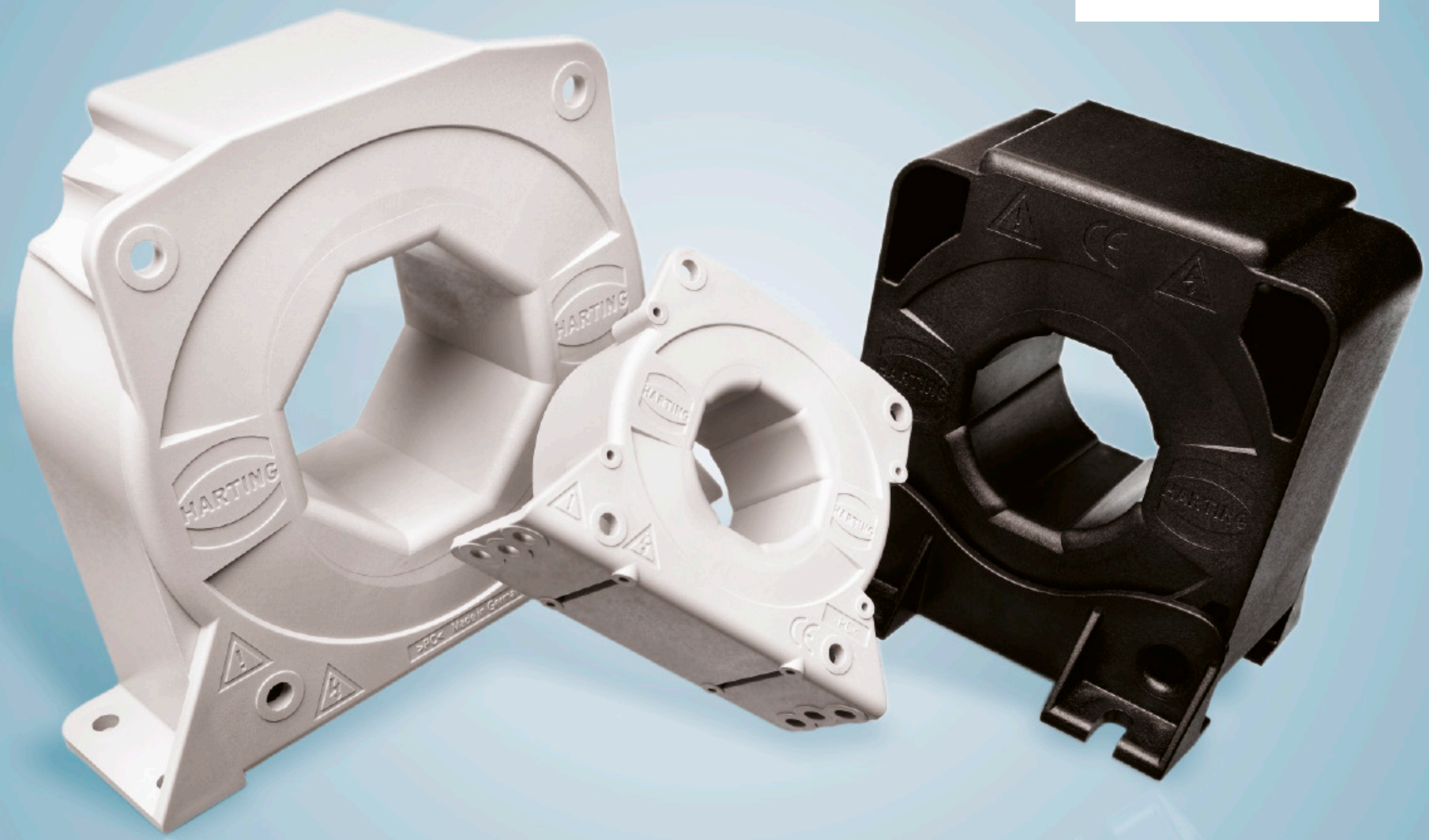


People | Power | Partnership

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.

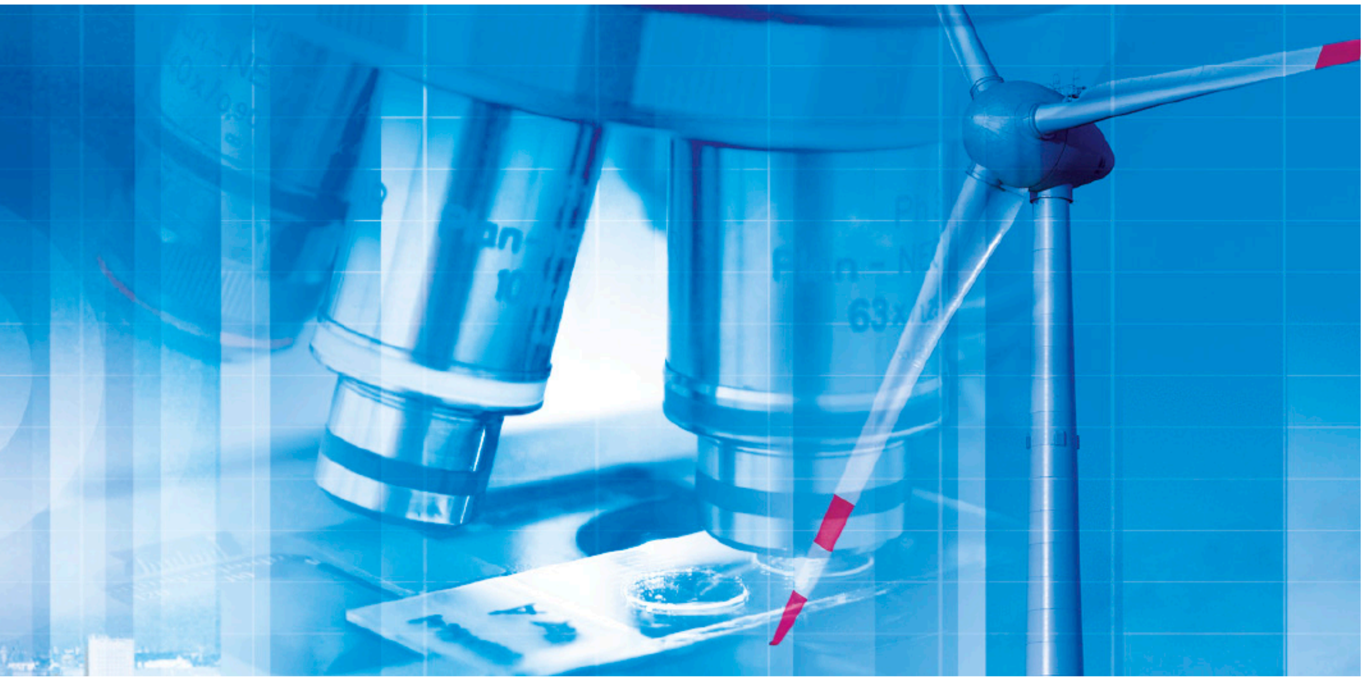
Our claim: Pushing Performance.
HARTING provides more than optimally attuned components. In order to serve our customers with the best possible solutions, HARTING is able to contribute a great deal more and play a closely integrative role in the value creation process.
From ready assembled cables through 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.

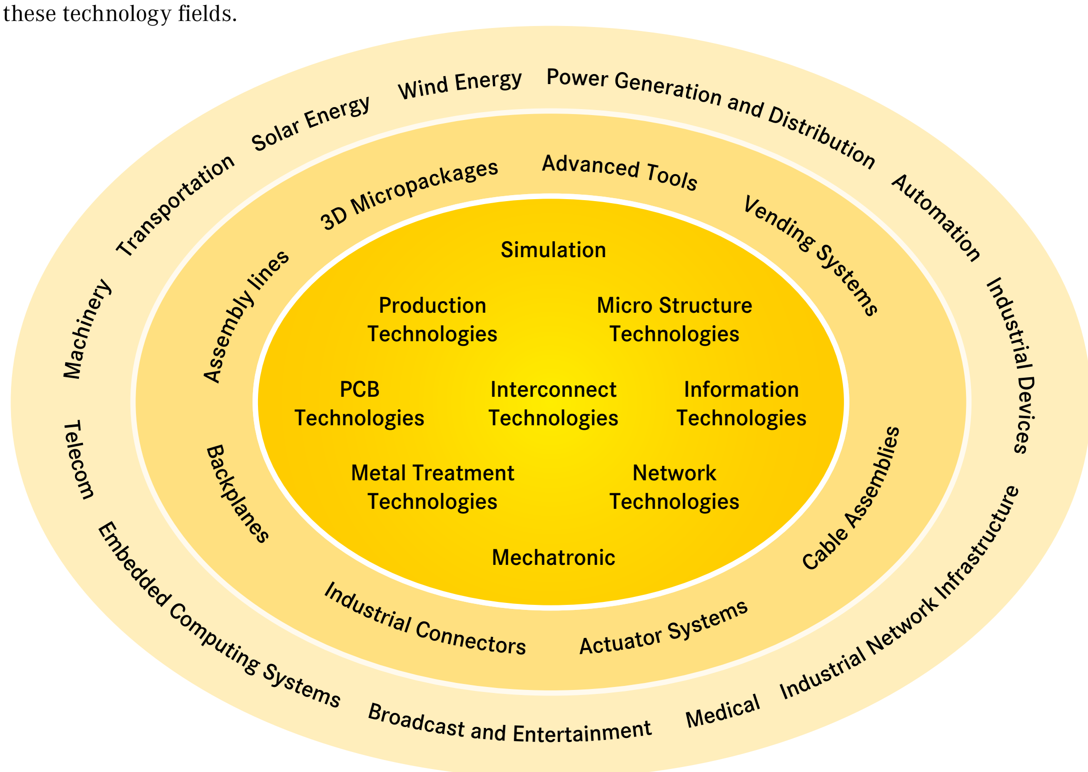
HARTING solutions extend across technology boundaries.
Drawing on the comprehensive resources of the group's technology pool, HARTING devises practical solutions for its customers. Whether this involves industrial networks for manufacturing automation, or hybrid interface solutions for wireless telecommunication 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 equipement DIN EN 50 178:
Electronic equipment for use in power installations

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

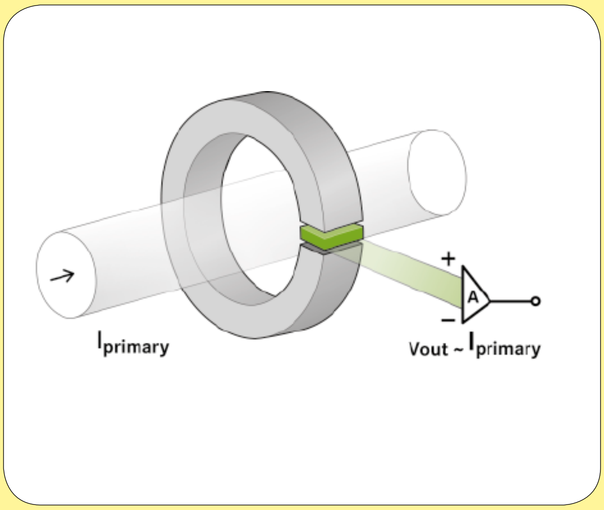
General information:

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.

Contents

Direct current sensor



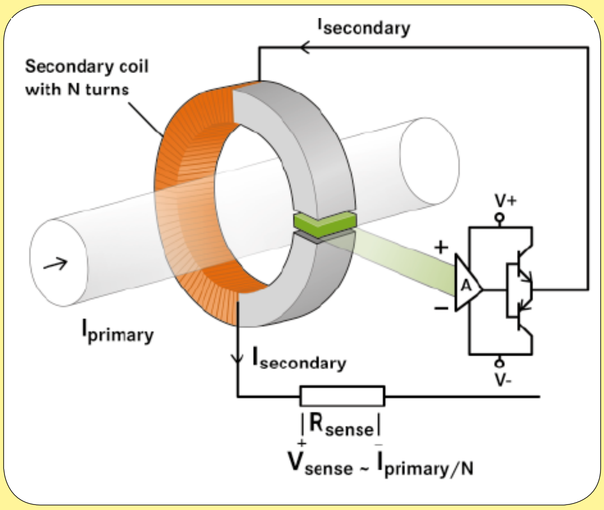
Characteristics

- Accuracy ~ 1 % of I_{Pn} at 25 °C
- Accuracy ~ 5 % at -40 °C … 85 °C (Max. error)
- Linearity < 0.5 %
- Delay time ~ 3 µs
- 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 µs
- Frequency range 0 ... 150 kHz
- Nominal power supply ±15 V ... 24 V
- Output 100 mA at I_{Pn} (typisch)

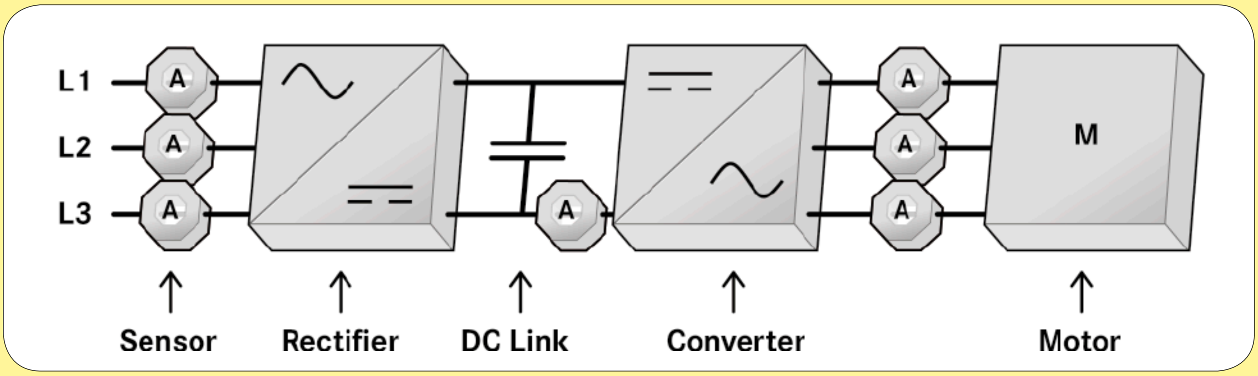
Description

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 x 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

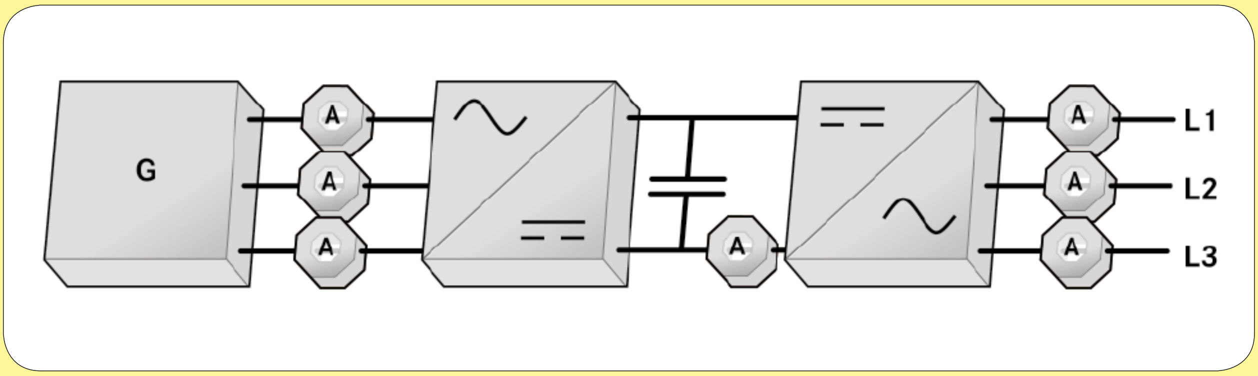
- Frequency converter for drive control

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



- Frequency converter for Generator-Grid connection

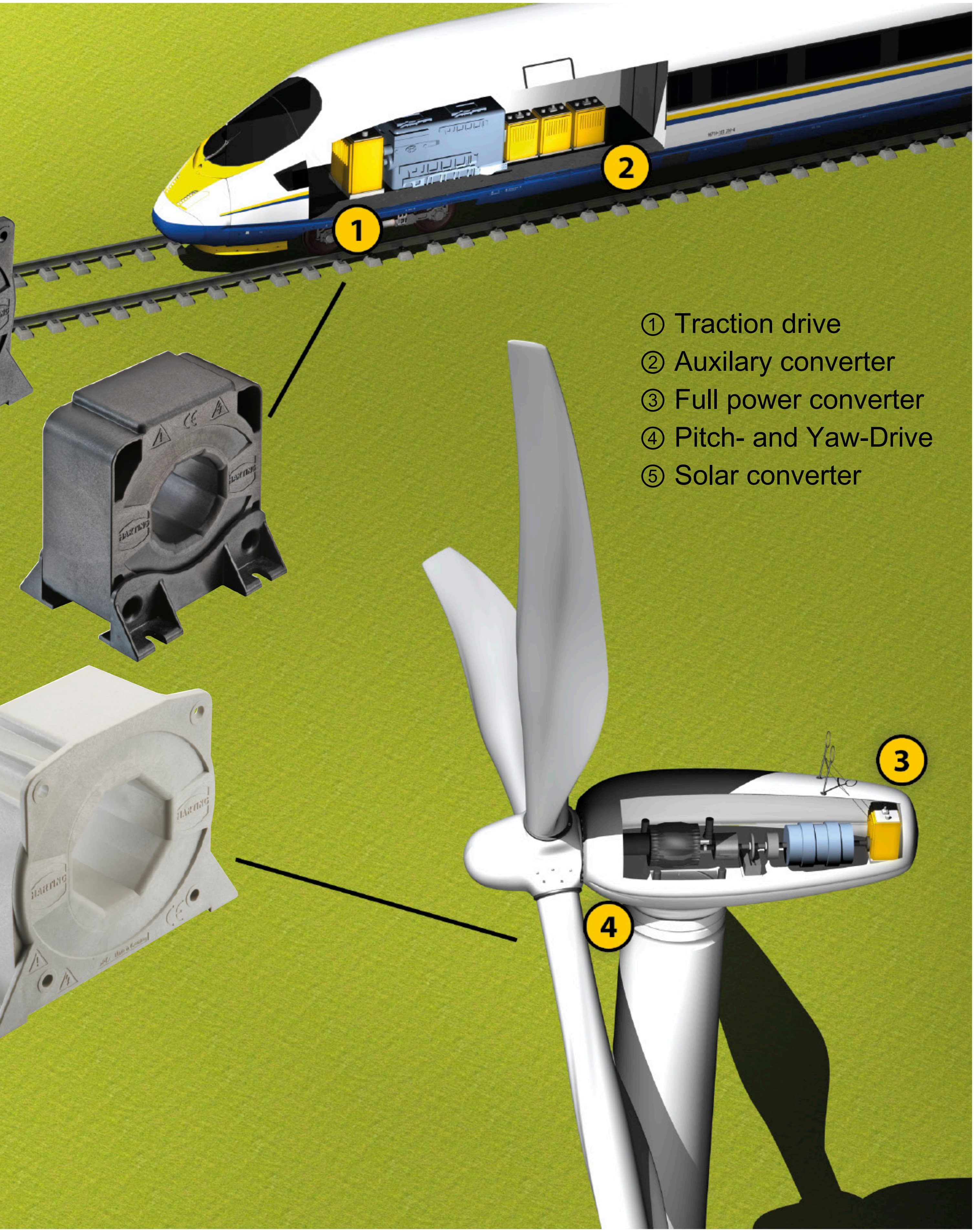
  Measurement of the generator currents and output currents to control the system and for protection of the power semiconducters



- 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



1
2
3
4
① Traction drive
② Auxilary converter
③ Full power converter
④ Pitch- and Yaw-Drive
⑤ Solar converter

HARTING Hall effect current sensor HCS 200 A

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 @ VC = 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/temperatur, I_O, -40°C ... +85 °C	max ±0.8 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 °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 µs	10 kV			
V_B	Rated voltage [1)]	600 V			

Approval CE

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

HARTING Hall effect current sensor HCS 200 A

I_{PN}= 200 A

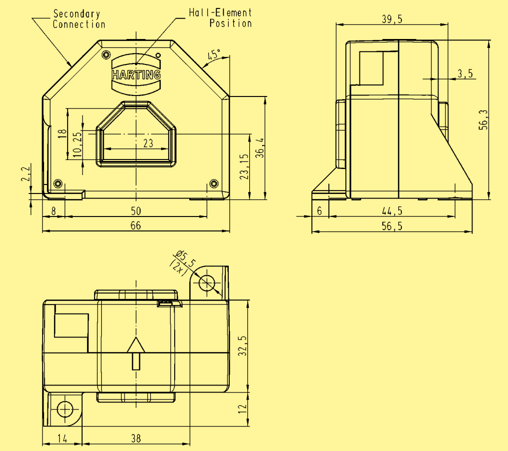
Measureable currents are AC, DC, pulsed …

Identification	Part numbered	Drawing	Dimensions in mm

HCS 200

Sensor fastening:
2 x M5 Steel screws
(recommended fastening torque 4 Nm)

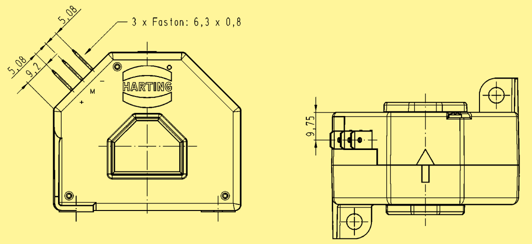
Tolerances ±0.5 mm



HCS 200

Connections:
Faston 6.3 x 0.8 mm 3pins

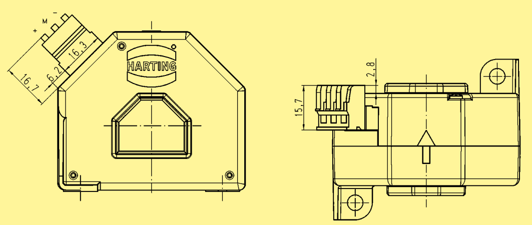
20 31 020 0101



HCS 200

Connections:
Spring clamp terminal, pluggable
Centerline 5.0 mm; 3pins

20 31 020 0102



HCS 200

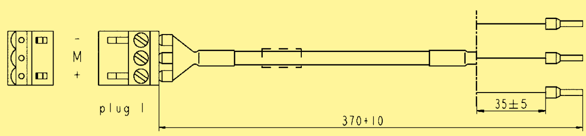
Clamp terminal, pluggable
including signal cable 300 mm,
0.5 mm², stripped with end sleeve

1 - (numbered stands)
2 M
3 +

Other secondary connections on request

20 31 020 0202

Sensor with separate cable



HARTING Hall effect current sensor HCS 300 A

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 @ VC = 15 V	25+ I_S mA			
X	Overall accuracy at I_{PN} T_A = +25°C	±0.5 %			
E_L	Linearity	< 0.1 %			
I_O	Offset current at I_P = 0, T = +25 °C	max ±0.3 mA			
I_{OT}	Zero offset/temperatur, I_O, -40 °C ... +85 °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 °C			
T_S	Storage temperature range	-45 °C ... +90 °C			
m	Weight	~ 0.25 kg			
RS	Coil resistance at T_A= +85 °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			

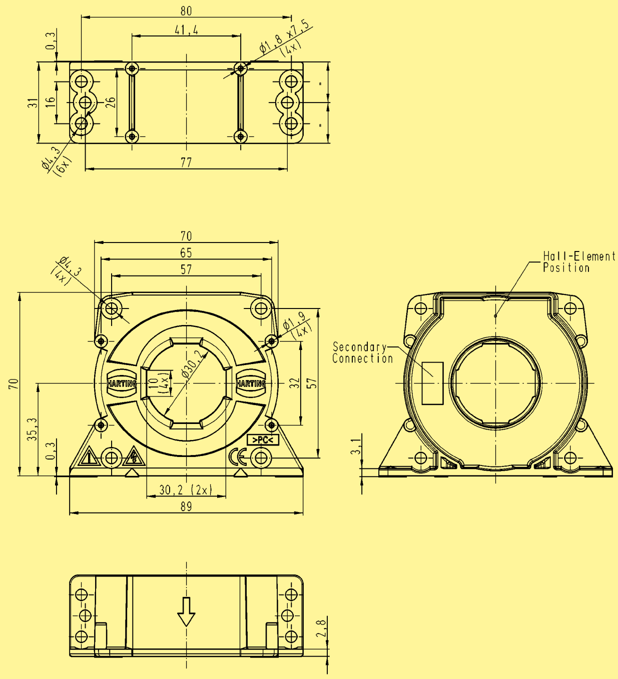
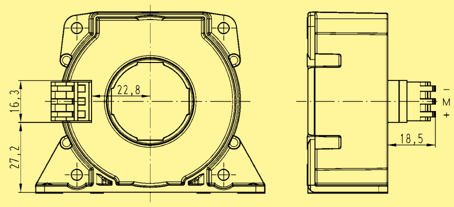
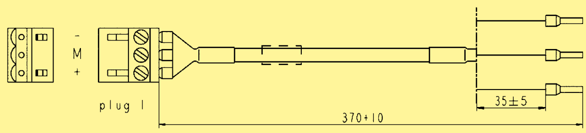
Approval: CE

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

HARTING Hall effect current sensor HCS 300 A

I_{PN}= 300 A

Measureable currents are AC, DC, pulsed …

Identification	Part numbered	Drawing	Dimensions in mm
HCS 300 Sensor fastening: 4 x M4 Steel screws (recommended fastening torque 3.2 Nm) Tolerances ±0.5 mm			
HCS 300 Connections: Spring clamp terminal, pluggable Centerline 5.0 mm; 3pins	**20 31 030 0101**		
HCS 300 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 31 030 0201**	Sensor with separate cable 	

HARTING Hall effect current sensor HCS 500 A

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 min 0	R_M max	55 Ω
		at ±800 A max	R_M min 0	R_M max	10 Ω
	with ±24 V	at ±500 A max	R_M min 5	R_M max	140 Ω
		at ±800 A max	R_M min 5	R_M 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 @ VC = 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/temperatur, I_O, -40 °C ... +85 °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 °C			
T_S	Storage temperature range	-45 °C ... +90 °C			
m	Weight	~ 0.25 kg			
RS	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 µs	10 kV			
V_B	Rated voltage [1)]	600 V			

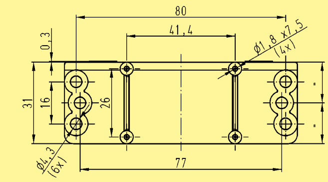
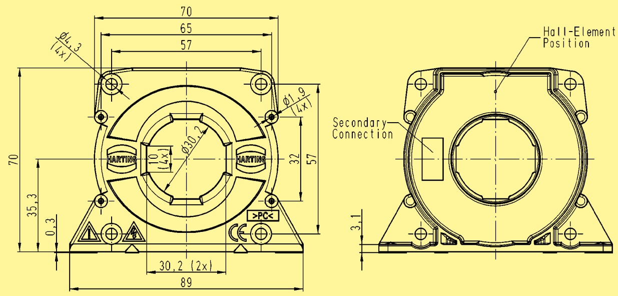
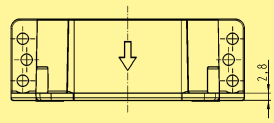
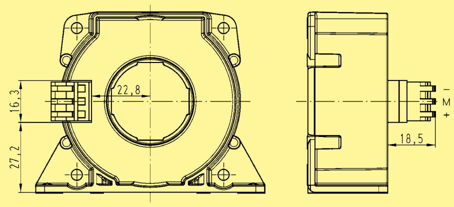
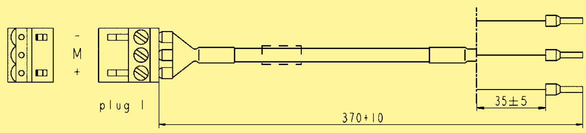
Approval CE

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

HARTING Hall effect current sensor HCS 500 A

I_{PN}= 500 A

Measureable currents are AC, DC, pulsed …

Identification	Part numbered	Drawing	Dimensions in mm
HCS 500 Sensor fastening: 4 x M4 Steel screws (recommended fastening torque 3.2 Nm) Tolerances ±0.5 mm		  	
HCS 500 Connections: Spring clamp terminal, pluggable Centerline 5.0 mm; 3pins	**20 31 050 0101**		
HCS 500 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 31 050 0201**	Sensor with separate cable  	

HARTING Hall effect current sensor HCS 1000 A

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 min 0 R_M max	15 Ω
	with ±24 V	at ±1000 A max	R_M min 10 R_M max	55 Ω
		at ±1500 A max	R_M min 10 R_M 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 @ VC = 15 V	28+ I_S mA		
X	Overall accuracy at I_{PN} TA = +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/temperatur, I_O, -40 °C ... +85 °C	max ±0.8 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 °C		
T_S	Storage temperature range	-45 °C ... +90 °C		
m	Weight	~ 0.5 kg		
RS	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 µs	12 kV		
V_B	Rated voltage [1)]	900 V		

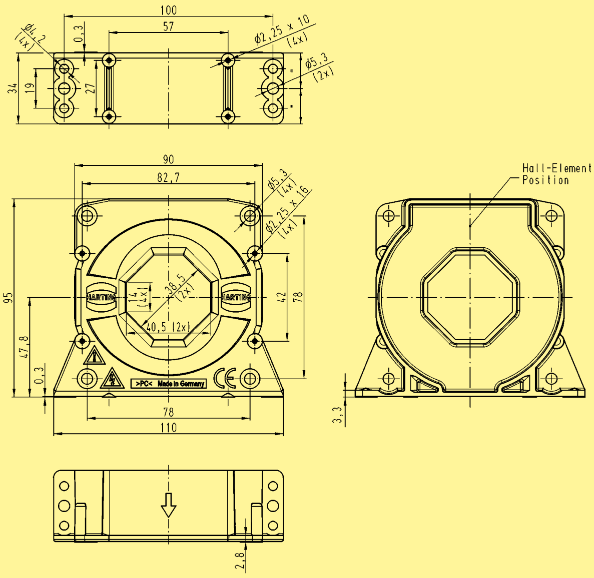
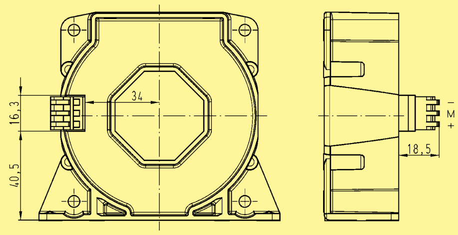
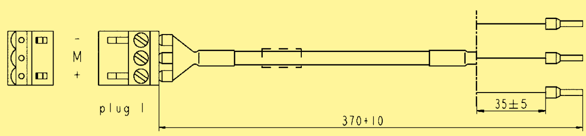
Approval CE

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

HARTING Hall effect current sensor HCS 1000 A

I_{PN}= 1000 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 ±0.5 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 	

HARTING Hall effect current sensor HCS 2000 A

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 min 0	R_M max	7 Ω
	with ±24 V	at ±2000 A max	R_M min 5	R_M max	27 Ω
		at ±3000 A max	R_M min 5	R_M 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 @ VC = 15 V	33+ I_S mA			
X	Overall accuracy at I_{PN} TA = +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/temperatur, I_O, -40 °C ... +85 °C	max ±1.2 mA			
t_r	Delay time of I_{PN}	< 1 µs			
Di/dt	di/dt correctly following	> 60 A/µs			
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			
RS	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 µs	15 kV			
V_B	Rated voltage [1)]	1500 V			

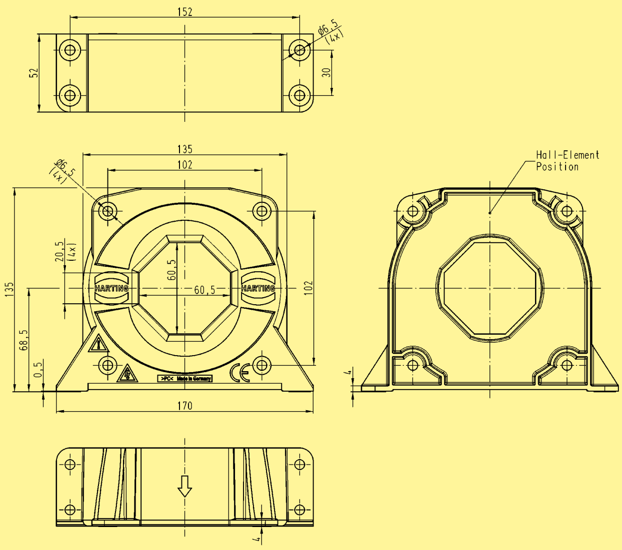
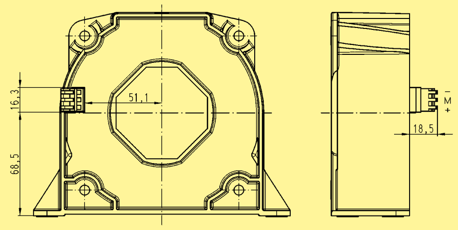
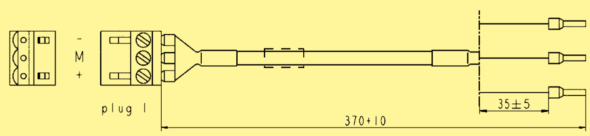
Approval CE

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

HARTING Hall effect current sensor HCS 2000 A

I_{PN}= 2000 A

Measureable currents are AC, DC, pulsed …

Identification	Part numbered	Drawing Dimensions in mm
HCS 2000 Sensor fastening: 4 x M6 Steel screws (recommended fastening torque 4.2 Nm) Tolerances ±0.5 mm		
HCS 2000 Connections: Spring clamp terminal, pluggable Centerline 5.0 mm; 3pins	**20 31 200 0101**	
HCS 2000 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 31 200 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, 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

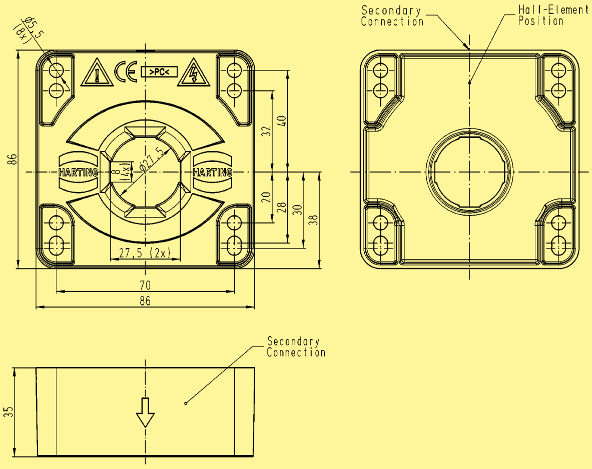
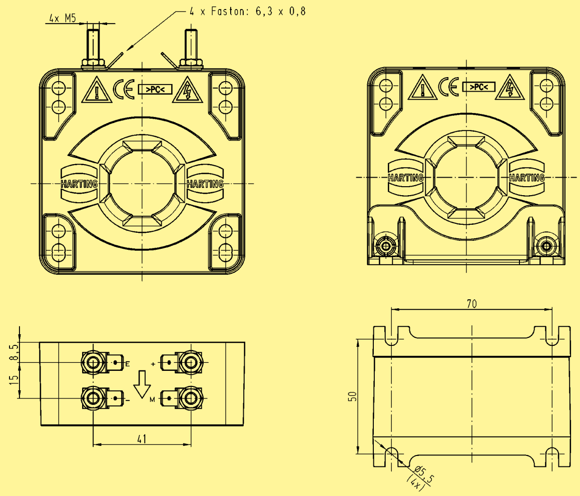
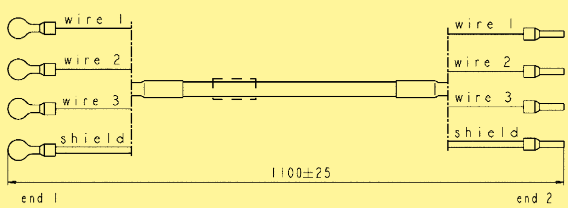
I_{PN}	Nominal primary current	500 A			
I_P	Measuring range	0 ... ±1200 A			
R_M	Burden resistance				
	with ±15 V	at ±500 A max	R_M min 0	R_M max	45 Ω
	with ±24 V	at ±500 A max	R_M min 0	R_M max	100 Ω
		at ±1200 A max	R_M min 0	R_M max	20 Ω
I_{SN}	Nominal secondary current	125 mA			
K_N	Turns ratio	1 : 4000			
V_C	Nominal power supply (±5 %)	±15 ... 24 V			
I_C	Supply current @ VC = 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/temperatur, I_O, -40 °C ... +85 °C	max ±0.8 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 °C			
T_S	Storage temperature range	-45 °C ... +90 °C			
m	Weight	~ 0.4 kg			
RS	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 µs	20 kV			
V_B	Rated voltage [1)]	2000 V			

Approval CE

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}= 500 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 ±0.5 mm			
HCSR 500 Connections: Screw terminal with faston; 4pins Screen connected to separate terminal			
without mounting feet	20 31 050 9101		
with mounting feet	20 31 050 8101		
HCSR 500 including shielded cable 1000 mm 0.5 mm², stripped with end sleeve 1 - (numbereded white strands) 2 M 3 + Internal screen on separate terminal		Sensor with separate cable 	
without mounting feet	20 31 050 9201		
with mounting feet	20 31 050 8201		
Other secondary connections on request			

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 @ VC = 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/temperatur, I_O, -40 °C ... +85 °C	max ±0.8 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 °C			
T_S	Storage temperature range	-45 °C ... +90 °C			
m	Weight	~ 0.7 kg			
RS	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 µs	20 kV			
V_B	Rated voltage [1)]	2000 V			

Approval CE

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

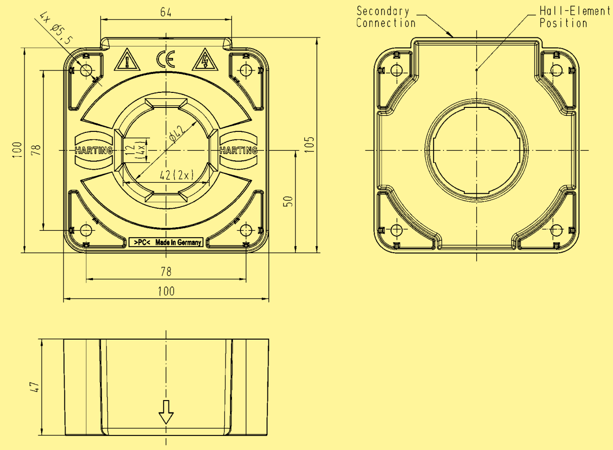
I_{PN}= 1000 A

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)

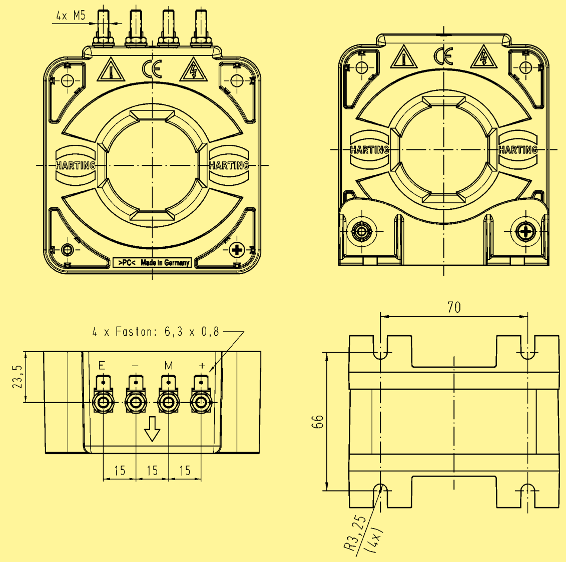
Tolerances ±0.5 mm



HCSR 1000

Connections:
Screw terminal with faston; 4pins
Screen connected to separate terminal

without mounting feet	**20 31 100 9101**
with mounting feet	**20 31 100 8101**



HCSR 1000

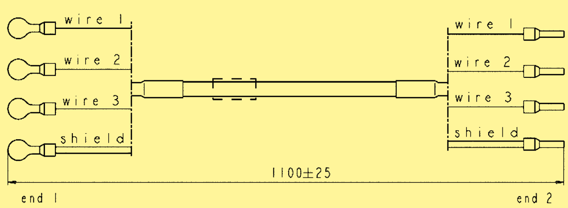
including shielded cable 1000 mm
0.5 mm², stripped with end sleeve

1 - (numbereded white strands)
2 M
3 +
Internal screen on separate terminal

without mounting feet	**20 31 100 9201**
with mounting feet	**20 31 100 8201**

Other secondary connections on request

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 %)	±15 ... 24 V			
I_C	Supply current @ VC = 15 V	33+ I_S mA			
X	Overall accuracy at I_{PN} TA = +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/temperatur, I_O, -40 °C ... 85 °C	max ±1 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°C			
T_S	Storage temperature range	-45 °C ... +90°C			
m	Weight	~ 1.5 kg			
RS	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 µs	20 kV			
V_B	Rated voltage [1)]	2000 V			

Approval: CE

[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}= 2000 A

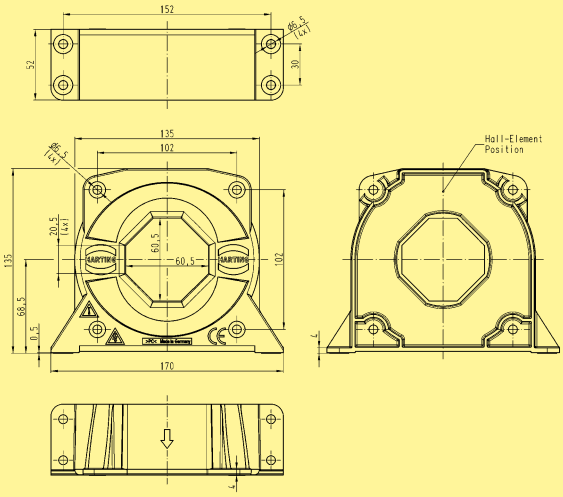
Measureable currents are AC, DC, pulsed …

Identification	Part numbered	Drawing	Dimensions in mm

HCSR 2000

Sensor fastening:
4 x M6 Steel screws
(recommended fastening torque 4.2 Nm)

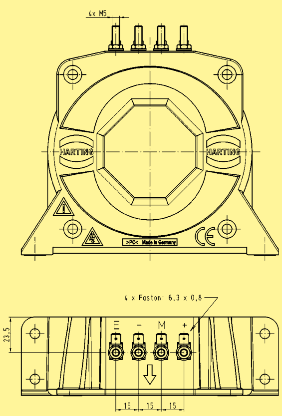
Tolerances ±0.5 mm



HCSR 2000

Connections:
Screw terminal with faston; 4pins
Screen connected to separate terminal

20 31 200 9101



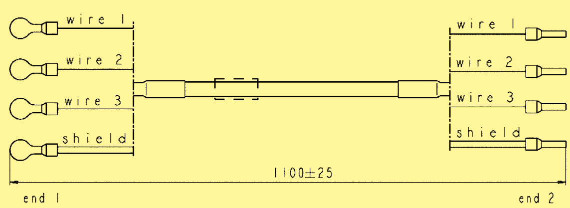
HCSR 2000

including shielded cable 1000 mm
0.5 mm², stripped with end sleeve

1 - (numbereded white strands)
2 M
3 +
Internal screen on separate terminal

20 31 200 9201

Sensor with separate cable



Other secondary connections on request

Features

- Direct hall effect current sensor
- I_{Pmax} = 300 A … 1000 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 ... ±300 A

HCSE 300

I_{PN}	Nominal primary current	300 A
I_P	Measuring range	0 ... ±900 A

HCSE 500

I_{PN}	Nominal primary current	500 A
I_P	Measuring range	0 ... ±1000 A

HCSE 800

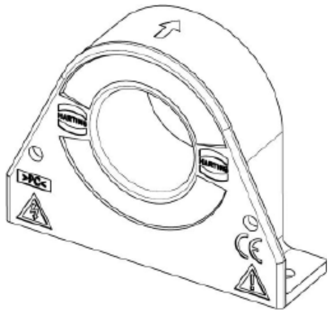
I_{PN}	Nominal primary current	800 A
I_P	Measuring range	0 ... ±1000 A

V_{out}	Output voltage at I_{PN}	4 V
R_L	Load resistance	>1 kΩ
V_C	Nominal power supply (±5 %)	±15 V
I_C	Supply current @ VC = 15 V	< 25 mA
R_{IN}	Insulation resistance	> 500 MΩ
X	Accuracy at I_{PN} TA= 25°C without offset	±1 %
E_L	Linearity	< 0.5 %
V_O	Offset voltage at I_P = 0, T = 25 °C	±10 mV
V_{OOL}	Offset after I_{Pmax}	±10 mV
V_{OT}	Thermal offset drift, T = -25°C … +85°C	±1 mV/K
V_{outT}	Thermal gain drift, T = -25 °C … +85 °C	±0.05 %/K
t_r	Delay time of I_{PN}	< 3 µs
Di/dt	di/dt correctly following	> 50 A/µs
f	Bandwidth	DC ...50 kHz

T_A	Operating temperature range	-25 °C ... +85 °C
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

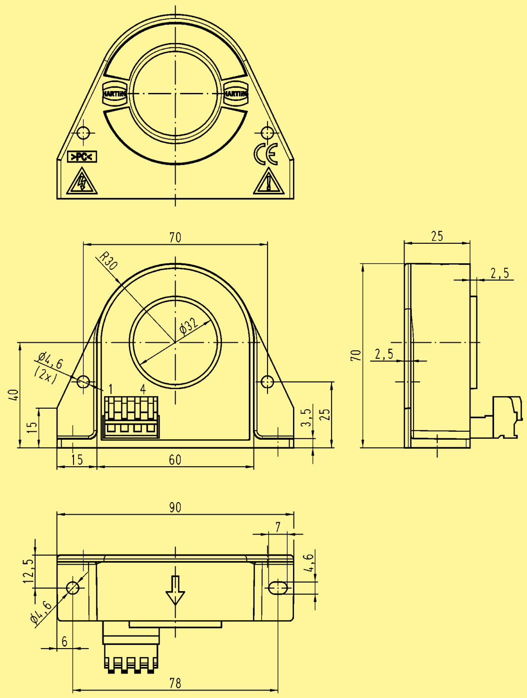
Approval: CE

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



I_{PN}= 100 A ... 800 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 ±0.5 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

<table>
<tr><th></th><th>Definitions</th><th></th></tr>
<tr><td>I_{PN}</td><td>Nominal primary current</td><td>RMS Value for AC Currents</td></tr>
<tr><td>I_P</td><td>Primary current, measuring range</td><td>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</td></tr>
<tr><td>X</td><td>Accuracy at I_{PN} T_A = 25°C</td><td>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</td></tr>
<tr><td>t_r</td><td>Response time of I_{PN}</td><td>Time difference in which the primary current and the measurement signal reach 90% of the end value</td></tr>
<tr><td>Di/dt</td><td>di/dt at optimal magnetic coupling</td><td>Maximum current rise rate correcly 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</td></tr>
<tr><td>f</td><td>Frequency range (-1dB)</td><td>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.</td></tr>
<tr><td>R_M</td><td>Burden resistance</td><td>Compensated current sensors: The larger the burden resistor R_M the lower the measuring range I_P

$I_P = (V_C - V_A)/(Rm + Rs) x N$

V_A = Voltage drop internal amplifier

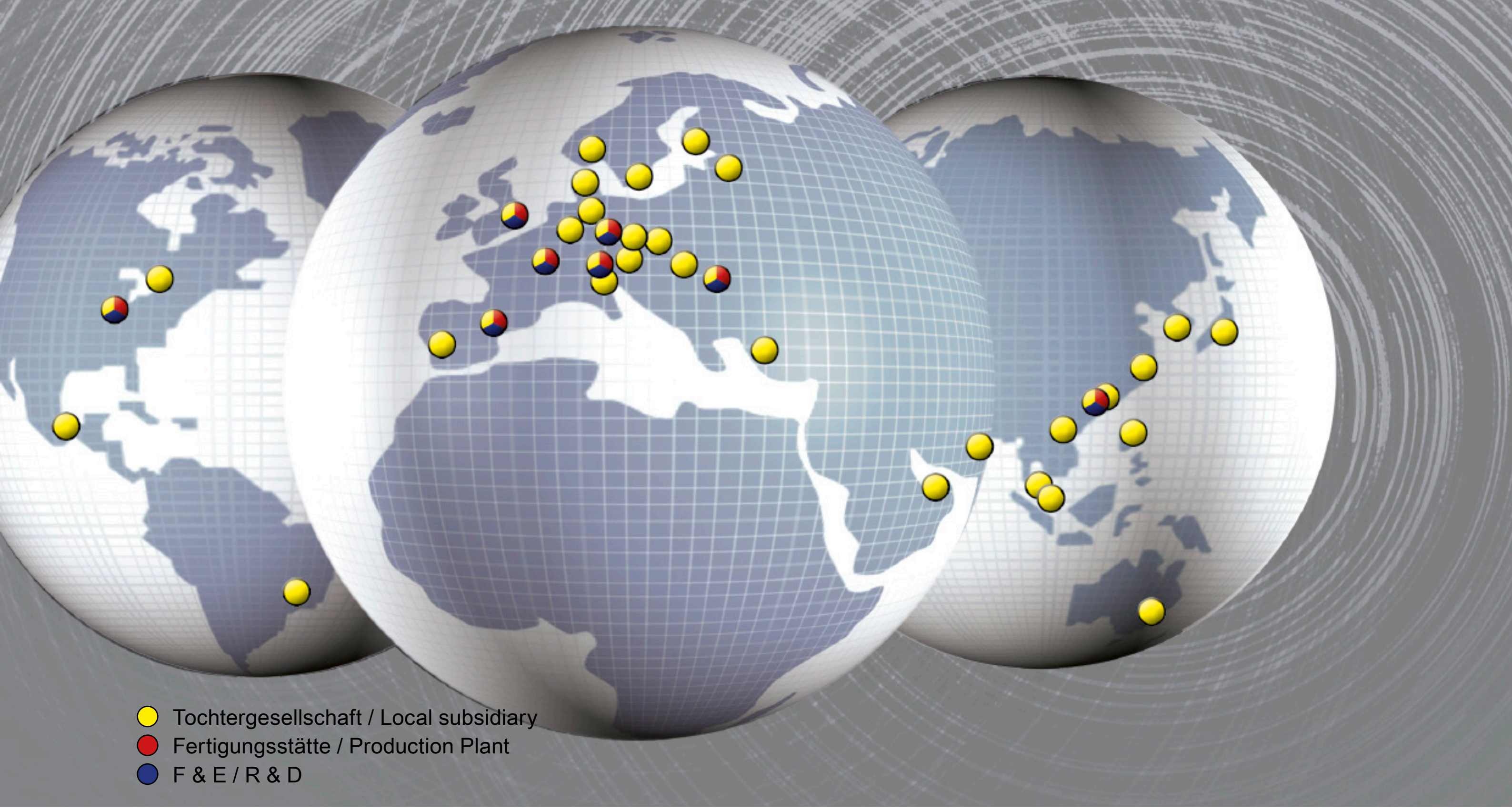
<table>
<tr><th>V_A in V</th><th>200 A</th><th>300 A</th><th>500 A</th><th>1000 A</th><th>2000 A</th></tr>
<tr><td>HCS</td><td>1.5</td><td>1.5</td><td>1.5</td><td>1.5</td><td>1.5</td></tr>
<tr><td>HCSR</td><td></td><td></td><td>1.5</td><td>1</td><td>1</td></tr>
</table>
</td></tr>
</table>

Remarks

- If I_P flows in the direction of the Arrow I_{Sek} is positive
- Over currents (»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 Save 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



Sales Network – worldwide

Albania
see Eastern Europe

Argentina
Condelectric S.A.
Hipólito Yrigoyen 2591, 1640 - Martínez
Buenos Aires – Argentina
Phone +54 11 4836 1053
Fax +54 11 4836 1053
comercial@condelectric.com.ar

Armenia
see Eastern Europe

Australia
HARTING Pty Ltd
Suite 11 / 2 Enterprise Drive
Bundoora 3083, AUS-Victoria
Phone +61 3 9466 7088
Fax +61 3 9466 7099
au@HARTING.com
www.HARTING.com.au

Austria
HARTING Ges.m.b.H.
Deutschstraße 19, A-1230 Wien
Phone +431 6162121
Fax +431 6162121-21
at@HARTING.com
www.HARTING.at

Azerbaijan
see Eastern Europe

Bahrain
see United Arab Emirates

Belarus
see Eastern Europe

Belgium
HARTING N.V./S.A.
Z.3 Doornveld 23, B-1731 Zellik
Phone +32 2 466 0190
Fax +32 2 466 7855
be@HARTING.com
www.HARTING.be

Bosnia and Herzegovina
see Eastern Europe

Brazil
HARTING Ltda.
Rua Major Paladino 128; Prédio 11
CEP 05307-000 São Paulo
SP – Brazil
Phone +55 11 5035 0073
Fax +55 11 5034 4743
br@HARTING.com
www.HARTING.com.br

Brunei
see Singapore

Bulgaria
see Eastern Europe

Canada
HARTING Canada Inc.
8455 Trans-Canada Hwy., Suite 202
St. Laurent, QC, H4S1Z1, Canada
Phone 855-659-6653
Fax 855-659-6654
info.ca@HARTING.com
www.HARTING.ca

China
HARTING (Zhuhai) Manufacturing Co., Ltd.
Shanghai Branch
Room 3501- 3503,
No. 1, Hong Qiao Road, Grand Gateway I
Xu Hui District, Shanghai 200030, China
Phone +86 21 6386 2200
Fax +86 21 6386 8636
cn@HARTING.com
www.HARTING.com.cn

Croatia
see Eastern Europe

Czech Republic
HARTING s.r.o.
Mlýnská 2, CZ-160 00 Praha 6
Phone +420 220 380 460
Fax +420 220 380 461
cz@HARTING.com
www.HARTING.cz

Denmark
HARTING ApS
Hjulmagervej 4a
DK - 7100 Vejle
Phone +45 70 25 00 32
Fax +45 75 80 64 99
dk@HARTING.com
www.HARTING.com

Eastern Europe
HARTING Eastern Europe GmbH
Bamberger Straße 7
D-01187 Dresden
Phone +49 351 4361 760
Fax +49 351 436 1770
Eastern.Europe@HARTING.com
www.HARTING.com

Estonia
see Eastern Europe

Finland
HARTING Oy
Teknobulevardi 3-5
FI-01530 Vantaa
Phone +358 207 291 510
Fax +358 207 291 511
fi@HARTING.com
www.HARTING.fi

France
HARTING France
181 avenue des Nations, Paris Nord 2
BP 66058 Tremblay en France
F-95972 Roissy Charles de Gaulle
Cédex
Phone +33 1 4938 3400
Fax +33 1 4863 2306
fr@HARTING.com
www.HARTING.fr

Germany
HARTING Deutschland GmbH & Co. KG
P.O. Box 2451, D-32381 Minden
Simeonscarré 1, D-32427 Minden
Phone +49 571 8896 0
Fax +49 571 8896 282
de@HARTING.com
www.HARTING.de

Georgia
see Eastern Europe

Great Britain
HARTING Ltd., Caswell Road
Brackmills Industrial Estate
GB-Northampton, NN4 7PW
Phone +44 1604 827 500
Fax +44 1604 706 777
gb@HARTING.com
www.HARTING.co.uk

Hong Kong
HARTING (HK) Limited
Regional Office Asia Pacific
3512 Metroplaza Tower 1
223 Hing Fong Road
Kwai Fong, N. T., Hong Kong
Phone +852 2423 7338
Fax +852 2480 4378
ap@HARTING.com
www.HARTING.com.hk

Hungary
HARTING Magyarország Kft.
Fehérvári út 89-95, H-1119 Budapest
Phone +36 1 205 34 64
Fax +36 1 205 34 65
hu@HARTING.com
www.HARTING.hu

Iceland
Smith & Norland, Nóatún 4
IS – 105 Reykjavík
Phone +354 520 3000
Fax +354 520 3011
olaf@sminor.is, www.sminor.is

India
HARTING India Pvt Ltd
7th Floor (West Wing), Central Square II
Unit No.B-19 Part, B 20&21
TVK Industrial Estate
Guindy, Chennai - 600032
Phone : +91-44-43560415
+91-44-43456262
Fax : +91-44-43560417
in@HARTING.com
http://www.HARTING.in

Indonesia
see Malaysia

Israel
COMTEL
Israel Electronic Solutions Ltd.
Bet Hapamon, 20 Hataas st.
P.O.Box 66
Kefar-Saba 44425
Phone +972-9-7677240
Fax +972-9-7677243
sales@comtel.co.il
www.comtel.co.il

Italy
HARTING SpA
Via Dell' Industria 7
I-20090 Vimodrone (Milano)
Phone +39 02 250801
Fax +39 02 2650 597
it@HARTING.com
www.HARTING.it

Japan
HARTING K. K.
Yusen Shin-Yokohama 1 Chome Bldg., 2F
1-7-9, Shin-Yokohama, Kohoku
Yokohama 222-0033 Japan
Phone +81 45 476 3456
Fax +81 45 476 3466
jp@HARTING.com
www.HARTING.co.jp

Jordan
see United Arab Emirates

Kazakhstan
see Eastern Europe

Kirghizia
see Eastern Europe

Korea (South)
HARTING Korea Limited
#308 Yatap Leaders Building
342-1, Yatap-dong, Bundang-gu
Sungnam-City, Kyunggi-do
463-828, Republic of Korea
Phone +82 31 781 4615
Fax +82 31 781 4616
kr@HARTING.com
www.HARTING.co.kr

Kosovo
see Eastern Europe

Kuwait
see United Arab Emirates

Latvia
see Eastern Europe

Lithuania
see Eastern Europe

Macedonia
see Eastern Europe

Malaysia (Office)
HARTING Singapore Pte Ltd
Malaysia Branch
11-02 Menara Amcorp
Jln. Persiaran Barat
46200 PJ, Sel. D. E., Malaysia
Phone +60 3 / 7955 6173
Fax +60 3 / 7955 5126
sg@HARTING.com

Montenegro
see Eastern Europe

Netherlands
HARTING B.V.
Larenweg 44
NL-5234 KA 's-Hertogenbosch
Postbus 3526
NL-5203 DM 's-Hertogenbosch
Phone +31 736 410 404
Fax +31 736 440 699
nl@HARTING.com
www.HARTINGbv.nl

New Zealand
see Australia

Norway
HARTING A/S
Østensjøveien 36, N-0667 Oslo
Phone +47 22 700 555
Fax +47 22 700 570
no@HARTING.com
www.HARTING.no

Oman
see United Arab Emirates

Pakistan
see United Arab Emirates

Philippines
see Malaysia

Poland
HARTING Polska Sp. z o. o
ul. Duńska 9
PL- 54-427 Wrocław
Phone +48 71 352 81 71
Fax +48 71 350 42 13
pl@HARTING.com
www.HARTING.pl

Portugal
HARTING Iberia, S. A.
Avda. Josep Tarradellas 20-30 4º 6a
E-08029 Barcelona
Phone +351 219 673 177
Fax +351 219 678 457
es@HARTING.com
www.HARTING.es/pt

Qatar
see United Arab Emirates

Republic of Moldova
see Eastern Europe

Romania
HARTING Romania SCS
Europa Unita str. 21
550018-Sibiu, Romania
Phone +40 369-102 671
Fax +40 369-102 622
ro@HARTING.com
www.HARTING.com

Russia
HARTING ZAO
Maliy Sampsoniyevsky prospect 2A
194044 Saint Petersburg, Russia
Phone +7 812 327 6477
Fax +7 812 327 6478
ru@HARTING.com
www.HARTING.ru

Saudi Arabia
see United Arab Emirates

Serbia
see Eastern Europe

Singapore
HARTING Singapore Pte Ltd.
25 International Business Park
#04-108 German Centre
Singapore 609916
Phone +65 6225 5285
Fax +65 6225 9947
sg@HARTING.com
www.HARTING.sg

Slovakia
HARTING s.r.o.
Sales office Slovakia
J. Simora 5, SK - 940 52 Nové Zámky
Phone +421 356-493 993
Fax +421 356-402 114
sk@HARTING.com
www.HARTING.sk

Slovenia
see Eastern Europe

South Africa
HellermannTyton Pty Ltd.
Private Bag X158 Rivonia 2128
34 Milky Way Avenue
Linbro Business Park 2065
Johannesburg
Phone +27(0)11879-6600
Fax +27(0)11879-6606
sales.jhb@hellermann.co.za

Spain
HARTING Iberia S.A.
Avda. Josep Tarradellas 20-30 4º 6ª
E-08029 Barcelona
Phone +34 93 363 84 75
Fax +34 93 419 95 85
es@HARTING.com
www.HARTING.es

Sweden
HARTING AB
Gustavslundsvägen 141 B 4tr
S-167 51 Bromma
Phone +46 8 445 7171
Fax +46 8 445 7170
se@HARTING.com
www.HARTING.se

Switzerland
HARTING AG
Industriestrasse 26
CH-8604 Volketswil
Phone +41 44 908 20 60
Fax +41 44 908 20 69
ch@HARTING.com
www.HARTING.ch

Taiwan
HARTING Taiwan Ltd.
Room 1, 5/F
495 GuangFu South Road
RC-110 Taipei, Taiwan
Phone +886 2 2758 6177
Fax +886 2 2758 7177
tw@HARTING.com
www.HARTING.com.tw

Tajikistan
see Eastern Europe

Thailand
see Malaysia

Turkey
HARTING TURKEI Elektronik Ltd. Şti.
Barbaros Mah. Dereboyu Cad.
Fesleğen Sok.
Uphill Towers, A-1b Kat:8 D:45
34746 Ataşehir, İstanbul
Phone +90 216 688 81 00
Fax +90 216 688 81 01
tr@HARTING.com
www.HARTING.com.tr

Turkmenistan
see Eastern Europe

Ukraine
see Eastern Europe

United Arab Emirates
HARTING Middle East FZ-LLC
Knowledge Village, Block 2A, Office F72
P.O. Box 454372, Dubai
United Arab Emirates
Phone +971 4 453 9737
Fax +971 4 439 0339
uae@HARTING.com
www.HARTING.ae

USA
HARTING Inc. of North America
1370 Bowes Road
USA-Elgin, Illinois 60123
Phone +1 (877) 741-1500 (toll free)
Fax +1 (866) 278-0307 (Inside Sales)
us@HARTING.com
www.HARTING-USA.com

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Phone +49 5772 47-97100
Fax +49 5772 47-495
electric@HARTING.com
www.HARTING.com

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HARTING Technology Group
Marienwerderstr. 3, 32339 Espelkamp – Germany
P.O. Box 11 33, 32325 Espelkamp – Germany
Phone +49 5772 47-0, Fax +49 5772 47-400
info@HARTING.com
www.HARTING.com

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