High Performance Current Transducer
ITL 900-T

For the electronic measurement of currents: DC, AC, pulsed..., with galvanic isolation between the primary circuit and the secondary circuit.

**Electrical data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{PN}$ Primary nominal rms current</td>
<td>400 A</td>
</tr>
<tr>
<td>$I_{PM}$ Primary current, measuring range</td>
<td>0 .. ± 900 A</td>
</tr>
<tr>
<td>$R_M$ Measuring resistance with ± 15 V</td>
<td>$R_{M\text{ min}}$ 5 Ω, $R_{M\text{ max}}$ 5 Ω</td>
</tr>
<tr>
<td>$I_S$ Secondary current</td>
<td>0 .. ± 600 mA</td>
</tr>
<tr>
<td>$I_{SN}$ Secondary nominal rms current</td>
<td>266.666 mA</td>
</tr>
<tr>
<td>$K_N$ Conversion ratio</td>
<td>1 : 1500</td>
</tr>
<tr>
<td>$U_C$ Supply voltage (± 5 %)</td>
<td>± 15 V</td>
</tr>
<tr>
<td>$I_C$ Current consumption</td>
<td>+ 15 V ≤ 280 + $I_S$ mA, - 15 V ≤ 45 + $I_S$ mA</td>
</tr>
</tbody>
</table>

**Accuracy - Dynamic performance data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\varepsilon_L$ Linearity error @ $T_A = 10 \degree C$ (50°F) ... 50 °C (122°F)</td>
<td>1 ppm</td>
</tr>
<tr>
<td>$I_{OE}$ Electrical offset current + self magnetization + effect of earth magnetic field</td>
<td>10 ppm</td>
</tr>
<tr>
<td>$I_{OM}$ Magnetic offset current in case of overload 3000 A @ $T_A = 25 \degree C$ (77°F) and $R_M = 5 \Omega$</td>
<td>20 ppm</td>
</tr>
<tr>
<td>$\Delta I_{OE}$ Offset stability (4 hours)</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>$T_{C_{OE}}$ Temperature coefficient of $I_{OE}$ (10 °C (50°F) ... 50 °C (122°F))</td>
<td>0.3 ppm/K</td>
</tr>
<tr>
<td>$\varepsilon_G$ Sensitivity error @ $T_A = 25 \degree C$ (77°F)</td>
<td>4 ppm</td>
</tr>
</tbody>
</table>

**General data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_A$ Ambient operating temperature</td>
<td>10 .. + 50 °C, 50 .. + 122 °F</td>
</tr>
<tr>
<td>$T_S$ Ambient storage temperature</td>
<td>- 20 .. + 85 °C, - 4 .. + 185 °F</td>
</tr>
<tr>
<td>$R_S$ Resistance of secondary winding @ $T_A = 50 \degree C$</td>
<td>13.1 Ω</td>
</tr>
<tr>
<td>$m$ Mass</td>
<td>1.5 kg</td>
</tr>
</tbody>
</table>

**Features**

- Closed loop (compensated) current transducer using an extremely accurate zero flux detector
- Electrostatic shield between primary and secondary circuit
- Can be synchronized with an external clock signal

**Advantages**

- Very high accuracy
- Excellent linearity
- Extremely low temperature drift
- Wide frequency bandwidth
- Negligible self-magnetization
- High immunity to external interference
- Current overload capability

**Applications**

- Feed back element in high performance gradient amplifiers for MRI
- Feed back element in precision current regulated devices

**Application domain**

- Industrial and Medical

**Notes**

1) With external synchronization signal
2) All ppm figures refer to secondary measuring range 600 mA.
Current Transducer ITL 900-T

Isolation characteristics

Between primary and secondary

\[ U_b \] Rated insulation rms voltage, reinforced or basic insulation 650 V
- with IEC 61010-1 standards and following conditions
- Over voltage category III
- Pollution degree 2
\[ U_d \] Rms voltage for AC insulation test, 50Hz, 1 min 5 kV
\[ U_W \] Impulse withstand voltage 1.2/50 µs 9.9 kV

\[ U_b \] Rated insulation rms voltage, reinforced or basic insulation with EN 50178 standards and following conditions
- Over voltage category III
- Pollution degree 2
\[ U_d \] Rms voltage for AC insulation test, 50 Hz, 1 min 5 kV
\[ U_W \] Impulse withstand voltage 1.2/50 µs 9.9 kV

\[ d_{cp} \] Creepage distance 11 mm
\[ d_{cl} \] Clearance 11 mm

CTI Comparative tracking index (Group I) 600 V

Between secondary and external synchronization SMA connector

\[ U_b \] Rated insulation rms voltage, reinforced or basic insulation 100 V
- with IEC 61010-1 & EN 50178 standards and following conditions
- Over voltage category III
- Pollution degree 2
\[ U_d \] Rms voltage for AC insulation test, 50 Hz, 1 min 1.4 kV
\[ U_W \] Impulse withstand voltage 1.2/50 µs 2.5 kV
\[ d_{cp} \] Creepage distance 1.5 mm
\[ d_{cl} \] Clearance 1.5 mm

Safety

⚠️ This transducer must be used in electric/electronic equipment with respect to applicable standards and safety requirements in accordance with the manufacturer’s operating instructions.

⚠️ Caution, risk of electrical shock

When operating the transducer, certain parts of the module can carry hazardous voltage (e.g., primary busbar, power supply).

Ignoring this warning can lead to injury and/or cause serious damage.

This transducer is a build-in device, whose conducting parts must be inaccessible after installation.

A protective housing or additional shield could be used.

Main supply must be able to be disconnected.
Current Transducer ITL 900-T

Output noise figures: @ 25° C / 77° F

Random noise rms:

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Noise (μA rms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.125 Hz - 1 Hz</td>
<td>&lt; 10 μA rms</td>
</tr>
<tr>
<td>1 Hz – 10 Hz</td>
<td>&lt; 15 μA rms</td>
</tr>
<tr>
<td>12.5 Hz – 45Hz</td>
<td>&lt; 15 μA rms</td>
</tr>
<tr>
<td>55 Hz – 100 Hz</td>
<td>&lt; 12 μA rms</td>
</tr>
<tr>
<td>95 Hz – 1 kHz</td>
<td>&lt; 15 μA rms</td>
</tr>
<tr>
<td>1 kHz – 10 kHz</td>
<td>&lt; 5 μA rms</td>
</tr>
<tr>
<td>10 kHz – 30 kHz</td>
<td>&lt; 5 μA rms</td>
</tr>
</tbody>
</table>

Coherent noise:

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Noise (μA rms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Hz / 60 Hz</td>
<td>&lt; 50 μA rms</td>
</tr>
</tbody>
</table>

Re-injected noise measured on 1 primary turn: < 25 μV

Dynamic performance data

- **BW**: Frequency bandwidth for small signal 5 %, 32 A rms, \( R_m = 5 \, \Omega \)
  
  - (-1 dB): DC .. 100 kHz
  - (-3 dB): DC .. > 200 kHz

- **\( \frac{di}{dt} \)**: \( \frac{di}{dt} \) accurately followed \( R_m = 5 \, \Omega \)
  
  - > 100 A/μs

- **\( t_r \)**: Response time \(^1\) to 90 % of \( I_{IN} \) step
  
  - < 0.5 μs

- **PSRR**: Power supply rejection ratio \( R_m = 5 \, \Omega \)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>PSRR on +15V</th>
<th>PSRR on -15V</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 Hz</td>
<td>85 dB</td>
<td>95 dB</td>
</tr>
<tr>
<td>120 Hz</td>
<td>80 dB</td>
<td>90 dB</td>
</tr>
<tr>
<td>300 Hz</td>
<td>71 dB</td>
<td>84 dB</td>
</tr>
<tr>
<td>600 Hz</td>
<td>66 dB</td>
<td>78 dB</td>
</tr>
<tr>
<td>1000 Hz</td>
<td>64 dB</td>
<td>75 dB</td>
</tr>
<tr>
<td>2000 Hz</td>
<td>60 dB</td>
<td>70 dB</td>
</tr>
<tr>
<td>10 000 Hz</td>
<td>62 dB</td>
<td>72 dB</td>
</tr>
</tbody>
</table>

\[
PSRR = 20 \log_{10} \left( \frac{V_{ripple \ on \ supply}}{V\ measured \ on \ R_m = 5 \, \Omega} \right)
\]

Note: \(^1\) With a \( \frac{di}{dt} \) of 100 A/μs.
Current Transducer ITL 900-T

Over current protection

As soon as electrical saturation appears, the transducer switches from normal operation to over current mode.

This electrical saturation is defined as 1.05 times the current range ($I_{PM}$)

Under these conditions:

- the output (pin 6 of D-SUB-9 connector) of the transducer is short circuited to the 0 V inside the transducer (with the help of a relay contact).
- the contact (operation status) between pin 8 to 3 (of D-SUB-9 connector) switches off, this contact becomes open.
- the green LED (located on the cover plate of the transducer and related to operation status) switches off.

The over current mode remains until the primary current decreases below the recovery current.

The value of the recovery current is typically ± 165 A (max 260 A, min 70 A).

- TO ENSURE PROPER OPERATION, THE MAXIMUM BURDEN RESISTOR ALLOWED IS 50 OHMS. (5 OHMS MINIMUM).

Maximum measuring resistor

![Graph showing maximum measuring resistor vs. primary current](image-url)
Voltage across the maximum measuring resistor

![Graph showing voltage across the maximum measuring resistor](image_url)

**Miscellaneous**

- **Bus bar free zone (from center)**: \( r \geq 100 \) mm
- **Disturbance by a \( \text{d}v/\text{d}t \) of 5000 V, 6000 V/\( \mu \text{s} \)**: \(< 100\) ppm \(^1\)
- **Sensitivity to DC magnetic field 900 A @ 100 mm**: \(< 10\) ppm \(^1\)

**External synchronization signal**: If needed, an external signal can be applied on the SMA connector.

This signal consists in a square wave 0 to 5 V, 10 mA, 31.25 kHz (± 1 kHz).

**Note**: \(^1\) All ppm figures refer to secondary measuring range 600 mA.
Dimensions ITL 900-T (in mm)

Connection

- Normal operation status (Pins 8 and 3):
  Normal operation means:
  - ± 15 V present
  - zero detector is working
  - compensation current ≤ 105% of $I_{PM}$

  The contacts of the related relay are closed under normal operation.

- Synchronization status (Pins 7 and 2)
  Synchronization means: working of ITL 900-T is synchronized with an external synchronization signal.
  Under this condition, the contacts of the relay are closed.

Mechanical characteristics

- General tolerance ± 0.5 mm
- Transducer fastening by busbar
  Primary connection 2 holes Ø 9 mm
  Recommended fastening torque 4 N·m
- Transducer fastening
  Recommended fastening torque 5 N·m
- Connection of secondary connector on D-SUB-9, UNC 4-40
- Connection of external synchronization signal on SMA connector

Remarks

- $I_p$ is positive when $I_p$ flows in the direction of the arrow.
- Temperature of the primary conductor should not exceed 100 °C (212°F).