

## GSM-R Radio Module

# MT5E



The MT5E is a GSM Phase 2+ radio module with GSM-R and ASCL 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 and is approved according to GCF3.14.

## ADDITIONAL FUNCTIONS

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

Additionally a software according GSM Rel. 04 is available.

## 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
	ARFCN 970	-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

Level of useful signal on 970 (dBm)	Interferer(s) characteristics				
Mobile in- put level (dBm/200kHz)	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	Comment
-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

#### GSM Phase 2+ Teleservices

<b>TS11:</b> Telephony	<b>T S12:</b> Emergency calls
<b>TS21:</b> Short Message Service MT/PP	<b>TS22:</b> Short Message Service MO/PP
<b>TS23:</b> Short Message Service Cell Broadcast	<b>TS62:</b> Automatic Facsimile Group 3
<b>TS91:</b> Voice Group Call	<b>TS92:</b> Voice Broadcast Call

#### GSM Phase 2+ Bearer Services

<b>BS24:</b> 2.4 kbits T/NT, UID, 3.1 kHz, V110	<b>BS25:</b> 4.8 kbits T/NT, UID, 3.1 kHz, V110
<b>BS26:</b> 9.6 kbits T/NT, UDI, 3.1 kHz, V110	<b>BS70:</b> GPRS Bearer Service

### EIRENE SPECIFIC FEATURES

Functional addressing	Call preemption and arbitration (eMLPP)
Location dependent addressing	Railway Emergency Call (REC) / enhanced Emergency Call (eREC)

### HF CHARACTERISTICS

Operating frequencies	R-GSM: 876 ... 915 MHz / 921 ... 960 MHz ER-GSM: 873 ... 915 MHz / 918 ... 960 MHz
Power transmission	8W (GSM Klasse 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

## TECHNICAL DATA

### CLIMATIC CONDITIONS

Operating Temperature	-25 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Maximal Gradient <sup>1</sup>	± 1 °C/min
Relative humidity	acc. to EN 50155

### DIMENSIONS / WEIGHT

Height	Body: 110 mm Front panel: 3U
Width	Body: 36.6 mm Front panel: 10HP
Depth	169.9 mm
Weight	0.75 kg

### FIRE PROTECTION PROPERTIES

Fire protection	according to EN 45545-2:2020-10 and EN 45545-5
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### ELECTRICAL DATA

Input voltage	12 VDC 5 VDC
Input power (according to input voltage)	max. 6 W <sup>2</sup> max. 4 W

### BACKPLANE CONNECTOR

Power Supply	Data / Service (TTL)
Reset	Analog audio in/out

<sup>1</sup> of ambient temperature

<sup>2</sup> 8 W transmission power, for single TX slot