TECH ICAD Rotating machinery protection and monitoring system

TNC2010

Vibration, displacement and temperature monitor MCM2

10-channel, input for phase marker, LAN, RS485

Application

The MCM2 monitor is a 10-channel device dedicated to monitoring the dynamics of rotating machinery, i.e. compressors, fans, blowers, pumps, electric motors. It is designed to cooperate with :

- piezoelectric vibration sensors with 2-wire IEPE supply system
- proximity non-contacting sensors of MDS type and contacting sensors of LDS type with 3-wire interface and negative supply voltage (-24VDC power supply, common zero, -2 to -20V output signal),
- PT100 and Ni100 temperature sensors

In the field of monitoring of rotating machinery it can be applied to measure:

- bearing housing absolute vibration,
- shaft relative vibration in sleeve bearings,
- shaft axial position in thrust bearing,
- rotor thermal expansion,
- case thermal expansion,
- bearings temperature,
- rotating speed

Besides the measurement of different estimates of measured quantities, the monitor is a source of digital data representing sampled analog signal associated with time stamp.

These data transmitted to diagnostic station via LAN, can be used for visualization, archiving and analysis of the dynamic state of the machine. Among others to determine shaft trajectory in sleeve bearings, to determine spectrum and envelope spectrum of the vibration signals. Our company provides appropriate software.

The device is highly recommended for use in industrial facilities with distributed rotating machinery infrastructure with LAN on site. Digital link allows significant savings on cable routes installation compared to analogue signal outputs.

The device features 2 binary inputs and 10 binary outputs providing machine protection.

Description

Multi-channel MCM2 monitor is based on 32-bit digital processor. All measured values are calculated and transmitted as a response to the master system queries (the monitor is a slave system). Data is being transmitted via LAN and/or RS-485 with MODBUS RTU protocol commonly used in PLC, SCADA and DCS systems.



The monitor has 10 measurement channels plus additional phase marker sensor input essential for the time synchronization of analog-to-digital conversion and measurement of rotation.

A complete input interface is composed of five 2channels modules, each can be freely selected from following three:

- interface for proximity sensors
- interface for accelerometers (IEPE standard) 3 executions
- interface for temperature sensors of Pt100 and Ni100 type

The configuration of measuring channel types is based on choosing a type and a quantity of 2-channel input interface modules. This is a part of ordering method of MCM2, which is presented later in this data sheet.

The device is compatible with standard sensors used in vibration, displacement and temperature measurements with the following parameters:

- accelerometer (IEPE standard) with sensitivity: 10; 100; 500; 1000 mV/g
- vibration velocity sensors (IEPE standard), sensitivity: 4; 20 mV/mm/s
- eddy–current sensors (non–contacting or contacting), sensitivity: -0,066 to –8 V/mm
- Pt100 and Ni100 temperature sensors

The following signal parameters can be measured at each of ten channels:

- RMS value,
- mean value (in case of proximity sensor corresponds the value of the gap before probe tip)
- peak-to-peak value (p-p).

Two threshold values can be set for each channel: warning and alarm, for any of measured signal parameter. The data on exceeded values are included in the digital output signal.

Machine protection is carried out via 10 open collector type switching outputs with optical isolation, each one can be assigned to any individual channel or a group of channels. Threshold values are set in accordance with relevant standards or manufacturer's instructions.

1

Przedsiębiorstwo Wdrażania Diagnostyki Technicznej TECHNICAD Spółka z o.o. 44 -100 Gliwice, ul Kozielska 18, Poland tel/fax: (00 48) 32 279 07 56, 279 07 57, e-mail: info@technicad.pl, www.technicad.pl

TECHNICAD Rotating machinery protection and monitoring system

TNC2010

The monitor is made in a housing designed for mounting on a TS35 (DIN) rail. The front side features a LCD touch panel showing the measured values in digital form, the information of the exceeded values for warnings and alarms, the time signal and spectrum for chosen channel as well as information about the state of LAN connections. On the face panel 10 BNC sockets are located providing a buffered sensor signal from each individual channel.

In the upper and lower part of the housing there are two-part connectors (socket with a plug with spring terminals) for connecting sensor signals, binary inputs, 24VDC power supply, OC outputs, RS485 output and RJ45 socket for LAN network.The monitor is programmable (configurable) via RS485 or LAN.



Specification

METROLOGICAL

INPUTS

Signal inputs (10) depending on the applied sensor interface:

• Piezoelectric vibration sensor (IEPE standard):

Sensitivity:10; 100; 500; 1000 mV/g or 4; 20mV/mm/s

 Eddy current non - contacting or contacting sensor / transducer

Sensitivity: -0,066 to -8,00 V/mm Input voltage range: -2 do -20V Power supply: -24VDC

 Temperature sensor: PT100, Ni100 with 2 or 3 wires

Phase marker sensor input (1): 3-wires eddy current sensor interface

Sensor signal: -2 do –20V, Sensor supply voltage: –24VDC Binary inputs (2): voltage-free relay contacts

OUTPUTS

Digital outputs: RS485 with MODBUS RTU (transmission rate 2400 to 256000 bauds) Ethernet MODBUS TCP

Binary outputs (10, with optical isolation):

OC type, activated from threshold values of measured quantities, rotating speed, any measuring circuit fault and from any combination thereof.

Alarm thresholds are programmable. Switching (binary) output activation delay adjustable between 100ms and 10 min.

Analog outputs:

BNC connectors at the front panel: buffered sensor signal from each individual channel - original sensor sensitivity in case of piezoelectric vibration sensors and sensitivity reduced by half for eddy-current sensors in the range -1V to -10V.

The outputs provide compatibility with mobile equipment for signal recording and analysis.

In case of temperature measurement BNC connectors are not used.

Output of power supply for eddy current transducer: -24VDC

LCD with touch panel (70x54mm):

-device configuration data

-measured values, exceeded thresholds, channel fault

-time signal and spectra view of the signal in chosen channel (max resolution 4096 of spectra lines and 8192 of time samples)

Measured parameters and values:

Absolute vibration: RMS, Peak-to-Peak of vibration acceleration, vibration velocity or vibration displacement.

Vibration displacement measurement can be carried out only by using vibration velocity sensor.

Relative vibration: Peak-to-Peak

Displacement based on proximity sensor:

proportional value - a gap

Displacement based on eddy current contacting sensor: proportional value

Bearing temperature: proportional value

TECHNICAD Rotating machinery protection and monitoring system

TNC2010

Frequency response:

Absolute vibration: Lower cut-off frequency adjustable from: 2Hz, 5Hz, 10Hz, 100Hz, 1kHz, 2kHz, 5kHz, 10kHz Upper cut-off frequency adjustable from 200Hz to 20kHz Relative vibration 0Hz to 5kHz Displacement based on non-contacting sensor 0Hz to 5kHz Linearity error: Vibration, displacement: ±1% of measuring range Temperature: ±0,1% of measuring range Programmable parameters: -digital link and transmission parameters -type of sensor for the channel -sensitivity of sensor for the channel

-measured quantity

-thresholds values of measured quantities (two per channel)

-logic sum of any treshold values exceedings to activate definite OC output

-OC switching output activation delay between 0,01s and 10min

-lower and upper cut-off frequency for absolute vibrations

ELECTRICAL

Supply voltage: 18-24-36VDC Current consumption (at 24VDC): <400mA Power consumption: <10W Galvanically isolated inputs, outputs and supply voltage: 1,5kV

ENVIRONMENTAL Ambient temperature: -20°C do +70°C Relative humidity: 90% non condensing

MECHANICAL

Mounting: TS35(DIN) Rail Dimensions (H x W x D): 105x210x84mm Cross section of connecting cables: 0,50 to 1,50mm² Weight: 950g Enclosure material : aluminum, polycarbonate side walls Protection rating: IP40

Ordering information

A A A A A A A MCM2-01-00-23-00-45-00-67-00-89-00

A DD Code of interface for one channel pair

- 0 1 IEPE accelerometer; sensitivity 10mV/g
- 0 2 IEPE accelerometer; sensitivity 100mV/g
- 0 3 IEPE accelerometer; sensitivity 500mV/g
- 0.4 IEPE accelerometer; sensitivity 1000mV/g
- 0.5 IEPE accelerometer, sensitivity according to the order
- 0 6 IEPE vibration velocity sensor; sensitivity 4mV/mm/s
- 0 7 IEPE vibration velocity sensor; sensitivity 20mV/mm/s
- 0.8 Eddy current sensor/transducer supplied –24VDC, signal: –2 to –20V
- 0 9 PT100 or Ni100 temperature sensor

Explanations:

- 01 code of channel pair 0 and 1
- 23 code of channel pair 2 and 3
- **45** code of channel pair 4 and 5
- 67 code of channel pair 6 and 7
- **89** code of channel pair 8 and 9

"A" code behind the code of a channel pair refers to that channel pair.

Examples of codes for ordering the MCM2:

1. MCM2-01-02-23-02-45-02-67-02-89-02

The code above means, that:

all ten channels have input interface prepared to cooperate with the IEPE accelerometer with sensitivity 100mV/g

2. MCM2-01-08-23-08-45-08-67-06-89-06

The code above means, that:

- channels from 0 to 5 operate with the interface of eddy current sensor, which can be used e.g. for measurement of shaft axial displacement at thrust bearing and measurement of relative vibrations on two bearings in X and Y axes

- channels from 6 to 9 operate with vibration velocity sensor interface and can be applied to bearing absolute vibration measurement

3