

# Electrical operating instructions

**GB**

## Door Control Panel TS 960

(Design and functions subject to change)

51171098 / 10.2002



**ELEKTROMATEN®**



# OPERATING INSTRUCTIONS

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# SAFETY DIRECTIONS

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## Basic Directions

This control has been built in accordance with **EN 12453 Industrial, commercial and garage doors and gates - Safety in use of power operated doors - Requirements**; pr **EN 12978 Industrial, commercial and garage doors and gates - Safety devices for power operated doors - Requirements and Test methods** - and left the factory in perfect condition from the point of view of safety. To maintain this condition and to ensure safe operation, the user must observe all the directions and warnings contained in these operating instructions.

In principle, only trained electrical craftsmen should work on electrical equipment. They must assess the work which has been assigned to them, identify potential danger sources and take suitable safety precautions.

Reconstruction of or changes of this control Panel TS 960 is only permissible with the approval of the manufacturer. Original replacement parts and accessories authorised by the manufacturer guarantee safety. Liability ceases to apply if other parts are used.

The operational safety of this control Panel TS 960 is only guaranteed if it is used in accordance with the regulations. The limiting values stated in the technical data should not be exceeded under any circumstances (see corresponding sections of the operating instructions).

## Safety Regulations

During the installation, initial operation, maintenance and testing of the ELEKTROMATEN, it is necessary to observe the safety and accident-prevention regulations valid for the specific application.

In particular, you should observe the following regulations (this list is not exhaustive):

European normativ

- EN 12453  
Safety in use of power operated doors - Requirements
- EN 12445  
Safety in use of power operated doors - Test methods
- pr EN 12978 Industrial, commercial and garage doors and gates -  
Safety devices for power operated doors - Requirements and Test methods

Please check normative's bellow.

VDE-regulations

- DIN EN 418  
Safety machinery  
Emergency stop equipment functional aspects  
Principles for design
- DIN EN 60204-1 / VDE 0113-1  
Safety of machinery - Electrical equipment of machines - Part 1:  
Prescriptions générales
- DIN EN 60335-1 / VDE 0700-1  
Safety of household and similar electrical appliances - Part 1:  
General requirements



Regulations

- Please ensure that the local regulations relating to the Safety of Operations of Doors are followed

# SAFETY DIRECTIONS

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## Explanation of warnings

These operating instructions contain directions which are important for using the ELEKTROMATEN appropriately and safely.

The individual directions have the following meaning:



### **DANGER**

This indicates danger to the life and health of the user if the appropriate precautions are not taken.



### **CAUTION**

This warns that the ELEKTROMATEN or other materials may be damaged if the appropriate precautions are not taken.

## General warnings and safety precautions

The following warnings are to be understood as a general guideline for working with the ELEKTROMATEN in conjunction with other devices. These directions must be observed strictly during installation and operation.



- Please observe the safety and accident prevention regulations valid for the specific application.
- The ELEKTROMATEN must be installed with the authorised coverings and protective devices. Care should be taken that any seals are fitted correctly and screw couplings are tightened correctly.
- In the case of ELEKTROMATEN with a permanent mains connection, an all-pole main switch with appropriate back-up fuse must be provided.
- Check live cables and conductors regularly for insulation faults or breakages. When a fault is detected in the cabling, the defective cabling should be replaced after immediately switching off the mains supply.
- Before starting operation, check whether the permissible mains voltage range of the devices corresponds to the local mains voltage.
- With three – phase motor connection it must have right phase rotation

# FUNCTION OVERVIEW

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- Starter print with reversing contactor
- For ELEKTROMATEN up to 2,2KW at 400V/ 3 ph.
- main supply 400V/ 3ph.,
  - or 230V / 3 ph.,
  - or 230V/ 1 ph. ( monophase with symmetric winding)
- Delivered in dead-man mode, Open and Close Buttons ( for setting the limits)
- Self-hold open and dead-man mode close ( without safety edge control)
- Automatic open and close ( with safety edge connected)
- Automatic close feature after 60 sec. activated with slide switch ( DIP 3)
- On interrupting and re-making photo-beam, closing after 5 sec.
- Integrated Safety edge systems
  - 8K2 normally open contact
  - 1K2 normally closed contact
  - optical safety edge system (Fraba- OSE Type)
- Automatic recognition of safety edge system and operating status by LED´s
- 230v Supply for external devices (except supplies without neutral) load up to 1A
- 24V DC Supply for external devices, load up to 150 mA
- Plug for 5 pole motor connector
- Plug for spiral cable ( safety edge and shutter passdoor contact)
- Plug for foil keypad Open-Stop-Close
- Plug for 6 pole limits
  - Terminals for Emergency Stop (normally closed contact)
  - OPEN - limit (normally closed contact)
  - CLOSE - limit (normally closed contact)
  - Additional limit normally closed contact
- Additional limit S6 (intermediate stop or switching position of relay contact) normally closed
- Additional terminals for different signal emitters
  - Emergency STOP
  - Additional safety stop
  - external three push-button
  - Light barrier activates (Stop / Reversing function), time reset, time interruption 5 sec. after passed photo - beam.
  - One - channel impulse functions (e.g. Ceiling pull switch or radio control)
  - Key switch (latching) for intermediate Stop
- 1x potential free relay - output ( NC / NO ) output signal from aux. limit, e.g. signal lamp. If a signal lamp is in use, the potentialfree relay output is not available.
- Function mode 4 DIP switches
- Operating status indication by 6 LED's

## ENCLOSURE INSTALLATION

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Before mounting the enclosure, the surface has to be checked for flatness, slope and freedom from vibrations. Mounting must be vertical.

## MAINS SUPPLY (Fig.: Page 8)

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**Warning! This indicates danger to life through electric shock.**

Before starting assembly, disconnect the supply-cable from the electricity supply and check that the cables are dead.

The control panel TS 960 has a universal electric supply and works with the following supplies. (See diagrams Fig.1 - 5) (Page 8, Wiring diagram)

## FIRST INSTALLATION

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The control unit recognises a connectec pushbutton or light barrier automatically.

**A reset is requested:**

The general reset back to the delivery state of the controllers inputs, is made as in first installation ( DIP 1 = OFF) and a short push of the foil keypad STOP.



### **First installation**

On first installation the control is in set-up mode and only DEAD MAN operation is possible.

During the set-up the control checks and recognizes the safety edge system if it is plugged in and the connection of external push buttons.

# WIRING DIAGRAM: MAIN SUPPLY; SAFETY DEVICES

Fig. 1

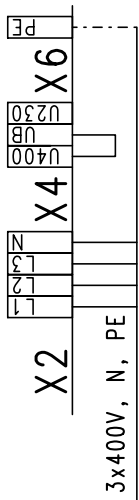


Fig. 2

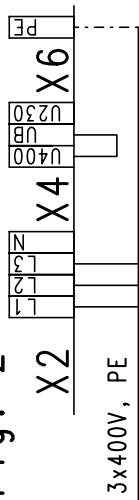


Fig. 3

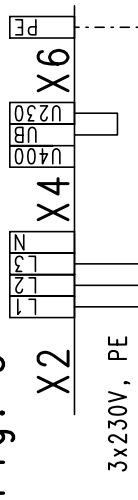


Fig. 4

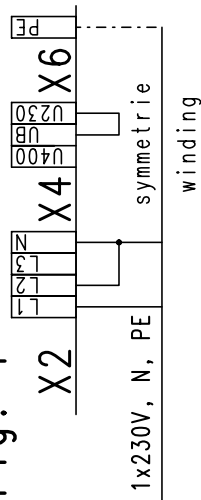


Fig. 5

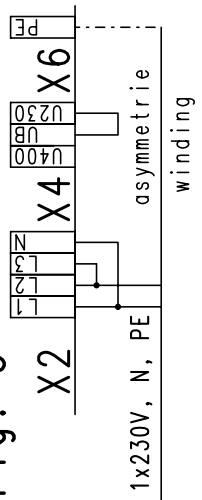


Fig. 6

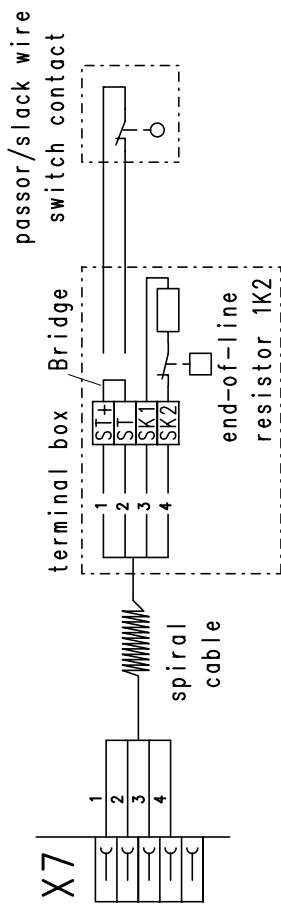


Fig. 7

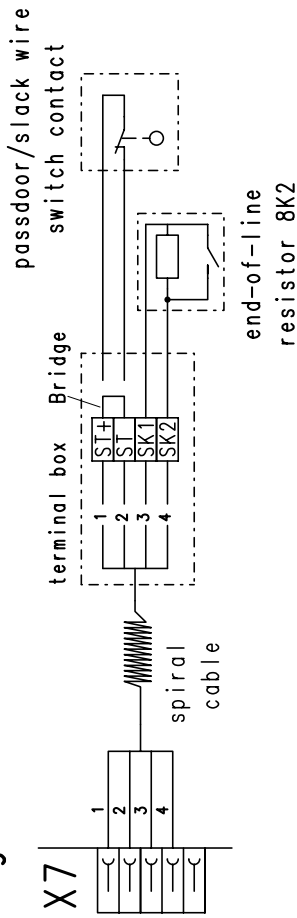
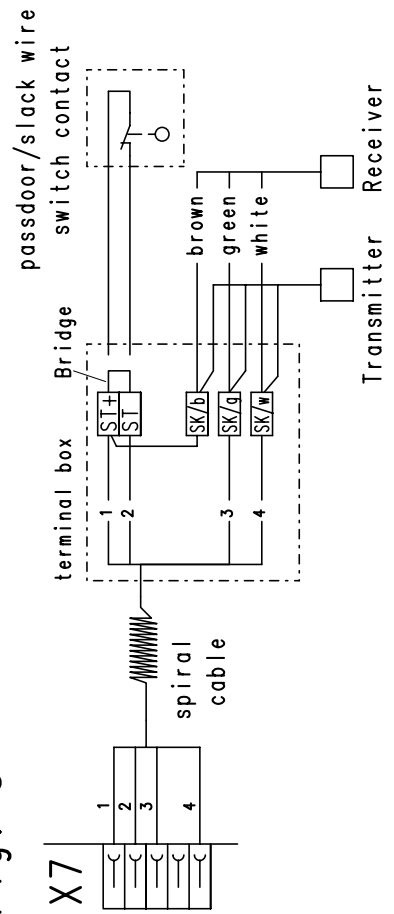
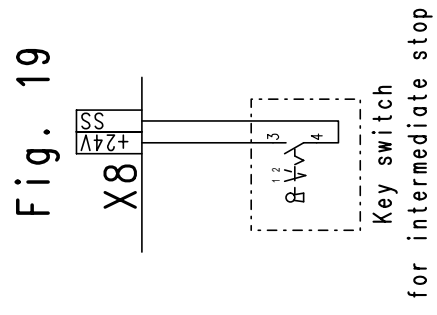
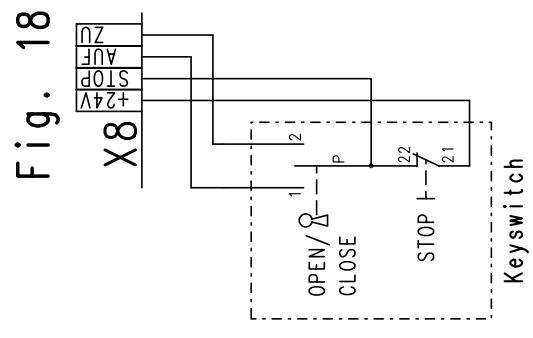
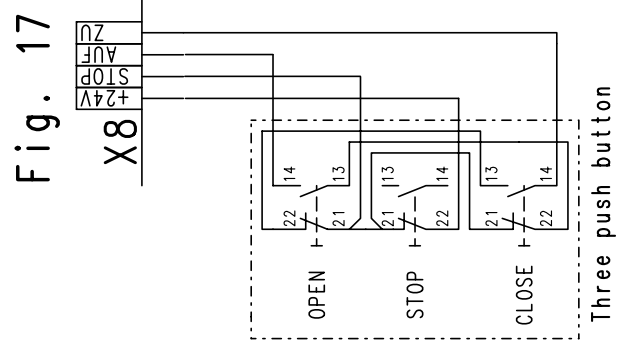
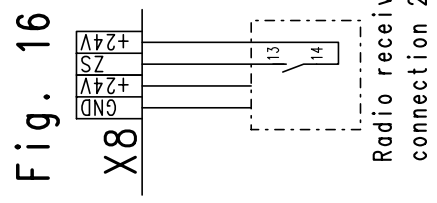
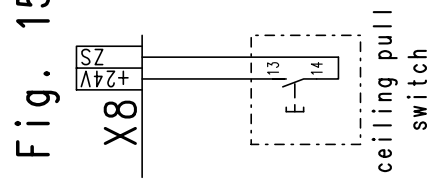
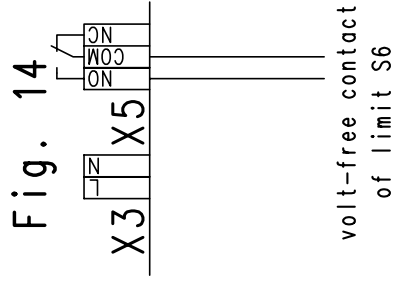
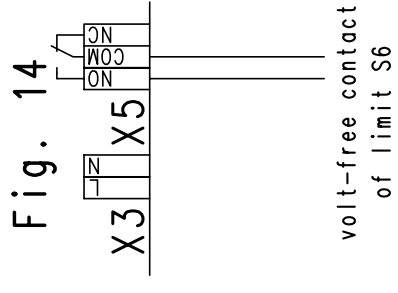
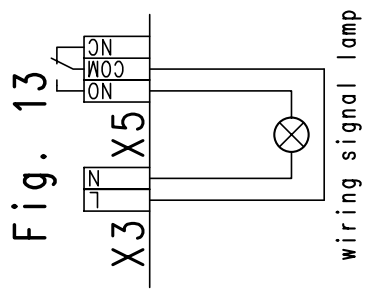
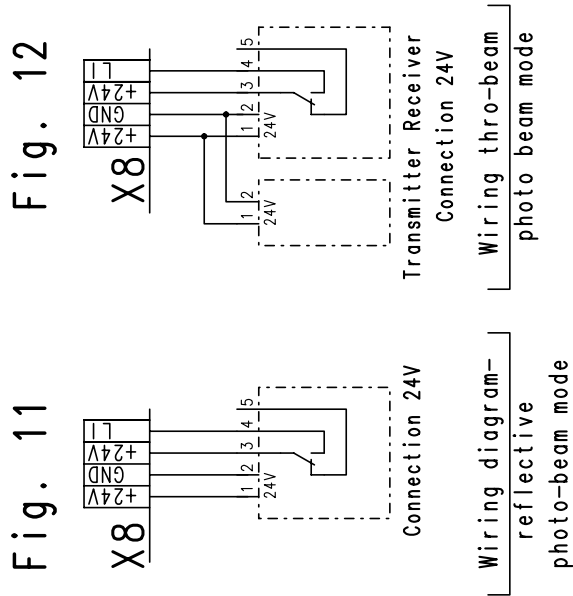
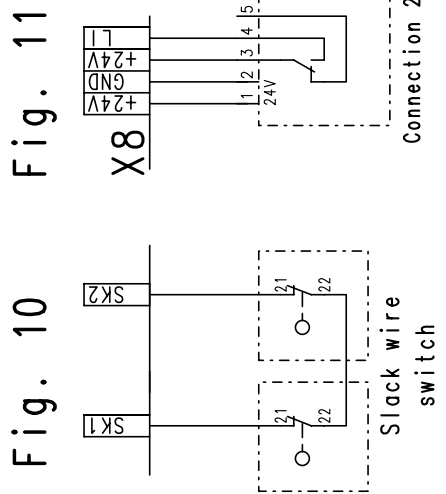
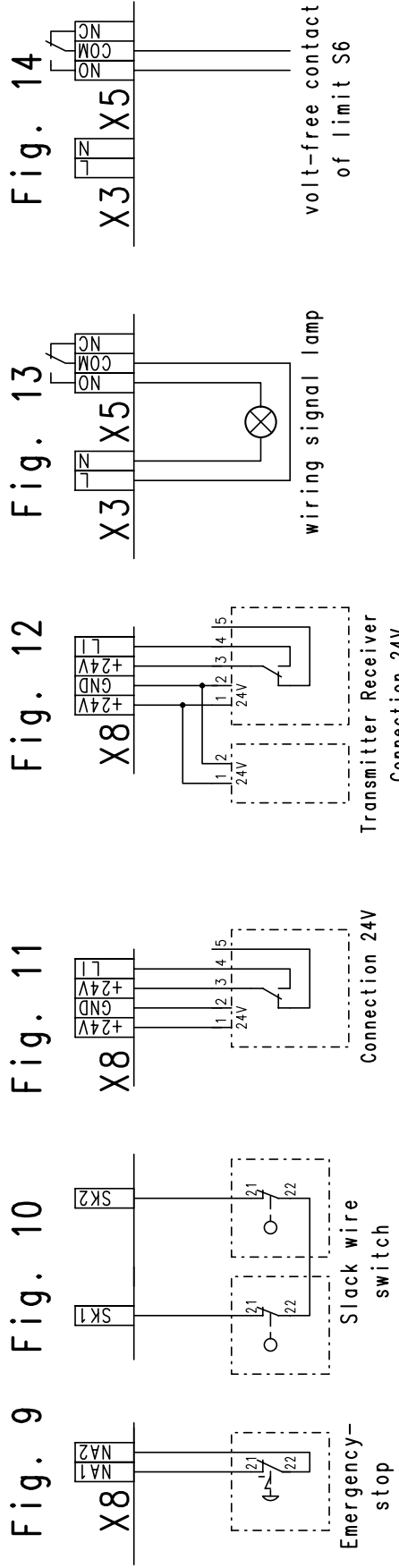


Fig. 8

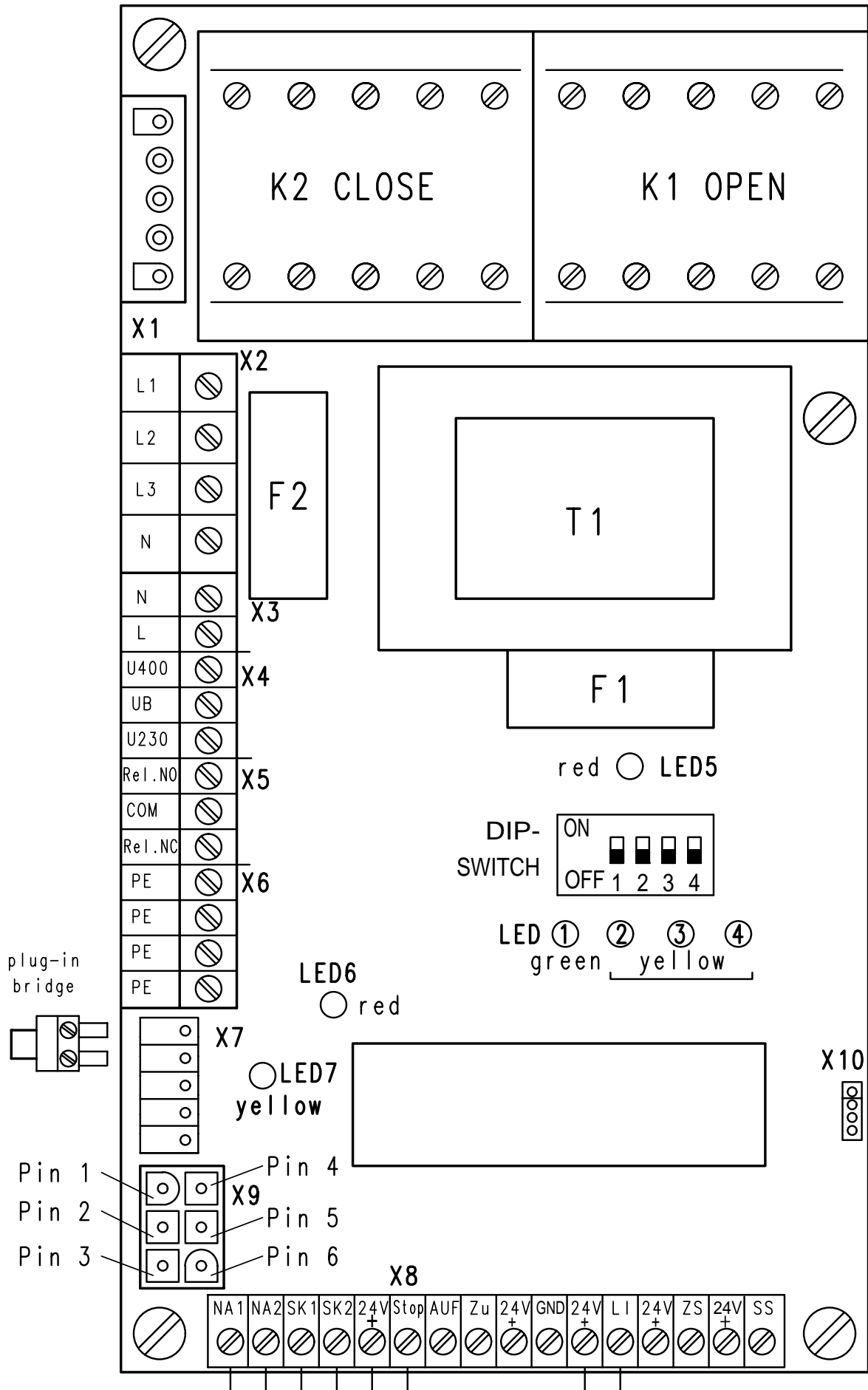




# WIRING DIAGRAM: SAFETY DEVICES; PUSHBUTTON



# HARDWARE OVERVIEW



# DESCRIPTION PRINT / DIP - SWITCHES

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- K1/K2** = Reversing contactors conforming to EN 12453, electrical interlocked  
**X1** = Motor connection  
**X2** = Mains supply  
**X3** = Connection external devices 230V  
**X4** = Voltage changing (230V / 400V)  
**X5** = Potentialfree relais contact  
**X6** = PE-terminal  
**X7** = Connection safety edge system  
**X8** = Connection pushbutton  
**X9** = Limit switch connection
- | Pin | - | Ader |                                                           |
|-----|---|------|-----------------------------------------------------------|
| 1   | - | 5    | supply + 24V                                              |
| 2   | - | 6    | S 5 aux. limit only for Testing of safety edge system     |
| 3   | - | 7    | open - limit                                              |
| 4   | - | 8    | S 6 aux. limit for intermediate Stop or switching contact |
| 5   | - | 9    | close limit                                               |
| 6   | - | 10   | safety circuit common limit                               |
- X10** = Connection foil keypad

## Function DIP - switches

The following operating modes are possible.

DIP-switches are delivered in OFF.

- DIP 1** dead man = **OFF** dead man - close and open  
= **ON** dead man close self-hold open
- DIP 2** Pre-warning signal light = **OFF** relay contact - switch contact S6  
= **ON** relay cont. flash pre-warning 3 sec.
- DIP 3** automatic closing = **OFF** no automatic closing  
= **ON** automatic closing after 60 sec.
- DIP 4** safety edge in Pre-limit area = **OFF** safety edge is activated after Pre-limit area (reaction stop)  
= **ON** safety edge is deactivated after pre-limit area (no reaction) Function for Folding Doors

# LED - STATUS

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## LED - operating status

Operating status indicators 7 LED's

LED	color	controled by	function	description
LED 1	green	Software	RUN-LED	<b>ON</b> : automatic mode blinking: stop flicker: general fault (defect)
LED 2 LED 3 LED 4	yellow	Software	safety edge	see function safety edge system
LED 5	red	Hardware	overload 24V	<b>OFF</b> : Standard mode <b>ON</b> : Fuse F1 control voltage blown
LED 6	red	Hardware	safety chain	<b>OFF</b> : Standard mode <b>ON</b> : Safety circuit is interrupted
LED 7	yellow	Hardware	pre limit S5	<b>OFF</b> : Pre-limit switch is contacted <b>ON</b> : Pre-limit switch is not contacted

## Information system error

LED 6 red	LED 1 green	LED 2 yellow	LED 3 yellow	LED 4 yellow	Status
off	off	on	on	on	reset, Microcontroller defect
off	off	off	off	on	RAM - fault
off	off	off	on	on	ROM - fault

## Operating status

LED 6 red	LED 1 green	LED 2 yellow	LED 3 yellow	LED 4 yellow	Status
on	blinking	changing modes			Emergency OFF
off	on	function see			operation
off	on short off	"safety edge´s modes"			operation, signal change to one input
off	blinking	off	off	off	defect e.g. limit not plausible
on	blinking	static			Emergency OFF

# LED - OPERATING STATUS

## Funcion safety edge system, light barrier

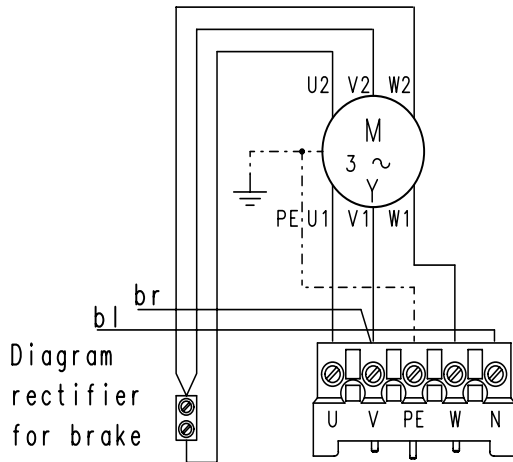
The type of safety edge system would be recognized automatically with connection of spiral cable. Operating status about three yellow LED's.

LED 2 yellow	LED 3 yellow	LED 4 yellow	Status photo beam and external Stop-button	Status safety edge 8K2
running light LED's			external Stop-button not activated	unknown
<b>LED 2</b> yellow (LED 3+4 permanently on)			<b>Status photo beam and external Stop-button</b>	<b>Status safety edge</b>
on, off each 2 sec.				el. Safety edge ready
1Hz in change with LED 1				short circuit
flicker with 8Hz				activated or short circuit spiral cable
off, on each 2 sec.			photo beam activated *)	el. Safety edge ready
on, off each 2 sec.			external Stop-button activated *)	el. Safety edge ready.
<b>LED 3</b> yellow (LED 2+4 permanently on)			<b>Status photo beam and external Stop-button</b>	<b>Status safety edge 1K2</b>
on, off each 2 sec.				DW-S ready
1Hz in change with LED 1				pneumatic testing negativ or short circuit spiral cable
flicker with 8Hz				activated or short circuit
off, on each 2 sec.			photo beam activated *)	DW-S ready
on, off each 2 sec.			external Stop-button activated *)	DW-S ready
(LED 2+3 permanently on)	<b>LED 4</b> yellow		<b>Status photo beam and external Stop-button</b>	<b>Status safety edge</b>
on, off each 2 sec.				opto safety edge ready
1Hz in change with LED 1				opto-safety edge fault
flicker with 8Hz				activated or short circuit
off, on each 2 sec.			photo beam activated *)	opto-safety edge ready
on, off each 2 sec.			external Stop-button activated *)	opto-safety edge ready

\*) If external stop-pushbutton or light barrier are not connected.

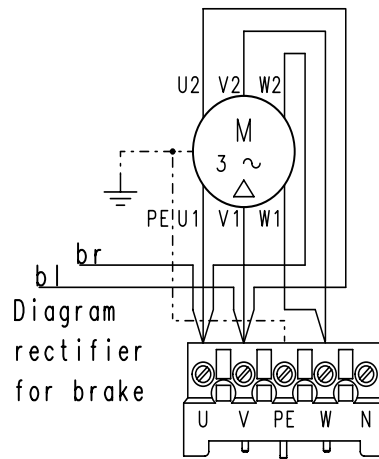
Reset: **DIP 1 OFF** and a short push of the foilkeypad **STOP**

# MOTOR CONNECTION

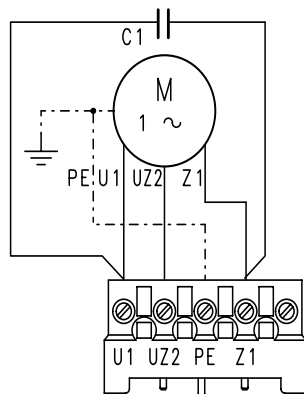


three-phase motor 3x400V AC,N, PE  
Star connection

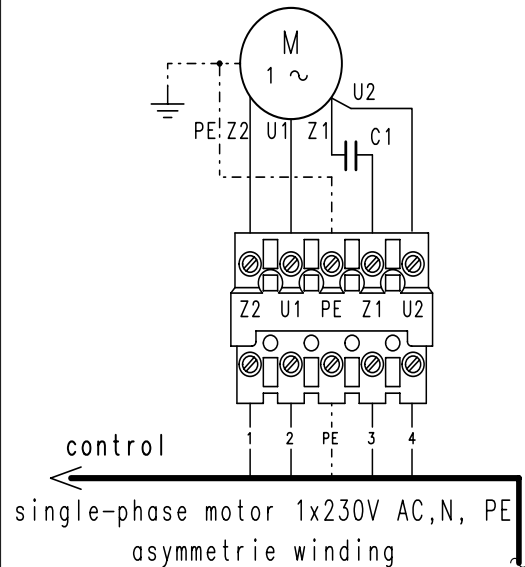
**ATTENTION!** When connecting a supply 3x400V with earth but no neutral, the brake rectifier should be connected to terminal V and the STAR POINT of the motor.



three-phase motor 3x230V AC, PE  
Delta connection



single-phase motor 1x230V AC,N, PE  
symmetric winding



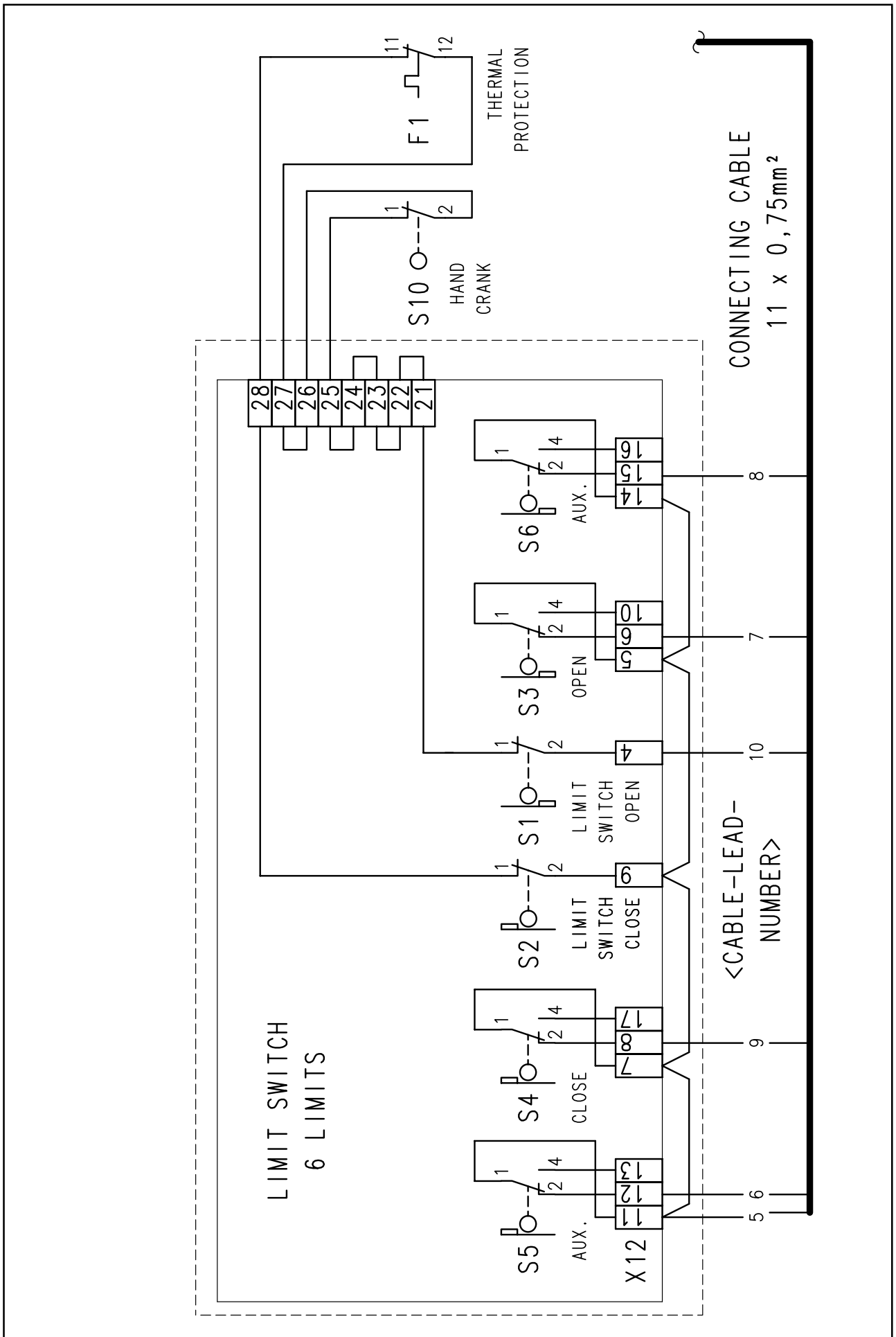
single-phase motor 1x230V AC,N, PE  
asymmetric winding



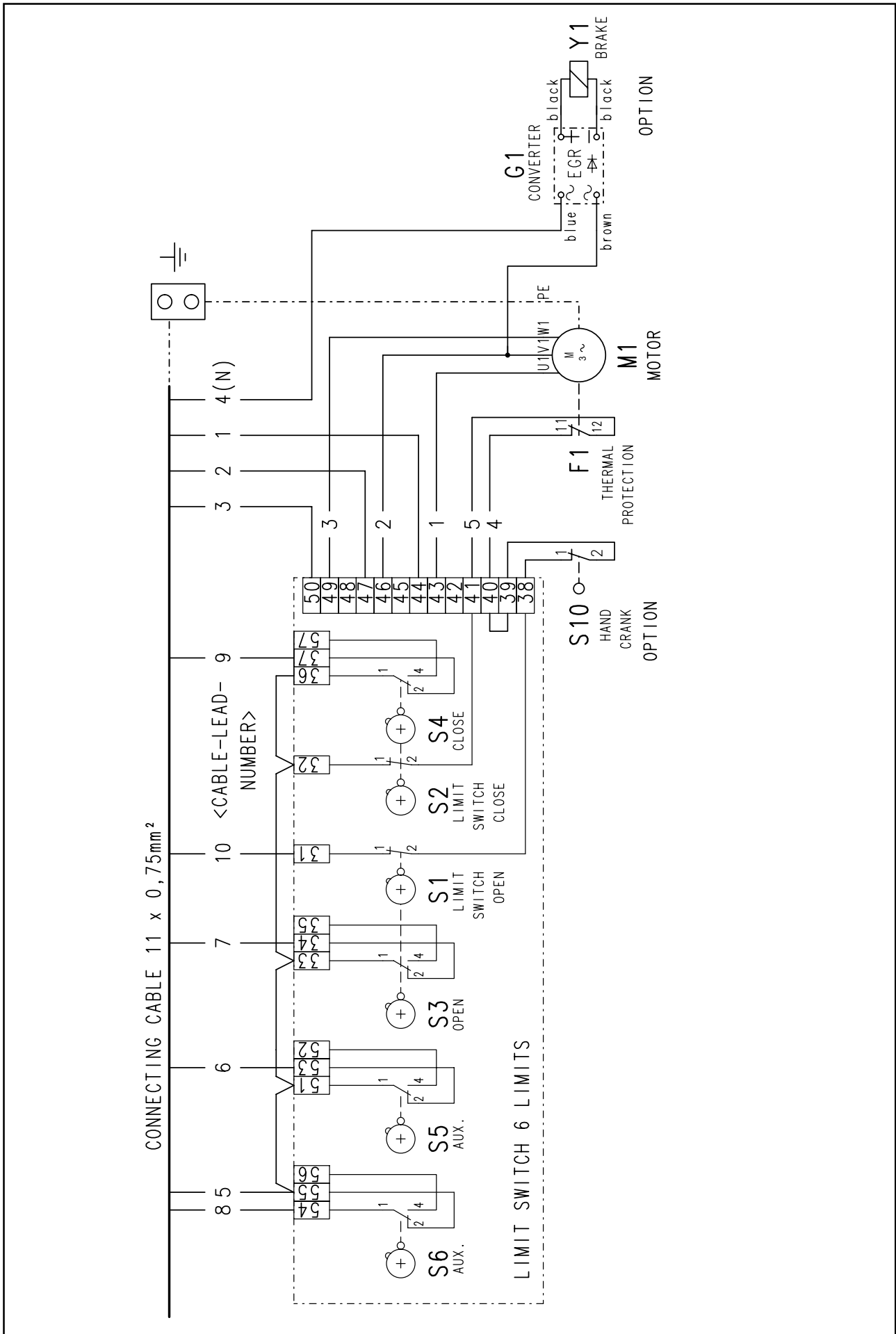
## Important Notice!

After the Mains supply has been connected by inserting the CEE plug in the appropriate socket or turning on the main switch, confirm that the phase rotation is correct by checking that the door opens when the OPEN push button is operated. If the door closes when operating the OPEN push button reverse two phases at the terminal X1.

# WIRING DIAGRAM LIMITS



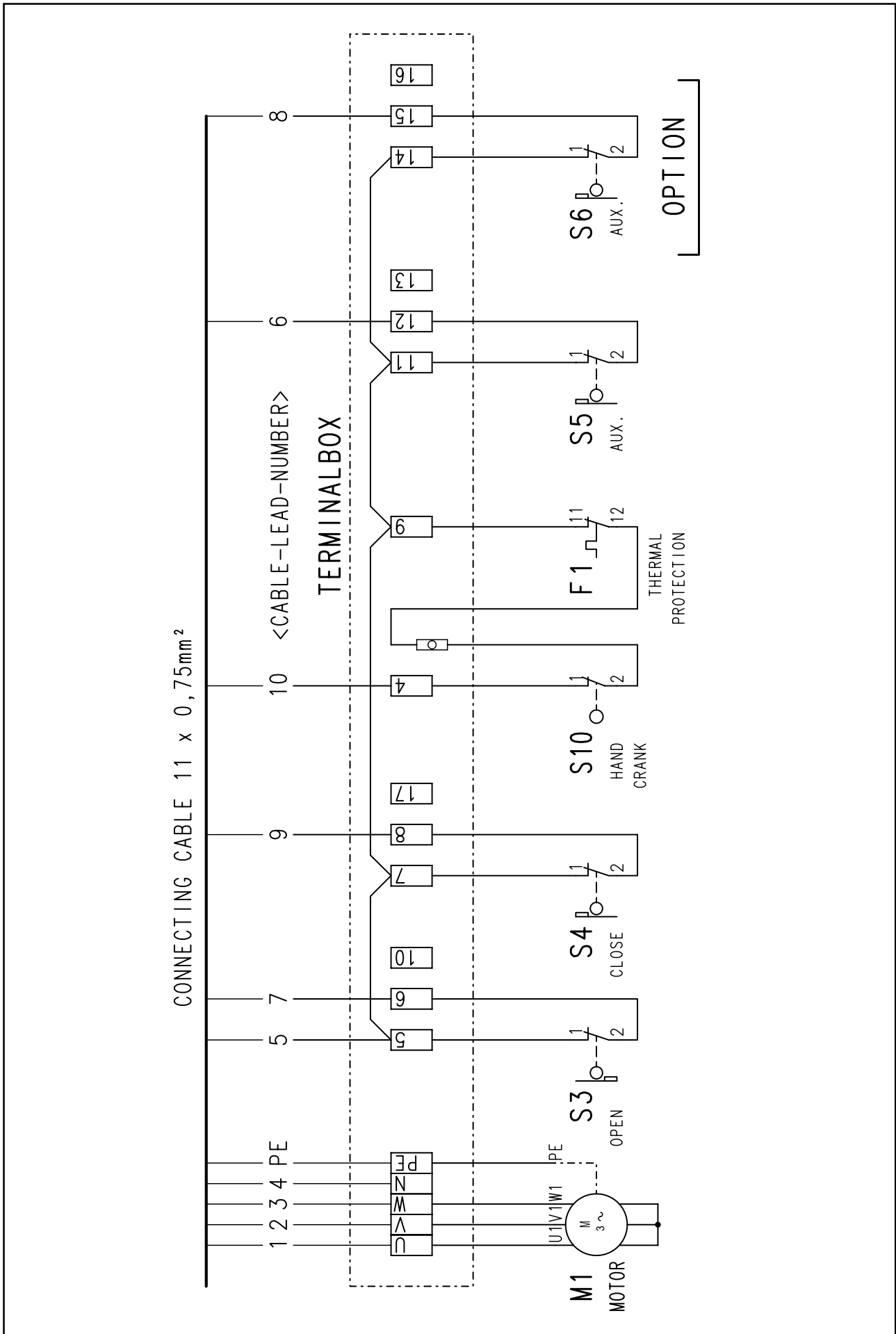
# WIRING DIAGRAM LIMITS PCB – print for hollow-shaft drive units up to delivery year 1997





# WIRING DIAGRAM LIMITS

## Folding – door ELEKTROMATEN



## SAFETY DEVICES (Fig.: Page 8)

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### Safety edge system with optional connection for shutter passdoor or slack wire switch contact.

The control recognizes and works with 3 different safety edges.

Each one needs a special 4 core spiral cable and includes an optional shutter passdoor or slack wire switch contact.

The spiral cable connection must be made on the print with the plug provided. The opposite side of the cable is connected to a terminal box or a signal (pressure switch) emitter.

- **Resistance evaluation 1K2 with normally closed safety edge contact** (safety edge with pressure wave switch and "Testing") **(Fig. 6)**
- **Resistance evaluation 8K2 with normally open safety edge contact** **(Fig. 7)**
- **Optical safety edge system (Brand Fraba)** **(Fig. 8)**



#### **Important note!**

When connecting a safety edge, take account of EN 12978 for Industrial, commercial and garage doors and gates - Safety devices for power operated doors - Requirements and Test methods.

### Mounting the spiral cable

A bush is provided on both sides of the control box for mounting the spiral cable.

Push the blue plugs through into the enclosure until there is sufficient cable to allow the blue plugs to be connected to the board. The plug with two cores must be connected to the passdoor or slack wire switch terminals. The three core plug must be connected to the safety edge terminal.

The control panel TS 960 recognizes on first installation the safety edge system being used.

**If passdoor / slack wire switch contact exists, remove bridge at terminal ST and ST+ in the terminal box. The plug at terminal X7 must be removed.**



#### **Important note!**

When using a safety edge system the limit S5 must be set. Close the shutter and stop it 5 cm before the end position, now set limit S5.

## SAFETY DEVICES (Fig.: Page 8)

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### Resistance evaluation 1K2 with normally closed safety edge contact (Fig. 6)

This evaluation system is made for pressure-wave switches (N/C) within an end-of-line resistor of 1K2  $\pm$  5% 0,25W.

A pressure wave is generated by compressing the rubber profile, which is conducted to the pressure-wave switch through the plastic hose. The system should be tested in the CLOSE position. The limit S5 must be set to activate "Testing function".

For adjusting the testing function, CLOSE the shutter and stop max. 5 cm before the end position, now set limit S5.

When shutter runs over the limit S 5, a timer of two seconds starts to countdown at once.

If a pressure wave activates the pressure switch in this time the TS 960 recognizes the function of the safety edge. If the pressure switch has not been activated, the control goes into fault mode and the system works only in DEAD MAN function in downwards direction. (see description Page 18)

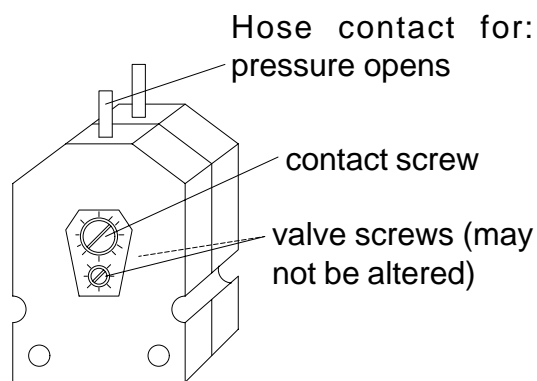
### Pressure-wave switch - function

The contact between the contact screw and diaphragm is opened (opening contact). The pressure-wave switch is set to a release pressure of approx. 1.5 mbar.

The valve screws are set to a throughput of 110 ml/min with a static admission pressure of 5 mbar. This warrants that a maximum temperature increase of 30° is compensated for in 20 minutes.

The setting of the valve screws may not be altered. Should the release pressure be insufficient (pressure wave too insensitive), the contact screw may be turned counterclockwise to the left by 1-2 graduation marks. The switch's sensitivity is thus increased.

In case of excessive sensitivity, the contact screw is set clockwise by 1-2 graduation marks (decreased sensitivity).



**Pressure-wave switch**

### Resistance evaluation 8K2 with normally open safety edge contact (Fig. 7)

This evaluation system is made for electrical safety edges within an end-of-line resistor of 8K2  $\pm$  5% 0,25W. The resistor must be connected in series with the switch in the safety edge.

### Optical safety edge (Fraba Brand) (Fig. 8)

The principle of operation is as a one way light barrier. By activating the safety edge, the photo-beam will be interrupted.

# SAFETY DEVICES (Fig.: Page 9)

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## Emergency - stop (Fig. 9); Slack wire switch (Fig. 10)

For doors with a cable or chain drive, in accordance EN 12453- slackness must be monitored. The control can be done with a slack wire switch which can be connected directly on TS 960 terminals SK1-SK2, the function is STOP only.

## Light barrier (Fig. 11, 12)

One external light barrier( thro beam or reflective photo beam mode) can be connected to the control.

Whenever the light barrier is triggered during the shutter's downward movement, the shutter will STOP and move BACK UP. The reversing action is only activated when travelling in the downwards direction.

A supply for the light barrier 230V AC and/or 24V DC is available.

If the automatic closing function is active, the shutter will close after a delay of 60 seconds, with a light barrier connected it will close 5seconds after the beam has been interrupted and re-made.



### Important note!

The load on the 24 V DC power supply may not exceed 150 mA.

The light barrier is used in a normally closed operating mode.

In case the light barrier is activated or it malfunctions the contact will open and cause following reactions.

Shutter position/ movement	Reaction following the activation of the light barrier
End position closed	no reaction
Upwards	no reaction
End position open*)	reset open time at automatic closing mode
Downwards	Stop and move back up

\*) or intermediate position at closed Keyswitch and adjusted limit switch S6 (Fig. 19)

**A reset is required if the photo-beam has been disconnected (see page 7, set-up)**

## RELAY CONTACT (Fig.: Page 9)

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### Wiring signal lamp (Fig. 13)

The control provides a potential free relay output, which can be used for several functions. The relay output can be chosen as switched contact or a pulsating mode. If a flashing signal lamp is required, the slide switch DIP 2 must be set to ON. After a command, the lamp starts flashing for 3 seconds as pre-warning time before the shutter moves and continues until the shutter reaches the end position. When the movement is interrupted in between the final positions, the flashing mode continues.

## CEILING PULL SWITCH / RADIO CONTROL (Fig.: Page 9)

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### Ceiling pull switch (Fig. 15); Radio control (Fig. 16)

It is possible to connect a ceiling pull switch or a radio receiver. The radio receiver's switching contact must be potential free. With each command (contact) the shutter operates in the following sequence:

Shutter position	Shutter operation
Shutter closed	Shutter moves to fully open
Shutter moving upwards	No reaction
Shutter open	Shutter moves to fully closed position
Shutter intermediate position open	Shutter moves to fully open
Shutter moving downwards	Shutter will STOP and move BACK UP

## PUSHBUTTON (Fig.: Page 9)

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**Three position switch** (Fig. 17); **key switch** (Fig. 18)

### Foil keypad and control devices

The foil keypad and control devices are working independently of each other. On simultaneous command the foil keypad has priority before external push buttons.

The control automatically recognises the installation of remote external push buttons.

When dismantling the external push button a bridge at terminal X8, 24V and Stop, can be linked to set the control in function again, or the control input terminals can be reset by switching the Dip 1 to the Off-position and pushing the stop button on the foil keypad.

**A reset is required if the pushbutton has been disconnected (see page 7, set-up)**

### Key switch - intermediate stop - relay output

Intermediate stop can be activated / deactivated by closing the terminals X8 24V and SS with a normally open switch (latching).

When the key switch is not connected respectively the contact is open the output relay is controlled from the auxillary limit S6.

If the key switch contact is closed the aux. limit S6 is used for the intermediate position.

Key switch	Final open position	aux. limit S6	output relay
not connected or contact open	no intermediate stop	contact open contact closed	De-activated activated
connected or contact closed	intermediate stop activated	contact open, shutter position below intermediate stop	De-activated
		contact closed, intermediate position reached	De-activated

### Intermediate stop (Fig. 19)

Intermediate mode can be activated with a key switch (latching ON-OFF) and setting the limit S6 at the required intermediate position.

The intermediate shutter position "PART-OPEN" is only in effect in the upwards direction and is the new open position. By de-activating the key switch to the off position, the shutter works in standard mode.

# CONTROLFUNKTION / SAFETY EDGE SYSTEM

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A safety edge contact has the following results for automatic functions

Shutterposition	reaction to safety edge contact
downwards before pre-limit activation	<ul style="list-style-type: none"> <li>● Reversing, move back to final open position*</li> <li>● after 2 futile downward movements with activation of safety edge</li> <li>- automatic OFF at final open position.</li> <li>- fault report LED</li> <li>- dead mans mode, in downwards movement only</li> <li>● automatic mode after cpl. dead mans mode</li> </ul>
downwards after pre-limit activation	depends on adjustment: see adjustment DIP 4
final limit close	● activation report , no result
upwards	● activation report , no result
final limit open *)	● activation report , no result

\*) or intermediate stop at closed key switch

A faulty safety edge has the following effect on automatic operation

Shutter position	Effect of safety edge fault
At closed limit man	<ul style="list-style-type: none"> <li>● automatic mode OFF</li> <li>● fault LED report</li> <li>● depends on adjustment: Upwards self hold or dead mode see adjustment DIP 1</li> <li>● further effects see at open limit</li> </ul>
Moving open	<ul style="list-style-type: none"> <li>● Upwards to final limit open*)</li> <li>● further effects see final limit open.</li> </ul>
At open limit *)	<ul style="list-style-type: none"> <li>● automatic mode OFF</li> <li>● fault LED report</li> <li>● downwards only dead man mode</li> <li>● automatic mode after cpl. dead mans mode</li> </ul>
Closing before pre-limit activation	<ul style="list-style-type: none"> <li>● Reversing, move back to final open position*)</li> <li>● further effects see final limit open.</li> </ul>
Closing after pre-limit activation	<ul style="list-style-type: none"> <li>● Stop at once</li> <li>● automatic mode OFF</li> <li>● defect LED report</li> <li>● depends on adjustment: Upwards self-hold or only dead man mode see adjustment DIP1</li> <li>● further effects see final limit open.</li> </ul>

\*) or intermediate stop at closed key switch

# TECHNICAL DATA

Measurement of pcb	100mm x 200mm
Mounting	vertical
Supply Motor via L1,L2,L3	Fuse external unit, 10A delayed up to 3x400VAC + -10% 50...60Hz
Control via L1,L2	400V AC or 230V AC + - 10%, 50-...60Hz, voltage changing with bridge to 3- pol terminal, safety fuse
External supply 1	supplies via L1 and N, fuse protected 1A
Motor duty cycle	ED S3 60%, S1 100%
Permitted Load	ca. 25 VA without motor and without 230V external consumption
Power demand of control	25VA without motor and external supply
Control voltage external Supply ( external 2 )	24V DC not controlled (+- 20% at normal current and normal voltage) 0,8A Fuse
Controlling inputs	24V DC / 10mA all inputs are to be linked potential free: less than 2V is logic low more than 18V is logik high signal length must be more than 100ms
Safety circuit including emergency stop and limits up and down	all inputs have to be linked potential free maximal contactload: max. 35VDC/ at min 200mA if the safety circuit is interrupted no movement is posible even in dead man mode
Relay output	if inductive loads are to be switched (e.g. other relays) those have to be protected with free-wheeling Diodes
Motor output	up to 3 x 400V AC, max. load 2,2KW
Temperature	in use: from - 10 up to +50°C in storage: from - 20 up to +70°C
Humidity:	up to 95% not condensing
Vibration:	vibration free mounting, e.g. on flat built wall
Protection:	in Case with plugged cable IP54, IP65 available