

# MIP-6

## Motor Insulation Protection



## Instruction Manual


Ver. 28 October 2008

**1. TABLE OF CONTENT**

<b>1.</b>	<b>Table of Content .....</b>	<b>2</b>
<b>2.</b>	<b>Safety &amp; Warnings .....</b>	<b>3</b>
2.1	Safety .....	3
2.2	Attention .....	3
2.3	Warnings .....	3
<b>3.</b>	<b>Technical Data .....</b>	<b>4</b>
3.1	Introduction .....	4
3.2	Options .....	4
3.3	MIP selection .....	5
3.4	Protection features .....	5
3.5	Input features .....	6
3.6	Supervision and communication features .....	6
3.7	Optional serial link communication .....	6
<b>4.</b>	<b>Wiring Diagram .....</b>	<b>7</b>
4.1	Low voltage wiring diagram .....	7
4.2	Medium voltage wiring diagram .....	8
<b>5.</b>	<b>Terminals Description .....</b>	<b>9</b>
<b>6.</b>	<b>Control Keypad .....</b>	<b>11</b>
6.1	LCD Arrangement .....	11
6.2	Push-buttons .....	11
6.3	Status LEDs .....	12
6.4	Reviewing and modifying parameters .....	12
6.5	Special actions performed by the key-pad .....	12
6.5.1	Run self test .....	12
6.5.2	Obtaining software version .....	12
6.5.3	Obtaining default parameters .....	13
6.5.4	Clear statistical data .....	13
6.5.4.1	Data cleared when STATISTICAL DATA is reset. ....	13
6.5.5	Adjusting real time clock .....	14
6.6	Mode pages .....	14
6.7	Blinking messages .....	15
6.8	Constant messages .....	15
6.9	Mode pages and default values .....	16
6.9.1	Insulation parameters settings – page 1 .....	18
6.9.2	I/O Parameters settings – page 2 .....	20
6.9.3	Tripping/alarm Options – page 3 .....	23
6.9.4	Comm. Parameters settings – page 4 .....	24
6.9.5	Measured data – page 5 .....	25
6.9.6	Last 24 hour data – page 6 .....	26
6.9.7	Last 31day data – page 7 .....	26
6.9.8	256 months data – page 8 .....	27
6.9.9	21 years data – page 9 .....	27
6.9.10	Fault data – page 10 .....	28
<b>7.</b>	<b>Case and Cutout Details .....</b>	<b>29</b>
<b>8.</b>	<b>Rear Panel Connection .....</b>	<b>30</b>
<b>9.</b>	<b>Resistor Units RU-7 &amp; RU13 Dimensions .....</b>	<b>30</b>
<b>10.</b>	<b>Technical Specifications .....</b>	<b>31</b>
<b>11.</b>	<b>Ordering Information .....</b>	<b>32</b>

## 2. SAFETY & WARNINGS


### 2.1 Safety

	1	Read this manual carefully before operating the equipment and follow its instructions.
	2	Installation, operation and maintenance should be in strict accordance with this manual, national codes and good practice.
	3	Installation or operation not performed in strict accordance with these instructions will void manufacturer warranty.
	4	Disconnect all power inputs before servicing the MIP-6 and/or the load.

### 2.2 Attention

	1	This product was designed for compliance with IEC 947-4-2 for class A equipment.
	2	Use of the product in domestic environments may cause radio interference, in which case, the user may be required to employ additional mitigation methods.
	3	Utilization category is AC-53a or AC-53b, Form 1. For further information, see Technical Specification

### 2.3 Warnings

	1	Internal components and PCBs are at mains potential when the MIP-6 is connected to mains. This voltage is extremely dangerous and will cause death or severe injury if contacted.
	2	When MIP-6 is connected to mains, even if control voltage is disconnected, full voltage may appear on its internal PCBs.
	3	The MIP-6 must be grounded to ensure correct operation, safety and to prevent damage.

**The company reserves the right to make any improvements or modifications to its products without prior notice.**

### 3. TECHNICAL DATA

#### 3.1 Introduction

Solcons' MIP-6 is a sophisticated OFF-Line Motor Insulation measure and Protection unit. The MIP-6 is designed for testing the insulation resistance of both Low Voltage and Medium Voltage motors (Low voltage model and Medium voltage models are different models). For Low Voltage motors, the MIP-6 is a stand alone unit. For Medium Voltage motors, external RU7 (up to 7200V) or RU13 (up to 13800V) should be used. The MIP-6 is a fully digital unit and can be used for all types of AC motors.

The MIP-6 measures:

- Actual insulation resistance.  
When the optional real time clock is installed, the option MIP-6 is capable to calculate:
- Last hour average insulation resistance.
- Last twenty four hours average insulation resistance.
- Last (previous) month average insulation resistance.
- Last (previous) year average insulation resistance

Two types of Minimum and Maximum insulation resistance levels are recorded. One type is for the present month and the other for minimum and maximum levels, since the last reset.

All above parameters can be displayed and read through the optional RS485 communication. Built in programmable time delay, prevents wrong insulation measurement due to motor cable capacitances and motor induced voltages. The MIP-6 relay protects the system from abnormal low insulation resistance condition in the motor and cabling. Upon fault, the MIP-6 can alarm or trip the motor or prohibit starting. The MIP-6 uses automatically Adjustable DC voltage level for the optimal Insulation resistance measurement. To increase system and user safety maximum DC voltage is 50V.

Insulation measurement range is 0 – 50Mohm for both low voltage and medium voltage types.

The MIP-6 measures the insulation level when the motor is off line. Measurement is performed only when the upstream line contactor is open. A discrete (digital) input is used to inform the MIP-6 if it should measure the insulation resistance or not. The MIP-6 cannot measure the insulation resistance when motor is powered. No damage will occur if the MIP-6 connected properly when the motor is powered.

To prevent mistake and high insulation resistance reading, as a result of a disconnected measurement line, Line Test feature enables user to perform line test and verify that the insulation measurement line is properly connected. This feature tests also that the MIP functions normally. This feature applicable only to M.V. units.

In addition, internal self test is running in the background and testing the MIP-6. Manual self test can be also performed.

The MIP-6 is fully programmable with 8 protection functions, including Insulation Trip, Insulation Alarm, Line Test fail (M.V. units only!), optional Communication Port failure, Internal Fault and three External Faults.

The MIP-6 has a two line, 16 character LCD display and a six buttons keyboard for programming, reading actual values, statistical & maintenance data.

#### 3.2 Options

1. [Real time clock](#). More than 21 years of data can be stored in the MIP-6. Data will be lost if MIP-6 is disconnected from the auxiliary power supply voltage, for more than 2 weeks. The MIP-6 is capable of storing and displaying the following historical values:
    - Average Insulation resistances, hour by hour, of the last 24 hours.
    - Average Insulation resistances, day by day, of the last 31 days.
    - Average Insulation resistances, month by month, of the last 256 months.
    - Average Insulation resistances, year by year, of the last 21 years.
-

2. [RS-485 communication](#) for MIP-6 programming, remote data readings and controlling.
3. [Analog output](#). The MIP-6 can output present insulation level, 1 hour average, 24 hours average or one month average.

### 3.3 MIP selection

Select the MIP-6 according to mains rated voltage.

Low Voltage – Up to 690V line to line.

Medium Voltage 1 – up to 7200V line to line (together with RU7).

Medium Voltage 2 – up to 13800V line to line (together with RU13).

### 3.4 Protection features

The MIP-6 alarms if the motor ground insulation level decreases below a preset value. This relay should protect the motor against too low insulation resistance between motor windings and ground (earth).

For low voltage, up to 690V, the MIP-6 is directly connected to one of the motor phases. For MV, all three motor phases are connected to an external resistor and protection unit RU7/13. The output of the RU7/13 is connected to the MIP-6.

The MIP-6 incorporates one programmable Analog Output (optional) as well as six programmable discrete inputs and six programmable output relays. Four relays are of the N.O. type with one common line to all four. The other two relays are change-over (form C) type.

All inputs and outputs are combined to provide a very flexible package.

All output relays can be programmed as: [TEST COMMAND OFF](#) (M.V. units only!), [TEST COMMAND ON](#) (M.V. units only!), [INS. TST NOT ACT.](#), [INS. TST ACTIVE](#), [INSUL. IN RANGE D](#), [INSUL. IN RANGE C](#), [INSUL. IN RANGE B](#), [INSUL. IN RANGE A](#), [FAULT-FAIL SAFE](#), [FAULT](#), [ALARM-FAIL SAFE](#), [ALARM](#), [TRIP-FAIL SAFE](#), [TRIP](#),

In addition to the above programming options for all relays, each of A, B or C relays can be configured as [TRIPPING/ALARM](#) as shown on the following table:

(i.e. - It is possible to assign certain faults to each one of the relays A, B or C.)

#### The MIP-6 can handle 8 different trips / alarms.

INSULATION TRIP	Programmable level normally used to prevent starting the motor.
INSULATION ALARM	Programmable level normally used to alarm that the insulation level is decreasing.
COMM PORT FAILED	Used to alert for a communication port fault.
LINE TEST FAILED	Used to alert when insulation test line is faulty. Applicable only in MIP-6 for Medium voltage application (with RU7 or RU13).
INTERNAL FAILURE	Background running self test program continuously tests the hardware and software of the MIP-6. This protection can signal if an internal error occurs.
EXTERNAL FAULT 1	
EXTERNAL FAULT 2	Three external fault inputs can be programmed to alarm or trip the motor.
EXTERNAL FAULT 3	

Protection levels and time delay settings are programmable using the key pad on the front panel or through communication.

Note that other relays – D, E and F can not be programmed as a [TRIPPING/ALARM](#) relays.

Refer to section 6.9.3 on page 23 for more details.

### 3.5 Input features

Six optically isolated logic inputs are used. Each input can be programmed as: EXT FAULT 3 N.C., EXT FAULT 3 N.O., EXT FAULT 2 N.C., EXT FAULT 2 N.O., EXT FAULT 1 N.C., EXT FAULT 1 N.O., EMERGENCY RESTART, AUTHORIZED KEY, REMOTE RESET, TEST LINE (M.V. units only!), TEST INSUL. N.C., TEST INSUL. N.O.

### 3.6 Supervision and communication features

A Liquid Crystal Display (LCD), together with a keypad and LEDs enables “user friendly” interface, accurate digital parameters setting, actual parameters readings, and detailed trip and alarm message displays. Unauthorized setting changes can easily be prevented by the correct use of the Authorized key input terminals and settings.

<u>Measured Data</u>	Actual Insulation value, one hour average insulation value <sup>(1)</sup> , 24 hours insulation value <sup>(1)</sup> , previous month average insulation <sup>(1)</sup> , present month minimum and maximum insulation values <sup>(1)</sup> , minimum/maximum insulation values since last reset, output and output contacts status
<u>Last 24 Hours Data</u> <sup>(1)</sup>	Average insulation resistances, hour by hour, of the last 24 hours.
<u>Last 31 Day Data</u> <sup>(1)</sup>	Average insulation resistances, day by day, of the last 31 days.
<u>256 Months Data</u> <sup>(1)</sup>	Average insulation resistances, month by month, of the last 256 months.
<u>21 Years Data</u> <sup>(1)</sup>	Average insulation resistances, year by year, of the last 21 years.
<u>Fault data</u>	Last Trip, Last Alarm, insulation resistance at time of trip, last 10 faults with time and date stamp. <sup>(1)</sup>

**Note:**

<sup>(1)</sup> – Optional when real time clock option is installed.

### 3.7 Optional serial link communication

The MIP-6 is equipped with an optional powerful data communication system.

This communication system is unmatched in its reliability, flexibility and ease of use providing the ideal basis for the design of a modern motor management system.

The MIP-6 incorporates a rear RS485 serial link that uses a MODBUS RTU protocol (The protocol description is not included in this document) to provide high speed data acquisition to supervisory computers.

Data formats have been carefully structured to provide fast notification of alarms and continuous updates of performance parameters.

The following information and control can be accessed through the communication.

(See MIP-6 Communication instruction manual.)

- All Actual data values
- All MIP-6 Parameter Settings (Read & Write)
- All the control commands for the MIP-6 (Measure command, Test line)
- Reset

The MIP-6 system is user expandable. No special engineering skills or tools are required.

For small systems, the host computer can communicate directly with the MIP-6 via a twisted shielded pair.

For larger systems a data highway enables multiple MIP-6 connection. Up to 32 MIP-6s can be added on each twisted pair of the Host serial link with full access to all MIP-6's.

The system also performs high speed data acquisition. Users have a simple and friendly means of creating a fully integrated monitoring and control systems.

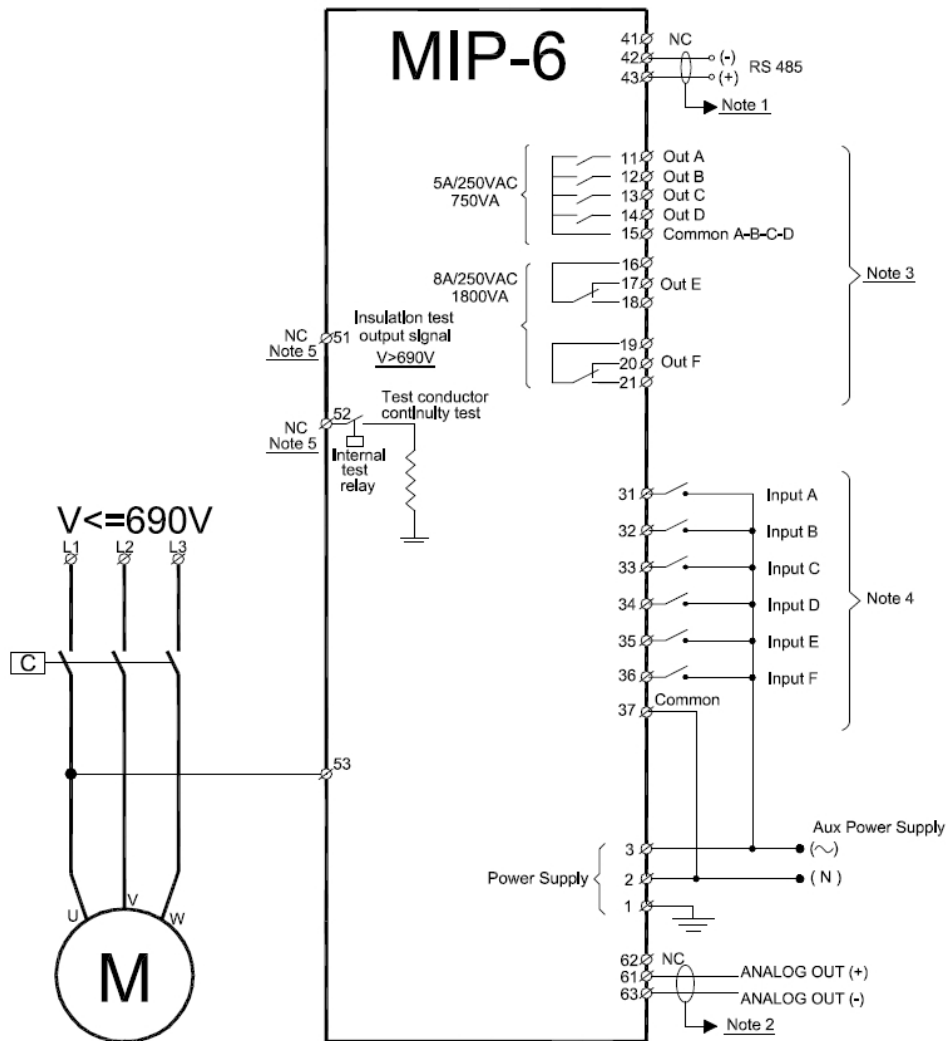
System reliability is exceptionally high, meeting the highest standards of reliable communication in the industry. Included in each message is a 16 bit CRC.

**Notes:**

- Protocols other than MODBUS RTU available upon consultation.
- Terminate serial link cable with 120 Ohm resistors at both ends.

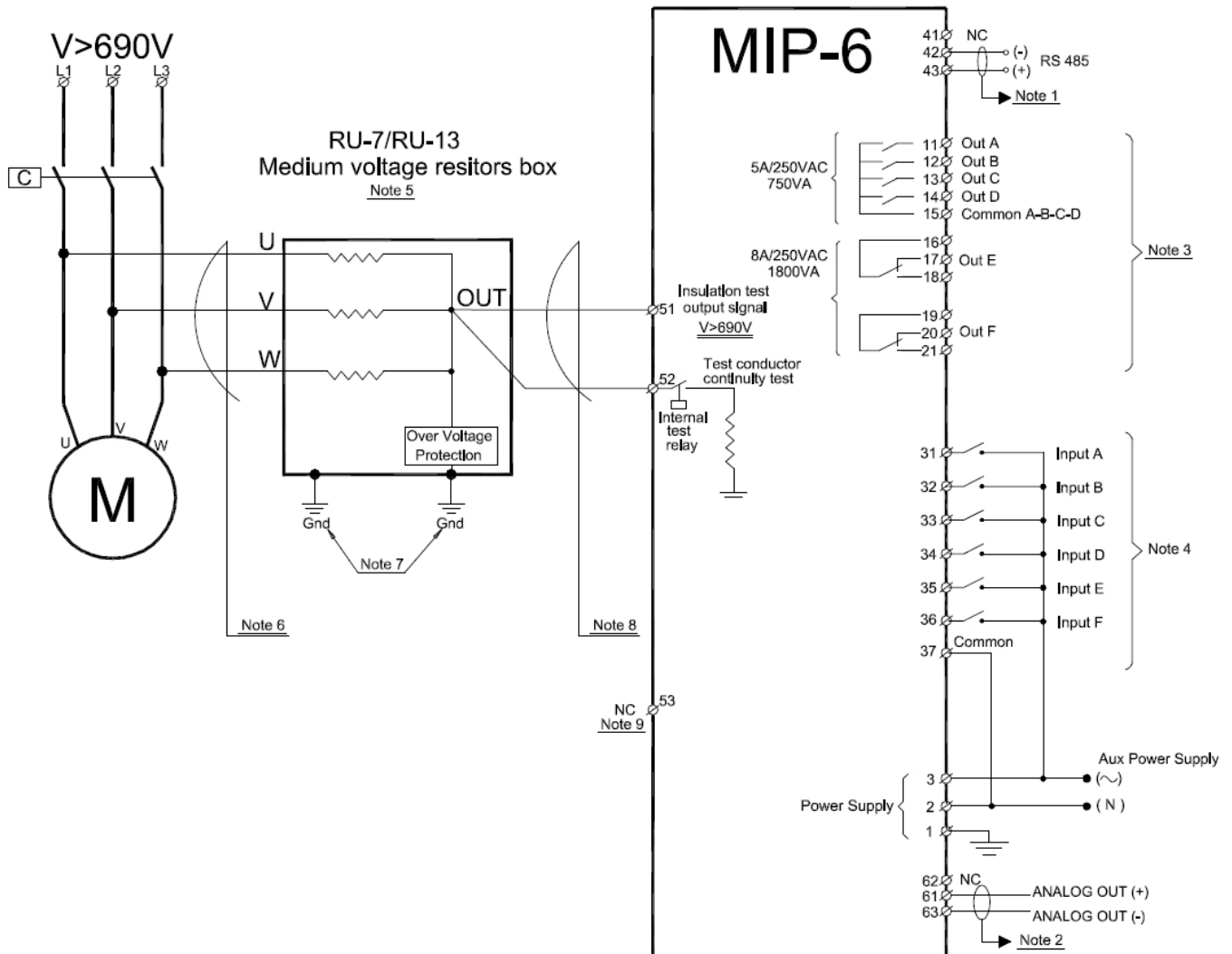
## 4. WIRING DIAGRAM

## 4.1 Low voltage wiring diagram

**Notes:**

- (1) – The optional communication RS485 output is an isolated output. Use shielded twisted pair for RS485 communication. It is recommended to ground the shield near the MIP-6.
- (2) – The optional analog output is an isolated output. Use shielded twisted pair for analog output. It is recommended to ground the shield of the analog output cable at the receiver side.
- (3) – All output relays are programmable. Refer to section 6.9.2 page 20 for more details.
- (4) – All input relays are programmable. Refer to section 6.9.2 page 20 for more details.
- (5) – Leave terminals 51, 52 not connected.

## 4.2 Medium voltage wiring diagram

**Notes:**

- (1) – The optional communication RS485 output is an isolated output. Use shielded twisted pair for RS485 communication. It is recommended to ground the shield near the MIP-6.
- (2) – The optional analog output is an isolated output. Use shielded twisted pair for analog output. It is recommended to ground the shield of the analog output cable at the receiver side.
- (3) – All output relays are programmable. Refer to section 6.9.2 page 20 for more details.
- (4) – All input relays are programmable. Refer to section 6.9.2 page 20 for more details.
- (5) – RU7 is applicable for voltage up to 7.2kV.  
RU13 is applicable for voltage up to 13.8kV.
- (6) – Use medium voltage leads to connect the RU7/13 to the M.V. motor.
- (7) – Use two ground connection to ground the RU7/13.
- (8) – Use low voltage leads from RU7/13 to MIP-6 unless these leads run near M.V. exposed equipment.
- (9) – Leave terminal 53 not connected.



## 5. TERMINALS DESCRIPTION

Indication	Description	Remarks
Terminal 3 – Phase or DC (+) Terminal 2 – Neutral or DC (-) Terminal 1 – Ground	<b><u>Control voltage.</u></b> 85-230VDC/AC (50/60Hz)	Same unit for all range of auxiliary power supply. No need for adjustments of any kind.
Terminal 31 – Input A Terminal 32 – Input B Terminal 33 – Input C Terminal 34 – Input D Terminal 35 – Input E Terminal 36 – Input F Terminal 37 – Common	<b><u>Discrete Inputs.</u></b> 6 programmable discrete inputs. To turn ON an input connect control voltage between it's terminal and the common terminal 37.	Each input can be programmed as: EXT FAULT 3 N.C. EXT FAULT 3 N.O. EXT FAULT 2 N.C. EXT FAULT 2 N.O. EXT FAULT 1 N.C. EXT FAULT 1 N.O. EMERGENCY RESTART AUTHORIZED KEY REMOTE RESET TEST LINE (M.V. units only!) TEST INSUL. N.C. TEST INSUL. N.O. Refer to section 6.9.2 on page 20 for more details.
Terminal 11 – Output relay A N.O Terminal 12 – Output relay B N.O Terminal 13 – Output relay C N.O Terminal 14 – Output relay D N.O Terminal 15 – Common of output relays A, B, C & D.  Terminal 16 – Common of output relay E Terminal 17 – Output relay E N.C Terminal 18 – Output relay E N.O  Terminal 19 – Common of output relay F Terminal 20 – Output relay F N.C Terminal 21 – Output relay F N.O	<b><u>Discrete Outputs.</u></b> 6 programmable discrete outputs.  Discrete outputs A, B, C, D rated 5A/250VAC resistive, 750VA, NO configuration with common terminal.  Discrete outputs E, F rated 8A/250VAC resistive, 1800VA inductive, change over (form C) configuration.	Each output can be programmed as: TRIPPING/ALARM (relays A, B and C only!) TEST COMMAND OFF TEST COMMAND ON INS. TST NOT ACT. INS. TST ACTIVE INSUL. IN RANGE D INSUL. IN RANGE C INSUL. IN RANGE B INSUL. IN RANGE A FAULT-FAIL SAFE FAULT ALARM-FAIL SAFE ALARM TRIP-FAIL SAFE TRIP Refer to section 6.9.2 on page 20 for more details.
Terminal 43 – Serial port (+) Terminal 42 – Serial port (-)	<b><u>Serial link (Optional)</u></b> Standard RS485 half duplex, with MODBUS protocol. Twisted shielded pair should be used for wiring. Shield should be connected to chassis ground externally, near the MIP-6. Acceptable baud rates: 2400, 4800, 9600, 19200 and 38400 BPS.	Refer to section 3.7 on page 6 for more details.  Refer to section 6.9.4 on page 24 for more programming details.  <b>Note:</b> Connect 120 Ohm resistors between (+) and (-) at both sides of the line.

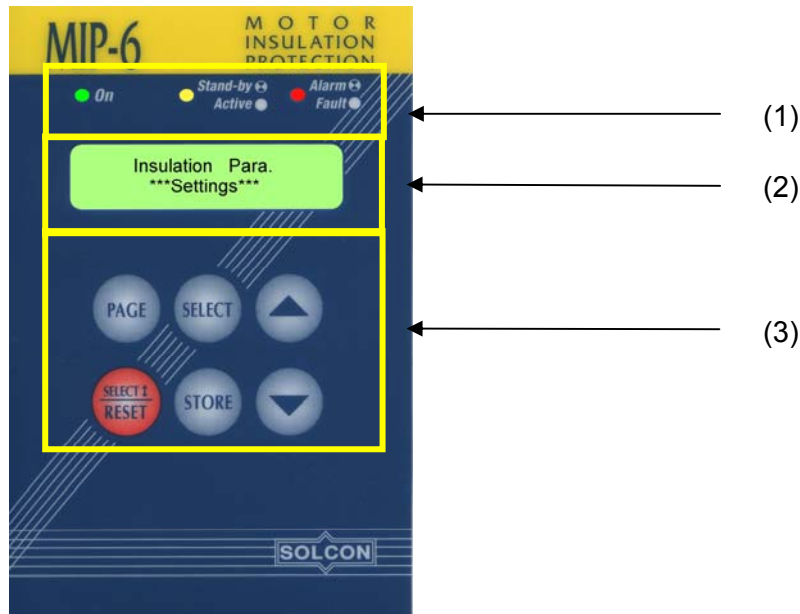
Indication	Description	Remarks
<p>Terminal 51 – Medium voltage insulation input. Terminal 52 – Medium voltage line test input. Terminal 53 – Low voltage insulation input.</p>	<p><b>Insulation inputs</b> <u>For Low voltage</u>, up to 690V line to line, use terminal 53 only. Leave terminals 51 and 52 open. Terminal 53 should be connected directly to one of the motor phases. Terminal 53 can be connected to AC voltage (when live) of 400V maximum (690/1.73), without damage. There is no line test for low voltage.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p><b>WARNING!</b> Terminal 53 is the only, terminal that can be connected directly to mains live voltage of up to 690V line to line. Connecting any live voltage to terminals 51 and/or 52 will cause immediate damage to the MIP-6 and can be dangerous!!! Terminals 51 and/or 52 must be connected to mains only through RU7 (up to 7200V) or RU13 (up to 13800V) unit. !</p> </div> <p><u>For Medium Voltage</u>, use terminals 51 and 52. Terminal 51 is used for the insulation measurement and terminal 52 is used for the line test. Both terminals should be connected to motor via resistors unit RU7/13. It is recommended to use two separate cables. One from terminal 51 to the RU7/RU13 output and the other from terminal 52 to the RU7/RU13 output. Upon Line test, internal resistor is connected to ground on terminal 52. Terminal 51 should measure the parallel resistance of motor insulation and the internal resistance.</p>	
<p>Terminal 61 – Analog out (+) Terminal 63 – Analog out (-)</p>	<p><b>Analog output (Optional)</b> Analog output type can be programmed to 4..20 mA or 0..20 mA. Load resistance should be less than 400Ω. <b>Note:</b> The analog output electronics is fully isolated electronic circuitry. Twisted and Shielded cable must be used. Shield should be connected to ground externally, near the analog output signal receiver.</p>	<p>The Analog output can be programmed to represent one of following parameters: <a href="#">INS. R. AVG. -1MNTH</a><sup>(1)</sup> <a href="#">INS. RES. AVG. -24H</a><sup>(1)</sup> <a href="#">INS. RES. AVG. -1H</a><sup>(1)</sup> <a href="#">INSULATION RES.</a> Refer to section 6.9.2 on page 20 for more details. Note: <sup>(1)</sup> – Applicable only when real time clock option is installed.</p>

## 6. CONTROL KEYPAD

The control keypad is the link between the MIP-6 and the user.

The MIP-6 control keypad features:

- (1) Three indication LEDs (*On*, *Stand by/Active*, *Fault/Alarm*)
- (2) Two lines of 16 alphanumeric characters each.
- (3) Six push-buttons (**Page**, **Select/Reset**, **Select**, **Store**, Up (▲) and down (▼) keys).








### 6.1 LCD Arrangement


CONFIG. INPUT A  
TEST INSUL. N.O.

Upper line displays function.

Lower line displays setting and/or measured values.

### 6.2 Push-buttons

	Allows the operator to browse through the display and programming menus available in the MIP-6.
	Allows the operator to select a function within each <b>Page</b> . <b>Note:</b> Pressing <b>Select</b> continuously changes shown parameters continuously.
	Allows the operator to increase adjusted values shown in the display. Operator should press this button momentarily, for slow value changes in the display, or continuously, for rapid value changes in the display.
	Allows the operator to decrease adjusted values shown in the display. Operator should press this button momentarily, for slow value changes in the display, or continuously, for rapid value changes in the display.
	Allows the operator to store modified parameters in the non-volatile memory to save modified parameters. When <b>Store</b> is pressed while actual value is displayed, this display becomes the default display.

	<p>This key has two functions:</p> <ul style="list-style-type: none"> <li>Used to toggle between “backwards” and “forward” while pressing <b>Select</b> key. When pressing <b>Select</b> key, an underline mark will show/not show on the first digit of the second row of the display. While underline mark shows – <b>Select</b> key goes “backwards”. While underline mark does not show – <b>Select</b> key goes “forward”.</li> <li>When MIP-6 is in latched trip or in alarm status the <b>Reset</b> key allows the user to reset the unit. The <b>Reset</b> key has to be pressed for 1 second in order to reset the MIP-6.</li> </ul>
---	---

### 6.3 Status LEDs.

●	Green	On	Lights when control supply voltage is connected to the MIP-6.
●	Yellow	<i>Stand-by/ Active</i>	Blinks when in stand-by. Lights when measurement is active.
●	Red	<i>Alarm/ Fault</i>	Blinks when in alarm. Lights when in fault condition.

### 6.4 Reviewing and modifying parameters

Press **Page** key several times until you reach the required Mode page.  
Press **Select** key to review parameters of this Mode.

When reaching the required parameter, modify its values with ▼ or ▲ keys.

Once value is set press **Store key**. Once data was properly stored in the non-volatile memory, the LCD will display DATA SAVED OK for 2 seconds.

In addition the modified parameter/s can be stored at the end of every mode page.

Press **Select** until STORE ENABLE XXX PARAMETERS message appears, then press **Store** key. The LCD will display DATA SAVED OK for 2 seconds.

### 6.5 Special actions performed by the key-pad.

#### 6.5.1 Run self test

Press **Page** and ▼ keys simultaneously.

The LCD will display:

```
TEST / MAINTENANCE
***OPTIONS***
```

Press **Select** key.

The LCD will display:

```
RUN SELF TEST?
PUSH 'VALUE-UP'
```

To perform a self test push UP ARROW.

If self test OK, display will show:

```
SELF TEST PASSED
```

Press **Mode** key to exit test/maintenance mode.

#### 6.5.2 Obtaining software version

Press **Page** and ▼ keys simultaneously.

The LCD will display:

```
TEST / MAINTENANCE
*****OPTIONS*****
```

Press **Select** key twice.

The LCD will display the software version:

BTL-04/10/2006  
MIP6-051006-Mb

Press **Mode** key to exit test/maintenance mode

### 6.5.3 **Obtaining default parameters**

Press **Page** and **▼** keys simultaneously.

The LCD will display:

TEST / MAINTENANCE  
\*\*\*\*\*OPTIONS\*\*\*\*\*

Press **Select** key three times.

The LCD will display:

STORE NOW ?  
DEFAULT SETTINGS

To obtain “default parameters” press **Page+Store** simultaneously.

The LCD will display:

DATA SAVED OK

At this point (If “default parameters” were obtained) the MIP-6 exit test/maintenance mode.

#### **CAUTION!**

Obtaining Default Parameters erases all previously modified settings and requires the operator to program all parameters values again.

### 6.5.4 **Clear statistical data**

Press **Page** and **▼** keys simultaneously.

The LCD will display:

TEST / MAINTENANCE  
\*\*\*\*\*OPTIONS\*\*\*\*\*

Press **Select** key four times.

The LCD will display:

CLEAR NOW ?  
STATISTICAL DATA

To clear “statistical data” press **Reset+Store** simultaneously.

The LCD will display:

DATA SAVED OK

At this point (If “statistical data” is cleared) the MIP-6 exit test/maintenance mode.

#### 6.5.4.1 Data cleared when STATISTICAL DATA is reset.

The following data is cleared when STATISTICAL DATA is cleared:

- Total measure time
- Total # of trips
- Min. Insulation Resistances (general and of present month)
- Max. Insulation Resistances (general and of present month)
- Pre Trip Insulation value
- Last Trip
- Last Alarm
- Previous trips information and time stamps
- Hour, Date, Month, Year arrays with Insulation resistance history !

#### **CAUTION!**

After clearing statistical data it is not possible to retrieve any cleared values.

### 6.5.5 **Adjusting real time clock**

Press **Page** and **▼** keys simultaneously.

The LCD will display:

```
TEST / MAINTENANCE
*****OPTIONS*****
```

Press **Select** key five times.

The LCD will display:

```
hh.mm      dd.mm.yy
09:10      29/11/06
```

Pay attention to the under line mark under the hour value.

modify the hour value with **▼** or **▲** keys.

Press **Store** key.

The LCD will display:

```
DATA SAVED OK
```

And after few seconds will change to:

```
hh.mm      dd.mm.yy
09:10      29/11/06
```

Pay attention to the under line mark under the minutes value.

Repeat the same procedure as for the hour settings to seconds, day, month and year settings.

After **Store** key is pressed last time the LCD will display:

```
DATA SAVED OK
```

At this point the MIP-6 exit test/maintenance mode.

#### **NOTE!**

For longer life, the Real Time Clock uses a backup capacitor and not a backup battery. The backup capacitor retains data and keeps clock running for a few days.

If the MIP-6 is not powered for a longer period, the clock has to be initialized. Initialization can be done manually as described above or through a serial link.

### 6.6 **Mode pages**

Upon initiation of the MIP-6, the LCD displays:

```
INSULATION PARA.
***SETTINGS***
```

By pressing the **Page** key all mode pages can be reviewed:

```
I/O PARAMETERS
***SETTINGS***
```

```
TRIPPING/ALARM
***OPTIONS***
```

```
COMMUNICATION P.
***SETTINGS***
```

```
MEASURED DATA
_****_
```

```
LAST 24 HOUR DATA
_****_
```

```
LAST 31 DAY DATA
_****_
```

```
256 MONTHS DATA
_****_
```

```
21 YEARS DATA
_****_
```

```
FAULT DATA
_****_
```

**Notes:**

1. Pressing **Store** key while the LCD displays an "Actual Data" parameter, will store this parameter as default display. If no key is pressed for more than five minutes, this parameter will be constantly displayed.
2. Pressing **Store** key, while the LCD displays a header, will store this header as the default display. If no key is pressed for more than five minutes this header will be constantly displayed.

**6.7 Blinking messages**

Blinking messages are displayed as a response to an event.

Blinking message is displayed for 2 seconds and then the display returns to the previous message.

Blinking messages are usually displayed as a response to an operator action.

The messages are either to confirm activation of the requested operation, or to indicate a reason for not doing so.

<b>Display</b>	<b>Description</b>
DATA SAVED OK	Displayed after pressing <b>Store</b> key. If an error is found during store process, then next message is shown.
STORAGE ERROR	Displayed when an error is found in the store process.
WRONG PARAMETERS	Displayed after power-up, if the non-volatile parameter check sum is found to be wrong.
UNAUTHORIZED ACCESS	When Authorized Key is open (locked), and a parameter change is attempted. Also displayed after Unauthorized Store and Reset action.
SELF TEST PASSED	Displayed as a response to running the built in test procedure, provided that all tests were "OK".
SELF TEST FAILED ERROR CODE=32	Displayed as a response to finding an error during the operation of test procedure. In case of test failure, reset and test again. If problem persists then error code should be reported to an authorized factory representative.

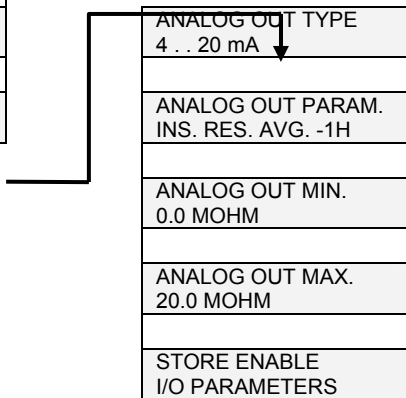
**6.8 Constant messages**

Constant messages are displayed upon a fault.

<b>Display</b>	<b>Description</b>
ALARM LINE TEST FAILED	Displayed when the Alarm LED illuminates. The lower line displays the Alarm name.
TRIP INSULATION TRIP	Displayed when the Trip LED illuminates. The lower line displays the Trip name.
ALARM: INT. FAILURE=XX	Displays in case of an internal failure. Error code should be reported to an authorized factory representative.

6.9 Mode pages and default values

INSULATION PARA. ***SETTINGS***	I/O PARAMETERS ***SETTINGS***	TRIPPING/ALARM ***OPTIONS***	COMMUNICATION P. ***SETTINGS***	MEASURED DATA --****--
See page 18	See page 20	See page 23	See page 24	See page 25
Display and default values	Display and default values		Display	Display
WAIT BEFORE TEST 2 MIN	CONFIG. INPUT A TEST INSUL. N.O.		BAUD RATE 19200	INSULATION RES. 34377 KOHM
INSUL. TRIP LVL 1.0 MOHM	CONFIG. INPUT B TEST LINE		ADDRESS NUMBER OFF	1 HOUR AVG. INSUL 23456 KOHM
INSUL. TRIP DLY 10 MIN.	CONFIG. INPUT C REMOTE RESET		S.LINK PAR. SAVE DISABLE	24 HOUR AVG. INSUL 24456 KOHM
INSUL. ALARM LVL 2.0 MOHM	CONFIG. INPUT D AUTHORIZED KEY		S.LINK CONTROL DISABLE	PREV. MONTH AVG. 34566 KOHM
INSUL. ALARM DLY 10 MIN.	CONFIG. INPUT E EXT FAULT 1 N.O.		FRONT COM ADDRES OFF	THIS MONTH MIN. 12345 KOHM.
INSUL. RANGE A 4.0 MOHM	CONFIG. INPUT F EXT FAULT 2 N.O.		STORE ENABLE COMM. PARAMETERS	THIS MONTH MAX. 4321 KOHM.
INSUL. RANGE B 6.0 MOHM	PARAM. SETTINGS NOT LOCKED			MINIMUM INSUL. R 34521 KOHM.
INSUL. RANGE C 8.0 MOHM	CONFIG. OUTPUT A INSUL. IN RANGE D			MAXIMUM INSUL. R 99888 KOHM.
INSUL. RANGE D 10.0 MOHM	OUTPUT DELAY 600 SEC.			IN # 1 2 3 4 5 6 0 1 1 0 0 0
DISPLAY MODE FULL DISPLAY	CONFIG. OUTPUT B INSUL. IN RANGE C			OUT # 1 2 3 4 5 6 0 1 1 0 0 0
STORE ENABLE INSULATION PARA.	OUTPUT DELAY 600 SEC.			TOTAL MEASURE T. 2 HOURS
	CONFIG. OUTPUT C INSUL. IN RANGE B			TOTAL # OF TRIPS 0
	OUTPUT DELAY 600 SEC.			
	CONFIG. OUTPUT D INSUL. IN RANGE A			
	OUTPUT DELAY 600 SEC.			
	CONFIG. OUTPUT E ALARM			
	OUTPUT DELAY 300 SEC.			
	CONFIG. OUTPUT F TRIP			
	OUTPUT DELAY 120 SEC.			





LAST 24 HOUR DATA __****__	LAST 31 DAY DATA __****__	256 MONTHS DATA __****__	21 YEARS DATA __****__	FAULT DATA __****__
See page 26	See page 26	See page 27	See page 27	See page 28
Display	Display	Display	Display	Display
PREVIOUS INSUL.: AVERAGE VALUES	PREVIOUS INSUL.: AVERAGE VALUES	PREVIOUS INSUL.: MONTH/YEAR	PREVIOUS INSUL.: MONTH/YEAR	LAST ALARM INTERNAL FAILURE
HOUR=0..... 23 52.6 MOHM	DATE=1..... 31 51.3 MOHM	04/00 AVG, MIN, MX 60.0 60.0 60.0 M	04/00 AVG, MIN, MX 60.0 60.0 60.0 M	PRE TRIP INSUL. 0 KOHM
PREVIOUS INSUL.: AVERAGE VALUES				LAST 10 TRIPS: HH:MM DD/MM/YY

6.9.1 **Insulation parameters settings – page 1**

<b>INSULATION PARA. ***SETTINGS***</b>		
<b>Display and default values</b>	<b>Range</b>	<b>Description</b>
WAIT BEFORE TEST 2 MIN	0 – 960 min.	Idle time after measure command. Insulation measurement starts after the WAIT BEFORE TEST TIME has elapsed.
INSUL. TRIP LVL 1.0 MOHM	0.2 – 25 MOhm.	Trip occurs when present value of measured resistance is lower than INSUL. TRIP LVL, for more than INSUL. TRIP DLY (See next parameter) <b>Note:</b> In order to be activated, this parameter must be programmed to: I/O PARAMETERS SETTINGS – Parameters CONFIG. OUTPUT X (Refer to section 6.9.2 page 20 for more details) TRIPPING/ALARM OPTIONS (Refer to section 6.9.3 page 23 for more details)
INSUL. TRIP DLY 10 MIN.	0 – 960 min.	Time Delay of Insulation trip.
INSUL. ALARM LVL 2.0 MOHM	0.2 – 25 MOhm.	Alarm occurs when present value of measured resistance is lower than INSUL. ALARM LVL, for more than INSUL. ALARM DLY (See next parameter) <b>Note:</b> In order to be activated, this parameter must be programmed to: I/O PARAMETERS SETTINGS – Parameters CONFIG. OUTPUT X (Refer to section 6.9.2 page 20 for more details) TRIPPING/ALARM OPTIONS (Refer to section 6.9.3 page 23 for more details)
INSUL. ALARM DLY 10 MIN.	0 – 960 min.	Time Delay of Insulation alarm.
INSUL. RANGE A 4.0 MOHM	0.2 – 25 MOhm.	Insulation is inside range A (can operate a relay for signalling) when measured Insulation resistance is lower than INSUL. RANGE A setting.
INSUL. RANGE B 6.0 MOHM	0.2 – 25 MOhm.	Insulation is inside range B (can operate a relay for signalling) when measured Insulation resistance is lower than INSUL. RANGE B setting.
INSUL. RANGE C 8.0 MOHM	0.2 – 25 MOhm.	Insulation is inside range C (can operate a relay for signalling) when measured Insulation resistance is lower than INSUL. RANGE C setting.
INSUL. RANGE D 10.0 MOHM	0.2 – 25 MOhm.	Insulation is inside range D (can operate a relay for signalling) when measured Insulation resistance is lower than INSUL. RANGE D setting.
DISPLAY MODE FULL DISPLAY	FULL DISPLAY	Future enhancement.
STORE ENABLE INSULATION PARA.		Storing modified parameters To store selected parameters, press <b>Store</b> key. <b>Note:</b> Storing more than one parameter possible only when

INSULATION PARA. ***SETTINGS***		
Display and default values	Range	Description
		<p>the MIP-6 is not running.</p> <p>While MIP-6 is running each parameter can be changed individually by pressing <b>Store</b> key after modifying the parameter.</p> <p>When parameters are correctly stored, the LCD will read:</p> <div data-bbox="935 398 1334 465" style="border: 1px solid black; padding: 2px; text-align: center;">DATA SAVED OK</div> <p><b><u>This concludes INSULATION PARAMETER settings.</u></b></p> <p>Pressing Select key after DATA SAVED OK returns to the first display in this mode.</p> <p><b><u>Note:</u></b></p> <p>In case of a failure in parameter storing, the LCD displays:</p> <div data-bbox="935 667 1334 734" style="border: 1px solid black; padding: 2px; text-align: center;">STORAGE ERROR</div> <p>In this case load MIP-6 default parameters. Refer to section 6.5.3 on page 13 for more details on loading MIP-6 default parameters.</p>

## 6.9.2 I/O Parameters settings – page 2

<b>I/O PARAMETERS ***SETTINGS***</b>		
<b>Display and default values</b>	<b>Range</b>	<b>Description</b>
CONFIG. INPUT A TEST INSUL. N.O.	EXT FAULT 3 N.C. EXT FAULT 3 N.O. EXT FAULT 2 N.C. EXT FAULT 2 N.O. EXT FAULT 1 N.C. EXT FAULT 1 N.O. EMERGENCY RESTART AUTHORIZED KEY REMOTE RESET TEST LINE TEST INSUL. N.C. TEST INSUL. N.O.	<p>Sets MIP-6 INPUT A.</p> <p><b>EXT FAULT 3 N.C.</b> <sup>(1)</sup> is programmed for open to trip.  <b>EXT FAULT 3 N.O.</b> <sup>(1)</sup> is programmed for close to trip.  <b>EXT FAULT 2 N.C.</b> <sup>(1)</sup> is programmed for open to trip.  <b>EXT FAULT 2 N.O.</b> <sup>(1)</sup> is programmed for close to trip.  <b>EXT FAULT 1 N.C.</b> <sup>(1)</sup> is programmed for open to trip.  <b>EXT FAULT 1 N.O.</b> <sup>(1)</sup> is programmed for close to trip.  <b>EMERGENCY RESTART</b> is programmed to reset and prevent insulation trip by the MIP-6. (See also PARAM. SETTING below)  <b>AUTHORIZED KEY</b> is programmed to prevent parameter modifications. Closing the contact will enable programming the MIP-6.  <b>REMOTE RESET</b> is programmed to remote reset the MIP-6. To remote reset close contact momentarily.  <b>TEST LINE</b> is programmed to start the wiring test of the cable from the resistor unit (RU7/RU13). Close the contact to start the insulation measurement. Applicable only in medium voltage applications.  <b>TEST INSUL. N.C.</b> is programmed to start the insulation measurement. Open the contact to start the insulation measurement.  <b>TEST INSUL. N.O.</b> is programmed to start the insulation measurement. Close the contact to start the insulation measurement</p> <p><b>Note:</b>  <sup>(1)</sup> In order to be activated, this parameter must be programmed to:  I/O PARAMETERS SETTINGS – Parameters CONFIG. OUTPUT X (Refer to section 6.9.2 page 20 for more details)  TRIPPING/ALARM OPTIONS (Refer to section 6.9.3 page 23 for more details)</p>
CONFIG. INPUT B TEST LINE	Same as for CONFIG. INPUT A.	
CONFIG. INPUT C REMOTE RESET	Same as for CONFIG. INPUT A.	
CONFIG. INPUT D AUTHORIZED KEY	Same as for CONFIG. INPUT A.	
CONFIG. INPUT E EXT FAULT 1 N.O.	Same as for CONFIG. INPUT A.	
CONFIG. INPUT F EXT FAULT 2 N.O.	Same as for CONFIG. INPUT A.	
PARAM. SETTINGS NOT LOCKED	LOCKED OUT NOT LOCKED	When set to LOCKED OUT, AUTHORIZED KEY programming in CONFIG INPUT A (See above) functions normally.

I/O PARAMETERS ***SETTINGS***		
Display and default values	Range	Description
		When set to NOT LOCKED, overrides AUTHORIZED KEY programming in CONFIG INPUT A and enables the user to program the MIP-6.
CONFIG. OUTPUT A INSUL. IN RANGE D	TRIPPING/ALARM TEST COMMAND OFF TEST COMMAND ON INS. TST NOT ACT. INS. TST ACTIVE INSUL. IN RANGE D INSUL. IN RANGE C INSUL. IN RANGE B INSUL. IN RANGE A FAULT-FAIL SAFE FAULT ALARM-FAIL SAFE ALARM TRIP-FAIL SAFE TRIP	<p><b>TRIPPING/ALARM</b> <sup>(1)</sup> is programmed when OUTPUT A operates by a group of faults as set in tripping/alarm page. Refer to section 6.9.3 page 23.</p> <p><b>TEST COMMAND OFF</b> is programmed to close the contact when TEST COMMAND is not active. Applicable only in M.V. applications.</p> <p><b>TEST COMMAND ON</b> is programmed to close the contact when TEST COMMAND is active. Applicable only in M.V. applications.</p> <p><b>INS. TST NOT ACT.</b> is programmed to close the contact when insulation test is not active.</p> <p><b>INS. TST ACTIVE.</b> is programmed to close the contact when insulation test is active.</p> <p><b>INSUL. IN RANGE D</b> <sup>(2)</sup> is programmed to close the contact when the insulation level is below insulation level programmed as RANGE D.</p> <p><b>INSUL. IN RANGE C</b> <sup>(2)</sup> same as <b>INSUL. IN RANGE D</b> but for RANGE B.</p> <p><b>INSUL. IN RANGE B</b> <sup>(2)</sup> same as <b>INSUL. IN RANGE D</b> but for RANGE B.</p> <p><b>INSUL. IN RANGE A</b> <sup>(2)</sup> same as <b>INSUL. IN RANGE D</b> but for RANGE B.</p> <p><b>FAULT-FAIL SAFE</b> <sup>(3)</sup> is programmed to close the contact in case of an alarm <b>OR</b> a trip.</p> <p><b>FAULT</b> is programmed to close the contact in case of an alarm <b>OR</b> trip.</p> <p><b>ALARM-FAIL SAFE</b> <sup>(3)</sup> is programmed to close the contact in case of an alarm.</p> <p><b>ALARM</b> is programmed to close the contact in case of an alarm.</p> <p><b>TRIP-FAIL SAFE</b> <sup>(3)</sup> is programmed to close the contact in case of a trip.</p> <p><b>TRIP</b> is programmed to close the contact in case of a trip.</p> <p><b>Notes:</b></p> <p><sup>(1)</sup> TRIPPING/ALARM programming is optional to relays A, B, or C only.</p> <p><sup>(2)</sup> Note that by proper setting of the output relays, it is possible to get on the cabinet, light indication according to the status of motor insulation.</p> <p><sup>(3)</sup> When a relay is configured for FAIL SAFE operation, relay is energized when MIP-6 is powered and de-energized upon fault, ALARM OR TRIP CONDITIONS. It is recommended to assign one relay as a FAIL SAFE, to alarm constantly when the unit is not powered.</p>
OUTPUT DELAY 600 SEC.	0-3600sec.	Sets delay time for OUTPUT A relay.
CONFIG. OUTPUT B INSUL. IN RANGE C	Same as for CONFIG. OUTPUT A.	

<b>I/O PARAMETERS</b> <b>***SETTINGS***</b>		
<b>Display and default values</b>	<b>Range</b>	<b>Description</b>
OUTPUT DELAY 600 SEC.	0-3600sec.	Sets delay time for OUTPUT B relay.
CONFIG. OUTPUT C INSUL. IN RANGE B	Same as for CONFIG. OUTPUT A.	
OUTPUT DELAY 600 SEC.	0-3600sec.	Sets delay time for OUTPUT C relay.
CONFIG. OUTPUT D INSUL. IN RANGE A	Same as for CONFIG. OUTPUT A, except that in relay D TRIPPING/ALARM programming is not optional.	
OUTPUT DELAY 600 SEC.	0-3600sec.	Sets delay time for OUTPUT D relay.
CONFIG. OUTPUT E ALARM	Same as for CONFIG. OUTPUT A, except that in relay E TRIPPING/ALARM programming is not optional.	
OUTPUT DELAY 300 SEC.	0-3600sec.	Sets delay time for OUTPUT E relay.
CONFIG. OUTPUT F TRIP	Same as for CONFIG. OUTPUT A, except that in relay F TRIPPING/ALARM programming is not optional.	
OUTPUT DELAY 120 SEC.	0-3600sec.	Sets delay time for OUTPUT F relay.
ANALOG OUT TYPE 4 . . 20 mA	4 . . 20 Ma 0 . . 20 mA	Sets the type of the analog output.
ANALOG OUT PARAM. INS. RES. AVG. -1H	INS. R. AVG. -1MNTH INS. RES. AVG. -24H INS. RES. AVG. -1H INSULATION RES.	Sets MIP-6 analog output. (Terminals 61 out(+), 63 out(-)) <b>INS. R. AVG. -1MNTH</b> - is programmed when analog output is related to the average insulation level in the last month. <b>INS. RES. AVG. -24H</b> - is programmed when analog output is related to the average insulation level in the last 24 hours. <b>INS. RES. AVG. -1H</b> - is programmed when analog output is related to the average insulation level in the last one hour. <b>INSULATION RES.</b> - is programmed when analog output is related to the actual insulation level being measured.
ANALOG OUT MIN. 0.0 MOHM	0.0-1.0MOhm	Sets the minimum value of the analog output related to 0mA or 4 mA as programmed in ANALOG OUT TYPE (See above)
ANALOG OUT MAX. 20.0 MOHM	1.0-50.0MOhm	Sets the maximum value of the analog output related to 20mA.
STORE ENABLE I/O PARAMETERS	Same as STORE ENABLE INSULATION PARA. on page 18.	

### 6.9.3 Tripping/Alarm Options – page 3

For easy viewing, tripping/alarm pages are not listed as in other pages but as a table.

As shown in the following table, each of relays A, B or C can be programmed to react to one or more of eight fault conditions.

Note that other relays – D, E and F can not be programmed as a “tripping/alarm” relays.

**Notes:**

1. **All protections MUST be programmed in this page in order to be operative!!**
2. Each of the faults listed below can be programmed as DISABLED (-) or ENABLED (+)
3. The table below shows factory defaults.

FAULT	Trip	Alarm	Auto Reset	Panel Reset	Remote Reset	Output A	Output B	Output C
INSULATION TRIP	+	-	-	+	+	-	-	-
INSULATION ALARM	-	+	-	+	+	-	-	-
COMM PORT FAILED	-	+	-	+	+	-	-	-
LINE TEST FAILED	-	+	-	+	+	-	-	-
INTERNAL FAILURE	-	+	-	+	+	-	-	-
EXTERNAL FAULT 1	-	-	-	+	+	-	-	-
EXTERNAL FAULT 2	-	-	-	+	+	-	-	-
EXTERNAL FAULT 3	-	-	-	+	+	-	-	-

6.9.4 **Comm. Parameters settings – page 4**

<b>COMMUNICATION P. ***SETTINGS***</b>		
<b>Display and default values</b>	<b>Range</b>	<b>Description</b>
BAUD RATE 19200	OFF, 19200, 9600, 4800, 2400, 1200	Sets MIP-6 BAUD RATE. Available only when communication option is installed.
ADDRESS NUMBER OFF	OFF, 1-247	Sets MIP-6 rear communication ADDRESS LINK NO. Available only when Communication option is installed.
S.LINK PAR. SAVE DISABLE	ENABLE DISABLE	When set to DISABLE, it prevents parameter setting through serial link communication. When set to ENABLE, parameter setting through serial link is enabled.
S.LINK CONTROL DISABLE	ENABLE DISABLE	When set to DISABLE, it prevents DO NOT MEASURE, MEASURE, LINE TEST, REMOTE RESET commands through serial link communication. When set to ENABLE, commands through serial link are enabled.
FRONT COM ADDRES OFF	OFF, 1-247	This is a future enhancement.
STORE ENABLE COMM. PARAMETERS		Same as STORE ENABLE INSULATION PARA On page 18.



6.9.5 **Measured data – page 5**

MEASURED DATA --****--	
Display	Description
INSULATION RES. 34377 KOHM	Displays the actual measured value of the resistance. Range: 0kOhm – 60000kOhm.
1HOUR AVG. INSUL 23456 KOHM	Displays the average measured resistance of the last 1 hour. Range: 0kOhm – 60000kOhm.
24HOUR AVG. INSUL 24456 KOHM	Displays the average measured resistance of the last 24 hours. Range: 0kOhm – 60000kOhm.
PREV. MONTH AVG. 34566 KOHM	Displays the average measured resistance of the previous month. Range: 0kOhm – 60000kOhm.
THIS MONTH MIN. 12345 KOHM.	Displays the <b>minimum</b> measured resistance of this month. Range: 0kOhm – 60000kOhm.
THIS MONTH MAX. 4321 KOHM.	Displays the <b>maximum</b> measured resistance of this month. Range: 0kOhm – 60000kOhm.
MINIMUM INSUL. R 34521 KOHM.	Displays the minimum resistance measured since last reset. To reset this value, push the Reset button for more then 0.5 sec. Range: 0kOhm – 60000kOhm.
MAXIMUM INSUL. R 99888 KOHM.	Displays the maximum resistance value measured since last reset. To reset this value, push the Reset button for more then 0.5 sec. Range: 0kOhm – 60000kOhm.
IN # 1 2 3 4 5 6 0 1 1 0 0 0	Displays a status indication of the six digital inputs. “0” indicates open, “1” indicates closed.
OUT # 1 2 3 4 5 6 0 1 1 0 0 0	Displays a status indication of the six digital outputs. “0” indicates open, “1” indicates closed.
TOTAL MEASURE T. 2 HOURS	Displays total hours of active insulation measurement. Range: 0 – 65000. At 65000 this parameter is resets to zero. (approx. 7.4 years)
TOTAL # OF TRIPS 0	Displays total number of trips. Range: 0 – 65535.

6.9.6 **Last 24 hour data – page 6**

<b>LAST 24HOUR DATA</b> --****--	
<b>Display</b>	<b>Description</b>
PREVIOUS INSUL.: AVARAGE VALUES	This is a header for the following screens, specifying that the following values are hourly averaged values.
HOUR=3 20.6 MOHM	First line specifies the hour (Last full hour before present hour), at the end of which, average insulation value was recorded. Second line shows the recorded insulation value. When no button is pressed the display shows a scrolling screens with previous hours data. Range: 0 – 60MOhm.
HOUR=2 20.4 MOHM	Previous hour data. Range: 0 – 60MOhm.
HOUR=1 20.4 MOHM	Previous hour data. Range: 0 – 60MOhm.
HOUR=0 20.4 MOHM	Previous hour data. Range: 0 – 60MOhm.
HOUR=23 20.4 MOHM	Previous hour data. Range: 0 – 60MOhm.
HOUR=..... 52.6 MOHM	Display 19 more screens (to complete 24 screens with hours data) showing average insulation values for HOUR=22 to HOUR=4. Range: 0 – 60MOhm.

6.9.7 **Last 31day data – page 7**

<b>LAST 31 DAY DATA</b> --****--	
<b>Display</b>	<b>Description</b>
PREVIOUS INSUL.: AVARAGE VALUES	This is a header for the following screens, specifying that the following values are daily averaged values.
Date=3 20.6 MOHM	First line specifies the date (date of yesterday), at the end of which, at 24:00, average insulation value was recorded. Second line shows the recorded insulation value. When no button is pressed the display shows a scrolling screens with previous days data. Range: 0 – 60MOhm.
Date=3 20.4 MOHM	Previous day data. Range: 0 – 60MOhm.
Date=2 20.4 MOHM	Previous hour data. Range: 0 – 60MOhm.
Date=1 20.4 MOHM	Previous day data. Range: 0 – 60MOhm.
Date=0 20.4 MOHM	Previous day data. Range: 0 – 60MOhm.
Date=31 20.4 MOHM	Previous day data. If last month is less than 31 days, the extra day will show: "NO DATA"

LAST 31 DAY DATA --****--	
Display	Description
	Range: 0 – 60MOhm.
DATE=..... 52.6 MOHM	Display 26 more screens (to complete 31 screens) showing average insulation values for DATE=30 to DATE=4.
	Range: 0 – 60MOhm.

6.9.8 **256 months data – page 8**

256 MONTHS DATA --****--	
Display	Description
PREVIOUS INSUL.: AVARAGE VALUES	This is a header for the following screens, specifying that the following values are monthly averaged values.
04/00 AVG, MIN, MX 60.0 60.0 60.0 M	First line specifies the month (Month/Year), at the end of which, at last day, at 24:00, average, minimum and maximum insulation values of the 31 month days was recorded. It also specifies that the three numbers in the second line are average, minimum and maximum values. When days 29, 30 and 31 days do not exist it will not influence the average. Second line shows the recorded insulation value. When no button is pressed the display shows a scrolling screens with previous months data. Range: 0 – 60MOhm.
03/00 AVG, MIN, MX 60.0 60.0 60.0 M	Previous month data. Range: 0 – 60MOhm.
02/00 AVG, MIN, MX 60.0 60.0 60.0 M	Previous month data. Range: 0 – 60MOhm.
01/00 AVG, MIN, MX 60.0 60.0 60.0 M	Previous month data. Range: 0 – 60MOhm.
12/99 AVG, MIN, MX 60.0 60.0 60.0 M	Previous month data. Range: 0 – 60MOhm.
11/01 AVG, MIN, MX 60.0 60.0 60.0 M	Display up to total of 256 screens showing average, minimum and maximum insulation levels for all previous months since commissioning or since resetting of actual data. Range: 0 – 60MOhm.

6.9.9 **21 years data – page 9**

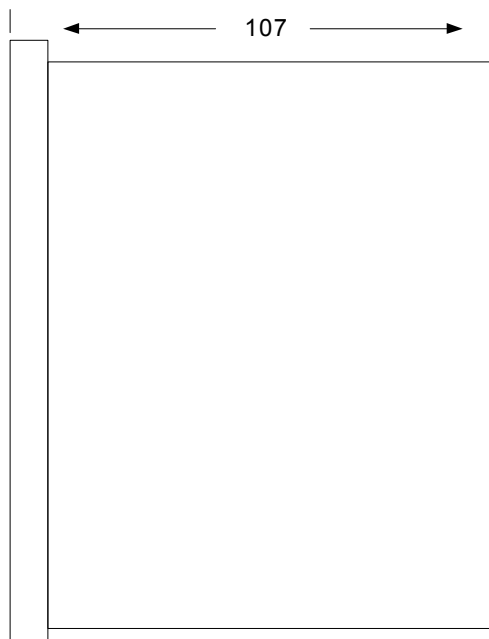
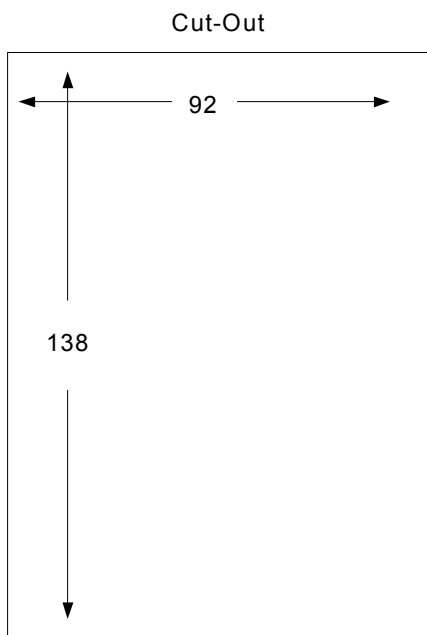
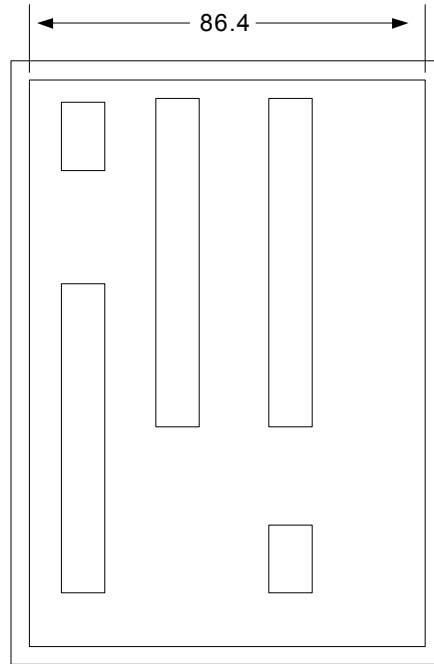
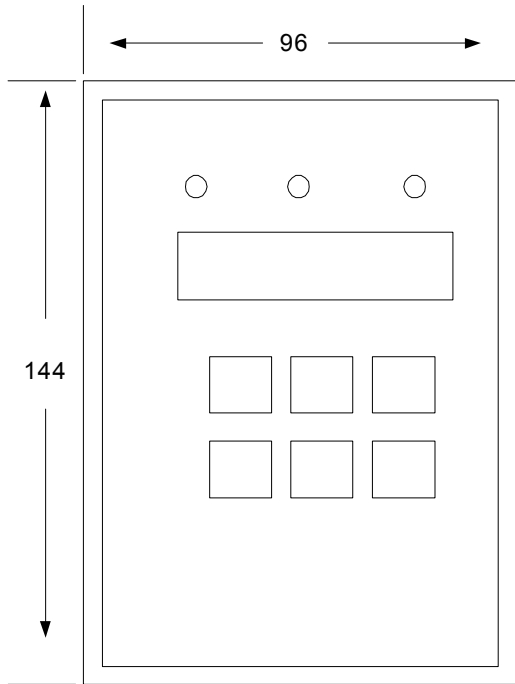
21 YEARS DATA --****--	
Display	Description
PREVIOUS INSUL.: AVARAGE VALUES	This is a header for the following screens, specifying that the following values are yearly averaged values.
YEAR=08 60.0 MOHM	First line specifies the year (last year), at the end of which, at December 31, at 24:00, <b>average</b> insulation values of the year 12 months was calculated and recorded. Second line shows the recorded insulation value. When no button is pressed the display shows a scrolling screens with previous years data. Range: 0 – 60MOhm.
YEAR=07 60.0 MOHM	Previous year data. Range: 0 – 60MOhm.

<b>21 YEARS DATA</b> _****_	
<b>Display</b>	<b>Description</b>
YEAR=06 60.0 MOHM	Previous year data. Range: 0 – 60MOhm.
YEAR=.. 45.5 MOHM	Display up to total of 21 screens showing average levels for all previous years since commissioning or since resetting of actual data. Range: 0 – 60MOhm.

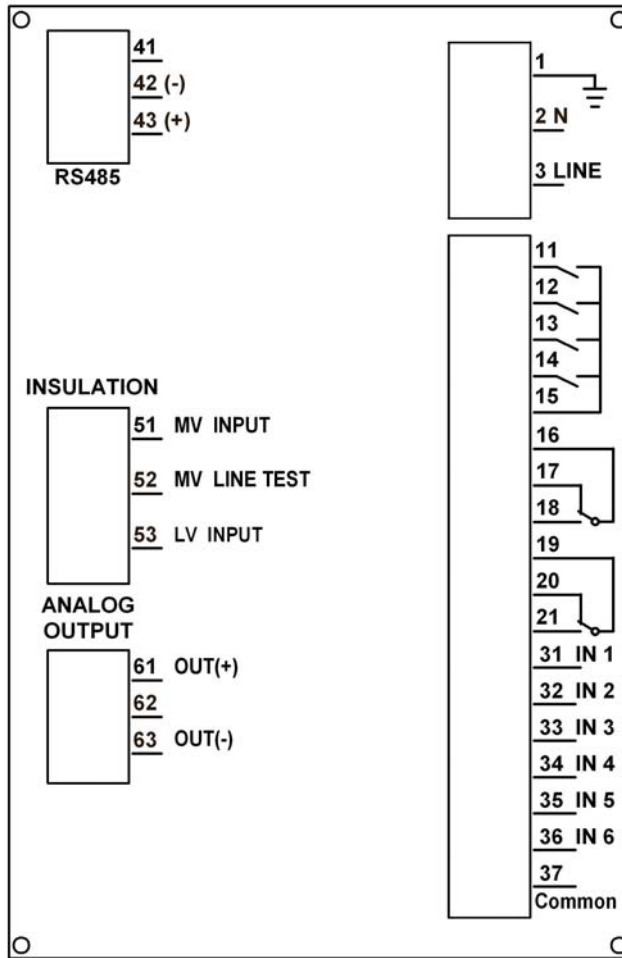
6.9.10 **Fault data – page 10**

<b>FAULT DATA</b> _****_	
<b>Display and default values</b>	<b>Description</b>
LAST TRIP INTERNAL FAILURE	Displays last active fault that was enabled as a trip.
LAST ALARM INTERNAL FAILURE	Displays last active fault that was enabled as an alarm.
PRE TRIP INSUL. 0 KOHM	Displays values of insulation resistance before last trip.
LAST 10 TRIPS: HH:MM DD/MM/YY	Displays the header of next 10 screens showing the details of last 10 trips with time stamps. hour: minutes Day/Month/Year
INSULATION TRIP 18:00 16/07/07	Displays last trip with its time stamp.
EXTERNAL FAULT 1 18:00 16/07/07	Displays previous trip with its time stamp.
EXTERNAL FAULT 2 19:00 17/07/07	Displays previous trip with its time stamp.
NO DATA	Displays in case no fault data exist.

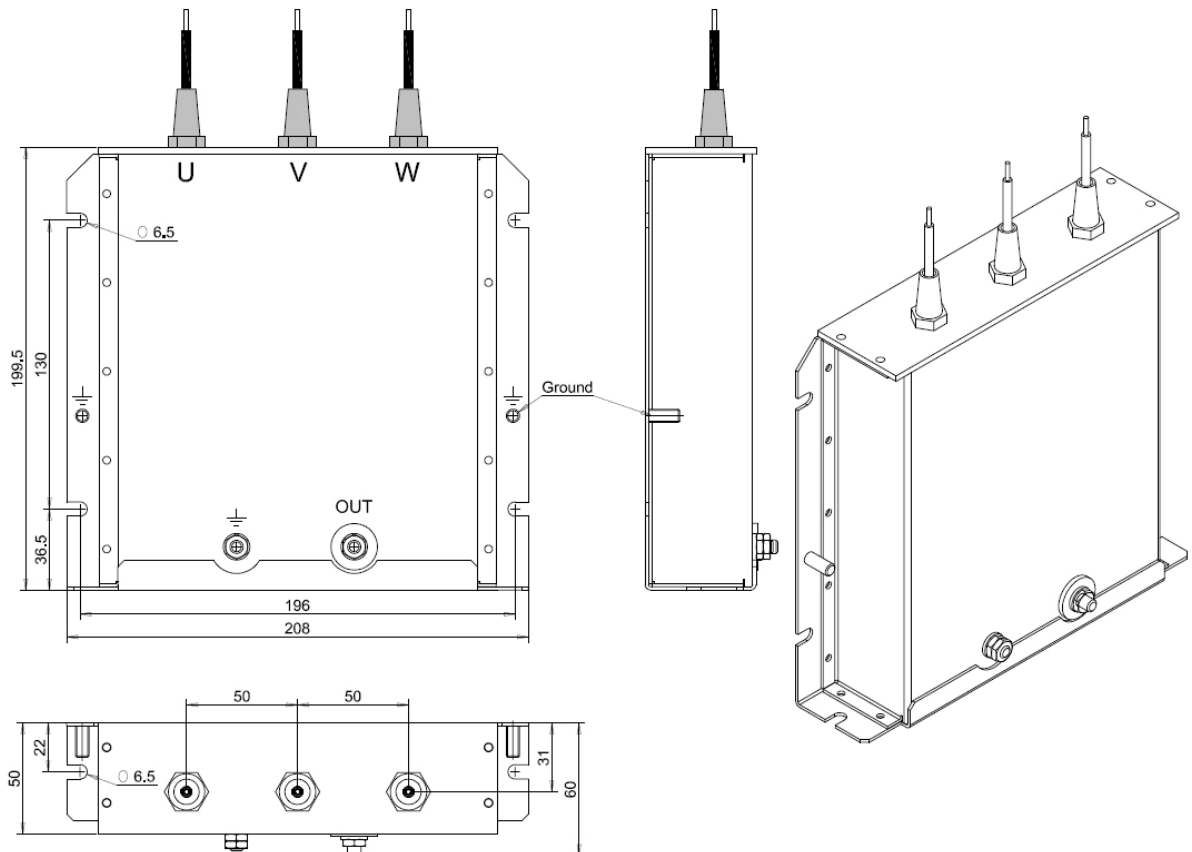
7. CASE AND CUTOUT DETAILS



8. REAR PANEL CONNECTION



9. RESISTOR UNITS RU-7 & RU13 DIMENSIONS



## 10. TECHNICAL SPECIFICATIONS

### **Auxiliary Power Supply (terminals 2, 3)**

AC/DC Power Supply:

Standard voltage version: 85 - 250 V (for 110V or 220V AC or DC)

Other Voltages: Consult Factory.

Frequency: DC, 45 to 65 Hz.

Power consumption: Less than 5 VA (MIP-6 alone, without RU7 / RU13)

### **MV Insulation Resistance Input (terminal 51)**

#### **WARNING!**

Must be used with RU7/RU13 unit. This terminal should NEVER be connected directly to any live voltage, including Low Voltage. !!  
Applicable for Medium Voltage only.

Method: Off Line – Does not measure when mains is connected. Automatically adjustable power supply, Injecting DC current to the motor windings, through external RU7 (up to 7200V mains) or RU13 (up to 13800V mains) unit. DC voltage is limited to 50V for safety.

Range: 0 – 60Mohm

Full scale: 60 Mohm.

Accuracy:  $\pm 10\% \pm 100$  Kohm.

### **MV Line Test Input (terminal 52)**

#### **WARNING!**

Must be used with RU7/RU13 unit. This terminal should NEVER be connected directly to any live voltage, including Low Voltage. !!  
Applicable for Medium Voltage only.  
There is no Line Test for Low Voltage.

Method: Internal 1Mohm resistance connected to ground (earth, chassis) through internal controlled switch. Tests both external and internal connections and wiring and electronic circuitry.

### **LV Insulation Resistance Input (terminal 53)**

Method: Off Line – Does not measure when mains is connected. Can be connected to AC voltage (when live) of 400V (690/1.73) maximum, without damage. Automatically adjustable power supply Injecting DC current directly (no external unit) to motor windings. DC voltage is limited to 50V, for safety.

Range: 0 – 60Mohm

Full scale: 60 Mohm.

Accuracy:  $\pm 10\% \pm 100$  Kohm.

### **Analog Output (terminals 61, 63)**

Range: 0-20mA or 4-20mA.

Accuracy: 2% of Full Scale + 3% of input.

### **Total Run Time**

Accuracy:  $\pm 2\%$ .

### **Fault Time Delays**

Accuracy:  $\pm 0.5$  Sec. or  $\pm 2\%$  of time, which ever is greater. After sudden change in Insulation resistance value, few more seconds can be added. This is since MIP-6 waits until insulation resistance reading to stabilized.

### **Discrete Inputs (terminals 31 - 37)**

Six Discrete (digital) inputs. The inputs are optically Isolated. Should be connected to 110V/230V AC/DC.

### **Discrete outputs relays contacts(terminals 11 – 21)**

Maximum voltage: 250VAC.

Relays A,B,C,D (terminals 11 – 15): N.O. type, 5A / 250 VAC resistive, 750VA. The relays share one common terminal.

Relays E and F (terminals 16 – 21): Change Over (form C) type, 8 A / 250 VAC resistive, 1800 VA.

### **Ambient Temperature**

0°C to +50°C

## 11. ORDERING INFORMATION

MIP-6      **LV-**      **0-**      **S**  
**Mains Voltage**    **Options**      **Front Panel**

**Mains Voltage**

Specify	Description
LV	230 ≤ Vn ≤ 690 VAC, 50/60Hz
MV1 <sup>(1)</sup>	690 < Vn ≤ 7200 VAC, 50/60Hz
MV2 <sup>(2)</sup>	7200 < Vn ≤ 13800 VAC, 50/60Hz
<b>Notes:</b>	<sup>(1)</sup> MIP MV1 is supplied with a resistor unit RU-7. <sup>(2)</sup> MIP MV2 is supplied with a resistor unit RU-13.

**Options**

Specify	Description
0	No options
M	Communication RS-485 (MODBUS) Rear connection
5	Analogue output.
8	Harsh environment treatment
C	Real time clock
<b>Notes:</b>	For more than one option indicate, for example: RM+5+8 (Rear modbus communication, analogue output and Harsh environment) All options must be ordered in factory – Options can not be installed on site.

**Front Panel**

Specify	Description
S	Standard



**Solcon Industries Ltd.**

[www.solcon.com](http://www.solcon.com) Technical support: [office@solcon.com](mailto:office@solcon.com)