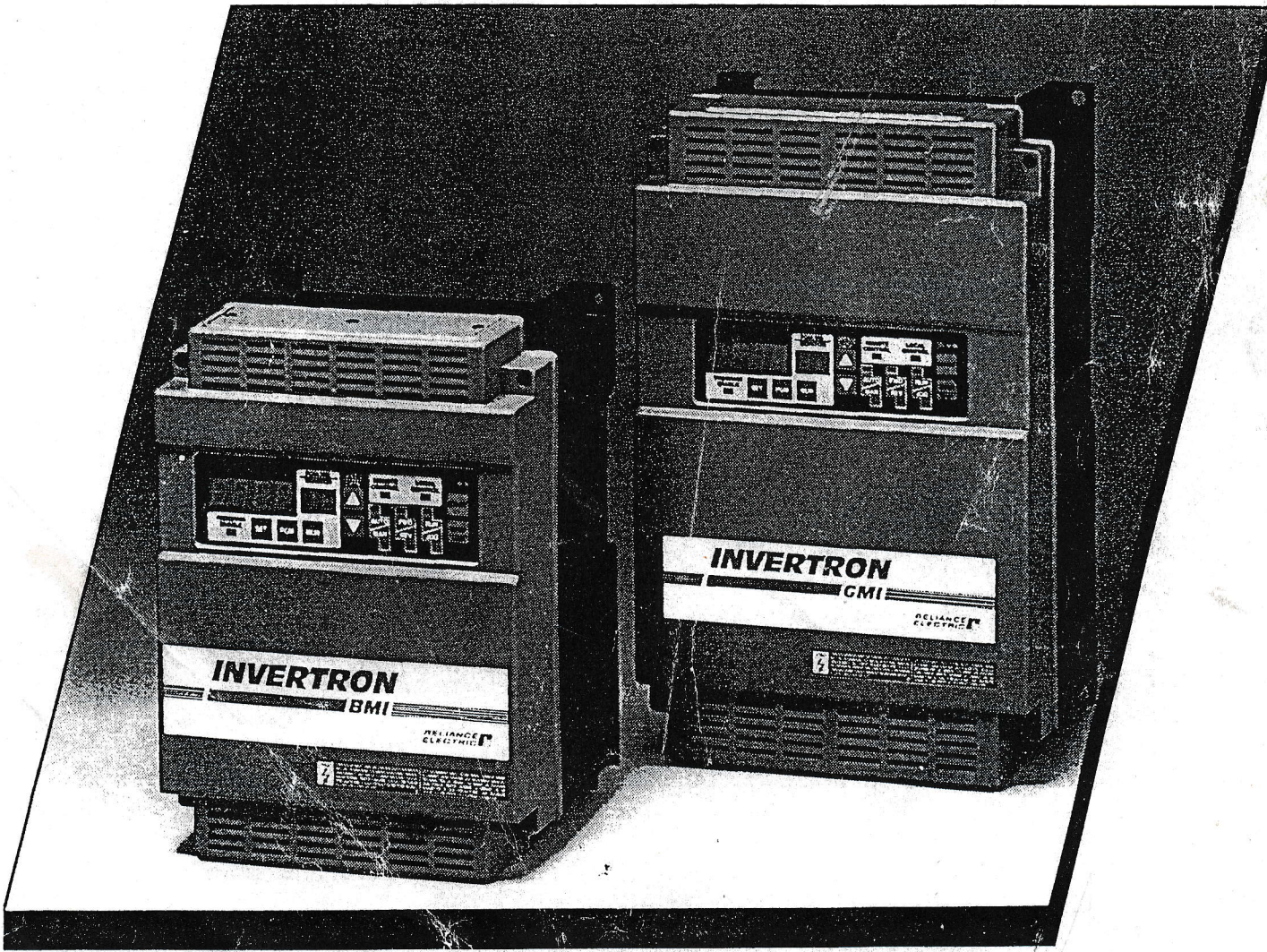


# **INVERTRON**

**BMI/GMI**

**Instruction manual**  
**Betriebsanleitung**  
**Instructions de service**  
**Istruzioni di servizio**  
**Manual de instrucciones**



4UV

TYPE GMI - 809  
Part No 762.27.30  
380/440V 12,3 A

49 1288 english 05

**RELIANCE ELECTRIC**  
AG CH-6036 Dietikon

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### WARNING

Before installing and/or operating this device, this manual must be understood by the qualified electrical maintenance person who is familiar with this type of equipment and the hazards involved.

Failure to observe this precaution could result in bodily injury.

### WARNING

Electronic devices are in principle not fail-safe. It is the responsibility of the user to ensure, that in the case of a failure of this device, the drive is brought to a safe condition. Especially on drives for use with personnel transportation, electronic independent safety circuits must be provided.

### WARNING

Electronic convertors cause disturbances to the supply network.

The basic version of the INVERTRON does not include any radio interference- or harmonic filters, to fulfil the limits in the recommendations, because they are dependent on the supply network (impedance).

### WARNING

Earth fault detection devices must not be used on this convertor as sole protection measure against unintentional touching. The DC-component in the earth fault current may inhibit the correct function of the fault detector.

### 1.0 GENERAL

#### 1.1 Introduction

This Manual contains information regarding the operating principle, the technical data, the engineering, the installation, the operation and start-up of the INVERTRON BMI and INVERTRON GMI frequency invertors. In addition a section is included containing explanatory notes on trouble-shooting and a brief overview of the various parameters.

For applications with larger power demands we recommend our proven product ranges comprising:

INVERTRON VTI : 7,5 - 315 KW

INVERTRON VGI : 7,5 - 315 KW

INVERTRON VCI : 7,5 - 250 KW

INVERTRON CSI : 18,5 - 900 KW

INVERTRON REO : 15 - 55 KW  
(Regenerative Option)

More detailed information is available from any RELIANCE ELECTRIC - District Office.

#### 1.2 Equipment Description

INVERTRON BMI / GMI units are frequency invertors for variable speed control of three-phase standard motors in the power range from 0.2KW - 75KW.

The units up to and including 7.5KW output consist of a die-cast aluminium casing and are fitted with a plastic cover on the front. The units above 11KW output are supplied in a sheet metal housing. All the units feature a sealed keypad / display panel.

The terminal strips for connecting the power and signal lines are located inside the casing.

Casing holes for cable lead-ins with cable grips are located on the bottom of the casing.

INVERTRON BMI units from 2.2KW output and INVERTRON GMI units from 5.5KW output are supplied with an integral cooling air fan.

### 1.3 Standard Features

- > Enclosure IP20
- > Operation control via:
  - Local Control (Keypad)
  - Remote Control (Terminal Strip)
  - Remote Control Station (Option)
  - RS 232C Communication Port (Option) or Standard RELIANCE I/O - Port
- > Standard Functions on Keypad:
  - Speed adjustment
  - Start / Stop
  - Forward / Reverse
  - Auto / Manual
  - Run / Jog
  - Setting of Parameters
  - Monitoring of Output data
  - Diagnostic fault monitoring
- > Adjustable DC-Braking
- > Adjustable Torque Boost
- > DC Offset for Synchronous Motors
- > Adjustable Motor Thermal Overload Function
- > Adjustable Current Limit
- > Internal MOP selectable
- > Adjustable Frequency Range 0 - 400 Hz
- > Adjustable Limitation of Frequency range (Over frequency limit)
- > Three preset speed selections
- > Adjustable Slip Compensation
- > Programmable for:
  - Constant or Variable Torque Application
  - Individual Base Frequency Selection-
- > Different isolated Reference Input selections:
  - 0V - 10V DC
  - 0mA - 20mA
  - 4mA - 20mA
  - 0Hz - 97,656.25Hz
- > Digital Reference output
- > Programmable Auto-reset after Fault stop
- > Avoidance frequency and bandwidth selections
- > Separate acceleration and deceleration ramps
- > Selection of Automatic Flux Control
- > Separate adjustable Jog Reference
- > Line-Dip-Ride-Through Function up to 500 ms
- > Line-to-line and line-to-ground output short circuit protection

### 1.4 Options

The operating and application features of the INVERTRON BMI/GMI units can be enlarged with various options.

- RMI Card (Remote Meter Interface Card):  
This card has three isolated analog outputs for displaying output frequency, output voltage and output current by means of external indicating instruments. In addition, the card also has three contact outputs. Two of these outputs can be programmed for to various functions. The card is installed within the units. For reasons of space, the RMI Card and the Serial Communication Port Card cannot be installed together.
- Serial Communication Port Card:  
This card contains an RS-232C interface and a standard Reliance I/O port. This option enables the BMI / GMI units to be controlled by means of an IBM-compatible personal computer or by a Reliance DCS system. The card is installed inside the units. For reasons of space, the RMI Card and the Serial Communication Port Card cannot be installed together.
- Remote Digital Meter:  
With this display, the actual values of output frequency, output voltage and output current can be displayed alternately in digital form. The display can be used only in combination with the RMI Card.

## 1 - GENERAL

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- Remote control station:

The remote control station contains a digital display for optionally indicating output frequency, output current or output voltage. 'Run' and 'Fault' conditions are indicated by LED's.

'Forward/Reverse', 'Manual/Auto' 'Start/Stop' and 'Reset' can be selected by switches.

A reference potentiometer is used for selecting the output frequency.

The remote control station is available as a flush-mounted version or in a self-contained casing with protection class IP 21 conforming to IEC standard.

The remote control station can be used only in combination with the RMI Card and requires an external power supply.

- Braking unit:

The dynamic response of the INVERTRON BMI / GMI units can be improved with a braking unit.

Use of a braking unit is recommended primarily in those cases in which the driven load represents a high inertia and a rapid and precise deceleration is required.

The Dynamic Braking Unit dissipates the power regenerated by the motor during deceleration through a resistor.

The braking unit is located in a separate casing and must be installed externally.

- Regenerative option:

This unit may not be connected directly to the GMI drive, an external charging circuit has to be provided. Please contact Reliance Electric for further information.

- Reference Trim Potentiometer:

The Reference Trim Pot Kit provides a hardware adjustment for the relationship between output frequency and speed reference when the process control is in the Auto selection.

This kit will compensate for variations in the analogue reference path.

The various optional equipment is described in greater detail in the section 'Equipment Options'.

The options 'Serial Communication Port Card' and 'Remote Control Station' are supplied with a separate Operating Manual, which is enclosed with the respective option.

### 2.0 DELIVERY AND STORAGE

#### 2.1 Goods Acceptance

Upon receipt of the goods, it is important to check whether these have been delivered complete and undamaged. Any damage in transit, or missing parts, should be advised without delay to the carrier.

#### 2.2 Storage

In the event that the units are not used immediately, they should be stored in the interim period in their original packaging in a clean and dry place:

Storage temperature : -40°C through 65°C.  
Air humidity : 5% up to 95% relative humidity, non-condensing

The units should not be exposed to severe shocks or corrosive gases at the storage point.

#### 2.3 Equipment Variants

As the INVERTRON BMI/GMI units are used world-wide, they are available in three different versions:

- American version with 'UL' acceptance (UL = Underwriters Laboratory. The unit has been tested and accepted in accordance with American safety standards).
- Canadian version with 'CSA' acceptance (CSA = Canadian Standards Authority. The unit has been tested and accepted in accordance with Canadian safety standards).
- European version for constant torque application (S-Type) and European version for variable torque applications, i.e. like pump & fan (P-Type).

The three versions differ primarily in respect of the data of their power input. This Manual is restricted to describing the European version. ( Part Number of 'UL'-Version is given in table 2.4 ). Should you require further information regarding one of the other versions, please contact your nearest RELIANCE ELECTRIC office.

## 2 - DELIVERY AND STORAGE

### 2.4 Model- and Part numbers

RED-Model Number	Controller Input Voltage	Motordata		RED-part-number
BMI-S04	1 * 200 - 230V	0,75 kW	4,5A	762'20-00
BMI-U04	3 * 200 - 230V	0,75 kW	4,5A	762'20-02
BMI-S07	1 * 200 - 230V	1,5 kW	7,5A	762'20-10
BMI-U07	3 * 200 - 230V	1,5 kW	7,5A	762'20-12
BMI-S11	1 * 200 - 230V	2,2 kW	10,6A	762'20-20
BMI-U11	3 * 200 - 230V	2,2 kW	10,6A	762'20-22
BMI-S15	3 * 200 - 230V	3,7 kW	16,7A	762'20-30
BMI-U15	3 * 200 - 230V	3,7 kW	16,7A	762'20-32
GMI-S02	3 * 380 - 440V	0,75 kW	2,3 A	762'21-00
GMI-S04	3 * 380 - 440V	1,5 kW	3,9 A	762'21-10
GMI-U04	3 * 460V	1,5 kW	3,4 A	762'21-12
GMI-S06	3 * 380 - 440V	2,2 kW	5,9 A	762'21-20
GMI-U06	3 * 460V	2,2 kW	5,3 A	762'21-22
GMI-S09	3 * 380 - 440V	4,0 kW	9,2 A	762'21-30
GMI-U09	3 * 460V	4,0 kW	8,2 A	762'21-32
GMI-S13	3 * 380 - 440V	5,5 kW	12,6 A	762'21-40
GMI-U13	3 * 460V	5,5 kW	11,1 A	762'21-42
GMI-S16	3 * 380 - 440V	7,5 kW	16,4 A	762'21-50
GMI-U16	3 * 460V	7,5 kW	14,2 A	762'21-52
GMI-S23	3 * 380 - 440V	11,0 kW	23,0 A	762'21-60
GMI-U23	3 * 460V	11,0 kW	21,0 A	762'21-62
GMI-S31	380 - 440V	15,0kW	31,0A	762'21-70
GMI-U31	3 * 460V	15,0kW	27,0A	762'21-72
GMI-506	3 * 500V	4,0 kW	6,2 A	762'21-34
GMI-512	3 * 500V	7,5 kW	12,0 A	762'21-54
GMI-523	3 * 500V	15,0 kW	23,0 A	762'21-74
GMI-S38	3 * 380 - 440V *	18,5 kW	39 A	762'21-80
GMI-S44	3 * 380 - 440V *	22 kW	46 A	762'21-90
GMI-S56	3 * 380 - 440V *	30 kW	58 A	762'22-00
GMI-S70	3 * 380 - 440V *	37 kW	70 A	762'22-10
GMI-S88	3 * 380 - 440V *	45 kW	88 A	762'22-20
GMI-S104	3 * 380 - 440V *	55 kW	104 A	762'22-30
GMI-P09	3 * 380 - 440V *	4 kW	8,2 A	762'21-31
GMI-P13	3 * 380 - 440V *	5,5 kW	11,5 A	762'21-41
GMI-P16	3 * 380 - 440V *	7,5 kW	15,2 A	762'21-51
GMI-P23	3 * 380 - 440V *	11 kW	21,8 A	762'21-61
GMI-P31	3 * 380 - 440V *	15 kW	29,5 A	762'21-71
GMI-P38	3 * 380 - 440V *	18,5 kW	37,0 A	762'21-81
GMI-P44	3 * 380 - 440V *	22 kW	46 A	762'21-91
GMI-P56	3 * 380 - 440V *	30 kW	60 A	762'22-01
GMI-P70	3 * 380 - 440V *	37 kW	71 A	762'22-11
GMI-P88	3 * 380 - 440V *	45 kW	88 A	762'22-21
GMI-P104	3 * 380 - 440V *	55 kW	104 A	762'22-31
GMI-P136	3 * 380 - 440V *	75 kW	136 A	762'22-41

**Remark:** -The P-Family (GMI-P09 up to GMI-P136) is for pump - and fan application (variabel torque) with a reduced overload of 115%!  
 -\* for 440V application see chapter 5.3

## 2 - DELIVERY AND STORAGE

### 2.5 BMI/GMI Options and Part numbers

	RED-Stock-Number:
Remote Meter Interface Card RMI	762.20-80
Serial Communication Card for Automax System	762.20-86
RS 232 Interface Card	762.20-88
RS232 Programming Diskette 3.5" (MMI)	762.20-90
Remote Keypad Kit	762.20-92
Remote Digital Meter	762.20-82
Remote Operator's Control Station IP00	851.95-01
Remote Operator's Control Station IP20	851.95-11
Line Choke for BMI-S04	252.42-00
Line Choke for BMI-S07 and BMI-S11	252.42-01
Line Choke for BMI-S15, GMI-S02 up to GMI-S23	252.40-01
Line Choke for GMI-S31	252.40-02
Line Choke for GMI-S38 up to S56 and GMI-P44 up to P56	252.40-04
Line Choke for GMI-S70 up to S88 and GMI-P70 up to P88	252.80-06
Line Choke for GMI-S104 and GMI-P104 up to P136	252.40-07
RIF Filter for BMI-S02 up to BMI-S11 (single phase)	839.50-00
RIF Filter for GMI-S02 up to GMI-S09 and BMI-S15	839.51-00
RIF Filter for GMI-S13 up to GMI-S16	839.51-02
RIF Filter for GMI-S23 and GMI-S31	839.51-04
RIF Filter for GMI-S38 up to S88 and GMI-P44 up to P88	xxx.xx-xx
RIF Filter for GMI-S104 and GMI-P104 and P136	xxx.xx-xx
Braking Unit for BMI	762.18-90
Braking Unit for GMI-S02 - GMI-S16	762.18-92
Braking Unit for GMI-S23 and GMI-S31	762.18-93
Reference Trim Potentiometer	762.20-84

### 3.0 FUNCTION DESCRIPTION

#### 3.1 General Function Description

A three-phase motor is normally operated at a constant voltage and at a constant frequency from the line supply. This results in a constant rated motor torque at a constant speed. To vary motor speed, motor voltage and motor frequency must be varied. This is achieved by a frequency inverter. The inverter transforms the constant input quantities into variable output quantities (variable output voltage and variable output frequency). The ratio of output voltage to output frequency (Volts/Hz) is calculated for standard applications as follows:

$$(\text{Volts/Hz}) = \text{rated motor voltage} / \text{rated motor frequency}$$

The (Volts/Hz) ratio is, as a matter of principle, constant over the output frequency range. This enables a load equivalent to the rated torque to be applied to the speed-controlled motor at the inverter over practically the entire frequency range.

The inverter consists basically of two sections, the power section and the regulator section:

In the power section, the line voltage is converted into a D.C. voltage from which a variable output voltage with variable frequency is produced by means of transistors. In the controller section, the control of the transistor required for this purpose is produced and monitored. The block diagram presented at the end of this section shows the basic linkage of the individual sections. This diagram does not take into account the various equipment versions in respect of line input and intermediate circuit.

#### 3.2 Power section

The line voltage at the input terminals of the inverter is passed through a leakage current sensor to an uncontrolled diode rectifier and converted into the D.C. voltage of the intermediate circuit. Special components at the line input limit any line voltage peaks to the permissible levels of the diode rectifier.

The rectified voltage of the diode bridge is smoothed by means of the intermediate circuit capacitors. A charging resistor is connected into the circuit upstream of the intermediate circuit capacitors to limit the capacitor charging current when the line voltage is connected. This resistor is short-circuited by a relay after the capacitors have been charged.

A D.C. sensor in the intermediate circuit serves to detect any short-circuits in the event of a fault. In view of the larger rated outputs of GMI units, these are equipped additionally with fuses in the intermediate circuit as a protection against short-circuits.

The D.C. voltage of the intermediate circuit is converted into a variable output voltage and frequency by suitably controlling a six-pulse transistor bridge. The three-phase output of the transistor module is fed to the motor terminals. The level of the output current is detected in two output phases as a protection against short-circuits and overloads.

#### 3.3 Regulator Section

The regulator section can be split into three different sections:

- Regulator board
- Power supply and driver card
- Keypad

The regulator board features SMD technology.

Two microprocessors perform the open-loop and closed-loop control tasks of the inverter.

The closed-loop control is based in the principle of voltage-led vector control. In this case, a frequency of approx. 10kHz passes through an analysis loop within a microprocessor. The actual output voltage is compared in this analysis loop with a theoretical, ideal voltage. If a major difference exists between actual and ideal value, the controller reacts by activating the power transistors accordingly. However, if the actual value corresponds approximately to the ideal value, the activation of the power transistors which exists at that moment is not varied. This results in a variable switching frequency of the power transistors within the range from 0Hz up to approximately 800Hz. The consequence of this is that it eliminates the typical monotonous noise pattern for many pulse width-modulated invertors. Use of the most modern microprocessors in combination with special semi-conductor components of drive engineering results in excellent dynamic properties of the drive.

The resolution of the output frequency of the inverter is 0.025Hz. This guarantees optimal motor operating characteristics even when subject to severe load changes and permits, among other features, precise slip compensation for induction motors.

All the settings of the operating parameters can be performed with the sealed keyboard. The equipment can be controlled from the keyboard or in a conventional manner through the control terminals.

Analog set point signals are converted into digital signals by a voltage/frequency converter.

All the control signal inputs are isolated by opto couplers.

In addition, the controller card features a relay-controlled contact output for error message (IET).

The display or control possibilities can be increased either by connecting the RMI card or the communication card with serial interfaces to the controller.

The power and driver card consists of a switched-mode power supply section for supplying the control voltage and the isolated driver stages for controlling the power transistors.

### 3 - FUNCTION DESCRIPTION

#### 3.4 Typical Functional Block Diagram

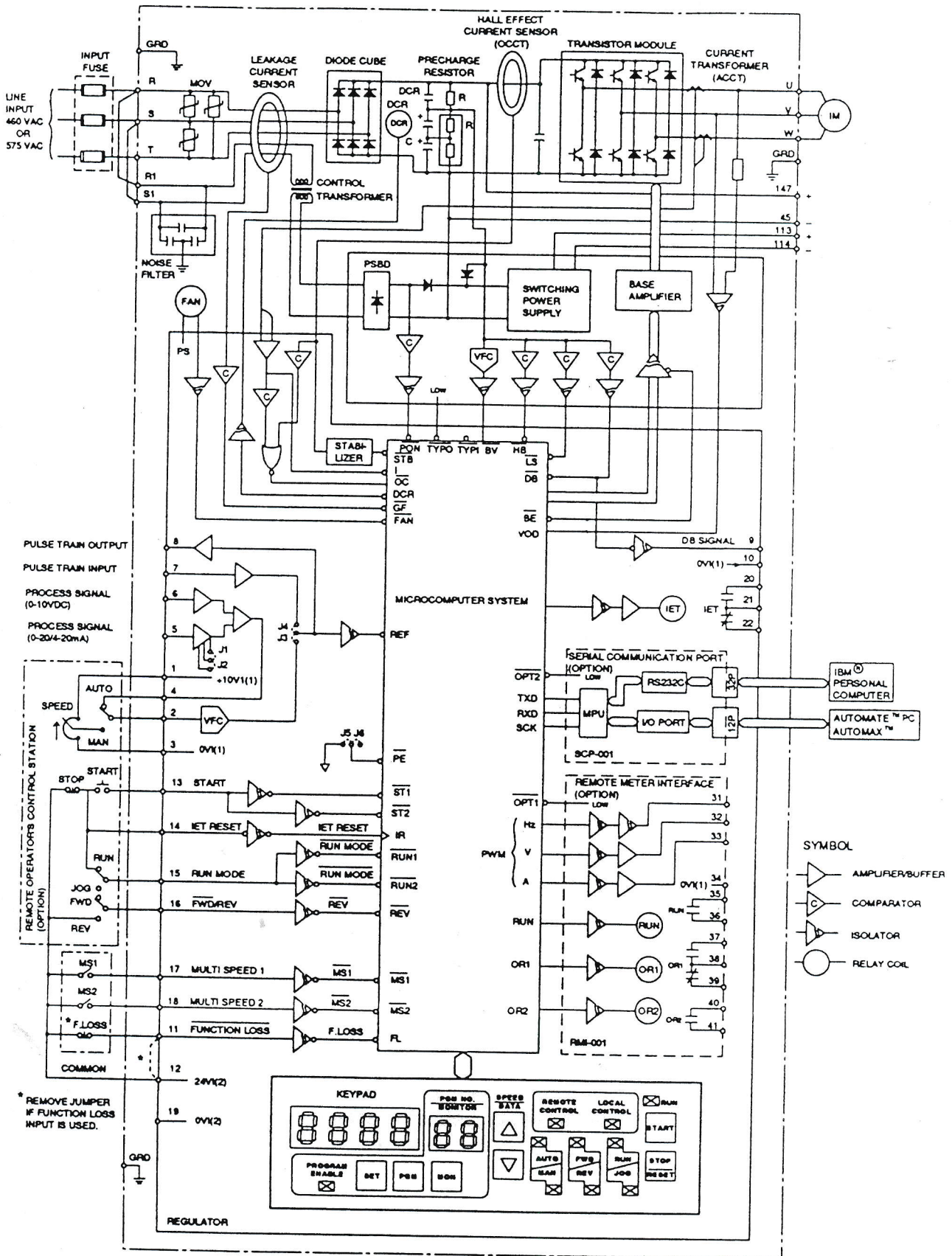


Figure 3.a: Functional Block Diagram GMI

### 4.0 ENGINEERING INSTRUCTIONS

#### 4.1 Line Voltage / Input-Fuse

The INVERTRON BMI units are designed for 220V/230V networks. models BMI-S04, BMI-S07 and BMI-S11 are fed from a single-phase supply, only whereas BMI-S15 must be connected to a three-phase supply.

The INVERTRON GMI units are suitable only for three-phase connection. They can be operated on networks with rated voltages from 380V - 440V.

All the INVERTRON BMI/GMI invertors may only be connected to the supply by means of an external line input-fuse. The fuse current rating should be within the limits described in the section 'Technical Data'.

#### 4.2 Input Transformer / Line Reactor

INVERTRON BMI units can be connected directly to the supply with line-side fuses if the capacity of the line transformer is  $< 500$  kVA.

INVERTRON GMI-S04 up to GMI-S31 units can be connected directly to the supply with line-side fuses if the capacity of the line transformer is  $< 1000$  kVA.

INVERTRON GMI-S38 up to GMI-S104 units and GMI-P44 up to GMI-P136 can be connected directly to the supply with line-side fuses if the capacity of the line transformer is  $< 250$  kVA.

Should the transformer rating be higher, a line reactor or matched isolating transformer should be connected upstream of the unit to limit the short-circuit current in the event of a fault.

#### 4.3 Line Disturbances

INVERTRON BMI and GMI units operate using an uncontrolled diode bridge at the network end. Consequently, the power factor has a constant value better than 0.96 irrespective of the load and speed at the unit output.

Current rectifiers produce current harmonics. The resulting voltage harmonics must not exceed the limits specified in the respective national specifications. It is necessary to examine in each individual case whether measures are required for reducing network harmonics (installation of line filter or line reactor).

The use of a line reactor or of a series transformer offers the additional benefit of smoothing the line voltage peaks or improving radio interference suppression.

In order to reduce radio interference noise produced by the inverter, it is recommended to install the matched Radio Interference Filter. The noise level will be reduced according VDE 0875, Level "N". The maximal length between Inverter and filter should not exceed 0.3m.

The use of a filter does not mean that other measures to reduce noise are not necessary anymore (shielded motor leads, shield at both ends grounded, cables as short as possible, no cables in parallel).

4.4 Motor Selection

INVERTRON BMI and GMI units are suitable for supplying three-phase standard motors (asynchronous squirrel-cage motors) and permanent magnet synchronous motors (note - unit requires adaptation). Other motors are also permitted under certain conditions. In such cases, please contact your nearest RELIANCE office.

In view of the reduced cooling capacity of self-ventilated motors when running at reduced speed, preference should be given to motors with an integral temperature switch as a protection against thermal overloads

4.5 Power Reduction

A power reduction at the motor shaft is likely as a consequence of the imperfect sine-shaped motor currents and voltages as well as the reduced cooling of self-ventilated motors when running at reduced speed. The following diagram shows the correlation between the available torque and speed. The maximum value of the short-term available torque is determined by the variable current limiting.

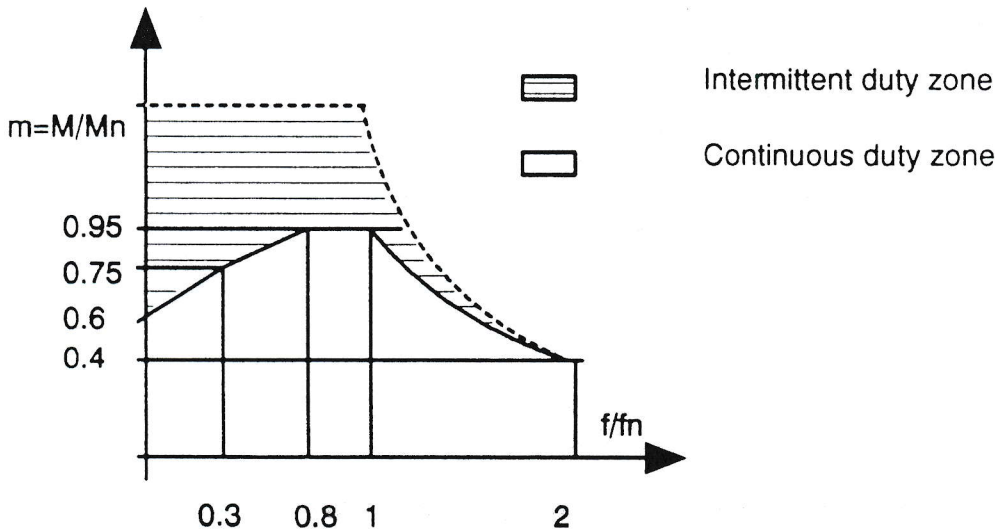


Figure 4.a: Torque vs. speed diagram

4.6 Maximum Motor Size

The maximum motor size (rated output) which should be connected to an INVERTRON BMI or GMI, is limited. This also applies if the required shaft output is less than the rated unit output. It is permissible to use a motor which is one IEC rating class higher than the rated unit output.

The minimum motor size is not limited from a technical aspect. The units can be operated without any problems also without any motor being connected (start-up).

### 4.7 Multiple Motor Applications

If several motors are supplied from one inverter, a distinction must be made between the following two cases:

- The motors are not connected while inverter is in operation. In this case, the total of the motor rated currents must not exceed the unit rated current.
- It is required to connect individual motors during operation. This is only possible in those cases where the unit maximum current is greater than the total of the load currents of all the motors running, plus the starting current of the motor which is connected.

### 4.8 Motor Lead

In engineering a system, allowance should be made for the fact that the maximum length of the motor lead is limited to 100m. In the case of multiple motor applications, it is necessary to add together the length of each individual lead.

Use of screened cables for the motor lead may result in an improvement in radio interference suppression, but at the same time involve an enlargement of capacitive ground currents. If long motor leads are used (particularly with screened cables), these capacitive ground currents may result in an internal equipment trip (IET - short to ground). In addition, if long motor leads are used, it is necessary to allow for a reduction in available motor shaft output.

### 4.9 Chassis Version

It is possible to convert the units very simply into a chassis version (open casing), if required e.g. for installing in control cabinets. This is done by removing the front cover, detaching the bottom slide-in plates with the cable lead-ins and removing them from the casing. In addition, the top cover of the ventilation slot is removed.

Following this, the front cover is fitted on again. The plates on the INVERTRON GMI units with sheet metal casing, can be detached without removing the front cover. In this version, the permissible upper limit of the ambient temperature can be increased from 40°C to 55°C. It should be noted in this case that the protection class of the units is reduced from IP20 to IP00.

## 5 - TECHNICAL DATA

### 5.0 TECHNICAL DATA

#### 5.1 Performance Data of BMI/GMI Units:

Unit	Input Voltage	Controller Input	Maximum Input Amps	Maximum Output Amps
BMI-S04	1 * 200 - 230V	2,6kVA	12,0A	4,5A
BMI-S07	1 * 200 - 230V	3,4kVA	15,5A	7,5A
BMI-S11	1 * 200 - 230V	5,3kVA	24,0A	11,5A
BMI-S15	3 * 200 - 230V	7,8kVA	19,6A	16,7A
GMI-S02	3 * 380 - 440V	1,8kVA	2,8A	2,3A
GMI-S04	3 * 380 - 440V	3,4kVA	5,2A	3,9A
GMI-S06	3 * 380 - 440V	5,4kVA	8,2A	5,9A
GMI-S09	3 * 380 - 440V	8,0kVA	12,3A	9,2A
GMI-S13	3 * 380 - 440V	10,3kVA	15,6A	12,6A
GMI-S16	3 * 380 - 440V	12,7kVA	19,3A	16,4A
GMI-S23	3 * 380 - 440V	18,6kVA	28,2A	23,0A
GMI-S31	3 * 380 - 440V	25,6kVA	38,9A	31,0A
GMI-S38	3 * 380 - 440V *	33 kVA	47,0A	38,0A
GMI-S44	3 * 380 - 440V *	38 kVA	53,0A	44,0A
GMI-S56	3 * 380 - 440V *	47 kVA	67,0A	56,0A
GMI-S70	3 * 380 - 440V *	58 kVA	83,0A	70,0A
GMI-S88	3 * 380 - 440V *	69 kVA	99,0A	88,0A
GMI-S104	3 * 380 - 440V *	80 kVA	115,0A	104,0A
GMI-P09	3 * 380 - 440V *	8,0 kVA	12,3A	8,2A
GMI-P13	3 * 380 - 440V *	10,3 kVA	15,6A	11,5A
GMI-P16	3 * 380 - 440V *	12,7 kVA	19,3A	15,2A
GMI-P23	3 * 380 - 440V *	18,6 kVA	28,2A	21,8A
GMI-P31	3 * 380 - 440V *	25,6 kVA	38,9A	29,5A
GMI-P38	3 * 380 - 440V *	33 kVA	47,0A	37,0A
GMI-P44	3 * 380 - 440V *	38 kVA	55,0A	44,0A
GMI-P56	3 * 380 - 440V *	47 kVA	68,0A	56,0A
GMI-P70	3 * 380 - 440V *	58 kVA	83,0A	70,0A
GMI-P88	3 * 380 - 440V *	69 kVA	99,0A	88,0A
GMI-P104	3 * 380 - 440V *	80 kVA	115,0A	104,0A
GMI-P136	3 * 380 - 440V *	94 kVA	136,0A	136,0A
GMI-506	3 * 500V	7,5kVA	7,5A	6,2A
GMI-512	3 * 500V	14,5kVA	14,5A	12,0A
GMI-523	3 * 500V	27,8kVA	27,9A	23,0A

The values of the input currents describe the maximum input current at unit rated current (output current). It is possible to increase these values short-term as a consequence of an overload at the output end (maximum 150 % at S-Types, 115% at P-Types).

\* for 440V line see chapter 5.3

## 5 - TECHNICAL DATA

### 5.2 Performance Data of Recommended Motors and Options

Unit	Motor Nominal Power	Motor Shaft Power	Max. Input Fuse	Min. Input Fuse
BMI-S04	0,75kW	0,7kW	30A	16A
BMI-S07	1,5kW	1,4kW	30A	20A
BMI-S11	2,2kW	2,1kW	30A	30A
BMI-S15	3,7kW	3,5kW	30A	25A
GMI-S02	0,75kW	0,7kW	30A	10A
GMI-S04	1,5kW	1,4kW	30A	10A
GMI-S06	2,2kW	2,1kW	30A	10A
GMI-S09	4,0kW	3,8kW	30A	16A
GMI-S13	5,5kW	5,2kW	30A	20A
GMI-S16	7,5kW	7,1kW	30A	25A
GMI-S23	11,0kW	10,4kW	63A	40A
GMI-S31	15,0kW	14,2kW	63A	50A
GMI-S38	18,5kW	17,6kW	100A	63A
GMI-S44	22,0kW	20,9kW	100A	80A
GMI-S56	30,0kW	28,5kW	100A	100A
GMI-S70	37,0kW	35,2kW	160A	125A
GMI-S88	45,0kW	42,8kW	160A	125A
GMI-S104	55,0kW	52,3kW	160A	125A
GMI-P09	4,0 kW	3,8 kW	30A	16A
GMI-P13	5,5 kW	5,2kW	30A	20A
GMI-P16	7,5kW	7,12kW	30A	25A
GMI-P23	11,0kW	10,4kW	63A	40A
GMI-P31	15,0kW	14,2kW	63A	50A
GMI-P38	18,5kW	17,6kW	63A	50A
GMI-P44	22,0kW	20,9kW	100A	63A
GMI-P56	30,0kW	28,5kW	100A	80A
GMI-P70	37,0kW	35,2kW	100A	100A
GMI-P88	45,0kW	42,8kW	160A	125A
GMI-P104	55,0kW	52,3kW	160A	125A
GMI-P136	75,0kW	71,2kW	160A	160A
GMI-506	4,0kW	3,8kW	15A	10A
GMI-512	7,5kW	7,1kW	25A	20A
GMI-523	15,0kW	14,2kW	40A	30A

The reduction in output at the motor shaft is explained in the section 'Engineering Instructions'.  
 The rating of the maximum back-up fuse should on no account be exceeded for reasons of the short-circuit protection. The figure indicated for the minimum back-up fuse refers to the inverter mode with rated output. In the event that the inverter is over dimensioned compared to the motor, it may indeed be a sensible measure to use smaller fuse rated values.  
 The tripping characteristic of the line fuses should correspond to the type 'gL' (all BMI and GMI), for all BMI and GMI-S02 up to GMI-S31 are also fuses type 'slow' possible.

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## 5 - TECHNICAL DATA

### 5.3 Line data

Line voltage	
BMI	: 200 - 230V
GMI-S02 to GMI-S31 / GMI-P09 to GMI-P38	: 380 - 440V
GMI-S38 to GMI-S104/GMI-P44 to GMI-P136	: 380 - 415V
for 440V	: change plug at trafo from 415V to 440V
GMI (UL Type)	: 460V
Line voltage tolerance	: +/- 10%
Line frequency	: 48Hz - 62Hz
Max. input transformer rating	
BMI	: 500kVA
GMI-S02 to GMI-S31/GMI-P09 to GMI-P38	: 1000kVA
GMI-S38 to GMI-S104/GMI-P44 to GMI-P136	: 250kVA
Power factor	: 0,96

### 5.4 Power Unit Data

Max. output voltage	: equal line voltage
Output frequency range	: 0Hz to 405Hz
Output frequency stability (long term)	: 0,01% of base frequency (digital reference)
	: 0,5% of base frequency (analog reference)
Linearity (speed reference to output frequency)	: ±1%
Speed accuracy	: ±1% with
adjusted slip compensation	
Duty	: S1
Overcurrent level (IET)	: >200% of nominal current
Current limit	
S-Types	: 150% for 1 minute every 10 minutes
P-Types	: 115% short time

### 5.5 Enclosure

Standard version	: IP20 (IEC- Norm)
Chassis version	: IP00 (IEC- Norm)

### 5.6 Service Conditions

Altitude	: 1000m above sea level
Ambient temperature for Standard version	: -10°C to 40°C
Ambient temperature for Chassis version	: -10°C to 55°C
Relative humidity	: max. 95% non-condensing

### 5.7 Protections

Instantaneous electronic trip (IET) at:	- Line over- and undervoltage
	- DC-Bus under- or overvoltage
	- Overcurrent or earth current
	- Over temperature
	- Cooling fan fault
	- Microprocessor logic fault
	- Memory error

## 5.8 Signal Inputs and Outputs

INVERTRON BMI/GMI units can, if required, be controlled through isolated inputs, which are available on the internal terminal strip.

Control Inputs (+24VDC from internal or external Supply)	: Start
	: Forward / Reverse
	: Run / Jog
	: Reset
	: Function Loss
	: Preset speed 1
	: Preset speed 2
Current consumption per Control input	: 2mA if 'On' is selected
Control output maximum Amps	: Relays controlled Error Contact : 1A at 250VAC ; 2A at 30VDC

Reference should be made to the connection diagrams in the section 'Installation' for the terminal assignments of the inputs and outputs.

analogue Reference input	: 0V - 10V DC
	: 0mA - 20mA DC
	: 4mA - 20mA DC
digital Reference input	: Pulse train input
Frequency range	: 0Hz - 97,656.25Hz
Pulse amplitude	: 12V
min. Pulse with	: 2,5µs at high or low level
digital Reference output	: Pulse train output
Frequency range	: 0Hz - 97,656.25Hz
Pulse amplitude	: 12V
Pulse with	: 50% duty (typical value)

The various possibilities of set point selection and terminal assignment of the inputs and outputs are presented schematically in the section 'Installation'.

INVERTRON BMI/GMI units can be equipped on request with an additional card for expanding the signal inputs and outputs.

## 5 - TECHNICAL DATA

### 5.9 Power Losses

The level of the power losses which occur within the INVERTRON BMI/GMI units depend on their rated power. The following data refer to operation at rated load.

Rated Output Power	Losses
0,75kW	100W
1,5kW	100W
2,2kW	150W
4,0kW	200W
5,5kW	250W
7,5kW	300W
11,0kW	400W
15,0kW	550W
18,5kW	700W
22,0kW	800W
30,0kW	1100W
37,0kW	1300W
45,0kW	1500W
55,0kW	1800W
75,0kW	2400W

### 5.10 Dimensions and Weight

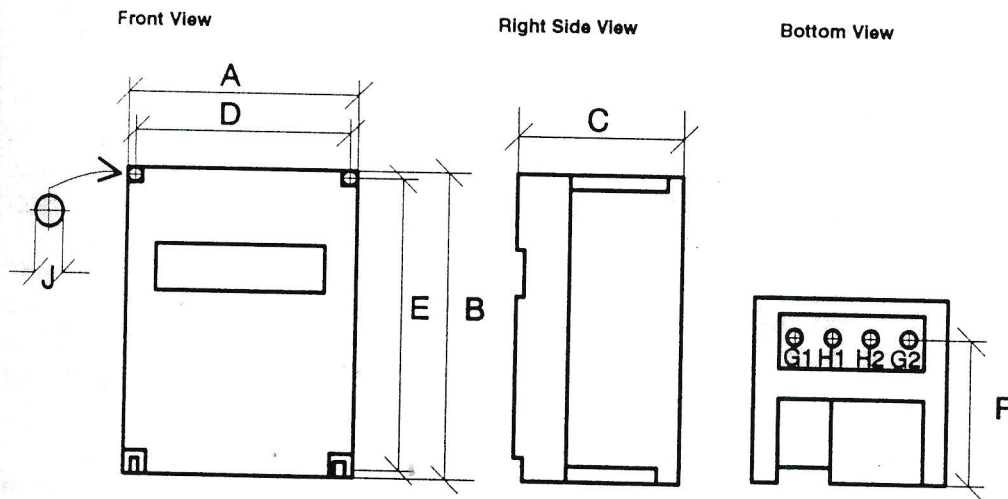


Fig. 5.a: Dimensions

Dimensions ( in mm ) and Weights :

Unit	A	B	C	D	E	F	G1	G2	H1	H2	J	kg
BMI	220	300	180	200	280	112	27,8	27,8	22,2	-	7,2	6,4
GMI - S02-S16 GMI - P09-P23	250	400	200	230	380	127	27,8	27,8	22,2	22,2	10	12
GMI - S23-S31 GMI - P31-P38	280	500	277	230	480	197	27,8	27,8	22,2	22,2	10	25
GMI - S38-S56 GMI - P44-P70	286	750	301	225	730	263	22,2	38	38	22,2	9	34
GMI - S70-S104 GMI - P88-P136	418	750	301	355	730	263	47	47	38	38	9	60

### 6.0 INSTALLATION

#### 6.1 Installation Point

The units should be installed at a clean and dry point to ensure that the permissible ambient temperatures and installation conditions can be observed as specified in the section 'Technical Data'.

Preparatory work relating to installation, such as drilling, welding etc, should be completed prior to actual installation.

The units should be installed in the vertical position to ensure adequate cooling air ventilation (terminal strip inside the casing should be on the underside of unit).

Proper allowance should be made for adequate clearance at the side, top and bottom to other units or to cabinet walls etc, when installing.

Cooling air slots provided in the casings must not be sealed or closed over to ensure trouble-free operation.

#### 6.2 Regulations

It is essential to observe and take into account national regulations and provisions relating to installation and operation of electrical systems.

The IEC regulations demand, among other things, that an effective equipment and line protection be provided against short-circuits and shorting to ground. This necessitates the installation of fuses or similar protective devices at the line connection of the equipment. The appropriate data of the fuse rated values recommended by RELIANCE are summarized in the section 'Technical Data'.

The relevant national regulations often require that electrical systems may only be connected to the supply network provided they can be isolated from the circuit. An isolation of this nature is not provided in the unit and must be provided externally. It has proven good practice to install an equipment master switch in the line feeds.

A further possibility is also to install a line or motor contactor. Should specifications require that the entire system must be isolated from the line supply in the event of an emergency stop, it is than beneficial to use a line contactor.

The internal +24V DC power supply for external control of the unit is isolated from the system ground. If required, this feed can be earthed by means of a wire jumper from terminal 19 to GRD.

If using the remote control station or the version with external control by means of contactors or switches, note that the maximum lead length is limited to 100 metres.

Signal lines should be designed with screened cables. These should be laid separately from live conductors and powerful magnetic fields.

All contactors and relay coils or electrical valve coils etc which are linked to the drive, must be suitably connected (AC coils with RC elements, DC coils with diodes).