

AIR CURTAINS CONTROL AND AUTOMATICS

A decorative graphic consisting of a series of overlapping squares and diamonds, arranged in a curved line that tapers to the right. The shapes are light gray and semi-transparent, creating a sense of depth and movement.

1. REVIEW OF AUTOMATICS ELEMENTS

Using the automatic systems for air curtains we keep the required air parameters at lower object exploitation costs. The automatics task is to restrict at the most human impact on direct operation of those systems in order to restrict the system operation only to setting the parameters of required conditions. All other elements should be ensured by the automatic regulation system.

The automatics system for curtains is optionally equipped with:

- 1.1. Supply – control box: ZS.../1
- 1.2. Revolutions controller: ARW/FA or RTRD
- 1.3. Room thermostat: TP/room thermostat with TPP time programmer
- 1.4. Valve: V
- 1.5. Valve servo-motor: MVK

1.1. ZS-..../1 SUPPLY-CONTROL BOX

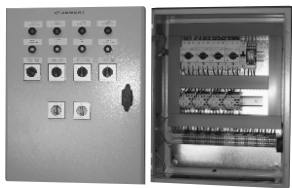
This box is intended to supply and control the curtain operation with single or three-phase motors.

It's equipped with the following components:

- main switch
- overcurrent breakers
- contactors
- relays
- operation switches (auto/manual/stop)
- signal lamps (operation//malfunction)

Used connecting equipment manufactured by the top producers of electro-installation equipment ensures high operational efficiency level of the switchgears and it's placed in the module panels behind the frontal shields, whereas from the outside only the drives levers, regulation hand wheel and signal equipment are accessible. Internal connections are completely shielded and protected, whereas service personnel can conduct inspections and exploitation activities safely. Among the advantages of such box you can find the following features: big space for installing and connecting the cables for bypass clamps, high safety, easy and simple servicing, maintenance as well as safe and operational friendly construction. The size of the box depends on the quantity of curtains connected to the box (one or two curtains can be connected to one box)

Fig. 1.1 ZS Boxes dimensions

Box Type	ZS-1/1	ZS-2/1	
Height [mm]	240	280	
Width [mm]	160	200	
Depth [mm]	125	125	

As a standard, the boxes are adapted to operate with MVK valve servo-motor, thermostat (TP or TPP) or with the limit switch (door type). The electric connection should be made in accordance with delivered set-up guide and adjustment manual. Box should be supplied from the main switchgear equipped with main switch and differential protection.

ZS (-1; -2)/1 boxes are adapted for operating the curtains with single-phase fans (1~230V) and with three-phase fans (single-speed)

DESIGNATIONS

Supply-control box

ZS - 1 | 1

Number of connected curtains 1;2

Curtain type 1-single phase, three-phase single-speed

1.2. TRANSFORMER MOTOR REVOLUTIONS GOVERNOR

Transformer, 5-speed revolutions governors ARW (-1,-2,-3) (1~230V/50Hz); FA...(5;11-;15) (1~230V/50Hz) or RTRD (-2,-4,-7)(3~400V/50Hz) enable air efficiency and thermal power control. All the revolutions speeds are chosen manually. Governors are delivered in three sizes. The sizes differ by the supply method and the nominal current value. Governor type selection for a given curtain should be done according to the tables: from 3.1. to 3.6.

Fig 1.2a ARW revolution governors parameters
Electric connection diagram see fig. 4.1


Governor type	ARW-1,2	ARW-3	
Voltage [V]	230	230	
Nominal current [A]	1,2	3	
IP	21	21	
External dimensions [mm]	123x77x71	173x90x89	

Fig. 1.2b FA revolution governors parameters
Electric connection diagram see fig. 4.2

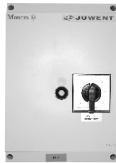

Governor type	FA-5	FA-11	FA-15	
Voltage [V]	230	230	230	
Nominal current [A]	5	11	15	
IP	21	21	21	
External dimensions [mm]	280X200X160	280X200X160	480X270X170	

Fig. 1.2c RTRD revolution governors parameters
Electric connection diagram see fig. 4.3

Governor type	RTRD-2	RTRD-4	RTRD-7	
Voltage [V]	400	400	400	
Nominal current [A]	2	4	7	
IP	54	21	21	
External dimensions [mm]	255X190X135	309X162X160	309X162X160	

Two curtains can be connected to one revolutions controller at most and it's necessary not to exceed the nominal currents of given controller. FA and RTRD governors have the motor thermal protection circuit controlled by the signal from the TK sensor installed in the motor windings.

Governors have to be supplied from the main switchgear equipped with the main switch and differential-shorting protection.

1.3. TP OR TPP ROOM THERMOSTAT

TP room thermostat (on-off) enables setting the required temperature with the hand wheel in the room within the range of 8...30°C, whereas TPP room thermostat (on-off) enables setting the required temperature on LCD display in the room within the range of 8...35°C in the day and night mode.

Fall of the temperature in the room below the set value causes that the thermostat sends the signal to open the valve and switches the fan on. If the temperature in the room will exceed the set value, then the thermostat is switched over and sends the signal to close the valve and switches the fan off.

Fig 1.3.a. TP room thermostats parameters
Electric connection diagram see fig. 4.4



Supply voltage	24..250V AC	
Measurement range	8...+30°C	
Contacts ampacity	6(2)A	
Protection class	IP30 or IP65	

Fig 1.3.b. TPP Room thermostats parameters
Electric connection diagram see fig. 4.5

Supply voltage	2 baterie 1,5V	
Measurement range	5...+35°C	
Contacts ampacity	5(2)A	
Protection class	IP30	


1.4. V VALVES

Separating valves have wide application in the curtains in regulation of the heating medium flow through the heaters, in case of the air curtains are applied the three-way valves with V20 and V25 internal thread are applied.

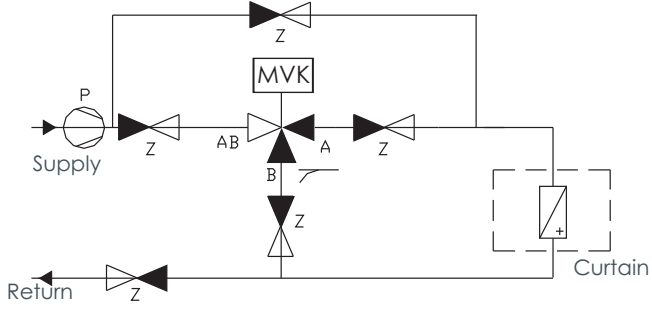
Medium flow depends on the signal from the thermostat/limit switch. Flow direction is permitted only toward the determined direction AB->A or AB-> B. System regulation with use of the valve consists in such valve adjustment to obtain the determined medium flow through the valve what will have the impact on the heated air temperature. Adjustment of the valve spindle in required position is enabled by the servo-motor installed on the valve. Valves should be installed on the supply line.

Selection of the valve type for a given curtain should be done according to the tables: 3.1. – 3.6.

Fig. 1.4. V valve

Symbol	DN	k _{vs} , m ³ /h	t[°C]	PN	
V20	20	3,5	1..110	16	
V25	25	5	1..110	16	

Fittings:
 Z: cut-off valve: manual
 P: circulating pump
 MV: three-way adjusting valve controlled with the servo-motor



1.1. MVK VALVE SERVO-MOTOR

Servo-motor mounted directly on the valve enables the "on-off" valve adjustment (with the help of TP/TPP valve or limit switch). So the position (protruded) of the servo-motor spindle is proportional to the command signal value from the thermostat/limit switch.

Fig. 1.5. Valve servo-motor: MVK
Electric connection diagram see fig. 4.6

Type	on/off	
Supply voltage	230V AC	
Opening/closing time	40s	
Protection class	IP 30	

2. CURTAINS WITH ELECTRIC HEATERS

As the standard equipment of curtains with electric heaters we use the supply-control box to control the curtain and to work with limit switch or room thermostat. Box is supplied in the closed casing designed for mounting on the wall (surface) in the place enabling easy service. It's equipped with the following switches: three-level opportunity of switching the heating power and START/STOP switch.




3. AUTOMATICS ELEMENTS SELECTION TABLE

Table 3.1. Automatics selection for Silver curtains-- (-W;-Z) and GOLD-1-(-W, -Z) curtains. Electric connection diagram see fig. 4.7

Size	Length	Control box ZS-.../1	Revolutions controller			Servo-motor + valve		TP/TPP room thermostat
			FA-5	FA-11	FA-15	MVK+V20	MVK+V25	
SILVER-1	105/150/200	—	—	—	—	•	—	•
SILVER-2	170/210/250	—	—	—	—	•	—	•
SILVER-3	150/225	—	—	—	—	•	—	•
SILVER-3	300	—	—	—	—	—	•	•
GOLD-1	112/157/207	—	—	—	—	•	—	•

- optional equipment
- not applicable

SILVER or GOLD air curtains are as a standard equipped with integrated control system working with wireless infrared pilot (IR) see fig 3.1a, which is equipped with the following buttons:

Button function	Designation
On/off – switching on/off standby mode	
Operation mode without heater/ Operation mode with heater	
Heating power level option (electric heater) and fan efficiency	

Curtains are as a standard equipped with IR receiver and two signal diodes located on the front curtain wall (figure 3.1.b):

- two color diode: red color – STANDBY / green color - OPERATION
- diode: yellow color – operation with the heater

There is an optional opportunity of operating the SILVER curtains with the help of ZS boxes with built-in speed regulator, this option has to be specified in the order.

In the curtains with the electric heaters the heating power efficiency is chosen with the adequate efficiency level:

- low level – 1/3 of heating power
- middle level - 2/3 of heating power
- high level - 3/3 of heating power

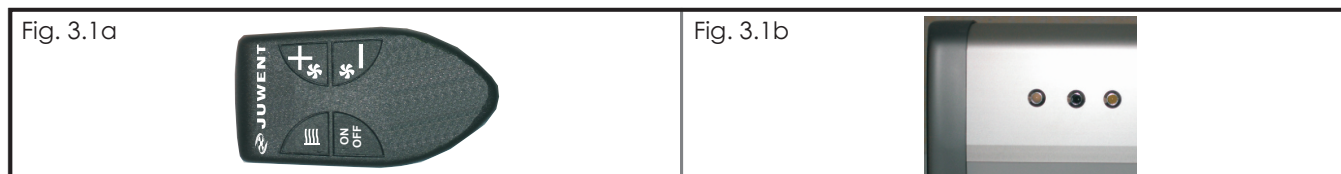


Table 3.2. The selection of automatics for KP/Dp...-(-W; -Z) curtains. Electric connection diagram see fig. 4.8.

Size	Control box ZS-.../1	Revolutions controller		Servo-motor + valve		TP/TPP room thermostat
		ARW-1,2	ARW-3	MVK+V20	MVK+V25	
KP/Dp-103	•	+	—	•	—	•
KP/Dp-171	•	+	—	•	—	•
KP/Dp-200	•	—	+	•	—	•

- + standard equipment
- optional equipment
- not applicable

Table 3.3 Automatics selection for KP/BB-.....-T-[-W;-Z]

Electric connection diagram see fig. 4.10

Size	Length	Control box ZS-.../1	Revolutions controller			Servo-motor + valve		TP/TPP room thermostat
			RTRD-2	RTRD-4	RTRD-11	MVK+V20	MVK+V25	
KP/BB-A-01	94	•	•	—	—	—	•	•
KP/BB-A-01	141	•	•	—	—	—	•	•
KP/BB-A-01	188	•	•	—	—	—	•	•
KP/BB-A-01	235	•	•	—	—	—	•	•
KP/BB-A-02	110	•	•	—	—	—	•	•
KP/BB-A-02	165	•	•	—	—	—	•	•
KP/BB-A-02	220	•	•	—	—	—	•	•
KP/BB-A-02	275	•	•	—	—	—	•	•
KP/BB-A-1	120	•	•	—	—	—	•	•
KP/BB-A-1	180	•	•	—	—	—	•	•
KP/BB-A-1	240	•	•	—	—	—	•	•
KP/BB-A-2	130	•	—	•	—	—	•	•
KP/BB-A-2	195	•	—	•	—	—	•	•
KP/BB-A-2	260	•	—	—	•	—	•	•
KP/BB-A-3	140	•	—	•	—	—	•	•
KP/BB-A-3	210	•	—	—	•	—	•	•
KP/BB-A-3	280	•	—	—	•	—	•	•
KP/BB-B-01	150	•	•	—	—	—	•	•
KP/BB-B-02	150	•	•	—	—	—	•	•
KP/BB-B-1	200	•	•	—	—	—	•	•
KP/BB-B-1	300	•	•	—	—	—	•	•
KP/BB-B-2	200	•	—	•	—	—	•	•
KP/BB-B-2	300	•	—	•	—	—	•	•
KP/BB-B-3	200	•	—	•	—	—	•	•
KP/BB-B-3	300	•	—	—	•	—	•	•

• optional equipment — not applicable

Table 3.4 Automatics selection for KP/BB ECONOMIC-.....-T-[-W]

Electric connection diagram see fig. 4.10

Size	Length	Control box ZS-.../1	Revolutions controller			Servo-motor + valve		TP/TPP room thermostat
			RTRD-2	RTRD-4	RTRD-11	MVK+V20	MVK+V25	
KP/BB ECO.-A-1	120	•	•	—	—	—	•	•
KP/BB ECO.-A-1	180	•	•	—	—	—	•	•
KP/BB ECO.-A-1	240	•	•	—	—	—	•	•
KP/BB ECO.-A-2	130	•	—	•	—	—	•	•
KP/BB ECO.-A-2	195	•	—	•	—	—	•	•
KP/BB ECO.-A-2	260	•	—	—	•	—	•	•
KP/BB ECO.-A-3	140	•	—	•	—	—	•	•
KP/BB ECO.-A-3	210	•	—	—	•	—	•	•
KP/BB ECO.-A-3	280	•	—	—	•	—	•	•
KP/BB ECO.-B-1	200	•	•	—	—	—	•	•
KP/BB ECO.-B-1	300	•	•	—	—	—	•	•
KP/BB ECO.-B-2	200	•	—	•	—	—	•	•
KP/BB ECO.-B-2	300	•	—	•	—	—	•	•
KP/BB ECO.-B-3	200	•	—	•	—	—	•	•
KP/BB ECO.-B-3	300	•	—	—	•	—	•	•

• optional equipment — not applicable

Table 3.5 Automatics selection for KP/BB-.....-J-[-W;-Z]

Electric connection diagram see fig. 4.10

Size	Length	Control box ZS-.../1	Revolutions controller			Servo-motor + valve		TP/TPP room thermostat
			FA-5	FA-11	FA-15	MVK+V20	MVK+V25	
KP/BB-A-01	94	•	•	—	—	—	•	•
KP/BB-A-01	141	•	•	—	—	—	•	•
KP/BB-A-01	188	•	•	—	—	—	•	•
KP/BB-A-01	235	•	•	—	—	—	•	•
KP/BB-A-02	110	•	•	—	—	—	•	•
KP/BB-A-02	165	•	•	—	—	—	•	•
KP/BB-A-02	220	•	•	—	—	—	•	•
KP/BB-A-02	275	•	•	—	—	—	•	•
KP/BB-A-1	120	•	•	—	—	—	•	•
KP/BB-A-1	180	•	•	—	—	—	•	•
KP/BB-A-1	240	•	—	•	—	—	•	•
KP/BB-A-2	130	•	—	•	—	—	•	•
KP/BB-A-2	195	•	—	•	—	—	•	•
KP/BB-A-2	260	•	—	—	•	—	•	•
KP/BB-A-3	140	•	—	•	—	—	•	•
KP/BB-A-3	210	•	—	—	•	—	•	•
KP/BB-A-3	280	•	—	—	•	—	•	•
KP/BB-B-01	150	•	•	—	—	—	•	•
KP/BB-B-02	150	•	•	—	—	—	•	•
KP/BB-B-1	200	•	•	—	—	—	•	•
KP/BB-B-1	300	•	•	—	—	—	•	•
KP/BB-B-2	200	•	—	•	—	—	•	•
KP/BB-B-2	300	•	—	•	—	—	•	•
KP/BB-B-3	200	•	—	•	—	—	•	•
KP/BB-B-3	300	•	—	•	—	—	•	•

• optional equipment — not applicable

Table 3.6 Automatics selection for KP/BB ECONOMIC -.....-J-[-W]

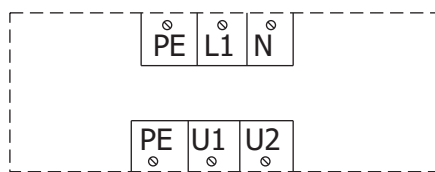
Electric connection diagram see fig. 4.10

Size	Length	Control box ZS-.../1	Revolutions controller			Servo-motor + valve		TP/TPP room thermostat
			FA-5	FA-11	FA-15	MVK+V20	MVK+V25	
KP/BB ECO.-A-1	120	•	•	—	—	—	•	•
KP/BB ECO.-A-1	180	•	•	—	—	—	•	•
KP/BB ECO.-A-1	240	•	—	•	—	—	•	•
KP/BB ECO.-A-2	130	•	—	•	—	—	•	•
KP/BB ECO.-A-2	195	•	—	•	—	—	•	•
KP/BB ECO.-A-2	260	•	—	—	•	—	•	•
KP/BB ECO.-A-3	140	•	—	•	—	—	•	•
KP/BB ECO.-A-3	210	•	—	—	•	—	•	•
KP/BB ECO.-A-3	280	•	—	—	•	—	•	•
KP/BB ECO.-B-1	200	•	•	—	—	—	•	•
KP/BB ECO.-B-1	300	•	•	—	—	—	•	•
KP/BB ECO.-B-2	200	•	—	•	—	—	•	•
KP/BB ECO.-B-2	300	•	—	•	—	—	•	•
KP/BB ECO.-B-3	200	•	—	•	—	—	•	•
KP/BB ECO.-B-3	300	•	—	•	—	—	•	•

• optional equipment — not applicable

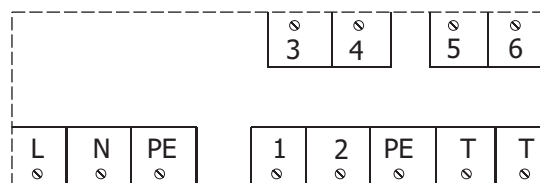
4. ELECTRIC CONNECTIONS DIAGRAMS

Fig. 4.1 ARW revolutions controller



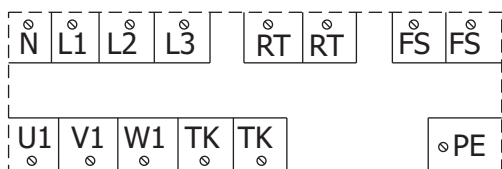
PE-L1-N Supply voltage
PE,U1,U2 Output voltage (control)

Fig.4.2 FA revolutions controller



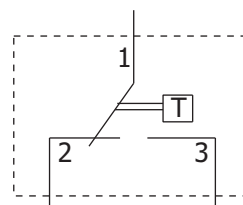
L-N-PE Supply voltage
1-2-PE Output voltage (control)
T-T Motor thermal protection circuit
3-4 Remote switching on/off (TP/TPP thermostat or limit switch)
5-6 Valve servo-motor

Fig. 4.3 RTRD revolutions controller



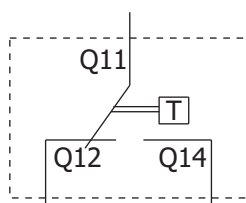
L1-L2-L3 Supply voltage
U1,V1,W1 Output voltage (control)
TK-TK Motor thermal protection circuit
RT-RT Remote switching on/off (TP/TPP thermostat)
FS-FS Frost protection thermostat

Fig. 4.4 TP Thermostat



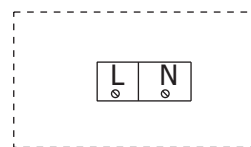
1-2 Heating
1-4 Cooling

Fig. 4.5 TPP Thermostat



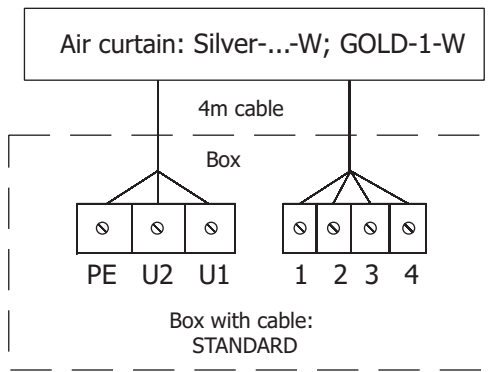
Q11-Q14 Heating
Q11-Q12 Cooling

Fig. 4.6 MVK Servo-motor

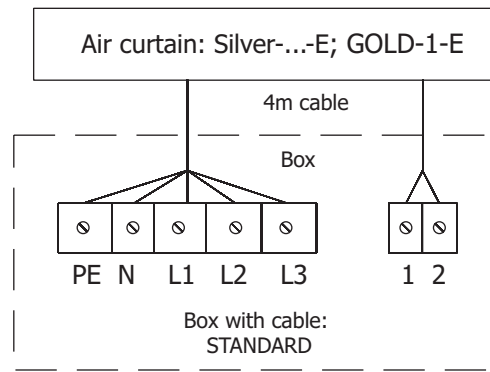


L-N Supply voltage 230V AC

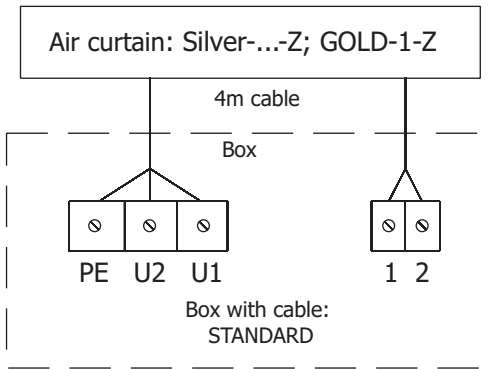
Fig.4.7 Bloc diagram of curtains connection: Silver-...-[-W;-Z;-E] and GOLD-1-[-W;-Z;-E]



PE, U2, U1 - Power supply (1~230V; U2-N; U1-L)
 1-2 - TP/TPP thermostat or limit switch
 3-4 - Valve servo-motor (3-N; 4-L)

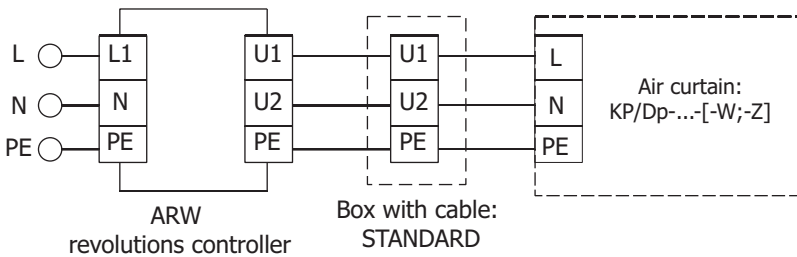


PE-N-L1-L2-L3 - Power supply (3~400V)
 1-2 - TP/TPP thermostat or limit switch

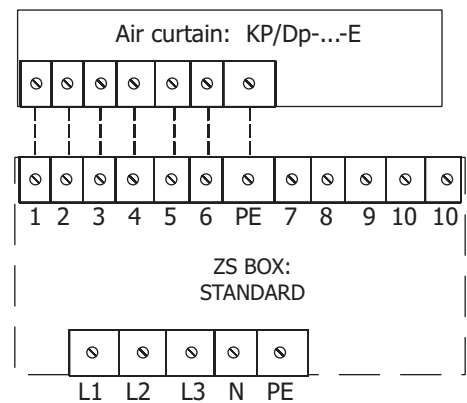


PE,U2,U1 - Power supply (1~230V; U2-N; U1-L)
 1-2 - TP/TPP thermostat or limit switch

Fig. 4.8 Bloc diagram of curtains connection: KP/Dp-...-[-W;-Z;-E]

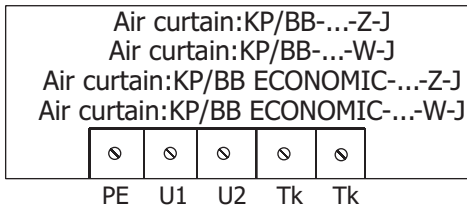


PE-L1-N - Supply voltage
 PE-U1-U2 - Output voltage

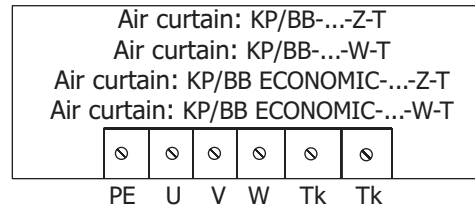


PE, N, U1, V1, W1 - Power supply (3~400V)
 1-2-3-4 - Heaters
 5 - Fan
 6 - Heater protection
 7-8-9 - Limit switch
 10-10 - TP/TPP thermostat

Fig. 4.10 Bloc diagram of curtains connection: KP/BB-...-[W;-Z;-][J;-T] and KP/BB ECONOMIC-...-W-[-J;-T]

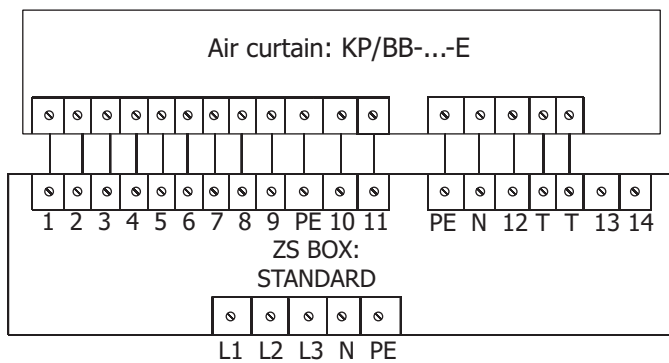


PE,U2,U1 - Power supply (1~230V; U2-N; U1-L)
Tk-Tk - Motor thermal protection circuit



PE-U-V-W - Power supply (3~400V)
Tk-Tk - Motor thermal protection circuit

Fig. 4.11 Bloc diagram of curtains connection: KP/BB-...-E-T



PE, N, L1, L2, L3 - Power supply (3~400V)
T- Motor thermal protection circuit
1-9-PE - Heater power supply
10-11 - Heater protection circuit
PE-N-12- Fans power supply
T-T - Motor thermal protection circuit
13-14 - TP/TPP thermostat or limit switch