

Rotor controllers Type KR4 and KR7 Rotation controller for regenerative heat exchangers



KLINGENBURG
ENERGY RECOVERY

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The efficiency of regenerative heat exchangers can be adjusted by means of the rotor speed.

The rotor speed can be adjusted by means of the KR controller across the complete control range. For further performance features see page 4.

The new KR controller is the fourth generation of a series of controllers for regulating regenerative heat exchangers developed by our company since 1979. Developments in modern processing technology and our wish to make the operating controls as simple as possible provided the impetus for an extensive development programme.

The controller is housed in an extruded aluminium case which improves heat dissipation and increases mechanical stability.

The case also ensures good electric screening. More space was provided for the wiring and the new configuration of the terminals makes it easier to hook up the controller.

And of course all new industry standards have been taken into account. The radio shielding incorporates the latest technology.



The rotor drive is effected through three-phase alternating current motors which can be operated up to a rotor diameter of 1919 mm direct from the mains. Furthermore, an acceleration and deceleration ramp must be utilised for the gears.

So, for the optimum control of the drive, the rotor controller KR is required.

Only two types are required for all rotor sizes:

KR4 = 400 Watt
rotor diameters smaller than 3760 mm

KR7 = 750 Watt
rotor diameters larger than 3760 mm

The KR controllers represent the latest standards for rotor technology.

What can the controller do?



The KR4 and KR7 control units and their central component, the frequency inverter, permit you to fully adjust the rotor speed for the entire permissible range.

These control units can be utilised worldwide.
(With supply voltage 230V ~)

When designing these control units, all known regulations were taken in consideration.

Quality features

- Latest processor technology
- CE conformity
- Casing IP 54
- Short-circuit-proof output
- EN 55011 tested
- EN 61000-3 tested
- EN 61000-4-2 tested
- EN 61000-4-4 (Burst) tested
- EN 61000-4-5 (Surge) tested
- EN 61800-3 tested
- Each single module is tested repeatedly
- exchangeable info sheet

Performance features

- 6 detailed fault display
- Thermal protection including function display
- Starting and running out switching
- Menu controlled programming
- Clear text display via LCD display
- Three push-button operation
- External control signal processing
- Self-cleaning function
- Rotor operation control *)

Optional features

The following functions can be selected by means of the extended Z-controller:.

- Summer operation including display of function *)
- Enthalpy comparison
- Temperature comparison
- Temperature switching over supply air temperature control *)
- sequence switching register including function display

In this case the controller bears the model number KR4 Z or KR7 Z. See page 13 for order codes.

*) The corresponding sensors must be installed for the control features marked with an asterisk.

Functions of the KR4 and KR7 basic controllers



KR4 = 400 Watt for rotor diameters smaller than 3760 mm

KR7 = 750 Watt for rotor diameters bigger than 3760 mm

The electronics function test checks motor current and processor operation. After starting the motor it checks the functions of the motor. In addition it verifies for short circuits or earth faults.

In case of a fault the fault contact switches over from S1 to S2. The error message appears on the display. (see page 16)

Example:

H a r d w a r e e r r : E X X

Operation mode: Manual operation

In manual operation mode you can determine by depressing the selection push-button a fixed rotational speed.

Operation mode: External operation

By evaluation of a external control signal (0 - 20 mA, 4 - 20 mA or 0 - 10 V) the rotational speed is justified.

Rotation monitor

As the rotor turns, the rotation is monitored by a magnetic proximity switch mounted inside the rotor case. A magnet which is mounted on the circumference of the rotor reports the rotation movement back to the controller. In case of a rotor operation fault, e.g. the V-belt comes off, the fault contact switches over from S1 to S2. The following error message then appears on the display.

R u n c o n t r o l e r r o r

If the rotor stops turning, the reaction time of the controller will vary between 0.5 and 3 minutes, depending upon the speed of the rotor beforehand. The controller renews operation once the error message has been acknowledged by pressing the three buttons on the controller.

The function of the rotation monitor is not active at frequencies 10 Hz.

The rotation monitor is a component of the basic controller. If you require this function, you must order the magnetic proximity switch and the installation set that comes with it (KR4 R or KR7 R).

Self-cleaning operation

One result of the constant air flow in regenerative heat exchangers is a very beneficial self-cleaning effect. As a result, cleaning is not required in most cases. In case of doubt, please consult us.

At times when the ventilation unit is running but the rotor function itself is not required, it is still expedient to activate the rotor periodically. The cleaning cycle can be set for 20, 40, 60, 80 or 100 minutes. In this manner smaller dirt deposits can be cleaned away.

Speed display

You can calculate the speed of the rotor from the frequency.

80 Hz corresponds to approximately 10 rpm.

Functions of KR4 Z and KR7 Z controllers with additional functions



The extended version with independent sensor evaluation bears the number KR4 Z or KR7 Z.

The "Z" controller is extended by the following functions.

Supply air temperature control
sequence switch-heat register
Summer operation mode

1. Setting supply air temperature

The supply air temperature can be set to a value between 10-40°C. The rotor speed increases and decreases until the desired temperature is reached or until the rotor reaches its minimum / maximum speed. A temperature sensor type PT 1000 is required in order to regulate the supply air temperature (200 mm resp. 2000 mm).

Other temperature ranges require a special order.

2. Sequence switch

The sequencer is a change-over switch which allows you, e.g., to operate a downstream heat source in sequence with the rotor. It ensures that the heating is switched on only if the rotor is already turning. In this manner, you can be sure that the heating is only being used as a residual heater. The heating activation value is set under the menu item "Activation value". It can be set to a value between 5- 100 % in 5%-steps. In the center of the display a "#" indicates that the sequence switch is activated.

3. Summer mode, Cooling mode

As you well know, your rotary heat exchanger is not only the ideal solution for recuperating heat; it can also be used as a "cooler". If the exhaust air in summer is cooler than the outer air, the rotor can be used as a cost-saving cooling unit. By running the rotor at full speed, it is possible to pre-cool the outer air. The KR Z automatically tests whether the conditions merit operating in summer mode. You can choose from different versions of the summer operating mode:

3.1 Temperature comparison mode

In the temperature comparison mode, the KR Z decides when to switch the rotor to cooling mode by comparing the temperature of the outer air with that of the exhaust air. If the exhaust air is cooler than the outer air, then the rotor can use the outer air to cool the supply air. Two temperature sensors are required for the temperature comparison mode.

3.2 Enthalpy comparison mode

In the enthalpy comparison mode, the KR Z decides when to switch the rotor to cooling mode by comparing the total heat content of the outer air with that of the exhaust air. If the enthalpy of the outer air is higher than that of the exhaust air, then the rotor can use the outer air to cool the incoming air. Two enthalpy sensors are required for the enthalpy comparison mode.

3.3 Outer temperature measurement

This method uses an adjustable reference value to decide when to change over to summer mode. It is also referred to as the change-over mode. When the outside temperature surpasses the set value, the rotor switches to cooling mode. The rotor then runs at maximum speed. The change-over mode requires a temperature sensor to measure the outside temperature.

Technical specifications

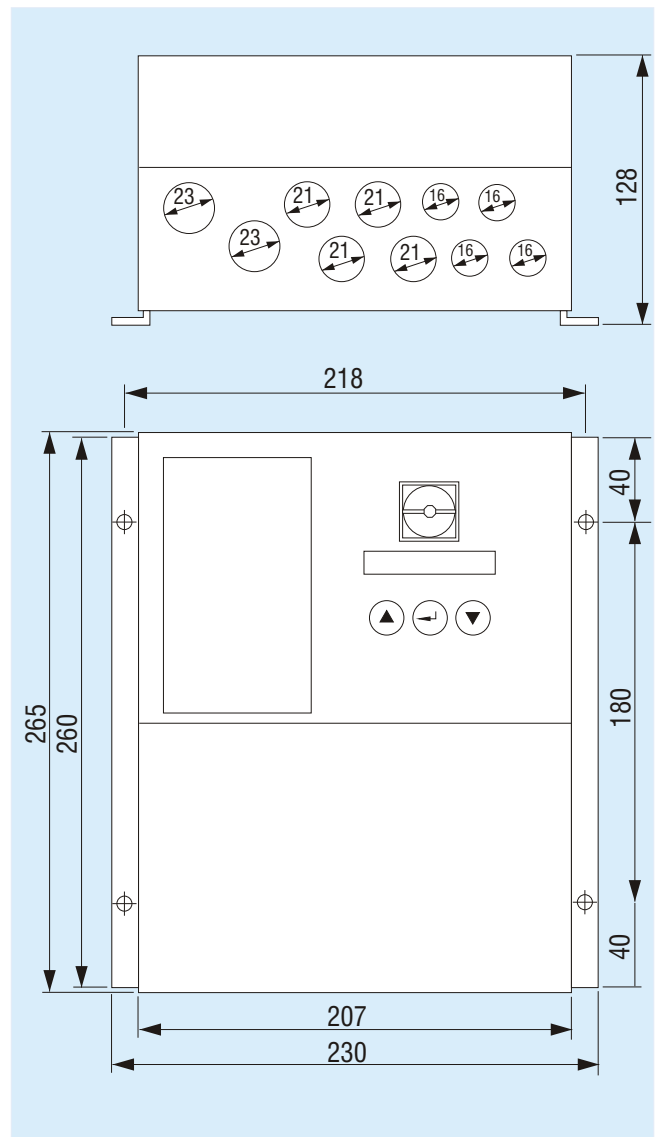
KR4/KR7 and KR4 Z/KR7 Z

Motor data



Type	KR4	KR7
Output:	0,4 kW	0,75 kW
Fuse:	6,3 A	10 A
Supply voltage:	220-240 V	
Weight:	3200 g	3500 g
Operating temperature:	-10°C - + 40°C When operating temperatures are below 0 °C, we recommend that the motors be left off when the power is first turned on to allow the controller to warm up.	
Supply air temperature:	10°C - 40°C Other temperature ranges can be specially ordered.	
System of protection:	IP 54	
Output frequency:	0 - 80 HZ	
Frequency resolution:	0,08 Hz	
Control signals:	0 - 10 V, 0 - 20 mA, 4 - 20 mA	
Fault contact:	230 V, 1 A	
Power cord:	A shielding power cord must be used in all cases and if longer than 15m, additional main suppression filter should be installed. Please ask for more information.	

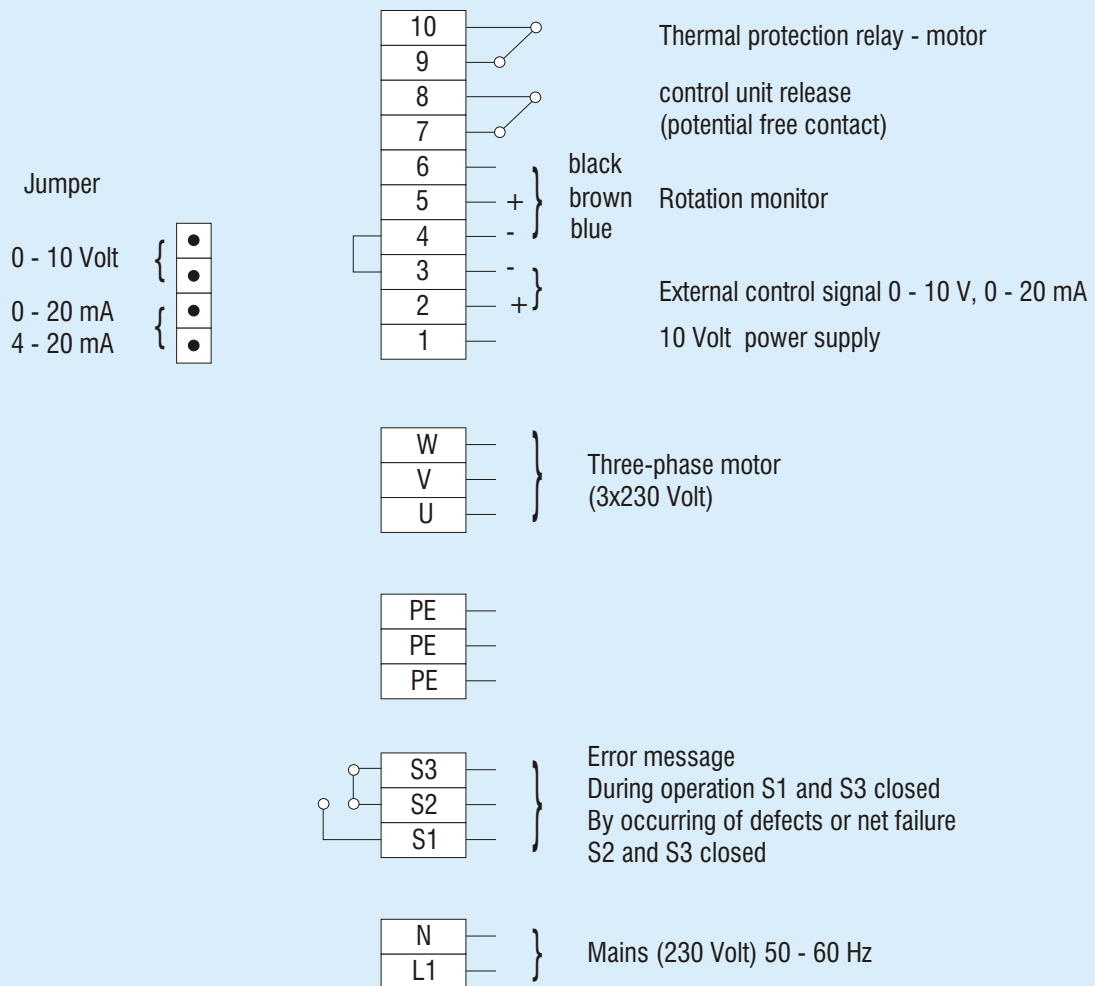
Dimensions



Motor data

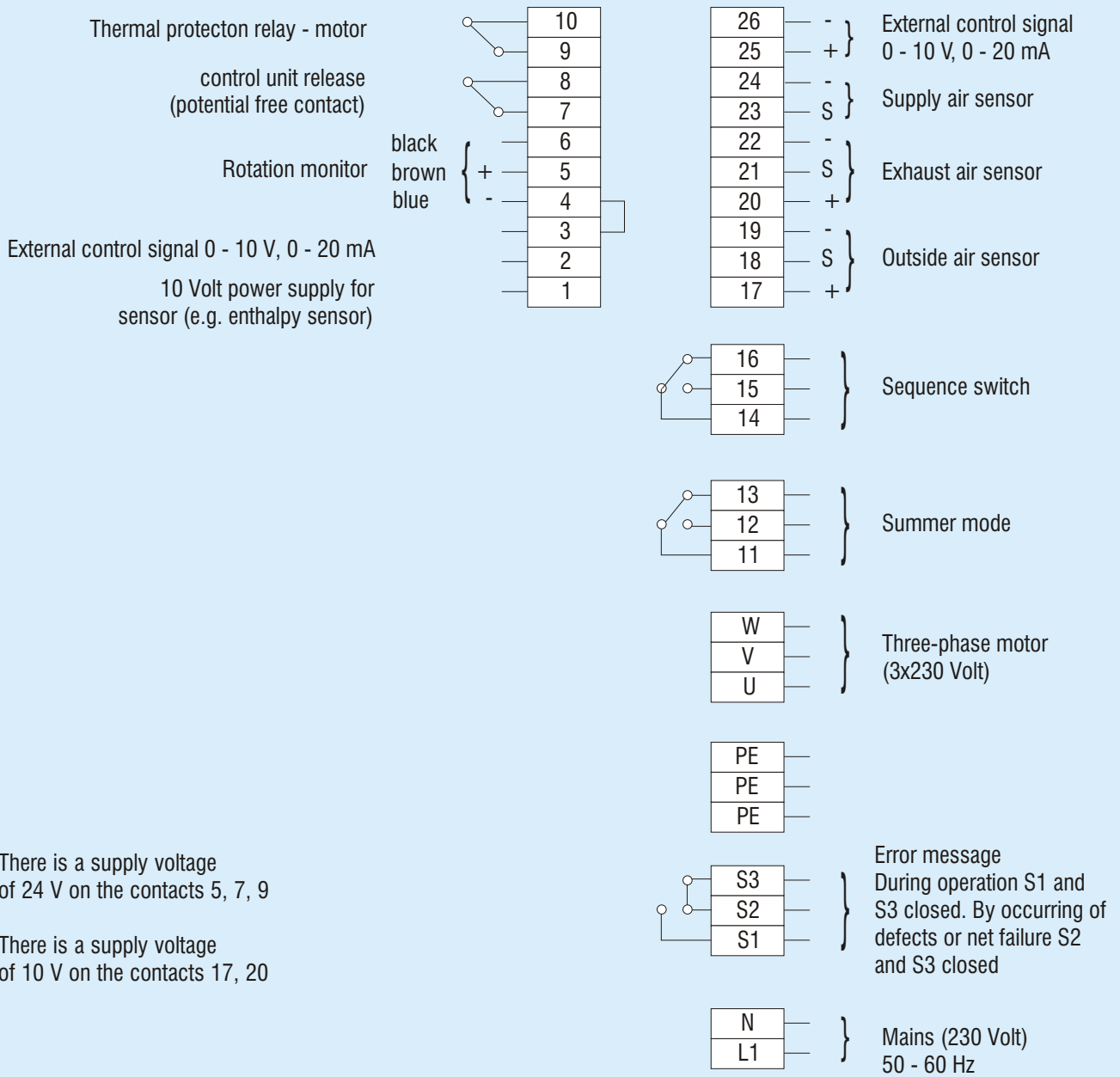
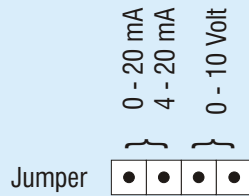
Rotor diameter [mm]	Performance [W]	Supply voltage [V]	Max. current consumption [A]		Isolation class	Type of protection
			(230 V)	(400 V)		
1419	90	230/400	0,64	0,37	F	IP 54
1420-2379	180	230/400	1,05	0,60	F	IP 54
2380-3759	370	230/400	2,07	1,20	F	IP 54
3760	750	230/400	3,46	2,00	F	IP 54

Terminal configuration of the KR4 / KR7 controller



There is a supply voltage of 24 V on the contacts 5, 7, 9

Terminal configuration of the KR4 Z / KR7 Z controller



Hooking up KR4 and KR7 basic controllers



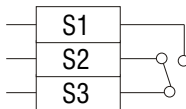
1. Power supply

Both the KR4 and KR7 models must be hooked up to a 230 V power supply.



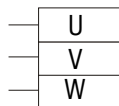
2. Hooking up the fault contact

In the normal operating conditions, S1 is connected with S3. In case of a fault or when the device is voltage free, S2 is connected with S3.



3. Motor connection

In order to avoid interference from the connecting wires to the motor, it is necessary to install each of these separately in a shielded cable. The KR4 and KR7 frequency inverter from Klingenburg operate with an output voltage of 3 x 230 V. This must be taken into account when wiring the terminal board on the motor. Using standard motors 230/400 V they have to be installed in delta connection.



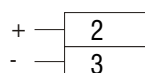
4. External control signal inputs

Control signal connection

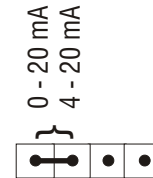
The KR can process the following signals:

- 0 - 20 mA
- 4 - 20 mA
- 0 - 10 Volt

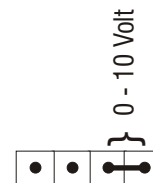
Hook up the control signal to terminals 2 and 3.



For a control signal of 0 - 20 mA or 4 - 20 mA, the pins must be jumped as illustrated below.

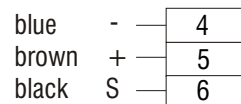


For a control signal of 0 - 10 V, the pins must be jumped as illustrated below.



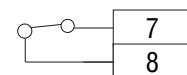
5. Connecting the rotation monitor

The rotation sensor must be hooked up to terminals 4, 5 and 6.



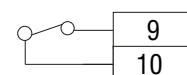
6. Controller release (Enable)

The controller release is driven over terminals 7 and 8 on the control terminal strip. The contact used to connect the controller release must be voltage free.



7. Thermal protection relay - motor

The thermal protection relay must be connected using shielded wire in order to protect the motor from excessive overheating when running at low speeds. The warranty is voided if the thermal protection relay for the motor is not connected.



Hooking up KR4 Z and KR7 Z basic controllers with installed options board



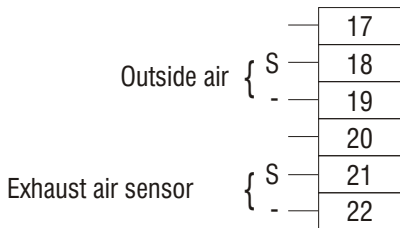
In case of the Z-Controller the connections must be made as follows:

The sensors must be installed as illustrated. When ordering, this function is indicated by the letter "C" (see "Orders" page).

1. Summer mode, Cooling mode

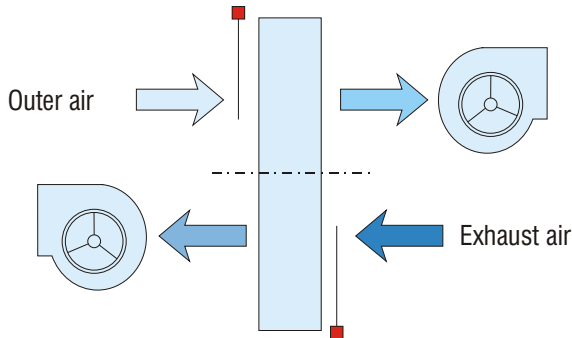
1.1 Temperature comparison "B"

The 200 mm long outside air and exhaust air rod sensors are connected to terminals 18 and 19 (outside air sensor) and 21 and 22 (exhaust air sensor) as shown in the following illustration.



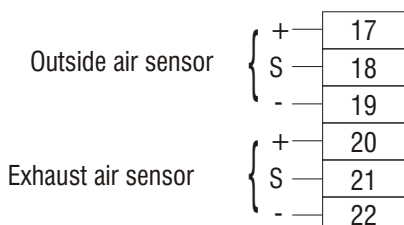
The sensors must be installed as illustrated. When ordering, this function is indicated by the letter "B" (see page titled "Ordering controllers").

Mounting the sensor:

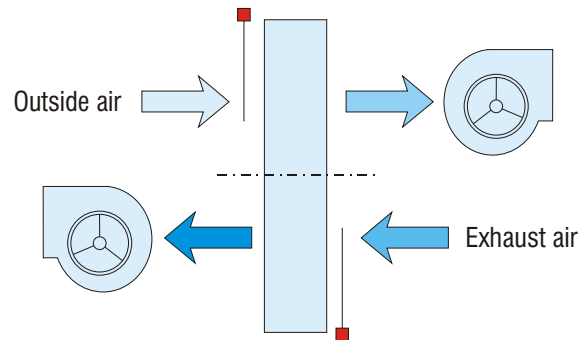


1.2 Enthalpy comparison "C"

The 200 mm long outside air and exhaust air rod sensors are connected to terminals 17, 18, and 19 (outside air sensor) and 20, 21 and 22 (exhaust air sensor) as shown in the following illustration.



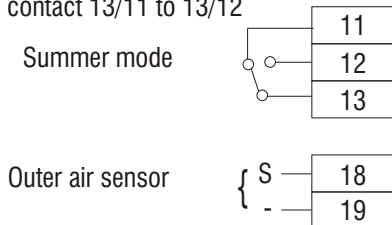
Mounting the sensor:



1.3 Outside temperature measurement "D"

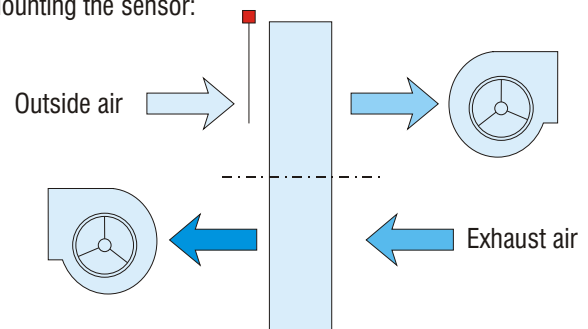
(summer change-over mode)

The 200 mm long outside air and exhaust air rod sensors are connected to terminals 18 and 19 (outside air sensor) on the options board as shown in the following illustration. When operating in summer mode, the summer mode relay switches from contact 13/11 to 13/12



The temperature sensor must be installed in the outside air. When ordering, this function is indicated by the letter "D" (see page titled "Ordering controllers").

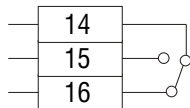
Mounting the sensor:





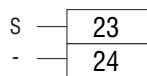
2. Sequence switch

The sequencer must be set in accordance with the activation value. The sequencer contact can support a maximum of 230 V and 1 A.

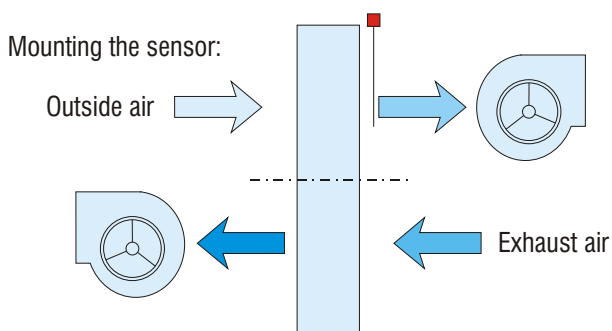


3. Connecting the supply air sensor "A"

The 200 mm resp. 2000 mm long supply air sensor type PT 1000 must be connected to the terminals 23 and 24 as illustrated.

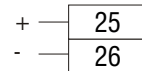


The temperature sensor should be installed behind the rotary heat exchanger on the supply air side. When ordering, this function is indicated by the letter "A" (see page titled "Ordering controllers").

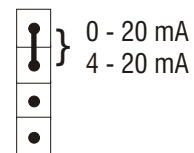


4. External control signal inputs

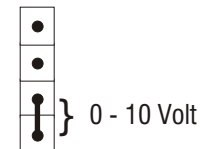
In the case of basic controllers with an installed options board, the external control signal input is located at the terminals 25 and 26.



In order to process a signal of 0-20 mA or 4-20 mA, the two pins must be jumped as illustrated.



In order to process a signal of 0-10 Volt, the two pins must be jumped as illustrated.



Ordering a controller



The KR controllers for regenerative heat exchangers are available in two sizes:
 KR4 = 400 Watt und KR7 = 750 Watt

The basic controller can be upgraded using an options board. Certain functions require additional sensors (see below).

Basic controller:
 Control signal inputs
 Speed display
 Fault output
 Intermittent operation
 Motor thermal protection
 Rotation monitor

- basic controller
 - controller output
 - rotation monitor *)

KR 4 R
7

Basic controller

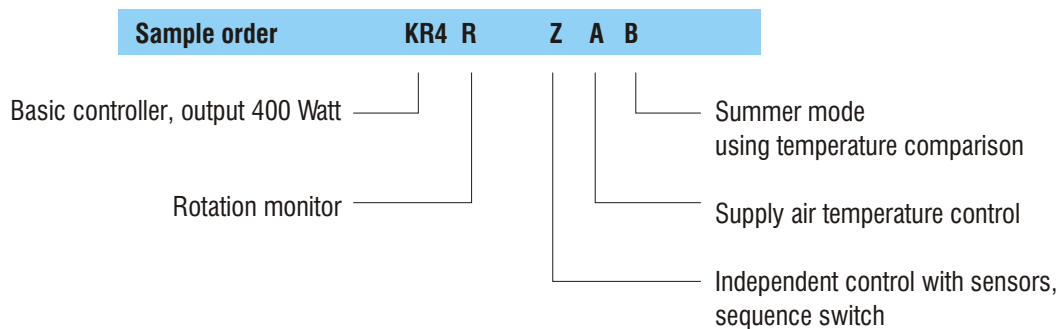
Additional functions:
 Sequence switch
 Supply air temperature control
 Summer mode

- additional functions
 - supply air temperature control
 - summer mode

Z **A** **B** using temperature comparison
C using enthalpy comparison
D using outside temperature measurement

Additional functions

*) see basic controllerr



Required additional sensors for optional features

- Supply air temperature control
1 sensor in the supply air
- Summer mode using temperature comparison
2 sensors
- Summer mode using enthalpy comparison
2 sensors
- Summer mode using outside temperature measurement
1 sensor

Putting in operation of control units KR4 / KR7



All functions on the KR controller can be accessed using the three keys. The left-hand and the right-hand keys are used to select options. The centre key is used to confirm entries. Programming is initiated by pressing all three keys simultaneously.



1. Commissioning

Once turned on, the display shows

S F : 0 0 H z I F : 0 0 H z

If the following messages appears,

Hardware err: E X X

Contr. blocked!

Motor temp!

then the system must be checked according to the message display.

Begin by pressing all three keys at the same time. After about 5 sec. the display shows the message

Motor stop!

After that, the following message appear

Please wait!

After the motor has come to a complete stop, the controller guides you through the menu items.

Guide to menu items

You can set the display language to either English or German. To change the display language, use the selection keys

Deutsch

English

Confirm your choice with the Enter push-button.

After that, the following message appears:

Manual operation

External drive

As before, you select by means of the selection push-buttons and confirm by depressing the "Enter" push-button.

Corresponding to your selection, the control unit leads you through the series of inquiries "Manual operation" or "External operation", as described in the following.

Manual operation

The display shows:

Man. frequ: 00 Hz

By depressing the selection push-button, a frequency can be determined. At 80 Hz, the rotor will run a standard 10 rpm.

Attention: Contact with live elements even after the power supply has been cut can be life threatening. Please wait 15 minutes!



External operation

After having determined “External operation”, the following display is shown:

Start point: 05%

The Control Unit is pre-set to 5%, in spite of this it is possible that an unwanted running of the rotor could be caused on account of interference voltages. By increasing this voltage rate, this can definitively be prevented. Acknowledgement is carried out by depressing the Enter push-button. The following display then appears:

Cleaning on
Cleaning off

In case “Cleaning on” is selected, the value is pre-set to 20 minutes.

Clean int 40min

The cleaning run is set in a cyclic mode between 40, 60, 80 and 100 minutes. The cleaning run ensures that the rotor revolves regularly by half a rotation when the control signal is set to 0 V for a prolonged period of time. The control unit must, however, be released. By multiple depressing of the selection loads, the intervals will change. Confirm by depressing the Enter push-button.

Manual Operation / External Operation

The rotation of the rotor can be supervised by means of the rotation monitor. In case you have ordered a control unit with the option rotation monitor, you will select

Runcontrol on

In case the Control Unit is not equipped with a rotation monitor, you will select

Runcontrol off

The ON/OFF switching of the rotation monitor is effected via the selection push-buttons, the confirmation by means of the Enter push-button.

During operation correct running is shown by the following display:

Runcontrol
SF: 80Hz IF: 80Hz

In order to accept the changes that have been entered at last, it is necessary to store them.

Store data?

In order to store the data, depress the “Enter” push-button.

Stored!

By depressing the selection push-buttons instead of the “ENTER” push-button, the changes that have been entered at last are deleted and the previous menu items are active again.

Not stored!

The control unit returns into its normal operation mode.

In the case of manual operation, the display shown is as follows:

HF: Hz IF: Hz

In order to start or to stop the controller in the case of manual operation, depress the “ENTER” push-button. The selected rotational speed is justified.

In the case of external operation, the display shown is as follows:

SF: Hz IF: Hz

Attention: Contact with live elements even after the power supply has been cut can be life threatening. Please wait 15 minutes!



Troubleshooting

Correct running and operation is shown by the following display

S F : 0 0 H z I F : 0 0 H z

If, however, the following display is showing

H a r d w a r e e r r : E 0 1

you will have to check the defect according to the following list.

H a r d w a r e e r r : E X X

- 01: Excess current (motor / rotor blocked; short circuit between U, V, W)
- 05: Overload (Control unit / motor overloaded)
- 09: Mains undervoltage
- 14: Earth fault
- 15: Excessive voltage in network
- 21: Excessive temperature at the power output stage, ambient temperature too high; control unit overloaded
- 99: Software error

The control unit is again ready for operation as soon as the trouble has been acknowledged by interruption of the mains voltage or by simultaneous pushing of the three push-buttons.

Trouble shooting for the basic control unit KR4 / KR 7

U n i t i s b l o c k e d

- Check fuse / Mains voltage

- Control unit is not enabled (ext. potential free contact closed)

M o t o r e x c . t e m p .

- Check the thermal protective contact
- Connect thermal protective contact at the control Unit.
- on contacts 5, 7 and 9 against ground (contacts 3 or 4) supply voltage of 24 V must exist.

If not: check trip line

R u n n i n g c h e c k

During operation with rotation monitor:

- Check distance of magnetic switch to the rotor
- Check connection of the magnetic switch at the control Unit
- Check if V belt has come off
- Check V belt tension

During operation without rotation monitor:

- Alter programming of the Control Unit (See Description of the item rotation monitor)

S F : 0 0 H z I F : 0 0 H z

- Check position of jumper according to the requirements
- Check if control unit signal is effective
- Check connection control signal at the control unit

Attention: Contact with live elements even after the power supply has been cut can be life threatening. Please wait 15 minutes!

Putting in operation control units with additional functions KR4 Z und KR7 Z



The leading through the menu items is the same as for controllers KR4 / KR7.

After the items "Manual operation" and "External operation" appears in addition:

Input temp. regul

After confirmation the following menu item appears:

Setpoint: °C

After adjusting the selected value between 0 and 40 °C and confirming entry with the Enter push-button, go to the menu item "Summer mode"

Summer mode

When selecting the summer operating mode, you can select among "Summer mode off", "Summer temperature comparison", "Summer enthalpy comparison" and "Outside air temperature measurement".

Summer funct. off

Summerswitch on

Summer Temp. comp

Summer Enth. comp

If you select "Summer mode off", the program will go to the menu item "Sequencer activation value" after you press the Enter push-button.

If you select one of the summer operation modes and confirm your entry with the Enter push-button, the following message appears:

Setpoint: °C

The selected temperature activates the summer operation and can be set in 1°C increments in a range from 18 - 42°C. After you have entered the desired reference temperature and confirmed with the Enter push-button, the following menu item will appear:

Switchpoint: x%

After confirmation continue as described for the controller KR4 / KR 7.

Trouble shooting / Trouble shooting for the controller with additional functions KR4 Z und KR7 Z

In case of the Z-controller, please note these additional search points.

Nature of problem:	Action:
Supply air control does not reply	Check sensor and connection. On the contacts 1, 17 and 20 against ground has to be a supply voltage of 10 V.
No summer operation mode	Check controller programming and connections

Please ensure that you state model and serial numbers of the rotary heat exchanger when making enquiries about your controller or its components.

Attention: Contact with live elements even after the power supply has been cut can be life threatening. Please wait 15 minutes!

Summary of features



Basic controller KR4

KR4 = 400 Watt
for rotor diameters smaller than 3760 mm
KR controller as frequency inverter with control unit
Processor technology
3 touch key with display for programming settings and showing function and error messages
IP 54 - aluminium case
External signal inputs
Fault indicator
Intermittent operation
Thermal protection relays

Optional:

Rotation monitor with sensor => KR4 R

Basic controller KR7

KR7 = 750 Watt
for rotor diameters greater than or equal to 3760 mm
KR controller as frequency inverter with control unit
Processor technology
3 touch key with display for programming settings and showing function and error messages
IP 54 - aluminium case
External signal inputs
Fault indicator
Intermittent operation
Thermal protection relays

Optional:

Rotation monitor with sensor => KR7 R

Controller with additional functions KR4 Z

KR4 = 400 Watt
for rotor diameters smaller than 3760 mm
KR controller as frequency inverter with control unit
Processor technology
3 touch key with display for programming settings and showing function and error messages
IP 54 - aluminium case
External signal inputs
Fault indicator
Intermittent operation
Thermal protection relays
Sequence switch

Optional:

Rotation monitor with sensor => KR4 RZ
Supply air temperature control - 1 sensor
Summer mode: temperature comparison - 2 sensors
Summer mode enthalpy comparison - 2 sensors
Summer mode: outside air temperature measurement - 1 sensor

Controller with additional functions KR7 Z

KR7 = 750 Watt
for rotor diameters greater than or equal to 3760 mm
KR controller as frequency inverter with control unit
Processor technology
3 touch key with display for programming settings and showing function and error messages
IP 54 - aluminium case
External signal inputs
Fault indicator
Intermittent operation
Thermal protection relays
Sequence switch

Optional:

Rotation monitor with sensor => KR7 RZ
Supply air temperature control - 1 sensor
Summer mode: temperature comparison - 2 sensors
Summer mode enthalpy comparison - 2 sensors
Summer mode: outside air temperature measurement - 1 sensor

Safety and Warning Instructions



Please read the Product manual carefully and observe all safety and warning instructions, before the installation and putting into operation of the frequency transformer. Keep this Product Manual always at your finger tips in the vicinity of the frequency inverter.

Definition of the instructions:

Warning! In the case of non-observance of these instructions, death, severe injuries or considerable damage may occur.

Attention! In the case of non-observance of these instructions, slight injuries or damage may be incurred.

General

Warning! During operation ensure that the power supply is constant.

This frequency inverter generates dangerous electric voltages and controls rotating components that may become dangerous. In the case of non-observance of the instructions in this Manual, death, severe injuries or considerable damage may be incurred.

The installation, putting into operation and maintenance of these drives is permitted to be undertaken only by technically suitable persons who are completely familiar with the mode of operation of the equipment and of the machine.

The devices are equipped with intermediate circuit capacitors which have dangerously high voltage rates even after having been disconnected from the mains. You must wait at least fifteen (15) minutes after having disconnected the voltage before you can open the device and start working. It is important to note that no live components are contacted. The earthing safety measures serve only the protection of the frequency inverter and not for the protection of persons. Three-phase frequency transformers are - according to VDE 0160 - not allowed to be connected with current-operated earth-leakage circuit breakers because in the case of a possible direct current component (direct current load). In the case of such trouble the sensitivity of the current-operated earth-leakage circuit breaker is reduced. As a protective measure, the regulations of VDE 0160 are to be observed.

Warning! Earth the frequency inverter at the connection provided for this purpose.

Warning! Do not come into contact with your hands or objects components within the enclosure - when the device is connected to the mains or if the intermediate circuit is still not discharged. Do not work at the wires and do not check any signals as long as the device is connected to the mains.

Be particularly careful when the automatic restarting device is activated. Install on the mains side a switch which is inactivated in the case of a mains failure and which can be switched on when voltage becomes available again only by manual operation, in order to prevent injuries through uncontrolled restarting of the frequency transformer after a mains failure. Earth the frequency transformer at the corresponding connection.

Warning! Make sure that the input voltage complies with the voltage stated on the type plate of the machine. Influences of the environment, such as high temperatures, air humidity are to be avoided in the same way as dust, oil and aggressive gases. The place of installation should be a well ventilated location not exposed to direct sun rays. Install the device at a vertical, fire-resistant wall which does not transmit any vibrations. Do not connect any mains voltage to the terminals U/T1, V/T2, W/T3.

Please contact the manufacturers of the motors or machines when standard motors with frequencies >60 Hz are to be operated.

All frequency transformers are tested regarding voltage resistance and insulation resistance measurements. Insulation resistance measurements are allowed to be carried out, e.g. in the scope of inspections, only between the power terminals and the ground. Do not carry out any insulation resistance measurements at the control terminals.

Enter the operation signals START / STOP via the control terminals or the control panel and not by switching the mains or motor contactor. Do not install any capacitors or excess voltage distribution-type arresters into the motor input lines.

Attention! In order to safeguard safe and reliable functioning of your Klingenburg Frequency inverter, all applicable safety regulations, e.g. accident prevention regulations, VDE regulations, etc. must be strictly observed. On account of the fact that these regulations are differently handled in various countries, the user is required to observe the requirements which are applicable in his case. Klingenburg GmbH cannot warrant the user from the duty to exactly follow the latest safety regulations applicable in his case.

The technical data and descriptions in this Operation Manual have been compiled according to our best knowledge. Product improvements are introduced all the time - Klingenburg GmbH reserves the right, for this reason, to carry out such alterations without prior notification.

The instructions in this Operation Manual have been compiled with great care. Should, in spite of everything, defects or damage be incurred through the utilization of these instructions, then Klingenburg GmbH cannot be held responsible for any damage of this type.



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