SKF Multilog On-line System IMx-M

State of the art solution for protecting and enhancing the reliability of your critical machinery

The SKF Multilog On-line System IMx-M is the latest addition to the current generation of powerful, cost effective solutions suitable for a variety of applications. Together with SKF @ptitude Monitoring Suite software, the SKF Multilog IMx-M can provide a complete system for initiation of machinery shutdown, early fault detection and diagnosis. In addition, the SKF Multilog IMx-M system provides automated advice for correcting existing or impending conditions which can affect machine reliability, availability and performance.

Key features

**Machine protection**
- 19 inch rack format
- Meets the intent of API 670
- Up to 64 analog inputs (dynamic and static) per rack
- Up to 32 digital/speed inputs per rack
- Up to 96 relay outputs per rack
- Multiple transducer types
- Radial vibration, position, temperature
- TSI measurements (absolute shaft vibration, eccentricity, and complementary differential expansion)
- Simultaneous measurement of all input channels
- Redundant Modbus RTU communications
- Buffered outputs front and rear
- Local status indication and display
- Flexible voting logic

**Machine condition monitoring**
- Independent of machine protection
- DC to 40 kHz
- Overall level and vector processing
- Spectrum with up to 6,400 line resolution
- Transient and steady-state data capture
- Multi-parameter gating
- SKF Acceleration Enveloping
- Adaptive alarm levels
- Data buffering in non-volatile memory
- Fully supported by SKF @ptitude Monitoring Suite
1 **Power supplies, 90 to 264 V AC**
   Single or dual redundant. Each power supply alone may power a fully loaded rack.

2 **Protection I/O module**
   Supports multiple transducer types and performs signal processing for alarm generation.
   16 dynamic channels and eight digital inputs. Segregation of input channel processing such that any single circuit failure cannot affect more than two channels.

3 **Relay module**
   32 electro-mechanical relays with configurable logic assigned to any channel in the 19 inch rack, LEDs indicators and relay status.

4 **CPU module**
   Parallel data-acquisition of dynamic data for machinery analysis and diagnostics independent of protection function. Also provides user interface and TCP/IP communications.

5 **16 channel CPU and I/O pair**
   Consisting of a 16 channel Protection I/O Module and 16 channel condition monitoring CPU Module. Up to four pairs per 19 inch rack. Configuration shown is maximum – 64 channels with 96 relays.

6 **LED Indication**
   Each channel provides LED color for status alarms – Alert, Danger and Transducer OK. Module OK indication.

7 **Front buffered outputs**
   Three BNC connectors on Protection I/O Module front provide direct access buffered transducer signals. Channel assignment using keypad on CPU Module. Ideal for use with portable data analyzers (two channels + phase).

8 **USB ports**
   For direct configuration of CPU and I/O pair.

9 **Local user interface**
   CPU Module provides channel value and alarm status bargraph display for any two channels, selectable by the keypad. Communications and System OK indication LEDs.
1 CPU and I/O pairs
maximum four pairs per rack

2 Relay modules
maximum three modules per rack

3 Power supply and ground connections
maximum two modules per rack

4 Redundant AC power feeds

5 Relay outputs
for machine protection

6 Status relays
for circuit fault and disarm indication

7 Ethernet connections to condition monitoring with internal switch
For convenient interconnection of CPU Modules with external network. Each CPU Module has an individual TCP/IP address.

8 Redundant RS 485 communications
Two separate RS 485 lines (L1, L2) provide redundant connections to DCS. No single protection module failure or removal will affect DCS communications with other modules.

9 Disarm
activation by contact closure

10 Digital field inputs
Sensor types include, but not limited to:
- Eddy current probes (phase reference and speed)
- TTL inputs for speed
- Logical inputs

11 Analog field inputs
Sensor types include, but not limited to:
- Eddy current probes (radial vibration, position)
- Accelerometers and velocity sensors
- Temperature RTD (Pt 100)
- Process variables (4 to 20 mA)
- DC voltage

12 4 to 20 mA outputs
16 recorder outputs, assignable to monitored channel variables (one output per channel)

13 Rear analog buffered outputs
for connection to external multi-channel data analyzers

14 Digital buffered outputs
re-transmission of tachometer signal to other systems
CMON 2007
19 inch rack with backplane

Key features
- Standard 19 inch rack mounted
- Standard 6U height
- Robust aluminium design

The 19 inch rack enclosure contains the electronics of the SKF Multilog IMx-M. Each rack holds up to four I/O cards, four CPU cards, three relay cards and up to two redundant power supplies. The rack has a backplane providing electric interconnection between CPU cards, I/O cards, relay cards and power supplies. All cards are inserted from the front side of the rack. On the rack rear, there are termination boards for each card set.

Technical data

Backplane
- Two slots for power supplies
- Four slots, each for one protection I/O module and one CPU module (always mounted in pairs)
- Three slots for relay cards
- Screw terminals, RJ45 and D-sub connectors on rear of unit
- Redundant power bus to protection I/O modules, total eight per rack

Physical
- 19 inch rack mounted, 6U high
- Dimensions:
  - Height: 266 mm (10.47 in.)
  - Width: 482 mm (18.98 in.)
  - Depth: 240 mm (9.45 in.)
- Weight (bare rack): 3.5 kg (123 oz.)

Environmental
- Temperature range: −20 to +65 °C (−4 to +149 °F)
- Humidity: 95% Relative humidity (non-condensing)
CMON 2102
Machine protection I/O module

Key features
- Meets the intent of API 670
- Multiple transducer types
- RTD temperature (Pt 100)
- Radial vibration, position, temperature
- TSI functions (absolute shaft vibration, eccentricity, complementary differential expansion)
- Simultaneous measurement of all channels
- Redundant Modbus RTU communications
- Buffered outputs front and rear
- Local status Indication and display
- Alarm evaluation and response within 100 ms
- Flexible voting logic

The CMON 2102 Machine protection I/O module accepts a variety of sensor inputs. Signals such as acceleration, velocity and displacement or other parameters are easily adopted. Each input can be configured for standard accelerometers, velocity sensors, proximity probes, 4 to 20 mA or ±25 V. All channels are processed in parallel.

In addition to the analog channels, eight digital channels may be used for measuring speed or digital status.

The design prevents a single circuit failure from affecting more than two measurement channels, and it is possible to detect and indicate circuit failure. All channel pairs are independent, and can be configured for redundancy. Each channel has indicators for alarm/shutdown and it is possible to manually bypass alarm and shutdown (alert/danger) functionality. The system provides remote reset of latching alarm/shutdown conditions.

Technical data

Physical
- 19 inch rack mounted
- Size: 6U high, 4TE wide
- Weight: 0.5 kg (18 oz.)

Environmental
- Temperature range: –20 to +65 °C (-4 to +149 °F)
- Humidity: 95% Relative humidity (non-condensing)

Input board

Analog inputs
- 16 analog differential inputs (8 can be used for RTD’s)
- Individual ±24 V transducer power, maximum 40 mA/channel
- Power supply for standard accelerometers (8 mA constant current) for each channel
- Input range: ±25 V
- Impedance: >100 kΩ

Digital inputs
- 8 digital Opto isolated inputs with +24 V sensor power, maximum 40 mA/channel (TTL two-wire tachometers, three-wire tachometers, pulse, etc.). Available –24 V DC power for eddy current probes on 4 inputs.

Outputs
- 16 rear analog buffered outputs
- 8 rear digital buffered outputs
- Two analog buffered outputs (at front, user selectable)
- One digital buffered output (at front, user selectable)
- Single 4 to 20 mA output per channel

Processing
- Overall level processing
- Radial vibration (mils, microns) peak to peak
- Acceleration (g’s) 0 to peak, rms
- Velocity (ips, mm/sec) 0 to peak, rms
- Position (mils, mm)
- Temperature (°C, °F)
- TSI functions (absolute shaft vibration, eccentricity, complementary differential expansion)

Interface
- USB service interface
- RS 485, Modbus, redundant

Miscellaneous
- CE certified according to EN61000-6-4
CMON 2102 Machine protection I/O module

Front view of I/O board

- Module status LED
- Analog buffered outputs
- Channel status LED
- Analog transducer inputs
- Redundant RS 485 LEDs
- USB port for configuration of protection part
- Digital buffered outputs
- Analog buffered outputs
- Analog transducer inputs
- Redundant RS 485 (protection)

Rear view of CPU – I/O slot

- 4 to 20 mA outputs
- Digital inputs
- Status relays
- Disarm
- Analog buffered outputs
- Disarm
- 1
- ETH
- 2
- I/O

Analog buffered outputs
- Digital buffered outputs

Analog buffered outputs
- Digital buffered outputs

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Analog buffered outputs
- Digital buffered outputs
CMON 2103
Condition monitoring processing (CPU) module

Key features – machine condition monitoring

• Independent of machine protection
• DC to 40 kHz
• Overall level and vector processing
• FFT up to 6 400 line resolution
• Transient and steady-state data capture
• Multi-parameter gating
• SKF Acceleration Enveloping
• Adaptive alarm levels
• Data buffering in nonvolatile memory
• Fully supported by SKF @ptitude Monitoring Suite

The CPU module for the SKF Multilog IMx-M offers data acquisition for condition monitoring purposes, and is independent of the machinery protection function. It acquires and processes data from all channels simultaneously and in parallel. This allows for multiple advanced signal analysis methods to be employed. Several measurement points can be connected to each channel signal and individual conditions for warning and alarm may be set for each point. These conditions can be based on fixed frequencies and/or speed-following frequencies (including harmonics). For each measurement point, multiple conditions can be applied – such as warning and alarm levels may be controlled by machine speed or load. A built-in hardware diagnostic system continuously checks all sensors, cabling and electronics for any faults, signal interruption, shortcuts or power failure. Any malfunction can be set to trigger an alert alarm. In the case of system power failure, the system will automatically restart when the power returns.

Technical data

Physical
• 19 inch rack mounted
• Size: 6U high, 8TE wide
• Weight: 0.6 kg (21 oz.)

Environmental
• Temperature range: –20 to +65 °C (–4 to +149 °F)
• Humidity: 95% Relative humidity (non-condensing)

Analog measurement
• 24-bit AD conversion enables continuous transient capture (no gain or AC/DC switching necessary)
• True simultaneous sampling of all 16 channels (no multiplexing)
• Simultaneous sampling of different channels with different sampling rates
• Frequency range: From DC to 40 kHz
• Dynamic range: 120 dB
• Signal to noise ratio: 90 dB
• Cross-talk rejection: 100 dB
• Accuracy amplitude: ±2%, phase ±3° (up to 100 Hz)

Digital measurement
• Frequency range: 0.1 Hz to 7.5 kHz
• Accuracy frequency: 0.01%
• Pulse counting

Signal processing – condition monitoring
• Time waveform
• Vector analysis with circular alarms
• FFT: 100 to 6 400 lines
• SKF Acceleration Enveloping
• Integration/differentiation in frequency domain
• Window function: Hanning
• Mathematical expressions
• Dynamic alarm levels, active range determined on multiple parameters
• Data storage on time, event or alarm condition
• Data buffering in flash memory when communication link is down
• Detection of sensor and cable fault
• Watchdog and self testing

Protection LCD and keypad
• Set-up menu
• Bargraph
• Buffered output front selection
• Channel values

Interface
• Ethernet: 10/100 Mbit RJ45, TCP/IP
• Built-in two port data switch, 10/100 Base-T
• USB service interface
• RS 485, Modbus

Miscellaneous
• CE certified according to EN61000-6-4
CMON 2103 Condition monitoring processing (CPU) module

Front view of CPU board

Rear view of CPU – I/O slot
CMON 2109
Relay module

Key features – machine protection

- 32 relays per module (28 SPDT, 4 DPDT)
- Up to three modules per rack
- Software configurable
- Flexible relay assignment
- On board voting logic
- Voting across protection I/O modules
- Redundant operation
- Normally open/normally closed
- Normally energized/de-energized (user-selectable)
- Latching/non-latching

Each CMON 2109 machine protection relay module has 32 relays, for a maximum of 96 relays per 19 inch rack. All channels can access all relays.

The relay module is software configurable, with no need for DIP switch settings. Relay logic is flexible AND/OR/MAJORITY voting.

Technical data

Relay specification

- Maximum switching capacity: Up to 60 V DC, 30 V RMS/42.4 V peak
- Maximum switching current: 2 A
- Mechanical endurance: Typical 10^8 operations
- Electrical endurance: Minimum 10^5 operations at maximum rating
- Category of protection: Hermetically sealed (RT V)

Physical

- 19 inch rack mounted
- Size: 6U high, 4TE wide
- Weight: 0.4 kg (14.11 oz.)

Environmental

- Temperature range: –20 to +65 °C
  (–4 to +149 °F)
- Humidity: 95% Relative humidity (non-condensing)

Miscellaneous

- CE certified according to EN61000-6-4
CMON 2202
Power supply module

Key features
- Four individual LED status indicators (one per I/O / CPU slot)
- Supports power supply redundancy

The CMON 2202 supplies power to the various modules in the SKF Multilog IMx-M rack. The power supply accepts AC (90 to 264 V). A single power supply can support a fully loaded rack. A second power supply can provide redundancy.

Technical data

Physical
- 19 inch rack mounted
- Size: 6U high, 12 TE wide
- Weight: 1.6 kg (56.44 oz.)

Environmental
- Temperature range: –20 to +65 °C
  (–4 to +149 °F)
- Humidity: 95% Relative humidity (non-condensing)

Power supply
- 90 to 264 V AC, 47 to 63 Hz input voltage
- Maximum power consumption: 300 W
- Redundant option, individual main terminal

Miscellaneous
- CE certified according to EN61000-6-4

CMON 2202 Power supply module

Front and rear views of Power Supply Unit
Scalable plantwide solutions for machinery monitoring

Typical non-hazardous area installation

SKF offers comprehensive solutions for protection and condition monitoring of all classes of rotating machinery, encompassing a variety of architectures that can be scaled to optimize functionality with respect to total installed cost.

**SKF Multilog On-line System IMx-M**

Provides a 19 inch rack format solution that is located in a non-hazardous area such as an instrument or control room. The SKF Multilog IMx-M combines high functionality with high channel density, which leads to lower requirements for a cabinet and associated infrastructure.

**SKF Multilog On-line System DMx**

API 670 compliant in a distributed field I/O format solution, located on the machine skid in the hazardous area. The SKF Multilog DMx combines a high functionality in a small physical package that greatly reduces field cable, and almost eliminates the need for instrument room cabinets.

**SKF Multilog On-line System IMx-S**

A multi-channel, on-line condition monitoring device suitable for field installation in non-hazardous areas. The SKF Multilog IMx-S provides fully automated monitoring and analysis capabilities and is best suited for semi-critical and balance of plant equipment.
Scalable plantwide solutions for machinery monitoring

Typical hazardous area installation

**SKF Machine Condition Transmitters (MCT)**
Provides a range of simple single-point devices for providing traditional 4 to 20 mA signals to the plant control system and basic machine trip functionality.

**SKF Microlog Analyzer**
SKF Microlog portable instruments offer a comprehensive range of predictive maintenance tools.

**SKF @ptitude Monitoring Suite**
Predictive maintenance software platform that brings all data from field instruments together for processing into actionable information regarding equipment reliability. The package provides the database for complex dynamic vibration data, and provides plots and tools for the experienced analyst. SKF @ptitude Decision Support is a data reduction engine and knowledge base for automating much of the analysis process. In addition, the cloud/server architecture allows for remote diagnostic services.
Analytical tools from SKF @ptitude Monitoring Suite software

SKF @ptitude Monitoring Suite is a comprehensive software solution with powerful diagnostic and analytical capabilities. SKF @ptitude Monitoring Suite provides fast, efficient and reliable storage, analysis, and retrieval of complex asset information and makes the information accessible throughout your organization. SKF @ptitude Monitoring Suite easily scales to your specific needs, whether it is operator inspection rounds, condition monitoring data collection or in-depth vibration analysis and expert advice.

SKF @ptitude Monitoring Suite allows your operations, maintenance and reliability staff to view data from different sources using the same application and communicate information to other departments in a customizable format.

SKF @ptitude Monitoring Suite integrates the range of SKF on-line and off-line data collection devices into one enterprise-wide software platform.

Cascade plot.

Topology plot.

Orbit plot.

Bode plot.
Transducer systems

Eddy current probe systems
SKF offers a full range of API 670 compliant non-contacting displacement sensors (Eddy current probes) for use in critical machinery, including models with NEC and ATEX agency approvals.

CMSS 65 / CMSS 665 series, 5 mm eddy probe system
- 5 mm tip diameter, 2 mm (80 mil) measurement range
- 5 m system length
- CMSS 65 Eddy current probe
- CMSS 665 Driver
- CMSS 958 Extension cable

CMSS 68 / CMSS 668 series, 8 mm eddy probe system
- 8 mm tip diameter, 2.3 mm (90 mil) measurement range
- 5 m or 10 m system lengths
- CMSS 68 Eddy current probe
- CMSS 668 Driver
- CMSS 958 Extension cable

Accelerometers and velocity sensors
SKF offers a full range of piezoelectric casing vibration sensors, including models with NEC and ATEX agency approvals.

General purpose industrial accelerometers
- CMSS 2100 Top exit, industrial accelerometer
- CMSS 2200 Low profile, side exit, industrial accelerometer
- CMSS 2106 High temperature, top exit, industrial accelerometer
- CMSS 2207 High temperature, low profile, side exit, industrial accelerometer
- CMSS 793V Piezoelectric industrial velocity sensor

Agency approved accelerometers*
- CMSS 786A-IS and CMSS 786A-D2 CSA and ATEX approved, intrinsically safe, general purpose, top exit, industrial accelerometer
- CMSS 787A-IS and CMSS 787A-D2 CSA and ATEX approved, intrinsically safe, general purpose, low profile, side exit, industrial accelerometer
- CMSS 793-CA CSA approved, intrinsically safe, general purpose, top exit, industrial accelerometer
- CMSS 793-EE ATEX approved, intrinsically safe, general purpose, top exit, industrial accelerometer
- CMSS 797-EE ATEX approved, intrinsically safe, general purpose, low profile, ring mode, industrial accelerometer

*Installation must conform to hazardous area requirements when used in this environment.
Ordering information

SKF Multilog On-line System IMx-M components:

- **CMON 2007**: 19 inch rack enclosure including backplane and power terminal card
- **CMON 2102**: Machine protection I/O module including terminal card (maximum four per rack)
- **CMON 2103**: Condition monitoring processing (CPU) module (one per CMON 2102)
- **CMON 2109**: Relay module and terminal card (one per CMON 2102 and maximum three per rack)
- **CMON 2202**: Power supply unit (maximum two per rack)

The Power of Knowledge Engineering

Drawing on five areas of competence and application-specific expertise amassed over more than 100 years, SKF brings innovative solutions to OEMs and production facilities in every major industry worldwide. These five competence areas include bearings and units, seals, lubrication systems, mechatronics (combining mechanics and electronics into intelligent systems), and a wide range of services, from 3-D computer modelling to advanced condition monitoring and reliability and asset management systems. A global presence provides SKF customers uniform quality standards and worldwide product availability.