

DESCRIPTION:

The SENIS Insulation Defect Locator IDL02 utilizes two high-sensitivity clamp-on micro-ammeters to measure and track the direct current passing through a defect or fault in the insulation system and to determine the position of a leakage current path to the ground.

The system has been designed for use in large hydro generator stator windings, but it's not limited to this purpose only.

The IDL02 system is controlled by a Lab VIEW software (running on the Laptop). This software acquires the current output signals from the two Dual Clamp-On Heads **MiAH02-2x90-120** that are connected to the corresponding Micro-Ammeter Electronic Interfaces (MiAEI02).

The Clamp-On Open-Loop DC Current Transducer has an extraordinary measurement resolution of +/-1uA.

The IDL02 system (figure 1) contains of:

- a laptop computer with two USB3.0 ports (**Laptop02** on the figure 1) and
- two Micro-Ammeters, **MiA02-1** and **MiA02-2**.

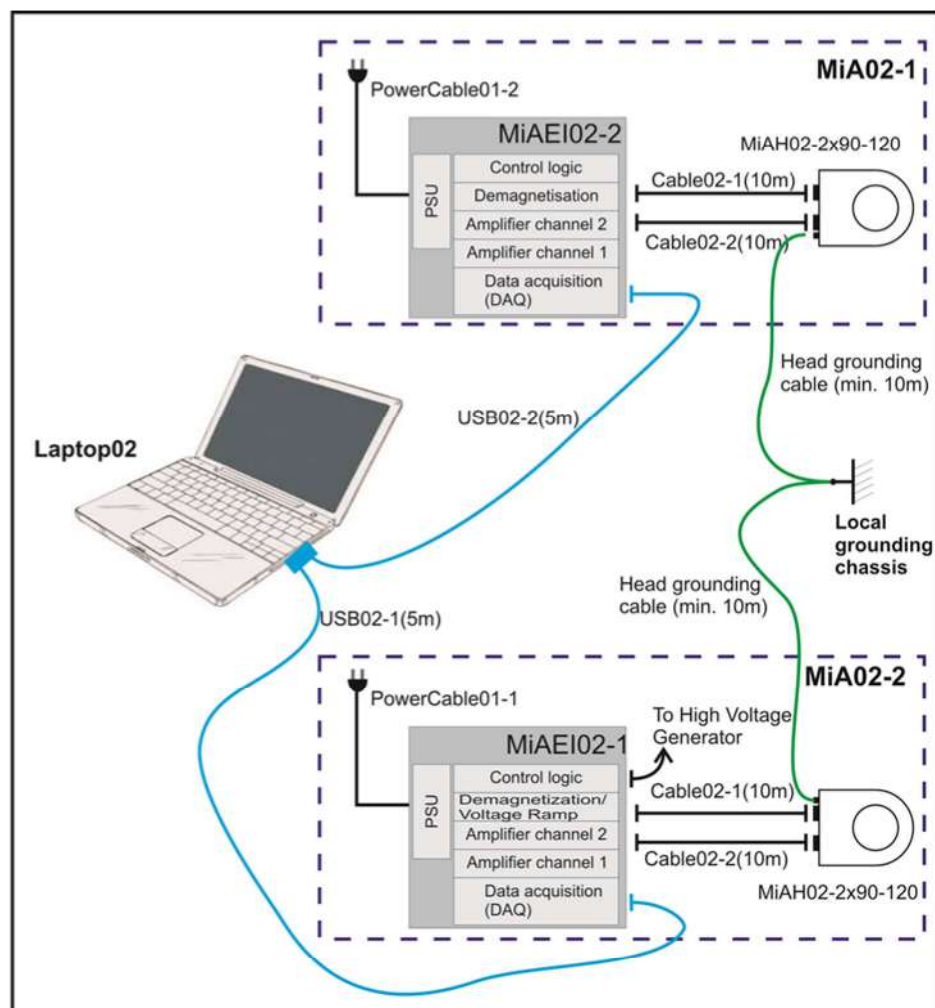


Figure 1: Block diagram of IDL02 system

Each Micro-Ammeter MiA02 contains of:

- dual clamp-on Micro-Ammeter Head **MiAH02-2x90-120** (figure 2),
- Micro-Ammeter Electronic Interfaces (**MiAEI02-1** and **MiAEI02-2**, as per figure 3, figure 4 and figure 5),
- USB2.0 5m long cable (**USB02**) for connection between data acquisition blocks (**DAQs**) and **Laptop02**,
- one cable between the head MiAH02-2x90-120 and the MiAEI02 for the demagnetisation and biasing of "H-bridge" integrated into heads (**Cable02**, with 10m length),
- one cable between the head MiAH02-2x90-120 and the MiAEI02 for biasing sensors into MiAH02-2x90-120 (**Cable01**, with 10m length) and
- a power cord cable for supplying MiAEI02.

An operator can select one of three available frequencies of demagnetization signal with the slider placed on the front panel and marked as "Degauss 1".

The dimension of the Micro-Ammeter Electronic Interface is 213,66 x 133.35 x 315.5mm (width x height x depth).

The inner diameter of the Micro-Ammeter heads is 90mm $\pm$ 2mm.

IDL02 – 2x90-120 System Features:

- Two clamp-on Current Transducers are used during the maintenance of power machines to enable the current difference measurement in electrical conductors, powered at high voltage.
- For the measurement, the conductors do not have to be cut or insulation shall be removed.
- Simultaneous current measurements enable detection of a defect or a faulty location in complex systems, even with more than one leakage path to ground.
- Data are acquired and displayed in real time for the immediate analysis.

Option

- Computer control via another PC through the Wi-Fi interface provides electrical isolation and operator safety (Extended IDL02)



Figure 2: Photograph of the MiAH02-2x90-120



Figure 3: MiAEI02-1, dimension (W x H x D) 213,6x133.3x315.5mm



Figure 4: MiAEI02-2, dimension (W x H x D) 213,6x133.3x315.5mm



Figure 5: Rear side of the electronic interfaces MiAEI02-1 and MiAEI02-2

Figure 6 and figure 7 show an application of a previous generation of the SENIS IDL system.



Figure 6: Application on Electrical Generator Stator. The two Current Transducer Heads are shown installed on the winding links. Reprinted by permission of the US Department of the Interior, Bureau of Reclamation (USBR)



Figure 7: Assembling a Current Transducer Head on a winding link of an Electrical Generator Stator. Reprinted by permission from the USBR.

ELECTRICAL CHARACTERISTICS:

Micro Ammeter specification

Unless otherwise noted, the given specifications apply at room temperature (23°C) and after a device warm-up time of 10 minutes.

Parameter	Nominal value	Remarks
Range		
Primary nominal current, I_{PN}	$\pm 5\text{mA}$	Optimal measurement range
Maximum (full scale) primary current, I_{PMAX}	$\pm 100\text{mA}$	No saturation of the outputs
Overload capacity, I_{OC}	$\pm 500\text{A}$	With degaussing
Accuracy		
Resolution	better than $1\mu\text{A}$	
Base accuracy	better than 10% of measured value	
Sensitivity		
Nominal sensitivity to current, S_{NOM}	$125\mu\text{V}/\mu\text{A}$	
Tolerance of sensitivity, S_{Err}	$\pm 10\%$ of S_{NOM}	
Temperature coefficient of sensitivity	$-0.2\%/K$	
Long-term instability of sensitivity	$< 1\%$ over 10 years	
Sensitivity to external magnetic field	$\approx 350\mu\text{A}/\mu\text{T}$	
Offset		
Offset ($B = 0\text{T}$) $V_{Off}(B_{Off})$	$\approx 500\mu\text{A}$	Can be eliminated during measurements
Temperature coefficient of the offset	$< 2\mu\text{A}/10\text{min}$	
Noise		
Equivalent Primary Current Noise (p-p)	$< 0.7\mu\text{A}$	
Frequency response		
Bandwidth	DC - 0.5 Hz	
Cables for interconnection		
From PC to Electronic interfaces (MiAEI02)	USB2.0 High Speed	5m length
From Electronic Interfaces (MiAEI02) to magnetic heads (MiAH02) for biasing AMRs	2-LiFYCY 6x2x0.08qmm	10m length
From Electronic Interfaces to magnetic heads for biasing "H bridge" and demagnetization	2-LiFYCY 4x2x0.08qmm	10m length
Cable for Head grounding	2.5qmmm	at least 10m

Electronic Interfaces specification

Parameter	Value	Remarks
Power supply		
Type	Mean Well NET-35B	Switching PSU
Input voltage	100 – 240VAC	
Input current	< 0.9A	
Input frequency	47 – 63Hz	
Output voltage (Rated current)	+5Vdc (3.0A) +12Vdc (1.0A) - 12Vdc (0.5A)	
Withstand voltage	I/P-O/P: 3KVAC I/P-FG: 2KVAC O/P-FG: 3KVAC	
Isolation resistance	I/P-O/P, I/P-FG,O/P-FG: 100M Ω /500Vdc/25°C/70%RH	
EMC Emission	EN55022 (CISPR22) Class B, EN61000-3-2,-3	
EMC immunity	EN61000-4-2, 3, 4, 5, 6, 8, 11, EN55024, EN61000-6-1	
Multifunction DAQ		
Type	NI 6211, USB2.0	
Analog input	16 single-ended or 8 differential inputs	
Sample rate	250kS/s	
Resolution	16 bits	
Number of analog output channels	2	
Number of digital I/O channels	4 differential input and 4 differential output	
Logic levels	TTL	
Signal/biasing connectors		
For biasing AMR	LUMBERG KJV 120	
For biasing "H bridge" and demagnetization	LUMBERG KJV 80	
Isolated Analog Output, only on MiAEI02-1, for Voltage Ramp		
Analogue programming voltage	$\pm 10V$	
Isolation	2500Vrms, $\pm 3500V_{\text{PEAK CONTINUOUS}}$	
Nonlinearity	$\pm 0.012\%$ max	
Bandwidth	20kHz	
Gain drift	$\pm 25\text{ppm}/^{\circ}\text{C}$	
CMR	120dB (G=100V/V)	

Parameter	Value	Remarks
Dimension & Weight		
Dimension (w x h x d)	213,66x133.35x315.5mm	
Weight	2 kg	

Heads specifications

Parameter	Value/Remarks
Type	Dual Clamp-on Head separable into two parts.
Voltage isolation	±5kV DC
Jaw opening capability	Ø90±2mm
Output connectors	LUMBERG SGV 120 – for biasing AMRs LUMBERG SGV 81 – for biasing "H bridge" and demagnetization coils
Dimension (W x H x D).	124mm x 47mm x 167,9mm
Weight	1,0kg