SKF

SCALABLE CONDITION MONITORING

SKF Multilog On-line System IMx-16/IMx-16Plus
24/7 condition monitoring to enhance machine reliability

SKF Multilog On-line System IMx-16/IMx-16Plus

The SKF Multilog On-line System IMx-16/IMx-16Plus, provide powerful solutions for condition monitoring applications requiring up to 16-channels, per device. Coupled with SKF software, they provide 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-16/IMx-16Plus pack a high-specification condition monitoring product into a compact form. They offer 16 analogue inputs, eight constant current accelerometers or voltage inputs and a further eight that in addition have PT1000 compatibility for temperature monitoring. They also have four digital channels available for speed sensor inputs.

Both modules provide 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-16/IMx-16Plus integrate easily with SKF's Cloud service for data storage, data sharing and for SKF Remote Diagnostic Services.

The SKF Multilog IMx-16/IMx-16Plus have 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

- Ethernet (RJ45) and for IMx-16Plus only: mobile data or Wi-Fi connectivity options
- 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

- 22–50 V DC and/or Power over Ethernet
- Output relay drivers – alarms and system
- Multi-parameter gating
- Multiple SKF enveloping filters

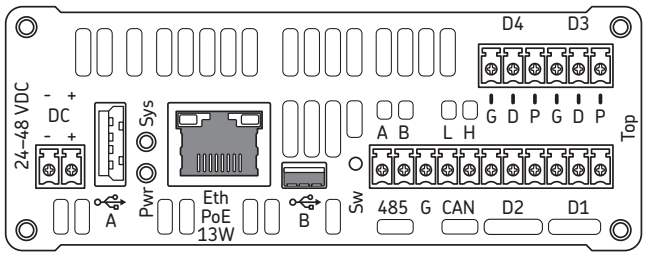
- Data buffering in non-volatile memory when communication is down
- 2 GB available for vibration, temperature, speed, location and other measurement data

- Integrates to SKF's Cloud service and SKF Remote Diagnostic Services
- Local access via iOS and Android apps
- Bluetooth

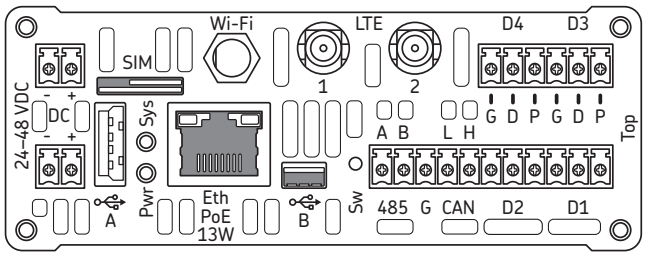
Multiple industry/environmental approvals:

- CE
- WEEE
- RoHS
- EMC immunity and emissions

IMx top connectors



IMx-16



IMx-16Plus

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 (nominal)
–	0 V DC

Connect the incoming DC power to the DC terminals, on the IMx-16Plus the lower pair must be used. It is recommended that the supply be protected by a 2 A slow blow fuse.

The IMx-16/IMx-16Plus support Power over Ethernet (PoE) via the RJ45 connector and both power options can be applied to provide redundancy.

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

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.

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 and another as part of CMON 4135. (Not required when connecting optional GPS module).

Notes:

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

Interfaces
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 specific

Wi-Fi

Wi-Fi antenna connection.
Wi-Fi connectivity provides an alternative method for a TCP connection to @ptitude Observer software (Monitor service). The selection of connection method (mobile data or LAN) 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.

Micro SIM card slot (Mobile Data)

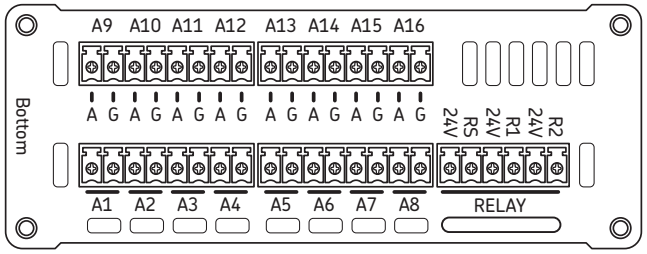
Firmware configurable support for physical micro-SIM (this slot) or eSIM.

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

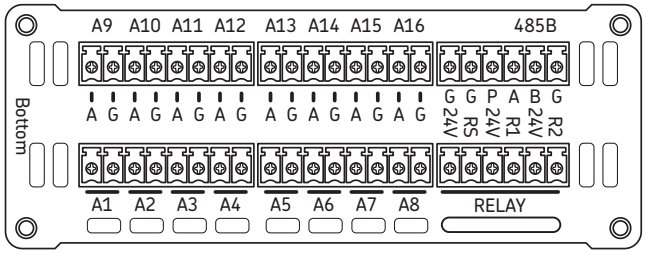
Additional notes for the IMx-16Plus:

Interfaces
Mobile data and Wi-Fi are alternative options for connection to @ptitude Observer software and multiple interfaces cannot be enabled simultaneously.

IMx bottom connectors



IMx-16



IMx-16Plus

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

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

IMx-16Plus: 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 one or two 6-way are provided, model dependent.

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 device.

IMx-16Plus: 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 nominal (22 to 50 V DC), supply fuse rating: T2AL 10 W or less typical, 13 W maximum
Power over Ethernet	PoE nominal voltage 48 V, 13 W maximum Available as the main or as a redundant supply source
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 kΩ
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 Ω/(Ω °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 (D1 to D4)
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 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
Device weights	IMx-16: 571 g *(1.26 lb)*, IMx-16Plus: 582 g *(1.28 lb)*
IP rating	IP 30 (IP65 SKF cabinets available)
Operating temperature range	IMx-16: –40 to +70 °C *(–40 to +158 °F),* IMx-16Plus: –40 to +65 °C *(–40 to +149 °F)*
Storage temperature range	–50 to +85 °C *(–58 to +185 °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
Connectors	Pluggable terminal block connectors The use of bootlace ferrules sized at 1.5 mm^2 / 16 AWG is recommended System specific connectors are used for LAN, USB and, where applicable, antenna connections

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: ±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	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)
Acquisition types	Fixed frequency range or order tracking
Synchronous measurements	Configurable across (up to) all 16-channels
Alarm capabilities	
Overall value	Warning and alarm (window), scalar or vector (circular, amplitude/phase) Adaptive alarming Alarm group support
Other measurement types	
Modbus external channels	32 available
IMx derived points	Calculated values based on measurement data
Digital channels	
Frequency range	From 0.016 Hz to 20 kHz *(1 cpm – 1.2 Mcpm)* 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 antenna, LAN (Wi-Fi antenna and RJ45) and RS485 terminals USB A dongle provides: Bluetooth v4.0 Low Energy
IMx-16 top connectors	RJ45 connector and RS485 terminals USB A dongle provides: Bluetooth v4.0 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, Scheduled 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 data 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 device) firmware update
Supporting software tool	SKF @ptitude Observer Online 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
Product Safety	**UL/CSA 62368-1:2014**
Certifications and approvals	**IMx-16**
CE directive	EMC Directive 2014/30/EU
EMC emissions	EN/IEC 61000-6-4:2018
EMC Immunity	EN/IEC 61000-6-2:2016
DNV GL Renewables	DNVGL-SE-0439:2016-06 Certification of condition monitoring for Wind Turbines Monitoring Systems for Wind Turbines
Marine Type Approvals	IACS E10:1991/rev 8:2021 Installation class: “General power distribution zone” DNV: DNVGL-CG-0339:2019 Location class: “All locations except Bridge and Open deck” EMC A ABS PDA: ABS Part 4:2021, Chapter 9, section 9, table 1 and table 2, Installation class: “General power distribution zone” Lloyds Register assessed to IACS UR E10 Rev. 8/2021 for Marine, Offshore and Industrial applications
Certifications and approvals	**IMx-16Plus**
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
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
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.

Ordering information

Part number	**Description**
CMON 4116	SKF Multilog IMx-16
CMON 4116-PLUS	SKF Multilog IMx-16Plus
CMON 4133	Mini USB cable (isolated) for all IMx-8 and IMx-16 variants
CMON 4134	SKF Bluetooth dongle for all IMx-8 and IMx-16 variants
CMON 4135	Set of double deck connectors and resistors for Modbus termination, 4–20 mA inputs and PT1000 inputs for all IMx-8 and IMx-16 variants*
CMON 4136	Analogue isolator module (4-20 mA to voltage) for all IMx-8 and IMx-16 variants
CMON 4137	DIN rail mounted power supply for all IMx-8 and IMx-16 variants
CMON 4139	External GPS module for all IMx-8/IMx-16 variants
CMON 4142	External antenna for SKF Multilog IMx-Rail/IMx-8Plus/IMx-16Plus
CMON 4144	Screw-in type connectors for any IMx-8 or IMx-16 variant
CMON 4145	Screwless plug-in type connectors for any IMx-8 or IMx-16 variant
CMON 4146	HMI Display for all IMx-8/IMx-16 variants
CMON 4150	IP65 cabinet with pre-drilled holes for any IMx-8 or IMx-16 variant
CMON 4151	IP65 cabinet without pre-drilled holes for any IMx-8 or IMx-16 variant

*PT1000 inputs are only supported by the IMx-16/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.

IMx variants included in the “any” or “all” descriptions above are the IMx-8, IMx-8Plus, IMx-16 and IMx-16Plus.

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PUB CM/P2 18244/4 EN · March 2025