GSD1 Series DC Drives

GSD1 Introduction

GSD1-48-10N4X

GSD1-48-xxC

GSD1-24-15N4X-R

GSD1 Series DC Drives	
12VDC @ 10A	*1/50 – 1/8 hp motor*
24VDC @ 10A	*1/50 – 1/4 hp motor*
36VDC @ 10A	*1/50 – 3/8 hp motor*
48VDC @ 10A	*1/50 – 1/2 hp motor*
12VDC @ 20A	*1/50 – 1/4 hp motor*
24VDC @ 20A	*1/50 – 1/2 hp motor*
36VDC @ 20A	*1/50 – 3/4 hp motor*
48VDC @ 20A	*1/50 – 1 hp motor*

Overview

IronHorse GSD1 series DC drives are high-performance Pulse-Width-Modulated (PWM) controllers for 12- to 48-volt equipment, providing smooth control with high-efficiency operation.

The advanced design permits a substantial increase in equipment running time between charges compared to systems using conventional techniques.

Features include adjustable maximum speed, minimum speed, current limit, I.R. compensation, and acceleration. The adjustable current-limit feature protects the control, battery, and motor from sustained overloads.

GSD1 series DC drives are available in open-frame and NEMA 4X enclosed styles, and all come standard with a speed pot, knob, and dial plate.

GSD1 series DC drives are available in 10A and 20A versions. A jumper on the drive selects 12, 24, 36 or 48V operating voltage.

Features

- Provides smooth variable speed capability for mobile equipment
- Automatic compensation holds motor speed steady even if the load varies or battery voltage declines.
- Speed regulation is ±1% of base speed
- Adjustable maximum speed
- Adjustable minimum speed
- Adjustable IR compensation
- Adjustable current limit
- Adjustable acceleration speed
- 5kΩ speed pot with leads, knob and dial included
- Speed adjustment using 5kΩ speed pot or optional 0–10VDC* analog input signal
- Inhibit terminal permits optional start-stop without breaking battery / power line

** For 0–10 VDC input signal to GSD1, please refer to "Operational Description – GSD1 – 0 to 10 VDC Analog Reference Signal" at the end of this GSD1 section.*

Accessories

- Replacement speed potentiometer kit
- Digital speed potentiometer (120-240 VAC only)

Detailed descriptions and specifications for GSD accessories are available in the "GSD Series DC Drives Accessories" section.

Typical Applications

- Auger feeders
- Automated door actuators
- Commercial cooking equipment
- Commercial lifts
- Food production
- Industrial pumping systems
- Measurement instruments
- Miniature lathes and mills
- Packaging / material-handling equipment
- Printing and labeling machines
- Small shop machine tools
- Spray / print reciprocating heads

GSD1 Series DC Drives

GSD1 Selection and Specifications

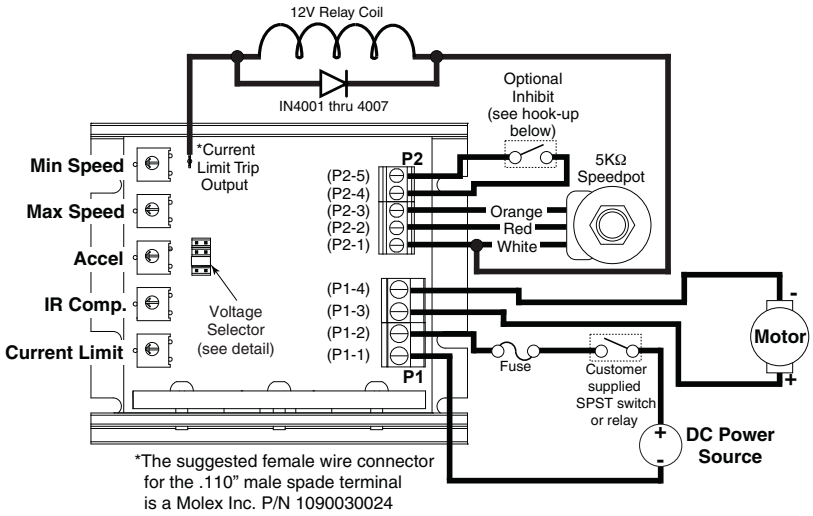
GSD1 Series DC Drives – Selection & Specifications				
Model	***GSD1-24-15N4X-R***	***GSD1-48-10C***	***GSD1-48-10N4X***	***GSD1-48-20C***
Price	$544.00	$217.00	$473.00	$251.00
Package Configuration	NEMA 4X	open frame	NEMA 4X	open frame
Power Quality Form Factor	1.05			
Input Voltage **	12–24 VDC ±15%	12/24/36/48 VDC ±15% (jumper selectable)		
Output Voltage	0–12/24 VDC	0–12/24/36/48 VDC		
Motor Rating (hp)	1/50–5/16	1/50–1/2		1/50–1
Output Current (continuous)	15A (DC)	10A (DC)		20A (DC)
Current Overload Capacity	200% for 10s; 150% for 60s			
Current Limit	Adjustable to 200% of motor Full Load Current, up to 200% of control current rating			
Speed Adjustment ***	5kΩ potentiometer or 0–10VDC*** input signal			
Speed Range	30:1			
Speed Regulation	1% of base speed via adjustable IR compensation trim pot			
Maximum Speed	Adjustable from 50% to 100% of base speed			
Minimum Speed	0–30% of adjustable maximum speed			
Acceleration	Adjustable from 0–10s			
Deceleration	0.5s (non-adjustable)			
Dynamic Braking	No			
Plugging Capability *****	No			
Internal Operating Frequency	18kHz			
Power Connections (P1)	Euro-style terminal block (10–14 AWG)	Euro-style terminal block (14–28 AWG)		Euro-style terminal block (10–14 AWG)
Signal Connections (P2)	Euro-style terminal block (14–28 AWG)			
External Fusing Required	DC-rated @ 150% motor Full Load Current (up to 150% Continuous Output Current rating of drive)			
Operating Temperature	-30 to 65°C [-22 to 140°F] for Chassis -15 to 60°C [5 to 140°F] for Enclosed			
Thermal Protection	None			
Mounting Orientation	Can be mounted in any orientation			
Corrosive Gases	NOT compatible with any corrosive gases			
Package Configuration	Black anodized aluminum extrusion			
Weight	40oz [1049g]	8oz [227g]	40oz [1049g]	8oz [227g]
Agency Approvals	RoHS			
Optional Accessories *				
Replacement Potentiometer	GSDA-5K			
Digital Potentiometer	GSDA-DP / GSDA-DP-D / GSDA-DP-S			
Manual Reverse Switch	GSDA-MREV	n/a		

** For accessories details, refer to the "GSD Series DC Drives Accessories" section.*
*** Input power supply must not exceed recommended voltage, or it may damage the GSD1 drive.*
Linear power supply can be sized per drive voltage and motor full load current.
Switched power supply should be sized per drive voltage and double the motor full load current.
**** For 0–10 VDC input signal to GSD1, please refer to "Operational Description – GSD1 – 0 to 10 VDC Analog Reference Signal" at the end of this GSD1 section.*
***** Plugging is a method of rapidly changing motor direction by reversing motor armature polarity, while the motor is still running.*

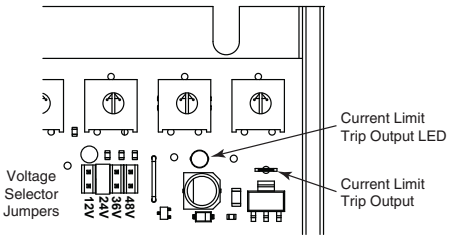
GSD1 Series DC Drives

GSD1 Wiring Diagrams

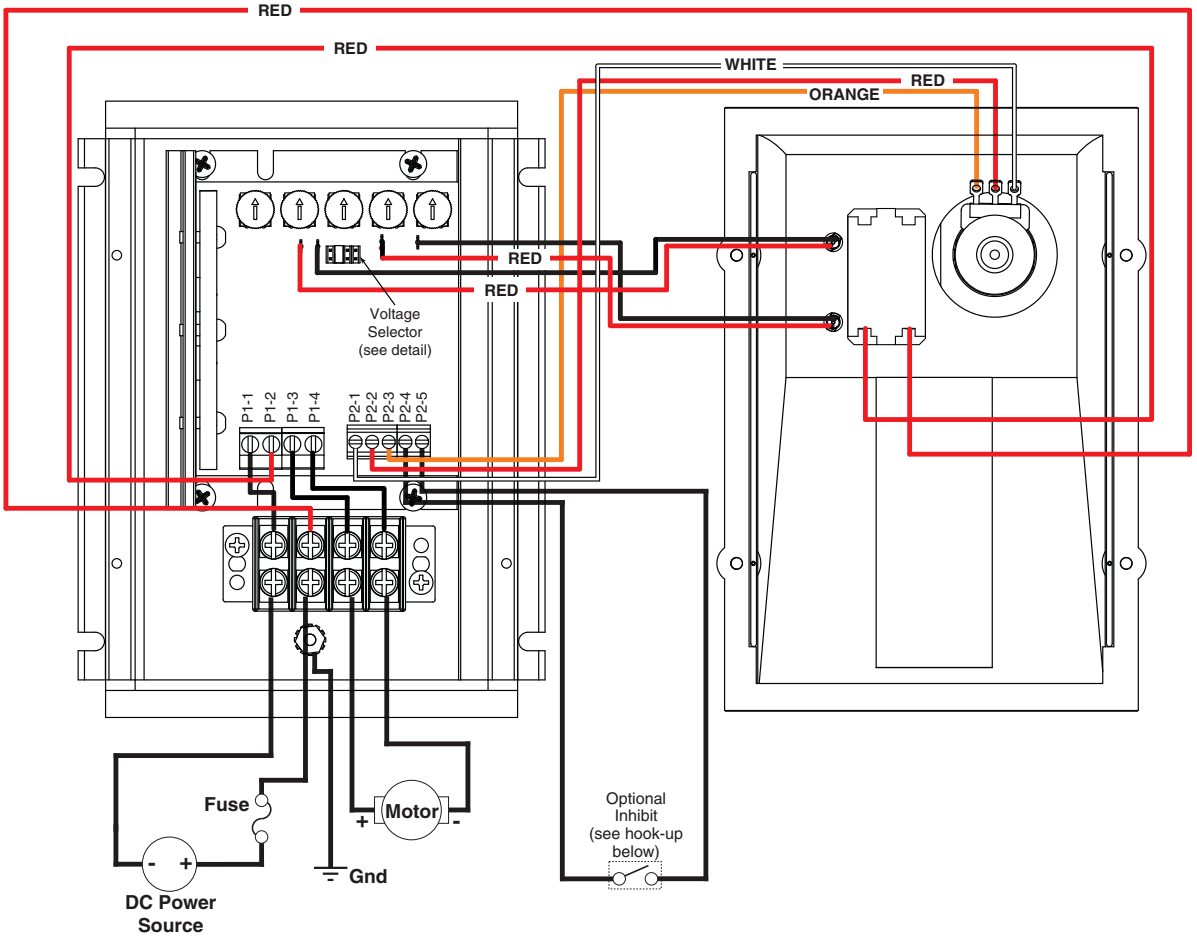
GSD1-48-xxC Basic Wiring Diagram – *(refer to User Manual for more detailed wiring information)*



GSD1 Series Terminals		
Terminal Number	***Description***	***Terminal Marking***
P1-1	– Battery	(–B)
P1-2	+ Battery	(+B)
P1-3	+ Armature	(+A)
P1-4	– Armature	(–A)
P2-1	Potentiometer High	(HI)
P2-2	Potentiometer Wiper	(WP)
P2-3	Potentiometer Low	(LO)
P2-4	Common	(COM)
P2-5	Inhibit	(INH)



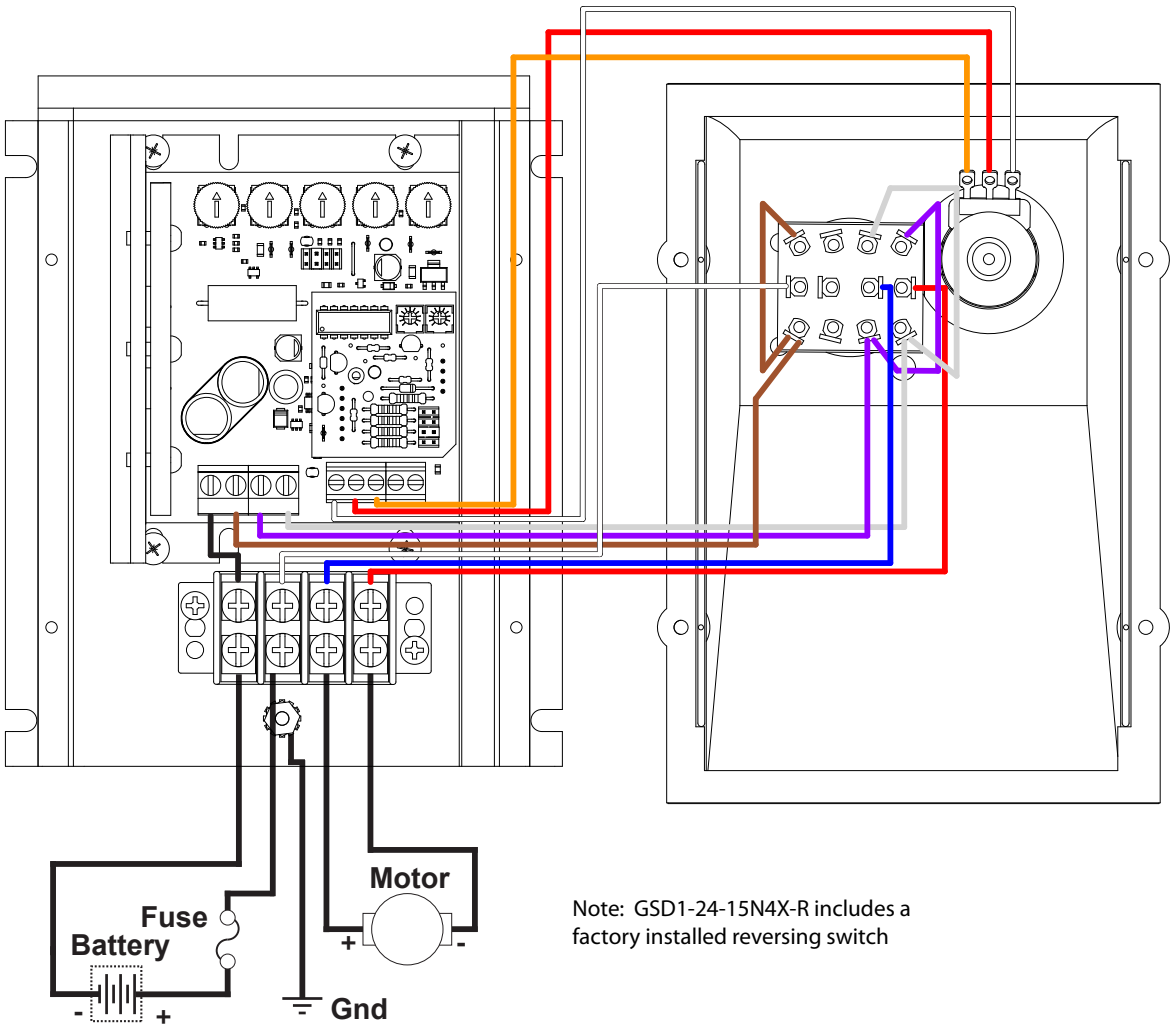
GSD1-48-10N4X Basic Wiring Diagram – *(refer to User Manual for more detailed wiring information)*



GSD1 Series DC Drives

GSD1 Wiring Diagrams

GSD1-24-15N4X-R Basic Wiring Diagram **–** *(refer to User Manual for more detailed wiring information)*

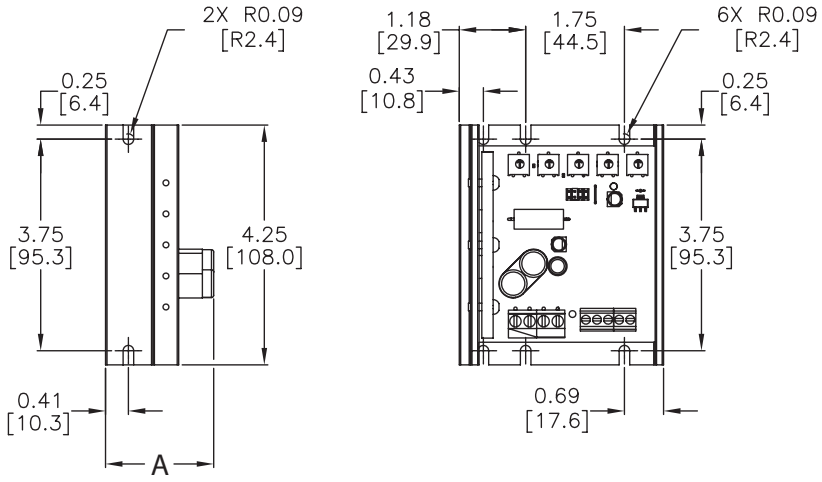


Note: GSD1-24-15N4X-R includes a factory installed reversing switch

GSD1 Series DC Drives

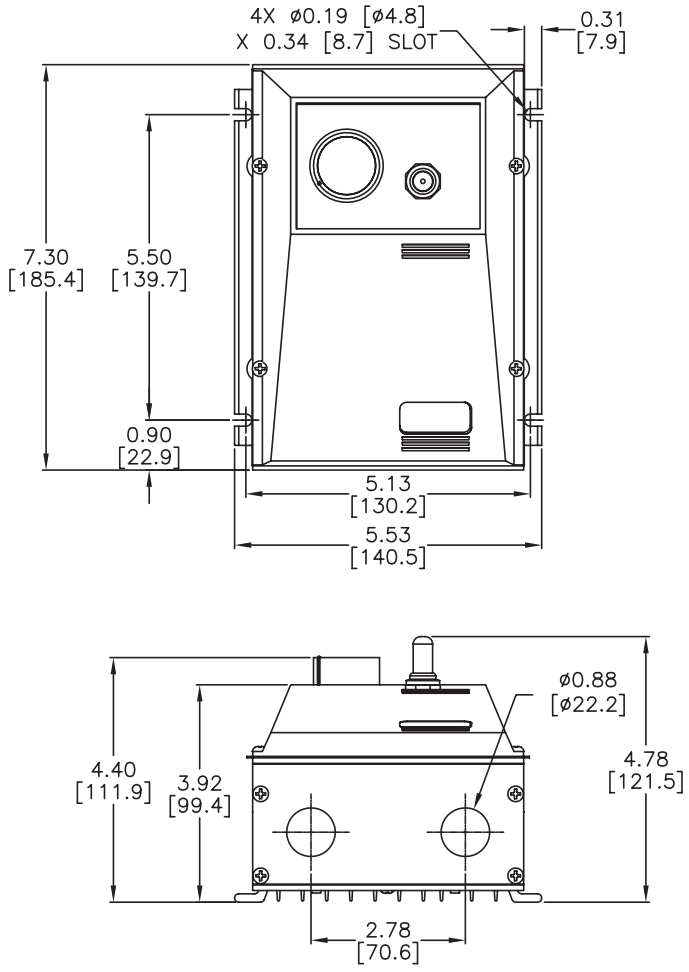
GSD1 Dimensions – *dimensions = in [mm]*

GSD1-48-xxC Dimensions



Model	A
GSD1-48-10C	1.70 [43.1]
GSD1-48-20C	1.92 [48.7]

GSD1-48-10N4X and GSD1-24-15N4X Dimensions



GSD1 Series DC Drives

Operational Description – GSD1 – 0 to 10 VDC Analog Reference Signal

IronHorse GSD1 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 GSD1 drive, output voltage is zero volts until the analog reference value reaches two volts, where the GSD1 drive output voltage will begin to rise. As the analog reference voltage rises, the GSD1 drive output voltage rises in proportion and linear to the reference. At 5 volts reference the GSD1 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 4.7kΩ resistor across Pot Hi (P2-1) and Pot Lo (P2-3) helps with GSD1 drive output voltage, but is NOT a perfect solution. With the resistor installed, GSD1 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 GSD1 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 and a 4.7–5 kΩ resistor from Pot Hi to Pot Lo is needed.

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.

There is NO signal conditioning solution for the performance issue described in the GSD1 drive.