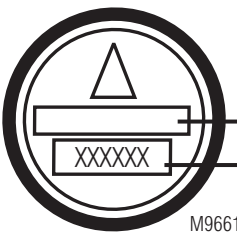
USER MANUAL
Wireless Safety System

SAFEMASTER W ireless safety

DOLD

ORIGINAL_LA/500P_11/2016_0255709

Please enter the 4-digit identity code of the Wireless Safety System here (Identity label on radio-controlled safety module, remote control and electronic key) and the 6-digit key number (engraved on electronic key):



(electronic key, side view)

Identitynumber: .....

Key number: .....

Selected frequency:.....

1. alternative frequency. .....

2. alternative frequency. .....

It is in the responsibility of the manufacturer of the equipment or machine to ensure its function in general. DOLD does not accept any liability for the recommendations made or implied here. Also, no additional guarantee, warranty or liability claims, beyond those included in our delivery and payment terms, may be derived from this.

Content

Attention! **This manual describes the functions of the radio-controlled safety modules delivered as of calendar week 42/08 with software version starting with PN5910_BI_A_01_0D_01_01. Operating modes 8 and 9 (5.4.2 Operating modes 8 to 9 – monitored zone access) have been changed compared to earlier versions. Software version and production date are visible on the outside of the enclosure of the radio-controlled safety module BI5910.**

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1 Important notes

This manual intends to provide for your safety and that of the plant operators. Read this manual carefully before you install or commission the SAFEMASTER W system or use it when working on the protected machine or equipment.

If you encounter technical problems, please contact our customer service at:

Telephone: (+49) 0 77 23 / 654-0;

Fax: (+49) 0 77 23 / 654-356;

e-mail: dold-relays@dold.com

1.1 General safety instructions

The European Machinery Directive considers a remote control a control device and, because of its switch-off function, a safety part. The safety instructions resulting from this must be observed during operation.

- **For optimum safety** during operation of the remote control, the instructions in this manual MUST be observed in any case.
- **SAFEMASTER W must only be installed and set up by authorised** and skilled persons,
  - Who are familiar with the correct handling of safety components,
  - Who are familiar with the relevant rules and standards for safety at work and accident prevention and have read and understood this user manual.
- **The operator must be trained accordingly and authorised to operate remote controls**
- **A visible Emergency Stop button must always be active.**
  While sitting in the charger, the remote control is inoperable. Therefore, the charger must be mounted in a way that the snapped on remote control (especially the Emergency Stop button) is not visible.
- **The operator must have full view of all actions prompted by him/her.**
  The operator must always have a clear view of the hazard zone.If the operator‘s direct field of vision on the relevant equipment or plant parts is partly restricted, for example machine access, drilling/milling head, etc., that is if such areas cannot be seen from all operator positions, we recommend using an additional infrared system. Therefore, zones with a good overview can be defined as start zones. The application can be started from within these zones only.

1.1 General safety instructions

- **If, at times, the remote control is not used**, it should be placed in the charger in order to maintain readiness for operation. The remote control is inactive during charging.
- **While the electronic key is inserted in the remote control, thus authorising controlling activities, the operator must carry the remote control with him/her at all times.** Suitable cases are available as accessories. If the remote control is placed in the charger, the electronic key must be removed for safety reasons.

- **If more than one remote control is used at the same location**, different radio frequencies must be used. There must be at least on free channel between two active ones (for example, channels 5, 7, 9, etc.).
- **The equipment must be handled with care** and be checked in regular intervals, depending on the usage and as necessary.

You, as the installer of the machine or plant, must make clear reference to these safety instructions in the relevant operating manual.

1.2 Disposal

Unserviceable devices that cannot be repaired must be disposed in accordance with the relevant country-specific waste disposal regulations (see also Section 9.1 Replacing the remote control battery).

2 Introduction of system

SAFEMASTER W - is an innovative wireless safety system for protection of man and machine. The **wireless remote control** can be taken to the hazard zones by the operator, thus serving as a quickly reachable and **safe Emergency Stops**. The Wireless Safety System features a **safety transmission path** for signal transmission from remote control to radio-controlled safety module. In addition, the system offers configuration of application-specific control functions that can be operated through the remote control as well. Hard-wired safety elements can be integrated into the system too.

SAFEMASTER W **significantly increases the safety, scope of action and reaction time** of persons working in the hazard zone. SAFEMASTER W allows **setup operation**, adjustment work, etc. as **stress-free**, **efficient and safe** as possible.

2.1 Guidelines, directives, standards and certification

The Wireless Safety System SAFEMASTER W is TÜV-certified and meets all safety requirements of the guidelines, directives and standards that are in place currently.

- Machine directive 2006/42/CE
- EN ISO 13849-1: Category 4, Performance Level „e“
- EN 61508: Safety Integrity Level SIL 3

CE TÜVRheinland® CERTIFIED Functional Safety Type Approved www.tuv.com ID 0600000000

Please note: A validation according to EN ISO 13849-2 is always required for the complete system.

2.2 Applications, intended use

SAFEMASTER W offers more safety and operating and economic efficiency. Operating staff is safer, closer to the process and can control and switch it off directly on site.
Typical applications are:

- Hazard areas that need to be accessed by operating staff, for example for setup, lubrication, troubleshooting or adjustment work.

- Hazard areas where protective equipment is necessary for the safety of persons but where wiring is impossible or does not make sense, for example in applications with very wide-spread, extensive hazard zones or accessible hazard zones with restricted view.

- Mobile and stationary plants and equipment, for example large machines, assembly halls and scaffolds, conveyor belts, high-rack warehouses, warehouses, fork lifts, etc.

The remote control is intended for radio controlling machines, plants and equipment, without any limitation, that used to be controlled by wired devices or control panels. Its usage is only restricted by such valid safety regulations that prohibit, for example, to stay under suspended loads. The remote control does not replace customary safety circuits (for example an emergency stop) but provides additional functionality.

Reach of the remote control is approx. 400 m in the open and approx. 150 m in an industrial environment.

2.3 Design

Main components of this safety system are the radio-controlled safety module, the wireless remote control and the monitored charger for the remote control. Optionally, the system may be equipped with infrared receiver(s) and various accessories.

The radio-controlled safety module is wire-connected in a control cabinet and may be operated with an attached or external aerial. It receives signals of up to two hard-wired safety elements and the signals of the active remote control sent through a safe transmission path. Safety-relevant switching commands are connected through relay outputs, not safety-relevant control signals through semiconductor outputs.

The wireless remote control is lightweight, ergonomic, rugged and can easily be operated with one hand. It features a clear, easy to understand control panel where the buttons and switches are protected against unintended use (for example by dropping it). In addition to the emergency stop button, it includes a start button and four function keys (1 or 2 position push-buttons, 2 / 3 position rotary switches, or 2 / 3 position rotary switches with auto resetting). LEDs indicate settings or status of the remote control. In addition to the system identity code, the electronic key incorporates various settings (for example radio frequency or activity monitoring) and allows granting of user privileges to authorised operators.

The charger provides for the proper charging of the battery included in the remote control. The charger contacts are monitored to detect removal of the remote control. Only then the signals of the remote control are accepted.

One or more infrared receivers can be added to the system. The start signal (from the remote control with infrared transmitter) is considered in addition to the radioed start signal. Thus, it is possible to force a controlled start from predefined start zones with good overview. Further, the working team‘s identity can be validated. This helps preventing accidents.

For detailed descriptions of basic system parts and accessories see chapter 8. Ordering data / selection aid.

2.4 Functions

Up to 2 hard-wired safety elements (for example, emergency stop buttons, light curtains, gate monitoring) may be integrated into the system. Irrespective of the remote control‘s status, these are always active.

If the remote control is removed from the charger and enabled, it provides the following functions:

- Emergency stop via radio (safety-relevant)
- Start via radio (safety-relevant, start options can be set through operating modes)
- User legitimation through key in remote control (safety-relevant)
- Control functions via radio (Black push-buttons/rotary switches, not safety-relevant)

While the remote control is active, it takes the master role in the hazard area to protect its operator, that means it overrides the hard-wired safety functions. The application may be restarted after resetting the remote control only. If the safety transmission path is interrupted, the system will enter into a safe state. This is true too if the remote control is not operated within defined time intervals (Activity monitoring which can be configured as an additional function). It is possible to adjust the radio frequency to allow usage of several radio-controlled safety systems at the same location (Refer to safety instructions).

As an additional measure for accident prevention, the Wireless Safety System is available with an infrared feature. This allows determining start areas, from where the application may be started with the remote control. For a successful start, the system then requires an infrared start signal from the remote control in addition to the start signal through the safety transmission path. Up to 3 infrared receivers can be integrated into the system for determining start zones.

2.4 Functions

Different operating modes that can be set on the safety module, provide various options for designing the start process (for example, release of the safety contacts of the radio-controlled safety module). When the remote control is in the charger, depending on the set operating mode, the application can be started through the hard-wired start button or by the Autostart function (if the safety requirements have been met). With an active remote control too, the operating mode settings control which actions are required for starting the machine. The start options differ depending on whether the system is equipped with an infrared feature or not.

With the start options, it is also possible to determine the activation time on the radio-controlled safety module. It indicates the maximum time span allowed between removing the remote control from the charger and its activation. When this time span lapses with no valid radio signal received, the system will enter into a safe state.

3 Sytem description

3.1 Design and functions of remote control

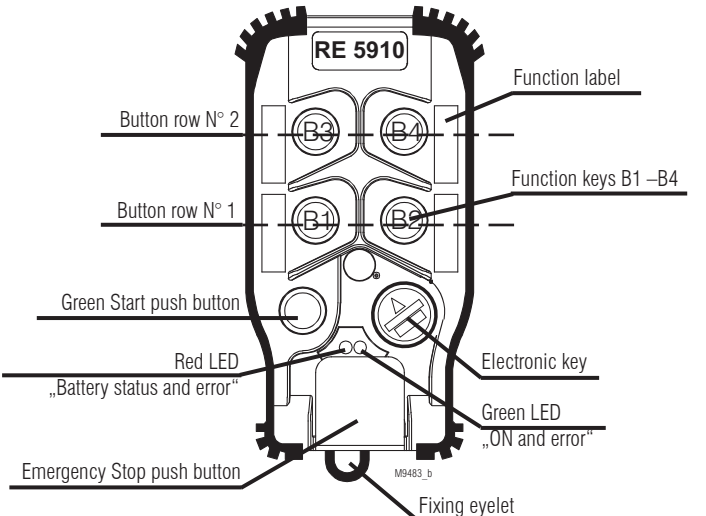
Main features of the remote control are:

- User-friendly and compact: comfortable single hand operation;
- Extra rugged for use in an industrial environment;
- Quick charging and high battery capacity;
- Quick adjustment of frequency to environment, directly on remote control;
- Operation authorisation in form of an electronic key;
- Perceptible acting points on 2 step buttons;
- Provides labelling space next to push-buttons;
- Protection against unintentional activation;
- Optional accessories: Leather case for belt, shoulder rig.

3.1.1 Remote control; front view

The remote control features the controls shown in the figure.

Specific characteristics of the various controls and the key functions of the remote control are explained in the sections below.



3.1.2 Function keys for custom control functions

3.1.2.1 Function key designs

The B1 to B4 remote control function keys can be designed as follows, depending on model:

B1-B4:

- Push-button, 1 acting point (BPSV)

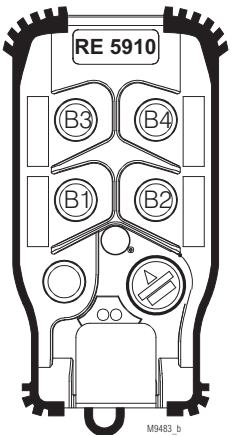
- Push-button, 2 acting point (BPDV)

B3-B4:

- Rotary switch, 2 positions (COM2)
  (B3: centre / top, B4: centre / bottom)

- Rotary switch, 3 positions (COM3)

- Rotary switch, 3 positions (COM3R)
  (with automatic reset to central position)



For further information on remote control models see 8.4 Selection aid remote control

3.1.2.2 Mutual locking of function keys

Locking of the function keys of the horizontal button rows (B1+B2 or B3+B4) prevents malfunctions caused by execution of two conflicting control functions. If two function buttons are mutually locked, the control functions are disabled if pushed simultaneously (state of the assigned semiconductor outputs is OFF). They can only be activated individually.

Depending on the model of the BI5910 receiver, the following function keys are mutually locked / unlocked:

Attention: Please note that a remote control with rotary switch cannot be used with a BI5910 receiver on which the row of switches is mutually locked.

	Receiver model: BI 5910._ _ / 0_MF9 _ _ _										
	Stan-dard	**002**	**022**	**003**	**004**	**005**	**006**	**007**	**008 023**	**014**	**029**
Mutually locked between B1 and B2	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	No	No
Mutually locked between B3 and B4	Yes	Yes	No	No	No	No	No	No	No	No	No
	Not suitable for remote control with rotary switch			Suitable for remote control with rotary switch on B3 and / or B4							

3.1.2.3 Function key assignment to semiconductor outputs

Depending on the BI5910 receiver model, the acting points of the different function keys are assigned to the following semiconductor outputs:

		Receiver model: BI 5910._ _ / 0_MF9 _ _ _										
Push button	**Position**	**Stan-dard**	**002**	**022**	**003**	**004**	**005**	**006**	**007**	**008 023**	**014**	**029**
B1	Idle position	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	Key point 1	27	27	27	27	27	27	27	27	27	27	27
	Key point 2	27+47	OFF	27+47	OFF	OFF	OFF	OFF	OFF	27+47	OFF	27+47
B2	Idle position	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	Key point 1	37	37	37	37	37	37	37	37	37	37	37
	Key point 2	37+47	OFF	37+47	OFF	OFF	OFF	OFF	OFF	37+47	OFF	37+47
		Not suitable for remote control with rotary switch			Suitable for remote control with rotary switch							

For further designs, please contact the manufacturer

3.1.2.3 Function key assignment to semiconductor outputs

	Receiver model: BI 5910._ _ / 0_MF9 _ _ _											
Button / switch	**Position**	**Stan-dard**	**002**	**022**	**003**	**004**	**005**	**006**	**007**	**008 023**	**014**	**029**
B3	Idle pos. (centre)	OFF	OFF	OFF	OFF	57	OFF	OFF	OFF	OFF	OFF	OFF
	Key point 1	57	57	57	47	47	47	57	57	57	47	
	Switch on top				47	47	47	57	57	57	47	57
	Key point 2	57+77	OFF	57+77	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
	Switch on bottom				57	67	OFF	47	47	OFF	OFF	
B4	Idle pos. (centre)	OFF	OFF	OFF	67	OFF	OFF	OFF	OFF	OFF	67	OFF
	Key point 1	67	67	67	OFF	77	67	67	67	67	57	
	Switch on bottom				OFF	77	67	67	67	67	57	67
	Key point 2	67+77	OFF	67+77	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
	Switch on top				67+77	OFF	57	77	77	OFF	77	77

Attention: The standard model and model BI5910._ _/ _ MF9002 are not suited for remote controls with rotary switches.
For further designs, please contact the manufacturer.

3.1.3 Electronic key

Functions:

1. Operator authorisation for activating the remote control

The remote control is personalised by inserting the electronic key. If the operator then carries the remote control with him/her properly, a mix-up is excluded when several SAFEMASTER W systems are used at the same location.

2. Saving information required for system operation:

- System identity code (see Section 3.1.4 Identity code)
- Most recently programmed radio frequency (see Section 3.1.5 Radio frequency)
- Settings for activity monitoring (see Section 3.1.6 Activity monitoring)
- Authorisation for operating various function keys
  (for example various restricted control privileges, master key)

3.1.4 Identity code

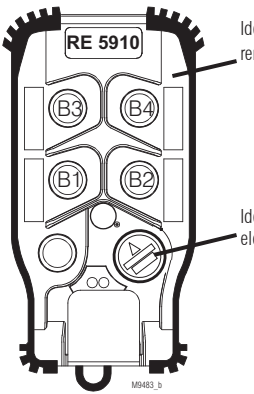
3.1.4 The identity codes of the radio-controlled safety module and the related key(s) are individually programmed at the production site and cannot be changed.

A SAFEMASTER W system will work only if the identity codes of the radio-controlled safety module, the remote control and the electronic key(s) correspond (status on delivery).

Use of spare remote control

If the remote control's identity code differs from the one of the electronic key / radio-controlled safety module (for example when using a spare remote control) this is indicated by 3 flashes of the two LEDs on the remote control. The system identity code must then be transmitted from the electronic key to the new remote control (see Section 5.3.1.4 Identity code: Transmission from electronic key to remote control).

Warning:
If a spare remote control is used MAKE SURE that it features the same key configuration as the originally used remote control. Otherwise the control functions may not work properly.



3.1.4 Identity code

New electronic key

If a new key is to be used in the system, it must be programmed by the manufacturer first, with the identity code of the relevant system. When ordering an electronic key, the system identity code must be stated. Please note the ordering instructions in chapter 8. Ordering data / selection aid.

Repair / replacement of system components

In order to have a functioning system after a future repair or replacement of the radio-controlled safety module or the remote control, it is urgently recommended to note and keep safe the identity code printed on or attached to the devices to allow correct programming of the replacement parts. Use the first page of this manual to note the code numbers.

3.1.5 Radio frequency

The remote control and the related radio-controlled safety module communicate through a free radio frequency that can be set by selecting a channel. During communication, the radio-controlled safety module checks the received commands for their identity code. It executes only commands from the remote control assigned to it (same identity code).

If more than one remote controls are used at the same location, different radio frequencies must be used. There must be at least one free channel between two active ones.

The frequency can be programmed by the user (see Section 5.3.1.2 Selection and programming of radio frequency).

3.1.6 Activity monitoring

The activity monitoring function disables the remote control if its function keys are not operated within a set time span. If the remote control is disabled, radio transmission is interrupted and the application will enter into a safe state.

If the machine is shut off by the activity monitoring function, it can be restarted within 15 seconds (green LED is on continuously) by the green start button on the remote control. If this time span has lapsed too (green LED is off), the remote control must be reset by pressing and unlocking the remote emergency stop button („Reset of remote control“). Then, the respective start routine for the operating mode must be executed.

For the response time of the activity monitoring function, values between 1 second and 98 minutes can be selected. The activity monitoring function can also be switched off (response time = 99 minutes, configuration on delivery), that means that the remote control will remain active until its battery is completely empty, if it is not placed in the charger earlier. Configuration is stored in the remote control‘s electronic key.

Response time and time base can be configured by the user (see 5.3.1.3 Activity monitoring: Setting the response time).

3.1.7 Remote control battery

The remote control is powered by a lithium ion battery which provides autonomy for up to 30 hours.

Display of remaining battery capacity
After removing the remote control from the charger and prior to its activation (by pressing the start button) the battery capacity is shown: The red LED on the remote control indicates whether the remaining battery capacity is more than 50% (red LED is off), between 50% and 10% (red LED flashes slowly) or less than 10% (red LED flashes quickly). See 6.1 Indicators of remote control.

Alarm function for battery load status
While the remote control is in use a quickly flashing red LED on the remote control indicates that the remaining load is below 10%. The remote control can then be used for another 15 minutes. A charging time of only about 10 minutes is enough to extend availability by approx. 1 hour.

Charging of remote control battery
To charge the battery, the remote control must be placed in the functioning charger. Press the emergency stop button of the remote control while doing so.
With a remaining battery load of <60% the quick-charge mode is used (green LED flashes constantly), otherwise, the maintenance mode (green LED is on continuously) is used. See 6.1 Indicators of remote control.

If the remote control battery must be replaced, please see 9.1 Replacing the remote control battery.

3.2 Design and functions of radio-controlled safety module

Main features of the radio-controlled safety module:

- To connect:
  - 2-channel emergency stop buttons, safety gate contacts or light curtain of type 4 according to EN 61496
  - 1 start button
  - Depending on application, 1 or 2 control contacts to monitor if the remote control is on the charger
- Radio receiver for:
  - Emergency stop signals
  - Control signals for 6 non-safety semiconductor outputs for control functions
- Depending on model: Start function through infrared + radio
- Functions set through rotary switches:
  - Manual or auto start
  - When remote control is removed from charger (open control contact), manual start via remote control as an option
  - Muting of access protection with active remote control possible
- Broken wire and short circuit detection with fault indication
- 3 semiconductor outputs for status indication
- LEDs for status indication
- 67.5 mm width
- Compact device, easy to install
- Mounting on DIN rail
- Removable terminal blocks

3.2 Design and functions of radio-controlled safety module

The following inputs/outputs are available:

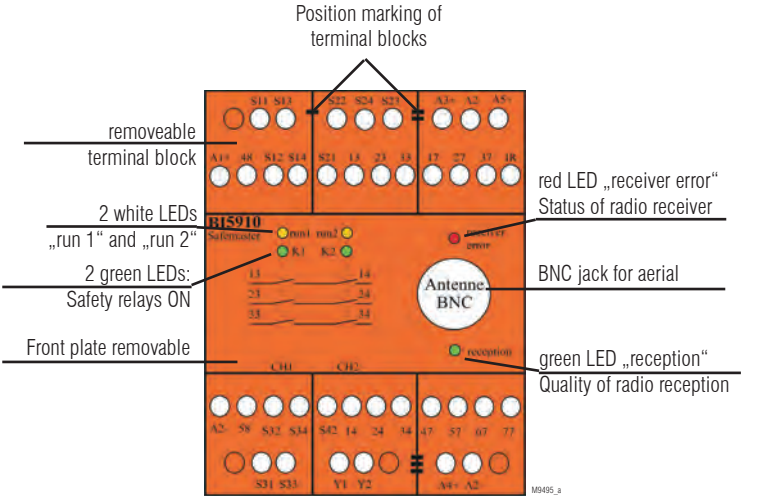
Inputs

- Depending on application: 1 or 2 emergency stop buttons or light barriers (type 4) or 1 safety gate
- Depending on application: 1 or 2 control contacts to detect charging of remote control in battery charger
- 1 start button
- 1 feed back circuit to monitor external relays
- Depending on model: input for infrared receiver

Outputs

- 3 NO safety contacts or 2 NO safety contacts + 1 NC contact
- 6 semiconductor outputs to control movements by remote control
- 3 semiconductor outputs for indication of radio-controlled safety module‘s status

3.2.1 Overview radio-controlled safety module; front view



3.2.2 Receiver aerial

The radio connection of the radio-controlled safety module to the remote control is made via an aerial that may be attached directly to the front of the radio-controlled safety module. If the device is installed in a metal cabinet, the aerial is to be mounted to the outside of the cabinet. The connection from the radio-controlled safety module to the aerial is made via a special screened coax cable. (see 8.5 Accessories)

3.2.3 Function of safety elements

If the radio-controlled safety module is switched off through a hard-wired safety element (for example the emergency stop button) the following requirements must be met for a restart:

Both control signals of the operated 2-channel safety element must have been switched off simultaneously (contact open). The two control signals must be switched on again within 250ms (contact closed).

If the control signals of the safety elements have been applied when power is switched on, the safety elements meet the start requirements.

When the remote control is removed from the charger, the two control contacts must open within the set activation time.
When the remote control is placed in the charger again, they must close within 3s. If this requirement is not met, the radio-controlled safety module switches off.

If the radio-controlled safety module is deaktivated while the remote control is active, for example by pressing a hard-wired emergency stop button, the behind button on the remote control must always be pressed first before the BI6910 can be enabled again. This prevents that a second person switches on the machine while a person with active remote control stays in the hazard zone.

3.2.4 Function of control contacts

Depending on the operating mode selected, the radio-controlled safety module has 1 or 2 inputs (S31-S32 and S33-S34) to connect the control contacts of the battery charger. They signal whether the remote control is active or not.

- **Control contacts are closed:**
  That means that the remote control is in the charger. Only hard-wired safety elements are in operation. The remote control must get inactive no later than 1 second after the control contacts close. Any radio transmission beyond that lets the safety relays de-energise.

- **One control contact opens:**
  That means that the remote control is removed from the charger. The safety relays remain energised. Output 58 and the white LED run 2 flash fast to indicate, that the emergency stop button of the remote control must be unlocked and then the green start button must be pressed. If the radio-controlled safety module does not receive the middle position from the remote control within the set time span (rotary switch A) the safety relays de-energise. The safety relays will also de-energise if both contacts do not open at the same time when operated in modes with 2 control contacts.

- **The control contacts are open and the remote control is active:**
  As soon as the remote control is taken from the charger and is reset with the green start button, output 58 and the white LED run2 go from flashing to a continuous signal. From this point on, the emergency stop signal of the remote control is accepted. As long as the safety relays remain active, the function key actions of the remote control are transmitted to semiconductor outputs 27-77. Depending on the set operating mode, all safety functions of BI 5910, also the hard-wired emergency stop buttons, can be reset from the remote control.

3.2.5 Start options

3.2.5.1 Manual start and reset

The start button to be connected to terminal S42 are used for manual start and to reset the radio-controlled safety module. The maximum activation time of the start buttons is 3 sec. If the button is pressed more than 3s the unit does not start. When power is applied to the radio-controlled safety module, no start button must be activated.

3.2.5.2 Auto start

he emergency stop button or light curtain on terminals S11 to S14 and S21 to S24 can be set for automatic start. This means that the radio-controlled safety module energises the safety relays as soon as the safety function is fulfilled (for example, the emergency stop button is reset). If the remote control is placed back in the charger after the safety module has been deactivated by an hard-wired safety element, the receiver module will not be activated automatically on closed control contacts.

3.2.5.3 Start with infrared (IR) start mode

Starting the plant or machine must be limited to a specific start zone providing a good overview of the hazard zone.

If a start by remote control is requested, using the infrared start mode is ideal. Using infrared start mode forces the operator to return to the defined start zone (see 4.6 Location and connection of infrared modules (IR modules).

In addition to the normal start, in IR start mode the operator has to point the remote control to the infrared module mounted on the monitored plant or machine. When this option is selected the receiver waits for 2 conditions to be fulfilled before energising the safety and function relays:

1st condition:

Receiving a start radio message sent from the remote control to the radio-controlled safety module

2nd condition:

Receiving the same message that is sent from the remote control to the radio-controlled safety module via the infrared receiver at the same time. Transmission of the infrared message takes place while the green start button is activated. After this starting sequence, only radio messages are needed.

3.2.6 Semiconductor outputs

The BI 6910 has 3 non-safety semiconductor outputs (48, 58 and 17), that indicate the actual status of the safety module (see section 6.2 Indicators and status messages of radio-controlled safety module). Outputs 48 and 58 are internally supplied by the voltage connected to A1+. Besides this, there are 6 more non-safety semiconductor outputs (27 to 77) that can be operated by the remote control. To activate outputs 27 to 77 the safety relays must be energised too 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 through separate terminals (A3+ and A4+).

4 Installation and connection

4.1 Important notes on installation and connection

- Before you switch on the radio-controlled safety module for the first time, you must configure the required operating mode (see 5.4 Setup and commissioning of radio-controlled safety module)
- **A visible Emergency Stop button must always be operable**.
  While sitting in the charger, the emergency stop button of the remote control is inoperable. Therefore, the charger must be mounted in a way that the emergency stop button is not visible while charging (for example on the side of the desk, hidden by a panel, in a drawer, etc.).

It has shown that a successful installation depends on the following factors:

- Location of **radio-controlled safety module** and aerial;
- Connection and location of infrared modules (IR modules);
- Connection of safety elements;
- Careful wiring;
- Protection of the electric supply;
- Min. and max. switching current of the different outputs;
- Protection against interference.

4.2 Wiring

Do not install cables of different classes in parallel.
Maintain a minimum distance of 20cm between the different cable classes:

Class 1: Radio, aerial wires (aerial extension wires)
Class 2: Electric circuit for supply of the different 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 installed with max. possible distance.

Attention:
The electrical connection of the power supply must be installed in a way that with deactivation of the main power switch the radio-controlled safety module is deactivated as well.

Attention:
Protection against contact of the connected elements and insulation of the supply lines must be laid out for the maximum voltage applied to the device.

Make sure, that no inductances are created when 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.

4.3 Protection of power supply

Protection against overcurrent resulting from overvoltage (EN 60204-1, § 7.2)
The power supply of the radio-controlled safety module BI 5910 is protected with an internal PTC.

4.4 Location of radio-controlled safety module and aerial

The radio-controlled safety module must be installed as near as possible to the machine to be controlled, preferably inside the control cabinet. It must be protected against shocks an weather influences.

The aerial must be installed outside the cabinet and in maximum possible distance to class 3 cables and load equipment (power supplies, motors, inverters) and in an area that is suited for a radio receiver. If necessary, an aerial extension cable (RE5910/042 or RE5910/043) can be used.

Attention:
Radio systems can receive interfering signals from other systems and can also interfere with other systems. The system and in particular its aerial is to be set up in a way that systems do not interfere with each other, the same applies to the used frequency channel.

The aerial is to be positioned as high as possible in the room of the machine to be controlled.

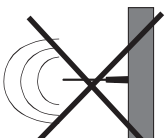
No metal screen must be between operator and aerial.
The aerial must be directed to the working area of the remote control (on a bridge crane downwards).

4.4 Location of radio-controlled safety module and aerial

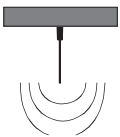
Attention!

The following minimum distances apply for the aerial: 0.5m to ceilings and 0.1m to walls!

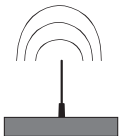
M9491_c



GOOD



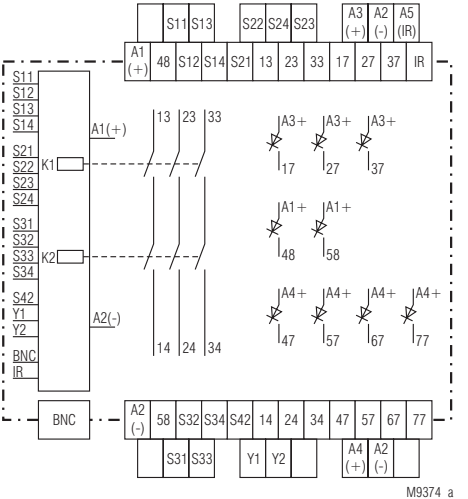
GOOD



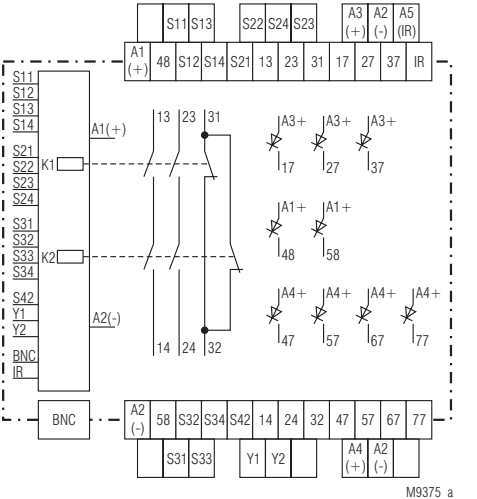
GOOD

BAD

4.5 Terminal connections of radio-controlled safety module BI 5910



BI 5910.03/00MF9



BI 5910.22/00MF9

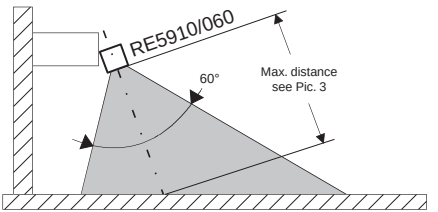
4.5 Terminal connections

Terminal	Inputs and safety outputs
A1+	DC 24 V; supply voltage for radio-controlled safety module
A2	Common ground
48/58	non-safety semiconductor outputs 24 V: State of radio-controlled safety module
S11/S12	Input 1 for 1st emergency stop or LC
S13/S14	Input 2 for 1st emergency stop or LC
S21/S22	Input 1 for 2nd emergency stop or LC
S23/S24	Input 2 for 2nd emergency stop or LC
S31/S32	1st control input for charger unit
A3+	DC 24 V voltage supply of semiconductor outputs
A2	Common ground
17	Start without remote control (non-safety)
27 37 47	Non-safety semi-conductor outputs, assignment to push buttons / switches of remote control depending on selected model

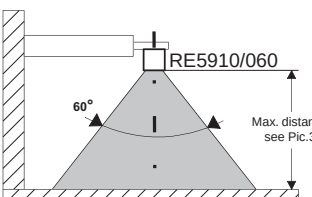
Terminal	Inputs and safety outputs
57 67 77	Non-safety semi-conductor outputs, assignment to push buttons / switches of remote control depending on selected model
S33/S34	2nd control input for charger unit
S42	Input for hard-wired start button
Y1-/Y2	Input for feed back loop of external contact amplifier
13/14	1st safety output, NO safety contact
23/24	2nd safety output, NO safety contact
33/34	2nd safety output, NO safety contact
or 31/32	Monitoring output NC contact
A5+	Voltage output DC 12V
IR	Input signal
A2	Common ground

4.6 Location and connection of infrared modules (IR modules)

4.6.1 Position of infrared receiver module



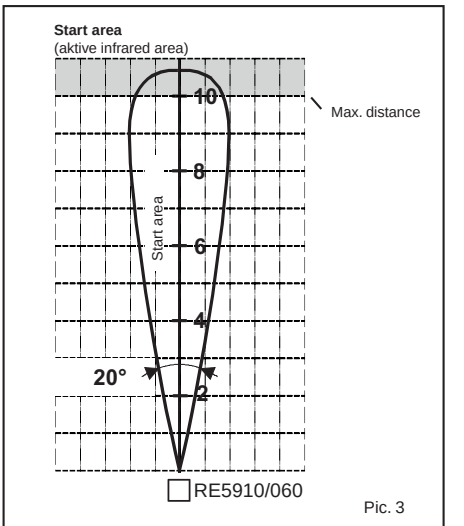
Pic. 1



Pic. 2

M9497_a

Protection of module IR RE5910/060: IP 65



Pic. 3

4.6.1 Position of infrared receiver module

Infrared signals of remote controls may also be reflected by light-coloured surfaces. The infrared receiver must be positioned so that only signals sent by the remote control can be received if pointed at it. If necessary, the receiving area must be reduced by a tube, by inclining, etc.

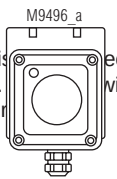
4.6.2 Connection of infrared receiver module

Attention:
The wiring of the IR receiver module must be lead separately from power lines and sources of interferences (for example, power converters).

The infrared module RE 5910/060 is supplied with a 10m screened connection cable. Such connection may be extended by 2 times 10m for a total length of 30m. For this, screened cables with connectors (RE 5910/061, length = 10m) are available.

Attention:
The infrared receiver is connected against reverse polarity. Wiring may destroy the receiver.

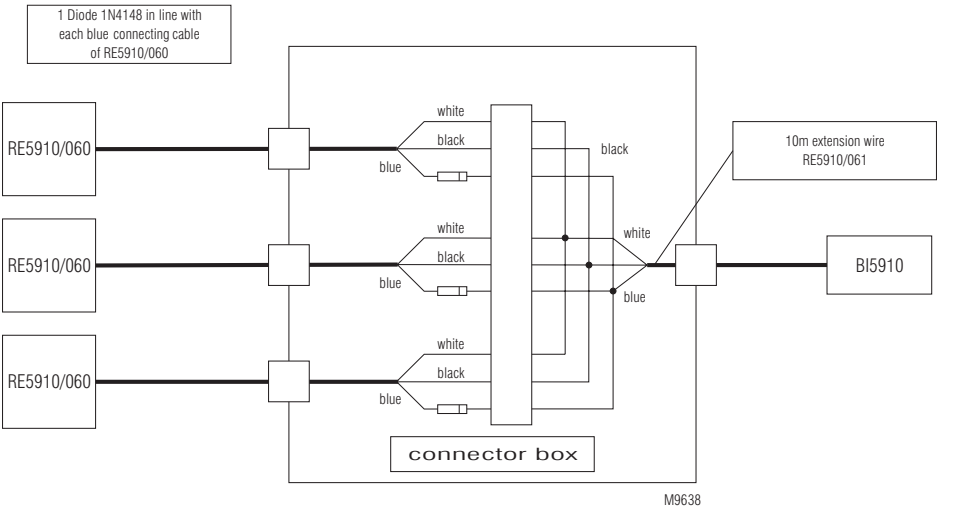
Wire	terminal of receiver BI5910
black	A2-
white	A5+
blue or brown	IR



IR-receiver
RE 5910/060

4.6.3 Connection example: Connection of 3 infrared modules

It is possible to connect up to 3 IR receiver modules to one radio-controlled safety module. Connection must be made according to the drawing below. Make sure to install the diodes correctly.



4.7 Connection of safety elements

The safety elements must always be connected as shown in the connection examples.
When connecting safety elements with semiconductor outputs (e.g. light curtain of type 4 according to EN 61496) the unit will not detect any short circuit between the signals. The short circuit must then be detected by the sensor.

4.8 Minimum and maximum output current

Please make sure, that the minimum and maximum values for the current stated under 7.2 Radio-controlled safety module BI5910 are not exceeded. If necessary, install additional load or interfacing relays. (for example amplifying relay in cabinet for power control).

4.9 Auxiliary control system

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 and any hanging load (for example spare remote control or hard-wired safety elements).

4.10 Interference suppression

If inductive loads are connected to relay outputs (contactor coils, valves or electric brakes) make sure to provide the right protection devices (such as capacitors, RC circuits, diodes, etc.) directly at the controlled elements and connect them, keeping wiring as short as possible (see also sec. 4.4 Location of radio-controlled safety module and aerial).

5 Commissioning (and instruction manual)

5.1 General instructions for commissioning

- Before you switch on the radio-controlled safety module for the first time, you must configure the required operating mode (see 5.4 Setup and commissioning of radio-controlled safety module)
- Prior to the first commissioning of the Wireless Safety Systems you must charge the remote control in the charger for 24 hours (see 3.1.7 Enabling switch battery). To make sure to have a ready-for-use remote control at any time, the battery of the remote control should always be fully charged (store in charger).
- Check for proper matching of identity codes and radio channels of remote control, electronic key and radio-controlled safety module.
- Check if the selected radio channel suits the frequency plan set up for the location.
- Determine the radio range by walking around in the operation area with an active remote control and consider interferences with other radio equipment and the frequency plan of the location.
- Check assignment of the remote control keys to the outputs of the radio-controlled safety module. Make sure that prior to pressing the start button on the remote control outputs 27 to 77 remain inactive.

5.1 General instructions for commissioning

- In infrared start mode determine the infrared range and check if it is limited to the area defined for this application. It must be excluded in this regard that it can be started from outside the defined start area..

  ⇒Watch especially for reflecting or light-coloured surfaces!
  Make sure that reflecting surfaces CANNOT extend the start area. The infrared receiver must be positioned in a way that only signals from the remote control can be received if pointed at it. If necessary, the receiving area must be reduced by a tube, by inclining, etc.

  ⇒ The operator must be advised of the risks that lie in reflecting surfaces.

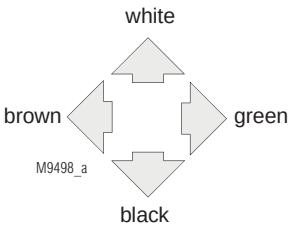
If an operator has to enter a hazard zone with the remote control and the machine is running (for example during setup), the machine must only run in a non-dangerous speed. The two status signals on outputs 58 and 17 of the radio-controlled safety module BI 6910 can be used to reduce speed and activate monitoring.

Attention
For safety information, both outputs 17 and 58 are required.

5.1.1 Remote control and machine marking

Machine and remote control must be marked in a way that allows clear assignment of the keys or switches on the remote control to the controlled functions or movements of the machine. For this, you can use arrows, for example. Attach these arrows to the controlled equipment so that each arrow colour corresponds to the colour of the assigned control key.

To the extent possible, the movement direction of the control switches should correspond to the movements of the machine. The symbols must be placed in a way that they show a clear relation between the position of the control switches on the remote control and the direction of movement.



5.1.2 Neighbouring machines with relevant remote control

If several machines are equipped with remote control and work close to each other (e.g. in a production hall) each remote control must be clearly marked to indicate which machine is controlled by which remote control. For this, you could mark the machine with the remote control‘s identity number using large letters that can be read from far, for example.

5.2 Configuration on delivery

Note:
Delivered is always a complete system with an identity number that is determined at production.
When ordering a spare radio-controlled safety module, remote control or electronic key, the identity number and the number of the electronic key of the system with which the ordered part is used must be stated.
For this, note the number of the electronic key and the identity code at the beginning of this manual.

5.2.1 Configuration of radio-controlled safety module

Set channel:	Channel 01, 433.100 MHz
Identity number::	Individual number assigned at production.
Activation time:	5 seconds (Rotary switch A = 0)
Operating mode: :	Manual start of hard-wired safety functions only through hard-wired manual button Manual start after emergency stop through remote control with the remote control start button (Rotary switch B = 0) (Must only be used with infrared option.)

See chapter 5.4 Setup and commissioning of radio-controlled safety module

For permanent assignment of remote control function keys to the outputs (see section 3.1.2.3 Function key assignment to semiconductor outputs).

5.2.2 Configuration of remote control

Set channel:	Channel 01, 433.100 MHz
Identity number:	Individual number assigned at production.
Activity monitoring:	Switched off by default
Disabling/enabling of remote control programming:	The remote control is delivered with enabled remote control programming
Number of electronic key:	Individual number engraved on the key.

The activity monitoring function, the frequency and the disabling/enabling of programming for the electronic key can be modified by a trained user (see 5.3.1 Configuration of remote control).

5.3 Commissioning of remote control

As long as the remote control is placed in the charger (control contacts closed) the radio-controlled safety module will work only with its hard-wired safety elements. The safety relays are de-energised when in this state a radio signal is received from the remote control. When the remote control is taken from the charger the control contacts open and indicate to the radio-controlled safety module that the remote control must now be considered. If the radio-controlled safety module‘s safety relays have been energised the remote control must be activated after a specific response time that was set with a rotary switch. The running time is indicated by the quickly flashing white LED „run2“ and status output 58. During this response time, the following activation steps of the remote control must have been completed or the remote control placed in the charger again, otherwise the safety relays will de-energise again.

Activation steps for the remote control:

1. Make sure that the electronic key is inserted correctly
2. Release the stop button, the red LED lights up for approx. 1 sec, then goes off and the green LED goes on continuously.
3. If both LEDs flash 5 times (wrong ON-Off-cycle), the e-stop button must be pressed and reset again. After that the green LED goes on with continuous light.
4. Press green start button (for a max. 3 seconds)

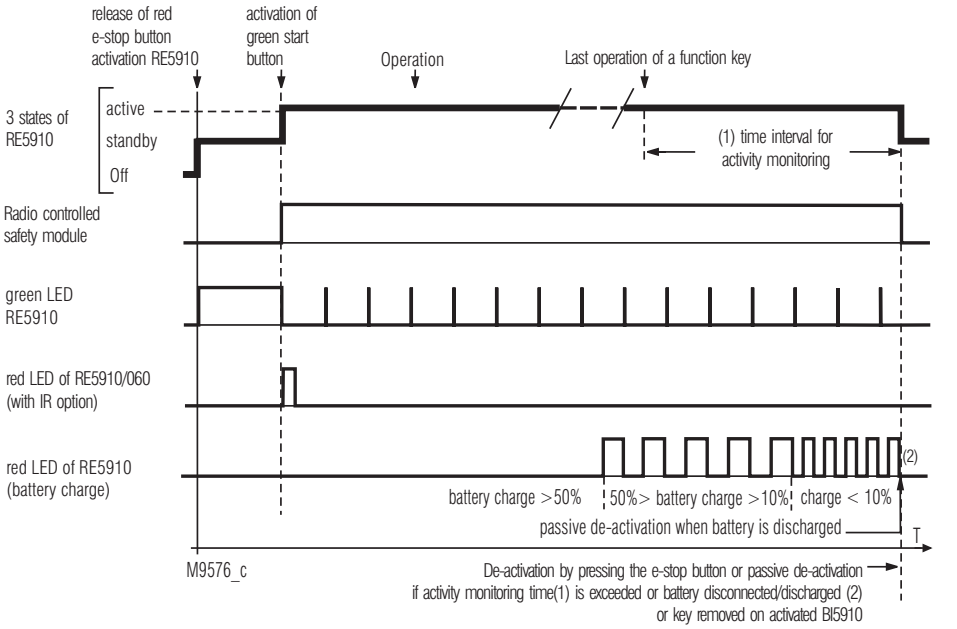
Restart of remote control after activity monitoring has triggered

For a restart, the following steps are necessary::

1. Press the emergency stop button on the remote control
2. Unlock the emergency stop button on the remote control
3. Press the green start button on the remote control (In IR start mode, the remote control must be pointed to the IR module. In non-IR start modes, the radio-controlled safety module BI5910 must be released by pressing its hard-wired start button after that.)

Note: Due to the obligatory stop-start-test of the remote control, it shows always a failure after taking it from the charger (5 flashes on red and green LEDs), when it was placed into the charger with released e-Stop button.

5.3 Commissioning of remote control



5.3.1 Configuration of remote control

In the following we describe the programming of the parameters that are set with the remote control. These are transmission frequency, response time of activity monitoring (time base and time value N) and the transmission of the identity code from electronic key to remote control. Programming of these parameters can be blocked or unblocked by a trained and authorised person.

5.3.1.1 Blocking and unblocking of remote control programming

1. Switch of power on the radio-controlled safety module.

2. Keep the buttons B1 ,B2 and the green start button pressed - then release the e-stop button (fig.1) and then the buttons B1, B2 and start..

   The current blocking status is now indicated by the two LEDs on the remote control.
   Only the red LED is on: Remote control programming is blocked.
   Both LEDs are on: Remote control programming is released.

3. Select blocking/unblocking by pressing the button B2; the selected mode is indicated by the LEDs (fig.2+3).

4. Once the mode is selected, the selection must be confirmed by pressing the start button (fig.4).

5. The remote control saves the new mode in the key memory (fig. 5) and the LEDs go OFF.

6. Leave the programming mode by pressing the emergency stop button (fig. 6).

Note:
If the operator tries to change the frequency or the response time for activity monitoring on a disabled remote control, a failure is indicated by 4 flashes of the LEDs.

5.3.1.1 Blocking and unblocking of remote control programming

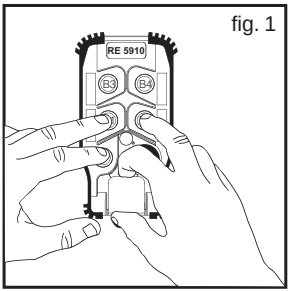


fig. 1

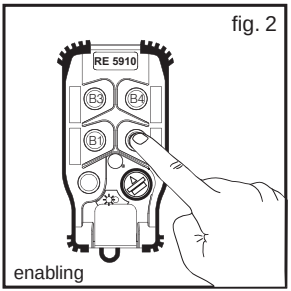


fig. 2

enabling

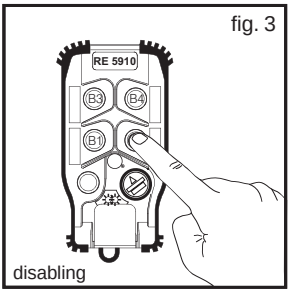


fig. 3

disabling

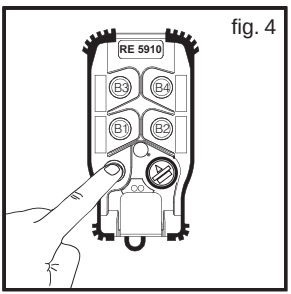


fig. 4

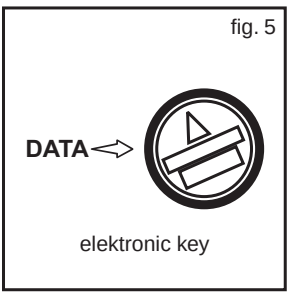


fig. 5

elektronic key

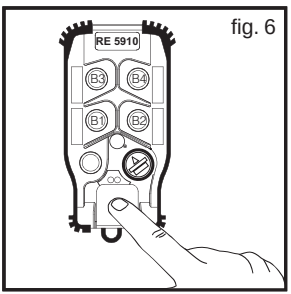


fig. 6

M9486_b

5.3.1.2 Selection and programming of radio frequency

The 64 radio channels of the remote control RE 5910 offer a broad range within the frequency band. For a good operation quality it is necessary to make sure that the selected frequency channel is not used by any other equipment in the working area.

Attention:

If several remote controls are used in the same location no neighbouring channels must be used. It is necessary to have at least one free channel between 2 active ones (e.g. 5, 7, 9). It is recommended to set up a frequency plan listing all the active frequencies in the area with their applications.

Which frequencies are used in a working area can be easily detected by means of a standard low-cost frequency scanner. It is recommended to select at least two spare frequencies for each application in order to quickly change to another frequency in case of interference, without having to do further frequency measuring.

Availability of the selected free frequencies must be checked in regular intervals (for this, also see section 4.4 Location of radio-controlled safety module and aerial).

5.3.1.2 Selection and programming of radio frequency

List of available frequencies: Frequency 434 MHz, distance between channels: 0.025 MHz.

Channel	Frequency MHz	Channel	Frequency MHz	Channel	Frequency MHz	Kanal Channel	Frequency MHz
01	433.100	17	433.500	33	433.900 [2)]	49	434.300 [2)]
02	433.125	18	433.525	34	433.925 [1) 2)]	50	434.325 [2)]
03	433.150	19	433.550	35	433.950 [2)]	51	434.350 [2)]
04	433.175	20	433.575 [1)]	36	433.975 [(1 (2]	52	434.375 [(2]
05	433.200	21	433.600	37	434.000 [2)]	53	434.400 [2)]
06	433.225	22	433.625 [1)]	38	434.025 [1) 2)]	54	434.425 [2)]
07	433.250	23	433.650	39	434.050 [2)]	55	434.450 [2)]
08	433.275	24	433.675 [1)]	40	434.075 [2)]	56	434.475 [2)]
09	433.300	25	433.700	41	434.100 [2)]	57	434.500 [2)]
10	433.325	26	433.725 [1)]	42	434.125 [2)]	58	434.525 [2)]
11	433.350	27	433.750	43	434.150 [2)]	59	434.550 [2)]
12	433.375	28	433.775 [1)]	44	434.175 [2)]	60	434.575 [2)]
13	433.400	29	433.800 [1)]	45	434.200 [2)]	61	434.600 [2)]
14	433.425	30	433.825 [1) 2)]	46	434.225 [2)]	62	434.625 [2)]
15	433.450	31	433.850 [2)]	47	434.250 [2)]	63	434.650 [2)]
16	433.475	32	433.875 [1) 2)]	48	434.275 [2)]	64	434.675 [2)]

[1)]: list of channels that can be used in Denmark; [2)]: list of channels that can be used in Singapore

5.3.1.2 Selection and programming of radio frequency

Attention: For programming, related receiver must be schitched on and all other receivers in the reception area (in particular with procedure b) must be switched off. This ensures that their frequencies cannot be changed.

Programming of radio frequency:

1. Keep buttons B1 and B2 pressed and release emergency stop button (fig. 1), then let go buttons B1 and B2.

   The current channel setting is now indicated by the two LEDs on the remote control.
   Number of flashes of red LED: Setting of the tens of a channel
   Number of flashes of green LED: Setting of the units of a channel

2. Select the new channel (01 to 64) with buttons B1 and B2 (fig. 2 + 3). Button B1 increases the tens and button B2 increases the units. The flashing of both LEDs indicates the new selected channel.

3. After selecting the required channel it must be confirmed. For this, select the confirmation option of the two that suits best:

a) The formerly used working channel is known:	b) The formerly used working channel is not known:
⇒ Press the start button shortly (fig. 4): The remote control sends to the radio controlled safety module the new channel number through the former working chan nel and stores the new working channel (fig. 5).	⇒ Press the start button longer (3 s) (fig. 4): The remote control sends to the radio-controlled safety module the new channel number through all 64 possible channels of the radio link and stores the new wor-king channel (fig. 5). Wait for the flashing LEDs to stop before you continue.

4. Leave the programming mode by pressing the emergency stop button (fig. 6).

5. Check as described under 5.3 Commissioning of remote control if the radio-controlled safety module responds to the new radio frequency.

5.3.1.2 Selection and programming of radio frequency

fig. 1

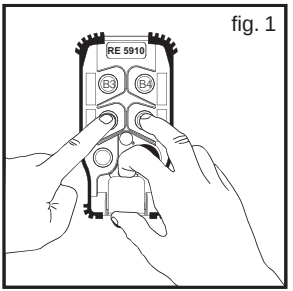


fig. 2

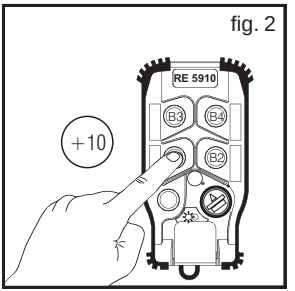


fig. 3

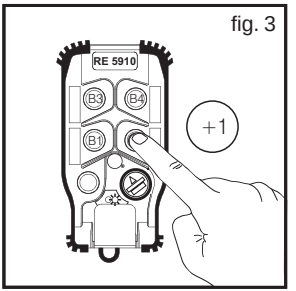


fig. 4

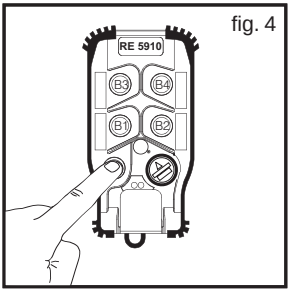


fig. 5

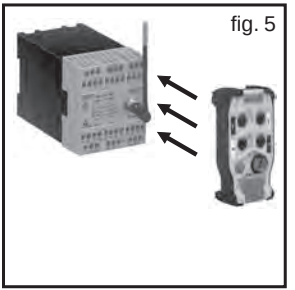
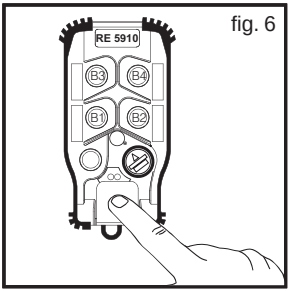


fig. 6



M9487_c

5.3.1.3. Activity monitoring: Setting the response time

The response time of the activity monitoring function is set with the time base (minutes or seconds) and the numerical value N of the response time (for further important information on this see chapter 3.1.6 Activity monitoring). Both parameters can be programmed separately by a trained user as described below.

5.3.1.3.1 Programming of time base

1. Switch of power on the radio-controlled safety module.

2. Keep button B1 pressed and release emergency stop button (fig. 1), then let go button B1.

   The current time base setting is now indicated by the two LEDs on the remote control.
   The red LED is on: Setting the time base to minutes
   The green LED is on: Setting the time base to seconds

3. Switching of the time base by pressing button B2 (fig. 2).
   During the switching process, the selected time base (minutes or seconds) is indicated on both LEDs.

4. The selected time base (minutes or seconds) is confirmed by pressing the start button (fig.3).

5. Leave the programming mode by pressing the emergency stop button (fig. 5).

Attention:
Each time the activity monitoring function is changed, the actual response time must be checked and adjusted, if necessary. The outcome must be noted.

5.3.1.3.1 Programming of time base

fig. 1

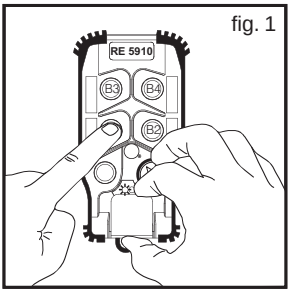


fig. 2

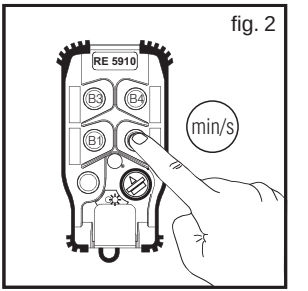


fig. 3

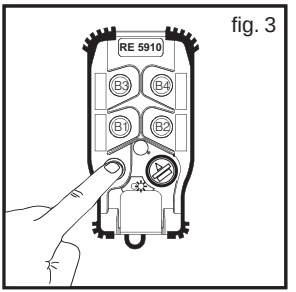


fig. 4

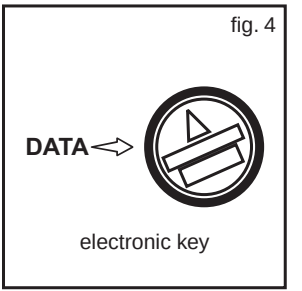
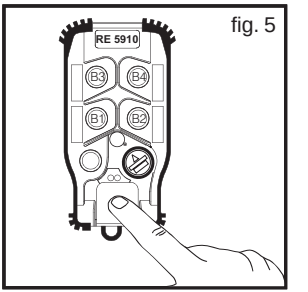


fig. 5



M9488_b

5.3.1.3.2 Programming of numerical value N for the response time

1. Switch off power on the radio-controlled safety module.

2. Keep buttons B1 and Start pressed and release the emergency stop button (fig. 1), then let go buttons B1 and Start.

   The current time base setting is now indicated by the two LEDs on the remote control.
   The red LED flashes: Indicates the tens
   The green LED flashes: Indicates the units

3. Setting the new numerical value with buttons B1 and B2: Pressing button B1 increments the tens (fig. 2) and pressing button B2 increments the units (fig. 3). The flashing of both LEDs indicates the newly selected numerical value of the response time.

4. The selected numerical value N of the response time (01 to 99) is confirmed by pressing the start button (fig. 4). If the time base was set to „minutes“ and the value N is „99“ (factory configuration) activity monitoring is disabled.

5. Leave the programming mode by pressing the emergency stop button (fig. 6).

Attention:

Each time the activity monitoring function is changed, the actual response time must be checked and the outcome must be noted. This requires measuring the time that passes between activation of the remote control (without pressing any other key or button) and the activity monitoring response (radio-controlled safety module is switched off). If necessary, the response time must be adjusted.

5.3.1.3.2 Programming of numerical value N for the response time

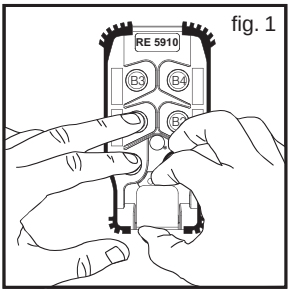


fig. 1

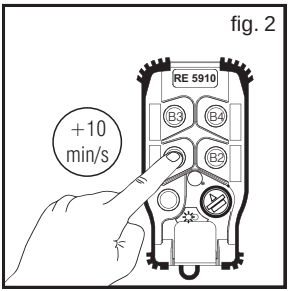


fig. 2

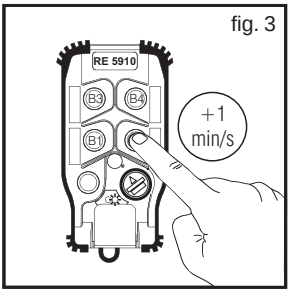


fig. 3

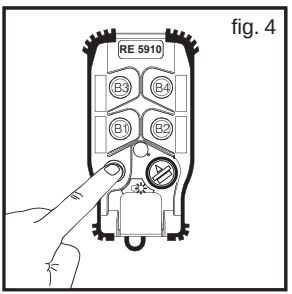


fig. 4

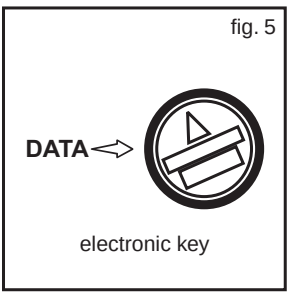


fig. 5

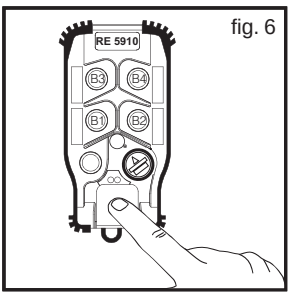


fig. 6

M9489_b

5.3.1.4 Identity code: Transmission from electronic key to remote control

Requirements for this procedure:
The key configuration of the replacement remote control must be identical with the configuration stored in the electronic key, that is with the design of the original remote control.

If a replacement remote control is used or if the electronic key was changed, you need to follow the procedure described below:

1. Switch off power on the radio-controlled safety module.

2. Keep buttons B2 and Start pressed and release the emergency stop button (fig. 1), then let go to buttons B2 and Start.
   Both LEDs of the remote control RE 5910 flash fast.

3. Press the start button to begin automatic programming of the identity code. Both LEDs of the remote control go OFF (fig. 2). The “Identity code” information is copied from the electronic key to the remote control memory (fig. 3).

4. Leave the identity code programming mode by pressing the emergency stop button. (fig. 4).

Note:
It could be necessary to reprogram the radio frequency. For example, if the new key was programmed for a different frequency. In such case, proceed as described in section 5.3.1.2 Selection and programming of radio frequency.

5.3.1.4 Identity code: Transmission from electronic key to remote control

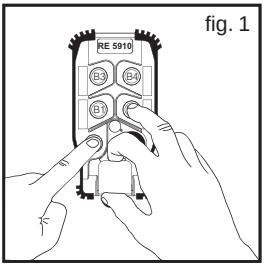


fig. 1

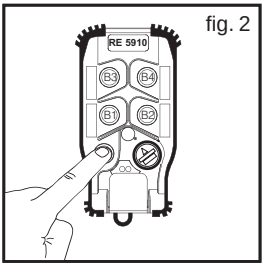


fig. 2

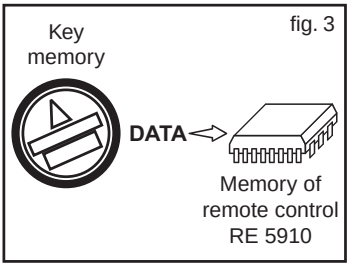


fig. 3

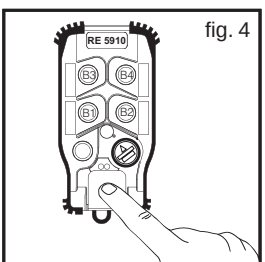


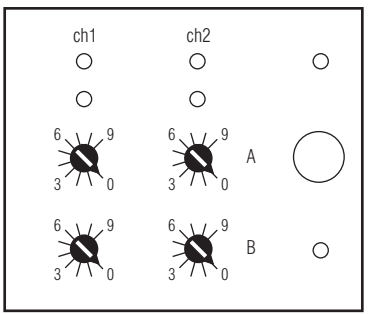
fig. 4

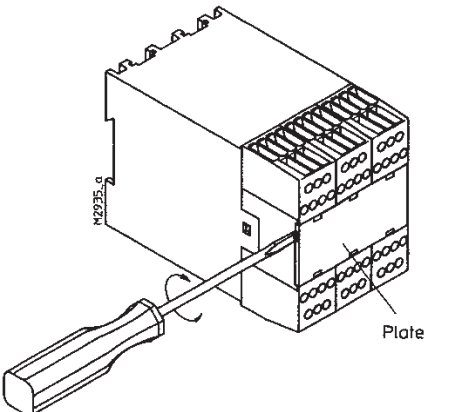
M9490_b

fig. 6

5.4 Setup and commissioning of radio-controlled safety module

Attention:
Adjustment must only be carried out by trained staff while the unit is disconnected from power. Provide for potential equalisation before opening the front of the unit





After removing the front plate (fig.) the desired operating mode (rotary switch B) and the maximum time span for activating the remote control and/or muting for access control (rotary switch A) can be configured. Both rotary switches B must be configured identically. The same applies for both rotary switches A.

5.4.1 Operating modes 0 to 4

5.4.1.1 Setting the start options (rotary switch B)

Start types to be used with **infrared only** (IR): Overview of settings rotary switch B

<table>
<tr><th rowspan="2">Position rotary switch B</th><th>Operation without remote control (remote control in charger)</th><th colspan="2">Operation with remote control (remote control active)</th></tr>
<tr><th>Start upon pressing and unlocking of hard-wired emergency stop through:</th><th>Start upon pressing and unlocking of hard-wired emergency stop through:</th><th>Start upon pressing and unlocking of radio emergency stop through:</th></tr>
<tr><td>0</td><td rowspan="2">Manual start (start button on S42)</td><td>Reset radio emergency stop, radio start with IR, then start button on S42</td><td rowspan="3">Radio start with IR</td></tr>
<tr><td>4</td><td rowspan="2">Reset radio emergency stop, radio start with IR</td></tr>
<tr><td>2</td><td>Auto start (automatic start if safety requirements have been met)</td></tr>
</table>

When configured to modes 0 to 4, the hard-wired safety elements are always active.

5.4.1.1 Setting the start options (rotary switch B)

Start types to be used without* infrared (IR): Overview of settings rotary switch B
*) If necessary, it may be combined with infrared

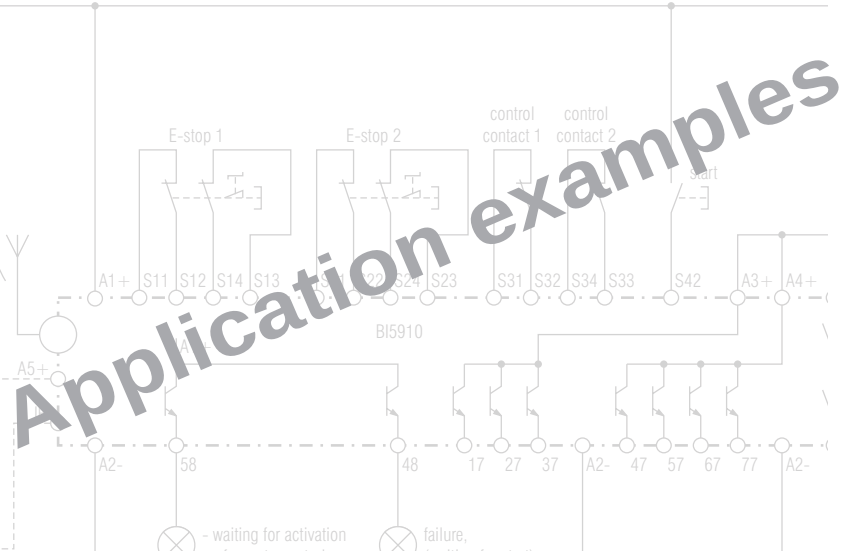
Position rotary switch B	Operation without remote control (remote control in charger)	Operation with remote control (remote control active)	
	Start upon pressing and unlocking of hard-wired emergency stop through:	Start upon pressing and unlocking of hard-wired emergency stop through:	Start upon pressing and unlocking of radio emergency stop through:
1	Manual start (start button on S42	Reset radio emergency stop, radio start with IR, then start button on S42	Radio start, then start button on S42
3	Auto start (automatic start if safety requirements have been met)		

Reset radio emergency stop: Reset and unlock radio emergency stop

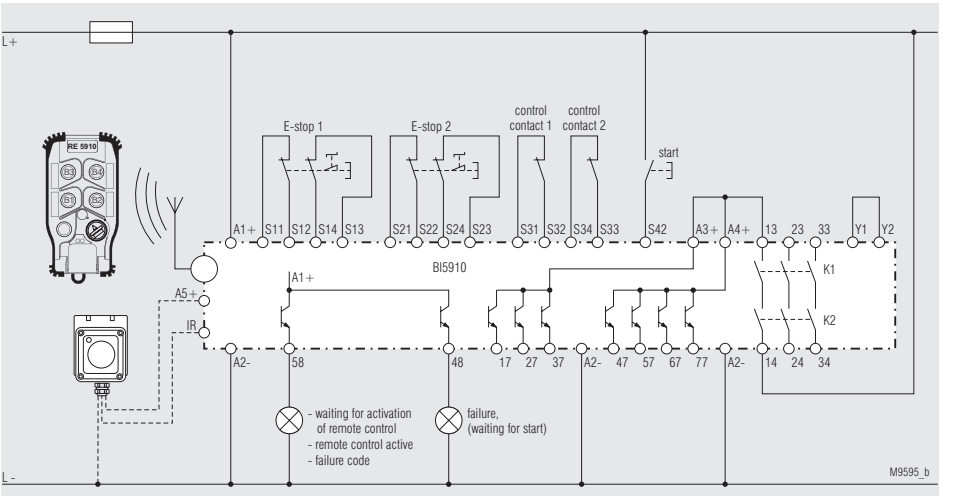
When configured to modes 0 to 4, the hard-wired safety elements are always active

5.4.1.2 Setting the activation time (rotary switch A)

Position rotary switch A	0	1	2	3	4	5	6	7	8	9
Max. time to activate the remote controls	5 s	6 s	7 s	8 s	9 s	10 s	15 s	20 s	25 s	30 s



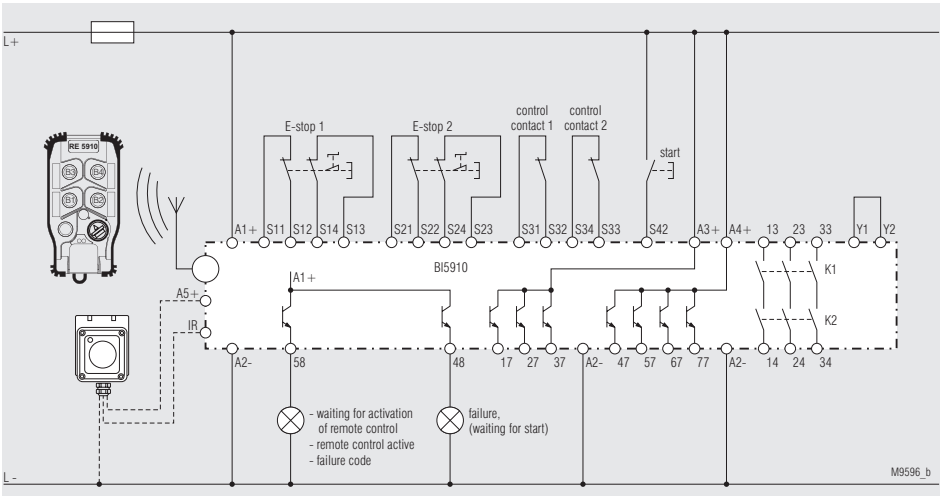
5.4.1.3 Application examples (Operating modes 0 to 4)



Safe disconnection of remote controlled semiconductor outputs

see also 4. Installation and connection

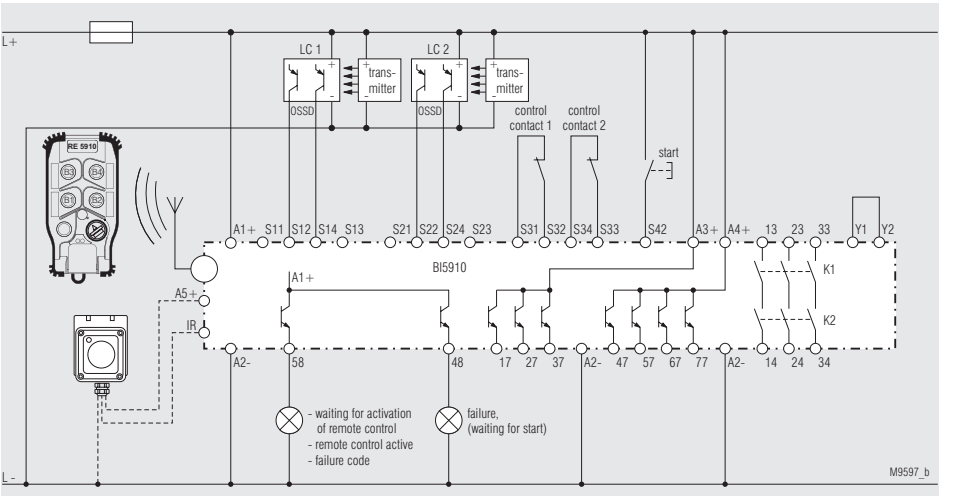
5.4.1.3 Application examples (Operating modes 0 to 4)



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

see also 4. Installation and connection

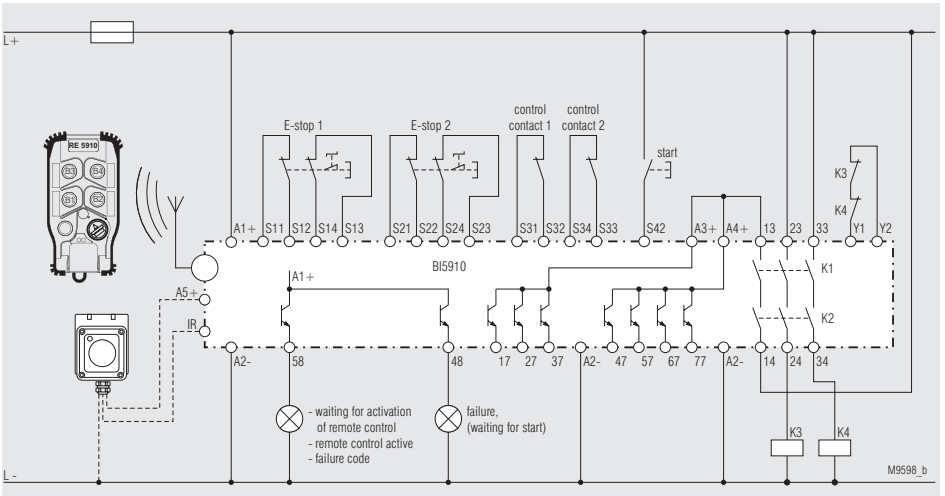
5.4.1.3 Application examples (Operating modes 0 to 4)



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

see also 4. Installation and connection

5.4.1.3 Application examples (Operating modes 0 to 4)

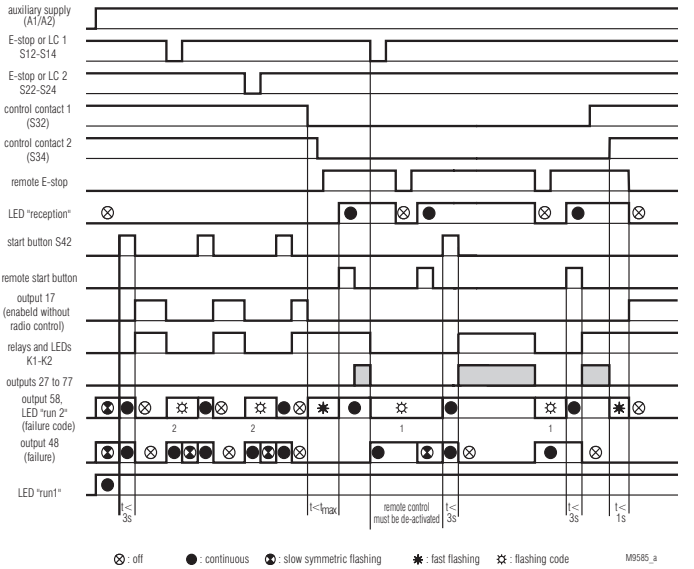


2 E-stop, external contact reinforcement, Radio controlled e-stop via remote controlsafe disconnection of remote controlled semiconductor outputs

see also 4. Installation and connection

5.4.1.4 Function diagrams

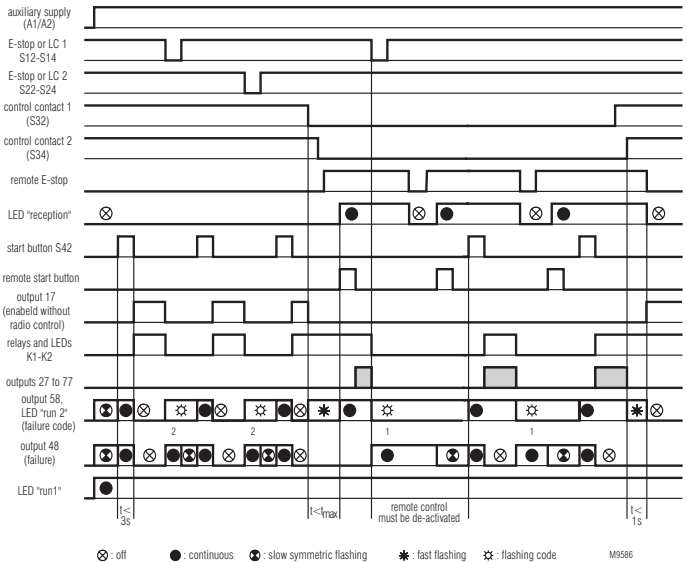
5.4.1.4.1 Function diagram for operating mode 0



Rotary switch B = 0:

- The safety elements on S11-S14 and S21-S24 are always considered, manual start only via start button on S42
- The remote control is only considered if at least one of the control contacts on S32 or S34 is open.
- Reset of radio emergency stop with start button on remote control including infrared
- $t_{max.}$ = maximum time to activate the remote control set with rotary switch A

5.4.1.4.2 Function diagram for operating mode 1

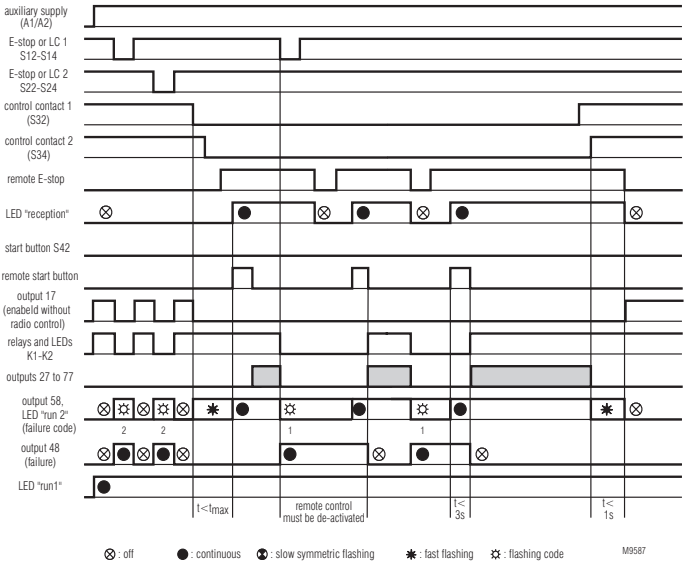


Rotary switch B = 1:

- The safety elements on S11-S14 and S21-S24 are always considered, manual start only via start button on S42
- The remote control is only considered if at least one of the control contacts on S32 or S34 is open.
- Reset of remote emergency stop with start button on S42 after reset of remote control through remote start button
- $t_{max.}$ =maximum time to activate the remote control set with rotary switch A

When starting with open control contact, the radio-controlled safety module can only be activated by a local start button, when the remote control has been reset and activated by its own start button..

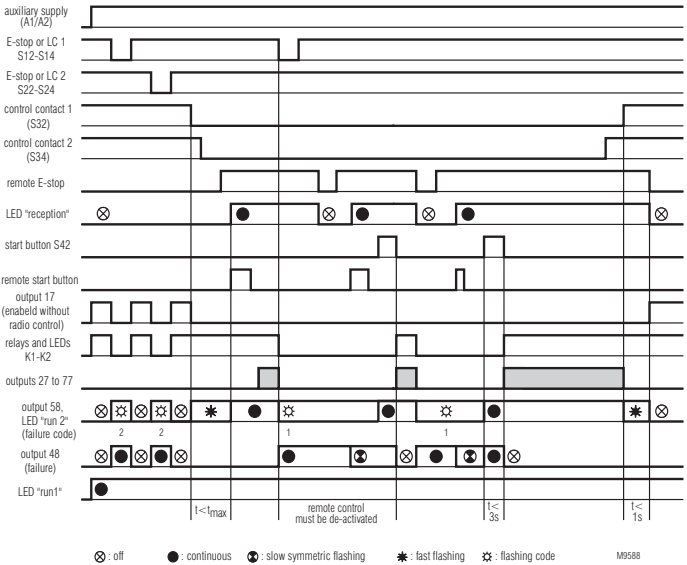
5.4.1.4.3 Function diagram for operating mode 2



Rotary switch B = 2:

- The safety elements on S11-S14 and S21-S24 are always active, auto start
- The remote control is only considered if at least one of the control contacts on S32 or S34 is open.
- Reset of remote emergency stop with remote start button including infrared.
- $t_{max.}$ = maximum time to activate the remote control set with rotary switch A

5.4.1.4.4 Function diagram for operating mode 3

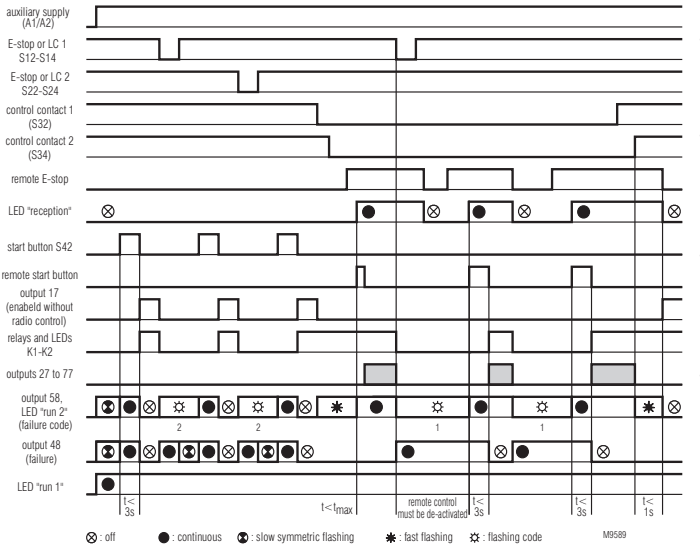


Rotary switch B = 3:

- The safety elements on S11-S14 and S21-S24 are always active, auto start.
- The remote control is only considered if at least one of the control contacts on S32 or S34 is open.
- Reset of remote emergency stop with start button on S42 after reset of remote control through remote start button
- $t_{max.}$ = maximum time to activate the remote control set with rotary switch A

When starting with open control contact, the radio-controlled safety module can only be activated by a local start button, when the remote control has been reset and activated by its own start button.

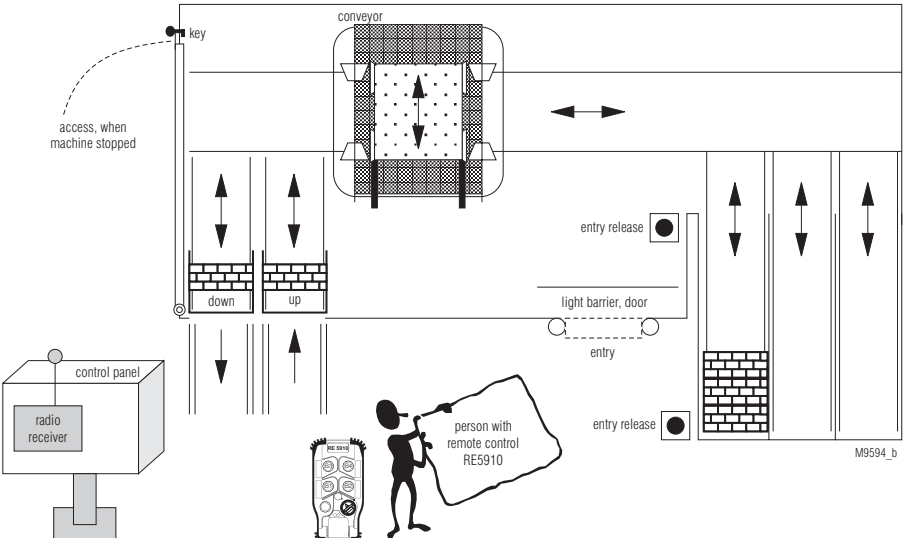
5.4.1.4.5 Function diagram for operating mode 4



Rotary switch B=4:

- The safety elements on S11-S14 and S21-S24 are always active, manual start
- The remote control is only considered if at least one of the control contacts on S32 or S34 is open.
- Reset of all failures with start button on S42 or through remote start button including infrared.
- $t_{max.}$ = maximum time to activate the remote control set with rotary switch A

5.4.2 Operating modes 8 to 9 – monitored zone access



Access to the machine is protected by a light curtain or a safety gate. To access the operator will have to disable the safety equipment temporarily.

5.4.2 Operating modes 8 to 9 – monitored zone access

Working principle:

1. As long as the remote control is in the charger (control contact S31-S32 is closed), the machine is protected by the hard-wired emergency 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. Control contact S31-S32 opens, the white LED run2 and output 58 flash fast. This indicates that the remote emergency stop button has to be released and the remote control has to be reset by pressing the green start button within the set time. Otherwise the safety relays will deenergise.
3. If the remote control is reset within the required time the white LED run2 and output 58 turn to be on continuously.
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. Now the white LED run 2 and output 58 are flashing slowly to indicate the muting of the safety equipment. Now, the operator must open the gate or interrupt the light curtain. The time between pressing the first of the two buttons and the opening of the gate must not exceed the set activation time.
5. When opening the gate the muting time starts. The operator can reset and restart this time by pressing both buttons again.
6. When closing the door or leaving the light curtains the zone protection equipment is activated again. This state is indicated by a continuous signal of the white LED run 2 and the output 58.

5.4.2 Operating modes 8 to 9 – monitored zone access

7. If the door is not closed after the muting time has lapsed the zone protection equipment is also activated again and the safety relays de-energise.

8. Outside the protected area the operator places the remote control back into the charger and the control contact (S31 -S32) closes.

No later than one second after this, the remote control must get inactive, otherwise the safety relays will deenergise. The white LED run 2 and output 58 get inactive.

The maximum time for resetting the remote control after taking it out of the charger and the maximum time between pressing the first button and opening the door can be set within a range of 5 to 30 seconds, by rotary switch A. The muting time is set within a range of 5 seconds and 10 minutes with the same rotary switches A.

Since terminals S21 to S24 can also be used to connect a safety gate, the monitoring time for simultaneousness of the signals has been increased from 250 ms to 3 seconds.

To provide maximum safety during the time the operator is in the hazard zone the function activity monitoring must be active. This function requires activation of a push-button in certain intervals.

When using the remote control inside a machine or hazard zone, the speed of the machine must be reduced to a safe level. The output signals on terminals 58 and 17 provide independent status information for this function. (See also 6.2 Indicators and status messages of radio-controlled safety module).

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

5.4.2.1 Setting the start type (rotary switch B)

Overview of settings rotary switch B

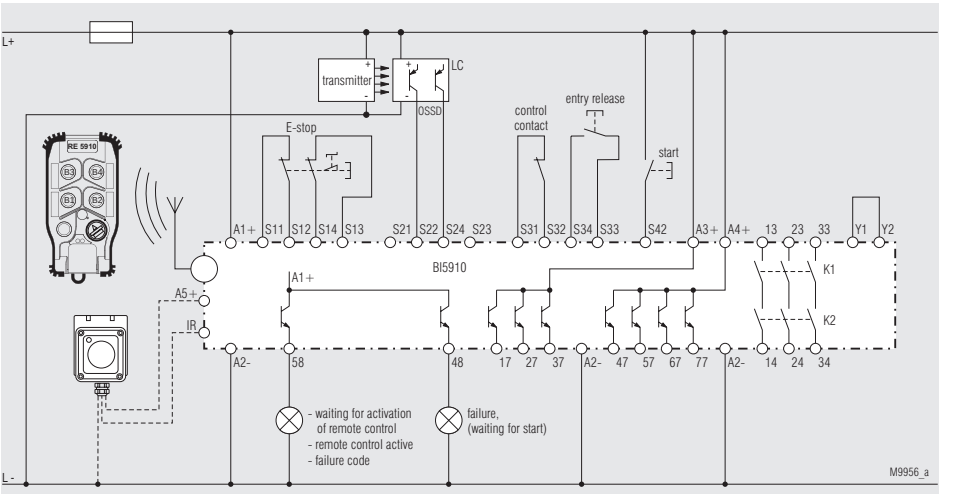
Position rotary switch B	Operation without remote control (remote control in charger)	Operation with remote control (remote control active)	
	Start upon pressing and unlocking of hard-wired emergency stop through:	Start upon pressing and unlocking of hard-wired emergency stop through:	Start upon pressing and unlocking of radio emergency stop through:
8 (to be used with IR only)	Manual start (start button on S 42)	Reset radio emergency stop, then radio start with IR	Radio start with IR
9*		Reset radio emergency stop, radio start, then start button on S42	Radio start*, then start button on S42

Radio start*: If necessary, it may be combined with infrared
Reset radio emergency stop: Reset and unlock radio emergency stop.

5.4.2.2 Setting the muting time

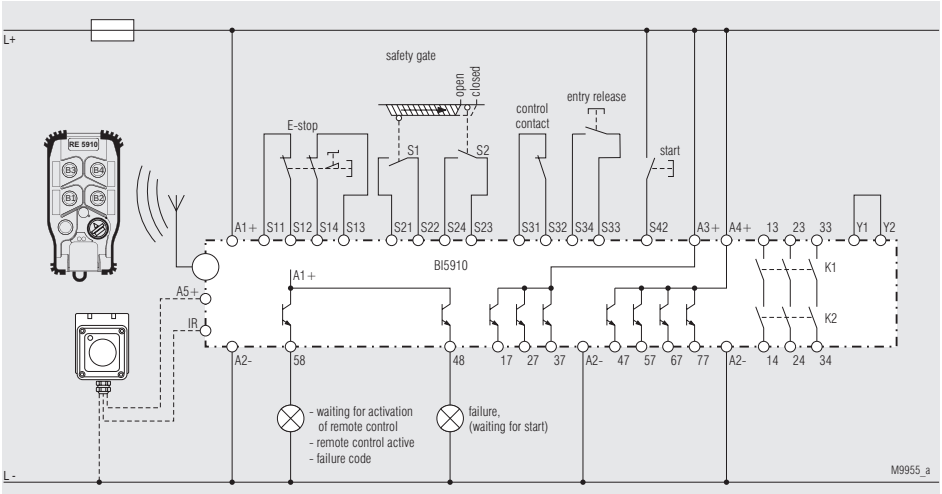
	Rotary switch A Max. time to activate the remote control or the muting and muting time for access control									
Activation	0	1	2	3	4	5	6	7	8	9
	5 s	6 s	7 s	8 s	9 s	10 s	15 s	20 s	25 s	30 s
Muting	5 s	10 s	20 s	40 s	1 Min.	2 Min.	3 Min.	4 Min.	5 Min.	10 Min.

5.4.2.3 Application examples



Monitored zone access: Zone protection by light curtain

5.4.2.3 Application examples

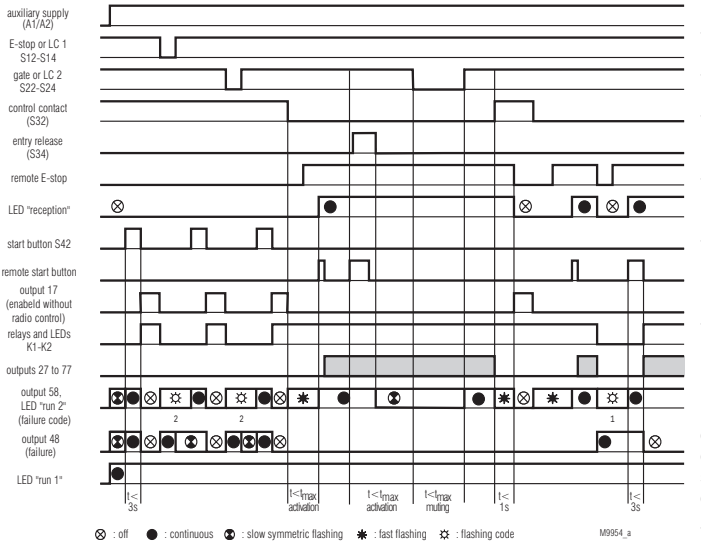


Monitored zone access: Zone protection by safety gate.

See also chapter 4. Installation and connection

5.4.2.4 Function diagrams

5.4.2.4.1 Function diagram for operating mode 8



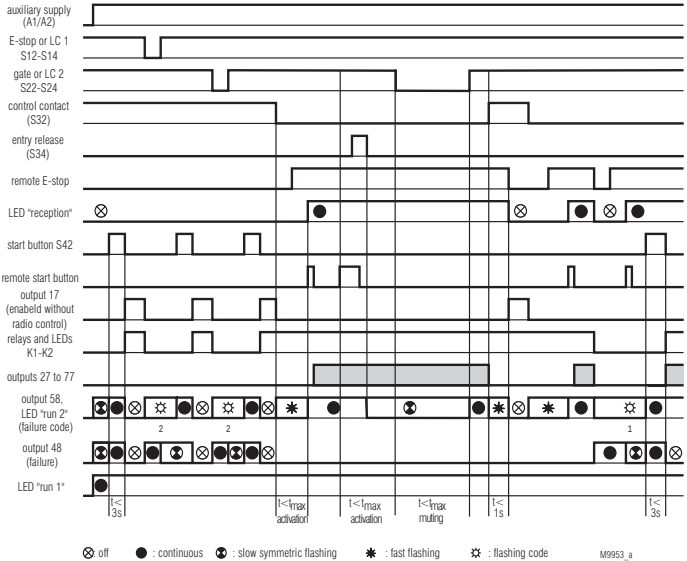
Rotary switch B = 8:

- Monitored zone access, manual start
- Protective devices on S11-S14 always active
- Protective device on S21-S24 always active, when control contact is closed
- Remote control active, when control contact on S32 is open
- Zone protection on S21-S24 can be disabled for a certain time with remote control (muting)
- Reset of all failures with hard-wired start button or start button on remote control (+infrared)

Disconnection for S12-14 or S22-S24 when control contact S32 is open: See 5.4.1.4.1 Function diagram operating mode 0

- $t_{max.}$ max. time set with rotary switch A

5.4.2.4.2 Function diagram for operating mode 9



Rotary switch B = 9:

- Monitored zone access, manual start
- Protective devices on S11-S14 always active
- Safety equipment on S21-S24 always active, when control contact is closed
- Remote control active, when control contact on S32 is open
- Zone protection on S21-S24 can be disabled for a certain time with remote control (muting)
- Reset of all failures with hardwired start button

Disconnection for S12-14 or S22-S24 when control contact S32 is open: See 5.4.1.4.2 Function diagram operating mode 1

- $t_{max.}$ max. time set with rotary switch A

6 Troubleshooting

6.1 Indicators of remote control

State of remote control	red LED	green LED	Status	Description / message	Recommended action
All states of the remote control	OFF	OFF	Inactive	1) Switched off (activated emergency stop) or 2) Response time of activity monitoring has lapsed or 3 RESET with empty battery	2) See 3.1.6 Activity monitoring 3) Place remote control in charger immediately
	3 x flashes	3 x flashes	Error	Electronic key and memory of remote control do not match	Programming required, (see 5.3.1.4 Transmission of identity code)

6.1 Indicators of remote control

State of remote control	red LED	green LED	Status	Description / message	Recommended action
All states of the remote control	4 x flashes	4 x flashes	Error	Button defective	It may have been tried to configure the frequency or activity monitoring function while locked.
	5 x flashes	5 x flashes	Error	Error at activation or deactivation detected.	Press e-stop button and release it again. (see 5.3 Comissioning of remote control)
	6 x flashes	6 x flashes	Error	Error at activation or deactivation detected.	Contact manufacturer
	7 x flashes	7 x flashes	Error	Internal error in electronic key or remote control	
	8 x flashes	8 x flashes	Error	Internal error in remote control	

6.1 Indicators of remote control

State of remote control	red LED	green LED	Status	Description / message	Recommended action
Remote control in charger	ON	Flashes	Inactive	Battery charging: Quick charging	-
	ON	ON	Inactive	Battery charging: Maintenance charging	-
	2 x flashes	2 x flashes	Error	Charging error	Contact manufacturer
Remote control out of charger, but not activated	OFF	ON	Ready	Battery charge > 50%	-
	Flashes slowly	ON	Ready	50% > Battery charge > 10%	-
	Flashes quickly	ON	Ready	Battery charge < 10% The remote control will remain operable for a max. of 15 min	Charge battery as soon as possible
	ON	ON	Error	Reading error of electronic key	Contact manufacturer

6.1 Indicators of remote control

State of remote control	red LED	green LED	Status	Description / message	Recommended action
Remote control out of charger, and activated with the green start button	OFF	Short flashing	Active	Radio transmission	-
	Flashes quickly	Short flashing	Active	Radio transmission + battery charge < 10% The remote control will remain operable for a max. of 15 min	Charge battery as soon as possible

If the remote control is in configuration mode, the current state is also indicated by the two LEDs on the remote control (see 5.3.1 Configuration of remote control).

6.2 Indicators and status messages of radio-controlled safety module

With the three status semiconductor outputs and the LEDs on the front side of the radio-controlled safety module, different states are indicated:

	Continuously ON	Flashing (regularly or as flash code)	Continuously OFF
Output 17	Remote control is inactive, control contacts are closed and safety relays are energised		- Safety outputs are inactive or - Control contacts are open and remote control is active
Output 58	Remote control and safety outputs are active	**Failure code:** One function does not enable the unit **Fast flashing:** The remote control must be activated **Slow flashing:** One safety element is muted	- Control contact closed and safety outputs active or - All outputs inactive because of system failure
Output 48	One function does not enable the unit	Regular flashing: ready for operation, waiting for start button	- Safety outputs active or - system failure

6.2 Indicators and status messages of radio-controlled safety module

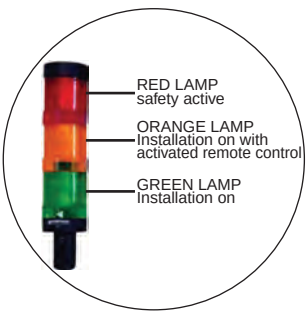
Attention
The machine may be operated with normal working speed only if the following requirements are met:
Output 58 Continuously OFF
Output 17: Continuously ON

This means: The hazard zone MUST NOT be entered!
It is recommended to use these 3 message outputs as follows:

Output 17: Green light for indicating operation without activated remote control

Output 58: Orange light for indicating operation with activated remote control

Output 48: Red light for indicating failures (safety relays deenergised



6.2 Indicators and status messages of radio-controlled safety module

LEDs	**Continuously ON**	**Flashing (regularly or as flash code)**	**Continuously OFF**
White run 1	No system failure	All outputs inactive because of system failure (failure code)	All outputs inactive because of system failure
White run 2	Safety relays K1 and K2 activated	- System failure when LED run 1 is off or flashes - Otherwise same function as output 58 when LED run 1 is on	- Control contact closed and safety relays active or - All outputs inactive because of system failure
Green K1 and K2	Safety relays K1 and K2 active		Safety relays K1 and K2 inactive
Green "reception"	Remote control in operation and good reception	**Irregular flashing:** bad reception **Regular flashing:** failure in receiver unit (failure code)	No radio signal
Red "receiver error"	Programming status	- Failure in receiver unit (failure code) or - Invalid identity code received (regular flashing)	- No radio signal or - Valid identity code received

6.2.1 Status and failure codes

The radio-controlled safety module consists of a handling part for safety in general and a handling part specifically for the safe radio reception. Therefore the failure and status indication is divided into 2 groups.

1. White LEDs “run1” and “run2”: Failure or status indication for global safety treatment.
2. Red LED “receiver error” and green LED “reception”: Failure or status indication of the safety radio receiver.

When reporting failures it is important for us to know the status of all LEDs, especially which LED indicates a failure and with which failure code.

6.2.1.1 System failures in global safety treatment (white LEDs left side)

No.	Failure	Explanation
0 OFF	Communication failure	1) If one processor detects a system failure it indicates such by a flash code and interrupts communication with the other processor. This one will then indicate failure 0. 2) If both LEDs remain OFF, the unit is defective and must be repaired.
5	Setting failure	1) The rotary switch settings for both channels do not match. 2) Invalid setting.
6	Under- or overvoltage	1) Left LED „run 1“ flashes: Supply voltage is below the min. level < 0.85 UN 2) Right LED „run 2“ flashes: Supply voltage is above max. level > 1.15 UN + 5% ripple
7	Input failure	A short circuit has occurred on the inputs
8	Failure on safety relays	1) If the safety relays are inactive, the feed back circuit on Y1-Y2 is not closed. (The feed back circuit must closed within 50ms after the relays de-energise). 2) One of the output relays or its control circuit is defective. Unit must be repaired.

6.2.1.1 System failures in global safety treatment (white LEDs left side)

No.	Failure	Explanation
9	Output failure	For one of the two channels it was detected that the required positions of the output contacts do not match.
10	Software failure	A processor detected a failure in its own routine.
11	Matching failure	It takes too long until both hardware processors match.
Failure 9,10 and 11 are important failure messages for the manufacturer. Try to analyse the procedure that has lead to this failure and pass this information to the manufacturer or supplier of the unit.		
12	Version failure	The software versions of both unit components do not match. Unit must be repaired.
13	Checksum failure	The program memory of a processor is defective. Unit must be repaired.
14	RAM failure	The working memory of a processor is defective. Unit must be repaired.

If a failure occurs in the general safety system part, the administration part interrupts the safety dialog with the radio part. It then reports failure code 3 with both processors (see 6.2.1.3 Failure and status indication of the radio receiver (LEDs right side).

6.2.1.2 Status indication of global safety treatment (white LEDs left side)

A status that leads to de-energisation of the safety outputs is indicated by the white LED run2 and output 58 with failure code (error no.: number of flashes). The white LED run1 remains conti-nuously active. Output 48 is continuously active while the failure exists. It will flash regularly when it is possible to reset with the start button again.

No.	Status	Explanation
1	Emergency stop by remote control	- The control contact is open and one safety element has been activated. - The control contact is open and the radio connection is not active. - When the safety relays have deenergised with open control contacts, the remote control must be deactivated before it can be restarted again.
2	Emergency stop	A safety element has been activated (Emergency stop, light curtain, safety gate)

6.2.1.2 Status indication of global safety treatment (white LEDs left side)

No.	Status	Explanation
3	Simultaneous-ness failure / time failure	- Both signals of an emergency stop, light curtain or safety gate have not been activated within the required time (do not meet the simultaneousness requirement). Both signals must now be deactivated before a new start is possible. - The „entry release“ button or the start button on the remote control have been operated too long. - The remote control has not been started within the required time after removing it from the charger. - The remote control and the receiver are not setted to the same channel.
4	Failure on start button	- Pressed longer than 3 s - Already pressed on start-up - A failure occurred while start button was pressed
5	Entry release failure	The entry release button (S34) has been pressed while the unit is powered up.
6	Control contact failure	Only one of the control contacts is open.

6.2.1.3 Failure and status indication of the radio receiver (LEDs right side)

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	Message
	OFF	Normal operation	No radio signal Message with valid identity code
	Regular flashing		Message with invalid identity code
	ON	Serial connection	Writing parameters or reading data
2	Flashes with code	Fault	Supply
3			Failure in administration part (see also 6.2.1.1 System failures in global safety treatment (white LEDs left side))
4			EEPROM
5			RAM
6			ROM
7			Prozessor type

6.2.1.3 Failure and status indication of the radio receiver (LEDs right side)

Green LED „reception“

No.	Status	Mode	Message
	OFF Irregular flashing ON	Normal operation	No radio signal Bad reception Good reception
	OFF	Serial connection	Writing parameters or reading data
2	Flashes with code	Fault	Supply
3			Failure in administration part (see also6.2.1.1 System failures in global safety treatment (white LEDs left side))
4			EEPROM
5			RAM
6			ROM
7			Prozessor type

7 Technical data

7.1 Remote control RE 5910

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:	approx. 150 m in industrial environment *); approx. 400 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.)

Battery

Battery type:	Lithium-ion
Service life:	min. 500 cycles (charge/discharge cycles)
Charging time:	2 h, at +20°C (80%) (with fully discharged battery)
Full charging time:	2 h 30 min (100%)

Charge capacity
- with fully charged battery and normal use of push-buttons: 50 h at 50% operation, +20°C
- after 10 minutes charging time of discharged battery: allows approx. 1 h operation

Storage temperature:	-20°C . +45°C
Charging temperature:	0°C . +40°C

7.1 Remote control RE 5910

Attention!
Charging outside this temperature range may damage the battery.
Charge capacity depends on the operating conditions of the remote control (continuous or temporary use, ambient temperature, etc.)

Enclosure

Material:	ABS	
Degree of protection:	IP65	
Shock resistance	The unit is designed to withstand falls from a height of 1m.	
Ambient temperature:	-20°C ... +45°C	
Climate resistance:	-20 / 45 / 4	IEC/EN 60068-1
Holder for non-operation:	Charger unit	
Weight (with battery):	240 g	

Dimensions
(Height x width x length): 46 x 78 x 143 mm

Charger

Material:	ABS	
Max. terminal cross-section:	1 mm^2 stranded wire with sleeve	DIN 46 228-1/-2/-3/-4
Min. terminal cross-section:	0.2 mm^2 stranded wire with sleeve	DIN 46 228-1/-2/-3/-4

Dimensions:
(Height x width x length): 73 x 48 x 185 mm

7.2 Radio-controlled safety module BI5910

Radio

Conformity:	ETS 300 220
Aerial:	1/4 aerial, impedance 50 Ω, plug in as accessory
Frequency:	64 programmable frequencies (from 433.1 to 434.675 MHz)
Sensitivity:	< -100 dBm
Nominal voltage U_N:	DC 24 V
Voltage range:	0.85. 1.15 UN at max. 5 % residual ripple
Nominal consumption:	max. 120 mA (Semiconductor outputs not connected)
Control voltage on	
S11, S13, S21, S23, S31, S33:	DC 23 V pulse, average value approx. 7V
Control voltage on 48, 58:	DC 23 V at UN
Control current on	
S12, S14, S22, S24, S32, S34, S42:	each 4.5 mA at U_N
Minimum voltage for active signal on	
S12, S14, S22, S24, S32, S34, S42:	DC16V
Maximum voltage for inactive signal on	
S12, S14, S22, S24, S32, S34, S42:	DC 9 V
Max. input current on	
S12, S14, S22, S24, S32, S34, S42:	DC30V
Fusing:	Internal with PTC

Max. time difference between input signals of one function

Emergency stop, light curtain:	250 ms
Safety gates:	3 s

7.2 Radio-controlled safety module BI5910

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	
Pick up time type at U_N		
Automatic start:	max. 1000 ms	
Manual start:	max. 110 ms	
Automatic restart:	max. 70 ms	

Switching off time (response time)

S12-S14, S22-S24, S32-S34:	max. 25 ms	
Emergency stop (Radio):	max. 170 ms	
Passive disconnection because of interrupted radio signal:	max. 500ms	
Disconnection with active radio signal despite closed 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
To DC 13:	DC 2 A / 24V	IEC/EN 60 947-5-1
DC switching capacity:	DC 8 A / 24 V at 0.1Hz	IEC/EN 60 947-5-1

7.2 Radio-controlled safety module BI5910

Electrical life

To AC 15 at 2 A, AC 230 V:	100,000 switching cycles	IEC/EN 60 947-5-1
Allowed switching frequency:	max. 1200 switching cycles / h	

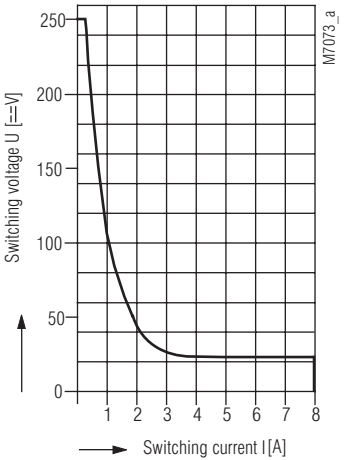
Please also read the section 4.10 Interference suppression

Short circuit strength

Max. fuse rating:	6 A gL	IEC/EN 60 947-5-1
Mechanical life:	10 x 10^6 switching cycles	

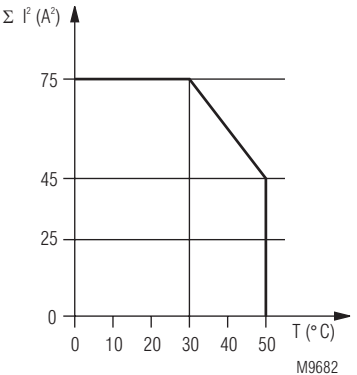
Semiconductor outputs

Outputs (terminals 48, 58, 17, 27, 37, 47, 57, 67, 77):	transistor outputs, PNP
Nominal output voltage (A3+, A4+):	DC 24 V
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 for inductive loads, arrange the necessary protection measures
Min. operating current:	min. 0.5 mA
Residual current:	min. 0.1 mA



safe breaking, no continuous arcing
under the curve, max. 1 switching cycle/s

Limit curve for arc-free operation



Quadratic total current

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

I_1, I_2, I_3 - current in contact paths

Quadratic total current limit curve

7.2 Radio-controlled safety module BI5910

General Data

Operating mode:	Continuous operation	
Temperature range:		
operation:	0 ... 50°C	
storage:	-40° ... +80°C	
altitude:	≤ 2.000 m	
Clearance and creepage distance rated impuls voltage /		
pollution degree:	4 kV / 2	IEC 60 664-1
Overvoltage category:	II	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 voltage		
between supply lines:	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:	according to EN 61 496-1 (1997) the unit must be Mounted in a control cabinet with protection class IP 54	
Housing:	IP 40	IEC/EN 60 529
Terminals:	IP 20	IEC/EN 60 529

7.2 Radio-controlled safety module BI5910

Housing:	Thermoplastic with V0 behaviour according to UL Subject 94	
Vibration resistance:	according to EN 61496-1 (1997)	
Amplitude	0.35 mm	IEC/EN 60 068-2-6
Frequency:	10 ... 55 Hz	
Shock resistance		
Acceleration:	30g	
Impulse length:	11 ms	
Number of shocks:	3 in both directions per axis on all 3 axes (18 in total)	
Climate resistance:	0 / 050 / 04	IEC/EN 60068-1
Terminal designation:	EN 50 005	
Wire connection:		
Max. terminal cross-section:	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
Min. terminal cross-section:	0.5 mm^2 stranded wire with sleeve	DIN 46 228-1/-2/-3/-4
Wire fixing:	plus minus terminal screws	
	M 3.5 box terminals with wire protection	
Quick mounting:	DIN rail	IEC/EN 60 715
Net weight:	495 g	
Dimensions		
Width x height x depth:	67.5 x 84 x 129 mm	

7.3 Safety-relevant technical data

Safety category:	Category 4, Performance Level „e“	EN ISO 13849-1
Safety Integrity Level:	SIL 3	EN 61508

Probability of dangerous failure per hour

a) Emergency stop from a hard-wired safety element: PFH_D: $1{,}2 \cdot 10^{-9}$ 1/h

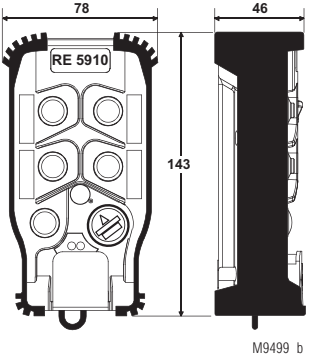
b) Emergency stop from radio control RE5910: PFH_D: $2{,}0 \cdot 10^{-9}$ 1/h

Safe failure fraction (SFF)	99,5%
Interval for repetition of tests (T1)	20 years

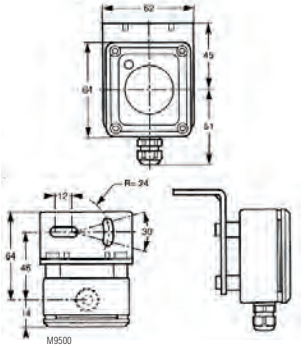
7.4 Infrared Receiver RE5910/060

Power supply:	from Radio-controlled safety module BI 5910
max. cable length:	30 m
max. distance from emitter RE 5910:	3 m
Degree of protection:	IP 65

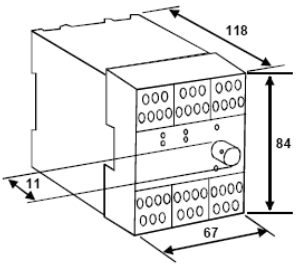
7.5 Dimensional drawings



Remote control RE 5910

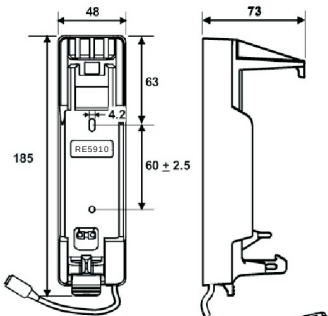


IR module RE 5910/060

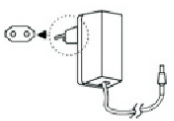


Radio controlled safety module BI 5910

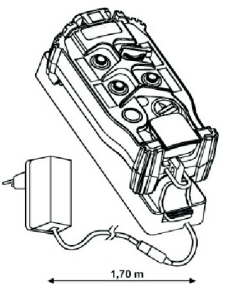
7.5 Dimensional drawings

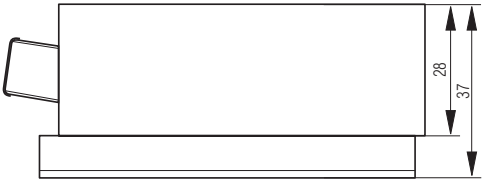


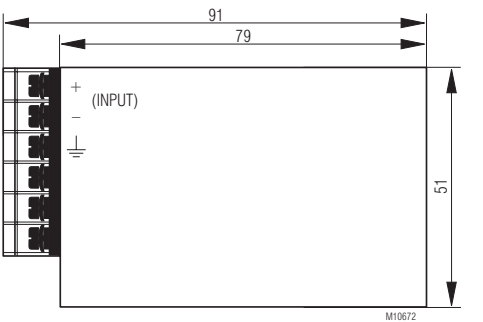
Industrial charger unit-
RE 5910/010



RE 5910/011
(AC 230V)







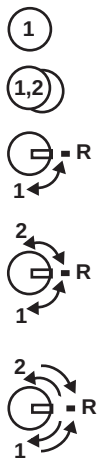
RE 5910/012

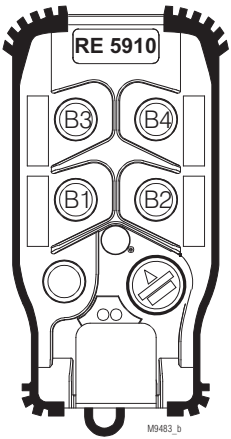
8 Ordering data / selection aid

8.1 Used abbreviations

This section
uses the following abbreviations:

- Push-button, 1 acting points (BPSV)
- Push-button, 2 acting points (BPDV)
- Rotary switch, 2 positions (COM2)
  (B3: centre / top, B4: centre / bottom)
- Rotary switch, 3 positions (COM3)
- Rotary switch, 3 positions (COM3R)
  (automatic reset to central position)



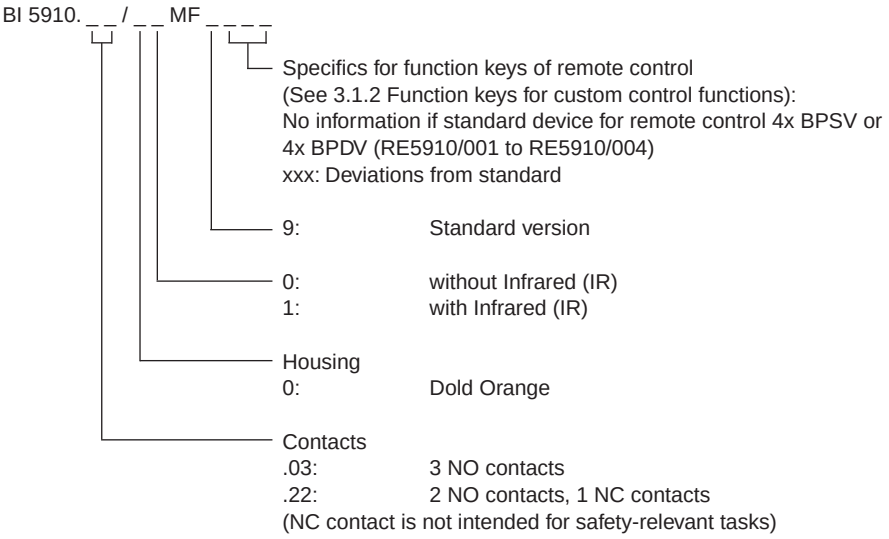


8.2 Minimum equipment

To have a functioning Wireless Safety System with or without infrared (IR) feature, at least the following basic components must be used. These must be ordered following the selection tools below.

Without infrared feature	With infrared feature
• 1 radio-controlled safety module w/o IR	• 1 radio-controlled safety module with IR
	• 1 infrared module with cable
• 1 remote control w/o IR	• 1 remote control with IR
• 1 aerial	• 1 aerial
• 1 charger	• 1 charger
• 1 power supply for charger	• 1 power supply for charger

8.3 Selection aid for radio-controlled safety module



The unit includes a radio-controlled safety module and comes with this user manual.

8.4 Selection aid remote control

Order numbers remote control (see 8.1 Abbreviations used):		
RE5910 / 0 0 1	without IR	4 x BPDV
RE5910 / 0 0 2	with IR	4 x BPDV
RE5910 / 0 0 3	without IR	4 x BPSV
RE5910 / 0 0 4	with IR	4 x BPSV
RE5910 / 0 0 5	without IR	B1-B3: BPSV, B4: COM3R
RE5910 / 0 0 6	with IR	B1-B2: BPSV, B3-B4: COM3
RE5910 / 0 0 7	without IR	B1-B2: BPSV, B3-B4: COM3
RE5910 / 0 0 8	without IR	B1-B2: BPDV, B3-B4: COM2
RE5910 / 0 0 9 0 1 A	without IR	B1-B2: BPSV, B3: COM3, B4: COM3R
RE5910 / 0 0 9 0 1 B	without IR	B1-B2: BPSV, B3-B4: COM3R
RE5910 / 0 0 9 1 1 4	with IR	B1-B3: BPSV, B4: COM3
RE5910 / 0 0 9 0 2 3	without IR	B1-B2: BPDV, B3:BPSV, B4: COM2
RE5910 / 0 0 9 1 2 9	with IR	B1-B2: BPDV, B3:COM2, B4:COM3R

RE 5910 / 0 0 9 _ _ _ _

- No figure: Standard
  E-stop red, start button green,
  other buttons or switches: black.
  0 to 9 and A to Z: Deviations from standard
- B3-B4: No. of buttons or switches
- B1-B2: No. of buttons or switches
- 0: without IR; 1: with IR

Scope of delivery includes as remote control with battery and electronic key and a comprehensive label set for individual marking of the function keys

Possible button / switch combinations

B1	B2	
BPSV	BPSV	1
BPDV	BPDV	2

B3	B4	
BPSV	BPSV	1
BPDV	BPDV	2
BPSV	COM2	3
BPSV	COM3	4
COM2	COM2	5
COM2	COM3	6
COM3	COM3	7
BPSV	COM3R	8
COM2	COM3R	9
COM3	COM3R	A
COM3R	COM3R	B
None	None	C

8.5 Accessories

	Description	Description
Accessories remote control	Charger unit	RE 5910/010
	Power supply for charger AC 230 V / DC 5V (EU plug)	RE 5910/011
	Power supply for charger AC 230 V / DC 5V (UK plug)	RE 5910/013
	Power supply for charger DC 24 V / DC 5V (DIN rail)	RE 5910/012
	Electronic key green, programmed*	RE 5910/020*
	Electronic key orange, programmed*	RE 5910/021*
	Label set with "movement" labels in 6 colours for 2-step push-buttons	RE 5910/030
	Label set with 90 black and white labels	RE 5910/031
	Label set with 48 white labels and 48 transparent films	RE 5910/033
	Spare battery l	RE 5910/051
	Leather case for remote control with metal clip for fixing on belt or 3-point shoulder rig	RE 5910/070
	3-point shoulder rig for fixing the leather case	RE 5910/071

* **Important:** Please state in purchase order:
• No. of electronic key or identity code (as noted on first page of the manual).
• Frequency channel (between 01 and 64), if it is to be programmed by the manufacturer
• Response time for activity monitoring function (01-99 sec, 01-98 min or infinite)

8.5 Accessories

	Beschreibung	Bestellbezeichn.
Accessories for radio-controlled safety module	Aerial straight 1/4, 433 - 434 MHz – BNC	RE 5910/040
	Aerial straight 1/2, 433 - 434 MHz – BNC	RE 5910/041
	Extension cable for aerial (2m) with through hole connector – BNC, fixing bracket	RE 5910/042
	Extension cable for aerial (5m) with through hole connector – BNC, fixing bracket	RE 5910/043
	Extension cable for aerial (50cm) with through hole connector – BNC	RE 5910/045
	Aerial combination kit with 2 aerials RE5910/040 and 5m cable	RE5910/044
	90° adapter for aerial	RE 5910/046
	Infrared receiver module with cable (10m)	RE 5910/060
	Extension cable for infrared module (10m)	RE 5910/061

9 Maintenance and care

User-friendly maintenance

- Personal identification stored in electronic key
- Indicator LEDs and semiconductor outputs for diagnostics

Regular checks

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

- Test of all security functions (at minimum annually)
- User-friendliness of the remote control, such as the easy operation of the buttons and switches, smooth pressing of the emergency stop, etc
- Response time of the receiver module onto control signals sent by the remote control, i. e. between sending of the control signal and the respective movement

9.1 Maintenance of remote control

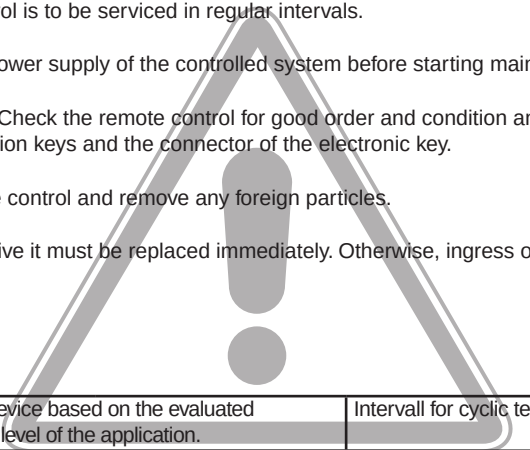
The remote control is to be serviced in regular intervals.

Disconnect the power supply of the controlled system before starting maintenance.

Every 3 months: Check the remote control for good order and condition and inspect especially the seals of the function keys and the connector of the electronic key.

Clean the remote control and remove any foreign particles.

If a seal is defective it must be replaced immediately. Otherwise, ingress of moisture could damage the unit.



Demand to our device based on the evaluated eccessary safety level of the application.		Intervall for cyclic test of the safety function
acc. to EN ISO 13849-1	PL e, Cat. 3 or Cat. 4	once per month
	PL d, Cat. 3	once per year
acc. to IEC/EN 61508	SIL 3	once per month
	SIL 2	once per year

9.1 Maintenance of remote control

Replacing the remote control battery

- Only the batteries listed in section 8.5 Accessories may be used.
- In order to avoid damage of the electronic components of the remote control, the battery may only be exchanged at a workplace that is protected against electrostatic discharge (conductors and antistatic bracelets).

Open case

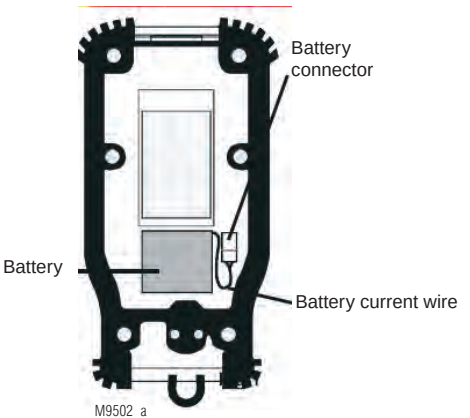


fig. 1

1. Switch off the corresponding radio-controlled safety module.
2. Press emergency stop button on remote control.
3. Remove electronic key from remote control.
4. Turn around the unit and remove the 6 screws on the enclosure with a flat screw driver size 5mm.
5. Open remote control enclosure (fig. 1).
6. Remove old battery..

9.1 Maintenance of remote control

7. Connect the new battery and set it in. Make sure that the battery is positioned correctly so that the enclosure can be closed.

8. Close enclosure: Make sure that the seals and the contact surfaces are clean. The battery wire MUST NOT be squeezed!

9. Tighten the enclosure screws in the order shown in fig. 2. This ensures proper sealing.

10. Insert electronic key again.

11. Protection of persons must be ensured in the following tests

Attention! It is your responsibility as an end user to dispose old batteries correctly. Of course, you may return replaced batteries to us.

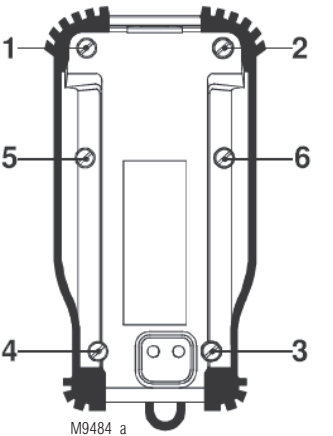


fig. 2

9.2 Maintenance of radio-controlled safety module

Maintenance of the radio-controlled safety module corresponds to that of the remote control.

Please check the following points:

- Wiring of BI 5910 with the machine circuits
- Proper functioning of active and passive disconnection.
- Check aerial for correct connection and make sure that the aerial shell is not damaged and that the unit is clean and free of oxidation

To check active disconnection press the emergency stop button. The safety relays of the radio-controlled safety module must de-energise immediately.

Spare parts: The only spare part an end user will need is the replacement battery RE5910/051 for the remote control. See chapter 9.1 Replacement of remote control battery.

Demand to our device based on the evaluated eccessary safety level of the application.		Intervall for cyclic test of the safety function
acc. to EN ISO 13849-1	PL e, Cat. 3 or Cat. 4	once per month
	PL d, Cat. 3	once per year
acc. to IEC/EN 61508	SIL 3	once per month
	SIL 2	once per year

10 Disclaimer and warranty

The safety instructions listed in the manual MUST be observed.

The applications listed in this manual are examples only that must be reviewed by the user, considering each individual case in its own responsibility. Their applicability must therefore be evaluated on a case-by-case basis.

Please be aware that our SAFEMASTER W is a radio-controlled system that could be influenced by external radio signals. In the case of external interferences the availability of the system could be reduced by sudden disconnection, without reducing the safety of men or machine.
We are not liable for influences of this kind.

We recommend setting up an internal frequency plan in order to avoid double usage of frequency channels.

CE DECLARATION OF CONFORMITY

The manufacturer :

E. Dold & Söhne KG
Bregstr. 18
D 78120 Furtwangen
Germany

declares that the radio remote control system described in the instruction manual and designated as :

Safemaster W

including the transmitter **RE5910**
the receiver **BI5910**

complies:

- 2004/108/EG EMC-Directive
- 2006/42/EG Machinery Directive
- 1999/5/EG R&TTE Directive for radio equipment and telecommunication terminal equipment with particular reference to:
  - article 3.1 a. concerning health and safety protection
  - article 3.1 b. concerning the protection requirements with respect to electromagnetic compatibility
  - article 3.2. concerning the requirements with respect to the proper use of the allocated spectrum in order to avoid harmful interference

- standards:
  - EN ISO 13849-1:2008 concerning the main requirements of health and safety relative to the design and construction of machines and safety components for category 4
  - EN 61508-1…-7:2010
  - EN 60204-32:2008 concerning the safety of machinery –Electrical equipment of machines Part 32: Requirements for hoisting equipment.
  - EN 60204-1:2006 concerning the „emergency stop function" for its „emergency stop function".

To this end, the notified body n°0573

AEMC Lab
19, rue François Blumet
ZI de l'Argentière
38330 SASSENAGE

has evaluated the above mentioned transmitter/receiver system according test reports n° R0704142C3-E-A1, and n° R0904148C-E for the fulfilment of the standards EN 301 489-3 v1.4.1(2002); EN 61000-6-2(2005); EN 62061 annexe E (2005), and test reports n° R0704142R5-E-A2 and n° R0704142R7-E-A2 for the fulfilment of the standards EN 300 220-2 v2.1.2. and EN 300 220-1 v2.1.1

and the notified body n° NB 0035:

TUV Rheinland Industrie Service GmbH
Alboinstraße 56
12103 Berlin

has evaluated the above mentioned transmitter/receiver system according to the CE type approvals n° 01/205/0635.01/15 for the fulfilment of the standards EN ISO 13849-1:2008; EN 61508-1...-7:2010; EN 60204-1:2006 +A1 :2009 +Cor :2010; EN ISO 13850:2008; EN 60947-5-1:2004 + Cor :2005 + A1 :2009; EN 50178:1997.

For the compilation of technical documents is authorized:/

Nom : Gamal Hagar
Function : R&D Manager
Signature :

Signatory :

Name : ppa. Christian Dold
Position : Product management
Place and date : Furtwangen, 9.2.2015
Signature :

This original declaration confirms the conformity of the mentioned directives but does not comprise any guarantee of the product characteristics. The safety directives of the product documentation are to be considered.

DOLD

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