General Specifications

DTSX1
Fiber Optic Heat Detector

GS 39J06B35-01EN

■ Outline

The DTSX1 fiber optic heat detector senses temperatures with fiber optic sensor cable and detects high heat over a wide area quickly and precisely.

The DTSX1 is easy to deploy because components such as an optical fiber temperature sensor, relay output, and alarm display are integrated and wired in a single box.

An ability to configure the alarm display and sound individually to suit filed conditions applications enables rapid detection, localization, and identification of abnormalities, which increases the cost effectiveness of the system as a whole.

■ Features

- The DTSX1 utilizes a heat detection function and is easy to handle; components and device configuration are standardized and integrated into a single box.
- The DTSX1 can be operated as a package in conjunction with a fiber optic sensor cable (standard).
- The DTSX1 is dedicated to facility abnormality monitoring and fire detection so it can be deployed timely and economically compared to general-purpose fiber optic temperature sensors.
- An up to 4-channel optical switch module, along with a 16-km measurement distance of the fiber optic sensor cable for each channel enables the precise detection of heat over a wide area.
- Integration with Yokogawa's process control system and safety instrumented system provides a comprehensive production control and safety solution.
- The fiber optic heat detector is compliant with the European fire detection certification standard (EN 54-22 Classes A1N, A2N, BN, and CN) and approved by VdS (certification authority). (No. G 220001).

■ System Configuration

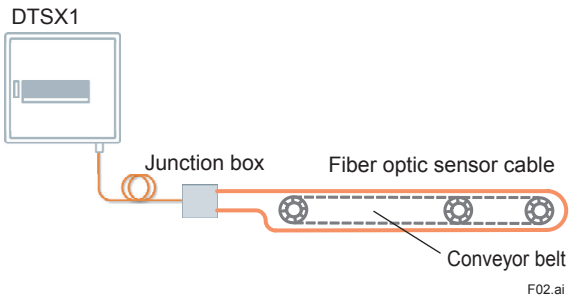


Figure: DTSX1 heat detection system example



■ Specifications

Item			Description
Measurement distance range			2, 4, 6, 8, 10, 16 km
Number of channels			1, 2, 4
Spatial resolution			1 m or less*1
Sampling resolution			Measuring temperature at 0.5-meter or 1-meter intervals
Minimum temperature measurement time			5 sec
Measurement mode			Single-ended, double-ended
Number of zones configured			1,000 (no overlapping)
Interface	Optical output		E2000/APC 50/125 µm GI
	LAN		10BASE-T or 100BASE-TX Modbus/TCP
	Relay output		8, 64 ports, max 35 V / 1 A DC
	Relay input		4 ports ON: 12 to 30 V / 5 mA DC OFF: 3 V / 2 mA DC
	Display*2		POWER SYSTEM OPERATING ALARM/PRE-ALARM/FAULT (Displayed for each channel)
	Switch	RESET	Alarm state reset
		ACK	Alarm acknowledgement (Hold the alarm state)
Power supply	Operating voltage		10 to 30 V DC (Rated voltage: 12 or 24 V DC)
	Power consumption		30 W (normally 15 W at 23°C ambient temperature)
Dimensions (W×H×D)			500 mm × 500 mm × 250 mm
Weight			28 kg
Mount type			Wall mount

*1: The length at which a 10% to 90% temperature change is detected at the near end of the fiber optic sensor cable when sampling a 16 km or less range at 0.5 m intervals

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*2: Display

Display	Color	Description
POWER	Green ON	Power ON, the power voltage is normal
	Yellow ON	Power ON, the power voltage is abnormal
	Green flashing	DTSX1 is booting
	OFF	Power OFF
SYSTEM	Green ON	DTSX1 is normal
	Yellow ON	DTSX1 is abnormal
	OFF	Power OFF
OPERATING	Green ON	Heat detection is operating
	Red ON	Test mode
	OFF	Heat detection is stopped
ALARM	Red ON	Alarm occurred
	OFF	No alarm occurred
PRE-ALARM	Red flashing	Pre-alarm occurred
	OFF	No pre-alarm occurred
FAULT	Orange ON	There is a fault in the fiber optic sensor cable
	OFF	There is no fault in the fiber optic sensor cable

● Functional Specifications

Item		Description
Heat detection	Alarm	Measures the temperature of the detection object with fiber optic sensor cable according to the distance and channel settings and detects heat according to the alarm settings.
	Pre-alarm	Outputs a pre-alarm when reaching a temperature limit. This function is available for the upper temperature limit, average temperature difference upper limit, and temperature rise per time unit.
	Reset	Resets the alarm state regardless of the alarm condition and holds the state until the next alarm.
	ACK	Acknowledges and holds the alarm state.
	Zone data*1 generation	Generates zone data (maximum/minimum/average values) to detect heat from the temperature measurement data.
Setup	Alarm setting*2	Set each alarm for the temperature upper limit, average temperature difference upper limit, and temperature rise per time unit for each zone, along with a preset function to suit each application.
	Zone setting	Set up to 1,000 zones for which to output an alarm.
Interface	Alarm output*3	Set a programmable alarm output for each relay output.
	Alarm input	Inputs an alarm from other devices via relay. Reset and ACK inputs are possible.
	Alarm display	Displays the alarm when an alarm occurs.
	Communication	Acquires zone data and alarm status via Modbus/TCP.
Maintenance	Fiber optic sensor cable break detection	Detects the break status when the signal level of the fiber optic sensor cable drops and displays the status for each channel. The status can be acquired via Modbus/TCP.
	Power supply voltage monitoring	Monitors the power supply voltage drop and displays the status in the event of an abnormality. The status can be acquired via Modbus/TCP.
	System fault detection	Monitors the system fault status and displays the status in the event of an abnormality. The status can be acquired via Modbus/TCP.
	Self-diagnosis	Self-diagnoses the status of each part of the system via Modbus/TCP or with configuration software.

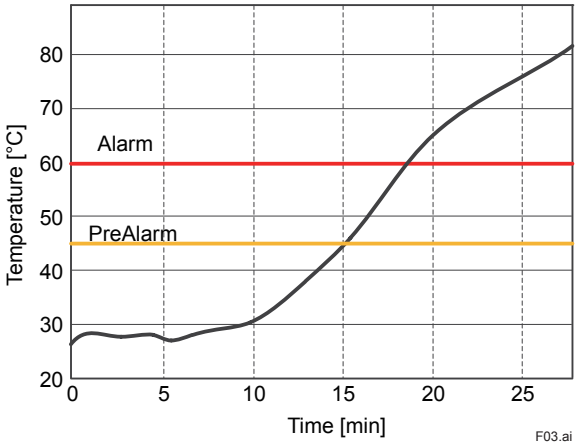
*1: The temperature data for the zone to detect heat. Zones can be set arbitrarily.
*2: An alarm status is determined by selecting or combining alarm settings from among the three limits. See “Alarm Determination.”
*3: Up to three points can be set in each zone.

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● Alarm Determination

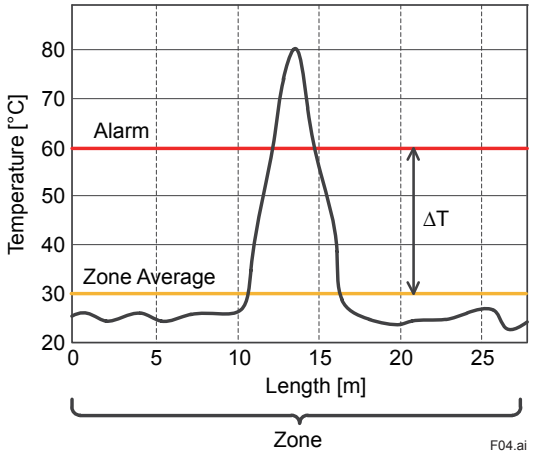
• Temperature upper limit

Output an alarm when the maximum value in the zone becomes larger than the threshold.



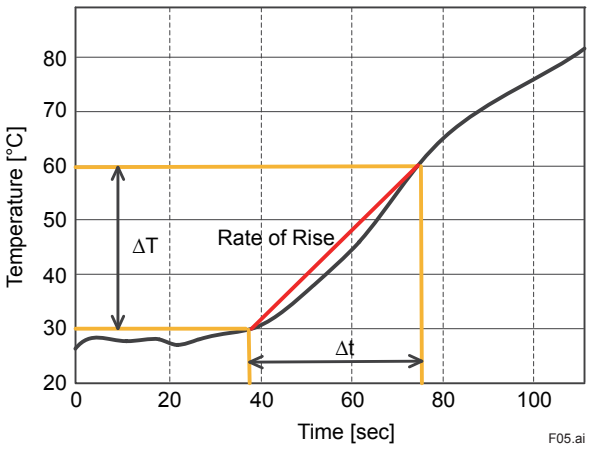
• Average temperature difference upper limit

Output an alarm when the difference between the maximum value and average value in the zone becomes greater than the threshold.



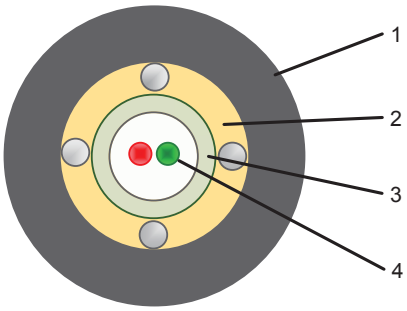
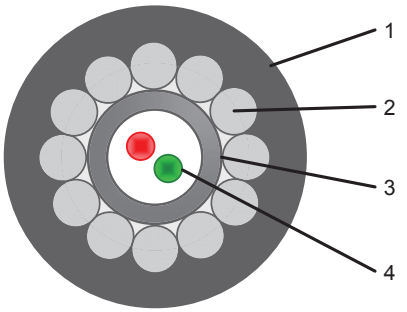
• Temperature rise per time unit

Output an alarm when the rate of rise of the maximum temperature in the zone becomes larger than the threshold.



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● **Fiber Optic Sensor Cable** (Note)

Item	Standard type	Robust type
Cross-sectional structure	 1 Outer layer 2 Tensile strength fiber 3 Loose tube 4 Optical fiber F06.ai	 1 Outer layer 2 Tensile strength stainless steel wire 3 Stainless tube 4 Optical fiber F07.ai
Optical fiber	50/125 µm GI, 2 cores	50/125 µm GI, 2 cores
Outer layer	Flame retardant non-corrosive (FRNC)	Flame retardant non-corrosive (FRNC)
Standard outer diameter	4.5 mm	4.0 mm
Operating temperature range	−40 to 85°C	−40 to 85°C
Allowable tension (short term/ long term)	700 N/200 N	1,500 N/1,100 N
Minimum bend radius (static/ dynamic)	60 mm/80 mm	60 mm/80 mm
Weight	21 kg/km	32 kg/km
Operating environment/ conditions	Indoors/outdoors	Indoors/outdoors
Compliance with the EN 54-22 standard	Class A1N, A2N, BN, CN Environmental group II*1	Class A1N, A2N, BN, CN Environmental group III*2
Type No.	S9550TK	S9580TK

Note: The cables are recommended for use for a fire detection system. Cables provided by other suppliers can also be used to suit your applications provided they are compatible with the optical output specifications of the DTSX1.
Three Environmental groups are defined depending on the environment in which the device is used, and each group has different certification conditions.
The DTSX1 and each fiber optic sensor cable are certified according to the conditions of the relevant Environmental groups.

*1: Environmental group II is intended for equipment to be installed inside buildings (indoors) on the premises of general commercial or industrial areas.

*2: Environmental group III is intended for equipment to be installed outdoors.

■ Installation Requirements

Item		Description
Temperature	Normal operating condition	−20 to 60°C*1
	Transport/ storage condition	−40 to 70°C
Humidity	Normal operating condition	5 to 95%RH (No condensation)
	Transport/ storage condition	5 to 95%RH (No condensation)
Installation		Indoors
Vibration, shock, impact		Compliant with EN 54-22 Class A1N, A2N, BN, and CN standards. (EN 60068-2-6, 27, 75)
Corrosive gas		Compliant with EN 54-22 Class A1N, A2N, BN, and CN standards. (EN 60068-2-42)
EMI noise		Compliant with EN 54-22 Class A1N, A2N, BN, and CN standards. (EN 50130-4)

*1: The DTSX1 has been tested at low and high temperatures of -10°C and 55°C according to the fire detection standards (EN 54-22 Classes A1N, A2N, BN, and CN) and certified in Environmental group II.

■ Software

DTSX3000 Control Visualization Software (DTAP3000)

This software is required for the operation and initial setup of the DTSX1, such as temperature calibration and alarm condition and zone settings.
For details, refer to the “DTSXL Distributed Temperature Sensor Long Range System (Software)” (GS 39J02B40-01EN).

Data Logging Software (GA10)

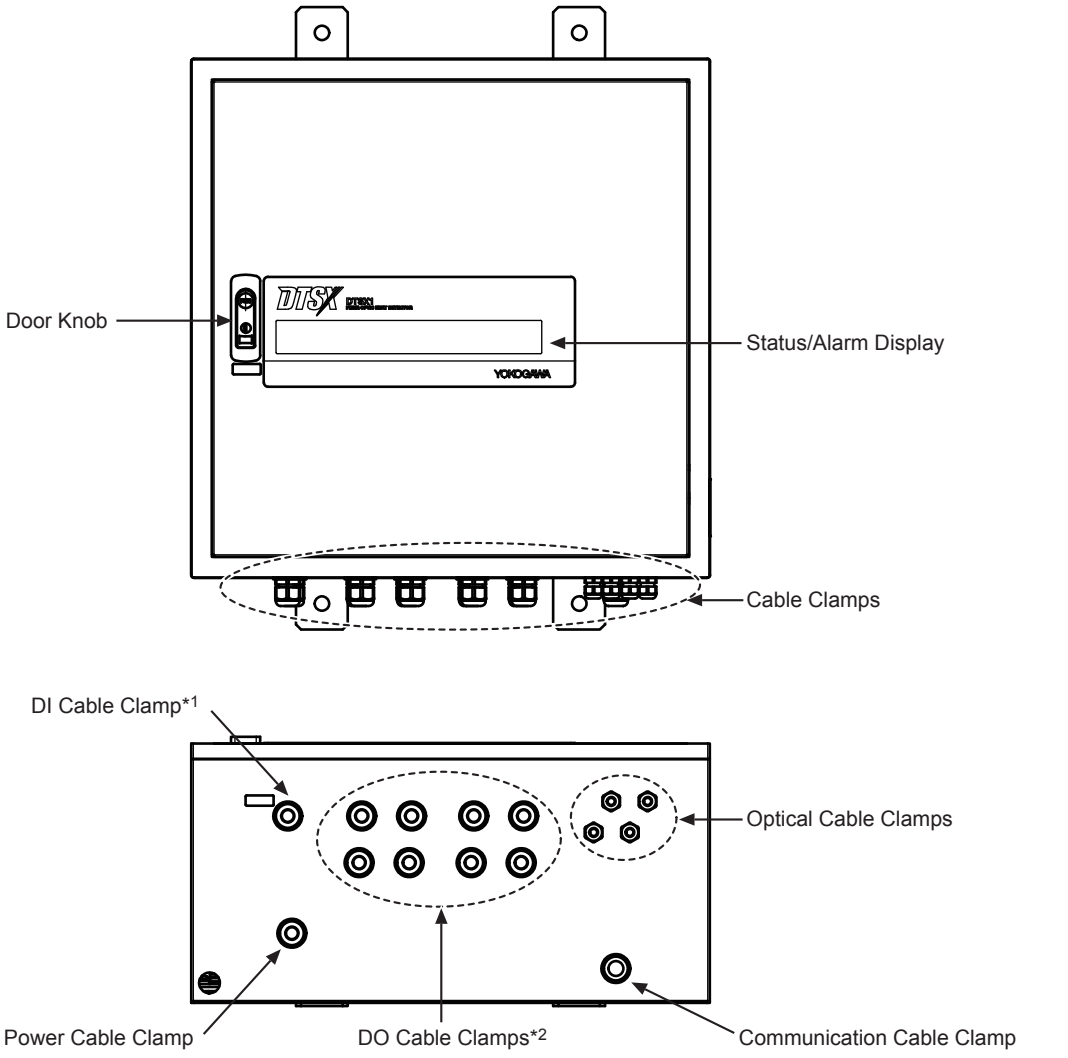
This software has templates dedicated to the DTSX1 and the custom display function. The GA10 graphically displays the temperature measurement data from the DTSX1. Purchase this software when necessary. For details, refer to the “GA10 Data Logging Software” (GS 04L65B01-01EN).

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■ Standard Accessories

Item		Number of pieces
Wall mounting bolt		4
Wall mounting washer		4
Relay I/O connector	64 relay output	17
	8 relay output	3
Cable hole cover sheet		13
Door lock key		2

■ Part Names and Functions



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*1: 4 ports per clamp
*2: 8 ports per clamp (Maximum 64 ports: 8 ports × 8 clamps)

● **Status/Alarm Display**

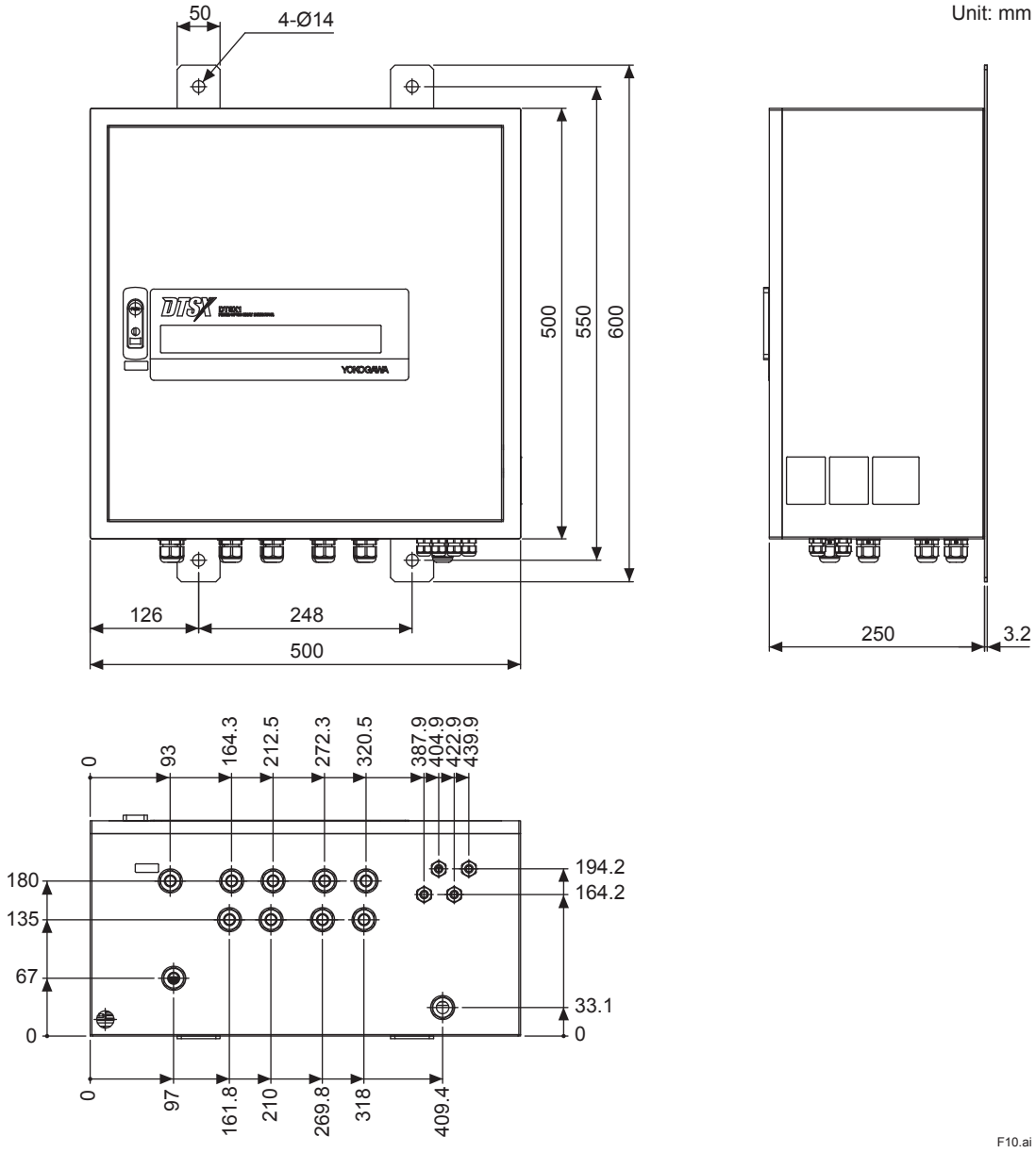


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■ External Dimensions

Unit: mm



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■ Setup/Adjustment

● **Software Operating Environment**

Item	Requirement*1
OS	Windows 10 / Windows 11
CPU	Dual Core 2 GHz or faster processor
RAM	2 GB or more (4 GB or more is recommended)
HD free space	2 GB or more
Ethernet adapter	100BASE-TX or 10BASE-T
Web browser	Microsoft Edge
PDF reader*2	Adobe Acrobat Reader

*1: Operation is not guaranteed for all PC environments that meet these requirements.
*2: The PDF reader is required to display the Instruction Manual (IM).

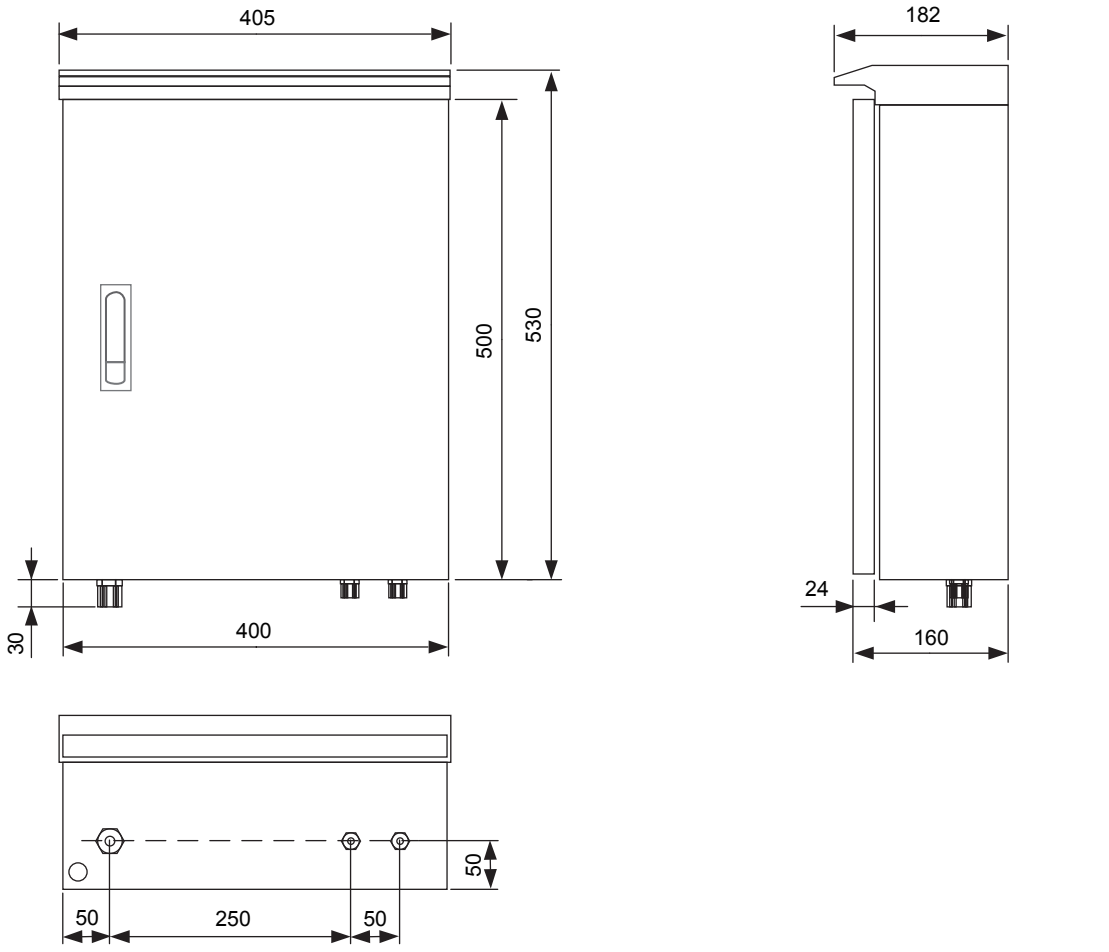
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■ External Dimensions of Peripherals

● Junction Box

• D1JB-01

Unit: mm



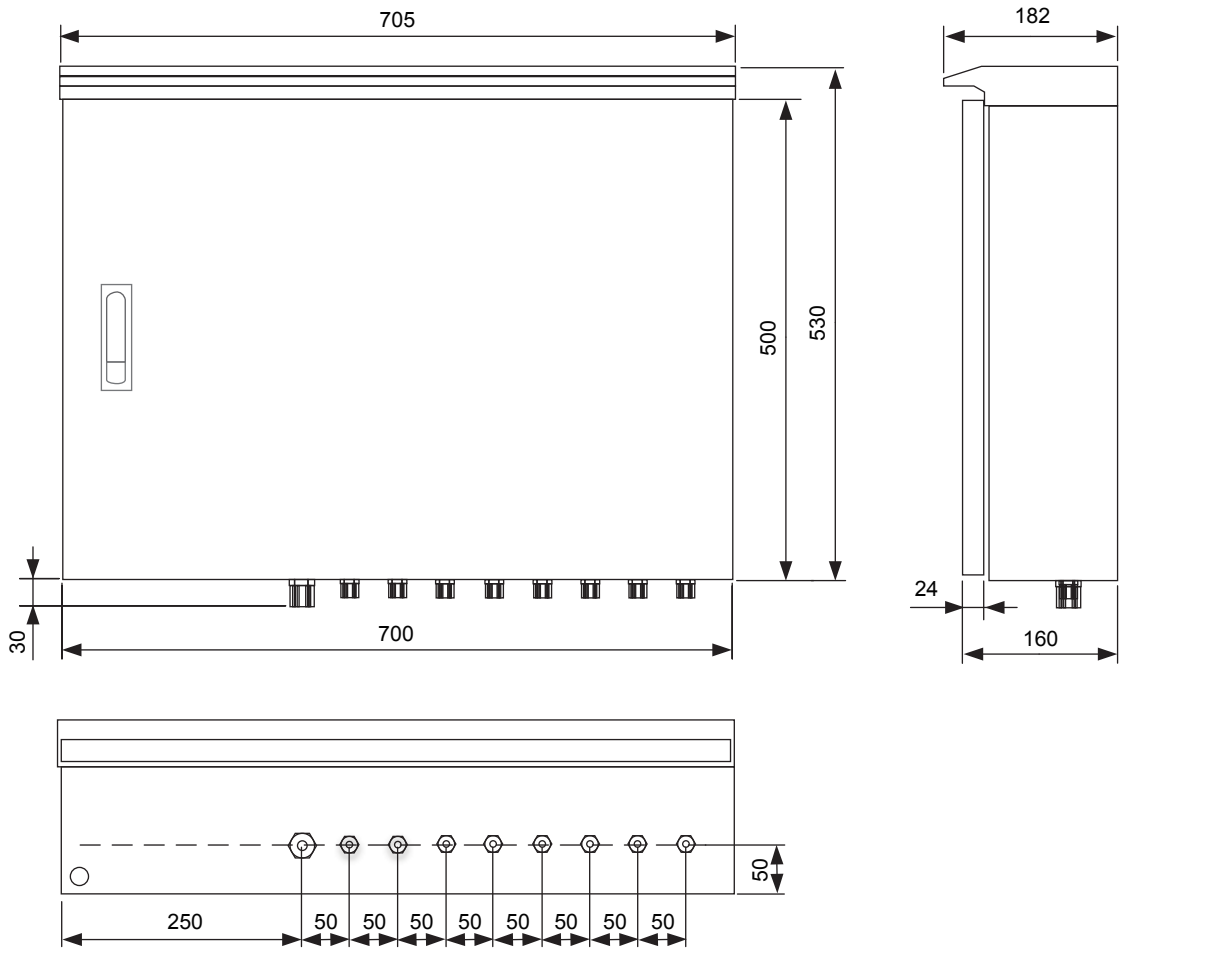
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Item	Description
Dimensions (W×H×D)	405 mm x 530 mm x 182 mm (Excluding cable clamp and mounting bracket)
Weight	14.5 kg
Mounting	Wall mounted
Material	Steel
Surface treatment	Coating
Cable hole (Inside hole)	3 ports (Maximum 10.5 mm x 1 port and Maximum 4.5 mm x 2 ports)

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• D1JB-03

Unit: mm



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Item	Description
Dimensions (W×H×D)	705 mm x 530 mm x 182 mm (Excluding cable clamp and mounting bracket)
Weight	23 kg
Mounting	Wall mounted
Material	Steel
Surface treatment	Coating
Cable hole (Inside hole)	9 ports (Maximum 10.5 mm x 1 port and Maximum 4.5 mm x 8 ports)

● Patch Cable

• D1PT-01

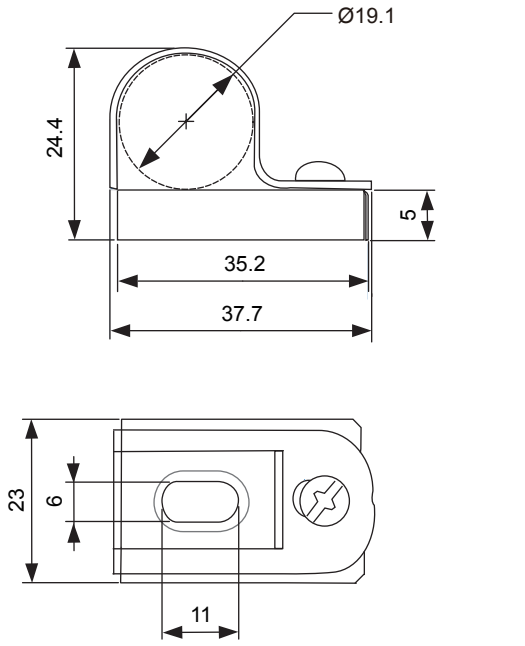
Item	Description
Optical fiber	50/125μm GI, 1 core
Standard outer diameter	2.8 mm
Length	10 m
Connector	One side E2000 MM APC connector
Incretion loss	0.15dB or less

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● **Cable Clamp**

• D1CL-01

Unit: mm



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Item	Description
Application	Ceiling install clamp
Dimensions (W×H×D)	37.7 mm x 24.4 mm x 23 mm
Weight	30 g
Material	Stainless

■ Precautions on Fiber Optic Sensor Cable

● **Connection and Wiring**

- When wiring fiber optic sensor cables, the maximum number of connections, including the optical output of the DTSX1, is 20 per channel.
- Fusion splice a fiber optic sensor cable with a 0.1 dB loss or less.
  If connector connection is unavoidable, use an APC connector to contain the loss to 0.5 dB or less.
- For more detailed information on connection and wiring of the power cable, contact I/O cables, network cables, and fiber optic sensor cables, refer to the “DTSX1 Optic Fiber Heat Detector Installation, Configuration and Operation Guide” (IM 39J06B35-01EN).

● **Handling**

- Use the optical connector and fiber optic sensor cable specified in the product specifications.
- Clean the optical connector end to remove foreign substances such as dirt, dust, and oil film before connecting it.
- Check that there is no scratch at the optical connector end. If an optical connector with a scratch at the end is used, the mating optical connector may be damaged.
- Check that the optical connector is connected and locked securely.
- Wire fiber optic sensor cables properly according to the prescribed instructions and do not apply external forces such as excessive tension or side pressure or excessive bending or twisting.

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■ Notes on EN 54-22 Certified Products

The forms of DTSX1 products and devices that can be used to build a fire detection system compliant with each EN 54-22 certification are defined.

The table below shows the configurations and combinations of DTSX1 products and devices.

EN 54-22 certification	EN 54-22-certified device model name		
	DTSX1	Fiber optic sensor cable	Peripherals*1
EN 54-22 Class A1N, A2N, BN, CN	DTSX1-N02□□□ DTSX1-N04□□□ DTSX1-N06□□□ DTSX1-N08□□□ DTSX1-N10□□□ DTSX1-N16□□□	S9552TK S9554TK S9556TK S9558TK S9581TK S9582TK S9583TK S9584TK S9585TK S9586TK S9587TK S9588TK	Junction box: D1JB-01/ D1JB-03 Patch cable: D1PT-01

*1: When junction boxes and patch cables are used to install fiber optic sensor cables.

■ Model and Suffix Codes

● DTSX1

Model	Suffix code				Remark
DTSX1	-N				Fiber optic heat detector
Measurement distance range*1		02			2 km
		04			4 km
		06			6 km
		08			8 km
		10			10 km
		16			16 km
Number of channels			1		1 channel
			2		2 channels
			4		4 channels
Relay output				08	8 ports
				64	64 ports

● Fiber Optic Sensor Cable

Type	Model/parts	Cable length
Standard	S9552TK S9554TK S9556TK S9558TK	2 km 4 km 6 km 8 km
Robust	S9581TK S9582TK S9583TK S9584TK S9585TK S9586TK S9587TK S9588TK	1 km 2 km 3 km 4 km 5 km 6 km 7 km 8 km

● Peripherals

Model	Suffix code	Remark
D1JB	-01	Junction box 400 mm width
	-03	Junction box 700 mm width
D1PT	-01	Patch cable
D1CL	-01	Cable clamp*1

*1: One anchor clamp is included with each cable clamp, in units of 100.

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■ Compliant Standards

Category		Standard	Remark
Fire detection		EN 54-22	Heat response class: A1N, A2N, BN, CN Environmental group: II VdS certification No.: G 220001
Laser safety		IEC 60825-1	Class1M (2007)/Class1 (2014)
		EN 60825-1	Class 1
		FDA(CDRH)	21CFR 1040.10
CE mark*1	EMC	EN 55011 EN 61000-6-2	Class A Group 1*2
	Safety*3	EN 61010-1	–
		EN IEC 61010-2-201	–
	RoHS Directive*4	EN IEC 63000	–
	Laser safety	EN 60825-1	Class 1
CSA-US mark	CSA Safety*3	CSA C22.2 No.61010-1-12	–
		CSA C22.2 No.61010-2-201:18	–
	UL Safety*3	UL 61010-1	–
		UL 61010-2-201	–
KC mark	EMC	Korean EMC standards	–
RCM mark	EMC	EN 55011	Class A Group 1

*1: The manufacturer and the authorized sales representative in Europe are shown below according to the EU's laws and regulations.
Manufacturer: Yokogawa Electric Corporation (9-32, Nakacho 2-chome, Musashino-shi, Tokyo, Japan 180-8750)
Authorized sales representative in Europe: Yokogawa Europe B.V. (Euroweg 2, 3825 HD Amersfoort, the Netherlands)
*2: Class A compliant devices are designed for an industrial environment and cannot be used for any other purposes.
*3: In order to make the DTSX1 compliant with the standard, a dedicated breaker compliant with the following standards must be installed on the power supply side.
CE mark Safety: EN 60947-1 and EN 60947-3
CSA Safety or UL Safety: CSA C22.2 No.5 or UL489
*4: Including the confirmation of 10 restricted substances defined in the Commission Delegated Directive(EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Note: Waste Electrical and Electronic Equipment (WEEE) Directive
This is a directive governed by the EU's environmental regulations. The DTSX1 is designed to comply with the requirements for large industrial equipment among the equipment categories controlled by the WEEE Directive.

■ Ordering Information

When ordering, specify the model, suffix codes, and optional codes.

■ Trademarks

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