6.3 Line Connection

6.5

The conditions regarding line voltage, line fuses, series transformer and system reactions should be observed.

6.4 Motor Connection

The condition regarding motor selection, power reduction, maximum motor size and multiple motor applications should be observed.
The maximum length of the motor lead is limited to 100 metres. If longer motor leads are used, allowance must be made for a reduction in available motor shaft output power otherwise internal equipment tripping may result from high ground currents. Further information in this connection is available in the section 'Engineering Instructions'.
Use of screened cables for the motor lead results in an improvement in radio interference protection.

6.5 Controller Wiring Locations

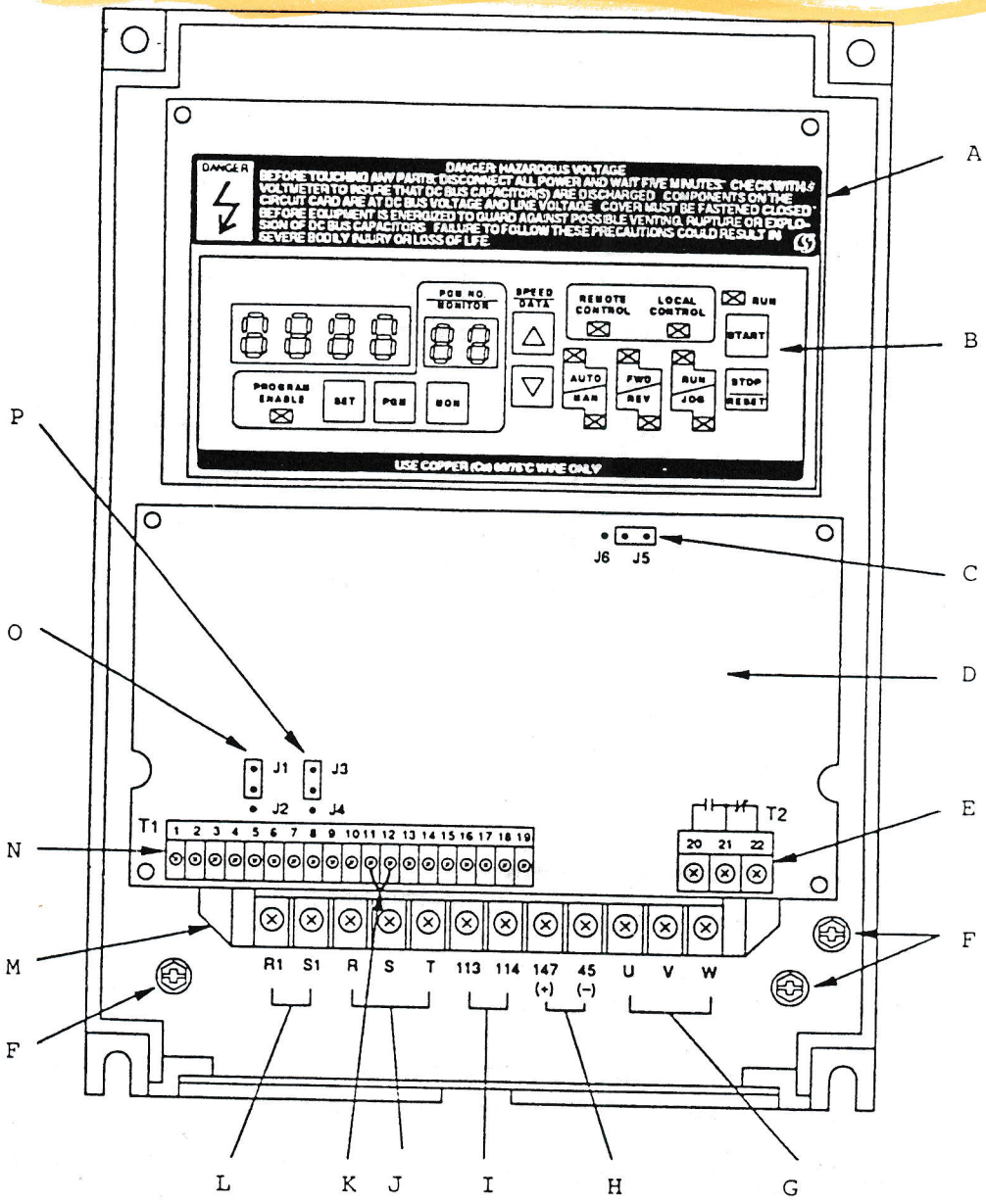


Fig. 6a: Wiring Locations

A: Power supply & Base driver board
B: Keypad and display
C: Program Jumper:
Position 'J5' - Programming disable
Position 'J6' - Programming enable
D: Regulator board
E: IET Contact terminals
F: Ground terminals
G: AC Output to motor
H: DC-Bus and optional DB-unit terminals
I: Supply for DB-unit
(Only for GMI)
J: AC Input
K: Function Loss Jumper
L: AC Input control
M: Power terminals
N: Control signal terminals
O: Speed reference jumper:
Position 'J1' for 4-20mA
Position 'J2' for 0-20mA
P: Speed reference jumper:
Position 'J3' for analog reference
Position 'J4' for pulse train input

6.6 Terminal Assignment of Regulator Board

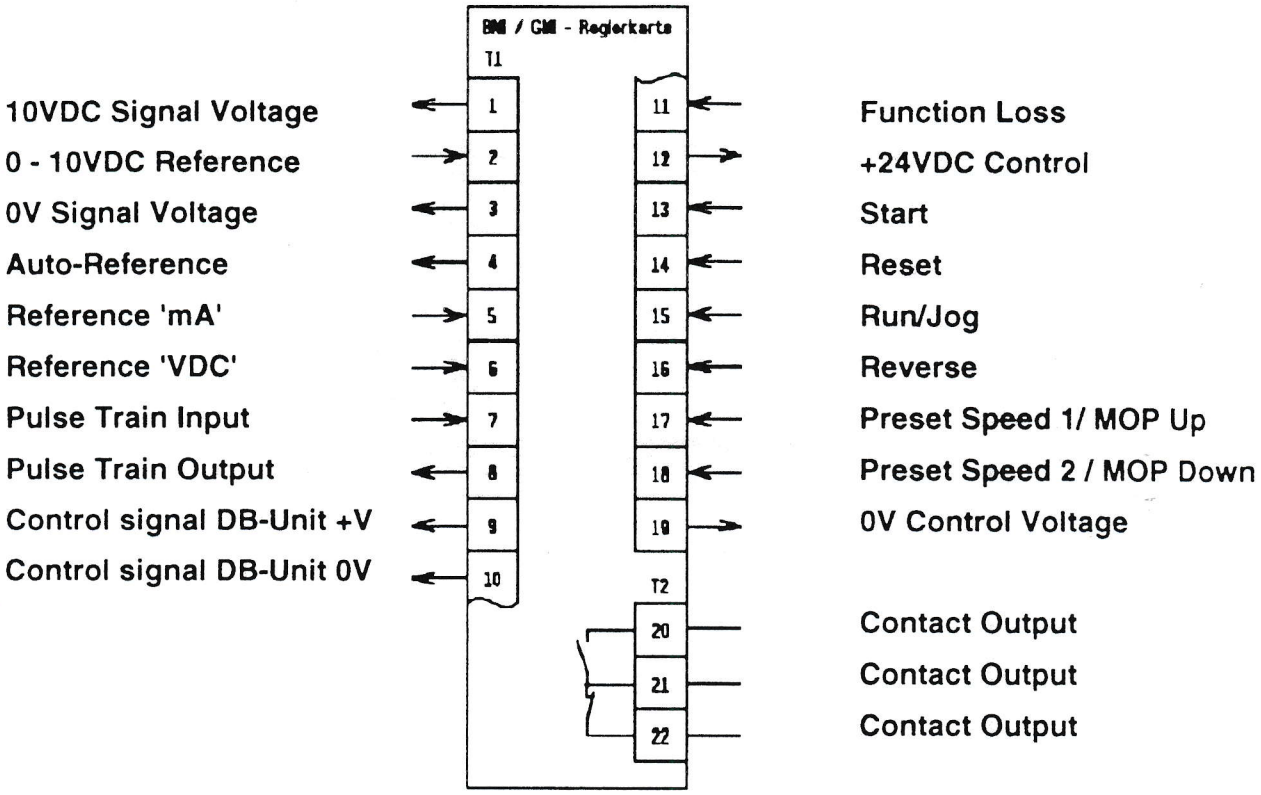


Fig. 6b: Terminal Assignment of Regulator Board

Notes: The control signal to the brake unit (terminals 9 and 10) should be connected only in combination with this equipment option.

If the Function Loss control input is used (terminal 11), the factory-installed wire jumper between terminals 11 and 12 must be removed.

An error reset can be performed by activating the 'Reset' control input (terminal 14). As this control input reacts to a signal edge, it is of no consequence whether this circuit is closed or open for the error reset.

Activating the control input Run/Jog (terminal 15) results in the Start command being locked in and the reference switching to the appropriate set point selection.

Simultaneously activating control inputs Fixed Speed 1 and 2 (terminals 17 and 18) enables the fixed speed 3 to be selected.

If the drive is configured for MOP function (Parameter 57), then the functionality of the inputs 17 and 18 will change from preset speed to accelerate (17) or decelerate(18).

Should it be necessary to ground the 24V DC control voltage to conform with specific national specifications, a wire jumper should be installed from terminal 19 to the casing (GRD).

The contact at terminal 20 and 21 closes as soon as an equipment fault exists.
The contact at terminal 21 and 22 opens as soon as an equipment fault exists.

6.7 Block Diagram Reference Selection

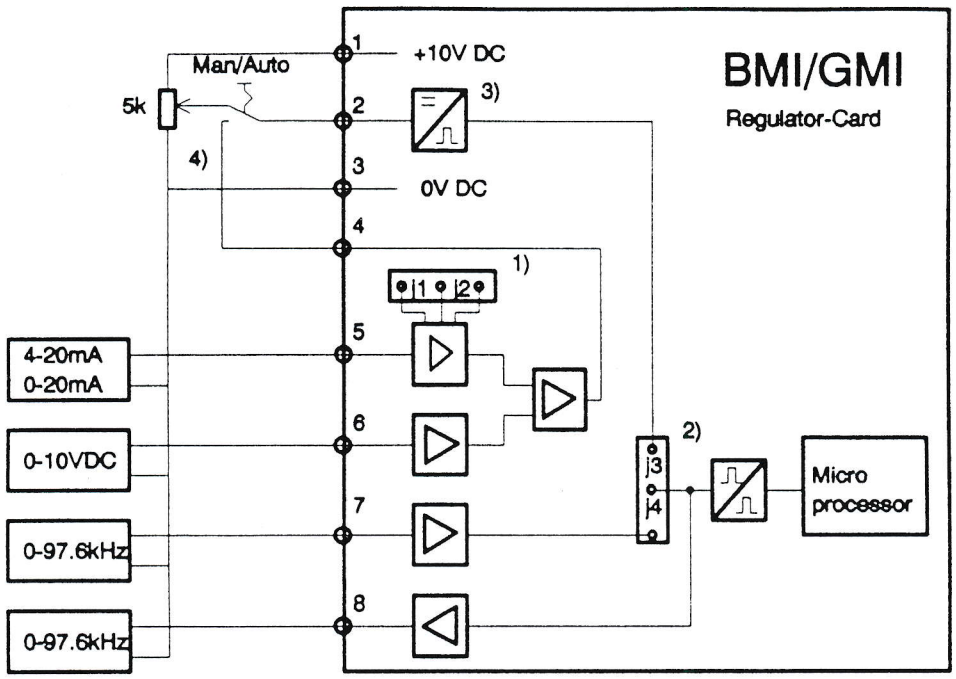


Fig. 6c: Block Diagram Reference Selection

1) Plug-in jumper for set point selection:
Position 'J1' for set point signal 4 - 20mA
Position 'J2' for set point signal 0 - 20mA

2) Plug-in jumper for set point selection:
Position 'J3' for analog set point signals
Position 'J4' for pulse frequency input

3) All analog set point signals are converted into a digital frequency signal by means of this A/D converter. The resolution of this converter enables the output frequency to be varied in 0.1Hz steps.

4) If the option Reference Trim Potentiometer is built in, the connection from terminal 4 to terminal 2 has to be removed.

Note: If an external set point potentiometer is used between terminals 1 and 3, its resistance should be 5kOhm for reasons of linearity.

The data of the pulse frequency input and of the pulse frequency output should be obtained by referring to the section 'Technical Data'.

The pulse frequency output is suitable for reference to a follower drive.

The 'MAN/AUTO' must be configured for the required reference.

6.8 Main Circuit Wiring Diagrams

The line fuses can be selected in accordance with the section 'Technical Data'. The fuse rated values depend on the respective equipment input current. Use of a series transformer or a line reactor is not absolutely necessary and should be examined in accordance with the particulars in the section 'Engineering Instructions'.

Single Phase Input:

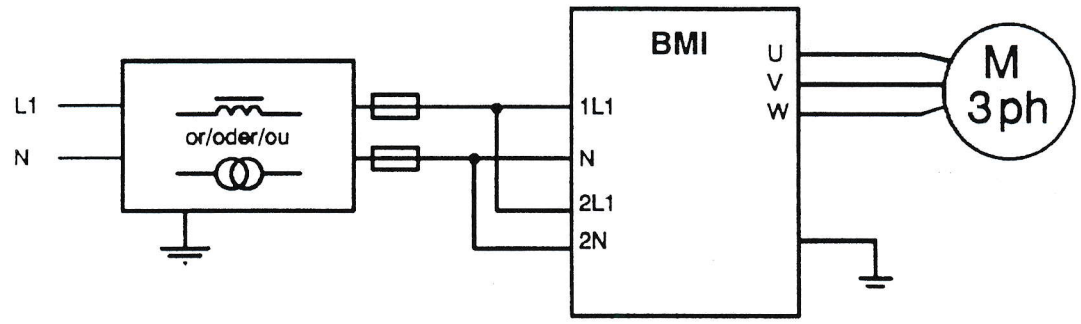


Fig. 6d: Wiring diagram of single phase input, power circuit

Three Phase Input:

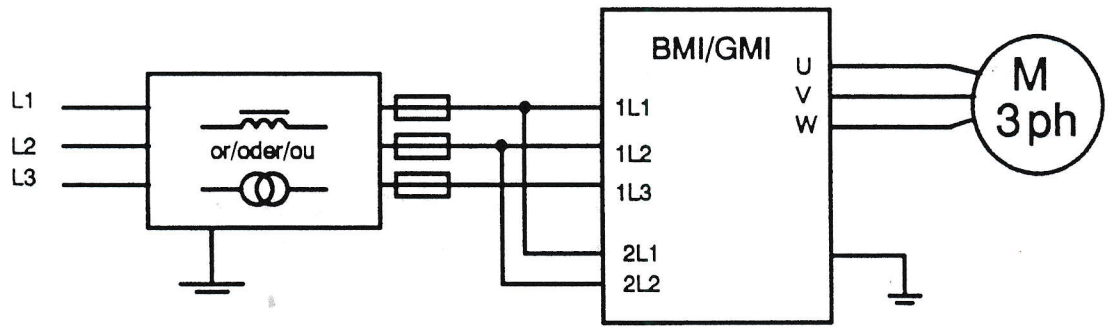


Fig. 6e: Wiring diagram of three phase input, power circuit

With Input Contactor:

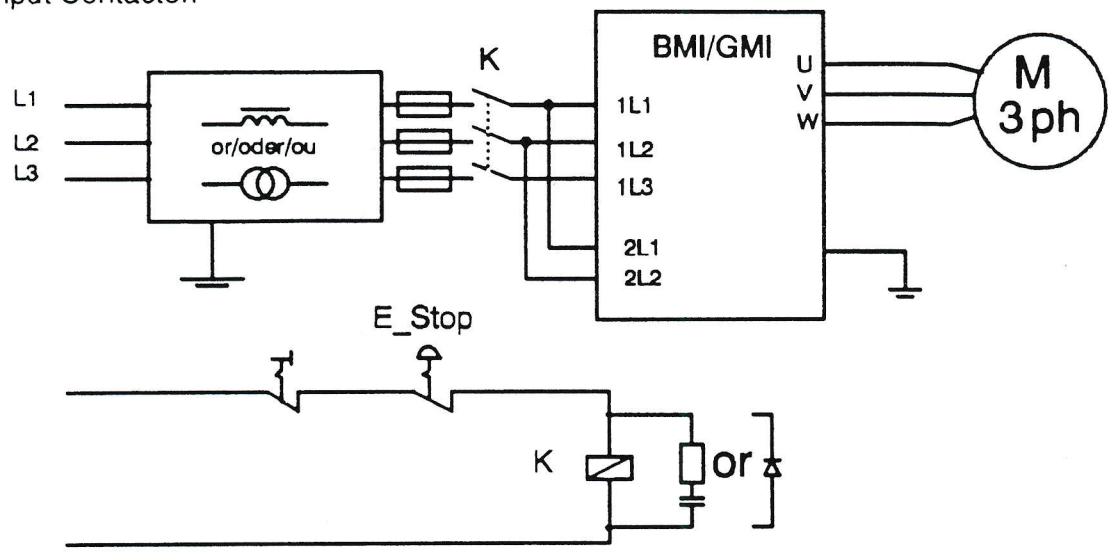


Fig. 6f: Wiring Diagram with Input Contactor, power circuit

Notes: All contactor and relay coils which are linked to the drive, must be connected in a suitable manner to avoid non-permissible overvoltage peaks (AC coils with RC elements, DC coils with diodes).

With Input Contactor and separate Regulator Supply:

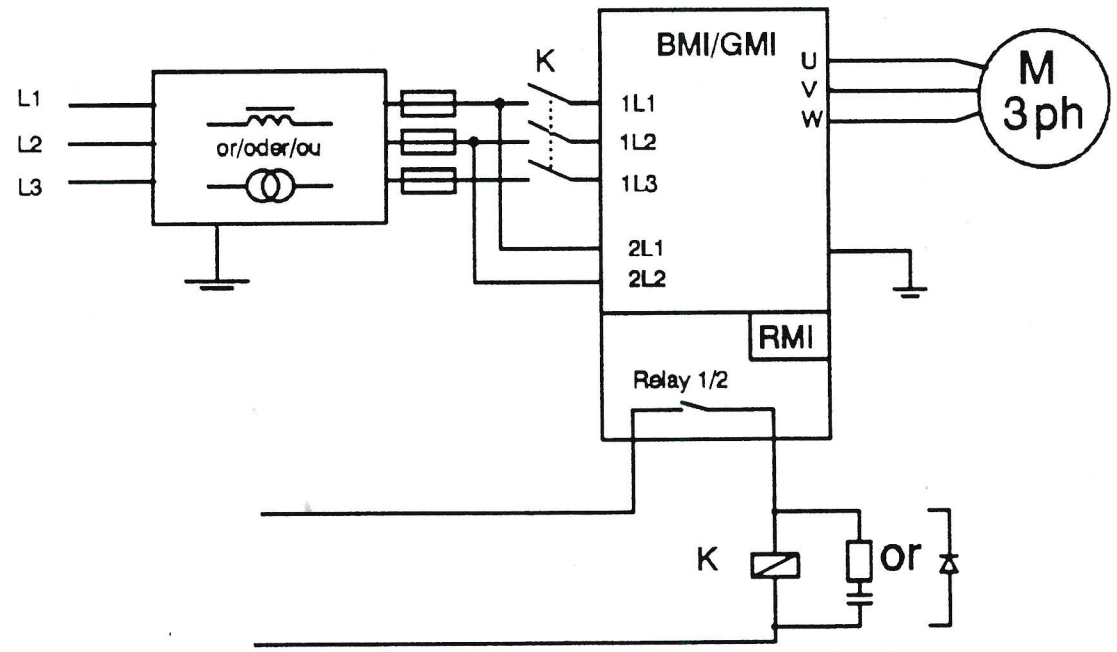


Fig. 6g: Wiring diagram with Input Contactor and separate Regulator Supply

Notes: All contactor and relay coils which are linked to the drive, must be connected in a suitable manner to avoid non-permissible overvoltage peaks (AC coils with RC elements, DC coils with diodes).

A line contactor with a separate controller feed should be actuated only in combination with the RMI card and one of the programmable output relays available on this card, because of the sequential control required in this case.

The output relay used is internally linked for this purpose to the necessary sequential control by pre-selecting 'line contactor' from the appropriate parameters.

With Output Contactor:

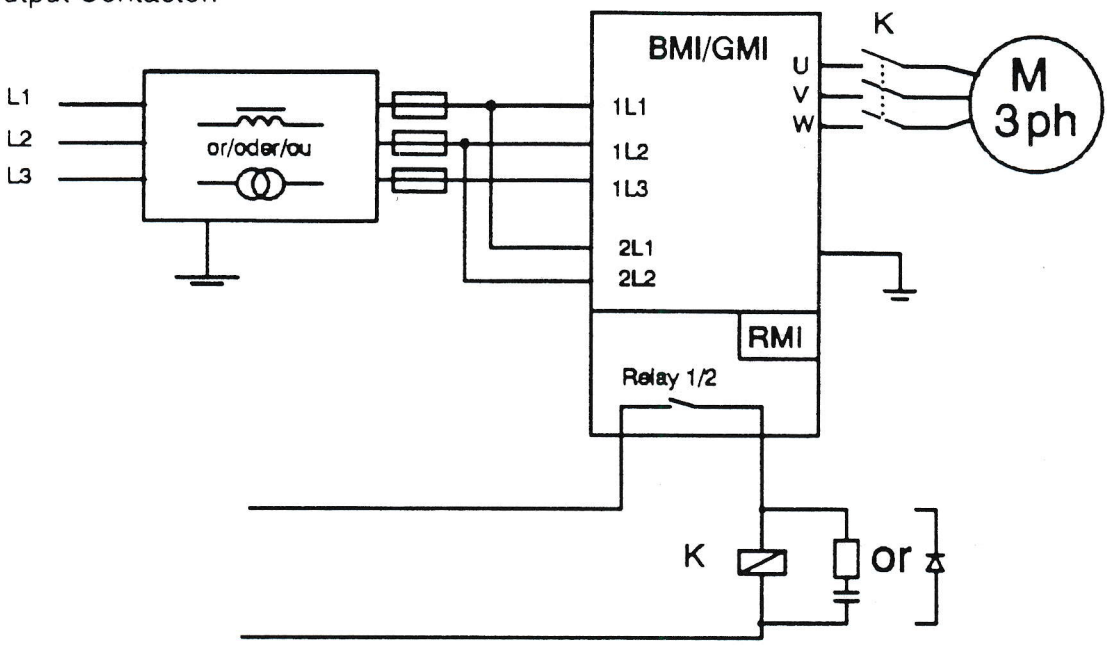


Fig. 6h: Wiring diagram with output contactor, power circuit

Notes: A motor contactor should be actuated only in combination with the RMI card and one of the programmable output relays available on this card, because of the sequential control required in this case.

The output relay used is internally linked for this purpose to the necessary sequential control by pre-selecting 'motor contactor' from the appropriate parameters.

6.9 Wiring Diagrams Control Circuit

Without external elements:

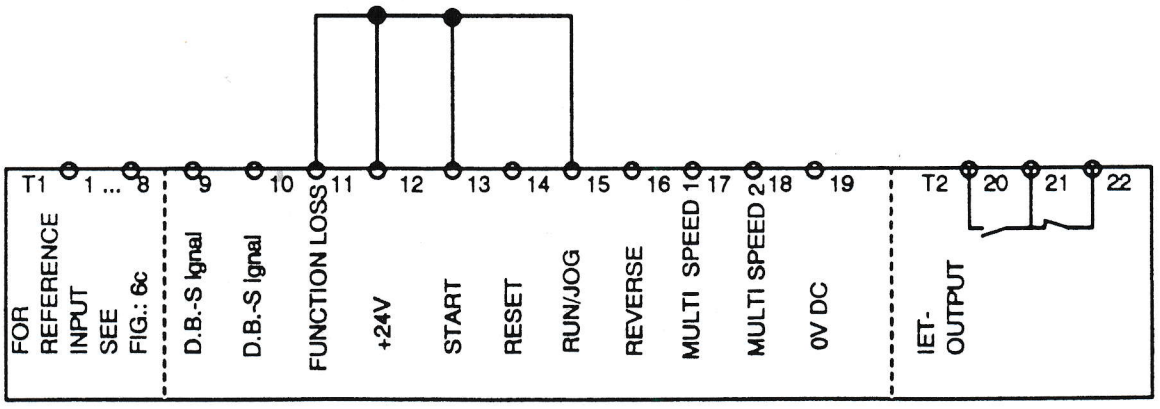


Fig. 6i: Wiring diagram without external elements, control circuit

Notes: The unit is started by connecting the line voltage. An error can be reset and the motor stopped only by switching off the line voltage.

With external contact:

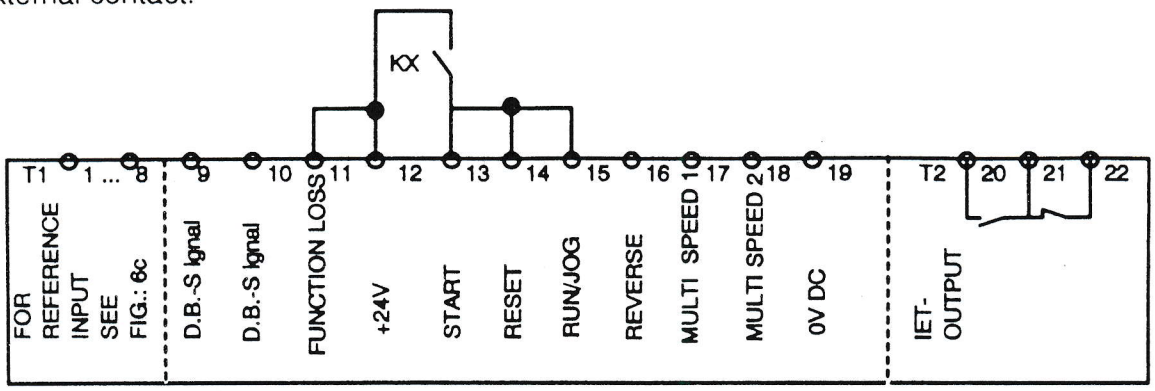


Fig. 6j: Wiring diagram with external contact, control circuit

Notes: The unit is started when the maintained contact Kx closes. An error is reset and the motor also stopped by the contact Kx opening.

With external switch and push buttons:

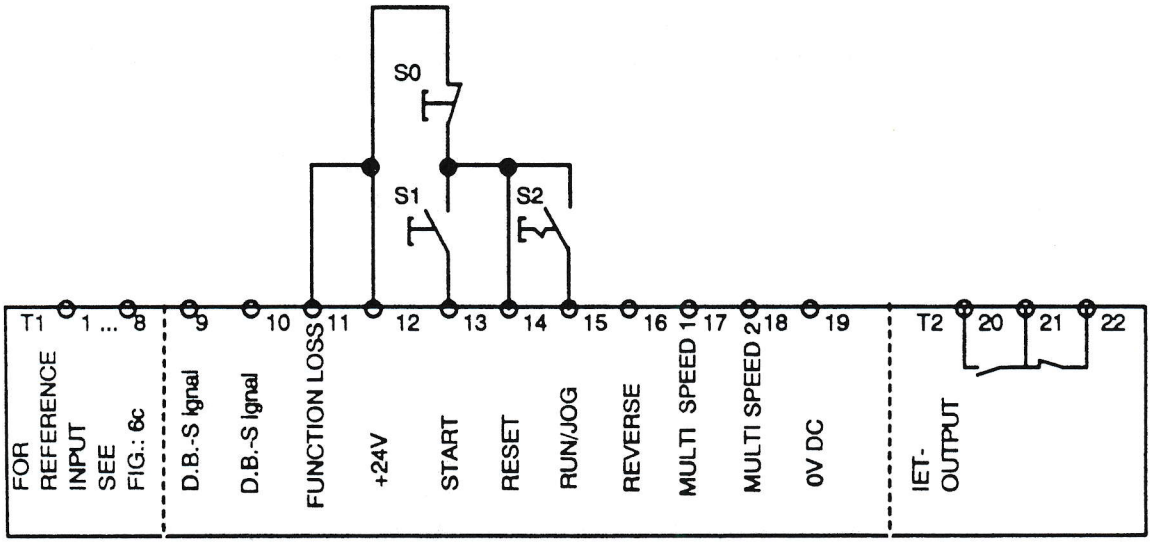


Fig. 6k: Wiring diagram with switch and push button, control circuit

Notes: The unit is started by operating the momentary-contact switch S1. If the maintained-contact switch S2 is opened, the unit operates in the 'Jog Mode'. The unit output is controlled only for as long as switch S1 is closed.

If switch S2 is closed, and switch S1 is operated, the start command is maintained and the external set point selected. The motor can be stopped both by opening maintained-contact switch S2 as well as by operating momentary-contact switch S0.

An error reset can only be made, however, by pressing momentary-contact switch S0.

Other control inputs:

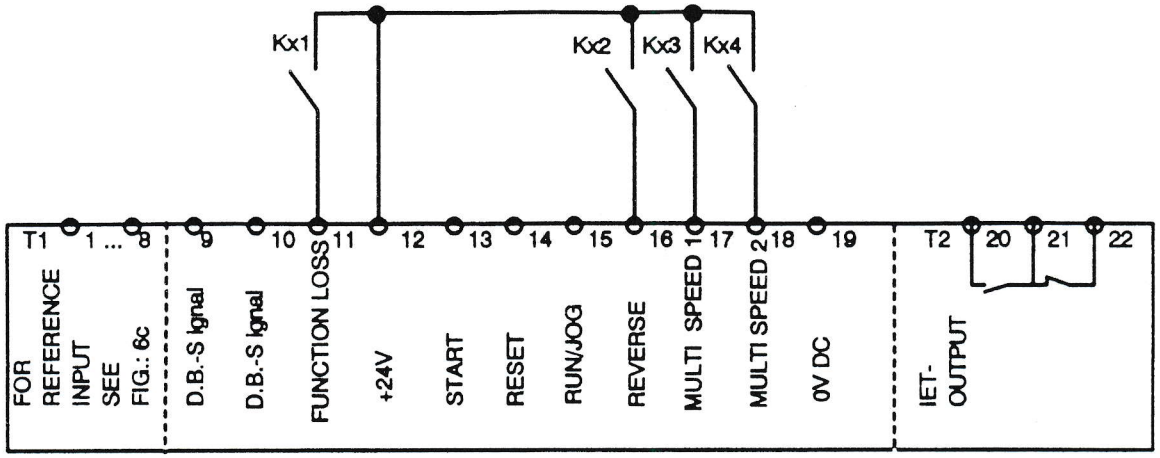


Fig. 6l: Wiring diagram other control inputs, control circuit

Notes: In addition to the connection examples described above, further control functions can be implemented by means of external contacts. Opening the Function Loss control input by means of contact Kx1 results in an error stop of the inverter. Depending on the pre-selected parameter 32, the motor either runs down off-circuit or stops at the deceleration ramp. This control input can be used e.g. for switching off by means of a motor temperature switch in the event of the motor overheating. The direction of rotation can be reversed by closing contact Kx2.
Contacts Kx3 and Kx4 permit the switchgear from external reference selection to three variable fixed speeds. In this case, the third fixed speed can be selected by closing both contacts.

External 24VDC - Supply:

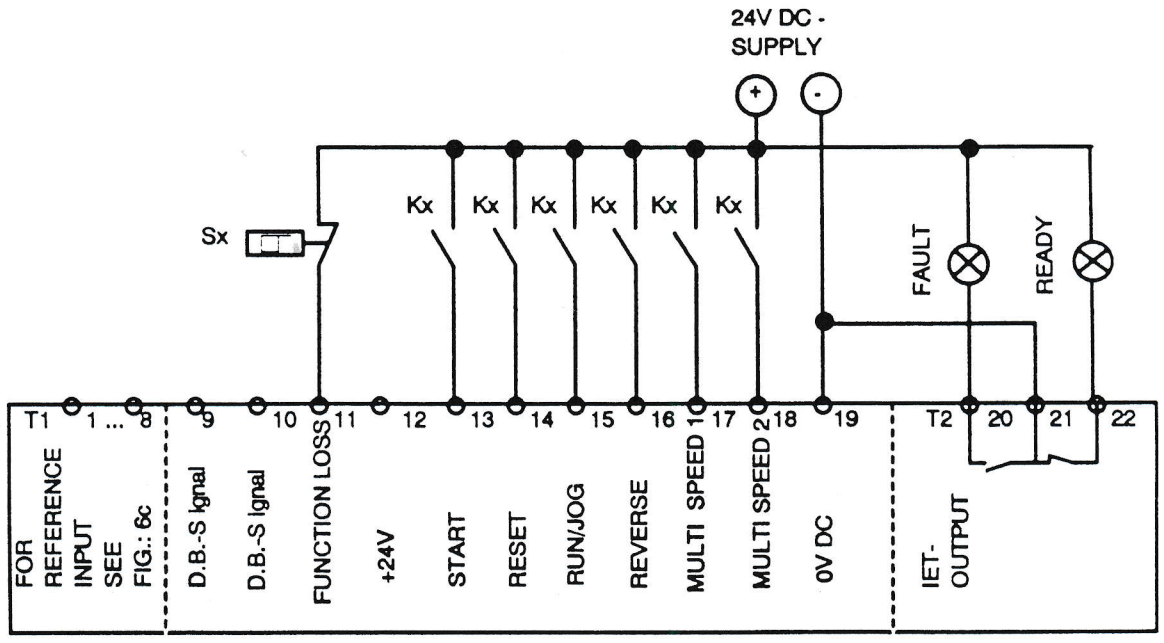


Fig. 6m: Wiring diagram with external 24V DC - Supply, control circuit

Notes: The control can be achieved by means of an external 24VDC feed, of which the negative should be connected to terminal 19.

The power consumption of the control inputs is 2mA per input in the 'On' state.

Control via the internal MOP function:

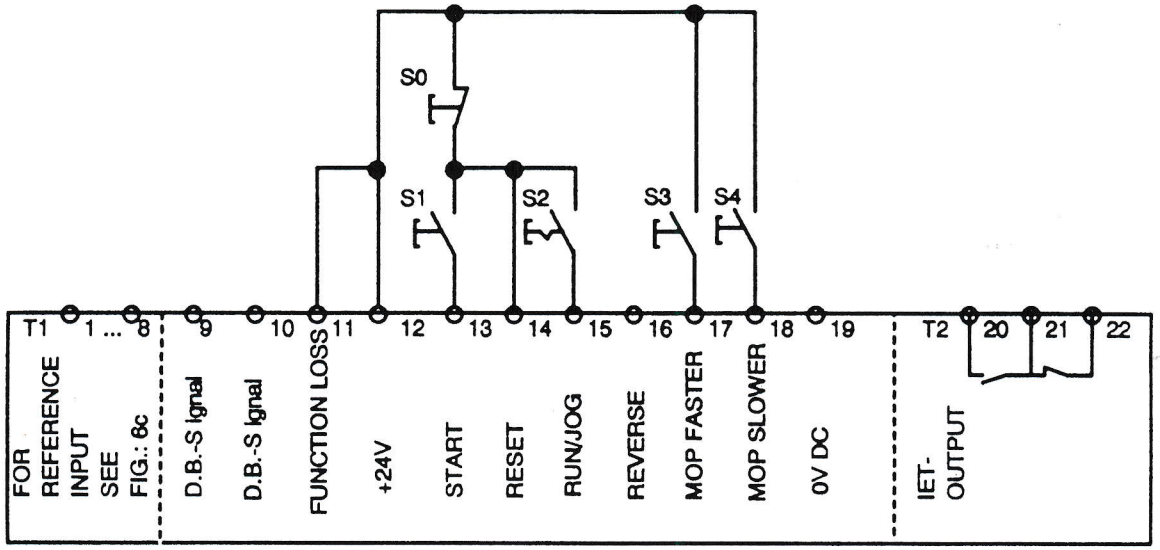


Fig. 6n: Wiring diagram control inputs, incl. internal MOP function

Notes: Its also possible to start the drive in this mode with a maintained start switch (see figure 6j).

The internal MOP will be activated by selecting "Remote Control" (Parameter 0 = 1), then Parameter 57 defines the function of control inputs 17&18 (Parameter 57 = 1 means MOP function).

After switching on, the drive will accelerate to the specified minimum speed. As long as the "faster" Push Button is pressed, the drive will accelerate with the specified acceleration time.
As long as the "slower" Push Button is pressed, the drive will decelerate with the specified deceleration time, until it reaches the specified minimum speed.

Both push buttons pressed or released means that the drive will maintain its actual speed.

7.0 OPTIONS

CAUTION
The equipment must be disconnected from the supply before performing any manipulation. The intermediate circuit voltage should be checked at terminals 147 and 45 using a voltmeter. The unit must not be touched until the voltage is less than 50VDC. Discharge of the intermediate circuit capacitor takes approximately two minutes.

7.1 RMI Card

General Description

This card has three isolated analog outputs for displaying output frequency, output voltage and output current by means of an external indicating instrument, a remote control station or the external digital display.
The signals for displaying output voltage and output frequency are calculated within the BMI/GMI invertors.
The signal for displaying the output current is based on a current measurement at the equipment output.
Use of this card does not influence the operating data display of the sealed keyboard.

In addition, there are three relay-controlled, floating contact outputs on the card:

Contact output of 'Run Relay'
Contact output of 'Relay 1'
Contact output of 'Relay 2'

The 'Run Relay' is activated for as long as the unit is in the 'Run' operating state (green LED 'RUN' on the keyboard illuminated).
Activation of relay 1 and relay 2 can be selected by means of the parameters 28 and 29.

Technical Data

Contact outputs for:

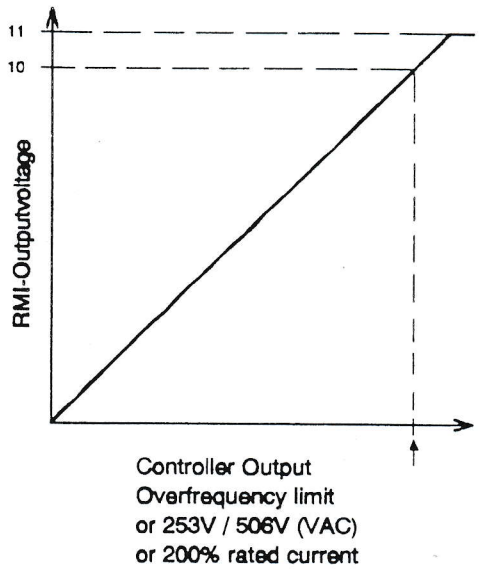
- Run Relay
  The make contact of this relay is available at terminals 35 and 36.

- Relay 1
  The changeover break-before-make contact of this relay is available at terminals 37, 38 and 39. The make contact is connected to terminals 37 and 38 while the break contact is connected to terminals 38 and 39.
  The various control possibilities of this relay can be selected by means of parameter 28.

- Relay 2
  The make contact of this relay is connected to terminals 40 and 41. The various control possibilities of this relay can be selected by means of parameter 29.

The maximum contact rating of these relays is 1A at 250VAC or 2A at 30VDC.

Analog Signal outputs:



- Output frequency
  The voltage at terminal 31 reaches +10VDC when the actual controller output frequency reaches the Over frequency limit (Parameter No. 38).

- Output voltage
  The voltage at terminal 32 reaches +10VDC when the actual output voltage is equal to the upper limit of the rated voltage. (253VAC for BMI and {506VAC} for GMI).

- Output current
  The voltage at terminal 33 reaches +10VDC when the actual output current reaches 200% of the nominal output current.

Note: As the RMI card is also supplied as an option for the American version (460VAC line voltage), the addition of Unom + 10% (460VAC + 46VAC) results in a maximum of 506VAC.

The maximum output current of each of these signal outputs is 1mA at + 10VDC.
All the signals are measured in relation to terminal 34 (0VDC, isolated ground).

The accuracy of the signal outputs is specified as follows:
- The maximum error at a signal voltage of +10VDC is +0.5VDC, -0.3VDC
- The maximum zero point drift is +0VDC, -0.3VDC
- The maximum linearity error (variation from ideal output signal) is +/- 0.15VDC.

Installation

- Remove the front cover of the unit when the inverter is disconnected from the supply.
- The two spacer holders should be pre-fixed in place in the holes provided on the controller card, as shown in the illustration below, by applying light pressure on the plugs.
- After fitting the RMI card onto the two spacer holders, both cards can be firmly connected to each other by pressing in the plugs.
- In the event of removing the RMI card, the connection to the spacer holders should be effected by turning the square head of the plugs through approx. 45°.
- The two plugs should be connected to the corresponding connectors on the controller board (CN 21 to CN 1 and CN 22 to CN 2) directly.
- The external wiring should be passed through the centre cable lead-in on the underside of the unit, bound together as a 'cable harness', and run to the terminal strip of the RMI card.

RMI - Diagrams

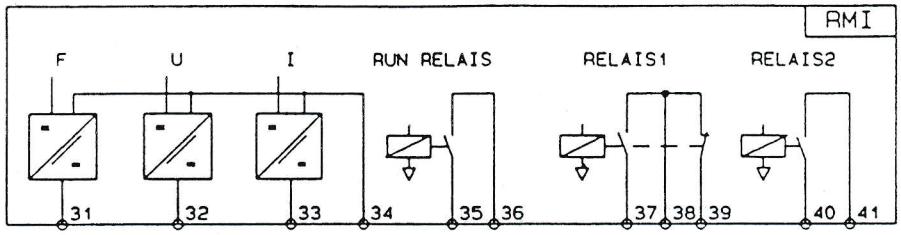


Fig. 7b: Terminal Assignment of RMI-Card

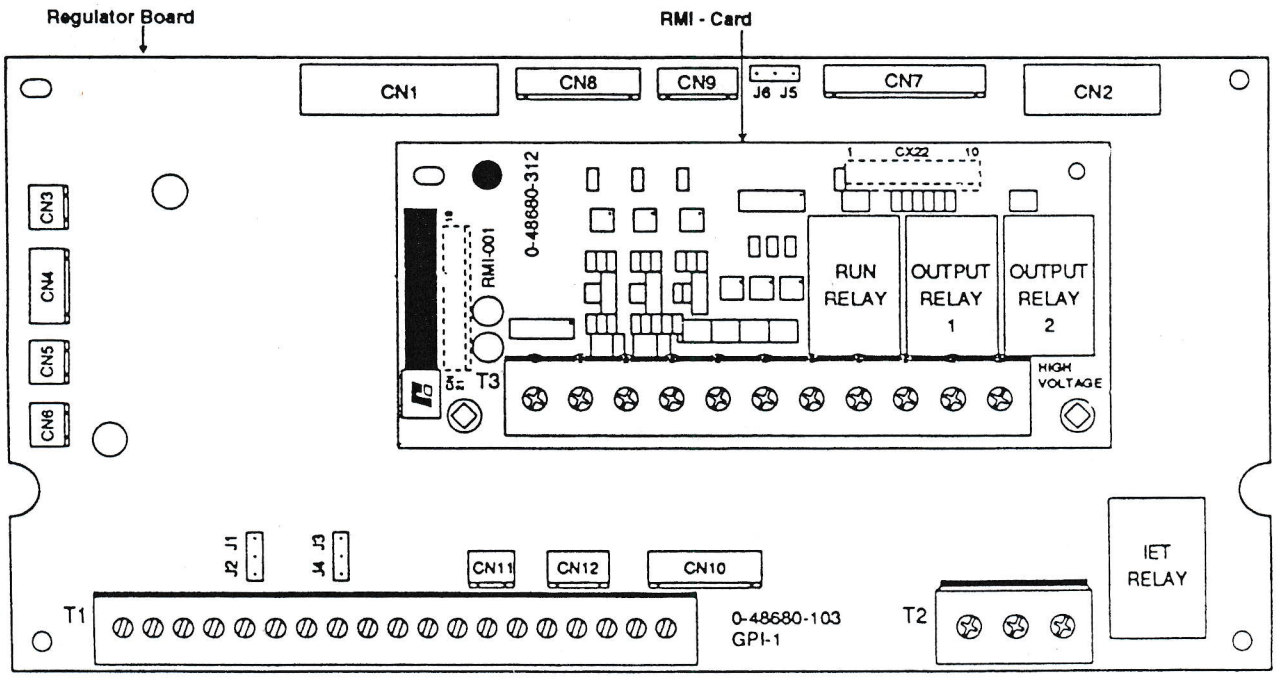


Fig. 7c: Terminal Assignment of RMI - Card

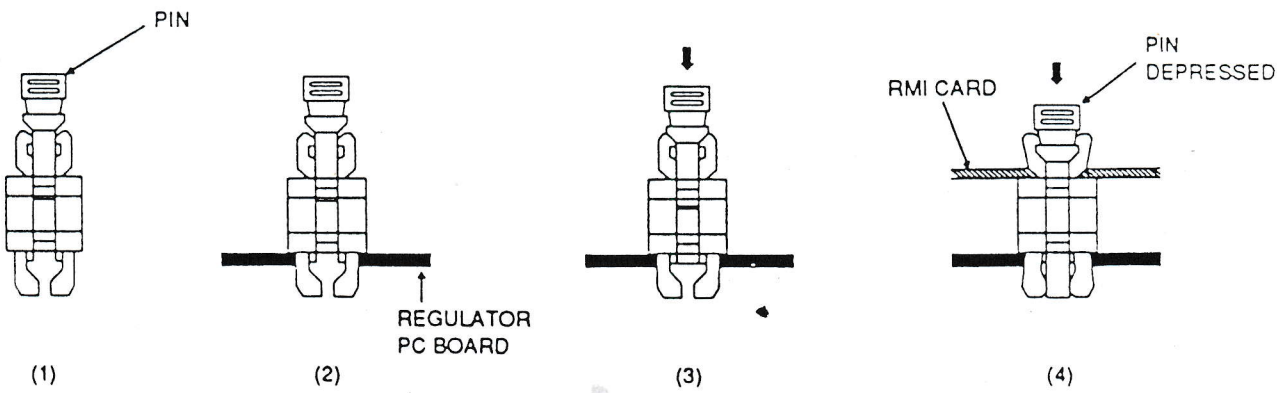


Fig. 7d: Mounting with spacers

7.2 Braking Unit

General Description

The dynamic braking unit is suitable for reducing the deceleration times in the case of loads with a high moment of inertia.
The energy fed back by the motor during rapid deceleration is stored in this case in the intermediate circuit of the inverter. This results in a voltage rise in the intermediate circuit. If the intermediate circuit voltage exceeds a defined threshold as a result, a control signal activates the dynamic braking unit. The excess energy is passed into this unit to a load resistor and is thus converted into thermal energy. The braking units differ in respect of rated voltage and unit output. An integral neon lamp (RUN READY) lights up as soon as the intermediate circuit voltage is greater than 90VDC. This lamp serves only to provide an optical warning of a hazardous voltage. It is not linked to the operation or workings of the braking unit.
An integral thermostat switch protects the braking unit from overloads. If the temperature in the load resistor of the unit rises to above 210°C, the thermostat switch operates. This results in the integral fuses tripping. As a consequence of this, the intermediate circuit voltage in the inverter will rise above the maximum permissible threshold, causing the unit to switch off by means of an internal equipment trip (IET). If the fuses in the braking unit trip, this indicates that the unit is being operated above the permissible limits.

Technical Data

Braking unit for BMI:

Duty cycle:	3 Starts/Stops per minute
Maximum inertia J:	0,03kgm2
Resistor wattage:	200W
DC-Bus fuse:	600V, 10A Type Ferraz (A060URB010T13)
Max. ambient temperature:	55°C

Braking unit for GMI up to 7,5kW:

Duty cycle:	3 Starts/Stops per minute
Maximum inertia J:	0,11kgm2
Resistor wattage:	800W
DC-Bus fuse:	600V, 20A Type Ferraz (A060URB020T13)
Max. ambient temperature:	55°C

Braking unit for GMI up to 15KW:

Duty cycle:	3 Starts/Stops per minute
Maximum inertia J:	0,28kgm2
Resistor wattage:	1600W
DC-Bus fuse:	600V, 20A Type Ferraz (A060URB020T13)
Max. ambient temperature:	55°C

Installation

- Switch unit off-circuit and remove front covers.
- Install the braking unit vertically so that the convection air flow is not obstructed. The distance between braking unit and inverter should not be more than 10 metres. The braking unit should be installed so that its heat loss can be dissipated without any obstruction and does not result in any other unit being exposed to additional heat. Do not install brake unit below or in the direct vicinity of the invertors.
- Install wiring as shown in the connection diagram.
- Re-fit front covers to casing.

Dimensions and weights

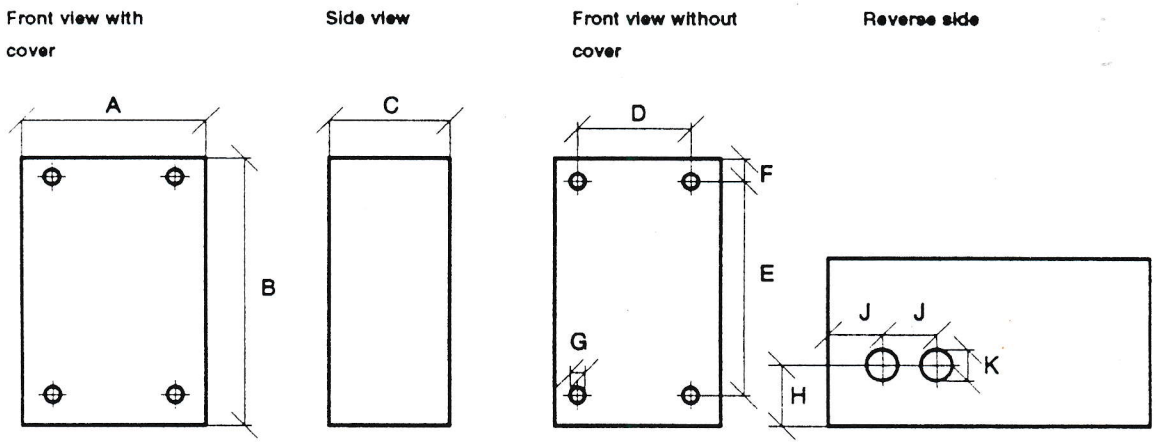


Abb. 7e: Dimensions Braking Unit

Dimensions (in mm) and weights:

Bremseinheit für:	A	B	C	D	E	F	G	H	J	K	kg .
BMI	200	250	100	170	223	10	5	45	35	22,2	3,0
GMI (beide Typen)	222,2	330	222,2	197	282	24	7	161	45	22,2	9.0

Wiring Diagram

Wiring Diagram for Braking unit with BMI:

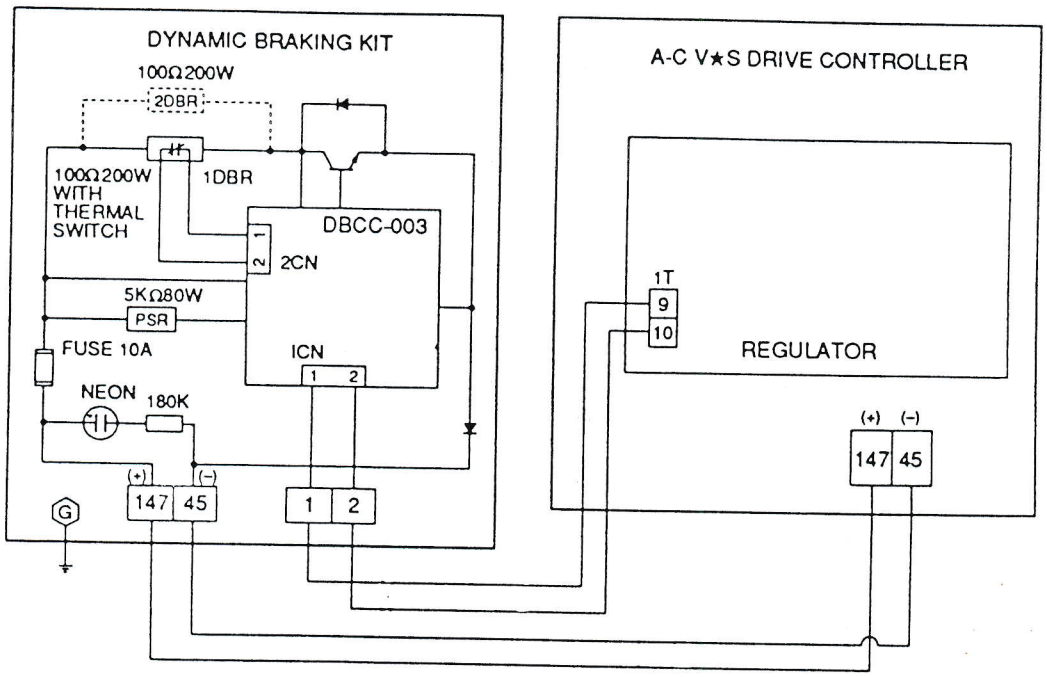


Fig. 7f: Wiring Diagram for Braking unit with BMI

Wiring Diagram for Braking unit with GMI up to 15kW (for GMI bigger than 15kW please contact Reliance Electric):

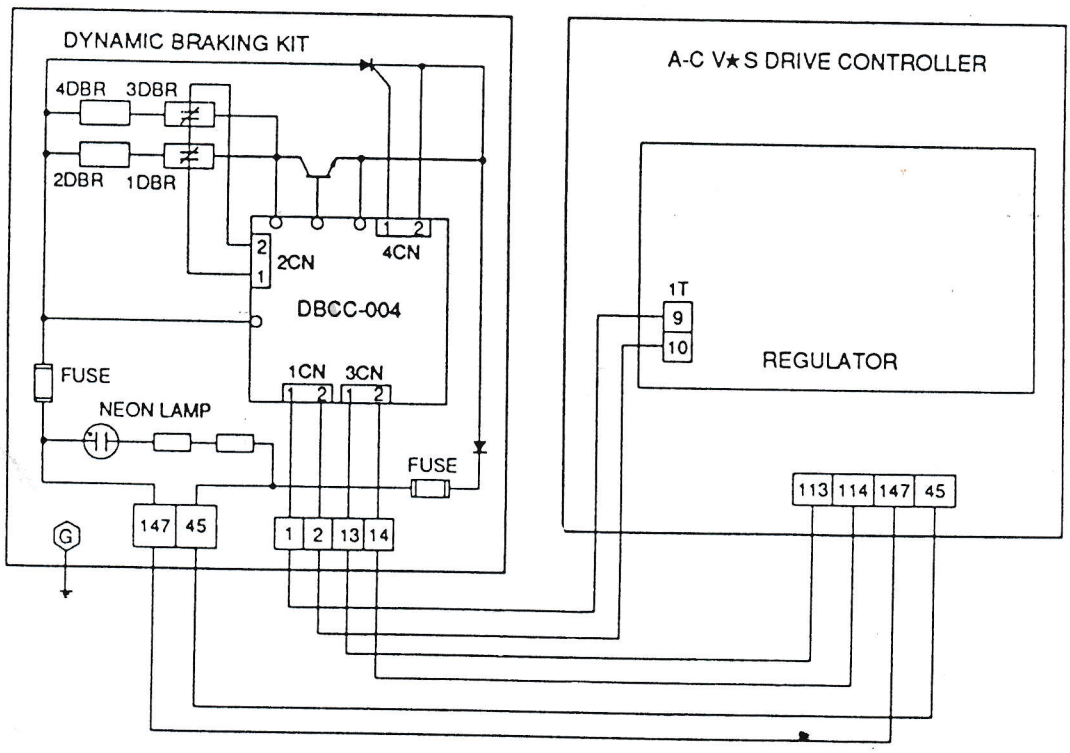


Fig. 7g: Wiring Diagram for Braking unit with GMI

7.3 Line reactor

Dimensions and Weights

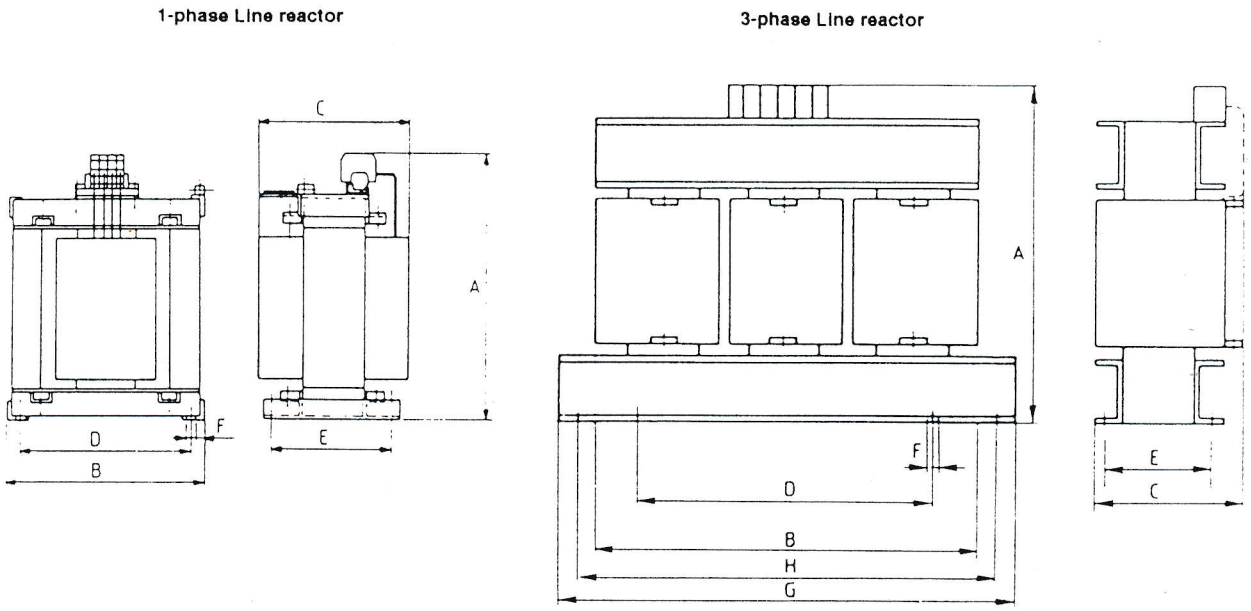


Fig. 7h: Line reactor dimensions

Dimensions (in mm) and Weights:

Line choke:	A	B	C	D	E	F	G	H	Weight in kg:
252-42-00 (1ph)	126	85	78	64	61	4,8	-	-	1,9
252-42-01 (1ph)	150	105	90	84	70	5,5	-	-	3,8
252-40-01 (3ph)	190	150	70	75	45	5,5	190	170	3,8
252-40-02 (3ph)	190	150	70	75	60	6,5	190	170	6,5
252-40-04 (3ph)	160	180	95	90	52	7	240	210	7,8
252-80-06 (3ph)	160	180	115	-	72	7	240	210	10
252-40-07 (3ph)	210	260	170	240	75	8	260	-	26

Wiring Diagram

Single phase line reactor:

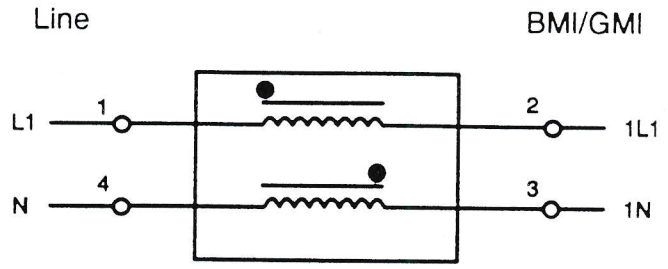


Fig. 7j: Wiring diagram single phase line reactor

Notes: When connecting the single-phase line reactor, it is essential to observe the reversal of the electrical connections at the second winding (failure to observe this will result in impaired effect of the magnetic circuit).

Three phase line reactor:

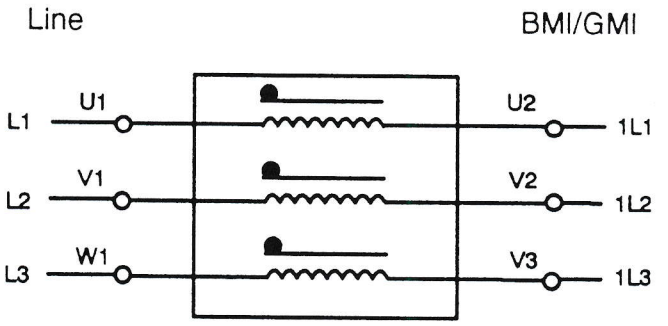


Fig. 7k: Wiring diagram three phase line reactor

7.4 Radio Interference Filter

General Description

Frequency converter in general cause line disturbances. A study regarding these line disturbances produced by the frequency converter has been carried out.
Compared with the limit values of VDE 0875, part 1, directly connected to the line, the frequency converter does not fullfill this specification VDE 0875, level "N".
Through the use of the adapted Radio Interference Filter RFI, the BMI/GMI fullfills these specifications according noise level "N".

Installation

In order to achieve this RFI performance, the Installation should be done according the following rules:

-the specified line filter must be fitted in the mains supply line. The connection to the drive should be made with screened cables, which don't exceed a length of about 0.3m. The screen should be grounded at both ends.

-also the connection from the drive to the motor should be wired with screened cables, the screen should be connected to the ground at both ends. This grounding should also for HF represent a low impedance.

Please refer to Engineering Instructions (4-3) for further installation requirements.

Dimensions and weight

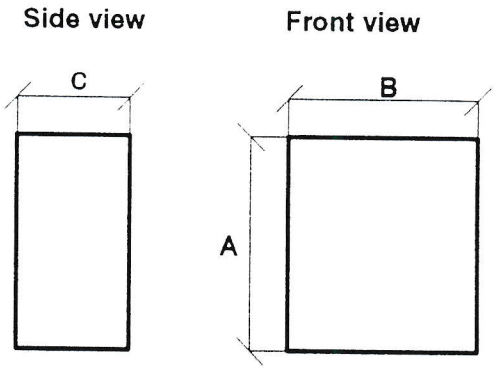


Abb. 7I: Dimensions of the Radio Interference Filter

Maximum Dimensions (mm) and weight:

Radio Interference Filter:	A	B	C	weight [kg]
839.50-00; (250V,25A)	105	150	57	1,5
839.51-00; (440V,10/16A)	150	222	65	2,2
839.51-02; (440V,20/25A)	150	250	65	2,2
839.51-04; (440V,40/50A)	150	250	65	3,0

7.5 Reference Trim Potentiometer

The optional Reference Trim Potentiometer allows a hardware adjustement of the ratio between speed reference and output frequency. This adjustement enables the compensation of the inaccurencies of the different analog elements in the reference path.
If there are several line drives running with the same reference, then it is possible through this adjustement to ensure analog inaccuries will be compensated for each speed trimming between drives.

Mounting and Starting up of the Reference Trim Potentiometer

1. Switch Power off
2. Measure the DC Bus voltage at the terminals 147 (+) and 45 (-) and wait, until it has fallen below 50 V.
3. Remove the cover of the casing.
4 If there is a connection between terminal 2 and terminal 4 on terminal board 1, remove it.
5. The optional Reference Trim Pot may be hooked up on the terminal 2, 3 and 4 of terminal board 1.
6. The reference has to be wired according the below connection diagram.
7. Adjust the Pot in order that you reach your desired output frequency (Parameter 4, Max Hertz) at the nominal Reference Input (10V, 20 mA or 97.6kHz).
8. Mount the cover on the casing.

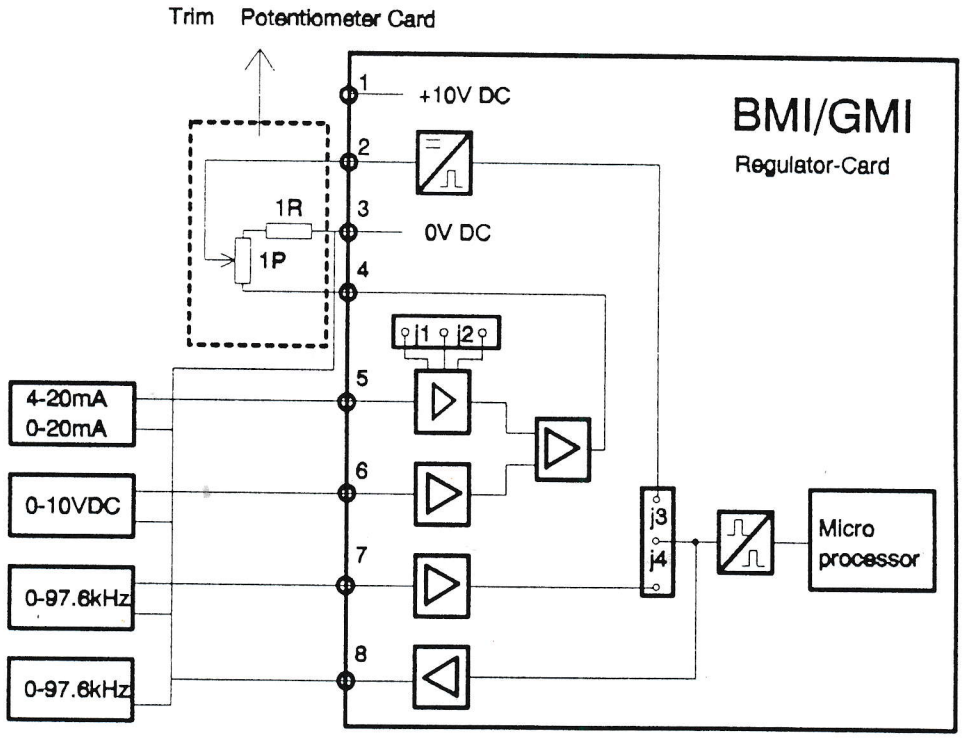


Fig. 7m: Wiring of the Auto Reference

7.6 External Digital Display

The output frequency (Hz), the output voltage (V) and the output current (% of nominal current) can be displayed on the external 3 digital display.
One of these values may be selected with the select push button on the front of the display.
A LED indicator shows which of these values is displayed.
A further LED indicates IET-Error (Overcurrent).
The display is integrated in a standard casing, which can be mounted in a panel.

Note: This external display must only be used together with the RMI card.

Technical Datas:

Accuracy (U;I):	+6%/-4%
Accuracy (f):	1%/-1%
max cable length:	50m
signal cables:	twisted pairs
power supply:	230VAC, -50V/+23V
Input current:	20mA
Input fuse:	100mA
maximum capacity of the line transformer:	10kVA

Dimensions

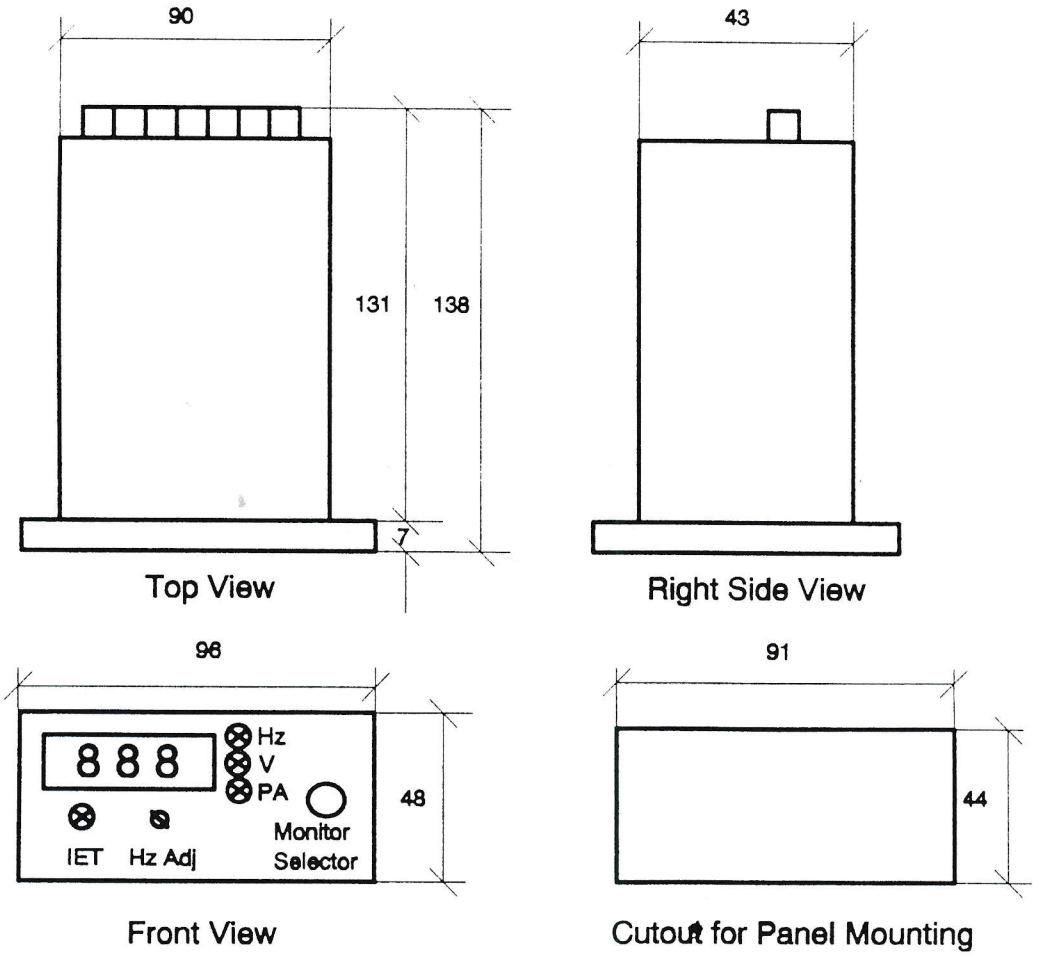


Fig. 7m: Dimensions of the external digital display

Wiring and Start Up

1. Switch Power at the Inverter off
2. Check DC-Bus voltage at the terminals 147 (+) and 45 (-), wait until it has fallen below 50V.
3. Remove the cover of the casing (4 screws).
4. Plug jumper JP in the appropriate position for the actual line voltage.
   Position JP1 = 230VAC
   Position JP2 = 230V - 460VAC
   Position JP3 = 460V - 575VAC

Factory set up is position JP1 (230V).

Note:The casing has to be opened to change the jumpers (4 screws on the rear side of the casing).

5. The wiring has to be done according to connection diagram 7n with twisted pairs of cable.
6. If not already done start up the inverter first.
7. Switch power supply, terminal 88 and 89 on.
8. The LED "Hz" should now light, indicating that the displayed number is the output frequency in Hz (as long as the inverter is not in run mode, no figure will be displayed).
9. The adjustement can be done as follows:
   -At maximum speed the actual frequency can be monitored at the keypad of the drive (by pressing "Mon").
   -By means of the potentiometer the displayed value can be adjusted until they both show the same value.
10. By pressing the Selector button the display may now be altered from frequency, voltage and current.

Connection diagram

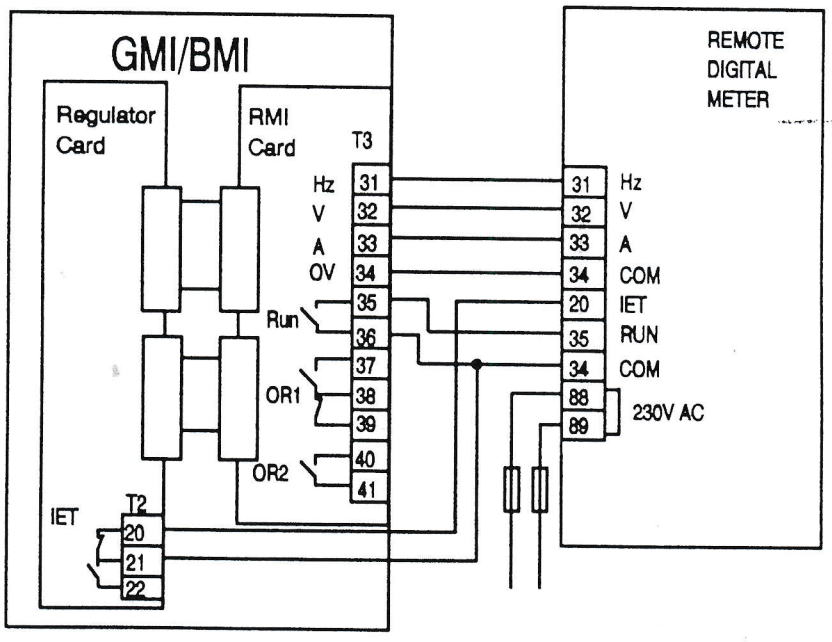


fig. 7n: Connection diagram external display

8.0 OPERATION and PROGRAMMING

8.1 Function Description of Keypad and Display

All the INVERTRON BMI/GMI units are equipped as standard with a sealed keyboard. This comprises the following functions:

- Control functions and display of actual output parameters.
- Programming of application-dependent parameters.
- Analysis, storage and display of malfunctions.

Keypad and Display:

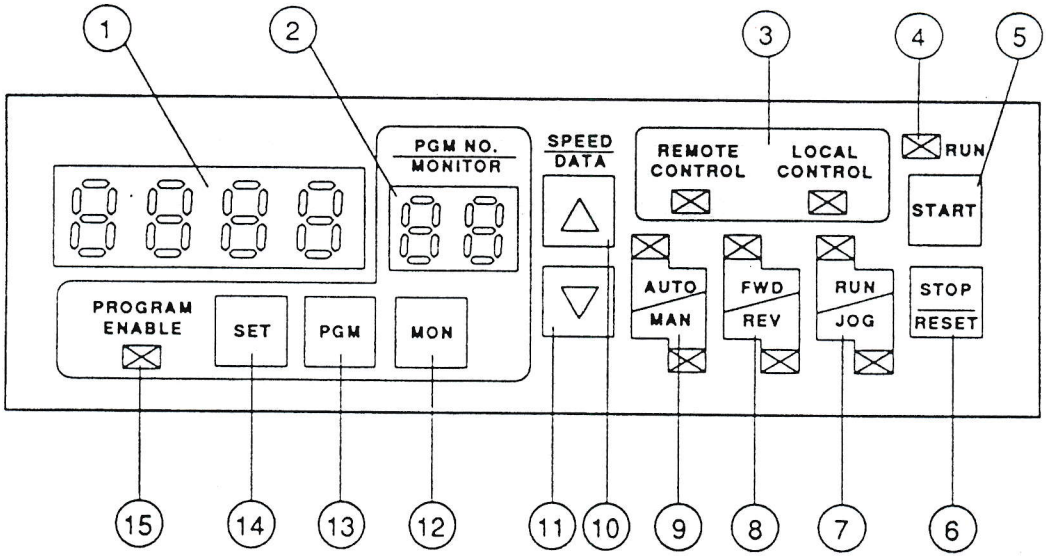


Fig. 8a: Keypad and Display

1: 4-digit display of function values/IET codes
2: 2-digit display of monitor selection/function number
3: Operators control LED's
4: Run mode LED (Green)
5: Start - key
6: Stop/Reset - key
7: Run/Jog - key with indicating LED's
8: Forward/Reverse - key with indicating LED's
9: Auto/Man - key with indicating LED's
10: Speed/data increment key
11: Speed/data decrement key
12: Monitor - key
13: Program - key
14: Set - key
15: Program enable LED