



## GSM-R Radio Module

### MT5E

The MT5E is a GSM Phase 2+ radio module with GSM-R and ASCI enhancements. The module can be operated within the GSM-R frequency band at a maximum output power of 8 watts (GSM Power Class 2).

The MT5E operates also in the ER-GSM-frequency band. It is able to support GPRS Multi-Slot Class 10 with the operation modes Class B, C, CS (optional). The protocol software meets the requirements of the specification R97/R99 GSM.

Additionally a software according GSM Rel. 04 is available.

#### The following tasks can be maintained:

- Interface configuration
- Software update
- Setup of Voice- and Data connections (Circuit/Packet)
- GSM-R-protocol message tracing (optional)

#### Highlights:

- Characteristic values are more strictly specified than required by the GSM standard.
- Maximum reliability and availability
- Electronic is housed in a sturdy chassis that can withstand against the poor conditions in the harsh environment of railway operations.
- Basic **GSM-** und **GPRS-Software** had been extended by railway specific functions (such as functional addressing, USS1 and USSD)
- Combined Tx/Rx connector at the front side as well as a connector for the serial interfaces at the rear side
- Fulfills the railway specific receiver requirements according ETSI TS 102 933 V 2.1.1
- **Has improved characteristics against RF - blocking and interferences**
- The module is controlled via AT-commands according the GSM-specifications 3G 27.005, 3G 27.007 and MORANE.

## Excellent characteristics against RF-blocking and interferences integrierte Filter

- Special filter banks in the GSM-R module
- Intelligent actuation via software
- Adaptation of the protocol stack (Layer 1) to operate the filter bank, depending on the BCCH information (Broadcast Control Channel)
- Fulfilling of the ETSI standards, TS 102 933-1 V2.1.1 & TS 102 933-2 V2.1.1 for GSM-R improved receiver parameters

FR frequency (ARFCN of useful signal)	FB frequency (Blocking signal)	ETSI TS 102 933-2 V2.1.1 professional MS R-GSM 900/ER-GSM 900 Level in dBm	Funkwerk MT5E R-GSM 900/ER-GSM 900 typical values Level in dBm
924,2 MHz ARFCN 970	FR ± 600 kHz ... FR ± 800 kHz	-38	-29.5
	FR ± 800 kHz ... FR ± 1.6 MHz	-33	-25
	FR ± 1.6 MHz ... FR ± 5 MHz	-23	max. 0
	100 kHz ... < 835 MHz	-23	max. 0
	835 MHz ... < 873 MHz	+0	max. 0
	873 MHz ... < 880 MHz	+0	max. 0
	880 MHz ... < 912 MHz	-5	max. 0
	912 MHz ... < 915 MHz	-12	max. 0
	915 MHz ... FR - 5 MHz	-23	max. 0
	FR + 5 MHz ... 925.6 MHz	-23	-4.6
	> 925.6 MHz ... 927 MHz	-13	-8.7
	> 927 MHz ... 960 MHz	-10	max. 0
	> 960 MHz ... 1 000 MHz	+0	max. 0
	> 1 000 MHz ... 12.75 GHz	-23	max. 0

Table 1: Level of unwanted signals for professional MS from EN 102 933-2, chapter 4.2.1.4.2

Pegel Nutzsignal auf ARFCN 970 (dBm)	Interferer(s) characteristics				Comment
	ARFCN	Freq. (MHz)	ETSI TS 102 933-2 V2.1.1 Mobile input level (dBm/5MHz)	Funkwerk MT5E Mobile input level (dBm/5MHz) typical values	
-101	3476	927.6	-13	-2	LTE single interferer
	3476 & 3526	927.6 & 932.6	-13	-5.6	LTE dual interferer

Table 2: Blocking with Broadband interfering Signals from EN 102 933-2, chapter 4.3.1.4.2

## Technical Data

GSM Services				Mechanical Data	
Tele Services				Height	Width
TS11: Telephony		TS12: Emergency calls		Body: 110mm	Body: 36.6mm
TS21: Short Message Service MT/PP		TS22: Short Message Service MO/PP		Front panel: 3U	Front panel: 10HP
TS23: Short Message Service Cell Broadcast		TS62: Automatic Facsimile Group 3			
TS91: Voice Group Call		TS92: Voice Broadcast Call			
Bearer Services				Depth	Weight
BS24: 2.4kbits T/NT, UID, 3.1 kHz, V110		BS25: 4.8kbits T/NT, UID, 3.1 kHz, V110		169.9mm	0.75 kg
BS26: 9.6kbits T/NT, UDI, 3.1 kHz, V110		BS70: GPRS Bearer Service			
EIRENE Specific Features					
Functional addressing		Location dependent addressing			
Call preemption and arbitration (eMLPP)		Railway Emergency Call (REC) enhanced Emergency Call (eREC)			
HF Characteristics					
Operating frequencies	R-GSM	876 to 915 MHz	921 to 960 MHz		
	ER-GSM	873 to 915 MHz	918 to 960 MHz		
Power transmission	8W (GSM Class 2)				
Sensitivity	-104 dBm				
Environmental Conditions					
Protection class	IP20 according to EN 60529				
Vibration and shocks	according to EN 50155				
EMC	according to EN 50121-3-2 and EN 50155				
Fire Protection Properties					
Fire protection	according to EN 45545-2:2020-10 and EN 45545-5				
Climatic Conditions					
Operating Temperature	-25°C to 70°C	Maximal Gradient <sup>1)</sup>	± 1°C/min		
Storage Temperature	-40°C to 85°C	Relative humidity	acc. to EN 50155		
Electrical Data					
Input voltage	+12 VDC	Input power (according to input voltage)	max. 6 W <sup>2)</sup>		
	5 VDC		max. 4 W		
Backplane Connector					
Power Supply	Reset	Data / Service (TTL)	Analogue audio in/out		

1) of ambient temperature

2) 8 W transmission power, for single TX slot

**Funkwerk Systems GmbH**

Im Funkwerk 5 | D-99625 Köllda

Phone: +49 (0) 3635/458-0 | Fax: +49 (0) 3635/458-599

info@funkwerk.com | www.funkwerk.com

