





GRAPHIC OPERATION CONTROLLER - MAIN UNIT MODEL


GC35MH-32MR-D GC35MH-16MR-D

INSTALLATION MANUAL

Thanks for choosing Graphic Operation Controller (GOC), a micro range of controller which consists of PLC function, HMI function and illuminated keys embedded. User can attach I/O extension units (up to 2) and COM extension units (up to 2) to add I/Os and to enhance functionality. It is designed to cater most of the automation requirements of any small size, standalone machine. Before installation and wiring of Main unit, please read this manual carefully for safety precautions, specifications, dimensional details, installation and wiring guidelines.

1 SAFETY RECOMMENDATIONS

-  Read and understand the manual carefully before controller use, to avoid damages to persons, property and environments. Ensure safe and proper usage of this controller.
-  The qualified personnel should only install and operate the controller. The personnel should be aware of all safety of automated products and completely familiar with all associated documentation for the said controller.
-  Manual should be located at the easily retrievable location for reference. Also, share this manual with the end user of this controller.
-  This controller should be considered as Industrial waste.

 Protect the controller from conductive dust, corrosive gases, wire debris, flammable gases, rain and fluid from entering into the controller through ventilation slits. This may cause malfunction, damage, fire, electrical shock and deterioration to the controller.

The controller should not be exposed to direct sunlight, high explosive risk, excessive magnetic interference and inflammable substances.

Do not modify, dismantle, reconstruct and repair the controller. Do not paint the controller. For repair, contact the nearest authorized sales office/ technical support.

Provide external interlock circuit like emergency stop or protective circuit to keep the control system safe, in case, there is problem in the controller. Especially for output, place fail safe protective circuit external to the controller to ensure that machine operates safely, in case of the controller fault condition. Also, it is recommended to build external output monitoring circuit to identify the output to which the problem has occurred.

During installation and wiring or maintenance activities of the controller, switch off the controller supply as well as all the phases of power supply for control panel. Failure to do so may cause personnel injury or controller malfunction.

Do not touch any terminal while the controller power is on. It may cause electric shocks and malfunction due to static electricity.

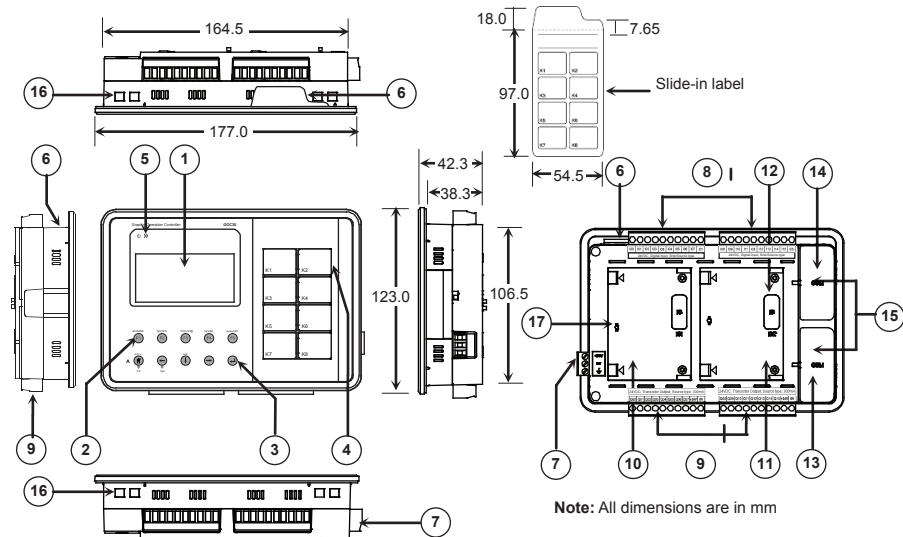
Use controller within the range of general and technical specifications.

2 REFERENCES

Title	Document No.	Title	Document No.
GOC User Manual	ED-2002-114	GOC Tool Kit Installation Manual	ED-2002-116
GOC 1 Port RS232 Serial COM Extension Installation Manual	PD-2002-107	GOC 1 Port Ethernet COM Extension Installation Manual	PD-2002-115

3 NOMENCLATURE AND DIMENSIONS

Product packaging consists of Main unit, installation manual, mounting template and 4 mounting clamps. Main unit is dispatched with all the terminal blocks attached to it and default slide-in label inserted. Slot covers are attached to I/O slots and COM slots. The figure below shows model GC35MH-32MR-D with 2 terminal blocks each for inputs and outputs. Model GC35MH-16MR-D provides 1 terminal blocks each for input and output.



- | | |
|---|-----------------------------|
| 1. 128 x 64 pixels LCD with backlight | 10. IO1 slot |
| 2. Function keys [F1 to F5] | 11. IO2 slot |
| 3. HMI keys for display navigation and settings | 12. IO slot cover |
| 4. 8 illuminated keys | 13. COM1 slot |
| 5. LED indications [POWER: RUN] | 14. COM2 slot |
| 6. Slide-in label | 15. COM slot cover |
| 7. 24 VDC supply terminal block [+24VDC, 0V, Earth] | 16. Slot for mounting clamp |
| 8. 2 nos., 10-pins input terminal block | 17. Slot projection |
| 9. 2 nos., 10-pins output terminal block | |

Unit	Description
GC35MH-32MR-D	16 Pt. 24 VDC Digital Input, Sink/ Source + 16 Pt. Relay Output, 500mA per Output, 220 VAC/ 30 VDC
GC35MH-16MR-D	8 Pt. 24 VDC Digital Input, Sink/ Source + 8 Pt. Relay Output, 500mA per Output, 220 VAC/ 30 VDC

4 GENERAL SPECIFICATIONS

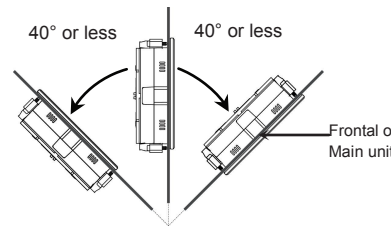
Environmental			EMC-Immunity: As required by IEC 61131-2, IEC 61000-6-2	
Operating Temperature	Operating: 0 to 55 °C	Storage: -20 to 75 °C	Electro Static Discharge (IEC 61000-4-2)	±8 KV Air discharge, ±4KV contact discharge
Humidity	Operating: 10 to 90 % RH, No condensation	Storage: 10 to 90 % RH, No condensation	Electrical Fast Transient (IEC 61000-4-4)	Power line: ±2 KV, Digital I/O: ±1 KV, Analog and communication I/O: ±1 KV
Altitude	2000 m or less		Radiation Susceptibility (IEC 61000-4-3)	80 MHz ~ 2.7 GHz, 10 V/m to 1 V/m, 80% AM at 1 KHz
Pollution level	2 max. (only non-conductive pollution)		Conducted by Radio Frequency (IEC 61000-4-6)	0.15 MHz~80 MHz, 10V/m, 80% AM at 1 KHz
Operating atmosphere	Corrosive gas must not be present		Surge (IEC 61000-4-5)	Power line: ±0.5 KV, Digital I/O: ±1 KV, Analog and communication I/O: ±1 KV
Over voltage category	II (IEC 60664-1) The surge voltage withstand level for up to the rated voltage of 30V is ±500 V		Power Frequency Magnetic field (IEC 61000-4-8)	30 A/m, 50 /60 Hz
Vibration, Shock	As required by EN- 61131-2, IEC 60068 -2-6 (test Fc), IEC 60068-2-27 test Ea		EMC-Emission: As required by IEC 61131-2, IEC 61000-6-4	
Class of equipment	Front panel mount		Radiated Emission (CISPR 16-2-3)	30 MHz ~ 1000 MHz
IP protection	IP65 from front, IP20 from rare			


5 INSTALLATION


Install the controller in an environment conforming to the general specifications and mounting recommendations and precautions.

Mounting Recommendations

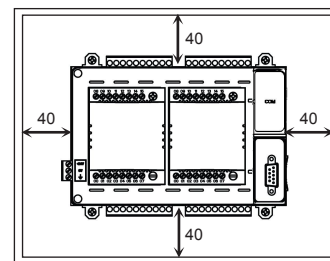
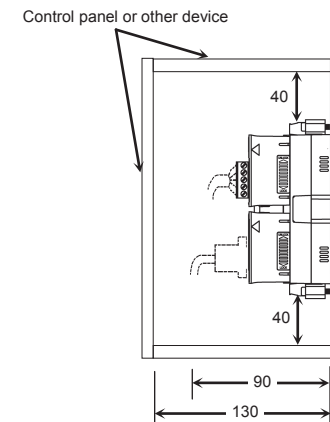
- Mount controller on a firm, plane and conducting surface. Installation in orientation other than recommended one (as shown in adjacent figure), may cause overheating, damage and malfunctioning of the controller.
- Mount controller on non-vibrating surface and should be protected by rubber pads so that the shock is not felt.
- Mounting plate thickness should not exceed 4 mm



 Programming of the controller is possible by attaching COM extension (GC-ENET-COM or GC-RS232-COM) unit in COM1 slot. This unit is optional and should be purchased separately. Installation should take care of keeping free space considering depth of controller with COM extension unit installed on it i.e. 90 mm inclusive of additional space required for communication cable routing.

 User can install upto 2 I/O extension units and upto 2 COM extension units on the back side of Main unit. Refer installation manuals of respective extension units.

- Ensure the gap of 40 mm between controller and cabinet walls, other equipments and wiring duct.
- Leave a minimum space of 40 mm around the Main unit to facilitate air circulation for heat transfer by natural convection and easy fixing and removal of unit.



Precautions to be taken

- Make sure to cut off all the phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.
- Maintain proper thermal distances between equipments producing heat (like heaters, transformers, etc) inside the control panel. Do not install controller above such equipments.
- Exposure to humid environment for a long time can reduce component life. It may cause corrosion of electrical and electronic components, or may lead to shorts or malfunctions. Do not expose controller to humid atmosphere for an extended period.
- Avoid controller exposure to excessive or continuous vibrations or shocks. Failure to do so may cause disengagement of PCB components, sockets, on-board soldered components etc. from their counter positions.
- Cover unused slots (IO and COM) to protect them against dust, moisture and ESD (Electric Static Discharge).
- Use controller within the range of general and technical specifications

Fixing of Main Unit

Detach all the terminal blocks (10-pin I/O terminal blocks and 3-pin power supply terminal block) from Main unit. Make sure that gasket on outer periphery of front panel backside is in place.

- Normally, Main unit is provided with default slide-in label inserted. But user can remove it and insert customized label as shown in Figure 1. Slit is provided to insert slide-in label. It is located at left top on the backside of Main unit. Insert label from side opposite to the fold such that fold line is aligned with slit edge. Shape of folded part is designed such that it doesn't obstruct mounting clamp.
- Remove adhesive tapes provided at corners of backside of mounting template and stick the mounting template on front panel where Main unit is to be mounted. Mark 4 corners of the rectangular cut-out and make a cut out. Dimensions of cut out are 166.5 X 107.5 mm as shown on mounting template in Figure 2.

- Insert Main unit from outside through cut out on panel. Make sure that folded part of slide-in label is passed through the cut out. Hold Main unit by hand from outer side of the panel so that it will not fall during fitment of mounting clamps.

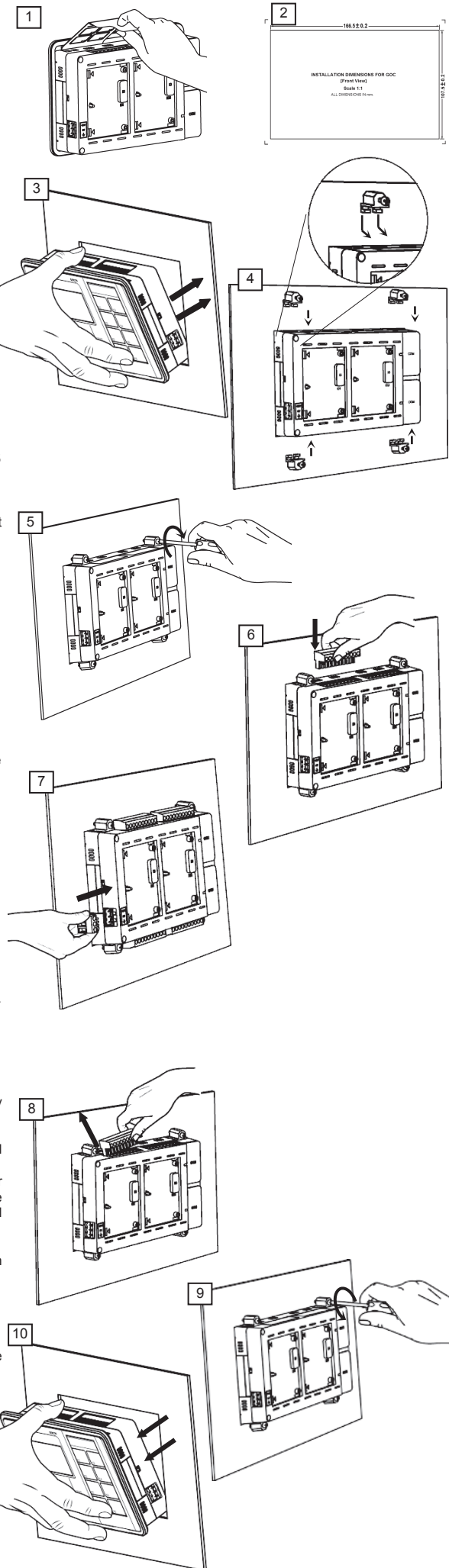
- 2 rectangular openings are provided near each corner on the extended part on back side. Insert 'L' shaped projections of mounting clamp into matching slots and pull it away from panel to engage it into the slots as shown in Figure 4.
- Turn mounting clamp screw in clockwise direction till tip of screw slightly touches inner surface of panel as shown in Figure 5. Rotate screw an additional ¼ - ½ turn in clockwise direction and ensure controller is firmly mounted in the panel. Fix all the 4 mounting clamps by tightening screws one by one progressively.

- Insert 10-pin input terminal block/s at upper side. Insert 10-pin output terminal block/s at lower side.
- Insert 3-pin power supply terminal block.

Removal of Main Unit

Cut off all the phases of the power supply to the control panel.

- Remove 3 pin power supply terminal block. Remove all the I/O terminal blocks. For removal, pull terminal block from one side first. Once this part is out, pull remaining part easily.
- Turn mounting clamp screws in anti-clockwise direction to loosen it. Push body of clamp towards panel to disengage it from matching slots on the Main unit. Pull body of clamps off the Main unit. Hold Main unit with one hand while undoing last of the clamps.
- After removing all mounting clamps, pull out unit from outside, to remove it from cut out.



6 TECHNICAL SPECIFICATIONS

Power Supply		
Input voltage	24 VDC (18 to 30 VDC including ripple) 400 mA, 9.6 Watt	
Inrush current	15 Amps for 6 ms	
Fuse protection	Subminiature fuse T630 mA, 250V, Type 372, Littelfuse make	
Reverse polarity	Protected by series diode up to 40 V.	
Dimensions (in mm)	Cut-out: 166.5 (W) x 107.5 (H)	
	Front: 177.0 (W) x 123.0 (H) x 4 (D)	
	Rear: 164.5 (W) x 106.5 (H) x 38.3 (D)	
Main Unit Assembly Weight (in grams)	GC35-32MR-D	500
	GC35-16MR-D	435
Certification	CE	

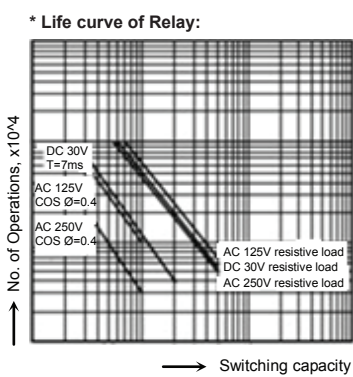
Digital Inputs (Sink/ Source type)		
Number of inputs	16 for GC35MH-32MR-D 8 for GC35MH-16MR-D	
Voltage rating	24 VDC (18 to 30 V including ripple)	
Type	Sink or Source in group of 4, with one common per group	
ON voltage level	18 VDC minimum	
OFF voltage level	5 VDC maximum	
Input Current	6 mA at 24 VDC	
On / OFF current	ON current : 6 mA at 24VDC	OFF current : 3.8 mA maximum
Input impedance	5.2 KΩ	
Transition delay	10 ms (filter time)	
Isolation	Optical 1.5 KV between input and internal circuit. 1.5 KV between groups. Nil between individual input points in a group.	
I/O terminal blocks	Two 10-pin, screw type removable terminal blocks for GC35MH-32MR-D One 10-pin, screw type removable terminal block for GC35MH-16MR-D	

HMI	
Display	128 x 64 pixel graphics LCD, View size: 70.7 x 38.8 mm
HMI keys	5 user defined function keys (F1 to F5) and 5 keys for display navigation and settings.
Illuminated keys	4 x 2 key matrix with dual colored LED (Red, Green)
Slide-in label	Inserted over illuminated keys

Relay Outputs		
Number of outputs	16 for GC35MH-32MR-D 8 for GC35MH-16MR-D	
Type of output	Non latching normally open (NO) contact Electro-mechanical relay	
Voltage rating	24 to 250 VAC, 47-63 Hz, 5-30 VDC	
Current rating	500 mA at 250 VAC and 30 VDC per point 1.5 A per common	
Minimum load	1 mA	
Contact Life	Electrical life	Refer table and Life curve*
	Mechanical life	min 20, 000, 000 (180 cpm)
Response time	OFF to ON	10 ms
	ON to OFF	5 ms
Isolation	Galvanic between output and internal circuit	
Dielectric strength	3 KVrms (between coil and contact circuit) 0.75 KVrms (for open contact)	
I/O terminal blocks	Two 10-pin, screw type removable terminal blocks for GC35MH-32MR-D One 10-pin, screw type removable terminal block for GC35MH-16MR-D	

Digital Inputs Special Functions (User Configurable)				
Single phase counters (up to 2 nos.)	Counter	Input		
	Counter0	Input I00		
	Counter1	Input I03		
	Input frequency: 20 KHz maximum			
	Pulse ON/ OFF time: 20 µsec minimum			
Quadra-ture encoder (Up to 2 nos.)	Encoder	A phase	B phase	Z marker
	Encoder0	Input I00	Input I01	Input I02
	Encoder1	Input I03	Input I04	Input I05
	Input frequency: 10 KHz maximum (for each phase)			
	Pulse ON / OFF time for A and B phase: 20 µsec minimum. Pulse ON / OFF time for Z marker pulse: 50 µsec minimum.			
Interrupt events	Counter compare (Up to 2) for counter/encoder configuration for inputs I00 and I03			
	Periodic: 1, 0.5/1 ms resolution, settable from 0.5/1 ms to 1250/ 2500 ms			
	Up to 2 Rising edge and falling edge for configuration of input I00 and I05			
	Pulse ON time: 100 µsec minimum			
	Pulse OFF time: 2 msec minimum			
Pulse catch	2, User configurable for input02 and input05			
	Minimum pulse duration: 500 µs			

* Electrical life of Relay:			
Voltage	Current	Type of Load	Electrical Life (20 cpm)
250 VAC	1 Amp	Resistive	500,000
		Inductive	30,000
	500 mA	Resistive	10,00,000
		Inductive	80,000
30 VDC	1 Amp	Resistive	600,000
		Inductive	150,000
	500 mA	Resistive	10,00,000
		Inductive	3,80,000



7 WIRING

Wiring recommendations

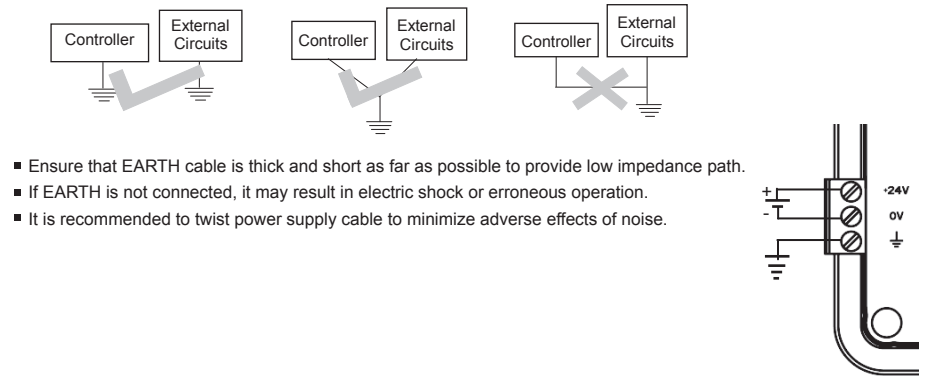
- Terminal block pitch size is 5.08 mm.
- Use stranded (flexible) or solid wire of size 0.5 to 1 mm² (AWG 22 to 18). Strip insulation of stranded wire and twist the strands to prevent it from spreading and crimp the lug.
- The adjacent figure shows recommended size of lug.
- Terminal has M3 size of screw. For tightening terminal screw, use flat blade screw driver. The figure shows desired size of screwdriver blade.
- The tightening torque should not exceed 0.50 Nm

Precautions to be taken

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.
- Do not use wire without lug. Do not solder-plate the wire ends.It may cause loose connection. Ensure that only one lug is connected to one terminal.
- Ensure that size of wire and lug used are as per the specifications. Use screw driver with specified size of tip. Tightening torque should be as per the specifications.
- Ensure the gap of 40 mm between controller and cabinet walls, other equipments and wiring duct This will help in natural cooling of controller and also easy mounting or unmounting of hardware.
- Separate wiring by signal types. Bundle wiring with similar electrical characteristics together.
- Differentiate wiring with different electrical characteristics by coloured insulations e.g. AC wiring and DC wiring
- Make sure that there is a separate bundle and routing for input and output wires. Fixup the wire bundle with support on panel so that there is no stress on wires and subsequently on unit. Ensure that bunch is routed properly and wires are not kept hanging.
- Do not bundle 24 VDC I/O wires with main control panel wiring.
- Do not bundle cable carrying low level signals like communication and analog signals with input output wiring and control panel wiring.
- 50 to 100 meter long wiring for input/output will not cause any problems of noise but, generally, the wiring length should not exceed 30 meters to ensure the safety. For longer distance, route the input and output signal lines separately.
- Ensure that length of wire that connects 24 VDC power supply to I/O unit is less than 3 meters. Locate 24 VDC power supply near to the controller

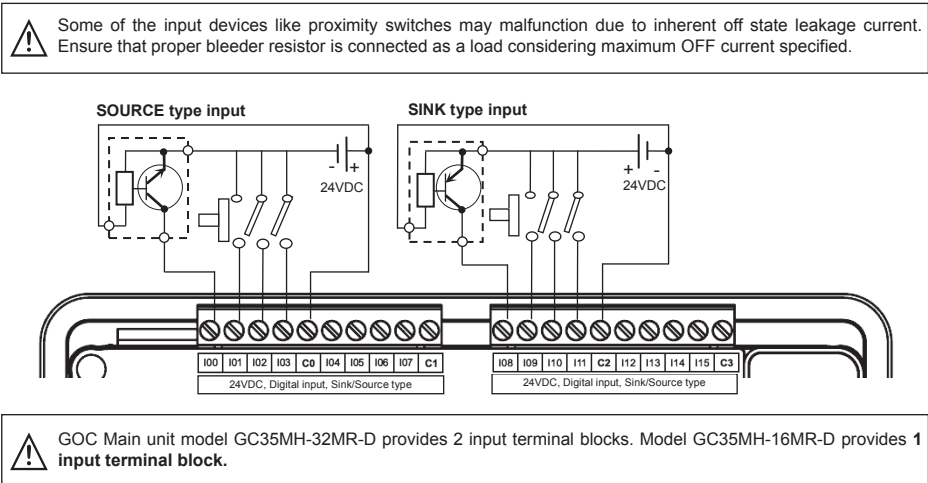
Power Supply Wiring

- Connect EARTH terminal directly to clean earth in the control panel avoiding ground loops.
- Perform Class D grounding. (Grounding resistance: 100 Ω or less)
- Ground the controller independently. If it cannot be grounded independently, ground it jointly as shown.



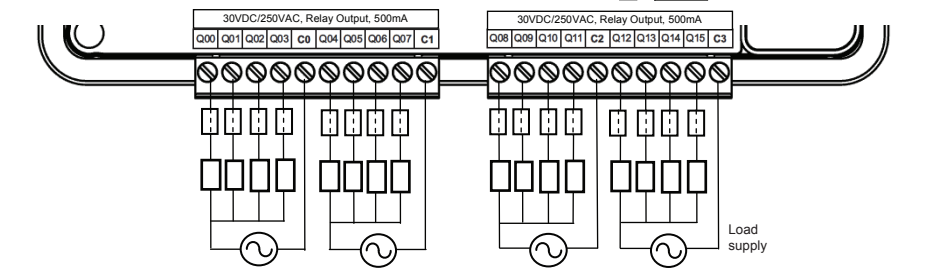
Digital Input Wiring

Unit provides 1 common each for a group of 4 inputs. Any group can be wired for sink or source operation independently. The wiring diagram below shows how to connect field input devices like potential free push buttons and limit switches for sink and source operation. The diagram also shows connection of typical proximity switch. PNP type of switch is connected for sink type of operation and NPN type of switch is connected for source type of operation. Here, input group I00 to I03 connected for source type of operation and input group I08 to I11 connected for sink type of operation



Relay Output Wiring

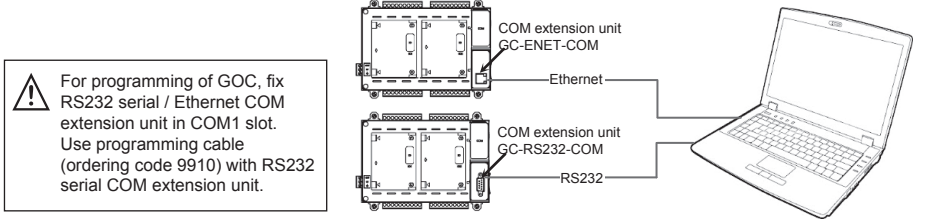
- External fuse links or fused terminals are recommended for relay output wiring to avoid any burnout of internal copper tracks due to excessive current flow due to external short circuit, overload or inductive surges.
- The life of relay contacts can be enhanced by the use of RC snubber (spark quenchers) across the AC load. A suggested combination for of the R and C could be R=220Ω/ Half watt and C=0.1 µF/1000 Volts
- For DC loads a free-wheeling diode such as 1N4007 should be used in reverse polarity to avoid effects of back EMFs generated by inductive load.
- The diode and the snubber should be positioned and wired up as near as possible to the external load for maximum effect



GOC Main unit model GC35MH-32MR-D provides 2 output terminal blocks. Model GC35MH-16MR-D provides 1 output terminal block.

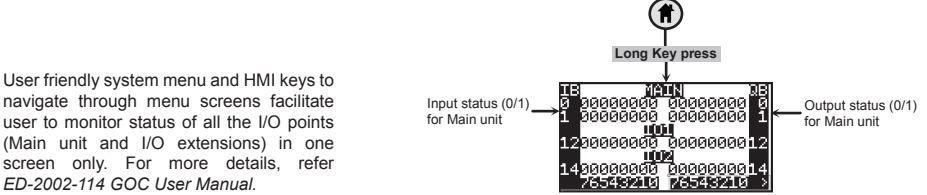
8 CONFIGURATION AND PROGRAMMING

Programming software CoDeSys V2.3 is required to program the controller. Integrated tool *Hardware Configuration Tool* facilitates configuration of special functionality of digital inputs and extension units. Controller HMI functionality can be programmed by *HMI Configuration Tool*. Controller can be programmed through Ethernet port or RS232 serial port. For the same, user can fix COM extension unit (GS-ENET-COM or GC-RS232-COM) in COM1 slot. Once programming and commissioning is over, it can be removed if not needed to interface any third party device. In COM1 slot, user can fix and remove COM extension unit as and when required. Refer *ED-2002-107 GOC 1 Port RS232 Serial COM Extension Unit Installation Manual*, *ED-2002-115 GOC 1 Port Ethernet COM Extension Unit Installation Manual*. Also refer *ED-2002-116 GOC Tool Kit Installation Manual* and Context sensitive help provided in *Hardware Configuration Tool*.



9 STATUS AND DIAGNOSTICS ON LCD SCREEN

After powering on the controller, CPU detects presence of Main unit as well as extension units if attached. The status of Main unit is available in system variables and can be monitored on LCD screen. I/O status can be monitored on LCD screen. User can monitor ordering code of Main unit using CoDeSys project, in Global variables list. Click on CoDeSys tab, Resources → Global_variables → _SYSVARCPU → AMODULEORDERINGCODE.AMODULEORDERINGCODE[I0]



LED Indications

Status	Power (⏻)	Run (⏻)
	Red	Green
OFF	No power	User stop, Firmware update New firmware download, System error
ON	Power ON	Run mode
Blinking 1x	Not applicable	IO Error
Blinking 2x		Forcing is active
Blinking 3x		Scan error
Flashing		Memory Error Application Download in progress Ikey Error - If any Ikey is observed as pressed, at power ON - Ikey (Hardware) fault occurs HMI Key Error - If any HMI key is observed as pressed, at power ON - HMI key (Hardware) fault occurs

MATIZ SYSTEMS

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