*DURA*PULSE GS4 AC Drive Quick-Start Guide

5014008002
2021-07

GS4 AC Drives Installation Instructions

Sensorless Vector Control Variable Frequency Drive

- *Please read this instruction sheet thoroughly before installation and keep this instruction sheet.*
- *To ensure the safety of operators and equipment, only qualified personnel familiar with AC drives should install, wire, program, and operate the GS4 drive. Always read this instruction sheet thoroughly before using the GS4 drive, especially the WARNING, DANGER and CAUTION notes. If you have any questions, please contact AutomationDirect.*

PLEASE READ PRIOR TO INSTALLATION FOR SAFETY

DANGER

- *The ground terminal of the GS4 drive must be grounded correctly. The grounding method must comply with the laws of the country where the GS4 drive is to be installed.*
- *After power has been turned off, the capacitors in the GS4 drive may retain a charge for several minutes. To prevent personal injury, visually verify that the "CHARGE" LED has turned off. Then measure to confirm that the DC bus voltage level between terminals (+1) and (-) is less than 25VDC before touching any terminals. (Will take at least 5 minutes for most GS4 models; 10 minutes for GS4 models ≥40hp.)*
- *The CMOS ICs on the internal circuit boards of the GS4 drive are sensitive to static electricity. Please DO NOT touch the circuit boards with your bare hands before taking anti-static measures. Never disassemble the internal components or circuits.*
- *If wiring changes must be made, turn off power to the GS4 drive before making those changes. Allow the internal DC bus capacitors in the GS4 drive sufficient time to discharge prior to making changes in power or control wiring. Failure to do so may result in short circuit and fire. To ensure personal safety, allow DC bus voltage to discharge to a safe level before making wiring changes to the GS4 drive.*
- *DO NOT install the GS4 drive in locations subject to high temperature, direct sunlight, or flammable materials.*

WARNING

- *Never apply power to the output terminals U/T1, V/T2, W/T3 of the GS4 drive. If a fault occurs during operation of the GS4 drive, refer to the fault code descriptions and corrective actions to reset the fault before attempting to operate the GS4 drive.*
- *DO NOT use Hi-pot test for internal components. The semi-conductors in the GS4 drive are easily damaged by high voltage.*

CAUTION

- *Long motor lead lengths may result in reflective wave due to impedance mismatch between the motor cable and the motor. Reflective wave may damage the insulation of the motor. To avoid the possibility of reflective wave damage, use an inverter-rated motor with an insulation rating of 1600 volts. A load reactor installed between the GS4 drive and motor will help to mitigate reflective wave.*
- *Nominal supply voltage to the GS4 drive should be less than or equal to 240 volts AC for GS4-2xxx models, and less than or equal to 480 volts AC for GS4-4 models.*
- *Nominal supply current capacity should be less than or equal to 5kA RMS for GS4 models of 40hp or less, and less than or equal to 10kA RMS for GS4 models of 40hp and larger.*
- *The GS4 drive must be installed in a clean, well-ventilated and dry location, free from corrosive gases or liquids.*
- *The GS4 drive must be stored within an ambient temperature range from –25°C to +75°C, and relative humidity range of 0% to 90% without condensation.*
- *Do not apply AC power to the GS4 drive with the front cover removed. Following a fault of the GS4 drive, wait 5 seconds before pressing the RESET key.*
- *To improve power factor, install a line reactor ahead of the GS4 drive. Do not install power correction capacitors in the main AC supply circuit to the GS4 drive to prevent drive faults due to over-current.*

Minimum Wiring

- *AC input power to L1, L2, L3 (for single-phase input, use two of the terminals) (For applicability of 1-phase input power, please refer to Chapter 1 of the DURApulse GS4 AC Drives User Manual at AutomationDirect.com.)*
- *Ground from the power supply*
- *Drive power to the motor (U, V, W on T1, T2, T3) (For use with 3-phase motors only!)*
- *Ground to the motor*
- *STO1 and STO2 (both must be wired through appropriate N.C. safety-rated contacts to SCM1 and SCM2)*

With this minimal wiring, the drive can be operated via the keypad to test the motor and drive installation. See the "Parameter Quick-Start Set Up" (page 3) section to configure the drive for keypad operation.

Recommended Safety Wiring

We strongly recommend that customers use the STO safety feature.

The Safe Torque Off (STO) function turns off the power supplied to the motor through the hardware, so that the motor cannot produce torque. This method of removing power from the motor is considered an emergency stop, also known as "coast to stop."

To use this feature, disconnect the appropriate factory-installed jumpers and wire a safety relay, safety PLC, or E-Stop pushbutton as shown. See "GS4 with Sinking Digital Inputs" (page 1) for wiring using the GS4 internal power supply, or Appendix E of the GS4 user manual for wiring using an external power supply.

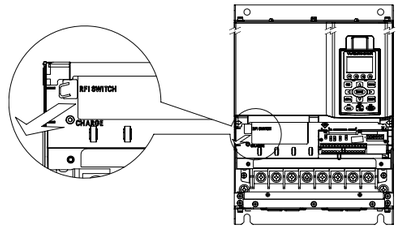
Wiring Diagrams

RFI Jumper Removal

If the power distribution system supplying the GS4 AC drive is a floating (IT) or an asymmetric ground system, the RFI jumper must be removed.
Removing the RFI jumper uncouples the internal RFI capacitor (filter capacitor) between the GS4 drive frame and circuitry to avoid damaging those circuits and (according to IEC 61800-3) to reduce ground leakage current.

GS4 Frame A through C

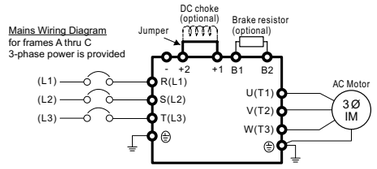
GS4 Frame D0 through G



Mains Wiring (Power Circuit)

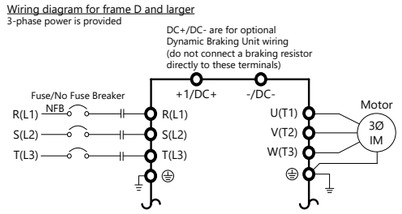
For main (power) wiring terminal specifications, Please refer to "Specifications for Wiring Terminals – Main-Circuit Terminals" (page 6).

GS4 Frame A through C



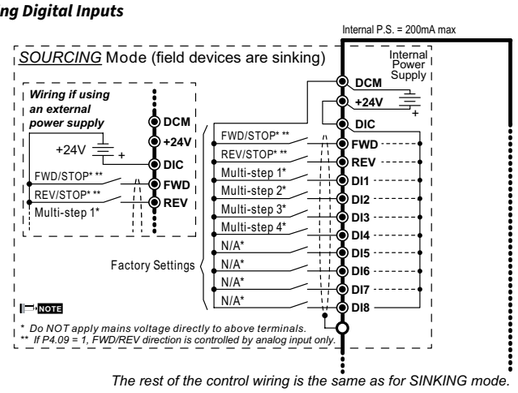
For connection of Dynamic Braking Units and separate control power (large-frame drives only).

GS4 Frames D and Larger



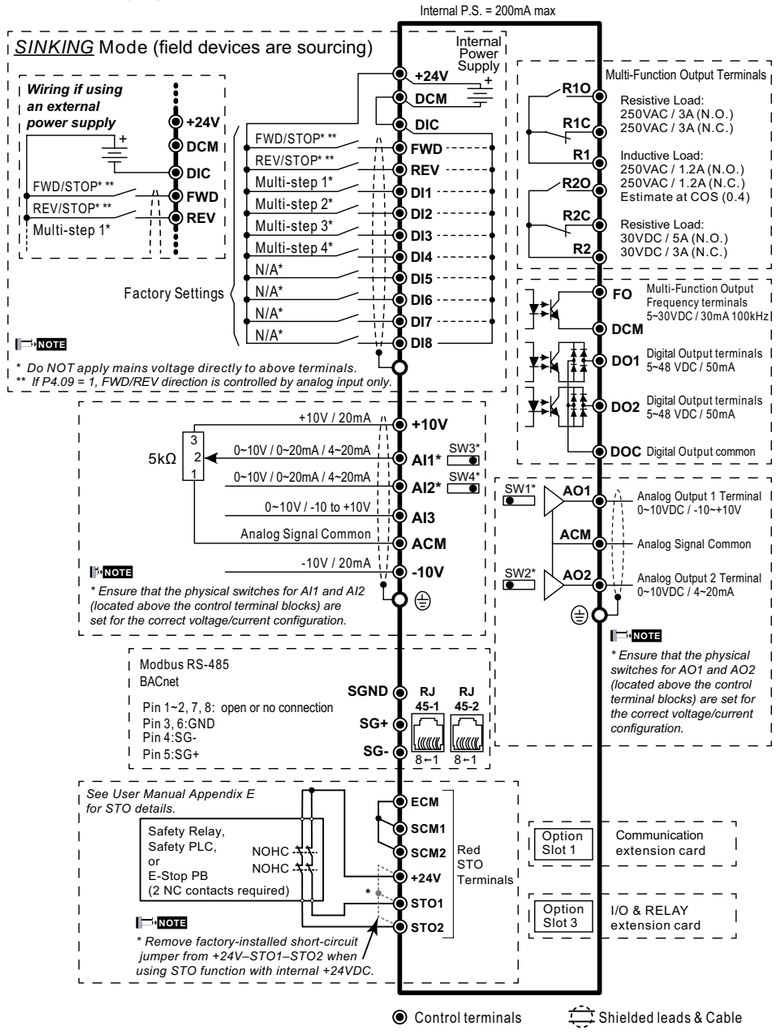
Control-Circuit Wiring

GS4 with Sourcing Digital Inputs



The rest of the control wiring is the same as for SINKING mode.

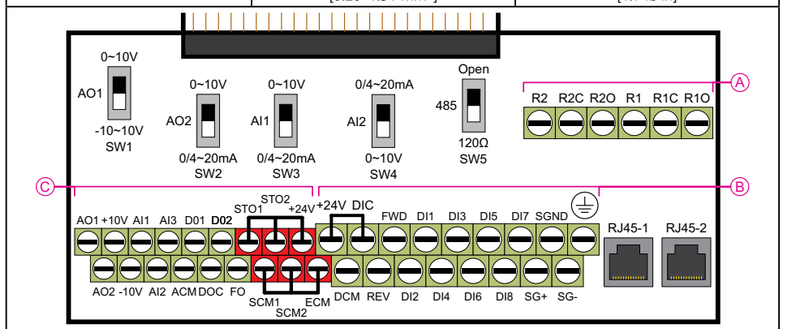
GS4 with Sinking Digital Inputs



Specifications for Wiring Terminals – Control Circuit

GS4-xxxx All Models; All Frame Sizes

Terminal	Wire Gauge	Torque
A	24–16 AWG [0.20–1.31 mm²]	5kg·cm [4.3 lb·in]
B	26–16 AWG [0.13–1.31 mm²]	8kg·cm [6.9 lb·in]
C	24–16 AWG [0.20–1.31 mm²]	2kg·cm [1.7 lb·in]



Control circuit board is removable from the GS4 (for ease of wiring)

DIGITAL KEYPAD FUNCTIONS AND INDICATIONS

Description of the functions of the keys and indicators of the GS4 AC Drive Keypad.

Descriptions of Keypad Functions	
RUN	**RUN Key** • Valid only when the source of operation command is from the keypad. • The RUN LED light (above the button) turns ON when the drive is running. • RUN can be pressed even when drive is in process of stopping. • When in "LOCAL" mode, RUN is valid only when the source of operation command is from the keypad.
STOP RESET	**STOP/RESET Key** *This key has the highest processing priority in any situation.* • When the drive receives a STOP command, whether or not the drive is in operation or stop status, the drive will execute a "STOP" command. • The RESET key can be used to reset the drive after a fault occurs. For those faults that can't be reset by the RESET key, see the fault records after pressing MENU key for details. *NOTE: The ability to STOP the drive from the keypad is effective ONLY if the drive is configured to RUN and/or STOP from the keypad. Keypad STOP can be disabled by parameters such as P3.00, P3.01, P3.03~P3.16.*
FWD REV	**Operation Direction Key** • This key controls only the operation direction and does NOT activate the drive. FWD: forward. REV: reverse. • Refer to the LED descriptions for more details.
ENTER	**ENTER Key** Press ENTER to go to the next menu level. If it is the last level, then press ENTER to execute the command.
ESC	**ESC Key** The ESC key function serves to leave the current menu and return to the last menu. It also functions as a return key while in the sub-menu.
MENU	**MENU Key** Press MENU to return to the Main Menu. Menu Content: 1) Param Setup 2) Quick Start 3) Keypad Lock 4) Fault Record 5) PLC 6) Copy Param 7) Copy PLC 8) Displ Setup 9) Time Setup 10) Language 11) Start-up
▲ ◄ ► ▼	**Direction: Left/Right/Up/Down** • In the numeric value setting mode, the arrows are used to move the cursor and change the numeric value. • In the menu/text selection mode, the arrows are used for item selection.
F1 F2 F3 F4	**Function Keys** • F1 is JOG function. • The F2, F3 keys are reserved for future use. The F4 key is used to ADD parameters to the user-defined My-Menu Quick-Start Menu. (See "My Menu" in the Quick-Start section of the GS4 User Manual, "Chapter3: Keypad Operation and Quick-Start" for more information).
LOCAL	**LOCAL Key** • This key causes the drive to follow the LOCAL (2nd source) settings for frequency command and operation.* The factory settings of both source of Local frequency and Local operation are the Digital Keypad. • Pressing the LOCAL key with the drive stopped will switch the operation and frequency to the LOCAL source (P3.01 and P4.01). Pressing the LOCAL key with the drive running can be configured to keep running or to stop upon transition. See P3.58 for more information. • The selected mode, LOCAL or REMOTE, will be displayed on the GS4-KPD. • When P3.58=0 then LOCAL correlates to HAND mode. The Digital Input Definition must not be set to 33 (LOC/REM Switch). ** Refer to P3.58 for more detail and other options on how the drive behaves when switching between LOCAL and REMOTE. Refer to P3.00, P3.01, P4.00 and P4.01 for defining LOCAL and REMOTE sources of operation and frequency.*
REMOTE	**REMOTE Key** • This key causes the drive to follow the REMOTE (1st source) settings for frequency command and operation.* The factory settings of both source of Remote frequency and Remote operation are the Digital Keypad. • Pressing the REMOTE key with the drive stopped will switch the operation and frequency to the REMOTE source. Pressing the REMOTE key with the drive running can be configured to keep running or to stop upon transition. See P3.58 for more information. • The selected mode, LOCAL or REMOTE, will be displayed on the GS4-KPD. • When P3.58=0 then LOCAL correlates to HAND mode. The Digital Input definition must not be set to 33 (LOC/REM Switch). ** Refer to P3.58 for more detail and other options on how the drive behaves when switching between LOCAL and REMOTE. Refer to P3.00, P3.01, P4.00 and P4.01 for defining LOCAL and REMOTE sources of operation and frequency.*

Descriptions of LED Functions	
RUN	**Steady ON**: Drive is running. **Blinking**: Drive is stopping or in base block. **Steady OFF**: Drive is not currently executing an operational (RUN) command.
STOP RESET	**Steady ON**: Drive is stopped or in the process of stopping. **Blinking**: Drive is in standby; selected speed reference source is at zero. (If expecting movement, confirm that a speed reference is present.) **Steady OFF**: Drive is not currently executing an operational (STOP) command. *NOTE: The ability to STOP the drive from the keypad is effective ONLY if the drive is configured to RUN and/or STOP from the keypad. Keypad STOP can be disabled by parameters such as P3.00, P3.01, P3.03~P3.16.*
FWD REV	**Operation Direction LED** • Green light is on: The drive is running forward or will run forward when given a run command. • Red light is on: The drive is running backwards or will run backwards when given a run command. • Alternating green/red light: The drive is changing direction.
ERR COMM RUN	**ERR_COMM_RUN** These LEDs represent the status of RS-485 communication through COM port 1. **RUN-LED Flashing**: RS-485 is transferring **ERR-LED Red:** Latest Tx or Rx failed **Off**: Latest Tx or RX = OK **Flashing**: Please check the RS-485 master for proper configuration/communication, and also check the PLC code for proper operation if serial comm is enabled inside the PLC.

KEYPAD NAVIGATION EXAMPLE

Instruction	*Press Key*	*Display Will Show*	
Press "MENU" key to access the GS4 settings menu.	MENU	Menu 1:Param Setup 2:Quick Start 3:Keypad Lock ... 9:Time Setup 10:Language 11:Start-up	Menu ▲▼ 1: Param Setup 2: Quick Start 3: Keypad Lock
Use the "Down" arrow key to scroll down to select #2, the Quick-Start groups of parameter settings.	▼	Menu 1:Param Setup 2:Quick Start 3:Keypad Lock ... 9:Time Setup 10:Language 11:Start-up	Menu 1: Param Setup ▲▼ 2: Quick Start 3: Keypad Lock
Press "ENTER" key to access the Quick-Start menus.	ENTER	Quick Start 1:Basic Config 2:Control I/O 3:Enhancements 4:Protection 5:PID 6:My Menu	Quick Start ▼ 1: Basic Config 2: Control I/O 3: Enhancements
Use the Up or Down arrows to select the appropriate Quick-Start group. The display shows only three groups at a time, but the unseen groups come onto the display as you continue arrrowing Down (or Up). Group #1 (Basic Config) has the settings that you are required to adjust (Volts, Amps, Start/Stop method, etc.). Each successive Quick-Start group has more options and features, which may or may not need to be configured, depending upon the application.	▼	Quick Start 1:Basic Config 2:Control I/O 3:Enhancements 4:Protection 5:PID 6:My Menu	Quick Start 2: Control I/O 3: Enhancements ▲▼ 4: Protection
Use the Up or Down arrows to select the "Basic Config" Quick-Start parameter settings group.	▲▼	Quick Start 1:Basic Config 2:Control I/O 3:Enhancements 4:Protection 5:PID 6:My Menu	Quick Start ▼ 1: Basic Config 2: Control I/O 3: Enhancements
Press "ENTER" key to access the "Basic Config" Quick-Start parameter settings group.	ENTER	Basic Con :P00.00 01:Mtr1 Max Vo 02:Mtr1 Amps Ra 03:Mtr1 Base Hz ... 17:Derate Meth 18:Duty Selecti 19:Param Reset	Basic Con: P00.00 ▲▼ 01: Mtr1 Max Vo 02: Mtr1 Amps Ra 03: Mtr1 Base Hz
Press "ENTER" key to set P0.00, Motor 1 Maximum Output Voltage Output, which is the 1st parameter of the "Basic Configuration" Quick-Start group. One digit of the parameter variable will be blinking. Use the Up and Down arrow keys to adjust the blinking digit to your desired value, and use the right and left arrow keys to change which digit is blinking (settable). Press "ENTER" key to enter your new parameter value.	ENTER	00.00 V 230.0 Mtr1 Max VoltOut 0.0~255.00	00.00 V 230.0 Mtr1 Max VoltOut 0.0~255.0
Press "ESC" key to return to the "Basic Configuration" screen.	ESC	Basic Con :P00.00 01:Mtr1 Max Vo 02:Mtr1 Amps Ra 03:Mtr1 Base Hz ... 17:Derate Meth 18:Duty Selecti 19:Param Reset	Basic Con: P00.00 ▲▼ 01: Mtr1 Max Vo 02: Mtr1 Amps Ra 03: Mtr1 Base Hz
Scroll sequentially through the rest of the parameters in the "Basic Configuration" Quick-Start group, and set those parameters as needed for your application. After changing all of the applicable parameters, press "MENU" key to return to the Menu screen, and then press "ESC" key to return to the home screen.			

QUICK-START INTRODUCTION – HOW TO GET STARTED

Automationdirect.com would like to thank you for your purchase of the Durapulse GS4 AC drive. The GS4 drive is a state-of-the-art, full-featured AC drive. The Quick-Start Guide below will introduce you to many of the GS4 drive features and help you configure the GS4 drive in a minimum amount of time.

STO (Safe Torque Off) / Emergency Stop

The GS4 drive offers Safe Torque Off (STO) functionality, instead of a standard Emergency Stop circuit. STO provides the ability to immediately turn off the output of the GS4 drive in the event of an emergency, without the need for an emergency stop contactor between the drive and motor.

Please see P6.71 (STO Alarm Latch) in Quick-Start "Protection" Menu #4 (page 4).

Please see the Control-Circuit Wiring diagrams (page 1) for how to wire the STO circuit. From the factory, the GS4 STO terminals are jumpered and the STO circuitry of the drive is bypassed. STO is recommended for personnel safety.

After wiring the drive (*but before applying power*), the first thing you should do is press the E-stop button (or otherwise break the safety circuit) and verify that the circuit between the STO1/STO2 terminals and the STO +24V terminal is not connected. If these circuits are open, the STO feature will stop all power from going to the motor and there will be no danger of unexpected movement when you power up the drive.

Powering Up the GS4 Drive

Apply AC line power to the GS4 drive, but don't engage the safety circuit yet (keep the E-stop PB pushed in).

Starting, Stopping, and Controlling the Speed of the GS4 Drive

The GS4 drive keypad includes both LOCAL and REMOTE control modes. Out of the box, both LOCAL and REMOTE modes of operation (selected by the buttons on the keypad) are set to use the keypad buttons to RUN and STOP the drive and vary the drive speed. The drive can also be configured to run from potentiometers, external pushbuttons, Ethernet communication, etc.

Do not attempt to run the motor yet. Certain parameters (especially the motor protection parameters) must be set first.

Configure the Drive / Quick-Start Menus

The Quick-Start Menus below (press MENU on the keypad, then scroll to "Quick Start") will guide you through those parameters typically used in most applications. You can also navigate to any of these parameters through the "Param Setup" menu. (Refer to page 2 for information and instructions for using the Digital Keypad.)

All applications need to configure the parameters in the "Basic Configuration" quick start menu. At minimum, you MUST configure these motor parameters in the "Basic Configuration" menu before operating the drive:

- *P0.00 Motor1 Max Output Voltage (this will typically be either 230V or 460V)*
- *P0.01 Motor1 Rated Amps (depends on the motor)*
- *P0.04 Motor1 Max Output Frequency (this will typically be 50Hz or 60Hz)*

Your application will dictate which parameters need to be configured. It is NOT necessary to configure every parameter in a Quick-Start Menu or go through each Quick-Start Menu. Use only those you need.

Menu Descriptions:

12) Basic Configuration (page 3)
Parameters in this menu are necessary to configure and protect the motor, and to define the basic control modes of the GS4 drive. All applications should set these parameters.

13) Control I/O (page 3)
Parameters in this menu define which analog inputs and multi-speed digital inputs will control the GS4 drive. These parameters work in conjunction with P3.00, P3.01, P4.00, P4.01 from Menu #1.

14) Enhancements (page 4)
Parameters in this menu include those parameters used to enhance or refine the operation of the GS4 drive with features such as S-Curve, Jog Speed, Skip Frequencies, DC Injection, etc.

15) Protection (page 4)
Parameters in this menu include advanced GS4 drive protection parameters. These parameters define how the GS4 drive will respond to certain fault conditions and whether the GS4 drive will attempt to automatically recover.

16) PID (page 4)
Parameters in this menu are for PID control and configuration of the GS4 keypad in engineering units. More detailed information can be found in Parameter Groups 7 and 8.

After configuring the minimum settings, you can now engage the safety circuit. The RUN and STOP buttons should Start and Stop the drive. To adjust the output frequency, use the arrows keys to cursor to the "F" (Frequency) setting. Press ENTER to adjust the drive's Frequency setpoint (Up/Down arrows increase/ decrease; Left/Right arrows change the cursor position).

PARAMETER QUICK-START SET UP

*DURA*PULSE GS4 AC Drives offer a "Quick-Start" parameter setup from the keypad for some of the most common drives applications. Choose "Quick-Start" from the menu, and then select one of the five menus described in the following table. Then set the applicable parameters for that application as shown.

Please refer to the user manual if you need more detailed information about the parameters.

DURAPULSE GS4 Quick-Start Parameter Settings #1 – Basic Configuration

Parameter			Description	Settings	Default	User
19		P9.08	Restore to Default * * If configuring the GS4 drive for the first time, it is not necessary to Restore the Default configuration.	0: no function 1: Parameter Lock 2: no function 3: no function 4: no function 5: Reset kWh Display to Zero 6: Reset PLC (clear PLC) 7: no function 8: no function 9: Reset 50Hz Default 10: Reset 60Hz Default	0	
1		P0.00	Motor 1 Maximum Output Voltage	230V: 0.0~255.0V 460V: 0.0~510.0V	GS4-2xxx: 230.00 GS4-4xxx: 460.00	
2		P0.01	Motor 1 Rated Current	10~120% drive rated Amps	90% rated I of GS4	
3		P0.02	Motor 1 Base Frequency	0.00~599.00 Hz	60.00	
4	♦	P0.03	Motor 1 Rated RPM	0 to (120 x P0.02/P0.09)-1	1710 (60Hz 4-pole) 1410 (50Hz 4-pole)	
5		P0.04	Drive Maximum Output Frequency	0~599.00 Hz (400.0 on large drives)	50.00/60.00	
6	♦	P0.08	Motor 1 Rated Horsepower (HP)	0.00~655.35hp	Rated hp of GS4	
7		P0.09	Motor 1 Number of Poles	2 to (120 x P0.02/P0.03) See "Motor Base Speeds and Number of Poles" table (page 3)	4	
8	♦	P1.00	Stop Method	0: Ramp to stop 1: Coast to stop	0	
9	♦	P1.01	Acceleration Time 1	P1.15=0: 0.00~600.00 sec P1.15=1: 0.0~6000.0 sec	10.00	
10	♦	P1.02	Deceleration Time 1		10.00	
11		P3.00	1st Source of Operation Command [Remote]	0: Digital Keypad 1: External Terminal; Keypad/RS-485 STOP is enabled 2: External Terminal; Keypad/RS-485 STOP is disabled 3: RS485 (Modbus/BACnet); Keypad STOP is enabled 4: RS485 (Modbus/BACnet); Keypad STOP is disabled 5: Comm Card; Keypad STOP is enabled 6: Comm Card; Keypad STOP is disabled	0	
12		P3.01	2nd Source of Operation Command [Local]		0	
13	♦	P4.00	1st Source of Frequency Command [Remote]	0: Digital Keypad 1: RS485 Communication (Modbus/BACnet) 2: Analog Input 3: External UP/DOWN Terminal 4: Comm Card	0	
14	♦	P4.01	2nd Source of Frequency Command [Local]		0	
15	♦	P6.00	Electronic Thermal Overload Relay (Motor 1)	0: Constant Torque 1: Variable Torque 2: Inactive	1	
16	♦	P6.01	Electronic Thermal Characteristic (Motor 1)	30.0~600.0 sec	60.0	
17		P6.33	Drive Derating Method	0: Constant rated current 1: Constant carrier frequency 2: Constant rated current (with higher current limit)	0	
18	♦	P6.34	Variable/Constant Torque Duty Selection	0: VT, 3-phase input 1: CT, 3-phase input 2: CT, 230V 1-phase input	0	

♦ *The diamond bullet symbol indicates a parameter that can be set during operation.*

Motor Base Speeds and Number of Poles for P0.09

Motor Synchronous Speed (RPM)	900	1200	1800	3600
Number of Motor Poles (#)	8	6	4	2

DURAPULSE GS4 Quick-Start Parameter Settings #2 – Control I/O

Parameter			Description	Settings	Default	User
1		P3.02	2/3 Wire Operation Mode	0: 2-wire mode 1 (Fwd, Rev) 1: 2-wire mode 2 (Run, Direction) 2: 3-wire mode	0	
2		P3.03	Multi-Function Input (DI1)	see "Multi-Function Input Settings" table (page 5)	1	
3		P3.04	Multi-Function Input (DI2)		2	
4		P3.05	Multi-Function Input (DI3)		3	
5		P3.06	Multi-Function Input (DI4)		4	
6	♦	P3.17	Multi-Function Output Terminal 1 (Relay 1)	see "Multi-Function Output Settings" table (page 5)	11	
7	♦	P3.18	Multi-Function Output Terminal 2 (Relay 2)		1	
8	♦	P4.02	Analog Input 1 (AI1) Function	see "Analog Input Settings" table (page 5)	1	
9	♦	P4.03	Analog Input 2 (AI2) Function		0	
10	♦	P4.05	AI1 – I/V Selection	0: AI_v Selection (0~10V) 1: AI_i Selection (4~20mA)	0	
11	♦	P4.06	AI2 – I/V Selection	2: AI_i Selection (0~20mA)	1	
12	♦	P4.09	Analog Frequency Command for Reverse Run	0: Negative Frequency Input is Disabled. Forward and reverse directions are controlled by digital keypad or by external terminal. 1: Negative Frequency Input is Enabled. Forward direction when positive frequency; reverse direction when negative frequency. Forward and reverse directions are not controlled by digital keypad or by external terminal.	0	
13	♦	P4.10	AI1 Input Bias (Offset)	-100.0% to +100.0%	0	
14	♦	P4.11	AI1 Input Bias (Offset) Polarity	0: NO Offset 1: Positive Offset 2: Negative Offset	0	
15	♦	P4.12	AI1 Input Gain	-500.0% to +500.0%	100.0	
16	♦	P4.13	AI1 Filter	0.00~20.00 sec	0.01	
17	♦	P4.15	AI2 Input Bias (Offset)	-100.0% to +100.0%	0	
18		P4.16	AI2 Input Bias (Offset) Polarity	0: NO Offset 1: Positive Offset 2: Negative Offset	0	
19	♦	P4.17	AI2 Input Gain	-500.0% to +500.0%	100.0	
20	♦	P4.18	AI2 Filter	0.00~20.00 sec	0.01	
21	♦	P4.50	Analog Output 1 (AO1)	0: Output Frequency (Hz) 1: Frequency Command (Hz) 2: Motor Speed (Hz) 3: Output Current (A_{rms}) 4: Output Voltage (V) 5: DC Bus Voltage (V) 6: Power Factor (%) 7: Power (% Rated) 8: AI1 (%) 9: AI2 (%) 10: AI3 (%) 11: As 485 AO 12: As COM Card AO 13: Fixed Value	0	
22	♦	P4.51	AO1 Gain	0.0~500.0%	100.0	
23	♦	P4.52	AO1 Negative Value Handle	0: Absolute Value 1: 0V When Negative 2: Offset 5V = 0 Value	0	
24		P4.53	AO1 0~20mA/4~20mA Selection	0: 0~20mA 1: 4~20mA	0	
25		P4.60	AO1 Output Constant Level	0.00~100.00%	0.00	
26	♦	P5.01	Multi-Speed 1	0.00~599.00 Hz (400.0 on large drives)	0.0	
27	♦	P5.02	Multi-Speed 2	0.00~599.00 Hz (400.0 on large drives)	0.0	
28	♦	P5.03	Multi-Speed 3	0.00~599.00 Hz (400.0 on large drives)	0.0	
29	♦	P5.04	Multi-Speed 4	0.00~599.00 Hz (400.0 on large drives)	0.0	

♦ *The diamond bullet symbol indicates a parameter that can be set during operation.*

DURAPULSE GS4 Quick-Start Parameter Settings #3 – Enhancements

Parameter			Description	Settings	Default	User
1	♦	***P1.09***	S-curve Accel Time 1	P1.15=0: 0.00~25.00 sec P1.15=1: 0.0~250.0 sec	0.20	
2	♦	***P1.10***	S-curve Decel Time 1		0.20	
3	♦	***P1.13***	Jog Acceleration Time	P1.15=0: 0.00~600.00 sec P1.15=1: 0.0~6000.0 sec	10.00	
4	♦	***P1.14***	Jog Deceleration Time		10.00	
5	♦	***P5.00***	Jog Frequency	0.00~599.00 Hz (400.0 on large drives)	6.0	
6		***P1.19***	Skip Frequency 1 Upper Limit	0.00~599.00 Hz (400.0 on large drives)	0.00	
7		***P1.20***	Skip Frequency 1 Lower Limit		0.00	
8	♦	***P1.25***	DC Injection Current Level	0~100%	0	
9	♦	***P1.26***	DC Injection Time During Start-up	0.0~60.0 sec	0.0	
10	♦	***P1.27***	DC Injection Time During Stopping		0.0	
11	♦	***P1.28***	Start-Point for DC Injection During Stopping	0.00~599.00 Hz (400.0 on large drives)	0.00	
12		***P2.00***	Volts/Hertz Settings	0: General Purpose 1: High Starting Torque (TQR) 2: Fans and Pumps 3: Custom 4: 1.5 Power Curve * 5: Square Curve *	0	
13	♦	***P2.01***	Slip Compensation Gain	0.00~10.00	0.00 (V/Hz mode) 1.00 (Vector mode)	
14	♦	***P2.25***	Slip Compensation Filter	0.001~10.000 sec	0.100	
15	♦	***P2.02***	Torque Compensation Gain	0~10	0	
16	♦	***P2.03***	Torque Compensation Filter	0.001~10.000 sec	0.5	
17		***P2.10***	PWM Carrier Frequency	2~15 kHz	model specific; refer to param. details	
18	♦	***P2.11***	Control Mode	0: V/Hz Open Loop Control 1: SVC Sensorless	0	
19		***P2.18***	Zero Speed Select	0: Standby 1: Zero Hold 2: Fmin (Min Hz Output)	0	
20	♦	***P6.25***	Upper Limit of Output Frequency	0.00~599.00 Hz (400.0 on large drives). See manual for specific drives.	599.00	
21	♦	***P2.23***	Automatic Energy-Saving Operation	0: Disable 1: Enable	0	
22	♦	***P2.24***	Power Saving Gain	10~1000%	100	
23	♦	***P2.26***	Slip Deviation Level	0.0~100.0	0.0	
24	♦	***P2.27***	Slip Deviation Detection time	0.0~10.0	1.0	
25	♦	***P2.28***	Slip Deviation Treatment	0: Warn and continue OP 1: Warn and Ramp to Stop 2: Warn and Coast to stop 3: No Warn	0	

♦ *The diamond bullet symbol indicates a parameter that can be set during operation.*

** Energy Saving Power Curves For Fans & Pumps. (P2.00 settings 4 & 5)*

DURAPULSE GS4 Quick-Start Parameter Settings #4 – Protection

Parameter			Description	Settings	Default	User
1	♦	***P6.04***	Auto Restart after Fault	0~10	0	
2	♦	***P6.05***	Reset Time for Auto Restart after fault	0.0~6000.0 sec	60.0	
3	♦	***P6.06***	Base Block Speed Search after Fault (oc,ov,bb)	0: Disable 1: Speed search starts with current speed reference 2: Speed search starts with minimum output frequency	0	
4	♦	***P6.09***	Fwd/Rev Direction Inhibit	0: Enable Fwd/Rev 1: Disable Reverse Operation 2: Disable Forward Operation	0	
5	♦	***P6.13***	Auto Adjustable Accel/Decel	0: Linear Accel/Decel 1: Auto Accel, Linear Decel 2: Linear Accel, Auto Decel 3: Auto Accel, Auto Decel 4: Auto Accel/Decel Stall Prevention (limited by P1.01~P1.08 and P1.13~P1.14)	0	
6	♦	***P6.14***	Over-torque Detection Mode (OT1)	0: Disable 1: Enable during at speed 2: Enable during at speed and Stop 3: Enable during OP 4: Enable during OP and Stop	0	
7	♦	***P6.15***	Over-torque Detection Level (OT1)	10~200%	120	
8	♦	***P6.16***	Over-torque Detection Time (OT1)	0.1~60.0 sec	0.1	
9	♦	***P6.26***	Lower Limit of Output Frequency	0.00~599.00 Hz	0.00	
10	♦	***P6.28***	Dynamic Braking Voltage Level *	230V: 350.0~450.0 VDC 460V: 700.0~900.0 VDC	390.0 780.0	
11	♦	***P6.29***	Line Start Lockout	0: Enable start-up lockout 1: Disable start-up lockout	0	
12	♦	***P6.31***	Cooling Fan Control	0: Always ON 1: Fan OFF 1 minute after Stop 2: Run fan ON/Stop fan OFF 3: Heat sink temperature 4: Always OFF	0	
13		***P6.32***	PWM Fan Speed	0~100%	60	
14		***P6.45***	Output Phase Loss (OPhL) Detection Selection	0: Warn and continue to operate 1: Warn and ramp to stop 2: Warn and coast to stop 3: No warning	3	
15		***P6.46***	Output Phase Loss Detection time	0.000~65.535 sec	0.500	
16		***P6.47***	Output Phase Loss Current Detection Level	0.00~100.00% (of max current)	1.00	
17		***P6.49***	Input Phase Loss Treatment	0: Warn and ramp to stop 1: Warn and coast to stop	0	
18		***P6.69***	Input Phase Loss Detection Time	0.00~600.00 sec	0.20	
19		***P6.70***	Input Phase Loss Ripple Detection	230V models: 0.0~160.0 VDC 460V models: 0.0~320.0 VDC	30.0 60.0	
20		***P6.50***	GFF Detect Current Level (% of INV I-Rated)	0.0~100.0%	60.0	
21		***P6.51***	GFF Low Pass Filter Gain	0.00~655.35	0.10	
22	♦	***P6.71***	STO Alarm Latch	0: STO Alarm Latch 1: STO Alarm no Latch	0	

♦ *The diamond bullet symbol indicates a parameter that can be set during operation.*

** Valid only for 230V models below 30hp and 460V models below 40hp. (P6.28)*

DURAPULSE GS4 Quick-Start Parameter Settings #5 – PID

Parameter			Description	Settings	Default	User
1	♦	***P7.00***	PID Action/Mode	0: PID Disabled 1: PID Reverse Local/Remote 2: PID Forward Local/Remote 3: PID Reverse Remote Only 4: PID Forward Remote Only 5: PID Reverse Local Only 6: PID Forward Local Only	0	
2	♦	***P4.00***	1st Source of Frequency Command [Remote]	0: Digital Keypad 1: RS485 Communication (Modbus/BACnet) 2: Analog Input 3: External UP/DOWN Terminal 4: Comm Card	2	
3	♦	***P4.01***	2nd Source of Frequency Command [Local]		0	
4	♦	***P4.02***	Analog Input 1 (AI1) Function	see "Analog Input Settings" table (page 5)	1	
5	♦	***P4.03***	Analog Input 2 (AI2) Function		0	
6	♦	***P4.04***	Analog Input 3 (AI3) Function		0	
7	♦	***P4.05***	AI1 – I/V Selection	0: AI_v Selection (0~10V) 1: AI_i Selection (4~20mA) 2: AI_i Selection (0~20mA)	0	
8	♦	***P4.06***	AI2 – I/V Selection		1	
9	♦	***P7.03***	PID Feedback Gain	0.00 to 300.00%	100.00	
10	♦	***P7.04***	PID Offset Value	-100.0% to +100.0%	0.0	
11	♦	***P7.13***	Proportional Gain	0.0~100.0	1.0	
12	♦	***P7.14***	Integral Time	0.00~100.00 sec	1.00	
13	♦	***P7.15***	Derivative Value	0.00~1.00 sec	0.00	
14	♦	***P7.18***	PID Output Frequency Limit	0.0~110.0%	100.0	
15	♦	***P7.20***	Feedback Signal Detection Time	0.0~3600.0 sec	0.0	
16		***P7.21***	PID Feedback Loss	0: Warn and Continue Operation 1: Warn and Ramp to Stop 2: Warn and Coast to Stop 3: Warn and Operate at Last Frequency	0	
17	♦	***P7.22***	PID Feedback Loss Speed Level Default	0.00~400.00 Hz	0.00	
18		***P7.25***	PID Mode Selection	0: Old PID mode, Kp, Kp*Ki, Kp*Kd 1: New PID mode, Kp, Ki, Kd are independent	0	
19		***P7.26***	PID Reverse Enable	0: PID can't change command direction 1: PID can change command direction	0	
20	♦	***P8.00***	User Display	see "User Display Settings" table (page 5)		
21	♦	***P8.01***	Start-up Display Selection	0: Freq Setpoint 1: Output Hz 2: User Display (P8.00) 3: Output Amps		
22		***P8.02***	User Defined Format	see "User Defined Format" table (page 5)		
23		***P8.03***	User Defined Max	0: Disable 0~65535 (when P8.02 set to no decimal place) 0.0~6553.5 (when P8.02 set to 1 decimal place) 0.00~655.35 (when P8.02 set to 2 decimal place) 0.000~65.535 (when P8.02 set to 3 decimal place)	0	
24		***P8.04***	User Defined Setpoint	0~65535	0	

♦ *The diamond bullet symbol indicates a parameter that can be set during operation.*

PARAMETER SETTINGS TABLES

Multi-Function Input Settings for P3.03~P3.10

0: no function 1: Multi-Speed/PID Multi-Setpoint bit 1 2: Multi-Speed/PID Multi-Setpoint bit 2 3: Multi-Speed/PID Multi-Setpoint bit 3 4: Multi-Speed bit 4 5: Reset 6: JOG 7: Accel/Decel speed inhibit (Speed Hold) 8: 1st~4th Accel/Decel time selection, bit 0 9: 1st~4th Accel/Decel time selection, bit 1 10: External Fault Input by P3.56 (EF error) 11: Base Block Input 12: Drive Output OFF 13: Disable Auto Accel/Decel Time 14: Switch between drive settings 1 and 2	15: Operation speed command from AI1 16: Operation speed command from AI2 17: Operation speed command from AI3 18: Forced Ramp Stop by P3.56 (no error) 19: Digital Freq Up Command 20: Digital Freq Down Command 21: PID function Disable 22: Clear counter 23: Increment counter value (DI6 only) 24: FWD JOG 25: REV JOG 26: Emergency Stop EF1 (Coast stop)(EF1 error) 27: Signal Confirmation for Y-connection 28: Signal Confirmation for Delta connection 29: Disable EEPROM Write 30: Forced Coast Stop 31: Hand Contact for HOA Control 32: Auto Contact for HOA Control	33: LOCAL/REMOTE Selection 34: Drive Enable 35: Decel Energy Backup (DEB) Enable 36: PLC Mode select bit0 37: PLC Mode select bit1 38: Output MCR Auxiliary Confirmation 39: reserved 40: Fire mode and force drive run 41: Fire mode and maintain operation 42: Disable all motors 43: Disable Motor #1 44: Disable Motor #2 45: Disable Motor #3 46: Disable Motor #4 47: Disable Motor #5 48: Disable Motor #6 49: Disable Motor #7 50: Disable Motor #8

Multi-Function Output Settings for P3.17~P3.20

0: no function 1: AC Drive Running 2: At Frequency Setpoint 3: At Speed 1 (P3.32) 4: At Speed 2 (P3.34) 5: At Zero Speed Including Drive Running 6: At Zero Speed Drive not Running 7: Over Torque Level 1 8: Over Torque Level 2 9: Drive Ready 10: Low Voltage warning (Lv) 11: Error indication (All faults, Except for Lv Stop) 12: Brake Release Function (P3.51) 13: Over-temp Warning 14: Dynamic Braking Output 15: PID deviation error 16: Over Slip (oSL) 17: Middle Count Value Attained (P3.45) 18: Final Count Value Attained (P3.44) 19: Base Block Indication	20: Warning Output 21: Over Voltage Alarm 22: Oc Stall Alarm 23: Ov Stall Alarm 24: External Control Mode 25: Forward Command 26: Reverse Command 27: Above Current Output (≥ P3.52) 28: Below Current Output (< P3.52) 29: Wye Connected Command 30: Delta Connected Command 31: Zero Speed at Drive Running 32: Zero Speed including Drive Stop 33: Fault Option 1 (P11.00) 34: Fault Option 2 (P11.01) 35: Fault Option 3 (P11.02) 36: Fault Option 4 (P11.03) 37: At Speed (Setpoint include 0Hz) 38: Brake Function 39: Under Ampere (Low Current)	40: UVW Motor Contactor Enable 41: DEB active 42: Brake Released at Stop 43: RS485 Digital Output 44: COM Card Digital Output 45: Fire Mode Indication 46: Fire Bypass Indication 47: Motor #1 Selected 48: Motor #2 Selected 49: Motor #3 Selected 50: Motor #4 Selected 51: Motor #5 Selected 52: Motor #6 Selected 53: Motor #7 Selected 54: Motor #8 Selected 55: Mtr1/Mtr2 Nameplate Parameters Select 56: Safety N.O. STO A 57: Safety N.C. STO B 58: Above Frequency Output (≥ P3.53) 59: Below Frequency Output (< P3.53)

Analog Input Settings for P4.02~P4.04

0: no function 1: Frequency Command/PID Setpoint REMOTE (see P4.00) 2: Frequency Command/PID Setpoint LOCAL (see P4.01) 3: Frequency Command/PID Setpoint REMOTE & LOCAL 4: reserved	5: PID Feedback Signal 6: PTC Thermistor Input Value 7: PID Offset (Input) 8~10: reserved 11: PT100 Thermistor Input Value

User Display Settings for P8.00

0: Output Amps 1: Counter Value 2: Actual Freq 3: DC Bus Voltage 4: Output Voltage 5: Power Factor 6: Output Power 7: Calculated RPM 8~9: reserved 10: PID Feedback %	11: AI1 % 12: AI2 % 13: AI3 % 14: IGBT Temperature 15: Cap Temperature 16: DI Input Status 17: DO Output Status 18: Multi-Speed Step 19: CPU DI Status 20: CPU DO Status	21~24: reserved 25: Overload % 26: Ground Fault % 27: DC Bus Ripple 28: PLC D1043 Value 29: reserved 30: User-Defined 31: Out Hz x P8.05 32~33: reserved 34: Fan Speed	35: reserved 36: Carrier Frequency 37: reserved 38: Drive Status 39: reserved 40: reserved 41: kWh 42: PID Reference 43: PID Offset 44: PID Output Hz

User Defined Format Settings for P8.02

Bits 0~3: User defined decimal place: 0000b: no decimal place 0001b: one decimal place 0010b: two decimal place 0011b: three decimal place	Bits 4~9: User defined unit: 000xh: Hz 001xh: rpm 002xh: % 003xh: kg 004xh: m/s 005xh: kW 006xh: hp 007xh: ppm 008xh: 1/m 009xh: kg/s 00Axh: kg/m 00Bxh: kg/h 00Cxh: lb/s 00Dxh: lb/m 00Exh: lb/h 00Fxh: ft/s	Bits 4~9: (continued) User defined unit: 011xh: m 012xh: ft 013xh: °C 014xh: °F 015xh: mbar 016xh: bar 017xh: Pa 018xh: kPa 019xh: mWG 01Axh: inWG 01Bxh: ftWG 01Cxh: psi 01Dxh: atm 01Exh: L/s 01Fxh: L/m	Bits 4~9: (continued) User defined unit: 020xh: L/h 021xh: m3/s 022xh: m3/h 023xh: gpm 024xh: cfm

COOLING AND HEAT DISSIPATION

Model Number	Airflow Rate for Cooling: Flow Rate (cfm) External	Flow Rate (cfm) Internal	Flow Rate (cfm) Total	Flow Rate (m^3/hr) External	Flow Rate (m^3/hr) Internal	Flow Rate (m^3/hr) Total	Power Dissipation: Power Dissipation (Watt) Loss External (Heat sink)	Power Dissipation (Watt) Internal	Power Dissipation (Watt) Total
GS4-21P0	–	–	–	–	–	–	33	27	61
GS4-22P0	14	–	14	24	–	24	56	31	88
GS4-23P0	14	–	14	24	–	24	79	36	115
GS4-25P0	10	–	10	17	–	17	113	46	159
GS4-27P5	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	124	409	121	529
GS4-2020	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	179	30	209	304	51	355	913	186	1099
GS4-2050	179	30	209	304	51	355	1091	220	1311
GS4-2060	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	–	–	–	–	–	–	33	25	59
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	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	124	396	122	518
GS4-4025	99	21	120	168	36	204	369	138	507
GS4-4030	99	21	120	168	36	204	476	158	635
GS4-4040	126	21	147	214	36	250	655	211	866
GS4-4050	179	30	209	304	51	355	809	184	993
GS4-4060	179	30	209	304	51	355	929	218	1147
GS4-4075	179	30	209	304	51	355	1156	257	1413
GS4-4100	186	30	216	316	51	367	1408	334	1742
GS4-4125	257	73	330	437	124	561	1693	399	2092
GS4-4150	223	73	296	379	124	503	2107	491	2599
GS4-4175	224	112	336	381	190	571	2502	579	3081
GS4-4200	289	112	401	491	190	681	3096	687	3783
GS4-4250	–		454	–		771	–		4589
GS4-4300			454			771			5772

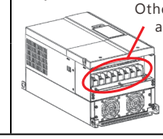
- External Flow Rate is across the heat sink.
- Internal Flow Rate is through the chassis.
- Published flow rates are the result of active cooling using fans, factory installed in the drive.
- Unpublished flow rates (-) are the result of passive cooling in drives without factory installed fans.
- The required airflow shown in the 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.

- 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. 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/power dissipation should be the heat/power 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.

ENVIRONMENT FOR OPERATION, STORAGE, AND TRANSPORTATION

DO NOT expose the GS4 drive to environments that contain dust, direct sunlight, corrosive/inflammable gases, high humidity, liquids, or high vibration. The salt in the air must be less than 0.01 mg/cm² throughout the year.

Environment	Installation Location	IEC60364-1/IEC60664-1 Pollution degree 2, Indoor use only		
	Surrounding Temperature	Storage: -25°C to +70°C	Transportation: -25°C to +70°C	
		Non-condensation, non-frozen		
	Rated Humidity	Operation: Max. 90%	Storage/Transportation: Max. 95%	
		No condense water		
	Air Pressure	Operation/Storage: 86 to 106 kPa	Transportation: 70 to 106 kPa	
	Pollution Level	IEC721-3-3		
		Operation: Class 3C2; Class 3S2	Storage: Class 2C2; Class 2S2	Transportation: Class 1C2; Class 1S2
		No concentrate		
	Altitude	Operation	If the GS4 drive is installed at altitudes of 0~1000m, follow normal operation restriction. If installed at altitudes of 1000~3000m, decrease 1% of rated current or lower 0.5°C of temperature for every 100m increase in altitude. Maximum altitude for Corner Grounded is 2000m.	
Package Drop	Storage / Transportation	ISTA procedure 1A (according to weight) IEC60068-2-31		
Vibration	1.0mm, peak-to-peak value range from 2Hz to 13.2 Hz; 0.7G~1.0G range from 13.2Hz to 55Hz; 1.0G range from 55Hz to 512 Hz. Comply with IEC 60068-2-6.			
Impact	IEC/EN 60068-2-27			
Operation Position	Max. allowed offset angle ±10° (under normal installation position)	10° 10°		

Frame		Top cover	Conduit Box	Protection Level	Operation Temperature
A~C	230V: 1.0~30HP	With top cover removed	Standard conduit plate	IP20 / UL Open Type	-10~50°C
	460V: 1.0~40HP	With top cover in place		IP20 / UL Type1 / NEMA1	-10~40°C
D0~G	230V: >30HP	N/A	With conduit box	IP20 / UL Type1 / NEMA1	-10~40°C
	460V: >40HP				
D0~G	230V: >30HP	N/A	Without conduit box	IP00 / IP20 / UL Open Type Only the circled area is IP00. Other parts are IP20. 	-10~50°C
	460V: >40HP				

To prevent personal injury, please make sure that the case and wiring are installed according to these instructions. The figures in these instructions are only for reference. They may be slightly different from the one you have, but it will not affect your customer rights.

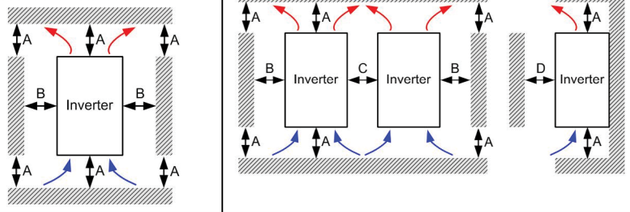
These installation instructions may be revised without prior notice. The most recent edition can be downloaded from the AutomationDirect web site at any time: http://www.automationdirect.com/static/manuals/index.html.

Minimum Mounting Clearances

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

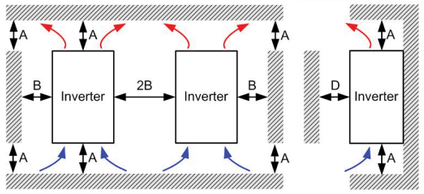
← *(Blue Arrow) Inflow* ← *(Red Arrow) Outflow*

(Frame A~G)
Single drive:
Independent installation.



(Frame A, B, C, G)

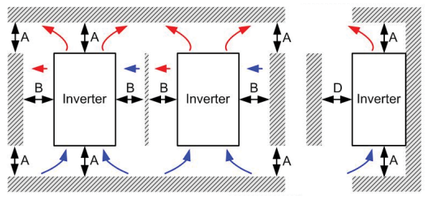
Multiple drives:
Independent horizontal installation.



(Frame D0, D, E, F)

Multiple drives:
Independent horizontal installation.

Install a barrier between the drives.



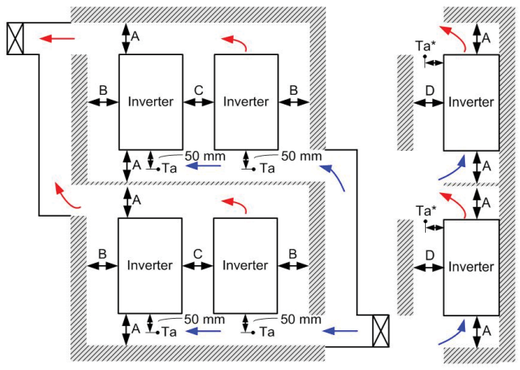
(Frame A~G)

Multiple drives:
Independent installation.

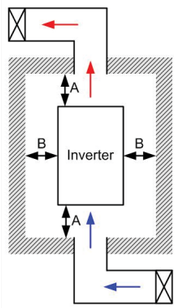
Ta: Frame A~G
(inflow air temperature)

It is suggested to install a barrier between the drives. Adjust the size of the barrier until the temperature of the fan on the inflow side is lower than the operation temperature. This barrier is to prevent the lower drives' hot exhaust from going straight into the upper drives' intake.

(Refer to the right figure)
Operation temperature is the temperature measured 50mm away from the inflow side of the fan.



Minimum Mounting Clearance

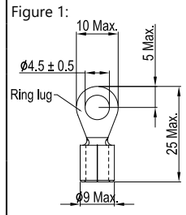
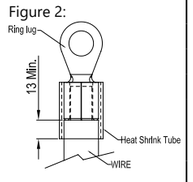
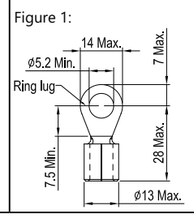
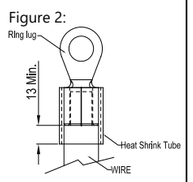


Frame	A (mm / in)	B (mm / in)	C (mm / in)	D (mm / in)
A~C	60 / 2.4	30 / 1.2	10 / 0.4	0 / 0
D0~F	100 / 4.0	50 / 2.0	n/a	0 / 0
G	200 / 7.9	100 / 4.0	n/a	0 / 0

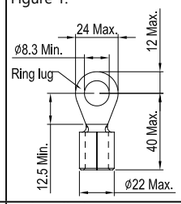
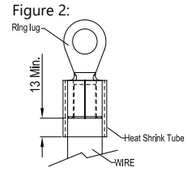
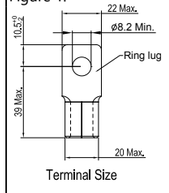
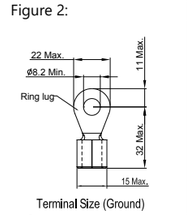
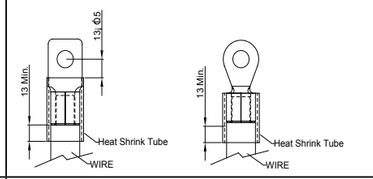
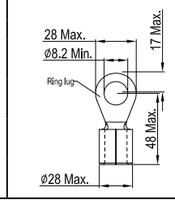
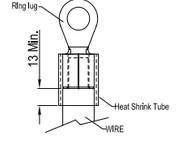
Note:

- The mounting clearances shown in figure to the left are NOT for installing the GS4 drive in a confined space (such as cabinet or electric box). When installed in a confined space, in addition to the minimum mounting clearances, ventilation equipment or air conditioning should be installed to keep the surrounding temperature lower than the operation temperature.
- The following table shows heat dissipation and required air volume when installing a single GS4 drive in a confined space. When installing multiple drives, the required air volume shall be multiplied by the number of GS4 drives.
- Refer to the chart (Air flow rate for cooling) for ventilation equipment design and selection.
- Refer to the chart (Power Dissipation) for air conditioner design and selection.
- If GS4 drives in frames sizes A thru D are installed with clearance dimensions less than specified, the cooling fans in these models may not adequately cool the drive.

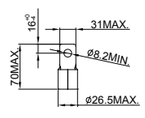
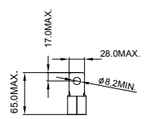
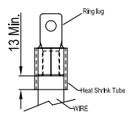
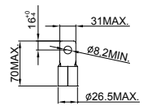
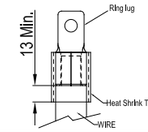
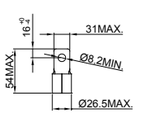
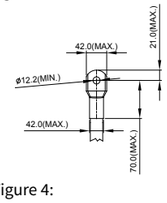
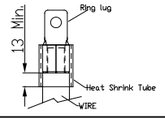
Specifications for Wiring Terminals – Main-Circuit Terminals

Drive Models		Max Wire Gauge	Min Wire Gauge	Torque (±10%)	Note
Frame A	GS4-21P0	8 AWG (8.4 mm²)	14 AWG (2.1 mm²)	M4 20 kg·cm (17.4 lb·in) (1.96 N·m)	UL installations must use 600V, 75°C or 90°C wire. Please use copper wire only. (Fig. 1) The usage of ring terminals should comply with this specification. (Fig. 2) The figure shows the specification of insulated heat shrink tubing that complies with UL (600C, YDPU2). Figure 1:  Figure 2: 
	GS4-22P0		12 AWG (3.3 mm²)		
	GS4-23P0		10 AWG (5.3 mm²)		
	GS4-25P0		8 AWG (8.4 mm²)		
	GS4-41P0		14 AWG (2.1 mm²)		
	GS4-42P0				
	GS4-43P0				
	GS4-45P0		10 AWG (5.3 mm²)		
	GS4-47P5				
Frame B	GS4-27P5	4 AWG (21.2 mm²)	8 AWG (8.4 mm²)	M5 35 kg·cm (30.4 lb·in) (3.43 N·m)	Terminal D+[+2 & +1]: Torque 45 Kg·cm [39.0 lb·in] (4.415 N·m) (±10%) Use 600V, 90°C wire for UL installation of GS4-2015 install if ambient temperature exceeds 45°C. UL installations of other models must use 600V, 75°C or 90°C wire. Please use copper wire only. (Fig. 1) The usage of ring terminals should comply with this specification. (Fig. 2) The figure shows the specification of insulated heat shrink tubing that complies with UL (600C, YDPU2). Figure 1:  Figure 2: 
	GS4-2010		6 AWG (13.3 mm²)		
	GS4-2015		4 AWG (21.2 mm²)		
	GS4-4010		8 AWG (8.4 mm²)		
	GS4-4015				
	GS4-4020		6 AWG (13.3 mm²)		

Specifications for Wiring Terminals – Main-Circuit Terminals (continued)

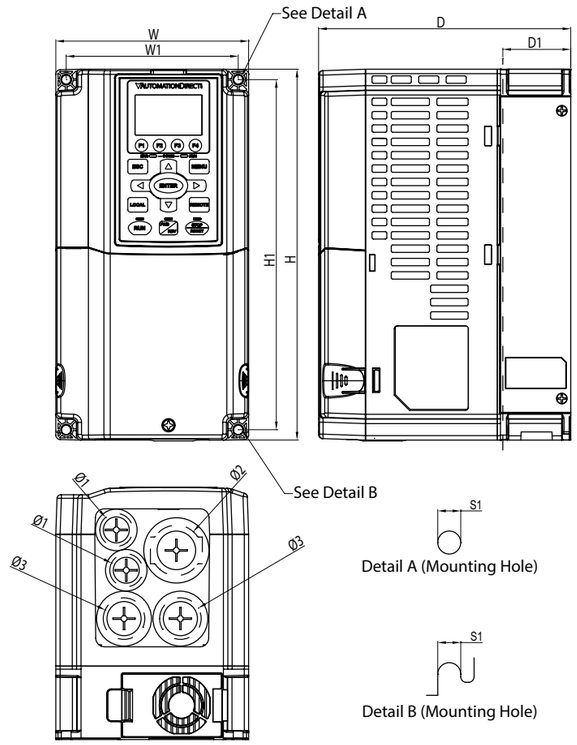
Drive Models		Max Wire Gauge	Min Wire Gauge	Torque (±10%)	Note
Frame C	GS4-2020	1/0 AWG (53.5 mm²)	1 AWG (42.4 mm²)	M8 80 kg·cm (69.4 lb·in) (7.85 N·m)	Terminal D+[+2 & +1]: Torque 90 Kg-cm [78.2 lb-in.] (8.83Nm) (±10%) Use 600V, 90°C wire for UL installation of GS4-2030 install if ambient temperature exceeds 40°C. UL installations of other models must use 600V, 75°C or 90°C wire. Please use copper wire only. (Fig. 1) The usage of ring terminals should comply with this specification. (Fig. 2) The figure shows the specification of insulated heat shrink tubing that complies with UL (600C, YDPU2). Figure 1:  Figure 2: 
	GS4-2025		1/0 AWG (53.5 mm²)		
	GS4-2030				
	GS4-4025		4 AWG (21.2 mm²)		
	GS4-4030				
	GS4-4040		2 AWG (33.6 mm²)		
Frame D0	*For models without conduit box*			M8 81.6 kg·cm (70.8 lb·in) (8N·m)	UL installations must use 600V, 75°C or 90°C wire. Please use copper wire only. (Fig. 1) The usage of ring terminals should comply with this specification. (Fig. 2) Ground wire spec: 2AWG*2 [33.6mm²*2] (Fig. 3) The figure shows the specification of insulated heat shrink tubing that complies with UL (600C, YDPU2). Figure 1:  Terminal Size Figure 2:  Terminal Size (Ground) Figure 3: 
	GS4-4050	2/0 AWG (67.4 mm²)	1/0 AWG (53.5 mm²)		
	GS4-4060				
Frame D	*For models without conduit box*			M8 200 kg·cm (173 lb·in) (19.62 N·m)	UL installations must use 600V, 75°C or 90°C wire. Please use copper wire only. (Fig. 1) The usage of ring terminals should comply with this specification. (Fig. 2) The figure shows the specification of insulated heat shrink tubing that complies with UL (600C, YDPU2). Figure 1:  Figure 2: 
	GS4-2040	300 MCM (152 mm²)	4/0 AWG (107 mm²)		
	GS4-2050		250 MCM (127 mm²)		
	GS4-4075		3/0 AWG (85mm²)		
	GS4-4100		300 MCM (152 mm²)		
	For models with conduit box				
	GS4-2040	4/0 AWG (107 mm²)	3/0 AWG (85 mm²)		
	GS4-2050		4/0 AWG (107 mm²)		
	GS4-4075		2/0 AWG (67.4 mm²)		
	GS4-4100		4/0 AWG (107 mm²)		

SPECIFICATIONS FOR WIRING TERMINALS – MAIN-CIRCUIT TERMINALS (CONTINUED)

Drive Models	Max Wire Gauge	Min Wire Gauge	Torque (±10%)	Note
Frame E				
For models without conduit box			M8 200 kg·cm (173 lb·in) (19.62 N·m)	UL installations must use 600V, 75°C or 90°C wire. Please use copper wire only. (Fig. 1) The usage of ring terminals should comply with this specification. (Fig. 2) Grounding wire specification: • 300MCM*2 [152 mm²*2] • Torque M8 180 kg·cm [156 lb·in] (17.64 N·m) (±10%) (Fig. 3) The figure shows the specification of insulated heat shrink tubing that complies with UL (600C, YDPU2). Figure 1: Figure 2:   Figure 3: 
GS4-2060	300 MCM*2 (152 mm²*2)	1/0 AWG*2 (53.5 mm²*2)		
GS4-2075		3/0 AWG*2 (85 mm²*2)		
GS4-2100		4/0 AWG*2 (107 mm²*2)		
GS4-4125		1/0 AWG*2 (53.5 mm²*2)		
GS4-4150		3/0 AWG*2 (85 mm²*2)		
For models with conduit box				
GS4-2060	4/0 AWG*2 (107 mm²*2)	1/0 AWG*2 (53.5 mm²*2)		
GS4-2075		2/0 AWG*2 (67.4 mm²*2)		
GS4-2100		3/0 AWG*2 (85 mm²*2)		
GS4-4125		1/0 AWG*2 (53.5 mm²*2)		
GS4-4150		2/0 AWG*2 (67.4 mm²*2)		
Frame F				
For models without conduit box			M8 200kg·cm (173 lb·in) (19.62 N·m)	UL installations must use 600V, 75°C or 90°C wire. Please use copper wire only. Grounding wire specification: 300MCM*2 [152 mm²*2]. (Fig. 1) The usage of ring terminals should comply with this specification. (Fig. 2) The figure shows the specification of insulated heat shrink tubing that complies with UL (600C, YDPU2). Figure 1: Figure 2:  
GS4-4175	300 MCM*2 (152 mm²*2)	4/0 AWG*2 (107 mm²*2)		
GS4-4200		300 MCM*2 (152 mm²*2)		
For models with conduit box				
GS4-4175	4/0 AWG*2 (107 mm²*2)	3/0 AWG*2 (85mm²*2)		
GS4-4200		4/0 AWG*2 (107 mm²*2)		
Frame G				
For main circuit terminals: R/L11, R/L12, S/L21, S/L22, T/L31, T/L32			M8 200 kg·cm (173 lb·in) (19.62 N·m)	Use 600V, 90°C wired for UL installation for GS4-4300; install in ambient temperature that exceeds 45°C. UL installations of other models must use 600V, 75°C or 90°C wire. Please use copper wire only. (Fig. 1) The usage of ring terminals for R/L11, R/L12, S/L21, S/L22, T/L31, and T/L32 should comply with this specification. (Fig. 2) The usage of ring terminals for U/T1, V/T2, W/T3, +1/DC+, and -/DC- should comply with this specification. (Fig. 3 & 4) The figure shows the specification of insulated heat shrink tubing that complies with UL (600C, YDPU2). Figure 1: Figure 2:   Figure 3: 
For main circuit terminals: U/T1, V/T2, W/T3, +1/DC+, -/DC-			M12 408 kg·cm (354 lb·in) (40 N·m)	
For models without conduit box				
GS4-4250	500 MCM*2 (253 mm²*2)	400 MCM*2 (203 mm²*2		
GS4-4300		500 MCM*2 (253mm²*2)		
For model with conduit box				
GS4-4250	500 MCM*2 (253 mm²*2)	300 MCM*2 (152 mm²*2)		
GS4-4300		400 MCM*2 (203 mm²*2)		

DIMENSION DIAGRAMS

GS4 FRAME A

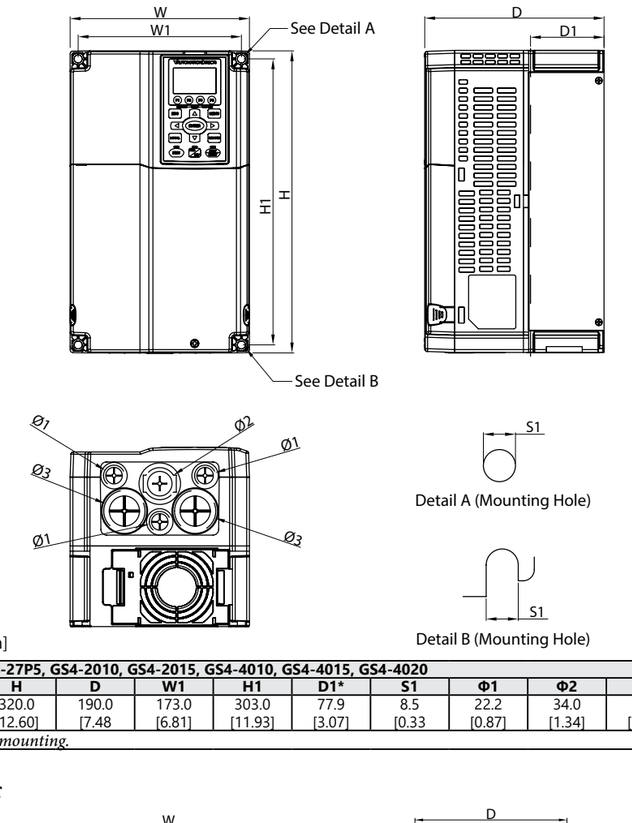


Units = mm [in]

Frame A: GS4-21P0; GS4-22P0, GS4-23P0, GS4-25P0, GS4-41P0, GS4-42P0, GS4-43P0, GS4-45P0, GS4-47P5									
W	**H**	**D**	**W1**	**H1**	**D1***	**S1**	**Φ1**	**Φ2**	**Φ3**
130.0 [5.12]	250.0 [9.84]	170.0 [6.69]	116.0 [4.57]	236.0 [9.29]	45.8 [1.80]	6.2 [0.24]	22.2 [0.87]	34.0 [1.34]	28.0 [1.10]
**D1 = Flange mounting.*									

DIMENSION DIAGRAMS

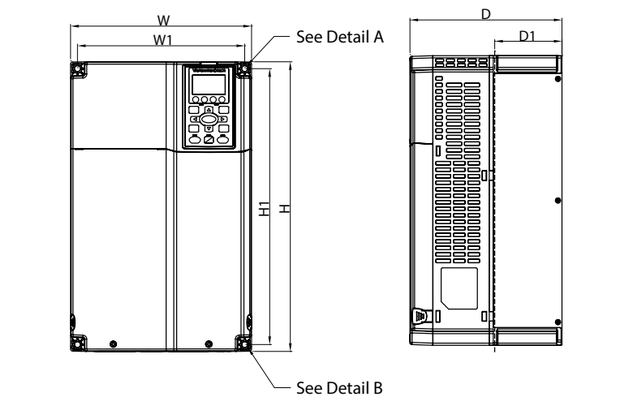
GS4 FRAME B



Units = mm [in]

Frame B: GS4-27P5, GS4-2010, GS4-2015, GS4-4010, GS4-4015, GS4-4020									
W	**H**	**D**	**W1**	**H1**	**D1***	**S1**	**Φ1**	**Φ2**	**Φ3**
190.0 [7.48]	320.0 [12.60]	190.0 [7.48	173.0 [6.81]	303.0 [11.93]	77.9 [3.07]	8.5 [0.33	22.2 [0.87]	34.0 [1.34]	28.0 [1.10]
**D1 = Flange mounting.*									

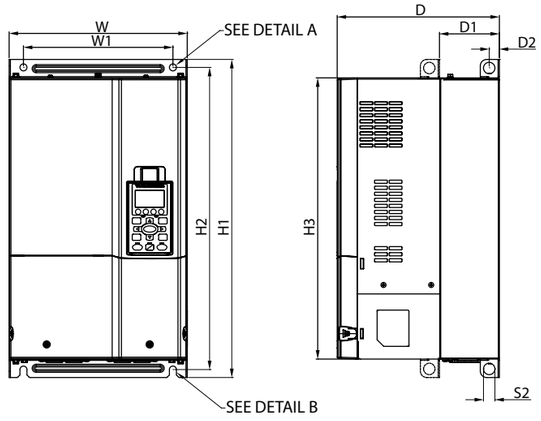
GS4 FRAME C

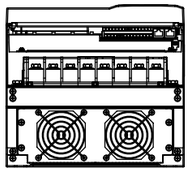


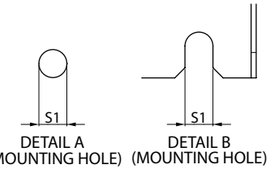
Units = mm [in]

Frame C: GS4-2020, GS4-2025, GS4-2030, GS4-4025, GS4-4030, GS4-4040									
W	**H**	**D**	**W1**	**H1**	**D1***	**S1**	**Φ1**	**Φ2**	**Φ3**
250.0 [9.84]	400.0 [15.75]	210.0 [8.27]	231.0 [9.09]	381.0 [15.00]	92.9 [3.66]	8.5 [0.33]	22.2 [0.87]	34.0 [1.34]	34.0 [1.34]
**D1 = Flange mounting.*									

GS4 Frame D0 (without conduit box)



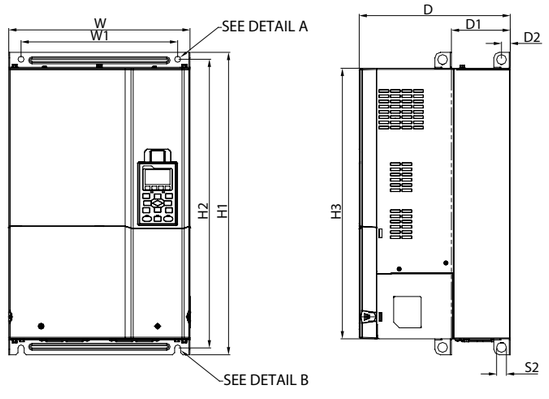


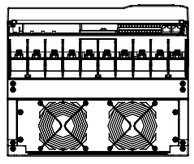


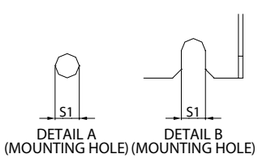
Units = mm [in]

Frame D0: GS4-4050, GS4-4060														
W	**H**	**D**	**W1**	**H1**	**H2**	**H3**	**D1***	**D2**	**S1**	**S2**	**Φ1**	**Φ2**	**Φ3**
280.0 [11.02]	–	255.0 [10.04]	235.0 [9.25]	500.0 [19.69]	475.0 [18.70]	442.0 [17.40]	94.2 [3.71]	16.0 [0.63]	11.0 [0.43]	18.0 [0.71]	–	–	–
**D1 = Flange mounting.*													

GS4 Frame D (without conduit box)



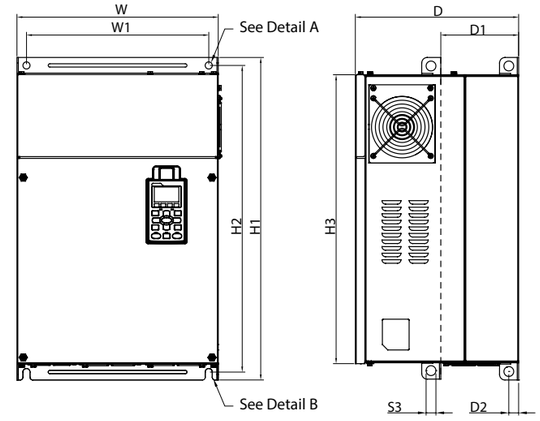


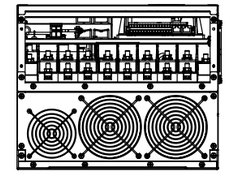


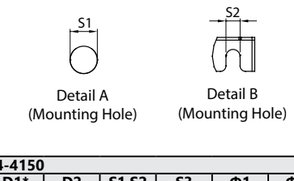
Units = mm [in]

Frame D: GS4-2040, GS4-2050, GS4-4075, GS4-4100														
W	**H**	**D**	**W1**	**H1**	**H2**	**H3**	**D1***	**D2**	**S1**	**S2**	**Φ1**	**Φ2**	**Φ3**
330.0 [12.99]	–	275.0 [10.83]	285.0 [11.22]	550.0 [21.65	525.0 [20.67]	492.0 [19.37	107.2 [4.22]	16.0 [0.63]	11.0 [0.43]	18.0 [0.71]	–	–	–
**D1 = Flange mounting.*													

GS4 Frame E (without conduit box)



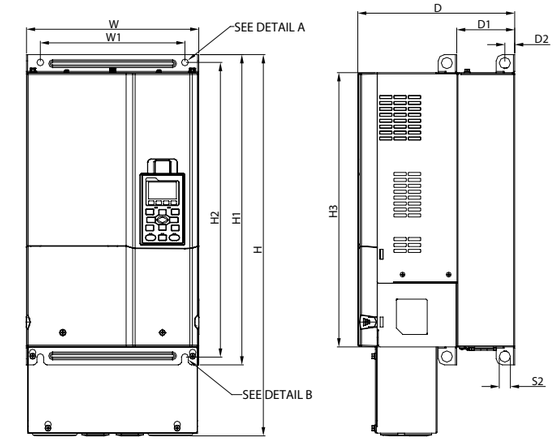


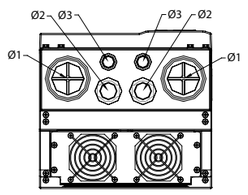


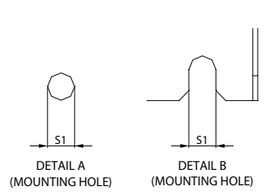
Units = mm [in]

Frame E: GS4-2060, GS4-2075, GS4-2100, GS4-4125, GS4-4150													
W	**H**	**D**	**W1**	**H1**	**H2**	**H3**	**D1***	**D2**	**S1,S2**	**S3**	**Φ1**	**Φ2**	**Φ3**
370.0 [14.57]	–	300.0 [11.81]	335.0 [13.19]	589 [23.19]	560.0 [22.05]	528.0 [20.80]	143.0 [5.63]	18.0 [0.71]	13.0 [0.51]	18.0 [0.71]	–	–	–
**D1 = Flange mounting.*													

GS4 Frame D0 (with conduit box)



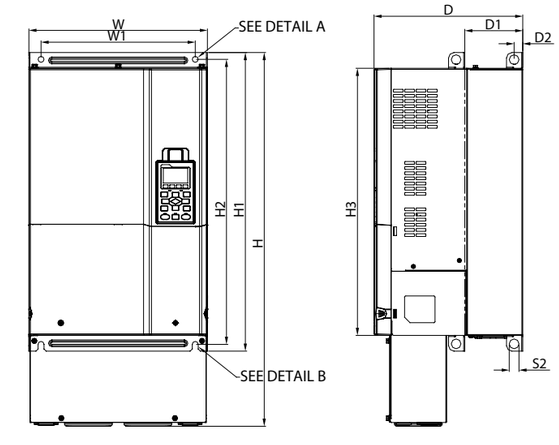


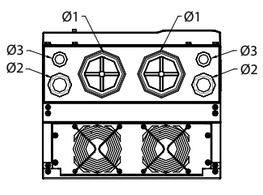


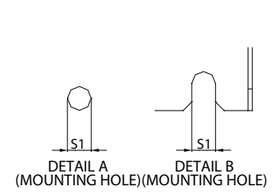
Units = mm [in]

Frame D0 – with Conduit Box (Option): GS4-4050, GS4-4060														
W	**H**	**D**	**W1**	**H1**	**H2**	**H3**	**D1***	**D2**	**S1**	**S2**	**Φ1**	**Φ2**	**Φ3**
280.0 [11.02]	614.4 [24.19]	255.0 [10.04]	235.0 [9.25]	500.0 [19.69]	475.0 [18.70]	442.0 [17.40]	94.2 [3.71]	16.0 [0.63]	11.0 [0.43]	18.0 [0.71]	62.7 [2.47]	34.0 [1.34]	22.0 [0.87]
**D1 = Flange mounting.*													

GS4 Frame D (with conduit box)



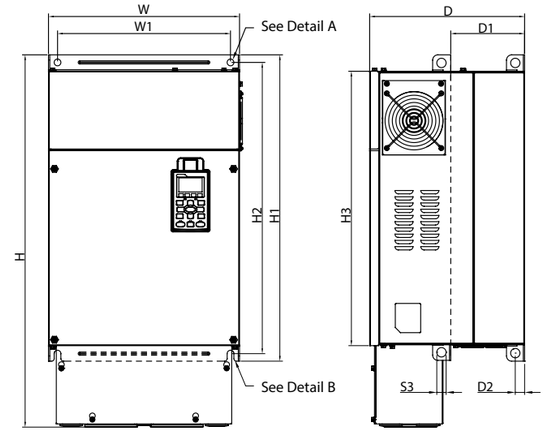


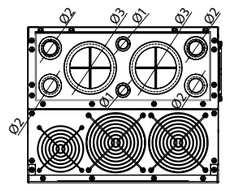


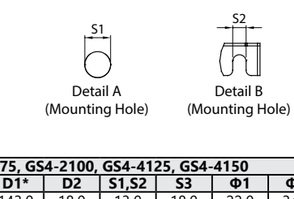
Units = mm [in]

Frame D – with Conduit Box (Option): GS4-2040, GS4-2050, GS4-4075, GS4-4100														
W	**H**	**D**	**W1**	**H1**	**H2**	**H3**	**D1***	**D2**	**S1**	**S2**	**Φ1**	**Φ2**	**Φ3**
330.0 [12.99]	688.3 [27.10]	275.0 [10.83]	285.0 [11.22]	550.0 [21.65	525.0 [20.67]	492.0 [19.37	107.2 [4.22]	16.0 [0.63]	11.0 [0.43]	18.0 [0.71]	76.2 [3.00]	34.0 [1.34]	22.0 [0.87]
**D1 = Flange mounting.*													

GS4 Frame E (with conduit box)



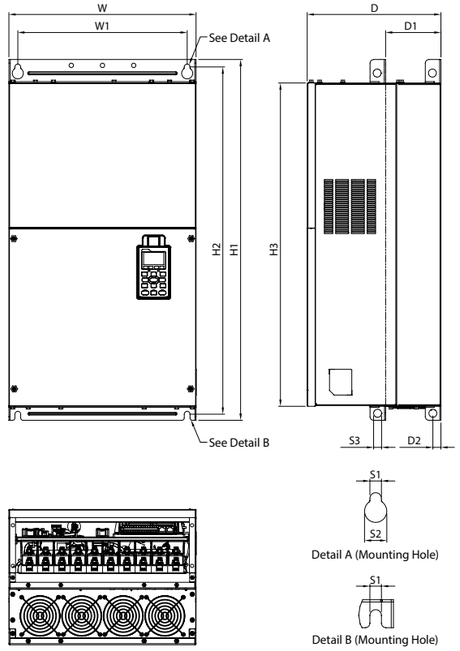




Units = mm [in]

Frame E – with Conduit Box (Option): GS4-2060, GS4-2075, GS4-2100, GS4-4125, GS4-4150													
W	**H**	**D**	**W1**	**H1**	**H2**	**H3**	**D1***	**D2**	**S1,S2**	**S3**	**Φ1**	**Φ2**	**Φ3**
370.0 [14.57]	715.8 [28.18]	300.0 [11.81]	335.0 [13.19]	589 [23.19]	560.0 [22.05]	528.0 [20.80]	143.0 [5.63]	18.0 [0.71]	13.0 [0.51]	18.0 [0.71]	22.0 [0.87]	34.0 [1.34]	92.0 [3.62]
**D1 = Flange mounting.*													

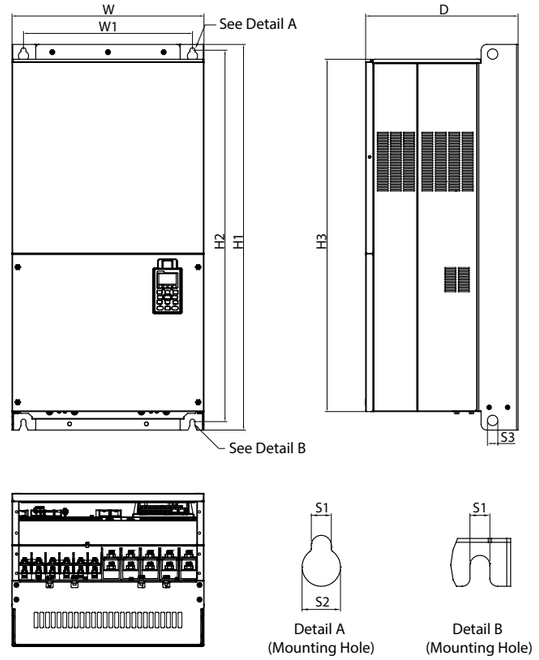
GS4 Frame F (without conduit box)



Units = mm [in]

Frame F: GS4-4175, GS4-4200														
W	H	D	W1	H1	H2	H3	D1*	D2	S1	S2	S3	Φ1	Φ2	Φ3
420.0 [16.54]	–	300.0 [11.81]	380.0 [14.96]	800.0 [31.50]	770.0 [30.32]	717.0 [28.23]	124.0 [4.88]	18.0 [0.71]	13.0 [0.51]	25.0 [0.98]	18.0 [0.71]	–	–	–
*D1 = Flange mounting.														

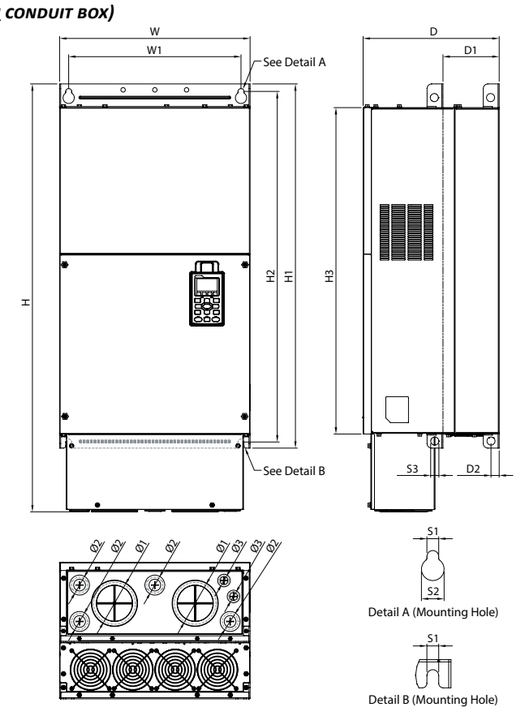
GS4 Frame G (without conduit box)



Units = mm [in]

Frame G: GS4-4250, GS4-4300													
W	H	D	W1	H1	H2	H3	S1	S2	S3	Φ1	Φ2	Φ3
500.0 [19.69]	–	397.0 [15.63]	440.0 [217.32]	1000.0 [39.37]	963.0 [37.91]	913.6 [35.97]	13.0 [0.51]	26.5 [1.04]	27.0 [1.06]	–	–	–

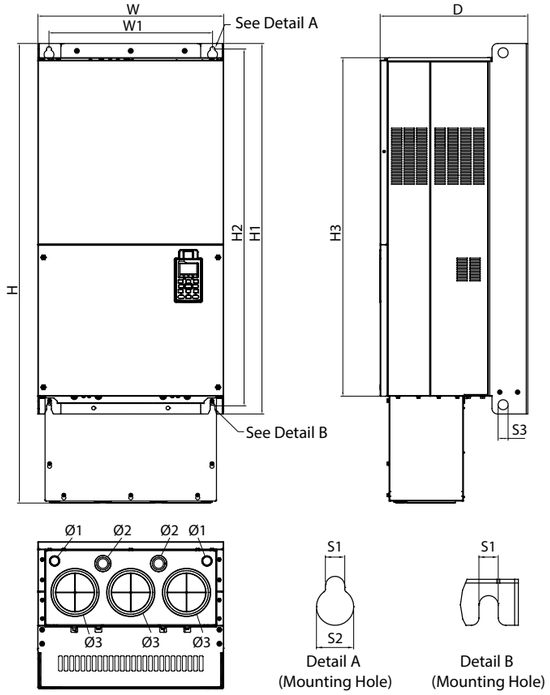
GS4 Frame F (with conduit box)



Units = mm [in]

Frame F – with Conduit Box (Option): GS4-4175, GS4-4200														
W	H	D	W1	H1	H2	H3	D1*	D2	S1	S2	S3	Φ1	Φ2	Φ3
420.0 [16.54]	940.0 [37.00]	300.0 [11.81]	380.0 [14.96]	800.0 [31.50]	770.0 [30.32]	717.0 [28.23]	124.0 [4.88]	18.0 [0.71]	13.0 [0.51]	25.0 [0.98]	18.0 [0.71]	92.0 [3.62]	35.0 [1.38]	22.0 [0.87]
*D1 = Flange mounting.														

GS4 Frame G (with conduit box)



Units = mm [in]

Frame G – with Conduit Box (Option): GS4-4250, GS4-4300													
W	H	D	W1	H1	H2	H3	S1	S2	S3	Φ1	Φ2	Φ3
500.0 [19.69]	1240.2 [48.83]	397.0 [15.63]	440.0 [217.32]	1000.0 [39.37]	963.0 [37.91]	913.6 [35.97]	13.0 [0.51]	26.5 [1.04]	27.0 [1.06]	22.0 [0.87]	34.0 [1.34]	117.5 [4.63]

GS4 Fault Codes

Fault Codes	
0: No Error 1: Overcurrent during Accel (ocA) 2: Overcurrent during Decel (ocd) 3: Overcurrent during normal speed (ocn) 4: Ground Fault (GFF) 5: IGBT short circuit (occ) 6: Overcurrent during Stop (ocS) 7: Overvoltage during Accel (ovA) 8: Overvoltage during Decel (ovd) 9: Overvoltage during normal speed (ovn) 10: Overvoltage during Stop (ovS) 11: Low voltage during Accel (LvA) 12: Low voltage during Decel (Lvd) 13: Low voltage during normal speed (Lvn) 14: Low voltage during Stop (LvS) 15: Output ripple / Input phase loss (OrP) 16: IGBT Overheat 1 (oH1) 17: Cap Overheat 2 (oH2) 18: Thermister 1 open (tH1o) 19: Thermister 2 open (tH2o) 20: Power Reset Off (PWR) 21: Overload (oL) (150% 1Min, Inverter) 22: Motor1 Thermal Overload (EoL1) 23: Motor2 Thermal Overload (EoL2) 24: Motor Overheat-PTC (oH3) 25: reserved 26: Over Torque 1 (ot1) 27: Over Torque 2 (ot2) 28: Under current (uc) 29: reserved 30: EEPROM write error (cF1) 31: EEPROM read error (cF2) 32: reserved 33: U phase current sensor detection error (cd1) 34: V phase current sensor detection error (cd2) 35: W phase current sensor detection error (cd3) 36: CC Hardware Logic error 0 (Hd0) 37: OC Hardware Logic error 1 (Hd1) 38: OV Hardware Logic error 2 (Hd2) 39: OCC Hardware Logic error 3 (Hd3) 40: Motor auto tune error (AuE) 41: PID Feedback loss (AFE) 42~47: reserved	48: Analog input signal loss (ACE) 49: External Fault (EF) 50: Emergency Stop (EF1) 51: Base Block (bb) 52: Password Error (Pcod) 53: Software Code lock (ccod) 54: PC Command error (CE1) 55: PC Address error (CE2) 56: PC Data error (CE3) 57: PC Slave error (CE4) 58: PC Communication Time Out (CE10) 59: PC Keypad Time out (CP10) 60: Braking Transistor Fault (bf) 61: Y-Delta connection Error (ydc) 62: Decel Energy Backup Error (dEb) 63: Over Slip Error (oSL) 64: Electromagnet switch error (ryF) 65~71: reserved 72: STO Loss1 (STL1) STO1~SCM1 internal hardware detect error 73: ES1 Emergency Stop (S1) 74: In Fire Mode (Fire) 75: reserved 76: Safety Torque Off function active (STO) 77: STO Loss2 (STL2) STO2~SCM2 internal hardware detect error 78: STO Loss3 (STL3) – STO1~SCM1 and STO2~SCM2 internal hardware detect errors 79: U Phase Short (Uoc) 80: V Phase Short (Voc) 81: W Phase Short (Woc) 82: U Phase Loss (UPHL) 83: V Phase Loss (VPHL) 84: W Phase Loss (WPHL) 85~89: reserved 90: PLC Force Stop (FStp) 91~96: reserved 97: Ethernet Card Timeout (CD10) 98: reserved 99: CPU Command error (TRAP) 100~110: reserved 111: reserved