Current transducer IT 65-S ULTRASTAB

I_{PN} = 60 A

For the electronic measurement of current: DC, AC, pulsed..., with galvanic separation between the primary and the secondary circuit.

Features

- Wide operating temperature range of –40 °C to 85 °C
- Closed loop (compensated) current transducer using an extremely accurate zero flux detector
- Electrostatic shield between primary and secondary circuit
- 9-pin D-Sub male secondary connector
- Optically insulated output (photocoupler type) indicates transducer state
- LED indicator confirms normal operation.

Advantages

- Very high accuracy
- Excellent linearity
- Extremely low temperature drift
- Wide frequency bandwidth
- High immunity to external fields
- No insertion losses
- Low noise on output signal
- Low noise feedback to primary conductor.

Applications

- Feed back element in high performance gradient amplifiers for MRI
- Feedback element in high-precision, high-stability power supplies
- Calibration unit
- Energy measurement
- Medical equipment.

Standards

- EN 61000-6-2: 2005
- EN 61000-6-3: 2007
- EN 61010-1: 2010.

Application Domains

- Industrial
- Laboratory
- Medical.

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Insulation coordination

Parameter	Symbol	Unit	Value	Comment
Rated insulation RMS voltage, basic insulation	U_{Nm}	V	2000	IEC 61010-1 conditions - over voltage cat III - pollution degree 2
Rated insulation RMS voltage, reinforced insulation	U_{Nm}	V	600	
Rated insulation RMS voltage, basic insulation	U_{Nm}	V	1000	EN 50178 conditions - over voltage cat III - pollution degree 2
Rated insulation RMS voltage, reinforced insulation	U_{Nm}	V	600	
RMS voltage for AC insulation test, 50/60 Hz, 1 min	U_d	kV	5.4	Between primary and secondary + shield
		V DC	200	Between secondary and shield
		V DC	300	Between secondary and status output
Impulse withstand voltage 1.2/50 µs	U_{Ni}	kV	9.9	
Clearance (pri. - sec.)	d_{Cl}	mm	11	Shortest distance through air
Creepage distance (pri. - sec.)	d_{Cp}	mm	11	Shortest path along device body
Comparative tracking index	CTI		600	

If insulated cable is used for the primary circuit, the voltage category could be improved with the following table (for single insulation) (IEC 61010-1 standard):

Cable insulated (primary)	Category
HAR03	2150 V CAT III
HAR05	2250 V CAT III
HAR07	2350 V CAT III

Environmental and mechanical characteristics

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Ambient operating temperature	T_A	°C	–40		85	
Ambient storage temperature	$T_{A\,st}$	°C	–40		85	
Relative humidity	RH	%	20		80	Non-condensing
Dimensions						See drawing on page 7
Mass	m	kg		0.33		

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Electrical data

At T_A = 25 °C, ±U_C = ±15 V, unless otherwise noted.
Lines with a * in the comment column apply over the −40 … 85 °C ambient temperature range.

Parameter	Symbol	Unit	Min	Typ	Max		Conditions
Primary continuous direct current (nominal)	I_{PNDC}	A	−60		60	*	
Primary nominal RMS current	I_{PN}	A			60	*	
Primary current, measuring range	I_{PM}	A	−85		85	*	Peak limit
Measuring resistance over operating current temperature and supply voltage range	R_M	Ω	0		50		See graph on page 5
Secondary current	I_S	mA	−142		142	*	Peak limit
Secondary nominal RMS current	I_{SN}	mA			100	*	
Turns ratio	N_P/ N_S			1:600		*	
Resistance of secondary winding	R_S	Ω		28			
Maximum withstand primary peak current [1]	$\hat{I}_{P\,max}$	A	−300		300		@ pulse of 100 ms
Supply voltage DC	U_C	V	±14.25	±15	±15.75	*	
Current consumption	I_C	mA		65	71		Add I_S for total current consumption
				70	78	*	
RMS noise current 0 ... 10 Hz [2]	I_{no}	ppm			0.5		
RMS noise current 0 ... 100 Hz [2]					0.75		
RMS noise current 0 ... 1 kHz [2]					2		
RMS noise current 0 ... 10 kHz [2]					6		
RMS noise current 0 ... 50 kHz [2]					15		
Re-injected RMS noise on primary bus bar		µV			30		0 ... 50 kHz
Electrical offset current + self magnetization + effect of earth magnetic field [2]	I_{OE}	ppm		±225	±300		
				±330	±400	*	
Offset stability [2]		ppm/month			2.5		
Linearity error [2]	ε_L	ppm		±1	±3		@ ±I_{PNDC} range
				±3	±9	*	
Delay time to 90 % of the final output value for I_{PNDC} step [3]	$t_{D\,90}$	µs			1		di/dt of 100 A/µs
Frequency bandwidth (±1 dB)	BW	kHz		600			Small-signal bandwidth, 0.5 % of I_{PNDC}
Frequency bandwidth (±3 dB)	BW	kHz		800			Small-signal bandwidth, 0.5 % of I_{PNDC}

Notes: [1] Single pulse only, not AC. The transducer may require a few seconds to return to normal operation when autoreset system is running.
[2] All ppm figures refer to full-scale which corresponds to a secondary current (I_S) of 100 mA.
[3] For a di/dt = 100 A/µs, accurately followed.

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Overload protection - Electrical specification - Status

The overload occurs when the primary current I_P exceeds a trip level such that the fluxgate detector becomes completely saturated and, consequently, the transducer will switch from normal operation to overload mode.
This trip level is guaranteed to be greater than 110 % of I_{PM} and its actual value depends on operating conditions such as temperature and measuring resistance.
When this happens, the transducer will automatically begin to sweep in order to lock on the primary current again.

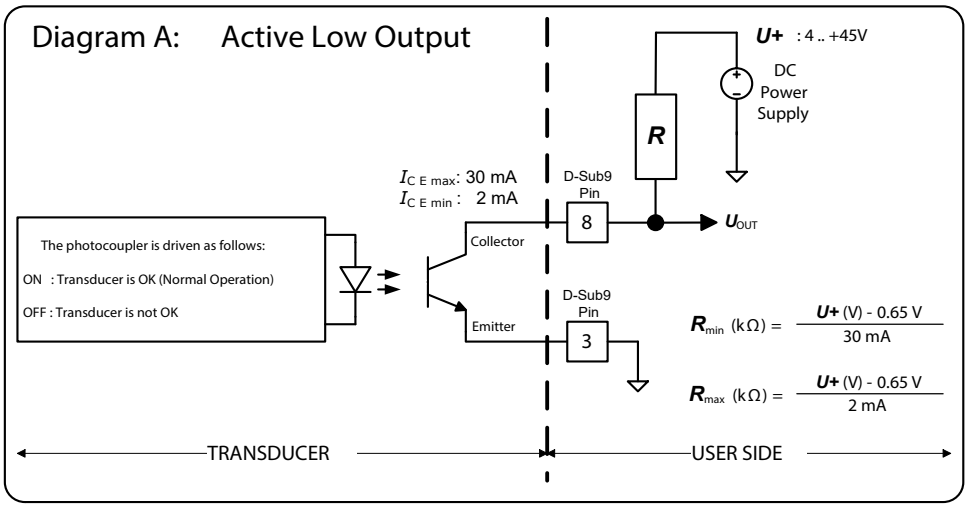
Overload condition should read:

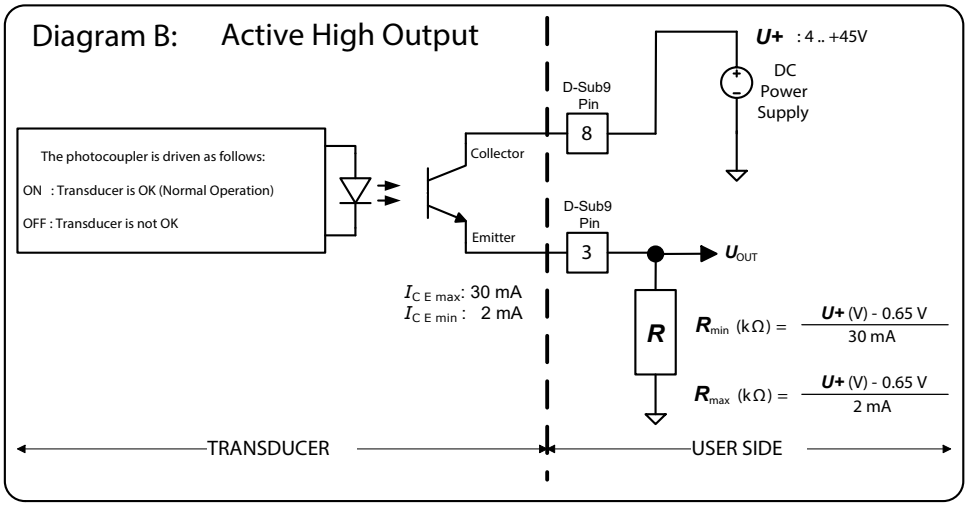
- The secondary current I_S generated is a low frequency signal between –142 mA and 142 mA.
- The signal U_{out} (operation status between pin 3 and 8 of the D-sub connector) switches to U+ or GND depending on how it is wired. In other words, the output transistor is switched off (i.e., no current from collector to emitter). See the status port wiring below.
- The green LED indicator (normal operation status) turns off.

The measuring can resume when the primary current returns in the nominal range between $-I_{PM}$ and $+I_{PM}$. Then the signal U_{out} switches to U+ or GND and the green LED indicator (normal operation status) is again lit.

TO ENSURE A SAFE RECOVERY FROM SATURATION, THE MAXIMUM BURDEN RESISTOR ALLOWED IS 43 Ω.

Status/Interlock port wiring





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The following table shows how the output signal U_{out} acts depending on how it is wired:

Case	U_{out}	Description
Diagram A	< 0.2 V	The transducer is OK (Normal operation)
	U+	The transducer is not OK (Overload mode or supply fault)
Diagram B	< 0.2 V	The transducer is not OK (Overload mode or supply fault)
	U+	The transducer is OK (Normal operation)

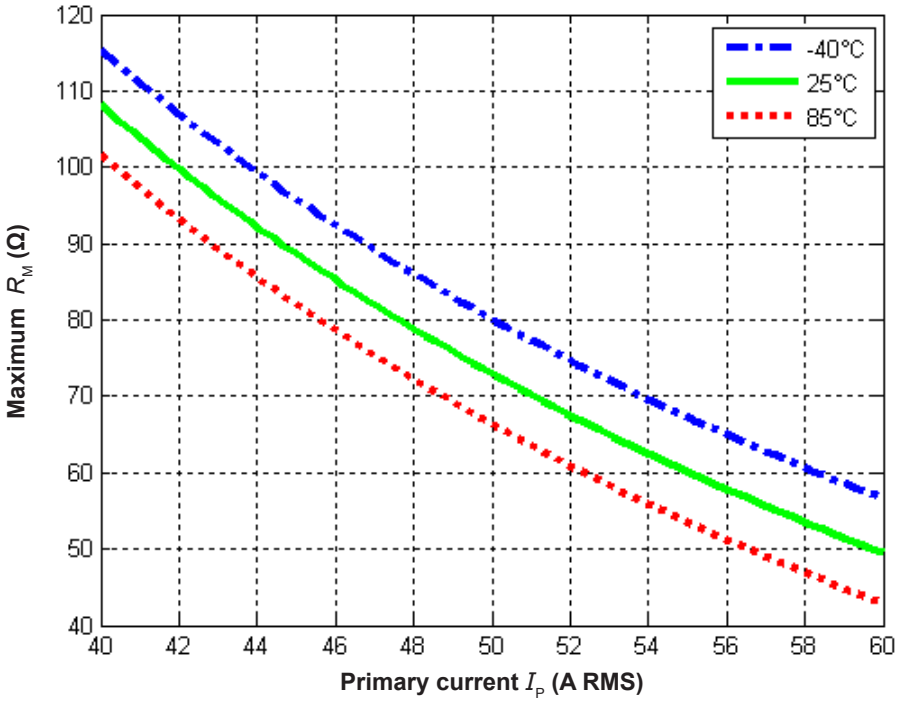
Some recommended standard values of R:

Power supply voltage U+	R_{min} (kΩ)	R_{max} (kΩ)	R standard values ±5 %
5 V	0.145	2.175	0.150 kΩ, 2 kΩ
12 V	0.378	5.675	0.390 kΩ, 5.6 kΩ
24 V	0.778	11.675	0.820 kΩ, 11 kΩ

Electrical data - status port

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Collector-emitter voltage, off-state	$U_{C E off}$	V	4		45	
Maximum collector-emitter current, on-state	$I_{C E max}$	mA	2		30	
Maximum reverse collector-emitter voltage, off-state	$U_{C E R off max}$	V			5	
Collector-emitter voltage, on-state	$U_{C E on}$	V			0.2	

Maximum measuring resistor versus primary current and temperature



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Safety

This transducer must be used in limited-energy secondary circuits according to IEC 61010-1.

This transducer must be used in electric/electronic equipment with respect to applicable standards and safety requirements in accordance with the manufacturer's operating instructions.

Caution, risk of electrical shock

When operating the transducer, certain parts of the module can carry hazardous voltage (eg. primary connection, power supply).
Ignoring this warning can lead to injury and/or cause serious damage.
This transducer is a build-in device, whose conducting parts must be inaccessible after installation.
A protective housing or additional shield could be used.
Main supply must be able to be disconnected.

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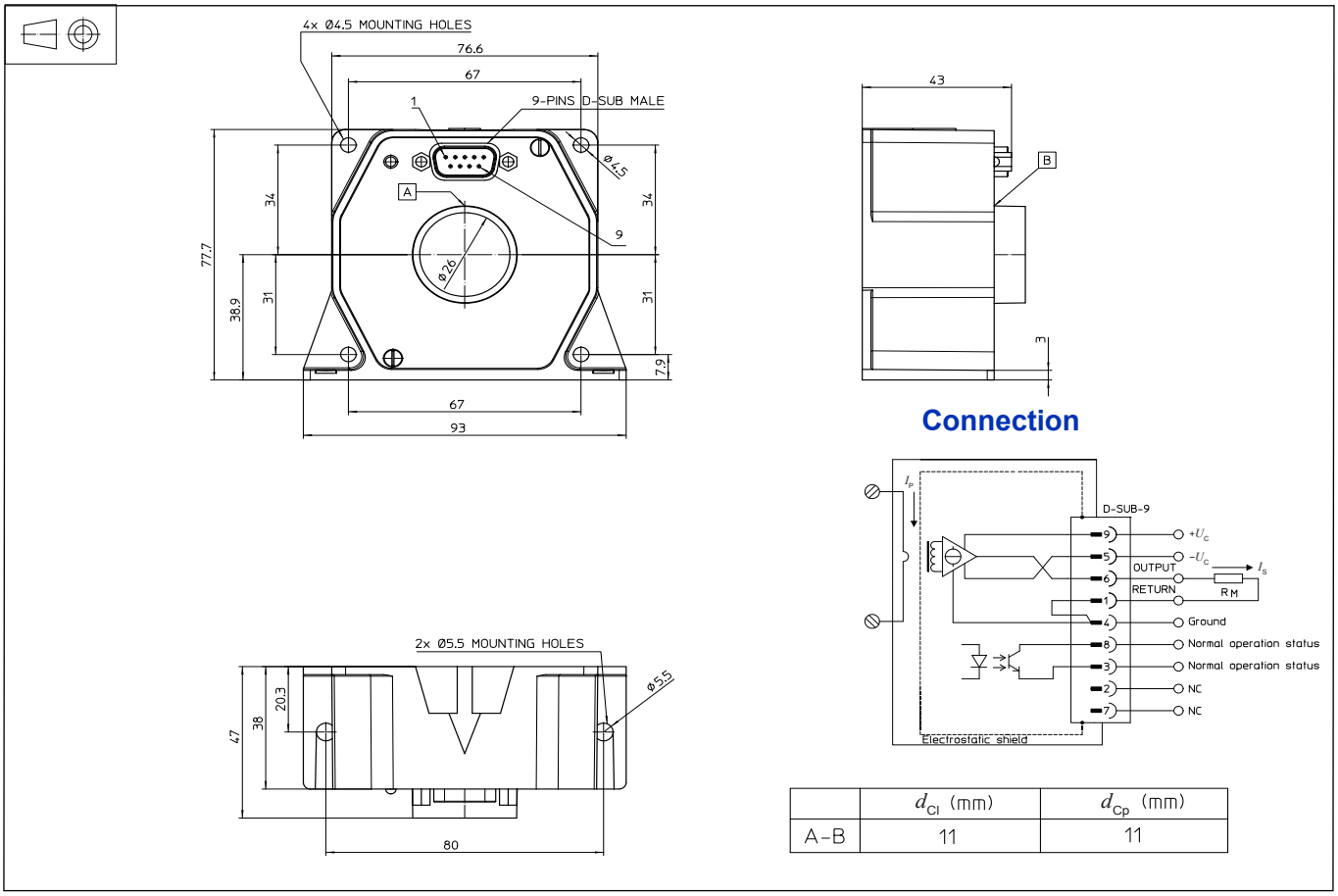
Dimensions (in mm)



Connection

	d_{Cl} (mm)	d_{Cp} (mm)
A–B	11	11

Connection

- Normal operation status (Pins 3 and 8)
  Normal operation means: - ±15 V (±U_C) present
  - zero detector is working
  - compensation current < 110 % of I_{PM}
  green LED indicator is lit.

Remarks

- I_S is positive when I_P flows in the direction of the arrow.
- We recommend that a shielded output cable and plug are used to ensure the maximum immunity against electrostatic fields.
- Pin 4 should be connected to cable and connector shield to maintain lowest output noise.
- All mounting recommendations are given for a standard mounting. Screws with flat and spring washers.
- Temperature of the primary conductor should not exceed 100 °C.
- Installation of the transducer must be done unless otherwise specified on the datasheet, according to LEM Transducer Generic Mounting Rules. Please refer to LEM document N°ANE120504 available on our Web site: **Products/Product Documentation.**

Mechanical characteristics

• General tolerance	±0.3 mm
• Transducer fastening	
- Straight mounting	2 holes Ø 5.5 mm
	2 M5 steel screws
Recommended fastening torque	3.7 N·m
- Flat mounting	4 holes Ø 4.5 mm
	4 M4 steel screws
Recommended fastening torque	2.8 N·m
• Connection of secondary connector	on D-SUB-9, UNC 4-40
• Primary through hole	Ø < 26 mm

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