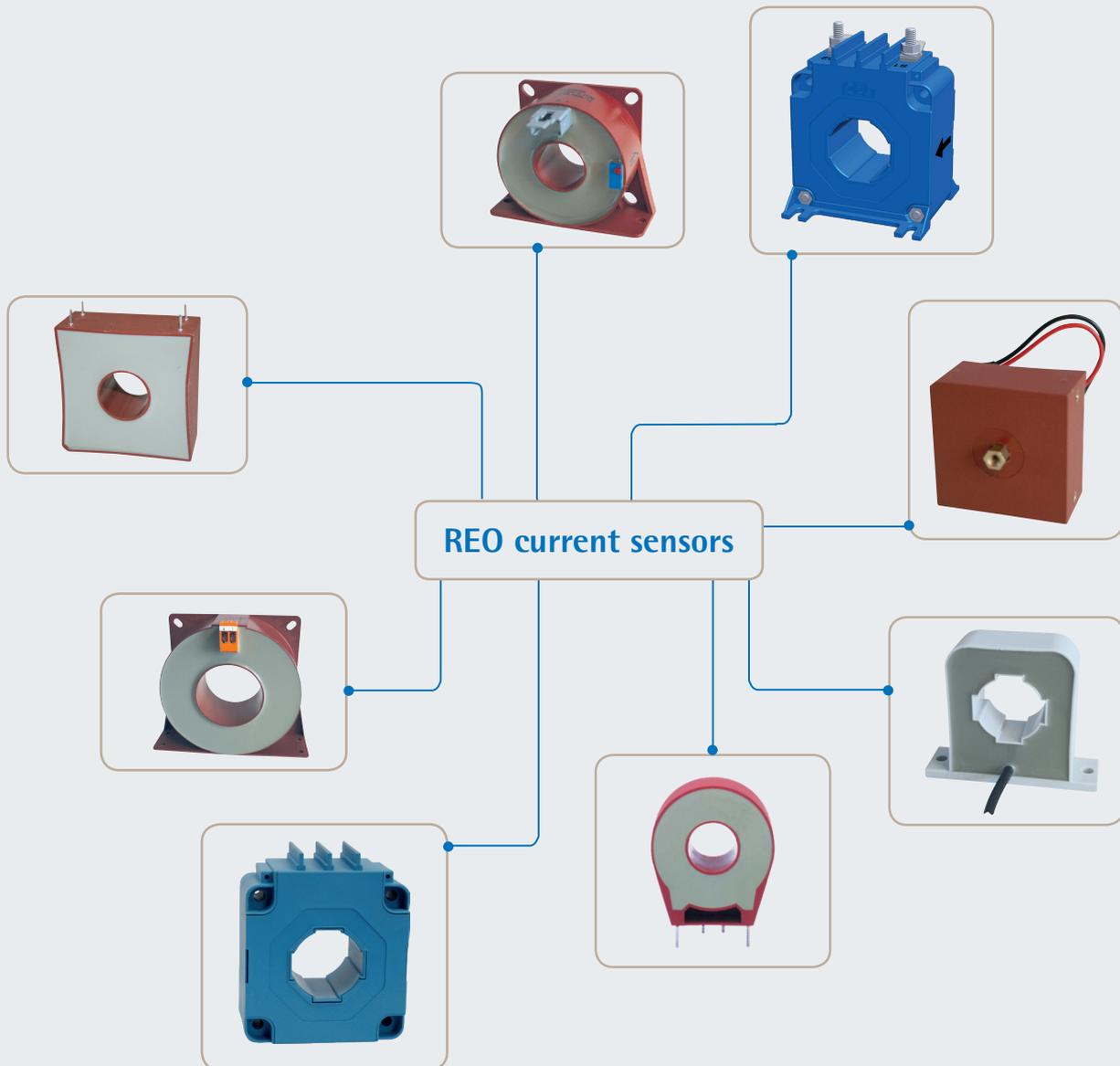


## REO current and voltage sensors

### Product catalogue

Aktive Stromwandler • Passive Stromwandler • Strom Controller • Sonderlösungen • Stromüberwachung • Energiereduzierung • Geringer Platzbedarf



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 different associations, 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.

**Data sheets for the individual current transformers and further products can be found under [www.reo.de](http://www.reo.de)**

<b>Facts about current transformers</b>	
Facts about current transformers	p. 4-5
REO Double-Core Technology	p. 6-7
Overview industrial applications	p. 8
Overview renewable energies	p. 9
Overview railway engineering	p. 10
Overview Measuring and testing technology	p. 11
Overview energy, automation and building technology	p. 12
<b>Active current transformers</b>	
Series WKO-2C / -2C B	p. 14-17
Active current transformers	p. 18-19
<b>Passive current transformers</b>	
Series IE	p. 21
Series IE modular	p. 22-23
Series IN	p. 24
Series IB 0,5	p. 25
Series IN-B	p. 26
Series IN-D	p. 27
Series IN-I	p. 28
<b>Special Solutions</b>	
Special solutions	p. 29
REOunity	p. 30
<b>Your REO-Plus</b>	
Your Plus	p. 31

## Application areas:



Renewable Energies



Drives technology



E-Mobility



Railway engineering



Metrology and testing

## Facts about current transformers

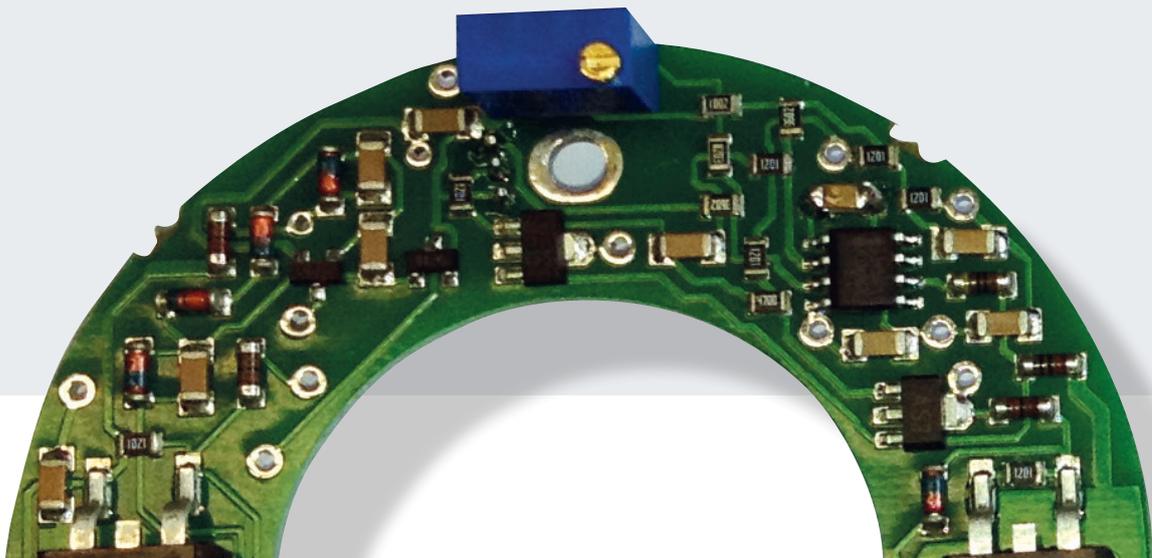
### A broad spectrum of REO transformers for individual applications

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.



### Low space requirement combined with outstanding performance

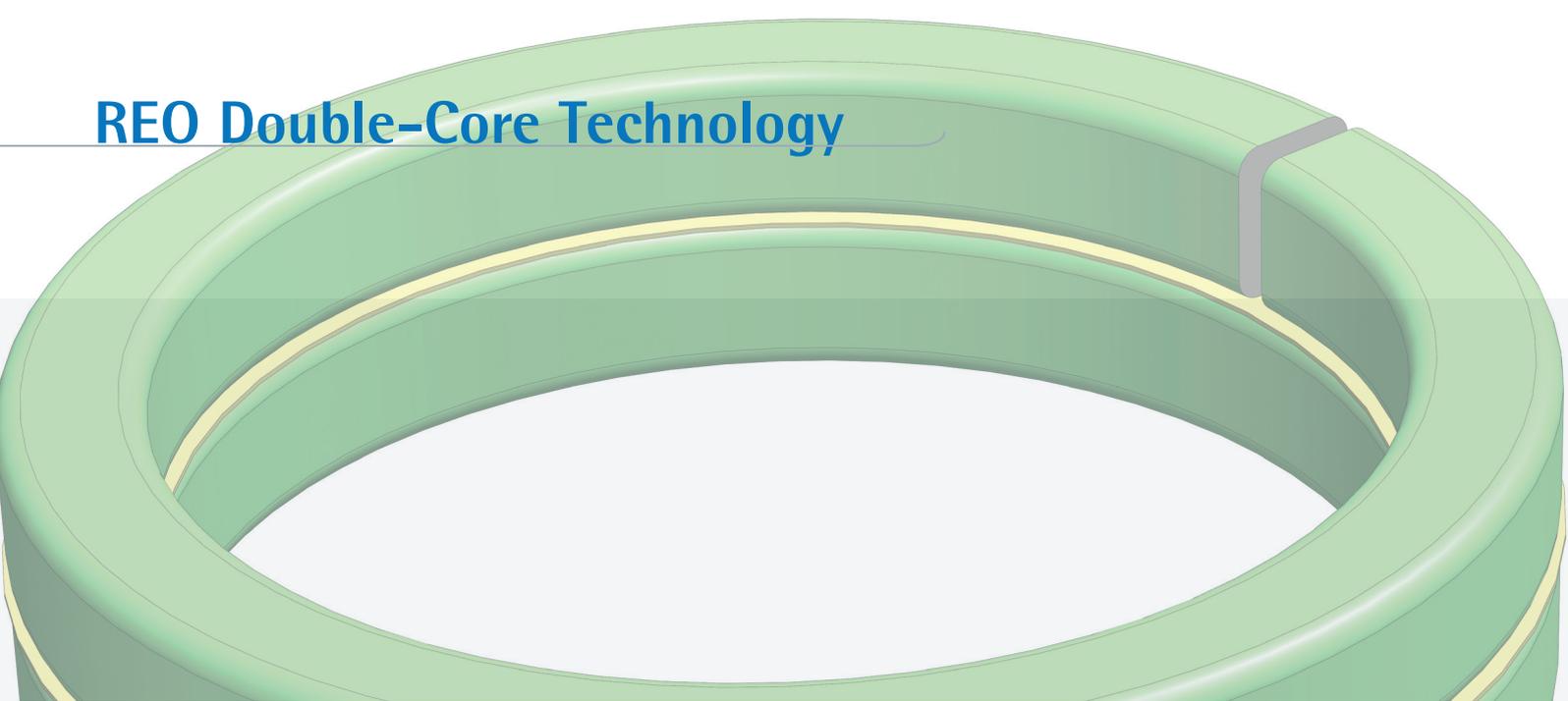
REO current transformers are particularly distinguished by their low space requirement, excellent linearity, fast response, and low iron and hysteresis losses.

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 primary and secondary
  - curve shape
  - saturation
  - core in relation to the winding
  - overcurrents and overvoltages
  - dynamic behaviour of the whole current transformer

# REO Double-Core Technology



## REO - Double-Core Technology

In most applications, closed-loop current transducers deal with measurements in the range from DC to frequencies up to 150 kHz. For this application a standard single-core technology hall effect sensor mounted in the air gap is a good solution (see Figure 1).

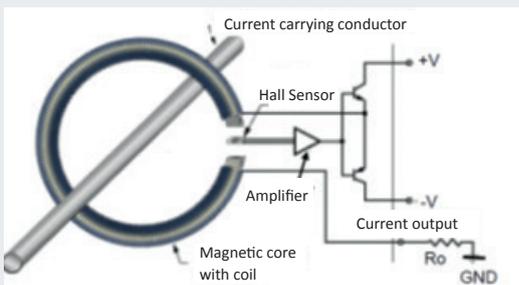


Figure 1: Closed loop compensated current transducer principle

In this design, the hall effect sensor located in the air gap is used with a bipolar power stage to create an equal and opposite magnetic field in the core. This means that the current output signal is directly proportional to the primary current travelling in the conductor.

This principle works well for lower frequencies, but as frequencies increase the core inductivity becomes a larger factor and the compensating electronics are not able to work adequately. At this point, the unit acts like a conventional current transformer with poor linearity. This effect is demonstrated in Figure 2. This effect and subsequent lack of measurement accuracy are those facts which make the REO WKO 2C with double-core technology so important.

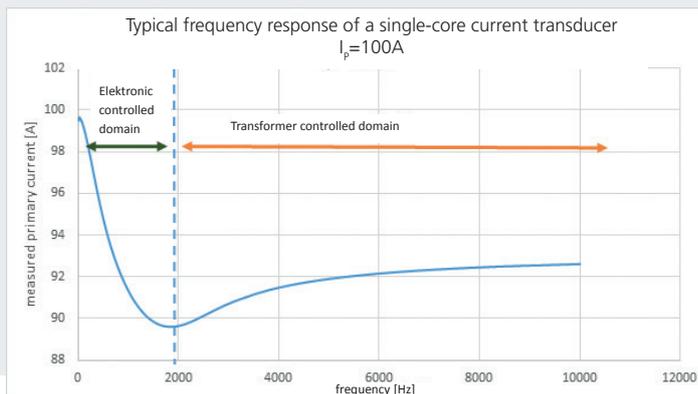


Figure 2: The performance of the electronic and transformer stages are not balanced.

# REO Double-Core Technology

The REO design team developed a solution to achieve a smooth, high accuracy transition from electronics to transformer-controlled domain.

We took two identical cores and joined them together as shown in Figure 3. This patented solution significantly improves measurement accuracy.

- Due to the compensation effect, the current transducer is insensitive to external magnetic fields.
- Better frequency response



Figure 3: Double core, integrated hall sensor in core  
Patent: DE 10 2008 036 582 A1

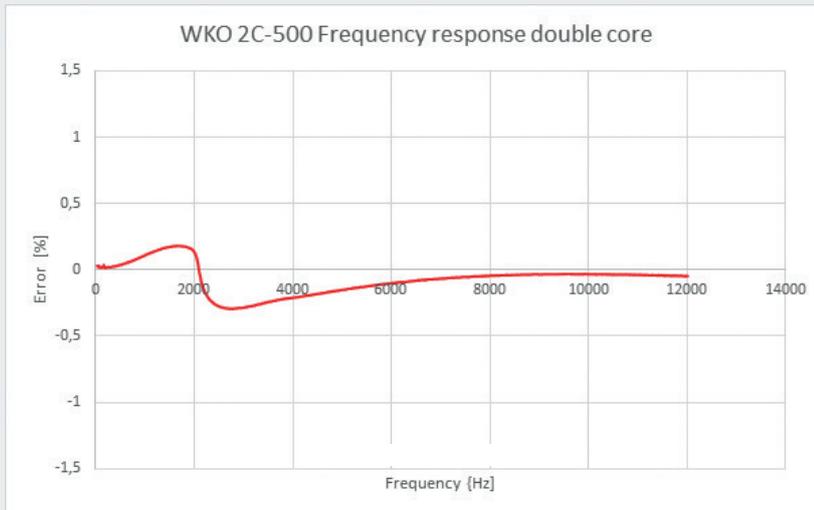


Figure 4: Double core frequency response

REO's double-core frequency response in Figure 4 shows the smooth transition between electronics and transformer domains.

We have tested other current transducer technologies and we can safely say that only a few of them have acceptable smooth frequency transition performance as shown in Figure 5 below.

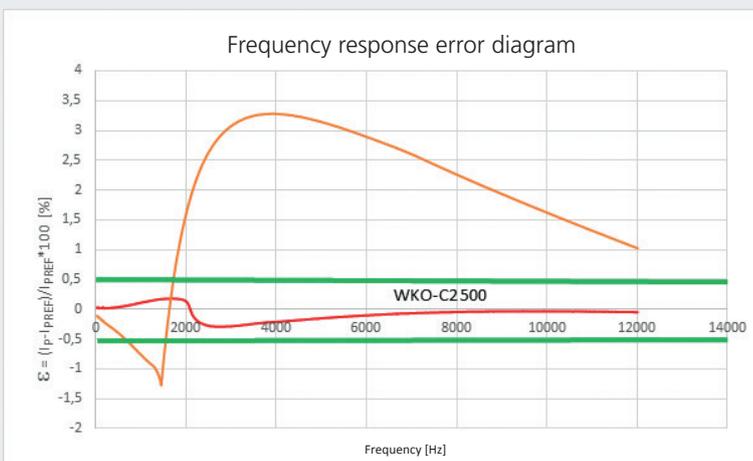
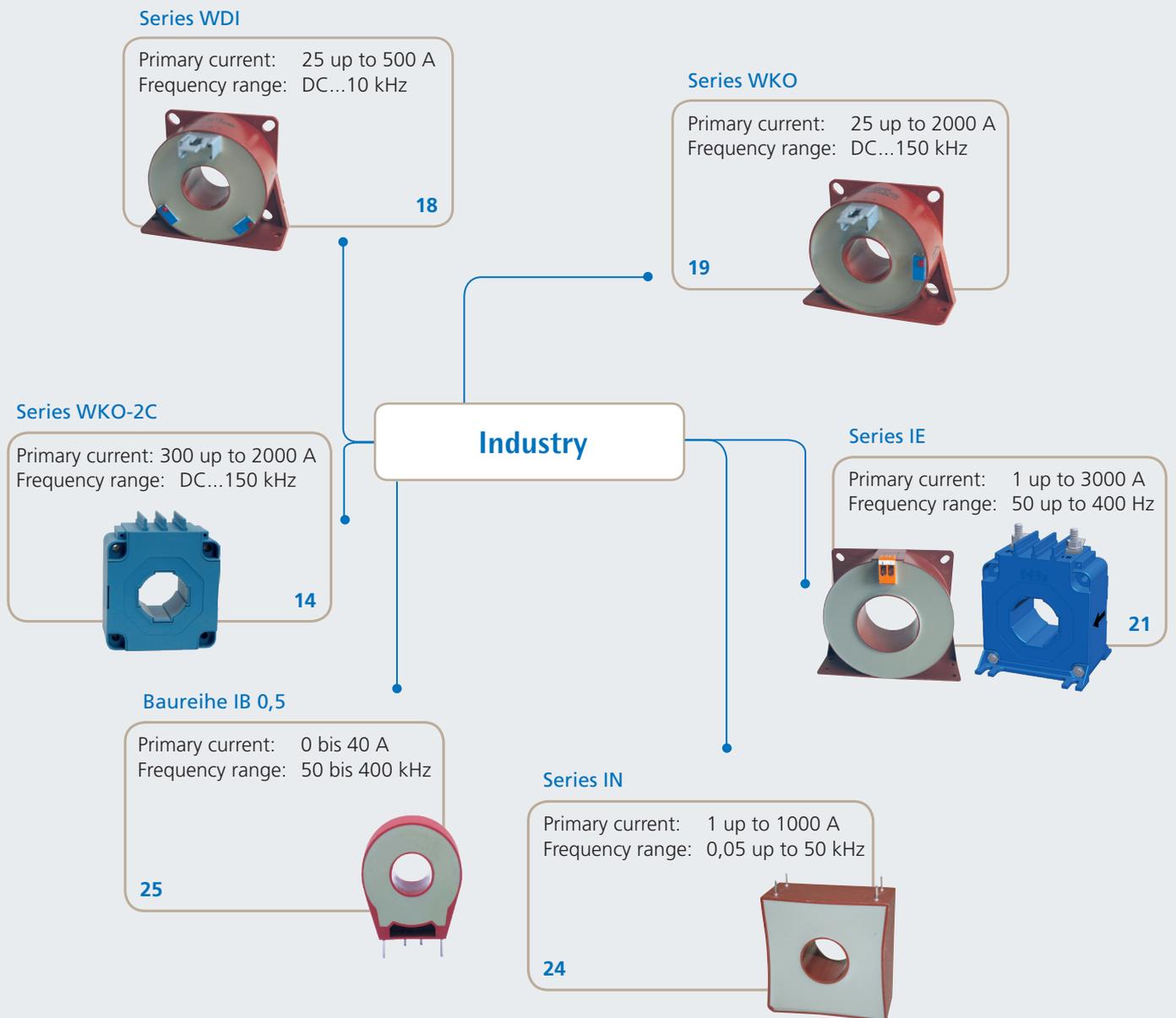


Figure 5: Comparison WKO-2C 500 and competitors products



## Areas of application

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



## Renewable energies

### Series WDI

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



18

### Series WKO

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



19

### Series WKO-2C

Primary current: 300 up to 2000 A  
Frequency range: DC...150 kHz



14

### Series IN

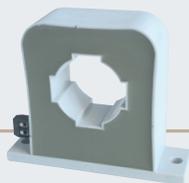
Primary current: 1 up to 1000 A  
Frequency range: 0,05 up to 50 kHz



24

### Series IN-D

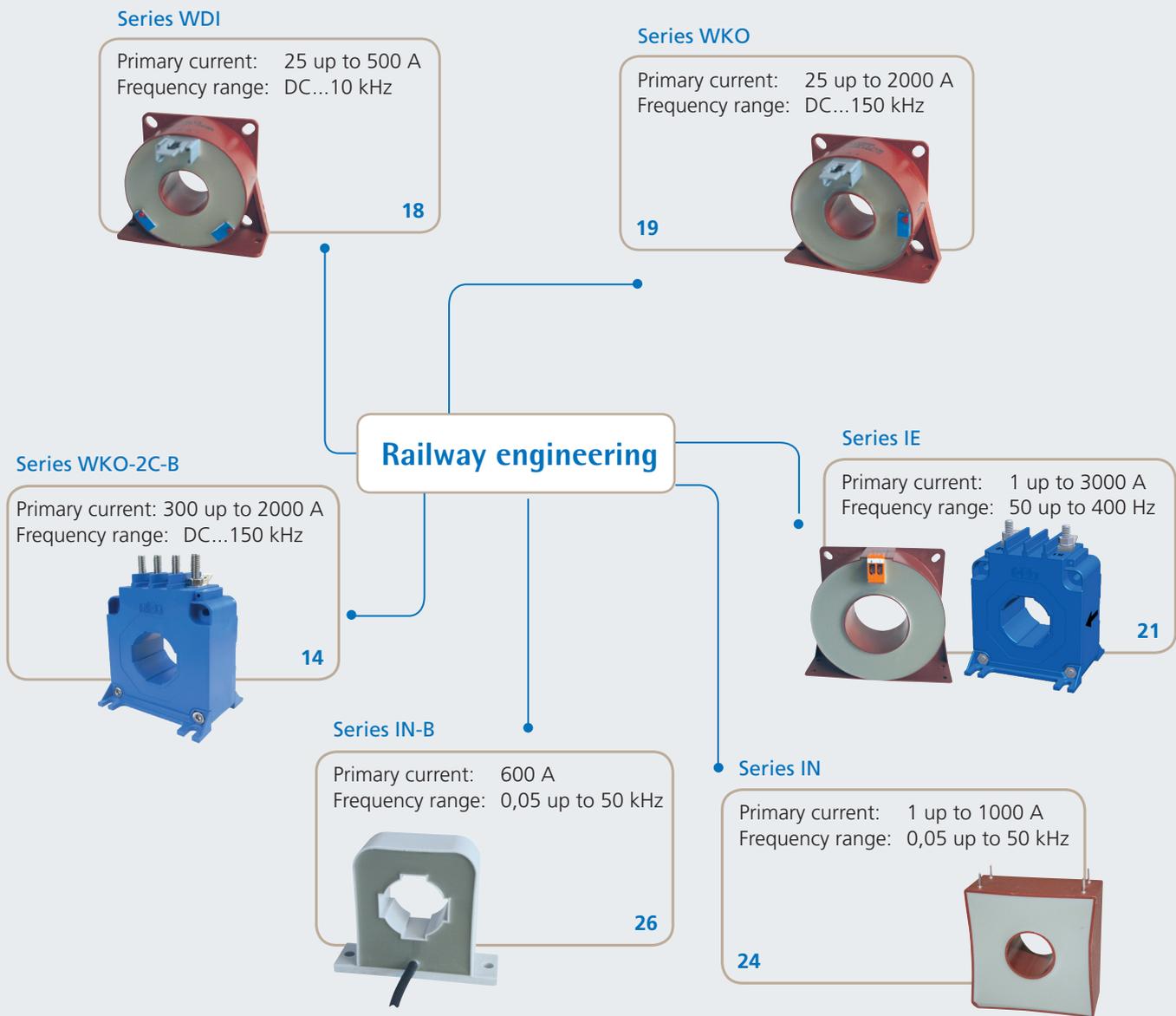
Residual current: 0,1 up to 10 A  
Frequency range: 0,05 up to 50 kHz



- Wind-power engineering

- Solar technology

- Grid monitoring



## Areas of application

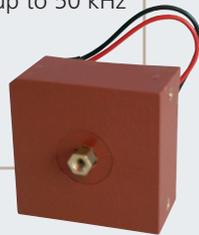
- Main and subsidiary inverters for underground and surface trains
- Monitoring switching states
- Energy measurements
- Auxiliary converters
- Control measurements



## Series IN-I

Primary current: 0 up to 200 A  
Frequency range: 0,05 up to 50 kHz

28



## Series IE

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

21



## Metrology and testing techniques

## Baureihe IB 0,5

Primary current: 0 bis 40 A  
Frequency range: 50 bis 400 kHz

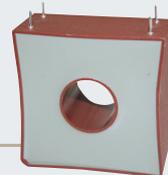
25



## Series IN

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

24



## Areas of application

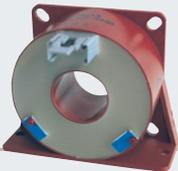
- Current matching
- Phase control
- Display devices
- Pulse measurement
- Network and plant protection
- Meters



## Energy, automation and building technology

### Series WDI

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



18

### Series WKO

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



19

### Series IE

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



21

### Series WKO-2C-B

Primary current: 300 up to 2000 A  
Frequency range: DC...150 kHz



14

### Baureihe IB 0,5

Primary current: 0 bis 40 A  
Frequency range: 50 bis 400 kHz



25

### Series IN

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



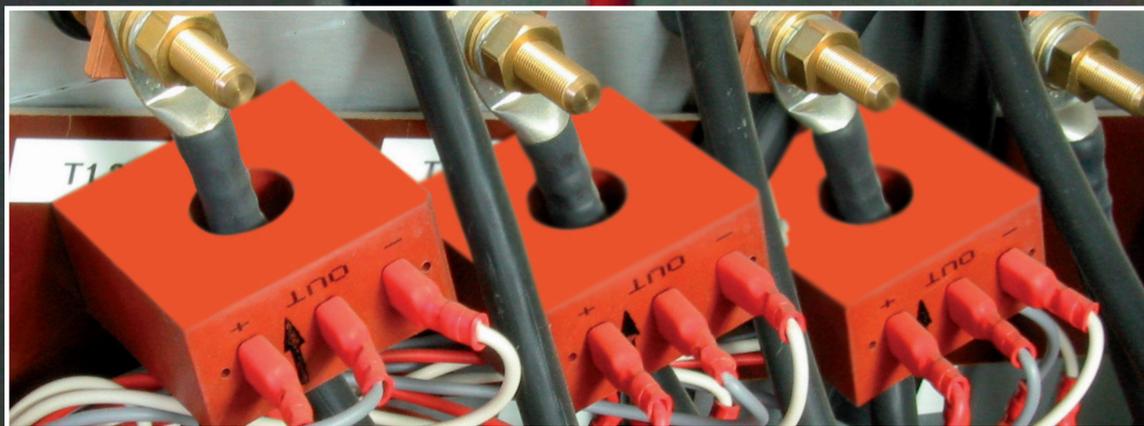
24

### Areas of application

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

RIEGL

SETZERMANH 1 VP  
HE 05/50-1/1  
B2 056 KWS 1/02



# REO WKO-2C / -2C-B

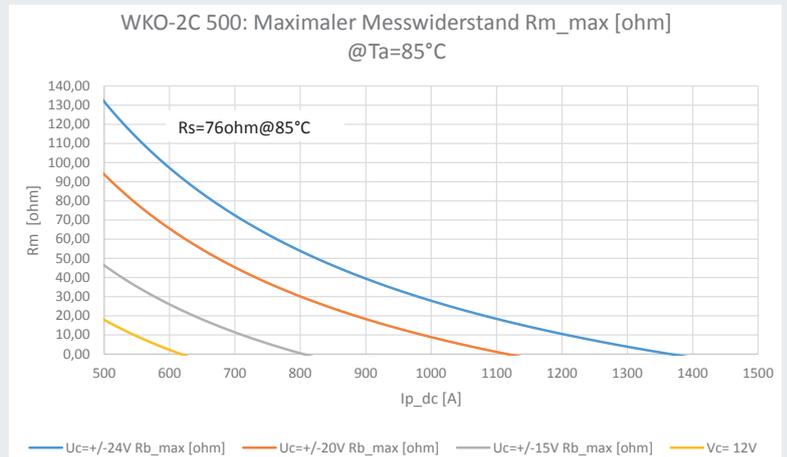
## Benefits

- High current measurement accuracy of 0.3%
- Modular designs providing universal mounting options
- Lower sensitivity to external magnetic fields
- Bidirectional and isolated current measurement
- Current output
- REO double-core technology
- All materials used are UL listed

REO has developed a new generation of closed-loop (C/L) current transducers which guarantee increased current measurement accuracy better than 0.3% in the whole frequency range: DC to 150 kHz.

The new current transducer type WKO-2C is a completely new development utilizing REO's double-core technology magnetic design. The unit uses the latest hall effect elements with an extended frequency response up to 150 kHz and accurate phase response.

Completely redesigned electronics ensures that the new C/L current transducer has better drift compensation and an extended temperature range from -40°C to 85°C.



## Technical data

Type	Primary RMS Nominal current $I_{PN}$ [A]	Measurement range $I_p$ [A]	Feed-in $U_c$ [V]	Measurement accuracy $X_G@I_{PN}$ [-20...+70°C] of $I_{PN}$ [%]	Ratio $K_N$	Secondary RMS nominal current $I_{SN}$ [mA]	Secondary winding Resistor $R_s@85^\circ\text{C}$ [ $\Omega$ ]	No-load current [mA]
WKO-2C-300	300	0 ... $\pm 2000$	$\pm 11,4...25,2$	$< \pm 0,3$	2000	150	13	$26+I_s$
WKO-2C-500	500	0 ... $\pm 1000$	$\pm 11,4...25,2$	$< \pm 0,3$	5000	100	76	$26+I_s$
WKO-2C-1000	1000	0 ... $\pm 2700$	$\pm 14,25...25,2$	$< \pm 0,3$	5000	200	42	$26+I_s$
WKO-2C-2000	2000	0 ... $\pm 4000$	$\pm 14,25...25,2$	$< \pm 0,3$	5000	400	26	$26+I_s$

## Accuracy and dynamic data

Type	Linearity mistake $e$ [%]	Offset mistake@25° $I_o$ [mA]	Offset drift -25°C ... +70°C $I_{OT}$ [mA]	Reaction time $t_{ra}$ [ $\mu\text{s}$ ]	Response time 10%-90% $t_a$ [ $\mu\text{s}$ ]	di/dt [A/ $\mu\text{s}$ ]	Stock width -1dB [kHz]
WKO-2C-300	$< \pm 0,1$	$\pm 0,5$	$< 25$	0,2	0,4	400	150
WKO-2C-500	$< \pm 0,1$	$\pm 0,5$	$< 25$	0,2	0,4	400	150
WKO-2C-1000	$< \pm 0,1$	$\pm 0,5$	$< 25$	0,2	0,4	400	150
WKO-2C-2000	$< \pm 0,1$	$\pm 0,5$	$< 25$	0,2	0,4	1000	150

## Isolation data

Type	Creepage distance $d_{Cp}$ [mm]	Clearance $d_{Ci}$ [mm]	Creep resistance [CTI]	AC-Isolation test 50/60Hz 1min $U_d$ [kV]	Impulse voltage test 1,2/50 $\mu\text{s}$ $U_i$ [kV]	Weight [kg]
WKO-2C-300	14	13	600	6	12,5	0,340
WKO-2C-500	14	13	600	6	12,5	0,260
WKO-2C-1000	20	18	600	6	12,5	0,700
WKO-2C-2000	35	30	600	6	12,5	1,600

## Typical applications

- Variable speed control of 3-phase AC motors and servo motor drives
- Industrial inverters
- Uninterruptable power supplies
- All types of switched-mode power supplies
- Power supplies for welding applications

Plug + Play



- EN 50178:1997
- UL 94-V0

## Modular construction

- various mounting options through pluggable mounting feet and mounting kit for busbars
- 3 different connection options: Molex plugs, litz wires or litz wires with plug
- Through standardized design REO current sensors WKO-2C are compatible with conventional models available on the market – no modifications necessary
- Molex-22-29-2031
- JST-BH03B-XASK-BN High-Box Standard
- JST-BH3P-VH-1
- Bolted connection with faston connection
- stranded wire connection = **Plug+Play**



## Also available for railway applications

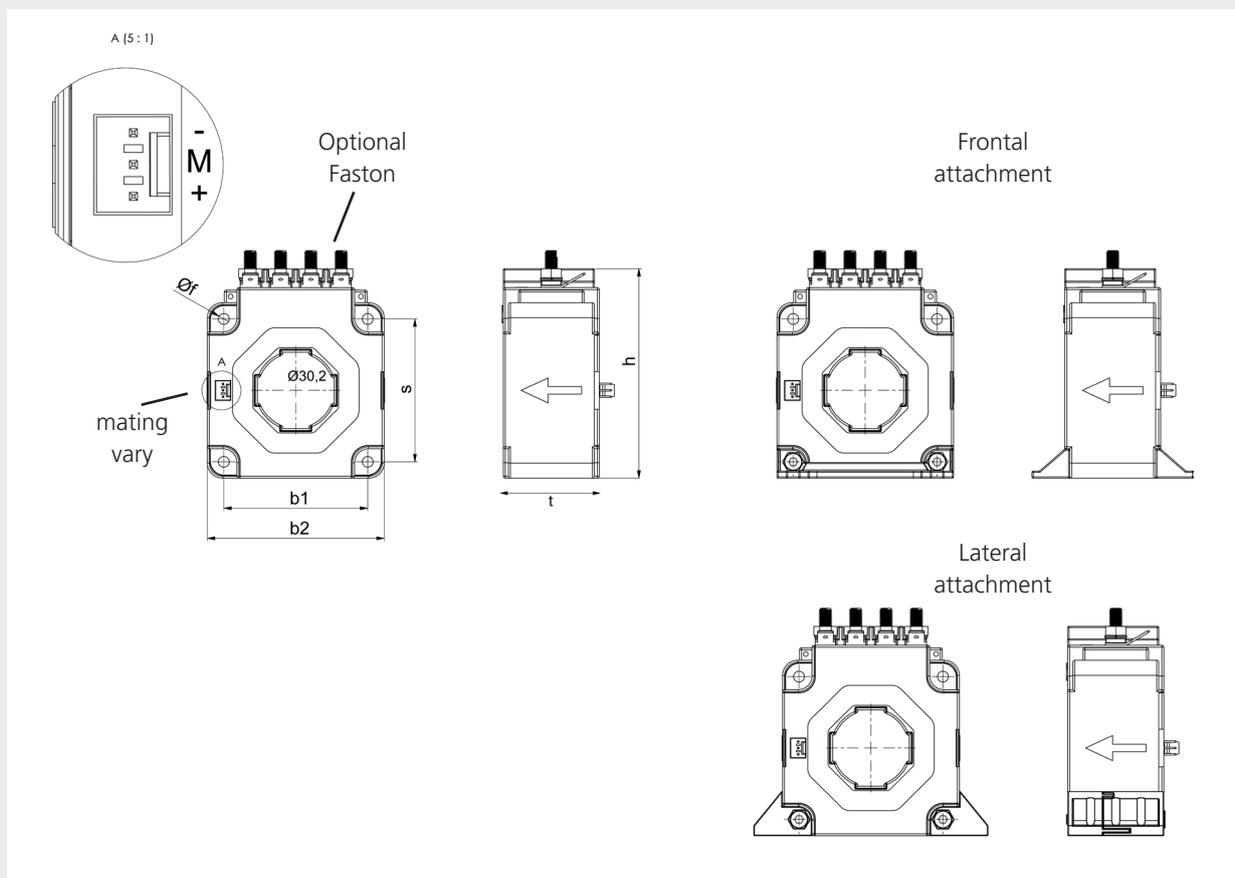
- Fulfills the required railway engineering safety standards:  
EN 50175, EN 50155:2007 and IEC 61373:2010
- Specially for railway technology: shock and vibration tested according to IEC 61373:2010
- Bolted connection with faston connection

= **WKO-2C-B**



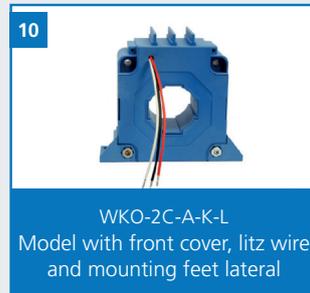
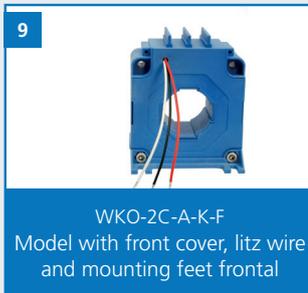
## Mechanical Data

- Various mounting options with pluggable bases
- The multi-purpose mounting system means that the units can be used easily in new designs and in retro-fit applications.
- various connection possible

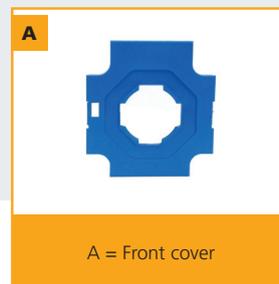
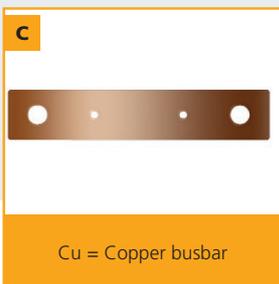


Type	b1 [mm]	b2 [mm]	t [mm]	s [mm]	h [mm]	D $\varnothing$ [mm]	D1/D2 [mm]	$\varnothing f$ [mm]	$\varnothing e$ [mm]
WKO-2C-300	57	70	38	57	70	30,2	10,4/30,4	4,3	4,3
WKO-2C-500	57	70	38	57	70	30,2	10,4/30,4	4,3	4,3
WKO-2C-1000	78	94	42	78	94	38,5	13,5/40,5	5,3	5,3
WKO-2C-2000	102	135	52	102	135	57,5	20,5/60,5	6,5	6,5

# Active current transformers / Series WKO-2C and WKO-2C-B



## Fastenings – optionally available for mounting to the basic model





## Series WDI

### Technical data

Primary nominal current	$I_{PN}$	25 up to 500	[A]
Measurement range	$I_{maxPN}$	0 up to $\pm 600$	[A]
Max. permissible output current	$I_{outputN}$	$\pm 5$	[mA]
Effective nominal compensating voltage	$U_{aN}$	10	[V]
Supply voltage	$U_S$	$\pm 15Vdc \pm 5\%$	[Vdc]
No-load current	$I_{BO}$	9	[mA]
Terminating resistor	$R_{min}$	2	[k $\Omega$ ]
Terminating resistor	$R_{max}$	10	[k $\Omega$ ]
Measurement precision [50 Hz]	$F_U$	$\pm 0,6$	[%]
Linearity	$F_{LU}$	$\leq 1$	[%]
Ambient temperature	$T_A$	-25 up to +75	[ $^{\circ}C$ ]
Frequency range	$f$	DC...10	[kHz]
Response time	$t_R$	$\leq 25$	[ $\mu s$ ]
Offset voltage	$U_o$	20	[mV]
Drift in offset voltage	$\Delta U_o$	60	[mV]
Temperature drift	$\%/\Delta T$	$\leq 0,05$	[%K]
Insulation test voltage	$V_p$	3	[kVac]

Series WDI

### 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
- Assembly-friendly design
- Connections: clamps, plugs, flat-cable plugs or cables
- Wide range of housings with various push-through openings



### Open loop current transformers

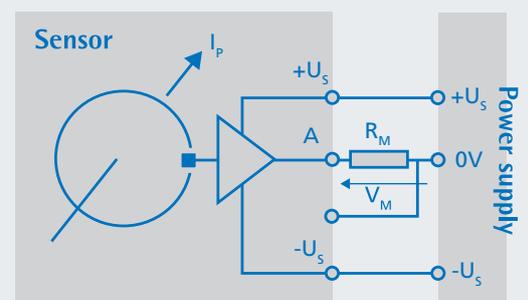
The WDI current sensor is an open loop current transformer designed for measuring direct and alternating currents.

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

### Mode of Operation



# Active current transformer



## Series WKO

### Technical data

Primary nominal current	$I_{PN}$	25 up to 2000	[A]
Measurement range	$I_{maxPN}$	0 up to $\pm 3000$	[A]
Secondary current	$I_{aN}$	25 up to 400	[mA]
Transformation ratio	$K_N$	1000 up to 5000	[1:]
Working voltage	$U_s$	$\pm 12$ up to $\pm 24$	[V]
Terminating resistor	$R_{min} / R_{max}$	0 up to 200	[ $\Omega$ ]
Measurement precision with RT	$F_U$	0,65 up to $\pm 1,0$	[%]
Ambient temperature	$T_A$	-25 up to +85	[ $^{\circ}C$ ]
Frequency range	$f$	DC...150 up to DC...200	[kHz]
Response time	$t_R$	$\leq 1,5$	[ $\mu s$ ]
Offset voltage	$I_o$	$\leq 0,1$ up to $\pm 0,3$	[mA]
Drift in offset voltage	$\Delta I_o$	$\pm 0,2$ up to $\pm 0,5$	[mA]
Insulation test voltage	$V_p$	3 - 6	[kVac]

Series WKO

### 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

- Assembly-friendly design
- Variable connections, e.g. clamps, plugs, flat-cable plugs or cables
- Wide range of housings with various push-through openings

### 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.

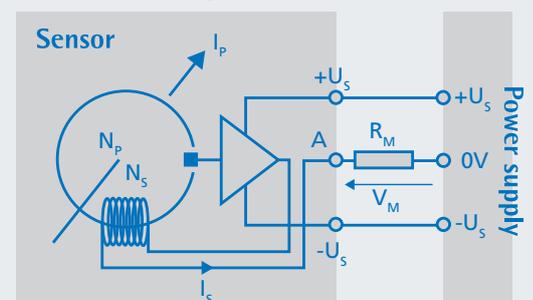
The primary current generates a magnetic flux, which is compensated by an internal secondary coil. The current is evaluated by an electronic circuit and a Hall sensor. The secondary compensating current is a precise representation of the primary current to be measured.

### Areas of application

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



### Mode of Operation



More information can be found on the internet at [www.reo.de](http://www.reo.de)





## Series IE

### Technical data

Primary nominal current	$I_{pN}$	1 up to 3000	[A]
Maximum primary nominal current	$I_{maxPN}$	1,2 up to 3600	[A]
Secondary current	$I_{aN}$	20 up to 1000	[mA]
Power	$P_{sek}$	0,1 up to 25	[VA]
Transformation ratio	$K_N$	50 up to 3000	[1:]
Compliance voltage	$U_{RB}$	0,5 up to 25	[V]
Load impedance	$R_B$	0,5 up to 250	[ $\Omega$ ]
Measurement precision with RT	$F_U$	$\leq 1$	[%]
Ambient temperature	$T_A$	-25 up to +70	[ $^{\circ}C$ ]
Frequency range	$f$	50 up to 400	[Hz]
Insulation test voltage	$V_p$	3	[kVac]

Series IE

### 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

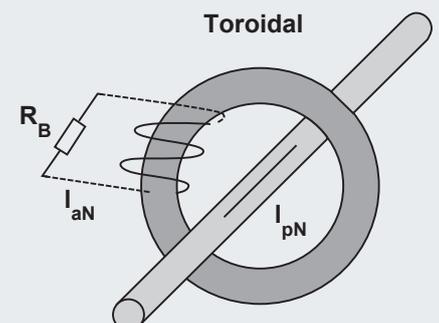
### Bushing-type and bar-type current transformers

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.



### Mode of Operation



### Areas of application

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

## Technical Data

Type IE modular		500	1000	2500 A	
IPN	Primary rated current	500	1000	2500	[A]
ImaxPN	Max. primary rated current	600	1200	2500	[A]
IaN	Secondary current	1000			[mA]
RB	Load resistance	5	15	30	[Ω]
URB	Load voltage	5	15	30	[V]
PSek	Capacity	5	15	30	[VA]
KN	Transmission ratio	500	1000	2500	
Fi	Measuring accuracy [50 Hz]	0,5	0,5	0,5	[%]
f	Frequency	50 - 400			[Hz]
TA	Ambient temperature	-25 bis +70			[°C]
Vp	Insulation test	3			[kVac]
<b>General Data</b>					
Connection	MS Bolts/Flat plugs 6,3 x 0,8				[mm²]
Weight	0,8	0,8	1,8		[kg]
Standards	61869-2				

Series IE

## Description

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.

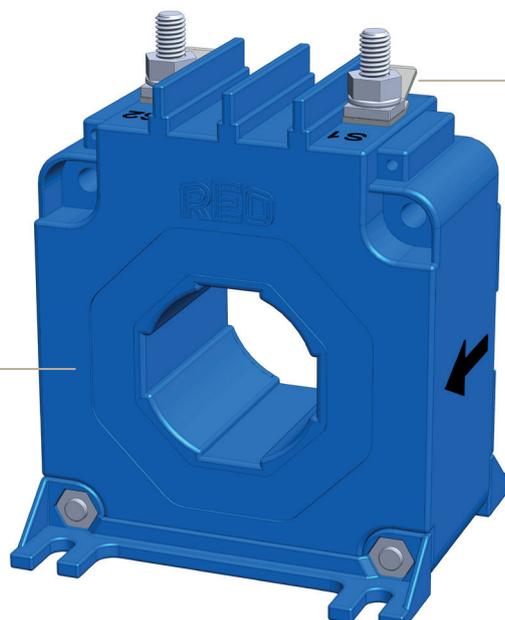
According to: 61869-2  
 Primary rated current: 500, 1000, 2500 A  
 Frequency range: 50 - 400 Hz

## Applications:

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

## Benefits

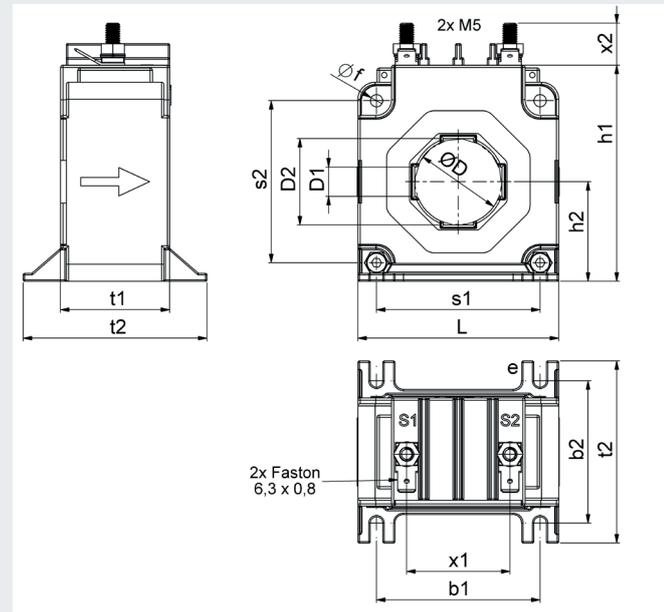
- Bolts or flat plug connection
- Bushing-type current transformers for direct conductor feedthrough
- In-phase current representation
- Accuracy classes: 1; 0.5 ; 0.2
- Toroidal cores made of high-quality magnetic cores
- Frequency range 16 2/3 to 400 Hz optional
- In-house core production: Special designs are possible
- High core output power and high-quality insulation (UL)
- Electrically isolated primary and secondary circuits
- Easy-to-assemble modular-type housing
- Variable connections, e.g. bolts, flat plugs, litz wires
- Wide range of housings with various push-through openings
- Very long lifetime



# Passive current transformer

## A new REO development of AC current sensors in modular design

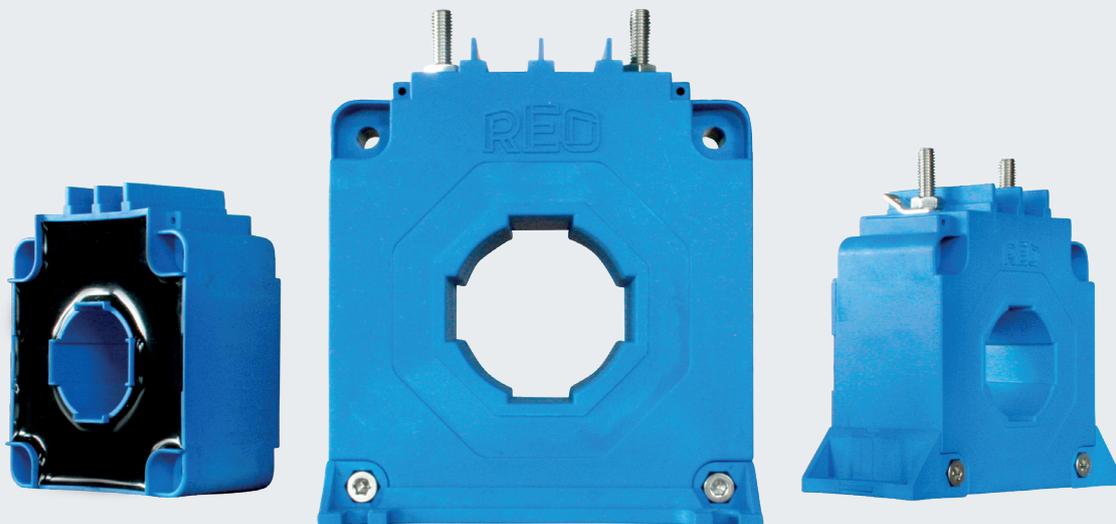
The well-established current sensors of the IE range are now available as improved versions in our new modular-type housing. Various mounting options such as mounting feet, mounting kit for busbars, etc. provide the users a wide range of mounting possibilities. This new "IE modular" series meets both the industrial and railway standard requirements. The use of special magnetic cores enabled to improve the class accuracy to class 0.5. With adapted burdens, it is even possible to achieve accuracy classes up to cl. 0.2.



## Dimensions

Type	l [mm]	h1/h2 [mm]	t1/t2 [mm]	s1/s2 [mm]	b1/b2 [mm]	D [mm]	D1xD2 [mm]	f [mm]	e [mm]	x1/x2 [mm]
IE modul	70	76/35	38/64	57/57	57/50	30,2	30,4x10,4	4,3	4,3	36/15
IE modul	94	100/47	42/72	78/78	78/60	38,5	40,5x13,5	5,3	5,3	36/15
IE modul	135	141/67,5	52/88	102/102	102/70	57,5	60,5x20,5	6,5	6,5	36/15

## IE modular – Basic model with front cover and different mounting options



# Passive current transformer



Series IN



## Technical data

Primary nominal current	$I_{PN}$	1 up to 1000	[A]
Maximum primary nominal current	$I_{maxPN}$	1,2 up to 1200	[A]
Secondary current	$I_{aN}$	1 up to 1000	[mA]
Power	$P_{sek}$	0,05 up to 15	[VA]
Transformation ratio	$K_N$	50 up to 2000	[1:]
Compliance voltage	$U_{RB}$	0,5 up to 15	[V]
Load impedance	$R_B$	0,5 up to 125	[ $\Omega$ ]
Measurement precision with RT	$F_U$	$\leq 1$	[%]
Ambient temperature	$T_A$	-25 up to +70	[°C]
Frequency range	f	0,05 up to 50	[kHz]
Insulation test voltage	$V_p$	3	[kVac]

Series IN

## 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

- 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

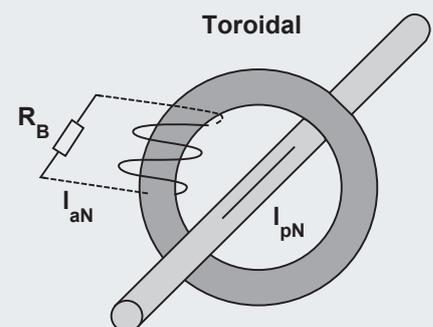
## Instrument transformers

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.



## Mode of Operation



## Areas of application

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

More information can be found on the internet at [www.reo.de](http://www.reo.de)



## Baureihe IB 0,5

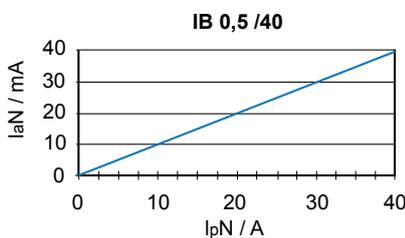
### Technische Daten

Primärnennstrom	$I_{PN}$	0 bis 40	[A]
Maximaler Primärnennstrom	$I_{maxPN}$	7 bis 50	[A]
Sekundärstrom	$I_{aN}$	0 bis 40	[mA]
Leistung	$P_{sek}$	0 bis 0,040	[VA]
Übersetzungsverhältnis	$K_N$	500 bis 1000	[1:]
Bürendspannung	$U_{RB}$	0 bis 1	[V]
Bürdenwiderstand	$R_B$	25 bis 100	[ $\Omega$ ]
Messgenauigkeit bei RT	$F_U$	$\leq 1$	[%]
Umgebungstemperatur	$T_A$	0 bis +85	[°C]
Frequenzbereich	f	50 bis 400	[kHz]
Isolationsprüfspannung	$V_p$	3	[kVac]

IB 0,5

## Instrument transformers

REO current transformers Smart are suitable for mounting on printed-circuit boards in the electric range of modern drive engineering for control purposes and measurement value logging. All safety regulations as for example double insulation are obtained.



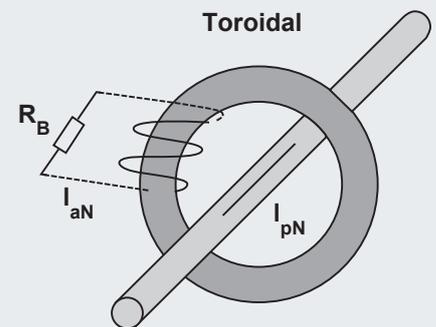
## Electrical benefits

- 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

- Assembly-friendly design
- 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
- small construction space

## Mode of Operation



Type	[A]	Höhe [mm]	Breite [mm]	s1/s2 [mm]	Tiefe [mm]	Öffnung [mm]	PIN Stärke [mm]	PIN Länge [mm]
IB 0,5/5	0 - 5 A	30	26,5/17,5	57/57	14,5	10,5	0,7x0,7	5,0
IB 0,5/20	0 - 20 A	30	26,5/17,5	78/78	14,5	10,5	0,7x0,7	5,0
IB 0,5/40	0 - 40 A	30	26,5/17,5	102/102	14,5	10,5	0,7x0,7	5,0



## Series IN-B

### Technical data

Primary nominal current	$I_{PN}$	600	[A]
Maximum primary nominal current	$I_{maxPN}$	720	[A]
Secondary current	$I_{aN}$	300	[mA]
Power	$P_{sek}$	0,9	[VA]
Transformation ratio	$K_N$	2000	[1:]
Load impedance	$R_B$	10	[Ω]
Compliance voltage	$U_{RB}$	3	[V]
Measurement precision [50 Hz]	$F_U$	± 1	[%]
Ambient temperature	$T_A$	-25 up to +70	[°C]
Frequency range	$f$	0,05 up to 50	[kHz]
Insulation test voltage	$V_p$	3	[kVac]

Series IN-B

## 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

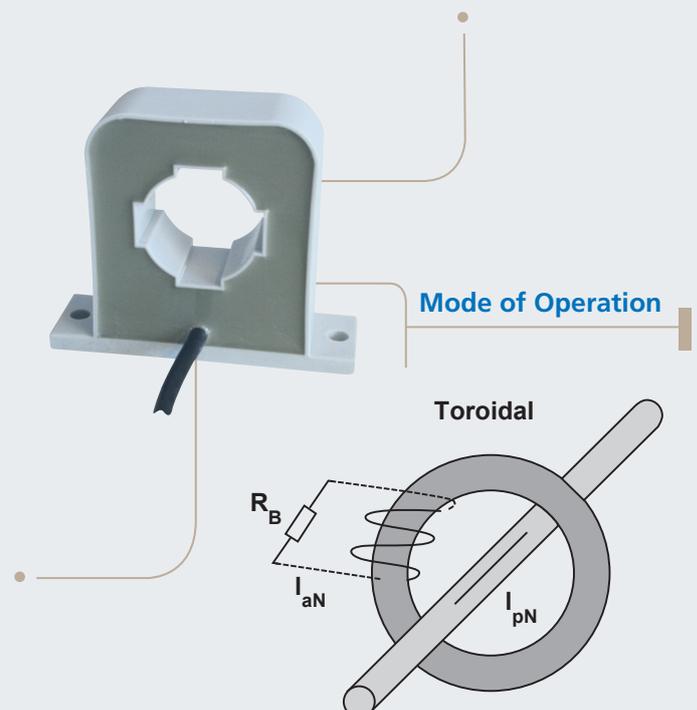
- Railway engineering

## 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

- Assembly-friendly design
- 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





## Series IN-D

### Technical data

Primary differential current	$\Delta I_{pN}$	0,1 up to 10	[A]
Max. primary differential current	$\Delta I_{maxPN}$	2 up to 50	[A]
Thermal short-time current	$I_{Tk}$	0,5 up to 9	[kA]
Rated output current	$I_{aN}$	2 up to 20	[mA]
Power	$P_{sek}$	0,004 up to 0,06	[VA]
Transformation ratio	$K_N$	500 up to 2000	[1:]
Compliance voltage	$U_{RB}$	1,5 up to 6,0	[V]
Load impedance	$R_B$	75 up to 1000	[Ohm]
Measurement precision	$F_U$	$\leq 1,0$	[%]
Ambient temperature	$T_A$	-10 up to +50	[°C]
Frequency range	$f$	25 up to 400	[Hz]
Insulation test voltage	$V_p$	3	[kVac]

### Electrical benefits

- Current transformers for measuring differential current
- Measurement from 25Hz to -400 Hz
- Use of nanocrystalline cores
- High-quality UL listed insulating materials (e.g. UL94-V0)
- Safe electrically isolated primary and secondary circuits
- Inexpensive solution for current monitoring

### Mechanical benefits

- Assembly-friendly design
- Variable connections, e.g. clamps, plugs, flat-cable plugs or cables
- Wide range of housings with various push-through openings

### Differential current transformers

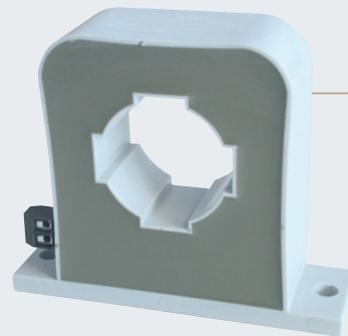
A differential current transformer permits the measurement of differential current in single-phase or three-phase supply cables or in individual lines. Both current-carrying conductors (outward conductor and return conductor) are led through the current opening of the current transformer. The current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

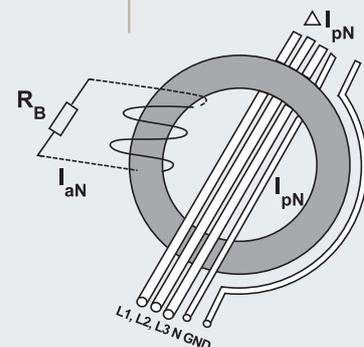
- stage 1: Notice of a malfunction
- stage 2: Alarm
- stage 3: Switching off

### Areas of application

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



### Mode of Operation



More information can be found on the internet at [www.reo.de](http://www.reo.de)



## Series IN-I

Series IN-I

Primary nominal current	$I_{pN}$	0 up to 200	[A]
Maximum primary nominal current	$I_{maxPN}$	$\pm 60$ up to $\pm 240$	[A]
Secondary current	$I_{aN}$	0 up to 200	[mA]
Power	$P_{Sek}$	0,5 up to 1,5	[VA]
Transformation ratio	$K_N$	1000	[1:]
Compliance voltage	$U_{RB}$	7,5 up to 10	[V]
Load impedance	$R_B$	37 up to 200	[ $\Omega$ ]
Measurement precision	$F_I$	$\pm 0,2$	[%]
Phase error	$d_i$	$\leq 10$	[min.]
Ambient temperature	$T_A$	-20 up to +70	[ $^{\circ}C$ ]
Frequency range	$f$	0,05 up to 50	[kHz]
Insulation test voltage	$V_p$	3	[kVac]

### Electrical benefits

- High-precision current measurements CI 0.2
- Pulsed current measurement (8/20 $\mu$ s 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

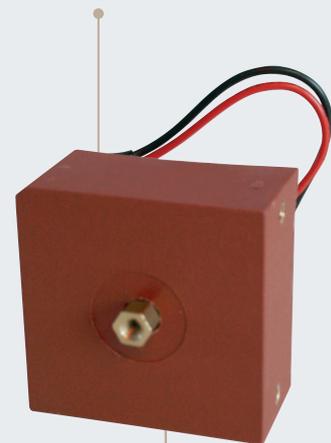
Because of the materials selected, REO pulsed current transformers in the IN-I series monitor current with high precision and in the appropriate transformation ratio - which makes them particularly suitable for power measurements, current monitoring and analysis, and for use in solar inverters. They 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.

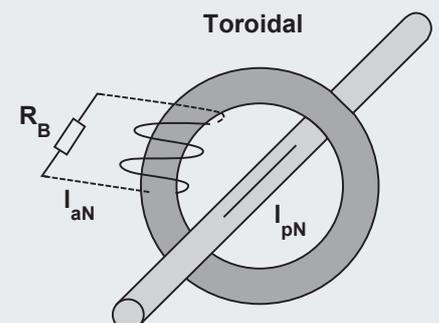
The magnetic field generated by the flow of current through the conductor is detected by the toroidal core, which, in accordance with the transformation ratio of the secondary winding, generates a smaller current for measurement purposes. By this means, a heavy current to be measured is reduced to a substantially smaller current and is in addition isolated from the primary circuit by safe electrical isolation.

### Areas of application

- Metrology and testing techniques



### Mode of Operation



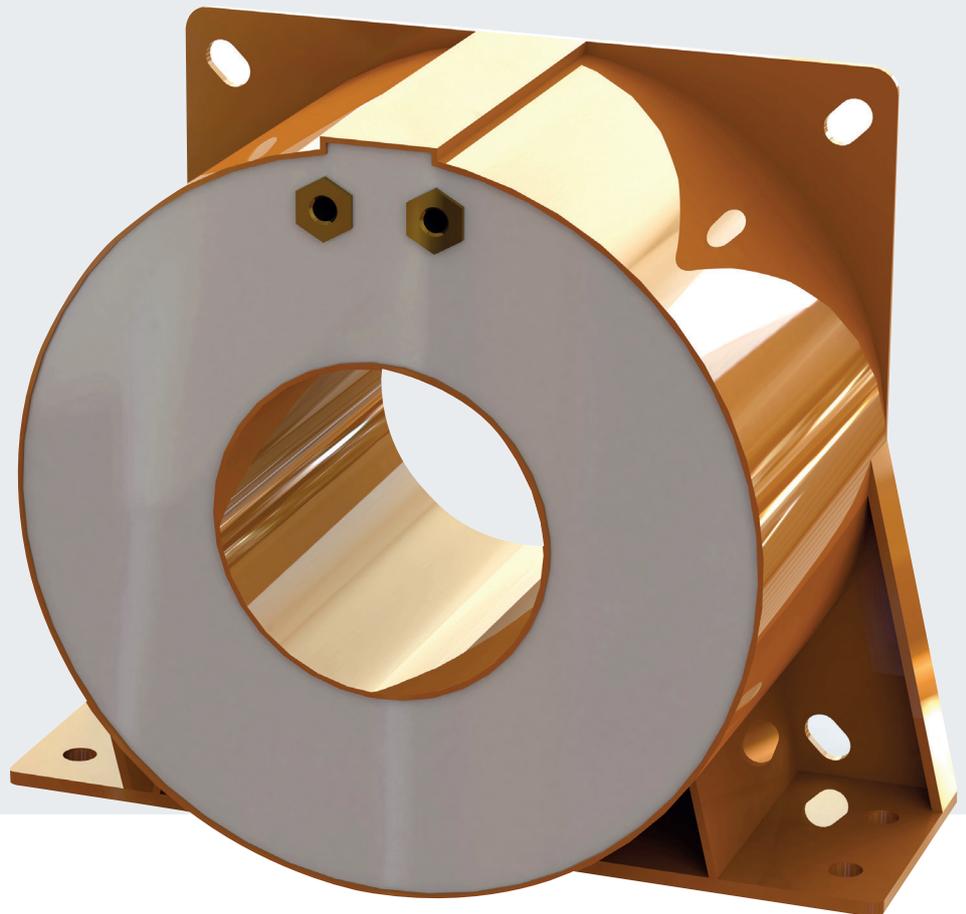
### Standard or individual product solution – also with small amounts

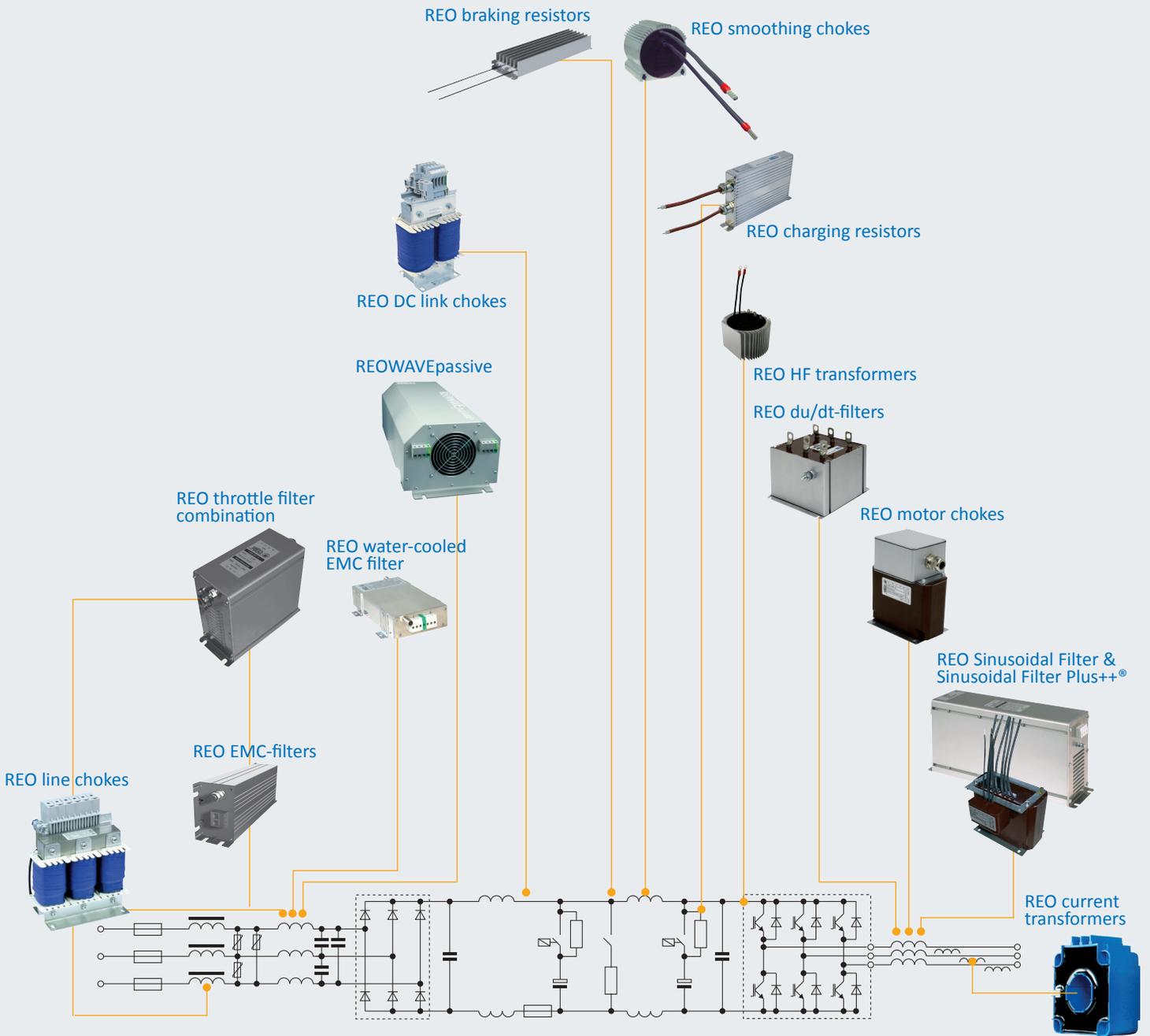
In addition to our wide standard product portfolio we can develop and manufacture your specific solution with the optimal performances you need.

#### Example:

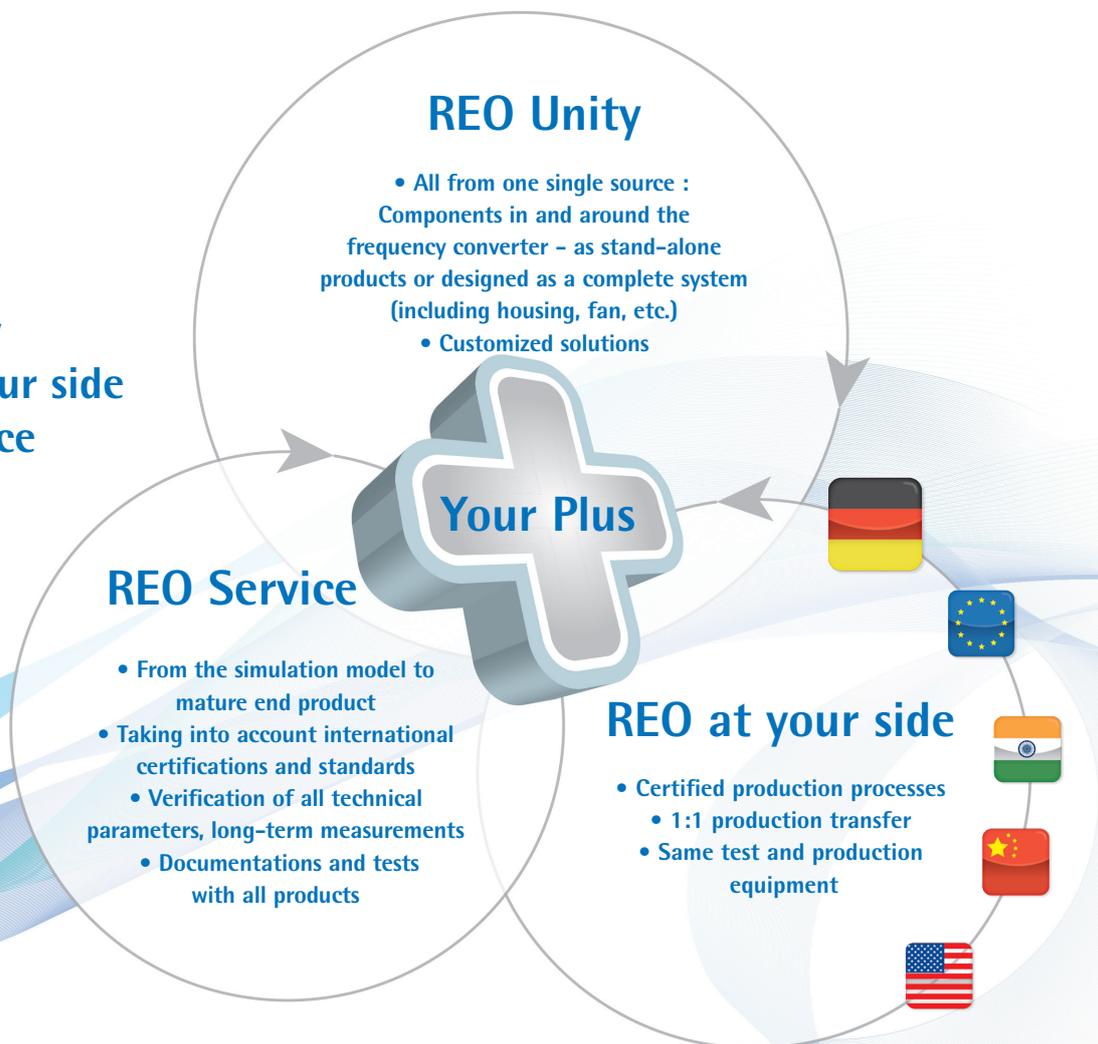
The new generation of REO current transformers with the following benefits:

- Accuracy 0,2 %
- Load voltage 10VA
- Large push-through opening
- Insulation class II UL94V0
- According to IEC 60044-1





- REO Unity
- REO at your side
- REO Service



### 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.



REO AG

Brühler Straße 100 · D-42657 Solingen  
Tel.: +49 (0)212 8804 0 · Fax: +49 (0)212 8804 188

E-Mail: [info@reo.de](mailto:info@reo.de)  
Internet: [www.reo.de](http://www.reo.de)

#### ■ Divisions:

##### » REO Vibratory Feeding and Power Electronics Division

REO Vibratory Feeding and Power Electronics Division  
Brühler Straße 100 · D-42657 Solingen  
Tel.: +49 (0)212 8804 0 · Fax: +49 (0)212 8804 188  
E-Mail: [info@reo.de](mailto:info@reo.de)

##### » REO Train Technologies Division

REO Train Technologies Division  
Erasmusstraße 14 · D-10553 Berlin  
Tel.: +49 (0)30 3670236 0 · Fax: +49 (0)30 3670236 10  
E-Mail: [zentrale.berlin@reo.de](mailto:zentrale.berlin@reo.de)

##### » REO Drives Division

REO Drives Division  
Holzhausener Straße 52 · D-16866 Kyritz  
Tel.: +49 (0)33971 485 0 · Fax: +49 (0)33971 485 90  
E-Mail: [zentrale.kyritz@reo.de](mailto:zentrale.kyritz@reo.de)

##### » REO Medical and Current Transformer Division

REO Medical and Current Transformer Division  
Schuldhölzinger Weg 7 · D-84347 Pfarrkirchen  
Tel.: +49 (0)8561 9886 0 · Fax: +49 (0)8561 9886 40  
E-Mail: [zentrale.pfarrkirchen@reo.de](mailto:zentrale.pfarrkirchen@reo.de)

##### » REO Test and PowerQuality Division

REO Test and PowerQuality Division  
Brühler Straße 100 · D-42657 Solingen  
Tel.: +49 (0)212 8804 0 · Fax: +49 (0)212 8804 188  
E-Mail: [info@reo.de](mailto:info@reo.de)

#### ■ PRODUCTION + SALES:

##### ■ China

REO Shanghai Inductive Components Co., Ltd  
E-Mail: [info@reo.cn](mailto:info@reo.cn) · Internet: [www.reo.cn](http://www.reo.cn)

##### ■ India

REO GPD INDUCTIVE COMPONENTS PVT. LTD  
E-Mail: [info@reogpd.com](mailto:info@reogpd.com) · Internet: [www.reo-ag.in](http://www.reo-ag.in)

##### ■ USA

REO-USA, Inc.  
E-Mail: [info@reo-usa.com](mailto:info@reo-usa.com) · Internet: [www.reo-usa.com](http://www.reo-usa.com)

#### ■ SALES:

##### ■ France

REO VARIAC S.A.R.L.  
E-Mail: [reovariac@reo.fr](mailto:reovariac@reo.fr) · Internet: [www.reo.fr](http://www.reo.fr)

##### ■ Great Britain

REO (UK) Ltd.  
E-Mail: [main@reo.co.uk](mailto:main@reo.co.uk) · Internet: [www.reo.co.uk](http://www.reo.co.uk)

##### ■ Italy

REO ITALIA S.r.l.  
E-Mail: [info@reitalia.it](mailto:info@reitalia.it) · Internet: [www.reitalia.it](http://www.reitalia.it)

##### ■ Poland

REO CROMA Sp.zo.o  
E-Mail: [croma@croma.com.pl](mailto:croma@croma.com.pl) · Internet: [www.croma.com.pl](http://www.croma.com.pl)

##### ■ Spain

REO ESPAÑA 2002 S.A.  
E-Mail: [info@reospain.com](mailto:info@reospain.com) · Internet: [www.reospain.com](http://www.reospain.com)

##### ■ Switzerland

REO ELEKTRONIK AG  
E-Mail: [info@reo.ch](mailto:info@reo.ch) · Internet: [www.reo.ch](http://www.reo.ch)

##### ■ Turkey

REOTURKEY ELEKTRONIK San. ve Tic. Ltd. Şti.  
E-Mail: [info@reo-turkey.com](mailto:info@reo-turkey.com) · Internet: [www.reo-turkey.com](http://www.reo-turkey.com)