General Specifications

Model TDLS8000 Tunable Diode Laser Spectrometer

GS 11Y01D01-01EN

Overview

Yokogawa's new TDLS8000 houses all of the industry's leading features in one robust device. The platform design is for in situ measurements which negate the need for sample extraction and conditioning.

The non-contacting sensor allows for a variety of process types including corrosive, abrasive and condensing.

The first generation platform has been proven in many others for the measurements of O_2 , CO, CH_4 , NH_3 , H_2O and many more NIR absorbing gases.

This second generation platform has improved reliability and ease of installation and maintenance while still meeting or exceeding designed application demands.

■ Features

- SIL2, TruePeak combined with smart laser technology
- Measurement integrates the area of the absorbance and gets a true, interference-free analysis under changing pressure, temperature and background
- Laser module is replaceable on site without any calibration or adjustment
- Internal reference cell in the laser module ensures peak locking during trace measurement
- Laser and Detector modules are sealed to protect them from dirty purge gas
- On board diagnostics and low TCO(*1) (no moving parts, high MTTF(*2) for components)
- IEC61508 SIL designed & approved, SIL 2 capability for single analyzer use, SIL 3 capability for dual analyzer use

• Intuitive touchscreen HMI

- Large HMI provides easy operation and control of up to 4 analyzers at the same time·A standard mini display at both sides enables easy optical alignment
- HART and Modbus TCP communications standard
- 8-stage auto-gain adapts to difficult applications
- Auto-gain enables wide signal ranges against dynamic variation of transmission.
- Fully field repairable with 50 days of data and spectra storage
- Compact design for one-man installation without sacrificing ruggedness
- IECEx, ATEX, FM (US, Canada) hazardous area approvals based on Nonincendive/Type n and Explosionproof/flame proof.
- Purge gas is no need for explosion protection.
- In-situ or extractive analysis and fast response (2-5 seconds, 1 second (optional))
- Process pressures up to 1 MPa abs. and process temperatures up to 1,500°C (Note)

Note: Maximum process temperatures and pressures will vary by application



TDLS8000 with YH8000 HMI Unit

- *1: Total Cost of Ownership
- *2: Mean Time To Failure

Typical gases measured include:

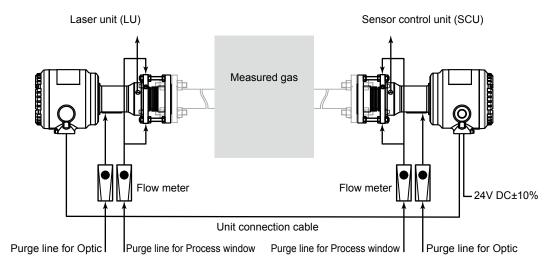
- Oxygen in process and combustion applications.
 Process temperatures can be as high as 1,500°C, and process pressures can be as high as 1 MPa abs.
 Measurement span is typically between 1% and 25% oxygen.
- Carbon monoxide in process and combustion applications. Process temperatures can be as high as 1,500°C. Two versions are available, high sensitivity with ppm detection limits, and standard sensitivity for higher ppm and percent level CO measurement
- Moisture in corrosive and aggressive process streams. Measurement down to the sub-ppm level is available for some applications

Other applications and gas measurements are possible with the TDLS8000. Please fill out the Application Data Sheet at the end of this document and send to Yokogawa.

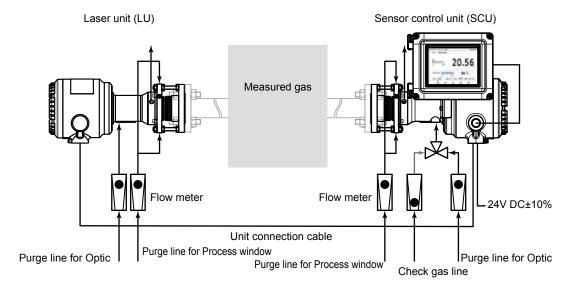


■ System configuration

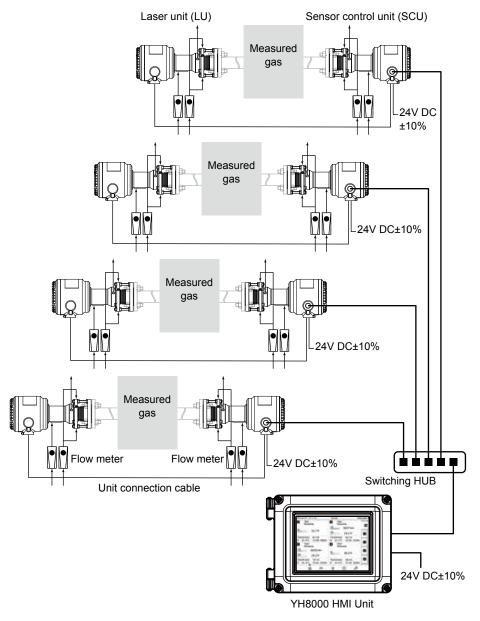
Standard System Configuration



System Configuration with YH8000 HMI Unit and Validation gas line



Multi Analyzer Configuration with Remote HMI



Note: If power supply is 100 to 240 V AC, purchase the Universal Power Supply, separately.

If four multi analyzer configuration with remote HMI is made, five universal power supply including YH8000 are needed.

■ STANDARD SPECIFICATIONS

TDLS8000 Tunable Diode Laser Spectrometer

Measurement object:

O₂, CO, CO or CH₄, CO₂, CO + CO₂, H₂O, NH₃, NH₃ + H₂O, H₂S, HCl concentration in combustion exhaust gas and process gas

If other gas measurements are required. consult with Yokogawa

Measurement system:

Tunable diode laser spectroscopy Light source; Near-infrared tunable diode laser Measured components and ranges:

Measured com	ponent	Min. range	Max. range
O ₂		0-1%	0-25%
CO (ppm)		0-200 ppm	0-10,000 ppm
CO or CH ₄ (*3)	CO	0-200 ppm	0-10,000 ppm
CO 01 CH ₄ (3)	CH ₄	0-4	5%
NH ₃		0-30 ppm	0-5,000 ppm
H ₂ O (ppm) in nor	HC (*1)	0-30 ppm	0-30,000 ppm
H ₂ O (ppm) in HC	(*2)	0-30 ppm	0-30,000 ppm
CO (%)		0-20%	0-50%
CO (%) + CO ₂ (%	(b)	0-30%	0-100%
NH ₃ + H ₂ O	NH ₃	0-30 ppm	0-5,000 ppm
NH3 + H2O	H ₂ O	0-5%	0-50%
H ₂ S		0-5%	0-100%
CO ₂ (%) High Ra	nge	0-1%	0-5%
CO ₂ (%) Extend.	Range	0-30%	0-50%
H ₂ O (%)		0-10%	0-100%
HCI		0-50 ppm	0-5,000 ppm

- Non hydrocarbon background. *1.
- *2: Hydrocarbon background
- *3: Please consult with Yokogawa if CO or CH₄ ingredient coexists.

Please consult with Yokogawa if the measuring range for your sample gas is outside of the above ranges

Optical path length:

Optical distance between the laser unit and the sensor control unit

Standard; 0.5 to 6 m (Application dependent) 30 m (With optional Large Aperture Max:

Optics (LAO)

Note: If your optical path length is under 0.5 m or over 30 m, please consult with Yokogawa.

Safety and EMC conforming standards:

Safety Conforming Standards:

EN61010-1, EN61010-2-030 CE UL61010-1, UL 61010-2-030 UL **CSA** CAN/CSA-C22.2 No.61010-1, CAN/ CSA-C22.2 No.61010-2-030

GB GB30439 Part 1

Installation altitude: 2000 m or less

Installation category:

I (Anticipated transient overvoltage 330V)

Measuring category: O (Other)
Pollution degree: 2, Indoor/Outdoor use

Note: Installation category, called overvoltage category, specifies impulse withstand voltage. Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which may reduce dielectric strength.

EMC Conforming Standards:

EN55011 Class A Group 1

EN61326-1 Class A Table 2 (For use in

industrial location), EN61326-2-3

EN55011 Class A Group 1 **RCM**

KN11 Class A Group 1, KN61000-6-2 KC (Korea Electromagnetic Conformity)

Laser classification: CSA E60825-1-03(R2012), CE EN60825-1:2007, FDA 21CFR part

1040.10 Class 1 laser product

SIL Certification: IEC 61508: Functional safety of Electrical/electronic/programmable

electronic related systems; SIL 2 capability for single analyzer use, SIL 3 capability for dual analyzer use.

Display: 128 x 64 dots LCD; On Sensor Control Unit Status LEDs; 3 on Sensor Control Unit (Green: Power, Orange: DO, Red: Fault)

4 digit 7-segment LEDs: On Laser Unit

Display items:

LCD on Sensor Control Unit; Gas concentration, Transmission, Process gas temperature (AI), Process gas pressure (AI), System status, Alarm information, System information (Product serial no., Laser module serial no., Output signal, IP address, HART address, Optical path length, Analyzer internal temperature)

7-segment LEDs on Laser Unit; Transmission Analog output: 2 points, 4 to 20 mA DC (Isolated from the power supply and ground, Max. load resistance 550 Ω)

Output types; Gas concentration, Transmission, Process gas temperature, Process gas pressure

Output range: 3.0 to 21.6 mA DC

Digital communications:

HART: On analog output signal 1 (AO-1) Load resistance; 250 to 550 Ω (Include cable resistance)

Ethernet; RJ-45 connector in Sensor Control Unit

Modbus/TCP Protocol;

Communication speed; 100 Mbps

2 points, contact rating 24V DC, 1A Digital output:

DO:

Function: Activate during Warning / Calibration

/ Validation / Warm up / Maintenance

conditions

Contact Specification: Relay contact output (Isolated from the power supply and ground), C-contact (NC/NO/COM)

Fault:

Function: Activate during Fault condition or when the system power is off

Contact Specification: Relay contact output (Isolated from the power supply and ground), A-contact (NC/COM)

Valve control output: 2 points

Function: Activate calibration or validation solenoid valves for zero, span or validation gas. Output signal; 24V DC, 500 mA Max. per terminal

Alarm: Wetted materials: 316 SS, BK-7 glass, Teflon encapsulated Warning; Gas concentration low, Gas concentration high, Transmission low, Process pressure FKM (O-ring for alignment flange), Silicone low, Process pressure high, Process (O-ring for LAO) Paint color: Mint green (RAL 190 30 15 or equivalent) temperature low, Process temperature high, Validation required, Validation Weight: failure, Zero calibration error, Span Sensor Control Unit; 8 kg 8 kg calibration error, Non process alarm, Laser Unit: External alarm Large Aperture Optics; 14 kg Laser module temperature low, Laser ANSI Class 150-2-RF (Eq.) Alignment Flange; 5 kg/pc Fault: ANSI Class 150-2-N (Eq.) Alignment Flange; 7 kg/pc ANSI Class 150-4-RF (Eq.) Alignment Flange; 9 kg/pc DIN PN16-DN50-A (Eq.) Alignment Flange; 5 kg/pc DIN PN16-DN80-A (Eq.) Alignment Flange; 6 kg/pc module temperature high, Laser temperature low, Laser temperature high, Detector signal high, Peak center out of range, Reference peak height low, JIS 10K-50-FF (Eq.) Alignment Flange; 5 kg/pc Absorption too high, Transmission lost, JIS 10K-80-FF (Eq.) Alignment Flange; 6 kg/pc Flow Cell Alignment Flange; 5 kg/pc Reference transmission low, Reference peak height high, Laser unit failure, Laser module error, File access error, E2PROM Process gas condition: Process gas temperature; Max. 1,500°C, access error Application dependent Digital input: 2 points Process gas pressure; Max.1 MPa abs., Min. 90 kPa Function; External Alarm/Calibration start/ Validation start/Stream switch (Valve abs., Application dependent Max. 15 kPa G with LAO unit control) Contact specification; Zero voltage contact input Note: When using TDLS8000 as CE marking compliance product, it has following limitation. (Isolated from the power supply and General purpose model (-G1, -G2): ground) The upper limit of the measurement gas Input signal; Open signal: 100 k Ω or more, Close pressure is 50kPa in gauge pressure. signal: 200 Ω or less ATEX model (-S1, -S2): Analog input: 2 points The upper limit of the measurement gas Signal type; 4 to 20 mA DC (Isolated from pressure is 500kPa abs. The unstable the power supply and Ground), with gas defined by following cannot be selectable powered/unpowered function measured. An unstable gas in this context is a gas liable to Input signal range; 2.4 to 21.6 mA DC transform itself spontaneously, producing a sudden Input types; Process gas temperature, Process pressure increase. gas pressure . Such transformation as an example can result Transmitter power supply; 15 V DC or higher (at 20 mA DC) from a relatively small variation of an operating 26 V DC or less (at 0 mA DC) parameter (e.g. pressure, temperature, presence Note: This voltage is generated between the Al terminals of catalyzing material) in a confined volume. of TDLS8000. When calculating the minimum This includes gases that are classified as operating voltage for transmitters, consider to allow chemically unstable gases according to CLP margins for voltage drop in external wiring. Regulation (EC) No 1272/2008 as amended. Self-diagnostics: Typical examples of unstable gases: acetylene (UN 1001), methyl acetylene (UN 1060), Laser Unit temperature, Sensor Control Unit temperature, Laser temperature, vinylfluoride (UN 1860), ozone and dinitrogen Detector signal level, Memory read/write oxide (UN 1067). For further examples, see Table 35.1 of the UN function, Peak locking condition Manual of Tests and Criteria. Calibration: 20 g/m³ or less Calibration method; Dust in process gas; Zero/Span calibration (Dust loading levels are dependent Calibration mode: Manual, Auto (Time initiate, upon the application, OPL and other Remote initiate (DI/Modbus)), Semi-Auto installation factors) (YH8000/HART) Warm-up time: 5 min. Validation: Installation condition: Validation method: Up to 2 points Ambient operating temperature; -20 to 55°C Validation mode; Manual, Auto (Time initiated, Storage temperature; -30 to 70°C Remote initiate (DI/Modbus)), Semi-Auto Humidity; 0 to 95%RH at 40°C (Non-condensing) (YH8000/HART) Mounting flange type; ASME B16.5, DIN, JIS Power supply: 24V DC +/-10% Cable entries: If your power supply is 100 to 240 V AC Sensor Control Unit: 1/2NPT or M20x1.5mm,one hole Universal Power Supply, M1276WW (sold separately), is required 3/4NPT or M25x1.5mm, three holes Laser Unit: 3/4 NPT or M25x1.5mm, one hole Power consumption: Purge gas connections; Max. 20W; TDLS8000 only 1/4NPT or Rc1/4 Max. 60W; TDLS8000 with YH8000 and 2 solenoid

IP66, Type 4X

valves

Case; Aluminum alloy

Protection degree:

Material:

If other gas connections are required,

please consult with Yokogawa.

a purge gas fo except for oxyo Choosing betw	nstrument air could be used as r all of the below applications gen or H2O measurement. /een using nitrogen or	EN 60079 EN 60079	9-0:2012+A11:2013, 9-1:2007, EN 60079-28:2007, 9-31:2014, EN 60079-28: 2015
depend upon f	or purge gas will ultimately urther application details and ecision of the measurement. All	TDLS8000-E1 (IECEx Type of protection: Ex tb IIIC	
gasses should	be clean and dry.	Enclosure rating:	IP66 (In Accordance with
Recommended purge ga		IEC 6052	
O ₂ analyzer: N ₂ (99.9 dependent)	9% or greater, application	Applicable standards	s: 9-0:2011, IEC 60079-1:2007,
H ₂ O ppm analyzer:	N ₂ (99.99% or greater with	IEC 6007	9-28:2015, IEC 60079-31:2013
	₂ O for feed to the optional	Division 2, Zone 2: Noni	
dryer packa	nge) CO + CO ₂ , NH ₃ , NH ₃ + H ₂ O,	TDLS8000-D2 (FM Ap Division system:	proval for US)
	nalyzer: N ₂ (99.99% or		Nonincendive for Class I,
	olication dependent) or	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Division 2, Groups A, B, C,
Instrument			D, T5
Purge gas flow rates; 5 to 30 L/	min for process window		Dust-Ignitionproof for Class II/III, Division 1, Groups E,
	on dependent)		F, G, T5
		Enclosure rating:	Type 4X
lazardous area classificat	ions:	Applicable standard	
Division 1, Zone 1: Explo			3600: 2011, FM Class 3611: 1 Class 3616: 2011, FM Class
TDLS8000-D1 (FM App	proval for US)		05 NEMA 250: 2003
Division system: Type of protection:	Explosionproof for Class I,	Zone system:	0 17 045 4 04075
.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Division 1, Groups A, B, C,	Type of protection:	Class I, Zone 2, AEx nA nC IIC T5 Zone 21, AEx tb IIIC T100°C
	D, T5	Enclosure Rating:	IP66
	Dust-Ignitionproof for Class II/III, Division 1, Groups E,	Applicable standard	
	F, G, T5		A-60079-0-2013, ANSI/ISA- 5-2012, ANSI/ISA-60079-31-
Enclosure rating:	Type4X		SI/IEC 60529-2004 (R2011)
Applicable standard	s:	TDLS8000-C2 (FM Ap	proval for Canada) `
	3600: 2011, FM Class 3615: Class 3616: 2011, FM Class		Ex nA nC IIC T5
	95, NEMA 250: 2003	Enclosure rating:	II, Division 1, Groups E, F, G IP66, Type 4X
Zone system:		Applicable standards	
Type of protection:	Class I, Zone 1, AEx d IIC T5 AEx tb IIIC T100°C	CAN/CS/	A-C22.2 No.0-10 (R2015),
Enclosure rating:	IP66		A-C22.2 No.25-1966 (R2014), A-C22.2 No.94.1-07 (R2012),
Applicable standard	s:	CAN/CS/	A-C22.2 No.94.2-07 (R2012),
	60079-0 2013, ANSI/ISA-		A-C22.2 No.60079-0:11,
	009 (R2013), ANSI/ISA-60079- NSI/IEC 60529 2004 (R2011)		A-C22.2 No.60079-15:12, A-C22.2 No.61010-1-12,
TDLS8000-C1 (FM App			A-C22.2 No.61010-1-12,
	Ex d IIC T5		A-C22.2 No.60529-05 (R2010)
Enclosure rating:	l, Division 1, Groups E, F, G IP66, Type4X	ANSI/ISA TDLS8000-S2 (ATEX)	A-12.27.01-2011
Applicable standards		Type of protection:	II 3(1) G Ex nA nC [op is T6
CAN/CSA	-C22.2 No.0.4-04 (2013),	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Ga] IIC T5 Gc
	C22.2 No.25-1966 (R2014), C22.2 No.94.1-07 (R2012),	E. d	II 2 D Ex tb IIIC T100 °C Db
	-C22.2 No.94.1-07 (R2012), -C22.2 No.94.2-07 (R2012),	Enclosure rating:	IP66 (In accordance with EN 60529)
CAN/CSA	-C22.2 No.60079-0: 11,	Applicable standards	
	C22.2 No.60079-1: 11,		9-0: 2012+A11: 2013,
	C22.2 No.60079-31: 12, C22.2 No.60529-05 (R2010)		9-15: 2010, EN 60079-28: 2007, 9-28: 2015, EN 60079-31: 2014
TDLS8000-S1 (ATEX)	022.2 110.00020 00 (1.2010)	TDLS8000-E2 (IECEX	
Type of protection:	II 2(1) G Ex d [op is T6 Ga]	Type of protection:	Ex nA nC [op is T6 Ga] IIC
IIC T5 Gb	b IIIC T100°C Db		T5 Gc
Enclosure rating:	IP66 (In Accordance with	Enclosure rating:	Ex tb IIIC T100°C Db IP66 (In accordance with
EN 60529		•	IEC 60529)
		Applicable standards	
			9-0: 2011, IEC 60079-15: 2010, 9-28: 2015, IEC 60079-31: 2013

PERFORMANCE

Repeatability / Linearity:

Measure	d gas	Repeatability	Linearity
O ₂		+/- 1% reading or +/- 0.01 %O ₂ , whichever is greater	+/- 1% F.S.
CO (ppm))	+/- 2% reading or +/- 1 ppm CO, whichever is greater	+/- 1% F.S.
CO+	со	+/- 2% reading or +/- 1 ppm CO, whichever is greater	+/- 2% F.S.
CH ₄	CH ₄	+/- 4% reading or +/- 0.02% CH ₄ , whichever is greater	+/- 4% F.S.
NH ₃		+/- 2% reading or +/- 1 ppm NH ₃ , whichever is greater	+/- 2% F.S.
H ₂ O (ppm non HC	n) in	+/- 2% reading or +/- 0.1 ppm H ₂ O, whichever is greater	+/- 1% F.S.
H ₂ O (ppm HC	n) in	+/- 2% reading or +/- 0.1 ppm H ₂ O, whichever is greater	+/- 1% F.S.
CO (%)		+/- 1% reading or +/- 0.01% CO, whichever is greater	+/- 1% F.S.
CO (%) + CO ₂	со	+/- 1% reading or +/- 0.1% CO, whichever is greater	+/- 1% F.S.
(%)	CO ₂	+/- 1% reading or +/- 0.1% CO ₂ , whichever is greater	+/- 1% F.S.
NH ₃ +	NH ₃	+/- 2% reading or +/- 1 ppm NH ₃ , whichever is greater	+/- 2% F.S.
H ₂ O	H ₂ O	+/- 4% reading or +/- 0.05% H ₂ O, whichever is greater	+/- 2% F.S.
H ₂ S		+/- 1% reading or +/- 0.005% H ₂ S, whichever is greater	+/- 1% F.S.
CO ₂ (%) High Ran	ge	+/- 1% reading or +/- 0.005% CO ₂ , whichever is greater	+/- 1% F.S.
CO ₂ (%) Extend. R	ange	+/- 1% reading or +/- 0.02% CO ₂ , whichever is greater	+/- 1% F.S.
H ₂ O (%)		+/- 1% reading or +/- 0.004% H ₂ O, whichever is greater	+/- 1% F.S.
HCI		+/- 1% reading or +/- 2.5 ppm HCl, whichever is greater	+/- 2% F.S.

Measurement conditions: Gas temperature; 25°C, Gas pressure; 0.1 MPa, Optical path length; 1 m

Data Update Cycle:

Standard; Approx. 2 seconds (Response time may increase for non-standard applications)

If less than 2 seconds response is required, please consult with Yokogawa

Zero Drift: Typically <0.1% of the minimum range over 24 months

Influences on the Measurement - Application dependent

- A. Temperature: The temperature of the measured gas should be taken into account by the analyzer so that the reading can be corrected on a real time basis. The effect is specific to each different measurement gas.
 - a. If the gas temperature is constant at the desired measurement condition, then a fixed gas temperature may be programmed into the analyzer. This fixed value can be used in real time by the analyzer to provide a temperaturecompensated reading.
 - b. If the gas temperature is relatively equal to the ambient temperature, then an integral sensor value may be utilized by the analyzer. This active ambient value is used real time by the analyzer to provide a temperature compensated reading.

- c. If the gas temperature is variable, then an external sensor value may be utilized by the analyzer. This active input value can be used in real time by the analyzer to provide a temperature compensated reading.
- B. Pressure: The pressure of the measured gas must be taken into account by the analyzer so that the reading can be corrected on a real time basis. The effect is specific to each different measurement gas.
 - a. If the gas pressure is constant at the desired measurement condition, then a fixed gas pressure may be programmed to the analyzer. This fixed value can be used in real time by the analyzer to provide a pressure compensated reading.
 - b. If the gas pressure is variable, then an external sensor value may be utilized by the analyzer.
 This active input value can be used in real time by the analyzer to provide a pressure compensated reading.

• YH8000 HMI Unit

The YH8000 is an HMI designed specifically for the TDLS8000. The YH8000 features an easy-to-use touchscreen 7.5 inch color LCD which can be used to display maintenance information, display alarm statuses and records, and set all parameters of the TDLS8000.

The YH8000 can be installed directly on the TDLS8000 or installed remotely.

An Ethernet connection is used to connect the YH8000 to up to four TDLS8000s simultaneously via a hub.

Display: Touchscreen 7.5 inch TFT color LCD

panel, 640 x 480 (VGA)

Communication: Ethernet; RJ-45 connector

Communication speed; 100 Mbps

Case: Aluminum alloy

Paint color:Mint green (RAL 190 30 15 or equivalent)

Protection degree of enclosure: IP65, Type 4X

Window: Polycarbonate

Weight: 4 kg

Mounting: Analyzer mount (Front, left-side, right-side)

with tilt function, Pipe mount, or Panel

mount (Stainless steel)

Cable Entries: 1/2NPT or M20x1.5 mm, two holes

Installation conditions:

Ambient operating temperature; -20 to 55°C Storage temperature: -30 to 70°C

Humidity: 10 to 90%RH at 40°C (Non-condensing)

Power Supply: 24V DC +/-10% Power consumption: Max.12 W Safety and EMC conforming standards:

Safety Conforming Standards:

CE EN61010-1 UL UL61010-1

CSA CAN/CSA-C22.2 No.61010-1

GB GB30439 Part 1 Installation Altitude: 2000 m or less

Installation category:

(Anticipated transient overvoltage 330 V)
Pollution degree: 2, Indoor/Outdoor use

EMC Conformity Standards:

CE EN55011 Class A Group 1

EN61326-1 Class A Table 2 (For use in

industrial location)

RCM EN55011 Class A Group 1

KC KN11 Class A Group 1, KN61000-6-2 (Korea Electromagnetic Conformity)

Hazardous area classifications:

Division 2, Zone2: Nonincendive/Type n

YH8000-D2 (FM Approval for US)

Division system

Type of protection: Nonincendive for Class I, Division 2, Groups A, B, C, D, T5

Enclosure rating: Type 4X

Applicable standards: FM Class 3600: 2011, FM Class 3611: 2004, FM Class

3810: 2005, NEMA 250: 2003

Zone system

Type of protection: Class I, Zone 2, AEx nA ic

IIC T5

Enclosure rating: IP65

Applicable standards: ANSI/ISA-60079-0-2013,

ANSI/ISA-60079-11-2014, ANSI/ISA-60079-15-2012, ANSI/IEC 60529-2004 (R2011)

YH8000-C2 (FM Approval for Canada)
Type of protection: Ex nA nL IIC T5
Enclosure rating: IP65, Type 4X

Applicable standards:

CAN/CSA-C22.2 No. 0-10 (R2015), CAN/CSA-C22.2 No. 94.1-07 (R2012), CAN/CSA-C22.2 No. 94.2-07 (R2012), CAN/CSA-C22.2 No.60079-0:11, CAN/CSA-C22.2 No.60079-15:12, CAN/CSA-C22.2 No.61010-1-12, CAN/CSA No. 60529-5 (2010)

YH8000-S2 (ATEX)

Type of protection: II 3 G Ex nA ic IIC T5 Gc Enclosure rating: IP65 (In accordance with

EN 60529)

Applicable standards: EN 60079-0: 2012+A11:

2013, EN 60079-11: 2012, EN 60079-15: 2010

YH8000-E2 (IECEx)

Type of protection: Ex nA ic IIC T5 Gc Enclosure rating: Ex nA ic IIC T5 Gc IP65 (In accordance with

IEC 60529)

Applicable standards: IEC 60079-0: 2011, IEC

60079-11: 2011, IEC 60079-

15: 2010

IF8000 Isolation Flanges

A process isolation flange protects the TDLS8000 from the process gas pressure and the heat, dust, and corrosive elements of the process gas. A process isolation flange must be installed in the following situations.

- When the process gas pressure exceeds 500 kPa
- When the process temperature is high and the temperature of the process window area exceeds
 55°C even when process window purge is performed.
- When the process dust level is high and the adherence of dust or intrusion of corrosive elements cannot be prevented even when process window purge is performed.

The IF8000 isolation flanges can be used for additional protection in in-situ or bypass installations.

Note: Must use in conjunction with alignment flanges Process connections: (see below table)

Heatresistance temperature: 200°C max Measured gas pressure: Max. 1 MPa abs.

Wetted materials: Sapphire, 316 SS, Monel 400,

Kalrez (O-ring)

Weight:

, 1 (gnt;					
	Process	Analyzer	Weight			
	connection	connection	316SS	Monel 400		
	ANSI Class 150- 2-RF Flange		5 kg/pc	6 kg/pc		
	ANSI Class 300- 2-RF Flange		7 kg/pc	7 kg/pc		
	ANSI Class 150- 3-RF Flange	ANSI Class 150- 2-RF Flange	8 kg/pc	9 kg/pc		
	ANSI Class 300- 3-RF Flange		11 kg/pc	12 kg/pc		
	ANSI Class 150- 4-RF Flange		12 kg/pc	14 kg/pc		
	DIN PN16-DN50 Flange		7 kg/pc	7 kg/pc		
	DIN PN16-DN80 Flange	DIN PN16-DN50	10 kg/pc	11 kg/pc		
	JIS 10K-50-FF Flange	Flange	7 kg/pc	7 kg/pc		
	JIS 10K-80-FF Flange		9 kg/pc	10 kg/pc		

Note: When using TDLS8000 as CE marking compliance product, the upper limit of the measurement gas pressure is 50kPa in gauge pressure.

• YC8000 Flow Cell

Used for extracting sample streams at any location.

Note: Must use in conjunction with alignment flanges ("-FC")

Gas temperature: 200°C max
Gas pressure: Max. 1 MPa abs.

Wetted materials: Sapphire, 316 SS, Monel 400,

Kalrez (O-ring)

Weight;

Material/Optical Path Length	1016 mm (40 inch)	1524 mm (60 inch)		
Monel 400	15 kg	18 kg		
316 SS	14 kg	17 kg		

Note: When using TDLS8000 as CE marking compliance product, the upper limit of the measurement gas pressure in YC8000 is 50kPa in gauge pressure.

Calibration Cell

Used for off-line calibrations and validations. Appropriate process windows are included on calibration cell.

Optical Path Length: 660 mm Material: 316 SS

Part No.	Description	Weight
K9772XA	Calibration Cell with free-standing frame for O ₂	
K9772XB	Calibration Cell with free-standing frame for O ₂ LAO	
K9772XC	Calibration Cell with free-standing frame for ppm H ₂ O in non- hydrocarbon	
K9772XD	Calibration Cell with free-standing frame for NH ₃	
K9772XE	Calibration Cell with free-standing frame for ppm H ₂ O in hydrocarbon background	
K9772XF	Calibration Cell with free-standing frame for ppm CO	14 kg
K9772XG	Calibration Cell with free-standing frame for ppm CO LAO	
K9772XH	Calibration Cell with free-standing frame for CO (%) + CO ₂ (%), CO ₂ (%) Extend. Range	
K9772XJ	Calibration Cell with free-standing frame for HCl	
K9772XL	Calibration Cell with free-standing frame for CO(%), CO ₂ (%) High Range	
K9772XM	Calibration Cell with free-standing frame for H ₂ S	

Note: When using TDLS8000 as CE marking compliance product, the upper limit of gas pressure in calibration cell is 50kPa in gauge pressure.

Unit Connection Cable

Use for interconnecting the Sensor Control Unit and the Laser Unit.

Construction:Double-shielded (Overall shield and Individual shields) 4-pair cable

Part No.	Cable length
K9775WA	5 m
K9775WB	10 m
K9775WC	20 m
K9775WD	30 m
K9775WE	40 m
K9775WF	50 m
K9775WG	60 m

■ MODEL AND CODES

TDLS8000 Tunable Diode Laser Spectrometer

Model	Suffix Code			Option Code	Description		
TDLS8000				Tunable Diode Laser Spectrometer			
Туре	-G1 -G2					General Purpose, cable entry/piping:NPT General Purpose, cable entry:Metric thread, piping:Rc	
	-D2	-					FM (US) Class I Div 2, Zone2, cable entry/piping:NPT
	-C2						FM (Canada) Class I Zone2, cable entry/piping:NPT
	-S2						ATEX Type of protection "n", cable entry:Metric thread, piping:Rc
	-E2 -D1						IECEx Type of protection "n", cable entry:Metric thread, piping:Rc
	-C1						FM (US) Class I Div 1, Zone1, cable entry/piping:NPT FM (Canada) Class I Zone1, cable entry/piping:NPT
	-S1						ATEX Flameproof "d", cable entry:Metric thread, piping:Rc
	-E1						IECEx Flameproof "d", cable entry:Metric thread, piping:Rc
	-J1						TIIS Ex / Zone 1, cable entry:Metric thread, piping:Rc (*11)
Gas Parameter	_	-X1					O ₂ < 600°C, 0-25%
Oas i arameter		-X1					O ₂ < 1500°C, 0-25% Combustion
		-C1					CO (%) 0-20%/0-50% <500°C (*3)
		-C2					CO ppm 0-200ppm/0-10,000ppm <500°C (*3) (*9)
		-C3					CO ppm <1500°C Combustion (*9)
		-C4					CO ppm <1500°C or CH ₄ 0-5% Combustion (*9)
		-C5					CO (%) + CO ₂ (%) 0-30%/0-100% <150°C (*3)
		-A1					NH ₃ up to 0-5,000ppm <450°C DeNO _X
		-A2					NH ₃ 0-30ppm/0-5,000ppm + H ₂ O 0-5%/0-50% <400°C (*3)
		-S1					H ₂ S 0-5%/0-100% <100°C (*3)
		-D1					CO ₂ High Range 0-1%/0-5% <100°C (*3)
		-D5 -H1					CO ₂ Extend. Range 0-30/0-50% <150°C (*3) H ₂ O ppm non-Hydrocarbon Background (*1)
		-п і -Н3					H ₂ O ppm Hydrocarbon Background (*1)
		-H4					H ₂ O 0-10%/0-100% <500°C (*3)
		-L1		"			HCI 0-50ppm/0-5,000ppm <500°C (*3)
Optics Accesso	n/		NN				Without Alignment Flanges (*2)
Optics Accesso	ı y		LA				Large Aperture Optics, ANSI CLASS150-4-RF (*3) (*4) (*8)
			U2				ANSI CLASS150-2-RF(Eq.) Alignment Flange, pipng: NPT
			U3				ANSI CLASS150-3-RF(Eq.) Alignment Flange, pipng: NPT
		-(U4				ANSI CLASS150-4-RF(Eq.) Alignment Flange, pipng: NPT
		-	D5				DIN PN16-DN50-D(Eq.) Alignment Flange, pipng: Rc
			D8				DIN PN16-DN80-D(Eq.) Alignment Flange, pipng: Rc
			J5				JIS 10K-50-FF(Eq.) Alignment Flange, pipng: Rc
			J8				JIS 10K-80-FF(Eq.) Alignment Flange, pipng: Rc
		-1	FC				Flow Cell Alignment Flange (*4)
I/O Interface			-A	1			Analog with HART+Modbus Ethernet
SI Unit				-J			Only SI Unit
				-N	٠		SI Unit or non SI Unit (*10)
					-N		Always -N
Option						/D	Diverging Beam without LAO (*5)
						/RX	Reference Cell for O ₂ (*6)
						/RC	Reference Cell for CO (*7)
						/SCT	Stainless Steel Tag Plate

- *1: When "-H1" or "-H3" is selected, TIIS is not available.
- *2: When "-NN" is selected, Zone2/Div2/Type of protection "n", FM (Canada) Zone1 is not available.
- When "-LA" is selected, Zone1/Div1/Flameproof "d" is not available.
- *3: *4: When FM (US) or FM (Canada) is specified, the connecting port for window purge is 1/4NPT.
- When ATEX, IECEx or TIIS is specified, the connecting port for window purge is Rc1/4.

 The Option "/D" can be selected when Large Aperture Optics "-LA" of the Optic Accessory is not specified and Oxygen or *5: CO (-C2, -C3, -C4) analyzer is selected.
- *6: The Option "/RX" can be used when Oxygen analyzer is selected. When both "-X2" of the Gas Parameter and "-LA" of the
- Optics Accessory are selected, "/RX"must be specified.
 The Option "/RC" can be used when CO analyzer is selected. When both "-C3" or "-C4" of the Gas Parameter is selected, "/RC" must be specified.
- *8: For applications whose optical path length is 6 m or longer, select the "-LA". A condensing lens unit (LAO unit) is added to the SCU side.
- When CO or CH₄ ingredient coexist, please contact with YOKOGAWA.
- An end user is available for case choice except Japan. *10:
- *11: Pending.

YH8000 HMI Unit

Model	Suf	Suffix Code Option C		Option Code	Description			
YH8000					HMI Unit			
Туре	-G1							General Purpose, NPT thread for cable entry
	-G2				General Purpose, Metric thread for cable entry			
	-D2				FM (US) Class I Div 2, Zone2, NPT thread for cable entry			
	-C2				FM (Canada) Class I Zone2, NPT thread for cable entry			
	-S2 -E2		·S2		ATEX Type of protection "n", Metric thread for cable entry			
					IECEx Type of protection "n", Metric thread for cable entry			
	-J2				TIIS Ex / Zone 2, Metric thread for cable entry (*1)			
Language		Ψ			English			
_			-N		Always -N			
Option				/M	Mounting kit for TDLS8000			
				/P	Pipe mount			
				/W	Wall mount			
				/S	Sun Shield			
				/C	Local HMI connection cable: 3m			
				/SCT	Stainless Steel Tag Plate			

Pending.

IF8000 Isolation Flanges

Model		Su	iffix Co	de		Option Code	Description		
IF8000							Isolation Flange for TDLS8000 (2pcs/unit) (*1)		
Process	-21						ANSI CLASS150-2-RF(Eq.)		
Connection	-23						ANSI CLASS300-2-RF(Eq.)		
(*2)	-31						ANSI CLASS150-3-RF(Eq.)		
	-33						ANSI CLASS300-3-RF(Eq.)		
	-41						ANSI CLASS150-4-RF(Eq.)		
	-50						DIN PN16-DN50-D(Eq.)		
	-80						DIN PN16-DN80-D(Eq.)		
	-J5						JIS 10K-50-FF(Eq.)		
	-J8						JIS 10K-80-FF(Eq.)		
Analyzer Conne	ection	-21					ANSI CLASS150-2-RF(Eq.)		
(*3)		-50	_				DIN PN16-DN50-D(Eq.)		
Material			-MN				Monel 400		
			-SS				316/316L SS		
Sapphire Windo	ом Туре	е		-12			Coated for O ₂ (-X1, -X2)		
				-13			Coated for ppmH ₂ O non Hydrocarbon background (-H1)		
				-14			Coated for ppmNH ₃ (-A1, -A2)		
				-15			Coated for ppmH ₂ O Hydrocarbon background (-H3)		
				-16			Coated for ppmCO (-C2, -C3, -C4)		
				-17			Coated for %CO or %CO ₂ (-C5, -D5)		
				-18			Coated for HCl (-L1)		
				-20			Coated for -C1, -D1, -H4, -S1		
					-N		Always -N		

^{*1:} *2:

IF8000 is delivered with two sets (for LU and SCU). When ANSI flange of the Process Connection is selected, the "-21" of Analyzer Connection must be specified. When DIN or JIS of the Process Connection is selected, the "-50" of Analyzer Connection must be specified. The Analyzer Connection must be selected according to the flange size of TDLS8000.

^{*3:}

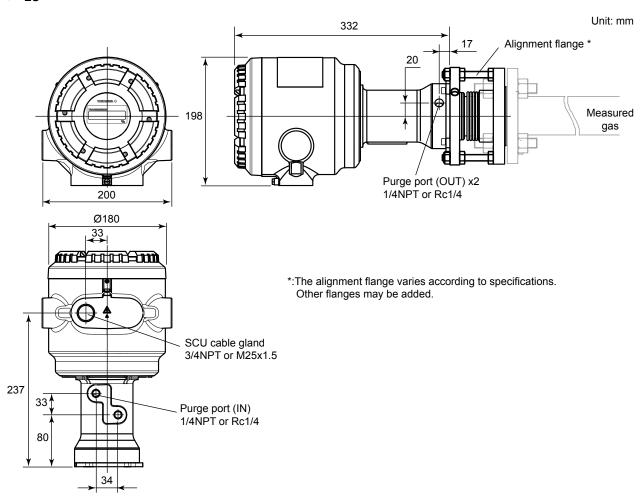
YC8000 Flow Cell

Model	Suffix Code							Option Code	Description		
YC8000									Flow Cell for TDLS8000		
Flow Cell Type	-EN								Enhanced		
Optical Path Lei	ngth	-40							Forty Inches		
		-60	_						Sixty Inches		
Material			-MN						Monel 400		
			-SS						316/316L SS		
Port Configurati	on			-3					3 ports		
Window Type					-XX				Oxygen (-X1, -X2)		
					-H3				Moisture Hydrocarbon background (-H3)		
					-HH			Moisture non Hydrocarbon background (-H1)			
					-NH			NH ₃ (-A1, -A2)			
					-cc	-CC			ppmCO (-C2, -C3, -C4)		
					-C2	-C2			_ ` ' '		
					-HC	-HC					
-MC			_			-C1, -D1, -H4, -S1					
Inside Wall Treatment -		-NN			No treatment (cleaned)						
						-EP			Electro-polish		
_							-N		Always -N		

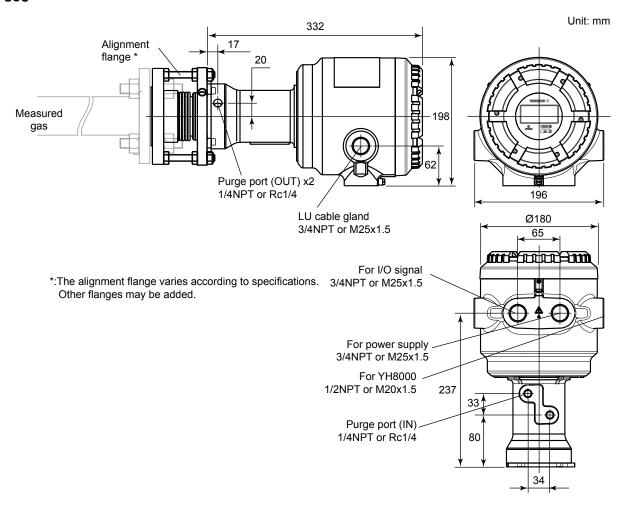
■ EXTERNAL DIMENSIONS

TDLS8000 with Alignment Flange

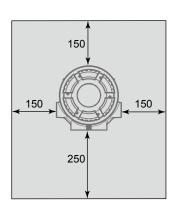
• LU

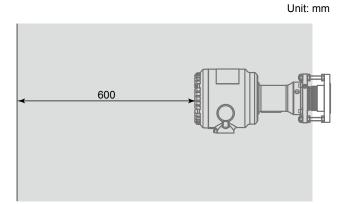


• SCU

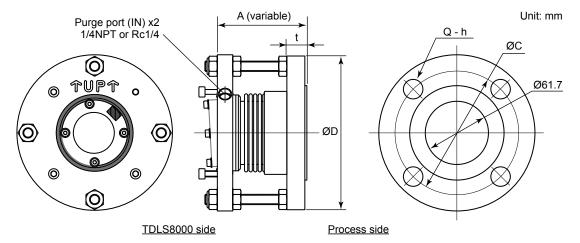


• Maintenance space



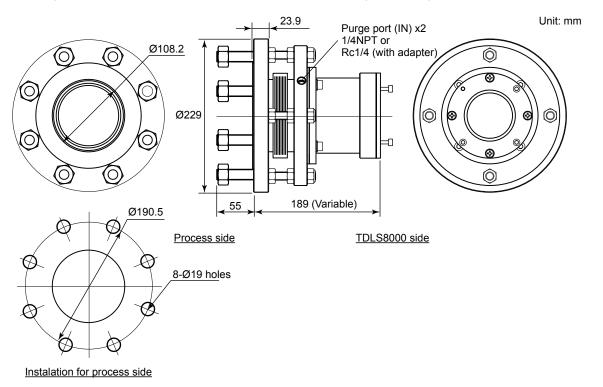


Alignment Flange

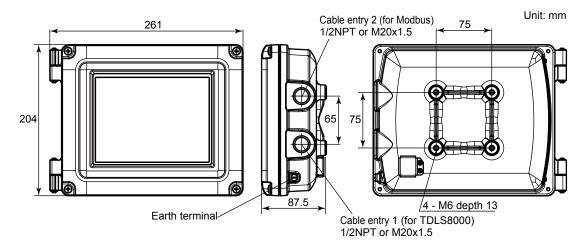


Optics Accessory code (flange)	Hole QTY Q	Hole h	Hole P.C.D C	Thickness t	Outside dia. D	Distance A	Purge port
-U2 ANSI CLASS150-2-RF(Eq.)	4	19	120.7	19.5	150	87	1/4NPT
-U3 ANSI CLASS150-3-RF(Eq.)	4	19	152.4	24.3	190	92	1/4NPT
-U4 ANSI CLASS150-4-RF(Eq.)	8	19	190.5	23.9	228.6	92	1/4NPT
-D5 DIN PN16-DN50-D(Eq.)	4	18	125	18	165	86	Rc1/4
-D8 DIN PN16-DN80-D(Eq.)	8	18	160	20	200	88	Rc1/4
-J5 JIS 10K-50-FF(Eq.)	4	19	120	16	155	84	Rc1/4
-J8 JIS 10K-80-FF(Ea.)	8	19	150	18	185	86	Rc1/4

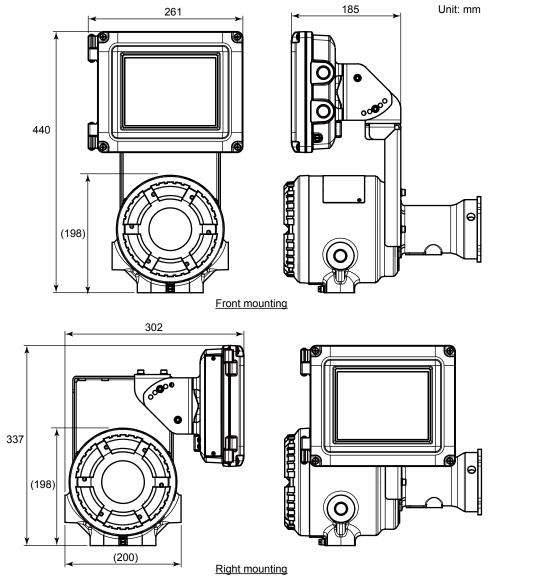
• LAO (Large Aperture Optics); Optics Accessory code "-LA"
This accessory is only for SCU side. For LU side, the Alignment flange ANSI CLASS150-4-RF (Eq.) will be mounted. When piping is Rc1/4, a conversion adapter will be attached on the Alignment flange of the LU side.



■ YH8000 HMI Unit

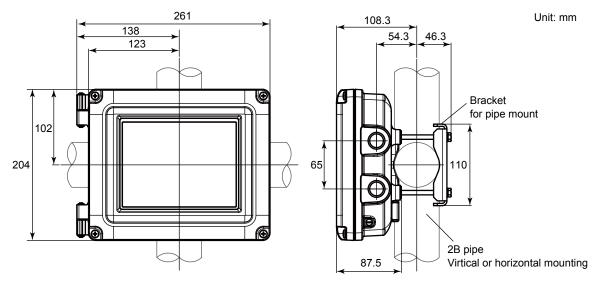


Mounting kit for TDLS8000 (Option code: /M)

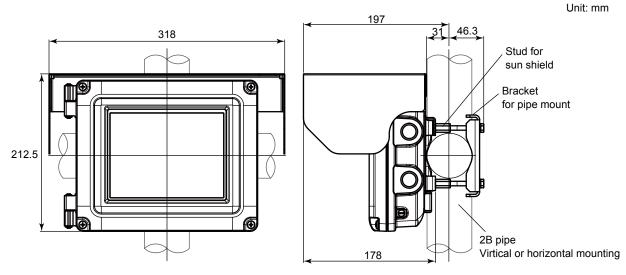


Available for left mounting

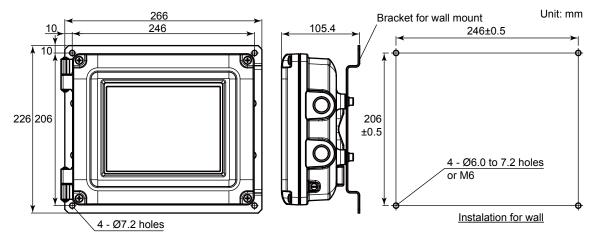
Pipe mount (Option code: /P)



Sun Shield (Option code: /S)

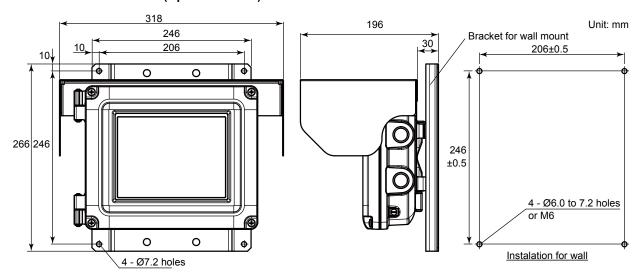


Wall mount (Option code: /W)



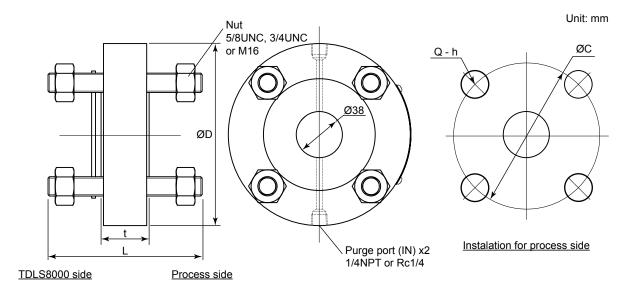
^{*:} The wall construction for mounting has to be designed for 4 times the weight of the YH8000. Bracket for wall mount can be placed in lengthwise

Sun Shield (Option code: /S)



When the sun shield is mounted, the bracket for wall have to be placed in widthwise.

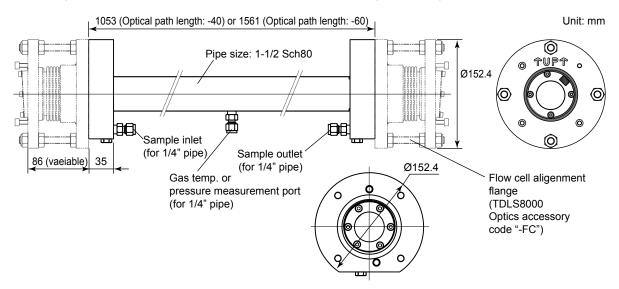
■ IF8000 Isolation Flanges



F	Process Connection code	Analyzer Connection		Hole QTY	Hole	Nut	Hole P.C.D	Thickness	Outside dia.	Bolt length	Purge
	(flange)	code (flange)		Q	h	Nut	С	t	D	L	port
-21	ANSI CLASS150-2-RF(Eq.)		4	19	5/8UNC	120.7	39.6	150	127		
-23	ANSI CLASS300-2-RF(Eq.)		8	19		127	39.6	165	137		
-31	ANSI CLASS150-3-RF(Eq.)	-21	-21 CLASS150-2- RF(Eq.)	4	19		152.4	39.6	190	137	1/4NPT
-33	ANSI CLASS300-3-RF(Eq.)			8	22	3/4UNC	168.3	39.6	210	146	
-41	ANSI CLASS150-4-RF(Eq.)			8	19	5/8UNC	190.5	39.1	228.6	137	
-50	DIN PN16-DN50-D(Eq.)	1-50	DIN PN16-	4	18	M16	125	41.6	165	137	Rc1/4
-80	DIN PN16-DN80-D(Eq.)			8	18		160	41.6	200	137	
-J5	JIS 10K-50-FF(Eq.)		DN50-D(Eq.)	4	19		120	40.6	165	139	
-J8	JIS 10K-80-FF(Eq.)		` ''	8	19		150	40.6	185	139	

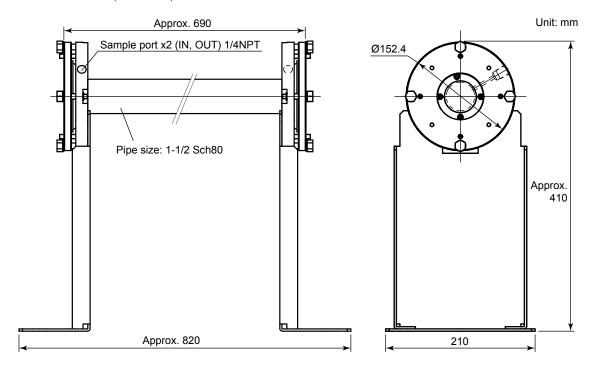
■ YC8000 Flow Cell

TDLS8000 have to be assigned the dedicated Alignment flange (Optic Accessory: -FC). When piping is Rc1/4, a conversion adopter will be attached on the Alignment flange.



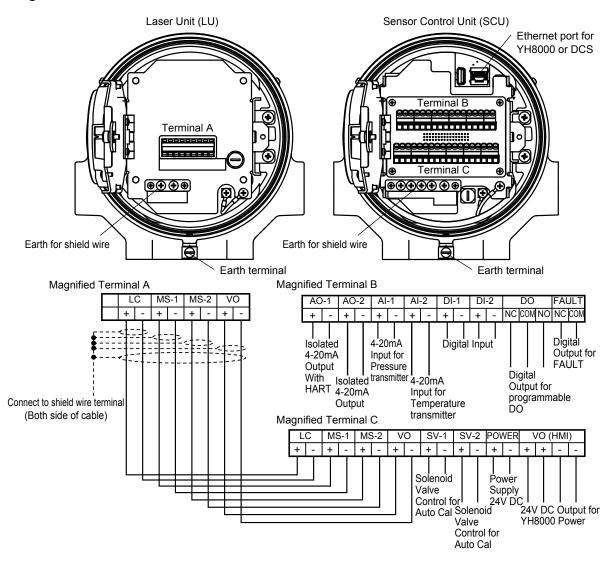
■ Calibration Cell

Part number: K9772XA, K9772XB, K9772XC, K9772XD, K9772XE, K9772XE, K9772XF, K9772XG, K9772XH, K9772XJ, K9772XL, K9772XM

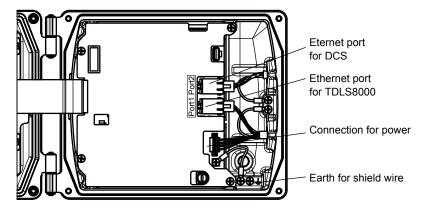


■ WIRING

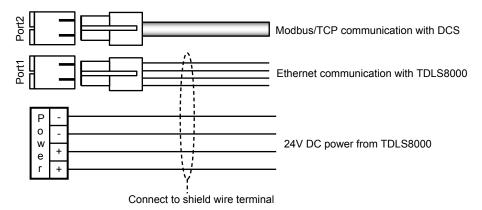
Wiring Laser Unit and Sensor Control Unit



Wiring the YH8000 HMI UNIT

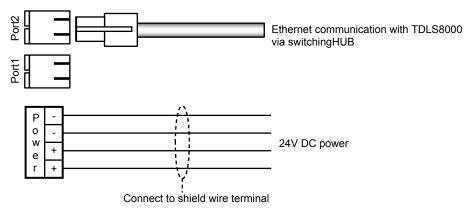


Local HMI configuration



- Connection cable between TDLS8000 and YH8000 must be use special cable which can be specified option code "/C."
- Maximum cable length between TDLS8000 and YH8000 is 3m. Maximum cable length between YH8000 and DCS is 100m.

Remote HMI configuration



Maximum cable length between YH8000 and Switching HUB is 100m.

TDLS8000 Tunable DiodeLase Gas Analyzer Inquiry Form

Thank you for your inquiry about our TDLS8000 Tunable Diode Laser Gas Analyzer. Please make inquiries by placing checkmarks in the appropriate boxes and filling in the blanks. (The items with check mark and descriptions previously filled on the underlines are fixed requirements.)

1.	General Information
	Company :
	Address :
	Contact Person:
	Email :
	Telephone:
	Fax :
	Requested delivery date (day/month/year):
	Plant name :
	Brief Description of application :
2.	Installation Details (check one-see drawing)
	☐ Cross Stack/Pipe. For measurement across the process.
	Path length
	Process Connection
	☐ Bypass Leg. Measurement across bypass leg located at process measurement point.
	Path length
	Process Connection
	☐ Extractive. Sample is extracted and transported (by others) to analyzer.
3.	Analyzer Options:
	☐ YH8000 HMI Unit ☐ IF8000 Isolation Flanges ☐ YC8000 Flow Cell
	☐ Calibration Cell ☐ Unit Connection Cable
	Cable length from Analyzer Unit to HMI Unit (specify units):
	Area Classification:
	Ambient Temperature (Min-Max.) Specify units
4.	Process Wetted Materials
	Must Use
	Must Not Use

5. Stream Composition (1 sheet per stream analyzed)

Component	Component Concentrations		Units	Measured	Range If Measured		
Name	Name Min. Typ. Max.		Max.	ppm(v)/vol%	Yes/No	If Measured	

6. Physical Properties

7.