USER MAUAL

Multifunction Safety Module BI 5910 with radio control

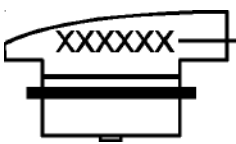
SAFEMASTER W ireless safety

DOLD

04/2007

Multifunction Safety Module BI 5910 with radio control

Please note here the number of your electronic key (6 figure number, engraved on the electronic key) and the Identity number of your remote control or your BI5910



(electronic key, side view)

Key-number: .....
Identnumber: .....
Selected frequency: .....
1. alternative frequency: .....
2. alternative frequency: .....

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Application Notes

Attention:

A remote control is regarded as a control device and also as safety part because of it's facility to switch off by the European Machinery Directive. Rules resulting from this fact have to be observed in operation.

- **For optimum safety** during operation of the remote control it is recommended to observe the instructions stated in this manual.
- **The operator must be trained and have a permission to use** remote controls.
- **A visible E-stop must always be active.** When placed in the charger the remote control is not active. Therefore the charger must be mounted in a way that the built in e-stop button is not visible.

Application Notes

- **The operator must have full overview on all actions created by him.** If the visual area of the operator is not sufficient lifting devices must be equipped with additional systems to improve the visibility. When operating several lifting devices (self moving devices) on rails they must be equipped with protective equipment to reduce the effect of collision. If not all safety areas can be overlooked am manual start with the remote control must only be possible by using the optional infra-red receiver.
- **Do not leave the remote control unattended,** especially not in operation.
- **Do not place the remote control on the floor or on metal surfaces.** If necessary push the Off-button first.

Application Notes

- **If several radio controlled devices are operated in the same working area,** different frequencies must be used with one channel in between (e.g. channel 5, 7, 9, …)
- Due to safety reasons the electronic key must be removed **when the devices are not in use.**
- **Do not forget to charge battery,** when discharged
- **Do not use transmitter when charging**
- **In the case of disturbance** the device must be switched off by pressing the Off button of the remote control and removing the electronic key.
- **The equipment must be handled with care** and be checked in regular intervals depending on the usage frequency.

1. Presentation of the Multifunction Safety module BI 5910 with radio control

We thank you for selecting this Dold product. You have purchased an industrial extremely compact remote control RE 5910.

The remote control can be used to control lifting devices like cranes and also for remote control of applications that have previously been wire bound or had a stationary control panel. The usage of the remote control makes it possible to monitor the operation from any place not excluded by safety rules (e.g. not stepping below the load). The remote control does not replace the existing safety circuits (e.g. e-stop) but adds additional performance.

Main features of the remote control RE 5910

- User friendly, compact transmitter
- Comfortable single hand operation
- With perceptible 2 step push buttons
- With marking space besides the push buttons
- Protection against unintentional activation
- Speed charging and high battery capacity
- Speed charging and high battery capacity
- Pocket for remote control as option

1. Presentation of the Multifunction Safety module BI 5910 with radio control

Main features of the multi function safety module BI 5910
- Compact device easy to install
- Mounting on DIN rail
- Removable terminal blocks

Solutions and options to increase the application safety of the application
- Additional inputs for wired e-stop buttons or light barriers
- Automatic detection of the remote control when taking from the charger
- Safety category 4, EN 954-1 for disconnection of remote control and Hamming distance ≥4 for every transmitted message
- Access only for staff with permission by electronic key
- Start by infra-red transmitter (as option) only from a restricted area to identify the working people
- Storage of number of working steps and duration of movements (as option)

User-friendly maintenance
- Identification stored in electronic key
- Indicator LEDs for diagnostics

1. Presentation of the Multifunction Safety module BI 5910 with radio control

This remote control is corresponding to the safety requirements of the valid or pending standards and are conform to the following European Directives:

Machines, disconnection of the remote control to safety category 4, EN 954-1 RTTE Radio control and telecommunication terminals (Low voltage, EMC, radio electrical spectrum)

If technical questions occur, please contact our service

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1.1 Components of the Multifunction Safety module BI 5910

The multifunction safety module includes:

- Remote control with integrated E-stop and additional function keys
- Electronic key for transmitter
- Labels for marking the transmitter push buttons
- Battery charger
- Safety module with radio receiver that accepts and operates the signals from the remote control

The following inputs/outputs are available:

Inputs

- depending on application 1 or 2 E-stop buttons or light barriers type 4
- depending on application 1 or 2 control contacts to locate remote control on battery charger
- 1 Start button
- 1 Feed back circuit to monitor external relays

Outputs

- NO safety contacts or 2 NO safety contacts and 1 NC contact
- 6 semiconductor outputs to control movements by remote control
- 3 Semiconductor outputs to indicate the actual status of the multifunctional safety module

1.2 Configuration on delivery

Operating mode of BI 5910
Rotary switch A = 0:
- Maximum time to activate remote control after taking from charger unit 5 sec.

Rotary switch B = 0:
- Sensor inputs S11-S14 and S21-S24 always active, manual start only with start button on S42
- Remote control active when control contact on S32 or S34 is open
- Reset from remote e-stop with remote start button (+ Infra-red)

Number of frequency channel
Channel 01, 433.100 MHz

Activity monitoring function time period
Standard programming is off.

Number of electronic key
IIndividual number generated at production and engraved on the key.
Please note on unpacking the number of the electronic key on the first page of this manual, with this number an identical key can be ordered from DOLD.

Configuration of push buttons and outputs
Fixed assignment of push buttons to outputs (see section 3.3)

Locking of the remote control

The remote control is delivered in unlocked state (with disabled activity monitoring function – 99). The activity monitoring function period, the frequency and the lock of the programming according to the electronic key can be modified by a trained user (see section 3.9).

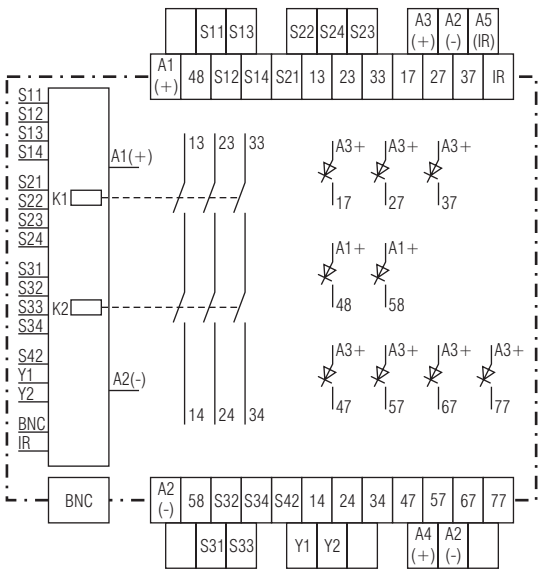
2. Multifunction safety module BI 5910/00MF9 with radio control

According to EU directive for machines 2006/42/EG

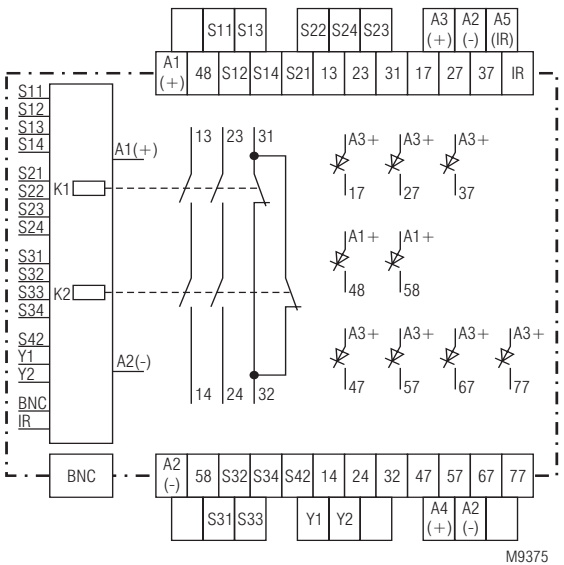
- According to IEC/EN 60 204-1, EN 954-1
- Safety category 4 to EN 954-1
- To connect:
  - 2-channel e-stop buttons, safety gate contacts or light barriers type 4 to EN61 496
  - 1 start button
  - Depending on application 1 or 2 control contacts to monitor the radio control operation
- Radio receiver for:
  - E-stop
  - Control signals for 6 non-safety semiconductor outputs
- Functions adjustable by rotary switches:
  - Manual or auto start
  - When remote control is removed from charger (open control contact), manual start via remote control
  - Bridging of access protection with active remote control
- Broken wire and short circuit detection with fault indication
- 3 semiconductor outputs for status indication
- LEDs for status indication
- 67.5 mm width

2. Multifunction safety module BI 5910/00MF9 with radio control

Applications



BI 5910.03/00MF9



BI 5910.22/00MF9

2. Multifunction safety module BI 5910/00MF9 with radio control

Approvals and marking

* pending

Anwendungen

Protection of men and machines in mobile and large plants where a fixed wiring is not possible, e.g. production halls, mounting scaffolds, plants and dangerous accessible areas.

2.1 Function of BI 5910

The device is equipped with a safety radio receiver to operate the signals from a remote control with remote e-stop. It has 1 or 2 inputs depending on the operation mode (S31-S32 and S33-S34) to connect the indication contacts of a battery charger for the remote control. The charging indication contacts show if the remote control is active or not.

Control contacts closed

=> The remote control is in the charger. Only hardwired Sensors are in operation. The remote control has to get inactive 1 second after the control contacts close.. If the radio transmission is not stopped the safety relays de-energise.

One control contact opens

=> The remote control is taken from the charger. The safety relais remain energised. Output 58 and the white LED run2 flash fast to indicate, that the e-stop button of the remote control has to be reset and also the remote control. If the BI 5910 does not receive the reset status of the e-stop button within the adjusted time span (rotary switch A) the safety relays de-energise.

The control contacts are open and the remote control is reset

=> As soon as the remote control is taken from the charger and is reset with the remote start button, the output 58 and the white LED run2 are continuously on. From this point on the safety function of the remote control is accepted.

As long as the safety relays remain active, the push button actions of the remote control are transmitted to the semiconductor outputs 27-77.

Depending on the adjusted function all safety functions (also the hardwired ones) of the BI 5910 can be reset with the remote control.

2.1.1 Important notes

A visible e-stop button must be active all the time
This means that the e-stop button of the remote control must not be visible when it is inactive. Therefore the charger must be mounted in a way that the remote control is not visible while charging.

A machine must only be started from a location from which one can see that no person is present in the dangerous area.

To solve this there are 2 variants of the BI 5910:
BI 5910._ _/00MF9
This unit is used in applications where start is only possible from a hardwired start button.
BI 5910._ _/01MF9
This unit has in addition to the radio control also an infrared function. The reset of the remote control is only accepted if the reset signal is received via radio and via infrared. This means that the remote control must be pointed at the infrared receiver for reset.

If an operator has to enter a dangerous area with the remote control, the machine must only run in a non dangerous speed. The BI 5910 has 2 status signals (output 58 and output17, that can be used to reduce speed and to activate a monitoring function (see 2.12)

2.2 Remote control

The radio connection of the multifunction safety module to the remote control is made via an aerial that is mounted directly on the front of the BI 5910. If the unit is built into a metal cabinet the aerial has to be mounted outside. The connection is made via a special screened coax cable.

Special functions like activity monitoring and selection of radio frequency can be adjusted on the remote control.

2.3 Safety function of the module

Both safety signals of a safety module must be switched off (contact open) and switched on within 250 ms (contact closed) to be recognised as safe. Both control contacts of the charger must go into active state within 3 sec.

If the BI 5910 is switched off while the remote control is active, e.g. by activating a hardwired e-stop button, the red e-stop button of the remote control has to be pressed also in order to reset the BI 5910. This avoids activation of the machine by a second person while a person with active remote control is inside a dangerous area.

2.4 Semiconductor outputs

The BI 5910 has **3 non safety semiconductor outputs** (48, 58 and 17), that indicate the actual status of the safety module (see 2.12 indicators). The output s 48 and 58 are internally supplied by the voltage connected to A1+.

Besides this there are 6 more non safety semiconductor outputs (27-77) that can be operated by the remote control.

To activate the outputs 27-77 the safety relays must be energised and the charger control contacts must be open.

To be able to disconnect the semiconductor outputs 17 to 77 in a safe way they are supplied via separate terminals (A3+ and A4+). A safety relay output contact can therefore be directly connected to the semiconductor outputs.

2.5 Connection of the sensors

The sensors always have to be connected according to the application examples. When connecting sensors with semiconductor outputs (e.g. Light curtains Type 4 according to EN 61496) the unit detects no short circuits between signals. The short circuit has to be detected by the sensor.

2.6 Manual start and reset

The start button on terminal S42 as well as the green button on the remote control are used for manual start and to reset the safety module. The maximum activation time of the start button is 3 sec. If the button is activated longer the unit does not start.

When switching on the BI5910 or when a failure occurs no start button must be activated.

2.7 Auto start

The e-stop function or light curtains on S11 to S14 and S21 to S24 can be configured for automatic start. I.e. the BI 5910 activates the safety output relays as soon as the safety function is fulfilled (e.g. e-stop button is reset).

If the remote control is placed back on the charger with activated e-stop the safety module will not be activated automatically on closed control contacts.

2.8 Option start by infrared (IR)

In addition to the normal start, in IR start mode the operator has to point the remote control to the infrared receiver mounted on the system.

When this option is selected the receiver waits for 2 conditions before activating the safety and function outputs:

1. condition
receiving a start radio message send from RE 5910 to BI 5910,

2. condition:
receiving the same message via infrared that is transmitted at the same time from RE 5910 to BI 5910 while pressing the green start button.

After this starting sequence only the radio control will be active.

2.8.1 Connection of infrared module RE 5910/060

The infrared module is delivered with a 10 m screened connection cable. By adding max. 2 RE 5910/061 10m long cable with connector the connection can be extended to 30 m.

Precautions for wiring

The wiring of the IR-Module must be lead separately from power lines and sources of emission.

Cable	Connection of IR module BI 5910
Black	A2-
White	A5+
Blue	IR

IR-receiver
RE 5910/060

2.8.2 Positioning of the IR-Module RE 5910/060

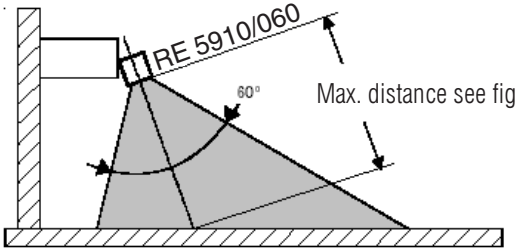


Fig. 1

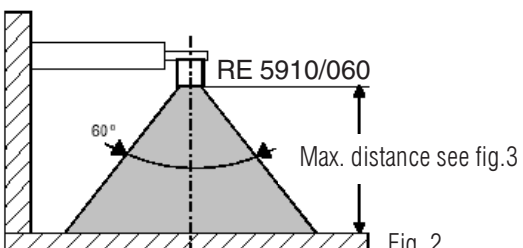


Fig. 2

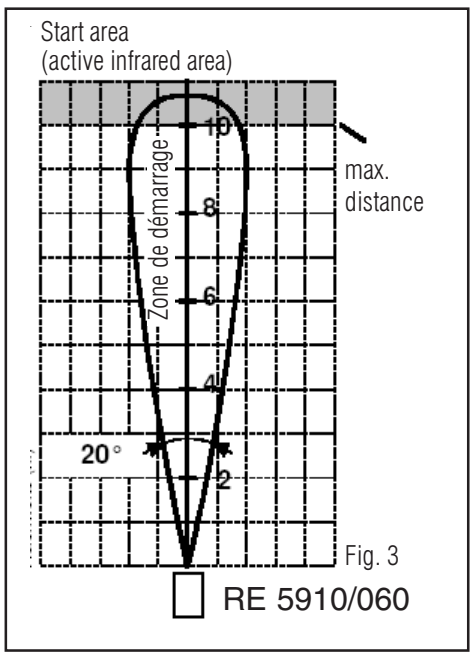
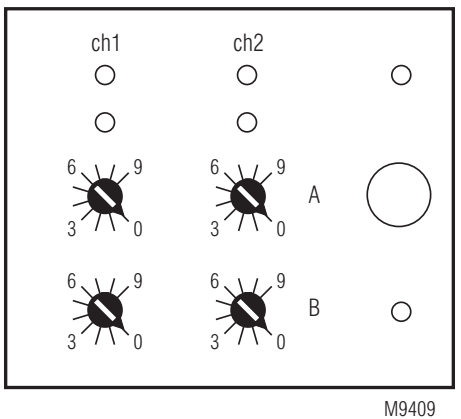
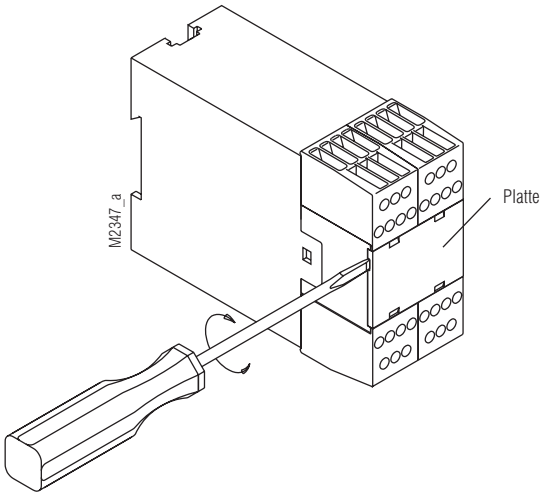


Fig. 3

Protection of IR-Moduls RE 5910/060: IP 65

2.9 Set up of safety module





The adjustment of the required functions is made by rotational switches, e.g. the setting of the max. time to activate the remote control or the max. bridging time for access control is done with switches A.

Attention

Adjustment must only be carried out by trained staff while the unit is disconnected from power. Before opening the front of the unit potential equalisation must be made.

2.9 Set up of safety module

<table>
<tr><td></td><td colspan="10">Rotational switch A
max. time to activate the remote control or
the max. bridging time for access control</td></tr>
<tr><td rowspan="2">rotational
switch B</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>5 s</td><td>6 s</td><td>7 s</td><td>8 s</td><td>9 s</td><td>10 s</td><td>15 s</td><td>20 s</td><td>25 s</td><td>30 s</td></tr>
<tr><td>0</td><td colspan="10">protective devices on S11-S14 and S21-S24 always active
manual start only via start button on S 42
remote control active, when one control contact on S32 or S34 is open
reset of remote e-stop with remote start button
(must only be used with infrared option)</td></tr>
<tr><td>1</td><td colspan="10">protective devices on S11-S14 and S21-S24 always active
manual start only via start button on S 42
remote control active, when one control contact on S32 or S34 is open
reset of remote e-stop with remote start button followed by start button S42</td></tr>
</table>

2.9 Set up of safety module

	Rotational switch A max. time to activate the remote control or the max. bridging time for access control									
rotational switch B	0	1	2	3	4	5	6	7	8	9
	5 s	6 s	7 s	8 s	9 s	10 s	15 s	20 s	25 s	30 s
2	protective devices on S11-S14 and S21-S24 always active with auto start remote control active, when one control contact on S32 or S34 is open reset of remote e-stop with remote start button **(must only be used with infrared option).**									
3	protective devices on S11-S14 and S21-S24 always active with auto start remote control active, when one control contact on S32 or S34 is open reset of remote e-stop with remote start button followed by start button S42									

2.9 Set up of safety module

	Rotational switch A max. time to activate the remote control or the max. bridging time for access control									
Com. B	0	1	2	3	4	5	6	7	8	9
	5 s	6 s	7 s	8 s	9 s	10 s	15 s	20 s	25 s	30 s
4	protective devices on S11-S14 and S21-S24 always active with manual start remote control active, when one control contact on S32 or S34 is open manual start after all type of failures also with remote start button **(must only be used with infrared option).**									
5	not used									
6	not used									
7	not used									

2.9 Set up of safety module

	Rotational switch A max. time to activate the remote control or the max. bridging time for access control									
rotational switch B	0	1	2	3	4	5	6	7	8	9
	5 s	6 s	7 s	8 s	9 s	10 s	15 s	20 s	25 s	30 s
8	monitored zone access: protective devices on S11-S14 and S21-S24 always active remote control active, when control contact on S32 is open zone protection on S21-S24 can be disabled for a specific time by remote control manual start after all type of failures also with remote start button **(must only be used with infrared option)**									

2.9 Set up of safety module

	Rotational switch A max. time to activate the remote control or the max. bridging time for access control									
rotational switch B	0	1	2	3	4	5	6	7	8	9
	5 s	6 s	7 s	8 s	9 s	10 s	15 s	20 s	25 s	30 s
9	monitored zone access: protective devices on S11-S14 and S21-S24 always active remote control active, when control contact on S32 is open zone protection on S21-S24 can be disabled for a specific time by remote control manual start after all type of failures only with start button on S42									

2.9 Set up of safety module

On setting 9 when starting with open charger contact the unit can only be activated with the local start button, when the remote control has been reset and activated by its own start button.

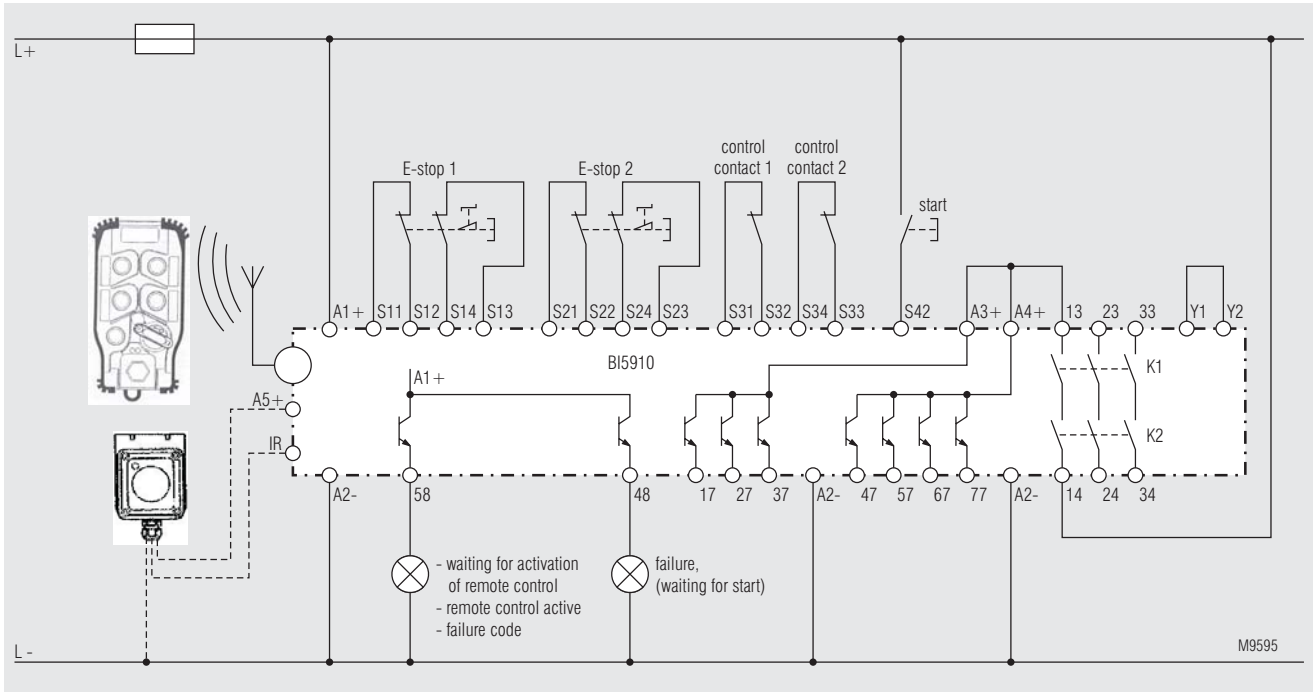
For function 8 and 9 only one charger contact is available, therefore only applications with **safety category 3** are possible.

2.9.1 Configuration of receiver

Radio frequency

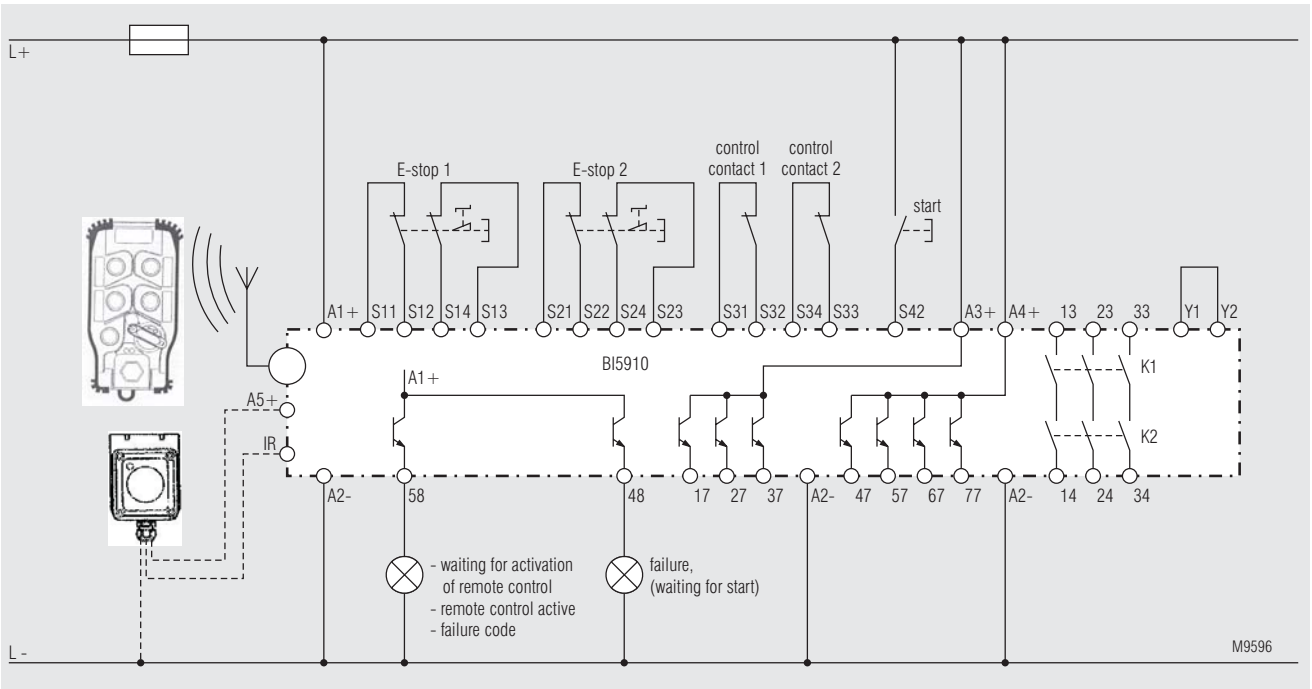
Factory preset is radio channel 1. A trained user with permission can change the frequency to another channel with the remote control following the programming routine (see 3.9.2).

2.10 Operating modes 0-4 application examples



Safe disconnection of remote controlled semiconductor outputs

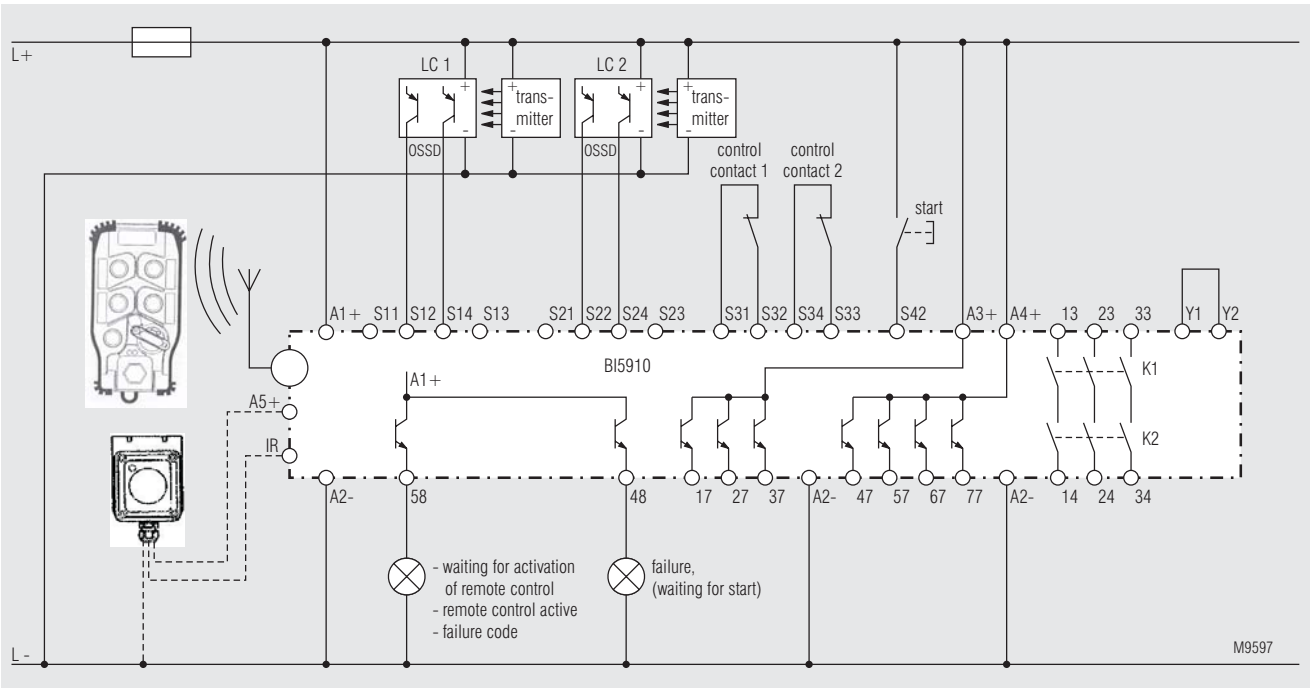
2.10 Operating modes 0-4 application examples



Rotational switches B: 0 to 4:
2 E-stop, Radio controlled e-stop via remote control

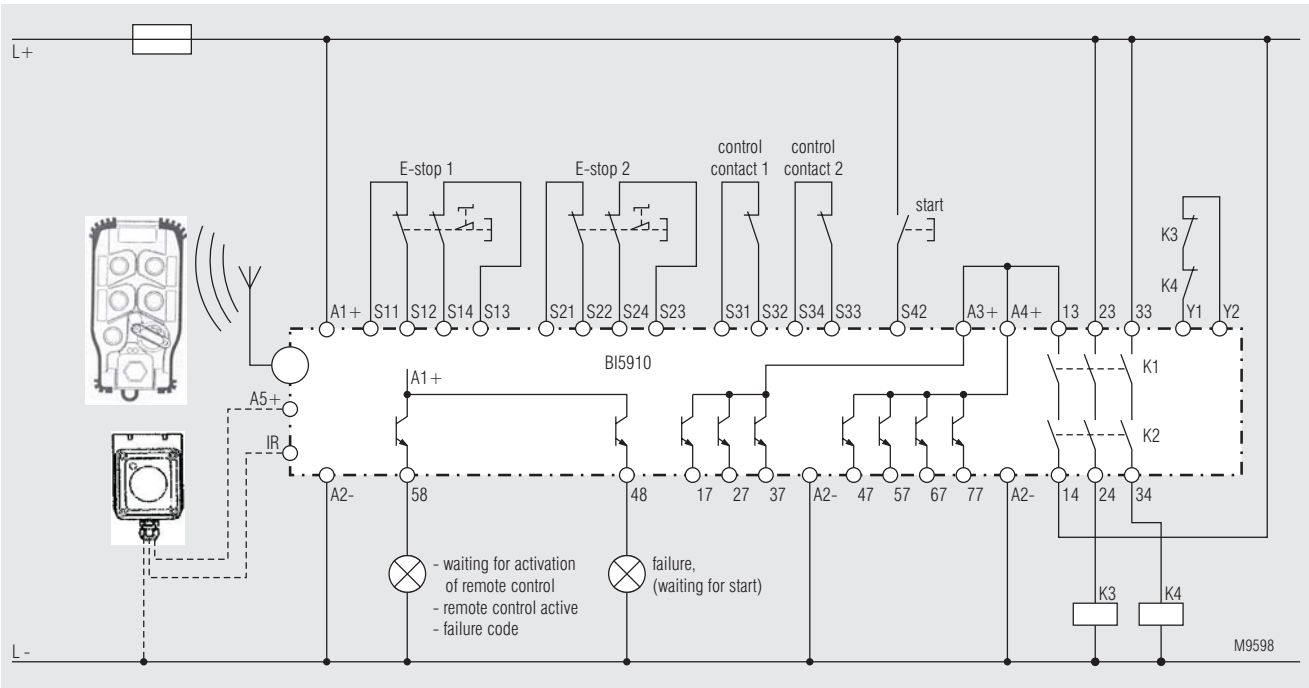
see also chapter 6 “Recommendations for installation”

2.10 Operating modes 0-4 application examples



Rotational switches B: 0 to 4:
2 light curtains, Radio controlled e-stop via remote control

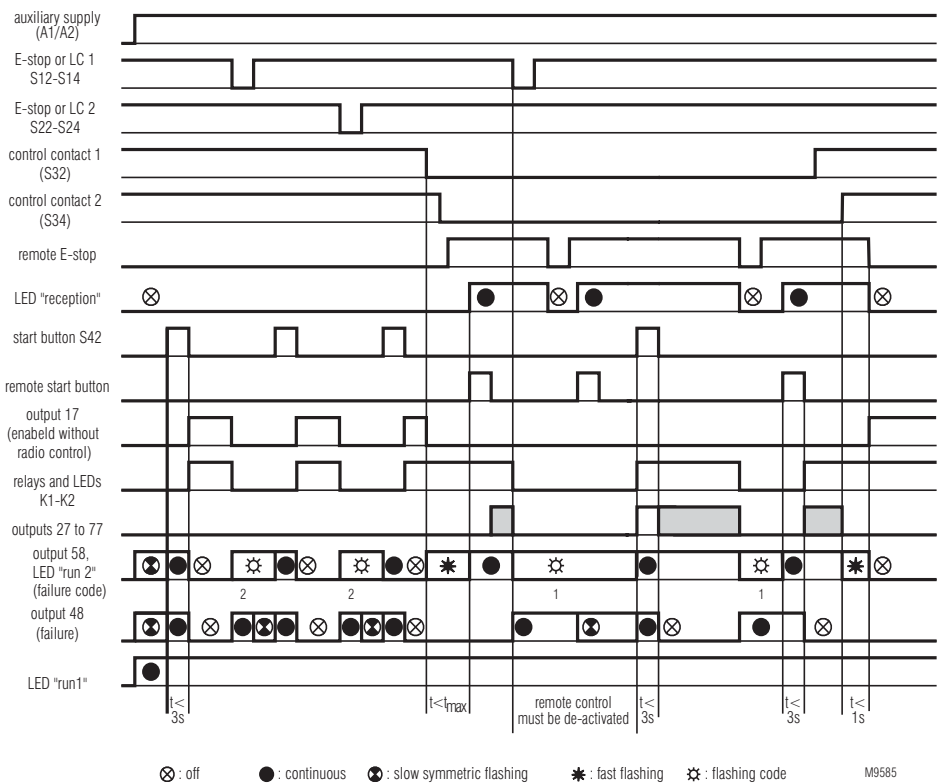
2.10 Operating modes 0-4 application examples



2 E-stop, external contact reinforcement, Radio controlled e-stop via remote control safe disconnection of remote controlled semiconductor outputs

see also chapter 6 “Recommendations for installation”

2.10.1 Function diagrams

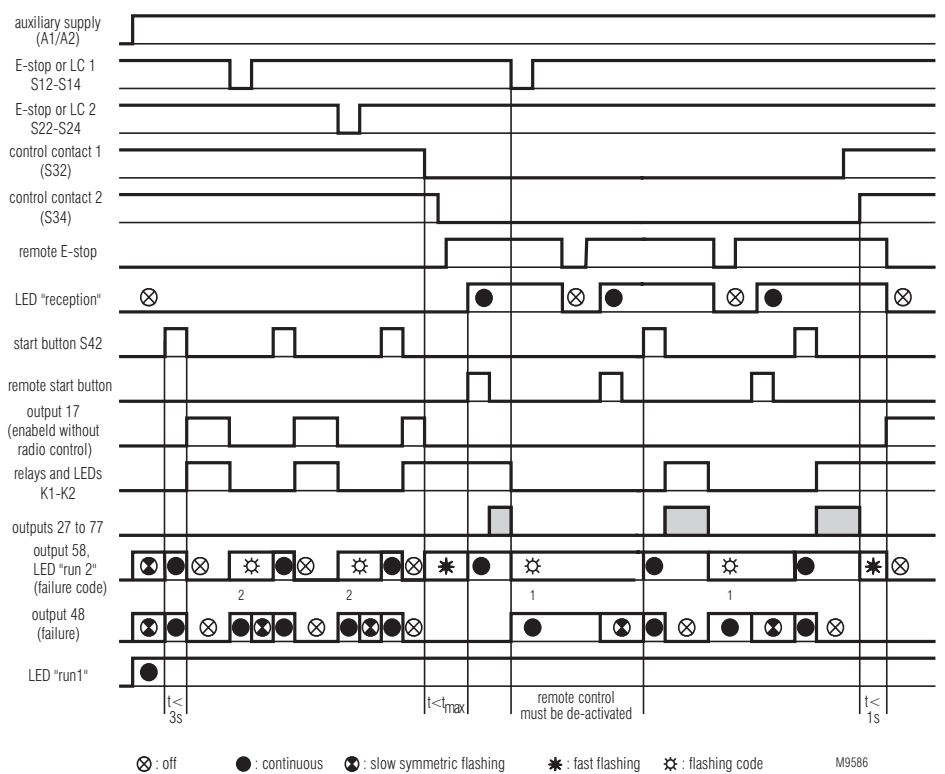


2.10.1 Function diagrams

Rotational switches B=0:

- Protective devices on inputs S11-S14 and S21-S24 always active, manual start only via start button on S42
- Remote control is active, when one control contact on S32 or S 34 is open.
- Reset of remote e-stop with remote start button (+infra red)
- $t_{max.}$ Adjustable monitoring time with rotational switch A

2.10.1 Function diagrams

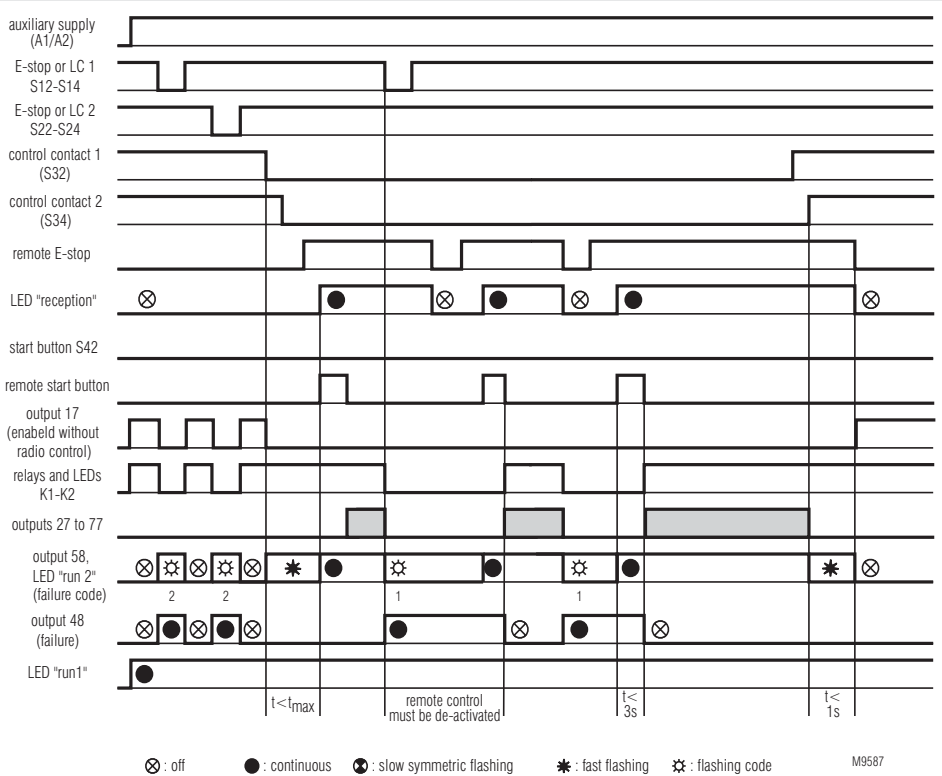


2.10.1 Function diagrams

Rotational switches B=1:

- Protective devices on inputs S11-S14 and S21-S24 always active, manual start only via start button on S42
- Remote control is active, when the control contacts on S32 or S 34 open.
- Reset of remote e-stop with start button on S42 after activating remote start button
- $t_{max.}$ Adjustable monitoring time with rotational switch A

2.10.1 Function diagrams

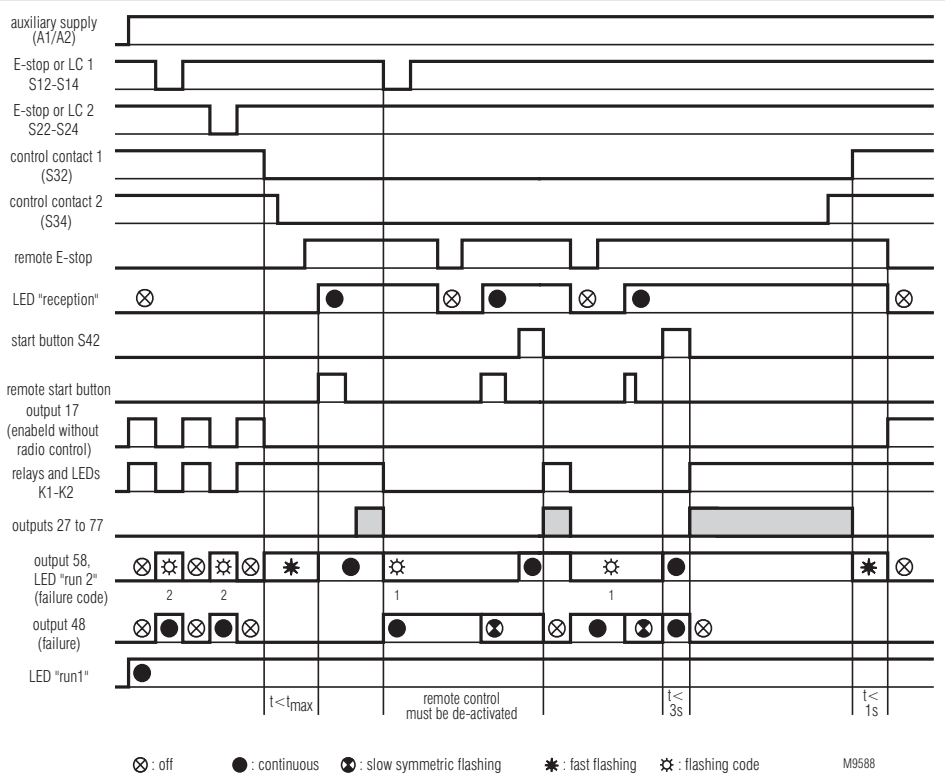


2.10.1 Function diagrams

Rotational switches B=2:

- Protective devices on inputs S11-S14 and S21-S24 always active, auto start
- Remote control is active, when the control contacts on S32 or S 34 open.
- Reset of remote e-stop with remote start button (+infra red)
- $t_{max.}$ Adjustable monitoring time with rotational switch A

2.10.1 Function diagrams

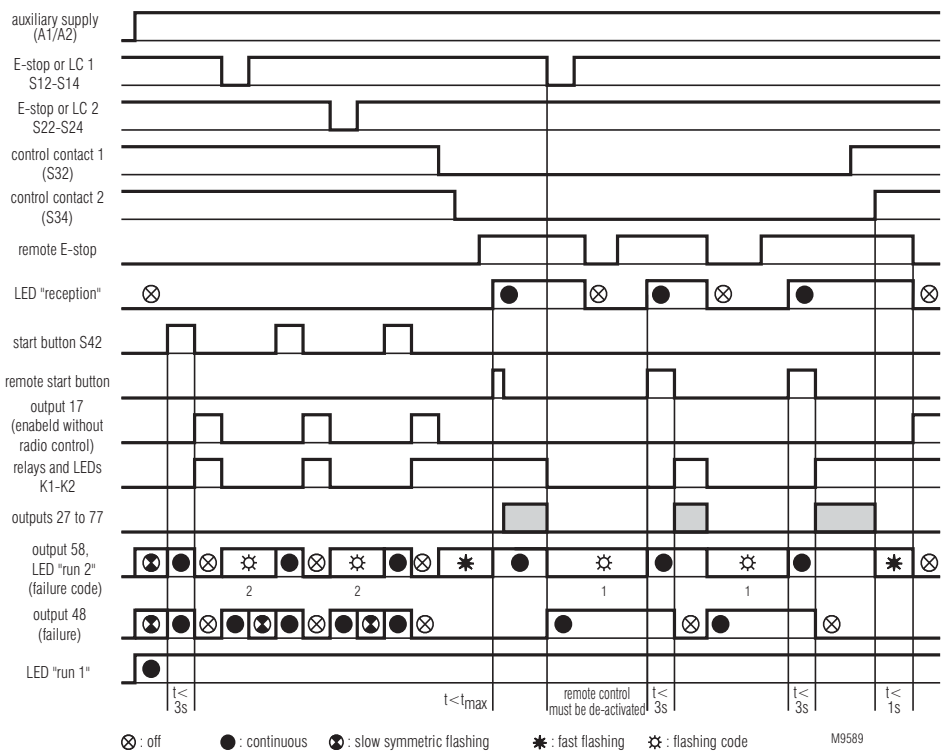


2.10.1 Function diagrams

Rotational switches B=3:

- Protective devices on inputs S11-S14 and S21-S24 always active, auto start
- Remote control is active, when the control contacts on S32 or S 34 open.
- Reset of remote e-stop with start button on S42 after activating remote start button
- $t_{max.}$ Adjustable monitoring time with rotational switch A

2.10.1 Function diagrams

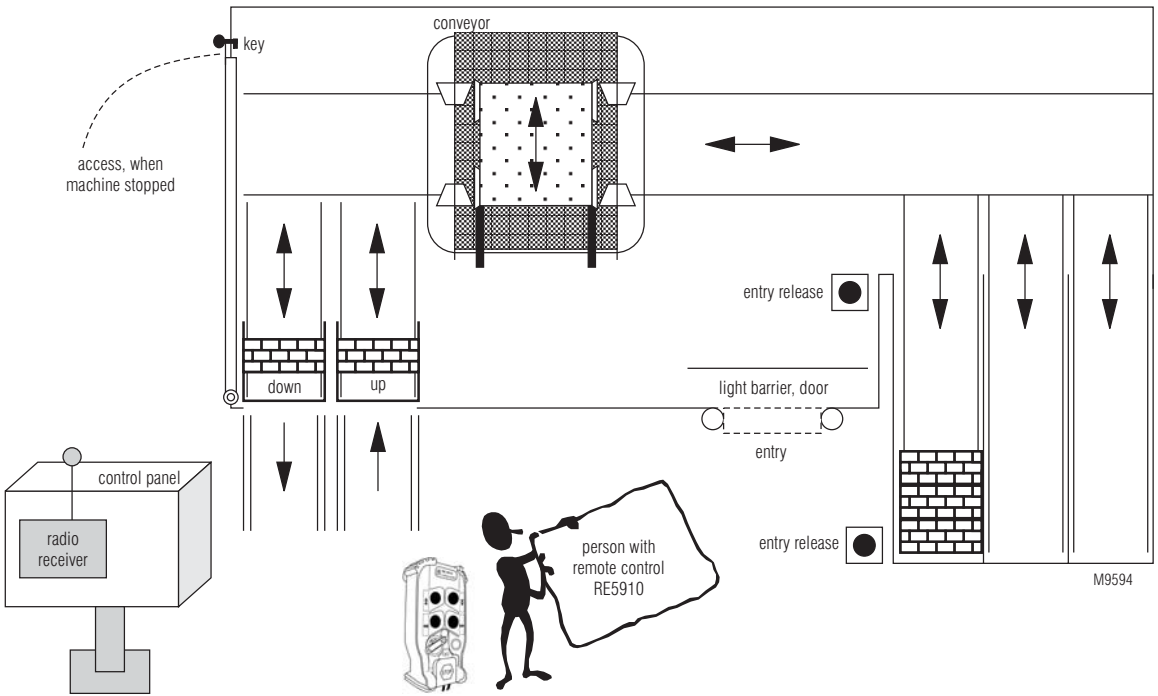


2.10.1 Function diagrams

Rotational switches B=4:

- Protective devices on inputs S11-S14 and S21-S24 always active, manual start
- Remote control is active, when the control contacts on S32 or S 34 open.
- Reset of all failures with start button on S42 or with remote start button (+infra red)
- $t_{max.}$ Adjustable monitoring time with rotational switch A

2.11 Operating modes 8 – 9 monitored zone access



The machine has an entry protected either by a light curtain or a safety gate. It may be necessary that the operator has to enter the protected area while the machine is running in order to carry out certain actions. The operator has to disable the protective device for a short period while entering or leaving the protected area.

2.11 Operating modes 8 – 9 monitored zone access

Working principle:

1. As long as the remote control is in the charger station (control contact S31-S32 is closed), the machine is protected by the hardwired e-stop on S11 to S14 and the light curtain or safety gate on S21 to S24. This state is indicated by the switched off white LED run2 and inactive output 58.
2. Before the operator enters the protected area, he takes the remote control from the charger. The control contact S 31-S32 opens, the white LED run2 and the out put 58 flash fast. This indicates that the remote e-stop button has to be released and the remote control has to be acknowledged by pressing the green start button within the selected time. If not, the safety relays will disconnect.
3. If the remote control is acknowledged within the required time the white LED run2 and the output 58 turn to be continnuously on.
4. Before entering the protected area the operator must activate and de-activate the outside entry release button (S33-S34) and the green start button on the remote control at the same time. From this moment the light barrier or safety gate function is disabled for the adjusted time. During this period the white LED run2 and the output 58 flash slowly and symmetric to indicate the disabled protection.

2.11 Operating modes 8 – 9 monitored zone access

5. After elapse of the bridging time the protection is activated again. This state is indicated by the white LED and the output 58 being continuously on.
6. To leave the protected area the operator must activate and de-activate the inside entry release button (S33-S34) and the green start button on the remote control at the same time. From this moment the light barrier or safety gate function is disabled for the adjusted time. During this period the white LED run2 and the output 58 flash slowly and symmetric to indicate the disabled protection.
7. Outside the protected area the operator places the remote control back into the chargaer and the control contact (S31-S32) closes. Latest after 1 sec the remote control must goes into inactive state, if not the safety relays will disconnect and the white LED run2 and output 58 go off.
   The disabling time and the max time to reset the remote control after taking from the charger are adjusted with the rotational switches A. Both buttons for entry release inside and outside are connected in parallel to terminals S33-S34.

2.11 Operating modes 8 – 9 monitored zone access

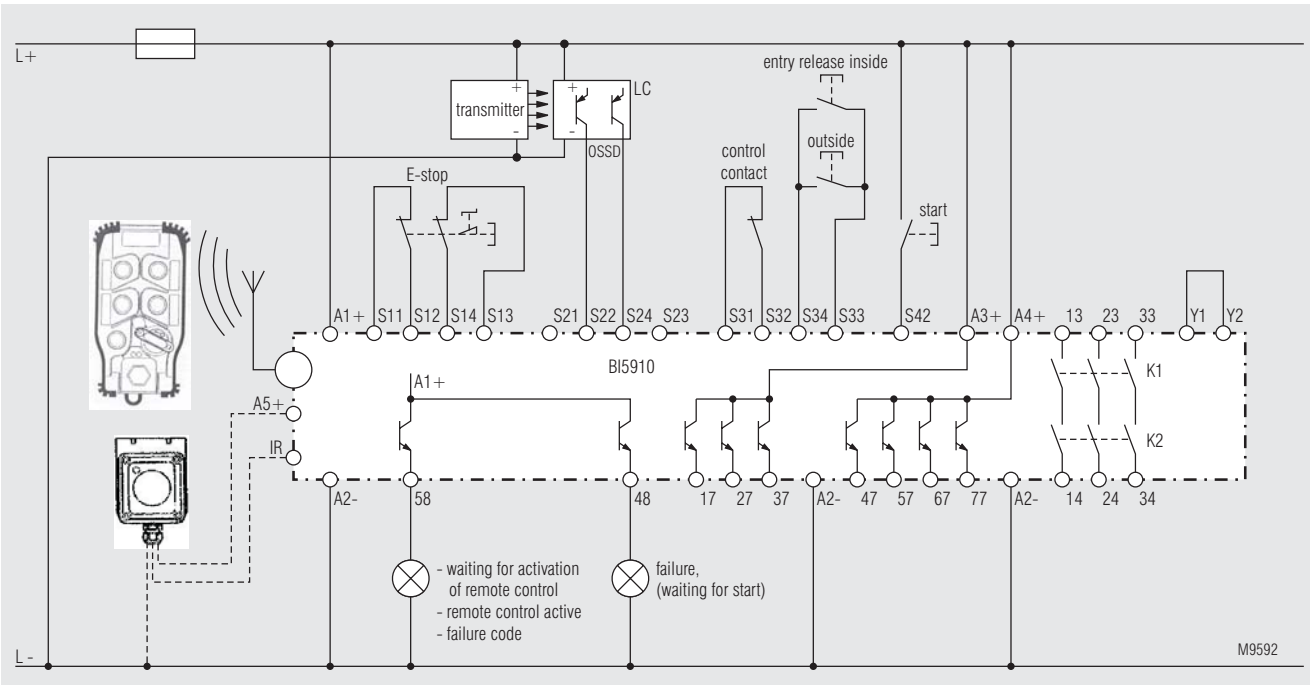
ATTENTION

As a safety gate can be connected to terminals S21 to S24 the simultaneous time for the input signals has been increased from 250 ms to 3 s.
To provide maximum safety during the time the operator is in the dangerous area the function activity monitoring must be active. This function requires activation of a pushbutton in certain intervals.

When using the remote control inside a machine or dangerous area, the speed of the machine must be reduced to a safe level. The output signals on terminal 58 and 17 provide independent status information for this function. (see also 2.12 Indication).

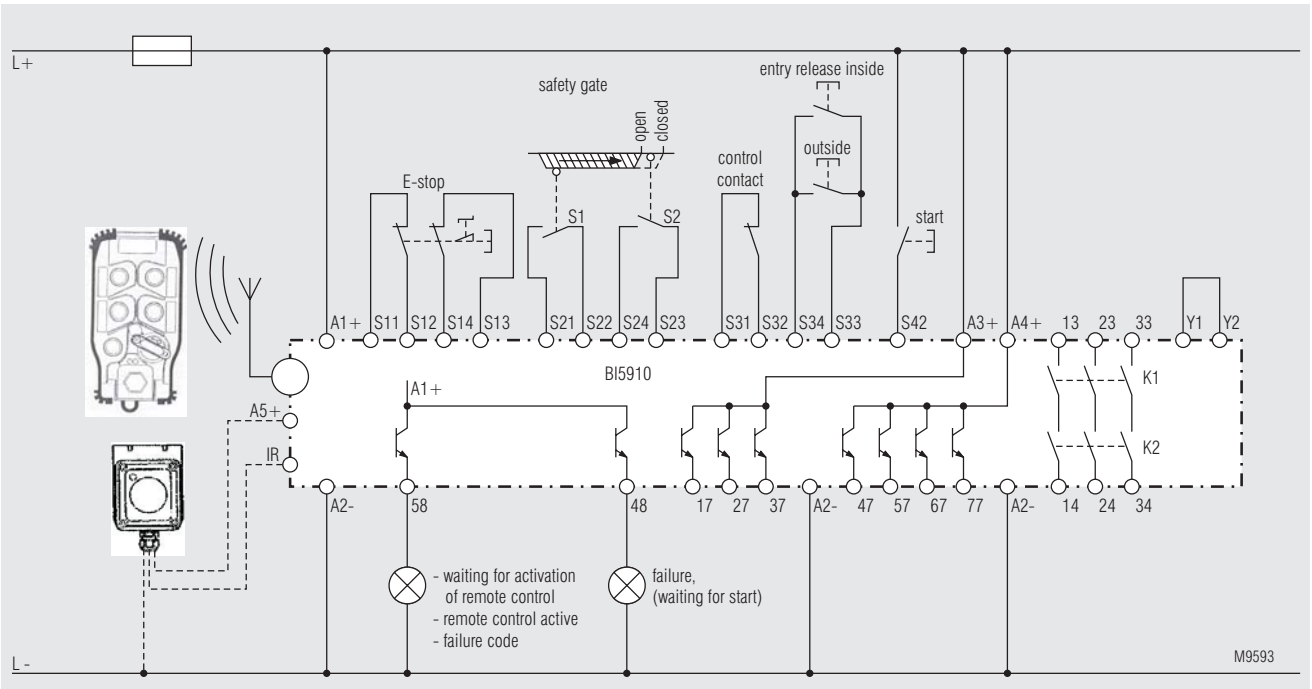
As only one control contact is available to monitor the remote control in the charger this application is only safety category 3.

2.11.1 Application examples



Monitored zone access: Zone protection by light curtain

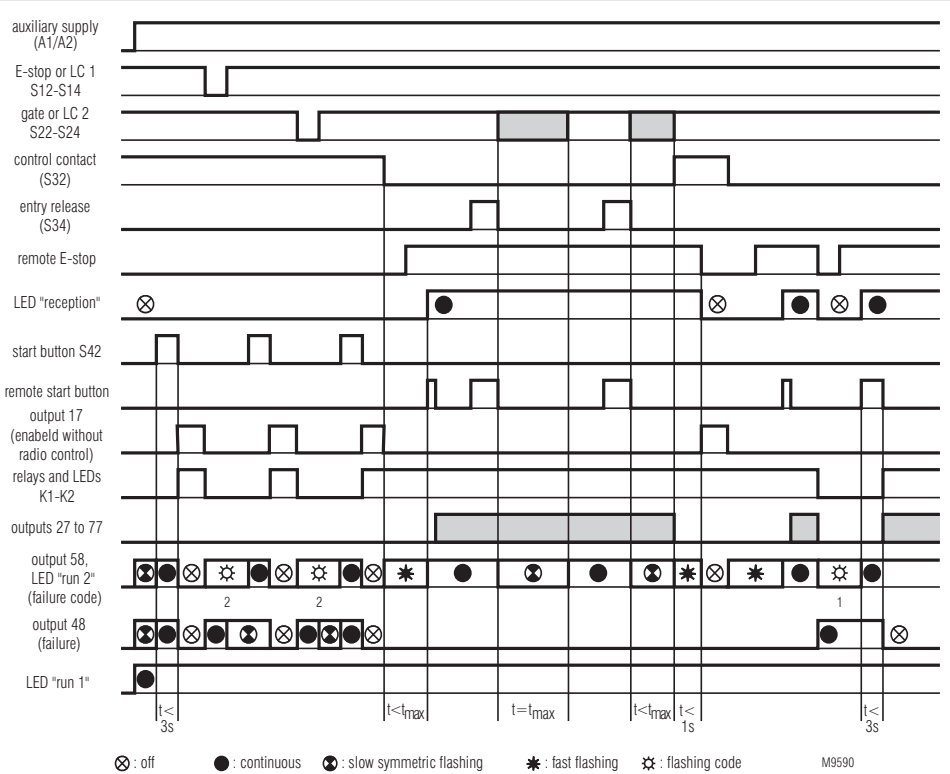
2.11.1 Application examples



Monitored zone access: Zone protection by safety gate

See also chapter 6 “installation notes”

2.11.2 Function Diagrams



2.11.2 Function Diagrams

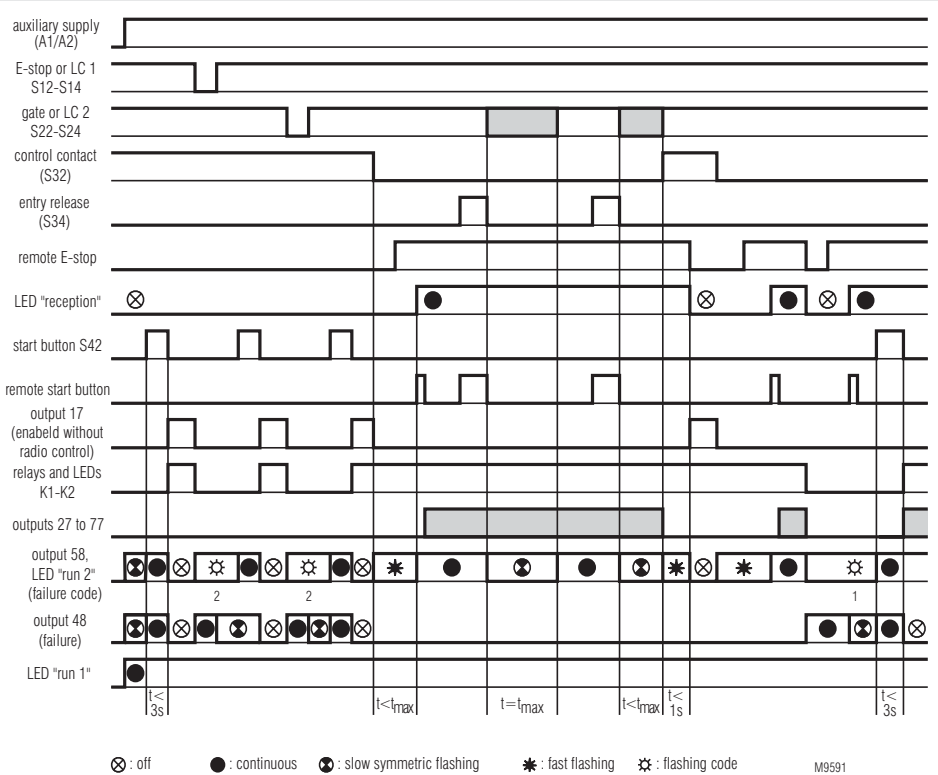
Rotational switches B = 8:

- monitored zone access, manual start
- protective devices on S11-S14 always active
- protective device on S21-S24 always active, when control contact on charger (S32) is closed
- remote control active, when control contact on S32 is open
- zone protection can be disabled for a certain time with remote control
- $t_{max.}$ Adjustable monitoring time with rotational switch A

reset of all failures with hardwired start button or start button on remote control (+infra red)

disconnection from S12-14 or S22-S24 when control contact S32 is open: see Function diagram of rotational switch B=0

2.11.2 Function Diagrams



2.11.2 Function Diagrams

Rotational switches B = 9:

- monitored zone access, manual start
- protective devices on S11-S14 always active
- protective device on S21-S24 always active, when control contact on charger (S32) is closed
- remote control active, when control contact on S32 is open
- zone protection can be disabled for a certain time with remote control
- $t_{max.}$ Adjustable monitoring time with rotational switch A

Reset of all failures with hardwired start button.
Disconnection from S12-14 or S22-S24 when control contact S32 is open:
see Function diagram of rotational switch B=1

2.12 Indication

With the LEDs on the front side and 3 semiconductor outputs different states are indicated.

	OFF	flashing	continuous ON
green LEDs K1 und K2	Safety relays K1 and K2 inactive		Safety relays K1 and K2 active
Output 58	Control contact for charger closed and safety outputs active orall outputs inactive because of system failure	- failure code: one function does not enable the unit - fast flashing indicates that the remote control must be reset - slow flashing indicates disabling of a protection device	Remote control and safety outputs are activated
White LED run 2	Control contact for charger closed and safety outputs active or all outputs inactive because of system failure	- flashing: function as on output 58 when LED run1 is ON - system failure, when LED run1 is OFF or flashes	Safety outputs activated
Output 48	Safety outputs activated or system failure	Symmetric flashing: no failure, waiting for start button	One function does not enable the unit

2.12 Indication

	OFF	flashing	continuous ON
green LEDs K1 und K2	Safety relays K1 and K2 inactive		Safety relays K1 and K2 active
White LED run 1	All relays inactive because of system failure	All relays inactive because of system failure	No system failure
Output 17	Safety outputs are de-activated or control contacts are open or remote control is activated		Remote control is inactive, control contacts are closed and the safety relays are activated
red LED receiver error (state radio part 1)	No radio signal or valid identity code received.	Failure in receiver unit (failure code) or invalid identity code received (symmetric flashing)	Connected to serial interface

2.12 Indication

	OFF	flashing	continuous ON
green LEDs K1 und K2	Safety relays K1 and K2 inactive		Safety relays K1 and K2 active
green LED reception (state radio part 2)	No radio signal Bad radio signal	- flashing: Bad radio signal - symmetric flashing: failure in receiver unit teil (failure code)	Good radio signal

If access to the dangerous area is permitted, the machine must only run on full speed, if output 58 is OFF and output 17 is continuously ON.

2.12.1 Status and failure codes

The multifunction safety module BI 5910 consists of a handling part for the complete safety functions and a handling part for the safe radio control. Therefore the failure and status indication is divided into 2 groups.

1. White LEDs “run1” and “run2”:
   Failure or status indication for safety functions

2. Red LED “receiver error” and green LED “reception”:
   Failure or status indication of the safety radio receiver

System failures in safety operation

If a system failure occurs one of the LEDs run1 or run2 is OFF or both flash with failure codes (No). The LEDS can show different failure codes at the same time.

No.	Description	Notes and measures
0	Communication failure	1) If one pocessor detects a system failure it indicates it with the failure code and interrupts the communication with the second processor. This one signals then failure 0 2) If both LEDs remain OFF, the unit is defective and must be repaired
5	Setting failure	1) The setting of the rotational switches are not identical 2) Switch position is invalid
6	Under- or overvoltage	1) left LED flashes: supply voltage is below the min. level < 0.85 U_N 2) right LED flashes: supply voltage is above max. level > 1.15U_N + 5% ripple
7	Input failure	A short circuit occurred on inputs

System failures in safety operation

No.	Description	Notes and measures
8	Failure on relay outputs	1) The feed back circuit on Y1-Y2 is not closed when safety relays are de-energised.(the feed back loop must close 50 ms after the relays de-energise 2) One of the output relays or it's control circuit is defective, the unit must be repaired.
9	Output failure	In one channel it was detected that the required position of the output contacts are not identically
10	Software failure	A processor detected a failure in it's own routine
11	Simultaneity failure	It takes to long until both hardware channels get the same state

System failures in safety operation

No.	Description	Notes and measures
12	Version failure	The software state of the 2 parts of the unit is not identically, the unit must be repaired
13	Checksum failure	The program memory of one processor is defective, the unit must be repaired
14	RAM failure	The work memory of one processor is defective, the unit must be repaired

Failure 9,10 and 11 are important information for the manufacturer. Please try to analyse the procedure that leads to this failure and pass this information to the manufacturer or supplier of the unit.

If a failure occurs in the general system procedure, the administration part interrupts the safety connection with the radio part. Both part will indicate failure code 3 (see no. 3 failure of radio part)

Status indication in safety operation

A status that leads to de-energisation of the safety outputs are indicated by the white LED run2 and the output 58 with flashing code (No). The white LED run1 remains active. Output 48 is activated as long as the failure is present, it flashes symmetrically when reset by start button is possible again.

No.	Message	Explanation
1	E-stop by remote control-	- The control contact is open an a protective device has been operated - The control contact is open and the radio signal is not active when the safety contacts are de-energised with open control contacts the remote control must be deactivated before a new start is possible
2	E-stop	- A protective device has been operated (e-stop, light barrier, safety gate)

Status indication in safety operation

No.	Message	Explanation
3	Simultaneity failure	- Both signals of an e-stop, light curtain or safety gate have not been operated within the required time. Both signals must now be disconnected before a new start is possible. - The entry release button or the start button on the remote control have been operated to long. - The remote control has not been started within the required time after removing it from the charger
4	Failure on start button	- Activated more the 3 s - Already pressed on start-up - A failure occurred while start button was pressed
5	Entry release failure	- The entry release button is pressed when the unit is powered up
6	Control contact failure	- only one of the control contacts is open

Failure and status indication of the radio receiver

The status of the safety radio receiver is indicated by flashing codes (No) of the red LED ”receiver error” and the green LED “reception”.

Red LED “receiver error”

No.	Status	Mode	Description
	OFF OFF Symmetric flashing	Normal operation	No radio signal Message with valid identity code Message with invalid identity code
	ON	Serial connection	Writing parameters and reading data
2	Flashing with failure code	Error	Supply
3			Safe connection to administrator part
4			EEPROM
5			RAM
6			ROM
7			Processor type

Failure and status indication of the radio receiver

Green LED “reception”

	No.	Status	Mode Description
	OFF Symmetric flashing ON	Normal operation	No radio signal Bad radio connection Good radio connection
	OFF	Serial connection	Writing parameters and reading data
2	Flashing with failure code	Error	Supply
3			Sicherheitsverbindung zum Verwaltungsteil
4			EEPROM
5			RAM
6			ROM
7			Processor type

3. Remote control RE 5910

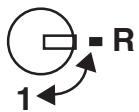
3.1 Type and specification of push buttons

The remote control is available with 5 different types of buttons:

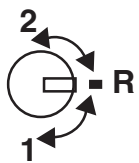
1-position push button **(BPSV)**

2-position push button **(BPDV)**

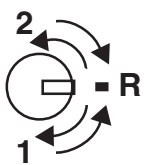
rotational switch with 2 positions **(COM2)**



rotational switch with 3 positions **(COM3)**



rotational switch auto resetting with 3 positions **(COM3R)**

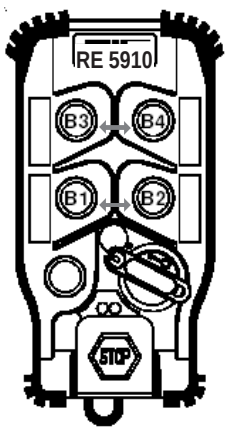


The location of the buttons is numbered to identify it as described in **appendix A**.

3.2 Temporary disabling of function keys

The function key can be temporary disabled in pairs.

1. button of pair	2. button of pair	Abbreviation
Button No. 1	Button No. 2	B1 - B2
Button No. 3	Button No. 4	B3 - B4



By pressing both buttons of a pair the function of this 2 buttons is disabled. (The corresponding semiconductor outputs are OFF).

3.3 Assignment of push buttons to outputs

The semiconductor outputs are assigned to the push buttons as follows:

	Button	Output
Remote control with 1-position push buttons	B1	27
	B2	37
	B3	57
	B4	67
Remote control with 2-position push buttons	Button	Outputs
	B1 position 1	27
	B1 position 2	27 + 47
	B2 position 1	37
	B2 position 2	37 + 47
	B3 position 1	57
	B3 position 2	57 + 77
	B4 position 1	67
	B4 position 2	67 + 77

3.4 Identity check

The remote control and the multifunction safety module are connected by a **frequency** signal and an **identity code**.

The Bi 5910 can only recognise and operate the commands of the assigned remote control (identical identity code and frequency).

- The frequency can be programmed by the operator (see 3.9.2).
- The identity code of the RE 5910 is stored on an electronic key and on the remote control
- The identity code of the BI 5910 is individual and cannot be modified, it is set in the factory.

There are 65536 different combinations for an identity code.

To achieve a working system after a future repair or exchange of BI 5910 or RE 5910 it is absolute necessary to record the identity code from the units in your documentation in order to provide correct programming for replacement parts. On page 2 of this manual you can register the code numbers.

3.5 Electronic key

The electronic key of the remote control RE 5910 has 2 different functions.

- It allows the activation of the remote control and offers a t the same time an access limitation to skilled and authorised persons.
- It contains all information that is necessary to operate the product, i.e.
  - last programmed frequency*,
  - identity code of the system,
  - duration of activity monitoring*

* can be changed by a trained operator, see 3.9

If the remote control is not active, the key must be removed. An interruption of the power supply prohibits against unauthorised usage of the remote control.

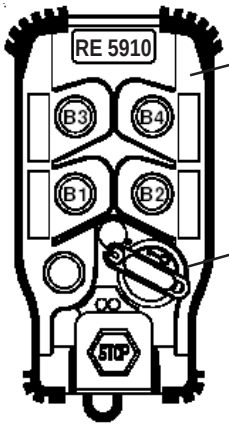
The key must only be removed from an active remote control after pressing the e-stop button. If the e-stop button is not pressed and the key is removed, an alarm signal is given (4 flash code) and a passive disconnection of the BI 5910 multifunction safety module follows. (can only be reset by switching off and on the power supply of the unit.)

If necessary the key can be used to switch of the remote control RE 5910.

Note: The remote control does not work without the electronic key!

Identity code of electronic key and remote control
An identity code is stored in the electronic key and in the remote control RE 5910. When both keys are identically the remote control can work.

3.5 Electronic key



Identity code stored
in remote control RE 5910

Identity code stored
in electronic key

The remote control can be operated when:
Identity code RE 5910 = Identity code electronic key

If the identity codes are different, the remote control indicates this by a 3 pulse flashing code on it's both LEDs.

In this case please follow the programming routine described under 3.9.4

Defective remote control

It is possible to take the key from an defective remote control and put it to a **spare one with the same push buttons as on the defective one.**

If the buttons are different they cannot be operated. Then the Identity code of the key has to be programmed into the spare remote control. See programming routine 3.9.4

Lost electronic key

A new key RE 5910/02_ can be ordered by stating the following details:

- 6-figure number of the old key (you should have noted this number on page 2 of this manual)
- Number of actually used frequency channel on RE 5910 (01 – 64)
- Time interval of activity monitoring (01 – 99 seconds or 01 –98 minutes).

With this information you will get an identical new key with all the parameters of your remote control.

3.6 Function activity monitoring

While activity monitoring is selected the remote control will be deactivated (interruption of radio signal) if within the programmed interval **N** in **seconds** or **minutes** no push button is activated.

The time **N** and the time unit (sec, min) can be adjusted by the operator. **N** can be 1 to 98 minutes or 1 to 99 seconds.

- If minutes are selected and N is 99, activity monitoring is switched off as the time will be infinite. (standard setting)

- If seconds are selected and N is 99 the the remote control will switch off after 99 sec without activity.(non standard setting)

Restart after activating activity monitoring
- Press e-stop on remote control
- Release e-stop on remote control
- Press green start button

Change time interval
The time interval n and the unit seconds or minutes can be changed by trained persons as described under 3.0.3

Note: Duration and time unit of activity monitoring are stored in the electronic key.

On delivery activity monitoring is switched off on the remote control RE 5910.

3.7 Battery operation – storage recommendations

The remote control RE 5910 has to be stocked with charged battery.

3.7.1 Charge battery

To charge battery:
- press e-stop button of remote control
- place remote control on charger unit

During charging the red LED of the remote control is continuously on, while the green LED shows the charging level:

Green LED flashes: Quick charge active

Green LED ON: Slow charging or charge conservation (charging level of RE 5910 >60%)

3.7.2 Indication of charging level

On the remote control there are 2 possibilities to indicate the charging state:
- When activating the remote control (release of e-stop button) the red LED shows the state of the battery:

  red LED OFF battery charged > 50%
  red LED flashes slowly: battery charged between 10% and 50%
  red LED flashes fast: battery charged < 10% it must be loaded immediately.

- When operating the remote control (radio transmission) a low battery state (battery charged < 10%) is indicated by a fast flashing red LED. The user is informed, that the remote control will be deactivated in short time (within approx. 15 minutes).

3.8 Activation of remote control

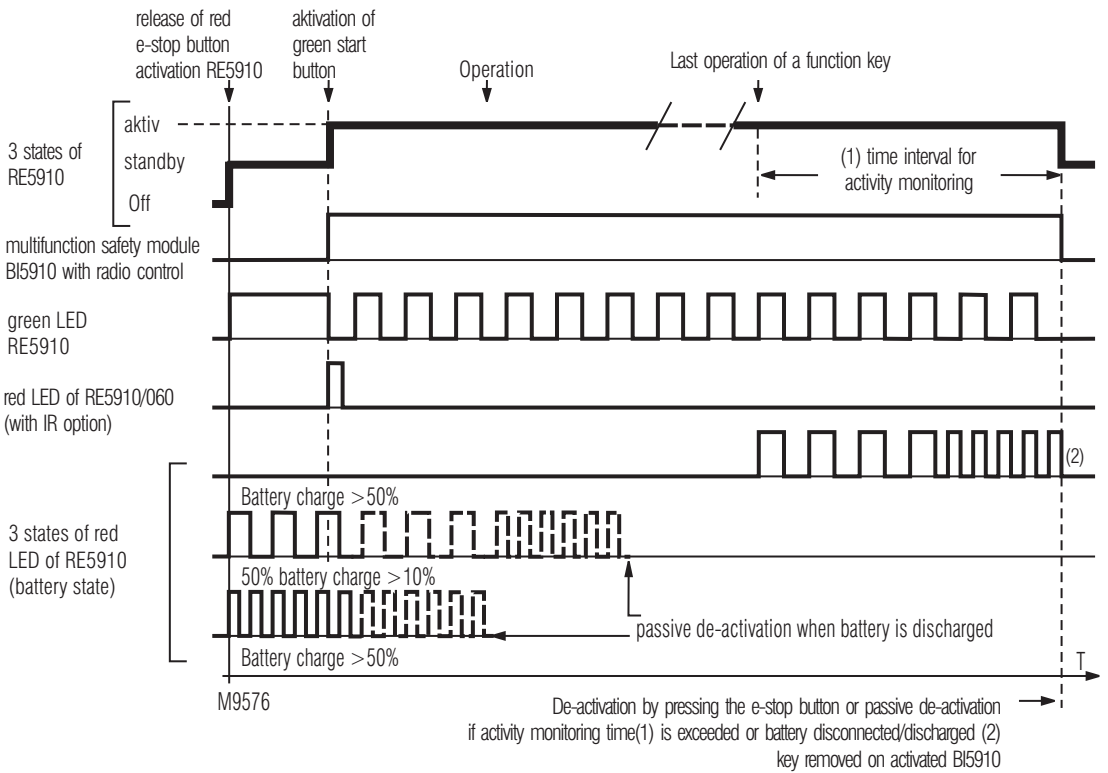
As long as the remote control is placed on the charger(control contacts closed on BI 5910) the radio controlled safety module work only with its hard wired safety sensors.. When the remote control is taken from the charger the control contacts open and indicate to the BI 5910 that the remote control is now on operation. If the safety contacts are already active the BI 5910 waits for the period of time adjusted with the rotational switches that the radio transmission get active. This state is indicated by the fast flashing white LED run2 and status output 58. Within this time the activation of the remote control must take place or it must be placed back on the charger. If this is not the case the safety relays will be de-energised.

Activation procedure of the remote control:
1. insert the electronic key
2. release of the e-stop butto
3. activate green start button (for max 3 seconds)

To stop the remote control press e-stop.

Notes: If this procedure is not followed, the remote control goes into failure mode with flash code: 5 pulses of red and green LED.

3.8.1 Function Diagrams



3.9 Configuration of remote control

The following parameters can be set on the remote control:

- Transmission frequency, selection of channel 01 – 64
- Time interval for activity monitoring 0-99 sec or 0-98 min or infinite (99 min)
- transfer of identity code from electronic key to the remote control

By a special procedure a trained and authorised person can disable or enable the above functions.

3.9.1 „Enabling-disabling“ of remote control programming

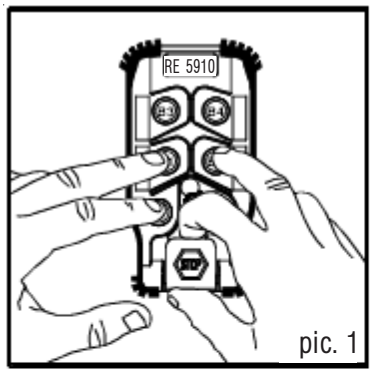
1. Disconnect the multifunction safety module BI 5910 with radio control
2. Insert the electronic key into the remote control
3. Keep the buttons B1,B2 and the green start button pressed
   - release the e-stop button (pic.1),
   - release all buttons

LED indication:
Transmitter disabled: red LED ON, green LED OFF
transmitter enabled: red and green LED ON

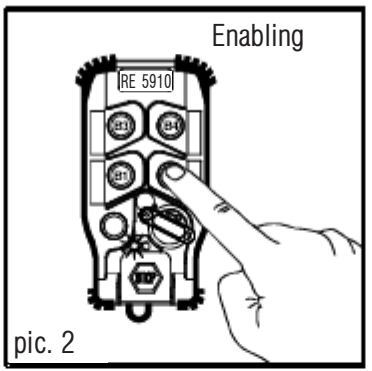
4. Enabling-disabling by pressing button B2 the selected mode is indicated on the LEDs (pic.2+3)
5. If the mode is selected, the selection must be confirmed by pressing the green start button (pic.4)
6. The remote control RE 5910 stores the new mode and the LEDs go OFF (pic.5).
7. Leave the configuration mode by pressing the e-stop button (pic.6).

Remark: If the operator tries to change the frequency or the time for activity monitoring on a disabled remote control, a failure is displayed by 4 pulse flashing of the LEDs.

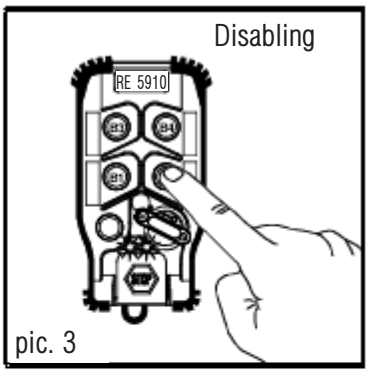
3.9.1 „Enabling-disabling“ of remote control programming



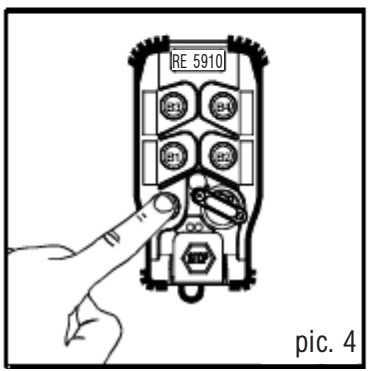
pic. 1



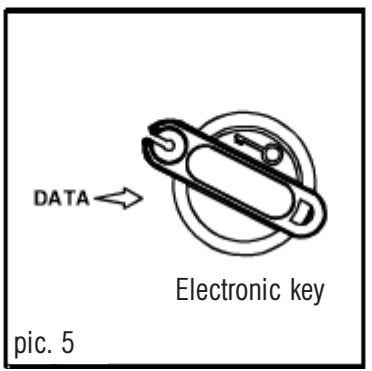
pic. 2



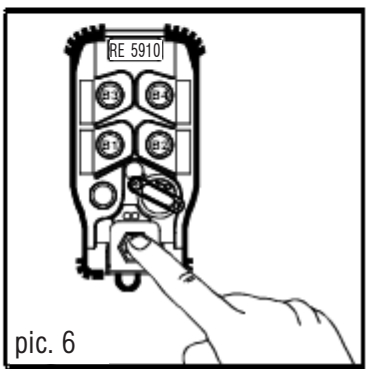
pic. 3



pic. 4



pic. 5



pic. 6

3.9.2 Programming of radio frequency

1. Disconnect the multifunction safety module BI 5910 with radio control
2. Insert the electronic key into the remote control
3. Keep the buttons B1,B2 pressed
   - release the e-stop button (pic.1),
   - release buttons B1, B2

   The flashing LEDs indicate the actual selected channel. The green LED shows the units and the red LED the tens of the channel number.

4. Select the new channel with the buttons B1 and B2. Pressing B1 increments the tens and pressing B2 increments the units. The flashing of the LEDs indicate the new selected channel.
5. When the required channel is selected (number between 01 and 64) the selection must be confirmed with the start button (Pic. 4).

3.9.2 Programming of radio frequency

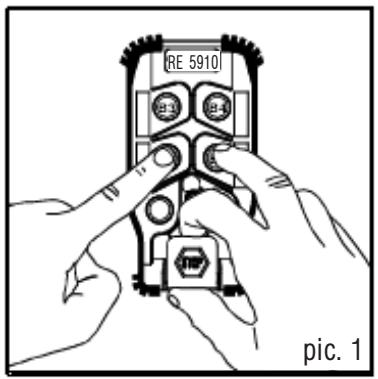
Short activation of start
The remote control sends the new channel number to the BI 5910 and stores the new working frequency (pic.5).

Long activation of start (3 sec)
The remote control sends the new channel number to the BI 5910 on all radio channels and stores the new working frequency, please wait until the flashing of the LEDs stops (approx. 30 sec) (pic.5).

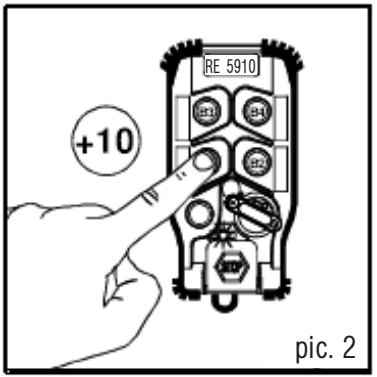
Attention: As in this procedure all frequencies are used all other receivers that must not be changed have to be switched off. This procedure should be used when the original frequency of the remote control is not known.

6. Leave the programming mode by pressing the e-stop button (pic.6)
7. Check if the BI 5910 has changed the channel with the procedure described under 3.8.

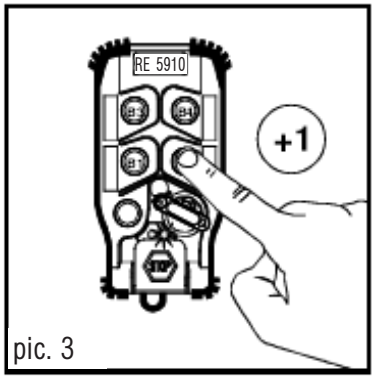
3.9.2 Programming of radio frequency



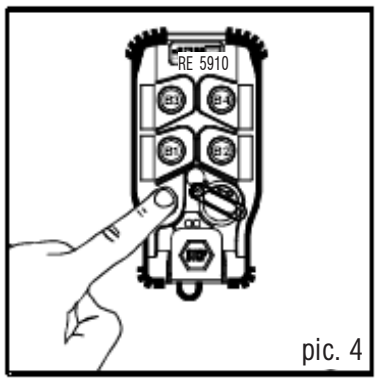
pic. 1



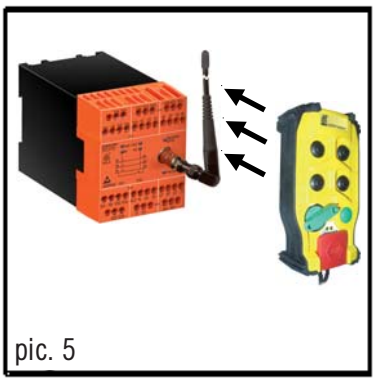
pic. 2

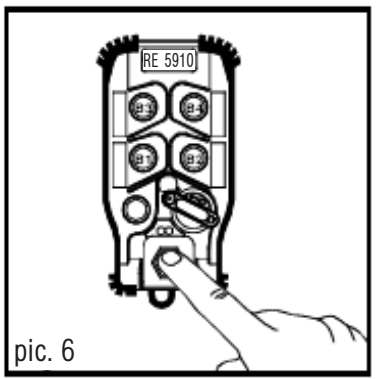


pic. 3



pic. 4


pic. 5



pic. 6

3.9.3 Time delay of activity monitoring

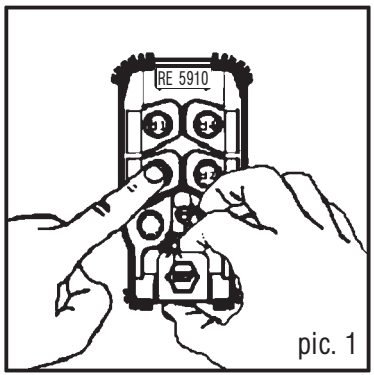
(Automatic disconnection of remote control)
The time interval is fixed by 2 parameters
1. The time base i.e. seconds or minutes
2. The time interval

3.9.3.1 Programming of time base – activity monitoring

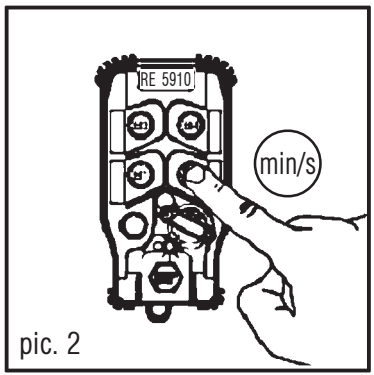
1. Disconnect the multifunction safety module BI 5910 with radio control.
2. Insert the electronic key into the remote control.
3. Keep the button B1 pressed,
   - Release the e-stop button (pic.1),
   - Release button B1
   The red LED is ON when minutes are selected,.
   The green LED is on when seconds are selected.
4. The time base can be changed by pressing B2 (Pic.2). During this procedure the momentarily selected time base is indicated on the LEDs.
5. The selected time base (minutes or seconds) is confirmed by pressing start (Pic.3).
6. Leave the programming mode for activity monitoring by pressing e-stop. (Pic.5).

Attention: When selected minutes and delay time 99 the time is infinite. If unintentionally the remote control is not de-activated it will discharge completely.

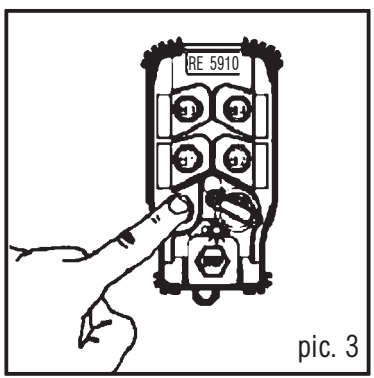
3.9.3.1 Programming of time base – activity monitoring



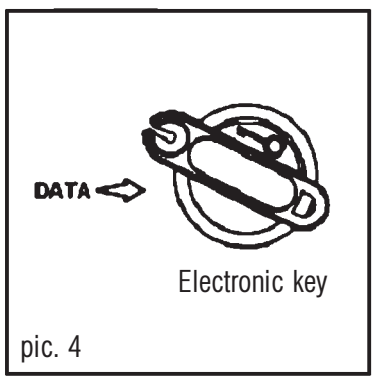
pic. 1



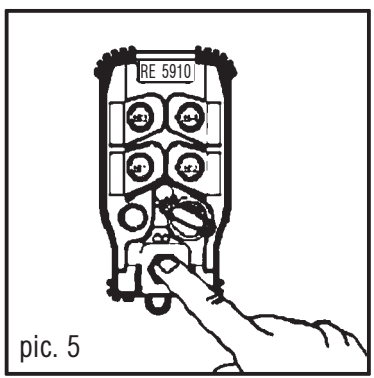
pic. 2



pic. 3



pic. 4



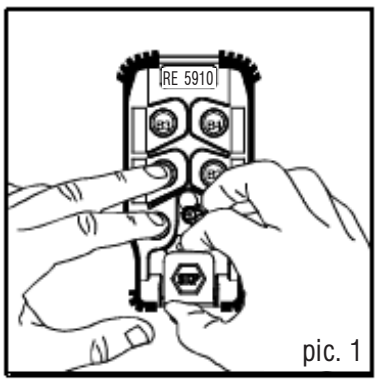
pic. 5

3.9.3.2 Programming of the time period – activity monitoring

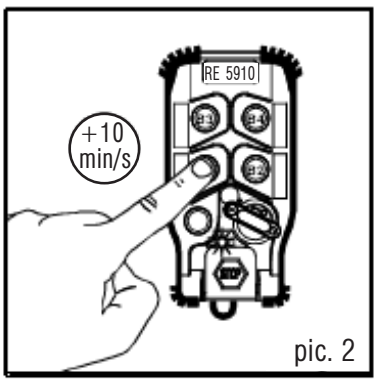
1. Disconnect the multifunction safety module BI 5910 with radio control
2. Insert the electronic key into the remote control
3. Keep the buttons B1and start pressed
4. Release the e-stop button (pic.1)
5. Release buttons B1 and start
6. The actual time value is indicated by the 2 flashing LEDs.of the remote control.
   The green LED shows the units and the red LED the tens of the time delay.
7. The new delay time can be adjusted with the buttons B1 and B2 (pic.2+3).
   Pressing B1 increments the tens and pressing B2 increments the units. During this procedure the momentarily selected delay time is indicated on the flashing LEDs.
8. The selected delay time (between 01 and 99, res. 01 and 98 min) is confirmed by pressing start (pic.4).
9. Leave the programming mode for activity monitoring by pressing e-stop. (pic.6).

Attention:
When selected minutes and delay time 99 the time is infinite. If unintentionally the remote control is not de-activated it will discharge completely.

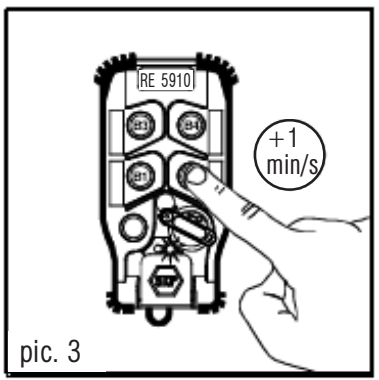
3.9.3.2 Programming of the time period – activity monitoring



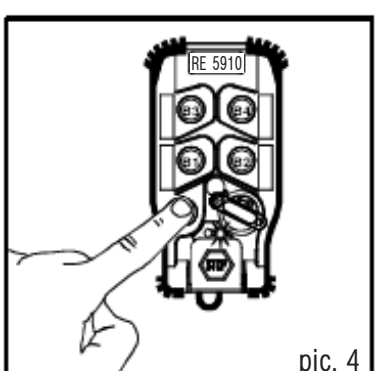
pic. 1



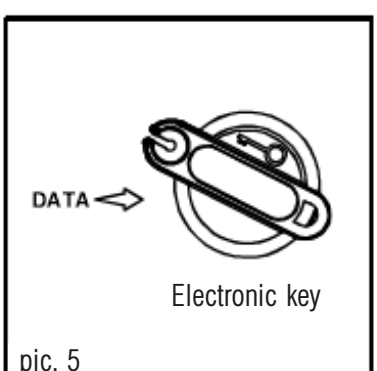
pic. 2



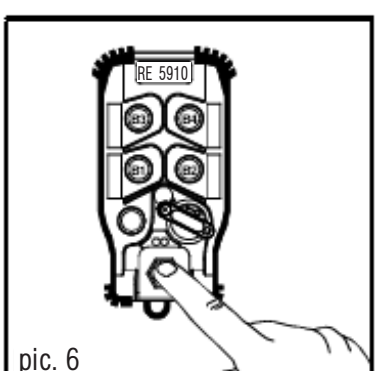
pic. 3



pic. 4



pic. 5



pic. 6

3.9.4 Copy of identity code from electronic key to remote control RE 5910

Please follow this instruction if a maintenance remote control should be used, or the electronic key has been exchanged.

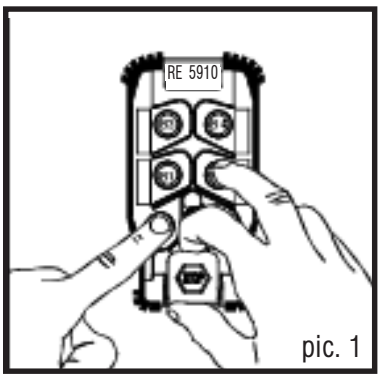
Note:
To operate the radio controlled system it is absolutely necessary the the identity codes of the remote control, the electronic key and the BI 5910 are identical.
If using a maintenance remote control or if the electronic key has been exchanged it is important to transfer the information from the electronic key into the remote control RE 5910.

Requirements for this procedure:
The key configuration of the replacement remote control must be identical with the configuration stored in the electronic key (or of the original remote control).

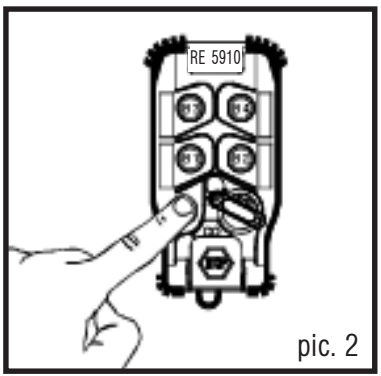
1. Disconnect the multifunction safety module BI 5910 with radio control
2. Insert the electronic key into the remote control
3. Keep the buttons B2and start pressed,
   - Release the e-stop button (pic.1),
   - Release buttons B2 and start
   Both LEDs of the remote control RE 5910 flash fast.
4. Press the start button to begin the automatic programming of the identity code. Both LEDs of the remote control go OFF (pic.2).
5. The information “Identity code” is copied from the electronic key into the remote control (pic.3).
6. Leave the programming mode for identity code by pressing e-stop. (Pic.4).

It could be necessary to reprogram the radio frequency(e.g. if the new key was programmed to a different frequency). In this case please follow the instructions under 3.9.2.

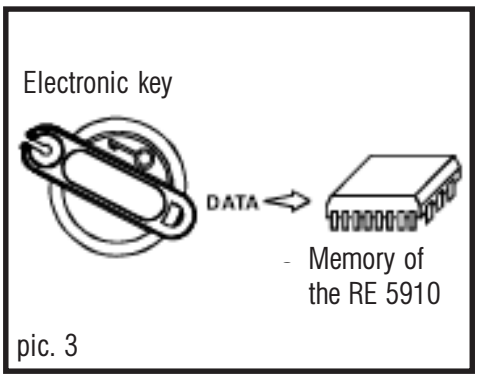
3.9.4 Copy of identity code from electronic key to remote control RE 5910



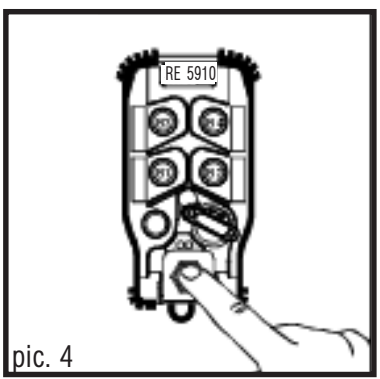
pic. 1



pic. 2



pic. 3



pic. 4

3.10 LED indicators of the remote control

Status	Red LED	Green LED	Function
Before or after „ON“	OFF	OFF	Switched OFF or time of activity monitoring exceeded or RESET with discharged battery
Before „ON“	OFF	ON	Battery charge > 50%
Before „ON“	Slow flashing	ON	50% > Battery charge > 10%
Before „ON“	Fast flashing	ON	Battery charge < 10%
Before „ON“	ON	ON	Read error of electronic key
After „ON“ (Modus NORM)	OFF	Flash	Radio transmission
After „ON“ (Modus NORM)	Fast flashing	Flash	Radio transmission and battery charge < 10%
Before „ON“	3 flashes	3 flashes	Error: Difference detected between electronic key and memory of remote control re-programming is necessary see 3.9.4

3.10 LED indicators of the remote control

Status	Red LED	Green LED	Function
Before or after „ON“	4 flashes	4 flashes	Push button defective
Before „ON“	5 flashes	5 flashes	Error at activation or deactivation detected. Please observe starting conditions under 3.8
Before „ON“	6 flashes	6 flashes	Error at activation or deactivation detected. Please observe starting conditions under 3.8
Before „ON“	7 flashes	7 flashes	Internal error in electronic key or remote control
Before „ON“	8 flashes	8 flashes	Internal error in remote control
Config.mode: Channel no., Activity monitoring	No. of flashes indicates the tens of the programmed parameter	No. of flashes indicates the units of the programmed parameter	Indication of tens and units of the parameters

3.10 LED indicators of the remote control

Status	Red LED	Green LED	Function
Config.mode: Disabling - Enabling	ON	OFF	Remote control disabled
Config.mode: Disabling - Enabling	ON	ON	Remote control enabled
Battery charging	ON	Flashing	Quick charge process (operated by (microprocessor of RE5910)
Battery charging	ON	ON	Slow charging or charge conservation (operated by microprocessor of RE 5910)
Battery charging	2 flashes	2 flashes	Charging error

4. Product specification
4.1 Remote control RE 5910

The model of the remote control is defined with a 10 figure type number:

RE 5910/00_

Variant

1: 4 x 2 step push buttons, without IR, with electronic key
2: 4 x 2 step push buttons, with IR, with electronic key
3: 4 x 1 step push buttons, without IR, with electronic key
4: 4 x 1 step push buttons, with IR, with electronic key
5: B1-B3: step push button (BPSV),
B4: rotational switch with auto return (COM3R)
6: B1-2: 1 step pushbutton (BPSV),
B3-B4: rotational switch with auto reset (COM3)

4.2 Multifunction safety module BI 5910 with radio control

The model of the multifunction safety module BI 5910 with radio control is defined with a 14 figure type number:

BI 5910._ _/0_MF9 DC 24 V

Option start with infra red
0: without IR start
1: with IR start

Contacts:
03: 3 NO contacts
22: 2 NO contacts, 1 NC contact*)
*) the NC contact is not a safety contact

4.3 Standard arrangement

The standard arrangement consists of the following components:

• 1 Receiver	BI 5910.03/01MF9
• 1 Infra red receiver with 10 m wire	RE 5910/060
• 1 Remote control + 1 electronic key	RE 5910/002
• 1 Aerial	RE 5910/040
• 1 Industriel charger unit	RE 5910/010
• 1 Power supply for charger	RE 5910/011
• 1 Set 48 white stickers + protection foils	RE 5910/033
• Operation manual	

4.4 Accessories – remote control RE 5910

RE 5910/010 Industriel charger unit
RE 5910/011 Power supply for charger AC 230V (Euro connector)
RE 5910/012 Power supply for charger DC 12/24 V

RE 5910/020 Green electronic key with program
RE 5910/021 Orange electronic key with program

Important: Please state the following details on order:
- Number of electronic key (6 figure number, noted on page 2 of this manual)
- Frequency channel, if it should be programmed by manufacturer
- Time delay for activity control (01-99 sec or 01-98 min)

RE 5910/030 Set with 6 colour stickers “movements” for 2-step push buttons
RE 5910/031 Set with 90 black and white stickers
RE 5910/033 Set with 48 white stickers + 48 transparent protection stickers for individual marking

RE 5910/050 Replacement rechargeable battery

4.5 Accessories Multifunction safety module BI 5910

RE 5910/040 Straight 1/4 λ aerial 433-434 MHZ – BNC
RE 5910/041 Straight 1/2 λ aerial 433-434 MHZ – BNC
RE 5910/042 2 m Extension for aerial + enclosure fixture –BNC
RE 5910/043 5 m Extension for aerial + enclosure fixture –BNC
RE 5910/045 Extension 50 cm

RE 5910/060 1 infra red receiver with 10 m wire
RE 5910/061 10 m extension wire for infra red module

5. Technical data
5.1 Remote control RE 5910

Enclosure

Material:	ABS
Degree of protection:	IP65
Ambient temperature:	-20°C ... +50°C
Holder for non-operation:	Charger unit
Weight (with battery):	240 g
Dimensions:	46 x 78 x 143 mm

Radio

Conformity:	ETS 300 220
Carrier frequency:	UHF, frequency modulated (FM)
Frequency:	64 programmable frequencies
Frequency range:	433.1 ... 434.675 MHz
HF-power:	< 10 mW (without licence), integrated aerial
Distance:	150 m under industrial ambient conditions *) 350 m in open area

) The distance can vary with the ambient conditions of the remote control and the receiver aerial (roof construction, metal walls etc.)

5. Technical data
5.1 Remote control RE 5910

Battery

Type:	NiMH
Charge/discharge cycles:	min. 500 cycles
Charging time:	2 h, at 20°C (80%) (for completely discharged battery)
Full charging time:	2 h 30 min (100%)

Charge capacity

Normal operation of push buttons:	20 h at 50% operation, +20°C
after 10 minutes charging of discharged battery:	approx. 1 h operation
Storage temperature:	-20°C ... +50°C
Charging temperature:	0°C ... +40°C **Attention!** Slow charging outside temperature range may damage the battery

5. Technical data
5.2 Multifunction safety module BI 5910

Radio	
Conformity:	ETS 300 220
Aerial:	1/4 aerial, plug in as accessory
Frequency:	64 programmable frequencies 433.1 … 434.675 MHz
Sensitivity:	< -100 dBm
Nominal voltage U_N:	DC 24 V
Voltage range:	at max. 5 % residual ripple: 0,85... 1,15 U_N
Nominal consumption:	max. 120 mA (Semiconductor outputs not connected)
Control voltage on S11, S13, S21, S23, S31, S33,48, 58:	DC 23 V at U_N
Control current on S12, S14, S22, S24, S32, S34, S42:	each 4,5 mA at U_N
Min. voltage at terminals S12, S14, S22, S24, S32 S34, S42:	DC 16 V
Max. voltage for inactive terminals: S12, S14, S22, S24, S32, S34, S42:	DC 9 V
Max. Inputvoltage on S12, S14, S22, S24, S32, S34, S42:	DC 30 V

Fusing:	Internal with PTC
Max. time difference between input signals of one function	
E-stop, Light curtains:	250 ms
Gates:	3 s

Safety Output

Contacts	
BI 5910.03:	3 NO contacts
BI 5910.22:	2 NO contacts, 1 NC contact The NC contact can only be used as indicator contact!
Contact type:	Relay, positive guided
Pic up time typ. at U_N	
automatic start:	max. 800 ms
manual start:	max. 110 ms
automatic restart:	max. 70 ms

Switching off time (reaction time)

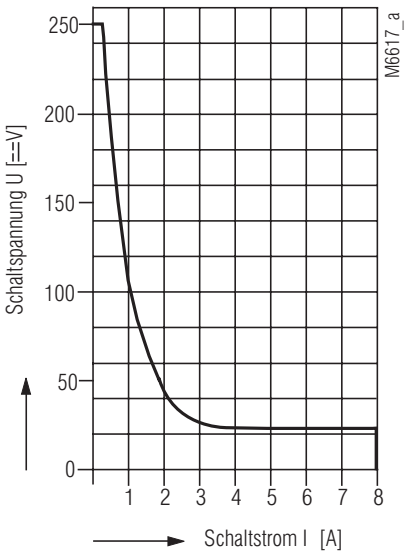
S12-S14, S22-S24, S32-S34:	max. 25 ms	
E-stop (Radio):	max. 170 ms	
Passive disconnection because of interrupted radio signal:	max. 500ms	
Disconnection with active radio signal and closed charge control contact:	max. 1 s	
Nominal output voltage:	AC 250 V DC: see limit curve for arc-free operation	
Switching of low loads:	> 100 mV	
Thermal current I_{th}:	5 A	
Switching capacity		
to AC 15		
NO contact:	AC 3 A /230 V	IEC/EN 60 947-5-1
NC contact:	AC 2 A /230 V	IEC/EN 60 947-5-1
nach DC 13:	DC 8A / 24V bei 0,1Hz	IEC/EN 60 947-5-1
Electrical life:		

to AC 15 at 2 A, AC 230 V:	100000 switching cycles	IEC/EN 60 947-5-1
Permissible switching frequence:	max. 1200 switching cycles / h	
Short circuit strength		
max. fuse rating:	6 A gL	IEC/EN 60 947-5-1
line circuit breaker:	C 8 A	
Mechanical life:	10 x 10^6 switching cycles	

Semiconductor outputs

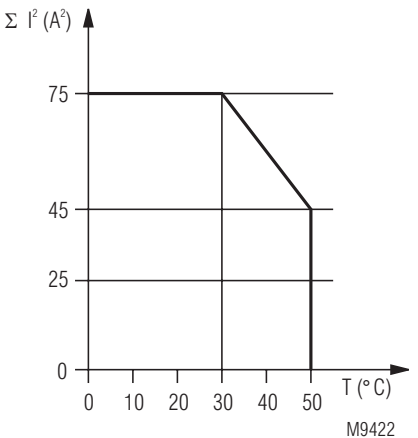
Output (Terminals 48, 58, 17, 27, 37, 47, 57, 67, 77):	transistor outputs, switching +
Nominal output voltage: (A3+, A4+):	DC 24 Volt
Nominal output voltage at U_N:	min. DC 23 V, max. 100 mA continuous current max. 400 mA for 0,5 s internal short circuit, over temperature and overload protection
Min. operating current:	min. 0,5 mA
Residual current:	min. 0,1 mA

5.2 Multifunction safety module BI 5910
5.2 Circuit Diagrams



Sicheres Abschalten, kein stehender Lichtbogen
unterhalb der Kurve, max. 1 Schaltspiel / s

Limit curve for arc-free operation



Quadratischer Summenstrom

$\Sigma I^2 = I_1^2 + I_2^2 + I_3^2$

I_1, I_2, I_3 - Strom in den Kontaktpfaden

Quadratic total current limit curve

5. Technical data
5.2 Multifunction safety module BI 5910

General Data

Operating mode:	Continuous operation	
Temperature range:	0 ... 50°C	
Clearance and creepage dist.		
overvoltage category / contamination level:	4 kV / 2	IEC 60 664-1
EMC		
HF- irradiation:	10 V / m	IEC/EN 61 000-4-3
Fast transients		
on wires for power supply A1-A2:	2 kV	IEC/EN 61 000-4-4
on signal and control wires:	2 kV	IEC/EN 61 000-4-4
Surge voltages		
between wires for power supply	1 kV	IEC/EN 61 000-4-5
between wire and ground:	2 kV	IEC/EN 61 000-4-5
HF- wire guided:	10 V	IEC/EN 61 000-4-6
Interference suppression:	Limit value class B	EN 55 011
Degree of protection:	acc. to EN 61 496-1 (1997) the unit has to be mounted in a control cabinet with protection class 54	
Housing:	IP 40	IEC/EN 60 529
Terminals:	IP 20	IEC/EN 60 529
Housing:	Thermoplastic with V0 behaviour acc. to UL subject 94	

Vibration resistance:	according to EN 61496-1 (1997) Amplitude 0,35 mm frequency 10 ... 55 Hz	IEC/EN 60 068-2-6
Shock proof		
Acceleration:	10g	
Impulse length:	16 ms	
Number of shocks:	1000 per ax is on all 3 axes	
Climate resistance:	0 / 050 / 04	IEC/EN 60068-1
Terminal designation:	EN 50 005	
Wire connection:	1 x 2,5 mm^2 stranded wire with sleeve or 1 x 4 mm^2 solid or 2 x 1,5 mm^2 stranded wire with sleeve DIN 46 228-1/-2/-3/-4	
Wire fixing:	Plus- minus- terminal srews M 3,5 box terminals with wire protection	
Mounting:	DIN rail	IEC EN 60 715
Weight:	495g	

Dimensions

Width x height x depth:	67,5 x 74 x 121 mm

6. Installation Notes

Experience shows, that an excellent working system is dependent on a careful installation:
- Protection against disturbance,
- Selection of operating frequency,
- Help on movement control,
- Location of BI 5910 and aerial,
- Careful wiring of BI 5910 and the connected systems,
- Protection of the electric supply,
- Min. and max. switching current of the different outputs

6.1 Disturbance protection

If inductive loads are connected to relay outputs (contactor coils, valves, electric brakes) it is necessary to provide the right protection devices (capacitor, RC-combination, diods, etc.) to the controlled actuators and connect them with the shortest possible wiring.

6.2 Selection of the operating frequency

The 64 radio channels offer a wide selection within the frequency band. For a good operation quality it is necessary to make sure that the selected frequency channel is not used by other equipment in the working area.

If several remote controls are used in the same location no neighbour channels must be used. It is necessary to have one free channel between 2 active ones (e.g. 5, 7, 9).
It is recommended to set up a frequency plan in which all the active frequencies of a system with their application are listed.

Which frequencies are use in a working area can be easily found out by using a standard low-cost frequency scanner.
It is recommended to select 2 spare frequencies for an application in order to change quickly in the case of disturbance.

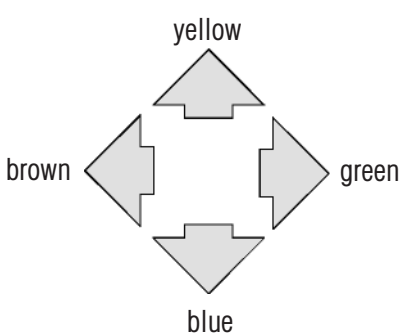
Please check in regular intervals the availability of the selected free channels.

6.3 Recommendations for motion control

If several lifting devices with hanging load are equipped with remote controls and work near to each other (e.g. in a production hall) each remote control must be clearly marked to indicate which load is controlled by which remote control.

For this purpose coloured arrows can be used to mark the equipment and the corresponding pushbutton on the remote control.

The movement direction of the control buttons should correspond to the movements of the lifting equipment with hanging load. The symbols must be placed in a way that a clear relation between the position of the control switches on the operator panel and the direction of movement is there.

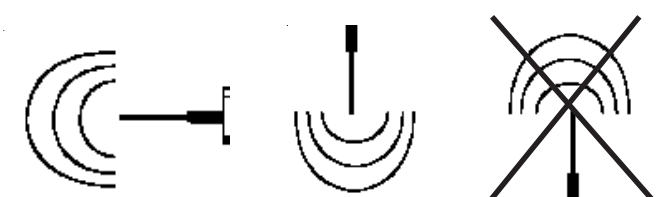


6.4 Location of BI 5910 and aerial

The multifunction safety module with radio control must be installed as near as possible to or inside the control cabinet.

The BI 5910 must be protected against shocks an weather influences

The aerial must be installed outside the cabinet and in max possible distance to class 3 wires and load equipment (power supplies, motors, inverters) and in an area that is useful for a radio receiver. If necessary an extension cable (RE5910/042 or RE5910/043 can be used.
The aerial is installed slightly above the operator using the remote control. No metal screen must be between operator and aerial.
The aerial is directed to the working area of the remote control (on a bridge crane downwards).



6.5 Wiring

Cables of different classes should not be installed in parallel, please obtain a min distance of 20 cm between different cable classes.

Class 1: Radio, aerial wires (aerial extension wires)
Class 2: Wires for power supply of the single enclosures
Class 3: Wires for motors, controls, etc.

The ideal solution is to install each cable class in its own cable duct. If only one cable duct is available the different class cables should be install wit max. possible distance.

Attention: The electrical connection of the power supply must be installed in a way that with de-activation of the main power switch also the BI 5910 is de-activated.

Make sure, that no inductances are created by wiring the charger that could damp the radio signal of the remote control when it is put into the charger. Make sure that all cables are wired at the bottom side of the charger.

6.6 Protection of power supply

Protection against overcurrent resulting from Overvoltage (EN 0204-1, § 7.2)
The power supply of the multifunction safety module BI 5910 with radio control is protected with an internal PTC.

6.7 Minimum and maximum output current

Please make sure, that the minimum and maximum values stated under 5.2 are not exceeded. If necessary install additional loads or interfacing relays. (contact reinforcement in cabinet).

6.7 Emergency operation

It must be possible to change to a different control system when a remote control is defective in order to provide safety to the operator in the case of hanging load.

7. Set up
7.1 Set up directives

- Before installation and testing please charge the unit for 24 hours (see 3.7.2).
- Please check that identity codes and radio channels are identically on RE 5910 and BI 5910
- Check if the selected radio channel corresponds to the generated frequency plan
- Check the if the outputs of BI 5910 correspond to the push buttons of RE 5910
- Make sure that when pressing the start button the outputs 27 to 77 remain inactive
- Test the preferred switch-off mode (with active remote control):

Active disconnection
By pressing the stop button the safety relays of the multifunction safety module are de-energised

Passive disconnection
When removing the electronic key the safety relays must be de-energised after max. 0.5 seconds.

- Check the effective delay of the activity monitoring function (automatic de-activation of the remote control):
  - Do not press any button after the remote control is active
  - Note the time after which the safety relays of BI 5910 are de-energised.

7. Set up
7.1 Set up directives

- In infra red start mode please evaluate and check the range of the radio control, that it is limited to the area defined for this application
- Evaluate and check the limits for radio control by operating it in all different areas of the application.
  - Interferences with other radio controlled equipment of the location must be taken in account.

7. Set up
7.1.1 Regular checking

In addition to the tests during set up in regular intervals and after all maintenance work the following test have to be made:

- The mechanical function of the remote control i.e. the function of the push buttons, activation of e-stop button etc. must be checked

- The response time between commands and actual movement must be checked.

8. Table of available frequencies:

If several remote controls are used in the same local area different radio channels have to be used for transmission with at least one free channel between two active channels (e.g. channel 5, 7, 9, …)

Range 433-434 MHz distance between channels 0.025 MHz

Channel	Frequency MHz	Channel	Frequency MHz	Channel	Frequency MHz
01	433.100	**12**	433.375	**23**	433.650
02	433.125	**13**	433.400	**24**	433.675 (1)
03	433.150	**14**	433.425	**25**	433.700
04	433.175	**15**	433.450	**26**	433.725 (1)
05	433.200	**16**	433.475	**27**	433.750
06	433.225	**17**	433.500	**28**	433.775 (1)
07	433.250	**18**	433.525	**29**	433.800 (2)
08	433.275	**19**	433.550	**30**	433.825 (1)(2)
09	433.300	**20**	433.575 (1)	**31**	433.850 (2)
10	433.325	**21**	433.600	**32**	433.875 (1) (2)
11	433.350	**22**	433.625 (1)	**33**	433.900 (2)

8. Table of available frequencies:

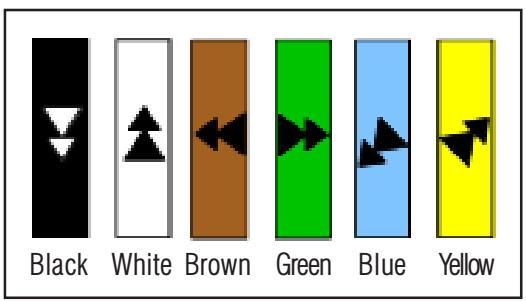
Channel	Frequency MHz		Channel	Frequency MHz		Channel	Frequency MHz	
34	433.925	(1) (2)	**45**	434.200	(2)	**56**	434.475	(2)
35	433.950	(2)	**46**	434.225	(2)	**57**	434.500	(2)
36	433.975	(1) (2)	**47**	434.250	(2)	**58**	434.525	(2)
37	434.000	(2)	**48**	434.275	(2)	**59**	434.550	(2)
38	434.025	(1) (2)	**49**	434.300	(2)	**60**	434.575	(2)
39	434.050	(2)	**50**	434.325	(2)	**61**	434.600	(2)
40	434.075	(2)	**51**	434.350	(2)	**62**	434.625	(2)
41	434.100	(2)	**52**	434.375	(2)	**63**	434.650	(2)
42	434.125	(2)	**53**	434.400	(2)	**64**	434.675	(2)
43	434.150	(2)	**54**	434.425	(2)			
44	434.175	(2)	**55**	434.450	(2)			

(1) list of channels that can be used in Denmark
(2) list of channels that can be used in Singapore

9. Marking of function keys on the remote control RE 5910

Marking is made on self adhesive stickers that can be fixed on the remote control in especially designed positions.
The stickers are delivered on sheets from which the operator selects the required stickers.

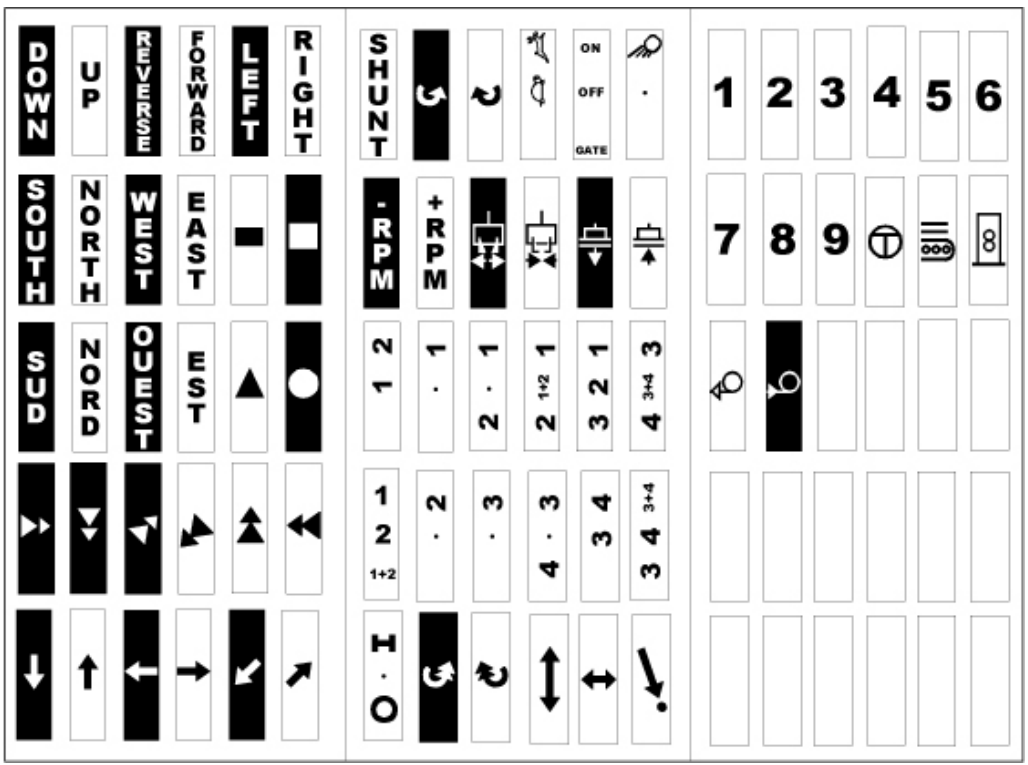
RE 5910/030
Set with 6-colour stickers “movements” for 2 step push buttons (2 marking areas)



9. Marking of function keys on the remote control RE 5910

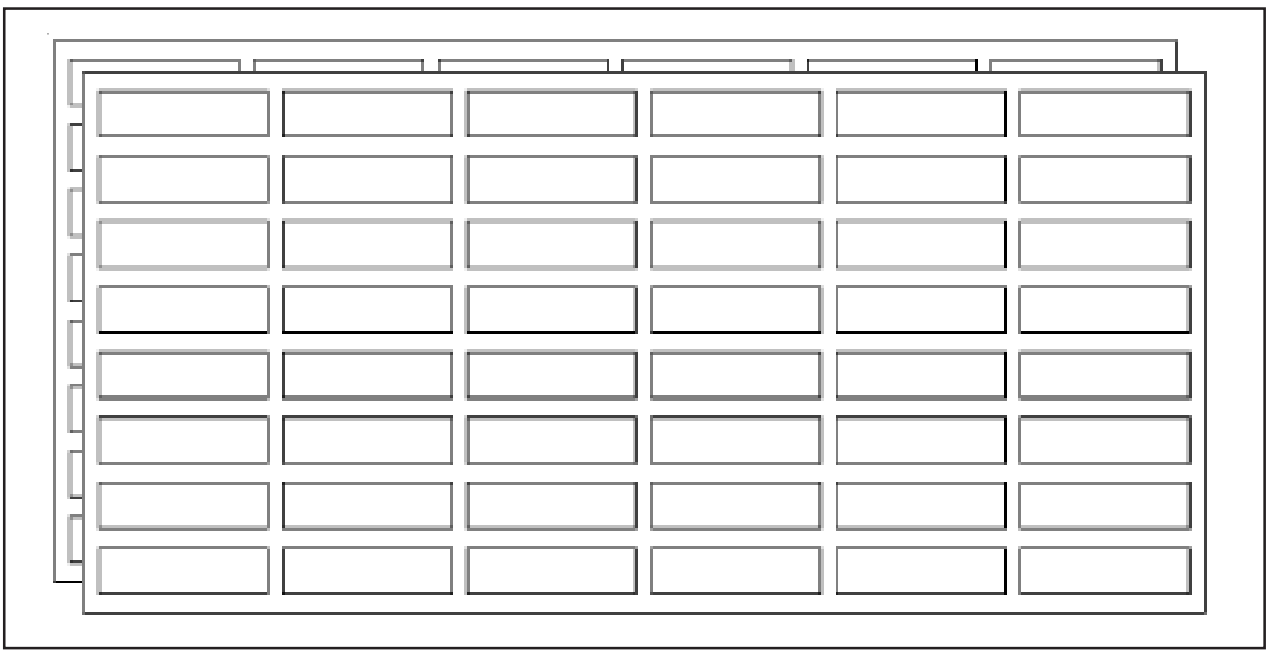
RE 5910/031

Set with 90 black and white stickers



9. Marking of function keys on the remote control RE 5910

RE 5910/033
Set with 48 unlabeled (white) stickers and 48 transparent protection stickers for idividual labelling



10. Accesories

RE5910/070:
Remote control holster for RE5910/001 or /002.
Material: leather, with rings to clip in the personal mounting harness RE 5910/071.
metal clip to fix it on belt.

RE 5910/071:
Personal mounting harness with elastic straps to carry the remote control BI 5910/001 or BI5910/002 in the holster RE5910/070 on the body of the operator.

11 Maintenance

Maintenance of the remote control RE 5910
This remote control needs a minimum of maintenance

Attention: Disconnect the power supply of the controlled system before starting maintenance

Every 3 months check the correct state of the remote control and inspect especially the seals of the push buttons and the electronic key. Clean the remote control and remove all particles.

Attention: If a seal is defective it must be changed immediately. If not water ingress could damage the unit.

11 Maintenance

Maintenance of the multifunction safety module BI 5910 with radio control
Please check the following points:
- The wiring of BI 5910 with the circuits of the controlled machine
- The correct function of active and passive disconnection
- Seal of aerial
- Connection of aerial and cleanness and oxidation of aerial

To check active disconnection press e-stop button. The safety relays of the receiver must de-energise immediately.

To check passive disconnection remove the electronic key from the remote control the safety relays of the receiver must disconnect within less the 0.5 seconds.

Pare parts:
The only necessary spare part is the battery of the remote control RE 5910

RE 5910/050: Battery for RE 5910
see appendix E (change of the battery)

12 Safety remarks, limitation of liability and warranty

Safety remarks

SAFEMASTER W must only be installed and set up by authorised and skilled persons :

- Who are trained for correct treatment of safety components,
- Who are familiar with the relevant standards for safety on work and protection against accidents, and have read and understood this user manual.

Limitation of liability and warranty

The applications in our documentation are only examples that have to be tested by the user at his liability.

Please be aware that our SAFEMASTER W is a radio controlled system that could be influenced by external radio signals.

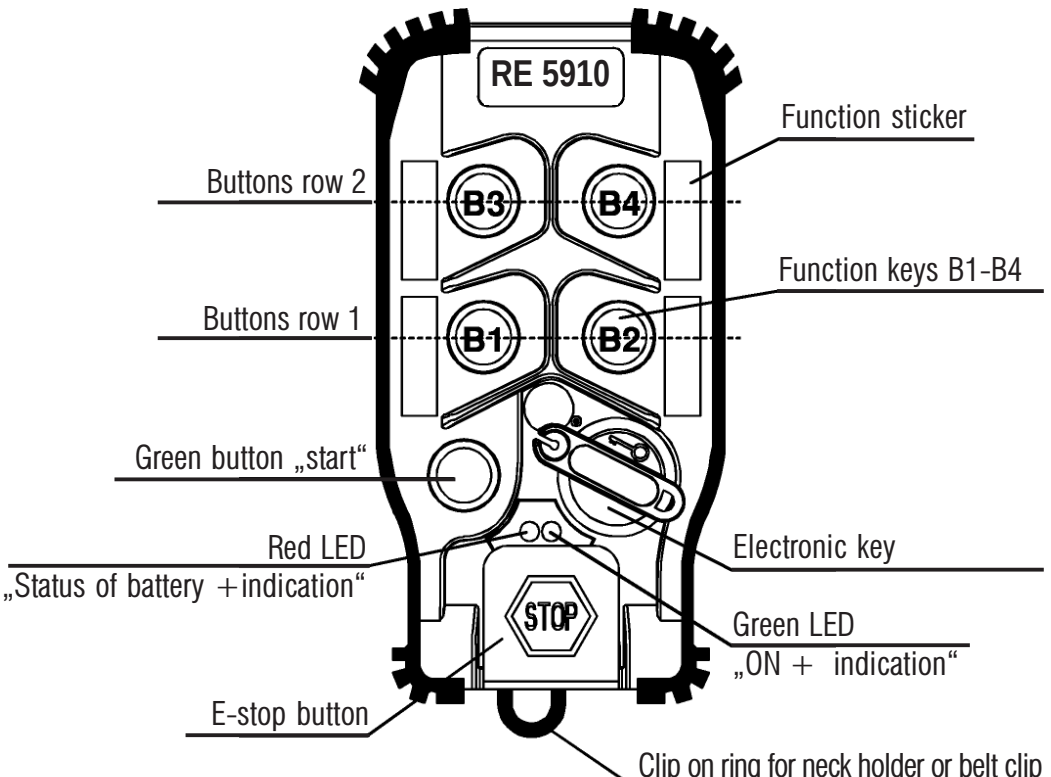
The possibility of using this system has to be evaluated in every single case by the user.

In the case of external interference the availability of the system can be influenced by sudden disconnection without loss of safety for men and machine. We are not liable for influences like this.

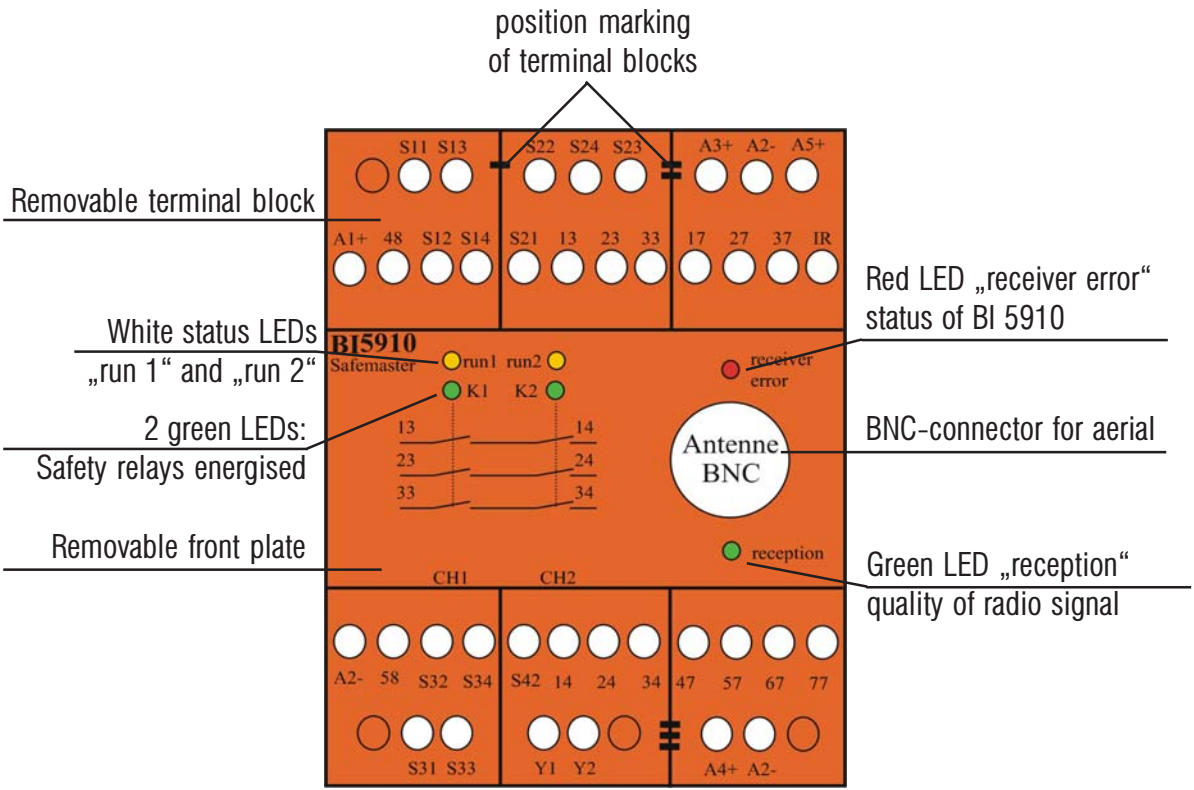
We recommend to set up a local frequency application plan in order to avoid double usage of frequency channels.

Appendix

Appendix
A Front of remote control RE 5910



Appendix
B Front of multifunction safety module BI 5910 with radio control



Appendix
B Connection of receiver BI 5910

Terminals	Inputs and safety outputs
A1+	DC 24 V supply voltage for safety module
A2-	Common ground
48/58	Semiconductor outputs 24 V: status of safety module
S11/S12	Input 1 for for 1. e-stop or light curtain
S13/S14	Input 2 für 1. e-stop or light curtain
S21/S22	Input 1 für 2. e-stop or light curtain
S23/S24	Input 2 für 2. e-stop or light curtain
S31/S32	1. control input for charger unit

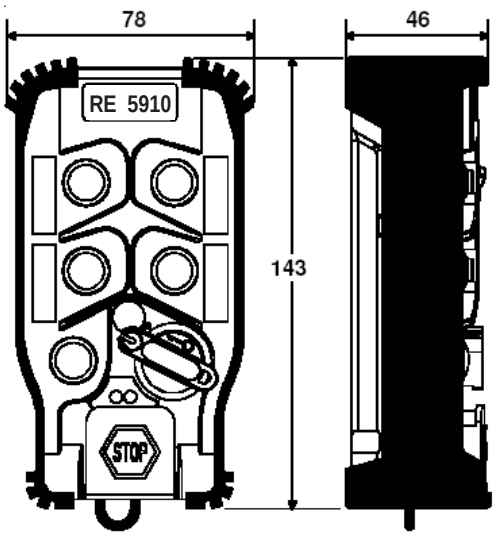
Terminals	Inputs and safety outputs
S33/S34	2. control input for charger unit
S42	input for hard wired start button
Y1-/Y2	Input for feed back loop of external contact reinforcement
13-/14	1. Safety output 1 NO contact
23/24	2. Safety output 1 NO contact
33/34	3. Safety output 1 NO contact
or	
31/32	monitoring output 1 NC contact

Appendix
B Connection of receiver BI 5910

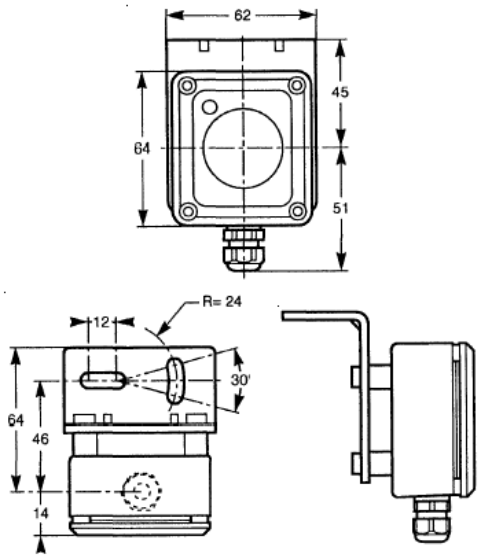
Terminals	semiconductor outputs assigned to remote control
A3+	DC 24 V supply for semiconductor outputs
A2-	Common ground
17	Start without remote control
27	B1, 1. step
37	B2, 1. step
47	2. step of B1 and B2
57	B3, 1. step
67	B4, 1. step
77	2. step of B3 and B4

Terminals	semiconductor outputs assigned to remote control
A5+	Voltage output DC 12V
IR	Input signal
A2-	Common ground

Appendix
C Dimensions

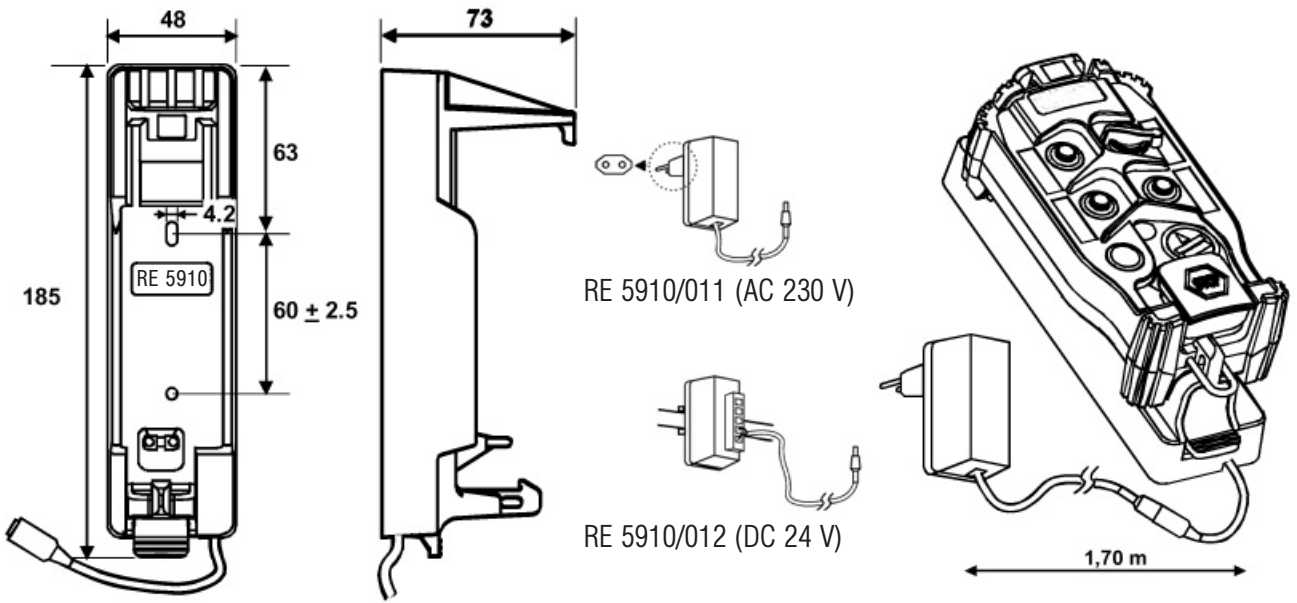


Remote control RE 5910



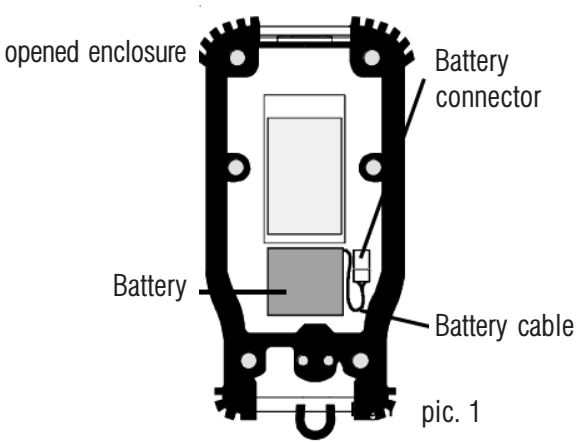
IR- module RE 5910/060

Appendix
C Dimensions



Industriel charger unit
RE 5910/010

Appendix
D Exchange of rechargeable battery



pic. 1

Attention

Change battery only in a place that is protected against electrostatic discharge (e.g. use of antistatic bracelets) to avoid damage of electronic components of the remote control.

1. Switch off the corresponding multi function safety module with radio control
2. Press e-stop button of remote control
3. Remove the electronic key from remote control
4. Turn the unit to the back side and remove the 6 screws with a flat screw driver size 5mm.
5. Open the enclosure of the remote control (pic. 1)

Appendix
D Exchange of rechargeable battery

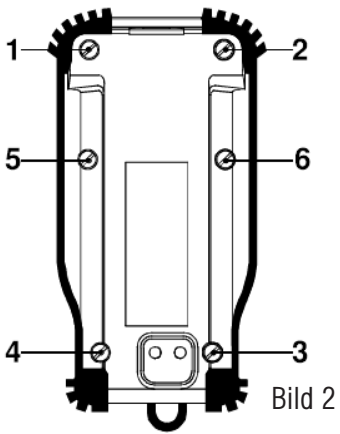


Bild 2

6. Remove old defective battery
7. Connect new battery
8. Check position of battery it must fit properly into the cover
9. Please check cleanness of seal and enclosure and close the unit, do not squeeze battery cable
10. Tighten the screws in the sequence shown in picture 2 to provide perfect seal.
11. Replace electronic key
12. Protection of persons must be provided when doing the necessary tests.

Notes

Notes

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