General Specifications

Model TDLS8000
Tunable Diode Laser Spectrometer

Overview
Yokogawa's new TDLS™ 8000 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 O₂, CO, CH₄, NH₃, H₂O 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(*) 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

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

• 10 language display options
  - YH8000 offers easy touch screen operation and simple menu structure in 10 languages. Menus of display, execution and setting are displayed in a selected language.

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

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.

TDLS, TruePeak are trademarks of Yokogawa Electric Corporation.
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## System configuration

### Standard System Configuration

- **Laser unit (LU)**
- **Unit connection cable**
- **Measured gas**
- **Sensor control unit (SCU)**
- **Flow meter**
- **Purge line for Optic**
- **Purge line for Process window**
- **24V DC±10%**

### System Configuration with YH8000 HMI Unit and Validation gas line

- **Laser unit (LU)**
- **Sensor control unit (SCU)**
- **Flow meter**
- **Purge line for Optic**
- **Purge line for Process window**
- **Check gas line**
- **24V DC±10%**
- **Unit connection cable**
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, 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:

<table>
<thead>
<tr>
<th>Measured component</th>
<th>Min. range</th>
<th>Max. range</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₂</td>
<td>0-1%</td>
<td>0-25%</td>
</tr>
<tr>
<td>CO (ppm)</td>
<td>0-200 ppm</td>
<td>0-10,000 ppm</td>
</tr>
<tr>
<td>CH₄ (ppm)</td>
<td>0-200 ppm</td>
<td>0-10,000 ppm</td>
</tr>
<tr>
<td>NH₃ (ppm) in non HC</td>
<td>0-30 ppm</td>
<td>0-5,000 ppm</td>
</tr>
<tr>
<td>H₂O (ppm) in HC (1)</td>
<td>0-30 ppm</td>
<td>0-30,000 ppm</td>
</tr>
<tr>
<td>CO (%)</td>
<td>0-20%</td>
<td>0-50%</td>
</tr>
<tr>
<td>CO (%) + CO₂ (%)</td>
<td>0-30%</td>
<td>0-100%</td>
</tr>
<tr>
<td>H₂S (ppm)</td>
<td>0-5%</td>
<td>0-100%</td>
</tr>
<tr>
<td>CO₂ (%) High Range</td>
<td>0-1%</td>
<td>0-5%</td>
</tr>
<tr>
<td>CO₂ (%) Extend. Range</td>
<td>0-30%</td>
<td>0-50%</td>
</tr>
<tr>
<td>H₂O (%)</td>
<td>0-10%</td>
<td>0-100%</td>
</tr>
<tr>
<td>HCl (ppm)</td>
<td>0-50 ppm</td>
<td>0-5,000 ppm</td>
</tr>
</tbody>
</table>

*1: Non hydrocarbon background.
*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)
Max: 30 m (With optional Large Aperture Optics (LAO))
25 m (Zone 1/Div.1/Flameproof “d” with LAO)

Note: LAO unit can be selected only with analyzers for O₂, CO (ppm) and CO+CH₄.
If your optical path length is under 0.5 m or over 30 m, please consult with Yokogawa.

Safety, EMC, and RoHS conformity standards:
Safety conformity standards:
CE EN61010-1, EN61010-2-030
UL UL61010-1, UL 61010-2-030
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

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 Protocol; Modbus/TCP Communication speed; 100 Mbps
Digital output: 2 points, contact rating 24V DC, 1A 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

EMC conformity standards:
CE EN55011 Class A Group 1
EN61326-1 Class A Table 2 (For use in industrial location), EN61326-2-3
RCM EN55011 Class A Group 1
KC KN11 Class A Group 1, KN61000-6-2 (Korea Electromagnetic Conformity)
RoHS conformity standards: EN50581
Information of the WEEE Directive
This product is purposely designed to be used in a large scale fixed installations only and, therefore, is out of scope of the WEEE Directive. The WEEE Directive does not apply.

The WEEE Directive is only valid in the EU.


SIL Certification: The TDLS8000 expect digital output (2 points), digital input (2 points), valve control output (2 points), and digital communications (HART, Modbus/TCP) are certified in compliance with the following standard.
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)
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Digital output: 2 points, contact rating 24V DC, 1A 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
Analog input: 2 points

Calibration:
- Laser Unit temperature, Sensor Control
- Self-diagnostics:

Digital input: 2 points

Fault:
- Laser module temperature low, Laser module temperature high, Laser temperature low, Laser temperature high, Peak center out of range, Reference peak height low, Transmission lost, Reference transmission loss, Reference peak height high, Laser unit failure, Laser module error, File access error, E2PROM access error

Analog input: 2 points

Signal type:
- 4 to 20 mA DC (Isolated from the power supply and Ground), with selectable powered/unpowered function

Input signal range:
- 2.4 to 21.6 mA DC

Input types:
- Process gas temperature, Process gas pressure

Transmitter power supply: 15 V DC or higher (at 20 mA DC), 26 V DC or less (at 0 mA DC)

Warning:
- Gas concentration low, Gas concentration high, Transmission low, Process pressure low, Process pressure high, Process temperature low, Process temperature high, Validation required, Validation failure, Zero calibration error, Span calibration error, Non process alarm, External alarm, Detector signal high, Absorption too high

Warning:
- Laser module temperature low, Laser module temperature high, Laser temperature low, Laser temperature high, Peak center out of range, Reference peak height low, Transmission lost, Reference transmission loss, Reference peak height high, Laser unit failure, Laser module error, File access error, E2PROM access error

Fault:
- Laser module temperature low, Laser module temperature high, Laser temperature low, Laser temperature high, Peak center out of range, Reference peak height low, Transmission lost, Reference transmission loss, Reference peak height high, Laser unit failure, Laser module error, File access error, E2PROM access error

Digital input: 2 points

Function:
- External Alarm/Calibration start/Validation start/Stream switch (Valve control)

Contact specification:
- Zero voltage contact input (Isolated from the power supply and ground)

Input signal:
- Open signal: 100 kΩ or more, Close signal: 200 Ω or less

Analog input: 2 points

Signal type:
- 4 to 20 mA DC (Isolated from the power supply and Ground), with selectable powered/unpowered function

Input signal range:
- 2.4 to 21.6 mA DC

Input types:
- Process gas temperature, Process gas pressure

Transmitter power supply: 15 V DC or higher (at 20 mA DC), 26 V DC or less (at 0 mA DC)

Note: This voltage is generated between the AI terminals of TDLS8000. When calculating the minimum operating voltage for transmitters, consider to allow margins for voltage drop in external wiring.

Self-diagnostics:
- Laser Unit temperature, Sensor Control Unit temperature, Laser temperature, Detector signal level, Memory read/write function, Peak locking condition

Calibration:
- Calibration method: Zero/Span calibration
- Calibration mode: Manual, Auto (Time initiation, Remote initiate (DI/Modbus)), Semi-Auto (YH8000/HART)

Validation:
- Validation method: Up to 2 points
- Validation mode: Manual, Auto (Time initiated, Remote initiate (DI/Modbus)), Semi-Auto (YH8000/HART)

Note: Validation check is not available when Large Aperture Optics “LA” of the Optic Accessory is specified or H2 ppm measurement “H1” of the Gas Parameter is specified. As well, when gas concentration is unstable, please consult Yokogawa.

Power supply:
- 24V DC +/-10%
- If your power supply is 100 to 240 V AC, Universal Power Supply, M1276WW (sold separately), is required

Power consumption:
- Max. 20W; TDLS8000 only
- Max. 60W, TDLS8000 with YH8000 and 2 solenoid valves

Protection degree:
- IP66, Type 4X

Material:
- Case; Aluminum alloy

Wetted materials:
- 316 SS, BK-7 glass, Teflon encapsulated FKM (O-ring for alignment flange), Silicone (O-ring for LAO)

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

Weight:
- Sensor Control Unit; Approx. 8 kg
- Laser Unit; Approx. 8 kg
- Large Aperture Optics; Approx. 14 kg
- ANSI Class 150-2-RF (Eq.) Alignment Flange; Approx. 5 kg/pc
- ANSI Class 150-3-RF (Eq.) Alignment Flange; Approx. 7 kg/pc
- ANSI Class 150-4-RF (Eq.) Alignment Flange; Approx. 9 kg/pc
- DIN PN16-DN50-A (Eq.) Alignment Flange; Approx. 5 kg/pc
- DIN PN16-DN80-A (Eq.) Alignment Flange; Approx. 6 kg/pc
- JIS 10K-50-FF (Eq.) Alignment Flange; Approx. 5 kg/pc
- JIS 10K-80-FF (Eq.) Alignment Flange; Approx. 6 kg/pc
- Flow Cell Alignment Flange; Approx. 5 kg/pc
- Cable gland for Japan Ex “-J1”; (/JA1) Approx. 320 g/pc, (/JB1, /JB4) Approx. 450 g/pc
- Cable gland for Japan Ex “-J2”; (/JC1, /JD1) Approx. 150 g/pc, (/JE3, /JE4) Approx. 200 g/pc

Process gas condition:
- Process gas temperature; Max. 1,500°C, Application dependent
- Process gas pressure: Max. 1 MPa abs., Min. 90 kPa abs., Application dependent
- Max. 15 kPa G with LAO unit

Note: When using TDLS8000 as CE marking compliance product, it has following limitation.
- General purpose model (-G1, -G2):
  - The upper limit of the measurement gas pressure is 50kPa in gauge pressure.
- ATEX model (-S1, -S2):
  - The upper limit of the measurement gas pressure is 50kPa abs. The unstable gas defined by following cannot be measured.

An unstable gas in this context is a gas liable to transform itself spontaneously, producing a sudden pressure increase.

Such transformation as an example can result from a relatively small variation of an operating parameter (e.g. pressure, temperature, presence of catalyzing material) in a confined volume. This includes gases that are classified as chemically unstable gases according to CLP Regulation (EC) No 1272/2008 as amended.

Typical examples of unstable gases: acetylene (UN 1001), methyl acetylene (UN 1060), vinylfluoride (UN 1860), ozone and dinitrogen oxide (UN 1067).

For further examples, see Table 35.1 of the UN Manual of Tests and Criteria.
Dust in process gas; 20 g/m³ or less
(Dust loading levels are dependent
upon the application, OPL and other
installation factors)

Warm-up time: 5 min.

Installation condition:
Ambient operating temperature; -20 to 55ºC
Storage temperature; -30 to 70ºC
Humidity; 0 to 95%RH at 40ºC (Non-condensing)
Mounting flange type; ASME B16.5, DIN, JIS

Sensor Control Unit: 1/2NPT or M20x1.5mm, one hole
3/4NPT or M25x1.5mm, three holes
Laser Unit: 3/4 NPT or M25x1.5mm, one hole

Purge gas connections;
1/4NPT or Rc1/4
If other gas connections are required,
please consult with Yokogawa.

Purge gas; Theoretically, instrument air could be used as
a purge gas for all of the below applications except for oxygen or H2O measurement.
Choosing between using nitrogen or
instrument air or purge gas will ultimately
depend upon further application details and
the desired precision of the measurement. All
gasses should be clean and dry.

Recommended purge gasses:
O2 analyzer: N2 (99.99% or greater, application
dependent)
H2O ppm analyzer: N2 (99.99% or greater with
< 20 ppm H2O for feed to the optional
dryer package)
CO, CO or CH4, CO2, CO + CO2, NH3, H2S, HCl
analyzer: N2 (99.99% or greater, application
dependent) or Instrument air

Purge gas flow rates;
Optic: 2 to 20L/min (Application dependent)
2 to 20L/min and 50 to 70L/min
(Zone 1/Div.1/Flameproof “d”)
* Not more than 10kPa at the inlet for
Zone 1/Div.1/Flameproof “d” and Zone
2/Div.2/Type of protection “n”
Process window: 5 to 30L/min (Application
dependent)

Hazardous area classifications:
Division 1, Zone 1: Explosionproof

Division system:
Type of protection:
Explosionproof for Class I, Division 1,
Groups A, B, C, D, T5
Dust-Ignitionproof for Class II/III,
Division 1, Groups E, F, G, T5

Enclosure rating: Type4X
Applicable standards:
FM Class 3600: 2011, FM Class 3615:
2006, FM Class 3616: 2011, FM Class

Zone system:
Type of protection:
Class I, Zone 1, AEx db IIC T5
Zone 21, AEx tb IIIC T100ºC

Enclosure rating: IP66
Applicable standards:
ANSI/ISA 60079-0-2013
ANSI/UL 60079-1:2015
ANSI/ISA 60079-31-2015
ANSI/IEC 60529-2004 (R2011)

Division 2, Zone 2: Nonincendive/Type n

TDLS8000-D2 (FM Approval for US)
Division system:
Type of protection:
Nonincendive for Class I, Division 2,
Groups A, B, C, D, T5
Dust-Ignitionproof for Class II/III,
Division 1, Groups E, F, G, T5

Enclosure rating: Type 4X
Applicable standards:
FM Class 3600: 2011, FM Class 3611:
2004, FM Class 3616: 2011, FM Class

Purge gas connections:
1/4NPT or Rc1/4
If other gas connections are required,
please consult with Yokogawa.

Purge gas; Theoretically, instrument air could be used as
a purge gas for all of the below applications except for oxygen or H2O measurement.
Choosing between using nitrogen or
instrument air or purge gas will ultimately
depend upon further application details and
the desired precision of the measurement. All
gasses should be clean and dry.

Recommended purge gasses:
O2 analyzer: N2 (99.99% or greater, application
dependent)
H2O ppm analyzer: N2 (99.99% or greater with
< 20 ppm H2O for feed to the optional
dryer package)
CO, CO or CH4, CO2, CO + CO2, NH3, H2S, HCl
analyzer: N2 (99.99% or greater, application
dependent) or Instrument air

Purge gas flow rates;
Optic: 2 to 20L/min (Application dependent)
2 to 20L/min and 50 to 70L/min
(Zone 1/Div.1/Flameproof “d”)
* Not more than 10kPa at the inlet for
Zone 1/Div.1/Flameproof “d” and Zone
2/Div.2/Type of protection “n”
Process window: 5 to 30L/min (Application
dependent)

Hazardous area classifications:
Division 1, Zone 1: Explosionproof

Division system:
Type of protection:
Explosionproof for Class I, Division 1,
Groups A, B, C, D, T5
Dust-Ignitionproof for Class II/III,
Division 1, Groups E, F, G, T5

Enclosure rating: Type4X
Applicable standards:
FM Class 3600: 2011, FM Class 3615:
2006, FM Class 3616: 2011, FM Class

Zone system:
Type of protection:
Class I, Zone 1, AEx db IIC T5
Zone 21, AEx tb IIIC T100ºC

Enclosure rating: IP66
Applicable standards:
ANSI/ISA 60079-0-2013
ANSI/UL 60079-1:2015
ANSI/ISA 60079-31-2015
ANSI/IEC 60529-2004 (R2011)

TDLS8000-C1 (FM Approval for Canada)
Type of protection:
Ex db IIC T5 Gb
Class II/III, Division 1, Groups E, F, G, T5
Ex tb IIIC T100 ºC, Db

Enclosure rating: IP66, Type4X
Applicable standards:
CAN/CSA-C22.2 NO. 0-10 (R2015)
CAN/CSA-C22.2 NO. 0.4-04 (R2013)
C22.2 NO. 0.5-1982 (R2012)
C22.2 NO.25-1966 (R2014)
CAN/CSA-C22.2 NO. 60079-0:15
CAN/CSA-C22.2 NO. 60079-1:16
CAN/CSA-C22.2 NO. 60079-31:15
CAN/CSA-C22.2 NO. 60529-05 (R2015)
CAN/CSA-C22.2 NO. 61010-1-12
CAN/CSA-C22.2 NO. 61010-2-030-12
ANSI/ISA 12.77.01-2011

TDLS8000-S1 (ATEX)
Type of protection:
II 2(1) G Ex db [op is T6 Ga] IIC T5 Gb
II 2 D Ex tb IIIC T100 ºC Db

Enclosure rating: IP66 (In Accordance with EN 60529)
Applicable standards:
EN 60079-0:2012+A11:2013,
EN 60079-1:2014, EN 60079-28:2015,
EN 60079-31:2014,

TDLS8000-E1 (IECEx)
Type of protection:
Ex d [op is T6 Ga] IIC T5 Gb
Ex tb IIIc T100ºC Db

Enclosure rating: IP66 (In Accordance with IEC 60529)
Applicable standards:
IEC 60079-0:2011, IEC 60079-1:2014,

TDLS8000-J1 (Japan Ex)
Type of protection: Ex d IIC T5 Gb

Enclosure rating: JNIOH-TR-46-1:2015
JNIOH-TR-46-2:2015

TDLS8000-Q1, -R1 (EAC)
Type of protection:
1Ex d [op is T6 Ga] IIC T5 Gb
Ex tb IIIc T100ºC Db

Enclosure rating: IP66 (In accordance with GOST 14254-96)
Applicable standards:
GOST R IEC 60079-0-2011
GOST IEC 60079-1-2011
GOST 31610.28-2012
GOST IEC 60079-31-2013

Division 2, Zone 2: Nonincendive/Type n

TDLS8000-D2 (FM Approval for US)
Division system:
Type of protection:
Nonincendive for Class I, Division 2,
Groups A, B, C, D, T5
Dust-Ignitionproof for Class II/III,
Division 1, Groups E, F, G, T5

Enclosure rating: IP66
Applicable standards:
ANSI/ISA 60079-0-2013
ANSI/UL 60079-1:2015
ANSI/ISA 60079-31-2015
ANSI/IEC 60529-2004 (R2011)
Zone system:
Type of protection:
Class I, Zone 2, AEx nA nC IIC T5
Zone 21, AEx tb IIIIC T100 ºC

Enclosure Rating: IP66
Applicable standards:

TDLS8000-C2 (FM Approval for Canada)
Type of protection: Ex nA nC IIC T5
Class II/III, Division 1, Groups E, F, G
Enclosure rating: IP66, Type 4X
Applicable standards:

TDLS8000-E2 (IECEx)
Type of protection:
II 3(1) G Ex nA nC [op is T6 Ga] IIC T5 Gc
II 2 D Ex tb IIIIC T100 ºC Db
Enclosure rating: IP66 (In accordance with EN 60529)
Applicable standards:

TDLS8000-K2 (KOSHA)
Type of protection:
Ex nA nC IIC T5
Ex tD A21 T100 ºC
Enclosure rating: IP66 (In accordance with IEC 60529)
Applicable standards:

TDLS8000-N2 (NEPSI)
Type of protection:
Ex nA nC [op is T6 Ga] IIC T5 Gc
Ex tD A21 T100 ºC
Enclosure rating: IP66 (In accordance with GB 4208)
Applicable standards:
GB 3836.1-2010, GB 3836.8-2014, GB 12476.1-2013, GB 12476.5-2013, IEC 60079-28:2015

TDLS8000-O2, -R2 (EAC)
Type of protection: 2Ex nA nC [op is T6 Ga] IIC T5 Gc X
Ex tb IIIIC T100 ºC Db X
Enclosure rating: IP66 (In accordance with GOST 14254-96)

PERFORMANCE

Repeatability / Linearity:

<table>
<thead>
<tr>
<th>Measured gas</th>
<th>Repeatability</th>
<th>Linearity</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₂</td>
<td>+/- 1% reading or +/- 0.01% O₂, whichever is greater</td>
<td>+/- 1% F.S.</td>
</tr>
<tr>
<td>CO (ppm)</td>
<td>+/- 2% reading or +/- 0.1 ppm CO, whichever is greater</td>
<td>+/- 1% F.S.</td>
</tr>
<tr>
<td>CO or CH₄</td>
<td>+/- 4% reading or +/- 0.02% CH₄, whichever is greater</td>
<td>+/- 4% F.S.</td>
</tr>
<tr>
<td>NH₃</td>
<td>+/- 2% reading or +/- 1 ppm NH₃, whichever is greater</td>
<td>+/- 2% F.S.</td>
</tr>
<tr>
<td>H₂O (ppm) in non HC</td>
<td>+/- 2% reading or +/- 0.1 ppm H₂O, whichever is greater</td>
<td>+/- 1% F.S.</td>
</tr>
<tr>
<td>H₂O (ppm) in HC</td>
<td>+/- 2% reading or +/- 0.1 ppm H₂O, whichever is greater</td>
<td>+/- 1% F.S.</td>
</tr>
<tr>
<td>CO (%)</td>
<td>+/- 1% reading or +/- 0.01% CO, whichever is greater</td>
<td>+/- 1% F.S.</td>
</tr>
<tr>
<td>CO (%) + CO₂ (%)</td>
<td>+/- 1% reading or +/- 0.01% CO₂, whichever is greater</td>
<td>+/- 1% F.S.</td>
</tr>
<tr>
<td>H₂S</td>
<td>+/- 1% reading or +/- 0.005% H₂S, whichever is greater</td>
<td>+/- 1% F.S.</td>
</tr>
<tr>
<td>CO₂ (%)</td>
<td>+/- 1% reading or +/- 0.005% CO₂, whichever is greater</td>
<td>+/- 1% F.S.</td>
</tr>
<tr>
<td>CO₂ (%) Extend. Range</td>
<td>+/- 1% reading or +/- 0.02% CO₂, whichever is greater</td>
<td>+/- 1% F.S.</td>
</tr>
<tr>
<td>H₂O (%)</td>
<td>+/- 1% reading or +/- 0.004% H₂O, whichever is greater</td>
<td>+/- 1% F.S.</td>
</tr>
<tr>
<td>HCl</td>
<td>+/- 1% reading or +/- 2.5 ppm HCl, whichever is greater</td>
<td>+/- 2% F.S.</td>
</tr>
</tbody>
</table>

Measurement conditions: Gas temperature; 25 ºC, 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 temperature-compensated 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 can be used in 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 series. 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 series.

An Ethernet connection is used to connect the YH8000 to up to four TDLS8000 series 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 60320 or equivalent)
Protection degree of enclosure: IP65, Type 4X
Window: Polycarbonate
Weight: Approx. 4 kg
Cable gland for Japan: (JA1, JA2) Approx. 320 g/piece
Mounting: Analyzer mount (Front, left-side, right-side) with tilt function, Panel mount, or Panel Mount
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, EMC, and RoHS conformity standards:
  Safety conformity 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: I
  (Anticipated transient overvoltage 330 V)
  Pollution degree: 2, Indoor/Outdoor use
  EMC conformity standards:
    CE EN55011 Class A Group 1
    UL 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)
  RoHS conformity standards: EN50581
  Information of the WEEE Directive
  This product is purposely designed to be used in a large scale fixed installations only and, therefore, is out of scope of the WEEE Directive. The WEEE Directive does not apply. The WEEE Directive is only valid in the EU.

Hazardous area classifications:
Division 2, Zone 2: 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

Zone system
  Type of protection: Class I, Zone 2, AEx nA ic IIC T5
  Enclosure rating: IP65

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

YH8000-S2 (ATEX)
  Type of protection: II 3 G Ex nA ic IIC T5 Gc
  Enclosure rating: IP65 (In accordance with EN 60529)

YH8000-E2 (IECEx)
  Type of protection: Ex nLc IIC T5 Gc
  Enclosure rating: IP65 (In accordance with IEC 60529)
YH8000-J2 (Japan Ex)
Type of protection: Ex nA ic IIC T5 Gc
Enclosure rating: IP54 (In accordance with IEC 60529) *1
JNIOSH-TR-46-6:2015
JNIOSH-TR-46-8:2015

YH8000-K2 (KOSHA)
Type of protection: Ex nA nL IIC T5
Enclosure rating: IP65 (In accordance with IEC 60529)
Applicable standards: Notice of Ministry of LaborNo. 2013-54

YH8000-N2 (NEPSI)
Type of protection: Ex nA ic IIC T5 Gc
Enclosure rating: IP65 (In accordance with GB 4208)
Applicable standards: GB 3836.1-2010, GB 3836.4-2010, GB 3836.8-2014

YH8000-R2 (EAC)
Type of protection: 2Ex nA ic IIC T5 Gc X
Enclosure rating: IP65 (In accordance with GOST 14254-96)

- **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

<table>
<thead>
<tr>
<th>Process connection</th>
<th>Analyzer connection</th>
<th>Weight (Approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI Class 150-2-RF Flange</td>
<td>ANSI Class 150-2-RF Flange</td>
<td>5 kg/pc 6 kg/pc</td>
</tr>
<tr>
<td>ANSI Class 300-2-RF Flange</td>
<td>ANSI Class 300-3-RF Flange</td>
<td>8 kg/pc 9 kg/pc</td>
</tr>
<tr>
<td>ANSI Class 150-3-RF Flange</td>
<td>ANSI Class 150-4-RF Flange</td>
<td>11 kg/pc 12 kg/pc</td>
</tr>
<tr>
<td>ANSI Class 300-3-RF Flange</td>
<td>DIN PN16-DN50 Flange</td>
<td>12 kg/pc 14 kg/pc</td>
</tr>
<tr>
<td>ANSI Class 150-4-RF Flange</td>
<td>DIN PN16-DN80 Flange</td>
<td>11 kg/pc 12 kg/pc</td>
</tr>
<tr>
<td>JIS 10K-50-FF Flange</td>
<td>JIS 10K-80-FF Flange</td>
<td>7 kg/pc 7 kg/pc</td>
</tr>
</tbody>
</table>

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")

<table>
<thead>
<tr>
<th>Material/Optical Path Length</th>
<th>1016 mm (40 inch)</th>
<th>1524 mm (60 inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monel 400</td>
<td>Approx. 15 kg</td>
<td>Approx. 18 kg</td>
</tr>
<tr>
<td>316 SS</td>
<td>Approx. 14 kg</td>
<td>Approx. 17 kg</td>
</tr>
</tbody>
</table>

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  

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>K9772XA</td>
<td>Calibration Cell with free-standing frame for O₂</td>
<td></td>
</tr>
<tr>
<td>K9772XB</td>
<td>Calibration Cell with free-standing frame for O₂ LAO</td>
<td></td>
</tr>
<tr>
<td>K9772XC</td>
<td>Calibration Cell with free-standing frame for ppm H₂O in non-hydrocarbon</td>
<td></td>
</tr>
<tr>
<td>K9772XD</td>
<td>Calibration Cell with free-standing frame for NH₃</td>
<td></td>
</tr>
<tr>
<td>K9772XE</td>
<td>Calibration Cell with free-standing frame for ppm H₂O in hydrocarbon background</td>
<td>Approx. 14 kg</td>
</tr>
<tr>
<td>K9772XF</td>
<td>Calibration Cell with free-standing frame for ppm CO</td>
<td></td>
</tr>
<tr>
<td>K9772XG</td>
<td>Calibration Cell with free-standing frame for ppm CO LAO</td>
<td></td>
</tr>
<tr>
<td>K9772XH</td>
<td>Calibration Cell with free-standing frame for CO (%) + CO₂ (%) Extend. Range</td>
<td></td>
</tr>
<tr>
<td>K9772XJ</td>
<td>Calibration Cell with free-standing frame for HCl</td>
<td></td>
</tr>
<tr>
<td>K9772XL</td>
<td>Calibration Cell with free-standing frame for CO(%) CO₂ (%) High Range</td>
<td></td>
</tr>
<tr>
<td>K9772XM</td>
<td>Calibration Cell with free-standing frame for H₂S</td>
<td></td>
</tr>
</tbody>
</table>

  - **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

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Cable length</th>
</tr>
</thead>
<tbody>
<tr>
<td>K9775XA</td>
<td>5 m</td>
</tr>
<tr>
<td>K9775XB</td>
<td>10 m</td>
</tr>
<tr>
<td>K9775XC</td>
<td>20 m</td>
</tr>
<tr>
<td>K9775XD</td>
<td>30 m</td>
</tr>
<tr>
<td>K9775XE</td>
<td>40 m</td>
</tr>
<tr>
<td>K9775XF</td>
<td>50 m</td>
</tr>
<tr>
<td>K9775XG</td>
<td>60 m</td>
</tr>
</tbody>
</table>

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

Note: When cable length is not more than 25m, Belden 1475A may be used as Unit Connection Cable.
# MODEL AND CODES

- **TDLS8000 Tunable Diode Laser Spectrometer**

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Code</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDLS8000</td>
<td>-G1</td>
<td>General Purpose, cable entry/piping:NPT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-G2</td>
<td>General Purpose, cable entry:Metric thread, piping:Rc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-GR</td>
<td>EAC General Purpose, cable entry:Metric thread, piping:Rc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-D2</td>
<td>FM (US) Class I Div 2, Zone2, cable entry/piping:NPT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-S2</td>
<td>ATEX Type of protection “n”, cable entry:Metric thread, piping:Rc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-K2</td>
<td>KOSH Type of protection “n”, cable entry:Metric thread, piping:Rc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-N2</td>
<td>NEPSI Type of protection “n”, cable entry:Metric thread, piping:Rc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Q2</td>
<td>EAC with PA Type of protection “n”, cable entry:Metric thread, piping:Rc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-R2</td>
<td>EAC Type of protection “n”, cable entry:Metric thread, piping:Rc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-C1</td>
<td>FM (Canada) Class I Zone1, cable entry/piping:NPT (*1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-E1</td>
<td>IECEx Flameproof “d”, cable entry:Metric thread, piping:Rc (*1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-J1</td>
<td>Japan Ex / Zone 1, cable entry:Metric thread, piping:Rc (*1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-J2</td>
<td>Japan Ex / Zone 2, cable entry:Metric thread, piping:Rc (*1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Q1</td>
<td>EAC with PA Flameproof “d”, cable entry:Metric thread, piping:Rc (*1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-R1</td>
<td>EAC Flameproof “d”, cable entry:Metric thread, piping:Rc (*1)</td>
<td></td>
</tr>
</tbody>
</table>

### Gas Parameter

- **-X1**  
  - $O_2 < 600^\circ C$, 0-25% (*2)
- **-X2**  
  - $O_2 < 1500^\circ C$, 0-25% Combustion
- **-C1**  
  - CO (%): 0-20%/0-50% <500°C
- **-C2**  
  - CO ppm 0-200ppm/0-10,000ppm <500°C (*3)
- **-C3**  
  - CO ppm <1500°C Combustion (*3)
- **-C4**  
  - CO ppm <1500°C or CH4 0-5% Combustion (*3)
- **-C5**  
  - CO (%): CO2(%): 0-30%/0-100% <150°C
- **-A1**  
  - NH3 up to 0-6,000ppm <450°C DeNOx
- **-S1**  
  - $H_2S$ 0-5%/0-100% <100°C (*2)
- **-D1**  
  - $CO_2$ High Range 0-1%/0-5% <100°C
- **-D5**  
  - $CO_2$ Extend. Range 0-30%/50% <150°C
- **-H1**  
  - $H_2O$ ppm non-Hydrocarbon Background (*1)
- **-H3**  
  - $H_2O$ ppm Hydrocarbon Background (*1)
- **-H4**  
  - $H_2O$ 0-10%/0-100% <500°C (*2)
- **-L1**  
  - HCl 0-50ppm/0-5,000ppm <500°C

### Optics Accessory

- **-NN**  
  - Without Alignment Flanges (*4)
- **-LA**  
  - Large Aperture Optics, ANSI CLASS150-4-RF (*5) (*6)
- **-U2**  
  - ANSI CLASS150-2-RF(Eq.) Alignment Flange, piping: NPT
- **-U3**  
  - ANSI CLASS150-3-RF(Eq.) Alignment Flange, piping: NPT
- **-U4**  
  - ANSI CLASS150-4-RF(Eq.) Alignment Flange, piping: NPT
- **-D5**  
  - DIN PN16-DN50-D(Eq.) Alignment Flange, piping: Rc
- **-D8**  
  - DIN PN16-DN80-D(Eq.) Alignment Flange, piping: Rc
- **-J5**  
  - JIS 10K-50-FF(Eq.) Alignment Flange, piping: Rc
- **-J8**  
  - JIS 10K-80-FF(Eq.) Alignment Flange, piping: Rc
- **-FC**  
  - Flow Cell Alignment Flange (*6)

### I/O Interface

- **-A1**  
  - Analog with HART+Modbus Ethernet

### SI Unit

- **-J**  
  - Only SI Unit
- **-N**  
  - SI Unit or non SI Unit (*7)
- **-N**  
  - Always -N

### Option

- **/D**  
  - Diverging Beam without LAO (*8)
- **/RX**  
  - Reference Cell for $O_2$ (*9)
- **/RC**  
  - Reference Cell for CO (*10)
- **/ST**  
  - Stainless Steel Tag Plate
- **/JA1**  
  - Cable gland for Japan Ex “-J1” (Cable O.D. 8-12mm, G1/2) 1pc, for local HMI
- **/JB3**  
  - Cable gland for Japan Ex “-J1” (Cable O.D. 10-16mm, G3/4) 3pcs
- **/JB4**  
  - Cable gland for Japan Ex “-J1” (Cable O.D. 10-16mm, G3/4) 4pcs
- **/JC1**  
  - Cable gland for Japan Ex “-J2” (Cable O.D. 6-9.5mm, M20) 1pc, for local HMI
- **/JD1**  
  - Cable gland for Japan Ex “-J2” (Cable O.D. 8.5-13.4mm, M20) 1pc, for local HMI
- **/JE3**  
  - Cable gland for Japan Ex “-J2” (Cable O.D. 9.5-15.4mm, M25) 3pcs

*1: Type “-D1”, “-C1”, “-S1”, “-E1”, “-J1”, “-Q1”, “-R1” cannot be selected with “-H1” or “-H3”.  
*2: When the process gas pressure is out of 90 to 130 kPa (abs.), please contact YOKOGAWA.  
*3: When CO or CH4 ingredient coexist, please contact YOKOGAWA.  
*4: When “-NN” is selected, Zone2/Div2/Type of protection “n”, FM (Canada) Zone1 is not available.
*5: 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. "-LA" can be selected when Oxygen or CO (-C2, -C3, -C4) analyzer is selected.

*6: When FM (US) or FM (Canada) is specified, the connecting port for window purge is 1/4NPT.
When ATEX, IECEx, KOSHA, NEPSI, EAC or Japan Ex is specified, the connecting port for window purge is Rc1/4.

*7: Available only to an end user located outside of Japan.

*8: The Option "ID" can be selected when Large Aperture Optics "-LA" of the Optic Accessory is not specified and Oxygen or
CO (-C2, -C3, -C4) analyzer is selected.

*9: 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.

*10: 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.

*11: For Japan Ex model (TDLS8000-J1, TDLS8000-J2), specified cable glands shall be attached to each cable entry for wiring.
Select one cable gland out of two types: (JB3 or JB4 for "-J1", JE3 or JE4 for "-J2"). If you need, specify (JA1 for "-J1", /J1 or/ JD1 for "-J2") as well. For detailed information, refer to Japanese General Specifications.
The Option "JA1", "JB3" and "JB4" can be used only when Japan Ex model (TDLS8000-J1) is selected.
The Option "JC1", "JD1", "JE3" and "JE4" can be used only when Japan Ex model (TDLS8000-J2) is selected.

YH8000 HMI Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Code</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>YH8000</td>
<td>-G1</td>
<td>General Purpose, NPT thread for cable entry</td>
<td></td>
</tr>
<tr>
<td>-G2</td>
<td>General Purpose, Metric thread for cable entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-GR</td>
<td>EAC General Purpose, Metric thread for cable entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-D2</td>
<td>FM (US) Class I Div 2, Zone2, NPT thread for cable entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-C2</td>
<td>FM (Canada) Class I Zone2, NPT thread for cable entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-S2</td>
<td>ATEX Type of protection &quot;n&quot;, Metric thread for cable entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-E2</td>
<td>IECEx Type of protection &quot;n&quot;, Metric thread for cable entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-J2</td>
<td>Japan Ex/Zone 2, Metric thread for cable entry (*2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-K2</td>
<td>KOSHA Type of protection &quot;n&quot;, Metric thread for cable entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-N2</td>
<td>NEPSI Type of protection &quot;n&quot;, Metric thread for cable entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-R2</td>
<td>EAC Type of protection &quot;n&quot;, Metric thread for cable entry</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Language :
-E | English and 9 languages (*1) |
-N | Always -N |

Option :
/M | Mounting kit for TDLS8000 series (*3) |
P | Pipe mount |
/W | Wall mount |
/S | Sun Shield |
/C | Local HMI connection cable: 3m |
/SCT | Stainless Steel Tag Plate |
/JA1 | Cable gland for Japan Ex (Cable O.D. 8-12mm, G1/2), 1 pc(*2) |
/JA2 | Cable gland for Japan Ex (Cable O.D. 8-12mm, G1/2), 2 pc(*2) |

*1: These languages are message languages on the display. One analyzer has English and 9 languages.

*2: For Japan ExZone 2 certified model (YH8000-J2), specified cable glands shall be attached to each cable entry for wiring. Select the Option "/JA1" or "/JA2".
For detailed information, refer to Japanese General Specifications (GS 11Y01D01-01JA).
The Option "/JA1" and "/JA2" can be used only when Japan ExZone 2 certified model (YH8000-J2) is selected. If "/JA1" or "/JA2" is necessary for other model, please contact Yokogawa.

*3: /M cannot be selected with TDLS8000 Type "-D1", "-C1", "-S1", "-E1", "-J1", "-Q1" "-R1".
### IF8000 Isolation Flanges

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Code</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF8000</td>
<td>-21</td>
<td>ANSI CLASS150-2-RF(Eq.)</td>
<td>Isolation Flange for TDLS8000 (2pcs/unit) (*1)</td>
</tr>
<tr>
<td>Process Connection</td>
<td>-23</td>
<td>ANSI CLASS300-2-RF(Eq.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-31</td>
<td>ANSI CLASS150-3-RF(Eq.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-41</td>
<td>ANSI CLASS150-4-RF(Eq.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-50</td>
<td>DIN PN16-DN50-D(Eq.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-80</td>
<td>DIN PN16-DN80-D(Eq.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-J5</td>
<td>JIS 10K-50-FF(Eq.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-J8</td>
<td>JIS 10K-80-FF(Eq.)</td>
<td></td>
</tr>
<tr>
<td>Analyzer Connection</td>
<td>-21</td>
<td>ANSI CLASS150-2-RF(Eq.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-50</td>
<td>DIN PN16-DN50-D(Eq.)</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>-MN</td>
<td>Monel 400</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-SS</td>
<td>316/316L SS</td>
<td></td>
</tr>
<tr>
<td>Sapphire Window Type</td>
<td>-12</td>
<td>Coated for O₂ (-X1, -X2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-13</td>
<td>Coated for ppm H₂O non Hydrocarbon background (-H1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-14</td>
<td>Coated for ppm NH₃ (-A1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-15</td>
<td>Coated for ppm H₂O Hydrocarbon background (-H3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-16</td>
<td>Coated for ppm CO (-C2, -C3, -C4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-17</td>
<td>Coated for % CO or % CO₂ (-C5, -D5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-18</td>
<td>Coated for HCl (-L1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-20</td>
<td>Coated for -C1, -D1, -H4, -S1</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>-N</td>
<td>Always -N</td>
<td></td>
</tr>
</tbody>
</table>

*1: IF8000 is delivered with two sets (for LU and SCU).
*2: When ANSI flange of the Process Connection is selected, the "-21" of Analyzer Connection must be specified.
*3: When DIN or JIS of the Process Connection is selected, the "-50" of Analyzer Connection must be specified.

### YC8000 Flow Cell

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix Code</th>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>YC8000</td>
<td>-EN</td>
<td>Enhanced</td>
<td>Flow Cell for TDLS8000</td>
</tr>
<tr>
<td>Flow Cell Type</td>
<td>-40</td>
<td>Forty Inches</td>
<td></td>
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<tr>
<td>Optical Path Length</td>
<td>-60</td>
<td>Sixty Inches</td>
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<tr>
<td>Material</td>
<td>-MN</td>
<td>Monel 400</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-SS</td>
<td>316/316L SS</td>
<td></td>
</tr>
<tr>
<td>Port Configuration</td>
<td>-3</td>
<td>3 ports</td>
<td></td>
</tr>
<tr>
<td>Window Type</td>
<td>-XX</td>
<td>Oxygen (-X1, -X2)</td>
<td></td>
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<tr>
<td></td>
<td>-H3</td>
<td>Moisture Hydrocarbon background (-H3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-HH</td>
<td>Moisture non Hydrocarbon background (-H1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-NH</td>
<td>NH₃ (-A1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-C2</td>
<td>ppm CO (-C2, -C3, -C4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-C</td>
<td>CO%+CO₂% (-C5, -D5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-HC</td>
<td>HCl (-L1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-MC</td>
<td>-C1, -D1, -H4, -S1</td>
<td></td>
</tr>
<tr>
<td>Inside Wall Treatment</td>
<td>-NN</td>
<td>No treatment (cleaned)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-EP</td>
<td>Electro-polish</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>-N</td>
<td>Always -N</td>
<td></td>
</tr>
</tbody>
</table>
EXTERNAL DIMENSIONS
For the external dimensions of Japan Ex model (TDLS8000-J1, TDLS8000-J2, YH8000-J2), see Japanese General Specifications (GS 11Y01D01-01JA).

TDLS8000 with Alignment Flange
- LU

*1: The alignment flange varies according to specifications. Other flanges may be added.
*2: The flow restrictors are attached in the case of type -D1, -C1, -S1, -E1, -J1, -Q1 or -R1.

- SCU cable gland
  3/4NPT or M25x1.5

- Purge port (IN)
  1/4NPT or Rc1/4

- Flow restrictor *2

- Purge port (OUT) x2
  1/4NPT or Rc1/4

- Alignment flange *1

Unit: mm
**SCU**

*1: The alignment flange varies according to specifications. Other flanges may be added.

*2: The flow restrictors are attached in the case of type -D1, -C1, -S1, -E1, -J1, -Q1 or -R1.

**Maintenance space**

* Unit: mm
● Alignment Flange

<table>
<thead>
<tr>
<th>Optics Accessory code (flange)</th>
<th>Hole QTY</th>
<th>Hole Q</th>
<th>Hole P.C.D</th>
<th>Thickness t</th>
<th>Outside dia. D</th>
<th>Distance A</th>
<th>Purge port</th>
</tr>
</thead>
<tbody>
<tr>
<td>-U2 ANSI CLASS 150-2-RF(Eq.)</td>
<td>4</td>
<td>19</td>
<td>120.7</td>
<td>19.5</td>
<td>150</td>
<td>87</td>
<td>1/4NPT</td>
</tr>
<tr>
<td>-U3 ANSI CLASS 150-3-RF(Eq.)</td>
<td>4</td>
<td>19</td>
<td>152.4</td>
<td>24.3</td>
<td>190</td>
<td>92</td>
<td>1/4NPT</td>
</tr>
<tr>
<td>-U4 ANSI CLASS 150-4-RF(Eq.)</td>
<td>8</td>
<td>19</td>
<td>190.5</td>
<td>23.9</td>
<td>228.6</td>
<td>92</td>
<td>1/4NPT</td>
</tr>
<tr>
<td>-D5 DIN PN 16-DN50-D(Eq.)</td>
<td>4</td>
<td>18</td>
<td>125</td>
<td>18</td>
<td>165</td>
<td>86</td>
<td>Rc1/4</td>
</tr>
<tr>
<td>-D8 DIN PN 16-DN80-D(Eq.)</td>
<td>8</td>
<td>18</td>
<td>160</td>
<td>20</td>
<td>200</td>
<td>88</td>
<td>Rc1/4</td>
</tr>
<tr>
<td>-J5 JIS 10K-50-FF(Eq.)</td>
<td>4</td>
<td>13</td>
<td>120</td>
<td>18</td>
<td>155</td>
<td>84</td>
<td>Rc1/4</td>
</tr>
<tr>
<td>-J8 JIS 10K-80-FF(Eq.)</td>
<td>8</td>
<td>19</td>
<td>150</td>
<td>18</td>
<td>185</td>
<td>86</td>
<td>Rc1/4</td>
</tr>
</tbody>
</table>

● 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 series (Option code: /M)

Unit: mm

- Front mounting
- Right mounting

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**

<table>
<thead>
<tr>
<th>Process Connection code (flange)</th>
<th>Analyzer Connection code (flange)</th>
<th>Hole QTY</th>
<th>Hole Q</th>
<th>Hole h</th>
<th>Nut</th>
<th>Hole P.C.D</th>
<th>Thickness t</th>
<th>Outside dia. D</th>
<th>Bolt length</th>
<th>Purge port</th>
</tr>
</thead>
<tbody>
<tr>
<td>-21 ANSI CLASS150-2-RF(Eq.)</td>
<td>-21 ANSI CLASS150-2-RF(Eq.)</td>
<td>4</td>
<td>19</td>
<td></td>
<td>5/8UNC</td>
<td>120.7</td>
<td>39.6</td>
<td>150</td>
<td>127</td>
<td>1/4NPT</td>
</tr>
<tr>
<td>-23 ANSI CLASS300-2-RF(Eq.)</td>
<td>-30 ANSI CLASS150-3-RF(Eq.)</td>
<td>8</td>
<td>19</td>
<td></td>
<td>5/8UNC</td>
<td>127.5</td>
<td>39.6</td>
<td>165</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>-31 ANSI CLASS150-3-RF(Eq.)</td>
<td>-33 ANSI CLASS300-3-RF(Eq.)</td>
<td>4</td>
<td>19</td>
<td></td>
<td>3/4UNC</td>
<td>152.4</td>
<td>39.6</td>
<td>190</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>-41 ANSI CLASS150-4-RF(Eq.)</td>
<td>-43 ANSI CLASS300-4-RF(Eq.)</td>
<td>8</td>
<td>22</td>
<td></td>
<td>3/4UNC</td>
<td>168.3</td>
<td>39.6</td>
<td>210</td>
<td>146</td>
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<tr>
<td>-50 DIN PN16-DN50-D(Eq.)</td>
<td>-50 DIN PN16-DN50-D(Eq.)</td>
<td>4</td>
<td>18</td>
<td></td>
<td>M16</td>
<td>125</td>
<td>41.6</td>
<td>165</td>
<td>137</td>
<td>D</td>
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<tr>
<td>-80 DIN PN16-DN80-D(Eq.)</td>
<td>-80 DIN PN16-DN80-D(Eq.)</td>
<td>8</td>
<td>18</td>
<td></td>
<td>M16</td>
<td>160</td>
<td>41.6</td>
<td>200</td>
<td>137</td>
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</tr>
<tr>
<td>-J5 JIS 10K-50-FF(Eq.)</td>
<td>-J5 JIS 10K-50-FF(Eq.)</td>
<td>4</td>
<td>19</td>
<td></td>
<td>M16</td>
<td>120</td>
<td>40.6</td>
<td>165</td>
<td>139</td>
<td></td>
</tr>
<tr>
<td>-J8 JIS 10K-80-FF(Eq.)</td>
<td>-J8 JIS 10K-80-FF(Eq.)</td>
<td>8</td>
<td>19</td>
<td></td>
<td>M16</td>
<td>150</td>
<td>40.6</td>
<td>185</td>
<td>139</td>
<td></td>
</tr>
</tbody>
</table>

Unit: mm

Installation for wall

Purge port (IN) x2
1/4NPT or Rc1/4

Unit: mm

Installation for process side

■ 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, K9772XF, K9772XG, K9772XH, K9772XJ, K9772XL, K9772XM
WIRING

Wiring Laser Unit and Sensor Control Unit

Laser Unit (LU)

Sensor Control Unit (SCU)

Ethernet port for YH8000 or DCS

Magnified Terminal A

Magnified Terminal B

Magnified Terminal C

Connect to shield wire terminal (Both side of cable)

<table>
<thead>
<tr>
<th>LC</th>
<th>MS-1</th>
<th>MS-2</th>
<th>VO</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AO-1</th>
<th>AO-2</th>
<th>AI-1</th>
<th>AI-2</th>
<th>DI-1</th>
<th>DI-2</th>
<th>DO</th>
<th>POWER</th>
<th>VO (HMI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Isolated 4-20mA Output

Isolated 4-20mA Output

4-20mA Input for Pressure transmitter

4-20mA Input for Temperature transmitter

Digital Input

Digital Output for programmable DO

Solenoid Valve Control for Auto Cal

Power Supply 24V DC

24V DC Output for YH8000 Power
Wiring the YH8000 HMI UNIT

Local HMI configuration

Port1  Port2
Ethernet port for TDLS8000 Series

Connection for power

Earth for shield wire

Modbus/TCP communication with DCS

Ethernet communication with TDLS8000 Series

24V DC power from TDLS8000 Series

- Connect to shield wire terminal

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

Remote HMI configuration

Port2  Port1
Ethernet communication with TDLS8000 Series via switching HUB

- Connect to shield wire terminal

• Maximum cable length between YH8000 and Switching HUB is 100m.
TDLS8000 Tunable Diode Laser 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)

<table>
<thead>
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<th>Component</th>
<th>Concentrations</th>
<th>Units</th>
<th>Measured</th>
<th>Range</th>
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</thead>
<tbody>
<tr>
<td>Name</td>
<td>Min.</td>
<td>Typ.</td>
<td>Max.</td>
<td>ppm(v)/vol%</td>
</tr>
<tr>
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<td></td>
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6. **Physical Properties**

<table>
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<th>Units</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
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<tbody>
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</tr>
<tr>
<td>Pressure</td>
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</tr>
<tr>
<td>Dew Point</td>
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</tr>
<tr>
<td>Water Vapor</td>
<td></td>
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</tr>
<tr>
<td>Flow</td>
<td></td>
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</tr>
<tr>
<td>Velocity</td>
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<tr>
<td>Particulate Conc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Installation location: □ Indoor □ Outdoor

Ambient temperature: _______ to _______ °C

7. **General Application & Installation Notes/Comments:**