Motor Condition Monitoring Devices
K6CM series

Stay alert to motor failures with 24/7 motor condition monitoring

- Load abnormality
- Comprehensive current diagnosis [Ver.UP] NEW
- Bearing wear
- Vibration & temperature monitoring
- Insulation degradation
- Insulation resistance monitoring

- Applicable in environment with inverters
- Prioritize maintenance inspections
- Monitor up to 10 motors remotely using the included PC monitoring software
- Clamp-type CT which is easy to install on existing equipment
Reduce the amount of required manual inspections

K6CM informs you when your motor requires maintenance

[Problems]

It’s difficult to prevent motor issues caused by degradation.

The conventional motor condition check had several check items. Therefore a skilled maintenance engineer was required to judge the motor’s maintenance timing. Additionally, inspection was time-consuming because there were many motors.

<table>
<thead>
<tr>
<th>Example of patrol inspection items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom</td>
</tr>
<tr>
<td>Bearing wear</td>
</tr>
<tr>
<td>Insulation degradation</td>
</tr>
<tr>
<td>Overload</td>
</tr>
<tr>
<td>Open phase</td>
</tr>
</tbody>
</table>

[Solution from OMRON]

Motors can be maintained in advance of failure due to degradation.

K6CM (comprehensive current diagnosis type) can consistently monitor the degradation tendency of the motor by observing the current waveform of the motor and processing complex analysis such as the frequency analysis, instead of a skilled maintenance engineer. Additionally, you can understand the motor’s maintenance timing without depending on an engineer, because K6CM provides threshold value setting.

<table>
<thead>
<tr>
<th>Degradation level</th>
<th>Time</th>
<th>Threshold level</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Failure critical&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Failure warning&quot;</td>
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</tbody>
</table>

[What is comprehensive current diagnosis?]

When an abnormality occurs in the load such as bearing, rotary shaft, or reducer, the motor does not rotate smoothly and a distortion occurs in its current waveform. K6CM measures its distortion as a degradation level.

Monitor up to 10 motors with PC software

With the accessory software “Motor Condition Monitoring Tool”, you can monitor motor conditions remotely.

* The screen is a sample image.
Comprehensive current diagnosis parameters are applicable for a wide range of motor abnormalities.

**Normal state when inverters are used**

Motor and load are normal

- Drive frequency components
- Noise components
- Cavity components
- Misalignment components

**Irregular change**

Degradation level 1

- Cavity components (Changing irregularly)

Cavitation occurs

Degradation level 1 can monitor abnormalities that have affect on the entire current waveform.

**Periodic change**

Degradation level 2

- Misalignment components (Changing periodically)

Misalignment occurs

Degradation level 2 can monitor abnormalities of certain frequency components other than noise components of inverter.

*The measurement of the degradation needs to measure the motor rotating at a constant speed about for 5 seconds.*

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**K6CM series**

**Type 01**

K6CM-CI

Comprehensive current diagnosis type

- Alarm bar display
  - Green: Status normal
  - Yellow: Failure warning
  - Red: Failure critical
- Display
  - [PV]: Present value
  - [MIN]: Minimum value
  - [MAX]: Maximum value
- Switches the units of the measured value displayed
  - [C1]: Degradation level 1
  - [C2]: Degradation level 2
  - [A]: Current

Also detects load abnormalities

When a load abnormality occurs, the current waveform of the motor changes, which allows the load abnormality to be detected.

Multiply to monitor the abnormalities by measuring degradation level 1 and degradation level 2, that are measured with different algorithms

**Degradation level 1**

Degradation level 1 is suited to monitoring abnormalities that have an irregular affect on the shaft of the motor because it can quantify the degree of deviation between the smooth sine wave of the ideal state and the entire current waveform as obtained during the sampling period.

[Abnormality detection]

- Cavitation, Air contamination, etc.

**Degradation level 2**

Degradation level 2 is suited to monitoring abnormalities which occurs periodically because certain frequency components among the frequency components affecting the rotating shaft of the motor are clearly captured and quantified. Even in environment with inverter noise, a motor or load abnormality can be captured with excellent sensitivity.

[Abnormality detection]

- Misalignment, Load imbalance, Foreign matter adhesion, etc.
Motor Condition Monitoring Device Lineup

**Type 02** Monitors bearing abnormalities through vibration and temperature

**K6CM-VB**

**Vibration & temperature monitoring type**

- Detects abnormalities in bearings
  - By constantly monitoring for vibrations, it can detect signs of abnormalities in bearings and the like as soon as possible.
- Constantly monitors temperature
  - The surface temperature of the routinely inspected motor can be measured at the same time as vibrations.

This eliminates the need to measure the temperature on site.

**Measuring vibration detection frequency up to 10 kHz can detect motor abnormalities at the earlier stage.**

- No vibration
  - High frequency amplitude: small
  - Out of range of measurement by sensor
- Working smoothly
  - High frequency amplitude: medium
  - Within range of measurement by acceleration
- Greased degraded
  - High frequency amplitude: large
  - Within range of measurement by velocity
- Damages
  - Leakage current (at the secondary side of the inverter) increases and decreases repeatedly.
  - The measurement of insulation resistance needs about 10 seconds while driving the motor by direct connection to commercial power supply and about 60 seconds by the inverter.

**Type 03** Constantly monitors the insulation resistance

**K6CM-IS**

**Insulation resistance monitoring type**

- Measures insulation resistance
  - With conventional products, measurement with a Megger Tester was necessary to check for insulation degradation. K6CM-IS can be used to perform this inspection during operation, making it possible to constantly monitor degradation trends while reducing the burden on the maintenance personnel.

The insulation resistance at the secondary side of an inverter can be measured.

- The current value increase and decrease repeatedly.
Features  Three functions for monitoring motor condition

1. Visual inspection through alarm bar display and two-step output
   **Alarm bar and output function**
   The K6CM series is equipped with an "alarm bar display" on the front of the product. The condition of motor is displayed by color-coding as green, yellow, or red. This shows the degree of abnormality and is helpful for visual inspection near the motor. Accordingly "failure warning" and "failure critical" statuses are also output. In addition, by using "display auto switching mode", you can see the measurement value in each without operation.

2. Monitors stable values even when load fluctuates
   **Trigger input function**
   Equipped with a "trigger input function" that measures the measurement timing according to the motor operation in order to accurately diagnose the condition of motors that are repeatedly started and stopped. The motor condition is determined from the operation signals (auxiliary output of the contactor and the PLC control signal), and measurement is only performed when the motor operation is stabilized, enabling fixed point observation on a daily or monthly basis under the same conditions. And the monitoring delay time function can be used to wait for the measurement values to stabilize. This function can delay the start of monitoring after the trigger input.

3. Self-diagnosis function that improves system reliability
   **Self-diagnosis function**
   When constantly monitoring for a long period of time, unexpected failures and other problems of measuring devices must be taken into consideration. The K6CM series is equipped with a self-diagnosis function as standard. The reliability of the system is improved by monitoring the service life of the device to be measured.

Motor Condition Monitoring Tool

The setting and monitoring tool software "Motor Condition Monitoring Tool" and the K6CM series are linked. Both allow the motor condition to be monitored visually with green, yellow, and red color-coding.

(Motor Condition Monitoring Tool is stored on the CD shipped with the K6CM device.)

**Motor condition list display**

The conditions of up to 10 motors are displayed as a list through the K6CM series connected to the network. The data of up to 30 K6CM units can be viewed. (Three types of K6CM can be installed to one motor)

**Displays condition list at same time as device displays**

**Error history display**

Displays the alarm statuses of multiple motors. Allows changes in the motor condition to be checked as a time series.

**Trend graph display**

Allows the measured value trends to be checked on graphs.

**Initial setting**

Initial settings of the K6CM series such as trigger input settings, motor information registration, network settings, and threshold adjustment can be made from a PC.

**Data can be output as a CSV file**

Measured and accumulated data can be output in CSV format. This is useful for creating reports and statistical materials.
In the interest of product improvement, specifications are subject to change without notice.
After installing a three-phase induction motor, performing proper maintenance by monitoring the motor condition will prolong its service life. Please select the optimal model for the type of abnormality you want to detect.

<table>
<thead>
<tr>
<th>Failure mode</th>
<th>Setup period</th>
<th>Operation period</th>
<th>Degradation progress period</th>
<th>Breakdown period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside the motor</td>
<td>Early operation</td>
<td>Insulation degradation</td>
<td>Insulation breakdown</td>
<td></td>
</tr>
<tr>
<td>Outside the motor</td>
<td>Grease degradation</td>
<td>Bearing damage</td>
<td>Bearing breakdown</td>
<td></td>
</tr>
<tr>
<td>Abnormality of rotary shaft</td>
<td>Adjustment</td>
<td>Faulty installation</td>
<td>Faulty centering etc.</td>
<td></td>
</tr>
<tr>
<td>Abnormality of rotary shaft</td>
<td>Early operation</td>
<td>Degradation progress of motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abnormality of rotary shaft</td>
<td>Faulty mounting</td>
<td>Faulty operating condition</td>
<td>Faulty load part</td>
<td></td>
</tr>
<tr>
<td>Load abnormality</td>
<td>Early operation</td>
<td>Degradation progress of load</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The measurement value in each model is a typical example.