

Original instruction manual

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Product

purePAM

Validity

Model/Type:

purePAM



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2 General Safety Advices

2.1 Intended use

The purePAM is a process air-conditioning system that controls the temperature and humidity. Its intended use is for the air supply of machines and facility systems. The purePAM is not designed for outdoor use and shall only be operated inside of buildings.

In order to operate the purePAM as intended, please ensure the required ambient conditions and supply media are available as defined in chapter 7.

The purePAM is equipped with a data interface for communication with an external host system provided by the customer. The interface allows for remote operation and data exchange with the purePAM.



NOTE!

Any other application of the product is declared as unintended use. Damages resulting from unintended use are not covered by the warranty obligations of pure engineering GmbH & Co. KG.

The following conditions are explicitly excluded from the intended use of the system:

- Operation of the purePAM for the supply and conditioning of gases other than air
- Operation of the purePAM for the supply of air that is chemically or in other way contaminated with aggressive substances
- Operation of the purePAM for the supply or treatment of air with explosive or flammable compounds
- Operation of the purePAM in rooms with explosive atmosphere according to ATEX-regulations.

2.2 Responsibilities of the operating company

This instruction manual can be used as a part of the Operation Instruction, although it cannot substitute the Operating Instruction by any means. The definition and surveillance of the Operating Instruction falls under the obligation of the operating company. The operating company has to ensure that the operator and user of the purePAM have permanent access to and full knowledge of this instruction manual.

Installation, connection and commissioning of the purePAM must be carried out as described in chapter 3.

The operating company has the obligation to operate the purePAM in a safe and defect-free condition. The operating company has to ensure, that local safety regulations are followed and that the product is maintained according to valid regulations. Electrical installations and equipment must be operated and maintained according to the recent valid local regulations, even if they are part of the climate control unit purePAM.

2.3 Qualification of employees

Installation, hook-up, commissioning and work on electrical equipment must only be carried out by skilled and qualified professionals under consideration of general and local rules and regulations.



Figure 9: Terminal blocks with closed cable trays

Follow the designation and naming as defined in the Electrical wiring diagram (refer to chapter 8.3).

Close the cable trays after connection of the wires to the terminal block.

- (2) Connect the electrical power supply line including the protective earth to the power supply of the facility
- (3) Connect the communication interface, if the system shall be linked to an external control system. Connect the external connector to the interface socket at the purePAM,



NOTE!

Data exchange to external control system is realized with an ETHERNET-interface.

- (4) Connect the water inlet to the DI-water-supply of the facility [Supply module],



NOTE!

Close all doors of the purePAM after completion of the works

3.7.2 System settings

After successful commissioning, specific settings (e.g. set points) can be adjusted. The settings are made via the HMI display in mode LOCAL (refer to chapter 5.1) or via the communication-interface in mode REMOTE.



NOTE!

Factory setting for the RA-damper is 0% for shipment. Please set to 58% during commissioning! (please refer to chapter 5.5.3.6)

3.8 Disposal

The purePAM consists of various different materials. Essentially these are: stainless steel, coated steel, lacquered steel parts, plastics, plastic/steel, plastic/non-ferrous metals blends, Poly-Urethane insulation foam and aluminum sheet metal parts. The materials must be disposed by the operating company in accordance with the provisions in the respective countries.

4 Product Description

The purePAM is a process air conditioning system, designed for permanent operation. Due to the high dew-points that can be set, the system requires regular maintenance and cleaning. Depending on the operation point, system allows for dew-points of the process air up to 49°C. The system is controlled via a PLC that also has an ETHERNET interface for connection to a host system. This connection allows for the switching of the system (START/STOP purePAM), monitoring of process values, operation and error messages and set-point setting for temperature and humidity of the process air and RA-flow.

Control parameters:

- Temperature of the process air
- Humidity of the process air
- Recirculation air flow

4.1 Humidification

Humidification of the process air is realized with a steam generator installed in the Supply module (Humidification module). The steam generator contains a resistance heating element in the steam vessel. Inside the steam generator the DI-water is boiled and the steam is guided via a specific steam hose to the steam diffusor inside the Air-handler module.

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5 Operation of purePAM

5.1 Operation modes

The system has the following operation modes:

- IDLE: PLC-control active, all other components OFF
- START-UP: Start-up sequence, all components sequentially ON. Refer to chapter 5.6.2.1
- RUN: all components ON, control active
- SHUTDOWN: after-run period ventilator; all other components OFF, followed by operation mode IDLE. Refer to chapter 5.6.4.

5.2 Operation settings

The system has the following operation settings:

- LOCAL: Operation via user display
- REMOTE: Operation via external communication interface

The operation setting is defined in the service menu, please refer to chapter 5.5. The setting can only be altered in stand-by mode.

5.3 Pass word protection

The user display has a pass word protection with the following pass word levels:

- Level 0: all users
- Level 1: user (1111)
- Level 2: service technician (1491)

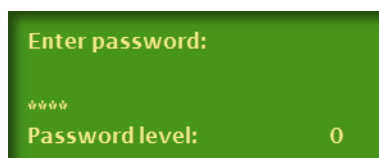


Figure 31: Password level

XXXX enter password with input buttons, confirm setting by pressing button [(5)-Enter].



NOTE!

The password protection of the operation menu of the purePAM has several levels. Please refer to the menu description in chapter 5.5.

5.5.4.2 Control mode

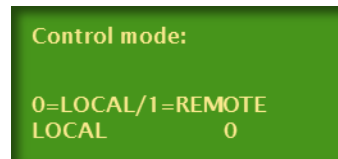


Figure 46: Control mode

The purePAM can be operated locally via the user display [operation mode LOCAL] or remote via the communication interface [operation mode REMOTE].

The setting of the control mode can be switched via the user display, please refer to chapter 5.1. Set-points of the purePAM cannot be changed via the user display if the system is set to operation mode REMOTE.

0=LOCAL/1=REMOTE

LOCAL/REMOTE enter desired value with input buttons, confirm setting by pressing button [(5)-Enter].
0=LOCAL: local operation via the user display
1=REMOTE: remote operation via the communication interface

5.5.4.3 Language

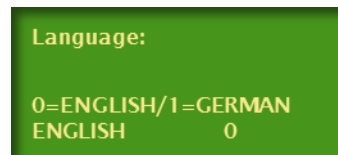


Figure 47: Language

0=ENGLISH/1=GERMAN

ENGLISH/GERMAN enter desired value with input buttons, confirm setting by pressing button [(5)-Enter].

5.5.4.4 Cascade control mode

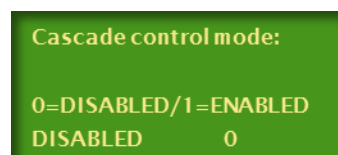


Figure 48: Cascade control mode

Due to heat pick-up/heat-loss through the walls of the duct system and the environmental chamber box of the membrane roll, the preset temperature and humidity conditions of the process air will differ between the position of the control sensor (air outlet of the Air-handler module - Combined temperature and humidity sensor [TTC13/MTC13; 31B1]) and the point of use (membrane roll). In order to compensate for this effect, an additional cascade control sensor can be integrated at the point of use. The measuring signal of the cascade control sensor will be added to the nominal value of the PLC (cascade control).

The measuring signals of the point-of-use sensor must be sent via the communication interface (Ethernet). Please refer to chapter 5.7 for the description of the command words.

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0=DISABLED/1=ENABLED

XXXABLED enter desired value with input buttons, confirm setting by pressing button [(5)-Enter].
0=CASCADE DISABLED: Set-point is controlled at the air outlet of the Air-handler module.
1=CASCADE ENABLED: Set-point is controlled at the point of use (cascade control sensor).

5.5.4.5 IP-Address

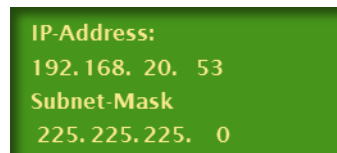


Figure 49: IP-Adresse

The purePAM owns a fix IP-Address for software updates. The communication port can be used for software updates.

IP-Address purePAM: 192.168.20.53

During operation the IP-address can be changed.

5.5.4.6 Default Gateway

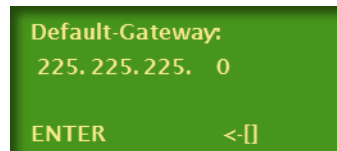


Figure 50: Default Gateway



NOTE!

Please note, that changing the settings must be confirmed by pressing button [(4)-Reset]!

5.5.5 Sensor offsets (e.g. T-Sensor TTC13)

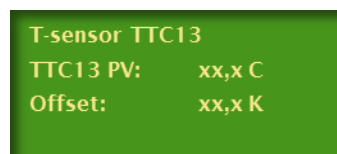


Figure 51: Sensor offset (e.g. T-Sensor TTC13)

XXX PV: actual reading of the value (PV=Present Value)

5.6.4 Shut-down Sequence

After turning OFF the purePAM, the SHUT-DOWN sequence starts. The duration of this sequence is 12 min.

- Humidification control is DISABLED and the heater of the humidifier is stopped.
- valve of the humidifier is closed
- the RA-air damper is closed
- Air flow rate is switched to Purge air flow (factory setting 400 m³/h)

5.7 Communication interface

The system communication is based on a defined communication protocol that allows for the setting and receiving of different operation modes, defined in diagnosis words.

Both communication partners send LifeBits (refresh rate approx. 1 s) to show operation readiness.

If sending or receiving of LifeBits is interrupted for a period exceeding 60 s, the PLC interprets a break-down of communication. In that case, the purePAM is switched to operation mode SHUT-DOWN automatically. The purePAM remains within the last set operation mode during those 60 s.

| Word | Content | Message | Note |
|------|--------------------------------|---|------|
| | Diagnosis Word | | |
| 0.0 | Diagnosis Bit 00 LifeBit | | |
| 0.1 | Diagnosebit 01 S1 Emergency | <u>Remark:</u> Collective Emergency message S1 | |
| 0.2 | Diagnosebit 02 S2 Alarm | <u>Remark:</u> Collective Alarm message S2 | |
| 0.3 | Diagnosis Bit 03 S3 Warning | <u>Remark:</u> Collective Warning message S3 | |
| 0.4 | Diagnosis Bit 04 | S2-TA03-OT Humidifier | |
| 0.5 | Diagnosis Bit 05 | S3-LA04: Low Level Humidfier | |
| 0.6 | Diagnosis Bit 06 | S2-LA04: High level humidifier | |
| 0.7 | Diagnosis Bit 07 | S2-LA06: Leak Humidifer Module | |
| 0.8 | Diagnosis Bit 08 | S2-PDT09 Sensor Break | |
| 0.9 | Diagnosis Bit 09 | S2-Fault Air Flow | |
| 0.10 | Diagnosis Bit 10 | S2-TTC13: Sensor break | |
| 0.11 | Diagnosis Bit 11 | S3-TTC13 Temp nok | |
| 0.12 | Diagnosis Bit 12 | S2-TTC13 Temp nok | |
| 0.13 | Diagnosis Bit 13 | S2-MTC14: Sensor break | |
| 0.14 | Diagnosis Bit 14 | S3-MTC14 Hum nok | |
| 0.15 | Diagnosis Bit 15 | S2-MTC14 Hum nok | |
| 1.0 | Diagnosis Bit 00 | S2-NS15-RA Damper nok | |
| 1.1 | Diagnosis Bit 01 | S2-LA06: Leak Air Handler | |
| 1.2 | Diagnosis Bit 02 | S1-GZ17 Door not closed | |
| 1.3 | Diagnosis Bit 03 | S2-TBD: fuse error | |
| 1.4 | Diagnosis Bit 04 | S2-TA12:OT Airheater | |
| 1.5 | Diagnosis Bit 05 | S2-NS10:Error Fan | |
| 1.6 | Diagnosis Bit 06 | | |
| 1.7 | Diagnosis Bit 07 | | |

| Word | Content | Message | Note |
|------|--|--|---|
| 1.8 | Diagnosis Bit 08 | | |
| 1.9 | Diagnosis Bit 09 | | |
| 1.10 | Diagnosis Bit 10 | | |
| 1.11 | Diagnosis Bit 11 | | |
| 1.12 | Diagnosis Bit 12 | | |
| 1.13 | Diagnosis Bit 13 | | |
| 1.14 | Diagnosis Bit 14 | | |
| 1.15 | Diagnosis Bit 15 | | |
| 2 | purePAM Status | 01: IDLE 02: START-UP 03: RUN 04: SHUT-DOWN | Status purePAM |
| 3 | Actual value airflow | | Processvalue*10, one position after decimal point |
| 4 | Actual value temperature | | Processvalue*10, one position after decimal point |
| 5 | Actual value rel. Humidity | | Processvalue*10, one position after decimal point |
| 6 | Controller output to electrical air heater | | Processvalue*10, one position after decimal point |
| 7 | Controller output to humidifier | | Processvalue*10, one position after decimal point |
| 8 | Setpoint Airflow | | Processvalue*10, one position after decimal point |
| 9 | Setpoint temperature purePAM | | Processvalue*10, one position after decimal point |
| 10 | Setpoint humidity purePAM | | Processvalue*10, one position after decimal point |
| 11 | Reserve | | |
| 12 | Reserve | | |
| 13 | Reserve | | |
| 14 | Reserve | | |
| 15 | Reserve | | |
| 16 | Reserve | | |
| 17 | Reserve | | |
| | Command Word | | |
| 0.0 | Start/Stop Command | | 0: Stop 1: Start |
| 0.1 | LifeBit | | |
| 0.2 | Open / Close revision door | | 1: Open 0: Close |
| 0.3 | Alarm reset | | |
| 0.4 | Reserve | | |
| 0.5 | Reserve | | |
| 0.6 | Reserve | | |
| 0.7 | Reserve | | |
| 0.8 | Reserve | | |
| 0.9 | Reserve | | |
| 0.10 | Reserve | | |
| 0.11 | Reserve | | |
| 0.12 | Reserve | | |
| 0.13 | Reserve | | |
| 0.14 | Reserve | | |

| | | | |
|--|---------------------|--|-----------------|
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| Word | Content | Message | Note |
|------|--|---------|---|
| 0.15 | Reserve | | |
| 1 | Setpoint Airflow (Re-circulation Air) Production | | Processvalue*10, position after decimal point |
| 2 | Setpoint Temperature | | Processvalue*10, position after decimal point |
| 3 | Setpoint rel. Humidity | | Processvalue*10, position after decimal point |
| 4 | Actual Value Temperature (Cascade Sensor) | | Processvalue*10, position after decimal point |
| 5 | Actual Value rel. Humidity (Cascade Sensor) | | Processvalue*10, position after decimal point |
| 6 | Setpoint Airflow (Re-circulation Air) Shutdown | | Processvalue*10, position after decimal point |

Figure 55: Communication interface

| | | | |
|--|--------------------------|--|-----------------|
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7.1.3 Drain connection Air-handler module

| Pos. | Designation | Value | SI-Unit |
|------|---|-----------|---------|
| 1 | Flow rate nominal (non-pressurized) | max. 10 | l/h |
| 2 | Interface connection (hose connector open to the atmosphere; connection requirements acc. to section 3.7.1 to be followed) | DN50 | mm |
| 3 | Temperature | up to 100 | °C |

Table 35: Specification drain

* Please note that the Air-handler module is equipped with a siphon that needs to be installed during Commissioning. Please ensure a sufficient water level inside the siphon to prevent air leakages through the connection.

7.1.4 Drain connection Supply module

| Pos. | Designation | Value | SI-Unit |
|------|---|------------------|---------|
| 1 | Flow rate nominal (non-pressurized) | max. 20 | l/min |
| 2 | Interface connection (hose connector open to the atmosphere; connection requirements acc. to section 3.7.1 to be followed) | G1" outer thread | inch |
| 3 | Temperature | Up to 100 | °C |

Table 36: Specification drain

7.1.5 DI-Water supply humidifier

The steam humidifier is designed for the operation with de-ionized water:

| Pos. | Designation | Value | SI-Unit |
|------|----------------------------------|--------------------|-------------------|
| 1 | Flow rate | 10 | l/h |
| 2 | Inlet temperature | < 20 | °C |
| 4 | Inlet pressure (minimum/maximum) | 4 - 6 | barG |
| 5 | Conductivity (minimum) | 3 | µS/cm |
| 6 | Blocking index SDI | < 5 | min ⁻¹ |
| 7 | Interface connection | G3/4" outer thread | inch |

Table 37: Specification Water supply (humidifier)

7.1.6 Communication interface

The purePAM is equipped with the following communication interface:

- ETHERNET: RJ45 (female)

7.1.7 Mains connection

Mains connection has to be provided from the facility of the customer according to the valid local regulations and the Machinery Directive (2006/42/EG). The installation and connection of