

Analog Meters

LS110 / LS80

Switchboard meters
for AC and DC applications



- LS110 is 4.5" square switchboard case
- LS80 is 3.25" square switchboard case
- All AC moving coil rectifier ammeter and voltmeters are $\pm 1\%$ accurate
- DC moving coil ammeters and voltmeters are $\pm 1\%$ accurate
- All Frequency meters are $\pm 0.15\text{Hz}$ (50Hz & 60Hz) accurate
- All meters are $\pm 1\%$ accurate
- CT Burden on all Ammeters and Power Meters <0.5VA maximum
- Easy-to-read long-scale (250° deflection)
- "Finger Safe" terminals standard
- Rectifier type or moving coil type meters
- Meets ANSI C39.1 Standard
- NEMA 12 (IP 55/65);
NEMA 4 and 4X (IP 66) available
- Custom artwork and customer logos available
- Colored dial segments available
- LED back lighting (Consult factory)
- Panel gaskets available
- Traceable calibration
- UL Listed (File E483274)

ELECTRICAL SPECIFICATIONS

MODEL TYPES AVAILABLE

AC Ammeters	DC Ammeters
AC Voltmeters	DC Voltmeters
AC Frequency Meters	DC Indicators
Kilowatt Meters (1Ph / 3 Ph)	
Kilovar Meters (1 Ph / 3 Ph)	Phase Sequence Meter
Power Factor (1 Ph / 3 Ph)	LED Synchroscope
Synchroscope (1 Ph / 3 Ph)	

INPUTS

AC Ammeters	0-5A 10A 25A,AC
AC Voltmeters	0-69V 150V 300V 500V 600V 750V,AC
Frequency Meters	45-55HZ 55-65HZ 45-65HZ 360-440HZ
DC Ammeters	0-50mV 100mV +/-50mV +/-100mV,DC 0-5A 10A 25A 50A,DC
DC Voltmeters	0-30V 150V 300V 500V 800V 1000V,DC
DC Indicators	0-1mA 4-20mA,DC

ACCURACY

AC Volts / Amps	$\pm 1\%$
Frequency	$\pm 0.15\text{Hz}$ (50Hz & 60Hz)
DC Volts / Amps	$\pm 1\%$
Power Meters	$\pm 1\%$

OVERLOAD

AC Volts / Amps	50% Momentary / 20% Prolonged
DC Volts / Amps	50% Momentary / 20% Prolonged
Frequency	20% Maximum
Power Meters	20% Maximum

BURDEN

AC Ammeters	<0.5VA
AC Voltmeter	0.5VA
Frequency (55/65Hz)	1.0VA
Power Meters – I / V	<0.5VA / 1.4VA

ENVIRONMENTAL

Operating Temperature	+14°F to +140°F (-10°C to +60°C)
Storage Temperature	-22°F to +158°F (-30°C to +70°C)
Humidity	5-95% (non-condensing) at 104°F (40°C)
Vibration	8-100Hz, 0.2G, 3 Axis
Shock	5G, 7millisecond, 3 Axis
Enclosure	NEMA 12

CONSTRUCTION

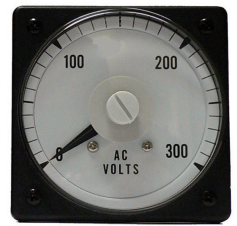
Scale Length	LS110:250° 183mm LS80: 250° 140mm
Case Construction	Cover: Acrylic Resin Case: Polycarbonate
Mounting	4 Stud
Pointer	Black Sword Style

OPTIONS

Enclosure	NEMA 4 Panel Gasket
Illumination	24V,DC Red LED Backlighting (dimmable – CF)

LS110

4.5" Switchboard meter
for AC and DC applications



LS110 STANDARD PART NUMBERS

AC VOLTMETERS (4.5")

Model	Input	Scale
LS110150V150V	0-150V,AC	0-150V,AC
LS110300V300V	0-300V,AC	0-300V,AC
LS110600V600V	0-600V,AC	0-600V,AC
LS110150V600V	0-150V,AC	0-600V,AC
LS110150V*V	0-150V,AC	0-*V,AC

* = advise desired PT ratio / end scale value.

DC VOLTMETERS (4.5")

Model	Input	Scale
LS110DC30V30V	0-30V,DC	0-30V,DC
LS110DC100V100V	0-100V,DC	0-100V,DC
LS110DC150V150V	0-150V,DC	0-150V,DC
LS110DC150VU	150-0-150V,DC	150-0-150V,DC
LS110DC800V800V	0-800V,DC	0-800V,DC

AC AMMETERS (4.5")

Model	Input	Scale
LS1105A/10A**A	0-5A/10A,AC	0-**A,AC
LS1105A50A	0-5A,AC	0-50A,AC
LS1105A100A	0-5A,AC	0-100A,AC
LS1105A200A	0-5A,AC	0-200A,AC
LS1105A**A	0-5A,AC	0-*A,AC

** = advise desired CT ratio / end scale value.

DC AMMETERS (4.5")

Model	Input	Scale
LS110DC50MV50A	0-50mV,DC	0-50A,DC
LS110DC50MVU50A	50-0-50mV,DC	50-0-50A,DC
LS110DC50MV***A	0-50mV,DC	0-***A,DC

*** = advise desired Shunt ratio / end scale value.

FREQUENCY METERS (4.5")

Model	Input	Scale
LS110HZ55651	120V,AC	55-65 Hz
LS110HZ45651	120V,AC	45-65 Hz
LS110HZ45551	120V,AC	45-55 Hz
LS110HZ55652	240V,AC	55-65 Hz
LS110HZ45652	240V,AC	45-65 Hz
LS110HZ45552	240V,AC	45-55 Hz

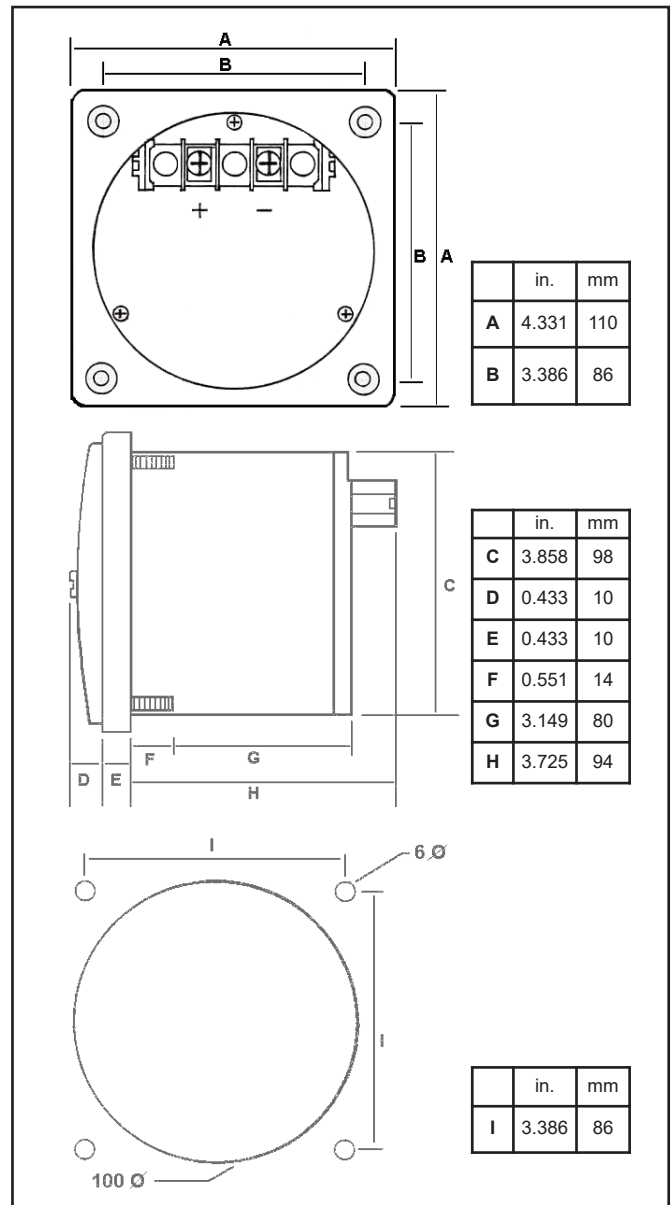
DC INDICATORS (4.5")

Model	Input	Scale
LS110DC1MA/****	0-1mA,DC	0-****
LS110DC420MA/****	4-20mA,DC	0-****
LS110DC****V/****	0-****V,DC	0-****

**** = advise desired end scale value and caption.

***** = advise desired end scale input voltage.

LS110 DIMENSIONS



LS110 STANDARD PART NUMBERS

KILOWATT METERS (4.5")

Model	System	Input	Scale	CT Ratio	PT Ratio
LS110KW12	1 Phase - 2 Wire (1EL)	120V - 5A,AC	Advise	Advise	Advise
LS110KW33	3 Phase - 3 Wire (2EL)	120V(L-L) - 5A,AC	Advise	Advise	Advise
LS110KW33480V5A	3 Phase - 3 Wire (2EL)	480V(L-L) - 5A,AC	Advise	Advise	Advise
LS110KW34	3 Phase - 4 Wire (2.5EL)	120V(L-N) - 5A,AC	Advise	Advise	Advise

KILOVAR METERS (4.5")

Model	System	Input	Scale	CT Ratio	PT Ratio
LS110KVAR12	1 Phase - 2 Wire (1EL)	120V - 5A,AC	Advise	Advise	Advise
LS110KVAR33	3 Phase - 3 Wire (2EL)	120V(L-L) - 5A,AC	Advise	Advise	Advise
LS110KVAR34	3 Phase - 4 Wire (2.5EL)	120V(L-N) - 5A,AC	Advise	Advise	Advise

POWER FACTOR METERS (4.5")

Model	System	Input	Scale
LS110PF12	1 Phase - 2 Wire	120V - 5A,AC	(0.5) lead - 1 - (0.5) lag
LS110PF33/4 (Bal Load)	3 Phase - 3/4 Wire	120V - 5A,AC	(0.5) lead - 1 - (0.5) lag

PHASE SEQUENCE / LOSS METERS (4.5")

Model	System	Input	Scale
LS110SEQ1	3 Phase	88 - 132V,AC	L1 - L2 - L3 and CORRECT - INCORRECT
LS110SEQ2	3 Phase	160 - 240V,AC	L1 - L2 - L3 and CORRECT - INCORRECT
LS110SEQ3	3 Phase	328 - 480V,AC	L1 - L2 - L3 and CORRECT - INCORRECT

SYNCHROSCOPE (4.5")

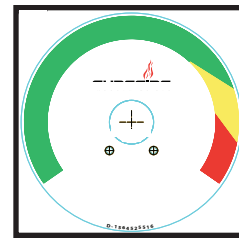
Model	System	Input	Scale
LS110SYNC12AB	1 Phase	120V,AC - 50/60Hz	Slow - Fast
LS110SYNC12C	1 Phase	120V,AC - 25Hz	Slow - Fast

LED SYNCHROSCOPE (4.5")

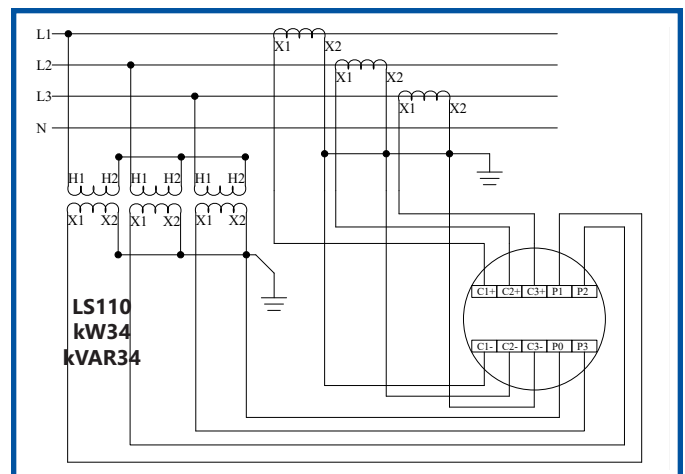
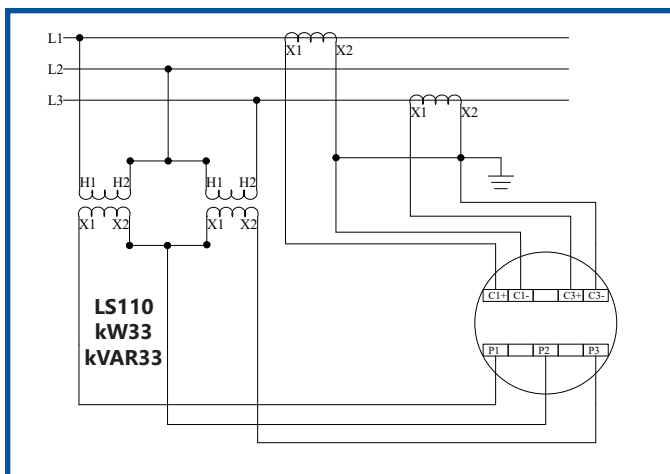
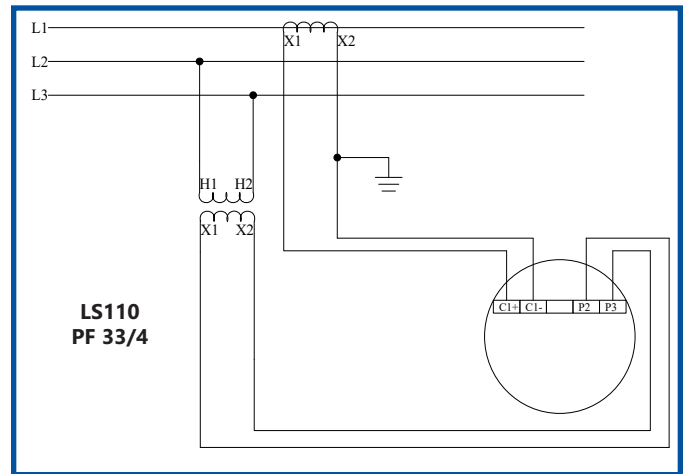
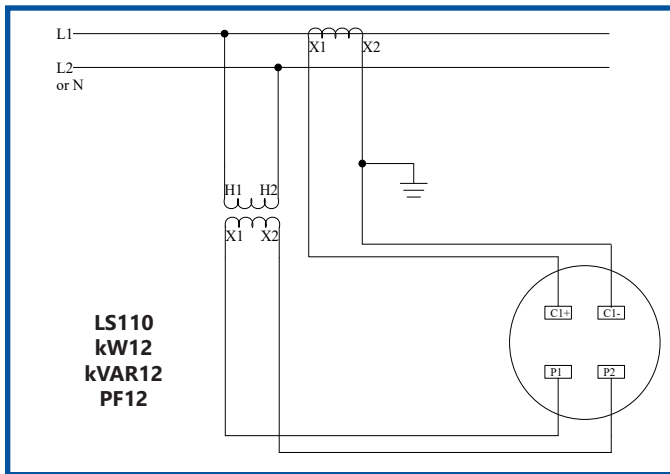
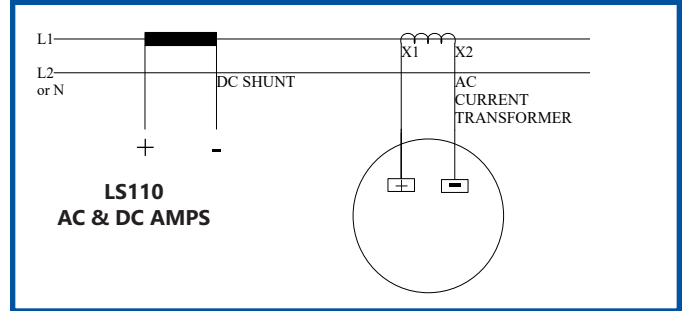
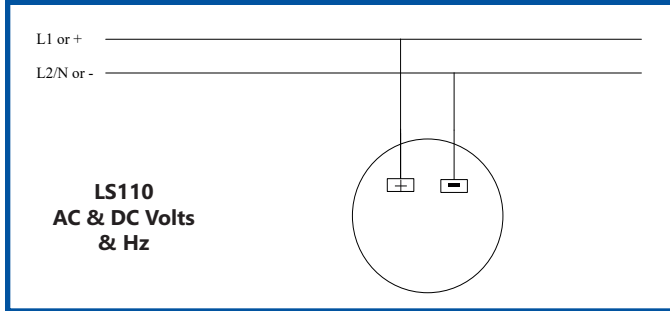
Model	System	Input (35-70HZ)	Scale
LS110SYNC1	1 Phase	108-132V,AC (120V,AC NOMINAL)	Slow - Fast and BUS - GEN - SYNC
LS110SYNC2	1 Phase	216-264V,AC (240V,AC NOMINAL)	Slow - Fast and BUS - GEN - SYNC
LS110SYNC3	1 Phase	100-121V,AC (110V,AC NOMINAL)	Slow - Fast and BUS - GEN - SYNC
LS110SYNC4	1 Phase	188-228V,AC (208V,AC NOMINAL)	Slow - Fast and BUS - GEN - SYNC



Custom artwork, logos and colored dial segments are available. See what an impact your design will make. Ask us to create a sample for you today!



LS110 WIRING DIAGRAMS



CT Reference Notes (IEC / ANSI)

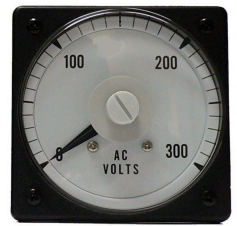
- K** = H1 (faces Source)
- L** = H2
- k** = X1 (white lead)
- I** = X2
(black lead, typically grounded)

PT Reference Notes (IEC / ANSI)

- U** = H1
- V** = H2
- u** = x1
- v** = x2

LS80

3.25" Switchboard meter
for AC and DC applications



LS80 STANDARD PART NUMBERS

MINI AC VOLTMETERS (3.25")

Model	Input	Scale
LS80150V150V	0-150V,AC	0-150V,AC
LS80300V300V	0-300V,AC	0-300V,AC
LS80600V600V	0-600V,AC	0-600V,AC
LS80150V600V	0-150V,AC	0-600V,AC
LS80150V*V	0-150V,AC	0-*V,AC

Note: Also available in moving coil rectifier type. Please consult with factory.
* = advise desired PT ratio / end scale value.

MINI DC VOLTMETERS (3.25")

Model	Input	Scale
LS80DC30V30V	0-30V,DC	0-30V,DC
LS80DC50V50V	0-50V,DC	0-50V,DC
LS80DC100V100V	0-100V,DC	0-100V,DC
LS80DC150V150V	0-150V,DC	0-150V,DC
LS80DC300V300V	0-300V,DC	0-300V,DC

MINI AC AMMETERS (3.25")

Model	Input	Scale
LS805A50A	0-5A,AC	0-50A,AC
LS805A100A	0-5A,AC	0-100A,AC
LS805A200A	0-5A,AC	0-200A,AC
LS805A**A	0-5A,AC	0-*A,AC

** = advise desired CT ratio / end scale value.

MINI DC AMMETERS (3.25")

Model	Input	Scale
LS80DC50MV50A	0-50mV,DC	0-50A,DC
LS80DC50MV100A	0-50mV,DC	0-100A,DC
LS80DC50MV***A	0-50mV,DC	0-***A,DC

*** = advise desired Shunt ratio / end scale value.

MINI FREQUENCY METERS (3.25")

Model	Input	Scale
LS80HZ55651	120V,AC	55-65 Hz
LS80HZ45651	120V,AC	45-65 Hz
LS80HZ45551	120V,AC	45-55 Hz
LS80HZ55652	240V,AC	55-65 Hz
LS80HZ45652	240V,AC	45-65 Hz
LS80HZ45552	240V,AC	45-55 Hz

MINI DC INDICATORS (3.25")

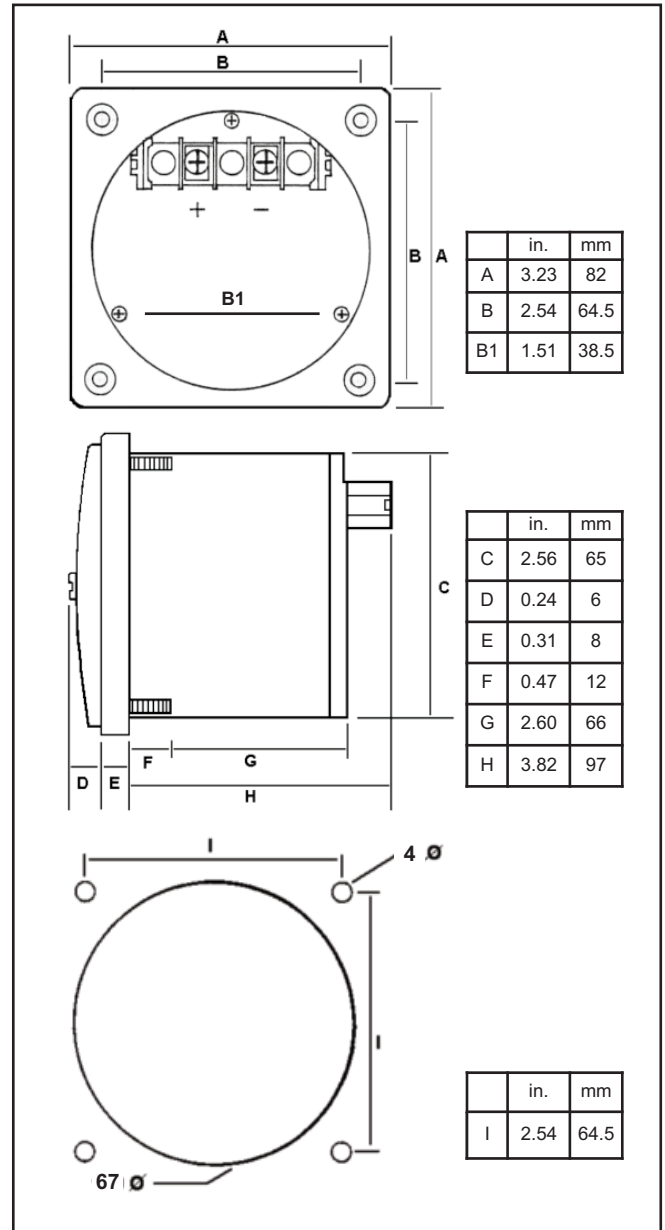
Model	Input	Scale
LS80DC1MA/****	0-1mA,DC	0-****
LS80DC420MA/****	4-20mA,DC	0-****
LS80DC****V/****	0-****V,DC	0-****

**** = advise desired end scale value and caption.

***** = advise desired end scale input voltage.

LS80 DIMENSIONS

See following page for PF, kW and kVAR dimensions



MINI KILOWATT METERS (3.25") includes transducer

Model	System	Input	Scale	CT Ratio	PT Ratio
LS80KW12	1 Phase - 2 Wire (1EL)	120V - 5A,AC	Advise	Advise	Advise
LS80KW33	3 Phase - 3 Wire (2EL)	120V(L-L) - 5A,AC	Advise	Advise	Advise
LS80KW34	3 Phase - 4 Wire (2.5EL)	120V(L-N) - 5A,AC	Advise	Advise	Advise

MINI KILOVAR METERS (3.25") includes transducer

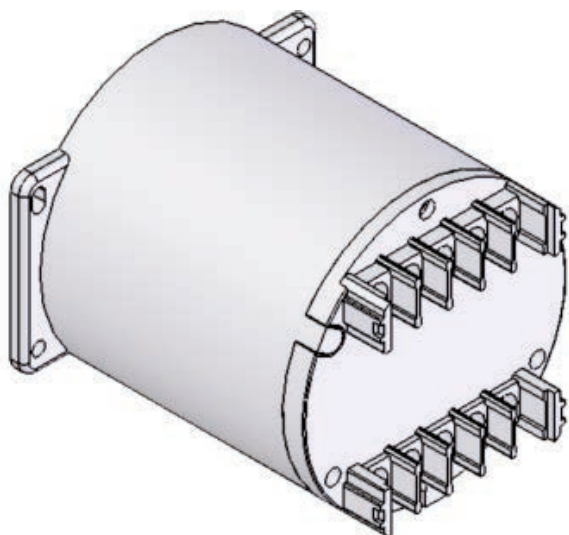
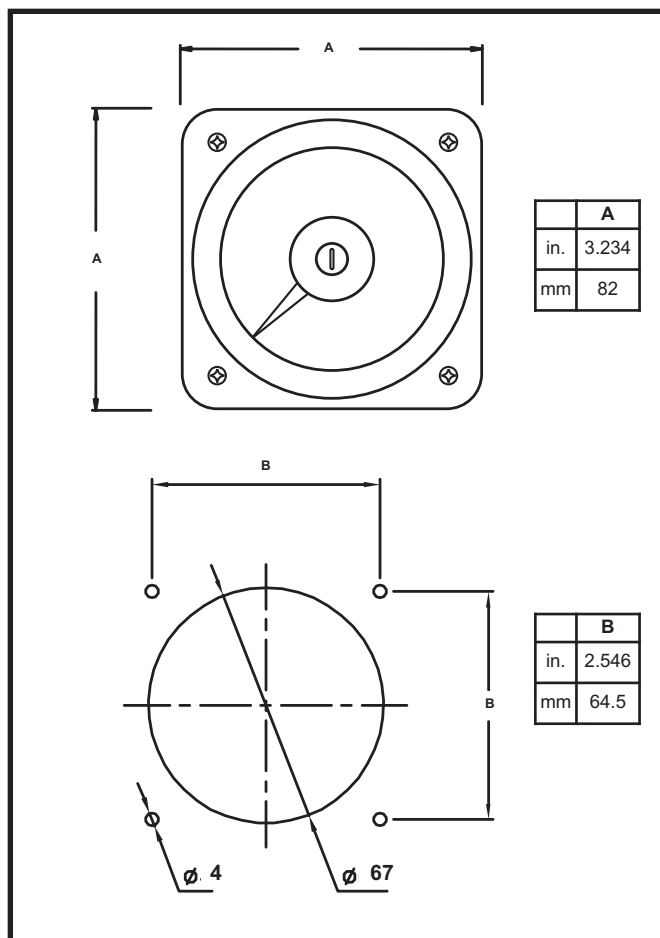
Model	System	Input	Scale	CT Ratio	PT Ratio
LS80KVAR12	1 Phase - 2 Wire (1EL)	120V - 5A,AC	Advise	Advise	Advise
LS80KVAR33	3 Phase - 3 Wire (2EL)	120V(L-L) - 5A,AC	Advise	Advise	Advise
LS80KVAR34	3 Phase - 4 Wire (2.5EL)	120V(L-N) - 5A,AC	Advise	Advise	Advise

MINI POWER FACT METERS (3.25") includes transducer

Model	System	Input	Scale
LS80PF12	1 Phase - 2 Wire	120V - 5A,AC	(0.5) lead - 1 - (0.5) lag
LS80PF33/4 (Bal Load)	3 Phase - 3/4 Wire	120V - 5A,AC	(0.5) lead - 1 - (0.5) lag

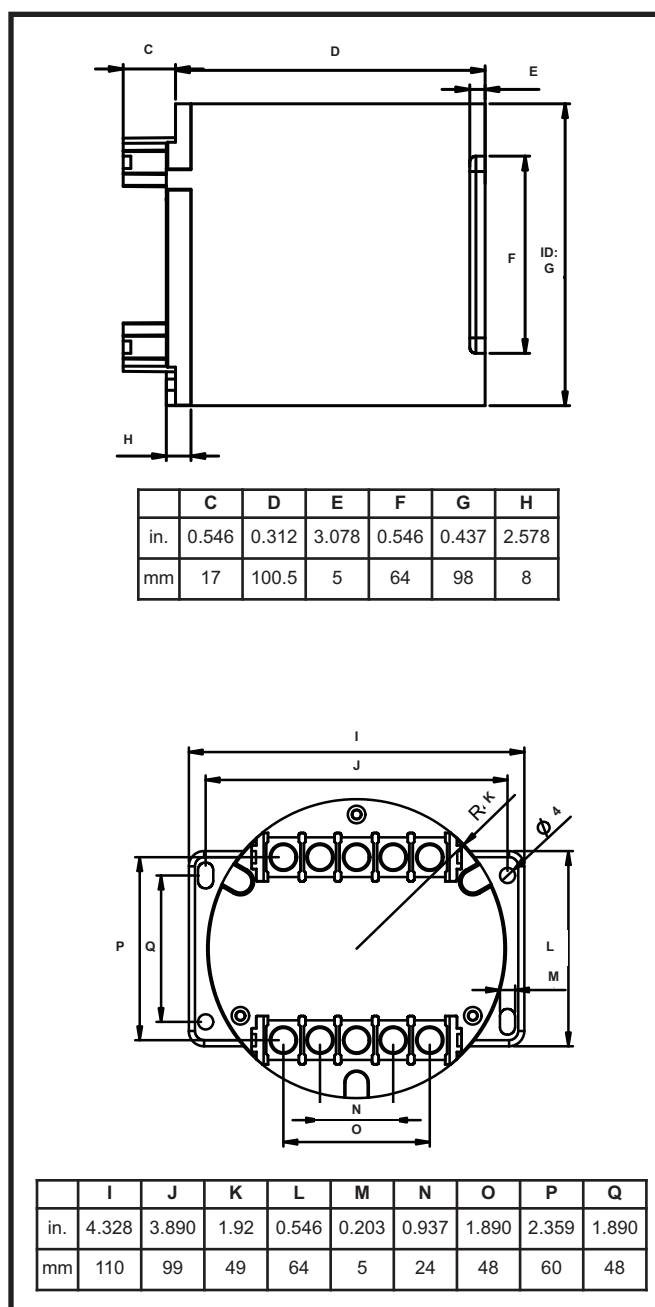
LS80 DIMENSIONS AND CUTOUT FOR PF, kW AND kVAR

PF, kW and kVAR METER

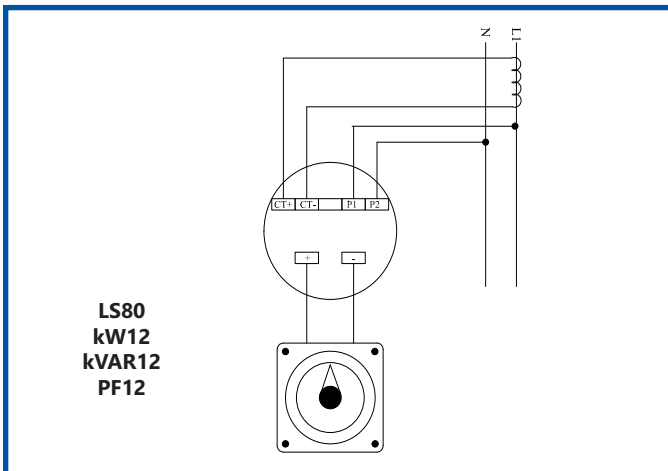
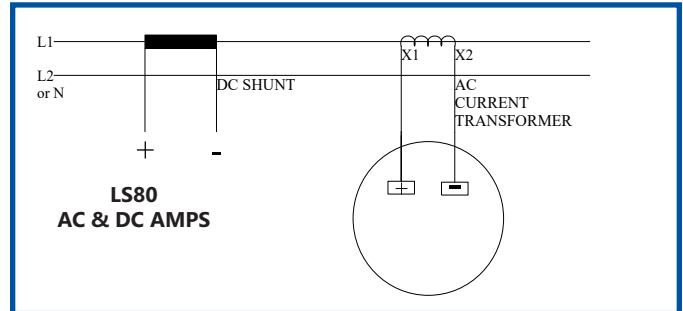
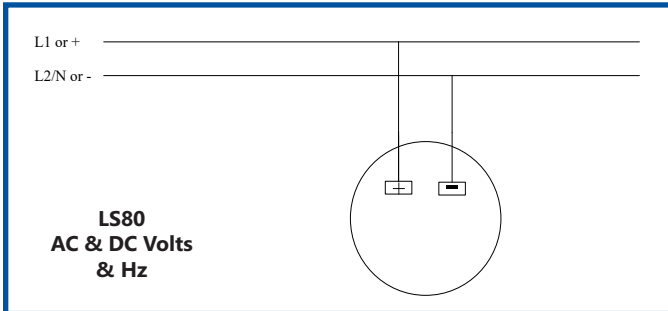


PF, kW and kVAR TRANSDUCER

External transducer - Required with all LS80kW, kVAR and PF Meters



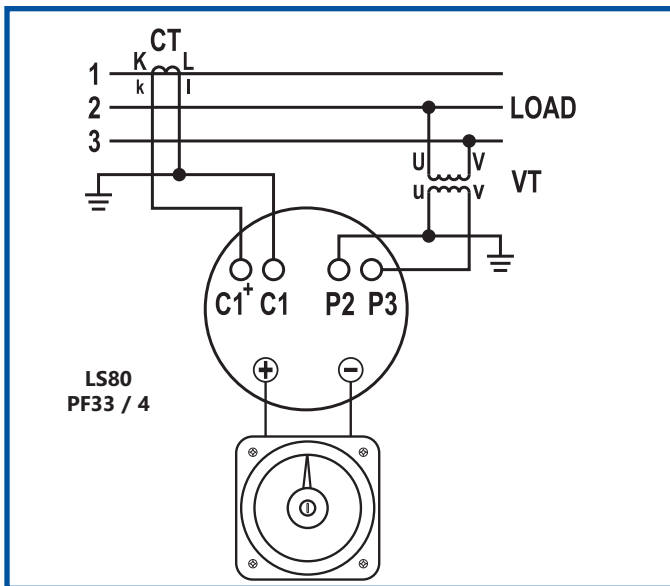
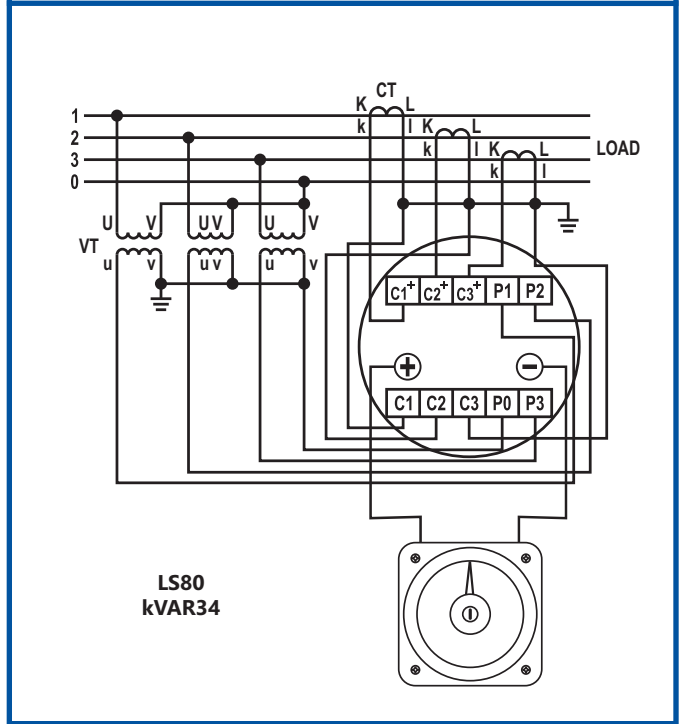
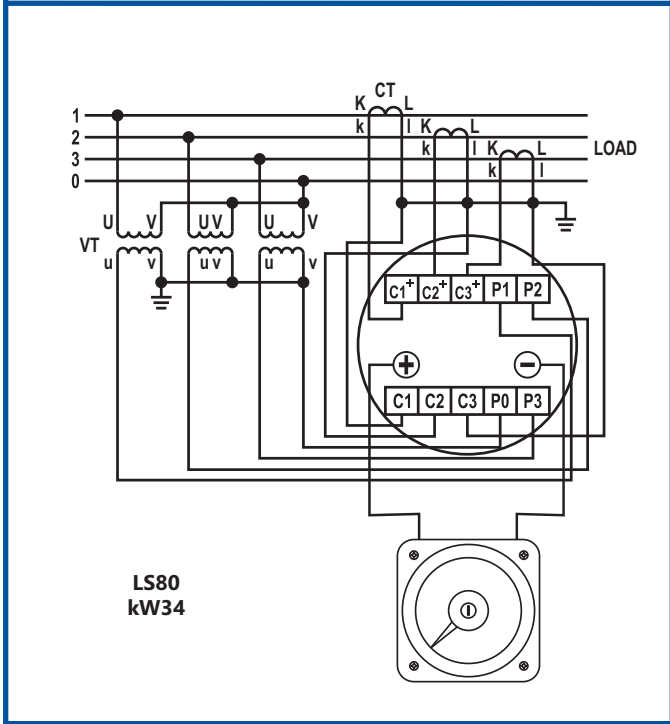
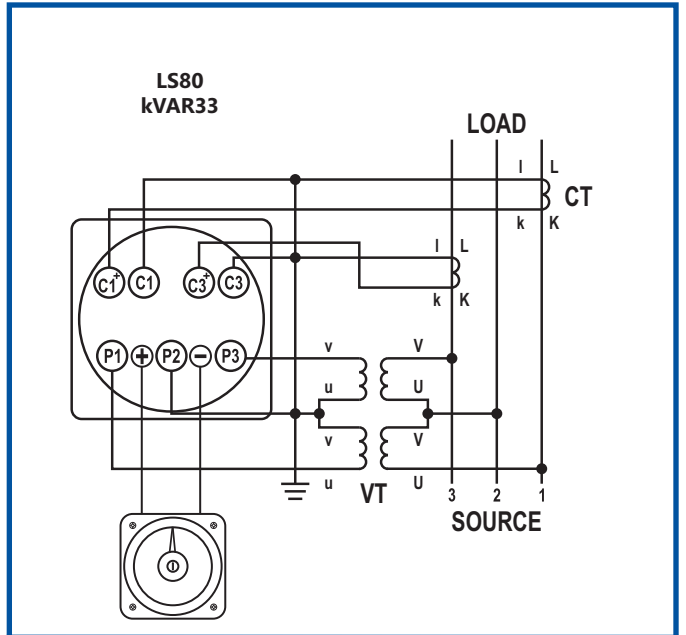
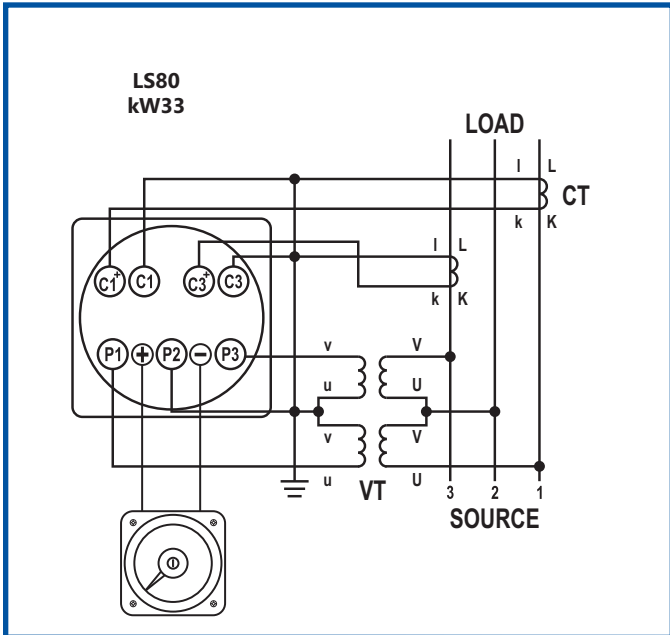
LS80 WIRING DIAGRAMS



The LS110 and the LS80 analog switchboard meter should be YOUR choice! Here's why:

- Volts, Amps, Watts, Vars, Speed, Frequency and Power Factor meters available
- Recommended for use on electric utility switchboards and industrial process control panels
- Complies with ANSI standard C39.1 for 1% class switchboard instruments
- Suitable for commercial, marine and industrial applications subjected to humid conditions
- High-Shock designs available for military requirements
- High overload capacity
- Rugged and durable construction
- Reliable and performance driven
- Offers special scales and calibration builds for your non-standard ranges
- Easy to read, attractive scale designs
- Weathertight construction is ideal for adverse conditions
- UL / CSA approved





CT Reference Notes (IEC / ANSI)

- K = H1 (faces Source)
- L = H2
- k = X1 (white lead)
- I = X2 (black lead, typically grounded)

PT Reference Notes (IEC / ANSI)

- U = H1
- V = H2
- u = x1
- v = x2

LS110SYNC

LED Synchroscope, 4.5" Switchboard

Theory of Operation

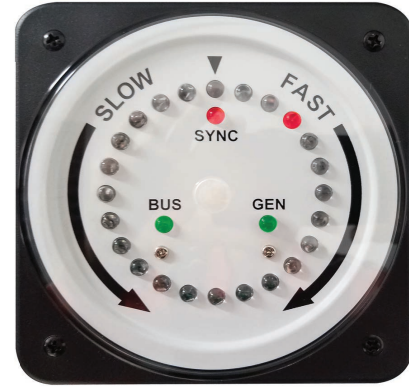
Initially, SYNC, BUS and GEN LED's are lit Red and the outer ring will show a single Red traveling LED. When voltage and phase angle are unmatched the outer ring LED rotates according to the system phase difference.

When the BUS voltage is at +/-10% of nominal system voltage, the BUS LED will change from Red to Green signifying proper BUS voltage has been established. When the GEN voltage is at +/-10% of nominal system voltage the GEN LED will change from Red to Green signifying proper GEN voltage has been established.

Once the BUS and GEN voltages are at their proper values, and the system has come into phase, the outer ring LED will stop rotating at the 12 o'clock position and change from Red to Green.

Finally, once all system voltages match and the systems are synchronized, the SYNC LED will change from Red to Green. All LED's are now Green when the systems are synchronized.

- Standard 4.5" switchboard case
- Front panel mount
- 120V,AC or 240V,AC input voltages
- 3 BiColor LED indicators for "SYNC", "GEN" and "BUS"
- 24 LEDs display the phase angle between 2 networks with 360° LED indication
- 12 o'clock LED is BiColor
- BiColor "SYNC" LED is only activated if both network voltages are within the set limits
- Customer logos and custom artwork available on dialface
- Available options include panel gaskets and traceable calibration
- UL Recognized (File E483274)



Note: Display above shows BUS and Gen at proper voltage levels and system not synchronized.

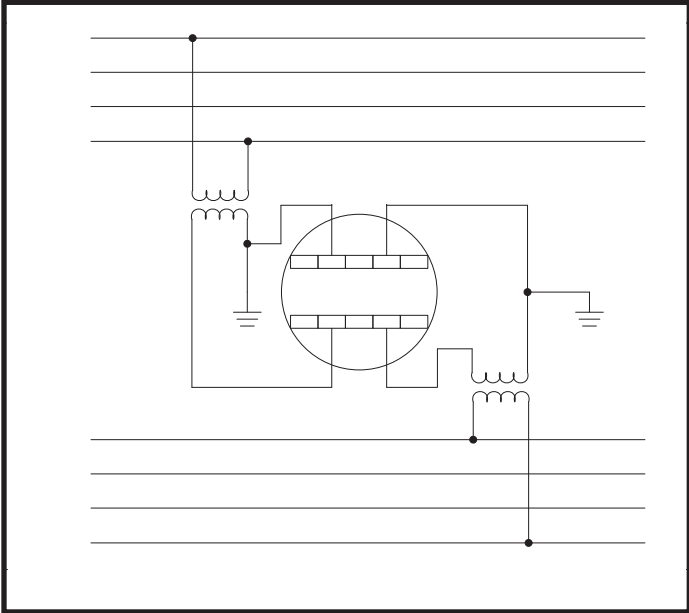
SPECIFICATIONS		
Nominal Input Voltage	120V,AC	240V,AC
Overload	1.25 x Nominal	
Frequency Range	35 ~ 70Hz	
Scale	SLOW / FAST	
Pointer LED	15 degrees/LED	
BUS LED (BiColor)	Green: 108V-132V,AC	Green: 216V-264V,AC
	Red: <108V / >132V,AC	Red: <216V / >264V,AC
GEN LED (BiColor)	Green: 108V-132V,AC	Green: 216V-264V,AC
	Red: <108V / >132V,AC	Red: <216V / >264V,AC
SYNC LED (BiColor)	Green: BUS + GEN are synchronized	Green: BUS + GEN are synchronized
	Red: BUS and GEN are not synchronized	Red: BUS and GEN are not synchronized

LS110SYNC ORDERING INFORMATION

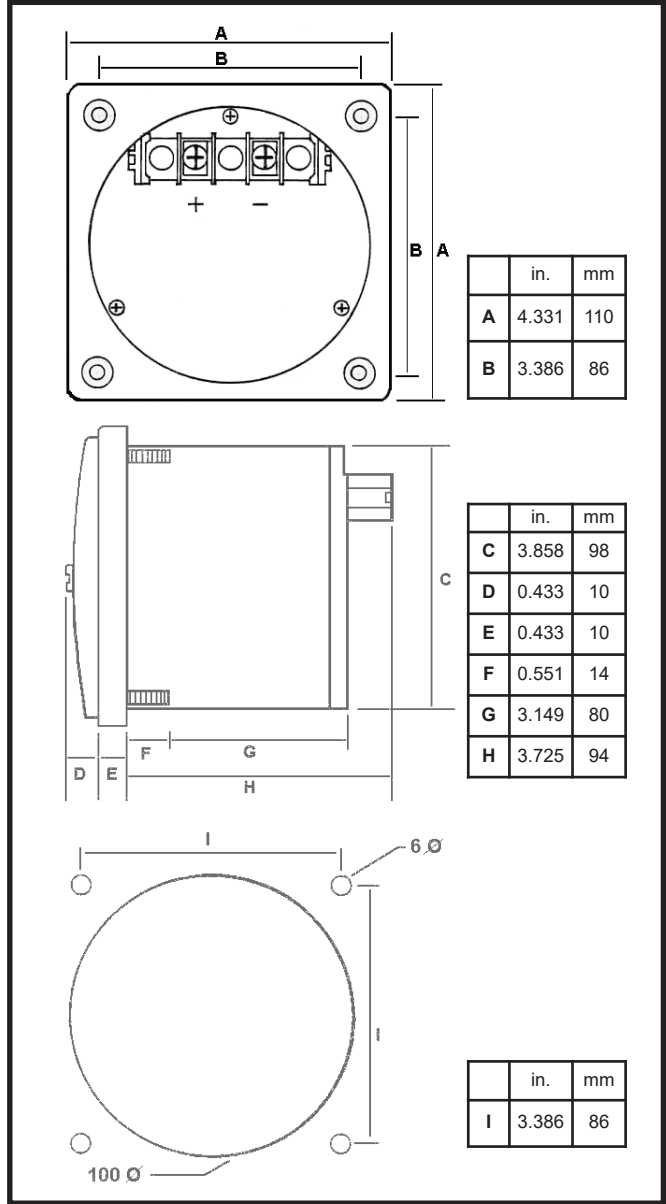
Part Number	System	Input Nominal (Voltage Range)	Scale
LS110SYNC1	1 Phase	120V,AC Nominal (>108V <132V)	Slow-Fast + BUS - GEN - SYNC
LS110SYNC2	1 Phase	240V,AC Nominal (>216V <264V)	Slow-Fast + BUS - GEN - SYNC
LS110SYNC3	1 Phase	110V,AC Nominal (>100V <121V)	Slow-Fast + BUS - GEN - SYNC
LS110SYNC4	1 Phase	208V,AC Nominal (>188V <228V)	Slow-Fast + BUS - GEN - SYNC



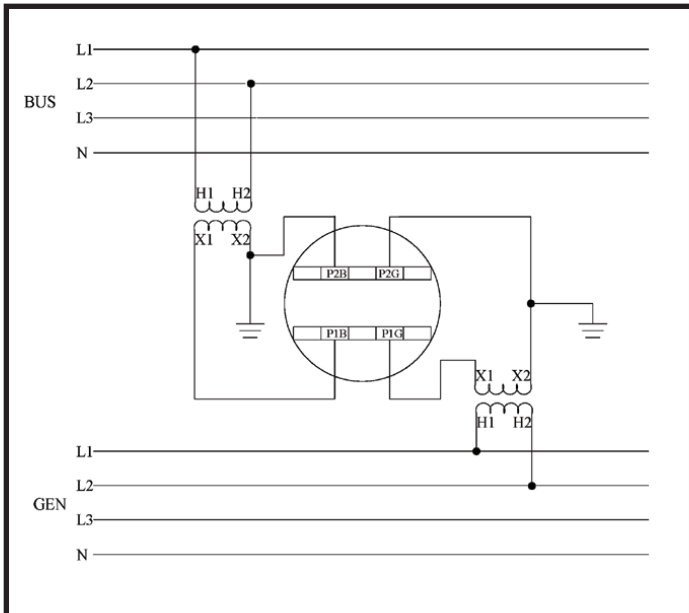
LS110SYNC WIRING



LS110 DIMENSIONS AND CUTOUT



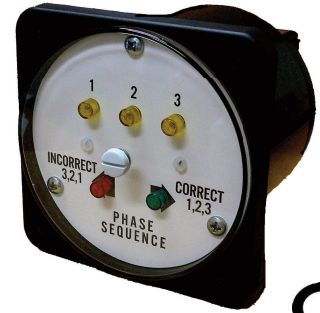
Alternate Wiring



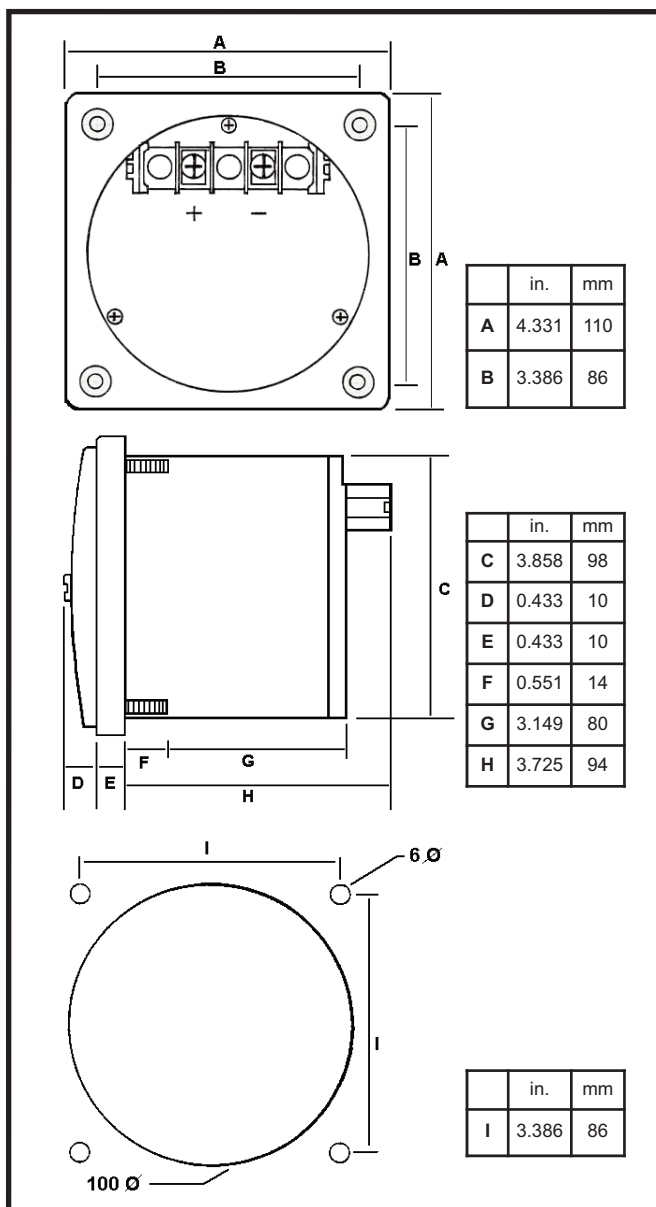
LS110SEQ

Phase Sequence / Loss Meter,
4.5" Switchboard

- Standard 4.5" switchboard case
- Front panel mount
- 3 LED indicators for L1, L2 and L3
- 2 LED indicators for correct (1-2-3) and incorrect (3-2-1)
- Customer logos and custom artwork available on dialface
- Available options include panel gaskets and traceable calibration

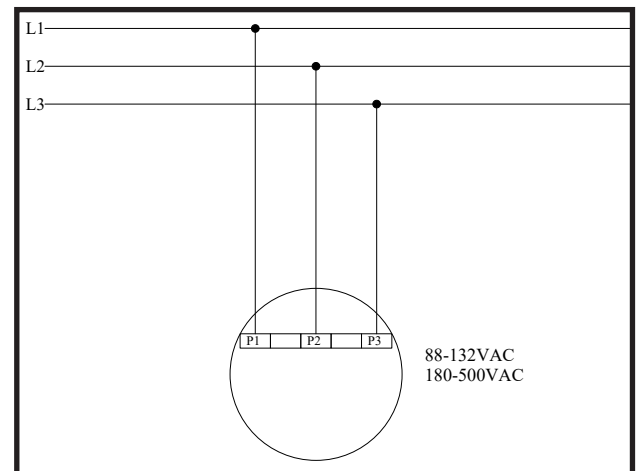


LS110 DIMENSIONS AND CUTOUT



Input Voltage	88-132V,AC or 160-240V,AC or 320-480V,AC
Overload	N/A
Frequency Range	35 ~ 70Hz
Scale	1-2-3+ Correct / Incorrect
Phase LED's (Amber)	>88V,AC (SEQ1) or >160V,AC (SEQ2) or >320V,AC (SEQ3)
Correct LED (Green)	Proper Phase Sequence
Incorrect LED (Red)	Improper Phase Sequence

LS110SEQ WIRING



LS110SEQ ORDERING INFORMATION

Part Number	System	Input	Scale
LS110SEQ1	3 Phase	88-132V,AC	L1-L2-L3 Correct-Incorrect
LS110SEQ2	3 Phase	160-240V,AC	L1-L2-L3 Correct-Incorrect
LS110SEQ3	3 Phase	320-480V,AC	L1-L2-L3 Correct-Incorrect



Why Make PC&S your Source for Power Equipment?

PC&S celebrated its 25th year of manufacturing and product distribution in 2014.

We supply quality instruments and components for the measurement and control of AC and DC power and transit systems. With over 25 direct employees, and a distribution and representation network of over 40 individuals, we are dedicated to the sales and support of our products. We are ISO 9001:2000 certified. PC&S is a customer-service oriented company that strives to meet customer requirements and exceeds expectations.

Our objective is to continuously improve on providing the electrical industry quality products for measurement, protection and control.

We offer solutions -- not just products -- and strive to offer our customer / partners the best value.

Smarter. Better. *FASTER.*



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