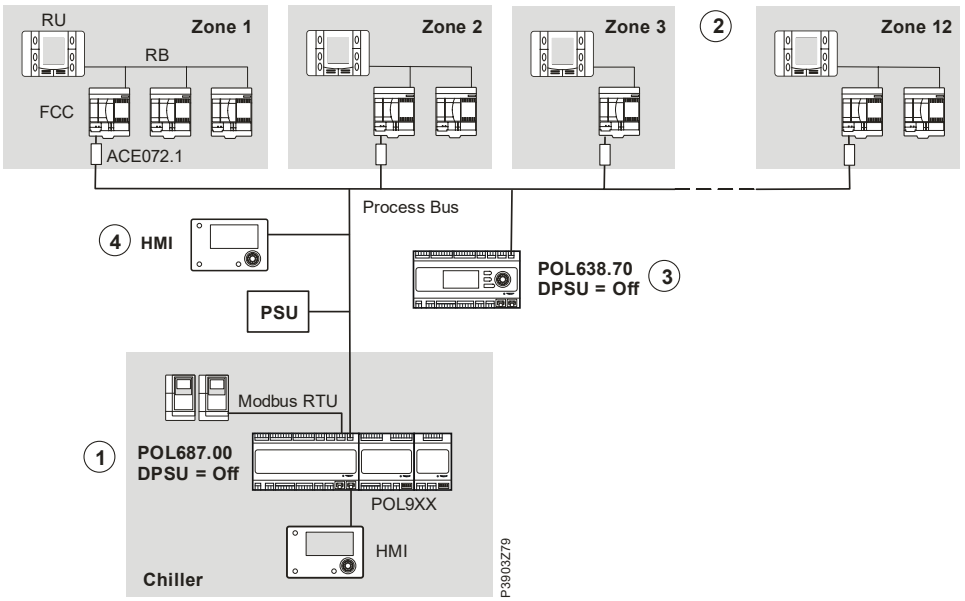
Total current required by devices without bus power supply is then 27 mA.

Conclusion

The bus can operate.

Example 2

Hydronic system with one chiller controller, one plant controller, 12 zones each with Hydronic system interface, and one centralized HMI-DM for system configuration and monitoring:



1	Chiller controller	3	Plant controller
2	Zones 1…8	4	Central HMI-DM
RU	Room units	FCC	Fan coil controllers
RB	Room bus	ACE072.1	Hydronic system interfaces
PSU	Power supply unit ACX95.329		

Required current without using a PSU

90 mA are available if DPSU is set to ON in POL687.00 and POL638.70, from:

Cimatix controller POL687.00 (DPSU = On)	1 X 45 mA
Cimatix controller POL638.70 (DPSU = On)	1 X 45 mA

Devices without bus power supply:

Hydronic system interface ACE072.1	12 x 5 mA
Climatix HMI-DM POL895.51	1 x 45 mA

The required current is 105 mA.
This value is higher than 90 mA from devices with DPSU set to On.

Therefore:
– An additional PSU (Central Power supply unit) N125/11 required.
– The devices with DPSU can be set to Off (DPSU=Off).

Calculation using a PSU

Current consumption is as follows using a PSU and setting DPSU = Off on the controllers:

Cimatix controller POL687.00 (DPSU = off)	5 mA
Cimatix controller POL638.70 (DPSU = off)	5 mA
Hydronic system interface ACE072.1	12x.5 mA
Climatix HMI-DM POL895.51	1 x 45 mA

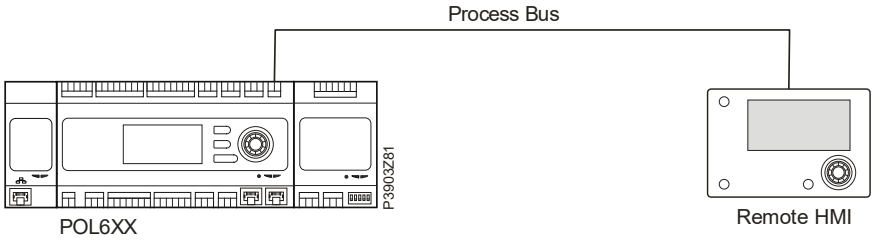
The total required current is then 115 mA.

Conclusion

320 mA is available using the PSU N125/11 and the process bus can operate.

1 Controller – 1 HMI-DM on process bus

The following picture illustrates the connection of 1 remote HMI-DM to 1 controller POL6XX via the process bus:

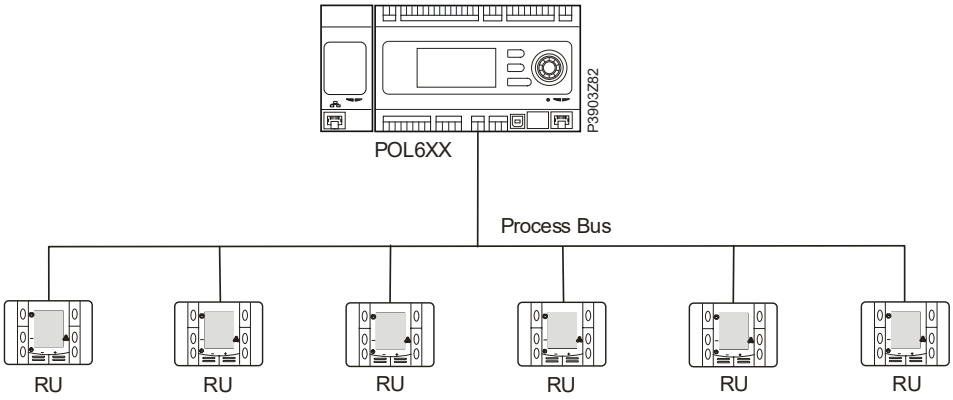


Explanation

The consumption of the HMI-DM POL895.51 is 45 mA . The controller POL6XX with DPSU=On is capable to supply 45 mA.
In this case for distances up to 350 m one POL895.51 can be connected to one controller without any external PSU.

1 Controller – n HMI-SG

The following picture illustrates the connection of several HMI-SGs to 1 POL6XX controller via the process bus:



Explanation

Consumption for one room unit POL822 (RU) is 7 mA, and the nominal current available from one controller with DPSU=On is 45 mA.
A maximum of 6 devices can so be connected to one POL6XX controller without adding any external PSU.
An external PSU is required to increase the number of room units whenever more than 6 room units POL822 are on the same process bus line with one only POL6XX with DPSU=ON.

Communication modes for the Climatix process bus

The Climatix process bus is based on standard KNX technology and relies on the same communication principles and mechanisms.

Actual implementation is not, however, fully KNX conform, so that there are some restrictions to consider including interoperability with generic KNX devices (requires verification on a case-by-case basis).

Climatix process bus supports different communication modes:

Modes	Description	POL4XX	POL6XX
1	Simple S-mode communication	Yes	Yes
2	Simple LTE mode communication	Yes	Yes
3	Full KNX LTE mode	Yes	Yes
4	Full KNX S mode	No	Yes

POL6XX also offers a master/slave (Satellite) communication mode, making use of fixed objects and properties in the SAPRO tool.

On the **same Climatix controller** modes 1 and 2 can be used at the same time. Mode 3 can also be used, but not at the same time with modes 1 and 2.

On the **same Climatix process bus**, all modes can coexist at the same time, from different devices.

Communication for the process bus requires some engineering that make use of the Language Support File (LSF) for mapping and formatting of data-points.

Full KNX mod

The **full KNX mode** is the most complete mode available, and takes advantage of the standard KNX tool for communication configuration. The data types are standard data types, so that in principle communication with third-party KNX devices is possible, assuming that the application is correctly engineered and qualified.

Simple KNX modes

The **Simple LTE mode** and **Simple S mode** are even simpler, but are also limited.

- In the simple S mode the group address is defined in the Language Support File and cannot be changed later in the application running on the controllers.
- In the simple LTE mode the data types are limited and do not conform to the standard data types. So this mode should be used in closed systems only, not in the same system with third party KNX devices.

HMI-DM and HMI-SG

The HMI-DM POL895.xx and HMI-SG POL822.xx working over the process bus in any case, as they include special proprietary telegrams to operate with as little engineering as possible efforts.

11 Commissioning and service

11.1 SD card upgrade options

Upgrade options

Upgrading control solutions is very important and easy with the Climatix family as application are improved or new software features are added.
There are two main options available to upgrade firmware (BSP) and SAPRO applications as well as languages support and communication mapping files.
The two options are the SCOPE tool or using an SD-card. This section explains how to use the SD card.

Upgrade via SD card

This upgrade procedure is only available to hardware with an SD Card slot. The following sections can be upgraded:

- Controller BSP and COM Module BSP (firmware)
- Controller SAPRO application
- Controller HMI templates
- Controller languages support and communication mapping file (OBH)
- Controller web file
- Plant configuration including parameters (Param.bin)

Requirements

The files for download must be located (unzipped) in the root folder on the SD card. The files must use the names listed above

BSP upgrade set

To upgrade the BSP for the different products, the files must have the right name per the list below:

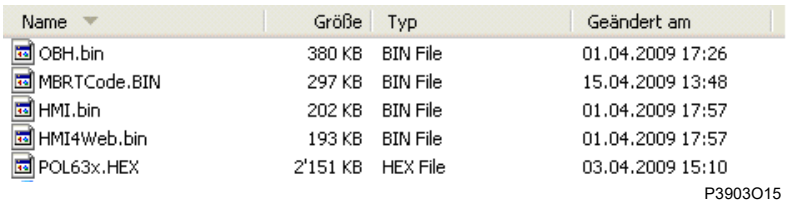
BSP target	**File name**
POL 63x	POL63X.hex
POL687	POL687.hex
POL906 (LON)	POL8193.hex
POL904 (BACnet MSTP)	POL8194.hex
POL908 (BACnet IP)	POL8195.hex
POL902 (Modbus)	POL8196.hex
POL907 (M-bus)	POL8198.hex
POL909 (AWM)	POL8197.hex

Application upgrade set

Files must have the right name per the list below to upgrade the SAPRO application:

Function	**File name**
SAPRO Application	MBRTCode.bin
HMI File	HMI.bin
Language and Mapping File	OBH.bin
HMI@Web File	HMI4Web.bin
Parameter file	Param.bin

Example of files on the SD card



SD card upgrade options, *continued*

BSP and application upgrade

Proceed as follows to upgrade BSP and application:

Step	Action
1	Format a SD card (max. 2 GByte) with FAT file system on a PC.
2	Copy the required files (BSP, Application) to the root directory on the PC.
3	Switch **off** the controller power supply.
4	Insert the SD card into the controller.
5	Press and hold the small button next to the BSP LED (e.g. with a paper clip).
6	Turn power **on**: – The controller is in BSP upgrade mode if the BSP red LED is off. – The controllers files are updating if the BSP LED flashes between red and green.
7	Release the button as soon as the controller is in upgrade mode (red-green).
8	Wait until the BSP LED is yellow.
9	Turn **off** power and turn **on** to restart the controller.

An application is automatically set to run if the upgrade includes an application file regardless of the prior controller state. As a result, no tool is required to start the application.

The BSP LED on the controller is yellow or flashing yellow if no upgrade controller BSP is requested. In this case, any COM module upgrades are executed.

Wait until communications cards (such as LON) are upgraded if the upgrade set contains BSPs for communication cards.

Upgrade COM modules

Prepare the upgrade set as described above to upgrade the communications module and follow the same procedure used to upgrade the controller:

Step	Action
1	Initiate the upgrade procedure.
2	The BSP LED for the controller is yellow.
3	The BSP LED for the COM module will flash between red and green (may take a few second depending on the module).
4	Wait until all COM modules are upgraded (all LEDs on the COM modules are yellow or green). *Note:* The modules are upgraded in sequence!

The application is not started during the upgrade procedure.

Upload and download configuration

You can save the parameter set and configurations on the SD card after successfully commissioning the unit and changing any parameter.
For example, you can use it to download to another controller with the same basic configuration:
– Operating system
– Application
– HMI
– HMI4Web
– Language/communications

The SCOPE tool helps accomplish this.

Using the HMI

They can also be implemented in the controller application so that the same operations are possible using an HMI-IB or HMI-DM.
A default HMI template for engineers is available to this end. Access level 4 is required in this template to allow the operations. See the example below.

Procedure over HMI

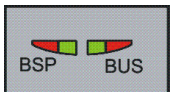
Proceed as follows to download application using HMI-IB or HMI-DM:

Step	Action
1	Insert an empty SD card into the controller.
2	Save data (upload) to the SD card: Main Index > System overview > Save / restore > **Config save SD = Execute**.
3	Wait until: Main Index > System overview > Save / restore > **Config save SD done = Yes**.
4	Insert card into the next controller.
5	Download data from the SD card: Main Index > System overview > Save / restore > **Config load SD = Execute**.
6	Wait until: Main Index > System overview > Save / restore > **Config load SD done = Yes**.
7	Reset controller: Main Index > System overview > Save / restore > **Reset required !! = Execute**

11.2 Status diagnostics

General information

Each controller, extension I/O module and communication module has two BI-Color LEDs. This section describes the LEDs.



P3903P25

The power supply is off if all LEDs are off.

Controllers

The status LEDs "BSP" and "BUS" can be red, green and yellow.

BSP LED

The LED displays the status of the "Board Support Package" (BSP):

LED	Meaning
Flashing between red and green every second	BSP upgrade mode
Yellow flashing with 50ms ON and 1000ms OFF	Application not loaded
Yellow	Application loaded but not running
Green	Application running
Red flashing with 2 Hz	BSP error (software error)
Red	Hardware error

BUS LED

The LED displays only the status of the integrated modem communications. It does not provide the status of internal communications (like I/O extension, COM extension); this status is visible on the extension I/O modules.

LED	Meaning
OFF	No Modem connected or LED disabled
Yellow	Modem connected and initialized, no communication active
Green	Modem connected and communications active
Red	Modem connected but errors active (e.g. provider missing, no initialization possible, etc.)

The modem LED can be enabled over the member "EnableModem" in the modem object. The default is "disable". Actual modem functionality is not affected.

Extension I/O modules

The status LEDs "BSP" and "BUS" can be red, green and yellow.

BSP LED

The LED displays the status of the "Board Support Package" (BSP):

LED	Meaning
Flashing between red and green every second	BSP upgrade mode
Green	BSP running
Red flashing with 2 Hz	BSP error (software error)
Red	Hardware error

BUS LED

The LED indicates the status of the communication to the controller only.

LED	Meaning
Yellow	Communication running, parameter missing
Green	Communication running, I/O operating
Red	Communication down

Communication modules

Each communication module has two BI-color LEDs with the following descriptions.

BSP LED

LED	Meaning
Flashing between red and green every second	BSP upgrade mode
Green	BSP running and communication with controller
Yellow	BSP running but no communication with controller
Red flashing at 2 Hz	BSP error (software error)
Red	Hardware error

BUS LED, general

The LED indicates external communication status (and not the communication with the controller). The status is displayed on the BSP LED:

LED	Meaning
Green	All communication running
Red	One communication down
Others	Depending on each specific Communication module

BUS LEDs, defined

The BUS LED is defined for the cards listed below.

LON module (POL906)

LED	Meaning
Green	Ready for communication (all parameters loaded, Neuron configured). Does not indicate communications with other devices.
Red	No communication to Neuron (internal error, could be solved by downloading a new LON application)
Yellow	Startup
Yellow flashing	Communication not possible to the Neuron. The Neuron must be configured and set online over the LON Tool.

BACnet MSTP module (POL904)

LED	Meaning
Green	Ready for communication. The BACnet server is started. Does not indicate active communication.
Red	BACnet server down. Automatically restarts after 3 seconds.
Yellow	Startup

BACnet IP module (POL908)

LED	Meaning
Green	Ready for communication. The BACnet server is started. Does not indicate active communication.
Red	BACnet server down. Automatically restarts after 3 seconds.
Yellow	Startup. The LED is yellow until the module receives an IP address, therefore a link must be established.

Modbus module (POL902)

LED	Meaning
Green	All communication running
Red	All configured communications down, i.e. no communication to the master. The timeout can be configured via the "aoCOMCard" object. In this case, if timeout is set to zero, then timeout is disabled.
Yellow	Startup or one configured channel not communicating to the master.

11.3 Real time clock

RTC function

The onboard Real Time Clock (RTC) handles time related functions, scheduling, alarm time stamping, and data-logging time base.

Buffering without battery

POL6XX controllers can retain RTC data for up to 3 days, without any backup battery.
After 3 days without power, the RTC reverts to the default value (01.01.2003) and must be re-configured.

Buffering with battery

You can retain real time clock data by up to 4 years by installing a standard backup battery type BR2032 (not included). It may even lasts longer depending on temperature conditions.

Install battery

Proceed as follows to install the battery:

Step	Action
0	**Ensure to maintain ESD (electrostatic discharge) protection during steps 2 to 4.**
1	Power off the controller.
2	Using a small screw driver, remove the front cover on the controller POL6XX.  P3903P26

⚠ **Attention**

Electrostatic discharge!
The display glass must not be touched while the front cover is open!

3	Insert the battery BR2032 into the compartment on the left side.  P3903P27
4	Close the front cover by first inserting the left side of the cover and then pressing on the right side with a finger.  P3903P28

The controller is now ready to operate with RTC backup.

12 Operate built-in HMI

12.1 Operating elements

Structure

The following picture illustrates the built-in HMI and identifies its operating elements:

P3903P29

Operating elements

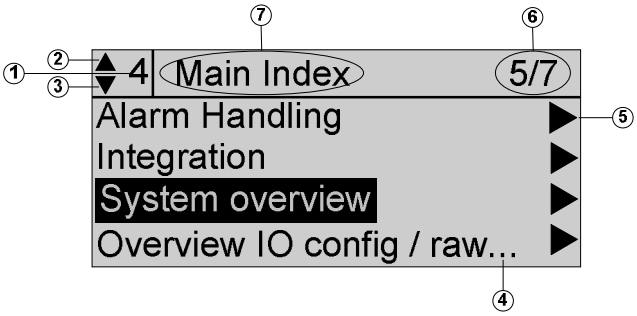
The operating elements and their functions:

Item	Action	Function
ROLL	Rotate clockwise	Scroll down lines or change values during editing. Turn rapidly and continually will accelerate their value change to larger steps.
	Rotate counterclockwise	Scroll up or decrease an input value; Rolling rapidly and continually can enable the acceleration function to change the value in a large extent.
	Push down	Select / confirm
	Push and hold	Activate login/logoff window.
ALARM	Push down	Activate and switch among alarm related pages. Please refer to section 12.6 "Alarm handling" for details.
INFO	Push down	Pushing down INFO key: – HMI goes to user defined page provided user has appropriate access privileges. Please refer to Saphir SCOPE online help for detailed information on defining the target page. – It goes to controller home page if no page is defined. – The INFO button functions on password-related pages depend on the user defined templates. Please refer to password management in section 12.3 "Log in" for details.
ESC	Push down	Cancel modification / Exit to upper level of menu / back to previous page.
	Push and hold	Jump back to controller home page.

12.2 Display

Display example

The built-in human machine interface (HMI) for POL6XX controllers allows end user operations, commission configuration and alarm management, including password protection for operations and displays.
Functionality is the same as the external HMI POL895.51/STD version with some different layouts to fit the screen size.
Engineering is common to both built-in and external HMI, as well as for HMI@web available via IP.
One only engineering step required for all three HMIs.



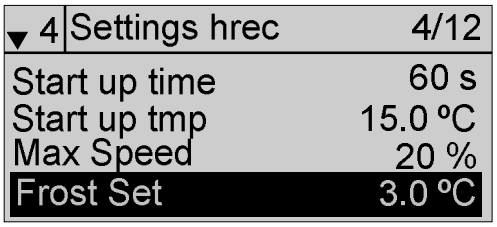
Meaning of display icons

The following table outlines the layout of the screen information:

Label	Icon	Meaning
1		If empty, the HMI does not login any user level.
	2	Current user level is end user.
	4	Current user level is service.
	6	Current user level is OEM factory.
2	▲	There are other line(s) hidden above the current page.
3	▼	There are other line(s) hidden below the current page.
4	•••	Indicating there are characters that displayed on this line. This happens: – If a string is longer than the length of the line, the "•••" is displayed at the end of the line. It scrolls automatically character by character if the line is highlighted. – For a line with more than one string, "•••" is displayed at the end of the string if the end part of a string is covered by the string for the next position. When highlighted, the first string with covered text scrolls automatically character by character. The character scrolling function shifts by one full character each time regardless of whether it is a Latin or Eastern Asian character.
5	►	A sub-menu exists.
6	5/7	This area indicates Current Line / Total Lines information for the selected page. In this example total number of lines on this page is 7, and the currently selected line is 5.
7	Title area	Title line: Never highlighted. Application engineer can define target page on this line, and a short press of the INFO key goes to this HMI target page if the user has the privilege to access to this target page. Please refer to Saphir SCOPE user manual to program a title line.

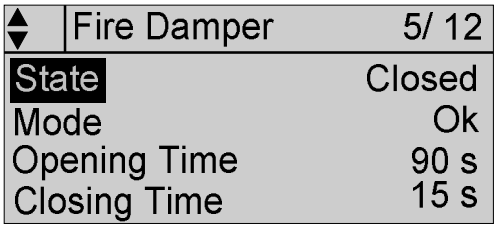
Writable values

The entire line is highlighted when selected if there is a writable value on a line (description and value are both highlighted). For example:



Read only values

Only the description text is highlighted when the line is selected and there is no writable value in a line. For example:



Number of characters on line

A maximum 5 lines can be displayed on one screen; a maximum of 24 characters for each line including the submenu indicator (►).

12.3 Log in

User level

The user can log in with one of four different user levels:

User	Icon	Recommended usage	Description
No login		The access rights at this level are suitable for users viewing basic information for the Climatix 600 controller range.	No password required. The setting corresponds to the access right for privilege 253 to 255 in SCOPE programming. Please refer to user manual for SCOPE programmer for more details.
End user	2	The access rights for users who operate the Climatix 600 controller range.	These user levels are password protected.
Service	4	The access rights for users who service the Climatix 600 controller range.	
OEM factory	6	The access rights for users who configure and commission the Climatix 600 controller range.	

Note

The application engineer can define specific access rights for each user level.

Password management

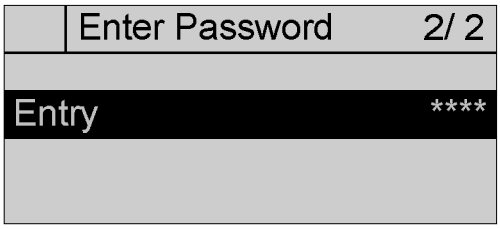
There are 5 password-related templates, the names and numbers in SCOPE are listed in the table below; the application engineer can define them via SCOPE.

Push down INFO key

INFO key is defaulted to go to the controller main page. The application engineer can change this and it may differ from page to page. Access rights determine response.

Login page

The Start Page is displayed if the user presses the INFO button. The login page appears by select the "Enter Password" line:

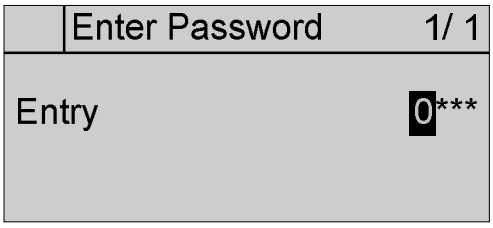
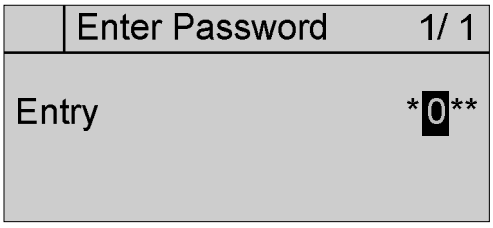


Press **INFO** to go to the Home Page:

On the Login page, the user enters 4-digits (0-9) as defined in the application for different user levels.

Enter password

Proceed as follows to enter a password:

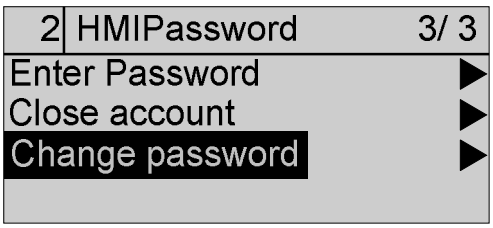
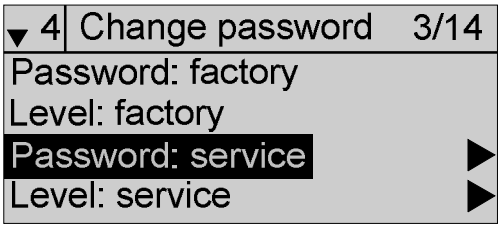
Step	Action
1	Choose a digit by turn the **ROLL** knob: 
2	Confirm input by pressing **ROLL** knob. The input value becomes an asterisk (*):  *Note:* Pressing key **ESC** at any time exits this page.
3	Enter the correct 4 digits for your own password, and confirm the last digit by pressing the **Enter** button, the controller then checks the password. If correct, the user level privilege is displayed on the top left corner of the screen: 

Enter password, *cont.*

Step	Action
4	The controller automatically goes to the minimum privilege level and the controller home page if the password is wrong. The privilege level is then empty accordingly: 

Change password

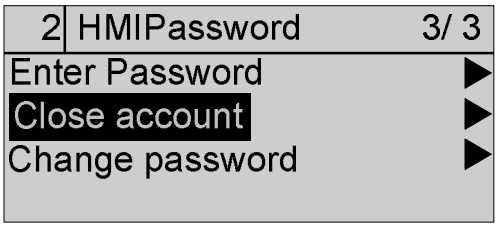
The application can program in SCOPE, the passwords that may be changed. Proceed as follows to change the password:

Step	Action
1	From the "Main index", select the "System overview" and then the "Password Handling" and press **Enter**. Select "Change password": 
2	The application engineer can program different levels of accessibility. The controller supports up to 7 access levels; some HMI version support only 4 levels. We recommend limiting to privilege levels to 4.  You can lower but not increase a privilege level associated to a certain password values.

12.4 Log off

Log off procedure

The user can log off after logging on at any user level:

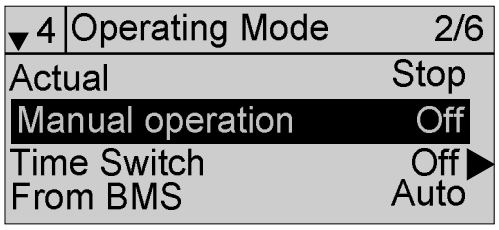
Step	Action
1	Go to the main page (“Main Index” in title area) by pressing the **Info** key:
2	Select “System overview” then “Password Handling” and press **Enter**. Finally press **Enter** on “Close Account”: 

The controller automatically logs off the user if no key is pressed for more than 10 minutes. The application engineer can change this time.

12.5 Parameter operating

Parameter browsing

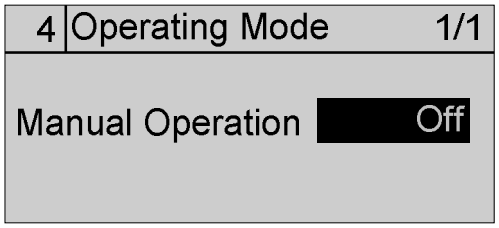
The user can browse parameter information by turning the **ROLL** knob. This page shows an example:



Highlighting the parameter and pressing the **ROLL** key enters a new page to edit the value.

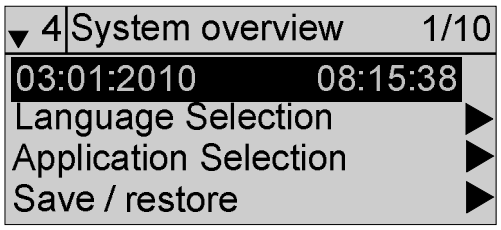
Editing a single value

A dedicated page is used to edit integer and float type values. On the value editing page, turn the **ROLL** knob to change the value. The editing value page is illustrated as follows:

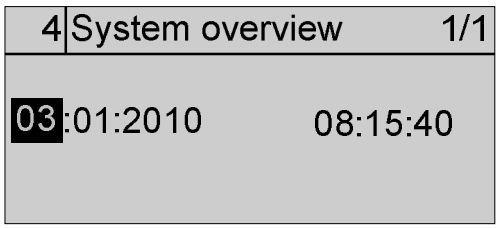


Multi editable values on one line

Some data are segmented by nature, such as IP address or date & time:



Segmented data points are highlighted one-by-one, after confirming the previous input:



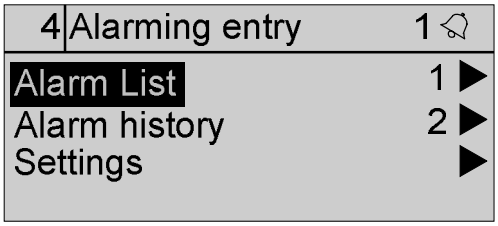
The HMI returns to the previous page after confirming the HMI.

Press **ESC** to cancel the input of the current line for more than one writable data points on one line.

12.6 Alarm handling

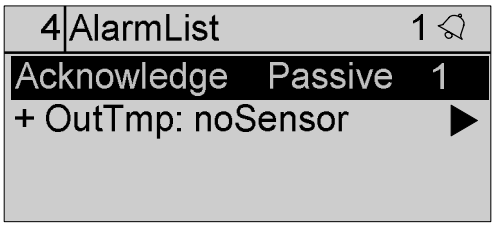
Alarm management

The Alarm Bell on the top right side of the screen moves for an alarm.
A new alarm must be acknowledged by the operator.
Press the **Alarm** key to access the Alarm entry page:



Alarm acknowledge

Enter the Alarm List menu to display the complete list of active alarms (Alarms that have not yet been acknowledged):



Enter the line for the selected alarm; related date and time information is provided together with the alarm class.

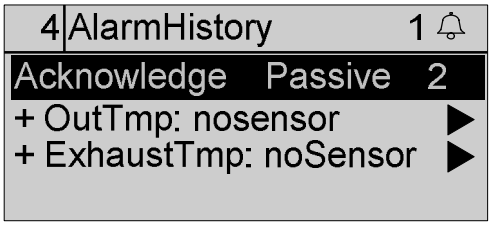
Cancel all alarms in the list by changing the Acknowledge value from Passive to Active. Requires the appropriate privilege level to be programmed in the application.

After canceling the alarms from the Alarm List, it moves to the Alarm history log.

The alarm bell stops ringing and remains displayed if the new alarms are acknowledged and remain displayed.

Alarm history

Alarm History lists all logged alarm events:



View the related information by entering selected alarm.
Change the acknowledge value from passive to active to cancel the alarm History.
The operation is protected by the privilege level programmed into the application.

The alarm bell disappears if no active alarms are on the list.

13 Using SCOPE tool – Basics

13.1 SCOPE introduction

What is SCOPE?

SCOPE is a commissioning and service tool for Climatix controllers and operator units (HMI). SCOPE is used in conjunction with SAPRO to create and maintain an entire application.
SCOPE has the following key functions:

Climatix controller

- Download program (application, HMI, HMI for Web, Object Language file).
- Read and edit data point objects and their members.
- Upload and download parameters (objects and members).
- Log, save, and display online trend data.
- Configure the archiving function as well as data display and reading.
- Save and restore parameter of controller.
- Edit the Unicode HMI.
- Engineer various communication protocols including BACnet, Modbus Slave, Konnex, Lon, SMS, etc.
- Edit of the time scheduler.

HMI functions

- Create and load files for layout and menu texts.
- Create, read and load Unicode character sets.
- Create and load files for language support of object texts and member designations.

Contents of this chapter

The following pages provide short descriptions on:

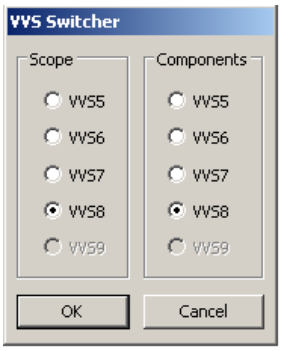
- Starting SCOPE
- Connecting SCOPE
- Download application
- Upload/download parameter

See SCOPE online help for detailed information

13.2 Starting SCOPE

VVS switcher

Prior to starting scope, you must use the VVS Switcher to select the correct SCOPE components for the controller you are currently going to use if an old SCOPE installation is on your computer (i.e. like VVS5, VVS6, etc.)..

Step	Action
1	Select **Start**, **Programs**, **SAPHIR Suite** and then **Saphir VVS Switcher**:  P3903O02
2	Select **SCOPE** and **Components** appropriate to your installation and click **OK.**

Start SCOPE

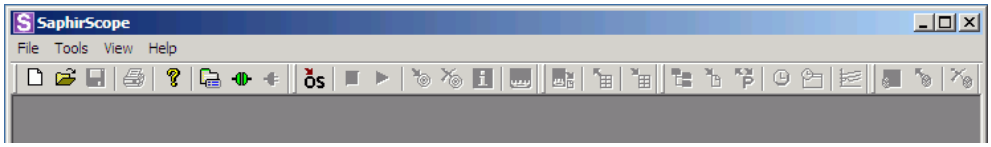
Proceed as follows to start SCOPE:

Step	Action
1	Select **Start**, **Programs**, **SAPHIR Suite** and then **SCOPE**:  P3903O03 → SCOPE opens the program window.

The program pane

The following figure shows the top program window pane immediately after start. The working pane is empty (no project is open). You see:

- the menu bar and
- the tool bar



P3903O04

The menu bar contains all possible operations available with SCOPE.
The toolbar contains general Window program buttons (New File, Open File, etc.). Generally speaking, all buttons on the toolbar have an equivalent in the menu bar.

The status bar is located at the bottom of the program window.

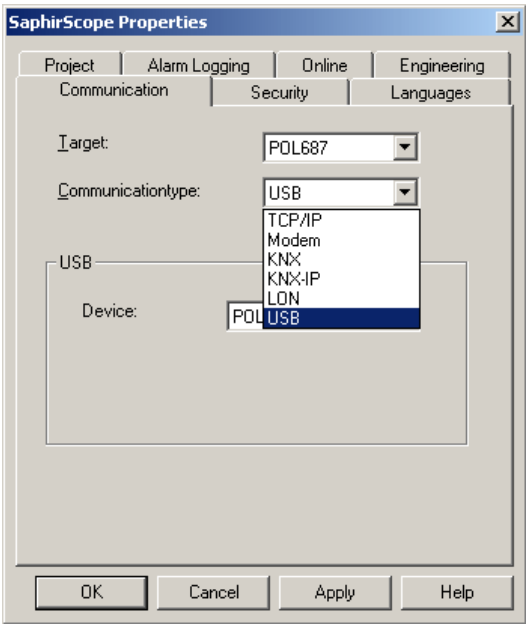
P3903O05

The status bar provides information on operation and connection status.

13.3 Connect SCOPE

Requirements

There are various physical routes for local communication between SCOPE and a Climatix controller, e.g. USB, TCP/IP, Konnex, LON, Modem, etc.

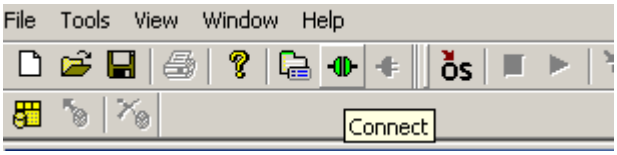


P3903O06

Make sure to have the proper communications cable and communication interface prior to connecting the PC and Climatix controller.

Target and communication type

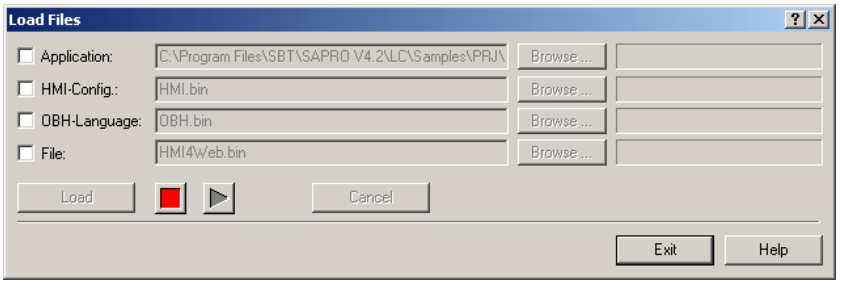
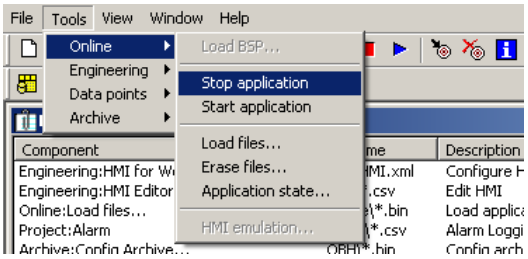
Check the basic settings for local communication when starting SCOPE for the first time:

Step	Action
1	Select **Files** and click **Properties**, then select the **Communication** tab (see picture above).
2	Finish all settings, click **Apply**, and then click **OK.**
3	Click **Connect** to connect to controller. Click **Disconnect** to disconnect to controller.  P3903O07 Or, select **Files** and click **Connect** or **Disconnect**.

13.4 Download application

Procedure

Proceed as follows to download an application file:

Step	Action
1	Select **Tools** and click **Online**, then select **Load files**.
2	The following dialog window appears:  P3903O09
3	Select the checkbox next to the file you want to download
4	Click **Browse…** to select the folder where you save your application bin file, **MBRTCode.bin**
5	Select **Tools** and click **Online**, then select **Stop application**; or directly click **Stop application**:  P3903O08
6	Click **Load** and wait until status bar goes from grey to blue.
7	Click **Start application** to restart the controller.

13.5 Upload/Download parameter

Introduction

The **Parameter** function allows you to:

- Upload all parameters (members for all objects) for the application from the target device to the PC and save the data to file.
- Only adjustable or all parameters for the saved file are downloaded to the target device.

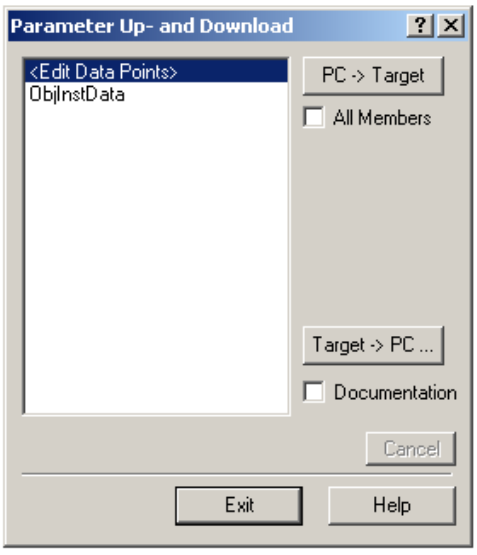
Application examples

The benefits of the **Parameter** function in the work process include:

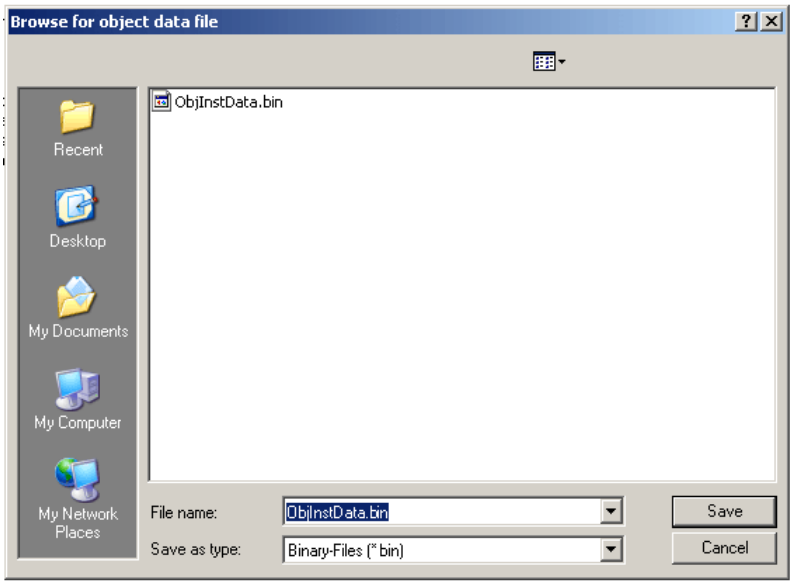
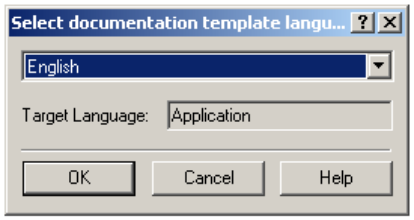
- Current parameter settings for the controller are saved following successful commissioning to allow a complete download of the data to a new controller in the event a controller is replaced.
  As a result, you do not need to re-specify or reenter plant-specific settings such as set points, controller parameters, schedules etc.
- To commission 30 controllers in a plant with the same basic application but using variants (e.g. 3). Specific parameter settings distinguish the variants (e.g. schedules for different user groups).
  Procedure: Each of the three variants is uploaded once and then downloaded to each of the other 9 controllers.

Upload parameter

Proceed as follows to upload data **from** the controller:

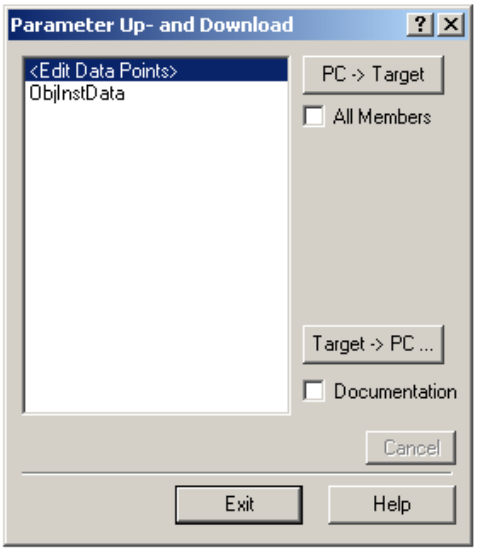
Step	Action
1	Select **Tools** > **Data Points**, then **Parameter**. → The **Parameter Up- and Download** dialog box opens:  P3903O10 The list box contains the data created during previous uploads. Only <Edit Data Points> is listed if no uploads were carried out. See "Information and possible settings" below.
2	To document the content of the update: Select the **Documentation** check box.

Upload parameter, *cont.*

Step	Action
3	Click **Target > PC**… → The **Browse for object data file** dialog box opens:  P3903O11
4	In the **Browse for object data file** dialog box: Apply the file name "ObjInstData.bin" suggested for uploading or enter a file name, e.g. "StandardAHU" and click **Save**. → SCOPE immediately lists the objects, unless you select **Documentation**; see Step 5. Notes: • The file extension must be *.bin. • Data uploaded previously and saved under a specific file name is listed as well.
5	If the **Documentation** checkbox was selected: The Select documentation template langu… dialog box opens:  P3903O12 Select the Template from the drop-down list box (e.g. English) and click **OK**: → The **Select documentation template langu…** dialog box closes: → SCOPE lists the objects (see progress bar next to **Cancel** button) and saves the information under the file name entered previously, e.g. "StandardAHU": Storage location for the files in the project folder: • Uploads: \PS • Documentation: \OBH
7	Click **OK** to exit.

Download parameters

Proceed as follows to download data to the controller:

Step	Action
1	Select **Tools** > **Data Points**, then **Parameter**. → The **Parameter Up- and Download** dialog box opens:  P3903O10 *Note:* **All Members** is not selected by default. This means that only members without a conditional flag in the block are written (see SAPRO documentation). All dynamic members are written to the blocks if **All Members** is selected, .
2	As desired: Select **All Members**. All members are downloaded.
3	Click **PC > Target**: → SCOPE loads the objects to the controller (see progress bar next to **Cancel**).
4	Click **OK** to exit.

Delete parameter files

Proceed as follows to delete a parameter file:

Step	Action
1	In the **Parameter Up- and Download** dialog box: Right-click the file you want to delete and select **Delete**.
2	Click **Yes** to confirm deletion: → The file is deleted.

14 Programming

14.1 SAPRO in brief

What is SAPRO

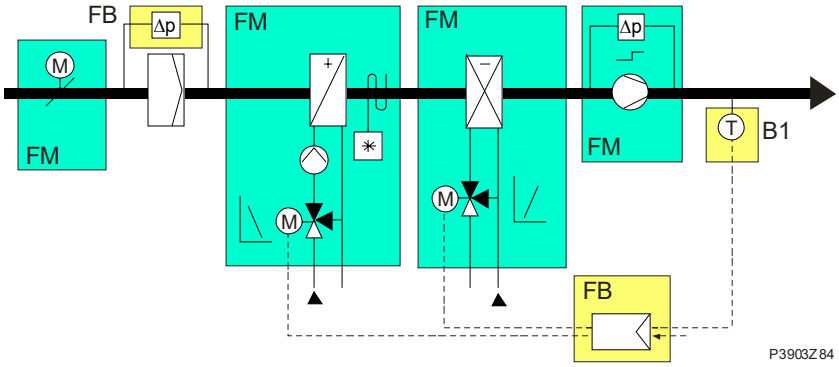
SAPRO stands for **Sa**phir **Pro**gramming; it is a PC-based tool for creating application programs for all controllers of the Climatix family.
SAPRO was specially developed to meet the instrumentation and control needs of HVAC plants:

- The programming process is object-oriented using a graphical editor.
- Extensive libraries are available with functional elements both for plant parts and for instrumentation and control tasks.
- Online test features provide application checking under real-time conditions.

SAPRO is highly versatile, reliable and user-friendly.

Based on plant schematic

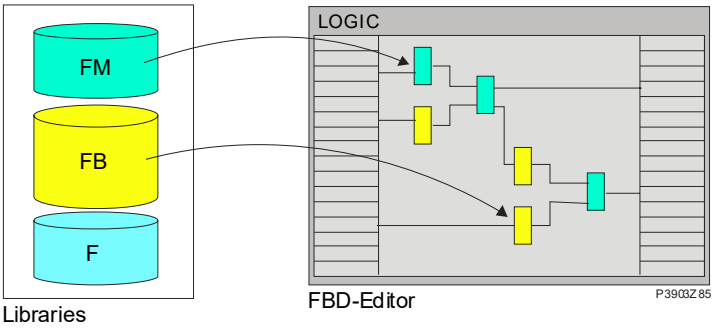
The instrumentation and control oriented plant schematic provides both the task requirements and the basis for program creation with SAPRO:



SAPRO provides the functions that are usually required in the form of graphical elements per requirements. They represent plant parts and instrumentation and control functions.

Data flow programming method

Programming is accomplished using the data flow method. Copies of the required functions are extracted from the libraries, assembled in the graphical editor (FDB Editor), and their inputs and outputs are interconnected based on the intended use.



The libraries contain the following three types of function elements:

- Function modules for complete plant parts, such as air dampers, electric air heaters, etc.
- Function blocks for plant components and instrumentation and control functions
- Functions for logic circuits, data conversions, etc.

SAPRO Library

A customized library consists of different FM and FB, and is built based on the SAPRO libraries. The libraries contain the following 9 types of function elements:

The 9 types displayed in the above picture are:
AutomationObject, COM, FunctionBlocks, IOExtension, OldBlocks, POL63X, POL687, Standard, ACR_V098.

Libraries contents

The following table provides an overview of the contents of the individual libraries:

Library	Contents
Standard library (IEC-61131-3 library)	General blocks for digital logic (e.g. AND), simple mathematical operations, timers, flip-flops, comparators, etc. IEC 61131 is an IEC standard for programmable logic controllers (PLCs). SAPRO offers a complete IEC-61131 library to support powerful, flexible programming logic circuits and data type conversion.
BACnet Automation Object Library	Automation object blocks to handle set points, sensors and actuators, and also loop controllers, etc. The BACnet automation object enable Climatix is compatible with the BACnet automation system. They are not only SAPRO objects, but also are BACnet automation objects.
HVAC Library	HVAC application library contains frequently used function blocks for HVAC control, such as compressor, pump, cooling/heating, fan, etc, as well as energy-saving functions for HVAC plants, including free-cooling, heat-recovery, capacity compensation, etc. HVAC Library contains application knowledge and can simplify application development.
SAPRO Function Block Library	Blocks with powerful functions in combination with automation objects blocks; some are also SAPRO objects.
Hardware library	Blocks for different specific controller hardware, mainly HW I/O blocks, like on-board I/O and extension I/O.
Communication library	Communications blocks to handle various types of communications

Application template

An application template is automatically generated if you create a new project for certain application types. The application template contains:

- A well-designed application frame and data type for your own further development as well as
- Required general functions such as physical I/O handling, schedule and calendar, communication card handling, alarm management, etc to simplify application development.

Optional programming methods

SAPRO provides two programming modes:
- ST(Structured Text)
- SFC (sequential function chart)

ST (Structured Text)

ST is a higher programming language similar (but not equal) to PASCAL. Not only machine-oriented commands are used but abstract commands may be combined to different command sequences as well.
Advantages of ST:
– Compact programming
– Clear program design due to structuring
– Complex command constructions possible
– Very useful for “search function” or “cycle function”

SFC (sequential function chart)

SFC was adopted for the sequential control system because SFC can graphically represent the sequence flow of control logic.
Advantages of SFC:
– SFC can clearly present the sequence of control programs.
– All possible states can be represented by using transitions and steps
– Suitable for pure state machine description.

ST and SFC functions required additional licenses to support; please specify when ordering the SAPRO programming dongle.

Standard application

Standard application for AHU, chiller, chiller plant, modular air-cool heat pump, close control can be available to assist customers with standardized system configurations.
Standard applications can be enhanced by customers with trained resources for programming with SAPRO tool.

SAPRO training courses

Programming is covered in detail as part of SAPRO training courses which are offered both at headquarters and at the Regional Companies.

15 Appendix

15.1 Input / Output signals, labeling

Overview

The following tables show:

- the signal types supported by the Climatix range
- the corresponding labeling

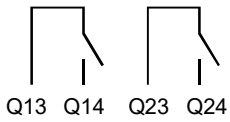
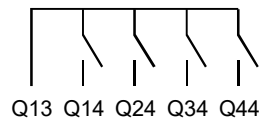
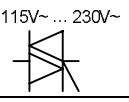
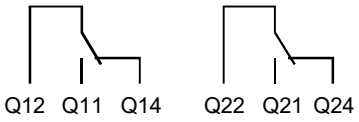
Supply voltage 24 V

Input	Labeling
AC or DC	24 V ~
Equipotent common	G0 ⊥

Input signals

Signal	Supported Input	Labeling
2-wire resistive sensors	NTC Sensor 10kΩ or 100kΩ Reference ground	B, B1…B(n) M ⊥
Universal signals	Programmable I/Os Reference ground	X, X1…X(n) M ⊥
Contact reading "voltage free"	Digital Input potential-free (SELV 24V, 8mA) Reference ground	D, D1…D(n) M ⊥
Contact reading 24V	Digital Input 24Vac or 24Vdc Galvanically separated Ref. ground from contact	DU, DU1…DU(n) DG
Contact reading 230V	Digital Input 115Vac or 230Vac Galvanically separated Different Neutral from contact	DL, DL1…DL(n) DN

Output signals

Signal	Supported Output	Labeling
Voltage Output 0-10V	DC 0…10 V Reference ground	Y, Y1... Y(n) M ⊥
Bipolar Motor drive	Stepper motor	M1+ M1- M2+ M2-
Normally Open Switched output	Single contact NO, externally supplied	
	Multi contact, (NO), externally supplied	
	Add-on for Triac	
Change Over Switched output	Normally Open or Normally Closed NO/NC	

15.2 Plug sets

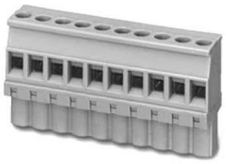
All **controllers POL6XX** and **extension I/O modules POL9XX** are delivered without plugs.
Customer need to order their favorite plug sets separately. Available sets:

- Screw type, cable side entry
  or
- Spring cage type, cable top entry

Screw type sets

The table below shows the order number and the contents of the individual plug sets for controllers POL6XX and extension I/O modules POL9XX:

Overview Plug sets composition

 Screw type, cable side entry				**POL068.75/STD - S55843-Z687-F100** Connector Set for POL687	**POL063.85/STD - S55843-Z638-F100** Connector Set for POL63X	**POL098.55/STD - S55843-Z985-F100** Connector Set for POL985	**POL098.E5/STD - S55843-Z988-F100** Connector Set for POL98U/E	**POL096.55/STD - S55843-Z965-F100** Connector Set for POL965	**POL096.E5/STD - S55843-Z968-F100** Connector Set for POL96E/U	**POL095.55/STD - S55843-Z955-F100** Connector Set for POL955	**POL094.E5/STD - S55843-Z948-F100** Connector Set for POL94E / POL94U	**POL094.55/STD - S55843-Z945-F100** Connector Set for POL945	**POL092.55/STD - S55843-Z925-F100** Connector Set for POL925
Type	**PhoenixNr**	**Color**	**Terminals**	Pcs	Pcs	Pcs	Pcs	Pcs	Pcs	Pcs	Pcs	Pcs	Pcs
MVSTBW 2,5/2-ST OG	1773879	Orange RAL2003	2	1	1								
MVSTBW 2,5/2-ST GY7035	1700441	Light Grey RAL7035	2	1	3		1	1	1	1	1		
MVSTBW 2,5/3-ST GY7035	1937745	Light Grey RAL7035	3	6	2	2	2	1	1	1	1	2	1
MVSTBW 2,5/4-ST GY7035	1700442	Light Grey RAL7035	4		1						1		
MVSTBW 2,5/5-ST GY7035	1778366	Light Grey RAL7035	5	1		2	4		2				
MVSTBW 2,5/6-ST GY7035	1700443	Light Grey RAL7035	6	1	2	1	1			3			1
MVSTBW 2,5/7-ST GY7035	1701270	Light Grey RAL7035	7	1		1	1	1	1		1	1	
MVSTBW 2,5/8-ST GY7035	1700445	Light Grey RAL7035	8	2	2	2	3	2	3				
board to board 		Light Grey RAL7035	4			1	1	1	1	1	1	1	1
ZEC1,0/4-LPV-3,5 GY35AUC2CI1	1751697												
board to wire 		Light Grey RAL7035	4										
ZEC1,0/4-ST-3,5 GY35AUC1R1,4	1751710												

Plug sets, *continued*

Spring cage type sets

The table below shows the order number and the contents of the individual plug sets for controllers POL6XX and extension I/O modules POL9XX:

Overview Plug sets composition

Spring cage, cable top entry				**POL068.76/STD** - **POL068.76/STD** Connector Set for POL687	**POL063.86/STD** - **S55843-Z638-G100** Connector Set for POL63X	**POL098.56/STD** - **POL098.56/STD** Connector Set for POL985	**POL098.E6/STD** - **S55843-Z988-G100** Connector Set for POL98U/E	**POL096.56/STD** - **POL096.56/STD** Connector Set for POL965	**POL096.E6/STD** - **S55843-Z968-G100** Connector Set for POL96E/U	**POL095.56/STD** - **S55843-Z955-G100** Connector Set for POL955	**POL094.E6/STD** - **POL094.E6/STD** Connector Set for POL94E / POL94U	**POL094.56/STD** - **POL094.56/STD** Connector Set for POL945	**POL092.56/STD** - **POL092.56/STD** Connector Set for POL925
Type	**PhoenixNr**	**Color**	**Terminals**	Pcs	Pcs	Pcs	Pcs	Pcs	Pcs	Pcs	Pcs	Pcs	Pcs
FKCT 2,5/2-ST OG	1751639	Orange RAL2003	2	1	1								
FKCT 2,5/2-ST GY7035	1751642	Light Grey RAL7035	2	1	3		1	1	1	1	1		
FKCT 2,5/3-ST KMGY	1998263	Light Grey RAL7035	3	6	2	2	2	1	1	1	1	2	1
FKCT 2,5/4-ST GY7035	1700377	Light Grey RAL7035	4		1						1		
FKCT 2,5/5-ST GY7035	1751655	Light Grey RAL7035	5	1		2	4		2				
FKCT 2,5/6-ST GY7035	1751668	Light Grey RAL7035	6	1	2	1	1			3			1
FKCT 2,5/7-ST GY7035	1751671	Light Grey RAL7035	7	1		1	1	1	1		1	1	
FKCT 2,5/8-ST GY7035	1751684	Light Grey RAL7035	8	2	2	2	3	2	3				
board to board		Light Grey RAL7035	4			1	1	1	1	1	1	1	1
ZEC1,0/4-LPV-3,5 GY35AUC2CI1	1751697												
board to wire		Light Grey RAL7035	4										
ZEC1,0/4-ST-3,5 GY35AUC1R1,4	1751710												

Plug set for remote extension IOs

Plug set for connecting remote extension modules (board to wire connection):

POL002.43/STD - S55843-Z024-D100

Look	Type	PhoenixNr	Color	Terminals	Pcs
	ZEC1,0/4-ST-3,5 GY35AUC1R1,4	1751710	Light Grey RAL7035	4	50

Plugs for comm. modules

All **communication modules** POL90X are already equipped with all needed plugs. Plugs for communication modules are all screw-type.

15.3 Service cable (POL68X)

Specific USB-RJ45 cable needed

To connect a PC to POL68X controllers over the USB port, a specific USB-RJ45 adapter cable is needed to access the T-HI connector (Local Service Interface for Tool over USB).

Order number / lengths

The cable POL0C2.40/STD is available for that. The cable is 1.5 m long.

Alternatively the T-IP connector (TCP-IP port) is accessible for operating with SCOPE tool and SAPRO tool by using standard Ethernet cables.

15.4 Demo case

Purpose

The Climatix demo case **POL0G6.87/STD** is designed to work with all Climatix platform controllers. It provides full functional testing and simulates input and output signals for Climatix controllers and associated extension I/O modules. In other words, it can be used to test the complete range of Climatix controller functionally as well as to test the customer application.
Compatible hardware:

- POL68X controllers
- POL63X Extension I/Os
- POL92x, POL94x, POL95x, POL96x, POL98x

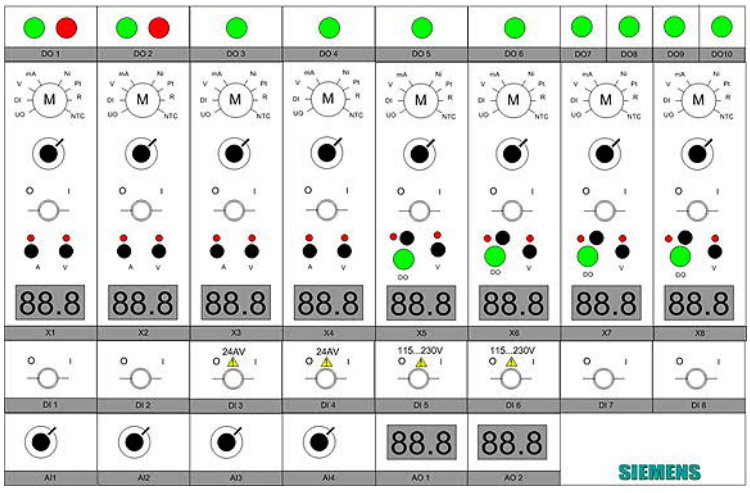
P3903P30

Summary

The demo case includes the front panel and the box:
– The front panel mainly displays Climatix controller inputs and outputs.
– The box operates controller or extension I/O modules.
The power supply for the demo case is 230V or 150V depending on country power supply (select the demo case accordingly). The box includes a transformer from AC 230V to AC 24V or AC 110V to AC 24V.
The controller is installed on a DIN rail in the box.
Various devices can be connected to the I/O demo case channels by manual wiring per specific or customized needs.

Function and I/O list

All the inputs can be operated from the front panel. The LEDs and displays represent Climatix device outputs.



P3903P31

Further information

For detailed information, please refer to operating manual "22_CE1B3978en_UseClimatixDemocase".

15.5 Climatix device selection

Purpose

The information in this chapter is intended to assist the reader on Climatix device selection regarding:

- The number of available inputs and outputs per device
- Signal types provided – fix or configurable

Available I/Os

This table outlines hardware I/Os of the controllers and extension I/O modules:

	POL63X	POL68X	POL985	POL965	POL955	POL945	POL4U/E	POL925	POL96U/E	POL98U/E
B..	–	3	3				–			3
D..	5	2	3					4		3
DU..	–	2					–			
DL..	–	2	2	1			1	2	1	2
X..	8	8	8	8	8	4 *)	3		12	12
Y..	2	–			2			–		
M +/-							1		2	2
Q..	–	2					1			
Q..	6	6	8	4	4	4			4	8
DO..	–	2	2	2					2	2
Total	**21**	**27**	**26**	**15**	**14**	**8**	**6**	**6**	**21**	**32**

*) Can be configured as:
4 digital inputs for potential-free contacts (D..) **or**
2 analog inputs NTC and 2 inputs for ratiometric sensors

Signal types

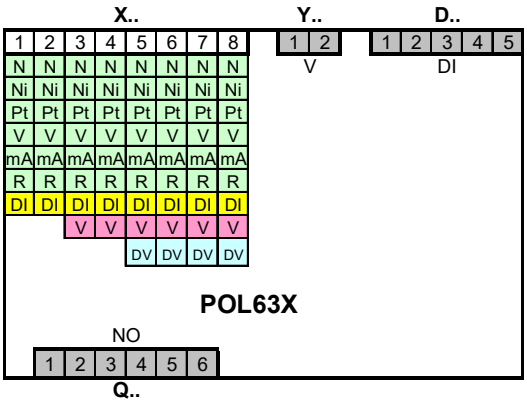
This table outlines available signal types on the hardware I/Os:

Lbl.	Signal type
B..	Analog inputs NTC 10 kΩ and 100 kΩ
D..	Digital inputs DC 24 V (binary) for potential-free contacts
DU..	Digital inputs, galvanically isolated, for AC/DC 24 V
DL..	Digital inputs, galvanically isolated, for AC 115/230 V
X..	Universal inputs/outputs, **configurable** via software as: *Analog inputs:* N: NTC 10 kΩ and 100 kΩ sensors Ni: Ni 1000 sensors Pt: Pt 1000 sensors Ω: 0…2500 Ohm resistance transmitters R: DC 0…5 V for ratiometric sensors V: DC 0…10 V signal mA: DC 0/4…20 mA signal *Digital inputs:* DI: DC 24 V (binary) for potential-free contacts *Analog outputs:* V: DC 0…10 V / 1 mA mA: DC 4…20 mA *Digital outputs:* DV: DC 24 V / 25 mA
Y..	Analog outputs DC 0…10 V, output current 2 mA
M +/-	Bipolar stepper motor output (4 wires)
Q..	Relay outputs for AC 24 V… AC 230 V, NO/NC contact
Q..	Relay outputs for AC 24 V… AC 230 V, NO contact
DO..	Triac outputs AC 24 V… AC 230 V, 0.5A

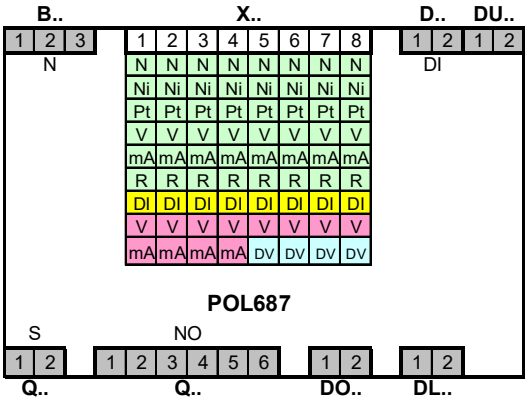
Graphic presentation

Below the available I/Os and signal types for the devices are presented as graphics.

Controller POL63X



Controller POL68X



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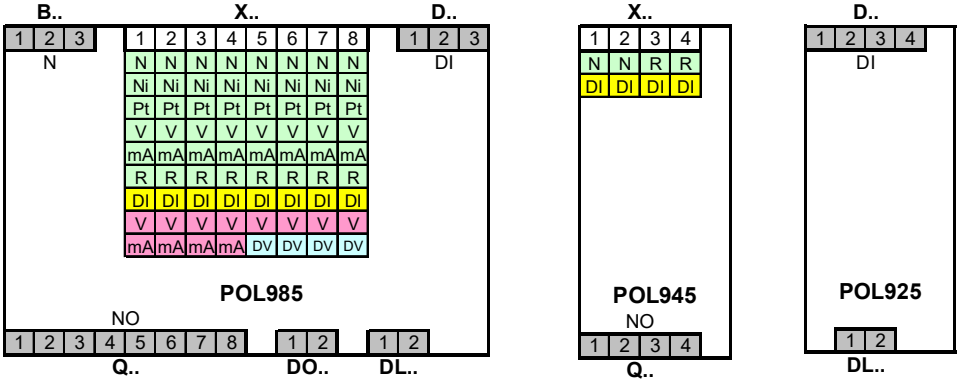

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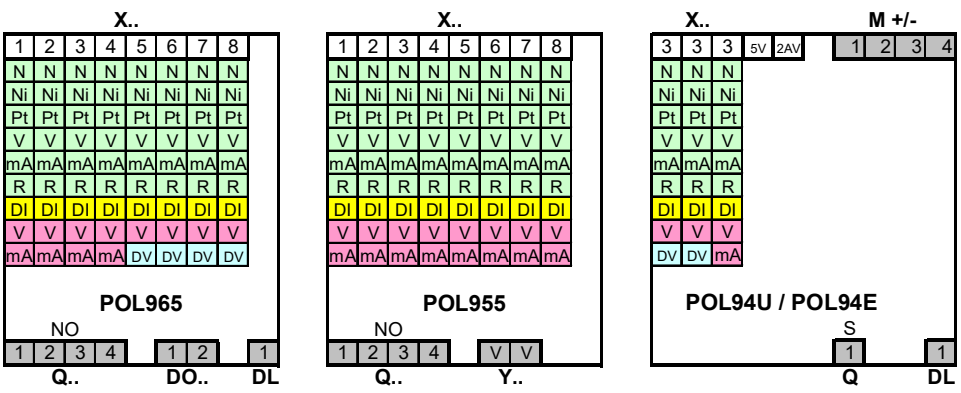

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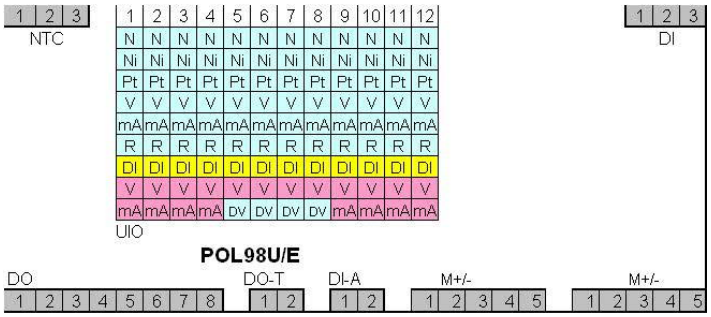

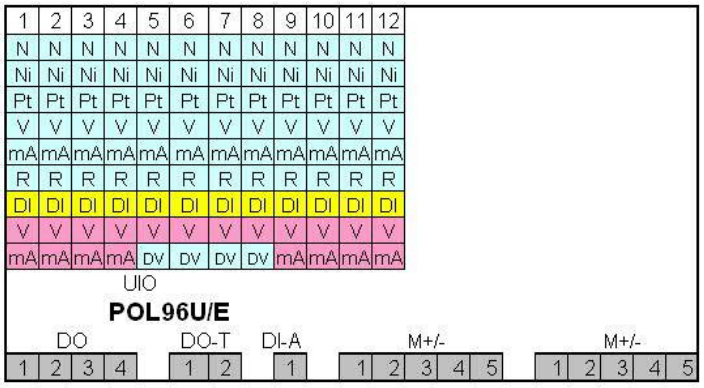

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Siemens Switzerland Ltd
Smart Infrastructure
Global Headquarters
Theilerstrasse 1a
CH-6300 Zug
Switzerland
Tel. +41 58 724 2424
www.siemens.com/buildingtechnologies