USER MANUAL
Wireless Safety System

SAFEMASTER W ireless safety

DOLD

LA/313O_04/2015_0263420_ORIGINAL

SAFEMASTER W

Please enter the 4-digit identity code of the Wireless Safety System here (Identity label on radio-controlled safety module and on the enabling switch):

Identitynumber: .....

Selected frequency:.....

1. alternative frequency:.....

2. alternative frequency.....

ATTENTION!

Before using the enabling switch the battery has to be connected (see 9.1 battery change), and has to be charged at least for 24 h by placing it into the charger unit that is connected to DC 24 V (see 3.1.6 battery of enabling switch).

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.

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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 enabling switch 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 enabling switch, 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 enabling switch**

- **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 enabling switch is not used**, it should be placed in the charger in order to maintain readiness for operation. The enabling switch is inactive during charging.
- **If more than one enabling switch 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 chapter 9.1 Replacing the enabling switch battery).

2 Introduction of system

SAFEMASTER W - is an innovative wireless safety system for protection of man and machine. The **wireless enabling switch** features a 2-channel **3-position pushbutton (enabling button) that only closes when it is pressed to its middle position from its quiescent position.** When it is pressed further the contacts open again and remain open until the pushbutton is released again and returned to its quiescent position.

It has an ergonomic design so that the operator can take it to dangerous areas and hold in the middle position for longer periods of time without cramps. In case of danger the operator opens the hand or cramps it. In both cases, the contacts of the enabling switch open and it deenergises the safety relays of the radio-controlled safety module BI6910.

The Wireless Safety System features **a safety transmission path** for signal transmission from the enabling switch to the radio-controlled safety module.
In addition, the system offers configuration of application-specific control functions that can be operated through the enabling switch 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/EG
- EN ISO 13849-1: Category 4, Performance Level „e“
- EN 61508: Safety Integrity Level SIL 3, approval is pending

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 enabling switch 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 enabling switch does not replace customary safety circuits (for example an emergency stop) but provides additional functionality.

2.3 Design

Main components of this safety system are the radio-controlled safety module, the wireless enabling switch and the monitored charger for the enabling switch. 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 enabling switch sent through a safe transmission path. Safety-relevant switching commands are connected through relay outputs, not safety-relevant control signals through semi-conductor outputs.

The wireless enabling switch is lightweight, ergonomic, rugged and can easily be operated with one hand. It features a large display, clearly arranged operating elements and an ergonomic design. There are 4 other function keys apart from the actual enabling pushbutton.

The display shows settings or status messages of the enabling switch.
The charger assigned to the enabling switch by an ID number undertakes the proper charging of the battery. The monitored charger contacts detect any removal of the enabling switch.

One or more infrared receivers can be added to the system. The start signal (from the enabling switch 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.
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 enabling switch's status, these are always active.

- If the enabling switch was taken from the charger and the enabling pushbutton was pressed up to its middle position, **it will cut off the machinery** when it is released or pressed through.

- When taken from its charger and pressed to its middle position, the enabling pushbutton allows the operator to move freely and to execute certain **control or setup functions via radio transmission** (black pushbuttons on the enabling switch).

While the enabling switch 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 enabling switch only. If the **safety transmission path** is interrupted, the system will enter into a safe state. This is true too if the enabling switch 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 re-started after the enabling switch was released or pressed fully. For a successful start, the system then requires an infrared start signal from the emabling switch 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 the start process (i.e. enabling of the safety contacts of the radio-controlled safety module). When the enabling switch 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 enabling switch 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.

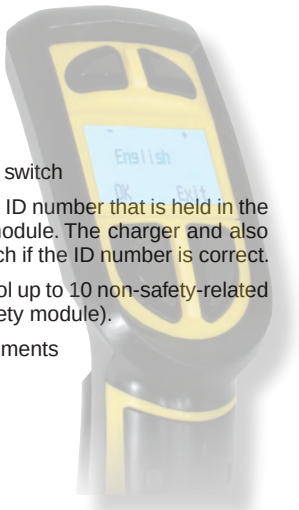
On the radio-controlled safety module, the operator can define the **activation time**.
It indicates the maximum time span allowed between removing the enabling switch from the charger's infrared area and its activation. When this time has expired without receipt of a valid radio signal, the system will enter into a safe state.

This setting also defines the **time for returning the enabling switch to the charger.**
Here, the charger detects by infrared that the enabling switch is in the vicinity. Then, it closes its control contacts. The enabling switch must then be inactivated within the set time. Otherwise the safety relays of the radio-controlled safety module are deenergised too.

3 Sytem description

3.1 Design and functions of enabling switch

Main features of the enabling switch are:



- User-friendly and compact: comfortable single hand operation
- Extra rugged for use in an industrial environment
- Adjustable transmission power to limit the application area
- Quick charging and high battery capacity
- Quick adjustment of frequency to environment, directly on enabling switch
- Identification of the complete SAFEMASTER W system by a unique ID number that is held in the charger, in the enabling switch and in the radio-controlled safety module. The charger and also the radio-controlled safety module will only detect the enabling switch if the ID number is correct.
- With the function keys of the enabling switch, the operator can control up to 10 non-safety-related functions (setting semiconductor outputs in the radio-controlled safety module).
- Loadable user-specific texts to display set functions and key assignments
- Optional accessories: Leather case for belt

3.1.1 Enabling switch, front view

The enabling switch features the controls shown in the figure.

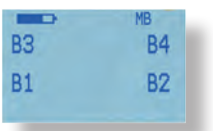
Specific characteristics of the various controls and the key functions of the enabling switch are explained in the sections below.

3.1.2 Function keys for custom control functions

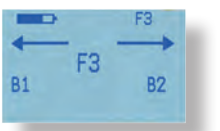
3.1.2.1 Configuring the function keys

The function keys B1 through B4 of the enabling switch can be configured as follows depending programming:

Command mode:
B1-B4:
4 command keys for 4 functions



Function mode
B3-B4:
The keys B3 and B4 are used to select a function (max. 10 different functions possible) which defines the outputs that are to be set when B1 or B2 are operated.
B1-B2:
Pushbuttons to control the selected function



The functions are controlled with the 6 semiconductor outputs (27 through 77) of the radio-controlled safety module BI6910. To adjust the operations for output decoding to the number of functions used there are several versions of the BI6910 with different output assignments. (For this see 8.2 “Selection guide / order numbers for the radio-controlled safety module”.)

3.1.3 Identity code

The ID code of the radio-controlled safety module and of the enabling switch is individually programmed in the factory and can not be changed at the radio-controlled safety module. During starting up of the system, the charger must adopt the ID number of the enabling switch. After this adoption, it only detects that enabling switch with this stored ID number.

A SAFEMASTER W system will work only if the identity codes of the radio-controlled safety module, the enabling switch and the electronic key(s) correspond).

3.1.3.1 Repair / replacement of system components

Attention! If a new enabling switch or radio-controlled safety module 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 a replacement enabling switch or radio-controlled safety module the ID code of the system has to be stated.

In order to have a functioning system after a future repair or replacement of the radio-controlled safety module or enabling switch, 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.

3.1.4 Radio frequency

The enabling switch 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 enabling switch assigned to it (same identity code).

If more than one enabling switchs 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 chapter 5.3.2.2 Selection and programming of radio frequency).

3.1.5 Transmission power

Depending on the model, the transmission power is 1mW or 10mW as a maximum. It may be necessary to limit the transmission power depending on the application. This will also limit the area where the enabling switch is allowed to be used. The user can adjust the transmission power on a scale from 1 to 5 or from 1 to 10. (For this, see also the chapter 7.1 “Specifications for the enabling switch RE6910” and chapter 5.3.2.4 “Adjusting the transmission power”.)

3.1.6 Programming of enabling switch

The enabling switch is pre-programmed in command mode and delivered with the identity code of the corresponding receiver BI 6910. The functions, text and graphics can be changed and transmitted into the enabling switch using the attached programming software. The enabling switch has to be opened and is then connected with a USB cable to the PC (see 9. Maintenance). The graphics can be generated in a simple program (e.g. PAINT) as a bitmap file (48 x 128 bit, black/white).

3.1.7 Battery of the enabling switch

A chargeable lithium ion battery providing a sufficient operating time is used as power source

Display of remaining battery capacity
On the LCD of the enabling switch, there is a battery symbol in the upper area indicating the battery's state of charge. See 6.1 "Indicators of the enabling switch".

Charging the battery of the enabling switch
To charge the battery, the enabling switch must be placed in the functioning charger. Also on the charger, the enabling switch shows its state of charge by the battery symbol on its LCD.

When a replacement of the battery in the enabling switch is needed, please note chapter 9 "Maintenance and care, battery replacement.

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 enabling switch 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 enabling switch is removed from charger (open control contact), manual start via enabling switch as an option
  - Muting of access protection with active enabling switch 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:

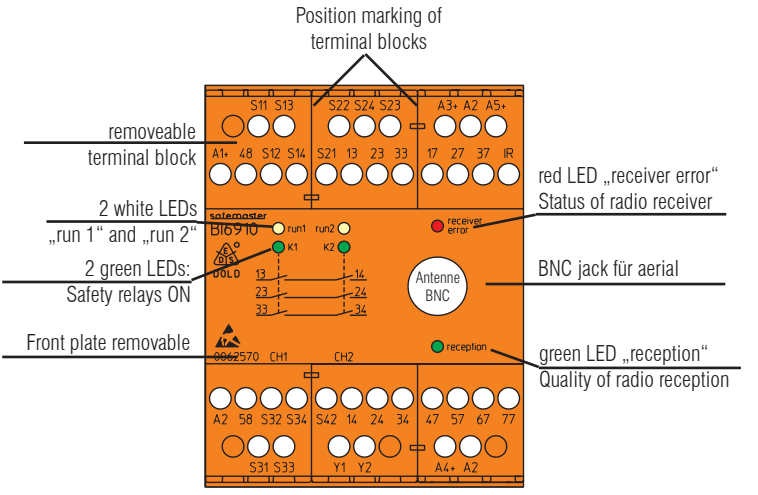
Inputs

- 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 enabling switch in battery charger
- 1 start button
- 1 feed back circuit to monitor external relays
- Depending on model: input for infrared receiver

Outputs

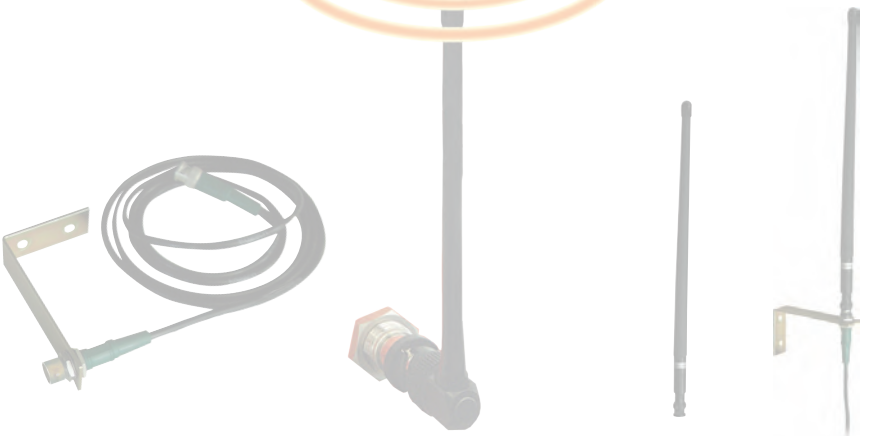
- 3 NO safety contacts or 2 NO safety contacts + 1 NC contact
- 6 semiconductor outputs to control movements by enabling switch
- 3 semiconductor outputs for indication of radio-controlled safety module‘s status

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 enabling switch 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 8.4 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 enabling switch is removed from the charger, the two charger control contacts must open within the set activation time.
When the enabling switch 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 deactivated while the enabling switch is active, for example by pressing a hard-wired emergency stop button, the enabling switch must always be released and activated before the BI6910 can be enabled again. This prevents that a second person switches on the machine while a person with active enabling switch 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 enabling switch is active or not.

- **Control contacts are closed:**
  That means that the enabling switch is in the charger. Only hard-wired safety elements are in operation. The enabling switch 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 enabling switch is removed from the charger. The safety relays remain energised. Output 58 and the white LED run 2 flash fast to indicate, that the enabling switch has to be held in its middle position. If the radio controlled safety module does not recoginse this state within the determined 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.

- **Charger control contacts are opened and the enabling pushbutton is held in its middle position:**
  When the enabling pushbutton of the enabling switch, which is taken out of its charger, is held in its middle position the output 58 and the white LED “Run 2”, change from a flashing to a continuous signal. From this moment, any releasing or pressing through of the enabling pushbutton is interpreted as stop signal. While the safety relays are energised any function key operations are passed on to the semiconductor outputs 27-77.

3.2.5 Start options

3.2.5.1 Manual start and reset

The start button to be connected to terminal S42 is 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, the start button must not be activated.
Depending on the set operating mode, the safety relays can be re-energised by repeated operation of the enabling pushbutton without the need to operate the start button after they have dropped out due to releasing or pushing through of the enabling pushbutton.
However, these operating modes should only be used in connection with the IR start option.

3.2.5.2 Auto start

The 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)

Note 1: If the enabling switch is placed back in the charger after the safety relays have been deenergised by a hard-wired safety element, the radio-controlled safety module will not be activated automatically when closed charger control contacts are detected. In such a case, the radio-controlled safety module has to be reactivated by the start button on S42.

Note 2: This setting is also necessary when the safety relays are to be energised solely by the enabling pushbutton (S11-S12, S13-S14, S21-S22, S23-S24 bridged).

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 enabling switch 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).

If this option is selected, the enabling pushbutton must be held in its middle position and the enabling switch targeted to the IR module that is close to the machinery to be controlled when starting. Before energising safety and function relays, the receiver waits for 2 conditions to be fulfilled: After this starting sequence, only radio signals are needed:

1st condition:
Receiving a start radio message sent from the enabling switch to the radio-controlled safety module

2nd condition:
Receiving the same message that is sent from the enabling switch to the radio-controlled safety module via the infrared receiver at the same time. After this starting sequence, only radio messages are needed.

When the radio-controlled safety module has detected the fulfiment of these 2 conditions it only expects information from the enabling switch by radio and the area covered by infrared can be left.

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 chapter 6.2 Indicators and status messages of radio-controlled safety module). Moreover, there are 6 non-safety-related semiconductor outputs (“27” through “77”) that can be energised via the function keys of the enabling switch provided the safety relays are also energised.

The outputs “48” and “58” are internally supplied by the voltage connected to A1+. 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)

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 devices
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 enabling switch 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 6910 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 and 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 enabling switch (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!

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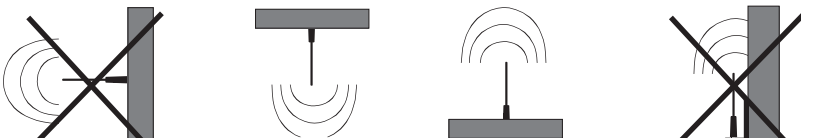

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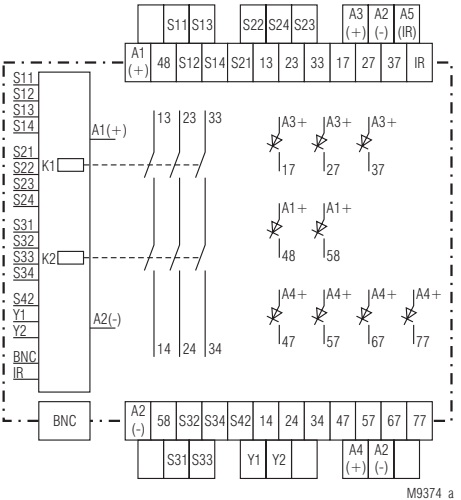
4.5 Terminal connections



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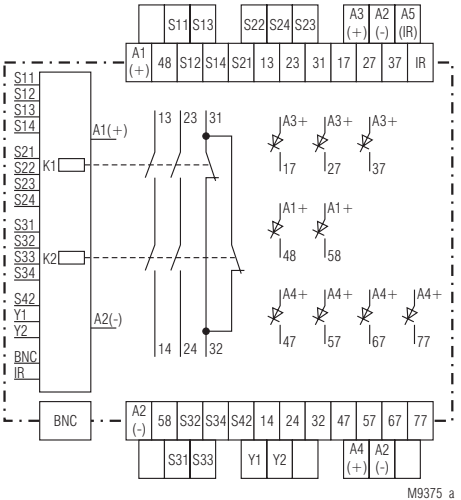

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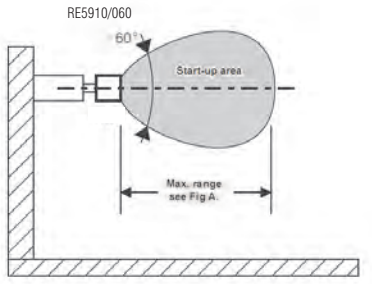
4.5 Terminal connections

Terminal	Inputs and safety outputs
A1+	DC 24 V; supply voltage for radio-controlled safety moduls
A2	Common ground (several terminals available)
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
S33/S34	2nd control input for charger unit or Input for bridging request
S42	Input for start button
Y1-/Y2	Input for feed back loop of external contact amplifier
IR	Input signal

Terminal	Inputs and safety outputs
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+	oltage output DC 12V for infrared receiver signal
A3+	DC 24 V voltage supply of semiconductor outputs 17 to 77
48, 58, 17	non-safety semiconductor outputs State of radio-controlled safety module
27, 37,47, 57, 67, 77	Non safe transistor outputs, operated by function keys on the enabling switch

4.6 Location and connection of infrared modules (IR modules)

4.6.1 Position of infrared receiver module



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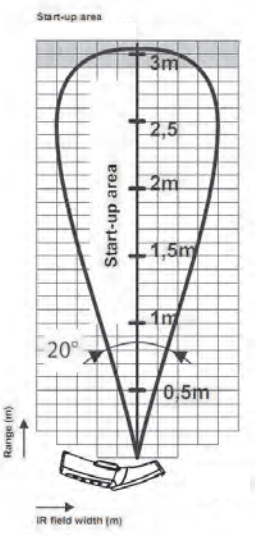


Degree of protection of the IR-modul RE 5910/060: IP 65

4.6.1 Position of infrared receiver module

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

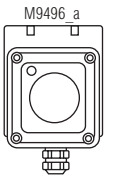
4.6.2 Connection of infrared receiver module

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 not protected against reverse polarity. Incorrect wiring may destroy the receiver.

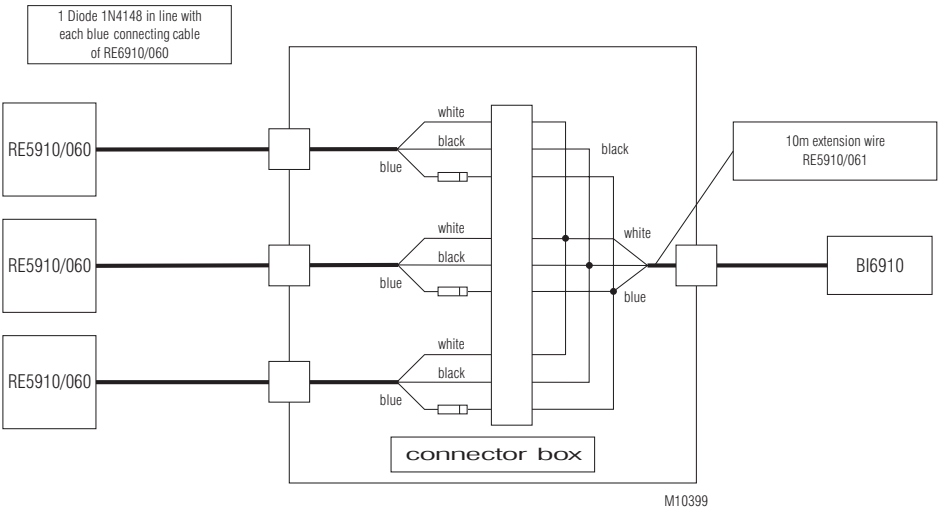
Wire	terminal of receiver BI6910
black	A2-
white	A5+
blue or brown	IR



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 7.3 Radio-controlled safety module BI6910 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 enabling switch is defective in order to provide safety to the operator and any hanging load (for example spare enabling switch 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 enabling switch in the charger for 24 hours (see 3.1.7 Enabling switch battery). To make sure to have a ready-for-use enabling switch at any time, the battery of the enabling switch should always be fully charged (store in charger).
- Check the correct matching of the ID code between enabling switch, charger and radio-controlled safety module. If required, the charger must be tought the ID code of the enabling switch (for this refer to 5.1.3 “Adjusting the charger to the ID code of the enabling switch”).
- Check the correct matching of the radio channel between enabling switch 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 enabling switch and consider interferences with other radio equipment and the frequency plan of the location.

5.1 General instructions for commissioning

- Check assignment of the enabling switch keys to the outputs of the radio-controlled safety module. Make sure that prior to activation of the anabling switch outputs 27 to 77 remain inactive.

- 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 enabling switch 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 enabling switch 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 Enabling switch and machine marking

Machine and enabling switch must be marked in a way that allows clear assignment of the buttons on the enabling switch to the controlled functions or movements of the machine.

5.1.2 Neighbouring machines with relevant enabling switch

If several machines are equipped with enabling switches and work close to each other (e.g. in a production hall) each enabling switch must be clearly marked to indicate which machine is controlled by which enabling switch. For this, you could mark the machine with the enabling switch‘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, enabling switch or spare SIM-card, the identity number and the number of the system with which the ordered part is used must be stated.
For this, note the number of the identity code at the beginning of this manual.

5.2.1 Configuration of radio-controlled safety module

Set channel::	Chanel 64, 434.675 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. Manual start through enabling switch with the 3-step push button of the enabling switch (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 enabling switch function keys to the outputs (see chapter 3.1.2.1 Configuring the function keys).

5.2.2 Configuration of enabling switch

Set channel:	Chanel 64, 434.675 MHz
Transmission power:	Max. stage: 5 (1 mW) or 10 (10mW) depending on model
Identity number:	Individual number assigned at production
Locking of the enabling switch programming:	The enabling switch is shipped with unlocked programming

The Frequency and Transmission Power configurations and the setup locking can be changed by a trained operator (see 5.3.2 “Configuration of the enabling switch”).

Function key mode: The command mode can be changed to function key mode with up to 10 functions using the attached programming software.

5.3 Commissioning of enabling switch

Attention!
Once the enabling switch has been received connect the battery (see 9.1.2 “Replacing the battery of the enabling switch”) and have it charged for at least 24 hours by putting the enabling switch in the charger that is connected to the 24 VDC power supply (see 3.1.6 “Battery of the enabling switch”) before starting up the device.

Attention!
Via two control contacts the charger signals to the radio-controlled safety module whether the enabling switch is placed in it and is being charged or is just used. For this, the charger has to be adjusted to the ID code of the enabling switch (refer to 5.3.1 “Adjusting the charger to the ID of the enabling switch).

5.3 Commissioning of enabling switch

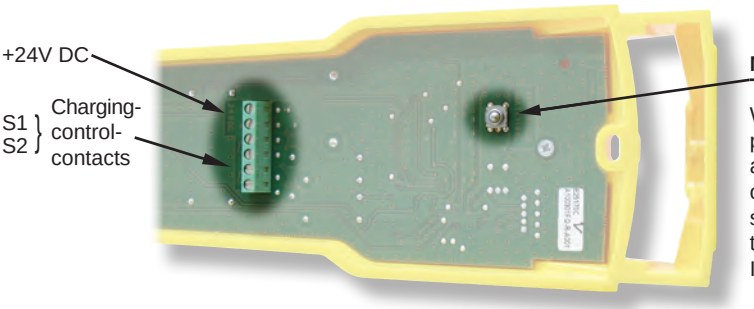
As long as the enabling switch is placed in the charger (control contacts closed) the radio-controlled safety module will work only with its hard-wired safety elements. The safety relays are de-energised when in this state a radio signal is received from the enabling switch.

If the radio-controlled safety module‘s safety relays have been already energised the enabling switch must be activated after an **Activation Time** that was set with a rotary switch. The time count is indicated by rapid flashing of the white LED “run2” and the status output 58. Within this response time, the enabling pushbutton must be pressed to its middle position from its quiescent position and held there or put in the charger. Otherwise, the safety relays are denergised.

The deactivation of the enabling switch occurs by releasing or pushing through of the enabling pushbutton.

5.3.1 Adjusting the charger to the ID of the enabling switch

1. Step: Connect the +24VDC power supply to the charger's terminals "+" and "-".



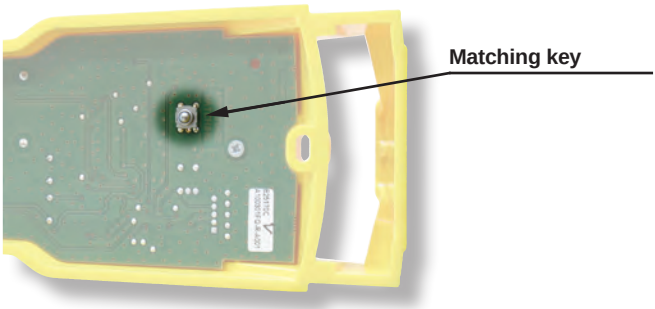
Matching key:

When this key is pressed the charger adopts the ID code of the enabling switch that is transmitted via an IR signal.

2. Step: Turn on the power supply. The red LED V2 must light.

5.3.1 Adjusting the charger to the ID of the enabling switch

3. Step: Target the enabling switch to the charger and press the charger's matching key. The green LED V1 must light.



4. Step: Release the matching key again. The green LED V1 must remain ON

Attention!

When the enabling switch is out of the charger's reach (approx. 30cm) the green LED V1 goes off. It comes up again when the enabling switch is put closer again.

The 2 control contacts of the charger are closed while the green LED V1 lights. They signal the radio-controlled safety module that the enabling switch is on the charger. In this condition, the radio-controlled safety module must not receive a radio signal. Otherwise, the safety relays are de-energised.

5.3.2 Configuration of the enabling switch

The following describes how to program the parameters that can be configured on the enabling switch (display language, transmission frequency and transmission power).
Programming of these parameters can be blocked or unblocked by a trained and authorised person.

ATTENTION! For safety reasons, the receiver must be isolated from the power supply before performing and testing settings

5.3.2.1 Blocking and releasing the enabling switch programming

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

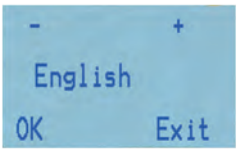
2. Press the B1 and B4 keys simultaneously. The current setting is indicated on the LC display:

3. By operating the B3 key (Yes) the blocking is enabled. B4 (No) disables it.

4. If you wish to keep the original setting, leave the setting mode by pressing the B2 key (Exit). When the desired setting is displayed it can be confirmed and the parameterisation mode left with the B1 key (OK).

5.3.2.2 Changing the display language

1. Switch off the power on the radio-controlled safety module.
2. Press the B3 and B4 keys simultaneously. The current setting is indicated on the LC display:



3. By pressing the B3 (-) or B4 (+) key the display language changes to one of the languages: German, Italian, Spanish, French or English. The display is updated during this
4. If you wish to keep the original setting, leave the setting mode by pressing the B2 key (Exit). When the desired setting is displayed it can be confirmed and the parameterisation mode left with the B1 key (OK).

Attention: Only the language of non-user-specific texts (e.g. error texts and texts for configuration) is switched. User-specific texts that are assigned to individual functions (B1-B4 or F1 through F10) remain unaffected.

5.3.2.3 Selection and programming of radio frequency

The 64 radio channels of the anabling switch RE 6910 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 enabling switchs 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.

5.3.2.3 Selection and programming of radio frequency

Frequency 434 MHz, distance between channels: 0.025 MHz. Depending on the model channels 1-64 are available with a transmission power of 1 mW or channels 40-64 with a transmission power of 10 mW.

Channel	Frequency MHz	Channel	Frequency MHz	Channel	Frequency MHz	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

5.3.2.3 Selection and programming of radio frequency

Programming of radio frequency:

1. the B1 and B2 keys simultaneously. The current setting is indicated on the LC display:

2. Select the channel number with the keys B3 (-) or B4 (+). The display is updated during this.

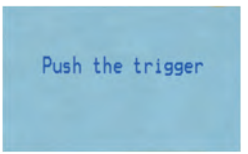
3. If you wish to keep the original setting, leave the setting mode by pressing the B2 key (Exit).

Confirm your desired setting by pressing the B1 key (OK).

a) By a short operation of the B1 key (OK) the change is transmitted with that frequency which was previously set in the system.
b) By a long operation of the B1 key (OK) the new channel number is transmitted via all 64 available frequencies to ensure that the receiver can receive the change. The displayed channel number blinks during this process. This procedure is required when the setting of the receiver is no longer known:

5.3.2.3 Selection and programming of radio frequency

4. Then, you are prompted to operate the 3-step enabling pushbutton. With this, the new setting is transmitted to the radio-controlled safety module. Keep this pushbutton pressed in its middle position during the complete process.



Attention

Prior to confirmation (in particular with procedure b) all other receivers in the reception area must be switched off. This ensures that their frequencies cannot be changed.

5. Once the programming process is completed leave the setting mode by pressing the B2 key (Exit).

6. Check as described under 5.3 ”Commissioning of the enabling switch” if the radio-controlled safety module responds to the new radio frequency.

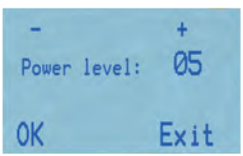
5.3.2.4 Programming the transmission power

To limit the operating area of the enabling switch you can set the transmitting power on a scale from 1 to 5 (5: 1 mW, max. power) or 1 to 10 (10: 10 mW max. power) for the channels 40 through 64 depending on the version. By this, the coverage is adjustable in a range from approx. 10 m to 150 m or to 250 m in industrial environments. The actual coverage strongly depends on the environment and has to be tested.

Programming the transmission power

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

2. Press the B2 and B3 keys simultaneously. The current setting is indicated on the LC display:



3. Select the power level with the keys B3 (-) or B4 (+). The display is updated during this

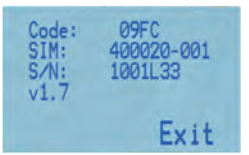
4. If you wish to keep the original setting, leave the setting mode by pressing the B2 key (Exit). When the desired setting is displayed you can press the B1 key (OK) to confirm and to leave the parameterisation mode.

5.3.2.5 Displaying the ID code and the manufacturing data

The factory-set ID code and manufacturing information can be called up for checking on the LC display of the enabling switch.

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

2. Press the B2 and B4 keys simultaneously. Following set information are displayed on the LCD:



Code: ID number
SIM: Serial number of the SIM card. It consists of 2 parts:
xxxxxx: Fixed serial number of the inserted SIM card. This number cannot be modified.
-xxx: programming number of the SIM card (on each modification of the programming via USB connector this number is increased by 1)
S/N: Unchangeable Serial number of the enabling switch
v1.7: Version number of the software in the enabling switch

3. You can leave the parameterisation mode by pressing the B2 key (Exit).

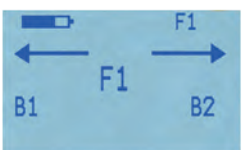
5.3.2.6 Programming user-specific display texts

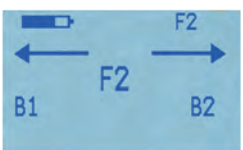
For a user-friendly application of the enabling switch it is useful to display explanatory text or graphics to a selected function on the enabling switch's display. It is also useful to display the currently set function key assignment.
The SIM card of the enabling switch has memory space for up to 10 graphics that correspond to the 10 configurable functions.

By default, these graphics are assigned as follows:

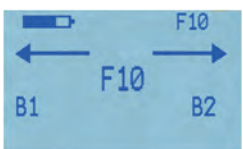
Command mode:

Function mode:





to



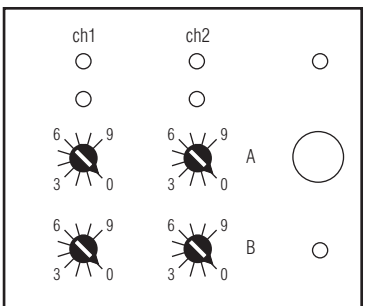
5.3.2.6 Programming user-specific display texts

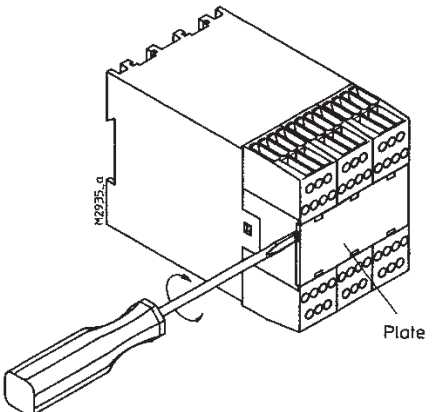
It is possible to replace these graphics by user-specific graphics. For this, they must be available as monochrome pictures in the Bitmap format (file name extension: .bmp) with 48x128 pixels.
Such graphics can be created using the graphics application ”Paint” that is available under accessories on almost every PC.

Examples of some graphics:

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 enabling switch 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 3 (usage on reduced speed)

5.4.1.1 Operation scenario for this operation mode

If it is necessary to intervene in a running machine, its speed must be reduced and monitored before the operator is allowed to move to the dangerous area with the enabling switch.

Following sequence should be kept:

- The operator requests a speed reduction from the control console
- When the speed is reduced the operator takes the enabling switch from the charger, activates it within the defined time by keeping the red pushbutton in its middle position. From then on up to the end of the action, the enabling pushbutton needs to be kept in its middle position.
- Using a pushbutton close to the access point the operator requests for the release of access
- The machine control will release the access if the speed is reduced and the enabling switch is active.
- If the access is released, the operator can go to the dangerous area and carry out necessary interventions or adjustments, e.g. with the function keys of the radio-controlled enabling switch.
- When the operator has completed the intervention and has left the machine's dangerous zone he signals that he is out of the dangerous zone using a pushbutton close to the access point.
- From this moment, the machine can be put to its normal speed again..
- Finally, the operator puts the enabling switch in the charger.

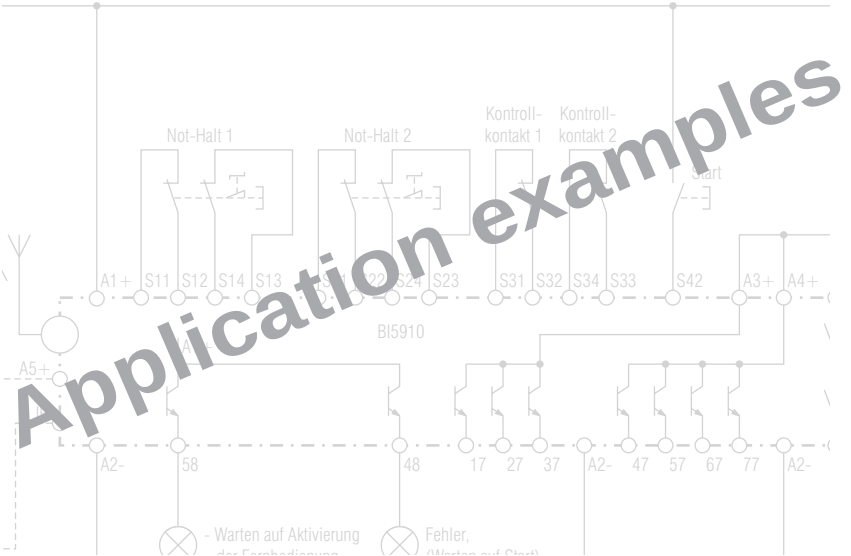
5.4.1.2 Setting the start options (rotary switch B)

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

Position rotary switch B	Function of terminals S11-S14 and S21-S24	Start after release or full actuation of the enabling switch	IR erfor-derlich
0	LC or E-stop Manual start via S42	new actuation of the enabling switch	YES
1		first actuation of the enabling switch, then manual start via S42	NO
2	LC or E-stop Autos tart	new actuation of the enabling switch	YES
3		first actuation of the enabling switch, then manual start via S42	NO

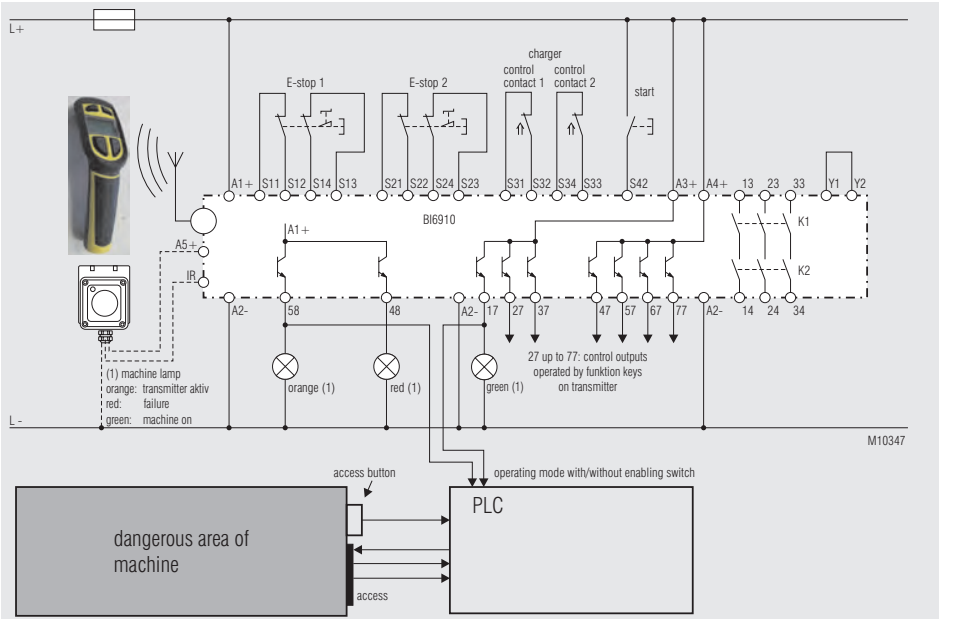
5.4.1.3 Setting the time for activation or back placing (rotary switch A)

Position rotary switch A	0	1	2	3	4	5	6	7	8	9
max. time for activation or. back placing of the enabling switch	5 s	6 s	7 s	8 s	9 s	10 s	15 s	20 s	25 s	30 s

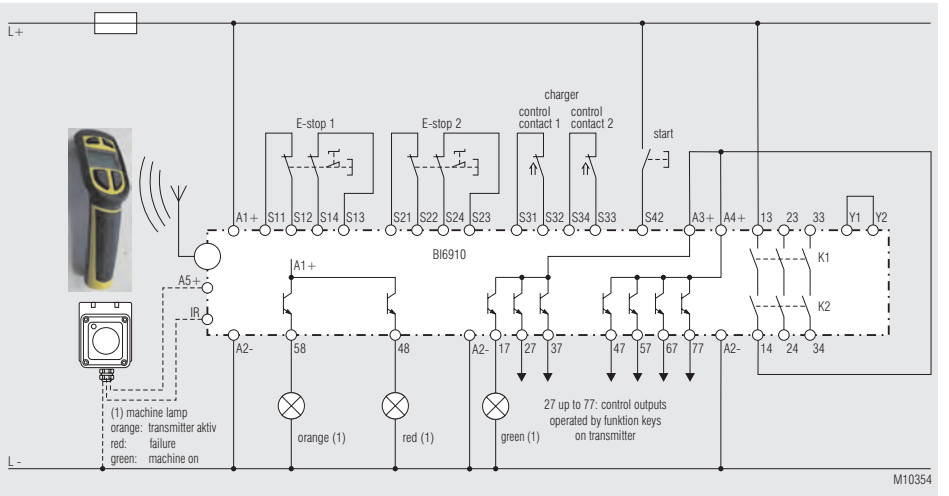


Application examples

5.4.1.4 Application examples (Operating modes 0 to 3)



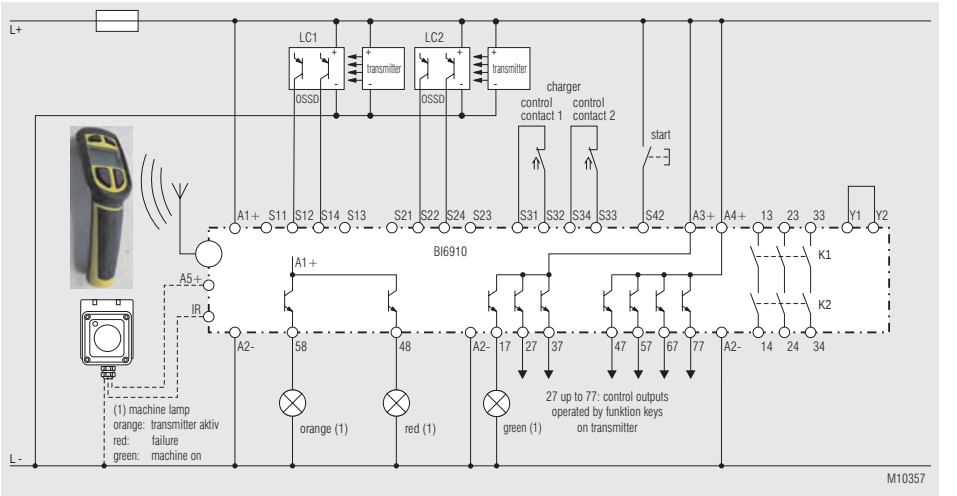
5.4.1.4 Application examples (Operating modes 0 to 3)



2 E-stop, safe disconnection of enabling switch controlled semiconductor outputs,

see also chapter 4. Installation and connection

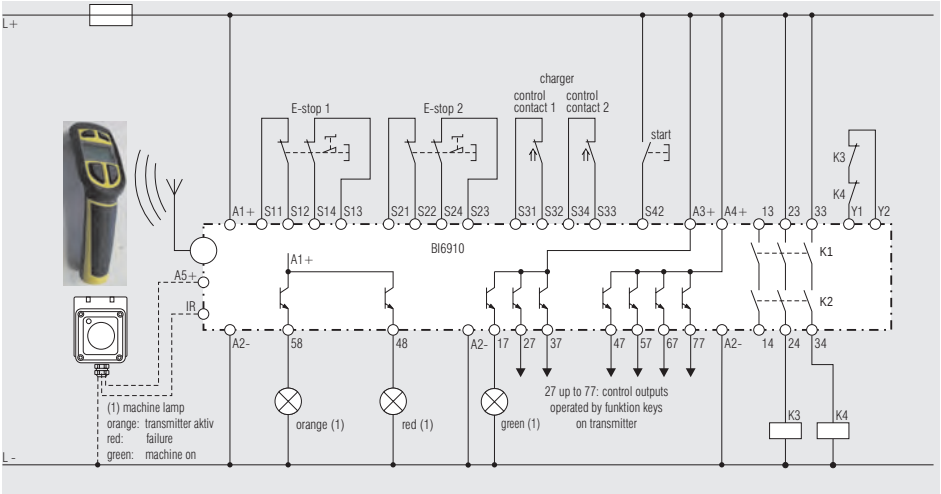
5.4.1.4 Application examples (Operating modes 0 to 3)



2 light curtains,

see also chapter 4. Installation and connection

5.4.1.4 Application examples (Operating modes 0 to 3)

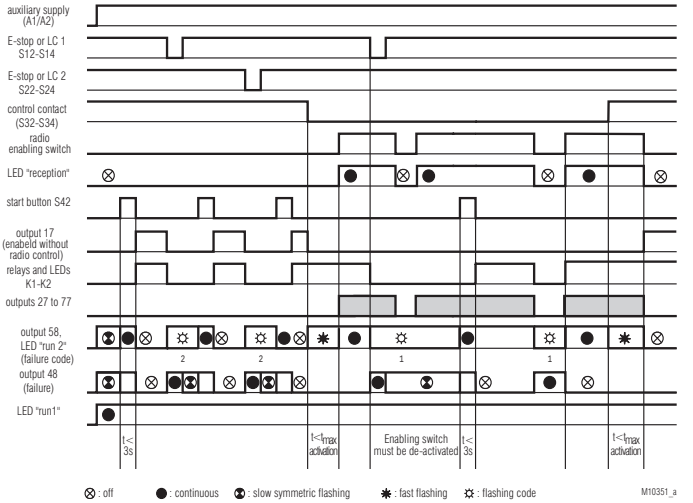


2 E-stop, external contact reinforcement,

see also chapter 4. Installation and connection

5.4.1.5 Function diagrams

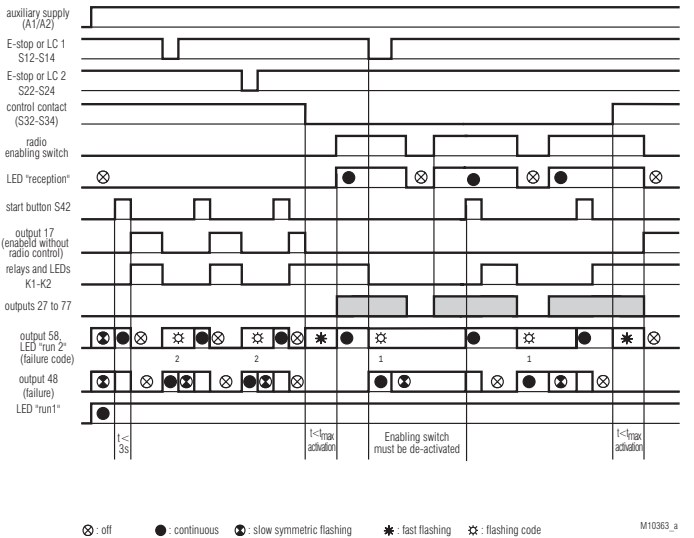
5.4.1.5.1 Function diagram for operating mode 0



Rotary switch B = 0:

- The safety elements on S11-S14 and S21-S24 are always monitored, manual start only via start button on S42
- The enabling switch is only active if at least one of the control contacts on S32 or S34 is open.
- After release of the enabling switch the radio ontrolled safety module can be restarted by correct activating of the enabling switch (only use with IR option).
- $t_{max.}$ = maximum time to activate the enabling switch set with rotary switch A

5.4.1.5.2 Function diagram for operating mode 1

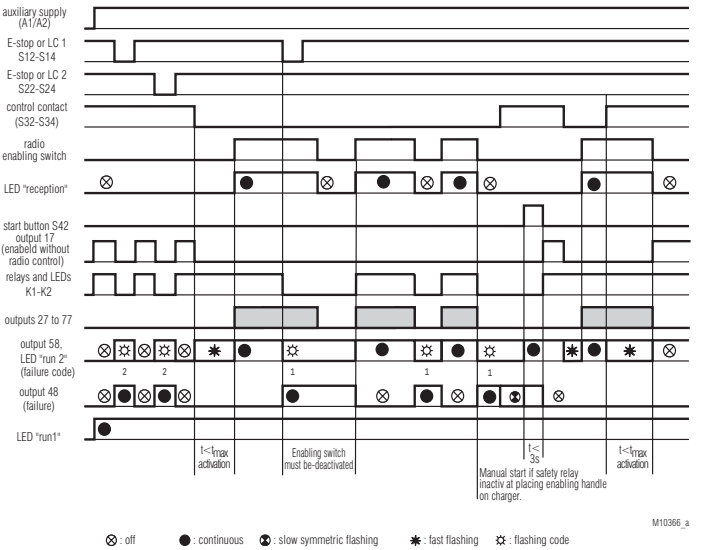


Rotary switch B = 1:

- The safety elements on S11-S14 and S21-S24 are always monitored, manual start only via start button on S42
- The enabling switch is only active if at least one of the control contacts on S32 or S34 is open.
- After release of the enabling switch the radio controlled safety module can be restarted by pressing the button on S42 after correct activating of the enabling switch
- $t_{max.}$ = maximum time to activate the enabling switch set with rotary switch A

When power up the radio controlled safety module with open charger control contacts (enabling switch not in charger unit) it can only be activated with the start button when also the enabling switch is activated.

5.4.1.5.3 Function diagram for operating mode 2

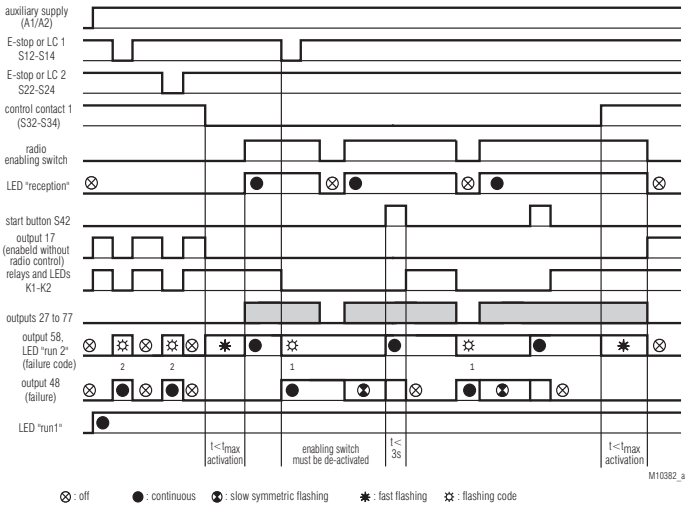


Rotary switch B = 2:

- The safety elements on S11-S14 and S21-S24 are always monitored, auto start
- The enabling switch is only active if at least one of the control contacts on S32 or S34 is open.
- After release of the enabling switch the radio ontrolled safety module can be restarted by correct activating of the enabling switch (only use with IR option).
- $t_{max.}$ = maximum time to activate the enabling switch set with rotary switch A

Attention: If the enabling switch is placed into the charger while the safety module is inactive, it can only be restarted manually with the button on S42

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 monitored, auto start.
- The enabling switch is only active if at least one of the control contacts on S32 or S34 is open.
- After release of the enabling switch the radio ontrolled safety module can be restarted by pressing the button on S42 after correct activating of the enabling switch or after the enabling switch is back in the charger unit
- $t_{max.}$ = maximum time to activate the enabling switch set with rotary switch A

5.4.2 Operating mode 7 - (bridging a gate monitor for access)

5.4.2.1 Operation scenario for this operation mode

With this operating mode, the access control of a machine is deliberately overridden for the time of the intervention for adjustment or checking tasks.
Here, the access point and the charger's control contacts are monitored by a safety PLC. The radio-controlled safety module is only used as evaluation device for the enabling switch and its function keys.
The safety relays of the radio-controlled safety module will only be energised if a two-channel release signal arrives at S12-S14 for activation in addition to the operation of the enabling pushbutton.
The inputs S22-S24 and S32-S34 are reserve inputs that must not be used for safety signal transmitters. S22 and S24 must be energised (+24 V or connected to S11, S13), S32 and S34 must be inactivated (not connected). Any other status of these inputs sets the radio-controlled safety module back to the initialisation phase.
The input S42 is not used.

5.4.2.1 Operation scenario for this operation mode

Phase	Description	Inputs		Outputs			
		release signal S12-S14	enabling switch	17	48	58	safety relays
0	Wating for initial state: After every discrepancy the output safety relays are de-energised and the unit waits for the initial state: S12-S14: ON, no radio transmission	x	x	OFF	ON	flashes (failure code)	OFF
1	**Initial state:** Enabling switch is in the charger, Access is monitored by PLC, Safety relays are disabled in safety module BI 6910.	OFF	OFF	**ON**	OFF	OFF	OFF
2	The operator takes the enabling switch from the charger (actuation is not yet necessary)	OFF	OFF	ON	OFF	OFF	OFF
3	The operater comes to the access door and activates the enabling switch. He requests by pressing a push button which is connected to a PLC, that the gate protection is bridged	OFF	**acti-vated**	OFF	OFF	**ON**	OFF

5.4.2.1 Operation scenario for this operation mode

Phase	Description	Inputs		Outputs			
		release signal S12-S14	enabling switch	17	48	58	safety relays
4	The PLC detects the request for bridging and reduces the speed of the machine. As soon as all conditions are fulfilled to allow the bridging, the PLC enables the radio controlled safety module to activate the safety output contacts. (continue with 5 or 6)	**ON**	acti-vated	OFF	OFF	ON	**ON**
5.1	In the case of danger the operator presses the enabling switch fully or releases it. The radio controlled safety module de-energises its relays and waits for the initial state.	ON	**OFF**	OFF	**ON**	**flashes (failure code)**	**OFF**
5.2	The PLC has to react and disables the permission to activate the safety output relays. Only then the initial state is achieved	**OFF**	OFF	**ON**	**OFF**	**OFF**	OFF

5.4.2.1 Operation scenario for this operation mode

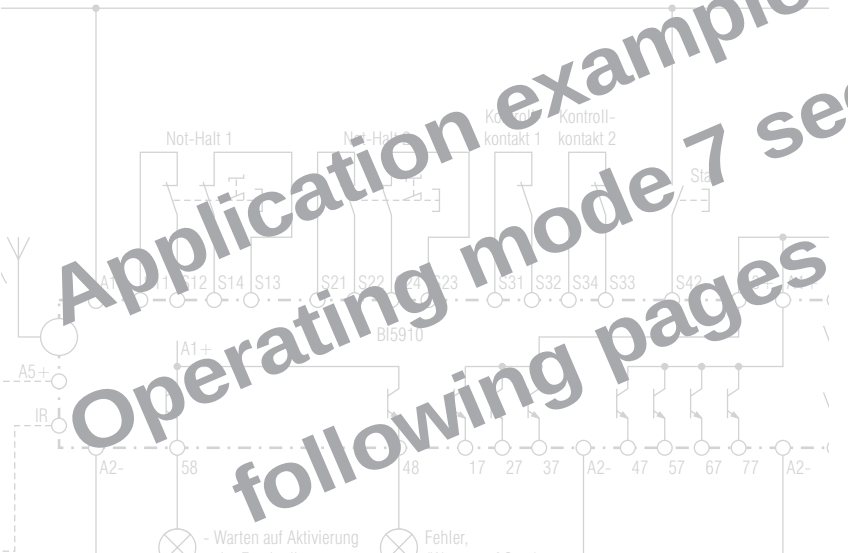
Phase	Description	Inputs		Outputs			
		release signal S12-S14	enabling switch	17	48	58	safety relays
6.1	Because of any reason (e.g. the operator has left the access gate) the PLC disables the permission to activate the safety output relays. The radio controlled safety module de-energises its output relays andwaits for the initial state	**OFF**	acti-vated	OFF	**ON**	flashes (failure code)	**OFF**
6.2	The operator has to react and to release the enabling switch Only the the initial state is achieved.	OFF	**OFF**	**ON**	**OFF**	**OFF**	OFF

5.4.2.2 Setting the operate mode (rotary switch B)

Position rotary switch B	Terminal designation S11-S14 und S21-S24	IR necces-sary
7	S12-S14:permission to activate the safety relays S22-S24: always active S32-S34: always inactive S42: not used	YES

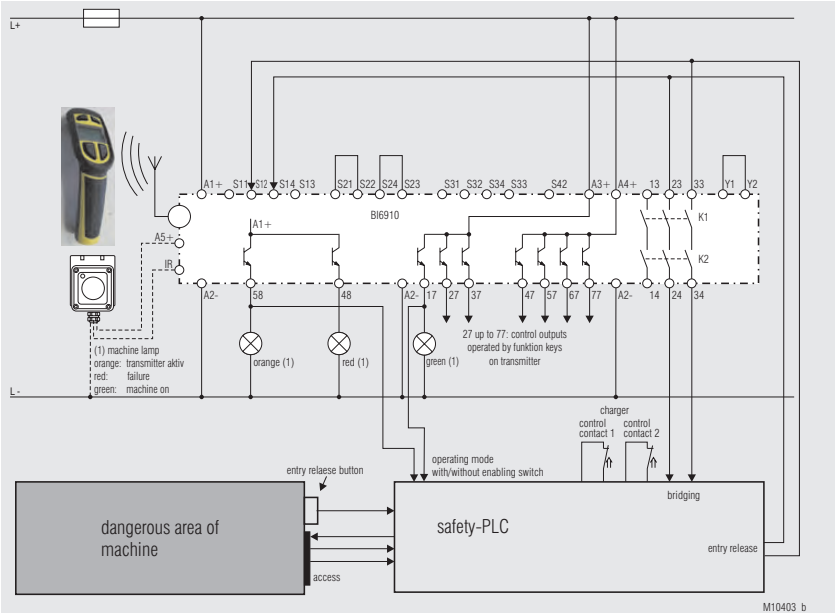
Setting rotary switch A:

Position rotary switch A	0	1	2	3	4	5	6	7	8	9
No influence	Both rotary switches A have to be in the same position									

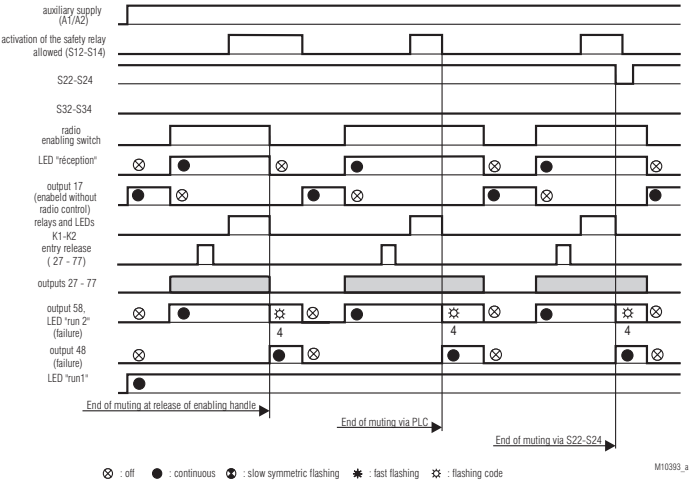


Application example
Operating mode 7 see
following pages

5.4.2.3 Application example operationg mode 7

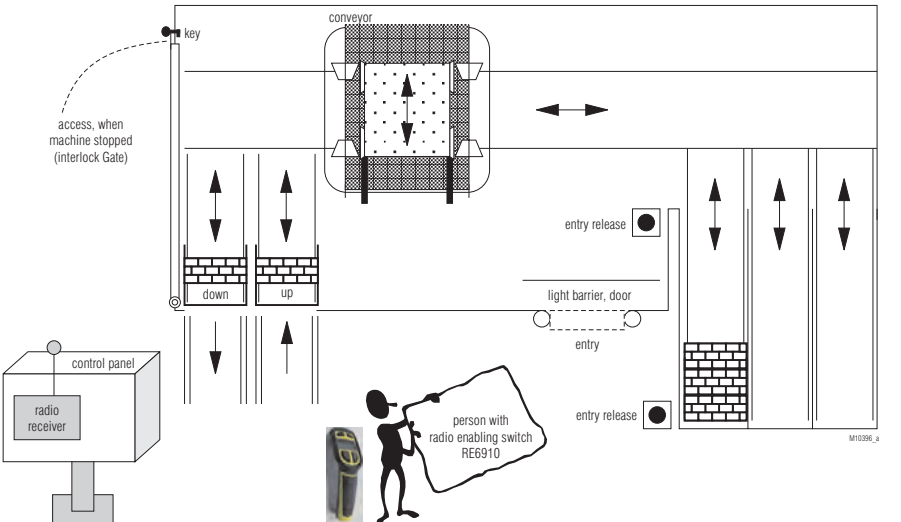


5.4.2.4 Function diagram operationg mode 7



Rotary switch B = 7

5.4.3 Operating modes 8 to 9 – monitored zone access



Access to the machine is protected by a light curtain or a safety gate. Occasionally, the machine operator needs to enter the protected zone while the machine is running in order to carry out specific tasks. So the operator has to override the guard for the time of the access and is still protected in an emergency case by taking the enabling switch and keeping the enabling pushbutton pressed in its middle position.

5.4.3 Operating modes 8 to 9 – monitored zone access

Working principle:

1. As long as the enabling switch 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 enabling switch from the charger. Control contact S31-S32 opens, the white LED run2 and output 58 flash fast. This indicates that the enabling switch has to be activated in the middle of position within the set time (activation time). Otherwise the safety relays will deenergise.

3. If the enabling switch is activated 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). 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.

5.4.3 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 enabling switch back into the charger and the control contact (S31 -S32) closes.

- The two entry release pushbuttons within and outside the machine area are connected parallel to the terminals S33-S34
- The max. time to operate the enabling pushbutton after taking it from the charger, and for releasing the enabling pushbutton when reinserting the enabling switch in the charger and the time from operation of the access pushbutton until opening the door are set in a range from 5 to 30 seconds using the rotary switches A (activation time). The same rotary switch A is used to set the overriding time in a range from 5 seconds to 10 minutes.

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

These 2 operating modes are designed for cases where a speed reduction of the machine is not required.
When using the enabling switch within the area of a high-speed machinery a reduction of the machine speed is mandatory. In this case, the access door must be locked until the enabling pushbutton is operated and the reduced speed is reached. For this, the output signals on the terminals 58 and 17 deliver two separate status information about the enabling switch (for this, see 6.2 ”Indicators and status signals of the radio-controlled safety module”). A separate safety device must be used to reduce the speed, to monitor it and to unlock the guard (e.g. speed monitor).

The charger’s control contacts must be connected in series to the terminal S32

5.4.3.1 Setting the start options (rotary switch B)

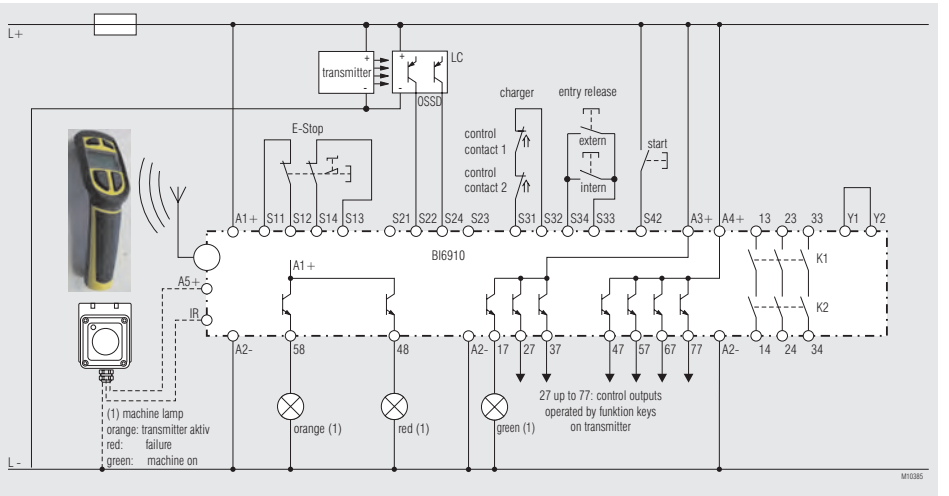
Overview of settings rotary switch B

Position rotary switch B	Terminal designation **S11 to S14 and S21 to S24**			**Starting modes after releasing or fully pressing the enabling switch**	IR necces-sary
	S11-S14	**S21-S24**	**Start mode**		
8	E-stop or LC	LC or safety gate	manual start (on S42)	Auto start with new activation of enabling switch	YES
9				Manual start via S42 with new activation of enabling switch	NO

5.4.3.2 Setting the time for activation or back placing (rotary switch A)

	Rotary switch A Max. time to activate the enabling switch 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.

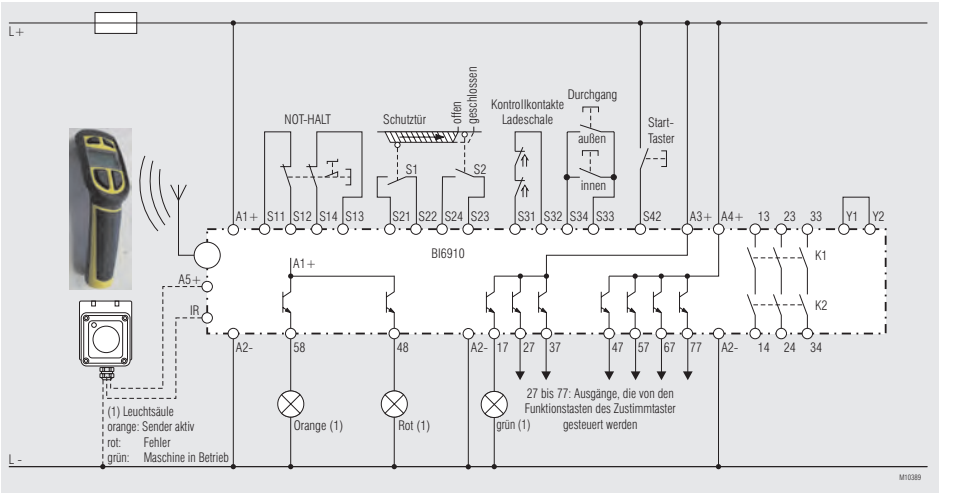
5.4.3.3 Application example



Monitored zone access: Zone protection by light curtain.

See also chapter 4. Installation and connection

5.4.3.3 Application example

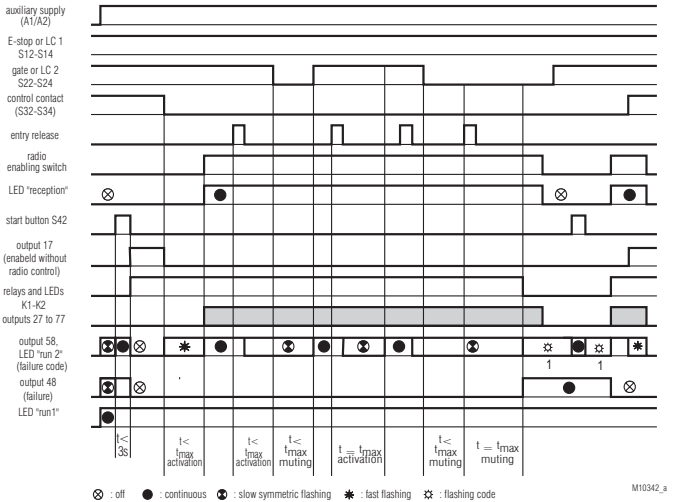


Monitored zone access: Zone protection by safety gate.

See also chapter 4. Installation and connection

5.4.3.4 Function diagram

5.4.3.4.1 Operating mode 8 and 9: Function diagrams for „Request Passage“



- **t_{max}-activiation:**
  maximum time set with Rotary switch A:
  - for operation of the enabling pushbutton after leaving the monitored charger area
  - for leaving the monitored charger area with operated enabling pushbutton
  - for releasing the enabling pushbutton (and putting back in the charger) when the enabling switch has entered the monitored charger area
  - from operation of the entry release pushbutton to guard opening (or interruption of the light curtain
- t_{max} **Muting**:
  by the maximum overriding time of the guard on S21-S24 set with rotary switch A

5.4.3.4.2 Common features of the operating modes 8 and 9

- Protective devices on S11-S14 always active, manual start
- Zone protection on S21-S24 always active when charger switch is closed, manual start
- Zone protection on S21-S24 can be overridden with the enabling switch for a certain period of time
- Enabling switch active when control contact on S32 is open

5.4.3.4.3 Speciality of the operating mode 8

After the de-energisation of the safety relays by releasing the enabling pushbutton on the enabling switch, they can be re-energised by repeated pressing of the enabling pushbutton (+IR).
Function diagrams of operation without Request Passage: see 5.4.1.5.1 ”Function diagram for operating mode 0”.

5.4.3.4.4 Speciality of the operating mode 9

Once the safety relays have been de-energised by releasing the enabling pushbutton they can only be re-energised by pressing the enabling pushbutton and the start pushbutton on S42.
Function diagrams of operation without Request Passage: see 5.4.1.5.2 ”Function diagram for operating mode 1”

6 Troubleshooting

6.1 Indicators on the enabling switch

Settings and errors of the enabling switch are displayed as clear text on an LC display

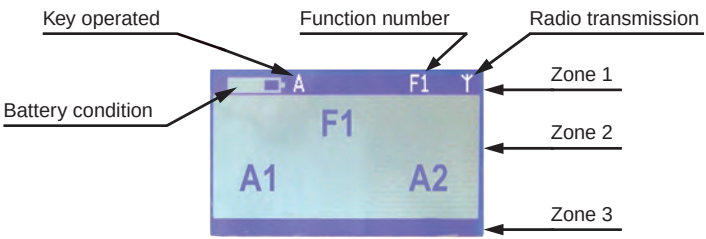
6.1.1 Status indicators

The display of the enabling switch is subdivided in 3 zones:

Zone 1: top line:
Displays the battery condition (battery symbol), the set function number and radio transmission (blinking antenna during transmission) .

Zone 2: middle area
The middle area shows set functions and the meaning of the function keys.
This area can be customised.

Zone 3: bottom line:
The bottom line is reserved for specific functions (for parameterisation, for example).



6.1.2 Alarm message

Possible alarm messages:

	Fault description	Corrective action
Battery symbol is empty or blinks	The battery is discharged	Put the enabling switch on the charger to charge the battery

	Fault description	Corrective action
ERROR no SIM CARD Exit	The SIM card that holds all settings of the enabling switch was not inserted correctly.	Before connecting the battery, insert the SIM card in the provided connector

	Fault description	Corrective action
ERROR Fault SIM CARD Exit	The SIM card that holds all settings of the enabling switch was not inserted correctly.	Remove the SIM card and re-insert it. Make sure that it is inserted up to the stop in the provided connector.

6.1.2 Alarm message

	Fault description	Corrective action
ERROR Fault push button Exit	One of the control function keys has been already detected when pressing the enabling pushbutton	The enabling pushbutton must be pressed at first. Only if it is pressed, the control function keys may be operated.

	Fault description	Corrective action
ERROR Misshandling Exit	Operation of the enabling switch was to fast. A fault of the enabling pushbutton has been detected	If this error occurs repeatedly, have the enabling switch repaired.

	Fault description	Corrective action
ERROR Fault SIM or trigger Exit	A fault in the memory of the enabling switch has been detected	If this error occurs repeatedly, have the enabling switch repaired.

6.1.2 Alarm message

	Fault description	Corrective action
ERROR Function error Exit	A treatment fault has been detected in the enabling switch	If this error occurs repeatedly, have the enabling switch repaired

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:

Indication via semiconductor outputs:

	Continuously ON	Flashing (regularly or as flash code)	Continuously OFF
Output 17	Enabling switch is inactive, control contacts are closed and safety relays are energised		- Safety outputs are inactive or - Control contacts are open and enabling switch is active
Output 58	Enabling switch and safety outputs are active	**Failure code:** One function does not enable the unit **Fast flashing:** The enabling switch 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:

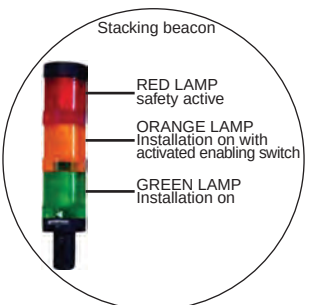
Output 58 Continuously OFF
Output 17: Continuously ON

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 enabling switch

Output 58: Orange light for indicating operation with activated enabling switch

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



6.2 Indicators and status messages of radio-controlled safety module

	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”	Enabling switch 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 - receiving valid identity code (when green LED reception ON)

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)

If a system failure occurs, the white LED run1 is off or flashes with a failure code and all outputs (safety relays and semiconductor outputs) are deenergised.
System failures can be indicated by LED run1 and/or LED run 2, depending on failure. The LEDs can also show different failure codes at the same time (failure no. = number of short flashes).

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 U_N 2) **Right LED „run 2“ flashes:** Supply voltage is above max. level > 1.15 U_N + 5% ripple
7	Input failure	A short circuit has occurred on the inputs
8	Failure on safety relays	1) The safety relays are inactive and the feed back circuit on Y1-Y2 is not closed. (The feed back circuit must close 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.
15	Timer fault	The timer does not work properly. Unit must be repaired.

Info

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 continuously 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	E-stop or enabling switch	- The control contact is open and one safety element has been activated (hard wired safety device or enabling switch released or pressed fully). - When the safety relays have deenergised with open control contacts, the enabling switch must be deactivated before it can be restarted again.
2	Emergency stop	A safety element has been activated (Emergency stop, light curtain, safety gate).
3	Time failure	- The enabling switch was not activated within the required time after taking it from the charger. - The enabling switch 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

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

No.	Status	Explanation
5	Bridged contact	The access button (S34) is already activated on manual start (pressing button on S42).
6	Charger control-contacts	A radio link is active while enabling switch is placed in charger.

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	Normal operation	No radio signal
	Irregular flashing		Bad reception
	ON		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 Enabling switch RE 6910

Radio

Conformity:	ETS 300 220
Carrier frequency:	UHF, frequency modulated (FM)
Frequency:	64 e.g. 25 programmable frequencies
Frequency range:	433.1 . 434.675 MHz
HF-power:	< 1 mW e.g. < 10 mW (without licence), integrated aerial
Distance :	approx. 150 m e.g. 250 m in industrial environment *)

*) The distance can vary with the ambient conditions of the enabling switch and the receiver aerial (roof construction, metal walls etc.) approx. 600 m in open area

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: 40 h at 50% operation, +20°C
- after 10 minutes charging time of discharged battery: allows approx. 1 h operation

7.1 Zustimmtaster RE 6910

Storage temperature: - 20°C ... + 45°C
Charging temperature: 0°C ... + 35°C

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

Enclosure

Material:	ABS	
Degree of protection:	IP54	
Shock resistance	The unit is designed to withstand falls from a height of 1m.	
Climate resistance:	- 20 / 050 / 04	IEC/EN 60068-1
Holder for non-operation:	Charger unit	
Weight (with battery):	340 g	

Dimensions
Height x width x length: 75 x 260 x 93 mm

7.2 Charger unit RE 6910/010

Nominal voltage U_N:	DC 24 V
Voltage range:	0,85. 1,15 UN at max. 5% residual ripple
Nominal consumption:	max. 300 mA
Storage temperature:	- 20 °C ... + 50 °C
Ambient-temperature:	0 °C ... + 35 °C

Attention!
Charging outside this temperature range may damage the battery.

Infrared area for detection of the enabling switch:	max. 30 cm
Fixing:	Screw mounting
Wire fixing:	captive minus terminal screws M0,5 box terminals with wire protection
Weight:	430 g
Dimensions	
Width x length x height: with included enabling switch:	90 x 328 x 110 mm

7.3 Radio-controlled safety module BI 6910

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

7.3 Radio-controlled safety module BI 6910

Safety output contacts

BI 6910.03:	3 NO contacts	
BI 6910.22:	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:	adjustable from 5 to 30s	
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

7.3 Radio-controlled safety module BI 6910

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	

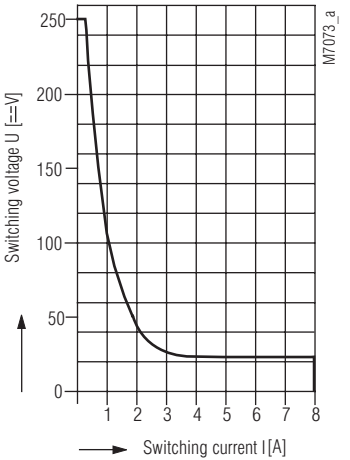
Please also read the chapter 4.10 Interference suppression

Short circuit strength

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

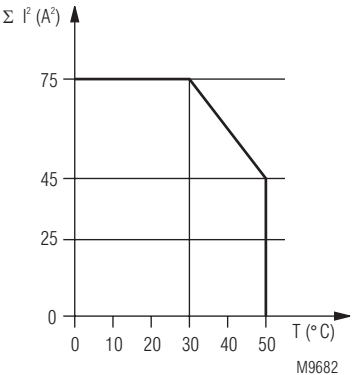
Semiconductor outputs

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

7.3 Radio-controlled safety module BI 6910

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 (basis insulation)	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

7.3 Radio-controlled safety module BI 6910

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	

7.4 Safety related 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 x 10^{-9} 1/h

b) Emergency stop from radio enabling switch RE 6910 PFH_D: 2.0 x 10^{-9} 1/h

Safe failure fraction (SFF)	99.5%
Interval for repetition of tests (T1)	20 years

The values stated above are valid for the standard type.

Safety data for other variants are available on request.

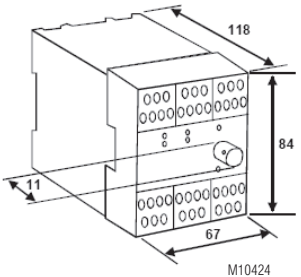
The safety relevant data of the complete system has to be determined by the manufacturer of the system.

7.5 Infrared Receiver RE 5910/060

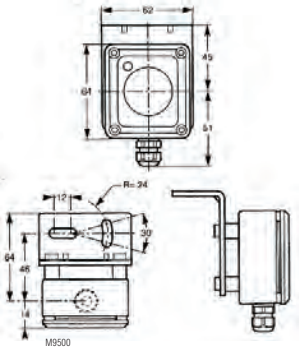
Power supply:	from Radio-controlled safety module BI 6910
max. cable length:	30 m
max. distance from enabling switch RE 6910:	3 m
Degree of protection:	IP 65

7.6 Dimensional drawings

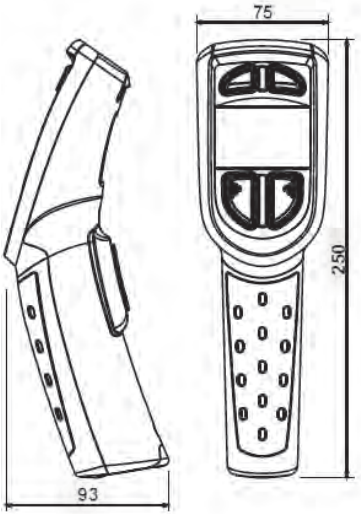
7.6.1 Safety module BI 6910



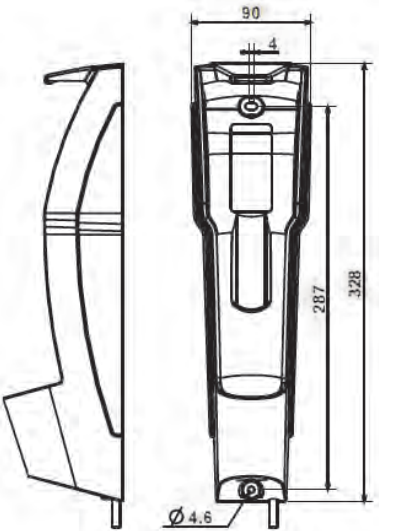
7.6.2 Infrared receiver RE 5910/060



7.6.3 Enabling switch RE 6910



7.6.4 Charger unit



M10425

8 Ordering data / selection aid

8.1 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 enabling switch	• 1 enabling switch
• 1 aerial	• 1 aerial
• 1 charger unit	• 1 charger unit

8.2 Selection aid for radio-controlled safety module

BI 6910 ._ _ /0_ MF9 _ _

Specification:
00[1]: for enabling switch in command or function mode with max. 8 functions (F1-F8) on 6 outputs of 1 receiver

01: Special version for enabling switch in function mode with max. 8 functions (F2-F9) on 6 outputs of 1 receiver

10: max. 10 functions on 6 outputs of 1 receiver

11, 12: pair of 2 receivers with same identity code for max 10 functions on 12 outputs of 2 receivers (12 only as BI6910.00/00MF12, not safety relevant)

see. 8.2.1

Option start by infrared
0: without infrared start
I: with infrared start

Contacts
.03: 3 NO contacts
.22: 2 contacts, 1 NC contacts[2]

Type

[1] The designation „00“ can be dropped
[2] NC contact is not intended for safety-relevant tasks.

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

8.2.1 Arrangement of transistor outputs to the function keys of the enabling switch

To keep the configuration work to a minimum we provide several versions of the radio controlled safety module BI6910

8.2.1.1 Standard version BI 6910.xx/xxMF9

This version can be used for RE6910 in command mode as well as in function mode with up to 8 functions.

8.2.1.1.1 Enabling switch in command mode

This version can be used for RE6910 in command mode as well as in function mode with up to 8 functions.

Button	Outputs of the receiver BI 6910					
	27	37	47	57	67	77
OFF						
B1	x				x	
B2		x			x	
B3			x		x	
B4				x	x	

8.2.1.1.2 Enabling switch in function mode

This version can be used for RE6910 in command mode as well as in function mode with up to 8 functions.

Function	Button	Output of the receiver BI 6910					
OFF		27	37	47	57	67	77
F1	B1	x				x	
	B2		x			x	
F2	B1			x		x	
	B2				x	x	
F3	B1	x					x
	B2		x				x
F4	B1			x			x
	B2				x		x
F5	B1	x				x	x
	B2		x			x	x
F6	B1			x		x	x
	B2				x	x	x
F7	B1	x					
	B2		x				
F8	B1			x			
	B2				x		
F9	B1	Function 9 and 10 are not available					
	B2						
F10	B1						
	B2						

- For enabling switches in function mode with up to 8 functions (F1-F8)
- Easy to code up to 3 functions (1 output per function)
- Binary coded with more then 4 functions

8.2.1.2 Special version BI6910.xx/xxMF901

If the failure state is acknowledged on the enabling switch (e.g. after operating fault) it always resets to function F1 in function mode. For applications where it is necessary to avoid the switching of incorrect outputs by unintended usage in this special version the functions of the standard version F1 to F8 are shifted to F2 to F9.

Function	Button	Output of the receiver BI 6910					
OFF		27	37	47	57	67	77
F1	B1	Function F1 are not available					
	B2						
F2	B1	x				x	
	B2		x			x	
F3	B1			x		x	
	B2				x	x	
F4	B1	x					x
	B2		x				x
F5	B1			x			x
	B2				x		x
F6	B1	x				x	x
	B2		x			x	x
F7	B1			x		x	x
	B2				x	x	x
F8	B1	x					
	B2		x				
F9	B1			x			
	B2				x		
F10	B1	Function F10 are not available					
	B2						

- For enabling switches in function mode (F2-F9)
- Function F1 and F10 are not available
- Easy to code up to 4 functions
- Binary coded with more then 4 functions

8.2.1.3 Special version BI 6910.xx/xxMF910

Function	Button	Output of the receiver BI 6910					
OFF		27	37	47	57	67	77
F1	B1	x	x				
	B2		x				
F2	B1	x		x			
	B2			x			
F3	B1	x			x		
	B2				x		
F4	B1	x	x				x
	B2		x				x
F5	B1	x		x			x
	B2			x			x
F6	B1	x			x		x
	B2				x		x
F7	B1	x	x			x	
	B2		x			x	
F8	B1	x		x		x	
	B2			x		x	
F9	B1	x			x	x	
	B2				x	x	
F10	B1	x				x	x
	B2					x	x

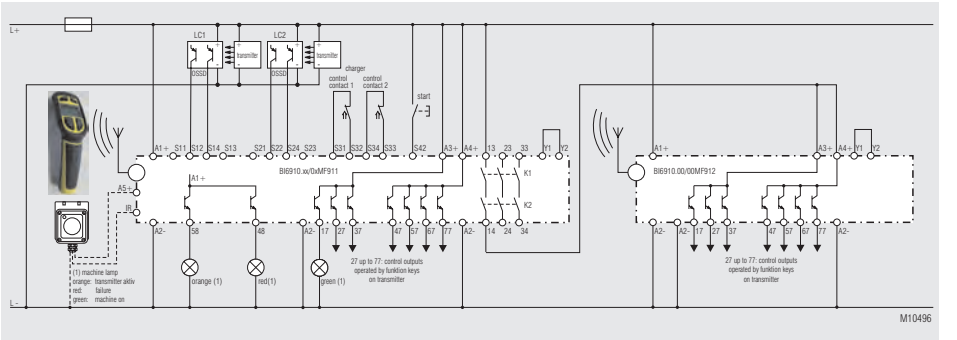
- For enabling switches in function mode with up to 10 functions
- Easy to code up to 3 functions (1 output per function)
- Easy to code up to 6 functions:
  - F1 to F3: 77 OFF
  - F4 on F6: 77 ON
- More sophisticated coding for mor the 6 functions

8.2.1.4 Special version BI6910.xx/xxMF911 and BI6910.00/x0MF912

Function	Button	Output of BI6910.xx/xxMF911						Output of BI6910.xx/xxMF912					
OFF		27	37	47	57	67	77	27	37	47	57	67	77
F1	B1	x		x									
	B2		x	x									
F2	B1	x			x								
	B2		x		x								
F3	B1	x				x							
	B2		x			x							
F4	B1	x					x						
	B2		x				x						
F5	B1	x						x					
	B2		x					x					
F6	B1	x							x				
	B2		x						x				
F7	B1	x								x			
	B2		x							x			
F8	B1	x									x		
	B2		x								x		
F9	B1	x										x	
	B2		x									x	
F10	B1	x											x
	B2		x										x

Up to 10 functions with 2 BI6910 having the same settings (identity code and frequency channel) easy to code (1 output per function).

8.2.1.5 Application example for BI6910.xx/xxMF911 and BI6910.00/x0MF912



- The voltage supply for the transistor outputs of the BI6910.00/x0MF912 has to be connected via a NO contact of the BI6910.xx/xxMF911.
- The remaining connections to the BI6910.xx/0xMF911 vary depending on the chosen operating mode. See also the application examples under 5.4 Setup and commissioning of the radio controlled safety module.

8.3 Selection aid / Ordering data enabling switch

RE 6910 /00_

1: max. transmission power 1 mW, channel 1 to 64
2: max. transmission power 10 mW, channel 40 to 64

The scope of supplies includes:
- Enabling switch with battery and SIM-card
- CD with user manuals and software for languages in German, English and French
- USB cable

Important: Please indicate the following when ordering a replacement unit:
- ID code (as noted on page 2 of the user manual).
- if it is to be programmed by the manufacturer Frequency channel (between 01 and 64).
- if it is to be programmed by the manufacturer transmission power (from 1 to 5)

8.4 Accessories

	Description	References
Accesssories enabling switch	Charger unit	RE 6910/010
	Spare SIM-card	RE 6910/020
	Spare battery	RE 6910/051
	Leather case	RE 6910/070

	Description	References
Accessories radio controlled safety modul	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	RE 5910/044
	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

Attention: All accessories from the radio safety receiver has the order references **RE 5910 /** _ _ _ (not RE 6910 / _ _ _).

9 Maintenance and care

User-friendly maintenance

- Individual settings are stored in SIM-card
- LCD display for diagnostics on the enabling switch
- 6 LEDs and 3 semiconductor outputs for diagnostics on the radio-controlled safety module

Spare parts: The user only needs a replacement battery RE6910/051 for the enabling switch as spare part. See chapter 9.1.2 „Replacing the enabling switch battery“.

9.1 Maintenance of enabling switch

The enabling switch is to be serviced in regular intervals.

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

Clean the enabling switch and remove any foreign particles.

Check the user-friendliness of the enabling switch such as smooth operation of the control elements.

Response time of the control elements on the enabling switch

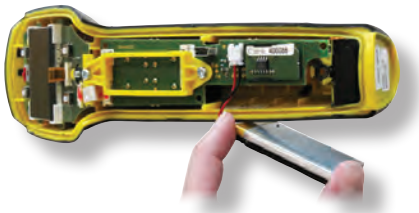
9.1.1 Inserting the SIM card

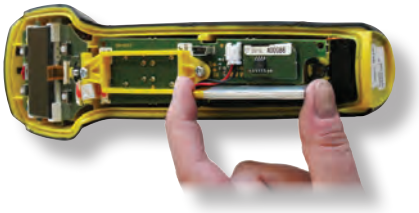
1. Open the enabling switch enclosure following the notes in chapter 9.1.3.
2. Disconnect the battery connector.
3. Slide the SIM card in the connector provided for this (the chamferred edge of the SIM card must match with the mark on the printed circuit board of the enabling switch).

4. Re-connect the battery
5. Close the enabling switch case following the notes in chapter 9.1.4
6. If required, the charger must be adjusted to the new ID code of the enabling switch (for this, refer to 5.3.1 ”Adjusting the charger to the ID code of the enabling switch”).

9.1.2 Replacing the enabling switch battery

1. Open the enabling switch case following the notes in chapter 9.1.3.





2. Remove the old battery.

3. Connect the new battery and insert in the recess provided for it. Make sure that the battery is properly fitted to be able to close the enclosure

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

5. Close the enabling switch enclosure following the notes in chapter 9.1.4.

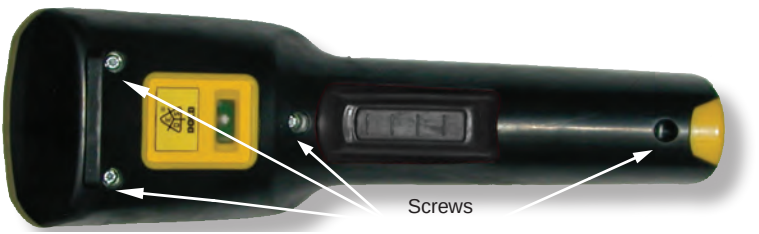
6. Protection of persons must be ensured in the following tests.

Attention !
The user is responsible to properly dispose of used batteries. You can also return replaced enabling switch batteries to us

9.1.3 Opening the enclosure of the enabling switch

ATTENTION !
In order to avoid damage of the electronic components of the enabling switch, the battery may only be exchanged at a workplace that is protected against electrostatic discharge (conductors and antistatic bracelets)

1. Switch off the corresponding radio-controlled safety module.
2. Flip over the enabling switch and remove the 4 enclosure screws using a Philips-tip screwdriver.



9.1.4 Closing the enclosure of the enabling switch

At first, screw in hand-tight the 2 upper and then the bottom enclosure screws. Tighten all 4 screws in the same order (**do not use screwdrivers without torque limiting**). This will ensure a good sealing.

9.2 Maintenance of radio-controlled safety module

Maintenance of the radio-controlled safety module corresponds to that of the enabling switch.

Please check the following points:

- Wiring of BI 6910 with the machine circuits
- All safety functions need to be checked (at least once a year)
- 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 the active disconnection press the enabling pushbutton as long as it is detected by the radio-controlled safety module. Then, press through or release the enabling pushbutton.

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 - radio enabling handle **RE6910**
- receiver **BI6910**

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, with reference to the standard EN60947-5-1 (05/1999)
  - 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
  - IEC 61508-1...-7:2001
  - EN 60947-5-8:2007 concerning low voltage switchgear and controlgear; part 5-8: control circuit devices and switching elements - three-position enabling switches.
  - EN 60204-1 concerning the „emergency stop function" for its „emergency stop function".

To this end, the notified body n° 0044

TÜV NORD CERT GmbH
Zertifizierungsstelle
Langemarckstr. 20
45141 Essen

has evaluated the above mentioned transmitter/receiver system according to the CE type approvals n° 44 205 10 384097 for the fulfilment of the standards EN ISO 13849-1:2008; EN ISO 13849-2:2008; EN 61508-1...-7:2001; EN 60204-1:2007; EN 50178:1997; EN 60947-5-1:2004; EN 60947-5-8:2007; EN ISO 13850:2008.

For the compilation of technical documents is authorized:/

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

Signatory :

Name : Klaus Dold
Position : Managing Director
Place and date : Furtwangen, 07.07.2010
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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