

# Condition Monitoring Essentials





The SKF brand now stands for more than ever before, and means more to you as a valued customer.

While SKF maintains its leadership as the hallmark of quality bearings throughout the world, new dimensions in technical advances, product support and services have evolved SKF into a truly solutions-oriented supplier, creating greater value for customers.

These solutions encompass ways to bring greater productivity to customers, not only with breakthrough application-specific products, but also through leading-edge design simulation tools and consultancy services, plant asset efficiency maintenance programmes, and the industry's most advanced supply management techniques.

The SKF brand still stands for the very best in rolling bearings, but it now stands for much more.

**SKF – the knowledge engineering company**

## Global presence – local solutions

With over 100 years of experience, SKF stands alone as a total solution provider for maximizing machine and plant productivity. With a reputation for quality, technological innovation and service that spans the globe, SKF brings what no other vendor can to the maintenance arena.

Local SKF sales and service representatives and worldwide distributors provide access to the range of SKF bearings, maintenance products, lubricants, condition monitoring instrumentation and software, independent of your location.

In any kind of rotating machinery, from huge rolling machines to the smallest of motors, the bearing knows if there is a potential problem. As the primary interface between moving parts, the bearing is literally the diagnostic heart of the machine.

Misalignment, unbalance, looseness and friction are all telegraphed through the bearing. Understanding the information coming from this diagnostic "pulse" and then applying the latest and best technology to the problem is the key to raising machine productivity and lowering operating costs.

This SKF condition monitoring essentials product catalogue features a convenient collection of monitoring tools that no industrial manufacturing plant should be without.

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SKF Machine Condition Advisor CMAS 100-SL

## SKF Machine Condition Advisor

CMAS 100-SL

*Machine monitoring, made simple*

Now both novice users and experts can easily, quickly, and accurately check the condition of rotating equipment throughout your facility. Equipping your maintenance and operations personnel with this rugged, ergonomic and easy-to-use instrument can provide early warning of potential machine problems before a costly failure occurs.



*SKF Machine Condition Advisor simultaneously measures vibration signals and temperature to indicate machine health or bearing damage.*

### Features

- Quick and easy to set up and use, measurements are shown on a bright display viewable in low light to direct sunlight. Free on-line training is also available at SKF @ptitude Exchange.
- Lightweight, compact, and ergonomically designed, the SKF Machine Condition Advisor fits neatly at the belt line, in a pocket or a tool kit. Exceptionally durable, the unit is rated IP 54 for use in industrial environments.
- Alert and Danger prompts provide increased diagnostic confidence.
- Measuring velocity, enveloped acceleration and temperature simultaneously saves time.
- Efficient, economical and environmentally friendly, the rechargeable SKF Machine Condition Advisor operates 10 hours on a single charge.
- Flexible enough to work with standard 100 mV/g constant current accelerometers, an optional external sensor can be used for hard-to-reach locations and for more repeatable and accurate measurement results.
- Features English, French, German, Portuguese, Spanish and Swedish for user convenience.

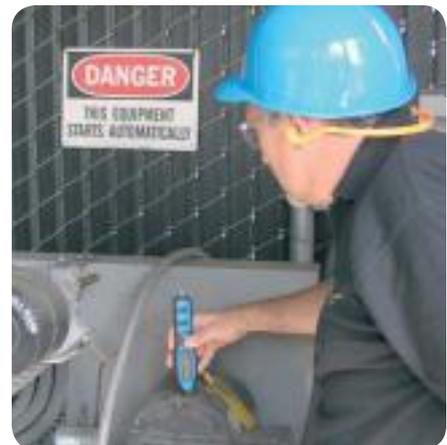
### Multiple measurements with a single device

The SKF Machine Condition Advisor provides an overall "velocity" vibration reading that measures vibration signals from the machine and automatically compares them to pre-programmed International Organization for Standardization (ISO) guidelines. An "Alert" or "Danger" alarm displays when measurements exceed those guidelines. Simultaneously an "enveloped acceleration" measurement is taken and compared to established bearing vibration guidelines to verify conformity or indicate potential bearing damage.

The SKF Machine Condition Advisor also measures temperature using an infrared sensor to indicate uncharacteristic heat.

### Accuracy, flexibility and confidence

When performing measurements, the SKF Machine Condition Advisor's acceleration sensor input signal is processed to produce two different measurements for each POINT on the machinery – overall velocity and enveloped acceleration.



At the same time, the SKF Machine Condition Advisor's non-contact infrared sensor measures the surface temperature of the measurement location and simultaneously displays all three measurement values.

Depending on the SKF Machine Condition Advisor's System setting, the front-panel LCD simultaneously displays:

- Metric or Imperial units
- Velocity in mm/s RMS or in./s derived Peak
- Temperature in Celsius or Fahrenheit
- Acceleration enveloping readings in gE

## Quick and easy – first time and every time

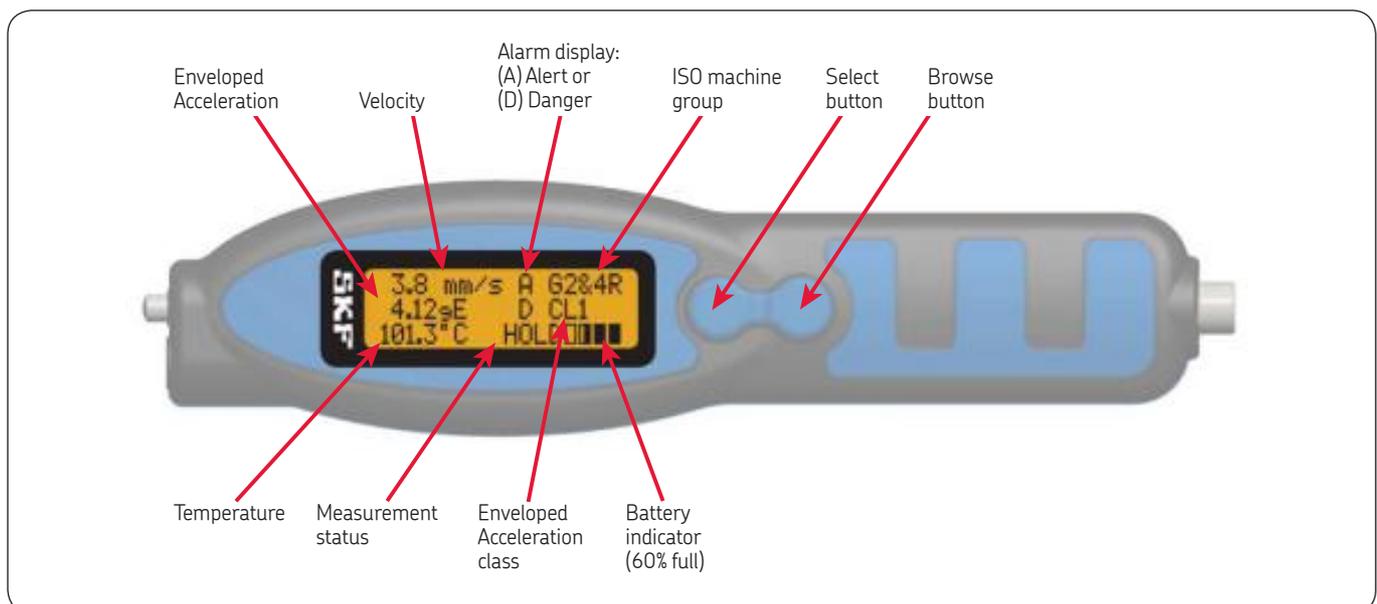
- 1 Press **Select** or **Browse** button to turn the SKF Machine Condition Advisor "On".
- 2 Press the sensor tip against the point to be measured.
- 3 When the readings stabilize, press the **Select** button to hold the reading.
- 4 Read and record the measurement values.

## Specifications

- Vibration pickup:
  - Internal: Integrated piezoelectric acceleration
  - External: Accepts a standard 100 mV/g constant current accelerometer
- Temperature sensor: Internal infrared temperature sensor
- Measurements:
  - Velocity:
    - Range: 0,7 to 65,0 mm/s (RMS) (0.04 to 3.60 in./s (equivalent Peak)), meets ISO 10816
    - Frequency: 10 to 1 000 Hz, meets ISO 2954

- Enveloped acceleration:
  - Range: 0,2 to 50,0 gE
  - Frequency: Similar to Band 3 (500 to 10 000 Hz)
- Temperature:
  - Range: –20 to +200 °C (–5 to +390 °F)
  - Infrared temperature accuracy: 2 °C (4 °F)
  - Distance: Short range, maximum 10 cm (4 in.) from target
- Operating temperature range:
  - In use: –10 to +60 °C (15 to 140 °F)
  - While charging: 0 to 40 °C (30 to 105 °F)
- Storage temperature:
  - Less than one month: –20 to +45 °C (–5 to +115 °F)
  - More than one month, but less than six months: –20 to +35 °C (–5 to +95 °F)
- Humidity: 95% relative humidity, non-condensing
- Enclosure: IP 54
- Approvals: CE
- Drop test: 2 m (6.6 ft.)
- Weight: 125 g (4.4 oz.)
- Dimensions:
  - Length: 200,0 mm (7.90 in.)
  - Width: 47,0 mm (1.85 in.)
  - Height: 25,4 mm (1.00 in.)
- Battery life: 10 hours before charging again (≈ 1 000 measurements)
  - With external sensor: Up to 55% less battery life
- Supported external sensor: Any standard accelerometer with 100 mV/g sensitivity constant current
- External sensor power: 24 V DC at 3,5 mA
- Charger specifications:
  - Universal AC/DC wall plug-in
  - Input: 90 to 264 VAC, 47 to 60 Hz
  - Output: 5 V DC regulated
  - 3 to 4 hours for a full charge

### LCD display in measurement mode



## Understanding and using guidelines for vibration

The SKF Machine Condition Advisor provides a means to evaluate machine health based on ISO 10816-3 and to evaluate the bearings according to general guidelines developed from a statistical analysis of existing databases.

### How to choose the correct "Alarm Velocity Group" for your machinery

The Alarm Velocity Group (**G2&4** or **G1&3**) determines the instrument's "overall vibration" alarm limits. Therefore, select the Group that best describes the general size, type, and speed of the machinery being measured. Note that these machine group classifications are set forth in ISO 10816-3, which rates overall velocity vibration levels for standardized machinery classifications.

#### Groups 2 and 4 (default)

ISO Group 2 and 4 classifications define the following type of machinery:

- Medium-sized machines and electrical machines with a shaft height between 160 and 315 mm (6.3 and 12.4 in.).
- These machines are normally equipped with rolling element bearings, but may use sleeve bearings, and operate at speeds above 600 r/min.
- These machines include pumps with multi-vane impellers and integrated drivers.

#### Groups 1 and 3

ISO Group 1 and 3 classifications define the following type of machinery:

- Large machinery and electrical machines with a shaft height greater than 315 mm (12.4 in.).
- These machines are generally equipped with sleeve bearings, but may use rolling element bearings.

These machines include pumps with multi-vane impellers and integrated drivers.



### Rigid or Flexible foundation?

An additional setting allows the specification (when defining the overall alarm levels) of measurements taken from machinery with **rigid** (default) or **flexible** foundations.

#### Options are:

##### G2 and 4R (default)

Alert: 2,8 mm/s (0.16 in./s)

Danger: 4,5 mm/s (0.25 in./s)

##### G2 and 4F

Alert: 4,5 mm/s (0.25 in./s)

Danger: 7,1 mm/s (0.39 in./s)

##### G1 and 3R

Alert: 4,5 mm/s (0.25 in./s)

Danger: 7,1 mm/s (0.39 in./s)

##### G1 and 3F

Alert: 7,1 mm/s (0.39 in./s)

Danger: 11,0 mm/s (0.61 in./s)

### How to choose the correct "Enveloped Acceleration Classification" for your machinery

The Enveloped Acceleration Classification (**CL1**, **CL2** or **CL3**) you specify determines the instrument's "bearing vibration" alarm levels. Therefore, the Enveloped Acceleration Classification that best describes the general size and speed of the bearings being measured should be selected.

#### Options are:

##### CL1

Bearings with a bearing bore diameter between 200 and 500 mm (7.9 and 19.7 in.) and a shaft speed below 500 r/min.

Alert: 1 gE

Danger: 2 gE

##### CL2 (default)

Bearings with a bearing bore diameter between 50 and 300 mm (2.0 and 11.8 in.) and a shaft speed between 500 and 1 800 r/min.

Alert: 2 gE

Danger: 4 gE

##### CL3

Bearings with a bearing bore diameter between 20 and 150 mm (0.8 and 5.9 in.) and a shaft speed from 1 800 to 3 600 r/min.

Alert: 4 gE

Danger: 10 gE

#### Note:

As with all commonly published severity guidelines, the above provides target thresholds for new, refurbished and recently maintained equipment.

In addition, if both lower limits of the guideline are used (for example in CL2, a 50 mm bearing bore diameter at 500 r/min), the applicable alarm values may be lower. Note that bearing bore diameter is equal to shaft height.

## Expanding your capabilities with SKF Machine Condition Advisor compatible accessories

### Extension sensor kit, Model CMAC 105-K

The extension sensor kit CMAC 105-K contains an accelerometer with integral cable (CMAC 104) and magnet (CMAC 109) with mounting stud. This kit is needed to take measurements from hard-to-reach places and for more repeatable and accurate measurement results.



CMAC 105-K extension sensor kit

### Accelerometer

- 100 mV/g sensitivity
- Small size case
- 0,5 to 15 000 Hz frequency response ( $\pm 3$  dB)
- Submersible

### Accelerometer specifications:

#### Dynamic performance

- Sensitivity ( $\pm 15\%$ ): 10,2 mV/(m/s<sup>2</sup>) (100 mV/g)
- Dynamic range:  $\pm 490$  m/s<sup>2</sup> ( $\pm 50$  g)
- Frequency response:
  - $\pm 3$  dB: 30 to 900 000 CPM (0,5 to 15 000 Hz)
  - $\pm 10\%$ : 42 to 420 000 CPM (0,7 to 7 000 Hz)

#### Electrical

- Settling time:  $\leq 2,5$  sec
- Voltage source: 18 to 30 V DC
- Constant current excitation: 2 to 10 mA
- Spectral noise at:
  - 10 Hz: 27,0  $\mu$ g/ $\sqrt{\text{Hz}}$
  - 100 Hz: 6,5  $\mu$ g/ $\sqrt{\text{Hz}}$
  - 1 000 Hz: 2,5  $\mu$ g/ $\sqrt{\text{Hz}}$
- Output impedance:  $< 100 \Omega$
- Bias output voltage: 7 to 14 V DC
- Case isolation:  $> 10^8 \Omega$

#### Physical

- Sensing element: PZT ceramic
- Sensing structure: Shear mode
- Weight: 20 g (0.7 oz.)
- Case material: 316L stainless steel
- Mounting: 1/4-28
- Resonant frequency: 1 920 000 CPM (32 000 Hz)
- Calibration certificate: CAL-Cert CMAC 105

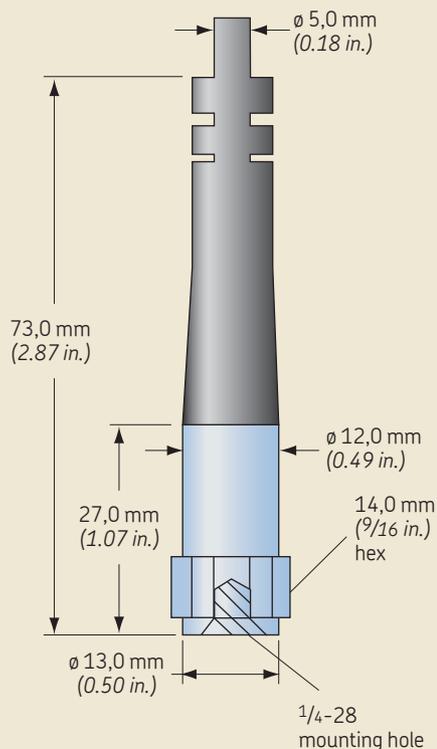
#### Environmental

- Temperature range:  $-50$  to  $+120$  °C ( $-60$  to  $+250$  °F)
- Maximum shock protection: 49 km/s<sup>2</sup> peak (5 000 g, pk)
- Electromagnetic sensitivity: CE
- Sealing welded: Hermetic
- Submersible depth: 152 m (500 ft.)

#### Integral cable (1,5 m standard)

- Connector to SKF Machine Condition Advisor CMAS 100-SL
- Various cable lengths available

#### CMAC 104 accelerometer dimensions

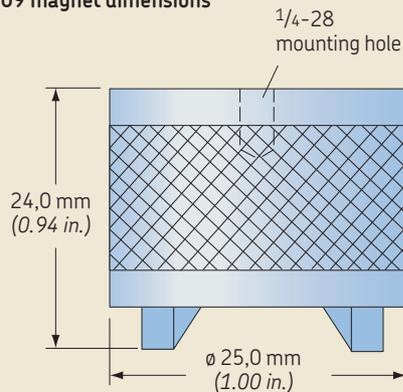


SKF Machine Condition Advisor CMAS 100-SL

### Magnet

- 14 kg (30 lbs.) pull-strength
- 25 mm (1 in.) diameter
- 1/4-28 mounting hole
- Case material: Stainless steel
- Magnet material: Neodymium

#### CMAC 109 magnet dimensions



### Connection cable (1,5 m), Model CMAC 107

Optional connection cable for standard constant current accelerometers with 100 mV/g, MIL-SPEC connector.



CMAC 107 connection cable

### Ordering information

#### SKF Machine Condition Advisor CMAS 100-SL includes:

- SKF Machine Condition Advisor unit
- Belt holster [CMAC 102]
- Charger, international DC power supply [CMAC 8004]
- User manual, English hard copy [32131800-EN]
- CD containing:
  - User manual available in PDF files in English, French, German, Portuguese, Spanish and Swedish
  - Link to training on SKF @ptitude Exchange
  - SKF Machine Condition Advisor trend worksheet (Excel .xls file)
  - SKF Condition Monitoring Essentials catalog available in PDF file in English [CM/P1 11704 EN]
- CD, Integrating Condition Monitoring Products and Services, product catalog [CM5057]

#### Accessories

- Extension kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet [CMAC 105-K]
- Connection cable, 1,5 m with M8 socket type connector for standard constant current 100 mV/g accelerometer [CMAC 107]

#### Replacement

- Charger, international DC power supply, +5 V, 1 600 mA, 90 to 264 V AC, 47 to 63 Hz [CMAC 8002]
- Magnet, magnet base, 1,0 in. diameter, 30 lbs. pull-strength [CMAC 109]
- Belt holster [CMAC 102]

#### Optional kits that include the SKF Machine Condition Advisor, CMAS 100-SL

- SKF Basic Condition Monitoring kit [CMAK 400-ML]
- SKF Electric Motor Assessment kit [CMAK 200-EN]
- SKF Bearing Assessment kit [CMAK 300-SL]
- SKF Energy Monitoring kit [CMAK 450-ML]
- SKF Advanced Bearing Analysis kit [CMAK 600-EN]

## SKF Infrared Thermometer

### CMSS 3000-SL

*Heavy duty, long range, dual laser sighted non-contact infrared thermometer*

There are many uses for this handheld non-contact, infrared thermometer. Rugged and easy to use – just aim, pull the trigger and read the temperature in less than a second. Measures surface temperatures of hot, hazardous, moving or hard-to-reach objects safely without contact.

### Features

- Dual point laser sighting
- Adjustable emissivity
- 50:1 distance to spot size ratio
- Temperature range:  $-60$  to  $+1\ 000$  °C ( $-75$  to  $+1\ 800$  °F)
- Exceptional battery life
- High and low alarm
- MAX, MIN, DIF, AVG temperature displays
- Amber back-light LCD display
- High intensity white LED flashlight
- Heavy duty magnet in base of handle
- Hard case

### Description

The non-contact thermometer senses the thermal energy radiated from an object with an infrared detector. When pointed at an object, the infrared detector collects energy producing a signal that the microprocessor translates as a reading on the backlit display. As the trigger is squeezed, the object temperature is continuously measured by the infrared detector. This allows for fast and accurate real-time readings.

This instrument features an extended temperature range  $-60$  to  $+1\ 000$  °C ( $-75$  to  $+1\ 800$  °F); dual laser sighting; bright large amber back-light LCD display; Maximum, Minimum, Difference (MAX-MIN) and "Lock" function for continuous temperature scanning; programmable High and Low audible alarms; selectable temperature units (°C or °F); low battery indicator, and adjustable emissivity for more accurate temperature measurements.

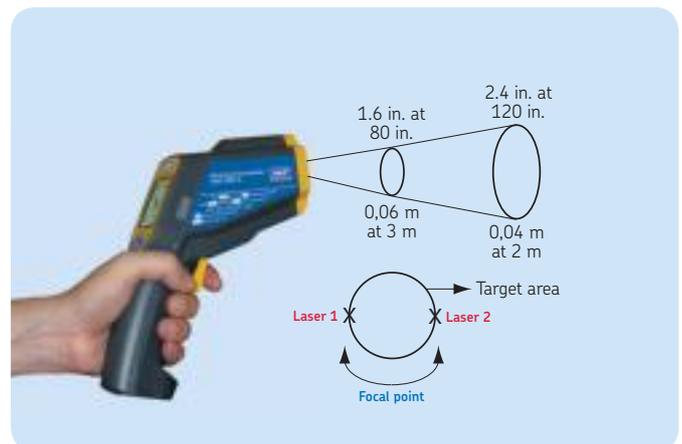


### Dual laser sighting and distance to spot ratio

Dual lasers provides easy aiming and defines the target area. The target area is highlighted at all distances with two laser dot markers. Laser 1 indicates one point of the measurement spot on one side of the target area to be measured and Laser 2 indicates the location of the diametrically opposed point on the other side of the measurement spot. At the focal point, where the spot size is the smallest, the dots line up vertically, rotating as the SKF Infrared Thermometer is moved closer or further from the target.

### Emissivity

Emissivity is a term used to describe the energy-emitting characteristics of materials. Most organic materials and painted or oxidized surfaces have an emissivity of 0,95. Inaccurate readings can result from measuring shiny or polished metal surfaces. To compensate for this, adjust the unit's emissivity reading, or cover the surface to be measured with masking tape or flat black paint ( $< 150$  °C /  $300$  °F). Allow time for the tape or paint to reach the same temperature as the material underneath it. Measure the temperature of the tape or painted surface.



*Distance to spot ratio  
50:1*

SKF Infrared Thermometer CMSS 3000-SL

## Hard case

A water resistant, dust-proof case which holds the unit (and magnetic stand) and measures 330 × 197 × 66 mm (13.00 × 7.75 × 2.60 in.) is included.

## Specification

- Measurement range: -60 to +1 000 °C (-75 to +1 800 °F)
- Operating range: 0 to 50 °C (30 to 120 °F)
- Accuracy (T<sub>object</sub> = 15 to 35 °C (60 to 95 °F), T<sub>ambient</sub> = 25 °C (75 °F)): ±1 °C (±2 °F)
- Accuracy (T<sub>object</sub> = 35 to 1 000 °C (90 to 1 800 °F); T<sub>ambient</sub> = 25 °C, ±3 °C (75 °F, ±5 °F)): ±2% of reading or +2 °C (+4 °F), whichever is greater
- Update frequency: 1,4 Hz
- Wave length response: 8 to 14 μm
- Emissivity range: 0,95 default – adjustable 0,1 to 1 step 0,01
- Relative humidity: 5 to 95% non-condensing
- Resolution, from -9,9 to +199,9 °C (14.2 to 391.8 °F): 0,1 °C (0.2 °F)
- Response time (90%): < 1 sec
- Distance spot ratio: 50:1
- Dimensions:
  - Height: 203,3 mm (7.90 in.)
  - Width: 197,0 mm (7.71 in.)
  - Depth: 47,0 mm (1.85 in.)
- Weight: 386,1 g (13.62 oz.) including batteries
- Power: Two AAA batteries (included)
- Battery life: Typical 180 hours, minimum 140 hours continuous use (Alkaline, without laser and back light)

- Modes: Maximum, Minimum, Average, Difference (MAX-MIN), Lock (allows for continuous temperature scan)

### Note:

Under an electromagnetic field of 3 V/m from 90 to 360 MHz the maximum error is ±10 °C (±18 °F).

National Institute of Standards and Technology (NIST), traceable factory calibration available.

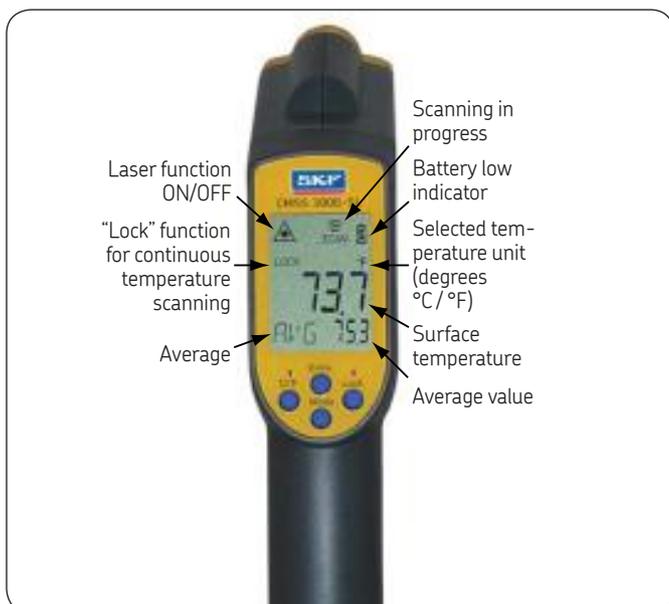
## Ordering information

- SKF non-contact Infrared Thermometer, including quick start guide in standard languages (English, French, German, Portuguese, Spanish and Swedish), two AAA batteries, hard carrying case and magnetic stand [CMSS 3000-SL]
- DOC-CAL CERT CMSS 3000, NIST Certificate of Calibration Accuracy (Watlow-Gordon XACT-CAL)

## Optional kits that includes the SKF Infrared Thermometer, CMSS 3000-SL

- SKF Basic Condition Monitoring kit [CMAK 400-ML]
  - SKF Machine Condition Advisor [CMAS 100-SL]
    - Extension kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet [CMAC 105-K]
  - SKF Infrared Thermometer [CMSS 3000-SL]
  - SKF Inspector Ultrasonic Probe [CMIN 400]
- SKF Bearing Assessment kit [CMAK 300-SL]
  - SKF Machine Condition Advisor [CMAS 100-SL]
  - SKF Infrared Thermometer [CMSS 3000-SL]
  - SKF OilCheck [THEH1]
- SKF Energy Monitoring kit [CMAK 450-ML]
  - SKF Machine Condition Advisor [CMAS 100-SL]
    - Extension kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet [CMAC 105-K]
  - SKF Infrared Thermometer [CMSS 3000-SL]
  - SKF Inspector Ultrasonic Probe [CMIN 400]
  - Hioki Clamp-on Power Meter [CPT3169-20]
  - Hioki Power Meter Clamps [CPT9661]

## LCD display



## SKF Inspector 400 Ultrasonic Probe

CMIN 400-K

*Complements your condition monitoring program*

The analog SKF Inspector 400 Ultrasonic Probe is easy to use and can detect early stages of machine problems.

This small approach to inspection can save money, energy and time.

### Features

- Detect pressure and vacuum leaks, including compressed air
- Check steam traps and valves quickly and accurately
- Detect arcing, tracking and corona in electric apparatus
- Test bearings, pumps, motors, compressors, etc.

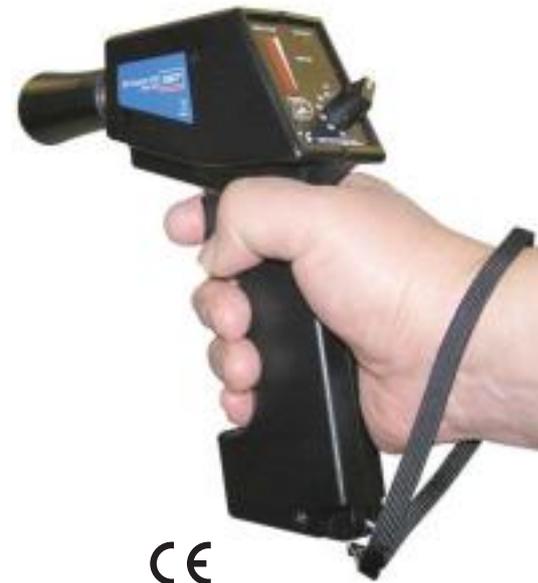
### Description

The SKF Inspector 400 Ultrasonic Probe senses high frequency sounds produced by operating equipment, leaks and electrical discharges. It electronically translates these signals by a heterodyning process, making them audible, so that a user can hear these sounds through a headset and see them as intensity increments on a meter.

The SKF Inspector 400 Ultrasonic Probe can complement your condition monitoring program by providing you with the following capabilities:

#### Pressure/Vacuum leaks

As any gas (air, oxygen, nitrogen, etc.) passes through a leak orifice, it generates a turbulent flow with detectable high frequency components. By scanning the test area with the SKF Inspector 400



Ultrasonic Probe, a leak can be heard through the headset as a rushing sound or noted on the meter bar graph indicator. The closer the instrument is to the leak, the louder the rushing sound and the higher the meter reading. Should ambient noise be a problem, a rubber focusing probe may be used to narrow the instrument's reception field and to shield it from conflicting ultra sounds.

#### Valve

Valve activity such as leakage or blockage can be accurately checked while the valve is on line. Properly seated valves are relatively quiet while leaking valves produce a turbulent flow as the fluid moves from the high pressure side through the leak to the low pressure side. Due to a wide sensitivity and ultrasonic frequency, all types of valves even in noisy environments can be accurately tested.

#### Valve stems

Valve stems may be quickly tested for leaks to atmosphere.

*Valve leakage*



*Pressure/Vacuum leaks*



SKF Inspector 400 Ultrasonic Probe CMIN 400-K

### Steam trap inspection

Major steam trap manufacturers have recommended ultra sound inspection of steam traps as one of the most reliable methods available. By converting the ultrasonic elements of a working steam trap into the audible range, the SKF Inspector 400 Ultrasonic Probe allows users to hear through headphones and see on a meter the exact condition of a steam trap while it is on line. Blowby, machine gunning, oversized traps or line blockage are all easily detected.

The SKF Inspector 400 Ultrasonic Probe markedly reduces confusion from extraneous sounds or from heat transfer, even when traps are extremely close together.

### Electrical inspection

**Arcing and corona discharge** emit ultra sounds at the site of emission. This electrical discharge can be located quickly by scanning the area with the SKF Inspector 400 Ultrasonic Probe. The signal is heard as a frying or buzzing sound in the headset. As with pressure or vacuum leak detection, the closer the instrument is to the discharge, the more intense the signal.

Test switch gear, transformers, circuit breakers, buss bars, relays, junction boxes, insulators and other electrical gear.

### General mechanical inspection

The SKF Inspector 400 Ultrasonic Probe can detect the early stage of a machine's mechanical malfunction. NASA research has demonstrated that ultrasound monitoring will locate potential bearing deficiencies before they are detected by the traditional heat and vibration methods. With the SKF Inspector 400 Ultrasonic Probe, users hear the sound quality of a bearing as well as monitor amplitude changes on the meter. This complements other monitoring instruments and adds to the ability to trend, troubleshoot, and confirm potential bearing problems.

General mechanical inspection is easy with the SKF Inspector 400 Ultrasonic Probe and with very little training, users can learn to test bearings within minutes. Current vibration programs can achieve enhanced diagnostic ability with the SKF Inspector 400 Ultrasonic Probe.

**Prevent over-lubrication** with the SKF Inspector 400 Ultrasonic Probe by simply lubricating only until the meter reaches a specified level. Over lubrication is one of the more common causes of bearing failure.

**General mechanical inspection** of pumps, motors, compressors, gears and gear boxes: all types of operating equipment may be inspected with the SKF Inspector 400 Ultrasonic Probe. Since the SKF Inspector 400 Ultrasonic Probe works in a high frequency, short wave environment, problems such as cavitation in pumps, compressor valve leakage, or missing gear teeth may be heard and isolated. Reciprocating compressor valve analysis has also become successful with the SKF Inspector 400 Ultrasonic Probe and therefore many engine analyzer companies now offer instruments with an ultrasonic input port.

### Heat exchangers, boilers and condensers

In-leakage or pressure leakage can be readily located with the SKF Inspector 400 Ultrasonic Probe. Fittings, valves and flanges are all easily scanned for leakage. The high frequency, short wave nature of ultrasound allows operators to pinpoint the location of a leak in high noise environments.

Condenser tubes and heat exchanger tubes may be tested for leakage through two methods: **vacuum** and **pressure**.

#### Vacuum

The tube sheet is scanned for the tell-tale rushing sound produced as the leak draws air into the tube.

#### Pressure

Additional testing may be performed when the system is off-line utilizing air pressure around the tube bundle and scanning for the rushing sound produced from the leaking tube.

### Applications

- Pressure and vacuum leak detection
- Valve seat leak detection
- Exhaust system leaks
- Heat exchangers, boilers, condensers
- Steam trap inspection
- Bearing testing
- Gear/Gearbox inspection
- General mechanical inspection and troubleshooting
- Tanks, pipes, etc., leak testing

*Tank leakage*



*Mechanical inspection*



## SKF Inspector 400 Ultrasonic Probe Stethoscope/Scanner kit includes:

- SKF Inspector 400 Ultrasonic Probe pistol housing with LED bar graph meter, eight-position sensitivity selection, low battery indicator
- Scanning module
- Rubber focusing probe
- Stethoscope module
- Lightweight foam lined headset
- 9 V alkaline battery (replaceable)
- Cordura/Nylon soft pack carrying case
- Comprehensive instruction manual (English language)

## Specifications

- Construction: Handheld ABS pistol type ultrasonic processor, stainless steel sensor enclosures
- Circuitry: SMD / solid state hybrid heterodyne receiver
- Frequency response: 20 to 100 kHz (centered at 38 to 42 kHz)
- Indicator: 10 segment LED bar graph (red)
- Sensitivity selection: Eight-position precision attenuation
- Power: 9 V alkaline battery
- Low battery voltage indicator: LED
- Headset: Lightweight foam lined double headset wired mono-phononic impedance; 16  $\Omega$
- Probes: Scanning module stainless steel unisonic (single transducer) piezoelectric crystal type; stethoscope/contact module stainless steel plug-in type with 14 cm (5.5 in.) stainless steel waveguide
- Rubber focusing probe: Shields stray ultrasonic signals and focuses detected signals
- Response time: 300 m/s
- Ambient operating temperature range: 0 to 50 °C (30 to 120 °F)
- Relative humidity: 10 to 95% non-condensing at up to 30 °C (85 °F)
- Storage temperature: -20 to 55 °C (0 to 130 °F)
- Dimensions:
  - Height: 133 mm (5.25 in.)
  - Width: 50 mm (2.00 in.)
  - Length: 203 mm (8.00 in.)
- Weight: 320 g (11 oz.)
- Carrying case: Cordura/Nylon soft pack with die cut foam

## Ordering information

- SKF Inspector 400 Ultrasonic Probe Stethoscope/Scanner kit [CMIN 400-K] including:
  - Probe pistol housing with LED bar graph meter, eight-position sensitivity selection, low battery indicator, scanning module, rubber focusing probe, stethoscope module
  - Lightweight foam headset
  - 9 V alkaline battery
  - Instruction manual hard copy in English language

## Accessories and replacement parts

- Lightweight foam lined headset [CMAC 8600-1]
- Deluxe noise isolating headphones [CMAC 8600-2]
- Deluxe noise isolating headphones to be worn with hard hat [CMAC 8600-3]
- Utility belt with holster [CMAC 8600-4]
- Patented liquid leak amplifier, case of 12 x 8 oz. bottles, (used for extremely low level leaks  $1 \times 10^{-6}$  mil/sec) [CMAC 8600-5]
- Stainless steel unisonic scanning module [CMAC 8600-6]
- Stainless steel stethoscope/contact module [CMAC 8600-7]
- Stethoscope extension rods [CMAC 8600-8]
- Rubber focusing probe [CMAC 8600-9]

## Optional kits that includes the SKF Inspector 400 Ultrasonic Probe, CMIN 400-K

- SKF Basic Condition Monitoring kit [CMAK 400-ML]
  - SKF Machine Condition Advisor [CMAS 100-SL]
    - Extension kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet [CMAC 105-K]
  - SKF Infrared Thermometer [CMSS 3000-SL]
  - SKF Inspector Ultrasonic Probe [CMIN 400]
- SKF Energy Monitoring kit [CMAK 450-ML]
  - SKF Machine Condition Advisor [CMAS 100-SL]
    - Extension kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet [CMAC 105-K]
  - SKF Infrared Thermometer [CMSS 3000-SL]
  - SKF Inspector Ultrasonic Probe [CMIN 400]
  - Hioki Clamp-on Power Meter [CPT3169-20]
  - Hioki Power Meter Clamps [CPT9661]



SKF Basic Condition Monitoring kit CMAK 400-ML

## SKF Basic Condition Monitoring kit

CMAK 400-ML

An essential collection of measurement tools for all industrial manufacturing plants, the SKF Basic Condition Monitoring kit makes machine health monitoring a simple task for maintenance, operations, reliability and vibration analysis departments.

### Features

- Assessment of overall machine condition
- Test bearings, pumps, motors, compressors, etc.

### Multi-parameter machine assessment with the SKF Basic Condition Monitoring kit:

#### SKF Machine Condition Advisor CMAS 100-SL

The SKF Machine Condition Advisor simultaneously measures machine vibration signals and temperature to indicate machine health and bearing condition.

#### SKF external sensor kit for the SKF Machine Condition Advisor CMAC 105-K

The external vibration sensor with magnet provides convenience for hard-to-reach surfaces and more repeatable and accurate measurements.

#### SKF Infrared Thermometer CMSS 3000-SL

The heavy duty SKF Infrared Thermometer is a dual laser sighted, non-contact instrument for long range application.

#### SKF Inspector 400 Ultrasonic Probe CMIN 400-K

The SKF Inspector 400 Ultrasonic Probe senses high frequency sounds produced by operating equipment, leaks and electrical discharges and makes them audible. The SKF Basic Condition Monitoring kit features all of the accessories from the SKF Inspector 400 Ultrasonic Probe kit.

#### Carrying case

The instruments are packaged in a light, durable aluminium carrying case for industrial environments.

- Style: Riveted construction
- Weight: 2,6 kg (5.7 lb.) case only



- Dimensions:
  - Length: 450 mm (18 in.)
  - Width: 330 mm (13 in.)
  - Depth: 150 mm (6 in.)
- Material: 0.040 5052 H34 (or H32) aluminium – satin (mill) finish
- Features:
  - Valance (extrusion) – at joining ends (aluminium)
  - Continuous hinge (aluminium) – full length
  - Tubular handle (plated steel)
  - Two locking draw bolts (plated steel)
  - Eight reinforced corners (plated steel)
  - Four plastic bumpers – hinge side
  - Made in the USA
  - Briefcase pallet (faux leather)
  - Custom dye cut foam interior (1.3 lb/ft<sup>3</sup> density)
- Color: Powder coated (blue)

### Ordering information

#### SKF Basic Condition Monitoring kit [CMAK 400-ML] includes:

- SKF Machine Condition Advisor [CMAS 100-SL]
  - External sensor kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet [CMAC 105-K]
- SKF Infrared Thermometer [CMSS 3000-SL]
- SKF Inspector 400 Ultrasonic Probe kit [CMIN 400-K]
  - Ultrasonic Probe pistol housing with LED bar graph meter
  - Lightweight foam lined headset [CMAC 8600-1]
  - Stainless steel unisonic scanning module [CMAC 8600-6]
  - Stainless steel stethoscope/contact module [CMAC 8600-7]
  - Stethoscope extension rods [CMAC 8600-8]
  - Rubber focusing probe [CMAC 8600-9]

SKF Machine Condition Advisor



External sensor kit



SKF Infrared Thermometer



SKF Inspector 400 Ultrasonic Probe



Carrying case



For additional information on the instruments included in the kit, please refer to the previous, respective sections.

## SKF Bearing Assessment kit

### CMAK 300-SL

A convenient collection of measurement devices for all industrial manufacturing plants.

The basic SKF Bearing Assessment kit makes the assessment of bearing condition a simple task for maintenance, operations, reliability and vibration analysis departments.

### Features

- Check bearing and lubrication condition
- Assessment of overall machine condition

### Multi-parameter machine evaluation with the SKF Bearing Assessment kit:

#### SKF Machine Condition Advisor CMAS 100-SL

The SKF Machine Condition Advisor simultaneously measures machine vibration signals and temperature to indicate machine health and bearing condition.

#### SKF Infrared Thermometer CMSS 3000-SL

The heavy duty SKF Infrared Thermometer is a dual laser sighted, non-contact instrument for long range application.

For additional information on the instruments included in the kit, please refer to the previous, respective sections. For technical details on the SKF OilCheck TMEH1, please see the following.

#### SKF OilCheck TMEH1

The SKF OilCheck indicates the degradation and contamination level of oil, and detects increased mechanical wear and loss of the oil's lubricating properties.

- Handheld and user friendly
- Numerical readout to facilitate trending
- Shows changes in oil condition affected by:
  - Water content
  - Fuel contamination
  - Metallic content
  - Oxidation



The usual contamination found in oils is caused by oxidation and acid build up, which occur during normal machinery operation and typically show up as a gradual increase in the oil's "dielectric constant" readings over a period of time. In addition, excessive wear or mechanical failure may cause other contaminants to occur (i.e., dirt, soot, fuel, water, antifreeze, metal particles, etc.). These contaminants also cause an increase in the oil's dielectric constant.

The SKF OilCheck detects and measures change in an oil's dielectric constant by comparing measurements obtained from new and used oil samples. Measuring and trending changes to an oil's dielectric constant level provides information that helps optimize intervals between oil changes, and helps detect increased mechanical wear and loss of the oil's lubricating properties.

#### Technical Data

- Suitable oil types: Mineral and synthetic oils
- Repeatability: Better than 5%
- Readout: Green/Red grading, numerical value (0 to 100)
- Battery: 9 V Alkaline IEC 6LR61
- Battery lifetime: > 150 hours or 3 000 tests
- Dimensions:
  - Width: 95 mm (3.7 in.)
  - Height: 250 mm (9.8 in.)
  - Depth: 32 mm (1.3 in.)

#### Note:

The SKF OilCheck is not an analytical instrument. It is an instrument to detect changes in the oil condition only. The visual and numerical readouts provide a guide and enable trending of the comparative readings of a good oil to a used oil of the same type and brand.



SKF OilCheck TMEH1

SKF Bearing Assessment kit CMAK 300-SL

### Carrying case

The instruments are packaged in a light, durable, aluminium carrying case for industrial environment.

- Weight: 2,6 kg (5.7 lb.) case only
- Dimensions:
  - Length: 450 mm (18 in.)
  - Width: 330 mm (13 in.)
  - Depth: 150 mm (6 in.)
- Color: Powder coated (blue)

### Ordering information

#### SKF Bearing Assessment kit [CMAK 300-SL] includes:

- SKF Machine Condition Advisor [CMAS 100-SL]
- SKF Infrared Thermometer [CMSS 3000-SL]
- SKF OilCheck [TMEH1]

*SKF Machine Condition Advisor*



*SKF Infrared Thermometer*



*Carrying case*



For additional information on the instruments included in the kit, please refer to the previous, respective sections.

## SKF Energy Monitoring kit

CMAK 450-ML

*For compressed air systems*

This basic SKF Energy Monitoring kit makes it possible for any facility to lower their energy cost and reduce their CO<sub>2</sub> emissions by monitoring and optimizing the energy used by their compressed air systems.

### Features

- **Cost savings** – Can facilitate significant energy and cost reductions without major capital expense
- **Dualistic approach** – Measure energy data and condition monitoring data at the same time
- **Basic kit** – Measurements are easy to set up and perform

All basic instruments to measure energy efficiency of compressed air systems are featured in one convenient carrying case.

#### SKF Machine Condition Advisor CMAS 100-SL

The SKF Machine Condition Advisor simultaneously measures machine vibration signals and temperature to indicate machine health and bearing condition.

#### SKF External sensor kit for the SKF Machine Condition Advisor CMAC 105-K

The external vibration sensor with magnet provides convenience for hard-to-reach surfaces and more repeatable and accurate measurements.

#### SKF Infrared Thermometer CMSS 3000-SL

The heavy duty SKF Infrared Thermometer is a dual laser sighted, non-contact instrument for long range application.

#### SKF Inspector 400 Ultrasonic Probe CMIN 400-K

The SKF Inspector 400 Ultrasonic Probe senses high frequency sounds produced by operating equipment, leaks and electrical discharges and makes them audible. The SKF Basic Condition Monitoring kit features all of the accessories from the SKF Inspector 400 Ultrasonic Probe kit.

#### Hioki Clamp-on Power Meter CPT3169-20

Instrument used for obtaining energy related measurements for energy conservation programs, ISO 14001 testing and electrical equipment diagnosis.

For technical details on this product, see the following page.



*Hioki Clamp-on Power Meter*

*SKF Machine Condition Advisor*



*External sensor kit*



*SKF Infrared Thermometer*



*SKF Inspector 400 Ultrasonic Probe*



*Carrying case*



For additional information on the instruments included in the kit, please refer to the previous, respective sections.

SKF Energy Monitoring kit CMAK 450-ML

### Hioki Power Meter Clamps CPT9661

Designed for use with the Hioki Clamp-on Power Meter. CE approved for input of up to 500 Ampere AC.

For technical details on this product, see next page.

#### Carrying case

The instruments are packaged in a light, durable aluminium carrying case for industrial environment.

- Weight: 4,2 kg (9.3 lb.) case only
- Dimensions:
  - Length: 660 mm (26 in.)
  - Width: 330 mm (13 in.)
  - Depth: 178 mm (7 in.)
- Color: Powder coated (blue)

## Hioki Clamp-on Power Meter CPT3169-20

### Description

Power measuring instrument for factory power supply maintenance and to improve energy-saving efficiency.

Measures voltage, current, active power, reactive power, apparent power, power factor, integrated value, frequency and harmonics.

### Features

- New approach to energy-related measurement, such as energy conservation, ISO 14001 testing, equipment diagnosis and harmonics measurement
- Measure up to two three-phase, two-wire systems
- Measure up to four single-phase, two-wire systems
- 5 to 5 000 A range, PC card data storage
- Power recording for individual waveforms
- Simultaneous recording of demand values and harmonics

### Specifications

- Measurement line type (50/60 Hz):
  - Single-phase, two-wire system
  - Single-phase, three-wire system
  - Three-phase, three-wire system
  - Three-phase, four-wire system

- Number of systems that can be measured (for systems that share the same voltage)
  - Single-phase:
    - Two-wire, four systems
    - Three-wire, two systems
  - Three-phase:
    - Three-wire (measures the voltage and current for two lines) two systems
    - Three-wire (measures the voltage and current for all three lines) one system
    - Four-wire (measures the voltage and current for three lines) one system
    - Four-wire (measures the voltage for three lines and the current for four lines) one system
- Measurement range:
  - Voltage: 150 to 600 V, three ranges
  - Current (when using Hioki Power Meter Clamps CPT9661): 5 to 500 A, five ranges
  - Power: 75 W to 9 MW, 108 combination patterns
- Basic accuracy:  $\pm 0,2\%$  single reading,  $\pm 0,1\%$  full scale plus clamp-on sensor accuracy (active power, at 45 to 66 Hz)
- Clamp sensor accuracy: Hioki Power Meter Clamps CPT9661 (rated for 500 A)  $\pm 0,3\%$  single reading,  $\pm 0,01\%$  full scale (full scale is the sensor's rated primary current value)
- Frequency characteristic: Fundamental waveforms up to the 50<sup>th</sup> order  $\pm 3\%$  full scale plus measurement accuracy (of a 45 to 66 Hz fundamental waveform)
- Other functions:
  - PC card (one slot, PC card standard compliant Type II, Flash ATA card type), (9727/9728 PC card, 256 to 512 MB
  - RS 232C (printer or PC connected to an RS 232C interface)
  - External input/output
- Display update rate: Approximately every 0,5 seconds (except when using a PC card while accessing the internal memory, or when performing RS 232C communications)
- Power supply voltage rating: 100 to 240 V AC, 50/60 Hz
- Dimensions:
  - Width: 210 mm (8.27 in.)
  - Height: 160 mm (6.30 in.)
  - Depth: 60 mm (2.36 in.)
- Weight: 1,2 kg (42 oz.)
- Accessories supplied:
  - Voltage cord set (one cord each of black, red, yellow and blue), one set each
  - Power cord, one each
  - Input cord label, one each
  - Operating manuals – advanced edition and Quick Start Guide
  - Advanced edition and RS 232C interface operating manuals (CD)

## Hioki Power Meter Clamps CPT9661

### Description

Clamp-on sensor for use with the Hioki Clamp-on Power Meter CPT3169-20 and for input up to AC 500 A. Sensors are designed with a safety barrier to protect the user from direct contact with live conductors and meets CE marking requirements.

### Specification

- Rated input current: 500 AAC
- Rated output current: 0,5 VAC
- Accuracy (at 45 to 66 Hz):
  - Amplitude:  $\pm 0.5\%$  single reading,  $\pm 0,2\%$  full scale
  - Phase:  $\pm 0,5^\circ$  or less
- Frequency characteristics: 66 Hz to 5 kHz ( $\pm 1\%$  or less from accuracy)
- Maximum allowable input: Continuous 550 A rms (45 to 66 Hz)
- Maximum circuit voltage: 600 V AC rms (insulated wire)
- Core jaw diameter:  $\varnothing 46$  mm (1.81 in.)
- Dimensions:
  - Width: 77 mm (3.03 in.)
  - Height: 151 mm (5.94 in.)
  - Depth: 42 mm (1.65 in.)
- Weight: 360 g (12.7 oz.)
- Cord length: 3 m (9.84 ft.)



Hioki Power Meter Clamps

## Leak tags for compressed air systems CMAC 8600-LEAK TAG-50

### Description

The leak tags are used for labeling leaks when identified during air system leak inspections. The leak tags, which measure  $8,9 \times 20,3$  cm ( $3.5 \times 8$  in.), feature necessary information about the equipment and the leak. The top half of the perforated tag stays close to the leak and the bottom half is used for tracking the repair. Each package contains 50 tags.

Additionally, a package of these tags is included in the CMAK 450-ML energy monitoring kit for compressed air systems and is also available as a separate purchase for customers who have a CMIN 400-K SKF Inspector 400 ultrasonic probe.



Leak tag

## Ordering information

### SKF Energy monitoring kit [CMAK 450-ML] includes:

- SKF Machine Condition Advisor [CMAS 100-SL]
  - External sensor kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet [CMAC 105-K]
- SKF Infrared Thermometer [CMSS 3000-SL]
- SKF Inspector 400 Ultrasonic Probe kit [CMIN 400-K]
  - Ultrasonic Probe housing with LED bar graph meter
  - Lightweight foam lined headset [CMAC 8600-1]
  - Stainless steel unisonic scanning module [CMAC 8600-6]
  - Stainless steel stethoscope/contact module [CMAC 8600-7]
  - Stethoscope extension rods [CMAC 8600-8]
  - Rubber focusing probe [CMAC 8600-9]
- Hioki Clamp-on Power Meter [CPT3169-20]
- Hioki Power Meter Clamps [CPT9661]
- Leak tags for compressed air systems (package of 50) [CMAC 8600-LEAK TAG-50]

SKF Advanced Bearing Analysis kit CMAK 600-EN

## SKF Advanced Bearing Analysis kit

CMAK 600-EN

*For industrial oil analysis and vibration test*

Supplied ready for use, in a heavy duty aluminum case, multi-parameter test kit contains all of the necessary equipment and consumables for oil and overall vibration condition monitoring.

### Features

- Fast accurate results for multiple oil parameters
- Easy to use, portable kit
- On-site maintenance decision
- Assessment of overall machine condition

### Multiple measurements

The center of the SKF Advanced bearing analysis kit is the Test Cell, providing simple, accurate results for Water in Oil (Lubricants) and Total Base Number (TBN).

An easy to read digital display provides instructions and test results with a five year (10 000 tests) battery life and built-in memory for recording previous test results. The Test Cell is capable of performing both test parameters in a single cell. Reagents are provided in the kit.

### Details

- Test time: 2 to 3 minutes
- Memory: Previous test, plus five oils
- Battery life: Five years (10 000 tests)



### Test Cell

#### Water in oil

Helps to maintain the equipment by protecting it from damage caused by water in oil.

- Prevent corrosion, cavitations or machinery failure by detecting water in oil, before any damage occurs
- Minimize instability of additive packages and damaging microbe growth by monitoring your oil
- Fully portable for use on-board or in the field, test cells are extremely robust, durable, and easy to use

#### Details

- Range: 0,02 to 1%, 200 to 10 000 ppm, 0 to 10%, 0 to 20%

#### Total Base Number

Measuring the Total Base Number provides indication of the oil's alkaline reserve and ability to neutralize acids from combustion. The SKF Advanced Bearing Analysis kit provides modern digital analysis for fast, accurate results that can be trended. The Test Cell gives a quick indication of Total Base Number depletion in lubricants.

- Avoid fouling within the engine and corrosion of engine components by monitoring the Total Base Number of lubricating oils
- Simple, economical monitoring of lubricants

#### Details

- Range: 5 to 80 Total Base Number
- Accuracy: Typically  $\pm 10\%$  of new oil Total Base Number



*Test cell: digital analysis of Total Base Number and water in oil*

### Water in lubricants

Water contamination may cause different problems in different types of lubricating oil, although corrosion is always directly associated with water ingress. Whatever the equipment, water can displace the oil at contacting surfaces, reducing the amount of lubrication and activating surfaces which may themselves act as catalysts for degradation of the oil. Water is an important contaminant in many lube oil systems because of its potential to cause failure via a number of mechanisms.

### Total Base Number

Total Base Number is a measure of reserve alkaline additives put into lubricants to neutralize acids, to retard oxidation and corrosion, enhance lubricity, improve viscosity characteristic and reduce the tendency of sludge buildup. Simply put, it is a test to measure the ability to neutralize corrosive acids that may be formed during normal operation.

Oil formulations of additives vary drastically between oil companies, so the most important analytical parameter is the change in base number when compared to the lubricant when new, or when in service, to the previous sample.

## Viscostick

The Viscostick gives a simple go/no-go result. Typically detected are 5 to 10% distillate fuel dilutions of an SAE 30 to 40 engine oil as well as increases in viscosity due to oil contamination.

- Measuring oil viscosity provides early detection of contamination, fuel ingress and shear thinning
- Suitable for hydraulic oils, diesel engine oils, enclosed gears and fuel oils
- Simple, cost effective equipment

### Details

- Range: Go/No-go
- Application: Lubricating oils, viscous hydraulics
- Number of tests: Unlimited
- Test time: One minute

Viscostick



Insolubles



## Insolubles

### Monitoring of combustion related debris and oxidation products

High insolubles will cause lacquer formation on hot surfaces, sticking of piston rings, and wear of cylinder liner, and bearing surfaces.

- Detection of insolubles from diesel engine combustion products such as fuel ash, carbon, partially oxidized fuel, oil oxidation products, and spent lubrication additive.
- Simple and quick to use, the Insolubles Test Papers provide a qualitative result when compared to a chart.

### Details

- Range: Qualitative
- Application: Diesel engine lubricants
- Number of tests: 100
- Test time: One hour (unattended)

## SKF Machine Condition Advisor

### Monitoring of vibration and temperature

The SKF Machine Condition Advisor simultaneously measures machine vibration signals and temperature to indicate machine health and bearing condition.

For additional information on this instrument included in the kit, please refer to the previous, respective section.

## Carrying case

The instruments are packaged in a light, durable aluminium carrying case for industrial environment.



### Details

- Weight: 2,6 kg (5.7 lb.) case only
- Dimensions:
  - Length: 450 mm (18 in.)
  - Width: 330 mm (13 in.)
  - Depth: 150 mm (6 in.)
- Color: Powder coated (blue)

SKF Machine Condition Advisor



**Viscosity**

Viscosity is the measure of the internal friction of a fluid. This friction becomes apparent when a layer of fluid is made to move in relation to another layer. The greater the friction, the greater the amount of force required to cause this movement, which is called shear. Shearing occurs whenever the fluid is physically moved or distributed, as in pouring, spreading, spraying, mixing, etc. Highly viscous fluids, therefore, require more force to move than less viscous materials.

**Insolubles**

Insolubles are a build up of combustion related debris and oxidation products. Contamination comes mainly from combustion products; fuel ash, carbon and partially oxidized fuel, plus a small contribution of oil oxidation products, and spent lubricant additive.

High insolubles will also decrease the detergent property of oil.

**Vibration**

Vibration monitoring is commonly used to observe the condition of rotating machinery.

Velocity is the most widely used parameter for machinery vibration measurement.

Enveloped acceleration or demodulation is the SKF signal processing technique that enables the detection of bearing and gearmesh defects as well as lubrication problems, much earlier than traditional analysis techniques.

## Specification

**Test Cell**

- Water in oil: 0,02 to 1%, 200 to 10 000 ppm, 0 to 10%, 0 to 20%
- Total Base Number (TBN): 5 to 80 TBN

**Test Paper**

- Insolubles: Qualitative

**Viscostick**

- Viscosity: Go/No-go

**SKF Machine Condition Advisor**

- Velocity, enveloped acceleration, temperature: Refer to the previous section for specifications

- Chromotography papers, 100 OFF [one each]
- Reagent A [two each]
- Reagent C [one each]
- 10 ml disposable syringe [three each]
- 5 ml disposable syringe [five each]
- Water in oil test reagent, pack of 50 [one each]
- Test agitator [one each]
- Stainless steel scissors [one each]
- Plastic disposable gloves, pack of 100 [one each]
- 100 ml beaker, plastic [one each]
- Stirring rod, plastic [one each]
- Instruction manuals
  - SKF Advanced Bearing Analysis kit
  - SKF Machine Condition Advisor

**Replenishment kits****Water in oil reagent kit [CMAK 2101 ] includes:**

- Water in oil test reagent, pack of 50 [one each]
- Test agitator [one each]
- Stainless steel scissors [one each]
- 5 ml disposable syringe [three each]
- Plastic disposable gloves, pack of 100 [one each]

**Total Base Number reagent pack [CMAK 2002 ] includes:**

- Reagent C [one each]
- 10 ml disposable syringe [three each]
- Plastic disposable gloves, pack of 100 [one each]

## Ordering information

**SKF Advanced Bearing Analysis kit [CMAK 600-EN] includes:**

- SKF Machine Condition Advisor [one each]
  - SKF Machine Condition Advisor accessories [one each]
    - Belt holster [CMAK 102]
    - Charger, international DC power supply [CMAK 8002]
    - Charger adapter, cable [CMAK 101]
    - User manual, English hard copy [32131800-EN]
    - Reference CD
- Test Cell [one each]
- Viscostick [one each]

## SKF Electric Motor Assessment kit

### CMAK 200-SL

*For evaluation of electric motor bearings and general machine health*

A fitting bundle of two measurement devices for electric motors and other industrial assets, the SKF Electric Motor Assessment kit makes the evaluation of electric motor bearings and general machine health simple.

### Features

- Inspect and assess electric motor machine condition
- Measures:
  - Overall machine health
  - Bearing condition
- Safely detect electrical discharges in electric motors
- Ideal for novice and expert users

### Multi-parameter measurements for electric motors

#### SKF Machine Condition Advisor CMAS 100-SL

The SKF Machine Condition Advisor (MCA) simultaneously measures machine vibration signals, specifically velocity, enveloped acceleration and temperature to indicate machine health and bearing condition.

For additional information on this instrument included in the kit, please refer to the previous, respective section.

#### SKF Electric Discharge Detector Pen TKED 1

The SKF Electric Discharge Detector Pen (EDD Pen) is a simple to use, handheld instrument that provides a unique, reliable and safe way to detect electrical discharges in electric motor bearings.

Electrical discharges are a result of motor shaft voltages discharging to earth through the bearing, causing electrical erosion, lubricant degradation and ultimately bearing failure.



Electric motors are more vulnerable to suffer electrical erosion in bearings when controlled by a variable frequency drive. When incorporated in a predictive maintenance program, the EDD Pen can help detect bearings that are more susceptible to failure, and can help to significantly prevent unplanned machine downtime.

- Unique remote solution allows operation at a distance from the motors, which protects the user from touching machinery in motion
- No special training required
- Capable of detecting electrical discharges on a time base of 10 seconds, 30 seconds or indefinite
- LED backlit screen allows use in low light environments
- IP 55 can be used in most industrial environments

### Specifications

- Power supply: 4,5 V, 3 × standard AAA batteries (LR03, AM4)
- Time control:
  - Presets: 10 or 30 seconds
  - Default: Infinite
- Operational temperature: 0 to 50 °C (30 to 120 °F)
- Storage temperature: -20 to +70 °C (-5 to +160 °F)
- Ingress protection level: IP 55
- Display – LCD counter range: 0 to 99 999 discharges
- User selectable backlight and low battery warning
- Dimensions:
  - Length: 203,2 mm (8.0 in.)
  - Width: 48,3 mm (1.9 in.)
  - Depth: 20,3 mm (0.8 in.)
- Weight: 105 g (3.7 oz.)

SKF Machine Condition Advisor



SKF EDD pen

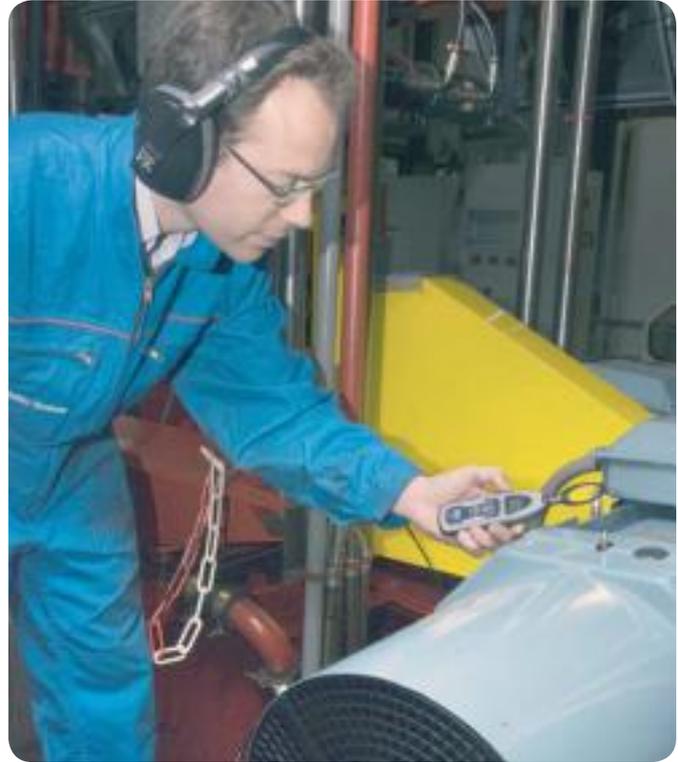


Since the 1990's, the use of variable-frequency drives (VFDs) to control alternating current (AC) motors has become very common, as they can save energy. However, the drawback of using VFDs is the fact that electrical motors are more vulnerable to suffer from electrical erosion in the bearings caused by electrical discharge currents. Electrical erosion can cause bearings to fail very prematurely, causing motor failure and unplanned downtime.

Until now there has not been an easy, cost effective method to detect electrical discharge currents in electric motor bearings. Thanks to the EDD Pen, this is now possible. Operating with only two buttons, the EDD Pen allows everybody to detect electrical discharge currents remotely in a safe way.

Unlike other traditional methods, the electrical discharge currents can be directly detected rather than measuring the effects in later stages when damage has already occurred.

When incorporated into a predictive maintenance program, the EDD Pen can significantly prevent unplanned machine downtime.



### Carrying case

The instruments are packaged in a durable nylon carrying case.



- Weight: 113 g (4 oz.) case only
- Dimensions:
  - Length: 279 mm (11.0 in.)
  - Width: 229 mm (9.0 in.)
  - Depth: 64 mm (2.5 in.)
- Color: Black

### Ordering information

- SKF Electric Motor Assessment kit CMAK 200-SL includes:
  - SKF Machine Condition Advisor [CMAS 100-SL]
  - SKF Electrical Discharge Detector Pen [TKED1]
  - Black nylon carrying case



*Lubricant degradation caused by electrical discharge currents.*

## SKF Machine Condition Detector Pro IS

CMVL 3600-IS

*Intrinsic Safety (IS) rated*

The SKF Machine Condition Detector Pro IS (MCD Pro IS) is a rugged, handheld analysis tool that captures and displays temperature, velocity and enveloped acceleration (vibration) and alarms.

The SKF MCD Pro IS is certified Intrinsically Safe (IS) for use in hazardous environments that require either a Zone I or Class I, Division I rating.

The MCD Pro IS collects and displays velocity, acceleration enveloping and temperature data with general alarm capabilities.



*ATEX and North America hazardous conditions approvals – the SKF Machine Condition Detector Pro IS provides for velocity, enveloped acceleration and temperature monitoring with general alarm capabilities.*

### Features

- Multi-parameter measurements
- Simple machine monitoring
- Alarm capabilities for enhanced user confidence

### Go/No Go machine monitoring

The MCD Pro IS is designed to provide a straightforward approach to machinery monitoring. The instrument's sensor affixes to a machine point via a SKF MARLIN QuickConnect (MQC) stud or magnetic base for automatic collection of vibration and temperature data. Green, yellow and red LEDs provide easy to interpret indications of machine status, so operations or maintenance personnel can quickly identify the need for more in-depth analysis on a particular machine.

### Multi-parameter monitoring capabilities

The MCD Pro IS operates as a stand-alone device or as an integral component of the complete SKF MARLIN System.

By pairing the MCD Pro IS with the SKF Microlog Inspector / SKF MARLIN handheld device, important machinery and process information may be stored for trending review. Data can also be transferred with the SKF system from the MCD Pro IS to @ptitude Inspector software for further detailed analysis.

### Vibration monitoring

When performing measurements, the MCD Pro IS's sensor input signal is processed to produce two vibration measurements for each measurement POINT. Velocity vibration identifies phenomena that are observable in the low to mid frequency range and indicates such structural problems as misalignment, unbalance, mechanical looseness and more.

Events that occur in the higher frequency ranges, such as bearing and gear problems, can also be detected by the MCD Pro IS with its "acceleration enveloping" capability, a signal processing technique that focuses on enhancing the repetitious vibration signals that characterize such problems.

### Temperature

Temperature measurements enhance the "early warning" benefit of the instrument by offering a useful indication of mechanical condition or the load applied to a specific component, since as a bearing or its lubrication fails, friction causes its temperature to rise.

## General alarm capabilities

When used as a stand-alone tool, the MCD Pro IS may be easily programmed for six alarm settings, which include the "alert" and "danger" levels for each of the three measurements.

When measurements are taken, current measured values are automatically compared to six user-defined settings, and the MCD Pro IS's alarm indicator and LEDs react appropriately. An "alert" condition provides the user with an early warning of impending problems for which immediate in-depth analysis should be performed. A "danger" alarm indicates that a problem has escalated to a point where actions must be made quickly to avoid a serious failure.

When used with the SKF Microlog Inspector / SKF MARLIN, data is logged for trending and percent change from last measurement and baseline data.

## SKF MARLIN QuickConnect studs for quality, repeatable data collection



Specially designed mechanical and computerized studs enable users to collect consistent, accurate and repeatable data from each measurement point. Engineered to work exclusively with the MCD Pro IS, the MQC mechanical and computerized studs provide for a fast, quarter-turn connection that temporarily fastens the probe to a measurement point. This reduces the possibility of errors and inconsistencies often resulting from data collected by using varying methodologies.

## Specifications

### Measurements

- Vibration pickup: Integrated piezoelectric acceleration (ceramic, shear type)
- Measurement range:
  - Velocity: 0,3 to 55,0 mm/s (RMS) (0.02 to 3.00 in./s (Eq. Peak)), meets ISO Standard 10861-1
  - Enveloped acceleration: 0,3 to 20,0 gE
  - Temperature: 0 to 100 °C (30 to 210 °F)

- Frequency range:
  - Overall velocity: 10 Hz to 1 kHz (tolerances measured within the frequency range are in accordance with ISO 3945)
  - Acceleration enveloping band 3: 500 Hz to 10 kHz

### Power

- Main power: Two 1,5 V alkaline AA batteries
- Battery lifetime: 30 hours
- Backup battery: One 3 V BR1225 Lithium-ion battery
- Auto off: Two minute countdown on last operation

### User environment

- Operating temperature:
  - Ordinary locations: -20 to +60 °C (-5 to +140 °F)
  - Hazardous locations: -20 to +40 °C (-5 to +105 °F)
- Storage temperature: -35 to +70 °C (-30 to +160 °F)
- Humidity: 5 to 95% non-condensing

### Hazardous area ratings

- Intrinsic Safety (IS):
  - ATEX: II1G EEx ia IIC T4 (Ta = -20 to +40 °C (-5 to +105 °F))
  - Class I, Division 1, Groups A, B, C, D T3A (USA, Canada)

### Physical characteristics

- Case: Water and dust resistant (IP 65)
- Drop test: 1,8 m (6 ft.) on multiple axes
- Dimensions: 190,5 × 43,2 × 41,4 mm (7.50 × 1.70 × 1.63 in.)
- Weight: 431 g (0.95 lb.) with battery, 635 g (1.4 lb.) with temperature magnet probe tip
- Display viewing area: 55,0 × 17,8 mm (2.17 × 0.70 in.)
- Communications port type: Micro D RS-232

### Quick connect interface

- Receptacle: 1/4 turn, 5/8"-24 two lead thread with contact

### Accessories

- CMSS 26xx series: SKF MARLIN QuickConnect studs

## Need to boost your plant's availability and reliability?

### Start with operator driven reliability from SKF

For today's power plants, optimizing output in the face of rising operating costs, reduced manpower and stringent regulations is a constant challenge. By enabling operators to take the lead in monitoring and maintaining equipment, the proven operator driven reliability (ODR) program from SKF is helping plants meet this challenge.

### Why operator driven reliability?

Because of their proximity to equipment, operators are usually the first to detect even the smallest changes in process conditions and machinery health, including leaks, abnormal readings, excessive heat, vibration or pressure.

In a successful ODR program, operators perform process parameter inspections, record and communicate observations on machine performance, and make minor adjustments. Using technology to automate these tasks facilitates consistency, accuracy and plant-wide information sharing, all of which can enhance your production and maintenance strategies.

With ODR, operators become an integral part of an overall reliability-based asset management strategy that can result in increased productivity and reduced unplanned downtime.

### Why choose SKF?

SKF knowledge engineering enables a comprehensive, single source ODR solution. Featuring hand held monitoring devices, sensors and software, SKF's ODR system components work together seamlessly and integrate with a plant's computerized maintenance management and/or decision support system.

SKF has the experience and expertise to tailor an operator driven reliability program to meet your facility's unique goals and help implement sustainable, continuous improvement.

## Ordering information

### SKF Machine Condition Detector MCD Pro IS CMVL 3600-IS-K-01-C Kit

Each **CMVL 3600-IS-K-01-C** kit consists of the following items:

- SKF Machine Condition Detector Pro IS probe [CMVL 3600-IS]
- Temperature magnet probe tip for SKF Machine Condition Detector Pro IS probe [CMAC 3610]
- AA Alkaline batteries, two each
- SKF Machine Condition Detector Pro IS setup key [CMAC 3620]
- SKF Machine Condition Detector Pro IS padded carrying case [31736700]
- SKF Machine Condition Detector Pro IS user manual [CMVL 3600M-SL]
- SKF Machine Condition Detector Pro IS quick start card [CMVL 3600-QS]
- Vibration severity card

### SKF MARLIN quick connect and mounting accessories

- SKF MARLIN quick connect interface receptacle, 1/4 turn, 5/8-24 two lead thread with contact
- SKF MARLIN quick connect mechanical M8 x 1,25 mounting thread – three studs per package [CMSS 2600-3]
- SKF MARLIN quick connect mechanical 1/4-28 mounting thread – three studs per package [CMSS 2610-3]
- SKF MARLIN quick connect computerized M8 x 1,25 mounting thread – three studs per package [CMSS 2601-3]
- SKF MARLIN quick connect computerized 1/4-28 mounting thread – three studs per package [CMSS 2611-3]
- Toolkit for spot face 1/4-28 [CMAC 9600-01]
- Toolkit for spot face M8 x 1,25 [CMAC 9600-02]
- Drill bit for 1/4-28 kit [CMAC 9600-03]
- Tap for 1/4-28 kit [CMAC 9600-04]
- Pilot for 1/4-28 kit [CMAC 9600-05]
- Drill bit for M8 x 1,25 kit [CMAC 9600-06]
- Tap for M8 x 1,25 kit [CMAC 9600-07]
- Pilot for M8 x 1,25 kit [CMAC 9600-08]
- End mill or counter bore for either kit [CMAC 9600-09]
- Toolkit for spot face M6 x 1,25 [CMAC 9600-10]



*The SKF MARLIN CMDM 6500 (left) and CMDM 5460 (right) are designed to work with the SKF Machine Condition Detector Pro IS to automate the machine inspection process.*



SKF Machine Condition Detector Pro IS CMVL 3600-IS

**Optional accessories**

- Cable, SKF MARLIN I-Pro CMDM 6500 series to SKF Machine Condition Detector Pro IS (Requires CMAC 6142 snap-on adapter, sold separately) [CMAC 6141]
- Snap-on adapter, SKF MARLIN I-Pro [CMAC 6142]
- Cable, SKF MARLIN S-Pro CMDM 5460 to SKF Machine Condition Detector Pro IS (Requires CMAC 6115 adapter) [CMAC 6109]
- Adapter, SKF MARLIN S-Pro [CMAC 6115]
- SKF Machine Condition Detector Pro IS setup key [CMAC 3620]
- Temperature magnet for SKF Machine Condition Detector Pro IS probe [CMAC 3610]
- Probe tip replacement kit for temperature magnet for SKF Machine Condition Detector Pro IS [CMAC 3630]
- Magnetic probe tip for SKF Machine Condition Detector Pro IS [CMAC 3611]
- Stinger probe 10 cm (4 in.) [CMSS 60139-04]
- 1/4-28 SKF MARLIN quick connect for stinger interface [CMSS 2610-1]
- SKF Machine Condition Detector Pro IS quick start card [CMVL 3600-QS]
- SKF Machine Condition Detector Pro IS user manual [CMVL 3600M-SL]



CMAC 3600-IS MCD Pro IS probe



CMAC 3625 carrying case

**SKF MARLIN data manager**

The SKF Machine Condition Detector Pro IS can be used in non-hazardous areas with the SKF MARLIN CMDM 6500 and CMDM 5400 series.

For additional information on the SKF MARLIN data managers, please refer to SKF publication number SR/P2 10272 EN or contact your local SKF Sales Representative.

CMAC 3610 temperature magnet probe tip



CMAC 3620 setup key



Protective cover



Vibration severity card (front and back)

Envelope Severity g <sub>rms</sub> Peak-to-Peak	Shaft Diameter and Speed		
	Diameter Between 200 and 500 mm and Speed 7500 rpm	Diameter Between 50 mm and 200 mm and Speed Between 1000 and 3000 rpm	Diameter Between 20 and 100 mm and Speed Between 1000 and 3000 rpm
0.1	Unacceptable (Danger)	Unacceptable (Danger)	Unacceptable (Danger)
0.2	Unacceptable (Danger)	Unacceptable (Alert)	Unacceptable (Alert)
0.3	Unsatisfactory (Watch)	Satisfactory	Satisfactory
0.4	Satisfactory	Satisfactory	Satisfactory
0.5	Good	Good	Good

Vibration Severity g <sub>rms</sub> Peak-to-Peak	Machinery Group 2 Medium Duty		Machinery Group 1 Large Duty	
	Speed Power: 15 kW to 300 kW Electrical Machines with Shaft Diameter 100 to 225 mm (4 to 9 in.)	Speed Power: 15 kW to 300 kW Electrical Machines with Shaft Diameter 100 to 225 mm (4 to 9 in.)	Speed Power: >300 kW	Speed Power: >300 kW
0.1	Unacceptable (Danger)	Unacceptable (Danger)	Unacceptable (Danger)	Unacceptable (Danger)
0.2	Unacceptable (Danger)	Unacceptable (Alert)	Unacceptable (Alert)	Unacceptable (Alert)
0.3	Unacceptable (Alert)	Unacceptable (Alert)	Unacceptable (Alert)	Unacceptable (Alert)
0.4	Unacceptable (Alert)	Satisfactory	Satisfactory	Satisfactory
0.5	Satisfactory	Satisfactory	Satisfactory	Satisfactory
0.6	Good	Good	Good	Good
0.7	Good	Good	Good	Good
0.8	Good	Good	Good	Good
0.9	Good	Good	Good	Good
1.0	Good	Good	Good	Good

## Loop-powered vibration transmitters series

CMSS 420VT / CMCP 420VT-T

*Simply, the most economical approach to preventive maintenance*

Have somebody look after your rotating machinery, including pumps, motors, fans, blowers, compressors and other machinery for too much vibration. The SKF loop-powered vibration transmitter works around the clock, seven days a week.

### Features

- Solid-state reliability
- Integral sensor
- Standard 4 to 20 mA output
- Dynamic signal output for portable analyzers
- CE approved
- Approved Class 1, Division 2, Groups B, C, D for United States and Canada

### Description

The CMSS 420 series are solid state, loop-powered vibration transmitters. They provide a 4 to 20 mA output that is proportional to overall vibration in terms of velocity. The series of CMSS 420 continuously monitor machinery health and transmit directly into a PLC or DCS for trending, alarm and machine shutdown. In addition, the CMSS 420VT provides access to the dynamic transducer output. The buffered output is available for temporary connection of portable analyzers for detailed machine fault analysis.

In addition, the CMCP 420VT-T provides a second 4 to 20 mA output related to temperature.

### Simple installation

Simply mount the CMSS 420VT into a 1/4-28 or M8 tapped hole in the bearing housing or machine case (NPT mounting adapters are available, part number CMSS 203), connect two wires into a 4 to 20 mA loop, and you are ready to interface with a PLC or DCS. Electrical conduit may be connected directly to the top 3/4 in. NPT fitting (NPT mounting adapters are available, part number CMSS 203).



Hazardous Location Safety  
E112798  
UL1604, CSA C22.2 No 213  
Cl 1, Div 2, Grp B,C,D  
24 VDC, 23 mA Max



### Specifications

#### CMSS 420VT velocity and dynamic signal output

##### Dynamic

- Output: 4 to 20 mA proportional to full scale velocity
- Accuracy:  $\pm 5\%$  of full-scale
- Frequency response: 2 to 2 000 Hz
- Frequency response accuracy:
  - $-3$  dB: 2 Hz to 2 kHz
  - 10%: 10 Hz to 1 kHz
  - 5%: 15 to 750 Hz
- Buffered output: Acceleration, 100 mV/g

#### CMCP 420VT-T velocity and temperature output

##### Dynamic

- Output 1: 4 to 20 mA proportional to full scale velocity
- Velocity accuracy:  $\pm 5\%$  of full-scale
- Frequency response: 2 to 2 000 Hz
- Frequency response accuracy:
  - $-3$  dB: 2 Hz to 2 kHz
  - 10%: 10 Hz to 1 kHz
  - 5%: 15 to 750 Hz
- Output 2: 4 to 20 mA proportional to full scale temperature
  - From 0 to 100 °C (30 to 210 °F)
- Temperature accuracy: 2,5 °C at 85 °C (4.5 °F at 185 °F)

**CMSS 420VT and CMCP 420VT-T****Environmental**

- Operating temperature: -20 to +80 °C (-5 to +175 °F)
- Sealed: Epoxy encapsulated
- Enclosure: SS, NEMA 4, 4X, 12
- Mounting: Stud mounted
- Weight (without display): 227 g (8 oz.)

**Regulatory approval**

CE Mark: SKF loop-powered vibration transmitter CMSS 420VT and displays CMSS 420LCD and CMSS 420LED

**Hazardous area ratings**

- Suitable for use in Class I, Division 2, Groups B, C, D (United States and Canada)

**Electrical ratings**

- 22 to 36 V DC, 4 to 23 mA, provided from an external DC source rated 36 V DC maximum, 23 mA maximum. The CMSS 420VT is suitable for use in Class I, Division 2, Groups B, C, D.
- Maximum load: Up to 500 Ω resistive at 24 V DC and no display (see note – maximum load resistance calculations for specific requirements)
- Grounding: Case isolated

**Ordering information**

- **CMSS 420VT-1**  
– 25,4 mm/s (0 to 1 in./s) RMS, includes 1/4-28 and M8 mounting studs
- **CMSS 420VT-2**  
– 50,8 mm/s (0 to 2 in./s) RMS, includes 1/4-28 and M8 mounting studs
- **CMCP 420VT-T1**  
– 25,4 mm/s (0 to 1 in./s) RMS, 0 to 100 °C (30 to 210 °F), includes 1/4-28 and M8 mounting studs
- **CMCP 420VT-T2**  
– 50,8 mm/s (0 to 2 in./s) RMS, 0 to 100 °C (30 to 210 °F), includes 1/4-28 and M8 mounting studs

**Optional display****Light Emitting Diode display (LED)**

- **CMSS 420LED-01**  
– 0 to 1 in./s
- **CMSS 420LED-02**  
– 0 to 2 in./s
- **CMSS 420LED-51**  
– 25,4 mm/s
- **CMSS 420LED-52**  
– 50,8 mm/s

**Liquid Crystal Display (LCD)**

- **CMSS 420LCD-01**  
– 0 to 1 in./s
- **CMSS 420LCD-02**  
– 0 to 2 in./s
- **CMSS 420LCD-51**  
– 25,4 mm/s
- **CMSS 420LCD-52**  
– 50,8 mm/s

**Note: Maximum load resistance calculations:**

DC supply voltage range: 22 to 36 V DC

$$R_L \text{ max} = \frac{V_s - 14 - V_d}{0,02}$$

$R_L$  = Load resistance

$V_s$  = DC supply voltage

$V_d$  = Display voltage: 5,0 V DC for LED, 2,0 V DC for LCD, 0,0 V DC for no display

The recommended Load Resistance ( $R_L$ ) for most installations is: 100 or 250 Ω at  $V_s = 24$  V DC, with or without an LED/LCD display.

**Accessories**

- **CMSS 420LCD/CMSS 420LED** display retrofit (requires transmitter)
  - LCD displays actual vibration levels in velocity on a Liquid Crystal Display. LED displays actual vibration levels in velocity on a Light Emitting Diode display. The displays are shipped loose, and it is a simple installation. Includes a BNC connector that provides access to the raw acceleration signal for the CMSS 420VT.
- **CMSS 420BNC** BNC adapter retrofit
  - 90 degree 3/4 in. NPT conduit elbow with a BNC connector to access the raw acceleration signal. This is useful for connecting the CMSS 420VT to the portable data collectors.
- **CMSS 420EL** 90 degree 3/4 in. by 3/4 in. NPT elbow
  - Useful for connecting CMSS 420VT to hard or flexible conduit. When used with the CMSS 420WF, provides a simple weatherproof exit for the instrument wire.
- **CMSS 420WF** 3/4 in. NPT weatherproof cable fitting
  - When used with the CMSS 420EL, provides a simple weatherproof exit for the instrument wire.
- **CMSS 203** pipe thread accelerometer mounting adapter
  - They are provided in several NPT sizes to accommodate the most common plugs found on most machinery. The adapters have a 1/4-28 threaded hole to mate with the CMSS 520VT and most common accelerometers and vibration transmitters.



*CMSS 420LCD / CMSS 420LED display retrofit*



*CMSS 420BNC BNC adapter retrofit*



*CMSS 420EL NPT elbow*



*CMSS 420WF NPT weatherproof cable fitting*

**CMSS 203 Mounting adapters**

**Part number**   **Pipe thread mounting adapter**

CMSS 203-01	1/2 in. (NPT) National pipe tapered thread
CMSS 203-02	3/4 in. (NPT) National pipe tapered thread
CMSS 203-03	3/8 in. (NPT) National pipe tapered thread
CMSS 203-04	1/4 in. (NPT) National pipe tapered thread



*CMSS 203 pipe thread accelerometer mounting adapter*

General purpose industrial accelerometer CMSS 2100

## General purpose industrial accelerometer

### CMSS 2100

*Incorporating the latest in technology to meet the demanding CE, EMC and low noise level requirements*

Using detailed knowledge acquired from many years of supplying high quality sensors to a broad spectrum of industry users, SKF offers rugged accelerometers designed for the pulp and paper, petrochemical, steel, mining, construction, metal working and machine tool industries.

### Features

- For use with the SKF junction boxes, on-line systems, protection systems and the portable data collection instruments
- Rugged, economical and all around general purpose sensor
- Sensitivity, 100 mV/g to optimize use in multiple applications
- Exceptional bias voltage (BV) stability at elevated temperatures
- Designed for exceptional low noise level for low elevated temperatures
- Meets stringent CE, EMC requirements
- Smaller profile industrial accelerometers
- Two mounting studs (1/4-28 and M8 x 1,25) provided
- Corrosion resistant and hermetically sealed for humidity areas
- Reverse polarity wiring protection

### Specifications

Specifications conform to ISA-RP-37.2 (1 to 64) and are typical values referenced at 25 °C (75 °F), 24 V DC supply, 4 mA constant current and 100 Hz.

#### Dynamic

- Sensitivity: 100 mV/g
- Sensitivity precision: ±5% at 25 °C (75 °F)
- Acceleration range: 80 g peak
- Amplitude linearity: ≤ 1%, up to full scale
- Frequency range:
  - ±5%; 3,0 to 5 000 Hz
  - ±10%; 1,0 to 9 000 Hz
  - ±3 dB; 0,5 to 14 000 Hz
- Resonance frequency: Mounted, nominal 30 kHz
- Transverse sensitivity: ≤ 5% of axial



#### Electrical

- Power requirements:
  - Voltage source: +24 V DC nominal, 18 to 30 V DC
  - Constant current diode: 2 to 10 mA DC, recommended 4 mA
- Electrical noise: 2,0 Hz; 20 µg/√Hz
- Output impedance: < 100 Ω
- Bias output voltage: 12 V DC
- Grounding: Case isolated, internal shielding

#### Environmental

- Temperature range: –50 to +120 °C (–60 to +250 °F), operating temperature
- Vibration limits: 500 g peak
- Shock limit: 5 000 g peak
- Electromagnetic sensitivity, equivalent g, maximum: 70 µg/gauss
- Sealing: Hermetic
- Base strain sensitivity: 200 µg/microstrain
- CE: According to the generic immunity standard for Industrial Environment EN50082-2.
- Acceptance Criteria: The generated "false equivalent g level" under the above test conditions should be less than 2 mg peak to peak.

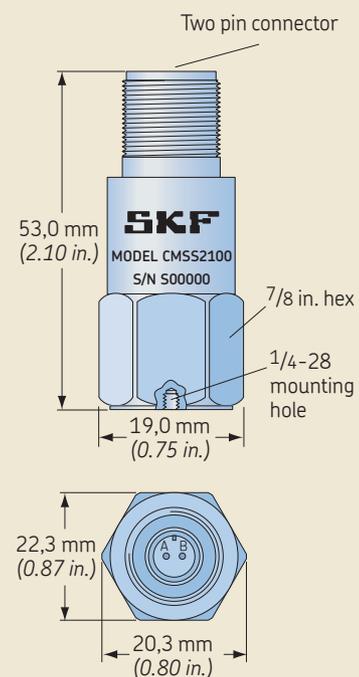
### Physical

- Dimensions: See drawing
- Weight: 90 g (3.2 oz.)
- Case material: 316L stainless steel
- Mounting: Internal 1/4-28 thread; mounting studs provided: one 1/4-28 to 1/4-28 thread and one M8 × 1,25 thread
- Mounting torque: 2,9 Nm (24 in. lbs.)
- Connector:
  - Pin A: Signal/Power
  - Pin B: Common
- Mating connector: CMSS 3106F-10SL-4S or equivalent
- Recommended cable: Two conductor shielded, fluorine based polymer jacket, 100 pF/m (30 pF/ft.)

### Ordering information

- **CMSS 2100** General purpose industrial accelerometer with top exit MIL-C-5015 two pin connector.
  - 1/4-28 and M8 mounting studs provided. Calibration sensitivity and nominal sensitivity is provided for each accelerometer package.

### Dimensions



## General purpose, low profile, side exit, industrial accelerometer

CMSS 2200 / CMSS 2200-M8

Accelerometers sense vibration commonly found in most industrial machinery. Applications for acceleration and velocity sensors include machinery health monitoring of motors, fans, pumps, gearboxes, blowers, machine tool spindles, compressors, chillers, rollers and mixers. Maintenance professionals use accelerometers for predictive maintenance to lower overall cost and increase machinery performance.

The CMSS 2200 / CMSS 2200-M8 with its side exit two pin connector offers a low profile for machinery with limited clearance. The sensor mounts in any orientation.

### Features

- For use with the SKF junction boxes, on-line systems, protection systems and the portable data collection Instruments
- Rugged, economical and all around general purpose sensor
- Sensitivity, 100 mV/g to optimize use in multiple applications
- Exceptional bias voltage (BV) stability at elevated temperatures
- Designed for exceptional low noise level for low frequencies at elevated temperatures
- Meets stringent CE, EMC requirements
- Low profile for side industrial accelerometer with captive mounting bolts (1/4-28, M6 × 1.00 or M8 × 1,25) provided
- Corrosion resistant and hermetically sealed
- Reverse polarity wiring protection

### Specifications

- Specifications conform to ISA-RP-37.2 (1 to 64) and are typical values referenced at 25 °C (75 °F), 24 V DC supply, 4 mA constant current and 100 Hz.

### Environmental

- Temperature range: -50 to +120 °C (-60 to +250 °F), operating temperature
- Vibration limits: 500 g peak
- Shock limit: 5 000 g peak
- Electromagnetic sensitivity, equivalent g, maximum: 70 µg/gauss
- Sealing: Hermetic



- Base strain sensitivity: 200 µg/microstrain
- CE: According to the generic immunity standard for Industrial Environment EN50082-2
- Acceptance criteria: The generated "false equivalent g level" under the above test conditions should be less than 2 mg peak to peak.

### Physical

- Dimensions: See drawing
- Weight: 145 g (5.1 oz.)
- Case material: 316L stainless steel
- Mounting: Captive mounting bolts provided; one 1/4-28 thread and one M6 × 1,00 thread
- Mounting torque: 3,4 Nm (30 in. lbs.)
- Connector:
  - Pin A: Signal/Power
  - Pin B: Common
- Mating connector: CMSS 3106F-10SL-4S or equivalent
- Recommended cable: Two conductor shielded, fluorine based polymer jacket, 100 pF/m (30 pF/ft.)

### Dynamic

- Sensitivity: 100 mV/g
- Sensitivity precision:  $\pm 10\%$  at 25 °C (75 °F)
- Acceleration range: 80 g peak
- Amplitude linearity: 1%
- Frequency range:
  - $\pm 10\%$ ; 1,0 to 5 000 Hz
  - $\pm 3$  dB; 0,7 to 10 000 Hz
- Resonance frequency: Mounted, minimum 22 kHz
- Transverse sensitivity:  $\leq 5\%$  of axial

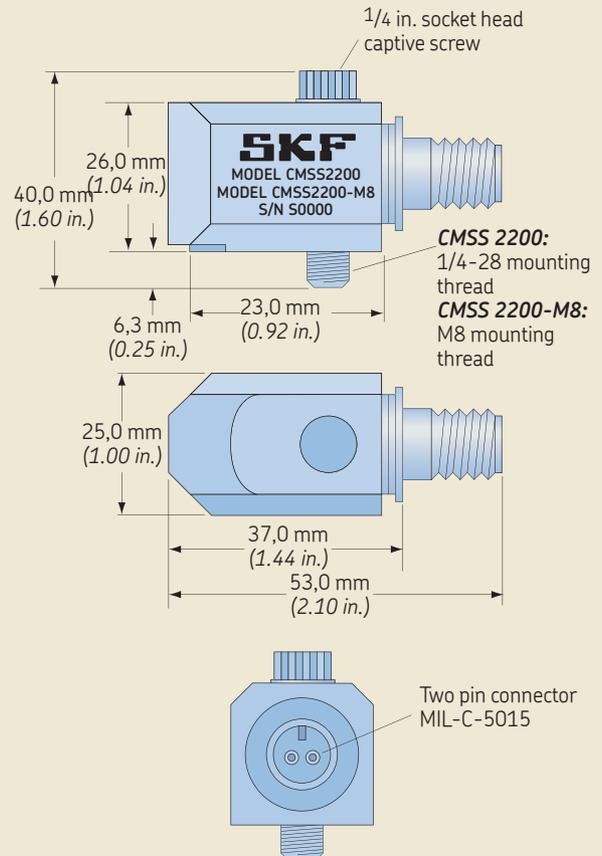
### Electrical

- Power requirements:
  - Voltage source: 18 to 30 V DC
  - Constant current diode: 2 to 10 mA DC, recommended 4 mA
- Electrical noise: 2,0 Hz; 20  $\mu\text{g}/\sqrt{\text{Hz}}$
- Output impedance:  $< 100 \Omega$
- Bias output voltage: 12 V DC
- Grounding: Case isolated, internal shielding

### Ordering information

- **CMSS 2200** General purpose low profile industrial accelerometer with side exit MIL-C-5015 two pin connector.
  - 1/4-28 and M6 mounting studs provided. Calibration sensitivity and nominal sensitivity is provided for each accelerometer package.
- **CMSS 2200-M8** General purpose low profile industrial accelerometer with side exit MIL-C-5015 two pin connector.
  - M8 mounting stud provided. Calibration sensitivity and nominal sensitivity is provided for each accelerometer package.

### Dimensions



Vibration sensor cables CMSS 93x series

## Vibration sensor cables

### CMSS 93x series

#### Bulk cable

##### CMSS 932-SY/DY/SB and CMSS 933-SY

Twisted pair or triads cables, single or double shielded, yellow or blue jacket

SKF's CMSS 93X-XX cables are premium sensor cables providing superior performance in demanding environments.

CMSS 932 is a single or double shield, twisted pair cable with the conductors individually insulated with a fluorine based polymer, a braided shield with drain wire and an outer insulated jacket also made of a fluorine based polymer. Two insulated conductors are cabled together with one uninsulated drain wire and two glass cord fillers. The double shielded option adds an inner shield of aluminum polyester foil with drain wire.

The CMSS 933 has the same characteristics as the CMSS 932 cable, except the CMSS 933 is a three wire version for use with dual temperature and vibration sensors. This cable does not have a double shielded option.

There are two wire colors (jackets) available:

- Yellow: For high visibility in the often dusty and debris laden industrial environment
- Blue: For use in intrinsically safe circuits in the Oil/Gas and Hydrocarbon processing industries

#### Recommended uses

The single shield cable is recommended for use with sensors in normal industrial applications where these cable types have been previously used and installed.

The double shield cable is highly recommended for use with sensors in industrial installations where there is a high noise field, such as machine tools and power generating facilities. Double shielded versions include:

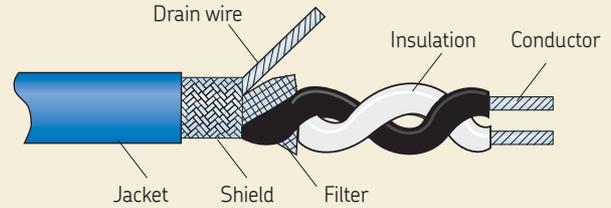
- Inner shield = Isolated
- Outer shield = Non-isolated

#### Specifications (all models)

##### Materials

- Conductor: Tin plated copper, 19 × 32 strands, size 20 AWG (American Wire Gauge)
- Insulation: Extruded FEP
- Drain wire: Tin plated copper, 7 × 32 strands, size 24 AWG
- Shield: 36 AWG tin plated copper braid
- Jacket: Extruded FEP

##### Two-wire cable assembly



##### Dimensions

- Conductor: 0,96 mm (0.038 in.) nominal
- Insulation: 1,40 mm (0.058 in.) nominal
- Drain wire: 0,61 mm (0.024 in.) nominal
- Shield: 3,50 mm (0.138 in.) nominal
- Jacket: 4,80 mm, ±0,1 mm (0.190 in., ±0.005 in.)

##### Environmental

- Minimum bend radius: 48 mm (1.9 in.)
- Working temperature range: -80 to +200 °C (-110 to +390 °F)
- Heat and flame resistance: Non-flame propagating
- Plenum rated
- Meets ROHS requirements

##### Electrical

- Capacitance: Approximately 89 pF/m (27 pF/ft.)
- Voltage rating: 600 V RMS maximum continuous use

##### Color code

- Two wire conductors:
  - A = White = Acceleration signal/power
  - B = Black = Common
- Three wire conductors:
  - A = Red = Acceleration signal/power
  - B = Black = Acceleration and temperature common
  - C = White = Temperature signal
- Jacket: Yellow (Y) or blue (B)

#### Ordering information

- **CMSS 932-SY-150M** Two-conductor, twisted pair, single shield, yellow cable with continuous cable length, 150 m (500 ft.) spool.
- **CMSS 932-SY-300M** Two-conductor, twisted pair, single shield, yellow cable with continuous cable length, 300 m (1 000 ft.) spool.
- **CMSS 932-DY-150M** Two-conductor, twisted pair, double shield, yellow cable with continuous cable length, 150 m (500 ft.) spool.
- **CMSS 932-SB-150M** Two-conductor, twisted pair, single shield, blue cable with continuous cable length, 150 m (500 ft.) spool.
- **CMSS 933-SY-150M** Three-conductor, triad, single shield, yellow cable with continuous cable length, 150 m (500 ft.) spool.

## Industrial cable connector assemblies for vibration sensors

### CMSS 932-68

The CMSS 932-68 are rugged cable connector assemblies designed for use with piezoelectric vibration sensors, which require high specification shielded cable to maximize the quality of the signal transmitted to the monitoring system. The assemblies are ingress protection rated (IP 68): allow no ingress of dust and are suitable for continuous immersion in water. The CMSS 932-68 are two-wire assemblies using a single or double shield, twisted pair cable with the conductors individually insulated with a fluorine based polymer, a braided shield with drain wire and an outer insulated jacket also made of a fluorine based polymer.

The double shielded option adds an inner shield of aluminum polyester foil with drain wire. There are two wire colors (jackets) available:

- Yellow: For high visibility in the often dusty and debris laden industrial environment
- Blue: For use in intrinsically safe circuits in the Oil/Gas and Hydrocarbon processing industries

## Specifications

### Cables

Two insulated conductors are cabled together with one uninsulated drain wire and two glass cord fillers.

### Materials

- Conductor: Tin plated copper, 19 × 32 strands, size 20 AWG (American Wire Gauge)
- Insulation: Extruded FEP
- Drain wire: Tin plated copper, 7 × 32 strands, size 24 AWG
- Shield: 36 AWG tin plated copper braid
- Jacket: Extruded FEP
- Molded boot: Black fluoroelastomer, offering better chemical resistance
- Adaptor / locking rings: Stainless steel

### Color code

- Two wire conductors:
  - A = White = Acceleration signal/power
  - B = Black = Common
- Jacket: Yellow (Y) or blue (B)



### Dimensions

- Conductor: 0,96 mm (0.038 in.) nominal
- Insulation: 1,40 mm (0.058 in.) nominal
- Drain wire: 0,61 mm (0.024 in.) nominal
- Shield: 3,50 mm (0.138 in.) nominal
- Jacket: 4,80 mm, ±0,1 mm (0.190 in., ±0.005 in.)

### Electrical

- Capacitance: Approximately 89 pF/m (27 pF/ft.)
- Voltage rating: 600 V RMS maximum continuous use

### Environmental

- Minimum bend radius: 48 mm (1.9 in.)
- Working temperature range: -80 to +200 °C (-110 to +390 °F)
- Heat and flame resistance: Non-flame propagating
- Plenum rated
- Meets ROHS requirements

Industrialized cable connector assemblies for vibration sensors CMSS 932-68

**Connectors**

MIL-style stainless steel connectors are designed for use with SKF sensors. There are two different styles of IP 68 connectors:



**CMSS 932-68TLX-SY-XXM: IP 68 sensor/connector/cable assembly with twist lock.**

The fluoroelastomer boot and a quarter twist locks the assembly into a tight fit.



**CMSS 932-68LCX-XX-XXX: IP 68 sensor/connector/cable assembly with locking collar.**

The locking collar is a threaded connector that threads onto an accompanying sensor adapter. It is recommended to secure the sensor adapter to the accelerometer connector using thread lock (Loctite). The locking collar features an O-ring and metal locking ring and is therefore more suitable for applications under water.

**Ordering example**

**CMSS 932-68TLI-SY-10M**

- Two-wire, IP 68 connector, twist lock, isolated, single shield, yellow, 10 m (32.8 ft.) length

**CMSS 932-68LCN-SY-20M**

- Two-wire, IP 68 connector, locking collar, non-isolated, single shield, yellow, 20 m (65.6 ft.) length

**Note:** Isolated connectors cannot be selected with double shielded cables (e.g., part number CMSS 932-68LCI-DY-XXM is not valid). As such, if a double shielded cable is required (shield = **D**), select a non-isolated connector (non-isolated = **N**); for example:

- CMSS 932-68LCN-DY-5M

If an isolated connector is required (isolated = **I**), select a single shielded cable (shield = **S**); for example:

- CMSS 932-68LCI-SY-5M

Double shielded cable should be grounded on both sides: the instrument side and the sensor side (through the machine). If an isolated connector is selected with a double shielded cable, the sensor side will be cut off and never connected to the sensor ground.

**Ordering information**

CMSS 932 Two-wire twisted pair cable / two-pin connector assembly.

Part number		CMSS 932-68aab-cd-eeM
<b>68</b>	IP 68 connector (immersion)	
<b>aa</b>	<b>Lock type</b>	
<b>TL</b>	Twist lock	
<b>LC</b>	Locking collar	
<b>b</b>	<b>Isolated/Non-isolated</b>	
<b>I</b>	Isolated (must use single shielded)	
<b>N</b>	Non-isolated	
<b>c</b>	<b>Shield</b>	
<b>D</b>	Double shielded (must use non-isolated)	
<b>S</b>	Single shielded	
<b>d</b>	<b>Jacket</b>	
<b>Y</b>	Yellow jacket	
<b>B</b>	Blue jacket	
<b>eeM</b>	<b>Length</b>	
<b>5M</b>	Length: 5 m (16.4 ft.)	
<b>10M</b>	Length: 10 m (32.8 ft.)	
<b>20M</b>	Length: 20 m (65.6 ft.)	
<b>XXM</b>	Length: Specify XX meters, in 5 m increments	

## Junction boxes and enclosures



### CMSS 260, CMSS 265, CMSS 300 and CMSS 310 series

- CMSS 260 series NEMA 4 and NEMA 4X enclosures
- CMSS 265 series termination junction boxes
- CMSS 300 series BNC junction boxes
- CMSS 310 series switchable BNC junction boxes



#### Industry standards

For all junction boxes and according to version (material)

Rating	Painted steel	Fiberglass	Stainless steel
UL 50	Type 4, 12 and 13	N/A	Type 3R, 4, 4X and 12
UL 508 A, UL 508	Type 4, 12 and 13	Type 3R, 4, 4X and 12	Type 3R, 4, 4X and 12
NEMA/EEMAC	Type 4, 12 and 13	Type 3R, 4, 4X and 12	Type 3R, 4, 4X and 12
JIC	EGP-1-1967	EGP-1-1967	EGP-1-1967
CSA	Type 4 and 12	Type 4, 4X and 12	Type 4, 4X and 12
IEC 60529	IP 66	IP 66	IP 66



CMSS 260 series NEMA 4 and NEMA 4X enclosures



CMSS 265 series termination junction boxes



CMSS 300 series BNC junction boxes



CMSS 310 series switchable BNC junction boxes

NEMA 4 and NEMA 4X enclosures CMSS 260 series

## NEMA 4 and NEMA 4X enclosures



### CMSS 260 series

*NEMA 4 and NEMA 4X enclosures are provided by SKF for housing of any instrument*

The enclosures' covers have a continuous hinge on the long side of the unit for convenience and are secured to the enclosure with clamps. The enclosures are available in NEMA 4 or NEMA 4X to cover most applications. All enclosures are provided with an oil resistant gasket and clamps for easy screwdriver access.



### CMSS 260FG

#### NEMA 4X fiberglass enclosures

NEMA 4X fiberglass enclosures are designed for use in areas that may be regularly hosed down or are very wet, and they are suitable for indoor or outdoor installations.

The enclosure is used in highly corrosive environments typically found in oil refineries, chemical processing plants, wastewater treatment, marine installations, pulp and paper processing, and electroplating plants.

### CMSS 260PS

#### NEMA 4 painted steel enclosures

These enclosures are designed for use in areas that may be regularly hosed down or are very wet, and they are suitable for indoor or outdoor installations. Wherever protection from dust, dirt, oil or hose-directed water is essential.

ANSI 61 powder coated on the interior and exterior surfaces, constructed from 14 gauge mild steel.

### CMSS 260SS

#### NEMA 4X stainless steel enclosures

Constructed from 14 gauge 304 stainless steel rather than a mild steel. They are designed for the same use as the NEMA 4 enclosures with the ability to resist corrosive environments.

**Ordering example:** NEMA 4X fiberglass enclosure measuring 15,2 × 15,2 × 10,2 cm (6.0 × 6.0 × 4.0 in.) would be the SKF model number CMSS 260FG-01.

#### Ordering Information

Description CMSS 260FG-XX

-XX **NEMA 4X fiberglass enclosures**  
(dimensions: height × width × depth)

**01** 15,2 × 15,2 × 10,2 cm  
(6.0 × 6.0 × 4.0 in.)

**02** 20,3 × 15,2 × 8,9 cm  
(8.0 × 6.0 × 3.5 in.)

**03** 25,4 × 20,3 × 15,2 cm  
(10.0 × 8.0 × 6.0 in.)

#### Ordering Information

Description CMSS 260PS-XX

-XX **NEMA 4 painted steel enclosures**  
(dimensions: height × width × depth)

**01** 15,2 × 15,2 × 10,2 cm  
(6.0 × 6.0 × 4.0 in.)

**02** 20,3 × 15,2 × 8,9 cm  
(8.0 × 6.0 × 3.5 in.)

**03** 25,4 × 20,3 × 15,2 cm  
(10.0 × 8.0 × 6.0 in.)

#### Ordering Information

Description CMSS 260SS-XX

-XX **NEMA 4X stainless steel enclosures**  
(dimensions: height × width × depth)

**01** 15,2 × 15,2 × 10,2 cm  
(6.0 × 6.0 × 4.0 in.)

**02** 20,3 × 15,2 × 8,9 cm  
(8.0 × 6.0 × 3.5 in.)

**03** 25,4 × 20,3 × 15,2 cm  
(10.0 × 8.0 × 6.0 in.)



## Termination junction boxes

### CMSS 265 series

Connecting centers by SKF



The CMSS 265 series termination junction boxes are multiple channel connecting centers for terminating the outputs of accelerometers or other transducer field wiring. Crew clamp, DIN-rail mounted terminals (three inputs per channel, usually signal, common and shield) are provided for the intermediate termination of accelerometers, proximity probes, speed sensors, RTDs and other transducers.

The CMSS 265 series junction boxes are available in three versions:

- NEMA 4X Fiberglass (FG)
- NEMA 4 Powder Coated Steel (PS)
- NEMA 4X Stainless Steel (SS)

### CMSS 265FG

#### NEMA 4X fiberglass junction boxes

The CMSS 265FG NEMA 4X enclosures are made of molded fiberglass polyester and is easily punched or drilled. It has outstanding chemical and temperature resistance and physical properties. A seamless foam in-place gasket assures a watertight and dust-tight seal. Screw covers are secured with captivated Monel cover screws.

### CMSS 265PS

#### NEMA 4 powder coated steel junction boxes

The CMSS 265PS NEMA 4 enclosure is constructed of 14 gauge mild steel and is ANSI 61 gray polyester powder coated on the all surfaces. A seamless foam in-place gasket assures a watertight and dust-tight seal.

### CMSS 265SS

#### NEMA 4X stainless steel junction boxes

The CMSS 265SS NEMA 4X enclosure is constructed from 14 gauge 304 stainless steel. This enclosure will better resist corrosive environments than the CMSS 265PS steel boxes. CMSS 265SS junction boxes feature continuously welded seams, ground smooth with no holes or knockouts. An oil-resistant, in-place gasket assures a watertight and dust-tight seal. Stainless steel screws and clamps are provided.

**Ordering example:** NEMA 4X stainless steel junction box with 16 channels and 48 terminals would be the SKF model number CMSS 265SS-16.

#### Ordering Information

Description CMSS 265FG-XX

-XX **NEMA 4X fiberglass junction boxes**  
(dimensions: height × width × depth)

**02** 2 channels, 6 terminals – 15,2 × 15,2 × 10,2 cm (6.0 × 6.0 × 4.0 in.)

**04** 4 channels, 12 terminals – 15,2 × 15,2 × 10,2 cm (6.0 × 6.0 × 4.0 in.)

**08** 8 channels, 24 terminals – 20,3 × 15,2 × 10,2 cm (8.0 × 6.0 × 4.0 in.)

**12** 12 channels, 36 terminals – 25,4 × 20,3 × 15,2 cm (10.0 × 8.0 × 6.0 in.)

**16** 16 channels, 48 terminals – 35,6 × 30,5 × 20,3 cm (14.0 × 12.0 × 8.0 in.)

#### Ordering Information

Description CMSS 265PS-XX

-XX **NEMA 4 powder coated steel junction boxes**  
(dimensions: height × width × depth)

**02** 2 channels, 6 terminals – 15,2 × 15,2 × 10,2 cm (6.0 × 6.0 × 4.0 in.)

**04** 4 channels, 12 terminals – 15,2 × 15,2 × 10,2 cm (6.0 × 6.0 × 4.0 in.)

**08** 8 channels, 24 terminals – 20,3 × 15,2 × 10,2 cm (8.0 × 6.0 × 4.0 in.)

**12** 12 channels, 36 terminals – 25,4 × 20,3 × 15,2 cm (10.0 × 8.0 × 6.0 in.)

**16** 16 channels, 48 terminals – 35,6 × 30,5 × 20,3 cm (14.0 × 12.0 × 8.0 in.)

#### Ordering Information

Description CMSS 265SS-XX

-XX **NEMA 4X stainless steel junction boxes**  
(dimensions: height × width × depth)

**02** 2 channels, 6 terminals – 15,2 × 15,2 × 10,2 cm (6.0 × 6.0 × 4.0 in.)

**04** 4 channels, 12 terminals – 15,2 × 15,2 × 10,2 cm (6.0 × 6.0 × 4.0 in.)

**08** 8 channels, 24 terminals – 20,3 × 15,2 × 10,2 cm (8.0 × 6.0 × 4.0 in.)

**12** 12 channels, 36 terminals – 25,4 × 20,3 × 15,2 cm (10.0 × 8.0 × 6.0 in.)

**16** 16 channels, 48 terminals – 35,6 × 30,5 × 20,3 cm (14.0 × 12.0 × 8.0 in.)

BNC junction boxes CMSS 300 series

## BNC junction boxes

CMSS 300 series

*Easy to use high quality products*



The CMSS 300 series BNC junction boxes are multiple channel connecting centers for terminating the outputs of accelerometers or other transducer field wiring. They are normally located in close proximity to the machine to reduce wiring cost and provide convenient access to the vibration signal by a portable data collector/analyzer.



### Features

- Now easier to wire! Hold it in your hand
- More room for wiring and conduit entry
- Short connections for less noise
- Large Monel screw type terminals
- Quick and convenient access to remotely installed accelerometers with portable data collector/analyzer
- Withstands harsh factory and outdoor environments

Both internal and external switch/BNC models are available. Internal models are provided with quick access latches and external models with screw covers and protective caps for the BNC fitting. In harsh environments internal models should be specified. Black and white bezel tagging is provided for channel and switch identification.

The CMSS 300 series junction boxes are available in three versions:

- NEMA 4X Fiberglass (FG)
- NEMA 4 Powder Coated Steel (PS)
- NEMA 4X Stainless Steel (SS)

**Ordering example:** NEMA 4 powder coated steel BNC junction box with six channels and external BNC would be the SKF model number CMSS 300FG-06-02.

## CMSS 300FG

### NEMA 4X fiberglass BNC junction boxes

The CMSS 300FG NEMA 4X fiberglass enclosure is made of molded fiberglass polyester and is easily punched or drilled. It has outstanding chemical and temperature resistance and physical properties.

A seamless foam in-place gasket assures a water tight and dust tight seal. Screw covers are secured with captivated Monel cover screws.

#### Ordering Information

##### Description

CMSS 300FG-XX-XX

- XX **NEMA 4X fiberglass BNC junction boxes** (dimensions: height × width × depth)
- 01 1 channel – 20,3 × 18,5 × 11,2 cm (8.00 × 7.29 × 4.41 in.)
- 02 2 channels – 20,3 × 18,5 × 11,2 cm (8.00 × 7.29 × 4.41 in.)
- 04 4 channels – 20,3 × 18,5 × 11,2 cm (8.00 × 7.29 × 4.41 in.)
- 06 6 channels – 25,4 × 18,5 × 11,2 cm (10.00 × 7.29 × 4.41 in.)
- XX **Internal/External BNC**
- 01 Internal BNC
- 02 External BNC

## CMSS 300PS

### NEMA 4 powder coated steel BNC junction boxes

The CMSS 300PS powder coated steel NEMA 4 enclosure is constructed of 14 gauge mild steel and is ANSI 61 gray polyester powder coated on the all surfaces.

#### Ordering Information

Description	CMSS 300PS-XX-XX
-XX NEMA 4 powder coated steel BNC junction boxes (dimensions: height × width × depth)	
01 1 channel – 19,1 × 17,8 × 10,8 cm (7.50 × 7.00 × 4.24 in.)	
02 2 channels – 19,1 × 17,8 × 10,8 cm (7.50 × 7.00 × 4.24 in.)	
04 4 channels – 19,1 × 17,8 × 10,8 cm (7.50 × 7.00 × 4.24 in.)	
06 6 channels – 25,4 × 17,8 × 10,7 cm (10.00 × 7.00 × 4.21 in.)	
-XX Internal/External BNC	
01 Internal BNC	
02 External BNC	

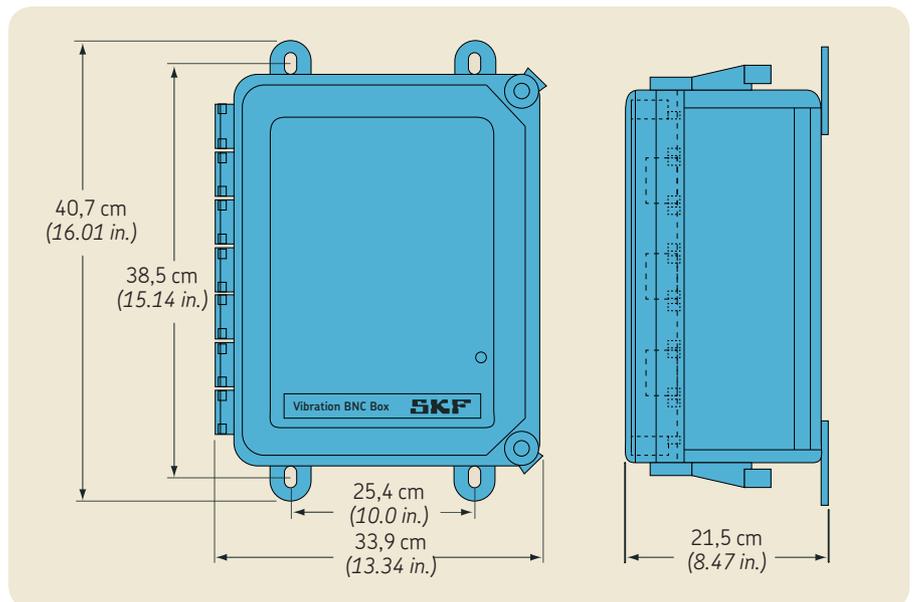
## CMSS 300SS

### NEMA 4X stainless steel BNC junction boxes

The CMSS 300SS NEMA 4X stainless steel enclosure is constructed from 14 gauge 304 stainless steel.

#### Ordering Information

Description	CMSS 300SS-XX-XX
-XX NEMA 4X stainless steel BNC junction boxes (dimensions: height × width × depth)	
01 1 channel – 19,1 × 17,8 × 10,9 cm (7.50 × 7.00 × 4.28 in.)	
02 2 channels – 19,1 × 17,8 × 10,9 cm (7.50 × 7.00 × 4.28 in.)	
04 4 channels – 19,1 × 17,8 × 10,9 cm (7.50 × 7.00 × 4.28 in.)	
06 6 channels – 24,1 × 17,8 × 10,7 cm (9.50 × 7.00 × 4.21 in.)	
-XX Internal/External BNC	
01 Internal BNC	
02 External BNC	



Dimension example:  
CMSS 300SS-06-01

Switchable BNC junction boxes CMSS 310 series

## Switchable BNC junction boxes

CMSS 310 series

*Convenient, quick and safe*

The CMSS 310 series switchable BNC junction boxes are designed for terminating and switching the outputs of up to 48 accelerometers. They are installed in a location as close to the machine as practical to reduce wiring cost and yet provide convenient safe access to the vibration signal by an operator with a portable data collector/analyzer.

### Features

- ROHS compliant
- Easier wiring, switch module (front panel) can be disconnected from the back board
- Large Monel screw type terminals

The CMSS 310 series switchable BNC junction boxes are available in three versions:

- NEMA 4X Fiberglass (FG)
- NEMA 4 Powder Coated Steel (PS)
- NEMA 4X Stainless Steel (SS)

Both internal and external switch/BNC models are available. Internal models are provided with quick access latches, and external models with screw covers and protective caps for the BNC fitting. In harsh environments internal models should be specified. Black and white bezel tagging is provided for channel and switch identification.



## CMSS 310FG

### NEMA 4X fiberglass switchable BNC junction boxes

The CMSS 310FG NEMA 4X fiberglass enclosure is made of molded fiberglass polyester and is easily punched or drilled. It has outstanding chemical and temperature resistance and physical properties.

A seamless foam in-place gasket assures a watertight and dust-tight seal. Screw covers are secured with captivated Monel cover screws.

#### Ordering Information

Description	CMSS 310FG-XX-XX
-XX <b>NEMA 4X fiberglass switchable BNC junction boxes</b> (dimensions: height × width × depth)	
<b>06</b> 6 channels – 25,4 × 18,5 × 11,2 cm (10.00 × 7.29 × 4.41 in.)	
<b>12</b> 12 channels – 25,4 × 18,5 × 11,2 cm (10.00 × 7.29 × 4.41 in.)	
<b>24</b> 24 channels – 40,7 × 33,9 × 21,5 cm (16.01 × 13.34 × 8.47 in.)	
<b>32</b> 32 channels – 45,7 × 39,0 × 21,5 cm (18.01 × 15.34 × 8.47 in.)	
<b>48</b> 48 channels – 45,7 × 39,0 × 21,5 cm (18.01 × 15.34 × 8.47 in.)	
-XX <b>Internal/External BNC</b>	
<b>01</b> Internal BNC	
<b>02</b> External BNC	

## CMSS 310PS

### NEMA 4 powder coated steel BNC junction boxes

The CMSS 310PS NEMA 4 powder coated steel enclosure is constructed of 14 gauge mild steel and is ANSI 61 gray polyester powder coated on the all surfaces.

#### Ordering Information

Description	CMSS 310PS-XX-XX
-XX <b>NEMA 4 powder coated steel BNC junction boxes</b> (dimensions: height × width × depth)	
<b>06</b> 6 channels – 24,1 × 17,8 × 9,6 cm (9.50 × 7.00 × 3.79 in.)	
<b>12</b> 12 channels – 24,1 × 17,8 × 9,6 cm (9.50 × 7.00 × 3.79 in.)	
<b>24</b> 24 channels – 39,4 × 33,1 × 21,1 cm (15.50 × 13.02 × 8.29 in.)	
<b>32</b> 32 channels – 44,5 × 38,2 × 21,1 cm (17.50 × 15.02 × 8.29 in.)	
<b>48</b> 48 channels – 44,5 × 38,2 × 21,1 cm (17.50 × 15.02 × 8.29 in.)	
-XX <b>Internal/External BNC</b>	
<b>01</b> Internal BNC	
<b>02</b> External BNC	

## CMSS 310SS

### NEMA 4X stainless steel BNC junction boxes

The CMSS 310SS NEMA 4X stainless steel enclosure is constructed from 14 gauge 304 stainless steel.

#### Ordering Information

Description	CMSS 310SS-XX-XX
-XX <b>NEMA 4X stainless steel BNC junction boxes</b> (dimensions: height × width × depth)	
<b>06</b> 6 channels – 24,1 × 17,8 × 10,9 cm (9.50 × 7.00 × 4.28 in.)	
<b>12</b> 12 channels – 24,1 × 17,8 × 10,9 cm (9.50 × 7.00 × 4.28 in.)	
<b>24</b> 24 channels – 39,4 × 33,1 × 16,0 cm (15.50 × 13.02 × 6.29 in.)	
<b>32</b> 32 channels – 44,5 × 38,2 × 21,1 cm (17.50 × 15.02 × 8.29 in.)	
<b>48</b> 48 channels – 44,5 × 38,2 × 21,1 cm (17.50 × 15.02 × 8.29 in.)	
-XX <b>Internal/External BNC</b>	
<b>01</b> Internal BNC	
<b>02</b> External BNC	

Switchable BNC junction boxes CMSS 310 series

## CMSS 261

### Liquid tight strain relief connectors

The CMSS 261 liquid tight strain relief connectors are used for either extension cable or multi-conductor wire entries into the CMSS 310 BNC junction boxes. Connectors are constructed of Polyamide and provide both environmental sealing and strain relief. The connectors are temperature rated to  $-60$  to  $+100$  °C ( $-40$  to  $+210$  °F) and have a pressure rating of up to 150 PSIG. Check the cable data sheet for the diameter of your extension cable.

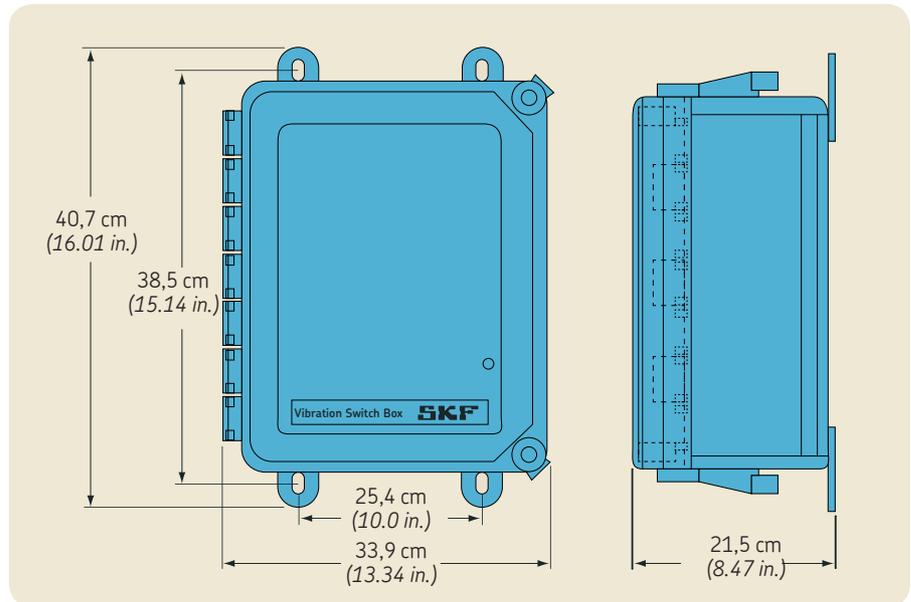
### Ordering Information

Description / Outer cable diameter (minimum/maximum)

CMSS 261-XX

-XX	Liquid tight strain relief connectors
01	2 mm (0.08 in.) / 5 mm (0.20 in.)
02	4 mm (0.16 in.) / 8 mm (0.31 in.)
03	5 mm (0.20 in.) / 9 mm (0.35 in.)
04	7 mm (0.28 in.) / 12 mm (0.47 in.)
05	9 mm (0.35 in.) / 18 mm (0.70 in.)
06	13 mm (0.51 in.) / 20 mm (0.78 in.)

**Ordering example:** NEMA 4X fiberglass switchable BNC junction box with 24 channels and internal BNC would be the SKF model number CMSS 310FG-24-01.



**Dimension example:** CMSS 310SS-24-01.

## SKF Machine Condition Transmitter (MCT) systems

CMSS 5301 / CMSS 5302

*One and two channel, complete MCT system*

The CMSS 5301 (one channel) and CMSS 5302 (two channel) are vibration monitors that have been designed for use on typical rotating machinery such as motors, pumps, fans, turbines, compressors, chillers, etc.

### Features

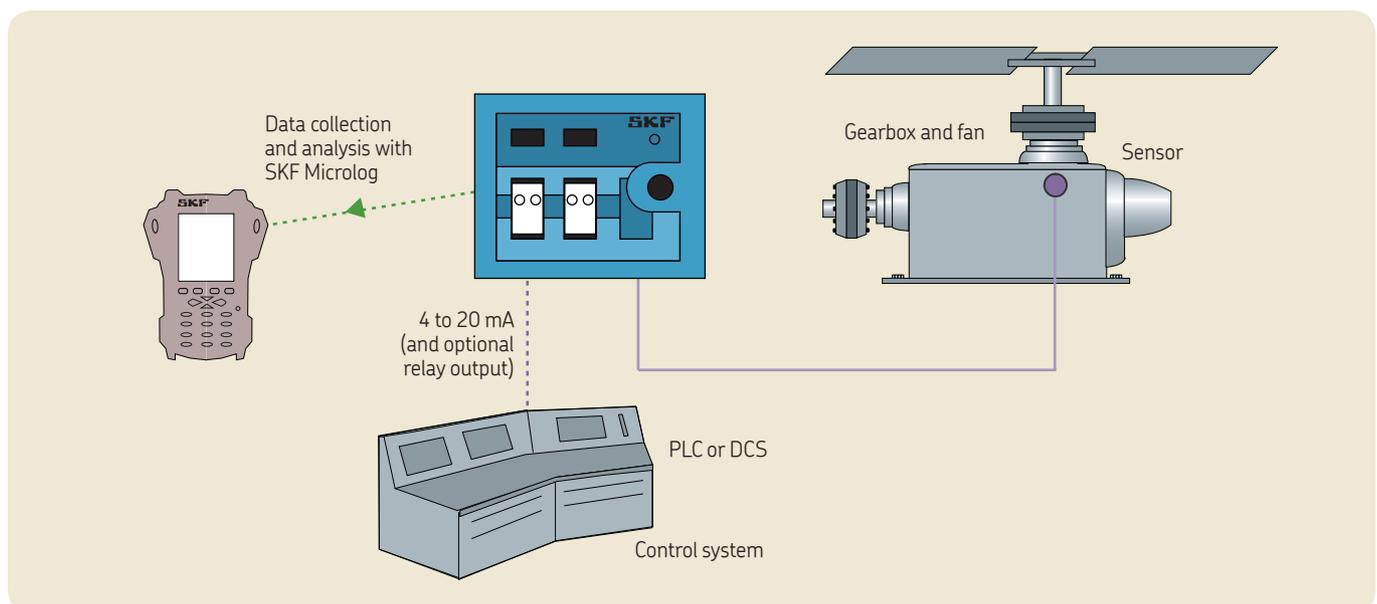
- Two levels of alarm with relays
- True "OK" circuitry with relay
- Adjustable time delays
- Trip multiply
- 4 to 20 mA output
- Buffered transducer output
- Reset button
- Bright LED digital readout
- Class I, Division 2 rated transmitters with monitors

### Description

The CMSS 5301 and CMSS 5302 accept inputs from any industry standard 100 mV/g accelerometer, conditions the input signals and provides a digital display and alarm status indication.

Analog outputs (4 to 20 mA) are provided for each channel for interface to a PLC or DCS for trending, alarm and operator interface. The alarm contacts for the OK circuit and for Alert and Danger may be interfaced to machine control and shutdown systems for a complete vibration protection solution.

*Example of SKF MCT system configuration.*



The system is a pre-wired, turnkey package with power supply and bright LED displays. The power supply accepts 110 or 220 VAC, 50 or 60 Hz. They are available in either an Imperial or Metric configuration. The standard enclosure is NEMA 4X fiberglass; powder coated steel and stainless steel enclosures are available.

### Specifications (both models)

#### Physical

- Dimensions:
  - Fiberglass (FG), single and dual channel: 28,5 × 15,5 × 23,4 cm (11.21 × 6.09 × 9.20 in.)
  - Powder-coated steel (PS) and stainless steel (SS), single channel: 25,0 × 15,0 × 20,3 cm (9.84 × 5.90 × 7.98 in.)
  - Powder-coated steel (PS) and stainless steel (SS), dual channel: 30,0 × 15,0 × 25,0 cm (11.81 × 5.91 × 9.85 in.)
- The steel enclosures (PS and SS) have a slightly different design with the door hinges on top.

#### Electrical

- Power: Accepts 110 or 220 VAC, 50 or 60 Hz
- Case: Isolated

SKF Machine Condition Transmitter (MCT) systems CMSS 5301 / CMSS 5302

**Input**

- Sensor: Accelerometer, 100 mV/g
- Sensor OK detection: Continuously monitors the transmitter bias and signal voltage; if this voltage exceeds preset limits, the 4 to 20 mA output current is reduced to less than 2 mA

**Output**

- Sensitivity: Depending on used sensor's input sensitivity, ±10%
- 4 to 20 mA DC output: 4 to 20 mA proportional to full scale range
- Accuracy: ±5% with single pole filter; -3 dB points at 2 Hz and 2 kHz
- Buffered output: BNC connector 0 to 20 kHz
- Maximum load: 600 Ω resistive per channel

**Environmental**

- Operating temperature: -20 to +80 °C (-5 to +175 °F)
- Storage temperature: -55 to +125 °C (-65 to +260 °F)
- Relative humidity: 0 to 95% non-condensing
- Approvals: NEMA 4X

**Ordering information**

**CMSS 5301:** One channel complete Machine Condition Transmitter System with display and NEMA 4X fiberglass enclosure:

- CMSS 5301FG-E: CMSS 530A100A-ER-ISOLF, 0 to 1 in./s, RMS, universal power supply
- CMSS 5301FG-M: CMSS 530A100A-MR-ISOLF, 0 to 25 mm/s, RMS, universal power supply
- CMSS 5301FG-ENV: CMSS 590A100A, 0 to 10 gE, universal power supply

Enclosures are available in:

- Fiberglass NEMA 4X (standard)
- Powder coated steel NEMA 4 (CMSS 5301PS)
- Stainless steel NEMA 4X (CMSS 5301SS)
- Custom cast aluminum for explosion-proof application is available upon request

**CMSS 5302:** Two channel complete Machine Condition Transmitter System with displays and NEMA 4X fiberglass enclosure:

- CMSS 5302FG-E: Two CMSS 530A100A-ER-ISOLF, 0 to 1 in./s, RMS, universal power supply
- CMSS 5302FG-M: Two CMSS 530A100A-MR-ISOLF, 0 to 25 mm/s, RMS, universal power supply
- CMSS 5302FG-ENV: Two CMSS 590A100A, 0 to 10 gE, universal power supply
- CMSS 5302FG-E-ENV: One CMSS 530A100A-ER-ISOLF, one CMSS 590A100A, universal power supply
- CMSS 5302FG-M-ENV: One CMSS 530A100A-MR-ISOLF, one CMSS 590A100A, universal power supply
- CMSS 5302FG-E-ENV-MS: One CMSS 530A100A-ER-ISOLF, one CMSS 590A100A, universal power supply
- CMSS 5302FG-M-ENV-MS: One CMSS 530A100A-MR-ISOLF, one CMSS 590A100A, universal power supply

The CMSS 5301 and CMSS 5302 are also available with any other CMSS 500 series monitor.

**Example:** Part ID CMSS 5302SS-E-ENV-MS: Master-slave configuration, specifies one Velocity MCT with Imperial units and one Enveloped Acceleration MCT, configured to work with one sensor (for dual-parameter measurements).



**Ordering information**

**CMSS 5301** Single channel monitoring system with display

**CMSS 5302** Dual channel monitoring system with displays

Part number	CMSS 530VWW-X-YYY-ZZ
<b>V</b>	<b>Number of channels</b>
1	Single channel
2	Dual channel
<b>WW</b>	<b>Enclosure</b>
FG	Fiberglass
PS	Powder-coated steel
SS	Stainless steel
<b>X</b>	<b>Transmitter type</b>
E	Velocity, Imperial, CMSS 530A100A-ER-ISOLF
M	Velocity, Metric, CMSS 530A100A-MR-ISOLF
ENV	Enveloped acceleration, CMSS 590A100A
<b>YYY</b>	<b>Transmitter mix</b>
ENV	One velocity and one enveloped acceleration
<b>ZZ</b>	<b>Transmitter configuration</b>
MS	Master and slave configuration, two transmitters, one sensor



# SKF – the knowledge engineering company

From the company that invented the self-aligning ball bearing more than 100 years ago, SKF has evolved into a knowledge engineering company that is able to draw on five technology platforms to create unique solutions for its customers. These platforms include bearings, bearing units and seals, of course, but extend to other areas including: lubricants and lubrication systems, critical for long bearing life in many applications; mechatronics that combine mechanical and electronics knowledge into systems for more effective linear motion and sensorized solutions; and a full range of services, from design and logistics support to condition monitoring and reliability systems.

Though the scope has broadened, SKF continues to maintain the world's leadership in the design, manufacture and marketing of rolling bearings, as well as complementary products such as radial seals. SKF also holds an increasingly important position in the market for linear motion products, high-precision aerospace bearings, machine tool spindles and plant maintenance services.

The SKF Group is globally certified to ISO 14001, the international standard for environmental management, as well as OHSAS 18001, the health and safety management standard. Individual divisions have been approved for quality certification in accordance with ISO 9001 and other customer specific requirements.

With over 120 manufacturing sites worldwide and sales companies in 70 countries, SKF is a truly international corporation. In addition, our distributors and dealers in some 15 000 locations around the world, an e-business marketplace and a global distribution system put SKF close to customers for the supply of both products and services. In essence, SKF solutions are available wherever and whenever customers need them. Overall, the SKF brand and the corporation are stronger than ever. As the knowledge engineering company, we stand ready to serve you with world-class product competencies, intellectual resources, and the vision to help you succeed.

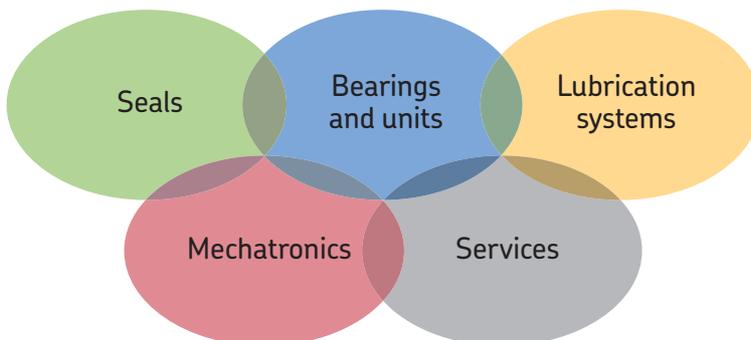


© Airbus – photo: e\*o company, H. Goussé

### ***Evolving by-wire technology***

*SKF has a unique expertise in the fast-growing by-wire technology, from fly-by-wire, to drive-by-wire, to work-by-wire. SKF pioneered practical fly-by-wire technology and is a close working partner with all aerospace industry leaders. As an example, virtually all aircraft of the Airbus design use SKF by-wire systems for cockpit flight control.*

*SKF is also a leader in automotive by-wire technology, and has partnered with automotive engineers to develop two concept cars, which employ SKF mechatronics for steering and braking. Further by-wire development has led SKF to produce an all-electric forklift truck, which uses mechatronics rather than hydraulics for all controls.*





**Harnessing wind power**

The growing industry of wind-generated electric power provides a source of clean, green electricity. SKF is working closely with global industry leaders to develop efficient and trouble-free turbines, providing a wide range of large, highly specialized bearings and condition monitoring systems to extend equipment life of wind farms located in even the most remote and inhospitable environments.



**Working in extreme environments**

In frigid winters, especially in northern countries, extreme sub-zero temperatures can cause bearings in railway axleboxes to seize due to lubrication starvation. SKF created a new family of synthetic lubricants formulated to retain their lubrication viscosity even at these extreme temperatures. SKF knowledge enables manufacturers and end user customers to overcome the performance issues resulting from extreme temperatures, whether hot or cold. For example, SKF products are at work in diverse environments such as baking ovens and instant freezing in food processing plants.



**Developing a cleaner cleaner**

The electric motor and its bearings are the heart of many household appliances. SKF works closely with appliance manufacturers to improve their products' performance, cut costs, reduce weight, and reduce energy consumption. A recent example of this cooperation is a new generation of vacuum cleaners with substantially more suction. SKF knowledge in the area of small bearing technology is also applied to manufacturers of power tools and office equipment.



**Maintaining a 350 km/h R&D lab**

In addition to SKF's renowned research and development facilities in Europe and the United States, Formula One car racing provides a unique environment for SKF to push the limits of bearing technology. For over 60 years, SKF products, engineering and knowledge have helped make Scuderia Ferrari a formidable force in F1 racing. (The average racing Ferrari utilizes around 150 SKF components.) Lessons learned here are applied to the products we provide to automakers and the aftermarket worldwide.



**Delivering Asset Efficiency Optimization**

Through SKF Reliability Systems, SKF provides a comprehensive range of asset efficiency products and services, from condition monitoring hardware and software to maintenance strategies, engineering assistance and machine reliability programmes. To optimize efficiency and boost productivity, some industrial facilities opt for an Integrated Maintenance Solution, in which SKF delivers all services under one fixed-fee, performance-based contract.



**Planning for sustainable growth**

By their very nature, bearings make a positive contribution to the natural environment, enabling machinery to operate more efficiently, consume less power, and require less lubrication. By raising the performance bar for our own products, SKF is enabling a new generation of high-efficiency products and equipment. With an eye to the future and the world we will leave to our children, the SKF Group policy on environment, health and safety, as well as the manufacturing techniques, are planned and implemented to help protect and preserve the earth's limited natural resources. We remain committed to sustainable, environmentally responsible growth.



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