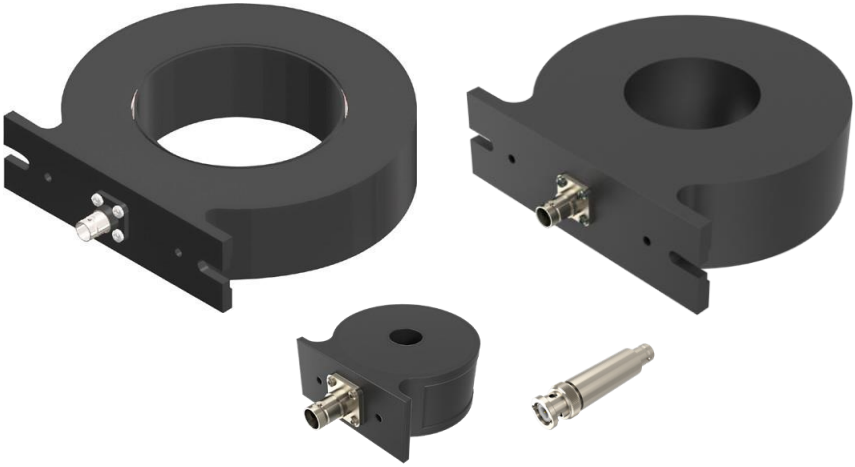
EN

PMK Probing Solutions. Made in Germany.



LILCO® Series

Precision Wide-Band AC Current Transformers

Up to 25 kA, up to 100MHz

Datasheet

About LILCO® Series Current Transformers

With bandwidths ranging from mHz to >60 MHz and input currents ranging from mA up to 25 kA, the LILCO® series of PMK's current transformers enables precision high bandwidth AC current measurements, which are required for a broad range of measurement applications. The current transformers are capable of accurately measuring large pulse or continuous input currents while electrical shielding between the input and output reduces the influence of electromagnetic fields on the output.

The BNC output of the LILCO® series current transformers makes it easy to connect to a variety of measurement devices, such as, oscilloscopes, digitizers, network analyzers, spectrum analyzer, power analyzers, DMM etc. with just a standard 50Ω coaxial cable.

Improved low frequency performance and increased I·t capability, as well as an attenuated output signal can be realized by changing the input termination of the measuring instrument. The LILCO® series attenuator ATT10BNCS is used to improve these specifications even more while maintaining the high frequency performance of the current transformer.

Measurement Principle

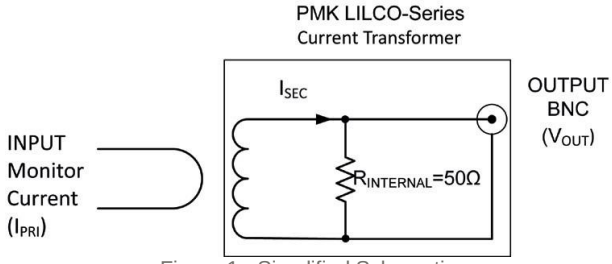


Figure 1 - Simplified Schematic

The measurement principle is the same as of power transformers. The current transformer has a primary and a secondary winding, and an alternating current flowing in the primary winding, I_{PRI}, induces an alternating current in the secondary winding, I_{SEC}. The secondary winding current, I_{SEC}, flows through the internal 50Ω impedance, $R_{INTERNAL}$, generating an output voltage, V_{OUT}, (Figure 1). This burden resistance, $R_{INTERNAL}$, in parallel with the BNC Output Termination, sets the L_{SEC}/ R_{BURDEN} time constant along with the secondary winding's inductance, L_{SEC}, to set the low frequency bandwidth cut-off point.

Galvanic isolation between input and output allows the LILCO® Series to be used in measurement setups with large potential differences or where unwanted currents between input and output appear like in ground loops.

The dedicated LILCO® Series Instruction Manual contains many valuable information about current transformer limitations in general, and about how making precise measurements, in one document only.

Scope of Delivery

- LILCO® Current Transformer
- Instruction Manual
- Factory Calibration Certificate

Specifications

Read the Instruction Manual before first use, and keep it for future reference. A digital copy of the latest Instruction Manual revision can be downloaded at www.pmk.de. Specifications not marked as guaranteed are typical. Allow the probe to warm up for 20 minutes. This probe comes with 2 years warranty.

Each specification is determined at +23 °C ambient temperature.

Electrical Specifications for 1 MΩ Termination

Improved low frequency performance, increased I·t capability and reduced lower frequency limit can be achieved by changing the input termination of your measuring instrument, see section "How to extend the LILCO® series performance".

- ### Electrical Specifications 13 series

The 13 series has 13mm inner diameter (0.5 inch).

Models	Output Sensitivity[1]	Time Domain						Frequency Domain			
		Max. Peak Current Ipeak	DC Saturation Current Isat [2]	Max. Droop	Rise Time (10% - 90%)	Max. I·t with DC Bias	Max. I·t	Max RMS Current Irms	Bandwidth LF (-3dB)	Bandwidth HF (-3dB)	Ipeak/f
	[V/A]	[A]	[A]	[%/ms]	[ns]	[mA·s]	[mA·s]	[A]	[Hz]	[MHz]	[A/Hz]
13W1000	1	500	0.25	12	7	7	4	7	30	60	0.02
13G1000	1	500	3	70	7	7	4	7	130	60	0.03
13E1000	1	500	22	880	7	4.5	2.5	7	1400	60	0.016
13W0500	0.5	1000	0.25	3	10	13	7	14	5	40	0.04
13G0500	0.5	1000	3	20	10	30	15	14	35	40	0.12
13E0500	0.5	1000	22	220	10	18	10	14	360	40	0.062
13W0200	0.2	2500	0.25	0.6	14	70	40	33	1	30	0.25
13G0200	0.2	2500	3	4	14	200	100	33	10	30	0.7
13E0200	0.2	2500	22	37	14	110	60	33	60	30	0.38
13W0100	0.1	5000	0.25	0.15	16	540	300	60	0.3	25	2
13G0100	0.1	5000	3	1	16	700	400	60	1.6	25	2.5
13E0100	0.1	5000	22	10	16	400	220	60	16	25	1.4
13W0050	0.05	10000	0.25	0.06	40	2200	1200	100	0.1	10	3
13G0050	0.05	10000	3	0.25	40	2200	1200	100	0.5	10	8
13E0050	0.05	10000	22	3.3	40	1200	660	100	5.3	10	4.1

Notes:

1. BNC Output Terminated into >50 kΩ, see Change in Specifications table in this manual. Warranted ±2 %*
2. The DC current level applied to the input signal when the transformer core starts to saturate and the LF 3 dB increases by a factor of two. (Droop factor has doubled)

* Over nominal climate conditions, for reduced bandwidth 10·LF-point to 1/10·HF.

• Electrical Specifications 58 Series, 89 Series

The 58 series has an inner diameter of 58 mm (2.2 inch), and the 89 series an inner diameter of 89 mm (3.5 inch).

Models	Output Sensitivity [1]	Time Domain						Frequency Domain			
		Max. Peak Current Ipeak	DC Saturation Current Isat [2]	Max. Droop	Rise Time (10% - 90%)	Max. I·t with DC Bias	Max. I·t	Max RMS Current Irms	Bandwidth LF (-3dB)	Bandwidth HF (-3dB)	Ipeak/f
	[V/A]	[A]	[A]	[%/ms]	[ns]	[mA·s]	[mA·s]	[A]	[Hz]	[MHz]	[A/Hz]
58M1000	1	500	2	25	14	18	10	12	40	30	0.06
58M0500	0.5	1000	2	9	20	70	40	20	15	20	0.2
58M0200	0.2	2500	2	2	20	360	200	50	4	20	1
58E0200	0.2	2500	55	25	20	360	200	50	40	20	1
58MH100	0.1	2500	2	0.6	20	700	400	100	1	20	2
58M0100	0.1	5000	2	0.3	40	1800	1000	100	0.5	10	6
58EH100	0.1	2500	55	12	20	700	400	100	20	20	2
58E0100	0.1	5000	55	6	40	1800	1000	100	10	10	6
58M0050	0.05	10000	2	0.1	80	6000	3400	200	0.15	5	20
58E0050	0.05	10000	55	1.5	80	6000	3400	200	2.5	5	20
58M0020	0.02	25000	2	0.04	200	20000	12000	500	0.06	2	70
58E0020	0.02	25000	55	0.5	200	20000	12000	500	0.8	2	70
58MH010	0.01	20000	2	0.025	80	24000	13000	400	0.04	5	85
58EH010	0.01	20000	55	0.38	80	24000	13000	400	0.5	5	85
89M0100	0.1	5000	5	0.33	40	2600	1400	100	0.5	10	9

Notes:

1. BNC Output Terminated into >50 kΩ, see Change in Specifications table in this manual. Warranted ±2 %. *
2. The DC current level applied to the input signal when the transformer core starts to saturate and the LF 3 dB increases by a factor of two. (Droop factor has doubled)

* Over nominal climate conditions, for reduced bandwidth 10·LF-point to 1/10·HF.

Environmental Specifications

Altitude	operating	up to 2000 m
	non-operating	up to 15000 m
Temperature Range	operating	0 °C to +50 °C
	non-operating	-40 °C to +71 °C
Maximum Relative Humidity	operating	80 % relative humidity for temperatures up to +31 °C, decreasing linearly to 40 % at +50 °C
	non-operating	95 % relative humidity for temperatures up to +40 °C

Probe Dimensions

The shown dimensions are in mm and [inch].

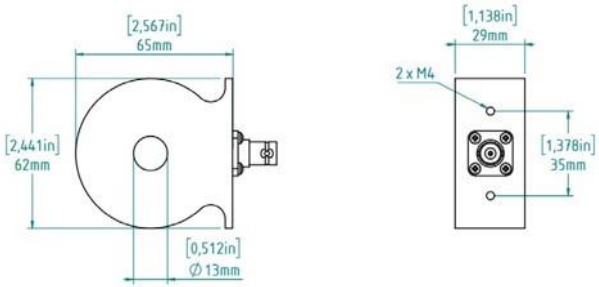


Figure 3 - PMK LILCO®-Series 13 Mechanical Dimensions

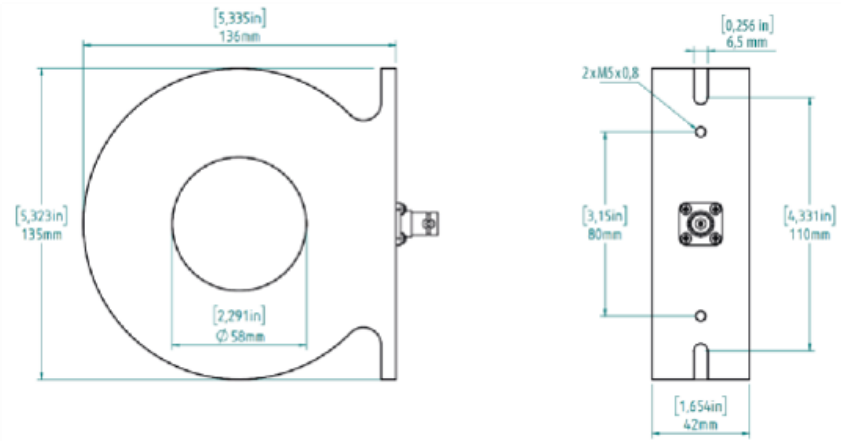


Figure 4 - PMK LILCO®-Series 58 Mechanical Dimensions

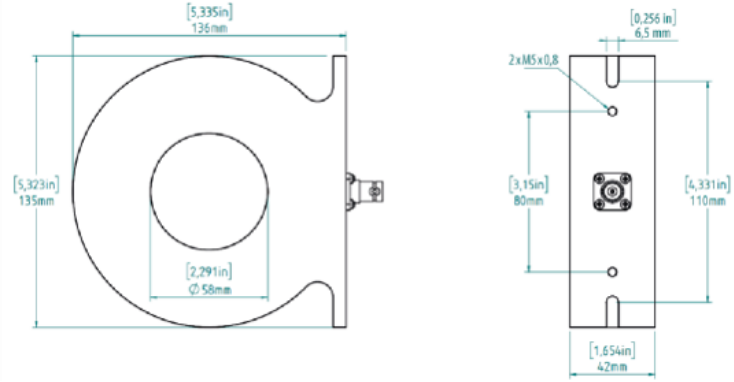


Figure 5 - PMK LILCO®-Series 89 Mechanical Dimensions

How to extend the LILCO® Series Performance

To extend the specifications of output sensitivity, lower bandwidth (LF, 3 dB BW) and droop from the Specifications can be achieved by changing the BNC output termination.

Tip! *Selecting the right termination provides the ability to optimize the performance to best adapt to a variety of applications.*

The overall I·t capability of the transformer increases when using 50Ω, or the attenuator ATT10BNCS.

LILCO® Output Connection	Change in Electrical Specification
1 MΩ (> 50 kΩ)	• None to Electrical Specification Table
50Ω	• Reduce LF bandwidth (3 dB cut-off) by factor 2 • Reduce droop by factor 2 • Reduce the output sensitivity by factor 2
Attenuator ATT10BNCS	• Reduce LF bandwidth (3 dB cut-off) by factor 10 • Reduce droop by factor 10 • Reduce the output sensitivity by factor 10

Note, the attenuator ATT10BNCS requires a measuring instrument with 1 MΩ input termination. The measurement device input termination is equal to the LILCO® output BNC termination.

Example: Model 13G1000 with 13 mm inner whole diameter

- 1 MΩ output termination (see Specification Table)
  - Output Sensitivity: 1 V/A
  - Droop: 880 %/ms (0.88 %/µs)
  - Bandwidth LF: 1400 Hz

- 50Ω termination

Reduces the output sensitivity by a factor of 2 while improving the low frequency performance by a factor of 2.

  - Output Sensitivity: 0.5 V/A
  - Droop: 440 %/ms (0.44 %/µs)
  - Bandwidth LF: 700 Hz

- Attenuator ATT10BNCS and 1 MΩ input termination of the measuring instrument

Reduces the output sensitivity by a factor of 10 while improving the low frequency performance by a factor of 10.

  - Output Sensitivity: 0.1 V/A
  - Droop: 88 %/ms (0.088 %/µs)
  - Bandwidth LF: 140 Hz

Optional Accessory: Attenuator LILCO® ATT10BNCS

Extend the LILCO® current transformer performance with the optional attenuator ATT10BNCS. The ATT10BNCS is for use with PMK's LILCO® current transformer series only.

Tip! *The ATT10BNCS reduces the LF bandwidth (3 dB cut-off) by factor 10, droop by factor 10 and the output sensitivity by factor 10 while preserving the high-frequency characteristics.*

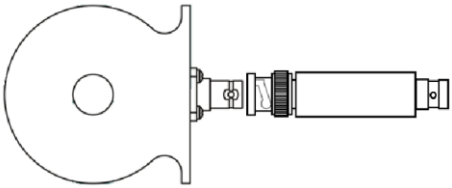


Figure 6 - ATT10BNCS connection to a LILCO® current transformer

The measurement device input termination should be set to 1 MΩ (>50 kΩ), otherwise with a 50Ω termination, the output sensitivity will be reduced by a factor of 20.

EN

Electrical Specifications for 1 MΩ Termination

Each specification is determined at +23 °C ambient temperature.

Attenuation Ratio	20 dB
Attenuation Tolerance	± 0.25 dB
Frequency Range	DC - 50 MHz
Output Impedance	50Ω ± 1 %
Maximum Input Power, RMS	2.25 W

Maximum Rated Input Peak Voltage, No Measurement Category, not in CAT II, III, IV ([1]):

Pollution Degree	2
No Measurement Category	100 V_{PEAK}

Mechanical Specifications

Dimensions (W x H x D)	approx. 97 mm x 35 mm x 29 mm
Weight	approx. 300 g