

imc CRONOSflex SEN-SUPPLY-4

Sensor supply for 4x current transducers or current clamps

The SEN-SUPPLY-4 module provides high power $\pm 15\text{V}$ supply voltage to feed 4 active sensors. It is particularly suited to operate modern fluxgate current transducers such as LEM Ultrastab types, Danisense as well as precision current clamps.

As a passive module it can be operated/combined with any amplifier types by hooking up to the amplifier inputs via patch cables (LEMO.1B).

It can be used both in conjunction with CRFX-modules (forming blocks via the click connector), as well as in stand-alone operation, and with amplifiers and devices belonging to other device families such as imc CANSAS, imc C-SERIES, etc.

Highlights

- 48 W sensor supply $\pm 15\text{ V}$
(4 x 540 mA / >12 W per channel,
max. 2 x 1080 mA)
- Suitable for current transducer (e.g. LEM, Danisense), current clamps or torque-transducers
- Sensor connection via DSUB-9 plug with integrated load resistor for sensors with current outputs
- Status indicator (LED) for fault conditions on either the sensor or power supply (overload)
- Supply of the module itself via a separate LEMO.1B input (20 V to 50 V DC), independently of the CRFX Click-mechanism
- Compatible with CRFX Power-Handle (10 V to 50 V DC) and Li-Ion long-term UPS
- Support of TEDS for automatical scaling of the measurement channels (plug & play)



CRFX/SEN-SUPPLY-4

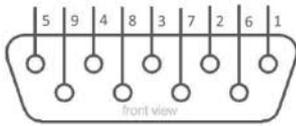
Typical applications

- Measurement of current and power, e.g. in the field of e-Mobility
- Operation of precision current transducers with high power demands and flexibly selectable load resistor. Comprehensive accessories and appropriate transducers are available
- Operation of torque sensors with 15 respectively 30 V supply
- For test rigs and mobile testing

Pin configuration

Sensor

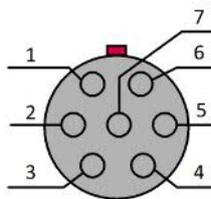
DSUB-9



Pin	Signal	Remarks
1	-IN	signal output from the sensor
2	TEDS GND	reference for TEDS (no connection with GND)
3	n.c.	reserved
4	GND	reference for supply voltage \pm SUPPLY
5	-SUPPLY	-15 V: power supply to sensor
6	+IN	signal output from the sensor
7	TEDS	TEDS-memory in the DSUB-9 plug
8	FAIL	sensor status: connection to GND = OK
9	+SUPPLY	+15 V: power supply to sensor

Amplifier

LEMO.1B (7-pin)



view on the socket

Pin	Signal	Remarks
1	+OUT	signal from the sensor, passed through to the amplifier
2	-OUT	reference for the signal
3	n.c.	
4	TEDS GND	reference for TEDS
5	TEDS	scaling information, to be interpreted by TEDS-capable amplifiers
6, 7	n.c.	

Click-mechanism and power supply

The signals for the EtherCAT system and power supply, which are routed on the module connector, are looped through the module, but not used. Instead, the module is supplied with power (20 V to 50 V DC) exclusively from the separate LEMO.1B (2-pin) socket and not from the click connector. This voltage is not fed out to the module connector, to which it has no connection.

The power supply input is compatible with the POWER-HANDLE or UPS-module for imc CRONOSflex: In this configuration, too, the module is not powered via the supply line of the click connector but rather by connecting its separate power input to one of the 5 POWER HANDLES's auxiliary power outputs ("AUX" on the rear panel, LEMO.1B.304; corresponding connection cables are available). They provide a constant 50V DC output regardless of the wide range 10 V to 50 V input making it thus suitable for vehicle use (e.g. 12 V). In conjunction with the UPS function this output will additionally be buffered.

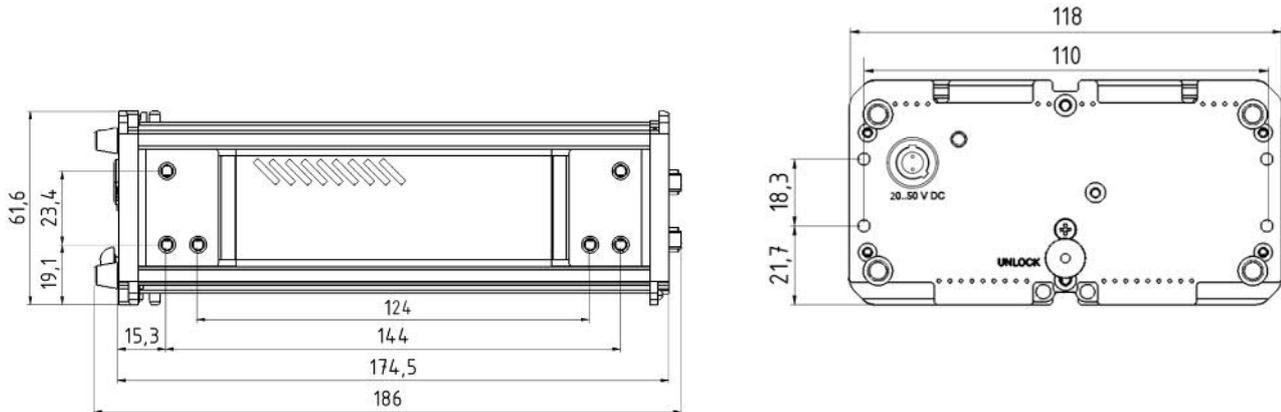
Unlike other CRFX modules, this particular type requires an individual power supply connection, even when operated within a block (click). So an extra AC/DC power adaptor or cable connection is needed (≥ 20 V)!

Suitable products are available as additional optional accessories. The standard delivery does not comprise such items (like AC/DC adapter), as the specific requirements will usually depend on the application.

Overview of the available variants

Order Code	Description	article no.	ET version*
CRFX/SEN-SUPPLY-4	±15 V, 48 W, Input: DSUB-9, Output: LEMO.1B	11900245	11910143

Mechanical dimensions



Shown in standard operating orientation.

Accessories and Connectors

Included accessories

- Test certificate

Order Code	Description	article no.
ACC/POWER-PLUG5	Power connector for the CRFX power-socket, LEMO.FGE.1B.302 (E-coded: 48 V)	13500150

Optional accessories

Power supply		
Order Code	Description	article no.
ACC/AC-ADAP-48-150-1B	AC/DC power adaptor, 48 V DC / 150 W plug: LEMO.FGE.1B.302 (E-coded: 48 V)	13500148
CRPL/AC-ADAPTER-60W-1B	AC/DC power adaptor, 24 V DC / 60 W, LEMO.1B.302	10800066
ACC/CABLE-LEMO-1B-BAN-2M5	power supply cable LEMO.1B.302 - banana, 2.5 m	13500277
CRFX/HANDLE-POWER	left handle with stabilized system power supply constant DC system supply 50 V, 100 W, from 10 V to 50 V wide range input, no UPS	11900058
CRFX/HANDLE-UPS-L	left handle with UPS with stabilized DC system supply 50 V, 100 W and with UPS (lead-gel)	11900043
CRFX/HANDLE-LI-IO-L	left handle with UPS in Li-Ion technology with stabilized DC system supply 50 V, 100 W, with UPS (Li-Ion), -10°C to +60°C	11900010
ACC/CABLE-CRFX-HANDLE-PWR-1m	CRFX Power Handle: Aux Power Out cable, 1 m, LEMO.1B.304 (4-pin, Aux out) to LEMO.1B.302 (2-pin, Module Power In)	13500254

* ET: Version in extended temperature range

Sensors and amplifier connection		
Order Code	Description	article no.
ACC/SENSORCABLE-LEMO-LEMO-0M2	Patch cable for connection of output SEN-SUPPLY-4 to Amp with LEMO.1B.307 both ends, 0.2 m length	13500306
ACC/SENSORCABLE-LEMO-LEMO-0M5	Patch cable for connection of output SEN-SUPPLY-4 to Amp with LEMO.1B.307 both ends, 0.5 m length	13500303
ACC/2xLEMO-DSUB-0M2	Patch cable DSUB-15 for connection of 2 outputs SEN-SUPPLY-4 to Amp DSUB-15, with 2 x LEMO.1B.307 to DSUB-15 (with TEDS), for bridge and UNI amps, 0.2 m length	13500307
ACC/4xLEMO-DSUB-0M2	Patch cable DSUB-15 for connection of 4 outputs SEN-SUPPLY-4 to Amp DSUB-15, with 4 x LEMO.1B.307 to DSUB-15 (with TEDS), for voltage amps, 0.2 m length	13500321
ACC/LEMO-1B-PHOE-0M5	Patch cable for the connection of Output SEN-SUPPLY-4 to amplifier HV2-2U2I LEMO.1B.307 to Phoenix KGG (3-pin), 0.5 m length	13500378
ACC/SENSORCABLE-1M	Signal input cable for an assembly of Patch cables towards DSUB-15 amps, LEMO.1B.307 IP54 sealed plug and unterminated cable end, 1 m length	13500255
SEN/DSUB9-10R	DSUB-9 plug for current transducer (LEM, Danisense): with internal load resistor 10 Ω and TEDS inside the DSUB	13940010
SEN/DSUB9-5R	DSUB-9 plug for current transducer (LEM, Danisense): with internal load resistor 5 Ω and TEDS inside the DSUB	13940018
SEN/DSUB9-1R	DSUB-9 plug for current transducer (LEM, Danisense): with internal load resistor 1 Ω and TEDS inside the DSUB	13940022
SEN/DSUB9-NR	DSUB-9 plug for general transducers (e.g. torque): without internal load resistor, with TEDS inside DSUB	13940012

Current clamps		
Order Code	Description	article no.
SEN/PROBE-20A-CT6841	Current clamp 20 A AC/DC (max. 20 mm) nom. 20 A, max. 40 A(rms), 57 A(pk); Taylored for CRFX/SEN-SUPPLY-4 (DSUB-9)	13950007
SEN/PROBE-200A-CT6843	Current clamp 200 A AC/DC (max. 20 mm) nom. 200 A, max. 400 A(rms), 570 A(pk); Taylored for CRFX/SEN-SUPPLY-4 (DSUB-9)	13950008
SEN/PROBE-500A-CT6845	Current clamp 500 A AC/DC (max. 50 mm) nom. 500 A, max. 1000 A(rms, pk); Taylored for CRFX/SEN-SUPPLY-4 (DSUB-9)	13950009
SEN/PROBE-1000A-CT6846	Current clamp 1000 A AC/DC (max. 50 mm) nom. 1000 A, max. 1700 A(rms, pk); Taylored for CRFX/SEN-SUPPLY-4 (DSUB-9)	13950020
SEN/ME15W-DSUB9-0M2	Adaptor for Current clamp ME15W (12-pin) to DSUB-9, 0.2 m length	13940015

Current transducers		
Order Code	Description	article no.
SEN/LEM-IT205	Current transducer 200 A, operating range: -40 .. +85°C including connection cable SEN/LEM-IT-CABLE-10R-3M	13950003
SEN/LEM-IT405	Current transducer 400 A, operating range: -40 .. +85°C including connection cable SEN/LEM-IT-CABLE-5R-3M	13950018
SEN/LEM-IT1000	Current transducer 1000 A, operating range: -40 .. +85°C including connection cable SEN/LEM-IT-CABLE-1R-3M (max. 2 transducers IN-1000 for each SEN-SUPPLY-4 module)	13950021
SEN/DANI-DS50ID	Current transducer 50 A, operating range: -40 .. +85°C with ASPC Protection (also protected in unpowered condition) including connection cable SEN/LEM-IT-CABLE-5R-3M	13950022
SEN/DANI-DS600ID	Current transducer 600 A, operating range: -40 .. +85°C with ASPC Protection (also protected in unpowered condition) including connection cable SEN/LEM-IT-CABLE-1R-3M (max. 2 transducers DS600ID for each SEN-SUPPLY-4 module)	13950023
SEN/LEM-IT-CABLE-10R-3M	Cable for LEM IT current transducer, 10R, 3 m both ends DSUB-9, including SEN/DSUB9-10R	13940013
SEN/LEM-IT-CABLE-5R-3M	Cable for LEM IT current transducer, 5R, 3 m both ends DSUB-9, including SEN/DSUB9-5R	13940017
SEN/LEM-IT-CABLE-1R-3M	Cable for LEM IT current transducer, 1R, 3 m both ends DSUB-9, including SEN/DSUB9-1R	13940019
SEN/LEM-IT205-3-BLOCK	3 x current transducer 200 A with assembly block, operating range: -40 .. +85°C, including universally installable mounting block, incl. connection cable SEN/LEM-IT-CABLE-10R-3M	13950004
SEN/LEM-IT405-3-BLOCK	3 x current transducer 400 A with assembly block, operating range: -40 .. +85°C, including universally installable mounting block, incl. connection cable SEN/LEM-IT-CABLE-5R-3M	13950019

Current transducers, complete with cascable mounting blocks (SEN/LEM-IT205-3-BLOCK)



Activation of current transducers and primary circuits

Primary current circuits should generally be activated only, after the current transducers have been activated: transducers being connected to SEN-SUPPLY-4 and the measurement system switched on. Current transducers might be permanently damaged by magnetic saturation effects when subjected to high primary currents while not being actively powered. This is not a property or limitation of the sensor supply module but rather a property of many common current transducers. When in doubt, please consult respective technical data sheets of transducers. Transducers such as DS50ID and DS600ID (Danisense with ASPC Protection) are explicitly protected against this specific operating condition.

Calibration and TEDS

When using current transducers with current output (especially LEM or Danisense with current output), the load resistor R_m in the DSUB-9 plug will also determine the overall accuracy of the measurement.

The accuracy of the individual obtainable plugs and connection cables is given in the technical specs below. However, upon delivery of a complete set of transducer plus cable this load resistor R_m will even be calibrated to achieve an extended precision. The resulting correction data are written to the TEDS memory and are offset against the nominal scaling value of the current transducer. The increased precision specified for this case is determined by the achievable accuracy of the calibration procedure and assumes that the downstream measuring amplifier has TEDS capability and takes the correction data into account accordingly.

The current transducers themselves are not explicitly calibrated: They are already rated for very high precision as a standard and will be accounted for with their nominal scaling value. Transducers will thus remain exchangeable with units of identical type. Both DSUB-9 connection cables and the non-assembled separate DSUB-9 plugs can be ordered for explicit (repeated) calibration.

Article	Order Code	TEDS	Rm calibrated	Rm (10R) Spec
For current transducers				
Plug (DSUB-9)	SEN/DSUB9-xxR	empty, writable	no	0.05 %
Connection cable for LEM	SEN/LEM-IT-CABLE-xxR-3M	empty, writable	no	0.05 %
Calibration of a DSUB-9 plug	SEN/CAL-DSUB9-RM	individual calibration value for R_m nominal scaling value for R_m (e.g. 10V/A at 10 Ω)	yes	0.01 %
Current transducer (LEM or Danisense) incl. connection cable	SEN/LEM-lxxx SEN/DANI-DSxxx	combined value from: individual calibration value for R_m nominal scaling value for current transducer (referred to the primary measuring range - e.g. 200 A converter) type information about the current transducer	yes	0.01 %
For current clamps				
Adaptor DSUB-9/ME15W	SEN/ME15W-DSUB9-0M2	empty, writable	no Rm	---
Current clamp transducer	SEN/PROBE-xxxA-CT68xx	nominal scaling value for current clamp	no Rm	---

Isolation and grounding

The sensor supply (± 15 V) as a complete unit (all 4 channels) is isolated from the case (CHASSIS) and from the power supply input of the module (20..50 V).

This galvanic isolation is internally limited to 500 k Ω parallel to 1 nF in order to avoid uncontrolled drifting. In environments with electromagnetic interference, it may be advisable to deliberately bridge this isolation and ground the sensor supply centrally. Depending on the specific conditions, dynamic common-mode injection can be minimized and interference suppression improved. Such fine tuning interventions can be carried out on the [DSUB-9 plug](#)¹¹⁾. For this optimization, a short circuit jumper connection must be established between the GND node of the connector contact (pad 4 or 5) and the connector housing.

Compatible measurement amplifiers

This sensor supply module is always used as in conjunction with a separate voltage measurement amplifier:

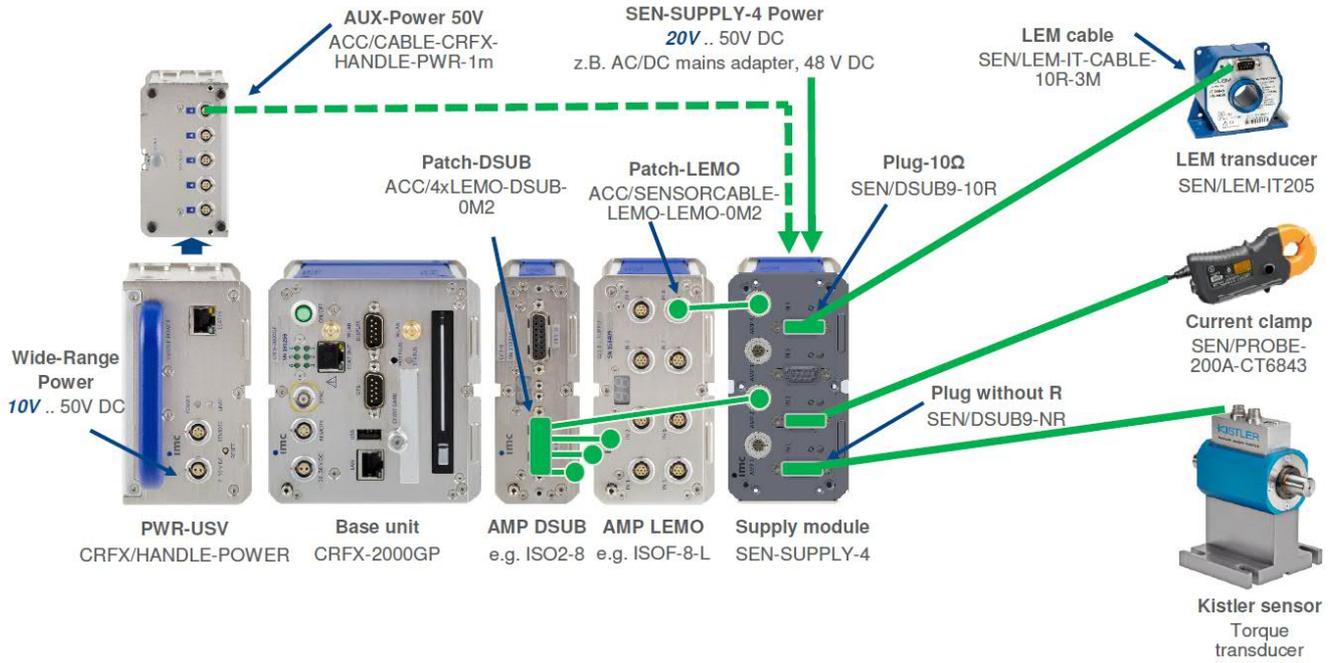
Selection of compatible and recommended measurement amplifiers		
Order Code	Remarks	article no.
CRFX/ISO2-8-L	Iso-amplifier (LEMO), 8-channel	11900050
CRFX/ISOF-8-L	High-speed iso-amplifier (LEMO), 8-channel	11900249
CRFX/LV3-8-L	High-speed voltage-amplifier (LEMO), 8-channel	11900xxx
CRFX/UNI2-8-L	Universal-amplifier (LEMO), 8-channel	11900048
CRFX/DCB2-8-L	DC-bridge-amplifier (LEMO), 8-channel	11900065
CRFX/B-8-L	High-speed DC-bridge-amplifier (LEMO), 8-channel	11900xxx
CRFX/UNI-4-L	Universal-amplifier (LEMO), 4-channel	11900064
CRFX/HV2-2U2I	High voltage, 4 channel (2 voltage, 2 current transducer)	11900119
EOS/U-4	High-speed compact voltage measurement device, 4-channel	12800001

This module can also be used with any other voltage, bridge and universal amplifiers with DSUB-15 connection technology. Also available from other device families such as imc CANSAS, imc CRONOS, imc SPARTAN, imc C-SERIES etc. DSUB-15 patch cables for 2- and 4-channels are also available.

With applications in HV environment where both current and voltage are to be acquired for power measurements, amplifier module CRFX/HV2-2U2I is recommended.

For optimized phase matching and resulting power accuracy corresponding current and voltage channels can then be configured on singular modules. This solution is superior to alternative configurations where current and voltage are associated with different modules and non-uniform amplifier types (such as HV2-4U + ISOF-8).

Typical system configuration and cabling



Technical Specs - SEN-SUPPLY-4

Sensor supply		
Parameter	Value	Remarks
Channels	4	
Terminal connection		
Sensor	DSUB-9	direct connection of current transducers (e.g. LEM Ultrastab, Danisense or current clamps)
Amplifier	LEMO.FGG.1B.307 (plug)	direct connection of any amplifier via LEMO patch cables
Power supply	LEMO.EGE.1B.302 (socket)	multicoded 2 notches (E-coded: 48 V) recommended plug: LEMO.FGE.1B.302
Module connector	2x 20 pin	CRFX system bus (EtherCAT) and power supply: passed through to further directly connected (clicked) amplifiers
Output voltage	±15 V	
Accuracy of output voltage	±2%	at terminals, no load
Temperature coefficient	typ. ±0.02%/K	25°C
Output power	max. 48 W	total continuous power, 4 channels
Current limiting	typ. 1080 mA ¹	for each channel pairs 1+2 or 3+4 (max. 2 transducer IN-1000 respectively DS600ID for each module)
Short-circuit protection	unlimited duration	automatic restart of all channels
Capacitive load	>470 µF	per channel
Efficiency	typ. 80%	full load, 25°C
Isolation	60 V	block isolation of entire global sensor supply (for all 4 channels, common reference"-SUPPLY, GND") to housing (CHASSIS, PE), as well as to power input
Status indication	channel individual LED	display of error status from sensor (signal or switching contact) or overload of power supply
TEDS	TEDS memory inside DSUB-9 connector (parameters and scaling information)	TEDS signals are passed to the connected (TEDS-capable) amplifiers

- 1 the pairs k1+k2 and k3+k4 are fused together with 1080 mA; typical operating examples:
 4 x 540 mA (e.g. 4 x IT-405) with k1/k2/k3/k4
 2 x 1080 mA (e.g. 2 x IN-1000 respectively DS600ID) with channel k1 and k3; k2/k4 thereby unused

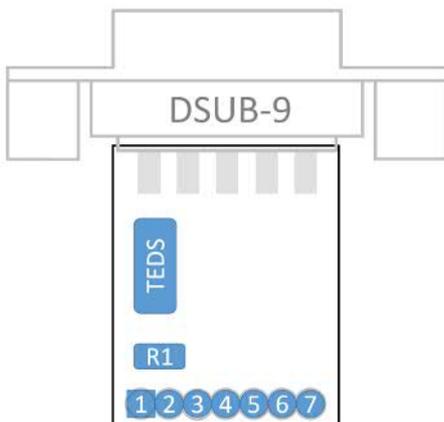
Power supply of the module		
Parameter	Value	Remarks
Input supply voltage	20 V to 50 V DC	only via LEMO.1B socket
Isolation	60 V	nominal isolation specification of the supply input
Power-over EtherCAT (PoEC)	not supported	DC power supply via EtherCAT network
Power consumption	max. 65 W	20 V to 50 V DC

Pass through power limits	
Directly connected (clicked) imc CRONOSflex modules via module connector	<p>3.1 A (maximum current)</p> <p>Equivalent power with chosen DC power input:</p> <ul style="list-style-type: none"> • 149 W at 48 V DC (e.g. AC/DC line adaptor) • 37 W at 12 V DC (typical vehicle supplied DC input) <p>Refers only to the supply power passed through (in/out). The module itself is always supplied individually from the LEMO socket</p>

Operating conditions		
Parameter	Value	Remarks
Operating environment	dry, non corrosive environment within specified operating temperature range	
Rel. humidity	80% up to 31°C, above 31°C: linear declining to 50%	according IEC 61010-1
Ingress protection rating	IP20	
Pollution degree	2	
Operating temperature (standard)	-10°C to +55°C	without condensation
Operating temperature (extended: "-ET" version)	-40°C to +85°C	condensation temporarily allowed
Shock- and vibration resistance	IEC 61373, IEC 60068-2-27 IEC 60062-2-64 category 1, class A and B MIL-STD-810 Rail Cargo Vibration Exposure U.S. Highway Truck Vibration Exposure	
Extended shock- and vibration resistance	upon request	specific tests or certifications upon request
Dimensions	62 x 118 x 186 mm	W x H x D
Weight	860 g	

Plug for the sensor connection			
Parameter	Value typ.	min. / max.	Remarks
Plug	DSUB-9		solder connections in the plug housing
Internal load resistor Rm	1 Ω, 5 Ω, 10 Ω		SEN/DSUB9-xR: for transducers with current output
	none		SEN/DSUB9-NR: for sensors with voltage output
Accuracy for Rm calibrated version 10 Ω 5 Ω 1 Ω not calibrated 10 Ω 5 Ω 1 Ω			see description
Temperature drift	0.05 ppm/°C		0 to +60 °C
	0.2 ppm/°C		-55 to +125 °C
Drift due to self-heating	5 ppm / W		
Long-term stability		50 ppm (= 0.005 %)	10 000 h @ 1 W
Power rating			+70°C
			+85°C
Operating temperature range	-40 to +85°C		

Pinning of the plug for the sensor connection (SEN/DSUB9-xxR)



Pad	Signal	LEM (I _{out})	Sensor (V _{out})	Remarks
1	-SUPPLY	-SUPPLY	-SUPPLY	-15 V
2	+SUPPLY	+SUPPLY	+SUPPLY	+15 V
3	FAIL	STATUS	n.c.	open: error
4	GND	STATUS_GND	n.c.	contact with FAIL
5	GND	PWR_GND	PWR_GND	Power-GND
6	-IN	n.c.	+SIGNAL	-V _{out}
7	+IN	I_OUT	-SIGNAL	+V _{out} / +I _{out}
R1	Bridge	n.c.	0 Ω	FAIL = 0 (OK)