LIM2010-AU

Line Isolation Monitor (LIM)

LIM2010-AU

Device features

- no interference with medical electrical equipment
- detect resistive and reactive faults
- detect balanced and unbalanced faults
- audible alarm with volume control and muting functions
- multi-colour digital display to show the Prospective Hazard Current
- text display to show system statuses and alarm messages
- integrated self-calibration and self-test
- transformer overload monitoring
- transformer overtemperature monitoring (optional)
- automatic fault location (optional)
- programmable voltage-free output relays for remote alarms
- RS485 communication interface for integration into SCADA or BMS systems
- provision for remote information panels
- easy to clean rugged front foil

Standards

Declarations of Conformity

Regulation	Standard	Title
Safety	AS/NZS3100	General safety requirements.
Performance	AS/NZS4510	Isolated electrical supply systems for medical use: Design and performance requirements.
EMC	AS/NZS 61000-6-3	General EMC Emissions requirements.

Product Description

The Line Isolation Monitor LIM2010-AU is designed to continuously monitor the Prospective Hazard Current of isolated electrical supplies for medical use. The term “Prospective Hazard Current” means the “Total Hazard Current” and is displayed on the front panel.

The state-of-the-art measuring technology implemented in LIM2010-AU, ensures that there is no interference with medical electrical equipment and allows to reliably and accurately detect both balanced and unbalanced resistive and reactive faults between active conductors and earth.

The clear indication of the Prospective Hazard Current is provided via the digital LED display and the gradually scaled LED bar.

Alarm system of LIM2010-AU provides audible alarm with volume control and muting functions, and easily noticeable visual alarms by flashing red LED, changing colour of the displayed Prospective Hazard Current to red and displaying alarm messages on the text LED display. LIM2010-AU also has a provision for connection of the remote information panel CP305.

For checking the correct functioning as per the Clause 4.7 of AS/NZS 4510, the LIM2010-AU is provided with the test facility LIM2010-AU Test box.

LIM2010-AU, when used in conjunction with BENDER earth fault evaluator EDS4xx series or EDS151 is capable of automatic location of line-to-earth faults without power interruption or disturbances to the connected medical electrical equipment.

Function

The LIM2010-AU, using the patented measurement technique, measures isolation impedance of the line and calculates a value of the Prospective Hazard Current that would flow in an isolation electrical supply if a line-to-earth fault occurred.

The value of the Prospective Hazard Current is shown on the seven-segment LED display and the LED bar graph.

When the Prospective Hazard Current is lower than the pre-set value of 2mA (or 5mA), the green “SAFE” LED is lit, the digital display shows the Prospective Hazard Current value in green, the LED bar graph is in the non-alarm (green zone) and the text display reads “SAFE”.

As soon as the Prospective Hazard Current exceeds the pre-set value of 2mA (or 5mA), the audible and visual alarms are actuated. The red “HAZARD” LED starts flashing, the Prospective Hazard Current value shown on the digital display turns red, the LED bar graph goes to alarm (red zone) and the text display shows “HAZARD”.

The audible alarm can be muted by pressing the “MUTE” button. The built-in amber LED in the “MUTE” button indicates a muted sate of the active alarm.

THC	THC display	Text display	SAFE LED	HAZARD LED	Buzzer
< 2 (5) mA	value (green)	SAFE	ON	OFF	OFF
≥ 2 (5) mA	value (red)	HAZARD	OFF	flashing	ON
> 9,9 mA	EF (red)	HAZARD	OFF	flashing	ON

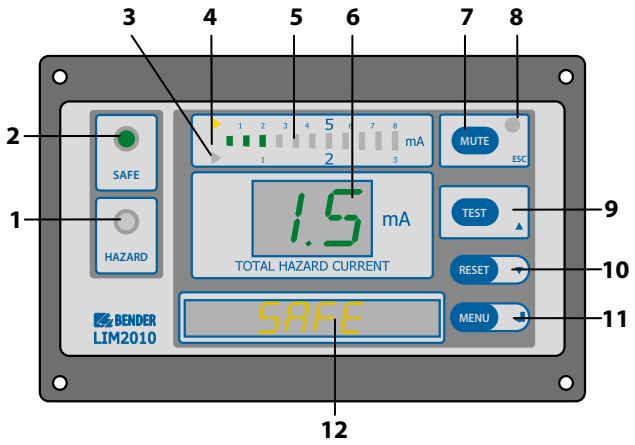
The LIM2010-AU also provides overloading monitoring of the primary current of an isolated supply. Audible alarm is actuated and the digital LED text display shows “TRANSFORMER OVERLOAD LOAD xxx%” when the rated current of the isolation transformer has been exceed.

Load	Text display	Buzzer
< 100 %	LOAD xxx%	OFF
> 100%	TRANSFORMER OVERLOAD LOAD xxx%	ON

The integrated self-test function is used to check the operation of the LIM2010-AU and can be activated by pressing the “TEST” button. During the self-test, the LIM2010-AU does not introduce the line-to-earth stray impedance to the system being monitored, nor contribute to the prospective hazard current.

Display LIM2010-AU - Normal condition

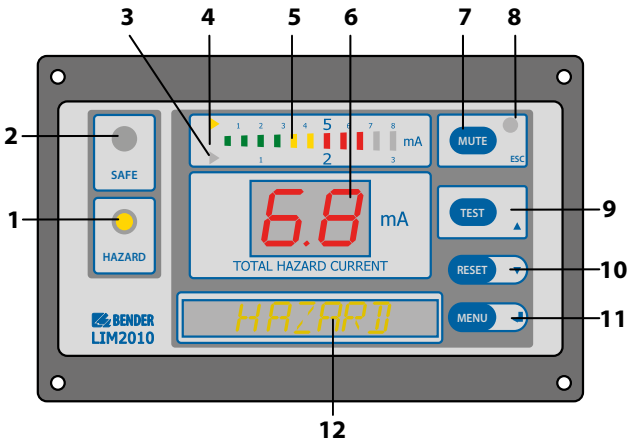
1. HAZARD LED (yellow): Not illuminated.



2. SAFE LED (green): Illuminated. Will be in the normal condition when the displayed Total (Prospective) Hazard Current is below the set response value (2 mA or 5 mA).
3. Trip value indication light (yellow): Indicates that the 2 mA trip level has been activated.
4. Trip value indication light (yellow): Indicates that the 5 mA trip level has been activated.
5. LED bar graph: In a normal condition, only the green bars are illuminated.
6. Seven-segment display of Total (Prospective) Hazard Current: Green in colour for the normal condition.
7. MUTE button / ESC key: To go to a higher level in the built-in menu.
8. MUTE LED: Not illuminated in the normal condition.
9. TEST button: Activates self-test.
   UP key: To move up in the menu and to increase values.
10. DOWN key: Moves down in the menu and to decrease values.
11. MENU button: Enters the main menu.
    ENTER key: To confirm entries.
12. Digital display: Reads SAFE in the normal condition. Also displays menu options when in the device's menu.

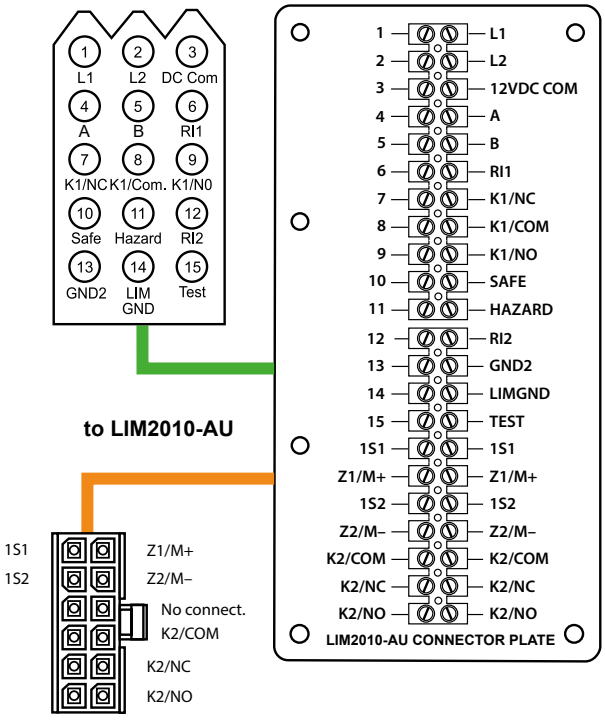
Display LIM2010-AU - Alarm condition

1. HAZARD LED (yellow): Flashes yellow.



2. SAFE LED (green): Not illuminated.
3. Trip value indication light (yellow): Indicates that the 2 mA trip level has been activated.
4. Trip value indication light (yellow): Indicates that the 5 mA trip level has been activated.
5. LED bar graph: In the alarm condition, the red bars will be illuminated.
6. Seven-segment display of Total (Prospective) Hazard Current: Red in colour for the alarm condition.
7. MUTE button / ESC key: To go to a higher level in the built-in menu.
8. MUTE LED: When in the alarm condition, will be illuminated yellow after the MUTE button has been pressed..
9. TEST button: Activates self-test.
   UP key: To move up in the menu and to increase values.
10. DOWN key: Moves down in the menu and to decrease values.
11. MENU button: Enters the main menu.
    ENTER key: To confirm entries.
12. Digital display: Reads HAZARD in the alarm condition.

LIM2010-AU Connector Plate



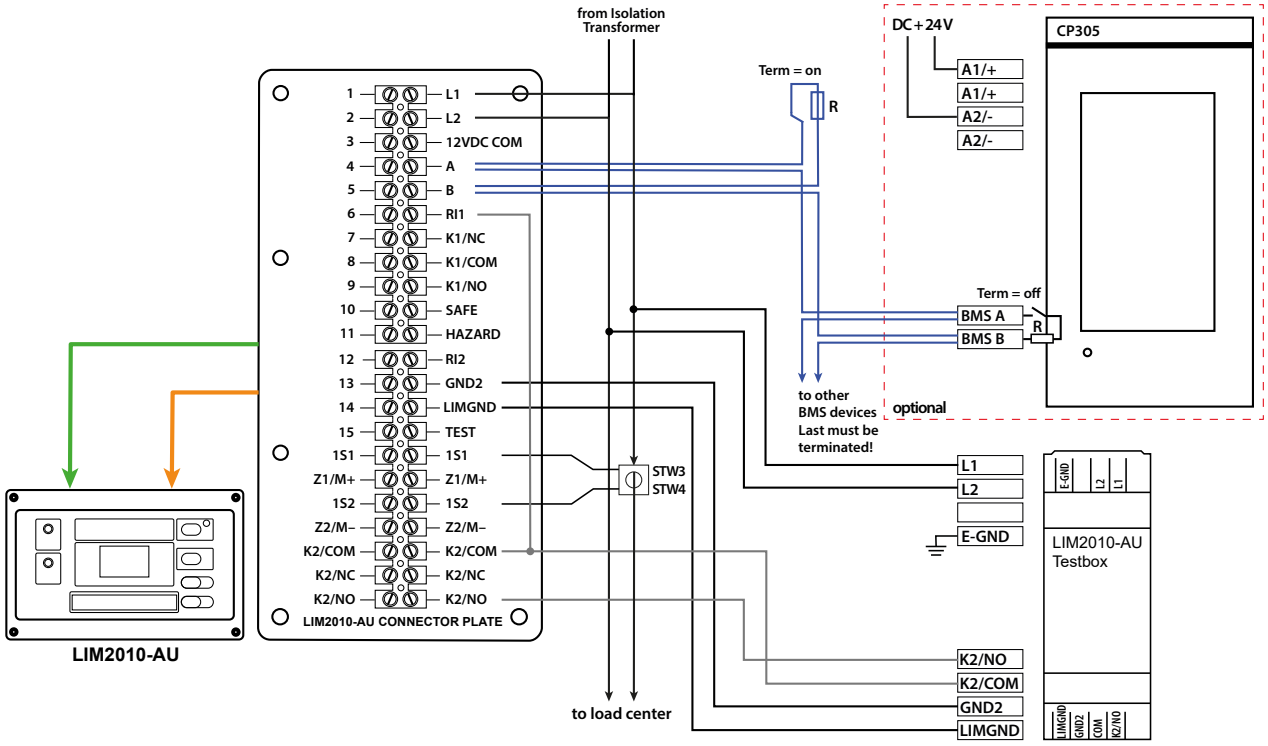
To LIM2010-AU (Connector viewed from mating end)

L1, L2	To secondary of Isolation Transformer.
12 V DC COM	Common connection
A, B	BMS interface
RI1	Test button source
K1/NC	NC contact of the alarm relay K1
K1/COM	Common contact of the alarm relay K1
K1/NO	NO contact of the alarm relay K1
SAFE	"SAFE" light connection of external Remote Indicator
HAZARD	"HAZARD" light connection of external Remote Indicator
RI2	Local and system muting from LIM and Remote Indicator
GND2, LIMGND	Ground connections, if connection to Testbox is interrupted LIM will alarm
TEST	Remonte "TEST" function

To LIM 2010-AU (Connector viewed from mating end)

1S1, 1S2	To Current Transformer (CT)
Z1/M+, Z2/M-	
No Connect.	
K2/COM	relay K2
K2/NC	relay K2
K2/NO	relay K2

Wiring Diagram

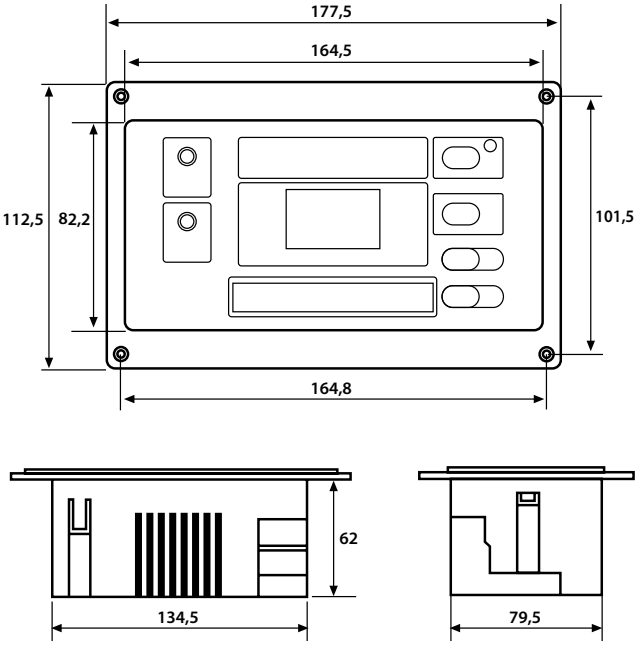


Dimension Diagram LIM2010-AU

Dimensions in mm

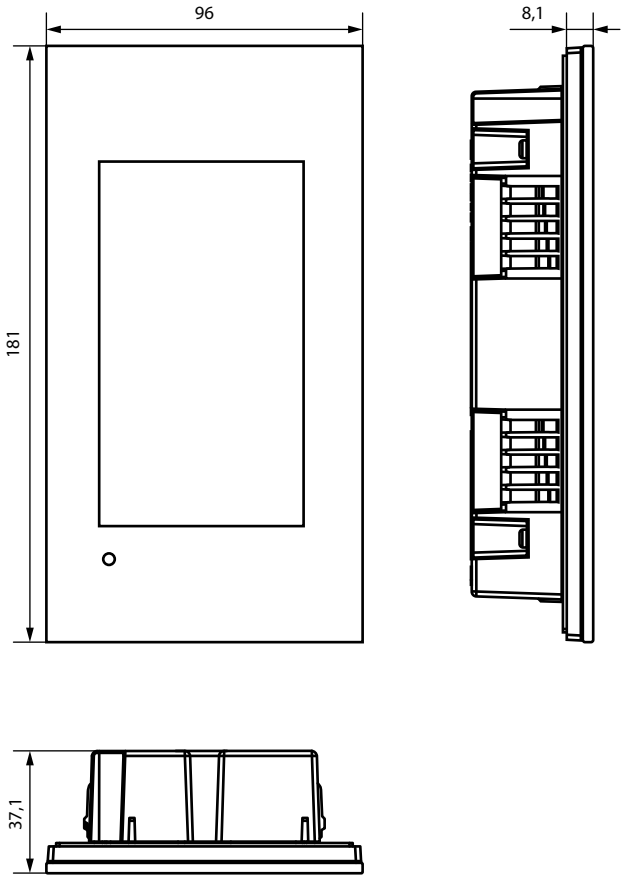
Physical Details

Cut-out needed for new flush panel mounting is 177,5 x 112,5 mm (+ 0,5 mm). Cut-out needed for surface panel mounting is 134,5 mm x 79,5 mm (+ 0,5 mm). Mounting holes are on 101,5 mm and 165,1 mm centers.



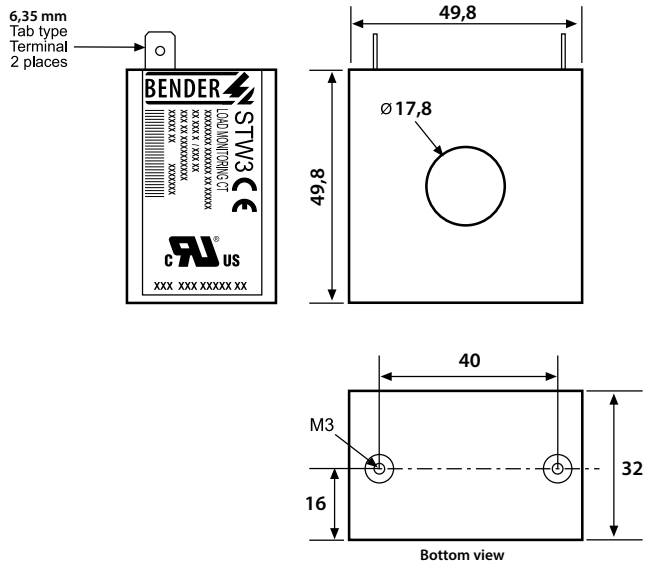
Dimension Diagram CP305

Dimensions in mm



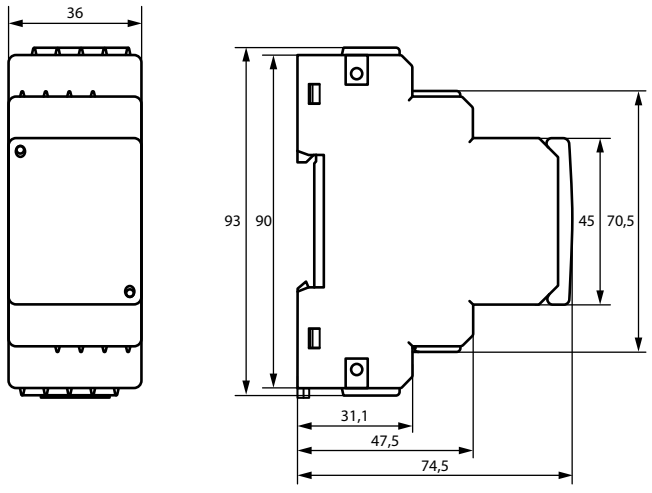
Dimension Diagram Current Transformer (CT) STW3/STW4

Dimensions in mm

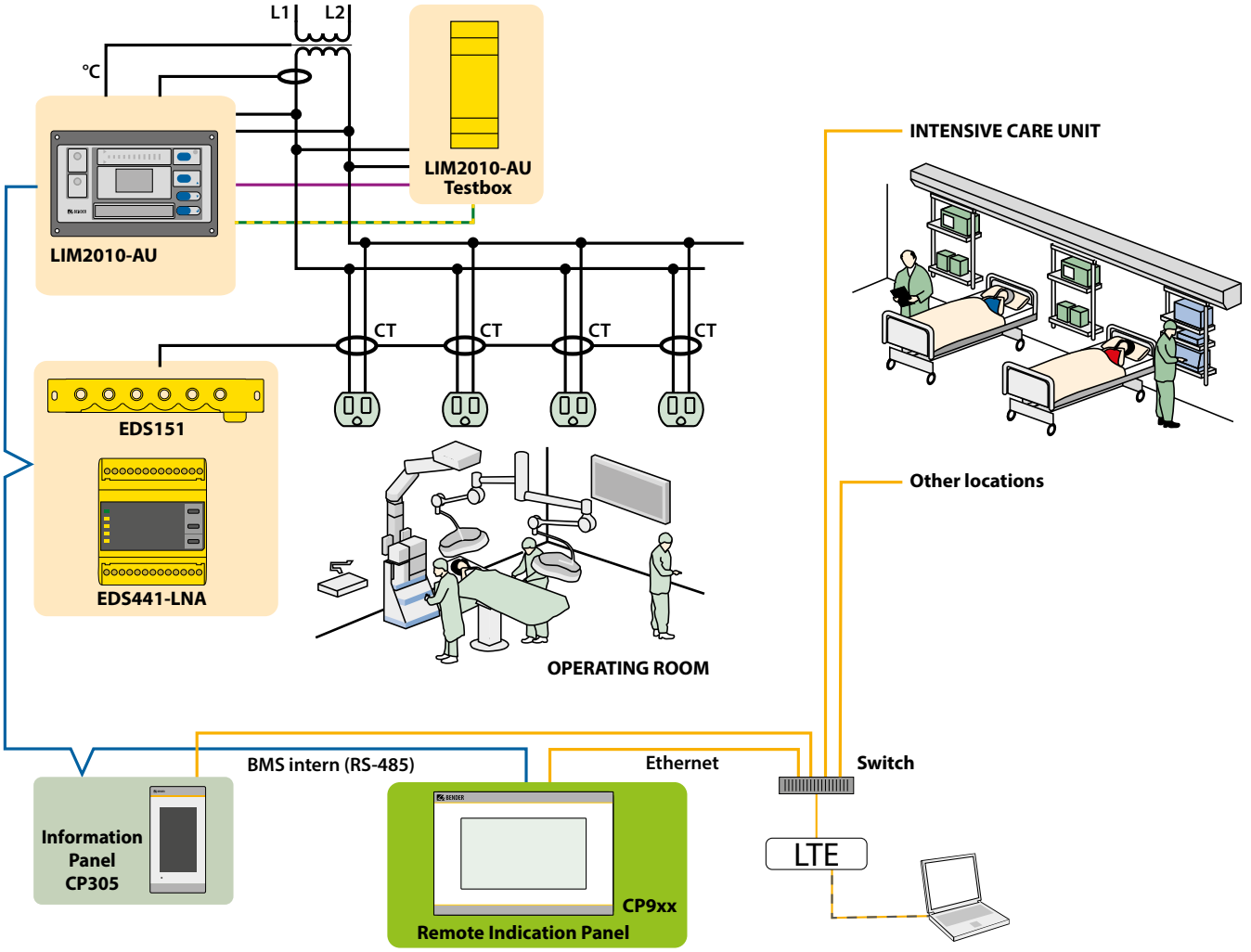


Dimension Diagram LIM2010-AU Test box

Dimensions in mm



System overview



Safety Instructions

Only qualified personnel, in consideration of the applicable safety regulations, shall install electrical equipment!

Technical Data Line Isolation Monitor LIM2010-AU

Insulation coordination acc. to IEC 60664-1/ UL1022

Rated insulation voltage	AC 250 V
Rated impulse voltage / pollution degree	2.5 kV / III
Voltage test acc. to IEC61010-1 and UL1022	2.0 kV

Supply voltage

Supply voltage Us	= Un
Power consumption	< 22 VA

Isolated electrical supply being monitored

Nominal voltage Un	AC100…240V
Operating range of Un	85 %...110 %
Rated frequency fn	50/60 Hz
Operating range of fn	±5 %

Prospective Hazard Current (PHC) monitoring

Response value PHC	2 mA / 5 mA (5 mA)*
Response tolerance	1.8…2 mA / 4.5…5 mA
Hysteresis	20%
Response value Z	10...200 kΩ (off)*
Response tolerance	±15 %
Hysteresis	25 %
Response value R	20...200 kΩ (off)*
Response tolerance	±15 %
Hysteresis	25 %
Response time tan	< 4 s

Measuring circuit

Measuring voltage Um	±48 V
Measuring current Im (at ZF = 0 Ω)	< 32 µA
Internal resistance	≥ 1.5 MΩ
Monitor Hazard Current MHC 120 V/240 V	60 µA / 95 µA
EDS mode:	
Monitor Hazard Current MHC	< 950 µA
Test cycle/idle time	2 s / 4 s

Voltage monitoring

Response value undervoltage/ overvoltage (< U/>U	80…300 V (off)*
Response tolerance	±3 %
Hysteresis	5 %

Load current monitoring

Response value	10…200 A (off)*
Response tolerance	±5 %
Hysteresis	4%

Temperature monitoring (optional)

Response value (permanently set)	4 kΩ
Release value	1.6 kΩ
PTC resistor acc. to DIN 44081	max. 6 connected in series

Specified time (not for PHC !)

Response delay ton	0...99 s (0 s)*
Delay on release toff	0...99 s (0 s)*

Displays, memory

14-segment display	8 digits, multifunctional
Measured value PHC	0.0…9.9 mA
Operating uncertainty	+7 %, ±0.1 mA
Measured value load current (as a percentage of the set response value)	10…199 %
Operating uncertainty	±5%, ±0,2 A
Measured value mains voltages	10…300 V
Operating uncertainty	±5%, ±2 V
Measured value impedance Z	0…1000 kΩ
Operating uncertainty	±5 %, ±1 kΩ
Measured value resistance R	2…1000 kΩ
Operating uncertainty Z ~ R	±20%, ±1 kΩ
Measured value leakage capacitance C	0…500 nF
Operating uncertainty Z ~ XC	±20 %, ±5 nF
(at Z < 2 kΩ ==> no indication of R and C !)	
Measured value load current	0.5A…250 A
Operating uncertainty	±5%, ±0.2 A
7-segment display	2 digits, digital PHC indication
Bar graph indicator	analogue PHC indication
History memory	300 data records
Data logger	300 data records

Inputs/Outputs

Current output M+/M- for measuring instruments MK2000M…	0…400 µA
Operating uncertainty	±10 %
Output RI1, 12VDC COM.	12 V / 200 mA
RI2, SAFE, HAZARD, TEST	max. 4 x MK2000(M)(C)(P)
Cable length	≤ 10m

Serial interface

Interface A-B / Protocol	RS-485 / BMS
Baud rate	9.6 kBit/s
Cable length	≤ 1200 m
Recommended cable (shielded, Shield connected to PE at one end	J-Y(St)Y 2x0.8
Terminating resistor	120 Ω(0,25 W) connectable via DIP switch (off)*
Device address, BMS bus	1…90, (1)*

Switching elements

Number	2 changeover contacts
Operating principle	N/C operation /N/O operation (N/C operation)*
Electrical endurance	10.000 cycles
Contact data acc. to IEC 60947-5-1:	
Relay 1:	
Utilisation category	AC-13 / AC-14 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
Rated operational current	5 A / 3 A / 1 A / 0,2 A / 0,1 A
Minimum contact rating	1 mA at AC / DC ≥ 10 V
Relay 2:	
Utilisation category	AC / DC-12 / DC-12 / DC-12
Rated operational voltage	AC250 V / 24 V / 110 V / 220 V
Rated operational current	2 A / 1.2 A / 0.4 A / 0.25 A
Minimum contact rating	1 mA at AC / DC ≥ 10 V

Environment/EMC

EMC	IEC 61326
Operating temperature	-10 °C...+55 °C
Storing temperature	-25 °C...+70 °C
Climatic class acc. to IEC 60721:	
Stationary use (IEC 60721-3-3	3K22
Transport (IEC 60721-3-2	2K11
Long-time storage (IEC 60721-3-1	1K22
Classification of mechanical conditions acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-time storage (IEC 60721-3-1)	1M12

Connection

Connection type	Molex plug 15-pole, type 03-09-2159

General data

Operating mode	continuos operation
Mounting position	display-oriented
Degree of protection, internal components (EN 60529)	IP30
Enclosure material	polycarbonate
Flammability class	UL94 V-0
Type of enclosure	enclosure for panel mounting
Screw fixing	4 Pcs. #4-40 Oval head Black Oxide Finished
Software version	D301 V1.0x
Software version	D306 V1.0x
Weight	≤ 550 g

( )* = Factory setting

Technical Data Connector Plates CP-LIM2010-AU

Cable length	510 mm
Terminal strip	22 terminals
Connector	15 pin Molex
Conductor size	0,33…0,82 mm² (AWG 22…18)
Screw fixing	6-32 x 1/2 slotted oval head machine screw SS
Tightening torque	0,9 Nm
Mounting orientation	any
Weight	approx. 200 gr

Technical data Information Panel CP305

Rated voltage	AC/DC 24 V
Supply via PoE+	
PoE+ standard	IEEE 802.3at
Rated voltage (PoE+)	DC 48 V
Max. cable length via AWG 26/7; 0.14 mm²	100 m
Display	5“ TFT touch display (720 x 1280 px)
Front	glass pane, hardened, IP66
Device dimensions (W x D x H)	181 x 96 x 37.1 mm
Weight	< 420 g

Technical data Current transformers STW3, STW4

Insulation coordination according to IEC 60664-1:

Rated voltage U_m	AC 720 V
Rated impulse voltage U_{isol}	4 kV

Measuring circuit

Max. rated primary current (STW3/4)	100 A / 200 A
Min. rated primary current (STW3/4)	1 A / 2 A
Nominal frequency	50…400 Hz

General data

Ambient temperature, during operation (STW3/4)	0 °C…+85 °C
Operating mode	continuous operation
Position	any position
Connection	Faston plug 6.3 x 0.8 mm / screw terminals

Type of connection to the measuring current transformer

Single wires ≥ 0.75 mm²	up to 1 m
Single wires, twisted ≥ 0.75 mm²	up to 10 m
Shielded cable ≥ 0.6 mm? (single-ended connection to PE) e.g. J-Y(St)Y 2 x 0.8	up to 40 m
Mounting	screw fixing M3 / zip ties
Flammability class	UL94V-0

Ordering Details

LIM

Product Type	Description	Approval	Article No.
LIM2010-AU	100 – 240 V / 1-Phase		B92075021AU
LIM2010-AU Test Box			B9207525AU

Remote Indicator

Product Type	Description	Approval	Article No.
CP305	Mute| Test| Overload	c UL us LISTED	B95100050

Current Transformer (CT)

Product Type	Description	Approval	Article No.
STW3	Up to 100 A load current	c UL us	B98021000
STW4	Over 100 A load current	c UL us	B98021001

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The Power in Electrical Safety©

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