

SKF Multilog On-line System IMx-16Plus

24/7 condition monitoring to improve machine reliability



SKF Multilog On-line System IMx-16Plus

The SKF Multilog On-line System IMx-16Plus, is a powerful solution for condition monitoring applications requiring up to 16-channels, per device. Coupled with SKF software, it provides a complete system for early fault detection and prevention, automatic advice for correcting existing or impending machine conditions and advanced condition based maintenance to improve reliability, availability and performance.

The SKF Multilog IMx-16Plus packs a high-specification condition monitoring product into a compact form. 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.

It incorporates a mobile data module and Ethernet connectivity to provide options for easy network access to the vibration and temperature data. An RS485 interface provides a Modbus RTU port for connection to a sensor or optional GPS receiver etc. for complementary data.

The SKF Multilog IMx-16Plus integrates easily with SKF's Cloud service for data storage, data sharing and for SKF Remote Diagnostic Services.

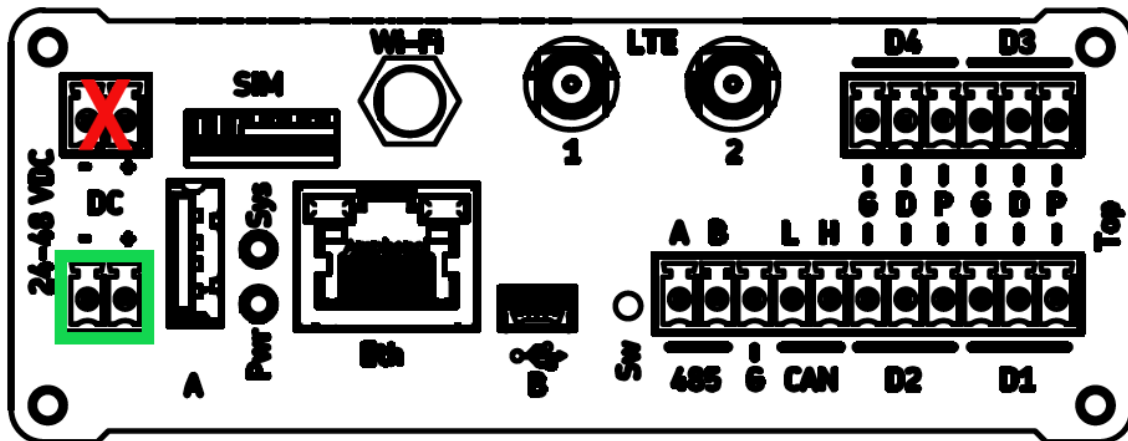
The SKF Multilog IMx-16Plus has several industry specific certifications and can typically be used in the following industries:

- Wind energy
- Marine
- Machine Tool
- Process Industries

Features

- No bigger than a paperback book
- 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 (GPRS, LTE) or Ethernet (RJ45 or Wi-Fi) connectivity
- DHCP client, capable
- On board clock/calendar
- Supports NTP time synchronisation protocol
- Modbus TCP/IP (when Ethernet in use)
- Modbus RTU (via RS485 link)
- External (Modbus) GPS module available
- 24–48 V DC and/or Power over Ethernet
- Output relay drivers – alarms and system
- 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
- Integrates to SKF's Cloud service and SKF Remote Diagnostic Services
- Local access via iOS and Android Apps
- Bluetooth
- Multiple industry/environmental approvals:
 - CE
 - WEEE
 - RoHS
 - EMC immunity and emissions

IMx-16Plus top connectors



DC input power connection

Terminals are provided for the incoming DC power supply. A (2-way) connector is provided.

| Pin | Description |
|-----|---------------|
| + | 24 to 48 V DC |
| - | 0 V DC |

Connect the incoming DC power to the lower pair of DC terminals. It is recommended that the supply be protected by a 2 A slow blow fuse.

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.

Micro SIM card slot (Mobile Data)

Firmware configurable support for physical micro-SIM (this slot) or eSIM.

| | |
|---------------------|------------------------------|
| Network support | 2G, 3G, 4G |
| Auto switching | Yes |
| Antenna connections | LTE 1 and LTE 2 (SMA female) |

USB A Host interface (Type A connector) SKF supply a Bluetooth dongle fitted in USB port A. The dongle supports Bluetooth v4.0 LE, (Low Energy).

USB B Service interface (Type mini-B) SKF can supply an isolated cable for USB port B.

LEDs Pwr – Power (green, normally on)
Sys – System (red, normally off)

Sw Rescue button (maintenance mode)

Wi-Fi

Wi-Fi antenna connection.

Wi-Fi connectivity provides an alternative method for a TCP connection to @Observer software (Monitor service). The selection of which connection method (LTE/GSM or LAN) is to be used, is a configuration choice. LAN connection is available by either Wi-Fi or RJ45.

| | |
|-------------------|---------------------|
| Standard | 802.11n |
| Band | 2,4 GHz |
| Network support | Open/secured |
| Security | WPA2-PSK |
| Auto connect | To a specified SSID |
| Antenna connector | SMA female |

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

DNS – server name lookup
NTP – time synchronisation.

Eth (Ethernet)

| | |
|-----------------|---------------|
| Connector | RJ45 with LED |
| Network support | 10/100 Mbit/s |

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

RS485 (2-wire) for Modbus RTU

| Pin | Description |
|---------|-------------|
| (485) A | RS485 A |
| (485) B | RS485 B |
| G | GND |

SKF provide one 120-ohm RS485 termination resistor (coloured black) with each IMx 16Plus (CMON 4108 PLUS) and another as part of CMON 4135. (Not required when connecting optional GPS module).

D1 to D4 (Digital/tacho input connections)

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

| Pin | Description |
|-----|--------------|
| G | GND / Return |
| D | Signal |
| P | Power |

Digital sensor power is always enabled to the 'P' 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.

Notes:

Demountable terminal connectors

For the top connectors, one 11-way, one 6-way and one 2-way are provided.

Interfaces

Mobile data and LAN are alternative options for connection to @Observer software. Multiple interfaces cannot be enabled simultaneously.

When a LAN connection is being used, Modbus TCP/IP can also be supported, including some simultaneous use with Modbus RTU and support for multiple Modbus TCP/IP slave functionality.

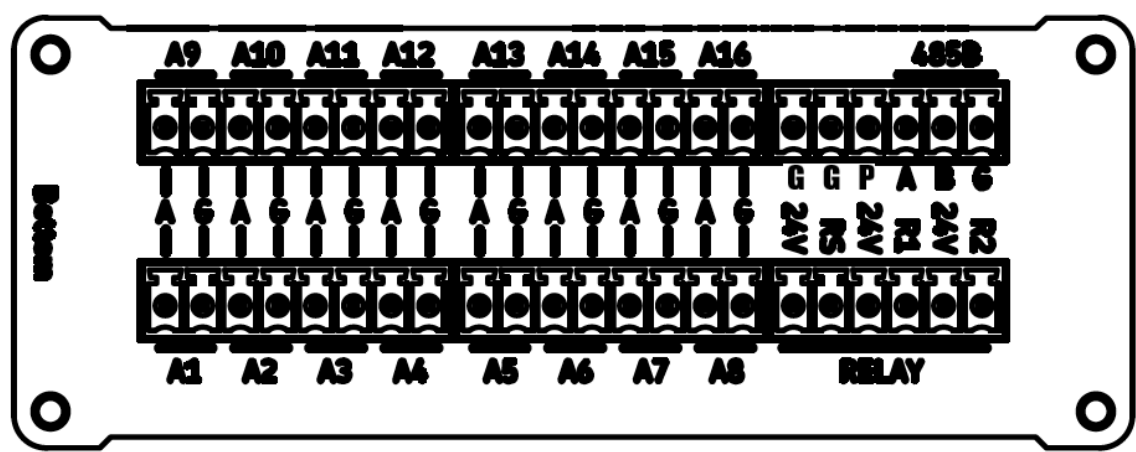
On a LAN connection, the IMx can be configured as a DHCP client to obtain its IP address automatically.

Optional items

For optional items and accessories, refer to ordering information.

| | |
|------------|---|
| CAN | For vehicle systems interfacing (currently no firmware support) |
|------------|---|

IMx-16Plus bottom connectors



Lower row:

A1 to A8 (Analogue inputs 1-8)

Channels A1 to A8 support constant current accelerometers, current or voltage inputs.

Transducer power is enabled by configuration, on a per channel basis.

| Pin | Description |
|-----|--------------|
| A | Signal |
| G | GND / Return |

Relay drivers (Digital outputs)

The IMx-16Plus provides 3 relay driver outputs for system, warning and alarm status indications.

| Pin | 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.

Upper row:

A9 to A16 (analogue inputs 9-16)

Channels A9 to A16 support accelerometers, current or voltage inputs, as channels 1 to 8.

In addition, these channels also support the direct connection of (2-wire) PT1000 temperature sensors.

| Pin | Description |
|-----|--------------|
| A | Signal |
| G | GND / Return |

Connections for general use

| Pin | Description |
|-------|--|
| G | GND |
| G | GND |
| P | Power (24V, can be used to power the optional GPS module). |
| A/B/G | Refer notes |

Notes:

Demountable terminal connectors

For the bottom connectors, four 8-way (A1 to A16) and two 6-way are provided.

Current signals

When connecting a 4-20 mA current signal to an analogue input an external load resistor is required. SKF provide a set of 250-ohm load resistors (coloured blue), as part of CMON 4135.

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 (A and B) are not to be connected, not used. The GND/return terminal (G) can be used if required.

Specifications

Hardware

| | |
|-----------------------------------|---|
| Power Input | 24–48 V DC ($\pm 5\%$), recommended supply fuse rating: T2AL 10 W typical, 12 W maximum (see Power over Ethernet for exception) |
| 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 |
| Analogue inputs | |
| Quantity | 16 (A1 to A16) |
| Input type | Non-isolated, referenced to chassis/enclosure ground |
| Input range | Functionally: ± 25 V (± 28 V without damage) |
| Impedance | >100 k Ω |
| Supported sensor types | 2-wire: Constant current accelerometers Voltage signals (4–20 mA requires external load resistor to be fitted) PT1000 temperature probes (channels A9 to A16 only) |
| Analogue sensor power | 4 mA constant current per sensor (2,23 mA for channels 9 to 16) Individually software enabled/disabled for each sensor Sensor power has short circuit protection |
| PT1000 | Sense current: 2,23 mA nominal, Temperature coefficient: 0,00385 $\Omega/(\Omega^\circ\text{C})$ |
| Sensor and cable fault detection | Automatic – software configurable |
| Analogue/Digital conversion | 24-bit (one A/D converter per channel) |
| Dynamic range | 120 dB |
| Signal to noise ratio | 90 dB |
| Digital inputs | |
| Quantity | 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 k Ω |
| Supported sensor types | 2- and 3-wire, including: TTL level and other pulses up to +24 V PNP sensors On-line oil debris sensor (Gastops MetalSCAN) |
| 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) 2 for measurement alarming and 1 for system alarming Total maximum drive current available: 70 mA Minimum individual coil resistances: 345 Ω (1 relay), 690 Ω (2 relays) 1035 Ω (if 3 relays are in use) |
| Physical and environmental | |
| Mounting | DIN-rail (35 mm x 7,5 mm 'top hat' DIN rail) |
| Size (H is across the rail) | Size (H x W x D): 172 ^A x 104 x 40 ^B mm (6.8 x 4.1 x 1.6 in.) A: Height (H) does not include terminal connectors and Bluetooth dongle B: Depth (D) is unmounted and excluding DIN-rail mounting bracket |
| Weight | 900 g (1.98 lb) |
| IP rating | IP 30 (IP65 SKF cabinets available) |
| Operating temperature range | –40 to +65 $^\circ\text{C}$ (–40 to +149 $^\circ\text{F}$) |
| Storage temperature range | –50 to +85 $^\circ\text{C}$ (–58 to +185 $^\circ\text{F}$) |
| 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 Removable terminal blocks with spring terminals The use of bootlace ferrules sized at 1,5 mm ² / 16 AWG is recommended System specific connectors are used for LAN, USB and antenna connections |
| Connectors | |

Specifications cont.

Measurement capabilities

Analogue channels

| | |
|--------------------------------|--|
| Frequency range | DC to 40 kHz |
| Maximum sampling frequency: | 102,4 kHz |
| Crosstalk rejection | -110 dB at 1 kHz |
| Vibration measurement accuracy | Amplitude: $\pm 2\%$ (up to 20 kHz), $\pm 5\%$ (20 to 40 kHz) Phase: $\pm 3^\circ$ (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 | Acceleration, velocity, acceleration enveloping (gE*) *SKF enveloping filters 1 to 4, for bearing damage detection Optional high-pass (AC) filter, selectable cut-offs RMS, true peak and peak-peak 100 to 6 400 lines, integration/differentiation in the frequency domain Hanning 256 to 16 384 points (equivalent to FFT lines above) |
| Detection | |
| FFT resolution | |
| FFT window function | |
| Time waveform (TWF) | |

Digital channels

| | |
|--------------------|--|
| Frequency range | From 0,016 Hz to 20 kHz (1 <i>cpm</i> – 1,2 <i>Mcpm</i>) When used for order tracking, maximum pulse frequency is 2,5 kHz |
| Speed accuracy | 0,05% of measurement value (typically 0,01% up to 2,5 kHz) |
| Other capabilities | Pulse counting Configurable pulses per rev. 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 antenna, LAN (Wi-Fi antenna and RJ45, connections) and RS485 USB A dongle provides: Bluetooth v4.0 LE (Low Energy) |
|---------------------------|---|

Communication protocols

Modbus RTU, Modbus TCP/IP
IEC 61850 (for communications networks in a sub-station environment)

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 modes: Manual, Event and Run Cycle |
| 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 | 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 |

Specifications cont.

Software/database/App support

| | |
|--------------------------|---|
| Main software | SKF @ptitude Observer |
| Software capabilities | Measurement configuration, data storage, assessment, analysis, reporting Automatic (IMx-8 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 | When the IMx-16Plus is placed inside a metal outer enclosure: EN/IEC 61000-6-4, EN 50121-3-2, ETSI EN 301 489-1, -17 2014/53/EU (RED) including ETSI EN 300 328, ETSI EN 301 908-1 |
| CE certified (EU) | FCC Part 15B 107/109, ICES-003, FCC Part 15C 15.247 (d), RSS-447 sect. 5.55.5 |
| FCC certified (North America) | 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 |
| Pending approvals: | The following approvals are in progress |
| DNV GL Renewables certificate | Valid only when the IMx-16Plus DIN rail version is mounted in an IP65 cabinet in a wind turbine that is built according to the DNV GL wind turbine type approval. |
| Marine type approvals | DNV GL ABS Lloyd's Register |

Ordering information

| Part Number | Description |
|----------------|--|
| CMON 4116-PLUS | SKF Multilog IMx-16Plus |
| CMON 4133 | Mini USB cable (isolated) for IMx-8/IMx-16Plus |
| CMON 4134 | SKF Bluetooth dongle for IMx-8/IMx-16Plus |
| CMON 4135 | Set of double deck connectors and resistors for Modbus termination, 4-20 mA inputs and PT1000 inputs for IMx-8/IMx-16Plus* |
| CMON 4136 | Analogue isolator module (4-20 mA to voltage) for IMx-8/IMx-16Plus |
| CMON 4137 | DIN rail mounted power supply for IMx-8/IMx-16Plus |
| CMON 4139 | GPS for SKF Multilog IMx-16Plus |
| CMON 4142 | External antenna for SKF Multilog IMx-Rail/IMx-16Plus |
| CMON 4150 | IP65 cabinet with pre-drilled holes for IMx-8/IMx-16Plus |
| CMON 4151 | IP65 cabinet without pre-drilled holes for IMx-8/IMx-16Plus |

*PT1000 inputs are only supported by the IMx-16Plus and the associated resistors are required for a SAT test. This accessory kit provides load resistors for up to eight channels of 4-20 mA signals.

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



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