Packed Receiver
for Energy Harvesting Switch (AFZE)
OPERATING MANUAL

1 Safety guidelines

⚠ **WARNING: Danger to life**
• Do not install this product as part of a safety-relevant, life or health preserving facility.

⚠ **CAUTION: Damage to the device due to electrical discharge**
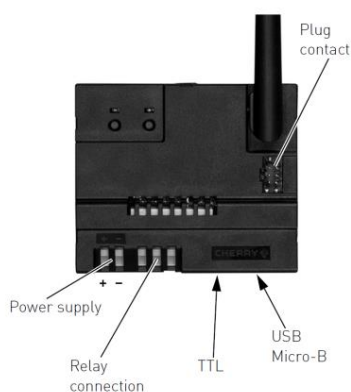• Observe the ESD protection.

⚠ **CAUTION: Damage due to liquid in the device**

• Prevent liquid from getting inside the components.
• Do not use solvents such as benzine or alcohol, or scouring agent and scourers for cleaning.

2 Area of application

The module is designed to receive a signal from CHERRY Energy Harvesting wireless switches (AFZE).
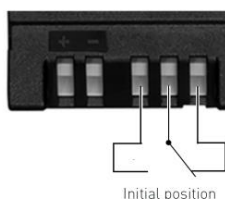
3 Interfaces

3.1 Power supply interface to connect the power using the external supply

Use the "Power supply" interface to connect the power using an external supply. The external supply must be galvanically isolated. The input voltage may total 7 to 24 V DC.

1 Observe the polarity (left + and right − when viewed from the front).
2 Connect the external supply using the spring terminal (wire diameter 0.5 to 1.5 mm2). To do so, press the spring downwards by inserting a screwdriver into the smaller opening, and by pushing the wire into the larger opening.

3.2 USB service interface

The USB interface is used for communicating with a PC and for connecting power using a USB Micro-B plug. The interface can be used for evaluating data received wirelessly for service purposes. The interface is protected from short circuits by a 500 mA SMD fuse. Observe the maximum values for the USB interface standard.

If the receiver is already connected to the power by the power supply interface when the USB is connected, then a reset must be carried out in order for USB communication to function.

3.2.1 USB transmission parameters

The USB connection appears as a virtual COM port in the PC. You can configure it on the PC any way you like.

If a transmitter has not been paired, then information from all transmitters will be output (see 3.4.3 "TTL data format"). If at least one transmitter has been paired, then only the paired transmitters will be output.

Name	Value
Data rate	57600 Baud
Start bit	1
Data bit	8
Stop bit	1
Parity	None

3.3 Relay connection

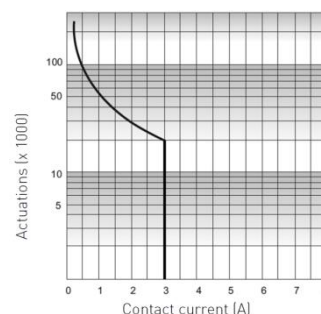Spring terminals are used for connection (wire diameter 0.5 to 1.5 mm2).

• To do so, press the spring downwards by inserting a screwdriver into the smaller opening, and by pushing the wire into the larger opening.

3.3.1 Relay positions

Initial position

3.3.2 Relay contact service life
Connection values:

3 A, 240 V AC resistive load
3 A, 30 V DC resistive load

3.3 TTL interface

⚠ **CAUTION: Excess PC voltage will damage the device.**

• Use a higher-level control unit for data communication.
• Do not connect the receiver directly to a PC using the RS 232 interface. (The voltage level of the RS 232 interface on the PC totals 12 V, the TTL voltage level totals 5 V).

When receiving data from a paired transmitter, the following information is output via the interface:
• Unique ID of the transmitter
• Switch information (pressed or released)
• Number of telegrams received
• Signal reception strength in dBm (see 3.4.3 "TTL data format")

3.4.1 RJ-45 pin assignment

PIN number	Function
1	TTL, TxD
2	TTL, RxD
3	Not assigned
4	Not assigned
5	Not assigned
6	Not assigned
7	Not assigned
8	Ground

3.4.2 TTL transmission parameters

Name	Value
Data rate	57000 Baud
Start bit	1
Data bit	8
Stop bit	1
Parity	None

3.4.3 TTL data format

| Byte	Wert
Startbyte	0x53
Länge	0x0B
Op-Code	0x1F
Version	0x01
UID	0xYY
	0xYY
	0xYY
	0xYY
Daten	0xYY
	(0x00 = Betätigt
	0x01 =
	Losgelassen)
Signalstärke (negativ)	0xYY
Anzahl Subtelegramme	0xYY
CRC (XOR)	0xYY

Y = any number

3.5 Plug contact

There is a contact for a PFL plug with a flat ribbon cable next to the antenna output in the housing. The plug contact is configured as a digital contact (active = high potential, inactive = low potential).

3.5.1 Digital output

The digital output is used for activating external modules digitally. There are 3 channels. "Channel" is configured as an open collector:

Symbol	Parameter	Condition	Max.
Imax	Max. current per channel	Open collector sink	250 mA
Imax 5V	Max. load 5 V	–	150 mA
Vinmax	Max. voltage on the channel	–	24 V

3.5.2 PIN assignment of the contact plug for the digital output
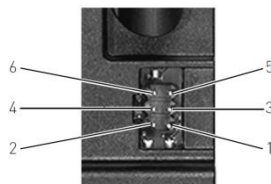
PIN number	Function
1	Channel 1
2	+5 V OUT (max. 150 mA)
3	Channel 2
4	Channel 3
5	Not assigned
6	Ground

3.5.3 Internal 5 V digital output

Example: LED driver
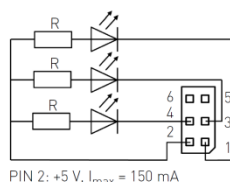
PIN 2: +5 V, I_{max} = 150 mA

3.5.4 External Vin digital output

Example: LED driver

PIN 6: GND_{in} External supply output

V_{in} mains supply output
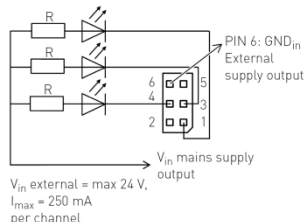
V_{in} external = max 24 V, I_{max} = 250 mA per channel

4 Starting up

4.1 Mounting the antenna sleeve

The receiver has a fitted wire antenna. You need to mount the antenna sleeve for protection and a straight alignment.

1 Guide the wire antenna into the opening at the side of the antenna sleeve.

2 Insert the antenna sleeve into the holder horizontally and turn it 90 degrees to the left.

The antenna sleeve is mounted.

4.2 Connecting the power supply

The power is supplied using an external supply (see 3.1 "Power supply interface to connect the power using the external supply") or a USB Micro-B plug (see 3.2 "USB service interface").
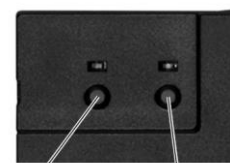
5 Pairing a transmitter

You can pair the transmitter either with the standard setting (see 5.1 "Simple transmitter pairing") or with a function (see 5.2 "Pairing transmitters with functions").

You can pair up to 32 transmitters. In addition, during pairing, you can decide which function the receiver should output upon signal reception.

Note that every transmitter only perform with one function.

On the receiver there are two buttons with LEDs on the left at the top in a recess. Press the buttons with a sharp object such as a ball-point pen.

Reset, green LED

Pairing, yellow LED

1 Get the transmitter that you want to pair ready. If you do not touch anything more for than 2 minutes during the procedure, it stops automatically.

2 Connect the recevier to the power supply. The left LED flashes green (if a transmitter has not yet been paired) or lights up green (if a transmitter has already been paired).

5.1 Simple transmitter pairing

Simple transmitter pairing is used to save the "button" function (see 5.2 "Pairing transmitters with functions", function number 1). This means that the output signal switches between active and inactive every time the wireless switch is pressed.

⚠️ **CAUTION: Unintentional transmitter pairing**
• Do not allow transmitters to be triggered that are not supposed to be paired during the pairing procedure.

1 Press the right button for 2 seconds (Pairing) until the right LED flashes yellow.

2 Trigger a signal on the transmitter.

3 If applicable, trigger a signal on the other transmitters you wish to pair.You can pair up to 32 transmitters consecutively.

4 Press the right button briefly (Pairing).
The left LED lights up green and the right LED is off. The transmitters are paired.

5 Trigger a signal on the transmitters you have just paired to check them.
The right LED flashes in yellow with every signal, and you can hear the relay switch on the receiver.

5.2 Pairing transmitters with functions

You have to pair each transmitter separately. You can allocate the following functions to the signal received when pairing:

Function number	Signal output on the receiver	Right yellow LED signal
1 (Standard value)	**Button**: Switch between active and inactive when the button is pressed No action when released.	Flashing once (✱...✱...✱)
2	**Switch**: Active when the button is pressed, and inactive when released	Flashing twice (✱✱...✱✱...✱✱)
3	**On only**: Active when the button is pressed	Flashing three times (✱✱✱...✱✱✱...✱✱✱)
4	**30 sec. on**: Active when the button is pressed for 30 sec.	Flashing four times (✱✱✱✱...✱✱✱✱)
5	**Off only**: Inactive when the button is pressed	Flashing five times (✱✱✱✱✱...✱✱✱✱✱)
6	**30 sec. off**: Inactive when the button is pressed for 30 sec.	Flashing six times (✱✱✱✱✱✱...✱✱✱✱✱✱)

1 Press and hold the right button (pairing button).

2 At the same time, briefly press the left button (reset button) whilst continuing to hold down the right button until the pairing LED flashes yellow.

The reset LED should now be solid green and the pairing LED should be flashing as per for "function number 1" sequence (see table below).

3 If required, the function can be changed by pressing the pairing button, as described in the table. This must be done at intervals of less than 1 second. For example: Function 2 requires two very brief actuations of the pairing button.
The receiver will recognize this command after approx. 1 second. The pairing LED will then flash yellow, in accordance with the function number.

4 Trigger a signal on the transmitter.

Both LEDs should now show a solid light.

CAUTION: If only the reset (left) LED is flashing green, then another transmitter was triggered in error during this process. This causes a collision, as the receiver is not able to determine which transmitter should be paired. In this instance:
•Press the pairing (right) button for 2 seconds.
•Trigger the required transmitter again.

5 Press the pairing button briefly.
The pairing LED will then flash yellow according to the selected function. For example: Twice per second for functi,on 2.

6 Press the reset button briefly.
The reset LED will then, following a brief pause, display a solid green light and disconnect the pairing LED. The transmitter is now paired.

7 Trigger a signal on the transmitter to varify pairing.
The pairing LED then flashes yellow with every signal, and the relay switch can be heard on the receiver.

6 Deleting transmitters

You can delete individual transmitters, or all transmitters.

•Connect the transmitter to the power supply.

The left LED lights up in green (if at least one transmitter has been paired).
If you do not touch anything more for than 2 minutes during the delete process, the procedure is canceled automatically.

6.1 Deleting individual transmitters

1 Have the transmitter that you want to delete ready.

2 Press the right button for 4 seconds (Pairing) until the right LED starts by slowly flashing before flashing rapidly.

3 Trigger a signal on the transmitter you wish to delete.

If only the left LED is flashing green, then another transmitter was triggered in this phase. This causes a collision, as it is not possible to distinguish which transmitter is supposed to be deleted. In this case:
• Press the right button (Pairing) for 2 seconds.
• Trigger the required transmitter again.

The right LED lights up in yellow.
4 Press the right button (Pairing) as confirmation.
The right LED flashes yellow rapidly.
5 Briefly press the left button (Reset).
The transmitter is deleted. If only one transmitter was paired, the left LED flashes green. If at least one more transmitter was paired, the left LED lights up in green.
6 Trigger a signal on the transmitters you have just deleted to check them.
If it was deleted, nothing happens. If it was not deleted, right LED flashes yellow with every signal, and you can hear the relay switch on the receiver.
In this case, repeat the delete procedure.

6.2 Deleting all transmitters (Reset)

1 Press the right button (Pairing) and hold it down.

2 Press the left button briefly (Reset) while also holding down the right button (Pairing).

3 When the right LED starts flashing slowly and then flashes faster after 4 seconds, release the right button (Pairing).

The left LED flashes green. All transmitters are deleted.

7 Error messages

If an error occurs, the left LED (Reset) flashes green rapidly. The right, yellow LED shows the error code. If several errors occur, then the error with the highest priority (error number) is shown.

Error number	Right yellow LED signal	Errors and effects on the transmitter
1	Flashing once (✱...✱...✱)	**Pairing button is continuously pressed (> 10 sec.):** All outputs are inactive as long as there is an error.
2	Flashing twice (✱✱...✱✱...✱✱)	**Transmitter list is full (when attempting to pair more than 32 transmitters):** Pairing procedure is canceled.
3	Flashing three times (✱✱✱...✱✱✱...✱✱✱)	**Reception buffer full**: All outputs are inactive, the buffer is cleared, error signal stops after 10 sec.

8 Troubleshooting

Fault	Rectification
Poor signal transmission	• Position the transmitter and receiver in a way that ensures as few sources of interference as possible are between them (e.g. walls). • When possible, do not install the transmitter and receiver on the same wall, but rather opposite each other. • Remove any metal objects with a shielding effect from the vicinity of the transmitter and receiver (e.g. cables). • Remove sources of electrical interference from the vicinity of the transmitter and receiver (e.g. other wireless devices, PCs, electronic ballasts for neon tubes and energy saving lamps). • Change the position of the transmitter or receiver. • Check the function of the transmitter directly on the receiver.
Receiver does not function	• Check the supply voltage. • Check the function of the activated device.
Random signal output on receiver	• Check whether a transmitter is triggering continuously. • If a transmitter was incorrectly paired and you are aware of this, you can delete the specific transmitter (see 6.1 "Deleting individual transmitters"). • Delete all transmitters and pair them again.

9 Technical data

Name	Value
Antenna	External wire antenna
Frequency EU	868.3 MHz (±15 kHz)
Frequency USA, Canada	915.0 MHz (±15 kHz)
Data rate	76.9 kBit/s
Interfaces	USB Micro-B, TTL, low voltage relay 48 V/230 V
Wireless log	ZF proprietary 2.0
Modulation	2-FSK
Coding	NRZ
Wireless channels	1
Range	300 m outdoors, 30 m indoors
Operating temperature	−40 °C to +85 °C
Sensitivity at 23 °C	−98 dBm at 0.1% telegram error rate
Supply voltage	5.0 V DC ±5% USB and/or 7 to 24 V DC (power supply connection)

10 Contact

If you require further information, please consult:

Europe:

ZF Friedrichshafen AG
Electronic Systems
Cherrystraße
91275 Auerbach
Germany

North America:

ZF Electronic Systems
Pleasant Prairie LLC
11200 88th Avenue
Pleasant Prairie, WI 53158
USA

Asia-Pacific:

ZF Electronics Asia Limited
2/F Technology Plaza
29-35 Sha Tsui Road
Tsuen Wan, New Territories
Hong Kong

Internet: www.switches-sensors.zf.com
E-Mail: switches-sensors@zf.com

11 General user information

We reserve the right to make technical modifications which serve the development of our products. Improper use and storage can lead to faults and damage to the product.

The warranty expires completely once unauthorized modifications to the product have been carried out. Do not carry out any unauthorized repairs and do not open up the product. These instructions are only valid for the supplied product.

The warranty for this product is for commercial customers for one year from date of purchase. Liability for financial damages and defects is excluded.

12 Declaration of conformity

12.1 CE (868.3 MHz version)

This component is CE certified and complies with the guidelines EN 300-220 SRD, EN 301 489-1/-3 and EN 60950-1. Observe the local regulations before using in other countries.

12.2 FCC (915.0 MHz version)

The device complies with FCC part 15.249 and 15B. Observe the local regulations before use in countries other than the USA.

13 Disposal

Dispose of the used components at an official collection point for electronic waste or at your local dealer.