

## IBreaker IB-48V Series Engineering Specification

### P/N 3A92 family

Revision Level	Date of revision	Author	Note
Rev 0.0	26/03/2002	Guido Fiesoli	Draft
Rev 1.0	03/04/2002	Guido Fiesoli	Purchasing P/N's
Rev 2.0	03/05/2002	Guido Fiesoli	Miscellaneous
Rev 3.0	23/07/2002	Guido Fiesoli	Product name and other
Rev 4.0	18/09/2002	Guido Fiesoli	Product name and other
Rev 5.0	02/12/2002	Guido Fiesoli	Miscellaneous, memory



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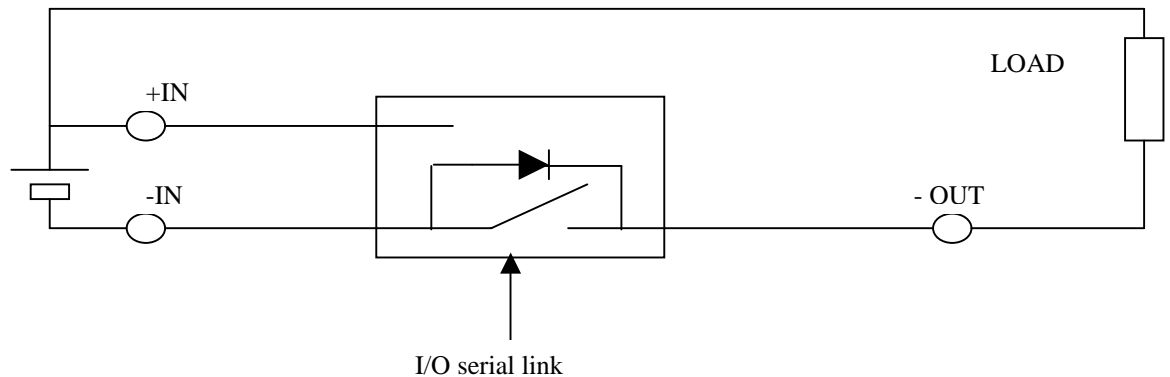
## 1 Scope

The scope of this document is to specify the electrical and mechanical characteristics of a family of electronic interrupting devices to be used in -48Vdc power distribution systems with controlling and monitoring characteristics via an I/O serial link.

The IB implements the functionality of current limitation during short circuit and overload, working like a current protector, sensing an over current or short circuit or input under/ over voltage condition and interrupting the current flow.

In OFF state the IB doesn't provide galvanic insulation between input and output.

Conceptual schematic:



## 2 Electrical

### 2.1 Input Characteristics

#### 2.1.1 Input Voltage

Typical telecommunication -48V system.

Input voltage range: -60Vdc .. -36Vdc

#### 2.1.2 Isolation

Live circuits to unit's frame isolation are 1100Vrms.

Frame heatsink is floating with respect to live parts and it may be connected to Earth.


I/O serial link to power circuitry 500Vdc.

#### 2.1.3 Input Under Voltage Protection

The IB senses the input voltage and trips when it is lower than a predetermined threshold.

Factory setting places the input UVP threshold at -35.8V +/-0.2V.

The input UVP threshold is adjustable via I/O serial link (from -48Vdc to -36Vdc) and this may be used to emulate the function of distributed LVD (Low Voltage Disconnect) with adjustable priority.

 <p><b>MAGNETEK</b> UNCOMMON POWER</p>	<p><b>IB-48V</b> <b>Engineering Specification</b>  <b>P/N 3A92</b></p>	<p>ES 3A92 Page: 5 of 16 ...</p>
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Recovery from Input Under Voltage condition is not automatic (latched state, by factory default) and it may be operated manually via front push button, or remotely via serial link. This modality may be set by factory to automatic recovery upon request as an option.

#### 2.1.4 Input Over Voltage Protection

The IB senses the input voltage and trips when it is higher than a predetermined threshold. Factory setting places the input OVP threshold at 65.0V.

Recovery from Input Over Voltage condition is not automatic (latched state) and it may be operated manually via front push button, or remotely via serial link.

#### 2.1.5 Catastrophic Fuses

Catastrophic fuses are present in series in order to provide further disconnection in case of damage of the switching devices.

### 2.2 Output characteristics

The electrical performances are listed for use in substantially non-inductive circuits and the Time-Current characteristic is similar to "Hydraulic-Magnetic mode".

The IB function is  $\mu$ P assisted.

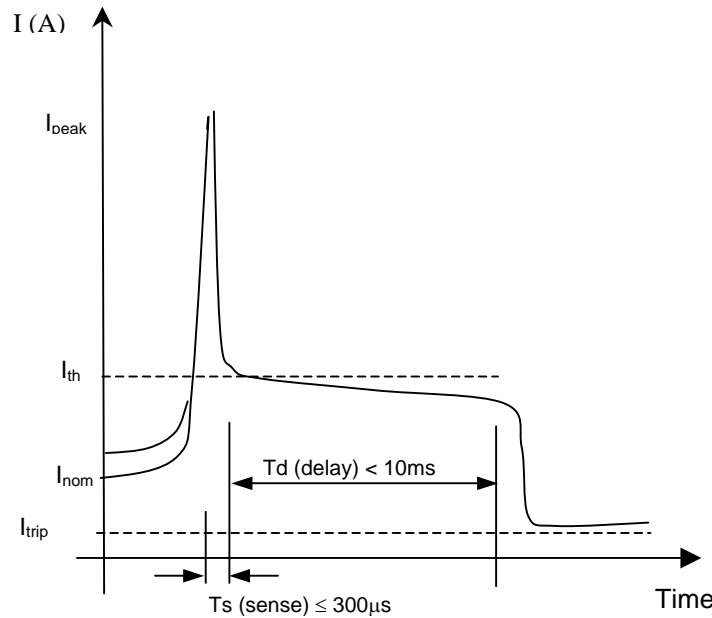
#### 2.2.1 Output Current

The -OUT is the interrupted negative power pole.

The IB works disabling the conduction of a parallel of mosfets in case of:

- Over Load                               trips automatically, latched state
- Short Circuit                             trips automatically, latched state
- Input Under Voltage                   trips automatically, latched state (optionally automatic)
- Input Over Voltage                   trips automatically, latched state
- Manual ON/OFF                         push button, accidental intervention avoided
- Remote ON/OFF                         I/O serial link
- Over Temperature                     trips automatically, latched state (optionally automatic)

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In case of Over Load and Short Circuit the IB works limiting the output current in constant current mode before tripping, at a level given by the current threshold not influenced by operational temperature.

The time to trip is maximum 10ms.

Tripped state condition (IB electrically OFF) due to Over Load or Short Circuit is maintained (latched state) until a manual or remote reset is done.

Output current after trip is maximum 0.1A in all-electrical and thermal condition here specified.

Current threshold is adjustable via I/O serial link (reduced with respect to factory setting).

### 2.2.2 Status

One bicolor LED on front panel visually indicates the status (On = green, Off = solid red, Tripped = blinking red).

The same information is available on the I/O serial link.

Memory of the last status had before a period of input voltage absence is kept.

### 2.2.3 Over Temperature

The unit is self-protected against Over Temperature condition generated by internal power losses and/or environmental conditions.

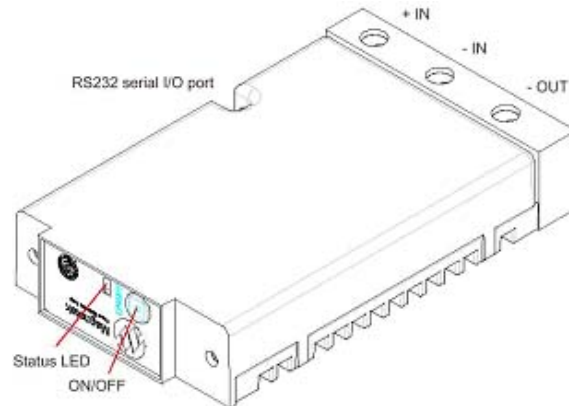
Recovery from Over Temperature condition is not automatic (latched state, by factory default) and it may be operated manually via front push button, or remotely via serial link.

This modality may be set by factory to automatic recovery upon request as an option.



## 2.2.4 Switching Capacity

Making and Breaking capacity up to 4kA.



## 2.3 Interface

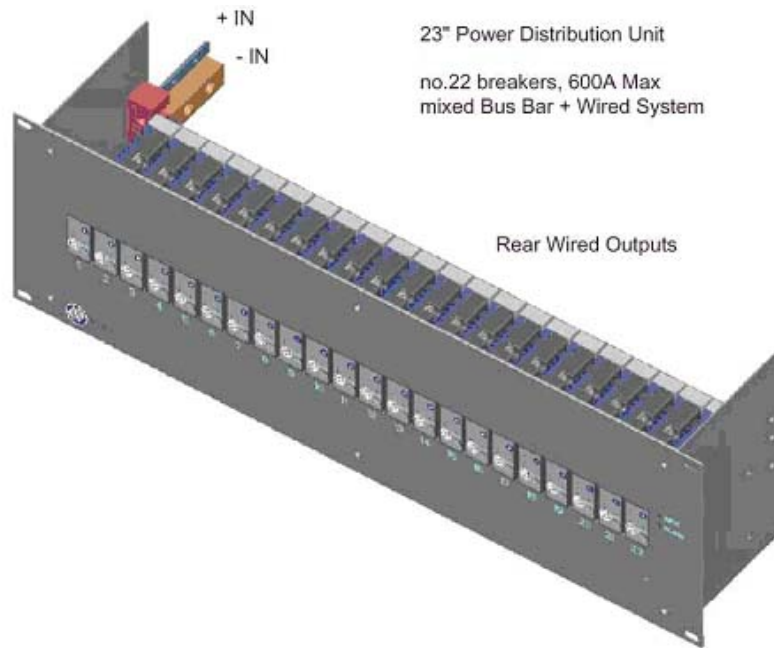
### 2.3.1 Input and Output Connections

Same screw-in type terminal blocks are used for both the three power terminals (+IN, -IN, -OUT); M6 screws shall be used.

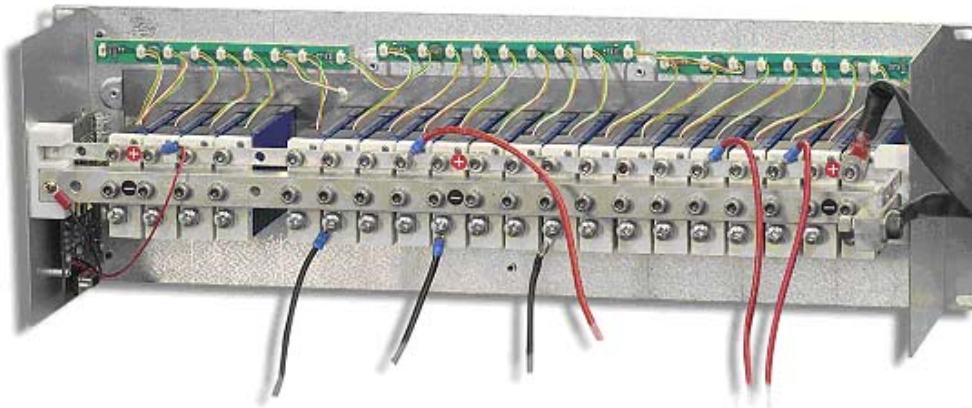
The IB is designed to be used in the following wiring configurations:

#### - Bus Bar Systems

- When rear access to distribution bars is available.
- Horizontal +IN bar for multiple system, as light as possible due to the fact that power is not distributed via this bar (i.e. 10mmx3mm).
- Horizontal -IN bar for multiple systems.
- Vertical -OUT distribution bars.
- Wired -OUT to pillar terminal (output conductor directly inserted into the terminal hole and clamped under the shank of the screw).
- Wired -OUT with conductor terminated with ring terminal.



23"PDU - Front view



23"PDU - Rear view (showing three I/O bus strips at the top and the Controller at the left)

- Backplane Systems

- When input and distribution is via rear accessible connectors.
- When dedicated solution are necessary, or additional circuitry is needed.

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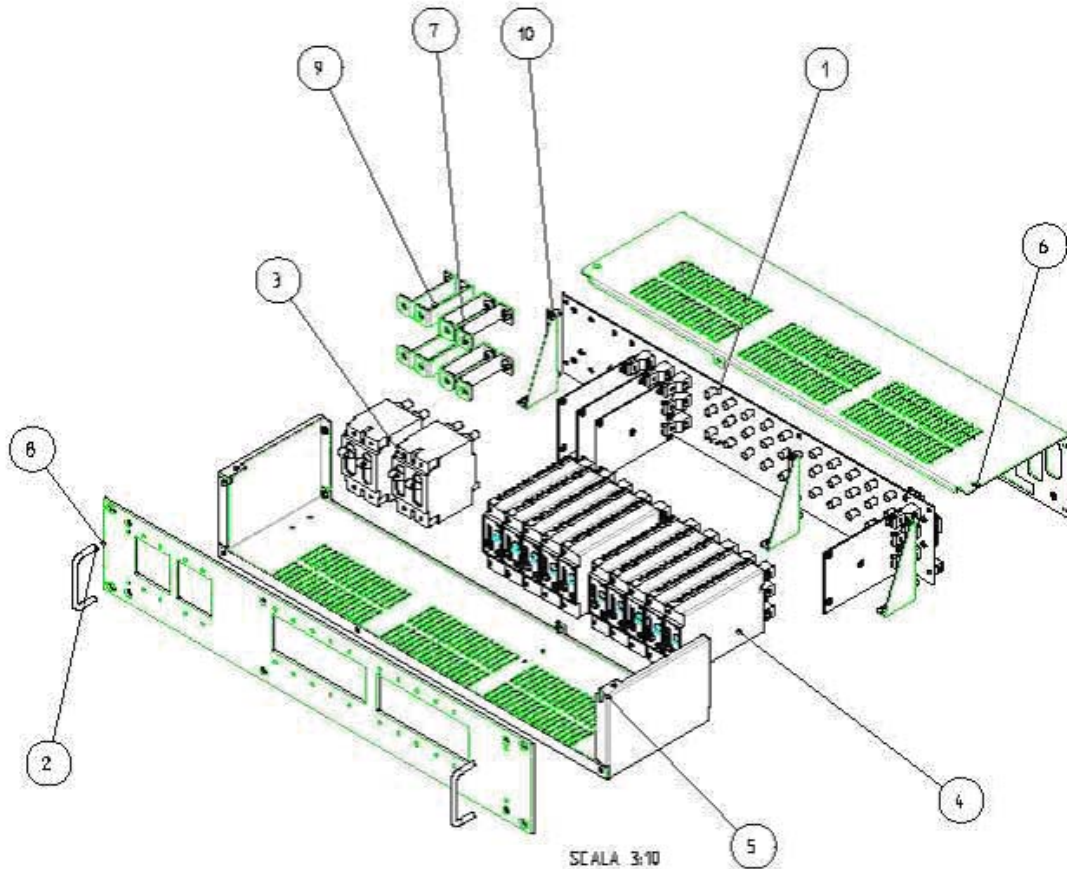
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19"PDU-Front view



19"PDU - Exploded view

- Wired Systems
  - Replacing existing magnetic-hydraulic breaker.
  - Few breaker installations.

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For power paths (-IN and -OUT) proper bar or wire dimensioning should be used (3A/mm<sup>2</sup> may be used as general rule).

**2.3.2 I/O Serial Link**

**INTERFACE** - Available via a three pins male connector Molex 53261-0390; female mating part commercial P/N is Molex 51021-0300 with terminations 50079 for AWG 26-28 or 50058 for AWG 28-32.

For connection to the Bus Strip an already made wire harness is available IB-WI.

**CONTROLLER** - For a remote control, an additional single board controller, 115mmx75mm, equipped with the same connector used by the individual IB, has to be used for interfacing IB's I/O serial ports in connection to the same three-way bus. Use IB-WI for connection to the Bus Strip.

The controller has to be powered with a -48V pairs, the same that has to be distributed.

The controller's digital output is via a DB9 female connector for both RS232 and RS485 serial communication (selectable by means of a dip switch).

Magnetek Controller IB-CTR is available upon request as option.

Pin out	RS232	RS485
2	RX	DIO+
3	TX	DIO-
5	GND	DATA RTN

A Keypad and LCD kit for local setting and reading is available upon request as option.

**BUS STRIP** - A three-way bus may be used for connecting all I/O serial ports in parallel from different units. Pinout 1-Common, 2-RX and 3-TX.

Magnetek IB-BS is a 164mmx15mm pcb bus strip equipped with 11 mating connectors and it is available upon request as option.

**PERSONAL COMPUTER** - With Controller in RS232 mode, the digital output may be connected directly to a PC serial port, COM1, COM2 etc. being the output RS232 of the controller galvanically insulated from the -48V system.

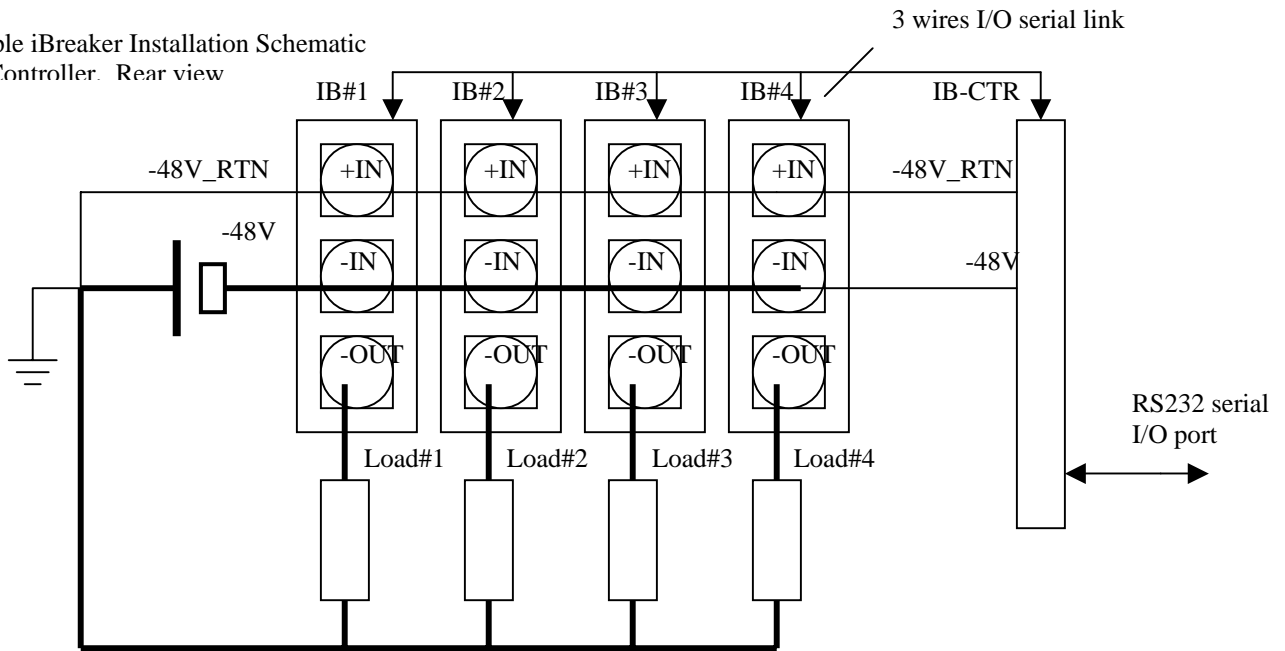
A demo software can be used for PDU monitoring; the control screen for a 22 units PDU is shown below.

Command table is available upon request as option.



REMOTE CONTROL UNIT - With Controller in RS485 mode, the digital output may be connected directly to the communication bus.  
Command table is available upon request as option.

Multiple iBreaker Installation Schematic with Controller. Rear view





	Vin (V)	Vout (V)	Iout (A)	ITh. (A)	UV Th. (V)	Size	Group	Status	
ON OFF				67	36	60	0	Normal	CONFIG
ON OFF				67	36	60	0	OFF	CONFIG
ON OFF				67	36	60		NO COMM	CONFIG
ON OFF				57	36	50		NO COMM	CONFIG
ON OFF				47	36	40	0	OFF	CONFIG
ON OFF				37	36	30	0	Normal	CONFIG
ON OFF				17	36	10	0	Normal	CONFIG
ON OFF				67	36	60	0	OFF	CONFIG
ON OFF				57	36	50	0	Normal	CONFIG
ON OFF				47	36	40	0		CONFIG
ON OFF				37	36	30	0		CONFIG
ON OFF				17	36	10	0		CONFIG
ON OFF				67	36	60	0		CONFIG
ON OFF				57	36	50	0		CONFIG
ON OFF				47	36	40	0		CONFIG
ON OFF				37	36	30	0		CONFIG
ON OFF				17	36	10	0		CONFIG
ON OFF				67	36	60	0		CONFIG
ON OFF				57	36	50	0		CONFIG
ON OFF				47	36	40	0		CONFIG
ON OFF				37	36	30	0		CONFIG
ON OFF				17	36	10	0	Normal	CONFIG

Start All ON All OFF Options ON command sent to breaker #22 TX RX

Control Screen

### 2.3.3 Warnings

Do not reverse input polarity.

Always operate installation with disconnected supply.

In the final assembly, attention has to be paid to assure air openings for cooling.

This unit is for building-in end-use products and for use only in conjunction with


ITE/Telecommunication Equipment.

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Keep proper precautions to avoid unlike contacts between power lugs if serviceable parts are in their vicinity during service personnel operation: Energy Hazardous parts.

### 3 Environmental

#### 3.1 Operating temperature

-5°C to +55°C convection cooling temperature

#### 3.2 Storage temperature

-40 to +85°C

#### 3.3 Operating and storage humidity

0 to 95% non-condensing.

#### 3.4 Cooling

Typical power dissipation for the IB is about 10W (60A rating at rated current). The heat is evacuated via the heatsink.

When mounted vertically, a proper natural convection airflow has to be assured, air must be able to circulate from bottom to top.

Horizontal mounting can be possible if a minimum airflow is assured (1m/s or 200LFM).

#### 3.5 Operational Vibration and Shock

Vibration

Random 5-20Hz, 0.96m<sup>2</sup>/s<sup>3</sup>; 20-500Hz, -3dB/oct; 3x10 min

Verification method: Test IEC 68-2-36

Shock

Full performance and no mechanical degradation after test.

Half sine 50m/s<sup>2</sup>, 6ms; 6x3 shocks

Verification method: Test IEC 68-2-27

### 4.0 EMC


#### 4.1 Definitions of Performance Criteria

##### Performance Criterion A

The apparatus shall continue to operate as intended during and after the test.

No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

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**Performance Criterion B**

The apparatus shall continue to operate as intended after the test.  
No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.  
During the test, degradation of performance is however allowed.

**Performance Criterion C**

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

**4.2 Immunity EN61000-6-2**

- \* ESD (Electro Static Discharge) - EN 61000-4-2: 1996 - 8kV air and 4kV contact - class B
- \* Radiated, radio-frequency, Electromagnetic Fields - EN 61000-4-3: 1997-10V/m-class A
- \* Radiated immunity keyed carrier - ENV 50204 - 10V/m - class A
- \* Electrical fast transient/burst -EN 61000-4-4: 1995 - Lev.3 - +/-2kV 5kHz - class B
- \* Surge - EN 61000-4-5: 1995 - CM+/-0.5kV, DM+/-0.5kV HiZ (12 Ohm)
- \* Immunity to conducted disturbances, induced by RF field - EN 61000-4-6. 1996 - 150kHz/80MHz 10Vrms 80%AM 1kHz sine wave - class A
- \* Power Frequency Magnetic Field - EN 61000-4-8: 1994 - 30A/m 50/60Hz - class A

**4.3 Emissions EN50081-1**

- \* Conducted - EN55022 class B.
- \* Radiated - EN55022 class B.

**5.0 Mechanical**

The IB is equipped with its heatsink and has dimensions 107.2mm in depth, 63.5mm in height, 20mm in width. See mechanical drawing.

The IB is panel-mounting type and may be used in Vertical or Horizontal mounting.

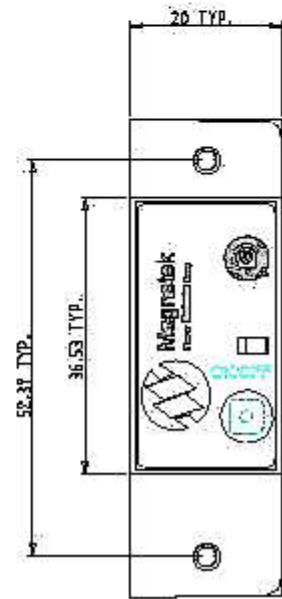
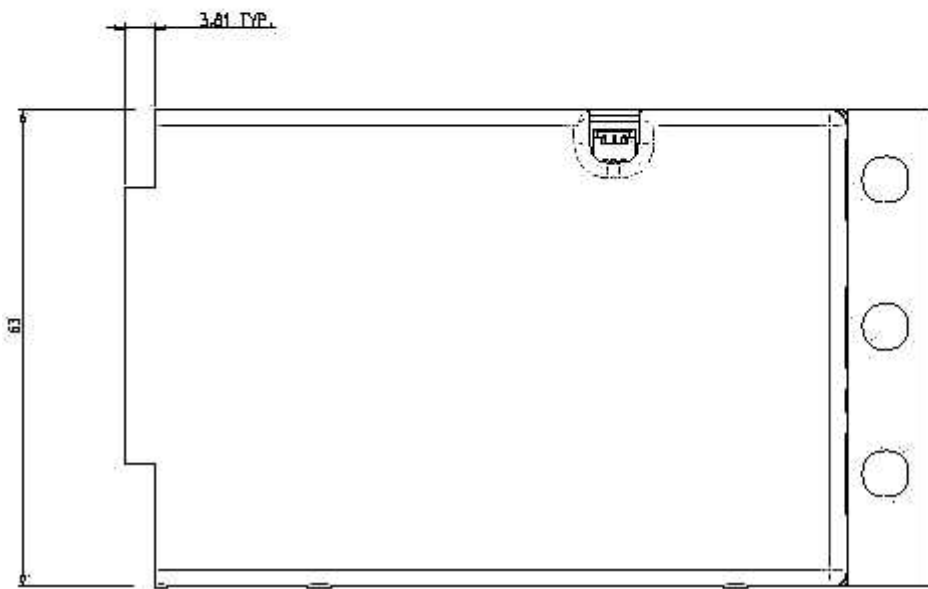
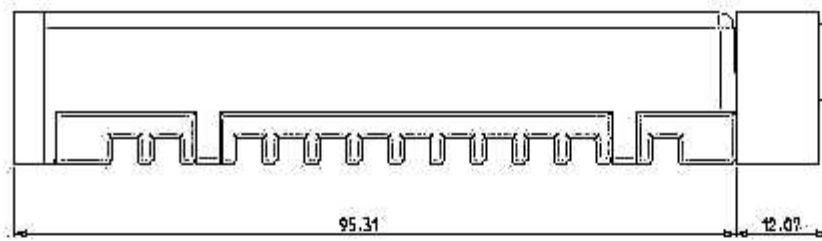
Mounting to customer front panel is done via two M3 screws; max hole depth 5mm, max torque 0.5Nm. See mechanical drawing for their location.

Electrical connections have to be done with three M6 screws; max hole depth 7mm, max torque 3.5Nm.

The unit has a plastic cover, there is no need the IB to be opened for operation or maintenance, opening the cover and breaking the label voids the warranty.

Weight: <250 g.

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Mechanical Drawing

## 6.0 Safety and regulations

The unit is compliant with EN60950, UL60950, CAN/CSA-C22.2 No.60950, for use inside end-use ITE/Telecommunication Equipment only.

Conformity to the applicable requirements of CAN/CSA-C22.2. No. 235 (*Supplementary Protectors*) and UL 1077 (*Supplementary Protectors for Use in Electrical Equipment*).

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## 7.0 Certification

The IB is cCSAus and Kema approved and marked according to the regulations listed in 6.0 and shall have CE-marking.

## 8.0 Reliability

The MTBF of the 60A IB assessed accordingly to Bellcore TR-NWT-000332 is >1'500'000 hours (171 years) at an average temperature of 30°C, rated current, natural convection cooling. It is higher for the lower rated current IBs, see table at paragraph 9.0.

The expected operational lifetime of the 60A IB is 35 years in the same conditions of MTBF.

Durability intended as number of on/off switch operations is unlimited.

## 9.0 Purchasing P/Ns

Product P/N	Rated Current $I_{nom}$ (A)	Overload Current Threshold $I_{th}$ (A)	Typical Voltage Drop (mV) @ Rated Current	MTBF (years)	Maximum Allowed Load Capacitance ( $\mu$ F)	No. Mos
IB-48V-05A	5A	12A	80	195	1'000	1
IB-48V-10A	10A	17A	80	190	2'000	2
IB-48V-20A	20A	27A	105	185	3'000	3
IB-48V-30A	30A	37A	120	180	4'000	4
IB-48V-40A	40A	47A	125	175	6'000	5
IB-48V-50A	50A	57A	130	170	8'000	6
IB-48V-60A	60A	67A	160	170	10'000	6