

## RF Receiver Type HFE..

### Order information

Name	Type	Part No.
RF Receiver 27 MHz	HFE27	133 020 01 AX
RF Receiver 35 MHz	HFE35	133 020 02 AX



- **RF receiver for hazardous areas**
- **Used for wireless radio connections in MR90 systems in underground pit areas**
- **Explosion Protection category / mode: I M 1 EEx ia I**

### Description

The RF receiver Type HFE.. is part of the intrinsically safe underground radio system MR90 and it is used for demodulation of frequency modulated receive signals.

The HFE 27 is a frequency modulated RF receiver with a receive frequency range of 26.5 to 27.5 MHz. There are 21 receive channels selectable. The channel spacing is 50kHz.

The HFE 35 is also a frequency modulated RF receiver. Both receivers are in principle equal in mechanical and electrical construction. The receiver circuit is redesigned merely for an operation in the 35 MHz band. Here are also 21 receive channels selectable with a channel spacing of also 50 kHz.

The RF receivers are clip-on modules, which for themselves have no independent function.

An electric connection to the corresponding LF interface NFT01 or to the data radio modem MOD02 is made by a 8-wire connection cable which has to be plugged on the 8-pole pin contact strip of the HFE.. receiver. The module is powered via this strip.

The RF receiver has been designed as double superhet-receiver. The Signals

coming in at the coax socket ST-HF1 are conducted through a receiving band-pass filter to an input mixer. This mixer transforms the input signal into the 1<sup>st</sup> intermediate frequency (10,7 MHz).

The necessary oscillator signal is generated by a synthesizer and is connected to a PLL circuit over a scaler chain set to a divisor according to the selected channel.

A PLL circuit tunes a VCO (voltage controlled oscillator) according to the selected channel and prepares a mute-delay-stage when the VCO has reached lock frequency (lock control). The signal transformed to the 10.7 MHz 1<sup>st</sup> intermediate frequency is fed to the 2<sup>nd</sup> mixer through a quartz filter and mixed down to the 2<sup>nd</sup> intermediate frequency of 455 kHz. The Signal passes through a ceramic filter, IF amplifier and a limiting amplifier. The modulation signal is recovered with a quadrature-modulator.

The so recovered LF signal passes a mute switch, a pre-amplifier and a low-pass filter to the 8-pole pin strip.

## RF Receiver Type HFE..

The mute signal (squelch circuit) is also accessible here. The mute delay-time can be switched over by the signal "T<sub>on</sub>". Using the RF receiver with the LF interface NFT01 the delay-time is 100 ms, using the receiver with the data radio modem MOD02 this time is 10 ms.

For measurement of the received signal strength a 2-pole pin strip provides a logarithmic-proportional DC-signal.

1 V<sub>DC</sub> corresponds to a receiver input voltage of 1 μV

2 V<sub>DC</sub> corresponds to a receiver input voltage of 10 μV

3 V<sub>DC</sub> corresponds to a receiver input voltage of 100 μV

4 V<sub>DC</sub> corresponds to a receiver input voltage of 1000 μV

On the top-side of the receiver a potentiometer is accessible to set the receive-level threshold value. If the receive level falls below this threshold value the LF output is switched off (mute control / squelch circuit).

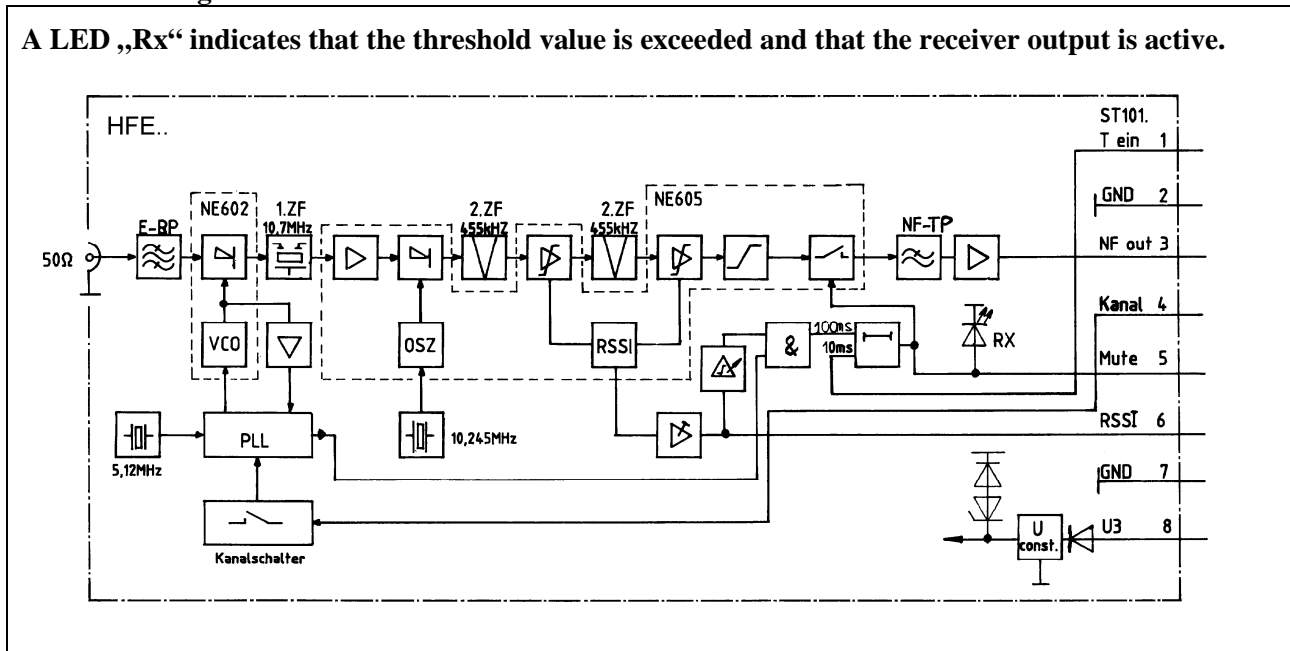
Left stop of the potentiometer ⇒ max. sensitivity

Right stop of the potentiometer ⇒ min. sensitivity.

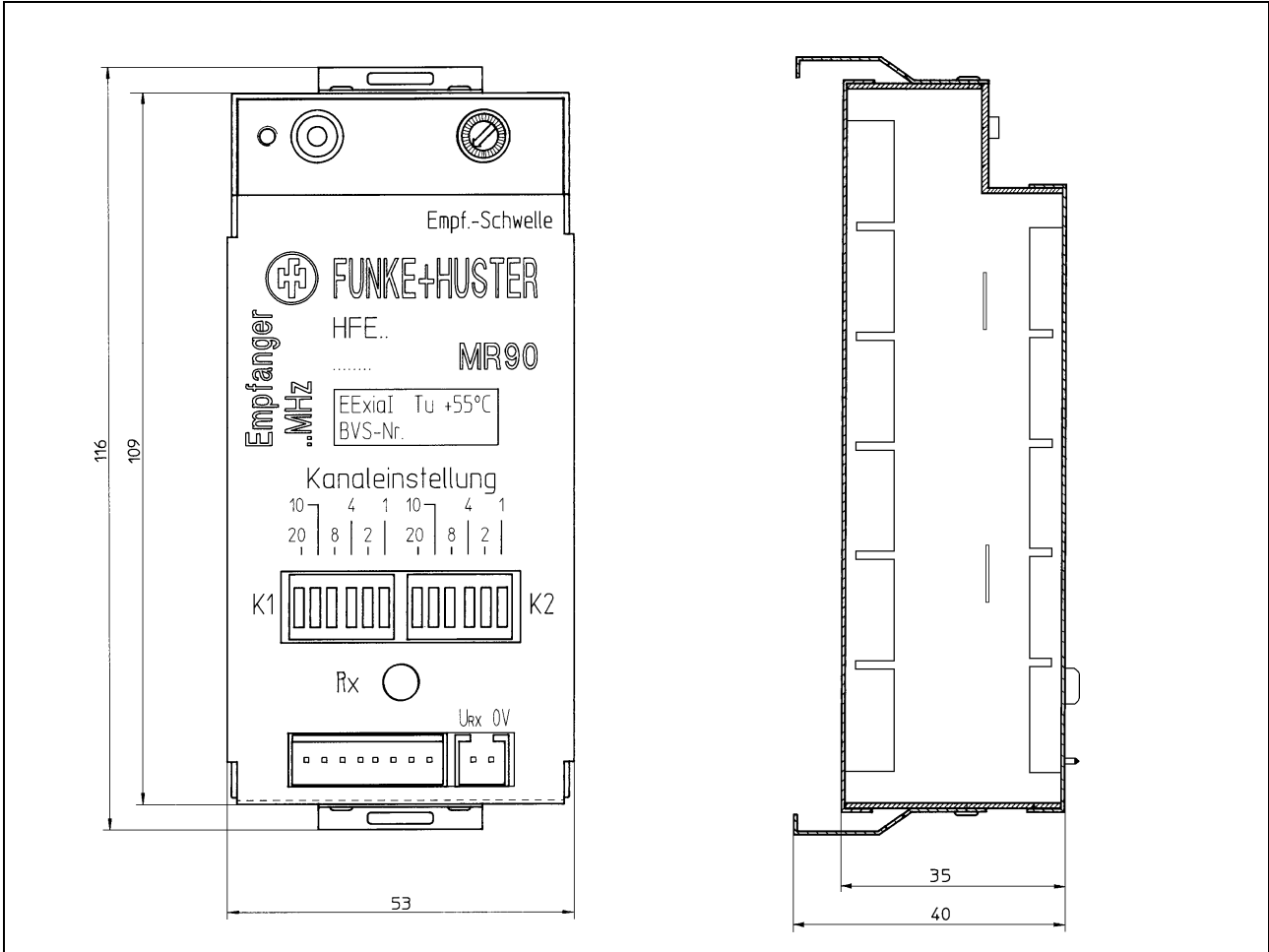
### Construction

The module has a tin plate housing. The electronics inside are placed inside on two printed circuit boards. It is mainly fabricated in SMD technology. At the front-sides of the module there are two clips to fasten the receiver on the corresponding LF interface module NFT01 or data radio modem MOD02.

### Connection diagram





Dimensional drawing



**Technical Data**

<b>Name Type</b>	<b>RF Receiver HFE27 or HFE35</b>	
<b>Elektrical Characteristics / Parameters</b>		
Power supply circuit (Pin contact strip U2 (ST101.8) and GND (ST101.2 = ST101.7))		
Max. input voltage $U_i$	15 V <sub>DC</sub>	
Max. input current $I_i$	107 mA	
Max. internal capacity $C_i$	negligible	
Max. internal inductivity $L_i$	negligible	
<b>RF Receiver inputs/outputs</b>		
Pin contact strip	T <sub>on</sub> LF-OUT CHANNEL MUTE RSSI	(ST101.1), (ST101.3), (ST101.4), (ST101.5), (ST101.6 = ST104.2)
<b>Control signals ST101.1, ST101.4, ST101.5</b>		
Max. output voltage $U_o$	7.7 V <sub>DC</sub>	
Max. output current $I_o$	7.7 mA	
Max. external capacity $C_o$	can be determined only in common with the connected devices and components	
Max. external inductivity $L_o$	can be determined only in common with the connected devices and components	
Max. input voltage $U_i$	7.7 V <sub>DC</sub>	
Max. internal capacity $C_i$	negligible	
Max. internal inductivity $L_i$	negligible	
<b>Signal voltage output ST101.3, ST101.6 = ST104.2</b>		
LF level	-6 dBm at 600 Ω	
LF frequency range	300 Hz to 3400 Hz	
Max. output voltage $U_o$	7.7 V <sub>DC</sub>	
Max. output current $I_o$	35 mA	
Max. external capacity $C_o$	can be determined only in common with the connected devices and components	
Max. external inductivity $L_o$	can be determined only in common with the connected devices and components	
Max. input voltage $U_i$	7.7 V <sub>DC</sub>	
Max. internal capacity $C_i$	negligible	
Max. internal inductivity $L_i$	negligible	
<b>Receiver input (ST-HF1)</b>		
Max. input voltage $U_i$	2.5 V <sub>DC</sub>	
Max. input voltage	7 mV <sub>AC</sub>	
Max. internal capacity $C_i$	negligible	
Max. internal inductivity $L_i$	negligible	
<b>Additional Technical Data</b>		
Receive frequency range	26.5 MHz to 27.5 MHz 34.5 MHz to 35.5 MHz	(HFE27) (HFE35)
Channel count	21	
Channel spacing (Frequency pattern)	50 kHz	
Channel setting	with 6-pole DIP switches K1 and K2 (K2 setting is activated with signal "Channel", pin 4 of St101)	
Modulation	Frequency Modulation	
Principle of circuit	Double-Superhet	

**Technical Data**

RF input	50 $\Omega$ unbalanced
Bandwidth	Sensitivity $\leq 1 \mu\text{V} / 20 \text{ dB SINAD}$ approx. 14 kHz
LF output	- 6 dB on 600 $\Omega$
LF frequency range	300 Hz to 3.4 kHz
Power supply	$U_n = 12\text{V}$ , $I_n = 26 \text{ mA}$
Weight:	approx. 0.2 kg
Dimensions	see dimensional drawing
Operating mode	100% duty-cycle / continuous operation
Operation position	any position
Temperature range	
- Operation	- 20 to + 55°C
- Storage and Shipping	- 25 to + 70°C
Testing and Certification	
Certification number	BVS 03 ATEX E 117 U
Explosion protection category / mode	IM1 EEx ia I
Identification / type label	
The RF receiver HFE27 or HFE35 is labelled as follows:	
Company	FHF Bergbautechnik D-42551 Velbert
Type	HFE**  IM1 EEx ia I BVS 03 ATEX E 117 U  0158 F. Nr.... Testing (short sign, month/year) $20^\circ\text{C} \leq T_a \leq + 55^\circ\text{C}$

**Assembly and Disassembly**

The assembly is done by clipping the HFE27 or HFE35 module on other devices, i.e. on the LF interface NFT01 or on the data radio modem MOD02. For this the clips on the front-sides must be bended e.g. by a screw-driver into the lock-position on the module carrier. The disassembly is done in the reverse way.

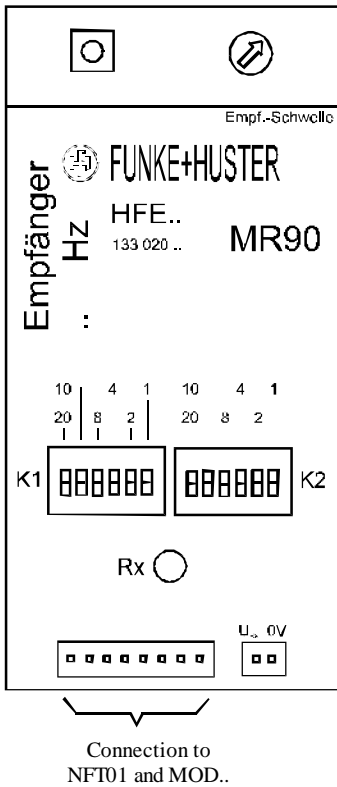
**Installation**

For installation the plug with the 8-wire connection cable coming from the right side of the modules NFT01 or MOD02 must be plugged onto the corresponding pin strip of the receiver. Due to a different pole count a reverse-connection is impossible.

The mechanical coding of the plug-in strip allows a connection only in the right order.

**Device Setup**

With the plug-in of the connection cable the device is ready for operation. The receive channel must be set according to the table beyond. Setting of the receive channel is made with a 6-pole DIP switch (K1). A second 6-pole DIP switch (K2) is available for the setting of a second channel frequency. The receiver can be switched over to this frequency via the interface signal "Channel" (pin 4 of ST101).



Frequency Setting HFE**									
1 = Switch in „On“ Position									
K1	20	10	8	4	2	1	Chan- nel	f/MHz	f/MHz
K2	0	0	0	0	0	0	0	26,50	34,50
						1	1	26,55	34,55
					1		2	26,60	34,60
					1	1	3	26,65	34,65
				1			4	26,70	34,70
			1		1		5	26,75	34,75
			1	1			6	26,80	34,80
			1	1	1		7	26,85	34,85
		1					8	26,90	34,90
		1			1		9	26,95	34,95
	1						10	27,00	35,00
	1					1	11	27,05	35,05
	1			1			12	27,10	35,10
	1			1	1		13	27,15	35,15
	1	1					14	27,20	35,20
	1	1	1				15	27,25	35,25
	1	1	1				16	27,30	35,30
	1	1	1	1			17	27,35	35,35
	1	1					18	27,40	35,40
	1	1				1	19	27,45	35,45
	1	0	0	0	0	0	20	27,50	35,50

**Maintenance**

The device doesn't contain any parts to be maintained.

**Special conditions for a safe usage**

The RF receiver HFE\*\* must be installed into a housing that ensures a minimum ingress protection mode of IP54 acc. to EN 60529.

This component is intended for an operation in an ambient temperature range of -20° C to +55° C.

The internal wiring must comply to the conditions of section 6.4.11 of EN 50020.

**Warn and Safety Advice**

<p>This explosion-proof intrinsically safe component in safety-class group I is designed for operation in hazardous areas with firedamp. Please pay particular attention to the following warning and safety instructions:</p>
<p>Any interconnection with other electric equipment must be especially certified.</p>
<p>The component must be connected and installed in accordance with the prescribed installation instructions by a trained specialist, taking the specified protection class into account.</p>
<p>This component must be connected and operated only with the specified voltage.</p>
<p>For operation of the component in commercial facilities the local accident prevention regulations for electrical plants and operating supplies have to be observed.</p>
<p>Unfavourable ambient conditions may damage the device and may possibly result to danger of life for users. Unfavorable ambient conditions could be:</p> <ul style="list-style-type: none"> <li>- Air humidity too high (&gt;75% rel., condensing)</li> <li>- Moisture, dust (observe type of protection)</li> <li>- inflammable gases, vapours, solvents, not covered by the protection class</li> <li>- Ambient temperature too high (&gt; +55°C)</li> <li>- Ambient temperature too low (&lt; -20°C).</li> </ul>
<p>The ambient temperature for the component may not fall outside the specified range during operation.</p>
<p>Keep only the specified operating modes.</p>
<p>The component is intended for use in hazardous firedamp areas.</p>
<p>Corrective maintenance may be executed only by the manufacturer or by a person appointed by the manufacturer concluded with a renewed routine test of the device.</p>
<p><b>The explosion protection is not guaranteed at non observance of the above mentioned points.</b></p>

<p>FHF Bergbautechnik GmbH &amp; Co. KG Eintrachtstr. 95 D-42551 Velbert</p>	 <p>FHF Bergbautechnik GmbH &amp; Co. KG</p>	<p>Tel: +49 (0) 2051 270 – 0 Fax: +49 (0) 2051 270-366 Mail: <a href="mailto:info@fhf-bt.de">info@fhf-bt.de</a> URL :<a href="http://www.fhf-bt.de">www.fhf-bt.de</a></p>
--	---	---

# EG-KONFORMITÄTSERKLÄRUNG

## EC DECLARATION OF CONFORMITY

**Wir erklären in alleiniger Verantwortung, dass das Produkt auf das sich diese Erklärung bezieht mit der/den folgenden Norm(en) oder normativen Dokumenten übereinstimmt:**

Herewith we declare bearing sole responsibility that the product referred in this declaration is in conformity with the following standards or normative documents and regulations of the directive:

<b>Bezeichnung Erzeugnis / Komponente</b> Name of product or component	<b>HF-Empfänger HF-Sender</b> HF-receiver HF-transmitter
<b>Geräte- oder Typenbezeichnung</b> Equipment type or mark of equipment	<b>HFE27, HFE35; HFS27, HFS35</b>
<b>Bestimmung der Richtlinie</b> Provisions of the directive	<b>Nr. und Ausgabedatum der Norm(en)</b> No. and date of issue of the standard(s)
<b>94/9/EG: Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen</b> 94/9/EC: Equipment and protective systems intended for use in potentially explosive atmospheres	<b>EN 50014:1997+A1+A2</b> General requirements <b>EN 50020:1994</b> Intrinsic safety „i“ <b>EN 50303:2000</b> Equipment Group I Category MI
<b>EG-Baumusterprüfbescheinigung</b> EC-Type-Examination Certificate	<b>BVS 03 ATEX E 117 U</b>
<b>Benannte Stelle für die Bescheinigung</b> Notified body of the certificate <i>Kennnummer / Inspection number</i>	<b>DEKRA EXAM GmbH</b> <b>0158</b>
<b>Hersteller / Anschrift</b> Manufacturer / Factory address	FHF Bergbautechnik GmbH & Co. KG Eintrachtstr. 95 D – 42551 Velbert

**Geschäftsführer:**  
Managing director:

Dr. Opitz, Hans-Peter

.....  
(name, prename)

Velbert

.....  
(Ort / place)

11.2.2011

.....  
(Datum / date)

  
.....  
(Unterschrift / signature)

ZW\_Li\_KEK\_HFxxx\_D\_GB.doc