HKVS – basics, planning and commissioning

Datum: 2020 Online training

Wolf Academy

30.07.2020, 10:00-11:30
(German Time)

Speaker: Dipl.-Ing. (FH) Peter Hofstetter

Basics	HKVS - Structure and physics
Components	Components of the hydraulic unit
Functions	Function of the components
Commissioning	Commissioning checklist
Documentation	Recommendations for a meaningful commissioning documentation

- **Requirement of EU Regulation 1253/2014 (ErP Directive)**

  Heat recovery efficiency **(atdry and balanced air volume flow):**

  ~~01.01.2016: 63%~~

  01.01.2018: 68%

Wolf Hydraulic unit Typ HE

Note on the calculation of the heat recovery coefficient:

The heat recovery coefficient results from the energy transfer **from the extract air to the supply air**.

Thus, the extract air volume flow is always used as the basis for calculating the balanced volume flow.

- **Available languages (assembly/operating instructions):**

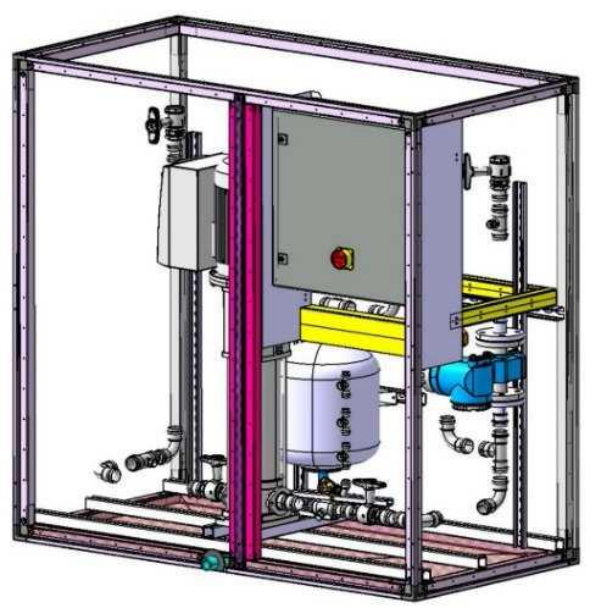
Controller language + Manual	
DE	German
GB/MT	English
ES	Spanish
EE	Estonian
SK	Slovak
CZ	Czech
NL	Dutch
FR/LU	French
RU	Russian
IT	Italian

Controller language (without country-specific manual)	
PT	Portuguese
PL	Polish
LT	Lithuanian
LV	Latvian
RO	Romanian
HR	Croatian
GR	Greek

- **Wolf HKVS - available variants HE, HEW (with additional energy feed on special request)**

HE (without casing)

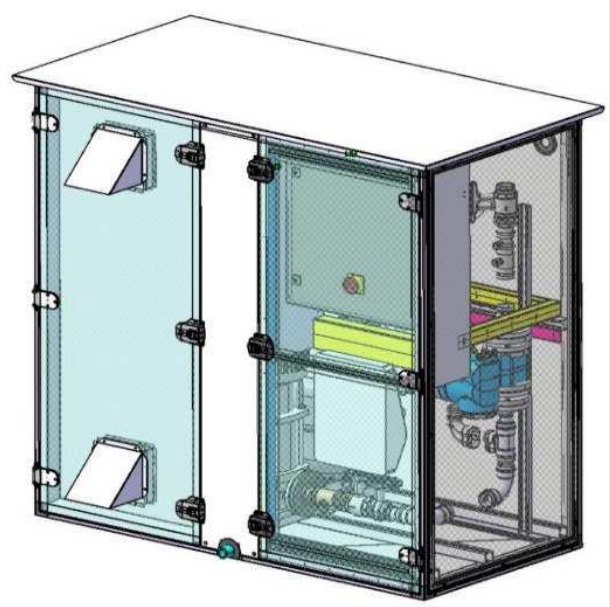
- Casing optional



› Inclusive 3D-pan

HEW (weatherproof version)

- Casing (without insulation)



› Integrated fan heater and cooling air fan

HE/HEW with additional energy feed

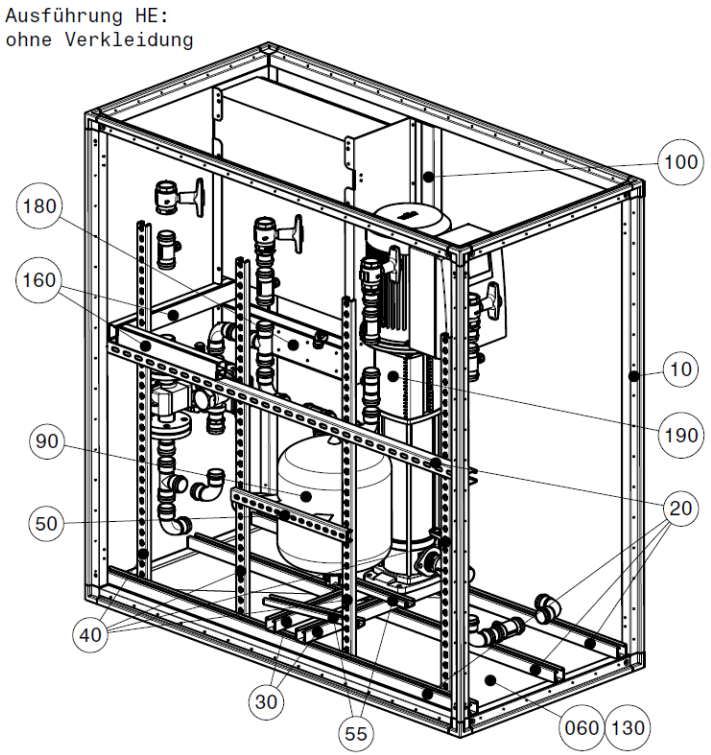
- Special design according to agreement

› Supply of external heat / external cooling

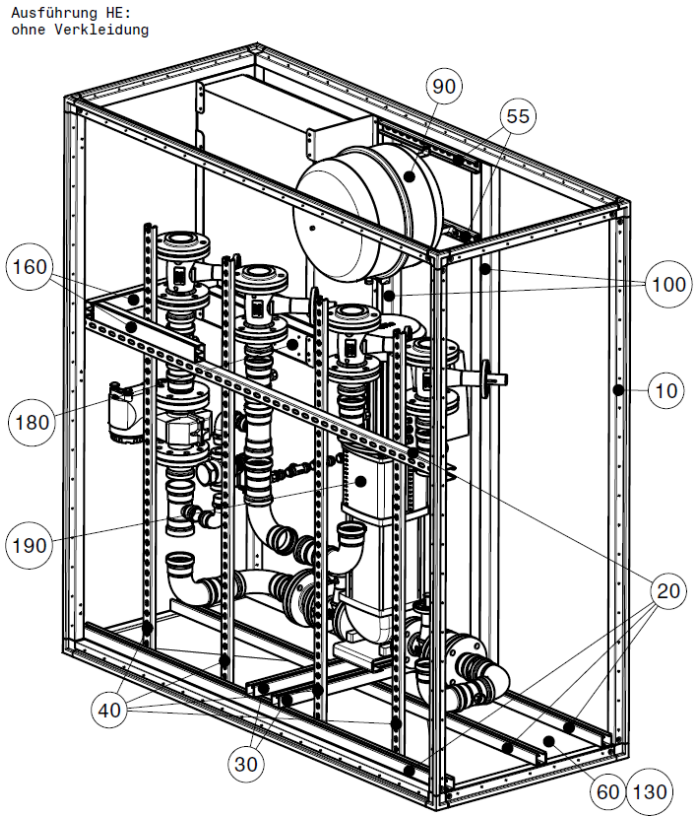
HKVS - Basics
Structure and physics

Art.Nr.	Size	Housing dimensions TxLxH Raster (mm) (T+38mm for Condensate connector)
6635463	HKVS DN32 HEW	08 x 16 x 16 (814x1627x1627)
6635464	HKVS DN40 HEW	08 x 16 x 16 (814x1627x1627)
6635465	HKVS DN50 HEW	08 x 16 x 16 (814x1627x1627)
6635466	HKVS DN65 HEW	08 x 19 x 19 (814x1932x1932)
6635467	HKVS DN32 HE	08 x 16 x 16 (814x1627x1627)
6635468	HKVS DN40 HE	08 x 16 x 16 (814x1627x1627)
6635469	HKVS DN50 HE	08 x 16 x 16 (814x1627x1627)
6635470	HKVS DN65 HE	08 x 19 x 19 (814x1932x1932)

DN32
DN40
DN50



DN65

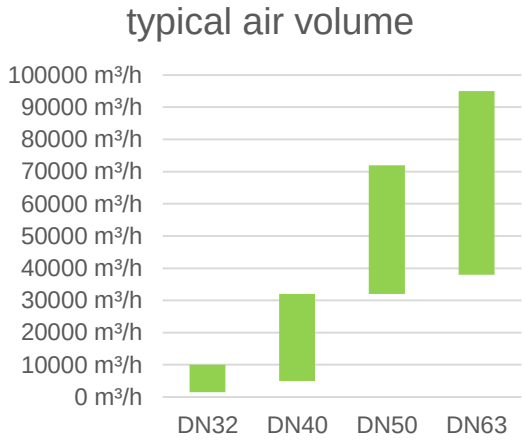


High pressure pump

Wilo Helix VE… Pumps for Wolf HE-Units (Status 7/2020)

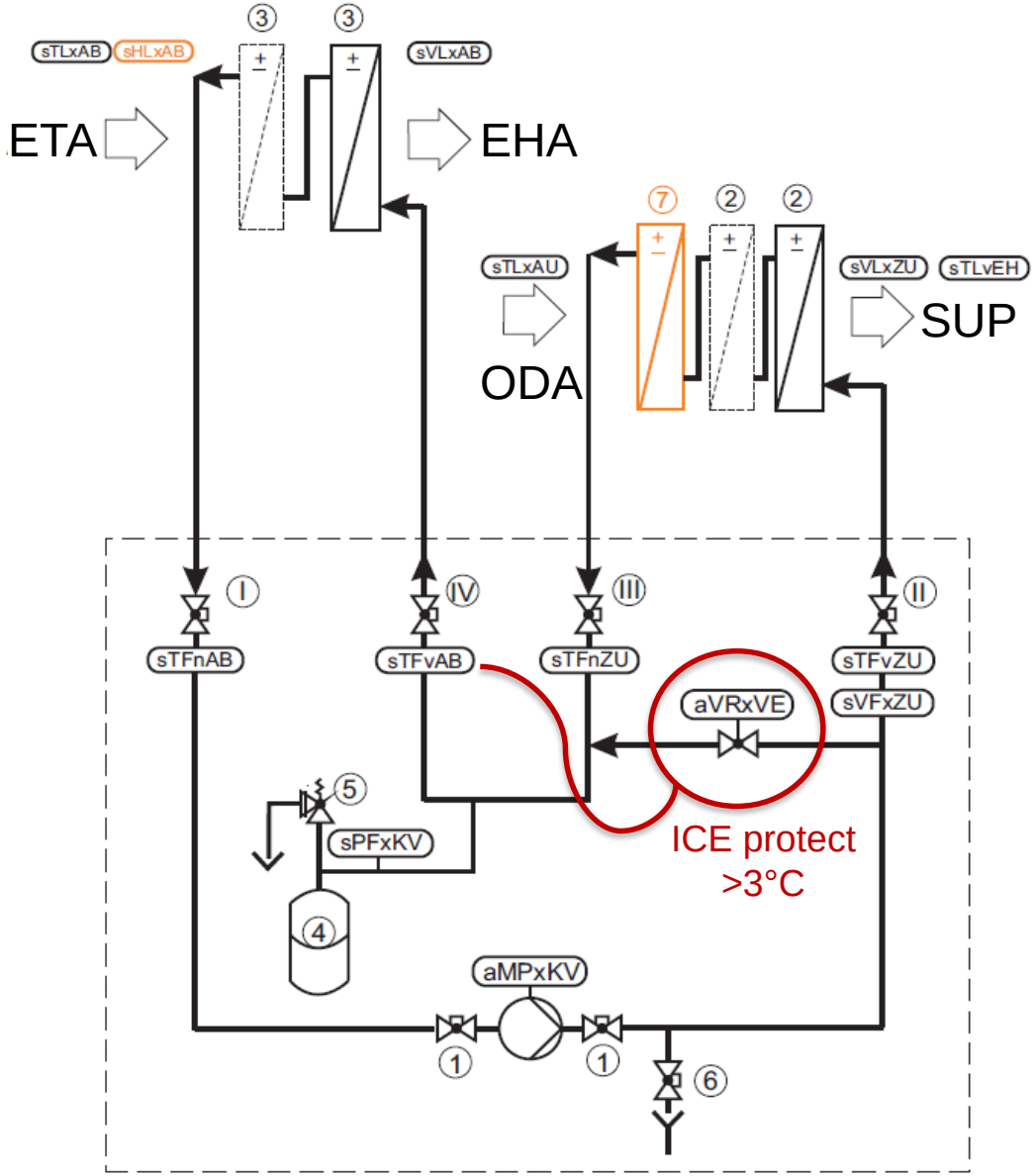
Nr.	Nominal diameter	Flow rate m³/h	max. pressure drop kPa
1	DN32	0,78 - 1,8	350
2	DN32	1,0 - 2,9	490
3	DN32	1,0 - 2,9	580
4	DN32	1,0 - 2,9	640
1	DN40	2,9 - 3,7	490
2	DN40	2,9 - 4,5	740
3	DN40	2,9 - 5,7	740
4	DN40	5,7 - 9,7	900
1	DN50	9,7 - 12,5	740
2	DN50	12,5 - 14,9	900
1	DN65	14,9 - 18	560
2	DN65	18 - 26	720

Important for correct planning - variants with different pumps or pressure drop stages



Design of the high pressure pump:
Regulated via integrated frequency converter (η 68%), seal suitable for frost protection up to 50% (= -40°C)

Hydraulic HE / HEW



Components and actors

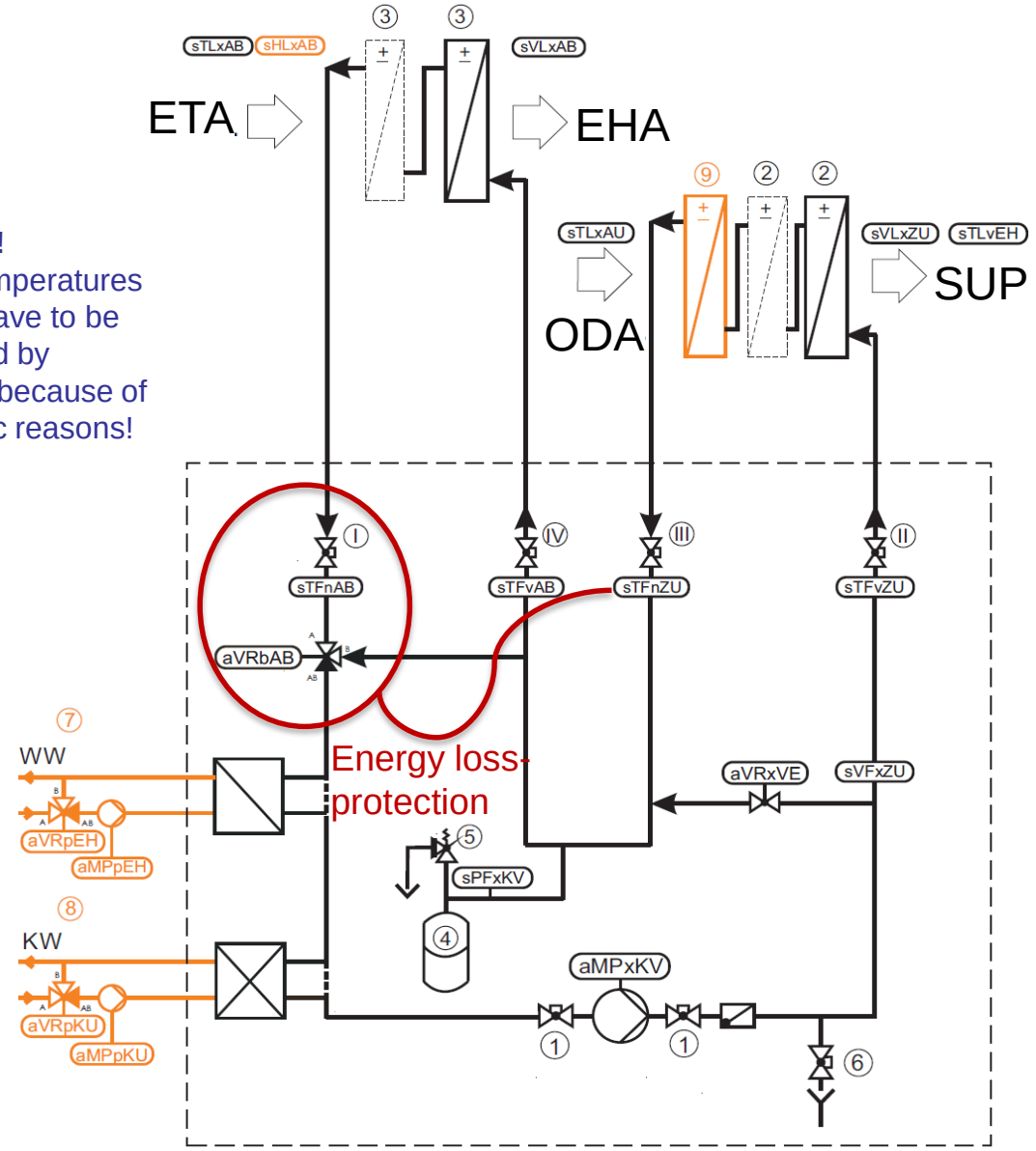
1-Shut-off-valves
2-Supply air coil (1 or 2 pieces)
3-Exhaust air coil (1or 2 pieces)
4-Expansion vessel
5-Savety valve
6-Drain
7-Filter preheater*
aMPxKV-speed-regulated Pump
aVRxVE-Bypass-valve
for icing protection

Sensors

sTFvZU-Fluidtemp. before supply air coil
sTFnZU-Fluidtemp. behind supply air coil
sTFvAB-Fluidtemp. before exhaust air coil
sTFnAB-Fluidtemp. behind exhaust air coil
sTLxAU-Outdoor air temperature
sTLvEH-Supply air temperature behind HR
sTLxAB-Extractair temperature
sVLxZU-Supply air volume flow
sVLxAB-Extract air volume flow
sPFxKV-Fluid-system-pressure
sVFxZU-Fluid volume flow supply air coil
sHLxAB-relative humidity in extract air*
*optional

Hydraulic HE / HEW with additional energy feed

Caution!
Brine temperatures >50°C have to be protected by controls because of energetic reasons!



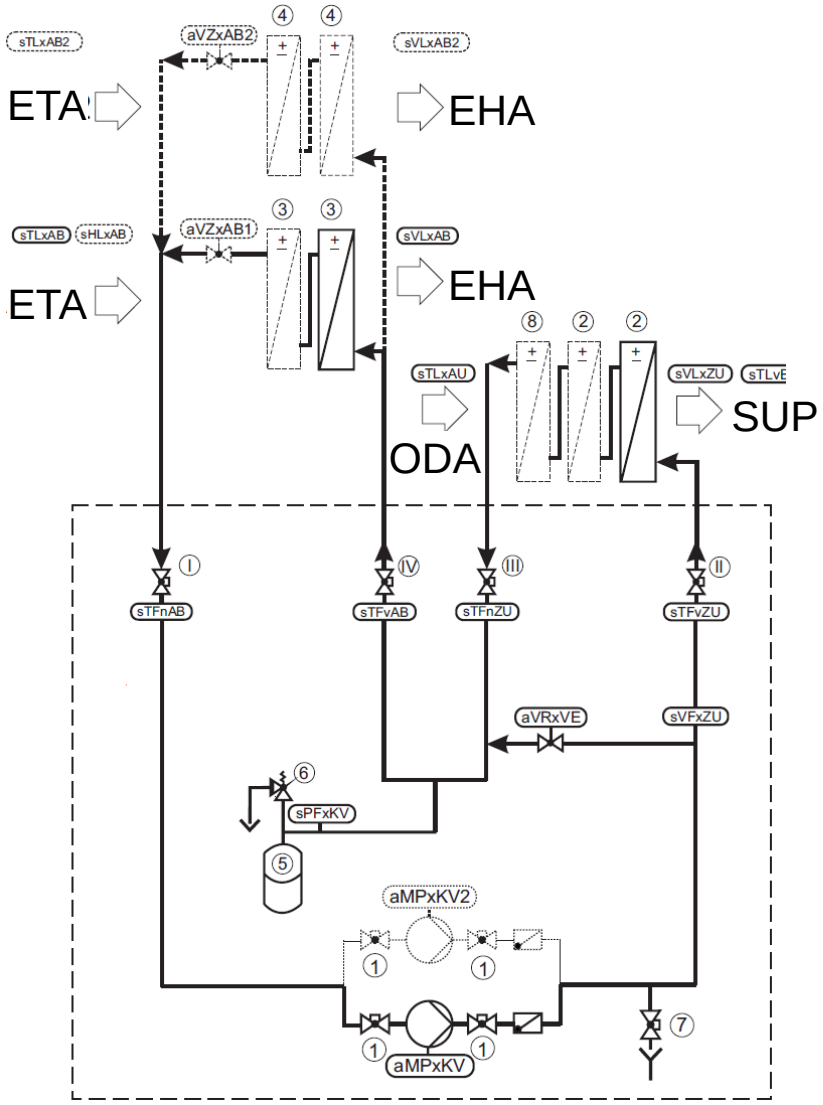
Components and actors

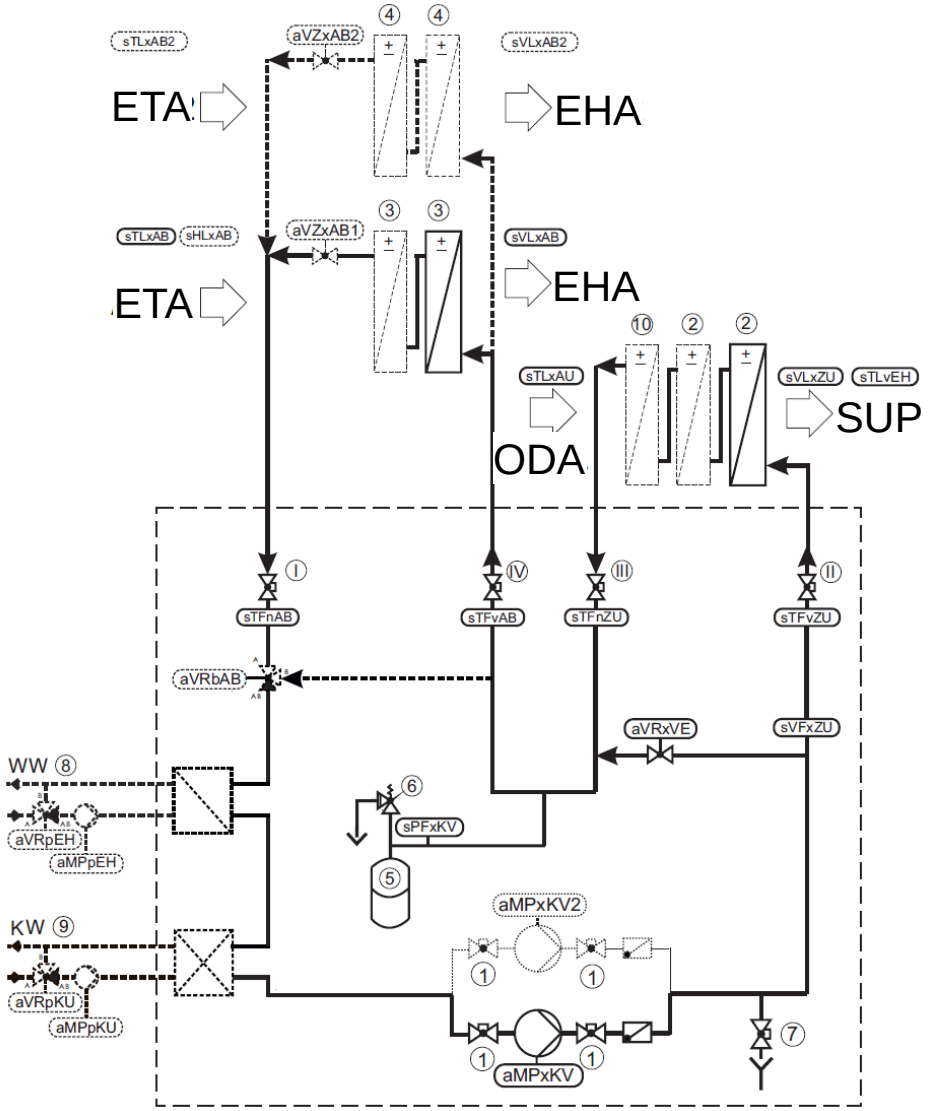
1-Shut-off-valves
2-Supply air coil (1 or 2 pieces)
3-Exhaust air coil (1or 2 pieces)
4-Expansion vessel
5-Savety valve
6-Drain
7-Feed of external heat energy
8-Feed of external cooling energy
9-Filter preheater*
aMPxKV-speed-regulated pump
aVRbAB-3-Way-valve extract air coil
aVRxVE--Bypass-valve ice protection
aMPpEH-heating circuit pump°
aVRpEH-Valve PWT heating°
aMPpKU-cooling circuit pump°
aVRpKU-Valve PWT cooling°

Sensors

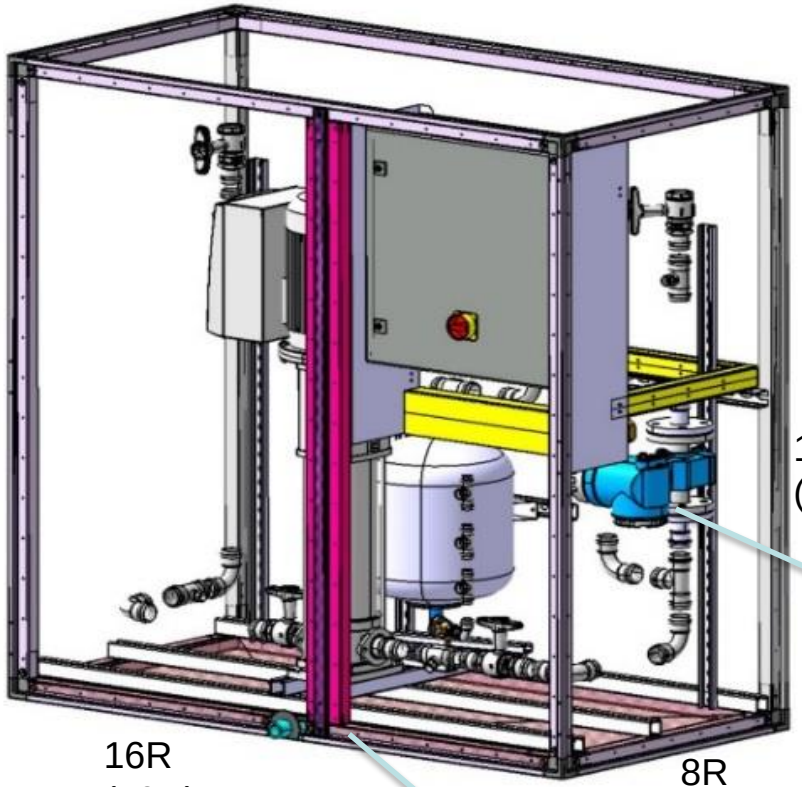
sTFvZU-Fluidtemp. before supply air coil
sTFnZU-Fluidtemp. behind supply air coil
sTFvAB-Fluidtemp. before exhaust air coil
sTFnAB-Fluidtemp. behind exhaust air coil
sTLxAU-Outdoor air temperature
sTLvEH-Supply air temperature behind HR
sTLxAB-Extractair temperature
sVLxZU-Supply air volume flow
sVLxAB-Extract air volume flow
sPFxKV-Fluid-system-pressure
sVFxZU-Fluid volume flow supply air coil
sHLxAB-relative humidity in extract air*
*optional
°on part of the customer

Hydraulic HE / HEW with several exhaust air lines





HE - Components



16R
(19R)

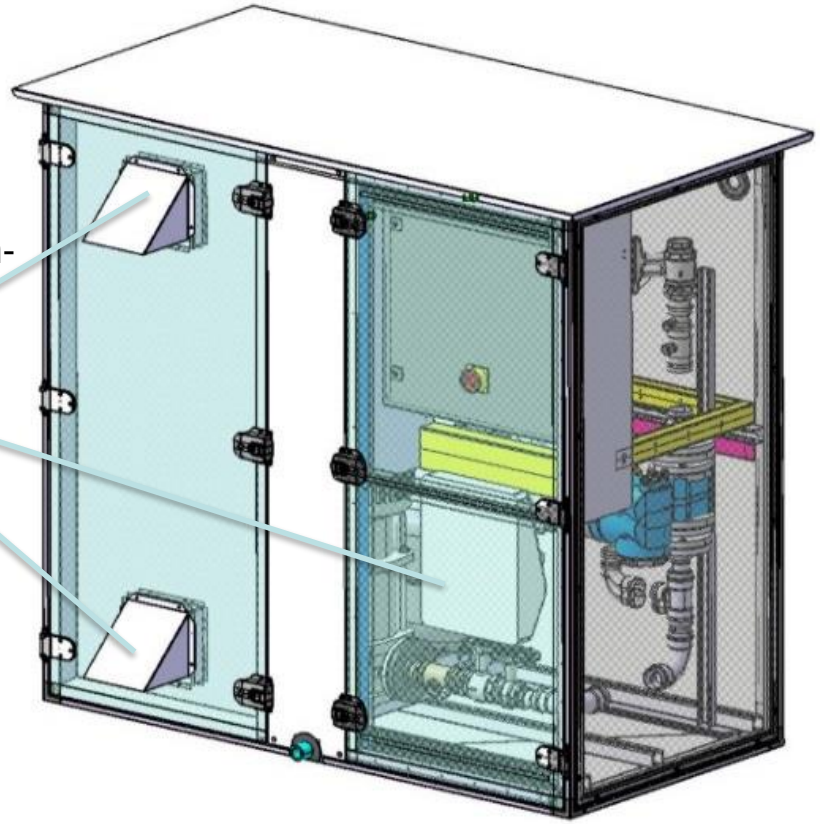
8R

16R
(19R)

Weatherproof version with:

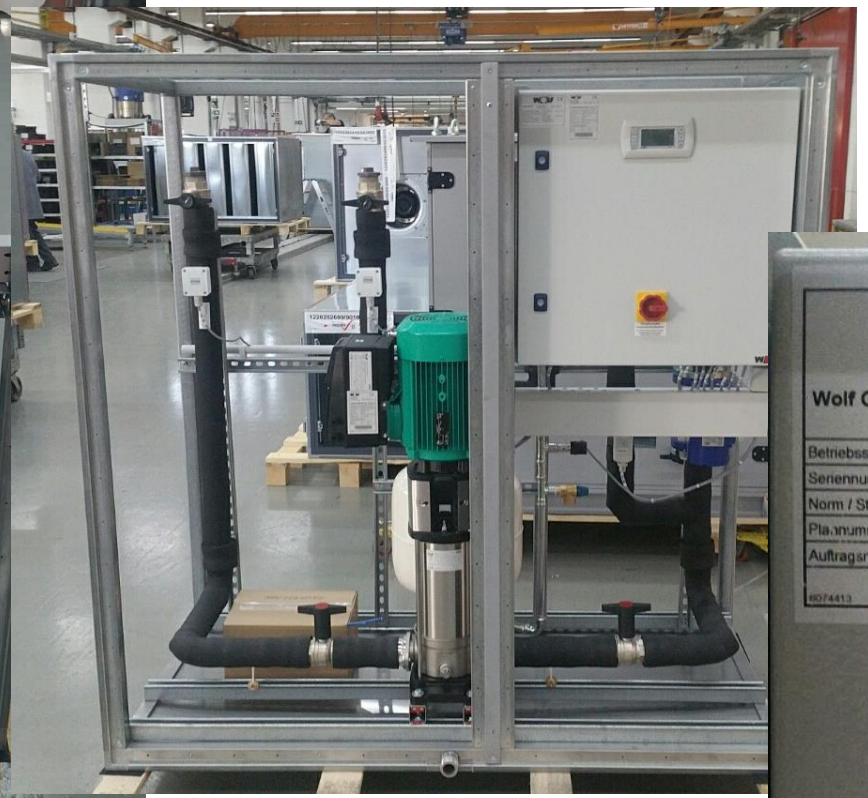
- integrated fan heater for minimum-Ambient temperature of the Pump > 0 ° C
- integrated fan for cooling the control cabinet

High quality
Flow meter (SIKA)



3D-tub with drain ! If necessary, provide plinth or base frame !

HKVS - Basics
Components and functions



The Hydraulic Units are produced in Factory Mainburg

Stand 2020

HE Basic functions - energy recovery in heating and cooling mode

- In order to optimise the efficiency of heat recovery over the entire control range of the air volumes, **the water volume flow must be permanently adjusted or controlled to the air volume flow**.
- The energy flow ratio (mass flow x specific heat capacity) is slightly higher on the medium side (brine = water/glycol) than on the air side.
- This results in a ratio of water quantity to air quantity of about 3m³ brine/h for 10,000 m³ air/h.

Requirements for the optimal operation of a HKVS unit

- Precise measurement of the air volume flow
- Precise measurement of the brine volume flow
- Permanent calculation of the heat flow capacity ratio taking into account the glycol content in the brine
- Permanent adjustment of the flow rate of the pump

Conclusion HKVS heat recovery systems meet the high energy efficiency requirements of the ErP Directive VO1253 if

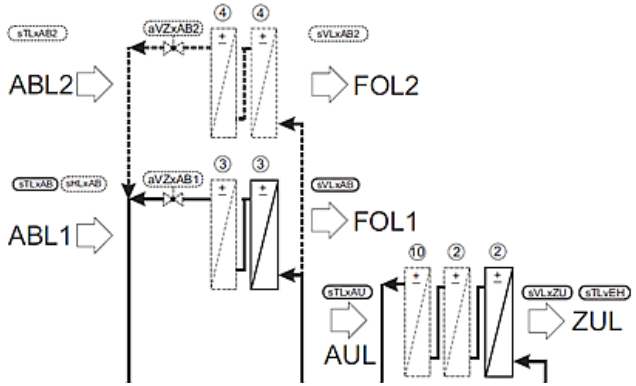
planning
and
commissioning

be carried out with the necessary competence.

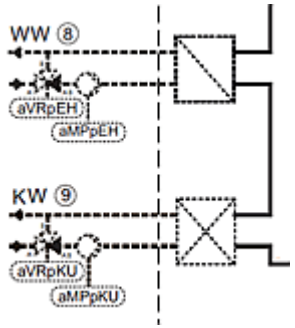
Design fundamentals Wolf-HKVS

- Basically systems can be covered with:

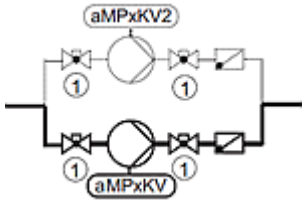
  1 x supply air + 1 x extract air
  1 x supply air + 2 x extract air



- Systems with an additional energy supply option are generally only offered on request



- Redundant pump systems on request
  (fault message from pump #1 automatically activates pump #2 - optionally a "sequence reversal cycle" can also be activated))



Design fundamentals Wolf-HKVS

- Available options:
  - Wolf „all-inclusive system“:
    - WOLF AHU… + WOLF AHU-control WRSK + WOLF HKVS-Coils + WOLF HE/HEW
  - AHU controller third-party brand » additional effort:
    - Temperature sensors ODA, SUP (after HKVS), ETA
    - Volume flow measurement SUP, ETA
    - Air humidity sensor ETA (optional)

    supplied loose
  - HE / HEW as Standalone system » additional effort:
    - Temperature sensors ODA, SUP (after HKVS), ETA
    - Volume flow measurement SUP, ETA
    - Air humidity sensor ETA (optional)

    supplied loose

Modbus interface for
HE-Controller - Accessories – necessary for:

- Setpoint setting (heating, cooling)
- Transmission of fault messages
- Display Operating data

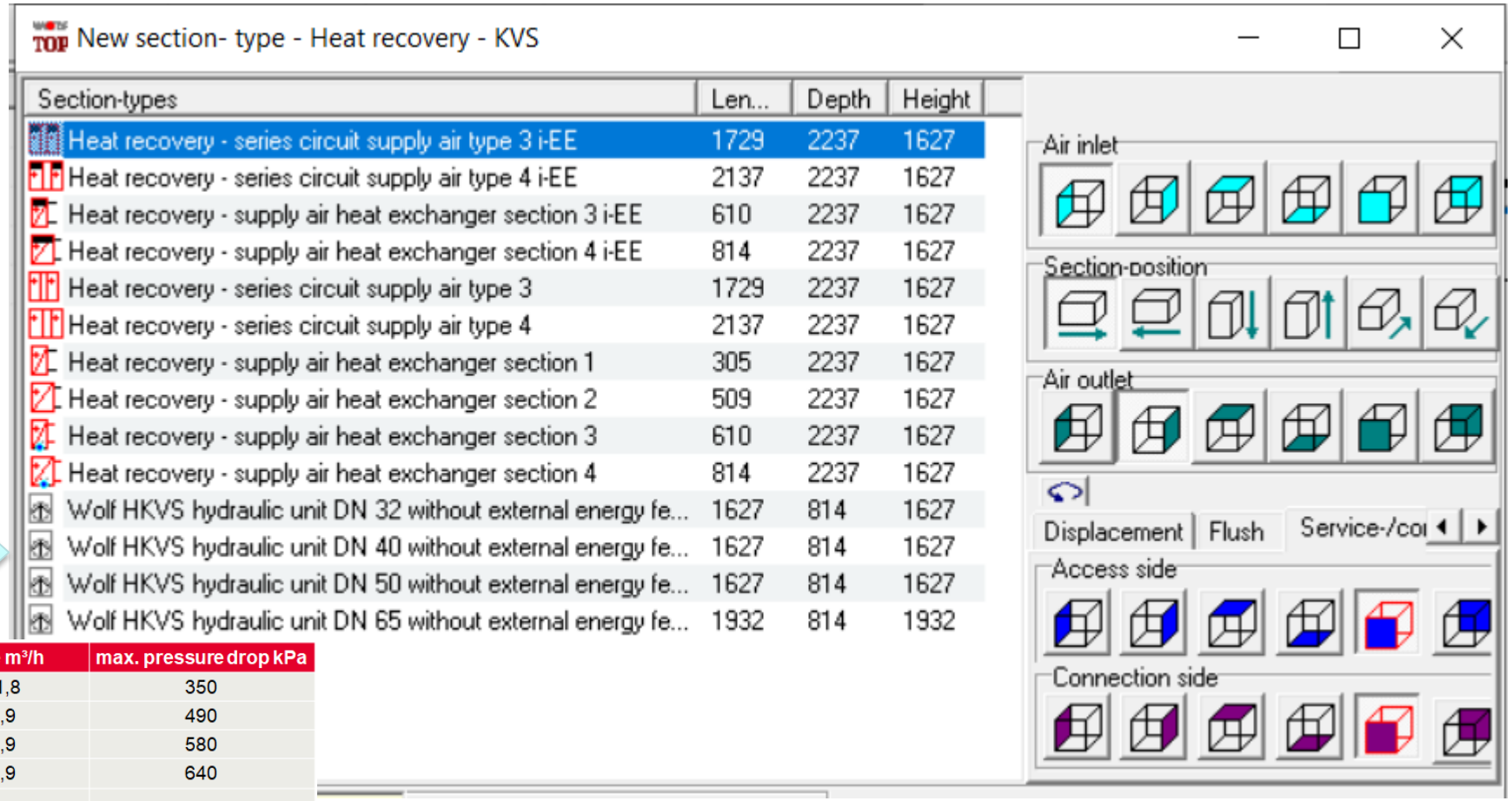
Design fundamentals Wolf-HKVS

- Available coil designs WOLF:
  - Coil with **outside vents / drains**
    - Air vent accessible from outside without having to open the airway.
    - With "night venting" the tub remains clean and does not need to be cleaned.
  - Coil with **internal air vents / drains**
    - Liquids from emptying or draining are safely drained off via the tub.
    - The venting/emptying connections are protected against mechanical stress during operation and transport.

HKVS in Wolf Configurator

Example 20000m³-Unit
AHU-TE 370

if only the HE has to be configured



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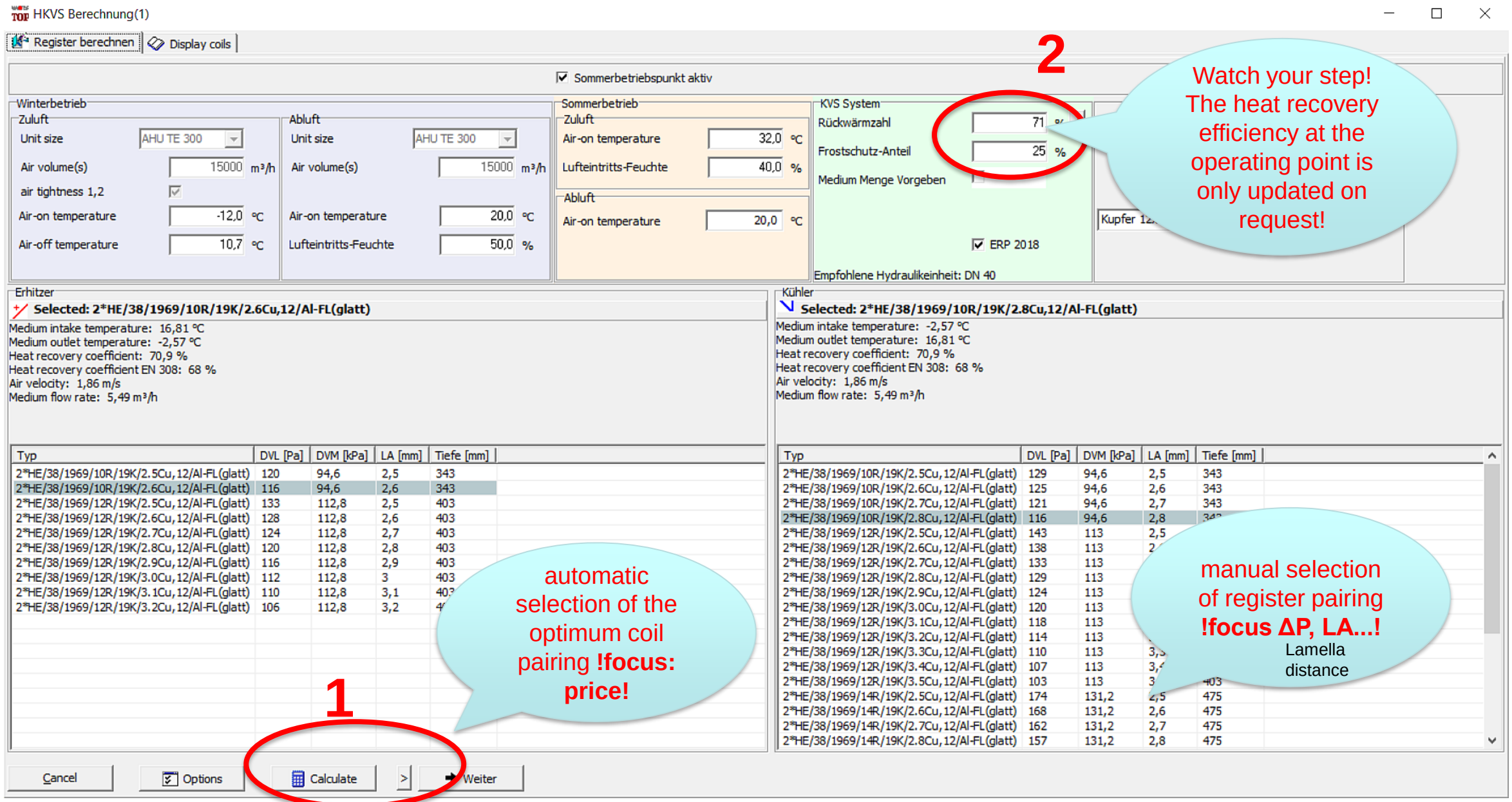
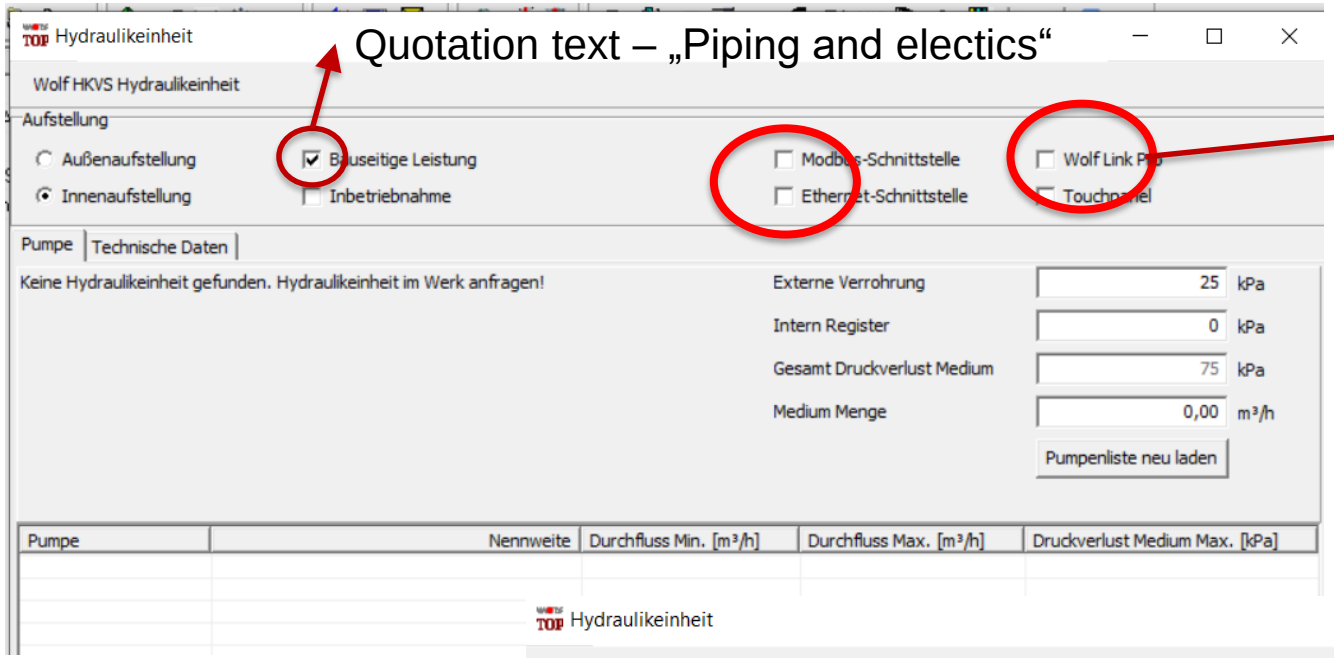

HKVS Berechnung(1)
Register berechnen
Display coils
Sommerbetriebspunkt aktiv
Winterbetrieb
Zuluft
Unit size AHU TE 300
Air volume(s) 15000 m³/h
air tightness 1,2
Air-on temperature -12,0 °C
Air-off temperature 10,7 °C
Abluft
Unit size AHU TE 300
Air volume(s) 15000 m³/h
Air-on temperature 20,0 °C
Lufteintritts-Feuchte 50,0 %
Sommerbetrieb
Zuluft
Air-on temperature 32,0 °C
Lufteintritts-Feuchte 40,0 %
Abluft
Air-on temperature 20,0 °C
KVS System
Rückwärmzahl 71 %
Frostschutz-Anteil 25 %
Medium Menge Vorgeben
ERP 2018
Empfohlene Hydraulikeinheit: DN 40
2
Watch your step! The heat recovery efficiency at the operating point is only updated on request!
Erhitzer
Selected: 2*HE/38/1969/10R/19K/2.6Cu,12/Al-FL(glatt)
Medium intake temperature: 16,81 °C
Medium outlet temperature: -2,57 °C
Heat recovery coefficient: 70,9 %
Heat recovery coefficient EN 308: 68 %
Air velocity: 1,86 m/s
Medium flow rate: 5,49 m³/h
Typ | DVL [Pa] | DVM [kPa] | LA [mm] | Tiefe [mm]
2*HE/38/1969/10R/19K/2.5Cu,12/Al-FL(glatt) 120 94,6 2,5 343
2*HE/38/1969/10R/19K/2.6Cu,12/Al-FL(glatt) 116 94,6 2,6 343
2*HE/38/1969/12R/19K/2.5Cu,12/Al-FL(glatt) 133 112,8 2,5 403
2*HE/38/1969/12R/19K/2.6Cu,12/Al-FL(glatt) 128 112,8 2,6 403
2*HE/38/1969/12R/19K/2.7Cu,12/Al-FL(glatt) 124 112,8 2,7 403
2*HE/38/1969/12R/19K/2.8Cu,12/Al-FL(glatt) 120 112,8 2,8 403
2*HE/38/1969/12R/19K/2.9Cu,12/Al-FL(glatt) 116 112,8 2,9 403
2*HE/38/1969/12R/19K/3.0Cu,12/Al-FL(glatt) 112 112,8 3 403
2*HE/38/1969/12R/19K/3.1Cu,12/Al-FL(glatt) 110 112,8 3,1
2*HE/38/1969/12R/19K/3.2Cu,12/Al-FL(glatt) 106 112,8 3,2
automatic selection of the optimum coil pairing !focus: price!
1
Kühler
Selected: 2*HE/38/1969/10R/19K/2.8Cu,12/Al-FL(glatt)
Medium intake temperature: -2,57 °C
Medium outlet temperature: 16,81 °C
Heat recovery coefficient: 70,9 %
Heat recovery coefficient EN 308: 68 %
Air velocity: 1,86 m/s
Medium flow rate: 5,49 m³/h
Typ | DVL [Pa] | DVM [kPa] | LA [mm] | Tiefe [mm]
2*HE/38/1969/10R/19K/2.5Cu,12/Al-FL(glatt) 129 94,6 2,5 343
2*HE/38/1969/10R/19K/2.6Cu,12/Al-FL(glatt) 125 94,6 2,6 343
2*HE/38/1969/10R/19K/2.7Cu,12/Al-FL(glatt) 121 94,6 2,7 343
2*HE/38/1969/10R/19K/2.8Cu,12/Al-FL(glatt) 116 94,6 2,8
2*HE/38/1969/12R/19K/2.5Cu,12/Al-FL(glatt) 143 113 2,5
2*HE/38/1969/12R/19K/2.6Cu,12/Al-FL(glatt) 138 113
2*HE/38/1969/12R/19K/2.7Cu,12/Al-FL(glatt) 133 113
2*HE/38/1969/12R/19K/2.8Cu,12/Al-FL(glatt) 129 113
2*HE/38/1969/12R/19K/2.9Cu,12/Al-FL(glatt) 124 113
2*HE/38/1969/12R/19K/3.0Cu,12/Al-FL(glatt) 120 113
2*HE/38/1969/12R/19K/3.1Cu,12/Al-FL(glatt) 118 113
2*HE/38/1969/12R/19K/3.2Cu,12/Al-FL(glatt) 114 113
2*HE/38/1969/12R/19K/3.3Cu,12/Al-FL(glatt) 110 113
2*HE/38/1969/12R/19K/3.4Cu,12/Al-FL(glatt) 107 113
2*HE/38/1969/12R/19K/3.5Cu,12/Al-FL(glatt) 103 113
2*HE/38/1969/14R/19K/2.5Cu,12/Al-FL(glatt) 174 131,2 2,5 475
2*HE/38/1969/14R/19K/2.6Cu,12/Al-FL(glatt) 168 131,2 2,6 475
2*HE/38/1969/14R/19K/2.7Cu,12/Al-FL(glatt) 162 131,2 2,7 475
2*HE/38/1969/14R/19K/2.8Cu,12/Al-FL(glatt) 157 131,2 2,8 475
manual selection of register pairing !focus ΔP, LA...!
Lamella distance
Cancel
Options
Calculate
>
Weiter

HE in Configurator

Example DN 50 HE



-> XL- Controler – uses a seperate ModBus address of LinkPro

For HE an internal pressure drop of 75-25 = 50kPa is assumed.

Nr.	Nominal diameter	Flow rate m³/h	max. pressure drop kPa
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4	DN40	5,7 - 9,7	900
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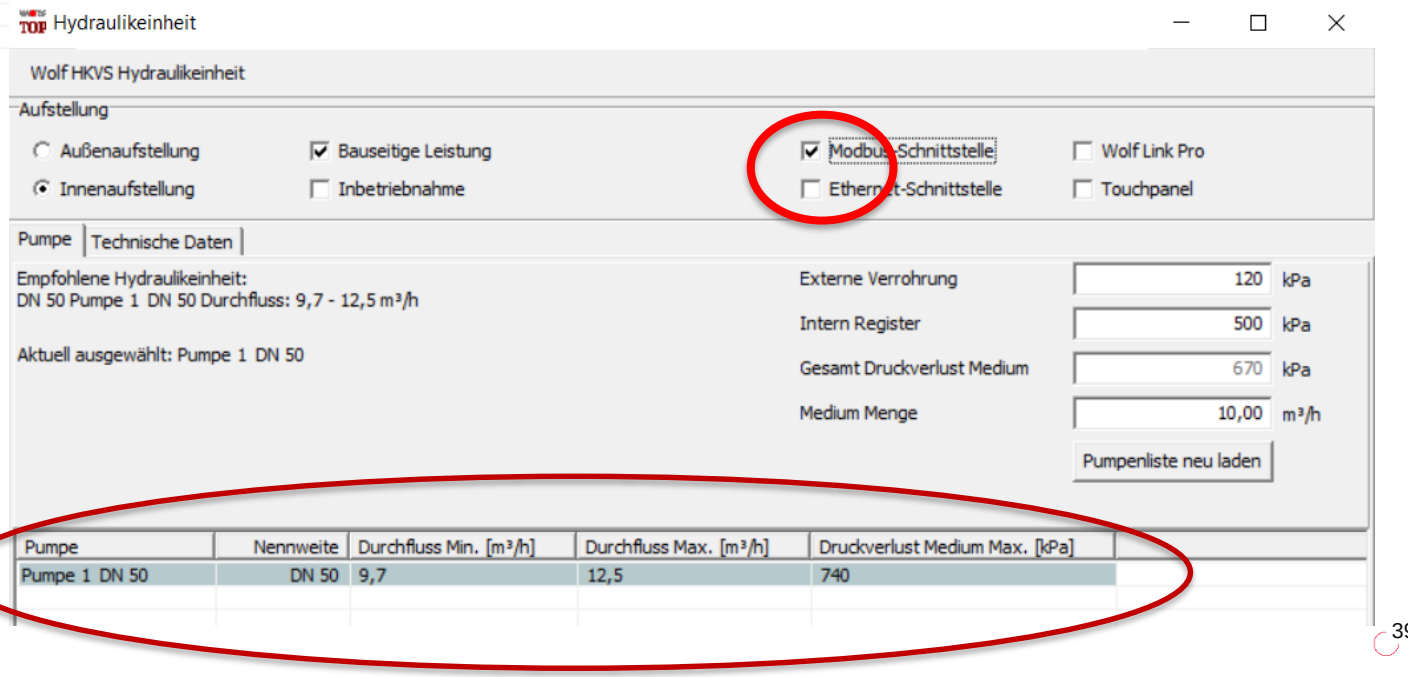


① With the alarm key, active fault messages are signalled by red flashing.
By pressing the key, current alarms are displayed and can be acknowledged by pressing it again.

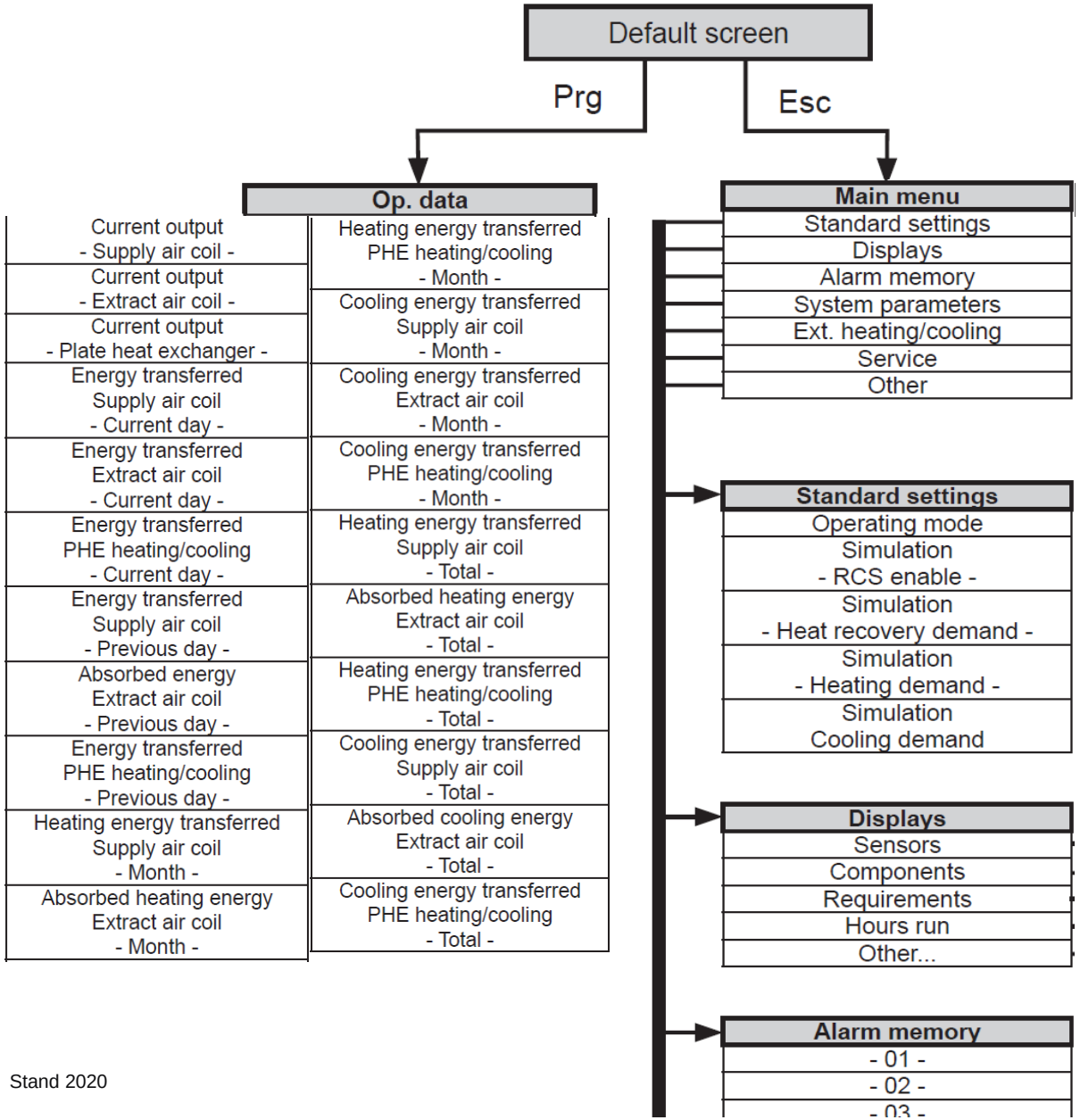
② By pressing the Prg-key you can access the operating data (display).

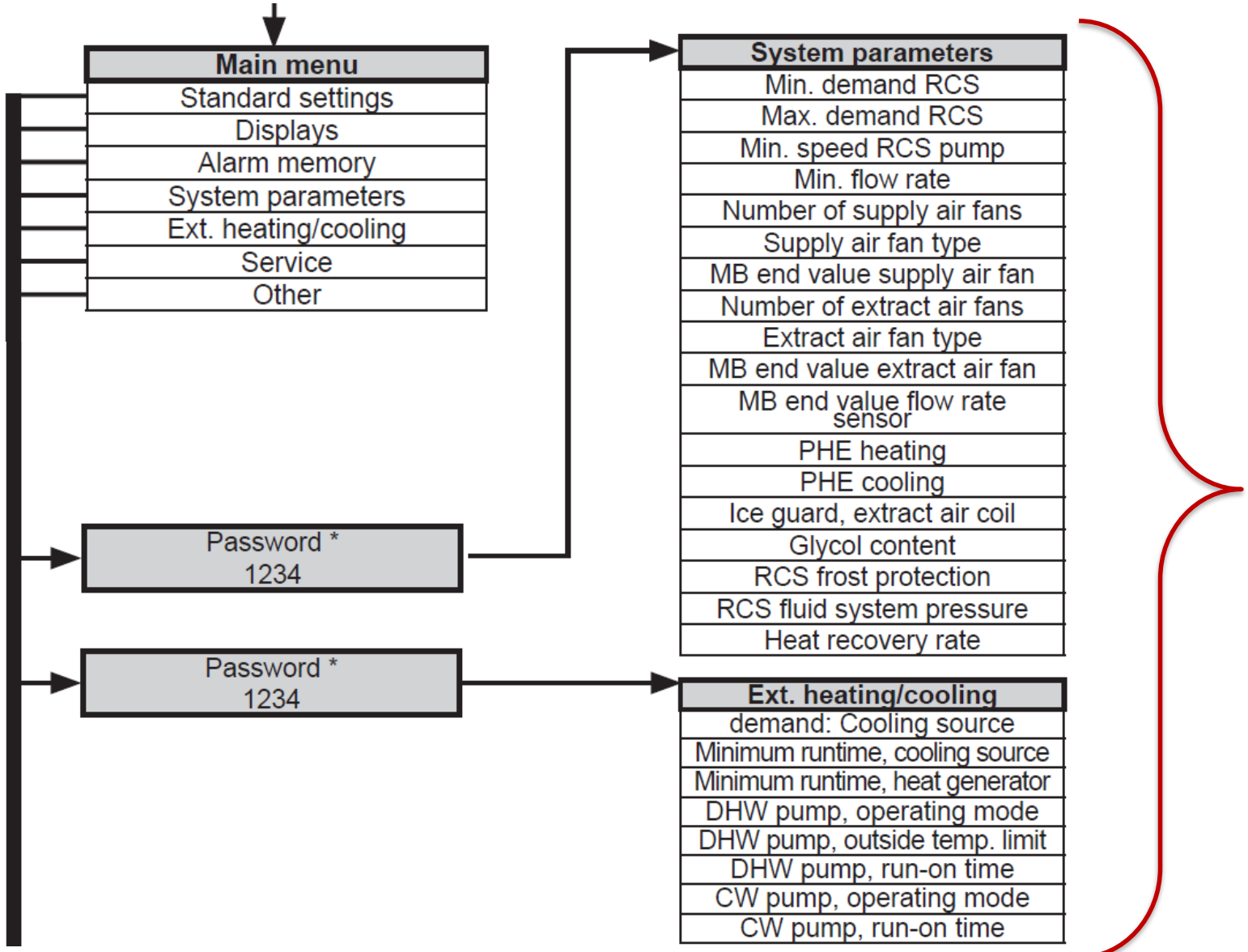
③ By pressing the ***Esc*** key, you can switch from the standard display (basic mask) of BMK (described below under point 8.) into the main menu.
Within a menu, you can return to the main menu by pressing the Esc key, previous mask or, in the case of parameter input fields, to the home position at the upper left edge of the display.

④ The ↑ key is used within a menu to scroll up or down for parameter settings.

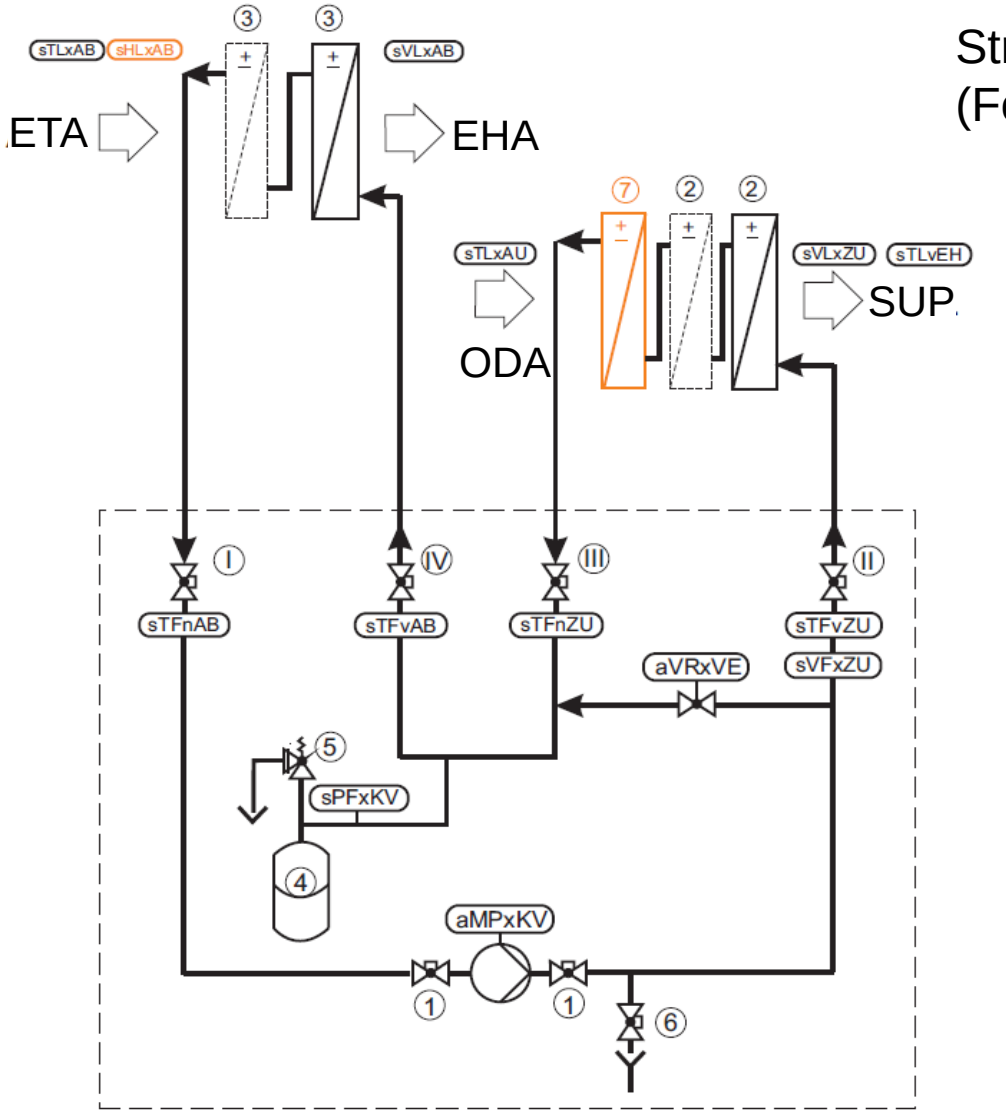
⑤ In the standard display, the system is switched on/off by pressing the ↵ key.
In a menu or parameter settings, press the ↵ key to confirm the selection or settings.

⑥ Within a menu, the ↓ key is used to scroll down or reduce parameter settings.


Default screen
Prg
Esc
Op. data
Current output - Supply air coil -
Current output - Extract air coil -
Current output - Plate heat exchanger -
Energy transferred Supply air coil - Current day -
Energy transferred Extract air coil - Current day -
Energy transferred PHE heating/cooling - Current day -
Energy transferred Supply air coil - Previous day -
Absorbed energy Extract air coil - Previous day -
Energy transferred PHE heating/cooling - Previous day -
Heating energy transferred Supply air coil - Month -
Absorbed heating energy Extract air coil - Month -
Heating energy transferred PHE heating/cooling - Month -
Cooling energy transferred Supply air coil - Month -
Cooling energy transferred Extract air coil - Month -
Cooling energy transferred PHE heating/cooling - Month -
Heating energy transferred Supply air coil - Total -
Absorbed heating energy Extract air coil - Total -
Heating energy transferred PHE heating/cooling - Total -
Cooling energy transferred Supply air coil - Total -
Absorbed cooling energy Extract air coil - Total -
Cooling energy transferred PHE heating/cooling - Total -
Main menu
Standard settings
Displays
Alarm memory
System parameters
Ext. heating/cooling
Service
Other
Standard settings
Operating mode
Simulation - RCS enable -
Simulation - Heat recovery demand -
Simulation - Heating demand -
Simulation Cooling demand
Displays
Sensors
Components
Requirements
Hours run
Other...
Alarm memory
- 01 -
- 02 -
- 03 -



Commissioning



Structur of field device names
(FeBeSy) - **Fe**ldgeräte **Be**zeichnungs**Sy**stem

sTLxVE

1. Section a - 1 x Low case letter for Field device category e.g. s = **S**ensor
2. Section b - 2 x Capital letter for medium and type e.g. TL = **T**emperature **L**uft (=Air)
3. Section c - 1 x Low case letter for Mounting e.g. **x** = no extention
4. Section d - 2 x capital letter for Location or Funktion e.g. **VE** = **Ve**reisung (=Icing)

Inbetriebnahme	Inbetriebnahmecheckiste
Dokumentation	Empfehlungen für eine aussagefähige Inbetriebnahmedokumentation

Functionality:

Control detects the air volume flow via the ring measuring lines at the fan inlet nozzles and adjusts the fitting brine volume flow via a speed-controlled high-performance pump.

A magneto-inductive flow sensor continuously monitors the calculated fluid volume flow independently of the glycol fraction.

The glycol content must be adapted to the specific plant (minimum temperature to be assumed).
Note: High glycol content also means high viscosity (temperature-dependent) and reduced heat capacity.

Depending on the glycol content, the density / heat capacity of the water / glycol mixture changes. Control calculates the values of the brine concentration via the adjusted glycol fraction and visualizes the corresponding frost protection limit.

HU can be adapted to WRS-K Control as well as to a building management system.
Even an indipendent operation is possible.

Fixed components of High efficient KVS with hydraulic unit:

- **Hydraulic Unit** (HE/HEW) with itegrated control system.
- **H-KVS controller** in the control cabinet, for maximum energy yield with minimum applied drive energy through optimal regulation of the heat flow capacity ratio (adjusted, controlled ratio of the variable air quantity to the brine quantity).
- **High-performance energy-saving pump**, speed-controlled via FU (individually adapted to air-conditioning system), it allows a continuous heat quantity adjustment.
- **Bypass valve (2-way valve),** built into HE as standard, prevents icing of the exhaust air register by raising the brine temperature to the set value.
- **3-way valve** in HE prevents e.g. in pure heating or cooling operation, a possible loss of efficiency by providing the possibility of hydraulically bypassing the exhaust air regulator (see diagram) (optional).

Fixed components of High efficient KVS with hydraulic unit:

- **Flow sensor (fluid)** magnetic-inductive, for the exact determination of the brine volume flow, independent of the brine concentration set.
- **Heat exchanger** (HKVS - heating and cooling coil), especially for water-brine mixtures with a large countercurrent fraction for particularly high re-heat rates.
- **Safety valve** (10 bar maximum pressure), the safety valve is a pressure relief device which protects a pressure system against impermissible pressures.
- **Expansion vessel** (10 bar pre-pressure), the task is to absorb the volume changes of the hydraulic fluid between minimum and maximum temperature and thus keep the pressure largely constant. (35l and 50l contents depending on the brine volume).
- **Filling and emptying valves**: for filling and discharging the brine and as a measuring point for measuring the pumping pressure.

Accessories (optional):

- **Water-water plate heat exchanger** (PWT in HE): external heat or cooling energy ("external energy") can be fed into the KVS brine circuit.

  The positioning of the PWT for heating is on the left, which is on the right for cooling
  from the control cabinet. In addition, a dirt trap is installed (Upstream of the plate heat exchangers).

  Electrically controlled accessories are to be obtained from Wolf or is designed according to the
  Specifications of the Wolf circuit diagram.

- **Mod-Bus:** Mod-Bus - interface for connecting to superordinate building management technology or external AHU-control.

- **Ethernet:** Ethernet - interface with integrated webserver to connect to a local area network (LAN).

- **pLAN connection with climate control WRS-K**
  The values of outside temperature, extract air temperature, airflow extract air, extract air humidity, as well as the requirements of WRG / heating / cooling is transferred to the KVS controller by bus
  Feedback in the event of a collective fault and operating messages. Time and date are synchronized with WRS-K

- **Calculation spec. Heat capacity and density of the brine concentration**
  Depending on the glycol content, the density and specific heat capacity of the water-glycol mixture changes. The Wolf KVS controller uses the adjusted glycol fraction to calculate the values of the brine concentration and visualizes to the customer the actual Frost protection limit.

- **Basic setting heat flow capacity ratio**
  On the basis of the speed-controlled high-performance pump the permanently calculated brine-flow is regulated as a function of the extract air or supply air volume.

- **Ice protection**
  By controlling the bypass valve when a set brine temperature is under limit, icing of the exhaust air regulators is prevented.

H-KVS Wiring cabinet – description and functions

- **Active frost protection**
  If the frost protection limit is undercutted at one of the 4 fluid temperature sensors (depending on the glycol content), the KVS high-performance pump is controlled to avoid freezing of the system. When feeding with additional heat energy, the function is supported by opening the 3-way valve on the water / water plate heat exchanger.

  Attention! - the frost protection must primarily be provided by a propper glycol fraction.

- **Anti seizing protection**
  Prevents the "seizure" of valves and pumps. For longer standstill times of the individual components, these are regularly controlled in a set interval. For manual valves, a maintenance note can be displayed.
- **Automatic venting**
  In conjunction with an optional "quick-venter", the KVS high-performance pump is activated by "pressure shocks“ in order to support venting the system.

- **Set value for maintenance interval**
  For regular, periodic and expert inspection of the system.

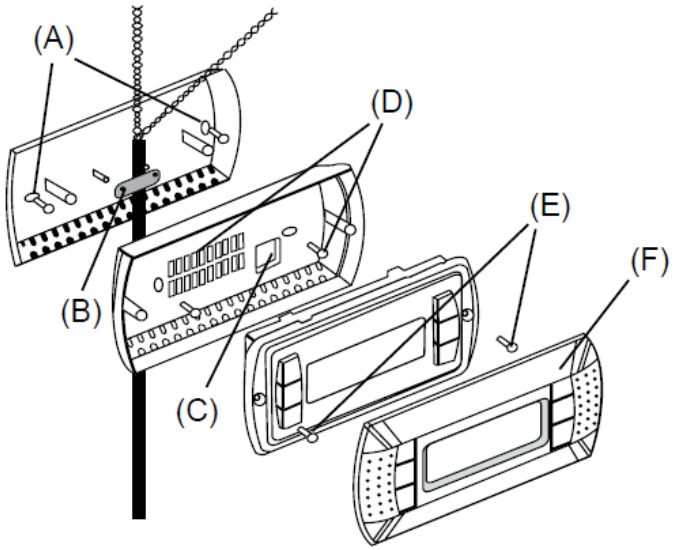
Examples from the field:

Examples from the field:

Safety shoes must be worn for the practical commissioning training!

A refractometer and a differential pressure gauge are recommended for a proper commissioning.

When commissioning the HKVS system, the MSR technician, who is responsible for the air-conditioning system, must also be on site!

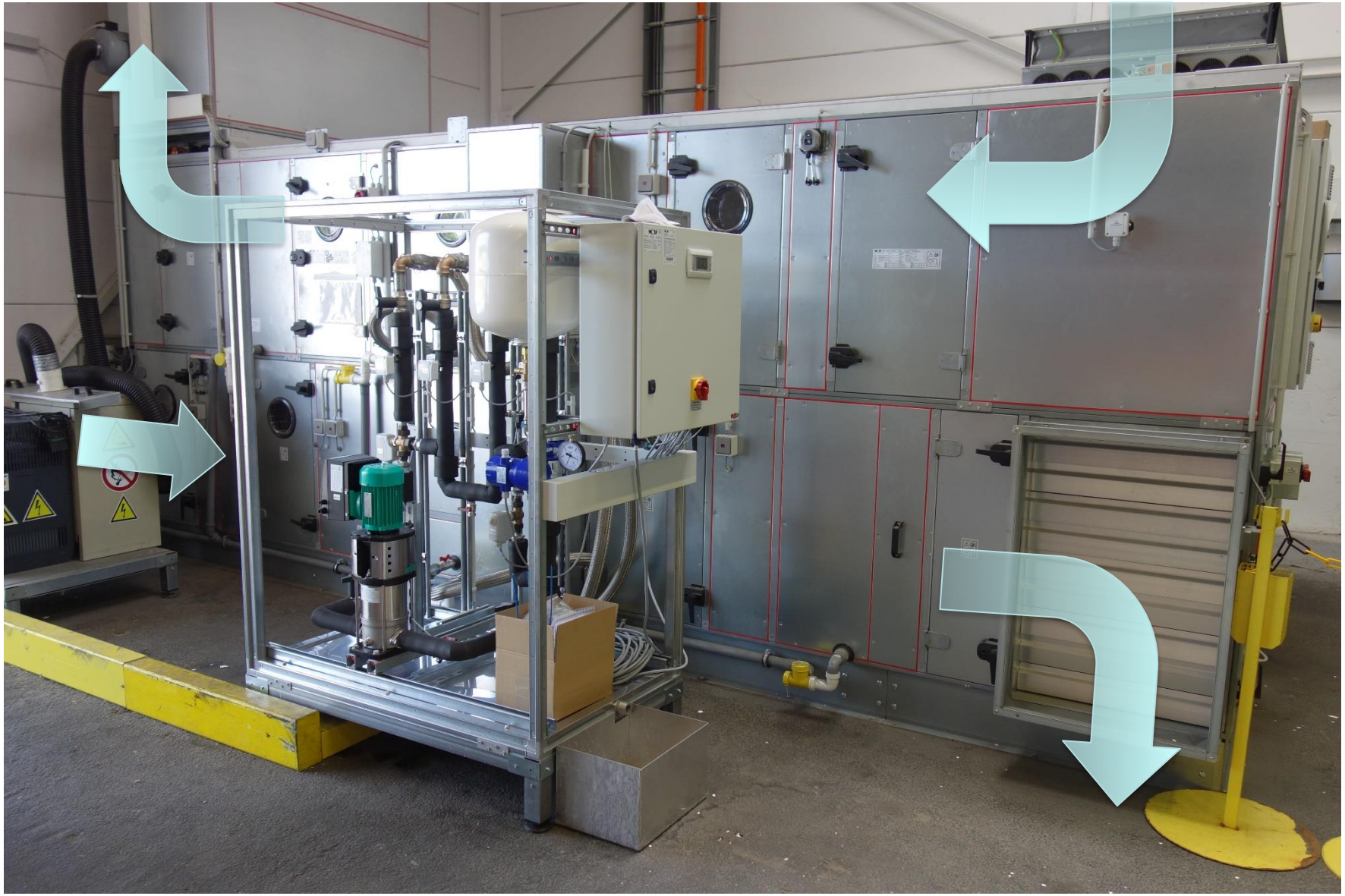


Check the address setting before commissioning the bus connection between KLM controllers

If the operating module is used as a second operating part, the bus address of the operating module must be adapted (for example, 2 x KLM or 2 x BKM).

To do this, proceed as follows:
When the BMK Programming Unit is connected to the control cabinet like shown in the wiring diagramm, switch on power. After startup sequence, press the right buttons (↑/← /↓) simultaniously and if necessary, adjust the display address to 28 or 29.

Controler (i/o-address usually is 4 in case of HKVS) - please also notice hints in wiring diagramm.



The commissioning engineer has to document the commissioning in his own interest!

Important informations:

- Order number (assignment to order documentation): _____
- Date of Commissioning:_____
- Commission - address, contact person etc.:_____
- Variant designation according to type label of switch cabinet:_____
- Serial number: _____ (YWWYXXXXXX)
- Construction year (from serial number):_____
- Istituted persons (e.g. facility manager etc. with name and signature) - see at end of protocol

Components:

☐ KLM-L ☐ KLM-XL Address BMK:_____

☐ BMK Front-integration ☐ BMK Wall-mounted, location:_____

☐ KLM-E Expansion modules ammount: _____

☐ Interfac(es) mounted? Typ?:_____

☐ Connected to WRS-K by pLAN (pLAN-plug occupied)

☐ Connection by Wolf LinkPro

SoftwareVersion:_____ (Display others)

simultaniously
3 seconds
(after ca. 10s.
-> bus overview)
Note:
In case of several controllers, each controller has to have a different address.
= usually setted by factory commissioning

Available Sensors:

HKVS-		WRSK-Control	
direct	pLAN	Field device	Description	check
☐		sTFvZU	fluid temperature to SUP-coil (PT1000)	
☐		sTFnZU	fluid temperature from SUP-coil (PT1000)	
☐		sTFvAB	fluid temperature to ETA-coil (PT1000)	
☐		sTFnAB	fluid temperature from ETA-coil (PT1000)	
☐		sVFxZU	flow rate SUP-coil (adjust meter)	
☐		sPFxKV	fluid system pressure KVS (1bar + hight/10)	
☐	☐	sVLxZU	supply air flow rate	
☐	☐	sVLxAB	extract air flow rate	
☐	☐	sTLxAu	outdoor air flow rate	
☐	☐	sTLxAB	extract air temperature	
☐		sTLvEH	supply air temperatur from WRG	
☐	☐	sHLxAB	extract air humidity (optional)	

Available Sensors:

Esc/Main menu/Displays/Sensors

Sensors	
Outside temperature	sTLxAU
Extract air temp	sTLxAB
Heat recovery SUP temp	sTLvEH
Extract air humidity	sHLxAB
Fluid temp. upstream of SUP coil	sTFvZU
Fluid t dwnstrm of SUP coil	sTFnZU
Fluid temp. upstream of ETA coil,	sTFvAB
Fluid t dwnstrm of ETA	sTFnAB
Supply air flow rate	sVLxZU
Extract air flow rate	sVLxAB
KVS throughput	sVFxZU

Esc/System Parameter/Password 1234

System parameter	
Min. demand KVS	
Max. demand KVS	
Min. speed KVS pump	
Min. flow rate	
Number of supply air fans	
Supply air fan type	
Number of extract air fans	
Extract air fan type	
PHE heating	
PHE cooling	
Ice guard, extract air coil	
Glycol content	
KVS frost protection	
KVS fluid system pressure	sPFxKV
Heat recovery rate	

Notes on the sensors:

- Testing the sensors, e.g. by heating -> Menu: Displays sensors

- The sensors on the air side are usually connected to the WRS-K - AHU- controller and are adopted from the HKVS controller?

- Exception: The temperature sensor sTLvEH (from heat recovery and to reheater) is connected directly to the KVS controller? connected.

In the case of redundant sensors (WRS-K + HKVS), the "hardware sensor" has priority against pLAN

pLAN = internal bus connection between KLM controllers and control modules

Available actors:

direct	Field device	Description	check
☐	aMPxKV	speed controlled pump KVS	
☐	aVRbAB	3-way valve ETA-coil	
☐	aVAxVE	bypass valve for ice protection	
☐	aMPpEH	heating circuit pump	
☐	aVRpEH	valve PWT heating	
☐	aMPpKU	cooling circuit pump	
☐	aVRpKU	valve PWT cooling	

Functional check of the actuators via the maintenance menu - to call up the maintenance menu, the system must be switched to "Off".

Esc/Main menu/Displays/Components

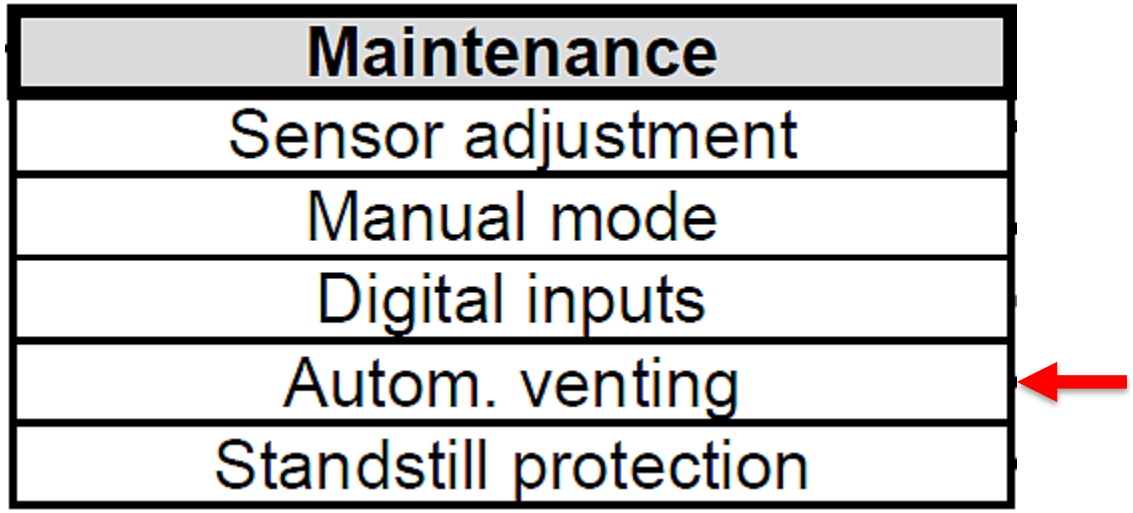
Components	
KVS pump	aMPxKV
Extract air bypass valve	aVRbAB
Bypass valve iced up	aVAxVE
Heating valve	aVRpEH
Pump, heat. circuit	aMPpEH
Heat generator demand	
Cooling valve	aVRpKU
Pump, cool. circuit	aMPpKU
Cooling source demand	

Funktionskontrolle:

direct	Description	check
☐	check: Hydraulic vented (on-site) 1)	
☐	calculate volumetric flow Check supply air and exhaust air	
☐	check bus communication to WRS-K	
☐	check WRG-, heating and cooling request from AHU 2)	
☐	check request of heat source 3)	
☐	check request of cooling source 3)	
☐	check operation, warning and alarm signs	

1) The complete venting is important and can last from 15 minutes to several hours. -> Automatic venting program in the maintenance menu -> Pulse mode 60/30 seconds for pump and valves. Venting possibilities - on the coil, quick venter, pump and on-site venters. A post-venting on site has to be planned!
2) Possibly by manual operation at AHU-controller
3) Possibly by manual operation at KVS-controller

Esc/Main menu/Maintenance



Settings:

item ”calculate volumetric flow Check supply air and exhaust air”	check
Measuring range differential pressure sensor SUP [Pa]	
Measuring range differential pressure sensor ETA [Pa]	

- Set the K factor correctly (read on the fan plate label and adjust it at the WRS-K controller)
- Operate the fan with 100%
- Fan differential pressure based on max. volume flow and the "K-formula" determine or measure with differential pressure gauge.
- Select the appropriate measuring range at the DIP switches of the differential pressure socket.
- Select the identical measuring range at the WRS-K controller - Expert / Pressure / volume flow control.

Please note

The calculation formula and k factor are indicated on the fan type plate.

Fan type 1 corresponds to the formula:

$$V = k \times \sqrt{\Delta p}$$

Fan type 2 corresponds to the formula:

$$V = k \times \sqrt{(2/1.2 \times \Delta p)}$$

Settings:

Adjustment - flow rate measuring of HKVS-pump	check
Measured flow rate at pump control 10V [l / min]	
Measuring range flow rate sensor Supply air coil [l / min] (water side)	
Selected measuring range of flow rate sensor [l/min] (System-parameter)	

Procedure:

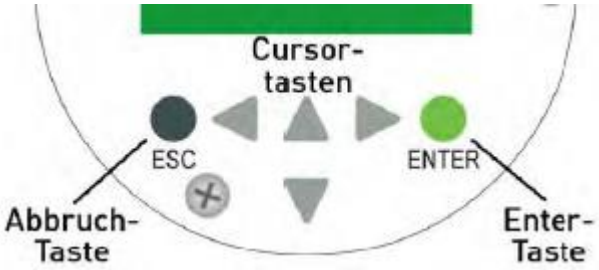
- Manual operation of the HKVS pump with maximum control 10V
- Check the flow rate at the sensor (flow meter)
- If the measuring range is exceeded, select the next higher measuring range at the sensor and the HKVS controller (the sensor signal 4-20mA is used with optimum accuracy).

Sika flowmeter

Measuring range adjustment

Please also wollow instruction manuals on site!

- Loosen the screw cover on the control panel
- In the main menu, change to „PASSWORD and enter and confirm **0002** under „costumer password“ = „Kundenpasswort“
- In the main menu, change to "FLOW" = “Durchfluss” and enter and confirm the maximum measuring range under "Volume flow measurement end value“ = “Messber.-Endwert”.
- Replace the screw cover of the control panel



- With the ◁ or ▷ -buttons is the navigation in the main menu possible
- The submenus are controlled with the △ or ▽ -buttons

Measurements:

Item	check
Fluid system pressure (setpoint: 2 bar plus 1 bar / 10m)	
Frost protection limit KVS (refractometer) [° C] Setting fluid under system parameters	
Antifreeze manufacturers:	
Antifreeze name:	
Fluid volume flow design value in [l/min]	from data sheet HKVS
Fluid volume flow at nominal airflow actual value in [l / min]	Nominal air at KG
Fluid volume flow Control signal pump in [V] (display components)	

- For the measurement, the WRG can be simulated to 100% in the basic settings of the KVS controller (or 100% requirement by the AHU control).
- At "Display requirements", the calculated setpoint flow KVS can be displayed.
- This test shows whether the pump is selected correctly and the measuring ranges are set appropriately.
- Procedure: Set the nominal air, set the 100% WRG, **the controller regulates to the setpoint after about 5 minutes.**

Basic settings:

Item	check
Operating mode	☐ ext. demand
	☐ pLAN air handling controller
	☐ simulation
	☐ BMS-Mode

Readings :

item	check
Nominal air volume SUP [m³/h]	
Nominal air volume ETA [m³/h]	
ODA temperature at nominal air volume (after approx. 10 min persistence) [°C]	
ETA temperature at nominal air volume (after approx. 10 min persistence) [°C]	
SUP temperature (from WRG, before heater) sTLvEH [°C]	
Fluid temperature before SUP coil [°C]	
Fluid temperature from SUP coil [°C]	
Fluid temperature before ETA coil [°C]	
Fluid temperature from ETA coil [°C]	

$$HR = \frac{t_{SUP} - t_{ODA}}{t_{ETA} - t_{ODA}}$$

at: ODA = 5°C, ETA = 25°C - dry
Heat recovery coefficient see system parameter

Other comments:

Certificate:

Commissioning successfully implemented: ☐ **yes** ☐ **no**

costumer (company), name

Instructed persons:

date, function, name, signiture

date, function, name, signiture

date, function, name, signiture

Klimageräte

Auftrag 1220261837 / 01000

Kunde	**WOLF GmbH Eigenbedarf**	Leistungskenndaten	DIN EN 13053 02/2012
Projekt / Kommission	HKVS Hydraulikeinheit	Wärmerückgewinnung	KVS
Unser Bearbeiter	Christian Fertl	Luftmenge Zuluft	6000 m³/h 1,67 m³/s
Ihre Nummer	Kst. 12412	Luftmenge Abluft	6000 m³/h 1,67 m³/s
Ihr Bearbeiter	Richard Riebesecker	Gerätetyp	Zu- und Abluft
LV-Pos		Verkleidungsart	50 mm
Auftragsmenge	1	Luftgeschwindigkeit	Zuluft:1,5 m/s Klasse: V1
Baugröße Zuluft	**KG Top 130**	Luftgeschwindigkeit	Abluft:1,5 m/s Klasse: V1
Baugröße Abluft	**KG Top 130**		

Nicht im Luftstrom

(1) Wolf HKVS Hydraulikeinheit DN 32

Hydraulikmodul für Hocheffiziente KV-Systeme

Schaltschrank:

Analoge Eingänge:		Durchflussmengensensor	4-20mA
WRG	0-10 Volt	Drucksensor Fluid	0-10V
Digitale Eingänge:		Betriebsmeldung	max. 2A bei 250V AC
Freigabekontakt HKVS	NO	Sammelwarnmeldung	max. 2A bei 250V AC
		Sammelstörmeldung	max. 2A bei 250V AC
Digitale Ausgänge:			

Sensorik:

Drucksensor Fluid	Temperatursensoren

Hydraulikpumpe:

Vertikale Hochdruckkreiselpumpe mit Inlineanschlüssen und mit integriertem, luftgekühltem Frequenzumformer

Rohranschluss	Saugseitig G1, PN16 / Druckseitig G1, PN16	Nennleistung	1,10 kW
Mediumtemperatur	-15°C ... +90°C	Nennstrom	3,2 A
Max. Umgebungstemperatur	50°C	Max. Drehzahl	3500 1/min
Fördermenge	1,86 m³/h	Schutzart	IP 55
Fördermenge	31,00 l/min	Isolationsklasse	F
Förderhöhe	35,60 m	Fabrikat	Wilo
Zulaufdruck	max. 10 bar	Typ	Helix VE
Netzanschluss	3 ~ 400 V / 50 Hz		

Hydraulikstation:

Sole Füllmenge	65 Ltr.	Breite	1322 mm
Anschlüsse	oben	Höhe	1627 mm
Länge	813 mm	Gewicht	276 kg

Zur Beachtung:

Für die bauseitige Verrohrung wurden 25 kPa Förderhöhe vorgesehen!

Hydraulik, DN 32, Pumpe 2 DN 32	>> 4 St. Temperatursensoren inkl. Tauchhülse gem. Matnr. 2745972
Rahmen, Rahmen, DN 32	>> 1 St. Durchflussmengensensor DN32 mit Vorparametrierung gem. Matnr. 2746016
Druckausgleichsbehälter, Druckausgleichsbehälter, DN 32	>> 1 St. Drucksensor SPT-I2 gem. Matnr. 2745973
Volumenstrom, Volumenstrom, DN 32	>> 1 St. Pumpe VE204-1/16/E/KS,G1; 0,55 kW gem. Matnr. 2072408
Anschlüsse, Anschlüsse, DN 32 Anschlüße nach oben	>> 1 St. Ausdehnungsgefäß 35 ltr. gem. Matnr. 2483075
Schaltschrank, Schaltschrank, Hydraulikeinheit	>> 1 St. Kappenventil 3/4" gem. Matnr. 2400445
Wanne Edelstahl 0813 KGT Ablauf links - sonder	>> 1 St. 2-Wege-Ventil VVP45.20-4 gem. Matnr. 2746111
Dreiwegeregelventil mit Stellantrieb und Verschraubungsset, VXP 459.25-6.3	>> 1 St. Stellantrieb SSC619WO gem. Matnr. 2744100
>> Hydraulikeinheit (HE) mit Sonder Abmessungen L x B x H = 813 x 1322 x 1627 mm	>> 1 St. Verschraubungsset "3x G1 IG - R1/2 IG" gem. Matnr. 2071742

Allgemeines Zubehör:

1 Stück Zuluftfühler WRS-K (MWTF NTC5K), lose
1 Stück Abluftfühler WRS-K (MWTF NTC5K), lose
1 Stück Aussentemperaturfühler lose

Bemerkungen:

>> Hydraulikeinheit (HE) mit Sonder Abmessungen L x B x H = 813 x 1322 x 1627 mm
>> 4 St. Temperatursensoren inkl. Tauchhülse gem. Matnr. 2745972
>> 1 St. Durchflussmengensensor DN32 mit Vorparametrierung gem. Matnr. 2746016
>> 1 St. Drucksensor SPT-I2 gem. Matnr. 2745973
>> 1 St. Pumpe VE204-1/16/E/KS,G1; 0,55 kW gem. Matnr. 2072408
>> 1 St. Ausdehnungsgefäß 35 ltr. gem. Matnr. 2483075
>> 1 St. Kappenventil 3/4" gem. Matnr. 2400445
>> 1 St. 2-Wege-Ventil VVP45.20-4 gem. Matnr. 2746111
>> 1 St. Stellantrieb SSC619WO gem. Matnr. 2744100
>> 1 St. Verschraubungsset "3x G1 IG - R1/2 IG" gem. Matnr. 2071742
>> Schaltschrank für H-KVS gem. TO-22-0056 aus Pos. 01001 in Kammer 1 montiert und teilverdrahtet
>> Kondensatablauf vorne.

Hinweis Wolf HKVS

Bauseitige Leistungen:

- Verrohrung der luftseitigen Wärmetauscher (Zuluft/Abluft) untereinander (max. zul. Druckverlust siehe technische Daten) incl. einer Entlüftungsmöglichkeit
- Verrohrung zwischen Wolf HKVS-Hydraulik Modul und den luftseitigen Wärmetauschern (Zuluft/Abluft)
- Bei integrierter Wärmeeinspeisung, die Verrohrung zwischen Wolf HKVS-Hydraulik Modul und den externen Wärmeerzeuger (Netz) (Vorlauf/Rücklauf)
- Bei integrierter Kälteeinspeisung, die Verrohrung zwischen Wolf HKVS-Hydraulik Modul und den externen Kälteerzeuger (Netz) (Vorlauf/Rücklauf)
- Fachgerechte(s) Dichtheitsprüfung, Füllen und Entlüften des Wolf HKVS System (einschließlich der Füllung mit vorgegebenen Wasser/Glykol-Anteil).
  Der Schmutzfänger vor der WRG-Pumpe ist dabei mehrmals zu reinigen.
- Ausreichende Entlüftung der WT nur bei höheren Strömungsmöglichkeiten möglich

- Isolierung aller bauseitigen Rohrleitungen für das Wolf HKVS- System nach den behördlichen Vorschiften
- Verkabelung (einschließlich auflegen im Wolf HKVS Schaltschrank) aller benötigten Sensoren und der Zuleitungen am Wolf HKVS Schaltschrank (entsprechenden Schaltpläne werden zur Verfügung gestellt)
- Alle Punkte wie vor, gemäß beiliegendem WRG-Schema
- Abfuhr oder Rückhaltevorrichtung für den im Fehlerfall möglichen Austritt von Wasser/Wasser/Glykol in der Auffangwanne und des Sicherheitsventils. Ausführung gemäß den jeweiligen gesetzlichen Vorgaben

Zusammenfassung Zubehör

1 x Dreiwegeregelventil mit Stellantrieb und Verschraubungsset, VXP 459.25-6.3

INBETRIEBNAHMEPROTOKOLL / PARAMETERLISTE

AUFTRAG.NR.	12202?????-01001	Plan. Nr.	TO - 22 - ????
Fa.	**MUSTERMANN**	SW-VER.	1.3.000

1. Grundeinstellungen

Beschreibung	Einheit	Bereich	Werks-einstellung	Kunden-einstellung
Betriebsart	Ext.Anforderung / pLAN-Klimaregler / Simulation / GLT-Betrieb		Externe Anforderung	
Simulation - Freigabe KVS	-	Aus / Ein	Aus	
Simulation - WRG Anforderung	%	0..100	0	
Simulation - Heizanforderung	%	0..100	0	
Simulation - Kühlanforderung	%	0..100	0	

2. Anzeigen/Sonstiges

Beschreibung	Einheit	Bereich	Werks-einstellung	Kunden-einstellung
Sprache wählen	German / English / Portuguese / Spanish / Italian / Dutch / French / Romanian / Croatian / Czech / Russian / Slovak / Latvian / Lithuanian / Greek / Estonian / Hungarian / Polish		German	

3. Systemparameter

Beschreibung	Einheit	Bereich	Werks-einstellung	Kunden-einstellung
KVS - Min. Anforderung	%	1..30	5	
KVS - Max. Anforderung	V	0,1…10	9,5	
KVS Pumpe - Min. Drehzahl	%	0..99	20	
KVS - Min. Durchfluss	l/min.	0..50	5,0	
Zuluftventilator - Anzahl	-	1..10	1	
Zuluftventilator - Ventilatortyp	-	1..2	1	
Zuluftventilator - k-Faktor	-	0..2000	0	
Abluftventilator - Anzahl	-	1..10	1	
Abluftventilator - Ventilatortyp	-	1..2	1	
Abluftventilator - k-Faktor	-	0..2000	0	
Plattenwärmetauscher Heizen	nicht vorhanden / integriert		nicht vorhanden	
Plattenwärmetauscher Kühlen	nicht vorhanden / integriert		nicht vorhanden	
Vereisungschutz Abluftregister - Grenzwert	°C	-10..10	-2,0	
Glykolanteil (Volumenprozent)	%	0..50	0	
Frostschutz KVS - Hysterese	K	2..20	5,0	
Fluidsystemdruck KVS - Warngrenzwert	bar	0,5..10	0,7	
Fluidsystemdruck KVS - Alarmgrenzwert	bar	0,5..10	0,5	

4. Ext. Heizen/Kühlen

Beschreibung	Einheit	Bereich	Werks-einstellung	Kunden-einstellung
Schaltpunkt für Anforderung Kälteerzeuger Stufe 2	%	2..100	50,0	
Mindestlaufzeit Stufe Kälteerzeuger	min.	0..20	6	
Min.Laufzeit Anforderung Wärmeerzeuger	min.	0..20	6	
Pumpe Warm-Wasser Betriebsart	bedarfsabhängig / über Außentemp. / Dauerbetrieb		bedarfsabhängig	
Pumpe Warm-Wasser Grenzwert Außentemperatur	°C	-20..15	2,0	
Pumpe Warm-Wasser Nachlaufzeit	min.	0..60	2	
Pumpe Kalt-Wasser Betriebsart	bedarfsabhängig / Dauerbetrieb		bedarfsabhängig	
Pumpe Kalt-Wasser Nachlaufzeit	min.	0..60	2	

5. Wartung

Beschreibung	Einheit	Bereich	Werks-einstellung	Kunden-einstellung
Fühlerabgleich				
Ablufttemperatur	K	-5..5	0,0	
Außentemperatur	K	-5..5	0,0	
Zulufttemperatur WRG	K	-5..5	0,0	
Differenzdruck Zuluft	Pa	-100..100	0	
Differenzdruck Abluft	Pa	-100..100	0	
Abluftfeuchte	%r.H.	-20..20	0,0	
Fluidtemp. vor Zuluftregister	K	-5..5	0,0	
Fluidtemp. nach Zuluftregister	K	-5..5	0,0	
Fluidtemp. vor Abluftregister	K	-5..5	0,0	
Fluidtemp. nach Abluftregister	K	-5..5	0,0	
Autom. Entlüftung				
Freigabe	-	Nein / Ja	Nein	
Stillstandschutz				
Zyklische Ansteuerung nach Tagen	Tagen	1..99	7	
Zeitpunkt der zyklischen Ansteuerung	Uhr	00:00..23:59	5:00	
Jährlicher Wartungshinweis - Freigabe	-	Nein / Ja	Ja	
Jährlicher Wartungshinweis - Monat	Januar - Dezember		Oktober	

6. Sonstiges

Beschreibung	Einheit	Bereich	Werks-einstellung	Kunden-einstellung
Neues Passwort	-	0000 - 9999	1234	
GLT-Protokoll	kein / LON / BACnet / Modbus / Ethernet / pCO Manager		nach Bestellung	
Übertragungsrate	1200 / 2400 / 4800 / 9600 / 19200 / 38400		nach Bestellung	
GLT-Adresse	-	1..207	1	
Stoppbit	-	1..2	2	
Parität	None / Even / Odd		None	
Datum	1.1.00 - 31.12.99		MESZ	
Uhrzeit	0:00 - 23:59		UTC+1:00	
Aufzeichnungen Energiemengen zurücksetzen	-	Nein / Ja	Nein	
Betriebsstunden Pumpe KVS zurücksetzen	-	Nein / Ja	Nein	
Betriebsstunden Pumpe Heizkreis zurücksetzen	-	Nein / Ja	Nein	
Betriebsstunden Pumpe Kühlkreis zurücksetzen	-	Nein / Ja	Nein	

7. Herstellerebene

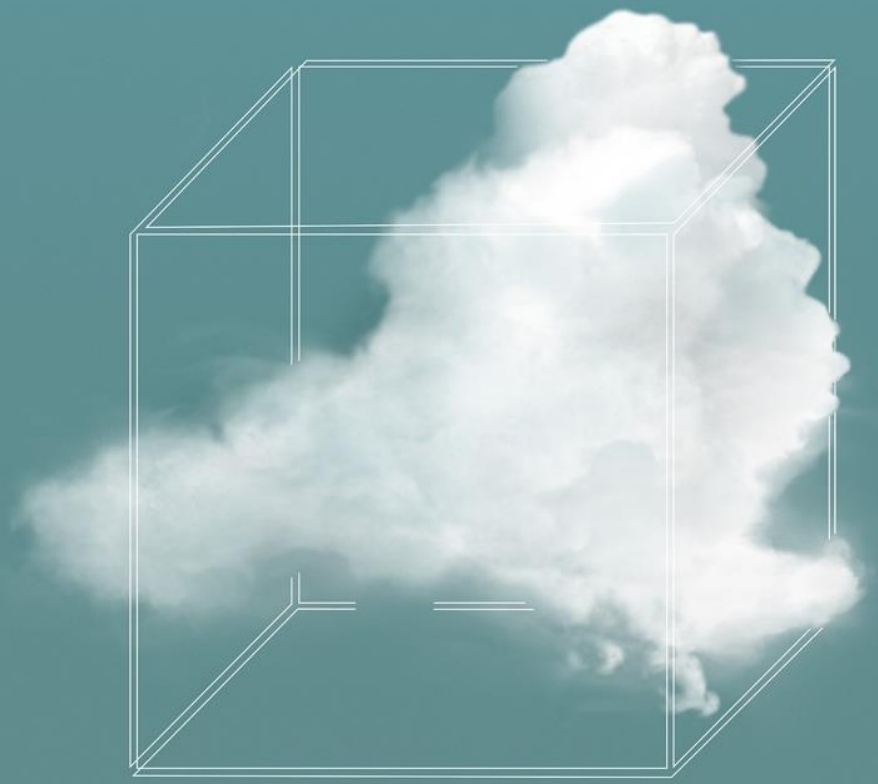
Ein-/Ausgänge		
Ein-/Ausgang	Zuweisung	
Digitale Eingänge		
	ID	
	ID	
	ID	
	ID	
	ID	
Analoge Eingänge		
	U	
	U	
	U	
	U	
	U	
	U	
	U	

7. Herstellerebene

Ein-/Ausgänge		
Ein-/Ausgang	Zuweisung	
Digitale Ausgänge		
	NO	
	NO	
	NO	
	NO	
	NO	
	NO	
	NO	
Analoge Ausgänge		
	Y	
	Y	
	Y	

Anlagenparameter				
Wärmekapazitätsstromverhältnis	-	0..2	1,1	
Freigabe Wärme-/Kälterückgewinnung - Hysterese	K	0..5	0,5	
Pumpe KVS - P-Anteil	l/min.	0..999	400	
Pumpe KVS - I-Anteil	s	0..100	20	
Vereisungsschutz Abluftreg. - P-Anteil	K	0..99	30	
Vereisungsschutz Abluftreg. - I-Anteil	s	0..999	120	
Frostschutz KVS - Freigabe	-	Nein / Ja	Ja	
Erweiterungsmodul KLM-E1	nicht vorhanden / vorhanden		nach Bestellung	
Erweiterungsmodul KLM-E2	nicht vorhanden / vorhanden		nach Bestellung	
Dämpfung für ext. Anforderungen - Filter	%	0…100	25,0	
Dämpfung für ext. Anforderungen - Zyklus	s	0…100	3	
Alarmmanagement - Zeitverzögerung Luftstromüberwachung	s	0…100	3	

THANK YOU
for your attention.



PERFECTLY IN TUNE WITH YOU.

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