



## Product Portfolio

**GSM-R Cab Radio**

# Innovation Is Our Philosophy

**GSM-R** (Global System for Mobile Communication for Railways) is the new standard for information transfer in European rail traffic. In the course of the rapidly advancing European harmonization and the demand for the interoperability of rail traffic connected with it, 32 European railroad companies have decided to introduce this trend-setting technology.

**An important technological innovation** “made by Funkwerk” has been the new generation of mobile radio terminals for railway companies, the series production of which commenced halfway through 2002. For rail traffic, the new single and dual mode devices and the resulting possibility of radio-based operation means a quantum leap with regard to security and efficiency.

**For this revolutionary change in technology**, Funkwerk takes advantage of its position as a leading supplier of mobile radio terminals in the rail traffic sector. During recent years, this position has been steadily strengthened by focussing on the Europe-wide introduction of voice and data communication via GSM-R (GSM-R voice and ETCS - European Train Control System).

**The individual system solution** is a successful product solution for our customers’ various installation and interface demands. Modularity and flexibility make our solutions exceptionally versatile and, at the same time, offer the reliability of a proven system solution. Newest technologies coupled with a wealth of experience of many years of cab radio development and on-the-road testing are incorporated into the GSM-R train radio system.

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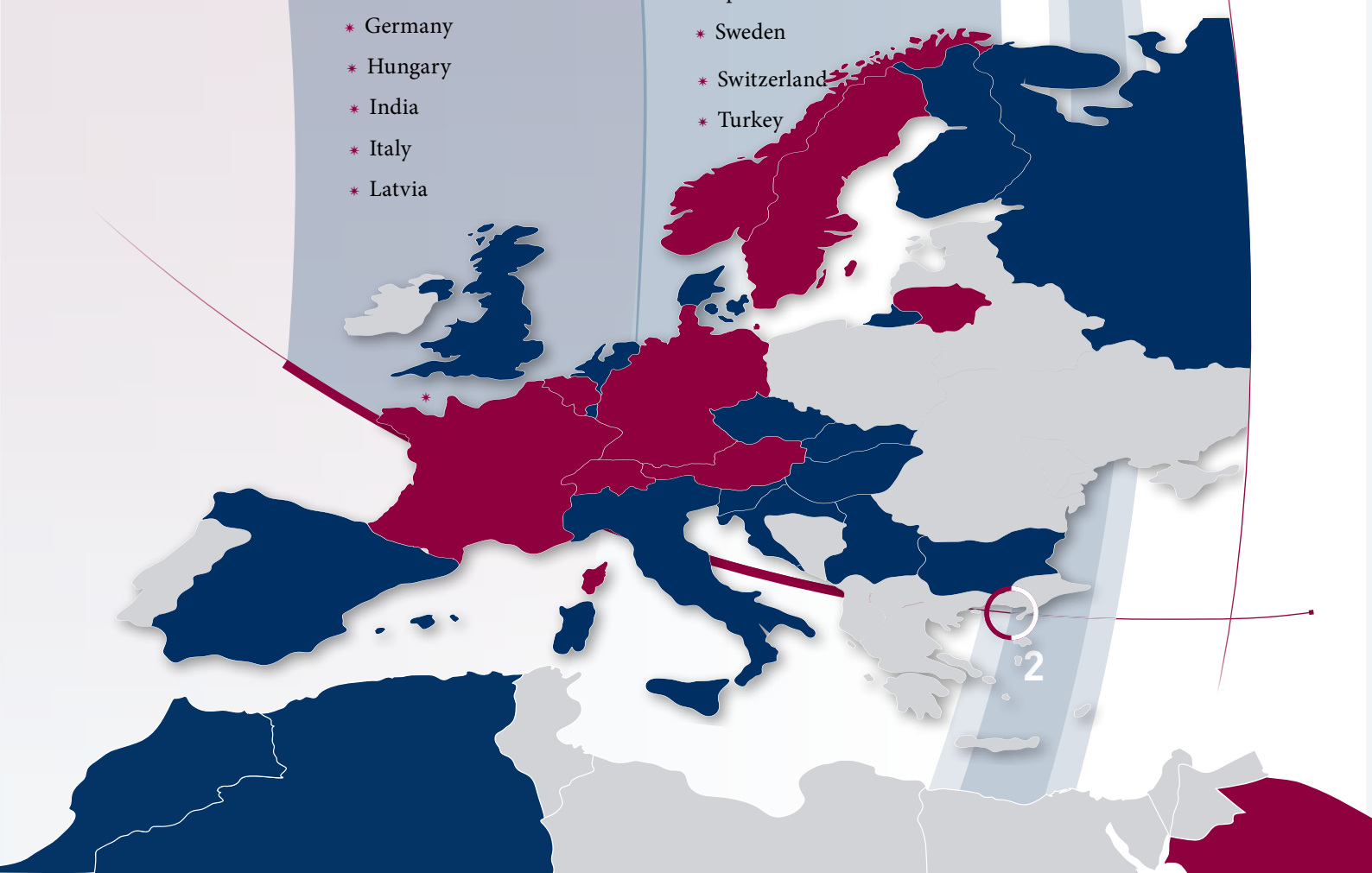
# Market and Projects

» Status Beginning of 2012

- \* Algeria
- \* Austria
- \* Australia
- \* Belgium
- \* Bulgaria
- \* China
- \* Croatia
- \* Czech Republic
- \* Denmark
- \* Finland
- \* France
- \* GB
- \* Germany
- \* Hungary
- \* India
- \* Italy
- \* Latvia
- \* Lithuania
- \* Luxembourg
- \* Morocco
- \* Netherlands
- \* Norway
- \* Romania
- \* Russia
- \* Saudi Arabia
- \* Serbia
- \* Slovak Republic
- \* Slovenia
- \* Spain
- \* Sweden
- \* Switzerland
- \* Turkey

 Funkwerk as  
main supplier of  
GSM-R mobiles

 Vehicles  
with GSM-R  
by Funkwerk



# Overview

» Cab-Radios Made by Funkwerk

|                   | Device       | Design |       |          | System     |
|-------------------|--------------|--------|-------|----------|------------|
|                   |              | Rack   | Box   | Portabel |            |
| Single-Mode GSM-R | MTRS 1 BS    |        | IP54  |          | MESA 23-04 |
|                   | MTRS 1 RS    | IP20   |       |          | MESA 23-05 |
|                   | GTM+         |        |       | IP42     | MESA 23-06 |
|                   | MTRS 1 RSS   | IP20   |       |          | MESA 23-07 |
|                   | MTRS 1 RI    | IP20   |       |          | MESA 23-08 |
|                   | MTRS 1 BC    |        | IP54  |          | MESA 23-09 |
|                   | MESA 24B-R1  | IP20   |       |          | MESA 24-01 |
|                   | MESA 24B-B   |        | IP54  |          | MESA 24-03 |
|                   | ZG25-1       |        | IP54  |          | MESA 25-01 |
|                   | ZG25-2       |        | IP54  |          | MESA 25-02 |
|                   | CR26P        |        | IP54  |          | MESA 26    |
|                   | CR26P        | IP20   |       |          | MESA 26    |
| Dual-Mode         | MTRS 1+A BSH |        | IP54  |          | MESA 23-01 |
|                   | MTRS 1+A RIH | IP20   |       |          | MESA 23-02 |
|                   | MTRS 1+A RSH | IP20   |       |          | MESA 23-03 |
|                   | MESA 24B-R2  | IP20   |       |          | MESA 24-02 |
| Analogue          | ARM 26-2/7   | IP 20  |       |          | MESA 26    |
|                   | ARM 26P-7    |        | IP 54 |          | MESA 26    |
| Data              | RIU-ETCS     | IP20   |       |          | -          |

## Note

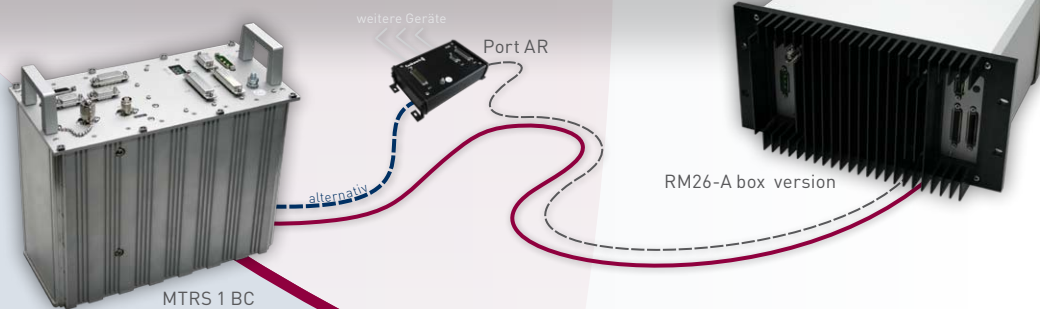
This product overview gives a presentable excerpt of our GSM-R devices.

For more information please contact us. (see front page)

# Configurations

## » MESA 23

| Device       | MMIS | Special Accessories |        |         |          |          |             |            |              |     |
|--------------|------|---------------------|--------|---------|----------|----------|-------------|------------|--------------|-----|
|              |      | Port AR             | RM26-A | FM 2-70 | KA 21.23 | KA 2D.23 | Balisenkoo. | UIC-Bridge | UIC-Splitter | MVB |
| MTRS 1 BS    | 2    |                     |        |         | (x)      | (x)      | (x)         | (x)        | (x)          | (x) |
| MTRS 1 RS    | 2    | x                   | x      | (x)     | x        | x        | x           | x          | x            | x   |
| GTM+         | 1    |                     |        |         |          |          |             |            |              |     |
| MTRS 1 RSS   | 2    | x                   | x      | (x)     | x        | x        | x           | x          | x            | x   |
| MTRS 1 RI    | 2    | x                   | x      | (x)     | x        | x        | x           | x          | x            | x   |
| MTRS 1 BC    | 2    | x                   | x      | (x)     | x        | x        | x           | x          | x            | x   |
| MTRS 1+A BSH | 2    |                     |        | x       | x        | x        | x           | x          | x            | x   |
| MTRS 1+A RIH | 2    | x                   |        | x       | x        | x        | x           | x          | x            | x   |
| MTRS 1+A RSH | 2    | x                   |        | x       | x        | x        | x           | x          | x            | x   |



### Example configuration

Connection of the RM26-A (alternatively via the Port AR combined with further analogue, possibly already existing radio devices).

The special interface card IFS-AR allows integration of the RM26-A. Already equipped devices can be upgraded by exchange or adding.

# ■ Single Mode

**Train Radios** (Cab Radios) intended for use only in the GSM-R network are called as Single Mode Devices.

**Due to different spacious and technical conditions** on rail vehicles there are different requirements to be fulfilled by the train radio devices particularly related to mounting dimension, ingress protection (IP) and interfaces. Due to our long-time experiences as well as through a close cooperation with Railways and a good understanding of their demands Funkwerk can offer a wide range of variants.

**You are interested in a customised solution?** Please contact us, so that we can submit you an offer.



# MTRS 1 BS

» Single Mode Device: Box

## Characteristics

- \* Construction ..... closed housing External dimensions (WxHxD) ..... (300 x 430 x 280) mm
- \* Weight ..... max. 22 kg
- \* Nominal input voltage ..... nom. 24, 36, 48, 72 oder 110 V<sub>DC</sub>
- \* Maximum power input ..... max. 290 W (calculated)

## Ambient Conditions

- \* Protection ..... IP 54 in accordance with EN 60529
- \* Vibrations and impacts ..... in accordance with DIN EN 50155
- \* EMC ..... in accordance with DIN EN 50121-3-2 and DIN EN 50155

## Interfaces

- |                                 |                      |
|---------------------------------|----------------------|
| * 2 for MMIs                    | * 1 for digital I/O  |
| * 1 for antenna GSM-R           | * 1 for UIC (option) |
| * 1 for service and diagnostics | * 2 RS 422 (option)  |
|                                 | * power supply, ...  |



Single Mode

MTRS 1 BS



# MTRS 1 RS

» Single Mode Device: Rack

## Characteristics

- \* Construction ..... 19" mounting rack according to IEC 60297 Part 3 (3 U / 84 HP)
- \* External dimensions (WxHxD) .. (482.6 x 132.6 x 243) mm
- \* Weight ..... max. 6 kg
- \* Nominal input voltage ..... 24, 36, 48, 72 or 110 V DC
- \* Maximum power input ..... 165 W (calculated)

## Ambient Conditions

- \* Protection ..... IP 20 in accordance with EN 60529
- \* Vibrations and impacts .. in accordance with DIN EN 50155
- \* EMC ..... in accordance with DIN EN 50121-3-2 and DIN EN 50155

## Interfaces

- \* 2 for MMIs
- \* 1 for antenna GSM-R
- \* 1 for service and diagnostics
- \* 1 for digital I/O
- \* 1 for UIC (option)
- \* 2 RS 422 (option)
- \* power supply, ...



Single Mode

MTRS 1 RS

## GTM+

### » GTM with Interface for Remote 2<sup>nd</sup> MMI

#### \_ Characteristics

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) . . . (316 x 276 x 345) mm
- \* Weight . . . . . ca. 15 kg
- \* Nominal input voltage . . . . . 24 to 110 V DC
- \* Maximum power input . . . . . 165 W (calculated)

#### \_ Ambient Conditions

- \* Protection . . . . . IP 42 in accordance with EN 60529  
. . . . . except handset and loudspeaker
- \* Vibrations and impacts . . . in accordance with DIN EN 50155
- \* EMC . . . . . in accordance with DIN EN 50121-3-2  
. . . . . and DIN EN 50155

#### \_ Interfaces

- \* 1 for GSM-R antenna
- \* 1 for service and diagnostics
- \* 1 for power supply
- \* 1 for MMI (remote)
- \* 1 for charging unit
- \* 1 RS 422



Single Mode

GTM+

# MTRS 1 RSS

» Single Mode Device: Rack

## Characteristics

- \* Construction ..... 19" mounting rack according to IEC 60297 Part 3 (3 U / 84 HP)
- \* External dimensions (WxHxD) .. (482.6 x 132.6 x 193) mm
- \* Weight ..... max. 7.5 kg
- \* Nominal input voltage ..... 24, 36, 48, 72 or 110 V DC
- \* Maximum power input ..... 170 W (calculated)

## Ambient Conditions

- \* Protection ..... IP 20 in accordance with EN 60529
- \* Vibrations and impacts .. in accordance with DIN EN 50155
- \* EMC ..... in accordance with DIN EN 50121-3-2 and DIN EN 50155

## Interfaces

- \* 2 for MMIs
- \* 2 for antenna GSM-R (1 optional)
- \* 1 for digital I/O
- \* 1 for service and diagnostics
- \* 1 D-Sub female 25-pole (option)
- \* 1 Mini-DIN female (option)
- \* 1 for UIC (option)
- \* 2 RS422 (option)
- \* power supply, ...



Single Mode

MTRS 1 RSS

# MTRS 1 RI

» Single Mode Device: Rack

## \_ Characteristics

- \* Construction . . . . . 19" mounting rack (6 U / 32 HP)
- \* External dimensions (WxHxD) . . . (167.25 x 307.7 x 233.25) mm
- \* Weight . . . . . max. 7 kg
- \* Nominal input voltage . . . . . 24, 36, 48, 72 or 110 V DC
- \* Maximum power input . . . . . 165 W (calculated)

## \_ Ambient Conditions

- \* Protection . . . . . IP 20 in accordance with EN 60529
- \* Vibrations and impacts . . . . . in accordance with DIN EN 50155
- \* EMC . . . . . in accordance with DIN EN 50121-3-2  
. . . . . and DIN EN 50155

## \_ Interfaces

- \* 2 for MMIs
- \* 1 for antennae GSM-R
- \* 1 for service and diagnostics
- \* 1 for digital I/O
- \* 1 for UIC (option)
- \* 2 RS422 (option)
- \* power supply, ...



Single Mode

MTRS 1 RI

# MTRS 1 BC

» Single Mode Device: Box Compact

## \_ Characteristics

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) . . . (260 x 133.5 x 200) mm
- \* Weight . . . . . ca. 5.5 kg
- \* Nominal input voltage . . . . . 24 V DC
- \* Maximum power input . . . . . 165 W (calculated)

## \_ Ambient Conditions

- \* Protection . . . . . IP 54 in accordance with EN 60529
- \* Vibrations and impacts . . . in accordance with DIN EN 50155
- \* EMC . . . . . in accordance with DIN EN 50121-3-2  
 and DIN EN 50155

## \_ Interfaces

- |                                 |                     |
|---------------------------------|---------------------|
| * 2 for MMIs                    | * 1 for UIC         |
| * 1 for antenne GSM-R           | * 2 RS 422 / AF     |
| * 1 for service and diagnostics | * power supply, ... |
| * 1 for digital I/O             |                     |



Single Mode

MTRS 1 BC

# MESA 24B-R1

» Single Mode Device: Rack

## \_ Characteristics

- \* Construction ..... Standard mounting rack  
..... according to NF F 61-005
- \* External dimensions (WxHxD) .. (482.6 x 266 x 369.25) mm
- \* Weight ..... max. 12 kg
- \* Nominal input voltage ..... 24 to 110 V DC
- \* Maximum power input ..... 120 W (calculated)

## \_ Ambient Conditions

- \* Protection ..... IP 20 in accordance with EN 60529
- \* Vibrations and impacts .. in accordance with DIN EN 50155
- \* EMC ..... in accordance with DIN EN 50121-3-2  
..... and DIN EN 50155

## \_ Interfaces

- |                                 |   |
|---------------------------------|---|
| * 2 for MMIs                    | * 4 RS 422 (GPS, ETCS)                              |
| * 1 for antennae GSM-R          | * NULOC, AUA, B1SD1, B1SD2,<br>VACMA, TBL, TVM, KVB |
| * 1 for service and diagnostics | * power supply, ...                                 |
| * 1 for UIC                     |   |



Single Mode

MESA 24B-R1

# MESA 24B-B

» Single Mode Device: Monoblock

## \_ Characteristics

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) . . . (304 x 193 x 230) mm
- \* Weight . . . . . ca. 15 kg
- \* Nominal input voltage . . . . . 24 to 110 V DC
- \* Maximum power input . . . . . max. 120 W (calculated)

## \_ Ambient Conditions

- \* Protection . . . . . IP 54 in accordance with EN 60529
- \* Vibrations and impacts . . . . . in accordance with DIN EN 50155
- \* EMC . . . . . in accordance with DIN EN 50121-3-2  
and DIN EN 50155

## \_ Interfaces

- |                                 |                         |
|---------------------------------|-------------------------|
| * 2 for MMIs                    | * 1 RS 422              |
| * 1 for antennе GSM-R           | * 1 for NULOC device    |
| * 1 for service and diagnostics | * 1 digital I/O (VACMA) |
| * 1 for UIC                     | * power supply, ...     |



Single Mode

MESA 24B-B



# ZG25-1 and -2

» Single Mode Devices

## \_ Characteristics

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) . . . (483 x 222 x 334) mm
- \* Weight . . . . . max. 25 kg
- \* Nominal input voltage . . . . . 24 to 110 V DC
- \* Maximum power input . . . . . max. 150 W (calculated)

## \_ Ambient Conditions

- \* Protection . . . . . IP 54 in accordance with EN 60529
- \* Vibrations and impacts . . . . . in accordance with DIN EN 50155
- \* EMC . . . . . in accordance with DIN EN 50121-3-2  
and DIN EN 50155

## \_ Interfaces

- \* 2 for MMIs
- \* 1 for antennae GSM-R
- \* 1 for service and diagnostics
- \* 1 for ZUB / IBIS
- \* 1 for UIC
- \* 1 Ethernet (10Base-T)
- \* 1 RS 485 / 2 RS 422
- \* 4 digital I/O each
- \* power supply, ...



MESA 25: ZG25-1

Single Mode

ZG25-1 and -2

# CR26 Cab Radio

» Single Mode Device: Rack

## Characteristics

- \* Construction ..... 19"-Rack according to  
..... IEC 60297 Teil 3 (6 HE / 84 TE)
- \* External dimensions (WxHxD) .. (258,7 x 128,4 x 238) mm
- \* Weight ..... max. 10 kg
- \* Nominal input voltage ..... 24 V<sub>DC</sub> / 48 V<sub>DC</sub>
- \* Maximum power input ..... max. 200 W (calculated)

## Ambient Conditions

- \* Protection ..... IP 20 according DIN EN 60529
- \* Vibrations and impacts .. according DIN EN 50155
- \* EMC ..... according to DIN EN 50121-3-2  
..... and DIN EN 50155

## Interfaces

- \* 2 for MMIs
- \* 2 for antenna (WLAN/ GSM-R) (Option)
- \* 1 for service and diagnostics
- \* 1 for digital In- and Outputs (Option)
- \* 1 for UIC (Option)
- \* 2 RS 422 (Option)
- \* 1 for extension interface
  - \* 1 for lok identificationsmodule
  - \* ...



Single Mode

CR26 Cab Radio

# CR26P Cab Radio Protected

» Single Mode Device: Box

## \_ Characteristics

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) . . . (410 x 132 x 200) mm
- \* Weight . . . . . max. 14 kg
- \* Nominal input voltage . . . . . 24 V<sub>DC</sub> / 48 V<sub>DC</sub>
- \* Maximum power input . . . . . max. 200W (calculated)

## \_ Ambient Conditions

- \* Protection . . . . . IP 54 in accordance with EN 60529
- \* Vibrations and impacts . . . in accordance with DIN EN 50155
- \* EMC . . . . . in accordance with DIN EN 50121-3-2  
. . . . . and DIN EN 50155

## \_ Interfaces

- \* 2 for MMIs
- \* 2 for antenna (WLAN/ GSM-R)
- \* 1 for service and diagnostics
- \* 1 for digital In- and Outputs (Option)
- \* 1 for UIC (Option)
- \* 2 RS 422 (Option)
- \* 1 for extension interface
- \* 1 for lok identificationsmodule
- \* ...



Single Mode  
CR26P Cab Radio Protected

# CR26P-1800 Cab Radio Protected

## Single Mode Device: MESA 26 for Australia

### Characteristics

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) . . . (482 / 132 / 240) mm / max. 10 kg
- \* Input nominal voltage . . . . . 120 V DC
- \* Max. power consumption . . . . . 120 W (calculated)
- \* Frequency range . . . . . 1800 MHz
- \* Transmission power . . . . . 4 W (1 W Datenverbindungen)

### Ambient Conditions

- \* Protection . . . . . IP54
- \* Vibrations and impacts . . . according EIRENE SRS V15.3 u. FE 116

### Interfaces

- \* Operating devices HMIC
- \* Handset / Cab amplifier
- \* Service and diagnostics
- \* Antenna
- \* UIC-A line
- \* Digital input and output
- \* RS422 / NF
- \* Miscellaneous
  - \* SIM Card



- Function Key
- PA Amplifier
- Guard's Audio Monitoring System
- RS422, Audio - Switch (Interface Box)
- Audio, PTT
- IRU
- Power supply 120 VDC
- NULOC
- GSM-R and GPRS Communication
- EDGE

Single Mode  
CR26P-1800 Cab Radio Protected

# ■ Dual Mode

**Train Radios** (Cab Radios) intended for use in both the GSM-R and the existing analogue network are called as Dual Mode Devices.

**Dependent on** the migration strategy during introduction of the GSM-R system or rather at cross-border traffic that kind of train radios are the right solution for parallel operation of those two radio technologies in the appropriate operational sphere.

**Due to different spacious and technical conditions** on rail vehicles there are different requirements to be fulfilled by the train radio devices particularly related to mounting dimension, ingress protection (IP) and interfaces. Due to our long-time experiences as well as through a close cooperation with Railways and a good understanding of their demands Funkwerk can offer a wide range of variants.

**You are interested in a customised solution?** Please contact us, so that we can submit you an offer.

# MTRS 1+A BSH

» Dual Mode Device: Box

## \_ Characteristics

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) . . . (300 x 530 x 280) mm
- \* Weight . . . . . max. 31 kg
- \* Nominal input voltage . . . . . 24, 36, 48, 72 or 110 V DC
- \* Maximum power input . . . . . 365 W (calculated)

## \_ Ambient Conditions

- \* Protection . . . . . IP 54 in accordance with EN 60529
- \* Vibrations and impacts . . . . . in accordance with DIN EN 50155
- \* EMC . . . . . in accordance with DIN EN 50121-3-2  
 . . . . . and DIN EN 50155

## \_ Interfaces

- \* 2 for MMIs
- \* 2 for antenna (analogue / GSM-R)
- \* 1 for service and diagnostics
- \* 1 for digital I/O
- \* 1 for UIC (option)
- \* 2 RS422 (option)
- \* power supply, ...



Dual Mode

MTRS 1+A BSH

# MTRS 1+A RIH

» Dual Mode Device: Rack

## Characteristics

- \* Construction . . . . . 19" mounting rack (9 U / 32 HP)
- \* External dimensions (WxHxD) . . . (167.6 x 423.5 x 233.3) mm
- \* Weight . . . . . max. 11 kg
- \* Nominal input voltage . . . . . 24, 36, 48, 72 or 110 V DC
- \* Maximum power input . . . . . 240 W (calculated)

## Ambient Conditions

- \* Protection . . . . . IP 20 in accordance with EN 60529
- \* Vibrations and impacts . . . . . in accordance with DIN EN 50155
- \* EMC . . . . . in accordance with DIN EN 50121-3-2  
and DIN EN 50155

## Interfaces

- \* 2 for MMIs
- \* 2 for antenna (analogue / GSM-R)
- \* 1 for service and diagnostics
- \* 1 for digital I/O
- \* 1 for UIC (option)
- \* 2 RS422 (option)
- \* power supply, ...



Dual Mode  
MTRS 1+A RIH



# MTRS 1+A RSH

» Dual Mode Device: Rack

## \_ Characteristics

- \* Construction ..... 19" mounting rack to  
 ..... IEC 60297 Part 3 (6 U / 84 HP)
- \* External dimensions (WxHxD) .. (482.6 x 266 x 243) mm
- \* Weight ..... max. 12 kg
- \* Nominal input voltage ..... 24, 36, 48, 72 or 110 V DC
- \* Maximum power input ..... 165 W (calculated)

## \_ Ambient Conditions

- \* Protection ..... IP 20 in accordance with EN 60529
- \* Vibrations and impacts .. in accordance with DIN EN 50155
- \* EMC ..... in accordance with DIN EN 50121-3-2  
 ..... and DIN EN 50155

## \_ Interfaces

- \* 2 for MMIs
- \* 2 for antenna (analogue / GSM-R)
- \* 1 for service and diagnostics
- \* 1 for digital I/O
- \* 1 for UIC (option)
- \* 2 RS 422 (option)
- \* power supply, ...



Dual Mode

MTRS 1+A RSH

# MESA 24B-R2

» Dual Mode Device: Rack

## \_ Characteristics

- \* Construction ..... Standard mounting rack  
 ..... according to NF F 61-005
- \* External dimensions (WxHxD) .. (482.6 x 266 x 369.25) mm
- \* Weight ..... max. 12 kg
- \* Protection grade ..... IP 20 according EN 60529
- \* Nominal input voltage ..... 24 to 110 V DC
- \* Maximum power input ..... 250 W (calculated)

## \_ Ambient Conditions

- \* Protection ..... IP 20 in accordance with EN 60529
- \* Vibrations and impacts .. in accordance with DIN EN 50155
- \* EMC ..... in accordance with DIN EN 50121-3-2  
 ..... and DIN EN 50155

## \_ Interfaces

- \* 2 for MMIs
- \* 2 for antenna (analogue / GSM-R)
- \* 1 for service and diagnostics
- \* 1 for UIC
- \* 4 RS 422 (GPS, ETCS)
- \* NULOC, AUA, BISD1, BISD2, VACMA, TBL, TVM, KVB
- \* power supply, ...



Dual Mode

MESA 24B-R2

# ■ Analogue Radio Module

The ARM is an analogue radio module for the Cab Radio MESA 26. It allows the operational communication in analogue radio systems in the frequency bands:

- 70 cm (according to UIC 751-3) and
- 2 m

Analogue Radio Module



## ARM 26-2/7 Analogue Cab Radio

» Analogue Module for MESA 26 (2m / 70 cm band)

### \_ Characteristics

- \* Construction ..... Standard mounting rack
- \* External dimensions (WxHxD) \_ (84 HP / 3 RU / 238 mm) / max. 10 kg
- \* Input nominal voltage ..... 24 V / 36 V / 48 V / 72 V / 110 V DC
- \* Max. current ..... 6 A (at 24 V) (calculated)
- \* Frequency range ..... 140,000 MHz ... 174,000 MHz (2 m band)  
..... 456,95 MHz .... 458,65 MHz (70 cm band)
- \* Transmission power ..... (1 ... 25) W 5-stepped (2 m band)  
..... 0,5 / 2 / 6 / 8 / 10 W (70 cm band)

### \_ Ambient Conditions

- \* Protection ..... IP20
- \* Vibrations and impacts \_ according to DIN EN 50155

### \_ Interfaces

- \* Service and diagnostics
- \* Antenna 2 m
- \* Antenna 70 cm
- \* 2 x IF Cab radio
- \* Power supply



Analogue Radio Module  
ARM 26-2/7 Analogue Cab Radio

## **ARM26P-7 Analogue Cab Radio Protected** » Analogue Module for MESA 26 (70 cm band)

### **\_ Characteristics**

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) \_ (437/132/200 mm) / max. 10 kg
- \* Input nominal voltage . . . . . 24 V / 36 V / 48 V / 72 V / 110 V DC
- \* Max. current . . . . . 6 A (at 24 V) (calculated)
- \* Frequency range . . . . . 456,95 MHz .... 458,65 MHz
- \* Transmission power . . . . . 0,5 / 2 / 6 / 8 / 10 W (sw controlled)

### **\_ Ambient Conditions**

- \* Protection . . . . . IP 54
- \* Vibrations and impacts . . according to DIN EN 50155

### **\_ Interfaces**

- \* Service and diagnostics
- \* Antenna 70 cm
- \* IF Cab radio
- \* Power supply



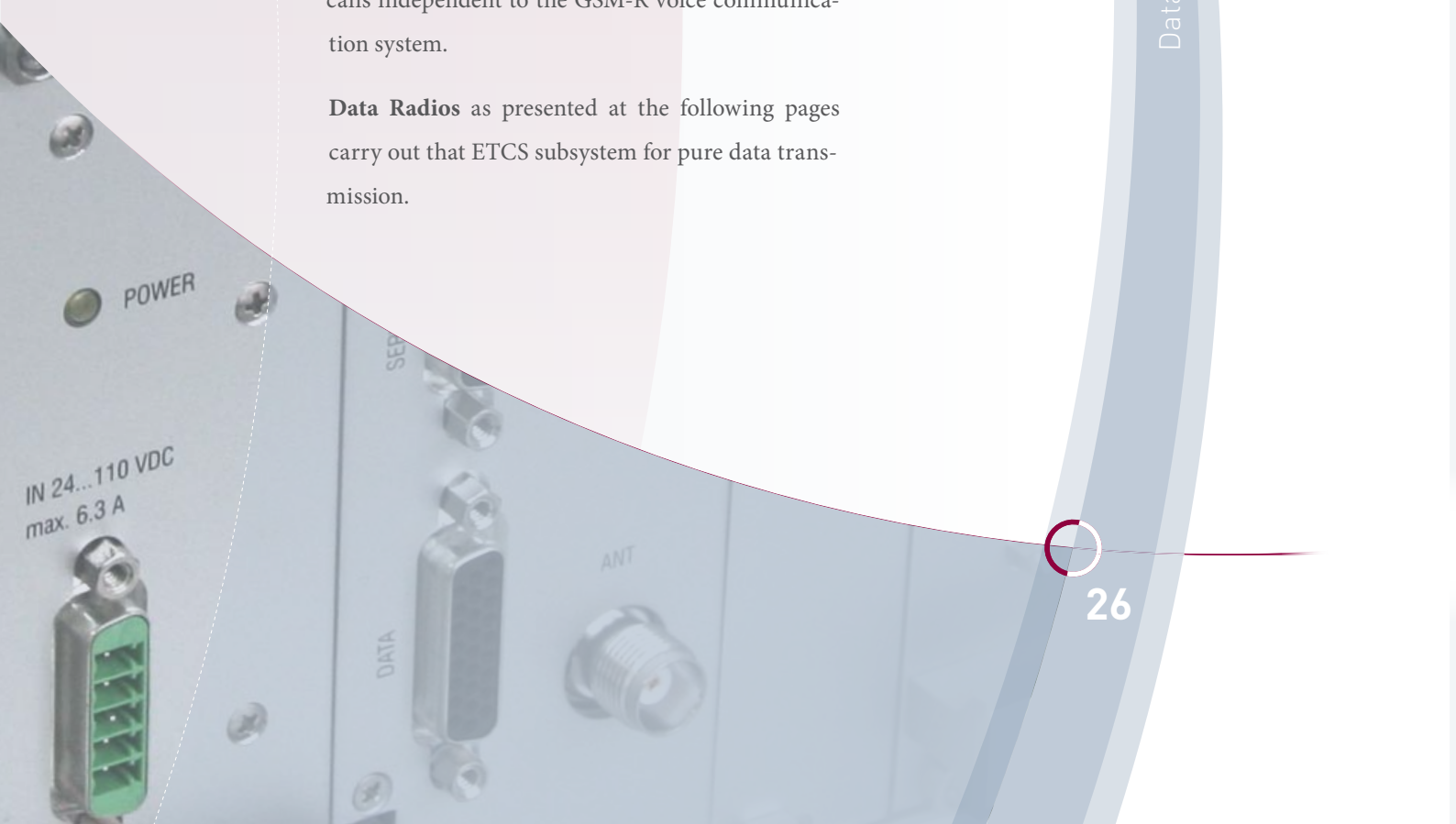
Analogue Radio Module  
ARM26P-7 Analogue Cab Radio Protected

# ■ Data Radio

**On an initiative of the EC**, European Railways have introduced ETCS (European Train Control System) as the unified control system for train command and control for high speed traffic. This standard shall insure European interoperability with high reliable and safe operation, economic operation and increased speed and track capacity besides many other operational and technical benefits.

**ETCS Levels 2 and 3** are supported via the GSM-R data communication in the transfer of movement authorities and a comprehensive information interchange. The trainborne equipment for these two levels requires two radio subsystems for GSM-R data calls independent to the GSM-R voice communication system.

**Data Radios** as presented at the following pages carry out that ETCS subsystem for pure data transmission.



# RIU-ETCS

## » Radio for Data Application: Rack

### \_ Characteristics

- \* External dimensions (WxHxD) . . . . (325 x 132 x 240) mm  
----- 19" mounting: (483 x 132 x 240) mm
- \* Weight . . . . . 6 kg  
----- 19" mounting: 7 kg
- \* Nominal input voltage . . . . . 24 to 110 V DC

### \_ Ambient Conditions

- \* Protection . . . . . IP 20 in accordance with EN 60529

### \_ Interfaces

- \* 2 for antenna connections (digital)
- \* 2 for User (DATA): V.24 / V.28 (RS232), V.11 (RS422)
- \* 2 for Service: V.24 / V.28 (RS232), Reset, Audio In/Out
- \* Power Supply
- \* ...



Data Radio

RIU-ETCS



# ■ Operating Units

**The operating unit MMI (Man Machine Interface)** is designed for the menu-driven operation of digital and/or analogue train radio. It fulfils the requirements for the operation on rail-vehicles and it is intended for the console installation in the driver's cab. With the use of an audio communication device, consisting of a handset and a loudspeaker, the driving crew is able to carry out diverse communication tasks.

**Funkwerk's operating units** are developed in accordance with customer's specification and relevant European standards characterising an innovative and intuitive way of using. Except permanently reachable key functions our MMIs are mainly controlled by softkeys (functional allocation is shown in dedicated display fields). Thereby the ease of use is highly increased. Furthermore the change of functionality is possible without any hardware modification.

**Each type of operating unit** is only compatible to the appropriate MESA family. Please contact us in case of questions.

# MMIS/E

## » Man Machine Interfaces for MESA 23

### \_ Characteristics

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) . . . (296 x 216 x 115) mm
- \* Weight . . . . . max. 3.5 kg
- \* Protection . . . . . front: IP 54  
 . . . . . back: IP 41  
 . . . . . in accordance to EN 60529
- \* Nominal input voltage . . . . . 24 V DC, from central unit
- \* LCD, graphics resolution . . . monochrome 360 x 128 pixels

### \_ Interfaces

- \* 1 to train radio device (central unit)
- \* 1 for handset
- \* 1 for loudspeaker
- \* 1 for service interface (infrared)
- \* 1 additional serial RS422
- \* 1 for digital I/O
- \* 1 for charging unit, ...



Operating Units

MMIS/E

# MMIB/R

## » Man Machine Interfaces for MESA 24

### \_ Characteristics

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) . . . . . MMIB: (215 x 279 x 82.8) mm  
 . . . . . MMIR: (160 x 240 x 82) mm
- \* Weight . . . . . MMIB: max. 3.5 kg  
 . . . . . MMIR: max. 2.5 kg
- \* Protection . . . . . front: IP 54  
 . . . . . back: IP 20  
 . . . . . in accordance to EN 60529
- \* Nominal input voltage . . . . . 24 V DC (from central unit)
- \* LCD . . . . . 640 x 480 pixels, 262,144 colours

### \_ Interfaces

- \* 1 to train radio device (central unit)
- \* 1 for handset
- \* 1 for loudspeaker
- \* Bluetooth



Operating Units

MMIB/R

MMIR

# MMI25-1 und -2

» Man Machine Interfaces for MESA 25

## Characteristics

- \* Construction . . . . . closed housing
- \* External Dimensions (WxHxD) . . . (190 x 182 x 116) mm
- \* Weight . . . . . 4.5 kg
- \* Protection . . . . . front: IP 54  
 . . . . . back: IP 41  
 . . . . . in accordance to EN 60529
- \* Nominal input voltage . . . . . 24 V DC (from central unit)
- \* LCD . . . . . 360 x 240 pixels, colours

## Interfaces

- \* 1 to connection box CB1 (VB1)



MMI25-2

Operating Units

MMI25-1 und -2

# HMIC

## » Man Machine Interfaces for CR26P-1800

### \_ Characteristics

- \* Construction . . . . . housing with mounting bracket
- \* External dimensions (WxHxD) . . . (172,97 x 50.5 x 95) mm
- \* Protection . . . . . front: IP 54  
 . . . . . back: IP 21  
 . . . . . in accordance to EN 50155
- \* Nominal input voltage . . . . . 24 V DC (from central unit)

### \_ Display

- \* Visible range . . . . . (96,5 x 50,3) mm
- \* Resolution . . . . . 480(H) x RGB x 272(V) dot
- \* Pixel configuration . . . . . RGB vertical stripe
- \* Viewing direction (grey inversion) 6 o'clock



MMI25-2

Operating Units

HMIC

# MMIC-1/26

## Man Machine Interfaces for MESA 26

### \_ Characteristics

- \* Construction . . . . . closed housing
- \* External dimensions (WxHxD) . . . (297 x 217 x 115) mm
- \* Weight . . . . . max. 3.5 kg
- \* Protection . . . . . front: IP 54  
 . . . . . back: IP 20 (44)  
 . . . . . in accordance to EN 60529
- \* Nominal input voltage . . . . . 48 V DC, from central unit
- \* LCD, graphics resolution . . . colour 800 x 480 pixels
- \* Backlight . . . . . LED-Backlight white, dimmable
- \*

### \_ Interfaces

- \* 1 to train radio device (central unit)
- \* 1 for handset
- \* 1 for loudspeaker
- \* 1 for service interface (infrared)
- \* 1 additional serial RS422
- \* 1 for digital I/O



Operating Units

MMIC-1/26

# ■ Components

## Reliable – Functional

As a link between the GSM-R network and mobile train radio devices, the MTs is a mobile termination in accordance with GSM Phase 2+ with GSM-R and ASCI extensions. The module is operated within the GSM-R frequency range with a maximum transmitted power of 8W.

Many of the characteristic values of MTs, e.g. transmitted power, sensitivity and maximum allowable input power either have lower tolerances or are more stringently specified than required by the GSM standard. This should ensure maximum reliability and availability in the special environment of railways.



# MT3

## » GSM-R Mobile Termination

### \_ EIRENE Specific Features

- \* Functional addressing
- \* Call preemption and arbitration (eMLPP)
- \* Location dependent addressing
- \* Railway Emergency Call (REC)

### \_ HF Characteristics

- \* R-GSM ..... 876 to 915 MHz, 921 to 960 MHz
- \* ARFCN ..... 955 to 1023, 0 to 124
- \* Power transmission ..... 8 W (GSM Class 2)
- \* Sensitivity ..... < -104 dBm

### \_ Electrical Data

- \* Input voltage/ power ... 13 VDC/ ca. 6 W
- \* Input voltage/ power ... 5 VDC/ ca. 2.5 W

### \_ Mechanical Data

- \* Height ..... Body: 100 mm, Front panel: 128.5 mm
- \* Width ..... Body: 40.7 mm Front panel: 50.5 mm
- \* Depth ..... 169.93 mm
- \* Weight ..... 0.75 kg



# MT3++

## » GSM-R Mobile Termination

### \_ EIRENE Specific Features

- \* Functional addressing
- \* Call preemption and arbitration (eMLPP)
- \* Location dependent addressing
- \* Railway Emergency Call (REC)

### \_ HF Characteristics

- \* R-GSM ..... 876 to 915 MHz, 921 to 960 MHz
- \* ARFCN ..... 955 to 1023, 0 to 124
- \* Power transmission ..... 8 W (GSM Class 2)
- \* Sensitivity ..... < -104 dBm

### \_ Electrical Data

- \* Input voltage/ power ... 13 VDC/ ca. 6 W
- \* Input voltage/ power ... 5 VDC/ ca. 2.5 W

### \_ Mechanical Data

- \* Height ..... Body: 100 mm, Front panel: 100 mm
- \* Width ..... Body: 39.5 mm Front panel: 39.7 mm
- \* Depth ..... 169.5 mm
- \* Weight ..... 0.75 kg



Components

MT3++

# MT5-1

## » GSM-R Mobile Termination

### \_ EIRENE Specific Features

- \* Functional addressing
- \* Call preemption and arbitration (eMLPP)
- \* Location dependent addressing
- \* Railway Emergency Call (REC)

### \_ HF Characteristics

- \* R-GSM ..... 876 to 915 MHz, 921 to 960 MHz
- \* ER-GSM ..... 873 ... 876, MHz 918 ... 921 MHz
- \* Power transmission ..... 8 W (GSM Class 2)
- \* Sensitivity ..... < -104 dBm

### \_ Electrical Data

- \* Input voltage/ power ... 13 VDC/ ca. 6 W
- \* Input voltage/ power ... 5 VDC/ ca. 2.5 W

### \_ Mechanical Data

- \* Height ..... Body: 100 mm, Front panel: 128.5 mm
- \* Width ..... Body: 40.7 mm Front panel: 50.5 mm
- \* Depth ..... 169.93 mm
- \* Weight ..... 0.75 kg



# MT6

## » GSM-R Mobile Termination

### \_ EIRENE Specific Features

- \* Functional addressing
- \* Call preemption and arbitration (eMLPP)
- \* Location dependent addressing
- \* Railway Emergency Call (REC)

### \_ HF Characteristics

- \* R-GSM ..... 1800 MHz
- \* Power transmission ..... 4 W (GSM Class 2)
- \* Sensitivity ..... < -104 dBm

### \_ Electrical Data

- \* Input voltage/ power ..... 13 VDC/ ca. 6 W
- \* Input voltage/ power ..... 5 VDC/ ca. 2.5 W

### \_ Mechanical Data

- \* Height ..... 100 mm
- \* Width ..... 40,7 mm
- \* Depth ..... 169.5 mm
- \* Weight ..... 0.75 kg



# ■ Handhelds

In respect of the needs for suitable and rugged handheld equipment for the specific harsh environmental conditions in railway operations Funkwerk has developed the product family focX®. This has been done based on the respective specifications for the digital GSM-R standard as well as for the analogue UIC 751-3 standard.

**The focX®- products** have been designed for the specific market needs of the European railway operators. Based on the design concept a highly efficient technological platform for GSM-R can be offered.

All focX®-handhelds are already prepared with a transceiver that supports the future use of the GSM-R frequency band extension from 4 to 7 MHz.

You are interested in a customised solution? Please contact us, so that we can submit you an offer.

# railfocX

## » Operational Handheld

### \_ Characteristics

- \* GSM 900, E-GSM 900, GSM (DCS) 1800, GSM-R, E-GSM-R
- \* Data transmission . . . . . 1 W in DCS 1800, 2 W in GSM-R
- \* External Dimensions (WxHxD) . (60 x 145 x 36) mm
- \* Gewicht . . . . . ca. 300 g
- \* Data transmission . . . . . GPRS class 10
- \* GSM-R application without shunting mode

### \_ Technical Data

- \* Display . . . . . 2.2" TFT colour display, 240 x 320 pixels
- \* Audio . . . . . 2 microphones, 2 loudspeakers
- \* Battery . . . . . 2.700 mAh
- \* Protection class . . . . . IP 65
- \* Interfaces . . . . . USB, peripheral accessory interface (remote microphone, headset, etc.)

### \_ Features

- \* Walkie-Talkie mode
- \* microphone muting
- \* emergency call audio recorder
- \* configuration cloning
- \* usable with gloves
- \* quick dialling register
- \* RF monitor
- \* menu scroll & select
- \* SMS
- \* MicroSD card slot



# shuntfocX

## » Operational Handheld for Shunting

### \_ Characteristics

- \* GSM 900, E-GSM 900, GSM (DCS) 1800, GSM-R, E-GSM-R
- \* Data transmission . . . . . 1 W in DCS 1800, 2 W in GSM-R
- \* External Dimensions (WxHxD) . . (60 x 145 x 36) mm
- \* Weight . . . . . ca. 300 g
- \* Data transmission . . . . . GPRS class 10
- \* GSM-R application with shunting mode

### \_ Technical Data

- \* Display . . . . . 2.2" TFT colour display, 240 x 320 pixels
- \* Audio . . . . . 2 microphones, 2 loudspeakers
- \* Battery . . . . . 2.700 mAh
- \* Protection class . . . . . IP 65
- \* Interfaces . . . . . USB, peripheral accessory interface (remote microphone, headset, etc.)

### \_ Features

- \* Walkie-Talkie mode
- \* microphone muting
- \* emergency call audio recorder
- \* configuration cloning
- \* usable with gloves
- \* quick dialling register
- \* RF monitor
- \* menu scroll & select
- \* SMS
- \* MicroSD card slot





# dualfocX

## » Operational Dual Mode Handheld

### \_ Characteristics

- \* GSM 900, E-GSM 900, GSM (DCS) 1800, GSM-R, E-GSM-R
- \* Frequency range ..... 450 - 570 MHz (Ch. 1-59)|FM|1W
- \* Transmitting power ..... 2 W in GSM / GSM-R
- \* External Dimensions (WxHxD) (60 x 145 x 36) mm
- \* Weight ..... ca. 300 g
- \* Data transmission ..... GPRS class 10
- \* UIC 751-3 ..... 467, 450 – 468, 300 MHz | FM | 1 W
  - » Variations in the frequency range 400 to 480 MHz can be supplied as acustomized assembly variant.
- \* GPS as Option ..... UIC 751-3 Simplex Mode C

### \_ Technical Data

- \* Display ..... 2.2" TFT colour display, 240 x 320 pixels
- \* Audio ..... 2 microphones, 2 loudspeakers
- \* Battery ..... 2.700 mAh
- \* Protection class ..... IP 65
- \* Interfaces ..... USB, peripheral accessory interface (remote microphone, headset, etc.)

### \_ Features

- \* Walkie-Talkie modes
- \* configuration cloning
- \* microphone muting
- \* automatic redialling
- \* quick dialling register
- \* etc...

optional available as **dualfocX®S (OPS + FM)**  
(GSM-R application with shunting mode)



**dualfocX**  
by funkwerk

Handhelds

dualfocX

# deskfocX

» GSM-R radio desk terminal

## Characteristics

- \* Power supply ..... 230 V AC / 12 VDC
- \* Power consumption ..... 15 ... 20 W
- \* Transmitting power
  - » max. 2W (33 dBm) at 873,2 – 914,8 MHz (GSM900 Class 4)
  - » max. 1 W (30 dBm) at 1710 – 1780,4 MHz (DCS1800 Class 1)
- \* Channel width ..... 200 kHz
- \* Modulation type ..... GMSK

## Technical Data

- \* Display ..... TFT, 4,3“, WQVGA 480x272 backlight
- \* Keyboard type ..... Membrane key , oval, backlight
- \* Antenna connector ..... TNC
- \* Protection class ..... IP 20 according to DIN EN 60529
- \* Antenna parameter ..... omni- directional, 0 dBi, 50 Ohm (or external antenna)

## Features

- \* OTA - SIM upgrade support
- \* automatic band recognition
- \* gooseneck microphone
- \* GSM ASCII application (Phase 2+)
- \* configuration cloning
- \* SMS
- \* quick dialling register
- \* etc...



# ■ Test Equipment

Test Equipment

# TEQoS2

## » Terminal Environment Quality of Service

### \_ Components

- \* GSM-R Mobile Termination (MT2)
- \* GSM-R Test Cabinet
- \* ComTalk Software
- \* Trace Software
- \* GPS-Receiver (not part of the product delivery)
- \* Notebook (not part of the product delivery)

### \_ Main Features

- \* Tracing of GSM Layer 2+3
- \* Measurement and graphical presentation of quality & field strength
- \* Coverage tests
- \* Neighbour cell measurements
- \* Power level & quality
- \* GPS location and data reference



Port AR-A

# TSB

## » Test Simulation Box (TSB)

### \_ Supported by

- \* Test of analogue radio systems (UIC 751)
- \* Test of GSM-R radio system
- \* Test of UIC 568 functionality under using UIC 558 interface in the direction towards railroad cars

### \_ Operated at

- \* 24-110V DC on board power supply
- \* 12 V DC car battery
- \* internal power supply for independent usage

### \_ Possible Configuration of TSB

- \* Basic Module with analogue radio tester, UIC 568 interface, power supply and Man Machine Interface.
- \* Basic Module with analogue radio tester, UIC 568 interface, power supply, GSM-R tester and Man Machine Interface.
- \* Basic Module with analogue radio tester, UIC 568 interface, supported Will'tek Device controlled by remote control and Man Machine Interface.
- \* Complete TSB with: BAM Basic Module (analogue radio tester, UIC 568 interface, power supply) GEM GSM-R radio tester, CB Cable Box, BKO Man Machine Interface

Test Equipment

TSB



# ■ Information

The **Passenger information systems** are used to inform and entertain travellers and allows a telephone connection between the guard and the train driver or via the train radio equipment to connect the guard with the operations control centre.

# LARS.01

## » Passenger information system

### \_ Characteristics

- \* Construction . . . . . 19" rack
- \* Weight . . . . . 6 kg
- \* Operating voltage . . . . . 24 V
- \* Input . . . . . 1,8 V ± 0,2 V
- \* Output . . . . . at 400 Ω: 100 V ± 5 V or  
 . . . . . at 2 Ω: 7 V ± 0,5 V
- \* Power consumption . . . . . 25 ... 50 W
- \* Open-circuit current . . . . . < 200 mA
- \* Frequency response . . . . . 60 Hz ... 15 kHz (-3 dB), basis 800 Hz

### \_ Microphone amplifier

- \* Frequency response . . . . . 300 Hz ... 8 kHz (-3 dB), basis 800 Hz
- \* Distortion factor . . . . . ≤ 1 %
- \* Dynamic regulation . . . . . If overamplify of the input signal about  
 20 dB  
 the output level only increase about 2 dB.





# ■ Accessories

**Several assessorly units** for a functional upgrade and adaptation to different conditions are available to be easily integrated, due to the sophisticated interface architecture.

**In cooperation with the train radio devices** Triple Mode or even Quad Mode systems can be built-up. Furthermore, customised Hardware related solutions can be realised and time- and cost-intensive alteration works can be substantially reduced by use of cable adaptations.

**A selection of the most important assessorly units** is presented on the next pages.

# Port AR

## » Connecting Analogue Train Radio Devices

### \_ Characteristics

- \* Construction ..... closed housing
- \* External Dimensions (WxHxD) .. Port AR-U: (243.4 x 51.3 x 108) mm  
..... Port AR-A: (193.4 x 51.1 x 108) mm
- \* Weight ..... 0.7 kg
- \* Protection ..... IP 54 entsprechend DIN EN 60529

### \_ Interfaces

- \* 1 to central unit MTRS
- \* 1 to radio module FM 2-70 (Port AR-U)
- \* 1 to central unit Koliber (Port AR-U)
- \* 1 to central unit ZFM90 (Port AR-A)
- \* ...



Port AR-A

# RM26-A

## » Remote Radio Module UIC 751 VEI

### \_ Characteristics

- \* Construction ..... Rack: 19" mounting rack  
 ..... Box: closed housing
- \* External Dimensions (WxHxD) .. Rack: 43 HP x 3 U x 244 mm  
 ..... Box: (300 x 144 x 285) mm
- \* Nominal input voltage ..... 13.8 V<sub>DC</sub> via external converter

### \_ Ambient Conditions

- \* Protection ..... Rack IP 20  
 ..... Box: IP 54  
 ..... according to DIN EN 60529
- \* Vibrations and impacts .. according to DIN EN 50155
- \* EMC ..... according to DIN EN 50121-3-2  
 ..... and DIN EN 5015

### \_ Interfaces

- \* 1 to central unit MTRS
- \* 1 to Port AR
- \* 1 to antenna
- \* 1 for RS 422
- \* 1 for service
- \* power supply



Accessories

RM26-A

## FM 2-70

» Radio Module 2 m / 70 cm

### \_ Characteristics

- \* Construction . . . . . closed housing
- \* External Dimensions (WxHxD) . . (270 x 150 x 150) mm
- \* Weight . . . . . 5 kg
- \* Nominal input voltage . . . . . 24, 36 or 110 V<sub>DC</sub>

### \_ Ambient Conditions

- \* Protection . . . . . IP 54 according to DIN EN 60529
- \* Vibrations and impacts . . . . . according to DIN EN 50155
- \* EMC . . . . . according to DIN EN 50121-3-2  
. . . . . and DIN EN 5015

### \_ Interfaces

- \* 1 to central unit
- \* 1 to antenna
- \* power supply



Accessories

FM 2-70

## KA 21.23

» Cable Adaptation from ZFM21

### \_ Characteristics

- \* Construction ..... closed housing
- \* External Dimensions (WxHxD) .. KA 21.23.MTRS: (70 x 120 x 85) mm  
..... KA 21.23.MMI: (70 x 165 x 80) mm
- \* Weight ..... KA 21.23.MTRS: 0.75 kg  
..... KA 21.23.MMI: 1.5 kg
- \* Protection ..... IP 20  
..... according to DIN EN 60529

### \_ Interfaces

- \* 1 to central unit MTRS
- \* 1 to operating unit MMIS



Montagesatz MS23 mit KA 21.23.MTRS

Accessories

KA 21.23

## KA 2D.23

### » Adapter for Wire Reduction

#### \_ Characteristics

- \* Construction . . . . . closed housing
- \* External Dimensions (WxHxD) . . . (243,4 x 51,3 x 108) mm
- \* Nominal input voltage . . . . . nominal 24 V<sub>DC</sub>

#### \_ Ambient Conditions

- \* Protection . . . . . IP 54 according to DIN EN 60529
- \* Vibrations and impacts . . . . . according to DIN EN 50155
- \* EMC . . . . . according to DIN EN 50121-3-2  
. . . . . and DIN EN 5015

#### \_ Interfaces

- \* 1 to central unit MTRS
- \* 1 to operating unit MMIS
- \* power supply



R&D status 03/2009

# Further Accessories

## » Overview

### **\_ Balise Device (Beacon Management)**

The Balise Device is used to connect beacon readers from train control systems KVB, TVM and TBL to a RS422 interface on a train radio device. It converts commands coming from the beacon readers and transmits them to the train radio device.

### **\_ UIC-Bridge LTI**

The UIC-Bridge LTI is an accessory for the train radio systems MESA 23 to enable listening of external announcements via the UIC PA system inside driver's cab.

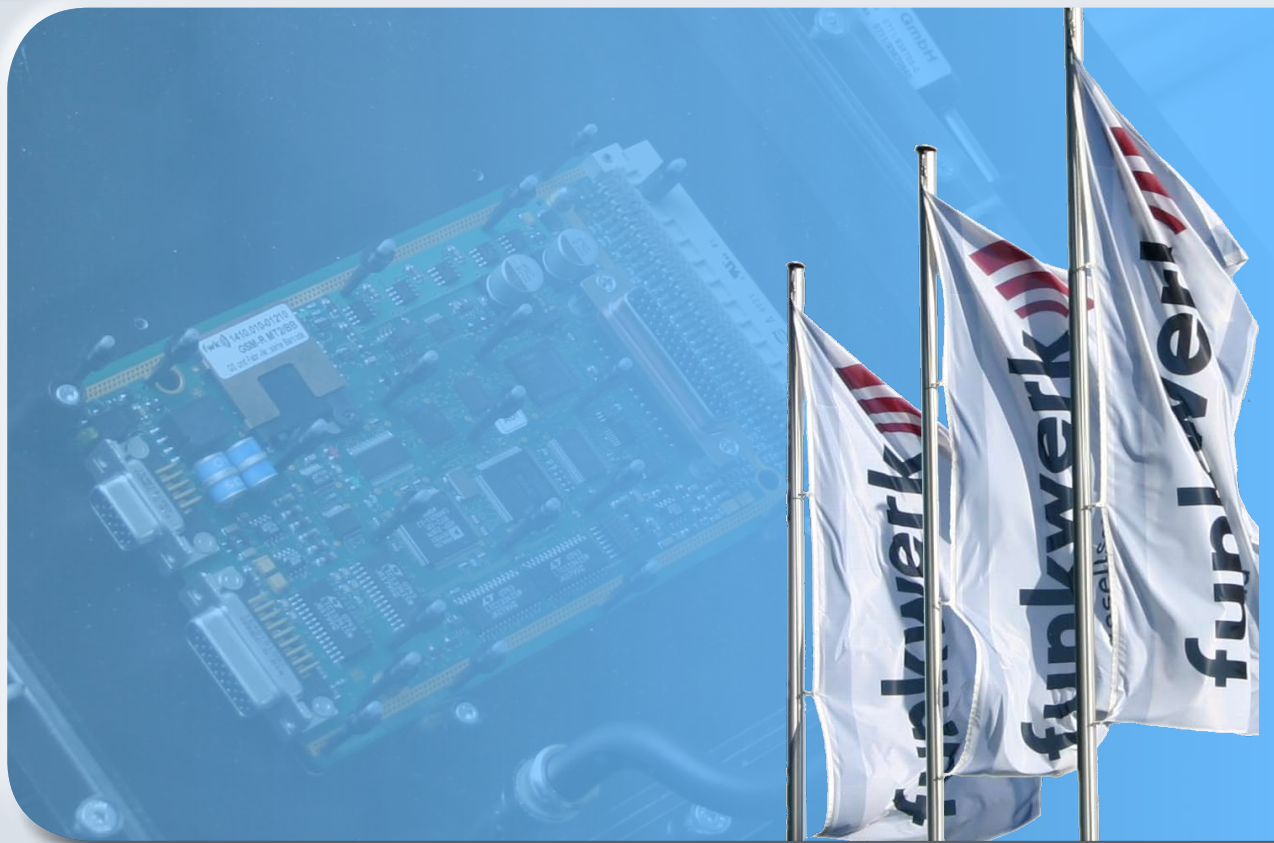
### **\_ UIC-Splitter R2**

The UIC-Splitter R2 is an accessory for the train radio systems MESA 23 to connect two UIC lines to a train radio device at the same time.

### **\_ MVB-Gateway D429**

The MVB-Gateway D429 is an external device to connect train radio devices MESA 23 to the Multiple Vehicle Bus (MVB)





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