

**WORLD'S
FIRST**

**LCD LOOP POWERED METER WITH SERIAL I/O
FOR MIL-SPEC, NUCLEAR & HI-REL INDUSTRIAL
>30 INPUT SIGNAL CONDITIONERS**

**MODEL
LPM**

**DISCONTINUED 9/9/14
ONLY LED REPLACEMENTS AVAILABLE.
PLEASE SEE MODEL LPE OR NTM-L.**

**4 1/2 DIGITS BACKLIT
(Option 4)**



(Negative Image)



**SIDE
VIEW**

FEATURES:

- Full 4 1/2 Digits (.1.9.9.9.9) 1/2" High
- Loop Powered, Low Burden
- 100% Metal Housing Nickel Plated
- Captive Screw Terminal Connector
- Wide Zero & Span Adjustments
- Loop Powered Backlight
- NEMA 4X, EMI/RFI Gaskets
- RS232, 485 or USB I/O
- Remote Display With Serial Input
- No Input Reflected Noise
- Stand Alone/SCADA/DCS Use
- 28VDC Power For Transmitter
- Lifetime Warranty

**4 1/2 DIGIT REFLECTIVE
(Option 0)**



REAR VIEW



**2.80" X 1.310" PANEL CUTOUT
BEZEL: 2.91 X 1.52"**

NEW: VDC MULTIRANGE 2-500V!

**SPECIFICATIONS @ 25°C
(Industrial Grade)**

DESCRIPTION

OTEK's New **LPM** Series brings the latest technology to your process! The single I.C. A/D can perform all the functions by itself or when the Serial I/O option is included, it can become a microprocessor based DPM with Serial I/O, Scaling, Zero Offset, Peak & Hold, Decimal Point and more. And all **Loop Powered!**

You can also use the **LPM** as serial input **Remote Display**. The **LPM** is available in several configurations:

1. **Loop Powered Stand Alone** with or without backlight. Only 2 wires to connect!
2. **Externally Powered (VDC) mA/V DPM**
3. **U.S.B. Powered** Your PC provides the power (5VDC). The compact metal case is Seismic Tested. The "EURO" screw connector is screwed to the case.

ADJUSTMENTS: Front panel adjustments; **Span** is on the left, **Zero** on the right.

BURDEN on your 4-20mA Loop is as low as 0.1V for externally powered models and as high as 5.5V for Loop Powered with backlight.

POWER FOR TRANSMITTER: 28VDC @ 20mA available on externally powered models (Options 1-8). See Note 7. Consumes 200mA @ 5VDC (1 Watt).

INTRINSICALLY SAFE Approval: Pending for CLI, Div. 1 & 2 GPS. A-G. See Note #5.

MIL-SPEC & NUCLEAR Qualified versions are built to your requirements. Contact OTEK.

The **HOUSING** is plastic or machined aluminum, nickel plated. **Sanitary** can be pipe, panel, wall or conduit mounted.

Loop Powered Models:

- Burden: 4.5V Max. With Red Backlight (7V for "S" Grade)
- 5.5V With Green Backlight
- Max. Input Current: 36mA, Max. Volts: 30V
- Min. Input Current: 3.6mA without μ Processor
- Accuracy & Linearity: $\pm 0.01\%$ of F.S. ± 1 Digit
- Span Adjustment: ± 3000 Counts of F.S. (10,000)
- Zero Adjustment: ± 3000 Counts of Zero (00000)
- Standard Calibration: 4-20 = 0-10000, Others On Request
- Serial I/O: RS232E (Parasitic)

Powered Models:

- Loop Burden: 1.0V@20mA; 50 Ohms
- Current Requirement @ 5V: 1mA + Backlight (20mA) (w/o microcontroller)
- Current Requirement @ 5V: 10mA + Backlight (20mA) (with microcontroller)
- Power Input: USB, 5VDC, 5-48VDC & 90-265VAC On Request

OTHER SPECIFICATIONS

- Display: LCD, 4 1/2 Digits 0.5", 6 O'Clock Viewing Angle
- 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 + 60/ -20 + 70°C
- MTBF: >100,000 Hours
- Serial I/O: RS232/485/USB, 300-19, 2KBB (8N1)
- RS232 Power: Parasitic From RS232, when loop powered
- RH: 5-95% RH Non-Condensing
- Temperature Coefficient: 50PPM/°C
- Sanitary Case: To 250°F Steam Cleaning

520-748-7900

FAX: 520-790-2808
E-MAIL: sales@otekcorp.com
<http://www.otekcorp.com>

OTEK™
CORP.
SINCE 1974

4016 E. TENNESSEE ST.
TUCSON, AZ. 85714 U.S.A.

MADE
IN
USA



HOW IT WORKS:

AC SIGNAL POWERED: For VAC & Hz we use a capacitor limiting rectifier to power the **LPM** and monitor the VAC with an RMS-DC converter. For Hz we use an F-V for accurate conversion. For A.A.C. we invented (Pat. # 4,908,569) a C-V converter to extract the current from your C.T. for power and monitor the signal with RMS-DC. (Digit 2, Options Q-T). See note under option "Z."

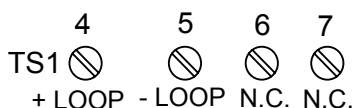
EXTERNALLY POWERED: Non-Isolated 5VDC or isolated 5-48VDC or 90-265VAC 50/60Hz is optional (Digit 3, Options 0-7). Max Power: 1 Watt.

INPUT TYPE (DIGIT 2)

OPTION 0, LOOP POWERED: Only 2 wires (+L & -L) required. The **LPM** requires >3mA to operate at ~4 V drop, if the 4V drop is too much, select Option 1 (Externally Powered) Also, display intensity is lowest at 4mA and brightest at 20mA.

CONNECTIONS:
FIG. LPM-0

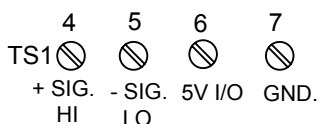
OPTION 0, LOOP POWERED



OPTION 1: 4-20mA EXTERNALLY POWERED: It only drops 1V @ 20mA (50 Ohms) but the "**LPM**" needs 5VDC @ 50mA to operate. Accuracy: ±0.05% of F.S.

CONNECTIONS:
FIG. LPM-1

OPTIONS 1-7, C-N, T-V EXTERIOR POWERED



NOTE: OPTION N INCLUDES 0.04 OHM 5W SHUNT AT TERMINALS 4 & 5

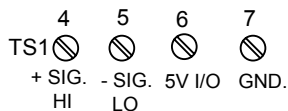
OPTIONS 2-7: VDC & mADC EXTERNALLY POWERED:

Input impedance is 1 Mega Ohms on all VDC ranges and 1K Ohms on 1 mA range.

Accuracy: ±0.05% of F.S.

CONNECTIONS:
FIG. LPM-1

OPTIONS 1-7, C-N, T-V EXTERIOR POWERED

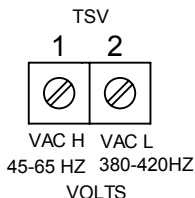


NOTE: OPTION N INCLUDES 0.04 OHM 5W SHUNT AT TERMINALS 4 & 5

OPTIONS 8: HERTZ SIGNAL POWERED: Warning: NO Isolation! Use P.T. The **LPM** is powered by the signal from your P.T. (~150mW) and converts the frequency to voltage. Frequency range is 50-440 Hz. Also see Option "T" for up to 20K Hz. Note: Digits 5 & 6 must be option 0.

CONNECTIONS:

FIG. LPM-8/Y OPTION 8/Y VAC OR HZ SIGNAL POWERED

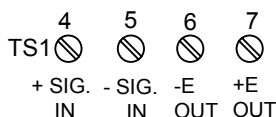


OPTION 9: CUSTOM: Use this option to describe any custom input, scale or modification to the **LPM** and contact us for feasibility and cost.

Option A: 4-30VDC Signal Powered: Another **OTEK** innovation. The voltage signal powers an **LDO** to protect the **LPM** 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 Options 2-8 (externally powered).

CONNECTIONS:
FIG. LPM-A

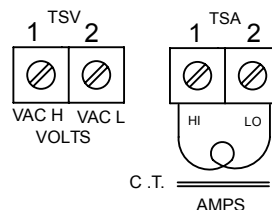
OPTION A VDC SIGNAL POWERED



Option B: AC Watts Signal Powered: 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 Q & R apply. Range: VAC: 50-150; AAC: 0.1 - 5A; Frequency: 40-450Hz; Accuracy & Linearity: ±0.1% of F.S.; Conversion: True RMS. Contact **OTEK** for other functions. Note: Digits 5 & 6 must be option 0.

CONNECTIONS:

FIG. LPM-B OPTION B WATTS SIGNAL POWERED

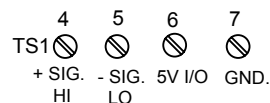


Option C & D:

These are higher sensitivity (10uV) versions of Option 5. Zin is 1 MEG Ohm. Same Connections.

CONNECTIONS:
FIG. LPM-1

OPTIONS 1-7, C-N, T-V EXTERIOR POWERED

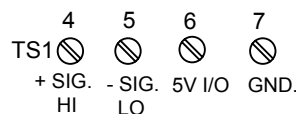


NOTE: OPTION N INCLUDES 0.04 OHM 5W SHUNT AT TERMINALS 4 & 5

Options E-M: V & mA RMs: Here we use a **True RMS-DC** Converter for accurate (± 0.05%) measurement of sine waves up to 10KHz (± 0.5%, 10-20KHz) and SCR;s fired to ± 2%. Input impedances vs. range are the same as for VDC ranges.

CONNECTIONS:
FIG. LPM-1

OPTIONS 1-7, C-N, T-V EXTERIOR POWERED



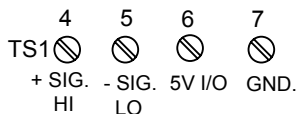
NOTE: OPTION N INCLUDES 0.04 OHM 5W SHUNT AT TERMINALS 4 & 5

LPM CONTINUED

Option N: 5Amps AC: Specifically for current transformers (**C.T.**) this option requires an externally mounted (supplied) 0.04 Ohm, 0.1% 5 Watt resistor. You can mount the "Shunt" at your **C.T.** or next to the **LPM** but make sure the connections are "Perfect" to electrical codes. The C.T. might have "**Lethal**" High Voltage without a "Shunt" (Open) and the **LPM** will "Smoke". See OTEK's New **ACS** models for **C.T.** powered instruments (Patent Pending).

CONNECTIONS:
FIG. LPM-1

OPTIONS 1-7, C-N, T-V
EXTERIOR POWERED



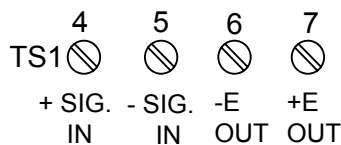
NOTE: OPTION N INCLUDES 0.04 OHM 5W SHUNT AT TERMINALS 4 & 5

Option P: Strain-Gage (<1K Ohm Type): Here we use a highly accurate and stable constant current (~1mA) source, and a differential amplifier to convert the 2 or 3m V/V (typical) sensitivity of your "Loadcell." *Specify* your Strain-Gage sensitivity and full scale and the **LPM's** display at Zero and Full Scale Please!

Accuracy: ±0.05% of F.S.

CONNECTIONS:
FIG. LPM-P

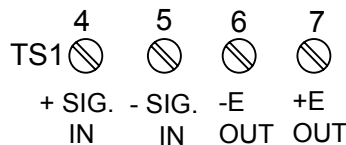
OPTIONS P/Q, STRAIN GAGE



Option Q: Strain-Gage (≥1K < 5K Ohm): These are typically "Monolithic" **S-G** that require constant voltage (preferably) excitation. We use 4.096 V for high stability and accuracy. *Specify* your S-G impedance and sensitivity and the **LPM's** display at Zero and Full Scale.

CONNECTIONS:
FIG. LPM-P

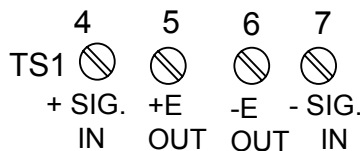
OPTIONS P/Q, STRAIN GAGE



Option R: RTD (PT100): We excite your 2, 3 or 4 wire RTD with 200uA to avoid the "self heating" effect. The range of the **LPM** 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 1000 Ohm RTD & legacy 0.00392 TC (known as ANSI 392) contact OTEK and use Option "09".

CONNECTIONS:
FIG. LPM-R

OPTION R, RTD



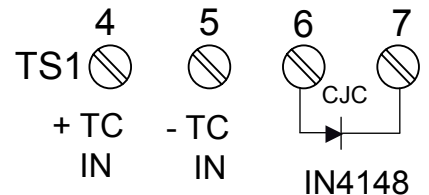
FOR 3 WIRE, JUMP 6 & 7
FOR 2 WIRE, JUMP 4 & 5
AND 6 & 7

Option S: 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 **LPM** at the connector base. Make sure the connections from your **TC** are as close as possible to avoid errors and calibrate after connecting. If you short out the **LPM's** TC wires together, the **LPM** will read the ambient temperature due to its built-in C.J.C.

Contact OTEK for types "K," "T" and others, including copper (10 Ohms).

CONNECTIONS:
FIG. LPM-S

OPTION S, TC

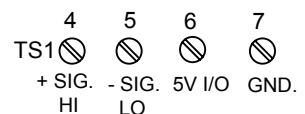


Options T: Frequency Input:

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 50-440 Hz power line frequency measurement use Option # "8" or see our **ACS** Powerless™ Series.

CONNECTIONS:
FIG. LPM-1

OPTIONS 1-7, C-N, T-V
EXTERIOR POWERED



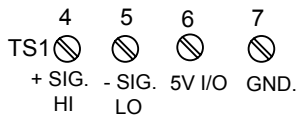
NOTE: OPTION N INCLUDES 0.04 OHM 5W SHUNT AT TERMINALS 4 & 5

LPM CONTINUED

Option U: %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** to specify your sensor's specifications.

CONNECTIONS:
FIG. LPM-1

**OPTIONS 1-7, C-N, T-V
EXTERIOR POWERED**



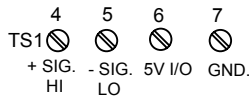
NOTE: OPTION N INCLUDES 0.04 OHM 5W SHUNT AT TERMINALS 4 & 5

Option V: pH (Acidity): We use a FET input (1015) amplifier and calibrate the **LPM** for 0-14.00 pH using the Industry's standard + 413 mV = + 7pH co-efficient.

Accuracy: +0.05% of F.S

CONNECTIONS:
FIG. LPM-1

**OPTIONS 1-7, C-N, T-V
EXTERIOR POWERED**



NOTE: OPTION N INCLUDES 0.04 OHM 5W SHUNT AT TERMINALS 4 & 5

Option W: ORP(Oxygen Reduction Potential): Our FET amplifier (109) accepts the industry standard 2000mV F.S. of the probe and the **LPM** displays it in % (0-100.00%)

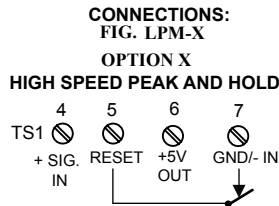
CONNECTIONS:
FIG. LPM-1

**OPTIONS 1-7, C-N, T-V
EXTERIOR POWERED**



NOTE: OPTION N INCLUDES 0.04 OHM 5W SHUNT AT TERMINALS 4 & 5

Option X: 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: +/- 0.1% of F.S. +/- 1 Digit

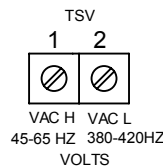
Linearity & Resolution: +/- 0.1% of F.S.

Response time: >20KHz (<50us)

Retention: >10 years (with power on).

Option Y: Signal Powered for VAC: No power supply req'd! Just connect to your P.T.(no-isolation) and display the value. Ideal for Analog meter replacement, range: 40-150VAC, 50-400Hz. Burden 0.1W, Accy.& Lin. : +/- 0.5% of F.S. Note: Digits 5 & 6 must be option 0.

CONNECTIONS:
FIG. LPM-8/Y OPTION 8/Y
VAC OR HZ SIGNAL POWERED

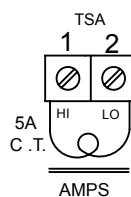


Option Z: Signal Powered Amps

AC: No Power Supply Req'd! Just connect to your P.T. range: 0.5-5Amp; 50-400Hz; burden; 0.1W Accy. & Lin.; +/- 0.5% of F.S.

Note: Our internal C.T. isolates your C.T. and powers the **LPM**. Note: Digits 5 & 6 must be option 0.

CONNECTIONS:
FIG. LPM-Z OPTION Z
AMPS SIGNAL POWERED



ABOUT AC POWERLESS TECH-

NIQUE: As with analog meters, the AC signal power models have a minimum signal input for illumination. For voltage or frequency, the minimum input signal is 40 VAC. For current, the minimum input signal is 0.5 AAC. See other options for externally powered models.

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

POWER/INPUT (Digit 3):

OPTIONS 1 & 2: NON-ISOLATED VDC POWER: All listed I/O options (except Powerless™) are available. Power requirements vary with options included. The basic **LPM** requires under 150mW (30 mA@5VDC). Fully Loaded: 1 watt. Confirm power input (Digit 3) before connecting. V+: TS1-12; V-:TS1-11.

OPTION 3: USB POWER:

VBUS: TS1-12; Ground: TS1-11; D+: TS1-9, D-TS1-8

OPTIONS 4,5 & 8: ISOLATED

POWER: These options offer minimum isolation of 500 VAC or DC and their efficiency is about 80%. All power input ranges are +/-10%.

ACHi/V+: TS1-12; ACLo/V-: TS1-11

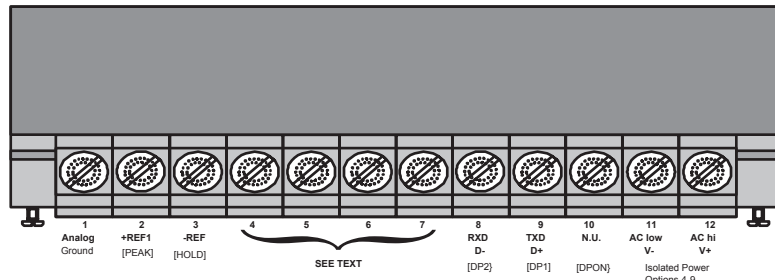
Serial I/O: Digit 5, Options 1-4:

TXD: TS1-9; RXD: TS1-8, Ground: TS1-1 or see user's manual at www.otekcorp.com.

Power For Transmitter, Digit 6,

Options 1-4: Only available for Powered models (Digit 3, options 1-8). We convert the internal 5VDC to 28VDC to power your transmitter. Maximum output: 25mA. Power consumption: 1 Watt@5VDC (200mA)

LPM STANDARD CONNECTIONS



(No Serial I/O)

NOTE: 1=OPEN; 0=CONN. TO TS1-1; X=N/A

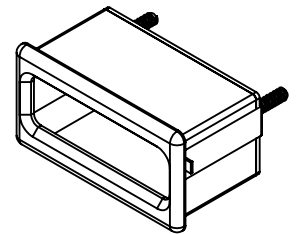
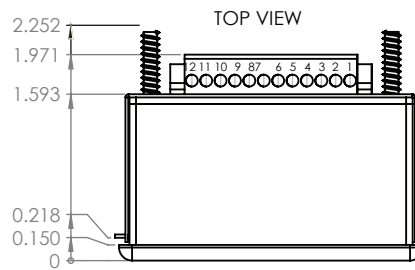
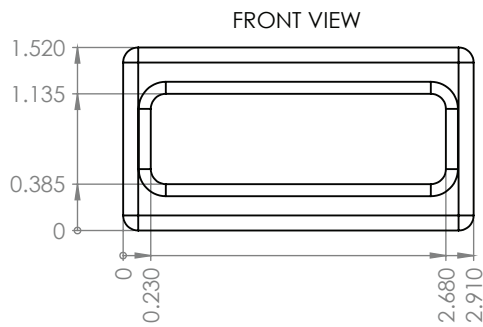
DEC. POINT	DPON	DP1	DP2	PEAK TS1-2	HOLD TS1-3
NONE	0	X	X	X	X
1.XXXX	1	1	1	X	X
1X.XXX	1	1	0	X	X
1XX.XX	1	0	1	X	X
1XXX.X	1	0	0	X	X
PEAK	X	X	X	0	1
HOLD	X	X	X	1	0

Only for Option 0 on Digit 5, others via Serial I/O

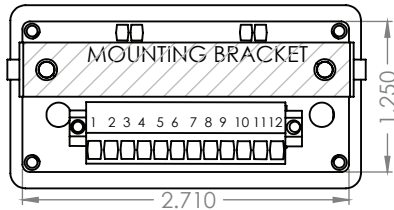
Notes:

1. Confirm power input (Digit 3) before connecting.
2. DP1 & 2 only for option 0 on Digit 5.
3. Serial I/O only for options 1-4 on Digit 5.
4. Do NOT connect to TS1 for Options 8, B, Y & Z (high voltage).

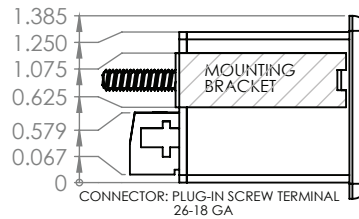
LPM MECHANICAL INFORMATION



REAR VIEW
PANEL CUT-OUT: 2.750 X 1.310"
TSV TSA

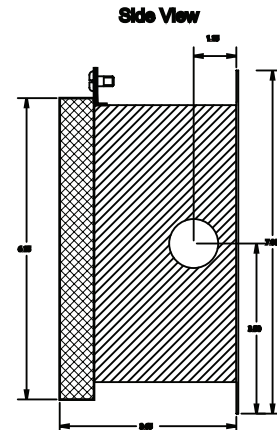
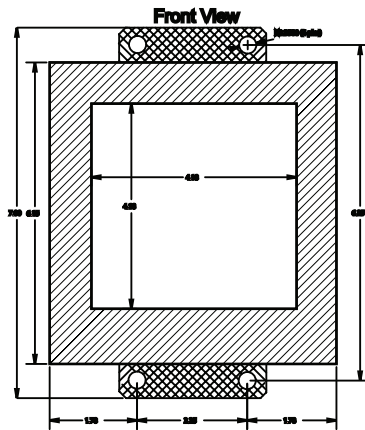


SIDE VIEW



PANEL CUT-OUT
2.75"x1.30"

SANITARY



NOTES:

1. Do Not Connect To Pins 1, 2 & 3 (For Special Functions Only)
2. Standard Serial I/O Settings are 8N1. 9600Kb Baud Rate, Address and Decimal Point are serially programmable.

For Loop Powered Just Connect "+ Loop" to Pin 6, "-Loop" to Pin 7. All others see User's Manual at otekcorp.com.

LPM SERIES ORDERING INFORMATION 5-7-13

NOTES: Please READ BEFORE building part number:

1. If digit 2 is option 0 or A, then digit 3 must be option 0, digit 5 must be option 0 or 1 and digit 6 must be option 0.
2. If digit 2 is option 8, B, Y or Z, then digits 3, 5 and 6 must be 0.
3. If digit 3 is option 3, then digit 5 must be option 4.
4. See notes on bottom of page.

LPM

DISCONTINUED 9/9/14
ONLY LED REPLACEMENTS AVAILABLE.
PLEASE SEE MODEL LPE OR NTM-L.

	1	2	3	4	5	6	7	8
Model: LPM -	□	□	□	□	□	□	□	□
GRADE (5)								
I.....Industrial								
M.....Mil-Spec								
N.....Nuclear (Contact Otek)								
S.....Intrinsically Safe								
9.....Custom (Contact OTEK)								
INPUT TYPE FULL SCALE (1,2,6)								
0.....4-20mA Loop Powered								
1.....External Power 4-20mA								
2.....External Power 2mA F.S.								
3.....External Power 20mA F.S.								
4.....External Power 200mA F.S.								
5.....External Power 2V F.S.								
6.....External Power 20V F.S.								
7.....External Power 200V F.S.								
8.....50-440 Hz Signal Powered								
9.....Custom (Contact OTEK)								
A.....Signal Powered 4-30VDC								
B.....AC Watts Signal Powered								
C.....±200mVDC								
D.....+50mVDC								
E.....200mV RMS								
F.....2V RMS								
G.....20V RMS								
H.....200V RMS								
J.....50mV RMS								
K.....2mA RMS								
L.....20mA RMS								
M.....200mA RMS								
N.....5 Amp RMS								
P.....Strain-Gage (<1 K Ohm)								
Q.....Strain-Gage (>1K Ohm)								
R.....RTD (PT100)								
S.....TC (Type J)								
T.....Frequency (40-20 K Hz Line)								
U.....% RH (Specify Sensor)								
V.....pH (0-14.00)								
W.....ORP (0-2000mV)								
X.....High Speed Peak & Hold (2VDC)								
Y.....VAC Signal Powered (P.T.)								
Z.....AAC Signal Powered (P.T. & C.T.)								
RANGE/CALIBRATION								
0.....Standard								
9.....Custom (Contact OTEK)								
CASE STYLE (9)								
0.....Metal								
1.....Metal NEMA 4X								
2.....Sanitary								
4.....Standard Plastic								
9.....Custom (Contact OTEK)								
POWER FOR TRANSMITTER (1,7)								
0.....None								
1.....(200mA).....Included								
SERIAL I/O (1,2,3,8)								
0.....None								
1.....Parasitic (Loop Powered) RS232E								
2.....Non-Isolated Powered RS232D								
3.....Non-Isolated Powered RS485								
4.....Non-Isolated Powered USB								
9.....Custom (Contact OTEK)								
BACKLIGHT								
0.....Reflective & None								
1.....Positive Image Red								
2.....Positive Image Green								
3.....Negative Image Red								
4.....Negative Image Green								
9.....Custom (Contact OTEK)								
POWER INPUT (1,2,3,8)								
0.....Non-Isolated Signal/Loop Powered								
1.....Non-Isolated 5VDC								
2.....Non-Isolated 7-32VDC								
3.....Non-Isolated USB Powered								
4.....Isolated 5VDC +/- 10%								
5.....Isolated 7-32VDC +/- 10%								
8.....Isolated 90-265VAC								
9.....Custom (Contact OTEK)								

NOTES (Continued):

5. Contact OTEK for M, N & S grades. **“Intrinsically Safe”** version is compliant by design only. No certificate available until further notice. 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.
6. Option S must specify range of interest within 300⁰ (F or C) span. Contact OTEK for other RTD/TC types. For Powerless AC Watts use option 9 and specify.
7. Power for transmitter (28VDC@20mA) NOT available with powerless input.
8. Only RS232E is available with Signal Powered. Must have Serial I/O to implement command functions (if required).
9. Maximum of 3 units inside sanitary case. If using more than 1 unit in a sanitary case, select Option 9 (Custom) and describe.