XM Monitoring Modules Specifications

Catalog Numbers 1440 series

The XM series of intelligent I/O modules process, in real-time, the critical parameters used to assess the current health and predict the future health of industrial machinery—providing machinery protection and reducing downtime. Use the XM modules in a standalone system, or integrate them with existing automation and control systems.

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Summary of Changes

This manual contains new and updated information. Changes throughout this revision are marked by change bars, as shown to the left of this paragraph.

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Addition of XM-124 Standard Dynamic Measurement Module (cat. no. 1440-SDM02-01RA)	16

The following measurement modules were removed from this manual as they are now in Silver Series status.

- XM-120 Standard Dynamic Measurement Module (cat. no. 1440-VST02-01RA)
- XM-121 Low Frequency Vibration Module (cat. no. 1440-VLF02-01RA)

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

XM DYN Dynamic Measurement Module

The XM dynamic measurement module (catalog number 1440-DYN02-01RJ) is a two-channel, general purpose monitor that supports measurements of dynamic inputs such as vibration, pressure, and strain. The module can be used for monitoring shaft, casing, and pedestal vibration in rotating equipment. The module is designed specifically for integration with ControlLogix controllers, connected through the 1440-ACNR ControlNet adapter.

Attribute	XM DYN (1440-DYN02-01RJ)
Inputs	
Two dynamic channel inputs	Eddy current transducer signals Accelerometer signals Voltage signals from any dynamic measurement sensor such as velocity or pressure transducer
Transducer power	Constant voltage 24V DC, -24V DC, 60 mA Constant current 4.5 mA +30%/-20% from 24V DC (IEPE) Bias current: monitors self-powered coil-based transducers None
Voltage ranges	-20…0V DC -10…10V DC 0…20V DC
Input impedance	> 100 kΩ
Sensitivity	Up to 15% from nom

mV/g	mV/ ips	mV/ mms	mV/ mil	mV/µ m	mV/ psi	mV/ mbar	V/V
10	100	4	100	3.94	20	0.29	1
25	150	6	150	5.91	50	0.73	
50	200	8	200	7.87	100	1.45	
100	500	20	285	11.2			
500	1000	40					
1000							
10000							

Tachometer Input	
One tachometer input	±25V (50V max peak-to-peak)
Input impedance	> 120 kΩ
Range	1...1.2 M rpm/0.0167...20 kHz
Pulses per revolution	0 (tach off)...50,000
Rate of change of speed, max	500 Hz/s

Attribute	XM DYN (1440-DYN02-01RJ)
Outputs	
Buffered outputs	One active buffer per dynamic channel One resistive buffer for tachometer
Indicators	
Status indicators	Module Network Channel 0 Channel 1 Tachometer Setpoint multiplier Virtual relay
Communication	
XM bus	Autobaud 125, 250, or 500 Kbps Max distance: 10 m (32.81 ft) Node number mechanically set to simplify installation and commissioning Customizable poll assembly optimizes space utilization within scanner Logix controller integration over the ControlNet network via 1440-ACNR adapter
Signal Conditioning	
Sampling mode	Selectable per channel Asynchronous FMAX: 1 Hz...20 kHz Synchronous FMAX: 10 < Orders x Speed (Hz) < 5000 Order range: 4...200 Min FMAX: 10 Hz Max FMAX: 5000 Hz
Resolution	A/D conversion: 24 bits Dynamic range: 80 dBfs (0.01% fs), 90 dBfs, typical
FFT lines	100, 200, 400, 800
Integration	None, single, or double
High pass analog filters	-3 dB corners: 0.2, 1, 5, 10, 40 Hz Roll off: -30 dB/octave for the 0.2 Hz filter, otherwise 24 dB/octave
Low pass filter	Applied to integrated acceleration measurements -6 dB corner: 2 kHz Roll off: -12 dB/octave
Units	g, ips, mm/s, mils, µm, PSI, mbar, volt
Measurements	
Types	FFT and time waveform Asynchronous or synchronous

Attribute	XM DYN (1440-DYN02-01RJ)
Real time	Overall RMS Peak (true or calculated) Peak-to-peak (true or calculated) Optional low pass filter – -3 dB corner: 200 Hz...20 kHz – Roll off: -24 dB/octave Gap (or transducer bias voltage) Speed SMAX magnitude SMAX phase
FFT derived	FFT bands Four bands per channel Defined in frequency or order domain Overall or max peak in band Orders Magnitude: 1x, 2x, 3x Phase: 1x, 2x Not 1x Sum harmonics
Alarms	
Number	Six alert and danger pairs Alarm on any measured value
Operators	Greater than Less than Inside range Outside range
Hysteresis	User-defined
Startup inhibit/setpoint multiplication	Period 0...1092 min Inhibit/multiplication function: Multiply by N (0...10, 0 = Disarm)
Speed inhibit	Speed range may be specified for each alarm. When applied, the alarm is disabled if the speed is outside the defined range
Configuration	
Automatic module configuration	Automatically configured from a configuration stored in module memory at powerup, or from a configuration held in a Logix5000 controller
Relays	
One virtual relay	Logic is provided to drive one virtual relay. Relay status is indicated by the relay status indicator
Relay function	Normally energized (failsafe) or normally deenergized (non-failsafe) Latching or non-latching Time delay: 0...25.5 s in100 ms increments Single or paired AND or OR logic applied to any alarm Reset by digital command from configuration software, via a command from the XM bus, or from output tag when integrated via ControlNet adapter

Attribute	XM DYN (1440-DYN02-01RJ)
Alarm status to activate on	Normal Alert Danger Gap/bias out of range Module fault Tachometer fault Disarm
Power	
Type	Requires Class 2 power supply
Module	24V DC nom
Consumption	250 mA, max 210 mA, typical
Heat production	4.56 W, max 3.60 W, typical
Environmental	
Temperature, operating	-20...70 °C (-4...158 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	5...95% noncondensing
Physical	
Terminal base	1440-TBS-J
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)
Weight, approx.	0.172 kg (0.38 lb)
Certifications(1)	
EMC	EN61000-6-2 EN61000-6-4 EN61326-1 (Industrial) EN61131-2 (Clause 8, Zones A and B)
UL	UL 508
ULH	UL 1604 Class I Division 2, Groups A, B, C, D
CUL	CSA C22.2 No. 142-M1987
CULH	CSA C22.2 No. 213-M1987 Class I Division 2, Groups A, B, C, D
LVD	EN61131-2 (Clause 11)
C-Tick	AS/NZS CISPR11 (Group 1, Class A)
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA nL IIC T4 Gc

(1) When product or packaging is marked. See the Product Certification link at http://www.rockwellautomation.com for Declarations of Conformity, Certificates, and other certification details.

XM-120E Eccentricity Module

The XM-120E module (catalog number 1440-VST02-01RA) is an XM-120 module with the alternative XM-120E firmware loaded. Eccentricity is the measure of the amount of bow in a rotor, and is critical for steam turbine operation. Eccentricity is usually caused by uneven heating or simply by the weight of the shaft itself while stopped. The eccentricity module is suitable for steam turbines where rotor bow must be measured prior to or during startup.

The eccentricity firmware ships with the module and can be downloaded from http://www.rockwellautomation.com/support/.

From the support website, choose Downloads>Firmware Updates>Condition Monitoring.

Attribute	XM-120E (1440-VST02-01RA)
Inputs	
Two channels	Eddy current transducer signals
Transducer power	Constant voltage 24V DC None (voltage input) Tachometer may be powered, constant voltage, or configured as voltage input
Voltage range	Selectable in software as 0…20V min; 40V max peak-to-peak
Sensitivity	User configurable in software
Input impedance	> 100 kΩ
Tachometer Input	
One tachometer input	±25V (50V max peak-to-peak) 1…50,000 events/revolution
Input impedance	120 kΩ min
Speed/frequency range	1…1,200,000 rpm 0.0167…20,000 Hz
Speed measurement error	1…12,000 rpm: ±1 rpm 12,001…120,000 rpm: ±6 rpm 120,001…1,200,000 rpm: ±50 rpm Exponential Averaging Time Constant parameter set to ≥ 120 ms
Outputs	
4…20 mA outputs	Two isolated outputs (one per eccentricity channel) 300Ω max load
Buffered outputs	One active buffer per vibration input channel Resistive buffer for tachometer
Indicators	
Status indicators	Module - red/green Network - red/green Channel 1 - yellow/red Channel 2 - yellow/red Tachometer - yellow/red Eccentricity -yellow Relay - red
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Signal Conditioning	
Frequency response	Peak-to-peak eccentricity Gap: 0.0039…20 Hz (0.235…1200 cpm) Gap: 0…20 Hz (0…1200 cpm)
Accuracy	±1% of measurement Noise Floor: 8 mV RMS Specified at ambient temperature of 25°C (77°F)
Gap resolution	5.2 mV
Waveform	Block Size: 256, 512, 1024, 2048 Periods: 5…800 s
Amplitude range	±21V
Data	
Complex data	Waveform (asynchronous)
Accuracy, min	±1% of full scale range for the channel ±1% of alarm setpoint for speed
Measurements	
Speed	rpm
Peak-to-peak eccentricity	Peak-to-peak eccentricity is the difference between the positive and the negative extremes of the rotor bow µm or mils
Gap (or transducer bias voltage)	Volts

Attribute	XM-120E (1440-VST02-01RA)
Gap, min	Volts
Gap, max	Volts
Alarms	
Number	Two alarm and danger pairs (one each for the eccentricity measurements)
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Speed inhibit	A speed range may be specified for each alarm. When applied, the alarm is disabled when speed is outside of the defined range
Relays	
Number	Single on-board relay, two sets of contacts - DPDT (2 Form C) Four additional relays when interconnected to an XM-441 expansion relay module or Four virtual relays whose status can be used by remote control systems or the XM-440 master relay module
On-board relay rating	Voltage, max: 120V DC, 125V AC Current, max: 3.5 A Current, min: 0 Power, max: 60 W, 62.5VA Max current is up to 40 °C (104 °F), then derates to 2 A at 65 °C (149 °F) Agency rating 120V AC @ 0.5 A 110V DC @ 0.3 A 30V DC @ 1.0 A
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)
Latching	Latching or Non-latching
Time delay	0…25.5 s, adjustable in 100 ms increments
Logic	Single or paired AND or OR logic applied to any alarm
Reset	Local reset switch on top of module Remote reset switch wired to terminal base Digital reset command via serial or DeviceNet interface
Activation on	Alarm status Normal Alert Danger Disarm Transducer fault Module fault Tacho fault

Attribute	XM-120E (1440-VST02-01RA)
Configuration	
Nonvolatile configuration	A copy of the module configuration is retained in nonvolatile memory from which the configuration is loaded upon powerup The configuration stored in nonvolatile memory can be deleted only by a module-reset command sent via the serial interface, using the Serial Configuration utility or via a DeviceNet interface from any compliant software application
Power	
Module	24V DC
Consumption	300 mA, max 175 mA, typical
Heat production	7 W (24 BTU/hr), max 4 W (14 BTU/hr), typical
Transducer	Isolated 24V DC, user configurable with wiring
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C
Physical	
Terminal base	1440-TB-A
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)
Certifications(1)	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection "n"
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

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XM-121A Absolute Shaft Vibration Module

The XM-121A module (catalog number 1440-VLF02-01RA) is an XM-121 module with the alternative XM-121A firmware loaded. Absolute shaft vibration is the measure of a steam turbine's shaft motion relative to free space—a measurement requirement for some large machines.

The absolute shaft firmware ships with the module and can be downloaded from http://www.rockwellautomation.com/support/.

From the support website, choose Downloads>Firmware Updates>Condition Monitoring.

Attribute	XM-121A (1440-VST02-01RA)
Inputs	
Channel 1	Eddy current transducer Supports 5, 8, and 11 mm 2100 series and Bently Nevada 3300 XL series probes
Channel 2	Case mounted sensor Supports these sensors 9000A general purpose accelerometer 9100VO velocity output velocimeter 9100 CSA general purpose accelerometer 9100T high temperature accelerometer
Transducer power	Constant voltage -24V DC Constant current 4.5 mA ±20% from 24V None (voltage input) Tachometer may be powered, constant voltage, or configured as voltage input
Voltage range	Selectable in software as 0…20V min; 40V max peak-to-peak
Sensitivity	User configurable in software
Input impedance	> 100 kΩ
Tachometer Input	
One tachometer input	±25V (50V max peak-to-peak) 1…50,000 events/revolution
Input impedance	120 kΩ min
Speed/frequency range	1…1,200,000 rpm 0.0167…20,000 Hz
Speed measurement error	1…120 rpm: ±0.2 rpm 121…600 rpm: ±1 rpm 601…4000 rpm: ±2 rpm 4001…24,000 rpm: ±10 rpm 24,001…120,000 rpm: ±20 rpm 120,001…600,000 rpm: ±80 rpm 600,001…1,200,000 rpm: ±160 rpm
Pulses per revolution	0 (tach disabled)…50,000
Rate of change of speed, max	500 Hz/s
Outputs	
4…20 mA outputs	Each output is independently programmed to represent any measured parameter, from either channel Two isolated outputs 300Ω max load
Buffered outputs	One active buffer per vibration input channel Resistive buffer for tachometer
Indicators	
Status indicators	Module - red/green Network - red/green Channel 1 - yellow/red Channel 2 - yellow/red Tachometer - yellow/red Setpoint multiplier -yellow Relay - red
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Signal Conditioning	
Tracking filter	User configurable in software Constant bandwidth (0.1…25 Hz) Constant Q (adjustable 1…200 with 0.5…15 Hz bandwidth limit) Stopband attenuation > 57 dB Speed range: 4…1000 Hz (240…60,000 rpm)
Frequency range	1…10,000 Hz
Resolution	A/D conversion: 24 bits Dynamic range: < 80 dBfs (0.01% fs), -90 dBfs, typical
Accuracy, min	±1% of channel full scale
Phase accuracy	3° above 600 rpm
Amplitude range	±21V

Attribute	XM-121A (1440-VST02-01RA)
High pass filter	User configurable in software 0.8, 2, 4, or 23.8 Hz -80 dB/decade rolloff
Low pass filter	Adjustable 600…4000 Hz -40 dB/decade rolloff
Complex Data	
Time waveform	Block size 256, 512, 1024, 2048 Period 0.02…80 s
Accuracy, min	±1% of full scale range for the channel ±1% of alarm setpoint for speed
Measurements	
Shaft relative (eddy current probe)	Overall 1x magnitude 1x phase Gap (volts)
Case absolute (velocity or accelerometer)	Output units selectable as either velocity or displacement Overall 1x magnitude 1x phase Bias (volts)
Shaft absolute (calculated)	Overall 1x magnitude 1x phase
Speed	rpm
Alarms	
Number	Nine alarm and danger pairs Shaft absolute overall Shaft absolute 1x magnitude Shaft relative overall Casing absolute overall Shaft relative 1x magnitude Casing absolute 1x magnitude Probe gap Accelerometer bias Speed
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Startup inhibit/set point multiplication	Period: 0…1092 min in 0.1 min increments Inhibit/multiplication function: Multiply by N (0…10, 0 = Disarm)
Speed inhibit	A speed range may be specified for each alarm. When applied, the alarm is disabled when speed is outside of the defined range

Attribute	XM-121A (1440-VST02-01RA)
Relays	
Number	Single on-board relay, two sets of contacts - DPDT (2 Form C) Four additional relays when interconnected to an XM-441 expansion relay module or Four virtual relays whose status can be used by remote control systems or the XM-440 master relay module
On-board relay rating	Voltage, max: 120V DC, 125V AC Current, max: 3.5 A Current, min: 0 Power, max: 60 W, 62.5VA Max current is up to 40 °C (104 °F), then derates to 2 A at 65 °C (149 °F) Agency rating 120V AC @ 0.5 A 110V DC @ 0.3 A 30V DC @ 1.0 A
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)
Latching	Latching or Non-latching
Time delay	0…25.5 s, adjustable in 100 ms increments
Logic	Single or paired AND or OR logic applied to any alarm
Reset	Local reset switch on top of module Remote reset switch wired to terminal base Digital reset command via serial or DeviceNet interface
Activation on	Alarm status Normal Alert Danger Disarm Transducer fault Module fault Tacho fault
Configuration	
Nonvolatile configuration	A copy of the module configuration is retained in nonvolatile memory from which the configuration is loaded upon powerup The configuration stored in nonvolatile memory can be deleted only by a module-reset command sent via the serial interface, using the Serial Configuration utility or via a DeviceNet interface from any compliant software application
Power	
Module	24V DC
Consumption	300 mA, max 175 mA, typical
Heat production	7 W (24 BTU/hr), max 4 W (14 BTU/hr), typical

Attribute	XM-121A (1440-VST02-01RA)
Transducer	Isolated 24V DC, user configurable with wiring
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C
Physical	
Terminal base	1440-TB-A
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)
Certifications[1]	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection "n"
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

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XM-122 gSE Vibration Module

The XM-122 module (catalog number 1440-VSE02-01RA) measures both conventional vibration and g Spike Energy (gSE). The gSE signal is a processing technique that provides an accurate measure of the energy generated by transient or mechanical impacts. This makes the module ideal for monitoring motors, pumps, fans, and gearboxes that are fitted with rolling element bearings and where continuous, real-time, protection is not required.

Unlike other XM modules, the XM-122 module continuously alternates between standard and gSE measurements, updating each every 4...80 seconds (depending on the selected block size and bandwidth). Consequently, the module is not suitable for applications requiring true, real-time monitoring or protection.

Attribute	XM-122 (1440-VSE02-01RA)
Inputs	
Two channels	Eddy current transducer signals Accelerometer signals Voltage signals from any dynamic measurement device, such as a velocity or pressure transducer
Transducer power	Constant voltage 24V DC Constant current 4.5 mA ±20% from 24V DC None (voltage input) Tachometer may be powered, constant voltage, or configured as voltage input
Voltage range	Selectable in software as 0…20V min; 40V max peak-to-peak
Sensitivity	User configurable in software
Input impedance	> 100 kΩ
Tachometer Input	
One tachometer input	±25V (50V max peak-to-peak) 1…50,000 events/revolution
Input impedance	120 kΩ min
Speed/frequency range	1…1,200,000 rpm 0.0167…20,000 Hz
Speed measurement error	1…12,000 rpm: ±1 rpm 12,001…120,000 rpm: ±6 rpm 120,001…1,200,000 rpm: ±50 rpm Exponential Averaging Time Constant parameter set to ≥ 120 ms

Attribute	XM-122 (1440-VSE02-01RA)
Outputs	
4…20 mA outputs	Each output is independently programmed to represent any measured parameter, from either channel Two isolated outputs 300 Ω max load
Buffered outputs	One active buffer per vibration input channel Resistive buffer for tachometer
Indicators	
Status indicators	Module - red/green Network - red/green Channel 1 - yellow/red Channel 2 - yellow/red Tachometer - yellow/red Setpoint multiplier -yellow Relay - red
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Signal Conditioning	
Sampling mode	Asynchronous Synchronous
Frequency range	1 Hz…20 kHz
Resolution	A/D conversion: 24 bits Dynamic range: < 80 dBfs (0.01% fs); -90 dBfs, typical FFT lines/waveform block size: 100/256 200/512 400/1024 800/2048
Amplitude range	Dependent on sensitivity
Integration	Two levels provided, first in hardware, second in firmware

Attribute	XM-122 (1440-VSE02-01RA)
Averaging	Any number of averages may be specified If sampling mode is Asynchronous: Averaging performed on the spectra Synchronous: Averaging performed on the waveforms
Low pass filters	Independently configured per channel Spectra FMAX: 10…2000 Hz gSE Spectra FMAX: 10…5000 Hz Optional overall measurement LP filter: 200…2000 Hz Roll off: -24 dB/octave
High pass filters	Independently configured per channel Integration off: 1, 5, 10, 40, 1000 Hz Roll off: -30 dB/octave for the 1 Hz HPF, otherwise -24 dB/octave Integration on: 5, 10, 40, 1000 Hz Roll off: Single integration: -30 dB/octave for the 5Hz HPF, otherwise -24 dB/octave Double integration: -42 dB/octave for the 5 Hz HPF, otherwise -24 dB/octave gSE HPF: 200, 500, 1000, 2000, 5000 Hz Roll Off: -12 dB/octave
Units	g, µm, ips, volt, mm/s, PSI, mils, Pa
Data	
Complex data	Spectra (synchronous or asynchronous) gSE Spectra Waveform (synchronous or asynchronous) Simultaneous waveforms (synchronous)
Accuracy, min	±1% of full scale range for the channel ±1% of alarm setpoint for speed
Peak speed capture	The module retains the value of the greatest speed observed since the module power was cycled or the peak speed value was manually reset

Attribute	XM-122 (1440-VSE02-01RA)
Measurements	
Real time	Overall gSE Overall RMS Peak (true or calculated) Peak-to-peak (true or calculated) Optional low pass filter Gap (or transducer bias voltage) Speed Acceleration SMAX magnitude SMAX phase
Bands	Four overlapping bands per channel (Hz or order based) Overall or max peak in band Orders Magnitude: 1x, 2x, 3x Phase: 1x, 2x Not 1x Sum harmonics
Data Buffers	
Delta time buffer	Number or Records: 2048 Delta Time Interval: 1…3600 s Trigger Mode: Relay on the module is activated or by a trigger signal (for example, DeviceNet command from a controller or host)
Delta rpm buffer	Number of Records: 512 Delta Speed Interval: 1…3600 rpm Trigger Mode: Startup collects data in increasing rpm direction only; coast-down collects data in both increasing and decreasing directions The data collected in the buffer is user defined and may contain up to 16 of the Measured Parameters specified above
Spectra or waveform	Saved on same trigger as delta time buffer
Alarms	
Number	16 alarm and danger pairs Any measured parameter
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Startup inhibit/setpoint multiplication	Period: 0…1092 min, adjustable in 0.1 min increments Inhibit/multiplication function: Multiply by N (0…10, 0 = Disarm)
Speed inhibit	A speed range may be specified for each alarm. When applied, the alarm is disabled when speed is outside of the defined range

Attribute	XM-122 (1440-VSE02-01RA)
Relays	
Number	Single on-board relay, two sets of contacts - DPDT (2 Form C) Four additional relays when connected to an XM-441 expansion relay module, or Four virtual relays whose status can be used by remote control systems or the XM-440 master relay module
On-board relay rating	Voltage, max: 120V DC, 125V AC Current, max: 3.5 A Current, min: 0 Power, max: 60 W, 62.5VA Max current is up to 40 °C (104 °F), then derates to 2 A at 65 °C (149 °F) Agency rating 120V AC @ 0.5 A 110V DC @ 0.3 A 30V DC @ 1.0 A
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)
Latching	Latching or Non-latching
Time delay	0…25.5 s, adjustable in 100 ms increments
Logic	Single or paired AND or OR logic applied to any alarm
Reset	Local reset switch on top of module Remote reset switch wired to terminal base Digital reset command via serial or DeviceNet interface
Activation on	Agency status Normal Alert Danger Disarm Transducer fault Module fault Tacho fault
Configuration	
Nonvolatile configuration	A copy of the module configuration is retained in nonvolatile memory from which the configuration is loaded upon powerup The configuration stored in nonvolatile memory can be deleted only by a module-reset command sent via the serial interface, using the Serial Configuration utility or via a DeviceNet interface from any compliant software application
Power	
Module	24V DC
Consumption	300 mA, max 175 mA, typical
Heat production	7 W (24 BTU/hr), max 4 W (14 BTU/hr), typical

Attribute	XM-122 (1440-VSE02-01RA)
Transducer	Isolated 24V DC, user configurable with wiring
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C
Physical	
Terminal base	1440-TB-A
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)
Certifications[1]	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection “n”
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

(1) When product or packaging is marked. See the Product Certification link at http://www.rockwellautomation.com for Declarations of Conformity, Certificates, and other certification details.

XM-123 Aeroderivative Module

The XM-123 module (catalog number 1440-VAD02-01RA) monitors aeroderivative gas turbine engines. The module can use either a tracking filter or a bandpass filter on each channel's broadband overall vibration level.

The module can operate standalone, with no interface to higher level systems. When required, the module can be deployed on a DeviceNet network where the module can provide real-time data and status information to other XM modules, programmable controllers, distributed control systems, and condition monitoring systems.

Attribute	XM-123 (1440-VAD02-01RA)
Inputs	
Two channels	Eddy current transducer signals Accelerometer signals Voltage signals from any dynamic measurement device, such as a velocity or pressure transducer
Transducer power	Constant current 4.5 mA ± 20% from 24V DC None (voltage input) Tachometer may be powered, constant voltage, or configured as voltage input
Voltage range	Selectable in software as 0…20V min; 40V max peak-to-peak
Sensitivity	User configurable in software
Input impedance	> 100 kΩ
Tachometer Input	
One tachometer input	±25V (50V max peak-to-peak) 1…50,000 events/revolution
Input Impedance	120 kΩ min
Speed/frequency range	1…1,200,000 rpm 0.0167…20,000 Hz
Speed measurement error	1…12,000 rpm: ±1 rpm 12,001…120,000 rpm: ±6 rpm 120,001…1,200,000 rpm: ±50 rpm Exponential Averaging Time Constant parameter set to ≥ 120 ms
Outputs	
4…20 mA outputs	Each output is independently programmed to represent any measured parameter, from either channel Two isolated outputs 300Ω max load
Buffered outputs	One active buffer per vibration input channel Output range configurable by wiring: -24…9V -5 …24V -5…9V Resistive buffer for tachometer
Indicators	
Status indicators	Module - red/green Network - red/green Channel 1 - yellow/red Channel 2 - yellow/red Tachometer - yellow/red Setpoint multiplier -yellow Relay - red
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Signal Conditioning	
Tracking filter	Tracked speed multiple: 0.1…20.0 times the measured (tachometer) rpm Constant Q: 1…200 Constant bandwidth: 0.1…25 Hz Roll off: -36 dB/octave, typical
Bandpass filter	Frequency, min 25…1000 Hz Frequency, max 100…5500 Hz Roll off: -60 dB/octave
Frequency range	1 Hz…20 kHz
Resolution	A/D conversion: 24 bits Dynamic range: < 80 dBfs (0.01% fs), -90 dBfs, typical
Amplitude range	Dependent on sensitivity
Integration	One level provided in hardware
Low pass filters	Independently configured per channel Optional overall measurement LP filter (200 Hz…20 kHz) Roll off: -24 db/octave

Attribute	XM-123 (1440-VAD02-01RA)
High pass filters	Independently configured per channel Integration off: 1, 5, 10, 40, 1000 Hz Roll off: -30dB/octave for the 1 Hz HPF, otherwise -24 dB/octave
Units	g, µm, ips, volt, mm/s, PSI, mils, Pa
Data	
Accuracy, min	±1% of full scale range for the channel ±1% of alarm setpoint for speed
Peak speed capture	The module retains the value of the highest speed observed since module power was cycled or the peak speed value was manually reset
Measurements	
Overall	RMS Peak (true or calculated) Peak-to-peak (true or calculated) User configurable in software
Specific	Speed Transducer bias voltage
Bandpass filter	Band value
Tracking filter	Tracked vector magnitude Tracked vector phase
Data Buffers	
Trend buffer	Stores a set of records containing measured parameters in response to a trigger event Trend record: 1…9 parameters Trend interval: 1…3600 s Trigger: Trend is stored when a specified relay on the module is activated, or by a trigger event (for example, DeviceNet command from a controller or host) Capacity: 227…2048 records depending on the number of parameters stored
Speed buffer	Stores a startup/coast-down trend of measurement parameters in response to changes in speed SU/CD record: 2…9 parameters SU/CD interval: 1…3600 rpm Trigger: Startup collects data in increasing rpm direction only; coast-down collects data in both increasing and decreasing directions Capacity: 186…512 records depending on the number of parameters stored SU/CD buffer may be latched to preserve the initial trip data in the event of subsequent trips

Attribute	XM-123 (1440-VAD02-01RA)
Alarms	
Number	12 alarm and danger pairs Speed, overall, DC bias, band or tracked magnitude from either channel
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Startup inhibit/setpoint multiplication	Period: 0…1092 min, adjustable in 0.1 min increments Inhibit/multiplication function: floating point value in the range of 0…10
Speed inhibit	A speed range may be specified for each alarm. When applied, the alarm is disabled when speed is outside of the defined range
Relays	
Number	Single on-board relay, two sets of contacts - DPDT (2 Form C) Four additional relays when interconnected to an XM-441 expansion relay module or Four virtual relays whose status can be used by remote control systems or the XM-440 master relay module
On-board relay rating	Voltage, max: 120V DC, 125V AC Current, max: 3.5 A Current, min: 0 Power, max: 60 W, 62.5VA Max current is up to 40 °C (104 °F), then derates to 2 A at 65 °C (149 °F) Agency rating 120V AC @ 0.5 A 110V DC @ 0.3 A 30V DC @ 1.0 A
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)
Latching	Latching or Non-latching
Time delay	0…65.53 s, adjustable in 0.01 s increments
Logic	Single or paired AND or OR logic applied to any alarm
Reset	Local reset switch on top of module Remote reset switch wired to terminal base Digital reset command via serial or DeviceNet interface

Attribute	XM-123 (1440-VAD02-01RA)
Activation on	Alarm status Normal Alert Danger Disarm Transducer fault Module fault Tacho fault
Configuration	
Nonvolatile configuration	A copy of the module configuration is retained in nonvolatile memory from which the configuration is loaded upon powerup The configuration stored in nonvolatile memory can be deleted only by a module-reset command sent via the serial interface, using the Serial Configuration utility or via a DeviceNet interface from any compliant software application
Power	
Module	24V DC
Consumption	300 mA, max 175 mA, typical
Heat production	7 W (24 BTU/hr), max 4 W (14 BTU/hr), typical
Transducer	Isolated 24V DC, user configurable with wiring
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C
Physical	
Terminal base	1440-TB-A
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)

Attribute	XM-123 (1440-VAD02-01RA)
Certifications[1]	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection "n"
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

(1) When product or packaging is marked. See the Product Certification link at http://www.rockwellautomation.com for Declarations of Conformity, Certificates, and other certification details.

XM-124 Standard Dynamic Measurement Module

The XM-124 module (catalog number 1440-SDM02-01RA) is a two-channel, general purpose monitor that supports dynamic measurements such as vibration, pressure, and strain, in addition to one static measurement (thrust/shaft position). The module can be used for monitoring shaft, casing, or pedestal vibration and thrust position in rotating equipment.

Attribute	XM-124 (1440-SDM02-01RA)
Inputs	
Two dynamic channel inputs	Eddy current transducer signals Accelerometer signals Voltage signals from any dynamic measurement device, such as a velocity or pressure transducer
Transducer power	Constant voltage: 24V DC, -24V DC, 60 mA Constant current 4.5 mA ± 30% / -20%from 24V DC (IEPE) None (voltage input) Tachometer can be powered, constant voltage, or configured as voltage input
Voltage range	-20…0V DC -10…10V DC 0…20V DC
Input impedance	> 100 kΩ
Sensitivity	Up to 15% from nom

mV/g	mV/ips	mV/mms	mV/mil	mV/µm	mV/psi	mV/mbar	V/V
10	100	4	100	3.94	20	0.29	1
25	150	6	150	5.91	50	0.73	
50	200	8	200	7.87	100	1.45	
100	500	20	285	11.2			
500	1000	40					
1000							
10000							

Attribute	XM-124 (1440-SDM02-01RA)
Tachometer Input	
One tachometer input	±25V (50V max peak-to-peak) 1…50,000 events/revolution
Input impedance	> 120 kΩ
Range	1…1,200,000 rpm 0.0167…20,000 Hz
Pulses per revolution	0 (tach off)…50,000
Rate of change of speed, max	500 Hz/s
Outputs	
4…20 mA	Each output is independently programmed to represent any measured parameter, from either channel Two isolated outputs 300 Ω max load
Buffered outputs	One active buffer per dynamic channel One resistive buffer for tachometer
Indicators	
Status indicators	Module Network Channel 1 Channel 2 Tachometer Setpoint multiplier Virtual relay
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Signal Conditioning	
Sampling mode	Selectable per channel Asynchronous FMAX: 1 Hz...20 kHz Synchronous FMAX: 10 < Orders x Speed (Hz) < 5000 Order range: 4...200 Min FMAX: 10 Hz Max FMAX: 5000 Hz
Resolution	A/D conversion: 24 bits Dynamic range: 80 dBfs (0.01% fs), 90 dBfs, typical
FFT lines	100, 200, 400, 800
Integration	None or single

Attribute	XM-124 (1440-SDM02-01RA)
High pass analog filters	-3 dB corners: 0.2, 1, 5, 10, 40 Hz Roll off: -30 dB/octave for the 0.2 Hz filter, otherwise 24 dB/octave
Low pass filter	Applied to integrated acceleration measurements -6 dB corner: 2 kHz Roll off: -12 dB/octave
Units	g, ips, mm/s, mils, µm, PSI, mbar, volt
Data	
Complex data	Spectra (synchronous or asynchronous) Waveform (synchronous or asynchronous) Simultaneous waveforms (synchronous)
Accuracy, min	±1% of full scale range for the channel ±1% of alarm setpoint for speed
Measurements	
Types	FFT and time waveform Asynchronous or synchronous
Real time	Overall RMS Peak (true or calculated) Peak-to-peak (true or calculated) Optional low pass filter – -3 dB corner: 200 Hz...20 kHz – Roll off: -24 dB/octave Gap (or transducer bias voltage) Speed SMAX magnitude SMAX phase Thrust position
FFT derived	FFT bands Four bands per channel Defined in frequency or order domain Overall or max peak in band Orders Magnitude: 1x, 2x, 3x Phase: 1x, 2x Not 1x Sum harmonics
Data Buffers	
Delta time buffer	Number of records: 2048 Delta time interval: 1…3600 s Trigger mode: Relay is activated or trigger event (such as DeviceNet command from a controller or host)
Delta rpm buffer	Number of records: 512 Delta speed interval: 1…3600 rpm Trigger mode: Startup collects data in increasing rpm direction only; Coast-down collects data in both increasing and decreasing directions The data collected in the buffer is user configurable and may contain up to 16 of the measurements
Spectra or waveform	Saved upon same trigger as delta time buffer
Alarms	
Number	16 alarm and danger pairs
Alarm parameters	Any measured parameter
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Startup inhibit/setpoint multiplication	Period: 0…1092 min, adjustable in 0.1 min increments Inhibit/multiplication function: Multiply by N (0…10, 0 = Disarm)
Speed inhibit	A speed range may be specified for each alarm. When applied, the alarm is disabled when speed is outside of the defined range.
Relays	
Number	Single on-board relay, SPDT, 1 Form A Four additional relays when interconnected to an XM-441 expansion relay module, or Four virtual relays whose status can be used by remote control systems or the XM-440 master relay module
Rating (resistive)	Capacity, nominal: 5 A @ 250V AC, 5 A @ 30V DC Capacity, min: 100 mA, 100 mV DC Power, max: 750 VA, 90 W Voltage, max: 250V AC, 110V DC Current, max: 5 A
Expected life (min operations)	Mechanical: $2x10^7$ Electrical @ 20 cpm – 3 A, 250V AC; 3 A, 30V DC: 10^5 – 5A, 250V AC; 5A, 30V DC: $5x10^4$
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)
Latching	Latching or Non-latching
Time delay	0…25.5 s, adjustable in 100 ms increments
Logic	Single or paired AND or OR logic applied to any alarm
Reset	Local reset switch on top of module Remote reset switch wired to terminal base Digital reset command via serial or DeviceNet interface

Attribute	XM-124 (1440-SDM02-01RA)
Activation on	Alarm status: Normal Alert Danger Disarm Transducer fault Module fault Tacho fault
Peak speed capture	The XM-124 retains the value of the highest speed observed since module power was cycled or the peak speed value was manually reset
Configuration	
Nonvolatile configuration	A copy of the module configuration is retained in nonvolatile memory from which the configuration is loaded upon powerup The configuration stored in nonvolatile memory can be deleted only by a module-reset command sent via a serial interface, using the Serial Configuration utility or via a DeviceNet interface from any compliant software application
Module	
Power supply	24V DC 350 mA Requires Class 2/SELV/PELV power supply
Relay power supply	24V DC 1.5 A
Power dissipation	8.7 W, max 4.7 W, typical
Isolation voltage	50V (continuous), basic insulation type between uninsulated live parts and the enclosure with the relay contacts open and closed Type tested at 707V DC for 60 s between uninsulated live parts and the enclosure with the relay contacts open and closed Type tested at 707V DC for 60 s between supply and output terminals
Wiring category[1]	2 - on signal ports 1 - on power and relay ports 2 - on DeviceNet ports 3 - on serial ports
North American temp code	T5
IEC temp code	T4
Physical	
Terminal base	1440-TB-A
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)

Attribute	XM-124 (1440-SDM02-01RA)
Environmental	
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	-20...65 °C (-4...149 °F)
Temperature, surrounding air max	65 °C (149 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...85 °C (-40...185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	15 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Emissions CISPR11 (IEC 61000-6-4)	Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80…2000 MHz 10V/m with 200 Hz 50% pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000…2700 MHz
EFT/B immunity IEC 61000-4-4	±3 kV at 5 kHz on power ports ±3 kV at 5 kH on signal ports ±3 kV at 5 kHz on DeviceNet ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power and relay ports ±1 kV line-earth (CM) on unshielded signal ports ±2 kV line-earth (CM) on shielded signal ports ±2 kV line-earth (CM) on DeviceNet ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz…80 MHz

Attribute	XM-124 (1440-SDM02-01RA)
Enclosure type rating	None (open-style)
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C
Physical	
Terminal base	1440-TBS-A
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)
Weight	Module: 0.172 kg (0.38 lb) Terminal base: 0.172 kg (0.38 lb)
Certifications[2]	
c-UL-us	UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2004/108/EC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with: • AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-11; Explosive Atmospheres, Protection "i" • EN 60079-0; General Requirements II 3 G Ex nAC [ic] IIC T4 Gc X
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3

(1) Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

(2) When product or packaging is marked. See the Product Certification link at http://www.rockwellautomation.com for Declarations of Conformity, Certificates, and other certification details.

XM-160 Direct (overall) Vibration Module

XM-161 Direct (overall) Vibration Module with 4…20 mA Out

XM-162 Direct (overall) Vibration Module with Proximity Probe Power

The XM-160 series modules monitor direct (overall) vibration levels. Each module measures and reports the overall vibration level between selected high and low pass filters, as well as the gap or bias voltage per channel.

Attribute	XM-160 (1440-VDRS06-00RH) XM-161 (1440-VDRS06-06RH) XM-162 (1440-VDRP06-00RH)
Inputs	
Six channels	Eddy current transducer signals IEPE accelerometer signals Voltage signals from any dynamic measurement device, such as a velocity or pressure transducer
Transducer power	IEPE constant current 2.69 mA ±20% from 24V DC None (voltage input) Constant voltage -24V DC (XM-162 only): 20 mA per channel, max
Voltage range	±24V DC 6.5V peak-to-peak
Sensitivity	User configurable in software
Input impedance	> 100 kΩ
Discrete switch (XM-161 and XM-162 only)	Relay reset and setpoint multiplier functions Non-isolated switch input: switch to ground (24V COM) Max nom sourced current (circuit limited): 5.1 mA
Buffered Outputs	
Number	One active buffer per vibration input channel
Range configurable in software	All channels negative (-22…3V DC) or positive (0.6…22V DC)
Output impedance	500 Ω
Response	-3 dB @ 16 kHz (down 5% @ 5 kHz)
Outputs	
4…20 mA outputs (XM-161 only)	Two isolated banks of three outputs (one per channel) 600 Ω max load (24V loop power) Outputs proportional to overall value Non-powered (external loop voltage required, 7…36V)

Attribute	XM-160 (1440-VDRS06-00RH) XM-161 (1440-VDRS06-06RH) XM-162 (1440-VDRP06-00RH)
Accuracy	±0.5% of full scale, max ±0.2% of full scale, typical
Response time (3 tau)	1.5 s
Indicators	
Status indicators	Module - red/green Network - red/green Channel 1 - yellow/red Channel 2 - yellow/red Channel 3 - yellow/red Channel 4 - yellow/red Channel 5 - yellow/red Channel 6 - yellow/red
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Vibration Measurement and Signal Conditioning	
A/D conversion	12 bits
Resolution	0.05% of full scale
Accuracy	±5% of full scale 3 Hz…1 kHz; +5/-10% 1…5 kHz, max ±1% of full scale, typical
Units	volts, g, ips, mm/s, mils, um, PSI, Pa
Range	0…2 ips RMS (integrated 100 mV/g accel @ 1 kHz) 0…20 g RMS (100 mV/g accel) 0…15.6 mils peak (200 mV/mil probe)
Low pass filter	1 kHz or 5 kHz selectable, two-pole 0.1 dB Chebyshev (-0.1 dB @ fo)
HigH pass filter	3.0 Hz or 10.0 Hz selectable, two-pole 0.1 dB Chebyshev (-0.1 dB @ fo)
Additional overall low pass filter	Single pole, -3 dB @ 10 kHz (down 10% @ 5 kHz)
Integrator	Single stage selectable, -0.3 dB @ 3 Hz RMS

Attribute	XM-160 (1440-VDRS06-00RH) XM-161 (1440-VDRS06-06RH) XM-162 (1440-VDRP06-00RH)
Overall level	Peak (true or calculated) Peak-to-peak (true or calculated)
DC Bias (gap) Voltage Measurement	
Low pass filter	Single pole, -3 dB @ 335 Hz
Range	-24…24V DC
Accuracy	±5% of full scale (48V DC), max ±1% of full scale, typical
Resolution	4 mV
Trend Buffer	
Number or records	1…12 parameters
Time interval	1…3600 s
Trigger	Relay on the expansion relay module is activated or by a trigger event (for example, DeviceNet command from a controller or host) The data collected in the buffer is user configurable in software
Post trigger	Percent of trend that is to be acquired after the trigger
Capacity	17…2048 records
Alarms	
Number	One per channel
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Startup inhibit	Period: 0…1092 min, adjustable in 0.1 min increments Inhibit/multiplication function: Multiply by N (0…10, 0 = Disarm) Inhibit/multiplication initiated by: DeviceNet command Front terminal setpoint multiplier circuit closure (XM-161 and XM-162 only) Inhibit/multiplication terminated by: Expired timer DeviceNet command Front terminal setpoint multiplier circuit open (XM-161 and XM-162 only)
Relays	
Number	Up to eight relays when interconnected to one or two XM-441 expansion relay modules or Eight virtual relays whose status can be used by remote control systems
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)

Attribute	XM-160 (1440-VDRS06-00RH) XM-161 (1440-VDRS06-06RH) XM-162 (1440-VDRP06-00RH)
Latching	Latching or Non-latching
Time delay	0…25.5 s, adjustable in 100 ms increments
Logic	Single or paired AND or OR logic applied to any alarm
Reset	Local reset switch on top of module Digital reset command via serial or DeviceNet interface Remote reset switch wired to terminal base (XM-161 and XM-162 only)
Activation On	Alarm status Normal Alert Danger Disarm Transducer fault Module fault
Configuration	
Nonvolatile configuration	A copy of the module configuration is retained in nonvolatile memory from which the configuration is loaded upon powerup The configuration stored in nonvolatile memory can be deleted only by a module-reset command sent via the serial interface, using the Serial Configuration utility or via a DeviceNet interface from any compliant software application
Power	
Module	18…32V DC
XM-160 module XM-162 module	Current, max: 190 mA @ 24V DC Power dissipation, max: 4.56 W @ 24V DC (4.3 W @ 18V DC, 4.9 W @ 32V DC)
XM-161 module	Current, max: 310 mA @ 24V DC Power dissipation, max: 7.44 W @ 24V DC (7 W @ 18V DC, 8 W @ 32V DC)
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Physical	
Terminal base	1440-TB-H
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)

Attribute	XM-160 (1440-VDRS06-00RH) XM-161 (1440-VDRS06-06RH) XM-162 (1440-VDRP06-00RH)
Certifications[1]	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection “n”
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

(1) When product or packaging is marked. See the Product Certification link at http://www.rockwellautomation.com for Declarations of Conformity, Certificates, and other certification details.

XM-220 Dual Speed Module

The XM-220 module (catalog number 1440-SPD02-01RB) measures speed, rotor acceleration, and peak speed and can detect zero speed, locked rotor, and reverse rotation. The module can also serve as a component of an electronic overspeed detection System (EODS).

Attribute	XM-220 (1440-SPD02-01RB)
Inputs	
Two tachometer inputs	±25V (50V max peak-to-peak) Eddy current transducer signals Magnetic pickups TTL output devices
Input impedance	120 kΩ min
Speed/frequency range	1…1,200,000 rpm 0.0167…20,000 Hz
Speed measurement error	1…240 rpm: ±0.2 rpm 241…12,000 rpm: ±2 rpm 12,001…20,400 rpm: ±5 rpm 20,401…120,000 rpm: ±20 rpm 120,001…360,000 rpm: ±50 rpm 360,001…1,200,000 rpm: ±160 rpm
Outputs	
4…20 mA outputs	Each output is independently programmed to represent speed or acceleration, from either channel Two isolated outputs 300 Ω max load One active buffer per input channel
Buffered outputs	Output range configurable by wiring: -24…9V -5 …24V -5 …9V Third buffered output available when the module is configured for single redundant channel mode. Outputs a CMOS (0…5V) level square-wave that corresponds to the active input signal
Sensor Fault Detection	
Eddy current transducer	Bias voltage is compared with the fault limits
Magnetic pickups	A current source is available for biasing passive magnetic pickups to detect open or short circuits
Indicators	
Status indicators	Module - red/green Network - red/green Channel 1 - yellow/red Channel 2 - yellow/red Startup -yellow Relay - red AUX - reserved for future use
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Measurements	
Units	rpm Direction of rotation Acceleration in rpm/min
Measured parameters	Forward Reverse rpm Direction of rotation Acceleration in rpm/min
Peak speed capture	The module retains the value of the highest speed observed since module power was cycled or the peak speed value was manually reset
Measurement Modes	
Dual channel	Two sensors are used independently to perform two separate speed, acceleration and peak speed measurements
Single redundant channel	One sensor is used to perform the speed, acceleration and peak speed measurements. If the current sensor fails, the module automatically switches to the second (redundant) sensor
Reverse rotation	Two sensors are used to monitor both speed and direction. The two sensors must be mounted out of phase from each other so that the rotational direction can be determined by monitoring which sensor the shaft keyway passes first
Alarms	
Number	Eight alarms, fixed per channel
Alarm parameters	Alarm and danger pair provided for each of: Speed Acceleration Zero speed Locked rotor

Attribute	XM-220 (1440-SPD02-01RB)
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Relays	
Number	Single on-board relay, two sets of contacts - DPDT (2 Form C) Four additional relays when interconnected to an XM-441 expansion relay module, or Four virtual relays whose status can be used by remote control systems or the XM-440 master relay module
On-board relay rating	Voltage, max: 120V DC, 125V AC Current, max: 3.5 A Current, min: 0 Power, max: 60 W, 62.5VA Max current is up to 40 °C (104 °F), then derates to 2 A at 65 °C (149 °F) Agency rating 120V AC @ 0.5 A 110V DC @ 0.3 A 30V DC @ 1.0 A
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)
Latching	Latching or Non-latching
Time delay	0…25.5 s, adjustable in 100 ms increments
Logic	Single or paired AND or OR logic applied to any alarm
Reset	Local reset switch on top of module Remote reset switch wired to terminal base Digital reset command via serial or DeviceNet interface
Activation on	Alarm Status Normal Alert Danger Disarm Transducer fault Module fault Tacho fault
Configuration	
Nonvolatile configuration	A copy of the module configuration is retained in nonvolatile memory from which the configuration is loaded upon powerup The configuration stored in nonvolatile memory can be deleted only by a module-reset command sent via the serial interface, using the Serial Configuration utility or via a DeviceNet interface from any compliant software application

Attribute	XM-220 (1440-SPD02-01RB)
Power	
Module	24V DC
Consumption	300 mA, max 225 mA, typical
Heat production	7 W (24 BTU/hr), max 4 W (14 BTU/hr), typical
Transducer	Isolated 24V DC, user configurable with wiring
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C
Physical	
Terminal base	1440-TB-B
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)
Certifications[1]	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection “n”
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

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XM-320 Position Module

The XM-320 module (catalog number 1440-TPS02-01RB) measures turbine supervisory position measurements, including axial position (thrust), valve position, differential expansion, and case expansion.

Attribute	XM-320 (1440-TPS02-01RB)
Inputs	
Two channels	Eddy current transducer signals Linear variable differential transformer Voltage signals from any position measurement sensor
Transducer power	Isolated 24V that can be wired to be either +24V or -24V
Voltage range	Selectable in software between -24…24V
Sensitivity	User configurable in software
Input impedance	> 100 kΩ
Outputs	
4…20mA outputs	Two isolated outputs 600 Ω max load
Buffered outputs	Two outputs (one per channel)
Indicators	
Status indicators	Module - red/green Network - red/green Channel 1 - yellow/red Channel 2 - yellow/red Setpoint multiplier - yellow Relay - red
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Measurement Modes	
Measurement modes	Normal (two independent channels) Head-to-head Radial cancel
Delta Time Buffer	
Number of records	2048
Delta time interval	1…3600 s
Trigger mode	Relay on the module is activated or by a trigger event (for example, DeviceNet command from a controller or host)
Alarms	
Number	Two alarm and danger pairs
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Startup inhibit/setpoint multiplication	Period: 0…1092 min, adjustable in 0.1 min increments Inhibit/multiplication function: Multiply by N (0…10, 0 = Disarm)
Relays	
Number	Single on-board relay, two sets of contacts - DPDT (2 Form C) Four additional relays when interconnected to an XM-441 expansion relay module or Four virtual relays whose status can be used by remote control systems or the XM-440 master relay module
On-board relay rating	Voltage, max: 125V DC, 125V AC Current, max: 3.5 A Current, min: 0 Power, max: 60 W, 62.5VA Max current is up to 40 °C (104 °F), then derates to 2 A at 65 °C (149 °F). Agency rating: 120V AC @ 0.5 A 110V DC @ 0.3 A 30V DC @ 1.0 A
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)
Latching	Latching or Non-latching
Time delay	0…25.5 s, adjustable in 100 ms increments
Logic	Single or paired AND or OR logic applied to any alarm
Reset	Local reset switch on top of module Remote reset switch wired to terminal base Digital reset command via serial or DeviceNet interface

Attribute	XM-320 (1440-TPS02-01RB)
Activation on	Alarm status: Normal Alert Danger Disarm Transducer fault Module fault
Configuration	
Nonvolatile configuration	A copy of the module configuration is retained in nonvolatile memory from which the configuration is loaded upon powerup The configuration stored in nonvolatile memory can be deleted only by a module-reset command sent via a serial interface, using the Serial Configuration utility or via a DeviceNet interface from any compliant software application
Power	
Module	24V DC
Consumption	200 mA, max 165 mA, typical
Heat production	5.28 W (18 BTU/hr), max 3.96W (13.5 BTU/hr), typical
Transducer	Isolated 24V DC, user configurable with wiring
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C
Physical	
Terminal base	1440-TB-B
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)

Attribute	XM-320 (1440-TPS02-01RB)
Certifications(1)	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection “n”
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

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XM-360 Process Module

The XM-360 module (catalog number 1440-TPR06-00RE) measures a DC voltage or a loop current and reports the data value, the rate of change for each channel, and the difference between adjacent channels.

Attribute	XM-360 (1440-TPR06-00RE)
Inputs	
Six channels	1…6 process DC voltage inputs or loop current inputs
Isolation	Up to 250V of isolation for each input
Sensitivity	User configurable in software
Input range	User configurable per channel as: 0…5V 0…10V 4…20 mA -5…5V 1…5V 0…20 mA
Input impedance	50 Ω current input 1 MΩ voltage input
Outputs	
4…20 mA outputs	Two isolated banks of three outputs (one per channel) 600 Ω max load
Accuracy	±1% of full scale, max ±0.2% of full scale, typical
Isolation	250V
Indicators	
Status indicators	Module - red/green Network - red/green Channel 1 - yellow/red Channel 2 - yellow/red Channel 3 - yellow/red Channel 4 - yellow/red Channel 5 - yellow/red Channel 6 - yellow/red
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Signal Conditioning	
Accuracy	1% of full scale, max ±0.2% of full scale, typical
Low pass filter	User configurable for the measurement value and rate of change value from each channel
Resolution	0.05% of input range
Units	°C, °F, PSI, inHg, CFM, mbar, m/s2, Pa, g, kPa, gSE, mA, rpm, ips, Hz, mm/s, mm, µm, radian, in, revolution, mil, °, %, unspecified
Measurements	
Rate of change	Per minute Updated once per second
Delta Time Buffer	
Number or records	2048
Delta time interval	1…3600 s
Trigger mode	Relay on the XM-441 expansion relay module is activated, or by a trigger event (for example, DeviceNet command from a controller or host)
Alarms	
Number	12 alarm and danger pairs Measurement value and rate of change value from each channel
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software

Attribute	XM-360 (1440-TPR06-00RE)
Relays	
Number	Up to eight relays when interconnected to one or two XM-441 expansion relay modules or Eight virtual relays whose status can be used by remote control systems
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)
Latching	Latching or Non-latching
Time delay	0…25.5 s, adjustable in 10 ms increments
Logic	Single or paired AND or OR logic applied to any alarm
Reset	Local reset switch on top of module Digital reset command via serial or DeviceNet interface
Activation on	Alarm status Normal Alert Danger Disarm Sensor-out-of-range Module fault
Configuration	
Nonvolatile configuration	A copy of the module configuration is retained in nonvolatile memory from which the configuration is loaded upon powerup The configuration stored in nonvolatile memory can be deleted only by a module-reset command sent via the serial interface, using the Serial Configuration utility or via a DeviceNet interface from any compliant software application
Power	
Module	24V DC
Consumption	300 mA, max 170 mA, typical
Heat production	7.2 W (24.6 BTU/hr), max 4 W (14 BTU/hr), typical
Transducer	Isolated 24V DC, user configurable with wiring
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C

Attribute	XM-360 (1440-TPR06-00RE)
Physical	
Terminal base	1440-TB-E
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)
Certifications(1)	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection “n”
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

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XM-361 Universal Temperature Module

XM-362 Isolated Thermocouple Temperature Module

The XM-361 and XM-362 modules measure temperature from RTDs and thermocouples. The modules report, and can alarm on, the measured temperature, rate of change for each channel, and difference between adjacent channels.

When only thermocouples are monitored, the XM-362 module is the preferred solution.

Attribute	XM-361 (1440-TUN06-00RE) XM-362 (1440-TTC06-00RE)
Inputs	
Channels	1…6 RTD or thermocouple signals, user configurable XM-361 accepts RTD and isolated thermocouple inputs XM-362 accepts isolated or grounded thermocouple inputs
Supported thermocouple types (XM-361 and XM-362)	• B 0…1810 °C (32…3290 °F) • C 0…1316 °C (32…2400 °F) • E 5…284 °C (41…543 °F) • J 0…364 °C (32 …687 °F) • K -40…484 °C (-40…903 °F) • N -40…620 °C (-40…1148 °F) • R -40…1760 °C (-40…3200 °F) • S -40…1760 °C (-40…3200 °F) • T -40…379 °C (-40…714 °F)
Supported RTD types (XM-361 only)	• 100 Ω 2-wire and 3-wire platinum (alpha = 0.00385) -40…660 °C (-40…1220 °F) • 200 Ω 2-wire and3-wire platinum (alpha = 0.00385) -40…453 °C (-40…847 °F) • 100 Ω 2-wire and 3-wire platinum (alpha = 0.003916) -40…660 °C (-40…1220 °F) • 200 Ω 2-wire and 3-wire platinum (alpha = 0.003916) -40…443 °C (-40…829 °F) • 250 Ω 2-wire and 3-wire platinum (alpha = 0.00392) -40…389 °C (-40…732 °F) • 100 Ω 2-wire and 3-wire nickel (alpha = 0.00618) -40…180 °C (-40…356 °F) • 120 Ω 2-wire and 3-wire nickel (alpha = 0.00672) -40…439 °C (-40…822 °F) • 10 Ω 2-wire and 3-wire copper (alpha = 0.00427) -40…260 °C (-40…500 °F)
RTD current source value	1.004 mA ±1%
Isolation (XM-362 only)	Up to 250V of isolation for each input
Common mode input voltage (XM-361 only)	±3V
Input impedance	XM-361: 1 MΩ voltage input XM-362: 10 kΩ voltage input
Outputs	
4…20 mA outputs	Two isolated banks of three outputs (one per channel) 600 Ω max load
Accuracy	±1% of full scale, max ±0.2% of full scale, typical
Isolation	250V
Indicators	
Status indicators	Module - red/green Network - red/green Channel 1 - yellow/red Channel 2 - yellow/red Channel 3 - yellow/red Channel 4 - yellow/red Channel 5 - yellow/red Channel 6 - yellow/red
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Signal Conditioning	
Accuracy	C thermocouples: ±3 °C (±6 °F) or 0.6% of full scale, whichever is greater E, J, K, N, T thermocouples: ±1 °C (±2 °F) or 0.6% of full scale, whichever is greater B, R, S thermocouples: ±4 °C (±7 °F) or 0.6% of full scale, whichever is greater Platinum and nickel RTDs (3-wire only): ±1 °C (±2 °F) or 0.6% of full scale, whichever is greater Copper RTDs (three-wire only): ±7 °C (±13 °F) or 5% of full scale, whichever is greater
Resolution	0.025% of temperature range

Attribute	XM-361 (1440-TUN06-00RE) XM-362 (1440-TTC06-00RE)
Low pass filter	User configurable for the measurement and rate of change value from each channel
Sampling rate	200 Hz
Units	°C, °F
Measurements	
Measured value	Temperature
Rate of change	Per minute Updated once per second
Delta Time Buffer	
Number of records	2048
Delta time interval	1…3600 s
Trigger mode	Relay on an XM-441 expansion relay module is activated, or by a trigger event (for example, DeviceNet command from a controller or host)
Alarms	
Number	18 alarm and danger pairs Measurement value and rate of change value from each channel
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Relays	
Number	Up to eight relays when interconnected to one or two XM-441 expansion relay modules or Eight virtual relays whose status can be used by remote control systems
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)
Latching	Latching or Non-latching
Time delay	0…25.5 s, adjustable in 100 ms increments
Logic	Single or paired AND or OR logic applied to any alarm
Reset	Local reset switch on top of module Digital reset command via serial or DeviceNet interface
Activation on	Alarm status Normal Alert Danger Disarm Sensor Out of Range Module fault

Attribute	XM-361 (1440-TUN06-00RE) XM-362 (1440-TTC06-00RE)
Configuration	
Nonvolatile configuration	A copy of the module configuration is retained in nonvolatile memory from which the configuration is loaded upon powerup The configuration stored in nonvolatile memory can be deleted only by a module-reset command sent via a serial interface, using the Serial Configuration utility or via a DeviceNet interface from any compliant software application
Power	
Module	24V DC
Consumption	400 mA, max
Heat production	7.2 W (24.6 BTU/hr), max 4 W (14 BTU/hr), typical
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C
Physical	
Terminal base	1440-TB-E
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)
Certifications[1]	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection “n”
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

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XM-440 Master Relay Module

The XM-440 master relay (catalog number 1440-RMA00-04RC) combines four relay outputs with XM bus master capabilities to provide remote, shared, and voted relay operation for distributed XM measurement modules. The relay supports linking of one or two XM-441 expansion relays to provide a capacity of up to 12 relays.

Attribute	XM-440 (1440-RMA00-04RC)
Indicators	
Status indicators	Module - red/green Network -red/green Relay 1 - red Relay 2 -red Relay 3 - red Relay 4 - red
Communication	
DeviceNet network	Standard DeviceNet protocol for all functions (not power—module power is provided independently) Available EDS file provides support for most DeviceNet compliant systems Communication rate automatically set by bus master to 125, 250, or 500 Kbps Configurable I/O Poll Response message helps optimize space utilization within scanner input tables: Selectable poll response assembly Selectable poll response size (bytes)
Serial	RS-232 via mini-connector or terminal base unit Communication rate fixed at 19.2 Kbps Local configuration via the Serial Configuration utility
Relays	
Number	Four relays, two sets of contacts each - DPDT (2 Form C) Four or eight additional relays when connected to one or two XM-441 expansion relay modules
Contacts	250V AC, 50/60 Hz @ 3 A resistive
Failsafe	Normally energized (failsafe) or Normally de-energized (non-fail-safe)
Latching	Latching or Non-latching
Time delay	0…25.5 s, adjustable in 100 ms increments
Logic	Per relay, defined as A out of B where B is up to 16 alarms or relays from any XM module on the bus and A is from 1 to B
Reset	Local reset switch on top of module Remote reset switch wired to terminal base Digital reset command via serial or DeviceNet interface
Power	
Module	24V DC
Consumption	200 mA, max
Heat production	3.4 W (11.6 BTU/hr), max
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C
Physical	
Terminal base	1440-TB-C
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)
Certifications[1]	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection “n”
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

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XM-441 Expansion Relay Module

The XM-441 expansion relay (catalog number 1440-REX00-04RD) adds four relays to any XM measurement module or to the XM-440 master relay.

Attribute	XM-441 (1440-REX00-04RD)
Indicators	
Status indicators	Module power -green Relay 1 - red Relay 2 - red Relay 3 - red Relay 4 - red
Communication	
Host communication	The XM-441 module communicates to a host module via the side connector of the terminal base. If the host is an XM-440 master relay module, then you can place two XM-441 modules immediately to the right of the XM-440 module. All XM measurement modules support just one expansion module, which must be connected directly to and on the right of the host module
Relays	
Number	Four relays, two sets of contacts each - DPDT (2 Form C)
Contacts	250V AC, 50/60 Hz @ 3 A resistive
Failsafe	Normally energized (failsafe, or Normally de-energized (non-failsafe)
Other features	These features are managed by the host XM module: Latching Time delay Logic Reset Activation
Power	
Module	24V DC
Consumption	120 mA, max
Heat production	2.9 W (9.9 BTU/hr), max
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C

Attribute	XM-441 (1440-REX00-04RD)
Physical	
Terminal base	1440-TB-D
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)
Certifications(1)	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection "n"
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

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XM-442 Voted EODS Relay Module

The XM-442 module (catalog number 1440-REX03-04RG) combines with three XM-220 modules to provide an API-compliant, triple-redundant electronic overspeed detection system (EODS).

Attribute	XM-442 (1440-REX03-04RG)
Indicators	
Status indicators	Module power - red/green Shutdown relay - red Alarm relay - red
Communication	
Host communication	The XM-442 module communicates to the speed modules connected to it only via the three digital inputs on the front of the terminal base. Power and communication pass through the side connector of the terminal base but are not used by the XM-442 module
Relays	
Number	Four relays, two sets of contacts each - DPDT (2 Form C)
Contacts	250V AC, 50/60 Hz @ 3 A resistive
Failsafe	Normally energized
Latching	The shutdown and alarm relays latch when the conditions that activate them are met
Logic	Two-out-of-three One-out-of-three
Activation	Low logic level (< 0.8V) on the overspeed/circuit fault inputs
Reset	Local reset switch on top of module Remote reset switch wired to terminal base
Power	
Module	24V DC
Consumption	120 mA, max
Heat production	2.9 W (9.9 BTU/hr), max
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C
Physical	
Terminal base	1440-TB-G
Dimensions (H x W x D), approx.	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)

Attribute	XM-442 (1440-REX03-04RG)
Certifications[1]	
UL	UL Listed for Ordinary Locations UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
CSA	CSA Certified Process Control Equipment CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
EEX	European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection "n"
CE	European Union 89/336/EEC EMC Directive
C-Tick	Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions

(1) When product or packaging is marked. See the Product Certification link at http://www.rockwellautomation.com for Declarations of Conformity, Certificates, and other certification details.

XM-720 Packaged Vibration Monitor with XM-120 Module

XM-721 Packaged Vibration Monitor with XM-121 Module

XM-722 Packaged Vibration Monitor with XM-122 Module

The XM-720 packaged monitors offer pre-assembled vibration monitoring systems that include an XM measurement module, an XM expansion relay module, and a front panel display. The XM-720 provides a standalone solution for monitoring the condition of fans, pumps, blowers, and other essential machinery.

Cat. No.	Description
1440-PK02-05M0	XM-720 machine monitor with XM-120 standard dynamic measurement module
1440-PK02-05M1	XM-720 machine monitor with XM-121 low frequency measurement module
1440-PK02-05M2	XM-720 machine monitor with XM-122 gSE vibration module

Attribute	XM-720 (1440-PK02-05M0) XM-721 (1440-PK02-05M1) XM-722 (1440-PK02-05M2)
Inputs	
Two dynamic inputs	Pre-wired and configured for standard ICP accelerometers Use of velometers or eddy current probes may require minor changes to wiring and configuration
Tachometer Input	
One tachometer input	±25V (50V max peak-to-peak) 1…50,000 events per revolution
Outputs	
4…20 mA outputs	Two isolated outputs 250 Ω max load
Three buffered outputs	Two active buffers, one per channel One resistive buffer for tachometer
Indicators	
Status indicators	Module Transducer Warning Trip status
Two digital meters	Resolution: ±1.66% of full-scale Indicators: 31 behind red tint filter Removable black bezel with white faceplate and black lettering Size: 1/16 DIN; 9.6 x 2.4 cm (3.8 x 0.95 in.) Scale: 0…100% Major divisions: 0, 25, 50, 75, 100% Minor divisions: 5%
Communication	
DeviceNet network	Remote system access is available via the DeviceNet interface
Serial	Serial (RS-232) port for local configuration
Alarms	
Number	16 alarm and danger pairs Any measured parameter
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Startup inhibit/setpoint multiplication	Period: 0…1092 min, adjustable in 0.1 min increments Inhibit/multiplication function: Multiply by N (0…10, 0 = Disarm)
Speed inhibit	A speed range may be specified for each alarm. When applied, the alarm is disabled when speed is outside of the defined range Alarms are defined by the particular XM measurement module in the package
Relays	
Number	Three relays pre-wired and available via back panel terminations for module; transducer tachometer fault (failsafe); warning; and trip
Rating	250V AC @ 3 A resistive
Power	
Module	85…264V DC
Consumption	0.07…0.21 A, max
Heat production	19 W (65 BTU/hr), max
Transducer	Isolated 24V DC, user configurable with wiring
Environmental	
Temperature, operating	-20...65 °C (-4...149 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Relative humidity	95% noncondensing

Attribute	XM-720 (1440-PK02-05M0) XM-721 (1440-PK02-05M1) XM-722 (1440-PK02-05M2)
Physical	
Dimensions (H x W x D), approx.	18.42 x 13.82 x 31.72 cm (7.25 x 5.44x 12.48 in.)
Faceplate width	14.36 cm (5.66 in.)
Weight, approx.	2.7 kg (6 lb)
Certifications	
Agencies	ODVA, CE, C-Tick, CSA Class I Div 2 Groups A, B, C, D[(1)]

(1) When product or packaging is marked. See the Product Certification link at http://www.rockwellautomation.com for Declarations of Conformity, Certificates, and other certification details.

Notes:

Accessories

Terminal Bases

Attribute	XM-940 (1440-TB-A)	XM-941 (1440-TB-B)	XM-942 (1440-TB-C)	XM-943 (1440-TB-D)	XM-944 (1440-TB-E)	XM-946 (1440-TB-G)	XM-947 (1440-TB-H)	XM-DYN (1440-TBS-J)
Supported XM Modules	XM-12*x*	XM-220, XM-320	XM-440	XM-441	XM-36*x*	XM-442	XM-16*x*	XM DYN
Power								
Module	21.6…26.4V DC						18…32V DC	24V DC nom
Consumption, max	300 mA 175 mA, typical		200 mA	120 mA	XM-360 300 mA 170 mA, typical XM-361, XM-362 400 mA	120 mA	Current 190 mA @ 24V DC	250 mA 210 mA, typical
Heat production, max	7 W (24 BTU/hr) 4 W (14 BTU/hr), typical		3.4 W (11.6 BTU/hr)	2.9 (9.9 BTU/hr)	7.20 W (24.6 BTU/hr) 4 W (14 BTU/hr), typical	2.9 W 9.9 BTU/hr)	4.56 @ 24V DC 4.3 W @ 18V DC 4.9 W @ 32V DC XM-161 current 310 mA @ 24V DC 7.44 W @ 24V DC 7 W @ 18V DC 8 W @ 32V DC	4.56 W 3.6 W, typical
Transducer	Isolated 24V DC, user configurable with wiring		N/A					
Environmental								
Temperature, operating	-20…65 °C (-4…149 °F)							-20…70 °C (-4…158 °F)
Temperature, storage	-40…85 °C (-40…185 °F)							-40…85 °C (-40…185 °F)
Relative humidity	95% noncondensing							5…95% noncondensing
Conformal coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C						N/A	
Physical								
Dimensions (H x W x D)	97 x 94 x 94 mm (3.8 x 3.7 x 3.7 in.)							
Side connector	Interconnect to adjacent modules passes primary power (3 A max), DeviceNet protocol and power (300 mA max), and the circuits necessary to support expansion modules							
Terminal screw torque	0.8 N•m (7 lb•in)							

Serial Configuration Utility

Use the XM Serial Configuration utility to commission and configure XM modules. The utility ships with each XM module and can be downloaded from http://www.rockwellautomation.com/support/.

From the support website, choose Downloads>Firmware Updates>Condition Monitoring.

Attribute	Serial Configuration Utility
Operating systems	Microsoft Windows: NT, 2000, XP
Computer requirements	Computer with an available RS-232 serial port Recommended: 400 MHz CPU, 128+ MB RAM, 10 MB free disk space Almost any up-to-date computer will suffice for configuring modules. The recommended configuration is suggested for systems that will be heavily used or that will be used to view live data
Security	Password facility that precludes unauthorized use
DeviceNet address management	0…63
Additional features	• Auto save configuration • Alarm and relay management • Module firmware update • Store highest tachometer speed with reset
Supported XM modules	XM-120 standard vibration XM-120E eccentricity XM-121 low frequency vibration XM-121A absolute shaft vibration XM-122 gSE vibration XM-123 aeroderivative XM-160 direct vibration XM-161 direct vibration with 4…20 mA output XM-162 direct vibration with eddy current probe power XM-220 dual speed XM-320 position XM-360 process XM-361 universal temperature XM-362 thermocouple temperature XM-440 master relay
Plots	Spectra Time waveform Trend Level Alarm and relay status The available plots depend on the module providing the data

Fuse Kit

The fuse kit limits the available current from listed safety extra low voltage (SELV) or protected extra low voltage (PELV) sources. The kit lets you use SELV or PELV supplies as an alternative to a listed Class 2 power source for an XM monitoring system.

Attribute	Fuse Kit (1440-5AFUSEKIT)
Fuse	Bussmann model MDA-5-R
Wire	(0.2…6 mm^2 (30…10 AWG) solid or stranded
Tightening torque	0.5 …0.6 N•m (4.5…5.3 lb•in)
Stripping length	10 mm (0.4 in.)

Serial Communication Cable

The serial communication cable connects a computer to an XM module for configuration by using the XM Serial Configuration utility.

Attribute	Communication Cable (1440-SCDB9FXM2)
Length	2 m (6.56 ft)
Connectors	9-pin female serial to micro-USB

ControlNet Adapter

The ControlNet adapter (catalog number 1440-ACNR) bridges an XM bus network and a ControlNet network. Use only with 1...10 XM dynamic measurement modules (cat. no. DYN02-01RJ).

Attribute	ControlNet Adapter (1440-ACNR)
I/O Capacity	
XM modules, max	10 XM dynamic measurement modules (cat.no. 1440-DYN02-01RJ)
ControlNet communication rate	5 M (fixed value)
XM bus communication rate	500 Kbps (fixed value)
Technical	
Status indicators	Module Backplane (XM bus) ControlNet A ControlNet B
Power consumption, max	2.4 W
Power dissipation, max	2.4 W
Thermal dissipation	8.194 BTU/hr
Input over voltage protection	Reverse polarity protected
Isolation voltage	Tested @ 900V AC for 60 s between XM bus-to-ControlNet network and ControlNet network-to-user power
Field power	Class 2 power supply Nom Voltage: 24V DC Supply Current: 120 mA, max
Wiring	
Power conductor wire size	22...14 AWG (0.34... 2.1 mm^2) solid or stranded copper wire rated at 75 °C (167 °F) or greater 1.2 mm (3/64 in.) insulation max
Wiring category	1 - on power ports 2 - on communication ports
Screw torque	0.8 N•m (7 lb•in)
Physical	
Dimensions (H x W x D), approx.	86.4 x 94 x 68.6 mm (3.4 x 3.7 x 2.7 in.)
Weight, approx.	0.2 kg (0.44 lb)

Attribute	ControlNet Adapter (1440-ACNR)
Environmental	
Temperature, operating	-20...70 °C (-4...158 °F)
Temperature, storage	-40...85 °C (-40...185 °F)
Shock, operating	15 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	20 g
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10...500 Hz
Certifications	
EMC	EN61000-6-2 EN61000-6-4 EN61326-1 (Industrial)
UL	EN61131-2 (Clause 8, Zones A & B)
ULH	UL 508
CUL	UL 1604 Class I Div 2, Groups A, B, C, D CSA C22.2 No. 142-M1987
CULH	CSA C22.2 No. 213-M1987 Class I Div 2, Groups A, B, C, D
LVD	EN61131-2 (Clause 11)
C-Tick (Australia)	AS/NZS CISPR11 (Group 1, Class A)
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA nL IIC T4 Gc

Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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