SKF Multilog On-line System IMx-Rail

24/7 condition monitoring to improve railway reliability
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
DC power connection
DC power for the IMx-Rail is applied via the external 4-pole connector. Internally this is prewired to the DC-DC power module fitted above the IMx-16Plus. The isolated, 24 V DC output from the power module is prewired to the IMx-16Plus. The IMx-16Plus supports Power over Ethernet (PoE) via the RJ45 connector, except when three relay outputs and LTE/GSM functions are all enabled. When PoE is allowed, both power options can be applied to provide redundancy.

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)

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
- 1800 MHz
PCS
- 1900 MHz
LTE
- 2.6 GHz
4G/LTE
- 791-960 MHz
- 1710-2690 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:

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>Power</td>
</tr>
<tr>
<td>SIG</td>
<td>Signal</td>
</tr>
<tr>
<td>GND</td>
<td>Ground / Return</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24V</td>
<td>Relay drive power</td>
</tr>
<tr>
<td>RS</td>
<td>System relay output</td>
</tr>
<tr>
<td>24V</td>
<td>Relay drive power</td>
</tr>
<tr>
<td>R1</td>
<td>Relay 1 output</td>
</tr>
<tr>
<td>24V</td>
<td>Relay drive power</td>
</tr>
<tr>
<td>R2</td>
<td>Relay 2 output</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Signal (Analogue)</td>
</tr>
<tr>
<td>GND</td>
<td>Ground / Return</td>
</tr>
</tbody>
</table>

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

RS485 (2-wire)

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>485A A</td>
<td>RS485 A</td>
</tr>
<tr>
<td>485A B</td>
<td>RS485 B</td>
</tr>
<tr>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>Ground (3 available)</td>
</tr>
</tbody>
</table>

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 mm² (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.

SA
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 over Ethernet**

- Not available when three relay outputs and LTE/GSM functions are all enabled
- Otherwise, available as the main or as a redundant supply source
- PoE nominal voltage 48 V, 13 W maximum

**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
  - Conducted emissions: EN55032 class B
- Railway standard: EN50155

**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 (+20 mA requires external load resistor to be fitted)
  - PT1000 temperature sensors (channels A9 to A16 only)
- Analogue sensor power:
  - A1 to A8: 6 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 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**

- 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): 260A x 160AB x 90C 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) |
| Measurement category | Cat II |
| Vibration tolerance | 4 – 13.2 Hz 1 mm |
| | 13.2 – 100 Hz 0.7 g |
| Number of axes | 3 mutually perpendicular |
| Connectors | User connection terminals are a lever, push-in type (no tool required) |
| | They accept conductors from 0.2 to 4 mm² (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*) |
| Detection | Optional high-pass (AC) filter, selectable cut-offs |
| | 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 | 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, 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) |
| (SNTP 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 |
**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

**Ordering information**

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMON 4116-R-24</td>
<td>SKF Multilog IMx-Rail / 24V (24 V DC input)</td>
</tr>
<tr>
<td>CMON 4116-R-110</td>
<td>SKF Multilog IMx-Rail / 110V (110 V DC input)</td>
</tr>
<tr>
<td>CMON 4133</td>
<td>Mini USB cable (isolated) for IMx-8/IMx-16Plus</td>
</tr>
<tr>
<td>CMON 4135</td>
<td>Set of resistors for Modbus termination, 4–20 mA inputs and PT1000 inputs for IMx-8/IMx-16Plus</td>
</tr>
<tr>
<td>CMON 4139</td>
<td>GPS for SKF Multilog IMx-16Plus</td>
</tr>
<tr>
<td>CMON 4140</td>
<td>24V (Replacement) Power Supply for IMx-Rail2</td>
</tr>
<tr>
<td>CMON 4141</td>
<td>110V (Replacement) Power Supply for IMx-Rail2</td>
</tr>
<tr>
<td>CMON 4142</td>
<td>External antenna for SKF Multilog IMx-Rail/IMx-16Plus2</td>
</tr>
<tr>
<td>CMON 4143</td>
<td>Socket power supply connector for IMx-Rail (one supplied with the IMx-Rail)</td>
</tr>
</tbody>
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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.