REO current and voltage sensors
Product catalogue
For many years, REO has been active in the development, manufacture and optimization of current transformers and instrument transformers that are used in the widest variety of applications - e.g. metrology and control technology, control cabinet construction, motor-speed control and welding engineering.

As a member of the Association of German Machinery and Equipment Constructors (VDMA), REO is committed to comply with all relevant norms and certifications worldwide, as well as ensuring that products are constantly developed to the latest state of the art.

In addition and particularly in the domain of railway engineering, stringent requirements must be met in relation to external environmental effects (heat, cold, sand or moisture), resistance to shock and vibration, insulation design, and high loading capacity.

These current transformers are distinguished by the appropriate norms (REO is IRIS certified) that are essential in railway engineering.
Content

Facts about current transformers
Facts about current transformers p. 4-5
Overview industrial applications p. 6
Overview renewable energies p. 7
Overview railway engineering p. 8
Overview metrology and testing techniques p. 9
Overview energy, automation and building technology p. 10

Active current transformers
Series WDI p. 12
Series WKO p. 13
Current controller p. 14

Passive current transformers
Series IE p. 16
Series IN p. 17
Series IN-B p. 18
Series IN-D p. 19
Series IN-I p. 20

Special Solutions
Special solutions p. 21
REO Setzermann p. 22

Your REO-Plus
Your Plus p. 23

Application areas:
- Renewable Energies
- Drives technology
- E-Mobility
- Railway engineering
- Metrology and testing
A broad spectrum of REO transformers for individual applications

Particularly in the complex area of solar and wind and other alternative energy sources, efficiency is a top priority, demanding the use of highly sophisticated power electronics. This feeds energy reliably into applications and keeps it precisely controlled and connected.

These systems and other modern applications demand high quality current monitoring to ensure precise coordination between power semiconductors, system monitoring and mechanical engineering.

From simple current monitoring to the efficient reduction of energy consumption

A broad spectrum of current and voltage transformers from REO provide solutions for a number of applications - for simple current monitoring or working within frequency converters, main and subsidiary current monitoring, and for the efficient reduction of energy consumption. A variety of technologies, such as open loop and closed loop technology, and the measurement of currents ranging up to 3000 A, ensure that the application can be optimized by using a sensor from REO.
Facts about current transformers

Low space requirement combined with outstanding performance

REO current transformers are particularly distinguished by their low space requirement, excellent linearity, fast response, and low iron and hysteresis losses.

Our current transformer designs are available for monitoring frequencies of up to 150 kHz and because of the tests performed before and during the production process (whether vacuum encapsulation, partial discharge measurements or high voltage testing) high reliability is ensured and are perfectly adapted to the application.

The advantages at a glance

• REO can supply direct replacements for many industry standard applications
• REO’s flexible production strategy mean that small production quantities are possible
• Individual solutions matched to your application
• Modern core materials (nanocrystalline and amorphous) are used for the optimisation
• REO speaks your language: Our worldwide field sales offices always keep us close to our clients - no matter what your language, time zone, or currency. A REO location is near you, guaranteeing fast, efficient and cost-effective handling for your order.
• Reliability thanks to tests:
  All our current transformers are checked against the following criteria:
  - phase shift between primarily and secondary
  - curve shape
  - saturation
  - core in relation to the winding
  - overcurrents and overvoltages
  - dynamic behaviour of the whole current transformer
Overview industrial applications

Areas of application
- Servo drives
- Static converters
- USV
- Welding equipment
- Plant monitoring in engine technology
- Forklift trucks
- Air-conditioning systems
- Lift technology

Series WDI
Primary current: 25 up to 500 A
Frequency range: DC...10 kHz

Series WKO
Primary current: 25 up to 2000 A
Frequency range: DC...150 kHz

Series IE
Primary current: 1 up to 3000 A
Frequency range: 50 up to 400 Hz

Series IN
Primary current: 1 up to 1000 A
Frequency range: 0.05 up to 50 kHz

Series 869
Primary current: 0 up to 16 A
Current controller
Overview renewable energies

- **Series IN-D**
  - Residual current: 0.1 up to 10 A
  - Frequency range: 0.05 up to 50 kHz

- **Series WDI**
  - Primary current: 25 up to 500 A
  - Frequency range: DC...10 kHz

- **Series WKO**
  - Primary current: 25 up to 2000 A
  - Frequency range: DC...150 kHz

- **Series IN**
  - Primary current: 1 up to 1000 A
  - Frequency range: 0.05 up to 50 kHz

Areas of application
- Wind-power engineering
- Solar technology
- Grid monitoring
**Areas of application**

- Main and subsidiary inverters for underground and surface trains
- Monitoring switching states
- Auxiliary converters
- Energy measurements
- Control measurements

**Series WDI**
- Primary current: 25 up to 500 A
- Frequency range: DC...10 kHz

**Series WKO**
- Primary current: 25 up to 2000 A
- Frequency range: DC...150 kHz

**Series IE**
- Primary current: 1 up to 3000 A
- Frequency range: 50 up to 400 Hz

**Series IN-B**
- Primary current: 600 A
- Frequency range: 0,05 up to 50 kHz

**Series IN**
- Primary current: 1 up to 1000 A
- Frequency range: 0,05 up to 50 kHz
Areas of application

- Current matching
- Phase control
- Display devices
- Pulse measurement
- Network and plant protection
- Meters

Overview metrology and testing techniques

Metrology and testing techniques

Series 869
Primary current: 0 up to 16 A
Current controller

Series IN-I
Primary current: 0 up to 200 A
Frequency range: 0,05 up to 50 kHz

Series IN
Primary current: 1 up to 1000 A
Frequency range: 0,05 up to 50 kHz

Series IE
Primary current: 1 up to 3000 A
Frequency range: 50 up to 400 Hz

Series 869
Areas of application

- Grid monitoring
- Overload relays
- Current relays
- Sensor monitoring
- Current measurement and monitoring
- Power supply shut-off
- Signal conversion
- Power control

Series WDI
Primary current: 25 up to 500 A
Frequency range: DC...10 kHz

Series WKO
Primary current: 25 up to 2000 A
Frequency range: DC...150 kHz

Series IE
Primary current: 1 up to 3000 A
Frequency range: 50 up to 400 Hz

Series IN
Primary current: 1 up to 1000 A
Frequency range: 0,05 up to 50 kHz

Series 869
Primary current: 0 up to 16 A
Current controller
**Open loop current transformers**

The WDI current sensor is an open loop current transformer designed for measuring direct and alternating currents.

The primary current generates a magnetic flux and this is evaluated by means of a magnetic circuit and Hall sensor in the air gap. The signal from the Hall sensor is processed by an electronic circuit and an exact representation of the primary current is output as a voltage.

**Areas of application**

- Industry
- Renewable energy
- Railway engineering
- Energy, automation and building technology

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**Technical data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary nominal current $I_{PN}$</td>
<td>25 up to 500 [A]</td>
</tr>
<tr>
<td>Measurement range $I_{maxPN}$</td>
<td>0 up to ± 600 [A]</td>
</tr>
<tr>
<td>Max. permissible output current $I_{outputPN}$</td>
<td>± 5 [mA]</td>
</tr>
<tr>
<td>Effective nominal compensating voltage $U_{AH}$</td>
<td>10 [V]</td>
</tr>
<tr>
<td>Supply voltage $U_s$</td>
<td>± 15 Vdc ± 5% [Vdc]</td>
</tr>
<tr>
<td>No-load current $I_{NO}$</td>
<td>9 [mA]</td>
</tr>
<tr>
<td>Terminating resistor $R_{min}$</td>
<td>2 [kΩ]</td>
</tr>
<tr>
<td>Terminating resistor $R_{max}$</td>
<td>10 [kΩ]</td>
</tr>
<tr>
<td>Measurement precision [50 Hz] $F_u$</td>
<td>± 0.6 [%]</td>
</tr>
<tr>
<td>Linearity $F_{Uu}$</td>
<td>≤ 1 [%]</td>
</tr>
<tr>
<td>Ambient temperature $T_a$</td>
<td>-25 up to +75 °C</td>
</tr>
<tr>
<td>Frequency range $f$</td>
<td>DC...10 [kHz]</td>
</tr>
<tr>
<td>Response time $t_R$</td>
<td>≤ 25 [µs]</td>
</tr>
<tr>
<td>Offset voltage $U_o$</td>
<td>20 [mV]</td>
</tr>
<tr>
<td>Drift in offset voltage $\Delta U_o$</td>
<td>60 [mV]</td>
</tr>
<tr>
<td>Temperature drift $%/\Delta T$</td>
<td>≤ 0.05 [%K]</td>
</tr>
<tr>
<td>Insulation test voltage $V_p$</td>
<td>3 [kVac]</td>
</tr>
</tbody>
</table>

**Electrical benefits**

- Measurement of direct and alternating currents
- Voltage output
- Low power consumption
- No additional losses in the measuring circuit
- High-quality UL listed insulating materials (e.g. UL94-V0)
- Safe electrically isolated primary and secondary circuits
- Good price/performance ratio

**Mechanical benefits**

- Low weight
- Robust housing designs (for horizontal/vertical mounting)
- Connections: clamps, plugs, flat-cable plugs or cables
- Wide range of housings with various push-through openings

**Mode of Operation**

![Mode of Operation Diagram](attachment:image)
Active current transformer

Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary nominal current</td>
<td>IPN</td>
<td>25 up to 2000</td>
<td>A</td>
</tr>
<tr>
<td>Measurement range</td>
<td>IPmaxN</td>
<td>0 up to ±3000</td>
<td>A</td>
</tr>
<tr>
<td>Secondary current</td>
<td>IPhi</td>
<td>25 up to 400</td>
<td>mA</td>
</tr>
<tr>
<td>Transformation ratio</td>
<td>KN</td>
<td>1000 up to 5000</td>
<td>1:1</td>
</tr>
<tr>
<td>Working voltage</td>
<td>U_s</td>
<td>±12 up to ±24</td>
<td>V</td>
</tr>
<tr>
<td>Terminating resistor</td>
<td>R_min/R_max</td>
<td>0 up to 200</td>
<td>Ω</td>
</tr>
<tr>
<td>Measurement precision with RT</td>
<td>F_U</td>
<td>0,65 up to ±1,0</td>
<td>%</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>T_A</td>
<td>-25 up to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Frequency range</td>
<td>f</td>
<td>DC up to 150 up to DC up to 200</td>
<td>kHz</td>
</tr>
<tr>
<td>Response time</td>
<td>t_r</td>
<td>≤ 1,5</td>
<td>µs</td>
</tr>
<tr>
<td>Offset voltage</td>
<td>i_o</td>
<td>≤ 0,1 up to ±0,3</td>
<td>mA</td>
</tr>
<tr>
<td>Drift in offset voltage</td>
<td>∆i_o</td>
<td>± 0,2 up to ±0,5</td>
<td>mA</td>
</tr>
<tr>
<td>Insulation test voltage</td>
<td>V_p</td>
<td>3 - 6</td>
<td>kV</td>
</tr>
</tbody>
</table>

More information can be found on the internet at www.reo.de

Closed loop current transformers

WKO current sensors work in accordance with the proven compensation principle and are suitable for measuring direct, alternating and mixed currents.

The primary current generates a magnetic flux, which is compensated by an internal secondary coil. The current is evaluated by an electronic circuit and a Hall sensor. The secondary compensating current is a precise representation of the primary current to be measured.

Electrical benefits

- Measurement of direct, alternating and mixed currents
- Very high precision and short response time
- Broad frequency spectrum and low temperature drift
- Very good linearity and overcurrent resistance
- No additional losses in the measuring circuit (DC to 150 kHz)
- Current output for lengthy transmission lines
- High-quality UL listed insulating materials (e.g. UL94-V0)
- Safe electrically isolated primary and secondary circuits

Mechanical benefits

- Robust housing designs (for horizontal/vertical mounting)
- Variable connections, e.g. clamps, plugs, flat-cable plugs or cables
- Wide range of housings with various push-through openings

Areas of application

- Industry
- Renewable energy sources
- Railway engineering
- Energy, automation and building technology
## Current controller

The type 869 current relay converts signals into digital form. The set current is monitored inductively on the line fed through the housing. If the set current is exceeded, the inbuilt relay switches over. The switching threshold is set coarsely via DIP switches (within the device) and precisely with a front-mounted potentiometer.

To prevent the relay “fluttering” around the switching point, switching hysteresis can be set. The relay can provide Normally Open or Normally Closed contacts.

### Areas of application
- Industry
- Metrology and testing techniques
- Energy, automation and building technology

### Technical data

<table>
<thead>
<tr>
<th>Input</th>
<th>Switching output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input current</td>
<td>Relay output</td>
</tr>
<tr>
<td>0 up to 16 A, AC</td>
<td>1 changeover contact</td>
</tr>
<tr>
<td>Frequency range</td>
<td>Max. switching voltage</td>
</tr>
<tr>
<td>45...50...65 Hz</td>
<td>250 V AC/DC</td>
</tr>
<tr>
<td>Curve shape</td>
<td>Max. switching current</td>
</tr>
<tr>
<td>Sinusoidal</td>
<td>2 A</td>
</tr>
<tr>
<td>Overcurrent capability</td>
<td>Switching hysteresis</td>
</tr>
<tr>
<td>2 x In constantly</td>
<td>adjustable via DIP switches</td>
</tr>
<tr>
<td>Connection type</td>
<td>Delay time</td>
</tr>
<tr>
<td>Push-through connection Ø</td>
<td>typ. 0,1 up to 10 s</td>
</tr>
<tr>
<td>4,2 mm</td>
<td>Operating and closed-circuit behaviour</td>
</tr>
<tr>
<td></td>
<td>adjustable via DIP switches</td>
</tr>
<tr>
<td>Relay status display</td>
<td>Relay status display</td>
</tr>
<tr>
<td>amber LED (relay active)</td>
<td></td>
</tr>
<tr>
<td>General data</td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>Max. current consumption</td>
</tr>
<tr>
<td>20 up to 30 V, DC</td>
<td>&lt; 30 mA</td>
</tr>
<tr>
<td>Max. current consumption</td>
<td>Precision of adjustment</td>
</tr>
<tr>
<td>&lt; 30 mA</td>
<td>&lt; 0,5 % typ.</td>
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<tr>
<td>Signal acquisition time</td>
<td>Ambient temperature range</td>
</tr>
<tr>
<td>40 ms</td>
<td>0 up to +40 °C</td>
</tr>
<tr>
<td>Protection</td>
<td>Protection</td>
</tr>
<tr>
<td>IP 20</td>
<td>Installation position</td>
</tr>
<tr>
<td>Any</td>
<td>Supply/relay connection type</td>
</tr>
<tr>
<td>Screw terminal 2,5 mm²</td>
<td>Insulation test voltage</td>
</tr>
<tr>
<td>3 KVac</td>
<td></td>
</tr>
</tbody>
</table>

### Electrical benefits
- Twofold overload capability
- Separate switching output with relay
- Adjustable current switching threshold and switching hysteresis
- No additional losses in the measuring circuit
- Status display with LED
- Operating or closed-circuit operation
- Safe electrically isolated primary and secondary circuits

### Mechanical benefits
- Top-hat rail mounting
- Screw terminal connection
- Standard housing
- Simple installation

### DIP switches

<table>
<thead>
<tr>
<th>Current</th>
<th>S8</th>
<th>S7</th>
<th>S6</th>
<th>S5</th>
</tr>
</thead>
<tbody>
<tr>
<td>0...1 A</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1...2 A</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2...3 A</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3...4 A</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4...5 A</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5...6 A</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6...7 A</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
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<tr>
<td>7...8 A</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8...9 A</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9...10 A</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
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<tr>
<td>10...11 A</td>
<td>0</td>
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<td>0</td>
<td>1</td>
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<tr>
<td>11...12 A</td>
<td>0</td>
<td>1</td>
<td>0</td>
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<tr>
<td>12...13 A</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>13...14 A</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
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<tr>
<td>14...15 A</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>15...16 A</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Electrical benefits

- Twofold overload capability
- Separate switching output with relay
- Adjustable current switching threshold and switching hysteresis
- No additional losses in the measuring circuit
- Status display with LED
- Operating or closed-circuit operation
- Safe electrically isolated primary and secondary circuits
RoHS COMPLIANT 2011/65/EG

Passive current transformer

Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary nominal current</td>
<td>(I_{in})</td>
<td>1 up to 3000 [A]</td>
</tr>
<tr>
<td>Maximum primary nominal current</td>
<td>(I_{maxPN})</td>
<td>1,2 up to 3600 [A]</td>
</tr>
<tr>
<td>Secondary current</td>
<td>(I_{an})</td>
<td>20 up to 1000 [mA]</td>
</tr>
<tr>
<td>Power</td>
<td>(P_{vak})</td>
<td>0,1 up to 25 [VA]</td>
</tr>
<tr>
<td>Transformation ratio</td>
<td>(K_n)</td>
<td>50 up to 3000 [1:]</td>
</tr>
<tr>
<td>Compliance voltage</td>
<td>(U_{LB})</td>
<td>0,5 up to 25 [V]</td>
</tr>
<tr>
<td>Load impedance</td>
<td>(R_b)</td>
<td>0,5 up to 250 [Ω]</td>
</tr>
<tr>
<td>Measurement precision with RT</td>
<td>(F_u)</td>
<td>≤ 1 [%]</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>(T_a)</td>
<td>-25 up to +70 [°C]</td>
</tr>
<tr>
<td>Frequency range</td>
<td>(f)</td>
<td>50 up to 400 [Hz]</td>
</tr>
<tr>
<td>Insulation test voltage</td>
<td>(V_p)</td>
<td>3 [kVac]</td>
</tr>
</tbody>
</table>

Electrical benefits

- Bushing-type current transformers for direct conductor feedthrough
- Wound primary type current transformer, version for small currents
- In-phase current representation
- Accuracy classes 3; 1; 0.5;
- Toroidal cores made of high-quality silicon-iron
- Measurement in the low frequency range 16 2/3 to -400Hz
- In-house core production:
  - Special designs are possible
  - High core output power and high-quality insulation (UL)
- Electrically isolated primary and secondary circuits

Mechanical benefits

- Designs for easy installation
- Variable connections, e.g. clamps, plugs, flat-cable plugs, flexible stranded wire or print mounting
- Wide range of housings with various push-through openings
- Very long useful lifetime

Bushing-type and bar-type current transformers

In the case of bushing-type current transformers, the customer’s primary wire is pushed through the current transformer opening in the housing. The push-through opening depends on the size of the primary current. Wound primary type current transformers have a primary winding and a secondary winding. Both windings are applied on the closed toroidal core and are isolated from each other by insulation. This principle applies mainly where primary currents are small.

Low-voltage current transformers for the proportional transformation of large currents to directly measurable smaller current values.

Areas of application

- Industry
- Renewable energy sources
- Railway engineering
- Energy, automation and building technology
Passive current transformer

RoHS COMPLIANT 2011/65/EG

Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>Primary nominal current</td>
<td>( I_{\text{m}} )</td>
<td>1 up to 1000</td>
<td>[A]</td>
<td></td>
</tr>
<tr>
<td>Maximum primary nominal current</td>
<td>( I_{\text{maxPN}} )</td>
<td>1,2 up to 1200</td>
<td>[A]</td>
<td></td>
</tr>
<tr>
<td>Secondary current</td>
<td>( I_{\text{aN}} )</td>
<td>1 up to 1000</td>
<td>[mA]</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>( P_{\text{sek}} )</td>
<td>0,05 up to 15</td>
<td>[VA]</td>
<td></td>
</tr>
<tr>
<td>Transformation ratio</td>
<td>( K_{\text{N}} )</td>
<td>50 up to 2000</td>
<td>[1:]</td>
<td></td>
</tr>
<tr>
<td>Compliance voltage</td>
<td>( U_{\text{eff}} )</td>
<td>0,5 up to 15</td>
<td>[V]</td>
<td></td>
</tr>
<tr>
<td>Load impedance</td>
<td>( R_{\text{B}} )</td>
<td>0,5 up to 2500</td>
<td>[Ω]</td>
<td></td>
</tr>
<tr>
<td>Measurement precision with RT</td>
<td>( F_{\text{U}} )</td>
<td>( \leq 1 )</td>
<td>[%]</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>( T_{\text{a}} )</td>
<td>-25 up to +70</td>
<td>[°C]</td>
<td></td>
</tr>
<tr>
<td>Frequency range</td>
<td>( f )</td>
<td>0,05 up to 50</td>
<td>[kHz]</td>
<td></td>
</tr>
<tr>
<td>Insulation test voltage</td>
<td>( V_{\text{p}} )</td>
<td>3</td>
<td>[kVac]</td>
<td></td>
</tr>
</tbody>
</table>

Instrument transformers

The growing development and spread of electronic devices with high working frequencies requires the use of current transformers with an extended frequency range.

This demand can be met with specially selected materials in conjunction with optimized design.

Areas of application

- Industry
- Renewable energy sources
- Railway engineering
- Metrology and testing techniques
- Energy, automation and building technology

Electrical benefits

- Current transformers for precise current measurements
- Measurements in the frequency range 16 2/3 to -50kHz
- Use of nanocrystalline and high-quality cores
- High-quality wires in temperature class F (155°C), H (180°C)
- High-quality UL listed insulating materials (e.g. UL94-V0)
- Safe electrically isolated primary and secondary circuits
- High reliability
- Non-critical in the event of overload currents

Mechanical benefits

- Robust housing designs (for horizontal/vertical mounting)
- Shock and vibration tests in accordance with DIN EN 61373 Category 1 Class B
- Variable connections: clamps, plugs, flat-cable plugs or cables
- Wide range of housings with various push-through openings

Mode of Operation

Toroidal

More information can be found on the internet at www.reo.de
### Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Unit(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary nominal current</td>
<td>$I_{n}$</td>
<td>600</td>
<td>[A]</td>
</tr>
<tr>
<td>Maximum primary nominal current</td>
<td>$I_{maxPN}$</td>
<td>720</td>
<td>[A]</td>
</tr>
<tr>
<td>Secondary current</td>
<td>$I_{n}$</td>
<td>300</td>
<td>[mA]</td>
</tr>
<tr>
<td>Power</td>
<td>$P_{sek}$</td>
<td>0.9</td>
<td>[VA]</td>
</tr>
<tr>
<td>Transformation ratio</td>
<td>$K_{n}$</td>
<td>2000</td>
<td>[1:]</td>
</tr>
<tr>
<td>Load impedance</td>
<td>$R_{a}$</td>
<td>10</td>
<td>[$\Omega$]</td>
</tr>
<tr>
<td>Compliance voltage</td>
<td>$U_{bb}$</td>
<td>3</td>
<td>[V]</td>
</tr>
<tr>
<td>Measurement precision [50 Hz]</td>
<td>$F_{u}$</td>
<td>± 1</td>
<td>[%]</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>$T_{a}$</td>
<td>-25 up to +70</td>
<td>[°C]</td>
</tr>
<tr>
<td>Frequency range</td>
<td>$f$</td>
<td>0.05 up to 50</td>
<td>[kHz]</td>
</tr>
<tr>
<td>Insulation test voltage</td>
<td>$V_{p}$</td>
<td>3</td>
<td>[kVac]</td>
</tr>
</tbody>
</table>

### Electrical benefits
- Current transformers for precise current measurements
- Measurements in the frequency range 16 2/3 to -50kHz
- Use of nanocrystalline and high-quality cores
- High-quality wires in temperature class F (155°C), H (180°C)
- High-quality UL listed insulating materials (e.g. UL94-V0)
- Safe electrically isolated primary and secondary circuits
- High reliability
- Non-critical in the event of overload currents

### Mechanical benefits
- Robust housing designs (for horizontal/vertical mounting)
- Shock and vibration tests in accordance with DIN EN 61373
- Category 1 Class B
- Variable connections: clamps, plugs, flat-cable plugs or cables
- Wide range of housings with various push-through openings

### Mode of Operation
- **Bushing-type and bar-type current transformers**
  - For the high demands of railway and industrial engineering at higher frequencies up to 50kHz.
  - High-quality nanocrystalline core materials guarantee the greatest degree of transmission quality and low losses.
  - Exclusive use of UL-listed materials, fully sealed with UL94-V0 material.
  - Current transformers for demanding applications, such as in the railway sector and general transportation sectors.
  - Robust housing construction with reliable securing options for vertical or horizontal mounting.

### Areas of application
- Railway engineering
Passive current transformer

Series IN-D

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Series IN-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary differential current</td>
<td>$\Delta I_{HN}$</td>
</tr>
<tr>
<td>Max. primary differential current</td>
<td>$\Delta I_{maxPN}$</td>
</tr>
<tr>
<td>Thermal short-time current</td>
<td>$I_{th}$</td>
</tr>
<tr>
<td>Rated output current</td>
<td>$I_{RN}$</td>
</tr>
<tr>
<td>Power</td>
<td>$P_{sek}$</td>
</tr>
<tr>
<td>Transformation ratio</td>
<td>$K_N$</td>
</tr>
<tr>
<td>Compliance voltage</td>
<td>$U_{BB}$</td>
</tr>
<tr>
<td>Load impedance</td>
<td>$R_B$</td>
</tr>
<tr>
<td>Measurement precision</td>
<td>$F_U$</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>$T_A$</td>
</tr>
<tr>
<td>Frequency range</td>
<td>$f$</td>
</tr>
<tr>
<td>Insulation test voltage</td>
<td>$V_P$</td>
</tr>
</tbody>
</table>

Differential current transformers

A differential current transformer permits the measurement of differential current in single-phase or three-phase supply cables or in individual lines. Both current-carrying conductors (outward conductor and return conductor) are led through the current opening of the current transformer. The current measurement is performed by comparing the two conductors.

Any difference is displayed at the output of the differential current transformer. The use of highly permeable materials permits a typical current deviation of 10 mA upwards. The wide opening allows the supply lines, with the exception of the earthing conductor, to be led through directly. High sensitivity to current enables measurement in several stages:

---stage 1: Notice of a malfunction
---stage 2: Alarm
---stage 3: Switching off

Areas of application

- Industry
- Renewable energy sources
- Metrology and testing techniques
- Energy, automation and building technology

More information can be found on the internet at www.reo.de
**Technical data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Unit</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary nominal current</td>
<td>$I_{IN}$</td>
<td>A</td>
<td>0 up to 200</td>
</tr>
<tr>
<td>Maximum primary nominal current</td>
<td>$I_{maxPN}$</td>
<td>A</td>
<td>± 60 up to ± 240</td>
</tr>
<tr>
<td>Secondary current</td>
<td>$I_{aN}$</td>
<td>mA</td>
<td>0 up to 200</td>
</tr>
<tr>
<td>Power</td>
<td>$P_{sek}$</td>
<td>VA</td>
<td>0.5 up to 1.5</td>
</tr>
<tr>
<td>Transformation ratio</td>
<td>$K_N$</td>
<td>1:1</td>
<td>1000</td>
</tr>
<tr>
<td>Compliance voltage</td>
<td>$U_{KB}$</td>
<td>V</td>
<td>7.5 up to 10</td>
</tr>
<tr>
<td>Load impedance</td>
<td>$R_B$</td>
<td>Ω</td>
<td>37 up to 200</td>
</tr>
<tr>
<td>Measurement precision</td>
<td>$F_i$</td>
<td>%</td>
<td>± 0.2</td>
</tr>
<tr>
<td>Phase error</td>
<td>$d_i$</td>
<td>min.</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>$T_A$</td>
<td>°C</td>
<td>-20 up to +70</td>
</tr>
<tr>
<td>Frequency range</td>
<td>$f$</td>
<td>kHz</td>
<td>0.05 up to 50</td>
</tr>
<tr>
<td>Insulation test voltage</td>
<td>$V_P$</td>
<td>kVac</td>
<td>3</td>
</tr>
</tbody>
</table>

**Electrical benefits**

- High-precision current measurements Cl 0.2
- Pulsed current measurement (8/20μs surge current pulse)
- Low-loss core (core losses <10W/kg at 20kHz/200mT)
- Housing made of UL-V0 material with inset thread

**Mechanical benefits**

- Fully encapsulated
- Glass-fibre reinforced cast housing

**Pulsed current transformers**

Because of the materials selected, REO pulsed current transformers in the IN-I series monitor current with high precision and in the appropriate transformation ratio - which makes them particularly suitable for power measurements, current monitoring and analysis, and for use in solar inverters. They are ideal for use in active filters, as they can be designed to measure current surges.

The primary current is measured in a conductor fed through the closed toroidal core.

The magnetic field generated by the flow of current through the conductor is detected by the toroidal core, which, in accordance with the transformation ratio of the secondary winding, generates a smaller current for measurement purposes.

By this means, a heavy current to be measured is reduced to a substantially smaller current and is in addition isolated from the primary circuit by safe electrical isolation.

**Areas of application**

- Metrology and testing techniques
Standard or individual product solution – also with small amounts

In addition to our wide standard product portfolio we can develop and manufacture your specific solution with the optimal performances you need.

Example:

The new generation of REO current transformers with the following benefits:
• Accuracy 0.2 %
• Load voltage 10VA
• Large push-through opening
• Insulation class II UL94V0
• According to IEC 60044-1
Our team in Pfarrkirchen

The team in Pfarrkirchen develops and manufactures above current transformers also toroidal transformers and components for medical technology:
- Isolation transformers for medical systems
- RFT locking transformers (open or sealed)
- Rectifiers

See more at www.reo.de
Worldwide Sales Network

With a worldwide sales network and comprehensive product portfolio, REO can react rapidly to your wishes anywhere in the world - no matter what language you speak. Besides our wide selection of standard products, we can of course offer you tailor-made solutions, developed specially to meet your wishes. Our production facilities in China, India and the USA are equipped in exactly the same way as those in Germany, and designed to provide the same product at the same quality.

Using the same software and with development and design in Germany we ensure that REO products are always up to the latest state of the art.

Wherever you are, even after the 1000th production run, a REO product always has the same quality.