**Click to go to Product Selector**

---

## Datasheet                                                      LIA-MV-150

# Lock-In-Amplifier Module



| Features | • **Working Frequency 10 Hz ... 45 kHz** |
|---|---|
| | • **Digital Phase Shifter 0 ... 360°** |
| | • **Current and Voltage Input** |
| | • **Parameter Control by local Switches and opto-isolated digital Inputs** |
| | • **Compact and EMI-Shielded Case** |

| Applications | • **Spectroscopy** |
|---|---|
| | • **Luminescence, Fluorescence, Phosphorescence Measurements** |
| | • **Light Scattering Measurements** |
| | • **Opto-electronical Quality Control** |
| | • **Integration in Industrial and Scientific Measurement-Systems** |

| Block Diagram | |
|---|---|

# Datasheet                                           LIA-MV-150

# Lock-In-Amplifier Module

| Specifications | *Test Conditions* | *Vs = ± 15 V, Ta = 25°C* |
|---|---|---|
| Voltage Input | Voltage Input Characteristic | Model "-S": Single-Ended Instrumentation-Amplifier |
| | | Model "-D": True Differential Instrumentation-Amplifier |
| | Voltage Input Range | 3 µV ... 100 mV in 1-3-10 steps (for Full Scale Output) |
| | Voltage Input Coupling | AC, 0.015 Hz |
| | Voltage Input Impedance | Model "-S": 1 MΩ // 4 pF |
| | | Model "-D": 2 MΩ // 2 pF differential |
| | Voltage Input Noise | 12 nV/√Hz |
| | Voltage Input CMRR | Model "-D": 110 dB @ 1 kHz, 100 dB @ 10 kHz |
| | Voltage Input Gain Drift | 100 ppm/K |
| Current Input | Current Input Characteristic | Transimpedance-Amplifier, -1 kV/A (inverting) |
| | Current Input Range | 3 nA ... 100 µA in 1-3-10 steps (for Full Scale Output) |
| | Current Input Noise | 13 pA/√Hz |
| | Current Input Source- Capacit. | 10 pF − 1 nF (recommended) |
| | Current Input Gain Error vs. | |
| | Source Capacitance | Cs        f < 20 kHz |
| | | ———————— |
| | | 10 pF      < 1 % |
| | | 100 pF     < 1 % |
| | | 1 nF       < 2 % |
| Signal Filter | Signal Filter Lowpass (-3 dB BW) | 150 kHz; 12 dB/Oct. |
| | Signal Filter Highpass (-3 dB BW) | 0.4 Hz; 6 dB/Oct. |
| | Signal Filter Cutoff accuracy | ± 20 % |
| Demodulator | Demodulator Dynamic Reserve | 35 dB @ Low Drift Setting |
| | | 55 dB @ High Dynamic Setting |
| Reference Input | Reference Input Voltage Range | ± 100 mV ... ± 5 V @ bip. Mode (0 V Comparator Threshold) |
| | | - 5 V / +10 V @ TTL Mode (2 V Comparator Threshold) |
| | Reference Input Impedance | 1 MΩ |
| | Reference Acquisition Time | max. 2 s @ Fast Setting |
| | | max. 4 s @ Slow Setting |
| Phase Shifter | Phase Shifter Type | Digital, Working Frequency 10 Hz ... 45 kHz |
| | Phase Shifter Range | 0 ... + 360 ° |
| | Phase Shifter Resolution | 1.4 ° |
| | Phase Shifter Drift | < 100 ppm/K |
| | Phase Shifter Accuracy | < 0.3 ° |
| Time Constants | Time Constant Range | 3 ms ... 10 s in 1-3-10 steps |
| | Time Const. Filter Characteristic | 6 dB/Oct. or 12 dB/Oct. switchable |
| Output | Output Channels | X = In Phase |
| | Output Voltage Range | ± 10 V (@ 2 kΩ Load) |
| | Output Current | ± 5 mA max. |
| | Output Impedance | 50 Ω |
| | Output DC-Stability | 50 ppm/K @ Low Drift Setting |
| | | 500 ppm/K @ High Dynamic Setting |
| | Output Basic Accuracy | 2 %, Frequency > 30 kHz 5% @ sinusoidal input signal |
| | Output Voltage Offset Range | ± 100 % Full Scale by ± 10 V Control @ Low Drift Setting |
| | | ± 100 % Full Scale by ± 1 V Control @ High Dyn. Setting |
| | Output Voltage Offset Control- | |
| | Voltage Impedance | 22 kΩ |

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY        F E M T O

# Datasheet                                               LIA-MV-150

## Lock-In-Amplifier Module

Specifications (continued)

| | | |
|---|---|---|
| Status Indicator LED | Functions | Amplifier Overload Status<br>Reference PLL Unlocked Status |
| Digital Control | Control Input Voltage | Low: - 0.8 V ... + 0.8 V<br>High: + 1.8 V ... + 12 V, TTL / CMOS compatible |
| | Control Input Current | 0 mA @ 0V, 1.5 mA @ + 5 V, 4.5 mA @ + 12V typ. |
| | Digital Status Output Voltage | Active: + 4.5 V typ.<br>Non Active: 0 V typ. |
| | Digital Status Output Current | 10 mA max. |
| Power Supply | Supply Voltage | ± 15 Vdc ... ± 20 Vdc |
| | Supply Current | - 60 mA, + 100 mA |
| Case | Weight | 370 gr. (0.86 lbs) |
| | Material | AlMg4.5Mn, nickel-plated |
| Temperature Range | Storage Temperature | - 40 ... + 100 °C |
| | Operating Temperature | 0 ... + 60 °C |
| Absolute Maximum Ratings | Signal Input AC Voltage | 20 Vpp |
| | Signal Input DC Voltage | ± 30 V |
| | Reference Input Voltage | ± 30 V |
| | Control Input Voltage | - 5 V, + 30 V |
| | Power Supply Voltage | ± 22 V |

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY       FEMTO

# Datasheet                                    LIA-MV-150

## Lock-In-Amplifier Module

| Switch Settings | 3 Dip Switch - Presettings |
|---|---|

| Switch | OFF | ON |
|---|---|---|
| S1 | Reference-Input-Threshold = 0 V | Reference-Input-Threshold = 2 V |
| S2 | Fast PLL-Locking | Slow PLL-Locking |
| S3 | Current Input | Voltage Input |

**Sensitivity Setting, General**

8 steps of input AC-gain are selectable. Output DC-gain is selectable in 2 settings. The DC-gain settings are marked as "Low Drift" and "High Dynamic" mode:

| Mode | DC-Gain | Dyn. Reserve | DC-Stability |
|---|---|---|---|
| Low Drift | 100 | Low | High |
| High Dynamic | 1000 | High | Low |

Select mode by sensitivity switch settings 0–7 or 8–F. If only low dynamic reserve is required, select the high DC-stability settings ("Low Drift" mode).

**Sensitivity Setting for Full Scale ( = 10 V Output)**

| Low Drift Mode | | | High Dynamic Mode | | |
|---|---|---|---|---|---|
| Setting | Voltage | Current | Setting | Voltage | Current |
| 0 | 100 mV | 100 µA | 8 | 10 mV | 10 µA |
| 1 | 30 mV | 30 µA | 9 | 3 mV | 3 µA |
| 2 | 10 mV | 10 µA | A | 1 mV | 1 µA |
| 3 | 3 mV | 3 µA | B | 300 µV | 300 nA |
| 4 | 1 mV | 1 µA | C | 100 µV | 100 nA |
| 5 | 300 µV | 300 nA | D | 30 µV | 30 nA |
| 6 | 100 µV | 100 nA | E | 10 µV | 10 nA |
| 7 | 30 µV | 30 nA | F | 3 µV | 3 nA |

**Time Constant Setting**

| 6 dB/Oct. | 12 dB/Oct. | Time Constant |
|---|---|---|
| 0 | 8 | 3 ms |
| 1 | 9 | 10 ms |
| 2 | A | 30 ms |
| 3 | B | 100 ms |
| 4 | C | 300 ms |
| 5 | D | 1 s |
| 6 | E | 3 s |
| 7 | F | 10 s |

**Phase Shift Setting**

Phase shift is adjusted by 2 phase switches with 8 Bit resolution. Values 0 ... 255 ( Hex 00 ... FF ) correspond to phase shift setting 0 ... +360 °.
One step with switch marked "Coarse" changes phase shift by 22.5 °. The "Fine"-switch changes phase shift by 1.4 ° - steps:



SOPHISTICATED TOOLS FOR SIGNAL RECOVERY    F E M T O

## Datasheet                                    LIA-MV-150
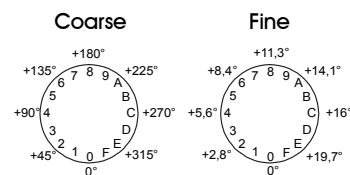
# Lock-In-Amplifier Module

| Connectors | Signal Input | Model "-S": BNC |
| | | Model "-D": LEMO Series 1S, 4-pin fixed Socket |

Voltage Input:  Pin 1:  Non Inverting Input
                Pin 2:  Inverting Input
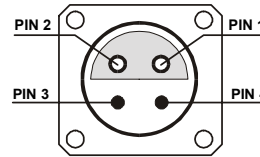                Pin 3:  GND
                Pin 4:  N.C.

Current Input:  Pin 1:  Current Amplifier Input
                Pin 2:  If Current Input is used,
                        connect to Pin 3 (GND)
                Pin 3:  GND
                Pin 4:  N.C.

PIN 2 · PIN 1 · PIN 3 · PIN 4

Reference Input     BNC

Output              BNC

Power Supply        LEMO Series 1S, 3-pin fixed Socket
                    Pin 1:  + 15V
                    Pin 2:  - 15V
                    Pin 3:  GND

PIN 2 -Vs · PIN 1 +Vs · PIN 3 GND
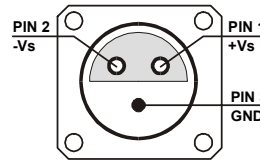
Control Port        Sub-D 25-pin, female, Qual. Class 2
                    Pin 1:      +12V (Stabilized Power Supply Output)
                    Pin 2:      -12V (Stabilized Power Supply Output)
                    Pin 3:      AGND (Analog Ground)
                    Pin 4:      +5V (Stabilized Power Supply Output)
                    Pin 5:      X-Output
                    Pin 6:      Overload Status Output
                    Pin 7:      Unlocked Status Output
                    Pin 8:      X-Output Offset Control Input
                    Pin 9:      DGND (Ground f. Digital Control Pin 10 - 25)
                    Pin 10:     Dynamic Mode (DYN0)
                    Pin 11:     Sensitivity (SEN0)
                    Pin 12:     Sensitivity (SEN1)
                    Pin 13:     Sensitivity (SEN2)
                    Pin 14:     Time Constant Slope (TCSL)
                    Pin 15:     Time Constant (TC0)
                    Pin 16:     Time Constant (TC1)
                    Pin 17:     Time Constant (TC2)
                    Pin 18:     Phase Shift (PH0)
                    Pin 19:     Phase Shift (PH1)
                    Pin 20:     Phase Shift (PH2)
                    Pin 21:     Phase Shift (PH3)
                    Pin 22:     Phase Shift (PH4)
                    Pin 23:     Phase Shift (PH5)
                    Pin 24:     Phase Shift (PH6)
                    Pin 25:     Phase Shift (PH7)

## SOPHISTICATED TOOLS FOR SIGNAL RECOVERY    FEMTO

# Datasheet                                               LIA-MV-150

## Lock-In-Amplifier Module

| Remote Control Operation | General | Remote control input bits are opto-isolated and connected by logical OR to local switch setting. The 4 hexadecimal switches are 4 bit-coded as shown in the following table: |

| Switch Code | MSB Bit 3 | Bit 2 | Bit 1 | LSB Bit 0 |
|---|---|---|---|---|
| 0 | Low | Low | Low | Low |
| 1 | Low | Low | Low | High |
| 2 | Low | Low | High | Low |
| 3 | Low | Low | High | High |
| 4 | Low | High | Low | Low |
| 5 | Low | High | Low | High |
| 6 | Low | High | High | Low |
| 7 | Low | High | High | High |
| 8 | High | Low | Low | Low |
| 9 | High | Low | Low | High |
| A | High | Low | High | Low |
| B | High | Low | High | High |
| C | High | High | Low | Low |
| D | High | High | Low | High |
| E | High | High | High | Low |
| F | High | High | High | High |

For remote control a Lock-In-Amplifier switch setting, set the local switch to "0" and select the wanted setting via a 4-bit-code at the corresponding digital inputs:

**Sensitivity Switch - Corresponding Inputs**

| Bit | Corresponding Control Port Input | |
|---|---|---|
| Bit 0 | SEN0 | (Pin 11) |
| Bit 1 | SEN1 | (Pin 12) |
| Bit 2 | SEN2 | (Pin 13) |
| Bit 3 | DYN0 | (Pin 10) |

**Time Constant Switch - Corresponding Inputs**

| Bit | Corresponding Control Port Input | |
|---|---|---|
| Bit 0 | TC0 | (Pin 15) |
| Bit 1 | TC1 | (Pin 16) |
| Bit 2 | TC2 | (Pin 17) |
| Bit 3 | TCSL | (Pin 14) |

**Phase Switch Coarse - Corresponding Inputs**

| Bit | Corresponding Control Port Input | |
|---|---|---|
| Bit 0 | PH4 | (Pin 22) |
| Bit 1 | PH5 | (Pin 23) |
| Bit 2 | PH6 | (Pin 24) |
| Bit 3 | PH7 | (Pin 25) |

**Phase Switch Fine - Corresponding Inputs**

| Bit | Corresponding Control Port Input | |
|---|---|---|
| Bit 0 | PH0 | (Pin 18) |
| Bit 1 | PH1 | (Pin 19) |
| Bit 2 | PH2 | (Pin 20) |
| Bit 3 | PH3 | (Pin 21) |

For example to select a switch setting code "6", you have to connect a "High"- level signal to the corresponding control input pins Bit 1 & Bit 2. Mixed operation, e.g.local phase setting and remote controlled sensitivity setting, is also possible.

## SOPHISTICATED TOOLS FOR SIGNAL RECOVERY       FEMTO

# Datasheet                                    LIA-MV-150

## Lock-In-Amplifier Module

Dimensions
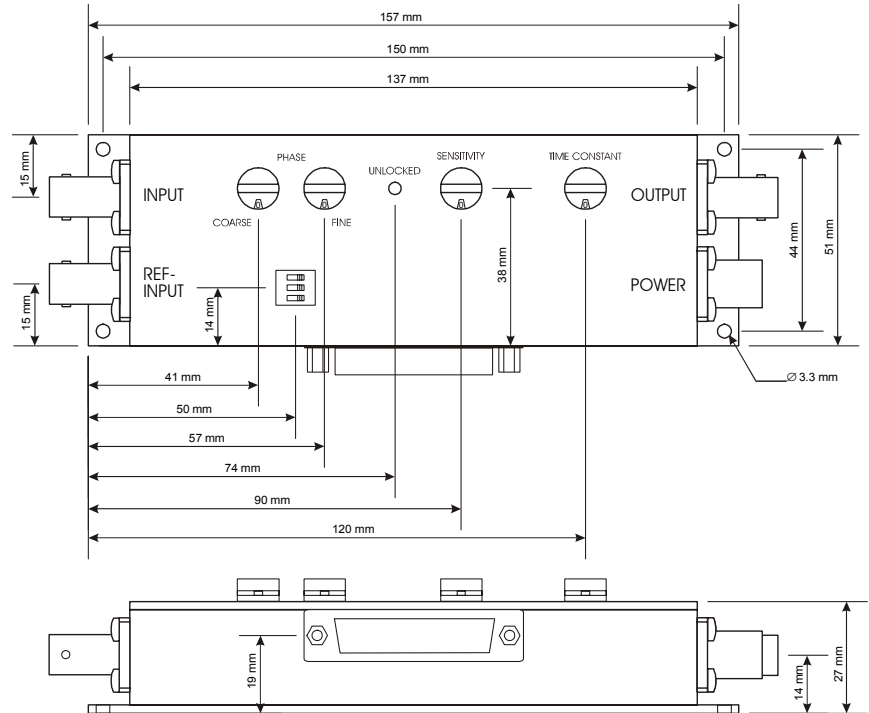


DZ01-1051-13a

Ordering Information

Available Models

Model No.: LIA-MV-150-S
- Singe-Ended Input (BNC-Connector Input)

Model No.: LIA-MV-150-D
- True Differential Input (LEMO-Connector Input)

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY        F E M T O

# Electro Optical Components, Inc.

SUNSTAR    http://www.sensor-ic.com/    TEL: 0755-83376549 FAX:0755-83376182 E-MAIL: szss20@163.con

**EOC**

5460 Skylane Boulevard, Santa Rosa, CA 95403

Toll Free: 855-EOC-6300

www.eoc-inc.com    |    info@eoc-inc.com

Click to go to
Product Selector

---

# Datasheet                                                              LUCI-10

## USB to D-Sub Control Interface
## for FEMTO Amplifiers



COMPATIBLE WITH
NATIONAL INSTRUMENTS
**LabVIEW**

| | |
|---|---|
| Features | • **Compact Digital I/O Interface for USB Remote Control of FEMTO Amplifiers**<br>• **Supports Opto-Isolation of Amplifier Signal Path from PC USB Port**<br>• **16 Digital Outputs, 3 Opto-Isolated Digital Inputs**<br>• **Bus-Powered Operation**<br>• **System Driver, Application Software and VI's for use with LabVIEW™ Included** |
| Applications | • **Remote Control of FEMTO® Amplifiers and Photoreceivers Directly from a PC** |
| Block Diagram |  |

## Hardware Specifications

### General Characteristics

| | |
|---|---|
| Bus Interface | USB 2.0 (full-speed) |
| Digital I/O Channels | 16 output lines<br>3 opto-isolated input lines |
| Supply | PC USB port, + 5 V, typ. 100 mA, bus-powered<br>(no auxiliary power supply required) |
| Connectors | USB type A<br>D-Sub, 25 pin, male |
| Cable | AWG 28, length 1.8 m |

### Output

| | |
|---|---|
| Number of Channels | 16 output lines, supporting opto-isolation inside FEMTO<br>amplifiers and photoreceivers |
| Output Voltage Range | LOW bit:  0 … + 0.5 V (@ 0 … 2 mA output current)<br>HIGH bit:  + 4 … + 5.5 V (@ 0 … 2 mA output current) |
| Max. Current | 6 mA per channel |
| Writing Rate | max. 800 operations per second |

# Datasheet                                                      LUCI-10

## USB to D-Sub Control Interface
## for FEMTO Amplifiers

| | | |
|---|---|---|
| Input | Number of Channels | 3 opto-isolated input lines |
| | Input Voltage Range | LOW bit: - 20 … + 1.5 V |
| | | HIGH bit: + 3 … + 20 V |
| | Switching Current | 1 mA typ. @ 5 V |
| | Reading Rate | max. 400 operations per second |
| Power Supply | USB Port, Bus Powered | + 4.5 … + 5.5 V DC |
| | Active Current | max. 200 mA / typ. 100 mA |
| | Suspend Current | < 0.5 mA (standby mode of Windows®) |
| Case | D-Sub Case | metal hood (EMI/RFI shielding), with jack screws |
| | Weight | 130 g (0.3 lb.) |
| | Material | zinc die-cast, nickel plated |
| Temperature Range | Storage Temperature | - 40 … + 100 °C |
| | Operating Temperature | 0 … + 50 °C |
| Absolute Maximum Ratings | Max. Voltage at Input | +/- 30 V |
| | Max. Short Circuit Output Current | +/- 20 mA per channel, 200 mA total |
| | Max. Isolation Voltage | +/- 60 V (Input Ground to Output Ground) |
| Connectors | Device Port | D-Sub, 25 pin, male |
| | | Pin 1:    NC |
| | | Pin 2:    NC |
| | | Pin 3:    GND (IN) |
| | | Pin 4:    NC |
| | | Pin 5:    Digital IN |
| | | Pin 6:    Digital IN |
| | | Pin 7:    Digital IN |
| | | Pin 8:    NC |
| | | Pin 9:    GND (OUT) |
| | | Pin 10:   Digital OUT Low Byte, LSB |
| | | Pin 11:   Digital OUT Low Byte |
| | | Pin 12:   Digital OUT Low Byte |
| | | Pin 13:   Digital OUT Low Byte |
| | | Pin 14:   Digital OUT Low Byte |
| | | Pin 15:   Digital OUT Low Byte |
| | | Pin 16:   Digital OUT Low Byte |
| | | Pin 17:   Digital OUT Low Byte, MSB |
| | | Pin 18:   Digital OUT High Byte, LSB |
| | | Pin 19:   Digital OUT High Byte |
| | | Pin 20:   Digital OUT High Byte |
| | | Pin 21:   Digital OUT High Byte |
| | | Pin 22:   Digital OUT High Byte |
| | | Pin 23:   Digital OUT High Byte |
| | | Pin 24:   Digital OUT High Byte |
| | | Pin 25:   Digital OUT High Byte, MSB |
| | PC Port | USB type A |

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY      F E M T O

# Datasheet                                          LUCI-10

## USB to D-Sub Control Interface
## for FEMTO Amplifiers

| Software Specifications | | |
|---|---|---|
| Software (included on CD) | Device Driver | dynamic link library (DLL) for integration in Microsoft Windows® operating system for use with C/C++, LabWindows™ /CVI™ or LabVIEW™ |
| | Application Software | GUI (graphical user interface) programs for simple remote control of FEMTO amplifiers and photoreceivers provided as executable programs and LabVIEW projects |
| | LabVIEW Programs | sample programs to control and test the LUCI-10 hardware (including front panel and block diagram) |
| | LabVIEW Library | special VI toolkit for integration in LabVIEW development environment |

**Note:** A National Instruments LabVIEW™ license is not included in this software package. For use of the GUI application programs the LabVIEW Run-Time Engine is required. If not detected on the host PC during the installation process the LabVIEW Run-Time Engine will be installed automatically from the CD.

| System Requirements | | |
|---|---|---|
| | Operating System | Microsoft Windows XP with Service Pack 2, or higher |
| | Processor | Intel Pentium III or AMD Athlon, or better |
| | System Memory | 512 MB of RAM, or more |
| | Hard Disk Space | about 200 MB |
| | Interface Port | USB 1.1 or USB 2.0 |
| | Supported FEMTO Modules | any standard FEMTO amplifier or photoreceiver with 25 pin D-Sub socket, except model HLVA-100 |

**Optional Requirements**

For development of own application programs an additional development environment like LabVIEW Version 8 (or higher) or C/C++ is required.

**Legal Notice**

LabVIEW, CVI, National Instruments and NI are trademarks of National Instruments. Neither FEMTO Messtechnik GmbH, nor any software programs or other goods or services offered by FEMTO Messtechnik GmbH, are affiliated with, endorsed by, or sponsored by National Instruments.
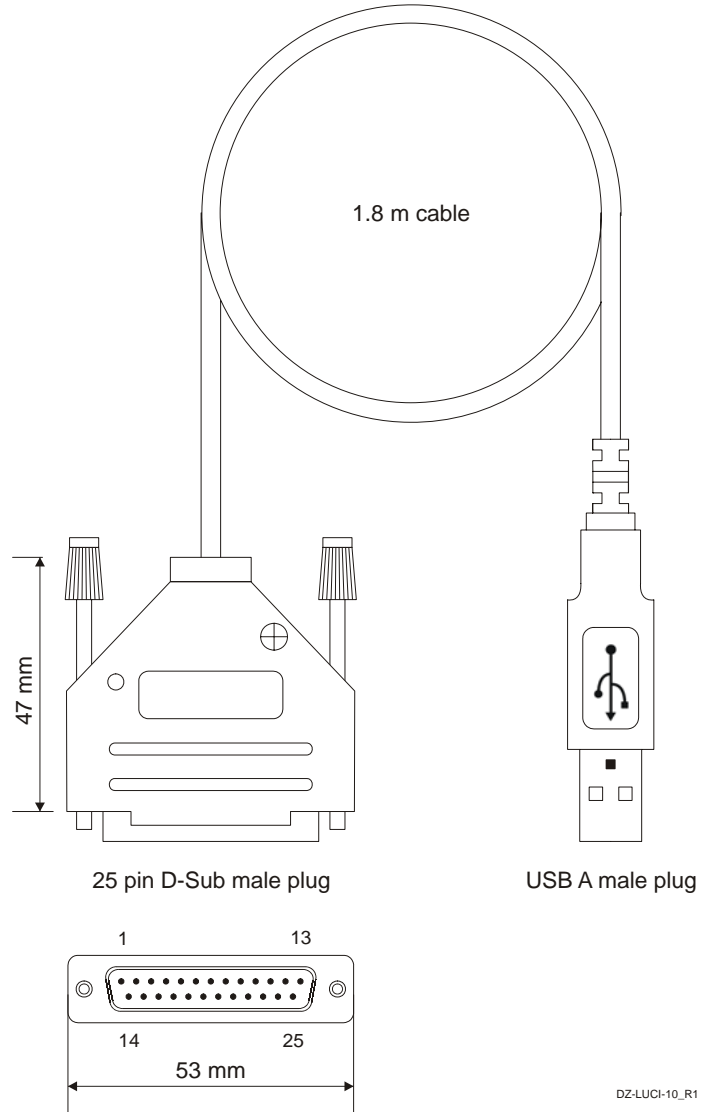The mark LabWindows is used under a license from Microsoft Corporation.
Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
FEMTO and the FEMTO logo are trademarks or registered trademarks of FEMTO Messtechnik GmbH in Germany, the U.S. and/or other countries.
Product and company names mentioned may also be trademarks or trade names of their respective companies used here for identification purposes only.

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY    F E M T O

# Datasheet                                    LUCI-10

## USB to D-Sub Control Interface
## for FEMTO Amplifiers

Dimensions



1.8 m cable

47 mm

25 pin D-Sub male plug          USB A male plug

1          13

14          25

53 mm

DZ-LUCI-10_R1

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY          F E M T O