

# Technical documentation

WP Max-HiQ & WP Max-LoQ

As of 2025.04

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# 1. FUNCTION DESCRIPTION

The WP Max-HiQ high-temperature heat pump is suitable for widely varying source temperatures in the range from 10 to 55 °C. This flexibility is achieved by a patented process that enables the system to always reach the optimum operating point despite changing source temperatures. The WP Max-LoQ heat pump, on the other hand, is suitable for source temperatures below 15 °C. The maximum flow temperature for both heat pump types is 72 °C. The areas of application for the heat pumps range from sustainable heating and energy networks, to photovoltaic-controlled electricity use, to charging large heat storage tanks, to use as conventional water/water or brine/water heat pumps. Thanks to their speed control, they cover a wide range of outputs and are therefore ideally suited for the use of fluctuating amounts of energy from photovoltaics, for example.



## ADVANTAGES

- Use of highly fluctuating sources possible
- Maximum flexibility thanks to speed-controlled inverter operation
- Flow temperatures up to 72 °C possible
- Integrated energy management (smart grid-compatible)
- Easy installation thanks to complete pre-assembly at the factory, no refrigeration licence required
- With ratiotherm components, a fully coordinated, future-proof system

## 2 NOTES ON DOCUMENTATION

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The following information is a guide to the complete documentation.

Other documents apply in conjunction with these operating and installation instructions. These installation and operating instructions for specialist tradesmen are part of the ratiotherm WP Max-HiQ/LoQ heat pump.

The ratiotherm WP Max-HiQ/LoQ heat pump must not be operated without these instructions.

The instructions must be made available to the operator and the specialist technician for information at any time.

When selling the ratiotherm WP Max-HiQ/LoQ heat pump, the instructions must also be provided.

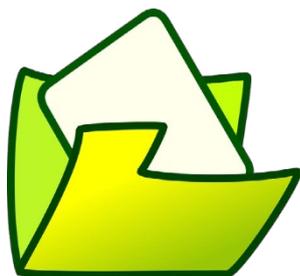
We accept no liability for damage caused by failure to observe these instructions.



### TARGET GROUP

These operating instructions are intended for

- the operator (user) and
- the specialist tradesman working on the system.



### STORAGE OF DOCUMENTS

Keep this manual and all applicable documents in a place where they are available when needed.

Hand over the documents to the successor when moving out or selling.

## 2. NOTES ON DOCUMENTATION

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### 2.1 BASIC SAFETY INSTRUCTIONS

#### **DANGER!**

Immediate danger  
leading to serious injury or death.  
Potentially dangerous situation  
which could result in serious injury or death.

#### **WARNING!**

Potentially dangerous situation  
that could result in personal injury.

#### **CAUTION!**

Potentially dangerous situation  
that could result in personal injury or damage to a component or object in the vicinity.

#### **NOTE!**

Application notes  
and other useful information that facilitates the intended use of the machine.

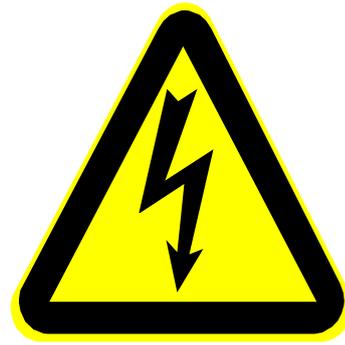
## 2. NOTES ON DOCUMENTATION

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### 2.2 SYMBOLS USED



Danger



Danger from electric current



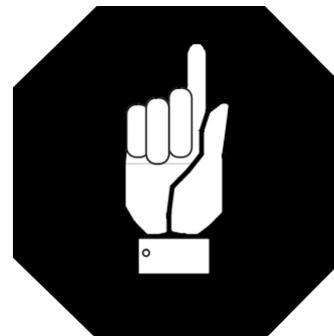
Warning of hot surfaces and liquids



STOP



De-energise before working



Note regarding damage



Read operating instructions



## 2. NOTES ON DOCUMENTATION

### 2.3 INTENDED USE

The ratiotherm WP Max-HiQ/LoQ heat pump is built in accordance with the latest technology and recognised safety regulations.

The heating appliance is intended exclusively for domestic and/or commercial use for hot water preparation (domestic water) and for heat or cold generation.

Improper or unintended use may result in danger to the life and limb of the user or third parties.

In addition, damage to the devices and other property may occur.



The ratiotherm WP Max-HiQ/LoQ heat pump is not intended for use by persons (including children) with limited physical, sensory or mental abilities.

The heat pump should also not be operated by persons with insufficient experience and/or knowledge

- unless they are supervised by a person responsible for their safety or have received instructions from this person on how to use the device.



The ratiotherm WP Max-HiQ/LoQ heat pump is intended exclusively for hot water preparation (domestic water) and for heat and cold generation.

Any other use or use beyond this is considered improper. The manufacturer/supplier is not liable for any damage resulting from this.

The risk is borne solely by the user (operator).

Intended use also includes observing the operating and installation instructions and all other applicable documents, as well as complying with the inspection and maintenance conditions.

## 2. NOTES ON DOCUMENTATION

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### 2.4 GENERAL SAFETY INSTRUCTIONS



#### WARNING! POSSIBLE DAMAGE

- Use only by qualified and trained persons.
- For intended use only.
- Any other use constitutes misuse.



#### CAUTION! RISK OF SCALDING

- The outlet temperature at the hot water taps can be up to 60 °C.
- Carefully check the water temperature at the hot water taps before placing your hands completely under the water jet.



#### NOTE! POSSIBLE DAMAGE

Damage to the heat pump and components is possible.

- Read and follow the operating instructions.
- To avoid accidents and damage to property, observe the safety instructions!
- The national regulations of the country in which the ratiotherm WP Max-HiQ/LoQ heat pump is used must be observed.



#### WARNING! POSSIBLE DAMAGE

Do not make any modifications

- to the heat pump;
- on the water and electricity pipes;
- on the safety valve;
- structural conditions that may affect the operational safety of the device;
- structural conditions in the vicinity of the device, insofar as these may affect the operational safety of the device.

## 2. NOTES ON DOCUMENTATION

### 2.5 INSTALLATION AND SETTING



The installation, commissioning or dismantling of the device may only be carried out by a specialist with specific knowledge necessary for the activities involved with this device.

The existing regulations, rules and guidelines as well as the local installation requirements must be observed.

#### CAUTION!



Safety valve and blow-off line

The volume of water increases during the heating process. Therefore, never close the blow-off line of the safety valve.

Hot water may escape from the blow-off pipe!



Leaks

If there are leaks in the heat pump area, switch off the system and shut off the connection to the rest of the heating system. These leaks must be repaired immediately.

#### NOTE!



Corrosion damage

To prevent corrosion on the device, do not use sprays, solvents, chlorinated cleaning agents, paints, adhesives, etc. in the vicinity of the device. Under unfavourable conditions, these substances can lead to corrosion.

Spare and wear parts

Components that have not been tested with the system may cause damage to the system or impair its functions. Only use original spare parts and original wear parts.

## 2. NOTES ON DOCUMENTATION

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### 2.6 GUIDELINES, STANDARDS AND LAWS



When setting up and installing the heater, the following regulations, rules and guidelines must be observed in particular:



#### IN GERMANY:

- VDE and EVU regulations and provisions (in particular VDE 0100);
- Regulations and provisions of local utility companies;
- DVGW worksheet W 382  
"Installation and operation of pressure reducers in drinking water consumption systems";
- DIN 1988 – TRWI Technical rules for drinking water installations;
- DIN 4753 – Water heating systems for drinking and service water;
- DIN 8947 – Ready-to-connect heat pumps for water heating with electrically driven compressors;
- Accident prevention regulations VGB 20 Accident prevention regulations  
"Refrigeration systems" with implementation instructions;
- Energy Saving Ordinance EnEV – Ordinance on energy-saving thermal insulation and energy-saving system technology in buildings from 2009

In addition, further local regulations and guidelines, e.g. local building regulations, may also apply.

As a general rule, the legal regulations applicable in the respective country must be observed!

## 2. NOTES ON DOCUMENTATION

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### 2.7 QUALIFICATION OF PERSONNEL



The installation, commissioning or dismantling of the device may only be carried out by a specialist with specific knowledge necessary for the activities involved with this device.

By personnel, we mean all persons who work on the ratiotherm WP Max-HiQ/LoQ heat pump. Trainees are not considered qualified personnel in this sense.

We assume that

- the operating personnel have been trained to operate the ratiotherm WP Max-HiQ/LoQ heat pump.
- the maintenance personnel adjust, check and repair the ratiotherm WP Max-HiQ/LoQ heat pump in such a way that there is no danger to people or property.

## 2. NOTES ON DOCUMENTATION

### 2.8 RESPONSIBILITY OF THE SPECIALIST TRADESMAN

#### CAUTION!



To avoid injuries of any kind, the general accident prevention regulations must be observed under all circumstances and appropriate personal protective equipment must be used.

To ensure safe installation, the responsible specialist tradesman must ensure that:



- the personnel have the necessary qualifications and receive the necessary training;
- the personnel have read and understood the operating instructions;
- staff have access to the operating instructions at all times;
- local accident prevention and environmental regulations are implemented and complied with;
- staff are instructed by the responsible supervisor and unauthorised persons are kept away from the ratiotherm WP Max-HiQ/LoQ heat pump;
- the ratiotherm WP Max-HiQ/LoQ heat pump is only handed over and operated in a safe and functional condition and any damage to the heat pump is repaired immediately or the damaged heat pump is shut down immediately.



Technical modifications

Technical modifications to the system are not permitted.

This also applies to the retrofitting of safety devices and welding on load-bearing parts.

Safety devices must not be taken out of service. Only original spare parts and original accessories from the manufacturer may be used.

## 3. TECHNICAL DATA

### 3.1 WP MAX-HiQ

Max-HiQ	F06	F14	F21	
<b>Performance data heating mode</b>				
W20/W55				
Heating output	3.06 to 8.7	5.9 to 19.8	7.8 to 25.1	kW
Power consumption	0.66 to 2.2	1.5 to 5.2	1.9 to 5.9	kW
COP at rated power	4.91	4.53	4.75	
<b>Compressor</b>				
Type	Fully hermetic, Rotary piston, inverter		Fully hermetic, scroll, inverter	
Blocking current LRA	32	40	45	A
Oil quantity	0.63	2	2	litres
<b>Evaporator</b>				
Design	Copper-brazed plate heat exchanger			
Material	Stainless steel / copper			
Brine flow rate	0.4 to 1	0.8 to 2	1 to 4	m <sup>3</sup> /h
Pressure loss	0.2	0.3	0.3	bar
Temperature difference	3	5	5	K
min. / max. source temperature	10 / 55			°C
Connection dimensions	1 1/2", AG			
<b>Condenser</b>				
Design	Copper-brazed plate heat exchanger			
Material	Stainless steel / copper			
Water flow rate	0.8 to 2.2	1.2 to 2.5	1.6 to 4.8	m <sup>3</sup> /h
Pressure loss	0.2	0.3	0.3	bar
Temperature difference	5 to 10			K
min. / max. flow temperature	30 / 72			°
Connection dimension	1 1/2", AG			
<b>Refrigeration circuit</b>				
Working medium	R134 A			
Filling quantity	1.4	1.9	2.2	kg
Max. operating pressure	26			bar
<b>Electrical</b>				
Mains connection	230 V / 1~ / 50 Hz		400 V / 3~ / 50 Hz	
Fuse	16	16	20	A
Max. operating current compressor	15	15.8	19	A
<b>Device data</b>				
Sound pressure level Interior at a distance of 1 m	40			dB(A)
Dimensions of interior	777 x 1800 x 512			WxHxD (mm)
Weight	210	230	250	kg
Max. operating pressure water	10			bar

## 3. TECHNICAL DATA

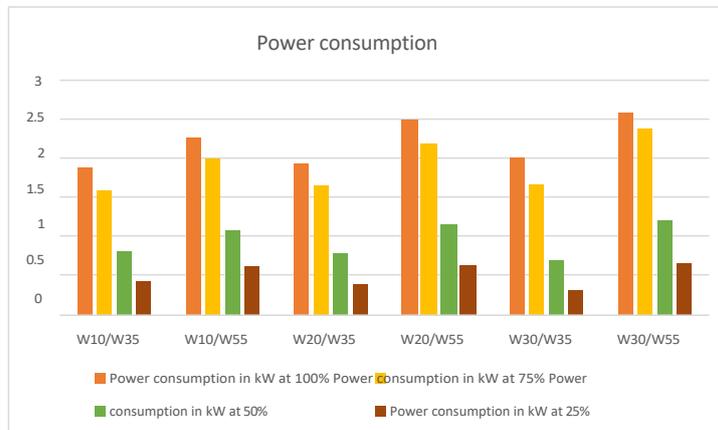
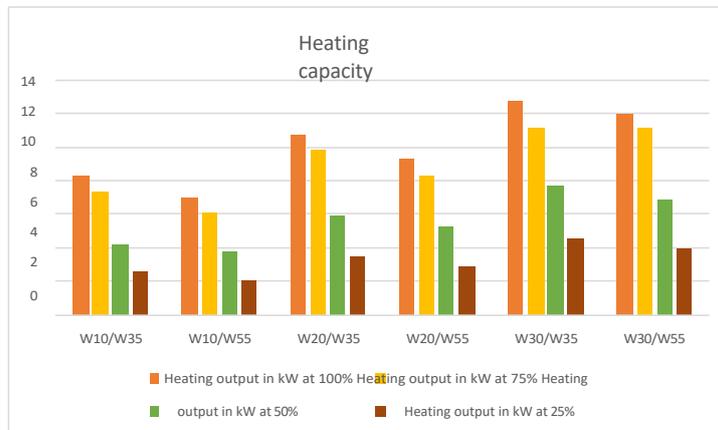
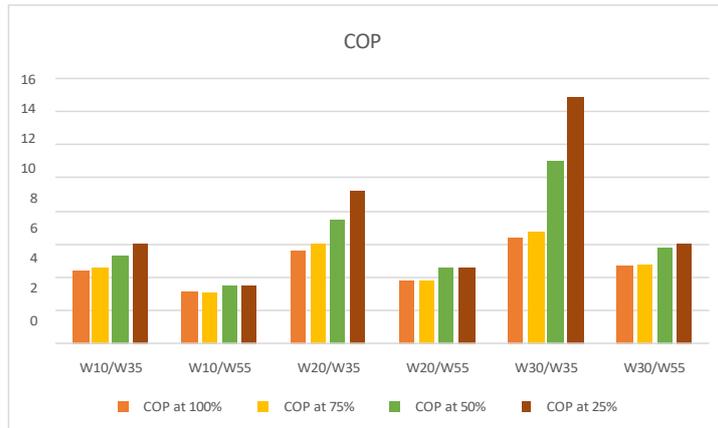
### 3.2 WP MAX-LoQ

Max-LoQ	F06	F14	F21	F27	
<b>Performance data heating mode</b>					
W10/W55					
Heating output	2.5 to 7.2	4.9 to 16.4	6.5 to 20.8	7.7 to 30.7	kW
Power consumption	0.66 to 2.2	1.5 to 5.2	1.9 to 5.9	2.5 to 10	kW
COP at rated power	3.77	3.33	3.33	3.37	
<b>Compressor</b>					
Design	Fully hermetic, Rolling piston,		Fully hermetic, scroll, inverter Inverter		
Blocking current LRA	32	40	45	50	A
Oil quantity	0.63	2	2	2.5	litres
<b>Evaporator</b>					
Design	Copper-brazed plate heat exchanger				
Material	Stainless steel / copper				
Brine flow rate	0.4 to 1	0.8 to 2	1 to 4	1 to 4.5	m <sup>3</sup> /h
Pressure loss	0.2	0.3	0.3	0.3	bar
Temperature difference	3	5	5	5	K
min. / max. source temperature					-5 / 15 °C
Connection dimensions	1 1/2", AG				
<b>Condenser</b>					
Design	Copper-brazed plate heat exchanger				
Material	Stainless steel / copper				
Water flow rate	0.8 to 2.2	1.2 to 2.5	1.6 to 4.8	1.6 to 5.3	m <sup>3</sup> /h
Pressure loss	0.2	0.3	0.3	0.3	bar
Temperature difference					5 to 10 K
min. / max. flow temperature					25 / 72 °C
Connection dimensions	1 1/2", AG				
<b>Refrigeration circuit</b>					
Working medium	R134 A		R513a		
Filling quantity	1.4	1.9	2.2	2.7	kg
Max. operating pressure					26 bar
<b>Electrical</b>					
Mains connection	230 V / 1~ / 50 Hz		400 V / 3~ / 50 Hz		
Fuse	16	16	20	25	A
Max. operating current compressor	15	15.8	19	24	A
<b>Device data</b>					
Sound pressure level Inner part at a distance of 1 m					40 dB(A)
Internal dimensions	777 x 1800		x 512		WxHxD (mm)
Weight	210	230	250	270	kg
Max. operating pressure water					10 bar

# 3. TECHNICAL DATA

## 3.3 PERFORMANCE CURVES OF THE MAX-HIQ F06

COP, heating capacity and power consumption at varying speeds:



	COP at				Heating capacity in kW at				Power consumption in kW at			
	100	75	50	25	100	75%	50	25	100	75	50	25
W10/W35	4.41	4.59	5.25	6.05	8.30	7.30	4.20	2.60	1.88	1.59	0.80	0.43
W10/W55	3.08	3.05	3.52	3.44	7.00	6.10	3.80	2.10	2.27	2.00	1.08	0.61
W20/W35	5.52	5.98	7.47	9.21	10.70	9.80	5.90	3.50	1.94	1.64	0.79	0.38
W20/W55	3.73	3.79	4.57	4.53	9.30	8.30	5.30	2.90	2.49	2.19	1.16	0.64
W30/W35	6.37	6.75	11.0	14.84	12.80	11.20	7.70	4.60	2.01	1.66	0.70	0.31
W30/W55	4.65	4.71	5.75	6.0	12.00	11.20	6.90	3.90	2.58	2.38	1.20	0.65

## 4. MECHANICAL INSTALLATION

### 4.1 INDOOR UNIT

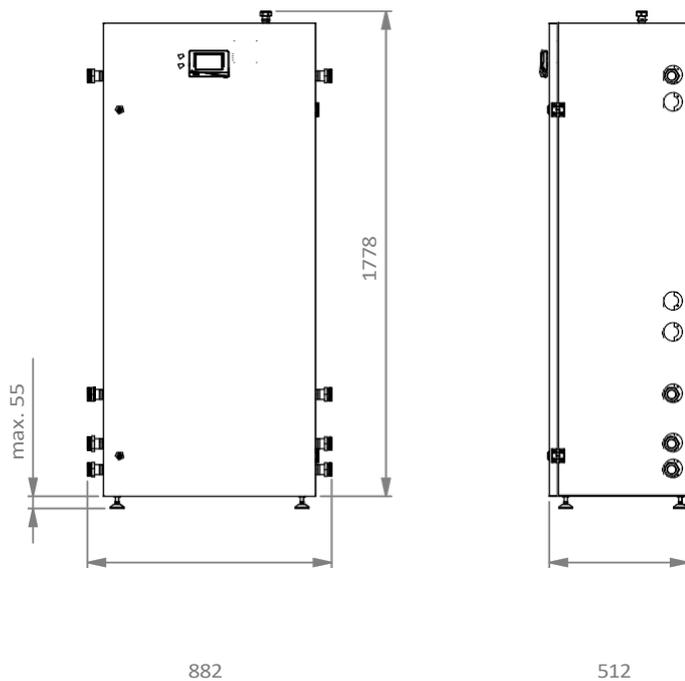
Storage conditions:

- Ensure **frost-free** storage.

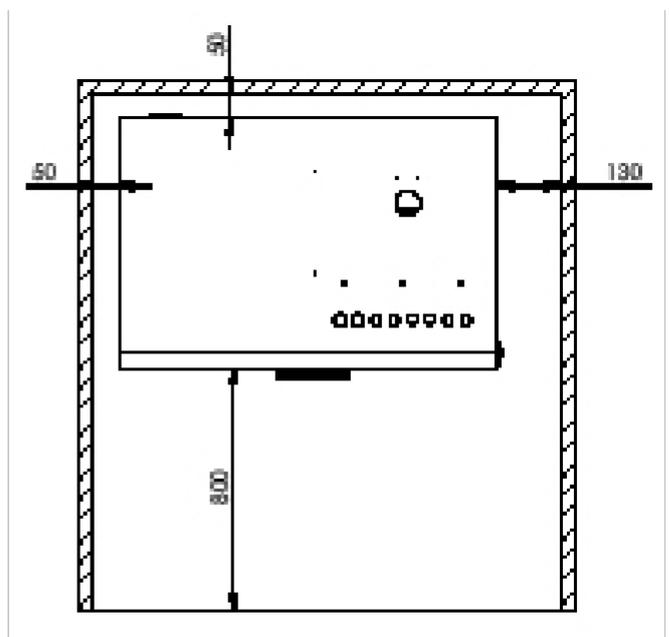
Installation conditions:

- A **floor drain** must be provided to protect against water damage.
- The ratiotherm WP Max-HiQ/LoQ heat pump must be installed in a clean, ventilated and dry location. The ambient temperature must be permanently **> 10 °C and < 35 °C**.
- The **minimum distances** must be observed for maintenance reasons.
- In installation rooms with sound-reflecting walls, the operating noise can be significantly amplified. Acoustic insulation on the affected surfaces can remedy this.
- To prevent vibration transmission, we recommend **installation on raw concrete**. If this is not possible, the screed at the installation site should be removed and a **concrete base** created on the raw concrete. If this is also not possible, the use of a sound-insulated underlay is recommended.
- After installation, the appliance must be aligned in a **horizontal** position (the adjustable feet are adjustable).
- The minimum room height should be 2.03 m (due to the safety group on the top).

Dimensions:

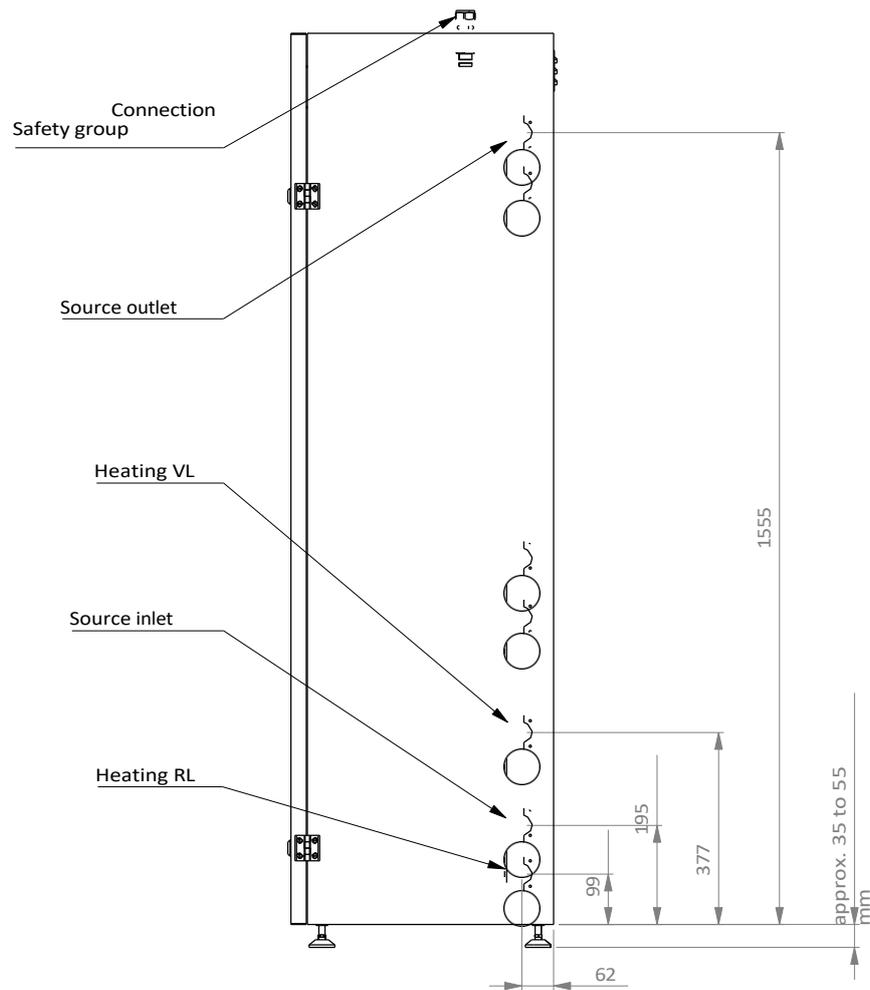


Distance dimensions:



# 5. HYDRAULIC INSTALLATION

## 5.1 CONNECTION DIMENSIONS AND DIMENSIONS

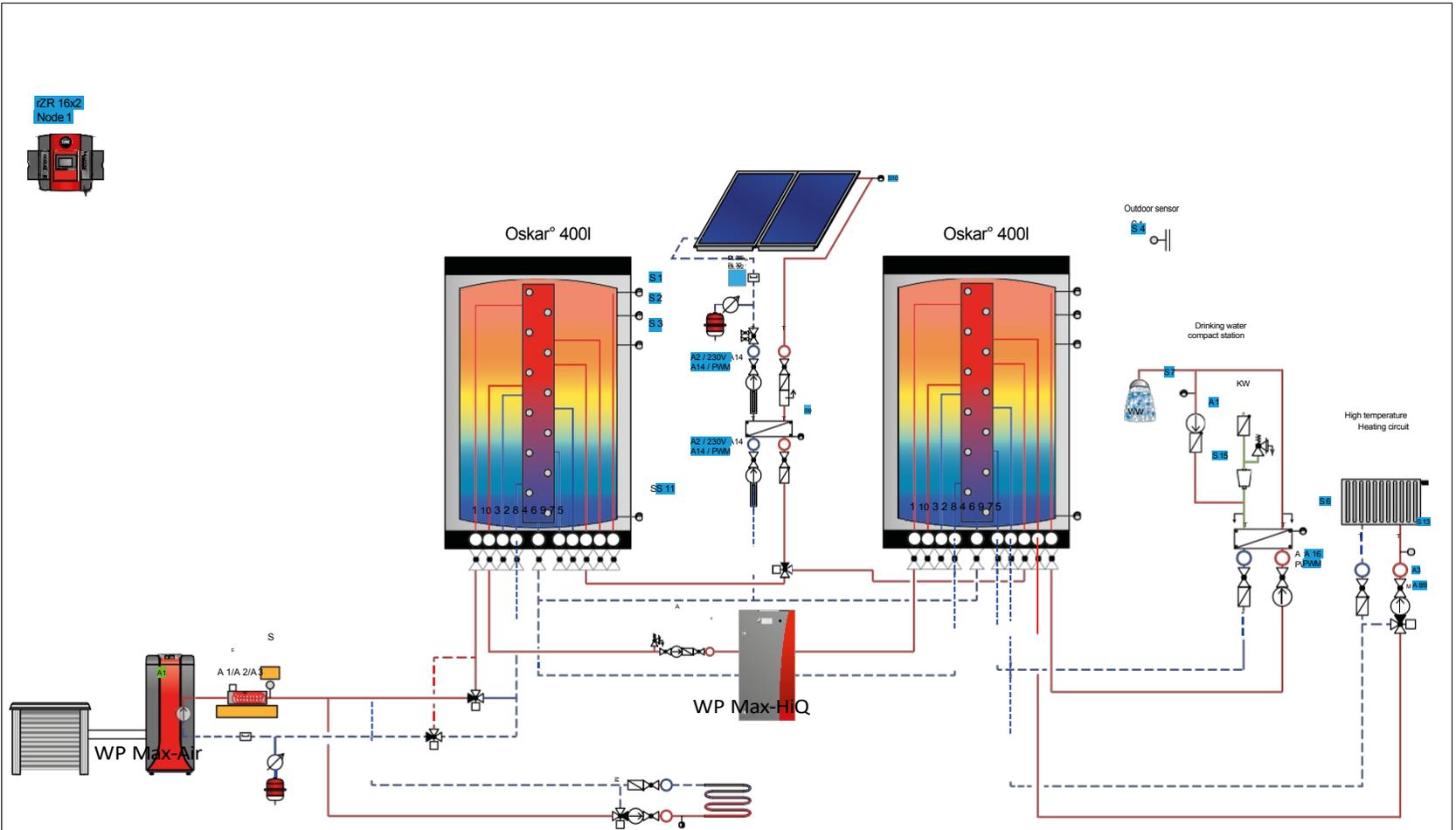


- A **reciprocal** connection is possible as desired.
- Shut-off valves and vents must be provided on site.
- Sludge separators and magnetite separators must also be provided on site.
- A vibration-decoupled connection via hoses is recommended. Recommendation: Cornerstone TWS 40
- The condenser/sink pump is integrated into the device; a mains pump can be integrated as an option.
- Please fill the system via the return flow.
- Drain taps are installed in the system.
- When tightening, please hold the connections in place!

# 5. HYDRAULIC INSTALLATION

## 5.2 DIAGRAM

Possible combination of the WP Max-Air air source heat pump and the Max-HIQ high-temperature heat pump.  
 HIQ high-temperature heat pump for existing buildings.

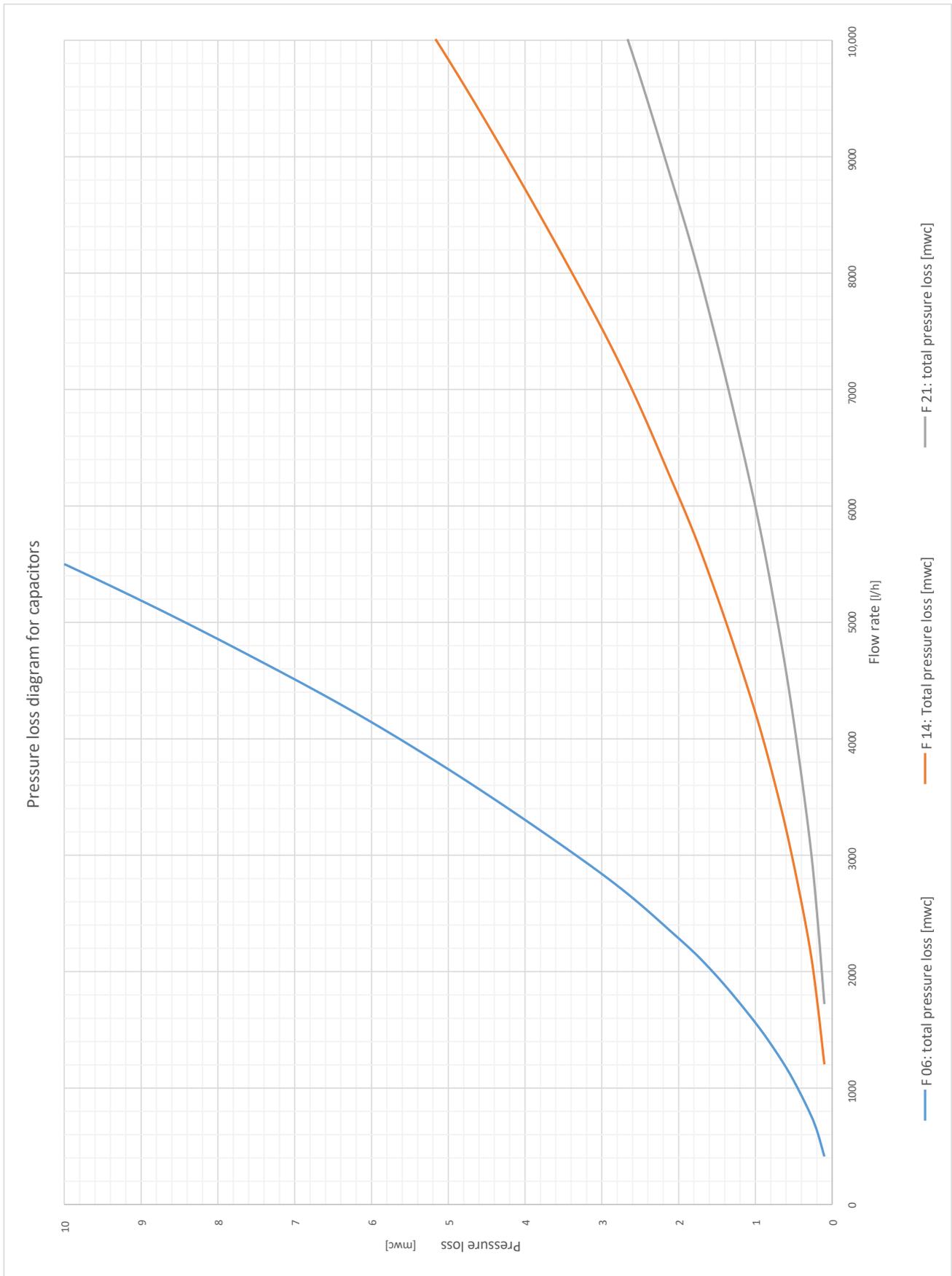


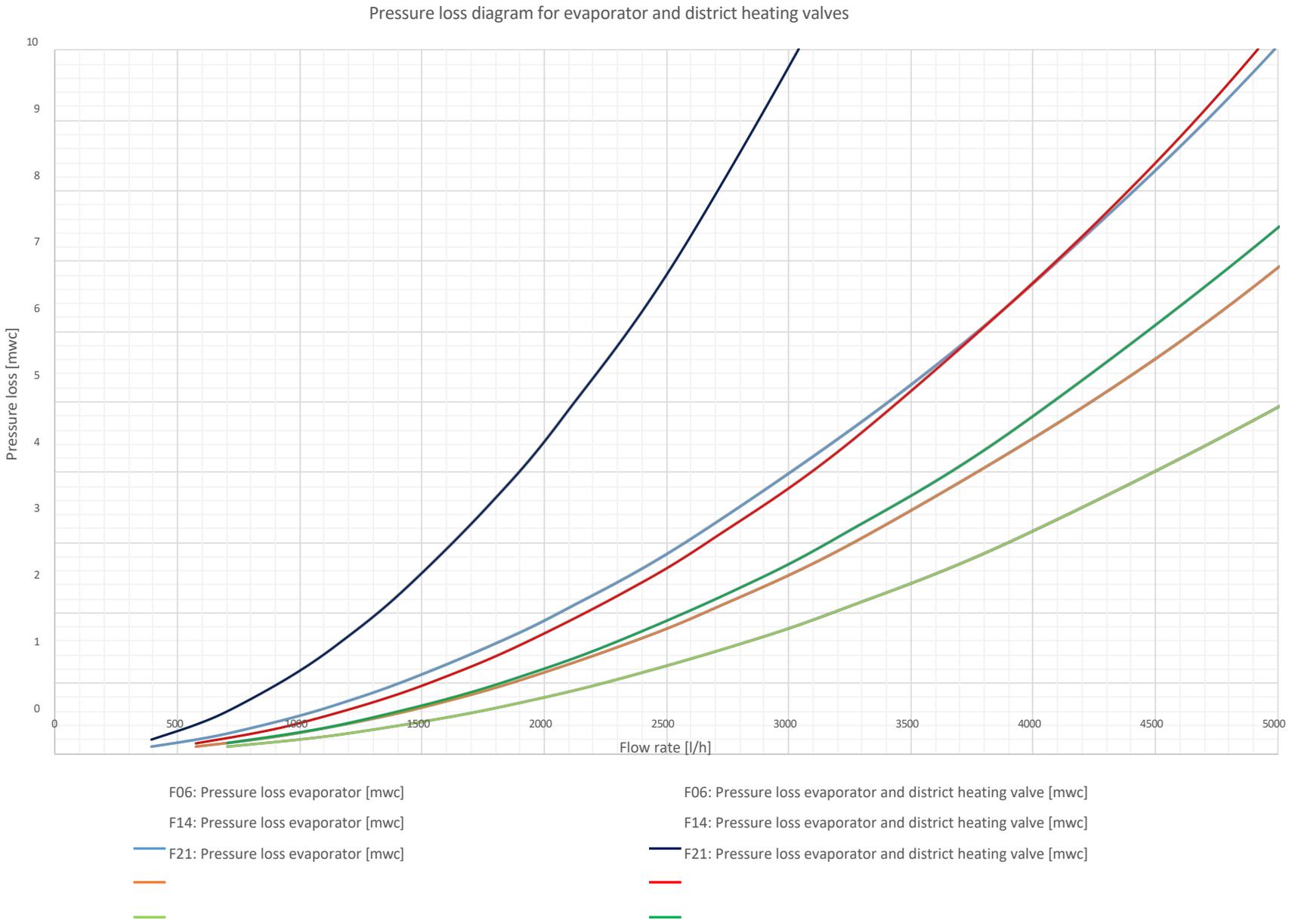
Shut-off device	3-way mixer with shut-off valve (push total at top)	Pump in flow direction Non-return valve	T. Thermometer --- Heat meter	Plan designation: rZR 16x2 Standard WP Max-HIQ	Name L. Böheim J. Kruck	Date 13 May 2019 13 May 2019	Please note: This diagram is only a recommendation and does not claim to be exhaustive in any way.
Shut-off device with safety flap	Shut-off device with drain	Plate heat exchanger	S. Sensor	Schematic no.:	Drawn L. Böheim	27 May 2019	
M. Motorized valve	safety valve Pressure gauge	Flow rates Adjustment valve Expansion	Expansion vessel drainage		Checked L. Böheim		
3-way mixer with servomotor (summing valve at top)					Amended		



# 5. HYDRAULIC INSTALLATION

## 5.3 PRESSURE LOSS DIAGRAM CONDENSER





# 5. HYDRAULIC INSTALLATION

## 5.5 REQUIREMENTS FOR GROUNDWATER

Parameters	Unit	Concentration	Copper soldered	Stainless steel soldered	Screwed
pH value	/	< 6.0	-	°	°
		6.0 - 7.5	°	+	+
		7.5 - 8.5	+	+	+
		8.5 - 10.0	°	+	+
		> 10	°	+	+
Conductivity	µS/cm	< 10	+	+	+
		10 - 500	+	+	+
		500 - 1,000	°	+	+
		> 1,000	-	+	+
Chloride	mg/L	< 10	+	+	+
		10 - 50	+	+	+
		50 - 80	+	+	+
		80 - 100	+	+	°
		100 - 1,000	°	°	-
		> 1,000	-	°	-
Free chlorine	mg/L	< 0.5	+	+	+
		0.5 - 1.0	+	+	°
		1.0 - 5.0	°	°	-
		> 5.0	-	-	-
Total hardness	°dH	< 5	+	+	+
		5 - 15	+	+	+
		15 - 30	°	+	+
		> 30	-	+	+
Ammonia (NH <sub>3</sub> , NH <sup>+</sup> ) <sub>4</sub>	mg/L	< 2	+	+	+
		2 - 20	°	+	+
		> 20	-	+	+
Alkalinity (HCO <sub>3</sub> <sup>-</sup> )	mg/L	< 60	+	+	+
		60 - 300	°	+	+
Sulphate (SO <sub>4</sub> <sup>2-</sup> )	mg/L	> 300	+	+	+
		< 100	°/-	+	+
		100 - 300	-	+	+
HCO <sub>3</sub> <sup>-</sup> / SO <sub>4</sub> <sup>2-</sup>	mg/L	> 1.5	+	+	+
		< 1.5	°/-	+	+
		> 100	+	+	+
Nitrates (NO <sub>3</sub> ) <sub>3</sub>	mg/L	< 100	+	+	+
		> 100	°	+	+
Hydrogen sulphide (H <sub>2</sub> S)	mg/l	< 0.05	+	+	+
		> 0.05	°/-	+	+
Free carbon dioxide (CO) <sub>2</sub>	mg/L	< 5	+	+	+
		5 - 20	°	+	+
		> 20	-	+	+
Manganese	mg/L	< 0.1	+	+	+
		> 0.1	°	+	+
Iron (Fe)	mg/L	< 0.2	+	+	+
		> 0.2	°	+	+
Aluminium	mg/L	< 0.2	+	+	+
		> 0.2	°	+	+

Depending on the water quality of the well, the use of a safety heat exchanger is recommended. Depending on the water quality found, the table can be used to decide whether and which safety heat exchanger should be used. If the properties are not optimal for more than two criteria (°) or if one criterion does not meet the minimum requirement (-), the respective type should not be used.

## 5. HYDRAULIC INSTALLATION

### 5.6 REQUIREMENTS FOR SYSTEM WATER

The system water may contain a maximum of 50% glycol.

Parameter	Unit	Concentration	Copper soldered
pH	/	< 6.0	-
		6.0 - 7.5	°
		7.5 - 8.5	+
		8.5 - 10.0	°
		> 10	°
Conductivity	µS/cm	< 10	+
		10 - 500	+
		500 - 1,000	°
		> 1,000	-
Chloride	mg/L	< 10	+
		10 - 50	+
		50 - 80	+
		80 - 100	+
		100 - 1,000	°
		> 1,000	-
Free chlorine	mg/L	< 0.5	+
		0.5 - 1.0	+
		1.0 - 5.0	°
		> 5.0	-
Total hardness	°dH	< 5	+
		5 - 15	+
		15 - 30	°
		> 30	-
Ammonia (NH <sub>3</sub> , NH <sup>+</sup> ) <sub>4</sub>	mg/L	< 2	+
		2 - 20	°
		> 20	-
Alkalinity (HCO <sub>3</sub> )	mg/L	< 60	+
		60 - 300	+
		> 300	°
Sulphate (SO <sub>4</sub> <sup>2-</sup> )	mg/L	< 100	+
		100 - 300	°/-
		> 300	-
HCO <sub>3</sub> / SO <sub>4</sub> <sup>2-</sup>	mg/L	> 1.5	+
		< 1.5	°/-
Nitrates (NO <sub>3</sub> )	mg/L	< 100	+
		> 100	°
Hydrogen sulphide (H <sub>2</sub> S) <sub>2</sub>	mg/L	< 0.05	+
		> 0.05	°/-
Free carbon dioxide (CO <sub>2</sub> )	mg/L	< 5	+
		5 - 20	°
		> 20	-
Manganese	mg/L	< 0.1	+
		> 0.1	°
Iron (Fe)	mg/L	< 0.2	+
		> 0.2	°
Aluminium	mg/L	< 0.2	+
		> 0.2	°

*It must be ensured that the system water meets all requirements. If the properties are not optimal for more than two criteria (°) or if one criterion does not meet the minimum requirement (-), no warranty claim can be made.*

# 6. ELECTRICAL INSTALLATION

## 6.1 NOTES



- The power supply to the heater comes from the control cabinet and must be protected by a separate type B residual current device with a tripping current of 300 mA (RCD), 10 ms short-time delay and with the appropriate power rating.  
Recommendation: ABB F204B-40/0.3
- A separate RCD must be provided for each outdoor or indoor unit!
- The 400 V supply (X1) and the 230 V supply (X2) must go through the same RCD, but must be individually protected by circuit breakers.
- The RCD circuit breaker must be marked separately for the heater, e.g. as "WP". Please ensure that the phase/neutral conductor is correctly assigned during cabling.
- Ensure that the rotating field is clockwise.
- The device must be earthed.
- Use cable cross-sections appropriate for the power rating of the heater.
- The electrical installation must comply with the applicable standards and generally accepted rules of technology.



- Never work on the hydraulics or mechanics of the device while it is under pressure.
- The same applies when filling or subsequently pressurising.
- Even if the main switch of the device is switched off, the cable terminal is still live.
- To completely disconnect the device from the mains, the RCD circuit breaker in the control cabinet must be switched off.
- Maintenance work may only be carried out by an authorised person.
- Never short-circuit the safety pressure limiter of the heat pump.

## 6.2 ELECTRICAL CONNECTION POWER

TYPE:	F06	F14	F21	F27	
CONTROL VOLTAGE	Fuse:	B10A 1-pole	B10A 1-pole	B10A 1-pole	B10A 1-pole
	Cable cross-section cross-section:	3G 1.5 mm <sup>2</sup>			
COMPRESSOR	Fuse:	B16 1-pole	B16 3-pole	B20 3-pole	B25 3-pole
	Cable cross-section cross-section:	3G 2.5 mm <sup>2</sup>	5G 2.5 mm <sup>2</sup>	5G 4 mm <sup>2</sup>	5G 4 mm <sup>2</sup>

All information, images and drawings are subject to errors and changes.

ATTENTION! Installation, Wiring may only be installed by authorised specialist personnel.

The generally applicable and recognised rules of technology and any local regulations must be observed!

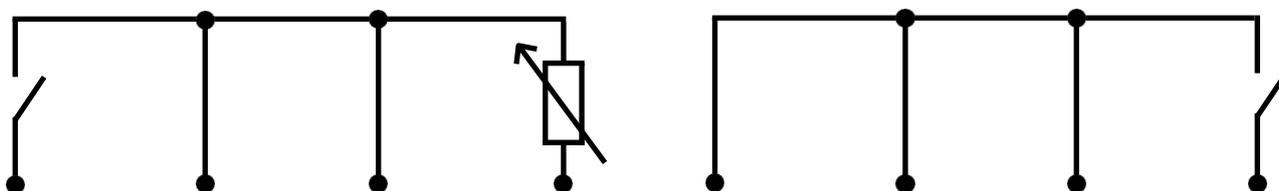
Values apply to installation in conduits up to 100 m in length.

## 6. ELECTRICAL INSTALLATION

### 6.3 TERMINAL DIAGRAM AND DESCRIPTION

X1									
L1	L1	L2	L2	L3	L3	N	N	PE	PE
Compressor	E-rod	Compressor	E-rod	Compressor	E-rod	Compressor	E-rod	Compressor	E-rod
400 V mains (factory-bridged, remove bridges if supply lines are separate!)									

X2								
L1	N	PE	1	N	PE	2	N	PE
230 V mains control/pumps			230 V Fault output			230 V Source pump output		



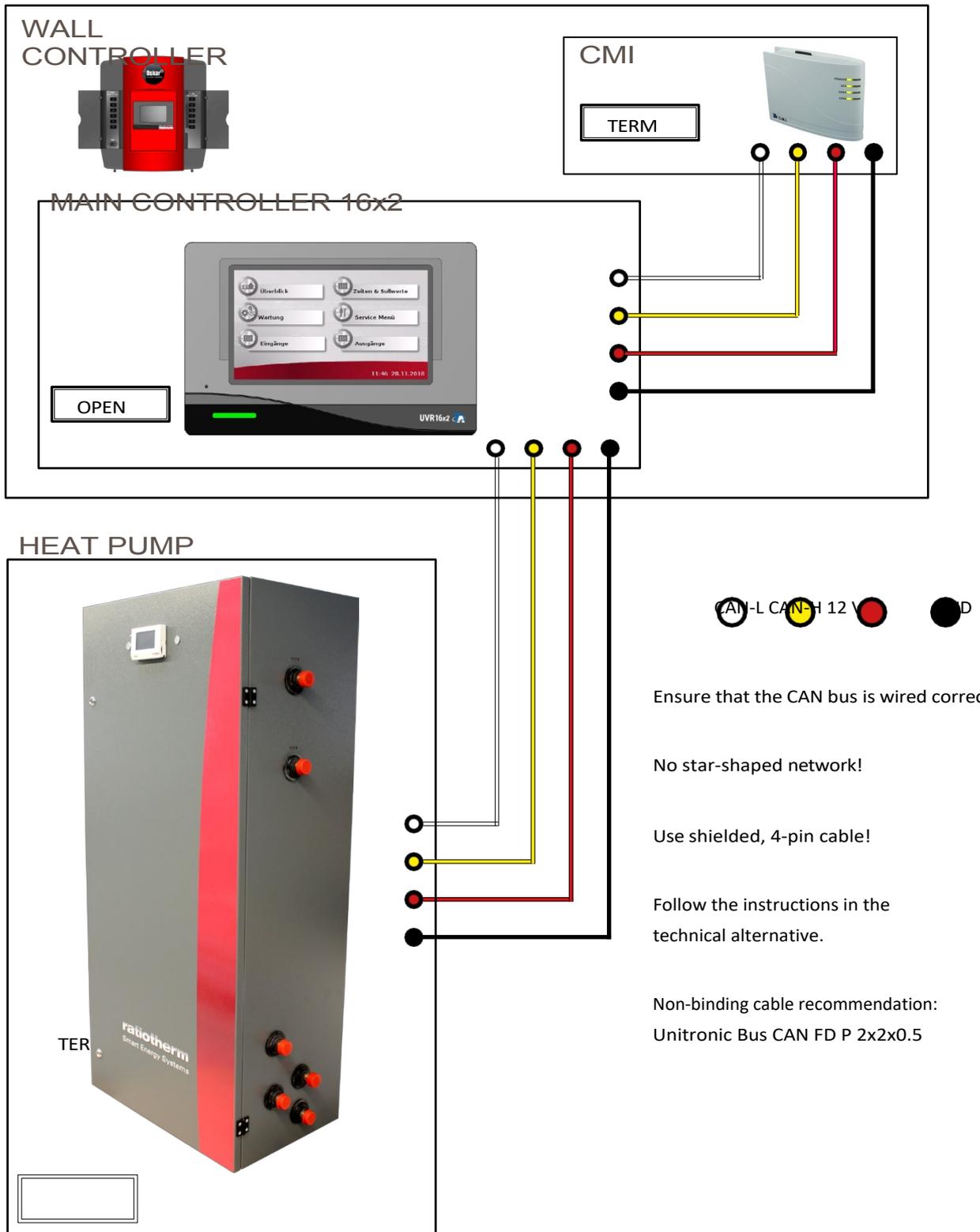
X3							
1	GND	GND	2	3	GND	GND	4
Request contact (potential-free)	Speed signal (0 - 10 V)		Smart Grid 1 / Energy Suppliers		Smart Grid 2		

X3					
GND	12 V	CAN-H	CAN-L	CAN-H	CAN-L
CAN bus (connection to RT-GLT)			CAN bus (connection to RT-GLT)		

- Terminal range X1 is intended for the compressor and the electric heating element. Depending on the power rating (e.g. F06), the connection can also be single-phase. The connection is delivered with jumpers from the factory (electric heating element only active when compressor is locked). The jumpers can be removed with a separate supply line.
- X2.2 is used to connect a source pump. If this is already integrated in the housing, the terminal is not required.
- X3.3 and X3.4 are used to process a signal from the grid operator/energy supplier. X3.3 is backward compatible with the EVU contact.
- Please wire the EVU contact as a normally open contact (closed when EVU lock is active).

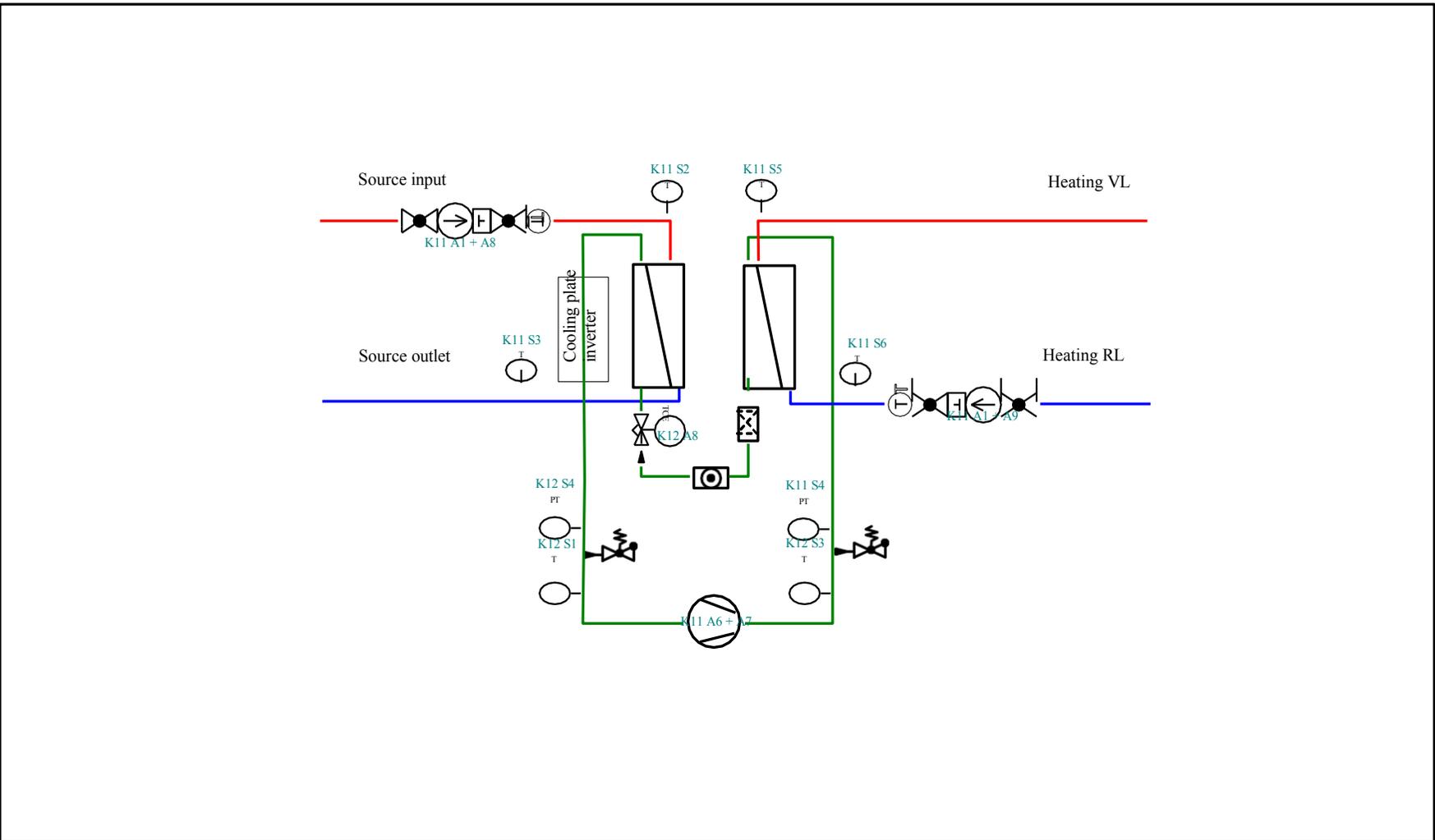
# 6. ELECTRICAL INSTALLATION

## 6.4 CAN BUS PLAN



# 7. REFRIGERATION SYSTEM

## 7.1 REFRIGERATION DIAGRAM



 Smart Energy Systems	Kälteschema Max-HiQ, Grid-HiQ 2019-04			Bearb. JK
	Datum: 16.04.2019	Schema-Nr.	Blatt-Nr.	ACHTUNG: Hydraulische Einbindung des ratiotherm-Schichtspeichers ist eine Empfehlung und erhebt keinen Anspruch auf Vollständigkeit!

# 8. STRUCTURE AND FUNCTION

## 8.1 STRUCTURE AND SPARE PARTS

The ratiotherm WP Max-HiQ/LoQ heat pump has a complete refrigeration circuit and uses a source circuit as its primary energy source.

The refrigeration circuit is a hermetically sealed circuit consisting of a rotary piston compressor (F06) or a scroll compressor (F14, F21), a condenser (plate heat exchanger), an evaporator (plate heat exchanger) and an electronic expansion valve, which controls the flow of refrigerant. The environmentally friendly R134A is used as the working medium.

The ratiotherm WP Max-HiQ/LoQ heat pump is shipped fully filled and ready for operation. No further refrigeration commissioning is required.

The ratiotherm WP Max-HiQ/LoQ heat pump is controlled by the RSM610 controller from Technische Alternativen. All parameters and operating states of the heat pump are shown on a separate display.

The WP Max-HiQ/LoQ heat pump can be operated in combination with most electric, gas or oil boilers.

Number	Designation	Quantity	RA number	F06		F14		F21	
				HiQ	LoQ	HiQ	LoQ	HiQ	LoQ
1	Filter dryer	1	ra/12201	x		x			
		1	ra/10034						x
2	Sight glass	1	ra/10004	x		x			
		1	ra/11335						x
3	Evaporator	1	ra/13192	x					
		1	ra/13291			x			
		1	ra/13421						x
		1	ra/13036	x					
4	Expansion valve	1	ra/13290		x				
		1	ra/13040			x			x
		1	ra/13038				x		
		2	ra/13038					x	
5	Capacitor	1	ra/13193	x					
		1	ra/13319			x			
		1	ra/13420						x

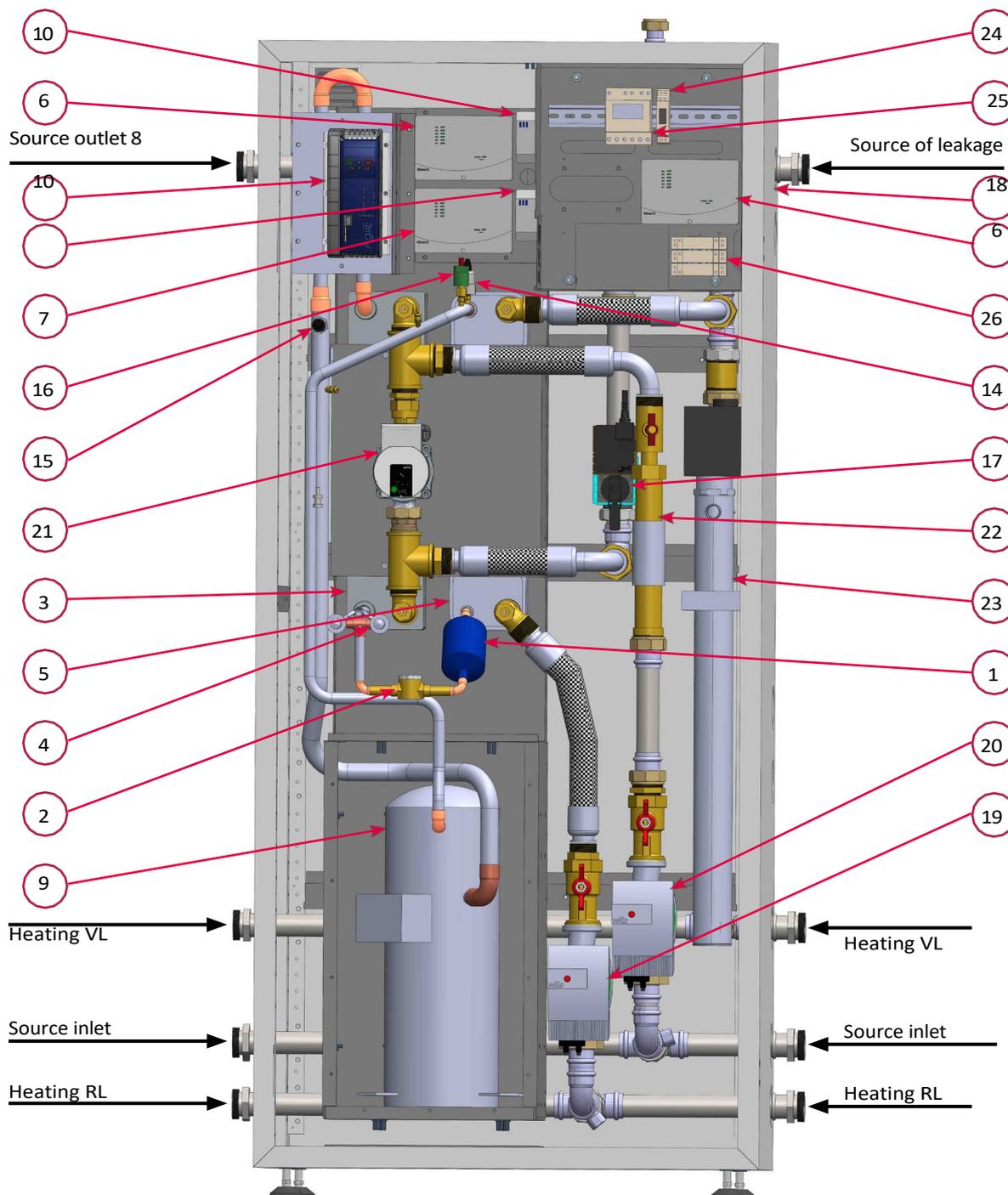
## 8. STRUCTURE AND FUNCTION

### 8.1 STRUCTURE AND SPARE PARTS

Number	Description	Quantity	RA number	F06		F21		F27
				HiQ	LoQ	HiQ	LoQ	LoQ
6	RSM610	2 (1x optional)	ra/95.10.3305	x		x		x
7	RSM610 - 24 V	1	ra/13197	x		x		x
		1	ra/13308	x				
8	Frequency converter	1	ra/13025			x		
		1	ra/13023					x
		1	ra/13296	x				
9	Compressor	1	ra/13327			x		
		1	ra/13418					x
10	Stepper motor control	1	ra/13047	x		x		x
		2	ra/13047				x	
11	Ultra-fast sensor	4	ra/13467	x		x		x
12	Contact temperature sensor TF44	1	ra/13440	x		x		x
13	Contact sensor	2	ra/12894	x		x		x
14	Pressure transmitter High pressure	1	ra/13049	x		x		x
15	Low pressure pressure transmitter	1	ra/13048	x		x		x
16	Cartridge pressure limiter	1	ra/10076	x		x		x
<b>Hydraulics</b>								
17	2-way valve	1	ra/13393	x	-		-	-
		1	ra/14062			x		x
18	Volume flow sensor	1	ra/95.85.4525	x				
		1	ra/13616			x		x
19	Condenser pump	1	ra/13309	x				
		1	ra/13423			x		x
20	Evaporator pump	1(opt.)	ra/13309	x				
		1 (opt.)	ra/13423			x		x
21	Pump	1	ra/13309	x				
		1	ra/13310			x		x
22	Heat meter	1(opt.)	ra/12229	x				
		1 (opt.)	ra/12251			x		x
23	E-rod	1 (opt.)	ra/12719	x		x		x
24	Electricity meter 230 V	1 (opt.)	ra/12248	x		x		x
25	Electricity meter 400 V	1 (opt.)	ra/13000	x		x		x
26	Contactator for E-rod	1 (opt.)	ra/12906	x		x		x

# 8. STRUCTURE AND FUNCTION

## 8.1 STRUCTURE AND SPARE PARTS



The connections for the source and the connections for the heating can be made on both sides.

Display

ra/95.10.3219

ON/OFF switch

ra/13339



Reset switch

ra/13340

# 8. STRUCTURE AND FUNCTION

## 8.2 CONTROL LOGIC AND CONTROL



### Control logic:

- The heat pump is activated via a potential-free digital signal. This activates the pumps and valves. The compressor starts up after 45 seconds. From model year 20/45 onwards, the heat pump is also activated when a 0-10 V signal is applied to X3.2. This gives the user the choice of activating the system digitally or via 0-10 V.
- When the system is activated, the minimum running time is 5 minutes. An error immediately switches off the system.
- The target speed of the compressor or the target outlet temperature (adjustable via a fixed value) can be specified by an external control system using a 0-10 V signal.
- If there is no 0–10 V signal, the compressor runs at a constant, adjustable speed (factory setting: 75%).
- If a 0–10 V signal lower than 1.9 V is present, the heat pump is started in cooling mode. If available, the 4-way valve is switched and the speed of the compressor is regulated to the target cooling temperature.
- The compressor speed is limited during the start-up phase, which is why full speed is only reached after 4 x 1.5 minutes.
- If the source temperature inside the evaporator is below 11 °C for longer than one minute, the system is switched off for frost protection reasons. If the evaporator temperature is above 55 °C, start-up is also prevented. Once the temperatures return to normal, the machine starts up as usual.
- If the temperature on the source side falls below 8 °C, a frost protection fault is triggered and the system is blocked for 7 minutes or, if this occurs repeatedly, shut down.
- The condenser pump regulates the deltaT between the heating flow and return (factory setting 6 K).
- If the heating flow temperature rises above 69 °C, the pump begins to increase its speed to prevent shutdown.
- If the heating flow temperature exceeds 72 °C, the system automatically switches off for 20 minutes. If the temperature drops during this time, the system restarts after the 20-minute waiting period.
- The evaporator pump regulates the deltaT between the source inlet and outlet (factory setting 3 K).
- If an anomaly is detected (HD, ND, antifreeze), an error is triggered and the system is blocked for 5 or 7 minutes. This cannot be acknowledged using the reset button! If the same error occurs three times within an hour, the system is locked. This can be cancelled using the reset button.
- To prevent anomalies, high pressure, low pressure and compressor temperature are monitored and, if necessary, the speed is reduced for at least 8 minutes.

# 9. OPERATING INSTRUCTIONS

## 9.1 CONTROLLER OPERATION



- The rZR16x2 is operated via a 4.3" touch screen (= touch-sensitive screen).
- For easier handling, a stylus is available, which is inserted above the controller (under the cover).
- The stylus can be used to tap on control surfaces and scroll through the display view by sliding the scroll bar.
- Selecting one of the windows takes you to the corresponding submenu.

The indicator light can display various statuses:

- **Red steady light** - The controller is booting up (=startup routine after power-up, reset or update) or displaying a message that has not yet been cleared.
- **Orange steady light** - Hardware initialisation after booting.
- **Green steady light** - Normal operation of the controller.
- **Green "flashing"** – After hardware initialisation, the controller waits approx. 30 seconds to receive all the information necessary for operation (sensor values, network inputs).

Controls:



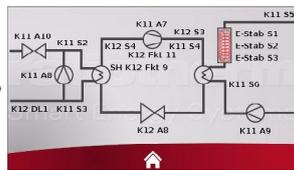
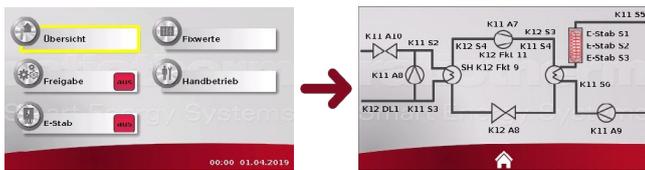
Control switch:



# 9. OPERATING INSTRUCTIONS

## 9.1 CONTROL OPERATION

Overview of the menu structure:



# 9. OPERATING INSTRUCTIONS

## 9.1 CONTROL OPERATION



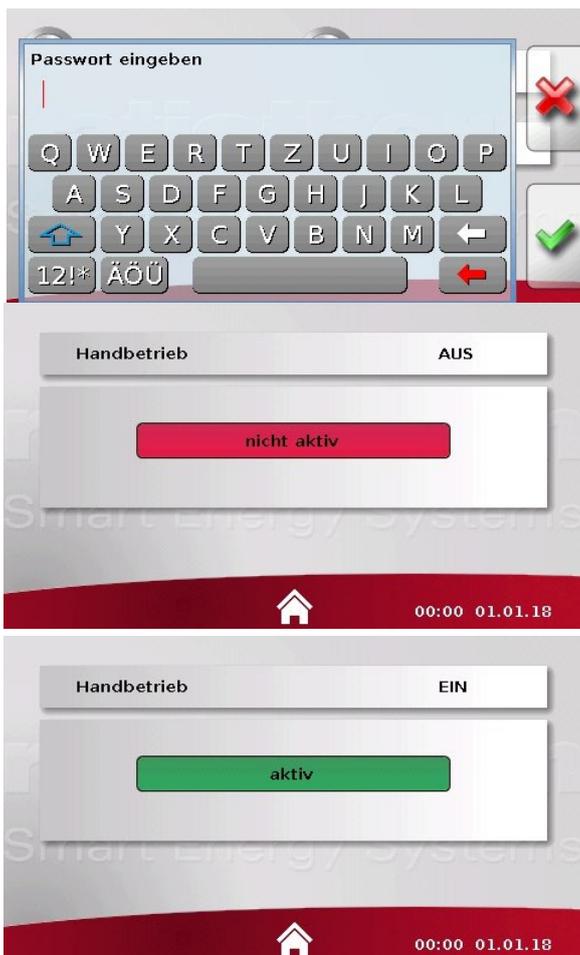
E-rod: ON

The E-rod can be switched on independently of the bivalence temperature.



Enable: ON

Heat pump may start up when requested.



Enter password

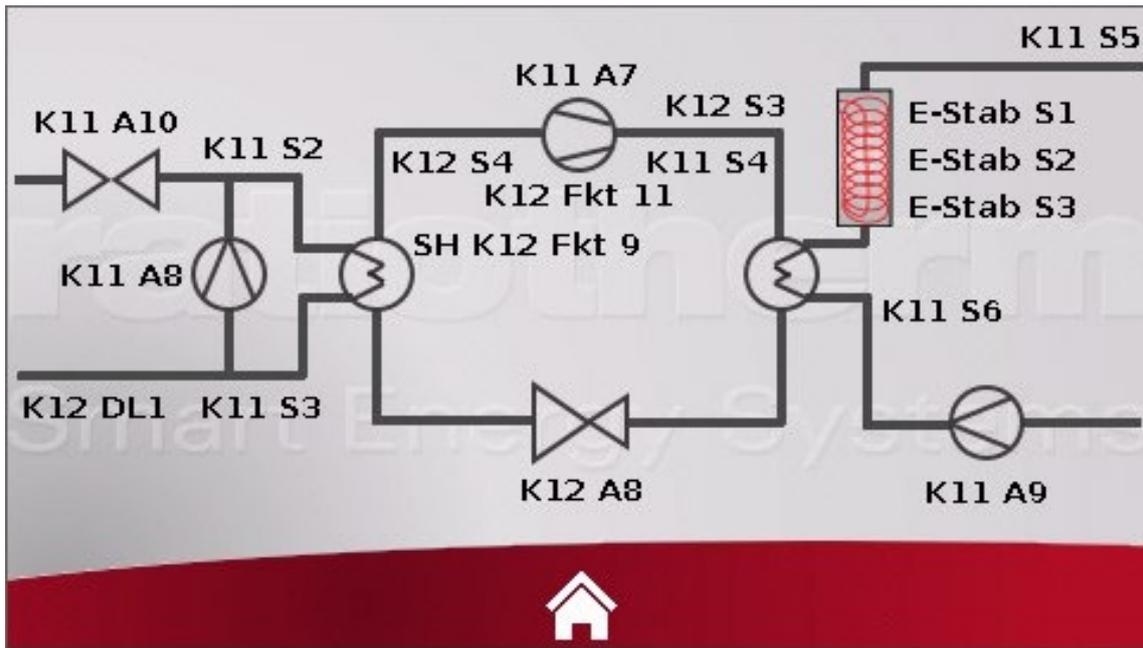
Enter the specialist password to access the specialist menu

Manual mode: ON

Forced start of the heat pump regardless of the request signal

# 9. OPERATING INSTRUCTIONS

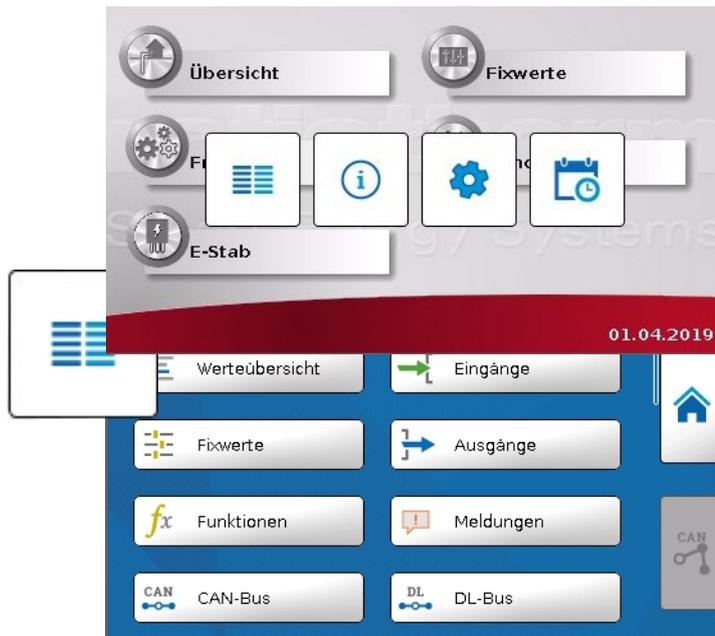
## 9.1 CONTROLLER OPERATION



K11 S2	T evaporator inlet
K11 S3	T-evaporator outlet
K11 S4	High pressure
K11 S5	T. Heat pump VL
K11 S6	T. Heat pump RL/Reset
K11 A7	Compressor 0-10 V
K11 A8	Evaporator pump PWM
K11 A9	Condenser pump PWM
K11 A10	District heating valve 0-10 V
K12 S3	Inverter fault/hot gas
K12 S4	Low pressure
K12 A8	Ex-valve PWM
K12 DL1	Volume flow source
K12 Fct 11	Evaporation temperature
SH K12 Fkt 9	Actual superheat
E-rod S1	E-rod level 1
E-rod S2	E-rod level 2
E-rod S3	E-rod Level 3

# 9. OPERATING INSTRUCTIONS

## 9.1 CONTROL OPERATION

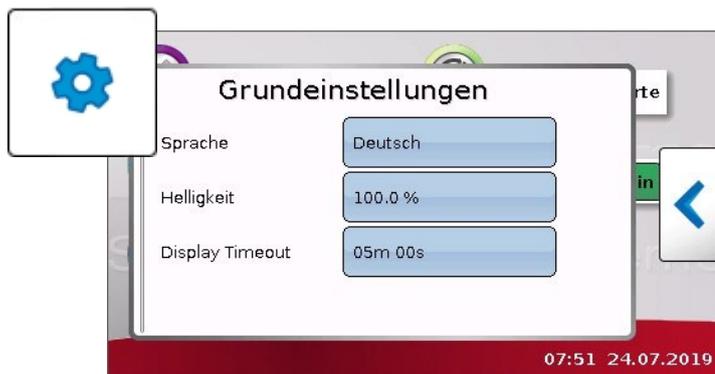


### Intermediate menu

Press and hold the display for 5 seconds to access the intermediate menu, which allows you to make basic settings or switch to the controller menu.

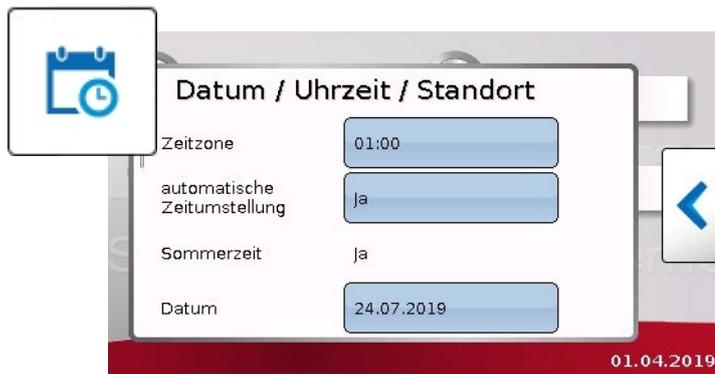
### Controller menu

Link to the controller menu



### Basic settings

You can set the language, brightness and display timeout.



### Date/time/location

Set the time zone and date

# 9. OPERATING INSTRUCTIONS

## 9.2 SETTINGS



### Fixwerte

Fixed values	Description	Settings options	Preset settings
<b>User</b>			
Target T-Diff Condenser	Target temperature difference at the condenser	1 °C to 10 °C	8 °C
Target speed Verdi. Fixed	Target speed of the compressor when no external speed signal is present.	0% to 100	75
<b>Specialist</b>			
T evaporator maximum	Maximum permissible evaporator temperature	35 °C to 70 °C	55
T-evaporator minimum	Minimum permissible evaporator temperature	8 °C to 20 °C	11
Target superheat	Setpoint superheat of the expansion valve in the outdoor unit during normal operation	0 °C to 10 °C	5.3 °C
Start opening of expansion valve	Start opening of the expansion valve in the outdoor unit	Levels 0 to 500	Level 280
T-setpoint evaporator inlet	Target evaporator inlet temperature (mixing temperature injection circuit)	10 °C to 30 °C	30 °C
Target T-Diff Evaporator	Target temperature difference between evaporator inlet and outlet	1 °C to 8 °C	3.5 °C
Speed Power reduction	Compressor speed while power reduction is active.	Stages 0 to 100	Stage 45
High pressure limit	Maximum pressure at which a HP fault or a HP fault is triggered.	20 bar to 26 bar	24 bar
Low pressure limit	Minimum pressure at which an LP error or an LP fault is triggered. Frost protection	0.8 bar to 5 bar	1 bar
limit	Minimum temperature at which a Frost protection error or a frost protection malfunction is triggered.	4 °C to 12 °C	8 °C
E-rod's own power supply	Enabling parallel operation of electric heating rod and compressor. Only possible if the electric rod has its own power supply.	OFF / ON	OFF
ND/HD error time	Time lock for restart if ND/HD error has occurred.	0 to 24 hours	5 min
ND emergency operation	Minimum pressure at which a temporary power reduction is triggered.	1 bar to 10 bar	1.5 bar
HD emergency operation	Maximum pressure at which a temporary power reduction is triggered.	15 bar to 25 bar	22 bar

# 9. OPERATING INSTRUCTIONS

## 9.2 SETTINGS



### Fixwerte

Fixed values	Description	Setting options	Preset setting
<b>Specialist</b>			
T. distribution outlet Emergency operation compressor,	Maximum discharge temperature of the compressor, at which a temporary reduction in output is triggered.	80 °C to 130 °C	110 °C
Time Frost protection error	Time lock for restart when a frost protection error has occurred.	0 to 24 hours	7 min
Time until fault	If three faults occur within one hour occur within one hour, the machine switches off.	0 to 24 hours	60 min

# 10. TROUBLESHOOTING

## INVERTER

Error message	Inverter fault
Error description	The inverter's fault contact does not close.
Behaviour of the heat pump	<ul style="list-style-type: none"> <li>• System lock</li> <li>• Unlocking by pressing the reset switch</li> </ul>
Cause of fault	<ul style="list-style-type: none"> <li>• No power supply</li> <li>• Other inverter malfunction</li> </ul>
Troubleshooting	<ul style="list-style-type: none"> <li>• Check the power supply (right-hand rotating field, phase failure)</li> <li>• Check the error code (see appendix)</li> </ul>

## FROST PROTECTION

Error message	Frost protection error	Frost protection malfunction
Error description	The frost protection limit of the hydraulic circuit has been triggered.	
Behaviour of the heat pump	<ul style="list-style-type: none"> <li>• System lockout for 10 minutes</li> <li>• If 3 faults occur within 60 minutes, switch to frost protection fault</li> </ul>	<ul style="list-style-type: none"> <li>• System lockout</li> <li>• Unlock by pressing the reset switch</li> </ul>
Cause of error	<ul style="list-style-type: none"> <li>• Lack of heat absorption in the inner section</li> <li>• Heat source too cold</li> </ul>	
Troubleshooting	<ul style="list-style-type: none"> <li>• Checking the heat source (temperatures, pumps, heat exchangers)</li> <li>• Vent</li> </ul>	

## HIGH PRESSURE

Error message	HD error	HD fault
Error description	High pressure protection of the refrigeration circuit has been triggered.	
Behaviour of the heat pump	<ul style="list-style-type: none"> <li>• System locked for 5 minutes</li> <li>• If 3 faults occur within 60 minutes, switch to HD fault</li> </ul>	<ul style="list-style-type: none"> <li>• Lock the system</li> <li>• Unlock by pressing the reset switch</li> </ul>
Cause of error	<ul style="list-style-type: none"> <li>• Lack of heat dissipation</li> <li>• Blockage of cooling circuit</li> <li>• Heat sink too hot</li> </ul>	
Troubleshooting	<ul style="list-style-type: none"> <li>• Check the sink temperature or target temperatures</li> <li>• Temperatures below max. water temperature according to type plate</li> <li>• Check heat dissipation to the medium (pump, heat exchanger)</li> <li>• Vent and check the heating pressure</li> <li>• Refrigeration check</li> </ul>	

## 10. TROUBLESHOOTING & REMEDY

### LOW PRESSURE

Error message	ND error	ND malfunction
Error description	Low pressure protection of the refrigeration circuit has been triggered.	
Behaviour of the heat pump	<ul style="list-style-type: none"><li>• System locked for 5 minutes</li><li>• If 3 faults occur within 60 minutes, switch to low pressure fault</li></ul>	<ul style="list-style-type: none"><li>• Lock the system</li><li>• Unlock by pressing the reset switch</li></ul>
Cause of error	<ul style="list-style-type: none"><li>• Insufficient heat absorption</li><li>• Insufficient refrigerant charge</li><li>• Blockage of the refrigeration circuit</li></ul>	
Troubleshooting	<ul style="list-style-type: none"><li>• Check heat absorption at the evaporator (flow rate, temperature); vent if necessary</li><li>• Refrigeration check</li></ul>	

# 11. MAINTENANCE & SERVICING

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## 11.1 CLEANING

### Cleaning the heating side

- Cleaning: to be carried out by an installer
- Flushing device: connection to the condenser's flow and return pipes
- Condenser: Flush against the normal flow direction (note gravity brake)

### Cleaning the heat pump

The units can be cleaned with a standard household cleaner (see below for exceptions).

Check the air inlets and outlets (regularly check the intake and exhaust hood grilles for adhering leaves and other dirt).

Sweep away the dirt. The fan should not be running while sweeping, as otherwise the dirt may be sucked into the device.



### NOTE! POSSIBLE DAMAGE

The surface of the appliance may be damaged by using the wrong cleaning agents.

- Do not use abrasive or cleaning agents that could damage the plastic casing, fittings or controls.
- Do not use sprays, solvents or chlorine-based cleaning agents.
- Clean the heat pump casing with a damp cloth and a little soap.
- Avoid placing or leaning objects on or against the heat pump.

## 11.2 MAINTENANCE

Regular inspection/maintenance of the device by a recognised, qualified and ratiotherm-authorized specialist is a prerequisite for continuous operational readiness and operational safety, reliability and a long service life. We recommend having maintenance carried out annually.



### WARNING!

Risk of damage to property and personal injury due to improper handling!

- Never attempt to carry out maintenance or repairs on the system yourself.
- Commission a recognised, qualified and ratiotherm-authorized specialist tradesman to do this.
- We recommend taking out a maintenance contract.
- Failure to carry out maintenance can impair the operational safety of the appliance and lead to damage to property or personal injury.



### NOTE!

The safety valve may be stuck due to limescale deposits.

- Operate the safety valve of the heating system manually once a month.

## 11.3 LEAK TEST

### Leak test of the heat pump

In accordance with Regulation (EC) No. 842/2006 on certain fluorinated greenhouse gases, the heat pump must be checked regularly for leaks. This check can be carried out by a recognised and qualified specialist (with certification as a refrigeration engineer or state-certified technician specialising in refrigeration technology).

The following must be observed:

- DIN EN 378:2000 "Refrigerating systems and heat pumps – Safety and environmental requirements"
- VDMA Standard Sheet 24243 (August 2005) "Refrigerating machines and systems – Tightness of refrigeration systems and heat pumps – Leak detection/leak testing"



### NOTE!

- The test must be carried out in accordance with the system logbook.
- The results of the test must be documented in accordance with regulations and kept for at least 5 years. A system log for this purpose can be found in the "System log for heat pumps".

## 12. DECOMMISSIONING & DISPOSAL

When the heat pump is no longer in operation, the machine may only be dismantled by qualified personnel. Care must be taken to ensure that hazardous materials and waste are disposed of properly. When dismantling the heat pump, observe the instructions at the beginning of the technical documentation and the safety instructions listed below.

Danger from electricity.

Serious or fatal electric shocks are possible on electrical equipment.



### DANGER!

- Disconnect the machine from the power supply before decommissioning/dismantling.
- Secure against being switched back on.

### TEMPORARY DECOMMISSIONING

Switch the mains switch to the "OFF" position.



### CAUTION

Damage to components and impaired functionality

Improper decommissioning of the machine may result in damage to components and thus functional impairment.

Possible damage to the system due to frost

- Water freezes at outdoor temperatures below 0 °C.
- Decommissioning without draining the heating circuit is only permitted at temperatures above 0 °C.

### FINAL DECOMMISSIONING/DISPOSAL

- Only a specialist company may carry out the final decommissioning/disposal.
- Environmental requirements regarding the recovery, reuse and disposal of operating materials and components in accordance with current standards must be observed.



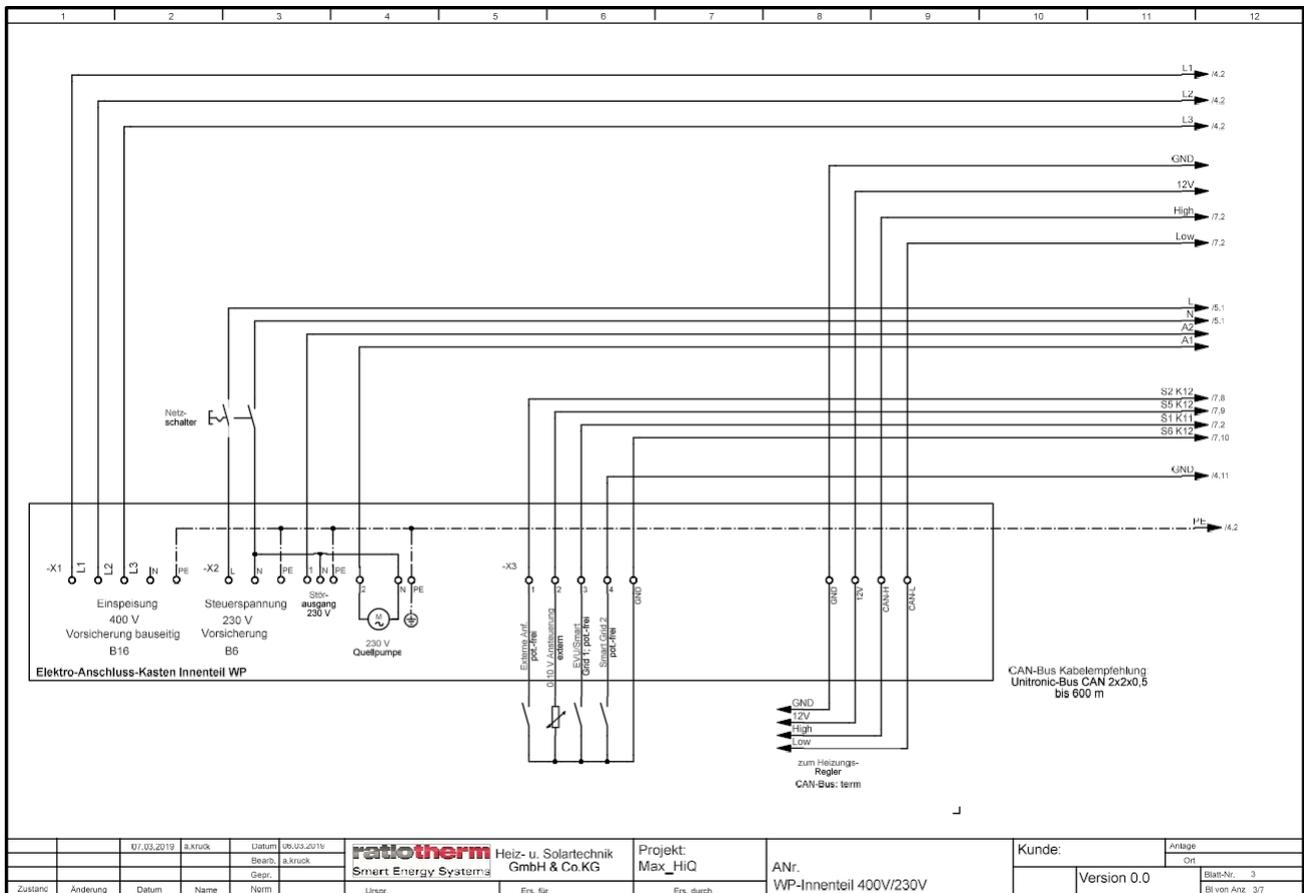
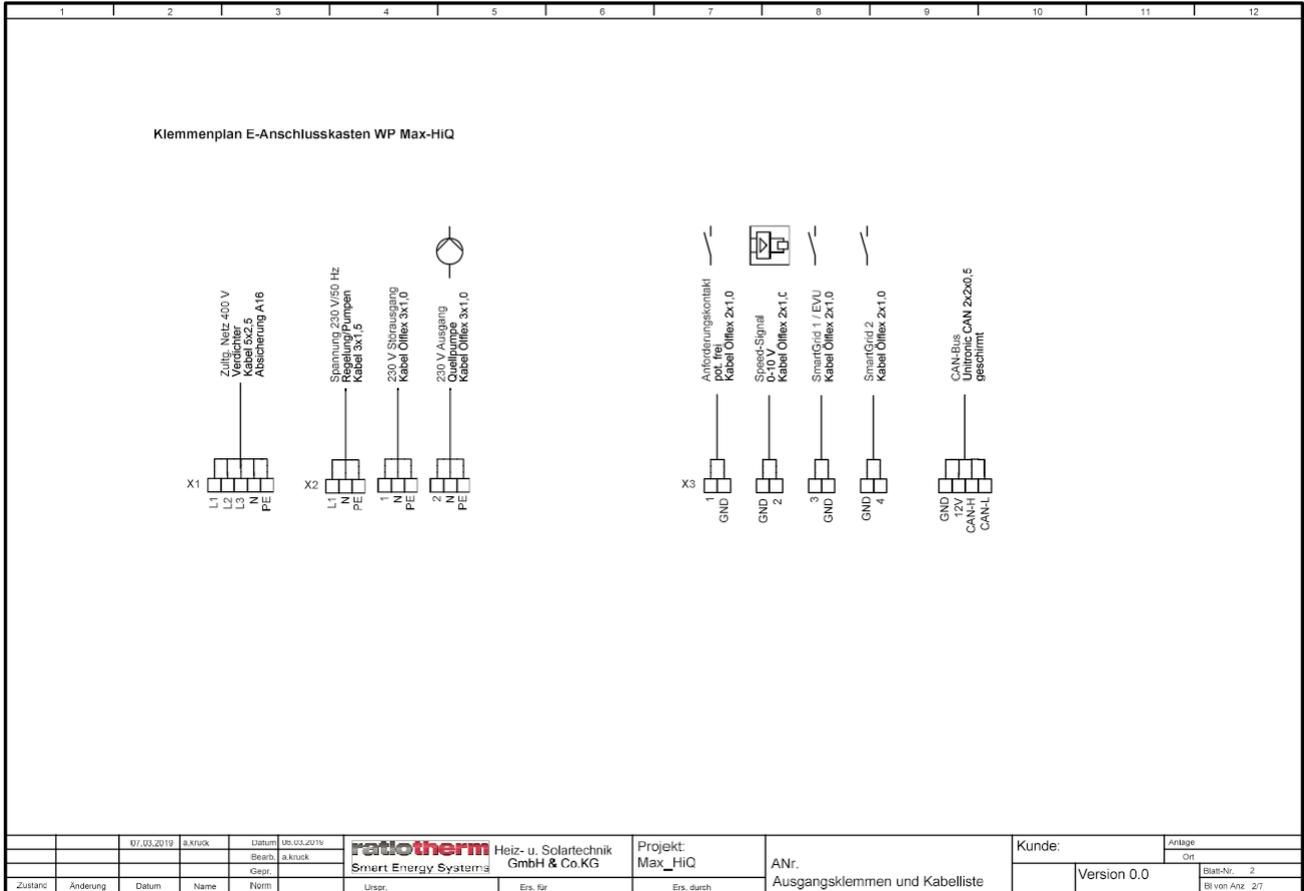
### CAUTION!

Environmental pollution due to improper disposal.

Improper disposal of components and operating materials can cause environmental damage.

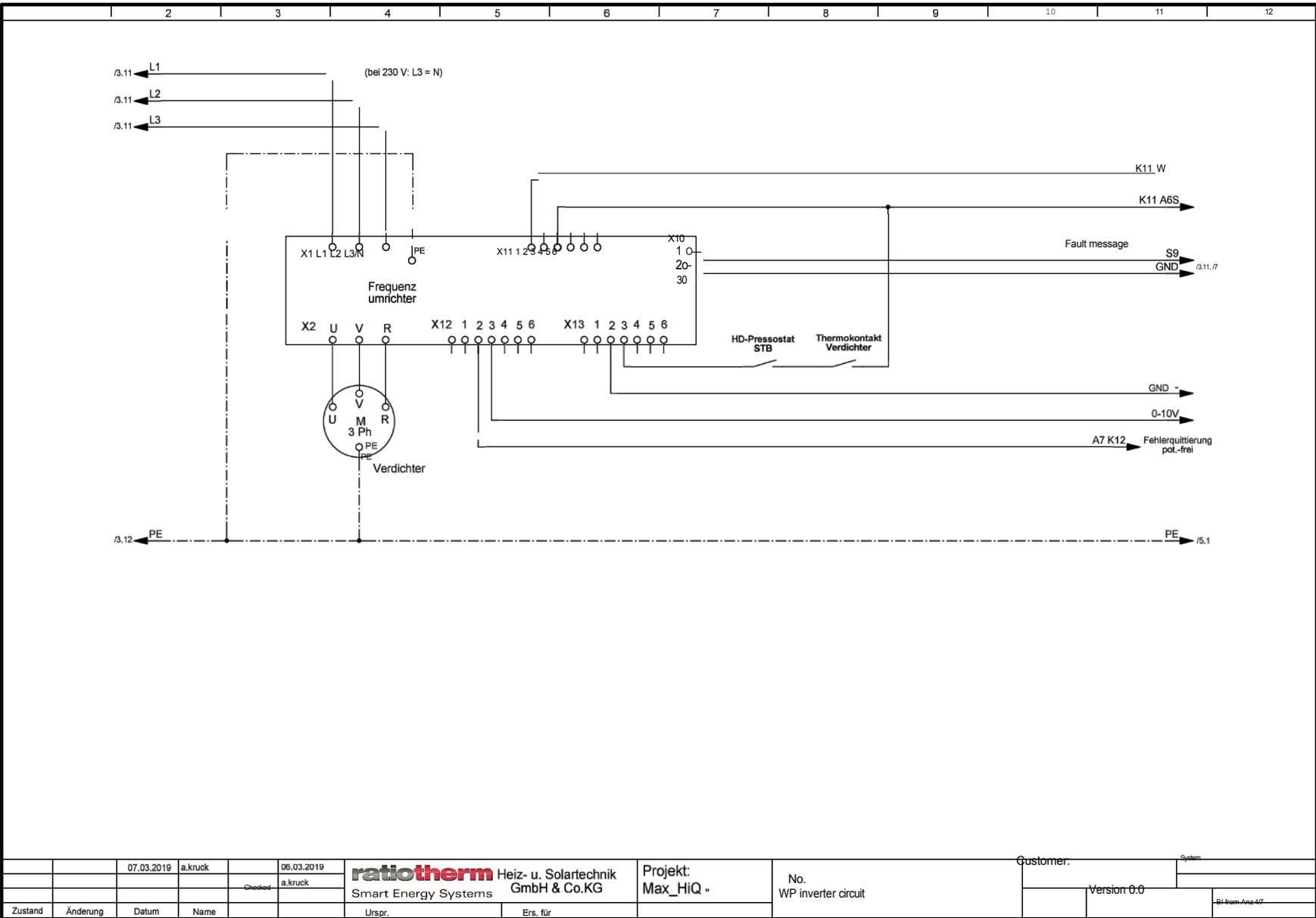
- Dispose of electrical and electronic components of the heat pump properly.
- Dispose of refrigerants properly.

## 13.1 ELEKTROPLAN



# 13. APPENDIX

## 13.1 ELECTRICAL PLAN

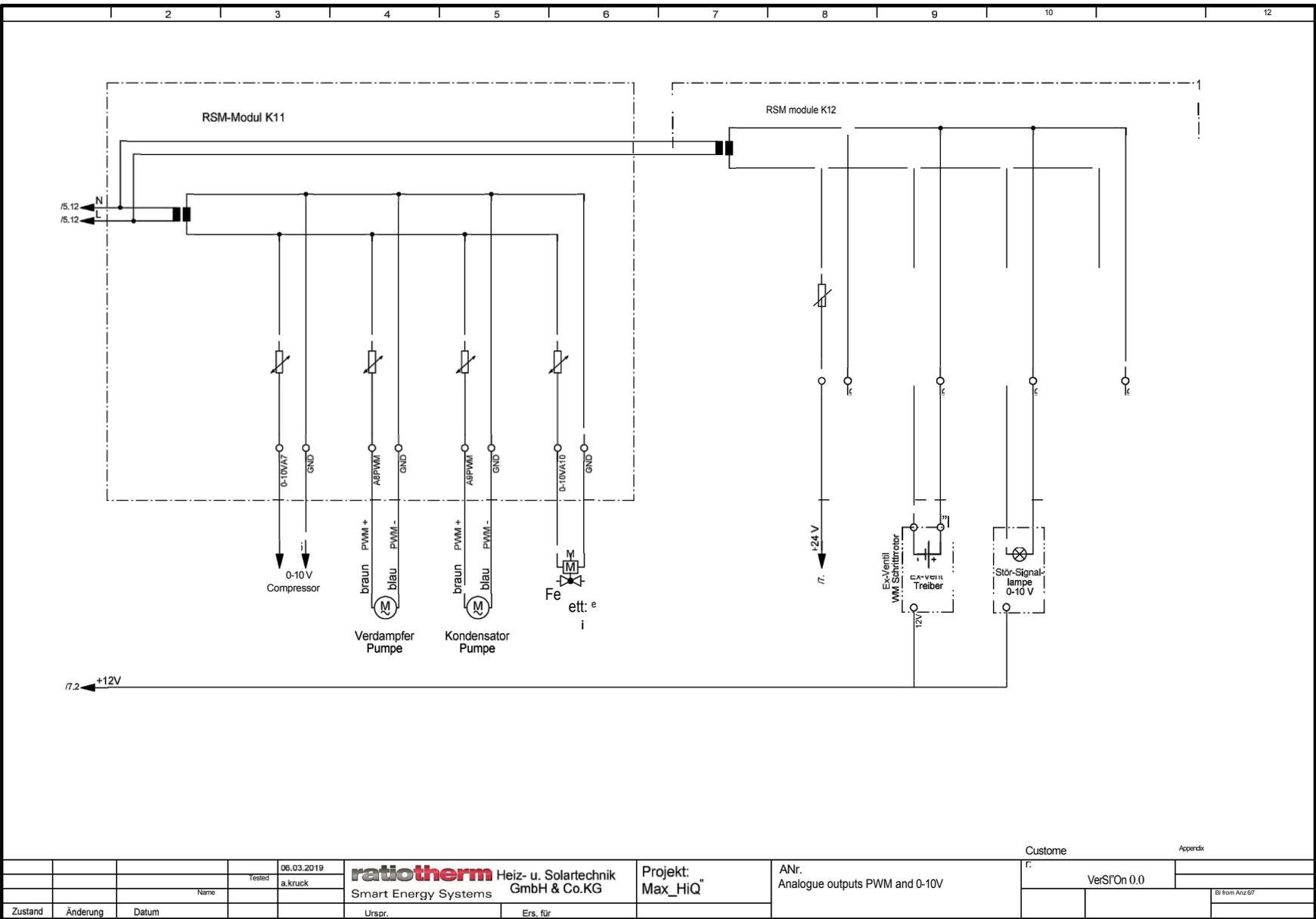


		07.03.2019	a.kruck		06.03.2019	<b>ratiotherm</b> Heiz- u. Solartechnik Smart Energy Systems GmbH & Co.KG	Projekt: Max_HIQ "	No. WP inverter circuit	Customer:		System:	
			Checked	a.kruck						Version 0.0		
Zustand	Änderung	Datum	Name			Urspr.	Ers. für					



# 13. APPENDIX

## 13.1 ELECTRICAL PLAN



		06.03.2019		<b>ratiotherm</b> Heiz- u. Solartechnik GmbH & Co.KG		Projekt: Max_HiQ		ANr. Analogue outputs PWM and 0-10V		Custome		Appendix	
		a.kruck				VerS'On 0.0						B1 from Anz 07	
Zustand	Änderung	Datum		Urspr.	Ers. für								



# 13. APPENDIX

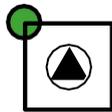
## 13.2 PUMP WILO-PARA STG

### Technical

Connection voltage	1 ~ 230 V +10 %/-15 %, 50/60 Hz
Protection class	IP X4D
Energy efficiency index EEI	see type plate (6)
Medium temperatures at max. ambient temperature	-20 °C to +95 °C (heating/GT)
Ambient temperature	-10 °C to +110 °C (ST)
Max. operating pressure	10 bar (1000 kPa)
Minimum inlet pressure at +95 °C/+110 °C	0.5 bar/1.0 bar (50 kPa/100 kPa)



### Indicator lights (LEDs)

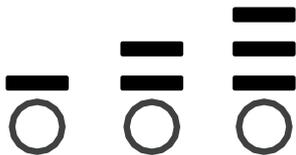


#### Signal indicator

- LED lights up green during normal operation
- LED lights up/flashes in case of malfunction

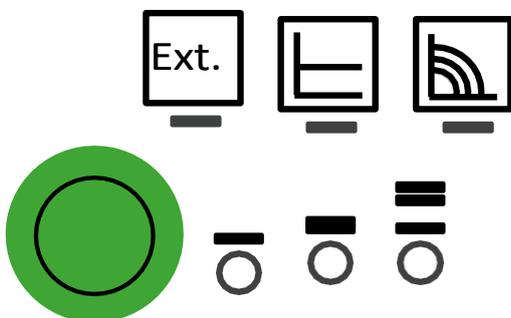


Display of selected control mode PWM,  $\Delta p$ -c and constant speed



Display of the selected characteristic curve (I, II, III) within the control mode

### Control button



#### Press

- Select control mode
- Select characteristic curve (I, II, III) within the control type

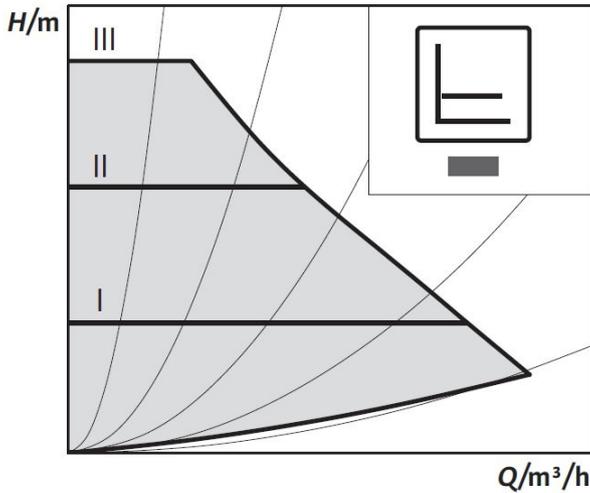
#### Press and hold

- Activate venting function (press for 3 seconds)
- Activate manual restart (press for 5 seconds)
- Lock/unlock button (press for 8 seconds)

## 13.2 PUMP WILO-PARA STG

### CONTROL TYPES AND FUNCTIONS

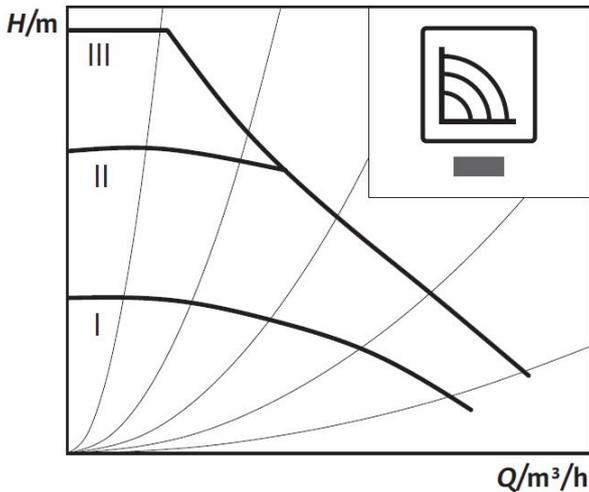
Constant differential pressure  $\Delta p$ -c (I, II, III)



Recommended for underfloor heating systems, large-diameter pipes, all applications without variable pipe network characteristics (e.g. storage tank charging pumps) and single-pipe heating systems with radiators.

The control keeps the set delivery head constant regardless of the delivered volume flow. Three predefined characteristics (I, II, III) to choose from.

Constant speed (I, II, III)



Recommended for systems with unchanging system resistance that require a constant volume flow.

The pump runs at three predefined fixed speed levels (I, II, III).



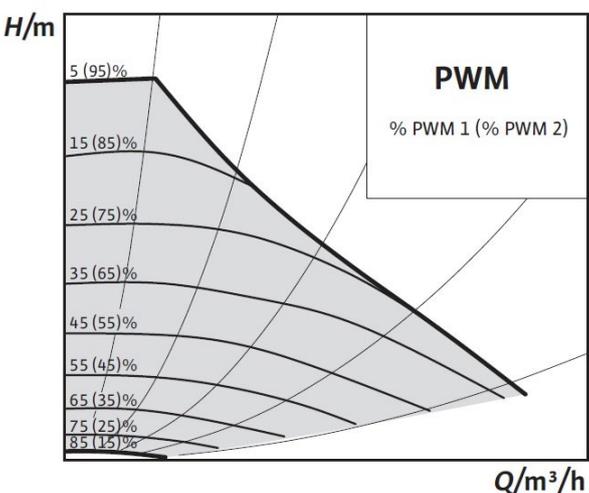
### NOTE!

Factory setting:

Constant speed, characteristic curve III

The required setpoint/actual value comparison is performed by an external controller for regulation purposes. A PWM signal (pulse width modulation) is supplied to the pump as a control variable via a separate cable with plug.

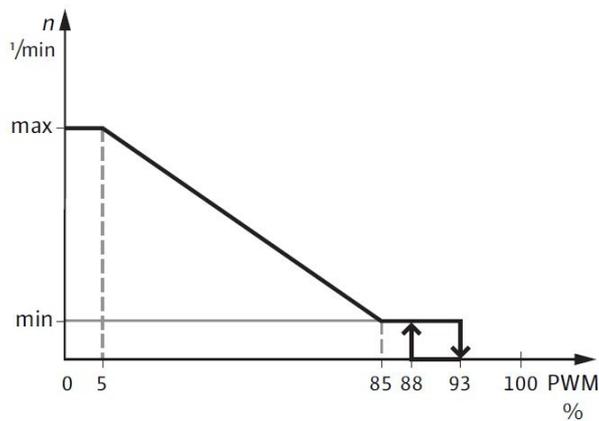
External control via iPWM signal



The PWM signal generator sends a periodic sequence of pulses (the duty cycle) to the pump in accordance with DIN IEC 60469-1.

# 13. APPENDIX

## 13.2 PUMP WILO-PARA STG



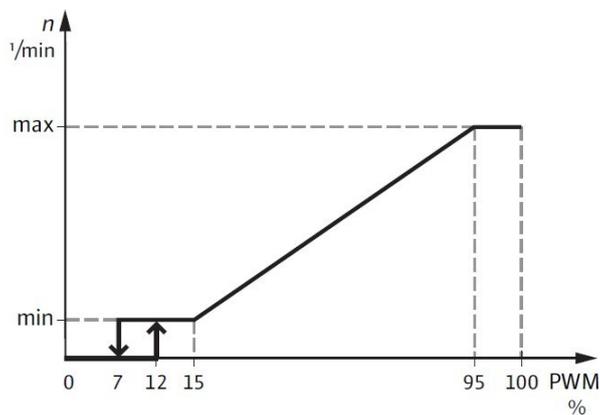
iPWM 1 mode (heating application):

In iPWM 1 mode, the pump speed is controlled depending on the PWM input signal. Behaviour in the event of a cable break:

If the signal cable is disconnected from the pump, e.g. due to a cable break, the pump accelerates to maximum speed.

PWM signal input [%]

- > 5: Pump runs at maximum speed
- 5 - 85: The speed of the pump decreases linearly from  $n_{max}$  to  $n_{min}$
- 85 - 93: Pump runs at minimum speed (operation)
- 85 - 88: Pump runs at minimum speed (start-up)
- 93 - 100: Pump stops (standby)



iPWM 2 mode:

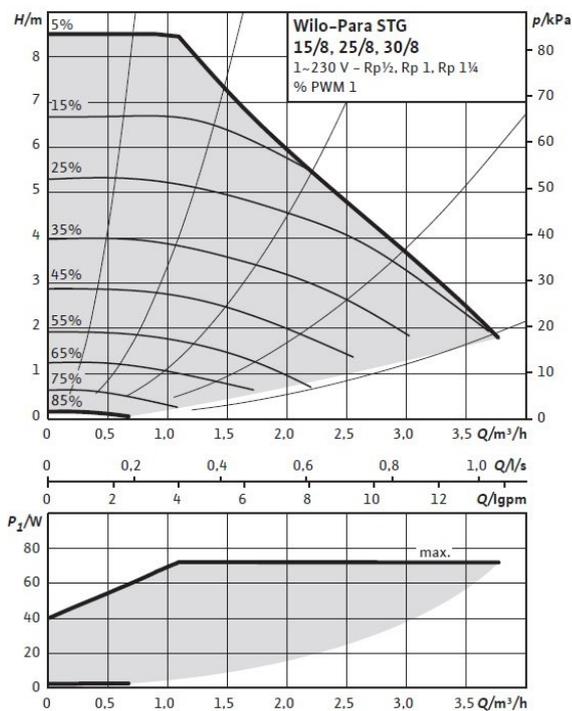
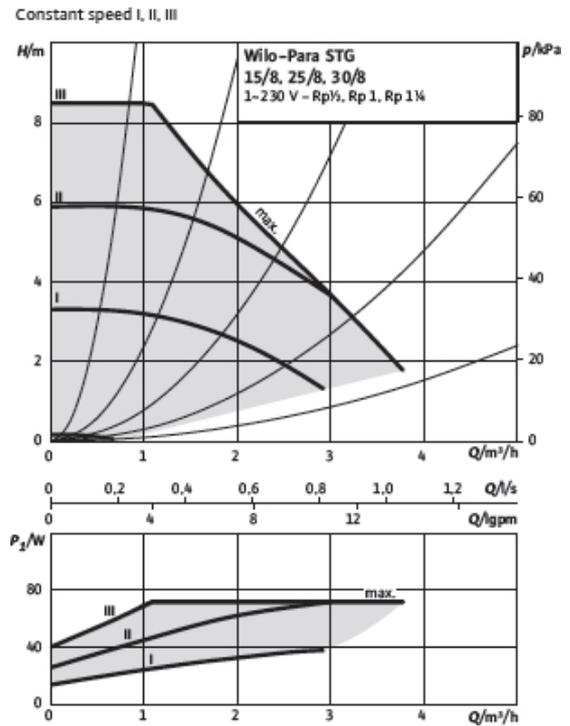
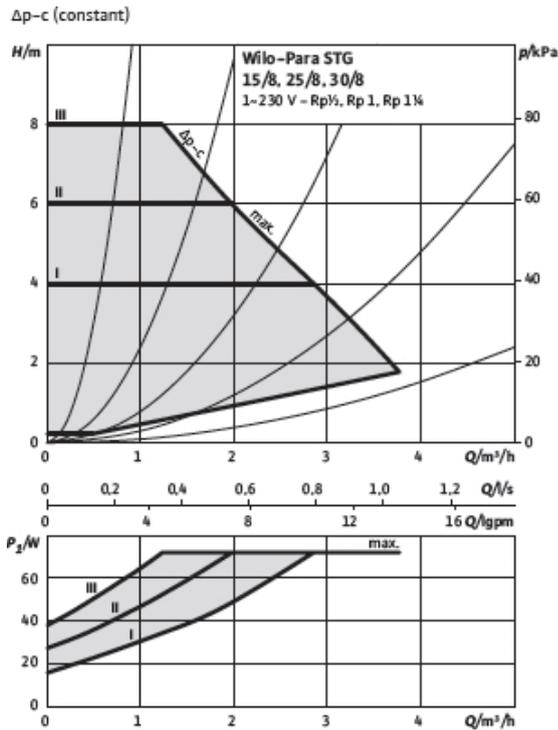
In iPWM 2 mode, the pump speed is controlled depending on the PWM input signal. Behaviour in the event of a cable break:

If the signal cable is disconnected from the pump, e.g. due to a cable break, the pump stops.

PWM signal input [%]

- 0 - 7: Pump stops (standby)
- 7 - 15: Pump runs at minimum speed (operation)
- 12 - 15: Pump runs at minimum speed (start-up)
- 15 - 95: The speed of the pump increases linearly from  $n_{min}$  to  $n_{max}$
- > 95: Pump runs at maximum speed

## 13.2 PUMP WILO-PARA STG



### Ventilation

The venting function is activated by pressing and holding (3 seconds) the control button and automatically vents the pump. The heating system is not vented during this process.

### Manual restart

A manual restart is activated by pressing and holding (5 seconds) the control button and unblocks the pump if necessary (e.g. after a long period of inactivity during the summer).

### Key lock

The key lock is activated by pressing and holding (8 seconds) the control button and locks the settings on the pump. It protects against unwanted or unauthorised adjustment of the pump.

## Stratos PARA \*\*/1-8



### Field of application

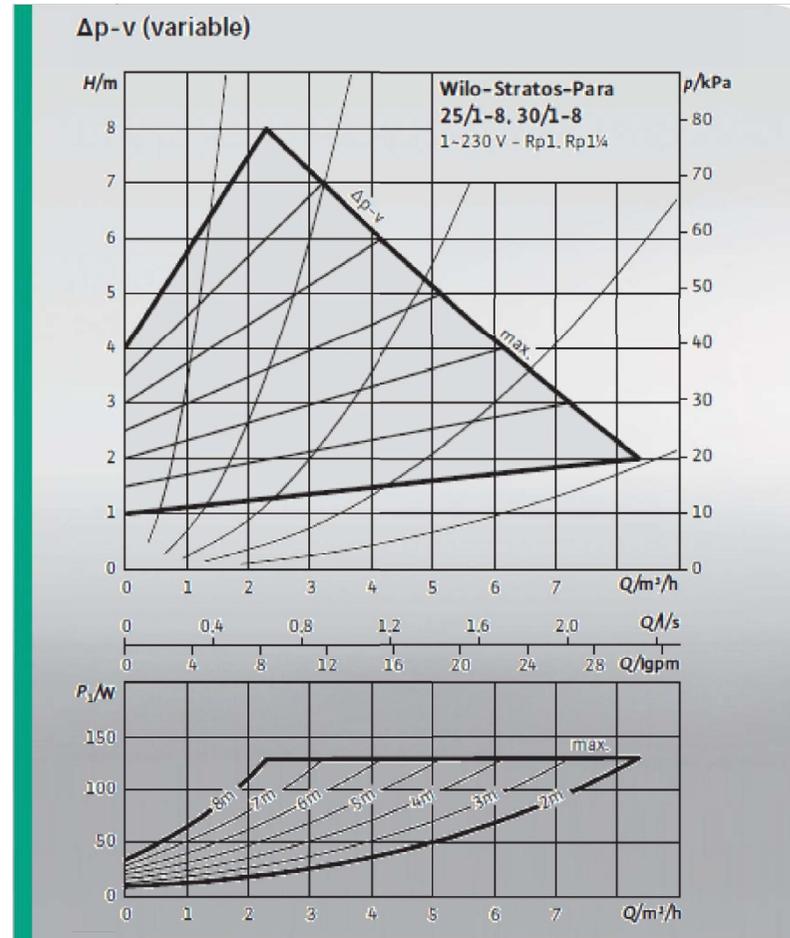


Heating/Geothermal/Solar

#### Stratos PARA 25/1-8 T1

Stratos PARA	Electronically controlled high-efficiency pump
25	Threaded connection DN 25
1-8	1-8 = delivery head in [m] at Q = 0 m <sup>3</sup> /h
T	The pump is controlled by Red Knob technology P-v, for variable differential pressure $\Delta$ P-c, for constant differential pressure $\Delta$ P-c, for constant differential pressure Control input "Analog" in 0 ... 10V" with cable break detection Control input "Analog" in 0 ... 10V" with cable break detection

## Hydraulic operational area $\Delta p$ -v (variable)

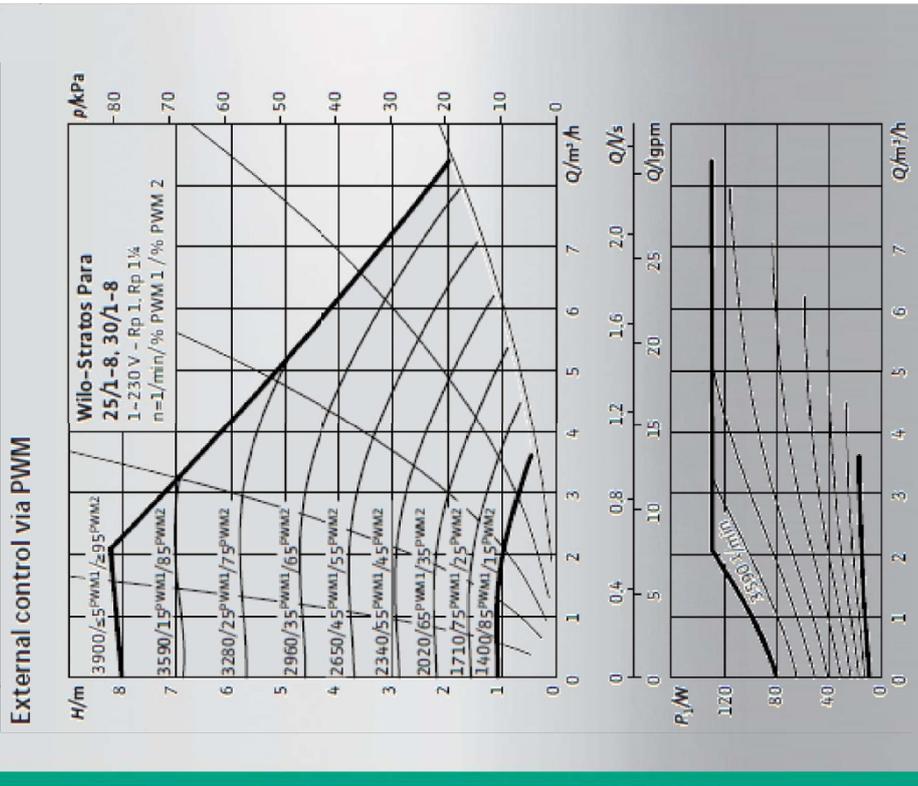


13.3 PUMP WILO STRATOS PARA

Data sheet Stratos PARA 718

04/10

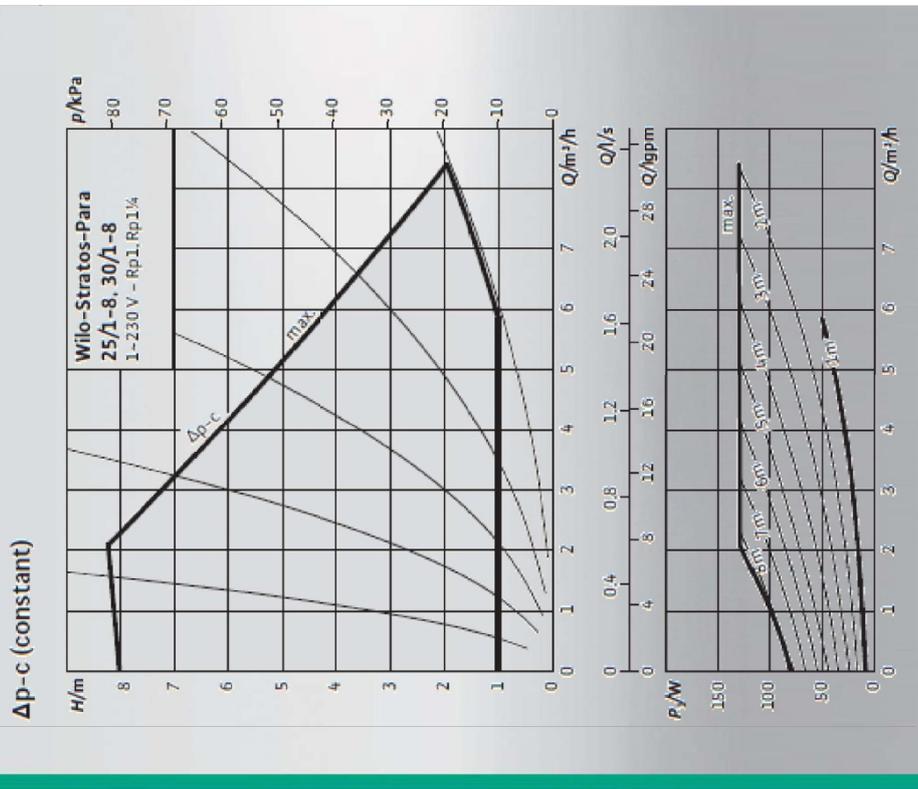
Hydraulic operational area external control PWM



Data sheet Stratos PARA 718

04/10

Hydraulic operational area  $\Delta p-c$  (constant)



# 13. APPENDIX

## 13.4 ERROR CODES BONFIGLIOLI AGILE FREQUENCY CONVERTER

Error messages		
Code		Meaning
F00	00	No fault has occurred.
Overload		
F01	00	Frequency converter overloaded (60 s), check load behaviour. Reduce ramps and speed.
	01	Frequency converter overloaded in the low output frequency range.
	02	Frequency converter overloaded (60 s), check load behaviour.
	03	Short-term overload (1 s), check motor and application parameters.
Heat sink		
F02	00	Heat sink temperature too high, check cooling and fan.
	01	Heat sink temperature too low, check permissible ambient temperature.
Interior		
F03	00	Interior temperature too high, check cooling and fan.
	01	Interior temperature too low, check permitted ambient temperature.
	02	Elko temperature too high, check cooling and fan.
Motor connection		
F04	00	Motor temperature too high or sensor defective, check connection to terminal X12.4.
	01	The motor protection switch has tripped; check the drive.
	02	The V-belt monitor reports that the drive is idling.
	03	Motor phase failure, check motor and wiring.
Output current		
F05	00	Overloaded, check load conditions and ramps.
	06	Motor phase current too high, check motor and wiring.
	07	Phase monitoring message, check motor and wiring.
	08	Phase monitoring message, check motor and wiring.
	09	Phase monitoring message, check motor and wiring.
	11	Motor still turning. The motor, which was still energised, turned and an attempt was made to <ul style="list-style-type: none"> <li>• start the drive with the search function deactivated or</li> <li>• start a device test.</li> </ul>
Internal error		
F06	xx	Internal error. Please contact your Bonfiglioli branch.
DC link voltage		
F07	00	DC link voltage too high, check deceleration ramps and connected braking resistor.
	0	DC link voltage too low, check mains voltage.
	02	Mains failure, check mains voltage and circuit.
	03	Phase failure in mains supply, check mains fuse and circuit.
	04	<i>UD limit setpoint 680</i> too low, check mains voltage.
	05	Overvoltage brake chopper. See complete operating instructions, chapter 13.3.
	06	Overvoltage motor chopper. See complete operating instructions, chapter 13.3.

## 13.4 ERROR CODES BONFIGLIOLI AGILE FREQUENCY CONVERTER

Error messages		
Code	Meaning	
Electronics voltage		
F08	01	Electronics voltage DC 24V too low, check control terminals.
	04	Electronics voltage too high, check wiring of control terminals.
	05	Error in A/D converter. Remove all external connections (control terminals, etc.) and check whether the error persists.
	06	Supply voltage for the optional communication module too low. No communication possible via the bus system. Disconnect the wiring of the bus system and acknowledge the error message. Check the connections and cables of the bus system. Replace the communication module if the error still occurs when the bus system is disconnected. Notify BONFIGLIOLI customer service if the error persists after replacing the communication module.
Brake chopper		
F10	10	Brake chopper overcurrent; see also the complete operating instructions, chapter 7.10.4.
Output frequency		
F11	00	Output frequency too high, check control signals and settings.
	0	Max. frequency reached by control, check deceleration ramps and connected braking resistor.
Safe Torque Off (STO)		
F12	01	The STO diagnostic software has detected that the STO shutdown paths are no longer functioning properly. Check the wiring and connect the shields correctly. Check the EMC environmental conditions. If the error persists, replace the device.
	02	Error message from the STO diagnostic function. If the error persists after restarting the device, replace the device.
	04	Internal device error. Notify BONFIGLIOLI customer service.
	05	The STOA and STOB release signals were not switched simultaneously, but with too long a time delay. Check the control of the release inputs.
	06	The voltage of the STO signals is too low. Check the dimensioning of the 24 V DC supply that supplies the STO inputs.
	07	The internal STO diagnostic software has detected that the STO signal levels do not indicate a clear status. Check the wiring and ensure that the signal levels are clearly defined (0V/24V). If the error persists, check with another device to see if the error also persists there.
	08	The STO diagnostic software has detected that the STO signal states within the device no longer correlate at different measuring points. Check the wiring and connect the shields correctly. If the error persists, replace the device.
	09	The STO diagnostic software has detected that an STO signal level is too high within the device. Check the wiring and ensure that the signal levels are clearly defined (0V/24V). If the error persists, replace the device.
Motor connection		
F13	00	Earth fault at the output, check the motor and cabling.
	10	Minimum current monitoring, check motor and wiring.

# 13. APPENDIX

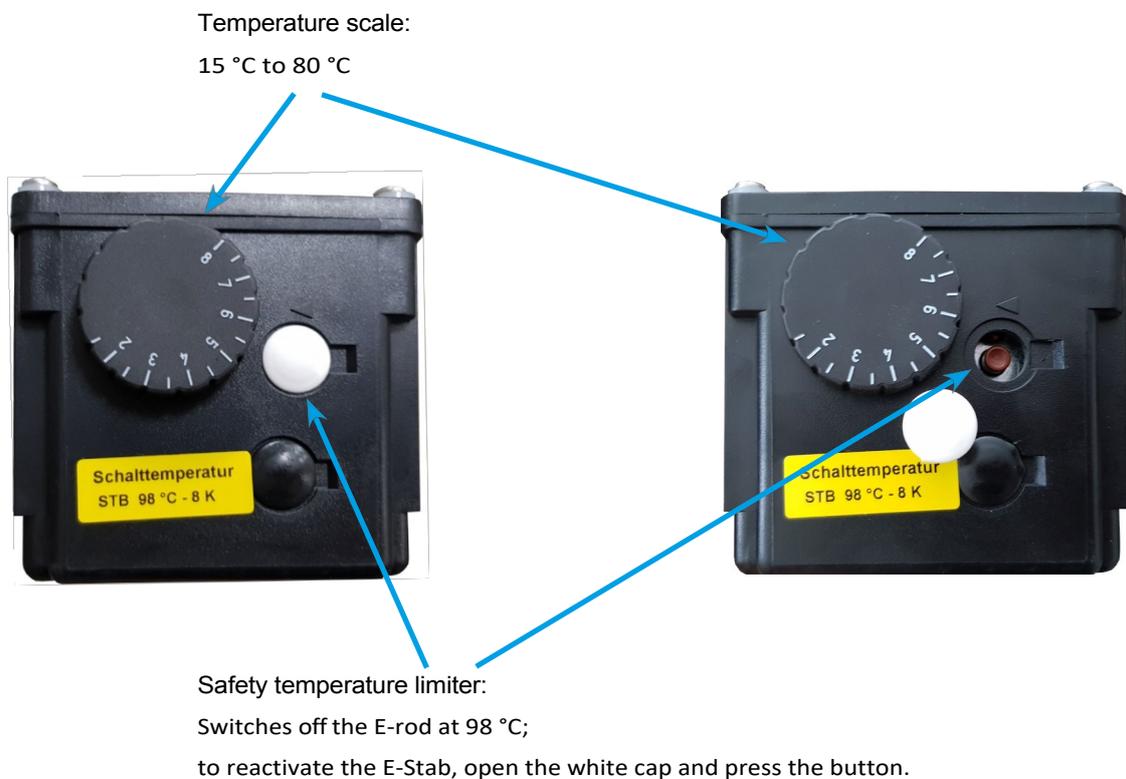
## 13.4 ERROR CODES BONFIGLIOLI AGILE FREQUENCY CONVERTER

Error messages			
Code	Meaning		
Control connection			
F14	01	Setpoint signal at multifunction input 1 faulty, check signal.	
	02	Setpoint signal at multifunction input 2 faulty, check signal.	
	07	Overcurrent at multifunction input 1, check signal.	
	08	Overcurrent at multifunction input 2, check signal.	
	09	The actual value for the technology controller is missing. The absence was reported in accordance with the setting for <i>Failure Actual Value</i> 440.	
	50	Temperature measurement with KTY measuring resistor faulty. Check signal and measuring resistor.	
	54	External error; the drive has responded in accordance with the parameter setting for <i>operating mode ext. error</i> 535. The error was triggered via the logic signal or digital input signal assigned to the <i>external error</i> parameter 183.	
Modbus and VABus			
F20	10	Communication error according to parameter <i>X21: VABus watchdog timer</i> 1502.	
	11	Communication error according to parameter <i>CM: VABus watchdog timer</i> 413.	
CANopen			
F20	21	CAN bus OFF	
	22	CAN guarding	
	23	Error state	
	24	SYNC error (SYNC timing)	
	25	CAN error state	
	26	RxPDO1 length error	Number of bytes received differs from mapping.
	27	RxPDO2 length error	
	28	RxPDO3 length error	
	2	RxPDO1 timeout	RxPDO was not received within the expected time. Ensure that the RxPDO can be received within the time set in "Event time" (subindex 5).
	2B	RxPDO2 timeout	
2C	RxPDO3 timeout		
DeviceNet			
20	5n	DeviceNet error. Please refer to the DeviceNet manual.	
Profibus			
20	6n	Profibus error. Please refer to the Profibus manual.	
Internal error			
F20	7x	Internal error. Please contact your Bonfiglioli branch.	
System bus			
F21	nn	Fault message on the system bus master in the event of a system bus slave fault, nn = node ID of the slave (hex).	
F22	0	System bus communication error, sync telegram timeout	
	0	Communication error on system bus, RxPDO1 timeout	
	02	Communication error system bus, timeout RxPDO2	
	03	Communication error system bus, timeout RxPDO3	
	10	Communication error system bus, bus off	
CANopen			
F23	nn	Heartbeat error, nn = triggering node.	

## 13.4 ERROR CODES BONFIGLIOLI AGILE FREQUENCY CONVERTER

Error messages		
Code		Meaning
CM module detection		
F24	0	Unknown CM module. Check compatibility of firmware and CM module.
Industrial Ethernet		
F27	nn	Industrial Ethernet error. Please refer to the instructions for the Ethernet module used.
EtherCAT		
F28	nn	EtherCAT error.
User error VPLC		
F30	3n	User-caused error of the internal PLC function. Please refer to the VPLC application manual.
Optional components		
FOB	13	The communication module was installed without disconnecting the mains voltage. Switch off the mains voltage.
Internal monitoring		
FOC	40	After 6 warm starts in less than 3 minutes, this error is triggered, as there is a high probability of a programming error in the PLC or function table. In addition, the function table is stopped (P.1399 = 0 only in RAM).

## 13.5 E-STAB

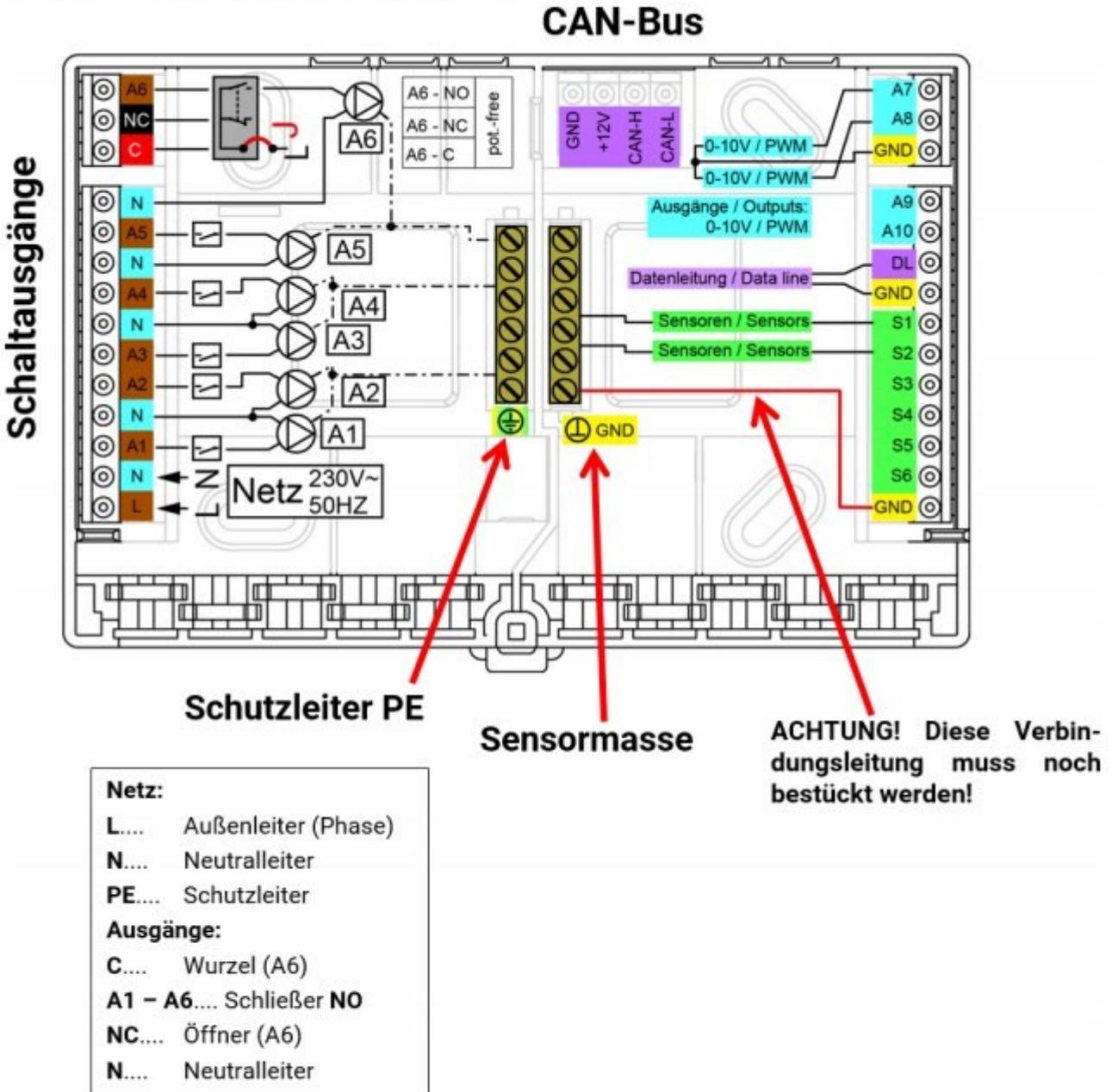


# 13. APPENDIX

## 13.6 TECHNICAL DATA RSM610

### Klemmenplan

Ansicht des Gehäuse-Unterteils mit Klemmen



### Netzanschluss

Das Modul hat ein eingebautes Netzteil und wird durch dieses versorgt. Der Netzanschluss muss daher **230V 50Hz** sein, diese Spannung wird auch durch die Ausgangsrelais durchgeschaltet. Das eingebaute Netzteil unterstützt gleichzeitig die Spannungsversorgung des CAN-Busses.

## 13.6 TECHNICAL DATA RSM610

**Technische Daten RSM610**

alle Eingänge	Temperatursensoren der Typen PT1000, KTY (2 k $\Omega$ /25°C), KTY (1 k $\Omega$ /25°C), PT100, PT500, Ni1000, Ni1000TK5000 und Raumsensoren RAS bzw. RASPT, Strahlungssensor GBS01, Thermoelement THEL, Feuchtesensor RFS, Regensensor RES01, Impulse <b>max. 10 Hz</b> (z.B. für Volumenstromgeber VSG), Spannung <b>bis 3,3V DC</b> , Widerstand (1-100k $\Omega$ ), sowie als Digitaleingang
Eingänge 4, 5	zusätzlich Spannung 0-10V DC
Eingang 6	zusätzlich Impulseingang <b>max. 20 Hz</b> , z.B. für Volumenstromgeber VSG oder S0-Signale
Ausgang 1-5	Relaisausgänge, Schließer
Ausgang 6	Relaisumschaltkontakt - <b>potentialfrei</b>
Ausgänge 7 - 10	Analogausgänge 0-10V (max. 20mA) oder PWM (10V/1kHz) in jeweils 1000 Stufen (=0,01V bzw. 0,1% pro Stufe) oder Erweiterungsmöglichkeit als Schaltausgänge mit Zusatzrelaismodulen
Ausgang 7 RSM610-24, -MB24	Versorgung für externe 24V-Geräte, <b>in Summe</b> mit den 12V-Geräten max. 6W
Ausgang 9 RSM610-MB, -MB24	M-Bus-Eingang für bis zu 4 M-Bus-Zähler
max. Schaltleistung	je Ausgang 230V / 3A
max. Buslast (DL-Bus)	100%
CAN-Bus	Standard-Datenrate 50 kbit/s, einstellbar von 5 bis 500 kbit/s
M-Bus RSM610-MB, -MB24	Standard-Baudrate 2400 Baud, einstellbar von 300 bis 38400 Baud, max. 4 M-Busgeräte auslesbar
12V	Versorgung für externe Geräte, <b>in Summe</b> max. 6W
Differenztemperaturen	mit getrennter Ein- und Ausschalt Differenz
Schwellwerte	mit getrennter Ein- und Ausschalt Differenz oder mit fixer Hysterese
Temperaturmessbereich	PT100, PT500, PT1000: -200,0°C bis + 850°C mit einer Auflösung von 0,1K; alle anderen Temperatursensoren: -49,9°C bis +249,9°C mit einer Auflösung von 0,1K
Genauigkeit Temperatur	typ. 0,4K, max. $\pm$ 1K im Bereich von 0 - 100°C <b>für PT1000-Sensoren</b>
Genauigkeit Widerstandsmessung	max. 1,6% bei 100k $\Omega$ (Messgröße: Widerstand, Prozessgröße: Widerstand)
Genauigkeit Spannung	typ. 1%, max. 3% vom maximalen Messbereich des Eingangs
Genauigkeit Ausgang 0-10V	max. -2% bis +6%
Anschluss	100 - 230V, 50- 60Hz, (Ausgänge A1 – A5 und Gerät gemeinsam abgesichert mit 6,3A flink)
Zuleitung	3 x 1mm <sup>2</sup> H05VV-F laut EN 60730-1 (Kabel mit Schutzkontaktstecker im Sensor-Grundpaket enthalten)
Leistungsaufnahme	1,0 – 1,9 W, je nach Anzahl aktiver Schaltausgänge
Schutzart	IP40
Schutzklasse	II – Schutzisoliert <input type="checkbox"/>
Zulässige Umgebungstemperatur	+5 bis +45°C

Technische Änderungen sowie Satz- und Druckfehler vorbehalten. Diese Anleitung ist nur für Geräte mit entsprechender Firmware-Version gültig. Unsere Produkte unterliegen ständigem technischen Fortschritt und Weiterentwicklung, wir behalten uns deshalb vor, Änderungen ohne gesonderte Benachrichtigung vorzunehmen. © 2018

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		Revision - Issue no.: 7
		Date: 14/8/2014
		Replaces: 15/11/2010
Tetrafluoroethane (R134a)		MSDS No. 14



2.2: Nicht entzündbar,  
nicht giftige Gase

Warning



#### SECTION 1. Identification of the substance or mixture and of the company

##### 1.1. Product identifier, Trade name

Safety data sheet number : Tetrafluoroethane (R134a)  
 Chemical name : SDS No. 14  
 : Tetrafluoroethan (R134a)  
 CAS-Nr. : 811-97-2  
 EG-Nr. : 212-377-0  
 Index No. : —  
 Registration No. : 01-2119459374-33  
 Chemical formula : C2H2F4

##### 1.2. Relevant identified uses of the substance or mixture and uses advised against

**Relevante identifizierte Verwendungen :** Verwendung als Kältemittel,  
 Industriell und berufsmäßig, Vor Anwendung Gefährdungsbeurteilung durchführen,  
 Prüfgas / Kalibriergas, Laborzwecke,  
 Kontaktieren Sie Ihren Lieferanten für weitere Informationen über Verwendungen.

##### 1.3. Details of the supplier providing the safety data sheet, Company name

GASE GmbH : TYCZKA INDUSTRIE-  
 Landzungenstrasse 17  
 D-68159 Mannheim  
 Fax 0621/18009-150  
 sdb@tig.de / www.tig.de  
 EM Address (of the competent : sdb@tig.de

##### 1.4 Emergency telephone number

**Notfall-Telefonnummer** : 0800/1809555

TYCZKA INDUSTRIE-GASE GmbH  
 Landzungenstrasse 17 D-68159 Mannheim  
 Telefon 0621/18009-0  
 Fax 0621/18009-150  
 sdb@tig.de / www.tig.de

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		Date: 14/8/2014
		Replaces: 15/11/2010
Tetrafluoroethane (R134a)		MSDS No. 14

#### SECTION 2. Potential hazards

##### 2.1. Classification of the substance or mixture

###### Gefahrenklasse und -kategorie nach Verordnung EG 1272/2008 (CLP)

• Physical hazards : Gases under pressure - Liquefied gases - Caution - (CLP: Pressurised gas) - H280 Classification according to  
 EC 67/548 or EC 1999/45  
 : Nicht als gefährlicher Stoff / gefährliches Gemisch eingestuft.  
 In Anhang VI CLP nicht genannt.  
 Keine EG Kennzeichnung erforderlich.

##### 2.2. Labelling elements

###### Labelling according to Regulation EC 1272/2008 (CLP)

• Hazard pictogram(s)



• Hazard pictogram code : GHS04  
 • Signal word : Warning  
 • Hazard statements : H280 - Contains gas under pressure; may explode if heated.  
 • Safety instructions : P403 - Store in a well-ventilated place.

##### 2.3. Other hazards

Erstickend in hohen Konzentrationen.  
 Kontakt mit der Flüssigkeit kann Kaltverbrennungen/Erfrörungen verursachen

#### SECTION 3. Composition/information on ingredients

##### 3.1. StoW / 3.2. Mixture

Einstufung(DSD)

##### Tetrafluoroethan (R134a)

Enthält keine anderen Komponenten oder Verunreinigungen, die die Einstufung dieses Produktes beeinflussen.

- \* 1: Aufgeführt in Anhang IV / V REACH, von der Registrierung ausgenommen.
  - \* 2: Registrierungszeitraum noch nicht abgelaufen.
  - \* 3: Registrierung nach REACH nicht erforderlich: Stoff wird importiert < 1t/a.
- Volltext der R-Sätze siehe Abschnitt 16. Volltext der Gefahrenhinweise siehe Abschnitt 16.

TYCZKA INDUSTRIE-GASE GmbH  
 Landzungenstrasse 17 D-68159 Mannheim  
 Telefon 0621/18009-0  
 Fax 0621/18009-150  
 sdb@tig.de / www.tig.de

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Tetrafluoroethane (R134a)		MSDS No. 14

**SECTION 4. First aid measures**

- 4.1. Description of first aid measures**
- **Einatmen** : Das Opfer ist unter Benutzung eines umluftunabhängigen Atemgerätes in frische Luft zu bringen. Warm und ruhig halten. Arzt hinzuziehen. Bei Atemstillstand künstliche Beatmung. In case of burns, rinse with water for at least 15 minutes. Cover with a sterile dressing. Consult a doctor.
  - **Hautkontakt** : Immediately rinse eyes with water for at least 15 minutes.
  - **Eye contact** : Ingestion is not considered a possible route of exposure.
  - **Ingestion**
- 4.2. Most important acute and delayed symptoms and effects**
- Hohe Konzentrationen können Ersticken verursachen. Symptome können Verlust der Bewegungsfähigkeit und des Bewusstseins sein. Das Opfer bemerkt das Ersticken nicht. In niedrigen Konzentrationen können narkotische Effekte entstehen. Symptome können Schwindelgefühl, Kopfschmerz, Übelkeit und Koordinationsstörungen sein.
- 4.3. Indications for immediate medical attention or special treatment**

**SECTION 5. Firefighting measures**

- 5.1. Extinguishing media**
- Suitable extinguishing agents : water spray or water mist.
  - **Ungeeignete Löschmittel** : Wasserstrahl zum Löschen ungeeignet.
- 5.2. Special hazards arising from the substance or mixture**
- Exposure to fire may cause the container to burst/explode.
  - Bei Einwirkung von Feuer können durch thermische Zersetzung die folgenden toxischen und/oder ätzenden Stoffe entstehen: Kohlenmonoxid, Fluorwasserstoff, Carbonylfluorid.
- 5.3. Firefighting measures**
- Spezifische Methoden** : Behälter aus dem Wirkungsbereich des Brandes entfernen, wenn dies gefahrlos möglich ist. Wenn möglich, Gasaustritt stoppen. Firefighting measures : Prüfung auf den Brand in der Umgebung abstimmen. Druckbehälter können bersten, wenn sie direktem Feuer bzw. Wärmestrahlung durch Feuer ausgesetzt sind. Gefährdete Druckbehälter mit Wasserstrahl aus geschützter Position kühlen. Schadstoffbelastetes Löschwasser nicht in Abläufe und die Kanalisation gelangen lassen. Wassersprühstrahl oder Wassermebel einsetzen, um Rauch niederzuschlagen.
- Spezielle Schutzausrüstung für die Feuerwehr** : Umluftunabhängiges Atemgerät benutzen. Standardschutzkleidung und -ausrüstung (Umluftunabhängiges Atemschutzgerät) für die Feuerwehr. Standard EN 469 - Schutzkleidung für die Feuerwehr. Standard EN 659 - Schutzhandschuhe für die Feuerwehr. Standard EN 137 - Umluftunabhängige Atemschutzgeräte mit Vollgesichtsmaske.

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**SECTION 6. Accidental release measures**

- 6.1. Personal precautions, protective equipment and emergency procedures**
- Versuchen, den Gasaustritt zu stoppen. Gebiet räumen. Für ausreichende Lüftung sorgen. Beim Betreten des Bereiches umluftunabhängiges Atemgerät benutzen, sofern nicht die Ungefährlichkeit der Atmosphäre nachgewiesen ist. Eindringen in Kanalisation, Keller, Arbeitsgruben oder andere Orte, an denen die Ansammlung gefährlich sein könnte, verhindern. Ortlichen Alarmplan beachten. Auf windzugewandter Seite bleiben.
- 6.2. Environmental precautions** : Versuchen, den Gasaustritt zu stoppen.
- 6.3. Methods and material for containment and cleaning up**
- 6.4. Reference to other sections** : See also sections 8 and 13.

**SECTION 7. Handling and storage**

- 7.1. Safety measures for safe handling**
- Safe handling of the Stoe
- Only experienced and appropriately trained persons should handle gas under pressure handhaben. Umgang mit dem Stoff im Einklang mit allgemeinen Arbeitsschutzmaßnahmen und Sicherheitsanweisungen. Nur solche Ausrüstung verwenden, die für dieses Produkt und den vorgesehenen Druck und Temperatur geeignet ist. Im Zweifelsfall den Gaslieferanten konsultieren. Beim Umgang mit dem Produkt nicht rauchen. Stellen Sie sicher, dass das gesamte Gassystem vor dem Gebrauch (und danach regelmäßig) for leaks (v rd). Provide safety valves in gas installations.
- Sicherer Umgang mit dem Druckgasbehälter.**
- Gas nicht einatmen. Produktaustritt an die Atmosphäre vermeiden. Bedienungshinweise des Gaslieferanten beachten. Eindringen von Wasser in den Gasbehälter verhindern. Rückströmung in den Gasbehälter verhindern. Gasflaschen vor mechanischer Beschädigung schützen; nicht ziehen, nicht rollen, nicht schieben, nicht fallen lassen. Für den Transport von Gasflaschen, selbst auf kurzen Strecken, immer einen Flaschenwagen oder anderen geeigneten Handwagen benutzen. Ventilschutzkappe nicht entfernen bevor die Flasche an einer Wand oder einen Labortisch oder auf einen Flaschenständer gestellt wurde, und zum Gebrauch bereit ist. Falls der Benutzer irgendwelche Schwierigkeiten bei der Bedienung des Flaschenventils bemerkt, den Gebrauch unterbrechen und Kontakt mit dem Lieferanten aufnehmen. Versuchen Sie nie, Ventile oder Sicherheitsdruckentlastungseinrichtungen am Behälter zu Beschädigungen an diesen Einrichtungen müssen umgehend dem Lieferanten mitgeteilt werden. Ventilschlüsse des Behälters sauber und frei von Verunreinigungen halten, insbesondere frei von Öl und Wasser. Setzen Sie die Auslasskappen oder -stöpfe und die Ventilschutzkappe wieder auf, sobald der Behälter von der Anlage getrennt wird. wenn er noch immer angeschlossen ist. Versuchen Sie nicht, das Gas von einer Gasflasche oder Behälter in einen anderen umzufüllen. Benutzen Sie nie Flammen oder elektrische Heizgeräte zur Druckerhöhung im Behälter.

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D e d i a t i m u g d i r a l l g e m e i n e n u n d a n d e r e n m e n e d i e r e n n a b e n d A T T E N T I O N ! I n f o r m a t i o n e n s i n d n u r f ü r d i e n a t u r l i c h e n G e b r a u c h b e z i e h t u n d n i c h t f ü r a n d e r e Z u e h o r u n g e n . A l l e R e c h t e r e s e r v i e r t .

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## SECTION 7. Handling and storage (ForseeDung)

Das Produktetikett dient der Identifizierung des Inhalts der Gasflasche und darf nicht entfernt oder unkenntlich gemacht werden.

## 7.2. Conditions for safe storage, taking into account incompatibilities

: Behälter bei weniger als 50°C an einem gut gelüfteten Ort lagern.  
Alle Vorschriften und örtlichen Erfordernisse an die Lagerung von Behältern müssen eingehalten werden. Behälter aufrecht stehend lagern und gegen Umfallen sichern. Gelagerte Flaschen sollten regelmäßig auf Leckagen und korrekte Lagerbedingungen geprüft werden. Ein Ventilschutzring sollte vorhanden sein oder die Ventilschutzkappe angebracht werden. Die Behälter sollten an einem Ort ohne Brandgefahr und entfernt von Wärme- und Zündquellen gelagert werden.  
Die Behälter nicht unter Bedingungen lagern, die die Korrosion beschleunigen. Von brennbaren Stoffen fernhalten.

## 7.3. Specific end uses

## SECTION 8. Exposure controls/personal protective equipment

## 8.1. Parameters to be monitored

DNEL: Derived No Effect Level (Beschäftigte)

Tetrafluoroethan (R134a)

Inhalation-Long Term (Systemic) [mg/m<sup>3</sup>]: 14000

PNEC: Abgeschätzte Nicht Effect

Tetrafluoroethan (R134a)

Freshwater [mg/L]: 0.1 Seawater [mg/L]: 0.01

Aquatic invertebrate [mg/L]:  
Sediment, fresh water [mg/kg dry matter]: 0.75 Sewage treatment plant (STP) [mg/l]: 73

## 8.2. Exposure limits and monitoring

## 8.2.1. Geeignete technische Steuerungseinrichtungen

: Anlagen, die unter Druck stehen, sollten regelmäßig auf Dichtheit geprüft werden. Sauerstoff-Detektoren einsetzen, falls ersickend wirkende Gase emittiert werden können. Sicherstellen, dass Konzentrationen des Produktes in der Umgebungsluft ausreichend unterhalb des Arbeitsplatzgrenzwertes liegen.  
Allgemeine und lokale Absaugung vorsehen.  
Arbeitsverfahren z.B. bei Wartungsarbeiten in Betracht ziehen.

## 8.2.2. Individuelle Schutzmaßnahmen, z.B. Persönliche Schutzausrüstung

: Eine Gefährdungsbeurteilung sollte für alle Arbeitsbereiche erstellt und dokumentiert sein, in der alle Risiken der Verwendung des Produktes erfasst sind und die erforderliche persönliche Schutzausrüstung abgeleitet wird. Die folgenden Empfehlungen sollten in Betracht gezogen werden:

Personal protective equipment that complies with EN / ISO standards protects the eyes, face and skin from liquid splashes.

## • Augen- / Gesichtsschutz

: Schutzbrille mit Seitenschutz tragen.  
Schutzbrille mit Seitenschutz oder Vollschutzbrille tragen wenn Umrüstarbeiten oder An- und Abschleifarbeiten ausgeführt werden.  
Standard EN 166 - Persönlicher Augenschutz.

## - Handschutz

: Arbeitshandschuhe bei der Handhabung von Druckbehältern, Druckgasflaschen tragen. Schutzhandschuhe gegen mechanische Risiken.

## - Sonstige Schutzmaßnahmen

: Beim Umgang mit Druckgasflaschen / Druckbehältern Sicherheitsschuhe tragen. Standard EN ISO 20345 - Persönliche Schutzausrüstung - Sicherheitsschuhe.

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## SECTION 8. Exposure controls/personal protective equipment (continued)

- **Atenschutz** : Umluftunabhängiges Atemschutzgerät oder eine Druckluftleitung mit Maske in im Fall von sauerstoffreduzierter Atmosphäre verwenden.  
Standard EN 137 - Umluftunabhängige Atemschutzgeräte mit Vollgesichtsmaske.
- **Thermische Gefahren** : Keine erforderlich.
- 8.2.3. **Begrenzung und Überwachung der Umweltexposition** : Nationale Emissionsregelungen beachten. Weitere Information für besondere Methoden der Abgasbehandlung siehe Abschnitt 13.

## SECTION 9. Physical and chemical properties

## 9.1. Information on basic physical and chemical properties

## Aussehen

Physikalischer Zustand bei 20°C / 101. : Gas

Colour : Colourless.

Gesch : Ethereal.

Geruchsschwelle : Odour perception is subjective and not suitable for preventing overexposure.  
wert (l) : 1

pH : Not applicable.

Molmasse [g/mol] : 102

Schmelzpunkt [°C] : -101

Siedepunkt [°C] : -26.1

Critical temperature [°C] : 101

Flash point [°C] : Not applicable to gases and gas mixtures.

Evaporation rate (ether=): Not applicable to gases and gas mixtures.

1) Zündgrenzen [Vol.% in Luft] : Nicht brennbar.

Dampfdruck [20°C] : 4.7 bar

Löslichkeit in Wasser [mg/l] : 1930

Verteilungskoeffizient n-Oktanol/Wasser [log Kow] : 0,94

Zündtemperatur [°C] : Not applicable.

Viscosity at 20 °C [mPa.s] : Nicht anwendbar.

Explosive Eigenschaften : Nicht anwendbar.

Oxidising properties : None.

## 9.2. Other information

Sonstige Angaben : Gas/Dämpfe sind schwerer als Luft. Sie können sich in geschlossenen Räumen ansammeln, insbesondere am Fußboden oder in tiefergelegenen Bereichen.

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**SECTION 10. Stability and reactivity**

10.1. Stability  
 : a G here reactivity other than those listed in the following subsections

10.2. Chemical stability  
 : Stable under normal conditions.

10.3. Possibility of dangerous reactions  
 : None.

10.4. Conditions to avoid  
 : None under the recommended conditions of use and storage (see section 7).

10.5. Incompatible materials  
 : Feuchtigkeit.  
 Weitere Informationen zur Materialverträglichkeit: siehe ISO11114.

10.6. Hazardous decomposition products  
 : Unter normalen Bedingungen bei Verwendung und Lagerung werden gefährliche Zersetzungsprodukte nicht erzeugt.

**SECTION 11. Toxicological information**

11.1. Information on toxicological effects  
 Acute toxicity : No toxic effects of the product are known. Skin irritation : No effects of the product are known. Serious eye damage/irritation : No effects of the product are known. Respiratory tract/skin sensitisation: No effects of the product are known. Carcinogenicity : No effects of the product are known.  
 Teratogenicity : No effects of the product are known. Reproductive toxicity : No known effects of the product. Specific target organ toxicity at : No known effects of the product.  
 Specific target organ toxicity ( ) : No known effects of the product.  
**wiederholter Exposition**  
**Aspirationsgefahr** : Nicht anwendbar auf Gase und Gasgemische.

**SECTION 12. Environmental information**

12.1 Toxizität  
 EC50 48h - Daphnia magna [mg/l] : 930  
 EC50 72h - Algae (mg/l) : No data available.  
 LC50 96 hours - Fiach (mg/l) : 450

12.2 Persistence and degradability  
 Assessment : Nicht leicht bio-abbaubar.

12.3 Bioaccumulation potential  
 Assessment : Due to the low logKow value (log Kow < 4), bioaccumulation of the substance is unlikely. See section 9.

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**SECTION 12. Environmental information (continued)**

12s. Mobility in soil  
**Bewertung** : Wegen seiner hohen Volatilität ist es unwahrscheinlich, dass das Produkt Boden- oder Wasserverschmutzung verursacht.

12.5. Results of the PBT and vPvB assessment  
 : Not classified as PBT or vPvB.

12.6. Other harmful effects  
 Weathering Ozone Acrylic acid : None.  
 (CO2) : 1300  
**Auswirkung auf die globale Erwärmung** : Enthält Treibhausgas(e), die im Kyoto-Protokoll genannt sind. Kann bei Austritt großer Mengen zum Treibhauseffekt beitragen.

**SECTION 13. Disposal considerations**

13.1. Waste treatment methods  
 : Nicht in die Atmosphäre ablassen.  
 Nicht in die Kanalisation, Keller, Arbeitsgruben und ähnliche Plätze, an denen die Ansammlung des Gases gefährlich werden könnte, ausströmen lassen.  
 Für weitere Information über die Abfallbeseitigung siehe den EIGA-Code of practice Doc 30/10 "Disposal of gases" verfügbar unter <http://www.eiga.org>.  
 : The emission values comply with local regulations or operating permits. 14.06.01: Einhalten werden.  
 Chlorinated/fluorinated hydrocarbons.

**Verzeichnis gefährlicher Abfälle (Entscheidung der Kommission EG 2001/118)**

13.2. Additional information  
 : None.

**SECTION 14. Transport information**

14.1. UN number  
 3159

**Kennzeichnung nach IMDG, IATA**  
  
 2.2: Non-flammable, non-toxic gases

14.2. Proper UN shipping name  
 Transport by road/air : 1,1,1,2-TETRAFLUOROETHANE (GA6 AS REFRIGERANT R 134A) Transport  
**Eisenbahnverkehr (ADR/RID)**  
 by air (IATA) : 1,1,1,2-TETRAFLUOROETHANE (REFRIGERANT GAS R 134A)  
**U.S. DOT (IMDG)**  
 by sea (IMDG) : 1,1,1,2-TETRAFLUOROETHANE (REFRIGERANT GAS R 134A)

14.3. Transport hazard class(es)  
 Transport in Seaberv  
**Eisenbahnverkehr (ADR/RID)**

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## SECTION 14. Transport information (continued)

<b>Klasse</b>	: 2
<b>Klassifizierungscode</b> for labelling	: 2 A : 20
Tunnel restriction uug come	: C/E : Beförderung in Tanks; Durchfahrt verboten durch Tunnel der Kategorien C, D und E Sonstige Beförderungen: Durchfahrt verboten durch Tunnel der Kategorien E.
<b>Transport in Luftverkehr ICAO-T1 (IATA-DGR)</b>	
KasSelDivisionNebengeCah(en) Transport Maritime transport@WDG	: 2.2
<b>Klasse/Division Nebengefahr(en)</b>	: 2.2
Nodal Pan (EmS) - Fire	: FC
Nodal Pan (EmS) - Leakage	: SV

## 14.4. Packaging group

Roadair transport <b>Eisenbahnverkehr (ADR/RID)</b>	: Nicht anwendbar.
Sea Air transport (ICAO-TT) : Not applicable. Transport by sea	

(IMDG)	: Not applicable.
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## 14.5. Environmental hazards

Transport by road/ <b>Eisenbahnverkehr (ADR/RID)</b> Transport by air (ICAO-T1) / <b>(IATA-DGR)</b> sea (IMDG)	: None. : None.
---	--------------------

## 14.6. Special precautions for the user

<b>Verpackungsanweisung(en)</b> <b>Transport im Straßen-/ Eisenbahnverkehr (ADR/RID)</b>	: P200
Transport by air (ICAO-T1) / <b>(IATA-DGR)</b>	
<b>Passagier- und Frachtflugzeug</b> <b>Verpackungsanweisung - Passagier- und Frachtflugzeug</b>	: 200
<b>Nur Frachtflugzeug</b> <b>Verpackungsanweisung - Nur Frachtflugzeug</b>	: 200

Transport by sea (IMDG)	: P200
<b>Besondere Vorsichtsmaßnahmen für den Verwender</b>	: Möglichst nicht in Fahrzeugen transportieren, deren Laderaum nicht von der Fahrerkabine getrennt ist. Der Fahrer muß die möglichen Gefahren der Ladung kennen und er muß wissen, was bei einem Unfall oder Notfall zu tun ist.  - Behälter sichern. - Das Flaschenventil muß geschlossen und dicht sein. - Die Ventilverschlußmutter oder der Verschlußstopfen (soweit vorhanden) muß korrekt befestigt sein. - Die Ventilschutzvorrichtung (soweit vorhanden) muß korrekt befestigt sein. - Ausreichende Lüftung sicherstellen.

## 14.7. Bulk cargo transport in accordance with Annex II of the MARPOL Convention 73/78 and in accordance with the IBC Code

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## SECTION 14. Transport information (continued)

Massengutbeförderung gemäß Anhang II des MARPOL-Übereinkommens 73/78 und gemäß IBC-Code

## SECTION 15. Legal provisions

## 15.1. Safety, health and environmental regulations/specific legislation for the substance or mixture

## EG-Gesetzgebung

Verwendungsbeschränkung(en) National legislation	: None. : Nicht angeführt.
---	-------------------------------

## 15.2. Material safety assessment

Observe all national/local regulations.

A chemical safety assessment (CSA) has been prepared.

## SECTION 16. Other information

## Änderungen

01 See safety data sheet prepared in accordance with Regulation (EU) No. 453/

## Schulungshinweise

Das Risiko des Ersticken wird oft übersehen und muß bei der Unterweisung der Mitarbeiter besonders hervorgehoben werden.

## Weitere Angaben

Dieses Sicherheits-Datenblatt wurde im Einklang mit geltenden europäischen Richtlinien erstellt. Es gilt für alle Länder, die diese Richtlinien in ihre nationale Gesetzgebung

Volltext der Gefahrenhinweise in  
Abschnitt 3.  
DISCLAIMER

H280 - Contains gas under pressure; may explode if heated.

Bevor das Produkt in irgendeinem neuen Prozeß oder Versuch benutzt wird, sollte eine sorgfältige Untersuchung über die Materialverträglichkeit und die Sicherheit durchgeführt

Die Angaben in diesem Dokument sind keine vertraglichen Zusicherungen von Produkteigenschaften. Sie stützen sich auf den heutigen Stand der Kenntnisse.

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## SAFETY DATA SHEET

### 1. Identification

**Identification**  
**Product name:** RL 32-3MAF (4314-64, 4314-66, 4314-65, 4314-67)

**Additional identification**  
**Chemical name:** Mixture

**Recommended use and restrictions on use**

**Recommended use:** Not determined.  
**Restrictions on use:** Not determined.

**Details of the supplier of the safety data sheet**

**Supplier**  
**Company Name:** THE LUBRIZOL CORPORATION  
**Address:** 29400 LAKELAND BOULEVARD  
WICKLIFFE, OH 44092-2298 US  
**Telephone:** (440) 943-1200

**Emergency telephone number:**  
FOR TRANSPORT EMERGENCY CALL CHEMTREC (+1)703 527 3887, OR WITHIN THE USA 800 424 9300 (LUBRIZOL)

### 2. Hazard identification

**Hazard Classification**  
Not classified

**Label elements:**

**Hazard symbol:** No symbol

**Signal word:** No signal word.

**Hazard Statement:** Not applicable

**Precautionary Statement:** Not applicable

**Other hazards which do not result in GHS classification:** None identified.

### 3. Composition/information on ingredients

**General information:** The components are not hazardous or are below required disclosure limits.

### 4. First-aid measures

**Ingestion:** Treat symptomatically. Seek medical attention.

**Inhalation:** Remove exposed person to fresh air if adverse effects are observed.

**Skin Contact:** Wash with soap and water. If skin irritation occurs, seek medical attention. Wash contaminated clothing before reuse.

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**Eye contact:** Any material that contacts the eye should be washed out immediately with water. If easy to do, remove contact lenses.

**Most important symptoms/effects, acute and delayed**

**Symptoms:** See section 11.

**Indication of immediate medical attention and special treatment needed Treatment:**

Treat symptomatically.

### 5. Fire-fighting measures

**General fire hazards:** No unusual fire or explosion hazards noted.

**Suitable (and unsuitable) extinguishing media**

**Suitable extinguishing media:** CO2, dry chemical or foam. Water can be used to cool and protect exposed material.

**Unsuitable extinguishing media:** Do not use water jet as an extinguisher, as this will spread the fire.

**Specific hazards arising from the chemical:** See section 10 for additional information. Keep away from heat, sparks and open flames. Water may cause splattering. Container may rupture when heated.

**Special protective equipment and precautions for firefighters**

**Special firefighting procedures:** No data available.

**Special protective equipment for fire-fighters:**

Wear full protective fire gear including self-contained breathing apparatus operated in positive pressure mode with full facepiece, coat, trousers, gloves and boots.

### 6. Accidental release measures

**Personal precautions, protective equipment and emergency procedures:** Personal Protective Equipment must be worn, see Personal Protection Section for PPE recommendations. Ventilate area if spilled in confined space or other poorly ventilated areas.

**Methods and material for containment and cleaning up:** Dike far ahead of larger spill for later recovery and disposal. Pick up free liquid for recycling and/or disposal. Residual liquid can be absorbed on inert material.

**Environmental precautions:** Avoid release to the environment. Do not contaminate water sources or sewer. The environmental manager must be informed of all major spills. Prevent further leakage or spillage if safe to do so.

### 7. Handling and storage

**Precautions for safe handling:** Observe good industrial hygiene practices. Provide adequate ventilation. Wear appropriate personal protective equipment. Keep away from ignition sources such as heat, sparks and open flames. No smoking. Keep containers closed when not in use. Wash thoroughly after handling. Launder contaminated clothing before reuse. Empty containers contain product residue which may exhibit hazards of the product.

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<b>Maximum Handling Temperature:</b>	Not determined.
<b>Conditions for safe storage, including any incompatibilities:</b>	Store away from incompatible materials. See section 10 for incompatible materials.
<b>Maximum storage temperature:</b>	Not determined.

### 8. Exposure controls/personal protection

#### Control Parameters:

**Occupational Exposure Limits**  
None of the components have assigned exposure limits.

**Appropriate engineering controls:** Use material in well ventilated area only. Adequate ventilation should be provided so that exposure limits are not exceeded. Mechanical ventilation or local exhaust ventilation may be required.

#### Individual protection measures, such as personal protective equipment

<b>General information:</b>	Use personal protective equipment as required.
<b>Eye/face protection:</b>	If contact is likely, safety glasses with side shields are recommended.
<b>Skin protection</b>	
<b>Hand protection:</b>	Neoprene. Suitable gloves can be recommended by the glove supplier.
<b>Other:</b>	A long-sleeved shirt is recommended. Wear an apron or protective clothing in case of contact.
<b>Respiratory protection:</b>	Use a respirator with an organic vapour cartridge if the exposure limit is exceeded. Consult with an industrial hygienist to determine the appropriate respiratory protection for your specific use of this material. A respiratory protection programme compliant with all applicable regulations must be followed whenever workplace conditions require the use of a respirator. Use self-contained breathing apparatus for entry into confined spaces, other poorly ventilated areas and large spill clean-up sites.
<b>Hygiene measures:</b>	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

### 9. Physical and chemical properties

#### Appearance

<b>Physical state:</b>	liquid
<b>Form:</b>	liquid
<b>Colour:</b>	Colourless to yellow Mild
<b>Odour:</b>	No data available. No
<b>Odour threshold: pH:</b>	data available. No
<b>Freezing point:</b>	data available. No
<b>Boiling point:</b>	data available.
<b>Flash point:</b>	464 °F (240 °C) (Cleveland Open Cup)

<b>Evaporation rate:</b>	No data available.
<b>Flammability (solid, gas):</b>	No data available.
<b>Upper/lower limit on flammability or explosive limits</b>	<b>Flammability limit - upper (%):</b> No data available.
	<b>Flammability limit - lower (%):</b> No data available.
	<b>Upper explosive limit (%):</b> No data available.
	<b>Explosive limit - lower (%):</b> No data available.
	<b>Vapour pressure:</b> No data available.
	<b>Vapour density:</b> No data available.
	<b>Relative density:</b> 0.981 68 °F (20 °C)
<b>Solubility</b>	
<b>Solubility in water:</b>	Slightly soluble
<b>Solubility (other):</b>	No data available.
<b>Partition coefficient (n-octanol/water):</b>	No data available.
<b>Auto-ignition temperature:</b>	No data available.
<b>Decomposition temperature:</b>	No data available.
<b>Viscosity:</b>	31.2 mm <sup>2</sup> /s (104 °F (40 °C)) 5.6 mm <sup>2</sup> /s (100 °C (212 °F))
<b>Other information</b>	
<b>Pour point temperature:</b>	-69 °F (-56 °C)

### 10. Stability and reactivity

<b>Reactivity:</b>	No data available.
<b>Chemical Stability:</b>	The material is stable under normal conditions.
<b>Possibility of Hazardous Reactions:</b>	Will not occur.
<b>Conditions to Avoid:</b>	Do not expose to excessive heat, ignition sources, or oxidising materials.
<b>Incompatible Materials:</b>	Strong acids. Strong bases. Strong oxidising agents.
<b>Hazardous Decomposition Products:</b>	Thermal decomposition or combustion may generate smoke, carbon monoxide, carbon dioxide, and other products of incomplete combustion.

### 11. Toxicological information

<b>Information on likely routes of exposure Inhalation:</b>	No data available.
<b>Ingestion:</b>	No data available.
<b>Skin contact:</b>	No data available.
<b>Eye contact:</b>	No data available.
<b>Information on toxicological effects Acute toxicity</b>	
<b>Oral</b>	
Product:	Not classified for acute toxicity based on available data.
<b>Dermal</b>	
Product:	Not classified for acute toxicity based on available data.



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<b>Inhalation</b>	
Product:	Not classified for acute toxicity based on available data.
<b>Skin corrosion/irritation:</b>	
Product:	Prolonged or repeated contact may cause irritation. Remarks: Not classified as a primary skin irritant.
<b>Serious Eye Damage/Eye Irritation:</b>	
Product:	Remarks: Not classified as a primary eye irritant.
<b>Respiratory sensitisation:</b>	
	No data available No
<b>Skin sensitisation:</b>	
	data available
<b>Specific Target Organ Toxicity - Single Exposure:</b>	
	No data available
<b>Aspiration hazard:</b>	
	No data available
<b>Chronic effects</b>	
<b>Carcinogenicity:</b>	
	No data available
<b>IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:</b>	
	No carcinogenic components identified
<b>US National Toxicology Program (NTP) Report on Carcinogens:</b>	
	No carcinogenic components identified
<b>US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):</b>	
	No carcinogenic components identified
<b>Germ cell mutagenicity:</b>	
	No data available
<b>Reproductive toxicity:</b>	
	No data available
<b>Specific target organ toxicity – repeated exposure:</b>	
	No data available

#### 12. Ecological information

<b>Ecotoxicity</b>	
Fish	No data available
<b>Aquatic invertebrates Toxicity</b>	
	No data available No
<b>to aquatic plants</b>	
	data available

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<b>Toxicity to soil dwelling organisms</b>	
	No data available No
<b>Sediment Toxicity</b>	
	data available
<b>Toxicity to terrestrial plants</b>	
	No data available
<b>Toxicity to above-ground organisms</b>	
	No data available
<b>Toxicity to microorganisms</b>	
	No data available
<b>Persistence and degradability</b>	
<b>Biodegradation</b>	
	No data available
<b>Bioaccumulative Potential</b>	
<b>Bioconcentration Factor (BCF)</b>	
	No data available
<b>Partition Coefficient n-octanol / water (log Kow)</b>	
	No data available
<b>Mobility:</b>	
	No data available
<b>Other Adverse Effects:</b>	
	No data available.

#### 13. Disposal considerations

<b>Disposal instructions:</b>	Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations. Since emptied containers retain product residue, follow label warnings even after container is emptied.
<b>Contaminated Packaging:</b>	Container packaging may exhibit hazards.

#### 14. Transport information

<b>DOT</b>	Not regulated.
<b>IMDG</b>	Not regulated.
<b>IATA</b>	Not regulated.
<b>Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code</b>	None known.

Shipping descriptions may vary based on mode of transport, quantities, temperature of the material, package size, and/or origin and destination. It is the responsibility of the transporting organisation to follow all applicable laws, regulations and rules relating to the transportation of the material. Review classification requirements before shipping materials at elevated temperatures.

#### 15. Regulatory information

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**US Federal Regulations**

**TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**  
None present or none present in regulated quantities.

**Superfund Amendments and Reauthorization Act of 1986 (SARA) Hazard categories**  
None known.

**SARA 302 Extremely Hazardous Substance SARA 304 Emergency Release Notification SARA 311/312 Hazardous Chemical SARA 313 (TRI Reporting)**

This product may contain chemical(s) regulated under the Superfund Amendments and Reauthorization Act (SARA). For additional information, please contact Lubrizol Customer Assistance. America(s): AmerLZAMCustomerAssistance@Lubrizol.com ; Europe: EMEAICustomerAssistance@Lubrizol.com ; Asia: APCustomerAssistance@Lubrizol.com

**US State Regulations**

**US. California Proposition 65**  
No ingredient regulated by CA Prop 65 present.

**Inventory Status**
**Australia (AICS)**

All components comply with chemical notification requirements in Australia.

**Canada (DSL/NDSL)**

All components comply with the Canadian Environmental Protection Act and are present on the Domestic Substances List.

**China (IECSC)**

All components of this product are listed on the Inventory of Existing Chemical Substances in China.

**European Union (REACH)**

To obtain information on the REACH compliance status of this product, please visit [Lubrizol.com/REACH](http://Lubrizol.com/REACH), or e-mail us at [REACH\\_MSDDS\\_INQUIRIES@Lubrizol.com](mailto:REACH_MSDDS_INQUIRIES@Lubrizol.com)

**Japan (ENCS)**

All components are in compliance with the Chemical Substances Control Law of Japan.

**Korea (ECL)**

All components are in compliance in Korea.

**New Zealand (NZIoC)**

All components are in compliance with chemical notification requirements in New Zealand.

**Philippines (PICCS)**

All components are in compliance with the Philippines Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 (R.A. 6969).

**Switzerland (SWISS)**

All components are in compliance with the Environmentally Hazardous Substances Ordinance in Switzerland.

**Taiwan (TCSCA)**

All components of this product are listed on the Taiwan inventory.

**United States (TSCA)**

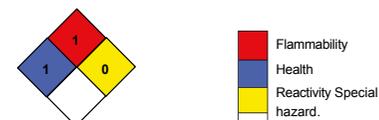
All components of this material are on the US TSCA Inventory.

*The information used to confirm the compliance status of this product may differ from the chemical information shown in Section 3.*

**16. Other information, including date of preparation or last revision**
**HMIS Hazard ID**

Health	1
Flammability	1
Physical Hazards	0

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; RNP - Rating not possible; \*Chronic health effect

**NFPA Hazard ID**


Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; RNP - Rating not possible

**Issue date:**

03/08/2015

**Version**

1.0

**Source of information:**

Internal company data and other publicly available resources.

**Further information:**

Contact supplier (see Section 1)

**Disclaimer:**

As the conditions or methods of use are beyond our control, we do not assume any responsibility and expressly disclaim any liability for any use of this product. Information contained herein is believed to be true and accurate but all statements or suggestions are made without warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material or the results to be obtained from the use thereof. Compliance with all applicable federal, state, and local regulations remains the responsibility of the user.

13.9 FINDER ACTIVE CURRENT METER



Montage- und Bedienungsanleitung Typ 7E.46

65 A-Wirkenergizähler 3-phasig, Fig. 1

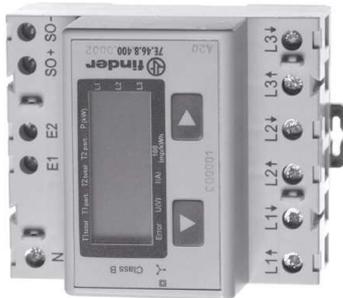


Fig. 1

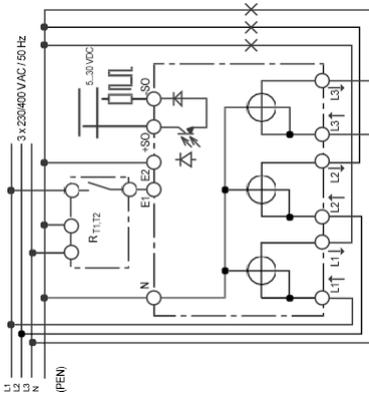


Fig. 2

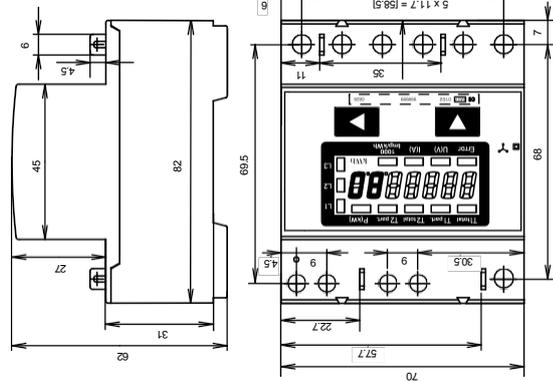


Fig. 3

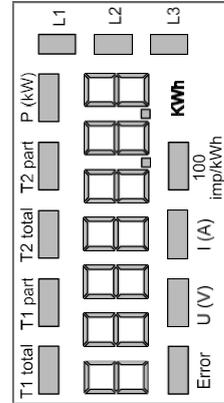


Fig. 4

Deutsch

Hinweise vor dem Anschliessen

1. Nicht die Phase L1, L2 oder L3 an N anschliessen.
2. Um Feuchtigkeit im Zähler durch Kondenswasser zu vermeiden, den Zähler vor dem Anschliessen ca. eine halbe Stunde bei Raumtemperatur akklimatisieren.

Achtung!

Diese Geräte dürfen nur durch eine Elektrofachkraft installiert werden, anderfalls besteht Brandgefahr oder Gefahr eines elektrischen Schlag!

Bedienung der LCD-Anzeige

Die grafische Darstellung der Bedienung ist aus Fig. 4 ersichtlich.

Montagehinweis

Die 3-Phasen-Energiezähler lassen sich auf eine 3,5 mm Schiene (EN 60715TH35) aufschrauben. Sie dürfen nur in dazu geeigneten Installationsstrahlen verwendet werden.

EG-Konformitätserklärung

Finder SpA, erklärt in alleiniger Verantwortung: Die folgenden Energiezähler sind konform zu den EG-Richtlinien:

- 7E.46.8.400.0002
- 7E.46.8.400.0012

Die folgenden Energiezähler sind zur Energieverrechnung an Dritte zugelassen:

- 7E.46.8.400.0012

Sie stimmen darüber hinaus mit folgenden Normen oder normativen Dokumenten überein:

- EN 50470 Teile 1 und 3 (Elektronische Zähler), Oktober 2006
- Richtlinie 2004/22/EG des Europäischen Parlaments und des Rates über Messgeräte (MID)
- Anhang I, Grundlegende Anforderungen
- Anhang MH003, Elektrizitätszähler für den Wirkverbrauch

Ausstellungsjahr der EG Konformitätserklärung : 2009  
Finder SpA  
Konformitätsbewertungsstelle:

Zertifizierungsstelle METAS-Cert, Nr. 1259  
CH-3003 Bern-Wabern  
Marcello Grande, Technical Manager

Gezeichnet

Änderungen technischer Daten vorbehalten

01.2010 FINDER SpA  
Via Drubioglio, 14  
10040 Alimese (TO) - ITALY

4 319 5085 0a

# 13. APPENDIX

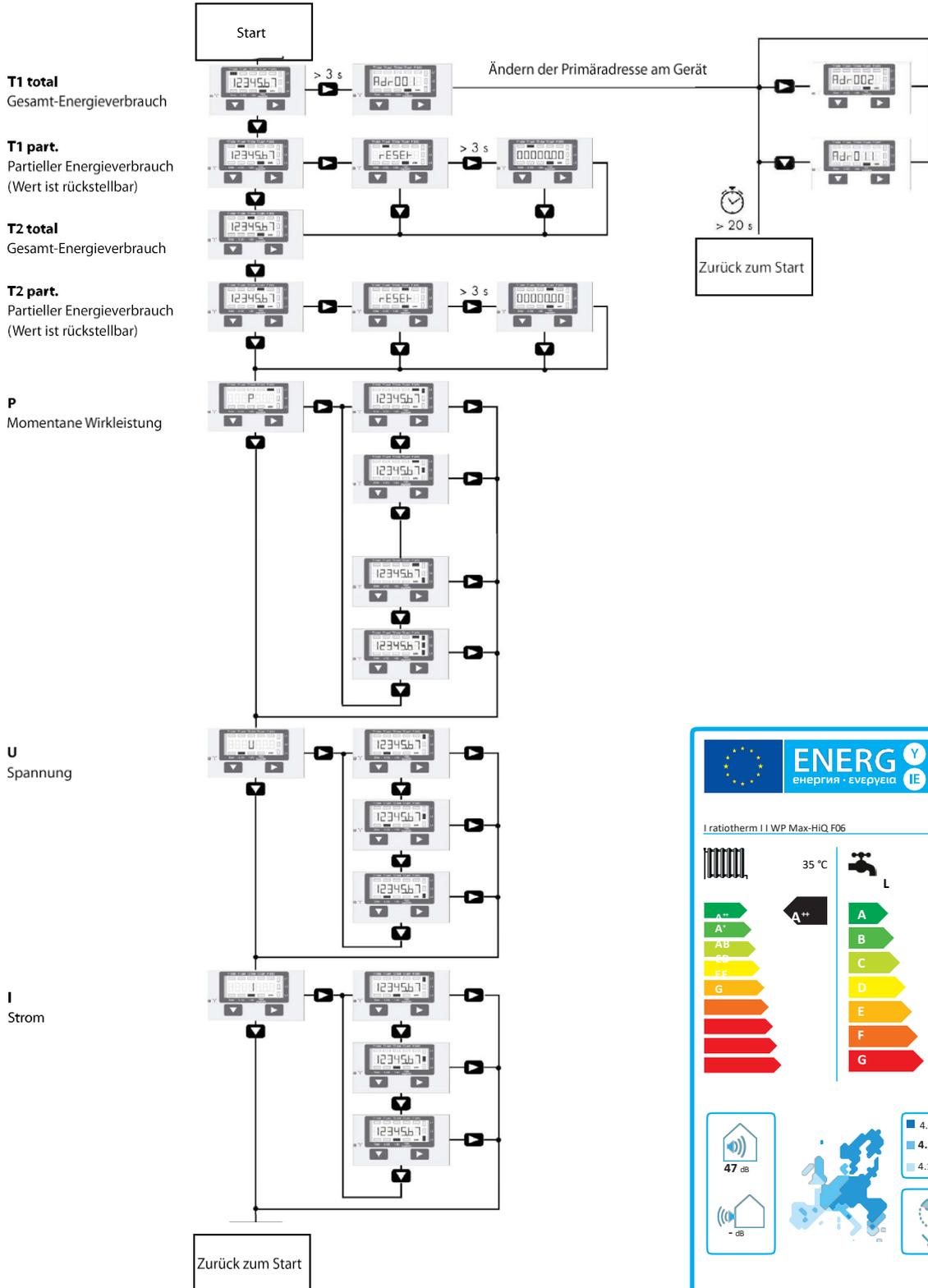
## 13.9 FINDER ACTIVE CURRENT METER

**SERIE 7E**  
Elektronische Wirkstromzähler



SERIE  
**7E**

### Blockdiagramm Typ 7E.46 mit integrierter M-Bus-Schnittstelle



IX-2017, www.findernet.com

## 13.11 EC DECLARATION OF CONFORMITY

EC Declaration of Conformity in accordance with EC Machinery Directive 2006/42/EC, Annex II Part 1. A, EU Official Journal L 157/24 dated 09.06.2006

Manufacturer and address:	ratiotherm GmbH & Co. KG Wellheimer Straße 34 91795 Dollnstein	
Authorised representative for documentation:	Julian Kruck Head of Heat Pump Technology	
Product name:	Heat pump (water/water and brine/water)	
Type:	WP Max-HiQ F06/F14/F21 and WP Max-LoQ F06/F14/F21	

We hereby declare that the above-mentioned machine has been developed, designed and manufactured in accordance with the EC/EU directives mentioned in this declaration.

The above-mentioned machine also complies with the protection objectives of the EU Directives

- "Low Voltage" 2014/35/EU, EU OJ L 96/357 of 29 March 2014,
- "RoHS" 2011/65/EU, EU OJ L 174/88 of 8 June 2011,
- "RoHS" 2011/65/EU, EU OJ L 189/164 of 15 May 2014,
- "ErP" 2009/125/EC, EU OJ L 285/10 of 21 October 2009,
- "EnEV" 2010/30/EU, EU OJ L 153/1 of 19 May 2015,

and the essential requirements of the EU Directive

- "EMC" 2014/30/EU, EU OJ L 96/79 of 26 February 2014.

Applied harmonised standards:	EN 378	EN 61000-3-2
	EN 349	EN 61000-3-3
	EN 60529	EN 61000-3-11
	EN 60335-1	EN ISO 12100-1
	EN 60335-2-40	EN ISO 12100-2
	EN 55014-1	EN ISO 13857
	EN 55014-2	EN 12141-1
	EN 60204	EN 60730

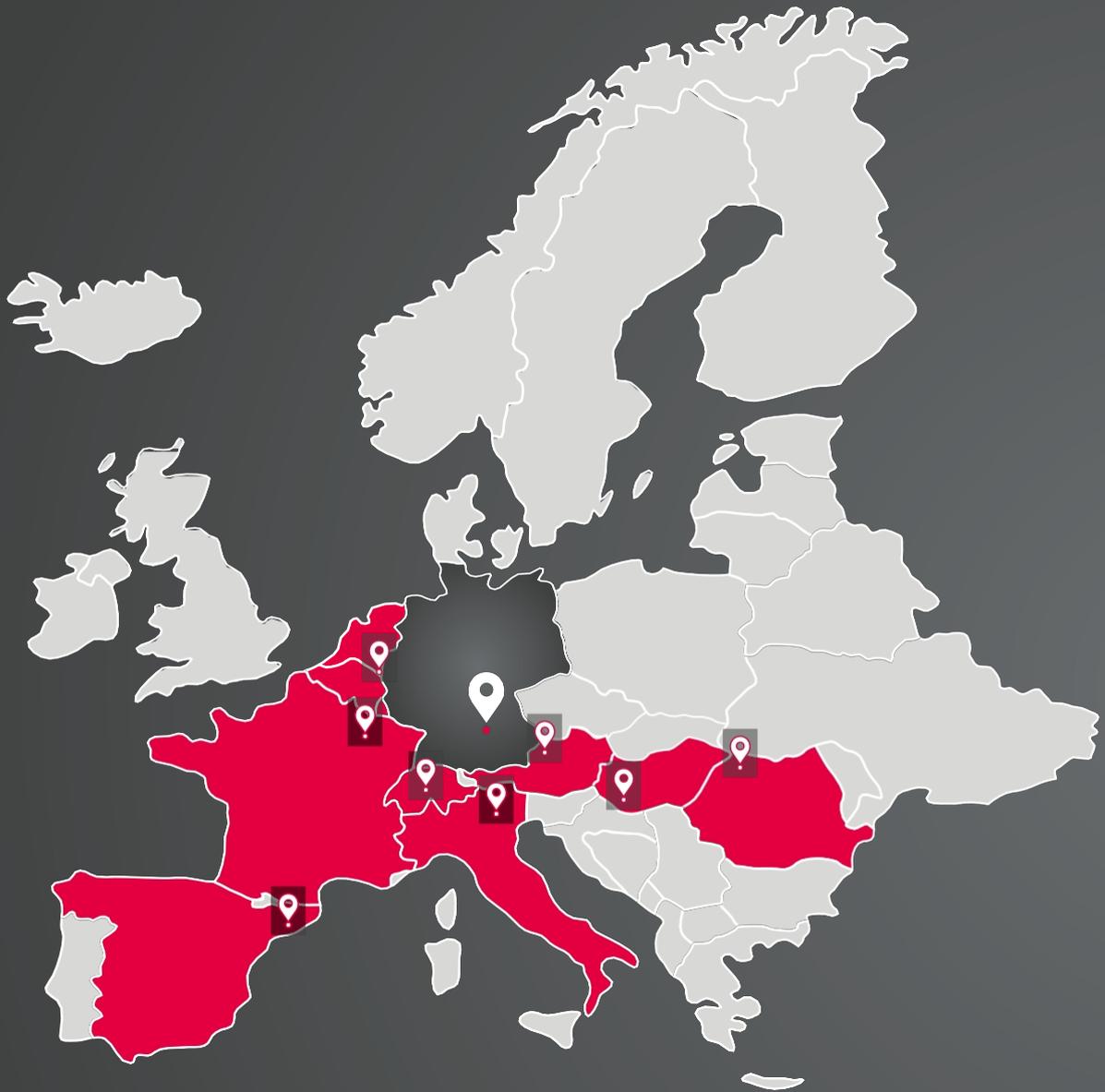
Applied national standards and Specifications:	DIN EN 14511
	DIN EN 12263
	DIN 8901

ratiotherm GmbH & Co. KG  
Wellheimer Straße 34  
91795 Dollnstein

Dollnstein, 29 October 2019  
Date

  
Signature  
Julian Kruck, Head of Heat Pump Technology

# You can find us here



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info@ratiotherm.de www.ratiotherm.de