IST ULTRASTAB

USER GUIDE

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1 INTRODUCTION

Congratulations with your purchase of LEM International IST ULTRASTAB.

The IST ULTRASTAB unit serves as power supply and signal processing unit for up to 6 individual LEM International high precision current transducers. It ensures that the extremely high precision and low noise offered by the transducers is preserved and made available in a convenient and user-friendly unit.

Please read this manual carefully before use. It contains information on how to set up and use the IST ULTRASTAB and how to build a system utilizing the multichannel capabilities of the unit. In case of unanswered questions do not hesitate to contact your LEM International representative.

> **IMPORTANT:** LEM International will not be held responsible for use of the IST ULTRASTAB unit under conditions and/or in application setups not supported by the information in this user guide.

2 RECEIVING AND UNPACKING

The shipping material and the IST ULTRASTAB should be thoroughly inspected for signs of obvious physical damage immediately upon receipt.

All materials in the package should be checked against the enclosed packing list and the list of standard delivery below. LEM International will not be responsible for any shortages unless notified immediately.

The IST ULTRASTAB package should contain:

- Electronics 19 inch crate model IST ULTRASTAB
- European (Schuko) and USA mains cable with three-pole IEC female connector.

IN CASE OF DAMAGE

If the equipment is damaged in any way, a claim should be filed with the shipping agent, and a full report of the damage should be forwarded to LEM International immediately upon arrival. Please see more on http://www.lem.com , After Sales customer service – Return Merchandise Authorization RMA procedure.

Upon receipt of the report, LEM International will forward instructions concerning the repair, replacement or return shipment.

Please include the Product description, Serial number and Order reference on any communication with LEM International.

TECHNICAL SPECIFICATIONS

Electrical Data – MAINS INPUT		
Mains Input	100-240 V AC (±10 %)	IEC-type inlet socket OVCII and PD2
Mains input frequency	50-60 Hz	
Fuses	2.5 At / 250 V AC	User-replaceable
Power consumption	< 200 W	All channels driven at max. 1 A RMS secondary output current
Electrical data – TRANSDUCER PORT		
Supply output	±15 V DC	6 channels
Ripple	< 15 mV RMS	50-60 Hz
Noise	< 15 mV RMS	DC to 10 kHz
Load regulation	< 5 %	

Note:[1)] In case of high overloads (> 15 kA), internal power supply can raise up to -19 V in case of overloads > +15 kA and +19 V in case of overloads > -15 kA. So, a certain caution should be taken vs the associated sensors to protect them against these overloads' conditions. In these special overload's conditions of use, the main supply enters in protection mode and falls down to 0 V. Then this requires to switch off the main AC supply during 1 minute so that the IST to operate in normal mode again.

Electrical data – STATUS PORT		
Max Collector-Emitter voltage, off-state	45 V	
Max Collector-Emitter current, on-state	30 mA	
Max reverse Collector-Emitter voltage, off-state	5 V	
Collector-Emitter voltage, on-state	≤ 1 V	
Insulation voltage	3 kV RMS	between rack electronics and status port connections
Physical data		
Dimensions	483 x 88 x 290 mm	W x H x D, incl. handles/connectors
Weight	4.2 kg	
Operating conditions		
Temperature	10 … 40 °C	
Humidity	20 … 80 % RH	
Altitude	2000 m [1)]	
Environmental conditions		Indoor
Cooling conditions	Passive	Natural convection
Storage conditions		
Temperature	-20 … 85 °C	
Humidity	20 … 80 % RH	

Note: [1)] Insulation coordination at 2000 m.

3 COMPLIANCE WITH REGULATIONS

FCC statement
This equipment complies with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference in which case the user will be required to correct the interference at his own expense.

CE statement
This product has been tested and found to comply with the following standards.

Electrical safety: IEC 61010-1: 2010 + AMD1: 2016

Electromagnetic Compatibility:
Emission: EN 61326-1:2013
Immunity: EN 61326-1:2013

The IST has been tested for Industrial environment level, and is a Class B equipment (RF emission)

A technical file is kept available at:

LEM International S.A.
Route du Nant-d'Avril, 152

1217 Meyrin

4 USAGE PRECAUTIONS AND RECOMMENDATIONS

The following precautions are recommended to insure your safety and to provide the best operating conditions of this instrument. If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

4.1 TERMS AND SYMBOLS

These terms and symbols may appear in this manual or on the product.

	**WARNING**: Warning statement identifying condition or practices that could result in human injury or loss of life.
	**CAUTION**: Caution statement identifying conditions or practices that could result in damage to the product.
	**DANGER**: High Voltages.
	Protective Ground Conductor Terminal.

4.2 GENERAL USE AND WEAR

CAUTION: Do not place any heavy objects on the instrument.
Avoid severe impacts or rough handling that could damage the instrument.
Use electrostatic discharge precautions while handling and making connections to the instrument.
Do not place bare or unterminated wires into the connectors of the instrument, only mating connectors and adapters.
Do not block or obstruct the ventilation openings on the side panels and over the heat sink.

4.3 GROUNDING CONSIDERATIONS

To avoid the risk of electrical shock it is mandatory to observe proper grounding practices.

WARNING: To avoid electrical shock the power cord protective grounding conductor must be connected to earth ground.

Failure to establish a functional ground connection to earth may lead to hazardous errors and cause malfunction and/or measurement inaccuracies.

4.4 FUSES

WARNING: The unit has user replaceable fuses.
If fuses need replacement, please used equivalent one that it's specified.

Due to the nature of the zero-flux based transducer principle it is necessary to take the following precautions:

CAUTION: Do not subject the system to primary current without mains power applied.

CAUTION: Do not operate the system with a disconnected secondary when the system is subject to primary current.

5 SYSTEM DESCRIPTION

The system cabinet is compatible with standard 19 inch rack mount systems, but can also be used in a table-top setup.

LEM International IST ULTRASTAB is available in two versions:

- Current output
- ±10 V Voltage output.

The IST Voltage output version differs from the current output one only in having up to six current-to-voltage conversion modules (VOM), which are mounted in the chassis.

Typical applications include multichannel AC and DC measurements on three-phase systems like motors and motor drivers, power converters and similar types of equipment often in combination with a precision power analyser.

Depending on the transducer's type and applied primary current (DC or AC), the IST ULTRASTAB can drive up to 6 channels at a total consumption of maximum 125 W.

Current range	Products
60 A	IT 60-S, IT 65-S
100 A	IN 100-S
200 A	IT 200-S, IT 205-S, IN 200-S
400 A	IT 400-S, IT 405-S, IN 400-S
500 A	IN 500-S
600 A	IT 605-S, ITN 600-S
700 A	IT 700-S
900 A	ITN 900-S
1000 A	IT 1000-S/SP1, ITN 1000-S, IN 1000-S
1200 A	IN 1200-S
2000 A	IN 2000-S (1)

TABLE 1: IT/ITN/IN ULTRASTAB compatibility chart.

Note 1) For IN 2000-S series and only in pure AC measurement, the IST ULSTRASTAB can provide the power for 6 channels. For DC measurement or for AC and DC combined, the IST ULSTRASTAB provides the power for 4 channels maximum.

5.1 FRONT PANEL

The front panel includes indicators for each transducer channel.

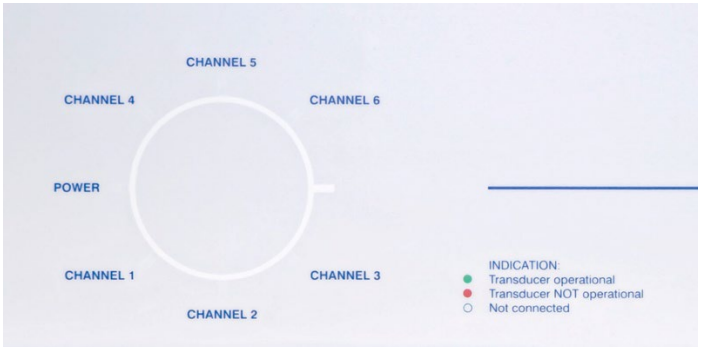


FIGURE 1: An overview of the front panel, with a close-up of the indicator panel

5.2 INDICATOR PANEL

The illuminated indicator panel has seven fields that are lit in the following modes:

POWER:

- **Green light** - Mains power is applied.
- **No light** – Unit is in off-state.

CHANNEL 1-6:

- **Green light** - Indicated transducer is attached and Normal Operation signal is ok. Transducer is operational.
- **Red light** - Indicated transducer is attached and Normal Operation signal is NOT ok.
- **No light** – No transducer is connected.

5.3 BACK PANEL

The IST ULTRASTAB unit provides 9-pin D-Sub female connector for up to six transducers and the measured secondary current from each transducer is looped to a set of output jacks (4 mm standard “banana” terminals) for the current output version.
For the voltage output, the secondary current from each transducer flows through the burden resistance in the corresponding Voltage-Output-Module (VOM).
The status of each individual transducer is presented on a 15-pin D-Sub male connector common for all six channels.

> **IMPORTANT:** The IST ULTRASTAB unit has NO breaker for switching mains on and off. Power is supplied to the unit once the mains cable is inserted into the mains inlet and mains are switched on at the outlet. Indication of active mains is provided by the POWER indicator.

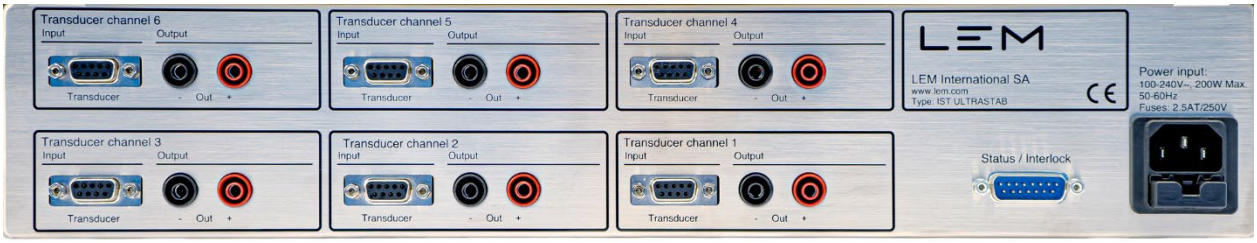
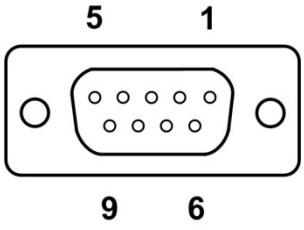


FIGURE 2: Overview of the IST ULTRASTAB back panel

5.4 TRANSDUCER PORT

Each channel is equipped with a 9-pin D-Sub connector that interfaces to LEM International transducers. The pinout is shown below:

Pin 1: Output Current Return
Pin 2: N/C
Pin 3: Ground
Pin 4: Ground
Pin 5: Negative supply -15V
Pin 6: Output Current
Pin 7: N/C
Pin 8: Normal Operation
Pin 9: Positive supply +15V



9-pin D-Sub female UNC 4-40 screw lock

FIGURE 3: Pinout for 9-pin transducer connector

5.5 CONNECTING THE TRANSDUCERS

The IST ULTRASTAB rack provides 6 9-pin D-Sub connectors on the back panel for connecting to 6 individual transducers.
Each 9-pin D-Sub connector is used to connect the supply voltage to the DC power input of the transducer. It also routes the secondary current lines and the status signal from the transducer to the IST ULTRASTAB unit.

Connect the transducers at the 9-pin D-Sub connectors on the IST ULTRASTAB back panel via the shielded connection cables which must be ordered separately.

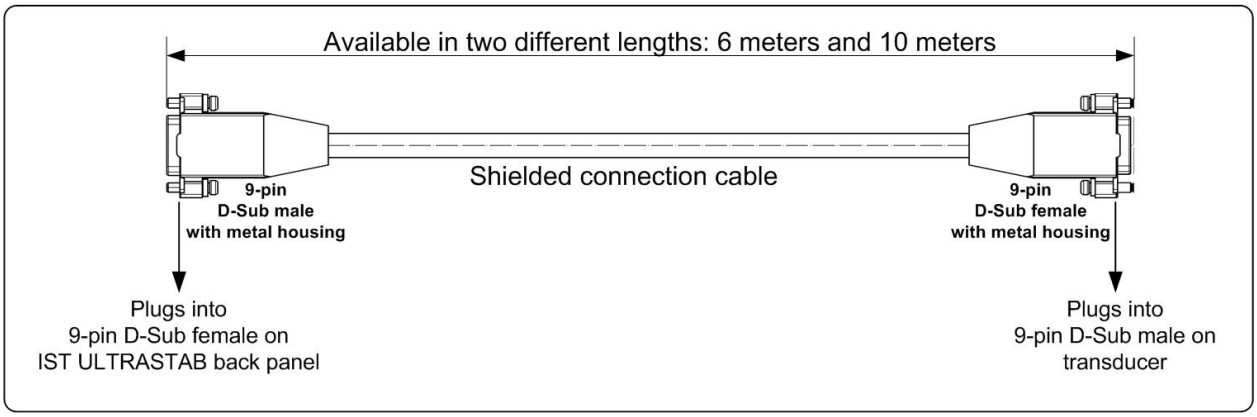


FIGURE 4: Connecting a transducer to IST ULTRASTAB

The following two shielded connection cables are available:

Description	Order number
Shielded connection cable length = 6 meters	71.12.08.000.0
Shielded connection cable length = 10 meters	71.12.13.000.0

TABLE 2: Shielded connection cables

It is recommended to use the connection cables indicated above. It is also possible to configure your own cable, bearing the following wiring description in mind.

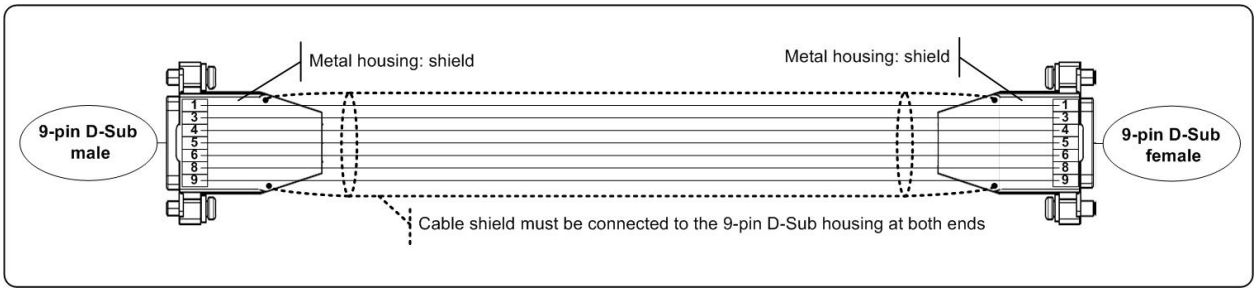


FIGURE 5: Transducer to IST ULTRASTAB connection cable wiring

To prevent any malfunction that may occur due to the cable/wire voltage drop (i.e., its length and the wire resistance inside the cable) between the IST ULTRASTAB rack and the transducer, a cable with at least 7 wires, each having a cross section AWG 22, AWG 23 or ≥ 0.25 mm², must be used.

In addition, it is recommended to use shielded cables in order to limit the effects of noise due to electromagnetic interference (EMI).

5.6 OUTPUT PORT

The measured secondary current or the ±10 V signal is output on a pair of 4 mm safety “banana” jacks.

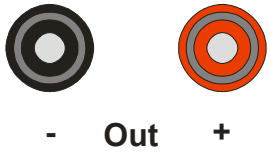
Red: Current output or ±10 V Voltage output depending on IST version. In current output case, this terminal is connected directly to pin 6 of the corresponding transducer port	
Black: Current output return or ±10 V signal ground. In current output case, this terminal is connected directly to pin 1 of the corresponding transducer port	

FIGURE 6: Output terminals

IMPORTANT: The secondary current path must ALWAYS be closed before applying primary current, i.e. a terminating burden resistor must be connected.

5.7 VOLTAGE OUTPUT VERSIONS

The following versions with ±10 V output signal are available:

Description	Order number	Secondary output current	Concerned transducers
IST 200-B ULTRASTAB	71.93.44.000.0	±200 mA	IT 200-S, IT 205-S, IT 400-S
IST 400-B ULTRASTAB	71.93.48.000.0	±400 mA	IT 400-S/SPxx, IT 605-S, IT 700-S, ITN 600-S

TABLE 3: Voltage output versions

5.8 STATUS / INTERLOCK

All LEM INTERNATIONAL current transducers generate a status signal, which contains information about the operational status of the unit. This signal is routed through the IST ULTRASTAB and available in one 15-pin D-Sub male connector for each channel. The pinout is shown in figure 8.

The status port can optionally be used in any general safety interlock set up circuit.
All signals on the status/interlock connector are optically isolated, photo-couplers type, floating Collector and Emitter. Depending on how each signal is wired, it can be “Active Low” or “Active High” as shown below:

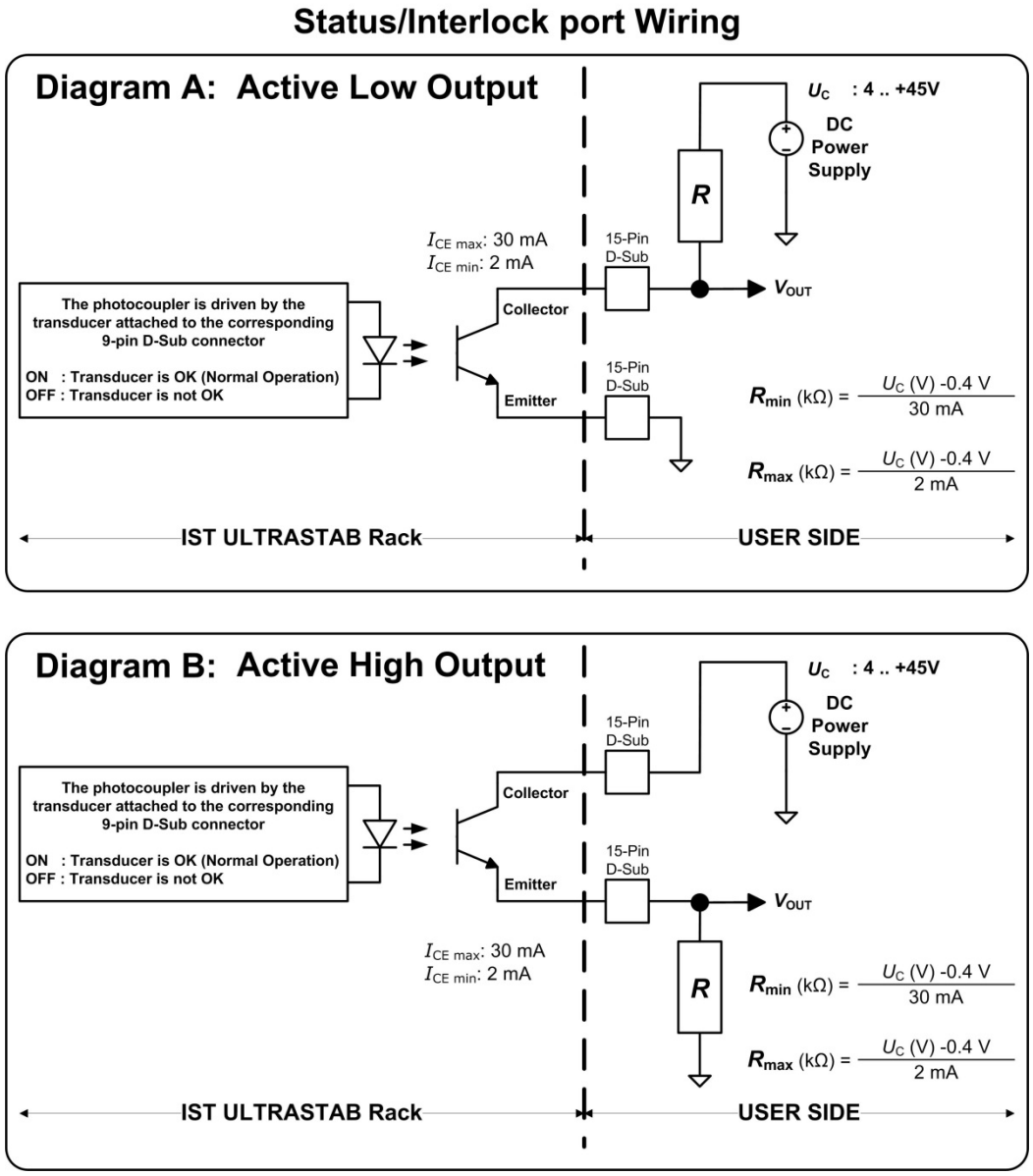


FIGURE 7: Status/Interlock port wiring

In the diagram A, the active low output signal U_{out} switches to GND when the corresponding transducer is OK (Normal operation and Green LED is lit). In the same manner, the transistor is switched off (No current from collector to emitter) to indicate that the corresponding transducer is not OK. Consequently, U_{out} switches to U_C and the corresponding Green LED is OFF, whereas the corresponding Red LED is lit.
In the diagram B, the active high output signal *(U_{out}* switches to U_C when the corresponding transducer is OK (Normal operation and Green LED is lit). In the same manner, the transistor is switched off (No current from collector to emitter) to indicate that the corresponding transducer is not OK. Consequently, U_{out} switches to GND and the corresponding Green LED is OFF, whereas the corresponding Red LED is lit.

The power supply (TBTS power supply) voltage U_C must be between 4 V and 45 V DC and the resistor value R must be chosen between a minimum value R_{min} and a maximum value R_{max}.

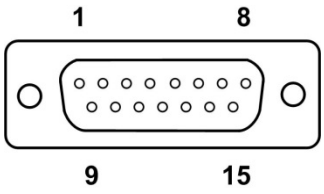
Some recommended standard values of R are given in the following table:

Power supply Voltage U_C	R_{min} (kΩ)	R_{max} (kΩ)	***R* Standard Values** ±5%
5 V	0.153	2.3	180 Ω, 1 kΩ, or 2.2 kΩ
12 V	0.386	5.8	470 Ω, 2.2 kΩ or 4.7 kΩ
24 V	0.786	11.8	1 kΩ, 2.2 kΩ or 10 kΩ

TABLE 4: Recommended standard values of *R*

Status Connector:

Power Status: Pin 1 Collector & Pin 5 Emitter
Channel 1: Pin 9 Collector & Pin 13 Emitter
Channel 2: Pin 2 Collector & Pin 6 Emitter
Channel 3: Pin 10 Collector & Pin 14 Emitter
Channel 4: Pin 3 Collector & Pin 7 Emitter
Channel 5: Pin 11 Collector & Pin 15 Emitter
Channel 6: Pin 4 Collector & Pin 8 Emitter



15-pin D-Sub male UNC 4-40 screw lock

FIGURE 8: Pinout for 15-pin status connector

6 INSTALLATION

Before applying mains power to the unit, check that the specified AC voltage and current are available, and that the ambient temperature is within the range specified in this manual.

> **IMPORTANT:** The IST ULTRASTAB is passively cooled by airflow entering the perforated areas in top, sides, and bottom of the cabinet. Make sure that these holes are not blocked as this will severely affect the performance of the unit.

Establish the Ground connection according to the local authority regulations and the requirements of the equipment via the AC power plug.

Mount the shielded connection cables between the electronics crate and the transducers. Use channel 1 to 3 as default. Check that all plugs are pushed fully in place.

The transducer itself may be installed in any orientation but be careful to consider potential influence of the physical layout of the setup with surrounding bus bars, transformers etc.

A typical 3-channel setup is shown below:

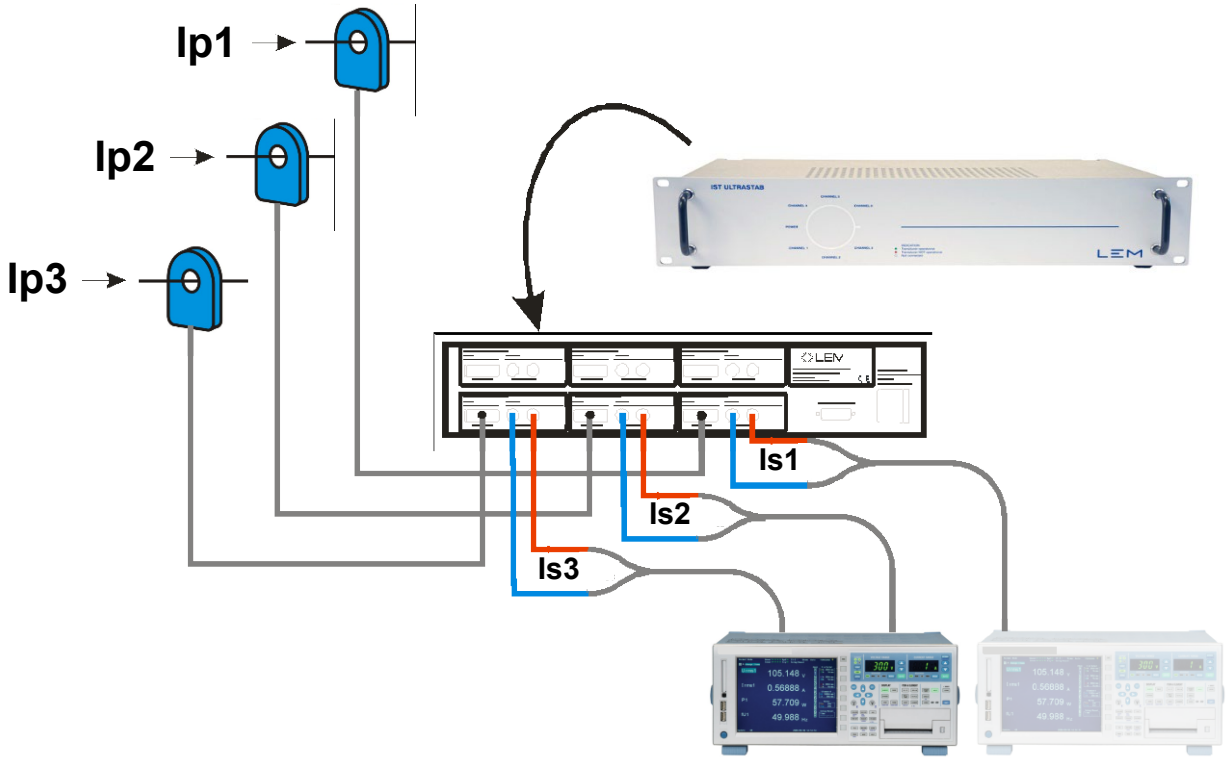


FIGURE 9: IST ULTRASTAB in a typical 3-channel current output application

7 OPERATING INSTRUCTIONS

When instructions for installation are complete, the IST ULTRASTAB can be switched ON.

Caution: Since the IST system has no mains switch the unit be powered immediately by inserting the mains cord.

240 V AC main	Power cable, C13, IEC to CEE 7/4, Schuko, 16 A, 250 V
110 V AC main	Power cable, C13, IEC to NEMA 5/15, 10 A, 125 V

Apply mains power by inserting the cable plug in the mains inlet and by switching on mains at the outlet. The green indicator LED “Power” will be lit.

Observe that the channel indicators turn on GREEN where transducers are connected and remains unlit where no transducer is connected. If a channel indicator turns RED please go through the setup, check that all cables are securely fastened etc. – it may also be that the transducer is faulty.

If any problem LEM International persists during this operation, please immediately take contact with LEM.

Further application information for high precision transducers can be found in their respective data sheets which can be easily obtained on www.lem.com or by contacting your local representative.

IMPORTANT: In order to avoid excessive saturation of the iron core in the transducer head, the IST ULTRASTAB unit should ALWAYS be switched on before the actual primary current source is applied to any of the attached transducers.

IMPORTANT: The secondary current path must NEVER be opened when primary current is applied. This means that cables to/from the current output port (banana jacks) should never be detached during operation.

8 MAINTENANCE

The IST ULTRASTAB assembly does not require any maintenance under normal operation.

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