ELCA
RADIOCONTROLS

Remote control system for Drilling Machine

User manual

BRAVO
Industrial radio remote control

AT BRAVO-FUNK-915
Transmitting Unit

AR BRAVO-FUNK-915
Receiving Unit

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User manual

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a. FEDERAL COMMUNICATIONS COMMISSION (FCC) CONFORMITY AND FREQUENCIES

a.1 CONFORMITY

Each BRAVO-FUNK-915 series' radio remote control working in the frequency band 915-928MHz complies with Part 15 of standards FCC and with RSS-210 of IC standards.

Transmitting Unit AT BRAVO-FUNK-915 FCC ID: 2ABS7-ATBRFU915
Receiving Unit AR BRAVO-FUNK-915 FCC ID: 2ABS7-ARBRFU915

a.2 FCC CONFORMITY STATEMENT

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

a.3 FREQUENCIES

The radio link between the units of ELCA BRAVO-FUNK-915 series radio remote controls is built at one of the frequencies permitted by the US standards in force when the system is put on the market.
Frequency band 915-928MHz
Transmitting power ..... meets FCC and IC requirements
Available radio channels 259
Channel spacing 50kHz
BRAVO-FUNK-915 series industrial radio remote controls communicate either in dynamic or static mode.
Mode is set by the machine manufacturer

Dynamic mode
A radio remote control communicating in dynamic mode:
- uses a working frequency in the band 915-928MHz
- checks that the frequency is free before using it
- continually changes the working frequency to maintain the radio link even when interference occurs.

Static mode
A radio remote control communicating in static mode:
- uses a working frequency in the band 915-928MHz
- checks that the frequency is free before using it
- always works at the same frequency until the stop function is activated.

a.4 MARKET

- BRAVO-FUNK-915 series' radio remote controls working in the frequency band 915-928MHz can be used in the United States market.

1. USER MANUAL

Read this Manual before operating the Radio Remote Control.
For ease of reference, symbols have been placed at the side of paragraph titles to highlight **the importance** of the information contained in the paragraph.

IMPORTANT!
To learn how to operate your radio remote control: operating instructions for radio remote control.

To become familiar with your radio remote control: radio remote control technical data.

To become thoroughly familiar with your radio remote control: detailed information on radio remote control.

Use instructions of the BRAVO-FUNK-915 radio remote control system for drilling machines.

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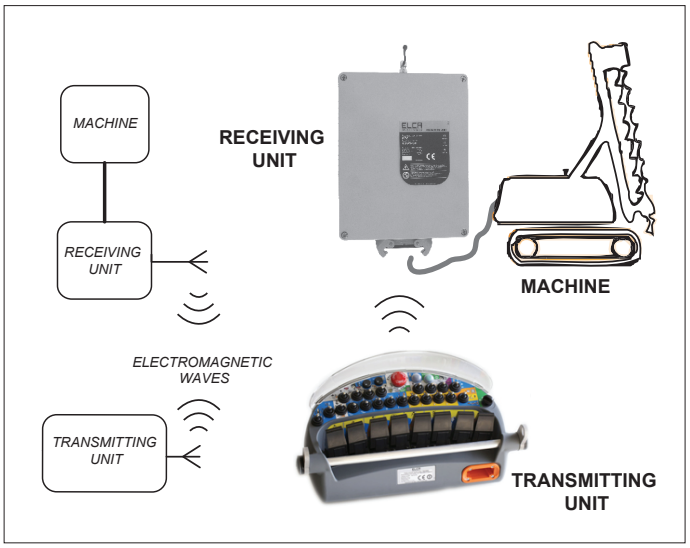
Bold face is used to call attention to text that you should read carefully.

This manual has been drawn up entirely by qualified ELCA personnel.
The contents of this manual are subject to change without prior notice, therefore the operator is required to verify (before using the radio remote control) that the information contained in this publication are consistent with the device in their possession. Additional information on how the radio remote control works, especially if it is manufactured in accordance with special requirements of the customer, can be found in the documents annexed to this manual. The annexed documents must be considered as being an integral part of this manual.
Contact ELCA in the event there are instructions, warnings or indications which may prove to be unclear.
The information provided by ELCA in this manual are regarded as accurate and reliable; however, the company can not be held responsible for omissions or errors.
This updated edition incorporates suggestions from our Customers to provide an effective tool supporting you in your day-to-day work.

2. USE INSTRUCTIONS

2.1 GENERAL INFORMATION



General block diagram

The BRAVO type ELCA Radio Remote Control System is a family of industrial safety radio remote controls that can be used for the control of lifting, transportation and general equipment on machines where specific safety features are required on the Stop command (Cat. 3 PL d or cat. 4 PL e) and on the unintended activation of Joystick commands in the rest position (UMFS Cat. 3 PL d). On request, it is possible to have UMFS with Cat. 3 PL d also on particular On/Off controls. (in accordance with EN ISO 13849-1)
The BRAVO type radio remote control system is composed of two main parts:

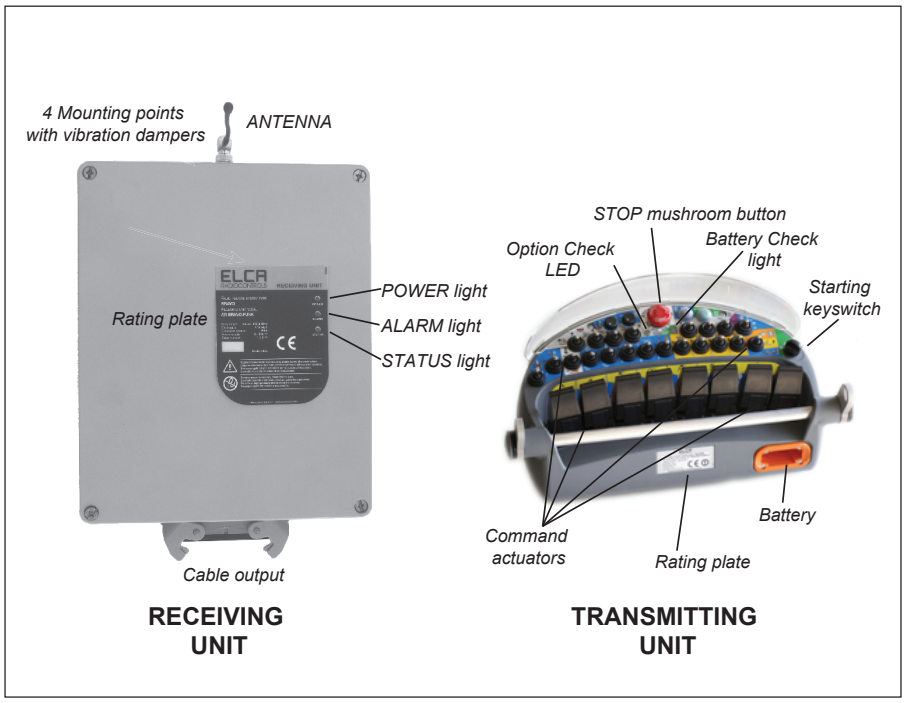
1. The transmitting unit (AT BRAVO-FUNK-915) that allows the user to communicate to the receiver the sequence of digital data that form the selected command.
2. The receiving unit (AR BRAVO-FUNK-915) that decodes the sequence of digital data and transforms them into electric impulses that the machine requires to activate the selected command.

The system, which uses electromagnetic waves to transport the control signals, enables the operator to freely move around the machine giving the possibility to position himself where it is possible to better control its movements and to choose a safer operating position in total freedom.
The radio remote control is designed in order to be used when an interference-free frequency is activated so as not to disturb other devices in the vicinity and vice versa not be disturbed. During transmission, the system checks transmission status and, in the presence of a disturbance, is capable of automatically changing the transmission frequency without interruptions. Any command transmitted contains a unique code that can not be changed, which makes the activation of manoeuvres by different transmitters of any brand or model impossible.

2.2 APPLICATIONS AND USE CONDITIONS NOT PERMITTED.

This radio remote control can not be installed in applications in which:
- EXPLOSION-PROOF characteristics are required.
- The movement and/or lifting of persons is made and safety features greater than "PL e" are required on the STOP command and "PL d" on the UMFS safety function on movements controlled by the Joysticks.
- An alternate current power supply to the receiver and outputs is required.
- Galvanic isolation of the power supply circuit or of the devices connected to the outputs is not guaranteed when compared to the possible power supply in alternate current.
- The loss of the radio link and the relative shutdown of the receiver outputs may generate dangerous situations.
- The risk analysis has given a negative result.
- Doubt concerning the operation of the radio remote control remain.

2.3 INSTRUCTIONS FOR A PROPER AND SAFE USE OF THE RADIO REMOTE CONTROL SYSTEM.



IMPORTANT! Radio remote control user MUST:

- Check the correct mechanical operation of the STOP button before every operation.
- Check the correct operation of the control devices.

If there is a deterioration in the correct operation of the STOP button or functional abnormalities in the control devices, the use of the radio remote control must be prohibited until the full restoration of the system's functionality.

- Use the transmitter unit by holding it or fastening it to the body in a safe and stable manner to avoid it accidentally falling.
- Be thoroughly familiar with the functions and features of the radio remote control and of the machine the receiving unit is connected to.
- Before activating any movement of the machine, ensure that the operator's position is such to ensure that:
  - There is no danger of tripping.
  - There is no danger of loss of balance.
  - It is impossible that small-sized objects can introduce themselves between the command actuators and involuntarily activate an operation.
  - Allow to follow the movements of the machine and the load in view.
  - Guarantee the safety conditions concerning those engaged in other operations, activities or work in the work area of the machine and operator.
- Turn off the transmitting unit whenever the work is suspended, even momentarily, even if the device is equipped with automatic shut-off.
- Switch-off the transmitting unit and disconnect the power supply of the receiver before performing any maintenance on the radio remote control or on the machinery.
- Do not leave the transmitting unit unattended and switched on.
- Remember that the transmitting unit can operate the machine even when placed indoors and far from the receiving unit, so improper use can cause severe damage to people and property.
- Never wash the units with water jets, use a damp cloth only.
- Do not use in shielded environments (e.g. inside the drum of the mixer).
- Charge the batteries in an environment that is not too hot, too cold, too humid or dusty.
- Keeping the batteries partially charged at all times can extend their useful life.
- Do not leave the batteries discharged for long periods.
- Charge the batteries at least once a year even if the unit has not been used since the last charge.

IMPORTANT ! The installer of the radio remote control must:

- Carry out a thorough risk assessment on the use of the machine with the radio remote control.
- Assess that there are no hazardous conditions in the event the radio remote control stops due to the loss of the radio link.
- Do not install the radio remote control on machines in which the safety of moving, lifting or transporting people is entrusted to the radio remote control with inadequate PL commands.
- Do not install the radio remote control where explosion-proof characteristics are required of the radio remote control (EX).
- Secure the receiver so that it is always facing the transmitter in normal use.
- Ensure that there are no metal obstacles between the transmitter and receiver or obstacles that may interfere with the transmission of electromagnetic waves.
- Choose the installation of the receiver in a vertical position and easily accessible for maintenance operations.
- Avoid that the receiver is subjected to strong vibrations. Use vibration dampers if necessary.
- Always make sure that the value of the supply voltage complies with the rated voltage indicated on the rating plate of the receiver.
- Use multi-pole connectors for the electrical connection of the receiver to the machinery to allow easy removal if required.
- Use cables of suitable section, max. 1.0 mmq (AWG 16).
- Connect the Stop circuit making sure that the current circulating therein does not exceed the value of the protection fuse.
- Distribute the common wire to the functions interposing always the Safety relay.
- After installation check that the stop circuit works correctly.
- Check that all limit switches, load or position limiters are working correctly.
- Ensure that all manoeuvres are functioning correctly and are consistent with the symbols placed on the transmitter.

Definition of the key functions:

Acquisition of identification code:

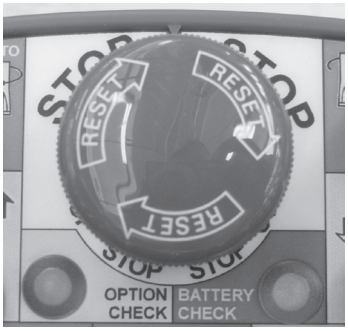
- Whenever a new match key is connected to a transmitter module, it is necessary to perform the procedure for the acquisition of the identification code. Press the Stop mushroom button, bring the keyswitch selector in position 1, press the Start button for approximately 10 seconds, until the green LED stops blinking. In new radio remote controls, the identification code has already been acquired.

Switching on and switching off:

- ENABLING THE TRANSMITTER. Check that the Mushroom pushbutton is in rest position (lifted) and bring the keyswitch selector in position 1. If the receiver is powered, the transmitter instantly activates a communication channel and the green LED (Battery Check) flashes fast.
- START-UP. After having enabled the transmitter, bring the keyswitch in position Start (if applicable) or, in general, activate the START command. Now the green LED flashes slowly and the system is on. Every transmitted command is now activated by the receiver.
- SWITCHING OFF THE TRANSMITTER. Press the Mushroom pushbutton or bring the keyswitch selector in position 0.

Safety function:

- PASSIVE EMERGENCY: In case the receiver can no longer correctly interpret the signals transmitted by the Transmitter to interrupt the radio connection, the receiving unit automatically stops, deactivating all the outputs and opening the Stop circuit. Intervention time of the passive emergency is under 500 ms.
- ACTIVE EMERGENCY: With the radio remote control on, when pressing the mushroom button the Stop command is transmitted and the receiver turns off all outputs and opens the stop circuit. Intervention time under 130 ms
- SAFETY COMMAND: The Safety command is transmitted whenever a joystick is placed outside position zero. This is used to ensure greater protection from unintended movements with the actuator in rest position (UMFS).



Indicator lights

- SYSTEM ON IN WAIT FOR START: The green Battery Check LED flashes rapidly.
- INDICATION OF SYSTEM ON. When the system is working properly and the battery is fully charged, the green Battery Check LED flashes slowly.
- INDICATION OF LOW BATTERY. When the battery is low, the Battery Check LED slowly flashes red, signalling there are approximately 10 minutes of power reserve left.
- ERROR - STOP MUSHROOM ENABLED: The Battery Check LED flashes red once, then switches off when the system detects that the Stop Mushroom button is enabled, when activated.
- ERROR - ON/OFF COMMAND ENABLED: The Battery Check LED flashes red twice, then switches off when the system detects that the ON/OFF command is enabled, when activated.
- ERROR - LOW BATTERY: The Battery Check LED flashes red three times, then switches off when the system detects that the battery is low, when activated.
- ERROR - JOYSTICK OUT OF ZERO: The Battery Check LED flashes red four times and then switches off when the system detects a joystick out of zero, when activated.
- INDICATION OF DAMAGED TRANSMITTER: The Battery Check LED stays on red for two seconds, then switches off.

Sound signals:

- When the Red LED that indicates an error or Low Battery goes on, the transmitter emits a sound signal.

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2.5 INFORMATION FOR INSTALLATION

The installation must necessarily be carried out by qualified and, if need be, licensed staff, as required by the provisions of law of certain Countries. Installation is really important, because the safety of the machinery, its proper operation and the ease of performing an effective maintenance on the Radio Remote Control depend on it.

In addition to all information made available by the machine manufacturer, the installer should always take the following precautions:

- Perform a thorough risk assessment considering the use of the machine by means of the radio remote control.
- Apply and comply with the provisions of the reference standards for the field of application of the machine on which installation is being performed.
- Position the receiver unit so that it is easily accessible for maintenance operations.
- Connect the receiver unit to the machine using multi-pole connectors so that it can be easily disconnect in the event that it needs to be sent to a service centre.
- Position the receiving unit vertically, so that the antenna is facing the operating position of the operator, and so as to optimise the working range of the radio remote control.
- Position the receiving unit so that it is the farthest possible from metal objects. Do not position the receiving unit inside containers made out of metal or other conductive material, without having provided for the installation of an external antenna.
- Avoid exposing the receiver unit to strong vibrations. If necessary, use appropriate anti-vibration systems.
- Use cables with suitable section for wiring connections.
- The power supply of the receiver unit must be protected against short circuit.
- Provide for the possible disconnection of the power supply to the receiving unit during installation, wiring and maintenance operations.
- Warning. Never supply voltage from the outside toward the outputs of the receiver, even when the radio remote control system is off. Return voltage through the outputs may limit or exclude the safety performance of the radio remote control.

- Use decoupling systems for the receiver outputs when an electrical command other than the radio remote control is foreseen, except when use of the alternative command is made with the receiving unit of the radio remote control electrically disconnected from the machine.
- Pay attention to the current in the STOP and SAFETY outputs so that it never exceeds the permitted value of 7.5A.
- The SAFETY relay contact must be connected in series to the common wire of the movement command when the safety protection is required in relation to the involuntary activation of the control with actuator at rest (UMFS unintended movement from standstill PL d). This connection is already prearranged internally for the ON/OFF or PWM outputs of the Joysticks.
- IT IS IMPERATIVE that the two STOP contacts on the receiver are always used.
- It is necessary to always have a positive voltage (8-30 V) in the inputs IN_STP1 (K1), IN_STP2 (J1) and IN_SAFETY G1), otherwise the receiver cannot function.
- If the machine is configured to manage only one Stop command, connect the input IN_STP1 (K1) to the positive pole, connect the two STOP contacts in series, connecting OUT_STP1 (K2) to IN_STP2 (J1) with a bridge; output OUT_STP2 (H1) is now the Stop output. The Stop contact is now located between the terminals IN_STP1 and OUT_STP2, with the need to have current flow from IN_STP1 toward OUT_STP2.
- Connecting the two STOP contacts separately if the machine is set to manage two separate Stop contacts (use four wires). In this case, always connect the positive pole to the inputs IN_STP1 and IN_STP2. Current must always flow from the input to the output. The installer is responsible to perform the wiring able to guarantee the level of security required.
- Gather up the wiring cables and lock them into place, so that the weight cannot tear the crimped contacts of the single cables. If need be, use the included spring to be mechanically fastened to the connectors of the receiver and fasten the wires with a plastic strip.
- After installation, test the machine operated by the radio remote control, checking the actual safety of the machine by means of the STOP command, the exact correspondence of the command symbols with the actual movement of the machine.
- Check that operations that render the machine's safety systems ineffective are not performed during installation (limit switches, interlocks, load limiters, etc..).
- Check that the contact of the SAFETY command is in series with all commands to which a UMFS protection is required.
- Check also the correct operation of the machine without the use of the radio remote control where possible.
- Make sure that the activation of the auxiliary commands on the machine (if electrical) does not entail the application of voltage to the outputs of the receiver. If need be, use decoupling systems (see paragraph 5.2). Return voltage through the outputs may limit or exclude the safety performance of the radio remote control.
- If abnormal operations are experienced, DISABLE the machine until the problem is fully solved.
- When closing the receiving unit again, carefully check the integrity of the sealing gasket and its correct housing. Press the connector until the two flaps on the cover slot into place (confirmed by a clicking sound).

2.6 MAINTENANCE

Before proceeding with any kind of maintenance make sure the receiver is not powered, that the transmitter is switched off and the emergency STOP button pressed.
In the event it is necessary to intervene on the machine or on the receiving unit for maintenance operations, electrically disconnect the receiver unit from the machine.

Even though the radio remote control system does not require special maintenance operations, some precautions are nevertheless necessary so that it remains fully efficient at all times.

Controls to be carried out daily before using the Radio remote control:
- Check that all the command symbols are clearly visible.
- Check that the mushroom Stop pushbutton works properly: the pressure exerted on the button must not be high and the reset must take place without friction or forcing.
- With the mushroom button pressed, press the Start command. The red Battery Check LED must switch on.
- Check the integrity of the transmitter's plastic casing. It should not have cracks.
- Check the integrity of the rubber of the command actuators (joysticks, toggle switches, pushbuttons, etc.). It should not have cracks or holes.
- Once you have finished using it, remove any deposits and clean it with a cloth.

Controls to be performed weekly:
- Clean the transmitter with a damp cloth and verify its integrity.
- Clean the springs of the battery holder and of the batteries.
- Clean the springs of the battery holder placed on the battery charger.
- Check the integrity of the receiving unit. The casing should not have cracks.

Controls to be performed monthly:
- Clean the receiving unit with a damp cloth and assess its integrity.
- Check the connection of the antenna on the receiver.

Controls to be performed yearly:
- Open the receiving unit and verify the integrity of the internal components. There should be no residual moisture or oxidation.
- Check the integrity of the receiving unit's gasket on the cover.
- Check cable seal.
- Fully recharge the batteries in the event of prolonged disuse of the system.

In addition to the above recommendations, in order to maintain the efficiency of the radio remote control System, the following precautions should be carried out:
- Protect the transmitting unit from jets of water or rain.
- Remove the receiving unit if it is installed externally during transport. In case of rain during transport, the receiving unit's IP level may not be sufficient to prevent water seepage, if it is directly exposed to the rain.
- Do not leave the transmitter unnecessarily exposed to direct sunlight or heat sources.

Should it be necessary to send the Radio Remote Control system to a service center to have it repaired, it is important to send the Transmitter along with the Receiver. Only by doing so can we guarantee the System will be certainly repaired and returned fully functional. Contact the service center in advance before proceeding to send the material and include a description of the abnormal condition encountered in the packing or in the waybill.

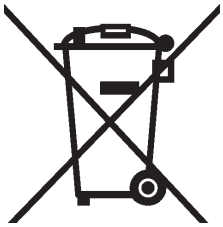
2.7 WARRANTY

The Elca Radio Remote Control System type BRAVO is covered by a 24-month warranty starting from date of purchase as evidenced by the way bill, that must also state the serial number of the Radio Remote Control System.
Warranty covers defects of manufacture of the radio remote control system and its components, when such defects have been determined to exist at Elca's sole discretion.
The battery pack is covered by a warranty of 12 months, starting from the date of its purchase.
User shall arrange the delivery to / collection from Elca authorised service centres and defective parts shall be replaced at no additional charge.
In the event of on-site servicing/repair, travel and personnel expenses shall be charged to the user, whereas the replacement of any defective parts shall be free of charge.
Servicing/repair by unauthorised persons, improper use or improper installation shall make the warranty null and void.
Warranty does not cover transport damage or loss.
Elca shall not be held liable for damage to property or persons.
Elca shall not be liable for machine down time and it is the user's responsibility to provide the option of manual or cable control for each machine.
Any disputes shall be submitted to the Court of Bassano del Grappa (Vicenza, Italy).

2.8 DISPOSAL INFORMATION

The radio remote control should be disposed of at a differential waste recovery service at the end of its useful life.

DISPOSAL OF BATTERIES, Directive 2006/66/EC and subsequent amendments.
Batteries may release toxic substances harmful to humans, animals and plants and contaminate the environment. They should be not disposed of with municipal solid waste but delivered to authorised collection centres for battery recycling and treatment.
Users' contribution to collect and recycle batteries is critical to minimising the potential impact of the contaminants used in these components on the environment and human health.
The European Union has set up different battery collection and recycling systems. For information on the method adopted in your area, contact your local authorities.
The crossed-out wheeled bin symbol on the batteries means that batteries must be disposed of separately from household waste in compliance with Directive 2006/66/EC and subsequent amendments and with local regulations.



3. TECHNICAL DATA

3.1 GENERAL FEATURES

GENERAL FEATURES.

Manufacturer ..... ELCA S.r.l.
Radio Remote Control System type ..... BRAVO
Working frequency ..... 915.050 - 927.950 MHz
Channel spacing used ..... 50 kHz
Working temperature ..... -25 - +55 °C
Storage and transportation temperature ..... -25 - +55 °C
Operating range ..... 100 m
Command response time ..... < 130 ms
Active Stop time ..... < 130 s
Passive Stop time (maximum stop time) ..... < 0,5 s
Performance Level of the safety functions in accordance with EN ISO 13849-1
Protection of ..... PL d stop (wiring with 2 wires)
Protection of ..... PL e stop (wiring with 4 wires)
Protection from unintended movements from the rest position of the Joysticks (UMFS) ..... PL d

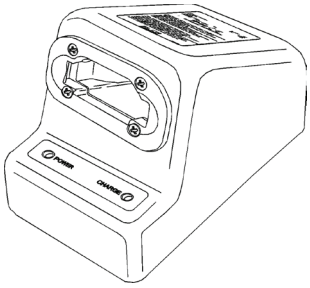
3.2 AT BRAVO-FUNK-915 TRANSMITTING UNIT FEATURES

Model ..... AT BRAVO-FUNK-915
Transceiver radio module RTA-AU1
Incorporated ..... antenna
Distance between the antenna and the human body ..... > 20 cm
Battery pack ..... power supply: Li-ion 7.4 V
Current draw ..... < 130 mA
Absorbed power ..... < 1 W
RF effective radiated power ..... < 25 mW ERP
Run time with fully charged battery at 20 °C ..... approximately 20 hours
Run time after battery low warning: ..... approximately 10 minutes
Protection degree IP65
Dimensions ..... 420x200x250 mm
Weight ..... 2600 g

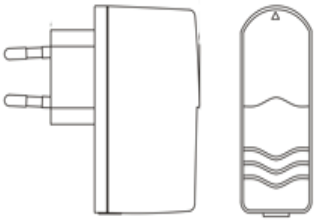
3.3 RECEIVING UNIT FEATURES

Model ..... AR BRAVO-FUNK-915
Transceiver radio module RTA-AU1
External ..... antenna
Distance between the antenna and the human body ..... > 20 cm
DC power supply: ..... 8-30 V ⎓
Maximum absorbed current ..... < 1 A
Absorbed power ..... < 5 W
STOP contacts protection fuses (MINI® Blade Fuse) ..... F3, F4= 7.5 A
SAFETY contacts protection fuse (MINI® Blade Fuse) ..... F5 = 7.5 A
SAFETY contacts protection fuse (MINI® Blade Fuse) ..... F1 = 3.0 A
Power supply protection fuse (MINI® Blade Fuse) ..... F2 = 7.5 A
Maximum permitted voltage ..... 30 V ⎓
Maximum rated current of proportional outputs in current (PWM) ..... 2 A (30 ⎓)
Maximum rated current of ON/OFF outputs ..... 4 A (30 ⎓)
Maximum rated current of proportional outputs in voltage ..... 10 mA (28 V ⎓)
Protection degree IP65
Dimensions ..... 230x280x110 mm
Weight ..... 1200 g

3.4 CHARGING SYSTEM FEATURES



Battery charger for battery pack LI-TE (7.4V - 17Wh [2.3Ah]) with Li-ion chemistry
Battery charger model ..... LITE-ION
Power supply voltage ..... 12-30 V ⎓
Absorbed current ..... < 1 A
Rated output voltage ..... 8.4 V ⎓
Rated output current ..... 1 A
Full recharging time ..... approx 4 hours
Charge time for 2 hours of run time ..... approx. 20 minutes
Working temperature ..... 0 +40 °C
Protection degree IP40
Dimensions ..... 144x84x92 mm
Weight ..... 300 g



Stabilised external AC/DC power unit for wall socket for LITE-ION battery charger
Input 100-240Vac 50/60Hz 450mA
Output ..... 12V= 1.5A (18W)
Plug ..... Eurospina (Euro-plug) Type C (EEC 7/16)
Dimensions ..... 59.3x30.7x75.6 mm
Weight ..... 120 g

4. TRANSMITTING UNIT

4.1 DESCRIPTION OF OPERATIONS

The receiving unit AT BRAVO-FUNK-915 comprises three main electronic circuits:

- **RADIO TRANSMITTING BOARD**. Containing all the electronics for the transmission and management of the working frequency.
- **INTERFACE CARD**. Containing all the electronics for the management of the command inputs and signal encoding
- **IDENTIFICATION CODE CARD**. Containing the unique identification code of the system.
- **TX EXTENSION CARD**. Permits to increase the available commands.

The transmitting unit AT BRAVO-FUNK-915 univocally communicates with the receiver with its own receiver, because the transmitted signal contains an identification code inside it that is not reproducible. Recognition of this code allows the receiving unit to identify with certainty the unit that has transmitted the command. In this way any other device, different or the same type, that is transmitting on the same frequency can not in any way replace the control of the machine to which the system is connected. Any radio transmissions on the same working frequency as our transmitter or any radio frequency disturbances can in the worst case only switch off the receiver with all outputs disabled (see description of receiving unit operation).

When a new match key is mounted to the transmitter, it is necessary to perform the procedure for the acquisition of the identification code. By means of the identification code acquisition procedure, the transmitter acquires the information contained on the match key. The procedure is arranged for the Stop mushroom button to be activated with the transmitter switched off; bring the starting keyswitch in position 1 and activate the Start command for approximately 10 seconds, until the Battery Check LED flashes green. Any error signals are not to be taken into consideration in this precise instant. After the acquisition procedure, only the receiver with the hardware key containing the same identification is enabled to activate the commands transmitted by the transmitter.

During normal use, when the keyswitch selector is brought into position 1, if the system does not encounter abnormal conditions, the Battery Check LED starts rapidly blinking green. When the Start command is pressed, the LED starts blinking slowly, to indicate that the system is working.

With the keyswitch in position 1, the system runs checks on the status of the Transmitter and, if it detects abnormal conditions, the following error statuses are displayed:

- Red Battery Check LED on for 2 seconds. The transmitting unit is not working properly or the procedure for the acquisition of the identification code has not been activated.
- Red Battery Check LED on for 1 second. The Stop pushbutton has been detected as being on or not working.
- Red Battery Check LED flashes 2 times. An ON/OFF command has been detected as being on.
- Red Battery Check LED flashes 3 times. The battery has been detected as being low.
- Red Battery Check LED flashes 4 times. A joystick has been detected as out of position zero.

Note. A sound signal is emitted when the red LED goes on.

During normal operation of the radio remote control, the red LED starts blinking when the battery is low and approximately only 10 minutes of run time are left.

Certain ON/OFF functions or certain proportional functions can be installed during assembly of the unit as functions that can be enabled when the transmitter is activated, without generating an error condition. More detailed information on this type of commands can be found in the documentation annexed to this manual that describes special customised radio controls, built in accordance with precise technical specifications of the customer.

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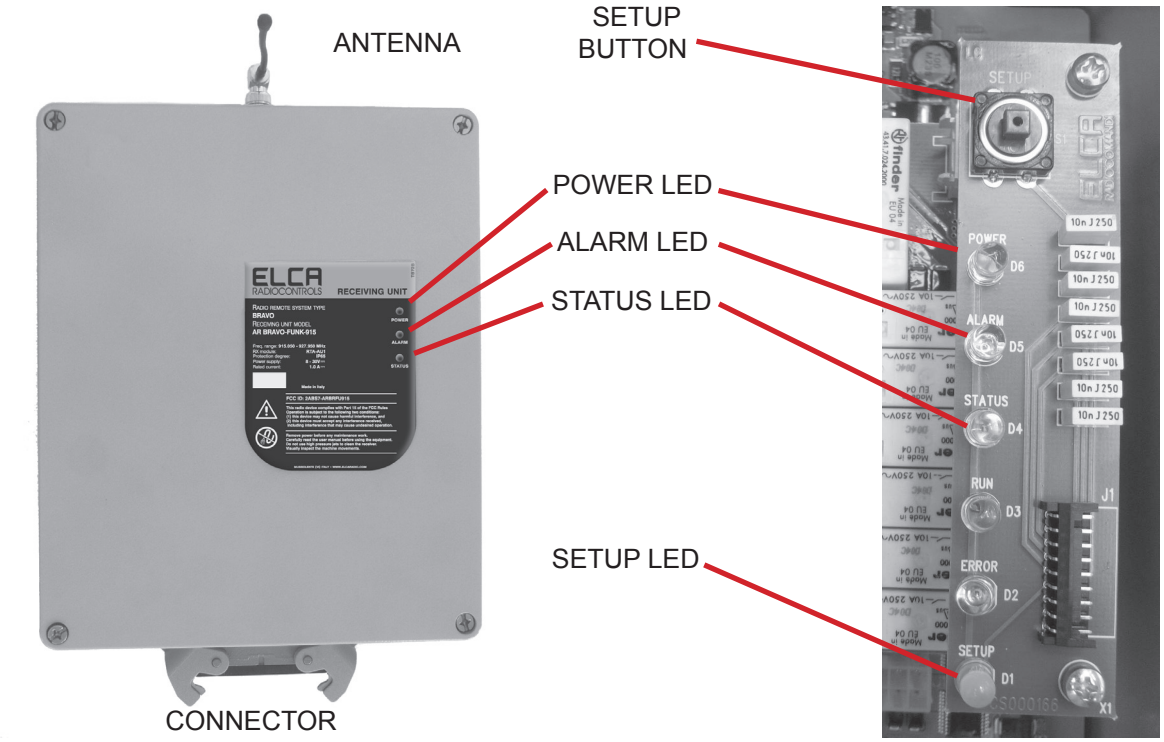
5. RECEIVING UNIT

5.1 DESCRIPTION OF OPERATIONS

The receiving unit AR BRAVO-FUNK-915 comprises several main electronic circuits:

- **MOTHER BOARD**. This contains the electronics for the decoding and implementation of the controls, the safety fuses, and backs up the radio module, the encryption key, the data memory and the expansion cards.
- **RADIO RECEIVER CARD**. Contains all the electronics for the reception and management of the working frequency.
- **IDENTIFICATION CODE CARD**. Contains the unique identification code of the system. This code allows the system to only recognise the signals transmitted from the transmitter having the same identification code.
- **DATA MEMORY CARD**. Contains all the parameters for the adjustment of the proportional outputs inside it.
- **LED CARD**. Backs-up the signalling LED to monitor the system.
- **ON/OFF AND PROPORTIONAL COMMANDS EXPANSION CARDS**. Increase the number of commands available.



From the outside, the receiving unit allows the user to check the system's operating status through the LEDs.
The information that can be obtained are:

- Green Power LED off: The unit is not powered.
- Green Power LED on: The receiving unit is powered, but no radio connection is enabled.
- Green Power LED blinking slowly: There is a radio connection with the transmitter.
-
- Red Alarm LED Off: No abnormal condition.
- Red Alarm LED flashes 1 time per second: Error in the STOP channels.
- Red Alarm LED flashes 2 times per second: Error in the SAFETY channel.
- Red Alarm LED fixed on: The unit is not working properly.

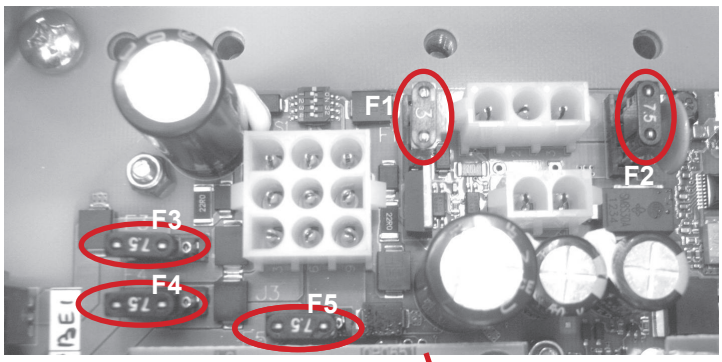
- Blue Status LED Off. The unit is not activated.
- Blue Status LED flashes slowly: There is a power supply voltage greater than the required one.
- Blue Status LED flashes rapidly: The receiving unit receives data from the transmitting unit.

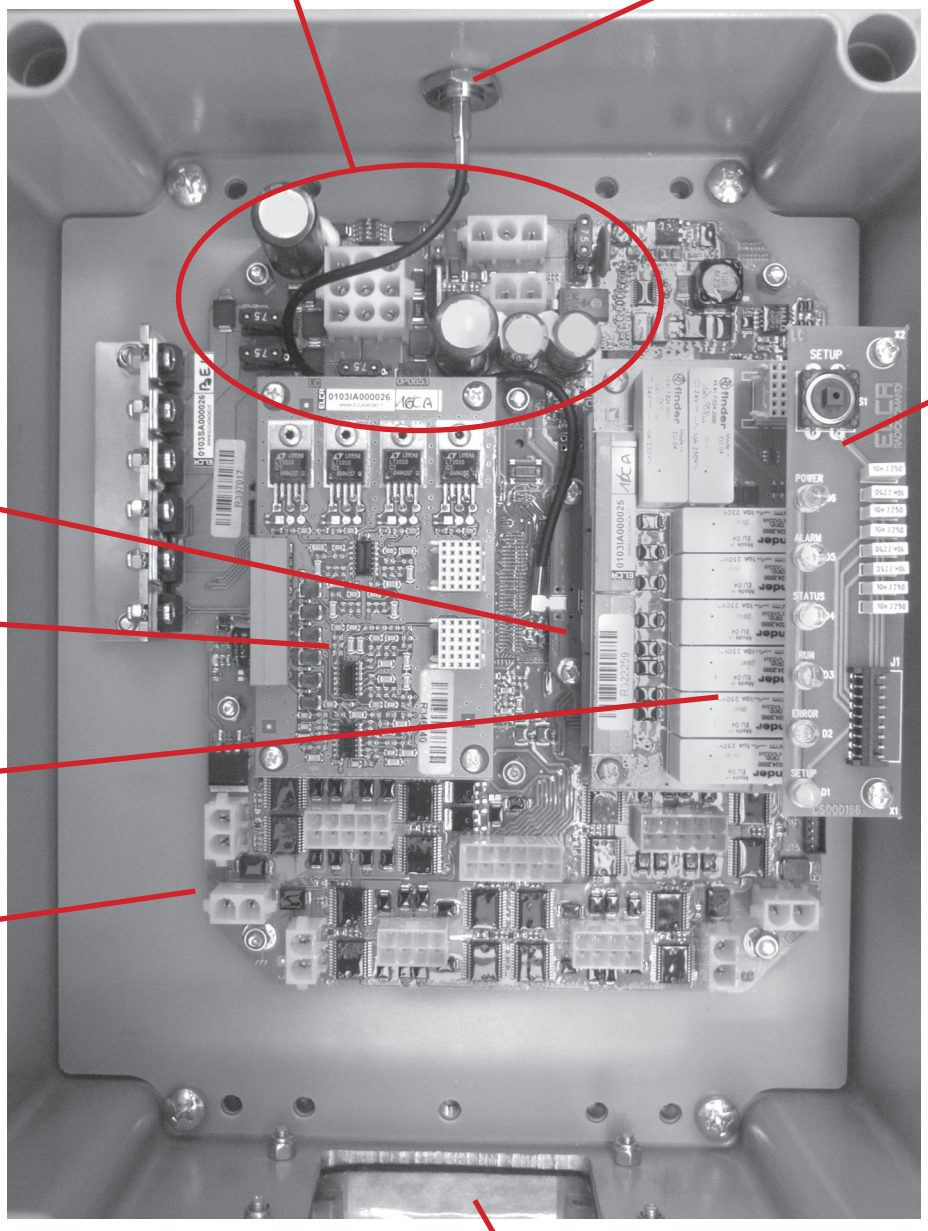
Other signalling LEDs are made visible by removing the cover.

The RUN and ERROR LEDs are not used, while the yellow “Setup” LED signals:

- Yellow Setup LED Off. The receiving unit is working properly.
- Yellow Setup LED flashes 1 time per second: There is an error in the encoding key.
- Yellow Setup LED flashes 2 times per second: There is an error in the data memory card.
- Yellow Setup LED flashes 3 times per second: The receiving unit is in the process of saving the adjustment parameters.
- Yellow Setup LED On. The receiving unit is in Remote Setup mode.

INTERNAL FUSES





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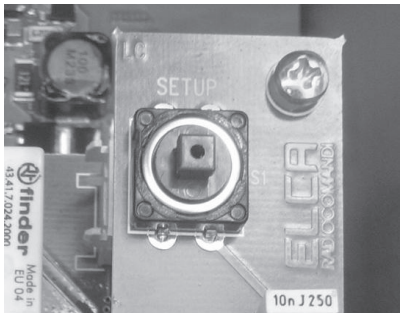
5.3 MODIFYING THE PROPORTIONAL FUNCTION PARAMETERS (SETUP)

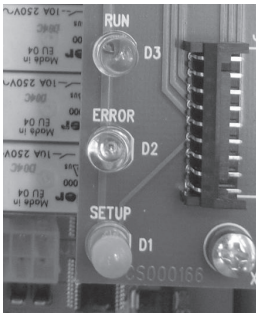
The parameters of the proportional functions can be changed by applying the SETUP procedure and involves the modification of the following parameters:
- Calibration of maximum and minimum values of each proportional function with output in voltage or in current (PWM).
- Calibration of proportional values in voltage in rest position (OFFSET).
- Inversion of movement direction of the Joystick axle.
- Reset to default Factory settings.

SETUP enabling.
Before proceeding to change the parameters of the proportional functions, it is necessary to enable the SETUP function.
- Open the receiver cover.
- Power the receiver.
- Press the SETUP button inside the receiver on the LED card.
- The yellow SETUP LED is on fixed.

Receiving



SETUP button



SETUP LED

P+/P- selector

Change maximum value.
- With the SETUP function enabled, check that all the proportional functions are in rest position. For the potentiometers, the rest position is with the potentiometer rotated counter-clockwise. Proportional functions out of zero prevent proper operation of the SETUP function. The presence of two or more proportional functions simultaneously out of zero is indicated by the rapid flashing of the SETUP LED.
- Move the Joystick of the function you want to adjust to the maximum and hold it in position.
- By operating the selector in which P+ / P- is indicated, you will change the maximum value of the function by either increasing or decreasing it.
- Press the STOP pushbutton to save the changed value. Switch off the receiver to cancel any changes.

Change minimum value.
- With the SETUP enabled, move the Joystick of the function you want to adjust just slightly out of zero and hold it in position.
- By operating the selector in which P+ / P- is indicated, you will change the minimum value of the function by either increasing or decreasing it.
- Press the STOP pushbutton to save the changed value. Switch off the receiver to cancel any changes.

Adjustment of the values at rest of the outputs in voltage (OFFSET).
- With the SETUP function enabled, check that all the proportional functions are in rest position. The presence of two or more proportional functions simultaneously out of zero is indicated by the rapid flashing of the SETUP LED.
- On the Transmitter, activate and release the selector with P+/P- indicated from the P+ side and immediately after activate and release the Start command.
- Repeat the operation described above until the SETUP LED starts blinking three times.
- Move the Joystick or the potentiometer of the function you want to adjust just slightly out of zero and hold it in position.
- By operating the selector in which P+ / P- is indicated, you will change the OFFSET value of the function by either increasing or decreasing it.
- Press the STOP pushbutton to save the changed value. To perform other adjustments, bring the Stop in rest position, press Start and resume operations from the two points described above we have just discussed. Switch off the receiver to cancel any changes.
- To exit the adjustment mode of the Offset voltage, it is necessary to exit the SETUP mode, switching the receiver off or moving the Elca Logo of the cable protection hood for approximately 10 seconds near to the area on the receiver indicated with Enable SETUP.

Inversion of the axle of the Joysticks.

- With the SETUP function enabled, check that all the proportional functions are in rest position. For the potentiometers, the rest position is with the potentiometer rotated counter-clockwise. Proportional functions out of zero prevent proper operation of the SETUP function. The presence of two or more proportional functions simultaneously out of zero is indicated by the rapid flashing of the SETUP LED.
- On the Transmitter, activate and release the selector with P+/P- indicated from the P+ side and immediately after activate and release the Start command
- Repeat the operation described above until the SETUP LED starts blinking 4 times.
- Move the Joystick or the potentiometer of the function you want to adjust just slightly out of zero and hold it in position.
- By operating the selector with P+ / P- indicated from the P+ side just once, the axle is inverted.
- Press the STOP pushbutton to save the changed value. Switch off the receiver to cancel any changes. To perform other adjustments, bring the Stop in rest position, press Start and resume operations from the two points described above we have just discussed.
- To exit the adjustment mode of the Offset voltage, it is necessary to exit the SETUP mode, switching the receiver off or moving the Elca Logo of the cable protection hood for approximately 10 seconds near to the area on the receiver indicated with Enable SETUP.

Reset to default Factory settings.

- With the SETUP function enabled, check that all the proportional functions are in rest position. For the potentiometers, the rest position is with the potentiometer rotated counter-clockwise. Proportional functions out of zero prevent proper operation of the SETUP function. The presence of two or more proportional functions simultaneously out of zero is indicated by the rapid flashing of the SETUP LED.
- On the receiver, move the Elca Logo of the cable protection hood near the area indicated with Enable SETUP for 3 times. When you have moved it the third time, hold it in position until the yellow SETUP LED starts blinking and, finally, returns to permanently lit.

WARNING: if you move the Elca Logo away from the area indicated with Enable SETUP before the yellow SETUP LRF returns to permanently lit, the reset of the default factory settings will be aborted and the reset will not be completed.

Exit from SETUP mode.

- With the SETUP enabled, remove power supply from the receiver or move the Elca Logo near the area of the receiver indicated with Enable SETUP, until the SETUP LED goes off (approximately 10 seconds).

6. BATTERY CHARGER

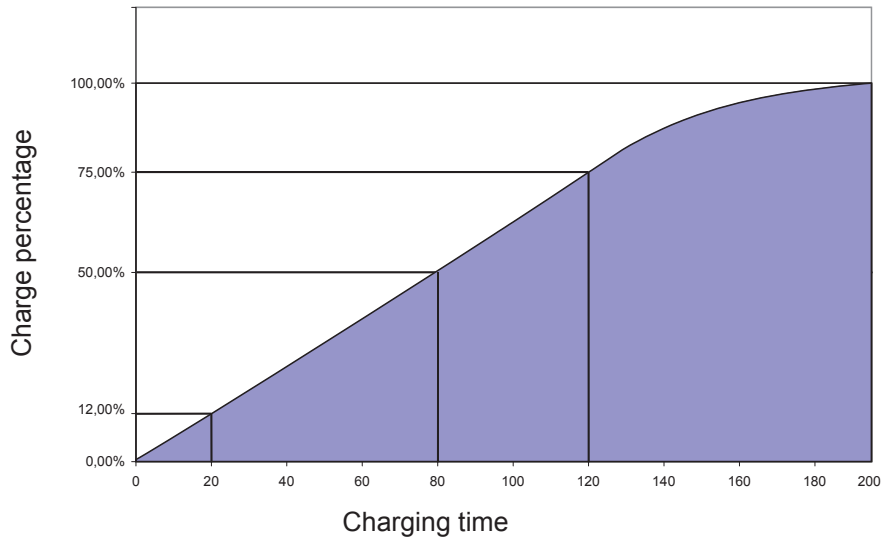
6.1 BATTERY CHARGER USAGE

The battery must be recharged in an environment in which the temperature ranges between 0°C and 40°C. If the ambient temperature is outside the allowable temperature range, the charging process is interrupted and the red CHARGE LED flashes to indicate a fault. Charging will automatically resume when the temperature is within the allowable temperature range.
Before you proceed to position the battery on the battery charger, it is a good custom to check that the battery poles are clean and dry.

Indicator lights:
Green POWER LED. Signals that the battery charger is properly powered.
Red CHARGE LED. Signals that the battery charge is in process.
When the ambient temperature is outside the permitted range, the red CHARGE LED flashes to indicate that the charging process has been interrupted. When the temperature returns within the permitted range, the charging process automatically resumes.
When the battery reaches the maximum charge level, the CHARGE LED goes off and the battery charger assumes charge status maintenance setup.
The battery may be faulty if the red CHARGE LED flashes despite the ambient temperature is within the permissible range. Replace it and check if the signal returns again.

The charging process for the lithium ion batteries allows to obtain a quick charge in the initial charging process. The graph below shows that 75% of the useful loads are obtained in two hours of charging, equivalent to about 15 hours of run time. Even a charge of just 20 minutes can ensure approximately 2 hours of run time.

It is advisable to always keep the batteries fully charged to be able to ensure full effectiveness. Avoid leaving the batteries discharged for long periods. Charge the batteries at least once a year.



7. TROUBLESHOOTING

7.1 TYPE OF TROUBLE

- **RADIO CONNECTION FAILURE**: After having turned the key on the transmitter to position 1, the radio link does not activate when pressing Start.
The radio connection is active and working when the green Battery Check LED flashes slowly (1 flash every second). During regular operation, the red LED flashes instead of the green indicating that the battery is low and there are still 10 minutes of battery life.
In the event of no radio link, perform the SELF-DIAGNOSIS OF THE TRANSMITTER: turn the key switch from position 0 to position 1 without pressing Start, the system performs a self-diagnosis, the outcome of which is given by the signal of the Battery Check LED as shown in the table below:

Battery Check **LED SIGNAL**	**POSSIBLE CAUSE**	**SUGGESTED REMEDY**
LED does not switch on	BATTERY ABSENT	Check that the battery is present and the battery contacts are clean.
Green LED flashes rapidly	SELF-DIAGNOSIS OK	Press START until the green LED flashed slowly. If this does not occur, see Par.7.3
Red LED on for 1 second, and then the transmitter switches off	STOP MUSHROOM BUTTON PRESSED	Release the STOP mushroom button.
Red LED on for 2 second, and then the transmitter switches off	IDENTIFICATION CODE NOT ACQUIRED	Perform the acquisition procedure of the access code (Par. 4.1).
	TX UNIT FAILURE	Contact the ELCA assistance service.
Red LED flashes 2 times and then the transmitter switches off	ON-OFF COMMAND ACTIVE	Check that there are no ON/OFF commands active on the transmitter when switched on.
Red LED flashes 3 times and then the transmitter switches off	LOW BATTERY	Recharge the batteries (see Chap. 6). Replace the battery with a charged one.
Red LED flashes 4 times and then the transmitter switches off	JOYSTICK OUT OF ZERO	Check that there are no joysticks out of zero when power on is performed.
For any other signals not listed above		See Paragraph 7.2.

Note: The lighting of the red LED is accompanied by an acoustic signal.

- **REPEATED RADIO CONNECTION FAILURES**:

SIGNAL	**POSSIBLE CAUSE**	**SUGGESTED REMEDY**
Blue STATUS LED on the receiver flashes quickly discontinuously.	RADIO INTERFERENCE	Ensure there are no other similar systems or sources of noise such as radio bridges or transmitters. Switch the transmitter off and back on again.
/	EXTERNAL ANTENNA (if fitted)	Check for correct position and connection.
	SYSTEM INCORRECTLY INSTALLED	Check system for proper installation (receiving unit position, metal obstacles,...). See Paragraph 2.5.
	For any causes other than those listed above	See Paragraph 7.2.

- **OPERATING ERROR**:

SYMPTOM	**POSSIBLE CAUSE**	**SUGGESTED REMEDY**
ONE OR MORE CONTROLS FAIL TO ACTUATE THE CORRESPONDING MOVEMENT.	WRONG WIRING CONNECTION	Check wiring in the receiving unit (see Paragraph 5.2).
	COMMAND TRANSMISSION FAILED	Contact the ELCA assistance service.

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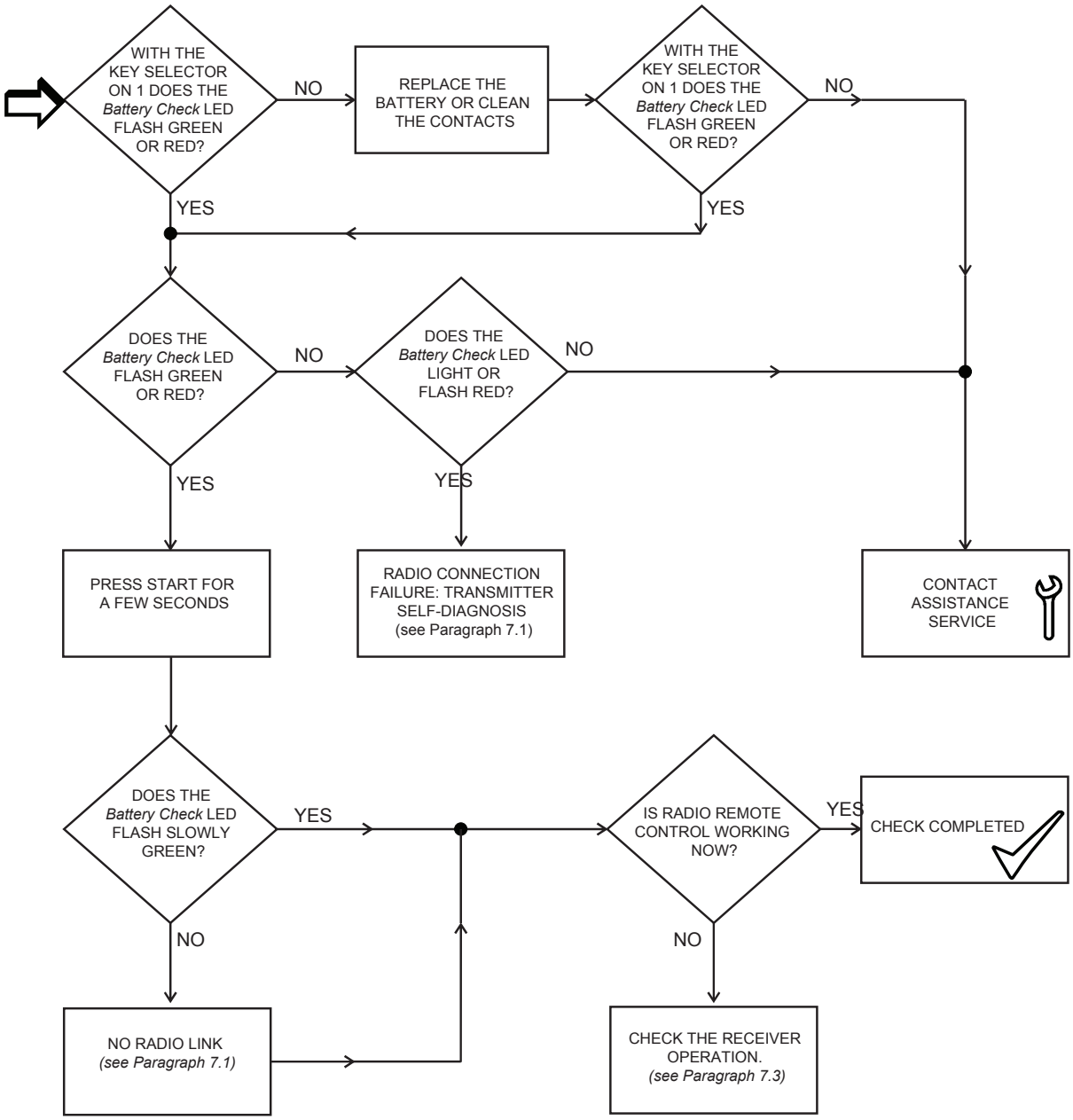
- **MALFUNCTION OF THE RECEIVER UNIT**: When the radio link is active and operational and the system works regularly on the receiving unit, the green POWER LED flashes slowly and the blue STATUS LED flashes rapidly. All other LEDs are off.
In the event of failure or malfunction, the main signals are summarized in the following table.

	Receiving unit LED SIGNAL	POSSIBLE CAUSE	SUGGESTED REMEDY
Green POWER LED	LED Off	RECEIVING UNIT NOT POWERED	Check the wiring of the system and that power is supplied to the plug. If the problem continues, check fuse F2 (see page 13).
	LED on fixed	NO RADIO LINK	Move the transmitter closer to the receiver. Check the operation of the transmitting unit (see paragraph 7.2).
	LED flashes slowly	OK	OK. The system is working properly.
Red ALARM LED	LED Off	OK	OK. The system is working properly.
	LED makes 1 flash + 1 pause	STOP OUTPUT ERROR	Check the system's wiring. If the problem continues, check fuses F3 and F4 (see page 13).
	LED makes 2 flashes + 1 pause	SAFETY OUTPUT ERROR	Check the system's wiring. If the problem continues, check fuses F1 and F5 (see page 13).
	LED fixed on or flashing in any other manner	RECEIVER UNIT FAILURE	Contact the ELCA assistance service.
Blue STATUS LED	LED Off	RECEIVER UNIT INACTIVE	No radio link Check the operation of the transmitting unit (see paragraph 7.2).
	LED flashes slowly	POWER SUPPLY OVER-VOLTAGE	Check that the supply voltage is within the limits foreseen for the technical characteristics of the receiver (see paragraph 3.3).
	LED flashes rapidly	DATA TRANSFER IN PROGRESS	OK. The system is working properly. If the flashing is discontinuous there are radio link problems: Move the transmitter closer to the receiver.
	LED on	OVER-CURRENT ON A PWM OUTPUT	Check the wiring of the system and any faults on the machine.
Yellow SETUP LED	LED Off	NO FAULT IN THE ADDRESS KEY AND DATA MEMORY	OK. The system is working properly.
	LED makes 1 flash + 1 pause	ADDRESS KEY ERROR	Contact the ELCA assistance service.
	LED makes 2 flashes + 1 pause	DATA MEMORY ERROR	Contact the ELCA assistance service.
	LED flashes rapidly	SYSTEM IN SETUP MODE	The system entered in the "Setup" mode and two analogue commands were activated simultaneously (see paragraph 5.3).
	LED on fixed	SYSTEM IN SETUP MODE	The system entered in the “Setup” mode (see paragraph 5.3).
/	For any other signals not listed above		Contact the ELCA assistance service.

7.2 TRANSMITTING UNIT FUNCTIONAL CONTROL

Follow the diagram below (starting from the top left corner) to solve or identify the problem.



NOTE:
If the radio remote control operates in a discontinuous manner, see section: REPEATED RADIO CONNECTION FAILURES in Paragraph 7.1.

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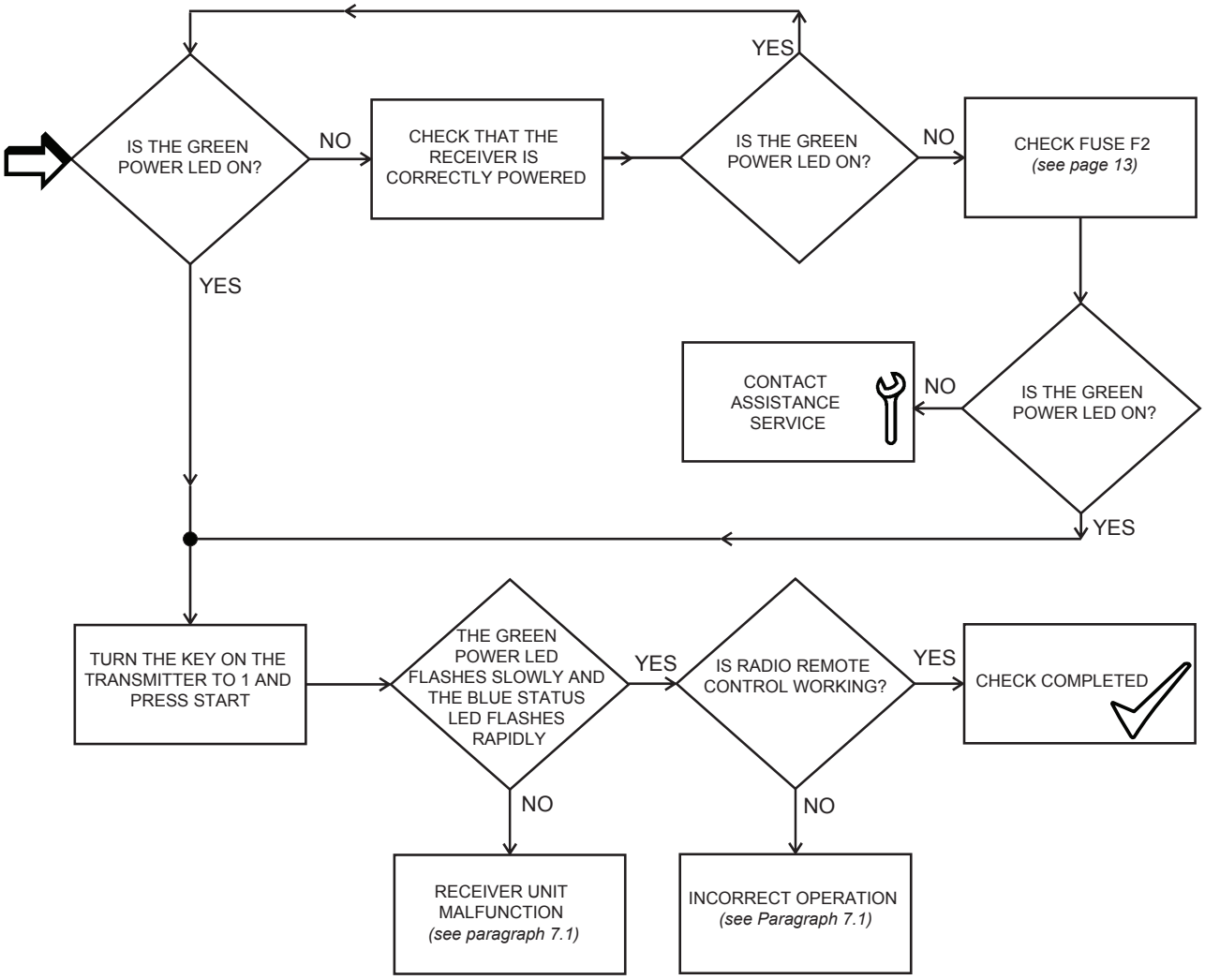
7.3 RECEIVING UNIT FUNCTIONAL CONTROL

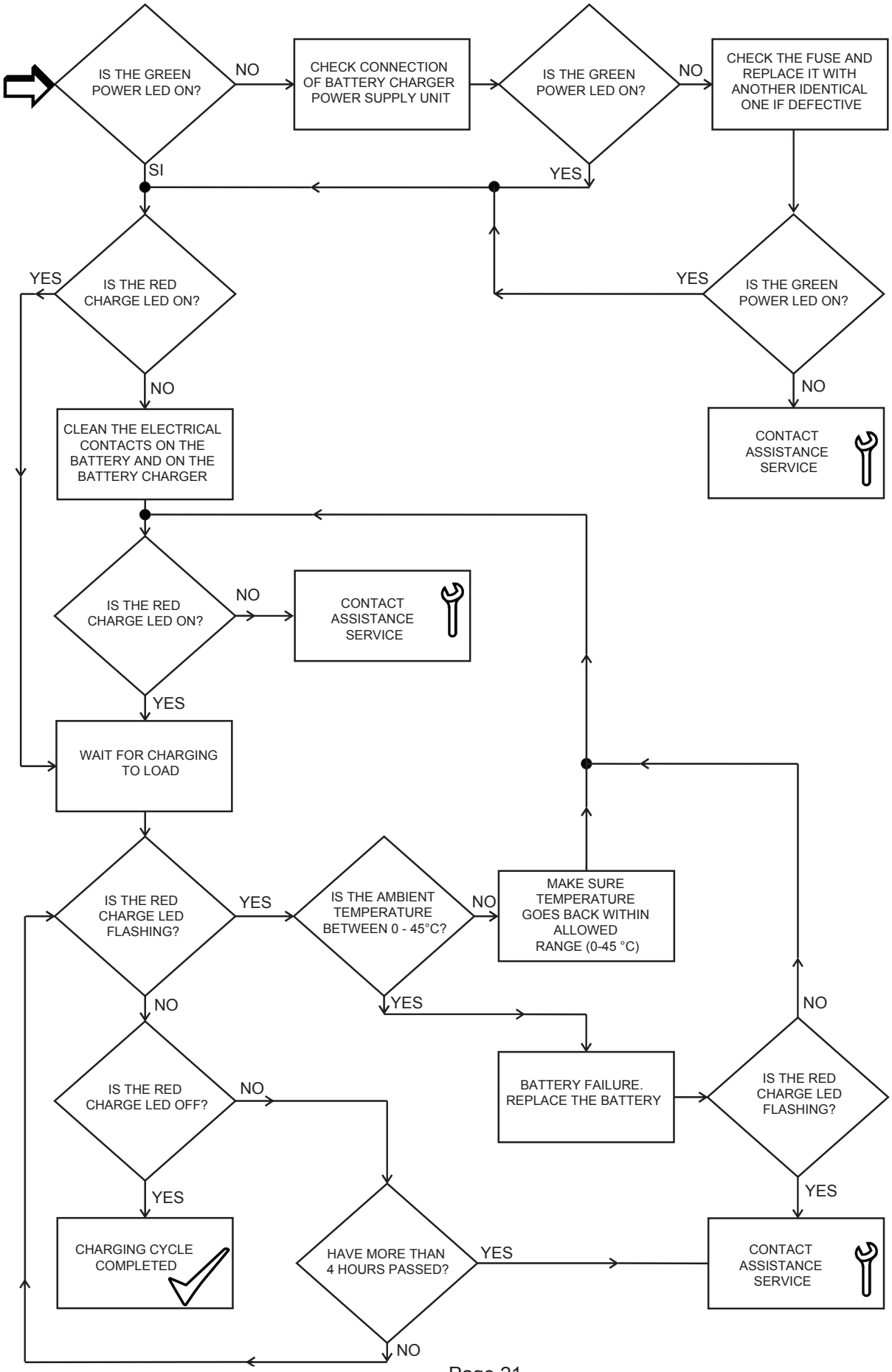
Follow the diagram below (starting from the top left corner) to solve or identify the problem.



NOTE:
If the radio remote control operates in a discontinuous manner, see section: REPEATED RADIO CONNECTION FAILURES in Paragraph 7.1.

7.4 CHARGING CYCLE FUNCTIONAL CONTROL

Follow the diagram below (starting from the top left corner) to solve or identify the problem.



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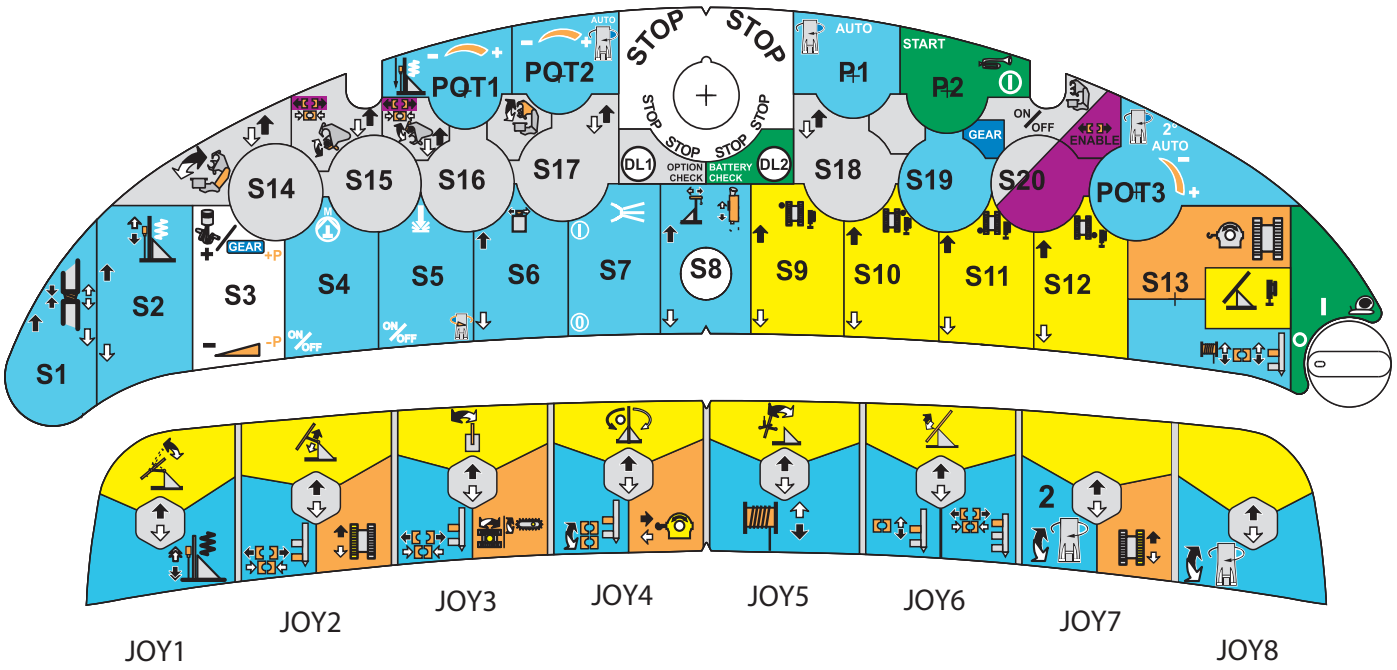
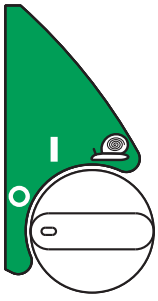
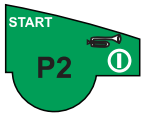
8. BRAVO-FUNK-915 RADIO REMOTE CONTROL TRANSMITTING UNIT



8.1 GENERAL INFORMATION

The BRAVO-FUNK-915 radio remote control system has been developed to ensure the best operating performance and has some special features outlined below.
The symbols illustrated in this document are indicative and may vary from one model to another. Refer to the specific documentation attached to the radio remote control.



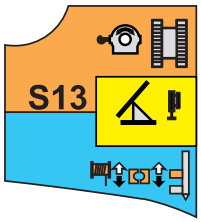


START PUSHBUTTON AND LED INDICATORS
P2 is the Start pushbutton that, if pressed with the key in position 1, activates the radio link with the receiver.

- *Display of correct operation:*
  Pressing the Start pushbutton, the LED DL2 will light with the colour sequence Orange for 0.5 seconds, Green for 1 second and then green flashing with a frequency of 1 flash per second

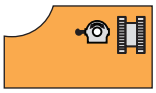
- *Display of Active Alarms Alert:*
  Pressing the Start pushbutton, the LED DL2 will light Orange for 1 second and then turns off. Keeping the Start pushbutton pressed, the display becomes Orange for 1 second and red until the Start command is released or the active command is excluded on the Start.
  Note: an active command is any selector or joystick out of the rest or Zero position or the mushroom Stop pushbutton when pressed.

- *"Slow" mode*
  Turning the keyswitch selector to "Slow" (At symbol), slows the outputs of Joy2, Joy3, Joy4, Joy7 in MOVEMENT mode only. The outputs have no variations in the other DRILLING and PLACING modes.



SELECTION OF THE OPERATING MODE

The selector S13 selects the operating mode of the machine:
Upon activation of the radio link with the receiver, this switch should be centrally positioned in the PLACING mode.

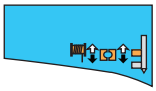


MOVEMENT

Only the functions shown on a White and Orange background are active in this operating mode. All others are deactivated.

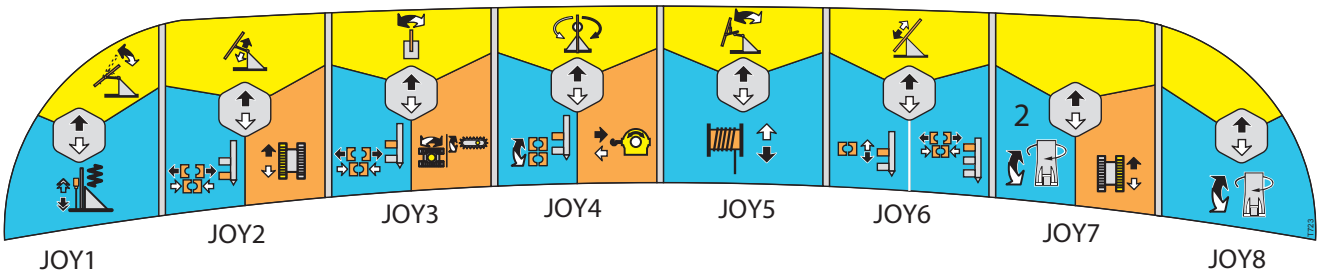
PLACING

Only the functions shown on a White and Yellow background are active in this operating mode. All others are deactivated.



DRILLING (WORK)

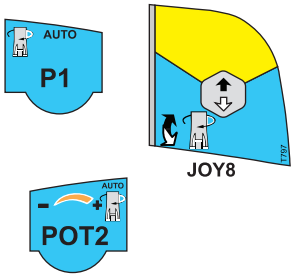
Only the functions shown on a White and Blue background are active in this operating mode. All others are deactivated. The activation of the working mode with selector S2 active, causes the error signal given by DL1 "Option Check" that flashes rapidly and all outputs off.



RELATIONSHIPS BETWEEN JOYSTICKS

Some Joysticks are placed in relation to each other and are:
JOY1-JOY5 can not perform both functions simultaneously and JOY1 has priority over JOY5
JOY5-JOY8 can not perform both functions simultaneously and JOY8 has priority over JOY5.
JOY6-JOY7 can not perform both functions simultaneously and JOY7 has priority over JOY6.

8.2 SPECIAL FUNCTIONS IN DRILLING MODE (WORK)

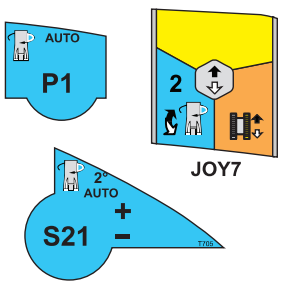


HEAD 1 AUTOMATIC ROTATION PUSHBUTTON

Pushbutton P1 together with the Joystick JOY8 allows the automatic rotation on the rotation of Head 1.

- *Activation sequence*:
  With JOY8 positioned out of zero, press pushbutton P1, release JOY8 and finally release P1. The automatic rotation is now active and it is possible to vary the rotation speed of Head1 by means of potentiometer POT2.

- *Deactivation sequence*:
  Move JOY8 in the out of zero position and the rotation control of Head 1 returns to the joystick. The automatic rotate function is switched off when exiting the drilling mode (work).



HEAD 2 AUTOMATIC ROTATION PUSHBUTTON

Pushbutton P1 together with the Joystick JOY7 allows the automatic rotation on the rotation of head 2.

- *Activation sequence:*
  With JOY7 positioned out of zero, activate pushbutton P1, release JOY7 and finally release P1. The automatic rotation is now active and it is possible to vary the rotation speed by means of selector S21. There are 8 predefined speed levels, with an impulse of S21 on + (upward) the speed increases and with - (downwards) decreases. When the radio remote control is switched off the selected speed value is stored and made available for the next work session.

- *Deactivation sequence*:
  Move JOY7 in the out of zero position and the rotation control of Head 2 returns to the joystick. The automatic rotate function is switched off when exiting the drilling mode (work).

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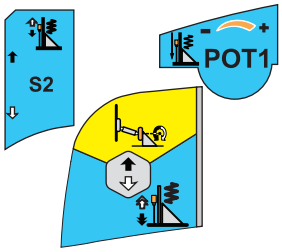
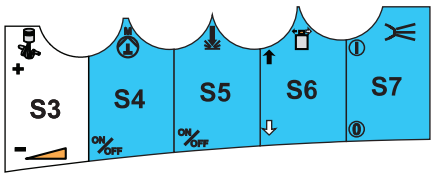


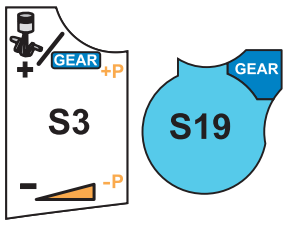
PULL, PUSH AND RAPID FUNCTION

The Push function is activated with selector S2 in the upward position. The adjustment of the thrust force is made using potentiometer POT1.
The Pull function is activated with selector S2 in the downward position and the pulling force is always the greatest in any position the potentiometer POT1 may be.
The selector S2 and Joystick JOY1 can be simultaneously activated to obtain the maximum movement speed of the head.
With JOY1 out of zero the push and pull force are always the maximum possible whatever the position of the potentiometer POT1.
The activation of the Drilling mode (work) with selector S2 active, causes the error signal given by DL1 "Option Check" that flashes rapidly and all outputs off. To restore the operation, set S2 in the center.



MAINTAINED FUNCTIONS

The functions on S4 and S5 (Pump and Percussion) are maintained functions (Push-Push) meaning that the first action activates and the second deactivates.
The maintained functions are disabled when the Drilling mode (work) is exited.

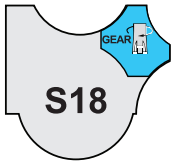


GEAR COMMAND

Keeping the selector S19 pushed forward and activating S3 at the same time enables the 'GEAR' command to change the gear of the head activating the two outputs GEAR1 and GEAR2 in the following sequence:

1	GEAR-1 - OFF	GEAR-2 - OFF
2	GEAR-1 - ON	GEAR-2 - OFF
3	GEAR-1 - OFF	GEAR-2 - ON

A forward action of S3 (GEAR+) passes to the next step;
A backward action of S3 (GEAR-) returns to the previous step.



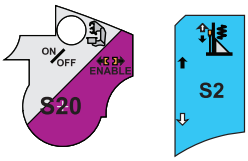
In certain configurations, the 'GEAR' command can be activated with selector S18 instead of selector S19.

With 'GEAR' active, all charger commands are blocked as well as S1, S2, S8.

"SLOW PERCUSSION" ADJUSTMENT

In some configurations there may be a potentiometer in the S19 position instead of the 'GEAR' selector, to adjust the 'SLOW PERCUSSION'.

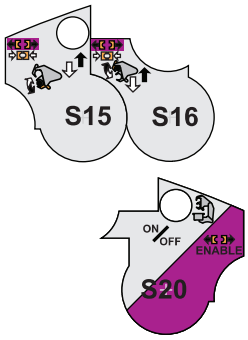
8.3 SPECIAL FUNCTIONS IN DRILLING MODE (WORK) WITH CHARGER



DRILLING MODE (WORK) WITH CHARGER

- *Activation of Charger mode:*
  The selector S20 pushed upwards activates the Charger mode. To activate this mode, the Drilling mode must be on (Work) and selector S2 in the central position.
  All functions on a Grey background can be activated in this mode; the GAS+/- (S3), S1 and S8 commands are never active at the same time as any other charger command.
  Display: the DL1 LED flashes slowly Yellow while DL2 flashes Green.

- *Charger mode deactivation:*
  An impulse on selector S20 or the activation of selector S2.
  Display: LED DL1 switches off.



CHARGER FUNCTIONS WITH SAFETY ENABLED

Selectors S15 and S16 open the clamp (selector pushed upwards) protected by safety enable command.

- *Clamp opening enabling activation:*
  To enable the opening of the clamp, keep S20 activated on Enable (selector pushed down).
  The clamp close command does not require the enable command.

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8.4 SPECIAL SAFETY AND MANAGEMENT FUNCTIONS

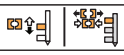
DISPLAY OF THE BATTERY CONDITION

The charge condition of the battery is displayed by LED DL2.
During normal use, when the keyswitch selector is brought into position 1, if the system does not encounter abnormal conditions, the Battery Check LED starts rapidly blinking green. When the Start command is pressed, the LED starts blinking slowly, to indicate that the system is working.
With the keyswitch in position 1, the system runs checks on the status of the Transmitter and, if it detects abnormal conditions, the following error statuses are displayed:
- Red Battery Check LED on for 2 seconds. The transmitting unit is not working properly or the procedure for the acquisition of the identification code has not been activated.
- Red Battery Check LED on for 1 second. The Stop pushbutton has been detected as being on or not working.
- Red Battery Check LED flashes 2 times. an ON/OFF command has been detected as being on.
- Red Battery Check LED flashes 3 times. the battery has been detected as being low.
- Red Battery Check LED flashes 4 times. a joystick has been detected as out of position zero.

Note. A sound signal is emitted when the red LED goes on.

During normal operation of the radio remote control, the red LED starts blinking when the battery is low and approximately only 10 minutes of run time are left.

10. CORRESPONDENCE OF FUNK UNIT FUNCTIONS FOR DRILLING MACHINE

SYMBOL	FUNCTION (ANALOGUE)	INDICATION ON THE JUNCTION BOARD
	Anl. Left Track	1. Anl. Cingolo SX
	Anl. Slewing ring / Oscillation Track	2. Anl. Ralla / Brandeggio
	Anl. Towing Winch	3. Anl. Verricello
	Anl. Right Track	4. Anl. Cingolo DX
	Anl. Rapid Feed	5. Anl. Avanzam. Rapido
	Anl. Lower Clamp	6. Anl. Morsa Inf.
	Anl. Upper Clamp	7. Anl. Morsa Sup.
	Anl. Unscrewing unit	8. Anl. Svitatore
	Anl. Winch	9. Anl. Argano
	Anl. Extractor carriage / 3^ Clamp	10. Anl. Carr. Estr. / 3^Morsa
	Anl. Rotary 1° head	11. Anl. Rotary
 2	Anl. Rotary 2° head	12. Anl. Rotary2
	Anl. Feed	13. Anl. Testa Spinta
	Anl. Mast Jambing	14. Anl. JOY1-POSIZ.
	Anl. Boom lifting	15. Anl. JOY2-POSIZ.
	Anl. Boom Oscillation	16. Anl. JOY3-POSIZ.
	Anl. Mast Rotation	17. Anl. JOY4-POSIZ.
	Anl. Mast Inclin.	18. Anl. JOY5-POSIZ.
	Anl. Mast Sliding	19. Anl. JOY6-POSIZ.
	Anl. Free-1	21. Anl. JOY7-POSIZ.
	Anl. Free-2	20. Anl. JOY8-POSIZ.

SYMBOL	FUNCTION (ON/OFF)	INDICATION ON THE JUNCTION BOARD
	Percussion On/Off	22. Percussione
	Normal Feed Up/Down	23. Avanzam.Testa
	Slidramatic Left/Right	24. Spostam.Testa
	In / Out Beak - Lower / Raise Cap	25. Becco / Cuffia
	Screw / Unscrew	26. Avvita / Svita
	Front LH Stab. Up/Down	27. Stabil.Ant.Sx
	Front RH Stab. Up/Down	28. Stabil.Ant.Dx
	Rear LH Stab. Up/Down	29. Stabil.Post.Sx
	Rear RH Stab. Up/Down	30. Stabil.Post.Dx
	Pump On / Off	Pompa
	RPM +/-	GAS +/-
	Gate Valve Open / Close	Saracinesca Apre / Chiude
	General EV	31. Ev. Gener.