

Climatix™

Climatix AHU application

Overview

Siemens Switzerland Ltd
Building Technologies Group
International Headquarters
Gubelstrasse 22
CH-6301 Zug
Tel. +41 41-724 24 24
Fax +41 41-724 35 22
www.siemens.com/sbt

© 2014 Siemens Switzerland
□ All changes reserved

Contents

1	About this document.....	5
1.1	Revision history	5
1.2	Validity	5
1.3	Related documents	5
2	Climatix for air conditioning units.....	7
2.1	Product range	7
2.2	Climatix AHU application.....	8
3	A brief overview of the AHU application	9
3.1	Plant diagram	9
3.2	Operating diagram	10
3.3	Control functions.....	11
3.4	Special features	12
4	System overview.....	13
4.1	Topology	13
4.2	Control devices.....	14
4.3	Communications module.....	15
4.4	Operator units.....	16
4.5	Modbus pressure sensor.....	17
4.6	Tools.....	18
4.7	Integration documentation.....	19
4.8	Accessories	20
5	Configure the AHU application.....	21
5.1	Configuration workflow.....	21
5.2	Configuration elements	22
6	AHU application functions	23
6.1	Overview	23
6.2	Start and stop functions.....	24
6.3	Locking and alarms.....	25
6.4	Dampers and fans controls	26
6.5	Monitoring functions.....	27
6.6	Temperature control.....	28
6.7	Humidity control.....	30
6.8	Auxiliary functions.....	31
Index	33	

1 About this document

1.1 Revision history

Version	Date	Changes	Section	Pages
	14.01.2014	First draft		
	11.02.2014	Small various update		

1.2 Validity

Product

This document applies to the following product:

Name	Version
Climatix AHU application implemented on controllers POL4XX and POL6XX	2.4



The following document includes only information on the product mentioned above. All generally applicable engineering information including installing the modules, communication settings, etc., are available in the documentation listed below.

Product versions

Description and functional scope of the products are based on the Climatix Valid Version Set 9.0 or higher.

Target readers

This document is intended for the following audience:

- System integrators
- Measuring and control technicians
- Sales and commissioning personnel

1.3 Related documents

Document list

The following documents contain additional information on the products described in this manual:

Document	Order no.
"Controllers POL6XX and I/O modules POL9XX", Basic document.	CB1P3903en
"Climatix AHU application", Basic document	CB1P3997en
"Modbus communication, slave mode", Integration guide	CB1J3960en
"Modbus communication, slave mode", reference addresses of Climatix AHU application V2.4	CB1Y3961en
"BACnet/IP communication with POL908.00", Integration guide.	CB1J3962en
"BACnet/MSTP communication with POL904.00", Integration guide.	CB1J3967en
"BACnet/IP communication with POL908.00", Climatix AHU application V2.4 objects	CB1Y3963en
"LON communication with POL906.00", Integration guide	CB1J3964en
"LON communication with POL908.00", Climatix AHU application V2.4 SNVTs	CB1Y3965en
"AWM communication with POL909.50", Integration guide	CB1J3935en
"AWB communication with POL909.80", Integration guide	CB1J3937en

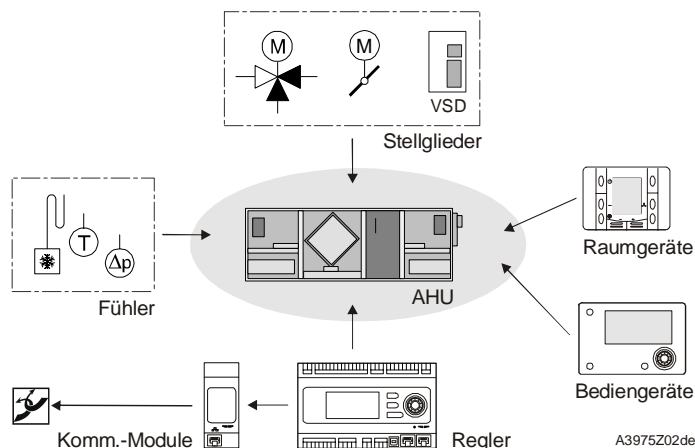
Blank page

2 Climatix for air conditioning units

2.1 Product range

The trend

With the Climatix controller product range for OEM, Siemens is supporting the trend within the industry to integrate measuring and control solutions for air conditioning and refrigeration technology into the devices at the factory and to lower in this way the costs of plant installation and commissioning.



Climatix controller as basis

The Climatix controllers 4XX and 6XX fulfill as the basis the requirements by covering all application segments, specifically including:

- Simple, cost optimized HVAC applications, such as fan coil units.
- More challenging, communicating applications.
- Complex solutions for air conditioning units or cooling units with maximum flexibility with regard to communication and extensions.

Complete product range of air conditioning units

In addition to Climatix controllers, Siemens offers a comprehensive product range to control the entire A/C range. The product range includes:

- Temperature, pressure, humidity, and room air quality sensors
- Actuating devices: Damper actuators, variable speed drives (VFSD) for fans and pumps, comprehensive range of valves and actuators.
- Communication modules for BACnet, LON, Modbus or OPC to integrate superposed systems.

OEM benefits:

- as the sole order source for procurement and logistics
- by being responsible as a sole supplier for the entire control functionality of the air conditioning unit.

Use of measuring and control solutions

Climatix controllers can be loaded with a high functionally measuring and control solution for the particular air conditioning unit. The OEM can select the required functionality via HMI or Web.

Complete documentation

The communication interfaces are prepared and fully document to ensure easy integration in superposed systems using standard communication. In addition, specific integration guides are also available including object description for BACnet, LON, or Modbus. Documents are provided to the OEM as source permitting the OEM to create its own specific documentation.

2.2 Climatix AHU application

Reasons and features

An application was developed to permit a fast time-to-market for the OEM customer and take advantage of Siemens application knowledge and experience in integrating measuring and control facilities in building automation and control systems; it is based on the Climatix OEM controller platform. The features of the application, referred to as the "Climatix AHU application" include:

- Highest level of flexibility of use and measuring and control functions
- Immediate use through simple configuration on the operator unit
- No knowledge or programming required as modifications to functionality or hardware extensions are also made by reconfiguring using the operator unit.

Application pre-loaded

The freely programmable controllers Climatix POL6XX and POL4XX are already loaded at the factory with the Climatix AHU application. The OEM customer can directly parameterize and employ it tailored to its specific measuring and control solutions to the task at hand without additional programming.

Customer benefits

It provides considerable benefits to both the OEM as well as the end customer, specifically:

Requirement	Benefits
Security.	The Climatix AHU application with its broad functionality based on years of experience by Siemens in the corresponding applications. It is certified and tested and documented with the requisite communication interfaces including BACnet, LON and Modbus, OPC, HMI@WEB, AWM Scada and SMS alarms.
Reduce costs	The standardization significantly reduces the costs for OEM. Support expenses are reduced and integration in Siemens or other building automation and control systems is guaranteed.
Flexibility	The Climatix AHU application is distinguished by the highest level of hardware and functionality. It meets the various requirements for plant types and measuring and control functionality.
Documentation	The application, devices, and parameters as well as communications interfaces are already documented as per the various target users (end users, system integrators, etc.). They do not need to be newly created on a project-by-project basis.

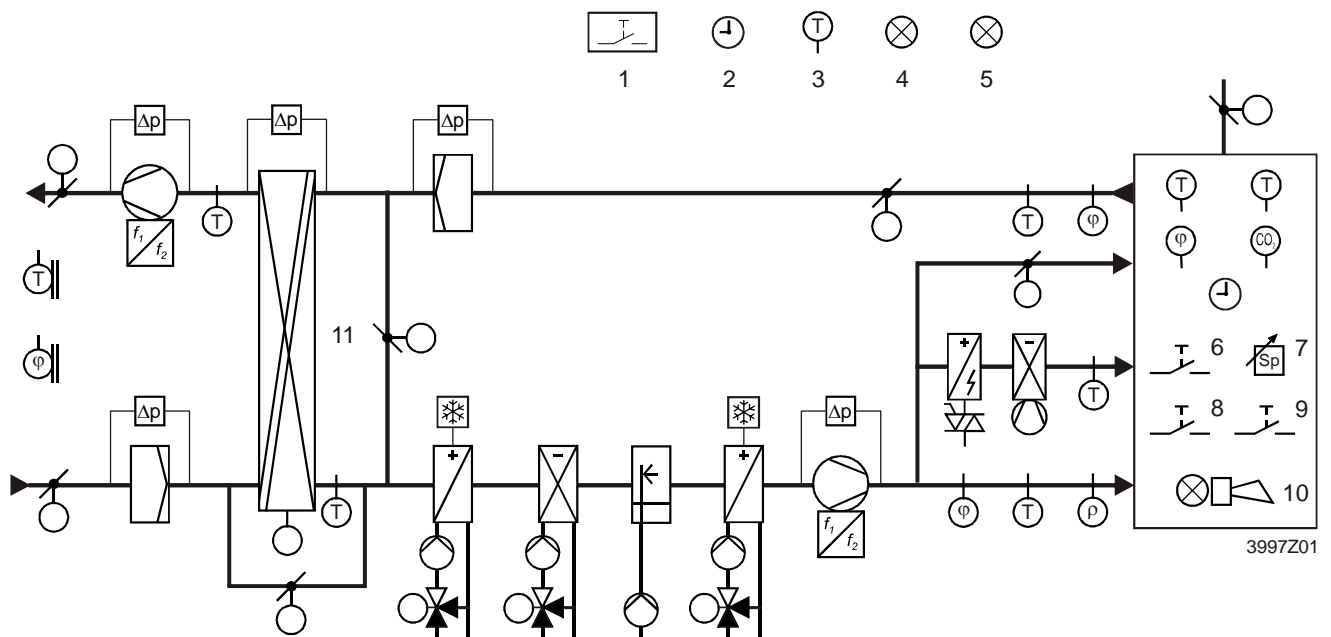
3 A brief overview of the AHU application

3.1 Plant diagram

Structure and elements

The Climatix AHU application includes all standard as well as a number of special control and monitoring functions for ventilation and air conditioning units (AHUs). The following diagram illustrates:

- The fundamental plant design equipped with the maximum number of air handling units.
- Devices that can be connected externally to implement the desired control and display functions.



Key

The above plant elements are:

Pos. Element

- 1 Fire detector
- 2 Scheduler
- 3 Free temperature sensor
- 4 Free alarm display
- 5 Display of a specified operating mode.
- 6 Occupancy button
- 7 Setpoint settings
- 8 Emergency button
- 9 Acknowledge alarm
- 10 Alarm display
- 11 Heat recovery:
Rotary heat exchanger, plate heat exchanger, water heat exchanger

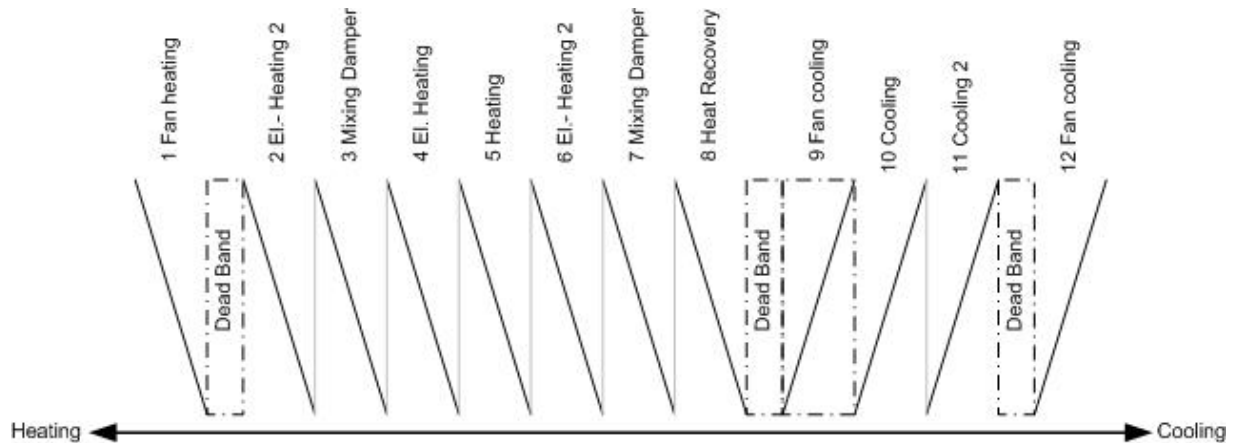
Selection and configuration

The units used in this example as well as the required sensors and functions are selected and configured accordingly using the Climatix operator unit HMI or via Web browser (HMI@WEB).

3.2 Operating diagram

With all aggregates

The figure displays a schematic of all possible sequences included in the application. Individual sequences and series are set automatically during configuration or for sequence 2/6(a) "El heating2", 3/7(b) "Mixing dampers", 9/12(c) "Cooling coils" by configuring the sequence.



Key

1	Heating coil	8	Heat recovery
2	Heating2 or Electric heating2 (a)	9	Cooling coils (c)
3	Mixing dampers (b)	10	Cooling
4	Electric heating	11	Cooling 2
5	Heating	12	Cooling coils (c)4
6	Heating2 or Electric heating2 (a)	DB	Dead zone
7	Mixing dampers (b)		

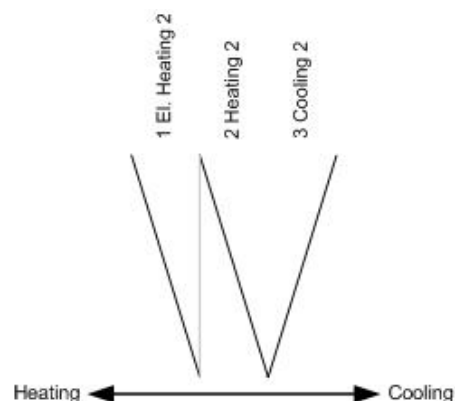
Liberties

The following liberties apply to placing units and assigning dead zones:

- Mixing dampers may be placed at various locations.
- Cooling coils may be placed at various locations.
- The dead zone between heating and cooling can be edited.
- Heating and cooling coils have their own adjustable dead zones.

Aggregate 2

All aggregate 2's can be configured in the normal sequence (top) or as its own sequence (bottom):



Key

1	Electric heating 2
2	Heating 2
3	Cooling 2

3.3 Control functions

Overview

The following table provides an overview of important control functions for the various plant areas:

Plant area	Control functions
Plant control	<ul style="list-style-type: none"> • Start and stop conditions • Operating modes (scheduler catalog, special operating modes auto or manual)
Dampers	<ul style="list-style-type: none"> • Fresh air and exhaust air damper control. • Fire damper control with auto test function.
Fans	<ul style="list-style-type: none"> • Stepped (maximum 3 steps) or frequency controlled or modulating analog controlled fans. • Extract air fan can be disabled. • Modbus driver for EBMPapst fans, including parameterization (no additional tool required) • Modbus drive for Danfoss and Siemens Sinamics VSDs
Temperature	<ul style="list-style-type: none"> • Supply air, room and return air and cascade control with optional limitation of supply air. • Summer/winter compensation of setpoint. • External setpoint default or setpoint shift. • Plant start of plant when room temperature with separate setpoint is too low (too high) – in spite of off (standby).
Heat recovery	<ul style="list-style-type: none"> • 4 variants for heat recovery • Cooling recovery.
Heating register	<ul style="list-style-type: none"> • Control 4 heating registers: <ul style="list-style-type: none"> □ 2 warm water, 2 electric registers (with up to 3 steps, or 0-10V DC) with up to 3 included in the heating sequence. • Limitation of electric register dependent on fan speed (stage). • Preheat function for hot water register, including frost sensor and/or frost detector
Cooling register	<ul style="list-style-type: none"> • 2 cooling registers (cold water or up to 3 stages or analog DX). • Limitation of direct expansion evaporator dependent on fan speed (stage). • Shut off cooling register when the outside air temperature is too low.
Humidity	<ul style="list-style-type: none"> • Humidification or dehumidification using humidifier or cooler. Humidity deviation alarms.
Air quality	<ul style="list-style-type: none"> • Increase or reduce the flow of outside air using fan speed or mixing air dampers.

3.4 Special features

In focus: Functions and handling

The Climatix AHU application has a series for special features including functions, placement of inputs/outputs, and flexibility for easy and safe handling:

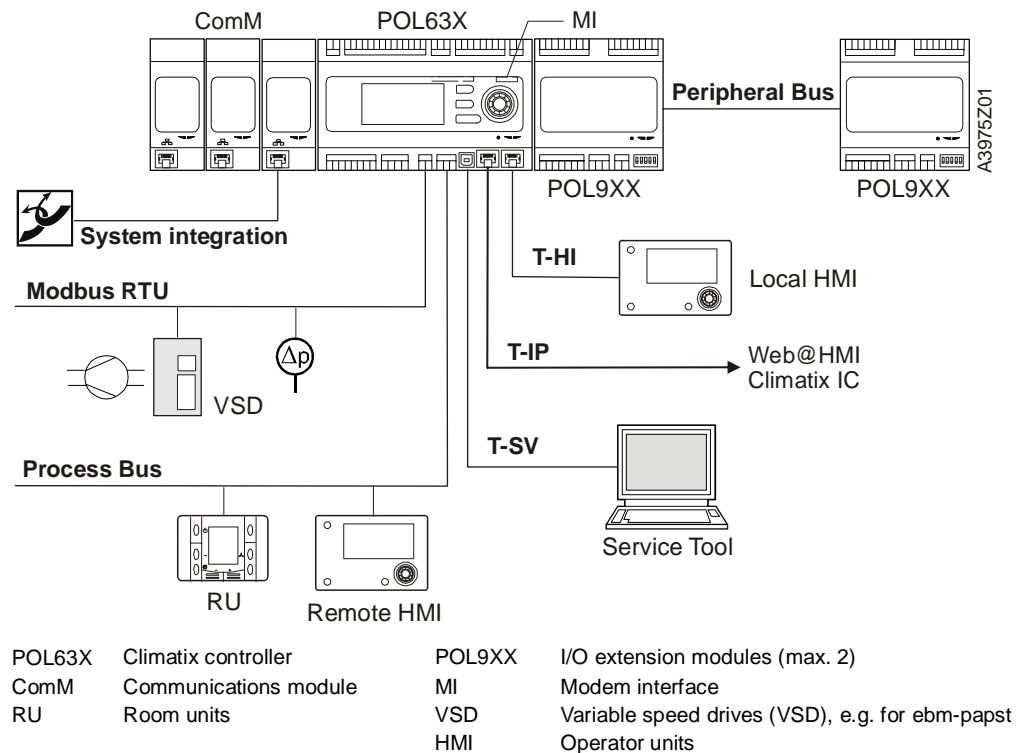
Topic	Special feature
Functions	All the functions as well as the inputs and outputs can be freely selected and configured for the desired functionality without any programming. Unused functions are not displayed in the HMI or communications.
Inputs and outputs	Free placement of all inputs and outputs. Up to two extension modules can be connected to the controllers (for a total of 49 inputs and outputs). Inputs and outputs can also be configured for communications. The specific documentation for the applicable communications protocol provides the exact information on supported inputs and outputs.
Sensor types	All sensor types for temperatures can be selected. (Pt1000, LGNi1000, Ni1000, NTC10k, Modbus sensors). The ranges for active sensors (0-10V) can be freely selected.
I/O check	In integrated I/O check outputs alarm texts if the same placement is used for two or more inputs/outputs or in the event that an input/output was not assigned space. The associated clear text can be determined using diagnostic tables and the required changes made accordingly.
Unibus	Bus-capable field devices such as sensors, actuators, dampers, but fans and variable speed drives as well can be easily selected and controlled directly accordingly. Supported devices: <ul style="list-style-type: none"> – Siemens QBM68/69 Pressure/flow sensor – Siemens Sinamics variable speed drive – Danfoss variable speed drive – EBM Papst EC Fan – Energy Meter EM24 from Carlo Gavazzi
EBM Papst Set up	EBM FAN GreenTec fans are configured directly via the Unibus (Modbus) without the need for an additional EBM configuration tool.
Configuration	"Configuration Guide": Functions that are not possible, e.g. due to a sensor not being connect, cannot be enabled. The device is easily configured through the HMI or on a PC.
Updates and data backup	The application can be easily updated via SD card as needed. An SD card can also use for backups and to save parameter settings.
History/archiving	Integrated function is available for the selected values.
PC service tool	USB port for easy, standard connection to the PC. One PC service tool (Scope Light) is available for easy commissioning and simple report handling.
Own default settings	Own default settings can be easily downloaded via PC or SD card.
HMI	HMI operates in multiple languages and password levels (as an option in the HMI integrated on the controller).

4 System overview

4.1 Topology

Maximum configuration

The figure displays the maximum possible configuration of the Climatix AHU applications as described here, to include all pin examples:



Interfaces

We distinguish between the following:

- Onboard interfaces directly on the controller and
- communication modules for system integration.

Onboard interfaces

Designation	Purpose
Modbus RTU	Modbus slave or masters, for example, to control Siemens VSDs.
Process bus	Siemens specific bus to connect HMIs, etc.
Peripheral bus	Internal bus to connect I/O extension modules.
T-SV	Tool interface with standard USB plug.
T-IP (Option)	Ethernet connection (TCP/IP) for tool, Internet, Climatic IC (Cloud based remote servicing), Modbus/TCP slave, OPC, FTP.
T-HI	Local service interface (USB / RS485) for HMI and Tool.
MI	Modem interface (RJ45/RS232) for remote service tool.



Communication modules for system integration.

Up to three communication modules can be used at the same time. Types and descriptions, see Sec. 4.3 "Communications module".

4.2 Control devices

Basis controllers

The Climatix AHU application is an all-in-one application programmed using the SAPRO Tool. It operates on the Climatix controllers POL63X and POL64X. The most important differences to properties are:

Device	Properties
POL63X 	<ul style="list-style-type: none"> The user loads the application on the controller. 49 inputs and outputs are available on the basis controller and the maximum of 2 connectable extension modules POL955.00/ALG. Max. 3 communications modules can be connected to integrate a building automation and control system.
POL42X 	<ul style="list-style-type: none"> Application with preset plant types is loaded at the factory. 21 inputs and outputs are available on the basis controller. No extension modules can be connected.

Sensor types

Numerous sensor types and signals are supported to fulfill the widest range of different requirements:


- Pt1000, LGNi1000, Ni1000, NTC10k
- 0...10 V
- Modbus sensor

The areas for active sensors can be freely selectable.

I/O extension modules

Climatix offers a selection of I/O extension modules with various types of inputs and output in different numbers.








The Climatix AHU application supports the use of a maximum of 2 POL955.00/STD to fully meet air conditioning plant requirements.

Device	Properties
POL955.00/STD 	<ul style="list-style-type: none"> Connect to controllers via the periphery bus. No additional power required. Addressing via DIL switch. 8 universal inputs/outputs. 2 analog outputs. 4 digital relay outputs.

4.3 Communications module

Types/features

The table below lists the different types and features:




Illustration	Type	Properties
	POL902.00/STD MODBUS RTU (RS485)	<ul style="list-style-type: none"> • Supports 2 Modbus slave communication ports • Galvanically separated connection to the Modbus network. <p>For details, see document number J3960en and Y3961en CB1P3934en.</p>
	POL904.00/STD BACnet/MSTP	<ul style="list-style-type: none"> • Supports BACnet MS/TP (B-BC profile) at the various Baud rates. • Network parameters can be configured via controllers, HMI, and Scope. • Preinstalled, generic BACnet server • Supports alarms and scheduler programs. <p>For details, see document number J3967en and Y3963en CB1P3933en.</p>
	POL906.00/STD LON	<ul style="list-style-type: none"> • Includes a LON network controller (Neuron Chip) that takes care of the LON network protocol and the user application. • Galvanically separated connection to LON network via TP/FT-10 Transceiver. • A standard LON tool in Flash memory can load user applications. • Set up via LON. <p>For details, see document number J3964en and Y3965en CB1P3931en.</p>
	POL908.00/STD BACnet/IP	<ul style="list-style-type: none"> • Supports BACnet/IP (B-BC profile, BBMD) • Preinstalled, generic BACnet server • Client communication to other BACnet devices. • Network parameters can be configured via controllers, HMI, and Scope. • Supports alarms and scheduler programs. <p>For details, see document number J3962en and Y3963en CB1P3933en.</p>
	POL 909.50/STD Advanced Web Module	<ul style="list-style-type: none"> • Complete Windows CE 5.0 with web server. • Tree viewer to read and write data. • SCADA package with configurable plant and trend views. • Modem interface <p>For details, see document number J3935en CB1P3935en.</p>
	POL 909.80/STD Advanced web and BACnet module	<ul style="list-style-type: none"> • Combines the functionality of the POL909.50 with that of POL908.00. • Complete solution to operate and monitor plants via a web browser and/or a BACnet/IP network. <p>For details, see document number J3937en CB1P3935en.</p>
	POL0L9.00/STD Remote OPC server	<ul style="list-style-type: none"> • Remote OPC server connection via integrated IP port or modem. • 2 different licenses (small or large). <p>For details, see document number CE1A3975en.</p>

4.4 Operator units

External operator units HMIs

The external operating units HMI configures and parameterizes the controllers POL63X and POL42X loaded with the Climatix AHU application.


There are three types of operator units available:

Type	Illustration	Properties
HMI-DM POL895		<ul style="list-style-type: none"> 8-line display with selectable backlight (bl/ws). Combined press/rotary knob for comfortable operation Alarm button with LED display Supports local or remote installation IP 31
HMI-TM POL871		<ul style="list-style-type: none"> 8-line, high-resolution display (240 x 128 pixels) 6 keys for easy operation ALARM, INFO and CANCEL keys with LED indicators Version POL871.71 for magnetic mounting; can be used as handheld unit. IP 65
Web@HMI		<ul style="list-style-type: none"> Available with POL638 or together with AWM (POL909.xx). Same look and feel as HMI-DM or HMI-TM Same user access level as HMI-DM or HMI-TM Remote parameterization via standard web browser. Menu screens can be used for documentation (print screen)

Identical menu structure

The menu structures of the three operator units are identical. The design of the operating elements and functions match at about 90%.



Room unit

Type	Illustration	Properties
POL822.60		<ul style="list-style-type: none"> Room unit with temp. sensor. Displays and settings for temperature, fan stage, time, weekday, etc. Scheduler Alarm display

4.5 Modbus pressure sensor

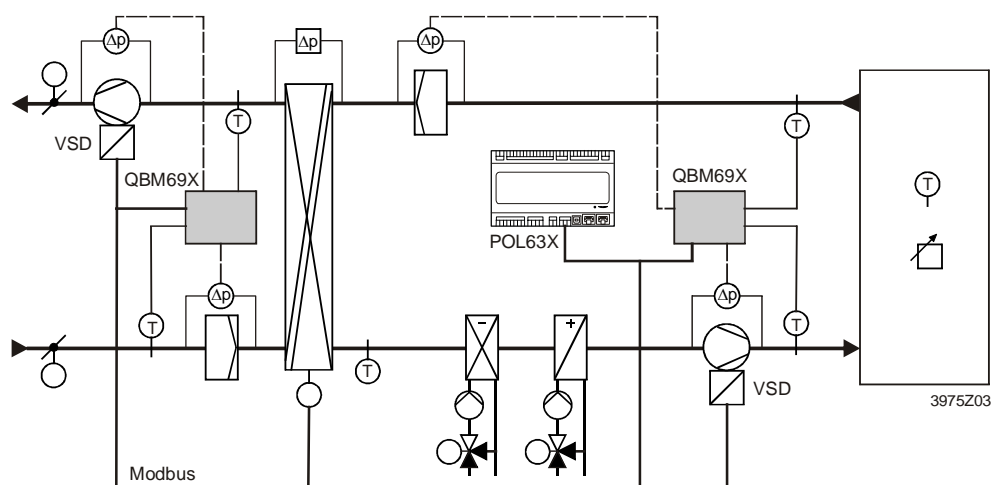
Two types

The differential pressure measuring transducers with Modbus output signal listed below are well suited for use with the Climatix AHU application. A DIL switch is used to assign the address. Additional engineering normally not required.

Type	Illustration	Properties
QBM68.X		<ul style="list-style-type: none"> Differential pressure measuring transducer Pressure-linear characteristic with selectable pressure measuring range. Operating voltage: AC 24 V or DC 15...36 V. Output signals: Modbus RTU and 0...10 V. Simple and fast mounting. Maintenance free Calibrated and temperature-compensated measured signal.
QBM69.X		<ul style="list-style-type: none"> Differential pressure measuring transducer Pressure-linear characteristic with selectable pressure measuring range. Operating voltage: AC 24 V or DC 15...36 V. Output signals: Modbus RTU 0...10 V. Accessory (option): 2 Temperature sensor, analog (LG-Ni1000, PT1000 or NTC10K). Maintenance free Calibrated and temperature-compensated measured signal.

Application example

The plant diagrams below illustrate an example for using the Modbus pressure sensor in a Climatix AHU application:



POL63X Climatix controller

QBM69.X Differential pressure measuring transducer
VSD Variable speed drives (VSD), e.g. for ebm-papst

4.6 Tools

Factory tool

The Climatix "Factory tool" support the OEM with its manufacturing process. It is matched to the Climatix AHU application.



The tool supports the OEM as follows:

- Loads all required files to the Climatix controllers.
- Configuring the controller and the application
- Creating plant diagrams
- Interface to define the required configuration from an OEM selection program.
- Create documentation specific to the configuration.

The "Factory Tool" is available upon request at Siemens OEM.

SCOPE Light

SCOPE Light is a supported service tool.



It simplifies commissioning the Climatix AHU application as follows:

- The SCOPE Light user sees the most important operating values, setpoints, inputs /outputs and can edit them accordingly.
- In addition, the user has a trend viewer plus an archive viewer at his or her disposal and can download programs as well as upload parameters.

4.7 Integration documentation

Document list

Various documents are already prepared on integration in a building automation and control system to reduce the cost of integration:

Topic/document	Order no.
Modbus	
Modbus Integration guide	CB1J3960de/en
Modbus data points	CB1Y3961de/en
BACnet	
BACnet/IP Integration guide	CB1J3962de/en
BACnet MS/TP Integration guide	CB1J3967de/en
AWB Integration guide	CB1J3937de/en
BACnet IP-MS/TP data points	CB1Y3963de/en
BACnet PICS Statement	CB1P3939de/en
LON	
LON Integration guide	CB1J3964de/en
LON SNVT list	CB1Y3965de/en
AWM	
Integration guide AWM	CB1J3935de/en
AWM SCADA package	CB1P3935de/en

4.8 Accessories

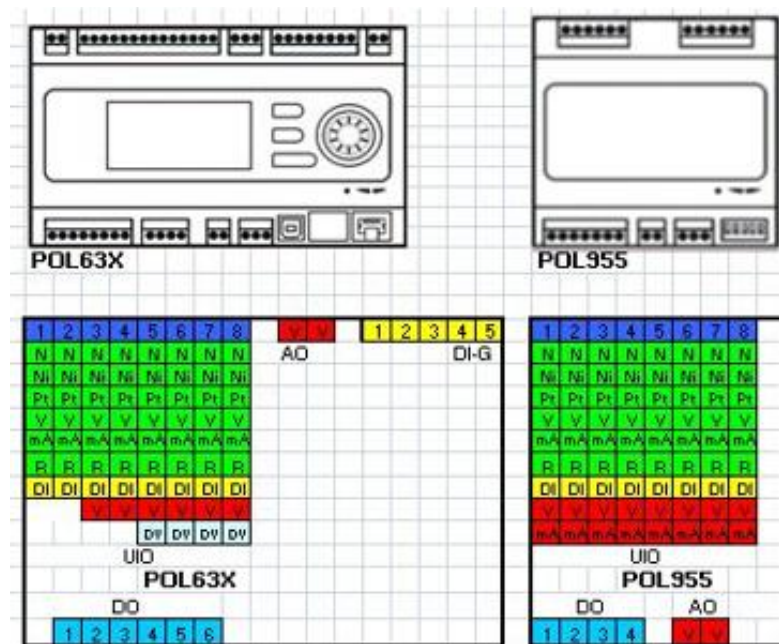
Demo case

We recommend using a Climatix demo case to test the specific configuration of the Climatix AHU application in the office. The case allows you to simulate all inputs/outputs using real values (Potentiometer) and test for correctness.



Sizing tool:
I/O Excel worksheet

Siemens provides an Excel file to enter the appropriate sensors and signals to get an overview of available inputs/outputs on a Climatix controller.

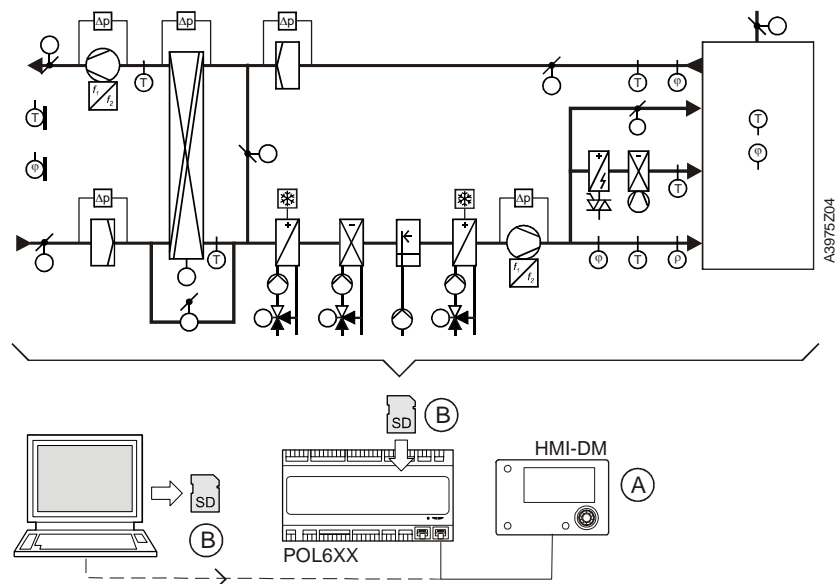


5 Configure the AHU application

5.1 Configuration workflow

Introduction

Below is a rough illustration on configuring the Climatix AHU application as per the available plant as well as a selecting and parameterizing the associated functions:



Two possibilities

There are two ways to configure a Climatix controller:

- Create a new configuration via the HMI or HMI@Web (A).
- Download a previously created and tested configuration file via PC or SD card (B).

New configuration

During configuration, the desired plant is designed in 6 steps:

Step	Designation	Tasks
1	Configuration 1	Enter the basic settings for the plant: General, sensor, plant parts, and functions.
2	Configuration 2	Determine sub-functions on partial plants, e.g.: Free cooling no/yes, fan control type, establish the controller sequences, alarms, etc.
3	Configuration IOs	Assign the just defined functions/IOs to the hardware. Parameterized sensor conversions. Check I/O configuration.
4	Configure fans *)	The supply air and extract air fans are sent the startup parameters if an EBM-Papst fan (Modbus control) is selected. The use is guided by dialogs. *) Required for EBM-Papst fans only.
5	I/O check	The selected overall configuration is automatically checked for correctness, e.g. whether all required inputs/outputs are connected to the hardware I/O.
6	Wiring test	Check panel wiring: Inputs are displayed, outputs can be forced.

The Climatic controller is ready to start the A/C unit once all the steps above are successfully completed.

5.2 Configuration elements

Plant elements and BACS equipment

The controller can be configured for a large number of plant elements and control equipment as well as the functions required to this end.

Hardware related functions:

- Number of extension modules
- Connected sensors
- Various types of fan control
- Damper functions
- Type of heating, heat recovery, and cooling with options such as pump control and alarm for each sequence.

Control functions:

- Scheduler program, functions, and stages.
- Various types of control.
- Various types of setpoint handling.
- Various compensation.
- Night (unoccupied) functions.

Alarms:

- Fire functions
- Alarm outputs

Auxiliary functions:

- Special display functions
- Switch or control independent devices

Features

The following features are useful configuration tool:

- In integrated I/O check outputs alarm texts if the same placement is used for two or more inputs/outputs or in the event that an input/output was not assigned space.
The associated clear text can be determined using diagnostic tables and the required changes made accordingly.
- The plant remains locked against switch on until configuration is complete and all inputs and outputs are assigned a space.
- All settings can be saved in two different storage areas: One for factory settings and one for commissioning settings. They can be edited later as needed.

6 AHU application functions

6.1 Overview

Introduction

The Climatix AHU application includes all common as well as specific BACS functions to control simply compact air conditioning units as well as complete air conditioning plants.

This section provides a brief listing of the most important function groups and their functions.

Function groups and functions

Start and stop functions

- Start/stop
- Start sequence
- Optimum start (OSSTP)

Locking and alarms

- Locks
- Fire alarms

Dampers and fans controls

- Damper control
- Fan control

Monitoring functions

- Frost protection
- Flow monitoring
- Filter detector
- Filter sensor

Temperature control

- Variants (control strategies)
- General options
- Frost protection
- Night cooling.
- Temperature start (unoccupied)
- Cooling recovery
- Recovery efficiency
- Alarm display

Humidity control

- Variants (control strategies)
- General options

Auxiliary functions

- Miscellaneous
- Auxiliary functions
- Energy meter.

Note

Details descriptions are available in manual CE1P3997en.

6.2 Start and stop functions

Start/stop

Options	Functions
Scheduler program	<ul style="list-style-type: none"> – A scheduler program and data control the supply air and exhaust air fans. – Changeover between stage 1, stage 2, and stage 3 as per the scheduler program and/or external inputs.
External	<p>The controller can override the scheduler program. Variants:</p> <ol style="list-style-type: none"> 1) An external time switch or presence detector activates an extended runtime. 2) An external button or room unit activates the extended runtime as per the time set on the controller. 3) An external switch or room unit can start or stop the air conditioning unit.
Manual	<ul style="list-style-type: none"> – The unit or plant can be started or stopped using parameters via the HMI. – All outputs can also be overridden in this manner. An alarm is triggered after a set period.
Pumps and other devices	<ul style="list-style-type: none"> – The heating pump is started if the valve is open or the outside temperature drops below the set value. The cooling pump is started if cooling is required. – The recovery pump is started if recovery is needed. – The controller switches on all pumps after a defined idle period (pump kick). – Refrigeration machines (direct expansion evaporators) are started if cooling is required.

Start sequence

Options	Functions
Low outside temperature	The heating valve is fully opened for a defined period if the outside temperature is below the set value when switching on the plant. The valve then moves to the position as per the outside temperature, the fans start, and the controller assumes the present position.
Exhaust air fan and mixed air damper	For heat recovery with mixed air dampers, the exhaust air fan is started before the supply air fan, together at 100% recirculated air . Control becomes active after a set period.
Exhaust air fan and heat exchanger	For heat recovery with heat exchange, the exhaust air fan is started before the supply air fan, together at 100% heat exchanger . Control becomes active after a set period.
Supply air fan	Control starts with the supply air fan.

Optimum start (OSSTP)

Options	Functions
Plant start (at time)	The plant is started by a specified period (fix) prior to the set time so that the room temperature setpoint can be reached at the start of occupancy. During the ramp up, the valves are controlled via supply air control using its own setpoint and full heat recovery requested.
<i>Plant start (in the future)</i>	<i>The plant start time should be calculated so that the room temperature setpoint is achieved at the start of occupancy. During ramp up, the valves are fully opened and full heat recovery is requested.</i>
Heat recovery with recirculated air dampers	Dampers and exhaust air fans can be blocked if recirculating air dampers are used.

6.3 Locking and alarms

Locks

Options	Functions
Plant in general	<ul style="list-style-type: none"> – Alarm class A (0) stops the plant without delay. – Alarm class A (1) stops the plant with delay (for exceeding, etc.). – Alarm class B (2) and C (3) do not stop the plant.
Via the pump	The plant is locked via the pump, if the outside temperature is below the set value or, if the valve is fully opened.
Via flow sensor	The plant is locked via a flow sensor or flow detector, if the flow is below or above the setpoint. The lock is blocked when the plant is switched off or upon start.
Via pressure sensor	The plant is locked via the pressure sensor, if pressure is below or above the setpoint. The lock is blocked when the plant is switched off or upon start.
Electrical register	<ul style="list-style-type: none"> – The electric register's safety thermostat is locked and the plant stopped. – The output signal for the electric register can be limited for each fan stage to prevent overheating.
Refrigeration machines	<ul style="list-style-type: none"> – Refrigeration machines are locked if the plant is switched off. – The output signal can be limited for each fan stage.
Dehumidification	Dehumidification is locked if the supply air fan is switched off.
Humidification	Humidification is locked if the supply air fan is switched off.

An alarm is triggered if execution of commands to fans, pumps, and dampers is not confirmed by a feedback signal.

Fire alarms

Options	Functions
Alarm from fire detectors	<ul style="list-style-type: none"> – The plant stops or starts together with the desired fan as per the settings if an alarm arrives from a fire or smoke detector. – The dampers following the impacted fan.
External alarm	An external fire alarm or exceeding the top limit value at the supply air or return air sensor cause the same actions as described above.

6.4 Dampers and fans controls

Damper control

Option	Functions
Standard	<ul style="list-style-type: none"> – The outside (supply) air damper is opened prior to starting the supply air fan and closed for stop after a set period. – The exhaust air damper is opened prior to starting the exhaust air fan and closed for stop after a set period.
Fan start delay	The fan is only started after receiving an "open" signal from the dampers without a specified period.
Alarm from fire detectors	<ul style="list-style-type: none"> – The plant stops or starts together with the desired fan as per the settings if an alarm arrives from a fire or smoke detector. – The dampers following the impacted fan.
Fire protection dampers	<ul style="list-style-type: none"> – Fire protection dampers can be tested manually or automatically, either by date/time or time interval. – The plant is stopped during the test and the dampers closed and opened as per the settings. – An alarm is triggered if no corresponding feedback occurs from the dampers.

Fan control

Variants

Supply air and exhaust air fan can be controlled to the desired speed in stages or via variable speed drives (variable or fixed frequency).

Variant	Functions
1) Pressure	Supply air and return air pressure is controlled via the variable speed drive to the entered setpoint.
2) Flow	Supply air and return air flow is controlled via the variable speed drive to the entered setpoint.
3) Supply air pressure and flow	Supply air pressure is controlled via the variable speed drive to the entered setpoint. The supply air flow is measured and the exhaust air flow is controlled via the variable speed drive to the same flow (+/- setpoint).
4) Return air pressure and flow	Return air pressure is controlled via the variable speed drive to the entered setpoint. The return air flow is measured and the supply air flow is controlled via the variable speed drive to the same flow (+/- setpoint).

Fan control

Options

Option	Functions
Compensate for air quality	The fan speed and/or position if the mixed air dampers is influenced based on air quality.
Compensate for room temperature	The fan speed is influenced based on room temperature as per the settings.
Compensate for room humidity	The fan speed is influenced based on room humidity as per the settings.
Compensate for outside temperature	The fan speed is influenced based on outside temperature as per the settings.
Staged fans	Compensation switched entire stages for staged fans. Stage 2 and 3 are blocked, however, if the outside temperature drops below a specific value.
Display	Supply air and return air flow are calculated separately.

6.5 Monitoring functions

Frost protection

Options	Functions
Integrated frost protection controller	<ul style="list-style-type: none"> – The integrated frost protection controller overrides the heating controller via the sensor placed in the return and takes over valve control and starts the pump if the outside temperature drops below a set value. – The plant is stopped if the temperature continues to fall and an alarm is triggered. – The water temperature is maintained at a set value for as long as the plant is switched off.
External frost protection	<ul style="list-style-type: none"> – The plant stops if an external frost protection device or frost detector responds.

Flow rate supervision

Options	Functions
Differential pressure sensor	<ul style="list-style-type: none"> – An alarm is triggered if the differential pressure over one the fans drops below the set value and the plant is stopped. – The function is locked if the plant is switched off or during start up.
Flow rate detector	<ul style="list-style-type: none"> – The plant is stopped if the flow above the supply air or exhaust air fan drops below the set value. – The function is locked if the plant is switched off or during start up.
Fan alarm	An alarm from a supply air or exhaust air fan stops the plant.
Operating hours alarm	An alarm is triggered if the operating hours counter for the supply fan exceed the limit value.
Deviation alarm	An alarm is triggered if the present pressure or flow deviates from the setpoint by more than a specific value.

Filter detector

Filter detector in the supply air and return air duct triggers alarms if the pressure exceeds the high limit.

Filter sensor

Filter sensor in the supply air and return air duct triggers alarms if the pressure exceeds the high alarm limit.

6.6 Temperature control

Temperature control variants

Variant	Functions
1) Supply air temp.	The supply air temperature is controlled to the set value.
2) Room temp. with cascade	<ul style="list-style-type: none"> – The room or return air temperature is controlled to the set value. For deviations, the setpoint for the supply air temperature is compensated as per the cascade function. – The supply air temperature is limited to a minimum and maximum value. The maximum limitation can also follow the room/return air temperature.
3) Supply air or cascade	The plant operates in winter with supply air control, in summer with cascade control.
4) Room temp./min/max x SA	<ul style="list-style-type: none"> – The room or return air temperature is controlled. – The supply air temperature is limited to the min/max values.

Temperature control General options

Option	Functions
Setpoint selection	The Economy/Comfort setpoint is defaulted via the scheduler program or external input.
Measuring methods	Minimum, maximum, or average temperature for up to two room unit/room sensor are used for control.
Alarm states	An alarm is triggered on an operating plant if the deviation of supply air and room/return air temperature is too large.
Su/Wi compensation	The outside temperature lowers or increases the setpoint of the primary controlled variable as per the settings made.
Dew point	The supply air temperature is limited to a minimum value as per the current dewpoint temperature.
Override main setpoint	The main setpoint is compensated or overridden by an external setpoint default, potentiometer, or room unit.
Air quality	Mixing dampers control the air quality.

Temperature sequences

The following sequences are processed as the temperature drops:

Pos.	Device/action
1	* Valve for cooling register or refrigeration machine (analog + 3 stages).
2	** Valve for cooling register or refrigeration machine (analog + 3 stages).
3	The fan speed is increased if cooling is required (can be placed as the first stage of the sequence).
4	Rotary hygroscopic thermal wheels, damper plate heat exchanger, or valve water heat exchanger.
5	Mixing damper (can be placed in the sequence after the heating valve).
6	** Heating valve
7	Electric register (analog + 3 stages).
8	* Heating valve or electric register (analog + 3 stages).
9	Fan speed is reduced if heating is required
* As an alternative, this can be an own sequence with own temp. sensor and setpoint, such as a preheater or a zone control:	
Pos.	Device/action
1	Valve for cooling register or refrigeration machine (analog + 3 stages).
2	Heating valve.
3	Electric register (analog + 3 stages).
** The outputs can be combined (Combi Coil) with only one of the outputs being active at one time via the default setpoint and outside temperature or digital switch.	

Temperature control, *Continued*

Frost protection

Option	Functions
Exhaust temp.	The damper/heat exchange wheel is controlled if the exhaust temperature drops below the entered setpoint.
Pressure supervision	The damper/wheel speed is overridden at a set value until the pressure is OK if pressure supervision for heat recovery determines that the pressure is too high.
Pressure sensor	The damper/heat exchange wheel is controlled if the pressure at the heat recovery sensor exceeds the setpoint.
Water temperature.	The water temperature in the heat recovery system is limited to a set value to prevent frost.

Night cooling.

Option	Functions
Standard	<ul style="list-style-type: none"> – "Night cooling is started if the room temperature exceeds the setpoint or the return air temperature exceeds setpoint during the daytime and if the outside temperature exceeds the setpoint and the difference between the outside and room temperature is greater than the set value. – The function is enabled 12 hours prior to normal start. It is stopped if the start conditions are no longer met, but not before the set minimum runtime. – The temp. sequence is locked during night cooling.
Night cooling required?	If only a return air sensor is used as an alternative, the plant starts at night to determine whether night cooling is needed.

Temperature start (unoccupied)

Option	Functions
Standard	The plant is started if the room temperature drops below or exceeds the setpoint at night by a specific value. During this period, supply air control is ramped up with fixed, assigned setpoints for heating/cooling, full heat recovery is requested, and the value are controlled. The function stops after a set, minimum runtime, if the room temperature is once again ok.
Return air damper used	Supply air damper and exhaust air fan can be locked if a return air damper is used.
Temperature - Start required?	If only a return air sensor is used as an alternative, the plant starts at night to determine whether this function is needed.

Cooling recovery

Full cooling recovery is enabled if the outside temperature exceed the return air temperature by a set value and cooling is required.

Recovery efficiency

Option	Functions
Efficiency	Recovery efficiency is calculated from the return air temperature, outside temperature, and exhaust air and supply air after heat recovery.
Alarm	The alarm is blocked if recovery is less than 100% or the difference between outside air and return air temperature is less than 5 degrees or the plant is "OFF".

Alarm display

The alarm outputs are enabled for display of High (A) and/or Low (B) alarms.

6.7 Humidity control

Variants

Variant	Functions
1) Supply air humidity	The supply air humidity is controlled to the set value.
2) Room humidity with cascade	<ul style="list-style-type: none"> – The room air humidity is controlled to the set value. For deviations, the setpoint for the supply air humidity is compensated as per the cascade function. – The supply air humidity is limited to a minimum and maximum value.
3) Room air humidity with SA limitation	<ul style="list-style-type: none"> – The room air humidity is controlled to the set value. – The supply air humidity is limited to a maximum value.

General options

Option	Functions
Relative or absolute humidity	Control to relative or absolute humidity via an internal calculation together with a temperature sensor.
Enthalpy	The enthalpy is calculated and displayed.
Alarm condition	An alarm is triggered if the plant is operating and both the deviation to supply air humidity as well as the room air humidity is too high.

Humidity sequences

The following sequences are processed as the humidity drops:

Pos.	Action/device
1	Dehumidification via normal cooling register, with temperature priority.
2	Humidification via analog and digital output as well as pump control.

6.8 Auxiliary functions

Miscellaneous

Options	Functions
Communications check	<ul style="list-style-type: none"> – Checks communications to the BAC system. – An alarm triggers if communication fails and the plant uses the internal scheduler.
Emergency stop	An emergency stop stops the plant without delay.
Alarm acknowledgment	An external button acknowledges alarms.
Internally placed outside sensors	The previously measured temperature (minimum outside temperature, maximum extract air temperature) is saved and used for required functions if the outside sensor and extract air sensor are placed in the duct at the damper and the fan is stopped.

Auxiliary functions

Options	Functions
Extra scheduler program	Extra scheduler program for additional switching tasks via digital output.
Analog output	<ul style="list-style-type: none"> – Analog output with invertible signal for each vfan stage, e.g. to control a damper. – Can also be used as digital output via voltage relays.
Operating mode indicator	Digital output to display the enabled operating mode (e.g. Comfort, Summer, Winter, etc.)
External alarm input	Digital input for external alarm or display.
Extra temp. sensor input	Analog input for an additional temperature sensor.

Energy meter

An energy meter EM24 (energy analyzer) by Carlo Gavazzi can be connected via Modbus.

Blank page

Index

A

Accessories	20
Application overview	
Open and closed-loop control functions	11
Plant diagram	9
Sequence diagram	10
Special features.....	12

C

Climatix AHU application.....	8
Climatix for air conditioning units.....	7
Configuration	
Elements	22
Workflow	21
Customer benefits.....	8

D

Demo case	20
Document validity	5

F

Factory tool.....	18
Function	
Start/stop.....	24
Functionen	
Auxiliary functions.....	31
Functions	
Alarm display.....	29
Damper control.....	26
Energy meter.....	31
Fan control	26
Filter detector	27

Filter sensor	27
Fire alarms.....	25
Flow rate supervision	27
Frost protection.....	27, 29
Humidity control	30
Locks	25
Night cooling.....	29
Optimum start (OSSTP)	24
Recovery efficiency	29
Start sequence	24
Temperature control	28
Temperature start.....	29

I

Integration documentation	19
---------------------------------	----

R

Related documents.....	5
------------------------	---

S

Sizing tool	20
System overview	
Communications modules	15
Control devices	14
Interfaces.....	13
Modbus pressure sensor.....	17
Operator units.	16
Tools	18
Topology	13

T

Target audience.....	5
----------------------	---

Siemens Switzerland Ltd.
Building Technologies Group
International Headquarters
Gubelstrasse 22
CH-6301 Zug
Tel. +41 41-724 24 24
Fax +41 41-724 35 22
www.siemens.com/sbt

© 2014 Siemens Switzerland
□ All changes reserved