Brüel & Kjær Vibro

Product Specifications

VC-6000 Monitoring System
Monitoring Module – SM-610-A03
User-Defined: 8x Vibration (Up to 2x Axial Position, 1x Relative Expansion, 8x single/dual-point, 4x User-defined Bandpass, 4x Vector), 2x Speed, 2x Process Channels, 8x DC Outputs, 2x Relays

The VC-6000 Monitoring System hardware is used for both stand-alone safety monitoring and condition monitoring using the Compass 6000 monitoring software modules and database. The VC-6000 offers various standard monitoring modules, power supply modules and communication modules. This Product Specification describes the SM-610-A03.

Applications

The SM-610 series of VC-6000 Monitoring Modules are designed to provide protective monitoring of various types of industrial machines. The SM-610-A03 is specifically designed as a “user-defined” monitoring module, where there are a number of selectable differential inputs and outputs. This is useful for monitoring machines with special applications.

General Description

The features and functions common to all SM-610 Monitoring Modules are briefly listed below. Please refer to the VC-6000 Product Specifications (BPS 0044) for more information.

- Interfacing with the CI-6xx Communication Modules
- High speed digital signal processor
- Relay outputs (logic controlled)
- OK-relay status indication
- Extensive local LED indication
- Flash memory for storing settings and local logbook
- High speed reaction time - 10ms
- Alarm limits with programmable hysteresis and response delay time
- Global trip multiply and override
- Extensive self-monitoring functions
- System bus interface to other modules
- Buffered vibration outputs

Inputs

- 8x vibration signals – up to: 2x axial, 8x single-point ISO filter measurements, 4x dual-point measurement pairs, 1x relative expansion, 4x user-defined bandpass, 4x vector
- 2x speed/phase reference signals
- 2x process signals
- 1x binary (for trip multiply)

Outputs

- 8x analogue DC outputs – selectable for any AC/DC measurement
- 2x relays (any combination of Alert and Danger). Selectable for any AC/DC measurement alarm limits. Relay logic operators AND, OR, NOT, and ( ) can be used in a user-defined voting logic with any combination of measurement alarm limits

Measurements

The measurements available depend on the inputs selected. This can include up to:

- Bandpass – up to: 8x ISO, 4x user-defined
- 4x vector (1n, 2n magnitude and phase)
- 4x residual value (all vibration components except harmonics)
- 4x overall RMS
- 5x DC – 2x axial, 1x relative expansion, 2x process
- 2x RPM

Input Channel Configuration Combinations

	Monitoring Module – SM-610-A03 User-Defined: 8x Vibration (Up to 2x Axial Position, 1x Relative Expansion, 8x single/dual-point, 4x User-defined Bandpass, 4x Vector), 2x Speed, 2x Process Channels, 8x DC Outputs, 2x Relays													
No. of Inputs[1]	**Channel Types**										**Additional Measurements**			**Relay's**
	Dual- point Vibr.[2] (ISO)	**Single-point Vibr**[2] (ISO)	**Axial Pos. DC-out**	**Speed**	Rod Drop	**Rel. Exp.**	Eccentricity	**DC Input** (Process, Absolute Exp)	**DC-out (selector)**	**Bin. in**	**Vector**[3]	**BP**	Tracking BP	
8	8		-	2		-		2	8	1	-	-		2x free configurable using available limits
8	6		2	2		-		2	8	1	4	-		
8	6		-	2		2		2	8	1	4	-		
8	4		2	2		2		2	8	1	4	-		
8	4		2	2		-		2	8	1	4	2		
8	4		-	2		2		2	8	1	4	2		
4	-		-	2		-		2	8	1	4	4		
	[1] The number of input signals is the sum total of the channels shown in yellow. [2] A dual-point ISO measurements can alternatively be set up as two single-point ISO measurements, and vice versa. Any combination is possible as long as the total number of channels does not exceed the value given in the Table. [3] Only 1n magnitude is monitored to alarm limits, the other vector values (1n phase, 2n magnitude and phase, residual values, and overall RMS) are for condition monitoring purposes.													

[1] The number of input signals is the sum total of the channels shown in yellow.

[2] A dual-point ISO measurements can alternatively be set up as two single-point ISO measurements, and vice versa. Any combination is possible as long as the total number of channels does not exceed the value given in the Table.

[3] Only 1n magnitude is monitored to alarm limits, the other vector values (1n phase, 2n magnitude and phase, residual values, and overall RMS) are for condition monitoring purposes.

Signal Flow Diagrams

Fixed Inputs

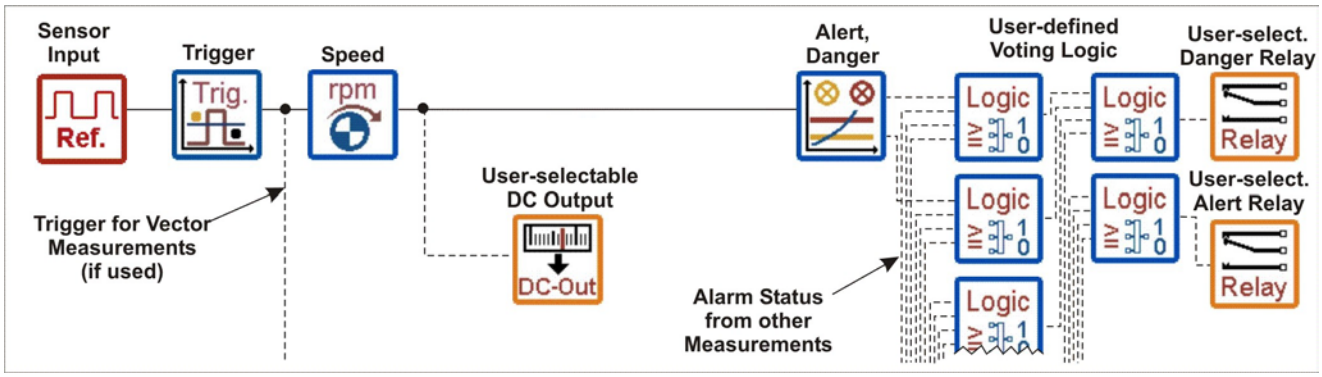

Figure 1. Phase/speed reference sensor input (2 channels).

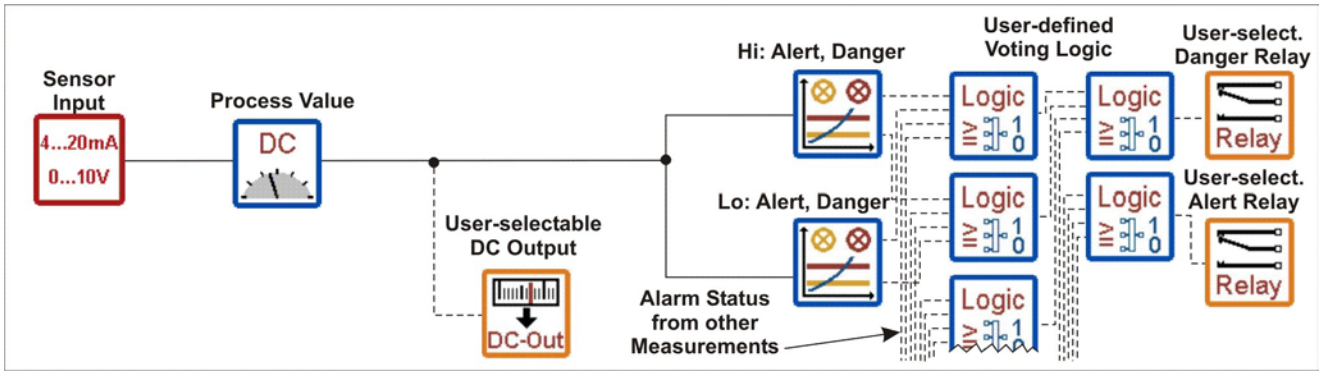

Figure 2. Process sensor input (2 channels).

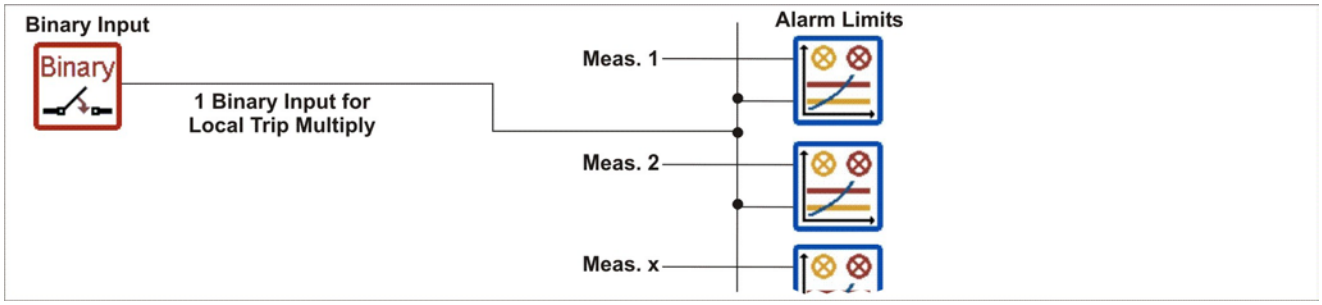

Figure 3. Binary input for local trip multiply of AC/DC vibration measurements (1 channel).

User Definable Position Measurement Inputs (No Trip Multiply)

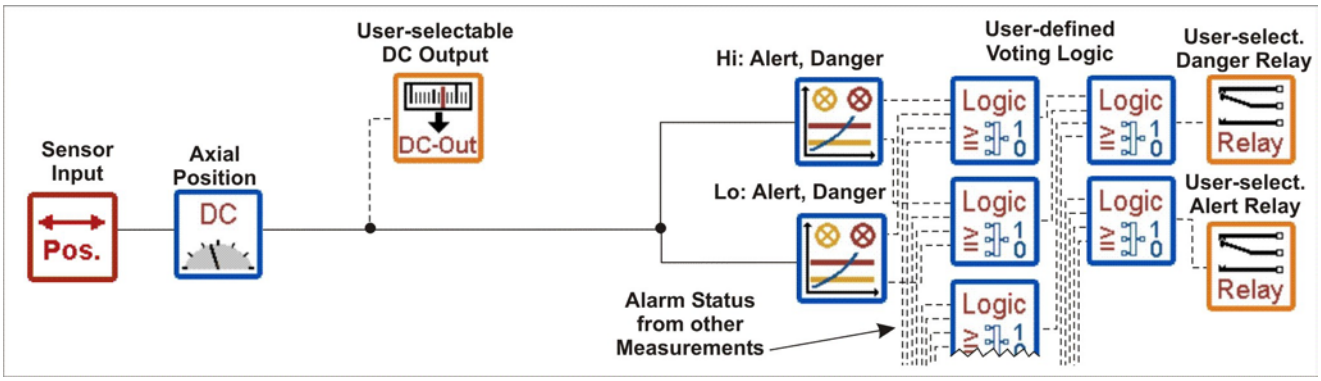

Figure 4. Axial position input (up to 2 channels).

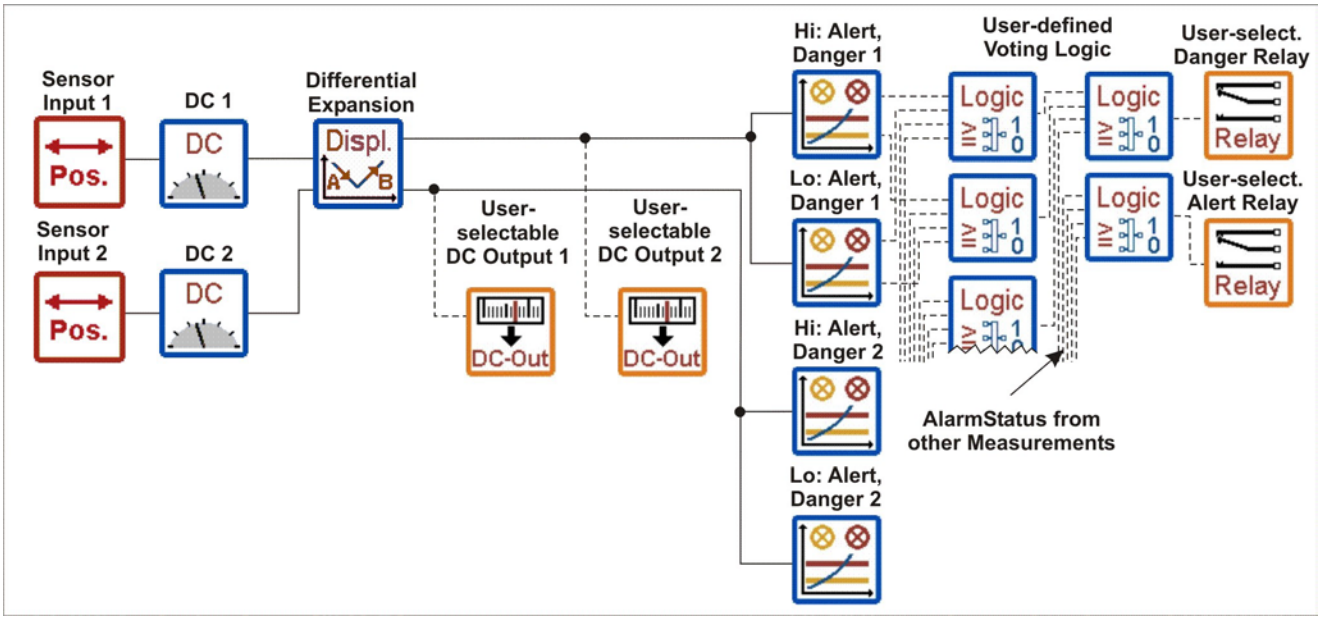

Figure 5. Relative expansion input (up to 2 channels, 1-pair).

User Definable Vibration Inputs (With Trip Multiply)

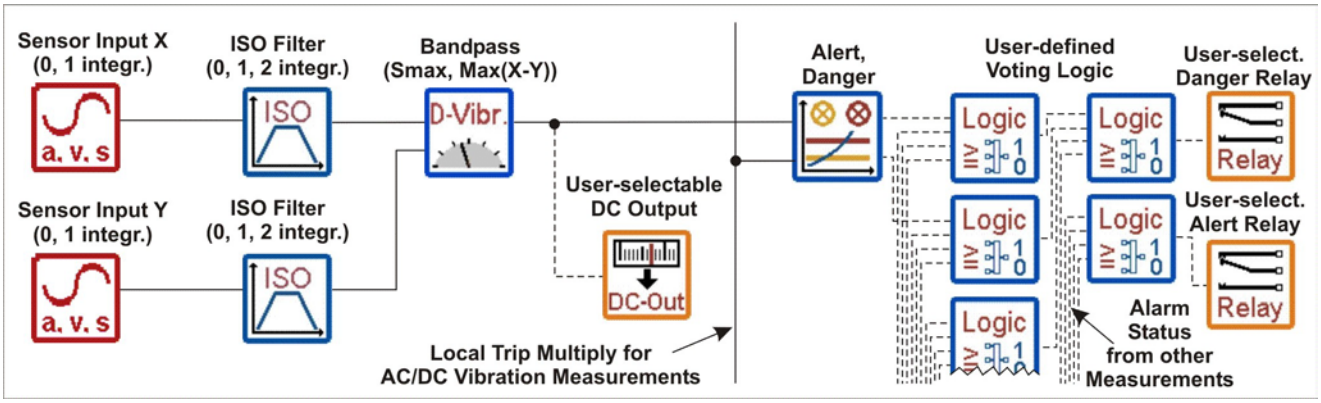

Figure 6. Dual-point ISO measurement input (up to 8 channels – 4 pairs).

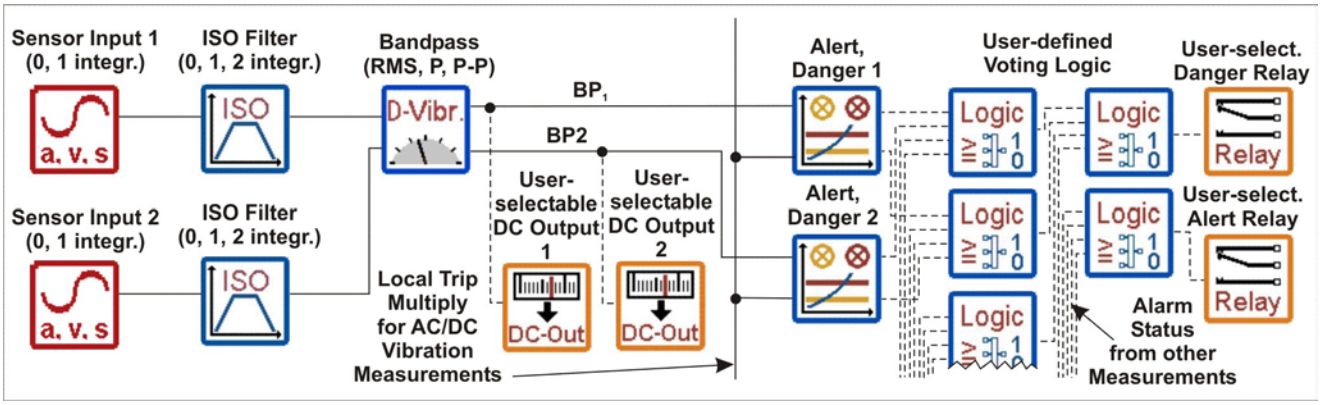

Figure 7. Two single-point ISO vibration measurements can be derived from a dual vibration input (Up to 8 channels).

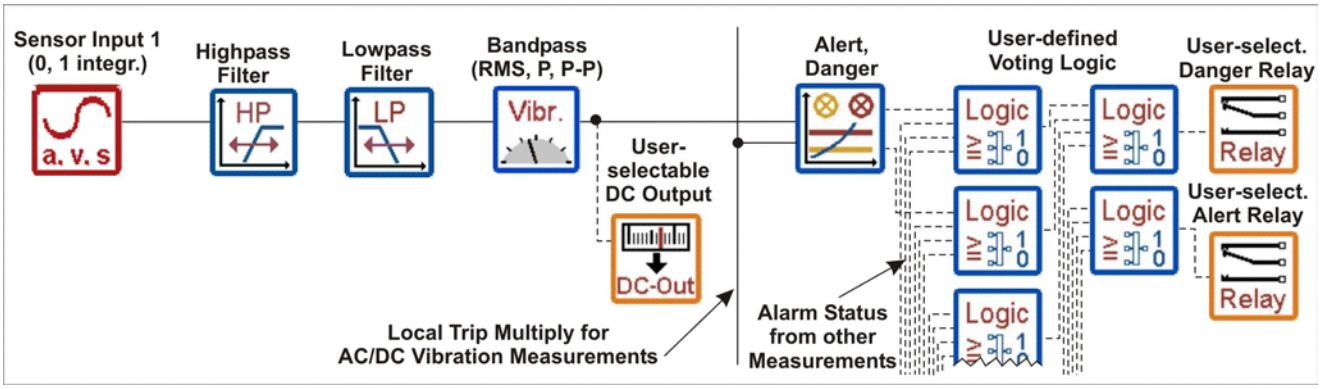

Figure 8. User-defined bandwidth input (up to 4 channels).

Add-on Measurements (With Trip-Multiply)

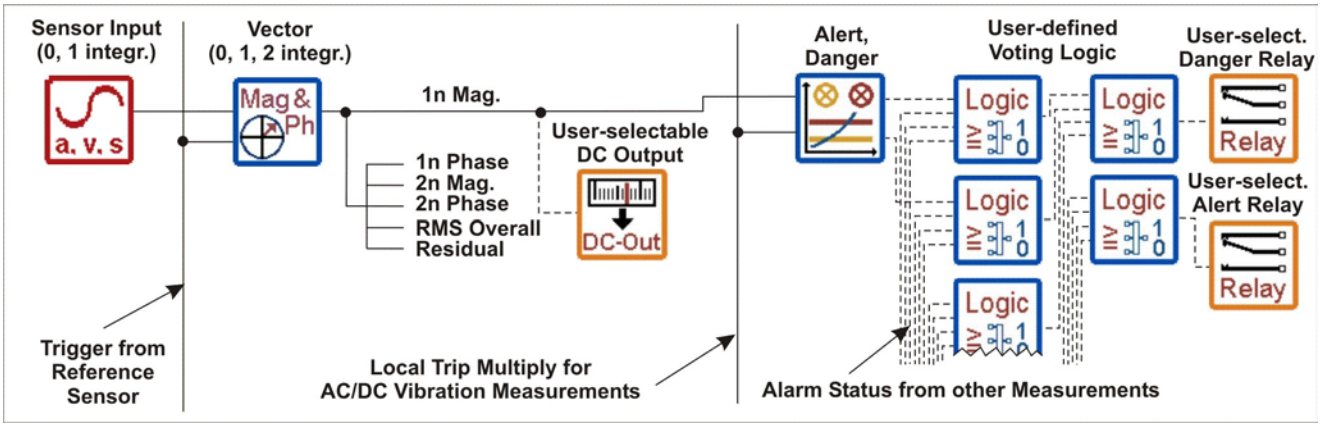

Figure 9. Vector measurement input (up to 4 channels). This measurement is added to an AC/DC vibration input channel, such as a user-defined bandpass, single-point ISO bandpass, dual-point Smax/Max(X-Y). Only 1n magnitude is monitored to alarm limits, the other vector values (1n phase, 2n magnitude and phase, residual values, and overall RMS) are for condition monitoring purposes only.

Technical Specifications

The specifications given below are specific for the SM-610-A03 Monitoring Module. See the VC-6000 Product Specifications for features and functions common to all SM-610 Monitoring modules.

AC/DC Vibration Sensor Inputs

Input voltage range ..... −21.5 to −1V

Input frequency range:
- Accelerometer/velocity sensor ..... 1Hz to 20kHz
- Displacement sensor ..... DC to 20kHz

Input impedance:
- Accelerometer ..... >800kΩ
- Velocity sensor 50kΩ
- Displacement sensor ..... >800kΩ

Gain:
- Accelerometer:
  - No integration ..... 1 to 80 (±0.75%)
  - Analogue integration ..... 1 to 80 (±2.75%)
- Velocity sensor ..... 1 to 80 (±0.75%)
- Displacement sensor ..... 1 (±0.75%)

Sensitivity:
- Accelerometer ..... adjustable (typ. 100 or 10mV/g)
- Velocity sensor ..... adjustable (typ. 100mV/mm/s)
- Displacement sensor ..... adjustable (typ. 8mV/μm)

Common mode rejection:
- DC to 30kHz ..... typically 90dB
- 30kHz to 100kHz ..... typically 85dB

Maximum accelerometer input signal (100mV/g):
- No integration ..... 1.25 to 80g peak
- Analogue integration ..... 12.5 to 150mm/s peak

Sensor power:
- Sensor supply ..... −24VDC ±2%
- Maximum current 30mA

Speed/Phase Reference Sensor Inputs

Input voltage range ..... −21.5 to −1V
Input frequency range ..... DC to 20kHz
Input impedance ..... >800kΩ
Gain ..... 1 (±0.75%)

Common mode rejection:
- DC to 10kHz ..... typically 90dB
- 10kHz to 100kHz ..... typically 85dB

Sensor power:
- Sensor supply ..... −24VDC ±2%
- Maximum current 30mA

Process Inputs

Input current range ..... ±30mA
Input voltage range ..... ±14V
Input frequency range ..... DC to 20kHz
Input impedance (voltage input) 200kΩ
Input current load 100Ω
Sensitivity ..... adjustable
Gain ..... 1 (±1%)
Sensor power ..... external

Binary Inputs

Input impedance 3.3kΩ
Accuracy ..... response time 5ms
Minimum current load 5mA
Maximum contact voltage ..... ±50V

Signal status LOW:
- Nominal input voltage 0V
- Input voltage range ..... −50 to 6.6V
- Maximum input current 2mA

Signal status HIGH:
- Nominal input voltage 24V
- Input voltage range ..... 16.5 to 50V
- Maximum input current 5mA

Buffered Outputs

Minimum output load 100kΩ
Output gain ..... 1 (±2%)
Cross-talk ..... typically −90dB (up to 50kHz)
Inherent noise (1Hz to 50kHz) ..... typically 10mV RMS
Output impedance ..... <100Ω
Frequency range ..... DC to 50kHz (phase shift <5%)
Output offset ..... ≤ ±13mV

Analogue DC Outputs

Current output:
- Current range ..... 0 to 20mA or 4 to 20mA
- Maximum output load 500Ω
- Accuracy ..... <2.4% of measured value
- Offset ..... <20μA

Voltage output:
- Voltage range ..... 0 to 10V or 2 to 10V
- Minimum output load 1kΩ
- Accuracy ..... <1.3% of measured value
- Offset ..... <9.5mV

Relay Outputs

Nominal working voltage.....24V
Maximum current.....100mA

Measurements

Meas. Name	**Frequency Range**	**Measuring Time**	**Detection**	**Alarm Limits**[6]	**Measuring Range**	**Units**[1]	**Accuracy** (25°C, 80Hz, 0-Peak)
Bandpass (ISO 10816)	HP: 1Hz to 10Hz (-1dB) LP: 1kHz (-1dB) 18dB/Octave (ISO 2954)	Adjustable 100ms to 100s in steps of 100ms	RMS, Peak, Peak-peak	1x Alert, 1x Danger	80g	g	±(0.08g + 0.75% of measured value)
					150mm/s (1 integration[3])	mm/s	±(0.6mm/s + 2.75% of measured value)
					100mm/s	mm/s	±(0.1mm/s + 0.75% of measured value)
Bandpass (ISO 7919)	HP: 1Hz to 10Hz (-1dB) LP: 1kHz (-1dB) 18dB/Octave (ISO 2954)	Adjustable 100ms to 100s in steps of 100ms	RMS, Peak, Peak-peak	1x Alert, 1x Danger	2000µm	µm	±(10.0µm + 1.0% of measured value)
S_{max}	HP: 1Hz to 10Hz (-1dB) LP: 1kHz (-1dB) 18dB/Octave (ISO 2954)	Adjustable 100ms to 100s in steps of 100ms	Peak	1x Alert, 1x Danger	2000µm	µm	±(10.0µm + 1.0% of measured value)
X-Y_{max}	HP: 1Hz to 10Hz (-1dB) LP: 1kHz (-1dB) 18dB/Octave (ISO 2954)	Adjustable 100ms to 100s in steps of 100ms	RMS, Peak, Peak-peak	1x Alert, 1x Danger	80g	g	±(0.08g + 0.75% of measured value)
					150mm/s (1 integration[4])	mm/s	±(0.6mm/s + 2.75% of measured value)
					100mm/s	mm/s	±(0.1mm/s + 0.75% of measured value)
					2000µm	µm	±(10.0µm + 1.0% of measured value)
Variable bandpass	HP: 1Hz to 16kHz (-1dB) LP: 1.25Hz to 20kHz (-1dB) 18dB/Octave (ISO 2954)	Adjustable 100ms to 100s in steps of 100ms	RMS, Peak, Peak-peak	1x Alert, 1x Danger	80g	g	±(0.08g + 0.75% of measured value)
					150mm/s (1 integration[4])	mm/s	±(0.6mm/s + 2.75% of measured value)
					100mm/s	mm/s	±(0.1mm/s + 0.75% of measured value)
					2000µm	µm	±(10.0µm + 1.0% of measured value)
DC (static shaft position)	-	Adjustable 10ms to 100s	-	2x Alert, 2x Danger	2mm	µm	±(2.0µm + 1.0% of measured value)
DC (axial)	-	Adjustable 10ms to 100s	-	2x Alert, 2x Danger	2000µm	µm	±(10.0µm + 1.0% of measured value)
DC (relative exp.)	-	Adjustable 10ms to 100s	-	2x Alert, 2x Danger	2000µm	µm	±(10.0µm + 1.0% of measured value)

Meas. Name	Frequency Range	Measuring Time	Detection	Alarm Limits[6]	Measuring Range	Units[1]	**Accuracy** (25°C, 80Hz, 0-Peak)
DC (process)	-	Adjustable 10ms to 100s	-	2x Alert, 2x Danger	±14V	V [2]	±(9.0mV+ 1.0% of measured value)
					±30mA	mA [2]	±(0.2μA+ 1.0% of measured value)
Vector (1n, 2n, and Residual value)	Fundamental: 0.33Hz-1kHz Bandwidth: 22%, 11%, 6%, 3% Upper freq.: 5kHz	Computed from bandwidth	RMS, Peak, Peak-peak	1x Alert, 1x Danger (1n)	1n and 2n (Magnitude and Phase)	g, mm/s, μm [4]	Magnitude: <1% + 0.2% of measured value
							Phase 10Hz to 200Hz: <2°
							Phase 5Hz to 500Hz: <4°
RPM	Signal slope: +/- Trigger level [7] (manual or automatic): -21.5 to -1V; adjustable in steps of 0.1V Hysteresis: 0 to 25; adjustable in steps of 0.1	Adjustable 10ms to 100s	RPM	1x Alert, 1x Danger	0.06 to > 1200000 RPM RPM multiplier and divider adjustable from 1 to 99999	RPM	Speed >10000rpm: ±0.01% of measured value Speed 100 to10000 rpm: ±1 rpm Speed < 100 rpm: ±0.1 rpm (one pulse per revolution)

[1] Metric and imperial units can be used; Metric units are shown only as an example.

[2] User-defined units. Sensor input signal units indicated here

[3] One analogue integration is possible. An additional digital integration can be done but this will result in less accuracy.

[4] One analogue integration is possible.

[5] One analogue integration is possible. An additional digital integration can be done without loss of accuracy.

[6] Relays can be set up as 2 Alerts or 2 Dangers

[7] Please refer to the sensor input for the allowed input signal.

Brüel & Kjær Vibro reserves the right to change specifications without notice

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