



Installation- and Operation Instructions

AIRWIN®

Ultrasonic Room Humidifier

RB/P-D2...16/3.1



Type	Item No.	Description	max. Capacity
RB/P-D2/3.1	7900270	Room humidifier with AquaDrain, Status message and communication interface, for D/d=6/4mm	1.0 kg/h
RB/P-D4/3.1	7900271	Room humidifier with AquaDrain, Status message and communication interface, for D/d=6/4mm	2.0 kg/h
RB/P-D6/3.1	7900272	Room humidifier with AquaDrain, Status message and communication interface, for D/d=6/4mm	3.0 kg/h
RB/P-D8/3.1	7900273	Room humidifier with AquaDrain, Status message and communication interface, for D/d=6/4mm	4.0 kg/h
RB/P-D10/3.1	7900274	Room humidifier with AquaDrain, Status message and communication interface, for D/d=6/4mm	5.0 kg/h
RB/P-D16/3.1	7900275	Room humidifier with AquaDrain, Status message and communication interface, for D/d=6/4mm	8.0 kg/h



Please read and keep these instructions!

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1. General Informations and Intended Use

The device is designed exclusively for the humidification with demineralised water according to the technical specifications. Nebulisation of other liquids is not permitted.

All AIRWIN® ultrasonic room humidifiers of RB/P-D2...16/3.1 series are designed for direct room humidification.

The power supply must be 48 V-AC. Operation with a different voltage is not permitted and can lead to a defect of the device.

These installation and operation instructions apply to all AIRWIN® ultrasonic humidifiers of RB/P-D2...16/3.1 series, hereafter referred to as humidifier. It contains important notes for professional installation, start-up, trouble-free operation and proper maintenance and cleaning.

In addition to regular maintenance, proper installation and care of the humidifier help to preserve the value of the device and are conditions for warranty claims.

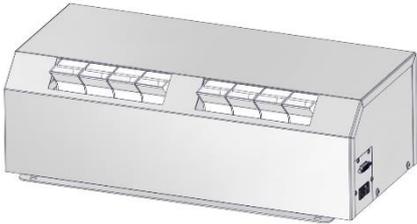
2. Safety Instructions

The humidifier described in this manual is designed and constructed in accordance with the international safety regulations. Like any other electrical device it has to be handled with care, to ensure safe usage.

In order to guarantee safe operation in all operating conditions, the following safety instructions must be observed.

	<ul style="list-style-type: none"> • The electrical system may only be set up by qualified electricians. In this context, the regulations of DIN VDE series 0100 are fundamental. • The regulations of the local power supplier concerning the electrical connection (e.g.: residual current circuit breaker, additional potential equalisation etc.) must be complied with. • An intended choice of electrical cables and connectors must be used. • Mains voltage and mains frequency of the voltage supply must correspond to the parameters indicated on the identification plate of the humidifier. • Do not connect a damaged humidifier (e.g.: damaged during transport) to the mains. • Contact your customer service if you have any queries about the electrical connection, the features or the security of the humidifier. • Disconnect the humidifier from mains, if it does not work perfectly or if damage has occurred. • Disconnect the humidifier from mains, if the electrical supply line is damaged. • Work on the humidifier may only be carried out as described in these instructions. • Never use high pressure cleaners to clean the humidifier. • Use grease and oil-free materials only.
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3. Scope of delivery

<p>Room Humidifier RB/P-D2...16/3.1</p>  <p>fig. RB/P-D8/3.1</p>	<p>Installation and operating instructions</p>  <p>Spare part list</p> 	
<p>Water filter for tube connection D/d = 6/4 mm and Stop cock Ø 6 mm</p>  <p>Item No. 0009178</p>	<p>Discharge tube RB/P-D und UB/P-D8 (consisting of: tube Ø 12 mm, elbow connection, T- connector, screwing-on connector)</p>  <p>Item no. 0009086</p>	
<p>Plug part 3-poles, 16 A</p>  <p>Item no.0001595</p>	<p>SUB-D Connector male, 15-pol, housing</p>  <p>Item no. 0002865</p>	

4. Optional accessories

Item no.	Type	Description	Illustration
0001144	Tube, PE D/d=6/4 blue	Tube water supply D=6mm (blue)	
0001197	Tube, PE D/d=12/9 black	Tube water drainage D=12mm (black)	
6100103	BO-HG M	Room hygostat for ON/OFF control of the humidification system, 1-step	
77001..	ST500 – ST1600	Transformer for control cabinet installation, from 500 VA to 1600 VA, with primary and secondary protection	
77002..	STH500 – STH1600	Transformer in powdered steel housing, with illuminated ON / OFF switch and cable glands from 500 VA to 1600 VA, with primary and secondary protection	
6002100	SUR/P-4b	Control cabinet with room humidity sensor or duct humidity sensor for continuous control	
60121..	SUR/PT...	Control cabinet with room humidity sensor or duct humidity sensor for continuous control and 500, 1000 or 1600 VA Transformer	



Item no.	Type	Description	Illustration
8005..	BO-RO..	Reverse osmosis system from 6 l/h and more with permeate storage tank. Other models on request.	
2000100	WDK	WDK Wall brackets for all RB and UB-8 stainless steel, surface K240 sanded, PU = 1 Set (1x left + 1x right)	
2001120 2001121 2001122	Leakage tray size A Leakage tray size B Leakage tray size C	Size A for RB/P-D2 to 6, Size B for RB/P-D8 to 10, Size C for RB/P-D16, with drain outlet, stainless steel, with 3D surface (glossy, partly matt)	

5. General information

5.1 Technical terms

Transducer	:	Piezo ceramic transducer
Aerosols	:	Finely distributed material (solids or liquids) in air or other gases, manifestations are e.g.: in smoke, dust, vapour and nebula
Demineralised water	:	Pure water, permeate
Concentrate	:	Concentrated water, waste water of reverse osmosis system

5.2 Physical principles of piezo ceramics

If certain crystals are deformed by mechanical stress, electrical charges will build up proportionally on their surface, producing electric field strength in the crystal.

This effect was discovered by Pierre and Jacques Curie in 1880. Even the reversal of this so-called piezoelectric effect or piezo-effect is possible. The same materials change their dimensions under the influence of an electric field.

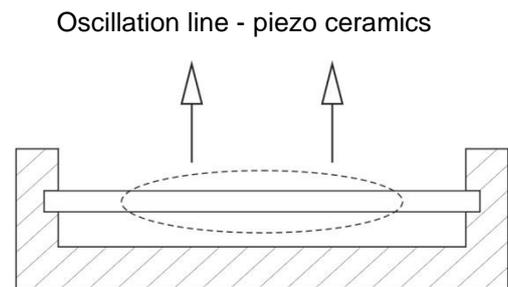


Fig. 1 - Schematic sketch of piezo-effect

Ceramic piezoelectric materials are hard, chemically inactive and completely insensitive to humidity or other atmospheric influences.

5.3 Funktionsbeschreibung Ultraschall-Luftbefeuchter

All frequencies above 20,000 Hz are called ultrasonic.

According to their physical nature, acoustic waves consist of mechanical oscillations of compressible media. These oscillations develop due to the deflection of the particles of a compressible material from their equilibrium position. Acoustic waves are bound to a medium and thus do not occur in the vacuum.

Oscillations develop as a result of a change in pressure. Repeated pressure increase and pressure reduction produce different acoustic waves.

In order to be able to use ultrasonic waves for air humidification, electrical energy must be converted into mechanical energy. This takes place in the piezoelectric transducer.

A vibration unit consists of the resonance circuit where the high frequency of ~ 1.7 MHz is produced and the piezoelectric transducer to convert the electrical frequency into a proportional mechanical oscillation. This frequency is not audible for human beings or animals.

The piezoceramic transducers are attached to the bottom of the fluid tank. During excitation of the transducer, the water leads the ultrasonic vibrations to the boundary layer between water and air. Constant compression and decompression of the water gauge over the transducer causes cavitation in the immediate proximity of the water surface. Thus, crossing capillary waves are developed, the finest water particles of which, the aerosols, are produced in the wave crest.

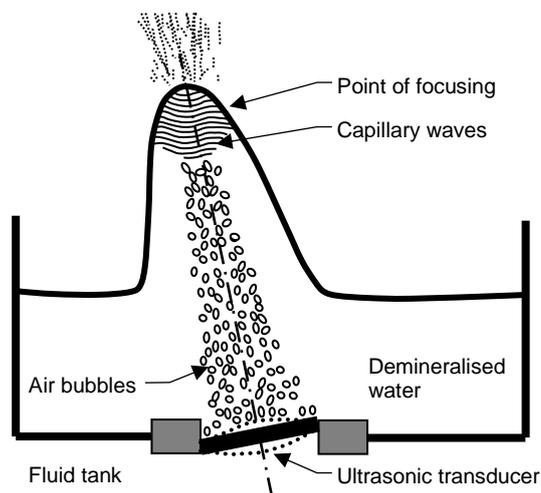


Fig. 2 - Schematic sketch aerosol production

The aerosols are delivered by the air flow in the humidifier and quickly mix with the ambient air. They have a small diameter (0.001 - 0.005 mm) and thus form a freely floating mist. The droplet diameter depends on the surface tension and the density of the medium, but also on the excitation frequency. The higher the excitation frequency, the smaller is the diameter of the droplets.

6. Advantages of ultrasonic air humidification

- 1. maximum energy saving**

Compared to steam and infrared humidifiers with the same humidification output, ultrasonic air humidifiers need up to 93 % less electricity.
- 2. lowest connected load**

Compared to electrode steam humidifiers with the same humidification output, only approx. 7 % of the power input is required. Thus, lower third-party connection costs are possible.
- 3. energy-saving cooling effect**

During humidification with the ultrasonic air humidifiers, the room air is cooled at the same time due to the adiabatic humidification principle. The result is a lower heat load reducing the cooling output requirements.
- 4. lowest water consumption**

Nebulizer humidifiers lose up to 70 % of the water, steam humidifiers up to 30 %. AIRWIN® Ultrasonic air humidifiers do not have any water loss apart from the cyclical emptying process of the fluid tank on AquaDrain plus.
- 5. immediate max. humidification**

Simultaneously with the request impulse, humidification is carried out without any delay.
Exception: during automatic drainage and line flushing.
- 6. max. evaporation of the water**

Ultrasonic air humidifiers produce a very fine aerosol mist. On average, the diameter of the aerosols is only 0.001 - 0.005 mm. Thus, the mist spreads quickly and is taken up by the air after a very short time



7. Device overview



Fig. 3 - RB/P-D8/3.1

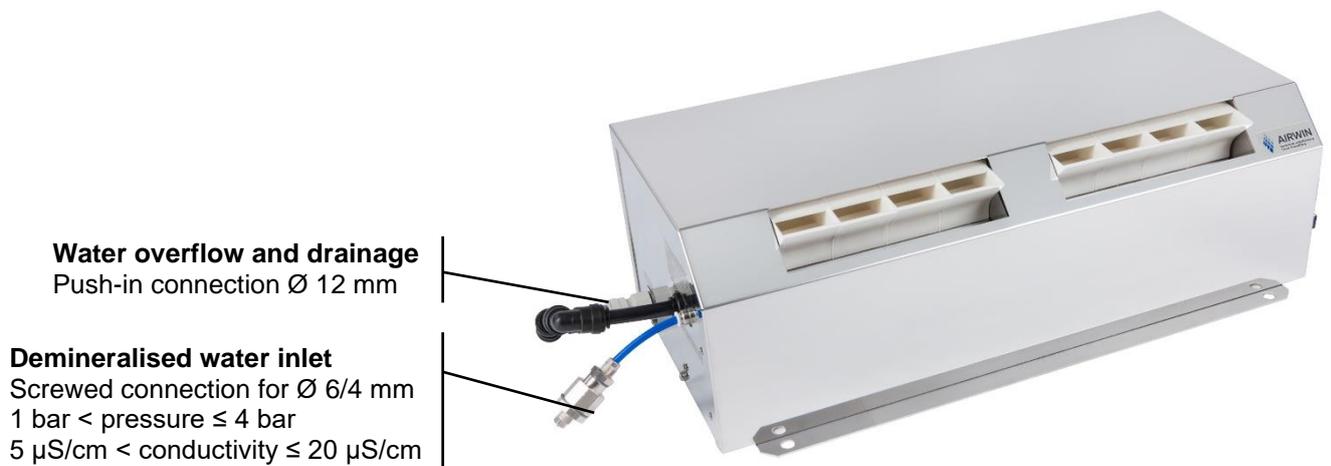


Fig. 4 - RB/P-D8/3.1

8. The RB/P-D2...16/3.1-System

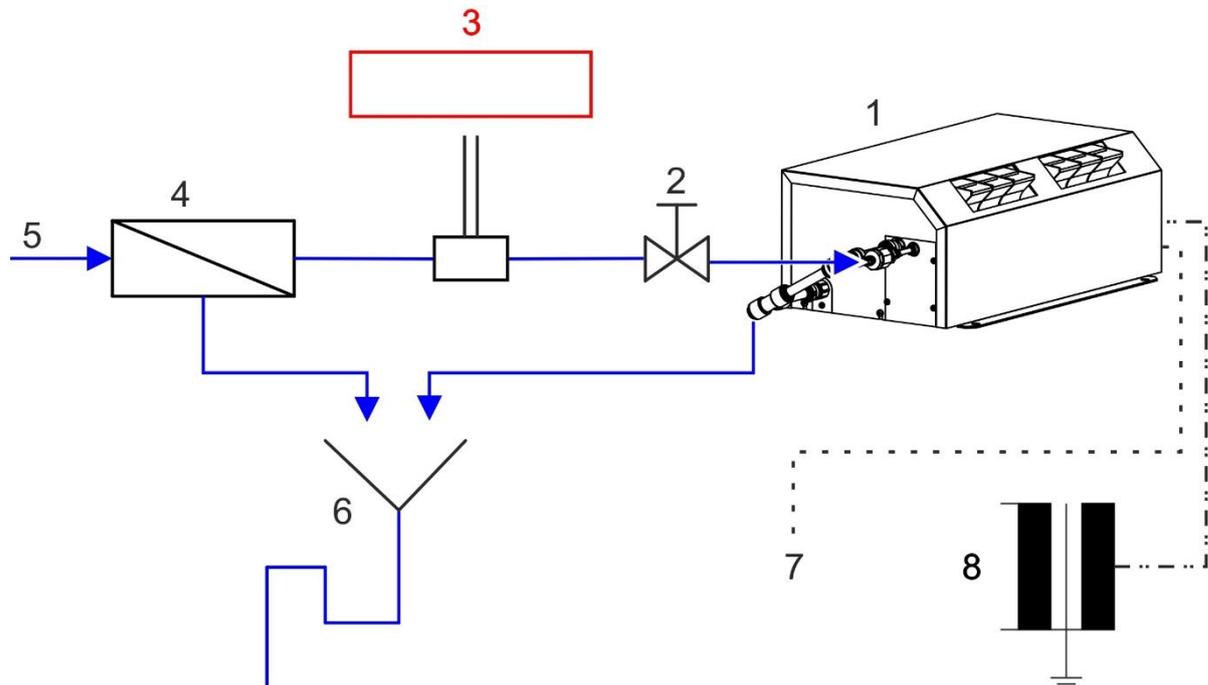


Fig. 5 - Schematic illustration of RB/P-D6/3.1 humidification system

Legende

1. RB/P-D6/3.1
2. Stop cock (included in the scope of delivery)
3. Conductivity meter (e.g. CM-1) to check the quality of the demineralised water (see optional accessories, REOS product range)
4. Reverse osmosis system (see REOS product range)
5. Drinking water supply (on site)
6. Free discharge according to DIN 1988-100 (on site)
7. External control (hygrostat or continuous control signal - see AIRWIN product range)
8. Transformer (see AIRWIN product range)

9. Installation

Installation is possible on wall brackets or on a leakage tray.



Fig. 7 - Installation on wall brackets



Fig. 6 - Installation on leakage tray



The humidifier must not be exposed to large temperature differences during installation as there is otherwise a danger of condensation inside the humidifier which could lead to a failure of the integrated electronics.



Protect humidifier interiors necessarily from pollution! The protective foil on the exhaust hoods should only be removed immediately prior to commissioning when the air ducts have been cleaned!

9.1 Installation conditions

- The humidifier must be installed exactly in horizontal position to ensure that the water level is the same **above ALL** ultrasonic transducers.
- The installation site must allow for the humidifier to be easily removed and replaced for maintenance and inspection purposes.
- The installation site must allow an even aerosol distribution in the room
- Horizontal distance to solid components in aerosol blow-out direction > 3 m
- Vertical distance to the ceiling > 0.5 m
- Installation height above the floor > 1.7 m
- Impacts by external air directly next to the humidifier by e.g. fans, ventilation systems etc. or even a strong natural airflow must be avoided.
- The hygostat or measurement sensor of the continuous control must be positioned in such way that it is located in the area of the humidifier, but that direct influence by the aerosol flow is excluded.

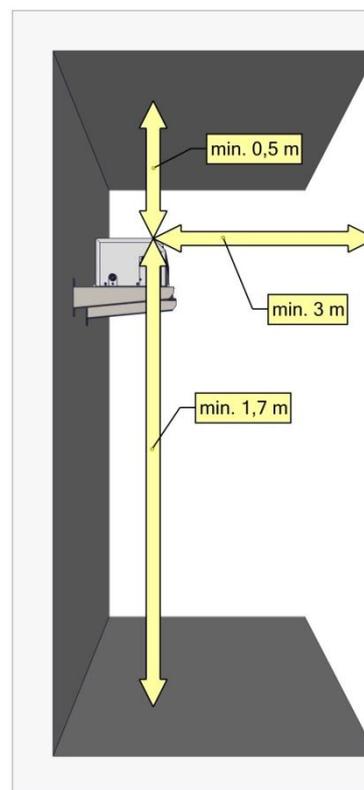


Fig. 8 - Positioning RB/P-D2...16/3.1

10. Hydraulic connection

10.1 Hydraulic conditions

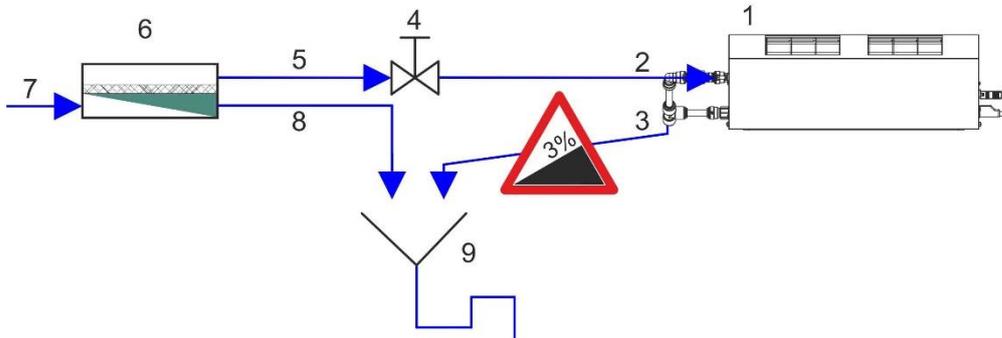


Fig. 9 - Schematic diagram of hydraulic conditions

Definitions

1. RB/P-D6/3.1
2. Water supply for plastic tube \varnothing 8/6 mm
3. Water overflow and discharge for plastic tube \varnothing 12 mm
4. Stop cock (included in the scope of delivery)
5. Demineralised water:
 $1 \text{ bar} < \text{pressure} \leq 4 \text{ bar}$
 $5 \mu\text{S/cm} < \text{conductivity} \leq 20 \mu\text{S/cm}$
6. Demineralisation system (reverse osmosis system)
7. Drinking water supply (on site)
8. Concentrate
9. Free discharge according to DIN 1988-100 (on site)

Important notes:

- The humidifier may only be operated with fully demineralised water (produced for example by a reverse osmosis system). The demineralised water must have a conductivity of min. $5 \mu\text{S/cm}$ and max. $20 \mu\text{S/cm}$.
- The contamination of drinking water may not exceed the max. values laid out in the drinking water regulations.
- The demineralised water is corrosive, therefore use stainless steel or plastic only. Non-ferrous metals (e.g. copper, brass) must not be used.
- Water pressure must be minimum 1 bar and maximum 4 bar.
- The free discharge on site must be set in accordance with DIN 1988-100.
- The water overflow- and discharge tube must be laid with a constant slope of min. 3% (3 cm on 1 m) to the free discharge.
- For easy revision, the stop cock included in the scope of delivery must be installed in the demineralised water supply line close to the device.



All materials coming into contact with the demineralised water must be resistant to demineralised water. Pressure and temperature stability must be observed. Demineralised water pipes must be flushed prior to commissioning the humidifier.

10.2 Establishing and detaching the connections with connectors

The connectors provide durable, safe and watertight connections between tube and connecting element. The tube is simply inserted by hand. The retaining element holds the tube safely without pressing it or decreasing the flow.

Establishing the connection

Cut tube squarely and free of burrs.
Make sure that the tube has no sharp edges, longitudinal grooves or other damage.

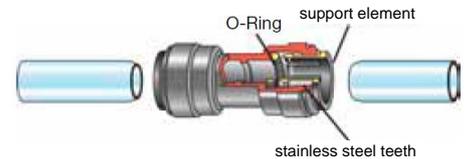


Fig. 10 - Establishing the connection

Connection is stable prior to sealing

Insert the tube up to the stop.
The supporting element holds the tube in the connector. With the help of the o-ring, a tight connection is established.



Fig. 11 - Insert tube

Check the connection by pulling towards the opposite side

By pulling towards the opposite side check whether the tube was safely inserted.
Then slide on the locking ring.



Fig. 12 - Check connection

Detaching the connection

First remove the locking ring.
The tube can be detached by pushing back the supporting element.

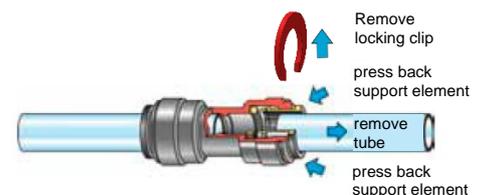


Fig. 13 - Detaching the connection

	<p>All pipes, tubes and connecting elements must be resistant to demineralised water.</p> <p>The surface hardness of pipes and tubes must not exceed 225 HV. Otherwise the retaining teeth in the connector do not securely hold on it.</p> <p>Soft tubes are also to be avoided.</p>
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11. Electrical Connection

11.1 Transformer

- The transformers are available either loose or installed in a sheet metal housing. When installing in a control cabinet, it is essential to make allowance for the heat dissipated from the transformers. The control cabinet may have to be provided with forced-air cooling.
- A single large transformer may be selected to serve several humidifiers. In such cases, make sure that each outgoing secondary circuit is fuse-protected, either external in the control cabinet or within the transformer ex-factory.
- The transformer transforms the primary voltage of 230 V / 50 Hz to the secondary voltage of 48 V / 53 V.
- The power connection cable leading to the transformer and from the transformer to the humidifier must at least satisfy H05VV or H05RR specifications.
- The transformers of BOGA are manufactured according to the following specifications: Single-phase control-power transformer in accordance with VDE 0550 Parts 1+3 and VDE 0113, IP00, Protection Class 1, Insulation Class T40E, separate windings, screw-connection in accordance with VBG4, 50/60 Hz.

primary:

230 V = L
 0 (N) = neutral wire
 -5 % = for U = 5 % < 230 V
 +5 % = for U = 5 % > 230 V

sekundär:

53 V = input humidifier at high ohmic losses due to long cable distance
 48 V = input humidifier
 0 (N) = neutral wire

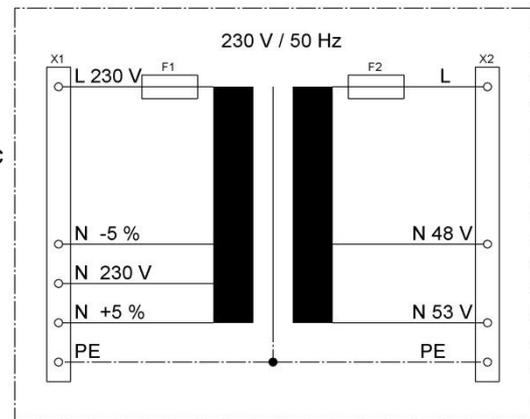


Fig. 14 - Transformer with a secondary output



The neutral conductor (N) on the secondary side must not be earthed!

11.2 Humidifier

The electric connections of the humidifier are found on the side of the housing. Confusion is prevented by form-coded plugs and sockets.



Fig. 15 - Electrical connection

11.2.1 Power connection

The 3-poles plug part (as shown below) has to be used for the 48 V / 50 Hz power supply of the humidifier. The socket is included in the scope of delivery.

- a) Unscrew the black cap from the socket. The cable screw connectors are marked

N = neutral wire
PE = protective conductor
L1 = conductor 48 V / 50 Hz

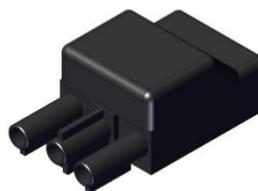


Fig. 16 - 3-poles plug part

- b) Connect the cables between the secondary output of the transformer and the socket according to the marking.

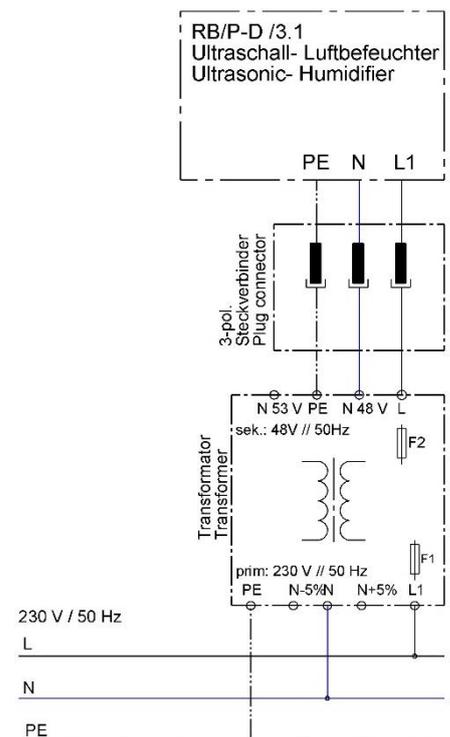


Fig. 17 - Electrical power connection

	Use wire end ferrules!
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11.2.2 Control connection

The 15-pin D-SUB connector must be used for the control signals for operating the humidifier.

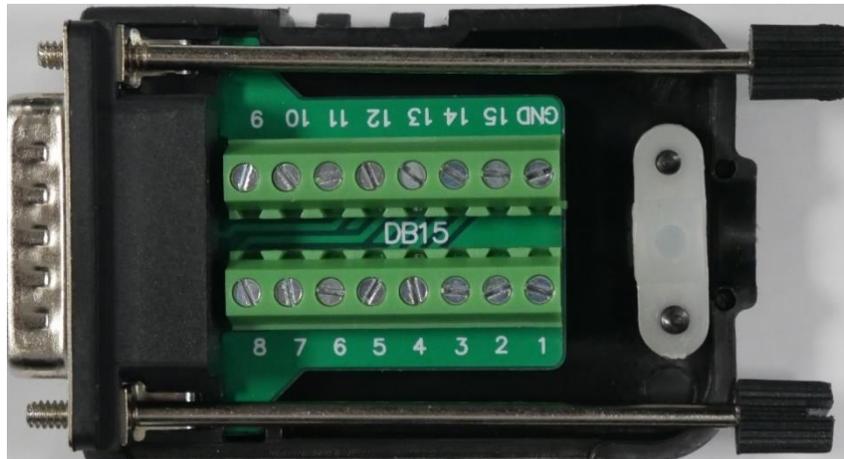


Fig. 18 - 15-pin D-SUB connector

Tab. 11-1 - Connection diagram plug D-SUB 15-pin

Clamp	Shortcut	Funktion	Technical description interface
1	SIC	Release humidification operation	Input for normally control contact safety chain
2	SIC	Release humidification operation	Input for normally control contact safety chain
3	Error	collective error message	Output potential-free contact fault status
4	Error	collective error message	Output potential-free contact fault status
5	Operate	Operational message	Output potential-free contact operation status
6	Operate	Operational message	Output potential-free contact operation status
7	Hyg 1 (-)	Humidification requirement 50% power	Input for normally control contact Humidification
8	Hyg 2 (-)	Humidification requirement 100% power	Input for normally control contact Humidification
9	Hyg (+)	Supply hyg	Common supply hyg
10	Reg-Com	Common	Common ground analog control
11	+Reg-1 mA	Analog input 4...20 mA	Control input 4-20 mA
12	+Reg-2 V	Analog input 0...10 V	Control input 0-10 V
13	RS-485 A	Interface RS-485	RS-485 Modbus A
14	RS-485 B	Interface RS-485	RS-485 Modbus B
15	RS-485 GND	Interface RS-485	RS-485 Modbus Com

11.2.3 Safety chain

Connect safety chain on the terminals marked 1 and 2 on the 15-pole plug.
Observe the 48 V-AC or 24 V-DC power supply.

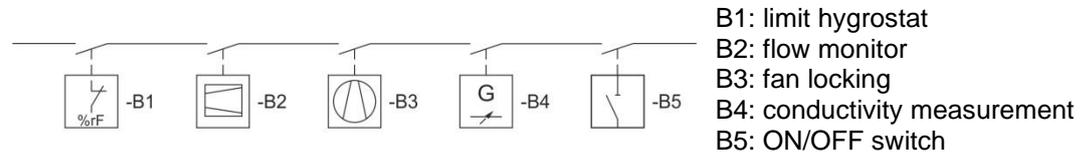


Fig. 19 - Safety chain

	<p>The input of the safety chain must always be connected to safety devices with an NC contact. A cable bridge is always wired at the factory between connections 1-2 / safety chain.</p> <p>The humidifier does NOT work otherwise.</p>
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11.2.4 Status Message Operation - Error

There are two signal outputs via PhotoMOS relay.



Fig. 20 - PhotoMOS Relais

Tab. 11-2 - Status messages operation / error

Status message	Message type	Connection terminal plug
1	Operational message	5 + 6
2	Collective Error message	3 + 4

	<p>If several humidifiers are connected to the safety chain, this must be isolated and connected to each humidifier with separate switching contacts.</p>
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11.3 Device control

11.3.1 Operation control on-off

The humidifier can be controlled via normally open contacts in on-off operation. The output power can be set to 50% (Hyg 1) or 100% (Hyg 2) humidifier output.

11.3.2 Control signal

The NKBD can process 2 different external controlled variables.

- 0-10 V-DC
- 4-20 mA

Input resistances (Load)

<u>Control variable</u>	<u>Input Impedance</u>
0-10 V-DC	50 kΩ
4-20 mA	500 Ω

11.3.3 Operation control continuous

The humidifier can process different external analog input signals.

The output power can be controlled in the smallest steps between 0% and 100% humidifier output.

- 0-10 V-DC (Standard factory setting)
- 4-20 mA (Standard factory setting)

Tab. 11-3 - Thresholds analog input

Control signal	Out PWM ON	Out 100 %	Out PWM OFF
0-10 V	1.1 V ± 0.5	8.5 V ± 0.5	0.9 V ± 0.5
4-20 mA	5.4 mA ± 0.1	18.5 mA ± 0.5	5.2 mA ± 0.1
1-10* V	2.1 V ± 0.5	8.5 V ± 0.5	2.0 V ± 0.5
0-20* mA	1.7 mA ± 0.1	18.0 mA ± 0.5	1.5 mA ± 0.1

(*) = Control signal optionally adjustable at the factory

11.3.4 Control via Modbus RTU

The humidifier can be controlled via BOGA Modbus RTU both in on-off operation or in continuous operation.

Further information can be found in the BOGA Modbus RTU interface description. This can be requested from the manufacturer or viewed and downloaded from the www.boga.de website.

11.4 Cross flow fan

The integrated cross flow fan for the aerosol transport is switched by the control electronics depending on the humidifier's function. After the humidification has been switched off, the fan remains switched on for 15 seconds (run-on time) in order to transport the remaining aerosol out of the device.

12. Structure and functions of the control board PCB AIRWIN 3.1

12.1 Connections

Inputs

X9 - Connection of float switch:

- 1: Float switch, level "S1" black
- 2: Float switch, level "S1" brown
- 3: Float switch, level "S1" blue
- 4: Float switch, level "S1" grey

- 5: Float switch, level "S2" black
- 6: Float switch, level "S2" brown
- 7: Float switch, level "S2" blue
- 8: Float switch, level "S2" grey

X8 - Connection sensor:

- 1: Current measurement -
- 2: Current measurement +

Notice:
Only connections relevant to the device are shown.

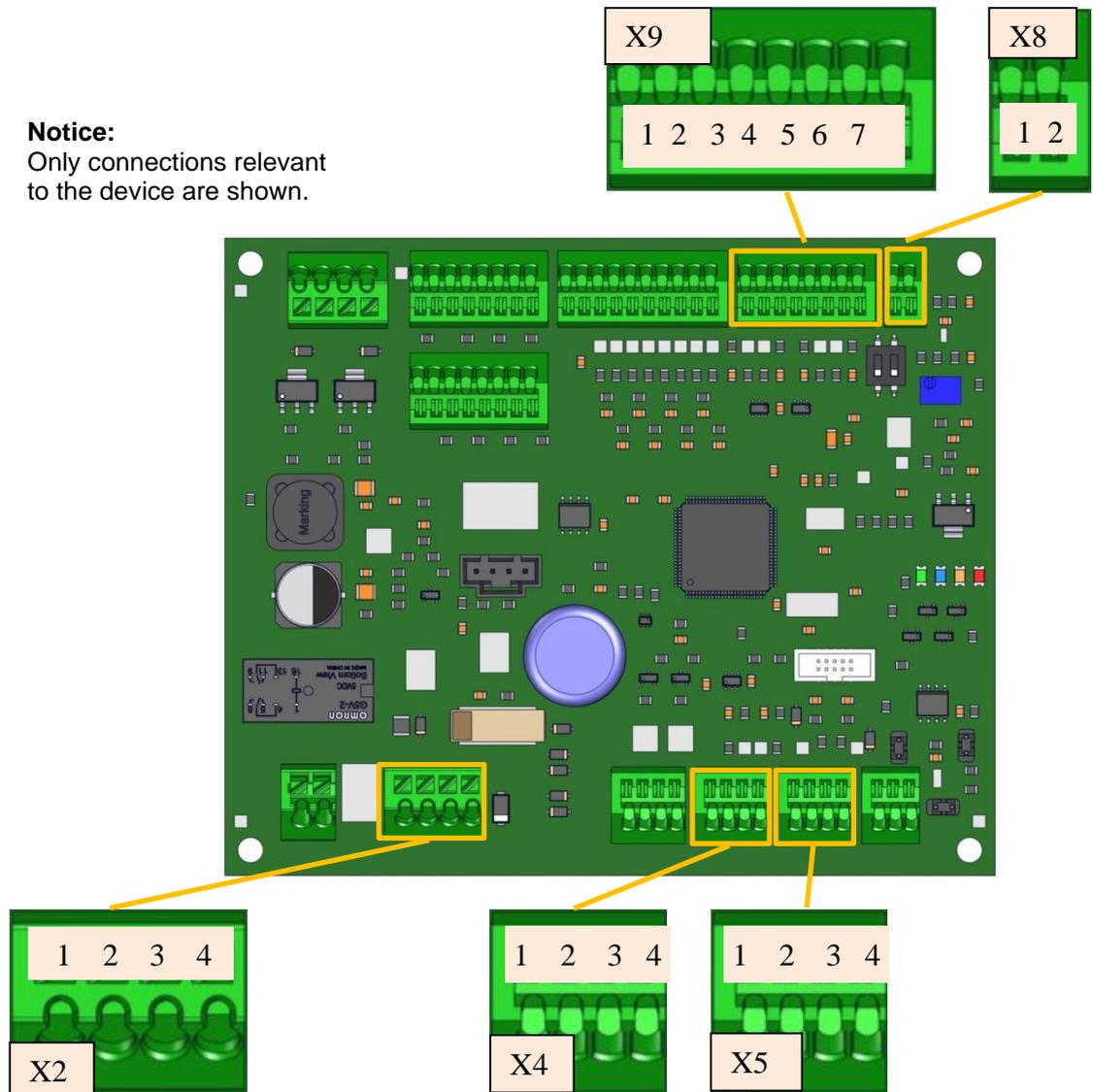


Fig. 21 - Control board PCB AIRWIN 3.1 Input

X2 - Connection to supply:

- 1: Power supply L 48 V-AC
- 2: Power supply N 48 V-AC
- 3: Release 48 V-AC, 24 V-DC
- 4: Release 48 V-AC, 24 V-DC

X4 - Connection hyg:

- 1: Hygostat input 1
- 2: Hygostat input 1
- 3: Hygostat input 2
- 4: Hygostat input 2

X5: - Connection Reg:

- 1: Control signal mA + (Ri: 500 Ω)
- 2: Control signal mA -
- 3: Control signal V + (Ri: 50 kΩ)
- 4: Control signal V -

Outputs

X7 - Connection of solenoid valves

- 1: Solenoid valve drain L+
- 2: Solenoid valve drain N-
- 3: Solenoid valve supply L+
- 4: Solenoid valve supply N-

X12 - Connection of oscillator boards:

- 1: PWM 4 - 5: PWM 2 -
- 2: PWM 4 + 6: PWM 2 +
- 3: PWM 3 - 7: PWM 1 -
- 4: PWM 3 + 8: PWM 1 +

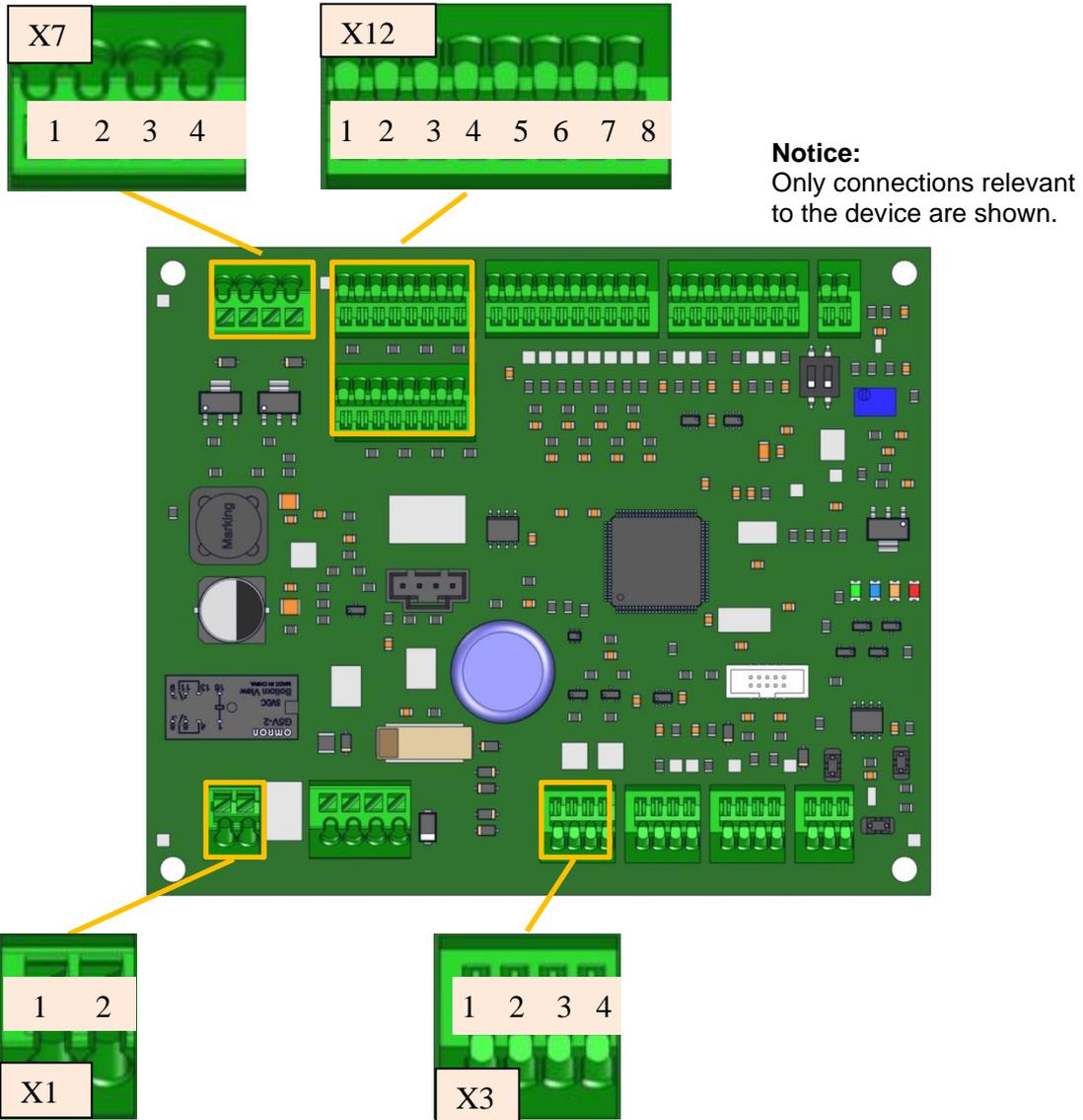


Fig. 22 - Control board PCB AIRWIN 3.1 Outputs

X1 - Connection Fan:

- 1: Relay closing contact
- 2: Relay closing contact

X3 - Status reports:

- 1 + 2: Operational message
- 3 + 4: Collective error message



12.2 Functional description of the control functions

Current measurement of the oscillator boards

In this configuration, a current check of the oscillator boards is performed every 3 hours. **This test only takes place when the humidification request is present and lasts max. 5 seconds. During this time, the humidifying power is set to 100% and a functional test of all transducers is performed.**

Change of the level control

Since the level control in the humidifier is an important control, the two existing level float switches are monitored simultaneously. A digital evaluation of the states of both float level levels reliably detects critical and impermissible states.

Check and holding voltage of the solenoid valves

The current consumption of the solenoid valves is checked before and during filling. If a fault is detected, contact "collective error message" opens.

Further monitoring-routines

Optionally there are monitoring routines for the filling (maximum filling time) and monitoring routines for emptying the fluid tray (maximum drainage time). If a fault is detected, an automatic problem-solving routine will attempt to correct this fault. Furthermore, it is possible to monitor the function of the fan, solenoid valve supply and solenoid valve drain via a current measurement.

If a system component does not work correctly, contact "collective error message" opens.

The default settings of the control board PCB AIRWIN 3.1 are shown in Tab. 12-1.

12.3 Default settings

Tab. 12-1 - Default settings PCB AIRWIN 3.1

	Parameter	RB/P-D2/3.1	RB/P-D4/3.1	RB/P-D6/3.1	RB/P-D8/3.1	RB/P-D10/3.1	RB/P-D16/3.1	
Time Constants	AquaDrain Duration	3 Min.		4 Min.			5 Min.	
	AquaDrain Cycle Time	12 hours						
	AquaDrain Delay	disabled						
	Flush Time	120 seconds						
	Inactivity Flush Timeout	12 hours						
	Inactivity Drain Timeout	12 hours						
	Humdification Timeout	disabled						
	Fill Timeout	15 minutes						
Current Measurement	Inlet Valve	enabled						
	Outlet Valve	enabled						
	Fan	enabled						
	Oscillator	25 %						
	Oscillator Check Intervall	3 hours						
IOs	Voltage Input Scale	0-10 V DC						
	Voltage Input Functionality	active						
	Current Input Scale	4-20 mA						
	Current Input Functionality	active						
MOD BUS	Functionality	enabled						
	Adress	Serial-No.Code						
	Speed	19200 Baud						

12.4 Adjustment options PCB AIRWIN 3.1

AquaDrain Duration:

The AquaDrain duration is the time the humidifier needs to empty the fluid tray. This value is given by design and depends on the type of humidifier, the size of the fluid tray and the installation.

Possible settings: 30 seconds, 1 minute, 2 minutes, 3 minutes, 4 minutes, 5 minutes, 6 minutes.

Default setting: depending on the device type (Tab. 12-1)

AquaDrain Cycle Time

The AquaDrain cycle time is directly linked to the automatic emptying of the fluid tray. The AquaDrain process is also performed when there is a humidification request.

Possible settings: Disabled, 10 minutes, 30 minutes, 1,5 hours, 3 hours, 6 hours, 12 hours, 24 hours, 48 hours.

Default setting: 12 hours

AquaDrain Delay

The AquaDrain delay is used when several humidifiers are mounted in a system and AquaDrain is enabled. The AquaDrain delay prevents all humidifiers from being emptied at the same time.

Possible settings: No delay, 1 x 15 minutes, 2 x 15 minutes, 3 x 15 minutes, 4 x 15 minutes, 5 x 15 minutes, 6 x 15 minutes, 7 x 15 minutes

Default setting: No delay

Flush Time

The flushing time is the time at which the water supply line is flushed before the first operation and after a certain period of inactivity.

Possible settings: 15 seconds, 30 seconds, 120 seconds, 200 seconds

Default setting: 120 seconds

Inactivity Flush Timeout

If no humidification is requested, the humidifier is in standby mode. If the fluid tank is still filled, it is automatically emptied after the adjustable time "Inactivity Drain Timeout".

Possible settings: Default setting, 10 minutes, 30 minutes, 1,5 minutes, 3 hours, 6 hours, 12 hours, 24 hours, 48 hours.

Default setting: 12 hours

Inactivity Drain Timeout

If no humidification is requested, the humidifier is in standby mode. If the fluid tank is still filled, it is automatically emptied after the adjustable time "Inactivity Drain Timeout".

Possible settings: Default setting, 10 minutes, 30 minutes, 1,5 hours, 3 hours, 6 hours, 12 hours, 24 hours, 48 hours.

Default setting: 12 hours

Humidification Timeout

The humidification timeout is implemented to check for possible water quality errors. If the humidifier operates for an adjustable amount of time and does not refill, the water may be dirty and cannot be misted. When the "Humidification Timeout" time has elapsed, the humidifier checks the function of the level switches, empties the liquid tank and refills it to remove the contamination. Another cause of this error could be a lack of airflow. This problem-solving process runs three times. If the problem-solving process is unsuccessful, the humidifier will enter the error mode and display the "Humidification Timeout" error.

Possible settings: Disabled, 5 minutes, 30 minutes, 1,5 hours, 3 hours, 6 hours, 12 hours, 24 hours, 48 hours.

Default setting: disabled

Fill Timeout

The "Fill Timeout" is the time the humidifier needs to fill the fluid tray. When the time for filling expires, without reaching the necessary fluid level in the fluid tray, a fill error has occurred and a problem solving routine is activated. If the error cannot be cleared, the humidifier displays the "Filling Error". The time to fill depends on the water supply pressure and the type of humidifier.

Mögliche Einstellungen: Deaktiviert, 5 minutes, 10 minutes, 15 minutes, 30 minutes, 60 minutes.

Standard Einstellung: 15 minutes

Oscillator Check Intervall

The oscillators can be automatically checked after a certain time. If the time interval has expired and a humidification request is present, the humidifier will operate for a short time (approximately 5 seconds) with 100% humidification performance.

Possible settings: Disabled, 5 minutes, 10 minutes, 15 minutes, 30 minutes, 1,5 hours, 3 hours, 6 hours, 12 hours, 24 hours, 48 hours.

Default setting: 3 hours

Changes to the default values can be made by prior arrangement presetted ex works.

12.5 State diagram

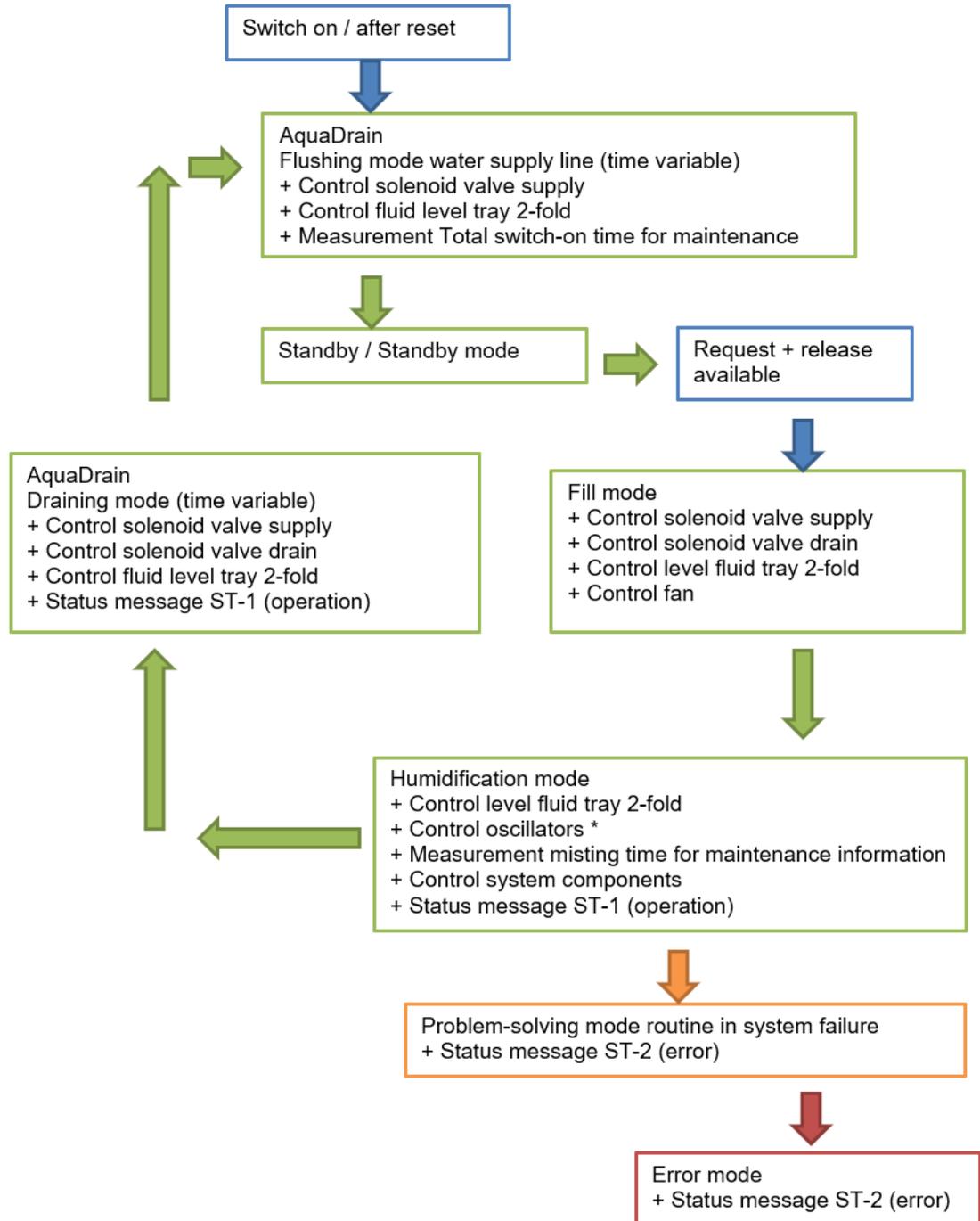


Fig. 23 - State diagram

*: During the “control Oscillators”, the nebulization output is automatically increased to 100% in the humidification mode for a maximum of 5 seconds

12.6 Status Message

Tab. 12-2 - Status messages - System States

System State	Operational message
Device switched off no supply voltage	Contact open
Humidification activ	Contact closed
Humidification inactiv	Contact open

System State	Error message
Device switched off / no supply voltage	Contact open
Normal operation	Contact closed
Fault Mode – Error Mode	Contact open

12.7 LED-Indicator and Decoding

There are 4 different colored LEDs on the control board PCB AIRWIN 3.1. Using different flashing and light frequencies all system states are displayed here.

Information about the next service (5,000 working hours) or maintenance interval (10,000 working hours) is also displayed here.

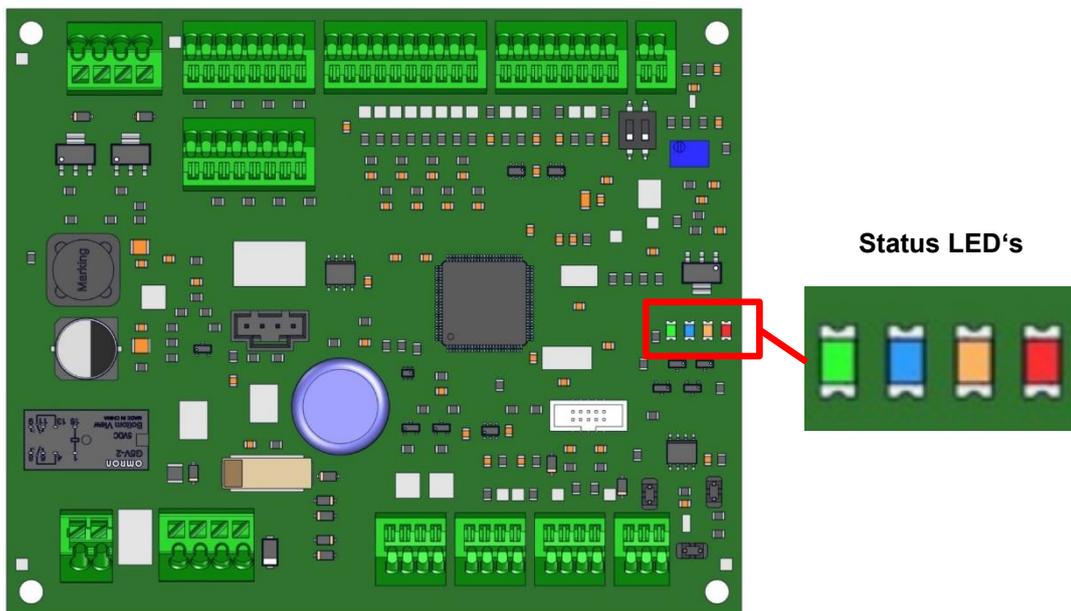


Fig. 24 - Control board PCB AIRWIN 3.1



LED green	LED blue	LED orange	LED red		
		1	1	Fehler Füllen (Füllen Timeout) Error filling (Fill Timeout)	Fehlercode / error code
		2	1	Fehler Entleeren (Entleeren Timeout) Error draining (Drain Timeout)	
		1	∞	Fehler Strommessung Magnetventil-Zulauf Error current measurement supply valve	
		2	∞	Fehler Strommessung Magnetventil-Ablauf Error current measurement drain valve	
		3	∞	Fehler Strommessung Lüfter Error current measurement fan	
		4	∞	Fehler Strommessung Oszillatorplatten Error current measurement oscillator boards	
		3	1	Fehler Vernebelung Timeout Error nebulisation timeout	
		4	1	Fehler Niveauschalter Error level switch	Zustand / status
∞			3	Bereitschaft (keine Freigabe & keine Anforderung) Standby (no release & no requirement)	
∞		∞		Vernebelung Nebulisation	
∞		1		Problemlöseroutine Problem solving	
∞		2		Spülung Flushing	
∞		3		Entleeren Draining	
∞		4		Wanne auffüllen & Lüfter Vorlauf Fill tank & fan pre-run	
	1			Wartung 1 (5.000 Std.) Maintenance 1 (5,000 hours)	Wartung / maintenance
	∞			Wartung 2 (10.000 Std.) Maintenance 2 (10,000 hours)	
∞			1	Befeuchtungsanforderung nicht vorhanden Humidification request not available	
∞			2	Freigabe nicht vorhanden Release not available	
		4	4	Unbekannter Fehler Unknown error	

Die Zahl gibt die Anzahl der Lichtimpulse der LED an. The number indicates the number of light pulses of the LED.

∞ = dauerhaft an

∞ = permanently on

Fig. 25 - Decoding LED-Display

12.8 Reset the maintenance interval

The resetting of the LED display may only be carried out by trained specialists.

After service or maintenance has been carried out, the LED display can be reset as follows:

1. Switch off the device and let it drain.
2. Remove the housing hood duct support.
3. Deactivate the safety chain by removing the control unit plug.
4. Switch on the device, wait for the rinsing cycle and the AquaDrain plus Duration.
5. Do the following action 5 times in a row.
Raise level switch S2 to the upper level, wait 1 second and then move it back to the lower level.
6. If the reset of the maintenance interval successful, the LED has gone out.
7. If the LED does not go out, repeat the process.
8. Put the duct support and housing hood back on and activate the safety chain.

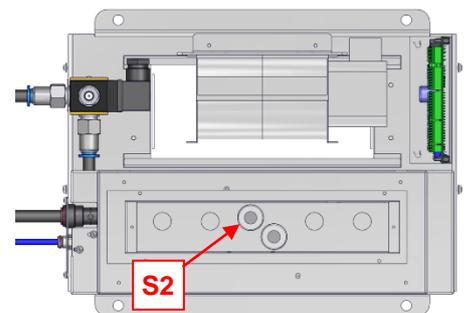


Fig. 26 - Level switch S2

12.9 Troubleshooting

Tab. 12-3 - Troubleshooting checklist

Error	Displayed error	Significance	Check installation	Check	Check control system	Elimination
No humidification	Error filling	The device is not filled within the specified time	Check inlet water pressure > 1 bar	Check water sieves	Check control unit settings	Restart humidifier
	Error draining	The device is not emptied within the specified time	Free drain available?	Check fluid tank for cleanliness and clean if necessary Function magnetic valve, check sequence	Check control unit settings	Restart humidifier
	Error current measurement supply valve	The solenoid valve supply is not activated	Solenoid valve coil connected?	Function magnetic valve, check inlet	Check control unit settings	Restart humidifier
	Error current measurement drain valve	The solenoid valve drain is not activated	Solenoid valve coil connected?	Function magnetic valve, check discharge	Check control unit settings	Restart humidifier
	Error nebulisation timeout	A refilling of the fluid tank did not take place during the specified duration (humidification timeout)	Water quality in accordance with technical specifications? Air flow available?	Function magnetic valve, check inlet Cleaning the fluid tank and level switch	Check control unit settings	Restart humidifier
	Error level switch	Level switch values are not plausible	Check exact horizontal installation	Check fluid tank for contamination. Check level switch functions		Restart humidifier Change level switch
	Unknown Error	Unknown error	Check connection of the device	Check for visual defects	Check control unit settings	Disconnect the power supply for at least 1 minute and then restart
Humidification performance dropped	Error current measurement oscillator boards	The power of the oscillators deviates from the reference value outside the tolerance range	Optical control of the transducer.	Check the function of the transducer visually Check service status	Check control unit settings	Restart humidifier

13. AquaDrain plus – hygiene management

13.1 Description

AquaDrain plus is a system designed to flush the demineralised water inlet pipe to the humidifier according to various parameters and to cyclically empty the fluid tank of the humidifier. To do so, AquaDrain plus uses a certain software and a solenoid valve combination integrated in the housing of the humidifier. In addition, AquaDrain plus prevents that the fluid tank is refilled with water, which had been reduced by evaporation, during the humidification-free periods of the AquaDrain plus cycle.

The AquaDrain plus cycle is the cycle in which the humidifier, minus the time for flushing the water inlet pipe and draining of the fluid tank, can humidify continuously, but does not necessarily have to do so. The AquaDrain plus cycle is 12 hours and the cycle was preset in the factory. Optionally this setting may be changed by the manufacturer see chapter 12.4.

If several humidifiers are installed in a system and AquaDrain plus is activated, the AquaDrain plus delay can be used to prevent all humidifiers from being emptied at the same time. For optional factory settings, see chapter 12.4.

Definitions

- 1. Humidifier
 - 1.1. Solenoid valve drain, integrated
 - 1.2. Solenoid valve supply, integrated
- 2. Water overflow
- 3. Water supply
- 4. Demineralisation system (reverse osmosis system)
- 5. Water drainage

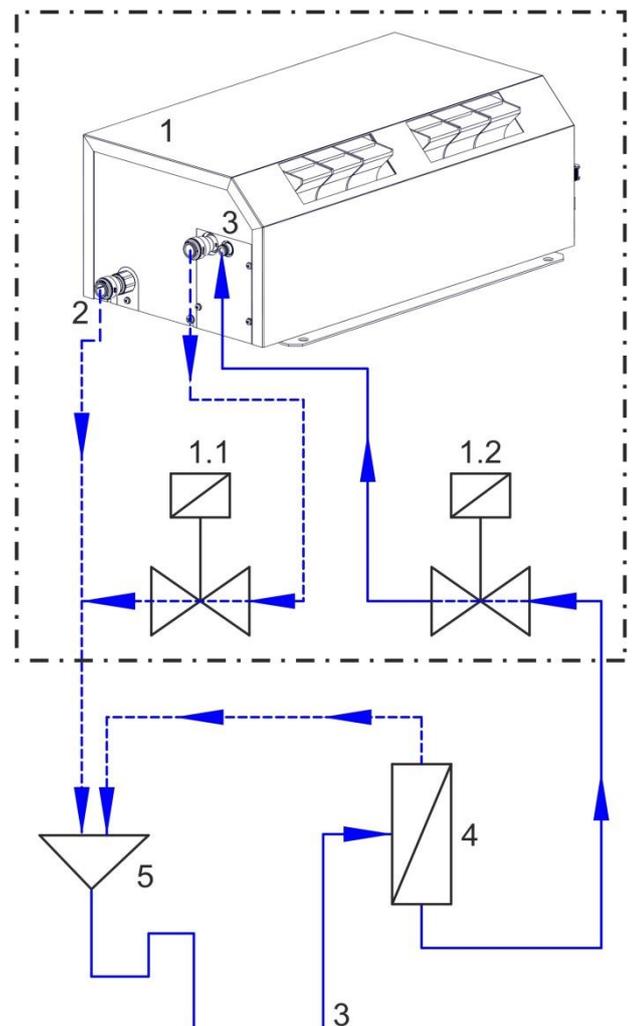


Fig. 27 - AquaDrain plus - diagram

13.2 Features

13.2.1 Flushing of water supply line

The humidifier goes into flushing mode, which is carried out in two phases depending on the time, for the following events:

1. Initial start-up (operating voltage is present for the first time)
2. Operating voltage is applied again (after each interruption of operation voltage)
3. After each humidifying pause which is longer than the AquaDrain plus cycle

The first phase includes the actual flushing process. The solenoid valves for supply and drain open at the same time for 120 seconds. The water supply pipes and/or tubes are rinsed. This ensures that the FIRST water present in the supply line (possibly hygienically questionable) is not nebulized as it is drained directly without filling up the fluid tank. The flushing volume depends on the pressure of the demineralised water (Fig. 32) and the flush time (Tab. 12-1).

In the second phase the solenoid valve supply is close. The solenoid valve drain remains open for 3, 4 or 5 Min. (Tab. 12-1 „AquaDrain Duration“) to ensure that the water that might still be inside the fluid tank is drained.

If a humidification request is made after the second phase, the humidifier will go into normal operation. At the same time, the solenoid valve supply opens and the solenoid valve drain closes. The fluid tank is filled up to maximum level. Humidification starts when there is a humidification request.

The filling time for the fluid tank of the humidifier is determined by the pressure of the demineralised water.

If no humidification request follows after the second phase, the humidifier will go into standby mode until a humidification request is carried out.

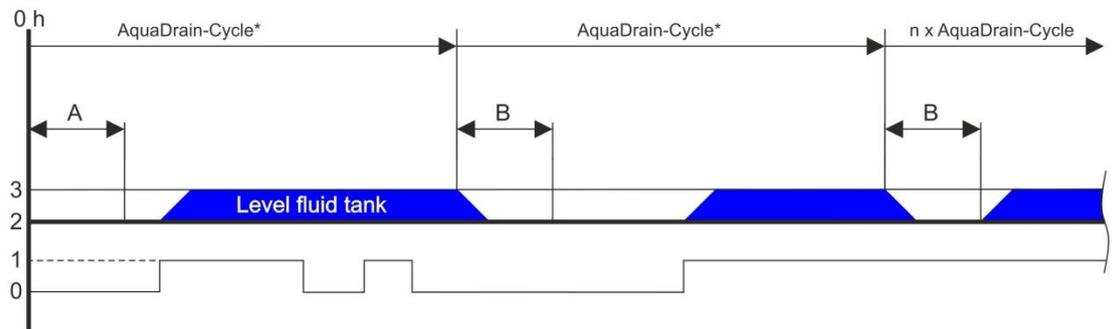


Fig. 28 - Example for commissioning and restart

Definitions

*) possible AquaDrain plus-Cycles: 10 Min., 30 Min, 1.5 h, 3 h, 6 h, 12 h, 24 h and 48 h (default 12 h, may be changed in the factory upon request)

- 0) Humidity request OFF
- 1) Humidity request ON
- 2) Fluid tank empty
- 3) Fluid tank full

- A) Flushing of water supply line
- B) Drainage of fluid tank

	<p>Any humidification request made during the AquaDrain plus duration will be ignored.</p>
---	--

13.2.2 Drainage of fluid tank

The humidifier is drained every 12 hours, if humidification took place in the last AquaDrain plus cycle and in case of any power interruption in the AquaDrain plus cycle (operating voltage is no longer present).

	<p>Any humidification request made during the drainage process will be ignored.</p>
---	---

If no humidification is requested, the humidifier is in standby mode.

If the fluid tub is still full, it will be automatically emptied after the adjustable "Inactivity Drain Timeout", Tab. 12-1. For optional factory settings, see chapter 12.4.

If the system is drained, the fluid tank will only be refilled, when a humidification request was made.

Time of AquaDrain Duration see Tab. 12-1.

The filling time for the fluid tank of the humidifier is determined by the pressure of the demineralised water and the humidifier model.

The fluid tank will stay dry, if there is no humidification request.

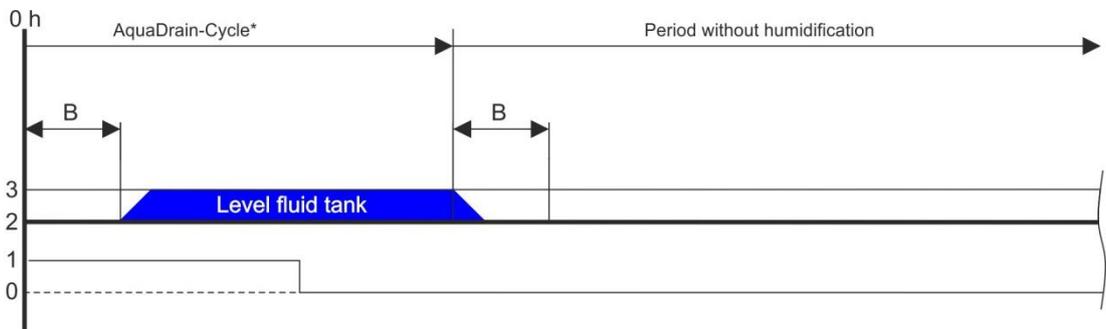


Fig. 29 - Period without humidification

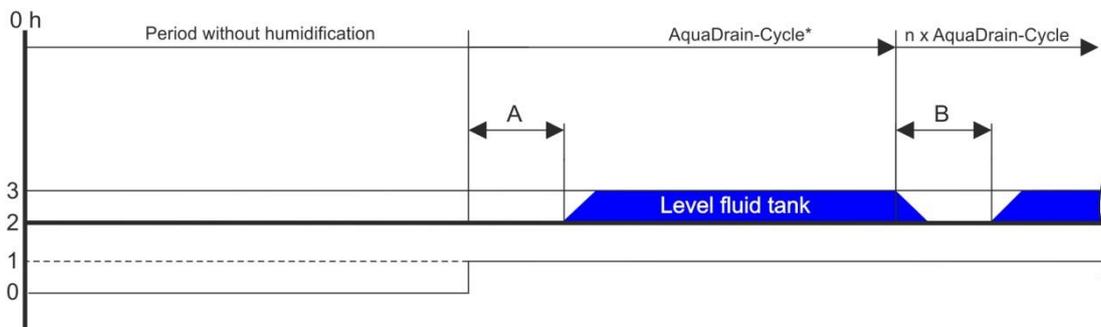


Fig. 30 - New humidification request

- A) Flushing of water supply line
- B) Drainage of fluid tank



13.3 AquaDrain plus diagrams

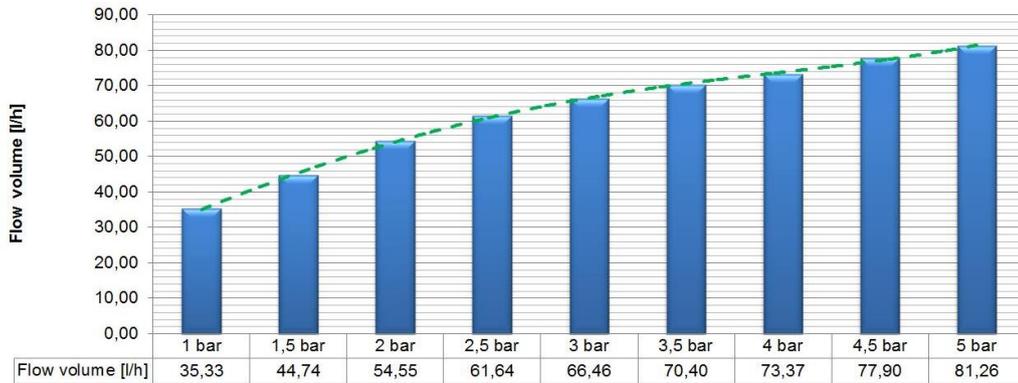


Fig. 31 - Flow volume solenoid valve supply ND 1.2 mm depending on water pressure

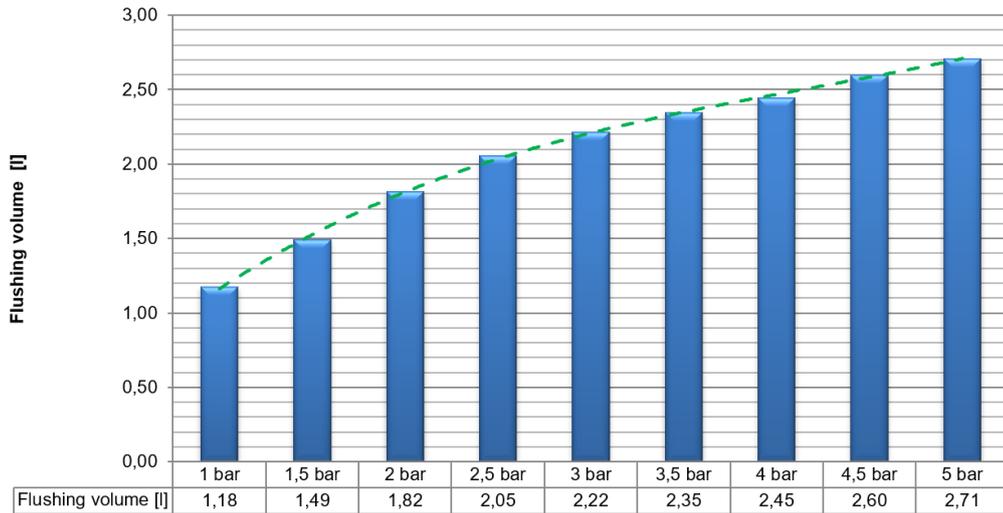


Fig. 32 - Flushing volume in liters at 120 sec flushing time depending on water pressure

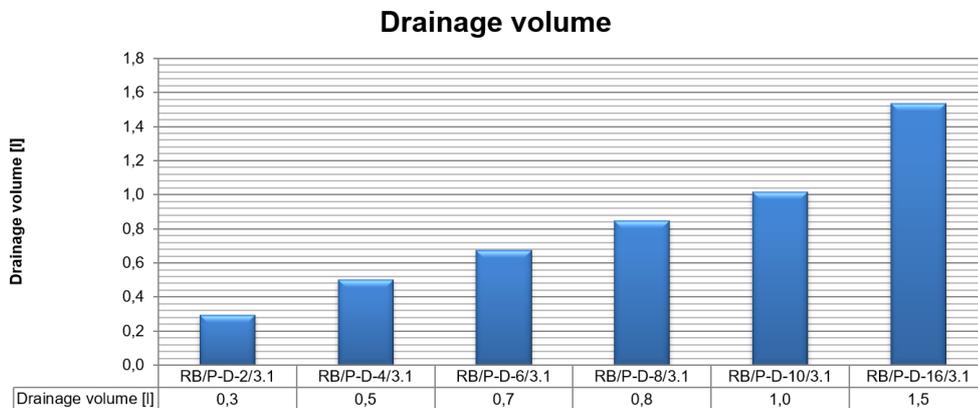


Fig. 33 - Drainage volume - fluid tank RB/P-D2...16/3.1

14. Dimensioning of cable cross section

The ohmic resistance between transformer and humidifier through the power cable produces a loss in voltage and consequently a drop in humidifier output.



The physical distance and the length of cable between the transformer and the humidifier should therefore be kept to a minimum!

The voltage drop caused by ohmic resistance may be reduced by using a cable of large cross section and compensated for by the 53 V secondary connection at the transformer. The graphs Fig. 34 - Fig. 37 show the ohmic loss for each humidifier depending on the cable length.

Using the 53 V transformer secondary voltage results in an overvoltage of 5 V (~ 10 % of 48 V) which may be consumed by the ohmic resistance of the cable. The correct cross-section of the cable will always be that which comes closest to the 5V mark for the voltage loss.

On account of the negligible power consumption of the humidifiers, the open-circuit voltage on the other hand is almost equal to the voltage at the transformer. To prevent damage to the humidifier electronics, the open circuit may **not exceed 54 V**.

Installation costs will be kept to a minimum if the graphs are correctly used.



The dimensions of the transformer is determined not only by the electrical power consumption of the humidifier but also on the power consumption of the cable feed (ohmic resistance)!

The conductor resistance of fine-stranded:	1.5 mm ²	=	13.30 Ω/km
	2.5 mm ²	=	7.98 Ω/km
	4.0 mm ²	=	4.95 Ω/km
	6.0 mm ²	=	3.30 Ω/km

(extract from VDE 0295 and IEC 60228 for bare wires, class 5)

Conductor resistances refer to single-stranded conductors. They must therefore be multiplied by 2 for two-stranded conductors (N+L1).

In addition, the load capability of insulated leads (current density) should be taken into account. VDE 0100 Part 430 and Part 523).



The use of shielded Lines (e.g., LiYCY) recommended for the power supply 48V-AC, as well as the signal and control lines,

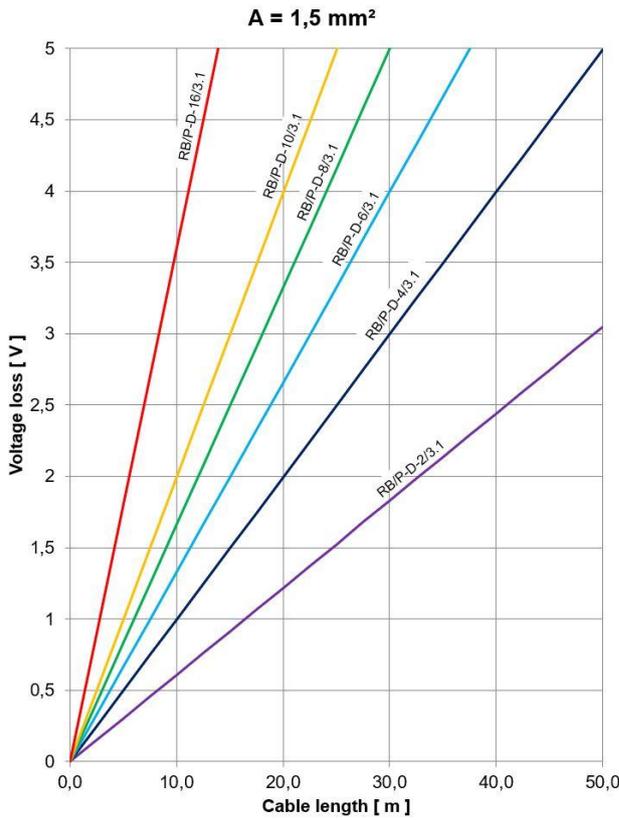


Fig. 34 - Voltage loss at A = 1.5 mm²

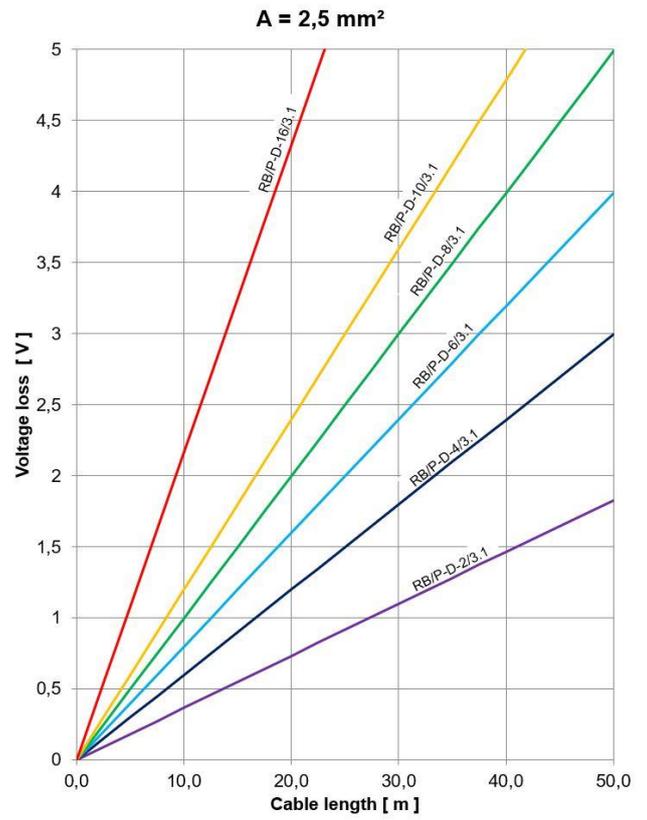


Fig. 35 - Voltage loss at A = 2.5 mm²

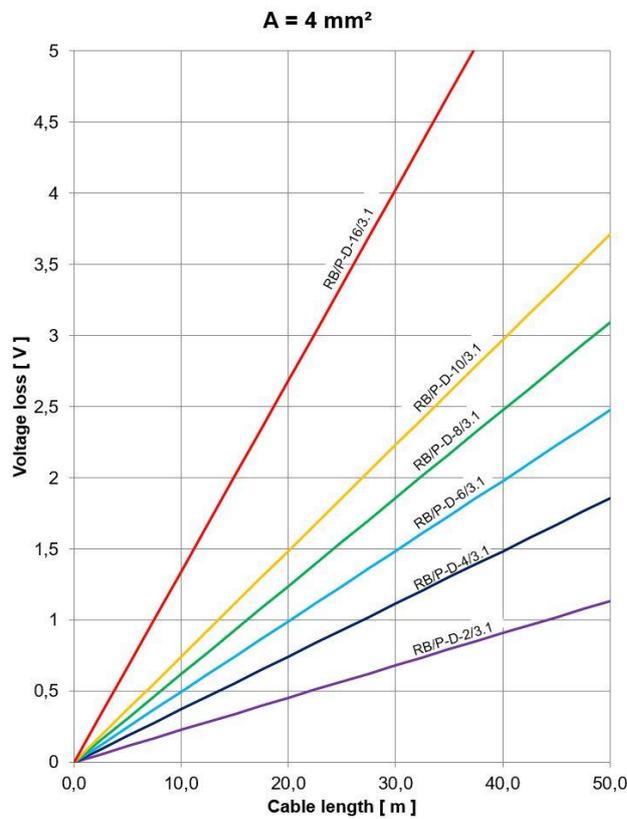


Fig. 36 - Voltage loss at A = 4 mm²

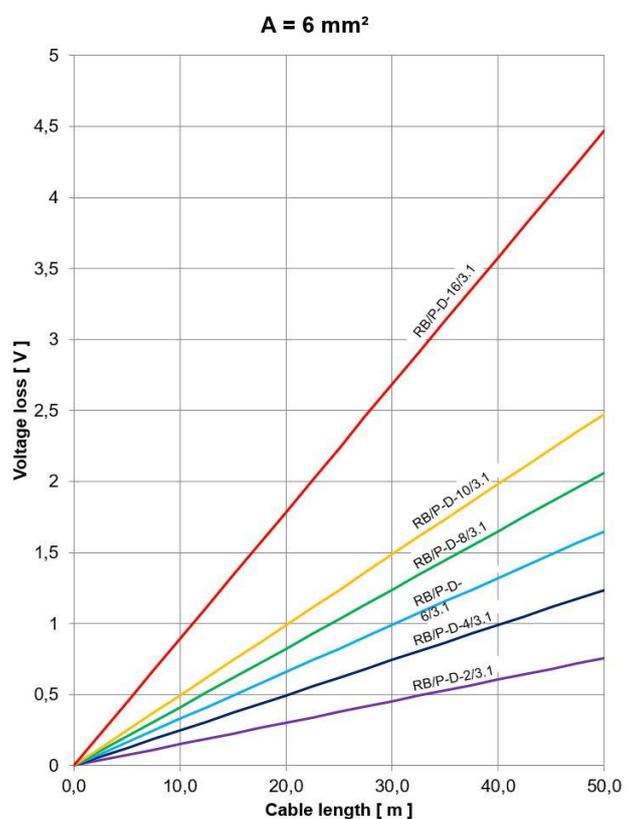


Fig. 37 - Voltage loss at A = 6 mm²

15. Commissioning

Before commissioning the humidifier, check once again that all installation and wiring work has been carried out correctly and fully completed. In particular, the water and power supply connections must be in proper order and comply with the relevant safety regulations.

15.1 Manual functions

- *Release of permeate inlet into the device*

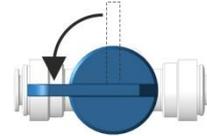


Fig. 38 - Stop cock

- *Release of 230 V / 50 Hz to the transformer and switch on transformer*



Fig. 39 - Circuit breaker

- *The SET humidity at the continuous control or hygrostat must be higher than the ACTUAL humidity*



Fig. 40 - Room hygrostat

15.2 Automatic functions:

- *Flushing of water supply line:*

The solenoid valve supply of the humidifier opens. The solenoid valve drain is open. The water supply line is flushed without the fluid tank of the humidifier being filled.

After that, the solenoid valve supply closes again. The solenoid valve drain stays open for 3, 4 or 5 minutes (Tab. 12-1 "AquaDrain Duration").

- *Filling the fluid tank:*

The Solenoid valve drain closes. The Solenoid valve supply opens. The fluid tank of the humidifier is filled. The water level is automatically controlled within narrow tolerances.



The fluid tank may only be filled if a humidification request has been made. Otherwise the fluid tank of the humidifier will remain dry.

- *Humidification:*

Once the maximum water level is reached and the humidification request is still present, humidification will start.

15.3 Make applied settings:

- Set target humidity

Commissioning of the humidifier is completed.

16. Technical Data

Tab. 16-1 - Technical specifications

Spezifications		RB/P-D2/ 3.1	RB/P-D4/ 3.1	RB/P-D6/ 3.1	RB/P-D8/ 3.1	RB/P-D10/ 3.1	RB/P-D16/ 3.1
Max. humidifying capacity *	kg/h	1.0	2.0	3.0	4.0	5.0	8.0
Transducer	piece	2	4	6	8	10	16
Power supply							
Transformer	V / 50 Hz	230	230	230	230	230	230
Humidifier	V / 50 Hz	48	48	48	48	48	48
Power consumption	VA / 50 Hz	110	180	240	300	360	650
Transformer **	ST	500	500	500	500	500	1000
Max. fan performance	m ³ /h	100	100	149	149	149	298

* The effective humidifying capacity depends on the level of supply voltage under load (set 48 V) and on the length and cross section of the tubes/pipes leading to the place of humidification.

** The power output of the transformers stated is optimised for the humidifier types. Their power reserves are sufficient to bear the power consumption of a correctly laid supply cable with short distance between humidifier and transformer. Nevertheless, it is advisable to check transformer selection mathematically according to local conditions.

Tab. 16-2 - Safety devices

Safety devices	Description
Dry-running protection with functional redundancy	If the water level falls below the minimum level in the fluid tank, the humidification switches off. For this purpose, both level switches are monitored separately.
Overheating protection	The humidifier stops humidifying at water temperatures > 60 °C.
Overflow protection	If the humidifier fluid tank is overfilled, the excess water is drained off to the outside through the overflow.
Disconnect protection	There are no defects in the event of electrical interruptions between the oscillator board and the transducer.
Monitoring	Monitoring of important system components with integrated problem solver routines.
Protection against power surges	The control board is protected by its own fuse. A varistor in the input of the power supply protects against power surges.

Tab. 16-3 - Operation conditions

Operation conditions	Parameter
Maximum air humidity	< 90 % relative humidity – no condensation!
Air temperature	5 - 45 °C
Demineralised water pressure	1 - 4 bar
Demineralised water quality	fully demineralised
Demineralised water conductivity	5 - 20 µS/cm

17. Device dimensions / weights

Tab. 17-1 - Dimensions and weights

RB/P-D/3.1								
Type	Weight	Dimensions						
		width			depth			height H
	B1	B2	B3	T1	T2	T3		
kg	mm	mm	mm	mm	mm	mm	mm	
RB/P-D2/3.1	7	162	261	444	251	270	290	176
RB/P-D4/3.1	9	271	370	553	251	270	290	176
RB/P-D6/3.1	11	361	460	643	251	270	290	176
RB/P-D8/3.1	13	451	550	733	251	270	290	176
RB/P-D10/3.1	15	541	640	823	251	270	290	176
RB/P-D16/3.1	21	811	910	1093	251	270	290	176

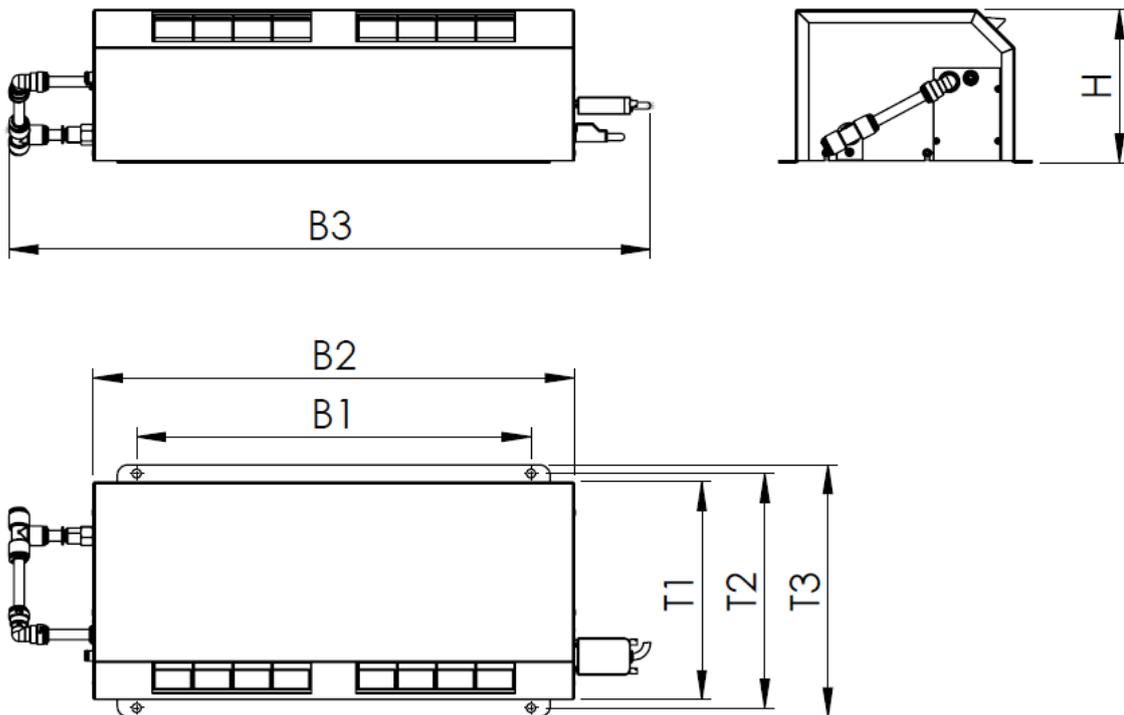


Fig. 41 - Total dimensions

18. Circuit diagrams

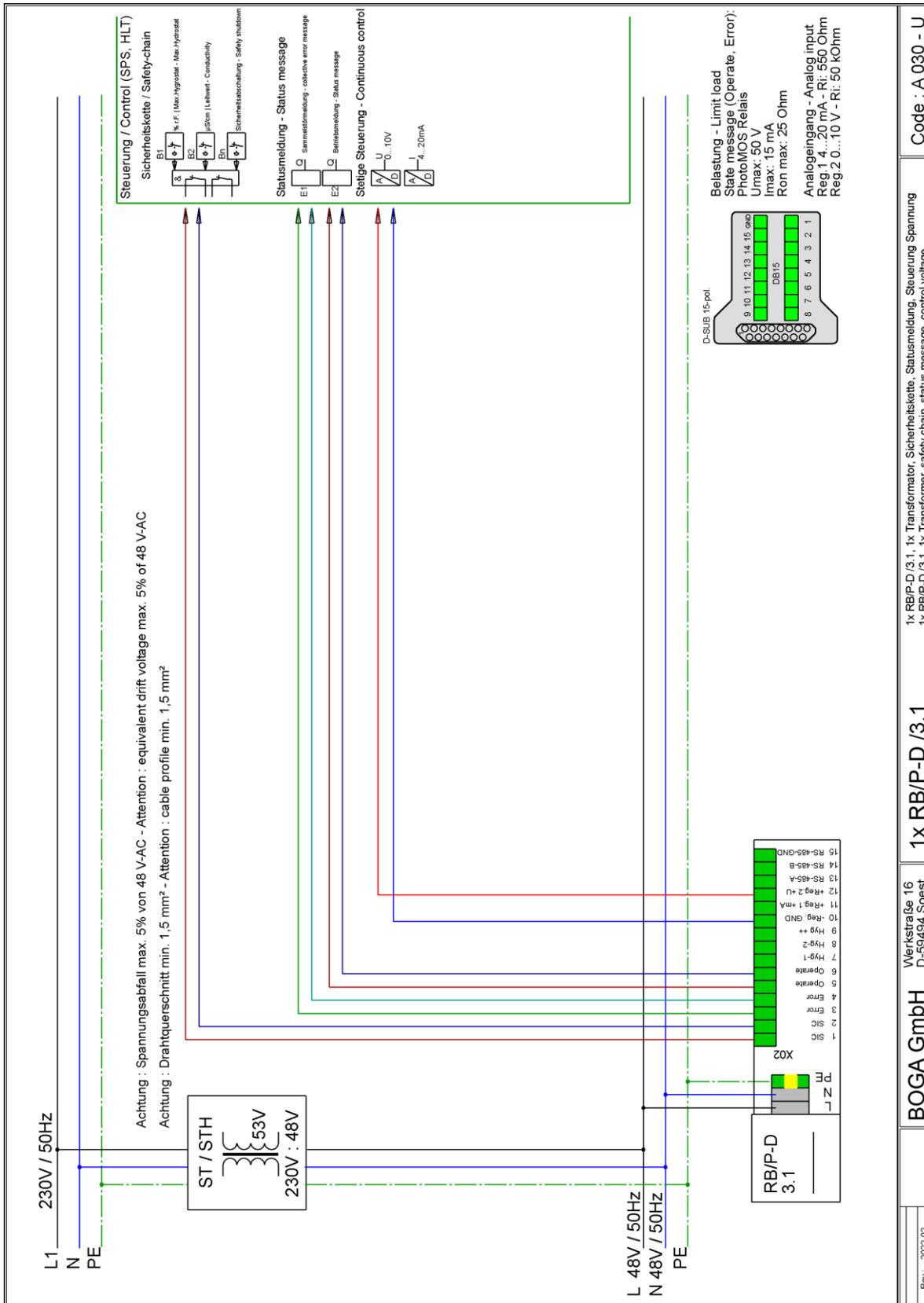


Fig. 42 - 1x RB/P-D/3.1, 1x transformer, safety chain, status message, control voltage

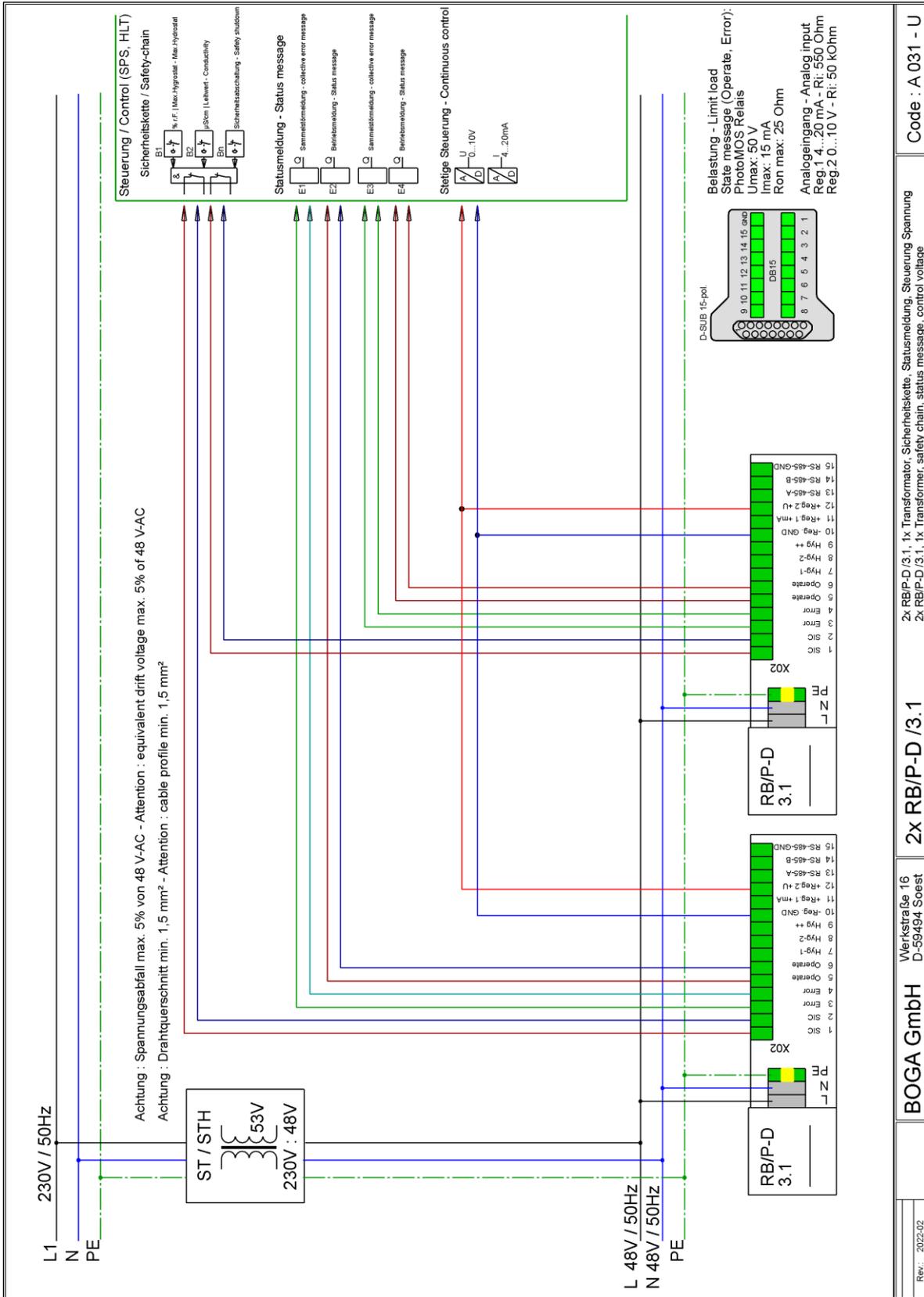


Fig. 44 - 2x RB/P-D/3.1, 1x transformer, safety chain, status message, control voltage

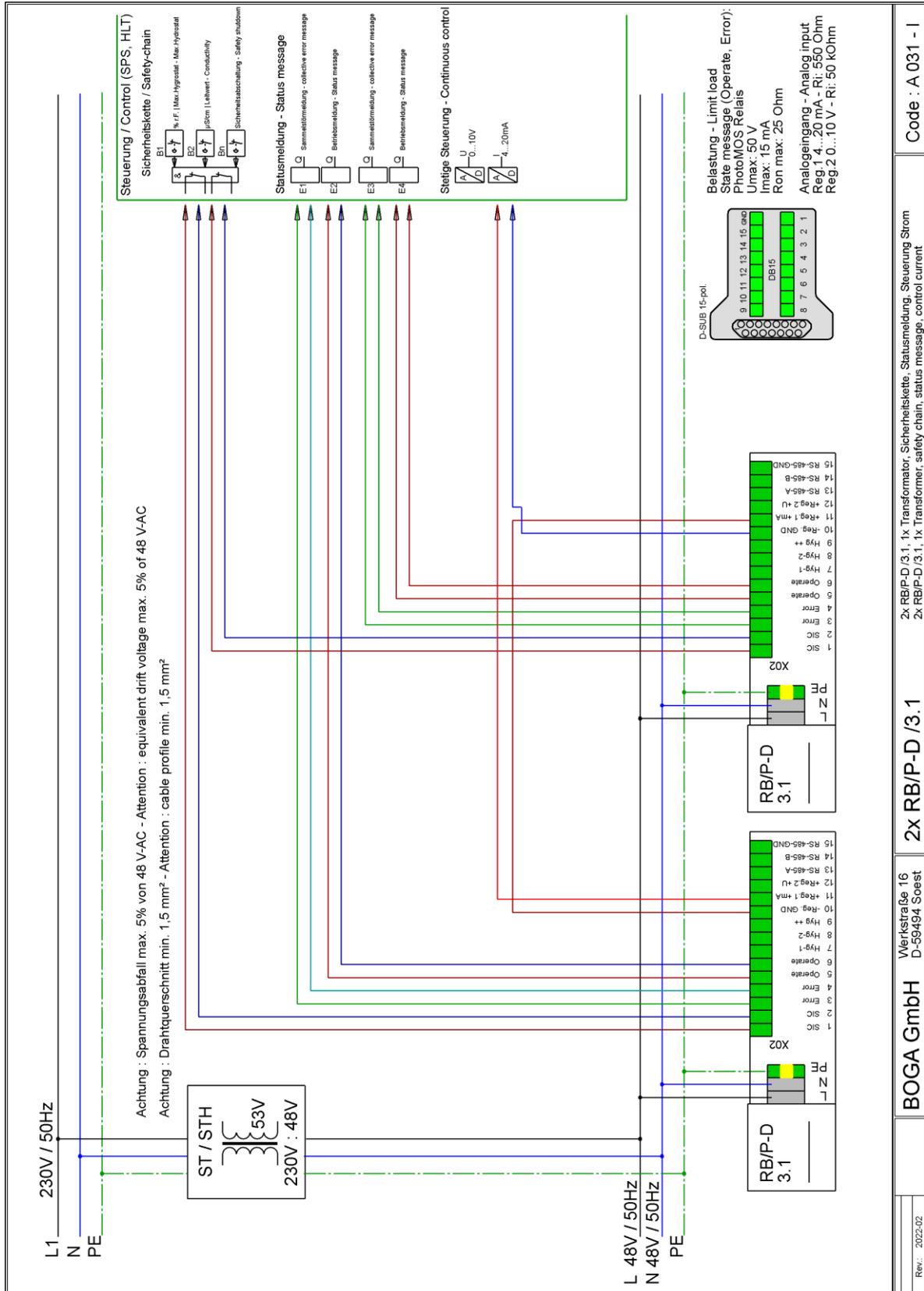
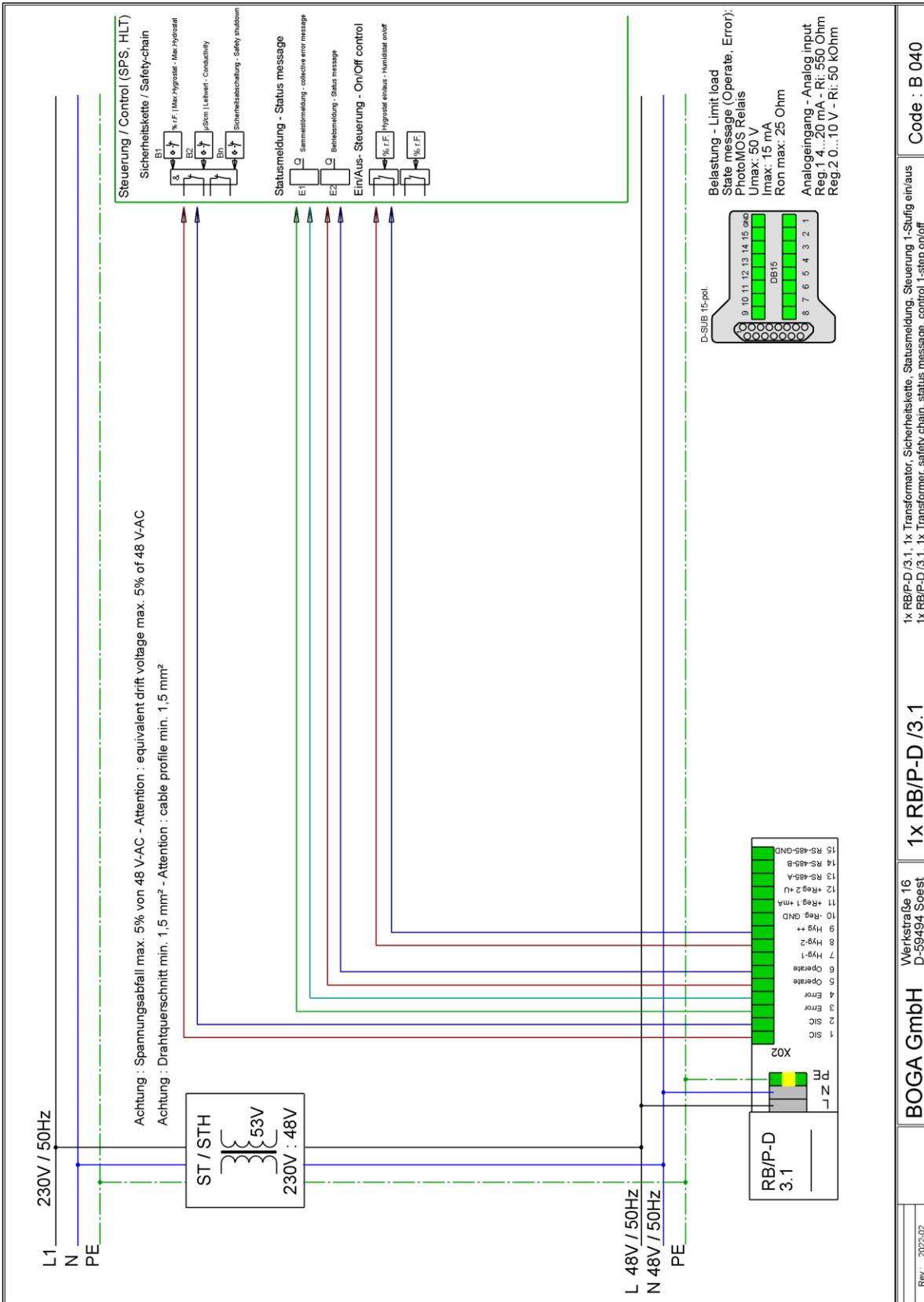


Fig. 45 - 2x RB/P-D/3.1, 1x transformer, safety chain, status message, control current



Code : B 040

1x RB/P-D/3.1, 1x Transformator, Sicherheitskette, Statusmeldung, Steuerung 1-Stufig ein/aus
1x RB/P-D/3.1, 1x Transformator, safety chain, status message, control 1-step on/off

1x RB/P-D /3.1

BOGA GmbH Werkstraße 16 D-59494 Soest

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Fig. 46 - 1x RB/P-D/3.1, 1x transformer, safety chain, status message, control 1-step on/off

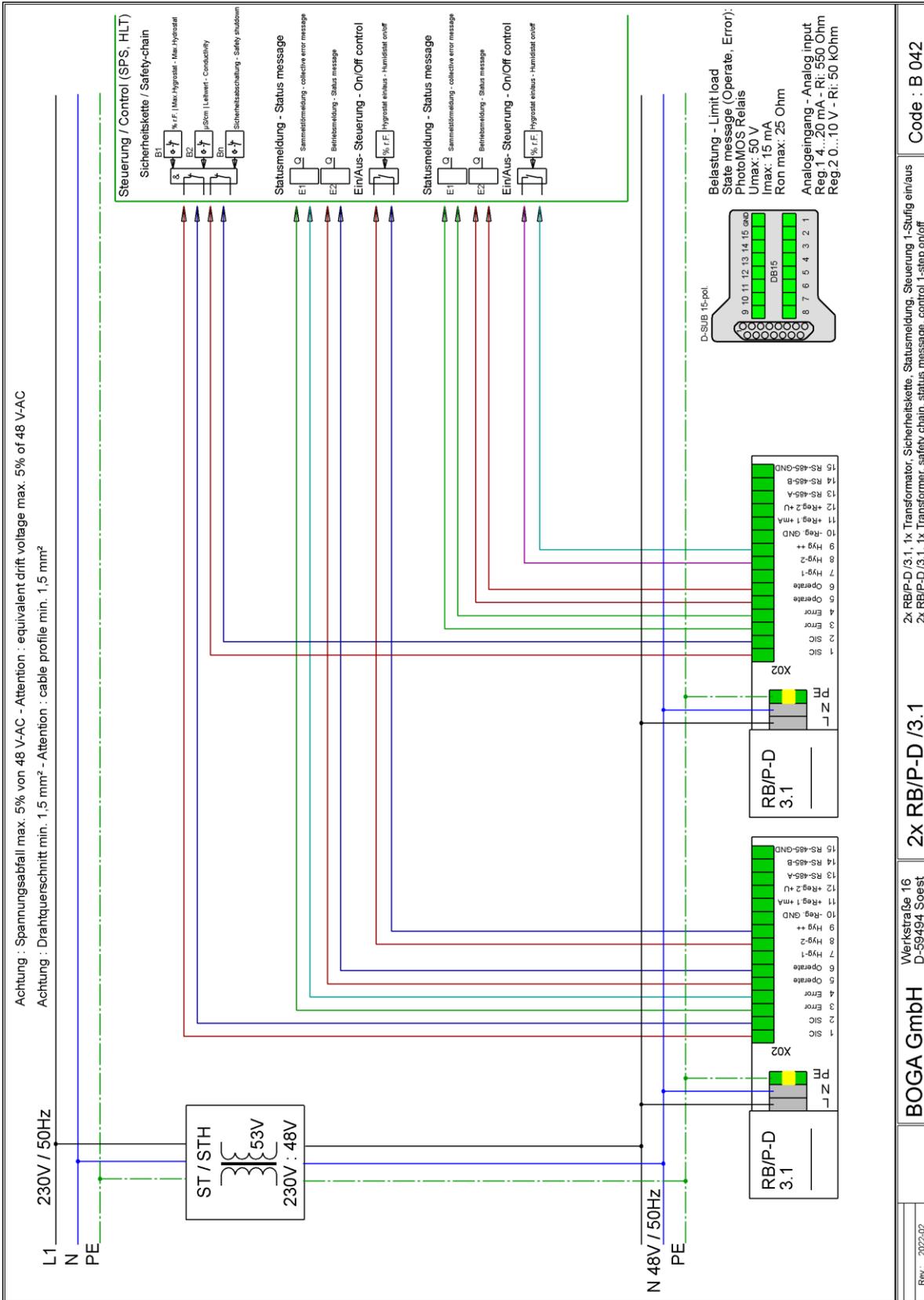
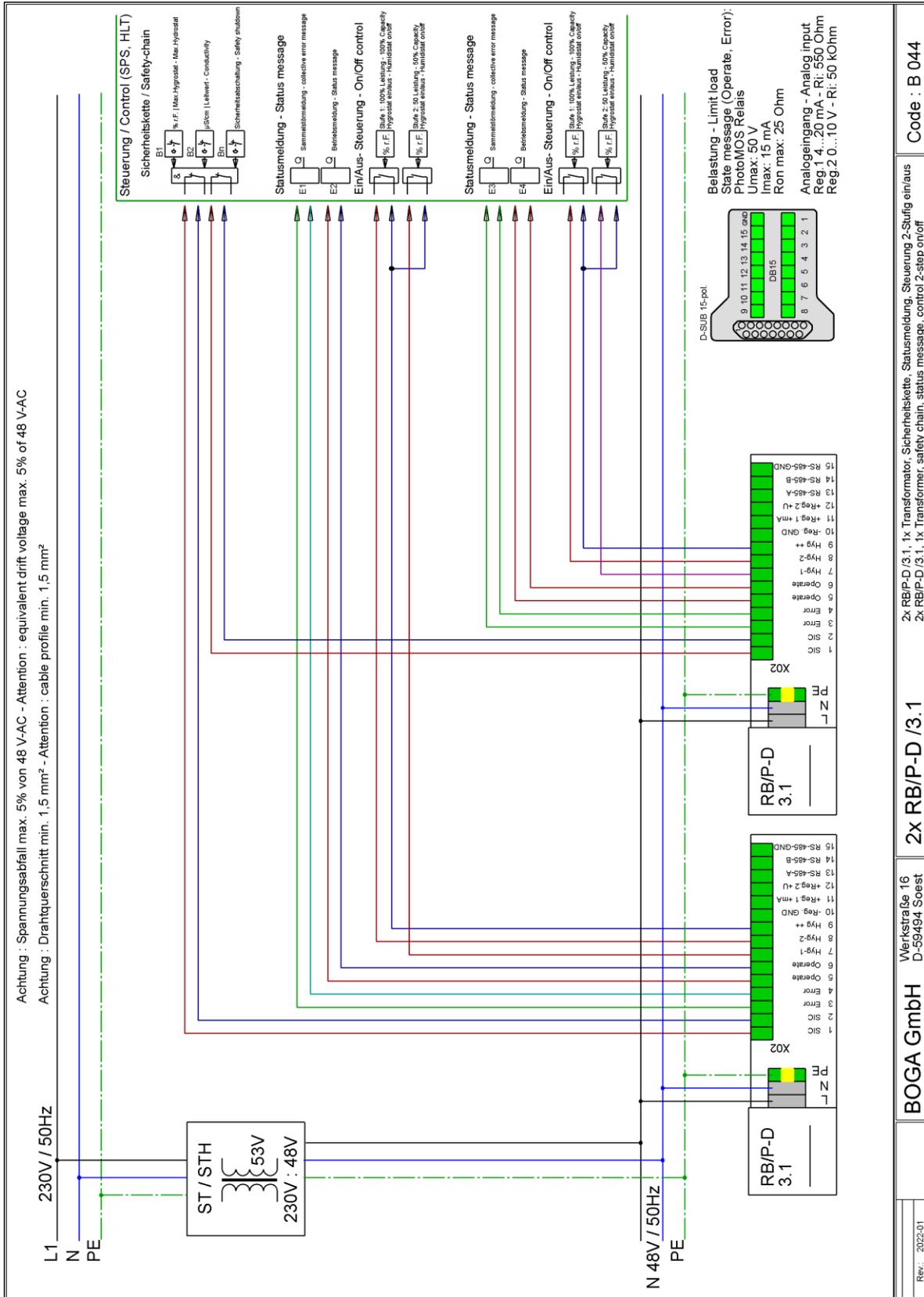


Fig. 48 - 2x RB/P-D/3.1, 1x transformer, safety chain, status message, control 1-step on/off



Code : B 044

2x RB/P-D/3.1, 1x Transformator, Sicherheitskette, Statusmeldung, Steuerung 2-Stepf ein/aus
 2x RB/P-D/3.1, 1x Transformator, safety chain, status message, control 2-step on/off

2x RB/P-D/3.1

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Fig. 50 - 2x RB/P-D/3.1, 1x transformer, safety chain, status message, control 2-step on/off

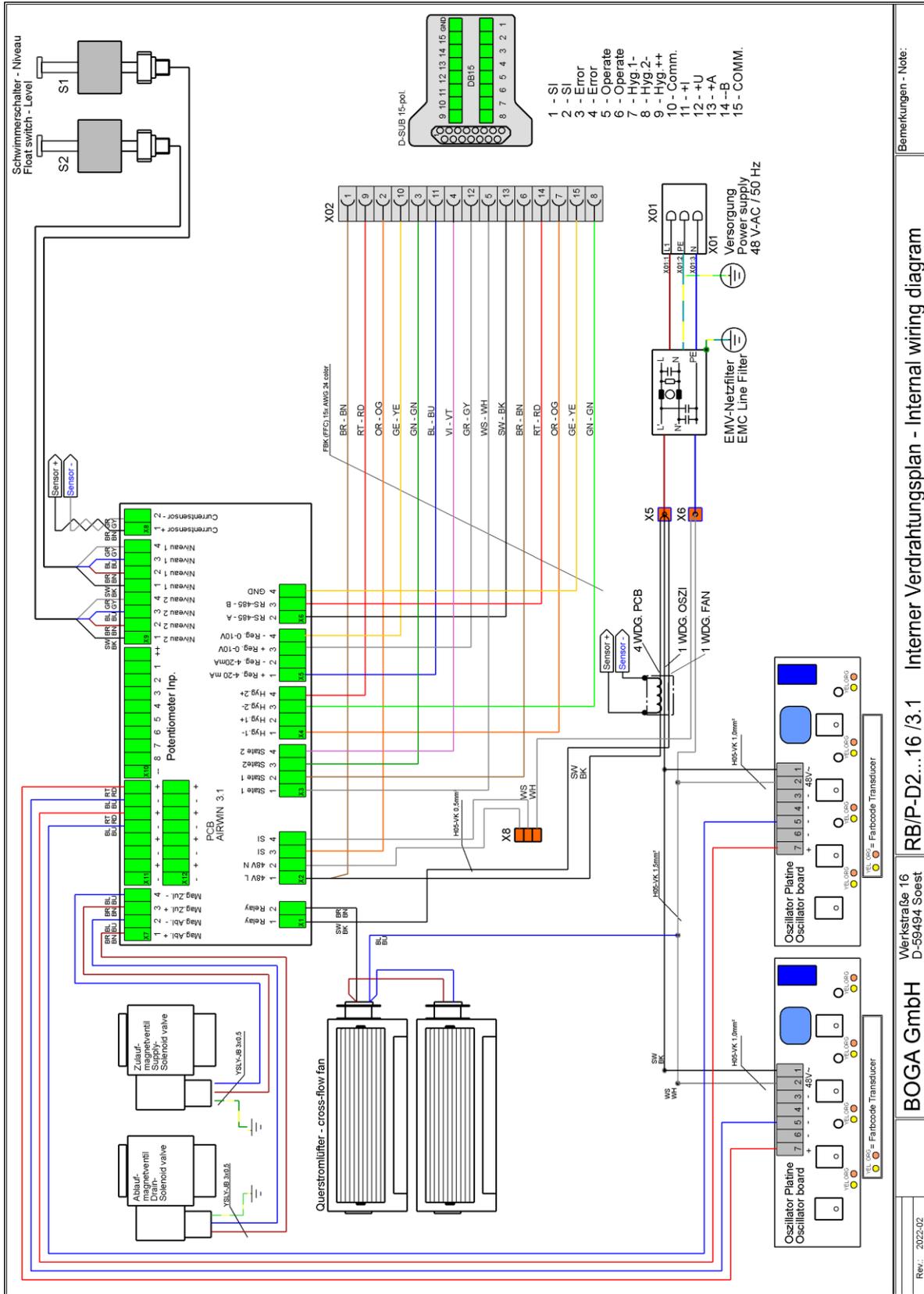


Fig. 51 - Internal wiring diagram RB/P-D2/3.1 to RB/P-D16/3.1

19. Care

It is essential that the humidifier is easy to inspect and easily accessible on site.

	Good accessibility and exchangeability of the humidifier save costs!
---	--

Prior to opening the humidifier, it must be disconnected from the electricity and water supply.

Then remove the housing cover and body duct support. In case of pollution, the fluid tank of the humidifier must be cleaned by using a clean, totally fat-free medium hard brush and clean water. The transducers must be wiped clean with a soft, scratch-free cloth. Incrustations or solid deposits on the transducers must be carefully removed. For that purpose, it is recommended to use 20 % formic acid.

	Deposits are a direct consequence of inadequate water quality!
---	--

The care intervals depend on the respective degree of contamination of the humidifier. It depends directly on the cleanliness of the intake air and the feed water quality. It may be necessary to perform care at shorter intervals.

The performance of the ultrasonic transducers decreases with actual operating hours. The life time of the ultrasonic transducers will be shortened by unfavourable operating conditions e.g. water and air pollution or overvoltage.



Care and cleaning tasks	
1. Checks	
<p>Check the fluid tank, the transducers and the intake air filter for contamination. → Clean them, if necessary!</p>	<p>Initially, a check has to be carried out after 1 week. Depending on the degree of contamination of the fluid tank, the transducers and the intake air filter, the cleaning intervals must be adjusted.</p>
	<p>If pollution is found during the check, cleaning must be performed.</p>
2. Care and cleaning	
<ul style="list-style-type: none"> - Fluid tank - Transducers - Intake air filter mat 	<p>Slime in the fluid tank is a sign of the presence of micro-organisms! Cause: Air and/or water</p> <p>Incrustations are mineral deposits! Cause: Water</p>
Measures	<ul style="list-style-type: none"> • Check and clean the environment, if required! • Check reverse osmosis system! • Adjust cleaning intervals!
	<p>Even without visible pollution, cleaning must be done at least every 12 months.</p>

20. Standards

20.1 EC declaration of conformity according to Machinery directive 2006/42/EC, Annex II 1.A

The resident authorised representative in the community

BOGA GmbH
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D-59494 Soest

hereby declares that the following product

Product designation:	Room Humidifer
Make:	AIRWIN
Series/type designation:	RB/P-D2/3.1 RB/P-D4/3.1 RB/P-D6/3.1 RB/P-D8/3.1 RB/P-D10/3.1 RB/P-D16/3.1

fulfills all the relevant provisions of the directive specified above and the additionally applied directives (in the following) - including the changes which applied at the time of the declaration.

The following additional EU directives have been applied:

- EMC Directive 2014/30/EU
- RoHS directive 2011/65/EU

The series complies with the safety regulations of VDE 0100 and was tested in accordance with VDE 701 part 1.

20.2 WEEE

The humidifier is WEEE-registered.

20.3 Imprint - Copyright

Imprint

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