

# MONITORING AND PROTECTING SYSTEM M225

## FUNCTION

The M225 Monitoring System is designed for the monitoring and protection of devices in which exceeding limits even for a short-time may lead to a failure or damage of the device. The system monitors and evaluates the most important parameters of the mechanical system - temperature and vibrations.

The system modularity enables its wide use in industry - from the measurement of temperatures and vibrations of gearboxes to the measurement of temperatures and vibrations of rotating electric machines synchronous or induction motors. Owing to its versatility it can be also applied in the monitoring and evaluation of parameters of mains-operated linear, torque or low-speed motors, soft starters or frequency converters.

Its practical applications include, for example, the protection of low-speed synchronous/induction motors for the direct (gearless) drive of cooling tower fans in power plants.

## CHARACTERISTIC FEATURES

- ★ System working in real time
- ★ Multi-channel, independently working unit
- ★ Signal transmission using current loops
- ★ High resistance against climatic effects of the environment
- ★ System modularity
- ★ High measurement and evaluation accuracy
- ★ Wide range of working temperatures
- ★ Vibration measurement from 3 Hz
- ★ Wide range of measured temperatures
- ★ Long-term stability of electrical parameters
- ★ Increased resistance to EMC
- ★ The distance of the monitored object from the evaluation unit up to 1000 m
- ★ Suitable for motors designed for frequency converter operation

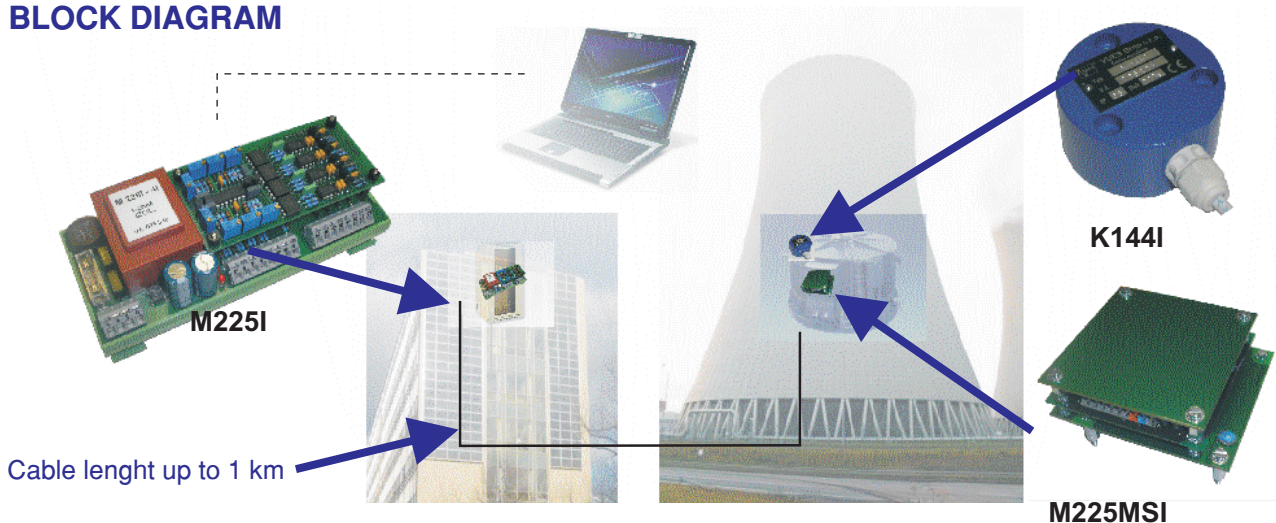


## SYSTEM DESCRIPTION

Basic components:

- ★ M225MS motor section
- ★ M225I interface
- ★ K144 vibration sensor
- ★ M225SS switchboard section

## BLOCK DIAGRAM



## MOTOR SECTION M225MS

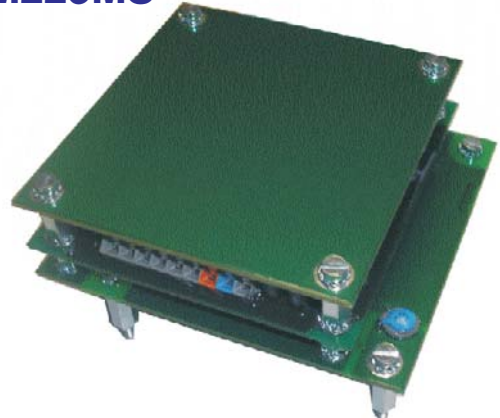
### FUNCTION

The motor section M225MS is designed as a compact electronic module, surface protected by a sealing compound. The unit processes signals from sensors and converts them to a unified output signal ( $\pm 10\text{mA}$ ,  $4 \div 20\text{mA}$ ).

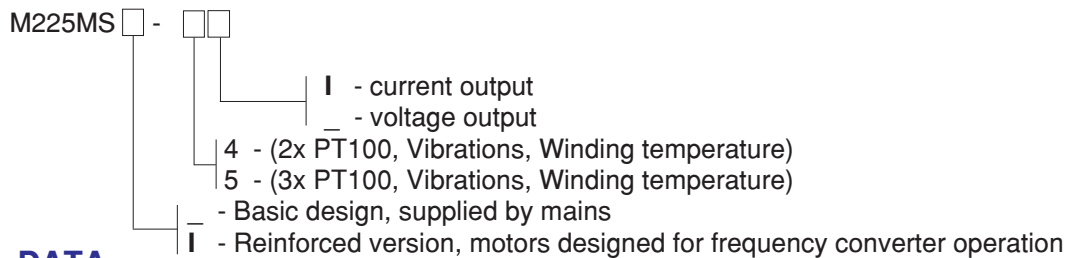
PT100 sensors are used for mechanical components temperature sensing (e.g. bearings or gearbox). The system processes one channel from the vibration sensor. After frequency treatment, the signal is converted to the effective value of vibrations.

For electric machines it is often important to monitor the temperature of winding, be it for the overload protection of the machine, a failure of the supply phase, load regularity or maintaining reliability. For this purpose, the section is equipped with circuits for the two-state processing of signal from posistors or for the accurate measurement of winding temperature with the PT100 sensor.

At the customer's request, it is possible to use also temperature sensors with other resistance values, e.g. Pt500, Pt1000, or a different sensor type (Ni 100, 500, 1000).



### TYPES



### TECHNICAL DATA

#### MONITORED CHANNELS basic type

	Temperature 1	Temperature 2	Temperature 3 - (only for M225MSI-5)
Type:	non-linearized Pt100	non-linearized Pt100	non-linearized Pt100
Range	-35 °C ÷ + 100 °C (238,16 ÷ 373,16 K)	-35 °C ÷ + 100 °C (238,16 ÷ 373,16 K)	-35 °C ÷ + 170 °C (238,16 ÷ 443,16 K)
Accuracy	±1,5%	±1,5%	±1,5%

#### Winding temperature

Posistors, 3 in series, temperature non-linear

Cold resistance 200 ÷ 900 Ω

Accuracy ±0,2 mA

	M225MSI-4,-5	M225MSI-4I,-5I
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$I_{IV}$ for 1000 Ω	4,7 mA	11,52 mA
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$I_{IV}$ for 1100 Ω	5,1 mA	12,16 mA
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$I_{IV}$ for 2400 Ω	9,6 mA	19,36 mA
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#### Vibrations

Vibration sensor K144I, setting for PMH motors

Transmission M225MSI-4I,5I  $I_v = 4 + v \cdot 0,16$  [mA; mm/s]

Accuracy ± 1,8 %

Range width 3 ÷ 1000 Hz

#### SUPPLY

	M225MSI-4,5	M225MSI-4I,5I
Supply voltage	±15V (± 5%)	24V (-15% + 10%)
Supply current	100 mA	20 mA
Max. voltage ripple	1%	5%
Withstand voltage	500 V <sub>AC</sub> , 1 min supply / input, supply / output; 100V <sub>AC</sub> , 1 min input/output	
Insulation resistance	min. 50 MΩ for 500V, supply / input, output	

#### OPERATING CONDITIONS

Vibration resistance	1 to 23 Hz, deviation 2.5 mm, 23 ÷ 100 Hz, acceleration 5g
Working temperature	- 40 °C ÷ +70 °C
Sealing protection	Sylgard 567
Altitude	up to 2500 m above s.l.
Humidity	95% non-condensing

#### MECHANICAL PARAMETERS

Dimensions	105 x 115 x 40 mm
Weight	approx 260 g
Degree of protection	IP00
Mounting	4 studs M4x20

## INTERFACE M225I

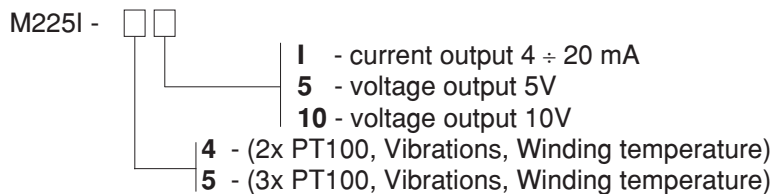
### FUNCTION

The interface M225I is a four-channel or five-channel electronic unit allowing the processing of long-distance transmission signals and their connection with a superior control system. This can be, for example, PLC or the control PC. The unit also supplies the distant motor measuring section of the M225 monitoring system and also its signal galvanic separation. This is important especially for excessive measuring systems, particularly if drive units are designed for frequency converter operation.

Depending on the unit type, up to 3 temperature resistance sensors, one posistor channel and one vibration sensor channel can be monitored.



### TYPES



### TECHNICAL DATA

#### SIGNAL PROCESSING: (Same for all channels), Accuracy ±1 %

Transition relation voltage output 5 V	$U_{vyst} = I_{vst} / 2$ [V; mA]
Transition relation voltage output 10 V	$U_{vyst} = I_{vst}$ [V; mA]
Transition relation current output	$I_{vyst} = 4 + 1,6 I_{vst}$ [mA; mA]
Withstand voltage	500 V <sub>AC</sub> , 1min. input / output; 100 V <sub>AC</sub> , 1min. input / output
Insulation resistance	min. 100 MΩ pro 1000 V, input / output; min. 50 MΩ pro 500 V, input / output
Capacity input / output	10 pF / channel

#### In coordination with M225MSI, the unit enables transmission of the following quantities:

TEMPERATURE	Bearings	Winding
Temperature (PT100)	-35 °C ÷ + 100 °C (238,16 ÷ 373,16 K)	-35 °C ÷ + 170 °C (238,16 ÷ 443,16 K)
Transmission (current 4-20)	$I_t = 4 + (t - 238,16) * 0,11852$ [mA; K]	$I_t = 4 + (t - 238,16) * 0,07805$ [mA; K]
Accuracy	± 1,5 %	± 1,5 %

#### WINDING TEMPERATURE (posistors)

	(voltage 5 V)	(voltage 10 V)	(current 4-20)
Output voltage for 1000 Ω	2,35 V	4,70 V	11,52 mA
Output voltage for 1100 Ω	2,55 V	5,10 V	12,16 mA
Output voltage for 2400 Ω	4,80 V	9,60 V	19,36 mA
Accuracy	± 0,1 V	± 0,2 V	± 0,3 mA

VIBRATION	
Measurement range	20, 50, 100 mm/s
Accuracy	± 2 %

#### SUPPLY

Mains voltage	230 V <sub>AC</sub> (±10%), internally protected by fuse
Mains frequency	50/60 Hz,
Input power	<10 VA
Withstand voltage	2500 V <sub>AC</sub> 1 min. supply / input, output

#### INPUT

Voltage input	max ± 10V
Current input	max ± 20mA

#### OUTPUT load

Voltage output	max 10mA;
Load impedance	min 2kΩ, max 100pF
Current output	15 ÷ 24V (min 12V, max 28V)
Load impedance	12V 0 ÷ 100Ω
	15V 0 ÷ 300Ω
	24V 100 ÷ 600Ω

#### MECHANICAL PARAMETERS

Dimensions	180 x 75 x 70 mm (W x H x D)
Degree of protection	IP00
Type	DIN 35 rail mounting
Weight	approx. 550 g

#### OPERATING CONDITIONS

Altitude	up to 2500 m above s.l.
Ambient temperature	0°C ÷ +40°C
Humidity	90% non-condensing

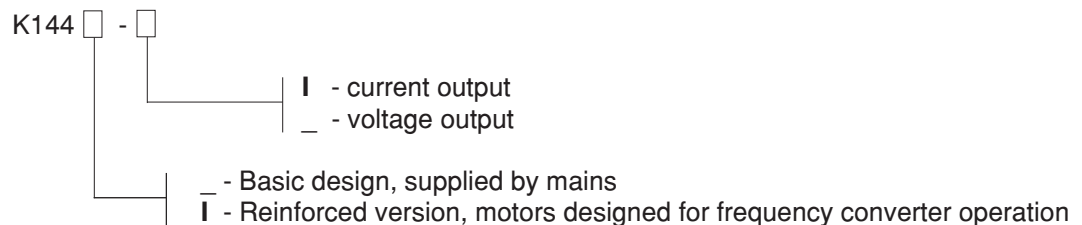
## VIBRATION SENSORS K144I

### FUNCTION

The K144 vibration sensor is a sensor designed for the measuring of acceleration and vibrations of low-speed synchronous and asynchronous motors designed for frequency converter operation. Owing to its high sensitivity and bandwidth it can be used also for the measuring of vibrations of gearboxes, pumps, fans, shaft bearing hubs, clamping plates of machines, lift cabins, etc. The frequency characteristic from 0 Hz enables a direct measurement of tilt.



### TYPES



### TECHNICAL DATA

#### POWER SUPPLY

Supply K144(I)	5V ± 5% (M225MS(I)...) approx. 10mA
Supply current	approx. 10mA
Max. supply voltage ripple	1%
Supply K144I-I	15 ÷ 24V (min 12V, max 28V)
Withstand voltage	1000 V <sub>AC</sub> , 1 min. shielding sensor housing
Insulation resistance:	min. 50 MΩ for 1000 V, shielding - sensor housing

#### OUTPUT

Voltage output	2,5V ± 2V, max 10mA
Load impedance	min 2kΩ, max 100pF
Current output	4 ÷ 20 mA (12mA ± 8mA)
Load impedance	12V 0 ÷ 100Ω 15V 0 ÷ 300Ω 24V 100 ÷ 600Ω
Working range K144(I)	± 1.5g at sensor axis perpendicular to g-vector direction
Sensitivity K144(I)	1V/g ± 2% statically (0 ÷ 1000 Hz)
Working range K144I-I	± 2.5g at sensor axis perpendicular to g-vector direction
Sensitivity K144I-I	3.2mA/g ± 2% statically (0 ÷ 1000 Hz)

#### OPERATING CONDITIONS

Altitude	up to 2500 m above s.l.
Ambient temperature	-25 °C ÷ +60 °C, at request -40 °C ÷ +80 °C
Humidity	90% non-condensing

#### MECHANICAL PARAMETERS

Dimensions	diameter 60 mm, height 32
Degree of protection	IP00
Mounting	3 x screw M5
Weight	approx. 580 g