Installation and Wiring

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Drive Models by Frame Size

GS4 *DURA*PULSE Drive Models by Frame Size	
Frame	***Drive***
A	GS4-21P0; GS4-41P0; GS4-22P0; GS4-42P0; GS4-23P0; GS4-43P0; GS4-25P0; GS4-45P0; GS4-47P5
B	GS4-27P5; GS4-2010; GS4-4010; GS4-2015; GS4-4015; GS4-4020
C	GS4-2020; GS4-2025; GS4-4025; GS4-2030; GS4-4030; GS4-4040
D0	GS4-4050; GS4-4060
D	GS4-2040; GS4-2050; GS4-4075; GS4-4100
E	GS4-2060; GS4-2075; GS4-2100; GS4-4125; GS4-4150
F	GS4-4175; GS4-4200
G	GS4-4250; GS4-4300

Installation

Install the AC drive in an enclosure that is specifically designed to house electrical and electronic control equipment. Provide proper spacing within the enclosure to allow the dissipation of heat produced by the drive and any other included electrical and electronic equipment. Ventilation or air conditioning may also be required, depending upon the application.

Failure to observe these precautions may damage the drive and void the warranty!

Improper installation of the AC drive will greatly reduce its life. Observe the following precautions when installing the drive:

- *Do not mount the AC drive near heat-radiating elements or in direct sunlight.*
- *Do not install the AC drive in a place subjected to high temperature, high humidity, excessive vibration, corrosive gases or liquids, or airborne dust or metallic particles.*
- *Install the AC drive in Pollution Degree 2 environments only.*
  Pollution Degree 2: Normally only non-conductive pollution occurs. Temporary conductivity caused by condensation is to be expected.
- *Install the AC drive in a metal cabinet. When installing one drive below another, use a metal separator between the drives to prevent mutual heating and to prevent the risk of fire.*
- *Mount the AC drive securely on a flat, rigid, non-flammable surface.*
- *Mount the AC drive vertically and do not restrict the air flow to the heat sink fins.*
- *Prevent fiber particles, scraps of paper, shredded wood saw dust, metal particles, etc. from adhering to the heat sink.*

AC drives generate a large amount of heat which may damage them. Auxiliary cooling methods are typically required in order not to exceed maximum ambient temperatures.

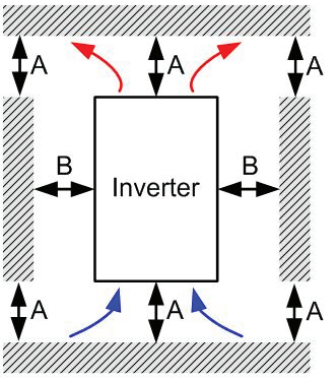
Minimum Clearances and Air Flow

Diagram Directional Arrows

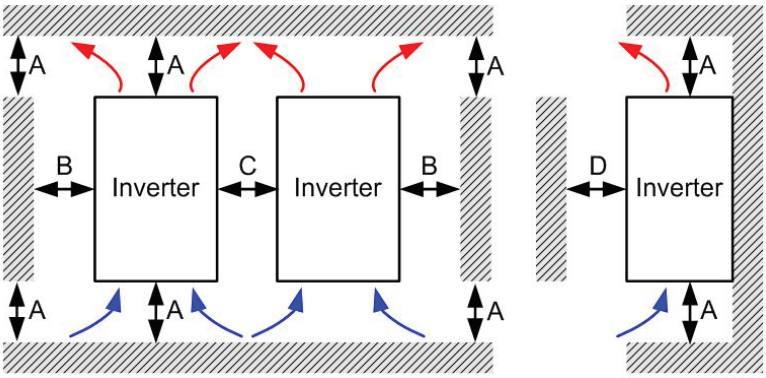
- *Air Inflow: Blue Arrow → →*
- *Air Outflow: Red Arrow → →*
- *Distance: Black Arrows ↔ ↔*

Minimum Clearance Distances

1) Single Drive Installation (Frames A–G)

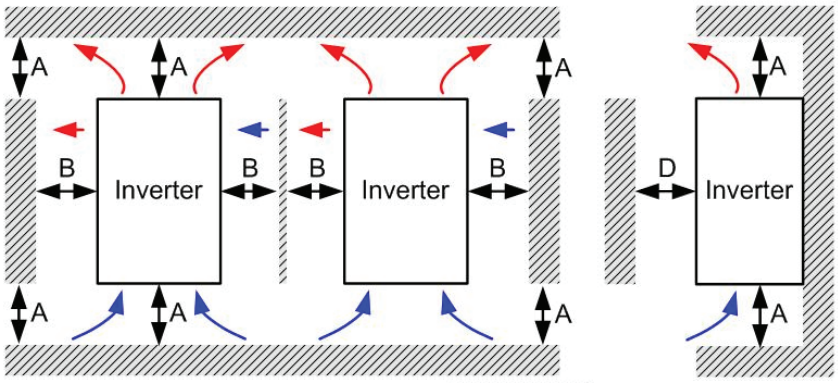


2) Multiple Drives Side-By-Side (Frames A–C)

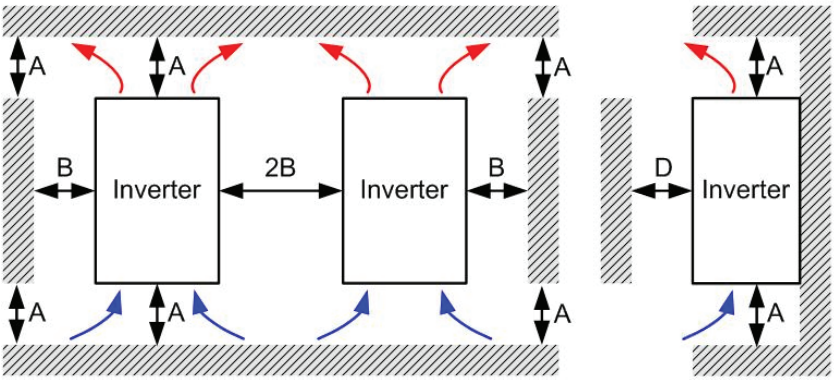


3) Multiple Drives Side-By-Side (Frames D0, D, E, F)

- *Install a metal separator between the drives.*

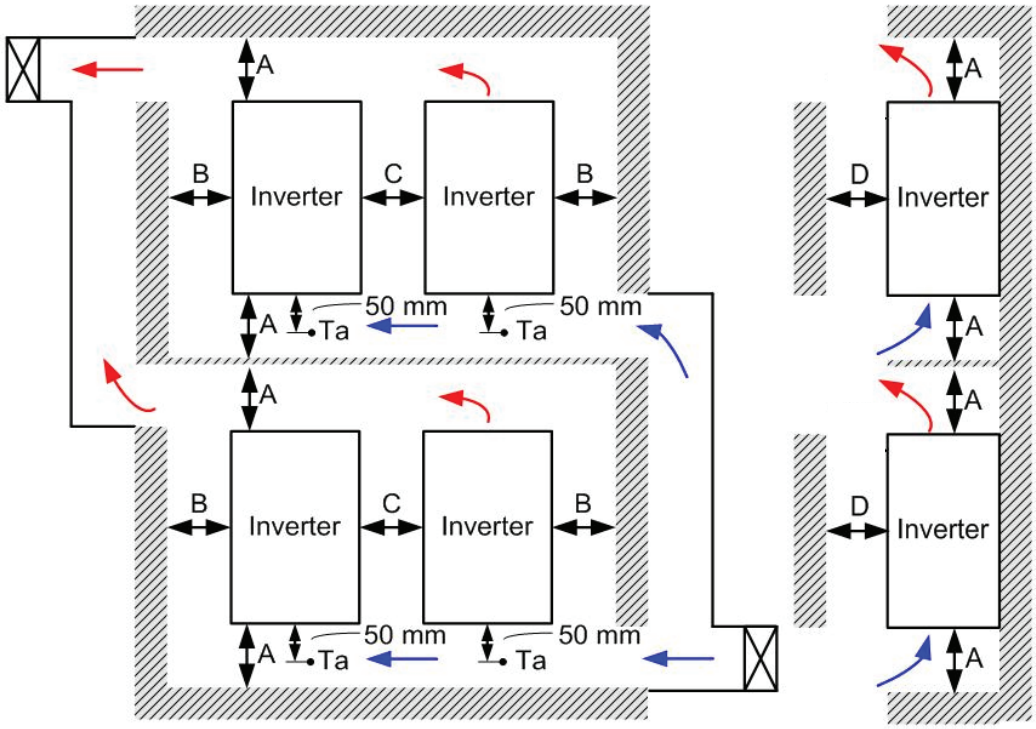


4) Multiple Drives Side-By-Side (Frame G)

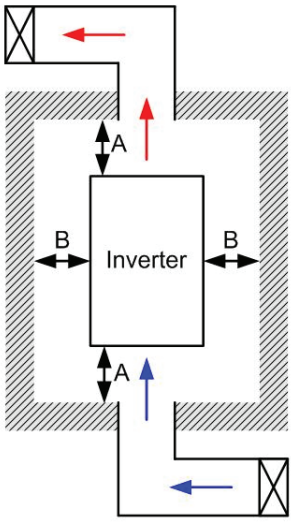


5) Multiple Drives Side-By-Side and Over/Under (Frames A–G)

- *When installing one AC motor drive below another one (over/under installation), use a metal separator between the drives to prevent mutual heating.*
- *The temperature measured at the fan's inflow side must be lower than the temperature measured at the operation side.*
- *If the fan's inflow temperature is higher, use a larger metal separator.*
- *T_a = ambient air temperature measured at 50mm away from the fan's inflow side.*



*Dimensions for Minimum Clearance Figures 1–5 **				
Frame Size	***A (mm / in)***	***B (mm / in)***	***C (mm / in)***	***D (mm / in)***
A–C	60 / 2.4	30 / 1.2	10 / 0.4	0 / 0
D(0)–F	100 / 4.0	50 / 2.0	n/a	0 / 0
G	200 / 7.9	100 / 4.0	n/a	0 / 0
** The minimum mounting clearances stated in this table applies to GS4 drives frames A to G. Failure to follow the minimum mounting clearances may cause the fan to malfunction and cause a heat dissipation problem.*				



- *Mounting clearances stated in the figure are for installing the drive in an open area. To install the drive in a confined space (such as cabinet or electric box), please observe these three rules: (1) Maintain the minimum mounting clearances. (2) Install ambient air ventilation equipment or an air conditioner to keep surrounding temperature lower than operation temperature. (3) Refer to parameter setting and set up P2.10 Carrier Frequency, P6.00/P6.02 Electronic Thermal Overload Relay, P6.33 Method of Derating, and P6.34 VT/CT Duty Selection.*
- *The following table shows the heat dissipation and the required air volume when installing a single drive in a confined space. When installing multiple drives, the required air volume should be multiplied by the number of drives.*
- *Refer to the following chart (Air flow rate for cooling) for ventilation equipment design and selection.*
- *Refer to the following chart (Power dissipation) for air conditioner design and selection.*

Airflow and Power Dissipation

Airflow and Power Dissipation										
Model Number	Frame Size	Airflow Rate(1) for Cooling						Power Dissipation(2)		
		Flow Rate(1) (cfm)			Flow Rate(1) (m^3/hr)			Power Dissipation(2) (Watt)		
		External	Internal	Total	External	Internal	Total	Loss External (Heat sink)	Internal	Total
GS4-21P0	A	–	–	–	–	–	–	33	27	60
GS4-22P0		14	–	14	24	–	24	56	31	87
GS4-23P0		14	–	14	24	–	24	79	36	115
GS4-25P0		10	–	10	17	–	17	113	46	159
GS4-27P5	B	40	14	54	68	24	92	197	67	264
GS4-2010		66	14	80	112	24	136	249	86	335
GS4-2015		58	14	73	99	24	123	409	121	530
GS4-2020	C	166	12	178	282	20	302	455	161	616
GS4-2025		166	12	178	282	20	302	549	184	733
GS4-2030		166	12	178	282	20	302	649	216	865
GS4-2040	D	179	30	209	304	51	355	913	186	1099
GS4-2050		179	30	209	304	51	355	1091	220	1311
GS4-2060	E	228	73	301	387	124	511	1251	267	1518
GS4-2075		228	73	301	387	124	511	1401	308	1709
GS4-2100		246	73	319	418	124	542	1770	369	2139
GS4-41P0	A	–	–	–	–	–	–	33	25	58
GS4-42P0		–	–	–	–	–	–	45	29	74
GS4-43P0		14	–	14	24	–	24	71	33	104
GS4-45P0		10	–	10	17	–	17	103	38	141
GS4-47P5		10	–	10	17	–	17	134	46	180
GS4-4010	B	40	14	54	68	24	92	216	76	292
GS4-4015		66	14	80	112	24	136	287	93	380
GS4-4020		58	14	73	99	24	123	396	122	518
GS4-4025	C	99	21	120	168	36	204	369	138	507
GS4-4030		99	21	120	168	36	204	476	158	634
GS4-4040		126	21	147	214	36	250	655	211	866
GS4-4050	D0	179	30	209	304	51	355	809	184	993
GS4-4060		179	30	209	304	51	355	929	218	1147
GS4-4075	D	179	30	209	304	51	355	1156	257	1413
GS4-4100		186	30	216	316	51	367	1408	334	1742
GS4-4125	E	257	73	330	437	124	561	1693	399	2092
GS4-4150		223	73	296	379	124	503	2107	491	2598
GS4-4175	F	224	112	336	381	190	571	2502	579	3081
GS4-4200		289	112	401	491	190	681	3096	687	3783
GS4-4250	G	–		454	–		771	–		4589
GS4-4300				454			771			5772

- The required airflow shown in chart is for installing a single GS4 drive in a confined space.
- When installing multiple GS4 drives, the required air volume would be the required air volume for a single GS4 drive multiplied by the number of GS4 drives.

- Heat dissipation shown in the chart is for installing a single GS4 drive in a confined space.
- When installing multiple drives, the volume of heat dissipation should be the heat dissipated by a single GS4 drive multiplied by the number of GS4 drives.
- Heat dissipation for each model is calculated by rated voltage, current and default carrier frequency.

1) External flow rate is across the heat sink.
Internal flow rate is through the chassis.
Published flow rates are the result of active cooling using fans; factory-installed in the drive.
Unpublished flow rates (-) are the result of passive cooling in drives without factory-installed fans.

2) When calculating power dissipation (Watt Loss) use the total value if the drive is foot mounted, or the internal value if the drive is flange mounted. Where only a total value is published, these models cannot be flange mounted.

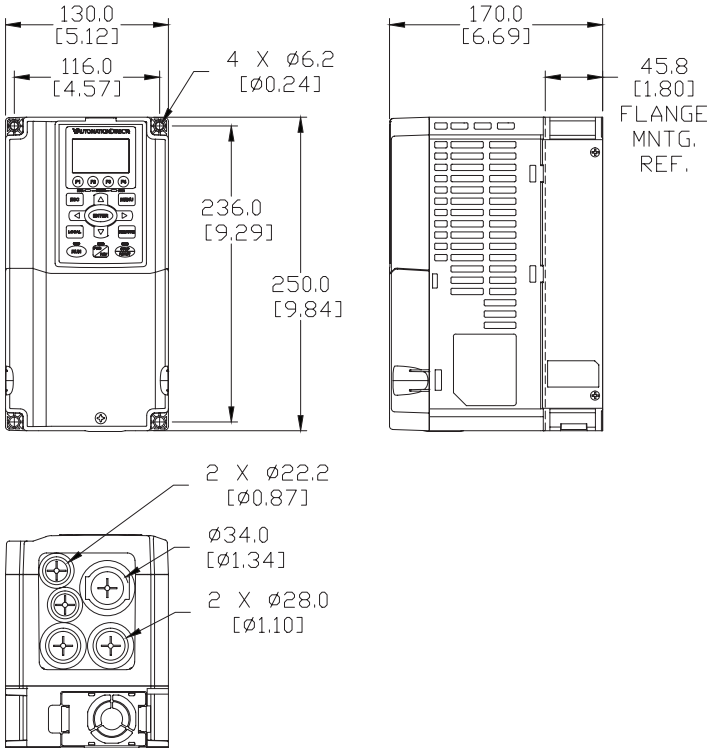
Dimensions

(Units = mm [in])

See our website: www.AutomationDirect.com for complete engineering drawings.

GS4 DURAPULSE Frame Sizes by Drive Model			
230V		460V	
Drive	Frame	Drive	Frame
GS4-21P0	A	GS4-41P0	A
GS4-22P0		GS4-42P0	
GS4-23P0		GS4-43P0	
GS4-25P0		GS4-45P0	
GS4-27P5	B	GS4-47P5	
GS4-2010		GS4-4010	B
GS4-2015		GS4-4015	
GS4-2020	C	GS4-4020	
GS4-2025		GS4-4025	C
GS4-2030		GS4-4030	
GS4-2040	D	GS4-4040	
GS4-2050		GS4-4050	D0
GS4-2060	E	GS4-4060	
GS4-2075		GS4-4075	D
GS4-2100		GS4-4100	
		GS4-4125	E
		GS4-4150	
		GS4-4175	F
		GS4-4200	
		GS4-4250	G
		GS4-4300	

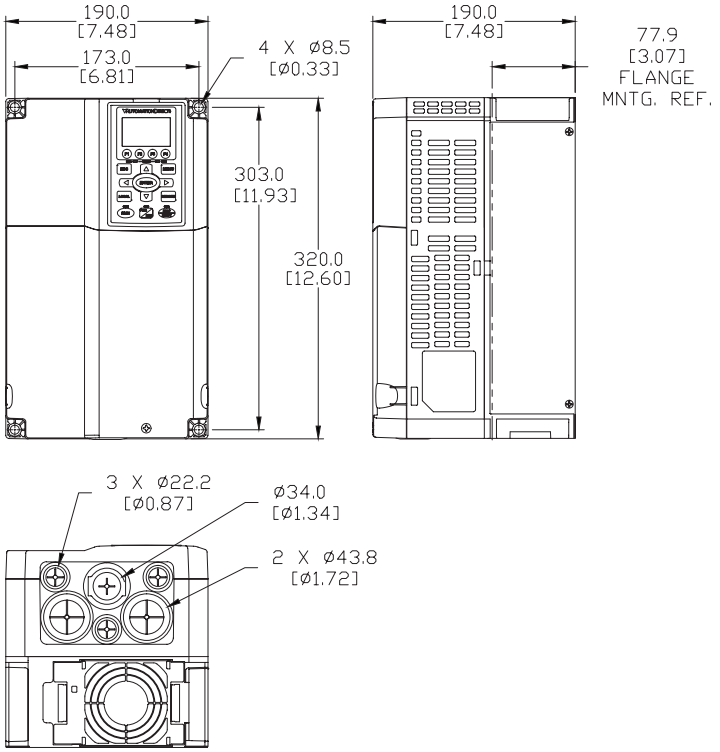
Frame Size A



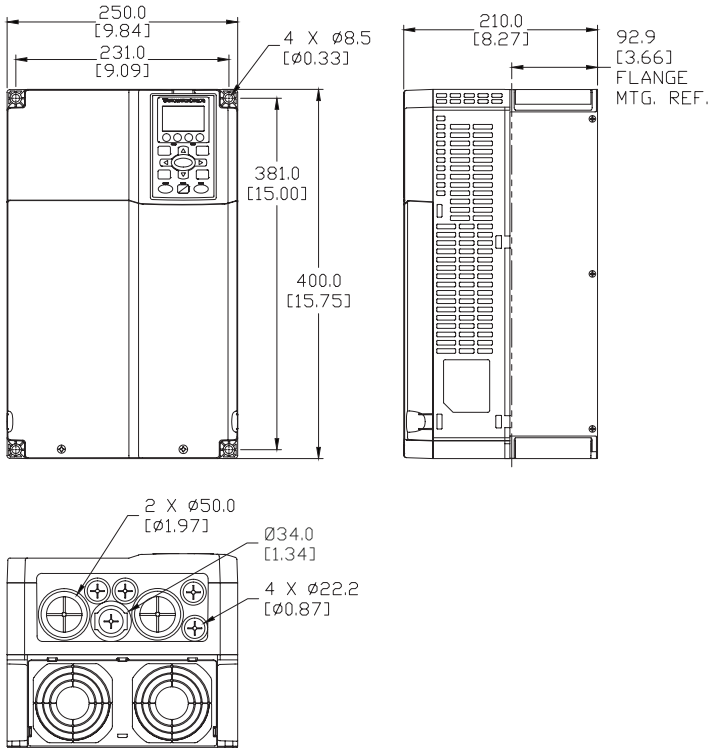
Dimensions (Units = mm [in])

See our website: www.AutomationDirect.com for complete engineering drawings.

Frame Size B



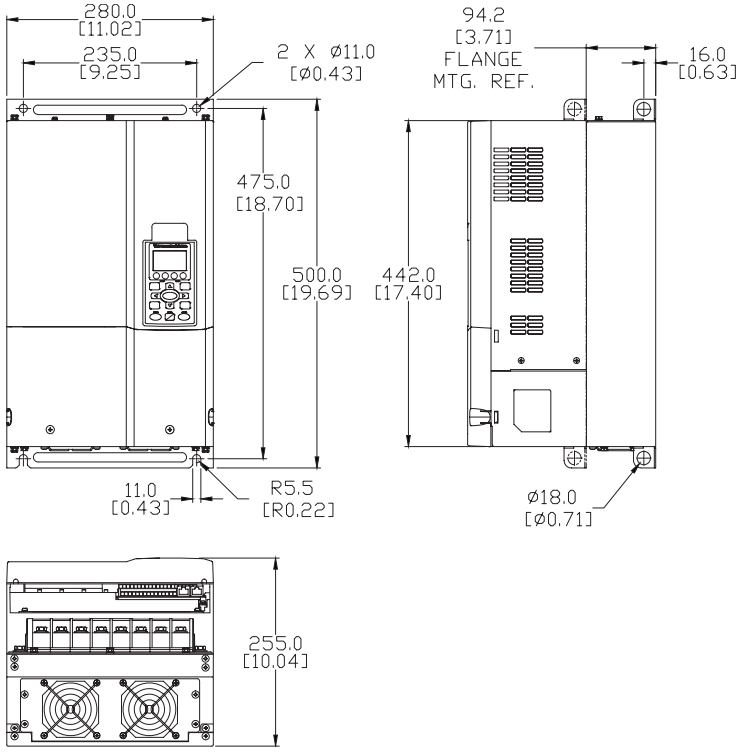
Frame Size C



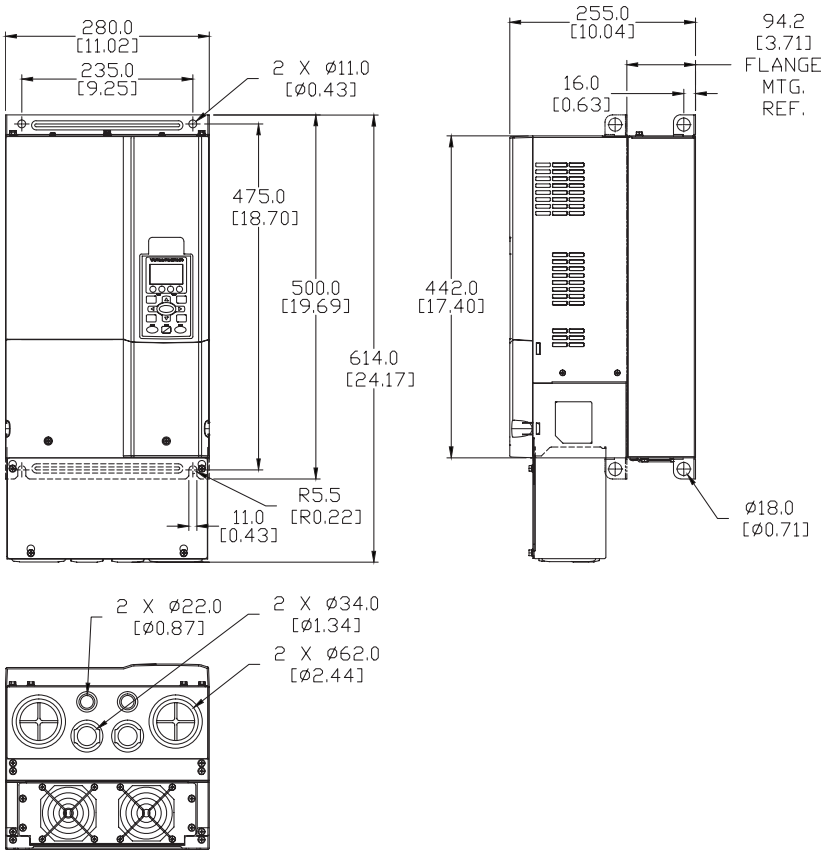
Dimensions (Units = mm [in])

See our website: www.AutomationDirect.com for complete engineering drawings.

Frame Size D0



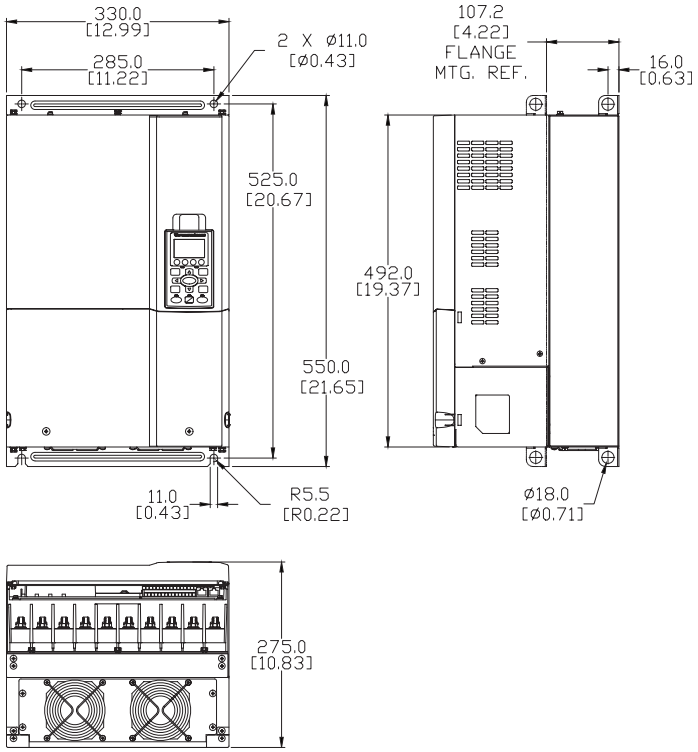
Frame Size D0 with Conduit box



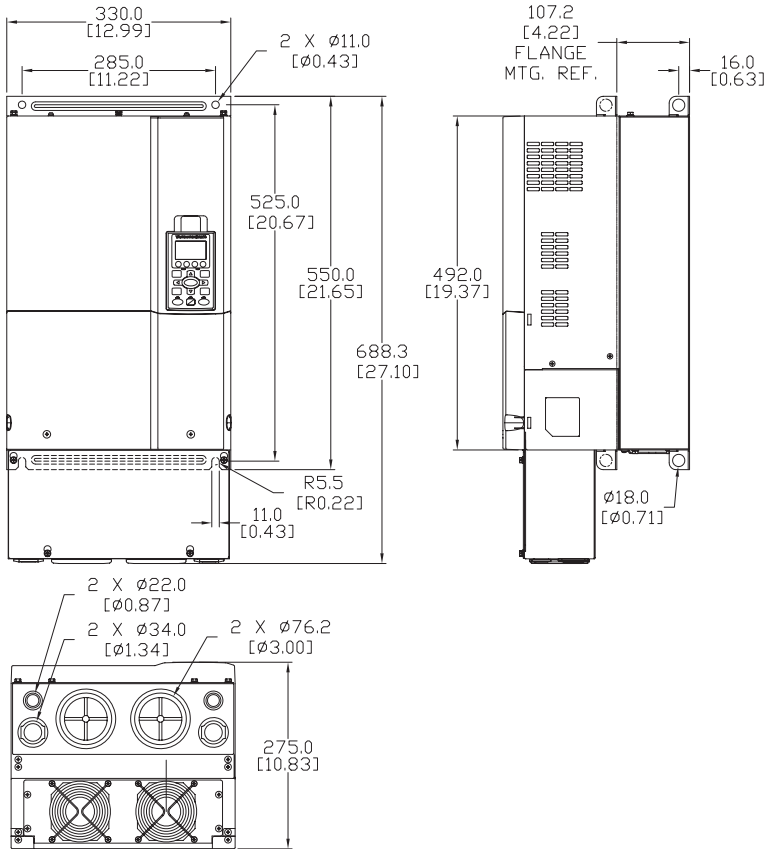
Dimensions (Units = mm [in])

See our website: www.AutomationDirect.com for complete engineering drawings.

Frame Size D



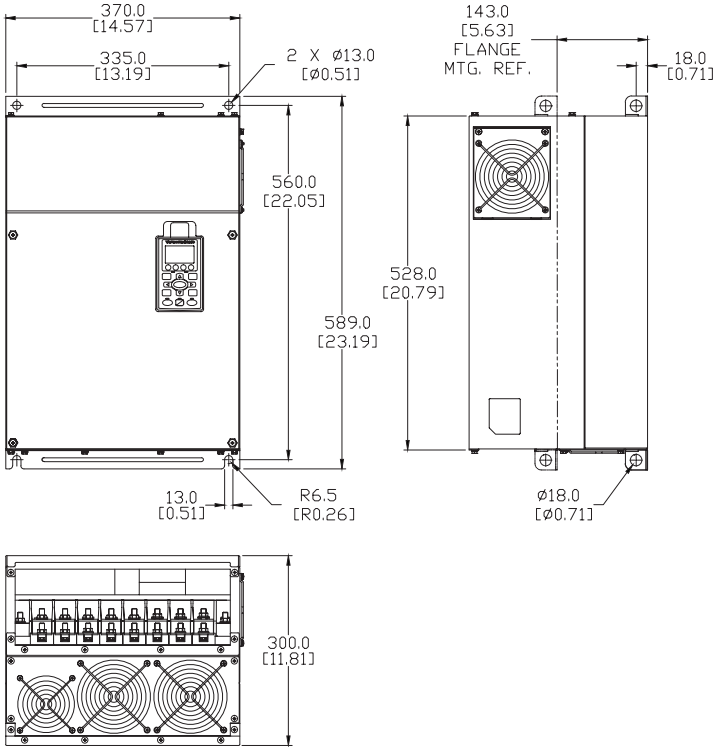
Frame Size D with Conduit Box



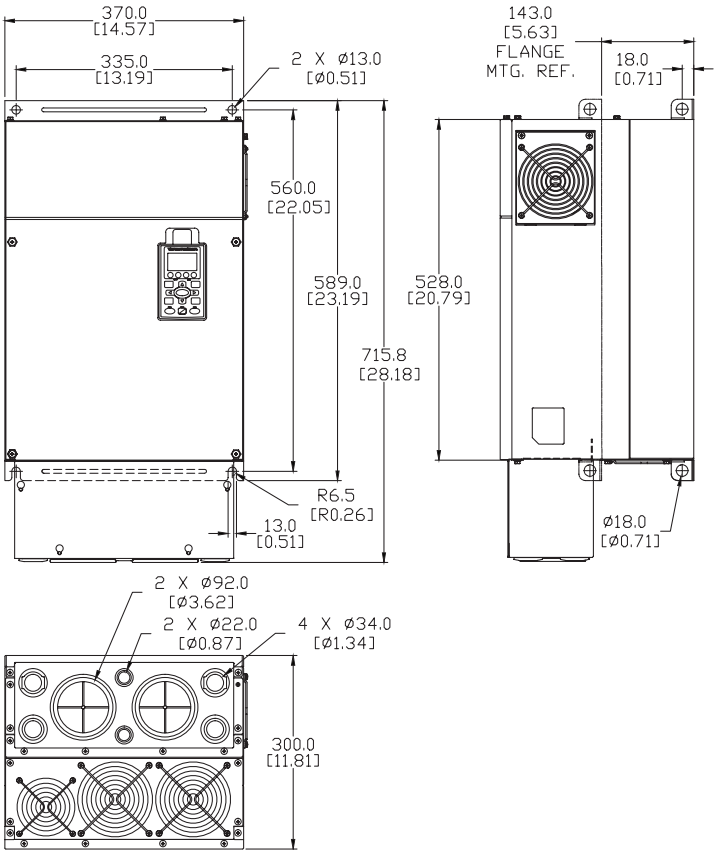
Dimensions (Units = mm [in])

See our website: www.AutomationDirect.com for complete engineering drawings.

Frame Size E



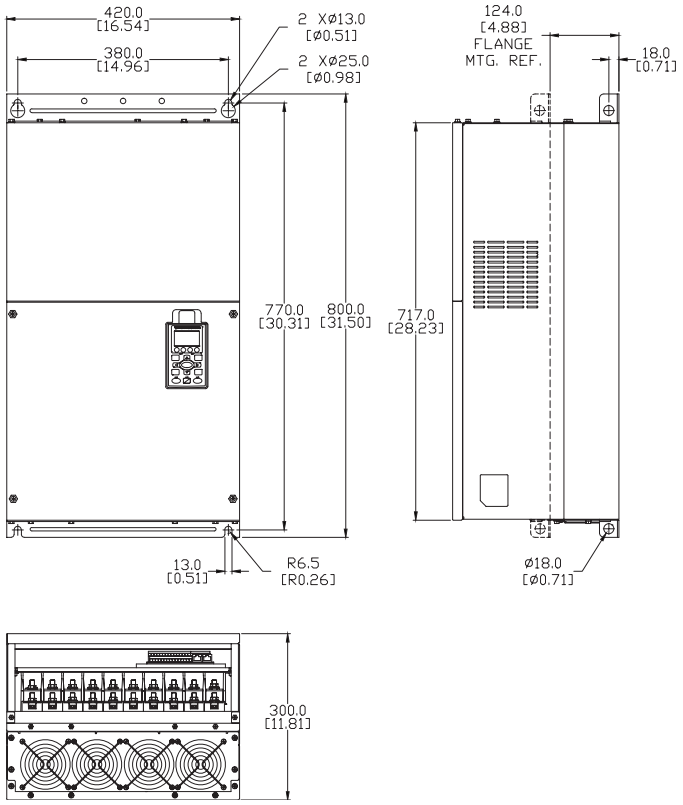
Frame Size E with Conduit box



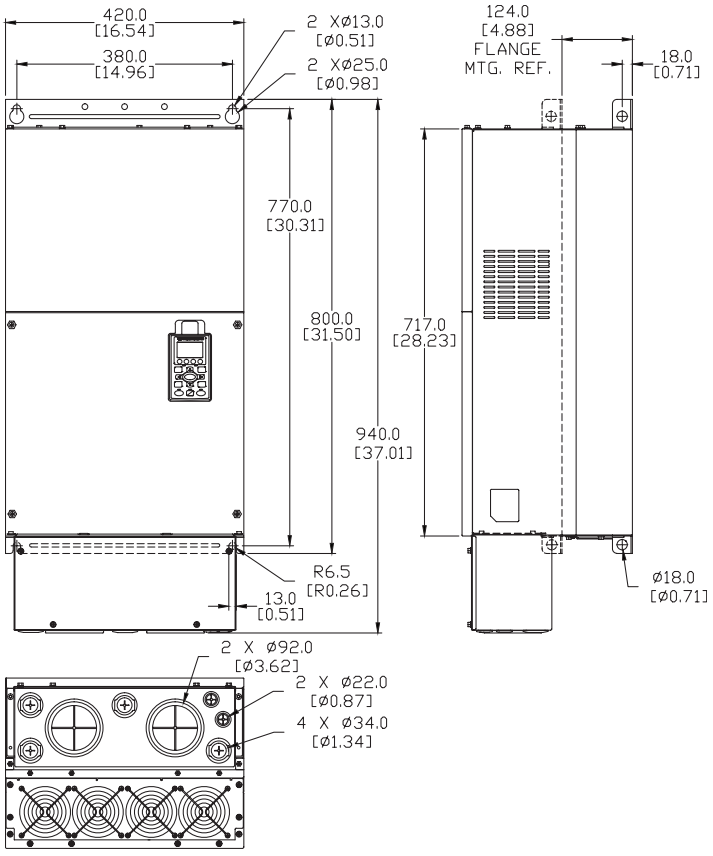
Dimensions (Units = mm [in])

See our website: www.AutomationDirect.com for complete engineering drawings.

Frame Size F



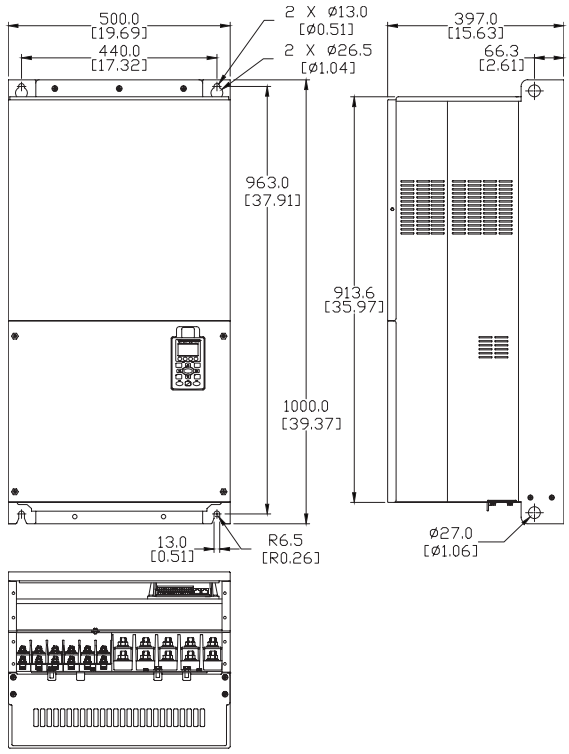
Frame Size F with Conduit box



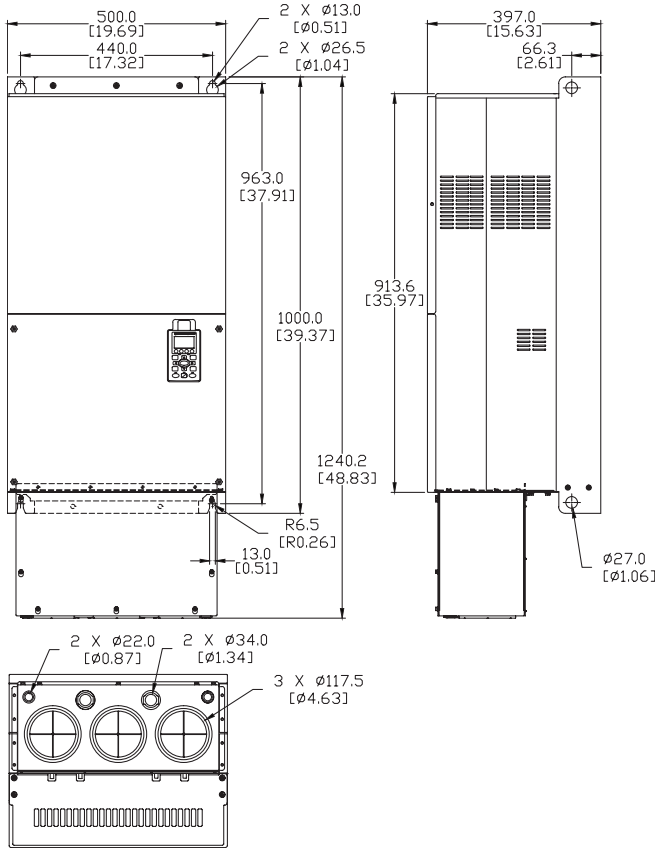
Dimensions (Units = mm [in])

See our website: www.AutomationDirect.com for complete engineering drawings.

Frame Size G (Not capable of flange mounting)



Frame Size G with Conduit box (Not capable of flange mounting)



Circuit Connections – RFI Jumper

RFI Jumper: The GS4 drive may emit electrical noise. The RFI jumper, when left in place, enables an internal filter to supress radio frequency interference on the power line.

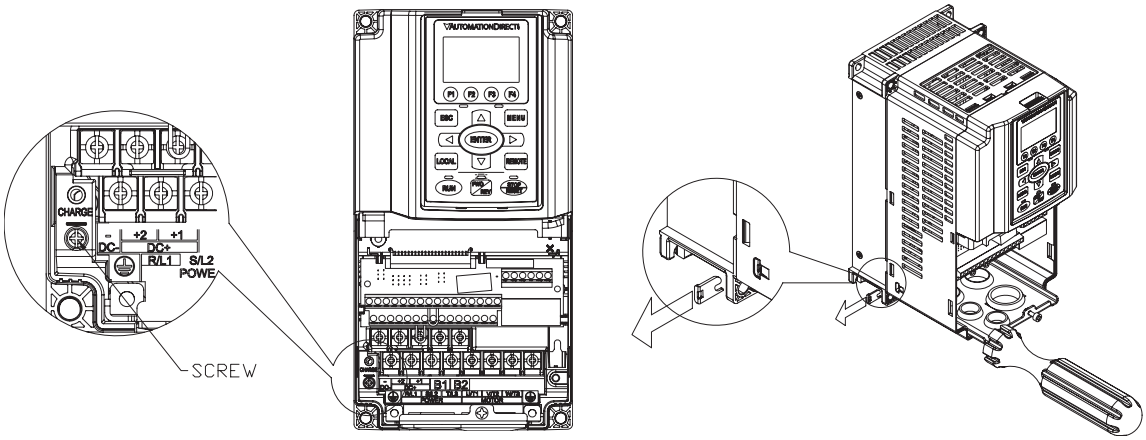
RFI Jumper Removal

The RFI jumper may need to be removed in some cases, such as situations in which the GS4 drive is powered from an Asymmetric Ground System (Corner Grounded TN System), as described on page 2–16.

Frames A~C

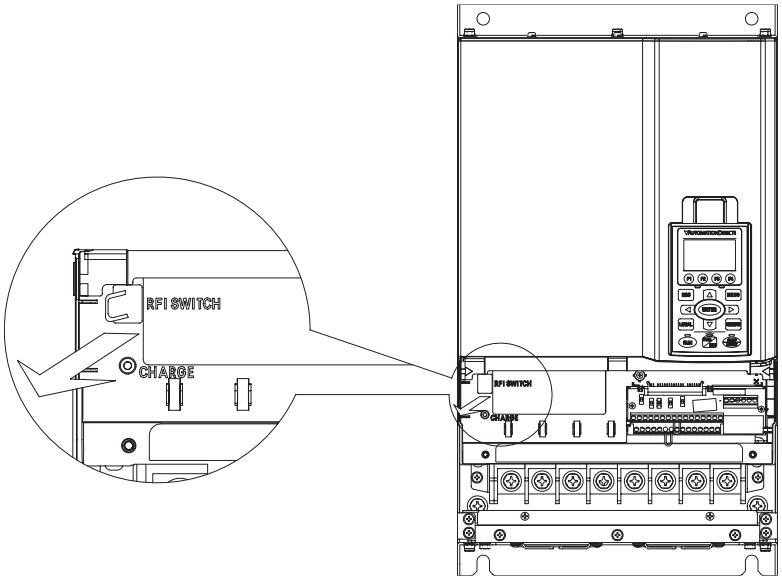
Screw Torque: 8~10 kg·cm [6.9~8.7 lb·in]

Loosen the screw indicated in the view below, and remove the RFI jumper. Tighten the screw to the specified torque after the RFI jumper is removed.



Frames D0~G

Remove the MOV-PLATE by hand; no screws need to be loosened.



Isolating Main Power from Ground

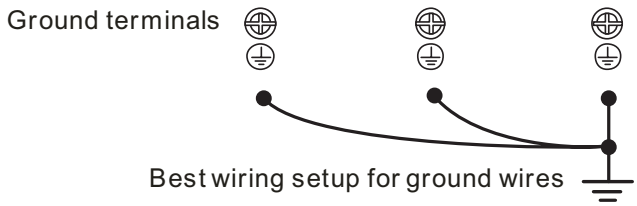
WARNING: If the power distribution system supplying the GS4 drive is single phase, the RFI jumper must be removed.

WARNING: If the power distribution system supplying the GS4 drive is a floating-ground system (IT) or an asymmetric-ground system (TN), the RFI jumper MUST BE REMOVED.

If the power distribution system supplying the GS4 drive is a floating ground system (IT) or an asymmetric ground system (TN), the RFI jumper must be removed. Removing the RFI jumper disconnects the internal RFI filter capacitor between the drive's frame and circuits to avoid damaging those circuits and to reduce ground leakage current.

Important points regarding ground connection

- *To ensure the safety of personnel, proper operation, and to reduce electromagnetic radiation, the GS4 drive must be properly grounded during installation.*
- *The diameter of the cables must meet the size specified by applicable codes and regulations.*
- *The grounding cable must be connected to the ground of the GS4 drive to meet safety regulations.*
- *The grounding cable can be used as the ground for equipment only when the aforementioned points are met.*
- *When installing multiple GS4 drives, do not connect the grounds of the AC motor drive in series. Instead, utilize a single-point grounding scheme (as shown below), or provide individual grounding rods for each GS4 drive.*



Pay particular attention to the following WARNINGS:

WARNING: Do not remove the RFI jumper while power is applied to the GS4 drive.

WARNING: Cutting the RFI short-circuit cable will also cut off the conductivity of the capacitor. Gap discharge may occur once the transient voltage exceeds 1000V.

WARNING: The RFI jumper may not be removed if the main power is a symetrical grounded power system.

WARNING: The RFI jumper may not be removed while conducting high voltage tests.

WARNING: When conducting a high voltage test to the entire facility, the main power and the motor must be disconnected if leakage current is too high.

Floating Ground System (IT Systems)

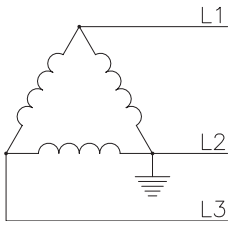
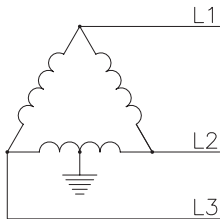
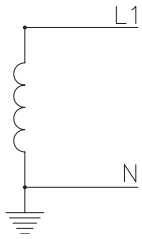
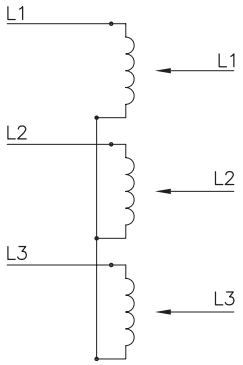
A floating ground system is also called an IT system, an ungrounded system, or a high impedance/ resistance grounding system (greater than 30Ω).

CAUTION: Do not install an external RFI/EMC filter! The EMC filter will pass through the RFI capacitor, thus connecting power input to ground. This is very dangerous and can easily damage the GS4 drive.

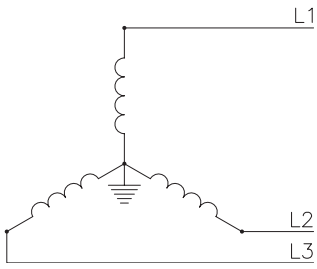
Asymmetric Ground System (Corner Grounded TN Systems)

CAUTION: Do not remove the RFI jumper while the input terminals of the GS4 drive carries power.

The RFI jumper must be removed in the following four situations. This is to prevent the system from grounding through the RFI capacitor, damaging the GS4 drive.

RFI Jumper Must Be Removed (Asymmetric Ground / Corner Grounded TN Systems)	
1) Grounding at a Corner of a Triangle Configuration 	2) Grounding at a Midpoint in a Polygonal Configuration 
3) Grounding at One End in a Single-Phase Configuration 	4) No Stable Neutral Grounding in a Three-Phase Autotransformer Configuration 

The RFI jumper should be left in place for a symmetrically grounded system.

RFI Jumper Left In Place (Symmetrical Ground System)	
Internal grounding through internal RFI filter, which reduces electromagnetic radiation. In a situation with higher requirements for electromagnetic compatibility, and using a symmetrical grounding power system, an EMC filter can be installed. As a reference, the diagram on the right is a symmetrical grounding power system.	

Circuit Connections – Warnings and Notes

Danger!

Hazardous Voltage! Before making any connection to the AC drive, disconnect all power to the AC drive, and wait five minutes for DC bus capacitors to discharge.

Warning: Any electrical or mechanical modification to this equipment will void all warranties, may result in a safety hazard, and may void the UL listing.

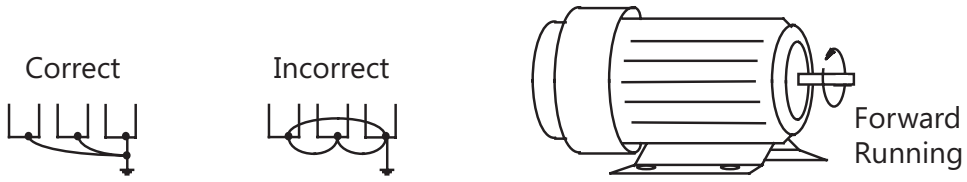
Warning: Do not connect the AC input power to the T1, T2, and T3 output terminals. Doing this will damage the AC drive.

Warning: Do not connect single-phase power to a three-phase drive model.

Warning: Tighten all screws to the proper torque rating. See "Main Circuit Wiring" later in this chapter.

Wiring Notes: PLEASE READ PRIOR TO INSTALLATION.

1) During installation, follow all local electrical, construction, and safety codes for the country in which the AC drive is to be installed.
2) Refer to the "DURApulse GS4 AC Drive Specifications" in chapter 1 for voltage and current requirements.
3) Torque the screws of the main circuit terminals to prevent loosening due to vibration.
4) The addition of a magnetic contactor (MC) in the AC line power input wiring is recommended to turn off power quickly and reduce the possibility of malfunction if the protection function of the GS4 AC drive is activated.
5) Do not use a power circuit contactor or disconnect switch for normal run/stop control of the GS4 AC drive and motor. This will reduce the operating life cycle of the AC drive. Cycling a power circuit switching device while the AC drive is in run mode should be done only in emergency situations.
6) Make sure the appropriate protective devices (circuit breaker or fuses) are connected between the power supply and AC drive.
7) Make sure that the leads are connected correctly and that the GS4 AC drive is properly grounded. (Ground resistance should not exceed 0.1Ω.)
8) Use ground leads that comply with AWG/MCM standards and keep them as short as possible.
9) Multiple GS4 AC drives can be installed in one location. All of the units should be grounded directly to a common ground terminal. The GS4 AC drive ground terminals may also be connected in parallel, as shown in the figure below.
   Make sure there are no ground loops.



10) When the GS4 AC drive output terminals T1, T2, and T3 are connected to the motor terminals T1, T2, and T3, respectively, the motor will rotate counterclockwise (as viewed from the shaft end of the motor) when a forward operation command is received. To reverse the direction of motor rotation, switch the connections of any of the two motor leads.
11) Make sure that the power source is capable of supplying the correct voltage and required current to the GS4 AC drive.
12) Do not attach or remove wiring when power is applied to the GS4 AC drive.
13) Do not inspect components unless inside "POWER" lamp is turned off.
14) Do not monitor the signals on the circuit board while the GS4 AC drive is in operation.
15) GS4 series AC drives ***cannot be used with single-phase motors***.

16) Route the power and control wires separately, or at 90 degree angle to each other.
17) Ground both ends of the shield wire or conduit for the power wiring.
    a) If using a "VFD cable," follow the manufacturer's recommendation for grounding the cable shield.
    b) If using conduit, bond and ground conduit according to applicable electrical codes.
18) If a filter is required for reducing EMI (Electro Magnetic Interference), install it as close as possible to the GS4 AC drive. EMI can also be reduced by lowering the Carrier Frequency.
    Please refer to the "Applied EMI/RFI Techniques" white paper at support.automationdirect.com.
19) If the GS4 AC drive is installed in a place where a load reactor is needed, install the reactor close to the T1, T2, and T3 side of GS4 AC drive. Do not use a Capacitor, L-C Filter (Inductance-Capacitance), or R-C Filter (Resistance-Capacitance).
20) When using a GFCI (Ground Fault Circuit Interrupt), select current sensor with sensitivity of 200mA or higher, and not less than 0.1-second operation time to avoid nuisance tripping.

Main Power Terminals

- *Do not supply GS4 460VAC models with single-phase power. R/L1, S/L2, and T/L3 have no phase-sequence requirement; they can be wired in any order.*
- *Do NOT start/stop the GS4 AC drive by turning input power ON/OFF. Start/stop the GS4 AC drive using RUN/STOP commands via control terminals or the keypad. If you must start/stop the GS4 AC drive by turning power ON/OFF, it is recommended to do so only ONCE per hour.*

Output Terminals for Main Circuit

- *Do not connect phase-compensation, L-C (Inductance-Capacitance) , or R-C (Resistance Capacitance) capacitors to the output terminals U/T1, V/T2, W/T3 of the GS4 AC drive.*
- *DO NOT connect phase-compensation capacitors or surge absorbers to the output terminals of the GS4 AC drive.*
- *Use a well-insulated motor suitable for inverter operation.*

Terminals for Connecting DC Reactor, External Brake Resistor, External Brake Resistor and DC Circuit

- *Terminals +1 and +2 are used to connect an optional DC reactor to improve the power factor. For the factory setting, they are connected by a short-circuit jumper. Remove this jumper before connecting a DC reactor.*
- *When the GS4 AC Drive is connected directly to a large-capacity power transformer (600kVA or above) or when a phase lead capacitor is switched, excess peak currents may occur in the power input circuit due to the load changes. The converter section may be damaged. To avoid this damage, it is recommend to use a serial connected AC input reactor at the GS4 AC Drive mains input side to reduce the current and improve the input power efficiency.*
- *Connect an optional brake resistor or brake unit in applications with frequent deceleration ramps, short deceleration time, too low brake torque or requiring increased brake torque.*
- *For GS4 frame sizes A–C, the external brake resistor should be connected to the terminals (B1, B2) of GS4 drives.*
- *For the models without built-in braking chopper, connect external brake unit and brake resistor (both of them are optional) to increase brake torque.*
- *If the terminals [+1], [+2], and [-] are not used, leave these three terminals open.*
- *DO NOT connect [+1, -], [+2, -], [+1/DC+, -/DC-], or brake resistor directly to prevent drive damage.*
- *DC+ and DC- are connected for common DC bus, please refer to "Main Circuit Wiring Terminals" in this chapter for wiring terminal specification and wire gauge information.*
- *Please refer to the DURApulse Drives Dynamic Braking User Manual for more information on installing brake units.*
  (Available for free download at http://www.automationdirect.com/static/manuals/index.html.)

Motor Operation Precautions

1) When using the GS4 AC drive to operate a standard 3-phase induction motor, notice that the energy loss is greater than for an inverter duty motor.
2) Avoid running a standard induction motor at low speed, which may cause the motor temperature to exceed the motor rating due to limited airflow produced by the motor's fan.
3) When the standard motor operates at low speed, the output load must be decreased.
4) If **100% output torque** is desired at low speed, it may be necessary to use a special **"inverter-duty" rated motor**.

Short Circuit Withstand (SCCR)

All *DURApulse* GS4 series drives are suitable for use on a circuit capable of delivering not more than 100,000 rms symmetrical amperes.

The maximum voltage is 240V for all 230V models, and 480V for all 460V models.

Applicable Codes

All *DURApulse GS4* AC drives are Underwriters Laboratories, Inc. (UL) and Canadian Underwriters Laboratories (cUL) listed, and therefore comply with the requirements of the National Electrical Code (NEC) and the Canadian Electrical Code (CEC).

Installations intended to meet the UL and cUL requirements must follow the instructions provided in "Wiring Notes" as a minimum standard. Follow all local codes that exceed UL and cUL requirements. Refer to the technical data label affixed to the AC drive and the motor nameplate for electrical data.

The "Circuit Protection Devices" section in Appendix A lists the recommended fuse part number for each *DURApulse* part number. These fuses (or equivalent) must be used on all installations where compliance with U.L. standards is required.

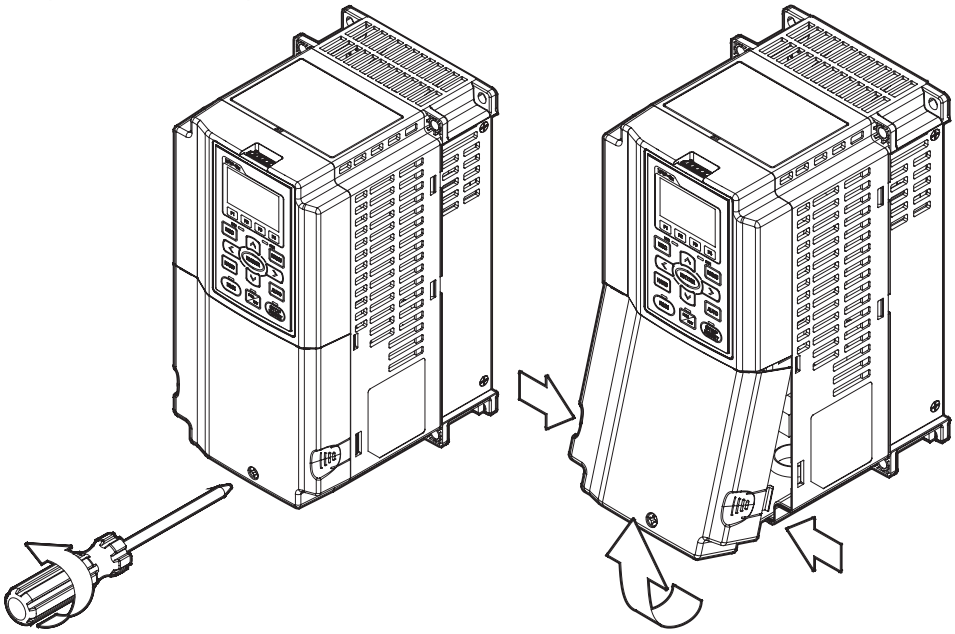
Wiring Terminal Access

Control Terminal Access

Remove the drive front cover to access and wire the multi-function input/output control terminals.

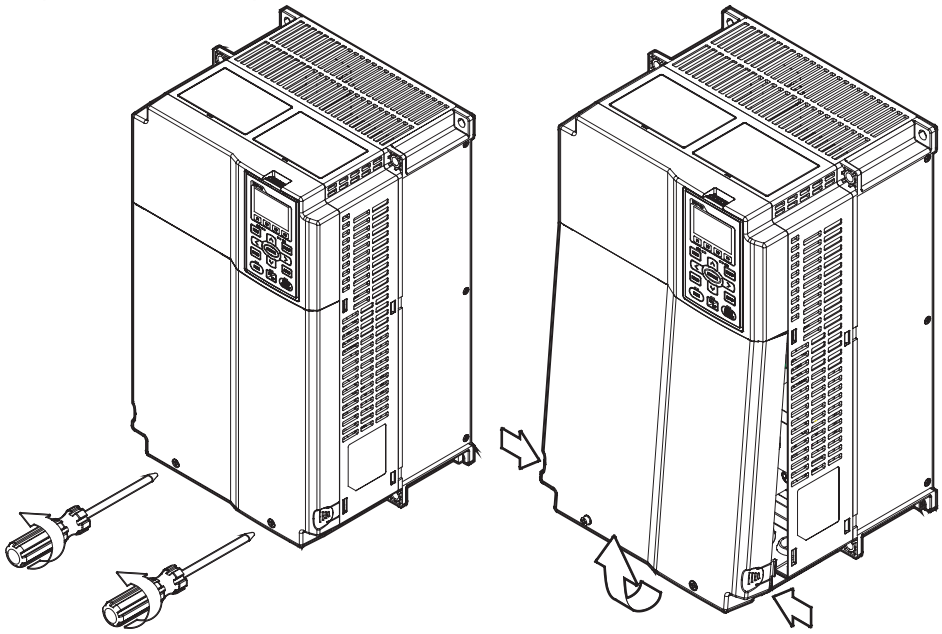
Drive Frames A and B

Loosen the captive screw and press the tabs on both sides to remove the cover.



Drive Frames C and D

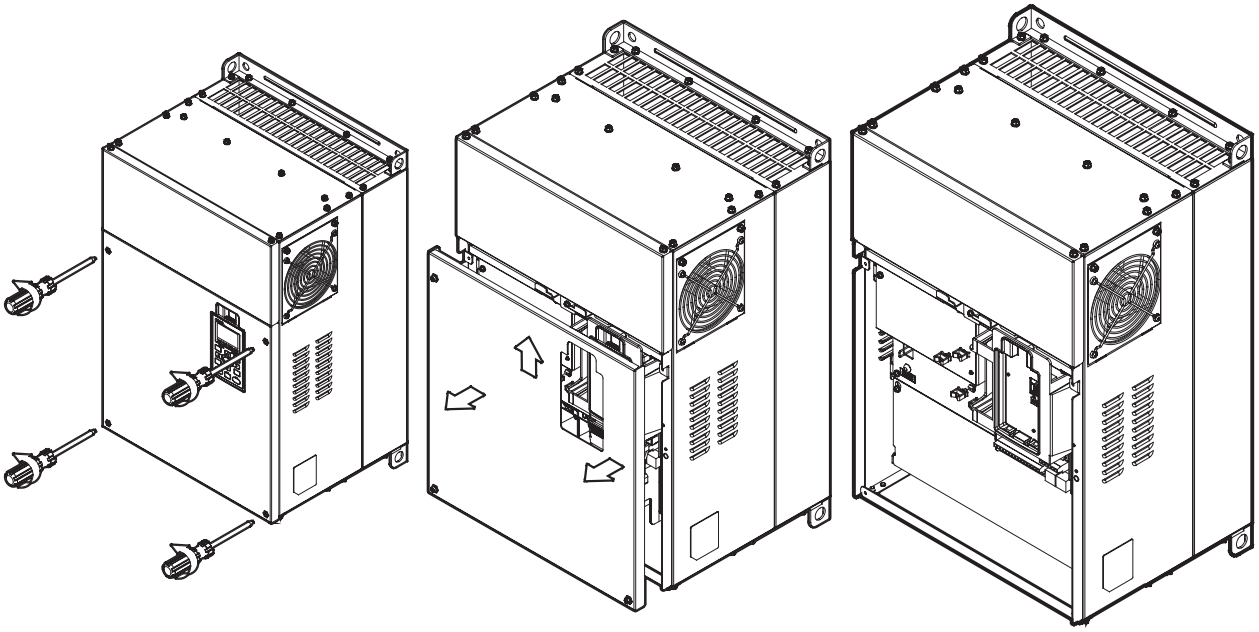
Loosen the captive screws and press the tabs on both sides to remove the cover.



Control Terminal Access (continued)

Drive Frame E, F, and G

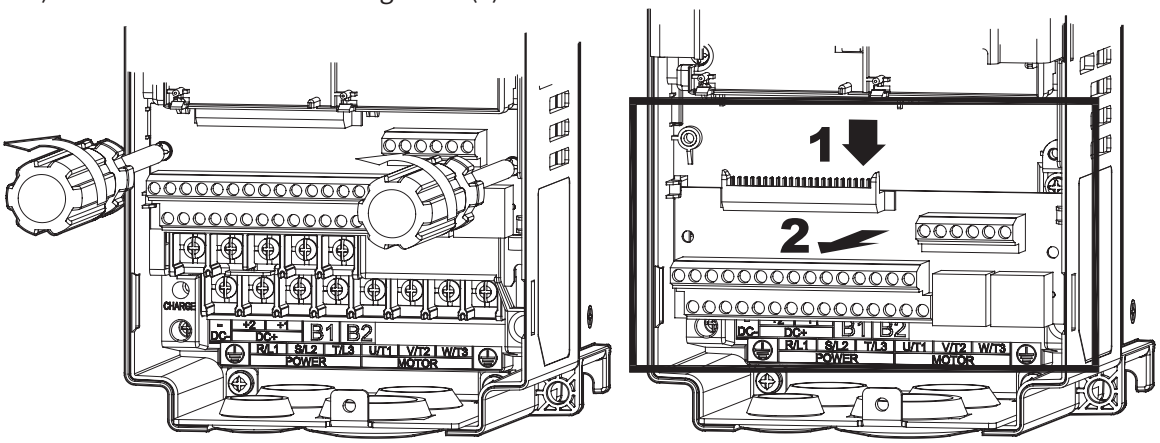
Loosen the captive screws, lift the cover slightly, and pull it outward.
(Frame E shown)



Removing the Control Terminal Block

The control terminal block is removable for ease of wiring.

1) Loosen the captive screws.
2) Slide the control board toward the bottom of the drive to disconnect the pins (1).
3) Lift the control board straight out (2).



Main Circuit Wiring Terminals

Main Terminal Specifications

Main Circuit Terminals	
Terminal	***Description***
R/L1	Input Power – phase 1
S/L2	Input Power – phase 2
T/L3	Input Power – phase 3
U/T1, V/T2, W/T3	AC Drive Output
+1, +2	DC Choke Connection (frames A–C)
B1, B2	Braking Resistor Connection (frames A–C)
+1/DC+, -/DC-	External Dynamic Brake Unit (frames D–G)
⏚	Ground

Main Circuit Wiring Specifications				
AC Drive Frame Size	***AC Drive Model***	***Wire Range (AWG [mm²])***		***Terminal Tightening Torque (kg·cm [lb·in])***
		Max	***Min***	
A	***GS4-21P0***	8 [8.4]	14 [2.1]	20 [17.4]
	GS4-22P0		12 [3.3]	
	GS4-23P0		10 [5.3]	
	GS4-25P0		8 [8.4]	
	GS4-41P0		14 [2.1]	
	GS4-42P0			
	GS4-43P0			
	GS4-45P0		10 [5.3]	
	GS4-47P5			
B	***GS4-27P5***	4 [21.2]	8 [8.4]	35 [30.4]
	GS4-2010		6 [13.3]	
	GS4-2015		4 [21.2]	
	GS4-4010		8 [8.4]	
	GS4-4015			
	GS4-4020		6 [13.3]	
C	***GS4-2020***	1/0 [53.5]	1 [42.4]	80 [69.4]
	GS4-2025		1/0 [53.5]	
	GS4-2030			
	GS4-4025		4 [21.2]	
	GS4-4030			
	GS4-4040		2 [33.6]	
D0	***GS4-4050***	2/0 [67.4]	1/0 [53.5]	81.6 [70.8]
	GS4-4060		2/0 [67.4] 1/0 [53.5]*	
D	***GS4-2040***	300 MCM [152] 4/0 [107]*	4/0 [107] 3/0 [85]*	200 [173]
	GS4-2050		250 MCM [127] 4/0 [107]*	
	GS4-4075		3/0 [85] 2/0 [67.4]*	
	GS4-4100		300 MCM [152] 4/0 [107]*	
E	***GS4-2060***	300 MCM x2 [152 x2] 4/0 x2 [107 x2]*	1/0 x2 [53.5 x2]	200 [173]
	GS4-2075		3/0 x2 [85 x2] 2/0 x2 [67.4 x2]*	
	GS4-2100		4/0 x2 [107 x2] 3/0 x2 [85 x2]*	
	GS4-4125		1/0 x2 [53.5 x2]	
	GS4-4150		3/0 x2 [85 x2] 2/0 x2 [67.4 x2]*	
** Wiring specifications for drives with optional conduit box*				
(continued next page)				

Main Circuit Wiring Specifications (continued)				
AC Drive Frame Size	**AC Drive Model**	**Wire Range (AWG [mm²])**		**Terminal Tightening Torque (kg·cm [lb·in])**
		Max	**Min**	
F	**GS4-4175**	300 MCM x2 [152 x2] 4/0 x2 [107 x2]*	4/0 x2 [107 x2] 3/0 x2 [85 x2]*	200 [173]
	GS4-4200		4/0 x2 [107 x2]	
G	**Terminals R/L11,12; S/L21,22; T/L31,32**			
	GS4-4250	300 MCM x4 [152 x4]	2/0 x4 [67.4 x4] 1/0 x4 [53.5 x4]*	200 [173]
	GS4-4300		3/0 x4 [85 x4] 2/0 x4 [67.4 x4]*	
	Terminals U/T1, V/T2, W/T3, +1/DC+, -/DC-			
	GS4-4250	500 MCM x2 [253 x2]	400 MCM x2 [203 x2] 300 MCM x2 [152 x2]*	400 [354]
	GS4-4300		500 MCM x2 [253 x2] 400 MCM x2 [203 x2]*	
** Wiring specifications for drives with optional conduit box*				

UL installations must use 600V, 75˚C or 90˚C wires. Use copper wire only.

Wiring Terminal Connector Dimensions – Main-Circuit Terminals

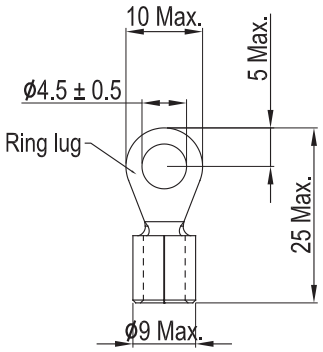
Dimensions = mm

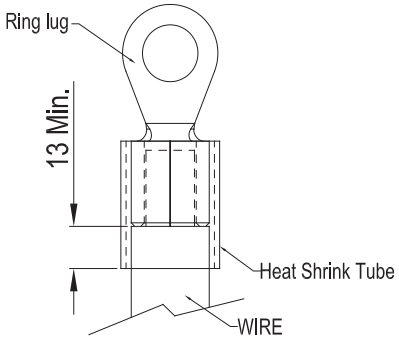
Frame Size A (GS4 model #s: 21P0, 22P0, 23P0, 25P0, 41P0, 42P0, 43P0, 45P0, 47P5)

NOTE: Crimp connectors are NOT required on A, B, and C frame drives.

NOTE: Heat shrink should comply with UL (600V, YDPU2).

Power Terminal Wiring Connectors: ***Heat Shrink Tubing:***



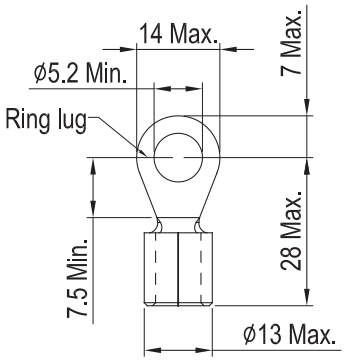


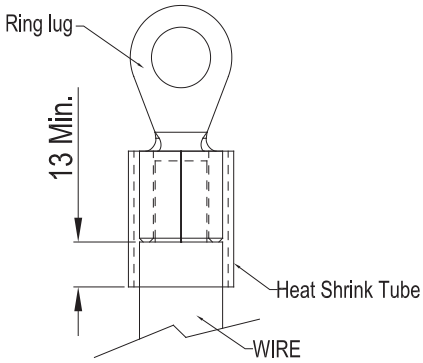
Frame Size B (GS4 model #s: 27P5, 2010, 2015, 4010, 4015, 4020)

NOTE: Crimp connectors are NOT required on A, B, and C frame drives.

NOTE: Heat shrink should comply with UL (600V, YDPU2).

Power Terminal Wiring Connectors: ***Heat Shrink Tubing:***





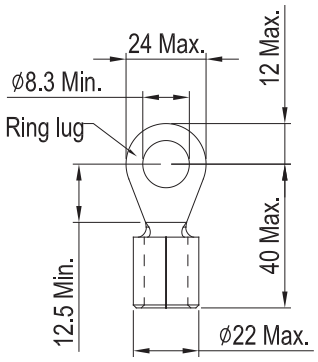
Main Circuit Crimp Connector Specifications (continued)

Dimensions = mm

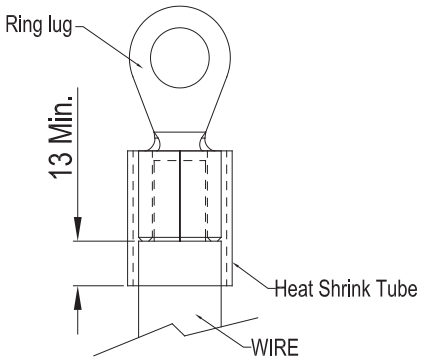
Frame Size C (GS4 model #s: 2020, 2025, 2030, 4025, 4030, 4040)

NOTE: Crimp connectors are NOT required on A, B, and C frame drives.
NOTE: Heat shrink should comply with UL (600V, YDPU2).

Power Terminal Wiring Connectors:



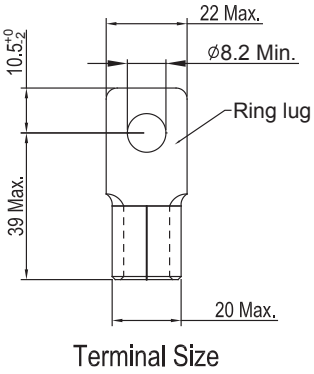
Heat Shrink Tubing:



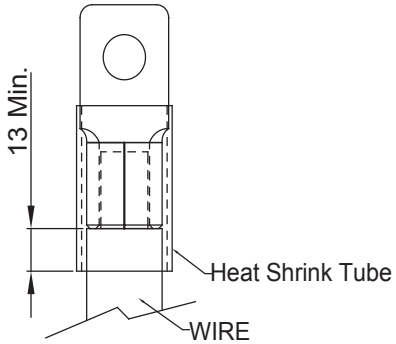
Frame Size D0 (GS4 model #s: 4050, 4060)

NOTE: Crimp connectors ARE required on D0, D, E, F, and G frame drives.
NOTE: Heat shrink should comply with UL (600V, YDPU2).

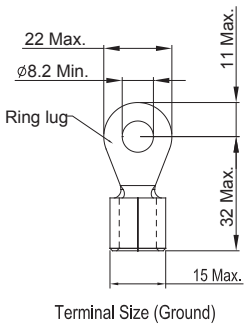
Power Terminal Wiring Connectors:
(except Ground Terminal Connectors)



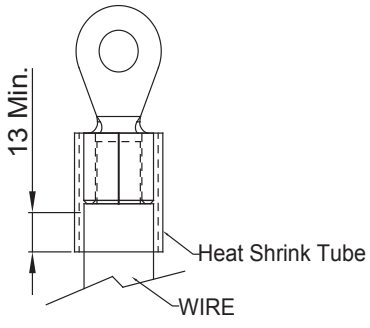
Heat Shrink Tubing:
(non-ground power connectors)



GROUND Terminal Wiring Connectors ONLY:



Heat Shrink Tubing:
(ground terminal power connectors)



Main Circuit Crimp Connector Specifications (continued)

Dimensions = mm

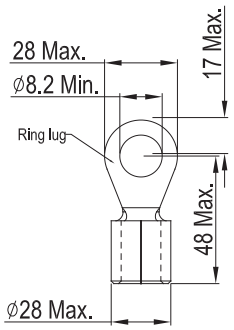
Frame Size D (GS4 model #s: 2040, 2050, 4075, 4100)

NOTE: Crimp connectors ARE required on D0, D, E, F, and G frame drives.

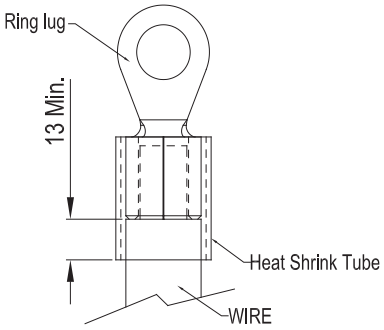
NOTE: ADC ring terminal part #s for GS4 A-frame drives: V70RK004011, V70RK004012, V70RK004017, V70RK004018

NOTE: Heat shrink should comply with UL (600V, YDPU2).

Power Terminal Wiring Connectors:



Heat Shrink Tubing:

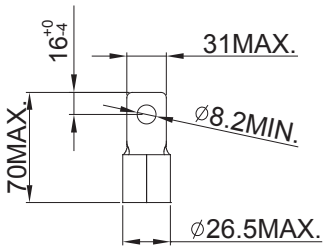


Frame Size E (GS4 model #s: 2060, 2075, 2100, 4125, 4150)

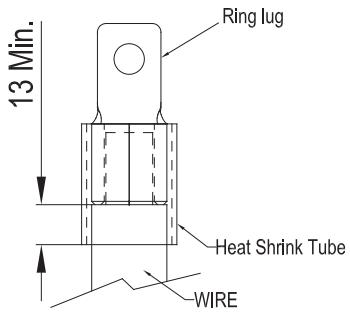
NOTE: Crimp connectors ARE required on D0, D, E, F, and G frame drives.

NOTE: Heat shrink should comply with UL (600V, YDPU2).

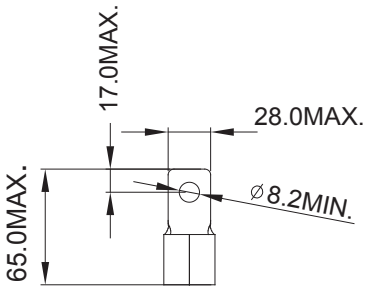
Power Terminal Wiring Connectors: (except Ground Terminal Connectors)



Heat Shrink Tubing:



GROUND Terminal Wiring Connectors ONLY:



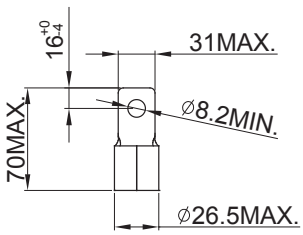
Main Circuit Crimp Connector Specifications (continued)

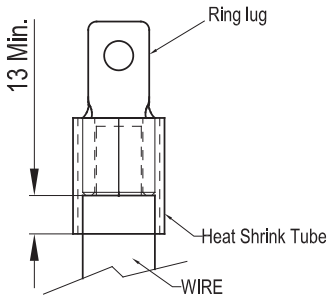
Dimensions = mm

Frame Size F (GS4 model #s: 4175, 4200)

NOTE: Crimp connectors ARE required on D0, D, E, F, and G frame drives.
NOTE: Heat shrink should comply with UL (600V, YDPU2).

Power Terminal Wiring Connectors: ***Heat Shrink Tubing:***



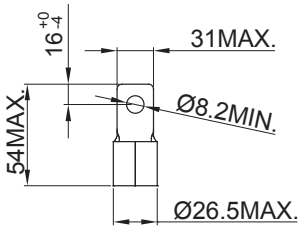


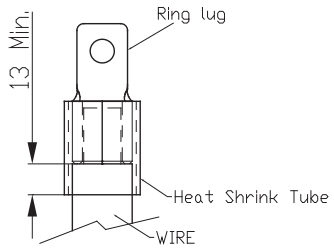
Frame Size G (GS4 model #s: 4250, 4300)

NOTE: Crimp connectors ARE required on D0, D, E, F, and G frame drives.
NOTE: Heat shrink should comply with UL (600V, YDPU2).

For Terminals: R/L11, R/L12, S/L21, S/L22, T/L31, T/L32:

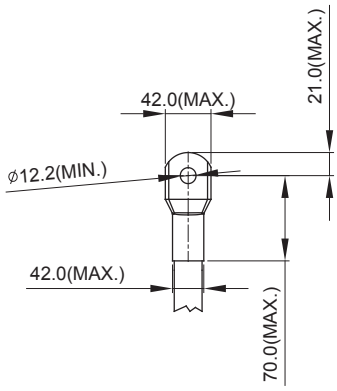
Power Terminal Wiring Connectors ***Heat Shrink Tubing:***

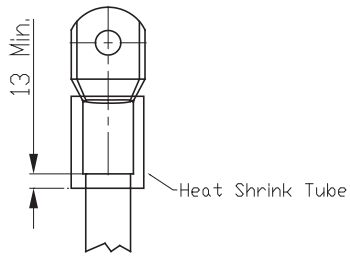




For Terminals: U/T1, V/T2, W/T3, +1/DC+, -/DC-

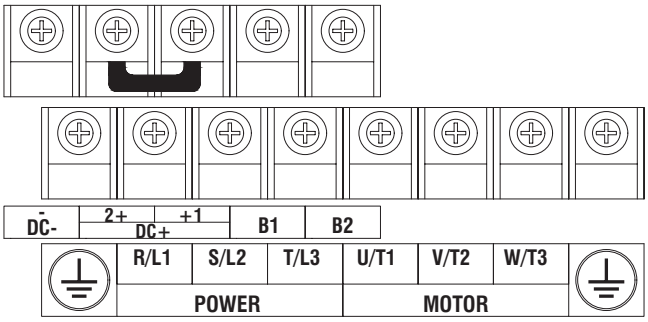
Power Terminal Wiring Connectors ***Heat Shrink Tubing:***



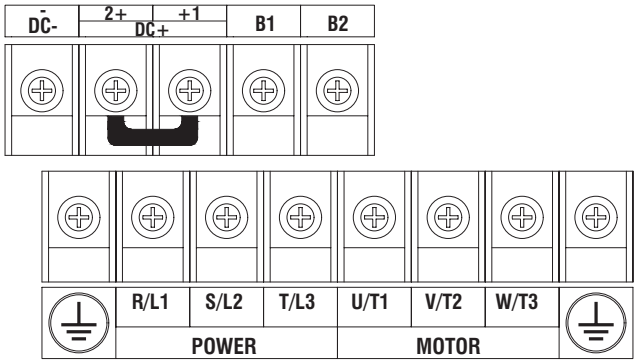


Main Terminal Diagrams

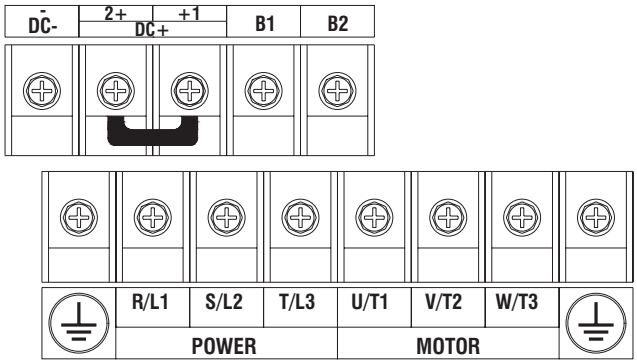
Frame Size A Main Terminals



Frame Size B Main Terminals

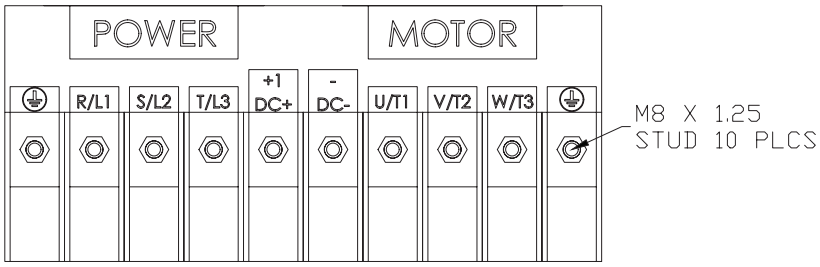


Frame Size C Main Terminals

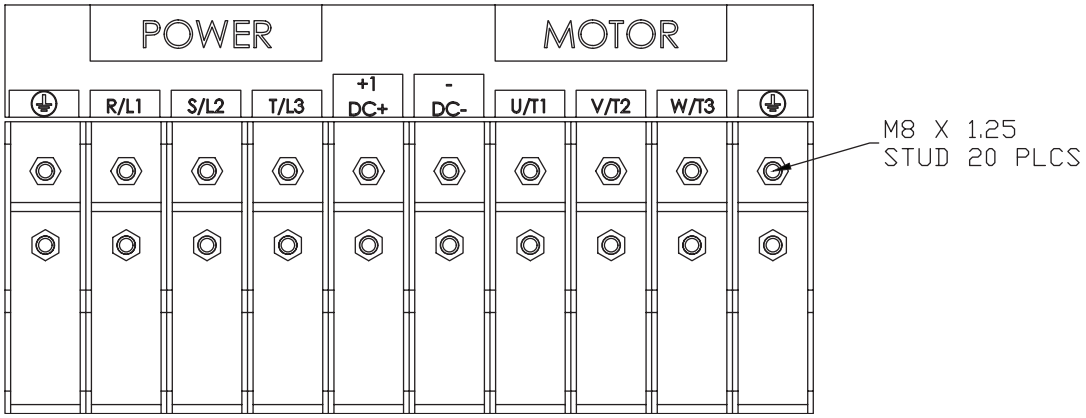


Main Terminal Diagrams (continued)

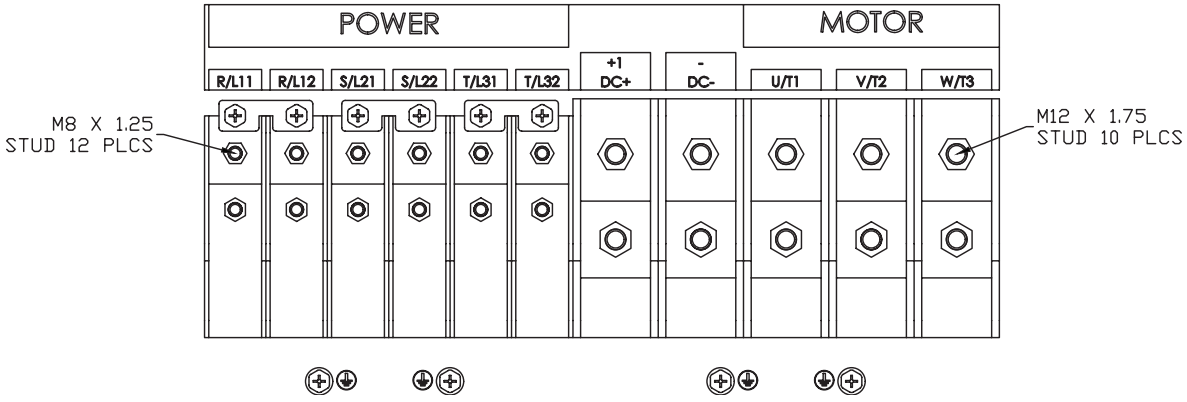
Frame Size D0, D Main Terminals



Frame Size E–F Main Terminals



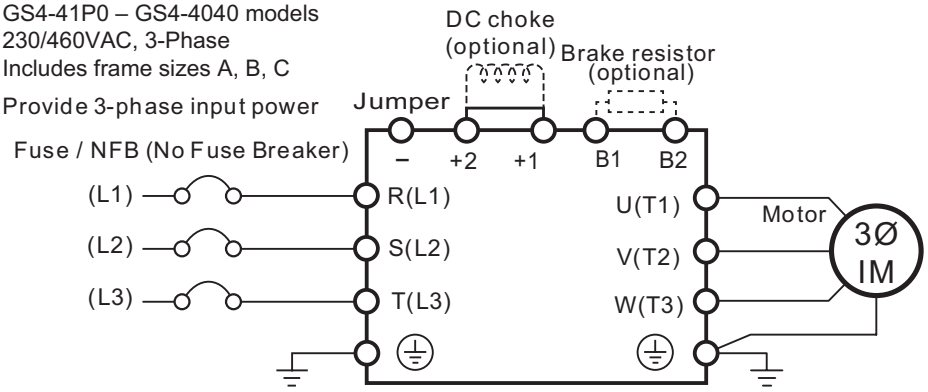
Frame Size G Main Terminals



Main Circuit Wiring Diagrams

Frame Sizes A, B, C Main Wiring Diagram, Three-Phase

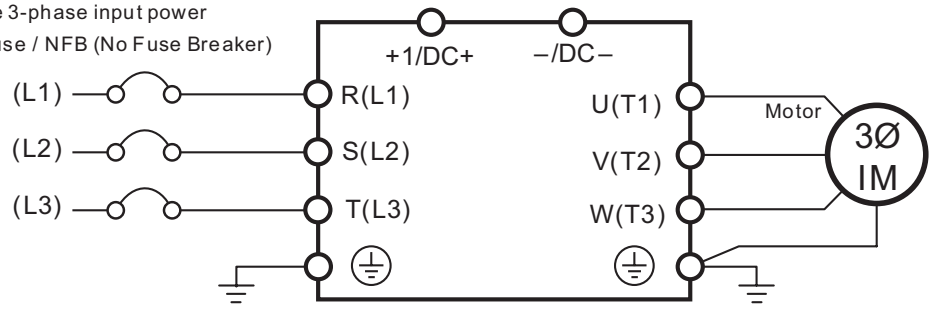
GS4-21P0 – GS4-2030
GS4-41P0 – GS4-4040 models
230/460VAC, 3-Phase
Includes frame sizes A, B, C
Provide 3-phase input power



Frame Sizes D0, D, E, F Main Wiring Diagram, Three-Phase

GS4-2040 – GS4-2100
GS4-4050 – GS4-200 models
230/460VAC, 3-Phase
Includes frame sizes D0, D, E, F
Provide 3-phase input power

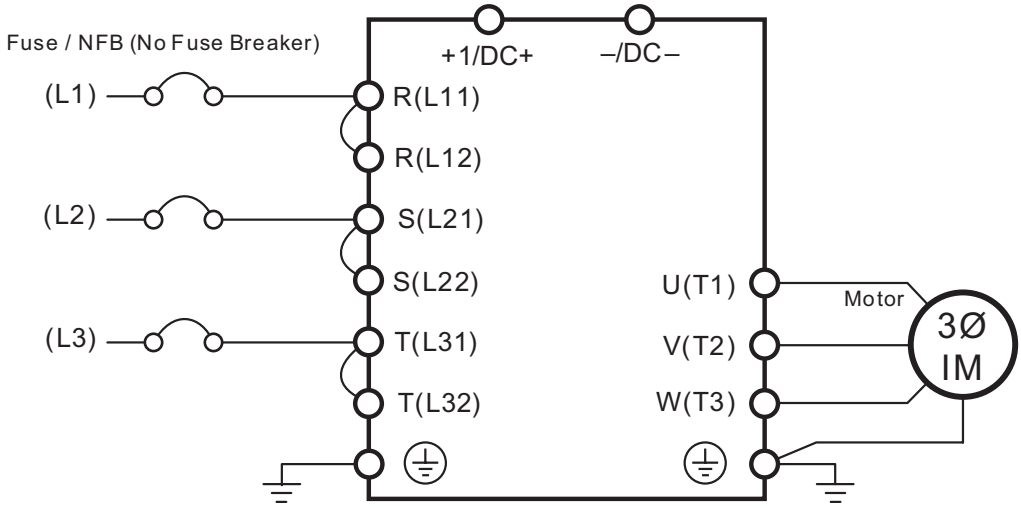
+1/DC+ & -/DC- terminals are for the connection of an optional GS-xDBU dynamic braking unit.
Do NOT connect a braking resistor directly to terminals +1/DC+ and -/DC-. Connecting a resistor directly to these terminals will damage the GS4 drive!



Frame Size G Main Wiring Diagram, Three-Phase

GS4-4250 &
GS4-4300 models
460VAC, 3-Phase
Provide 3-phase input power

+1/DC+ & -/DC- terminals are for the connection of an optional GS-xDBU dynamic braking unit.
Do NOT connect a braking resistor directly to terminals +1/DC+ and -/DC-. Connecting a resistor directly to these terminals will damage the GS4 drive!

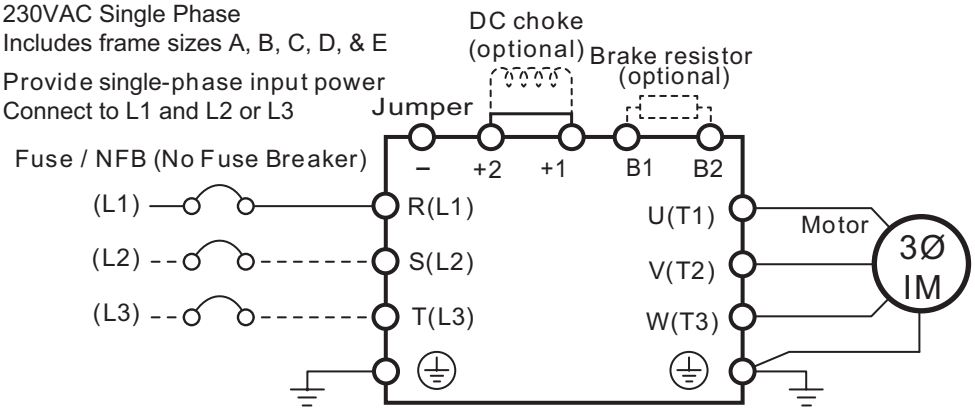


Main Circuit Wiring Diagrams (continued)

Single-Phase Main Wiring Diagram, GS4 230V Models

GS4-2xxx models,
230VAC Single Phase
Includes frame sizes A, B, C, D, & E

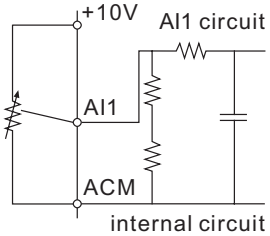
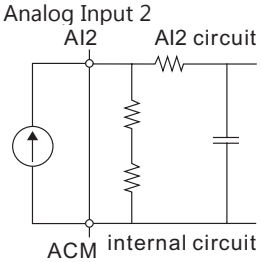
Provide single-phase input power
Connect to L1 and L2 or L3

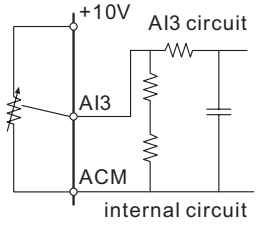
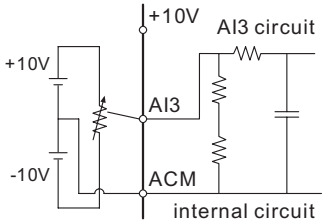
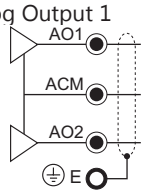
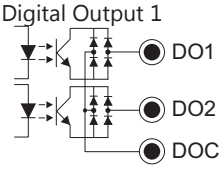


Connect 230VAC, Single-Phase power to any two of the R, S, or T terminals

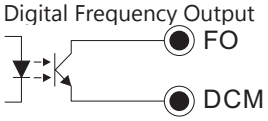
Control Circuit Wiring Terminals

Control Terminal Specifications

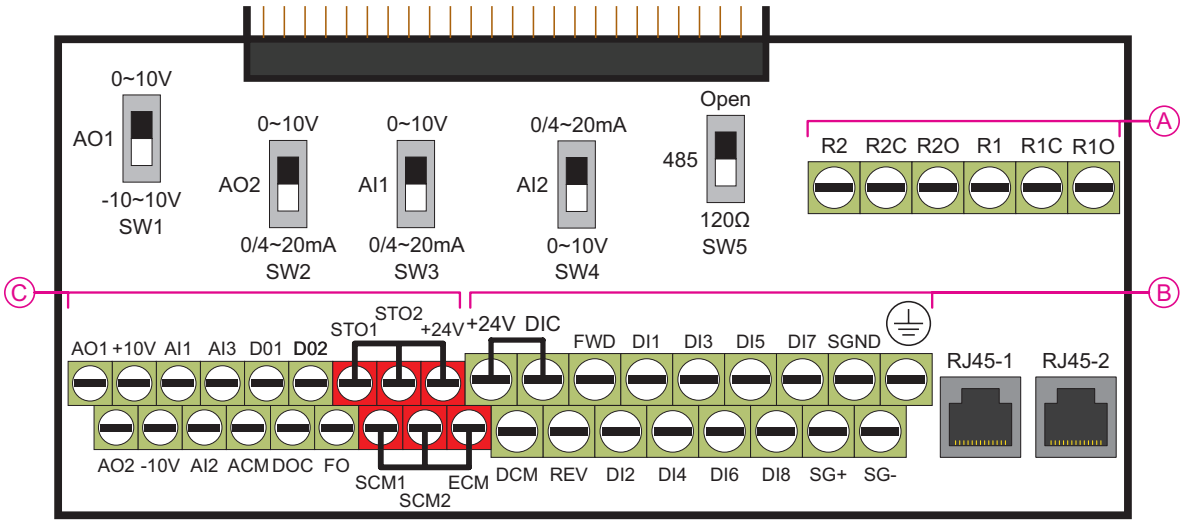
Control Circuit Terminals		
Terminal Symbol	***Description***	***Remarks***
+10V	Potentiometer Power Supply	Analog frequency setting: +10VDC 20mA max output
-10V		Analog frequency setting: -10VDC 20mA max output
+24V	Digital Control Signal Source	+24V±5%, 200mA max output; use with DCM
AI1	Analog Input 1 	Impedance: 20kΩ Range: 0~10V → 0/4~20mA = 0~Max Output Frequency AI1 switch = SW3; factory setting is 0~10V ● 0–10V SW3 (for AI1) 0–20mA / 4–20mA
AI2	Analog Input 2 	Impedance: 250Ω Range: 0/4~20mA → 0~10V = 0~Max Output Frequency AI2 Switch = SW4; factory setting is 0~20mA ● 0–20mA / 4–20mA SW4 (for AI2) 0–10V
(continued next page)		

Control Circuit Terminals (continued)		
Terminal Symbol	**Description**	**Remarks**
AI3	Analog Input 3 Internally Supplied, 0V to +10V (unipolar)  Externally Supplied, -10V to +10V (bipolar)  	Impedance: 20kΩ Range: -10 to +10 VDC = 0~Max Output Frequency *Note:* *For internally supplied -10V to +10V operation (bipolar), connect the pot to +10V and -10V. Keep the pot wiper connected to AI3.*
ACM	Analog Common	Common for analog terminals
AO1	Analog Output 1  	-10 to 10V max output current 2mA; max load 5kΩ Resolution: 0~10V corresponds to max operation frequency Range: 0~10V → -10 to +10V AO1 Switch = SW1, factory setting is 0~10V 0–10V SW1 (for AO1) -10 – +10V
AO2	Analog Output 2 (internal circuit same as AO1)	0–10V max output current 2mA; max load 5kΩ 0–20mA max output current 20mA; max load 500Ω Resolution: 0–10V corresponds to max operation frequency Range: 0~10V → 0/4~20mA AO2 Switch = SW2; factory setting is 0~10V 0–10V SW2 (for AO2) 0–20mA / 4–20mA
DIC	Digital Signal Common Rail	Common terminal for multi-function inputs; Can be tied to DCM (for sinking) or to +24V (for sourcing)
DI1	Digital Input 1	ON: the activation current is 3.3mA ≥ 11VDC OFF: leakage current tolerance is 1.4mA ≤ 5VDC
DI2	Digital Input 2	
DI3	Digital Input 3	
DI4	Digital Input 4	
DI5	Digital Input 5	
DI6	Digital Input 6	
DI7	Digital Input 7	
DI8	Digital Input 8	
DCM	Digital Signal Common	Refer to terminals FO, FWD, REV
DO1	Digital Output 1  	The AC motor drive releases various monitor signals such as drive in operation, frequency attained, and overload indication via transistor (open collector). Can be used sinking or sourcing. Use with DOC (common terminal). 5~48VDC / 50mA
DO2	Digital Output 2 (internal circuit same as DO1)	Multi-function Output 2 (photocoupler). Can be used sinking or sourcing. Use with DOC (common terminal). 5~48VDC / 50mA
DOC	Digital Output Common	Max 48VDC, 50mA

(continued next page)

Control Circuit Terminals (continued)		
Terminal Symbol	***Description***	***Remarks***
+24V	STO Control Signal Source	Safe Torque Off function. Refer to Appendix E: Safe Torque Off for more details.
ECM	EStop Common	
SCM1	STO Input 1 Common	
SCM2	STO Input 2 Common	
STO1	STO Input 1	
STO2	STO Input 2	
FO	Digital Frequency Output 	High-speed pulse output. Use with DCM. Digital Frequency Out = Drive Output Frequency [Hz] x P3.38 [Frequency Output Multiplier]. Duty-cycle: 50% ±1% Min load impedance: 1kΩ/100pf Max current: 30mA Max voltage: 30VDC
FWD	Forward Command	Use with DCM. ON → forward running OFF → deceleration to stop
R1	R1 Relay Common	Resistive Load: 3A(N.O.) / 3A(N.C.); 250VAC 5A(N.O.) / 3A(N.C.); 30VDC Inductive Load (COS 0.4): 1.2A(N.O.) / 1.2A(N.C.); 250VAC These terminals are to output monitoring signals, such as drive in operation, frequency attained, or overload indication. Note: R1 and R2 have N.O. and N.C. contacts.
R1C	R1 Relay N.C.	
R1O	R1 Relay N.O.	
R2	R2 Relay Common	
R2C	R2 Relay N.C.	
R2O	R2 Relay N.O.	
REV	Reverse Command	Use with DCM. ON → reverse running OFF → deceleration to stop
RJ45-1	RJ45 Port 1	Pins 1,2,7,8: Reserved Pins 3,6: SGND Pin 4: SG- Pin 5: SG+
RJ45-2	RJ45 Port 2	
SG+	Modbus RS-485	
SG-		
SGND		
⏚	Digital Control Ground	

Control Terminal Block Diagram & Wiring Specifications



- *SW1 sets AO1: 0~10V (default) or -10 to +10V*
- *SW2 sets AO2: 0~10V (default) or 0/4–20mA*
- *SW3 sets AI1: 0~10V (default) or 0/4–20mA*
- *SW4 sets AI2: 0/4~20mA (default) or 0~10V*
- *SW5 sets RS-485: open (default) or 120Ω terminated*

Control Circuit Wiring Specifications

AC Drive Model	Terminal #	Wire Range (AWG)	Tightening Torque (kg·cm [lb·in])
GS4-xxxx	A	24~16	5 [4.3]
	B	26~16	8 [6.9]
	C	24~16	2 [1.7]

Control Terminal Wiring Instructions

Digital Inputs

- *When using contacts or switches to control the digital inputs, use high quality components to avoid contact bounce.*

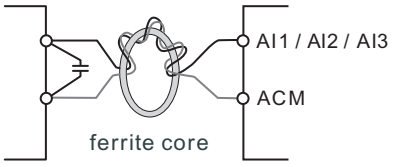
Wiring Multiple Drives Together – Digital Inputs

- *With drive Digital Inputs in SINKING mode, as shown on page 2–36: When connecting a single device to the Digital Inputs of multiple drives (Run, Stop, Reverse, etc.), the DCM (Digital Signal Common) terminals from each drive should be connected together. [Otherwise, do NOT connect the different drive DCM terminals together if the drive DI are sourcing.]*
- *With drive Digital Inputs in SOURCING mode, as shown on page 2–37 (and the connected field devices are sinking): Do NOT connect the different drive DCM terminals together. [If the DCM terminals of multiple drives are connected together with the drive DI in sourcing mode, the inputs of some of the drives may inadvertently turn ON if another drive is powered OFF.]*
  EXAMPLE: A switch is tied to Digital Input 1 of Drives A, B, C, and D. The Drive inputs are all set to Source current out to the field devices. If Drives A, B and C lose power, their Digital Inputs may sink enough current to inadvertently turn ON Digital Input 1 on Drive D.

WARNING: WITH DRIVE DIGITAL INPUTS IN SOURCING MODE (AS SHOWN ON PAGE 2–37: DO NOT CONNECT THE DIFFERENT DRIVE DCM TERMINALS TOGETHER.

Analog Inputs

- *Analog input signals are easily affected by external noise. Use shielded wiring and keep it as short as possible (<20m) with proper grounding. If the noise is inductive, connect the shield to terminal ACM.*
- *If the analog input signals are affected by noise from the AC motor drive, please connect a capacitor and ferrite core as indicated in the diagram at right.*
  (WIND EACH WIRE AROUND THE CORE 3 TIMES OR MORE.)



Control Terminal Wiring Instructions (continued)

Transistor Outputs

- *Make sure to connect the digital outputs to the correct polarity.*
- *When connecting a relay to the digital outputs, connect a surge absorber across the coil and check the polarity.*

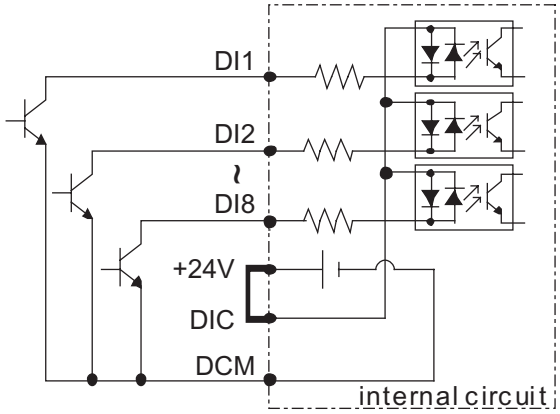
Analog Outputs

- *When setting **SW1**, and using it as a current source (external 500Ω resistor is required), ensure **P4.53 AO1 0~20mA/4~20mA selection** is set appropriately.*
- *When seting **SW2** to 0/4~20mA ensure to set **P4.57 AO2 0~20mA/4~20mA selection** appropriately. When setting to 0~10V (or leaving as default) ensure P4.57 is set to zero.*

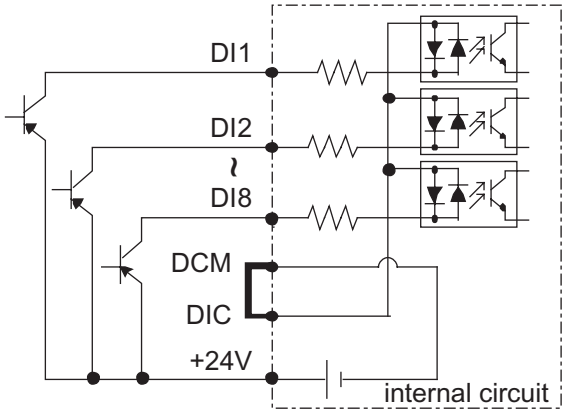
Control Circuit Wiring Diagrams

Digital Inputs

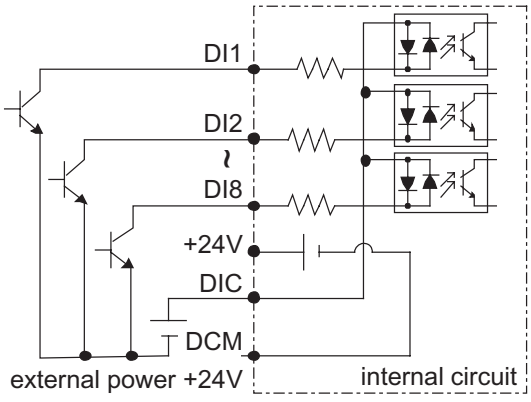
① Drive Source Mode (field devices are sinking) with internal power (+24VDC)



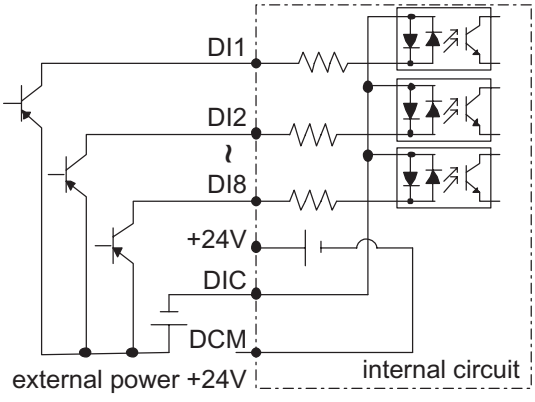
② Drive Sink Mode (field devices are sourcing) with internal power (+24VDC)



③ Drive Source Mode (field devices are sinking) with external power

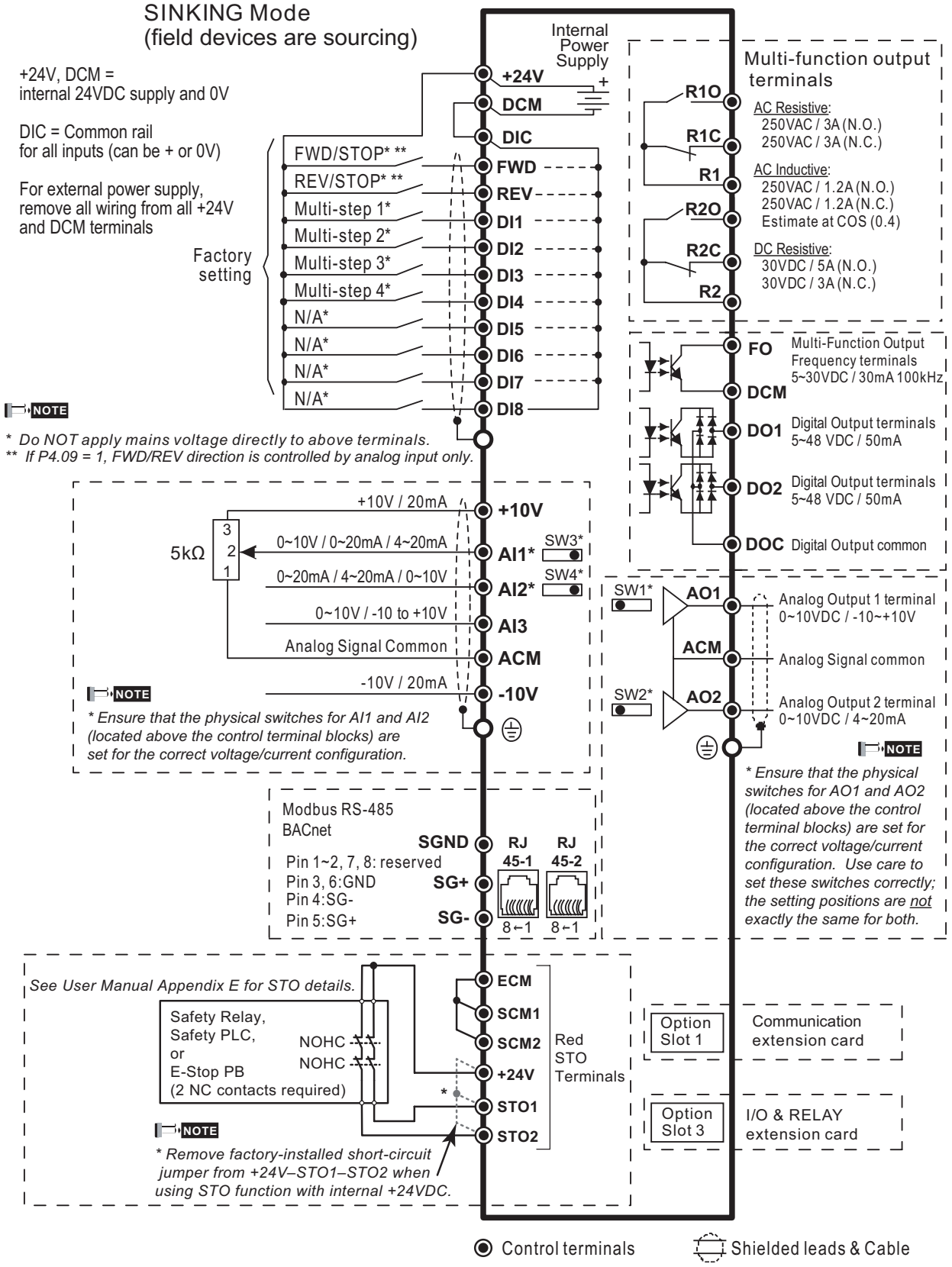


④ Drive Sink Mode (field devices are sourcing) with external power



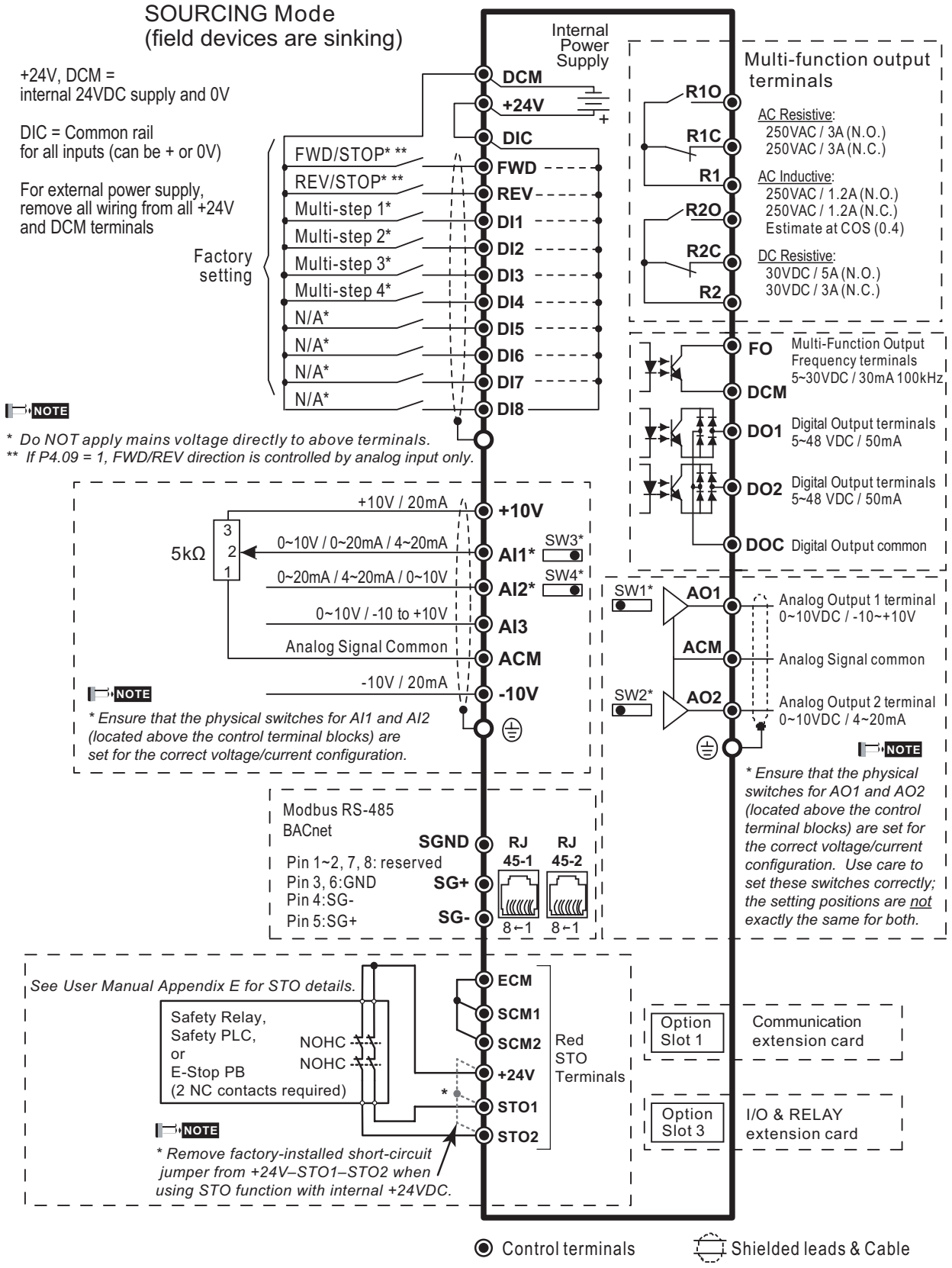
CONTROL CIRCUIT WIRING DIAGRAMS (CONTINUED)

FULL I/O WITH SINKING INPUTS



Control Circuit Wiring Diagrams (continued)

Full I/O with Sourcing Inputs



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