

NEW

TRIPLE LOOP POWERED DISPLAY (& POWERED) OVER 30 INPUT SIGNAL CONDITIONERS

**MODEL
TLP**

FEATURES:

- (1) 0.8" & (2) 0.6" 3 1/2 Digits
- Colors: Blue (Top), Red (Middle), Amber (Bottom)
- Metal, Plastic, Sanitary or Explosion Proof Case
- Signal or Loop Powered
- 3 Isolated Channels (>500VRMS)
- 3 Independent A/D
- Low Burden (<5V)
- NEMA 4X, EMI/RFI
- Loop or VDC Signal Powered or
- 5-48VDC/90-265VAC Power
- 28-VDC Power for Transmitter
- High Speed Peak & Hold
- Nuclear, Mil-Spec, I.S. & Industrial
- Lifetime Warranted

4" Switchboard



DESCRIPTION

You talk, **OTЕК** listens! We were requested to put 3 **LPE's** in one compact surface mount package with larger digits, like our **HI-O126**, so we did it! Now you can have 3 independent and isolated displays, driven from their own current loop (or externally powered) to concurrently display any 3 parameters.

Several options are available on the **TLP**:
(See Ordering Information). You can have it as a:

1. 4-20mA input loop powered. (Powerless™)
2. V/mADC Signal powered. (Powerless™)
3. Externally powered for V, mA DC & True RMS, TC, RTD, S-G, %RH, pH ORP, Hz, etc.

The Grades Are: Nuclear (10CFR50B), Mil-Spec (to your Mil-Std.) or Industrial (to published specs.).

The Power Inputs Are: Loop Powered, 5-48VDC or 90-265VAC.

You can even power your 4-20mA transmitters with the optional 28VDC compliance. The **TLP** is available in plastic or metal case (for Mil & Nuclear) conforming to **ANSI 4"** Switchboard standard only 1 1/2" thick with nothing behind the panel that also mounts on existing 1/4 **DIN** (92 x 92mm) panel cut-out, **Sanitary** case for 250 Degree F Steam Cleaning and Explosion Proof for Class I, Div. 1 & 2 are available.

Intrinsically Safe (I.S.) versions on request. See Foot Note under Ordering Information.

SPECIFICATIONS @ 25°C

(Industrial Grade)

Loop Powered Models (Each Channel):

- Burden: 5VDC Max. (7V For "S" Version)
 - Color Options: Red, Blue and Amber
 - Max. Input Current: 36mA, Max. Volts: 30V
 - Min. Input Current: 3.6mA
 - Accuracy & Linearity: $\pm 0.01\%$ of F.S. ± 1 Digit
 - Span Adjustment: ± 300 Counts of F.S. (1000)
 - Zero Adjustment: ± 300 Counts of Zero (0000)
 - Standard Calibration: 4-20 = 0-1000, Others On Request
- NOTE:** Display brightness is proportional to loop current, brightest @ 20mA, dimmest @ 4mA.

Powered Models (Each Channel):

- Color Options: Red, Blue, Green and Amber
- Loop Burden: 0.5V@20mA; 25 Ohms
- Current Requirement @ 5V: 35mA for each channel
- Compliance for Xmtrs: 200mA @ 5VDC (1W) per channel
- Power Input: 5VDC, 5-48VDC, 90-265VAC

OTHER SPECIFICATIONS

- Isolation Between Channels: >500VRMS
- Display: 0.8" & 0.6" High, 3 1/2 (-1.9.9.9) Color Coded
- Input Type: Differential & Single Ended. 10M For VDC
- Common Mode R.R.: 100dB @ 50/60 Hz
- Conversion Rate: 2.5/Second
- Step Response: 0.8 Sec. (0-90% of F.S)
- Common Mode Voltage: ± 2 VDC
- Op./Storage Temp: -10 +70/ -20 + 70°C
- MTBF: >100,000 Hours
- RH: 5-95% RH Non-Condensing
- Temperature Coefficient: 50PPM/°C
- Plastic Case: 94VO Textured Black
- Metal Case: Aluminum Nickel Plated
- Sanitary Case: To 250°F Steam Cleaning
- Explosion Proof For Class I, Div. 1 & 2 Certified

FAQ:

1. Can I change the scale in the field? Yes. Span & Zero are located on the front for each channel.
2. Can I change the display color sequence? Yes. Use #9 and specify when ordering.
3. Can I change the display designation? Yes. Use #9 and specify.
4. Can I change the input signal type in the field? No.
5. Do you have Peak & Hold? Yes, see Model: TLD
6. More Questions? Call **OTЕК** at 520-748-7900

**If You Don't See It
Ask For It!**



520-748-7900

FAX: 520-790-2808

E-MAIL: sales@otekcorp.com

http://www.otekcorp.com

OTЕК TM **CORP.**
SINCE 1974

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TUCSON, AZ. 85714 U.S.A.

MADE
IN
USA



THE SIGNAL CONDITION-ERS:

Option 00: 4-20mA Powered:

First introduced in 1975, the current flows through a Zener and "Shunt" resistor. The Zener clamps the voltage to about 3.5 Volts and the voltage across the Shunt is measured and displayed. If the "burden" (3.5 - 4.5V) is too high for your application, use the externally powered option.

Accuracy:

± 0.05% of F.S.

Option 01: 4-20mA Externally Powered:

It only drops 2V @ 20mA (100 Ohms) but the "TLP" needs 5VDC @ 40mA to operate per channel.

Accuracy:

± 0.05% of F.S.

Option 02: 4-30VDC Signal Powered:

Another OTEK innovation. The voltage signal powers an **LDO** to protect the **TLP** and a divider network is used to measure and display the signal. If the relatively low impedance (500 Ohms) and current (3-20mA) required by this Powerless™ technique is unacceptable, use externally powered options (Digit 5).

Accuracy:

± 0.1% of F.S.

Options 04-08: VDC Externally Powered:

Input impedance is 10 Mega Ohms.

Accuracy:

± 0.05% of F.S.

Option 09: Custom: Use this option to describe any custom input, scale or modification to the TLP and contact us for feasibility and cost.

Connections:

To Be Determined

Options 10-13: 20μ A - 200mADC:

Since the **TLP** is 2V full scale the "Shunt" resistors used are 10K, 100 or 10 Ohm. Don't forget that maximum display is 1,999 not 2,000!

Accuracy:

± 0.05% of F.S.

Options 14-22: V & mA RMS:

Here we use a **True RMS-DC** Converter for accurate (± 0.05%) measurement of sine waves up to 10KHz (± 0.1% for 10-20KHz). Input impedances vs. range are the same as for VDC ranges.

Accuracy:

±0.05% of F.S.

See options 40-43 for Signal Powered.

Option 23: 5Amps AC:

Specifically for current transformers (**C.T.**) this option requires an externally mounted (supplied) 0.1 Ohm, 0.1% 5 Watt resistor. You can mount the "Shunt" at your **C.T.** or next to the **TLP** but make sure the connections are "Perfect" to electrical codes. The C.T. might have "**Lethal**" **High Voltage** without a "Shunt" (Open) and the **TLP** will "Smoke". See OTEK's New **ACS**, **CTT** & **TAC** models for **C.T.** powered instruments (Patent #7,626,378) or options 40-43 for A.C. Signal powered options.

Accuracy:

±0.05% of F.S.

Option 24: Strain-Gage (<1000 Ohm Type):

Here we use highly accurate and stable constant current (~1mA) source, and a differential amplifier to convert the 2 or 3mV/V (typical) sensitivity of your "Load-cell". **Specify** your Strain-Gage sensitivity and full scale and the **SPM's** display at Zero and Full Scale Please!

Accuracy: ±0.05% of F.S.

Option 25: Strain-Gage (≥1K < 4K Ohm):

These are typically "Monolithic" **S-G** that require constant voltage (preferably) excitation. We use 4.096V for high stability and accuracy. **Specify** your S-G impedance and sensitivity and the **SPM's** display at Zero and Full Scale.

Accuracy: ±0.1% of F.S.

Note on S-G: Some S-G offer +/- 1VDC or 4-20mA condition output. Use Option 9 and specify.

Option 26: RTD (PT100):

We excite your 2, 3 or 4 wire RTD with 200μA to avoid the "self heating" effect. The range of the **TLP** is the same as your **RTD** typically -200°C to +800°C (-328 + 1562°F). You can place the decimal point at will (typically -200.0 to 800.0 (-328.0 to 1562.0)). The **PT100** has a temperature coefficient of 0.00385 Ohms/Ohm/°C. For legacy 0.00392 TC (known as ANSI 392) contact OTEK and use Option "09".

Accuracy:

±0.5°C/F + Sensor's Error

NOTE: Only center display (Channel 2) can be connected for 3 or 4 wire RTD. Others only 2 wire.

TLP Continued

Option 27: RTD (PT1000): Same as PT100 except it is 1000 Ohms at 0°C instead of 100 Ohms @ 0°C. The same technique is used. For copper **RTD** (10 Ohm), contact OTEK.

Accuracy:

$\pm 0.5^{\circ}\text{C}/\text{F}$ + Sensor's Error

NOTE: Only center display can be connected for 2, 3 or 4 wire (Channel 2) RTD. Others only 2 wire.

Option 28: Thermocouple (Type J):

This **TC** has a range of -210 to +760°C (-350 + 1390°F). Its color is white (+) and Red (-), cold junction (CJ) is inside the **TLP** at the connector base. If you short out the **TLP's** + & - TC terminals together, the **TLP** will read the ambient temperature due to its built-in C.J.C.

Accuracy:

$\pm 2^{\circ}\text{F}/\text{C}$ + Sensor's Error
(Per. TC. Tables)

Option 30: TC (Type K): This is yellow (+) and red (-) and has a range of -270 + 1370°C (-440 + 2500°F). The same notes as above.

Accuracy:

$\pm 2^{\circ}\text{F}/\text{C}$ + Sensor's Error
(Per TC Table)

Option 31: TC (Type T): This blue (+) and red (-) **TC** wire has the range of -270 + 400°C (-440 + 750°F). Same notes as above apply.

Accuracy:

$\pm 2^{\circ}\text{F}/\text{C}$ + Sensor's Error
(Per TC Table)

Options 32-33: Frequency Input:

We use an **F-V** to accept frequencies from 40 - 20KHz and amplitudes from 1-400V peak or dry contact or open collector transistor (O.C.T.) for 50 to 440Hz power line frequency measurement.

Use Option # "33" or see our **ACS**, **TAC** Powerless™ Series.

Accuracy: $\pm 0.5\%$ of F.S.

See option 42 for signal powered.

Option 34: %RH: This conditioner is designed to interface to a typical (capacitance type) 2-3pF/% of **RH** made by several manufacturers. Use Option "09" and contact OTEK with your sensor's specifications.

Accuracy: Same as Sensor

Option 35: pH (Acidity): We use a FET input (10^{15}) amplifier and calibrate the **TLP** for 0-14.00 pH using the Industry's standard $\pm 413 \text{ mV} = \pm 7\text{pH}$ co-efficient.

Accuracy: Same as Probe

Option 36: ORP (Oxygen Reduction Potential): Our FET amplifier (10^9) accepts the industry standard 2000mV F.S. of the probe and the **TLP** displays it in % (0-100.00%).

Accuracy: Same as Probe

Option 37: Hi Speed Peak & Hold (P&H): Now you can capture fast transients greater than 50 microseconds (even faster soon) with resolution greater than 0.1% of F.S. and retention of greater than 10 years (Due to OTEK's new and patent-pending **P&H Option**).

Input: V or mADC (Specify Range). Contact OTEK for V/mA RMS or Loop Powered).

Accuracy: $\pm 0.1\%$ of F.S. ± 1 Digit

Linearity & Resolution: \pm of F.S.

Response time: $>20\text{KHz}$ ($<50\mu\text{s}$)

Retention: >10 years (with power on).

Note: Options 40-43 only available with Powerless™ power input (Digit 5, Option 0)

Option 40: VAC Signal Powered:

Warning! No Isolation! This option uses the AC Voltage Signal to power the **TLP**. Since the **TLP** uses about 30mA @ 5VDC, we use a coupling capacitor AC-DC converter to generate 5VDC and not to "Load" the signal with a transformer. Consequently, your signal source should be capable of producing about 150mW without overloading it, otherwise use Options 14-17 (externally powered). Range: 50-150VAC; Method: RMS Calibrated; Accuracy & Linearity: $\pm 0.5\%$ of F.S. Best and safest when driven by a P.T. (Potential Transformer). **Always turn power off before connecting!**

Frequency Range: 50-440 Hz.

Option 41: AAC Signal Powered:

Warning! No Isolation! (Pat. Pend.)

OTEK's Patent Pending technique permits the extraction of power from a regular **C.T.** (Current Transformer) to power the **TLP** without distorting the signal. Since this option is designed to be powered from a C.T., it should not be connected directly to the mains without limiting the current and proper electrical grounding. **Lethal Voltage** might be present at the C.T. secondary (output) if the secondary is open. **Always turn power off before connecting!** Range (at C.T. output): 0.1-5AAC; Overload: 50%/30 seconds; Peak: 100%/1 second; Conversion: True RMS; Accuracy & Linearity: $\pm 0.05\%$ of F.S.; Burden on C.T.: <150mW.

Frequency Range: 45-65 Hz.

Option 42: Hertz (Frequency) Signal Powered: Warning!

No Isolation! This option uses the same power technique as Option 40 above and the same precautions and warnings apply. Here we use a "Zero Crossing" detector and a F-V converter to give you the **A.C.** line frequency display with 0.1 Hz resolution. Range: VAC: 50-150VAC/Frequency: 30-450Hz; Accuracy & Linearity: $\pm 0.05\%$ of F.S.

Frequency Range: 50-440 Hz.

Option 43: Signal Powered AC Watts: Warning! No Isolation!

Here we combine the powerless VAC & AAC options to arrive at real power calculations through our **CPU** and **DAC**. The same warnings and precautions of Options 40 & 41 apply. Range: VAC: 50-150; AAC: 0.1 - 5A; Frequency: 45-65Hz; Accuracy & Linearity: $\pm 0.1\%$ of F.S.; Conversion: True RMS.

Contact **OTEK** for other functions.

More: New Signal Conditioners will be added as per your requests and popularity, such as Ohms, Conductivity, Shock, Vibrations, Position, etc. Contact **OTEK**.

NOTES:

1. **Self Diagnostics:** The **TLP** will test all segments and I/O Signals for about 3 seconds on power up.

POWER & SIGNAL INPUTS: (DIGIT 5)

The **TLP** has 3 isolated A/D & displays. You can connect them all with common ground (- Loop or - Signal Return) or independent from each other (isolated, Option 0).

Option 0, 2, 4, & 6: All channels are isolated from each other.

Option 1: All channels share "-signal" input and "-power" input.

Options 3 & 5: Share only "-signal," but are isolated from power input (one common P.S. for all channels).

Power for Transmitters: When ordered (Options 1-3 on 6th digit), non-isolated DC-DC converter (5 to 28VDC) is included in the **TLP** (See Note 5). Its ground is common to all 3 channels signal ground. Watch out for external **ground loops!**

Case Style:

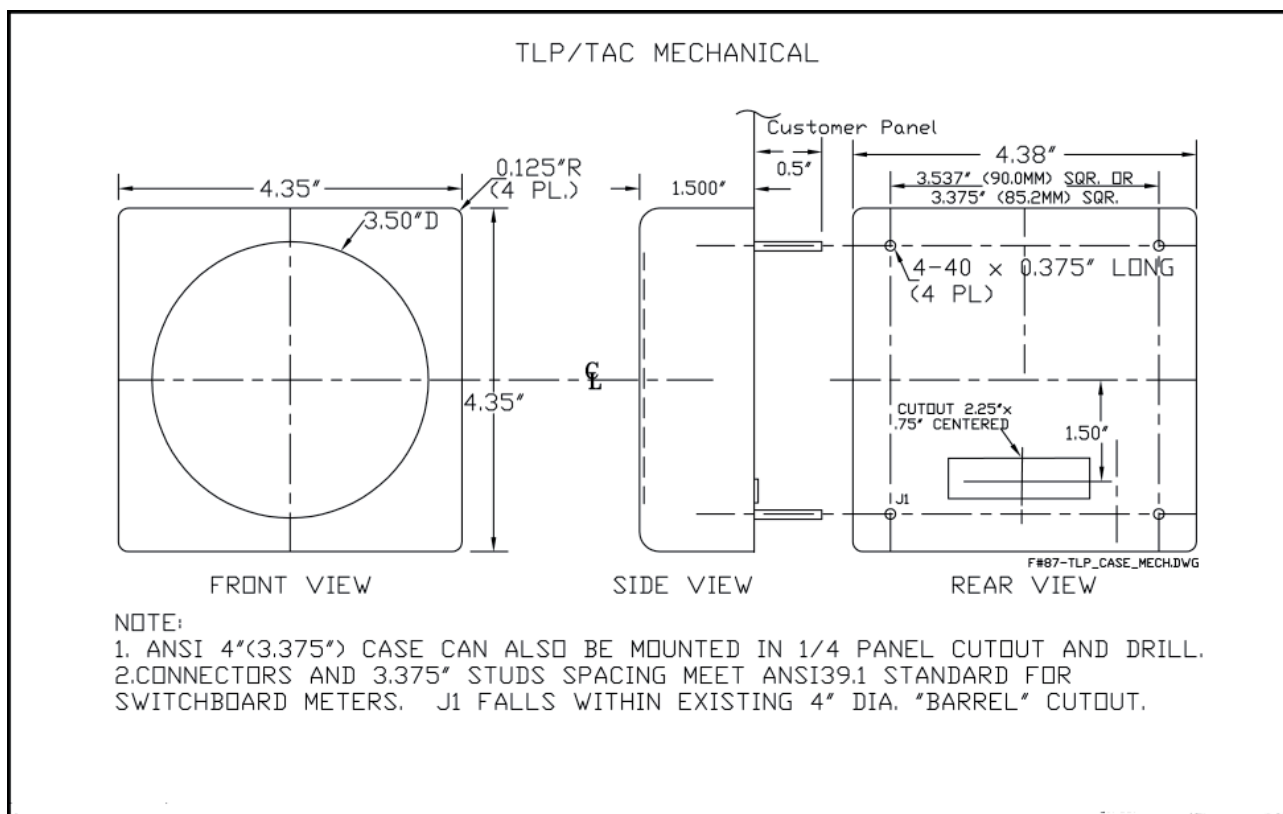
Switchboard: Conforms to ANSI 4" standard without barrel. Can also be mounted on existing 1/4 DIN (92 x 92mm) cut-out.

1/4 DIN: Conforms to DIN standard.

Sanitary: Withstands 250°F steam cleaning.

Explosion Proof: Certified for Class I Div 1 & 2.

TLP MECHANICAL FOR SWITCHBOARD (Options 0, 1, 4 & Digit 7)



TLP TYPICAL CONNECTIONS

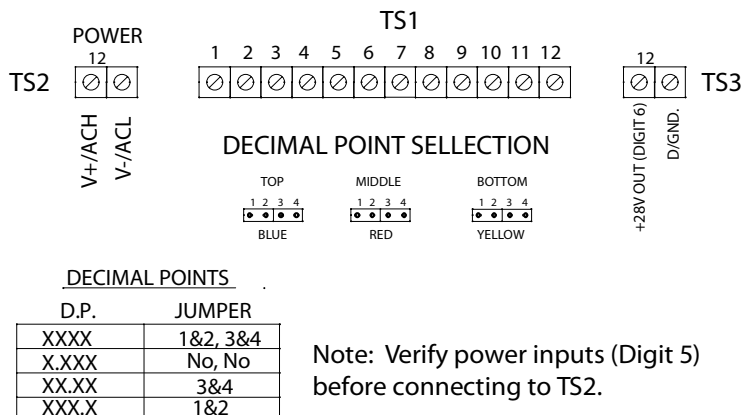
Note:

1. TS1 & TS2 connectors and 3.375" studs spacing meet ANSI 39.1 standard for switch board meters. TS1 & TS2 fall within existing "Barrel" cutout. Connectors accept 16-26 ga. wire.
- The TLP can also mount on existing 92x92mm (1/4 DIN) cut out.

TYPICAL CONNECTION EXT. POWERED (OPTIONS 01, 4-22 & 32-37)

*FOR SIGNAL POWERED (OPTION 00 & 02) ONLY USE TS 1-3 & 4, 7, & 8 AND 11 & 12

FOR OPTIONS 23-31, SEE FIG. TLP-23; FOR OPTIONS 40-43, SEE FIG. TLP-40.

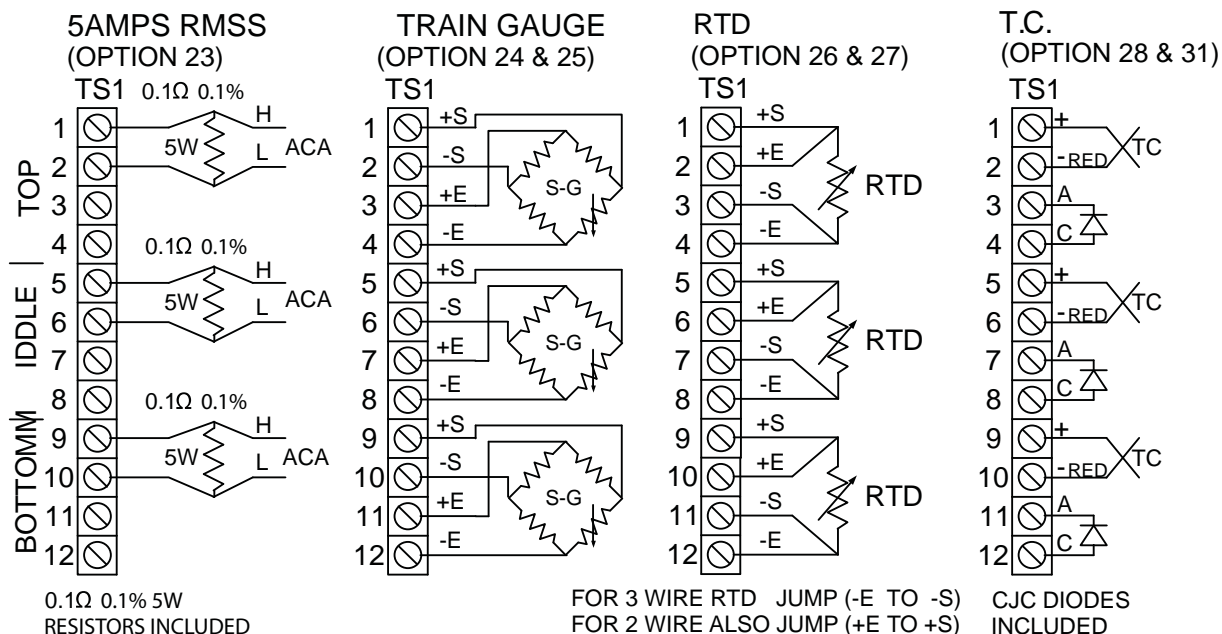


Note: Verify power inputs (Digit 5) before connecting to TS2.

TS1 TERMINAL	OPTIONS 01, 04-22 & 32-37	OPTIONS 00 & 02
1	+SIGNAL TOP (BLUE)	No Conn.
2	-SIGNAL TOP (BLUE)	N.C.
3	GROUND TOP (BLUE)	-SIGNAL (BLUE) *
4	+5V TOP (BLUE)	+SIGNAL (BLUE) *
5	+SIGNAL MIDDLE (RED)	N.C.
6	-SIGNAL MIDDLE (RED)	N.C.
7	GROUND MIDDLE (RED)	-SIGNAL (RED) *
8	+5V MIDDLE (RED)	+SIGNAL (RED) *
9	+SIGNAL BOTTOM (YELLOW)	N.C.
10	-SIGNAL BOTTOM (YELLOW)	N.C.
11	GROUND BOTTOM (YELLOW)	-SIGNAL (YELLOW) *
12 *	+5V BOTTOM (YELLOW)	+SIGNAL (YELLOW) *

Note: For Power Options 1-6, (5th Digit) TS1-3 & 4, 7, & 8 and 11 & 12 can output <50mA@5VDC each.

MOD. TLP TYPICAL CONNECTIONS (OPTION 23-31)



WARNING: H.V. MIGHT BE PRESENT! USE 10A S.B. with Amps & 1A with Volts

DECIMAL POINT SELECTION

Remove Power. No isolation
between A. C. signal and pins.

Top	Middle	Bottom
<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 100px;"> <div style="display: flex; justify-content: space-around; height: 20px;">• • • •</div> </div>	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 100px;"> <div style="display: flex; justify-content: space-around; height: 20px;">• • • •</div> </div>	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 100px;"> <div style="display: flex; justify-content: space-around; height: 20px;">• • • •</div> </div>
1 2 3 4	1 2 3 4	1 2 3 4
Blue	Red	Yellow

D.P.

xxxx - None

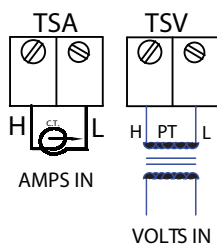
x.xxx - 3 & 4

xx.xx - 1 & 2

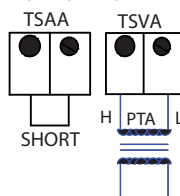
xxx.x - 1 & 2 and 3 & 4

(1 Phase, V, A, W or Hz)

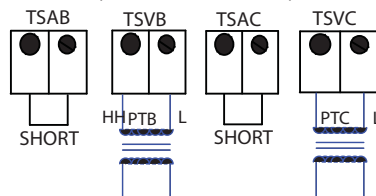
OPTIONS 0-3



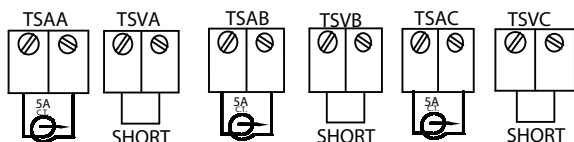
OPTION 4 OR 7



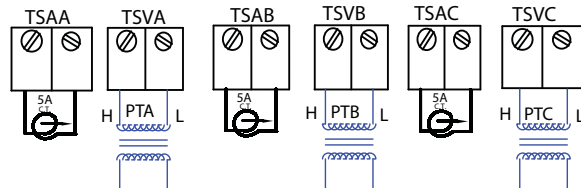
(3 PHASE VOLTS OR Hz)



OPTION 5 (3 PHASE AMPS)



OPTION 6 (3 PHASE WATTS)



TLP SERIES ORDERING INFORMATION 3-21-13

NOTE: Please READ BEFORE building part number:

1. If digit 2 & 3 is option 00, 02, 40, 41, 42, or 43, then digit 5 must be option 0 and digit 6 must be option 0.
2. See notes at bottom of page.

<p>Model: TLP-</p> <p><u>GRADE (3)</u></p> <p>I.....Industrial</p> <p>M.....Mil-Spec</p> <p>N.....Nuclear (Contact Otek)</p> <p>S.....Intrinsically Safe</p> <p>9.....Custom (Contact OTEK)</p> <p><u>INPUT SIGNAL (1,4,9)</u></p> <p>00.....4-20mA Loop Powered</p> <p>01.....4-20mA External Power</p> <p>02.....4-30VDC Signal Powered</p> <p>04.....+200mVDC</p> <p>05.....+2VDC</p> <p>06.....+20VDC</p> <p>07.....+200VDC</p> <p>08.....+50mVDC</p> <p>09.....Custom (Contact OTEK)</p> <p>10.....+ 200μADC</p> <p>11.....+2mADC</p> <p>12.....+20mADC</p> <p>13.....+200mADC</p> <p>14.....200mV RMS</p> <p>15.....2V RMS</p> <p>16.....20V RMS</p> <p>17.....200V RMS</p> <p>18.....50mV RMS</p> <p>20.....2mA RMS</p> <p>21.....20mA RMS</p> <p>22.....200mA RMS</p> <p>23.....5 Amp RMS</p> <p>24.....Strain-Gage (<1K Ohm)</p> <p>25.....Strain-Gage (>1K Ohm)</p> <p>26.....RTD (PT100)</p> <p>27.....RTD (PT1000)</p> <p>28.....TC (Type J)</p> <p>30.....TC (Type K)</p> <p>31.....TC (Type T)</p> <p>32.....Frequency (40-20KHz)</p> <p>33.....Frequency (50-440Hz Line)</p> <p>34.....% RH (Specify Sensor)</p> <p>35.....pH (0-14.00)</p> <p>36.....ORP (0-2000mV)</p> <p>37.....High Speed P & H (0-2VDC)</p> <p>40.....VAC Signal Powered</p> <p>41.....AAC Signal Powered</p> <p>42.....50-440 AcHz Signal Powered</p> <p>43.....WAC Signal Powered</p> <p><u>DISPLAY COLOR & INPUT ASSIGNMENT (5)</u></p> <p>0.....Blue, Red and Amber (Top: Blue,</p> <p>Middle: Red, Bottom: Amber)</p> <p>9.....Custom (Contact OTEK)</p>	<p>1 2 3 4 5 6 7 8 9</p> <p>Model: TLP- </p>	<p><u>RANGE/CALIBRATION</u></p> <p>0.....Standard</p> <p>9.....Custom (Contact OTEK)</p> <p><u>SCALE PLATE</u></p> <p>0.....Standard</p> <p>9.....Custom (Contact OTEK)</p> <p><u>CASE STYLE (8)</u></p> <p>0.....Switchboard Plastic</p> <p>1.....Custom Switchboard Metal</p> <p>4.....Sanitary</p> <p>5.....Explosion Proof</p> <p>9.....Custom (Contact OTEK)</p> <p><u>POWER FOR TRANSMITTERS (1,7)</u></p> <p>0.....None</p> <p>1.....For 1 Channel</p> <p>2.....For 2 Channels</p> <p>3.....For 3 Channels</p> <p>9.....Custom (Contact OTEK)</p> <p><u>POWER INPUT (1,6)</u></p> <p>0.....Signal/Loop Powered</p> <p>1.....Non - Isolated 7-32VDC</p> <p>2.....Triple Isolated 5VDC ± 10%</p> <p>3.....- Signal Common, Isolated 7-32VDC</p> <p>4.....Isol. Signals & Isol. 7-32VDC</p> <p>5.....- Sig. Com. & Isolated 90-265VAC</p> <p>6.....Isol. Signals & Isolated 90-265VAC</p> <p>9.....Custom (Contact OTEK)</p>	<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: auto;"> <p>MODEL</p> <p>TLP</p> </div>
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DOWNLOADS: For manuals, user-software
or drivers:
www.otekcorp.com

NOTES:

3. Contact OTEK for M, N & S Grades. Otek will build to certain nuclear or MIL-standards but testing and confirmation of compliance, if required, will need to be done by a third party and at customer's expense.
4. All 3 channels must have the same input signal type. For mixed signals (i.e. V, A, W; TC, S-G, RH) use option 9 and specify (i.e. Top Ch #40, Mid. Ch. #43, Bot. Ch. #41) or see models **TAC** or **TLD**.
5. Use #9 for custom screen printing, display color locations and input assignment or any other custom requirements.
6. **Important note:** Options 0, 2, 4 & 6: all signal inputs are isolated from each other and from power input. Options 1, 3 & 5: Signals are all common (No isolation between channels). Warning: Options 40-43 are H.V. AC signal powered and are isolated between channels, but NOT between the input and within its terminals.
7. Power for transmitter (Not available as powerless {option 0, digit 5}) is common to all 3 "-" loop inputs. Worst case V out (@ 20mA Out): 1 Channel: 25V, 2 Channels: 20V, all 3 channels: 15VDC. Consider your voltage drop and other loads. The **TLP** loop burden is 0.5V @ 20mA when externally powered.
8. Metal case (option 1) must be ordered for **M** or **N** grades.
9. Mixed or additional inputs (V&A, Temp & 4-20mA, etc.) are available as customizations. Choose option 09, and specify custom requirements.