User manual

SKF Multilog On-Line System IMx-S

User Manual Part No. 32087700-EN
Revision S – November 2019

> ***WARNING!*** *Read this manual before using the product. Failure to follow the instructions and safety precautions in this manual can result in serious injury, damage to the product, or incorrect readings. Keep this manual in a safe location for future reference.*

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SKF Group

Patents: US 4,768,380 • US 5,633,811 • US 5,679,900 • US 5,845,230 • US 5,852,351 •
US 5,854,553 • US 5,854,994 • US 5,870,699 • US 5,907,491 • US 5,992,237 • US 6,006,164 •
US 6,124,692 • US 6,138,078 • US 6,199,422 • US 6,202,491 • US 6,275,781 • US 6,301,514 •
US 6,437,692 • US 6,489,884 • US 6,513,386 • US 6,633,822 • US 6,789,025 • US 6,792,360 •
US 7,103,511 • US 7,697,492 • WO/2003/048714

Product Support – Contact Information

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For general product information (i.e., product data sheet, accessories catalog, etc.), visit the Condition Monitoring Products page on SKF.com and select the appropriate product link.

Technical Support Group

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Product Registration

Please take a moment to register your product at www.skf.com/cm/register to receive exclusive benefits offered only to our registered customers, including receiving technical support, tracking your proof of ownership, and staying informed about upgrades and special offers. (Please visit our website for more details on these benefits.)

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1
Introduction

Important Messages

The following messages are important information which require special care in order to have a safe and reliable IMx-S system.

Important messages, instructions and information in this manual must be carefully followed. Otherwise, harm might occur to equipment and/or personnel.

In order to install an IMx-S32-UPG-LMU (LMU/CMU upgraded to IMx-S32), installation must be done according to the "IMx-S32-UPG-LMU Installation manual".

In order to fulfil fire enclosure requirements, ensure the following:

- ***The cabinet must always be mounted using all four supplied mounting brackets.***
- ***All unused cable ways must be closed with the supplied blind plugs.***
- ***All cable glands and blind plugs must be made of material with fire protection V-1 or better.***

Important messages related to mains power (see Mains Power section as well):

- ***In some countries, the installer must be certified to install equipment such as an IMx-S.***
- ***Make sure that the power is disconnected before the installation begins.***
- ***Mains cable must be properly fixed with a cable gland to prevent the cord from strain, twist or movement. See Cable Glands section as well.***
- ***To prevent a hazardous event, mains cable neutral (N) and line (L1) wires must be secured together with a cable tie (for example, a nylon cable tie CV-100K) close to the mains power connector.***
- ***The system power supply must be provided with an external all pole power switch so as to be able to disconnect the IMx-S from mains power. The switch must be labelled "IMx-S" or similar with the On/Off position clearly marked. The switch must be located close to the IMx-S, within an operator's easy reach.***

An IMx-S contains circuit boards that are static sensitive. Therefore, use appropriate precautions to prevent ElectroStatic Discharge (ESD) when handling circuit boards.

Do NOT change DIP switch settings while the IMx-S unit is powered, as this may cause damage and void the warranty.

Before powering the IMx-S unit, make sure that DIP switch settings are properly set to match the recommendations for the connected sensors. Incorrect settings may cause permanent damage to the IMx-S unit.

All externally provided equipment must be evaluated individually and approved together with the IMx-S unit regarding EMC and safety requirements (CE and ETL). Always consult SKF before using the external mains output.

System Overview

The IMx-S is a part of the SKF Multilog On-line System product range and is designed to be used for a variety of condition monitoring applications. In conjunction with SKF @ptitude Observer or Analyst software, the IMx-S provides a complete system for early fault detection and prevention, automatic advice for correcting existing or impending conditions and advanced condition-based maintenance to improve machine reliability, availability and performance.

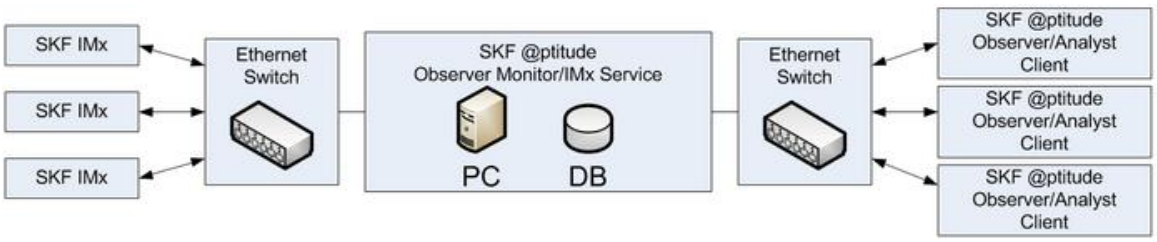


Figure 1 - 1.
System Overview, IMx-S with @ptitude Observer/Analyst.

The picture above illustrates how IMx-S units are linked together in a network that is connected via a LAN (it may also be a modem or GPRS router) to a SKF @ptitude Observer Monitor or Analyst IMx Service. The @ptitude Observer Monitor or Analyst IMx Service in turn can be connected to, for example, a LAN network making it possible for several @ptitude Observer or Analyst clients to access it.

@ptitude Observer or Analyst clients can also be installed on the same computer as @ptitude Observer Monitor or Analyst IMx Service login software. Through a general interface, also known as ODBC (open database connectivity), it is possible to link

@ptitude Observer Monitor or Analyst IMx Service login computer to an existing database for a control or processing system, if desired. @ptitude Observer Monitor or Analyst IMx Service, @ptitude Observer or Analyst clients and the database can be separated from each other as long as they are on the same network where ODBC calls can travel freely.

It is also possible to connect different types of on-line units in the same network, for example, IMx-S together with other IMx units and/or MasCon systems.

IMx-S Unit

Figure 1 - 2.
SKF Multilog On-line System IMx-S 16 (left) and IMx-S 32 (right).

IMx-S 16

- Up to 16 analogue channels.
- Up to 8 digital sensors, where 4 of the digital input channels are configurable for all standard trigger sensors and 4 channels for square pulses with trigger level 12 to 24 V.
- Each IMx-S 16 unit has 8 MB flash memory with the following storage capacity:
  - 2 MB for firmware, configuration files, etc.
  - 2 MB for trend value buffer.

    About 13 000 vibration trend values can be buffered.

    Speed and process data use half the space of vibration.
  - 4 MB for spectra and time signal buffer.

    About 250 spectra using 1 600 lines with phase and time signal can be buffered.

    If more lines are used, the number of spectra is reduced.

If less lines are used, the number of spectra is increased.

– When the buffer gets full, the oldest data is thrown away.

IMx-S 32

An IMx-S 32 is essentially composed of two IMx-S 16s.

- Up to 32 analogue channels.
- Up to 16 digital sensors with 8 configurable digital input channels for all standard trigger sensors and 8 channels for square pulses with trigger level 12 to 24 V.
- IMx-S 32 unit has two CPU cards. Each CPU card separately has 4 MB flash memory with the same storage capacity of IMx-S 16.

IMx-S features

- Individual conditions for alert and danger may be set for each measurement point.
- Each channel has indicators for alert and danger. Alert and danger levels may be controlled by machine speed or load. However, it is also possible to manually bypass the alert and danger functionality.
- The unit's built-in hardware auto-diagnosis system continuously checks all sensors, cabling and electronics for any faults, signal interruption, short circuits or power failure.

Initiating an IMx-S

Initiating the IMx-S is straightforward.

- It uses an initiating program @ptitude On-line Device Configurator or Multilog IMx Configurator tool and a laptop computer using an RS232 serial interface.
- The network configuration parameters, such as IP address, IMx identification number, etc. are first stored in a separate configuration file, then transferred to the IMx-S memory. These are retained in the event of power loss, so that the IMx-S can start automatically when power returns.

System LED Indicators

An IMx-S has two system LEDs on the CPU card.

- Red **SYS** LED indicates system fault. On means that a system fault has been detected.

  ➢ Note that SYS LED is on for a short time when the system is cold booted or re-started.

- Green **PWR** LED indicates the status of power. On means that the power is Ok.

2
Installation

The installation of an IMx-S must be carried out according to the instructions and advice given in this manual. Any deviation from these directions can be made only after consulting with the SKF.

Installation errors can lead to a situation where the system does not work as intended and machinery faults go undetected. In case of questions arising during installation contact TSG (Technical Support Group) for advice.

- Installation errors that require the involvement of SKF personnel to rectify, may incur additional charges.

Safety Considerations

Observe all site safety requirements including any that may be specific to the machines or areas where the installation is being carried out. This will likely include, but not be limited to, PPE (personal protective equipment) and a permit to work.

Important – An IMx-S unit contains circuit boards that are static sensitive. Therefore, use appropriate precautions to prevent ElectroStatic Discharge (ESD) when handling circuit boards.

The following are some of the ways to prevent ESD when handling or transferring circuit boards:

- Use an ESD wrist strap
- Use a grounding mat
- Use correct packaging materials such as anti-static bags

Important - In order to fulfil fire enclosure requirements, the cabinet must always be mounted using all four supplied mounting brackets.

When mounting the IMx-S unit, make sure that it is firmly attached at a location where it is not unnecessarily exposed to radiant heat or strong magnetic fields.

The ambient temperature limits for the IMx-S can be found in the Environmental section of the Technical Data.

Scenario

Before beginning an installation, it is important to assess and evaluate the location where the system is to be installed and to plan how the installation should look after it has been completed. For guidance on how and where to attach sensors to machines

being monitored, refer to the instruction manual: “Attaching Sensors for SKF Multilog On-Line Systems”.

Make a detailed layout of the equipment and note distances between components and the networks to which it should connect. Amongst other things, consider the lengths of all cables, their routing, where electrical power for the unit can be sourced and any interfaces to the plant systems. Good and thorough planning is the basis for a successful installation and system implementation.

Include specifically the IMx-S units, the @ptitude Observer Monitor or Analyst IMx Service computer, the database server computer and all hubs/routers in the network. Specify network configuration of each components, such as IP addresses and subnet masks. SKF application engineers or TSG personnel will need this information in order to assist.

Note that a CAT5/6 Twisted Pair (TP) Ethernet cable has a maximum working distance of 100 m. If longer cable lengths are needed, fibre optic cables may be used along with appropriate converters for fibre optic to CAT5/6 (TP) Ethernet and vice versa.

When GPRS is used, the GPRS routers should be reconfigured as a part of the application to run a lifeline connection with the Observer Monitor or Analyst IMx Service computer.

Important - Failure of this communication path will force the GPRS router to constantly reboot and can hamper the success of the application. This is especially important to consider when GPRS forms a part of the customers internal IP network (VPN). In such a case, SKF must be informed of this before ordering the GPRS, so that SKF can disable the lifeline functionality of the GPRS router.

Supply Cable

To connect IMx-S to 240 VAC or 120 VAC, the following is recommended:

- FKLK 3 x 1,5 mm2 (16 AWG) or EKLK 3 x 1,5 mm2 (16 AWG) or corresponding, with minimum voltage requirement 300 V and temperature range of -40 to +70 ºC (-40 to +158 ºF).

The IMx-S must be connected to protective ground/earth (PE). Refer to Mains Power for attaching power cable to the mains power/power grid.

Important - The cross-sectional area of the PE wire must be equal or greater than the cross-sectional area of the power wires. The PE wire should be colour coded green/yellow. However, in some countries, other cable requirements may apply.

Important - Mains cable must be properly fixed with a cable gland to prevent the cord from strain, twist or movement. See Cable Glands section as well.

Mains Power

Refer to Power Supply in Technical Data section for power requirements.

In order to attach power cable to the mains power grid, follow the directions below.

- First connect the green-yellow wire to the PE (protective earth) terminal.
- Connect the blue wire to the N (neutral) terminal.
- Connect the brown or black wire to the L1 (line) terminal.

Important - Make sure that the power is turned off before working with the power cable. Touching the leads of a powered cable can cause serious injuries.

Important - In some countries, the installer must be certified to install equipment such as an IMx-S.

Important - For permanently connected IMx-S an external all pole power switch must be installed in order to be able to disconnect the IMx-S from the mains power grid. The switch must be labelled "IMx-S" or similar. On/Off position must be clearly marked. The switch must be located close to the IMx-S, within operator's easy reach.

Important – The fuse holder CANNOT be used as a mains power disconnect device.

Important - In order to prevent a hazardous event, mains cable neutral (N) and line (L1) wires must be secured together with a cable tie (for example, a nylon cable tie CV-100K) close to the mains power connector.

Important - All externally provided equipment must be evaluated individually and approved together with IMx-S unit regarding EMC and safety requirements (CE and ETL). Always consult SKF before using the external mains output.

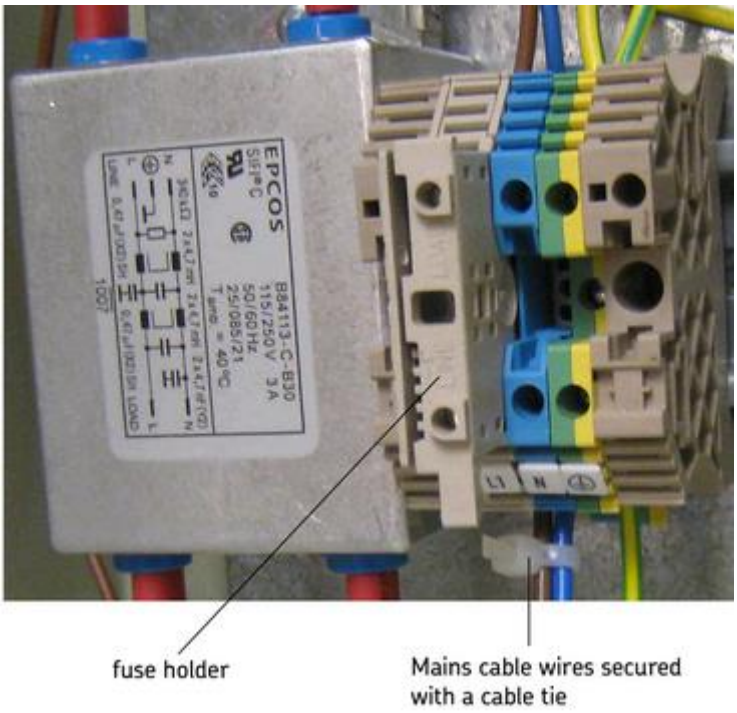


Figure 2 - 1.
IMx-S Mains Power and Fuse Holder.

As shown in the picture above, the incoming supply live terminal incorporates a fuse holder that is fitted with a slow blow T2A, 250 V, 5 x 20 mm, fuse.

Sensor Cables

When routing a sensor cable, it is important that the cable is firmly fixed. The cable must not be allowed to vibrate or oscillate, since this affects the capacitance of the cable, and thereby the measurement result.

The sensor cable should not be routed or bundled together with supply cables since they generate strong magnetic fields.

To connect the IMx-S to sensors, the following sensor cable type is recommended:

- Shielded, twisted pair $2 \times 2 \times 0{,}5$ mm^2 (FKAR-PG $2 \times 2 \times 0.50$, DUE 4002 or corresponding)

See also Cable Glands section.

Ethernet Cable

For lengths up to 15 metres, it is recommended to use pre-fabricated Ethernet twisted pair cable FTP type, CAT5/6.

For longer cable lengths, it is recommended to use S-FTP (screened shielded twisted pair) Ethernet cable CAT5/6.

Important - In general, all cables must be routed as far away as possible from high voltage cabling. If this cannot be done, care should be taken to use high quality shielded cables, such as S-FTP (screened shielded twisted pair) CAT6 for the network. In difficult cases, it is the safest to use fibre optic cables.

Ethernet Connections

The IMx-S unit data communications are compliant with the Ethernet standard 10/100 Mbit (half- and full-duplex).

An IMx-S has two, RJ45, Ethernet ports which work like an internal network switch. The Ethernet TP cable should be connected to one of these ports.

Both Ethernet ports have auto detection of crossover or straight through Ethernet cable connection. Basically, an IMx-S has a built-in 2-port Ethernet switch. It is possible to connect several IMx-S units in a daisy chain with up to 8 units in a single cable layout.

There are two LEDs on each RJ45 connector.

- Green LED is the Ethernet link indicator that lights up when the system is correctly connected to another network device.
- Yellow LED is the Ethernet traffic indicator that flickers whenever there is traffic on the network.

Cable Glands

If cable shields are to be grounded to the IMx-S unit, then metallic EMC type cable glands with a 360-degree shield connection are recommended for all cable types except the mains and communication cable.

- Avoid ground loops via the sensor cables by preferably connecting the shield at, and only at, the IMx-end.
- Ensure the metal/EMC cable gland has a good 360-degree connection to the IMx-S enclosure (nut or washer must penetrate any paint or coating on the box).

Important - All unused cable entries must be closed with blind plugs. All cable glands and blind plugs must be made of material with fire protection V-1 or better. All cable glands must also meet or exceed IP65 so as to maintain the IP rating of the enclosure.

3
Unit Configuration

In general, when referring to DIP switch settings 0 means Off and 1 means On:

Table 3-1: DIP switch setting definition.

DIP Switch Setting	Definition
0	OFF
1	ON

Analogue Inputs

The figure below shows the screw terminal connections for the IMx-S.

Important - The sensor shield should be connected either to the sensor or to the IMx-S unit depending on the cable and the sensor type. To avoid ground loops the sensor shield should be connected only at one end.

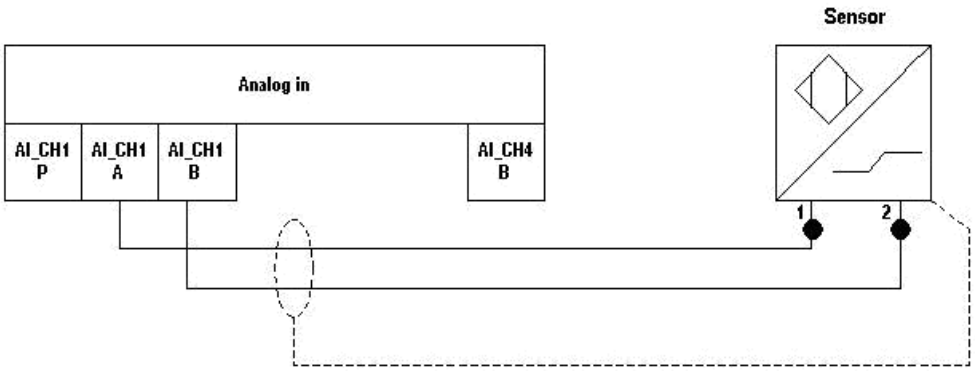


Figure 3 - 1.
IMx-S Terminal Connection, Standard Accelerometer.

The IMx-S I/O board along with the corresponding analogue terminal list are shown below.

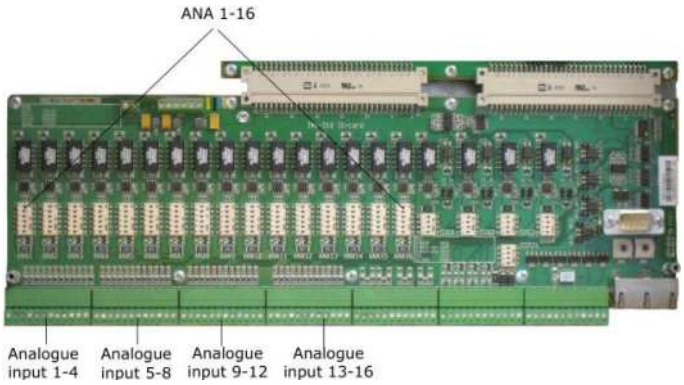


Figure 3 - 2.
IMx-S I/O Board, Analogue Inputs.

Table 3-2: Analogue terminal list.

The DIP switch settings for connected analogue sensors must be applied according to the table below.

Table 3-3: DIP switch settings for analogue sensors.

Signal	Terminal		DIP Settings position: 123456
Standard accelerometer (2-wire, IEPE)	N.C. + Signal/Pwr Com.	Pwr A B	100110
Voltage source	N.C. + Signal Com.	Pwr A B	000000
4–20 mA source	N.C. + Signal – Signal	Pwr A B	000001
B-sensor (4–20 mA output)	+24 V Signal Com.	Pwr A B	100101
Eddy current probe (–24 V)	–24 V Signal Com.	Pwr A B	011000
Voltage powered sensor (max 35 mA)	+24 V Signal Com.	Pwr A B	100100
4–20 mA (IMx powered)	+ Signal – Signal N.C.	Pwr A B	100101

N.C. = Not Connected
DIP switch setting 1 = ON, 0 = OFF

At maximum ambient temperature, the total sensor power from all inputs must not exceed:
IMx-S 16 10 W
IMx-S 32 10 W (at 60 ˚C [*140 °F*] only IEPE sensors are recommended)

At lower temperatures more total sensor power is allowed; please contact TSG or an SKF application engineer.

Important - Do NOT change DIP switch settings while the IMx-S unit is powered, as this may cause damage and void warranty.

Important - Before powering the IMx-S unit, make sure that DIP switch settings are properly set to match the recommendations for the connected sensors. Incorrect settings may cause permanent damage to the IMx-S unit.

Digital Inputs

The IMx-S I/O board along with the corresponding digital terminal list are shown below.

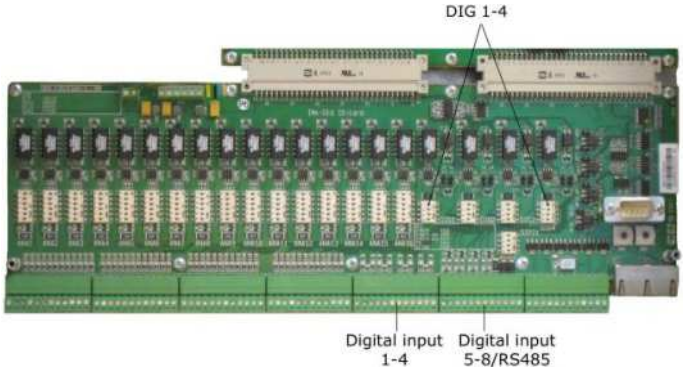


Figure 3 - 3.
IMx-S I/O Board, Digital Inputs.

Table 3-4: Digital terminal list.

49		61	
Dig1 A		Dig5 A	
Dig1 B		Dig5 B	
Dig1 O		Dig6 A	
Dig2 A		Dig6 B	
Dig2 B		Dig7 A	
Dig2 O		Dig7 B	
Dig3 A		Dig8 A	
Dig3 B		Dig8 B	
Dig3 O		N.C	
Dig4 A		RS485 A	
Dig4 B		RS485 B	
Dig4 O		GND	

Digital inputs 1 to 4 (Dig1 to Dig4) are configurable via DIP switch settings. These must be set according to the table below.

Table 3-5: DIP switch setting for digital sensors.

Signal	Terminal		DIP Settings position: 1234 (with I/O-board version less than v1.24)	DIP Settings position: 1234 (with I/O board v1.24 or greater, with a hole in front panel for DIP21)
Tacho 2-wire (24 V internally powered, max 30 mA)	+ – N.C.	A B O	1010	1011
Tacho 3-wire NPN (24 V internally powered, max 30 mA)	Brown (+24 V) Black (Signal) Blue (0 V)	A B 0	0100	0101
Tacho 3-wire PNP (24 V internally powered, max 30 mA)	Brown (+24 V) Black (Signal) Blue (0 V)	A B 0	1010	1011
Pulse 12–24 V (external power)	+ – N.C.	A B O	0100	0101
Pulse TTL (external power)	N.C. + –	A B 0	1010	1010

N.C. = Not Connected
DIP switch setting 1 = ON, 0 = OFF
DIP position 4 has no effect on the older I/O board (less than V1.24).

Digital inputs 5 to 8 (Dig5 to Dig8) are non-configurable and sensor power is from external source.

They are only used for externally powered signals with signal level of 12 to 24 V, square wave signal.

Table 3-6: Digital inputs 5 to 8 terminal list.

Signal	Terminal	
Pulse 12–24 V (external power)	+ –	A B

RS485 Communication

Twisted pair shielded cable shall be used.

> ***Important - Connect the shield only at one end to avoid ground loops.***

The cable connection should be according to the following:

Table 3-7: Cable connection.

IMx-S	RS485 Equipment
RS485 A Out	A
RS485 B Out	B

If the IMx-S unit is at the end or beginning of the RS485 Bus, activate the built-in termination resistor by setting DIP21 according to the table below. DIP21 can be accessed after the front panel has been taken off. It is located below the Dig3 DIP switch.

- On newer systems there is a hole in the front panel for DIP21 (no need to remove front panel).

Table 3-8: DIP21 functionality.

DIP21 settings position: 1234	Functionality with I/O board version less than v1.24 (DIP21-switch with 4 positions)
0100	Termination resistor enabled RS 485
0000	Termination resistor disabled RS 485
DIP21 settings position: 123456	**Functionality with I/O board v1.24 or greater (DIP21-switch with 6 positions)**
011010	Termination resistor enabled
001010	Termination resistor disabled

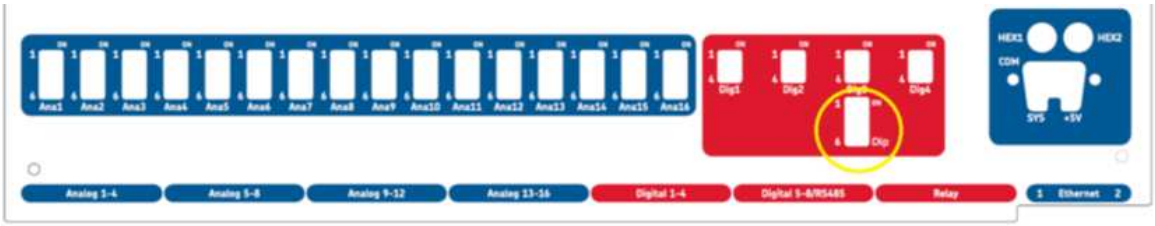


Figure 3 - 4.
Front Panel with DIP21 Hole (I/O board v1.24 or Greater).

This 2-wire RS485 communication supports Modbus RTU protocol in which the IMx-S can be configured as a Modbus master or as a Modbus slave device. For more information regarding RS485/Modbus and the different configurations that are supported, refer to the appropriate user manual, "Modbus for SKF IMx and @ptitude Observer" or “Modbus for SKF IMx and @ptitude Analyst” and also the application note “General Modbus Protocol Considerations for IMx-Devices" .

Relay Driver Outputs

The IMx-S I/O board has a total of five, relay driver outputs, the board along with the corresponding relay terminal list are shown below.

Figure 3 - 5.
IMx-S I/O Board, Relays.

Table 3-9: Relay output connection list.

Dig +12V	73
Dig1 OUT	
Dig +12V	
Dig2 OUT	
Dig +12V	
Dig3 OUT	
Dig +12V	
Dig4 OUT	
Dig +12V	
SYSTEM OUT	
Dig1 In Buf Output	
GND	

Software Controlled Relay Outputs

Each IMx-S 16 has four and IMx-S 32 has eight software controlled relay driver outputs labelled as Dig1 OUT through Dig4 OUT (see terminal list above). These relay driver outputs can be connected to relays as shown in the figure below.

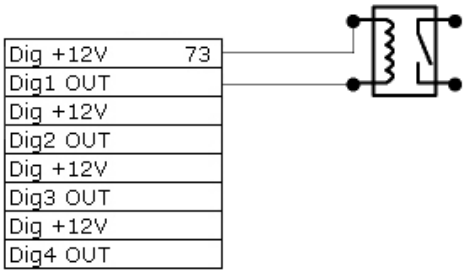


Figure 3 - 6.
Relay Driver Output Connections.

Note that terminals Dig +12V always have the voltage +12 V, whereas terminals Dig1 OUT to Dig4 OUT are low side drivers known as open collectors.

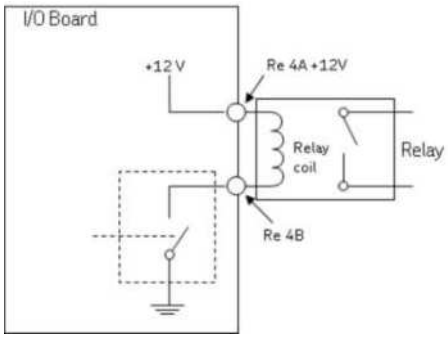


Figure 3 - 7.
Relay Open Collector Driver Showing Alarm Inactive.

System Relay Output

The relay driver output labelled SYSTEM OUT can be connected and used as an external system alarm indicator.

This is a system fault relay drive that is hardware controlled and cannot be configured by software.

The system relay driver output is always activated whilst the system is Ok, a "Fail-safe" configuration.

Important - Total coil current for all five connected relays (Dig1 Out to Dig4 Out and SYSTEM OUT) should not exceed 300 mA.

Dig1 Buffered Output

Each IMx-S 16 has one and the IMx-S 32 has two digital buffered outputs labelled as Dig1 In Buf Output (a buffered copy of the Dig1 input) as shown in Relay terminal list table, above.

- Dig1 In Buf Output copies and buffers the signal from digital channel 1 labelled as Dig1.
- This output is a low-side switch to GND. (The output does not provide any signal power, just short to GND.)
- This output can be directly connected to a two-wire tachometer input in the other IMx I/O board.

  – Connect Dig1 In Buf Output to Tacho 2-wire input A and connect GND to Tacho 2-wire input B.
- Dig1 In Buf Output and GND are located in last two pins in the relay terminal block.

  ➢ On I/O board v1.24 and greater, those with a hole in front panel for DIP21, the phase of the buffered output has been inverted. This 'inverted' buffered out will then have the same phase as the input signal.

- This method of cascading a digital input across multiple IMx-S is limited to applications where the signal frequency is no more than 9 kHz. This may therefore be unsuitable for applications where a high number of pulses per rev are being used.

Network Configuration

An IMx-S 16 has one identity number that needs to be configured and also it has to be assigned one IP address. An IMx-S 32 unit is essentially composed of two IMx-S 16 units; therefore, it has two (2) identity numbers that need to be configured and also it has to be assigned with two IP addresses.

The identity numbers must be between 1 and 255 and unique to the database to which the device is connected. Keep in mind that most of the time, all IMx-S units are on the same network and database, therefore units can NOT have the same IP address or the same unit ID.

Configuration also requires the network settings (IP address and port number) of the @ptitude Observer Monitor or Analyst IMx Service to which the IMx will be connected.

Network configuration uses:

- For Observer clients: Online Device Configurator. For detailed information, refer to the @ptitude Observer On-line Device Configurator User Manual.
- For Analyst clients: Multilog IMx Configurator in Admin Tools under SKF @ptitude Monitoring Suite.

There are two ways to configure a network and ID configuration:

- by Software: is configured by the software via On-line Device Configurator or Multilog IMx Configurator.
- by Hardware Switches: by configuring HEX rotary switches manually.

Configuration by Hardware Switches

If the network is being configured manually by hardware, the following points must be considered:

- The factory default configuration for the TCP/IP address is 10.0.0.1XY.
- The network configuration requires that the first three parts of the IP address are set at the Create IMx/MasCon16 Config screen of the On-line Device Configurator or Multilog IMx Configurator.
- The last, fourth, part of the IP address will be set by the HEX rotary switches on the IMx-S unit.
- For example, 10.0.0.1XY, where XY will be derived from the HEX rotary switches.
- These last two digits will also form the unit ID.
- The HEX rotary switches are located on the front panel, right hand side marked as HEX1 and HEX2 above the Ethernet connectors.
- The HEX rotary switches have to be set manually with a small screwdriver.

Table 3-10: TP/IP address/Unit ID when configured by HEX rotary switches.

TCP/IP address/Unit ID	HEX1 (x10)	HEX2 (x1)
Software defined	0	0
01	0	1
02	0	2
↓	↓	↓
99	9	9
Factory default configuration TCP/IP address: 10.0.0.1XY		

Configurator (RS232) Interface

The RS232 interface is only used to set the neccessary network configuration parameters.

The RS232 connector is located on the right-hand side of the IMx-S front panel, labelled as COM.

Use a suitable USB to RS232 converter or serial null modem cable with a 9-pin, female, D-SUB connector to connect to the IMx-S.

It is recommended to use a short length cable for the RS232 interface in order to maintain full communication speed.

Important – the RS232 connector is to be used only whilst the necessary basic network configuration setup is being done. The cable should not be connected to, or left connected to, the RS232 connector at any other time.

Table 3-11: RS232 connector pinout.

RS232 Connector Pinout	
Pin	**Description**
1	N.C.
2	Rx
3	Tx
4	N.C.
5	GND
6	N.C.
7	N.C.
8	N.C.
9	N.C.

N.C. = Not Connected

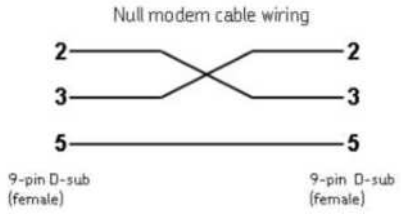


Figure 3 - 8.
Null Modem Cable Wiring.

IMx-S Time

IMx-S has a backup power capacitor which will keep the time for at least a month if IMx-S is disconnected from a power inlet.

To correct or set IMx-S time, use one of the following methods.

- **Automatic time synchronization**

  This method is preferable since the IMx-S will continuously synchronize the time with the computer that has @ptitude Observer Monitor or Analyst IMx Service running.

  The IMx-S uses a built-in function (NTP) in Windows for time synchronization.

  In order to activate time synchronization, refer to Time Synchronization chapter in "@ptitude Observer Installation Manual".

- **Manual set time**

  Use "Set time" function in @ptitude Observer or @ptitude Analyst application.

  In @ptitude Observer, the function is found under a tab menu called "On-line", then "MasCon/IMx units" interface.

  In @ptitude Analyst, the function is found at Transfer / Online / Status.

4
Hardware Maintenance

The IMx-S hardware, i.e. the IMx-S unit is maintenance free. However, customers are advised to undertake an annual visual inspection of the equipment.

5
Troubleshooting Guide

This section is intended as an aid to fault finding, on an IMx-S system. It is designed for instrumentation engineers and others with sufficient knowledge of electrical troubleshooting including safe working procedures, on mains powered electronic systems. Be aware that invasive troubleshooting may cause changes in alarm or channel status in the IMx-S and any interconnected systems.

Whilst striving to provide information that is as accurate as possible, SKF cannot be held responsible for any injury or damage to persons or material that occur in the interpretation of or due to actions taken, based on information in this document.

> ➢ Note - The product warranty will be invalidated if the IMx-S is damaged through an incorrect hardware configuration, or if incorrect connections have been made that expose any sub-system or circuit to voltages above their operational rating.

Sensor circuits

Possible causes for a 'non-responsive' sensor include:

- Cable damage, with an open or short circuit in the sensor cable
- Miswiring
- Incorrect DIP switch configuration
- Incorrect software configuration
- Sensor fault
- Hardware fault in IMx-S
- Tacho only: Speed signal 'too weak'/impedance too high for IMx-S

In addition to, most of, the above, where the sensor generates a higher than expected or widely varying signal, consider also the following possible causes:

- Incorrectly mounted or loose sensor
- Excitation of sensor mounted resonance
- Signal disturbance due to external noise (for example RFI)
- Grounding issue
- Eddy current probe only: shaft surface damage, probe circuit common inadvertently grounded at an uninsulated in-line connector or due to cable damage

After a visual inspection, deeper troubleshooting of a sensor circuit requires the use of suitable test equipment, minimum being a digital multimeter (DMM).

> *When using test equipment to measure within 'electronic control circuits' such as sensor wiring, be aware that even 'simple' equipment such as a DMM measuring DCV can in some circumstances significantly alter the circuit behaviour. Be particularly cautious of using instruments that have a 'low impedance measurement function to simultaneously test for voltage or continuity' and ensure the DCV measurement is being made in a high impedance mode.*

Checking vibration channels

The following flow steps can generally be used to troubleshoot a 2-wire accelerometer that is non-responsive. It is based on checking for the presence of a Bias Output Voltage (BOV) in an acceptable or expected range.

1. Identify the input terminals where the channel in question is connected to the IMx-S and measure the DC voltage between the sensor wires at the terminal block using a digital voltmeter.
2. Is the measured voltage within the expected normal working range? For a typical accelerometer this would be 8 to 12 V DC.

   NO: Skip to step **3**.

   YES: The cabling to the sensor is probably OK and the sensor interface to the IMx-S is normal. If the sensor output signal is still perceived as incorrect, then check the transducer mounting and try substituting the sensor.

   a. Did the fault remain after checking the mounting and changing the sensor?

      NO: If substituting the sensor cleared the fault then the sensor was defective and should be replaced.

      YES: The fault may be in the analogue input section of the IMx-S device. Contact TSG for advice and further information.

3. Is the voltage close to zero (typical < ±0,5 V)?

   NO: Skip to step **4**.

   YES: Now, verify that the voltage rises to normal open circuit voltage (about 24 V DC) when one of the sensor wires is disconnected from the terminal block of the IMx-S device.

   a. Did the voltage rise to normal open circuit voltage?

      NO: The IMx-S is not providing sensor power. Check that the IMx-S is correctly configured to supply sensor power for this channel. If properly configured, then the IMx-S may be damaged. Contact TSG.

      YES: Continue.

   b. The fault is in the sensor or its cable. Go to the sensor and disconnect the cable at this end. Reconnect the cable on the IMx-S terminal block and again measure the voltage across the two terminals. Does the short circuit remain (voltage close to zero)?

NO: The sensor is defective. Replace the sensor.

YES: The sensor cable (or contact/connector) has a short circuit and requires repair/replacement.

4. Is the voltage close to the open circuit voltage?

   YES: There is an open circuit in the cable or the sensor is damaged. Skip to step **5**.

   NO: If the voltage appears to be neither within the normal working range, close to zero nor close to the open circuit voltage, then the fault is an unusual one. First, recheck that the DCV measurement was correctly carried out, then contact TSG for advice.

Remaining faults can be due to a damaged sensor or a damaged IMx-S input circuit. First, disconnect one pole of the sensor cable and measure the open circuit voltage to verify whether the open circuit voltage is normal (about 24 V DC). If it is normal, then the fault is probably in the sensor, otherwise the fault is likely in the IMx-S.

5. Disconnect the connector from the sensor and short circuit the pins in the sensor contact, then re-measure the voltage on the IMx-S terminal block. Did the voltage sink to close to zero (<0,5 V)?

   NO: There is an open circuit in the cable. Repair/replace the cabling.

   YES: There is an internal open circuit in the sensor or there is a bad/oxidised contact. First, try cleaning the contact before replacing the sensor connector and checking again.

Checking eddy current probe inputs

Like troubleshooting a 2-wire accelerometer, the checking of eddy current probe inputs includes confirming the presence of a return signal DC offset in an acceptable or expected range. In this case however, the sensors are 3-wire, so have a separate wire for the power supply, and that signal return DC is related to the gap between the probe and the target or shaft.

1. Identify the input terminals where the channel in question is connected to the IMx-S and first measure the sensor power supply voltage between Pwr and B at the terminal block, using a digital voltmeter.
2. Is the measured voltage as expected? For an eddy current probe system this should be close to -24 V DC, a significantly lower voltage would indicate a fault.

   Yes: Skip to step **3**.

   No: Now remove the sensor wiring from the Pwr terminal and recheck.

   a. Did the fault remain?

      NO: The sensor circuit appears to be excessively loading the power supply. Check the sensor circuit cabling for the presence of a short, a similar measurement with the sensor wiring disconnected at the driver end can be used to indicate whether the fault lies with the cabling or the driver. Repair or replace as required.

      YES: Check first the configuration settings for this channel, especially the DIP switches. If all appears as expected, the fault may be with the IMx-S device, contact TSG for advice and further information.

3. Now check the return signal DC bias, between the A and B terminals. As mentioned the expectation is that this will vary according the probe/shaft gap, but for an 'in-range' measurement can be generally expected to be between -2 and -18 V DC. Is the return voltage consistent with the probe gap?

   NO: Skip to step **4**.

   YES: The sensor circuit appears to be responding as expected. The fault may be with the IMx-S device or the software configuration, contact TSG for advice and further information. If the appropriate work permit and machine isolations are in place to allow the probe itself to be checked

4. Now continue the checks at the eddy current probe, driver. Is the power supply voltage at the driver close to -24 V DC? Note that the value measured at the driver can be expected to be a little lower in magnitude than that measured at the IMx-S terminals, due to voltage drop.

   YES: Skip to step **5**.

   NO: A cable fault, likely an open or high resistance connection on the Pwr or common lines, is indicated as the power supply does not seem to be reaching the driver as expected. Repair or replace as required.

5. At the eddy current probe driver disconnect the signal wire and check the signal DC voltage at the driver. Is it consistent with the probe gap?

   NO: Skip to step **6**.

   YES: There is a disparity between the signal seen at the driver and that at the IMx-S terminals. Check for and repair or replace as necessary, an open circuit or poor connection in the cable signal core. If no cable fault is found recheck the return signal at the IMx-S but with the signal wire disconnected from the terminals. Contact TSG for advice and further information, advising them of the tests undertaken and the findings so far.

6. The tests carried out so far suggest the eddy current probe system is being powered correctly but is not generating the expected output. Providing the monitored machine is isolated and there are permits in place for such work, further possible checks are as follows:

   i. Carefully inspect the probe tip for damage and measure the gap to confirm it is in range.

   ii. Change the probe gap and monitor the driver output to check it changes appropriately. Alternatively as a quick function check, insert a screw driver blade or metallic feeler gauge between probe and shaft, in this case the magnitude of the output DC should reduce, towards its minimum value.

   iii. Changeout driver and/or probe and compare test results.

Checking 4-20 mA channels

In case of unexpected measurement values, check the hardware DIP switch settings are correct and review the channel configuration especially scale, zero level and choice of engineering units. Ensure the correct signal type has been chosen at the DIP switches and that the wiring is appropriately applied, noting particularly the difference between loop and IMx powered, 4-20 mA, circuits.

Confirm that the signal applied is a 4-20 mA and not for example 0 to 20 mA. Also, be aware that some 4-20 mA devices will set their outputs low (typically 2.9 mA) or high (typically 21 mA) to signal a sensor/circuit failure. In such circumstances the output current will be different to the source, measurement value.

1. Identify the input terminals where the channel in question is connected to the IMx-S and disconnect one signal wire from the terminal/connector and recomplete the circuit using a DMM set in current measurement mode. Is the measured current within the expected range, 4 to 20 mA DC?

   YES: Skip to step **2**.

   NO: This indicates a fault within the sensor loop, IMx load resistor or loop power supply. Recheck DIP switch settings and all loop connections. If the loop is IMx powered, disconnect the wiring to the Pwr terminal and check the voltage between Pwr and A terminals is around 24 V DC. In case of continued difficulty, contact TSG for advice and further information, advising them of the tests undertaken so far and details of the current loop being connected.

2. Does the measured mA current reasonably agree with the expected value from the sensor or system providing the signal?

   YES: Problem appears to be related to the IMx (hardware, installation or configuration). If on rechecking the aspects advised above, no reason for the measurement error is found, contact TSG for advice.

   NO: Recheck all loop wiring and where possible for test purposes, replace the sensor or loop source by something that will provide a known, fixed current output, then retest. In case of continued difficulty, contact TSG for advice and further information, advising them of the tests undertaken so far and details of the current loop being connected.

Checking analogue input channels

Analogue inputs refer to ‘other voltage inputs’ such as voltage sources or powered voltage sensors rather than accelerometers, eddy current probes or 4-20 mA signals. In case of unexpected measurement values, check the channel DIP switch settings and the configuration especially scale, zero level and choice of engineering units. Ensure that the cable check function enable/disable setting is appropriate for the signal applied.

1. Identify the input terminals where the channel in question is connected to the IMx-S and verify that the connections are correct. If all appears OK, measure the DC voltage across the channel input using a digital voltmeter. Is the voltage as expected for the connected signal type?

   NO: Continue to step **2**.

   YES: The sensor circuit and cabling appear essentially OK, double check the channel assignment and its configuration. If the measurement is DC and no reason for the measurement error is found, contact TSG for advice.

If the measurement is AC, it may be necessary to substitute another sensor or simulate a signal to effectively test the loop.

2. Disconnect the signal wire from terminal A and recheck the DC voltage between that and the common terminal, B. Is the voltage now as expected, for the connected signal, type?

NO: Problem appears to be related to the signal loop connected to the IMx input. Continue with further checks on the source equipment and the integrity of the interconnecting cables.

YES: Problem appears to be related to the IMx (hardware, installation or configuration) or to a compatibility issue with the sensor. If on rechecking the aspects advised above, no reason for the measurement error is found, contact TSG for advice.

Checking digital channels

Be aware that digital inputs 1 to 4 are configurable for different types of sensors, via DIP switch settings, whilst digital inputs 5 to 8 have fixed characteristics and provide no sensor power. Refer to Digital Inputs, for further detail.

Effective troubleshooting for tacho signals will likely require a handheld/portable oscilloscope or DMM with oscilloscope capabilities, a battery powered unit being preferred. It will be hindered if the IMx-S cannot be accessed when the speed signal is active.

1. Where applicable, check the sensor installation, the security of the mounting, the gap to the target and the differential gap between target and no target, conditions. Ensure these are acceptable for the sensor being used and that the sensor output will cross the trigger threshold for the particular IMx-S digital channel being used.
2. Identify the digital input terminals where the channel in question is connected to the IMx-S. Confirm that the wiring is correct for the sensor type in use and where applicable, the DIP switch settings are correct.
3. Is sensor power, supposed to be, supplied by the IMx-S?

   NO: Skip to step **4**, dynamic, oscilloscope checks

   YES: The sensor must use a digital channel in the range 1 to 4. Measure the DC voltage between the A (power) and 0 (common) terminals using a digital voltmeter.

   a. Is the measured voltage approximately 24 V DC, as expected?

   YES: Skip to step **4**, dynamic, oscilloscope checks

   NO: Disconnect the sensor cable from the A (power) terminal and recheck the voltage across the A and 0 terminals.

   b. Is the measured voltage now around 24 V DC as expected?

   YES: Double check that the sensor is compatible, especially that the sensor current requirement is within the capability of the IMx-S.

   To confirm a sensor/cable fault: if available try substituting an alternative sensor or confirm that in a known working installation the same type of sensor does not ‘load’ the IMx sensor power in this way.

   NO: The test suggests a fault in the IMx-S, contact TSG for further advice.
4. When a speed signal is expected to be present, observe the signal at the B (signal) and 0 (common) terminals on an oscilloscope. Is the expected pulsed waveform present?

   NO: Cable, sensor or installation issue. If practicable replace the sensor by a signal source to test the measurement chain, excluding sensor/target, and to verify

the cable integrity. If the sensor being simulated is an IMx powered 2-wire device, consider whether the signal generator can dissipate the worst-case power without damage, and if necessary or in doubt, decouple it from the IMx-S by a series capacitor.

YES: Verify that the signal has an appropriate voltage range and pulse height to allow the IMx-S to trigger. Check the software is correctly configured for this digital input. If no root cause is identified, contact TSG for further advice.

If a speed channel 'works' but gives an incorrect speed, check that the correct number of pulses per rev, have been configured in the software.

Relay driver outputs

1. Identify which relay driver output of the IMx-S, is being used for the alarm under investigation, the expected alarm state and consequently whether it is expected that the relay coil is currently being energised or not.
2. Is it expected that the coil should be energised?

   NO: Skip to step **4**.

   YES: Measure the DC voltage at the relay coil terminals, using a digital voltmeter.

   a. Is the measured voltage 12 V DC, as expected?

   YES: Skip to step **3**.

   NO: Disconnect the relay wiring at the IMx-S and recheck the voltage, across those terminals.

   b. Is the measured voltage now 12 V DC, as expected?

   YES: Double check that the relay is compatible with the IMx-S, especially that the relay current requirement is within its capability, considering also the total of all relays being used.

   Otherwise, a relay or cable fault is indicated.

   NO: Check again that the correct relay output is being tested and that the configuration is correct. If so, the test suggests a fault in the IMx device, contact TSG for further advice.
3. Disconnect the relay output wiring and using a DMM, measure resistance across the relay output terminals. Observe the reading and disconnect either of the connections to the relay coil. Has the reading changed (from an open to a low resistance or vice versa)?

   NO: A relay fault is indicated.

   YES: The IMx-S and relay sub-system seems as expected. Check the downstream system components: that the correct relay output contacts are being used, the power supply on the relay contact side, the 'detecting' device, etc.
4. Measure the DC voltage at the relay coil terminals, using a digital voltmeter. Is it approximately 12 V DC?

   YES: Check again that the correct relay output is being tested and that the configuration is correct. Check also that this relay is wired to the correct IMx-S, relay driver output.

If so, the test suggests a fault in the IMx device, contact TSG for further advice.

NO: The IMx-S relay driver output seems as expected. Check the downstream system components: that the correct relay output contacts are being used, the power supply on the relay contact side, the 'detecting' device, etc.

Connections to Monitor

In troubleshooting loss of connections to Monitor, in a multi-IMx system the type of fault can sometimes be inferred from knowing how many and which IMx have problems connecting. For multiple connection failures, consider first:

- Whether the PC hosting the Monitor service is currently operational.
- It can access and write to the database.
- If the status of the Monitor software is uncertain, try restarting the PC.
- Check for issues on the network infrastructure, from IMx to that PC.
- Any recent IT changes that may have impacted the system such as firewall, security changes, etc.

Where Monitor ceases to work with a certain IMx-S unit, consider also:

- Loss of power supply to the IMx-S unit.
- Hardware fault in the IMx-S unit, such as power supply or processor module.
- Break in or failure of the Ethernet network local to that IMx.

At the IMx-S level, check:

- System LEDs on the IMx-S unit. If the system LEDs are OK , check also the Ethernet LEDs on the RJ45 connectors being used.
- If the problem continues, contact TSG for advice and further guidance.

Checking Modbus RTU, RS485 communication

Communications can be affected by physical, typically wiring, issues for the RS485 bus, configuration issues related to the Modbus RTU protocol or in some cases third-party product not adhering to the Modbus RTU specification.

Physically these are, differential, 2-wire interfaces with the two wires marked as A and B. Whilst it is normal to connect 'A to A' and 'B to B' as indicated in Table 3-7, it is not unheard of, to have inconsistent marking on different manufacturer's equipment. So, when interfacing to 'new' equipment and experiencing problems it is worthwhile to test with the connections swapped, as no damage will be done by operating with swapped RS485 connections. Bear in mind if there are multiple issues, say a configuration problem and an incorrect connection, all issues will have to be solved before a communications test will be successful. Pay attention also to bus termination and grounding, as described in Table 3-8.

When using the interface, the connection will be between a single master and one or sometimes more slave devices, where each slave must have a unique address in the range 1 to 247. The master device initiates all communications the slave device only ever responds, if asked to send a reply. Incorrect addressing, such as a mismatch between the address at which the master understands the slave resides and that actual address, will result in unanswered messages.

The Modbus RTU protocol exchanges binary data across the bus. Detection of message start and message end rely on certain bit state combinations and inter-message minimum pauses, with no communications traffic. For each device on the bus to correctly interpret these from the electrical patterns on the bus requires an equal understanding of the bit allocations and the bit rate or baud rate, being used. Commonly an arrangement known as 8-N-1 (eight data bits, no parity bit and one stop bit) transmitted at 9 600 or 19 200 bits per second are used. If devices are differently set, by configuration or otherwise, communications will fail.

The Modbus RTU timing requirements also apply to responses sent when a slave device is answering a master device command: the response must not start until a time corresponding to 3.5 characters at the configured baud rate, has elapsed since the end of the command. SKF has identified that some Modbus transducers do not always adhere to these requirements and consequently a reply sent without observing the required 3.5 character gap risks not being recognised as a valid message. In this eventuality the IMx may be unable to successfully communicate with these Modbus slaves and unread and input ignored error messages, time-out and frame errors will result.

Note that although the 3.5 character gap is a hard requirement that should be observed by all Modbus RTU equipment, it is not an absolute cut-off because there is an ‘illegal’ timing area between 1.5 and 3.5 characters to allow inter character and inter message (frame) gaps to be reliably distinguished. Be aware that as a consequence non-compliant equipment may work in some test scenarios, such as with a PC master device, but not in others such as with an IMx master device.

If difficulty is experienced with a particular type of slave and this issue is suspected, where possible, it may be advantageous to increase the baud to 19 200 as at this higher rate any fixed response time will correspond to twice the character gap compared to 9 600 baud.

For further information on RS485 and Modbus RTU, refer to the documents listed in the RS485 Communication section.

When there is access to the IMx-S RS232 service interface, some further diagnostic checks are possible:

1. Start the @ptitude Observer, On-line Device Configurator.
2. Click **Start serial interface.**
3. On the Serial interface dialog, select the COM port number and type in the word "modbus" in the command box.
4. Statistics on communication errors and then summaries for each Modbus connection will appear on the screen.

   The statistics include:

   - Frame errors, short and long, and checksum errors

   Then for each connection the:

   - Number of messages sent (tx) and received (rx)
   - Number of request timeouts (to) and exceptions

   Each connection has an identifier, example RM1, that uses the following key:

   - T/R: TCP or RTU

- M/S: Master or slave
- Number: slave ID

5. A properly working Modbus communication link should exhibit increasing numbers of messages sent and received, without a significant increase in errors or timeouts.
6. In case of significant errors or timeouts, check the following aspects:
   - That the RS485 cable is correctly, physical connected
   - Transmission characteristics are configured correctly
   - The Modbus Master-Slave pair address is entered correctly
   - RS485 termination is done correctly
7. This process of checking Modbus communication can be repeated, as required during the installation/test to confirm communications activity or the lack of it.

6
Technical Data

Environmental

- Size (H x W x D):

  Standard cabinet:

  – IMx-S 16: 500 × 400 × 155 mm (*19.7 x 15.7 x 6.1 in.*)

  – IMx-S 32: 500 × 500 × 220 mm (*19.7 x 19.7 x 8.7 in.*)

  Stainless steel cabinet:

  – IMx-S 16: 500 × 400 × 210 mm (*19.7 x 15.7 x 8.3 in*.)

  – IMx-S 32: 500 × 500 × 220 mm (*19.7 x 19.7 x 8.7 in.*)

- Weight:

  Standard cabinet:

  – IMx-S 16: 15,0 kg (*33.1 lb.*)

  – IMx-S 32: 21,0 kg (*46.3 lb.*)

  Stainless steel cabinet:

  – IMx-S 16: 21,5 kg (*47.4 lb.*)

  – IMx-S 32: 23,1 kg (*50.9 lb.*)

- Stainless steel grade 304L
- IP rating: IP 65
- Temperature range: –20 to +60 °C (*–4 to +140 °F*)
- Stainless steel cabinet optional
- Measurement category II
- Pollution degree 2
- Maximum altitude: 2 000 m (*6 561.7 ft.*)

Power Supply

- 100 to 240 VAC, 47 to 63 Hz
- Power consumption:
  – IMx-S 16: 30 W
  – IMx-S 32: 60 W

Analogue Inputs

- Analogue differential inputs:
  - IMx-S 16: 16
  - IMx-S 32: 32
- Individual 24 V power supply, maximum 35 mA per channel
- Selectable standard accelerometer power supply (4 mA constant current)
- Input range: ±25 V
- Impedance: >100 kΩ

Digital Inputs

- Digital opto-isolated inputs:
  - IMx-S 16: 8
  - IMx-S 32: 16
- Individual 24 V power supply, maximum 30 mA per channel:
  - IMx-S 16: 4 channels
  - IMx-S 32: 8 channels
- Trigger level: 2,9 V
  - For inputs used with a ‘signal level of 12 to 24 V’ note that the pulse should be ≥ 12 V.

Outputs

- Relay driver outputs:
  - IMx-S 16: 4
  - IMx-S 32: 8
- System relay outputs:
  - IMx-S 16: 1
  - IMx-S 32: 2

Analogue Measurement

- 24-bit AD conversion enabling continuous transient capture (no gain or AC/DC switching necessary)
- True simultaneous sampling, with no multiplexing:
  - IMx-S 16: all 16 channels
  - IMx-S 32: all 32 channels

- 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% (up to 20 kHz), ±5% (20 to 40 kHz)
- Accuracy phase: ±3° (up to 100 Hz)

Digital Measurement

- Frequency range: 0,1 Hz to 20 kHz (I/O board v1.24 and later, DIP21-switch with 6 positions)
- Frequency range: 0,1 Hz to 12,5 kHz (I/O board older versions, DIP21-switch with 4 positions)
  - Required pulse width: > 4 μs for electrical positive
    > 40 μs for electrical negative
- Accuracy frequency: 0,05% of measurement value (typically 0,01% up to 2,5 kHz)
- Pulse counting

Signal Processing

- Time waveform
- Vector analysis with circular alarms
- FFT: 100 to 6 400 lines
- SKF's four enveloping bands
- Integration/Differentiation in frequency domain
- Window function: Hanning
- Customer formulated mathematical equations
- 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

Interface

- Ethernet:
  - 100 Mbit RJ45, TCP/IP
  - 2-port Ethernet network switch (possibility for daisy chaining between IMx-S)
- RS232 service interface

Data Processing

- 64 MB RAM for data processing (from serial number 12000)

Miscellaneous

- Calibration, traceable to BIPM
- CE certified according to EN61000-6-3 and EN61000-6-2
- Support IEC 61850

Quality Control

SKF Sverige AB, Luleå is ISO 9001:2015 certified.

7
IMx-S Drawings

IMx-S 16 Standard Cabinet

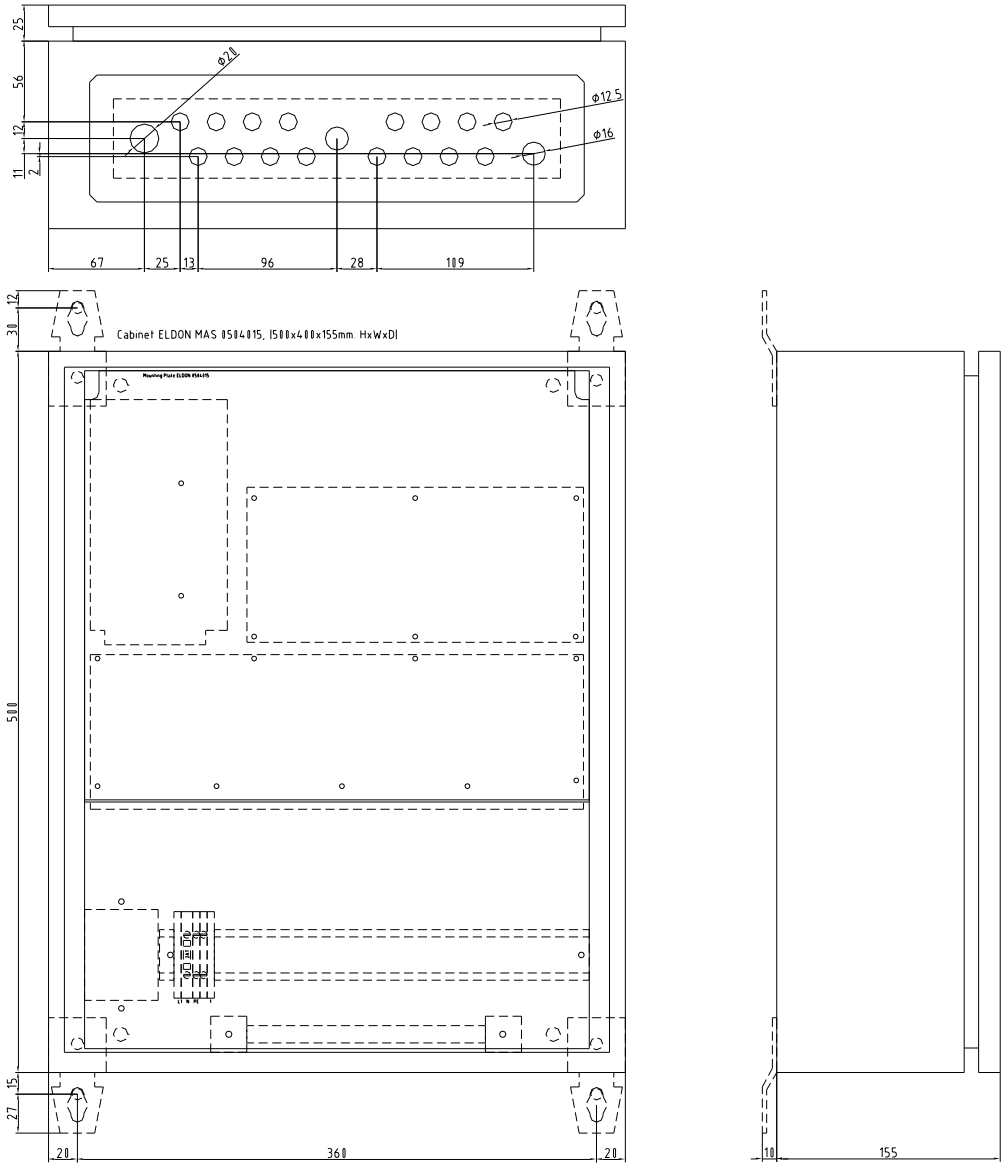


Figure 7 - 1.
IMx-S 16 Standard Cabinet.

IMx-S 16 Stainless Steel Cabinet

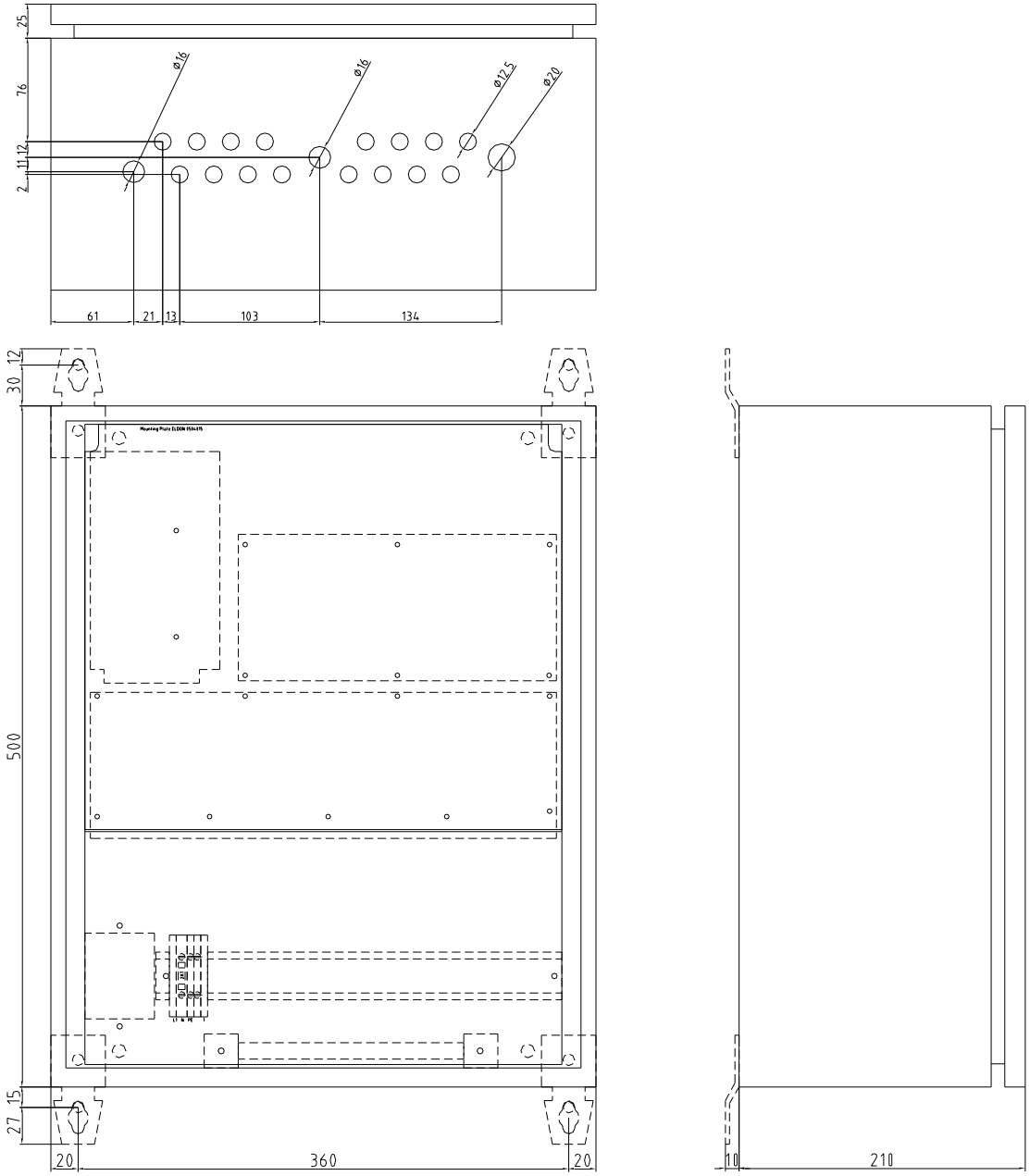


Figure 7 - 2.
IMx-S 16 Stainless Steel Cabinet.

IMx-S 32 Standard & Stainless Steel Cabinet

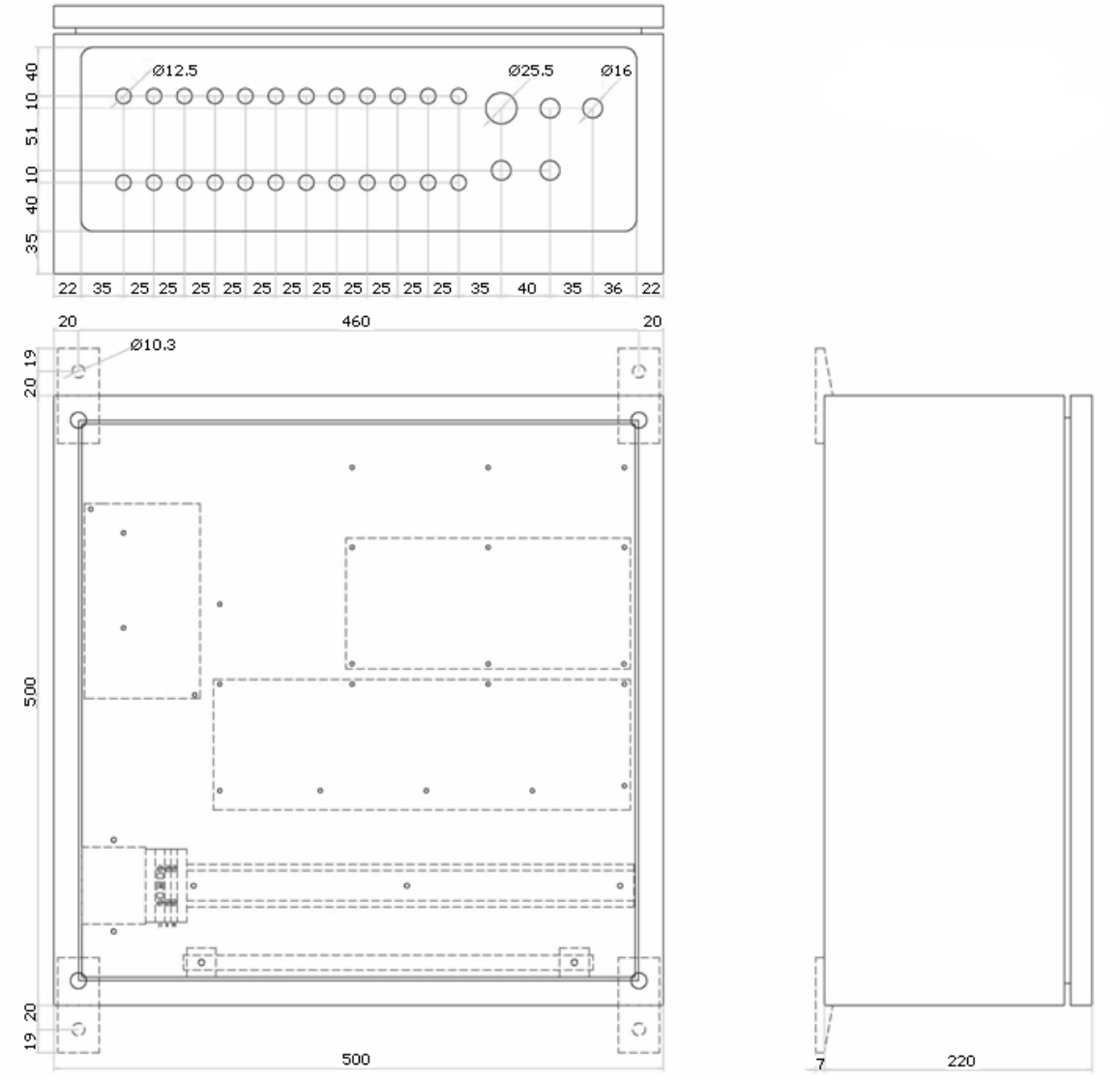


Figure 7 - 3.
IMx-S 32 Standard & Stainless Steel Cabinet.

Terminal List

Table 8-1: Terminal list.

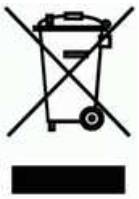
1 to 48

Ana1 Pwr	1
Ana1 A	
Ana1 B	
Ana2 Pwr	
Ana2 A	
Ana2 B	
Ana3 Pwr	
Ana3 A	
Ana3 B	
Ana4 Pwr	
Ana4 A	
Ana4 B	
Ana5 Pwr	13
Ana5 A	
Ana5 B	
Ana6 Pwr	
Ana6 A	
Ana6 B	
Ana7 Pwr	
Ana7 A	
Ana7 B	
Ana8 Pwr	
Ana8 A	
Ana8 B	
Ana9 Pwr	25
Ana9 A	
Ana9 B	
Ana10 Pwr	
Ana10 A	
Ana10 B	
Ana11 Pwr	
Ana11 A	
Ana11 B	
Ana12 Pwr	
Ana12 A	
Ana12 B	
Ana13 Pwr	37
Ana13 A	
Ana13 B	
Ana14 Pwr	
Ana14 A	
Ana14 B	
Ana15 Pwr	
Ana15 A	
Ana15 B	
Ana16 Pwr	
Ana16 A	
Ana16 B	

49 to 84

Dig1 A	49
Dig1 B	
Dig1 O	
Dig2 A	
Dig2 B	
Dig2 O	
Dig3 A	
Dig3 B	
Dig3 O	
Dig4 A	
Dig4 B	
Dig4 O	
Dig5 A	61
Dig5 B	
Dig6 A	
Dig6 B	
Dig7 A	
Dig7 B	
Dig8 A	
Dig8 B	
N.C	
RS485 A	
RS485 B	
GND	
Dig +12V	73
Dig1 OUT	
Dig +12V	
Dig2 OUT	
Dig +12V	
Dig3 OUT	
Dig +12V	
Dig4 OUT	
Dig +12V	
SYSTEM OUT	
Dig1 In Buf Output	
GND	

8
Electrical Waste



Electrical waste and electrical equipment should be recycled according to the WEEE-directive and not be placed in the general refuse. Product should be sent to an approved recycling centre for safe recycling, recovery, reuse or sent to SKF Sverige AB for proper recycling.

SKF Sverige AB
Aurorum 30
97775 Luleå
Sweden

Appendix A
Limited Warranty

SKF – Limited Warranty

WARRANTY

Subject to the terms and conditions contained herein and provided that there is no applicable written agreement between the selling entity in the SKF Group ("SKF") and the Buyer specifically covering the sale of the Products (as defined below) that includes a product warranty, SKF warrants to the Buyer that for the warranty period indicated below the products sold by SKF that are listed below (the "Products"), when properly installed, maintained and operated, will be free from defects in material and workmanship and shall be fit for the ordinary purposes for which the Products are designed.

BUYER'S LIMITED REMEDIES

This limited warranty defines SKF's sole and exclusive liability and Buyer's sole and exclusive remedy for any claim arising out of, or related to, any alleged deficiency in any Product sold by SKF, even if such claim is based on tort (including negligence or strict liability), breach of contract, or any other legal theory. If the Product does not conform to this limited warranty, Buyer must notify SKF or SKF's authorized service representative within thirty (30) days of discovery of the nonconformity; provided, however, that SKF shall not be liable for any claim for which notice is received by SKF more than thirty (30) days following the expiration of the applicable warranty period for the Product. Upon receipt of timely notification from Buyer, SKF may, at its sole option, modify, repair, replace the Product, or reimburse Buyer for any payment made by Buyer to SKF for the purchase price of the Product, with such reimbursement being pro-rated over the warranty period.

WARRANTY PERIOD

Except as expressly provided below, the warranty period for each Product shall commence on the date the Product is shipped by SKF to Buyer.

90-DAY WARRANTY

Products warranted for ninety (90) days by SKF are as follows: cable assemblies, MARLIN QuickConnect (MQC), magnetic temperature probes, and all refurbished equipment.

ONE-YEAR WARRANTY

Products warranted for one (1) year by SKF are as follows: all Microlog products and accessories, all Microlog Inspector applications including hand-held computers, all MARLIN data managers (MDM), all MARLIN Condition Detectors (MCD), all Wireless Machine Condition Detectors (WMCD), all Multilog Condition Monitoring Units (CMU, TMU), Multilog Local Monitoring Units (LMU), all Multilog Wireless Monitoring Units (WMx), Multilog On-line System Wireless Vibration Transmitter ISA100, all Wireless Monitoring Systems V/T, all Vibration PenPlus, all Machine Condition Advisors (MCA), all Machine Condition Indicators (MCI), all transmitters, all Monitor Interface Modules (MIM), all Machine Condition Transmitters (MCT), all MicroVibes and Custom Products with the prefix of CMCP (with the exception of any consumable or expendable items), Shaft Alignment Systems TKSA 60 and TKSA 80 including hand-held computer, measuring units and accessories.

TWO-YEAR WARRANTY

Products warranted for two (2) years by SKF are as follows: all standard Eddy Probes, Eddy Probe Drivers, and Eddy Probe Extension Cables, all Multilog On-line Systems (IMx) and all Wireless Machine Condition Sensors.
For all On-line Systems (as defined below) that have satisfied Criteria 1 and 2 below, the warranty period shall be either thirty (30) months from the date the On-line System is shipped by SKF to Buyer, two (2) years from the date the On-line System is installed and commissioned by SKF, or two (2) years from

the date on which the installation of the On-line System has been audited and commissioned by SKF or its authorized service representative, whichever period ends first.

Criteria 1.

Devices used with a Multilog On-line System (IMx), Multilog Condition Monitoring Unit (CMU), Multilog Local Monitoring Unit (LMU), including, but not limited to, the sensing device, the interconnect cabling, junction boxes, if any, and the communications interface, must consist only of SKF-supplied or SKF-approved devices and/or components. The computer provided by Buyer must meet the requirements stipulated by SKF.

Criteria 2.

SKF or its authorized service representative has installed the On-line System or has audited the installation and commissioned the On-line System.

"On-line Systems" are defined as systems consisting of Multilog On-line System (IMx), Multilog Condition Monitoring Unit(s) (CMU), Multilog Local Monitoring Unit(s) (LMU), and any sensing or input devices, the interconnect cabling between the sensing or input devices and the Multilog On-line System (IMx), Multilog Condition Monitoring Unit(s) (CMU), Multilog Local Monitoring Unit(s) (LMU), and the cabling between the Multilog On-line System (IMx), Multilog Condition Monitoring Unit (CMU), Multilog Local Monitoring Unit (LMU) and the proprietary SKF communications interface with the host computer.

FIVE-YEAR WARRANTY

Products warranted for five (5) years by SKF are as follows: special seismic sensors.

LIMITED LIFETIME WARRANTY

Products covered under this Limited Lifetime Warranty (as set forth below) are as follows: standard seismic sensors of the CMSS 2XXX and CMSS 7XX series (accelerometers and velocity transducers) as marked and published in the SKF Vibration Sensor Catalogue.

(A) Subject to the terms herein, SKF will provide a "Limited Lifetime Warranty" for the products specified above sold by SKF after April 15, 2014. Under the Limited Lifetime Warranty, those products shall, at the time of shipment, be free from defects in material and workmanship. If any of these products fail to meet the terms of this Limited Lifetime Warranty during the life of such products, SKF, in its sole discretion, will repair, replace or exchange the products for the same model if the necessary components for the products are still available to SKF on a commercially reasonable basis. SKF will not provide a Limited Lifetime Warranty on products damaged by accident, abuse, misuse, neglect, improper installation, problems with electrical power, natural disaster, or by any unauthorized disassembly, repair or modification.

(B) Upon receipt of any product covered by the Limited Lifetime Warranty, SKF will pay all shipping charges to send the repaired, replaced or exchanged product to the original point of shipment. SKF reserves the right to decline repair or replacement if no fault is found in the product.

(C) For any warranty claim, the original Buyer must provide SKF with the applicable model and serial numbers, the date of purchase, the nature of the problem, and proof of purchase. SKF, in its sole discretion, will determine if the Buyer must return the product covered under this warranty to SKF.

(D) The express warranty set forth in the Limited Lifetime Warranty is in lieu of and excludes any and all other warranties express or implied,

including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

(E) SKF's sole obligations under this Limited Lifetime Warranty are set forth in paragraphs (A) and (B), and SKF's liability under this Limited Lifetime Warranty shall not exceed the purchase price of the product, plus any shipping and handling charges that SKF may be obligated to pay pursuant to paragraph (B).

(F) **IN NO EVENT SHALL SKF BE LIABLE OR OBLIGATED TO THE BUYER OR ANY OTHER PERSON FOR SPECIAL, EXEMPLARY, PUNITIVE, INCIDENTAL, DIRECT, INDIRECT, GENERAL OR CONSEQUENTIAL DAMAGES (INCLUDING, BY WAY OF EXAMPLE ONLY, LOST PROFITS OR SAVINGS, LOSS OF BUSINESS OR LOSS OF USE) OR ANY OTHER LOSS, COST OR EXPENSE IN CONNECTION WITH THE PRODUCTS REGARDLESS OF WHETHER OR NOT ANY OF THE FOREGOING WERE FORESEEABLE OR THAT SKF WAS ADVISED AS TO THE POSSIBILITY OF SUCH DAMAGES, LOSS, COST, OR EXPENSE.**

(G) The Limited Lifetime Warranty applies solely to the original Buyer and is non-transferrable.

OTHER SKF PRODUCTS

Any SKF product supplied hereunder but not covered by this limited warranty shall be either covered by the applicable SKF limited warranty then in place for such product or, if no such warranty exists, shall be covered by the 90-day warranty stated above.

THIRD PARTY PRODUCT WARRANTIES

For any third party products sold to Buyer by SKF, SKF will transfer to Buyer any warranties made by the applicable third party product vendor to the extent such warranties are transferable.

CONDITIONS

As a condition to SKF's warranty obligations hereunder and if requested or authorized in writing by SKF, Buyer shall forward to SKF any Product claimed by Buyer as being defective. Buyer shall prepay all transportation charges to SKF's factory or authorized service center. SKF will bear the cost of shipping any replacement Products to Buyer. Buyer agrees to pay SKF's invoice for the then-current price of any replacement Product furnished to Buyer by SKF, if the Product that was replaced is later determined by SKF to conform to this limited warranty.

SKF shall not be obligated under this limited warranty or otherwise for normal wear and tear or for any Product which, following shipment and any installation by SKF (if required by the contract with the Buyer), has, in SKF's sole judgment, been subjected to accident, abuse, misapplication, improper mounting or remounting, improper lubrication, improper repair or alteration, or maintenance, neglect, excessive operating conditions or for defects caused by or attributable to the Buyer, including without limitation Buyer's failure to comply with any written instructions provided to Buyer by SKF.
SKF shall be free to conduct such tests, investigations and analysis of the Products returned to SKF, as it deems reasonable and proper in the exercise of its sole judgment. As a further condition to SKF's obligations hereunder, Buyer shall offer its reasonable cooperation to SKF in the course of SKF's review of any warranty claim, including, by way of example only, Buyer's providing to SKF any and all information as to service, operating history, mounting, wiring, or re-lubrication of the Product which is the subject of the Buyer's warranty claim.

EXCEPT WARRANTY OF TITLE AND FOR THE WARRANTIES EXPRESSLY SET FORTH IN HEREIN, IT IS UNDERSTOOD AND AGREED THAT:

(A) SKF MAKES NO OTHER WARRANTY, REPRESENTATION OR

INDEMNIFICATION, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT;

(B) IN NO EVENT SHALL SKF BE LIABLE OR OBLIGATED FOR SPECIAL, EXEMPLARY, PUNITIVE, INCIDENTAL, DIRECT, INDIRECT, GENERAL OR CONSEQUENTIAL DAMAGES (INCLUDING, BY WAY OF EXAMPLE ONLY, LOST PROFITS OR SAVINGS, LOSS OF BUSINESS OR LOSS OF USE) OR ANY OTHER LOSS, COST OR EXPENSE IN CONNECTION WITH THE PRODUCTS AND RELATED SERVICES, IF ANY, PROVIDED BY SKF, AND THIS DISCLAIMER SHALL EXTEND AS WELL TO ANY LIABILITY FOR NONPERFORMANCE CAUSED BY SKF'S GROSS OR ORDINARY NEGLIGENCE, AND IN ALL CASES REGARDLESS OF WHETHER OR NOT ANY OF THE FOREGOING WERE FORESEEABLE OR THAT SKF WAS ADVISED AS TO THE POSSIBILITY OF SUCH DAMAGES, LOSS, COST, OR EXPENSE; AND

(C) NO PERSON HAS BEEN AUTHORIZED BY SKF TO MAKE ANY FURTHER OR CONTRARY INDEMNITIES, REPRESENTATIONS OR WARRANTIES ON BEHALF OF SKF. THE FOREGOING LIMITATIONS AND DISCLAIMERS OF LIABILITY SHALL BE MADE APPLICABLE TO THE SALE OF ANY PRODUCT BY SKF TO THE FURTHEST EXTENT PERMITTED BY APPLICABLE LAW.

The exclusive remedies provided in this limited warranty shall not be deemed to have failed of their essential purpose so long as SKF is willing and able to perform to the extent and in the manner prescribed in this limited warranty.

CM-F0001 EN
Revision ZA, April 2018

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