



GSM-R Radio Module

MT5E-AD / MT5E-SD

The MT5E-AD/MT5E-SD is a GSM Phase 2+ radio module with GSM-R 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-AD/MT5E-SD operates also in the ER-GSM-frequency band.

It is able to support EDGE and GPRS Multi-Slot Class 12 with the operation mode Class B. The protocol software meets the requirements of the specification Rel. 04 GSM.

The following tasks can be maintained:

- Interface configuration
- Software update
- Data connections (Circuit/Packet-Switched Data)
- Trace function using SW Tool "Trace2"

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)
- Separated Tx/Rx connector at the front side 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 3GPP TS 27.005, 3GPP TS 27.007 and MORANE.

Excellent characteristics against RF-blocking due to integrated filters

- Special solutions to protect the GSM-R frequencies
- Adaptive protection mechanisms (software-controlled)
- 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-AD/MT5E-SD 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 to 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 ARFCN of useful signal 970 (dBm)	Interferer(s) characteristics				Comment
	ARFCN	Freq. (MHz)	ETSI TS 102 933-2 V2.1.1 Mobile input level (dBm/5MHz)	Funkwerk MT5E-AD/MT5E-SD 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		MT5E-AD	MT5E-SD
TS11: Telephony	TS12: Emergency calls (112)	3HE8TE	3HE10TE
TS21: Short Message Service MT/PP	TS22: Short Message Service MO/PP		
TS23: Short Message Service Cell Broadcast	TS61: Automatic Facsimile Group 3		
Bearer Services			
BS24: 2.4 kbits T/NT, UID, 3.1 kHz, V110 ¹⁾	BS25: 4.8 kbits T/NT, UID, 3.1 kHz, V110		
BS26: 9.6 kbits T/NT, UDI, 3.1 kHz, V110	BS70: E/GPRS Bearer Service		
EIRENE Specific Features			
Functional addressing	Location dependent addressing		
Call preemption and arbitration (eMLPP) for P2P call or data calls	Support of GPRS header compression		
Support of GPRS data compression	Automatic GPRS attach procedure at switch-on		
Support for user settings of minimum QoS	Support of Secondary PDP Context Activation		
HF Characteristics			
Operating frequencies	R-GSM	876 to 915 MHz	921 to 960 MHz
	ER-GSM	873 to 876 MHz	918 to 921 MHz
	GSM	890.2 ... 914.8 MHz	935.2 ... 959.8 MHz
Power transmission	8 W (GSM Class 2)		
Sensitivity	-104 dBm		
Environmental Conditions			
Protection class	IP 20 according to EN 60529		
Vibration and shocks	according to EN 50155		
EMC	according to EN 50121-3-2 and EN 50155		
Climatic Conditions			
Operating Temperature	-25 °C to 70 °C	Maximal Gradient ²⁾	± 1 °C/min
Storage Temperature	-40 °C to 85 °C	Relative humidity	acc. to EN 50155
Electrical Data			
Input voltage		+5 VDC	+12 VDC
Power consumption ³⁾	Idle-Mode	3.4 W	0.1 W
	GSM-Mode	2.2 W	2.4 W
	GPRS-Mode	4.5 W	6.3 W
	EDGE-Mode	3.5 W	4.8 W
Backplane Connector			
Power Supply	Reset	Data / Service (TTL)	Analogue audio in/out

1) V22 to/ V26 / V32 / V110

2) of ambient temperature

3) by measuring: in GSM with 1Tx and 1Rx
 in GPRS with 4Tx and 1Rx
 in EDGE with 4Tx and 1Rx

(Tx / Rx refers to the number of occupied time slots)

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