LAUREL
ELECTRONICS, INC.

L40 Low-Cost, Universal Analog Input Digital Panel Meter

User Selectable Ranges

- **DC voltage: ±60.0 mV, ±200.0 mV, ±2.000V, ±20.00V, ±200.0V, ±400V**
- **DC current: ±20.00 mA, ±5.00A**
- **AC rms voltage: 60.0 mV, 200.0 mV, 2.000V, 20.00V, 200.0V, 400V**
- **AC RMS current: 20.00 mA, 5.00A AC**
- **Process: 4-20 mA, 0-10V**
- **Thermocouple types: K, J, E, N, L, C, R, S, B, T**
- **RTD types: Pt100, Pt500, Pt1000, Ni100, Ni200, Ni1000**
- **Thermistor types: NTC, PTC**
- **Resistance: 0-9.999 kohm, 0-99.99 kohm**
- **Potentiometer input: 200 Ω to 50 kΩ**

Options

- **1 or 2 mechanical relays, 8A, 250 Vac**
- **Isolated analog output**
- **RS485 Modbus RTU data output**

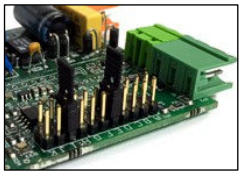
Standard Features

- **Universal power: 18 Vac/dc to 265 Vac/dc**
- **1/8 DIN case with 3 front panel keys**
- **Display: 4 red LED digits, 14.2 mm (0.56")**
- **Typical accuracy: 0.2% of full scale**
- **Removable screw-clamp connectors**
- **External control input**

Description

Model L40 is a low-cost, universal meter for 65 user selectable analog input signal types and ranges. These include DC voltage and current, AC RMS voltage and current, process signals (4-20 mA, 0-10V), thermocouples (10 types, °C or °F), RTD (6 types, °C or °F), thermistors (NTC or PTC), resistance (0-10k or 0-100k ohms), and potentiometer inputs. The same meter handles all signal types with no need for a plug-in signal conditioner board.

A universal power supply accepts voltages from 18V to 265V, AC or DC, so that power can be 24 Vdc or worldwide AC power. The meter conforms to the popular 1/8 DIN size standard and features four 14.2 mm (0.56") bright red LED digits. The display is user scalable for all input types other than temperature.

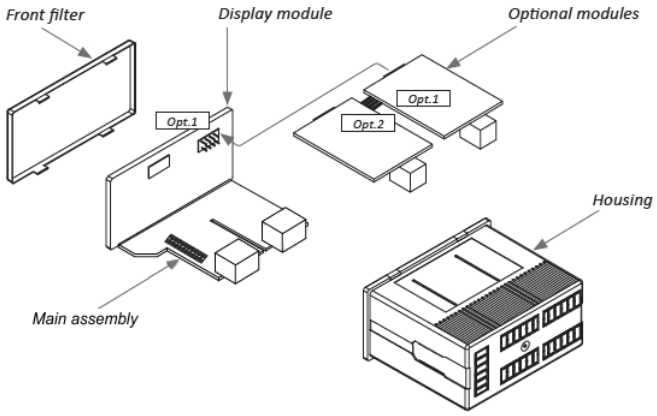


The base L40, as shipped by Laurel, is set up so that 400 Vac input reads 400. To change to another signal type or range, pry off the meter faceplate, push out the electronics, and place jumpers as illustrated in the manual. The jumper positions are well labeled, and the jumpers have a large, easy-to-grasp handle. Also make software selections using front panel keys. If you want Laurel or your distributor to set jumpers and do the front panel programming for you, order the FS option.

Extensive software features add flexibility to this low cost meter. Programmable features include five levels of display brightness, min and max capture, dual scaling selectable by an external control input, a deadband around 0 for AC measurements, a moving average digital filter, a "count by" function, hysteresis for alarm operation, a user-configurable fast access menu, and selectable password protection. Further flexibility is provided by 1 or 2 optional output boards, which can be added at any time.

Additional flexibility is provided by optional output boards, which can be added at any time.

- **An Option 1 board** can plug into the display board. This can be a single 8A relay board, an isolated active or passive 4-20 mA analog output board, or an isolated Modbus compatible RS485 serial data output board.
- **An Option 2 board** can plug into the Option 1 board if installed. This is another single 8A relay board. For example, this board allows an L40 to have and analog output and a relay output, or to have two relay outputs.



Easily accessible electronics

Specifications

DC Voltage & Current

Range	Resolution	Input Resistance	Max Signal	Accuracy
±60.0 mVdc	0.1 mV	1 MΩ	1000 mVdc	< 0.25% FS
±200.0 mVdc	0.1 mV	10 kΩ	1000 mVdc	< 0.20% FS
±2.000 Vdc	1 mV	100 kΩ	10 Vdc	< 0.20% FS
±20.00 Vdc	0.01V	1 MΩ	100 Vdc	< 0.20% FS
±200.0 Vdc	0.1 V	12 MΩ	400 Vdc	< 0.20% FS
±400 Vdc	1 V	12 MΩ	600 Vdc	< 0.25% FS
±20.00 mAdc	0.01 mA	4.7 mΩ	1000 mAdc	< 0.15% FS
±5.00 Adc	10 mA	20 mΩ	7 Adc max, 7 sec	< 0.25% FS

AC RMS Voltage & Current

Range	Resolution	Input Resistance	Max Signal	Accuracy
60.0 mVac	0.1 mV	1 MΩ	1000 mVac	< 0.3% FS
200.0 mVac	0.1 mV	10 kΩ	1000 mVac	< 0.3% FS
2.000 Vac	1 mV	100 kΩ	10 Vac	< 0.3% FS
20.00 Vac	0.01V	1 MΩ	100 Vac	< 0.3% FS
200.0 Vac	0.1 V	12 MΩ	400 Vac	< 0.3% FS
400 Vac	1 V	12 MΩ	600 Vac	< 0.3% FS
20.00 mAac	0.01 mA	4.7 mΩ	25 mAac	< 0.5% FS
5.00 Aac	10 mA	20 mΩ	7 Aac max, 7 sec	< 0.5% FS

Process Signals

Range	Scaling	Input Resistance	Max Signal	Accuracy
4-20 mAdc	-1999 to 9999	4.7 mΩ	1000 mA	< 0.15% FS
0-10 Vdc	-1999 to 9999	1 MΩ	100 Vdc	< 0.20% FS

Thermocouple Temperature Probes

TC Type	Range °C	Range °F	Accuracy
Type K	-100 to 1350°C	-148 to 2462°F	< 3°C
Type J	-100 to 1200°C	-148 to 2192°F	< 3°C
Type E	-100 to 1000°C	-148 to 1832°F	< 3°C
Type N	-200 to 1300°C	-328 to 2372°F	< 3°C
Type L	-100 to 900°C	-148 to 1652°F	< 3°C
Type C	0 to 2300°C	32 to 4172°F	< 5°C
Type R	0 to 1768°C	32 to 3214°F	< 3°C
Type S	0 to 1768°C	32 to 3214°F	< 3°C
Type B	700 to 1828°C	1292 to 3322°F	< 5°C
Type T	-100 to 400°C	-148 to 752°F	< 3°C

Pt and Ni RTD Temperature Probes

RTD Type	Range °C	Range °F	Accuracy
Pt100	-200 to 700°C	-328 to 1292°F	< 1°C
Pt500	-150 to 630°C	-238 to 1166°F	< 1°C
Pt1000	-190 to 630°C	-310 to 1166°F	< 1°C
Ni100	-60 to 180°C	-76 to 356°F	< 1°C
Ni200	-60 to 120°C	-76 to 248°F	< 1°C
Ni1000	-60 to 180°C	-76 to 356°F	< 1°C

NTC Thermistors (negative temperature coefficient)

R25 Values	Beta Values	Resolution	Accuracy
100Ω to 100.00 kΩ	2000 to 5500	1° or 0.1°, °C or °F	< 1.5% of resistance

PTC Thermistors (positive temperature coefficient)

Main Series	Range °C	Range °F	Accuracy
KTY-121	-55 to 150°C	-67 to 302°F	< 1°C
KTY-210, KTY-220	-55 to 150°C	-67 to 302°F	< 1°C

Resistance

Range	Resolution	Bias Current	Accuracy
0 to 5.000 kΩ	1 Ω	926 to 64 µA	< 0.5% FS
0 to 50.00 kΩ	10 Ω	86 to 20 µA	< 0.5% FS

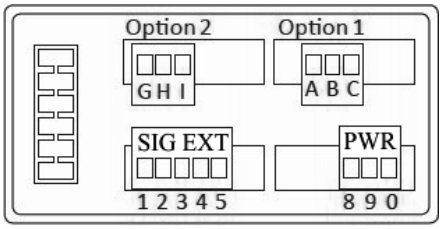
Potentiometer

Potentiometer Range	Default Scaling	Resistance	Accuracy
50Ω to 100.00 kΩ	0 to 100.0 Ω	200 Ω to 50 kΩ	< 0.5% FS

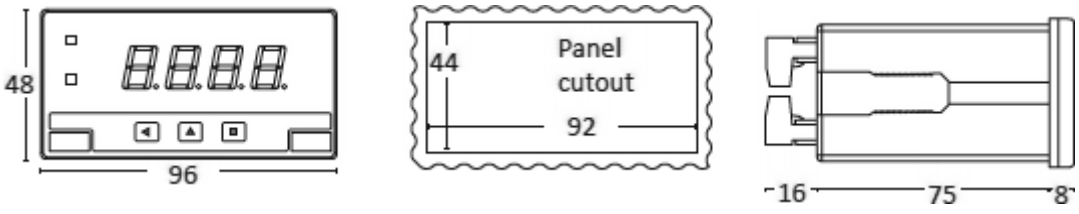
Applicable to All Signal Types

Display	
Digital readout	4 red LED digits, 7-segment, 14.2 mm (.56") digit height, 5 brightness levels
Display range	-1999 to 9999
Update time	300 msec
Sensor break indication	Display of "h.ovr" for overrange, "h.udr" for underrange
Indicator lamps	2 red LED alarm indicators
Power	
Universal voltage	18 to 265 Vac/dc
Power consumption	< 1.5W meter only, < 2.5W meter with options
Isolation	2500 Veff
Analog Output (1AOT option)	
Output level	4-20 mA, active or passive (selectable at connector)
Maximum load	350 Ω active, 700 Ω passive
Scaling	Zero and full scale adjustable from -1999 to +9999 counts
Accuracy	< 0.5% FS
Update time	400 ms
Isolation	1000 Vdc
Relay Outputs (1RL option for slot 1 or 2RL option for slot 2)	
Relay type	Single 3-contact relay (NC, NO, common)
Current rating	8A at 250 Vac
Isolation	2500 Vrmd
RS485 (1RS485 option for slot 1)	
Protocol	Modbus RTU
Programmable addresses	1-247
Supported function code	4 = "read the register"
Data rates	9600 or 4800 baud
Isolation	1000 Vdc
Environmental	
Operating temperature	0°C to 50°C
Storage temperature	-20°C to 70°C

Signal Connections



Dimensions



Ordering Guide

Create a model number with line items separated by commas: **L40, 1RL, IPC**.
Describe FS option separately.

Base Meter	
L40	Digital panel meter for 65 user-selectable analog signal types and ranges. Includes power from 18-265 Vac/dc. Without FS option, shipped with factory default settings of 0-400 Vac, display of 0-400.
Custom Setup by Vendor	
FS	Jumper settings and front panel programming done by vendor as a service. Specify the signal type and range. For DC, AC, process and resistance signals which require scaling, specify min input, min reading, and max input, max reading. For temperature, specify 1° or 0.1° resolution and °C or °F. For NTC thermistors, specify R25 and beta.
Slot 1 Option Board. Maximum of one. Shipped installed in meter.	
RL1 **AOT** **RS485**	Single 8A relay Isolated, scalable 4-20 mA analog output Isolated RS485 output, Modbus RTU
Slot 2 Option Board. Maximum of one. Requires slot 1 option board. Shipped installed in meter.	
RL2	Single 8A relay
Add-on Options & Accessories	
NL **BL** **IPC** **BOX1** **BOX2** **CASE1** **CASE3**	Front panel with button pads but no Laurel logo. Front panel without button pads or Laurel logo. Front panel cover, seals front of meter to NEMA 4X. Wall mount polycarbonate enclosure sealed to NEMA 4X. Wall mount polycarbonate enclosure sealed to NEMA 4X, plus IPC cover. Benchtop laboratory case for one 1/8 DIN meter. Benchtop laboratory case for two 1/8 DIN meters.