RADIO CONTROL SYSTEM

Instruction Manual

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I Intended use

The radio control system is equipment for wireless machine control. It consists of a transmitter and a receiver. The equipment is available in two voltage options . i.e. 230VAC and 24-48VAC.

The receiver operates at radio waves for transferring machine instructions, which catches all commands to be executed by a machine. If the radio transmission is interrupted, incorrect or false, the receiver will automatically stop the entire system.

Please read this instruction manual and be sure to follow its recommendations.

II Technical data

1. Joint parameters

- Operating frequency ..... ……ISM 434MHz
- Number of channels..... ……...63
- Transmission power..... ……10mW
- Typical range ..... ……..50m*
- Maximum range..... ……..80m/150m**
- Degree of protection IP ..... ……...65

2. Transmitter

- Supply voltage Un ..... ……2 - 3V
- Minimum battery life..... ……about 20h***
- Maximum power consumption during normal operation ..... ……110mA
- Battery power consumption when switched off..... ……50µA****
- Ambient temperature during operation..... ……-20°C ÷ 55°C
- Storage temperature ..... ……..40°C ÷ 70°C
- Dimensions ..... ……215X65X50mm
- Weight ..... ……about 350g

3. Receiver

- Supply for the 230V option:
  Supply voltage U_z..... ……100-240V AC
  Maximum supply current I_{max} ..... ……0,2A

- Supply for the 48V option:
  Supply voltage U_z..... ……18-60V AC
  Maximum supply current I_{max} ..... ……1A

- Rated current (power) of safety relay contact load in category:

  AC1: ..... ……6A/250VAC
  AC15: ..... ……3A
  DC13: ..... ……6A

- Rated current (power) of function relay contact load in category:
  AC1: ..... ……..5A/250VAC
  10A/125VAC
  AC1: ..... ……1250 VA

AC3: ..... …..186W (single-phase motor)
DC1: ..... ……5A/28VDC

- Cable section ..... …….0.2--2.5 mm^2
- Safety relay mechanical durability ..... ……..10^7 cycles
- Function relay mechanical durability ..... ……..10^7 cycles
- Ambient temperature during operation..... …….-20°C ÷ 55°C
- Storage temperature..... …….-40°C ÷ 70°C
- Dimensions..... …….225x175x80mm
- Cable gland..... ……..PG21
- Weight ..... ……..about 1 kg

*- the range depends on the surrounding conditions and may differ from the specified value
**- with the external antennae, the range depends on the surrounding conditions and may differ from the specified value
*** approximate time for the remote control supply with two NiMH AA batteries with 2000mAh capacity each
**** - with the “Emergency STOP” button switched on and after 2 minutes of inactivity

III Design and principle of operation

The radio control system consists of a transmitter and a receiver.

1. Transmitter

The transmitter should be powered by two NiMH storage cells or two NiMH alkaline AA batteries. The keyboard consists of 10 buttons, of which 8 are two-level ones, that is, with two release thresholds, and two with one release threshold. The key scheme is presented on figure 1.

Additionally, the transmitter is featured with a “STOP” emergency button, which main function is blocking the control possibility in case of emergency.

1.1. Pairing mode

The transmitter-receiver set must be paired for proper operation. The set is paired by default by the manufacturer. If the transmitter or receiver set is replaced, it is essential to re-pair the devices. Pairing is carried out in a special pairing mode.

The pairing mode activation procedure:

1. Switch on the receiver.
2. Switch on the transmitter by briefly pressing any button.
3. Switch the “Emergency STOP” button.
4. Press the S3 button fully.
5. Holding the S3 button, press the “Emergency STOP” button.
6. The transmitter enters the pairing mode which is indicated by pulsating red light on the D5 LED.
7. The transmitter is in the pairing mode until the devices are paired correctly, but not longer than 2 minutes.
8. After the devices are paired successfully, the transmitter enters the normal operation mode.
9. If pairing is failed, the transmitter is switched off.


Emergency button
D1 LED
D3 LED
D5 LED
D2 LED
D4 LED
S1 control function button
S2 control function button
S3 control function button
S4 control function button
S5 control function button
S6 control function button
S7 defined function button
S8 defined function button
S9 hoist selection button
S10 Start/Buzzer button
Lead/belt holder
Battery cover
Battery cover bolts
Battery chamber
Plate with serial number

Figure 1

1.2. Normal operation mode

The RCT_01 radio control transmitter is featured with four basic operation functions:

- **Switching on/off the transmitter.**
  In order to switch on the transmitter, unblock the "Emergency STOP" button. The transmitter is switched on by pressing any button. After switching on, the transmitter is automatically connected with the receiver. The remote control is switched off after 2 minutes of inactivity (2 minutes after the last button press on the keyboard).

- **Transmitter authorisations.**
  The transmitter authorisations (unblocking the possibility of receiver outputs control) are activated by pressing the S10 key for at least 2s. After activating authorisations with use of the remote control, the receiver switches on the "Emergency STOP" circuit relays and switches on the K19 relay until the S10 button is released (terminals no. 37, 38 - intended for the sound signalling device).

- **Control via transmitter.**
  After switching on and activating the transmitter authorisations you may proceed to control procedure. Any button press results in switching on a corresponding relay in the receiver (the description of transmitter buttons and relay contacts assigned to them is presented in table 3).

- **Emergency control switch-off.**
  Emergency switch-off of the radio control system is done by pressing the "Emergency STOP" button. The press of the button results in opening the "Emergency STOP" relay circuits in the receiver and switching off all function relays in the receiver. The switch-on of the "Emergency STOP" button results also in blocking the transmitter - it does not react to any function buttons.

The operation status of the radio control system is signalled by LED diodes on the upper part of the transmitter. The LED status description is provided in table 1 below.

Table 1.

Diode	Signalled status	Signalling manner
D1,D2	Operation mode selection	Shows constant green light
D3	Low battery	Blinks amber at 1Hz
D4	Transmitter authorised for control	Shows constant green light
D5	Waiting for radio connection with the receiver	Blinks green at 1Hz
	Successfully connected with the receiver	Shows constant green light
	Receiver output control	Shows constant green light, dims after 50ms when sending the control frame
	Damaged transmitter keyboard	Blinks red at 0.5Hz
	Damaged "Emergency STOP" circuit relays	Blinks green and red alternately at 4Hz

2. Receiver

The ERC01_RCR_01 receiver consists of the following function circuits:

- a radio module,
- a control unit,
- function execution circuits,
- "Emergency STOP" circuits,
- a power supply unit.

The general receiver operation rule is as follows: the radio module, having received the information from the remote control, sends it to the control unit, which, having checked the information correctness, switches on the execution circuit relay, it is implemented for the command received from the transmitter.

The central unit controls the "Emergency STOP" circuit - should it not receive an appropriate command from the remote control, the "Emergency STOP" circuit and execution relays remain safe, that is, switched off. There are two situations, when the "Emergency STOP" circuit may be disconnected:

- If the connection with the remote control is broken, the "Emergency STOP" circuit is automatically disconnected.
- Press of the "Emergency STOP" button on the remote control.

The central unit signals also the receiver operation status. For this purpose, it uses the LED diode.
The manner of signalling the operation status is presented in the table below.

Table 2.

Receiver operation status	Signalling:
Waiting for the remote control connection	Blinks green at 1Hz
The receiver is connected with the remote control	Shows constant green light
The receiver receives correct control packets from the remote control	Goes out after 50ms after each received information
Damaged radio module	Blinks red at 0.5Hz
Damaged safety circuit	Blinks red at 4Hz

Additionally, each relay is featured with a diode signalling its power-up, the D1 power supply presence and its proper D2 value.

The transmitter buttons assigned to its corresponding relays in the receiver are presented in table 3.

The K20 relay is intended for connecting a sound signalling device. Relays no. 17 and 18 are intended for controlling the operation mode, subsequent presses of the S9 button in the transmitter result in: switching on the K17 relay, switching on the K18 relay, switching on both relays, switching off both relays.

The buttons within a given pair are blocked - pressing both buttons of a given pair results in an immediate switch-off of the relays assigned to the button pair. The relays are switched off accordingly to the press depth. The example for pair no 1 (the S1 and S2 buttons) is presented in table 4. Pairs no 2 (S3, S4) and 3 (S5, S6) operate analogically.

The S7 and S8 buttons may be assigned to individual user functions.

Table 3.

		Transmitter button	Pressing depth	Receiver relay
Excluding function buttons	Pair no 1	S1	1	K1
			2	K1+K3
		S2	1	K2
			2	K2+K4
	Pair no 2	S3	1	K5
			2	K5+K7
		S4	1	K6
			2	K6+K8
	Pair no 3	S5	1	K9
			2	K9+K11
		S6	1	K10
			2	K10+K12
		S7	1	K13
			2	K13+K14
		S8	1	K15
			2	K15+K16
		S9	1	K17 or K18 or K17+K18
		S10	1	K20

Table 4.

Pressed button	Pressing depth	Relay			
		K1	K2	K3	K4
S1	1	1	0	0	0
S1	2	1	0	1	0
S2	1	0	1	0	0
S2	2	0	1	0	1
S1+S2	1	0	0	0	0
S1+S2	S2=1, S1=2	0	0	1	0
S1+S2	S2=2, S1=1	0	0	0	1
S1+S2	2	0	0	0	0

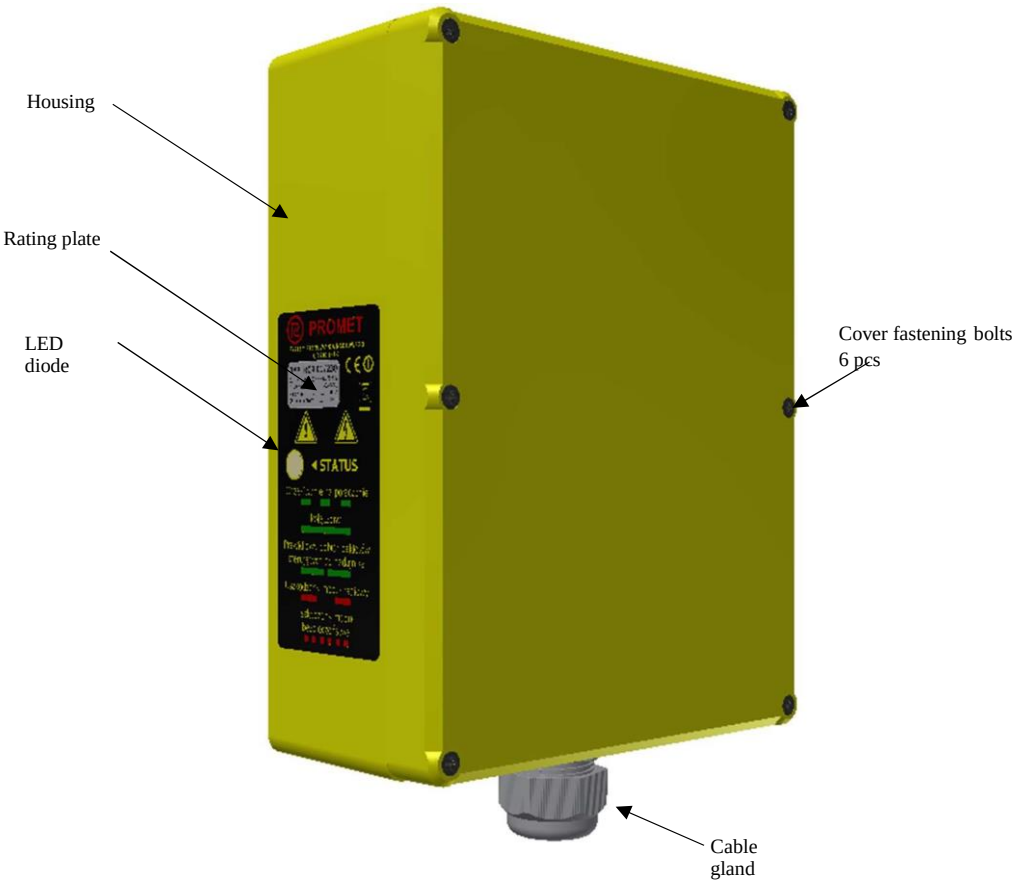


Figure 2

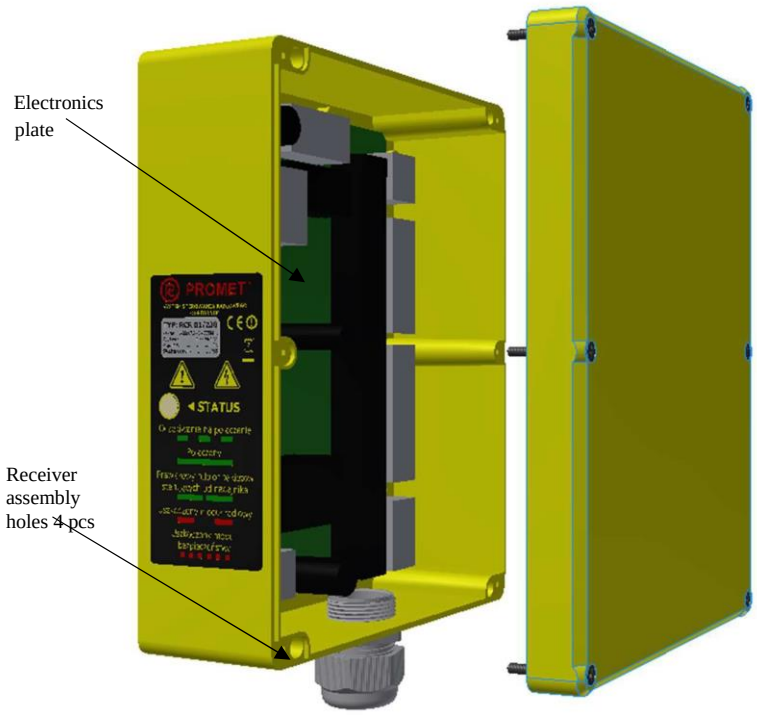


Figure 3

The connections in the receiver are presented in table 5 below; the scheme is presented in figure 4.

Table 5.

Marking	Function
AC1, AC2	Terminal for the source of supply
ST1, ST2	Terminal for the stop circuit K21, K22
1, 2	Closing contact terminal of K1 relay
3, 4	Closing contact terminal of K2 relay
5, 6	Closing contact terminal of K3 relay
7, 8	Closing contact terminal of K4 relay
9, 10	Closing contact terminal of K5 relay
11, 12	Closing contact terminal of K6 relay
13, 14	Closing contact terminal of K7 relay
15, 16	Closing contact terminal of K8 relay
17, 18	Closing contact terminal of K9 relay
19, 20	Closing contact terminal of K10 relay
21, 22	Closing contact terminal of K11 relay
23, 24	Closing contact terminal of K12 relay
25, 26	Closing contact terminal of K13 relay
27, 28	Closing contact terminal of K14 relay
29, 30	Closing contact terminal of K15 relay
31, 32	Closing contact terminal of K16 relay
33, 34	Closing contact terminal of K17 relay
35, 36	Closing contact terminal of K18 relay
37, 38	n/a
39, 40	Closing contact terminal of K20 relay
CON23	Antennae terminal

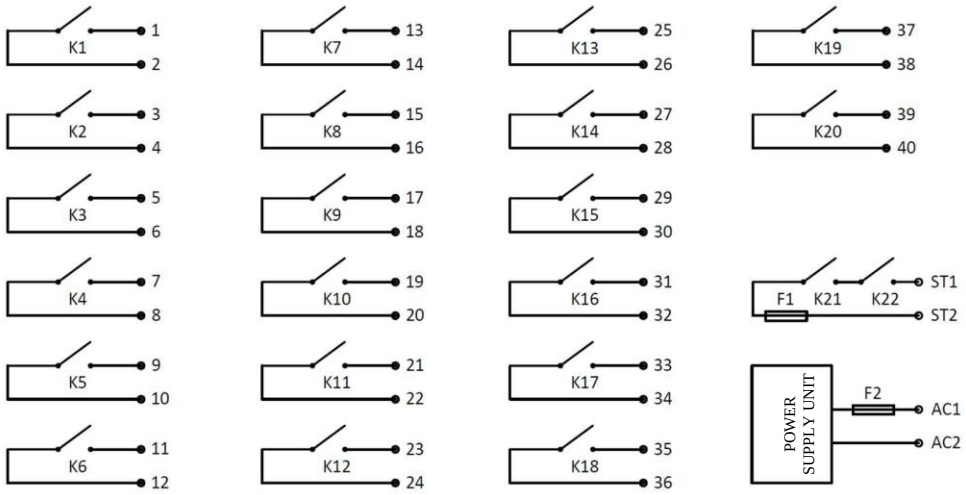


Figure 4

Each relay is featured with a diode signalling its power-up and the D1 power supply presence and its proper D2 value.

There are two cut-outs in the RCR_01 receiver:

- F1 - fast tubular fusible cut-out Ø5x20mm with rated voltage of 6.3A and rated current of 250VAC
- F2 -fast tubular fusible cut-out Ø5x20mm with rated current of 500mA (for the 230V option) or 3.15A (for the 48V option) and rated voltage of 250VAC.

Cut-out scheme is presented on the figure below.

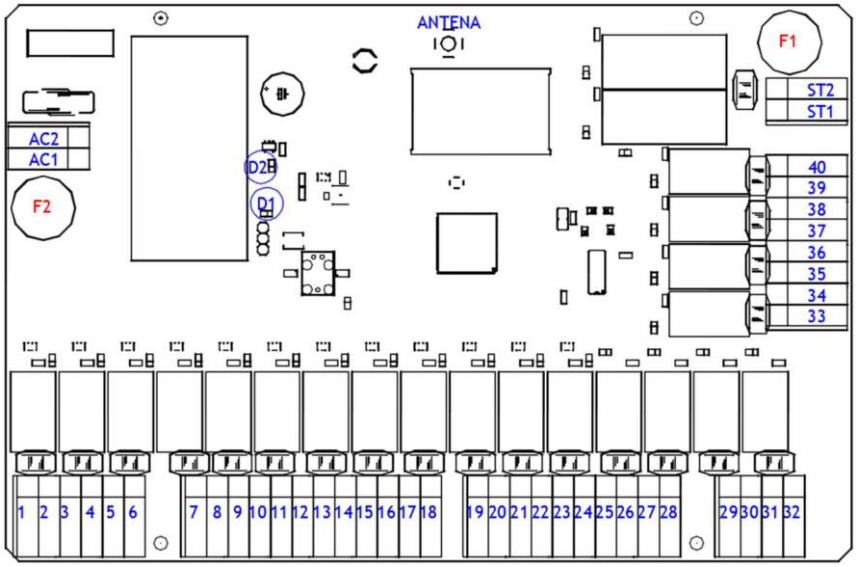
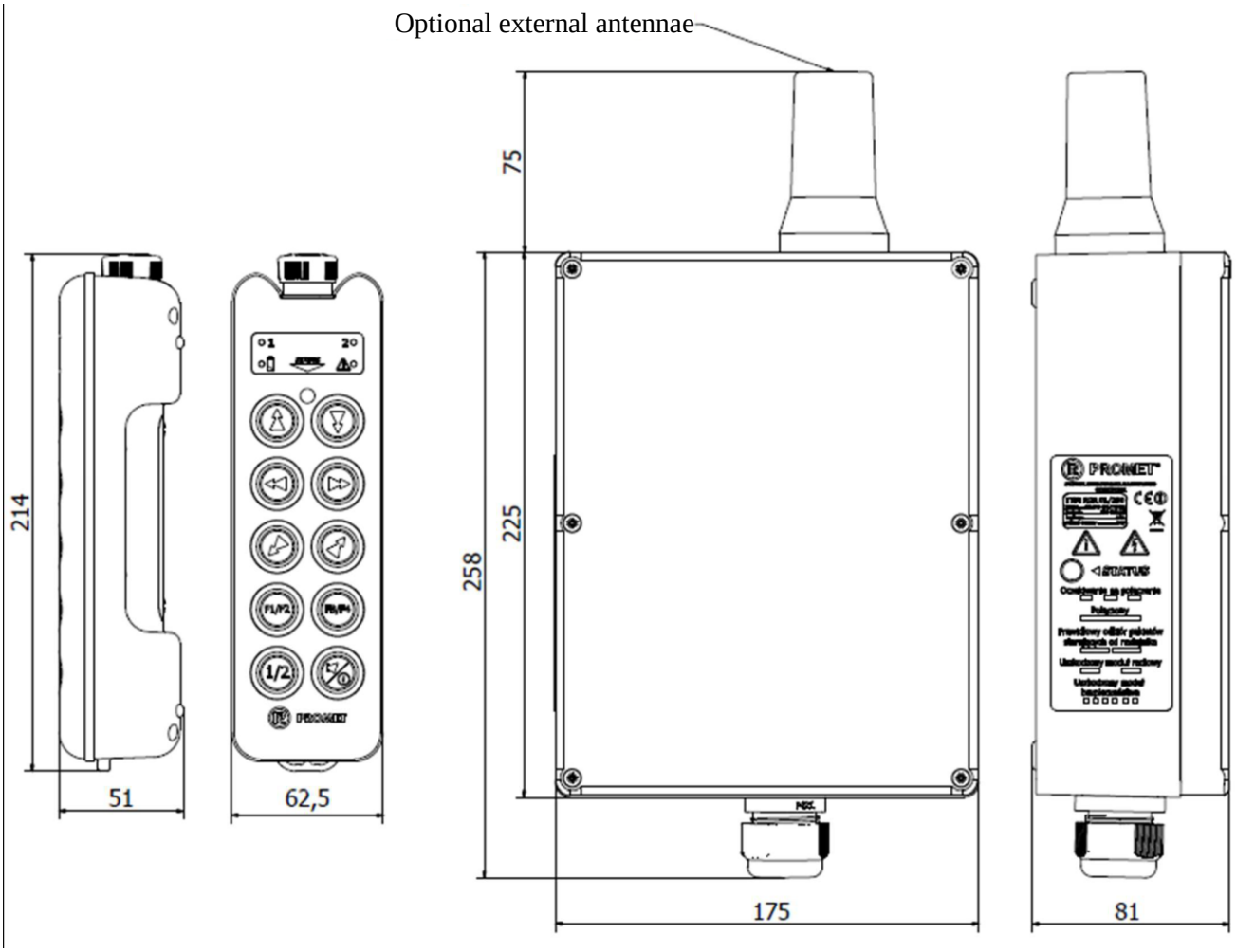


Figure 5

3. Overall dimensions



4. User precautions:

- Track all machines and charge movements staying in the normal operating range of the radio control system,
- Be in a position enabling good visibility of the transmitter/receiver system and the charge, as appropriately as possible,
- Before starting the device operation, always make sure, whether the STOP button can be easily pressed and released: if it does not work correctly, do not use the radio control system.
- Switch off the transmitter if work is interrupted. Avoid leaving the charge hanged in the air even when replacing batteries,
- Never leave the transmitter uncontrolled,
- Switch on or use the transmitter from the time the work is started,
- Never switch on or use the transmitter in closed spaces, without a machine within a field of view or beyond the normal operating range,
- Press the STOP button immediately in case of emergency,

- Pay attention to the entire working area. Press the STOP button immediately in case of emergency,
- Do not allow the transmitter to get in contact with concrete, sand, lime grains, etc., as this may result in damaging the device or its improper functioning,
- In case of improper operation and/or damage and/or defective parts, stop the operation immediately until the problem is solved,
- From time to time, check the battery cover seal during replacement of the batteries; in case of any damage, replace the seal,
- During the battery replacement procedure, observe their polarity, screw the battery cover with bolts, and press it in half-length so that it does not come off by final screwing home,
- If the transmitter is not used for longer time, take out the batteries.
- Used batteries or storage cells should not be thrown away with normal waste; they should be utilised by throwing them into an appropriate container or taken to your collection point for hazardous materials.

5. Fitter precautions:

- The installation must be carried out by qualified personnel according to the installation standards,
- Install the receiver vertically with the cable gland pointing downwards,
- Install the receiver in the visible place, not exposed to atmospheric conditions
- Install the receiver in 4 points using the holes on the housing corners under the cover,
- You should not modify or interfere in radio control, the machine or its electrical panels,
- Check whether the supply voltage is proper,
- Do not bypass the safety circuits,
- Observe the standards for lifting machines and/or for all machines,
- Lay cables away from the radio module,
- After installation and connecting the wiring system, check the operation of all circuits, in particular the STOP circuit,
- When installing the cover, check the seal with regard to damage, etc.,

6. Maintenance

- Make sure that batteries have been taken out of the transmitter before performing any technical maintenance activities
- All activities related to the control and technical maintenance of the radio control system should be verified and recorded by a person responsible for the machine technical maintenance
- It is essential to carry out maintenance procedures according to these instructions in order to ensure safe radio control system operation.
- After each maintenance procedure, make sure whether all commands sent from the receiver start appropriate operations.

6.1. Daily maintenance

- Clean the transmitter of dust and other dirt not using high water pressure, water vapour, solvents, flammable materials, corrosive agents
- Store the transmitter in a dry and clean place
- Check seals, rubber button casings with regard to wear-out signs, cracking as well as their elasticity and flexibility.

- Check whether the transmitter housing is not damaged, cracked or deformed
- Check whether the descriptions are visible and replace them if necessary
- Before starting work, check whether the STOP button works properly.

6.2. Periodic maintenance - every 3 months

- Clean the receiver of dust and other dirt not using high water pressure, water vapour, solvents, flammable materials, corrosive agents
- Check whether the receiver housing is not damaged, cracked or deformed
- Check whether the receiver wiring system is not damaged

6.3. Periodic maintenance - every 6 months

- Check whether all receiver relay contacts function properly
- Check whether commands sent to the receiver start desired operations and release them after the command is no longer sent.

Additionally, each time when you open the receiver cover or transmitter battery chamber, check the sealing condition.

In case of any defects in the set operation, contact the manufacturer and provide the following information:

- Date of purchase
- Supplier
- Serial number (transmitter - you can find it under batteries, receiver - you can find it under the cover on the left, next to the LED diode signalling the device operation status)
- Correspondence address of the system operation place
- Defect description

IV Appendices

1. Protection of the environment - utilisation of waste electronic equipment

- The symbol of the crossed out bin means that, the equipment should be disposed of according to the Directive on Waste Electric and Electronic Equipment of 11 September 2015.
- The symbol meaning that the product should be collected and recycled, namely it should be utilised separately from municipal waste and delivered to the appropriate local waste collecting point or handed over to the Manufacturer or its service.
- Proper disposal of the equipment can protect the natural environment and human health.

2. Scheme of assembly holes drilling