

# GETTING STARTED

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## Contents of this Chapter...

Manual Overview . . . . .	1-2
Overview of this Publication . . . . .	1-2
Who Should Read This Manual . . . . .	1-2
Supplemental Publications . . . . .	1-2
Technical Support . . . . .	1-2
Special Symbols . . . . .	1-2
<i>DURAPULSE</i> AC Drive Introduction . . . . .	1-3
Purpose of AC Drives . . . . .	1-3
Drive Package Contents . . . . .	1-3
Model Explanation . . . . .	1-3
Nameplate Information . . . . .	1-3
External Parts and Labels . . . . .	1-4
<i>DURAPULSE</i> AC Drive Specifications . . . . .	1-5

## Manual Overview

### Overview of this Publication

The *DURAPULSE* AC Drive User Manual describes the installation, configuration, and methods of operation of the *DURAPULSE* Series AC Drive.

### Who Should Read This Manual

This manual contains important information for those who will install, maintain, and/or operate any of the GS3 Series AC Drives.

### Supplemental Publications

The National Electrical Manufacturers Association (NEMA) publishes many different documents that discuss standards for industrial control equipment. Global Engineering Documents handles the sale of NEMA documents. For more information, you can contact Global Engineering Documents at:

**15 Inverness Way East  
Englewood, CO 80112-5776  
1-800-854-7179 (within the U.S.)  
303-397-7956 (international)  
www.global.ihs.com**

NEMA documents that might assist with your AC drive systems are:

- **Application Guide for AC Adjustable Speed Drive Systems**
- **Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems.**

### 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](http://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](http://www.automationdirect.com).

### Special Symbols



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*When you see the “notepad” icon in the left-hand margin, the paragraph to its immediate right will be a special note.*

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**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).**

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# DURAPULSE AC Drive Introduction

## Purpose of AC Drives

AC drives are generally known by many different names: Adjustable Frequency Drives (AFD), Variable Frequency Drives (VFD), and Inverters. Drives are used primarily to vary the speed of three phase AC induction motors, and they also provide non-emergency start and stop control, acceleration and deceleration, and overload protection. By gradually accelerating the motor, drives can reduce the amount of motor startup inrush current.

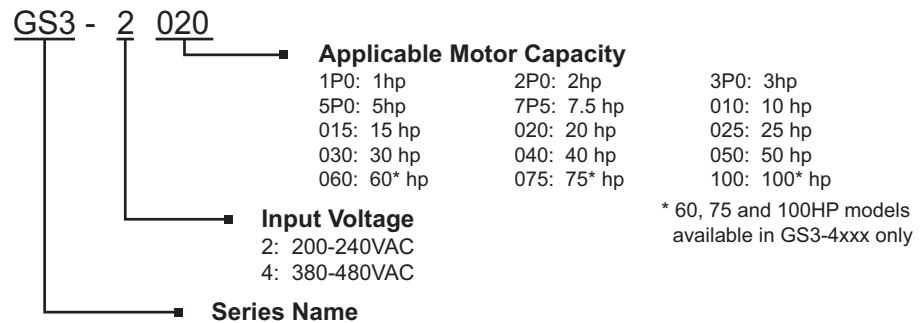
AC drives function by converting incoming AC power to DC, which is then synthesized back into three phase output power. The voltage and frequency of this synthesized output power is directly varied by the drive, where the frequency determines the speed of the three phase AC induction motor.

## Drive Package Contents

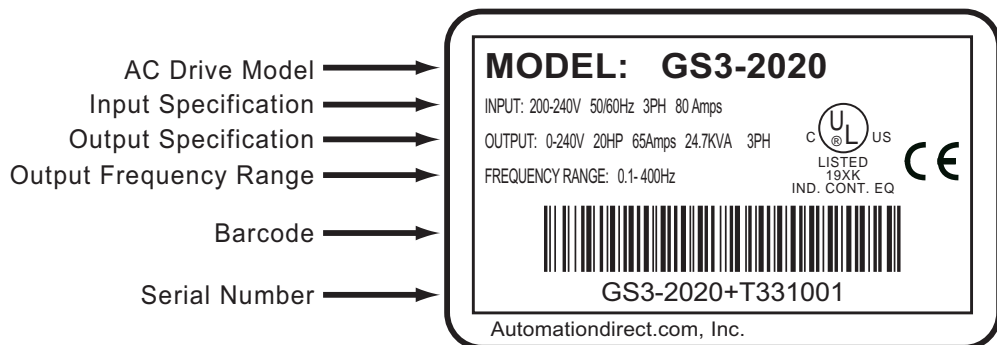
After receiving the AC motor drive, please check for the following:

- Make sure that the package includes an AC drive, the *DURAPULSE* AC Drive User Manual, and the *DURAPULSE* AC Drive Quick Reference.
- Inspect the unit to insure it was not damaged during shipment.
- Make sure that the part number indicated on the nameplate corresponds with the part number of your order.

## Model Explanation

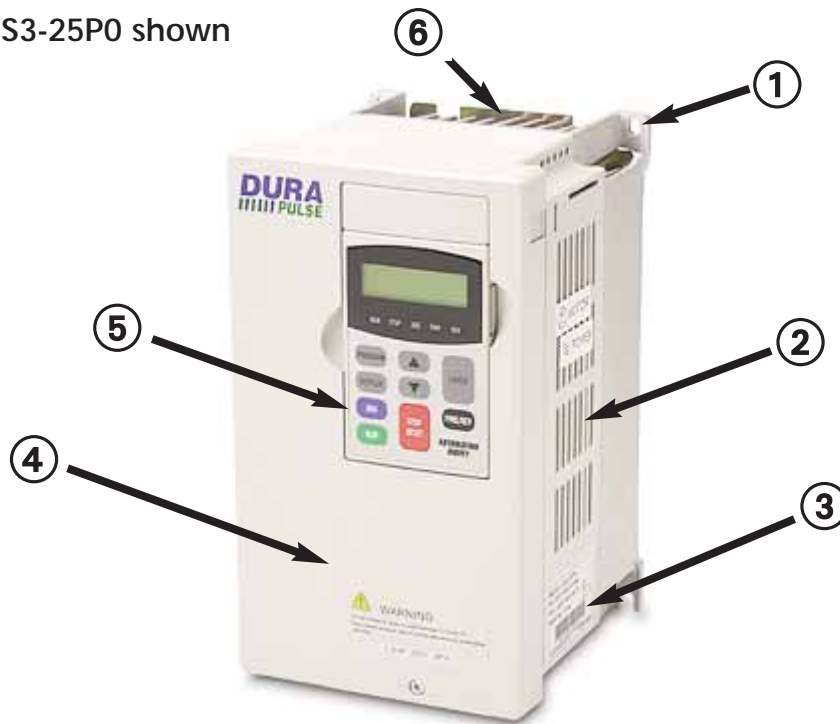


## Nameplate Information

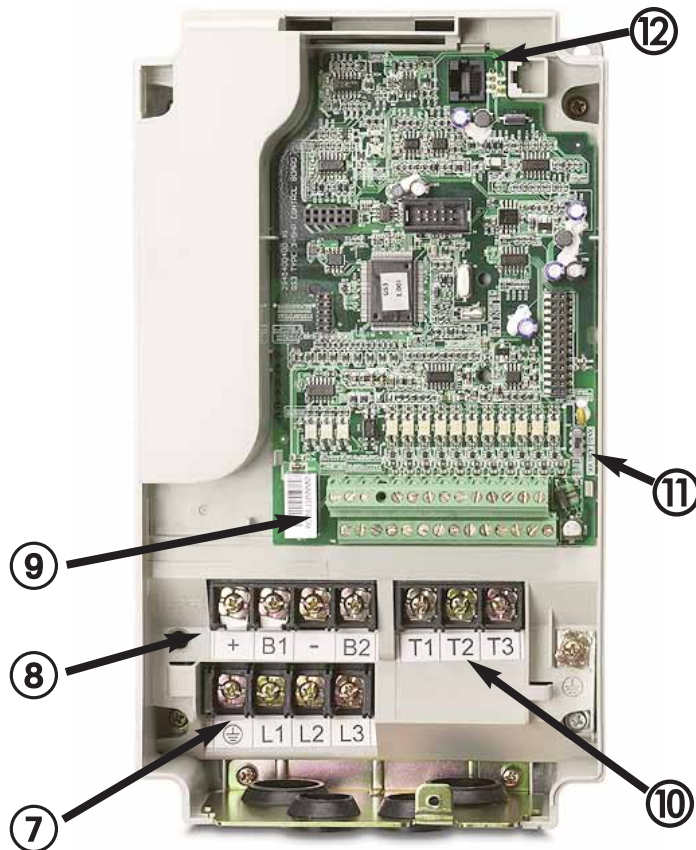


## External Parts and Labels

GS3-25P0 shown



- ① Mounting Screw Holes
- ② Ventilation Slots
- ③ Nameplate Label
- ④ Cover
- ⑤ Digital Keypad
- ⑥ Heat Sink Fins
- ⑦ Input Power Terminals
- ⑧ Braking Terminals
- ⑨ Control Terminals
- ⑩ Output Power Terminals
- ⑪ Input Mode Switch (Sink/Source)
- ⑫ Serial Communication Port



# DURAPULSE AC Drive Specifications



Please review the AutomationDirect Terms and Conditions for this product.  
There is **no** 30-day money-back guarantee on any drive over 10 hp.

230V Class							
Model Name: GS3-xxx			21P0	22P0	23P0	25P0	27P5
Output Rating	Maximum Motor Output	hp	1.0	2.0	3.0	5.0	7.5
		kW	0.75	1.5	2.2	3.7	5.5
	Rated Output Current (A)		5	7	11	17	25
	Maximum Output Voltage		Three-phase 200 to 240V (proportional to input voltage)				
Rated frequency		0.1 to 400 Hz					
* Input Rating	Rated Voltage/Frequency		Single/Three-phase; 50/60 Hz; 200/208/220/230/240 VAC		Three-phase; 50/60 Hz; 200/208/220/230/240 VAC		
	Rated Input Current (A)		11.9 / 5.7	15.3 / 7.6	22 / 15.5	20.6	26
	Voltage/Frequency Tolerance		Voltage: $\pm 10\%$ Frequency: $\pm 5\%$				
	Short Circuit Withstand (SCCR) (A, rms symmetrical)		5kA @ 240 VAC				
Watt Loss 100% I (W)			60	82	130	194	301
Weight (lb [kg])			4.5 [2.034]	4.5 [2.034]	9.4 [4.24]	9.4 [4.24]	13.3 [6.031]
* All 3-phase power sources must be symmetrical. Do not connect DURApulse drives to grounded, center-tapped delta transformers (which are typically used for lighting circuits).							

230V Class (continued)									
Model Name: GS3-xxx			2010	2015	2020	2025	2030	2040	2050
Output Rating	Maximum Motor Output	hp	10	15	20	25	30	40	50
		kW	7.5	11	15	18.5	22	30	37
	Rated Output Current (A)		33	49	65	75	90	120	145
	Maximum Output Voltage		Three-phase 200 to 240V (proportional to input voltage)						
Rated frequency		0.1 to 400 Hz							
* Input Rating	Rated Voltage/Frequency		Three-phase, 200/208/220/230/240 VAC; 50/60 Hz						
	Rated Input Current (A)		34	50	60	75	90	110	142
	Voltage/Frequency Tolerance		Voltage: $\pm 10\%$ Frequency: $\pm 5\%$						
	Short Circuit Withstand (SCCR) (A, rms symmetrical)		5kA @ 240 VAC						
Watt Loss 100% I (W)			380	660	750	920	1300	1340	1430
Weight (lb [kg])			13.3 [6.031]	14.3 [6.487]	26.5 [12]	26.5 [12]	26.5 [12]	77.2 [35]	77.2 [35]
* All 3-phase power sources must be symmetrical. Do not connect DURApulse drives to grounded, center-tapped delta transformers (which are typically used for lighting circuits).									

460V Class – Three Phase										
Model Name: GS3-xxx			41P0	42P0	43P0	45P0	47P5	4010	4015	
Output Rating	Maximum Motor Output	HP	1	2	3	5	7.5	10	15	
		kW	0.75	1.5	2.2	3.7	5.5	7.5	11	
	Rated Output Current (A)		2.7	4.2	5.5	8.5	13	18	24	
	Maximum Output Voltage		Three-phase 380 to 480V (proportional to input voltage)							
Rated frequency		0.1 to 400 Hz								
* Input Rating	Rated Voltage/Frequency		Three-phase, 380/400/415/440/460/480VAC; 50/60 Hz							
	Rated Input Current (A)		3.2	4.3	5.9	11.2	14	19	25	
	Voltage/Frequency Tolerance		Voltage: ± 10% Frequency: ± 5%							
	Short Circuit Withstand (SCCR) (A, rms symmetrical)		5kA @ 480 VAC							
Watt Loss 100% I (W)			70	102	132	176	250	345	445	
Weight (lb [kg])			3.9 [1.759]	4.4 [1.994]	4.1 [1.857]	9.4 [4.24]	13.2 [6.002]	13.5 [6.106]	14.4 [6.525]	
* All 3-phase power sources must be symmetrical. Do not connect DURApulse drives to grounded, center-tapped delta transformers (which are typically used for lighting circuits).										

460V Class – Three Phase (continued)										
Model Name: GS3-xxx			4020	4025	4030	4040	4050	4060	4075	4100
Output Rating	Maximum Motor Output	HP	20	25	30	40	50	60	75	100
		kW	15	18.5	22	30	37	45	55	75
	Rated Output Current (A)		32	38	45	60	73	91	110	150
	Maximum Output Voltage		Three-phase 380 to 480V (proportional to input voltage)							
Rated frequency		0.1 to 400 Hz								
* Input Rating	Rated Voltage/Frequency		Three-phase, 380/400/415/440/460/480; 50/60 Hz							
	Rated Input Current (A)		32	39	49	60	63	90	130	160
	Voltage/Frequency Tolerance		Voltage: ± 10% Frequency: ± 5%							
	Short Circuit Withstand (SCCR) (A, rms symmetrical)		5kA @ 480 VAC					10 kA @ 480 VAC		
Watt Loss 100% I (W)			620	788	1290	1420	1680	2020	2910	3840
Weight (lb [kg])			26.5 [12]	26.5 [12]	26.5 [12]	77.2 [35]	77.2 [35]	77.2 [35]	116.8 [53]	116.8 [53]
* All 3-phase power sources must be symmetrical. Do not connect DURApulse drives to grounded, center-tapped delta transformers (which are typically used for lighting circuits).										



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General Specifications			
<b>Control Characteristics</b>			
<b>Control System</b>	Pulse Width Modulation, Carrier frequency 1-15 kHz, adjustable, depending on the model. This system determines the control methods of the AC drive. 00: V/Hz open loop control, 01: V/Hz closed loop control, 02: Sensorless Vector 03: Sensorless Vector with external feedback		
<b>Rated Output Frequency</b>	0.1 to 400.0 Hz		
<b>Output Frequency Resolution</b>	0.1 Hz		
<b>Overload Capacity</b>	150% of rated current for 1 minute		
<b>Torque Characteristics</b>	Includes auto-torque boost, auto-slip compensation, starting torque 125% @ 0.5 Hz / 150% @ 1.0 Hz		
<b>Braking Torque</b>	20% without dynamic braking, 125% with optional braking resistor (braking circuit built-in only for units under 20 hp)		
<b>DC Braking</b>	Operation frequency 60-0 Hz, 0 - 100% rated current, Start time 0.0 - 5.0 seconds, Stop time 0.0 - 25.0 seconds		
<b>Acceleration/Deceleration Time</b>	0.1 to 600 seconds (linear or non-linear acceleration/deceleration), second acceleration/deceleration available		
<b>Voltage/Frequency Pattern</b>	Settings available for Constant Torque - low & high starting torque, Variable Torque - low & high starting torque, and user configured		
<b>Stall Prevention Level</b>	20 to 200% of rated current		
<b>Operation Specification</b>			
<b>Inputs</b>	<b>Frequency Setting</b>	<b>Keypad</b>	Setting by <UP> or <DOWN> buttons
		<b>External Signal</b>	Potentiometer - 3-5 k $\Omega$ , 0 to 10 VDC (input impedance 10 k $\Omega$ ), 0 to 20 mA / 4 to 20 mA (input impedance 250 $\Omega$ ). Multi-Speed Inputs 1 to 4, RS-232C/RS-485 communication interface
	<b>Operation Setting</b>	<b>Keypad</b>	Setting by <RUN>, <STOP>, <JOG> buttons
		<b>External Signal</b>	Forward/Stop, Reverse/Stop (run/stop, fwd/rev), 3-wire control, Serial Communication RS-232C & RS-485 (Modbus RTU)
	<b>Input Terminals</b>	<b>Digital Sink/Source Selectable</b>	11 user-programmable: FWD/STOP, REV/STOP, RUN/STOP, REV/FWD, RUN momentary (N.O.), STOP momentary (N.C.), External Fault (N.O./N.C.), External Reset, Multi-Speed Bit (1-4), Manual Keyboard Control, Jog, External Base Block (N.O./N.C.), Second Accel/Decel Time, Speed Hold, Increase Speed, Decrease Speed, Reset Speed to Zero, PID Disable (N.O.), PID Disable (N.C.), Input Disable
		<b>Analog</b>	3 user-configurable, 0 to 10 VDC (input impedance 10 k $\Omega$ ), 0 to 20mA / 4 to 20mA (input impedance 250 $\Omega$ ), 10 bit resolution -10V to +10V, 10 bit resolution
<b>Outputs</b>	<b>Output Terminals</b>	<b>Digital 3 transistors 1 relay</b>	4 user-programmable: Inverter Running, Inverter Fault, At Speed, Zero Speed, Above Desired Frequency, Below Desired Frequency, At Maximum Speed, Over Torque Detected, Above Desired Current, Below Desired Current, PID Deviation Alarm, Heatsink Overheat Warning (OH), Soft Braking Signal, Above desired Frequency 2, Below desired Frequency 2, Encoder Loss
		<b>Analog</b>	1 user-programmable, 0 to 10 VDC, 8 bit resolution frequency, current, process variable PV
	<b>Operating Functions</b>	Automatic voltage regulation, voltage/frequency characteristics selection, non-linear acceleration/deceleration, upper and lower frequency limiters, 15-stage speed operation, adjustable carrier frequency (1 to 15 kHz), PID control, 5 skip frequencies, analog gain & bias adjustment, jog, electronic thermal relay, automatic torque boost, trip history, software protection	

General Specifications (cont.)		
<b>Protective Functions</b>	Electronic Thermal, Overload Relay, Auto Restart after Fault, Momentary Power Loss, Reverse Operation Inhibit, Auto Voltage Regulation, Over-Voltage Stall Prevention, Auto Adjustable Accel/Decel, Over-Torque Detection Mode, Over-Torque Detection Level, Over-Torque Detection Time, Over-Current Stall Prevention during Acceleration, Over-Current Stall Prevention during Operation	
<b>Operator Interface</b>	<b>Operator Devices</b>	9-key, 2 line x 16 character LCD display, 5 status LEDs
	<b>Programming</b>	Parameter values for setup and review, fault codes
	<b>Status Display</b>	Output Frequency, Motor Speed, Scaled Frequency, Output Current, Motor Load, Output Voltage, DC Bus Voltage, PID Setpoint, PID Feedback, Frequency Setpoint
	<b>Key Functions</b>	RUN, STOP/RESET, FWD/REV, PROGRAM, DISPLAY, <UP>, <DOWN>, ENTER
<b>Environment</b>	<b>Enclosure Rating</b>	Protected Chassis, IP20
	<b>Ambient Temperature</b>	-10°C to 40°C (14°F to 104°F)
	<b>Storage Temperature</b>	-20°C to 60°C (-4°F to 140°F) – during short term transportation period
	<b>Ambient Humidity</b>	20 to 90% RH (non-condensing)
	<b>Vibration</b>	9.8 m/s <sup>2</sup> (1G) less than 10 Hz, 5.9 m/s <sup>2</sup> (0.6G) 10 to 60 Hz
	<b>Installation Location</b>	Altitude 1000m or lower above sea level, keep from corrosive gas, liquid and dust
<b>Options</b>	Noise filter, input AC reactor, output AC reactor, cable for remote operator, programming software, Dynamic braking resistor, input fuses	