

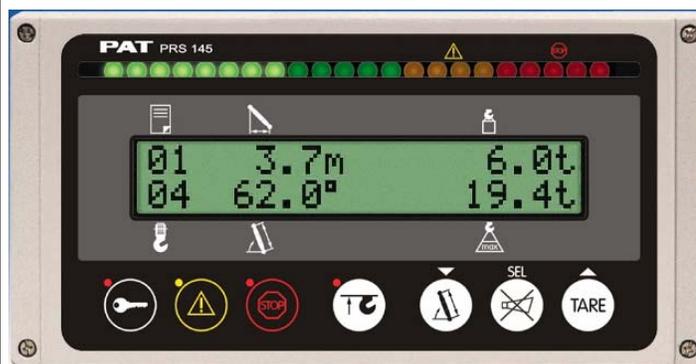


HIRSCHMANN

PAT

LOAD MOMENT INDICATOR SYSTEM

PRS145



OPERATOR'S MANUAL

P/N 031-300-190-160 REV B 04/08/2003

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About this Manual

This document is a constituent part of the system supplied by:

PAT GmbH

In this documentation you will find information on starting-up, operating and maintaining the system.

The Safety Information chapter tells you how warning information and symbols are used in this manual. You will also find information on the intended use of the system and the qualifications needed by the operatives.

Safety Information

Warning Information and Symbols

The following designations and symbols are used in the operating manual to indicate information that is especially important:



This symbol refers to dangers involved in the activity under description that could possibly result in injury to personnel.



Here your attention is drawn to dangers which could pose a threat to property, e.g. damage to the equipment or the environment.



The hand with the pointing finger refers you to sections providing additional information and tips.



This sign points out a possible loss of warranty cover.

Make sure you read all the safety information in this documentation and comply with this information when using the system.

Always keep these instructions in a safe place. Issue a copy to every operator.

The control system may be operated only by hand. Never use pointed objects to depress keys.

The system may no longer be operated if the device is damaged. It should be disconnected from the mains. The indicator must be protected against damp, liquids and dust, in particular, for as long as the display window is damaged.

Always use mild detergents when cleaning the device. Solvent-containing, aggressive and abrasive detergents may not be used.



On disposal of the indicator, the electronic assemblies must be disposed of as special waste in accordance with local regulations.

Intended Use



This system is built to recognised safety standards. However, the improper use of the device can endanger the life and limb of the user or of other persons and may result in damage to the equipment or other items.

It may be used only for the intended purpose and must be in perfect technical condition. There should be no doubt that this system contains many electronic and mechanical components and therefore the possibility of a fault occurring cannot be completely ruled out.

Faults that represent a potential safety risk must be remedied immediately.

This system is designed solely for the tasks described in this documentation. It may not be used for any other purpose.

Caution: this system cannot make up for any lack of on-the-job experience or judgment regarding the use of the equipment on the part of the operator. Responsibility for the entire operating process and any consequences arising therefrom rests solely with the operator.

The manufacturer can accept no liability for damage or injury caused by improper or impermissible use of the system. The user alone bears the risk.

Requirements for Operating Personnel

Only appropriately trained personnel should operate this system, i.e. persons who:

- are familiar with the procedures for starting up and operating the system;
- have read and understood the documentation or have received the necessary training or instruction;
- know the accident-prevention regulations.

General Information

The PAT load moment system PRS 145 has been designed to provide the crane operator with the essential information required to operate the machine within its design parameters.

Using different sensing devices, the system monitors various crane functions and provides the operator with a continuous reading of the crane's capacity. The readings continuously change, as the crane moves through the motions needed to make the lift.

The PRS 145 provides the operator with information regarding the angle of the boom, working radius, rated load and the total calculated weight being lifted by the crane.

If non permitted conditions are approached, the PRS 145 will warn the operator by sounding an audible alarm, lighting a warning light and locking out those functions that may increase load moment; such as: lowering or extending the boom or lifting the load.

Warnings

The PRS 145 is an operational aid that warns a crane operator of approaching overload conditions and of over hoist conditions that could cause damage to equipment and personnel.

The device is not, and shall not, be a substitute for good operator judgment, experience and use of accepted safe crane operating procedures.

The responsibility for the safe crane operation shall remain with the crane operator who shall ensure that all warnings and instructions supplied are fully understood and observed.

Prior to operating the crane, the operator must carefully and thoroughly read and understand the information in this manual to ensure that he knows the operation and limitations of indicator and crane.

Proper functioning depends upon proper daily inspection and observance of the operating instructions set forth in this manual. Refer to Pre- Operation Inspection and Calibration Verification page 21 of this handbook.

System Description

The system operates on the principle of reference/real comparison. The real value, resulting from the load measurement is compared with the reference and calibration data, stored in the central processor memory and evaluated in the microprocessor. When limits are reached, an overload warning signal is generated at the indicator panel/operator's console. At the same time, the aggravating crane movements, such as hoist up and boom down, will be stopped.

The fixed data regarding the crane, such as capacity charts, boom weights, centers of gravity and dimensions are stored in memory chips in the central processor unit. This data is the reference information used to calculate the operating conditions.

The PRS 145 consists of:

indicator panel (*operating console*) which displays the following:

- program number
- selected parts of line (*main/aux*)
- boom radius
- boom angle/boom length (selectable)
- load on the hook (*actual load*)
- load moment (*permitted load*)

central unit (*microprocessor and input/output electronics*)

- angle sensor
- length sensor
- pressure sensors
- Anti-Two-Block switch

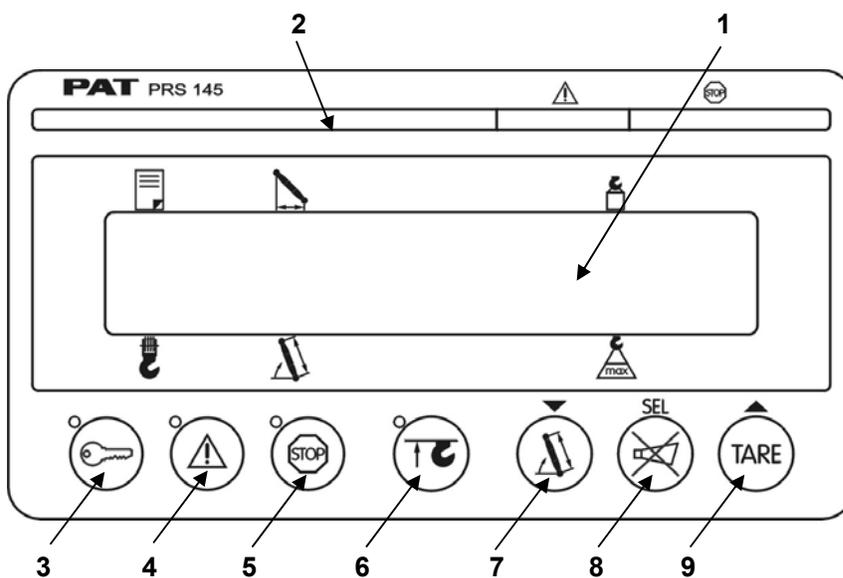
(*Other combinations are possible depending on demand*)

Operating Console

The console has 3 functions:

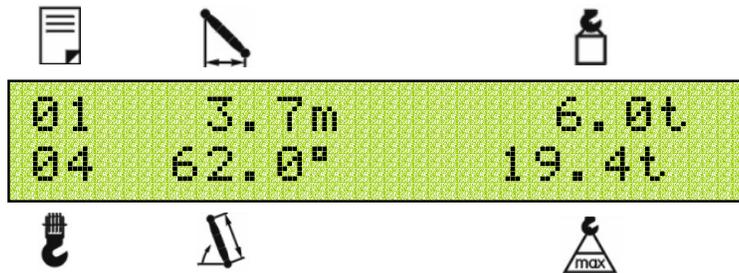
- inputs by the crane operator (*operating mode, reeving*)
- input of geometry limit values and signalization of exceeded limit values
- display of important data and information

The operator's console is mounted in the crane's cab in the operator's field of vision. For a better identification the LC- display is continuously backlit during operation.



- 1) Display Area
- 2) LED bargraph
- 3) By-Pass Warning Light
- 4) Load Moment Prewarning Light
- 5) Load Moment Limit Light
- 6) Alarm Light / Bypass Button **"Anti-Two-Block"**
- 7) Down/Boom Length Button
- 8) Program/**"Buzzer"** Button
- 9) UP / **"TARE"** Button

Display Area



program number (example above shows **01**)



selected parts of line (main/aux) (example above shows **04**)



boom radius (example above shows **3.7m**)



boom angle or selectable boom length (example above shows **62.0°**)



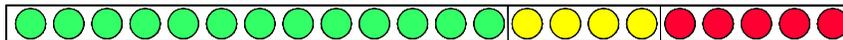
load on the hook (actual load) (example above shows **6.0t**)



maximum permitted load (example above shows **19.4t**)

All information, except the boom length, which only can be set on demand by a pushbutton, is monitored at a time by a backlitged LC display (1).

LED Bargraph



The load moment information will clearly be monitored by an LED bargraph (2), consisting of **22 LEDs** (**13 green, 4 yellow and 5 red ones**).

By-Pass Warning Light



The red **"BY-PASS WARNING LIGHT"** (3) turns on to indicate that the cutoff function of the LMI system is deactivated (see page 18).

Load Moment Prewarning Light



The yellow **"LOAD MOMENT PRE-WARNING LIGHT"** (4) will light up when the load on the crane reaches the defined prewarning area, thus indicating that an overload condition is approaching.

This means for the operator to continue crane operation with extreme caution.

Load Moment Limit Light



The red **"LOAD MOMENT LIMIT LIGHT"** (5) warns the operator that a maximum load condition has been reached. It lights up when the load on the crane reaches the crane load capacity. The audible alarm also sounds when this condition has been reached.

The following crane movements will be stopped concurrently:

- hoist up
- telescope out
- boom down

Alarm Light / Bypass Button "Anti-Two-Block"



The red **"Anti Two-Block Alarm Light"** (6) lights up when the anti-two-block limit switch contacts open, indicating that a two-blocking condition is approaching. At the same time the audible alarm will sound.

The following crane movements will be stopped subsequently: hoist up, boom down and telescoping out (*depending on your machine*).



The anti-two-block switch can however bypassed as long as this button is being pressed. In bypass condition the crane needs to be operated extremely careful to avoid damage and accidents.

Down/Angle-Length Button



During operation, the operator can toggle between the displaying boom angle or boom length, by pressing the **"DOWN/ANGLE-LENGTH"** (7).

The down button is used during programming/calibration procedures to scroll through menu options. It is also used to scroll through Error messages and normal display in case of error conditions (see *Error Messages page 23*)

Program/"Buzzer" Button



The **"PROGRAM BUTTON"** (8) starts the programming function to (*crane configuration setup*).

Pressing the **"BUZZER BUTTON"** (8) allows the audible alarm to be temporarily silenced.

UP/"TARE" Button



During operation, this button allows the actual load to be tared, set to zero. It can be cancelled by pressing the pushbutton, **"UP/TARE"** (9) again. The load dimension **"lb"** (or **"t"**, **"kg"**) flashes during the tare condition. Note: The tared condition will also be cancelled when the system has been switched off, the program number or parts of line has been changed or boom angle or length have been changed.

The up button is use during programming/calibration procedures to scroll through menu options.

Crane Configuration Setup

The PRS 145 setup procedure allows the operator to input the crane configuration using the following displays. The operator must complete the setup procedure for the PRS 145 system before operating the crane.

On initial power up, the configuration setup procedure consists of the following steps:

- setting the program number (*boom type and counterweight configuration*)
- specify the hoist configuration (*optional*)
- specify the parts of line (*reeving*)

After pressing the "**PROGRAM/BUZZER**" (8) key (*during normal operation*), the configuration setup procedure consists of the following steps:

- setting the program number (*boom type and counterweight configuration*)
- specify the hoist configuration (*optional*)
- specify the parts of line (*reeving*)
- specify the angle presets (*minimum/maximum*)



The correct crane configuration setting is of utmost importance for the proper functioning of the system and the crane. Therefore, only operators who are thoroughly familiar with the crane and the operation of the system should execute the setting of the system according to the operating configuration of the crane.

After switching on the supply voltage the unit will complete a system check routine for ca. 1 second, where all lights and the buzzer are activated. After successful check the display will show:

```
PAT GROUP
PRS 145
```

The displayed number is the valid program/software number of the system. Then the display automatically switches over to the crane configuration setup. This allows the operator to select the existing crane configuration.

```
01: ON  OUTR  EXT  6m
      31  JIB  7.5m/5°
```

Use the pushbuttons, "**DOWN/ANGLE-LENGTH**" (7) or "**UP/TARE**" (9) to toggle down or up to the operating load chart program number that matches the actual crane configuration. Confirm the displayed selection with the pushbutton "**PROGRAM/BUZZER**" (8).

If available, the display will request the operator specify the hoist/winch selection. If not available the display switches directly to the part of line selection mode.

```
SELECT WINCH
      MAIN
```

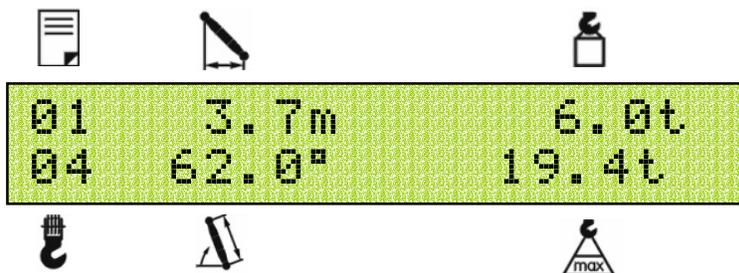
Use the pushbuttons "**DOWN/ANGLE-LENGTH**" (7) or "**UP/TARE**" (9), to specify hoist/winch. Confirm displayed selection with the pushbutton "**PROGRAM/BUZZER**" (8).

The display will request the parts of line configured.

```
PARTS OF LINE
      02
```

Use the pushbuttons "**DOWN/ANGLE-LENGTH**" (7) or "**UP/TARE**" (9) to select the number of parts of line. Confirm displayed selection with the pushbutton "**PROGRAM/BUZZER**" (8).

The normal operating display **OR** the minimum angle preset selection mode will be displayed at this time.



If the displayed values are incorrect or the setup is changed since the crane was powered off, press the pushbutton **"PROGRAM/BUZZER"** (8) to restart the configuration setup procedure (*Crane Configuration Setup*).



To preset angle limits select the **"PROGRAM/BUZZER"** (8) key to restart the configuration setup procedure (*Crane Configuration Setup*).

If display is correct, go to page 17 Operation

If the operator restarted the configuration setup procedure by pressing the pushbutton **"PROGRAM/BUZZER"** (8) the angle preset selection mode will be displayed and the operator must complete the following steps.

The display switches over to the minimum angle preset selection mode.



The indicated angle is the value already stored in memory



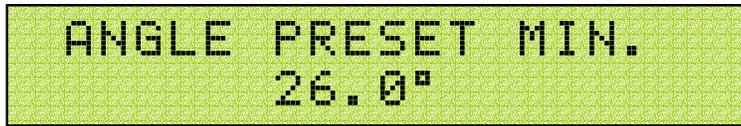
WARNING

When setting the preset angle limit, always keep a safe working distance to any obstacles. Never work outside a safe working area as outlined by common practice, standards, and manuals.

To change the stored value, move the boom to the minimum/maximum angle. Store the position into the memory by pressing the pushbutton **"UP/TARE"** (9). The new value will be shown on the display at this time.

To disable the preset limits, press the pushbutton **"DOWN/ANGLE-LENGTH"** (7).

Confirm displayed selection with the pushbutton **"PROGRAM/BUZZER"** (8).



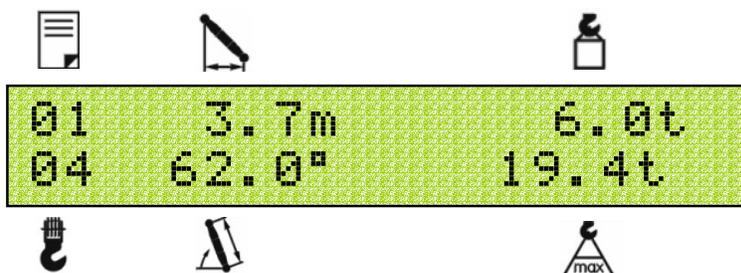
ANGLE PRESET MIN.
26.0°

Complete the maximum angle preset same as the minimum.

Confirm displayed selection with the pushbutton **"PROGRAM/BUZZER"** (8).

Operation

After having set the PRS 145 to the actual crane configuration, the system is ready for operation. The display shows:



program number (example above shows **01**)



selected parts of line (main/aux) (example above shows **04**)



boom radius (example above shows **3.7m**)



boom angle or temporary boom length (example above shows **62.0°**)



load on the hook (actual load) (example above shows **6.0t**)



maximum permitted load (example above shows **19.4t**)

Press the pushbutton "**PROGRAM/BUZZER**" (8) to restart the configuration setup procedure and complete Section 4 Crane Configuration Setup.

Angle Limit Setup

To set angle limits press the pushbutton "**PROGRAM/BUZZER**" (8) to restart the programming procedure and follow the instruction in Section 4 *Crane Configuration Setup*.

LMI Bypassed Condition

The LMI can be placed in a bypass condition for rigging operation. The switch is located on the central unit and the bypassed condition will show on the console by the "LMI BYPASSED" pilot lamp (3).



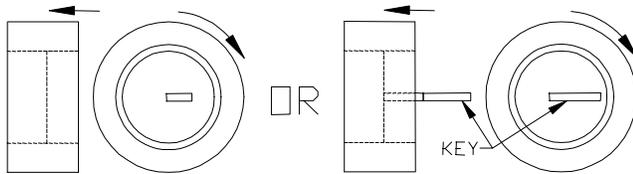
Since **BYPASSING** deactivates the lockout function of the load moment and the anti two-block system, the following instructions must be obeyed:

The by-pass function shall be used with discretion, as unwarranted use of it to override the control lever lockout system can result in harm to the crane and danger to property and persons.

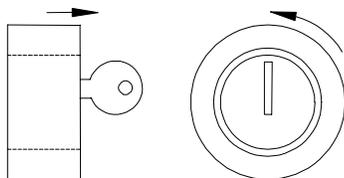
Never use the by-pass function to either overload or operate the crane in a non-permissible range.

Key switch positions:

Normal operation: the inter portion of the key switch is pushed in and turned clockwise for normal operation.



Bypass condition: From the normal position, insert and turn the key counter-clockwise so the inter portion of the key switch is flush and key is locked in place. The key can not be removed while in a bypass condition.



Service Menu

The PRS 145 consists of two service menus:

- An accessible menu for the operator that allows user to adjust the LED brightness and select a language (*optional, if there is only one preprogrammed language this selection will not be available.*)
- A service menu that is protected by an access code and allows sensor and calibration adjustment. For further description refer to the calibration manual.



The LMI function is not active while in the service menu. In this mode, the crane operator is responsible for safe operation of the crane.

The accessible menu can be initialized by simultaneously pressing the **"PROGRAM/BUZZER"** (8) and **"DOWN/ANGLE-LENGTH"** (7) keys.

When a menu is displayed, the flashing menu point can be selected by using the **"PROGRAM/BUZZER"** (8) key or select the **"UP/TARE"** (9) or **"DOWN/ANGLE-LENGTH"** (7) to select another menu point.

Led-Brightness

The brightness of the LED bargraph (2) can be adjusted. When this menu point has been selected, all LEDs will be turned on and following information will be displayed.

Adjust the brightness with the **"UP"** and **"DOWN"** keys. Brightness can be adjusted in **16** steps from **1...16**.



Press the **"PROGRAM/BUZZER"** key to confirm the selected value and the system will return to the last menu.

Language

After selecting the language menu point, the following will be displayed.



The language currently selected will be displayed, use the **"UP"** and **"DOWN"** keys to select the preprogrammed languages.

Press the **"PROGRAM/BUZZER"** key to confirm the selected value and the system will return to the last menu. In case the language has been changed, the system will generate a reset.

Reset

This menu point will generate a system reset similar to when the system is switched on.

Exit

When this menu point has been selected, the system will return to the load chart setup.

Pre- Operation Inspection and Calibration Verification

WARNING

The following tests shall be performed with care to prevent damage to the machine or injury to personnel. Proper functioning of the system requires successful completion of these tests before operating the machine.

Before operating the crane, the following electrical connections must be checked to ensure that the system is properly connected for the crane configuration.

After the electrical connections have been checked to insure that the system is properly connected for the crane configuration, the following checks shall be made:

- 1) Check the electrical wiring connecting the various parts of the system for physical damage.
- 2) Check the spring-loaded cable reel to be sure it is free to rotate, has tension and the cable is reeled properly.

WARNING

Failure to re-position the anti two-block switch weight will prevent the over hoist system from functioning properly. No weight shall be on the main hoist anti two-block switch when the boom extension is being used.

- 3) Check the anti two-block switches and weights for free movement.

If the operator cannot see the load-handling device approaching the boom nose, he shall have an assistant (*signal person*) watch the load-handling device. The operator shall be prepared to stop the machine immediately should the LMI system not function properly as indicated by lighting the red warning light (6), sounding the audible alarm and locking the crane movements, hoist up, telescope out and boom down.

- 4) Check the anti two-block alarm light (6) and the audible alarm by performing one of the following tests:
 - a) By manually lifting the weight attached to the anti two-block switches. When the weight is lifted, the audible alarm should sound; the anti two-block alarm light (6) should light.

- b) Slowly raise the main boom load-handling device to create a potential two-block condition. When the load-handling device lifts the weight, the audible alarm should sound, the anti two- block alarm light (6) should light and the motion of the load-handling device should be stopped. Lower the load-handling device slightly to eliminate this condition.
- c) Slowly lower the boom to create a potential two-block condition. When the load-handling device lifts the weight, the anti two-block audible alarm and light should turn on and the boom telescoping function should be stopped. Lower the load-handling device slightly to eliminate this condition.
- d) Slowly extend (*telescope*) the boom to create a potential two-block condition. When the load-handling device lifts the weight, the anti two-block audible alarm and light should turn on and the boom lowering function should be stopped. Lower the load-handling device slightly to eliminate this condition.

 **WARNING**

If the light and audible alarm do not function as described and the crane movements are not stopped, the system is not working properly. The malfunction shall be corrected before operating the crane.

- 5) If the crane is equipped with a boom extension, repeat the test procedure for the boom extension anti two-block switch. Check that the display of the main boom length agrees with the actual boom length.
- 6) Check that the display of the main boom angle agrees with the actual boom angles.
- 7) Check that the display of the operating radius of the crane agrees with the actual radius.
- 8) Check the load display by lifting a load of known weight.

Error Messages

There are (2) different kinds of errors: system or operation. When an error occurs this means the system has a fault. The description and number of errors will appear on the screen.

System errors will occur if a system component has failed or been damaged and must be corrected and then the system needs to be reset to continue operation.

Operation errors are measurement errors, i.e.; the actual radius is lower than in the load chart. The information will be shown on the second line of the display with an error message or description. The system will return to operation mode when user corrects error.

Errors are numbered by the significance of the error; the highest priority is listed first. Example: If there are three messages in line two, the display will show **1/3 (1 of 3)**. The first number indicates the error which is displayed. The second number indicates the number of errors.

If a second or third error exists press the pushbutton **"UP/TARE"** (9) to see the description of the error.

During an Error Condition:

To switch back to the operating screen pushbutton **"DOWN/ANGLE-LENGTH"** (7) has to be pressed. If however the operator wants to switch over again to the error message, he has to press the pushbutton **"DOWN/ANGLE-LENGTH"** (7) twice.

Preventive Maintenance

This system consists of electronic and electrical components.

Maintenance work may be carried out on the system only by service personnel of the company **PAT GmbH**, by personnel authorised by the manufacturer or by personnel trained by **PAT GmbH**.

As even minor damage can significantly impair the efficiency of the device or even put it out of operation, the operator must ensure that the device is fully operational before the start of work each day.

Specifications

Supply voltage:	12VDC (24VDC) +/-20%
Current consumption:	< 500mADC
Working temperature range:	-25°C.-.+70°C (-13°F to 160°F)
Relative humidity:	Max. 95% / 40°C (104°F), not cond.
Display:	Alphanumeric LC display, 2 lines of 20 characters, character height 8mm, backlighting
Display parameter:	Program-No., parts of line, radius and length in m or ft, resolution 10cm resp. 0.5ft, boom angle, resolution 0.5°, actual and maximum load in t or lb, resolution 0.1t resp. 100lb
Tare:	Actual load, 0...100%
Analog inputs:	Max. 8, input signal 0...8VDC or 4...20mADC
Digital inputs:	Max. 5, input signal, 10 - 30VDC
Relay outputs:	Standard 4, one changeover contact each, contact consumption 30VDC/5A
Supervision:	By microprocessor, power-on-reset, watchdog, system error code
Protection:	IP 65
Interconnection:	Directly, PG-connectors
Dimensions (L - B - T):	200 x 100 x 60 mm