

CE

# OPERATING INSTRUCTIONS

# FS-100



Transmission system for wireless machine operation



## Transmitter Module FT-100

- ✓ Sturdy housing with 3 (optionally 4) switches or pushbuttons
- ✓ Standardly with switching functions UP / DOWN / EMERGENCY STOP
- ✓ Bidirectional design for safe operation in industrial applications
- ✓ Integrated antenna
- ✓ High degree of protection against dust, dirt and water (IP67)
- ✓ Mechanical interlock for switches and buttons (option)
- ✓ Battery monitoring (option)



## Receiver Module FR-100

- ✓ Easy learning of the transmitter module
- ✓ 4 potential free changeover relay outputs
- ✓ Switching function key / toggle per relay individually configurable
- ✓ Integrated antenna
- ✓ DC supply via internal screw terminals
- ✓ Dust and splash proof IP54 housing with mounting lug
- ✓ Snap-on housing for top hat rail (option)

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# 1 General

## 1.1 Product Features

The FS-100 electronic transmission system serves as a wireless alternative to conventional wired remote controllers within a wide range of machine applications. Application examples are amongst other things conveying and lifting equipment in industry or forestry.

The radio range of the system is (depending on the visual contact or building development) between 8 and 200 meters.

## 1.2 Product Components

### 1.2.1 Transmitter Module FT-100

The battery powered controller with three (optionally four) transmission channels is located in a fracture and impact resistant industrial housing. Each channel corresponds to a switching application via pushbutton or switch. The battery life is about 4 years. The internal 12 volt battery (Type MN21 23A) can be replaced by loosening the 4 upper Phillips screws (see [☞](#) section 5.2).

Functioning: The FT-100 transmitter module sends serial data to the FR-100 receiver and then evaluates the feedback from the receiver.

*For a detailed component description refer to chapter [☞](#) 5.*



Figure 1: Transmitter Module FT-100

### 1.2.2 Receiver Module FR-100

The FR-100 receiver component with switching function has a 12 ... 24 VDC voltage supply input and is equipped with four potential-free changeover relay outputs for switching the respective pushbutton or switch.

Functioning: The radio receiver FR-100 evaluates the radio signals of the FT-100 transmitter module and switches one or more of the four potential-free changeover relays ON and / or OFF. The switching mode "Key" or "Toggle" can be set individually for each individual relay contact.

*For a detailed component description refer to chapter [☞](#) 6.*



Figure 2: Receiver Module FR-100

## 2 Indented Use

The FT-100 transmitter module sends serial data to the FR-100 receiver and then evaluates the feedback from the receiver. It is forbidden to modify or change component parts of the product. The electronics are protected against specified external influences according to the technical data and may only be used within environments in accordance with this information.

Used connecting cables must not be longer than 1 meter.

The system component FR-100 verifies coded radio frequency signals sent by the FS-100 transmitter module and operates relay outputs on receipt of a correct signal. The rated current for each relay is 10 A / 230 VAC maximum.

The transmitter module FT-100 is only suitable for receivers of the FR-100 series (and vice versa).

## 3 Safety














**It should be noted that for applications that could put human life at risk, by using radio connection there is always present a potential hazard due to extraneous disturbances. The Operating Instructions need to be followed at all times!**



**Ensure that the product is isolated from any power supply before opening. Opening and installation of the product must be performed only by a qualified electrician.**

### 3.1 Safety Precautions

-  Every applicable regulations and standards have to be observed, in particular VDE0100, VDE0550/0551, VDE0700, VDE0711 and VDE0860. The use of solid cables for connection is recommended since terminal design does not incorporate stress relief. The product corresponds to Safety-Class II (without protective earth terminal) according to VDE0700, IEC335EN60335.
-  For commercial use, compliance must be made with the recommendations and instructions of the responsible regional/national authorities.
-  For use in public institutions, schools, clubs and do-it-yourself workshops the operation of this product has to be supervised by qualified personnel.
-  We do not assume any warranty and liability for personal or material damages caused by incorrect application or by failure to follow these operating instructions!
-  For reasons of safety and conformity (CE) it is not permitted to modify or change parts of the product.
-  Opening and installation of this product has to be performed only by authorized electricians.
-  If you have not the corresponding expertise, ask qualified specialists or workshop for installation and commissioning. This product and connected devices can be damaged as a result from inappropriate installation, connection or operation.
-  Furthermore, this could lead to other damages e.g. short circuit, fire or electric shock.
-  The product must not be installed or used in places where a risk of explosion may exist.
-  Do not touch antenna connectors with live parts!
-  The FS-100 system corresponds to the state of the art. Residual hazards may result from the system if it is assembled or commissioned unqualified.

## 4 Operating Range

The FS-100 radio system is designed for a large operating range of up to 200 meters. Walls including steel reinforced concrete can be penetrated. The maximum range can be achieved under optimum conditions and by line-of-sight contact between transmitter and receiver without disruption by external high frequency disturbances.

**The following are possible causes that could reduce range of operation:**

- Obstructing buildings, vegetation or other factors will substantially reduce the operating range.
- The distance between the antenna and the operator's body or other conducting objects (e.g. Earth) may influence the operating range.
- Background "electrical noise" could be relatively high so that the signal-to-noise-ratio may decrease and therewith the operating range. Also other devices, with similar operating frequency, operated in the neighborhood of the receiver may reduce the sensitivity.
- Operating the receiver adjacent to badly shielded electronic components (e.g. PCs) that can produce electromagnetic distortion, may severely reduce the range of operation and could result in intermittent operation.
- Adjustable and open components should not be adjusted or modified!

## 5 Description FT-100 (Handheld Transmitter)

### 5.1 Battery Supply

The handheld transmitter is powered internally by a 12 volt MN21 23A battery. This is already included in the delivery. The battery life is up to 4 years, depending on the type of loading and application. If the range is greatly reduced or no function tripping is possible, the battery must be replaced. A battery monitoring LED is only equipped when ordering a FS-100 system with option „L“ (see ¶ 8). The procedure for changing the battery is described below.

### 5.2 Battery Change

Procedure for changing the battery:

1. Loosen the 4 upper Phillips screws
2. Turn the device over and remove the bottom cover
3. Remove the battery and insert a new one



**Please pay attention to the correct polarity and only use batteries of the type MN21 23A (recommended: Duracell 12 V MN21 Alkaline).**



Figure 3: Battery Change

#### **Disposal of Batteries:**

*Outside Germany please contact your local authorities for disposal or recycling information.*

### 5.3 LED Functions and Acoustic Beeper (Option „L“)

**The functions described in this section are only available if option "L" has been ordered!**

The FT-100 hand-held transmitter allows remote control of three (optional up to four) functions of a FR-100 receiver. The user gets information about the radio system and the communication by the following visual and auditory signals:

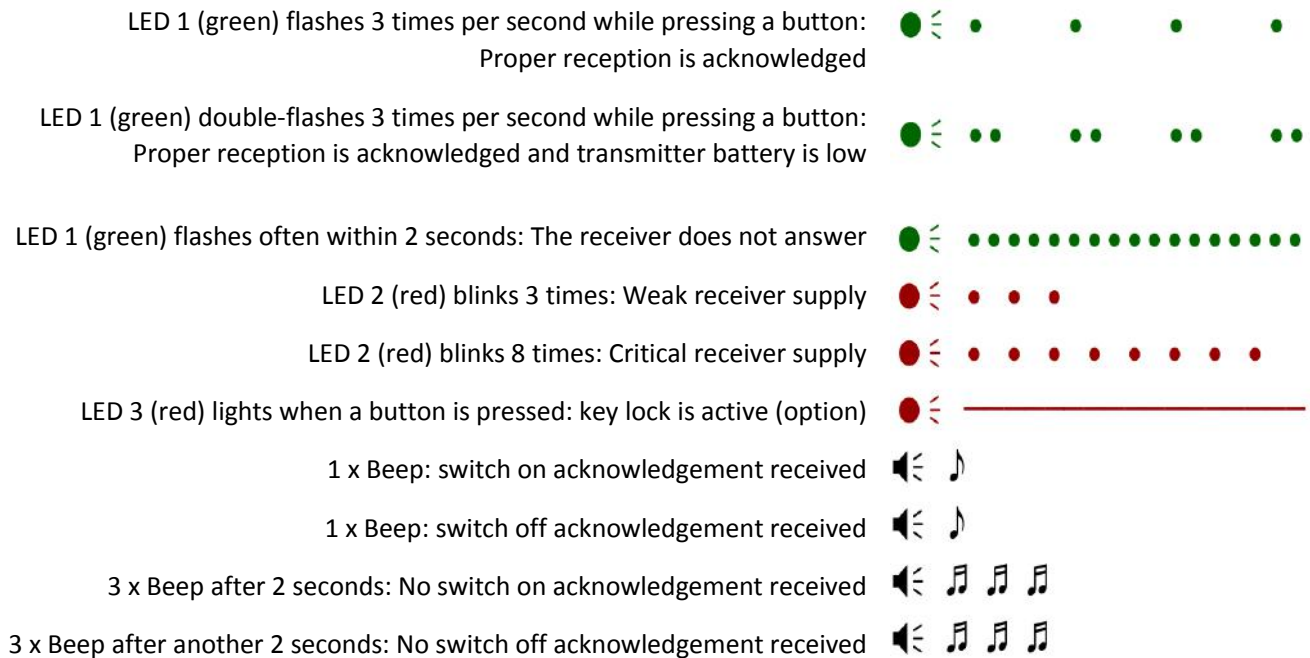


Figure 4: LED and Beeper Signals



FR-100 receivers acknowledge a proper reception by using the weak receiver supply signal.


Each transmitter has an individual serial number. If more transmitters for one receiver are used, than each transmitter must be programmed to the receiver.



**With a FR-100 receiver it is possible to learn transmitters with or without acknowledgement. The corresponding learning process may result in a reconfiguration of the transmitter. This may lead to incompatibility with receivers, which have previously learned this transmitter.**

## 5.4 Keylock Function (Option „T“)

Important note: The interlock function (Option „T“) **is supplied on request only**, as this feature is unsuitable for most industrial applications. In addition, it can only be implemented for the FS-101 version with four channels (switches / buttons) and together with the "L" option, since all four switches / buttons and the LED functions are required for this.

You can find information about the order options in the section Type Designation / Order Code  8.

### 5.4.1 Activate Keylock Function

Press and hold push button 3 und 4 for at least 2 seconds until LED 3 indicates the activation. Please take in account that during this time the radio function 3 and 4 is transmitted. After activation no radio signal is transmitted anymore. At any time you press one of the push buttons LED 3 will indicate the activated keylock function.

### 5.4.2 Deactivate Keylock Function


Press first push button 1 followed within 1.5 seconds by push button 4. Please take in account that in this case the radio function 4 is transmitted.

## 5.5 Frequency Change (f1 / f2)

The module can be operated with two different operating frequencies:

- f1 = 433.62 MHz (standard setting)
- f2 = 434.22 MHz (optional setting)

In rare cases it is necessary to change the frequency because of interference from other devices. In this case, the unit can be factory set to the second operating frequency. For this you have to send the transmitter module back to the manufacturer.

The associated receiver must then also be switched to the second frequency. The procedure for this is described in section  6.3.

## 6 Description FR-100 (Receiver)

### 6.1 Power Supply Voltage

The receiver module type FR-100 needs a power supply of 12 ... 24 VDC. The used supply has to deliver about 200 mA with active relays. The corresponding terminals are marked on the internal board as + (12 ... 24 VDC) and – (0 V / GND). The board is accessible by removing the housing cover.

### 6.2 Relay Switching Functions

Each switch or button of the transmitter FT-100 is permanently assigned to a relay contact of the receiver module FR-100 and activates the respective contact when actuated.

You may select between Key- or Toggle-function separately for each relay by putting Jumper **X1** to **X4** in position 1:1 (key function) or in position ON/OFF (toggle function).

If the key function (1:1) is selected the relays will stay activated as long as the transmitter key remains active, while the toggle function permits to switch on and off the relay with the same transmitter key (each signal command puts the relay into the opposite state).

The relays are connected via the respective screw terminals which are indicated on the board.

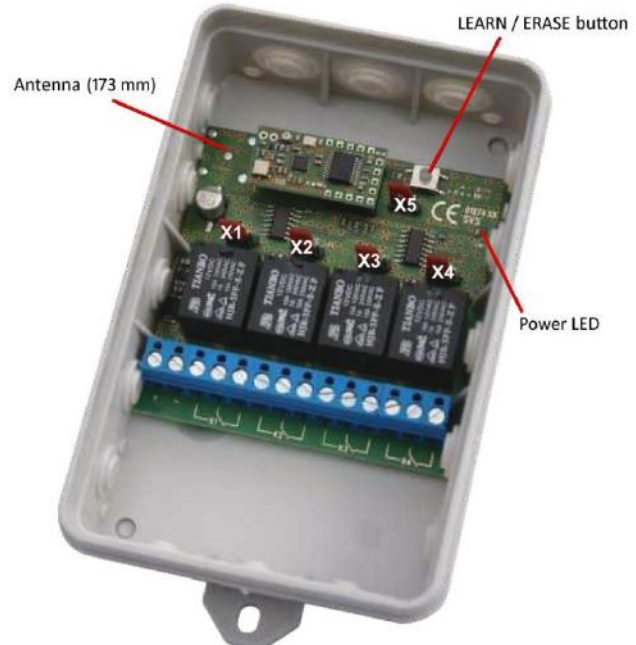


Figure 5: FR-100 Jumper Settings

### 6.3 Frequency Change (f1 / f2)

The module can be operated with two different operating frequencies:

- f1 = 433.62 MHz (standard setting)
- f2 = 434.22 MHz (optional setting)

By default, jumper **X5** is in position **f1**. To select the working frequency **f2**, set the jumper to position **f2** and restart the receiver. Please note that the corresponding transmitter also has to be switched to **f2** (refer to section 5.5).

## 7 Installing the FT-100 / FR-100 System

For the location of the FR-100 receiver module, select a place which is not shielded by conducting objects and position the antenna in such a way that it is not subject to interference from the rest of the circuit and is parallel to the transmitter antenna.


Connect the supply voltage to the input 12 ... 24 VDC and the POWER LED will turn on.



**Take care of the technical data and of the supply polarity (8). Maximum supply voltage is 24V DC. Higher supply voltages will destroy the receiver. In continuous operation of all 4 relays the supply voltage must not exceed 12 V.**



## 7.1 Programming the FT-100 Switches/Buttons

In order to learn a transmitter or a key it is necessary to switch from the normal receive mode to a learn mode by specific pressing of the **LEARN/ERASE** button (see  Figure 5). After that a switch or button of the FT-100 transmitter has to be pressed in a distance of no less than 1m.

Following learn modes are available:

### 7.1.1 Learn Mode I:

Learn a transmitter with acknowledgement of the transmitter signal. Press the **LEARN/ERASE** button 1 x shortly. The light of the LED beside the button interrupts 1 x every 2 seconds.

### 7.1.2 Learn Mode II:

Learn a single key with acknowledgement of the key signal. Press the **LEARN/ERASE** button 2 x shortly. The light of the LED beside the button interrupts 2 x every 2 seconds.

### 7.1.3 Learn Mode III:

Learn a transmitter without acknowledgement of the transmitter signal. Press the **LEARN/ERASE** button 3 x shortly. The light of the LED beside the button interrupts 3 x every 2 seconds. The corresponding transmitter is configured automatically.

### 7.1.4 Learn Mode VI:

Learn a single key without acknowledgement of the key signal. Press the **LEARN/ERASE** button 4 x shortly. The light of the LED beside the button interrupts 4 x every 2 seconds. The corresponding transmitter is configured automatically.

Each learn mode returns to normal receiving mode if a valid signal has been received, or if the **LEARN/ERASE** button is pressed again, or if the learn- and erase mode is already active more than 30 seconds.

The receiver module may learn up to 60 different transmitter codes. A successful learn process will be signaled by a flash of the LED besides the **LEARN/ERASE** button. Possible causes for failed learn processes are a full list of learned transmitters or the list contains already the transmitter.

Check for error free operation of the receiver by pressing the transmitter buttons desired. The state of each relay is indicated by appropriated control LEDs.

## 7.2 Delete FT-100 Transmitters or Keys

In order to erase a transmitter or a key it is necessary to switch from the normal receive mode to an erase mode by specific pressing of the **LEARN/ERASE** button. Keep the **LEARN/ERASE** button pressed down for at least 3 seconds. The LED beside the button begins to flash. Pressing afterwards a FT-100 transmitter key in a distance of no less than 1 meter causes the erasure of all list entries corresponding to this transmitter. Instead of pressing a transmitter button you can press the **LEARN/ERASE** button for at least 3 seconds again to clear the whole list of learned transmitters.

If you are sure that all functions are properly working you may start wiring of the relay contacts. If the relay voltage exceeds 40 V, ensure that the receiver is free of voltage before perform starting wiring.

## 8 Type Designation / Order Code

**FS - 1XX - L - T - H**

### System Information

<b>FS</b>	Bidirectional Radio System / Remote Controller
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### Transmitter / Receiver

<b>100</b>	<b>FT</b> -100 (3-channel transmitter) + <b>FR</b> -100 (receiver)
<b>101</b>	<b>FT</b> -100 (4-channel transmitter) + <b>FR</b> -100 (receiver)

### Options

<b>L</b>	Transmitter module <b>FT</b> -100 with <ul style="list-style-type: none"> <li>• battery monitoring</li> <li>• acoustic signals (beeper)</li> <li>• status LEDs</li> </ul>
<b>T*</b>	Transmitter module <b>FT</b> -100 with mechanical interlock for buttons resp. switches*
<b>H</b>	Receiver module <b>FR</b> -100 with snap-on housing for 35 mm top hat rail

\*) Available only on request

### Order / reorder of single components

**Please note:** Transmitters and receivers as well as desired options, can be ordered separately. In this case, the order code shown above is also applicable, but then **FT** or **FR** must be indicated as system information (instead of **FS**).

Examples of orderable individual components:

- FT-100** → 3-channel transmitter module (standard version)
- FT-100-L** → 3-channel transmitter module with battery monitoring, beeper and status LEDs
- FT-101-L** → 4-channel transmitter module with battery monitoring, beeper and status LEDs
- FR-100** → Receiver module with switching function (standard version)
- FR-100-H** → Receiver module with switching function and top hat rail housing

## 9 Technical Specifications

### 9.1 Transmitter Module FT-100

Power supply:	12 V battery, type MN21 23A (recommended: Duracell 12 V MN21 Alkaline)
Current consumption:	Normal operation: approx. 6 mA (on average) At standby: 0.1 $\mu$ A
Battery service life:	Up to 4 years (depending on type of loading / application)
Operation frequency:	f1 433.62 MHz; f2 434.22 MHz (see <a href="#">5.5</a> )
Channels for switching functions:	3, optionally 4 (see <a href="#">8</a> )
Antenna:	50 $\Omega$ (integrated)
Optional indicators:	Battery LED, status LEDs and Beeper (option "L", <a href="#">8</a> )
Temperature range:	-20° C ...+ 65° C
Housing:	Plastic, break and impact resistant
Housing dimensions (L x W x H):	140 x 62 x 46 mm / 5.51 x 2.44 x 1.81" (without keys) 140 x 62 x 70 mm / 5.51 x 2.44 x 2.76" (with keys)
Protection class:	IP67

### 9.2 Receiver Module FR-100

Power supply:	12.0 ... 24.0 VDC (maximum 26 V)
Current consumption:	At standby: 25 mA All relays energized : ca. 200mA
Operation frequency:	f1 433.62 MHz; f2 434.22 MHz (see <a href="#">5.5</a> )
Antenna:	50 $\Omega$ (integrated)
Relay outputs:	4 potential free changeovers
Relay switching power:	230 VAC / 10 A; 30 VDC / 5 A
Temperature range:	-20° C ...+ 65° C
Connections:	Internal screw terminals
Housing:	Standard: surface-mounted housing, plastic Option „H“: snap-on housing for top hat rail ( <a href="#">8</a> )
Housing dimensions (L x W x H):	130 mm x 85 mm x 37 mm / 5.43 x 3.35 x 1.46"
Protection class:	IP54

### 9.3 Conformity

According to the 2014/53/EU (RED) standard

Health and safety:	EN 60 950-1:2006 + A11:2009 + A1:2010 + A12:2011 + AC:2011 + A2:2013
Electromagnetic compatibility:	EN 301 489-1 : V1.9.2 / EN 301 489-3 : V1.6.1
Use of the radio frequency spectrum:	EN 300 220-2 : V2.4.1
Assessment of hazardous substances:	EN 50581:2012

Declaration of conformity [see next page](#)

**Konformitätserklärung gemäß der Richtlinie 2014/53/EU (RED)**  
**Declaration of Conformity in accordance with the Directive 2014/53/EU (RED)**

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller / This declaration of conformity is issued under the sole responsibility of the manufacturer:

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**Bodenseeallee 18**  
**DE 78333 Stockach**

erklärt, dass die Funkanlage / declares that the Radio equipment:

**SHR-12 L4**

**HSV 13.20**

**FS-100**

**Fernwirkempfänger / remote control receiver**

mit den Bestimmungen der nachfolgenden EU-Richtlinie übereinstimmt / complies with the requirements of the following directive:

**2014/53/EU** European Radio Equipment Directive (RED)  
**2011/65/EU** Restriction of Hazardous Substances (RoHS)

und dass die nachstehenden, harmonisierten europäischen Normen zur Anwendung gelangt sind / and that the following harmonized european standards has been applied:

Gesundheit und Sicherheit / Health and safety:

**EN 60 950-1:2006 + A11:2009 + A1:2010 + A12:2011 + AC:2011 + A2:2013**

Elektromagnetische Verträglichkeit / Electromagnetic compatibility:

**EN 301 489-1 : V1.9.2**

**EN 301 489-3 : V1.6.1**

Nutzung des Frequenzspektrums / Use of the radio frequency spectrum:

**EN 300 220-2 : V2.4.1**

Beurteilung gefährlicher Stoffe / Assessment of hazardous substances:

**EN 50581:2012**

Ort, Datum / Place, date of issue:

Verantwortliche Person / responsible person:  
Name und Unterschrift / name and signature:

Stockach, 10.01.2018



**Alexander Beck, Geschäftsführer**