

ONOSOKKI

FG-1300

FIBER OPTIC SENSOR AMPLIFIER

Instruction Manual

WORLDWIDE ONO SOKKI CO., LTD.

1-16-1 Hakusan, Midori-ku, Yokohama 226-8507, Japan

Phone : +81-45-935-3918 / Fax : +81-45-930-1808

E-mail : overseas@onosokki.co.jp

■ Warranty ■

1. This product is covered by a warranty for a period of one year from the date of purchase.
2. This warranty covers free-of-charge repair for defects judged to be the responsibility of the manufacturer, i.e., defects occurred while the product is used under normal operating conditions according to descriptions in this manual and notices on the unit label.
3. For free-of-charge repair, contact either your sales representative or our sales office nearby.
4. The following failures will be handled on a fee basis even during the warranty period.
 - (a) Failures occurring through misuse, mis-operation, or modification
 - (b) Failures occurring through mishandling (dropping) or transportation
 - (c) Failures occurring through natural calamities (fires, earthquakes, flooding, and lightning), environmental disruption, or abnormal voltage.

* For repairs after the warranty period expired, contact your sales representative or our sales office nearby.

1. This document may not be reproduced, in whole or part, in any form or by any means without the prior written permission of the publisher.
 2. The contents of this document are subject to change without notice.
 3. This document has been produced based on a series of strict verifications and inspections. Should a failure occur nonetheless, please inform our sales representative or sales office.
 4. Ono Sokki shall have no liability for any effect resulting from any operation, whether or not the effect is attributable to a defect in the documentation.

Copyright © ONO SOKKI CO., LTD. 2015 All rights reserved.

Introduction

Thank you for purchasing the FG-1300 Fiber Optic Detector .

This instruction manual describes the functions, specifications, connecting method and precautions on the FG-1300 Fiber Optic Detector.

To ensure proper use of the FG-1300 Fiber Optic Detector, be sure to read this manual before using the product.

This manual contains some precautions which, if ignored, could cause property damage. In handling the product, make sure to follow the instructions described in this manual.

Please keep this manual in a safe place after reading and refer to it whenever you feel uncertain of handling and operating this product.





- The contents of this document are subject to change in future editions without prior notice.
- No part of the contents of this document may be reprinted or reproduced without authorization.
- While the contents of this document have been prepared in our best efforts for perfection, should there be any unclear point, error, or any other questionable point, please advise us of them.
- Please be advised that we should not be responsible for results of your operation, regardless of the preceding paragraph.
- All corporate names and product names used herein are either trade names or registered trade names of their respective holders.

For Your Safety

- Before using the FG-1300 Fiber Optic Detector, be sure to read this instruction manual and follow the descriptions for proper use of the product.
- Observe precautions specific to the FG-1300 Fiber Optic Detector that may be described in supplementary manuals other than this instruction manual.
- Please keep this manual near at hand so that you can quickly refer to it as required.
- The information given herein is based on the materials when this manual was drafted. Thus, note that some of this information (contact, address, telephone number, website URL, e-mail address) may have been changed.

■ Safety symbols

For safe use of the product, this manual uses the following symbols to indicate relevant safety instructions which, if ignored, could cause damages, injury or death.

 Warning	Failure to follow the instruction can lead to death or serious injury.
 Caution	Failure to follow the instruction can lead to minor injury or property damage.

■ Precautions on the power supply and power cables

Warning



Make sure to use power supply at the specified voltage and frequency.

- Using the product at an improper voltage may cause an electric shock, smoking or fire.

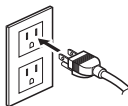
Insert the plug into the power socket with a grounding pole. Otherwise, electric shock may result.



- Be sure to use the power cable supplied with the product or the one specified by Ono Sokki.
- Insert the plug completely until it contacts the socket.
- If an extension cable is used, be sure to use one with a grounding pole.



Grounding with a 3-pin plug





- For grounding, insert the 3-pin plug of the supplied AC power cable into a 3-prong outlet as shown in the figure below.




	<p>Avoid connecting the plug to a not grounded outlet. Otherwise, electric shock may result.</p> <ul style="list-style-type: none"> Do not use 3-prong to 2-prong adapter.
	<p>If any foreign object or water enters inside of the product, immediately disconnect the power plug.</p> <ul style="list-style-type: none"> Using the product under such condition may cause fire or electric shock. <p>When the product is not used for a long time, remove the plug from the outlet.</p> <ul style="list-style-type: none"> Failure to do so gives rise to a risk of electric leakage fire due to degraded insulation.

■ General precautions

⚠ Warning

	<p>Never disassemble or overhaul the FG-1300 Fiber Optic Detector.</p> <ul style="list-style-type: none"> It could cause a failure or electric shock. When it is necessary to make internal adjustments, inspection or repair of the product, contact the nearest Ono Sokki sales office or the distributor where you purchased the product.
	<p>Do not splash or spill water on the FG-1300 Fiber Optic Detector.</p> <ul style="list-style-type: none"> Otherwise, a fire or electric shock due to short circuit may occur.
	<p>Do not look at the light source of the fiber optic sensor with your bare eyes.</p> <ul style="list-style-type: none"> Otherwise, it could cause you an eye deficiency.
	<p>Do not use the product for detecting human body.</p> <ul style="list-style-type: none"> The FG-1300 Fiber Optic Detector is not designed to serve for detecting human body.

⚠ Caution

	<p>Do not install the product in an unstable place.</p> <ul style="list-style-type: none"> Otherwise, the product may drop or fall, and thus may cause an injury. <p>Do not put any large or heavy item on the product.</p> <ul style="list-style-type: none"> The item placed on the product may drop, causing an injury. <p>Do not install the product in locations where there is oily smoke, steam, high humidity, or a lot of dust.</p> <ul style="list-style-type: none"> It may cause a fire or electric shock.
---	---

CONTENTS

Introduction	1
For Your Safety	2
1. Overview of the FG-1300 Fiber Optic Detector	5
1.1 Overview and Features of the FG-1300 Fiber Optic Detector	5
1.2 Checking Supplied Items	6
2. Component Names and Functions	7
2.1 Front Panel	7
2.2 Rear Panel	9
3. Preparation and Operation of the FG-1300 Fiber Optic Detector	11
3.1 Pre-operational Checks and Precautions	11
3.2 Preparations for Operation	12
3.3 Fiber Optic Sensor Installation	14
3.4 Adjustment for Operation	16
4. Specifications	18
4.1 Input Section	18
4.2 Output Section (MONITOR/PULSE OUT)	18
4.3 General Specifications	18
5. External Dimensions	20
5.1 External Dimension of the FG-1300 Fiber Optic Detector	20
6. Appendix	22
6.1 Specifications of the FS-540 Fiber Optic Sensor	22
6.2 External Dimensions of the FS-540 Fiber Optic Sensor (Optional)	23

1. Overview of the FG-1300 Fiber Optic Detector

1.1 Overview and Features of the FG-1300 Fiber Optic Detector

Combined with a optical fiber sensor, the FG-1300 Fiber Optic Detector projects visible light to the measured object through the optical fiber, and receives the reflected light coming back through the optical fiber, thus detecting the variation in reflected light intensity.

This product is an effective device to measure and detect the rotation of thin objects such as a motor rotation shaft or the rotation of objects to be measured from a distance.

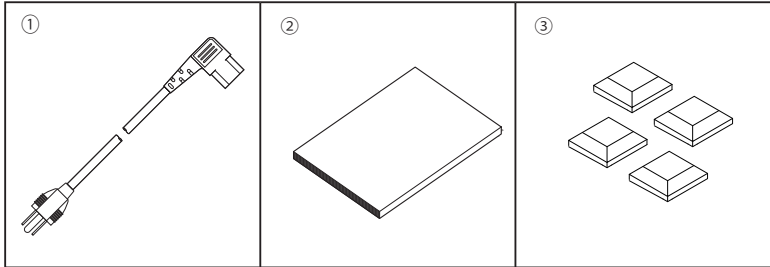
■ Features

- The pulsed lighting system employed in the device inhibits the noise of ambient light.
- High sensitivity to minimal variation in light intensity.
- Compact and light-weight design facilitating the installation and handling.
- Automatic adjustment of threshold level is feasible.
- Pulse dividing function enables the frequency division ranging from 1 to 10.
- Detection distance adjusting function allows the detection from a proximity of 10 mm to a distance of 44 to 69 mm (when the reflection mark supplied with the fiber optic sensor is pasted).

1.2 Checking Supplied Items

The delivered package contains accessories besides the FG-1300 Fiber Optic Detector. Using the following list of items, check and ensure that all of the items are included in the package.

If any item is missing or damaged, immediately contact the nearest Ono Sokki sales office or the distributor where you purchased the product.



■ List of supplied items

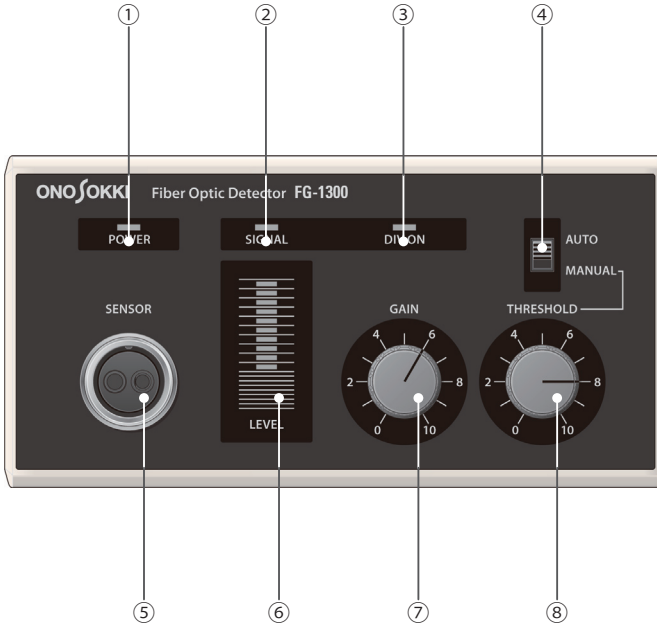
Number	Item	Quantity
①	Power cable	1
②	Instruction manual (this document)	1
③	Rubber pod	4



- The delivered package does not include a fiber optic sensor or panel mounting hardware, which should be purchased separately. For the purchase of these items, please contact nearest Ono Sokki sales office or distributor.

2. Component Names and Functions

2.1 Front Panel



- ① **POWER**
Power supply indicator.
Lit while the power is turned ON.
- ② **SIGNAL**
Signal indicator.
Lit when the intensity of reflected light exceeds the preset threshold.
- ③ **DIV ON**
Frequency division indicator. Lit while the frequency dividing function is enabled.

Component Names and Functions

Lit when a division ratio is set (when the division ratio is set to 0 or any value from 2 to 9 with the DIV SET switch on the rear panel).

④ **AUTO/MANUAL switch**

Used for switching between the automatic setting (AUTO) and manual setting (MANUAL) of a THRESHOLD level.

The automatic setting is performed at approximately 50% of a signal amplitude (peak value). The operational voltage range is 1 V or more.

In the MANUAL setting, you can adjust the pulsating level with the THRESHOLD control knob.



- Since a time constant is involved in the automatic threshold setting, it takes approximately 1 second to stabilize the amplifier operation after the first signal is input. In such a case, use the amplifier in the manual threshold setting (MANUAL) mode.
(ex.: If the motor is started from a stopped state, it will take 1 second before the amplifier starts to operate properly.)

⑤ **SENSOR connector**

Connect a fiber optic sensor to the connector.

⑥ **LEVEL indicator**

Indicates the intensity of reflected light.

⑦ **GAIN control knob**

Adjusts the gain according to the detected light intensity.

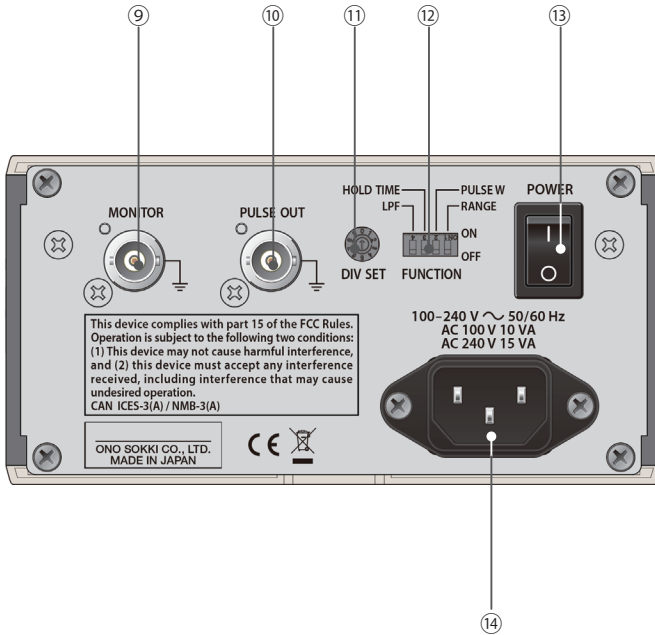
Used for setting an optimum signal level by adjusting the GAIN control knob while monitoring the reflected light intensity displayed on the LEVEL indicator (⑥).

⑧ **THRESHOLD control knob**

Used for THRESHOLD level setting that is enabled when THRESHOLD level (④) is switched to manual setting (MANUAL) mode.

Adjust the THRESHOLD level to obtain a stabilized pulse signal while monitoring the SIGNAL indicator (②).

2.2 Rear Panel



⑨ MONITOR

Connector to acquire an analog output according to the reflected light intensity.

⑩ PULSE OUT

This is a pulse output connector for pulsed outputs of the variation in reflected light intensity at a preset THRESHOLD level.

⑪ **DIV SET (division ratio setting switch)**

This switch allows you to set the division ratio (range: 1 to 10) of output pulse count corresponding to input signal.

To select a setting value, turn the rotary switch using a flat-head screwdriver.

For setting the division ratio to 10, select 0. Its output width will be the same as that of division ratio 1, regardless of the division ratio selected.

Nevertheless, it is delayed by the minimum pulse width in the falling edge as follows:

PULSE W	OFF	10 μ s
	ON	160 μ s

<Division ratio>

Division ratio	DIV SET (division ratio setting switch)	DIV ON (division indicator)
1	1	OFF
2 to 9	2 to 9	ON
10	0	ON

⑫ **FUNCTION (bit switch)**

Switching the bit switch to ON or OFF validates the setting of each of the following functions.

Use a flat-head screwdriver to turn on and off the bit switch.

<Set functions>

Item	Function	Initial setting
RANGE	Switching the detection distance (between the fiber optic sensor and the measured object)	OFF
	ON Proximate (10 mm), when a reflection mark is used	
	OFF Normal (44 to 69 mm), when the reflection mark is used	
PULSE W	Switching the minimum width of output pulse	OFF
	ON 160 μ s	
	OFF 10 μ s	
HOLD TIME	Switching the following capability after the THRESHOLD level is switched to AUTO setting mode	OFF
	ON 10 seconds (when the speed is constant or fluctuates slow)	
	OFF 1 second (when the speed fluctuates sharply)	
LPF	Determining the responsiveness of MONITOR or switching the cut-off frequency of low path filter	OFF
	ON $f_c = 72$ Hz	
	OFF $f_c = 14$ kHz	

⑬ **POWER switch**

Power supply switch to the FG-1300 Fiber Optic Detector.

⑭ **AC inlet**

This is a connector for power supply.

Be sure to use the power cable supplied together with the product.

3. Preparation and Operation of the FG-1300 Fiber Optic Detector

Set up the FG-1300 Fiber Optic Detector in the order beginning with connecting the cables and devices, attaching the fiber optic sensor and adjusting the product for measurement as described below. This chapter describes the operation procedure in the case of using the FS-540 fiber optic sensor. When using another type of fiber optic sensor, refer to the instruction manual supplied with the fiber optic sensor to be used.

3.1 Pre-operational Checks and Precautions

The following describes the items to be checked and precautions that should be observed before using the FG-1300 Fiber Optic Detector. See "For Your Safety" on page 2 before handling the product.

● Precautions against sunlight

Caution



Avoid using the product and measurement under direct sunlight.

- Note that direct sunlight may be adversely affect the measurement with the fiber optic sensor.

● Precautions for electric appliances (such as remote control)

Do not operate the remote control for home appliances such as TV, DVD player or the like by directing it to the FG-1300 Fiber Optic Detector. Otherwise, the remote control may adversely affect the FG-1300 Fiber Optic Detector, resulting in a malfunction.

Caution



Avoid using the FG-1300 Fiber Optic Detector near infrared remote controls of electric appliances.

- Otherwise, it could impairs the remote control function.

● Precautions for using the FS-540 fiber optic sensor

Warning



Do not use the product for detecting human body.

- The FG-1300 Fiber Optic Detector is not designed to serve for detecting human body.

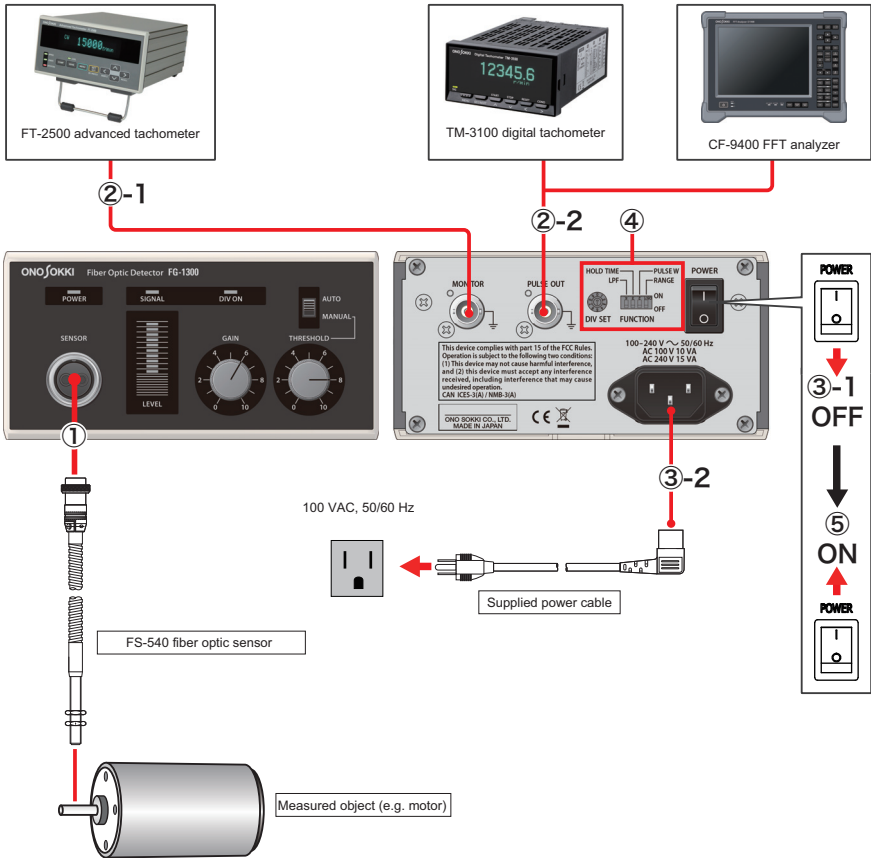


Do not look at the light source of the fiber optic sensor with your bare eyes.

- Otherwise, it could cause you an eye deficiency.

3.2 Preparations for Operation

Complete the connection of a fiber optic sensor and power cable to the FG-1300 Fiber Optic Detector in the following procedure:



- ① Connect the FG-1300 Fiber Optic Detector with the FS-540 fiber optic sensor. Connect the FS-540 fiber optic sensor to the sensor connector on the front panel of the sensor amplifier. Since the FS-540 fiber optic sensor consists of fine glass fibers, and thus stretching the fibers with violent forces or bending them at a sharp angle will result in fiber breakage. When bending the FS-540 fiber optic sensor, allow a radius of at least 50 mm.

- ② **Connect peripheral devices that suit intended usage or purpose to the FG-1300 Fiber Optic Detector.**

Connect peripheral devices appropriate to intended measurement to the MONITOR and PULSE OUT connectors on the rear panel of the FG-1300 Fiber Optic Detector.

For example, connect the Ono Sokki FT-2500 Advanced Tachometer that is effective for measuring a rotational speed to the MONITOR (analog output) connector.

Likewise, connect the PULSE OUT (pulse output) connector to the trigger signal input terminal of an TM-3100 series tachometer and an FFT analyzer such as CF-9400 model.



- For details of peripheral devices and their configuration appropriate to your intended usage and purposes, contact the nearest Ono Sokki sales office or distributor.

- ③ **Connect the power cable to the FG-1300 Fiber Optic Detector**

First, turn the POWER switch to OFF.

Then, connect the supplied power cable to the AC inlet on the rear panel of the amplifier.



Warning

Be sure to use a 3-pin plug and outlet.

Make sure to use the power cable and plug that are specified or supplied with the product.



Precautions for using at over 125 VAC

- When using the product at over 125 VAC, be sure to use the specified power cable provided as an optional item. (For the details, contact the nearest Ono Sokki sales office or the distributor where you purchased the product.)

- ④ **Set the detector end of the FS-540 fiber optic sensor against the measured object and configure the service conditions.**

When the detection distance is 10 mm, set the RANGE bit switch (in FUNCTION) to ON on the rear panel of the product.

Set the frequency dividing conditions of PULSE OUT by using the DIV SET (division ratio setting) switch on the rear panel.

For details of the FS-540 fiber optic sensor, see “3.3 Fiber Optic Sensor Installation” on page 14 on the following page.

- ⑤ **Turn on the power to the FG-1300 Fiber Optic Detector.**

Finally, turn the POWER switch to ON on the rear panel of the product.

3.3 Fiber Optic Sensor Installation

The following describes the installation procedure of the FS-540 fiber optic sensor.

When using another type of fiber optic sensor, refer to the instruction manual supplied with the fiber optic sensor to be used.

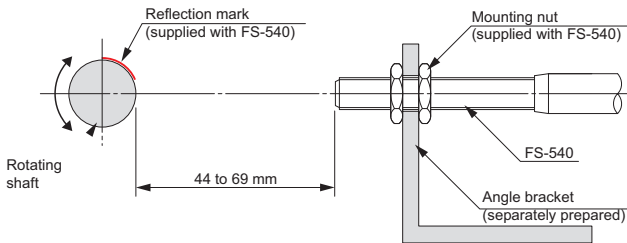
■ Precautions for handling the FS-540 fiber optic sensor

Before using the FS-540 fiber optic sensor, pay attention to the following:

- Since the FS-540 fiber optic sensor consists of fine glass fibers, and thus stretching the fibers with violent forces or bending them at a sharp angle will result in fiber breakage.
- When bending the FS-540 fiber optic sensor, allow a radius of at least 50 mm.

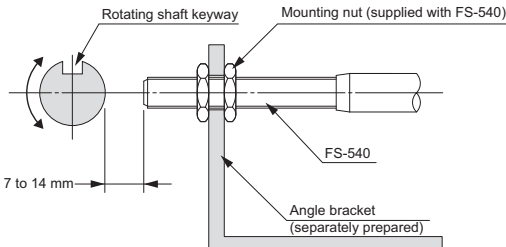
■ Detection with the reflection mark

As illustrated below, pasting a dedicated reflection tape on the spindle allow the device to perform detection from a distance of 44 to 69 mm away.



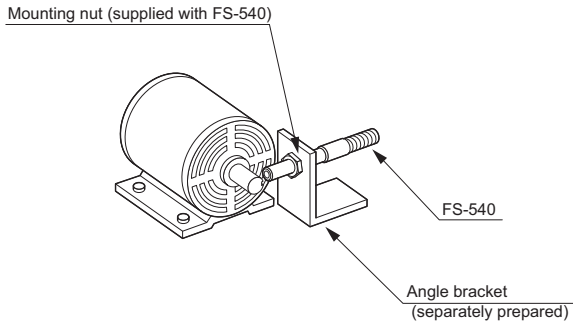
■ Detection using the keyway

Rotation of a concave part such as a keyway can be detected at a distance of 7 to 14 mm away.



■ Detection using a keyway and D-cut face

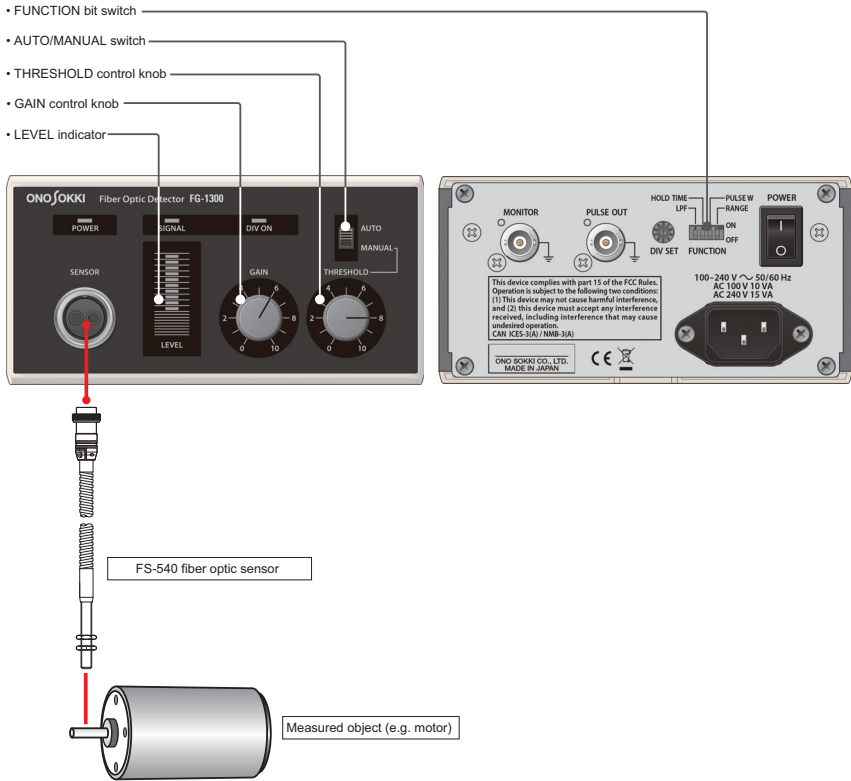
The following illustrates an example of set-up for the detection using a keyway and D-cut face.



3.4 Adjustment for Operation

After completing the connection and installation of FS-540 fiber optic sensor, perform the adjustment of FG-1300 Fiber Optic Detector in the following procedure:

The control knobs, switches and indicator used for adjustment are shown below. For the details, see "2. Component Names and Functions" on page 7.



1 Adjust the FG-1300 Fiber Optic Detector to detect the desired signal from the measured object.

Adjust the GAIN control knob while monitoring the LEVEL indicator.

The desired signal from the measured object can be detected when three or more segments of the LEVEL indicator are lit with the reflection mark in light.

2 Adjust the THRESHOLD control knob.

When the AUTO/MANUAL switch is set to MANUAL, adjust the THRESHOLD control knob so that the SIGNAL will flash constantly.

When the AUTO/MANUAL switch is set to AUTO, the THRESHOLD level is automatically set to approximately 50% of the signal amplitude (peak value).

3 Set up the HOLD TIME and PULSE W.

When the rotation speed is low (over 1 second per cycle), set the HOLD TIME bit switch to ON in the FUNCTION on the rear panel.

When synchronizing with a rotating object, use the rising edge of a pulse. In a falling edge, a delay of 10 μ s or 160 μ s may occur.

To adjust the minimum pulse width to 160 μ s, set the PULSE W bit switch in the FUNCTION on the rear panel.

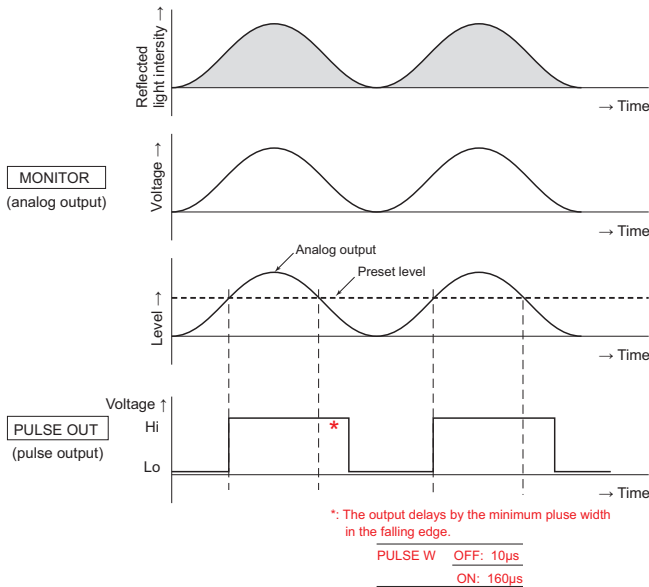
4 Adjust the GAIN control knob to use the analog output from the MONITOR connector.

For using analog signal, adjust the GAIN control knob while checking the output from the MONITOR connector with the digital voltmeter.

Set the LPF bit switch in FUNCTION according to the responsiveness of output signal from the MONITOR connector.

OFF	: High speed (fc = 14 kHz)
ON	: Low speed (fc = 72 Hz)

Relationships between reflected light intensity and signal output



4. Specifications

4.1 Input Section

Compatible sensor	FS-540 fiber optic sensor
Input/output detection element	Phototransistor
Response frequency range	0 to 10 kHz
Input connector	Integrated light projection/reception connector (exclusive)
Light source	Pulse-lighting red LED

4.2 Output Section (MONITOR/PULSE OUT)

Output signal	Analog and pulse outputs	
MONITOR	Analog output	Voltage in proportion to reflected light intensity
	Output voltage range	0 to 10 V
	Output connector	C02 (BNC)
	Output impedance	50 Ω or less
PULSE OUT	Pulse Output	Digitizes the reflected light intensity and outputs at Hi and Lo levels
	Output format	TTL (Hi: 4.5 V, min.; low: 0.5 V, max.)
	Output connector	C02 (BNC)
LEVEL indicator	Light intensity monitor (interlocked with the MONITOR output)	



Caution

- Precaution for isolation
Be aware that the signal ground is at the same potential as that of the enclosure.

4.3 General Specifications

Withstand voltage	1500 VAC (1 minute)	
Dielectric resistance	10 M Ω or more (500 VDC)	
Resistance to vibration	Vibrational acceleration	9.8 m/s ²
	Frequency range	10 to 150 Hz, sinusoidal vibration
	Vibration applying direction and number of cycles	20 cycles each in the X, Y and Z directions (for approx. 150 minutes)

Shock resistance	Impact acceleration	147 m/s ²
	Duration	11 ms
	Impact applying direction and number of applying times	3 times in each of $\pm X$, $\pm Y$ and $\pm Z$ directions
Power	100 to 240 VAC (50/60 Hz)	
Power consumption	100 VAC: 10 VA or less	
	240 VAC: 15 VA or less	
Operating temperature range	0 to +40°C	
Relative humidity range for operation	5 to 80% RH (no condensation allowed)	
Storage temperature range	-10 to +50°C	
Relative humidity range for storage	5 to 80% RH (no condensation allowed)	
Mass	Approx. 1 kg	
External dimensions	144 (W) x 72 (H) x 180 (D) mm (no protrusion included)	

■ Conforming standards

CE marking	LVD Directive 2006/95/EC	
	Standard EN61010-1	
	EMC Directive 2004/108/EC	
	Standard EN61326-1	
FCC	RoHS Directive 2011/65/EU	
	Standard EN50581	
	CFR47 Part15 Subpart B	
	<p>Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.</p>	

- For details, see: <http://www.onosokki.co.jp/English/english.htm>

■ Accessories

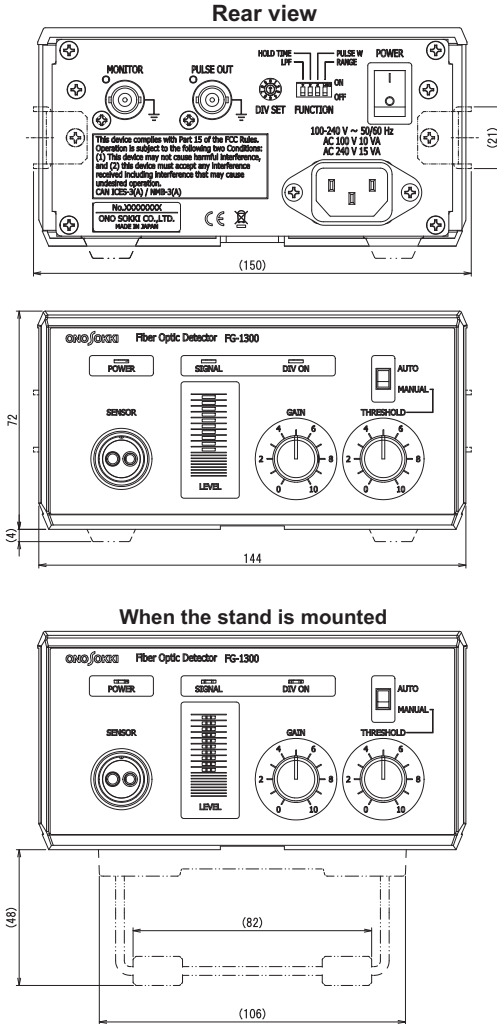
Instruction manual	1
Power cable	1
Rubber pod	4

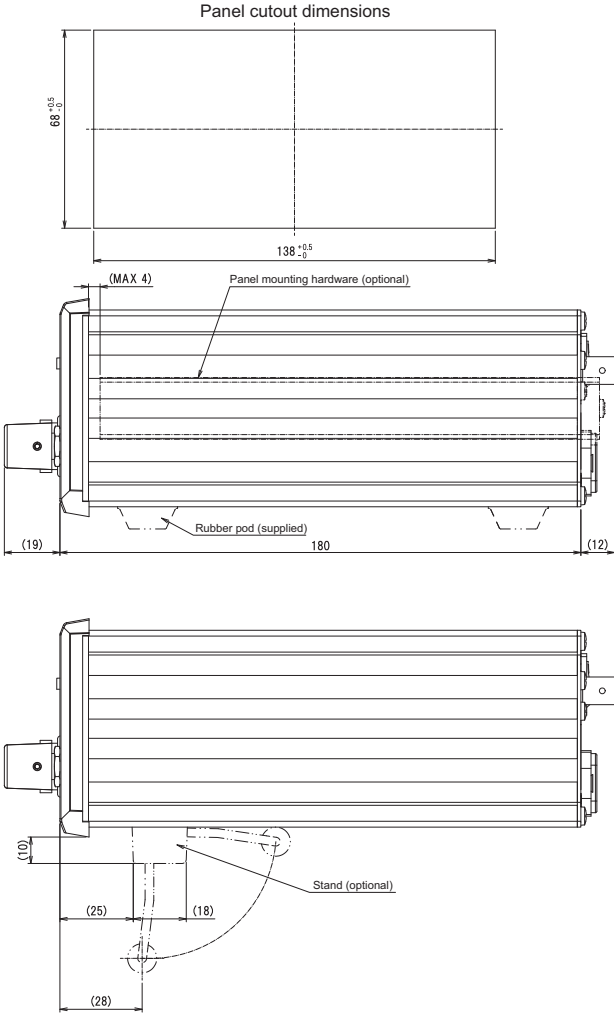
■ Optional

Panel mounting hardware	
Stand	

5. External Dimensions

5.1 External Dimension of the FG-1300 Fiber Optic Detector



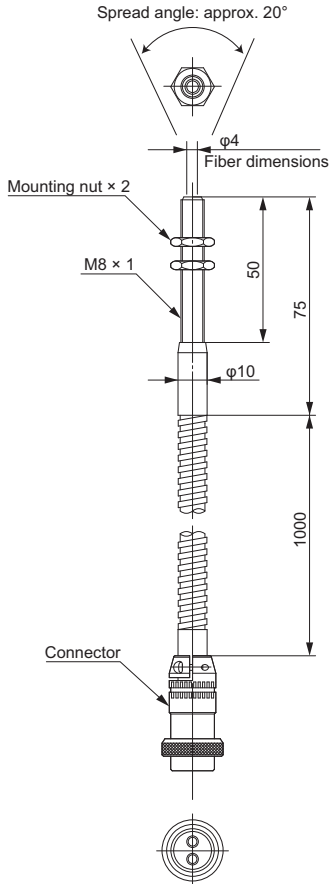


6. Appendix

6.1 Specifications of the FS-540 Fiber Optic Sensor

Fiber optic sensor	Length (standard specifications)	1 m
	Fiber diameter	4 mm
	Screw	M8 × 1.0
Detection distance	Adjustable within the following approximate values by the gain adjustment	
	Reflecting object (contrast type)	Detection distance (mm)
	When the glossy spindle is coated with a matt-finished black enamel	7 to 14
	When the dedicated reflection mark (12 mm square) is attached to the spindle	44 to 69
Operating temperature range	-10°C to +70°C	

6.2 External Dimensions of the FS-540 Fiber Optic Sensor (Optional)



ONOSOKKI

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

HOME PAGE: <http://www.onosokki.co.jp/English/english.htm>

WORLDWIDE

ONOSOKKI CO., LTD.

1-16-1 Hakusan, Midori-ku,

Yokohama 226-8507, Japan

Phone : +81-45-935-3918

Fax : +81-45-930-1808

E-mail : overseas@onosokki.co.jp

B00002423/IM14091701 (1.1)