

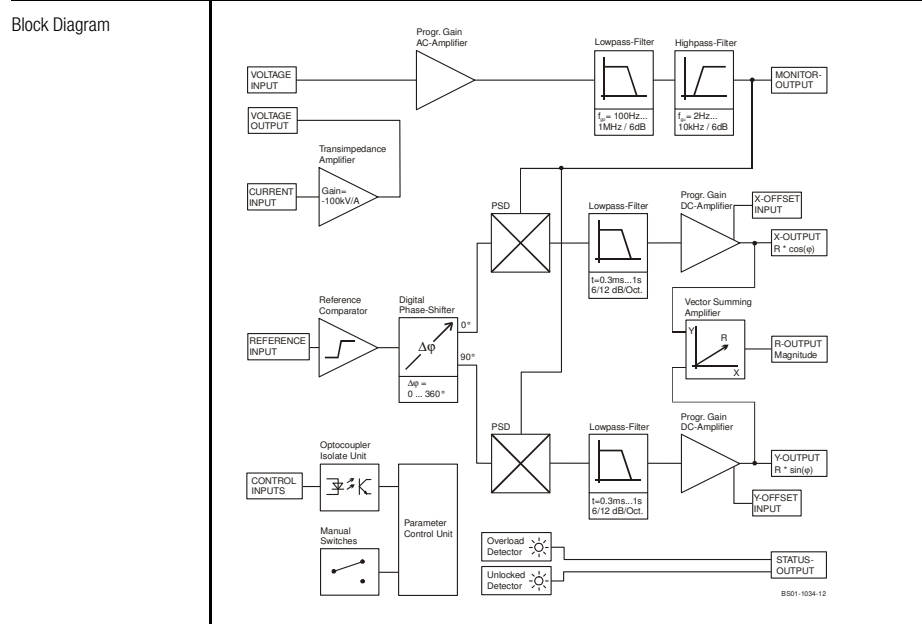
Datasheet

LIA-MVD-200-H

Dual Phase Lock-In-Amplifier Module



|              |  |
|--------------|--|
| Features     | <ul style="list-style-type: none"> <li>• BNC connectors for input and output signals</li> <li>• Rugged aluminum housing</li> <li>• Dual phase detection with X, Y and magnitude output</li> <li>• Working frequency 50 Hz ... 120 kHz, digital phase shifter 0 ... 360°</li> <li>• Parameter control by local switches and opto-isolated digital inputs</li> <li>• Optional reference oscillator module available</li> </ul> |
| Applications | <ul style="list-style-type: none"> <li>• Spectroscopy</li> <li>• Luminescence, fluorescence, phosphorescence measurements</li> <li>• Light scattering measurements</li> <li>• Opto-electronical quality control</li> </ul>   |



SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



DE-LIA-MVD-200-H\_R3/MG, JM/22 JUN 2016

01/24 / V3 / CHIF / femto/lockin/liamvd200h

**Datasheet**

**LIA-MVD-200-H**

**Dual Phase Lock-In-Amplifier Module**

| Specifications   | Test Conditions  | $V_s = \pm 15 \text{ V}$ , $T_A = 25 \text{ }^\circ\text{C}$  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|--|--|---|--|----------------------|----------------------|-----------------------|-------|-------|-----|-----|--------|-------|-----|-----|--------|-------|-----|
| Voltage Input  | Voltage input characteristic   | true differential instrumentation amplifier   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Voltage input range  | 3 $\mu\text{V}$ ... 1V in 1-3-10 steps (for full scale output)  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Voltage input coupling   | AC  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Voltage input impedance  | 1 M $\Omega$ // 4 pF  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Voltage input noise  | 12 nV/ $\sqrt{\text{Hz}}$   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Voltage input CMRR   | 110 dB @ 1 kHz, 100 dB @ 10 kHz   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Voltage input gain drift   | 100 ppm/K   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| Current Input  | Current input characteristic   | transimpedance amplifier, -100 kV/A (inverting)   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Current input range  | 30 pA ... 10 $\mu\text{A}$ in 1-3-10 steps (for full scale output)  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Current input noise  | 0.4 pA/ $\sqrt{\text{Hz}}$  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Current input source-capacit.  | 10 pF – 500 pF (recommended)  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Current input gain error vs. Source capacitance  | <table border="1"> <thead> <tr> <th><math>C_s</math></th> <th><math>f &lt; 20 \text{ kHz}</math></th> <th><math>f = 50 \text{ kHz}</math></th> <th><math>f = 100 \text{ kHz}</math></th> </tr> </thead> <tbody> <tr> <td>10 pF</td> <td>&lt; 1 %</td> <td>1 %</td> <td>4 %</td> </tr> <tr> <td>100 pF</td> <td>&lt; 1 %</td> <td>1 %</td> <td>3 %</td> </tr> <tr> <td>500 pF</td> <td>&lt; 1 %</td> <td>4 %</td> <td>3 %</td> </tr> </tbody> </table> | $C_s$  | $f < 20 \text{ kHz}$ | $f = 50 \text{ kHz}$ | $f = 100 \text{ kHz}$ | 10 pF | < 1 % | 1 % | 4 % | 100 pF | < 1 % | 1 % | 3 % | 500 pF | < 1 % | 4 % |
| $C_s$  | $f < 20 \text{ kHz}$   | $f = 50 \text{ kHz}$  | $f = 100 \text{ kHz}$  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| 10 pF  | < 1 %  | 1 %   | 4 %  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| 100 pF   | < 1 %  | 1 %   | 3 %  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| 500 pF   | < 1 %  | 4 %   | 3 %  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| Signal Filter<br>(without optional<br>Bandpass-Module) | Signal filter lowpass (-3 dB BW)   | 1 MHz, 100 kHz, 10 kHz, 1 kHz, 100 Hz; 6 dB/oct. selectable per jumper  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Signal filter highpass (-3 dB BW)  | 2 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz; 6 dB/oct. selectable per jumper   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Signal filter cutoff accuracy  | $\pm 20 \%$   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Max. dynamic reserve   | 80 dB   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| Signal Monitor Output                                  | Signal monitor output gain   | 1 ... 3333 (depends on gain setting)  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Signal monitor output voltage  | $\pm 8 \text{ V}$ max.  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Signal monitor output impedance  | 100 $\Omega$  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Signal monitor output current  | $\pm 10 \text{ mA}$ max.  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| Note   | When using current input with low input ranges, the monitor output may be disabled by opening the soldering jumper at the board (near JP1) to prevent from recoupling. |   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| Demodulator  | Demodulator dynamic reserve  | 15 dB @ ultra stable setting<br>35 dB @ low drift setting<br>55 dB @ high dynamic setting   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Reference Input  | Reference input voltage range   | $\pm 100 \text{ mV}$ ... $\pm 5 \text{ V}$ @ bip. mode (0 V comparator threshold)<br>-5 V / +10 V @ TTL mode (+2 V comparator threshold) |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Reference input impedance  | 1 M $\Omega$  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| Reference acquisition time                             | max. 2 s @ fast setting<br>max. 4 s @ slow setting   |   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| Phase Shifter  | Phase shifter type   | digital, working frequency 50 Hz ... 120 kHz  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Phase shifter range  | 0 ... + 360 $^\circ$  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Phase shifter resolution   | 1.4 $^\circ$ @ $f < 60 \text{ kHz}$ , 2.8 $^\circ$ @ $f > 60 \text{ kHz}$   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Phase shifter drift  | < 100 ppm/K   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Phase shifter accuracy   | < 0.3 $^\circ$  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Phase shifter orthogonality  | < 0.1 $^\circ$  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
| Time Constants   | Time constant range  | 300 $\mu\text{s}$ ... 1 s in 1-3-10 steps   |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |
|  | Time const. filter characteristic  | 6 dB/oct. or 12 dB/oct. switchable  |  |                      |                      |                       |       |       |     |     |        |       |     |     |        |       |     |

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**Dual Phase Lock-In-Amplifier Module**

| Specifications (continued)<br>Output | <p>Output channels X = in phase, Y = quadrature, R = magnitude</p> <p>Output voltage range <math>\pm 10</math> V (@ 2 k<math>\Omega</math> load)</p> <p>Output current <math>\pm 5</math> mA max.</p> <p>Output impedance 50 <math>\Omega</math></p> <p>Output DC-stability 5 ppm/K @ ultra stable setting<br/>50 ppm/K @ low drift setting<br/>500 ppm/K @ high dynamic setting</p> <p>Output basic accuracy 2 % (X and Y-output) @ sinusoidal input signal<br/>4 % (R-output) @ sinusoidal input signal</p> <p>Output voltage offset range <math>\pm 100</math> % full scale by <math>\pm 10</math> V control voltage</p> <p>Output voltage offset control-</p> <p>Output load impedance <math>&gt; 2</math> k<math>\Omega</math></p>   |                                    |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
|--------------------------------------|---|------------------------------------|--------------|----|----|--------------------------|--------------------------|----|----------|----------|----|------------------|------------------|----|---------------------------------|------------------------------------|------|---------|--------------|--------------|--------------|----|-----|------|-----------|-----|--------|--------|--------------|------|------|-----|
| Status Indicator LED                 | <p>Functions amplifier overload status<br/>reference PLL unlocked status</p>  |                                    |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| Digital Control                      | <p>Control input voltage low: <math>-0.8</math> V ... <math>+0.8</math> V, high: <math>+1.8</math> V ... <math>+12</math> V</p> <p>Control input current 0 mA @ 0V, 1.5 mA @ <math>+5</math> V, 4.5 mA @ <math>+12</math> V typ.</p> <p>Digital status output voltage Active: <math>+4.5</math> V typ., Non Active: 0 V typ.</p> <p>Digital status output current 10 mA max.</p>  |                                    |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| Power Supply                         | <p>Supply voltage <math>\pm 15</math> Vdc ... <math>\pm 18</math> Vdc</p> <p>Supply current <math>-60</math> mA, <math>+120</math> mA</p>   |                                    |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| Case                                 | <p>Material Aluminum anodized</p> <p>Dimension 64,4 x 105,0 x 223,0 mm (without BNC connectors)</p> <p>Weight 1000 g (2.2 lb)</p>   |                                    |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| Temperature Range                    | <p>Storage temperature <math>-40</math> ... <math>+100</math> °C</p> <p>Operating temperature 0 ... <math>+60</math> °C</p>   |                                    |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| Absolute Maximum Ratings             | <p>Signal input AC voltage 50 V<sub>pp</sub></p> <p>Reference input voltage <math>\pm 15</math> V</p> <p>Control input voltage <math>-5</math> V, <math>+30</math> V</p> <p>Power supply voltage <math>\pm 22</math> V</p>  |                                    |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| Switch Settings                      | <p>4 dip switch - presettings</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>switch</th> <th>OFF</th> <th>ON</th> </tr> </thead> <tbody> <tr> <td>S1</td> <td>low drift &amp; high dynamic</td> <td>ultra stable &amp; low drift</td> </tr> <tr> <td>S2</td> <td>1-f mode</td> <td>2-f mode</td> </tr> <tr> <td>S3</td> <td>fast PLL-locking</td> <td>slow PLL-locking</td> </tr> <tr> <td>S4</td> <td>reference-input-threshold = 0 V</td> <td>reference-input-threshold = <math>+2</math> V</td> </tr> </tbody> </table> <p>Sensitivity setting,<br/>output DC-gain modes</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>mode</th> <th>DC-gain</th> <th>dyn. reserve</th> <th>DC-stability</th> </tr> </thead> <tbody> <tr> <td>ultra stable</td> <td>10</td> <td>low</td> <td>high</td> </tr> <tr> <td>low drift</td> <td>100</td> <td>medium</td> <td>medium</td> </tr> <tr> <td>high dynamic</td> <td>1000</td> <td>high</td> <td>low</td> </tr> </tbody> </table> <p>If only low dynamic reserve is required, select the higher DC-stability settings. Use dip switch S1 to preselect either the two upper or the two lower DC-gain modes, then select best mode by sensitivity switch settings 0–7 or 8–F.</p> | switch                             | OFF          | ON | S1 | low drift & high dynamic | ultra stable & low drift | S2 | 1-f mode | 2-f mode | S3 | fast PLL-locking | slow PLL-locking | S4 | reference-input-threshold = 0 V | reference-input-threshold = $+2$ V | mode | DC-gain | dyn. reserve | DC-stability | ultra stable | 10 | low | high | low drift | 100 | medium | medium | high dynamic | 1000 | high | low |
| switch                               | OFF   | ON                                 |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| S1                                   | low drift & high dynamic  | ultra stable & low drift           |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| S2                                   | 1-f mode  | 2-f mode                           |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| S3                                   | fast PLL-locking  | slow PLL-locking                   |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| S4                                   | reference-input-threshold = 0 V   | reference-input-threshold = $+2$ V |              |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| mode                                 | DC-gain   | dyn. reserve                       | DC-stability |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| ultra stable                         | 10  | low                                | high         |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| low drift                            | 100   | medium                             | medium       |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |
| high dynamic                         | 1000  | high                               | low          |    |    |                          |                          |    |          |          |    |                  |                  |    |                                 |                                    |      |         |              |              |              |    |     |      |           |     |        |        |              |      |      |     |

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Switch Settings (continued)

S1 = ON: sensitivity setting  
for full scale (= 10 V output)

| ultra stable mode |             |            | low drift mode |             |           |
|-------------------|-------------|------------|----------------|-------------|-----------|
| setting           | voltage     | current    | setting        | voltage     | current   |
| 0                 | 1 V         | 10 $\mu$ A | 8              | 100 mV      | 1 $\mu$ A |
| 1                 | 300 mV      | 3 $\mu$ A  | 9              | 30 mV       | 300 nA    |
| 2                 | 100 mV      | 1 $\mu$ A  | A              | 10 mV       | 100 nA    |
| 3                 | 30 mV       | 300 nA     | B              | 3 mV        | 30 nA     |
| 4                 | 10 mV       | 100 nA     | C              | 1 mV        | 10 nA     |
| 5                 | 3 mV        | 30 nA      | D              | 300 $\mu$ V | 3 nA      |
| 6                 | 1 mV        | 10 nA      | E              | 100 $\mu$ V | 1 nA      |
| 7                 | 300 $\mu$ V | 3 nA       | F              | 30 $\mu$ V  | 300 pA    |

S1 = OFF: sensitivity setting  
for full scale (= 10 V output)

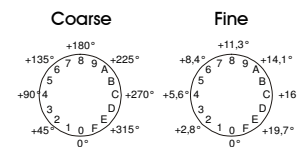
| low drift mode |             |           | high dynamic mode |             |         |
|----------------|-------------|-----------|-------------------|-------------|---------|
| setting        | voltage     | current   | setting           | voltage     | current |
| 0              | 100 mV      | 1 $\mu$ A | 8                 | 10 mV       | 100 nA  |
| 1              | 30 mV       | 300 nA    | 9                 | 3 mV        | 30 nA   |
| 2              | 10 mV       | 100 nA    | A                 | 1 mV        | 10 nA   |
| 3              | 3 mV        | 30 nA     | B                 | 300 $\mu$ V | 3 nA    |
| 4              | 1 mV        | 10 nA     | C                 | 100 $\mu$ V | 1 nA    |
| 5              | 300 $\mu$ V | 3 nA      | D                 | 30 $\mu$ V  | 300 pA  |
| 6              | 100 $\mu$ V | 1 nA      | E                 | 10 $\mu$ V  | 100 pA  |
| 7              | 30 $\mu$ V  | 300 pA    | F                 | 3 $\mu$ V   | 30 pA   |

Time constant setting

|   | 6 dB/oct. | 12 dB/oct. | time constant |
|---|-----------|------------|---------------|
| 0 | 8         |            | 300 $\mu$ s   |
| 1 | 9         |            | 1 ms          |
| 2 | A         |            | 3 ms          |
| 3 | B         |            | 10 ms         |
| 4 | C         |            | 30 ms         |
| 5 | D         |            | 100 ms        |
| 6 | E         |            | 300 ms        |
| 7 | F         |            | 1 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:



If frequency range  $f > 70$  kHz or 2-f mode is selected, the resolution of digital phase control changes to 2.8° and the phase shift range doubles to 0 ... +720°.

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Internal Jumper Settings  
(jumpers are accessible  
when top of case is  
removed)

Input signal filter  
setting

Set cut-off frequency of input lowpass filter  
with JP1 + JP2 (always same position) and  
highpass filter with JP3:

| JP3   | highpass<br>-3 dB cut-off | JP1, JP2 | lowpass<br>-3 dB cut-off |
|-------|---------------------------|----------|--------------------------|
| 3 - 4 | 2 Hz                      | 1 - 2    | 100 Hz                   |
| 1 - 3 | 10 Hz                     | 3 - 4    | 1 kHz                    |
| 2 - 4 | 100 Hz                    | 5 - 6    | 10 kHz                   |
| 3 - 5 | 1 kHz                     | 7 - 8    | 100 kHz                  |
| 4 - 6 | 10 kHz                    | none     | 1 MHz *                  |

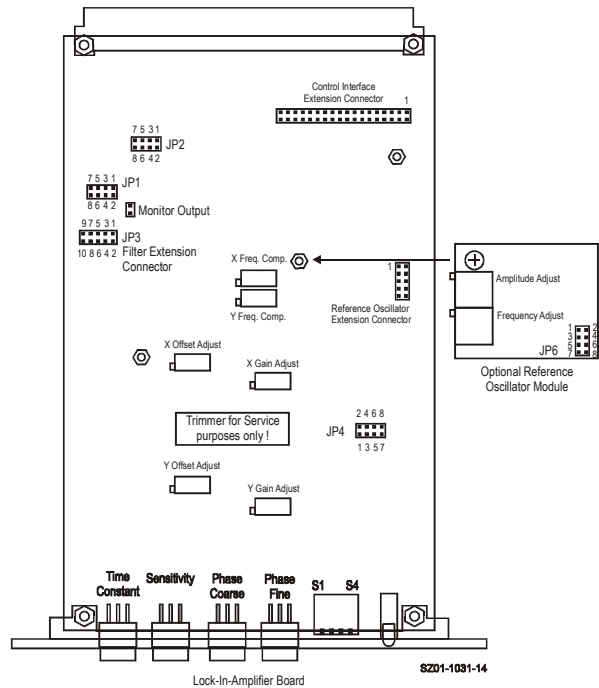
\* (At sensitivity settings 6,7 & E,F max. 200 kHz )

Frequency range  
selection

| JP4           | frequency range       |
|---------------|-----------------------|
| 1 - 2         | f < 60 kHz            |
| 3 - 4 & 5 - 6 | f > 60 kHz            |
| 7, 8          | test pins, do not use |

(if 2-f mode is used, position is always 1-2)

Internal Jumper Position  
Diagram  
(look at top of board when  
case is opened)



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Internal Connector  
(of build-in Lock-In Board)

|   |  |
|---|--|
| Connector type  | Euro-card DIN 41612 connector, 64 pin male, (a+c)  |
| Input   | Pin C2: voltage input, non-inverting, DC-coupled<br>Pin C3: voltage input, non-inverting, AC-coupled<br>Pin C4: voltage input, inverting, AC-coupled<br>Pin C5: voltage input, inverting, DC-coupled<br>Pin C7: current input<br>Pin C6: current amplifier voltage output<br>Pin A2- A6: input GND   |
| Monitor output  | Pin C9: monitor output<br>Pin A9: monitor GND  |
| Output  | Pin A12: R-signal output<br>Pin C14: X-signal output<br>Pin A14: Y-signal output<br>Pin C15: output GND  |
| Offset input  | Pin A10: X-offset input<br>Pin A11: Y-offset input<br>Pin A13: offset GND  |
| Status output   | Pin C10: unlocked status output<br>Pin C11: overload status output<br>Pin C17: status output GND (=power supply GND)   |
| Power supply  | Pin A16+C16: power supply – 15V<br>Pin A18+C18: power supply + 15V<br>Pin A17+C17: power supply GND  |
| Remote control inputs<br>(opto-isolated)  | Pin C19: time constant (TC0)<br>Pin A19: time constant (TC1)<br>Pin C20: time constant (TC2)<br>Pin A20: time constant slope (TCSL)<br>Pin A22: sensitivity (SENO)<br>Pin C21: sensitivity (SEN1)<br>Pin A21: sensitivity (SEN2)<br>Pin C22: dynamic mode (DYN0)<br>Pin A28: phase shift (PH0)<br>Pin C28: phase shift (PH1)<br>Pin A27: phase shift (PH2)<br>Pin C27: phase shift (PH3)<br>Pin A26: phase shift (PH4)<br>Pin C26: phase shift (PH5)<br>Pin A25: phase shift (PH6)<br>Pin C25: phase shift (PH7)<br>Pin C24: disable local switch control<br>Pin A23+A24: remote control GND<br>(common optocoupler cathode) |
| Reference input   | Pin A32: reference input<br>Pin A31: reference input ground  |
| Reference output<br>(Connected only if optional<br>oscillator module is installed)                                      | Pin A30: reference output<br>Pin A17: refer. output GND (=power supply GND)<br>Pin A29: reference synchronization input  |
| Standard control interface<br>(Connected only if optional<br>control interface module<br>(future product) is installed) | Pin C29: interface 0<br>Pin C30: interface 1<br>Pin C31: interface 2<br>Pin C32: interface 3   |

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External Connectors  
(at backside, Standard  
Configuration)

|                 |   |
|-----------------|---|
| Signal input    | Factory set to BNC, isolated (single ended)   |
| X-output        | BNC   |
| Y-output        | BNC   |
| R-output        | BNC   |
| Reference input | BNC   |
| Power supply    | Lemo® series 1S, 3-pin fixed socket<br>(mating plug type: FFA.1S.303.CLAC52)<br>Pin 1: +15V<br>Pin 2: -15V<br>Pin 3: GND  |
|                 |   |
| Control port    | Sub-D 25-pin, female, qual. class 2<br>Pin 1: +12V (stabilized power supply output)<br>Pin 2: -12V (stabilized power supply output)<br>Pin 3: AGND (analog ground)<br>Pin 4: +5V (stabilized power supply output)<br>Pin 5: X-output<br>Pin 6: overload status output<br>Pin 7: unlocked status output<br>Pin 8: disable local switch control input<br>Pin 9: DGND (ground f. digital control pin 8 - 25)<br>Pin 10: dynamic mode (DYN0)<br>Pin 11: sensitivity (SEN0)<br>Pin 12: sensitivity (SEN1)<br>Pin 13: sensitivity (SEN2)<br>Pin 14: time constant slope (TCSL)<br>Pin 15: time constant (TC0)<br>Pin 16: time constant (TC1)<br>Pin 17: time constant (TC2)<br>Pin 18: phase shift (PH0)<br>Pin 19: phase shift (PH1)<br>Pin 20: phase shift (PH2)<br>Pin 21: phase shift (PH3)<br>Pin 22: phase shift (PH4)<br>Pin 23: phase shift (PH5)<br>Pin 24: phase shift (PH6)<br>Pin 25: phase shift (PH7) |

Connector Wiring Options

General

The BNC-connector configuration can be easily changed by setting electrical jumpers at the internal I/O-adaptor card. Disconnect the power supply and open the case by loosening the two upper screws at the case front and rear side. Please pay attention to the ground connection at the backplane. Now open the case by lifting the top. The jumper options and functions are described in the following table.

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



**Datasheet**

**LIA-MVD-200-H**

**Dual Phase Lock-In-Amplifier Module**

Connector Wiring Options,  
Jumpers on internal  
Adapter Board

| Input connectors (JP1)   | input wiring  | jumper installed   |
|--|---|--|
|  | IN A = voltage input<br>(single ended, AC)  | " +V-IN → IN A"<br>" GND → IN A/SHLD"<br>" -V-IN → IN A/SHLD"              |
|  | IN A = voltage input<br>(differential, AC)  | " +V-IN → IN A"<br>" -V-IN → IN A/SHLD"                                    |
|  | IN A / IN B = voltage input<br>(2 BNC differential, AC)<br>(OUT A cannot be used) | " +V-IN → IN A"<br>" GND → IN A/SHLD"<br>" -V-IN → IN B"                   |
|  | IN A = current input<br>(single ended)  | " C-IN → IN A"<br>" GND → IN A/SHLD"<br>" -V-IN → C-OUT"<br>" +V-IN → GND" |
|  |   |  |
| Output connectors (JP2)  | output wiring   | jumper installed   |
|  | OUT A = X-output  | " X → OUT A"<br>(JP1) "USE OUT A/NO IN B"                                  |
|  | OUT B = X-output  | " X → OUT B"   |
|  | OUT A = Y-output  | " Y → OUT A"<br>(JP1) "USE OUT A/NO IN B"                                  |
|  | OUT B = Y-output  | " Y → OUT B"   |
|  | OUT C = Y-output  | " Y → OUT C"   |
|  | OUT A = R-output  | " R → OUT A"<br>(JP1) "USE OUT A/NO IN B"                                  |
|  | OUT B = R-output  | " R → OUT B"   |
|  | OUT C = R-output  | " R → OUT C"   |
|  | OUT B = monitor output  | " MON → OUT B"   |
|  | OUT C = monitor output  | " MON → OUT C"   |
|  | OUT B = unlocked output   | " UNL → OUT B"   |
|  | OUT C = unlocked output   | " UNL → OUT C"   |
|  | OUT B = Overload output   | " OVL → OUT B"   |
|  | OUT C = overload output   | " OVL → OUT C"   |
|  | OUT C = reference output  | " REF-OUT → OUT C"   |
| Reference connector (JP3)  | reference wiring  | jumper installed   |
| (Reference output only if<br>optional oscillator module<br>is installed) | REF = reference input   | " REF-IN → REF" (2 jumper)   |
|  | REF = reference output<br>(reference output<br>connected to ref. input)           | " REF-OUT → REF-IN" (2 jp.)<br>" REF-IN → REF" (2 jumper)                  |
|  | REF = refer. sync. input<br>(use OUT C as<br>reference output)                    | " REF-SYNC → REF" (2 jp.)  |
|  |   |  |

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY





**Datasheet**

**LIA-MVD-200-H**

**Dual Phase 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   |       |       | LSB   |
|-------------|-------|-------|-------|-------|
|             | Bit 3 | Bit 2 | Bit 1 | 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 switch setting, set the local switch to "0" and select the wanted setting via the 4-bit-code at the corresponding digital inputs.

Sensitivity switch -  
corresponding inputs

| Bit   | corresponding control port input |           |
|-------|----------------------------------|-----------|
| Bit 0 | SEN0                             | (Pin A22) |
| Bit 1 | SEN1                             | (Pin C21) |
| Bit 2 | SEN2                             | (Pin A21) |
| Bit 3 | DYNO                             | (Pin C22) |

Time constant switch -  
corresponding inputs

| Bit   | corresponding control port input |           |
|-------|----------------------------------|-----------|
| Bit 0 | TC0                              | (Pin C19) |
| Bit 1 | TC1                              | (Pin A19) |
| Bit 2 | TC2                              | (Pin C20) |
| Bit 3 | TCSL                             | (Pin A20) |

Phase switch coarse -  
corresponding inputs

| Bit   | corresponding control port input |           |
|-------|----------------------------------|-----------|
| Bit 0 | PH4                              | (Pin A26) |
| Bit 1 | PH5                              | (Pin C26) |
| Bit 2 | PH6                              | (Pin A25) |
| Bit 3 | PH7                              | (Pin C25) |

Phase switch fine -  
corresponding inputs

| Bit   | corresponding control port input |           |
|-------|----------------------------------|-----------|
| Bit 0 | PH0                              | (Pin A28) |
| Bit 1 | PH1                              | (Pin C28) |
| Bit 2 | PH2                              | (Pin A27) |
| Bit 3 | PH3                              | (Pin C27) |

Remote control example

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 settings and remote controlled sensitivity setting, is also possible.

SOPHISTICATED TOOLS FOR SIGNAL RECOVERY



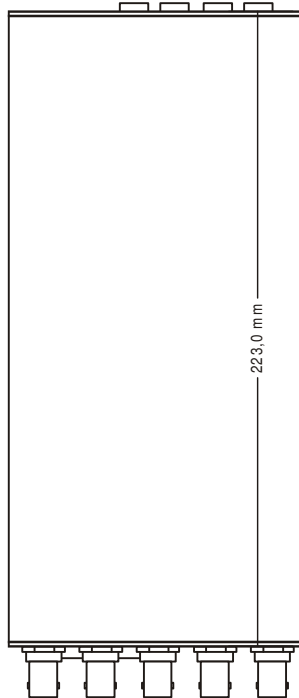
**Datasheet**

**LIA-MVD-200-H**

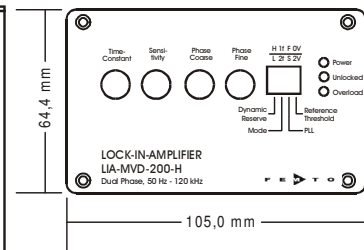
**Dual Phase Lock-In-Amplifier Module**

Dimensions

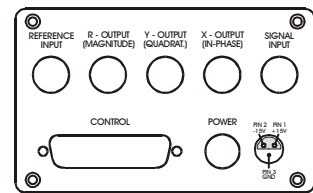
Top View



Front View



Back View



Case Material:  
Al, natural anodised DZ01-1074-10

Optional Extensions

|                             |  |
|-----------------------------|--|
| Reference oscillator module | Model No.: SOM-1<br>- frequency range 5 Hz ... 130 kHz, user adjustable<br>- output voltage 0 ... 2 V <sub>RMS</sub> , user adjustable<br>- 100 ppm/K amplitude accuracy |
| Factory set                 | 1 kHz, 1 V <sub>RMS</sub>  |

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SOPHISTICATED TOOLS FOR SIGNAL RECOVERY

