

## Motor Condition Monitoring Devices

K6CM series

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

**Load abnormality**

**CI** Comprehensive current diagnosis [Ver.UP] **NEW**

**Bearing wear**

**VB** Vibration & temperature monitoring

**Insulation degradation**

**IS** 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



EtherNet/IP<sup>®</sup>  
Modbus





Reduce the amount of required manual inspections

# K6CM informs you when your motor requires maintenance

**[Problems]**

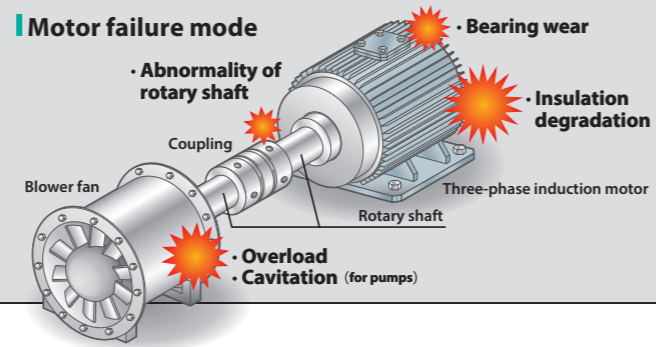
## It's difficult to prevent motor issues caused by degradation.

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.

**Example of patrol inspection items**

Phenomenon	Vibration	Heat generation	Decreased electrical resistance	Overcurrent
Bearing wear	✓	✓		✓
Insulation degradation			✓	
Overload	✓	✓		✓
Open phase		✓		

**Motor failure mode**

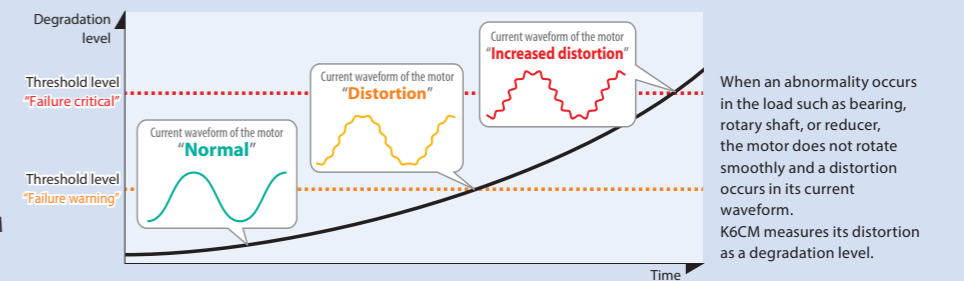


**[Solution from OMRON]**

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

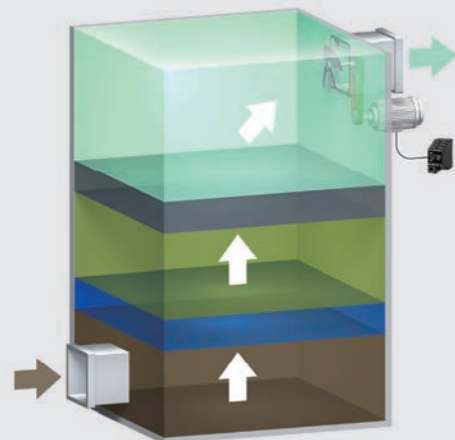
K6CM(comprehensive current diagnosis type) can consistently monitor the degradation tendency of the motor by observing the current waveform of the motor and processing complex analysis such as the frequency analysis, instead of a skilled maintenance engineer. Additionally, you can understand the motor's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

**What is comprehensive current diagnosis?**



**Monitors the 3-phase induction motor which is critical to facility operations**

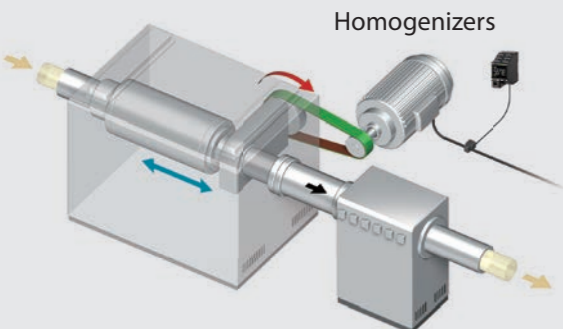
Ventilation fans in odorous gas treatment facilities



Washing pumps for automotive components



Dryers (for spray-drying powders)



Homogenizers

**Notify the factory floor with stack light**



**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.



K6CM Motor Condition Monitoring Devices

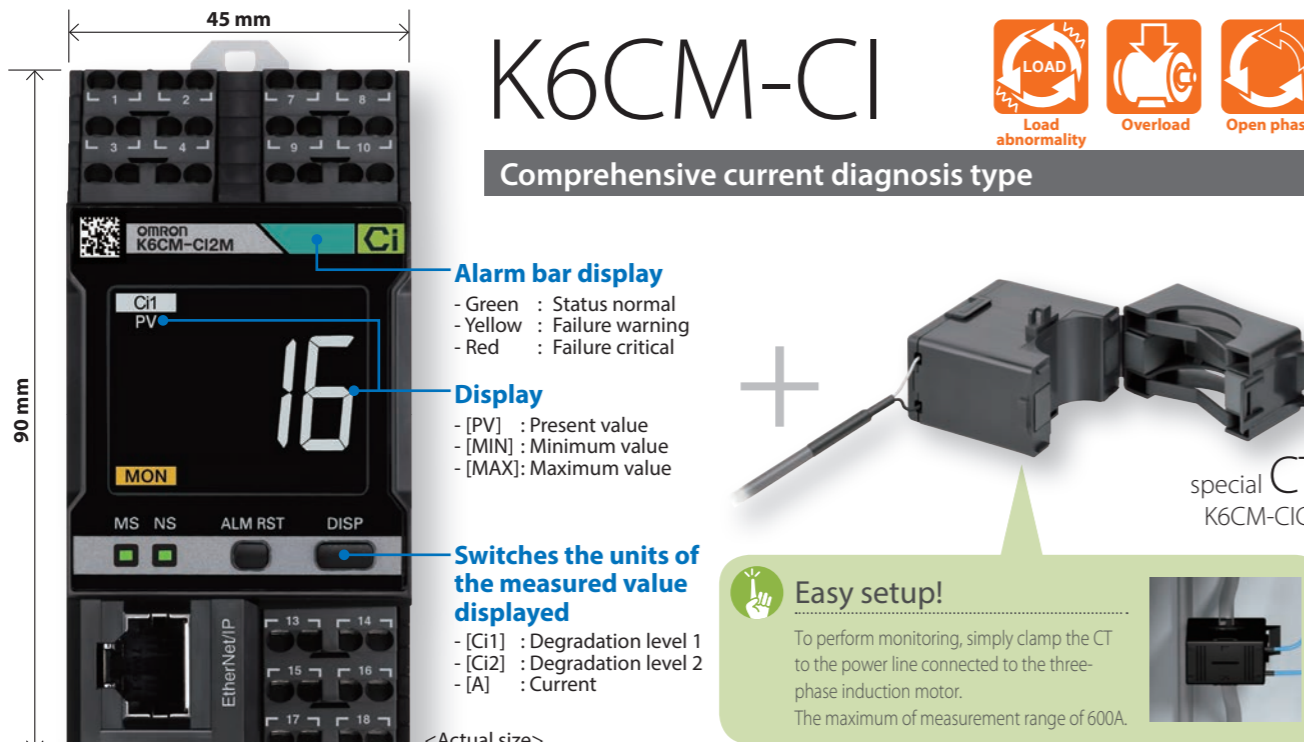
- Development Award of the TPM Award for Excellent Products 2018
- GOOD DESIGN AWARD 2018



# Motor Condition Monitoring Device Lineup

Note. Applicable motor type: three-phase induction motor

**type 01** Comprehensively monitors motor and load abnormalities through degradation level



**K6CM-C1**  
Comprehensive current diagnosis type

- LOAD abnormality
- Overload
- Open phase

**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**

- [Ci1] : Degradation level 1
- [Ci2] : Degradation level 2
- [A] : Current

**Easy setup!**

To perform monitoring, simply clamp the CT to the power line connected to the three-phase induction motor. The maximum of measurement range of 600A.

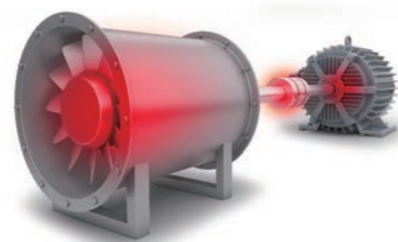
special CT K6CM-CICB

90 mm  
45 mm

<Actual size>

## 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 **NEW**

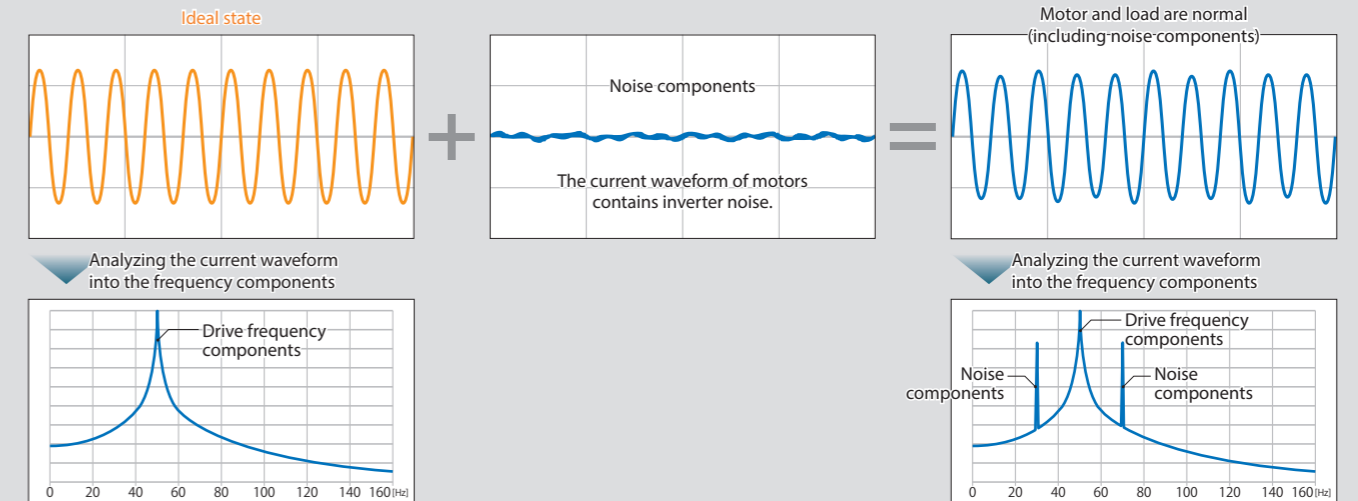
Degradation level 2 is suited to monitoring abnormalities which occurs periodically because certain frequency components among the frequency components affecting the rotating shaft of the motor are clearly captured and quantified. Even in environment with inverter noise, a motor or load abnormality can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

#### [Abnormality detection]

Misalignment, Load imbalance, Foreign matter adhesion, etc.

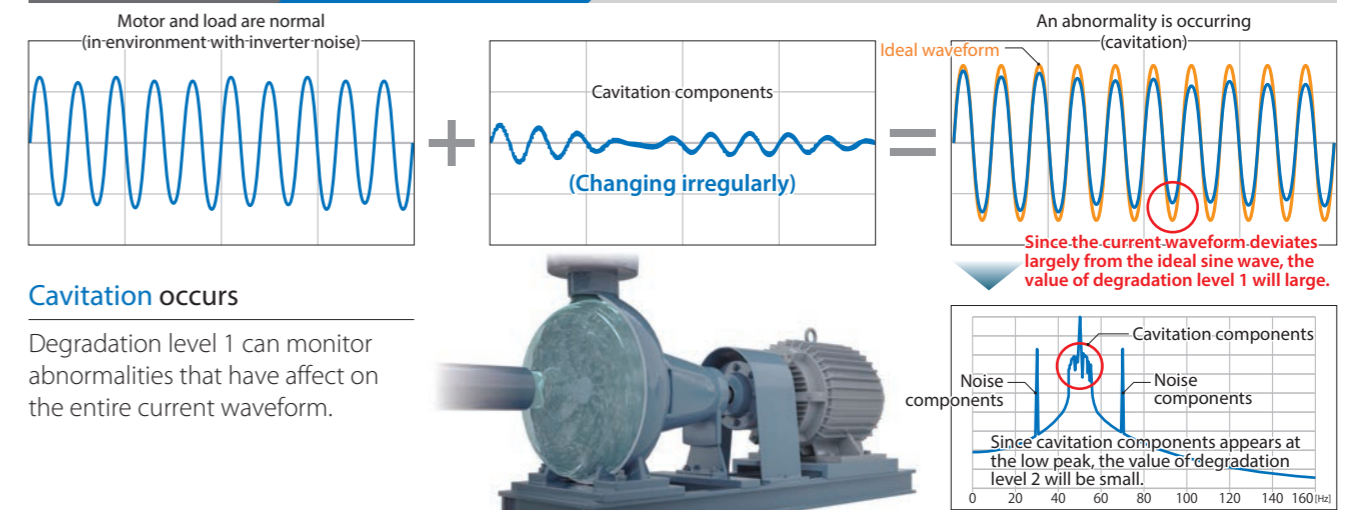
Comprehensive current diagnosis parameters are applicable for a wide range of motor abnormalities.

### Normal state when inverters are used



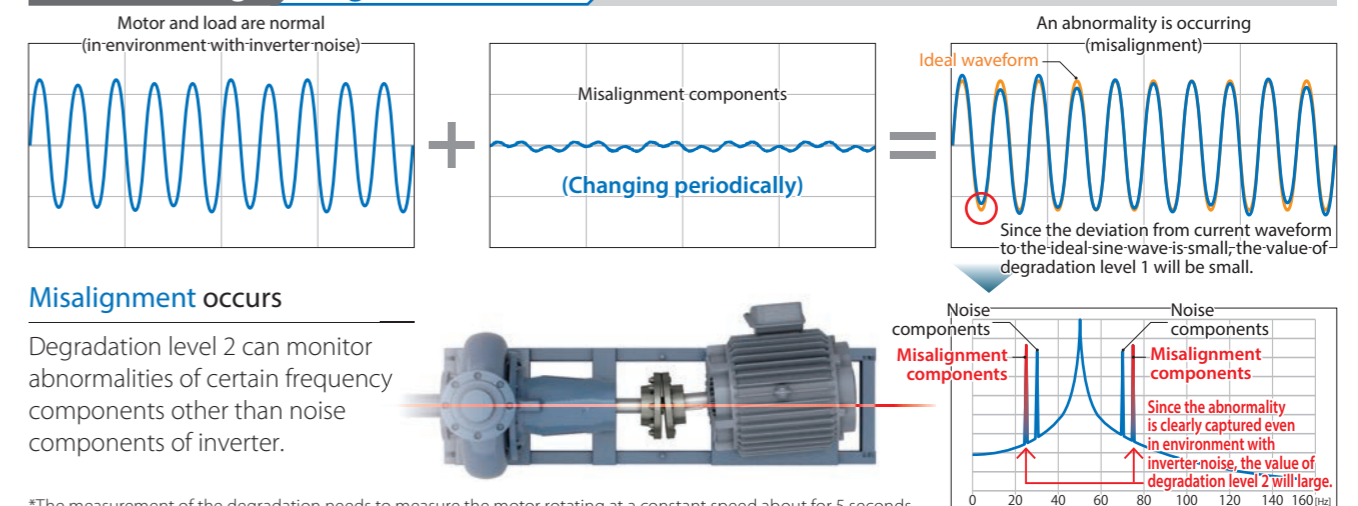
### Irregular change Degradation level 1

In the case of the abnormality with higher sensitivity of degradation level 1.



### Periodic change Degradation level 2

In the case of the abnormality with higher sensitivity of degradation level 2.



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



# Motor Condition Monitoring Device Lineup

Note. Applicable motor type: three-phase induction motor

type 02 Monitors bearing abnormalities through vibration and temperature



## K6CM-VB



Vibration & temperature monitoring type

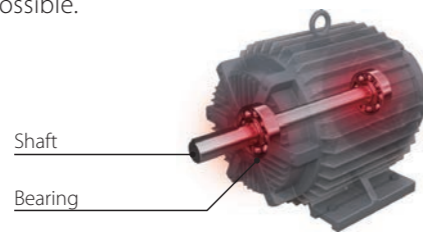
Detects abnormalities in bearings

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.

Pre-amplifier and Vibration & temperature sensor K6CM-VBS



This eliminates the need to measure the temperature on site.



\*Use K6CM-VBSAT1, the adhesive attachment if the motor cannot be tapped.

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

Bearing condition	New	Grease degraded	Damages	Breakdown
Motor condition	Working smoothly	Working smoothly	Abnormal noise occurs	Overheating/shaking
Motor vibration			The values change shortly and rapidly when motors are shaking by damages. Monitored by acceleration.	The values change largely and slowly when motors are shaking by breakdown. Monitored by velocity.
Measurement range by sensor	No vibration Out of range of measurement by sensor	High frequency Amplitude: small	Acceleration 1 to 10 kHz Amplitude: medium Within range of measurement by acceleration	0.01 to 1 kHz Amplitude: large Velocity Within range of measurement by velocity

type 03 Constantly monitors the insulation resistance



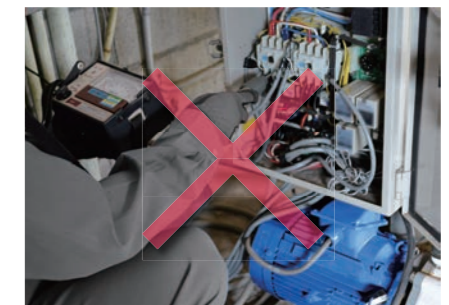
## K6CM-IS



Insulation resistance monitoring type

Measures insulation resistance

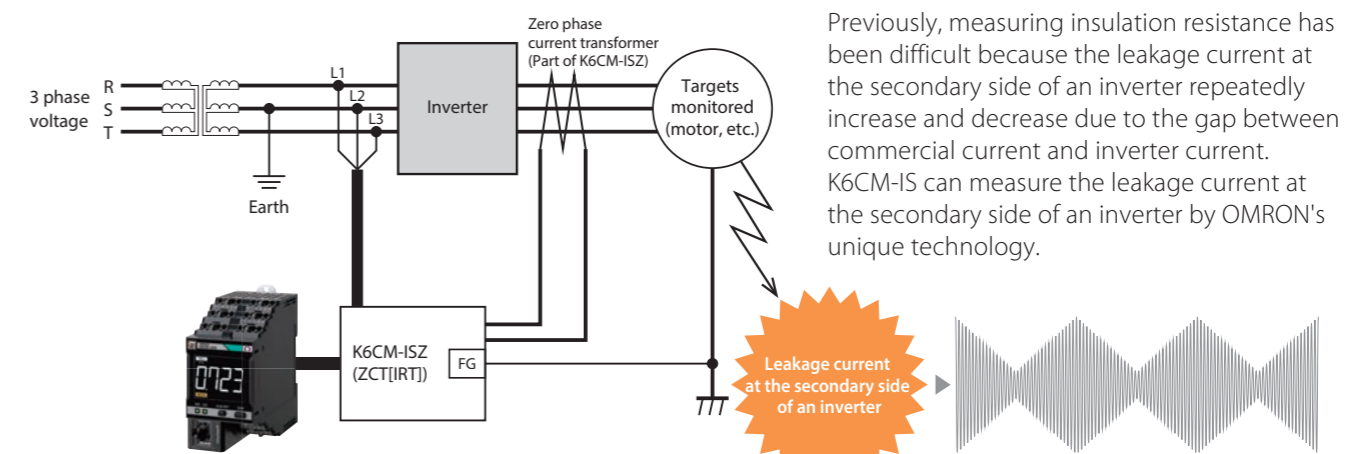
With conventional products, measurement with a Megger Tester was necessary to check for insulation degradation. K6CM-IS can be used to perform this inspection during operation, making it possible to constantly monitor degradation trends while reducing the burden on the maintenance personnel.



This eliminates the need for complicated insulation resistance measurements.

special ZCT (IRT) K6CM-ISZBI

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



Previously, measuring insulation resistance has been difficult because the leakage current at the secondary side of an inverter repeatedly increase and decrease due to the gap between commercial current and inverter current. K6CM-IS can measure the leakage current at the secondary side of an inverter by OMRON's unique technology.

\*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.

The image of the leakage current waveform at the secondary side of an inverter.

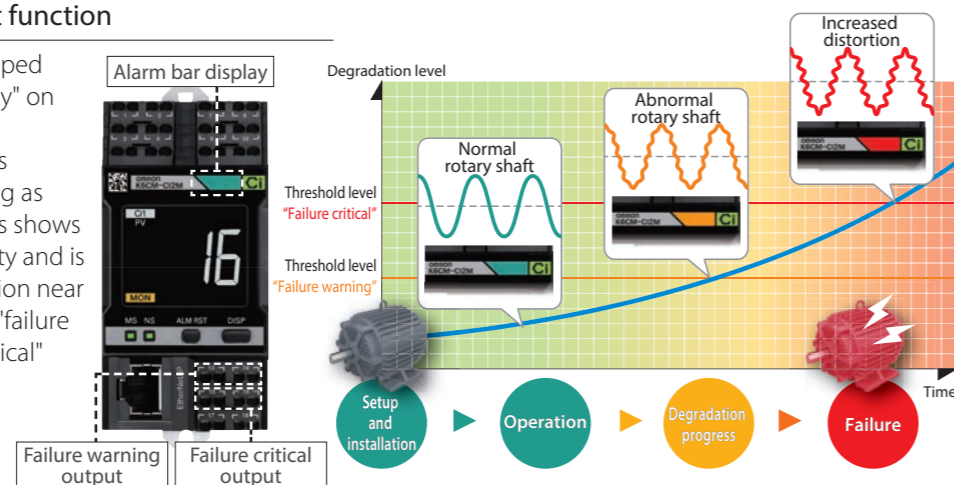
The current value increase and decrease repeatedly.

# Features Three functions for monitoring motor condition

## 1 Visual inspection through alarm bar display and two-step output

### Alarm bar and output function

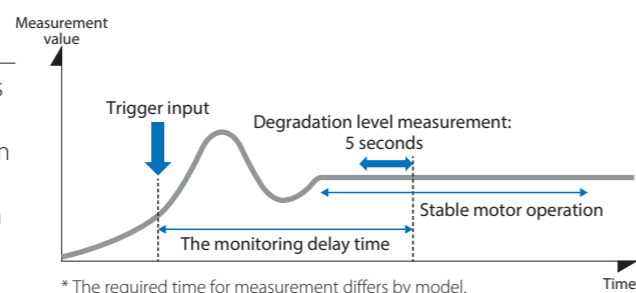
The K6CM series is equipped with an "alarm bar display" on the front of the product. The condition of motor is displayed by color-coding as green, yellow, or red. This shows the degree of abnormality and is helpful for visual inspection near the motor. Accordingly "failure warning" and "failure critical" 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.)

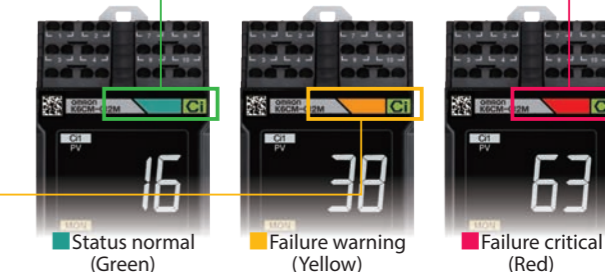


### Motor condition list display

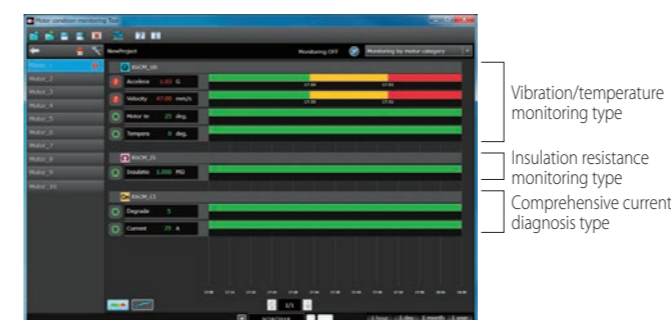


The conditions of up to 10 motors are displayed as a list through the K6CM series connected to the network. The data of up to 30 K6CM units can be viewed. (Three types of K6CM can be installed to one motor)

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.



Enter the shaft diameter, rotation speed and capacity, and you can automatically set the K6CM-VB threshold.

### 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.

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- Before you place an order, please read and understand "Terms and Conditions Agreement" on K6CM Datasheet (Cat. No. N218).

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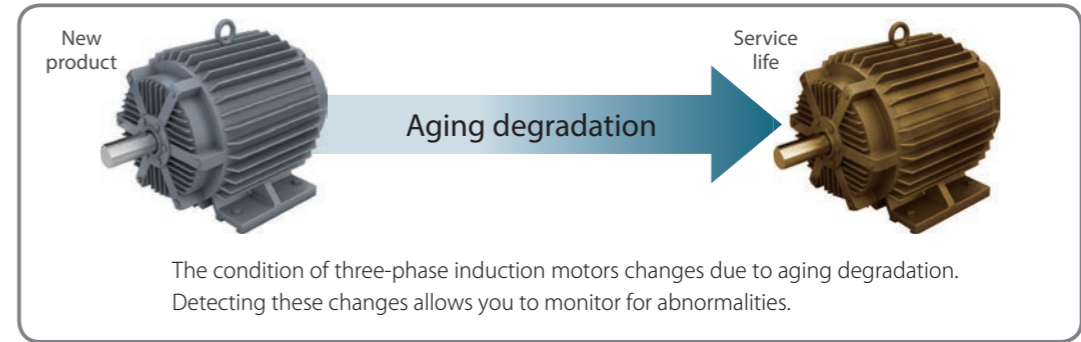
**Cat. No. N220-E1-07**




0320(1117)



# Degradation progress/failure mode correspondence table

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.



Failure mode	Motor and load condition			
	Setup period	Operation period	Degradation progress period	Breakdown period
<b>Inside the motor</b> Insulation degradation  Bearing abnormality  Abnormality of rotary shaft · Rotor/stator abnormality  Abnormality of rotary shaft · Imbalance · Misalignment  <b>Outside the motor</b> Load abnormality · Cavitation · Device abnormality · Overload		Early operation  Grease degradation  Faulty installation Faulty centering etc.  Early operation  Faulty mounting Faulty operating condition Faulty load part  Early operation	Insulation degradation  K6CM-IS (Insulation resistance monitoring type) [Insulation degradation]  Bearing damage  K6CM-VB (Vibration & temperature monitoring type) [Acceleration]  Degradation progress of motor  Degradation progress of load	Insulation breakdown  Bearing breakdown  K6CM-CI (Comprehensive current diagnosis type) [Degradation level]  K6CM-VB (Vibration & temperature monitoring type) [Temperature]  K6CM-CI (Comprehensive current diagnosis type) [Overcurrent]

The measurement value in each model is a typical example.