

# SKF Multilog On-line System IMx-Rail

24/7 condition monitoring to improve railway reliability



# SKF Multilog On-line System IMx-Rail

**The SKF Multilog On-line System IMx-Rail is a multi-channel online condition monitoring system specifically designed for railway applications. It can be mounted in either internal or external locations, as appropriate to the equipment being monitored.**

Environments include:

- Bogie mounting
- Car chassis mounting
- Internal car/coach mounting

The SKF Multilog IMx-Rail packs a high-specification condition monitoring product into a compact form. Featuring a latest generation (IMx-16Plus) device, it offers 16 analogue inputs (eight constant current accelerometers or voltage inputs and a further eight that in addition have, PT1000 compatibility for temperature monitoring). It also has four digital channels available, for speed sensor inputs.

The system can incorporate GPS data and uses mobile or Ethernet connectivity to provide easy access to the vibration, temperature and location data. These capabilities lend themselves to both rolling stock and track monitoring.

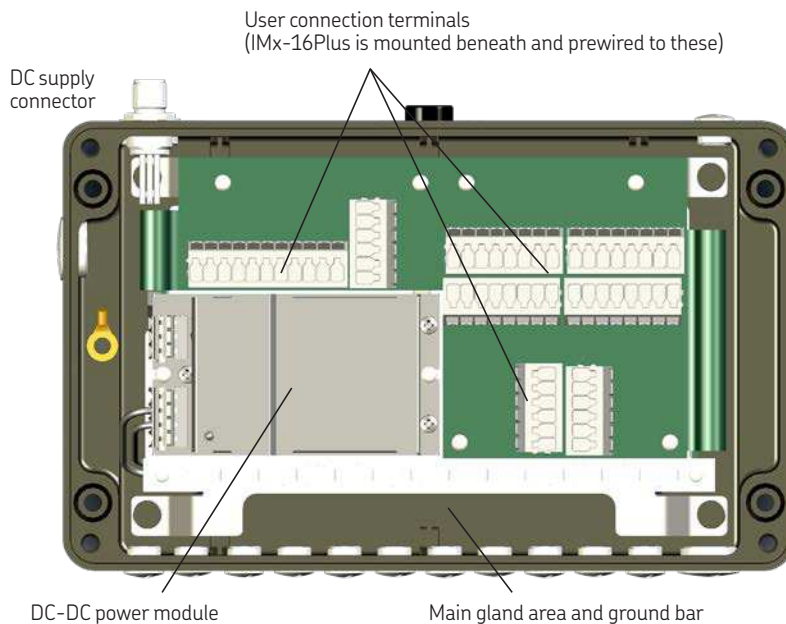
For the latter, it provides the front-end, train mounted, data collection for SKF Rail Track Monitoring.

The SKF Multilog IMx-Rail integrates easily with SKF's Cloud service for data storage, data sharing and for SKF Remote Diagnostic Services.

## Features

- 16 analogue inputs (typically vibration but up to 8 directly connected temperature sensors)
- 4 digital inputs (speed)
- Transducer power
- Simultaneous measurements on all channels
- Mobile data connectivity (LTE/GSM) or Ethernet (RJ45 or Wi-Fi) connectivity
- Integral aerial for mobile or Wi-Fi data
- DHCP client, capable
- Optional GPS module for location data
- On board clock/calendar
- Supports NTP time synchronisation protocol
- Choice of DC - DC power modules
  - 24 V DC nominal input
  - 110 V DC nominal input
- Ultra-wide input ranges around nominal
- Power supply (disturbance) protection
- IP66/IP67, pre-prepared for glands
- Multi-parameter gating
- Multiple SKF enveloping filters
- Data buffering in non-volatile memory when communication is down
- 2 GB used for measurement data: vibration, temperature, speed, location data including track monitoring
- Integrates to SKF's Cloud service and SKF Remote Diagnostic Services
- Local access via iOS and Android Apps
- Multiple industry/environmental approvals:
  - CE
  - WEEE
  - RoHS
  - EMC immunity and emissions

# Power, main interface connections and layout



## DC power connection

DC power for the IMx-rail is applied via dedicated M12 connector.

## Other connections/interfaces

- USB** Host interface (Type A connector)  
Service interface (Type mini-B)  
A USB extension cable (mini-B to Type A receptacle) is fitted to ease access to the service port.
- LED** Pwr – Power (green, normally on)  
Sys – System (red, normally off)  
Power module: output on (green)
- Sw** Rescue button (maintenance mode)

## Mobile Data (LTE/GSM)

**LTE 1 and 2** are prewired to the lid antenna. Firmware configurable support for physical micro-SIM or eSIM.

- Network support 2G, 3G, 4G
- Auto switching Yes
- Antenna Integral to enclosure

## Ethernet: Wi-Fi

The Wi-Fi connector is prewired to the lid antenna.

- Standard 802.11n
- Band 2,4 GHz
- Network support Open/secured
- Security WPA2-PSK
- Antenna Integral to enclosure
- Auto connect To a specified SSID

The mobile data/Wi-Fi antenna connections do not utilise any of the provided cable entry positions.

## Ethernet: RJ45

- Connector RJ45 with LED
- Network support 10/100 Mbit/s
- DHCP client Configurable

**NOTE:** The Ethernet connection is isolated from the enclosure and is unrelated to GND.

## NOTES:

### Network interfaces

Mobile data and LAN (RJ45 or Wi-Fi) are alternative options for connection to @Observer software. Multiple interfaces cannot be enabled simultaneously.

Whether mobile data or LAN connectivity is used, the connection supports:

- DNS – server name lookup
- NTP – time synchronisation

When a LAN connection is being used, Modbus TCP/IP can also be supported.

### Integral lid antenna

The integral antenna supports the following:

AMPS	850 MHz
GSM	900 MHz
3G	UMTS 2,1 GHz
Wi-Fi	2,4 GHz
DCS	1 800 MHz
PCS	1 900 MHz
LTE	2,6 GHz
4G/LTE	791-960 MHz
	1 710-2 690 MHz

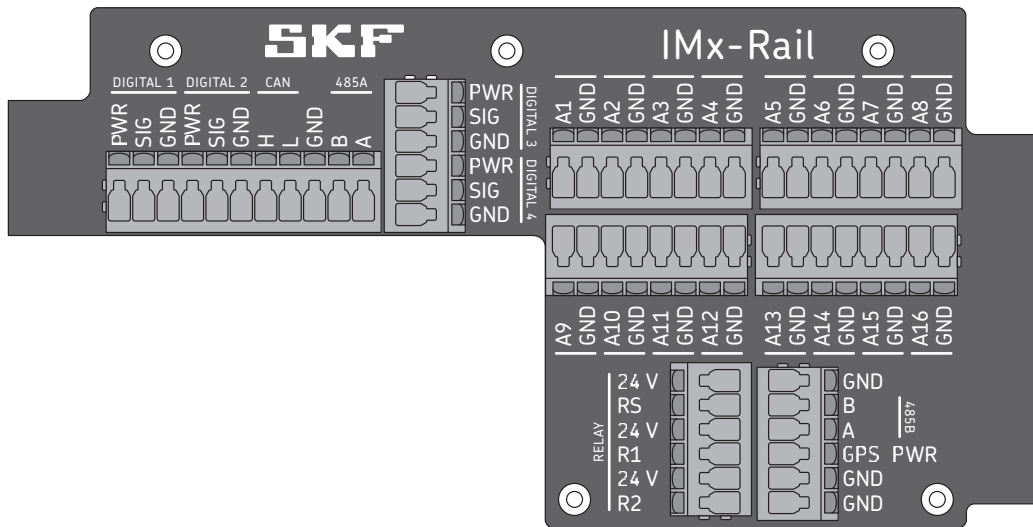
Bluetooth support in the IMx-16Plus is via a USB Bluetooth dongle not the antenna. The antenna does not support the 699-791 MHz range (typically N. American LTE).

### Optional GPS module

- GPS module External to IMx-Rail
- Antenna Integral to module
- Connection 5 m cable

The GPS module uses one of the provided cable entries (M12 gland supplied).

# User connection terminals



## Digital/tacho input connections D1 to D4

The digital input channels D1 to D4 support common types of two-, three-wire tacho sensors. For each input, 3-terminals are available:

Terminal	Description
PWR	Power
SIG	Signal
GND	Ground / Return

Digital sensor power is always enabled to the 'PWR' terminals. Peak current demand from the sensor should be no greater than the limit stated in the specifications, even if the average demand is less.

## Digital outputs (relay drivers)

The IMx-Rail provides 3 relay driver outputs for system, warning and alarm status indications.

Terminal	Description
24V RS	Relay drive power System relay output
24V R1	Relay drive power Relay 1 output
24V R2	Relay drive power Relay 2 output

The RS, R1 and R2 connections are of a type known as 'open collector' or 'open drain'. The system relay is failsafe (alarms on loss of power), R1 and R2 are non-failsafe.

## Analogue input connections channels 1-16

Channels A1 to A16 support accelerometers, current or voltage inputs. Transducer power is enabled by configuration, on a per channel basis.

In addition, A9 to A16 also support the direct connection of (2-wire) PT1000 temperature sensors.

Terminal	Description
A	Signal (Analogue)
GND	Ground / Return

## RS485 (2-wire)

Terminal	Description
485A A	RS485 A
485A B	RS485 B
GND	Ground

SKF provide a 120-ohm RS485 termination resistor (coloured black), with the IMx-Rail. (Not required when connecting the optional GPS module).

GPS PWR Power for the GPS module

## Connections for general use

Terminal	Description
GND	Ground (3 available)

## NOTES:

### User connection terminals

Tool-free, push-in and lever-operated. Cable entry is vertical (at right angles to the underlying PCB). Accepts conductors in the range 0,2 to 4 mm<sup>2</sup> (24 to 12 AWG).

### Current signals

When connecting a 4-20 mA current signal to an analogue input an external load resistor is required. SKF have available 250-ohm load resistors (coloured blue), for this purpose.

### PT1000 sensor inputs

For SAT testing where PT1000 temperature sensors are used, SKF provide one 1 kΩ resistor (colour-coded red), with each IMx-Rail device.

### 485B

The terminals marked 485B (A and B) are not to be connected, not used.

### CAN

H and L terminals provided but there is no firmware support for CAN.

# Specifications

## Hardware

<b>External Power Connector</b>	Pins 1 and/or 4: 0V, pins 2 and/or 3: +V A mating (M12, A-coded, IEC 61076-2-101 cable mounting) connector is supplied
<b>Power Module</b> 24 V DC nominal input 110 V DC nominal input Common features	24 V DC or 110 V DC 9 to 36 V DC, recommended supply fuse 2 A slow blow (T2AL) 43 to 160 V DC, recommended supply fuse 1 A slow blow (T1AL) Isolated, under voltage lockout, over temperature and short circuit protection EMC Railway standard: EN50121-3-2
<b>Analogue inputs</b> Input type Input range Impedance Supported sensor types	16 (A1 to A16) Non-isolated, referenced to chassis/enclosure ground Functionally: $\pm 25$ V ( $\pm 28$ V without damage) >100 k $\Omega$ 2-wire: Constant current accelerometers Voltage signals (4-20 mA requires external load resistor to be fitted) PT1000 temperature sensors (channels A9 to A16 only)
Analogue sensor power	A1 to A8: 4 mA constant current per sensor (accelerometer), A9 to A16: 2,23 mA Individually software enabled/disabled for each sensor 2,23 mA sense current for PT1000 sensors (automatic software enable) Sensor power has short circuit protection
Sensor and cable fault detection	Automatic – software configurable
Analogue/Digital conversion	24-bit (one A/D converter per channel)
Dynamic range	120 dB
<b>Digital inputs</b> Input type Input range Trigger level Impedance Supported sensor types	4 Non-isolated, referenced to chassis/enclosure ground Functionally: positive voltages up to 24 V (+27 V without damage) 2,9 V, Hysteresis 0,1 V 1,6 k $\Omega$ 2- and 3-wire, including: TTL level and other pulses up to +24 V PNP sensors
Digital sensor power	24 V DC. Maximum, peak demand up to 30 mA per sensor Sensor power always enabled (available on a dedicated terminal) Sensor power has short circuit protection
<b>Digital Outputs</b> Relay driver outputs	3 relay drivers (24 V DC), measurement alarming: 2 and system alarming: 1 Maximum drive current available: 70 mA across all relay coils
<b>Physical and environmental</b> Size (excluding protrusions)	Size (H x W x D): 260 <sup>A</sup> x 160 <sup>AB</sup> x 90 <sup>C</sup> mm (10.24 x 6.30 x 3.54 in.) A: Additional allowances are needed for glands and cabling B: Also account for the mating power connectors and power cabling, on one long side C: Antenna protrudes 32 mm, avoid it being closer than 500 mm to other metal structures
Weight	8 725 g (19.2 lb)
Mounting	4-point internal to enclosure, clearance on M6, fixing centres of 238 x 111 mm
IP ratings	Multilog IMx-Rail: IP66/IP67 External GPS module (optional): IP69K
Enclosure description	Black, powder coated, die cast aluminium
Gland areas	Pre-drilled and tapped (on three sides) and provided with a total of 22 cable entry points First long side: 18 positions (one M20 x 1,5 and 17, M12 x 1,5) Rear long side: 3 positions (one M20 x 1,5 and two M12 x 1,5) Short side: One M20 x 1,5 position. As supplied, all 22 are fitted with blanking plugs.
Operating temperature range	-40 to +65 °C (-40 to +149 °F)
Storage temperature range	-50 to +85 °C (-58 to +185 °F)

# Specifications cont.

Humidity	95% (relative) non-condensing
Pollution degree	2
Maximum altitude	2 000 m (6 562 ft)
Vibration tolerance	Vibration level according to EN61373 cat II
Connectors	User connection terminals are a lever, push-in type (no tool required) They accept conductors from 0,2 to 4 mm <sup>2</sup> (24 to 12 AWG), insertion length 9 to 11 mm System specific connectors are used for LAN, USB and antenna connections

## Measurement capabilities

### Analogue channels

Frequency range	DC to 40 kHz
Maximum sampling frequency:	102,4 kHz
Crosstalk rejection	-110 dB @ 1 kHz
Vibration measurement accuracy	Amplitude: ±2% (up to 20 kHz), ±5% (20 to 40 kHz) Phase: ±3° (up to 100 Hz)

For PT1000 on A9 to A16:	
Temperature measurement range	-50 to +100 °C (-58 to +212 °F)
Temperature measurement accuracy	±4 °C (excluding cable influence)

### Measurement types

Overall	Temperature, acceleration, velocity, acceleration enveloping (gE*) *SKF enveloping filters 1 to 4, for bearing damage detection Optional high-pass (AC) filter, selectable cut-offs
Detection	RMS, true peak and peak-peak
FFT resolution	100 to 6 400 lines, integration/differentiation in the frequency domain
FFT window function	Hanning
Time waveform (TWF)	256 to 16 384 points (equivalent to FFT lines above)

### Digital channels

Frequency range	From 0,016 Hz to 20 kHz (1 cpm to 1,2 Mcpm)
Speed accuracy	When used for order tracking, the maximum pulse frequency is 2,5 kHz
Pulses per rev	0,05% of measurement value (typically 0,01% up to 2,5 kHz) Software configurable. The product of pulses per rev and rotational speed is subject to the maximum frequency range, limitation.

### System Interfaces

IMx-16Plus top connectors	LTE/GSM and Wi-Fi antenna, RJ45 LAN, USB A and mini B USB A dongle provides: Bluetooth v4.0 LE (Low Energy) Mobile data or LAN (RJ45 or Wi-Fi) connectivity are alternative infrastructures to connect the IMx-Rail to the wider cloud network, they cannot be used simultaneously
MAC address	A single device MAC address applied to whichever interface (Wi-Fi or RJ45) is in use
GPS data (optional)	Longitude, latitude and altitude (via Modbus RS485) Optional GPS module is 60 x 50 x 24 mm (H x W x D) plus cable exit on one short side To be flat/surface mounted by two M5 fixings Clearance holes for mounting are on a 40-mm pitch and straddle the cable exit

### Measurement data storage

Modes	Data storage on time, associated measurement value or alarm condition Measurements linked to GPS and speed data (when available) Event capture trigger mode: Manual, Event, Run cycle (continuous capture between two locations for rail track monitoring)
Data time stamping support	Internal clock/calendar (backup power capacitor for about 1 week) (S)NTP time synchronisation protocol Time can also be set from the IMx-Manager App
On-board/internal buffering	Sufficient to store 4 hours of track monitoring data 4 GB (non-volatile/Flash memory) 1 GB for trend and dynamic 1 GB for event capture and run cycles 2 GB reserved

# Specifications cont.

## Self-diagnostics

Built-in	Automatic hardware monitoring and diagnosis (watchdog and self-testing)
Remote access	Hardware, firmware identification and status information

## Software/database/App support

Main software	SKF @ptitude Observer
Software capabilities	Measurement configuration, data storage, assessment, analysis, reporting Automatic (IMx-Rail device) firmware update

Supporting software tool	SKF @ptitude Observer On line device configurator
Tool capabilities	Network configuration

Supporting software	SKF Multilog IMx Manager Apps for iOS and Android
App capabilities	Network configuration Measurement configuration SAT (Site Acceptance Test) and installation support Firmware update Report generation and data viewer Set device time/date

## Data repositories

Customer specific repository	Machine (asset) templates Network configurations Firmware
Customer security/protection	IMx devices and repository users are associated only to specific companies Data is encrypted

## Certifications and approvals

EMC	EN/IEC 61000-6-4, EN 50121-3-2, ETSI EN 301 489-1, -17
CE certified (EU)	2014/53/EU (RED) including ETSI EN 300 328, ETSI EN 301 908-1
FCC certified (North America)	FCC Part 15B 107/109, ICES-003, FCC Part 15C 15.247 (d), RSS-447 sect. 5.55.5 FCC Part 22H 917/RSS-132 sect. 5.5, FCC Part 24E 328/RSS-133 sect 6.5, FCC Part 25.53(h)/RSS-139 sect.6.6
Railway standards	Compliant with EN 50155:2017 and EN 50121-3-2:2017

## Ordering information

### Part number

CMON 4116-R-24  
CMON 4116-R-110

### Description

SKF Multilog IMx-Rail / 24V (24 V DC input)  
SKF Multilog IMx-Rail / 110V (110 V DC input)

CMON 4133  
CMON 4135

Mini USB cable (isolated) for IMx-8/IMx-16Plus  
Set of resistors for Modbus termination, 4-20 mA inputs and PT1000 inputs<sup>1)</sup> for IMx-8/IMx-16Plus

CMON 4139

GPS for SKF Multilog IMx-16Plus

CMON 4140  
CMON 4141  
CMON 4142  
CMON 4143

24V (Replacement) Power Supply for IMx-Rail<sup>2)</sup>  
110V (Replacement) Power Supply for IMx-Rail<sup>2)</sup>  
External antenna for SKF Multilog IMx-Rail/IMx-16Plus<sup>2)</sup>  
Socket power supply connector for IMx-Rail (one supplied with the IMx-Rail)

<sup>1)</sup> This kit includes one Modbus resistor, eight current input and eight PT1000 SAT test resistors. It also comes with double deck connectors for the IMx-16Plus but these are not used in the IMx-Rail.

<sup>2)</sup> Repairs to an IMx-Rail device should only be carried out by an SKF repair centre.

For installation and training services, contact your local SKF supplier or representative.



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