

# Wireless Remote Control for marine engines



**Operator's manual & mounting instructions**

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## 1. The WRC system

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The installation of the 4500 WRC radio remote control doesn't modify in no way the existing control station functionality and layout. It offers you the further possibility to maneuver the boat moving freely, from bow to stern, increasing your field of vision if compared to the usual stationary control station.

The 4500 WRC allows you to easily perform delicate operations, such as mooring, maneuvering along the quay during refueling, or anchoring.

Through a simple hand-held transmitter, you can control the boat yourself, by evaluating the available spaces in the best possible way.

The enclosure made of shock-resistant plastic material withstands the most severe conditions of use, maintaining over time complete reliability and functionality.

Equipped with removable and rechargeable hermetic battery, the 4500 WRC remote control guarantees its operation even in harsh environmental conditions.

The radio remote control has a 32bit identification code, which makes an absolutely safe communication between transmitter and receiver, preventing commands coming from other TXs with different identification code. In the presence of interference, bad reception or interruption of the radio signal, the receiver automatically sets itself to a stop state, which involves the opening of the STOP circuit (**§9.2.7.3 EN 60204-32**).



The radio remote control is designed and built in compliance with European Directives and European Standards and it is suitable for creating a wireless control station which satisfies the highest levels of safety.



***The 4500 WIRELESS REMOTE CONTROL kit is composed by:***

- 1 Transmitter
- 1 Receiver,
- 2 Li-ion rechargeable battery packs
- 1 Power supply for the battery charger
- 1 Fast battery charger
- Wirings
- Wrist strap
- User manual

## 2. Symbols and conventions used in this manual

---



**Warning:** This symbol indicates instructions to be strictly followed for the correct functioning of the radio remote control.



**Danger:** This symbol indicates important information aiming to prevent dangerous situations when using the radio remote control.



**Note:** This symbol indicates useful suggestions for the proper use of the radio remote control.

	<b>Class II equipment</b> To identify equipment meeting the safety requirements specified for Class II equipment according to IEC 60536
	<b>Dangerous voltage</b> To indicate hazards arising from dangerous voltages.
	<b>Direct current</b> To indicate on the rating plate that the equipment is suitable for direct current; to identify relevant terminals
	<b>Alternating current</b> To indicate on the rating plate that the equipment is suitable for alternating current; to identify relevant terminals
	<b>Don't use high-pressure water</b> To indicate not to clean using high-pressure water jets
	<b>In house use</b> To indicate Indoor use only

### 3. Risk analysis

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**READ THE INSTRUCTIONS CAREFULLY BEFORE INSTALLING THE RADIO REMOTE CONTROL! FAILURE TO APPLY ANY OF THE PROCEDURES DESCRIBED IN THIS MANUAL MAY LEAD TO INJURIES TO PERSONS OR DAMAGES TO PROPERTY.**

**NO PART OF THE RADIO REMOTE CONTROL SHOULD BE USED AS A SPARE PART FOR OTHER RADIO REMOTE CONTROLS.**

Follow the local laws on safety and workplace accident prevention. All the regulations on using radio remote controls **MUST BE OBSERVED AT ALL TIMES.**

**Flexball assumes no responsibility for the unlawful use of the radio remote control.**



It is necessary to evaluate the risks in order to establish the safety and health safeguard requisites concerning the use of the radio remote control. A risk analysis must be carried out when deciding whether an application can be radio controlled or not. It should be carried out by qualified personnel **(the installer)**, who assumes all the relevant responsibilities.

**Flexball assumes no responsibility for failure to carry out a proper risk analysis.**



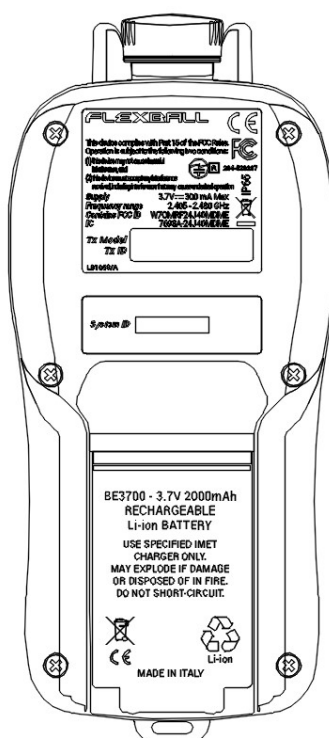
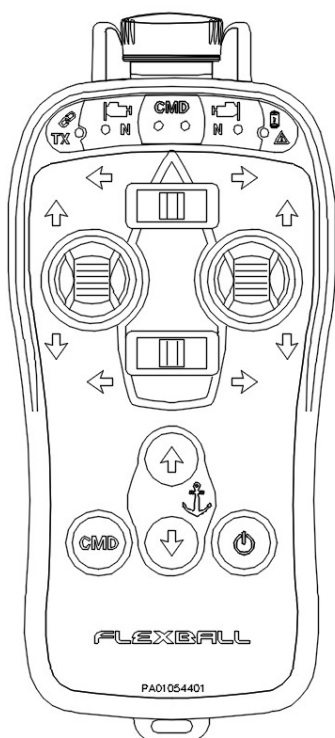
An eventual loss of communication between the transmitter and the receiver, caused by disturbances or electromagnetic interferences, shall automatically block the radio command (**§ 9.2.7.3 EN 60204-32**), thus implying a restart of the machine. The casual shutdown should be foreseen in the risk analysis.



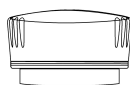
## 4. Pilot's instructions, how to use the Wireless Remote Control

### 1.1. Quick guide for the use of the radio remote control

- 1) Check always that the levers are in the neutral position
- 2) Check if the receiver is powered with the green POWER LED, the red LEDs STOP A and STOP B are lit up
- 3) Insert a charged battery into the battery compartment




- 4) Check that the STOP button is not pressed



- 5) Press and release the START button



- 6) The green led TX  flashes slowly until the transmitter catch the receiver



- 7) Once established the communication with the receiver, the green led TX start flashing

- 8) Press and release again the START button , the green led TX lights steadily and then you can send commands to the receiver



- 9) To enable the motor control on the radio remote control push and release the CMD button, the red LEDs CMD lit up and you can activate the propeller, the motors and anchor commands



- 10) By pressing the STOP button the receiver stops and all the remote commands are disabled



- 11) Once you have depressed the STOP button, if you want to activate again the radio remote control, repeat the operations from point 4 to point 8

For a correct use of the radio control, it is necessary to comply with some rules, essential for safety at work, described below.

## 1.2. Rules to be respected for safety



The use of the radio remote control is allowed to competent operators, who are fully aware of the operation of the same and equipped with a nautical license.

**Use the transmitter only on board the boat. Maneuvers are forbidden from the dock because the abandonment of the boat is a crime that can be prosecuted by law.**

Keep the radio control out of reach of children.

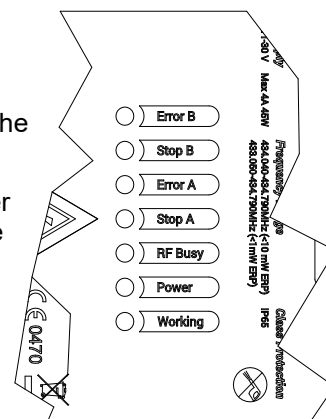


During periods of inactivity, the 4500 WRC must be switched off and **the battery must be removed from the transmitter**, to prevent its use by unauthorized persons.

## 1.3. Ignition of engines

### Check Always that the levers are in the neutral position

- Turn on the boat's engines and execute the call command in the event of multiple control locations
- Power up the receiver and wait for 2 seconds until the receiver performs the safety check tests. If the test was successful, the red LEDs "Stop A, Stop B" and the green LED "Power" remain lit fixed.



## 1.4. Power supply and start-up the radio remote control Initial conditions

- receiver unit switched off and powered
- Insert a charged battery into the transmitter

- Check that the STOP mushroom button is not pressed and there are no other active commands
- Switch on the transmitter by pressing the START button for about 1 second and wait to be established the link between the transmitter and the receiver (GREEN LED TX on the transmitter flashing rapidly and the WHITE LED “RF Busy” lights up on the receiver).
- Activate the START command for about 1 second. The green LED TX lits on the transmitter and the acoustic buzzer sounds to indicate correct operation
- Press the CMD command to enable the motor command from the radio remote control
- From this moment on, the boat can be controlled by radio control in situations of:
  - Mooring
  - Control from the bow when navigating in small spaces or in the presence of shallow water
  - Anchor
  - English mooring or docking to the quay for refuelling
  - Hooking / unhooking from the buoy

and in all situations where the fixed control station does not allow to have the best view for safety reasons the controls are active only with the second speed

### 1.5. **STOP function**

Press the STOP button: this action disables the 4500 WRC



If the CMD command was previously active on the radio remote control, the boat command must be resumed from the desired fixed control station.

To restore the operation it's necessary to re-arm the STOP button and proceed as in the previous paragraph

### 1.6. **Turning off the remote control**

There are two ways to turn the remote control off:

- Press the red mushroom button; after 3 seconds the remote control will turn off
- Remove the battery

The transmitter will turn off, the safety circuits will open and all active commands will be disabled. The transmitting unit also turns off when the battery runs down completely.

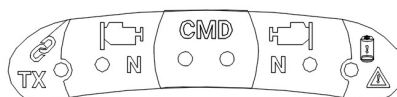
### 1.7. **Auto power-off (Time-out)**

The transmitter unit switches off automatically if a command is not activated for at least 15 minutes. The auto-off function can be excluded upon explicit request and responsibility of the user.

### 1.8. **Transmitter indicator LEDs**

The transmitter is equipped, among others, with 2 LEDs that provide the following information:

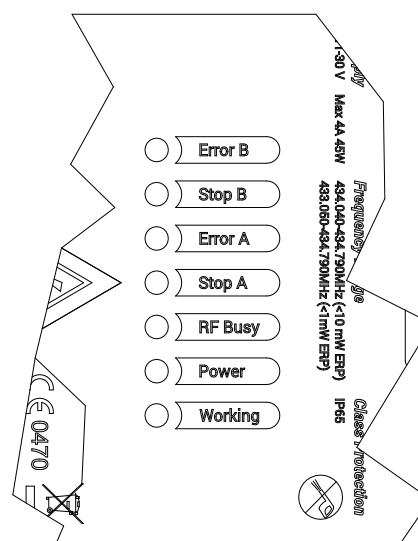
- Operating status
- Operating malfunctions
- Type of malfunction
- Battery exhausted



<b>Transmitting Unit Indication</b>	
<b>TX LED Status ( GREEN )</b>	
<b>Off</b>	<i>Transmitter off or damaged (see § 8)</i>
<b>Blinking</b>	<i>Radio link established. Not running:(Stop)</i>
<b>On</b>	<i>Radio link established between receiver and transmitter</i>
<b>Led Status (YELLOW)</b>	
<b>Battery out of charge</b>	<i>Two close blinks followed by 20s pause</i>

The receiver is equipped with 7 LEDs that signal

- Operation status
- Malfunctions
- Diagnostic functions and type of faults
- Power supplies status
- Link status



<b>Receiving Unit</b>	
<b>LED</b>	<b>Indication</b>
<b>Error B (Red/Green LED)</b>	Normally OFF during running mode. Red/Green error sequence while Channel B is in fault status
<b>Stop B (Red/Green LED)</b>	Green: while running. Red: system B channel is in STOP status.
<b>Error A (Red/Green LED)</b>	Normally OFF during running mode. Red/Green error sequence while Channel A is in fault Status.
<b>Stop A (Red/Green LED)</b>	Green: while running. Red: system B channel is in STOP status.
<b>RF Busy (White LED)</b>	ON if the link between remote control and receiver is established. Its intensity is proportional to the received signal's intensity. If cable connected, the RF Busy LED blinks at a fixed rate.
<b>Power Supply (Green LED)</b>	On if POWER is ON .
<b>Working (Blue LED)</b>	ON if radio link between receiver and remote control is established and the necessary power supply is present for the correct functioning.

## 5. The Wireless Remote Control (WRC)

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The Radio hand held command, here referred also as the Transmitter, is available in 4 different configurations:



### WRC 3F

- PORT ENGINE
- STARBOARD ENGINE
- BOW THRUSTER



### WRC 4F

- PORT ENGINE
- STARBOARD ENGINE
- BOW THRUSTER
- STERN THRUSTER



### WRC 5F

- PORT ENGINE
- STARBOARD ENGINE
- BOW THRUSTER
- ANCHOR WINCH



### WRC 6F

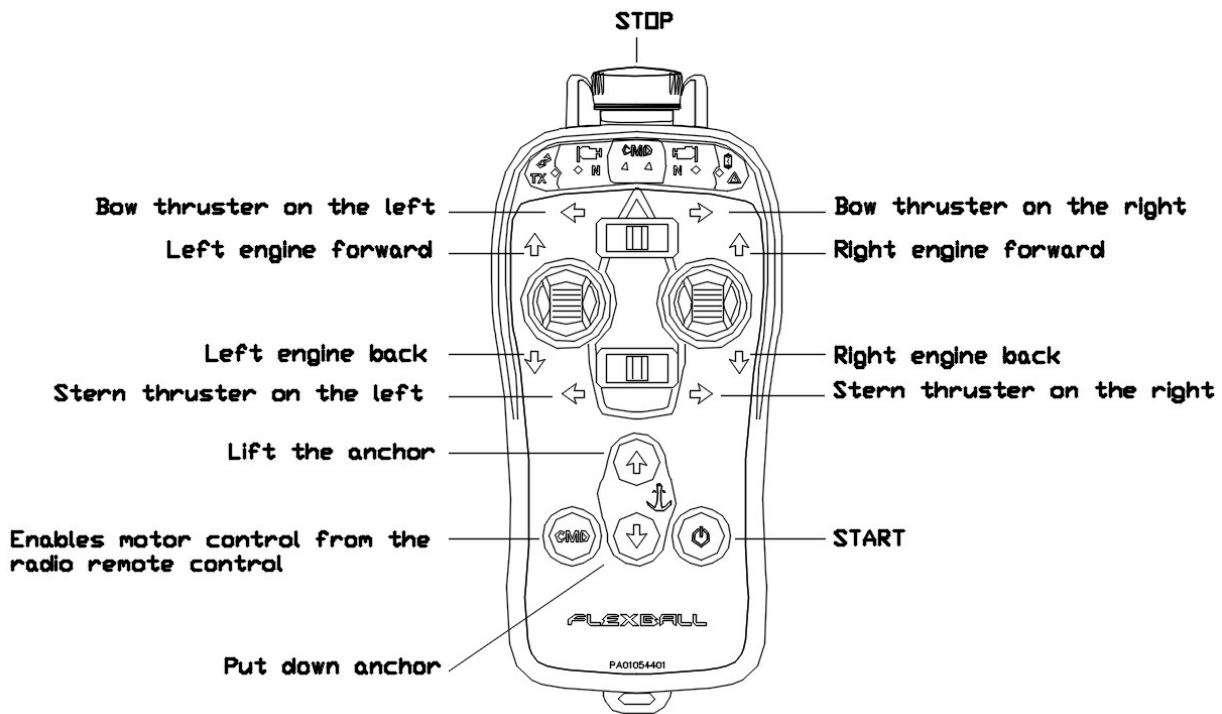
- PORT ENGINE
- STARBOARD ENGINE
- BOW THRUSTER
- STERN THRUSTER
- ANCHOR WINCH

There is only one Receiver which interfaces with these 4 different kind of devices.

In case of single engine installation, both left and right joysticks gear are active to engage the gear.

Technical specification of the Receiver is described in chapter 12.

## 5.1. Description of the transmitter commands



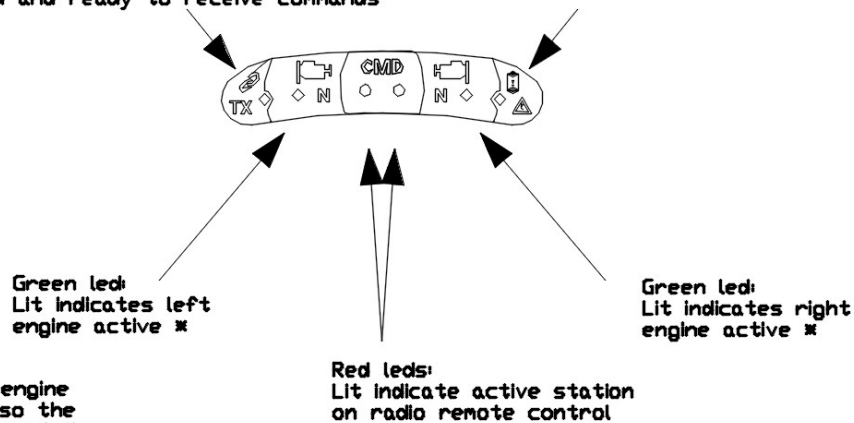
## 5.2. Description of the transmitter LED lights

### Green led:

- 1) after the first START flashing slow when the transmitter search the receiver.
- 2) Caught the receiver flashing fast during the waiting of the second START.
- 3) After the second START if lit indicates that the receiver is hooked and ready to receive commands

### Yellow led:

- 1) Flashes regularly with low battery
- 2) Flashes irregularly when it indicates an error code



### Note:

- \* In the single engine systems lit also the reciprocal green led

## 6. The Receiving Station



We recommend following the instructions below, in order to set up a properly operating radio remote control system. The radio remote control should be installed by qualified personnel only.

In case the vessel is built in wood, the receiving unit can be installed either under/in the dashboard or on the fly bridge.

In case the vessel is built in metal (e.g. ferry boat) follow the instruction here below.

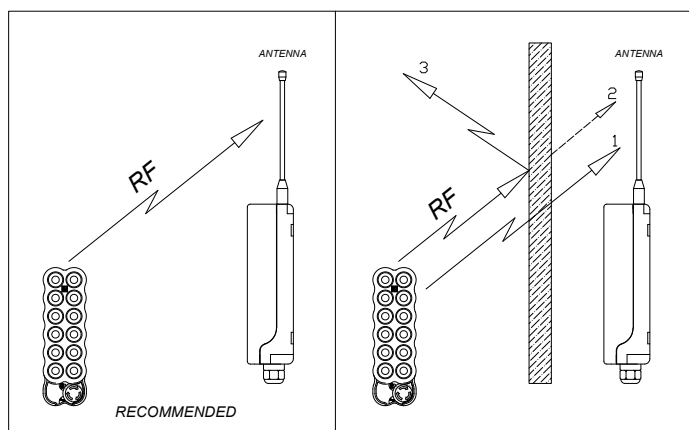
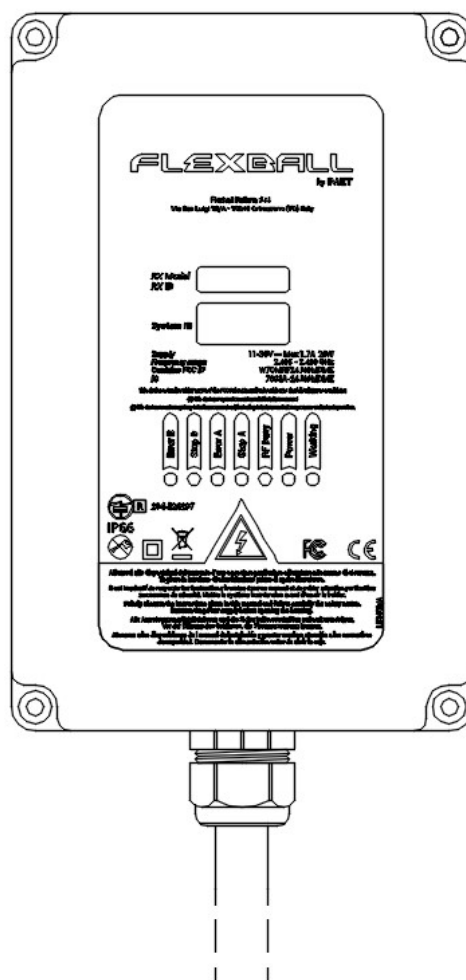
Install the receiving with no electromagnetic shielding. Do not install the unit on metal surfaces, if possible.

Do not bypass the machine's safety systems; follow the manufacturer's instructions.

Do not install the receiving unit too high above the ground (more than 10÷20 meters). At these heights the unit may receive local radio signals that could disturb transmitting operations.

**To prevent water infiltrations, install the receiving unit vertically, with the cable clamps and any other connections at the bottom, as shown in the figure.**

In case of strong mechanical vibrations, place a rubber shock-absorber between the machine and the receiver (dampers).



The technical drawing shows the front and side views of the FlexBall by M&E device. The front view is a square panel with a width of 162 mm and a height of 153 mm. It features four mounting holes at the corners and a central label area. The label contains the following information:

- FLEXBALL** by M&E
- Flexball Baller A.L.
- Via dei Ligi 10A - 10123 Ginevra (CH) Italy
- RCC Model: [ ]  
RCC ID: [ ]
- Option ID: [ ]
- Supply: 11-20V ~ max 1.2A 50Hz  
Power consumption: 5Watt - 1.4VA @ 230V  
Complies FCC ID: W769FSJAHM2ME  
ID: T0820-AJAHM2ME
- Warning symbols: Fire, Shock, High Voltage, etc.
- Certification marks: IP66, CE, RoHS, etc.

The side view shows a depth of 64 mm.



**The connection of the Receiver Unit must be done according to one of the electrical scheme reported in the following chapters . It is mandatory to switch the Receiver Unit at the same time with the Actuators.**

The wire connections between the receiving unit and the machine should respect the Standard EN60204 and must be stranded. The wires must have a cross-section of at least 0.75 mm<sup>2</sup> and less than 13 mm<sup>2</sup> and be self-extinguishing. If the equipment is used with ambient temperature of 70°C the maximum conductor operating temperature must be greater than 75°C.

4500 WRC - Wireless Remote Control





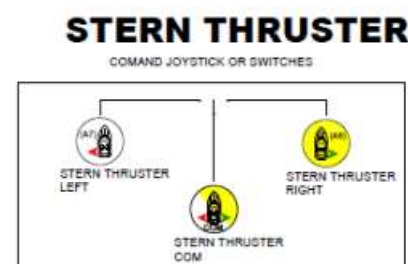
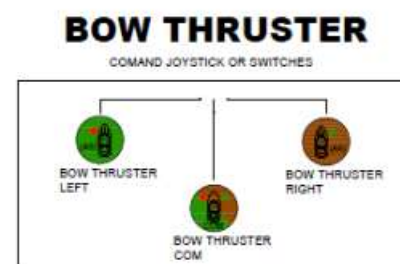
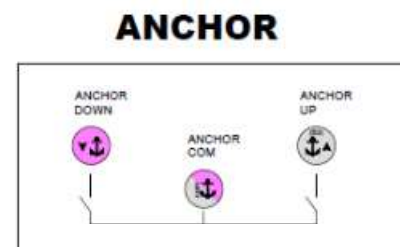
After installing, test the radio remote control make sure it works as expected. In addition, it is very important to make sure that the STOP circuit works properly. Pressing the STOP button during normal operation should immediately disengage the gearboxes and at the same time it should disable all the other the functions of the Wireless Remote Control including thrusters and anchor.

### 6.3. Signals outgoing the Receiver

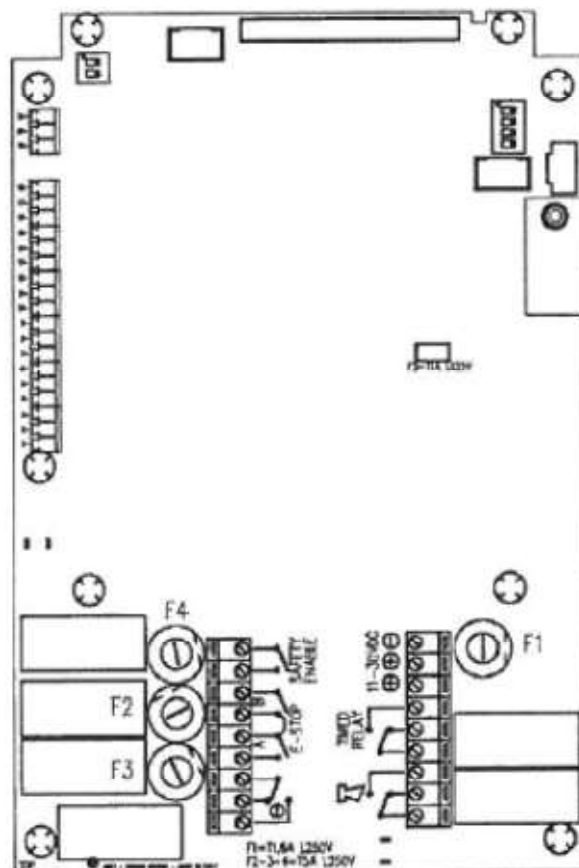
Once the Transmitter has acquired the control of the whole 4500 electronic system (Command LEDs lighted), the Receiver transmits via CANBus to the Actuator(s) the command(s) to engage or disengage the gears through the 12 pin Deutsch connector, all the commands for thrusters and the anchor.

Thrusters and the anchor are outputs are generated by relays with maximum current output of 5 Amp. Each group of function is protected by a 5 Amp fuse:

- Fuse F1: general PCB power supply
- Fuse F2: bow thrusters
- Fuse F3: stern thrusters
- Fuse F4: anchor



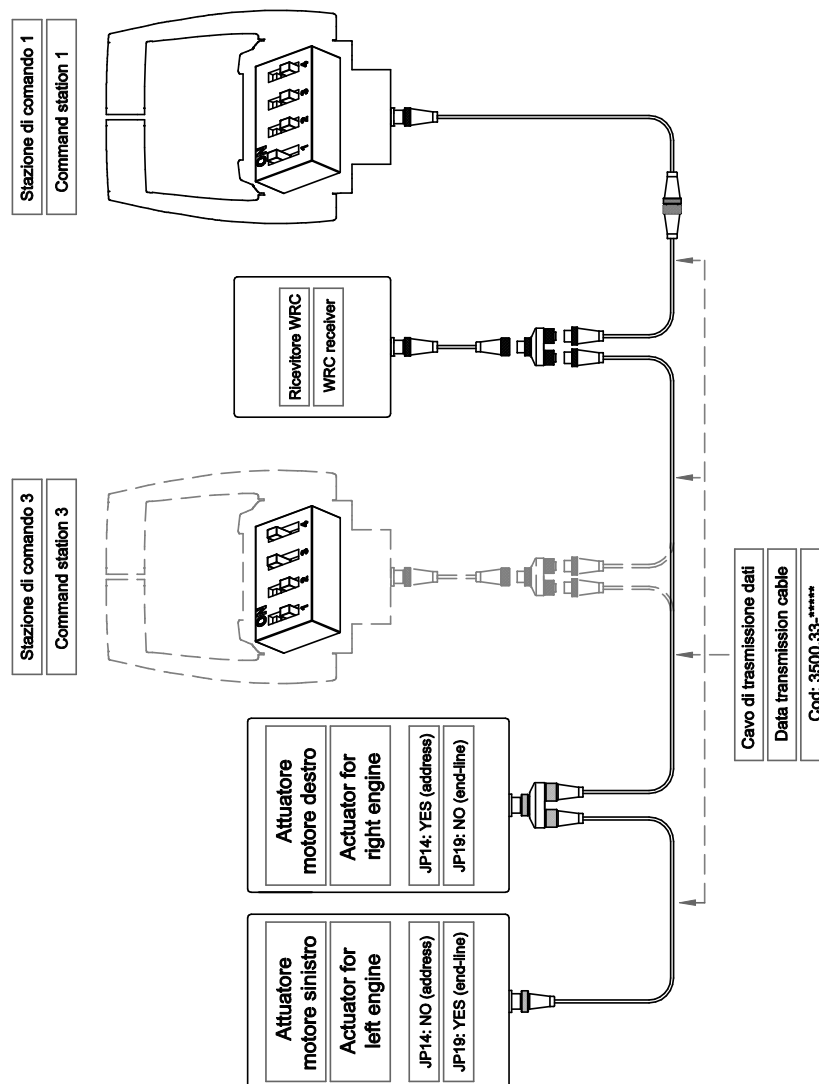
In case of replacement of a blown fuse, refer to the here below scheme.



## 7. Configuration of the CANbus network

The WRC is fully integrated in the 4500 electronic system and communicates with the other devices via CANBus. How to make the installation depends from the quantity, type of engines and gearboxes and number of command stations. In the following installation schemes, which cover the most common application cases, you find how to connect each device to the CANBus network. In the schemes is reported only the Receiver of the WRC because it is the only one part connected to the CANBus network. The WRC Receiver is always configured with address 2 (second station).

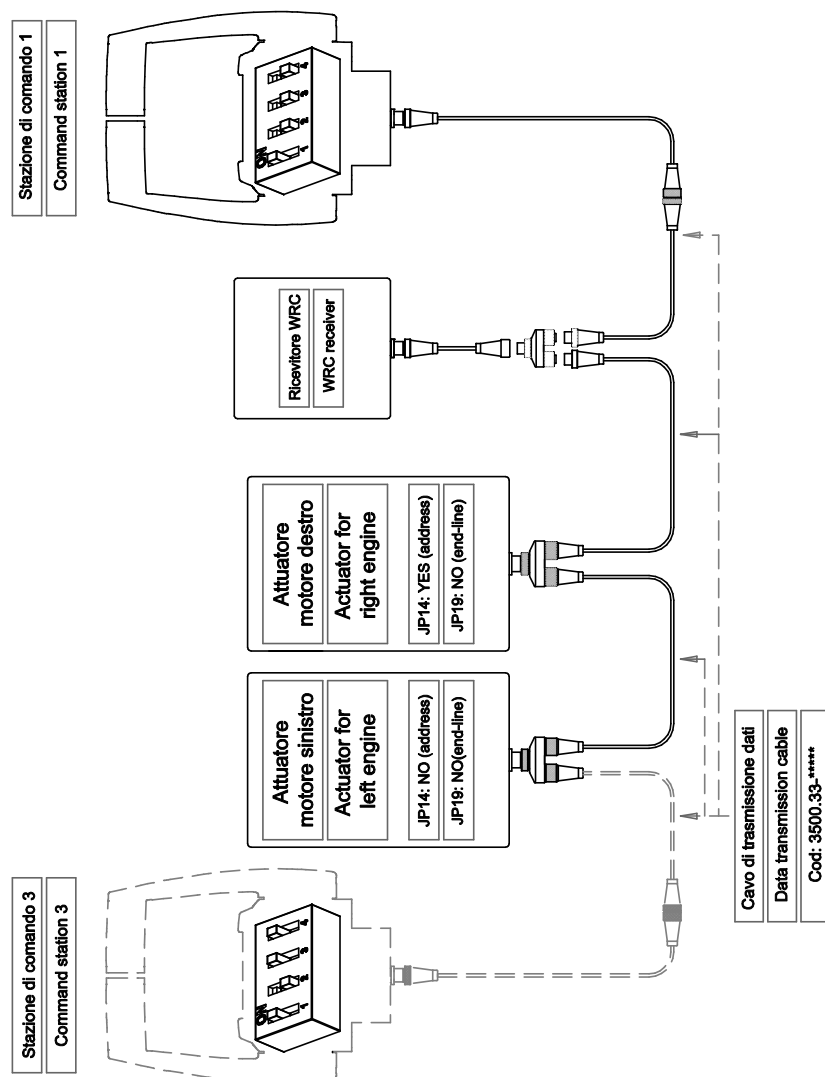
### 7.1. Installation with 2 mechanical actuators – solution A



This installation scheme is valid for systems with:

- WRC with up to 2 command stations and 2 engines with mechanical throttle, mechanical gearbox, with/without trim;
- WRC with up to 2 command stations and 2 hybrid engines with mechanical throttle, mechanical gearbox, analogue outputs for electric engine inverter driven, with/without trim.

## 7.2. Installation with 2 mechanical actuators – solution B

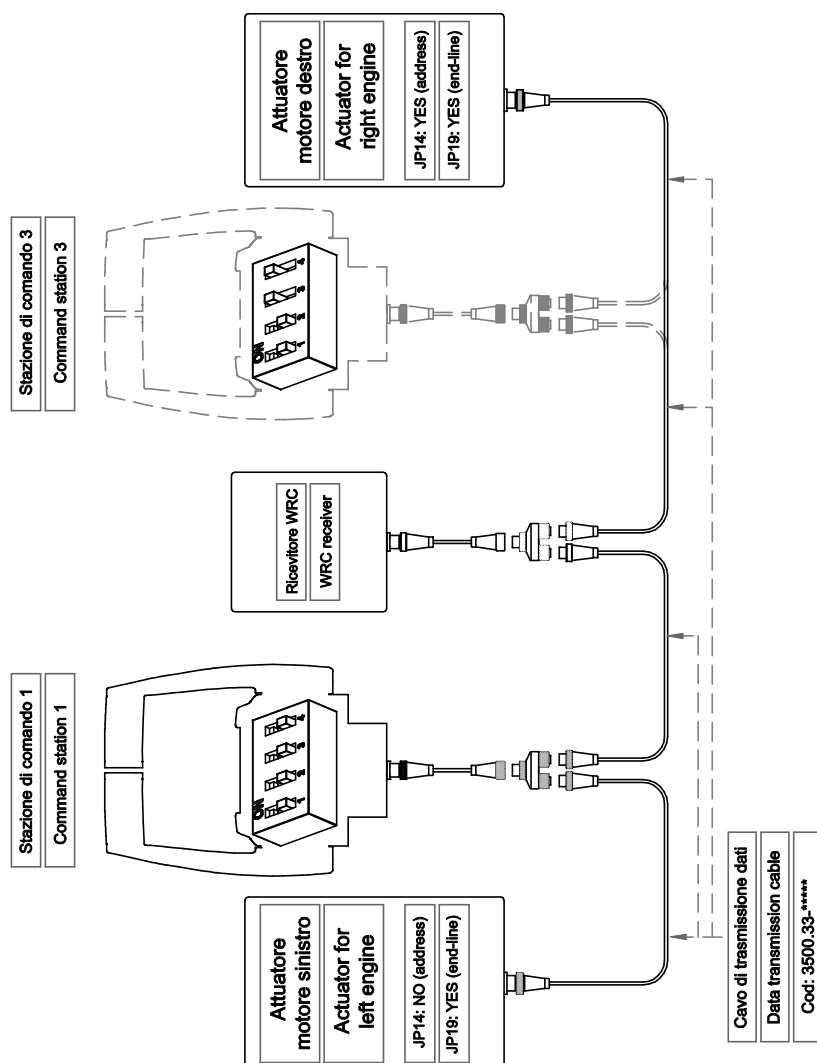


This installation scheme is valid for systems with:

- WRC with up to 2 command stations and 2 engines with mechanical throttle, mechanical gearbox, with/without trim;
- WRC with up to 2 command stations and 2 hybrid engines with mechanical throttle, mechanical gearbox, analogue outputs for electric engine inverter driven, with/without trim.
- **In case the installation is without the 3° station (it is the station highlighted in grey), you must activate the end of line termination and therefore set on the actuator JP19 = ON.**

## 7.3. Installation with 2 mechanical actuators – solution C

Actuators are placed at the ends of the CANBus network

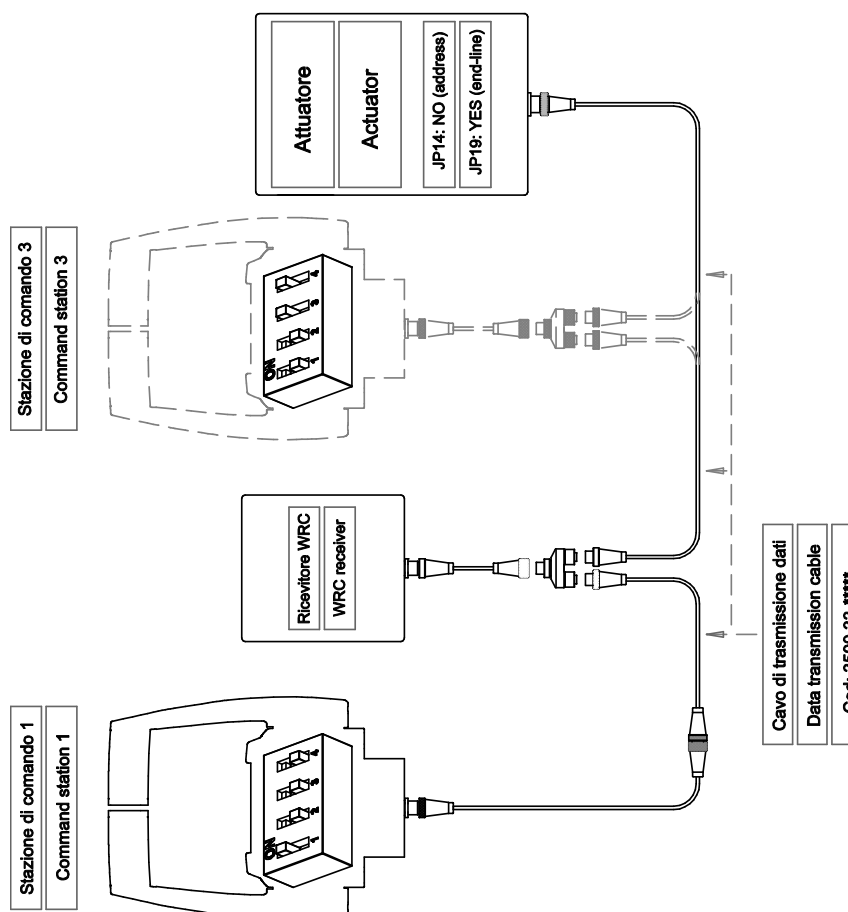


This installation scheme, typical for catamaran applications, is valid for systems with:

- WRC with up to 2 command stations and 2 engines with mechanical throttle, mechanical gearbox, with/without trim;
- WRC with up to 2 command stations and 2 hybrid engines with mechanical throttle, mechanical gearbox, analogue outputs for electric engine inverter driven, with/without trim.

## 7.4. Installation with 1 actuator – solution D

The actuator is placed at one end of the CANBus network.

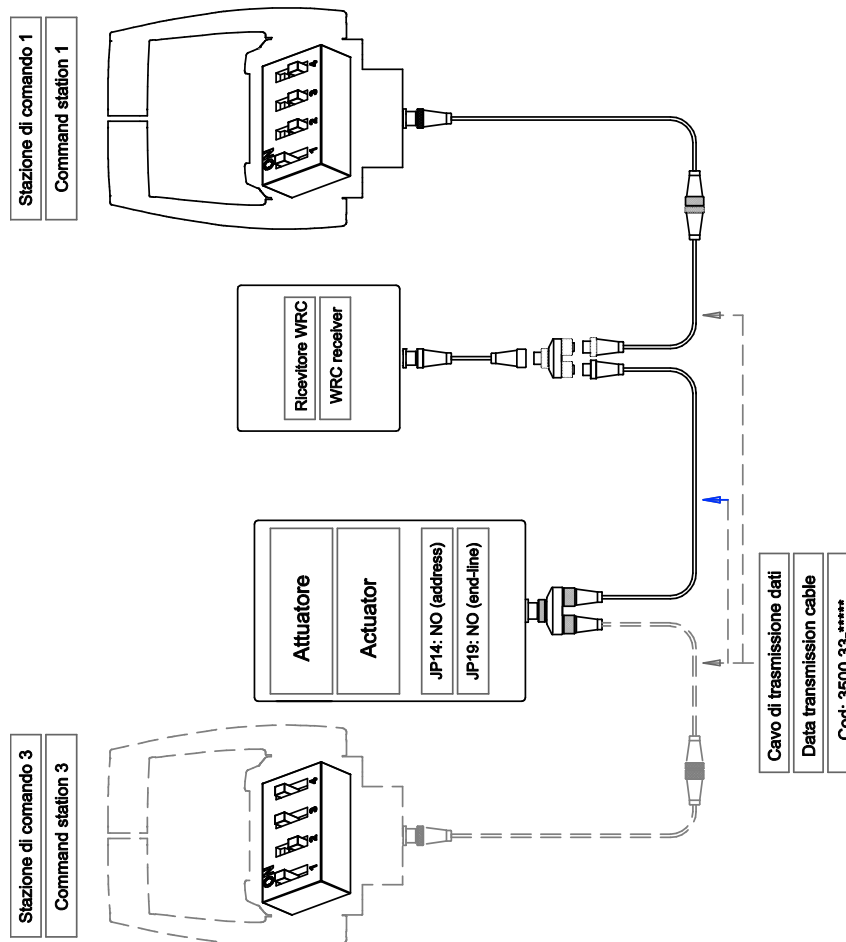


This installation scheme is valid for systems with:

- WRC with up to 2 command stations and 1 engine with mechanical throttle, mechanical gearbox, with/without trim (or flap);
- WRC with up to 2 command stations and 1 hybrid engine with mechanical throttle, mechanical gearbox, analogue outputs for electric engine inverter driven, with/without (or flap);
- WRC with up to 2 command stations with 1 or 2 mechanical throttles and 1 or 2 solenoid gearboxes, analogue outputs for electric engine inverter driven, with/without (or flap);
- WRC with up to 2 command stations and 1 or 2 engines with electronic throttle (voltage or CANBus), mechanical gearbox, with/without trim (or flap);
- WRC with up to 2 command stations and 1 or 2 engines with electronic throttle (voltage or CANBus), solenoid driven gearbox, with/without trim (or flap);
- WRC with up to 2 command stations and 1 or 2 hybrid engines with electronic throttle (voltage or CANBus), mechanical gearbox, analogue outputs for electric engine inverter driven, with/without trim (or flap);
- WRC with up to 2 command stations and 1 or 2 hybrid engines with electronic throttle (voltage or CANBus), solenoid driven gearbox, analogue outputs for electric engine inverter driven, with/without trim (or flap).

## 7.5. Installation with 1 actuator – solution E

The actuator is placed in the middle of the CANBus line.



This installation scheme is valid for systems with:

- WRC with up to 2 command stations and 1 engine with mechanical throttle, mechanical gearbox, with/without trim (or flap);
- WRC with up to 2 command stations and 1 hybrid engine with mechanical throttle, mechanical gearbox, analogue outputs for electric engine inverter driven, with/without (or flap);
- WRC with up to 2 command stations with 1 or 2 mechanical throttles and 1 or 2 solenoid gearboxes, analogue outputs for electric engine inverter driven, with/without (or flap);
- WRC with up to 2 command stations and 1 or 2 engines with electronic throttle (voltage or CANBus), mechanical gearbox, with/without trim (or flap);
- WRC with up to 2 command stations and 1 or 2 engines with electronic throttle (voltage or CANBus), solenoid driven gearbox, with/without trim (or flap);
- WRC with up to 2 command stations and 1 or 2 hybrid engines with electronic throttle (voltage or CANBus), mechanical gearbox, analogue outputs for electric engine inverter driven, with/without trim (or flap);
- WRC with up to 2 command stations and 1 or 2 hybrid engines with electronic throttle (voltage or CANBus), solenoid driven gearbox, analogue outputs for electric engine inverter driven, with/without trim (or flap).
- **In case the installation is without the 3° station (it is the station highlighted in grey), you must activate the end of line termination and therefore set on the actuator JP19 = ON.**

## 8. Electrical installation

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**System's components involved:** Receiver of the WRC, actuator, all the electrical cables

For “Flexball 4500 series electronic control system” installation, please refer to the “4500 Operating manual & mounting instructions” supplied with the system.

### 8.1. General guidelines

The following rules guidelines must be always followed, independently on the type of system configuration selected:

- CAN Bus network architecture must be the one depicted in previous chapter. Connect the CAN Bus M12 T Splitter to its counterpart on the Receiver (blue circle).
- Supply the Receiver using these two wires (Brown = positive, Blue = 0V; depicted in the red circle). Use a voltage source with a common reference (0V) with the power supply of the “Flexball 4500 series electronic control system”.
- **Actuators and WRC Receiver must be powered ON and OFF together, electrical circuit must be configured accordingly.**

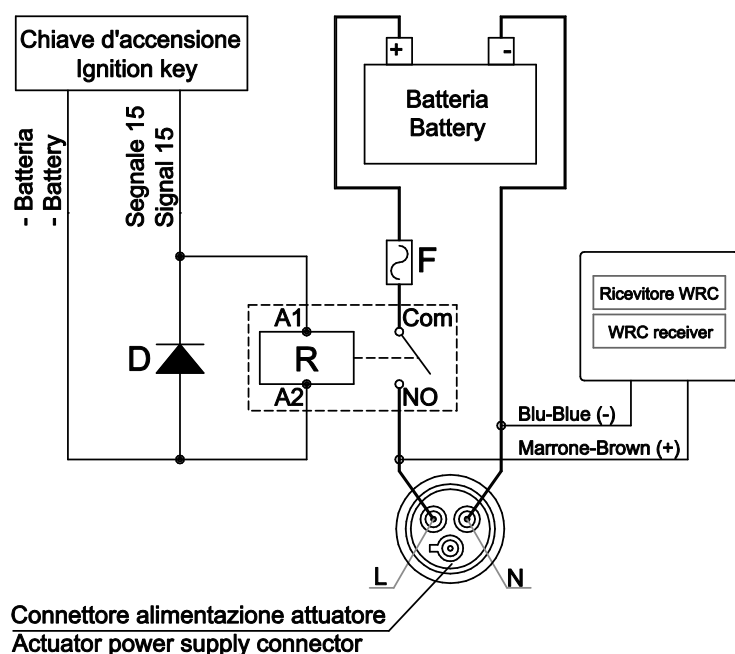


## 8.2. Wiring from the battery to the actuator (input cables)

For detailed information about the wiring of the actuators, refer to chapter 10 of the “4500 Operating manual & mounting instructions” supplied with the system.

### 8.2.1. Electrical installation of systems with 1 engine, 1 actuator and 1 ignition key

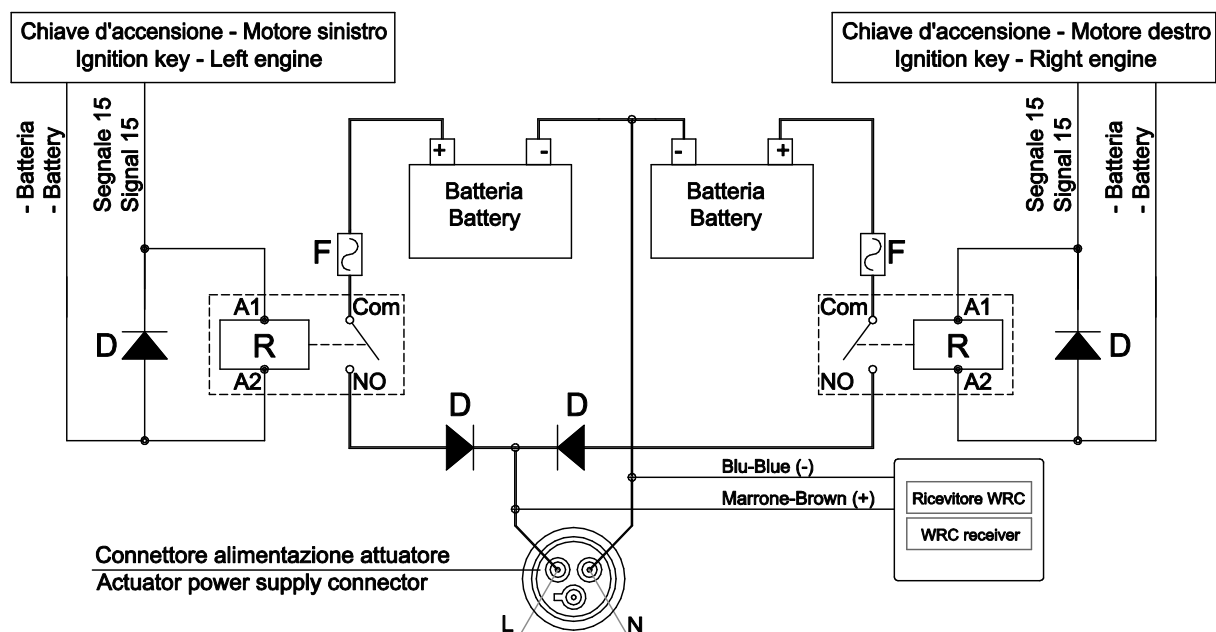
It follows the electrical schemes to be used to make the connection to power supply, including rated values of the electrical components.



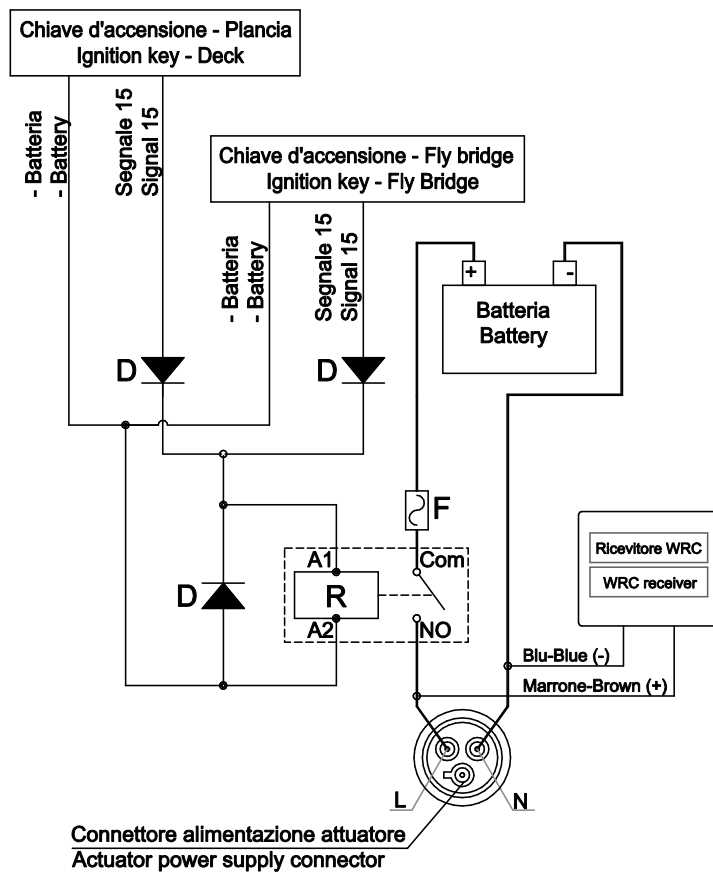
<i>Ref.</i>	<i>Description</i>	<i>12 V power supply</i>	<i>24 V power supply</i>
<i>D</i>	<i>Diode</i>	<i>10 A, 20 V</i>	<i>5 A, 24 V</i>
<i>R</i>	<i>Relay</i>	<i>10 A, 12 V</i>	<i>5 A, 24 V</i>
<i>F</i>	<i>Fuse</i>	<i>10 A</i>	
<i>15</i>	<i>Terminal 15 is the signal coming from the ignition key block. When the ignition key is on its first detent, signal 15 is active.</i>		
	<i>Supply cable cross section</i>	<i>2,5 mm<sup>2</sup></i>	<i>1,5 mm<sup>2</sup></i>



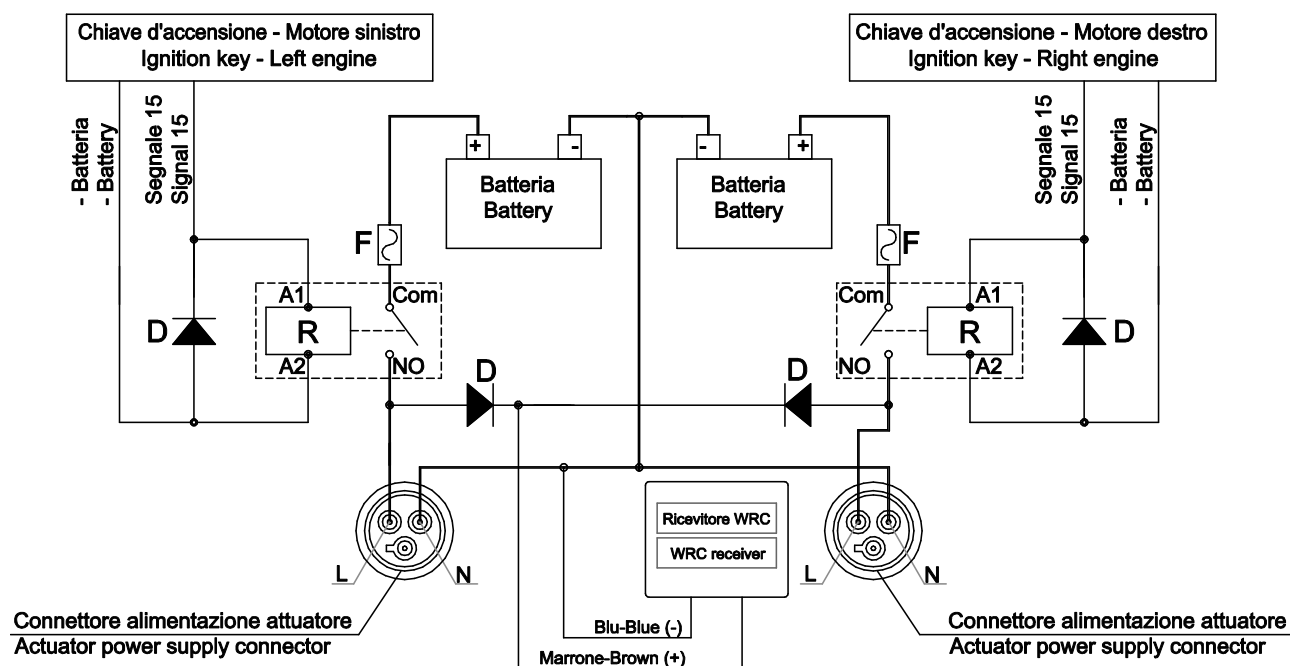
## 8.2.2. Electrical installation of systems with 2 engines, 1 actuator and 2 ignition keys



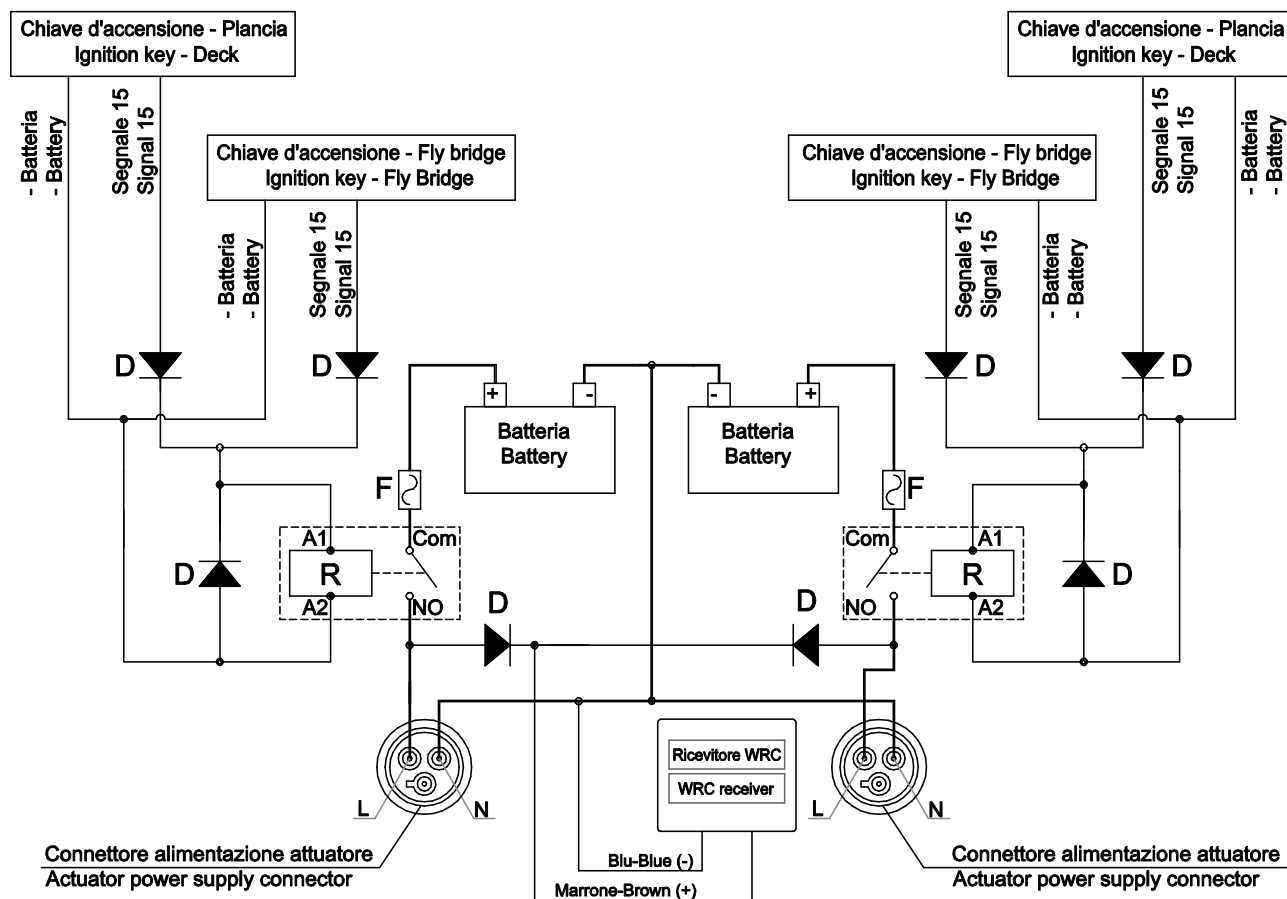
### 8.2.3. Electrical installation systems with 1 engine, 1 actuator and 2 ignition keys.



## 8.2.4. Electrical installation of systems with 2 engines, 2 actuators and 2 ignition keys



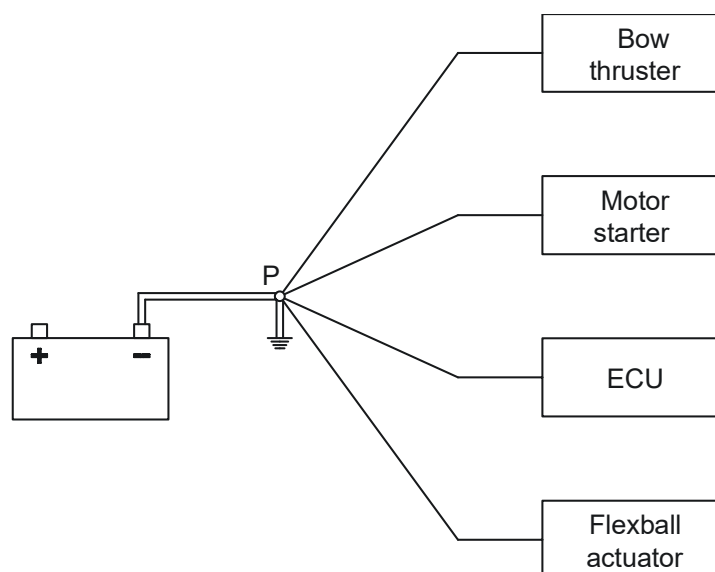
### 8.2.5. *Electrical installation of systems with 2 engines, 2 actuators and 2+2 ignition keys*



### 8.2.6. Dimensional criteria of the power supply cables

For supply cabling respect the following conditions:

- Cables from the battery to engine starter (both positive and negative poles) must have a minimum cross section of  $50 \text{ mm}^2$ , if it is not specified a higher cross section by the engine supplier.
- The GND of the actuator must be connected directly to the negative pole of the battery. Minimum cross section is  $2,5 \text{ mm}^2$ .
- In case electronic throttle, it is very important to connect to a common GND point (either GND buss bar or common bonding conductor or hull) all the negative poles of each electronic device.



## 9. The Radio Frequency Transmission

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### FCC-Regulatory Information (2,4 GHz radio module)

This equipment has been tested and found to comply with the limits for a digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada. Operation is subjected 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**



#### **WARNING:**

**Changes or modifications made to this equipment not expressly approved by FLEXBALL may void the FCC authorization to operate this equipment.**

#### **RF EXPOSURE NOTICE:**

The radiated output power of this device is below the FCC radio frequency exposure limits. Nevertheless, the transmitters shall be used in such a manner that the potential for human contact during normal operation is minimized.

Based on evaluation of either the Specific Absorption Rate (SAR) according to the standard FCC KDB 447498 D01, the Industry Canada RSS-102 and EN 50566, EN 62209-2, using the transmitter with its carrying belt guarantees the compliance with RF exposure boundaries.

In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the receivers with integrated antenna, or from its external antenna, shall not be less than 20 cm (8 inches) during normal operation.

### Changing the operating frequency



If any specific setting has not been made, the radio selects a frequency channel assigned by AFA mode (Automatic Frequency Agility). This mode allows the radio channel change as a result of disturbances detected due to other radio devices operating on the same frequency. There may be cases in which it is preferable to disable the AFA mode, by operating on a fixed channel selected by the operator, doing the procedure described below. In AFA mode, the receiver continuously monitors the frequency band in which it operates and, if the transmission channel becomes too disturbed, the system decides to “move” to the best available channel.



To verify the presence of disturbances, simply turn-off the transmitter and check the “RF-Link” LED on the receiver: if it stays on, it means that other devices are using the same frequency. If disturbances occur during operation, the receiver LEDs “Error\_A” and Error\_B” will turn off to each reception error detected.

Reception errors lasting more than passive emergency preset from 0.5 to 2 seconds, will put the receiver on passive emergency (see § 11.2).

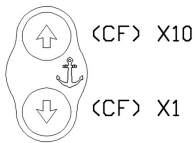
### 9.1. Initial conditions for the frequency change

Make sure the transmitter battery is charged; make sure the receiver is powered and bring the transmitter as close as possible to the receiver.

### 9.2. Frequency change procedure



Turn on the radio remote control, thus establishing the radio link (the green and blue LEDs on the TX side are blinking and the RF-link LED on the RX side is ON). Press the two frequency change controls (CF) at the same time (see Annex T for identification) and press and release the START button ①. The yellow LED on the transmitter will flash at 1s periods and a BUZZER tone will sound.



Release the two controls (CF): the system turns to AFA mode automatically.

Select “automatic” Mode: Press the START button ① or, to abort the operation, disconnect the battery pack or, if present, rotate the key selector.

**Select “manual” mode:** to set one of the possible channels, use (CF) X10 command for the tens and (CF) X1 command for the units. Press the START button ① to memorize the set channel. To abort the operation, disconnect the battery pack or, if present, rotate the key selector counter clockwise. Memorizing a channel exceeding 30 (or channel 69 if RF power is limited to 1mW, or 16 if the radio module is 2,4 GHz) make the system restart in automatic mode.

At the end of the procedure wait for about 5 seconds: the transmitter and the receiver store the data of the new mode. On the receiver side you will see the ERROR\_A and ERROR\_B (yellow) LEDs flash briefly: this means the frequency change procedure is being executed.

Press START ① to begin the sequence of commands. If it does not occur, it means the procedure was not correctly executed. Turn off all devices and repeat the entire procedure from the beginning.

### 9.3. Available frequencies (2,4 GHz radio module)

<b>Available Frequencies(16 channels DSSS) ERC REC 70-03</b>		
<b>FLEXBALL CHANNEL</b>	<b>ERC 70-03 CHANNEL</b>	<b>FREQUENCY</b>
01	11	2405 MHz
02	12	2410 MHz
03	13	2415 MHz
04	14	2420 MHz
05	15	2425 MHz
06	16	2430 MHz
07	17	2435 MHz
08	18	2440 MHz
09	19	2445 MHz
10	20	2450 MHz
11	21	2455 MHz
12	22	2460 MHz
13	23	2465 MHz
14	24	2470 MHz
15	25	2475 MHz
16	26	2480 MHz



FLEXBALL radio remote controls comply with the specifications ERC/REC 70-03 Annex1 Band I, Annex 3 Sub-band a. The national authorities for telecommunications may impose further restrictions or require use permits in the single countries. All member states allow their free use.

We recommend that you become acquainted with the local laws before using the radio remote control. More information can be found on the following website: <http://www.erodocdb.dk/>



## 10. Battery

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### Battery charge

#### 10.1. *Transmitting unit power supply*

Radio remote controls with portable transmitters are supplied with two rechargeable Ni-Mh batteries and a dedicated battery charger.

#### 10.2. *Battery status of charge*

The battery's status of charge is shown by the YELLOW LED on the transmitting unit.

A YELLOW LED OFF means the battery is charged.

A flashing YELLOW LED means the battery is low. Turn off the transmitting unit and change the battery. The LED begins to flash when the battery has power left for approximately 10 to 15 minutes.

**Note:** The yellow LED flashes with the specific sequences during special setup procedures and in the case of system failure.

A low battery charge can also be indicated by an intermittent acoustic warning by connecting a horn to the corresponding relay output on the receiver, which in this case, closes for 1 second every 8 seconds.

#### 10.3. *Changing and charging the battery*

Shut-off the transmitter unit, remove battery from its housing and insert it into the battery charger.

In order to guarantee better battery duration and efficiency, it is better to use the charge until it drains completely.

The battery chargers CB37LION for Lipo and Li-ion cells are equipped with a green LED that indicates that power is present and a blue LED that, after inserted the battery, if the voltage residual is below 4.2V, remains on until charging is complete.

The battery charger is capable of detecting residual charge and battery capacity. The average charge time for a battery that has been properly discharged is about 3 hours, depending on the residual charge and cell capacity. The charge cycle ends when the blue LED shuts off.

The battery charger is designed for indoor use: do not expose it to the elements. To preserve battery life, recharge the battery in a dry place and at a temperature between 0°C and 45°C (values recommended by Li-ion cells manufacturers).

**Warning: Explosion hazard if non-compatible batteries are used! Use the constructor's batteries only. See §. 14 for information on the disposal of exhausted batteries.**

#### 10.4. *Preventive maintenance*

**Before performing any maintenance operation, turn off the power to both, the receiving unit and the machine, and remove the battery from the transmitter.**

- Do not expose to heat sources
- Avoid prolonged exposure to direct sunlight
- Do not wash the device with water under pressure or dip it in water

- Avoid contact with oil or solvents
- If the device has been opened for any reason, make sure all the seals and gaskets are in place when closing
- When cleaning it, do not use alcohol or solvents, as they might damage the components and the housing.

### **10.5. Routine maintenance to be carried out by the operator**



Periodically clean the outside of the receiving and transmitting units. Dirt deposits could hinder the functioning of buttons, toggle switches and manipulators.

Apply special care to the STOP button, by keeping it clean and making sure it works effortless.

Remove any traces of rust from the battery contacts.

Check the casing and the components for cracks or apparent damages.

All rubber parts, buttons, seals and gaskets should show no sign of tearing.

Damaged components should be immediately replaced to prevent humidity or dirt from penetrating and jeopardizing the safe operation of the radio remote control.

### **10.6. Maintenance and internal checks**



After every year of use, we recommend carrying out a general inspection of the radio remote control (to be performed by qualified personnel).

Open the housings of the transmitting and receiving units and make sure:

- that the gaskets are in good shape
- that the cable clamps are efficient
- that the connection terminal screws and the connector couplings are tight
- that the electronic boards are securely fastened
- that the fastening screws of all components are tight

Although IP65 units are hermetically sealed, dust and humidity may accumulate over time when working in particular conditions. Carefully remove dust, powder and any unrelated element.



When closing the transmitting unit, apply special care to the casing's sealing, in order to prevent the infiltration of humidity.

Power on the device, being careful not to touch any live parts in the receiving unit, and perform the following tests:

- Check the functioning of all the controls.
- Verify that the STOP circuit intervenes correctly. By pressing the STOP button during operation, the relay contacts A and B of the E-STOP circuit must open.
- Any broken parts must be replaced with original spare parts, in order to keep the characteristics of the radio remote control unchanged. See the list of parts that can be replaced in §12.

## 11. Troubleshooting

This chapter contains advices on handling radio remote control malfunctions.



First of all, make sure that the problem actually depends on the remote control. To do so, operate the machine using the wired remote control instead of the radio remote control. The test is valid provided that the same controls are tested and that the radio remote control and the wired remote control use the same connector.



**Any tampering of the radio remote control or its components will automatically void the manufacturer's warranty.**

All repairs should be performed by qualified, authorized personnel and follow the manufacturer's instructions.

Use original spare parts when making replacements, in order to preserve the original features of the radio remote control (see the list of replaceable parts in § 13).

Radio Remote Control	
Problem	Possible Remedies
Limited operating range	<ul style="list-style-type: none"><li>• Check the antenna and move it to a new location if necessary (see §. 6)</li><li>• Check the Data Error EC-A and EC_B LEDs and if the system is not in AFA mode, change the frequency (see §. 9)</li></ul>
Transmitting Unit	
Problem	Possible Remedies
Transmitting unit does not turn on	<ul style="list-style-type: none"><li>• Check battery charge</li><li>• Make sure no commands are in the working position when you press START</li><li>• Make sure the STOP button is not pressed</li></ul>
At start-up the LED lights-up only while you press the Start button	<ul style="list-style-type: none"><li>• Check the contacts in the STOP button</li></ul>
Receiving Unit	
Problem	Possible Remedies
Receiver does not turn on	<ul style="list-style-type: none"><li>• Check the protection fuses</li><li>• Check the power cables</li></ul>
Receiver turns on but does not activate the application and the green LEDs are on	<ul style="list-style-type: none"><li>• On the receiver, check the fuse in series with the STOP relay and the control relay</li><li>• Check the wiring between the receiver and the application</li></ul>
Receiver turns on but does not activate the application and the red LEDs are on	<ul style="list-style-type: none"><li>• Check the radio remote control's operating range</li><li>• Make sure the device is not in passive emergency; if so, change the frequency</li></ul>
Certain commands are not executed	<ul style="list-style-type: none"><li>• Check the wiring between the receiver and the application</li></ul>
Battery Charger unit	
Problem	Possible Remedies
The green LED does not turn on	<ul style="list-style-type: none"><li>• Check the power cable</li><li>• Check the battery fuse</li></ul>
Charging lasts only a few minutes	<ul style="list-style-type: none"><li>• Battery is already charged</li><li>• Clean the contacts with a humid cloth</li></ul>
Battery charger remains in pre-charging phase indefinitely	<ul style="list-style-type: none"><li>• Battery has completed its life cycle</li><li>• Clean the contacts with a humid cloth</li></ul>

### 11.1. *Passive Emergency*



Passive emergency is a safety status that the system assumes automatically when it autonomously detects a malfunction (§9.2.7.3 EN 60204-32), mostly due to a loss of the communication between the receiver and the transmitter. Within a pre-set time of between 0.5 to 2 seconds (depending on the analysis risks) the systems try to re-establish the communication. The causes of the loss of communication generally are:

- Strong disturbances on the transmission channel or a significant attenuation of the RF signal caused by an obstacle.
- Excessive distance between transmitter and receiver (out of range).

The receiver enters automatically into the passive emergency mode, opens the E-STOP circuit and disables all the commands. In AFA mode, the radio remote control searches a free RF channel with which to establish a valid link, within the predetermined timeout from 0.5 to 2 seconds.

### 11.2. *Technical Assistance*

In case of malfunctions in the radio remote control that are not addressed in this manual, contact exclusively a Service Center authorized by the manufacturer.

Call the closest center or the dealer where the device was purchased and provide clearly the following information:

- The radio remote control model
- Serial number
- Defect encountered
- Date of purchase
- Description and history of the problem, status of the receiver and transmitter LEDs during malfunction

Keep this manual and the warranty certificate (filled-in in every part) in a safe place.

## 12. Technical specifications

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### 12.1. Radio transmission specification: CE, FCC, IC, ARIB radio module (2,4 GHz)

Frequency band	<b>I.S.M. Band 2400-2483.5 MHz</b>
Operating frequency	<b>2405- 2480 MHz</b>
Modulation	<b>O-QPSK</b>
MAC protocol	<b>IEEE 802.15.4</b>
Emission designation	<b>2M21F1D</b>
Number of programmable channels	<b>16 (DSSS)</b>
RF emission power	<b>&lt;100 mW</b>
Range	<b>~100 m (@100 mW)</b>
Channel selection	<b>By the operator</b>
Channeling	<b>5 MHz</b>
Modality of data transmission	<b>Half duplex</b>
Hamming distance	<b>≥ 8</b>
Error control	<b>32 bitCRC</b>
Error non-detection probability	<b>&lt;1.832 x 10<sup>-11</sup> (T.B.V.)</b>
Available pairing addresses	<b>131072</b>
Operating temperature range of L type receivers	<b>-25°C to +60 °C (-13°F to +140°F )</b>
Operating temperature range of transmitters	<b>-25°C to +55 °C (-13°F to +131°F )</b>
Storage temperature range	<b>-40°C to +85°C (-40°F to +185 °F)</b>
Marking	<b>CE, FCC, IC, ARIB</b>

NOTE<sup>(1)</sup>

**ISM Band** stands for Industrial, Scientific and Medical Band

### 12.2. Transmitter

Power supply	<b>3,7 VDC</b>
Current absorption	<b>80 mA (300 mA with back light on)</b>
Battery	<b>Li-Ion 3,7V</b>
Battery autonomy	<b>~25 hours (@ 20°C)</b>
Low Battery notification time	<b>15 minutes</b>
Operating temperature range	<b>-25°C a +55 °C (-13°F a +131°F )</b>
Storage temperature range	<b>-40°C a +85°C (-40°F a +185 °F)</b>
Transmitters housing material	<b>UL94 HB</b>
Casing protection degree	<b>IP65</b>
Dimensions	<b>157x8x44 mm (A.P.L.)</b>
Weight (battery included)	<b>340 g</b>

### 12.3. Receiver

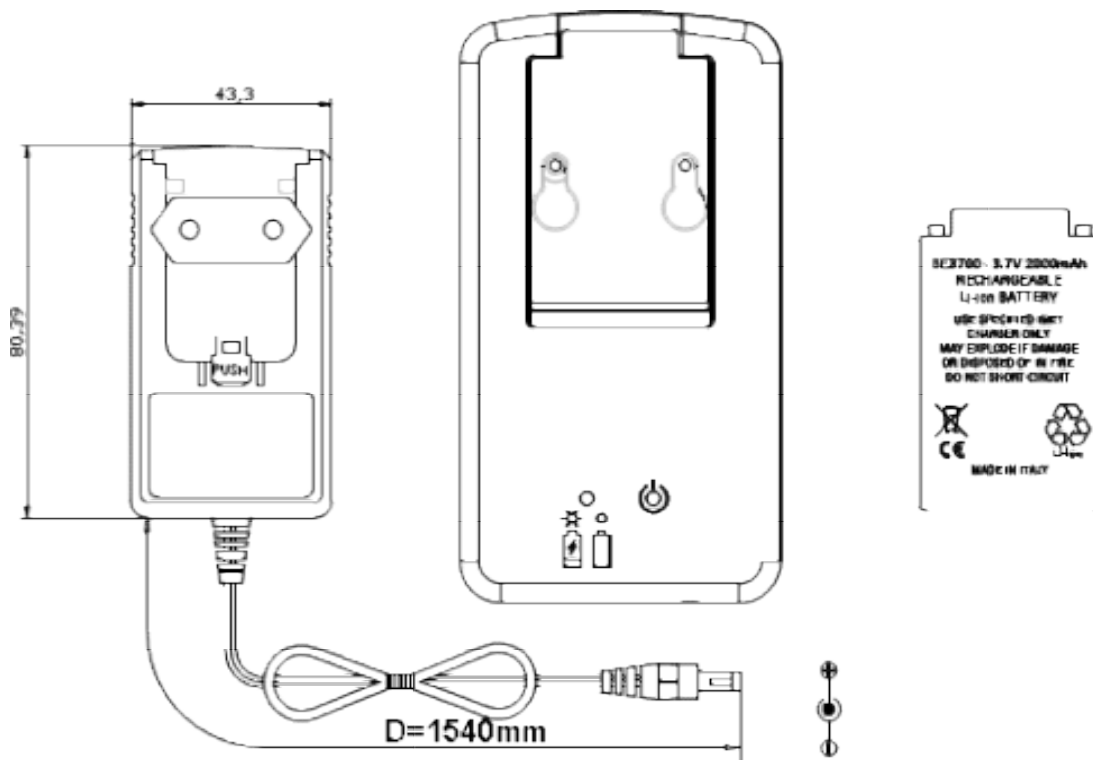
Radio module specs: see §12.1 and §12.2

Antenna	<b>Internal /(External as an option)</b>
Receiver power_up delay	<b>&lt;2,5 s</b>
Start command delay	<b>&lt;120 ms</b>
Command response time	<b>&lt;120 ms</b>
Active Stop time	<b>&lt;120 ms</b>
Passive Stop time	<b>500ms ≤ t ≤ 2000 ms<sup>(1)</sup></b>
HORN output	<b>1</b>
Power supply voltage	<b>11 - 30 Vdc</b>
Absorbed power	<b>22W Max</b>
Maximum absorption	<b>≅ 2A max @11Vdc</b>
Operating temperature range	<b>-25°C to +60°C (-13°F to +140 °F)</b>
Storage temperature range	<b>-40°C to +85°C (-40°F to +185 °F)</b>

Housing material  
 Casing protection degree  
 Dimensions  
 Weight (standard configuration)  
 Mounting brackets minimum load  
 Output relay (thrusters and anchor)

UL94 V0 5VA, UL 746C (f1)  
 IP66  
 140x65x230 mm(L.W.H.)  
 $\approx 1,700$  Kg  
 $\geq 100N$   
 5 Amp DC

#### 12.4. CB37LION battery charger



Power supply voltage  
 Power demand  
 Charging current  
 FLEXBALL battery (BE3700)  
 Max. charging time  
 Type of charge  
 Operating temperature during charge  
 Storage temperature (charger off and without battery)  
 Case material  
 Casing protection degree  
 Dimensions  
 Weight (power supply not included)

12-24 Vdc (min 11Vdc – max 30Vdc)  
 0.3A 3.3 W (during charge)  
 $\approx 540$  mA  
 Lipo 3.7V 2.0 Ah  
 2.45 hours  
 TTDM (JEITA range)  
 0°C to +45°C (+32°F to +113 °F)  
 -40°C to +85°C (-40°F to +185 °F)  
 UL94 V0, UL746C (f1)  
 IP20  
 70x25x130 mm(L.W.H.)  
 110g

**Note:** A Battery Charger kit comes with an external EU power plug (option US, UK or AUS on request).As option, a 6-feet AUTO POWER CORD can be delivered.

## 13. WRC spare part list

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### Transmitting units and battery charger

Description	Item code
Battery charger CB37LION	CR039
Battery BE3700 Lipo 2.00 Ah	AS087

### Receiver

Description	Item code	Remarks
F1 fuse 5x20 T 4A L250V	FS041	RX L DC(PCB100)
F2 fuse 5x20 T 5A L250V	FS005	RX L DC(PCB100)
F3 fuse 5x20 T 5A L250V	FS005	RX L DC(PCB100)
F4 fuse 5x20 T 5A L250V	FS005	RX L DC(PCB100)

## 14. Disposal

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Once no longer in use, the radio remote control should be handed over to the local waste disposal service.



The symbol of the crossed-out waste container on the device means that it must be handled separately from normal waste. The owner is responsible for handing over scrapped equipment to the designated points of collection for the recycling of electric or electronic waste material.



Waste separation contributes to protecting the environment and facilitates recycling.

Exhausted batteries should be disposed of at the specific points of collection, as required by law.

Illegal disposal of the product is punished (in Italy) by the penalties indicated in the Legislative Decree no. 22/1997 (Art. 50 and subs.) implementing the European Directive 2002/96/CE.