klaus pötter

INGENIEURGESELLSCHAFT mbH

LMI-96 8/16 - Operating Manual

1 Description of the LMI-96

The **LMI-96** is a microprocessor-controlled LED annunciator panel for front-panel mounting. According to configuration, it can display up to 16 signals, has control inputs and integrated buttons for acknowledging the signals and relay outputs for group signal and new-value annunciation.

The **versatile configuration options provided by DIP switches** make the standard version an extremely universal signalling system. Thus, it is possible:

⇒ for the inputs to be switched over between open and closed-circuit operation

⇒ to choose input signal delay in steps between 0 and 10s,

⇒ to choose between new-value, first-up-value and last-value signal modes,

⇒ to enable and disable signal storage and

⇒ for the LMI-96 to be set as fault/operating state annunciator.

According to requirements, the **LMI-96** is available in a variety of versions or with options, for example for operating voltages of: 12, 24, 48, or 60V DC and 12, 24, 110 or 230 V AC.

Up to 127 **LMI-96**'s can be networked to one another via an RS485 interface (twister-wire conductor) - this permits synchronized display and operation of 2032 signals.

Metallically separated auxiliary supply, opto-decoupled inputs with EMC filter, RS485 interface, plug-in screw terminals, ready access to the configuration DIP switches, standard 96 x 96 mm housing are the distinguishing features of the quality and ease of operation of the **LMI-96**.

The integral microprocessor permits versatile matching to special requirements.

2 Installation check list

This check list is intended to help you with operation of the LMI-96; it does not in any way replace your specialist knowledge and your knowledge of applicable standards, such as VDE, DIN, etc.

⇒ Please familiarize yourself with the properties of the LMI-96, that is to say, please read these instructions through carefully.

⇒ Make out a list of the functions and operating modes you wish to use.

⇒ Removing the bezel and the cover panels of the unit will expose the DIP switches.

⇒ Set the DIP switches with the aid of the list you have prepared in accordance with the above, using a fine screwdriver *(see Section 5 on page 5)* .

⇒ Where you are networking several LMI-96's together, please see *the notes in Section 6.1 on page 9*. When doing so, please remember the matching resistors at the two cable ends.

⇒ Close the unit up again.

⇒ Carry out the necessary wiring in your system.

⇒ Pull off the screw terminals off the back of the LMI-96 and connect them to the wiring of your system.

⇒ If you operate on the closed-circuit principle, ensure that inputs are connected to power supply.

3 Instructions in brief

The following brief instructions will allow you to start the unit up quickly. If any points are unclear here, please refer to the detailed instructions in Sections 4 to 8 below.
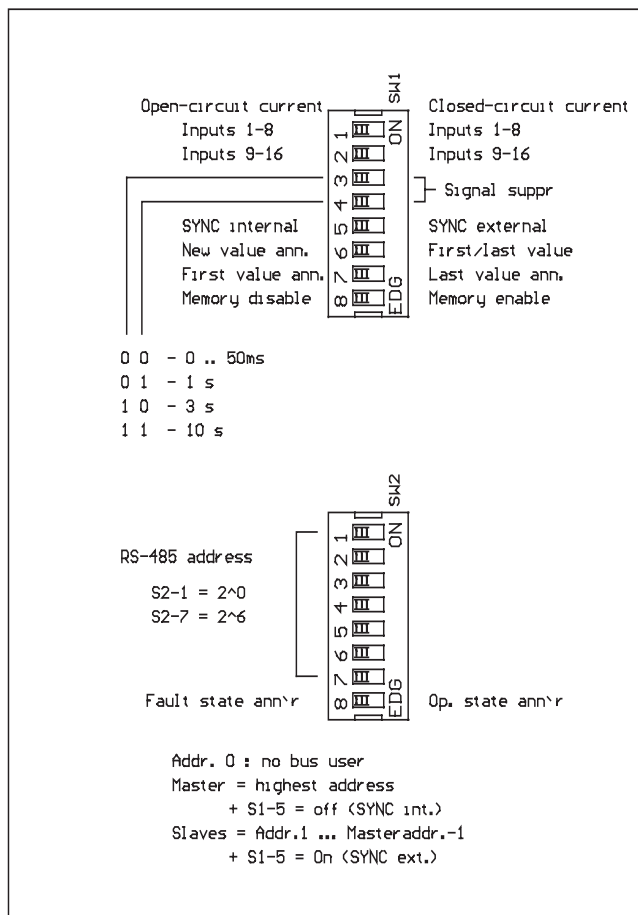
⇒ Connect the operating voltage (E_{op}) to terminals L and N with potential in accordance with the rating plate.

⇒ Connect the signal voltage (E_S) to the terminals E1 - E16 and the appropriate grounding terminals E1-8_GND and E9-16_GND with potential in accordance with the rating plate.

⇒ If necessary, connect the external operating buttons*(see Section 9 on page 13).*.

The unit is now ready for use and will operate as a fault state annunciator in the operating mode set at the works: "New-value annunciation without signal storage, open-circuit principle". **All DIP switches set to OFF.**

Different operating modes can be set with the aid of the DIP switches. For this purpose, please remove the bezel and cover panels from the unit this will expose the switches.

The diagram below, "Setting the DIP switches" will give you an overview of the setting options. A detailed description of the operating modes will be found in *Section 5 on page 5.*

```
                                    SW1
 Open-circuit current  ┌──────┐ ON    Closed-circuit current
      Inputs 1-8       1│▥ │       Inputs 1-8
      Inputs 9-16      2│▥ │       Inputs 9-16
                       3│▥ │
                       4│▥ │      ├ Signal suppr
     SYNC internal     5│▥ │       SYNC external
     New value ann.    6│▥ │       First/last value
     First value ann.  7│▥ │       Last value ann.
     Memory disable    8│▥ │EDG    Memory enable
                        └──────┘

 0 0  - 0 .. 50ms
 0 1  - 1 s
 1 0  - 3 s
 1 1  - 10 s

                                    SW2
                       ┌──────┐ ON
 RS-485 address        1│▥ │
                       2│▥ │
   S2-1 = 2^0          3│▥ │
   S2-7 = 2^6          4│▥ │
                       5│▥ │
                       6│▥ │
                       7│▥ │
 Fault state ann`r     8│▥ │EDG   Op. state ann`r
                        └──────┘

 Addr. 0 : no bus user
 Master = highest address
        + S1-5 = off (SYNC int.)
 Slaves = Addr.1 ... Masteraddr.-1
        + S1-5 = On (SYNC ext.)
```

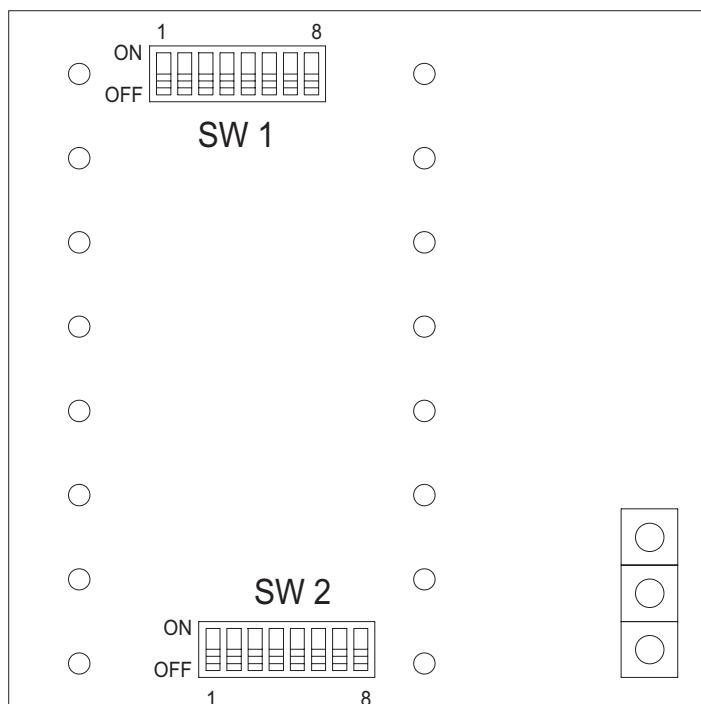Setting the DIP switches

4 Operating controls, LEDs

The LMI-96 is optionally supplied with control buttons in the front panel. The significance of the buttons is as follows:

Button **LP**   Lamp test. When this button is pressed, all the LEDs should illuminate, including those of a parallel panel optionally connected by means of connector XE. This button has no effect on the relay outputs.

Button **LQ**   Acknowledge lamps. Blinking LEDs change to continuous illumination.

Button **HQ**   Acknowledge alarm horn. The new-value annunciation output (horn relay) is cancelled.

The LEDs in the front panel are numbered to correspond to the inputs in question (e.g. LED H05 corresponds to Input E5). The principle of operation of the LEDs is explained in Section 5.4 on page 7.

5 Operating modes, setting by DIP switch

In this Section, for the sake of clarity, the explanations of the operating modes and the setting of the DIP switches have been combined.

View of the DIP switches with the front panel removed

Works setting: All DIP switches are set to OFF

5.1 Open-circuit/ closed-circuit principle (SW 1-1 and SW 1-2)

With these DIP switches, it is possible to set the inputs, divided into groups of eight, for open circuit/closed circuit. If both groups of eight are programmed for closed circuit, the lamp and alarm horn outputs will also operate on the closed-circuit principle *(This also applies, even if the unit only has eight inputs)*.

Closed circuit: signal at the input = status display; output = relay picked up
Open circuit: no signal at the input = status display; output = relay not energized

If the two principles are combined in extended systems (networking of several units), this must be taken into account in the wiring of the system.

SW 1-1	OFF	Input 1-8 open-circuit
	ON	Input 1-8 closed circuit
SW 1-2	OFF	Input 9-16 open circuit
	ON	Input 9-16 closed circuit

5.2 Signal suppression time (SW 1-3 and SW 1-4)

With the aid of these DIP switches, it is possible to determine the minimum length of input signals to be recognized.

SW 1-3	SW 1-4	Signal minimum length
OFF	OFF	*
OFF	ON	1 s
ON	OFF	3 s
ON	ON	10 s

* = 10ms with DC voltage, 50ms with AC voltage

5.3 Blink synchronization, RS485 Master/Slave (SW 1-5)

If several units are installed in a switchboard, it is an advantage visually for the signals to blink synchronously. In order to obtain a uniform blink cycle for all the units, use the RS 485-connection for networking. The "Master" send the blink cycle on all "Slaves".

More information for networking *(see Section 6 on page 9)*.

! **Set only one unit to "Sync. Internal"**

SW 1-5	OFF = Sync. internal (RS485 - Master)
	ON = Sync. external (RS485 - Slave)

5.4 Operation by means of external buttons

The LMI-96 can be operated by means of external buttons (LP, LQ and HQ). A detailed description in this connection will be found in

5.5 New, first-up or last-value annunciation (SW 1-6 and SW 1-7)

With the aid of these DIP switches, it is possible to choose between the operating modes "New-value annunciation", "First-up-value annunciation" and "Last-value annunciation" . The functional principles of these operating modes are described below.

All three modes:

 ∗ While a signal is blinking or continous present, the group signal annunciation (lamp relays) is energized.

 ∗ When each new signal occurs, the new-value annunciation (horn relays) is energized. It is de-energized by horn acknowledgement .

New-value annunciation:

 ∗ Each signal occurring is displayed by once-a-second (1 Hz) blinking rate of the corresponding LED.

 ∗ When LED acknowledgement takes place, the blinking LEDs change over to continuous illumination while the signal in question is still present.

 ∗ If a further signal occurs in the meantime, this is displayed by the corresponding LED blinking.

First-up value annunciation:

 ∗ The first signal occurring is displayed by rapid blinking (2 Hz) of the corresponding LED.

 ∗ Additional signals are displayed by once-a-second rate (1 Hz) blinking of the corresponding LEDs.

 ∗ When LED acknowledgement takes place, the blinking LEDs change over to continuous illumination as long as the signal in question is still present.

 ∗ If a further signal occurs in the meantime, this is again displayed by rapid blinking of the corresponding LED.

Last-value annunciation:

 ∗ If several signals occur consecutively, the most recent signal is displayed by the corresponding LED blinking rapidly (2 Hz). The LEDs corresponding to the less recent signals blink at a rate of once a second. The lamp relays also alternate at a rate of 2 Hz.

Last-value annunciation:

* If several signals occur consecutively, the most recent signal is displayed by the corresponding LED blinking rapidly (2 Hz). The LEDs corresponding to the less recent signals blink at a rate of once a second

* When LED acknowledgement takes place, all the blinking LEDs corresponding to the signals still present change over to continuous illumination.

* If further signals occur in the meantime, they are displayed by flashing, as described above.

SW 1-6	SW 1-7	Signal type
OFF	OFF	New-value
OFF	ON	New-value
ON	OFF	First-up-value
ON	ON	Last-value

5.6 Signal storage (SW 1-8)

Signal storage can be enabled or disabled with the aid of this switch.

When signal storage is enabled, every signal is displayed until lamp acknowledgement takes place, even if it was present for only a short time.

When signal storage is disabled, a signal is displayed only as long as it is present. The LEDs, the lamp relay and horn relay are cancelled when the signal ceases to be present.

SW 1-8	OFF = Signal storage OFF
	ON = Signal storage ON

5.7 Fault or operating-state annunciator (SW 2-8)

Fault-state annunciator:

* In its standard setting, the LMI-96 is a pure fault state annunciator.
* The above description applies to all inputs.

Operating-state annunciator:

* The above description is only applicable to the even-numbered inputs (E2, E4 ... E16).
* All the odd-numbered inputs (E1, E3 ... E15) act as pure signal display without blinking light and signal storage.
* A signal at these inputs will not lead to tripping of the lamp or horn relay.
* The signal suppression times set are effective for all inputs.

SW 2-8	OFF = Fault-state
	ON = Operating-state

5.8 RS485 Address (SW 2-1 to SW 2-7)

If several LMI-96 are to be networked with one another via the integral RS485 interface, an address must be assigned to each device. These are set using the DIP switches SW 2-1 to SW 2-7.

The addresses should be set in accordance with the examples given below.

Address	SW 2-1 Val. = 1	SW 2-2 Val. = 2	SW 2-3 Val. = 4	SW 2-4 Val. = 8	SW 2-5 Val. = 16	SW 2-6 Val. = 32	SW 2-7 Val. = 64
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF
68	OFF	OFF	ON	OFF	OFF	OFF	ON
127	ON	ON	ON	ON	ON	ON	ON

Remark: The input BL-IN described in Section 7.1 on page 11 is inoperative if the LMI-96 is addressed for bus communication.

6 The RS485 Serial Interface

The LMI-96 is fitted with an RS485 serial interface and the software for networking up to 127 of these units.

6.1 Networking several LMI-96

The signals of all devices in the system pass through the RS-485 bus connection. The signals for new, first-up and last-value recognition,blink synchronization and the initiation of the lamp and horn relays are also included in the bus. Thus, complete centralization of all events occurring in the entire network is possible.

The signals of all LMI-96 units networked to one another are acknowledged when the internal or external LQ or HQ button on one of the units is pressed. The same principle applies to the LP button.

As blink synchronization takes place via the RS485 bus, the input BL-IN described in *7.1 on page 11* is inoperative if the LMI-96 is addressed for bus communication*(see Section 5.8 on page 9)*.
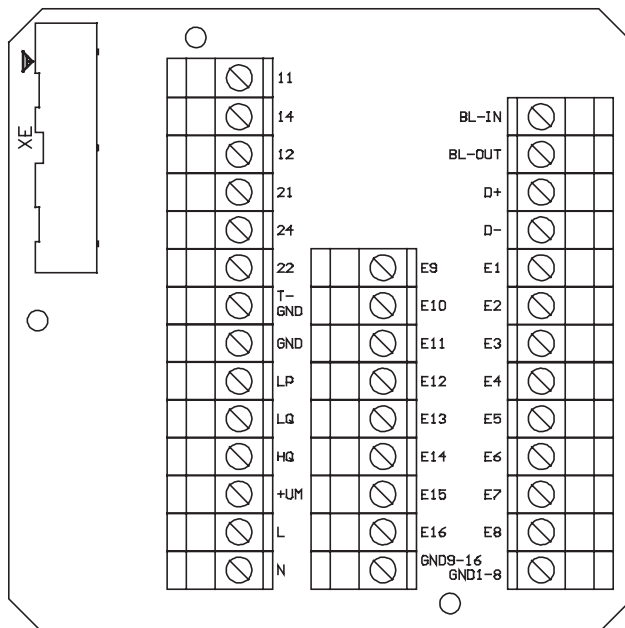
6.2 Check List for networking

⇒ When networking the LMI-96 via the RS-485 connection, one unit should be connected as "Master" and all the others as "Slaves". This is done with the aid of DIP switch SW 1-5 *(see Section 5.3 on page 6.).*

⇒ A matching resistor of 120 R should be connected at the two end-points of the RS485 lead, parallel to the LMI-96 (from D+ to D-).

⇒ An address should be set at each unit *(see Section 5.8 on page 9).*

⇒ The "Master" must always be given the highest address. If therefore, for example, 10 units are to be networked, the Master should receive the Address 10 and the "Slaves" the Addresses 1..9.

⇒ The address 0 is reserved: units with the Address 0 do not participate in communication.

⇒ It should be noted that no 2 units may receive the same address, as otherwise no communication is possible. Changes to the address settings should be carried out with the unit switched off.

7 Connections

The connections are led out to pull-off screw terminals. This permits extremely convenient wiring.

The optional Open-Emitter outputs for parallel connection of the channel relays are led out to a 20-pin tab connector (XE).

7.1 Description of terminal markings

11	Group signal (lamp) = changeover contact
14	Group signal (lamp) = NO contact
12	Group signal (lamp) = NC contact
21	New-value signal (horn) = changeover contact
24	New-value signal (horn) = NO contact
22	New-value signal (horn) = NC contact

T-GND Ground for inputs LP, LQ, HQ
On units with integral buttons and as soon as using the +Um terminal to supply the external buttons this connection should be connected to the GND Ground terminal.

GND, +Em Auxiliary supply and reference potential
This voltage (12V DC) is used to supply the external buttons. The Ground potential GND is the reference potential for the electronics of the unit. It should be noted there is not a genuine electrical isolation between the N and GND terminals on all models of the unit. On no account however should the GND terminals of different units be linked directly, as otherwise equipotential currents can flow which adversely affect the function of the unit.

LP, LQ, HQ Inputs for external buttons or coupling
Several units can be connected via these terminals. All annunciators can then be tested and acknowledged from a single LMI-96. For this purpose, the Ground terminal GND of the LMI-96 should be connected to the floating terminals T-GND of the other units.
In the case of RS485 networking, this connection becomes superfluous *(see Section 6.1 on page 9).*

L, N Operating voltage for the LMI-96, according to Version.
With the DC Version: L = + E_{op} ; N = -E_{op}

E1..E16 Signal inputs
The signal inputs are divided into two groups of 8 inputs each. Each group uses its own reference potential. In the case of DC voltage signals, it should be noted that the reference potential (0V) of the signal voltage is connected to the reference potential of the input group.

GND E1-8 Reference potential for inputs E1..E8
GND E9-16 Reference potential for inputs E9..E16

D+, D- RS-485 connection
If RS-485 communication is required, all the units are to be connected to their D+ or D- connections by means of a 2-strand twisted, if possible screened lead. In the case of units located at line ends, a 120R resistor is additionally to be connected in parallel (matching resistor)

7.2 Terminal assignment, XE connector

The outputs A1..A16 are functionally a replica of the LEDs H01..H16 and are intended for connection of the parallel channel relays or of a parallel annunciator panel. The outputs are optically insulated and are suitable for signal output of 24 VDC / 5mA . They do not incorporate any series resistors and are not short- circuit-proof.

Signal	Conn'r XE		Signal
A1	1	2	A9
A2	3	4	A10
A3	5	6	A11
A4	7	8	A12
A5	9	10	A13
A6	11	12	A14
A7	13	14	A15
A8	15	16	A16
A1-8_Eext.............	17	18	A9-16_Eext
A1-8_Eext.............	19	20	A9-16_Eext

8 Technical Data

Housing	Panel-mounting 96x96mm
Cutout dimensions............................	91x 91mm
Mounting depth with terminals..........	120mm
Weight	ca. 650g
Supply voltage	acc. to Type from 12 V to 230V AC or DC
Power input	max. 7VA
Temperature range...........................	-10 - +40°C
Signal inputs	optically insulated
Signal outputs.................................	optically insulated, Eext 5-24VDC / 5mA
Relay contacts.................................	changeover max. 250V 5A
Interface for networking	RS485

9 Wiring diagram LMI-96