SKF Multilog On-line System IMx-Rail

24/7 condition monitoring to improve railway reliability

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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.

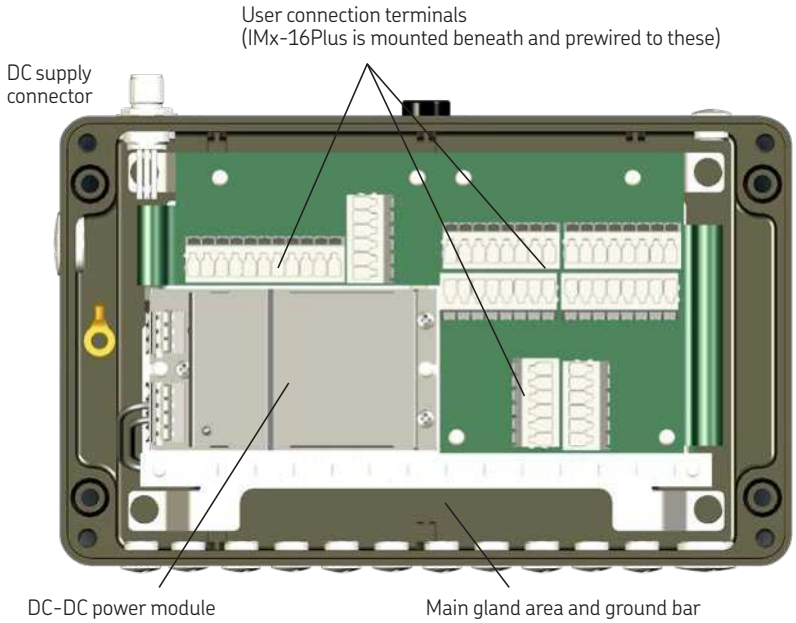
For the latter, it provides the front-end, train mounted, data collection for SKF Rail Track Monitoring.

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

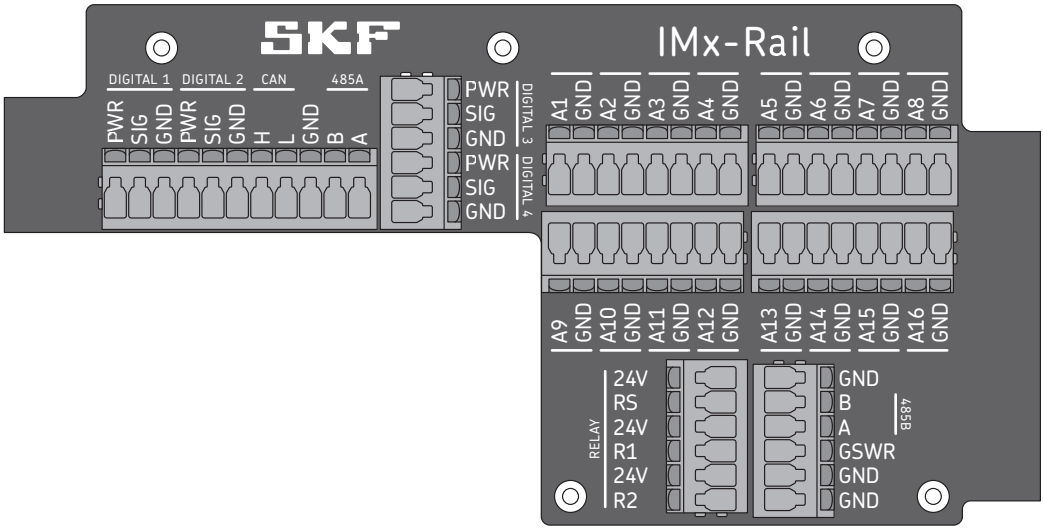
Bluetooth support in the IMx-16Plus is via a USB Bluetooth dongle not the antenna. The antenna does not support the 699-791 MHz range (typically N. American LTE).

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	Relay drive power
RS	System relay output
24V	Relay drive power
R1	Relay 1 output
24V	Relay drive power
R2	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^2 (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

External Power Connector	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
Power Module	24 V DC or 110 V DC
24 V DC nominal input	9 to 36 V DC, recommended supply fuse 2 A slow blow (T2AL)
110 V DC nominal input	43 to 160 V DC, recommended supply fuse 1 A slow blow (T1AL)
Common features	Isolated, under voltage lockout, over temperature and short circuit protection EMC Railway standard: EN50121-3-2
Analogue inputs	16 (A1 to A16)
Input type	Non-isolated, referenced to chassis/enclosure ground
Input range	Functionally: ±25 V (±28 V without damage)
Impedance	>100 kΩ
Supported sensor types	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
Digital inputs	4
Input type	Non-isolated, referenced to chassis/enclosure ground
Input range	Functionally: positive voltages up to 24 V (+27 V without damage)
Trigger level	2,9 V, Hysteresis 0,1 V
Impedance	1,6 kΩ
Supported sensor types	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
Digital Outputs	
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
Physical and environmental	
Size (excluding protrusions)	Size (H x W x D): 260[A] x 160 [AB] x 90[C] 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 two sides) and provided with a total of 21 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) As supplied, all 21 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^2 (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)* When used for order tracking, the maximum pulse frequency is 2,5 kHz
Speed accuracy	0,05% of measurement value (typically 0,01% up to 2,5 kHz)
Pulses per rev	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, Scheduled or Run cycle (latter 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
Giteki certified (Japan)	003-180238 – LTE with external antenna, 003-220101 – Wi-Fi with external antenna
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	**Description**
CMON 4116-R-24	SKF Multilog IMx-Rail / 24V (24 V DC input)
CMON 4116-R-110	SKF Multilog IMx-Rail / 110V (110 V DC input)
CMON 4133	Mini USB cable (isolated) for all IMx-8 and IMx-16 variants
CMON 4135	Set of resistors for Modbus termination, 4–20 mA inputs and PT1000 inputs[1] for all IMx-8 and IMx-16 variants
CMON 4139	External GPS module for all IMx-8/IMx-16 variants
CMON 4140	24V (Replacement) Power Supply for IMx-Rail[2]
CMON 4141	110V (Replacement) Power Supply for IMx-Rail[2]
CMON 4142	External antenna for SKF Multilog IMx-Rail/IMx-8Plus/IMx-16Plus[2]
CMON 4143	Socket power supply connector for IMx-Rail (one supplied with the IMx-Rail)

1) 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.
2) 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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