



Pushing Performance



People | Power | Partnership

HARTING

Hall effect current sensors

Transforming customer wishes into concrete solutions



The HARTING Technology Group is skilled in the fields of electrical, electronic and optical connection, transmission and networking, as well as in manufacturing, mechatronics and software creation. The Group uses these skills to develop customized solutions and products such as connectors for energy and data transmission applications including, for example, mechanical engineering, rail technology, a wind energy plants, factory automation and the telecommunications sector. In addition, HARTING also produces electro-magnetic components for the automobile industry and offers solutions in the field of Enclosures and Shop Systems. The HARTING Group currently comprises 37 subsidiary companies and worldwide distributors employing a total of more than 3,500 staff.



HARTING Subsidiary company



HARTING Representatives



We aspire to top performance.

Connectors ensure functionality. As core elements of electrical and optical wiring, connection and infrastructure technologies, they are essential in enabling the modular construction of devices, machines and systems across a very wide range of industrial applications. Their reliability is a crucial factor guaranteeing smooth functioning in the manufacturing area, in telecommunications, applications in medical technology – in fact, connectors are at work in virtually every conceivable application area. Thanks to the consistent further development of our technologies, customers enjoy investment security and benefit from durable, long term functionality.

Always at hand, wherever our customers may be.

Increasing industrialization is creating growing markets characterized by widely diverging demands and requirements. The search for perfection, increasingly efficient processes and reliable technologies is a common factor in all sectors across the globe.

HARTING is providing these technologies – in Europe, America and Asia. The **HARTING** professionals at our international subsidiaries engage in close, partnership based interaction with our customers, right from the very early product development phases, in order to realize customer demands and requirements in the best possible manner.

Our people on location form the interface to the centrally coordinated development and production departments. In this way, our customers can rely on consistently high, superior product quality – worldwide.

Our claim: Pushing Performance.

HARTING provides more than optimally attuned components. In order to serve our customers with the best possible solutions, **HARTING** is able to contribute a great deal more and play a closely integrative role in the value creation process.

From ready assembled cables through to control racks or ready-to-go control desks: Our aim is to generate the maximum benefits for our customers – without compromise!

Quality creates reliability – and warrants trust.

The **HARTING** brand stands for superior quality and reliability – worldwide. The standards we set are the result of consistent, stringent quality management that is subject to regular certifications and audits.

EN ISO 9001, the EU Eco-Audit and ISO 14001:2004 are key elements here. We take a proactive stance to new requirements, which is why **HARTING** ranks among the first companies worldwide to have obtained the new IRIS quality certificate for rail vehicles.



HARTING technology creates added value for customers.

Technologies by **HARTING** are at work worldwide. **HARTING's** presence stands for smoothly functioning systems, powered by intelligent connectors, smart infrastructure solutions and mature network systems. In the course of many years of close, trust-based cooperation with its customers, the **HARTING** Technology Group has advanced to one of the worldwide leading specialists for connector technology. Extending beyond the basic functionalities demanded, we offer individual customers specific and innovative solutions. These tailored solutions deliver sustained effects, provide investment security and enable customers to achieve strong added value.

Opting for HARTING opens up an innovative, complex world of concepts and ideas.

In order to develop connectivity and network solutions serving an exceptionally wide range of connector applications and task scopes in a professional and cost optimized manner, **HARTING** not only commands the full array of conventional tools and basic technologies. Over and beyond these capabilities, **HARTING** is constantly harnessing and refining its broad base of knowledge and experience to create new solutions that ensure continuity at the same time. In securing this know-how lead, **HARTING** draws on a wealth of sources from both in-house research and the world of applications alike.

Salient examples of these sources of innovative knowledge include microstructure technologies, 3D design and construction technology, as well as high temperature

or ultrahigh frequency applications that are finding use in telecommunications or automation networks, in the automotive industry, or in industrial sensor and actuator applications, RFID and wireless technologies, in addition to packaging and housing made of plastics, aluminum or stainless steel.

HARTING solutions extend across technology boundaries.

Drawing on the comprehensive resources of the group's technology pool, **HARTING** devises practical solutions for its customers. Whether this involves industrial networks for manufacturing automation, or hybrid interface solutions for wireless telecommunication infrastructures, 3D circuit carriers with microstructures, or cable assemblies for high-temperature applications in the automotive industry – **HARTING** technologies offer far more than components, and represent mature, comprehensive solutions attuned to individual customer requirements and wishes. The range covers ready-to-use cable configurations, completely assembled backplanes and board system carriers, as well as fully wired and tested control panels.

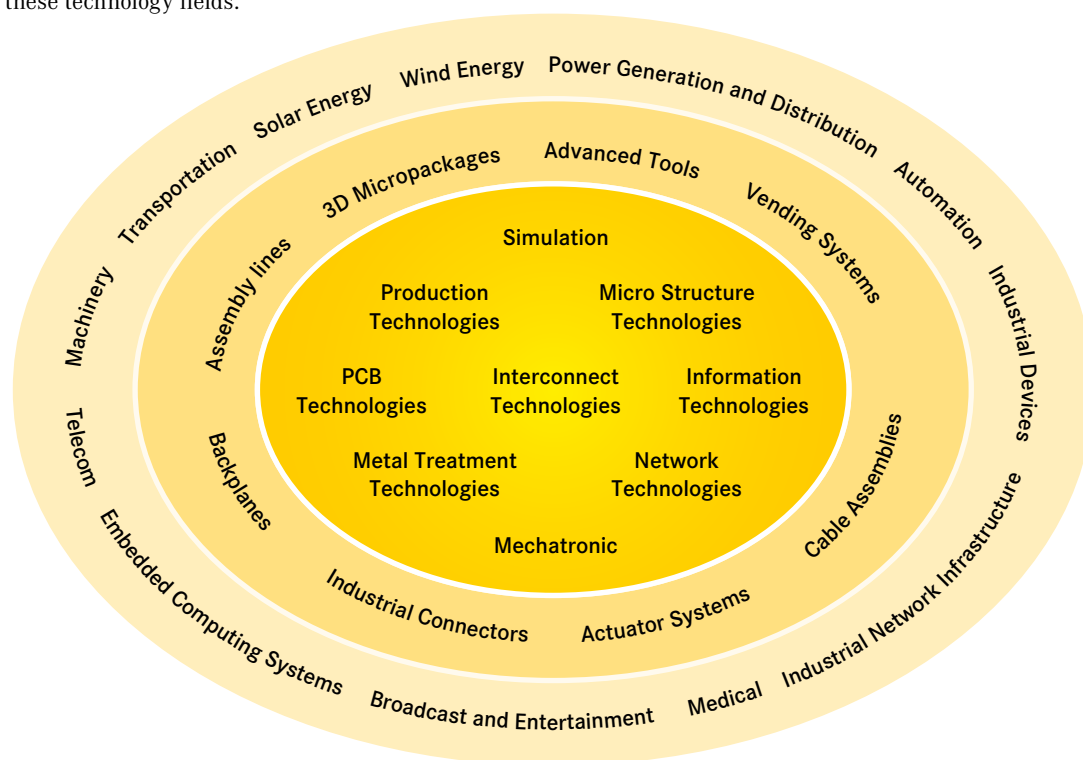
In order to ensure the future proof design of RF- and EMC-compatible interface solutions, the central **HARTING** laboratory (certified to EN 45001) provides simulation tools, as well as experimental, testing and diagnostics facilities all the way through to scanning electron microscopes. In the selection of materials and processes, lifecycle and environmental aspects play a key role, in addition to product and process capability considerations.



HARTING knowledge is practical know-how generating synergy effects.

HARTING commands decades of experience with regard to the applications conditions of connectors in telecommunications, computer and network technologies and medical technologies, as well as industrial automation technologies, such as the mechanical engineering and plant engineering areas, in addition to the power generation industry or the transportation sector. **HARTING** is highly conversant with the specific application areas in all of these technology fields.

The key focus is on applications in every solution approach. In this context, uncompromising, superior quality is our hallmark. Every new solution found will invariably flow back into the **HARTING** technology pool, thereby enriching our resources. And every new solution we go on to create will draw on this wealth of resources in order to optimize each and every individual solution. In this way, **HARTING** is synergy in action.



Field of applications

HARTING Hall effect current sensors are used for current measurement in power electronic applications. The hall effect sensors can measure different kinds of currents (AC, DC, pulsed...)

- Generators
- electrical drives
- Switch mode power supplies
- USV
- Other power electronic applications



Certified according to EN ISO 9001
in design/development, production,
installation and servicing

Specifications:

for Industrial equipment DIN EN 50 178:
Electronic equipment for use in power installations

for Railway equipment DIN EN 50 155:
Railway applications –Electronic Devices on Rolling
Stock

General information:

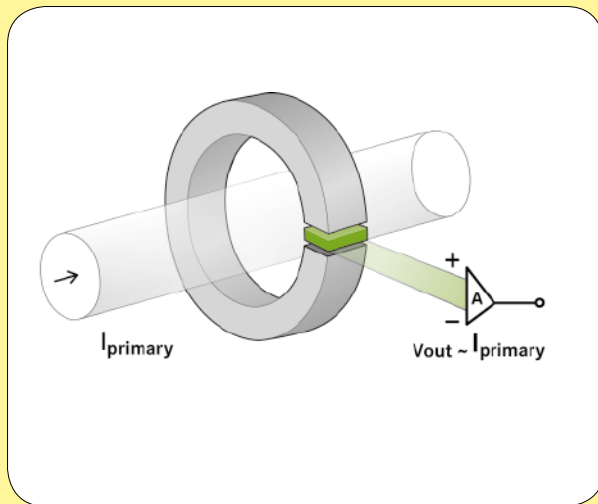
It is the user's responsibility to check whether the components illustrated in this catalogue comply with different regulations from those stated in special fields of application which we are unable to foresee.

We reserve the right to modify designs in order to improve quality, keep pace with technological advancement or meet particular requirements in production.

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Direct current sensor



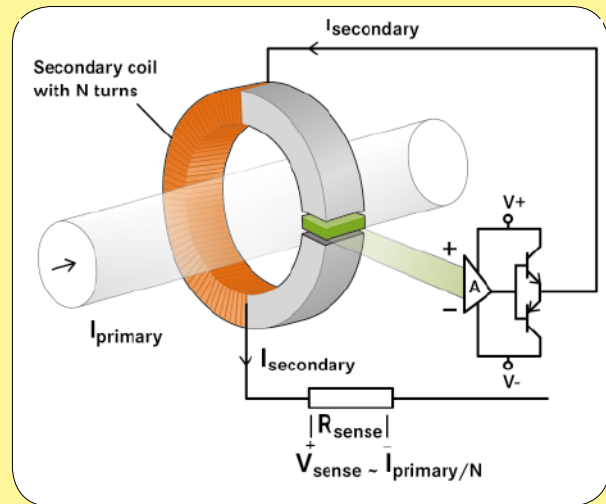
Characteristics

- Accuracy ~ 1 % of I_{PN} at 25 °C
- Accuracy ~ 5 % at -40 °C ... 85 °C (Max. error)
- Linearity < 0.5 %
- Delay time ~ 3 μ s
- Frequency range 0 ... 25 kHz
- Nominal power supply ± 15 V
- Output 4 V at I_{PN}

Description

For open loop sensors, the primary current's magnetic field is concentrated in a magnetically soft toroid. A Hall element that generates a voltage proportional to the magnetic field or to the current is positioned in the toroid's air gap. The Hall voltage is amplified and delivers a mapping of the primary current as an output signal. One advantage of these sensors is the simple design. The temperature dependency of the Hall element and the amplification (Offset and gain drift) influence the precision, however.

Compensated current sensor



Characteristics

- Accuracy ~ 0.5 % of I_{PN} at 25 °C
- Accuracy ~ 1 % at -40 °C ... 85 °C (Max. error)
- Linearity < 0.1 %
- Delay time ~ 1 μ s
- Frequency range 0 ... 150 kHz
- Nominal power supply ± 15 V ... 24 V
- Output 100 mA at I_{PN} (typisch)

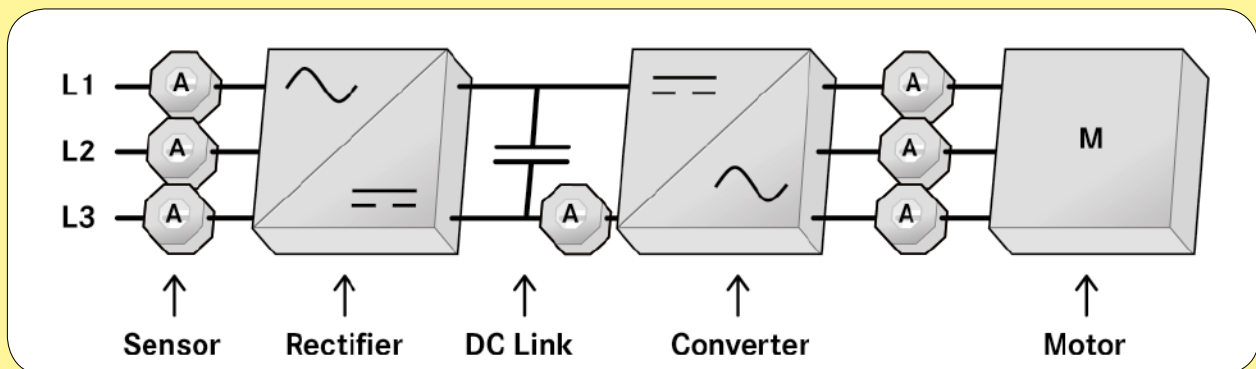
Description

Compensated current sensors (Closed-loop sensors) have a design similar to that of direct sensors. The Hall voltage, however is not used directly as measurement signal instead it is used to regulate a secondary current. The secondary current flows through a coil with N windings and generates a magnetic compensation field in the toroid. If the secondary current $\times N$ is exactly the same as the primary current, the two magnetic fields cancel each other in the toroid. The Hall element always regulates the magnetic flux to zero. The secondary current is simultaneously the sensor's output signal ($I_{sec} = I_{pri}/N$). These sensors consume more power, but work very precisely throughout the entire temperature range.

Application examples

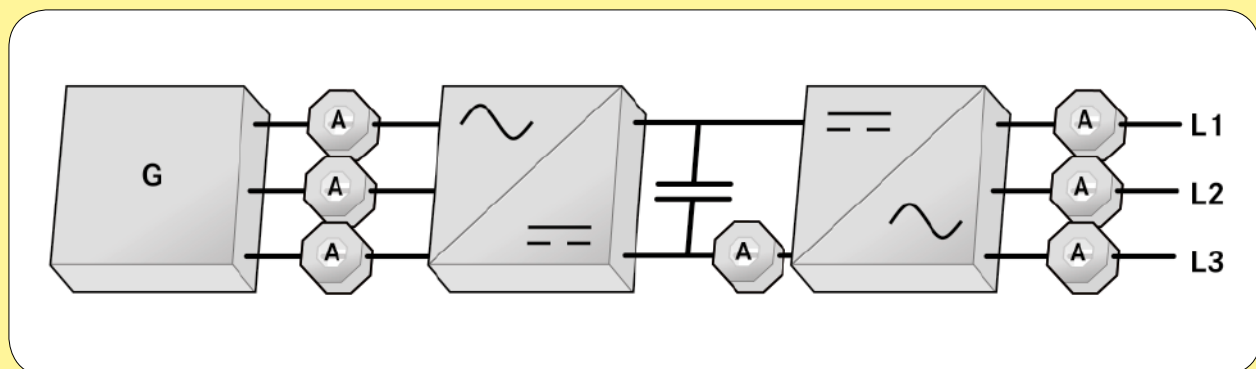
- Frequency converter for drive control

Measurement of the input currents and motor currents to control the system and for protection of the power semiconductors



- Frequency converter for Generator-Grid connection

Measurement of the generator currents and output currents to control the system and for protection of the power semiconductors

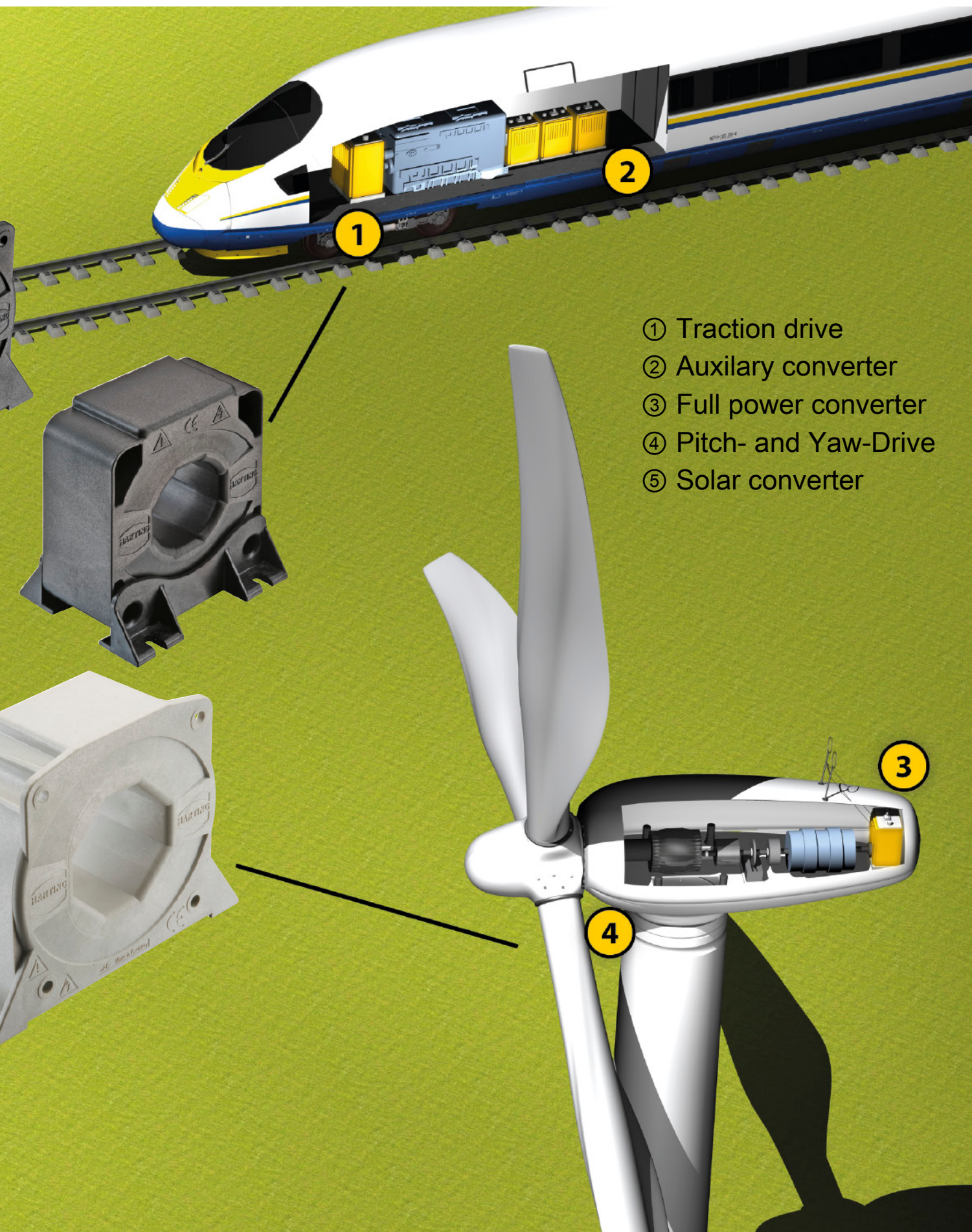


- Switch mode power supplies
- Uninterruptible power supplies/ Battery systems
- Electrical heating

Other application environments

- Robots
- Elevators
- Cranes
- Welding systems
- Electro-plating
- Electric vehicles
- Ship propulsion systems





Features

- Hall effect compensated current sensor
- Galvanic insulation between primary and secondary current
- Panel mounting
- Housing material and potting mass have a flammability rating UL94 V0
- Standard EN 50 178: Electronic equipment for use in power installations

Advantages

- High accuracy
- Wide measuring range
- High current overload capability
- Very low susceptance to external magnetic fields

Technical characteristics

I_{PN}	Nominal primary current	200 A			
I_P	Measuring range	0 ... ± 300 A			
R_M	Burden resistance with ± 12 V	at ± 200 A max	R_M min 0	R_M max	65 Ω
		at ± 300 A max	R_M min 0	R_M max	29 Ω
	with ± 15 V	at ± 200 A max	R_M min 5	R_M max	92 Ω
		at ± 300 A max	R_M min 5	R_M max	48 Ω
I_{SN}	Nominal secondary current	100 mA			
K_N	Turns ratio	1 : 2000			
V_C	Nominal power supply (± 5 %)	± 12 ... 15 V			
I_C	Supply current @ $V_C = 15$ V	20+ I_S mA			
X	Overall accuracy at I_{PN} $T_A = +25$ °C	± 0.8 %			
E_L	Linearity	< 0.1 %			
I_O	Offset current at $I_P = 0$, $T = +25$ °C	max ± 0.3 mA			
I_{OT}	Zero offset/temperature, I_O , -40 °C ... $+85$ °C	max ± 0.8 mA			
t_r	Delay time of I_{PN}	< 1 μ s			
di/dt	di/dt correctly following	> 100 A/ μ s			
f	Bandwidth	DC ... 100 kHz			
T_A	Operating temperature range	-40 °C ... $+85$ °C			
T_S	Storage temperature range	-45 °C ... $+90$ °C			
m	Weight	~ 0.15 kg			
RS	Coil resistance at $T_A = +85$ °C	38 Ω			
V_D	Proof stress voltage, effective, 50 Hz, 1 minute	3 kV			
V_{st}	Rated impulse voltage 1.2/50 μ s	10 kV			
V_B	Rated voltage ¹⁾	600 V			

Approval





$I_{PN} = 200 \text{ A}$

Measureable currents are AC, DC, pulsed ...

Identification	Part numbered	Drawing	Dimensions in mm
HCS 200 Sensor fastening: 2 x M5 Steel screws (recommended fastening torque 4 Nm) Tolerances $\pm 0.5 \text{ mm}$			
HCS 200 Connections: Faston 6.3 x 0.8 mm 3pins	20 31 020 0101		
HCS 200 Connections: Spring clamp terminal, pluggable Centerline 5.0 mm; 3pins	20 31 020 0102		
HCS 200 Clamp terminal, pluggable including signal cable 300 mm, 0.5 mm², stripped with end sleeve 1 - (numbered stands) 2 M 3 + Other secondary connections on request	20 31 020 0202	Sensor with separate cable	

Features

- Hall effect compensated current sensor
- Galvanic insulation between primary and secondary current
- Panel mounting
- Housing material and potting mass have a flammability rating UL94 V0
- Standard EN 50 178: Electronic equipment for use in power installations

Advantages

- High accuracy
- Wide measuring range
- High current overload capability
- Very low susceptance to external magnetic fields

Technical characteristics

I_{PN}	Nominal primary current	300 A			
I_P	Measuring range	0 ... ± 500 A			
R_M	Burden resistance				
	with ± 15 V	at ± 300 A max	R_M min 0	R_M max	53 Ω
		at ± 500 A max	R_M min 0	R_M max	7 Ω
	with ± 24 V	at ± 300 A max	R_M min 5	R_M max	90 Ω
		at ± 500 A max	R_M min 5	R_M max	40 Ω
I_{SN}	Nominal secondary current	150 mA			
K_N	Turns ratio	1 : 2000			
V_C	Nominal power supply (± 5 %)	± 12 ... 24 V			
I_C	Supply current @ $V_C = 15$ V	25+ I_S mA			
X	Overall accuracy at I_{PN} $T_A = +25^\circ\text{C}$	± 0.5 %			
E_L	Linearity	< 0.1 %			
I_O	Offset current at $I_P = 0$, $T = +25^\circ\text{C}$	max ± 0.3 mA			
I_{OT}	Zero offset/temperature, I_O , -40°C ... $+85^\circ\text{C}$	max ± 0.7 mA			
t_r	Delay time of I_{PN}	< 1 μs			
di/dt	di/dt correctly following	> 100 A/ μs			
f	Bandwidth	DC ... 100 kHz			
T_A	Operating temperature range	-40°C ... $+85^\circ\text{C}$			
T_S	Storage temperature range	-45°C ... $+90^\circ\text{C}$			
m	Weight	~ 0.25 kg			
R_S	Coil resistance at $T_A = +85^\circ\text{C}$	35 Ω			
V_D	Proof stress voltage, effective, 50 Hz, 1 minute	3 kV			
V_{st}	Rated impulse voltage 1.2/50 μs	10 kV			
V_B	Rated voltage ¹⁾	600 V			

Approval





Measureable currents are AC, DC, pulsed ...

Features

- Hall effect compensated current sensor
- Galvanic insulation between primary and secondary current
- Panel mounting
- Housing material and potting mass have a flammability rating UL94 V0
- Standard EN 50 178: Electronic equipment for use in power installations

Advantages

- High accuracy
- Wide measuring range
- High current overload capability
- Very low susceptance to external magnetic fields

Technical characteristics

I_{PN}	Nominal primary current	500 A			
I_P	Measuring range	0 ... ± 800 A			
R_M	Burden resistance				
	with ± 15 V	at ± 500 A max	$R_{M \text{ min } 0}$	$R_{M \text{ max}}$	55 Ω
		at ± 800 A max	$R_{M \text{ min } 0}$	$R_{M \text{ max}}$	10 Ω
	with ± 24 V	at ± 500 A max	$R_{M \text{ min } 5}$	$R_{M \text{ max}}$	140 Ω
		at ± 800 A max	$R_{M \text{ min } 5}$	$R_{M \text{ max}}$	60 Ω
I_{SN}	Nominal secondary current	100 mA			
K_N	Turns ratio	1 : 5000			
V_C	Nominal power supply (± 5 %)	± 15 ... 24 V			
I_C	Supply current @ $V_C = 15$ V	$24 + I_S$ mA			
X	Overall accuracy at I_{PN} $T_A = +25$ °C	± 0.6 %			
E_L	Linearity	< 0.1 %			
I_O	Offset current at $I_P = 0$, $T = +25$ °C	max ± 0.4 mA			
I_{OT}	Zero offset/temperature, I_O , -40 °C ... $+85$ °C	max ± 0.7 mA			
t_r	Delay time of I_{PN}	< 1 μ s			
di/dt	di/dt correctly following	> 100 A/ μ s			
f	Bandwidth	DC ... 100 kHz			
T_A	Operating temperature range	-40 °C ... $+85$ °C			
T_S	Storage temperature range	-45 °C ... $+90$ °C			
m	Weight	~ 0.25 kg			
R_S	Coil resistance at $T_A = 85$ °C	82 Ω			
V_D	Proof stress voltage, effective, 50 Hz, 1 minute	3 kV			
V_{st}	Rated impulse voltage 1.2/50 μ s	10 kV			
V_B	Rated voltage ¹⁾	600 V			

Approval





Measureable currents are AC, DC, pulsed ...

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Features

- Hall effect compensated current sensor
- Galvanic insulation between primary and secondary current
- Panel mounting
- Housing material and potting mass have a flammability rating UL94 V0
- Standard EN 50 178: Electronic equipment for use in power installations

Advantages

- High accuracy
- Wide measuring range
- High current overload capability
- Very low susceptance to external magnetic fields

Technical characteristics

I_{PN}	Nominal primary current	1000 A			
I_P	Measuring range	0 ... ± 1500 A			
R_M	Burden resistance				
	with ± 15 V	at ± 1000 A max	$R_{M \text{ min } 0}$	$R_{M \text{ max}}$	15 Ω
	with ± 24 V	at ± 1000 A max	$R_{M \text{ min } 10}$	$R_{M \text{ max}}$	55 Ω
		at ± 1500 A max	$R_{M \text{ min } 10}$	$R_{M \text{ max}}$	20 Ω
I_{SN}	Nominal secondary current	200 mA			
K_N	Turns ratio	1 : 5000			
V_C	Nominal power supply (± 5 %)	± 15 ... 24 V			
I_C	Supply current @ $V_C = 15$ V	$28 + I_S$ mA			
X	Overall accuracy at I_{PN} $T_A = +25$ °C	± 0.4 %			
E_L	Linearity	< 0.1 %			
I_O	Offset current at $I_P = 0$, $T = +25$ °C	max ± 0.4 mA			
I_{OT}	Zero offset/temperature, I_O , -40 °C ... $+85$ °C	max ± 0.8 mA			
t_r	Delay time of I_{PN}	< 1 μ s			
di/dt	di/dt correctly following	> 100 A/ μ s			
f	Bandwidth	DC ... 100 kHz			
T_A	Operating temperature range	-40 °C ... $+85$ °C			
T_S	Storage temperature range	-45 °C ... $+90$ °C			
m	Weight	~ 0.5 kg			
R_S	Coil resistance at $T_A = +85$ °C	50 Ω			
V_D	Proof stress voltage, effective, 50 Hz, 1 minute	3 kV			
V_{st}	Rated impulse voltage 1.2/50 μ s	12 kV			
V_B	Rated voltage ¹⁾	900 V			

Approval





$I_{PN} = 1000 \text{ A}$

Measureable currents are AC, DC, pulsed ...

Identification	Part numbered	Drawing	Dimensions in mm
HCS 1000 Sensor fastening: 2 x M5 Steel screws (vertical) (recommended fastening torque 4 Nm) 4 x M4 Steel screws (vertical) (recommended fastening torque 3.2 Nm) 4 x M5 Steel screws (horizontal) (recommended fastening torque 4 Nm) Tolerances $\pm 0.5 \text{ mm}$			
HCS 1000 Connections: Spring clamp terminal, pluggable Centerline 5.0 mm; 3pins	20 31 100 0101		
HCS 1000 Clamp terminal, pluggable including signal cable 300 mm, 0.5 mm², stripped with end sleeve 1 - (numbered stands) 2 M 3 + Other secondary connections on request	20 31 100 0201	Sensor with separate cable	

Features

- Hall effect compensated current sensor
- Galvanic insulation between primary and secondary current.
- Panel mounting
- Housing material and potting mass have a flammability rating UL94 V0
- Standard EN 50 178: Electronic equipment for use in power installations

Advantages

- High accuracy
- Wide measuring range
- High current overload capability
- Very low susceptance to external magnetic fields

Technical characteristics

I_{PN}	Nominal primary current	2000 A			
I_P	Measuring range	0 ... ± 3000 A			
R_M	Burden resistance				
	with ± 15 V	at ± 500 A max	$R_{M \text{ min } 0}$	$R_{M \text{ max}}$	7 Ω
	with ± 24 V	at ± 2000 A max	$R_{M \text{ min } 5}$	$R_{M \text{ max}}$	27 Ω
		at ± 3000 A max	$R_{M \text{ min } 5}$	$R_{M \text{ max}}$	10 Ω
I_{SN}	Nominal secondary current	400 mA			
K_N	Turns ratio	1 : 5000			
V_C	Nominal power supply (± 5 %)	± 15 ... 24 V			
I_C	Supply current @ $V_C = 15$ V	$33 + I_S$ mA			
X	Overall accuracy at I_{PN} $T_A = +25$ °C	± 0.3 %			
E_L	Linearity	< 0.1 %			
I_O	Offset current at $I_P = 0$, $T = +25$ °C	max ± 0.5 mA			
I_{OT}	Zero offset/temperature, I_O , -40 °C ... $+85$ °C	max ± 1.2 mA			
t_r	Delay time of I_{PN}	< 1 μ s			
di/dt	di/dt correctly following	> 60 A/ μ s			
f	Bandwidth	DC ... 100 kHz			
T_A	Operating temperature range	-40 °C ... $+85$ °C			
T_S	Storage temperature range	-45 °C ... $+90$ °C			
m	Weight	~ 1.5 kg			
R_S	Coil resistance at $T_A = +85$ °C	28 Ω			
V_D	Proof stress voltage, effective, 50 Hz, 1 minute	4 kV			
V_{st}	Rated impulse voltage 1.2/50 μ s	15 kV			
V_B	Rated voltage ¹⁾	1500 V			

Approval



Measureable currents are AC, DC, pulsed ...

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Features

- Hall effect compensated current sensor
- Galvanic insulation between primary and secondary current.
- Panel mounting
- Housing material and potting mass have a flammability rating UL94 V0, NF F 16-101 I3 F1
- Standard EN 50 155: Railway applications – Electronic Devices on Rolling Stock
- Internal Screen between primary and secondary circuit

Advantages

- High accuracy
- Wide measuring range
- High current overload capability
- Very low susceptance to external magnetic fields

Technical characteristics

I_{PN}	Nominal primary current	500 A			
I_P	Measuring range	0 ... ± 1200 A			
R_M	Burden resistance				
	with ± 15 V	at ± 500 A max	R_M min 0	R_M max	45 Ω
	with ± 24 V	at ± 500 A max	R_M min 0	R_M max	100 Ω
		at ± 1200 A max	R_M min 0	R_M max	20 Ω
I_{SN}	Nominal secondary current	125 mA			
K_N	Turns ratio	1 : 4000			
V_C	Nominal power supply (± 5 %)	± 15 ... 24 V			
I_C	Supply current @ $V_C = 15$ V	$35 + I_S$ mA			
X	Overall accuracy at I_{PN} $T_A = +25$ °C	± 0.6 %			
E_L	Linearity	< 0.1 %			
I_O	Offset current at $I_P = 0$, $T = +25$ °C	max ± 0.5 mA			
I_{OT}	Zero offset/temperature, I_O , -40 °C ... $+85$ °C	max ± 0.8 mA			
t_r	Delay time of I_{PN}	< 1 μ s			
di/dt	di/dt correctly following	> 100 A/ μ s			
f	Bandwidth	DC ... 100 kHz			
T_A	Operating temperature range	-40 °C ... $+85$ °C			
T_S	Storage temperature range	-45 °C ... $+90$ °C			
m	Weight	~ 0.4 kg			
R_S	Coil resistance at $T_A = +85$ °C	48 Ω			
V_D	Proof stress voltage, effective, 50 Hz, 1 minute				
	- primary – secondary / screen	7 kV			
	- secondary / screen	0.5 kV			
V_{st}	Rated impulse voltage 1.2/50 μ s	20 kV			
V_B	Rated voltage ¹⁾	2000 V			

Approval





$I_{PN} = 500 \text{ A}$

Measureable currents are AC, DC, pulsed ...

Identification	Part numbered	Drawing	Dimensions in mm
HCSR 500 Sensor fastening: 4x M5 Steel screws (recommended fastening torque 4 Nm) Tolerances $\pm 0.5 \text{ mm}$			
HCSR 500 Connections: Screw terminal with faston; 4pins Screen connected to separate terminal without mounting feet with mounting feet	20 31 050 9101 20 31 050 8101		
HCSR 500 including shielded cable 1000 mm 0.5 mm², stripped with end sleeve 1 - (numbered white strands) 2 M 3 + Internal screen on separate terminal without mounting feet with mounting feet Other secondary connections on request	20 31 050 9201 20 31 050 8201	Sensor with separate cable	

Features

- Hall effect compensated current sensor
- Galvanic insulation between primary and secondary current.
- Panel mounting
- Housing material and potting mass have a flammability rating UL94 V0, NF F 16-101 I3 F1
- Standard EN 50 155: Railway applications – Electronic Devices on Rolling Stock
- Internal Screen between primary and secondary circuit

Advantages

- High accuracy
- Wide measuring range
- High current overload capability
- Very low susceptance to external magnetic fields

Technical characteristics

I_{PN}	Nominal primary current	1000 A			
I_P	Measuring range	0 ... ± 2400 A			
R_M	Burden resistance				
	with ± 15 V	at ± 1000 A max	R_M min 0	R_M max	15 Ω
	with ± 24 V	at ± 1000 A max	R_M min 0	R_M max	45 Ω
		at ± 2000 A max	R_M min 0	R_M max	5 Ω
I_{SN}	Nominal secondary current	200 mA			
K_N	Turns ratio	1 : 5000			
V_C	Nominal power supply (± 5 %)	± 15 ... 24 V			
I_C	Supply current @ $V_C = 15$ V	$30 + I_S$ mA			
X	Overall accuracy at I_{PN} $T_A = +25$ °C	± 0.4 %			
X	Overall accuracy at I_{PN} $T_A = -40$ °C ... $+85$ °C	± 1 %			
E_L	Linearity	< 0.1 %			
I_O	Offset current at $I_P = 0$, $T = +25$ °C	max ± 0.5 mA			
I_{OT}	Zero offset/temperature, I_O , -40 °C ... $+85$ °C	max ± 0.8 mA			
t_r	Delay time of I_{PN}	< 1 μ s			
di/dt	di/dt correctly following	> 100 A/ μ s			
f	Bandwidth	DC ... 100 kHz			
T_A	Operating temperature range	-40 °C ... $+85$ °C			
T_S	Storage temperature range	-45 °C ... $+90$ °C			
m	Weight	~ 0.7 kg			
R_S	Coil resistance at $T_A = +85$ °C	44 Ω			
V_D	Proof stress voltage, effective, 50 Hz, 1 minute				
	- primary – secondary / screen	12 kV			
	- secondary / screen	1 kV			
V_{st}	Rated impulse voltage 1.2/50 μ s	20 kV			
V_B	Rated voltage ¹⁾	2000 V			

Approval



¹⁾ Safe separation (Overvoltage Category III, Pollution degree 2). Value applies for sensors with screw terminal, for other secondary connections are other values possible



$I_{PN} = 1000 \text{ A}$

Measureable currents are AC, DC, pulsed ...

Identification	Part numbered	Drawing	Dimensions in mm
HCSR 1000 Sensor fastening: 4 x M5 Steel screws (recommended fastening torque 4 Nm) Tolerances $\pm 0.5 \text{ mm}$			
HCSR 1000 Connections: Screw terminal with faston; 4 pins Screen connected to separate terminal without mounting feet with mounting feet	20 31 100 9101 20 31 100 8101		
HCSR 1000 including shielded cable 1000 mm 0.5 mm², stripped with end sleeve 1 - (numbered white strands) 2 M 3 + Internal screen on separate terminal without mounting feet with mounting feet Other secondary connections on request	20 31 100 9201 20 31 100 8201	Sensor with separate cable	

Features

- Hall effect compensated current sensor
- Galvanic insulation between primary and secondary current
- Panel mounting
- Housing material and potting mass have a flammability rating UL94 V0, NF F 16-101 I3 F1
- Standard EN 50 155: Railway applications – Electronic Devices on Rolling Stock
- Internal Screen between primary and secondary circuit

Advantages

- High accuracy
- Wide measuring range
- High current overload capability
- Very low susceptance to external magnetic fields

Technical characteristics

I_{PN}	Nominal primary current	2000 A			
I_P	Measuring range	3600 A			
R_M	Burden resistance				
	with ± 15 V	at ± 2000 A max	R_M min 0	R_M max	7 Ω
	with ± 24 V	at ± 2000 A max	R_M min 3	R_M max	13 Ω
		at ± 3600 A max	R_M min 3	R_M max	3 Ω
I_{SN}	Nominal secondary current	400 mA			
K_N	Turns ratio	1 : 5000			
V_C	Nominal power supply (± 5 %)	$\pm 15 \dots 24$ V			
I_C	Supply current @ $V_C = 15$ V	$33 + I_S$ mA			
X	Overall accuracy at I_{PN} $T_A = +25$ °C	± 0.3 %			
E_L	Linearity	< 0.1 %			
I_O	Offset current at $I_P = 0$, $T = +25$ °C	max ± 0.5 mA			
I_{OT}	Zero offset/temperature, I_O , -40 °C ... 85 °C	max ± 1 mA			
t_r	Delay time of I_{PN}	< 1 μ s			
di/dt	di/dt correctly following	> 100 A/ μ s			
f	Bandwidth	DC ... 100 kHz			
T_A	Operating temperature range	-40 °C ... $+85$ °C			
T_S	Storage temperature range	-45 °C ... $+90$ °C			
m	Weight	~ 1.5 kg			
R_S	Coil resistance at $T_A = +85$ °C	28 Ω			
V_D	Proof stress voltage, effective, 50 Hz, 1 minute				
	- primary – secondary / screen	12 kV			
	- secondary / screen	1.5 kV			
V_{st}	Rated impulse voltage 1.2/50 μ s	20 kV			
V_B	Rated voltage ¹⁾	2000 V			

Approval





$I_{PN} = 2000 \text{ A}$

Measureable currents are AC, DC, pulsed ...

Identification	Part numbered	Drawing	Dimensions in mm
HCSR 2000 Sensor fastening: 4 x M6 Steel screws (recommended fastening torque 4.2 Nm) Tolerances $\pm 0.5 \text{ mm}$			
HCSR 2000 Connections: Screw terminal with faston; 4pins Screen connected to separate terminal	20 31 200 9101		
HCSR 2000 including shielded cable 1000 mm 0.5 mm², stripped with end sleeve 1 - (numbered white strands) 2 M 3 + Internal screen on separate terminal Other secondary connections on request	20 31 200 9201	Sensor with separate cable	

Features

- Direct hall effect current sensor
- $I_{Pmax} = 300 \text{ A} \dots 1000 \text{ A}$
- Galvanic insulation between primary and secondary current
- Panel mounting
- Housing material and potting mass have a flammability rating UL94 V0
- Standard EN 50 178: Electronic equipment for use in power installations

Advantages

- High accuracy
- Wide measuring range
- High current overload capability
- Very low susceptance to external magnetic fields

Technical characteristics

HCSE 100

I_{PN}	Nominal primary current	100 A
I_P	Measuring range	0 ... $\pm 300 \text{ A}$

T_A	Operating temperature range	-25 °C ... +85 °C
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T_S	Storage temperature range	-25 °C ... +90 °C
-------	---------------------------	-------------------

m	Weight	~ 0.2 kg
---	--------	----------

V_D	Proof stress voltage, effective, 50 Hz, 1 minute	3.5 kV
-------	--	--------

V_B	Rated voltage ¹⁾	690 V
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HCSE 300

I_{PN}	Nominal primary current	300 A
I_P	Measuring range	0 ... $\pm 900 \text{ A}$

HCSE 500

I_{PN}	Nominal primary current	500 A
I_P	Measuring range	0 ... $\pm 1000 \text{ A}$

Approval



HCSE 800

I_{PN}	Nominal primary current	800 A
I_P	Measuring range	0 ... $\pm 1000 \text{ A}$

V_{out}	Output voltage at I_{PN}	4 V
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R_L	Load resistance	>1 k Ω
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V_C	Nominal power supply ($\pm 5 \%$)	$\pm 15 \text{ V}$
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I_C	Supply current @ $V_C = 15 \text{ V}$	< 25 mA
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R_{IN}	Insulation resistance	> 500 M Ω
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X	Accuracy at I_{PN} $T_A = 25^\circ\text{C}$ without offset	$\pm 1 \%$
---	--	------------

E_L	Linearity	< 0.5 %
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V_O	Offset voltage at $I_P = 0$, $T = 25^\circ\text{C}$	$\pm 10 \text{ mV}$
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V_{OOL}	Offset after I_{Pmax}	$\pm 10 \text{ mV}$
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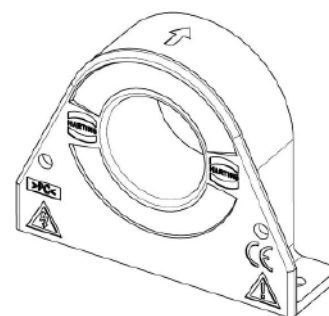
V_{OT}	Thermal offset drift, $T = -25^\circ\text{C} \dots +85^\circ\text{C}$	$\pm 1 \text{ mV/K}$
----------	---	----------------------

V_{outT}	Thermal gain drift, $T = -25^\circ\text{C} \dots +85^\circ\text{C}$	$\pm 0.05 \%/K$
------------	---	-----------------

t_r	Delay time of I_{PN}	< 3 μs
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di/dt	di/dt correctly following	> 50 A/ μs
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f	Bandwidth	DC ... 50 kHz
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$I_{PN} = 100 \text{ A} \dots 800 \text{ A}$

Measureable currents are AC, DC, pulsed ...

Identification	Part numbered	Drawing	Dimensions in mm
HCSE 100 – HCSE 800 Sensor fastening: 2 x M4 Steel screws (recommended fastening torque 3.2 Nm) Tolerances $\pm 0.5 \text{ mm}$			
HCSE 100	20 32 010 0101		
HCSE 300	20 32 030 0101		
HCSE 500	20 32 050 0101		
HCSE 800	20 32 080 0101		
Connections: Spring clamp terminal, pluggable Centerline 5.0 mm; 4pins Pin output: 1 +15 V 2 -15 V 3 Signal 4 0 V			

Definitions

	Definitions																			
I _{PN}	Nominal primary current	RMS Value for AC Currents																		
I _P	Primary current, measuring range	Maximum measureable Current, Overloads <5 x I _P do not damage the Sensor but will cause an additional Offset. The measurement range depends on the hight of the supply voltage and the burden resistor. See formular in line R _M																		
X	Accuracy at I _{PN} T _A = 25°C	Total error in % of I _{PN} at T _A = 25 °C including Offset at 25 °C und Linearity deviation. Compensated current sensor: Total error in % over whole temperature range = X+ (I _{OT} [mA]/I _{SN} [mA] *100) Direct current sensor: Total error in % over whole temperature range = X+ max. Offset drift + max. gain drift = X + (V _{OT} [mV/K]*60K)/V _{out} *100) + V _{outT} *60K																		
t _r	Response time of I _{PN}	Time difference in which the primary current and the measurement signal reach 90% of the end value																		
Di/dt	di/dt at optimal magnetic coupling	Maximum current rise rate correctly followed with an optimal magnetic coupling. Optimal magnetic coupling: Primary conductor is positioned in the middle of the sensor opening, no magnetic interference fields in the proximity of the sensor																		
f	Frequency range (-1dB)	Small signal bandwidth of the sensor electronic, measureable harmonic waves. At higher frequencies of the primary current (>5 kHz, dependig on the sensor type) I _P has to be reduced to avoid overheating of the transducer. Maximum allowed temperature of the sensor is 120 °C.																		
R _M	Burden resistance	Compensated current sensors: The larger the burden resistor R_M the lower the measuring range I_P $I_P = (V_C - V_A)/(R_m + R_s) \times N$$V_A = \text{Voltage drop internal amplifier}$ <table><tr><td>V_A in V</td><td>200 A</td><td>300 A</td><td>500 A</td><td>1000 A</td><td>2000 A</td></tr><tr><td>HCS</td><td>1.5</td><td>1.5</td><td>1.5</td><td>1.5</td><td>1.5</td></tr><tr><td>HCSR</td><td></td><td></td><td>1.5</td><td>1</td><td>1</td></tr></table>	V _A in V	200 A	300 A	500 A	1000 A	2000 A	HCS	1.5	1.5	1.5	1.5	1.5	HCSR			1.5	1	1
V _A in V	200 A	300 A	500 A	1000 A	2000 A															
HCS	1.5	1.5	1.5	1.5	1.5															
HCSR			1.5	1	1															

Remarks

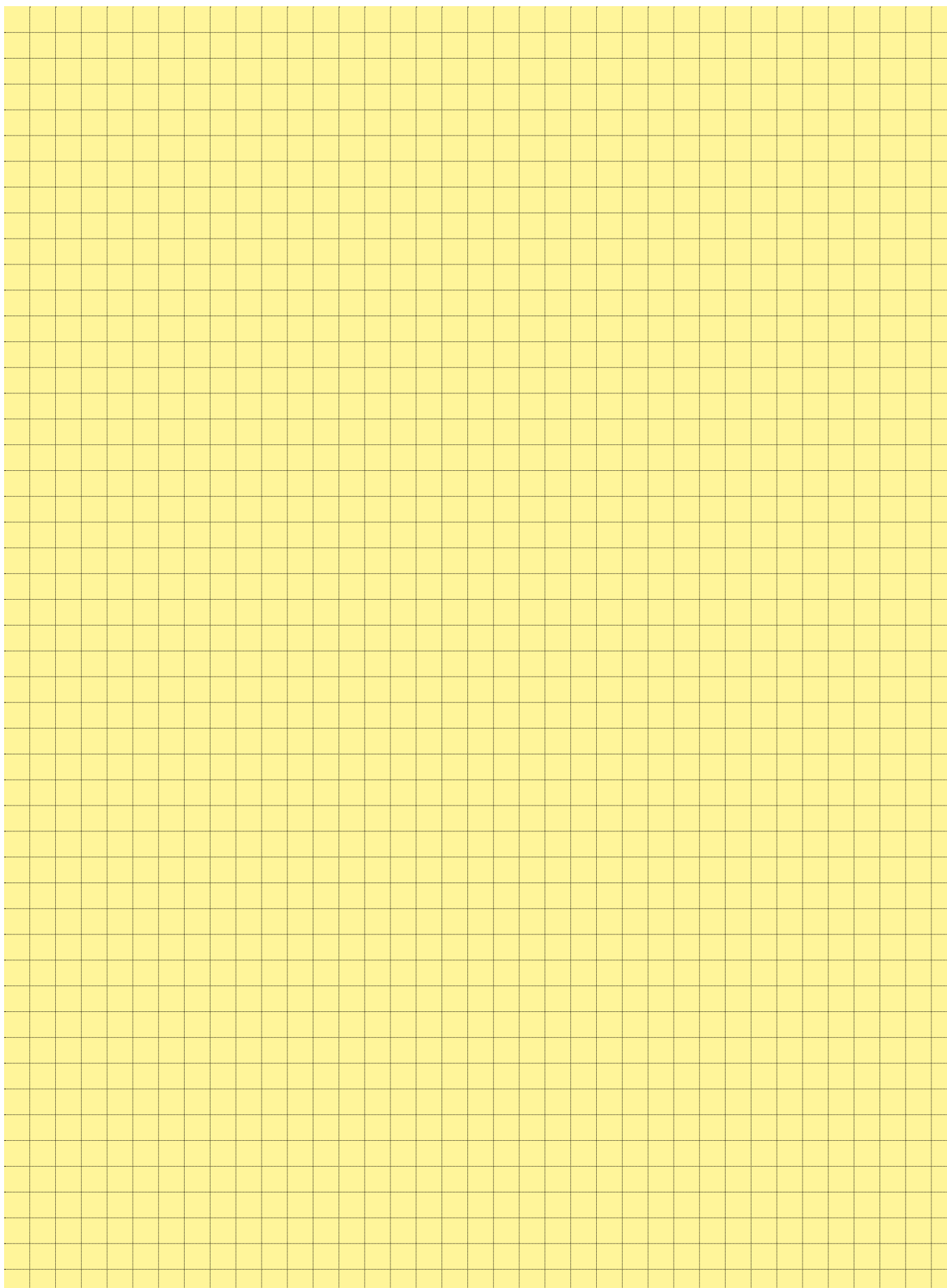
- If I_P flows in the direction of the Arrow I_{Sek} is positive
- Over currents ($\gg I_{PN}$) or the missing of the supply voltage can cause an additional remaining magnetic offset
- The temperature of the primary conductor may not exceed 100 °C
- Protection degree of the standard interface is IP 20

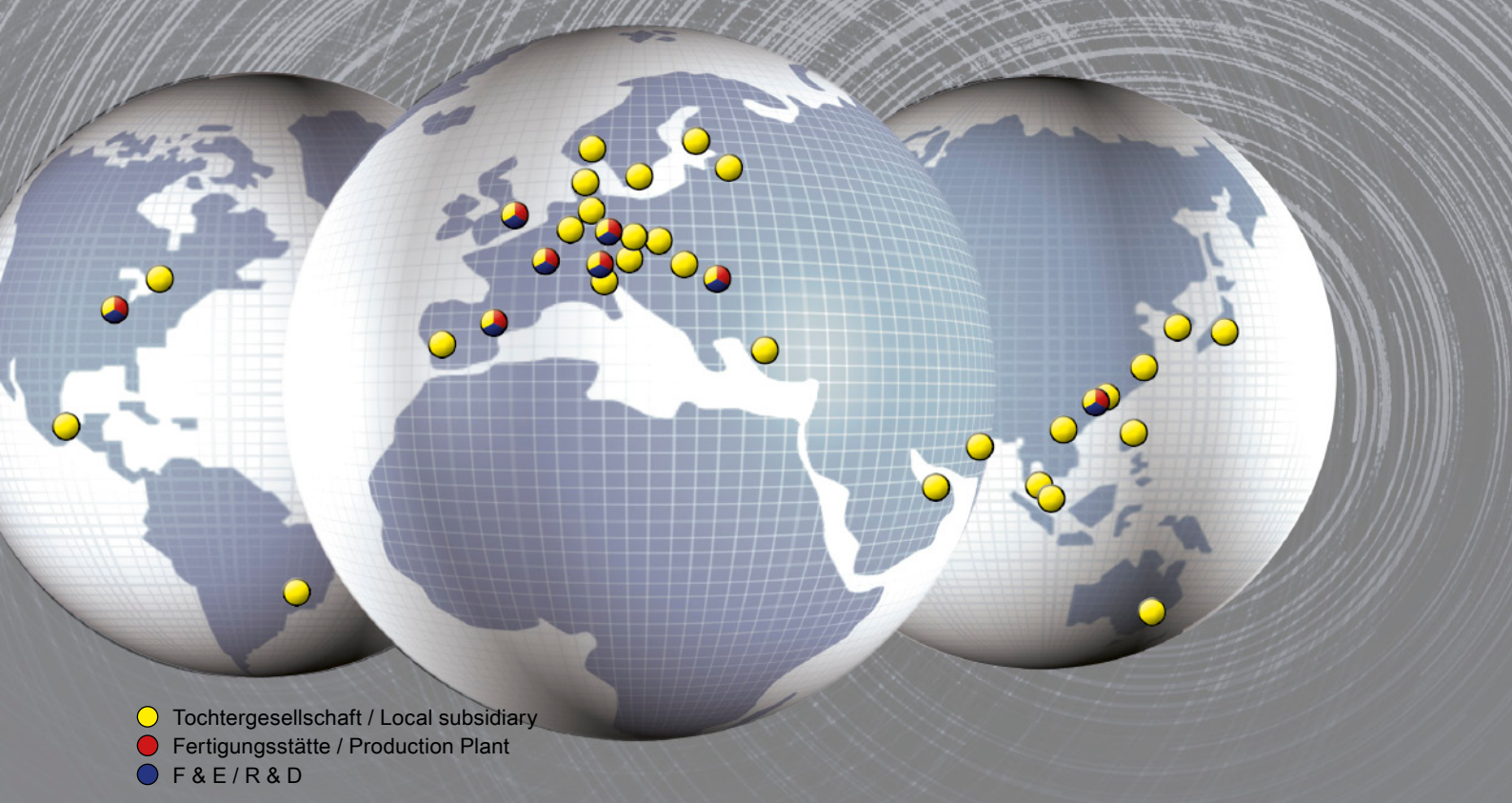


- This Sensors may only be used in electrical or electronic systems which fulfill the relevant regulations (Standards, EMC Requirements,...)



- Pay attention to protect non-isolated high-voltage current carrying parts against direct contact (e.g. with a protective housing)
- When installing this sensor you must ensure that the safe separation (between primary circuit and secondary circuit) is maintained over the whole circuits and their connections
- The Sensor may only be connected to a power supply respecting the SELV/PELV protective regulations acc. to EN 50 178
- Disconnecting the main power must be possible
- The Current Sensors support a Safe Separation. The creepage and clearance distances taken as a basis for the rated voltage are the shortest distance between the secondary connection and the transducer window. The actual rated voltage depends on the position of the primary conductor respectively on the actual distance between the primary conductor and the secondary connection





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