

# SKF Machine Condition Advisor

## CMAS 100-SL

Machine monitoring, made simple



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

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.

- 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.

### 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.

### 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.

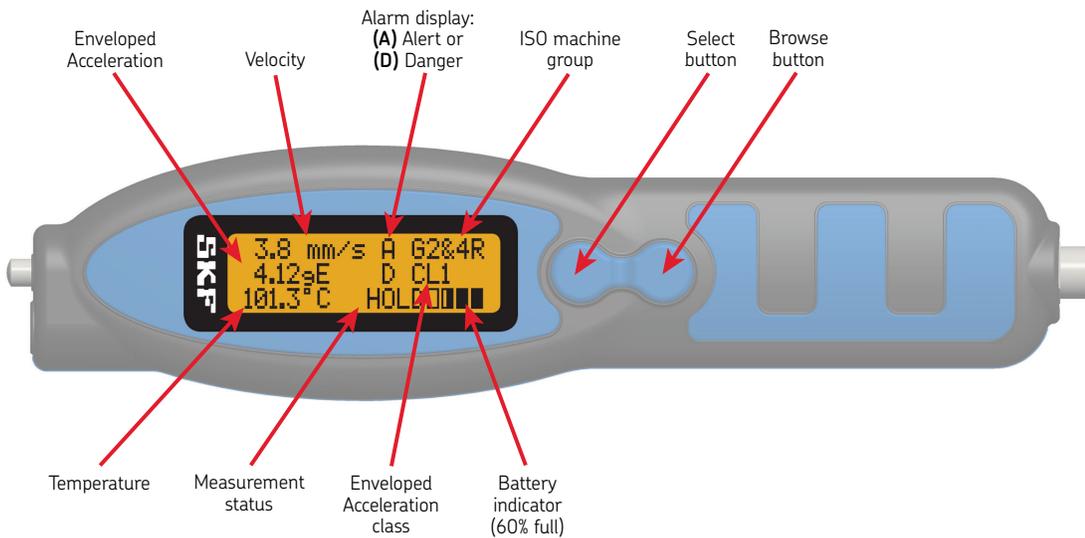
Depending on the SKF Machine Condition Advisor's System setting, the front-panel LCD simultaneously displays:

- 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 65,0 mm/s (RMS), 0.04 to 3.60 in/s (equivalent Peak), meets ISO 10816
    - Frequency: 10 to 1 000 Hz, meets ISO 2954
  - Enveloped acceleration:
    - Range: 0,2 to 50,0 gE
    - Frequency: Similar to Band 3 (500 to 10 000 Hz)
  - Temperature:
    - Range:  $-20$  to  $+200$  °C ( $-4$  to  $+392$  °F)
    - Infrared temperature accuracy:  $\pm 2$  °C ( $\pm 3.6$  °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 life: 10 hours before charging again ( $\approx 1$  000 measurements)
    - With external sensor: Up to 55% less battery life
  - Supported external sensor: Any standard accelerometer with 100 mV/g sensitivity constant current
  - External sensor power: 24 V DC at 3,5 mA
  - Charger specifications:
    - Universal AC/DC wall plug-in
    - Input: 90 to 264 VAC, 47 to 60 Hz
    - Output: 5 V DC regulated
    - 3 to 4 hours for a full charge

## Understanding and using guidelines for vibration

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

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

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

#### Groups 2 and 4 (default)

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

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

#### Groups 1 and 3

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

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

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

### Rigid or Flexible foundation?

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

Options are:

#### G2 and 4R (default)

Alert: 2,8 mm/s (0.16 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 (7.9 and 19.7 in.) and a shaft speed below 500 r/min.  
Alert: 1 gE  
Danger: 2 gE

#### CL2 (default)

Bearings with a bearing bore diameter between 50 and 300 mm (2.0 and 11.8 in.) and a shaft speed between 500 and 1 800 r/min.  
Alert: 2 gE  
Danger: 4 gE

#### CL3

Bearings with a bearing bore diameter between 20 and 150 mm (0.8 and 5.9 in.) and a shaft speed from 1 800 to 3 600 r/min.  
Alert: 4 gE  
Danger: 10 gE

#### Note:

As with all commonly published severity guidelines, the above provides target thresholds for new, refurbished and recently maintained equipment. In addition, if both lower limits of the guideline are used (for example in CL2, a 50 mm bearing bore diameter at 500 r/min), the applicable alarm values maybe lower. Note that bearing bore diameter is equal to shaft height.

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

### Extension sensor kit Model CMAC 105-K

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



#### Accelerometer

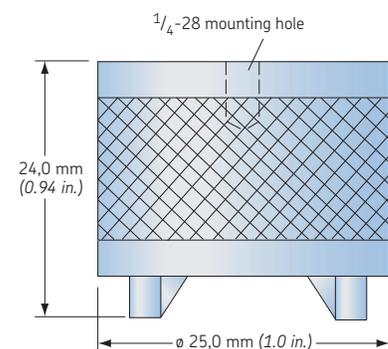
- 100 mV/g sensitivity
- Small size case
- 0,5 to 15 000 Hz frequency response ( $\pm 3$  dB)
- Waterproof

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

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

#### Magnet, Model CMAC 109

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



**Expanding your capabilities with SKF Machine Condition Advisor compatible accessories** (continued)

**Specifications (Accelerometer)**

**Dynamic performance**

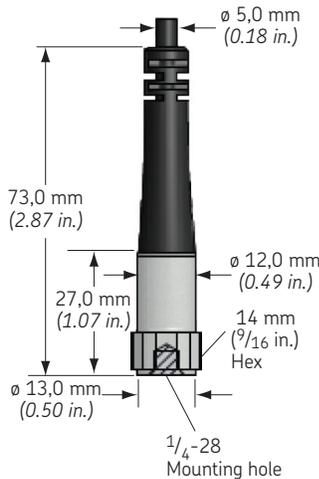
- Sensitivity ( $\pm 15\%$ ): 10,2 mV/(m/s<sup>2</sup>) (100 mV/g)
- Dynamic range:  $\pm 490$  m/s<sup>2</sup> ( $\pm 50$  g)
- Frequency response:
  - $\pm 3$  dB: 30 to 900 000 CPM (0,5 to 15 000 Hz)
  - $\pm 10\%$ : 42 to 420 000 CPM (0,7 to 7 000 Hz)

**Electrical**

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

**Physical**

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



**Environmental**

- Temperature range:  $-50$  to  $+121$  °C ( $-58$  to  $+250$  °F)
- Maximum shock protection: 49 km/s<sup>2</sup> peak (5 000 g, pk)
- Electromagnetic sensitivity: CE
- Sealing welded: Hermetic
- Submersible depth: 152 m (500 ft.)

**Ordering information**

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

- SKF Machine Condition Advisor unit
- Belt holster [CMAC 102]
- Charger, international DC power supply [CMAC 8004]
- User manual, English hard copy [32131800-EN]
- CD containing:
  - User manual available in PDF files in English, French, German, Portuguese, Spanish and Swedish
  - Link to training on SKF @ptitude Exchange

- SKF Machine Condition Advisor trend worksheet (Excel .xls file)
- SKF Condition Monitoring Essentials catalog available in PDF file in English [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-K]
- Extension kit, accelerometer with 3 m (9.8 ft.) integral cable and magnet [CMAC 105-K-3M]
- Extension kit, accelerometer with 5 m (16.4 ft.) integral cable and magnet [CMAC 105-K-5M]
- Extension kit, accelerometer with 10 m (32.8 ft.) integral cable and magnet [CMAC 105-K-10M]
- Connection cable, 1,5 m (4.9 ft.) with M8 socket type connector for standard constant current 100 mV/g accelerometer [CMAC 107]

**Replacement**

- Charger, international DC power supply, +5 V, 1 600 mA, 90 to 264 V AC, 47 to 63 Hz [CMAC 8002]
- Magnet, magnet base, 25,4 mm (1.0 in.) diameter, 13,6 kg (30 lbs.) pull-strength [CMAC 109]
- 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 Electric Motor Assessment kit [CMAK 200-EN]
- SKF Bearing Assessment kit [CMAK 300-SL]
- SKF Energy Monitoring kit [CMAK 450-ML]
- SKF Advanced Bearing Analysis kit [CMAK 600-EN]

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