

System Provider for Communications Technology



# Railway Communication via GSM-R

Portfolio  
Service and Maintenance  
Quality Assurance

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# Portfolio

GSM-R made by Funkwerk

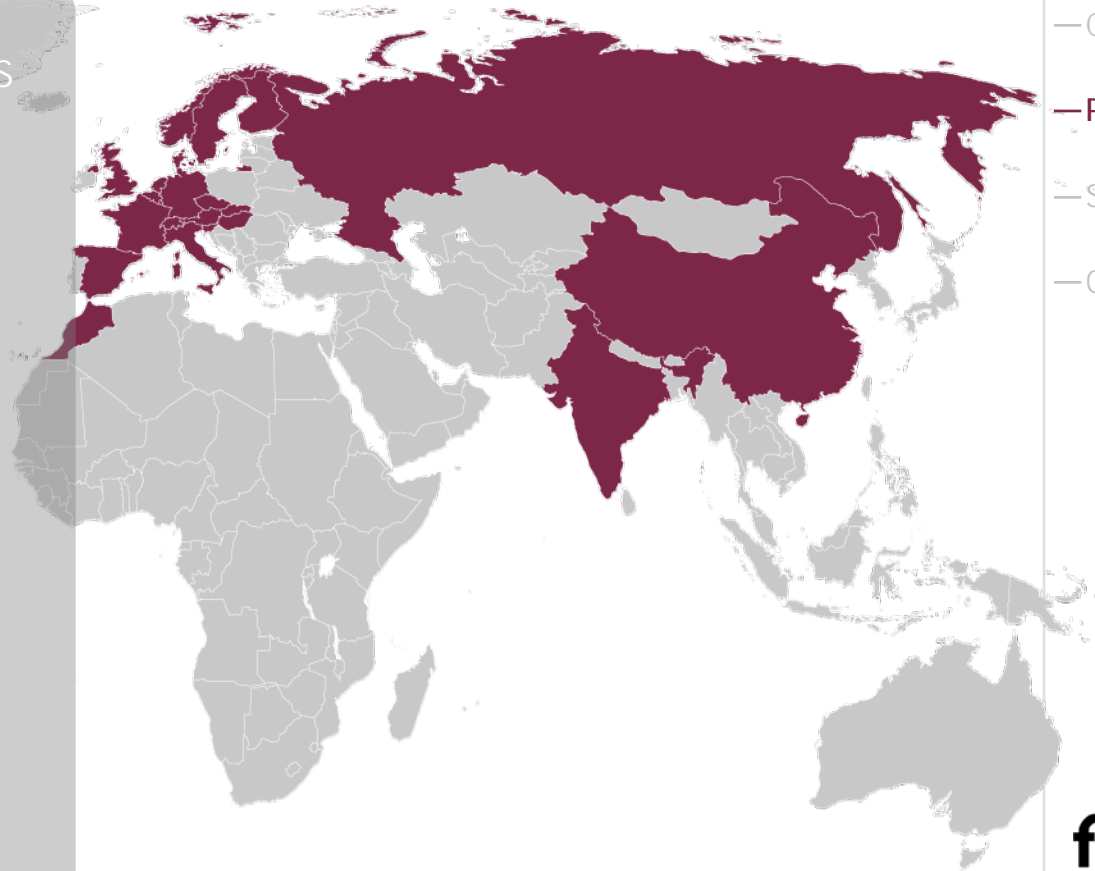


# Market and Projects

## Overview

### Funkwerk's Success - Cab Radio, MT and TEOoS

- Austria
- Belgium
- Bulgaria
- China
- Czech Republic
- Denmark
- Finland
- France
- Germany
- Great Britain
- Hungary
- India
- Italy
- Luxembourg
- Morocco
- Netherlands
- Norway
- Russia
- Slovenia
- Slovakia
- Spain
- Sweden
- Switzerland



— Company Presentation

— **Portfolio**

— Service / Maintenance

— Quality Assurance



# Market and Projects

## Cab Radio

### ■ Funkwerk as main supplier of GSM-R mobiles

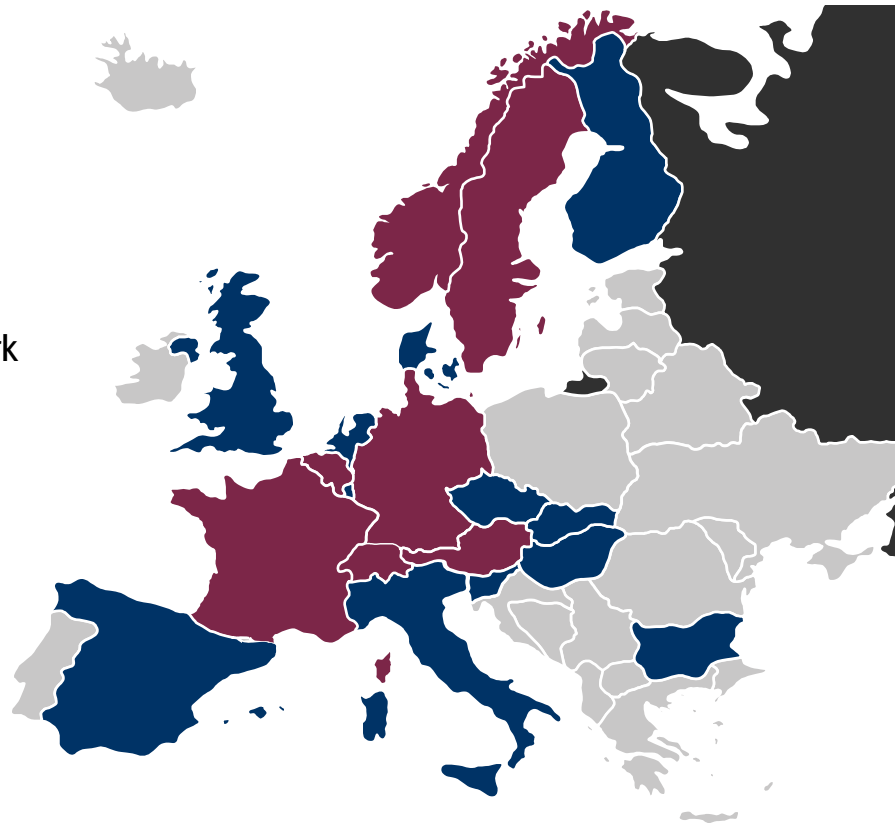
Germany	Switzerland
France	Norway
Belgium	Sweden
Austria	

### ■ Vehicles with GSM-R by Funkwerk

Italy	Great Britain
Luxembourg	Bulgaria
Netherlands	Denmark
Spain	India
Finland	Slovakia
Czech Republic	Slovenia
Hungary	

### ■ Test with GSM-R by Funkwerk

Russia  
China



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

# Market and Projects

## MT<sup>2</sup> and TEQoS

### ■ Radio Modules MT<sup>2</sup>

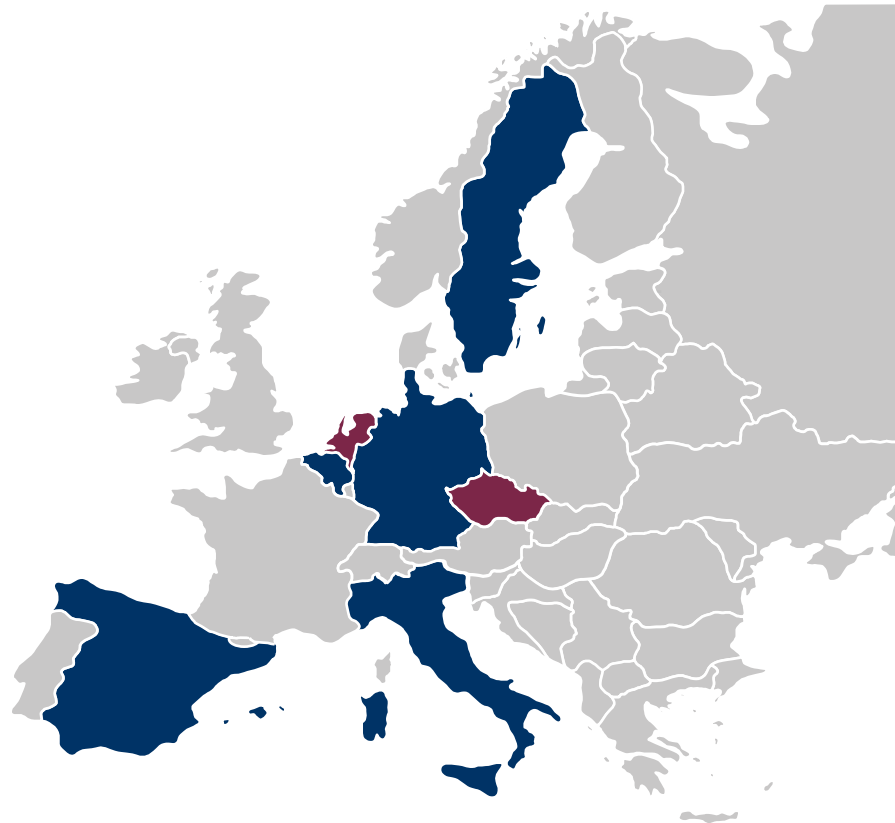
Netherlands  
Czech Republic  
China

### ■ TEQoS

Germany  
Belgium  
Italy  
Spain  
Sweden

#### TEQoS2

(Terminal Environment Quality of Service)  
is used during the start-up phase of a new GSM-R network, as well as in the ordinary operation and optimisation process, wherever measurements need to be performed to guarantee the quality of the GSM-R subsystem.



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

# Structure of MESA23 Dual Mode (450MHz / GSM-R) System

# Range of Products

## Selected Examples



- Company Presentation
- Portfolio
- Service / Maintenance
- Quality Assurance

# MESA 23

## Device Overview

### Variants

MTRS x BS	MTRS x BSH	MTRS x RIH	MTRS 1 BC	GTM / GTM+
MTRS x RS	MTRS x RSH	MTRS x RI		MMIS / MMIE



### Available Interfaces

- MMI
- Power Supply
- Antenna / Diplexer  
GSM-R and/or analogue
- UIC line
- RS 422
- Digital in- and outputs
- Service and diagnostics

— Company Presentation

— **Portfolio**

— Service / Maintenance

— Quality Assurance

# MESA 23

## MESA 23-01: MTRS 1+A BSH



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- External dimensions: 300 x 530 x 280 mm
- Weight: max. 31 kg
- Protection class: IP 54 acc. to EN 60529
- Operating temperature: -20 °C to +55 °C
- Input Voltage: 24, 36, 48, 72 or 110 V<sub>DC</sub>
- Power input: max. 365 W

### Interfaces

- 2 for MMIs
- 2 for antenna GSM-R and analogue
- 1 for digital in- and outputs
- 1 to connect radio module 2-70
- 1 for service and diagnostics
- 1 for UIC line (optional)
- 2 RS 422 (optional)
- 1 power supply
- 1 protective earth

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# MESA 23

## MESA 23-02: MTRS 1+A RSH



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- 19" construction: 6 U / 84 HP
- External dimensions: 482.6 x 266 x 243 mm
- Weight: max. 12 kg
- Protection class: IP 20 acc. to EN 60529
- Operating temperature: -20 °C to +55 °C
- Input Voltage: 24, 36, 48, 72 or 110 V<sub>DC</sub>
- Power input: max. 240 W

### Interfaces

- 2 for MMIs
- 2 for antenna GSM-R and analogue
- 1 for digital in- and outputs
- 1 to connect radio module 2-70
- 1 for service and diagnostics
- 1 for UIC line (optional)
- 2 RS 422 (optional)
- 1 power supply
- 1 protective earth

# MESA 23

## MESA 23-03: MTRS 1+A RIH



— Company Presentation

— **Portfolio**

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- 19" construction: 9 U / 32 HP
- External dimensions: 167.7 x 423.5 x 233.5 mm
- Weight: max. 11 kg
- Protection class: IP 20 acc. to EN 60529
- Operating temperature: -20 °C to +55 °C
- Input Voltage: 24, 36, 48, 72 or 110 V<sub>DC</sub>
- Power input: max. 240 W

### Interfaces

- 2 for MMIs
- 2 for antenna GSM-R and analogue
- 1 for digital in- and outputs
- 1 to connect radio module 2-70
- 1 for service and diagnostics
- 1 for UIC line (optional)
- 2 RS 422 (optional)
- 1 power supply
- 1 protective earth

# MESA 23

## MESA 23-04: MTRS 1 BS



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- External dimensions: 300 x 430 x 280 mm
- Weight: max. 22 kg
- Protection class: IP 54 acc. to EN 60529
- Operating temperature: -20 °C to +55 °C
- Input Voltage: 24, 36, 48, 72 or 110 V<sub>DC</sub>
- Power input: max. 290 W

### Interfaces

- 2 for MMIs
- 1 for antenna GSM-R
- 1 for digital in- and outputs
- 1 for service and diagnostics
- 1 for UIC line (optional)
- 2 RS 422 (optional)
- 1 power supply
- 1 protective earth

# MESA 23

## MESA 23-05: MTRS 1 RS



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- 19" construction: 3 U / 84 HP
- External dimensions: 482.6 x 132.6 x 243 mm
- Weight: max. 6 kg
- Protection class: IP 20 acc. to EN 60529
- Operating temperature: -20 °C to +70 °C
- Input Voltage: 24, 36, 48, 72 or 110 V<sub>DC</sub>
- Power input: max. 165 W

### Interfaces

- 2 for MMIs
- 1 for antenna GSM-R
- 1 for digital in- and outputs
- 1 for service and diagnostics
- 1 for UIC line (optional)
- 2 RS 422 (optional)
- 1 power supply
- 1 protective earth

# MESA 23

## MESA 23-06: GTM+



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- Construction: closed housing
- External dimensions: 316 x 276 x 345 mm
- Weight: max. 15 kg
- Protection class: IP 42 acc. to EN 60529  
excl. handset and loudspeaker
- Operating temperature: -20 °C to +55 °C
- Input Voltage: 24 ... 110 V<sub>DC</sub>
- Power input: max. 165 W

### Interfaces

- 1 for remote MMI
- 1 for antenna GSM-R
- 1 for service and diagnostics
- 1 RS 422
- 1 for charging unit
- 1 power supply
- 1 protective earth

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# MESA 23

## MESA 23-08: MTRS 1 RI



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- 19" construction: 6 U / 32 HP
- External dimensions: 167.7 x 307.7 x 233.25 mm
- Weight: max. 7 kg
- Protection class: IP 20 acc. to EN 60529
- Operating temperature: -20 °C to +70 °C
- Input Voltage: 24, 36, 48, 72 or 110 V<sub>DC</sub>
- Power input: max. 165 W

### Interfaces

- 2 for MMIs
- 1 for antenna GSM-R
- 1 for digital in- and outputs
- 1 for service and diagnostics
- 1 for UIC line (optional)
- 2 RS 422 (optional)
- 1 power supply
- 1 protective earth

# MESA 23

## MTRS 1 BC: Box Compact



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- 19" construction: 3 U / 51 HP
- External dimensions: 260 x 133.5 x 200 mm
- Weight: max. 5.5 kg
- Protection class: IP 54 acc. to EN 60529
- Operating temperature: -20 °C to +70 °C
- Input Voltage: 24 V<sub>DC</sub> (via external PS)

### Interfaces

- 2 for MMIs
- 1 for antenna GSM-R
- 1 for digital in- and outputs
- 1 for service and diagnostics
- 1 for UIC line (optional)
- 2 RS 422
- 1 power supply
- 1 protective earth

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# MESA 23

## Operating Unit MMIS



### Technical Parameters

- External Dimensions:
  - > above mounting level **296 x 116 x 13 mm**
  - > beneath mounting level **263 x 108 x 105 mm**
- Weight: **max. 3.5 kg**
- Protection class: **Front IP 54 / Back IP 41**  
acc. to EN 60529
- Operating temperature: **-20 °C to +55 °C**
- Input Voltage: **24V<sub>DC</sub>** (from central unit)
- Display (black/white): **360 x 128 pixels**  
> visible area **171 x 61 mm**

### Interfaces

- 1 to central unit
- 1 to handset
- 1 to loudspeaker / microphone with PTT
- 1 RS 422
- 1 for digital in- and outputs
- 1 for charging unit for GPH
- 1 protective earth
- 1 for Service (optical)
- 1 Brightness sensor

- Company Presentation
- Portfolio
- Service / Maintenance
- Quality Assurance

# MESA 23

## MMIC: Colour MMI

- Colour TFT display to show fundamental colours according to CENELEC and UIC 612
- Assembly dimensions compatible to MMIS
- Ring tones acc. to CENELEC



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- External Dimensions:
  - > above mounting level **296 x 116 x 13 mm**
  - > beneath mounting level **263 x 108 x 105 mm**
- Weight: **max. 3.5 kg**
- Protection class: **Front IP 54 / Back IP 41**  
acc. to EN 60529
- Operating temperature: **-20 °C to +55 °C**
- Input Voltage: **24V<sub>DC</sub>** (from central unit MTRS)
- Display: **Colour**

### Interfaces

- to central unit
- to handset
- to loudspeaker / microphone with PTT
- RS 422
- digital in- and outputs
- charging unit for GPH
- Brightness sensor
- for Service: WLAN, USB and Bluetooth as option

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# RM26-A

## Remote Radio Module acc. to UIC 751 VEI



RM26-A box version

- Company Presentation
- **Portfolio**
- Service / Maintenance
- Quality Assurance

### Technical Parameters

- Construction
  - > Rack: 19" rack
  - > Box: closed housing
- External dimensions
  - > Rack: 43 HP x 3 U x 244 mm
  - > Box: (300 x 144 x 285) mm
- Protection class
  - > Rack: IP 20
  - > Box: IP 54
- Operating temperature: -20 °C to +55 °C
- Input Voltage: 13.8 V<sub>DC</sub> (via DC/DC converter)

### Interfaces

- Central unit MTRS
- RS 422
- Port AR
- Antenna
- Service
- Power Supply

# Port AR

## Connecting Analogue Train Radio Devices



— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- Construction: closed housing
- External dimensions:
  - > Port AR-U: (243.4 x 51.3 x 108) mm
  - > Port AR-A: (193.4 x 51.3 x 108) mm
- Protection class: IP 54 acc. to EN 60529

### Interfaces

- Central unit MTRS
- Port AR-U
- to FM 2-70
  - to further analogue devices (e.g. Koliber)

Port AR-A

- to ZFM90

# KA 21.23

## Adapter from ZFM21 to MESA 23

- Adaptation from the existing ZFM21 cabling to MESA 23 have been successfully tested and put into operation, e.g. on type series 185.1 from Bombardier.



MTRS 1+A RIH inc. MS 23 and  
KA 21.23.MTRS for 2 MMIS

- Company Presentation
- **Portfolio**
- Service / Maintenance
- Quality Assurance

### Technical Parameters

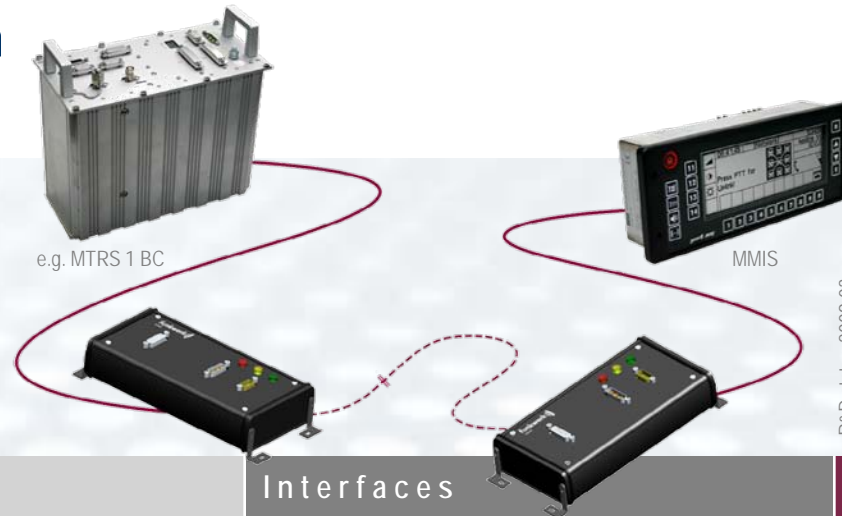
- Construction: closed housing
- External dimensions
  - > KA 21.23.MTRS: (70 x 120 x 85) mm
  - > KA 21.23.MMI: (70 x 165 x 80) mm
- Weight
  - > KA 21.23.MTRS: 0.75 kg
  - > KA 21.23.MMI: 1.5 kg
- Protection class: IP 20 acc. to EN 60529

### Interfaces

- KA 21.23.MTRS
  - to Central unit MTRS
- KA 21.23.MMI
  - to MMIS

# KA 2D.23

## Adapter for Wire Reduction



— Company Presentation

— **Portfolio**

— Service / Maintenance

— Quality Assurance

### Technical Parameters

- Construction: closed housing
- External dimensions: (243.4 x 51.3 x 108) mm
- Protection class: IP 54 acc. to EN 60529
- Operating temperature: -20 °C to +70 °C
- Input Voltage: 24 V<sub>DC</sub>

### Interfaces

- to MTRS or MMIS
- to two wired connection
- Power supply

# GSM-R Solution Poland - Migration Process

## MESA 23 with Koliber VHF



- Company Presentation
- Portfolio
- Service / Maintenance
- Quality Assurance

### Technical Parameters

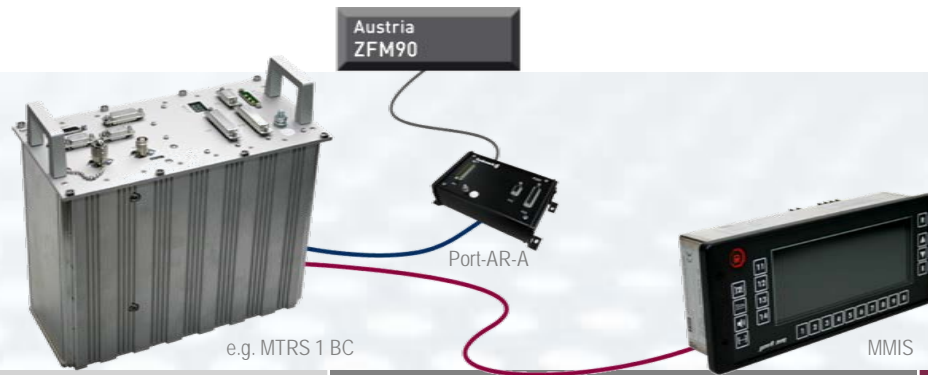
- External Dimensions (W x H x D)
  - e.g. MTRS 1 BC: (260 x 133.5 x 200) mm
  - MMIS: (296 x 216 x 115) mm
  - Adapter Box: (193.4 x 52.3 x 111) mm
  - KT-01 / KZ-01: (185 x 80 x 180) mm
- Nominal Input Voltage
  - e.g. MTRS 1 BC: 24, 36 to 48 or 72 to 110 V<sub>DC</sub>  
via external power supply
  - KZ-01: 15 to 220 V<sub>DC</sub>

### Interfaces

- e.g. MTRS 1 BC:
  - 2 MMIS, antenna GSM-R, service and diagnostics, digital I/O, UIC, 2 RS 422 / AF, power supply, protective earth
- MMIS:
  - central unit, handset, loudspeaker, service, RS 422, digital I/O
- VHF Radio KT-01:
  - antenna VHF, antenna GPS, service/date, control interface
- Power Supply Unit KZ-01:
  - power supply from loco and to KT-01

# GSM-R Solution Austria - Migration Process

## MESA 23 connected to ZFM90



- Company Presentation
- Portfolio
- Service / Maintenance
- Quality Assurance

### Technical Parameters

- External Dimensions (W x H x D)
  - e.g. MTRRS 1 BC: (260 x 133.5 x 200) mm
  - MMIS: (296 x 216 x 115) mm
  - Port AR-A: (193.4 x 51.3 x 108) mm
- Nominal Input Voltage
  - e.g. MTRRS 1 BC: 24, 36 to 48 or 72 to 110 V<sub>DC</sub> via external PS
  - MMIS: 24 V<sub>DC</sub> via central unit MTRRS

### Interfaces

- e.g. MTRRS 1 BC: 2 MMIs, antenna GSM-R, service and diagnostics, digital I/O, UIC, 2 RS 422/AF, power supply
- MMIS: central unit, handset, loudspeaker, service, RS 422, digital I/O
- Port AR-A: Central unit MTRRS, ZFM90

# PortBox Ultralite

## Portable Cab Radio



### Technical Parameters

- External Dimensions: 252 x 75 x 391 mm without QuickFix
- Weight: about 7 kg
- Protection class: IP 54 acc. to EN 60529
- Operating temperature: -20 °C to +70 °C
- Input Voltage: 24 ... 110 V<sub>DC</sub>

### Interfaces

- 1 for GSM-R antennae
- 1 for service
- 1 for external loudspeaker
- 1 for voice recorder
- 1 for DSD
- 1 contact „external alarm“
- 1 for power supply
- 1 protective earth

— Company Presentation

— Portfolio

— Service / Maintenance

— Quality Assurance



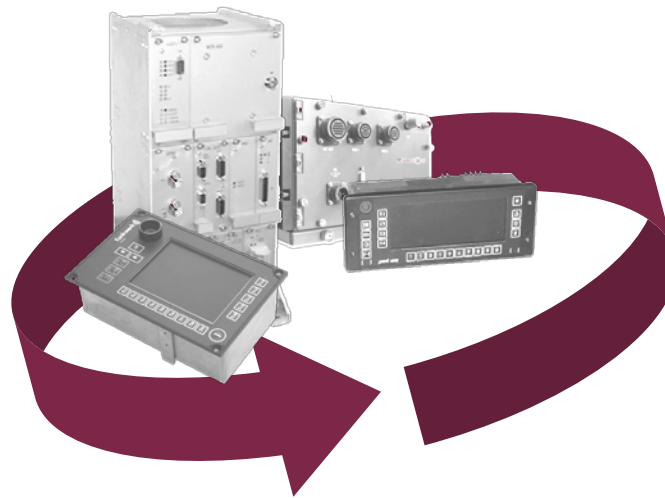
# Service and Maintenance

Support offered by Funkwerk



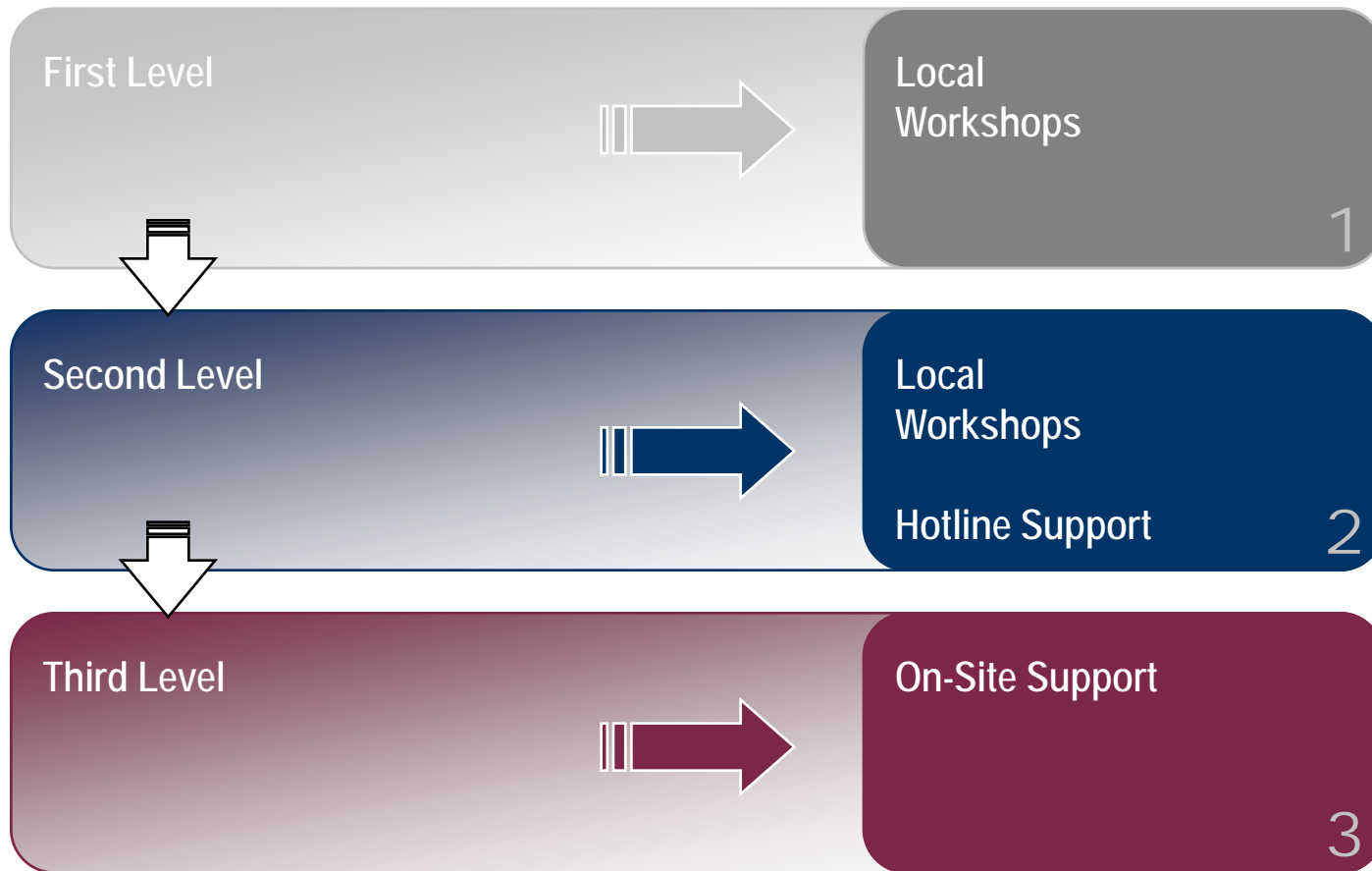
# Service around the Cab Radio

- Project Management
- Engineering
- Training
- Homologation
- Documentation
- Delivery of Accessories
- Add-on Equipment
- Installation
- Commissioning
- After Sales Service



- Company Presentation
- Portfolio
- **Service / Maintenance**
- Quality Assurance

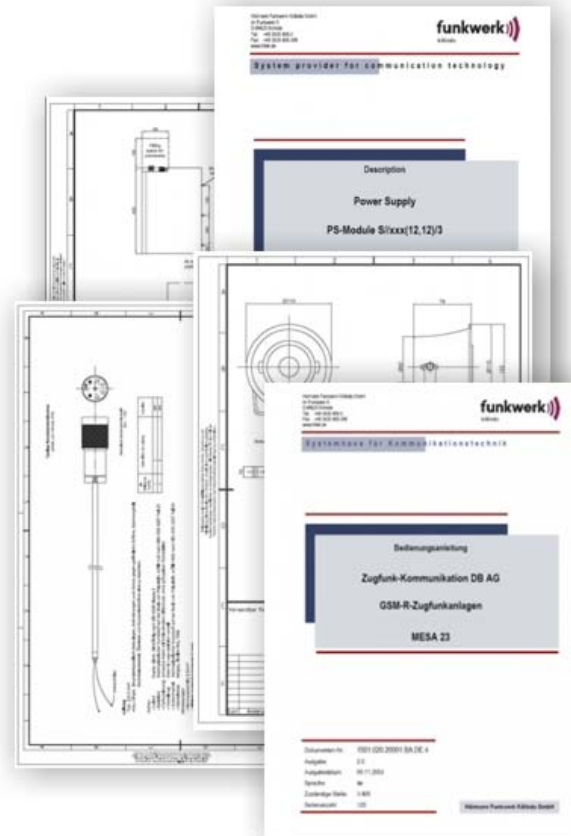
# Standard After Sales Service



- Company Presentation
- Portfolio
- **Service / Maintenance**
- Quality Assurance

# Translation, Adaptation and Amendment

- User manual (incl. in offer)
- Installation manual
- Commissioning manual
- Maintenance manual (incl. in offer)
- System description
- Description of all components



- Company Presentation
- Portfolio
- **Service / Maintenance**
- Quality Assurance



# Quality Assurance

# Quality Management

- Certified according to DIN EN ISO 9001:2000
- EC-Certificate from Eisenbahnbundesamt (federal railway administration)
- Certificated through DB AG as Q1-supplier
- Certificated through DB AG as A-supplier
- IRIS certification in preparation



- Company Presentation
- Portfolio
- Service / Maintenance
- Quality Assurance



Thank you  
for your attention

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