



Omniace RA3100

Input Modules Overview

Lineup of 9 input module types for inputting various phenomena

ANALOG
DIGITAL



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Lineup of 9 input modules for inputting various phenomena



Voltage System Input Modules

- (1) 2ch Voltage Module RA30-101
- (2) 4ch Voltage Module RA30-102
- (3) 2ch High Speed Voltage Module RA30-103
- (4) 2ch High Voltage Module RA30-107
- (5) 16ch Logic Module RA30-105

Sensor System Input Modules

- (6) 2ch AC Strain Module RA30-104
- (7) 2ch Acceleration Module RA30-109
- (8) 2ch Temperature Module RA30-106
- (9) 2ch Frequency Module RA30-108





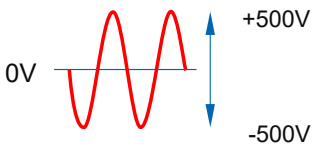
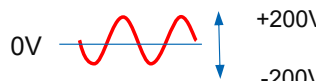
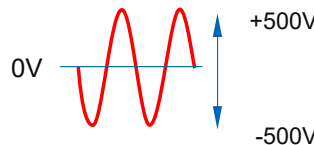
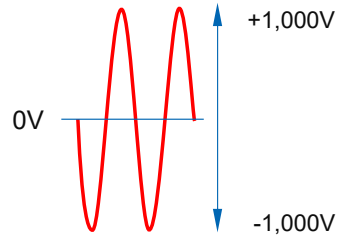
Voltage System Input Modules



	Name	Model name	Range	A/D Resolution	Sample Speed	Others	Features
Voltage	2ch Voltage Module	RA30-101	±500V to ±0.1V	16bit	1MS/s	AAF	Input module capable of measuring ±500V voltage. Anti-aliasing filter (AAF) allows for frequency analysis with no wrap-around.
	4ch Voltage Module	RA30-102	±200V to ±1V	16bit	1MS/s	-	Input module with a maximum input of ±200 V and 4 channels of voltage measurement. When 9 slots are used, a maximum of 36 channels can be measured.
	2ch High Speed Voltage Module	RA30-103	±500V to ±0.1V	14bit	20MS/s	-	This input module is capable of high-speed sampling at 20MS/s and measurement of ±500V input voltage.
	2ch High Voltage Module	RA30-107	±1,000V to ±2V	16bit	1MS/s	RMS	This module can directly input high voltages of ±1,000V (700Vrms). Voltage waveform or RMS can be measured.
Logic	16ch Logic Module	RA30-105	Voltage: 0 to 24V Contact	-	2μsec	-	Input module that measures voltage H, L or contact open / closed.





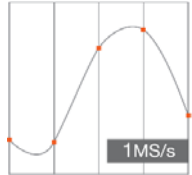
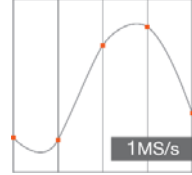
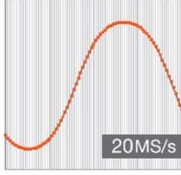
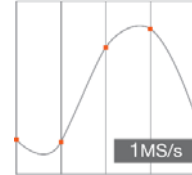




Voltage System Input Modules

Lineup of input modules for measuring many voltage signals from small to high

Name	2ch Voltage Module	4ch Voltage Module	2ch High Speed Voltage Module	2ch High Voltage Module
Model name	RA30-101	RA30-102	RA30-103	RA30-107
Appearance				
Functions	Input module capable of measuring $\pm 500V$ voltage. Anti-aliasing filter allow for frequency analysis with no wrap-around.	Input module with a maximum input of $\pm 200V$ and 4 channels of voltage measurement. When 9 slots are used, a maximum of 36 channels can be measured.	This input module is capable of high-speed sampling at 20MS/s and measurement of $\pm 500V$ input voltage.	This module can directly input high voltages of $\pm 1,000V$ (700Vrms). Voltage waveform or RMS value can be measured.
No. of channels	2ch	4ch	2ch	2ch
Maximum input voltage	Maximum input voltage: $\pm 500V$ 	Maximum input voltage: $\pm 200V$ 	Maximum input voltage: $\pm 500V$ 	Maximum input voltage: $\pm 1,000V$ 
Range	500V to 0.1V	200V to 1V	500V to 0.1V	1,000V to 2V

Voltage System Input Modules

Lineup of input modules for measuring many voltage signals from small to high

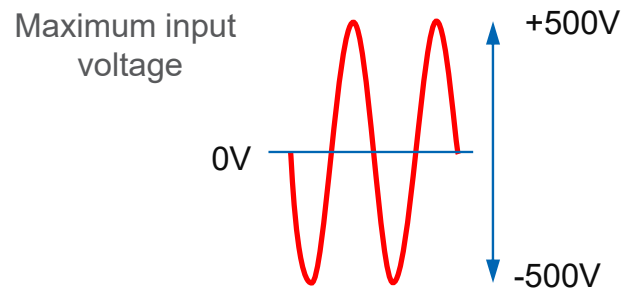
Name	2ch Voltage Module	4ch Voltage Module	2ch High Speed Voltage Module	2ch High Voltage Module
Model name	RA30-101	RA30-102	RA30-103	RA30-107
Appearance				
Sampling Speed	1MS/s 	1MS/s 	20MS/s 	1MS/s 
A/D Resolution	16bit	16bit	14bit	16bit
Other functions	With anti-aliasing filter	-	-	RMS conversion
Input cable	Insulated BNC cable (RA30-507) 	Insulated BNC cable (RA30-507) 	Insulated BNC cable (RA30-507) 	High voltage alligator clips (RA30-509-01) High-voltage connection cable (RA30-509-02) 

Voltage System Input Modules

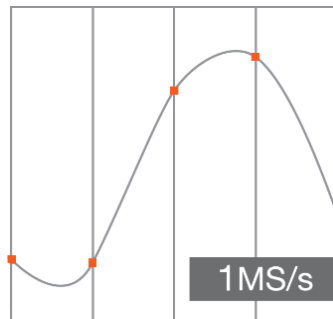


2ch Voltage Module RA30-101

This is the most general-purpose input module. It can measure low to high voltages of 0.1V to $\pm 500V$ and its anti-aliasing filter allows for frequency analysis with no wrap-around.



Sampling speed

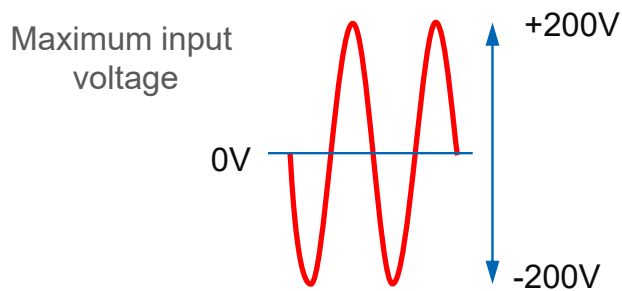


Item	Standard
Input Channels	2ch
Input Connector	Insulated BNC
Measurement Range	100mV to 500V
Anti-aliasing Filter (AAF)	Cutoff frequency: 20 to 40kHz, OFF
A/D Resolution	16bit
Max. sampling rate	1MS/s
Maximum allowable input voltage	$\pm 500V_{\text{peak}}$
Maximum Rated Voltage to Ground	AC/DC 500V CAT II

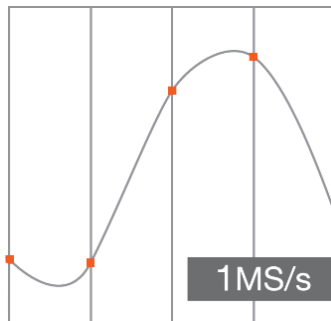
Voltage System Input Modules

4ch Voltage Module RA30-102

Input module with a maximum input of $\pm 200\text{V}$ and 4 channels of voltage measurement. It also offers high A/D resolution at 16bits and, when 9 slots of the RA3100 are used, up to 36 channels can be measured.



Sampling speed

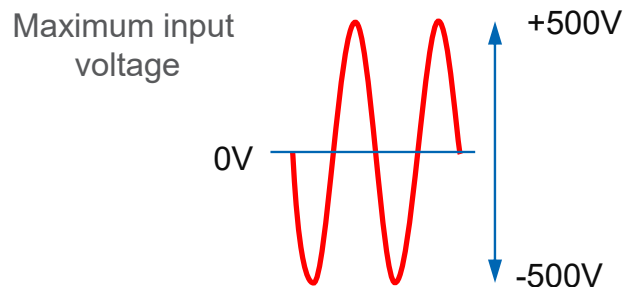


Item	Standard
Input Channels	4ch
Input Connector	Insulated BNC
Measurement Range	1V to 200V
A/D Resolution	16bit
Max. sampling rate	1MS/s
Maximum allowable input voltage	$\pm 200\text{V}_{\text{peak}}$
Maximum Rated Voltage to Ground	AC/DC 300V CAT II

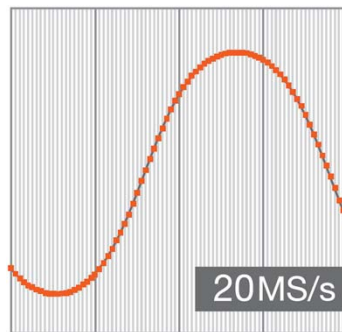
Voltage System Input Modules

2ch High Speed Voltage Module RA30-103

This input module is capable of high-speed sampling at 20MS/s and measurement of $\pm 500V$ input voltage. Built-in large-capacity memory (4GB) enables 18ch measurement for 5 seconds.



Sampling speed



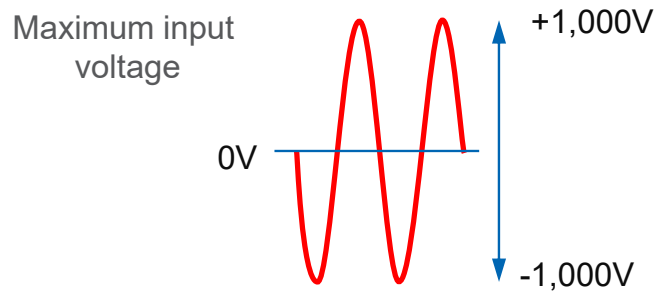
Item	Standard
Input Channels	2ch
Input Connector	Insulated BNC
Measurement Range	100mV to 500V
A/D Resolution	14bit
Max. sampling rate	20MS/s
Maximum allowable input voltage	$\pm 500V_{\text{peak}}$
Maximum Rated Voltage to Ground	AC/DC 500V CAT II

Voltage System Input Modules

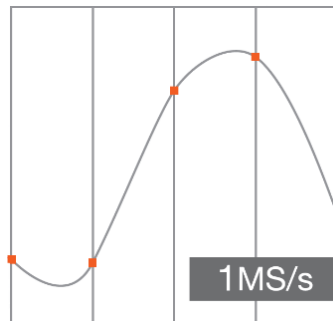


2ch High Voltage Module RA30-107

This module is capable of $\pm 1,000\text{V}$ high voltage input. Voltage waveform or RMS value can be measured.



Sampling speed



Item	Standard
Channels	2ch
Input Connector	Banana input terminal (dedicated input cable sold separately)
Input Impedance	4M Ω
Measurement Mode	Voltage measurement mode, RMS measurement mode
Measurement Range	2V to 1,000V
RMS conversion time (in RMS measurement mode)	High speed: 0.1s, Medium speed: 0.25s, Low speed: 1s
A/D Resolution	16bit
Max. sampling rate	1MS/s
Maximum allowable input voltage	$\pm 1,000\text{V}$ peak
Maximum Rated Voltage to Ground	AC/DC 1,000V CAT II, AC/DC 600V CAT III

Voltage System Input Module






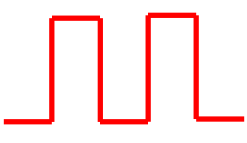
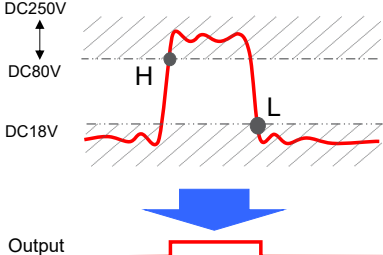
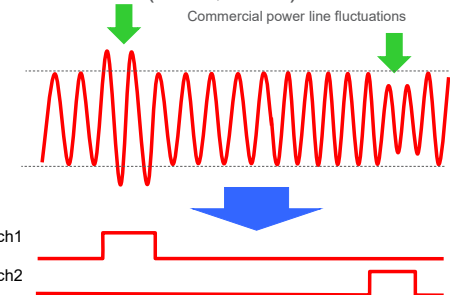
16ch Logic Module RA30-105

One unit of this input module can input 16 channels of logic signals and when 9 modules are installed in the main unit, 144 channels of logic signals can be measured.

Detects and records high and low voltage (0 to 24V) or open and closed contacts.

Furthermore, by connecting probes, it is possible to measure high and low AC and DC voltages up to 250V and power line variations (100V and 200V).



<p>Signal cable/ adapter</p>	<p>8ch logic cable (IC clip) RA30-501 8ch logic cable (alligator) RA30-502</p> 	<p>Floating voltage probe 1539S + 8ch logic cable (round type convertor connector) RA30-503</p> 	<p>Voltage conversion probes for recording voltage increases and decreases 1540S/1543S + 8ch logic cable (round type convertor connector) RA30-503</p> 
<p>Functions</p>	<p>Records high and low voltage (0 to 24V) or open and closed contacts.</p> <p>DC24V, closed ↕ 0V, open</p> 	<p>High and low AC/DC voltages of up to 250V can be measured.</p> 	<p>Power line fluctuations (100V, 200V) can be measured.</p> <p>Commercial power line fluctuations</p> 

Sensor System Input Modules

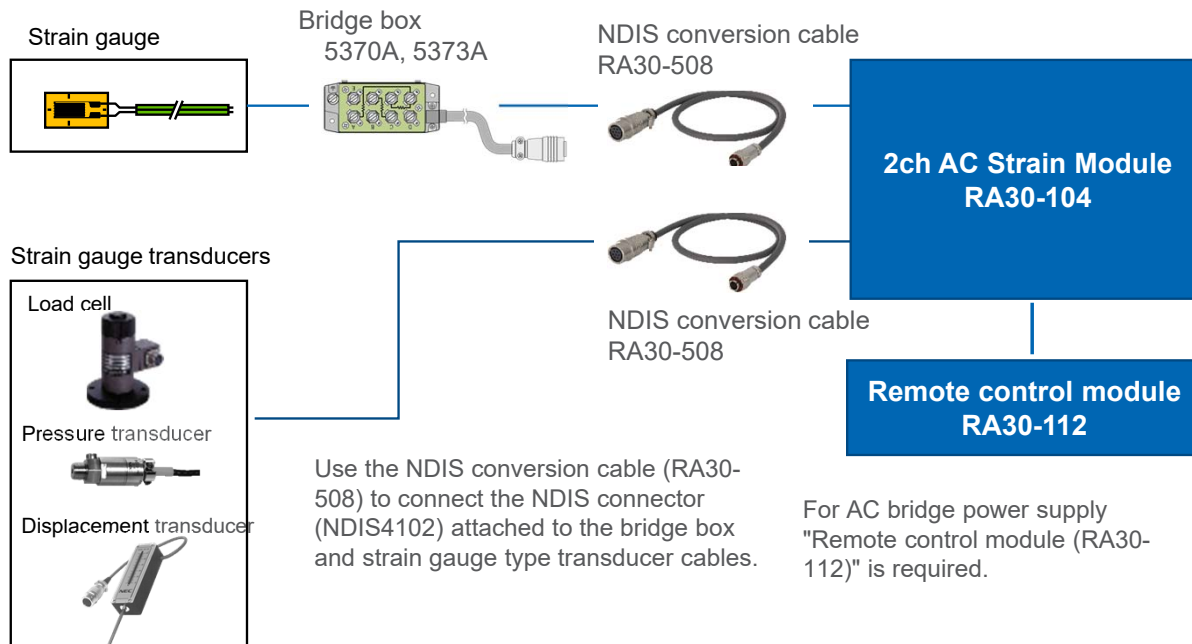


Name	Model name	Features
2ch AC Strain Module	RA30-104	Input module for high-sensitivity strain measurement. The AC bridge method can be used for measurement that is strong against external noise.
2ch Acceleration Module	RA30-109	This module can measure acceleration, speed, and displacement using a piezoelectric acceleration transducer. In addition to measuring acceleration, speed, and displacement, bearing abnormalities can be found using envelope processing.
2ch Temperature Module	RA30-106	An input module for a thermocouple or resistance temperature detector. Thermocouples can be used for high temperatures and wide temperature ranges, while resistance temperature detectors can be used to measure temperatures near room temperature with high accuracy.
2ch Frequency Module	RA30-108	This input module can measure the period, rotation speed, no. of pulses, etc., of input signals. Measurement result data such as period, rotation speed, no. of pulses, etc., can be recorded with the input pulse signal.

Sensor System Input Modules

2ch AC Strain Module RA30-104

This input module enables stress measurement using strain gauges as well as strain gauge transducers such as load cells, pressure transducers, and torque transducers. The AC bridge method can be used for measurement that is strong against external noise.



Item	Standard
Input Channels	2ch
Input Connector	NDIS4109 Connector (conversion cable sold separately)
Bridge Voltage (BV)	0.5VAC, 2VAC, 5kHz Sine Wave
Applicable Strain Gauge Resistance	120Ω to 350Ω
Gauge Rate	2
Equilibrium adjustment range and adjustment method	Within 10,000 x 10 ⁻⁶ strain, Electronic auto balance
Maximum Range	500 x 10 ⁻⁶ strain (at BV=2V)
Frequency Characteristics	DC to 2kHz ±10%
Other	Simple Bridge Check
A/D Resolution	16bit
Maximum Sampling Speed	100kS/s

Sensor System Input Modules

2ch Acceleration Module RA30-109

This module can measure acceleration, speed, and displacement of mechanical vibration using a piezoelectric acceleration transducer (built-in amplifier, charge output type). The periodicity of impact vibration caused by bearing flaws can be observed using RMS conversion and then envelope processing function.



Built-in amplifier



Voltage (V)
[mV/(m/s²)]

Charge output type



Charge (Q)
[pC/(m/s²)]

Charge converter



Voltage (V)
[mV/(m/s²)]

2ch Acceleration Module
RA30-109

Item	Standard
Input Channels	2ch
Input Connector	Metallic BNC
Sensor type	<ul style="list-style-type: none"> • Amplifier built-in piezoelectric acceleration transducers (charge output type, voltage output type) • Charge output type piezoelectric acceleration transducers (charge converter needed)
Sensor Power Supply	4.2mA, 22.5V
Sensor sensitivity setting range	0.100 to 100.000mV/(m/s ²)
Measurement Mode	Acceleration, speed, displacement
Measurement Range	Acceleration: 1m/s ² to 50km/s ² Speed: 10mm/s to 500m/s Displacement: 100μm to 5m
Arithmetic Functions	RMS conversion (response time) Envelope processing
Anti-aliasing Filter (AAF)	Cutoff frequency: 20 to 40kHz, OFF
TEDS	IEEE 1451.4 Class 1-compliant
A/D Resolution	16bit
Maximum sampling speed	1MS/s

BPF: bandpass filter, LPF: Low-pass Filter (LPF)

Sensitivity information can be automatically acquired from TEDS (Transducer Electronic Data Sheet)-compliant sensors, reducing measurement preparation time and ensuring reliable measurement.

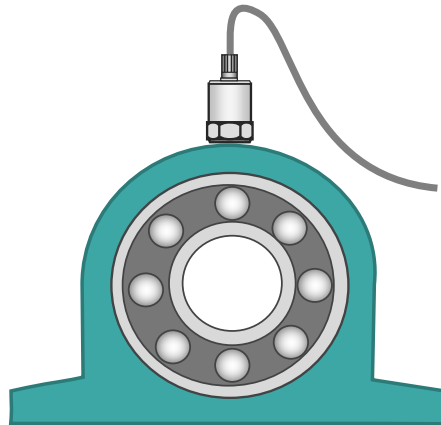
Sensor System Input Modules

2ch Acceleration Module RA30-109

Envelope processing

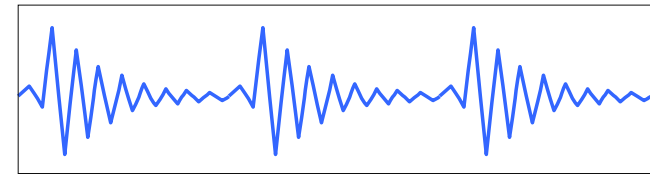
Envelope processing helps to identify abnormal areas of bearings (inner rings, outer rings, and rollers/balls) by looking at the periodicity of vibrations caused by bearing flaws.

Envelope-processed signals are subjected to frequency analysis and the resulting primary frequency and information such as the size of each bearing part, the number of rollers and balls, and the shaft rotation speed can be used to infer the damaged part.

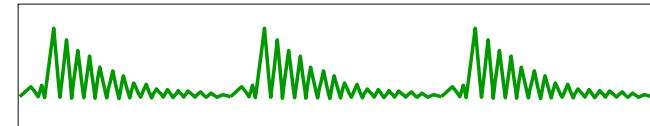


Envelope processing depiction

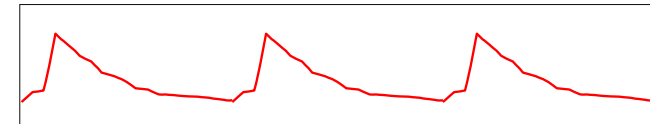
(1) Vibration waveforms caused by scratches on bearings are measured through a bandpass filter



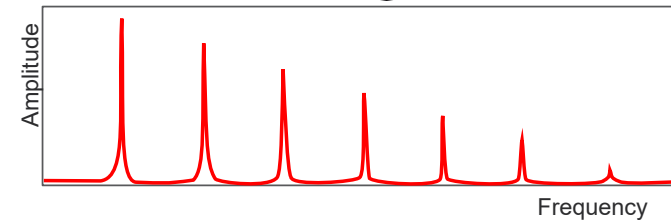
(2) Absolute value detection is performed on the vibration waveform



(3) High-frequency parts are removed with a low-pass filter



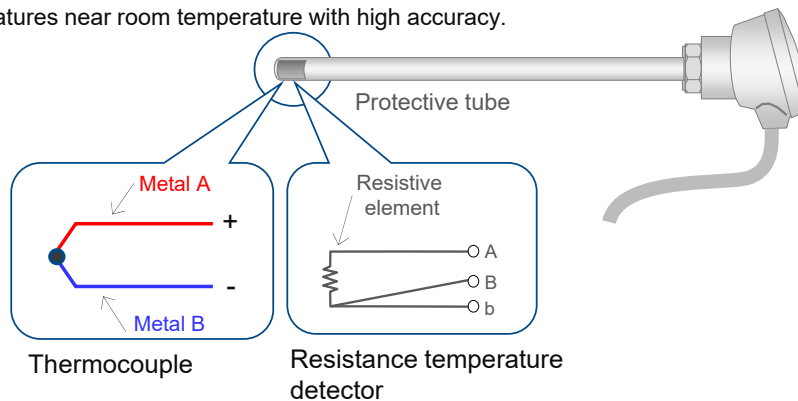
for Frequency Analysis



Sensor System Input Modules

2ch Temperature Module RA30-106

An input module for a thermocouple or resistance temperature detector. Thermocouples can be used for high temperatures and wide temperature ranges, while resistance temperature detectors can be used to measure temperatures near room temperature with high accuracy.



Item	Standard
Input Channels	2ch
Input Connector	Screw terminals
Adaptive Sensor	Thermocouple type: K, E, J, T, N, R, S, B, C (JIS C1602:2015) Resistance temperature detector (RTD): Pt100, Pt1000 (JIS C1604:2013)
A/D Resolution	16bit
Data update rate	High speed (1.5ms), normal (100ms), low speed (1s)

Features of Thermocouples and Resistance Temperature Detectors

Sensor Type	Description	Advantages	Disadvantages
Thermocouple	A sensor utilizing the phenomenon that a voltage is generated when a temperature difference is applied to the contact points at both ends of a circuit created by connecting two different types of metal wires.	Advantages	Low cost, high temperature and wide temperature range (-200 to 2,300°C), small temperature measurement objects, measurement in confined spaces, fast thermal response
		Disadvantages	Poor accuracy (compared to Resistance temperature detector), reference junction required
Resistance temperature detector	A sensor utilizing the phenomenon that the electrical resistance of metals changes with changes in temperature.	Advantages	High accuracy (compared to Thermocouple), no reference junction required
		Disadvantages	Large form factor, slow response, narrower temperature range (-200 to 850°C) than thermocouple, expensive, weak against vibration and shock

Sensor System Input Modules

2ch Frequency Module RA30-108

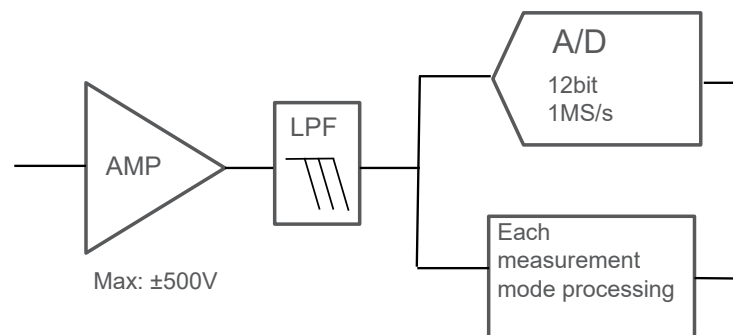
Period, rotation speed, pulse count, etc. can be measured for the input pulse signal.

Measurement result data such as period, rotation speed, pulse count, etc., and the input pulse signal can be saved.

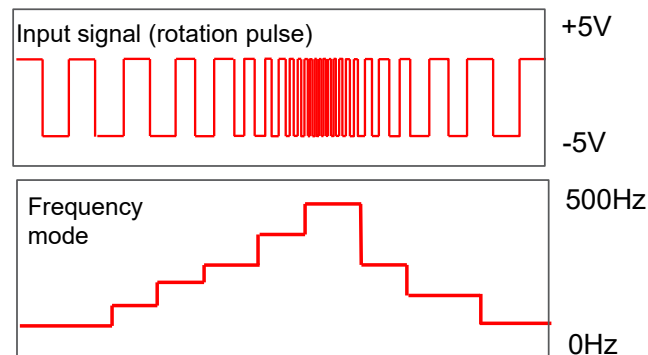


Item	Standard	
Input Channels	2ch	
Input Connector	Insulated BNC	
Input Voltage	$\pm 1V$ to $\pm 500V$	
Measurement Mode	Period: 5 μ s to 100s	Power frequency: 50Hz / 60Hz / 400Hz
	Frequency: 0 to 200kHz	Range of variation: center 13Hz to 13kHz
	Rotation speed: 0 to 1Mrpm	Pulse count: 40k counts
	Pulse width: 2.5 μ s to 100s	Pulse integration: 1 to 2G counts
	Duty: 0 to 100%	
Measuring Signal	4 signals (2-channel input signal and 2-channel measurement mode signal)	
A/D Resolution	12bit	
Maximum Sampling Speed	1MS/s	

Functional block



Measured data depiction



Sensor System Input Modules

2ch Frequency Module RA30-108



The following measurement modes can be selected for the input pulse signal.

Measurement Mode	Measurement Content
Period	Measures the period of the measured pulse. (s: seconds)
Frequency	Measure the frequency of the measured pulse. (Hz: hertz)
Rotation speed	Measure the rotation speed of the measured pulse. (rpm: rotations)
Pulse width	Measures the pulse width of the measured pulse. (s: seconds)
Duty ratio	Measure the duty ratio of the measured pulse. (%: percentage)
Power frequency	Measures fluctuations in power supply frequency. (Hz: hertz)
Range of variation	Measures the range of variation from the center frequency. (%: percentage)
Pulse count	Counts the number of measured pulses within the gate time. (no.)
Pulse integration	Integrates the number of measurement pulses. (no.)

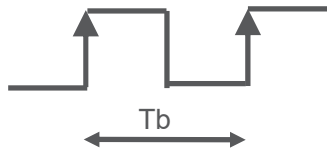
Sensor System Input Modules

2ch Frequency Module RA30-108



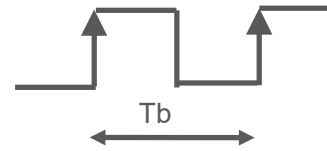
Period Mode

Measures the period of the measured pulse.
Measures the width (Tb) from leading edge to leading edge of the pulse.



Frequency Mode

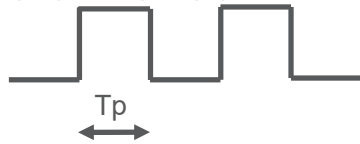
Measures the frequency of the measured pulse.
Calculates the period from the width (Tb) from leading edge to leading edge of the pulse.



$$f \text{ (Hz)} = 1 / \text{Period (Tb)}$$

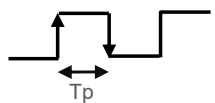
Pulse Width Mode

Measures the pulse width (Tp) from leading edge (trailing edge) to trailing edge (leading edge) of the pulse.



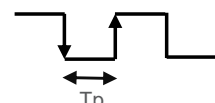
Either "leading edge" or "trailing edge" of the measured pulse can be set.

Positive



Pulse width (Tp) from leading edge to trailing edge is measured

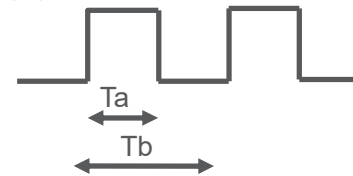
Negative



Pulse width (Tp) from trailing edge to leading edge is measured

Duty Ratio Mode

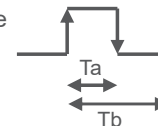
Measures the pulse ratio (Ta/Tb) from leading edge (trailing edge) to trailing edge (leading edge) of the pulse.



$$\text{Duty ratio} = \text{Pulse width (Ta)} / \text{Period (Tb)}$$

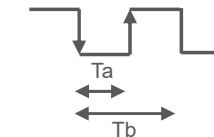
Either "leading edge" or "trailing edge" of the measured pulse can be set.

Positive



Pulse ratio (Ta/Tb) from leading edge to trailing edge is measured

Negative



Pulse ratio (Ta/Tb) from trailing edge to leading edge is measured

Sensor System Input Modules

2ch Frequency Module RA30-108



Rotation Speed Mode

Measures the rotation speed of the measured pulse.

$$\text{Rotation speed (rpm)} = 60 / (\text{Measured period} \times \text{No. of pulses per revolution})$$

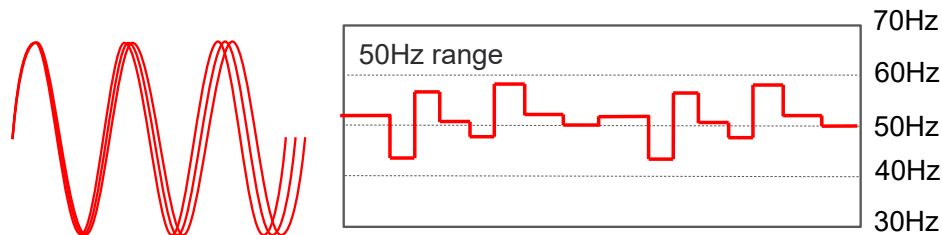
* The number of pulses per revolution can be set from 1 to 100.



The gear to the left has 11 teeth, so the number of pulses per revolution is 11.

Power Frequency Mode

Measures fluctuations in power supply frequency (50/60/400Hz).

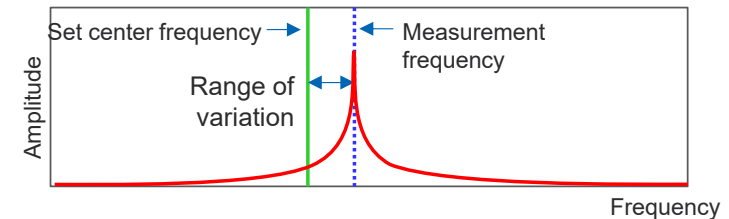


Range of Variation Mode

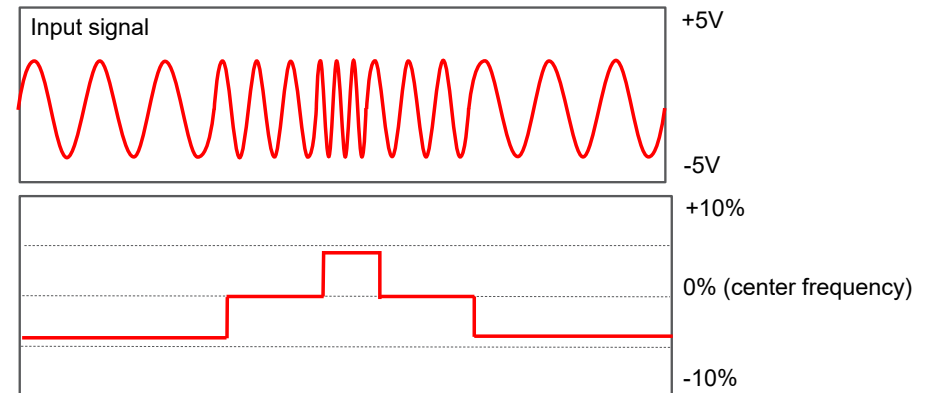
Measures the variation from the measured frequency and the set center frequency.

$$\text{Range of variation (\%)} = \text{Measurement frequency} / \text{Center frequency}$$

The illustration below shows the range of variation from frequency analysis data.



This module detects the frequency from the input pulse and calculates the variation from the set center frequency value. Changes in range of variation can be measured as sequential data.



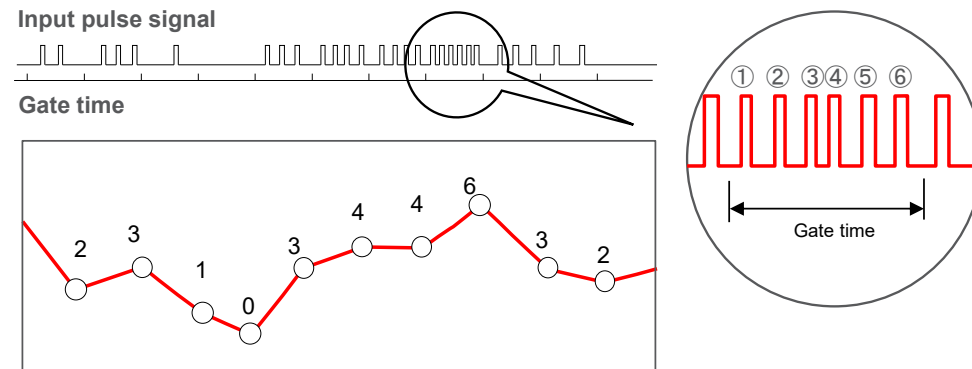
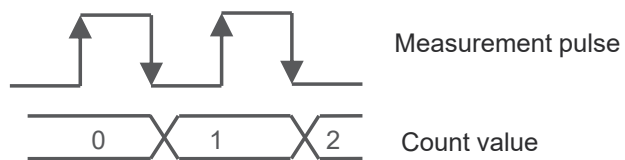
Sensor System Input Modules

2ch Frequency Module RA30-108

Pulse Count Mode

Counts the number of pulses confirmed from leading edge (trailing edge) to trailing edge (leading edge) of the pulse within the gate time.

The count value is cleared at every gate time.



The number of pulse signals input within the gate time is counted and recorded.

- Maximum integration: Up to 40,000 counts can be counted.
(Minimum pulse width: 2.5 μ s)

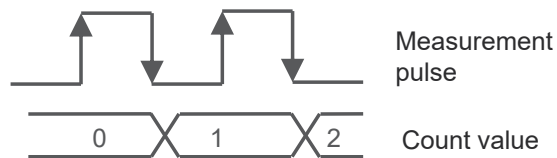
Sensor System Input Modules

2ch Frequency Module RA30-108



Pulse Integration Mode

Integrates the number of pulses when the pulse is confirmed from leading edge (trailing edge) to trailing edge (leading edge) of the pulse.



Count value reset operations

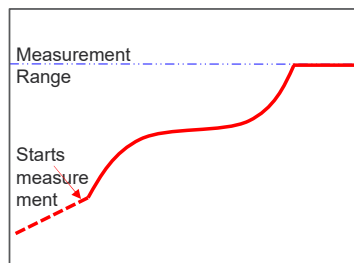
OFF: Count value is stopped at the range upper limit.

Start: When recording starts, the count value is reset and then stopped at the range upper limit.

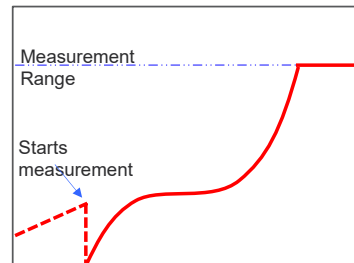
Over: When the count value reaches the range upper limit, the count value is reset and measurement starts again from 0.

Start & Over: The count value is reset when recording starts. When the count value reaches the range upper limit, the count value is reset and measurement starts again from 0.

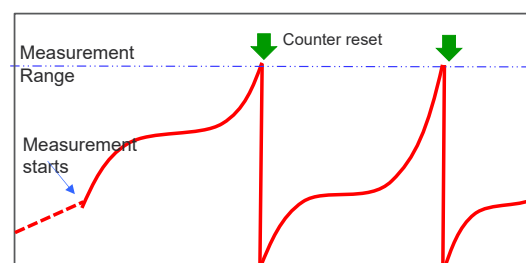
Reset operation: OFF



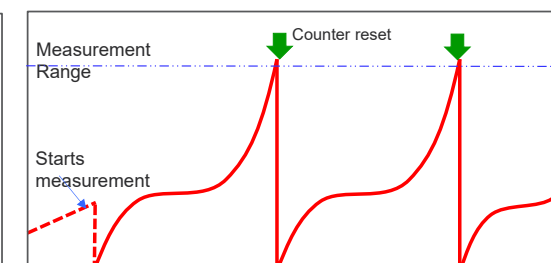
Reset operation: Start



Reset operation: Over





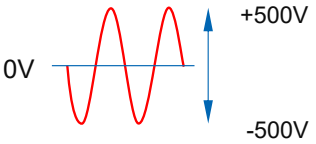
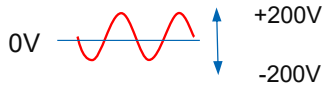
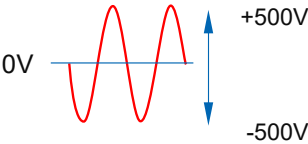
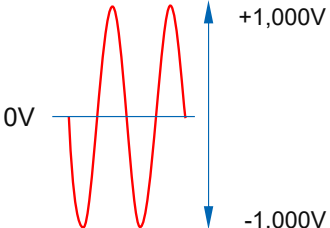
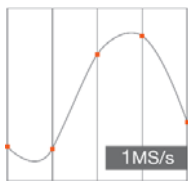
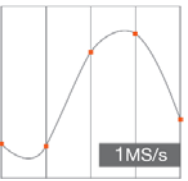
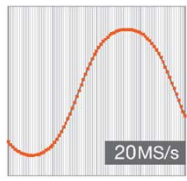
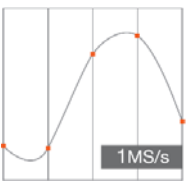


Reset operation: Start & Over



Voltage System Input Module

Lineup of input modules for measuring many voltage signals from small to high

Name	2ch Voltage Module	4ch Voltage Module	2ch High Speed Voltage Module	2ch High Voltage Module
Model name	RA30-101	RA30-102	RA30-103	RA30-107
Appearance				
Functions	Input module capable of measuring $\pm 500V$ voltage. Anti-aliasing filter allow for frequency analysis with no wrap-around.	Input module with a maximum input of $\pm 200V$ and 4 channels of voltage measurement. When 9 slots are used, a maximum of 36 channels can be measured.	This input module is capable of high-speed sampling at 20MS/s and measurement of $\pm 500V$ input voltage.	This module can directly input high voltages of $\pm 1,000V$ (700Vrms). Voltage waveform or RMS value can be measured.
No. of channels	2ch	4ch	2ch	2ch
Maximum input voltage	Maximum input voltage: $\pm 500V$ 	Maximum input voltage: $\pm 200V$ 	Maximum input voltage: $\pm 500V$ 	Maximum input voltage: $\pm 1,000V$ 
Range	500V to 0.1V	200V to 1V	500V to 0.1V	1,000V to 2V
Sampling speed				
A/D Resolution	16bit	16bit	14bit	16bit
Other functions	With anti-aliasing filter	-	-	RMS conversion