

Service Manual

G6 Radio Remote Control System

Made for Me





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Disclaimer

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Symbols

The safety symbols provide information about personal and/or product safety. Failure to follow these instructions could result in death, serious injury, or damage to the product, the operator, and others.

The following symbols are used in this Service Manual.



WARNING!

There is a risk of death or serious injury.



CAUTION!

There is a risk of moderate or minor injury, or damage to objects.



NOTICE!

This symbol identifies the parts of text in the manual that shall be read with special attention.



Glossary

Term	Description
Actuator	Joystick, lever, toggle switch, push button, and potentiometer
ADC	Analog Digital Converter
BLE	Bluetooth Low Energy
CAN bus	Controller Area Network
CRC	Cyclic Redundancy Check
CU	Control Unit (Receiver)
EEPROM	Electrically Erasable Programmable Read-only Memory
EIRP	Effective Isotropic Radiated Power
EMC	Electro Magnetic Compatibility
ESD	Electrostatic Discharge
Firmware	The operating system (OS) of a device
G6	Generation 6
HW	Hardware
IEC	International Electrotechnical Commission
I2C	Inter-integrated Circuit
LCD	Liquid Crystal Display
LED	Light Emitting Diode
Li-ion	Lithium Ion
LSS	Layer Setting Services
Modulate	Scanreco Windows program for configuration
MUX	Multiplexer
NiMH	Nickel Metal Hydride
NMT	Network Management
OD	Object Dictionary
OEM	Original Equipment Manufacturer
OTG adapter	On the Go adapter
PCU	Portable Control Unit (Transmitter)
PDO	Process Data Object
PL	Performance Level
RAM	Random Access Memory
RPDO	Received Process Data Object
RTC	Real Time Clock
SDO	Service Data Object
SIL	Safety Integrity Level
SISP™	Scanreco Integrated Safety Platform
SRDO	Safety-relevant Data Object
TPDO	Transmitting Process Data object
VAC	Voltage Alternating Current
VDC	Voltage Direct Current





PART 1: TECHNICAL INFORMATION

1. Introduction

The G6 Micro or Mini transmitter together with a G6 CAN receiver makes a complete Scanreco G6 radio remote control system. This system has been developed for professional usage in various safety critical applications in construction and industrial settings. The Scanreco G6 radio remote control system offers numerous configuration possibilities to suit different machines and operator preferences.

This service manual has been created for the use by qualified personnel with a technical background at machine producers, system integrators and distributors. Do not distribute to, or share with, end customers and/or machine operators.

It is the buyer's responsibility to train end customers and machine operators on the correct and safe usage of the Scanreco G6 radio remote control system, wherein no liability for improper use and implementation falls upon Scanreco.

Furthermore, it is the buyer's responsibility to write a complete manual for operators that covers both the machine itself and the functionality and usage of the Scanreco G6 radio remote control system. To assist in the creation of the complete manual for operators, Scanreco provides a generic user manual for the radio remote control system stand-alone.

This service manual is intended as a professional guideline when installing, troubleshooting, and servicing the products. It is intended to be generic, describing the Scanreco G6 platform of products, and your specific configuration may not contain all the elements described herein. See Scanreco technical specification or technical documentation provided by the system installer or machine producer for more information regarding individual system setups.

1.1. Scanreco Integrated Safety Platform (SISP™)

The system is equipped with a third party approved safety solution that monitors all safety classified functions. Dual microprocessors in both the transmitter and receiver will verify safe and correct functionality. This is a first of its kind modular safety solution invented by Scanreco in accordance to IEC 61508 and ISO 13849-1 safety standards.

1.2. Product Labels

Both the transmitter and receiver have product labels. It is important to use the part and serial/batch numbers in all communication with your point of purchase or Scanreco.



NOTICE!

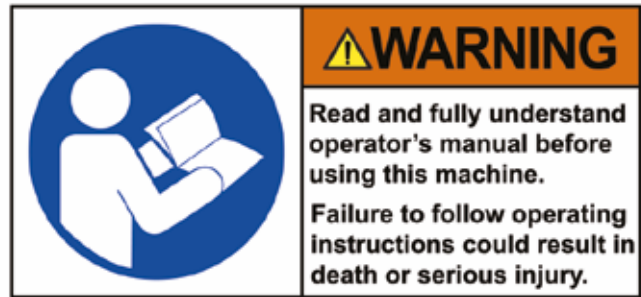
- Always document the product serial number found on the product label for both the transmitter and receiver. This will make traceability easier and help to identify which products that are associated with which machine.
- When exporting products outside of Europe and North America additional country specific approvals and labels will be needed. Contact your point of purchase or Scanreco for further information.
- Do not remove or cover these labels.



1.2.1. Transmitter Product Labels



Transmitter Product Label

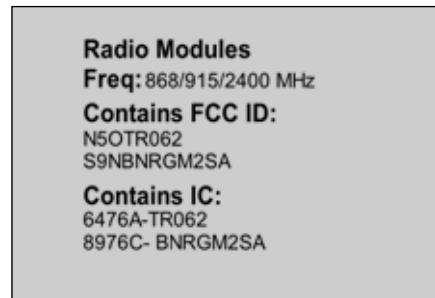


Transmitter Warning Label

1.2.2. Receiver Product Labels



Receiver Product Label



Receiver Radio Label



Receiver General Label



2. Safety Instructions



WARNING!

Read and understand all safety instructions in this manual, including the appendixes, before proceeding with the installation, maintenance, or operation of the products. Failure to follow the safety instructions could result in death or serious injury.

2.1 Safety Precautions for Installation and Maintenance

It is the responsibility of the system installer, machine producer and their authorized service workshops to always follow the instructions in this manual.



WARNING!

- Make sure that this document is always available to the system installer and maintenance technicians.
- Make sure to follow and comply with all relevant local and national standards and regulations.
- Make sure to label the products and machines according to local and national standards and regulations.
- It is the machine manufacturer and system installer's responsibility to label machines and products for the safe and reliable use and control of the machine with the Scanreco G6 radio remote control system.
- Make sure that only qualified, approved, and competent personnel carry out the installation and maintenance of the products.
- It is the machine manufacturer and system installer's responsibility to correctly implement and install the Scanreco Radio Remote Control System for a specific machine.
- If the Scanreco Radio Remote Control System is used in a safety critical application, the machine producer/system installer must do the appropriate risk analysis and testing of the final application.
- All repairs must be done by professionals authorized by Scanreco.
- When carrying out repairs, only use original spare parts from Scanreco.



2.2 Safety Precautions for Operation

It is the responsibility of the system installer or machine producer to forward these safety warnings to the machine owner and operator.



WARNING!

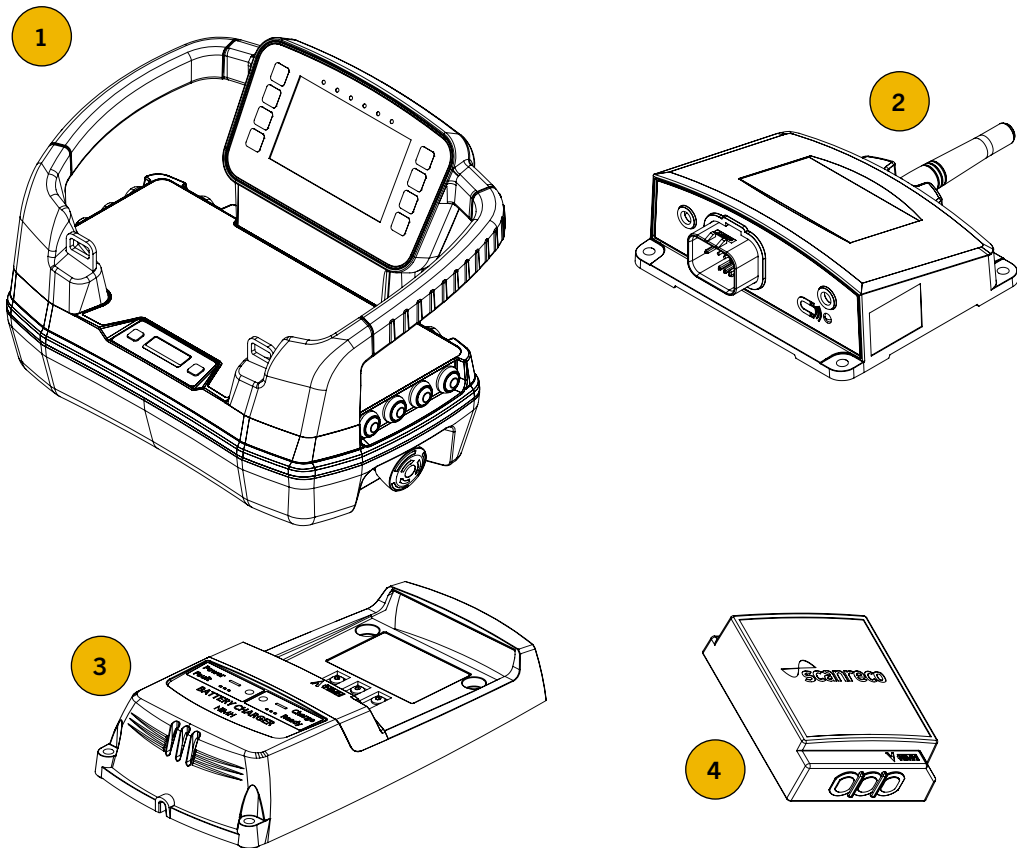
- Make sure that all the warnings in the user manual is permanently available to all machine operators.
- Make sure that only qualified, approved, and competent personnel carry out the installation, operation, and maintenance of the product.
- All repairs must be done by professionals authorized by Scanreco.
- Let only qualified and approved personnel operate the transmitter.
- Make sure the transmitter STOP button is working correctly before operating the system.
- Make sure the EMERGENCY STOP button(s) on the machine is working correctly before operating the system.
- Only use the correct transmitter unit with the matching receiver unit.
- Do not operate the transmitter if you find or suspect any faults, failure, or damage.
- Do not leave the transmitter unattended when it is switched on.
- Do not operate the transmitter when visibility is limited or the machine is out of view.
- Do not startup or operate the transmitter if there is a risk of losing balance or tripping.
- Always pay attention to warnings and visual, haptic, and acoustic signals.
- Always pay attention to the entire work area to avoid any dangerous situations.
- Always keep a safe distance from the machine during operation.
- Make sure that no unauthorized persons are within the machine's working area during operation.
- Immediately press the STOP button in case of any dangerous situations.
- Be aware that dangerous situations can occur when the STOP button is pressed, such as swinging loads.
- Do not use the products in potentially explosive atmospheres or environments.
- Always switch off the transmitter and receiver when not in use.
- Do not leave load hanging when the transmitter is switched off.
- Avoid knocking or dropping the transmitter.
- Store the transmitter in a safe place.



3. External System Overview

These are the main components of the G6 radio remote control system:

1. Transmitter.
2. Receiver.
3. Battery charger.
4. Battery.



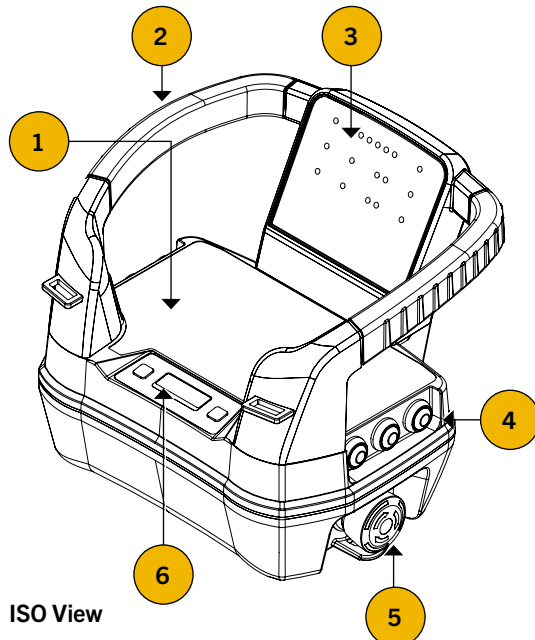
NOTICE!

The transmitter can be delivered with several optional accessories such as waist belt, neck strap and a tether cable.



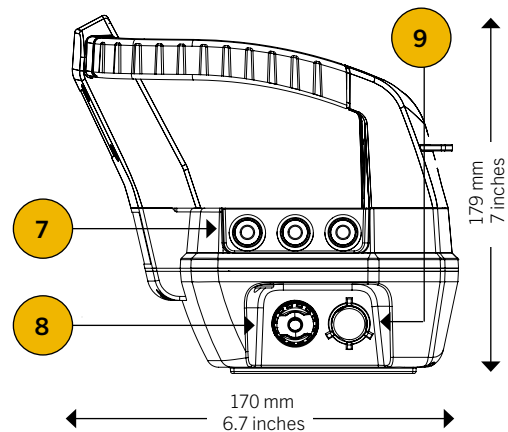
3.1. Transmitters Overview

Micro Transmitter Views



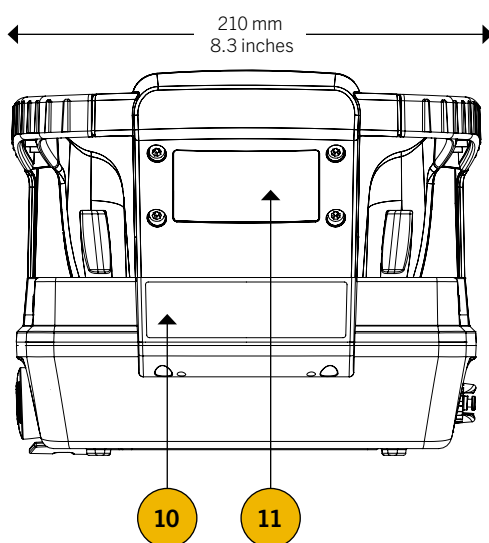
ISO View

1. Customizable area
2. Protective frame
3. LED display (optional)
4. Side buttons x3 (optional)
5. STOP button
6. Information center (LCD)



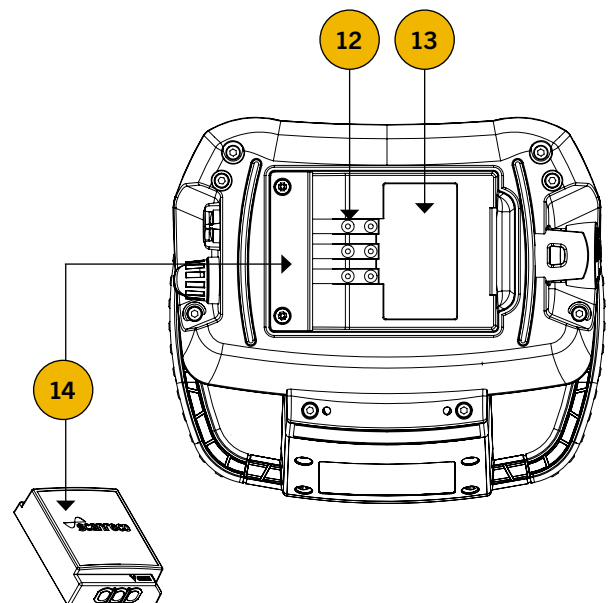
Side View (Left)

7. Side buttons x3 (optional)
8. Tether connector (optional)
9. Gore-Tex valve



Back View

10. Branding area
11. Warning label

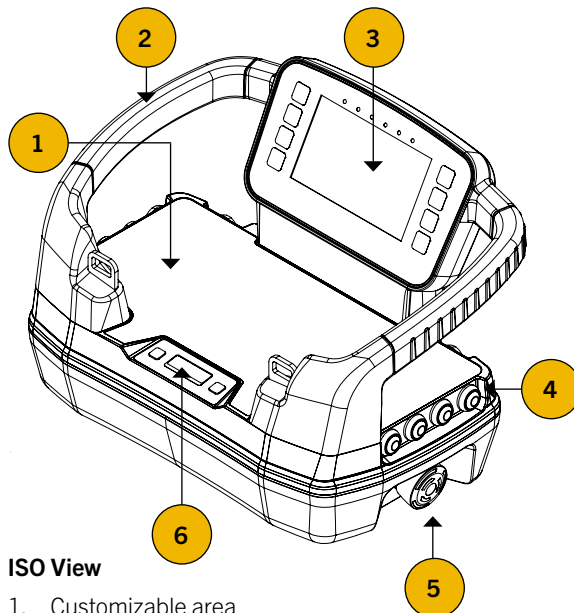


Bottom View

12. Battery compartment
13. Product label
14. Replaceable battery

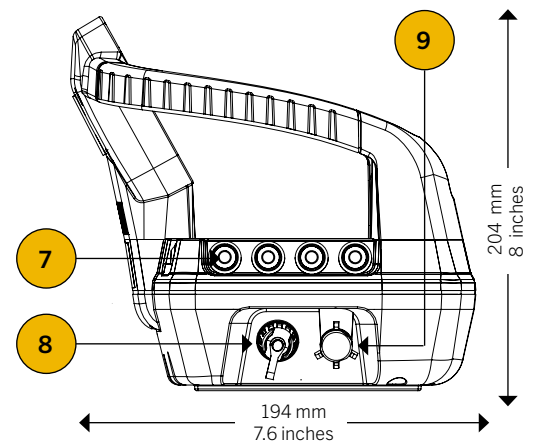


Mini Transmitter Views



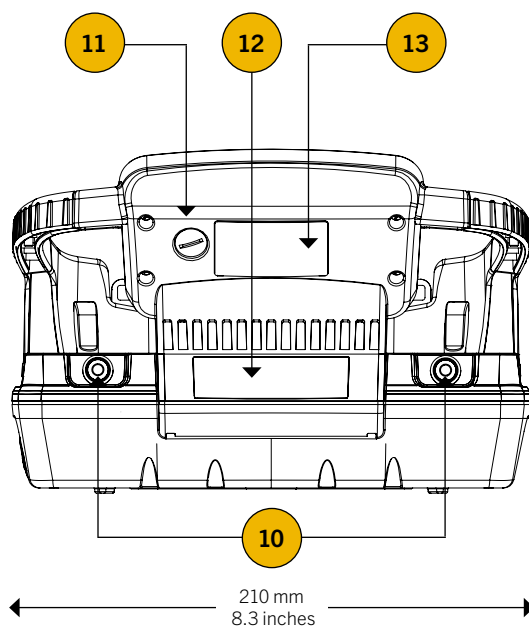
ISO View

1. Customizable area
2. Protective frame
3. Color display (optional)
4. Side buttons x4 (optional)
5. STOP button
6. Information center (LCD)



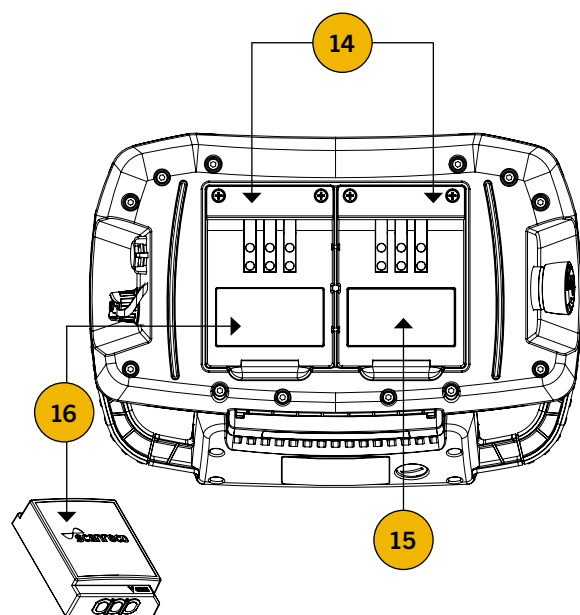
Side View (Left)

7. Side buttons x4 (optional)
8. Tether connector (optional)
9. Gore-Tex valve



Back View

10. Back buttons (optional)
11. Display connector
12. Branding area
13. Warning label



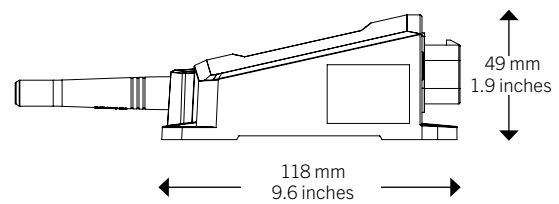
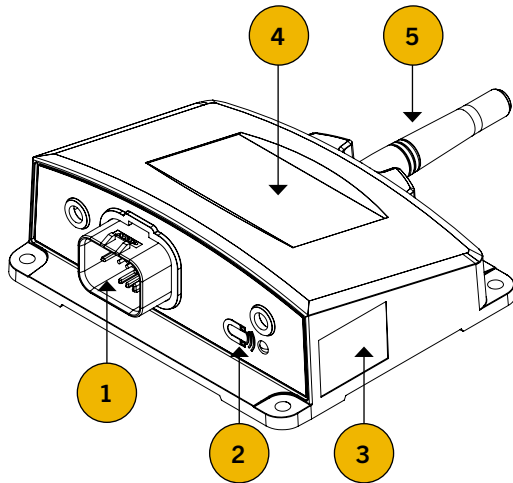
Bottom View

14. Battery compartment x2
15. Product label
16. Replaceable battery



3.2. Receiver Overview

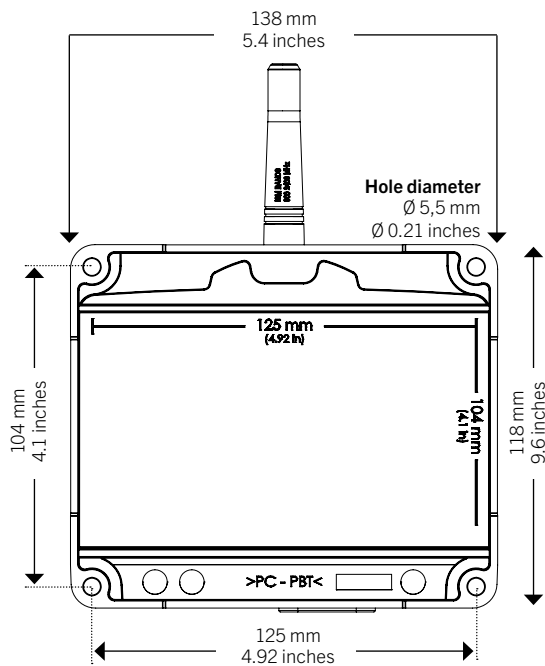
Receiver Views



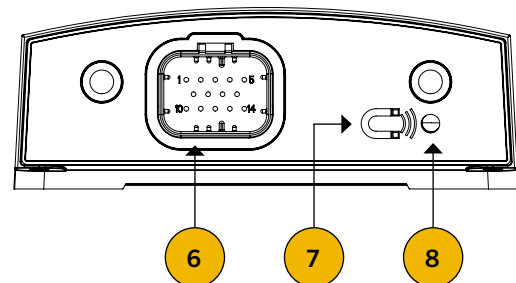
ISO View

1. AMPSEAL connector
2. Magnet symbol (for pairing)
3. Product label (Located on left and right side)
4. General label
5. External antenna

Side View (Left)



Back View



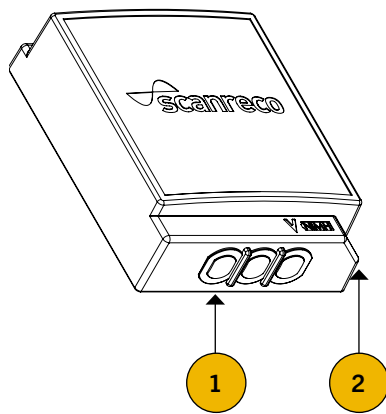
Bottom View

6. AMPSEAL connector
7. Magnet symbol (for pairing)
8. Status LED



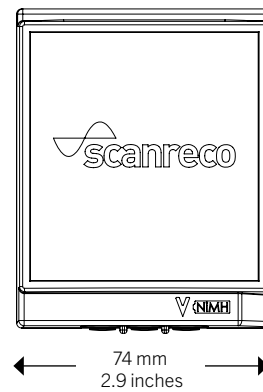
3.3. Battery and Battery Charger Overview

NiMH Battery

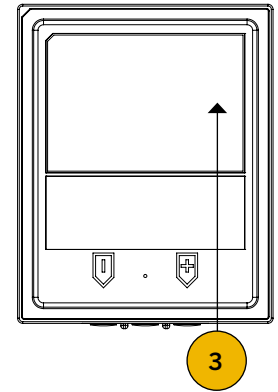


ISO View

1. Poles
2. Mechanical stop

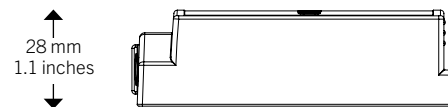


Top View



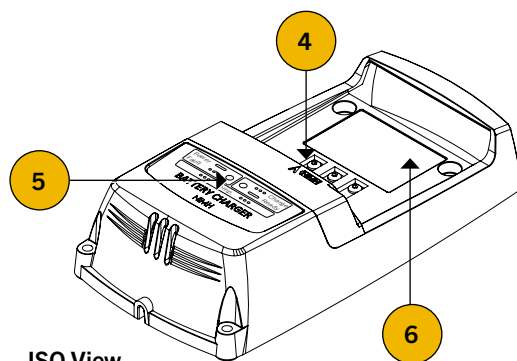
Bottom View

3. Product label



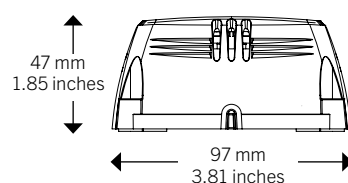
Side View

NiMH Battery Charger

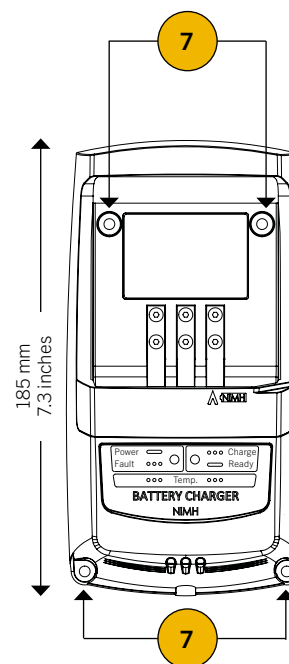


ISO View

4. Poles
5. LED Status Indicators
6. Product label

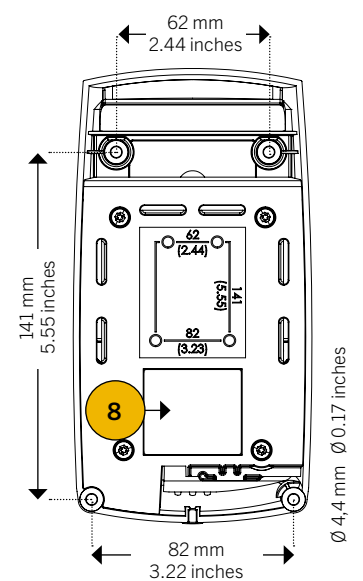


Side View



Top View

7. Screw holes
(for fixing the charger)

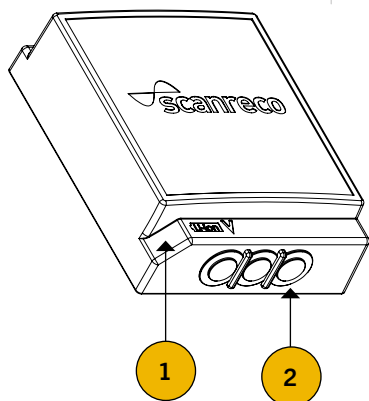


Bottom View

8. Information label

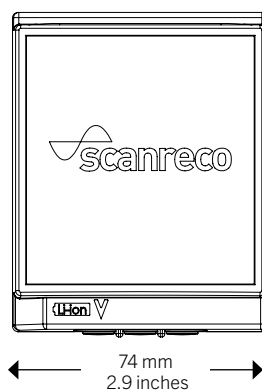


Li-ion Battery

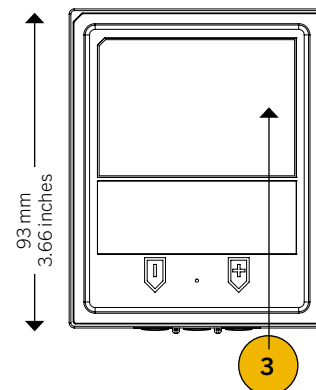


ISO View

1. Mechanical stop
2. Poles

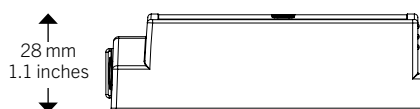


Top View



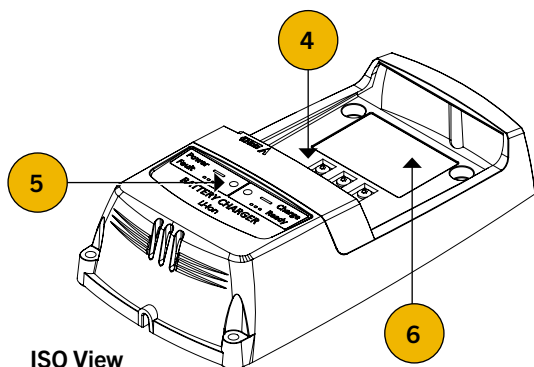
Bottom View

3. Product label



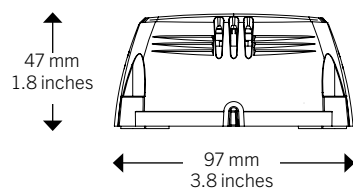
Side View

Li-ion Battery Battery Charger

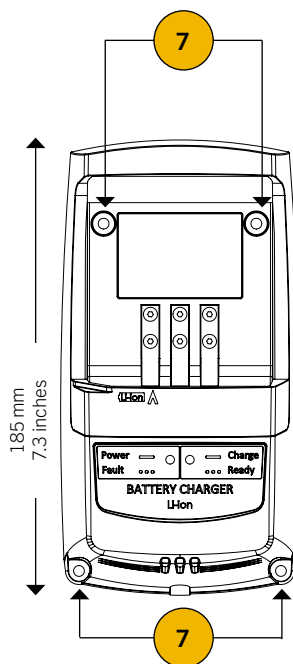


ISO View

4. Poles
5. LED Status Indicators
6. Product label

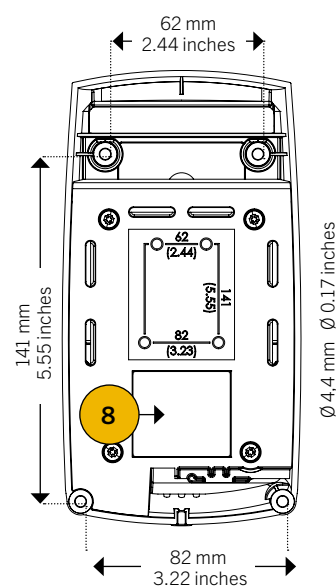


Side View



Top View

7. Screw holes
(for fixating the charger)



Bottom View

8. Information label



4. Technical Description

4.1. Transmitters and Receiver Specifications



NOTICE!

The information below may differ in OEM customized systems. For more detailed information regarding your system setup, see separate technical documentation.

Technical data	Micro transmitter	Mini transmitter	CAN receiver
Article number	P00003	P00004	P00005
Dimensions (W x D x H)	210 x 170 x 179 mm 8.3 x 6.7 x 7 inches	297 x 194 x 204 mm 11.7 x 7.6 x 8 inches	138 x 49 x 118 mm 5.4 x 1.9 x 4.6 inches
Weight	~ 1,6 kg ~ 3.5 lb <i>Depending on configuration</i>	~ 2,2 kg ~ 4.8 lb <i>Depending on configuration</i>	560 g 1.2 lb
Protection category	IP65	IP65	IP67/UL50E Type 6
Operating temperature (Celsius/Fahrenheit)	-25 °C to +70 °C -13 °F to +158 °F	-25 °C to +70 °C -13 °F to +158 °F	-25 °C to +70 °C -13 °F to +158 °F
Storage temperature (Celsius/Fahrenheit)	-40 °C to +85 °C -40 °F to +185 °F	-40 °C to +85 °C -40 °F to +185 °F	-40 °C to +85 °C -40 °F to +185 °F
Safety classifications	IEC 61508 / ISO 13849-1		
Safety classified hardware outputs	N/A	N/A	LOOP = SIL 3/PL e STOP_OUT = SIL 3/PL e ACT_MOV = SIL 3/PL e
Safety classified inputs	1 safety classified STOP button, SIL 3/PL e ≤ 16 safety classified analog actuators, SIL 3/PL e ≤ 8 safety classified digital actuators, SIL 3/PL e	1 safety classified STOP button, SIL 3/PL e ≤ 16 safety classified analog actuators, SIL 3/PL e ≤ 8 safety classified digital actuators, SIL 3/PL e	N/A
CAN bus	N/A	N/A	CANopen and Safety CAN
No safety classification	≤ 48 digital and analog input/outputs	≤ 48 digital and analog input/outputs	N/A
Overload protection	N/A	N/A	Yes (for the safety classified outputs)
Antenna	Internal	Internal	External
Radio frequency bands	868 MHz, 915 MHz, 2.4 GHz	868 MHz, 915 MHz, 2.4 GHz	868 MHz, 915 MHz, 2.4 GHz
Maximum radio frequency output power (within EU)	868 MHz: 25 mW 2.4 GHz: 100 mW (915 MHz not used in EU)	868 MHz: 25 mW 2.4 GHz: 100 mW (915 MHz not used in EU)	868 MHz: 25 mW 2.4 GHz: 100 mW (915 MHz not used in EU)
Frequency management	Automatic frequency hopping	Automatic frequency hopping	Automatic frequency hopping
Range (typical)	> 100 m	> 100 m	> 100 m
Battery type	NiMH, Li-ion	NiMH, Li-ion	N/A



Technical data	Micro transmitter	Mini transmitter	CAN receiver
Power supply by tether cable	12/24VDC from receiver	12/24 VDC from receiver	N/A
Power supply by battery	Nominal voltage 7.2 VDC	Nominal voltage 7.2 VDC	N/A
Power supply to receiver	N/A	N/A	12/24 VDC (Absolute maximum ratings 9-36 VDC)
Fuse	N/A	N/A	Use external fuse 10 A
Current consumption	Varies depending on configuration: 70 mA-250 mA	Varies depending on configuration: 70 mA-250 mA	< 200 mA (excluding external loads and in radio mode)
Operating times	Varies depending on configuration and number of functions: NiMH: 6 h-23 h Li-ion: 15 h-57 h	Varies depending on configuration and number of functions: NiMH: 6h-23 h Li-ion: 15h-57 h	N/A
BLE	Available for configuration via Scanreco Modulate software	Available for configuration via Scanreco Modulate software	Available for configuration via Scanreco Modulate software
Connector type	N/A	N/A	AMPSEAL 14-pin
Cable control	Optional, factory assembled M12 or Hirschman connector	Optional, factory assembled M12 or Hirschman connector	Optional, requires external connector

4.2. Color Display Specifications

The color display runs on a Linux computer with a Qt graphic programming environment. To program the color display, you need programming knowledge in C and Qt. For further information about Qt, see www.qt.io. Contact your point of purchase or Scanreco for instructions about programming the color display.

There are three versions of the color display available for the Mini transmitter:

- Color Display Standard
- Color Display Premium Basic
- Color Display Premium Full.



WARNING!

- The display and LED indications and warnings do not include all machine information.
- The information shown on the display and LEDs may have a delay or freeze.
- Displays with Wi-Fi have two separate radio links, one that controls the machine, and one that streams video or other contents. Interruptions may occur in one or the other radio link. This will either cause the display to malfunction while the machine is operational or shut down the communications between the receiver and transmitter while the display shows information.



NOTICE!

The color display is currently not available for the Micro transmitter.



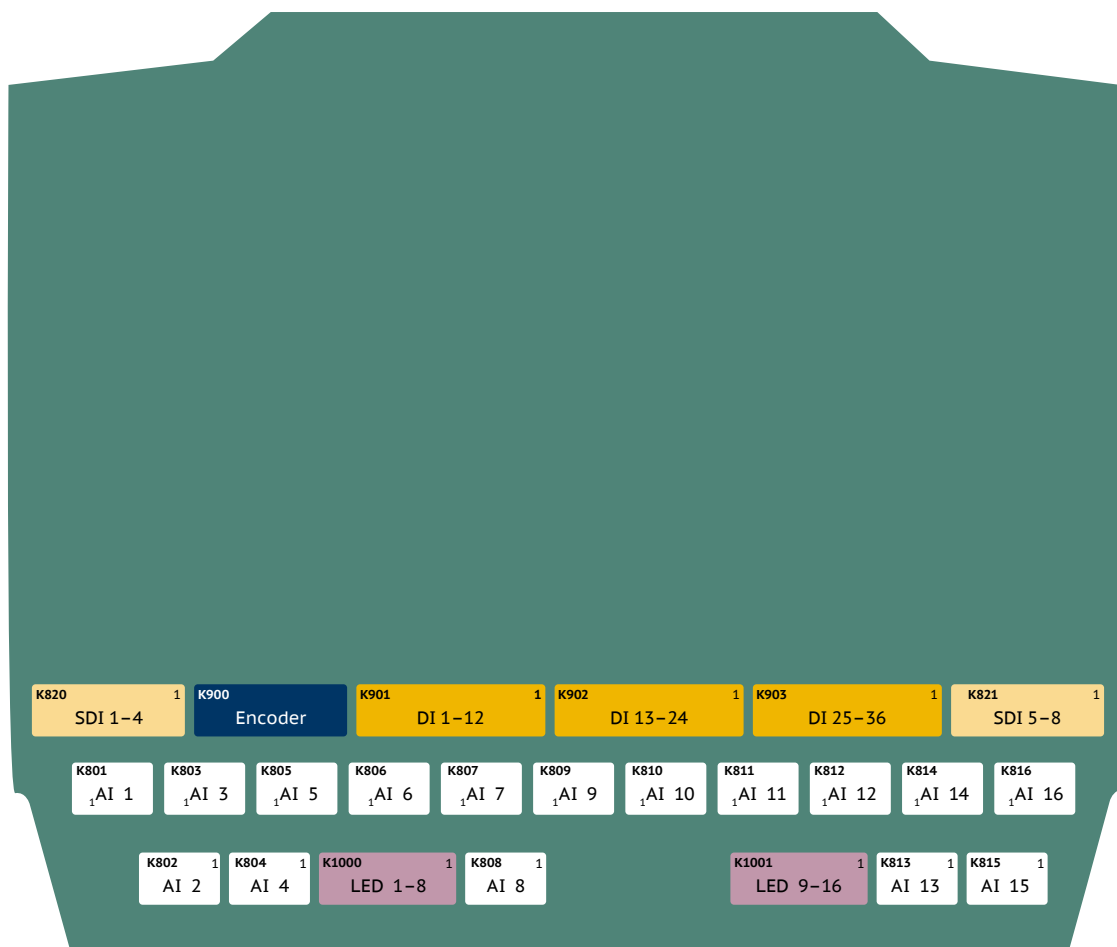
Technical data	Color Display Standard	Color Display Premium Basic	Color Display Premium Full
Size	4.3"	4.3"	4.3"
Resolution	480 x 272 pixels	480 x 272 pixels	480 x 272 pixels
Buttons	8 push buttons	8 push buttons	8 push buttons
Storage	4 GB	8 GB	8 GB
Backlight	Yes	Yes	Yes
Wi-Fi	No	No	Yes
Compass	No	No	Yes
Accelerometer	No	No	Yes
Gyroscope	No	No	Yes
Real-time clock	No	No	Yes
Connectivity	No	No	Wi-Fi
Programming connector	Micro USB	M12 5-poles	M12 5-poles

4.2.1. Color Display Wi-Fi Specifications

Technical data	
Support standards	802.11 B/G/N
Frequency	2412 – 2462 MHz
Quantity of channels	11
Max RF output power	+17.6 dBm (EIRP)
Type of antenna	Internal antenna
Supported bit rates	802.11b 1, 2, 5.5, 11 Mbps 802.11g 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n, HT, 20 MHz, 800 ns 6.5, 13, 19.5, 26, 39, 52, 58.5, 65 Mbps 802.11n, HT, 20 MHz, 400 ns 7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65, 72.2 Mbps



4.3. Transmitter Main Board

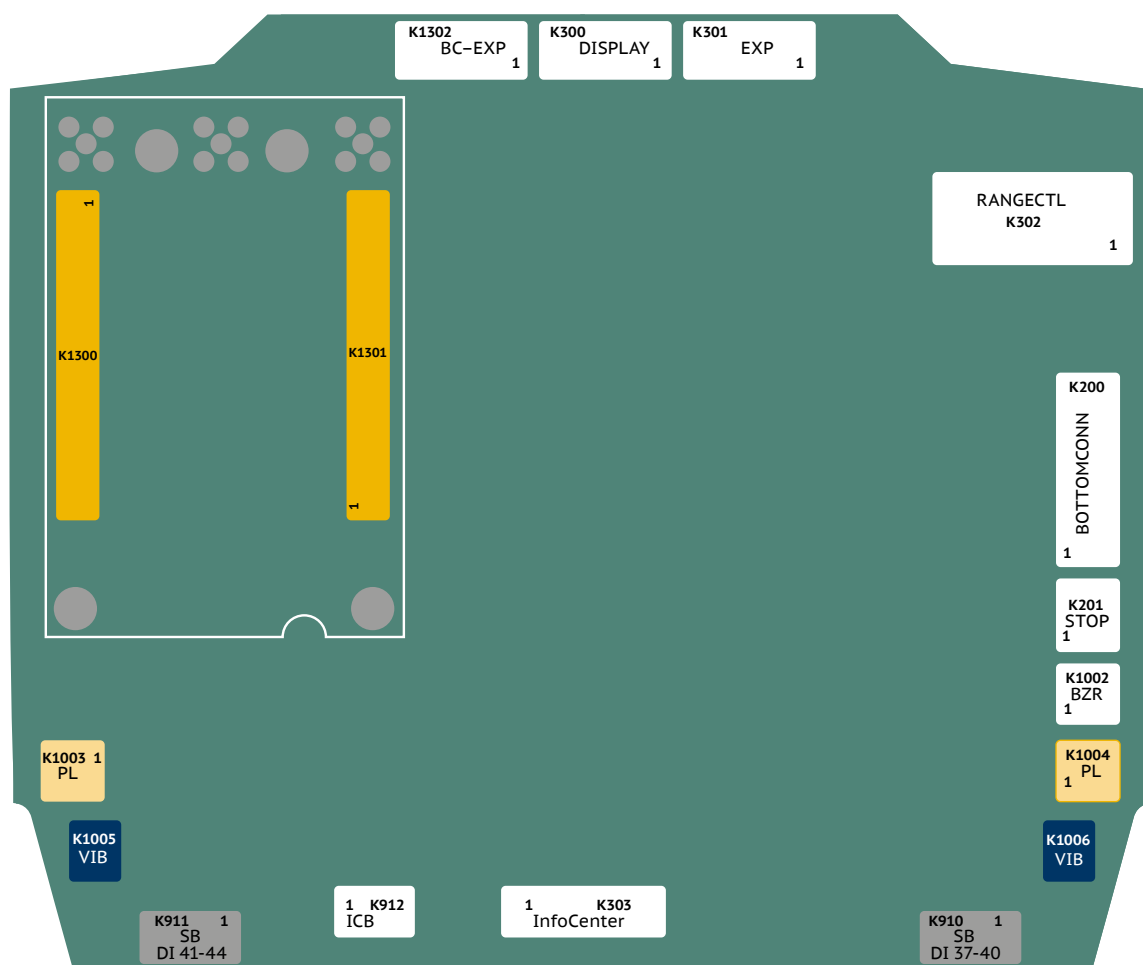


Connector side

Connector	Name	Description
K901	DI 1-12	Digital input 1–12 (13 pole connector) 0-5 V, DI 2-16 also works for potentiometer. Pin 1 GND Pin 2 Digital input 1 ⋮ Pin 13 Digital input 12
K902	DI 13-24	Digital input 13-24 (13 pole connector) 0-5 V, DI 2–16 also works for potentiometer. Pin 1 GND Pin 2 Digital input 13 ⋮ Pin 13 Digital input 24
K903	DI 25-36	Digital input 25–36 (13 pole connector) 0-5 V Pin 1 GND Pin 2 Digital input 25 ⋮ Pin 13 Digital input 36



Connector	Name	Description
K1000	LED 1-8	LED output (9 pole connector)
K1001	LED 9-16	Pin 1 LED 1 ⋮ ↓ Pin 8 LED 8 Pin 9 +5 V Common anode
K801	AI 1	Analog input 1 for safety actuator. Works for paddle lever, joystick, safety potentiometer, (4 pole connector) Pin 1 +5 V Pin 2 analog signal Pin 3 analog signal Pin 4 GND
K802	AI 2	
K803	AI 3	
K804	AI 4	
K805	AI 5	
K806	AI 6	
K807	AI 7	
K808	AI 8	
K809	AI 9	
K810	AI 10	
K811	AI 11	
K812	AI 12	
K813	AI 13	
K814	AI 14	
K815	AI 15	
K816	AI 16	
K820	SDI 1-4	Safe digital input (10 pole connector), 0–5 V Pin 1 +5 V Pin 2 SDI 1 Pin 3 SDI 1 Pin 4 SDI 2 Pin 5 SDI 2 Pin 6 SDI 3 Pin 7 SDI 3 Pin 8 SDI 4 Pin 9 SDI 4 Pin 10 GND
K821	SDI 5-8	
K900	Encoder	Encoder X3 with corresponding digital input for push function (11 pole connector) Pin 1 +5 V Pin 2 DI 36 (also in K903) Pin 3 Encoder 1 signal Pin 4 Encoder 1 signal Pin 5 DI 47 Pin 6 Encoder 2 signal Pin 7 Encoder 2 signal Pin 8 DI 48 Pin 9 Encoder 3 signal Pin 10 Encoder 3 Signal Pin 11 GND

*Component side*

Connector	Name	Description
K1003	PL	Panel light interface (2 pole connector) Right side
K1004	PL	Panel light interface (2 pole connector) Left side
K1005	VIB	Vibrator interface (2 pole connector) Right side
K1006	VIB	Vibrator interface (2 pole connector) Left side
K910	SB DI 37-40	Digital input 37-40 (5 pole connector)
K911	SB DI 31-44	0-5 V
		Pin 1 GND
		Pin 2 Digital input 37
		⋮
		Pin 5 Digital input 40
K1300	Radio interface	Internal interface for the TR06 radio module
K1301	Radio interface	Internal interface for the TR06 radio module



K300	Display	Connect all G6 compatible Displays
K200	BOTTOMCONN	Bottom part interface (10 pole connector) Pin 1 CAN H signal Pin 2 CAN L signal Pin 3 GND Pin 4 Battery 2 communication Pin 5 Battery 2 power Pin 6 GND Pin 7 Battery 1 communication Pin 8 Battery 1 power Pin 9 GND Pin 10 Cable power 9-36 V
K1002	BZR	Buzzer interface (2 pole connector)
K912	ICB	Info center button interface
K303	InfoCenter	Info Center interface
K201	STOP	Stop button interface (3 pole connector)
K1302	BC-EXP	Reserved for future use
K301	EXP	Reserved for future use
K302	RangeCTL	Reserved for future use



5. Standard and Optional Features

5.1. Standard Features

5.1.1. Information Center Display

The information center is a small display on the top section, located next to the customizable area. The main purpose of the information center is to give the operator essential information about the transmitter's operating status.

The information center will show the following information:

- Transmitter is switched on.
- Transmitter is locked.
- Battery level.
- Radio signal strength.
- Speed reduction.
- Error codes (with red backlight).
- Pairing options.
- Self-test mode.



There are two push buttons for browsing and selecting in the information center:



Next (left side).



Confirm (right side).

5.1.2. Auto-OFF timer

The Transmitter is equipped with a battery saving feature where it is switched off after a certain time when idle (1-60 minutes), depending on the configuration. The default configuration is five minutes. To reactivate the Transmitter, press the ON button. This feature can also be disabled.

5.2. Optional Features



NOTICE!

The optional features are installed from factory and shall not be retrofitted. To find out what feature you have in your transmitter, see separate technical documentation.

5.2.1. Panel Lights

The panel lights are built into the protective frame of the Micro and Mini transmitters. The purpose of the panel lights is to illuminate the top section with its actuators and decal area, and to make it easier for the operator to see and operate the transmitter in the dark.



5.2.2. Cable Control

The cable control functionality is always built into the receiver but optional for the transmitters and requires an external connector. The standard length of the tether cable is 10 meters. The cable control is used:

- As a backup solution, for example when a battery or batteries are not charged.
- In areas where radio transmission is not allowed.



WARNING!

- Be aware of the physical connection between the operator and machine when using cable control, especially when wearing carrying accessories such as a waist belt or neck strap. The operator must constantly pay attention to the machine and other equipment's movements to avoid any dangerous situations. The physical connection may cause the operator to be pulled or tripped by the cable.
- When working near overhead or underground power line's cables there is a risk of electrical shock from the machine to the operator due to the cable control.



NOTICE!

The transmitter and receiver must be paired for the cable control to function.

5.2.3. Haptic Feedback

The transmitters can be equipped with haptic feedback to make the operator aware of dangerous situations such as overload. Dual vibrator motors make the protective frame vibrate to alert the operator when holding the transmitter.

5.2.4. Buzzer

The Buzzer is an optional status indicator that will emit sound signals (beeps). What the sound signals indicate is determined by the system installer, typically some type of alert triggered from the machine.



PART 2: INSTALLATION, TROUBLESHOOTING AND MAINTENANCE

6. Installation

A typical Scanreco G6 radio remote control system consists of one portable battery-operated transmitter carried by the operator and one fixed receiver that is installed on the crane or machine that is being remote controlled. The communication between the Scanreco transmitter and receiver is wireless via a radio link. As an optional back-up solution, a tether cable can be installed between the transmitter and receiver, this automatically disables the radio communication and switches to serial communication via the cable.

The aim of this chapter is to present:

1. The inputs and outputs of the Scanreco radio remote control system.
2. Preparations before installation.
3. How to install the receiver.
4. How to setup and pair the transmitter.
5. How to install the battery charger.



WARNING!

- Read the safety instructions in chapter 2 carefully before proceeding with the installation.
- It is the responsibility of the system installer to correctly implement and install the Scanreco G6 radio remote control system for a specific machine.
- The system installer also has the responsibility to make sure that the system is installed in accordance with all country, federal, state, local and private safety and health regulations, codes, and standards. Scanreco does not take responsibility for any damage or injury caused by inadequate safety implementations.
- If the G6 system is used in a safety critical application, the system installer must do the appropriate testing and analysis of the final application to prevent injury to the end user.



NOTICE!

The radio and cable communication protocols in G6 are different from other Scanreco platforms. Therefore, it is not possible to mix transmitters and receivers from different platforms, pair transmitters/receivers from different platforms, or to operate transmitters/receivers from different platforms in a system.

6.1. Receiver Inputs and Outputs

6.1.1. CAN Bus

The receiver is by standard delivered with CANopen and Safety CAN. For detailed specifications regarding CAN bus see "APPENDIX 1 – G6 CANOPEN SPECIFICATION".

6.1.2. Safety Classified Functions

The receiver has the safety classified functions presented below. All safety classified functions are switched off within 0.5 seconds when the operator presses the STOP button on the transmitter, the radio link is interrupted, or when the battery runs out of power.



- **STOP output:** The STOP output is permanently high when the STOP button is in released state, the transmitter is switched on and a radio link is established. For some system configurations there are certain startup criteria that require fixed toggles and rotary potentiometers to be in zero-position before the STOP output can go high. The maximum load is 2 A. The function is safety classified according to IEC 61508, SIL 3/ISO 13849-1, PL e.
- **ACT_MOV:** The movement output is temporarily high when analog functions (e.g., joysticks, paddles, or safety potentiometers) on the transmitter are activated. Maximum load is 2 A. The function is safety classified according to IEC 61508, SIL 3/ISO 13849-1, PL e.
- **LOOP input/output:** Safety classified loop input/output for 9-36 VDC. The loop is closed when the transmitter is switched on and a radio link is established. Maximum load is 6 A. The function is safety classified according to IEC 61508, SIL 3/ISO 13849-1, PL e.
- **Safety CAN:** As part of the safety solution, the safety classified information will not only be available on HW signals, but they will also be available on CAN-bus by using the principles of the CANopen SRDO protocol.

**NOTICE!**

A common ground (GND) is required for Loop, power supply or manual mode.

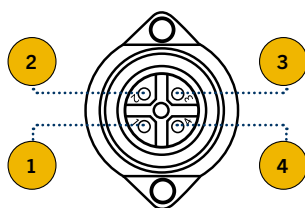
6.1.3. Manual Mode

This is a backup solution used if the transmitter is misplaced or damaged. The VIN MANUAL input enables manual override, typically from levers on a hydraulic valve block. When this input goes high and VIN REMOTE goes low, all safety classified outputs (see chapter 6.1.5. Receiver Pinout) will be enabled. As a system installer it is not mandatory to implement this function.

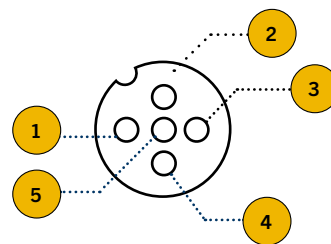
6.1.4. Tether Cable Connector

In systems with the optional tether cable control, a separate connector needs to be installed by the system installer on the machine. There are two different versions of the connector:

1. Hirschmann, four poles, female
2. M12, five poles, female.



1. Hirschmann



2. M12 connector

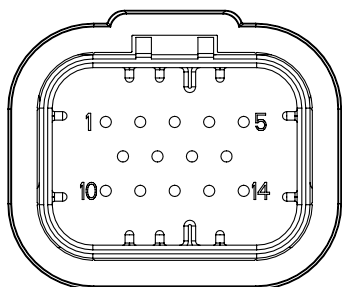
M12	Hirschmann	AMPSEAL	Description
1	N/A	N/A	N/A
2	1	3	+ CAB (supply voltage)
3	2	4	GND (ground)
4	3	8	Scanreco internal Serial communication High
5	4 (GND)	9	Scanreco internal Serial communication Low

**NOTICE!**

The internal serial communication between the transmitter and receiver is encrypted. It is not possible to read out this protocol.



6.1.5. Receiver Pinout



14-Pin AMPSEAL

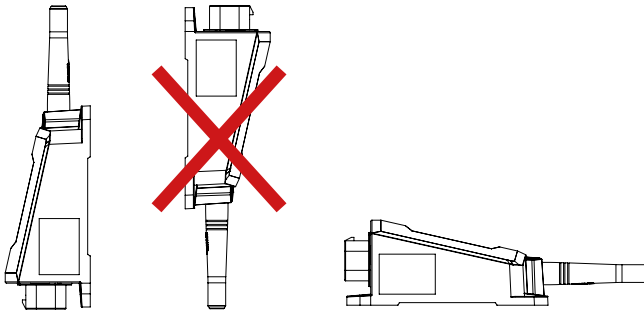
Pin	Signal	Description
1	VIN REMOTE	Power supply 12/24 VDC (Absolute maximum ratings 9-36 VDC) (Use external fuse 10 A)
2	LOOP IN	Safety classified loop input 9-36 VDC. Closed when transmitter is switched on and radio link established. Maximum load 6 A.
3	+CAB	Supply voltage for transmitter tether control (optional).
4	GND	Ground for transmitter tether control (optional).
5	LOOP OUT	Safety classified loop output. Closed when transmitter is switched on and radio link established. Maximum load 6 A.
6	GND	Ground
7	CAN1_H	CAN1 H
8	CABCAN_H	Serial communication for tether control (optional).
9	CABCAN_L	Serial communication for tether control (optional).
10	VIN MANUAL	Input for enabling manual override
11	CAN1_L	CAN1 L
12	ACT_MOV	Temporarily high when safety analog actuators (e.g., joysticks, paddles, or safety potentiometers) on the transmitter are activated. Maximum load 2 A.
13	GND	Ground
14	STOP_OUT	High when transmitter is switched on and radio link established Maximum load 2 A.

6.2. Receiver Installation

Make sure to follow the instructions in this chapter when installing the Receiver.

STEP 1: Find a good location on the machine and install the receiver.

1. Install the Receiver as high on the machine as possible or use an antenna extension cable to get optimum radio communication.
2. Avoid screening or surrounding the antenna with fixed objects.
This will largely reduce the range of the radio signals.
3. Do not let the antenna touch any metal object.



4. Install the Receiver vertically or horizontally with the cable connections downwards or sideways. When the receiver is installed horizontally an extension cable for the antenna must be used because the optimum antenna position is vertical.
5. Avoid installing the receiver in areas with excessive vibrations.
6. Install the Receiver away from strong sources of heat, for example exhaust pipes.
7. Use four (4) M5 screws (one in each corner) to install the receiver.
 - a. Screw holes: \varnothing 5,5 mm/0.21 inches.
 - b. Tighten the screws with a torque of 0.7 Nm.

STEP 2: Install the electrical connections.



NOTICE!

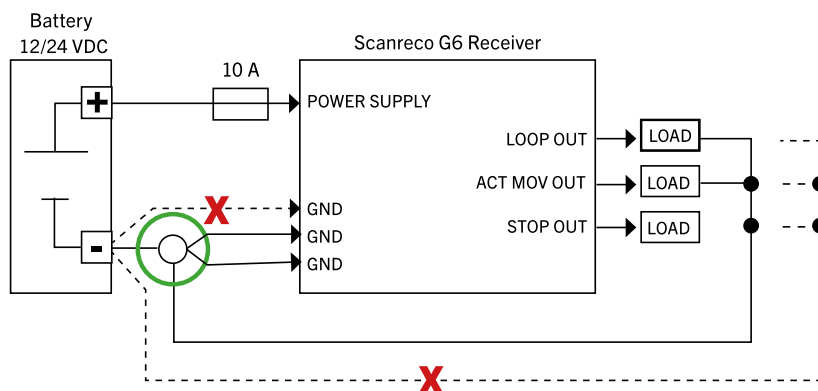
The receiver has an AMPSEAL 14-pin male connector from TE Connectivity. If you purchase the female mating connector yourself the items needed are:

776273-1 (CONN PLUG HSG 14POS AMPSEAL)

770854-3 (CONN SOCKET 16-20AWG CRIMP GOLD)

58529-1 (TOOL HAND CRIMPER 16-20AWG SIDE).

1. Install a 10 A external fuse on the power supply to the receiver.
2. Connect all ground (GND) cables to the common GND star point on the machine (X = not allowed). If one or more parallel GND cables gets disconnected it can cause undesired behavior on the outputs.





3. Connect the safety classified outputs LOOP OUT, STOP OUT and ACT MOV OUT to the corresponding safety inputs on the machine.
4. Connect the CAN bus and select external or internal termination.
 - a. External termination is enabled by installing a 120 Ohm resistor between CAN H and CAN L.
 - b. Internal termination is enabled/disabled by software parameters in the Scanreco digital servicing tool Modulate.
5. If the tether cable (optional feature) is used, a separate connector must be purchased and installed (M12/Hirschman). The separate female M12 or Hirschman connector can be placed anywhere on the machine for optimum ease of use.
6. Manual mode enables operation from control stations other than the transmitter. It is optional to install this functionality. To use manual mode an external switch must be purchased and installed.

STEP 3: Attach the antenna to the antenna connector (RP-SMA).

1. If you install the receiver outside, an antenna whip can be installed directly on the receiver.
2. If you install the receiver inside an electrical cabinet or obscured location, use an external extension cable.



NOTICE!

All systems use the license free ISM frequency bands: 868 MHz, 915 MHz, or 2.4 GHz. Make sure that the transmitter and receiver has the correct frequency band.

There are different antennas for different frequency bands. Scanreco has both a universal multiband antenna and a single band antenna. If you have purchased a multiband system, you can change the frequency using the Scanreco digital servicing tool Modulate. Make sure to select a frequency and output power that is allowed in your country. For countries outside of Europe and North America additional country specific approvals and labels are needed.

Frequencies typically used per region:

Worldwide:	2.4 GHz
Europe:	868 MHz or 2.4 GHz
North America:	915 MHz or 2.4 GHz
South America:	915 MHz (not all countries) or 2.4 GHz
Australia:	2.4 GHz
Asia:	2.4 GHz
Africa:	433 MHz

The list above is a simplified overview. Country specific differences occur. If you are uncertain about which frequency and output power to use, contact your point of purchase or Scanreco for further support.



WARNING!

External components connected to the receiver must have electrical safety approvals and fire enclosures if needed. External components must be safeguarded against fire under normal operating conditions and abnormal operating conditions.



6.2.1. Antenna

The receiver has an external antenna that is connected to the receiver with a RP-SMA connector. If the antenna needs replacing, make sure to use an antenna for the matching frequency (Maximum gain is 2 dBi for 2.4 GHz and +1 dBi for 868/915 MHz). Also, when attaching the new antenna, tighten it with a torque of 0,3-0,6 Nm.

When the receiver is installed inside an enclosure, an extension cable can be used to place the antenna in an optimal position. The extension cable must be a 50 Ohm coaxial low loss cable with a maximum length of 10 meters.

6.3. Transmitter Setup

Transmitters and receivers can be delivered either as a pre-paired system or as individual parts that will require pairing during initial setup. If the system is pre-paired the status LED on the receiver will switch from a green continuous light to a fast-flashing green light, when starting the transmitter.

6.3.1. Initial Pairing

To pair the transmitter and receiver, follow the instructions below.

-
1. Press the two buttons next to the information center display, **Next** (left side) and **Confirm** (right side), at the same time.
-

2. Navigate to **option 2** and press **Confirm**.
-

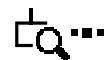


3. *Optional:* The option to cancel pairing will be shown on the screen. If you want to cancel the pairing process press **Next** to return to the main screen. Otherwise continue to the next step.
-

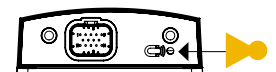


4. Press and hold down the buttons **Next + Confirm** at the same time for 3 seconds.
-

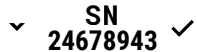


5. The transmitter will start searching for receivers.
-



6. Start pairing mode on the receiver.
 - a. Switch off the receiver.
 - b. Switch on the receiver.
 - c. Within five seconds after switching on the receiver, place the pairing magnet on the magnet symbol. The pairing magnet is supplied with every system delivery. If you do not have the pairing magnet, you can use any magnet with a force greater than 1 kg.
 - d. The LED on the receiver will flash orange with fast pulses, indicating that pairing is pending.
 - e. Immediately remove the magnet.
-





7. When the receiver is found its serial number will show on the information center.	
8. Make sure the serial number seen in the information center matches the intended receivers' serial number found on the product label. a. If it does not match, find the receiver with the non-matching serial number, and switch it off. b. Then you will have to switch off the transmitter and switch it on again. This will restart the pairing process from step one.	
9. If the serial numbers match, press Confirm to continue pairing.	
10. The pairing confirmation symbol will show for 2 seconds.	
11. The OFF symbol will show.	
12. Switch OFF the transmitter and power OFF the receiver.	
13. Power ON the receiver and switch ON the transmitter.	
14. The transmitter is now paired with the receiver.	

6.3.2. Color Display Setup

To upload graphics into the color display, follow the instructions below.

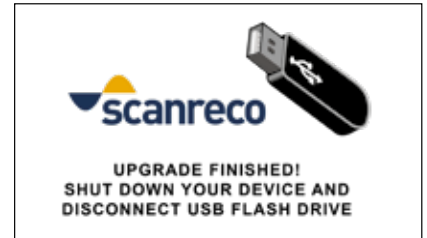
1. Switch off the transmitter.
2. Remove the programming connector lid on the back of the display.
3. Upload the graphics file into a USB flash drive.
 - a. Create a folder with the name "GUI".
 - b. The graphics file in the folder shall be named "scanreco_main".
4. Plug in the USB flash drive into the USB OTG adapter.
5. Plug in the USB OTG adapter into the programming connector.



6. Switch on the transmitter.
 - a. A green icon will show when the graphics are being uploaded to the display.
 - b. A message will be shown when the upload is finished.
7. Switch off the transmitter.
8. Disconnect the USB OTG adapter.
9. Put the programming connector lid back on.
10. The color display setup is now completed.



a. Uploading graphics



b. Finished uploading

**NOTICE!**

To copy the graphics from an already working display for use in another transmitter that controls an identical machine, or to keep as backup, plug in an empty USB flash drive into the working display. This will automatically copy the graphics file to the USB flash drive.

6.4. Bluetooth Connectivity

The transmitter and receiver uses Bluetooth Low Energy (BLE) to connect to the digital servicing tool Modulate. BLE is automatically activated when the transmitter or receiver are started and will remain active for one minute. If no connection is established during this time BLE will timeout. However, when the connection is made, it will stay connected until the system is switched off.

The following configurations can be made to the system using Modulate:

- Change and set parameters.
- Read out error codes.
- Install new firmware.

**NOTICE!**

For more information about Modulate, see chapter 8.1.1 Modulate.

6.5. Battery Charger

There are two different battery technologies available: Nickel Metal Hydride (NiMH) and Lithium Ion (Li-ion). They are not compatible with each other and that is why two different charger models are available. Use the matching battery and charger. Follow the instructions in this chapter to correctly install the battery charger.



6.5.1. Battery Charger Safety Information



CAUTION!

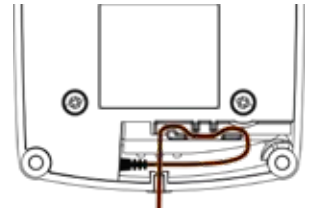
- This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.
- This appliance must only be supplied at SELV (Safety Extra-Low Voltage) corresponding to the marking on the appliance.
- Do not recharge non-rechargeable batteries.
- Never use a damaged or faulty battery charger.
- Never short circuit battery charger terminals.
- Avoid using the battery charger in temperatures other than specified.
- Avoid exposing the battery charger to direct sunlight.
- Always disconnect the battery charger from the power supply if it is not being used.
- Always install the battery charger indoors on a vibration-free and dry area.
- The battery charger must be externally fused with 3 A fuse.
- Do not install the battery charger in a closed compartment. The battery charger must be able to ventilate heat and/or gas.
- Do not use the battery charger if the connection cable is damaged or faulty.
- Do not use the battery charger in hazardous locations or near explosive substances.
- Do not cover the battery charger.
- The connection to the supply mains must be in accordance with the national wiring rules.



6.5.2. Battery Charger Installation

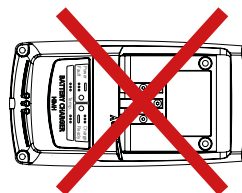
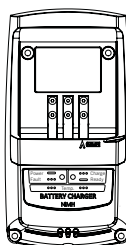
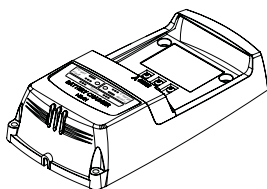
STEP 1: Connect the power cable.

1. Connect power cable to DC connector.
2. Place the power cable in the cable track to prevent it from disconnecting.
3. The power supply of battery charger is made in three versions:
 - a. 12/24 VDC with 1,8 m / 5.9 ft cable for terminal supply connection. Use a 3A external fuse.
 - b. 12/24 VDC with 1,8 m / 5.9 ft (extended length) coiled cable with car adapter.
 - c. 110/230 VAC power supply with 1,5 m/4.11 ft power cable.
4. After installing the power supply cable in the Li-ion battery charger, clamp the ferrite onto the cable 5 cm / 2 inches away from the charger housing. Ferrite is included in the cardboard box with the Li-ion charger. Ferrite does not apply for NiMH battery charger.



STEP 2: Mount the charger.

1. Mount the battery charger on a flat surface, preferably on a wall or table. When mounting on a wall make sure to mount it vertically with the power cable facing downwards.
2. Make sure to mount the charger at a height of maximum 2 meters above the floor. This is to comply with the electrical safety standards.
3. Use four (4) M5 screws (one in each corner) when mounting the charger.
 - a. Screw holes: Ø 4.4 mm / 0.17 inches.
 - b. Tighten the screws with a torque of 0.7 Nm.





7. Troubleshooting

The aim of this chapter is to present error codes and status indications, how to understand them, how to troubleshoot them, and how to fix the errors.

Errors can occur in the transmitter, receiver, battery, charger, machine, and external third-party products. If the troubleshooting steps presented in this chapter do not fix the errors, extend the troubleshooting to include the complete machine and/or external third-party products such as hydraulics or controllers. To troubleshoot specific machines or third-party products, see troubleshooting guides provided by the machine producer or the producer of third-party products.



NOTICE!

Before you start troubleshooting:

1. Identify the type of error in the error codes list below (chapter 7.1 Error Codes).
2. Troubleshoot the transmitter and/or receiver according to the error codes list.



WARNING!

- Always take a product out of use if you experience errors until they are troubleshooted and resolved. Contact the point of purchase or Scanreco for further support if needed.
- Always troubleshoot with caution and be aware of undesired machine movements or other dangerous situations.

7.1. Error Codes

The information center on the transmitter will light up in RED when a system error has occurred in any part of the Scanreco G6 radio remote control system. A four-digit error code will be shown on the display along with a warning triangle. If there are multiple errors the error codes will be shown cyclical.

Error codes and status indications presented in this chapter will also be available to users in the Scanreco digital servicing tool Modulate, as well as error logs for previously occurred errors. For more information about Modulate see Chapter 8.1.1 in this service manual.

Error Codes Overview

Code	Location	Product
1001	Stop button	TRANSMITTER
1101 – 1316	Analog safety actuators	TRANSMITTER
1401 – 1408	Digital safety actuators	TRANSMITTER
1501 – 1702	Self-checks 5V and ground	TRANSMITTER
1801 – 1916	Analog actuators	TRANSMITTER
2002/2202 – 3204	Self-checks for SISPTM	TRANSMITTER/RECEIVER
3201/3202	Battery	TRANSMITTER
8101 – 8107	CAN	RECEIVER
9001 – 9499	Self-checks	TRANSMITTER
9501 – 9505	RTC	RECEIVER
9801 – 9899	Self-checks	TRANSMITTER



Error Codes List

Code	Cause of error	Possible reason	Correction
1001	The dual electrical signals from the stop button have been interpreted as outside of specification.	Faulty stop button or main board error. The operator has pressed or released the stop button very slowly.	Repair or replace the transmitter if the stop button is pressed and/or released correctly and the error continues.
1101 – 1116	A safety classified analog actuator has been active when the transmitter was started. The last two digits of the error code indicates which actuator is faulty (01 → the analog connected to hardware input 1 was active when the transmitter was started).	The actuator (lever, joystick, or safety potentiometer) was active at startup. The actuator is broken. Main board error.	Make sure that all actuators are in neutral position when starting the transmitter. Especially safety potentiometers. Replace the actuator or main board if the error continues.
1201 – 1216	The dual outputs from safety classified analog actuators have been measured outside of specification. The last two digits of the error code indicates which actuator is faulty (01 → the analog connected to hardware input 1 was found faulty). The actuator will be disabled until the transmitter is restarted.	The actuator is broken. Main board error. The cable or terminal is broken.	Replace the actuator, main board, cable, or terminal.
1301 – 1316	The dual outputs from safety classified analog actuators have been measured outside of specification. The last two digits of the error code indicates which actuator is faulty (01 → the analog connected to hardware input 1 was found faulty). The actuator will be disabled until the transmitter is restarted.	The actuator is broken. Main board error. The cable or terminal is broken.	Replace the actuator, main board, cable, or terminal.
1401 – 1408	The dual outputs from safety classified digital actuators have been measured outside of specification. The last two digits of the error code indicates which actuator is faulty (01 → the digital connected to hardware input 1 was found faulty).	The actuator was moved very slowly between two positions. The actuator was very rapidly moved between two positions. The actuator is broken. Main board error.	Replace the actuator or main board if the actuator is operated correctly and the error continues.
1501 – 1504	A control signal for correct operation of the actuators has failed. The transmitter can report a fault on any of the four control signals, detailed by the last two digits of the error code.	Main board error.	Replace the main board or transmitter



Code	Cause of error	Possible reason	Correction
1701 – 1702	<p>The 5V reference voltage for correct operation of the actuators have failed.</p> <p>Error code 1701 indicates that the voltage is below expected values.</p> <p>Error code 1702 indicates that the voltage is above expected values.</p>	Main board error.	Replace the main board or transmitter
1801 – 1816	<p>A non-safety classified analog actuator has been found as faulty. The electrical signals are not within specified voltage range. The last two digits of the error code indicates which actuator is fault (01 → the analog connected to hardware input 1 is faulty).</p> <p>The actuator will be disabled until the transmitter is restarted.</p>	<p>Incorrect actuator type is configured.</p> <p>The actuator is broken.</p> <p>Main board error.</p> <p>The cable or terminal is broken.</p>	<p>Make sure that the correct type of actuator is configured.</p> <p>Replace the actuator, main board, cable, or terminal if the error continues.</p>
1901 – 1916	<p>A non-safety classified analog actuator was active when the transmitter was started. The last two digits of the error code indicates which actuator is faulty (01 → the analog connected to hardware input 1 was active when the transmitter was started).</p> <p>The actuator will be disabled until the transmitter is restarted.</p>	<p>The actuator (lever, joystick, or safety potentiometer) was active at startup.</p> <p>The actuator is broken.</p> <p>Main board error.</p>	<p>Make sure that all actuators are in neutral position when starting the transmitter.</p> <p>Configure the system to not check for this error, if intended.</p> <p>Replace the actuator or main board if the error continues.</p>
2002/2202	<p>A communication protocol deviation has been found, preventing the transmitter from linking up to the receiver.</p>	<p>The feedback link from the receiver to transmitter is not working.</p>	<p>Make sure that the receiver antenna is mounted and positioned correctly to improve the signal quality. Replace the antenna and/or radio components if the error continues.</p>
2003/2203	<p>A read write check has failed in the microprocessor when starting the transmitter.</p>	<p>Hardware error.</p> <p>External EMC interference.</p>	<p>Replace the main board if the error continues.</p>
2004/2204	<p>The microprocessor flash image is faulty.</p>	<p>Hardware error.</p> <p>External EMC interference.</p>	<p>Replace the main board if the error continues.</p>
2005/2205	<p>The microprocessor clock speed is faulty.</p>	<p>Hardware error.</p> <p>External EMC interference.</p>	<p>Replace the main board if the error continues.</p>
2006/2206	<p>One of the SISPTM micro-processors indicates that the other SISPTM micro-processors is faulty.</p>	<p>Side effect of another fault.</p>	<p>Solve the other error codes that are shown.</p>
2007/2207	<p>Communication protocol error where the message sent from the receiver to the transmitter is too long or too short.</p>	<p>Application software error.</p>	<p>Correct the application software and reprogram transmitter and/or receiver.</p>



Code	Cause of error	Possible reason	Correction
2008/2208	A CRC error has been found in the communication protocol.	Application software error. External EMC interference.	Replace the main board and/or reprogram the application software.
2009/2209	Communication protocol error where the message sent from the transmitter to the receiver is too long.	Application software error. External EMC interference.	Replace the main board and/or reprogram the application software.
2010/2210	A validation check has failed in the microprocessor RAM when starting the transmitter.	Hardware error. External EMC interference.	Replace the main board if the error continues.
2011/2211	A mismatch in the interpretation of a safety classified digital switch.	Application software error. Hardware error.	Replace the main board and/or reprogram the application software.
2012/2212	A mismatch in the interpretation of the stop button in the communication protocol.	Application software error. Hardware error.	Replace the main board and/or reprogram the application software.
2013/2213	The dual inputs from the stop button are faulty, where both signals have the same electrical level.	Faulty stop button Hardware error.	Replace the stop button or the main board.
2014/2214	A mismatch in the interpretation of safety classified analog actuators in the communication protocol.	Application software error. Hardware error.	Replace the main board and/or reprogram the application software.
2015/2215	Error in the cyclical sampling of safety classified inputs.	Application software error. Hardware error.	Replace the main board and/or reprogram the application software.
2016/2216	Software stack overflow.	Hardware error. Software error.	Replace the main board.
2017/2217	MUX sampling error of safety classified inputs.	Hardware error. Software error.	Replace the main board and/or reprogram the application software.
2018/2218	A voltage check error where the voltage is above or below specification.	Hardware error.	Replace the main board and/or reprogram the application software.
2019/2219	Monitoring of the MUX for sampling safety classified inputs has failed.	Hardware error. Software error.	Replace the main board and/or reprogram the application software.
2020/2220	The ADC in the microprocessor is faulty, preventing sampling of safety classified inputs.	Hardware error.	Replace the main board.
2021/2221	The internal supply voltage is too low.	Receiver supply voltage is too low. Hardware error.	Increase the supply voltage to the receiver if a tether cable is used for operation. Replace the main board if error continues.
2022/2222	The internal supply voltage is too high.	Receiver supply voltage is too high. Hardware error.	Decrease the supply voltage to the receiver if a tether cable is used for operation. Replace the main board if error continues.



Code	Cause of error	Possible reason	Correction
2023/2223	Reading cycle sampling error for safety classified inputs.	Application software error. Hardware error.	Replace the main board and/or reprogram the application software.
2025/2225	The transmitter temperature is too high.	The transmitter is operating in conditions outside of specification. Hardware error.	Wait for the transmitter to cool down. Replace the main board if error continues.
2026/2226	The transmitter temperature is too low.	The transmitter is operating in conditions outside of specification. Hardware error.	Wait for the transmitter to heat up. Replace the main board if error continues.
2027/2227	A generic self-test of the micro-processor has failed.	Hardware error.	Replace the main board if error continues.
2028/2228	An inconsistency regarding the serial number in the communication protocol.	The serial number is incorrectly configured.	Replace the main board if error continues.
2029/2229	The software and hardware are incompatible.	Hardware error.	Replace the main board if error continues.
2030/2230	A software register is faulty.	Hardware error. Software error.	Replace the main board if error continues.
2098/2298	The SISPTM processor has not been started correctly or is unable to communicate with the application microprocessor.	Hardware error.	Replace the main board if error continues.
2099/2299	The SISPTM processor has stopped working or is not able to communicate with the application microprocessor.	Hardware error.	Replace the main board if error continues.
2102/2302	A communication protocol error is preventing the transmitter to properly link up to the receiver.	The feedback link from the receiver to the transmitter is not working.	Make sure that the receiver antenna is mounted and positioned correctly to improve the signal quality. Replace the antenna and/or radio module if the error continues.
2103/2303	An inconsistency regarding the serial number in the communication protocol.	The serial number is incorrectly configured.	Replace the main board if error continues.
2104/2304	The connection between the transmitter and receiver has been lost in an unexpected way.	Software error.	Replace the receiver and/or reprogram the application software if the error continues.
2105/2305	The software and hardware are incompatible.	Hardware error.	Replace the receiver if the error continues.
2106/2306	One of the SISPTM microprocessors is indicating that the other SISPTM microprocessor is faulty.	Side effect of another fault.	Solve the other error codes that are shown.
2107/2307	Communication protocol error where the message sent from the transmitter to the receiver is too long.	Application software error. External EMC interference.	Replace the receiver and/or reprogram the application software if the error continues.



Code	Cause of error	Possible reason	Correction
2108/2308	A feedback signal for safety classified outputs indicates that the output is on when it should be off.	Hardware error. External EMC interference.	Replace the receiver if the error continues.
2109/2309	A validation check has failed in the microprocessor RAM when starting the receiver.	Hardware error. External EMC interference.	Replace the receiver if the error continues.
2110/2310	A read write check has failed in the microprocessor when starting the receiver.	Hardware error. External EMC interference.	Replace the receiver if the error continues.
2111/2311	The microprocessor flash image is faulty.	Hardware error. External EMC interference.	Replace the receiver if the error continues.
2112/2312	A generic self-test of the microprocessor has failed.	Hardware error.	Replace the receiver if the error continues.
2113/2313	The microprocessor clock speed is faulty.	Hardware error. External EMC interference.	Replace the receiver if the error continues.
2114/2314	Software stack overflow.	Hardware error. Software error.	Replace the receiver if the error continues.
2115/2315	The EEPROM is faulty, preventing critical parameters to be accessed.	Hardware error. Software error. External EMC interference.	Replace the receiver if the error continues.
2116/2316	A software register is faulty.	Hardware error. Software error.	Replace the receiver if the error continues.
2117/2317	Receiver supply voltage is too high.	Supply voltage too high. Hardware error.	Decrease the supply voltage to within specification. Replace the receiver if the error continues.
2118/2318	Receiver supply voltage is too low.	Supply voltage too low. Hardware error.	Increase the supply voltage to within specification. Replace the receiver if the error continues.
2119/2319	The receiver temperature is too high.	The receiver is operating in conditions outside of specification. Hardware error.	Wait for the receiver to cool down. Replace the receiver if the error continues.
2120/2320	The receiver temperature is too low.	The receiver is operating in conditions outside of specification. Hardware error.	Wait for the receiver to heat up. Replace the receiver if the error continues.
2121/2321	The overvoltage protection for the STOP output is faulty.	Hardware error.	Replace the receiver if the error continues.
2122/2322	The overvoltage protection for the LOOP output is faulty.	Hardware error.	Replace the receiver if the error continues.



Code	Cause of error	Possible reason	Correction
2123/2323	Power supply has been found on both manual and remote input.	Incorrect wiring. Hardware error.	Make sure the power is supplied to only one input at any time. Replace the receiver if the error continues.
2198/2398	The SISP™ processor has not been started correctly or is unable to communicate with the application microprocessor.	Hardware error.	Replace the receiver if the error continues.
2199/2399	The SISP™ processor has stopped working or is unable to communicate with the application microprocessor.	Hardware error.	Replace the receiver if the error continues.
3103	The receiver application microprocessor EEPROM is corrupted, clearing all configuration parameters.	Incompatible software has been installed. Hardware error. External EMC interference.	Correct the parameters and install the updated software on the receiver.
3201	The battery in compartment one (1) has been found as a non-original battery. The transmitter will shut down automatically after a few minutes.	A non-original or faulty battery is used. Dirty battery poles and/or springs.	Clean battery poles and springs. Replace the battery with an original Scanreco battery.
3202	The battery in compartment two (2) has been found as a non-original battery. The transmitter will shut down automatically after a few minutes.	A non-original or faulty battery is used. Dirty battery poles and/or springs.	Clean battery poles and springs. Replace the battery with an original Scanreco battery.
3203	The transmitter application microprocessor EEPROM is corrupted, clearing all configuration parameters.	Incompatible software has been installed. Hardware error. External EMC interference.	Correct the parameters and install the updated software on the transmitter.
3204	The transmitter microprocessor flash memory has been corrupted.	Software update was not successful. Hardware error. External EMC interference.	Update software correctly. Replace the main board if error continues.
8101	A CAN passive error has occurred.	Incorrect CAN wiring. Wrong baud rate setting. Incorrect CAN termination. Hardware error.	Ensure a correct CAN wiring and setting. Replace the receiver if the error continues.
8102	A CAN buffer overflow error has occurred.	Incorrect CAN wiring. Wrong baud rate setting. Incorrect CAN termination. Hardware error.	Ensure a correct CAN wiring and setting. Replace the receiver if the error continues.
8103	A CAN bus off error has occurred.	Incorrect CAN wiring. Wrong baud rate setting. Incorrect CAN termination. Hardware error.	Ensure a correct CAN wiring and setting. Replace the receiver if the error continues.



Code	Cause of error	Possible reason	Correction
8104	A CAN PDO length error has occurred in CAN1.	Incorrect RPDO length is received.	Make sure the object dictionary is reset. Make sure that the correct length on the RPDO is accurate.
8105	A CAN PDO length error has occurred in CAN2.	Incorrect RPDO length is received.	Make sure the object dictionary is reset. Make sure that the correct length on the RPDO is accurate.
8106	A CAN transmit collision occurred.	Incorrect CAN wiring. Wrong baud rate setting. Incorrect CAN termination. Too high CAN bus load. Hardware error.	Ensure a correct CAN wiring and setting. Replace the receiver if the error continues.
8107	A CAN passive error has occurred.	Node guarding protocol is not accurate.	Ensure correct node guarding protocol is implemented.
9001	The transmitter radio module is not responding.	The radio module is missing or broken.	Replace the radio module if the error continues.
9002	The transmitter's internal I2C bus is faulty.	Hardware error.	Replace the main board if the error continues.
9101 – 9199	A major receiver software error.	Software error. Hardware error.	Update the receiver software. Replace the receiver if the error continues.
9301 – 9399	A minor receiver software error.	Software error. Hardware error.	Update the receiver software. Replace the receiver if the error continues.
9401 – 9499	A major transmitter software error.	Software error. Hardware error.	Update the transmitter software. Replace the main board if the error continues.
9501	The receiver application was unable to read time and date from the RTC module.	No hardware support for RTC. Hardware error. The RTC battery service life has expired.	Make sure that the receiver is equipped with RTC. Disable the RTC parameters if it is not supported. Replace the receiver if the error continues.
9502	The receiver application was unable to set time and date to the RTC module.	No hardware support for RTC. Hardware error.	Make sure that the receiver is equipped with RTC. Disable the RTC parameters if it is not supported. Replace the receiver if the error continues.
9503	The receiver application was unable to read time and date from the RTC module.	No hardware support for RTC. Hardware error. The RTC battery service life has expired.	Make sure that the receiver is equipped with RTC. Disable the RTC parameters if it is not supported. Replace the receiver if the error continues.



Code	Cause of error	Possible reason	Correction
9504	The receiver application was unable to read time and date from the RTC module.	No hardware support for RTC. Hardware error. The RTC battery service life has expired.	Make sure that the receiver is equipped with RTC. Disable the RTC parameters if it is not supported. Replace the receiver if the error continues.
9505	The RTC time has been changed when RTC was initialized.	The time has been changed. The RTC battery service life has expired.	Replace the receiver if the error continues.
9801 – 9899	A minor transmitter software error has been found.	Software error. Hardware error.	Update the transmitter software. Replace the main board if error continues.

7.2. Self-test Mode

Use Self-test mode to diagnose errors in actuators on the customizable area of the transmitter. Self-test mode is started from the information center display. The purpose is to either identify a broken actuator or rule out errors in actuators. If no errors are found, further troubleshooting is required.

When starting the Self-test mode, all digital and analog data will be visible on the information center display and on the color display, if the transmitter is equipped with a color display. The displays will allow users to monitor data in real-time during testing. For the color display there will also be several screens that display different kinds of data. To switch between them press the Confirm button (right side of the information center display).








NOTICE!

Before testing, set rotary potentiometers to zero-position.



How to use Self-test mode:

1. Press the two buttons next to the information center display, Next (left side) and Confirm (right side), at the same time.
2. Press the Next button to navigate between options in the information center menu.
3. Navigate to option 1, Self-test mode, indicated by the symbol:  1.
4. Press the Confirm button to enter Self-test mode.
5. When Self-test mode is entered the following will occur:
 - a. All communication is stopped, preventing link-up with the receiver.
 - b. An automated sequence of tests will be done, one time for each optional feature (buzzer, haptic feedback, panel lights and LEDs), according to below event timing:
 - i. Panel LEDs and display LEDs will light up.
 - ii. The buzzer will make a sound.
 - iii. The panel lights will light up.
 - iv. The haptic feedback motors will vibrate one time for each motor (left and right).
6. The information center will display four different self-tests to choose from:

Option	Self-test	Symbol
1.1	Analog actuators	1.1 
1.2.	Digital actuators	1.2 
1.3.	Rotary encoders	1.3 
1.4.	Pitch and roll angle of the transmitter	1.4 

7. Navigate to the test that you want to do.
 - a. Press the Confirm button to start the test.
 - b. Manually test the actuators one-by-one.
 - c. Press the Next button to exit the test and return to the menu.
8. Repeat steps 6 through 7 to select and start another test.
9. Switch off the transmitter to exit Self-test mode.
10. Switch on the transmitter to resume normal operation.



NOTICE!

For detailed information regarding the four different tests when using Self-test mode, read subchapters 7.2.1 through 7.2.4.

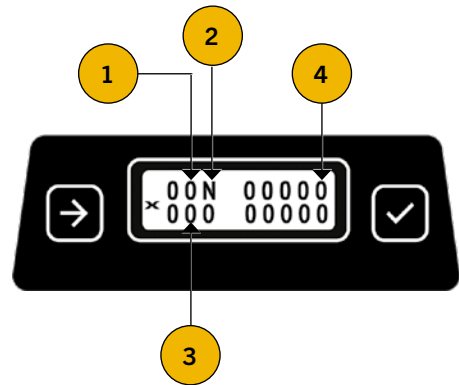


7.2.1. Analog Actuators

The analog actuators are joysticks, levers, and potentiometers. A set of numbers will show on the display when the Analog actuator self-test is started.

The numbers shown on the display refer to:

1. The analog actuator that is being moved. If multiple actuators are moved at the same time the actuator with the lowest number will be displayed.
2. The type of analog actuator that is being moved.
N = Non-safety classified actuator
S = Safety classified actuator.
3. The direction the analog actuator is being moved in. When moved in an opposite direction the colors of the numbers will be shown as inverted (white text on a black background). Values will range between 0-127.
4. These numbers are not detailed in this user manual since they are only used for advanced factory troubleshooting.



NOTICE!

If the numbers shown on the display do not change and remain zero (0) when moving the actuator:

1. The analog actuator is broken.
2. The analog actuator has not been implemented or activated in the software setting.

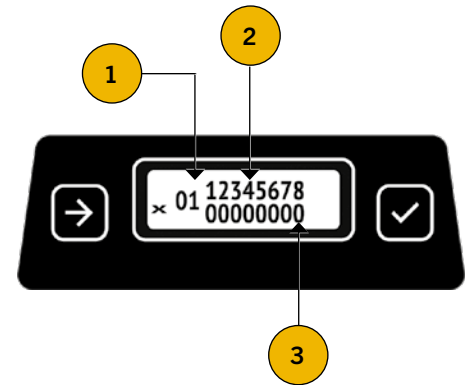


7.2.2. Digital Actuators

The digital actuators are push buttons, toggle switches and rotary switches. A set of numbers will show on the display when the Digital actuator self-test is started.

The numbers shown on the display refer to:

1. The last activated (moved or pushed) digital actuator. If another digital actuator is activated during the test, the numbers will change.
2. The number of safety classified digital actuators. The numbers 1-8 will always show on the display. This is because eight is the maximum number of safety classified digital actuators that can be configured.
3. The status of the safety classified digital actuator:
 0 = Not present or inactive
 1 = Activated
 2 = Invalid
 3 = Faulty.



NOTICE!

If the numbers do not change when activating a digital actuator during the self-test:

1. The digital actuator is broken.
2. The digital actuator has not been implemented or activated in the software setting.

Depending on the configuration of the transmitter, the number of safety classified digital actuators can vary. To find out how many safety classified digital actuators the transmitter has, refer to the technical specification for your configuration.

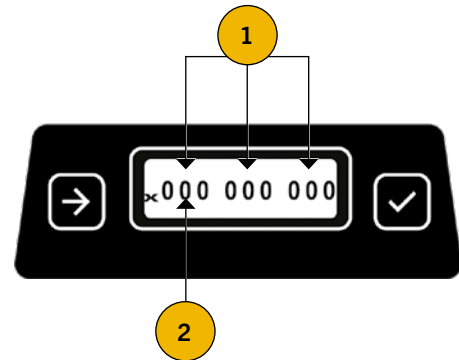


7.2.3. Rotary Encoders

A maximum of three rotary encoders can be configured on the transmitter. A set of numbers will show on the display when the Rotary encoders self-test is started. Check the status of the rotary encoders by turning them individually in increments of one (1) between the minimum and maximum values (000-255).

The numbers shown on the display refer to:

1. The status of each individual rotary encoder.
2. The position of the rotary encoder.
 - a. The minimum value is 000.
 - b. The maximum value is 255.



NOTICE!

If the numbers shown on the display do not change when turning the encoder:

1. The rotary encoder is broken.
2. The rotary encoder has not been implemented or activated in the software setting.

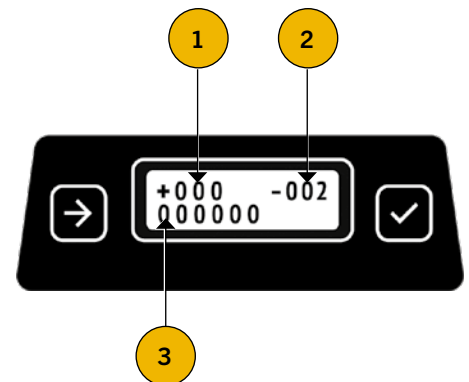


7.2.4. Pitch and Roll Angle of Transmitter

The transmitter can be configured with a tilt-sensor that measures the tilt of the transmitter in the x- and y-directions. A set of numbers will show on the display when the Pitch and roll angle self-test is started. The numbers will show the output from the tilt-sensor.

The numbers shown on the display refer to:

1. The roll angle of the transmitter.
 - a. A minus sign (-) will show the left roll angle.
 - b. A plus sign (+) will show the right roll angle.
2. The pitch angle of the transmitter.
 - a. A minus sign (-) will show the left pitch angle.
 - b. A plus sign (+) will show the right pitch angle.
3. The events that are triggered. Triggered events are indicated by the number one (1), and no triggered events by the number zero (0). The triggered events are counted from left to right, as follows:
 - a. Roll event
 - b. Pitch event
 - c. Freefall event (momentary)
 - d. Impact event (momentary)
 - e. Freefall event (static)
 - f. Impact event (static).



NOTICE!

- The tilt-sensor is broken if the numbers shown on the display do not change when tilting the transmitter during the self-test.
- Depending on the configuration, the transmitter can be switched off automatically if it is tilted too much in a certain direction. To find out if the transmitter is configured with this feature, see separate technical specification.
- The transmitter Pitch and roll functionality is optional to implement. The values from the sensor are presented as raw data via the CAN bus protocol.



7.3. Status Indications

7.3.1. Receiver Status Indications

The Receiver is equipped with one LED that indicates status for errors, pairing and connection. The LED will light up in three different colors: ● Red, ● Green and ● Orange.

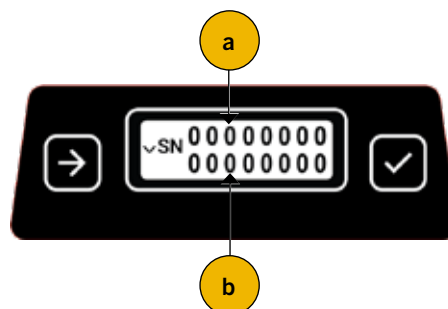
Status LED	Indicating
○ Off	No power supply
● Red continuous	Major error
● Red fast flashing	Minor error
● Orange continuous	Refuse link with transmitter
● Orange fast flashing	Pairing pending
● Orange slow flashing	Pairing
● Green continuous	Power supplied – No link to transmitter and no CAN communication
● Green fast flashing	Linked with transmitter
● Green slow flashing	Power supplied – No link to transmitter CAN in operational mode
● ● Green + Orange alternating	Linked over BLE to diagnostic tool

7.3.2. Serial Number Readout

If the product label is missing or unreadable the serial number can be viewed in the information center. Also, the serial number of the last paired receiver can be viewed. This is helpful if the transmitter is the only product that has been returned for service and repairs.

To view the serial numbers:

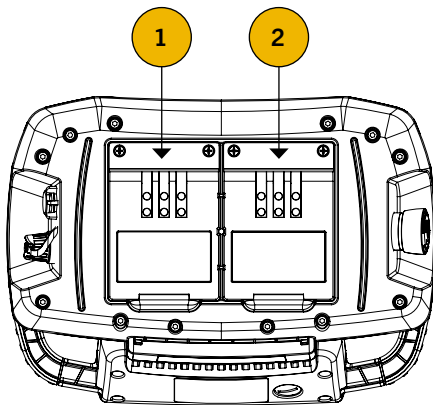
1. Press Next and Confirm at the same time.
2. Press Next button three times.
3. The serial numbers will be displayed.
 - a. Transmitter serial number
 - b. Receiver serial number.





7.3.3 Battery and Charger Status Indications


Symbols will be visible on the main screen of the Information center display that indicates the status of the batteries' charge and the batteries' condition. If the transmitter has two battery compartments, two status symbols will be visible, one for each battery.





Status	One Battery	Two Batteries (Only for Mini transmitter) Battery compartment 1 (left) Battery compartment 2 (right)
Battery 0%		or
Battery 25%		or
Battery 50%		or
Battery 75%		or
Battery 100%		
Battery FAULTY	+ Error code 3201	or + Error codes 3201/3202
Cable Connection		



7.3.4. Lock Status

If the transmitter is locked, the lock symbol  will be visible on the information center display. When locked, the transmitter will not be able to link up to a receiver. The button combination presented below is used to both lock and unlock the Transmitter.


1. Press and hold down **Confirm**: 
2. While holding down Confirm, press **Next** three times: 
3. Finally, release **Confirm**.
 - a. The transmitter is **unlocked** when the lock symbol is no longer visible.
 - b. The transmitter is **locked** when the lock symbol is visible.



NOTICE!

Depending on the configuration of your transmitter, the lock function might not be available. Test the transmitter according to the instructions above to find out if the lock function is available.

7.3.5. Speed Reduction Status

Speed reduction is a feature that allows machine operators to reduce the maximum speed of machine movements. When activated, the speed reduction symbol  will be visible on the information center display. Below the symbol a bar-graph is displayed indicating the currently selected speed reduction. If speed reduction is reduced to zero, the symbol will no longer be visible.



NOTICE!

Depending on the configuration of your transmitter, the speed reduction feature might not be activated. However, if speed reduction is activated, two digital buttons (including information center buttons) or one toggle switch, can be configured to increase and decrease speed reduction.



7.3.6. Radio Signal

The current state of the transmitter's radio signal strength will be visible on the main screen of the information center. The different radio signal states will be indicated by radio signal bars.

Radio Signal States	Symbol
No radio link	
Radio signal strength 1-25%	
Radio signal strength 26-50%	
Radio signal strength 51-75%	
Radio signal strength 76-100%	
Radio Standby	



NOTICE!

The Radio Standby symbol indicates that something is preventing the transmitter from operating. Make sure that joysticks, levers, potentiometers, and switches are in zero-position during startup of the transmitter and that the STOP button is not activated. If this does not solve the issue, see chapter 7 Troubleshooting.

7.3.7. Charger Status Indications

There are two LEDs on the battery charger that indicates the status of the batteries' charge: Power LED (● Red) and Status LED (● Green)

Power LED	Status LED	Indicating
● Red	○ Off	Charger powered. No battery is present.
● Red	● Green	Charger powered. Battery fully charged.
● Red	● Green flashing	Charger powered. Battery charging.
● Red flashing	○ Off	Error on battery or charger, or temperature out of charging range.
● Red flashing	● Green flashing	Only for NiMH: Battery is not charging because of too high or low temperature.



8. Maintenance



WARNING!

During on-site maintenance work at the machine, always be cautious of unwanted and dangerous machine movements.



NOTICE!

The inspection of the machine and Scanreco radio control system must comply with national requirements, and it must be done by authorized companies, according to the statutory inspection intervals.



CAUTION!

- Clean the Transmitter and/or Receiver exterior with a damp cloth.
- Never use high pressure water jets.
- Do not use sharp or pointed objects to clean with.
- Do not use solvents or flammable/corrosive materials for cleaning.
- Check the rubber bellows and rubber seals of the switches, buttons, levers, and joysticks for damage. Immediately replace any broken rubber bellows and/ or rubber seals.
- Only use original Scanreco spare parts.
- Make sure that no foreign objects are left in the product after maintenance.
- Always test and/ or troubleshoot the product after maintenance to make sure the issue or issues are resolved.
- Always carry out maintenance in a dry environment.
- Always carry out maintenance in an ESD-safe environment.
- Make sure that only maintenance technicians with a soldering certificate replace components that require soldering.

8.1. System Level

8.1.1. Modulate

Modulate is a Windows software and digital servicing tool developed by Scanreco that allows you to:

- Connect to the transmitter or receiver via Bluetooth Low Energy (BLE).
- View and clear error codes.
- View, change and set parameters.
- Update firmware.

**WARNING!**

1. Using Modulate requires specific training and personal account registration with Scanreco. Never give your log in credentials or forward the software to anyone.
2. When changing parameters, it is your responsibility to inform and educate the product owner of the changes. This is to avoid putting the product owner/operator in any dangerous situations due to new and changed functionality.
3. Always verify that the new functionality works as intended after changing any parameter.
4. Never change any parameters if you are uncertain about the consequences.
5. Disabling or changing a parameter can make the Scanreco product non-compliant according to standards and regulations. Make sure to always comply with all relevant machine and safety standards and regulations.

**NOTICE!**

- See Scanreco "Parameter Manual G6 Radio Remote Control System" for further information.
- Contact your point of purchase or Scanreco for support regarding parameters and Modulate.

8.1.1.1. Software Version

The software version is available through the Scanreco digital servicing tool Modulate. To identify the software programmed into the product the G6 software version follows a strict naming convention.

Naming convention: <Family>-<Type of Unit>-<Customer>-<Version>-<GIT commit>-<GIT hash>-[Dirty]-<Type of software>

Naming convention meaning:

Family:	G6
Type of unit:	CU (CAN receiver) or PCU (transmitter).
Customer:	STANDARD (generic product, none OEM specific), other OEM customers.
Version:	Four digit rolling release version number.
Build number:	Number of GIT commits since last release version, should always be 0 in released software.
GIT hash:	Unique identifier from GIT version system.
Dirty:	The string dirty is added only if the software was compiled on un-versioned code.
Type of software:	APP (application software), SISP™ (safety processor software).

Software version examples:

- CU application software for OEM customer:
G6-CAN-OEMCUSTOMER-0001-0-gc7b1a11-APP
- PCU safety software for generic customers:
G6-PCU-STANDARD-0014-0-g555fb09-SISP™



8.1.2. Spare Parts

Available spare parts are presented in alphabetical order in the table below.

- Spare parts list meanings:
P00027-Cxxxxxxx00: This item number refers to the specific customer configuration.
See the product label for your specific configuration number. Replace “xxxxxxx” with the configuration number found on the product label.
- Serviced by:
 - Operator: The spare parts can be replaced by the operator.
 - Service Point: The spare parts must be replaced by an authorized service technician.

Item number	Description	Product	Serviced by
49070	Antenna Omni 2.4-2.485 GHz RP-SMA Male	Receiver	Operator
102890	Antenna Omni 868/915/2400 MHz RP-SMA Male	Receiver	Operator
103216	Battery Charger Li-ion With Car Adapter 12/24 VDC	System	Operator
102242	Battery Charger Li-ion With Flying Leads 12/24 VDC	System	Operator
103217	Battery Charger Li-ion With Power Supply 110-230 VAC	System	Operator
103141	Battery Charger NiMH With Car Adapter 12/24 VDC	System	Operator
102232	Battery Charger NiMH With Flying Leads 12/24 VDC	System	Operator
103142	Battery Charger NiMH With Power Supply 110-230 VAC	System	Operator
701	Battery Li-Ion 5100 mAh 7.2 VDC Black Scanreco Logo	System	Operator
700	Battery NiMH 2000 mAh 7.2 VDC Grey Scanreco Logo	System	Operator
102421	Bottom Section SA Micro Black With Stop Button	Micro	Service Point
102466	Bottom Section SA Micro Black With Stop Button & Hirschman Tether Connector	Micro	Service Point
102422	Bottom Section SA Micro Black With Stop Button & M12 Tether Connector	Micro	Service Point
102444	Bottom Section SA Mini Black	Mini	Service Point
102470	Bottom Section SA Mini Black With Hirschman Tether Connector	Mini	Service Point
102443	Bottom Section SA Mini Black With M12 Tether Connector	Mini	Service Point
102442	Bottom Section SA Mini Black With Stop Button	Mini	Service Point
102468	Bottom Section SA Mini Black With Stop Button & Hirschman Tether Connector	Mini	Service Point
102441	Bottom Section SA Mini Black With Stop Button & M12 Tether Connector	Mini	Service Point
102545	Cable Assembly 10-pole 2-axis joystick	Micro/Mini	Service Point
102546	Cable Assembly 10-pole 3-axis joystick	Micro/Mini	Service Point
103155	Cable Assembly 10-pole Micro Bottom	Micro	Service Point
102561	Cable Assembly 10-pole Mini Bottom	Mini	Service Point
102552	Cable Assembly 10-pole Safe Digitals	Micro/Mini	Service Point
102550	Cable Assembly 11-pole Encoder, LED	Micro/Mini	Service Point
102549	Cable Assembly 13-pole Digitals	Micro/Mini	Service Point
103618	Cable Assembly TE Connectivity AMPSEAL 14-pol AWG 20 3.24 m	Receiver	Service Point
102554	Cable Assembly 3-pole Stop Button	Micro/Mini	Service Point
102547	Cable Assembly 4-pole L2 Lever	Micro/Mini	Service Point



Item number	Description	Product	Serviced by
100460	Cable Assembly 4-pole Hirschmann KS10 10 m	Micro/Mini	Operator
103432	Cable Assembly 4-pole Hirschmann Tether Connector Male With Lid	Micro/Mini	Service Point
102690	Cable Assembly 5-pole M12 Male – Male 10 m	Micro/Mini	Operator
102670	Cable Assembly 5-pole M12 Tether Connector Female With Lid	Micro/Mini	Service Point
102553	Cable Assembly 5-pole Side Buttons	Micro/Mini	Service Point
102548	Cable Assembly 8-pole Standard 4.3" Display	Mini	Service Point
102868	Cable Assembly 8-pole Premium 4.3" display	Mini	Service Point
102551	Cable Assembly 9-pole LED	Micro/Mini	Service Point
48060	Carrying Harness Black	Accessory	Operator
44512	Carrying Neck Strap Black	Accessory	Operator
48063	Carrying Vest Orange	Accessory	Operator
102521_S	CU CAN G6 2.4 GHz (General spare part that needs programming via Modulate)	Receiver	Service Point
102520_S	CU CAN G6 868/915 MHz/2.4 GHz (General spare part that needs programming via Modulate)	Receiver	Service Point
P00005-Cxxxxxxx00	CU CAN G6 - Configuration specific & pre-programmed	Receiver	Service Point
102515	Diode LED 5V Blue Panel Ø 8 mm	Micro/Mini	Service Point
102513	Diode LED 5V Green Panel Ø 8 mm	Micro/Mini	Service Point
102512	Diode LED 5V Red Panel Ø 8 mm	Micro/Mini	Service Point
102516	Diode LED 5V White Panel Ø 8 mm	Micro/Mini	Service Point
102514	Diode LED 5V Yellow Panel Ø 8 mm	Micro/Mini	Service Point
102518	Display Panel Color LCD Standard 4.3"	Mini	Service Point
52029	Display Panel Color LCD Premium 4.3"	Mini	Service Point
52151	Display Panel Color LCD Premium WIFI 4.3"	Mini	Service Point
103324	Display Panel Cover Micro	Micro	Service Point
103325	Display Panel Cover Mini	Mini	Service Point
102247	Display Panel LCD Information Center	Micro/Mini	Service Point
P00020-Cxxxxxxx00	Display Panel LED Micro Configuration Specific Overlay	Micro	Service Point
102428	Display Panel LED Micro Standard	Micro	Service Point
102519	Display Panel LED Mini Standard	Mini	Service Point
P00012-Cxxxxxxx00	Display Panel LED Mini Configuration Specific Overlay	Mini	Service Point
102472	Dummy Panel Light	Micro/Mini	Service Point
102800	E-Board Logic PCU G6 GHz (General spare part that needs programming via Modulate)	Micro/Mini	Service Point
103109	E-Board Transceiver TR06 PCU 2.4 GHz – Micro/Mini Internal PCB Antenna	Micro/Mini	Service Point
102474	E-Board Transceiver TR06 PCU Micro G6 2.4 GHz External Antenna	Micro	Service Point
102431	E-Board Transceiver TR06 PCU Micro G6 868/915 MHz/2.4 GHz External Antenna	Micro	Service Point



Item number	Description	Product	Serviced by
102476	E-Board Transceiver TR06 PCU Mini G6 2.4 GHz External Antenna	Mini	Service Point
102437	E-Board Transceiver TR06 PCU Mini G6 868/915 MHz/ 2.4 GHz G External Antenna	Mini	Service Point
102260	Gasket Thermoplastic Black	Micro	Service Point
102301	Gasket Thermoplastic Black	Mini	Service Point
102511	Joystick 1-axis	Micro/Mini	Service Point
102592	Joystick 1-axis With Push Button	Micro/Mini	Service Point
102505	Joystick 2-axis Square Gated	Micro/Mini	Service Point
102507	Joystick 2-axis Square Gated With Push Button	Micro/Mini	Service Point
102506	Joystick 3-axis X-Y-Z Square Gated	Micro/Mini	Service Point
47600	Lever L2B Black	Micro/Mini	Service Point
48412	Lever L2B Red	Micro/Mini	Service Point
100709	Lever Rotational $\pm 135^\circ$ – Safety Potentiometer Bi-directional	Micro/Mini	Service Point
100708	Lever Rotational 270° – Safety Potentiometer Uni-directional	Micro/Mini	Service Point
52021	Lid For Protective Frame	Mini	Operator
103157	M12 Lid With Strap For Tether Connector	Micro/Mini	Operator
103169	Magnet Shaft Mounted 21xx25 mm For Pairing	Receiver	Operator
102464	Mounting Kit Joystick	Micro/Mini	Service Point
102530	Mounting Kit Elevated Joystick	Micro/Mini	Service Point
102458	Mounting Kit Lever L2	Micro/Mini	Service Point
49409	Plastic Knob Black – 13 mm For Non-Safety Potentiometers	Micro/Mini	Operator
49410	Plastic Lid Black For Knob 49409	Micro/Mini	Operator
49411	Plastic Nut Cover Black For Knob 49409	Micro/Mini	Operator
45106	Plastic Knob Black – 21 mm For Non-Safety Potentiometers	Micro/Mini	Operator
45107	Plastic Knob Lid Black For Knob 45106	Micro/Mini	Operator
100453	Plastic Knob Black For Non-Safety Rotary Switches	Micro/Mini	Operator
100454	Plastic Lid Black For Knob 100453	Micro/Mini	Operator
103089	Plastic Knob Black For Safety Potentiometers And Safety Rotary Switches	Micro/Mini	Operator
103090	Plastic Lid Black For Knob 103089	Micro/Mini	Operator
45007	Plastic Rubber Hood Button Black	Micro/Mini	Service Point
102524	Plastic Rubber Hood Button Black – Side Button	Micro/Mini	Service Point
45609	Plastic Rubber Hood Button Green	Micro/Mini	Service Point
45607	Plastic Rubber Hood Button Red	Micro/Mini	Service Point
45608	Plastic Rubber Hood Button Yellow	Micro/Mini	Service Point
44510	Plastic Rubber Hood Toggle Black	Micro/Mini	Service Point
52025	Plastic Rubber Hood Toggle Black – Half Booth	Micro/Mini	Service Point
45448	Plastic Rubber Hood Toggle Black/Silver – Half Booth Latching Toggles	Micro/Mini	Service Point
49485	Plastic Rubber Hood Toggle Black/Black – Half Booth Latching Toggles	Micro/Mini	Service Point
51294	Plastic Rubber Hood Toggle Green	Micro/Mini	Service Point
52180	Plastic Rubber Hood Toggle Grey	Micro/Mini	Service Point

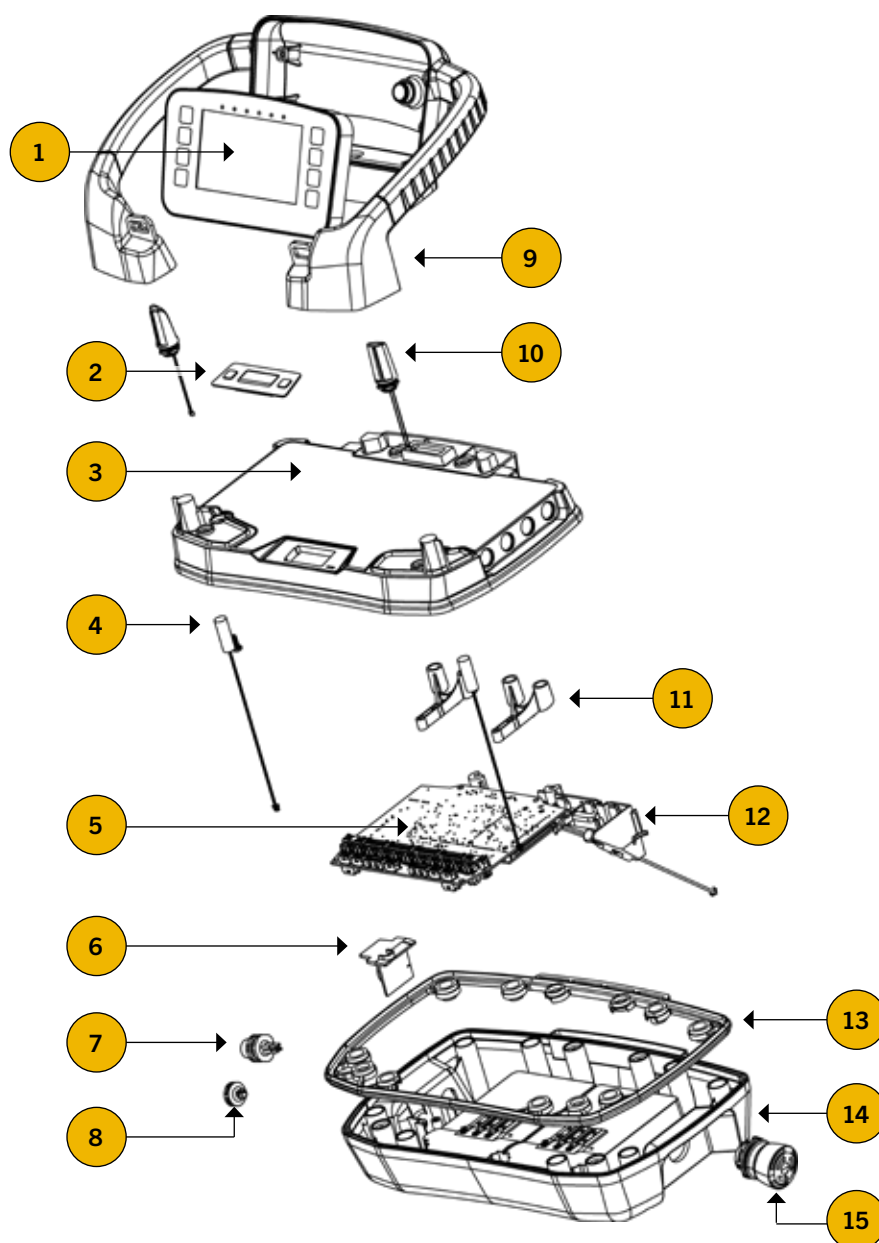


Item number	Description	Product	Serviced by
51292	Plastic Rubber Hood Toggle Red	Micro/Mini	Service Point
51293	Plastic Rubber Hood Toggle Yellow	Micro/Mini	Service Point
102447	Protective Frame_SA Micro Black/Grey	Micro	Service Point
102282	Protective Frame_SA Mini Without Bar Black/Grey	Mini	Service Point
49432	Resistor Potentiometer 100 Ohm THT Panel 14 x 18,5 mm Uni-directional	Micro/Mini	Service Point
103429	Resistor Potentiometer 1k Ohm THT Panel 19x41 mm Bi-directional	Micro/Mini	Service Point
102460	Screw Kit Micro	Micro	Service Point
102459	Screw kit Mini	Mini	Service Point
47871	Spare Part Kit Encoder (including knob)	Micro/Mini	Service Point
102499	Sub Assembly Buzzer G6	Micro/Mini	Service Point
102471	Sub Assembly Panel Light Transparent	Micro/Mini	Service Point
102485	Switch Push Button Hole Mounted – Side Type	Micro/Mini	Service Point
102895	Switch Push Button Hole Mounted (1)-0 2-pole	Micro/Mini	Service Point
45006	Switch Push Button Hole Mounted (1)-0 1-pole	Micro/Mini	Service Point
102964	Switch Rotary Hole Mounted 3-pos 2-pole	Micro/Mini	Service Point
46488	Switch Rotary Hole Mounted 3-pos 1-pole	Micro/Mini	Service Point
102965	Switch Rotary Hole Mounted 4-pos 2-pole	Micro/Mini	Service Point
50405	Switch Rotary Hole Mounted 4-pos 1-pole	Micro/Mini	Service Point
102966	Switch Rotary Hole Mounted 5-pos 2-pole	Micro/Mini	Service Point
102967	Switch Rotary Hole Mounted 6-pos 2-pole	Micro/Mini	Service Point
50290	Switch Rotary Hole Mounted 6-pos 1-pole	Micro/Mini	Service Point
51620	Switch Toggle Hole Mounted (1)-0-(1) 2-pole	Micro/Mini	Service Point
44507	Switch Toggle Hole Mounted (1)-0-(1) 1-pole	Micro/Mini	Service Point
51623	Switch Toggle Hole Mounted (1)-1 2-pole	Micro/Mini	Service Point
45202	Switch Toggle Hole Mounted (1)-1 1-pole	Micro/Mini	Service Point
103433	Switch Toggle Hole Mounted 1-0-(1) 2-pole	Micro/Mini	Service Point
45179	Switch Toggle Hole Mounted 1-0-(1) 1-pole	Micro/Mini	Service Point
44508	Switch Toggle Hole Mounted 1-0-1 1-pole	Micro/Mini	Service Point
103465	Switch Toggle Hole Mounted 1-0-1 2-pole	Micro/Mini	Service Point
44576	Switch Toggle Hole Mounted 1-1 2-pole	Micro/Mini	Service Point
44509	Switch Toggle Hole Mounted 1-1 1-pole	Micro/Mini	Service Point
49484	Switch Toggle with Latch Hole Mounted 1-0-1 2-pole – Flat Knob	Micro/Mini	Service Point
45447	Switch Toggle with Latch Hole Mounted 1-0-1 2-pole – Round Knob	Micro/Mini	Service Point
45477	Switch Toggle with Latch Hole Mounted 1-1 2-pole – Round Knob	Micro/Mini	Service Point
P00027- Cxxxxxx00	Top Section Micro Blue – Configuration specific with printed overlay and milled holes	Micro	Service Point
P00028- Cxxxxxx00	Top Section Mini Blue – Configuration specific with printed overlay and milled holes	Mini	Service Point
102496	Vibrator With Connector 13500 rpm 45 dB For Haptic feedback	Micro/Mini	Service Point
103256	Waistbelt Belt Black G6 Scanreco Logotype	Accessory	Operator



8.2. Transmitter Level

8.2.1. Mini Transmitter Exploded View

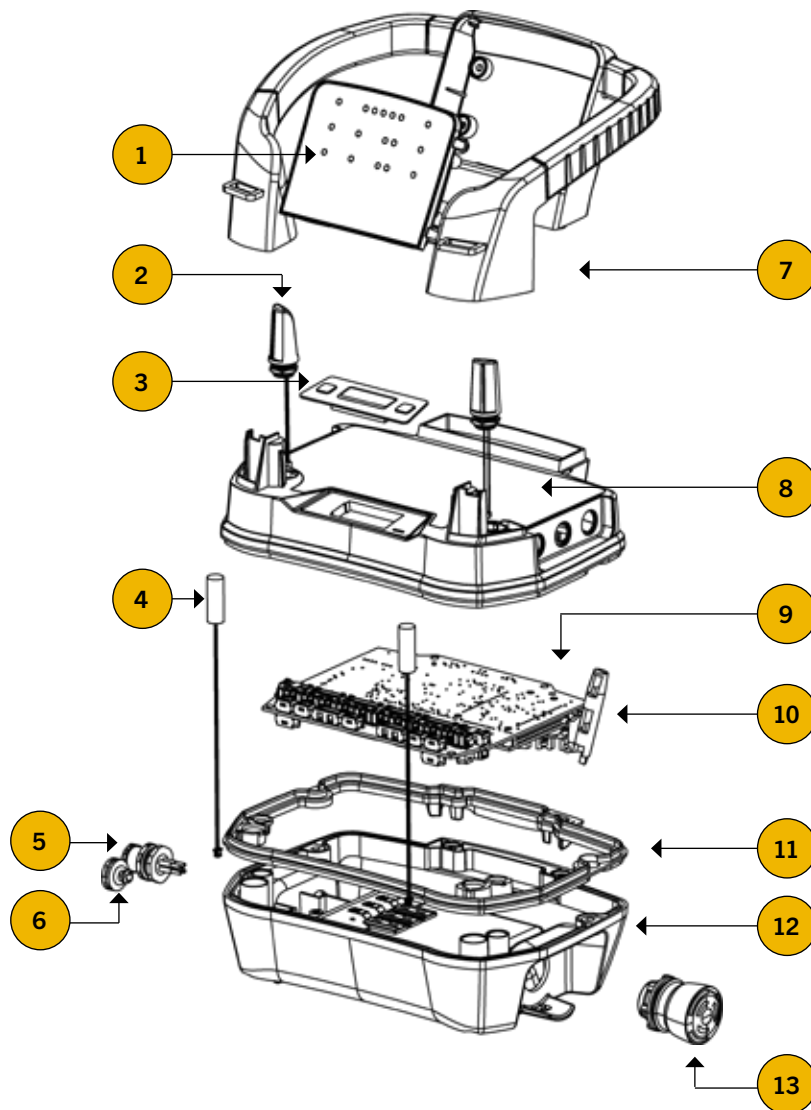


No.	Description	Quantity
1	Color display	1
2	Information center	1
3	Top section	1
4	Vibrator motor	2
5	Main board	1
6	Buzzer holder	1
7	Tether connector	1
8	Gore-Tex valve	1

No.	Description	Quantity
9	Protective frame	1
10	Panel Lights	2
11	Mounting brackets for main board	2
12	Radio module with antenna holder	1
13	Gasket	1
14	Bottom section	1
15	STOP-button	1



8.2.2. Micro Transmitter Exploded View



No.	Description	Quantity
1	LED display	1
2	Panel lights	2
3	Information center	1
4	Vibrator motor	2
5	Tether connector	1
6	Gore-Tex valve	1
7	Protective frame	1

No.	Description	Quantity
8	Top section	1
9	Main board	1
10	Radio module with antenna holder	1
11	Gasket	1
12	Bottom section	1
13	STOP-button	1



8.2.3. Disassembly

To access and replace broken parts the bottom section of the transmitter must be removed. A general step-by-step guide is presented below for best practices when disassembling the transmitter. Follow the steps to avoid parts and product damage. Also, see chapter 8.1.2 Spare Parts to find out which parts can be replaced.



WARNING!

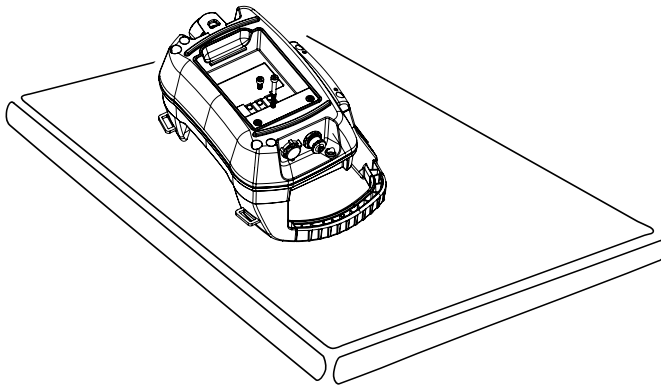
Before disassembly, switch off the Transmitter, remove the battery or batteries, and disconnect the tether cable.

STEP 1: Switch off the transmitter by pressing the STOP button.

STEP 2: Remove the battery or batteries.

STEP 3 Disconnect the tether cable, if applicable.

Scanreco does not authorize any end customers or operators to disassemble the transmitter housing. This must be done by authorized service technicians in an ESD-safe environment.



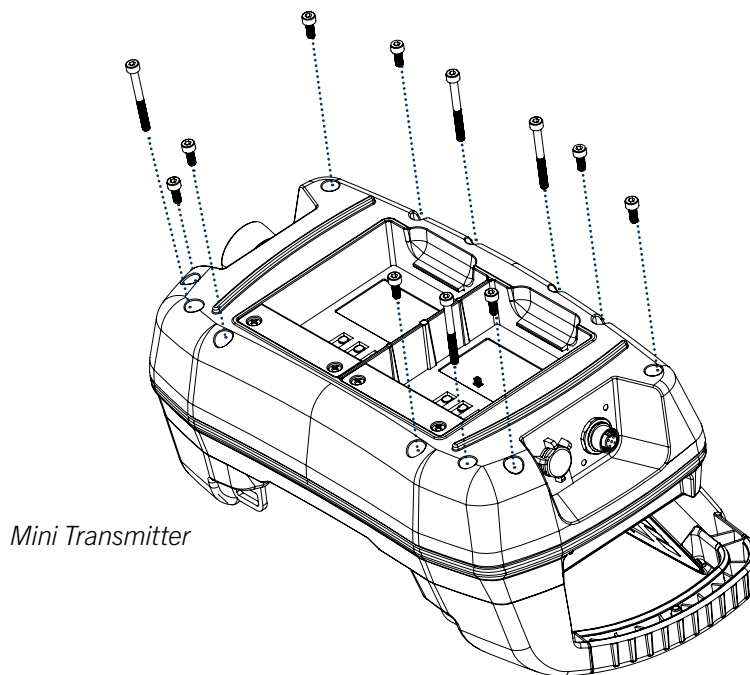
STEP 1: Place the transmitter upside down.

The protective frame is attached to the bottom section and will come loose during STEP 2 when the screws are removed. Before you start the disassembly process, make sure that the transmitter is stable by placing it upside down.

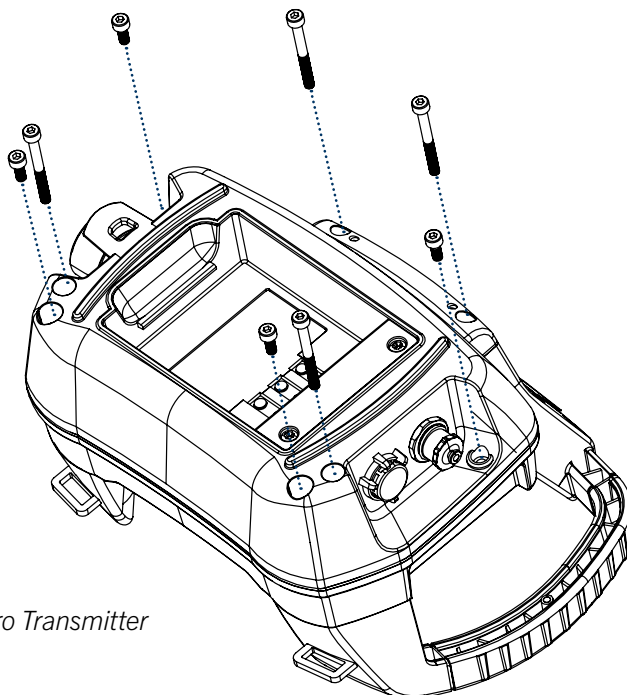
**STEP 2: Remove the screws.**

Use a hex key or screwdriver with an Allen bit (size H3) to remove the screws.

1. Remove the short screws first.
2. Remove the long screws second.



Mini Transmitter



Micro Transmitter



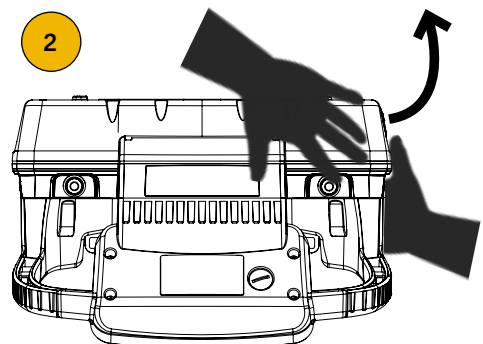
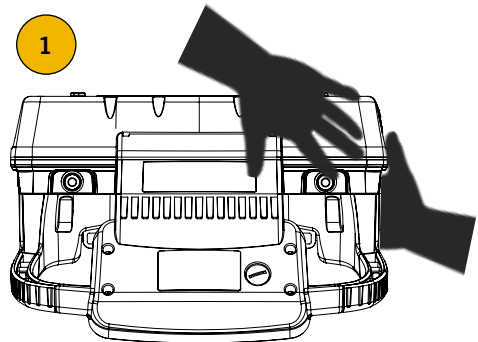
STEP 3: Remove the bottom section.



CAUTION!

- Do not use any tools to pry open the transmitter. This will damage the gasket and/or the plastic housing.
- Do not pull on or hold onto levers, joysticks, switches, and other external parts when removing the bottom section from the top section.
- Do not pull on or hold onto the protective frame when removing the bottom section. It is loose from removing the screws in the previous step.
- Remove the bottom section with caution since cables are attached to the top section.
- Always check the gasket for damage after removing the bottom section. Make sure to replace a damaged gasket before assembly.

1. Find a good hand placement. One hand should be gripping the top section and the other the bottom section. To avoid product damage, read the precautions above.
2. Pull the bottom section and gasket upwards until they come loose from the top section.
3. Carefully lift the bottom section and place it to the side of the transmitter with the attached wires facing up.
4. Check the gasket for damage after removing the bottom section. If it is damaged it must be replaced.
5. Disconnect the wires that connect the top and bottom sections together. This is done by disconnecting the wires from the white connection terminals on the main circuit board.



**STEP 4: Replace the broken parts.**

When the bottom section has been removed from the top section, the transmitter is ready for maintenance work. Use the following recommended tools to replace the broken parts:

- Soldering pen
- Scalpel
- Wrench
- Screwdriver with a Philips PH2 bit for actuators, display, radio module and main board.

**WARNING!**

- When replacing broken parts, only use original spare parts from Scanreco.
- Always replace broken parts with the same component that was installed from factory. Do not modify the transmitter by installing other similar parts.

STEP 5: Visual inspection.

- Check the inside of the product for moisture, dust, or foreign objects.
- Make sure that no cables are pinched.
- Make sure that the gasket is not pinched.
- Make sure that all actuators are firmly secured and not loose.

8.2.4. Assembly

When the broken parts have been replaced the transmitter must be assembled. A general step-by-step guide is presented below for best practices when assembling the transmitter. Follow the steps to avoid parts and product damage.

STEP 1: Place the top section upside down.

1. If the protective frame was removed from the top section during maintenance, you must assemble the two parts.
 - a. Make sure that the transparent gasket that is attached to the display cable is fitted tightly to the top section when you assemble the two parts. For systems without LED or Color display make sure that the rectangular rubber gasket is tightly fitted.
2. Make sure that the top section is stable by placing it upside down. The protective frame is still loose from when you disassembled the transmitter.

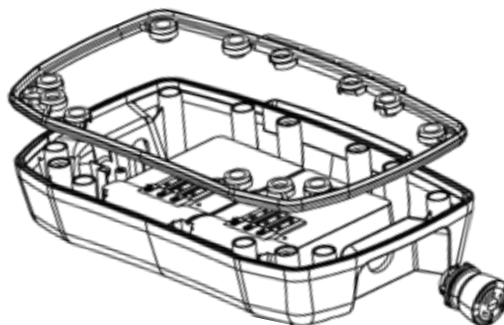
STEP 2: Connect the cables.

1. Connect all cables to the correct connection terminal. For more information on where to connect the cables on the main board see chapter 4.3. Transmitter Main board.
2. Make sure that all cables are securely connected.



STEP 3: Fit the gasket to the bottom section.

1. Fit the gasket to the bottom section.
2. Make sure that it is tightly fitted.
3. Make sure that no part is sticking out.



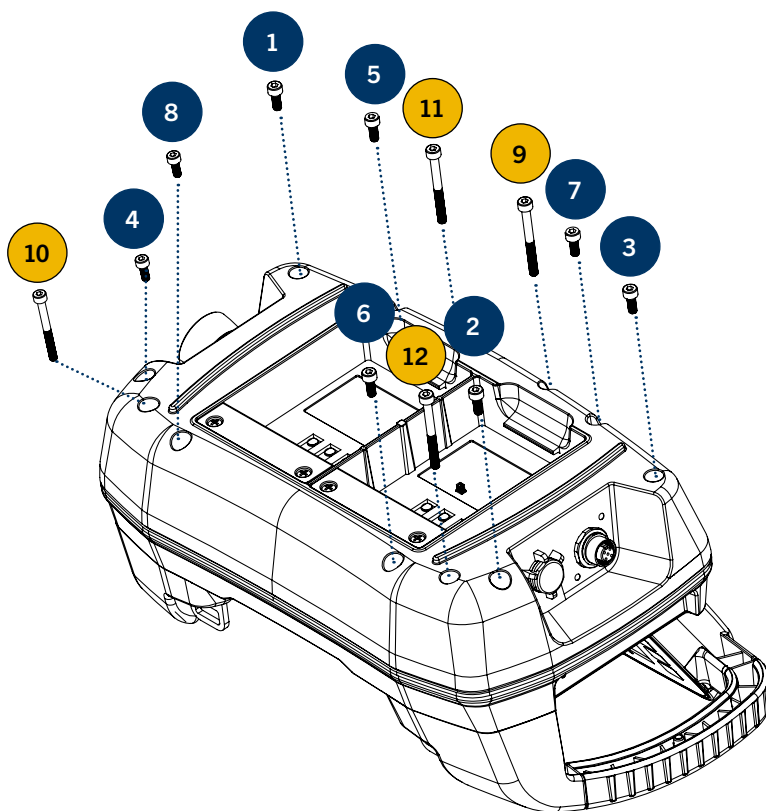
Gasket and bottom section

STEP 4: Mount the bottom section to the top section.

1. Mount the bottom section to the top section.
2. Make sure that no wires and no parts of the gasket are pinched.

STEP 5: Tighten the screws.

1. Use a screwdriver to tighten the screws (0.7 Nm torque).
2. Tighten the short screws ● first and then the long screws ●.
3. Tighten all screws in a zigzag pattern, illustrated below.



Screws	Mini Transmitter	Micro Transmitter
Long screws (M4 x 40 mm)	4	4
Short Screws (M4 x 10 mm)	8	4

**STEP 6: Test the functionality of the transmitter.**

Always do a complete check and test the transmitter after maintenance. It is the responsibility of the service technician to carry out the maintenance in a correct and professional manner.

8.2.5. Main Board Replacement

To replace the transmitter main board, follow the instructions below.

STEP 1: Remove the broken main board.

1. Unscrew the screws on the main board.
2. Carefully disconnect the cables from the connection terminals on both sides of the main board.
3. Unscrew the Radio module from the broken main board.

STEP 2: Install the new main board.

1. Screw the Radio module to the new main board.
2. Connect all cables to the correct connection terminal on the new main board. For more information where to connect the cables, see chapter 4.3. Transmitter Main board.
3. Tighten the screws (0.2 Nm torque).
4. Upload the parameter file from Modulate into the new main board.
5. Test the functionality of the transmitter.

**WARNING!**

When replacing a broken main board with a new one, you must load the correct parameter file from Modulate to the transmitter. This is to enable and secure the correct system functionality.

8.2.6. Radio Module Replacement

The radio module is a separate circuit board mounted on the main board. It can easily be replaced by removing the four (4) screws. When replacing the radio module make sure that the existing and the new radio module have the same item number.

Radio modules with 2.4 GHz single band can be replaced with a multiband version. However, the radio module parameter must be changed using Modulate in this case.

If your system is controlled only by tether cable, the radio module must still be installed and fully functional. Otherwise, the system will not work since the radio module monitors safety aspects of the communication between transmitter and receiver.



8.3. Receiver Level

The receiver is developed with Scanreco Never-Stop Technology™ and expected to work for many years even in tough conditions. It is potted with a molding compound to protect against dust and water which makes the receiver maintenance free. The only part that can be replaced is the external antenna.



NOTICE!

The radio module and main board in the receiver cannot be replaced since it is potted. If they fail the entire receiver must be replaced.



WARNING!

When replacing a broken receiver with a spare receiver, you must load the correct parameter file from Modulate to the receiver. This is to enable and secure the correct system functionality.



9. Regulatory Information

9.1. Europe

Hereby, Scanreco AB certifies and declares that the products listed below comply with the essential requirements and other relevant provisions in the directives and regulations listed below.

The complete Scanreco EU declaration of conformities are available at: scanreco.com/ compliance. To access the web page, enter the password: **1984**.

Product	Part number	Directives
Transmitter G6 Micro and Mini	P00003, P00004	2014/53/EU Radio Equipment Directive
		2006/42/EC Machinery Directive
		2011/65/EU+2015/863+2017/2102 RoHS Directive
		2012/19/EU WEEE Directive
		1907/2006 REACH Regulation
Receiver G6 CAN	P00005	2014/53/EU Radio Equipment Directive
		2006/42/EC Machinery Directive
		2011/65/EU+2015/863+2017/2102 RoHS Directive
		2012/19/EU WEEE Directive
		1907/2006 REACH Regulation
Battery Charger NiMH	102232	2014/30/EU EMC Directive
Battery Charger Li-ion	102242	2014/35/EU Low Voltage Directive
		2011/65/EU+2015/863+2017/2102 RoHS Directive
		2012/19/EU WEEE Directive
		1907/2006 REACH Regulation
Battery NiMH	700	2014/30/EU EMC Directive
Battery Li-ion	701	2006/66/EC Battery Directive
		2011/65/EU+2015/863+2017/2102 RoHS Directive
		2012/19/EU WEEE Directive
		1907/2006 REACH Regulation



9.2. North America

Radiation Exposure Statement

To satisfy FCC and IC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended.

FCC Statement (USA)

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.

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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. 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 separation 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.

IC Statement (Canada)

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's relevant EMC and radio standards. Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.



9.2.1. Radio Modules

The transmitters and receivers described in these instructions contain the following radio modules.

Radio module	Description	FCC ID	IC ID
TR06 001	Single band 2.4 GHz	N50TR061	6476A-TR061
TR06 002	Multi band 868/915 MHz 2.4 GHz	N50TR062 Approved for 915 MHz and 2.4 GHz	6476A-TR062 Approved for 915 MHz and 2.4 GHz
BLE	Connectivity used for product configuration.	S9NBNRGM2SA	8976C-BNRGM2SA
Wi-Fi	Optional connectivity, only for color display with wi-fi.	QOQWF111	5123A-BGTWF111





PART 3: APPENDIX 1 – G6 CANOPEN SPECIFICATION

Glossary

Term	Description
Actuator	Joystick, lever, toggle switch, push button, and potentiometer
LSS	Layer Setting Services
MOVE	Safe standstill indication, corresponds to HW output signal with name ACT_MOVE
NMT	Network Management
OD	Object Dictionary
PDO	Process Data Object
RPDO	Received Process Data Object
SANP	Safe Actuator Neutral Position – Bit wise indication if dedicated safe proportional actuator is in neutral (0) or not (1).
SDO	Service Data Object
SDP	Safe Digital Position
SRDO	Safety-relevant Data Object
STOP	STOP signal status, corresponds to HW output signal with same name.
TPDO	Transmitting Process Data Object

1. Protocol

This appendix contains a generic specification for the Scanreco G6 CANopen protocol. For the exact mapping of each actuator in your specific product see separate technical documentation.

1.1. General Settings

Possible configuration for following baud rates:

(20k*) 50k (100k*) 125k 250k 500k (800k*) 1 000k

Default value is 250k.

** Baud rate within parenthesis to be discussed upon request.*

Node ID

Default Node-ID is 1

1.2. NMT

Simple bootup is supported. In slave mode state PRE-OPERATIONAL is entered after initialization and a NMT bootup message is sent. In mini-master mode, state OPERATIONAL is entered automatically and a NMT start message is broadcasted. The NMT state transition messages are received at COB-ID 0. The RESET_NODE and RESET_COMM messages both reinitialize the CANopen interface of the node.



1.3. SDO

SDO listens to COB-ID (0x600 + node id) and transmits on COB-ID (0x580 + node id). Expedited, segmented and block transfers are supported. Chapter OD summarizes implemented objects.

1.4. PDO Configuration

All PDO's can be configured as specified in the CANopen standard where it is possible to choose if the PDO should be in use or not, mapping, transmission type, inhibit time and event time.

1.5. LSS

Node ID and baud rate can be inquired and/or changed using LSS protocol.

2. SRDO

As part of the safety solution for the G6 platform the safety classified information will not only be available on HW signals, but they will also be available on CAN-bus by using the principles of the CANopen SRDO protocol. This procedure ensures that critical system status is available on two different channels. This enables customers to fulfill their required safety integrity levels.

The SRDO protocol will be followed in following manner:

- COB-ID will as default be based on application used NODE ID (Value must be from 1-64 to follow CANopen standard) but can be changed also for customer specific needs. Messages are sent from two different safety CAN controllers.
- SCT time will be set to 50 cms (Safeguard cycle time) as default.
 - Configurable from 10 ms up to 200 ms in 10 ms steps.
- SRVT time will be set to maximum 5 ms (Safety object validation time).
- Data in tailing message will be bit-wise inverted.

It is important that the consumer (Customer's machine controller) is following SRDO consumer obligations by monitoring both SCT, SRVT and data content from both SRDOs before considering information valid.

Due to the use of separated CAN controllers it is possible that during a state transition there could be inconstant messages for one frame period. For robustness the consumer SRDO controller should allow missing SRDOs for at least 2 frame cycles."

Example: System state transition between standstill and movement **after** first SRDO is sent and **before** tailing SRDO is sent will cause incorrect data value between frames. This message pair shall be ignored by consumer and last state used.



2.1. SRDO Data Frame

Msg 1

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6
0xFF + (2 * NODE_ID)	7	STOP NC	STOP NO	MOVE	SANP 9-16	SANP 1-8	SDP 5-8	SDP 1-4

Msg 2

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6
0x100 + (2 * NODE_ID)	7	~STOP NC	~STOP NC	~MOVE	~SANP 9-16	~SANP 1-8	~SDP 5-8	~SDP 1-4

2.2. Examples

Node ID = 1

2.2.3. Safe State

Msg 1

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6
0x101	7	STOP NC	STOP NO	MOVE	SANP 9-16	SANP 1-8	SDP 5-8	SDP 1-4
		0x00	0xFF	0x00	0x00	0x00	0x00	0x00

Msg 2

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6
0x102	7	~STOP NC	~STOP NO	~MOVE	~SANP 9-16	~SANP 1-8	~SDP 5-8	~SDP 1-4
		0xFF	0x00	0xFF	0xFF	0xFF	0xFF	0xFF

2.2.2. Safe Standstill State

Msg 1

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6
0x101	7	STOP NC	STOP NO	MOVE	SANP 9-16	SANP 1-8	SDP 5-8	SDP 1-4
		0x00	0xFF	0xFF	0xFF	0xFF	¹ 0bhhggffee	¹ 0bddccbbaa

Msg 2

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6
0x101	7	STOP NC	STOP NO	MOVE	~SANP 9-16	~SANP 1-8	~SDP 5-8	~SDP 1-4
		0x00	0xFF	0xFF	0xFF	0xFF	~0bhhggffee	~0bddccbbaa



2.2.3. Safe Prop 4 and 15 Active

Msg 1

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6
0x101	7	STOP NC	STOP NO	MOVE	SANP 9-16	SANP 1-8	SDP 5-8	SDP 1-4
		0xFF	0x00	0xFF	0x40	0x08	¹ 0bhggffee	¹ 0bddccbaa

Msg 1

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6
0x102	7	~STOP NC	~STOP NO	~MOVE	~SANP 9-16	~SANP 1-8	~SDP 5-8	~SDP 1-4
		0x00	0xFF	0x00	0xBF	0xF7	¹ 0bhggffee	¹ 0bddccbaa

Each safe digital actuator can have following values and meaning.

Safe digital position meaning	Bit 1	Bit 0
Not mounted / in activated	0	0
Activated	0	1
Not valid	1	0
Broken actuator	1	1

^{*1} Safe digital format 0bddccbaa and 0bhggffee, aa = value from Safe digital actuator 1, bb from safe digital actuator 2, cc value for safe digital actuator 3, dd is value for safe digital actuator 4, ee is value for safe digital actuator 5, ff is value for safe digital actuator 6, gg is value from safe digital actuator 7 and hh is value from safe digital actuator 8.



3. TPDO

TPDO1

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
0x180 + NODE_ID	8	Analogue 1	Analogue 2	Analogue 3	Analogue 4	Analogue 5	Analogue 6	Analogue 7	Analogue 8

Format 1 (Default): 127 = Neutral, 0 = 100% B direction / Backward, 254 = 100 % A direction / Forward.

Format 2: 0 = Neutral, -100 = 100% B direction / Backward, +100 = 100 % A direction / Forward.

Format 3: 0 = Neutral, -127 = 100% B direction / Backward, +127 = 100 % A direction / Forward.

Mapping: Default mapping to object 0x6400.

TPDO2

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
0x280 + NODE_ID	8	Analogue 9	Analogue 10	Analogue 11	Analogue 12	Analogue 13	Analogue 14	Analogue 15	Analogue 16

Format 1 (Default): 127 = Neutral, 0 = 100% B direction / Backward, 254 = 100 % A direction / Forward.

Format 2: 0 = Neutral, -100 = 100% B direction / Backward, +100 = 100 % A direction / Forward.

Format 3: 0 = Neutral, -127 = 100% B direction / Backward, +127 = 100 % A direction / Forward.

Mapping: Default mapping to object 0x6400.

TPDO3

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
0x380 + NODE_ID	8	CAN digital 1-8	CAN digital 9-16	CAN digital 17-24	CAN digital 25-32	CAN digital 33-40	CAN digital 41-48	CAN digital 49-56	CAN digital 57-64

Default mapping to object 0x6000.

TPDO4

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
0x480 + NODE_ID	8	0x6404 sub1	0x6404 sub2	0x6404 sub3	0x6404 sub4	0x6404 sub5	0x6404 sub6	0x6404 sub7	0x6404 sub8

Mapping: Default mapping to object 0x6414.

RPDO5 / RPDO6

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7

Reserved.



4. RPDO

RPDO1

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
0x200 + NODE_ID	8								

Reserved.

RPDO2

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
0x300 + NODE_ID	8	Digital in 1-8	Digital in 9-16	Digital in 17-24	Digital in 25-32	Digital in 33-40	Digital in 41-48	Digital in 49-56	Digital in 57-64

Mapping: Default mapping to object 0x6200.

RPDO3

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
0x400 + NODE_ID	8								

Reserved.

RPDO4

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
0x500 + NODE_ID	8	Analog in 1	Analog in 2	Analog in 3	Analog in 4	Analog in 5	Analog in 6	Analog in 7	Analog in 8

Other (Encoder/Range/Accelerometer/RF/Battery) For details see [3] parameter ANA_STAT.
Default mapping to object 0x6404.

RPDO5 / RPDO6

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7

Reserved.



5. Emergency

The following CANopen Emergency message will be sent when an error has occurred in system.

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
0x80 + NODE_ID	8	Emer- gency error code (CO specific)	Emer- gency error code (CO specific)	Error register OD 0x1001	Scanreco error code	Scanreco error code	X	X	X

6. OD

Table below defines which objects are implemented in Scanreco CANopen OD. For detailed description please refer to *Scanreco_G6.eds* file.

Index [#sub], Hex	Description	Directives
1000	Device Type	0x00870191 / (CiA401, Dig in, Dig out, Analog in)
1001	Error Register	
1003	Error Field	Not used, see 0x2115 – 0x2121
1005	Sync ID	
1008	Device Name	G6-SISP™
1009	HW Version	4 char string
100A	SW Version	4 char string
100C	Guard Time	
100D	Lifetime Factor	
1010[4]	Store parameters	
1011[4]	Restore default parameters	
1014	EMCY ID	
1015	EMCY Inhibit Time	
1017	Producer Heartbeat Time	
1018	Identity Object	Sub 1: Vendor ID 0x000000F0 Sub 2: Product code (Scanreco article number) Sub 3: Revision number (Not used) Sub 4: Serial number receiver
1200	Server SDO COB ID	
1400[5]	RPD01 Communication	
1401[5]	RPD02 Communication	
1402[5]	RPD03 Communication	
1403[5]	RPD04 Communication	
1404[5]	RPD05 Communication	
1405[5]	RPD05 Communication	
1600[8]	RPD01 Mapping	
1601[8]	RPD01 Mapping	
1602[8]	RPD01 Mapping	
1603[8]	RPD01 Mapping	
1604[8]	RPD01 Mapping	



Index [#sub], Hex	Description	Directives
1605[8]	RPD01 Mapping	
1800[5]	TPD01 Communication Parameters	
1801[5]	TPD02 Communication Parameters	
1802[5]	TPD03 Communication Parameters	
1803[5]	TPD04 Communication Parameters	
1804[5]	TPD05 Communication Parameters	
1805[5]	TPD06 Communication Parameters	
1A00[8]	TPD01 Mapping	
1A01[8]	TPD02 Mapping	
1A02[8]	TPD03 Mapping	
1A03[8]	TPD04 Mapping	
1A04[8]	TPD05 Mapping	
1A05[8]	TPD06 Mapping	
2110[1]	CAN_PAIRING	
2115[1]	LOG (Current month)	[4]
2116[1]	LOG January	[4]
2117[1]	LOG February	[4]
↓	↓	[4]
2121[1]	LOG December	[4]
6000[8]	Read Digital	
6200[8]	Write Digital	
6400[16]	Read Analogue	
6404[8]	Read Analog Manufacturer specific	
6410[8]	Write Analogue	

7. CAN Pairing

Writing 0xAA to object 0x2110 subindex 1 is an option to set receiver in pairing mode without using the magnet sequence on the front of receiver.

Following is how the CAN message shall be sent.

Pairing mode

COB-ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
0x600 + NODE_ID	8	0x2F	0x10	0x21	0x01	0xAA	0x00	0x00	0x00



PART 4: APPENDIX 2 – SISP™ SAFETY MANUAL

Glossary

Term	Description	
E/E/PE	Electrical/Electronic/Programmable Electronic	[IEC 61508-4:2010]
FMEDA	Failure Modes Effects and Diagnostic Analysis	
FSA	Functional Safety Assessment	
IEC	International Electrotechnical Commission	
SISP™	Scanreco Integrated Safety Platform	
SRDO	Safety Related Data Object	[EN-50325-5:2010]

1. Introduction

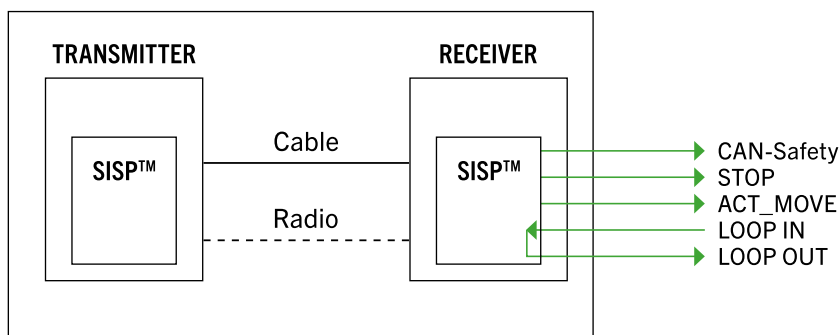
This Safety Manual contains detailed information, which is required to integrate the radio remote control into a safety-related system. The safety manual is applicable for all Scanreco remote control systems based on the SISP™ technology. The Safety Manual only specifies the safety classified functions and interfaces of the radio remote control system.

2. Basic Skills and Knowledge

The person's integrating the radio remote control system shall have experience of safety related systems and understanding of the regulations and standards applicable to the product developed.

3. SISP™ Overview

SISP™ is an integrated safety platform in the Scanreco remote control system that handles all safety classified aspects. SISP™ consists of one module in the transmitter and one module in the receiver. The transmitter is carried by the operator and the receiver is mounted on a machine and interfaces over CAN and digital HW signals. The transmitter and receiver communicate via radio or cable.



Overview of Scanreco remote control safety platform.



4. Safety Functions

There are four different safety classified functions handled by SISP™.

4.1. Stop Function

The Scanreco remote control system shall reach a safe state when the stop button on the transmitter is pressed or an Automatic/Passive stop occurs.

Safety parameters	Value
Safety integrity level	SIL 3
Probability of dangerous failure per hour	PFHd = $2,2 \times 10^{-8}$ (= λ_{du})
Fraction of total failure rate with dangerous and detected consequence	$\lambda_{dd} = 2,18 \times 10^{-6}$
Safe failure fraction	SFF = 99,5 %
Diagnostic coverage	DC = 99 %
Level of hardware fault tolerance	HFT = 0
Proof test interval	Product lifetime
Diagnostic test interval	Continuous

4.2. Prevention of Unintended Movement From Standstill

The Scanreco remote control system shall remain in *standstill* when the safety classified analog actuators of the transmitter are in neutral position and the system is in *standstill*.

Safety parameters	Value
Safety integrity level	SIL 3
Probability of dangerous failure per hour	PFHd = $4,4 \times 10^{-8}$ (= λ_{du})
Fraction of total failure rate with dangerous and detected consequence	$\lambda_{dd} = 4,36 \times 10^{-6}$
Safe failure fraction	SFF = 99,5 %
Diagnostic coverage	DC = 99 %
Level of hardware fault tolerance	HFT = 0
Proof test interval	Product lifetime
Diagnostic test interval	Continuous

4.3. Safe Digital Indication

The Scanreco remote control system shall indicate the state of the safety classified digital switches.

Safety parameters	Value
Safety integrity level	SIL 3
Probability of dangerous failure per hour	PFHd = $5,6 \times 10^{-8}$ (= λ_{du})
Fraction of total failure rate with dangerous and detected consequence	$\lambda_{dd} = 5,58 \times 10^{-6}$
Safe failure fraction	SFF = 99,5 %
Diagnostic coverage	DC = 99 %
Level of hardware fault tolerance	HFT = 0
Proof test interval	Product lifetime
Diagnostic test interval	Continuous



4.4. Correct Actuator Activation

The Scanreco remote control system shall indicate safety classified proportional actuators active or not active state correctly.

Safety parameters	Value
Safety integrity level	SIL 3
Probability of dangerous failure per hour	$PFH_d = 4,2 \times 10^{-8} (= \lambda_{du})$
Fraction of total failure rate with dangerous and detected consequence	$\lambda_{dd} = 4,19 \times 10^{-6}$
Safe failure fraction	SFF = 99,5 %
Diagnostic coverage	DC = 99 %
Level of hardware fault tolerance	HFT = 0
Proof test interval	Product lifetime
Diagnostic test interval	Continuous

Product lifetime SISPTM contains no lifetime limiting components, therefore the PFH figures are valid for up to 12 years, according to IEC 61508.

Passive Stop: A passive stop is initiated in the receiver if there is no communication between the receiver and the transmitter for more than 500 ms. The possible cause might be a corrupted radio link, no battery power, or that the transmitter has been switched off without STOP button activation.

5. Integrators Implementation

The Scanreco remote control system have the following safety classified interfaces that must be used by the integrator to comply with above stated values for each safety function.



NOTICE!

The Scanreco responsibility for the safety classified functions ends by the receiver connector.

5.1. Stop Function

Signal STOP

Signal moves to Vin when STOP button is released and system is running without fault. Signal moves to Zero as soon as STOP button is pressed.

Signals LOOP_IN/OUT

LOOP_IN and LOOP_OUT are connected when STOP button is released and system is running without faults. Loop function is based on two high side switches mounted in serial.

CAN safety

Indication for STOP function is available in the safety CAN SRDO (D0 and D1). It is the responsibility of the SRDO consumer to validate all SRDO information (Missing/lack of CAN communication must be handled by consumer).



5.2. Unintended Movement From Standstill

Signal ACT_MOVE

Signal moves to Vin when any safety classified analog actuator is moved from its neutral position.

CAN safety

Indication for ACT_MOVE function is available in the safety CAN SRDO (D2). It is the responsibility of the SRDO consumer to validate all SRDO information (Missing/lack of CAN communication must be handled by consumer).

5.3. Safe Digital Indication

CAN safety

Indication for the safe digital indication function is available in the safety CAN SRDO. It is the responsibility of the SRDO consumer to validate all SRDO information (Missing/lack of CAN communication must be handled by consumer).

5.4. Correct Actuator Activation

CAN safety

Indication for the correct actuator activation function is available in the safety CAN SRDO. It is the responsibility of the SRDO consumer to validate all SRDO information (missing/lack of CAN communication must be handled by consumer).

6. Configuration

No element affecting safety classified behavior is configurable by the integrator.

6.1. Safety Related Parameters

There are no safety related parameters in the Scanreco remotes based on SISPTM platform.

However, the CAN safety SCT time is allowed to be changed. It is the SRDO consumers responsibility to validate correct SCT and SRVT time on SRDO messages.

6.2. Safety Related Hardware Configurations

No safety related hardware configurations exists in the SISPTM section of the Scanreco remote control system.



WARNING!

Potentiometers, rotary switches, toggle switches and push buttons exist both as safety classified and non-safety classified in the Scanreco remote control system. The non-safety classified actuators are completely separate and do not activate any of the safety classified SISPTM functions described in chapters 5 and 6. See separate technical documentation for your specific system to find out how it is configured from factory.

7. Verification of Safety Functions

The Scanreco remote control system with SISPTM platform implements partial safety functions. The integrator is responsible for the verification of the complete safety function on the complete machine/system.



Notes:

[illegible]



Notes:







English

