



Installation and operating instructions Wolf refrigeration system controllers IK33 - IK400

KLM air handling and ventilation module
BMK programming module



1. Information about this document	3
1.1 Other applicable documents.....	3
1.2 Safekeeping of these documents.....	3
1.3 Symbols and warnings.....	3
1.4 Applicability of these instructions	3
2. Standards and directives.....	4
2.1 Installation / commissioning.....	4
2.2 Warnings.....	4
2.3 Service / repair.....	4
3. Functions / Commissioning	5
4. Unit description	6
4.1 KLM assignment.....	6
5. Installation / Electrical connection of the programming module.....	7
5.1 Wall mounting	7
5.2 Electrical connection.....	7
6. Programming module overview.....	8
7. BMK display	9
7.1 Standard display.....	9
7.2 Display level	9
7.3 Operating and setting level.....	9
8. Commissioning menu structure	10
9. Settings menu structure	11
10. Settings description	12-13
11. KLM controller parameter list.....	14
12. KLM plug/terminal assignment	15
13. Specification	16-17
13.1 Air handling and ventilation module	16
13.2 BMK programming module.....	17
14. NTC sensor resistances.....	18
15. Fault messages.....	19

1.1 Other applicable documents

Operating instructions for IK33 - IK400 refrigeration system controllers

The instructions for all accessory modules and further accessories may also apply.

1.2 Safekeeping of these documents

The system user or operator should ensure the safekeeping of all instruction manuals.

→ Pass on these operating instructions as well as all other applicable manuals.

1.3 Symbols and warnings

The following symbols are used in these instructions. This important information concerns personal as well as operational safety.



"Safety instructions" must be complied with to the letter, to prevent risks and injuries to individuals and damage to the appliance.



Danger due to live electrical components.
Please note: Turn off the ON/OFF switch before removing the casing.

Never touch electrical components or contacts when the ON/OFF switch is in the ON position. This carries a risk of electrocution that could lead to injury or death.

The terminals are live even when the ON/OFF switch is in the OFF position.



"Note" indicates technical instructions that must be observed to prevent material losses and appliance malfunctions.

Layout of warnings

You will recognise warnings in these instructions by a pictogram with a line above and below it. These warnings are laid out according as follows:



Keyword

Type and source of risk.

Explanation of the risk.

→ Action to prevent the risk.

1.4 Applicability of these instructions

These operating instructions are valid for Wolf IK33 - IK400 refrigeration systems controllers from software version 2.0.

The unit and controller accessories comply with the following regulations:

EC Directives

- 2006/95/EC Low Voltage Directive
- 2004/108/EC EMC Directive

EN Standards

- EN 55014-1 Emission
- EN 55014-2 Immunity
- EN 55022 Radio disturbance characteristics
- EN 55024 Immunity characteristics
- EN 60730-1 Automatic electrical controls for household and similar use
- EN 60730-2-9 Particular requirements for temperature sensing controls
- EN 61000-6-1 Immunity for residential, commercial and light-industrial environments
- EN 61000-6-2 EMC Immunity for industrial environments
- EN 61000-6-3 EMC Emission standard for residential, commercial and light-industrial environments
- EN 61000-6-4 Emission standard for industrial environments
- EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use

2.1 Installation / commissioning

- According to DIN EN 50110-1, only qualified electricians may carry out the installation and commissioning of the air handling controller and connected accessories
- Observe all regulations stipulated by your local power supply utility and all VDE or local regulations
- DIN VDE 0100 Regulations regarding the installation of high voltage systems up to 1000 V
- DIN VDE 0105-100 Operation of electrical installations

2.2 Warnings



- Removing, bypassing or disabling safety and monitoring equipment is not permissible.
- The system must only be operated if it is in perfect technical condition. Ensure that any faults or damage that may impact on safety are rectified immediately.

2.3 Service / repair

Note

- Regularly check that all electrical equipment is working correctly.
- Only qualified personnel may rectify faults or repair damage.
- Only replace faulty components or equipment with original Wolf spare parts.
- Observe specified electrical fuse ratings (see specification).
We accept no liability for any damage or loss resulting from technical modifications to Wolf controllers.

Functions

- Cooling or heating
- Output requirement 0-100 % via 0-10 V DC, 0-1 V DC, 0-5 V DC or 4-20 mA, PT1000, NTC, ON - OFF
- Monitoring of refrigerant circuits for high and low pressure
- Automatic load dump control via high or low pressure transmitter
- Start delay time, minimum runtime and blocking time adjustable
- Compressor activation according to the "first in/first out" principle for consistent compressor runtimes
- Part winding start-up for low starting currents and avoidance of switching current peaks
- Full motor protection through PTC thermistor monitoring
- Indication of compressor runtimes
- Central fault message

Commissioning

Check the following points during commissioning

- Check the rotating field and ensure that there are phases at the compressor.
- Check the motor protection PTC thermistor response by means of a contact break.
- Check the oil sump heater for the compressor when the compressor is at a standstill.
- Check the response of the low pressure switch and high pressure switch.
- Check the oil pressure switch.
- Check enabling and switching 0 - 10 V.
- Check that the pressure sensors show the correct value.

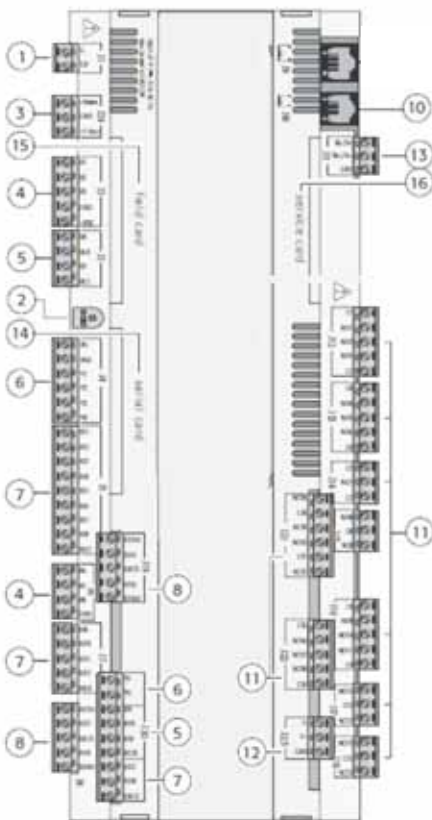
The KLM air handling and ventilation module is designed for the control of air handling, ventilation and refrigeration systems.

The controller is matched to the system at the factory.

The BMK air handling programming module is designed to display and operate the KLM-L or KLM-E air handling and ventilation module. The BMK can be mounted in the front of control panel doors (part no. 2744742) or on the wall (part no. 2744743).

4.1 KLM assignment

KLM-L air handling and ventilation module



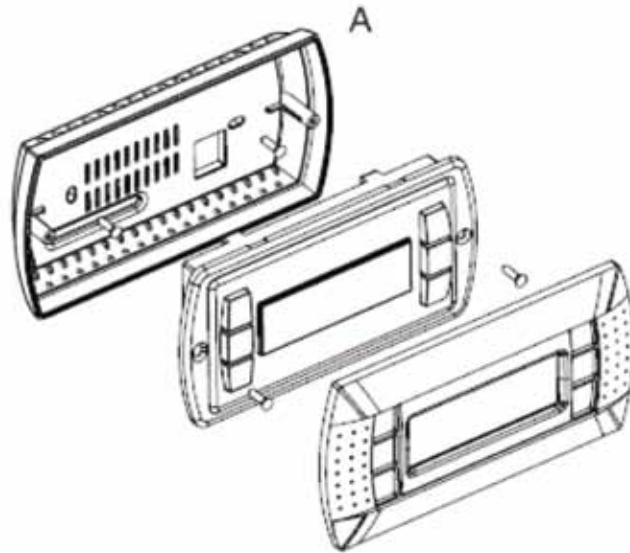
Key:

1. Supply plug [G (+), G0 (-)]
2. Yellow supply LED and 3 LEDs for the local pLAN network
3. Additional supply for programming module and ratiometric 0...5 V sensor
4. Universal analogue inputs (NTC-, 0...1 V-, 0...5 V, PT1000, 0...10 V-, 4...20 mA-), ON - OFF
5. Passive analogue inputs (NTC-, PT1000)
6. Analogue outputs (0...10 V-)
7. Digital inputs (24 V AC/V DC-)
8. Digital inputs (230 V AC- or 24 V AC/V DC-)
10. Plug-in connection for BMK programming module
11. Digital relay outputs
12. Plug-in connection for the KLM-E extension module
13. Plug-in connector for pLAN
14. Flap to insert the optional interface card (BACnet or LON interface)
16. Flap to insert the optional service card (memory extension)

5.1 Wall mounting

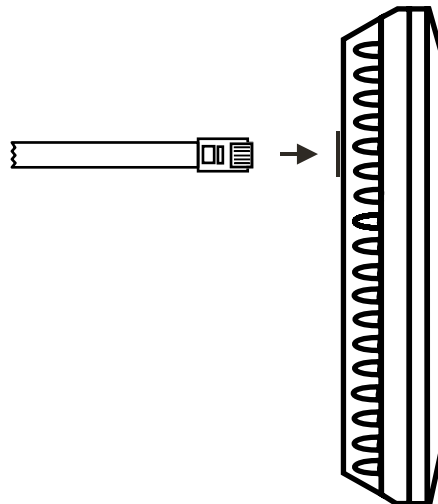
For wall mounting, remove the back panel from the programming module. To do so, carefully lever the l.h. and r.h. side of the programming unit using a screwdriver and lift off the top part of the back panel. The back panel can now be secured to the wall with screws through the fixing holes. (see Fig. A).

Note A terminal box is required behind the programming module for its connection (e.g. flush box).



5.2 Electrical connection

Connection via RJ12 plug

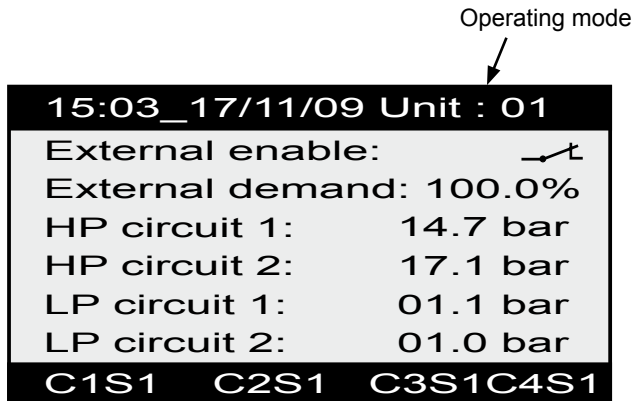


The BMK programming module has 6 function keys:



- ① Displaying and acknowledging active fault messages
- ② Access to the main menu
- ③ Displaying the operating data for the system
- ④ Scrolling forward within a menu and increasing values
- ⑤ Switching the system on and off, selecting menu items, confirming inputs (Enter)
- ⑥ Scrolling back within a menu and reducing values

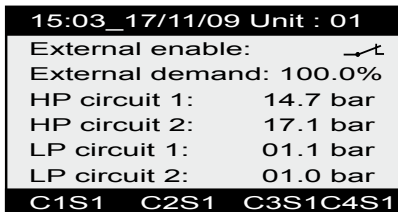
7.1 Standard display



Time, date and operating mode
 External enable for cooling or heating
 External demand
 0 – 100 %
 Pressure indicator, HP transmitter, circuit 1
 Pressure indicator, HP transmitter, circuit 2
 Pressure indicator, LP transmitter, circuit 1
 Pressure indicator, LP transmitter, circuit 2

Indicator for compressor stages
 C1 = compressor 1
 S1 = valve 1 from compressor 1
 S2 = valve 2 from compressor 1
 etc.

7.2 Display level



Pressing "Prg" takes you to the main menu.

Pressing "Esc" returns you to the display level.

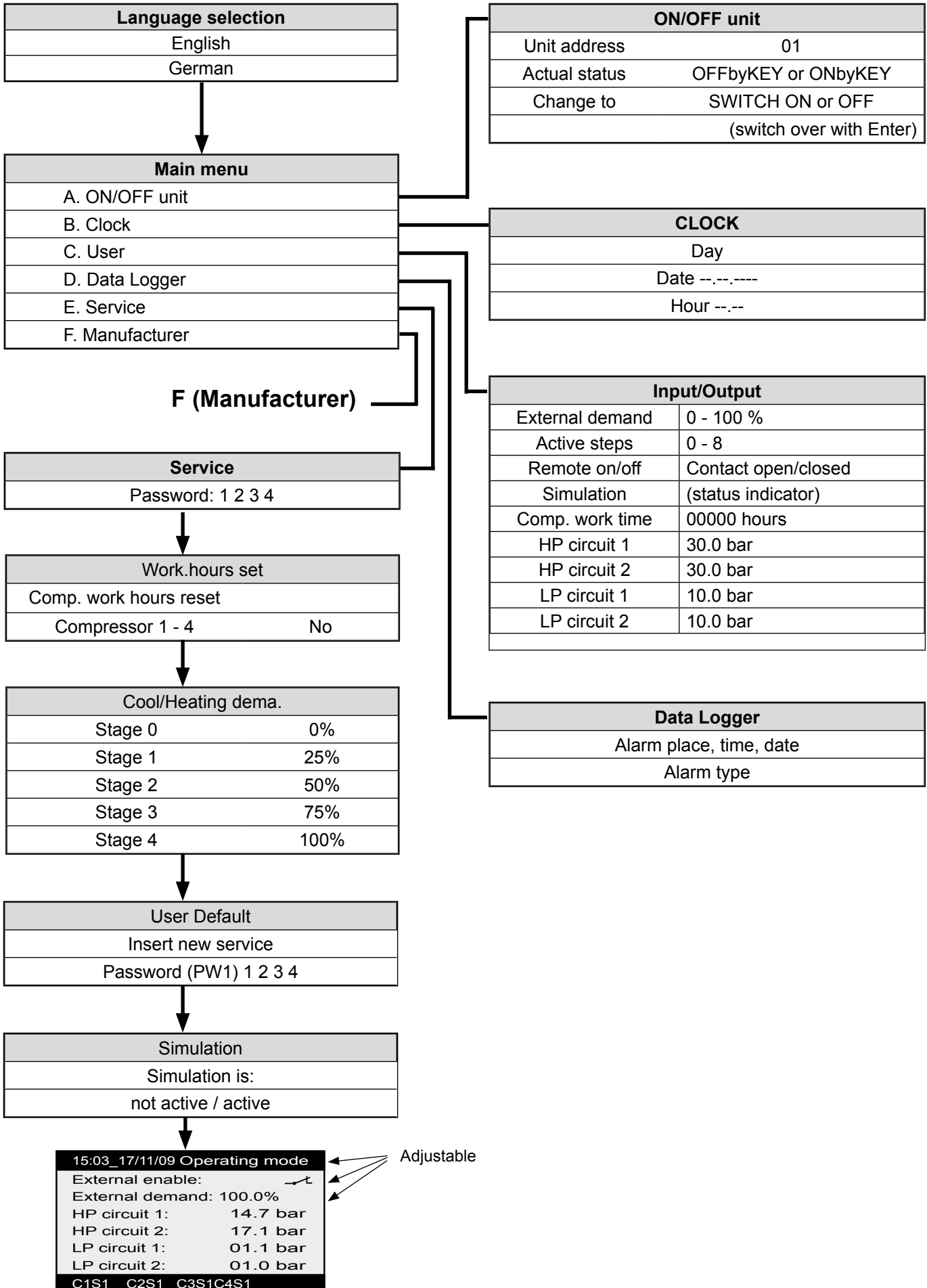
7.3 Operating and setting level

Main menu
A. ON/OFF unit
B. Clock
C. User
D. Data Logger
E. Service
F. Manufacturer

Use , to make a selection in the main menu. After selecting a menu choice, press to call up the required submenu.
 Press again, then or to change the setting.

Press "Prg" or "Esc" to return to the main menu standard display.

Pressing "Esc" returns you to the display level.



F (Manufacturer)

Contractor

Parameter



Password
1 2 3 4

Configuration	Setting	Range
Num.of circuit	2	1 / 2
Num.of compressor	2	1 - 4
Num.of capacity	1	1 / 2

Compressor time set		Range
Min. ON time	0 min	0 - 99
Min. OFF time	6 min	0 - 99
Start delay	2 min	0 - 99
Max. work time	30000 h	1000-99000
Press. level set HP	HP	HP - LP
Exp.board present?	No	No/Yes

Press. level set high pressure		Range
Comp.block	20.0 bar	0 - 99
Comp.deactive	23.0 bar	0 - 99
Stop delay	10 s	0 - 99

Press. level set low pressure		Range
Comp.block	4.0 bar	0 - 99
Comp.deactive	3.0 bar	0 - 99
Stop delay	10 s	0 - 99

Low press. alarm		Range
Startup delay	90 s	0 - 9999
Part-winding time	500 ms	0 - 9999

I/O configuration		Range
Analog input		
HP transducer circuit1		
Position:	02	
	4-20 mA	V. signals
Min./max. limit:	30 bar	00.0 - 99.9
Offset:	0.0 bar	-9.9 - 9.9

I/O configuration		Range
Analog input		
HP transducer circuit2		
Position:	03	
	4-20 mA	V. signals
Min./max. limit:	30 bar	00.0 - 99.9
Offset:	0.0 bar	-9.9 - 9.9

I/O configuration	Setting	Range
Analog input		
LP transducer circuit1		
Position:	06	
	4 - 20 mA	V. signals
Min./max. limit:	10 bar	00.0 - 10.0
Offset:	0.0 bar	-9.9 - 9.9

I/O configuration		Range
Analog input		
LP transducer circuit2		
Position:	07	
	4 - 20 mA	V. signals
Min./max. limit:	10 bar	00.0 - 10.0
Offset:	0.0 bar	-9.9 - 9.9

I/O configuration		Range
Analog input		
External	0 - 10 V	
Capacity regulation 01		
	0 - 10 V	V. signals
Min./max. limit:	100 %	00.0 - 999.9
Offset:	0.0 %	-9.9 - 9.9

Information
Software information

Information
Hardware information

Initialization
Insert new manufacturer Password (PW2) 1 2 3 4

I/O configuration
Digital input and output settings only through factory service after entry of password

Configuration**Num.of circuit 1 or 2****Num.of compressor (possible configurations)**

1 refrigerant circuit: 1 - 2 compressors, 0 - 2 valves,
3 compressors, 0 valves

2 refrigerant circuit: 2 compressors, 0 - 2 valves,
4 compressors, 1 valve

Compressor time set**Min. ON time**

If a minimum runtime is required, set the value.

Min. OFF time:

To protect the compressor, set at least 5 minutes.

Delay on time:

If the value is too low, overshooting or a high pressure fault may occur.

Max. work time:

When the runtime is reached, a service message is issued.

Press. level set: HP / LP

Via the pressure transducer, the system output is switched to high or there is a load dump.

Set required control type to high pressure or low pressure.

Extension board connected: No/Yes

Standard setting for cooling only: "No".

With heating function (heat pump function), set "Yes".

Press. level set high pressure**Comp.block 20.0 bar:**

If higher than 20 bar, the compressor does not start.

Comp.deactive 23.0 bar:

If higher than 23 bar, a load dump occurs.

Delay time 10 s:

Time until the next output stage starts.

Press. level set low pressure**Comp.block 4.0 bar:**

If lower than 4.0 bar, the compressor does not start.

Comp.deactive 3.0 bar:

If lower than 3.0 bar, a load dump occurs.

Delay time:

Time until the next output stage starts.

Low press. alarm**Startup delay:**

When the compressor is restarted, no fault message occurs for the set time if the system pressure is too low.

Part-winding time set:

For compressors with part-winding, winding group 2 is only started when this time has elapsed to avoid high starting currents.

Analog input

Analog input HP transducer circuit1

Analog input HP transducer circuit2

Analog input LP transducer circuit1

Analog input LP transducer circuit2

Position: __ Controller input wiring is fixed and must not be changed.

4 - 20 mA Here, you can choose from the following input signals
4-20 mA, 0-10 V, 0-1 V, PT1000, NTC, 0-5 V, ON/OFF

Min limit: Minimum value of pressure transducer

Max. limit: Maximum value of pressure transducer

Offset: Zero point adjustment of pressure transducer (for calibration)

Analog input external 0-10 V capacity regulation

Position: __ Controller input wiring is fixed and must not be changed.

0 - 10 V Here, you can choose from the following input signals
4-20 mA, 0-10 V, 0-1 V, PT1000, NTC, 0-5 V, ON/OFF

Min limit: 0%

Max. limit: 100%

Offset: Zero point adjustment (for calibration)

In the event of a fault message regarding unconnected pressure transducers, reset the controller input to position 00.

Switch OFF the unit.

In the main menu, confirm ON/OFF unit with Return.

Press Return again and set the unit to OFF.

Press Esc to switch to the main menu, select settings and enter 1234 as the password.

Use the arrow key to scroll down (at least 5x) until the input of the missing transducer appears. Press Return and set the position to 00.

Press Return to exit the setting range and then press Esc to return to the main menu.

Digital input and output settings:

Only through factory service after entry of password.

If, at the time of commissioning or testing, there are no requirements and there is no external demand, the simulation can be started. After the tests, the simulation must be switched off again.

Starting simulation:

Select simulation via the main menu and service using Enter and the arrow key.
The simulation is not active but this can be changed with Enter and the arrow key.

2x Esc brings up the standard display.

In the standard display, 3 values can be simulated.

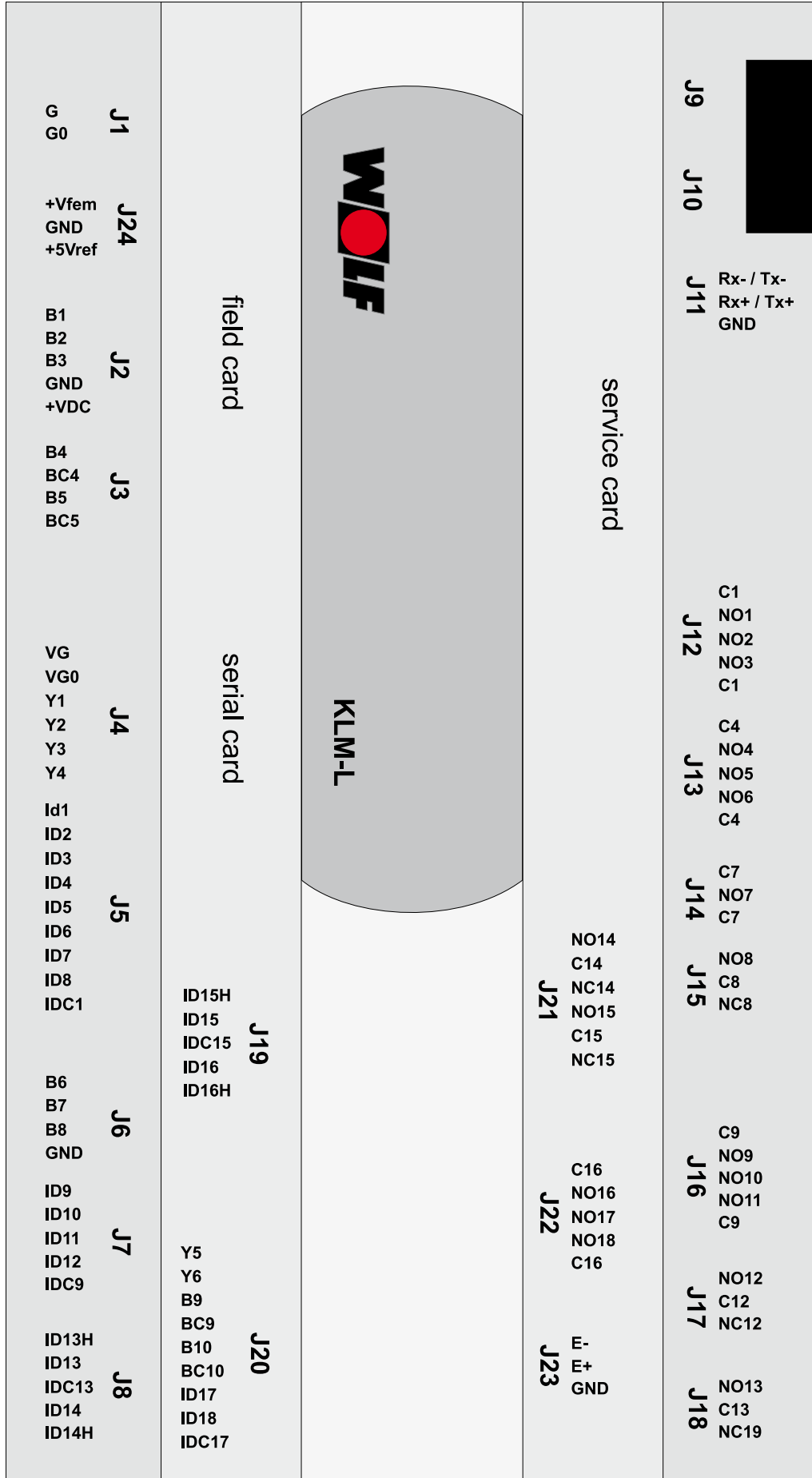
Cooling – heating

Remote on/off: Contact OFF/ON

External demand: 0-100 %

Press Enter to switch and adjust with arrow keys.

		Assignment	Plug	Terminal	Standard setting	Setting	Other
System type	Refrigerant circuits				2		
	Compressors				2		
	Valves				1		
Compressor time set	Min. ON time				0 min.		
	Min. OFF time				6 min.		
	Start delay				2 min.		
	Max. work time				30000 h		
	Press. level set				HP		
	Exp.board present?				No		
Press. level set high pressure	Comp.block				20 bar		
	Comp.deactive				23 bar		
	Start delay				10 s		
Press. level set low pressure	Comp.block				4 bar		
	Comp.deactive				3 bar		
	Start delay				10 s		
Low press. alarm	LP alarm startup delay				90 s		
	Part-winding time set				500 ms		
Analog inputs	HP transducer circuit1	Pos.02	J2	B2	4-20 mA		
	HP transducer circuit2	Pos.03	J2	B3	4-20 mA		
	LP transducer circuit1	Pos.06	J6	B6	4-20 mA		
	LP transducer circuit2	Pos.07	J6	B7	4-20 mA		
	External 0-10V	Pos.01	J2	B1	0-10 V		
Digital inputs	HP switch circuit 1	Pos.01	J5	ID1	NC		
	HP switch circuit 2	Pos.02	J5	ID2	NC		
	LP switch circuit 1	Pos.05	J5	ID5	NC		
	LP switch circuit 2	Pos.06	J5	ID6	NC		
	Oil press comp.1	Pos.07	J5	ID7	NC		
	Oil press comp.2	Pos.08	J5	ID8	NC		
	Oil press comp.3	Pos.09	J7	ID9	NC		
	Oil press comp.4	Pos.10	J7	ID10	NC		
	Motor alarm comp.1	Pos.11	J7	ID11	NC		
	Motor alarm comp.2	Pos.12	J7	ID12	NC		
	Motor alarm comp.3	Pos.13	J8	ID13	NC		
	Motor alarm comp.4	Pos.14	J8	ID14	NC		
	Global Malfunction	Pos.15	J19	ID15	NC		
	Remote on/off	Pos.16	J19	ID16	NC		
	Cooling active	Pos.17	J20	ID17	NC		
	Heating active	Pos.18	J20	ID18	NC		
	Digital outputs	Comp.1 part-winding A	Pos.01	J12	NO 1	NO	
Comp.1 part-winding B		Pos.02	J12	NO 2	NO		
Magnetic valve 1 comp.1		Pos.07	J14	NO 7	NO		
Comp.2 part-winding A		Pos.04	J13	NO 4	NO		
Comp.2 part-winding B		Pos.05	J13	NO 5	NO		
Magnetic valve 1 comp.2		Pos.08	J15	NO 8	NO		
Magnetic valve 2 comp.1		Pos.12	J17	NO 12	NO		
Magnetic valve 2 comp.2		Pos.13	J18	NO 13	NO		
Comp.3 part-winding A		Pos.09	J16	NO 9	NO		
Comp.3 part-winding B		Pos.10	J16	NO 10	NO		
Magnetic valve comp.3		Pos.14	J21	NO 14	NO		
Central fault		Pos.15	J21	NO 15	NO		
Comp.4 part-winding A		Pos.17	J22	NO 17	NO		
Comp.4 part-winding B		Pos.16	J22	NO 16	NO		
Magnetic valve comp.4		Pos.18	J22	NO 18	NO		
Magnetic valve circuit1 C/H		Pos.E3	J7	NO 3	NO		
Magnetic valve circuit2 C/H		Pos.E4	J8	NO 4	NO		
4-way valve circuit 1		Pos.E1	J5	NO 1	NO		
4-way valve circuit 2		Pos.E2	J6	NO 2	NO		



13.1 Air handling and ventilation module

Specification	Type KLM-L	Type KLM-E
Dimensions	110 x 315 x 60 mm	110 x 70 x 60 mm

Digital inputs		
Type	Opto-isolated	Opto-isolated
Total	16	4 (not active)
24 VAC or 24 VDC	14	
24 VAC/DC or 230 VAC	2	

Analogue inputs		
Universal 0-10 V, 0-1 V, 4-20 mA, 0-5 V, NTC5K, PT1000	4	4 (not active)

Digital outputs		
Type	Relay outputs	Relay outputs
Single pole	15	4 changeover contacts 250 V 3 A

Power supply	28...36 VDC and 24 VAC / 50-60 Hz
Connections	Via plug-in connector (part no. 2744746), max. voltage: 250 VAC, for 0.5-2.5 mm ² cross-section

Network / programming module connection	
Type	Asynchronous half duplex RS485 (pLAN)
Transfer rate	62.5 kbps or 115.2 kbps (adjustable via software)
BMK programming unit connection	6-pole telephone plug
Network connection (pLAN) / graphic programming module	3-pole plug-in connector

Max. distance between KLM and BMK	
Telephone cable	Max. cable length 50 m (supply from the KLM)
AWG24 cable, screened	Max. cable length 200 m (supply from the KLM)
AWG20 / 22 cable, screened	Max. cable length 500 m (requires separate supply)

Other characteristics	
Storage conditions	-40-70 °C, 90 % r.h., non-condensing
Operating conditions	-25-70 °C, 90 % r.h., non-condensing
IP rating	IP20

13.2 BMK programming module

Type	FSTN graphics
Illumination	Backlit (white)
Resolution	132x64 pixels
Character height	3.5 mm / 7.5 mm
Size	72x36 mm
Active area	66x32 mm
Key illumination	4x green LEDs (↑, ↓, ←, →, ESC keys) 2x red/orange LEDs (Prg, Alarm keys)
Interface	6-pole RJ12 plug or external supply 18 / 30 VDC
Max. power consumption	0.8 W
Max. cable length	50 m with telephone cable, 500 m with AWG22 twisted pair and TCONN6J000 distributor
IP rating	IP65 (part no. 2744742) IP40 (part no. 2744743)
Operating conditions	-20-60 °C, 90 % r.h. non-condensing
Storage conditions	-20-70 °C, 90 % r.h. non-condensing

Temp. °C	Resist. Ω	Temp. °C	Resist. Ω	Temp. °C	Resist. Ω	Temp. °C	Resist. Ω
-21	51393	14	8233	49	1870	84	552
-20	48487	15	7857	50	1800	85	535
-19	45762	16	7501	51	1733	86	519
-18	43207	17	7162	52	1669	87	503
-17	40810	18	6841	53	1608	88	487
-16	38560	19	6536	54	1549	89	472
-15	36447	20	6247	55	1493	90	458
-14	34463	21	5972	56	1438	91	444
-13	32599	22	5710	57	1387	92	431
-12	30846	23	5461	58	1337	93	418
-11	29198	24	5225	59	1289	94	406
-10	27648	25	5000	60	1244	95	393
-9	26189	26	4786	61	1200	96	382
-8	24816	27	4582	62	1158	97	371
-7	23523	28	4388	63	1117	98	360
-6	22305	29	4204	64	1078	99	349
-5	21157	30	4028	65	1041	100	339
-4	20075	31	3860	66	1005	101	330
-3	19054	32	3701	67	971	102	320
-2	18091	33	3549	68	938	103	311
-1	17183	34	3403	69	906	104	302
0	16325	35	3265	70	876	105	294
1	15515	36	3133	71	846	106	285
2	14750	37	3007	72	818	107	277
3	14027	38	2887	73	791	108	270
4	13344	39	2772	74	765	109	262
5	12697	40	2662	75	740	110	255
6	12086	41	2558	76	716	111	248
7	11508	42	2458	77	693	112	241
8	10961	43	2362	78	670	113	235
9	10442	44	2271	79	670	114	228
10	9952	45	2183	80	628	115	222
11	9487	46	2100	81	608	116	216
12	9046	47	2020	82	589	117	211
13	8629	48	1944	83	570	118	205

Alarms are signalled by the red LED flashing. Pressing the key displays the alarm message in plain text. Pressing the key on the alarm display again acknowledges resolved alarms. If several alarms are active, this is indicated by a symbol in the top r.h. corner. Further alarms can be called up with the arrow keys.

Alarm messages	Effects	Cause	Remedy
High pressure switch circuit 1 or 2	The compressors affected are switched OFF.	Too little output transferred at the cooling coil. Pressure on the hot gas side too high.	Check that the heating coil has not iced up; air flow too low.
Low pressure switch circuit 1 or 2	The compressors affected are switched OFF.	Refrigerant pressure in system too low.	Top up refrigerant.
Oil pressure compressors 1 - 4	The compressors affected are switched OFF.	Compressor oil level too low.	Top up oil.
Motor alarm compressors 1 - 4	The compressors affected are switched OFF.	Fuse/MCB protection or motor protection, compressor has responded.	Rectify cause of motor overload.
Global Malfunction	System is switched OFF.	Phase monitor not enabling (phase failure or phases interchanged).	Rectify fault; regulate rotational direction.

