

IRONHORSE™

GSD4A/GSD4 SERIES DC DRIVES USER MANUAL

USER MANUAL NUMBER: IH-GSD4_UMP



GSD4A-240-xC



GSD4-24x-xC



GSD4-240-10N4X

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PUBLICATION HISTORY

User Manual Publication History		
Issue	Date	Description
Second Edition	July 2019	Addition of GSD4A DC drives and accessories.
Second Edition, Rev. A	October 2019	Revised specifications

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GSD4A/GSD4 DC DRIVES USER MANUAL OVERVIEW

OVERVIEW OF THIS PUBLICATION

The IronHorse GSD4A/GSD4 Series DC Drives User Manual describes the installation, configuration, and methods of operation of the GSD4A/GSD4 Series DC Drives.

All information contained in this manual is intended to be correct. However, information and data in this manual are subject to change without notice. AutomationDirect (ADC) makes no warranty of any kind with regard to this information or data. Further, ADC is not responsible for any omissions or errors or consequential damage caused by the user of the product. ADC reserves the right to make manufacturing changes which may not be included in this manual.

WHO SHOULD READ THIS USER MANUAL

This manual contains important information for those who will install, maintain, and/or operate any of the GSD4A/GSD4 Series DC Drives.

TECHNICAL SUPPORT

By Telephone: 770-844-4200 (Mon.–Fri., 9:00 a.m.–6:00 p.m. E.T.)

On the Web: www.automationdirect.com

Our technical support group is glad to work with you in answering your questions. If you cannot find the solution to your particular application, or, if for any reason you need additional technical assistance, please call Technical Support at 770-844-4200. We are available weekdays from 9:00 a.m. to 6:00 p.m. Eastern Time.

We also encourage you to visit our web site where you can find technical and non-technical information about our products and our company. Visit us at www.automationdirect.com.

SPECIAL SYMBOLS



WHEN YOU SEE THE "NOTEPAD" ICON IN THE LEFT-HAND MARGIN, THE PARAGRAPH TO ITS IMMEDIATE RIGHT WILL BE A SPECIAL NOTE.



WHEN YOU SEE THE "EXCLAMATION MARK" ICON IN THE LEFT-HAND MARGIN, THE PARAGRAPH TO ITS IMMEDIATE RIGHT WILL BE A WARNING. THIS INFORMATION COULD PREVENT INJURY, LOSS OF PROPERTY, OR EVEN DEATH (IN EXTREME CASES).

IRONHORSE GSD4A SERIES DC DRIVES GENERAL INFORMATION



IronHorse GSD4A DC drives are designed to control DC Permanent Magnet, Shunt Wound, and some Universal (AC/DC) motors. Incoming AC voltage is converted to adjustable full-wave rectified DC voltage to operate the DC motor. Also, a full-wave field voltage is provided for shunt wound motors.



CAREFULLY CHECK THE DC DRIVE FOR SHIPPING DAMAGE. REPORT ANY DAMAGE TO THE CARRIER IMMEDIATELY. DO NOT ATTEMPT TO OPERATE THE DRIVE IF VISIBLE DAMAGE IS EVIDENT TO EITHER THE CIRCUIT OR TO THE ELECTRONIC COMPONENTS.

GSD4A STANDARD FEATURES

- Input voltages 120/240VAC, jumper selectable @ 50/60 Hz; output, jumper selectable, 120VAC = 90VDC, 240VAC = 90 or 180VDC.
- Adjustable horsepower settings.
- Barrier terminal strip.
- Full-wave bridge supply.
- 1% speed regulation with armature voltage feedback; $\pm 1/2\%$ with tachometer feedback.
- Adjustable Minimum speed, Maximum speed, IR Compensation, Current Limit, Acceleration & Deceleration (enclosed models), Inhibit Function.
- Line voltage compensation.
- 5k Ω speed potentiometer with leads, dial, and knob included.
- 50:1 speed range.
- Transient voltage protection.
- Voltage following mode or DC tachometer follower by supplying ungrounded 0–12VDC analog input signal.*
- DC tachometer feedback (6V at base speed).
- Inhibit circuit permits start & stop without breaking AC lines.
- Shunt field supply provided.

* Voltage following and DC tach feedback require the GSDA-AI-V4A analog option card.

GSD4A CONTROL FEATURES

MINIMUM SPEED – Allows adjustment of the motor speed when the speed pot is set at minimum (CCW). This permits the user to eliminate “Deadband” on the main speed control, permitting zero calibration. Clockwise rotation of “MIN” trim pot increases speed.

MAX SPEED (Maximum Speed) – Allows adjustment of the motor speed when the speed pot is set at maximum (CW). This permits the user to eliminate the top end “Deadband”, which will provide full speed at maximum rotation. Rotation of the “MAX” trim pot in the clockwise direction increases the maximum motor speed.

I.R. COMP (Speed Regulation) – This allows for adjustment of the circuitry that controls the speed regulation of the motor. The circuitry controls armature speed by changing the armature voltage to compensate for increased or decreased motor loading. Clockwise rotation of the “IR COMP” trim pot will increase compensation.

CUR. LIM. (Current Limit) – Provides protection from excessive armature current by limiting the maximum armature current the drive can provide. This enables adjustment of the maximum torque the motor can deliver. Torque adjustment (Cur. Lim.) is preset at 125% of rated motor torque (current) based on horsepower. Clockwise rotation of the “CUR. LIM.” trim pot increases the torque (current) the drive will provide.

INHIBIT TERMINAL PINS – Allows the user to (hard) quickly stop and start the control output via a SPST switch. Using the inhibit inputs will bypass Accel and Decel ramps.

ACCEL & DECEL – Has adjustable accel and decel with a setting range of 0.5-8 seconds for accel and 0.5-6 seconds for decel. CW rotation increases the accel and decel ramp times.

INPUT & OUTPUT SELECTION PINS – Comes standard with selectable input voltage pins for 120 or 240 VAC operation, and selectable output voltage pins for 90 or 180 Vdc motors. NOTE: 90VDC outputs can be achieved from 120 or 240VAC inputs however a 180VDC output can only be achieved from a 240VAC input supply.

POWER ON & CL LEADS – Comes standard with a power “ON” LED indicator and a Current Limit LED indicator.

Transient protection – Comes with MOV and X2 rated line capacitors for transient and noise protection.

IRONHORSE GSD4 SERIES DC DRIVES GENERAL INFORMATION



IronHorse GSD4 DC drives are designed to control DC Permanent Magnet, Shunt Wound, and some Universal (AC/DC) motors. Incoming AC voltage is converted to adjustable full-wave rectified DC voltage to operate the DC motor. Also, a full-wave field voltage is provided for shunt wound motors.



CAREFULLY CHECK THE DC DRIVE FOR SHIPPING DAMAGE. REPORT ANY DAMAGE TO THE CARRIER IMMEDIATELY. DO NOT ATTEMPT TO OPERATE THE DRIVE IF VISIBLE DAMAGE IS EVIDENT TO EITHER THE CIRCUIT OR TO THE ELECTRONIC COMPONENTS.

GSD4 STANDARD FEATURES

- Input voltages 24/36VAC or 120/240VAC @ 50/60Hz; output 0–24/36VDC or 0–90/180VDC.
- Adjustable horsepower settings.
- Barrier terminal strip.
- Full-wave bridge supply.
- 1% speed regulation with armature voltage feedback; $\pm 1/2\%$ with tachometer feedback.
- Adjustable Minimum speed, Maximum speed, IR Compensation, Current Limit, Acceleration & Deceleration (enclosed models).
- Line voltage compensation.
- 5k Ω speed potentiometer with leads, dial, and knob included.
- 50:1 speed range.
- Transient voltage protection.
- Voltage following mode or DC tachometer follower by supplying ungrounded 0–12VDC analog input signal. Requires optional GSDA-AI-V4A analog input card.
- DC tachometer feedback (6V at base speed). Requires optional GSDA-AI-V4A analog input card.
- Inhibit circuit permits start & stop without breaking AC lines.
- Shunt field supply provided.
- GSD4-240-10N4X only: NEMA 4X enclosure, Power ON/OFF switch, Power ON indicator, Adjustable acceleration and deceleration.

GSD4 CONTROL FEATURES

MINIMUM SPEED – Allows adjustment of the motor speed when the speed pot is set at minimum (CCW). This permits the user to eliminate “Deadband” on the main speed control, permitting zero calibration. Clockwise rotation of “MIN” trim pot increases speed.

MAX SPEED (Maximum Speed) – Allows adjustment of the motor speed when the speed pot is set at maximum (CW). This permits the user to eliminate the top end “Deadband”, which will provide full speed at maximum rotation. Rotation of the “MAX” trim pot in the clockwise direction increases the maximum motor speed.

I.R. COMP (Speed Regulation) – This allows for adjustment of the circuitry that controls the speed regulation of the motor. The circuitry controls armature speed by changing the armature voltage to compensate for increased or decreased motor loading. Clockwise rotation of the “IR COMP” trim pot will increase compensation.

CUR. LIM. (Current Limit) – Provides protection from excessive armature current by limiting the maximum armature current the drive can provide. This enables adjustment of the maximum torque the motor can deliver. Torque adjustment (Cur. Lim.) is preset at 125% of rated motor torque (current) based on horsepower. Clockwise rotation of the “CUR. LIM.” trim pot increases the torque (current) the drive will provide.

INHIBIT TERMINAL PIN – An adjustable acceleration ramp that allows the user a choice of stopping and starting hard (fast), or stopping hard with a soft start (without breaking the AC lines).

There are two ways to Inhibit a drive:

- 1) For all GSD4A and GSD4 drives (using the drive’s speed pot):

Remove power from the Speed Pot Wiper, which makes the input to the drive drop to Zero volts. A switch or contact can be placed in either the Speed Pot High lead, or in the Speed Pot Wiper lead.

- 2) For GSD4A and GSD4 drives (using the drive’s inhibit feature):

The inhibit feature provides a way to start/stop output of these drives by using a low-power rated contact (12VDC, mA of current), as opposed to a high-power contact that would be required to switch the source power to the drive.

Close the circuit between the Inhibit pins P13, Inhibit Input and P14, Inhibit Common on GSD4A series drives or P3, Inhibit input, and the drive’s Speed Pot Hi terminal on GSD4 series drives. The drive will stop and start quickly – bypassing any fixed or adjustable ACCEL or DECEL setting. When this connection is CLOSED, the drive’s 12VDC logic supply is collapsed by connecting it to a chassis COMMON point – the board logic shuts down and output to the motor ceases. When inhibited using these methods, the motors connected to the GSD4A and GSD4 series drive will coast to a stop. Output to the motor resumes when this contact is opened again.

SELECTION AND SPECIFICATIONS - GSD4A SERIES DC DRIVES

GSD4A Series DC Drives – Selection & Specifications		
Model	GSD4A-240-2C	GSD4A-240-6C
Package Configuration	open frame	
Power Quality Form Factor	1.4	
Input Voltage (@50/60Hz)	120/240VAC, jumper selectable (Note: 90VDC output voltage is available with both 120VAC and 240VAC input voltage levels.)	
Output Voltage	0–90VDC @ 120 VAC input /180 VDC @ 240 VAC input	
Shunt Field Voltage	100VDC @ 120VAC in / 200VDC @ 240VAC in (7Adc Max)	
Motor Rating @ Low V (hp)	1/50 – 1/8	1/8 – 1/2
Motor Rating @ High V (hp)	1/25 – 1/4	1/4 – 2
Output Current (continuous)	2A (DC)	6A (DC)
Current Overload Capacity	200% for 60s	
Current Limit (adjustable)	0.3–2.5A (DC)	1–15A (DC)
Transient Protection	Metal Oxide Varistor (MOV)	
I.R. Compensation	adjustable	
Speed Adjustment****	Potentiometer	5kΩ potentiometer or 0–10 VDC**** isolated input signal
	Current	4–20mA with option GSDA-AI-V4A
	Voltage	0–5VDC thru 0–250VDC with option GSDA-AI-V4A
Speed Range	50:1	
Speed Regulation	±1% of base speed	
Maximum Speed	adjustable from 60% to 110% of base speed	
Minimum Speed	0–30% of adjustable maximum speed	
Acceleration	adjustable from 0.5 to 8.0 seconds	
Deceleration	adjustable from 0.5 to 6.0 seconds	
Dynamic Braking	no	
Plugging Capability **	no	
Electrical Connections	11-position terminal strip; 22–14 AWG	
Fusing*** – External (required)	Fuse Amperages are based on motor HP; see “Fusing”	
Fusing*** – Internal (replaceable)	–	
Operating Temperature	-10 to 45 °C [14 to 113 °F]	
Thermal Protection	current limiting	
Mounting Orientation	can be mounted in any orientation	
Corrosive Gases	NOT compatible with any corrosive gases	
Weight	7.12 oz [202g]	7.12 oz [202g]
Agency Approvals	cUL _{US} Listed (E198015), RoHS, CE	
Optional Accessories * (Some Accessories are NOT compatible with GSD4 Series Drives)		
Replacement Potentiometer	GSDA-5K	
Digital Potentiometer	GSDA-DP	
Manual Reverse Switch	GSDA-MREV*****	
Signal conditioner	GSDA-DP-S	
Closed loop digital potentiometer	GSDA-DP-D	
Isolated Current/Voltage Analog Input Module	GSDA-AI-V4A**** (for GSD4A drives only)	
Heatsink	GSDA-HTSNK-4A (for GSD4A drives only)	
<p>* For accessories details, please visit www.AutomationDirect.com.</p> <p>** Plugging is a method of rapidly changing motor direction by reversing motor armature polarity, while the motor is still running.</p> <p>*** Fuse type: Bussman/Edison ABC, Littlefuse 314 series, or equivalent. Fuse hot legs only; do not fuse AC neutrals. (Edison ABC series fuses are available from AutomationDirect.)</p> <p>**** For 0–10 VDC input signal, please refer to “Operational Description: 0 to 10 VDC Analog Reference Signal to GSD4” on page 21.</p> <p>***** To meet NEMA4x requirements GSDA-MREV requires a user provided external enclosure.</p>		

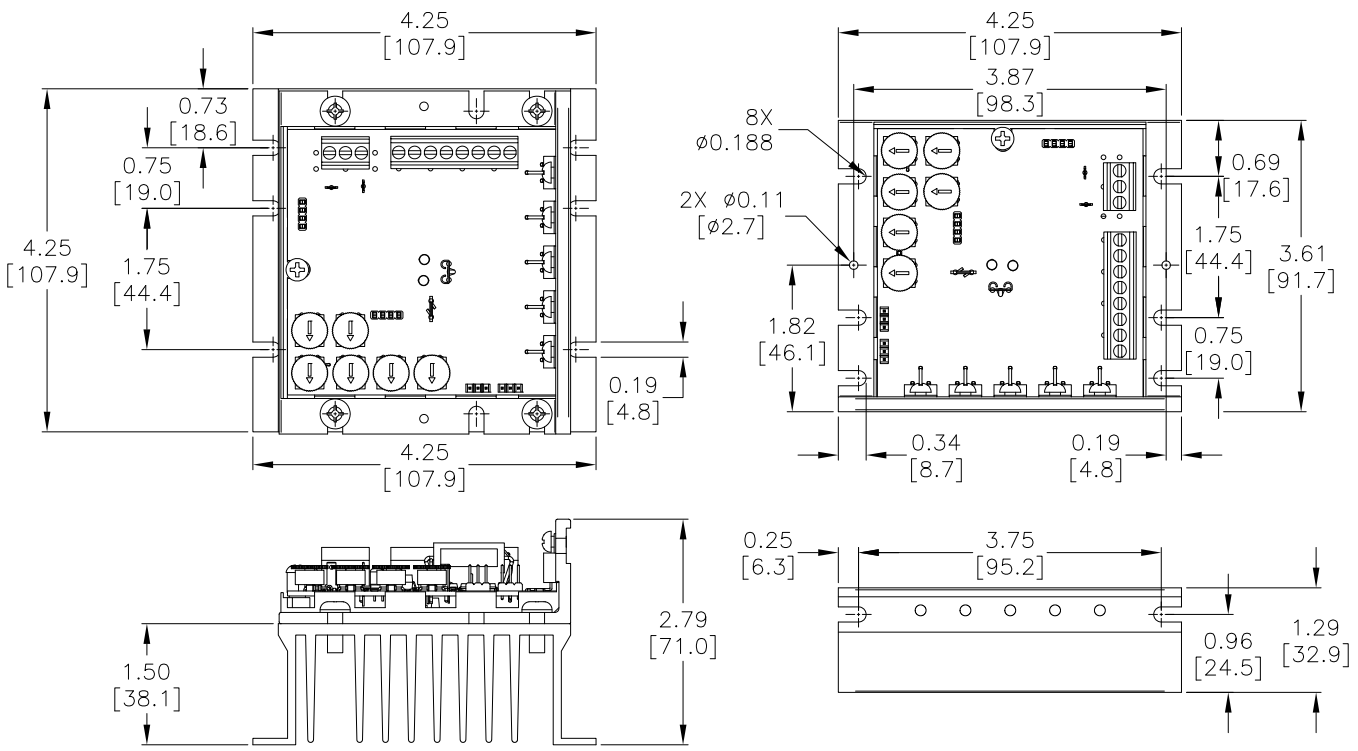
SELECTION AND SPECIFICATIONS - GSD4 SERIES DC DRIVES

GSD4 Series DC Drives – Selection & Specifications				
Model	GSD4-24A-5C	GSD4-240-1C	GSD4-240-5C	GSD4-240-10N4X
Package Configuration	open frame			NEMA 4X
Power Quality Form Factor	1.4			
Input Voltage (@50/60Hz)	24/36 VAC ±10%	120/240 VAC ±10%		
Output Voltage	0–24/36 VDC	90VDC @ 120VAC input / 180 VDC @ 240VAC input		
Shunt Field Voltage	20VDC @ 24VAC in 30VDC @ 36VAC in (1A max)	100VDC @ 120VAC in 200VDC @ 240VAC in (1A max)	100VDC @ 120VAC in 200VDC @ 240VAC in (0.5A max)	
Motor Rating @ Low V (hp)	1/50 – 1/6	1/50 – 1/8	1/8 – 1/2	1/8 – 1
Motor Rating @ High V (hp)		1/25 – 1/4	1/4 – 1	1/4 – 2
Output Current (continuous)	5.5A (DC)	1.2A (DC)	5.5A (DC)	10A (DC)
Current Overload Capacity	200% for 60s			
Current Limit (adjustable)	1–15A (DC)	0.3–2.5A (DC)	1–15A (DC)	
Transient Protection	–	Metal Oxide Varistor (MOV)		
I.R. Compensation	adjustable			
Speed Adjustment****	Potentiometer	5kΩ potentiometer	5kΩ potentiometer or 0–10 VDC**** isolated input signal	5kΩ potentiometer
	Current	4–20mA with optional accessory GSDA-AI-A		
	Voltage	n/a	0–5VDC thru 0–250VDC, 4–20ma with optional accessory GSDA-AI-V4	n/a
Speed Range	50:1			
Speed Regulation	±1% of base speed			
Maximum Speed	adjustable from 60% to 110% of base speed			
Minimum Speed	0–30% of adjustable maximum speed			
Acceleration	0.5 seconds			adjustable
Deceleration				0.5–8 seconds
Dynamic Braking	no			
Plugging Capability**	no			
Electrical Connections	8-position terminal strip; 22–14 AWG			
Fusing*** – External (required)	Fuse Amperages are based on motor HP; see “Fusing.			
Fusing*** – Internal (replaceable)	–			(1) 10A
Operating Temperature	-10 to 45 °C [14 to 113 °F]			-10 to 40 °C [14 to 104 °F]
Thermal Protection	current limiting			
Mounting Orientation	can be mounted in any orientation			
Corrosive Gases	NOT compatible with any corrosive gases			
Weight	8.0 oz [203g]	37 oz [1049g]	10.5 oz [297g]	59.5 oz [1687g]
Agency Approvals	RoHS, CE	cUL _{US} Listed (E198015), RoHS, CE		cUL _{US} Listed (E198015), RoHS
Optional Accessories * (Some Accessories are NOT compatible with GSD4A Series Drives)				
Replacement Potentiometer	GSDA-5K			
Digital Potentiometer	GSDA-DP			
Manual Reverse Switch	GSDA-MREV*****			
Signal conditioner	GSDA-DP-S			
Closed loop digital potentiometer	GSDA-DP-D			
Accel/Decel Adjustment Card	GSDA-ACCDEC-4 (for GSD4 drives only)			–
Analog Current Input Card	GSDA-AI-A (for GSD4 drives only)			–
Analog Voltage Input Card	–	GSDA-AI-V4**** (for GSD4 drives only)		–
Heatsink	GSDA-HTSNK-4 (for GSD4 drives only)			–
* For accessories details, please visit www.AutomationDirect.com .				
** Plugging is a method of rapidly changing motor direction by reversing motor armature polarity, while the motor is still running.				
*** Fuse type: Bussman/Edison ABC, Littelfuse 314 series, or equivalent. Fuse hot legs only; do not fuse AC neutrals. (Edison ABC series fuses are available from AutomationDirect.)				
**** For 0-10 VDC input signal, please refer to “Operational Description: 0 to 10 VDC Analog Reference Signal to GSD4” on page 21.				
***** To meet NEMA4x requirements GSDA-MREV requires a user provided external enclosure.				

DIMENSIONS

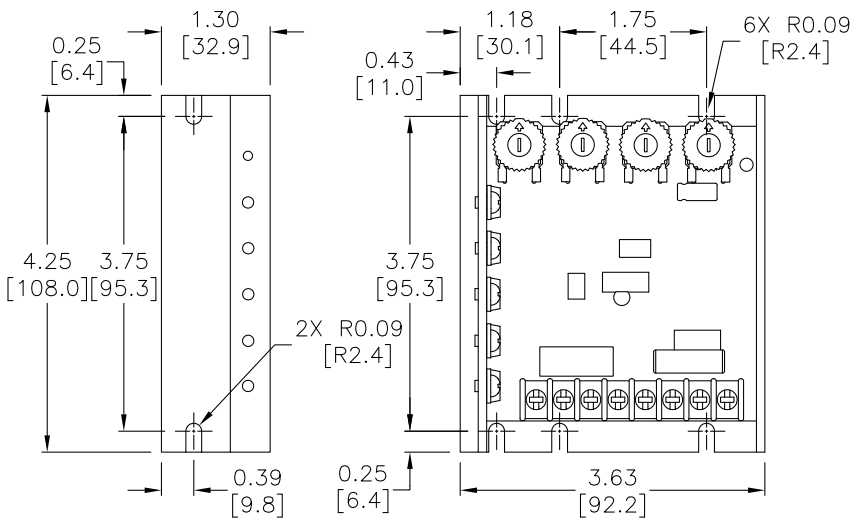
(Dimensions = in [mm])

GSD4A-240-xC

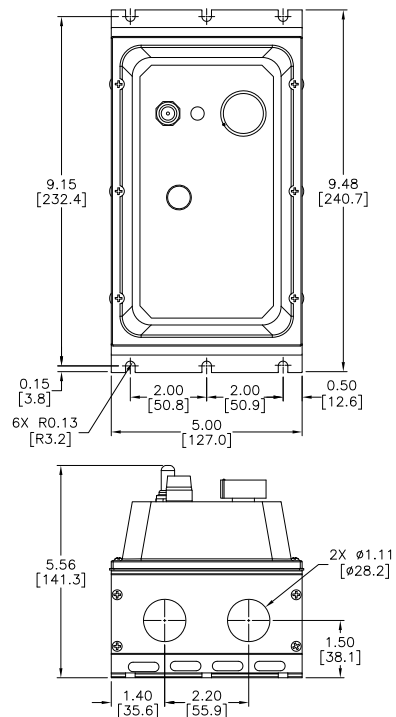


ABOVE DRAWINGS ON THE LEFT SIDE SHOW A GSD4A DRIVE WITH THE OPTIONAL HEATSINK INSTALLED (PART NUMBER GSDA-HTSNK-4A).

GSD4-24x-xC



GSD4-240-10N4X



INSTALLATION, WIRING, EXTERNAL FUSING (GSD4A/GSD4 MODELS)



INSTALL OPEN-FRAME DRIVES IN AN ENCLOSURE WITH A VOLUME AT LEAST THREE TIMES THE VOLUME OF THE OPEN-FRAME DRIVE.



DO NOT MOUNT DC DRIVE WHERE AMBIENT TEMPERATURE IS OUTSIDE THE RANGE OF -10 TO 45 °C (14 TO 113 °F).



SIZE ALL WIRES THAT CARRY ARMATURE OR LINE CURRENTS AS SPECIFIED BY APPLICABLE NATIONAL, STATE, AND/OR LOCAL CODES. ALL OTHER WIRES MAY BE 18AWG OR SMALLER AS PERMITTED BY THE CODES.



SEPARATE CONTROL WIRES FROM THE ARMATURE AND AC LINES WHEN ROUTED IN CONDUIT OR WIRE TRAYS.



THESE DRIVES DO NOT PROVIDE MOTOR OVER-TEMPERATURE SENSING OR MOTOR OVERLOAD PROTECTION. THE NEED FOR ADDITIONAL MOTOR OVERLOAD AND MOTOR OVER-TEMPERATURE PROTECTION SHALL BE DETERMINED BASED ON CONDITIONS IN THE END INSTALLATION IN ACCORDANCE WITH THE NEC.



CAUTION!! TURN POWER OFF WHILE MAKING WIRING CONNECTIONS.



IMPROPER INSTALLATION OR OPERATION OF THIS DC DRIVE MAY CAUSE INJURY TO PERSONNEL OR DRIVE FAILURE. THE DRIVE MUST BE INSTALLED IN ACCORDANCE WITH LOCAL, STATE, AND NATIONAL SAFETY CODES. MAKE CERTAIN THAT THE POWER SUPPLY IS DISCONNECTED BEFORE ATTEMPTING TO SERVICE OR REMOVE ANY COMPONENTS!!! IF THE POWER DISCONNECT POINT IS OUT OF SIGHT, LOCK IT IN DISCONNECTED POSITION AND TAG IT TO PREVENT UNEXPECTED APPLICATION OF POWER. ONLY A QUALIFIED ELECTRICIAN OR SERVICE PERSONNEL SHOULD PERFORM ANY ELECTRICAL TROUBLESHOOTING OR MAINTENANCE. AT NO TIME SHOULD CIRCUIT CONTINUITY BE CHECKED BY SHORTING TERMINALS WITH A SCREWDRIVER OR OTHER METAL DEVICE.



BEFORE ATTEMPTING TO WIRE THE DC DRIVE, MAKE SURE ALL POWER IS DISCONNECTED. RECHECK CODE DESIGNATION TO ASSURE PROPER VOLTAGE IS PRESENT FOR THE DC DRIVE. CAREFULLY SELECT PROPER WIRE SIZE FOR CURRENT AND VOLTAGE DROP. LIMIT THE VOLTAGE DROP THROUGH THE WIRING TO 5% OF THE LINE VOLTAGE AT FULL LOAD



CAUTION!! DO NOT ATTEMPT TO PERFORM A HI-POT TEST ACROSS THE AC LINES WITH THE DC DRIVE IN THE CIRCUIT. THIS WILL RESULT IN IMMEDIATE OR LONG-TERM DAMAGE TO THE DRIVE.



- 1) ENSURE THAT THE DRIVE CHASSIS IS PROPERLY GROUNDED.
- 2) MOTOR ARMATURE CONNECTIONS MUST NOT BE SWITCHED OR BROKEN WHILE THE GSD4 DRIVE IS ON.
SERIOUS DAMAGE MAY RESULT.
- 3) THE INPUTS TO THE SPEED POT TERMINALS (GSD4A: P12-HI, P12-W, P12-LO; GSD4: P1-6, P1-7, P1-8) MUST NOT BE GROUNDED.
SERIOUS DAMAGE MAY RESULT.

FUSING

External Fuse Selection *				
Motor HP	GSD4-24A-5C		Select fusing based on 200% of motor Full-Load Current	
	GSD4A-240-xC / GSD4-240-xC		GSD4-240-10N4X	
	Fuse @ 120 VAC Input	Fuse @ 240 VAC Input	Fuse @ 120 VAC Input	Fuse @ 240 VAC Input
1/50	2A	-	-	-
1/20	2A	1A	-	-
1/8	3A	2A	2A	-
1/4	4A	3A	4A	2A
1/3	6A	3A	6A	3A
1/2	8A	4A	8A	4A
3/4	12A	6A	12A	6A
1.0	15A	8A	15A	8A
1.5	-	12A	-	12A
2.0	-	15A	-	15A

* Fuse type: Bussman/Edison ABC, Littlefuse 314 series, or equivalent. Fuse hot legs only; do not fuse AC neutrals. (Edison ABC series fuses are available from AutomationDirect.)

WIRING TERMINALS (GSD4A/GSD4 MODELS)

GSD4A/GSD4 Wiring Terminals			
Type	Wire Range	Customer Wiring Temp Rating	Tightening Torque
11-position (GSD4A) or 8-position (GSD4) terminal strip	22–14 AWG	300V, 75 °C [167 °F] minimum	9.0 lb-in [1.0 N·m]

WIRING TERMINAL FUNCTIONS (GSD4A MODELS)

GSD4A-240-XC WIRING TERMINALS

GSD4A-240-xC Series DC Drives – Terminal Strip Functions CAUTION: BE SURE DRIVE HOUSING IS PROPERLY GROUNDED.	
Number	Purpose
JP1	90/180 VDC – Set this jumper selection to 90 for 90VDC motors or 180 for 180VDC.
JP2	120/240 VDC – Although a JP2 setting of 240V will allow the control to function adequately on lower 120V inputs for most applications, it is recommended that JP2 be set for the appropriate incoming AC line voltage. AC inputs of 108 through 140 Volts should use a jumper position of 120. AC inputs of 208 through 240 Volts should use a jumper position setting of 240. NOTE: NEVER USE A JP2 120V SETTING FOR INPUT VOLTAGES ABOVE 140VAC. PERMANENT CONTROL DAMAGE MAY OCCUR.
P16-AC1, P16-AC2	(AC or L) / (AC or N): 120 VAC – Connect incoming hot AC1/L1 (black wire) to P16-AC1 and neutral AC2/N (white wire) to (AC or N) P16-AC2. Connect ground (green wire) to CHASSIS of control. 240 VAC – Connect incoming hot AC1/L1 to terminal P16-AC1 and incoming hot AC2/L2 to terminal P16-AC2. Connect ground wire to CHASSIS of control. There are two AC1 and two AC2 terminals on the GSD4A drives.
P16-+A	(+ A) – Connect to PLUS (+) Armature wire on motor. 0-90 VDC for 120 VAC input or 0-90/180 VDC for 240 VAC input. See Specifications table for output rating. There are two +A terminals on the GSD4A drives.
P16- -A	(- A) – Connects to NEG (-) Armature wire on motor. There are two -A terminals on the GSD4A drives.
P12-HI	(SPEEDPOT HI) – Connects to high side (white wire) of the Speed pot (CW end). This is internal +12 volts. NOTE: INPUT MUST NOT BE GROUNDED!
P12-W	(SPEEDPOT WIPER) – Connects to wiper (red wire) of Speedpot (center lead). For Start-Stop applications requiring soft start and soft stop (Accel and Decel ramps), the connection between this terminal and Speedpot Wiper can be opened and closed by a SPST switch. NOTE: For Voltage Follower applications, this INPUT MUST NOT BE GREATER THAN +12V MAXIMUM AND MUST NOT BE GROUNDED!
P12-LO	(SPEEDPOT LO) – Connects to Low side (orange wire) of Speedpot (CCW end). This input is raised and lowered by the MIN trimpot. Electronic speed input (voltage follower) may be referenced to Speedpot LO if the MIN trimpot adjustments are to be active. Otherwise, inputs may be referenced to -ARM, which will bypass the MIN trimpot. NOTE: INPUT MUST NOT BE GROUNDED!
P8*	(+Field) NOT for use with permanent magnet motors. Supplies positive field voltage for shunt wound motors. For motors with a dual voltage field (ie. 50/100V or 100/200V), connect to the higher voltage field. Connector is 1/4" female spade connector.*
P9	(-Field) Connects to the Negative (-) field wire of a shunt wound motor. This connection is also circuit common and MUST NEVER be connected to earth or chassis ground. Grounding of this terminal will damage the GSD4A drive. Connection is 1/4" male spade connector.
P13	(INHIBIT INPUT) – Connecting this input to the Inhibit Common pin will result in a fast stop. Opening this connection will result in a quick acceleration of the motor to the wiper input set point. Stopping and starting via the Inhibit pins bypasses all accel and decel ramps. 1/8th inch, male spade connector.
P14	(INHIBIT COMMON) – Connecting this input to the Inhibit pin will result in a fast stop. Opening this connection will result in a quick acceleration of the motor to the wiper input set point. Stopping and starting via the Inhibit pins bypasses all accel and decel ramps. 1/8th inch, male spade connector.
* The P8 (+Field) terminal is used to supply power to the GSDA-AI-V4A and GSDA-RTU-4A options cards; making the terminal unavailable for +field connections.	

WIRING TERMINAL FUNCTIONS (GSD4 MODELS)

GSD4-xxx-xC WIRING TERMINALS

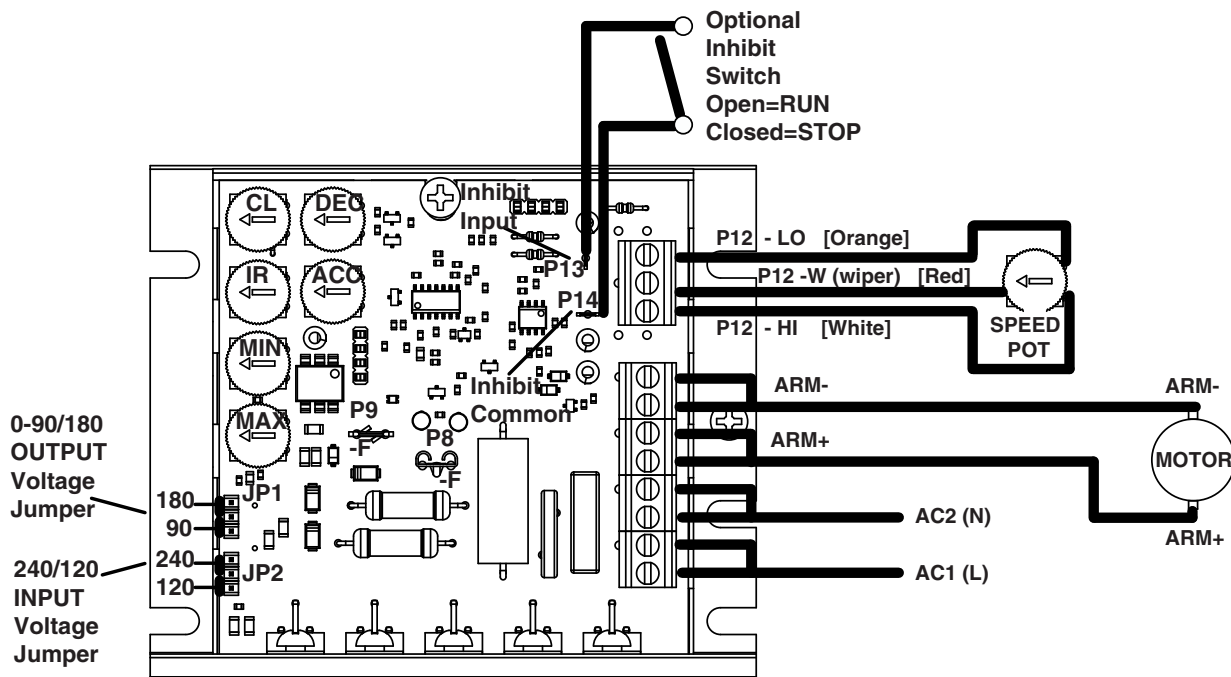
GSD4-xxx-xC Series DC Drives – Terminal Strip Functions CAUTION: BE SURE DRIVE HOUSING IS PROPERLY GROUNDED.	
Number	Purpose
P1-1	(L / AC1) 24–36 VAC – Connect incoming hot AC (black wire) to this terminal. (L / AC1) 120VAC – Connect incoming hot AC (black wire) to this terminal. (L / AC1) 240VAC – Connect either hot side. Connect ground (green wire) to drive chassis.
P1-2	(N / AC2) 24–36 VAC – Connect the neutral AC (white wire) to this terminal. (N / AC2) 120VAC – Connect the neutral AC (white wire) to this terminal. (N / AC2) 240VAC – Connect either hot side. Connect ground (green wire) to drive chassis.
P1-3	(+ ARM) – Connects to the plus (+) Armature wire on the motor. 0–24/36VDC for 24–36 VAC input, or 0–90 VDC for 120VAC input, or 0–180 VDC for 240VAC input. See “SPECIFICATIONS” for output rating. CAUTION: ARMATURE CONNECTION MUST NOT BE SWITCHED OR BROKEN WHILE DRIVE IS ON, OR SERIOUS DAMAGE TO THE DRIVE MAY RESULT.
P1-4	(- ARM / -FIELD) – Connects to minus (-) Armature wire on the motor, and, if necessary, (-) Field wire of Shunt Wound motor regardless of AC supply voltage.
P1-5	(+ FIELD) – DO NOT use for Permanent Magnet motor. This supplies (+) Field voltage for a Shunt Wound motor. For motors with dual voltage field (i.e. 50/100V or 100/200V), make sure the highest value is connected.
P1-6	(SPEEDPOT HI) – Connects to high side (white wire) of the Speed pot (CW end). This is internal +12 volts. INPUT MUST NOT BE GROUNDED !
P1-7	(SPEEDPOT WIPER) – Connects to the wiper (red wire) of the Speed pot (center lead). For voltage-follower applications, this INPUT MUST NOT BE GREATER THAN +12V MAXIMUM AND MUST NOT BE GROUNDED ! Speed pot can be replaced by 0–10V analog signal. See “GSDA-AI-V4” on page 30 , or use FC-33 or equivalent.
P1-8	(SPEEDPOT LO) – Connects to the low side (orange wire) of the 5kΩ Speed pot (normally the CCW end). This input is raised and lowered by the MIN trim pot. Electronic speed input voltage (voltage follower) may be referenced to Speed pot LO if the MIN trim pot adjustments are to be active. Otherwise, inputs may be referenced to -ARM (P1-4), which will bypass the MIN trim pot. INPUT MUST NOT BE GROUNDED !

GSD4-240-10N4X WIRING TERMINALS

GSD4-240-10N4X Series DC Drives – Terminal Strip Functions CAUTION: BE SURE DRIVE HOUSING IS PROPERLY GROUNDED.	
Number	Purpose
P4 – Terminal Strip for Power & Motor Armature Wiring	
P4-1	(L / AC1) 120VAC – Connect incoming hot AC (black wire) to this terminal. (L / AC1) 240VAC – Connect either hot side. Connect ground (green wire) to drive ground lug.
P4-2	(N / AC2) 120VAC – Connect the neutral AC (white wire) to this terminal. (N / AC2) 240VAC – Connect either hot side. Connect ground (green wire) to drive ground lug.
P4-3	(+ ARM) – Connects to the plus (+) Armature wire on the motor.
P4-4	(- ARM) – Connects to minus (-) Armature wire on the motor.
P1 – Terminal Strip for Shunt-Wound Motor Field Wiring	
P1-4	(-FIELD) – Connects to minus (-) Field wire of shunt-wound motors ONLY.
P1-5	(+ FIELD) – DO NOT use for Permanent Magnet motor. This supplies (+) Field voltage for a Shunt-Wound motor. For motors with dual voltage field (i.e. 50/100V or 100/200V), make sure the highest value is connected

WIRING DIAGRAMS (GSD4A MODELS)

GSD4A-240-XC BASIC WIRING DIAGRAM

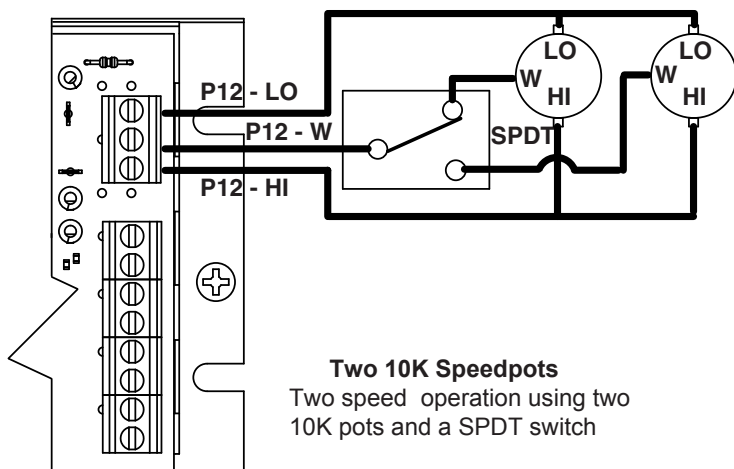


CONTROL HOOK-UP AND SETUP MODIFICATIONS (GSD4A MODELS)

TWO SPEED OPERATION (GSD4A MODELS)

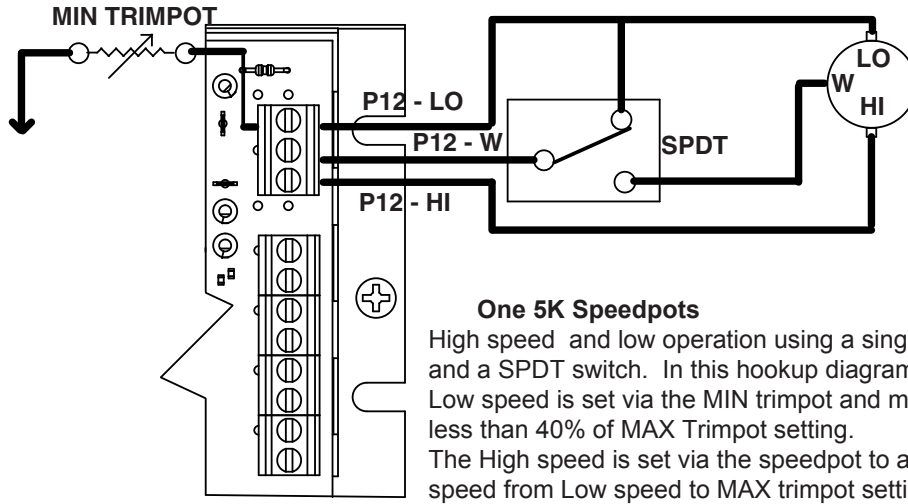
Two speed operation can be achieved by several methods as shown below. In all three methods, a center off switch can be used for a Speed1 / Off / Speed2 operation.

TWO 10K SPEEDPOTS

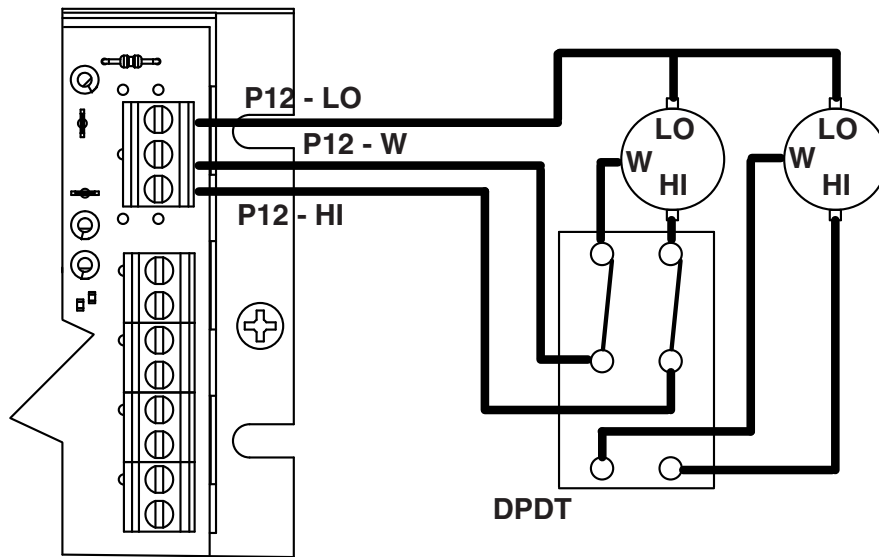


Two 10K Speedpots
Two speed operation using two 10K pots and a SPDT switch

ONE 5K SPEEDPOT



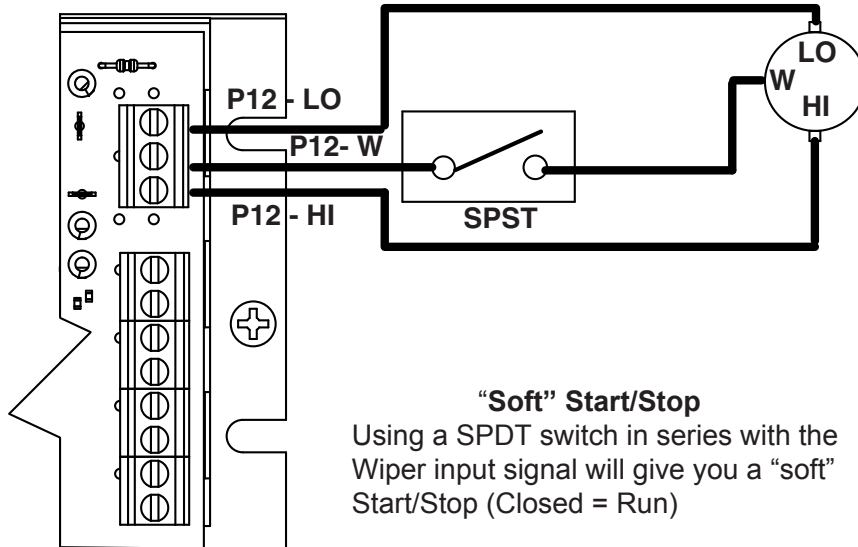
TWO 5K SPEEDPOTS



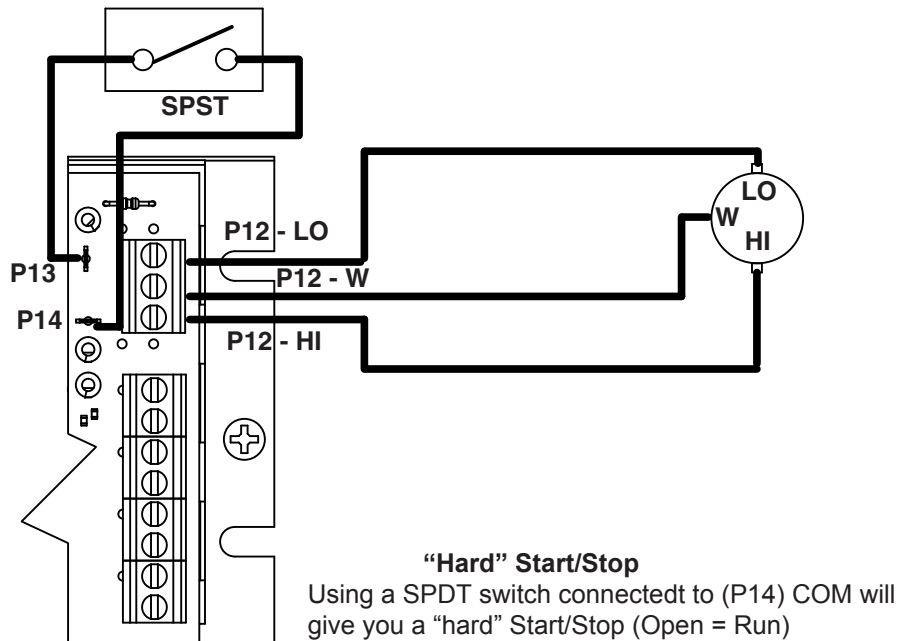
START, STOP AND INHIBIT OPERATION (GSD4A MODELS)

When a Start/Stop action is required by means of a switch, the following hook-ups may be used to achieve the necessary function. Starting and Stopping by means of the Inhibit pin (P13) will result in a hard Start/Stop. Use of the Inhibit input bypasses the Accel and Decel ramps. Start/Stop actions via the Wiper input signal (P12-W) will result in a soft Start/Stop. Refer to the diagrams below for several methods of starting and stopping that may meet you application requirements.

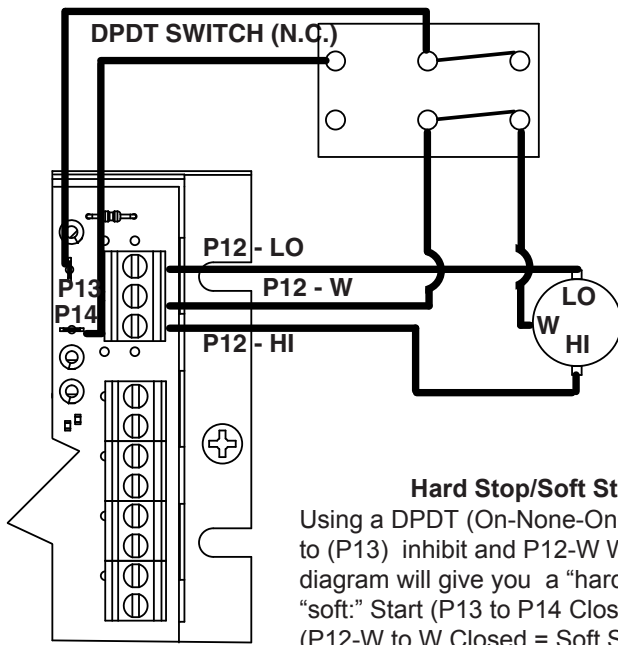
“SOFT” START/STOP



“HARD” START/STOP



"HARD" STOP/"SOFT" START



Hard Stop/Soft Start

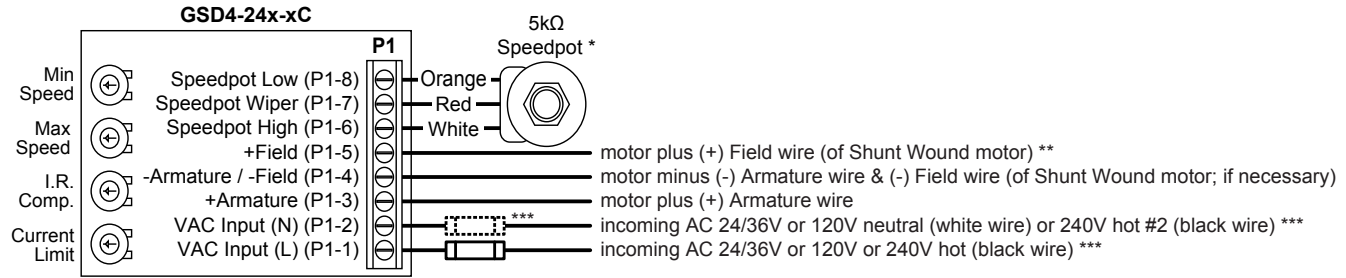
Using a DPDT (On-None-On) switch connected to (P13) inhibit and P12-W Wiper input, shown in this diagram will give you a "hard" Stop and a "soft:" Start (P13 to P14 Closed = Hard Stop) (P12-W to W Closed = Soft Start)

WIRING DIAGRAMS (GSD4 MODELS)

GSD4-24x-xC BASIC WIRING DIAGRAM

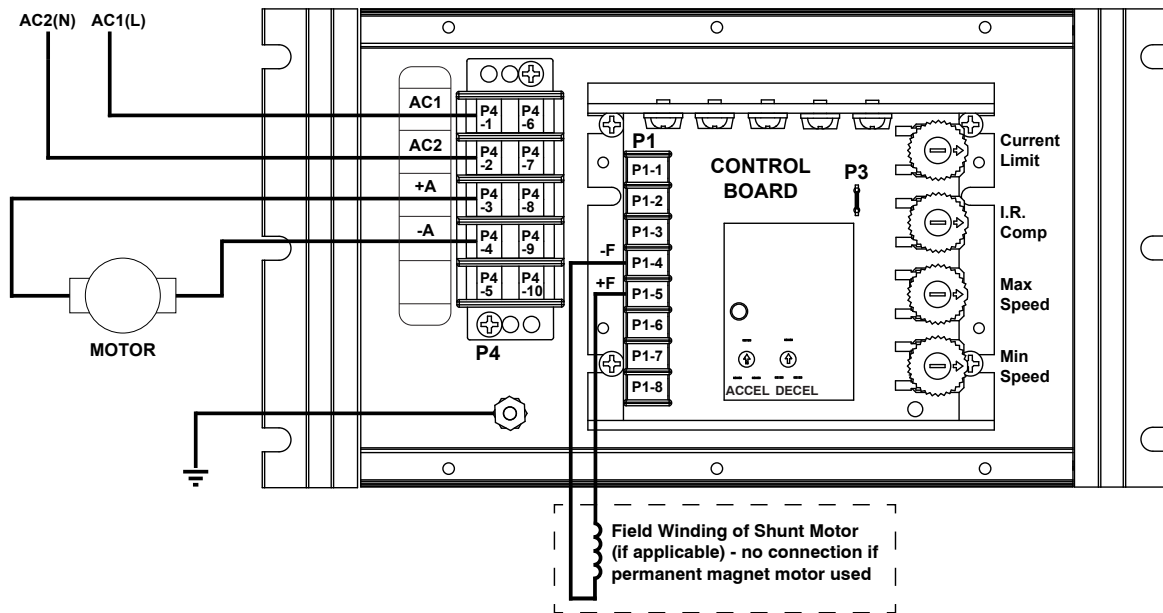


SPEED POT CAN BE REPLACED BY AN 0-10V ANALOG SIGNAL FOR SPEED CONTROL (FROM A PLC, ETC.). SEE "GSDA-AI-V4" ON PAGE 30.



- * P1-6 has internal +12V, and connects to Speedpot High (white wire). THIS INPUT MUST NOT BE GROUNDED!
For start-stop applications, the connection between P1-6 and Speedpot High can be opened and closed by a SPST switch.
- * P1-7 connects to Speedpot Wiper (red wire). THIS INPUT MUST NOT BE GROUNDED!
For Voltage-Follower applications, THIS INPUT MUST NOT BE GREATER THAN +12V MAXIMUM!
- * P1-8 connects to Speedpot Low, and is raised and lowered by the Min Speed trimpot. THIS INPUT MUST NOT BE GROUNDED!
Electronic speed input (voltage follower) may be referenced to this input if the Min Speed trimpot adjustments are to be active.
Otherwise, inputs may be referenced to -Armature, which will bypass the Min Speed trimpot.
- ** +F connection is only for Shunt Wound motor; NOT for Permanent Magnet motor.
For motors with dual voltage field, i.e. 50/100V or 100/200V, connect the highest value.
- *** Fuse hot AC inputs only; refer to Fusing section for size and type. Do NOT fuse AC (N) on 24/36V or 120V systems.
Fuse both AC lines for 240 VAC input. Connect incoming AC ground (green wire) to GSD4 chassis.

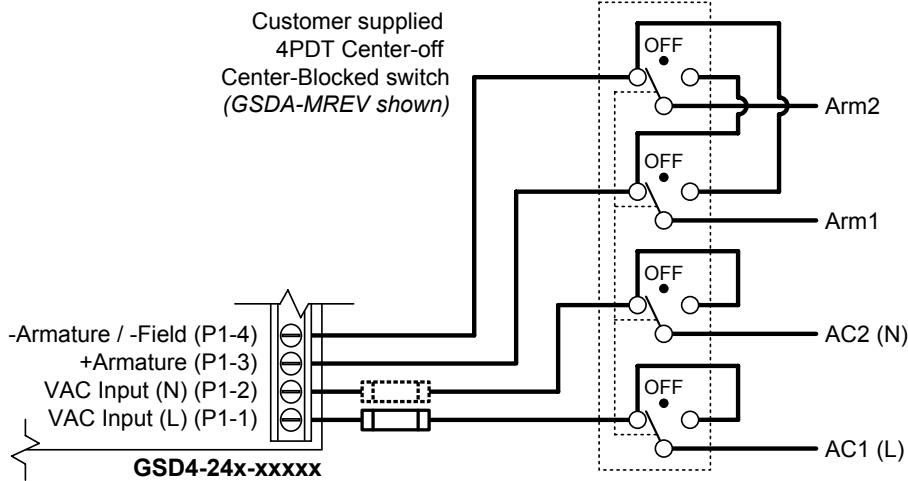
GSD4-240-10N4X BASIC WIRING DIAGRAM



GSD4-24x-xxx REVERSING WIRING DIAGRAM

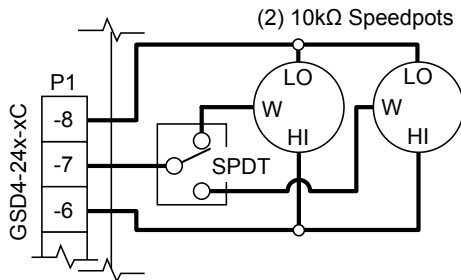


CAUTION: WHEN REVERSING A SPINNING PERMANENT MAGNET DC MOTOR, CAUTION MUST BE TAKEN THAT THE RESULTING CURRENT THROUGH THE ARMATURE OF THE MOTOR DOES NOT EXCEED THE OVERLOAD RATINGS OF THE DC DRIVE, OR THE DEMAGNETIZE RATING OF THE MOTOR BEING REVERSED. A CENTER-BLOCKED SWITCH WILL DELAY SWITCHING THE MOTOR DIRECTION. IF USING RELAYS TO AUTOMATICALLY REVERSE THE MOTOR, MAKE SURE TO HAVE A DELAY BETWEEN CHANGING MOTOR DIRECTIONS.



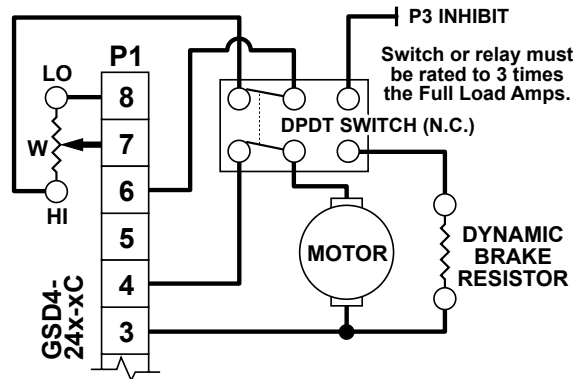
GSD4-24x-xc TWO-SPEED OPERATION

Two-speed operation is done using two 10 kΩ speed potentiometers in parallel, with both Highs connected to terminal P1-6, and both Lows connected to P1-8. A SPDT switch selects which pot Wiper is connected to terminal P1-7.



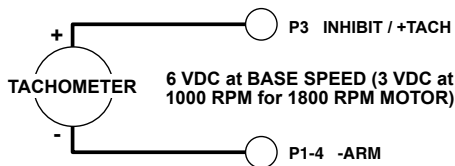
GSD4-24x-xc DYNAMIC BRAKING

A DPDT switch is used to control and to connect a customer-supplied Dynamic Braking Resistor (DBR). Typical values for the DBR are 35–50W at 5Ω for 120V, or 10Ω for 240V. Motor horsepower, inertia, and cycle time affect the sizing of the DBR.



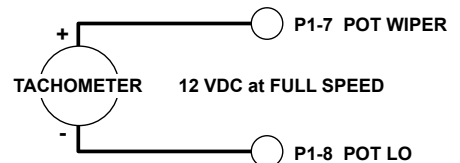
GSD4-24x-xxx TACHOMETER FEEDBACK

Improves regulation to ± 1/2% of base speed.



GSD4-24x-xxx TACHOMETER FOLLOWER

Allows drive output to follow tachometer voltage.



TACHOMETER CONTROL NEEDS TACHOMETER OUTPUT OF 7VDC/1000RPM WITH RIPPLE LIMITED TO 1% OR LESS.

INSTALLATION AND WIRING – WIRING DIAGRAMS (CONTINUED)

INHIBIT FEATURE START/STOP CONTROL

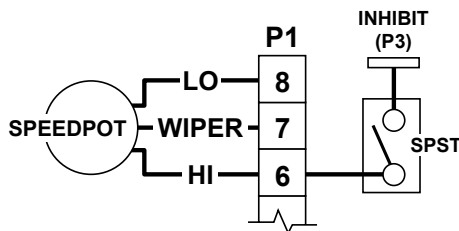
The inhibit feature allows the motor to be remotely started and stopped using a lower-rated 12VDC contact in the drive control circuit, instead of a higher-rated contact in the power circuit.

GSD4-24X-XC INHIBIT (USED INDEPENDENTLY)

This inhibit method bypasses the drive’s Accel and Decel settings to start and stop the motor. It instantly shuts off the drive’s output, and the motor freewheels to a stop. Start and stop rates are determined by the inertia of the load.

The customer-supplied SPST switch is connected in series between the Speed Pot High (P1-6) and the Inhibit pin (P3). To inhibit (stop motor), close Speed Pot High to the Inhibit pin. To restart, return the switch to open.

Fast Stop & Start:

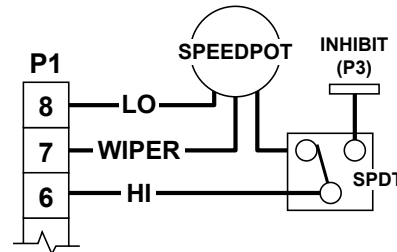


GSD4-24X-XC INHIBIT (USED WITH SPEED POT)

This inhibit method bypasses the drive’s Decel settings when stopping the motor, and the motor freewheels to a stop at a rate determined by the inertia of the load. However, the start rate is determined by drive’s Accel setting.

The common of the SPDT switch is connected to control pot High, and is switched between Speed Pot High (P1-6) and the Inhibit pin (P3). To inhibit (stop motor), Speed Pot High is closed to the Inhibit pin. To restart, return the switch to Speed Pot High.

Fast Sop. Soft Start (thru accel range):



-
- 1) IN THE EVENT OF SCR FAILURE OR FALSE TRIGGERING, THE INHIBIT CIRCUIT WILL NOT STOP THE MOTOR.
 - 2) ALWAYS USE SHIELDED WIRE WHEN CONNECTING TO THE INHIBIT TERMINAL, AND CONNECT THE SHIELD TO THE -ARMATURE OR COMMON OF THE DRIVE.
-

OPERATIONAL DESCRIPTION: 0 TO 10 VDC ANALOG REFERENCE SIGNAL TO GSD4

IronHorse GSD4 drives, though advertised to work with a 0 to 10 volt reference, exhibit an offset in output response when used in this manner. With 0 to 10 VDC connected to the GSD4 drive, output voltage is zero volts until the analog reference value reaches two volts, where the GSD4 drive output voltage will begin to rise. As the analog reference voltage rises, the GSD4 drive output voltage rises in proportion and linear to the reference. At five volts reference the GSD4 drive output is 50%, and at 10 volts reference the output is 100% of the expected voltage. Adjustments to min and max speed have no effect on the observed behavior.

The installation of a 4.7k Ω resistor across Pot Hi (P2-1) and Pot Lo (P2-3) helps with GSD4 drive output voltage, but is NOT a perfect solution. With the resistor installed, GSD4 drive output voltage is proportional to the lower reference voltage with a linear output response to midscale, where 1 to 5 volts reference equals 10% to 50% output. The problem is that linearity suffers as reference voltage increases. If the drive is linear from 1 to 5 volts then output voltage is low at the top, where 10 volts reference equals roughly 90% output. If adjustments are made to provide 100% output at the top, then the drive ignores the falling reference voltage and runs fast at midscale, where 5 volts reference equals 55% output.

All GSD4 drives have some dead band built into the speed pot circuit which, when a speed pot is used, can be tuned out using the MIN trim pot. The physical connection of a speed pot also provides a current path so that the MIN trim pot is active in the circuit. When using a reference signal connected +Signal to Wiper and -Signal to Pot Lo, the current path for the MIN trim pot is lost and therefore no longer in the circuit; thus the need for a 4.7–5 k Ω resistor from Pot Hi to Pot Lo.

With a 0–10 VDC reference signal input, and with the MIN trim pot active, the MIN trim pot can be turned up to reduce or eliminate the dead band in the bottom end of the signal. However, this also has the effect of shifting the reference signal to effectively be a 2–12 VDC signal. The top of the reference (10–12 VDC) is ignored and the drive response becomes non-linear.

For most applications this is not an issue, as most do not operate in the bottom or top 20% of reference signal / speed range. However, for those applications that do, another fix is to scale the reference signal at the source to keep the effective reference signal always in the 0–10 VDC range. Changing from a 0–10 to a 0–8 VDC signal at the source, and turning up the MIN trim pot ~2V to offset dead band at the bottom, will operate the motor from 0–100% speed with a more linear response.

In applications where the analog offsets described above are unacceptable; the GSDA-AI-V4A or GSDA-AI-V4 analog voltage input cards provide a solution. Reference “GSDA-AI-V4A” on page 28 or “GSDA-AI-V4” on page 30 for more information about these option cards.

START-UP

START-UP FOR GSD4A-240-XC

- 1) Recheck all wiring. Accidental grounds, loose or pinched wires on armature or speed pot wires may damage the DC drive when power is applied.
- 2) Check to see that the incoming power is of the correct voltage.
- 3) Check to make sure the input line voltage jumper selection (JP2) is set to the correct incoming service.
- 4) Check to make sure the 90/180 volt motor jumper selection (JP1) is set to the correct armature motor voltage required.
- 5) Turn the speed pot to zero (fully CCW).
- 6) Turn power on, and advance the speed pot while observing motor. If motor rotation is correct, proceed to step 8. *Power must be turned off again before step 7 can be accomplished!*
- 7) If the motor rotation is incorrect, turn power off at external disconnect, and reverse the +ARM and -ARM connections.
- 8) Check for satisfactory operation throughout the speed range.
- 9) If operation is satisfactory, no readjustments are needed.
- 10) If additional control tuning and setup are needed, refer to the “Trim Pot Adjustments” section.”
- 11) For other problems, consult the “Troubleshooting” section.

START-UP FOR GSD4-24X-XC

- 1) Recheck all wiring. Accidental grounds, loose or pinched wires on armature or speed pot wires may damage the DC drive when power is applied.
- 2) Check to see that the incoming power is of the correct voltage.
- 3) Turn the speed pot to zero (fully CCW).
- 4) Turn power on, and advance the speed pot while observing motor. *Power must be turned off again before step 5 can be accomplished!*
- 5) If the motor rotation is incorrect, turn power off at external disconnect, and reverse the +ARM and -ARM connections.
- 6) Check for satisfactory operation throughout the speed range.
- 7) *If operation is satisfactory, no readjustments are needed.*
- 8) If instability or surging is observed, or if maximum speed is higher than desired, refer to the “Trim Pot Adjustments” section.”
- 9) For other problems, consult the “Troubleshooting” section.

START-UP FOR GSD4-240-10N4X

- 1) Safety Precautions:
 - a) Observe the normal safety precautions for the voltages involved. We strongly suggest that only qualified electricians or service people should install, troubleshoot, maintain, or service the drive, motor, and interconnect wiring.
 - b) Be sure power is disconnected or shut OFF at fuse box or circuit breaker when installing the drive and making adjustments (except running adjustments).
 - c) Remove the load from motor (or gearmotor) before running it.
 - d) Use an insulated screwdriver to make trim pot adjustments.



WHEN MAKING RUNNING ADJUSTMENTS, BE VERY CAREFUL NOT TO TOUCH ANY COMPONENTS EXCEPT THE ADJUSTING POTS.

- 2) On the drive front panel, turn the drive ON-OFF switch to off and set the drive pot knob fully counterclockwise (CCW) and check line fuse. The fuse should be as specified by the Fuse Selection Table.
- 3) Check all the connections at the drive terminals and at the motor. Make sure that they are tight and are made according to the “Installation and Wiring” section.
- 4) Rotate the motor’s shaft manually to make sure it turns freely. A slight resistance may be noticed.
- 5) Turn the drive ON-OFF switch to the ON position and then slowly turn the Speed Control knob clockwise (CW) while observing direction of motor rotation. If opposite direction of rotation is desired, correct by turning OFF the drive and then reverse the motor armature connections.
- 6) With AC line power and control back ON, slowly turn Speed Control knob fully CW while observing the motor. Motor should accelerate smoothly to top speed.
- 7) Turn OFF control and AC power to drive.
- 8) Reconnect the motor load that the motor will normally drive.
- 9) Turn AC power and the drive back ON and adjust the trim pots as shown below for the motor horsepower and voltage being used.

	CL	IR	MAX	MIN	HP
GSD-240-10NX4					1/8
					1/4
INPUT 120 VAC					1/3
					1/2
OUTPUT 0-90 VDC					3/4
					1.0

Operation of the control beyond ±10% of the normal line voltage could result in re-adjustment. These adjustments are permanent; periodic re-adjustment is normally not needed.

	CL	IR	MAX	MIN	HP
GSD-240-10NX4					1/4
					1/3
INPUT 230 VAC					1/2
					3/4
OUTPUT 0-180 VDC					1.0
					1.5
					2.0

- 10) Test the drive and motor under actual operating and load conditions; run the motor through the entire range of speeds required while it is fully loaded. Check motor speed with a tachometer. If control/motor performance is still not satisfactory, continue adjusting the control by following the procedures given in the “GSD4-240-10N4X Trim Pot Adjustment” section.

TRIM POT ADJUSTMENTS

NOTE: A DC motor must be connected to the drive in order to make accurate trim pot adjustments.

If the system is unstable after the previous Start-Up procedure, then adjust the trim pots as described in this section.

GSD4A-240-xC TRIM POT ADJUSTMENT

GSD4A-240-xC Trim Pot Adjustment		
Trim Pot	Function	Adjustment
Min	Sets minimum motor speed when speed pot is set at zero. CW rotation will increase minimum motor speed.	<ol style="list-style-type: none"> 1) Set Speed pot to zero (fully CCW). 2) Rotate MIN trim pot CW until motor starts to rotate. 3) Slowly rotate MIN trim pot CCW until motor stops. <p>NOTE: If motor rotation is desired, rotate MIN trim pot CW until desired MIN speed is reached.</p>
IR Comp	Provides a means of improving motor speed regulation in the armature feedback mode. If a constant output voltage is desired, or if some speed loss with increased load is of no concern, then rotate this trimpot fully CCW.	<ol style="list-style-type: none"> 1) Set Speed pot at 50%. 2) Observe motor speed at no load condition. 3) Apply full load to motor. 4) Turn IR COMP trim pot CW to obtain the same motor speed as with no load.
Max	Sets maximum motor speed when speedpot is set at maximum (full CW rotation). CW rotation of MAX trimpot increases maximum motor speed. NOTE: MAX trimpot settings that result in output voltage greater than the motor rating may result in unregulated speeds at full load and higher than normal motor temperatures.	<ol style="list-style-type: none"> 1) TURN DRIVE POWER OFF!! 2) Connect a DC Voltmeter: + to +ARM; - to -ARM. NOTE: Meter must not be grounded! 3) Set meter voltage range: (90 VDC for 120 VAC; 180 VDC for 240 VAC). 4) Turn power on. Set Speed pot at 100%. 5) Observe output voltage on meter and adjust the max trimpot until desired maximum voltage is reached. A tachometer may be used in lieu of a voltmeter to set max output speed. NOTE: Do not exceed motor ratings.
Cur Lim	Limits DC motor armature current (torque) to prevent damage to the motor or control. The current limit is set for the rated motor current. CW rotation of this trim pot increases the armature current (or torque produced).	<ol style="list-style-type: none"> 1) TURN DRIVE POWER OFF! 2) Connect a DC Ammeter between A1 on motor and +ARM on drive. This is in series with the motor. 3) Turn power on. 4) Set Speed pot at the 50% position. 5) Apply friction braking to motor shaft until motor stalls. 6) With motor output shaft locked safely in a stalled position, set current at 125% of rated motor armature current by adjusting CUR. LIM. trim pot.
ACCEL	Sets the amount of time it takes the motor to go from the minimum set speed to the maximum set speed. The range of this setting is 0.5 to 8 seconds. CW rotation increases the Accel time. Full CCW is 0.5 seconds.	<ol style="list-style-type: none"> 1) Set Speedpot to zero (fully CCW). 2) Rotate Accel trimpot CW to desired setting based on 0.5-8 seconds 3) Set Speedpot to full CW and time the acceleration to full speed. 4) If a slower acceleration and longer time frame is need then rotate Accel trimpot CW.
DECEL	Sets the amount of time it takes the motor to go from the maximum set speed to the minimum set speed. The range of this setting is 0.5 to 6 seconds. CW rotation increases the Decel time. Full CCW is 0.5 seconds.	<ol style="list-style-type: none"> 1) Set Speedpot to full on (fully CW). 2) Rotate Decel trimpot CW to desired setting based on 0.5-6 second range. 3) Set Speedpot to full CCW and time the deceleration to zero speed. 4) If a slower deceleration and longer time frame is need then rotate Decel trimpot CW.

GSD4-24A-5C TRIM POT ADJUSTMENT

GSD4-24A-5C Trim Pot Adjustment *		
Trim Pot	Function	Adjustment
Min	Sets minimum motor speed when speed pot is set at zero. CW rotation will increase minimum motor speed.	1) Set Speed pot to zero (fully CCW). 2) Rotate MIN trim pot CW until motor starts to rotate. 3) Slowly rotate MIN trim pot CCW until motor stops. NOTE: If motor rotation is desired, rotate MIN trim pot CW until desired MIN speed is reached.
IR Comp	Provides a means of improving motor speed regulation in the armature feedback mode. If a slowdown due to load change is of no concern, rotate this trim pot fully CCW.	1) Set Speed pot at 50%. 2) Observe motor speed at no load condition. 3) Apply full load to motor. 4) Turn IR COMP trim pot CW to obtain the same motor speed as with no load.
Max	Sets maximum motor speed when speed pot is set at maximum (fully CW rotation). CW rotation of MAX trim pot increases maximum motor speed.	1) TURN DRIVE POWER OFF!! 2) Connect a DC Voltmeter: + to +ARM; - to -ARM. NOTE: Meter must not be grounded!! 3) Set meter voltage range: (90 VDC for 120 VAC; 180 VDC for 240 VAC). 4) Turn power on. Set Speed pot at 100%. 5) Adjust MAX trim pot to rated motor armature voltage as shown on meter. NOTE: A tachometer or strobe may be used in lieu of a meter. Follow above steps, except adjust MAX trim pot to rated motor base speed indicated by tachometer or strobe.
Cur Lim	Limits DC motor armature current (torque) to prevent damage to the motor or drive. The current limit is set for the rated motor current. CW rotation of this trim pot increases the armature current (or torque produced).	1) TURN DRIVE POWER OFF! 2) Connect a DC Ammeter between A1 on motor and +ARM on drive. This is in series with the motor. 3) Turn power on. 4) Set Speed pot at the 50% position. 5) Apply friction braking to motor shaft until motor stalls. 6) With motor stalled, set current at 125% of rated motor armature current by adjusting CUR. LIM. trim pot.

* This adjustment procedure is only for the GSD4-24A-5C DC Drive. Adjustments are done with motor connected to drive.

GSD4-240-5C TRIM POT ADJUSTMENT

Settings apply when using a 5K ohm master speedpot. This chart is used in conjunction with the adjustment procedure and is approximate.					
	C.L.	I.R.	MAX	MIN	HP
GSD4-240-1C 120 VAC input; 0-90 VDC output					1/50
					1/20
					1/8
GSD4-240-5C 120 VAC input; 0-90 VDC output					1/8
					1/4
					1/3
					1/2
					3/4*
					1.0*
Operation of the control beyond ±10% of the normal line voltage could result in re-adjustment. These adjustments are permanent; periodic re-adjustment is normally not needed.					

Settings apply when using a 5K ohm master speedpot. This chart is used in conjunction with the adjustment procedure and is approximate.					
HP	C.L.	I.R.	MAX	MIN	
1/20					GSD4-240-1C 240 VAC input; 0-180 VDC output
1/8					
1/4					
1/4					GSD4-240-5C 240 VAC input; 0-180 VDC output
1/3					
1/2					
3/4					
1.0					
1.5*					
2.0*					

* ADDITIONAL CUSTOMER HEATSINK REQUIRED for GSD4-240-5C with 120 VAC input & motors > 1/2 hp, and with 240 VAC input & motors > 1hp. Extrusion temperatures must not exceed 70 °C.

GSD4-240-10N4X TRIM POT ADJUSTMENT

Use the applicable sections of the following procedures if the “Start-Up” procedures did not provide satisfactory motor/control performance. Follow the Safety Precautions given in the “Start-Up” section.

MAX SETTING

If a different maximum speed or voltage is desired, adjust the MAX trim pot (on circuit board) as follows:

- 1) Turn ON AC power to the control.
- 2) Set Speed Control knob fully (100%) CW.
- 3) Check motor speed and voltage with a tachometer and a DC Voltmeter.
- 4) Using an insulated handle screwdriver, adjust the MAX trim pot on the drive PC board. CW adjustment of the pot increases the maximum output to the motor; CCW adjustment decreases the maximum output to the motor.
NOTE: Do not increase maximum motor speed above 1800 RPM for motors rated at 1725 RPM.
Do not operate motor continuously above the rated DC voltage.

MIN SETTING

If a minimum speed is desired, adjust as follows:

- 1) Turn ON AC power to the drive.
- 2) Turn Speed Control knob CCW as far as possible.
- 3) Check motor output speed or voltage
- 4) Adjust the MIN trim pot on the drive PC board. CW adjustment of the pot increases output to the motor; CCW adjustment decreases.
NOTE: Typically the MIN pot should be set at Deadband which is the point in the CW rotation just before getting an output.

IR SETTING

If better speed regulation is needed, then adjust the IR pot as follows:

- 1) Set speed at 50%.
- 2) Check speed with Tach at no load.
- 3) Apply normal load to the motor.
- 4) Adjust the IR pot CW to increase speed regulation or CCW to decrease speed regulation until loaded motor speed is equal to unloaded motor speed.

CUR LIM SETTING

Limits DC motor current to prevent damage to the motor or drive. CW rotation of this trim pot increases the maximum allowable armature current (or torque produced). To set:

- 1) Connect a DC current meter between A1 on motor and +ARM on the control (in series with the motor).
- 2) Set Speed pot at 50% or above.
- 3) Turn CL trim pot full CCW.
- 4) Stall and lock motor shaft so it can not spin.
- 5) With motor stalled, set current at 125% of rated motor current by adjusting CL trim pot CW.

ACCEL/DECEL SETTING

Individually Adjustable Linear Accel and Decel. These trim pots provide independently adjustable linear accel and decel from 0.5 to 8.0 seconds. Adjustment of both trim pots are accomplished via the labeled access holes on adder board. Full CCW rotation equals minimum accel or decel time, and full CW rotation equals maximum accel or decel time. Note: Each trim pot operates independently of the other.

TROUBLESHOOTING (GSD4A/GSD4 MODELS)

If a newly installed DC Drive will not operate, it is likely that a terminal connection is loose. Check the terminal connections and ensure that they are secure and correct. If the drive is still inoperative, refer to the Troubleshooting table below.

Troubleshooting		
Problem	Possible Cause(s)	Corrective Action
Motor doesn't run	<ol style="list-style-type: none"> 1) Blown fuse or circuit breaker 2) Incorrect or no power 3) Speed pot set at zero 4) Worn motor brushes 	<ol style="list-style-type: none"> 1) Replace fuse or reset breaker 2) Install proper power service 3) Rotate Speed pot CW to start 4) Replace motor brushes
Armature output voltage cannot be adjusted; output is a constant DC level Motor stalls, or runs very slowly with speed control set fully CW	<ol style="list-style-type: none"> 1) No motor or load connected 2) Speed pot low connection open 3) Low voltage 4) Overload condition 5) Worn motor brushes 6) Max speed set incorrectly 	<ol style="list-style-type: none"> 1) Ensure that motor or load is connected to armature terminals 2) Ensure that Speed pot Low wire is connected 3) Ensure that VAC is above 100VAC 4) Reduce load or increase motor size Current Limit setting 5) Replace brushes 6) Consult "Trim Pot Adjustments" section
Motor "hunts"	<ol style="list-style-type: none"> 1) Motor current less than 150 mA 2) Too much IR Comp 3) Motor is in Current Limit 4) Motor speed is above rated speed 5) Max set too high 	<ol style="list-style-type: none"> 1) Motor current must be greater than 150 mA (DC) 2) Consult "Trim Pot Adjustments" section 3) Consult "Trim Pot Adjustments" section 4) Reduce speed 5) Consult "Trim Pot Adjustments" section
Repeated fuse blowing	<ol style="list-style-type: none"> 1) Low voltage 2) Overload condition 3) Worn motor brushes 4) Defective motor bearings 5) Defective electrical components 	<ol style="list-style-type: none"> 1) Ensure that VAC is above 100 VAC for 120V systems and above 200V for 240V systems 2) Reduce load – disconnect to test 3) Replace brushes 4) Replace bearings 5) Contact AutomationDirect "Product Returns" for replacement

GSD4A SERIES ACCESSORIES



NOTE: THERE ARE ONLY FIVE ACCESSORIES THAT CAN BE USED WITH BOTH GSD4A AND GSD4 DRIVES: GSDA-5K (REPLACEMENT POTENTIOMETER), GSDA-DP (DIGITAL POTENTIOMETER), GSDA-MREV (MANUAL REVERSE SWITCH), GSDA-DP-S (SIGNAL CONDITIONER), AND GSDA-DP-D (CLOSED LOOP DIGITAL POTENTIOMETER). ALL OTHER ACCESSORIES ARE ONLY COMPATIBLE WITH EITHER GSD4A OR GSD4 DRIVES.

GSDA-5K

Spare/Replacement potentiometer for all GSD4A and GSD4-24x-xxxxx DC drives.
For installations instructions, please refer to product insert sheet at AutomationDirect.com.

GSDA-DP

Optional digital potentiometer for all GSD4A and GSD4-24x-xxxxx DC drives.
For installations instructions, please refer to product user manual at AutomationDirect.com.

GSDA-MREV

Optional manual reverse switch for all GSD4A and all GSD4-24x-xxxxx DC drives.
For installations instructions, please refer to product insert sheet at AutomationDirect.com.

GSDA-DP-S

Optional signal conditioner for all GSD4A and all GSD4-24x-xxxxx DC drives.
For installations instructions, please refer to product insert sheet at AutomationDirect.com.

GSDA-DP-D

Optional closed loop digital potentiometer for all GSD4A and all GSD4-24x-xxxxx DC drives.
For installations instructions, please refer to product insert sheet at AutomationDirect.com.

GSDA-AI-V4A

Isolated Current/Voltage Analog Input Module for GSD4A Series DC Drives

For installation and operation instructions, please refer to product insert sheet at AutomationDirect.com.

GSDA-RTU-4A

Modbus RTU Communications Card for GSD4A Series DC Drives

For installation and operation instructions, please refer to product insert sheet at AutomationDirect.com.

GSDA-HTSNK-4A

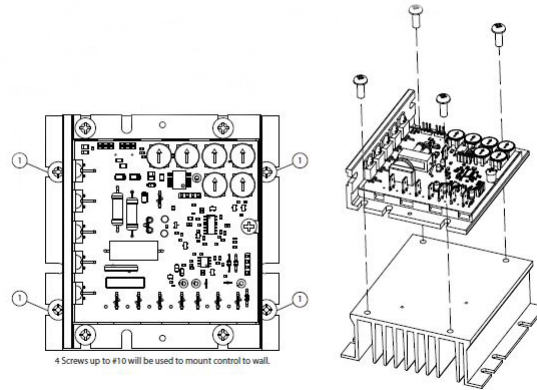
Optional heat sink for GSD4A Series DC Drives.

Increases the output current capability.

MOUNTING AND INSTALLATION REQUIREMENTS:

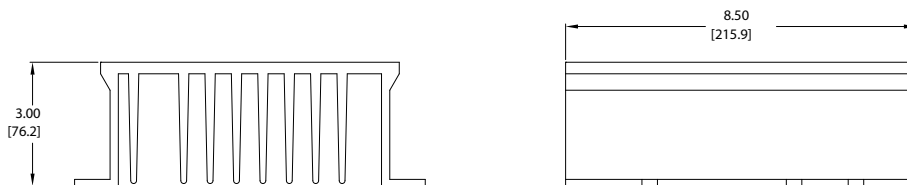
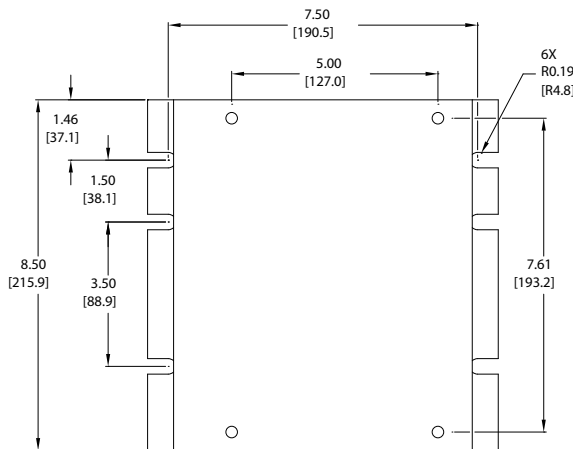
For increased load ratings the heatsink must be mounted with the fins in a vertical orientation.

- 1) Secure heatsink to base of GSD4A drive using four (4) #10 x 3/4" AB type screws (included) as shown in the illustration to the right.



GSDA-HTSNK-4A

DIMENSIONS (in [mm])



GSD4 SERIES ACCESSORIES



NOTE: THERE ARE ONLY FIVE ACCESSORIES THAT CAN BE USED WITH BOTH GSD4A AND GSD4 DRIVES: GSDA-5K (REPLACEMENT POTENTIOMETER), GSDA-DP (DIGITAL POTENTIOMETER), GSDA-MREV (MANUAL REVERSE SWITCH), GSDA-DP-S (SIGNAL CONDITIONER), AND GSDA-DP-D (CLOSED LOOP DIGITAL POTENTIOMETER). ALL OTHER ACCESSORIES ARE ONLY COMPATIBLE WITH EITHER GSD4A OR GSD4 DRIVES.

GSDA-5K

Spare/Replacement potentiometer for all GSD4A and GSD4-24x-xxxxx DC drives.

For installations instructions, please refer to product insert sheet at AutomationDirect.com.

GSDA-DP

Optional digital potentiometer for all GSD4A and GSD4-24x-xxxxx DC drives.
 For installations instructions, please refer to product user manual at AutomationDirect.com.

GSDA-MREV

Optional manual reverse switch for all GSD4A and all GSD4-24x-xxxxx DC drives.
 For installations instructions, please refer to product insert sheet at AutomationDirect.com.

GSDA-DP-S

Optional signal conditioner for all GSD4A and all GSD4-24x-xxxxx DC drives.
 For installations instructions, please refer to product insert sheet at AutomationDirect.com.

GSDA-DP-D

Optional closed loop digital potentiometer for all GSD4A and all GSD4-24x-xxxxx DC drives.
 For installations instructions, please refer to product insert sheet at AutomationDirect.com.

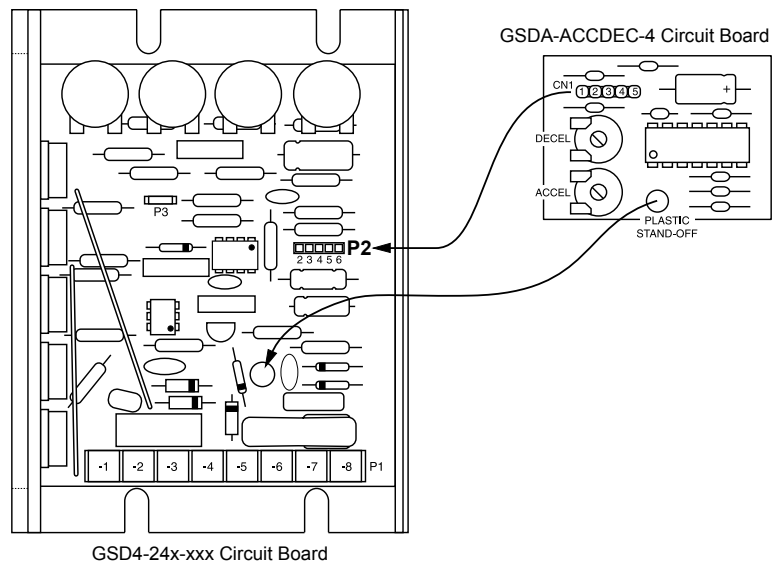
GSDA-AI-A

Optional analog current input card for open-frame GSD4-24x-xC DC drives only.
 For installations instructions, please refer to product insert sheet at AutomationDirect.com.

GSDA-ACCDEC-4

Optional individually-adjustable linear accel and decel card for open-frame GSD4-24x-xC DC drives only.

This option card plugs into the five position expansion connector on the GSD4 main circuit board. The GSDA-ACCELDEC-4 option card overrides the fixed accel ramp built into the GSD4 drive, providing independently adjustable linear acceleration and deceleration from 0.5 to 8.0 seconds. To install, flip over the option card so that the printed circuit lines are visible. Align the male connector CN1 (option card) with the female connector P2 (GSD4 drive) so terminal CN1-1 fits into P2-6, CN1-2 into P2-5, etc. Align the plastic stand-off on the option card with the hole shown on the GSD4 main board. Once connectors and stand-off are aligned, snap into place. Adjustment of both trim pots is accomplished via the labeled access holes on the back side of the option card. Full CCW rotation equals minimum accel or decel time, and full CW rotation equals maximum accel or decel time. Each trim pot operates independently of the other.



NOTE: CONTROLLED DECELERATION WITH THE GSDA-ACCDEC-4 DURING A STOP REQUIRES THE USE OF A RELAY CONTACT IN THE SPEED POT CIRCUIT OF THE GSD4 DRIVE. INSTALL A NORMALLY-OPEN RELAY CONTACT BETWEEN THE WIPER (RED WIRE) AND TERMINAL P1-7 OF THE GSD4 DRIVE. OPENING THE CONTACT WILL TURN OFF THE SPEED REFERENCE SIGNAL, COMMANDING THE DRIVE TO ZERO SPEED AT A DECELERATION RATE SET IN THE GSDA-ACCDEC-4. REMOVING POWER FROM THE DRIVE OR USING THE INHIBIT FEATURE OF THE DRIVE WILL RESULT IN A COAST STOP OF THE MOTOR WITHOUT CONTROLLED DECELERATION.

GSDA-AI-V4

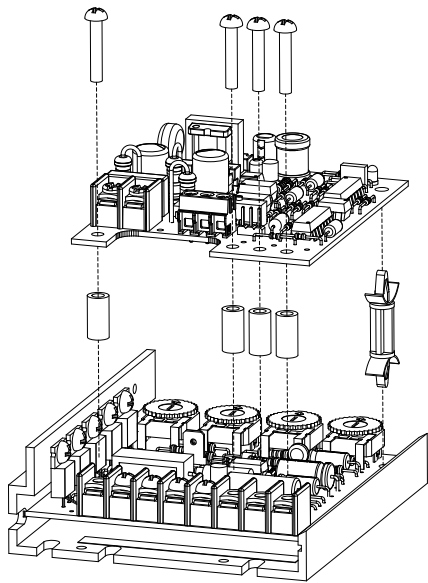
Optional analog voltage signal card for 240V open-frame GSD4-240-xC DC drives only

This option card allows for the use of either a grounded or non-grounded remote DC signal such as 0–5 VDC through 0–250 VDC, 4–20mA current, or a remote speed pot. The DC input signal type can be selected for voltage (Vin) or current (4–20mA) via the JP2 jumper clip. There is a Hi/Lo range jumper selection that should be set to the (Lo) setting when using a 4–20mA signal or voltage ranges of 0–5 VDC through 0–24 VDC or less. When using voltage ranges of 0–25 VDC through 0–250 VDC, this jumper must be set to (Hi). The GAIN trim pot is used to set full linear output in reference to the input signal range. The output of this remote signal isolation board is a linear signal that is proportional to the remote input signal being supplied.

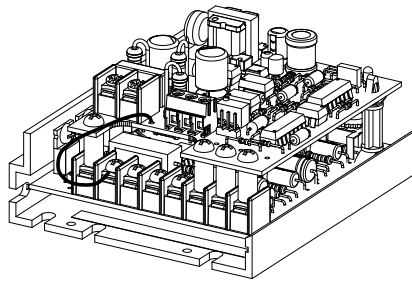
Items supplied with the GSDA-AI-V4 optional input card:

- (1) option card with (1) black wire and (1) plastic standoff attached
- (4) spacers (0.25 x 0.5 in)
- (4) Phillips-head screws (#6-32 x 0.75 in)

GSDA-AI-V4 MOUNTING AND WIRING



- 1) Remove (4) screws from GSD4 terminal block for AC1(L), HI, W, and LO connections.
- 2) Place (4) 3/4-in screws through GSDA-AI-V4 option board and spacers, and screw into place in GSD4 terminals.
- 3) Snap plastic standoff into GSD4 circuit board.
- 4) Connect pre-installed black wire from option board to GSD4 screw terminal AC2(N).

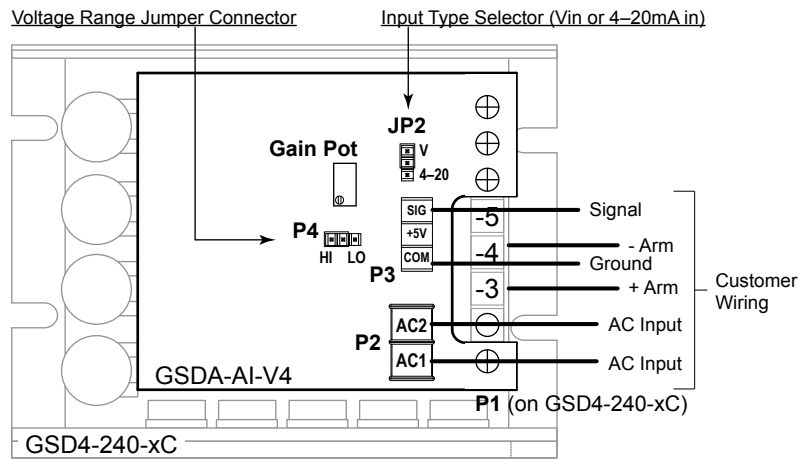


GSDA-AI-V4 SETUP PROCEDURE

- 1) With NO power to the drive, connect a DC voltmeter to drive outputs as follows: Meter COMMON to the -ARM terminal, and Meter POSITIVE to the +ARM terminal. Select correct meter range (0–90V or 0–180V).
- 2) Preset GAIN pot on the remote signal board fully CCW.
- 3) Place the JP2 jumper clip in the proper position based on the input signal being used.
- 4) Place the P4 jumper clip in the Lo position for 4–20mA signals or voltage signals less than 25VDC. Place the P4 jumper clip in the Hi position for voltage signals greater than 25VDC. (NOTE: Never exceed 250VDC)
- 5) Ensure that all connections are properly made per the wiring connection diagram, and then apply the proper AC power to the controller.
- 6) Set the remote input signal to its lowest setting. Adjust the MIN trim pot to deadband (the point just before an increase causes an output).
- 7) Apply the maximum remote input signal. Motor should start to run. Adjust the GAIN pot CW until no further increase in drive output voltage occurs, and then decrease the gain pot slowly until output voltage to the motor drops approximately 5VDC.
- 8) Set the MAX trim pot on the drive to the correct motor voltage.
- 9) Some interaction between trim pots may occur. Recheck the Min trim pot setting and repeat steps 6 through 8 as needed.

GSDA-AI-V4 WIRING DIAGRAM

Diagram



Terminal Connections

- Terminal P1** (on GSD4-240-xC)
- #3 = +ARM
 - #2 = connect JU4 pre-installed black jumper wire from GSDA-AI-V4 (not shown on drawing)
 - #4 = -ARM
- Terminal P2** (on GSDA-AI-V4)
- AC1 = customer AC input, L1
 - AC2 = customer AC input, N or L2
- Terminal P3** (on GSDA-AI-V4)
- COM = customer analog common
 - +5V = no customer connection
 - SIG = customer analog signal
- Jumper P4** (on GSDA-AI-V4)
- Set to Lo for 4–20mA input or 0–5 ≤ V ≤ 0–25 input
 - Set to Hi for 0–25 < V < 0–250 input
- Jumper JP2** (on GSDA-AI-V4)
- Set to V for voltage input
 - Set to 4–20 for current input

GSDA-HTSNK-4

Optional heat sink for open-frame GSD4-24x-xC DC drives only. Increases the output current capability for GSD4-xxx-xC drives. Increases the output current capability to 10A for GSD4-240-5C drives (*for non-UL applications only*).

GSDA-HTSNK-4 DIMENSIONS (in [mm])

