The TruePeak Tunable Diode Laser Spectroscopy (TDLS) Analyzer is capable of measuring a number of near-infrared absorbing gases in difficult process applications. With the capability of measuring at very high temperature, high pressures and under difficult conditions (corrosive, aggressive, high particulate service), the TruePeak analyzer is one of the most robust process analyzers available. Most applications are measured in-situ, reducing installation and maintenance costs. In addition, most measurements are rapid (5 seconds) and interference free, offering improved accuracy when compared to other process analyzers.

**Typical gases measured include:**
- Oxygen in process applications and combustion applications. Process temperatures can be as high as 1500°C, pressures can be as high as 10bar. Measurement span is typically between 1% and 100% oxygen.
- Carbon Monoxide in process and combustion applications. Process temperatures can be as high as 1500°C. Two versions are available, high sensitivity with ppm detection limits possible and standard sensitivity for high ppm and percent level CO measurements
- Part per million Moisture in aggressive process streams. Sub-ppm detection limits are possible with measurement in corrosive and aggressive process streams

Other applications and gases are possible with the TruePeak TDLS. Please fill out the Application Data Sheet at the end of this document and send to Yokogawa.

**Features**
- In Situ Analysis
- Fast Response (2-20 seconds)
- Interference Free for most applications
- TruePeak Measurement Capable of measuring under changing pressure, temperature and background
- Process Pressures up to 20 Bar
- Process Temperature up to 1500°C
- Optical Measurement, no sensor contact with process
- Low LTCo\(^1\) (no moving parts, high MTTF\(^2\) for components)
- Flexible Installation Options
- On Board Diagnostics
- ATEX Group II for zone 1 (Cat 2G) or 2 (Cat 3G) with purge systems

\(^1\) Long term cost of ownership
\(^2\) Mean time to failure

**System configuration**

- **Cross stack/Pipe**
- **Close Coupled Extrative / Bypass**
- **Extractive**

* Contact Yokogawa for further information
**Operational Principle**

Tunable Diode Laser Spectroscopy (or TDLS) measurements are based on absorption spectroscopy. The TruePeak Analyzer is a TDLS system and operates by measuring the amount of laser light that is absorbed (lost) as it travels through the gas being measured. In the simplest form a TDLS analyzer consists of a laser that produces infrared light, optical lenses to focus the laser light through the gas to be measured and then on to a detector, the detector, and electronics that control the laser and translate the detector signal into a signal representing the gas concentration.

Gas molecules absorb light at specific wavelengths, called absorption lines. This absorption follows Beer's law.

TDL Analysers are effectively infra red analyzers which obey the Beer-Lambert Law.

\[ I = I_0 e^{-E G L} \]

where \( I \) is the radiation intensity after absorption
\( I_0 \) is the initial radiation intensity
\( E \) is the extinction coefficient
\( G \) is the gas concentration
and \( L \) is the pathlength of the measurement area.

Using a Tunable Diode Laser as a light source for spectroscopy has the following benefits:

- **Sensitivity.** Application Dependant. Sub-PPM in some applications.
- **Selectivity.** The narrow linewidth of the laser is able to resolve single absorption lines. This provides more choices of a particular peak to use for measurement, usually allowing one isolated peak to be used.
- **Power.** Diode lasers have power ranging from 0.5mW to 35mW. Also, being highly coherent this allows measurement in optically thick environments (high particulate loading).
- **Monochromatic.** No dispersive element (filter, etc.) required. Light source itself is selective.
- **Tunable.** Wavelength can be swept across the entire absorption feature, this allows resonant (peak) and non resonant (baseline) measurement during every scan. By measuring the baseline and peak, power at the detector can fluctuate rapidly by large amounts without affecting the measurement. This is useful for high particulate applications.

**Measurement**

- During measurement the laser is held at a fixed temperature. This is the coarse wavelength adjustment.
- A current ramp is fed to the laser. This is the fine wavelength adjustment (figure 1).
- The current is ramped to scan across the wavelength region desired.
- The collimated light passes through the gas to be measured. The amount of light absorbed by the peak is proportional to the analyte concentration.
- The light is then focused on a detector (figure 2).
- This signal is used to quantify the light absorbed by the analyte (figure 3).

**Figure 1. Current ramp to laser**

![Figure 1. Current ramp to laser](image1.png)

**Figure 2. Signal at Detector**

![Figure 2. Signal at Detector](image2.png)

**Figure 3. Processed Detector Signal**

![Figure 3. Processed Detector Signal](image3.png)
**General Specifications**

**A. Measurement range:** Dependent on application and Optical Path length. Typical 0-100% for analysis of Oxygen or Carbon Monoxide. Measuring in ppm range is possible for Carbon Monoxide or Moisture.

**B. Output signal:** (3x) 4-20 mA DC with maximum load of 900 Ohm. Three isolated outputs may be used for gas concentration, transmission, re-transmission of data inputs, dual range, or second gas measurement where applicable. 3.3 mA user configurable on warnings and faults, according to NAMUR NE43.

**C. Output Span:** Freely programmable within measuring range.

**D. Contact outputs:** (3x) configurable relays for Status (Fault, Warning, In Validation, concentration level, etc.) Form C Single Pole Double Throw (SPDT) contact outputs with maximum 1A@24VDC or 0.5A@125 VAC.

**E. Valve control:** (3x) Form C SPDT contact outputs with C connected to 24VDC power supply to activate calibration solenoid valves for zero, span and dynamic spiking (validation) gas. Maximum load 1A (max 10W/ valve for zero and span gas and dynamic spiking).

**F. Current Input:** (2x) 4-20 mA inputs for Temperature and Pressure Compensation for loop powered or mains powered (115/220 VAC) mA transmitters for pressure and temperature.

**G. Digital Communication:** Ethernet IEEE 802.3 10/100 mbps, RJ45.

**H. Data storage:** USB1 and USB2 connection for data transfer using memory stick, data storage in CF card (result files, spectra capture, configuration data, etc.) Capture rate is configurable.

**I. Warm-up time:** 5 min for functioning, 60 min for full operation within specifications.

**J. Power Consumption:** 24 VDC, 4A.

**K. Accessories:**
- Universal Remote Display (URD)
- Utility Panel(s)
- Optical Power Supply Unit

*(These devices all supply 24 VDC to power the TDLS Analyzer)*

**L. Optical Path Length:** In situ standard, up to 30 meters allowed
- Minimum, OPL .5 meter
- Flow Cells, bypass installation, .5 meter recommended

**Note:** End User may supply 23.5 to 24.5 VDC direct to analyzer (typ.4A). Optional heat trace system may require additional and/or alternate power supplies.

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**Environmental Specifications**

**A. Ambient Temperature:** Continuous operation - 10ºC to 50ºC, start up temperature 0ºC to 50ºC. Extended temperature installation options are available please contact Yokogawa.

**B. Humidity:** 0-90 % RH non-condensing or 0-100% with correct purge gas specifications.

**C. Area Classification:** CE Marked for zone 2 ATEX group II Cat. 3G with purge system EEx pz II T5

**D. Weather resistance:** IP65

**E. Cable entries:** ¾” FNPT threads (unused holes are plugged)

**F. Gas Connections:** Analyzer - ¼” welded Swagelok connection Flow Cells - 3/8” and ¼” FNPT (other connections upon request)

**G. Enclosures:** Die Cast copper free Aluminum grade AL Si 12 with a powder coat exterior finish. The alloy is particularly resistant to salt atmosphere, Sulfur gases and galvanic corrosion. Stainless Steel captive screws and optional keypad. Laminated Safety Glass for optional display(s).

**H. Sample Gas Temperature:** Maximum 1500ºC, Application Dependant

**I. Sample Gas Pressure:** Maximum (20 bar), Application Dependant

**J. Mounting Flanges:** 2” 150# ANSI RF or 3” 150# ANSI RF or adaptors for 4” 150# ANSI RF

**K. Mounting Angle:** Flange alignment tolerance within ±2 degrees

**L. Weights, approx:**
- Launch Unit 16kg x (35lbs), Detect Unit 5.5kg (12lbs)
- 2” 150# Alignment flange 4.5kg (10lbs), 3” 150# Alignment flange 9.5kg (15lbs)

**M. Particulate loading:** Maximum 95% transmission loss

**Note:** Each application may differ in maximum limitations depending upon the combination of gas temperature, gas pressure, optical path length and concentration of gas being measured.
Performance Specification

Precision: Application Dependent

Linearity: Typically $R^2 > 0.999$

Response time: 2 seconds, plus transport time for extractive systems when applicable

Drift: Application Dependent

Installation Specifications

Hazardous Area: Zone 1: Contact Yokogawa
Zone 2: ATEX group II Cat. 3G with purge system EEx pz II T5 (-20 < $T_a$ < 50°C)

By Design: Class 1, Grp. B,C & D, Division 2 or Division 1 - (Purged)

Maximum Distance between Launch and Detect:

- 30 m (±90ft)
- Maximum interconnecting cable 50m

Wetted Parts: Analyzer & standard Alignment Flange - 316 SS, BK-7 Glass, Teflon encapsulated Viton and Silicone RTV sealant.

Optional: Isolation Flanges and Flow Cells - 316 SS, Sapphire, Kalrez - Also available in Monel A400, Hastelloy C-276, Carpenter 20, Titanium Grade 2 and others on request.

Utilities: Instrument Air may be used as a purge gas in principle for all of the below applications, but this will depend on the application type and the required precision of the measurement.

- Oxygen Analyzer: $N_2$
- CO Analyzer: $N_2$ or Instrument Air
- CO₂ Analyzer: $N_2$ or other non-CO₂ containing inert gas
- H₂O ppm Analyzer: $N_2$ with <20ppm levels H₂O for feed to optional Dryer Package
- H₂O % Analyzer: $N_2$

Flow Rate:

- 5-30 L/min for window purge
- 2 L/min for validation, calibration and optical purge

Basic System Configuration

The TruePeak can be installed in a number of ways depending on process requirements. The most typical installation types are shown below, however other installation methods are possible, please contact Yokogawa with your application details.

Cross Stack/Pipe Configuration

- Measures directly across process pipe or vessel
- Typically has nitrogen or other purge gas protecting process windows
- Span Validation via serial flow cell (see Operation Specifications).
- Full calibration requires removal from process
- May require pressure and temperature inputs

Close Coupled Extractive / Bypass Configuration*

- Measures across a section of pipe where process flow is directed
- The measurement section can be isolated from process flow for full calibration/validation, zero and span
- Process pressure and temperature can be controlled or the analyzer may require pressure and temperature inputs

- Multiple methods to increase Optical Path Length (OPL) if needed
- 5 meter interconnection cable standard

Extractive Configuration*

- Sample is fully extracted from process (and may be conditioned before measurement).
- Flow cells are available with ability to purge in front of windows (balanced flow cell) if required.
- Process pressure and temperature can be controlled or the analyzer may require pressure and temperature inputs

- Length of flow cell dependant on accuracy requirements and process conditions

* Contact Yokogawa for further details
Standard Accessories

Calibration Cell: - Used for off-line calibrations and validations
- Stainless steel 316 with free standing frame
- Connects Launch and Detect with 72.6cm (28.6") OPL

Flow Cells: - Used for extracted sample streams at any location
- 316SS low volume fixed alignment; 50°C,
  5.5 bar (80psig) max
- Enhanced for 200°C, 13.8bar (200psig),
  Sapphire window, Kalrez o-rings and can
  be constructed from 316SS, Monel A400,
  Hastelloy C-276, Carpenter 20 and other
  materials on request to suit the process

Isolation Flanges: - Used for additional protection for in-situ or
  by-pass installations
- 2” or 3” 150# or 300# ANSI RF, welded
  5/8" bolt studs included sapphire 13.8bar
  (200 psig) or BK-7 5.5bar (80psig) isolation window
- Kalrez window seal o-ring rated max 200°C
- 316SS, Monel A400, Hastelloy C-276, Carpenter 20, other on request

Note: Must use in conjunction with alignment flanges

Utility Panel: - Used for convenient field installation of
  utilities, configurations for
- Single, dual or four analyzers
- Manual or automatic on-line validation
  (controlled by analyzer)
- Safe area (GP), Div 2 purged or non-
  purged, ATEX CAT 2G components
- Purge flowmeters with integral needle valve,
  glass tube variable area
- Swagelok double female stainless steel tube
  fittings and tubing standard
- Panel mounted or fiberglass (NEMA 4X/
  IP65), with viewing window
- 5A 24VDC power supply, output to analyzer
  – requires VAC input power

Note: Custom configuration available to suit customer requirements

Integration: - Used for convenient analyzer & extractive system/flow cell integration
- Free standing frame, galvanized steel with
  304SS roof
- Fiberglass enclosure with powder coated
  steel frame
- Heat tracing and insulation for flow cells
  and sample handling
- 316SS and/or Monel A400 wetted parts –
  other on request
- Sample handling and conditioning systems to suit applications
- Stream switching manual or automatic
  (controlled by analyzer)

Note: Custom configuration available to suit customer requirements

Display and Software Functions

TruePeak Software has multiple levels, the default (or start page) is the
Main Menu:

Main Menu Displays: - Concentration & Units (% or ppm)
- Transmission %
- Status (warm-up, OK, Warning, Fault, etc.)
- Temperature (Fixed, Active Ambient or
  Active)
- Pressure (Fixed or Active)

Main Menu:
- Basic Menu
  - Configure, 3 functions
  - View Spectra, 2 functions
  - Data, 3 sub-menus
  - Trends

Advanced Menu
(User Password)
  - Calibrate & Validate, 3 sub-menus
  - Data, 4 sub-menus
  - Trends,

Active Alarms
- List of active alarms
Shut Down Analyzer
- Instructions to close TruePeak local or VAC

Calibration Functions:

On-line Validations:
- Manual
- Automatic

Setup Functions: Configuration:
- Process Path Length
- Pressure
- Temperature
- Units
- System I/O
- System
- Valve Control
- Laser Spectra & Control

Diagnostics:

Warnings include:
- Detector signal low
- Transmission low
- Spectrum noise high
- Process pressure out of range
- Process temperature out of range
- Concentration out of range
- Board temperature out of range
- Validation failure

Faults include:
- Laser temperature out of range
- Detector signal high
- Detector signal lost
- Peak center out of range

Output Settings:

Analog Output:
- Channel 1
- Channel 2
- Channel 3
- Warning Mode
- Fault Mode
- Field Loop Check
- AO CH calibration
In-Situ Calibration / Validation

Validation (shown below) can be performed on-line. A serial validation flow cell is fitted in the analyzer between the laser source and the process window. During normal operation the validation cell is filled with nitrogen (analyzer measuring process gas only). After initiating a validation, this cell is filled with a known standard of the gas being measured, the analyzer will then measure the process gas + the validation gas (dynamic spike). The validation cell flow is then returned to nitrogen (analyzer measuring process gas only).

The analyzer will calculate the validation response by averaging the process readings before and after the dynamic spike and subtracting that value from the reading during the dynamic spike. This provides a relative proof of span and a positive indication of operation.

Validation must be performed manually. The analyzer is removed from the process connections and installed on a calibration cell. Zero and span gas can then be applied to the analyzer with calibration performed through the user menu.

Extractive or Close Coupled Calibration / Validation:

Validation can be performed manually or automatically with the serial validation cell (span check only described above), or by isolating the analyzer from the process and flowing zero and span gas through the optical path (flow cell or bypass piping).

Calibration must be performed manually. The analyzer is isolated from the process gas, zero and span gas can then be applied to the analyzer with calibration performed through the user menu.

For applications where the measured gas is typically not present (0 level concentration), Yokogawa recommends an auto-validation sequence once per month.
User Interface

1. Local Analyzer Interface

Basic Unit (Blind)
(10/2000-3055-A or 10/2000-3065-A for ATEX)

No local interface built-in. USB port is provided for data transfer. To configure, start-up and service the analyser, User must use: a PC/Laptop with Ethernet (VNC) connection and (VAC) Virtual Analyzer Controller Software Package (included), or a (RIU) Remote Interface Unit (select 10/2000-2900-A).

Mini-Display (10/2000-2905-A option)

A 4 line 20 character (4x20) vacuum florescent display (VFD) built in to the door of the launch unit. It will display measurement concentration, Transmission, scrolling Status (including alarm types) and scrolling system information (including process parameters). User must use: a PC/Laptop with Ethernet (VNC) connection and (VAC) Virtual Analyzer Controller Software Package (included), or a (RIU) Remote Interface Unit (select 10/2000-2900-A). A USB port is provided for data transfer.

2. Remote Interface Unit (RIU):
(10/2000-2900-A option)

Use with any type of analyzer, a separate wall mount enclosure with screen and keypad. Connects via Ethernet (VNC), up to 3 (standard) 8 (on request) analyzers. Requires 24 VDC input power

- Wall mount enclosure, IP65 (NEMA 4) powder coated aluminum
- Approx 460x330x180mm (18"w x 13"h x 7"d)
- weight 11.5kg (25lbs)
- Purged for ATEX CAT 2G or CAT 3G, CE, NEC Cl.1, BCD, Division 1 or 2
- Requires 23.5 - 24.5VDC Input power
- Integral keypad and 6.5" display
- Accepts 8 analyzer Ethernet connections – Standard
- Accepts more analyzer Ethernet connections – On request
- Connection to Analyzer Unit via 8 pair shielded twisted pair cable (select 10/2000-1476-A).

TruePeak Virtual Analyzer Controller (VAC) software included, running Window XP embedded OS.

Screen & Keypad (10/2000-2910-A option)

A 30 key stainless steel keypad and 6.5” graphical LCD panel built in to the door of the launch unit. This provides full local interface. It eliminates the need for a PC/laptop or (RIU) Remote Interface Units. USB port is provided for data transfer.
Wiring of Launch Unit

Notes:
1. When powering a process compensation transmitter (pressure or temperature), connect the + MA terminal from the loop powered device to the +24 VDC and the – terminal to the + input terminal.
2. Alarm relay contacts are form C, SPDT rated max 1A@24VDC.
3. The analyzer sends a voltage out to the customer voltage free contacts (or switch) and the analyzer monitors for a return voltage. Do not ground or apply any external voltage.
4. When an optional DIV2/Zone 2 purge kit is installed, terminals 3 & 4 are used to power the purge kit.
5. Pair 3 white conductor is not terminated. Ensure it is insulated and do not ground.
6. Recommended cable for connecting launch unit to detect unit is belden 1475A, 4 shielded pairs, 18 AWG with overall shield and PVC jacket. Power limited tray rated for outdoor use.
7. Cable overall shield to be wound with individual pair shields. Overall shield to be connected to terminal #6 on TB7.
8. Wound individual pair shields to be landed on earth/chassis ground.

Wiring of Detector Unit

Notes:
1. Pair 3 white conductor is not terminated. Ensure it is insulated and do not ground.
2. Recommended cable for connecting launch unit to detect unit is belden 1475A, 4 shielded pairs, 18 AWG, with overall shield and PVC jacket. Power limited tray rated for outdoor use.
3. Cable overall shield to be landed to earth ground.
4. Individual pair shield ground pig-tail to be individually isolated.
The analyzer requires purge gas \( \text{N}_2 / \text{air} / \text{other} \) the flow of which needs to be controlled. Utility panels may be provided in various forms for one or two units to control purge gas and validation gases as standard and additional purge gas for hazardous area application when required. The Utility panel can automatically control via the analyzer validation gases which will indicate whether the analyzer is within calibration.

The Analyzer in normal useage is a non contact device. Purge gases are used to ensure sample does not contact the analyzer, and these gases are often a gas which does not contain the gas to be measured. Nitrogen, for example, is often used as a purge gas in Oxygen measurement. However, depending on the application, it may be possible to use air as a purge gas (even for oxygen measurements) and purge gases are not invariably required.
**Model Code, Option, Selections**

**Model TDLS200**

Tunable Diode Laser Gas Analyzer

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Description</th>
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<tbody>
<tr>
<td>TDLS200</td>
<td>Tunable Diode Laser Gas Analyzer</td>
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</tbody>
</table>

**Analyzer Enclosure (Select one only)**

- N General Purpose (none CE)
- G General Purpose (CE)
- O Purge System for Class 1, Div 2 BCD (pending)
- S ATEX CAT 3/ Zone 2 Purged
- Z Special, Consult Factory

**Gas Parameter (Select one only)**

- X1 Oxygen <600°C Range 0-1% up to 0-25%
- X2 Oxygen <1500°C Range 0-1% up to 0-25%
- X3 Oxygen <1500°C Range 0-1% up to 0-25%
- C1 Carbonmonoxide (%) <500°C
- C2 Carbonmonoxide (ppm) <500°C
- C3 Carbonmonoxide (ppm) <1500°C
- C4 Carbonmonoxide (ppm) <1500°C + CH4 0-5%
- A1 Ammonia 0-30ppm up to 0-5000ppm
- A2 Ammonia 0-30ppm up to 0-5,000ppm & 0-5% up to 0-50% H2O
- S1 Hydrogen Sulphide 0-5% up to 0-50% Range
- D1 Carbon dioxide High Range (0-1; 0-5%)
- D5 Carbon dioxide Extended Range (0-50-50%)
- H1 Water (ppm, min range 0-30ppm) Chlorine Background
- H2 Water (ppm) non-HC Background
- H3 Water (ppm) Hydrocarbon Background
- H4 Moisture High Level H2O (min 0-5%)
- XA Special Application - Refer to Quotation Details

**User Interface (Select one only)**

- N None - Blind Controller
- I Integral Mini Display (4 line, 20 Character Vacuum Fluorescent)
- 2 Integral Color LCD Backlit Display & SS Key Pad
- X Special user Interface - Refer to Quote Details
- N Standard Options for Path Length up to 6 meters
- A Large Aperture Optics for Long APL, 4" Detector, 3" Launch
- H Sunshield for LCD Display (NOT ATEX)
- U External USB Port IP66 with cap (NOT ATEX)
- PS Universal Power Supply (90 - 240 VAC, 50/60 Hz) (separate)
- URD Remote Power Supply (mini display; Etherenet port) (separate)
- Wxxx Launch-detect Cable (xxx m) Price/foot (Std. 5m supplied)
- Xxxx URD/RIU 8-pair Cable (xx m) Price/foot
- /Xxxx Ethernet Cable (xxx m) Price/foot (if >10m URD/RIU)/4 pair cable

**Separately Supplied Options - Must Select at Least One**

Note: If Optics Options -A (Large Aperture Optics) is selected below, then NO process interface is required.

**Process Adapter (Alignment Flange)**

- M1276XZ Process Interface Unit - 2", 150# pair, 316SS
- M1276YF Process Interface Unit - 3", 150# pair, 316SS
- M1276YG Flange Adapter set 4" to 2" 316SS studied, pair
- M1277BC Flange Adapter set 4" to 3" 316SS studied, single
- M1277AJ Inspection Port, fits 2" or 3" process adaptor (Qty -2)

**Isolation Windows (Also requires a Process Adaptor)**

- M1276YA Window - flange 316SS/Sapphire/Kalrez 2" 150# pair
- M1276YE Window - flange Monel A400/Sapphire/Kalrez 2" 150# pair

**Flow Cell (No process adaptor required)**

- M1276ZH Low Volume Flow Cell 316SS, OPL 1 meter
- M1276FG Enhanced Flow Cell 316SS Sapphire/Kalrez adj mount (40" OPL)
- M1276YU Enhanced Flow Cell Monel Sapphire/Kalrez adj mount (40" OPL)
- M1276YH Enhanced Flow Cell Monel Sapphire/Kalrez adj mount (30" OPL)

**Calibration (Off-Line)**

- M1276YM Calibration Cell 316SS (requires mounting system at site)
- M1276YN Calibration Cell 316SS with Free Standing Frame

**Utility Panels (Auto-Validate, FRP Enclosure)**

- M1276YR Utility Panel for Single Analyzer - General Purpose
- M1277BG Utility Panel for Single Analyzer - Class 1 Div 2 Group C & D
- M1276YS Utility Panel for Single Analyzer - ATEX (non-purged)
- M1276YT Utility Panel for Dual Analyzer - General Purpose
- M1277BH Utility Panel for Dual Analyzer - Class 1 Div 2 Group C & D
- M1276YU Utility Panel for Dual Analyzer - ATEX (non-purged)

**Remote Interface Unit (RIU)**

- M1276WY RIU (1-4 units) - No CE*
- M1276XL RIU (1-4 units) - CE*
- M1276WZ RIU (1-4 units) - NEC Class 1, Div 2 BCD Purged*
- M1276XX RIU (1-4 units) - ATEX CAT 3; Zone 2 Purged*
- M1277BD Analyzer to RIU (Interconnection Cable: Unit in Feet) (8 pair cable)

* Above 3 units additional (separate) terminal boxes required

**NOTE:** You can select **ONLY ONE** item from each section (unless designated otherwise).

Example: TDLS200-S-X1-2-N/H/U/PS
Application Inquiry Form

1. General Information
   - Company: 
   - Requested Delivery Date: 
   - Address: 
   - Contact Person: 
   - Email: 
   - Telephone: 
   - Fax: 
   - Plant Location: 
   - Brief Description of application: 

2. Installation Details (check one - see drawings):
   - 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:
   - User Interface: 
     - Blind analyzer
     - With mini display
     - With color LCD & Keypad
     - RIU for Multiple Analyzers
   - Cable (10/2000-1476-A) length from Analyzer Unit to User Interface (specify units): 
   - Area Classification: 
   - Ambient Temperature (Min-Max.) Specify units: 

4. Validation
   - Validation Method: 
     - Not supplied
     - Dynamic spiking (incl. valves and controls)
     - Auto-calibration check (extractive system)

5. Process Wetted Materials
   - Must Use
   - Must Not Use

6. Electrical Power Supply:
   - Optional: Universal AC Power Supply Unit, Accepts 100-240 VAC 50/60Hz input and outputs 24VDC, one per analyzer or RIU
     - 10/2000-2700-A

7. Stream Composition (1 sheet per stream analyzed)

<table>
<thead>
<tr>
<th>Component</th>
<th>Concentrations</th>
<th>Units</th>
<th>Measured</th>
<th>Range If Measured</th>
<th>Precision If Measured</th>
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<tbody>
<tr>
<td>Name</td>
<td>Min.</td>
<td>Typ.</td>
<td>Max.</td>
<td>ppm(v) vol%</td>
<td>Yes/No</td>
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| | +/- | +/- | +/- | +/- | +/- | +/- | +/- |

8. Physical Properties

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<th>Max</th>
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<tr>
<td>Particulate Concentration</td>
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</table>

9. General Application & Installation Notes/Comments:
Yokogawa has an extensive sales and distribution network. Please refer to the website (www.yokogawa.com/us/ia/analytical/tdls200.htm) to contact your nearest representative.