

MasCon16W (WindCon, iMU)

Part No. 32110200
Revision B

User Manual

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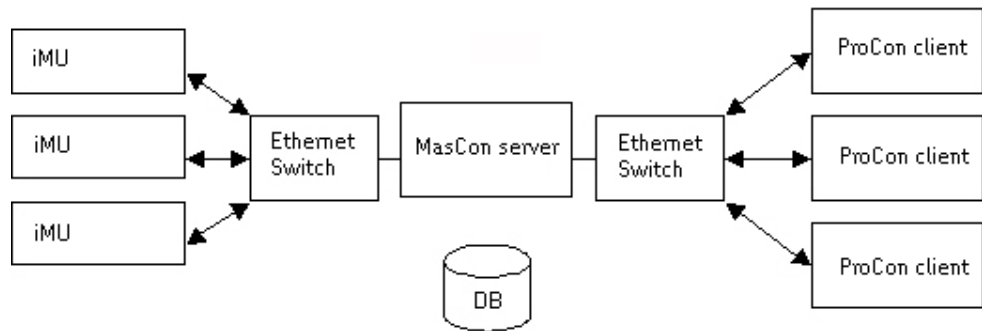
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System description

System overview



System overview, WindCon On-line system

In the picture above an On-Line solution is represented. iMU units are linked in a network that is connected via a modem or LAN to a MasCon Server. The MasCon Server in turn can be connected to e.g. a LAN network. Several ProCon clients may be linked in this network. ProCon can also be installed on the same computer as the logging server software. Through a general interface (ODBC) it is possible to link the logging computer MasCon Server to an existing database for an existing control or processing system if desired. The MasCon server, ProCon computers clients and the database can be separated from each other as long as they are on the same network so where ODBC calls can travel freely.

The iMU unit

The iMU unit is a modern industrial computer designed for on-line vibration monitoring. The unit is highly environmentally resilient, and is specially adapted for machines where damage develops rapidly and/or where periodical monitoring is difficult to carry out. The iMU unit should be mounted inside the nacelle, onto a vertical structure (e.g. wall), as far as possible from vibrating or high voltage objects.

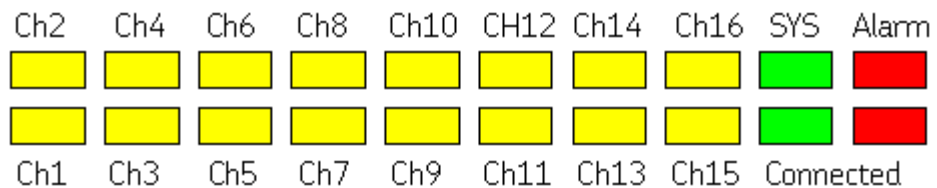


iMU unit

Up to 16 analogue and 2 digital sensors can be connected to each iMU unit. Initiating the iMU is simple to carry out. This is done via an initiating program and a (portable) computer. All initiation parameters are in a separate configuration file, and then transferred to the iMU memory with independent current supply in MasCon. These are then retained in the event of a loss of voltage, so that the iMU can start automatically when voltage returns. Initial configuration is done through a configuration program and transferred to the iMU units through a serial interface.

The system indicator LEDs

The iMU card have two rows of LEDs as shown in picture below. The sixteen yellow LEDs represent the sixteen analogue input channels. The upper green led indicates system status, and the lower green led indicates the status of connection to the MasCon Server. The last two red LEDs are for system warnings and alarms. Only one of these red LEDs is used for indication purposes.



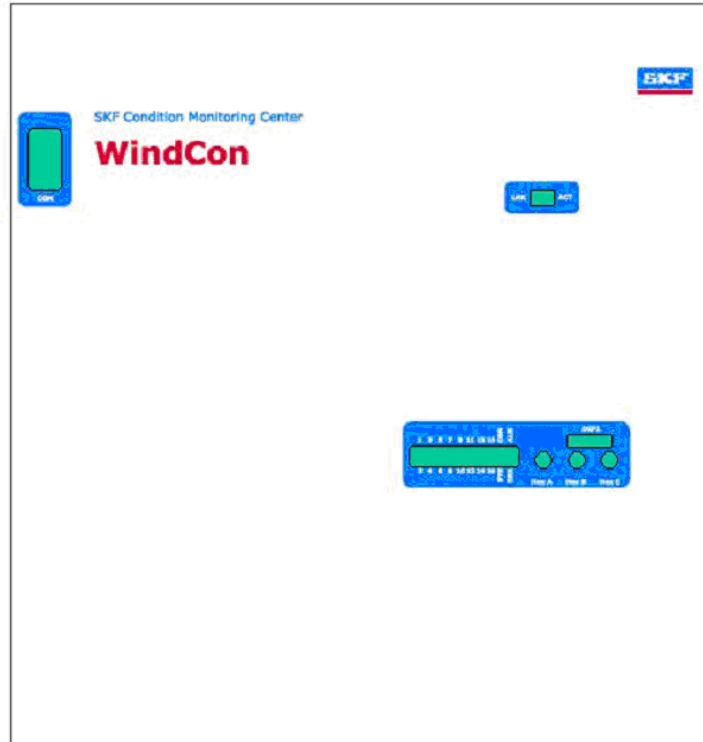
Indicator LEDs on the front panel

If the boot code does not discover any errors, or is manually halted, the main measurement software will be started. While the main software is reading the configuration and setting up the system the SYS will be blinking. All channels LEDs for which a sensor has been defined will be lit. When the system configuration is done the SYS led will stop blinking. There is a thirty seconds delay to ensure sensors are giving valid results before the system starts measuring.

If an alarm occur the LED for the actual channel will start blinking. Slow blink shows ALERT/WARNING and fast blink shows DANGER/ALARM. In combination with this, the

red ALARM LED will also light up. This only works after the iMU has already been configured and has taken some data for measurements because only then can alarms be checked according to the alarm and danger levels.

Installation directions



iMU

We expect that installation of a WindCon system be carried out in accordance with the instructions and advice given in this manual. Any deviation from these directions may be made only after consulting with the SKF WindCon team or personnel from SKF Condition Monitoring Center Luleå. In other cases, the installation will not be approved and start-up of the system will not be carried out until the errors are rectified.

Installation errors that the SKF Condition Monitoring Center Luleå personnel are required to rectify when the system is to be started up will be debited.

Safety and required conditions

Assess and evaluate the current site for safety instructions and stipulations.

During the installation work make oneself acquainted with the safety stipulations valid for the specific turbine. Different type of Wind Turbines can have different safety hazards and therefore different safety instructions. In all cases: read them carefully and act accordingly!

In case the WindCon vibration sensors will be mounted with glued pads please observe

the temperature. The glue used for these spats (or studs) will not solidify below 16°C.

Please note: Even when ambient temperatures are well below 16°C installations can still take place with glue, using the heat of the turbine. In such a case make sure the wind Turbine has been running until the installation starts. Usually the gearbox will provide enough heat during several hours after the turbine has stopped to guarantee a good quality glue connection. When in doubt, measure temperature!

Plan the scenario

Assess and evaluate the current site where the system will be installed.

Draw the thought scenario on a piece of paper before getting started, how you would like this installation to look like after it is complete and then consider if it is possible to achieve. Among other things consider length of cables, where electrical power to the iMU units can be connected, where the MasCon Server should be installed and positioned and who should analyse the data that is measured. Good and thorough planning is the bases for a successful solution and installation.

Make a detail layout of the equipment, the network and distances between components. Include specifically the iMU (WindCon units), the SQL server computer, the MasCon Server computer and all hubs/routers in the network. Specify each component 's network configuration such as IP addresses and sub net mask. Application engineers CAN NOT help you if you do not have this information up front. Take note that a CAT5/6 Ethernet network cable has a maximum working distance of about 100m! Take note of all needed converters such as converters for fibre optic to CAT5 Ethernet and vice versa. When GPRS is used, the GRPS routers are reconfigured as part of the application, to run a "lifeline" connection with the SKF server at IP address 80.126.94.126.

Failure of this communication path will force the GPRS router to reboot itself constantly and can hamper the success of the application. This is especially valuable to consider when the GPRS forms part of the customers internal IP network (VPN). In these cases SKF must be informed of this before ordering the GPRS so that SKF can disable the "lifeline" functionality of the GPRS router.

Cable routing of the vibration sensors

In general, all cables must be router as far as possible away from the KVA cables (high voltage electrical cables). If this cannot be done, care should be taken to use high quality shielded cables like for example CAT6 for the network and not CAT5 cables. In these cases it is the safest to stick to fibre optic cables up to 10cm from the iMU (WindCon) unit before converting to the Ethernet CAT5/6 cables.

When routing a sensor cable it is important that the cable is firmly fixed. The cable may never be allowed to vibrate or oscillate, since this affects the capacitance of the cable and thereby the measurement result.

The sensor cable may not be routed or bundled together with supply cables, which generate strong magnetic fields, such as supplies to: generator, Yaw and Pitch-motor drives, radiators, electronic frequency converters, etc.

Sensor cable - Others

To connect sensors to iMU, such as e.g. speed sensor, displacement sensor, pressure sensor, data communication RS 485, etc., use;

- Shielded, twisted pair 2* 0.5 mm² (FKAR-PG 1*2* 0.50, DUE 4002 or corresponding), with minimum voltage requirement 300V and minimum temperature -40°C.

Supply cable

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

- FKLK 3*1.5 mm² or EKLK 3*1.5 mm² or corresponding, with minimum voltage requirement 300V and minimum temperature -40°C.

It is required that the iMU must be connected to protective ground/earth (PE). Please refer Chapter "Attach power cable to the mains power / power grid"

The cross section area of the PE wire must be equal or greater than the cross section area of the power wires. The PE wire should be colour labelled green/yellow.

In some countries other cable requirements may apply.

Cable glands

Metallic EMC type cable glands with shield connection are used for all cable lead-through except the communication cable.

Communication cable

For lengths up to 15 metres, it is recommended to use prefabricated Ethernet cable of FTP type, CAT5/6. For longer cable lengths, use S-FTP Ethernet cable CAT5/6.

Data communication

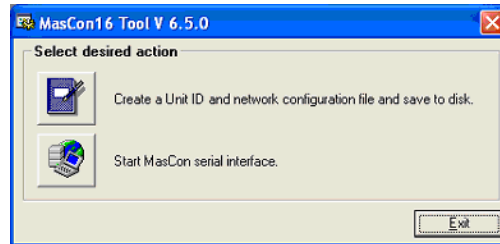
iMU/WindCon unit communications are compliant with the Ethernet standard 10 Mbit.

Configure Network settings using MasCon16 system configuration tool

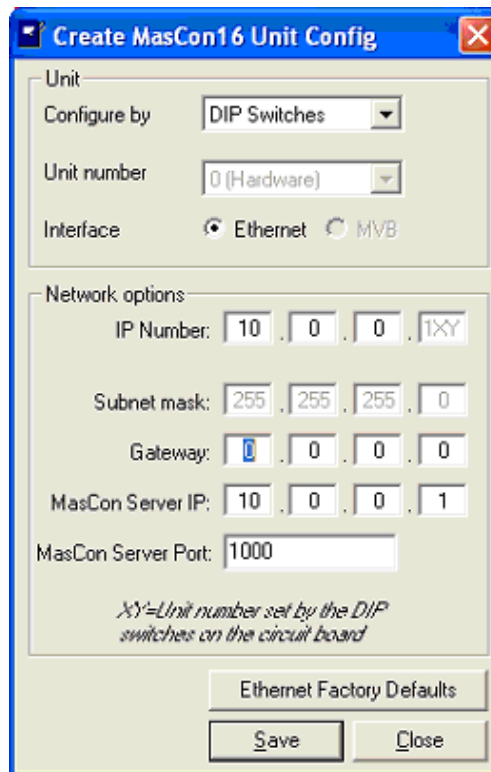
All iMU/WindCon units must have an identity number between 1 and 255, unique to the database it is connected to. It also requires network settings and the IP number of the MasCon Server it should connect to. Keep in mind that most of the time, all iMU units are on the same network and database, and can therefore NOT have the same IP

address or the same unit ID. These settings can be defined and downloaded with the “MasCon 16 Tool” as follows:

1. Start the M16Tool program located in the ProCon directory



2. Click the Book button to first create an ID file.
3. When running the configuration tool, start with filling in the system settings. The iMU unit ID must be the same as what is used in the database and in ProCon for the particular unit. The iMU unit must be given its own unique IP address and a correct subnet mask. Gateway can usually be left as 0.0.0.0 if there is no gateway in use to communicate with the MasCon Server (be very sure about this, else there will be no communication). The logging computer IP is the IP address of the computer running the MasCon Server software. This computer must have a fixed IP address, and must be on the same logical and physical network as the iMU unit. The subnet mask defines the size of the logical network



Select in the “Configure by” field, whether you want to determine the IP address and unit Id of this unit by using the DIP switches on the main board or whether you want it to be set by software. If you select the DIP switches, then you must set the first part of the IP address in this tool, and the DIP switches will control the last two digits of the IP address. These last two digits will also form the unit ID.

4. Take note of the “MasCon Server Port” setting to be used. This is important for when there is a firewall on the server. In this case, the firewall must be set to “allow”

connection and communication from this port to be accepted.

5. When fields have been filled in, use the “save” button to save your ID file.
6. Once saved, the configuration file must be downloaded to the iMU unit. This can be done now by connecting your own computer with a “Null Modem Serial Cable” to the local serial port on the iMU.
7. Click the serial communication interface button to start the MasCon Serial interface program.
8. Select the correct port that the serial cable is connected to on your computer and use the “Update MasCon” button to download the newly saved ID file to the iMU.

Installation of iMU units



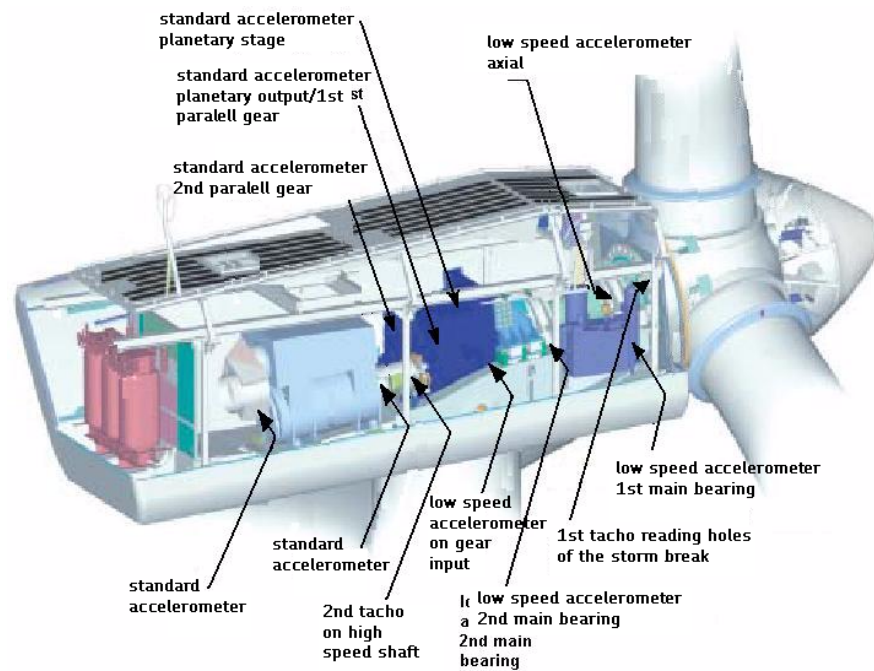
Mount the iMU unit and make sure that it is firmly attached. The iMU unit should be mounted at a location where it is not exposed to unnecessary radiant heat or strong magnetic fields.

Ambient temperature: -40 to +70 °C (Off-Line)
 -20 to +50 °C (On-Line)

Connecting accelerometers

Location of vibration sensors

On a typical turbine with 2 main bearings, a planetary gear and a 3 shaft second stage gear and a generator, SKF proposes the use of 9 Accelerometers, 4 low speed and 5 standard.



Main bearing:

- Low speed sensor in radial direction on the down side of the bearing.
- Low speed sensor in axial direction, preferably on the downside as well.

2nd Main bearing;

- Low speed sensor in radial direction on the down side of the bearing.

Planetary Gear:

- Low speed sensor in radial direction on the entrance bearing
- Standard sensor on top of the planetary gear

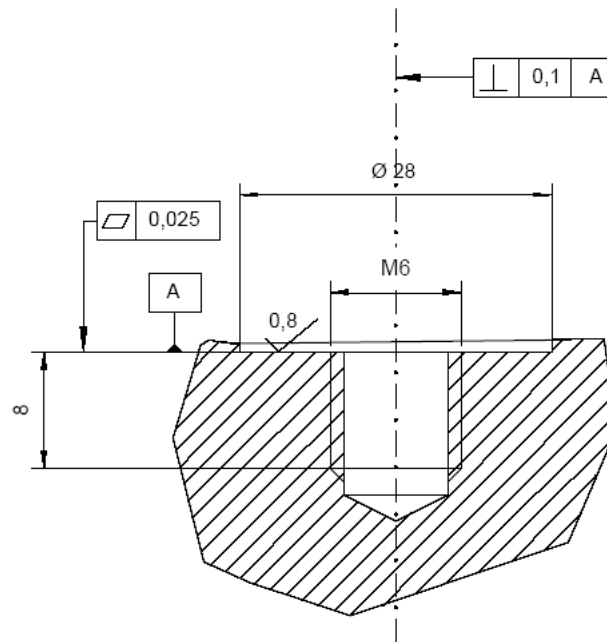
2nd stage gear:

- Standard sensor in radial direction between the entrance and intermediate shaft
- Standard sensor in axial direction between intermediate and high speed shaft

Generator:

- Standard sensor in radial direction on the downside of the rear bearing (see picture)
- Standard sensor in radial direction on the downside of the front bearing (see picture)

Attach vibration sensors using M6 bolts



The basic pre-condition for a successful measurement result is that the sensor is correctly located with regard to vibration factors.

1. Prepare the surface where the sensor is to be fitted. Paint, rust or other coatings must be removed in order that the sensor shall make good contact with the surface. In order that the area of contact shall be as large as possible, the surface must be flat.
2. Drill a hole perpendicular to the surface with a 5 mm bit (depth c. 10 mm).
3. Thread the hole with an M6 threading tap.
4. Carefully test-screw the sensor in place, to ensure that good contact is made.

If the sensor does not fit flat on the surface, and thereby makes bad contact with it - Drill a new hole!!

5. Unscrew the sensor and apply some form of thread lock on the contact surface and mounting screw, e.g. LOCTITE 242.

Tighten the sensor with a torque wrench. It is important that the sensor is tightened to the correct torque, to avoid the occurrence of false vibrations. Tightening too hard, besides damaging the thread, causes stress that causes signal noise. The correct tightening torque is 3-7 Nm.

Attach vibration sensors using glue

The basic pre-condition for a successful measurement result is that the sensor is correctly located with regard to vibration factors.

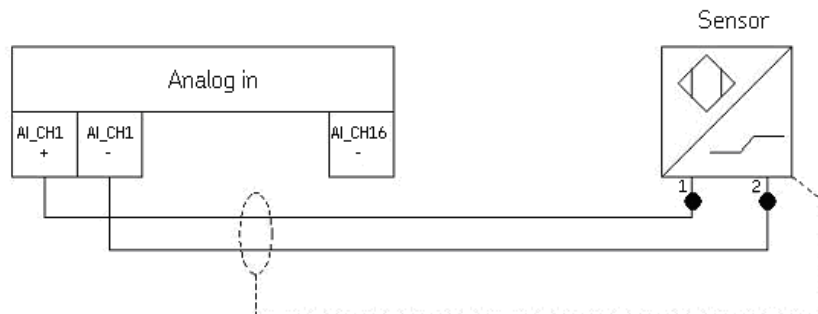
Prepare the surface where the sensor is to be fitted. Paint, rust or other coatings must

be removed in order for the sensor to make good contact with the surface. For the area of contact to be as large as possible, the surface must be flat. Take precautions to prevent rust after installation by covering the bare metal parts with a paint coating for example.



Connection accelerometer sensor cables to the iMU

- 1 – White (signal)
- 2 – Black (ground)



Connecting Pulse transmitter (Tacho)

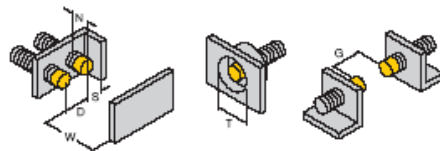


A pulse transmitter, linked to iMU, is used to measure rotational speed of the main shaft. The tacho could be mounted to detect holes (lack of metal) or something sticking out, like a bolt head (metal). The distance between sensor and the measurement object should be adjusted to 2-4 mm when the “lack of metal” is to be sensed (see picture to the left. Sensor used to sense the hole in the metal plate).

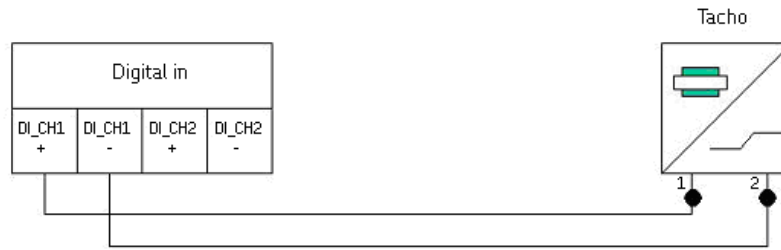
If a piece of extruding metal is to be sensed, the following guidelines should be considered:

Mounting instructions	Minimum gap
Gap D	3 x B
Gap W	3 x Sn
Gap T	3 x B
Gap S	1,5 x B
Gap G	6 x Sn
Gap N	20 mm

Diameter of active face B	Ø 18 mm
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Connecting the Tacho cables to the iMU

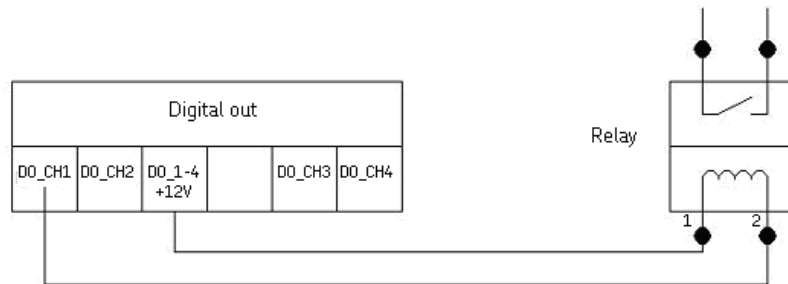


1 – Negative wire of the tacho probe

2 – Positive wire of the tacho probe

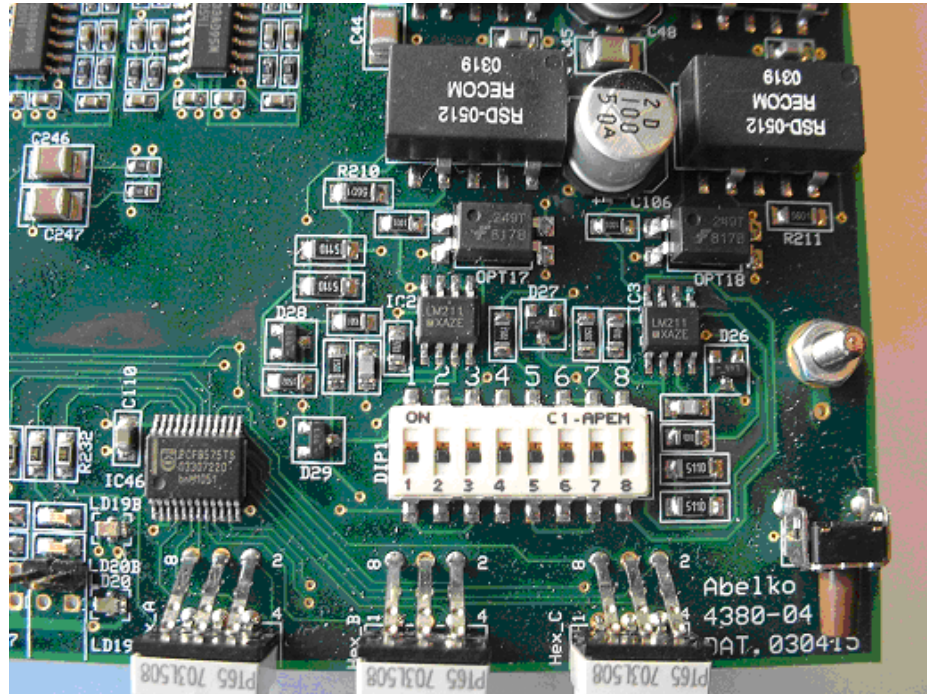
Relays

The MasCon16 has four relay driver outputs that can be connected to relays as shown in the figure below.



DIP-Switches for configuring Tacho power

In the right-bottom corner of the main board a set of DIP-switches are located (see picture below).



DIP switches location on the main board.

By default, WindCon is configured to supply power to both of the tacho channels (DIG1 and DIG2). The DIP switches control the power (12 V) on/off for the digital in (tacho) channels and can be set to the following configurations:

Digital channel In 1, sensor power (12V) from iMU internally

DIP-1	DIP-2	DIP-3	DIP-4
ON	ON	OFF	ON

Digital channel In 1, sensor power from external source (trigger level >7V)

DIP-1	DIP-2	DIP-3	DIP-4
OFF	OFF	ON	ON

Digital channel In 2, sensor power (12V) from iMU internally

DIP-5	DIP-6	DIP-7	DIP-8
ON	ON	OFF	ON

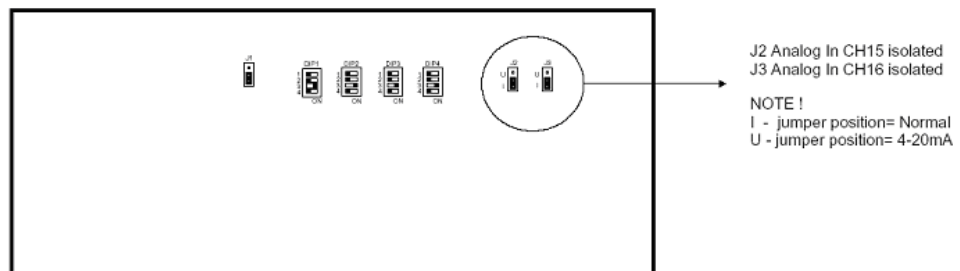
Digital channel In 2, sensor power from external source (trigger level >7V)

DIP-5	DIP-6	DIP-7	DIP-8
OFF	OFF	ON	ON

Jumper for configuring ISO15 and ISO16 for voltage or current measurements

On the lightning protection board for the iMU there are DIP switches to configure voltage or current measurement on the two (2) isolated channels 15 and 16 (When ISO15 and ISO16 are used on the screw terminals, you need to select in the software the tick box for "Isolated" on the setup of the individual channels). These two channels (ISO15 and ISO16) are always isolated. The jumpers only select whether the system needs to perform a current measurement or a voltage measurement on them.

If a voltage measurement with no isolation is required, then the normal channels 15 and 16 can be used without the need for any special configuration.



Lightning Protection Board DIP Switches

Attach Ethernet cabling

The Ethernet TP cable on the iMU is connected at the rightmost four terminals. How to connect the pairs depends on whether the system will be connected directly to a single computer, or if it is connected to a network through a switch or hub. If the system is correctly connected to another network device the yellow Link led will light up. The green led will flicker when there is traffic on the network.



Ethernet socket.

	Straight thru/Switch	Crossover/Single Computer
Tx+	Orange/White	Green/White
Tx-	Orange	Green
Rx+	Green/White	Orange/White
Rx-	Green	Orange

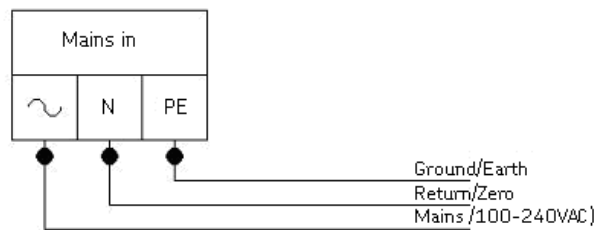
Cable placement

Attach power cable to the mains power / power grid

Please note! In some countries, you have to be certified in order to connect an iMU to the power grid.

Please note! Make sure that the power is disconnected before installation.

Please note! An external power switch, accessible by the operator, must be installed in order to be able to disconnect the iMU from the mains power / power grid. The switch must be labelled "on / off" or similar.



Power connection

Troubleshooting guide

This document is intended as an aid when the WindCon system is not functioning correctly.

The document is designed for instrumentation engineers and others with sufficient knowledge of electrical troubleshooting in electronic systems with a 230V/110V power supply and of the risks that this can mean in case of incorrect procedure.

SKF Condition Monitoring Center Luleå strives to provide information that is as accurate as possible. SKF Condition Monitoring Center Luleå however cannot be held responsible for any injury or damage (to persons or material) that can occur in the interpretation of, or due to actions taken on the basis of information in this document.

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Troubleshooting is aimed to determine which of the following categories the fault belongs to:

1. Sensor fault
2. Cabling fault
3. Hardware fault in iMU unit
4. PC fault
5. Configuration error in software
6. Usage error /misconception

Note that the guarantee becomes void if iMU units are damaged through incorrect intervention in the hardware, or a patently incorrect connection in contravention of directions given.

Sensor signal disappears or is abnormally changed (single channels)

- a/ Break in sensor cable
 - b/ Short circuit in sensor cable
 - c/ Sensor fault
 - d/ Hardware fault - iMU input stage
- => Carry out sensor/ cable test.

A sensor repeatedly generates a false alarm or varies abnormally

- a/ Break in sensor cable/ contact
 - b/ Incorrectly mounted sensor
 - c/ Hardware fault iMU input stage
- => First carry out sensor/ cable test. Check also the sensor mounting. If this is without result, contact SKF Condition Monitoring Center Luleå.

Speed signal unobtainable/ faulty for a certain machine

- a/ Cable fault (short circuit/ break) to speed sensor
 - b/ Faulty speed sensor, or faulty installation
 - c/ Speed signal too weak/ impedance too high for iMU
 - d/ Faulty iMU speed input
 - e/ Incorrect setting in hardware
- => Test speed input.

Analogue input gives faulty/ no signal

- a/ Cable fault (short circuit/ break) to sensor
 - b/ Faulty sensor
 - c/ Faulty earthing
 - d/ Faulty iMU input
 - e/ Incorrect setting in hardware
- => Carry out control of sensor and cabling.

Load input gives faulty/ no input signal

- a/ Cable fault (short circuit/ break) to sensor
 - b/ Faulty sensor signal
 - c/ Faulty earthing
 - d/ Faulty iMU load input
 - e/ Incorrect setting in software
- => The load input acts as an analogue input. Therefore, first carry out cabling/ input test. Contact SKF Condition Monitoring Center Luleå if this gives no result.

iMU alarm relay does not activate despite warning alarm

- a/ Cabling fault from iMU to alarm panel
 - b/ Configuration error in software
 - c/ Hardware fault in iMU unit
- => Check the relay signal.

Logging completely ceases to function

- a/ Logging PC non-functional
- b/ Logging software incorrectly set
- c/ Ethernet switch non-functional
- d/ Cable break in Ethernet network

=> Check logging problems.

Logging ceases to work from a certain iMU unit

- a/ Loss of voltage iMU unit
- b/ Hardware fault (power supply or processor module) iMU unit
- c/ Break in Ethernet network RS485 bus

Check of sensor and sensor cabling for vibration channels

1. Determine the unit number and channel number of the channel in question (through the measurement point information in the software, or through the list of terminal blocks)
2. Measure the DC voltage between the sensor wire on the iMU terminal block using a digital voltmeter. See table below for normal voltage values with and without a connected sensor respectively.

Sensor type	Normal operating (bias) voltage	Open-circuit voltage
	DC V	DC V
Standard Accelerometer (type 327)	8...12V	+15 V
Velomitor™	-12V	-24 V
Proximitor™	-1...-17V (DC measuring)	-24 V

Normal voltage values

3. Is the voltage within the normal working range?
 - YES: The cabling to the sensor is probably OK and the sensor electronics have normal input impedance. If the sensor signal is still not perceived to be normal, one should try changing the sensor.
 - NO: Continue to item 5
4. Does the fault remain after changing the sensor?
 - YES: The fault may be in the analogue input section of the iMU unit. Contact SKF Condition Monitoring Center Luleå for service/ further information.
 - NO: Sensor fault. The sensor is defective and must be replaced.
5. Is the voltage close to zero (typical $< \pm 0.5$ V) ?
 - YES: There is probably a short-circuit in the cable, or the sensor is defective. First verify that the voltage rises to normal open-circuit voltage when one of the sensor cable poles is disconnected from the terminal block of the iMU unit.

- NO: Continue to item 10
6. Did the voltage rise to normal open-circuit voltage?
- YES: Continue to item 9
- NO: The sensor is not receiving power; continue below.
7. Is it a Velomitor™ or Proximitor™ sensor?
- YES: These are powered by an external 24V power pack. Therefore, check the output voltage from this unit power pack – the fault is probable in the voltage unit or in the cabling to the iMU terminal block. However, if this turns out to be OK, then the iMU input is damaged. Contact SKF Condition Monitoring Center Luleå for further information.
- NO: Go to item 8
8. Sensor of standard type (type 327):
- These are powered internally from the iMU unit. If the iMU unit does not supply open-circuit voltage with input open, then the iMU input is probably damaged, or the input is not configured to supply a power feed to the sensor. Contact SKF Condition Monitoring Center Luleå.
9. The fault is in the sensor cable or the sensor. Go out to the sensor position and disconnect the cable at this end. Reconnect the cable on the iMU terminal block and again measure the voltage over these two poles. Does the short-circuit remain?
- YES: The sensor cable (or contact) has a short-circuit. Repair the cabling.
- NO: The sensor is defective. Replace the sensor.
10. Is the voltage close to the open-circuit voltage?
- YES: There is a break in the cable or the sensor is damaged. Continue below.
- NO: If the voltage appears to be neither within the normal working range, close to zero nor close to open-circuit voltage, then the fault is an unusual one. First check that the measurement was correctly carried out, then contact SKF Condition Monitoring Center Luleå. Remaining faults can be due to a damaged sensor or a damaged iMU input. First disconnect one pole of the sensor cable and measure the open-circuit voltage to verify whether the open-circuit voltage is normal. If it is normal, then the fault is probably in the sensor, otherwise the fault is in iMU.
11. Go out to the sensor, disconnect the contact connector from the sensor and short-circuit the pins in the sensor contact. Then re-measure the voltage on the iMU terminal block. Did the voltage sink to close to zero (< 0.5 V)?
- YES: There is an internal break in the sensor, or the contact is oxidised. First try cleaning the contact before replacing the sensor.
- NO: There is a break in the cable. Repair the cabling.

Check of sensor and sensor cabling for analogue channels

1. Determine the unit number and channel number of the channel in question (through the measurement point information in the software, or through the list of terminal blocks).

2. Measure the DC voltage between the sensor cable poles on the iMU terminal block, using a digital voltmeter.
3. Does the terminal block have the expected voltage level (see sensor sensitivity and the current actual value of the measured object)?
YES: The sensor and cabling are probably OK. If the actual value is still not perceived to be normal, then the fault is probably in the channel settings, or there is a hardware fault in the iMU unit. Continue below.
NO: Continue to item 5.
4. Check through the current settings for the channel in question in the software. 'Amplification' and 'Zero level' and determine the conversion to the user's unit. Further, 'Cable check' must be off (N). If this still does not produce the correct actual value, then the input card is probably damaged. Contact SKF Condition Monitoring Center Luleå.
5. The cable or the sensor is probably damaged. Test the cabling by disconnecting at the sensor end and connecting e.g. a 1.5V battery. Does the input now measure the voltage?
YES: The sensor is probably not functioning correctly. However, first check that the channel is correctly configured as regards the terminating resistor. In the list of terminal blocks it can be determined whether the channel in question has a terminating resistor (for current circuit). Check that this corresponds in reality, and that it corresponds to the sensor's mode of operation.
NO: The cabling is probably damaged. Continue to item 6.
6. Cabling is probably damaged. However, first try disconnecting one of the poles on the cable from the iMU terminal block. If the voltage is then OK, then the fault is in the iMU unit input stage, otherwise the cabling is damaged and needs repair.
7. Does the fault remain after replacing the sensor?
YES: The fault can be in the analogue input part of the iMU unit. Contact SKF Condition Monitoring Center Luleå.
NO: Sensor fault. The sensor is defective and must be replaced.

Check of speed input

1. Determine the unit number and speed input of the channel in question; either through the software measurement point setting or through the list of terminal blocks.
2. Measure the signal on the iMU terminal block using an oscilloscope or similar.

Please make sure to use a potential free oscilloscope
3. Is there an expected speed signal on the iMU terminal block?
YES: The signal can be too weak or at too high impedance for the iMU speed input to be triggered. Sufficient voltage ripple (peak to peak) is shown in the electrical specifications. If the signal level is sufficient then the iMU input is defective or the software is incorrectly configured. Check the settings in the program as regards the unit number and input number of the speed measurement point. Contact

SKF Condition Monitoring Center Luleå for consultation.

NO: The cabling is damaged, or the sensor is not sending the correct output signal. Check that the installation of the sensor is correct (is the machine rotating?) and if this produces no result, check the cabling. The entire chain from cable to input can be tested by linking a signal generator with a suitable frequency and amplitude at the sensor end. Note however that iMU normally supplies power to a sensor (shown in equipment list), which is why a coupling capacitor must then be connected in series, to avoid ruining the signal generator.

Check of relay signal

1. Determine the unit number of the alarming channel; either through the software measurement point setting or through the list of terminal blocks .
2. Disconnect the relay connection from the iMU unit in question (take care if the relay output is used to trip the machines!). Measure the voltage between the alarm relay poles.
3. Has the relay been activated (voltage close to zero)?

YES: The fault is in the cabling or output connections from iMU.

NO: Check in the software configuration (measurement point settings) whether the channel in question is allowed to activate the alarm relay. If this is not the case, then change the setting. Contact SKF Condition Monitoring Center Luleå if the channel is permitted to activate the relay, but does not do so.

Logging problems

Check first whether the @plitude Observer Monitor PC is functioning as it should. Try re-starting the computer if there is any doubt as to the status of the @plitude Observer Monitor software. Check also that the Ethernet network is functioning and that the @plitude Observer Monitor computer can write to the server disk.

Maintenance of the WindCon hardware

The WindCon hardware, i.c. the iMU and the sensors are maintenance free, however we advice the customer to do a yearly visual inspection of the equipment.

Technical data

Environmental

- Size, HxWxD in mm: 500x400x200
- Weight: 15 kg
- Temperature range (On-LineW): -20°C - +50°C,
- Temperature range (Off-LineR): -40°C - +70°C
- Power supply: 100 – 240 VAC, 50-60 Hz, 0,75A max.
- Humidity: 95% (rel.) non condensing
- Installation location: Inside nacelle use only
- Maximum altitude: 2000 m
- Measurement category II
- Pollution degree 2

Analogue inputs

- 16 analogue differential inputs in groups of four with software controlled ICP power supply (4 mA constant current).
- Software controlled selection of AC or DC measurement, using buffered inputs.
- Input range ± 25 V
- Impedance 50 kW at 1 kHz.
- Dynamic range: 100 dB

Digital inputs

- 2 digital inputs for frequency measurement, min. 3 V and max. 14 V peak to peak.
- Frequency range 0,15 to 1 kHz.
- Accuracy, frequency measurement 100 is for 0,15 to 10 Hz, 1,5 is for 10 to 35 Hz, 0,39 is for 35 to 300 Hz, and 50 ns for 0,3 to 1kHz.

Signal processing

- AC filter: First order 0,5 Hz.
- Anti-aliasing filter with software controlled cut off frequency, eighth order butterworth.
- 2 channel, 100 kSamples/sec, 16 bit AD conversion with automatic gain setting based on actual signal level

- Automatic overload detection with automatic gain correction and resampling.
- Automatic detection of sensor fault and cable fault.
- Simultaneous sampling of four channels up to a frequency range of 10 kHz. Single channel sampling up to a frequency range of 40 kHz.
- Time waveform (256 – 16384 samples per channel).
- FFT (Fast Fourier Transform) 100 – 6400 lines per channel.
- DPE (Digital Peak Enveloping) using 4 different band pass filters.
- Integration/Derivation in frequency domain.
- Window function: Hanning, Flat top, Uniform.

Interface

- Ethernet TCP/IP 10 Mbit.
- Serial interfaces RS232 and RS485.

Miscellaneous

- Calibration, traceable to BIPM
- CE certified according to EN50081-2:1993
- Lightning protection: EN61000-6-2:1999, EN61000-4-5: 4 kV (Online)

Quality control

SKF Condition Monitoring Center Luleå is ISO 9001:2000 certified.

iMU drawing

