



# Product Specifications

## VC-6000 Monitoring System Monitoring Module – SM-610-A06

User-Defined: up to 11x Vibration inputs, up to 2x axial position, up to 2x Speed with 8x DC Outputs and 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-A06.

### 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-A06 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, e.g. Hydro machines.

### General Description

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

- Interfacing with the CI-620 Communication Module
- High speed digital signal processor
- Relay outputs (logic controlled)
- DC outputs
- Module OK-relay status indication
- Extensive local LED indication
- Flash memory for storing settings and local logbook
- High speed reaction time
- 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 input signal outputs



### Inputs

- Up to 11 vibration input channels– freely configurable with measurements
  - Up to 2 axial position
  - 3 binary input channels
  - Up to 2 speed inputs, with on dedicated for 1x Master <sup>1</sup> (central) trigger input signal
- <sup>1</sup> Providing trigger signals to other SM-610xxx modules.

### Measurements

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

- 2x speed/phase reference – rotation direction, zero speed, run up, coast down
- Bandpass – 10x single-point or 5x dual-point pairs with user-defined **ISO** (up to 10x) OR user defined variable (up to 6x) **HP** and **LP filters**

- Limit monitoring with 8 different sets of Alert and Danger limits according to 8 definable machine states

used in a user-defined voting logic with any combination of measurement alarm limits

- 8x DC outputs freely assignable to any AC/DC measurement.

Outputs

- 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

Input Channel Configuration Combinations

No. of meas. Inputs	Measurements					Outputs	
	Variable Bandpass	ISO Filter	Axial Position	Speed/Phase Reference	Binary-Inputs	DC-out	Relays
6	6	-	-	-	3	8	2
7	5	-	1	1	3	8	2
8	5	2	1	-	3	8	2
8	5	1	2	-	3	8	2
8	4	2	1	1	3	8	2
8	4	2	1	1	3	8	2
8	4	-	2	2	3	8	2
9	4	4	1	-	3	8	2
9	4	3	2	-	3	8	2
9	3	5	-	1	3	8	2
9	3	4	-	2	3	8	2
10	3	4	2	1	3	8	2
10	3	7	-	-	3	8	2
10	3	3	2	2	3	8	2
10	2	7	-	1	3	8	2
10	2	6	-	2	3	8	2
11	3	6	2	-	3	8	2
11	2	9	-	-	3	8	2
11	2	6	2	1	3	8	2
11	2	5	2	2	3	8	2
12	2	8	2	-	3	8	2
12	1	11	-	-	3	8	2
12	1	8	1	2	3	8	2
12	1	8	2	1	3	8	2
12	1	7	2	2	3	8	2
12	0	10	1	1	3	8	2
12	0	10	2	-	3	8	2
12	0	10	-	2	3	8	2

Table 1 : Input channel combinations

Signal Flow Diagrams

User Definable Measurement Channel Inputs (maximum subject to overall input allocation, with trip-multiply).

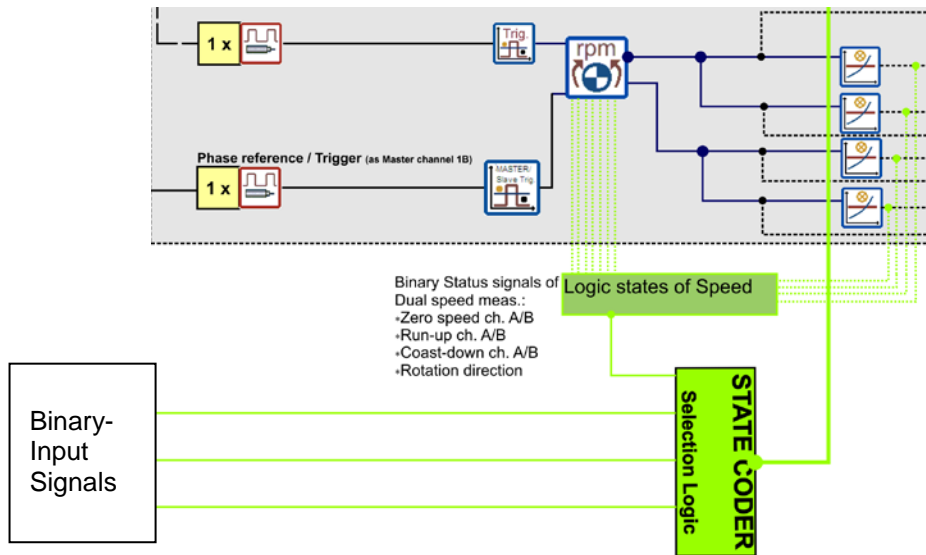


Figure 1. Phase/speed reference sensor input (up to 2 channels). The channel (only channel 1B) can be designated as a master speed/phase reference channel for distribution to other SM-610-xxx modules in up to 4 racks. The three binary input channels together with the digital status signals of the Dual Speed measurement are the input signals for the State Coder, which defines up to 8 different machine states. For each machine state a different limit set of Alert and Danger values can be set up.

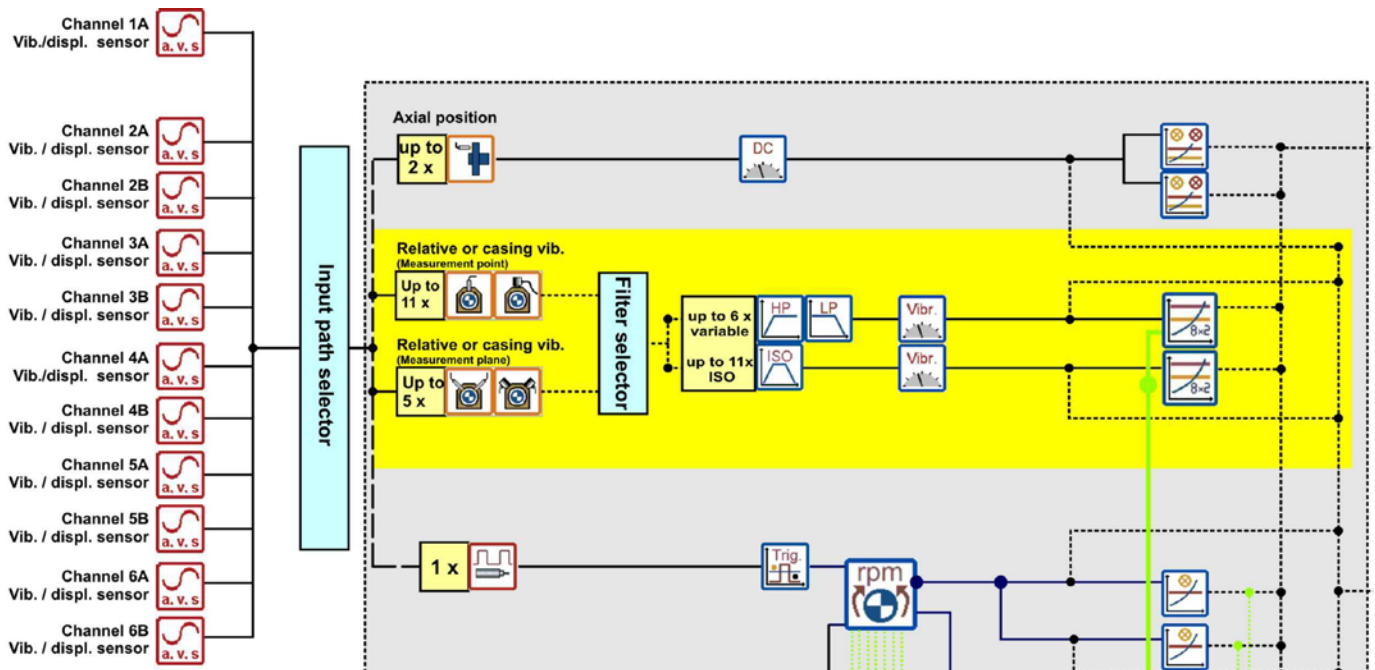


Figure 2. Up to 6 of the 11 vibration input channels can be configured as variable bandpass measurements, up to 10 can be configured as ISO bandpass measurements. The channels can be set up as Dual vibration measurements like Smax, Max X/Y or single vibration measurements, one channel can be configured as axial position. – Please have a look at table 1: Input channel combinations

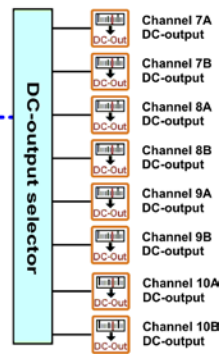


Figure 3. The eight DC-output channels can be freely assigned to any AC/DC measurement within the SM-610-A06 module.

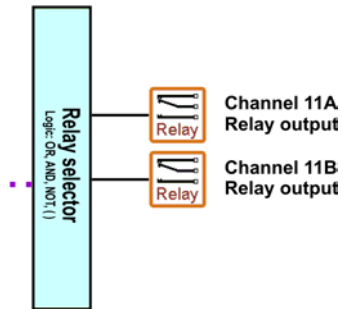


Figure 4. The two output relays can be assigned with a free assignable voting logic to any limit within the SM-610-A06 module.

## Technical Specifications

The specifications given below are specific for the SM-610-A04 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 ..... -21.5V to -1V

#### Input frequency range:

Accelerometer/velocity sensor ..... 1Hz to 20kHz  
 Displacement sensor ..... DC to 20kHz

#### Input impedance:

Accelerometer ..... >800k $\Omega$   
 Velocity sensor ..... 50k $\Omega$   
 Displacement sensor ..... >800k $\Omega$

#### Gain:

Accelerometer<sup>1</sup> sensor:  
 No integration ..... 1 to 80  
 Analogue integration ..... 1 to 80  
 Velocity<sup>1</sup> sensor ..... 1 to 80  
 Displacement<sup>1</sup> sensor ..... 1

#### Sensitivity:

Accelerometer ..... adjustable (e.g. 100mV/g)  
 Velocity sensor ..... adjustable (e.g. 100mV/mm/s)  
 Displacement sensor ..... adjustable (e.g. 8mV/ $\mu$ m)

#### Common mode rejection:

DC to 30kHz ..... typically 90dB  
 30kHz to 100kHz ..... typically 85dB

#### Maximum accelerometer input signal (100mV/g):

No integration ..... 1.25g to 80g peak  
 Analogue integration ..... 12.5mm/s to 150mm/s peak

#### Sensor power:

Sensor supply ..... -24VDC  $\pm$ 2%  
 Maximum current ..... 30mA

### Speed/Phase Reference Sensor Inputs

Input voltage range ..... -21.5V to -1V  
 Input frequency range ..... DC to 20kHz  
 Input impedance ..... >800k $\Omega$   
 Gain<sup>1</sup> ..... 1

#### Common mode rejection:

DC to 10kHz ..... typically 90dB  
 10kHz to 100kHz ..... typically 85dB

<sup>1</sup> measurement accuracy  $\pm$ (0.75% of measurement value + 0.10% of measurement end value)

#### Sensor power:

Sensor supply ..... -24VDC  $\pm$ 2%  
 Maximum current ..... 30mA

### Binary Inputs

Input impedance ..... 3.3k $\Omega$   
 Accuracy ..... response time 5ms  
 Minimum current load ..... 5mA  
 Maximum contact voltage .....  $\pm$ 50V

#### Signal status LOW:

Nominal input voltage ..... 0V  
 Input voltage range ..... -50V to 6.6V  
 Maximum input current ..... 2mA

#### Signal status HIGH:

Nominal input voltage ..... 24V  
 Input voltage range ..... 16.5V to 50V  
 Maximum input current ..... 5mA

### Buffered Outputs

Minimum output load ..... 100k $\Omega$   
 Output gain ..... 1 ( $\pm$ 2%)  
 Cross-talk ..... typically -90dB (up to 50kHz)  
 Inherent noise (1Hz to 50kHz) ..... typically 10mV RMS  
 Output impedance ..... <100 $\Omega$   
 Frequency range ..... DC to 50kHz (phase shift <5%)  
 Output offset .....  $\leq \pm$ 13mV

### Analogue DC Outputs

#### Current output:

Current range ..... 0mA to 20mA or 4mA to 20mA  
 Maximum output load ..... 500 $\Omega$   
 Accuracy ... max. deviation 2.4% of measured value  
 Offset ..... <20 $\mu$ A

#### Voltage output:

Voltage range ..... 0V to 10V or 2V to 10V  
 Minimum output load ..... 1k $\Omega$   
 Accuracy ... max. deviation 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	Measuring Range	Units <sup>1</sup>	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 <sup>3</sup> )	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 <sub>max</sub>	HP: 1Hz to 16kHz (-1dB) LP: 1.25Hz to 20kHz (-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 <sub>max</sub>	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)	mm/s	±(0.6mm/s + 2.75% of measured value)
					100mm/s	mm/s	±(0.1mm/s + 0.75% 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)	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 (axial)	-	Adjustable 10ms to 100s	-	2x Alert, 2x Danger	2000µm	µm	±(2.0µm + 1.0% of measured value)
DC (gap voltage) <sup>3</sup>	-		-		22.0 V	V	±(16.0mV + 1.0% of measured value)
RPM	Signal slope: +/- Trigger level (manual or automatic): -1.0 V to - 21.5 V; adjustable in steps of 0.1V Hysteresis: 0 to 25V; adjustable in steps of 0.1V	Adjustable 10ms to 100s	RPM	1x Alert, 1x Danger	0.06 to > 1500000 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)

<sup>1</sup> Metric and imperial units can be used; Metric units are shown only as an example.

<sup>2</sup> One analogue integration is possible.

<sup>3</sup> Only available for displacement sensor measurements e.g. vibration displacement, axial etc.

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

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