OMRON

Smart Sensors (High-precision Contact Type)

ZX Series (ZX-T)

CE



For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Ordering Information

■Sensors

Sensor Heads

Size	Type	Sensing distance	Resolution (See note.)	Model
6 dia.	Short type	1 mm	0.1 μm	ZX-TDS01T
	Standard type	4 mm		ZX-TDS04T
	Low measurement type			ZX-TDS04T-L
8 dia.	Standard type	10 mm	0.4 μm	ZX-TDS10T
	Ultra-low-load Type			ZX-TDS10T-L
	Air Lift Type			ZX-TDS10T-V
	Air Lift/Air Push Type			ZX-TDS10T-VL

Note: The resolution refers to the minimum value that can be read when a ZX-TDA□1 Amplifier Unit is connected.

■Amplifier Units

Appearance	Power supply	Output type	Model
	DC	NPN	ZX-TDA11 2M
		PNP	ZX-TDA41 2M

■Accessories (Order Separately)

Calculating Unit

Appearance	Model
	ZX-CAL2

ZX-series Communications Interface Unit

Appearance	Model
	ZX-SF11

SmartMonitor Sensor Setup Tool for Personal Computer Connection

Appearance	Name	Model
	ZX-series Communications Interface Unit	ZX-SF11
 + CD-ROM	ZX-series Communications Interface Unit + ZX-series Sensor Setup Software Basic	ZX-SFW11EV3 *1, *2
CD-ROM	ZX-series Sensor Setup Software	ZX-SW11EV3 *1

*1. When using the ZX-TDA11/41 with the SmartMonitor, either the ZX-SFW11EV3 or the ZX-SW11EV3 SmartMonitor must be used. Earlier versions cannot be used.

*2. The ZX-SFW11EV3 SmartMonitor can be used only to set functions and monitor waveforms.

Cables with Connectors on Both Ends (for Extension)*

Cable length	Model	Quantity
1 m	ZX-XC1A	1
4 m	ZX-XC4A	
8 m	ZX-XC8A	

* Robot Cable models are also available. The model numbers are ZX-XC□R.

Preamplifier Mounting Brackets

Appearance	Model	Remarks
	ZX-XBT1	Attached to each Sensor Head
	ZX-XBT2	For DIN track mounting

Specifications

■Amplifier Units

Item	ZX-TDA11	ZX-TDA41
Measurement period	1 ms	
Possible average count settings (See note 1.)	1, 16, 32, 64, 128, 256, 512, or 1,024	
Linear output (See note 2.)	Current output: 4 to 20 mA/F.S., Max. load resistance: 300 Ω Voltage output: ±4 V (±5 V, 1 to 5 V (See note 3.)), Output impedance: 100 Ω	
Judgement outputs (3 outputs: HIGH/PASS/LOW)	NPN open-collector outputs, 30 VDC, 30 mA max. Residual voltage: 1.2 V max.	PNP open-collector outputs, 30 VDC, 30 mA max. Residual voltage: 2 V max.
Zero reset input, timing input, reset input, judgement output hold input	ON: Short-circuited with 0-V terminal or 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)	ON: Supply voltage short-circuited or supply voltage of 1.5 V or less OFF: Open (leakage current: 0.1 mA max.)
Function	- Measurement value display - Present value/set value/output value display - Display reverse - ECO mode - Number of display digit changes - Sample hold - Peak hold - Bottom hold, peak-to-peak hold - Self-peak hold - Self-bottom hold - Zero reset - Initial reset - Direct threshold value setting - Position teaching - Hysteresis width setting - Timing inputs - Reset input - Judgement output hold input - (A-B) calculations (See note 4.) - (A+B) calculations (See note 4.) - Sensor disconnection detection - Zero reset memory - Function lock - Non-measurement setting - Clamp value setting - Scale inversion - Zero reset indicator - Span adjustment - Warming-up display - Pressing force alarm	
Indicators	Judgement indicators: High (orange), pass (green), low (yellow), 7-segment main digital display (red), 7-segment sub-digital display (yellow), power ON (green), zero reset (green), enable (green)	
Power supply voltage	12 to 24 VDC ±10%, Ripple (p-p): 10% max.	
Current consumption	140 mA max. (with Sensor connected), For 24-VDC power supply voltage: 140 mA max. (with Sensor connected)	
Ambient temperature	Operating and storage: 0 to 50°C (with no icing or condensation)	
Temperature characteristic	0.03% F.S./°C	
Connection method	Prewired (standard cable length: 2 m)	
Weight (packed state)	Approx. 350 g	
Materials	Case: PBT (polybutylene terephthalate), Cover: Polycarbonate	

Note 1. The response speed of the linear output is calculated as the measurement period × (average count setting + 1).
The response speed of the judgement outputs is calculated as the measurement period × (average count setting + 1).

2. The output can be switched between a current output and voltage output using a switch on the bottom of the Amplifier Unit.

3. Setting is possible via the monitor focus function.

4. A Calculating Unit (ZX-CAL2) is required.

■Sensor Heads

Item		ZX-TDS01T	ZX-TDS04T	ZX-TDS04T-L
Measurement range		1 mm	4 mm	
Maximum actuator travel distance		Approx. 1.5 mm	Approx. 5 mm	
Resolution (See note 1.)		0.1 μm		
Linearity (See note 2.)		0.5% F.S.		
Operating force (See note 3.)		Approx. 0.7 N		Approx. 0.25 N
Degree of protection (Sensor Head)		IEC60529, IP67		IEC60529, IP54
Mechanical durability		10,000,000 operations min.		
Ambient temperature		Operating: 0°C to 50°C (with no icing or condensation) Storage: −15°C to 60°C (with no icing or condensation)		
Ambient humidity		Operating and storage: 35% to 85% (with no icing or condensation)		
Temperature characteristic (See note 4.)	Sensor Head	0.03% F.S./°C		
	Preamplifier	0.01% F.S./°C		
Weight (packed state)		Approx. 100 g		
Materials	Sensor Head	Stainless steel		
	Preamplifier	Polycarbonate		
Accessories		Instruction manual, Preamplifier Mounting Brackets (ZX-XBT1)		

Note 1. The resolution is given as the minimum value that can be read when a ZX-TDA□1 Amplifier Unit is connected. This value is taken 15 minutes after turning ON the power with the average number of operations set to 256.
2. The linearity is given as the error in an ideal straight line displacement output.
3. These figures are representative values that apply for the measurement mid-point, and are for when the provided actuator is used, with the actuator moving downwards. If the actuator moves horizontally or upwards, the operating force will be reduced. Also, if an actuator other than the standard one is used, the operating force will vary with the weight of the actuator itself.
4. These figures are representative values that apply for the mid-point of the measurement range.

■Sensor (Long-range Type)

Item		ZX-TDS10T	ZX-TDS10T-V	ZX-TDS10T-L	ZX-TDS10T-VL
Vacuum retract (VR) and air push (AP) compatible		No	VR	No	VR/AP
Measurement range		10 mm			
Maximum actuator travel distance		10.5 mm			
Resolution (See notes 1 and 5.)		0.4 μm			
Linearity (See notes 2 and 5.)		±0.5% F.S.			
Operating force (See note 3.)		Approx. 0.7 N	Approx. 0.6 N	Approx. 0.065 N	Approx. 0.09 to 1.41 N
Air pressure	Vacuum retracting	---	−0.55 to −0.70 (bar)	---	−0.22 to −0.5 (bar)
	Air push		---		0.125 to 2 (bar)
Degree of protection	Sensor Head	IP65		IP50	
	Preamplifier	IP40			
Mechanical durability		10,000,000 operations min.			
Ambient temperature		Operating: 0 to 50°C (with no icing or condensation), Storage: −10 to 60°C (with no icing or condensation)			
Ambient humidity		Operating and storage: 35% to 85% (with no icing or condensation)			
Temperature characteristic (See note 4.)	Sensor Head	±0.01% F.S./°C			
	Preamplifier	±0.01% F.S./°C			
Vibration resistance		0.35-mm single amplitude at 10 to 55 Hz for 50 min each in the X, Y, and Z directions			
Shock resistance		150 m/S² 3 times each in 6 directions (up/down, left/right, and forward/backward)			
Connection method		Prewired connector (2 m from the Sensor Head to the Preamplifier, 0.2 m from the Preamplifier to the connector)			
Weight (packed state)		Approx. 100 g			
Materials	Sensor Head	Stainless steel			
	Rubber sleeve	Viton		None	
	Preamplifier	Polycarbonate			
	Mounting Brackets	Stainless steel			
Accessories		Instruction manual, Preamplifier Mounting Brackets (ZX-XBT1), Right-angle Adapter (See note 6.)			

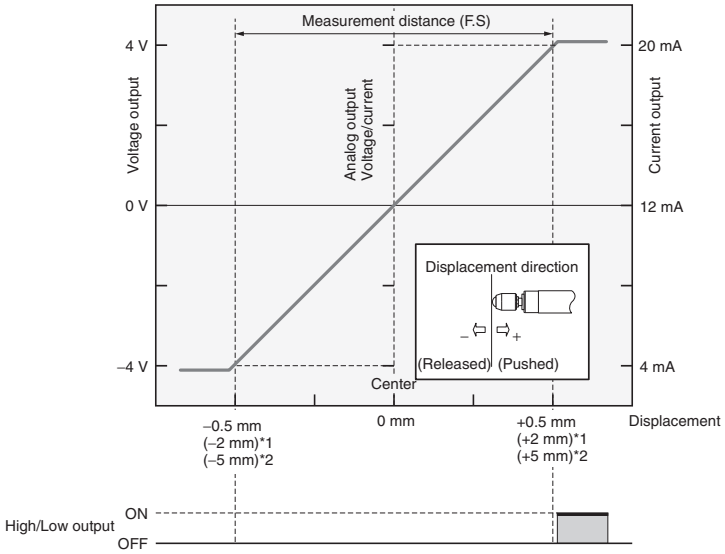
Note 1. The resolution indicates the variation (±3 σ) in the linear output (voltage output) when a ZX-TDA□1 Amplifier Unit is connected. This value is taken 30 minutes after turning ON the power with the average number of operations set to 1,024. The minimum value that can be read is 1 μm.
2. The linearity is given as the error in an ideal straight line displacement output.
3. These figures are representative values that apply for the mid-point of the measurement range when the Actuator provided is secured facing downward.
- ZX-TDS10T and ZX-TDS10T-V: The operating force will be reduced if the Actuator is secured facing horizontally or upward.
- ZX-TDS10T-L and ZX-TDS10T-VL: The actuator can be installed only facing downward.

4. These figures are representative values that apply for the mid-point of the measurement range.
5. These values were measured at an ambient temperature of 23°C.
6. The ZX-TDS10T comes with a Right-angle Adapter.

Characteristic Data

Output Characteristics
Voltage/Current Output

ZX-TDS01T/-TDS04T-□/-TDS10T-□□

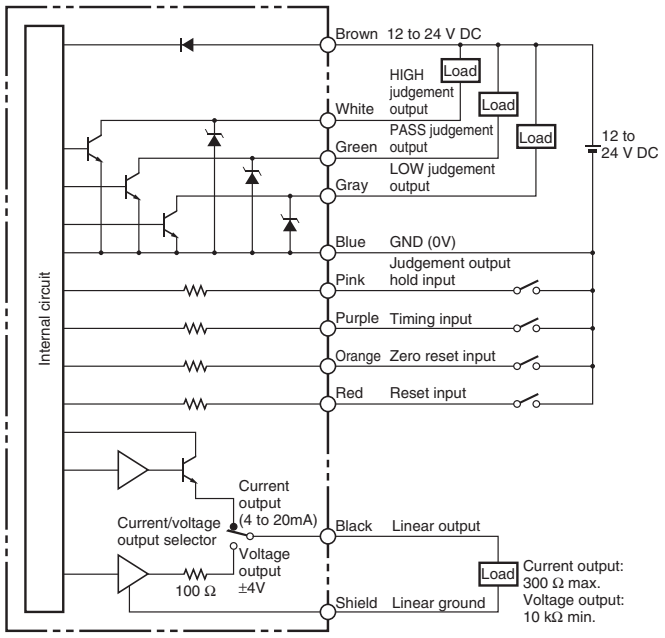


*1: Values for the ZX-TDS04T/-TDS04T-□.

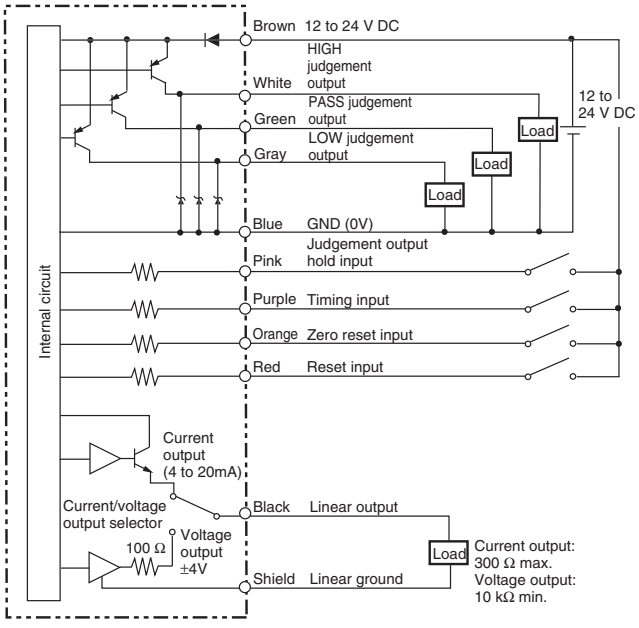
*2: Values for the ZX-TDS10T/-TDS10T-□□.

I/O Circuit Diagrams

NPN Amplifier Unit: ZX-TDA11

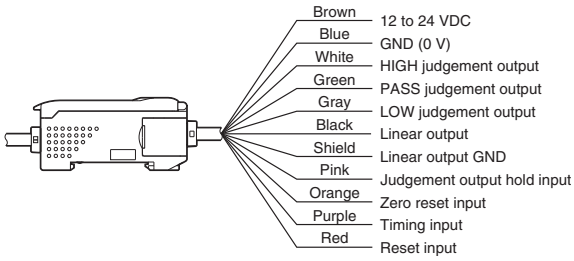


PNP Amplifier Unit: ZX-TDA41



Connectors

Amplifier Unit



Note 1. Use a stabilized power supply separate from other devices and power systems for the Amplifier Unit, particularly when high resolution is required.

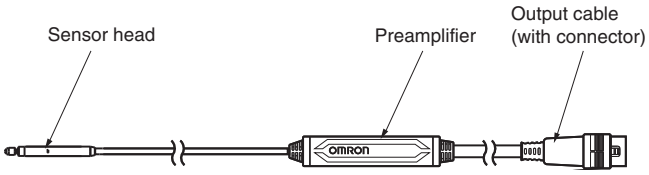
2. Always wire correctly. Incorrect wiring may damage the Unit. Use a different ground for the linear output from the normal ground.

3. The blue line (0 V) is the 0 V power supply line. The shield wire (linear output GND) is used together with the black line (linear output) to connect the linear output. Wire these lines correctly. Always ground the linear output terminal even when the linear output is not used.

Part Names

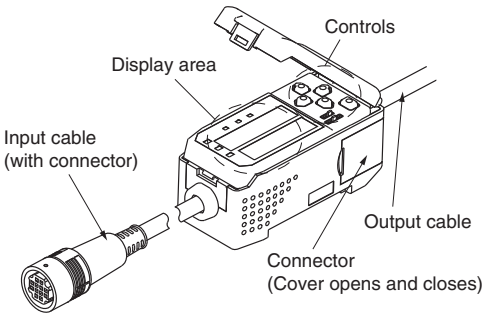
Sensor Heads

ZX-TDS01T
ZX-TDS04T-□
ZX-TDS10T-□□



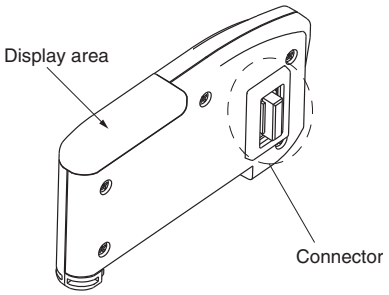
Amplifier Unit

ZX-TDA11
ZX-TDA41



Calculating Unit

ZX-CAL2



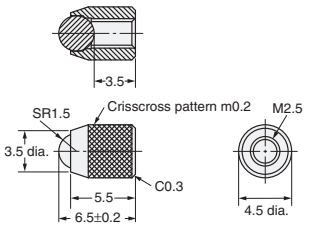
Options (Actuators)

Model		Type (material)	Screw section	Appearance	Application	Applicable Sensor (See note.)
						ZX-TDS□T
D5SN-	TB1	Ball type (steel)	Female screw M2.5 x 0.45		Measuring ordinary flat surfaces (standard actuator supplied with the ZX-TDS Series)	○
	TB2	Ball type (carbide steel)	Female screw M2.5 x 0.45		Measurements where abrasion resistance is critical Measured objects: Carbide (HR90) or lower.	○
	TB3	Ball type (ruby)	Female screw M2.5 x 0.45		Measurements where abrasion resistance is critical Measured objects: Carbide (HR90) or higher.	○
	TN1	Needle type (carbide steel)	Male screw M2.5 x 0.45		Measuring the bottom of grooves and holes	△
	TF1	Flat (carbide steel)	Male screw M2.5 x 0.45		Measuring spherical objects	△
	TA	Conversion Adapter (stainless steel)	Through-hole female screw M2.5 x 0.45		Mounting D5SN-TN1/-TF1 or commercially available actuators on ZX-TDS-series Sensors	○

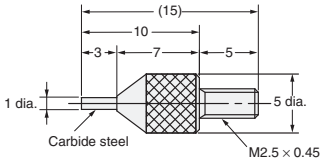
Note: ○ Replacement possible △ Conversion Adapter required

■Dimensions

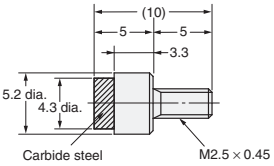
D5SN-TB1/TB2/TB3



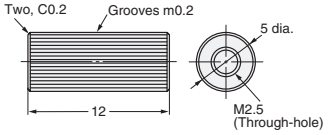
D5SN-TN1



D5SN-TF1



D5SN-TA

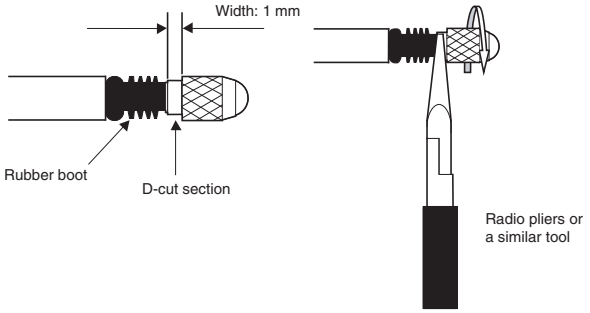


Replacing Actuators

Be careful not to damage the rubber boot with pliers or other tools when replacing the actuator.

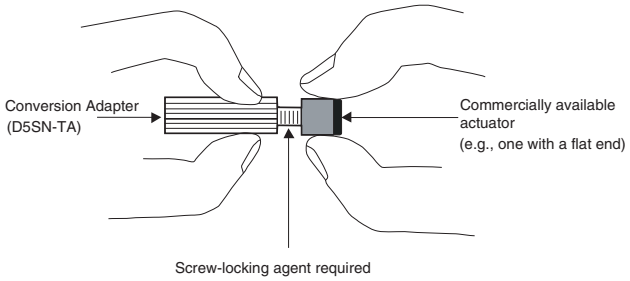
1. Remove the standard actuator.

- Hold the plunger's D-cut section with radio pliers or a similar tool while removing the actuator.
- If the replacement must be performed by holding the Sensor Head itself, ensure that a torque exceeding 0.15 N·m is not applied. Applying excessive torque may have an adverse affect on plunger operation.



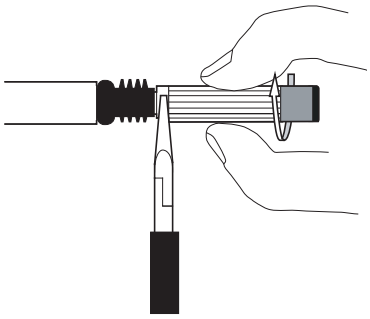
2. Mount the commercial actuator to the Conversion Adapter.

- Tighten the actuator securely, and ensure that there is no looseness.
- If necessary, apply a screw-locking agent. (Recommended: Three-Bond 1401B)



3. Mount the Conversion Adapter to the plunger.

- Hold the plunger's D-cut section with radio pliers or a similar tool while mounting and securing the Conversion Adapter.
- If the replacement must be performed by holding the Sensor Head itself, ensure that a torque exceeding 0.15 N·m is not applied. Applying excessive torque may have an adverse affect on plunger operation.



Precautions

Design Precautions

- Conform to the specified ratings and performance. Refer to *Specifications* on page 2 for details.
- Measurements may not be possible or may not be accurate for some materials and shapes.
- The Sensor will be destroyed if the Actuator is pressed too far. Do not use the Actuator past the point where a pressing force alarm (OVER) is displayed.
- Do not remove the rubber boot. Without the rubber boot, foreign matter may enter the Sensor Head, possibly causing the Sensor Head to malfunction.
- Use suitable torque and force when mounting the Sensor.
- The Sensor may be destroyed if excessive force is applied.

Environment

- Do not operate the product in locations subject to flammable or explosive gases.
- In order to ensure safe operation and maintenance, do not install the product in the vicinity of high-voltage devices or power equipment.

Wiring

- Do not use the product at voltages exceeding the rated values. Doing so may result in damage.
- Do not connect the product to an AC power supply or connect the power supply in reverse.
- Do not short-circuit the load for open-collector output.

Correct Use

●System Design

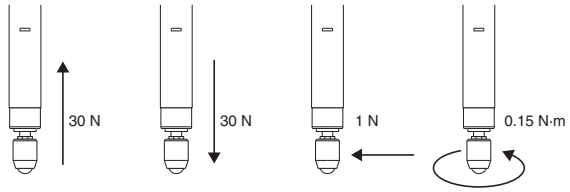
Warming Up

After turning ON the power, allow the Smart Sensor to warm up for 15 minutes minimum prior to use.

Measurements

Do not expose the plunger to forces exceeding the limits in the following diagram. Doing so may damage the plunger.

ZX-TDS-Series Sensors



●Adjustments

Settings

When setting the threshold value with the Smart Sensor connected to an external device, turn ON the Amplifier Unit's judgement output hold input to prevent the judgement from being output to the external device.

●Compatibility

Sensors and Amplifier Units are mutually compatible. Sensors can be added or replaced individually.

●Influence of High-frequency Electromagnetic Fields

Using the product in the vicinity of devices that generate high-frequency electromagnetic fields, such as ultrasonic cleaning equipment, high-frequency generators, transceivers, mobile phones, and inverters, may result in malfunction.

Other Precautions

Do not attempt to disassemble, repair, or modify the product.

Dispose of the product using standard procedures for industrial waste.

These Sensors are not compatible with the ZX-L□□ Smart Sensors (laser type). Do not connect combinations of ZX-E□□ Smart Sensors and ZX-T□□ Smart Sensors.

Wiring

●Wiring Check

After wiring is completed, before turning ON the power, confirm that the power supply is connected correctly, that there are no faulty connections, such as load short-circuits, and that the load current is correct. Incorrect wiring may result in failure.

●Cable Extension

Do not extend the cable for the Sensor and the Amplifier Unit to a length exceeding 10 m. Use a ZX-XC□A Extension Cable (sold separately) to extend the Sensor's cable. Extend the Amplifier Unit's cable using a shielded cable of the same type.

●Power Supply

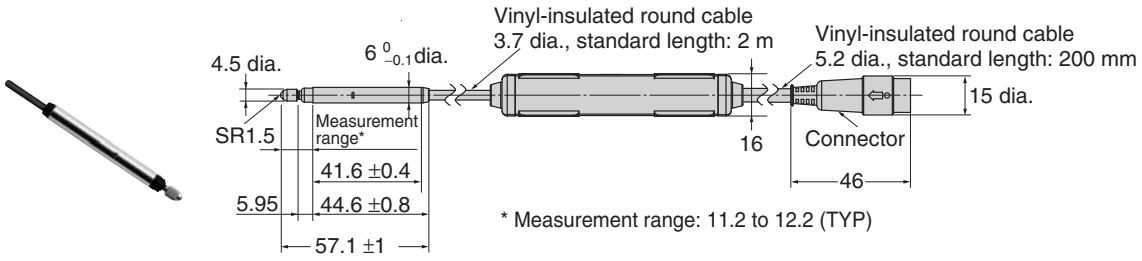
When using a commercially available switching regulator, ground the FG (frame ground) terminal.

If the power supply line is subject to surges, connect a surge absorber that meets the conditions of the operating environment.

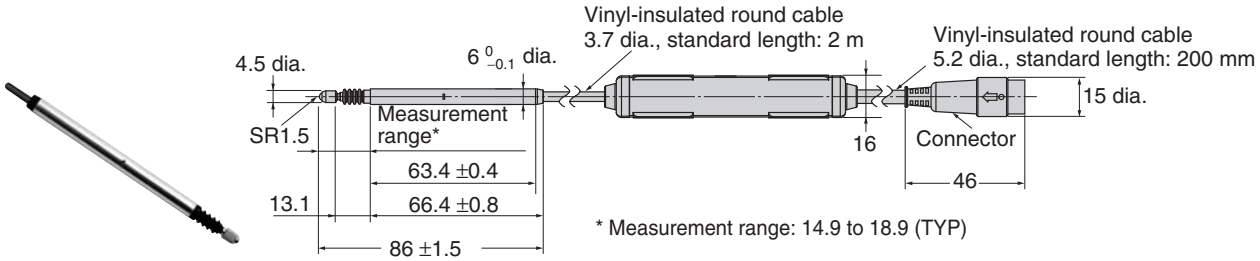
Dimensions

Sensors

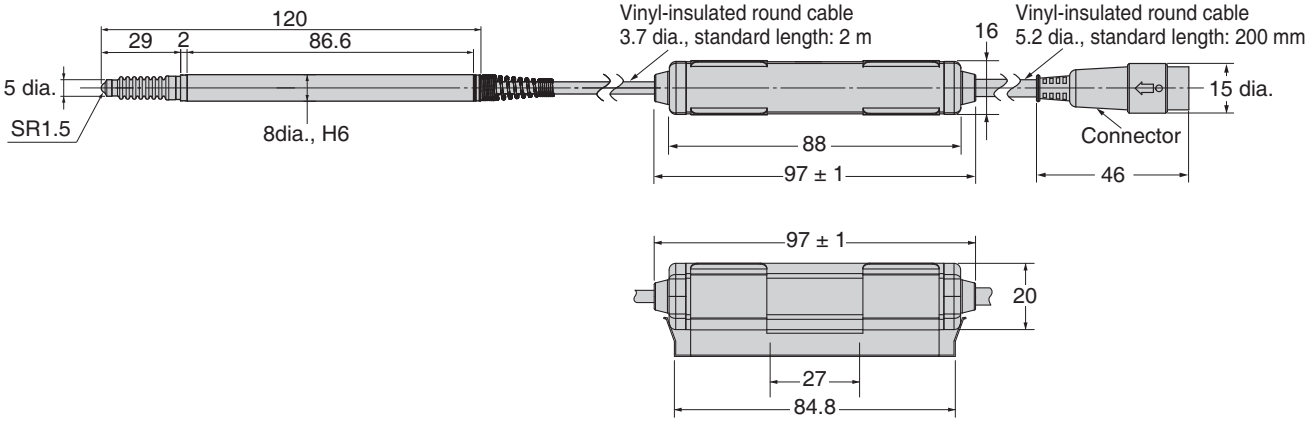
ZX-TDS01T



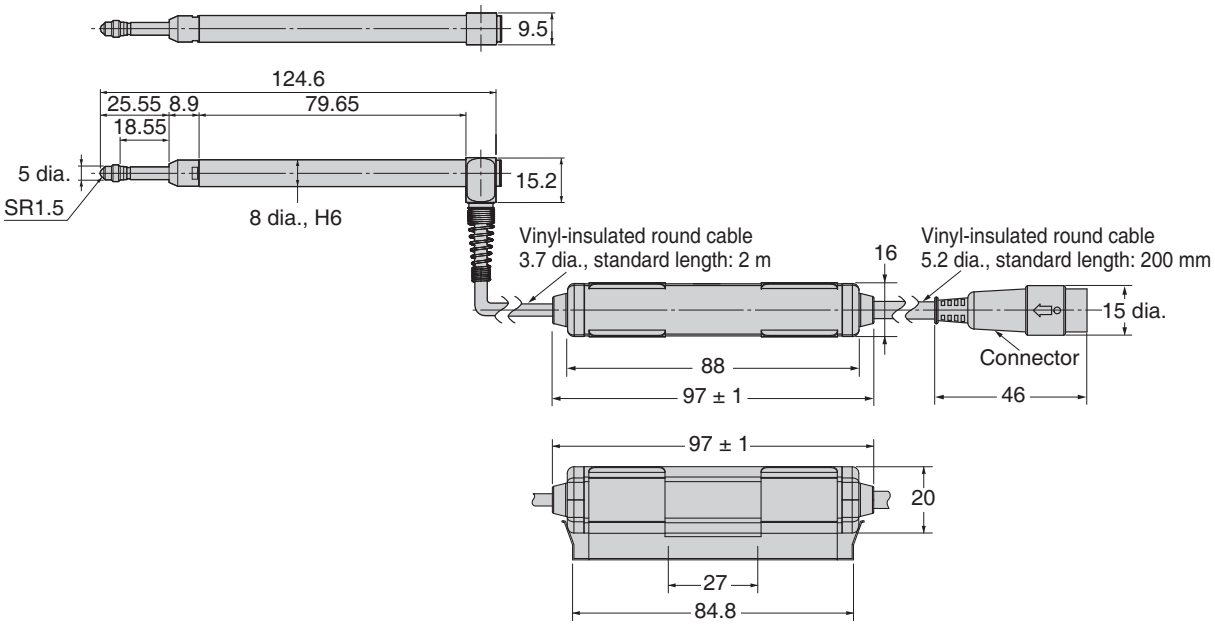
ZX-TDS04T
ZX-TDS04T-L



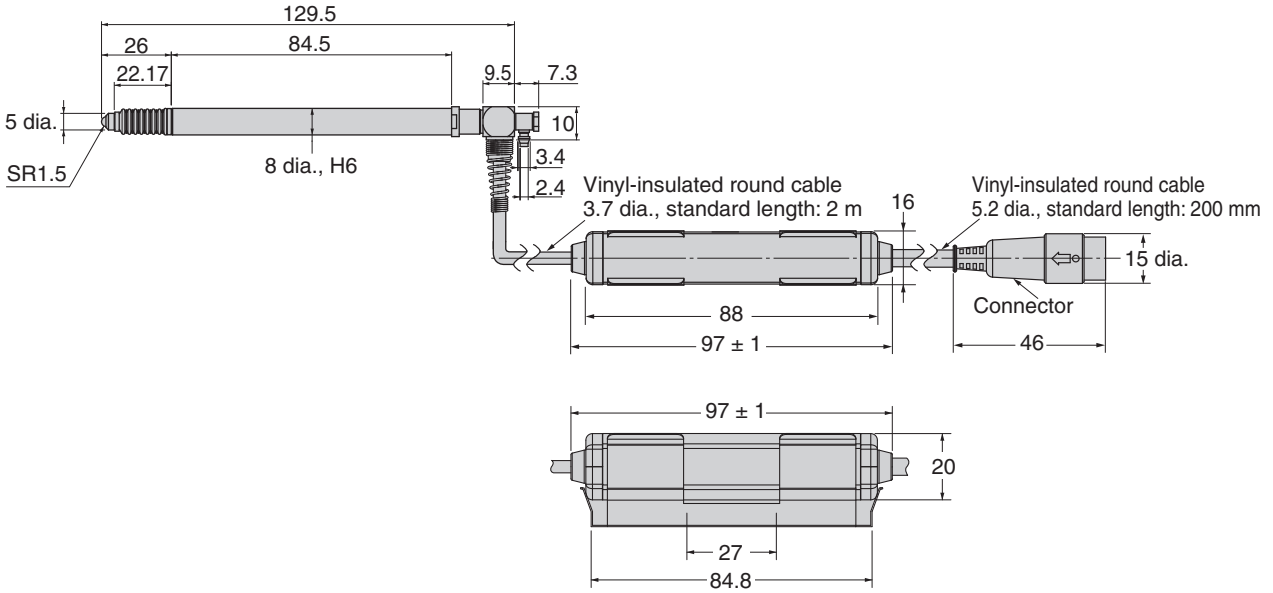
ZX-TDS10□



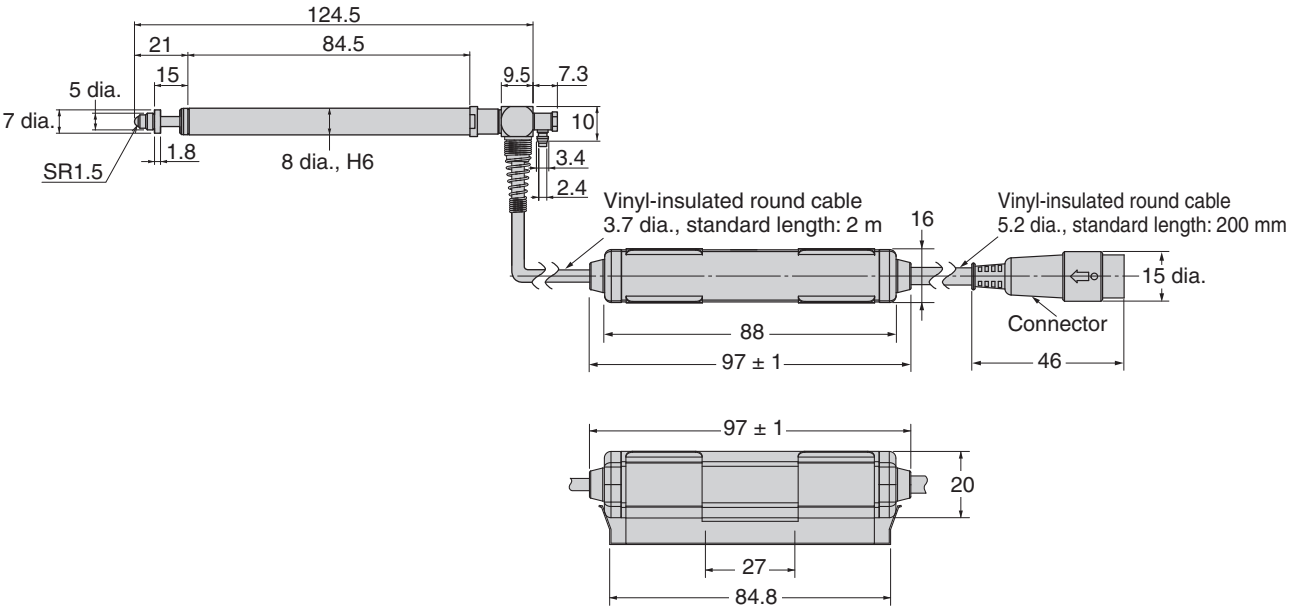
ZX-TDS10□-L



ZX-TDS10□-V

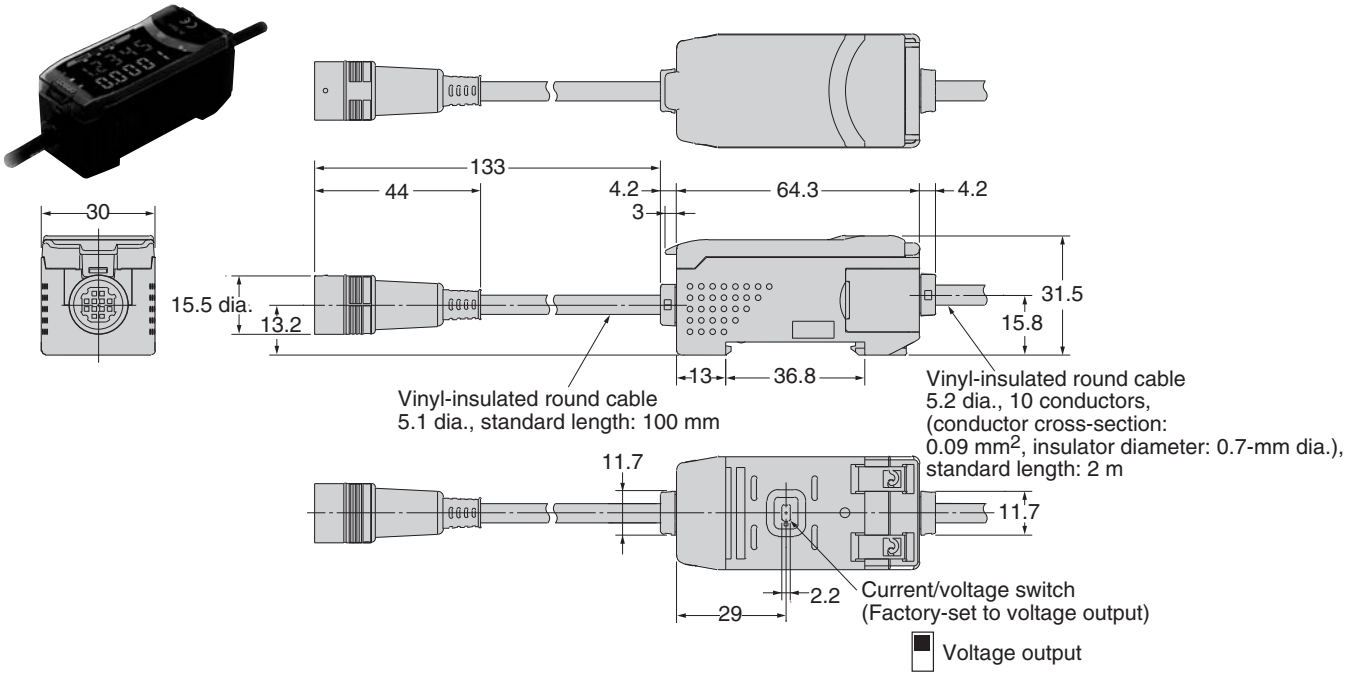


ZX-TDS10□-VL



Amplifier Unit

ZX-TDA11
ZX-TDA41

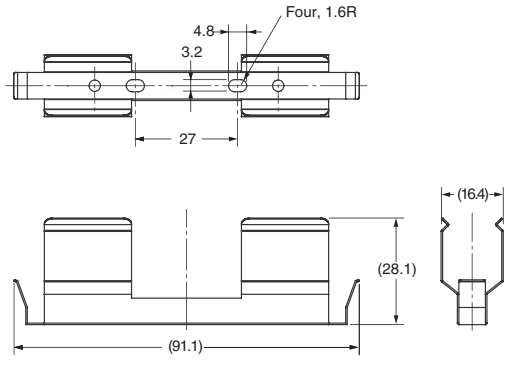


■Accessories (Order Separately)

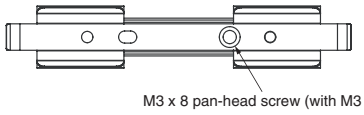
Preamplifier Mounting Bracket (Supplied with Each Sensor)

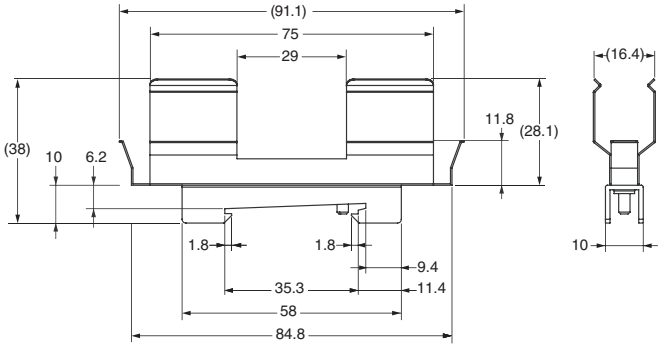
ZX-XBT1

ZX-XBT2 (For DIN Track Mounting)



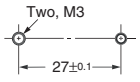
Material: Stainless steel





Material: Stainless steel

Mounting Hole Cutout Dimensions



Terms and Conditions Agreement

Read and understand this catalog.

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

Warranties.

(a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.

(b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) Buyer Remedy. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.

See http://www.omron.com/global/ or contact your Omron representative for published information.

Limitation on Liability; Etc.

OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

Suitability of Use.

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Programmable Products.

Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

Performance Data.

Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

Change in Specifications.

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions.

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

Note: Do not use this document to operate the Unit.

OMRON Corporation **Industrial Automation Company**

Kyoto, JAPAN **Contact : www.ia.omron.com**

Regional Headquarters

OMRON EUROPE B.V.
Wegalaan 67-69, 2132 JD Hoofddorp
The Netherlands
Tel: (31) 2356-81-300 Fax: (31) 2356-81-388

OMRON ELECTRONICS LLC
2895 Greenspoint Parkway, Suite 200
Hoffman Estates, IL 60169 U.S.A.
Tel: (1) 847-843-7900 Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.
438B Alexandra Road, #08-01/02 Alexandra
Technopark, Singapore 119968
Tel: (65) 6835-3011 Fax: (65) 6835-3011

OMRON (CHINA) CO., LTD.
Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-6023-0333 Fax: (86) 21-5037-2388

Authorized Distributor:

©OMRON Corporation 2003-2025 All Rights Reserved.
In the interest of product improvement,
specifications are subject to change without notice.

CSM_2_3
Cat. No. E345-E1-05 0125 (1203)