

NEW

Signal Powered!

**FLAT PACK PANEL METERS
NEED NO PANEL CUT OUT
> 40 INPUT SIGNALS ACCEPTED**

**5-28VDC or
Ext. Powered!**

**MODEL
FPM**



LED

FEATURES:

- 4 1/2 Digit (1.9.9.9.9) LED or LCD
- Signal Powered or Externally Powered
- High Accuracy & Resolution
- Self Diagnostics; Peak & Hold
- Signal Conditioners Embedded
- Installation Time: 2 Minutes
- NEMA 4X Case - No Adjustments
- Lifetime Warranted (LTD)



LCD

DESCRIPTION

Our New **FPM** Series is the 2nd generation of our famous "No Panel Cut-Out Required" meters introduced in 1976! The **FPM** uses **ASIC** and Nanotechnology to bring you a universal meter for all your applications (See Ordering Information For Listing of Input Functions).

Mounting: Just drill a 3/8" (10mm) hole, pass the wires through it and connect them, that's all!

Displays: Choice of bright 0.6" **LED** or backlit **LCD**. Either positive or negative image, red or green backlight.

Power Supply: Not needed for current loops or VDC signal inputs. That is why we call it **Power-less™** (5VDC for other input signals).

Signal Inputs: Signal Powered: 4-20, 10-50mA or 3-30VDC. **Externally Powered (5VDC):** V/mA DC & RMS, Strain-Gage, RTD, TC, Hertz, %RH, pH, ORP, Peak & Hold or your custom inputs!

Peak & Hold: The FPM has **Peak & Hold** with about 300us(3/sec) response. For high speed (>20KHz) see Option 37 Description.

Case:

- **NEMA 4X** (no adjustments)
- **NEMA 3** (Zero and Span adjustment holes)
- **Sanitary** to 250°F Steam Cleaning

The FPM replaces models:

516, 518, 521, 522, 523, 524, 525, 526, 527 and 528 with the newest technology!



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

SPECIFICATIONS @ 25°C(+/- 2 Digits)

Current Loop Powered:

- Accuracy & Linearity: $\pm 0.01\%$
- Burden: 4.5V @ 20mA, 3.5V @ 4mA
- Min-Max Current: 3-36mA
- Standard Calibration: 4-20 = 0-10,000 Counts
- Zero & Span: ± 3000 Counts
- Max. Open Loop volts: 30/1 Sec.

VDC Signal Powered:

- Accuracy & Linearity: $\pm 0.03\%$
- Quiescent Current: ≤ 20 mA
- Min-Max Input: See Ranges
- Standard Calibration: See Ranges
- Zero & Span: ± 3000 Counts
- A.C. Signal Powered; see Options 40 & 41
- **Externally Powered: (See Options)**
- Power: 5VDC @ 20mA Plus Signal Conditioner
- Loop Burden (4-20mA): 1 Volt
- Impedance (VDC): 100M Ohms
- V/mA RMS: True RMS Accy. & Lin.: $\pm 0.5\%$
- Strain-Gage: Accy. & Lin.: $\pm 0.5\%$
- RTD: PT100 (-200 + 800°C or °F) $\pm 1\%$ of F.S.
- TC: J or K 0°C to Max. $\pm 2\%$ of F.S.
- Hz: 30-20,000 Hz $\pm 1\%$
- pH: 10^{15} Zin, 0-14pH ± 0.1 pH
- % RH: To your Probe Specifications

Other Specifications:

- Displays: 0.6" LED, or 0.5" LCD
- Viewing Angle: LCD: 6 O'Clock
- Conversion Rate: 3/Second
- CMRR: 100dB (50-60Hz)
- Input Type: S.E./Differential
- Max. C.M.V.: 2VDC
- Op/Storage Temp: -10 + 70°C/-30 + 80°C
- Temp. Coefficient: 50PPM/°C
- CMTBF: >100,000 Hours

520-748-7900

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**OTEEK™
CORP.**
SINCE 1974

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TUCSON, AZ. 85714 U.S.A.

MADE
IN
USA



THE SIGNAL CONDITIONERS:

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. Because an LED acts as a Zener, instead of a Zener the LEDs of the backlite are used to power the meter. If the "burden" (3.5 - 4.5V) is too high for your application, use the externally powered Option 01.

Connections:

Red: +Loop
Black: - Loop

Option 01: 4-20mA Externally

Powered: It only drops 1V @ 20mA (10 Ohms) but the "FPM" needs 5VDC @ 20mA to operate (including the backlight or LEDs).

Connections:

Red: V+
Black: Ground
Yellow: +Loop
White: -Loop

Option 02: 4-30VDC Signal Pow-

ered: Another OTEK innovation. The voltage signal powers an LDO to protect the FPM 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 04-08 (externally powered).

Connections:

Red: V+
Black: V-

Options 04-08: VDC Externally

Powered: Input impedance is 1Mega Ohms. (See power input Digit 4).

Connections:

Red: V+
Black: Ground
Yellow: +Signal
White: -Signal

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

Connections:

To Be Determined

Options 10-13: 20mA - 200mADC:

Since the FPM is 200mV full scale (20,000 Counts) the "Shunt" resistors used are 1K, 100, 10 or 1 Ohm. Don't forget that maximum display is 19,999 not 20,000!.

Connections:

Red: V+
Black: Ground
Yellow: +Signal
White: -Signal

Options 14-22: V & mA RMs:

Here we use a **True RMS-DC** Converter for accurate ($\pm 0.05\%$) measurement of sine waves up to 10KHz ($\pm 0.5\%$, 10-20KHz) and SCR;s fired to $\pm 2\%$. Input impedances vs. range are the same as for VDC ranges.

Connections:

Red: V+
Black: Ground
Yellow: AC High
White: AC Low

Option 23: 5Amps AC:

Specifically for current transformers (**C.T.**) this option requires an externally mounted (supplied) 0.05 Ohm, 0.1% 3 Watt resistor. You can mount the "Shunt" at your **C.T.** or next to the FPM but make sure the connections are "Perfect" to electrical codes. The C.T. might have **"Lethal" High Voltage** without a "Shunt" (Open) and the FPM will "Smoke". See OTEK's New **ACS & CTT** models for **C.T.** powered instruments (Patent Pending).

Connections:

Red: V+
Black: Ground
Yellow: AC High
White: AC Low

Option 24: Strain-Gage (<1000

Ohm Type): Here we use high accuracy and stability 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 FPM's display at Zero and Full Scale Please!

Accuracy: $\pm 0.05\%$ of F.S.

Option 25: Strain-Gage ($\geq 1K$

< 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 FPM's display at Zero and Full Scale.

Accuracy: $\pm 0.1\%$ 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 200uA to avoid the "self heating" effect. The range of the FPM 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".

Connections:

Red: +V
Black: -RTD
Yellow: +RTD Signal
White: +E
Green: -E
White/Black: Ground

FPM 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 **O TEK**.

Connections:

Red: +V
Black: -RTD
Yellow: +RTD Signal
White: +E
Green: -E
White/Black: Ground

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 **FPM** at the connector base. Make sure the connections from the **FPM** 6" wires and your **TC** are as close to the **FPM's** entrance as possible to avoid errors and calibrate after connecting. If you short out the **FPM's** TC wires together, the **FPM** will read the ambient temperature due to its built-in C.J.C.

Connections:

Red: V+
Black: Ground
Yellow: TC+(White)
White: TC-(Red)

Option 30: TC (Type K): This is yellow (+) and red (-) and has a range of -270 + 1370°C (-440 + 2500°F). Use same notes as Option 28.

Connections:

Red: V+
Black: Ground
Yellow: TC+(Yellow)
White: TC-(Red)

Option 31: TC (Type T): This blue (+) and red (-) **TC** wire has the range of -270 + 400°C (-440 + 750°F). Use same notes as Option 28.

Connections:

Red: V+
Black: Ground
Yellow: TC+(Blue)
White: TC-(Red)

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 40 or 440 Hz power line frequency measurement. Use Option #"33" or see our **ACS** Powerless™ Series.

Connections:

Red: V+ Yellow: Hi
Black: Ground White: LO

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 **O TEK** to specify your sensor's specifications.

Connections:

Red: V+
Black: Ground
Yellow: + Sense
White: - Sense

Option 35: pH (Acidity): We use a FET input (1015) amplifier and calibrate the **FPM** for 0-14.00 pH using the Industry's standard + 413 mV = +7pH coefficient.

Accuracy: +0.05% of F.S

Connections:

Red: V+
Black: Ground and Shield
Yellow: + Signal
White: - Signal

Option 36: ORP(Oxygen Reduction Potential): Our FET amplifier (109) accepts the industry standard 2000mV.F.S. of the probe and the **FPM** displays it in % (0-100.00%)

Connections:

Red: V+
Black: Ground and Shield
Yellow: + Signal
White: - Signal

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

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

Response time: >20KHz (<50us)

Retention: >10 years (with power on).

Option 40: Signal Powered for

VAC: No power supply req'd! Just connect to your P.T.(non-isolation) and display value. Analog meter replacement, range: 40-150VAC, 50-400Hz. Burden 0.1W, Accy.& Lin. : +/- 0.5% of F.S.

Connections:

Warning No Isolation.

Yellow: A.C. High
White: A.C. Low
Note: Connect required Dec. Point before connecting A.C

FPM Continued

Option 41: Signal Powered Amps AC: No Power Supply Req'd! Just connect to your C.T. & P.T. range: VAC: 40-150; AAC; 0-5Amp; 50-400Hz; burden; 0.1W Accy. & Lin.; +/- 0.5% of F.S.

Note: NO Isolation, use with P.T. & C.T. only. Must use shunt on C.T. 0.05% Ohm, 5W. **Warning no isolation.** Connect D.P. if req'd before powering.

Yel: VAC Hi, White & Black VAC Lo & Amp Lo, Red: Amp Hi.

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

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: 40-440Hz; Accuracy & Linearity: $\pm 0.05\%$ of F.S.

TYPICAL CONNECTIONS
(See Description for Specific Option)

NOTES:

1. **Self Diagnostics:** The **FPM** will test all segments and I/O Signals for about 5 seconds.
2. "X" = any Option Listed

| WIRE | FUNCTION |
|--------------------|---------------------------------------|
| RED | +VDC in / + Loop Powered |
| BLACK | Power GND /- LOOP Powered |
| YELLOW | +SIGNAL in (External Powered) |
| WHITE | -SIGNAL in (External Powered) |
| ORANGE | HOLD (Connect to Green to Enable) |
| BROWN | PEAK (Connect to Green to Enable) |
| BLUE | DP2 (See Table Below) |
| GRAY | DP1 (See Table Below) |
| WHITE/BLACK STRIPE | OPTION GROUND (Loop Powered Ground) |
| GREEN | + 5VDC OUT (Only for Signal Enable) |
| VIOLET | DPON (Open for D.P., GND for no D.P.) |

- 1) To change the decimal points connect Blue and/or Gray to Option Ground.

| DECIMAL LOCATION | OPTION GROUND (Black or White/Black) |
|------------------|--------------------------------------|
| 1XXXX | VIOLET Grounded (For No D.P.) |
| 1.XXXX | VIOLET Open (For any D.P.) |
| 1X.XXX | BLUE Grounded |
| 1XX.XX | GRAY Grounded |
| 1XXX.X | BLUE & GRAY Grounded |

- 1) See options description for green, black, yellow, white & red.
- 2) For units with NO White/Black striped wire use the Black wire.

FPM SERIES ORDERING INFORMATION 11-10-11

NOTE: Please READ BEFORE building part number:

1. If digit 4 is option 0, then digits 1 & 2 must be either 00,02, 40, 41 or 42 (and conversely).
2. If digits 1&2 are options 14-36, then digit 4 (Power input) must be options 1 or 4 (and conversely).
3. See notes at bottom of page.

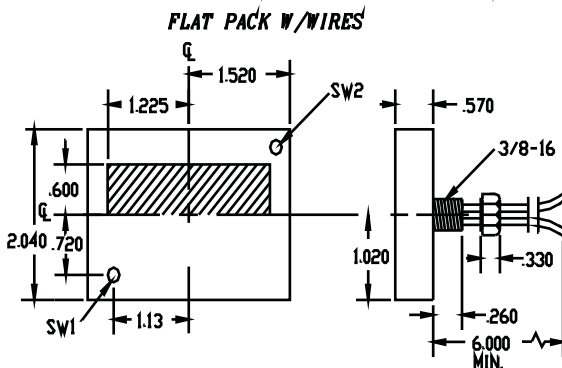
| | | | | | | | |
|---------------------|------------------------------------|-----------------------------------|---|---|---|---|---|
| Model: FPM - | | 1 | 2 | 3 | 4 | 5 | 6 |
| | | □ | □ | □ | □ | □ | □ |
| INPUT SIGNAL | | | | | | | |
| 00..... | Loop Powered 4-20mA | | | | | | |
| 01..... | External Power 4-20mA | | | | | | |
| 02..... | Signal Powered 4-30VDC | | | | | | |
| 04..... | +200mVDC | | | | | | |
| 05..... | ±2VDC | | | | | | |
| 06..... | ±20VDC | | | | | | |
| 07..... | ±200VDC | | | | | | |
| 08..... | ±50mVDC | | | | | | |
| 09..... | Custom (Contact OTEK) | | | | | | |
| 10..... | ± 200µADC | | | | | | |
| 11..... | ±2mADC | | | | | | |
| 12..... | ±20mADC | | | | | | |
| 13..... | ±200mADC | | | | | | |
| 14..... | 200mV RMS | | | | | | |
| 15..... | 2V RMS | | | | | | |
| 16..... | 20V RMS | | | | | | |
| 17..... | 200V RMS | | | | | | |
| 18..... | 50mV RMS | | | | | | |
| 20..... | 2mA RMS | | | | | | |
| 21..... | 20mA RMS | | | | | | |
| 22..... | 200mA RMS | | | | | | |
| 23..... | 5 Amp RMS | | | | | | |
| 24..... | Strain-Gage (<1K Ohm) | | | | | | |
| 25..... | Strain-Gage (>1K Ohm) | | | | | | |
| 26..... | RTD (PT100) | | | | | | |
| 27..... | RTD (PT1000) | | | | | | |
| 28..... | TC (Type J) | | | | | | |
| 30..... | TC (Type K) | | | | | | |
| 31..... | TC (Type T) | | | | | | |
| 32..... | Frequency (40-20KHz) | | | | | | |
| 33..... | Frequency (40-440Hz Line) | | | | | | |
| 34..... | % RH (Specify Sensor) | | | | | | |
| 35..... | pH (0-14.00) | | | | | | |
| 36..... | ORP (0-2000mV) | | | | | | |
| 37..... | High Speed Peak & Hold (2VDC) | | | | | | |
| 40..... | VAC Signal Powered (P.T.) | | | | | | |
| 41..... | AAC Signal Powered (P.T. & C.T.) | | | | | | |
| 42..... | 40-440 AC Hz Signal Powered (P.T.) | | | | | | |
| | | CASE (5) | | | | | |
| | | 0.....NEMA 4X - No Adjustments | | | | | |
| | | 1.....NEMA 3 | | | | | |
| | | 2.....Sanitary | | | | | |
| | | 9.....Custom (Contact OTEK) | | | | | |
| | | CALIBRATION/RANGE (4) | | | | | |
| | | 0.....Standard | | | | | |
| | | 9.....Custom (Contact OTEK) | | | | | |
| | | POWER INPUT | | | | | |
| | | 0.....Powerless™ | | | | | |
| | | 1.....5VDC | | | | | |
| | | 2.....6-15VDC | | | | | |
| | | 3.....10-28VDC | | | | | |
| | | 4.....120VAC External | | | | | |
| | | 9.....Custom (Contact OTEK) | | | | | |
| | | DISPLAY TYPE | | | | | |
| | | 0.....LED | | | | | |
| | | 1.....LCD Positive Red Backlite | | | | | |
| | | 2.....LCD Negative Red Backlite | | | | | |
| | | 3.....LCD Positive Green Backlite | | | | | |
| | | 4.....LCD Negative Green Backlite | | | | | |
| | | 5.....Reflective | | | | | |
| | | 9.....Custom (Contact OTEK) | | | | | |

NOTES:

3. 120VAC (Option 4) is AC Duplex Plug-In Module.
4. Standard calibration is 0-20,000 counts for V Input, 0-10,000 for 4-20mA (0-100.00%) or per sensor's range.
5. NEMA 4X has no Zero and Span Pots.

413 FLAT PACK MECHANICALS & TYPICAL CONNECTIONS

MECHANICAL



Mounting Instructions:

1. Drill a 3/8 - 1/2" diameter hole.
2. Attach supplied double sided tape to back of FPM.
3. Pass wires through hole.
4. Align and Press FPM on panel (that is all!)

Sanitary Case (Option 02)

