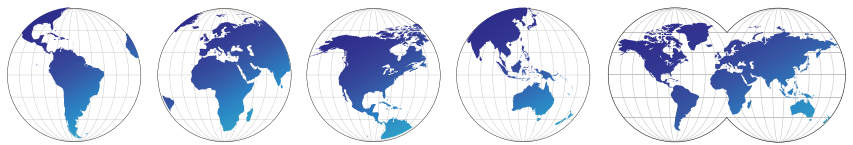


# SKF Reliability Systems – condition monitoring essentials



## 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 Reliability Systems 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

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.

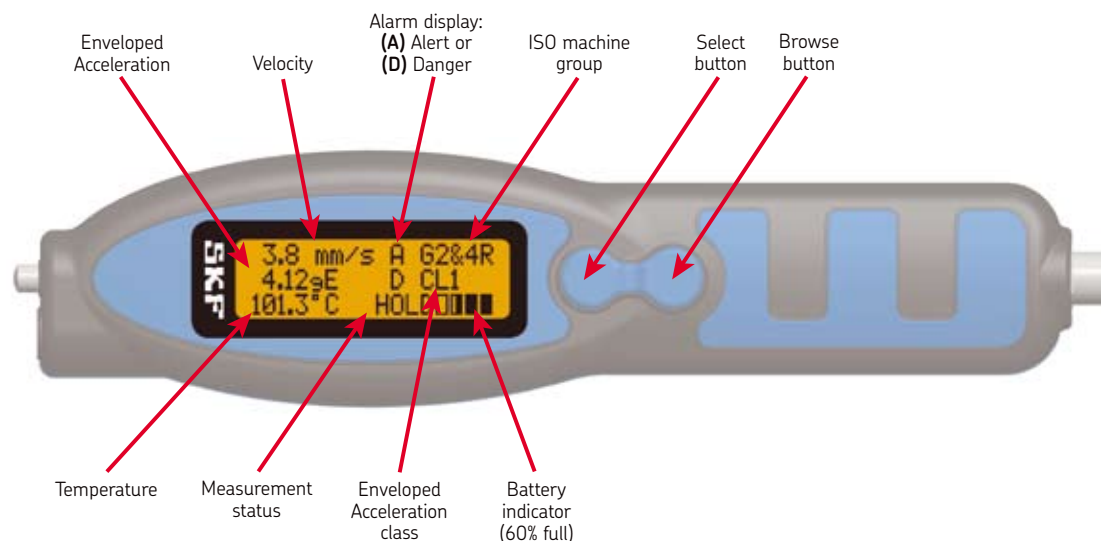
Depending on the SKF Machine Condition Advisor's System setting, the front-panel LCD simultaneously displays:

- Units in Metric or English
- Velocity in mm/s RMS or IPS 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

## LCD display in measurement mode



## 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 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: Band 3 (500 to 10 000 Hz)
  - Temperature:
    - Range: –20 to +200 °C (–4 to +392 °F)
    - Infrared temperature accuracy: ±2 °C (±3,6 °F)
    - Distance: Short range, maximum 10 cm (4 in.) from target
  - Operating temperature range:
    - In use: –10 to +60 °C (14 to +140 °F)
    - While charging: 0 to +40 °C (32 to +104 °F)
  - Storage temperature:
    - Less than one month: –20 to +45 °C (–4 to +113 °F)
    - More than one month but less than six months: –20 to +35 °C (–4 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 capacity: 550 mAh
- 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 that needs ICP (Integrated circuit- piezoelectric)
- External sensor power: 24 V DC at 3,5 mA
- Charger specifications:
  - Universal AC/DC wall plug-in
  - Input: 90 to 264 V AC, 47 to 60 Hz
  - Output: 5 V DC regulated
  - 3 to 4 hours for a full charge



## 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.
- 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.
- 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 ips)  
Danger: 4,5 mm/s (0.25 ips)

##### G2 and 4F

Alert: 4,5 mm/s (0.25 ips)  
Danger: 7,1 mm/s (0.39 ips)

##### G1 and 3R

Alert: 4,5 mm/s (0.25 ips)  
Danger: 7,1 mm/s (0.39 ips)

##### G1 and 3F

Alert: 7,1 mm/s (0.39 ips)  
Danger: 11,0 mm/s (0.61 ips)

### 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 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 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 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 maybe lower.

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

### Extension sensor kit Model CMAC 105

The Extension sensor kit CMAC 105 contains an accelerometer with integral cable and everything needed to take measurements from hard-to-reach places and for more repeatable and accurate measurement results.



### Accelerometer

- 100 mV/g sensitivity
- Small size case, 0.5 × 1.05 in.
- Small footprint, 0.5 in.
- 0.32 Hz to 10 kHz frequency range (±3 dB)
- Waterproof

### Integral cable (1,5 m)

- Connector to SKF Machine Condition Advisor CMAS 100-SL

### Magnet, Model CMAC 106

- 10 lbs. pull-strength, 0.75 in. diameter

Each accelerometer is fully enclosed in a potted and waterproof stainless steel case.

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

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



## Specifications (Accelerometer)

### Dynamic performance

- Sensitivity (±10%): 10.2 mV/(m/s<sup>2</sup>) (100 mV/g)
- Measurement range: ±490 m/s<sup>2</sup> (±50 g)
- Frequency range (±3 dB): 0.32 to 10 kHz
- Mounted resonant frequency: 22 kHz
- Amplitude linearity: ±1%
- Transverse sensitivity: 7%

### Electrical

- Settling time: ≤2 sec
- Excitation voltage: 18 to 30 V DC
- Excitation constant current: 2 to 20 mA
- Output impedance: <150 Ω
- Output bias voltage: 8 to 12 V DC
- Electrical case isolation: >10<sup>8</sup> Ω
- Electrical protection: RFI/ESD
- Integral cable: 22 AWG, +105 °C (22 AWG, +221 °F)

### Environmental

- Shock limit: 49 km/s<sup>2</sup> pk (5 000 g pk)
- Temperature range: -54 to +85 °C (-65 to +185 °F)

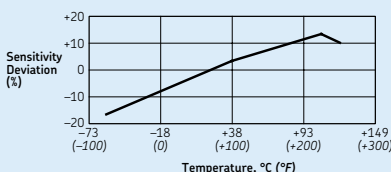
### Spectral Noise

- 10 Hz: 78,5 (mm/s<sup>2</sup>)/√Hz (8 μg/√Hz)
- 100 Hz: 49,1 (mm/s<sup>2</sup>)/√Hz (5 μg/√Hz)
- 1 kHz: 39,2 (mm/s<sup>2</sup>)/√Hz (4 μg/√Hz)

### Mechanical

- Size: 12,70 × 26,67 mm (0.50 × 1.05 in.)
- Weight (including 1,5 m cable): 70,7 g (2.5 oz.)
- Mounting thread: 1/4-28 UNF-2B
- Mounting torque: 2,7 to 6,8 Nm (2 to 5 ft. /lb.)
- Sensing element: Ceramic/shear
- Case material: Stainless steel
- Sealing: Potted
- Wrench flats: 7/16 in.

Typical sensitivity deviation vs. temperature



## 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 8002]
- Charger adapter, cable [CMAC 101]
- 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 Reliability Systems Condition Monitoring Essentials catalog available in PDF file in English [CM2355]
- 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]
- Connection cable, 1,5 m with M8 socket type connector for standard ICP 100 mV/g accelerometer (ICP: integrated circuit piezoelectric) [CMAC 107]

### Replacement

- Charger adapter, cable 4 in., connector to 5,5 mm power [CMAC 101]
- Charger, international DC power supply, +5 V, 1 600 mA, 90 to 264 V AC, 47 to 63 Hz [CMAC 8002]
- Magnet, magnet base, 0,75 in. diameter, 10 lbs. pull-strength [CMAC 106]
- Belt holster [CMAC 102]

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

- SKF Basic condition monitoring kit [CMAK 400-ML]
- SKF Bearing assessment kit [CMAK 300-SL]
- SKF Energy monitoring kit [CMAK 450-ML]

# SKF Infrared Thermometer

## CMSS 3000-SL

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

There are many uses for this hand-held 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 ( $-76$  to  $+1\ 832$  °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

### Introduction

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 ( $-76$  to  $+1\ 832$  °F); dual laser sighting; bright large amber back-light LCD display; Maximum, Minimum, Difference (MAX-MIN) and

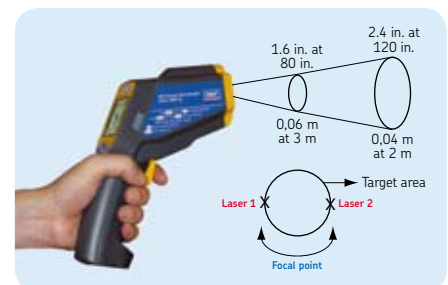


“Lock” function for continuous temperature scanning; programmable High and Low audible alarms; selectable temperature units (°C or °F); low battery indicator, and adjustable emissivity for more accurate temperature measurements.

### 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.

### LCD display





## 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 (< +148 °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.

## 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 (-76 to +1 832 °F)
- Operating range: 0 to +50 °C (32 to +122 °F)
- Accuracy (T<sub>object</sub> = 15 to 35 °C, T<sub>ambient</sub> = 25 °C): ±1.0 °C (±1.8 °F)
- Accuracy (T<sub>object</sub> = 33 to 1 000 °C; T<sub>ambient</sub> = 23 ±3 °C): ±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 .01
- Relative humidity: 5 to 95% non-condensing
- Resolution (from -9.9 to +199.9 °C): 0.1 °C / 0.1 °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

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 and 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]
  - 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]
  - 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 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.

#### 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.

Valve leakage



Pressure/vacuum leaks



### 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, 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 (2) 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/gear box inspection
- General mechanical inspection and troubleshooting
- Tanks, pipes, etc., leak testing

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

- SKF Inspector 400 Ultrasonic Probe pistol housing with LED bar graph meter, 8-position sensitivity selection, low battery indicator
- Scanning module
- Rubber focusing probe
- Stethoscope module
- Lightweight foam lined headset
- 9 volt alkaline battery (replaceable)
- Cordura/nylon soft pack carrying case
- Comprehensive instruction manual (English language)



Tank leakage



Mechanical inspection



## 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 monophonic impedance; 16 ohms
- Probes: Scanning module stainless steel unisonic (single transducer) piezoelectric crystal type; stethoscope/contact module stainless steel plug-in type with 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 (32 to +120 °F)
- Relative humidity: 10 to 95% non-condensing at up to +30 °C (+86 °F)
- Storage temperature: -18 to +54 °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 volt 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]
  - 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]
  - 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

## СМАК 400-МЛ

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 СМАС 100-СЛ

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 СМАК 105

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

#### SKF Infrared Thermometer СМСС 3000-СЛ

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

#### SKF Inspector 400 Ultrasonic Probe СМІН 400-К

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 U.S.A.
  - Briefcase pallet (faux leather)
  - Custom dye cut foam interior (1.3 lb/ft<sup>3</sup> density)
- Color: Anodized and color dyed exterior finish (Blue)



### Ordering information

#### SKF Basic condition monitoring kit [СМАК 400-МЛ] includes:

- SKF Machine Condition Advisor [СМАС 100-СЛ]
  - External sensor kit, 100 mV/g accelerometer with 1,5 m integral cable and magnet [СМАК 105]
- SKF Infrared Thermometer [СМСС 3000-СЛ]
- SKF Inspector 400 Ultrasonic Probe Kit [СМІН 400-К]
  - Ultrasonic Probe pistol housing with LED bargraph meter
  - Lightweight foam lined headset [СМАК 8600-1]
  - Stainless steel unisonic scanning module [СМАК 8600-6]
  - Stainless steel stethoscope/contact module [СМАК 8600-7]
  - Stethoscope extension rods [СМАК 8600-8]
  - Rubber focusing probe [СМАК 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.

- Hand held and user friendly
- Numerical readout to facilitate trending



- Shows changes in oil condition effected 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.)

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



#### 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.

#### 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: Anodized and color dyed exterior finish (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



# 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

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 next page.



### 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: Anodized and color dyed exterior finish (Blue)

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.

## 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 A 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 (1) set each
  - Power cord, one (1) each
  - Input cord label, one (1) 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 V AC
- 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.)

## 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]
- SKF Infrared Thermometer [CMSS 3000-SL]
- SKF Inspector 400 Ultrasonic Probe Kit [CMIN 400-K]
  - Ultrasonic Probe housing with LED bargraph 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]

# SKF Advanced bearing analysis kit

## CMAK 600-EN

For industrial oil analysis and vibration test

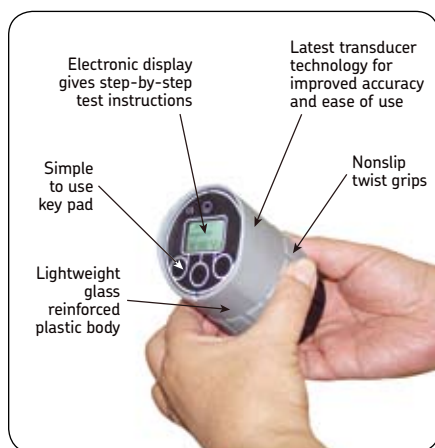
Supplied ready for use, in a heavy duty aluminum case, multi-parameter test kit contains all of the necessary equipment, and consumables for oil and overall vibration condition monitoring.

### 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%

### Test Cell

#### 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



### Water in lubricants

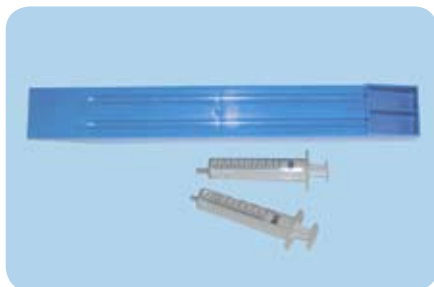
Water contamination may cause different problems in different types of lubricating oil, although corrosion is always directly associated with water ingress. Whatever the equipment, water can displace the oil at contacting surfaces, reducing the amount of lubrication, and activating surfaces which may 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



## 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 oxidised 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: Anodized and color dyed exterior finish (Blue)

### 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: Please refer to previous section for specifications

## Ordering information

### SKF Advanced bearing analysis kit [CMAC 600-EN] includes:

- SKF Machine Condition Advisor [one (1) each]
  - SKF Machine Condition Advisor accessories [one (1) each]
    - Belt holster [CMAC 102]
    - Charger, international DC power supply [CMAC 8002]
    - Charger adapter, cable [CMAC 101]
    - User manual, English hard copy [32131800-EN]
    - Reference CD
- Test Cell [one (1) each]
- Viscostick [one (1) each]
- Chromotography papers, 100 OFF [one (1) each]
- Reagent A [two (2) each]
- Reagent C [one (1) each]
- 10 ml disposable syringe [three (3) each]
- 5 ml disposable syringe [five (5) each]
- Water in oil test reagent, pack of 50 [one (1) each]
- Test agitator [one (1) each]
- Stainless steel scissors [one (1) each]
- Plastic disposable gloves, pack of 100 [one (1) each]
- 100 ml beaker, plastic [one (1) each]
- Stirring rod, plastic [one (1) each]
- Instruction manuals
  - SKF Advanced bearing analysis kit
  - SKF Machine Condition Advisor

## Replenishment kits

### Water in oil reagent kit [CMAC 2101 ] includes:

- Water in oil test reagent, pack of 50 [one (1) each]
- Test agitator [one (1) each]
- Stainless steel scissors [one (1) each]
- 5 ml disposable syringe [three (3) each]
- Plastic disposable gloves, pack of 100 [one (1) each]

### Total base number reagent pack [CMAC 2002 ] includes:

- Reagent C [one (1) each]
- 10 ml disposable syringe [three (3) each]
- Plastic disposable gloves, pack of 100 [one (1) 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 velocity, enveloped acceleration and temperature on electric motors and other operating equipment
- 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 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 hand-held



instrument and 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 more susceptible to failure, and 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 dark environments
- IP 55 can be used in most industrial environments



### Specifications

- Power supply: 4.5 V, 3 x standard AAA batteries (LR03, AM4)
- Time control:
  - Presets: 10 or 30 seconds
  - Default: Infinite
- Operational temperature: 0 to 50 °C (32 to 122 °F)
- Storage temperature: -20 to +70 °C (-4 to +158 °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.)

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 hasn't 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.



*Lubricant degradation caused by electrical discharge currents.*

#### 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

# SKF MicroVibe P

## CMVL 3860-ML

Power without complexity, an advanced instrument for simplified vibration assessment that fits in your pocket

Available in multiple languages (ML): English, Chinese, German, and Spanish.

With the SKF MicroVibe P, vibration assessment is as close and convenient as your PDA! This economical vibration meter expansion module fits in a PocketPC's compact flash card slot (CF Type II) and features the user-friendly Windows Mobile Operating System. Identify problems and assess machine condition quickly and easily with this versatile and easy-to-use pocket tool.

### Features

- Exceptional value
  - Low cost, compact, and lightweight
- Quickly identify problems
  - Expert judgment criteria based on ISO vibration severity standard and SKF bearing condition evaluation
  - FFT Spectrum analysis enables user to pinpoint problems like unbalance, misalignment, bearing, rubs, etc.
  - Multi-point automation for faster data collection
- Standard vibration measurements
  - Envelope acceleration, acceleration, velocity, and displacement in both FFT spectrum and time waveform displays
- Store and recall measurements
  - For trending and analysis, store up to:
    - 2 000 overall vibration signals,
    - 1 000 FFT spectrum, and
    - 200 time waveforms

- Data management software
  - Enables users to transfer machinery vibration data to a computer for trending and further analysis
- SKF MicroVibe P kit includes:
  - SKF MicroVibe P module, data management software, accelerometer and cable, magnetic base, earphones, user manual, and carrying case (everything but the PDA).

### Power without complexity

A handy "quick-check" solution, based on the universal PDA platform, SKF MicroVibe P is simple to use. Built-in automatic functions virtually eliminate setup, while analytical displays and automatic judgment of machine vibration readings help users identify machine problems on the spot!

### An advanced instrument for simplified vibration assessment

The SKF MicroVibe P collects and displays overall vibration readings and automatically provides expert judgment of the measured velocity and overall enveloped acceleration levels, enabling immediate, accurate, and reliable assessment of machine or bearing condition.



### Multi-point automation saves time and improves reliability

Automatically collect the most useful measurements for vibration analysis – acceleration, velocity, displacement, and enveloped acceleration – simultaneously. SKF's multi-point automation saves time and enhances the power, accuracy, and overall reliability of your decision making – giving you the information needed to make the best possible judgment call.



The SKF MicroVibe P system.

MicroVibe P			
Set			
DataNo :	1		
Time.C :	0.1s		
	RMS	PEAK	CF
A [G]	0.409	0.647	1.583
V [mm/s]	38.67	52.25	1.351
D [ump-p]	-.---	184.3	-.---
E 3	0.017	0.078	4.609
[GE]			
Start	Save	Judge	Menu
Done			



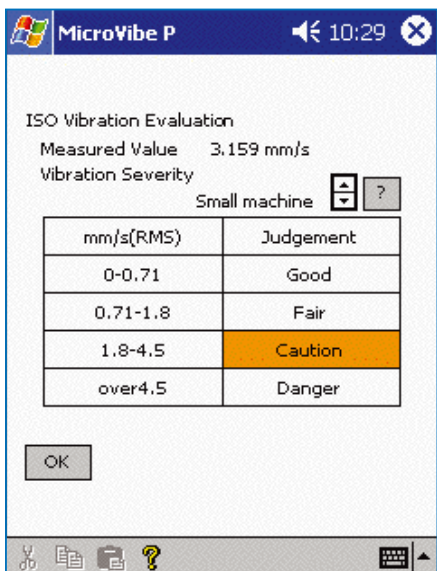
## Automatic setup and onboard expertise

The SKF MicroVibe P provides automatic setup and extensive evaluation of vibration results. Simply collect the data and the SKF MicroVibe P does the rest – comparing readings to pre-programmed velocity and enveloped acceleration severity criteria for accurate evaluation of machine vibration levels. This helps even novice users to easily determine abnormal conditions and take appropriate action.



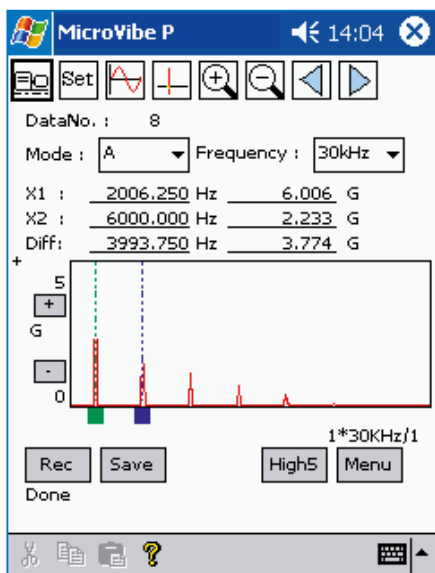
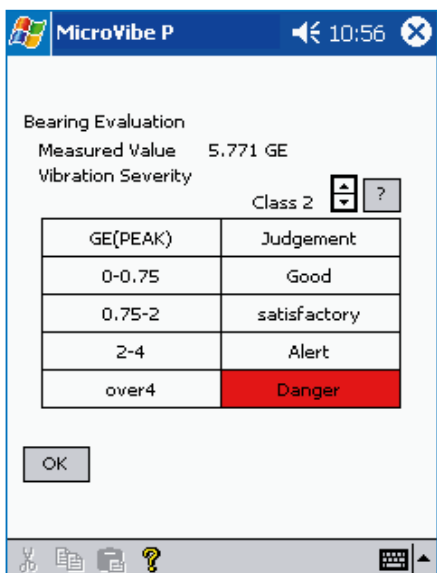
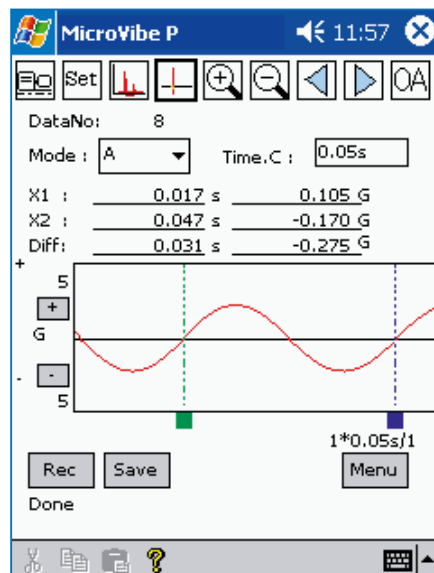
## Time waveform displays

Measure and store time waveform data, with the capability to select measurement type and duration. Time waveform displays are available for acceleration, velocity, displacement, or enveloped acceleration measurements. A unique “automatic transient capture” feature automatically starts data collection when the measured vibration signal exceeds a user-specified trigger level, enabling more detailed analysis of the pre- and post-trigger events surrounding a change in machine condition.



## FFT spectrum analysis capabilities

With pre-set measurements and user selectable FFT resolution at 400, 800 or 1 600 lines, selectable Fmax, and a 90 dB dynamic range, the SKF MicroVibe P has what it takes to help you easily pinpoint impending machine problems. Cursor position readout with display zoom optimizes your analysis power. In addition, it automatically tabulates and displays the highest vibration peaks from a spectrum, making it easy to quickly identify signals indicative of specific machine problems, like misalignment, imbalance, or bearing faults.



## Versatile measurement capability

The SKF MicroVibe P works with the two most commonly used vibration sensors – accelerometers and dynamic velocity transducers. Both enable you to take a multi-parameter approach to your analysis and optimize the SKF MicroVibe P's data collection capabilities.

## Audio analysis

Now you can actually listen to machine problems using the SKF MicroVibe P's acoustic capability. Simply connect the earphones and listen to the measured vibration signal. When abnormal noise is detected, use the SKF MicroVibe P's vibration analysis capabilities to help determine the type and severity of the problem.





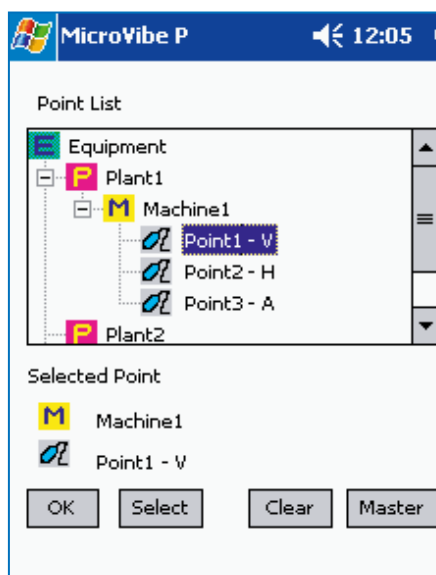
## Store and recall measurements for trending and analysis

The SKF MicroVibe P's data storage capacity is extraordinarily impressive. It can store up to 2 000 overall vibration signals, 1 000 FFT spectrums or 200 records of time waveform data for later recall. A search feature quickly retrieves specific collected measurement, and a "repeat measurement" feature let's you recall and repeat any measurement for more focused analysis or trending of a potential problem. Finally, a "recall data storage" list helps you keep track of and reference all collected data.

## Data management and software for your desktop computer

The SKF MicroVibe P offers added functionality, including a software program to extract, save, edit, and display collected data. It's ideal for small route data collection.

Data may be uploaded to your desktop computer for further analysis and trending using the data management software. Once uploaded, vibration data, overall trends, and spectra can be stored, trended, graphically displayed, and even exported to Microsoft Excel.



## Utilities add value

Several exciting utilities help make the SKF MicroVibe P a universal tool for machine vibration analysis, for any expertise level. Collect data in imperial or metric units.

The SKF MicroVibe P truly provides you vibration monitoring and analysis power, without complexity. It's tomorrow's big solution for vibration analysis in a small, smart package – and it's available today! Get more information at [www.skf.com/cm](http://www.skf.com/cm).

## Specifications

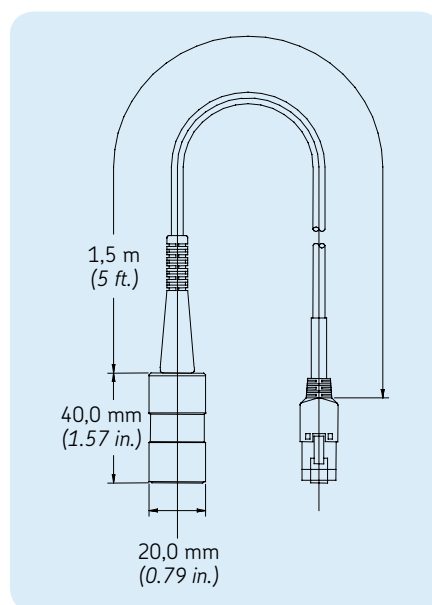
### SKF MicroVibe P CMVL 3860-EN

- Minimum PDA requirements(\*): Conforms to the Pocket PC specifications
- Operating system: Microsoft Windows Mobile 3.0/5.0/6.0
- Processor: ARM processor
- Interface: Compact Flash TYPE II Slot 3.3 V only
- Recommended specifications:
  - Processor: PXA255 400 MHz or higher
  - Memory (RAM): 64 MB or higher
- Interface with Pocket PC: Compact Flash TYPE II, slot 3.3 V only
- Power supply: +3.3 V (supplied by Pocket PC)
- Current:
  - Standby: 44  $\mu$ A
  - Under measurement: 48 mA
- Pickup input (PU IN):
  - AC voltage signal: Maximum  $\pm 2.5$  V
  - Input terminal: Eight pin modular jack (RJ-45), constant current type pre-amp built-in accelerometer is not connected.
- Raw waveform output (PU OUT):
  - AC voltage signal: Maximum  $\pm 2.5$  V
  - Output terminal: Mini-jack (2,5 mm F)
- Sampling frequency: Maximum 76.8 kHz (changes according to mode) 76.8 kHz/ 38.4 kHz
- Aliasing filter: 20 kHz/2 kHz (changes according to mode and sampling frequency)
- A/D: 16-Bit
- Temperature range: 0 to +45 °C (32 to +113 °F)
- Humidity range: <90% relative humidity, non-condensing

- Weight: 25 g (0.88 oz.) approximate (card only)
- Dimensions:
  - Width: 42,1 mm (1.66 in.)
  - Height: 60,0 mm (2.36 in.)
  - Depth: 16,9 mm (0.67 in.)
- Shape: Conforms to CF Card TYPE II, Card Type. See photograph.
- Color: Black

### CMSS 3811 Accelerometer

- Type: Pre-amp is built-in, shear type
- Power supply: DC  $\pm 5$  V
- Voltage sensitivity: 20 mV/g
- Resonance frequency: 20 kHz approximate
- Frequency range: 3 to 10 000 Hz
- Maximum acceleration: 500 m/s<sup>2</sup>
- Vibration limit: 5 000 m/s<sup>2</sup>
- Maximum output voltage:  $\pm 1$  V
- Output impedance: Below 100  $\Omega$
- Temperature range: –20 to +80 °C (–4 to +176 °F)
- Material: SUS
- Weight: 60 g (2.1 oz.) approximate
- Tapped hole: M6, P = 1, depth 5 mm, internal thread
- Integral cable: Length 1,5 m (5 ft.)
- Connector: Eight pin modular plug
- Dimensions: See drawing CMSS 3811 Accelerometer dimension drawing
- Structure: Dust-proof, spray-proof



CMSS 3811 Accelerometer dimensions.

\* May not work with all PDAs. Please see list of certified PDAs.

Measurement specifications (for measurement with CMSS 3811 Accelerometer)		Overall and judgment specifications		FFT specifications	
Frequency specifications		Overall and judgment specifications		FFT specifications	
Item	Specifications	Item	Specifications	Item	Specifications
<b>Frequency range</b>		Overall value simultaneous measurement	<ul style="list-style-type: none"> <li>• Simultaneous measurement of overall vibration level, multi-mode (A, V, D, E1 to E4)</li> <li>• Range = Auto</li> <li>• Measuring time = 0.1/0.5/1.0 s</li> <li>• Measurement data = RMS value, PEAK value, C. F. value</li> <li>• Measured value display digits: Significant figure 4 digits</li> <li>• Example: .9999/999.9/99.99/9.999</li> <li>• Status display (under measurement, measurement end)</li> </ul>	FFT, waveform analysis	<b>Mode</b> = A/V D/E1/E2/E3/E4 <b>Range</b> = Fixed/auto  <b>FFT measurement condition:</b> <ul style="list-style-type: none"> <li>• Analysis frequencies: Selection list                             <ul style="list-style-type: none"> <li>- A: 250/500/1 000/2 000/5 000/ 10 000/15 000/ 30 000 Hz</li> <li>- V: 250/500/1 000 Hz</li> <li>- D: 250 Hz/(500 Hz for CMSS 3812 Velocity Sensor only)</li> <li>- E1: 50 Hz</li> <li>- E2: 250/500 Hz</li> <li>- E3: 250/500/1 000/2 000/ 5 000 Hz</li> <li>- E4: 250/500/1 000/2 000/ 5 000/ 10 000 Hz</li> </ul> </li> <li>• Lines of resolution: 1 600/ 800/400</li> <li>• Averaging: Stable/exponential/ peak hold</li> <li>• 1/2/4/8 times</li> <li>• Window: Hanning</li> </ul>
A	Acceleration: 10 to 15 kHz <sup>(1)</sup>				
V	Velocity: 10 to 1 000 Hz	Judgment	<ul style="list-style-type: none"> <li>• Abnormal judgment by vibration severity standard (ISO 10816 [JIS-B-0906] Standard)</li> <li>• Abnormal bearing judgment by enveloped acceleration E3 mode</li> </ul>		<b>Measurement mode: Normal/recorder/post process</b> <ul style="list-style-type: none"> <li>• Normal: Recording time of waveform data is determined by FFT measurement condition (analysis frequency, line number). Executes the measurement for average cycle in FFT and records the waveform for frame time (final frame time).</li> <li>• Recorder: Records the waveform of specified time by recording time. Average cycle of FFT is one time.</li> <li>• Recording time: 1/2/5/10 s</li> <li>• Post-process: Calculates from raw waveform data (temporary saved data). Average cycle of FFT is one time.</li> </ul>
D	Displacement: 10 to 150 Hz				
E1	Envelope detection: 5 to 100 Hz				
E2	Envelope detection: 50 to 1 kHz				
E3	Envelope detection: 500 to 10 kHz				
E4	Envelope detection: 5 k to 20 kHz				
<b>Sampling frequency</b>	A, E3, E4: 76,8 kHz E1, E2, V, D: 38,4 kHz				
<b>Aliasing filter</b>	A, E3, E4: 20 kHz E1, E2, V, D: 2 kHz				
<b>Range</b>					
A, E1, E2, E3, E4	0 to 1 g: 100x range 0 to 5 g: 20x range 0 to 20 g: 5x range 0 to 100 g: 1x range				
V	0 to 10 mm/s: 100x range 0 to 50 mm/s: 20x range 0 to 200 mm/s: 5x range 0 to 1 000 mm/s: 1x range				
D	0 to 50 µm: 100x range 0 to 250 µm: 20x range 0 to 1 000 µm: 5x range 0 to 5 000 µm: 1x range				
<b>Display specifications</b>					
		<b>Item</b>	<b>Specifications</b>		
		Graph display	FFT graph <ul style="list-style-type: none"> <li>• Dominant frequency component (highest five frequencies)</li> <li>• Cursor indication value display</li> <li>• Zoom scroll value display</li> </ul> Waveform graph <ul style="list-style-type: none"> <li>• Cursor indication display</li> <li>• Zoom scroll display</li> </ul>		

<sup>(1)</sup> The upper bound frequency can be changed by Utility Menu's A Filter.

## Ordering information

### SKF MicroVibe P kit CMVL 3860-ML

#### includes:

- SKF MicroVibe P Module
- Accelerometer, 1,5 m (5 ft.) integral cable, with plug, and stinger one (1) each [CMSS 3811]
- Two-bar magnetic base, high strength 35 lb. pull, one (1) each [CMAC 3825]
- Earphones, one (1) each [CMAC 3830]
- Data management software CD-ROM, one (1) each
- SKF MicroVibe P documentation (English only)
  - User manual
  - Data management software manual
  - Quick start guide
  - CE declaration of confirmation
- Carrying case

#### Note:

**Pocket PC (PDA) NOT INCLUDED.**

### SKF MicroVibe P kits with Pocket PC:

#### SKF MicroVibe P kit CMVL 3860-EN-PPC for USA includes:

- SKF MicroVibe P kit, one (1) each [CMVL 3860-ML]
- Hewlett Packard – HP iPAQ 210/211 Pocket PC with English operating system Windows Mobile 6.0, one (1) each [CMAC 3835]

#### SKF MicroVibe P kit CMVL 3860-EN-U-PPC:

- SKF MicroVibe P kit, one (1) each [CMVL 3860-ML]
- Hewlett Packard – HP iPAQ 210/211 Pocket PC with English operating system Windows Mobile 6.0, one (1) each [CMAC 3835]
- Hewlett Packard – Universal AC adapter, one (1) each [CMAC 3840]

### Additional accessories

- Accelerometer, 1,5 m (5 ft.) integral cable (replacement), with plug [CMSS 3811]
- Velocity pickup sensor, 1,5 m (5 ft.) integral cable, with plug [CMSS 3812]
- Two-bar magnetic base, high strength 35 lb. pull, one (1) each [CMAC 3825]
- Earphones, one (1) each [CMAC 3830]

### Certified Pocket PC's

Certified Pocket PC's (PDA) with Windows Mobile 2006

- Hewlett Packard (HP)
  - iPAQ 210
  - iPAQ 211
  - iPAQ 212
  - iPAQ 214
  - iPAQ 216

Certified Pocket PC's (PDA) with Windows Mobile 2005

- Hewlett Packard (HP)
  - iPAQ hx2490
  - iPAQ hx2495
  - iPAQ hx2790

### Optional certificates

- Calibration certificate, certification of successful inspection results [DOC-CAL CERT CMVL 3860]
- Verification/calibration record, features the actual data and tolerance's [DOC-TEST CERT CMVL 3860]

# SKF Machine Condition Detector Pro IS

## CMVL 3600-IS

Intrinsic Safety (IS) rated

The SKF Machine Condition Detector Pro IS (MCD Pro IS) is certified Intrinsically Safe (IS) for Europe and North America. The ruggedized MCD Pro IS is ideal for use in the hazardous environments typically found in the petrochemical Industrial marketplace.

### 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 quick connect stud (MQC) 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 accessory to the SKF MARLIN hand held mobile computers for Operator Driven Reliability (ODR). When used with SKF @ptitude Inspector software and the SKF MARLIN quick connect line of mechanical and computerized studs, the complete



*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.*

system offers customers in non-hazardous conditions the added power, and functionality of immediate in-the-field feedback on alarm conditions, as well as data storage, trending, and analysis. Data is logged for trending, SPC (Statistical Process Control) rule violation, and percent change from last measurement and baseline data.

### 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 which are observable in the low to mid frequency range, and can indicate such structural problems as misalignment, unbalance, mechanical looseness, and more. Events which 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 which focuses on enhancing the repetitive 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 LED react appropriately. An "alert" condition provides a 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.

## SKF MARLIN quick connect 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 SKF MARLIN quick connect mechanical/computerized studs provide for a fast, quarter turn connection which temporarily fastens the probe to a measurement point. This reduces the possibility of errors and inconsistencies often resulting from data collected by a variety of individuals using varying methodologies.



- Enveloped acceleration: 0,3 to 20,0 gE
- Temperature: 0 to +100 °C (32 to +212 °F)
- Frequency range:
  - Overall velocity: 10 Hz to 1 kHz (Tolerances measured within the frequency range are in accordance with ISO 3945)
  - Enveloped acceleration band 3: 500 Hz to 10 kHz

### Display

Viewing area: 54,99 × 17,78 mm (2.165 × 0.700 in.)

### Power

- Main power: Two (2) 1,5 V alkaline "AA" batteries
- Battery lifetime: 30 hours
- Backup battery: One (1) 3 V BR1225 Lithium ion battery
- Auto off: Two (2) minute countdown on last operation

### Hazardous area ratings

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

### Physical characteristics

- Case: Water and dust resistant (IP 65)
- Drop test: Six (6) feet on multiple axes
- Dimensions:
  - Length: 190,5 mm (7.50 in.)
  - Width: 43,2 mm (1.70 in.)
  - Height: 41,4 mm (1.63 in.)
- Weight: 431 g (0.95 lb.) with battery, 635 g (1.4 lb.) with temperature magnet probe tip

### User environment

- Operating temperature:
  - -20 to +60 °C (-4 to +140 °F) ordinary locations
  - -20 to +40 °C (-4 to +104 °F) hazardous locations
- Storage temperature: -37 to +70 °C (-34 to +158 °F)
- Humidity: 5 to 95% noncondensing

### Communications port

- Type: Micro D RS 232

### Quick connect interface

- Receptacle: 1/4 turn, 5/8-24 two (2) lead thread with contact

### Accessories

- SKF MARLIN quick connect studs – CMSS 26xx series

## Specifications

### Measurements

- Vibration pickup: Integrated piezoelectric acceleration (ceramic, shear type)
- Measurement range:
  - Velocity: 0,3 to 55 mm/s (RMS), 0.02 to 3.00 in/s (equivalent Peak). Meets ISO Standard 10816-1.

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



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.

## 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 for SKF Machine Condition Detector Pro IS probe [CMAC 3610]
- "AA" Alkaline batteries, two (2) 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]

### SKF MARLIN quick connect and mounting accessories

- SKF MARLIN quick connect interface receptacle, 1/4 turn, 5/8-24 two (2) lead thread with contact
- SKF MARLIN quick connect mechanical M8 x 1,25 mounting thread – three (3) studs per package [CMSS 2600-3]
- SKF MARLIN quick connect mechanical 1/4-28 mounting thread – three (3) studs per package [CMSS 2610-3]
- SKF MARLIN quick connect computerized (*patent pending*) M8 x 1,25 mounting thread – three (3) studs per package [CMSS 2601-3]
- SKF MARLIN quick connect computerized (*patent pending*) 1/4 x 28 mounting thread – three (3) studs per package [CMSS 2611-3]
- Tool kit for spot face 1/4-28 [CMAC 9600-01]
- Tool kit 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]

### 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 (*Requires CMAC 6115 Adapter*) [CMAC 6115]
- 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]

### 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 Reliability Systems publication number SR/P2 10272 EN or contact your local SKF Reliability Systems Sales Representative.

# CMSS 420VT/CMCP 420VT-T

## Loop-powered Vibration Transmitters series

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).

### 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 Hz 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 Hz to 750 Hz
- Output 2: 4 to 20 mA proportional to full scale Temperature
  - From 0 to 100 °C (32 to 212 °F)
- Temperature accuracy: 2.5 °C at 85 °C (36.5 °F at 185 °F)

#### CMSS 420VT and CMCP 420VT-T

##### Environmental

- Operating temperature:  $-20$  to  $+80$  °C ( $-4$  to  $+176$  °F)
- Sealed: Epoxy encapsulated
- Enclosure: SS, NEMA 4, 4X, 12
- Mounting: Stud mounted
- Weight (without display): 227 g (8 oz.)



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



### 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 ohms 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 (32 to 212 °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 (32 to 212 °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  $\Omega$  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 420WF 3/4 in. NPT Weatherproof Cable Fitting**
  - When used with the CMSS 420EL, provides a simple weatherproof exit for the instrument wire.
- **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 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 520 VT and most common accelerometers and vibration transmitters.

### 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 420LCD/CMSS 420LED Display retrofit



CMSS 420BNC BNC adapter retrofit



CMSS 420WF NPT weatherproof cable fitting



CMSS 420EL NPT elbow



CMSS 203 Pipe thread accelerometer mounting adapter

# CMSS 2100



## General purpose industrial accelerometer

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, and 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 (2) 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 +24 °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 (+77 °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 (–58 to +248 °F), operating temperature

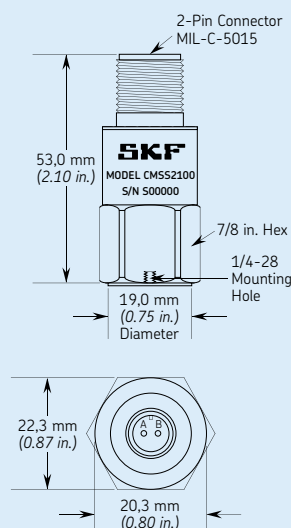
- Vibration limits: 500 g peak
- Shock limit: 5 000 g peak
- Electromagnetic sensitivity, equivalent g, maximum: 70 µg/gauss
- Sealing: Hermetic
- Base strain sensitivity: 200 µg/microstrain
- CE: According to the generic immunity standard for Industrial Environment EN50082-2.
- Acceptance Criteria: The generated “false equivalent g level” under the above test conditions should be less than 2 milli g 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) 1/4-28 to 1/4-28 English thread and one (1) M8 x 1,25 metric 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, teflon jacket, 100 pF/m (30 pF/ft.)



#### Dimension diagrams



### Ordering information

- **CMSS 2100** General purpose industrial accelerometer with top exit MIL-C-5015 two (2) pin connector.
  - 1/4-28 and M8 mounting studs provided. Calibration sensitivity and nominal sensitivity is provided for each accelerometer package.



# CMSS 2200/CMSS 2200-M8

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

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 coast 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 x 1.00 or M8 x 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 +24 °C (+75 °F), 24 V DC supply, 4 mA constant current and 100 Hz.

### Dynamic

- Sensitivity: 100 mV/g
- Sensitivity precision: ±10% at +25 °C (+77 °F)
- Acceleration range: 80 g peak
- Amplitude linearity: 1%
- Frequency range:
  - ±10%; 1.0 to 5 000 Hz
  - ±3 dB; 0.7 to 10 000 Hz
- Resonance frequency: Mounted, minimum 22 kHz
- Transverse sensitivity: ≤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 µg/√Hz
- Output impedance: <100 Ω
- Bias output voltage: 12 V DC
- Grounding: Case isolated, internal shielding

### Environmental

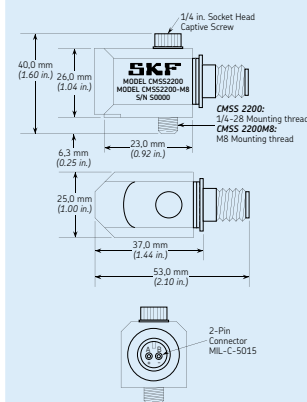
- Temperature range: –50 to +120 °C (–58 to +248 °F), operating temperature
- Vibration limits: 500 g peak
- Shock limit: 5 000 g peak
- Electromagnetic sensitivity, equivalent g, maximum: 70 µg/gauss
- Sealing: Hermetic
- Base strain sensitivity: 200 µg/microstrain
- CE: According to the generic immunity standard for Industrial Environment EN50082-2.
- Acceptance criteria: The generated “false equivalent g level” under the above test conditions should be less than 2 milli g 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) 1/4-28 English thread and one (1) M6 x 1,00 Metric 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, teflon jacket, 100 pF/m (30 pF/ft.)



### Dimension diagrams



### Ordering information

- **CMSS 2200** General purpose low profile industrial accelerometer with side exit MIL-C-5015 two (2) 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 (2) pin connector.
  - M8 mounting stud provided. Calibration sensitivity and nominal sensitivity is provided for each accelerometer package.



# CMSS 9100/CMSS 9200

## Single/double shield twisted pair cable

The SKF CMSS 9100 and CMSS 9200 premium sensor cables provide superior performance in demanding environments

### CMSS 9100

The CMSS 9100 is a single shielded, single twisted pair cable with the conductors individually insulated with DuPont FEP Teflon, a braided shield with drain wire and an outer insulated jacket also made of clear DuPont FEP Teflon. The cable is wrapped with a color tape under the outer insulated jacket and also has superimposed on the color tape a white marker tape with cable designation and SKF logo.

### CMSS 9200

CMSS 9200 is a double shielded, single twisted pair cable with the conductors individually insulated with DuPont FEP Teflon, an inner shield of aluminium polyester foil with drain wire, an inner insulated jacket of DuPont FEP Teflon, a braided outer shield, and the outer insulated jacket of clear DuPont FEP Teflon. The cable is wrapped with a color tape under the outer insulated jacket and also has superimposed on the color tape a white marker tape with cable designation and SKF logo.

### Features

- Tin plated copper conductors
- Heat and flame resistance

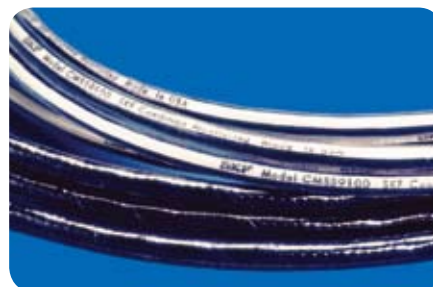
### Recommended uses

The single shield cable is recommended for use with sensors in normal industrial applications where historically these type cables 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 with one such example being machine tools and another being power generating facilities.

### Specifications (applicable to both models)

- Conductors: Tin plated copper, 19 x 32 strands, size 20 AWG (American Wire Gauge)
- Color code: Black and white pair, cable color is yellow with white SKF label
- Outer jacket diameter: 0.190 in. ( $\pm 0.005$  in.), includes glass fillers for roundness
- Wire materials: All conductors, drain wires and braided shields are of tin plated copper
- Capacitance: Approximately 89 pF/m (27 pF/ft.)
- Voltage rating: 600 V RMS
- Working temperature range:  $-80$  to  $+200$  °C ( $-112$  to  $+392$  °F)
- Heat and flame resistance: Meets requirements of UL 910 Stiner Tunnel test



### Ordering information

- **CMSS 9100-500** 150 m (500 ft. spool) single shield with continuous cable length.
- **CMSS 9100-1000** 300 m (1 000 ft. spool) single shield with continuous cable length.
- **CMSS 9200-500** 150 m (500 ft. spool) double shield with continuous cable length.

## CMSS R6Q(I)\*-9100-xx

### Cable assembly IP 68

Manufactured to your application requirements



This rugged MIL-C-5015 style cable assembly can be used with all 2-pin MS connector accelerometers (such as, CMSS 2100, CMSS 2200, CMSS 793, CMSS 797).

#### Features

- Q-type connector
- IP 68 (submersible, 1 m depth in water)
- High temperature +200 °C (+392 °F)
- Standard recommendation for harsh environments

The IP rating refers to the Ingress Protection as defined by the IEC (International Electrotechnical Commission). IP 68 represents total protection against dust and a water sealing that can withstand submersion for up to 1 m deep for approximately 15 to 30 minutes.

#### Ordering information

- Available in two versions:
  - “I” = Isolated type, for grounding on instrument side
  - “ ” leave blank for grounding on machine side. The cable shield is connected to the sensor casing, the sensor must be mounted on earth grounded machine casing or structural point.
- Available in different lengths:
  - “-XX” = for equivalent length in feet
  - “-16” = 4,87 m (16 ft.)
  - “-32” = 9,75 m (32 ft.)
  - “-64” = 19,50 m (64 ft.)

## CMSS R6SL(I)\*-9100-xx

### Cable assembly IP 66

Manufactured to your application requirements



This MIL-C-5015 style cable assembly can be used with all 2-pin MS connector accelerometers (such as, CMSS 2100, CMSS 2200, CMSS 793, CMSS 797).

#### Features

- SL-type connector
- IP 66 (withstands direct water jet)
- Elevated temperature +150 °C (+302 °F)
- Premium connector

The IP rating refers to the Ingress Protection as defined by the IEC (International Electrotechnical Commission). IP 66 represents total protection against dust and water sealing against jets of water.

#### Ordering information

- Available in two versions:
  - “I” = Isolated type, for grounding on instrument side
  - “ ” leave blank for grounding on machine side. The cable shield is connected to the sensor casing, the sensor must be mounted on earth grounded machine casing or structural point.
- Available in different lengths:
  - “-XX” = for equivalent length in feet
  - “-16” = 4,87 m (16 ft.)
  - “-32” = 9,75 m (32 ft.)
  - “-64” = 19,50 m (64 ft.)

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



## Junction boxes and enclosures

- 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.

# CMSS 260 series



## NEMA 4 and NEMA 4X enclosures

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 screw-driver 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 Information

Description	CMSS 260FG-XX
-XX NEMA 4X fiberglass enclosures (dimensions: height x width x depth)	
01 15,2 x 15,2 x 10,2 cm (6.0 x 6.0 x 4.0 in.)	
02 20,3 x 15,2 x 8,9 cm (8.0 x 6.0 x 3.5 in.)	
03 25,4 x 20,3 x 15,2 cm (10.0 x 8.0 x 6.0 in.)	

#### Ordering Information

Description	CMSS 260PS-XX
-XX NEMA 4 painted steel enclosures (dimensions: height x width x depth)	
01 15,2 x 15,2 x 10,2 cm (6.0 x 6.0 x 4.0 in.)	
02 20,3 x 15,2 x 8,9 cm (8.0 x 6.0 x 3.5 in.)	
03 25,4 x 20,3 x 15,2 cm (10.0 x 8.0 x 6.0 in.)	

#### Ordering Information

Description	CMSS 260SS-XX
-XX NEMA 4X stainless steel enclosures (dimensions: height x width x depth)	
01 15,2 x 15,2 x 10,2 cm (6.0 x 6.0 x 4.0 in.)	
02 20,3 x 15,2 x 8,9 cm (8.0 x 6.0 x 3.5 in.)	
03 25,4 x 20,3 x 15,2 cm (10.0 x 8.0 x 6.0 in.)	

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

# CMSS 265 series



## Termination junction boxes

### 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 water tight 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 water tight and dust tight seal. Stainless steel screws and clamps are provided.

#### Ordering Information

Description	CMSS 265FG-XX
-XX NEMA 4X fiberglass junction boxes (dimensions: height x width x depth)	
02 2 channels, 6 terminals – 15,2 x 15,2 x 10,2 cm (6.0 x 6.0 x 4.0 in.)	
04 4 channels, 12 terminals – 15,2 x 15,2 x 10,2 cm (6.0 x 6.0 x 4.0 in.)	
08 8 channels, 24 terminals – 20,3 x 15,2 x 10,2 cm (8.0 x 6.0 x 4.0 in.)	
12 12 channels, 36 terminals – 25,4 x 20,3 x 15,2 cm (10.0 x 8.0 x 6.0 in.)	
16 16 channels, 48 terminals – 35,6 x 30,5 x 20,3 cm (14.0 x 12.0 x 8.0 in.)	

#### Ordering Information

Description	CMSS 265PS-XX
-XX NEMA 4 powder coated steel junction boxes (dimensions: height x width x depth)	
02 2 channels, 6 terminals – 15,2 x 15,2 x 10,2 cm (6.0 x 6.0 x 4.0 in.)	
04 4 channels, 12 terminals – 15,2 x 15,2 x 10,2 cm (6.0 x 6.0 x 4.0 in.)	
08 8 channels, 24 terminals – 20,3 x 15,2 x 10,2 cm (8.0 x 6.0 x 4.0 in.)	
12 12 channels, 36 terminals – 25,4 x 20,3 x 15,2 cm (10.0 x 8.0 x 6.0 in.)	
16 16 channels, 48 terminals – 35,6 x 30,5 x 20,3 cm (14.0 x 12.0 x 8.0 in.)	

#### Ordering Information

Description	CMSS 265SS-XX
-XX NEMA 4X stainless steel junction boxes (dimensions: height x width x depth)	
02 2 channels, 6 terminals – 15,2 x 15,2 x 10,2 cm (6.0 x 6.0 x 4.0 in.)	
04 4 channels, 12 terminals – 15,2 x 15,2 x 10,2 cm (6.0 x 6.0 x 4.0 in.)	
08 8 channels, 24 terminals – 20,3 x 15,2 x 10,2 cm (8.0 x 6.0 x 4.0 in.)	
12 12 channels, 36 terminals – 25,4 x 20,3 x 15,2 cm (10.0 x 8.0 x 6.0 in.)	
16 16 channels, 48 terminals – 35,6 x 30,5 x 20,3 cm (14.0 x 12.0 x 8.0 in.)	

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



# CMSS 300 series



## BNC junction boxes

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

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)

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 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 <b>NEMA 4X fiberglass BNC junction boxes</b> (dimensions: height x width x depth)	
01 1 channel – 16,5 x 16,5 x 10,8 cm (6.50 x 6.50 x 4.25 in.)	
02 2 channels – 16,5 x 16,5 x 10,8 cm (6.50 x 6.50 x 4.25 in.)	
04 4 channels – 21,6 x 16,5 x 10,8 cm (8.50 x 6.50 x 4.25 in.)	
06 6 channels – 21,6 x 16,5 x 10,8 cm (8.50 x 6.50 x 4.25 in.)	
-XX <b>Internal/External BNC</b>	
01 Internal BNC	
02 External BNC	

**Ordering example:** NEMA 4 powder coated steel BNC junction box with 6 channels and external BNC would be the SKF model number CMSS 300FG-06-02.

## 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 × 10,2 cm (7.50 × 7.00 × 4.00 in.)
- 02** 2 channels – 19,1 × 17,8 × 10,2 cm (7.50 × 7.00 × 4.00 in.)
- 04** 4 channels – 24,1 × 17,8 × 8,9 cm (9.50 × 7.00 × 3.50 in.)
- 06** 6 channels – 24,1 × 17,8 × 8,9 cm (9.50 × 7.00 × 3.50 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 × 12,7 × 10,2 cm (7.50 × 5.00 × 4.00 in.)
- 02** 2 channels – 19,1 × 12,7 × 10,2 cm (7.50 × 5.00 × 4.00 in.)
- 04** 4 channels – 24,1 × 17,8 × 10,2 cm (9.50 × 7.00 × 4.00 in.)
- 06** 6 channels – 24,1 × 17,8 × 10,2 cm (9.50 × 7.00 × 4.00 in.)
- XX **Internal/External BNC**
- 01** Internal BNC
- 02** External BNC



# CMSS 310 series



## Switchable BNC junction boxes

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 water tight 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 – 24,1 × 17,8 × 8,9 cm (9.50 × 7.00 × 3.50 in.)	
<b>12</b> 12 channels – 24,1 × 17,8 × 8,9 cm (9.50 × 7.00 × 3.50 in.)	
<b>24</b> 24 channels – 39,4 × 33,0 × 15,2 cm (15.50 × 13.00 × 6.00 in.)	
<b>32</b> 32 channels – 44,5 × 38,1 × 15,2 cm (17.50 × 15.00 × 6.00 in.)	
<b>48</b> 48 channels – 44,5 × 38,1 × 15,2 cm (17.50 × 15.00 × 6.00 in.)	
-XX <b>Internal/External BNC</b>	
<b>01</b> Internal BNC	
<b>02</b> External BNC	

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

## 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 × 8,9 cm (9.50 × 7.00 × 3.50 in.)	
<b>12</b> 12 channels – 24,1 × 17,8 × 8,9 cm (9.50 × 7.00 × 3.50 in.)	
<b>24</b> 24 channels – 39,4 × 33,0 × 15,2 cm (15.50 × 13.00 × 6.00 in.)	
<b>32</b> 32 channels – 44,5 × 38,1 × 15,2 cm (17.50 × 15.00 × 6.00 in.)	
<b>48</b> 48 channels – 44,5 × 38,1 × 15,2 cm (17.50 × 15.00 × 6.00 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 × 8,9 cm (9.50 × 7.00 × 3.50 in.)	
<b>12</b> 12 channels – 24,1 × 17,8 × 8,9 cm (9.50 × 7.00 × 3.50 in.)	
<b>24</b> 24 channels – 39,4 × 33,0 × 15,2 cm (15.50 × 13.00 × 6.00 in.)	
<b>32</b> 32 channels – 44,5 × 38,1 × 15,2 cm (17.50 × 15.00 × 6.00 in.)	
<b>48</b> 48 channels – 44,5 × 38,1 × 15,2 cm (17.50 × 15.00 × 6.00 in.)	
-XX <b>Internal/External BNC</b>	
<b>01</b> Internal BNC	
<b>02</b> External BNC	

## 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 +212 °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 <b>Liquid tight strain relief connectors</b>	
<b>01</b> 2 mm (0.08 in.)/5 mm (0.20 in.)	
<b>02</b> 4 mm (0.16 in.)/8 mm (0.31 in.)	
<b>03</b> 5 mm (0.20 in.)/9 mm (0.35 in.)	
<b>04</b> 7 mm (0.28 in.)/12 mm (0.47 in.)	
<b>05</b> 9 mm (0.35 in.)/18 mm (0.70 in.)	
<b>06</b> 13 mm (0.51 in.)/20 mm (0.78 in.)	

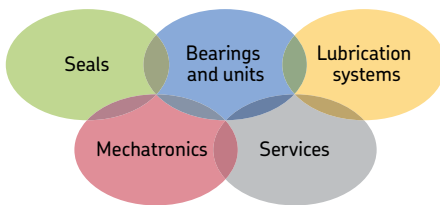






## Product Support Plan (PSP)

A range of Product Support Plans are available to protect your investment. Contact your local SKF Reliability Systems Sales Representative for additional information.



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