Advanced Tachometer

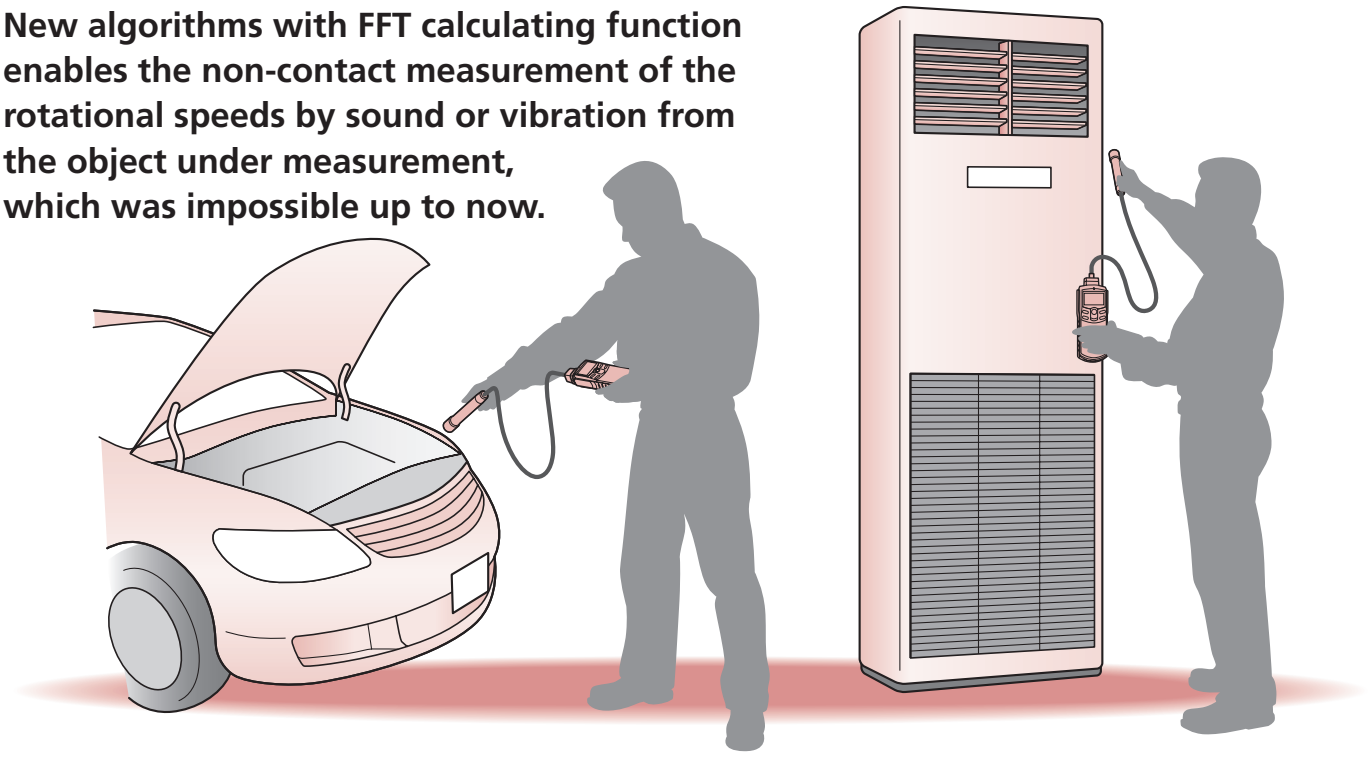
FT-7100

Discontinued
(Reference only)

ONO SOKKI

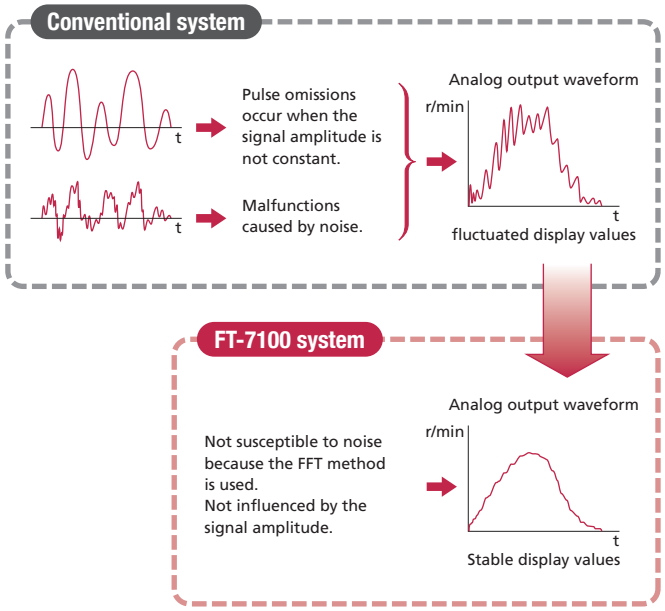
FT-7100 Advanced Tachometer

New algorithms with FFT calculating function enables the non-contact measurement of the rotational speeds by sound or vibration from the object under measurement, which was impossible up to now.



Outline

The FT-7100 is a handheld tachometer that uses FFT calculations to perform frequency analysis and measure rotational speed. It can be used in a wide range of measurement applications, such as motor's constant and steady rotational speed and engine rotations during acceleration/deceleration etc.



Features

- Rotation measurements can be taken even by sound or vibrations - no need for the modification or attachment to the rotational shaft for the measurement.
- Capable of measurement even changes in rotational speed during acceleration or deceleration.
- Effective for measuring the rotational speed of engines in completed vehicles.
- Various sensors can be used.
- Provided with an analog output function.
- Large size LCD with backlight for displaying the measured result is provided.
- Provided with an averaging function.

Condition display
(LOW battery, error display)

Indicator
Flashes at a regular interval when the amplifier sensitivity has been adjusted to an appropriate value.

Large, easy-to-read LCD display (Backlight)

Input connector (BNC)

Sensor selection switch
Switch to select the sensor type, IP series or sensors other than IP series.

Sensor amplifier sensitivity Adjustment dial

Screw for tripod attachment

Battery compartment
(Four AAA alkaline batteries)

Connector for the AC adapter

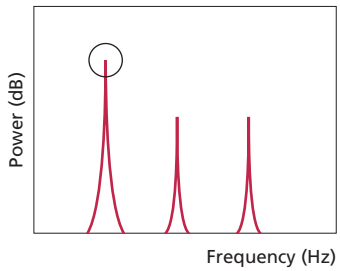
Connector for analog/monitor output

Four measurement mode algorithms can be selected to suit your measurement application

Measurement mode	Algorithm	Measurement algorithm
Constant rotation measurement (CNS)	A	Maximum peak frequency method
	B	Frequency interval method
Accelerated/decelerated rotation measurement (ACT)	D	Maximum peak frequency method
	E	Maximum peak frequency method
		Rotational speed candidate selection

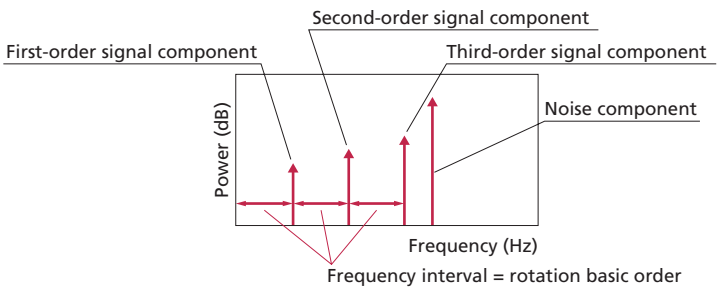
* With the D and E modes, since internal processing is performed at high speeds, the algorithm tracks the accelerated and decelerated rotation.
* With the E mode's rotational speed candidate selection function, the most suitable rotational speed can be selected from up to a maximum of eight frequency peaks.

Calculation is performed using the frequency of the power spectrum's maximum peak. Measurement is normally performed in this mode.



Maximum peak frequency method

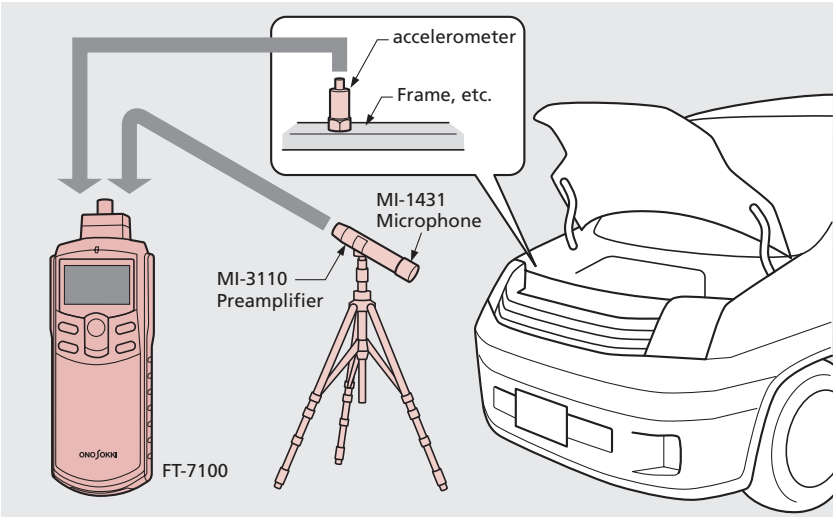
The frequency intervals of the order components of the rotation are sought sequentially. The largest frequency interval is judged to be the first-order component of the rotational speed. This method is used to determine the rotational speed, and is an effective method to use when the first-order peak is unstable.



Frequency interval method

Application examples

Using a microphone or an accelerometer to measure the rotational speed of an engine

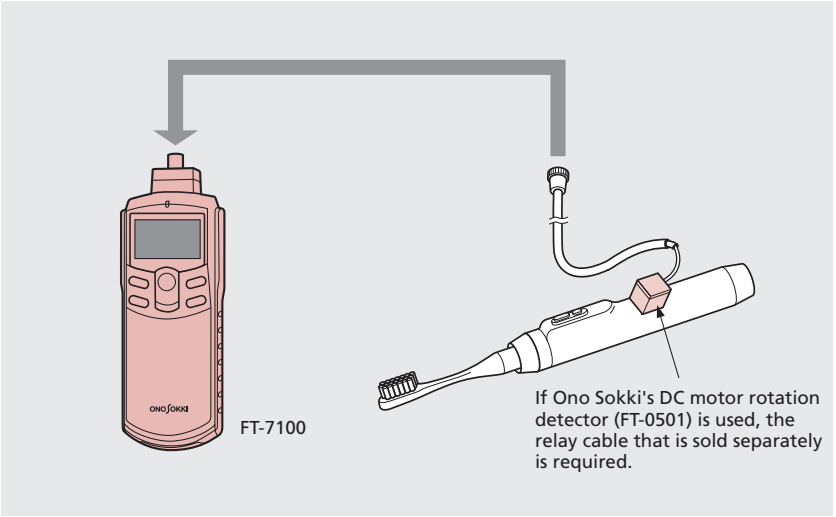


The rotational speed of an engine can be measured by the sound or vibration caused by the movement of the pistons. This is an effective measurement method when the engine compartment is covered, and engine rotation sensors cannot be attached.

* Set the number of pulses to match the number of ignition firings per one crankshaft rotation.

Example:
In the case of a four-cylinder engine with four-cycle, the number of pulse is set at 2 P/R.

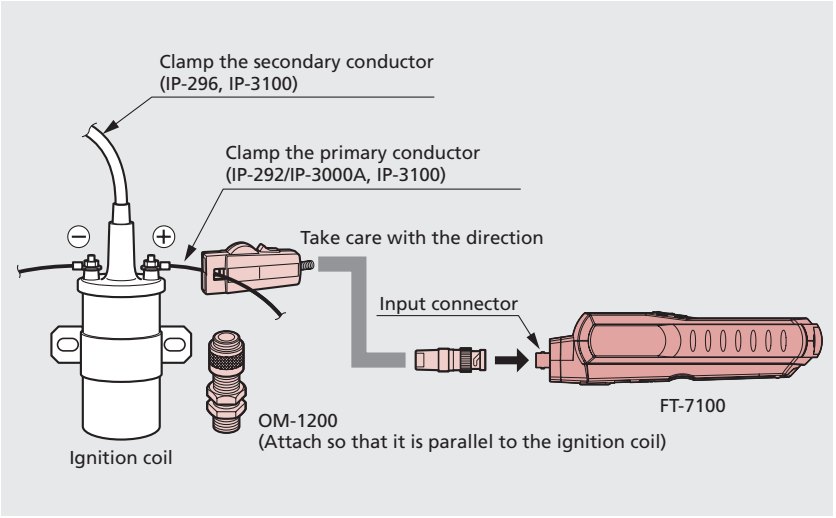
Measuring the rotational speed of DC motors incorporated into home appliances



This example shows how to measure the rotational speed of DC motors that are built in the home appliances. Even if the DC motor has been installed deep inside an appliance such as an electric toothbrush, the rotational speed can be obtained by the magnetic flux leaking from the motor.

* The rotational speed can be measured simply by inputting the number of poles in the DC motor rotor.

Using an engine rotation sensor to measure the rotational speed of an engine

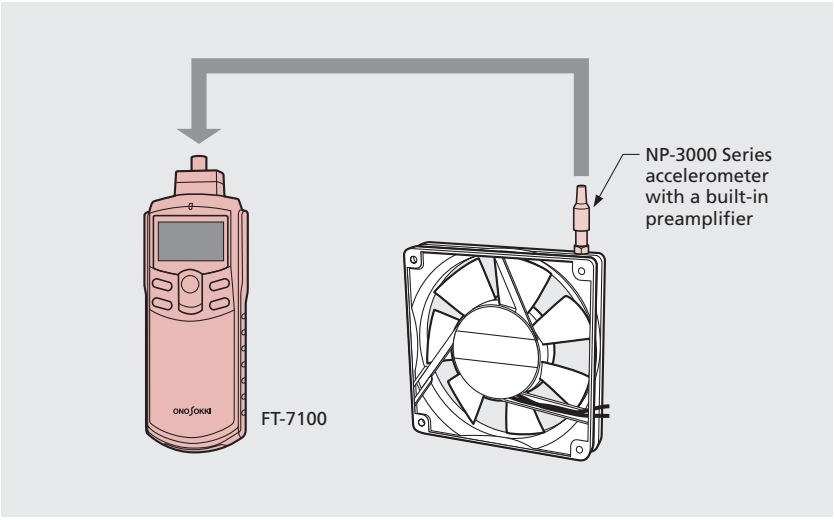


The rotational speed of an engine can be measured by clamping a sensor to the primary low-voltage or secondary high-voltage conductor. Measurement can be performed simply by inputting the number of ignitions per rotation.

* Set the number of pulses to match the number of ignition firings per one rotation.

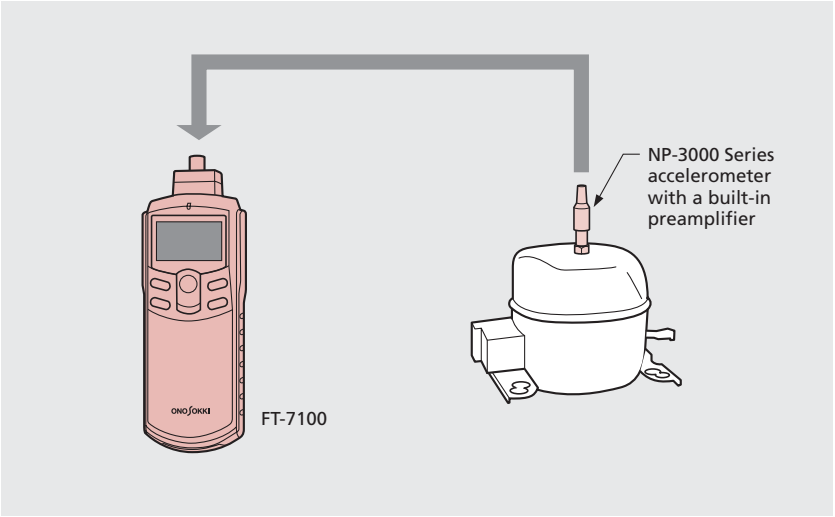
Example:
In the case of a 4-cycle engine
If you will be performing measurement on the primary conductor, set the number of pulses to half the number of cylinders.
If you will be performing measurement on the secondary conductor, make the setting 0.5 P/R so that there is one pulse for every two rotations.

Using an accelerometer to measure the rotational speed of a small fan



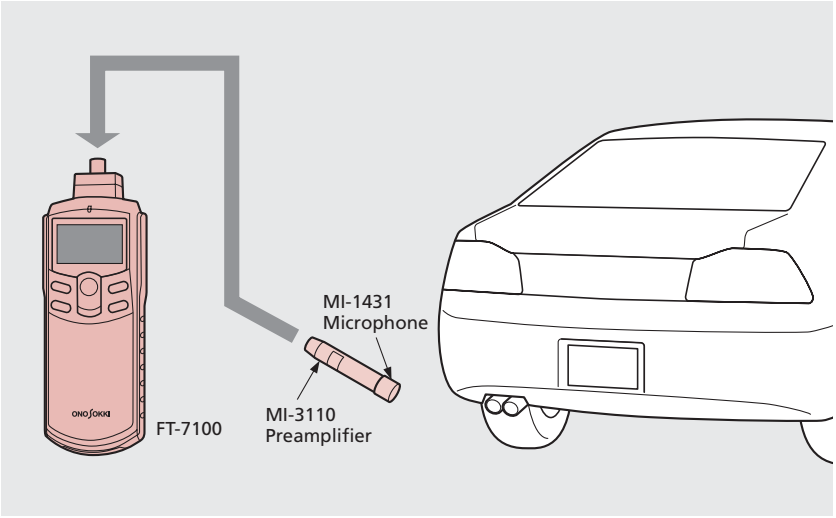
This example shows how to measure the rotational speed of rotating objects such as a small fan. The vibrations from a rotating object depend on the rotational movement of that object. The rotational speed of an object can be obtained by measuring the vibration frequency.

Using an accelerometer to measure the rotational speed of a compressor



This example shows how to measure the rotational speed of the compressors that are used in air conditioners and similar equipment. When used in combination with an accelerometer, the FT-7100 can be used to measure the rotational speed of a compressor whose rotational shaft is not directly accessible.

Using a microphone to measure the rotational speed of an engine from the muffler noise



This example shows how to measure the rotational speed of an engine from an automobile's muffler noise. Since the pulsation component of the engine rotation is included in the muffler noise, the engine's rotational speed can be obtained by this pulsation frequency component.

* Set the number of pulses to match the number of ignition firings per one crankshaft rotation. Please note, however, that depending on muffler performance, there may be cases when measurement cannot be performed.

*All detectors and peripherals described on page 4 & 5 are sold separately as options.

System Configuration

Rotation measurement from sound

Microphone
Preamplifier

MI Series
MI-3110
MI-1341

Rotation measurement from vibrations

Accelerometers

NP-2000/3000 Series

Engine rotation detectors
(Vibration sensors)

VP-202/1220

Rotation measurement from ignition pulse of engine

Ignition pulse detectors

IP-292/296
IP-3000A/3100

Electromagnetic type
detector (for ignitions)

OM-1200

Rotation measurement from a magnetic flux

DC motor rotation
detector

FT-0501

MX-100 Series
MX-101 (1.5 m)
MX-105 (5 m)
MX-110 (10 m)
MX-115 (15 m)
MX-120 (20 m)

NP-0120 Series
NP-0121 (1.5 m)
NP-0122 (3 m)
NP-0123 (5 m)

NP-0130 Series
NP-0131 (1.5 m)
NP-0132 (3 m)
NP-0133 (5 m)

NP-0150 Series
NP-0151 (1.5 m)
NP-0152 (3 m)
NP-0153 (5 m)

Note:
The suitable signal cable should be selected on the model of the selected accelerometers and measurement condition.

When using the NP-3000 Series

BNC/miniature conversion adaptor

NP-0021

When using the NP-2000 Series

Charge converter

CH-6130
CH-6140

Directly-connected cable (2.9 m)

Directly-connected cable (2.9 m)

MX-000 Series
MX-005 (5 m)
MX-010 (10 m)
MX-015 (15 m)
MX-020 (20 m)

Directly-connected cable (3.0 m)

Relay cable
(No model name: 0.5 m)

Note: MI Series and NP Series catalogue are available separately.

Direct connection

Advanced tachometer FT-7100

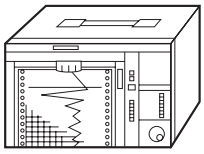
Note: All the peripheral equipment described on this page is sold separately as an option.

Analog output

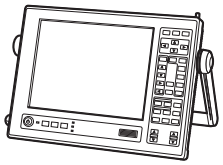
Analog output for a monitor

AC adapter
PB-7080 (AC100 to 220 V)

Recorder



FFT analyzer



FT-7100 Specifications

Measurement

Target measurement objects	DC motors, compressors, engines, general rotating objects
Calculation method	FFT calculation
Measurement time	Within 250 ms
Input frequency ranges	2000 Hz range: 30 Hz to 2000 Hz 500 Hz range: 7.5 Hz to 500 Hz 250 Hz range: 3.75 Hz to 250 Hz
Measurement unit	r/min (rotational speed)
Measurement accuracy	±2 x rotational speed resolution (r/min), ±1 count * The rotational speed accuracy depends on the frequency range.
Minimum rotational speed resolution	Frequency range (Hz) ÷ 6400 x 60 ÷ the number of pulses set (P/R) * The resolution becomes coarse when the rotational speed is accelerating or decelerating. 6400 = 200 lines x 32
Filter function	Limited to the frequency range that you wish to measure (rotational speed range) from the overall range of the selected frequency range
Averaging	Moving average No. of averages: OFF, 2, 4, 8, 16
Sensor amplifier sensitivity adjustment dial	The sensor amplifier sensitivity can be adjusted by using the rotary dial located on the right side of the main unit.

Detection

Compatible sensors	For engine rotation measurement only	OM-1200, VP-1220, VP-202, IP-292, IP-296, IP-3000A, IP-3100
		NP-3000 Series (with built-in preamplifier), MI-1431 +MI-3110 (microphone), magnetic flux leakage sensor
Voltage levels		5 V: Max ±5 V 0.5 V: Max ±0.5 V 0.05 V: Max ±0.05 V
Input coupling		AC coupling
Power supply for the NP sensor		Rated current power supply ±2.4 (0.5 mA)

Note: Measurement precautions: Depending on the type of engine or object under measurement, there may be cases when correct detection cannot be performed.

Display

Number of display digits	5 digits
Character height	10.2 mm
Display device	7-segment LCD, backlight
Display update time	0.5 ±0.2 s
Display resolution	1 r/min

Measurement modes

CNS (Constant)	Use this mode when there are minimal fluctuations in the rotational speed of the object under measurement (when measuring the rated speed or similar)
ACT (Active)	Use this mode when the rotational speed of the object under measurement accelerates or decelerates (please note, however, that measurement may not be performed correctly in the case of sudden changes)

Output

[REVO] Analog output	
Signal output	In proportional to the rotational speed displayed value
Voltage range	0 to 1 V/0 to F.S. (F.S. can be specified freely)
Conversion method	10-bit D/A conversion
Linearity	±1% of F.S.
Output refresh time	Within 250 ms
Temperature stability	±0.05% of F.S./˚C (ZERO & SPAN)
Setting error	±0.5% of F.S. (adjustment setting error at the time of shipment from the factory, ZERO & SPAN)
Load resistance	At least 100 kΩ
Output connector	Ultra-mini jack (ϕ2.5)
[SIG] Analog output for the monitor	
Signal output	Analog output for the monitor after waveform shaping of the sensor signal
Load resistance	At least 100 kΩ
Output connector	Ultra-mini jack (ϕ2.5, same which is also used as REVO output.)

General specifications

Power source	Four AAA alkaline batteries or dedicated AC adapter (PB-7080, sold separately)
Continuous measurement time	Approx. 7 hours (when the backlight is off) Approx. 6 hours (when the backlight is on) (When alkaline batteries are used at a temperature of 20˚C; excluding the use of an NP series accelerometer*1) *1: When an NP series accelerometer is used, current consumption increases because of the constant current power supply used to drive the NP series accelerometer. Use of the dedicated adapter is therefore recommended.
Battery LOW display	The "LOW" mark flashes when the voltage has dropped to approx. 4.2 V
Operating temperature range	0 to +40˚C
Storage temperature range	-10 to +50˚C
Operating humidity range	35 to 85% RH (non-condensing)
Storage humidity range	35 to 85% RH (non-condensing)
Weight	Approx. 230 g (main unit only, batteries not included)
Outer dimensions	189.5 (L) mm x 66.0 (W) mm x 47.5 (D) mm (main unit only)
Standard accessories	AAA alkaline batteries: 4 pieces Instruction manual, three types: 1 copy of each Carrying case: 1 piece

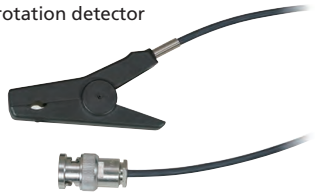
Compatible sensors and peripherals (sold separately as options)

Ignition pulse detector (Primary side)
IP-292

Ignition pulse detector (Secondary side)
IP-296

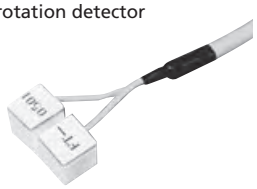
Engine rotation detector
IP-3000A

Engine rotation detector
IP-3100



Ignition pulse detector
OM-1200

DC motor rotation detector
FT-0501



Engine vibration detector
VP-202

Engine vibration detector (High-sensitive type)
VP-1220

Piezoelectric-type accelerometers
NP-2000/3000 Series

Microphone + preamplifier
MI Series

Magnetic stand/stand jig
HT-0522/0521A

The state which attached the main body.

Tripod
LA-0203B

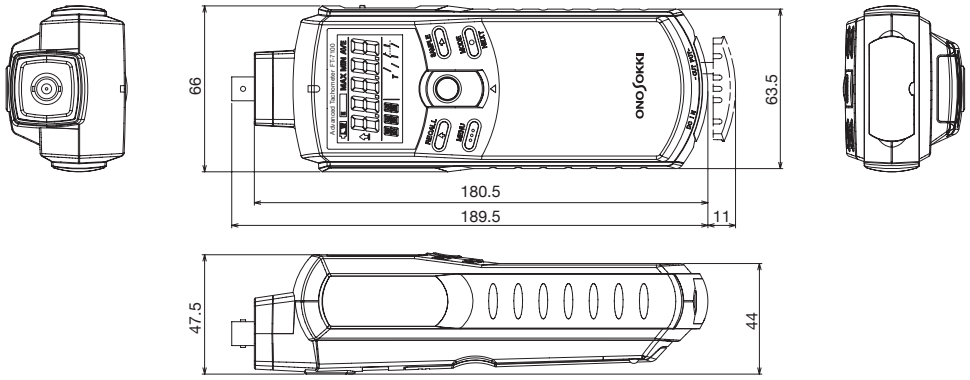
AC adapter
PB-7080

Analogue output signal cable
AX-501

Charge converter
CH-6130/6140

External drawing

(Unit: mm)



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* Outer appearance and specifications are subject to change without prior notice.

URL: http://www.onosokki.co.jp/English/english.htm

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