Getting Started

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User Manual Overview

Overview of this Publication

The *DURAPULSE* GS20 & GS20X Drive User Manual describes the installation, configuration, and methods of operation of the *DURAPULSE* GS20(X) Series AC Drive. Throughout this manual, please note:

- *GS20 refers to GS21 and GS23 models only*
- *GS20X refers to GS21X and GS23X models only*
- *GS20(X) refers to all drive models*

Who Should Read This Manual

This manual contains important information for those who will install, maintain, and/or operate any of the GS20(X) 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:

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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.

Produced By

GS20(X) series drives are a product of:
Automation Direct
3505 Hutchinson Road
Cumming, GA 30040-5860

Special Symbols

NOTE: When you see the "notepad" icon in the left-hand margin, the paragraph to its immediate right will be a special note.

WARNING: 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).

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.

Selecting the Proper Drive Rating

Determine Motor Full-Load Amperage (FLA)

Motor FLA is located on the nameplate of the motor.
NOTE: FLA of motors that have been rewound may be higher than stated.

Determine Motor Overload Requirements

Many applications experience temporary overload conditions due to starting requirements or impact loading. Most AC drives are designed to operate at 150% overload for 60 seconds. If the application requires an overload greater than 150% or longer than 60 seconds, the AC drive must be oversized.

NOTE: Applications that require replacement of existing motor starters with AC drives may require up to 600% overload.

Determine Application Type; Constant Torque or Variable Torque

This torque requirement has a direct effect on which drive to select. Variable Torque (VT) applications are generally easier to start; typically fans and pumps. Most other applications outside fans and pumps fall into the Constant Torque (CT) category (machine control, conveyors, etc.). If you are unsure of the application, assume Constant Torque. The specification, derating, and selection tables are generally segregated by Constant Torque and Variable Torque.

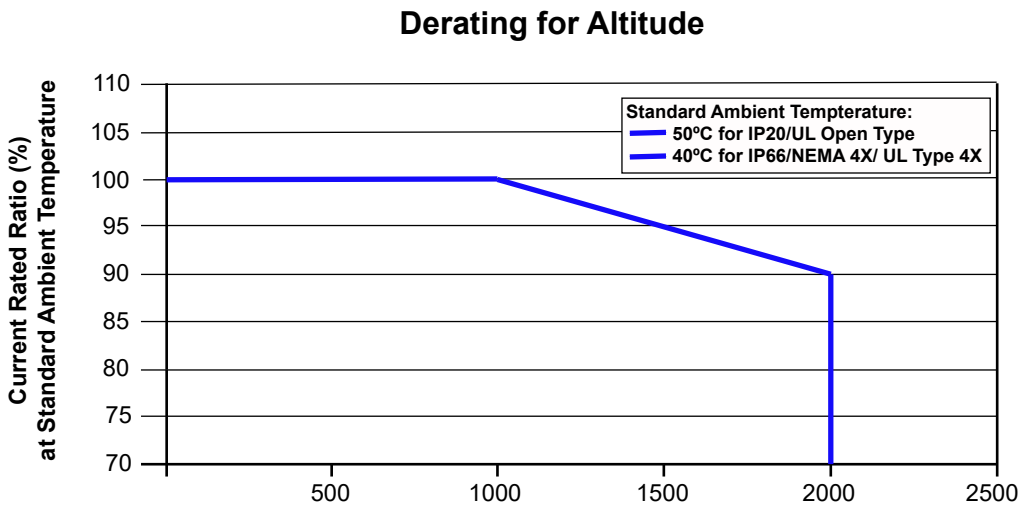
Installation Altitude

AC drives rely on air flow for cooling. As the altitude increases, the air becomes less dense, and this drop in air density decreases the cooling properties of the air. Therefore, the AC drive must be oversized to compensate for the decrease in cooling. Most AC drives are designed to operate at 100% capacity at altitudes up to 1000 meters.

NOTE: For use above 1000m, the AC drive must be derated as described below.

Derate Output Current Based on Altitude Above 1000 Meters

- *If the AC drive is installed at an altitude of 0~1000m, follow normal operation restrictions.*
- *If installed at an altitude of 1000~2000m, decrease 1% of the rated current or lower 0.5°C of temperature for every 100m increase in altitude.*
- *Maximum altitude for Corner Grounded is 2000m. If installation at an altitude higher than 2000m is required, please contact AutomationDirect.*



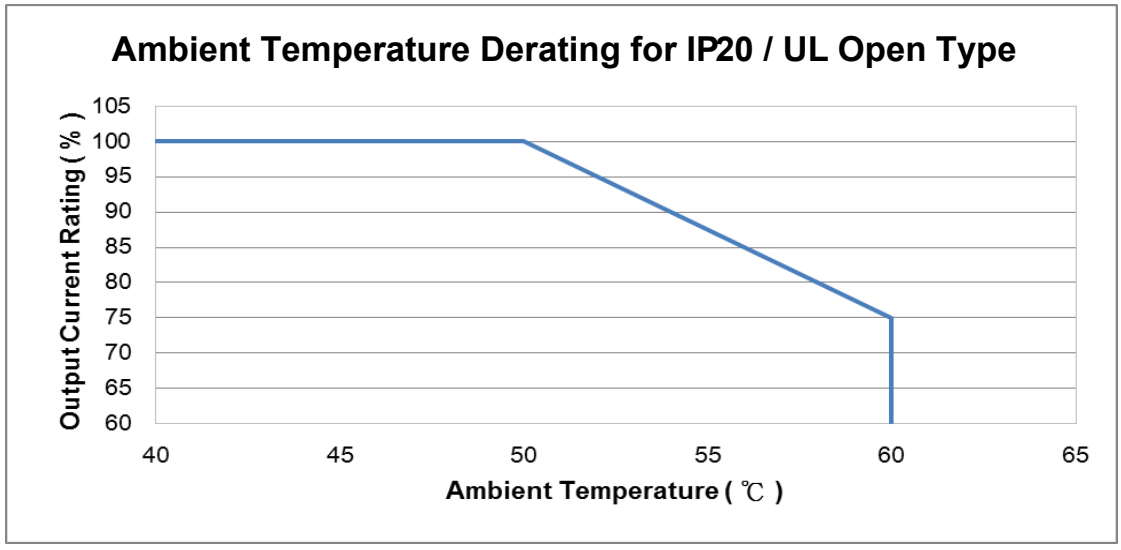
Determine Maximum Enclosure Internal Temperature

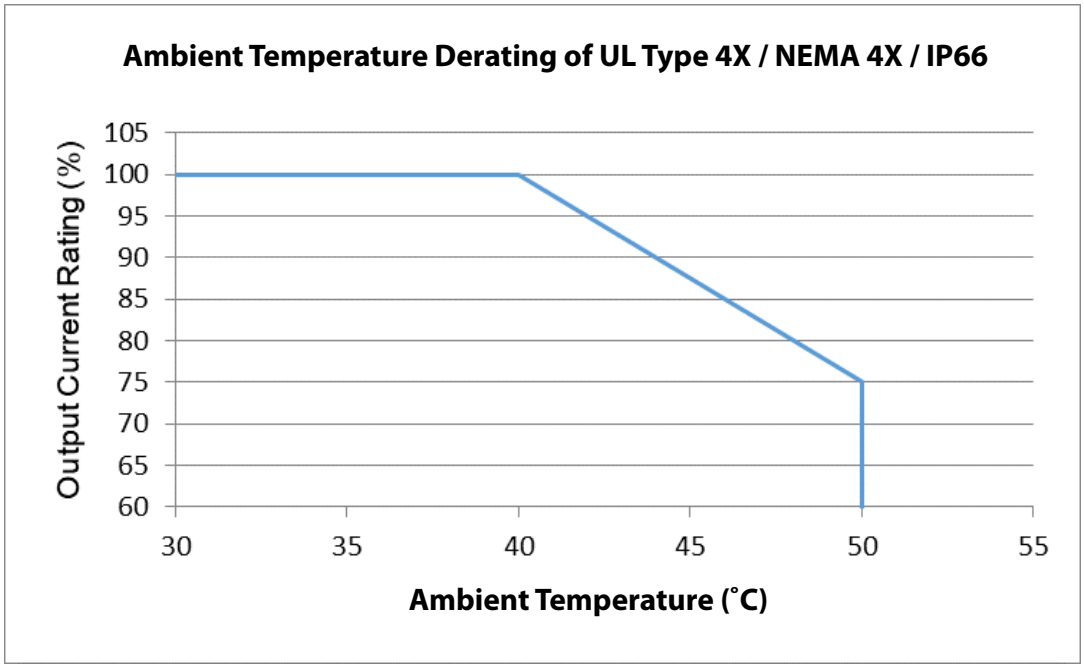
AC drives generate a significant amount of heat and will cause the internal temperature of an enclosure to exceed the rating of the AC drive, even when the ambient temperature is less than 104°F (40°C). Enclosure ventilation and/or cooling may be required to maintain a maximum internal temperature of 104°F (40°C) or less. Ambient temperature measurements/calculations should be made for the maximum expected temperature. When permissible, flange mounting the AC drive (mounting with the drive heatsink in open ambient air) can greatly reduce heating in the enclosure.

For use above 104˚F (40˚C), the AC drive must be derated as described below.

Derate Output Current Based on Temperature Above 104°F (40°C)

Drive Derating by Temperature and Protection Level	
Protection Level	***Derating***
UL Open Type / IP20 *	If the AC motor drive operates at the rated current, the ambient temperature needs to be between -20–50°C. If the temperature is above 50°C, decrease 2.5% of the rated current for every 1°C increase in temperature. The maximum allowable temperature is 60°C.
UL Type 4X / NEMA 4X / IP66 *	When the AC motor drive is operating at the rated current, the ambient temperature must be between -20–40°C. When the temperature is over 40 °C, for every increase by 1°C, decrease the rated current 2.5%. The maximum allowable temperature is 50°C.
** For more information about environmental ratings, refer to the "DURApulse GS20 & GS20X AC Drive Environmental Information" on page 1–17 of this chapter.*	




Ambient Temperature Derating of UL Type 4X / NEMA 4X / IP66
Output Current Rating (%)
105
100
95
90
85
80
75
70
65
60
30
35
40
45
50
55
Ambient Temperature (˚C)

Derate Output Current Based on Carrier Frequency (if necessary)

Carrier Frequency Effects

AC Drives rectify the incoming 50 or 60Hz line power resulting in DC power at 0Hz. The resulting DC power is then pulse-width modulated and supplied to the motor by the drive's power electronics. IGBTs invert the DC power, simulating a sine wave at the desired frequency (that's what allows variable speed in AC induction motors). The speed at which the IGBTs are turned ON and OFF is called Carrier Frequency. In AC drives, the Carrier Frequency can range from 2kHz to 15kHz. The Carrier Frequency can be adjusted in most AC Drives.

There are trade-offs between choosing High Carrier Frequencies and Low Carrier Frequencies.

Benefits of Higher Carrier Frequencies:

- *Better efficiency (lower harmonic losses) in the motor*
- *Lower audible noise*

Benefits of Lower Carrier Frequencies:

- *Better efficiency in the drive*
- *Lower EMI (electrical noise)*
- *Reduced reflective wave peak voltage*

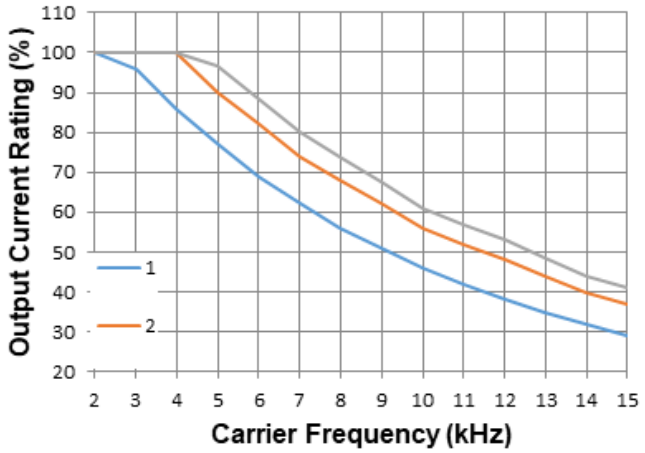
As a general rule, the Carrier Frequency should be set as low as possible without creating unacceptable audible noise in the motor. Smaller systems can have higher Carrier Frequencies, but larger drives (>20 or 30hp) should not have Carrier Frequencies set higher than 6kHz. Constant torque applications typically run around 2~4kHz.

GS20(X) Variable Torque Carrier Frequency Derating

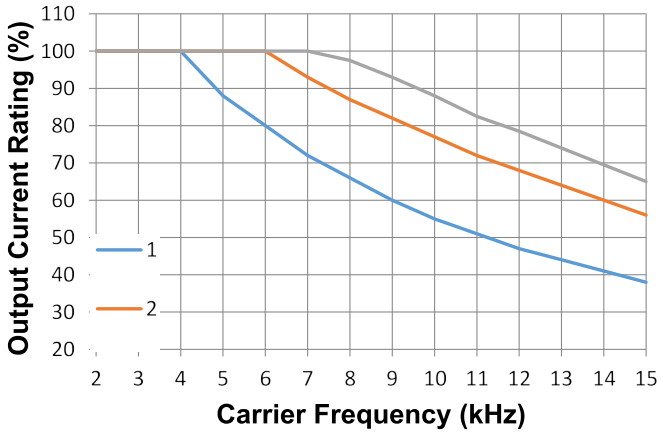
- *Line 1: Ta = 50°C / Load = 100%*
- *Line 2: Ta = 50°C / Load = 75% or Ta = 40°C / Load = 100%*
- *Line 3: Ta = 50°C / Load = 50% or Ta = 35°C / Load = 100%*

Note: Space Vector Pulse Width Modulation (SVPWM) and Two-Phase Pulse Width Modulation (DPWM) are determined by parameter P11.41. See Chapter 4 for details.

SVPWM Mode

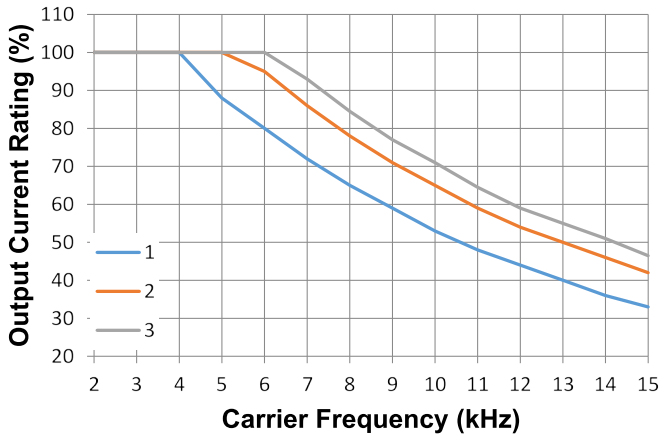


DPWM Mode

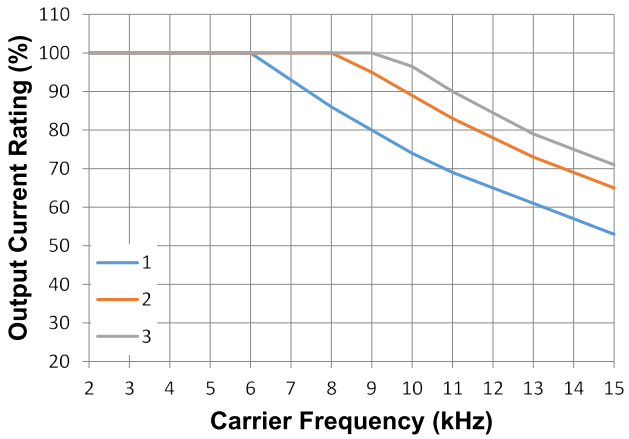


GS20(X) Constant Torque Carrier Frequency Derating

SVPWM Mode



DPWM Mode



DURAPULSE GS20 & GS20X AC DRIVE ENVIRONMENTAL INFORMATION

STORAGE AND TRANSPORTATION

AC drives should be kept in the shipping cartons or crates until they are installed. In order to retain the warranty coverage, they should be stored as described below if not to be installed and used within three months.

- *Store in a clean and dry location free from direct sunlight and corrosive fumes.*
- *Store within environmental conditions shown below in the "Environmental Conditions" table.*
- *DO NOT store in an area with rapid changes in temperature , to avoid condensation and frost.*
- *DO NOT place directly on the ground.*

If the drive is stored or is otherwise unused for more than a year, the drive's internal DC link capacitors should be recharged before use. Otherwise, the capacitors may be damaged when the drive starts to operate. We recommend recharging the capacitors of any unused drive at least once per year. (Refer to Chapter 6, "Maintenance and Troubleshooting" for information about recharging DC link capacitors.)

GS20 ENVIRONMENTAL CONDITIONS

Environmental Conditions for GS20 AC Drives			
Condition	Operation	Storage	Transportation
Installation Location	IEC 60364-1/ IEC 60664-1 Pollution degree 2, Indoor use only.	n/a	n/a
Ambient Temperature	IP20/UL Open Type: -20–50°C (-20–60°C w/derating)	-40–85°C	-20–70°C
	Non-condensing, non-freezing		
Relative Humidity	90%, no water condensation	95%, no water condensation	
Air Pressure	86–106 kPa	70–106 kPA	
Pollution Level	IEC 60721-3, concentrate prohibited		
	Class 3C2; Class 3S2	Class 2C2; Class 2S2	Class 1C2; Class 1S2
Altitude	<1000 m (For altitudes > 1000 m, derate to use it.)		
Package Drop	n/a	ISTA procedure 1A (according to weight) IEC 60068-2-31	
Vibration	1.0 mm, peak to peak value range from 2–13.2 Hz; 0.7–2.0 G range from 13.2–55 Hz; 2.0 G range from 55–512 Hz. Compliance with IEC 60068-2-6	2.5 G peak, 5 Hz–2 kHz 0.015" maximum displacement	
Impact	15 G, 11 ms, compliance with IEC/EN60068-2-27	30G	
DO NOT expose the GS20 AC Drive to harsh environments such as dust, direct sunlight, corrosive/flammable gases, humidity, liquid, or vibrations. The salts in the air must be less than 0.01 mg/cm^2 every year.			

GS20X ENVIRONMENTAL CONDITIONS

Environmental Conditions for GS20X AC Drives			
Condition	Operation	Storage	Transportation
Installation Location	PCB design is compliant with IEC 60364-1 / IEC 60664-1 Pollution Degree 2. The outer case meets IP66 standard for indoor use. If the drive is for outdoor application, avoid direct sunlight.	n/a	n/a
Ambient Temperature	IP66 / NEMA 4X / UL Type 4X: -20–40°C (-20–50°C w/derating)	-40–85°C	-20–70°C
	Non-condensing, non-freezing		
Relative Humidity	0-100%, no water condensation	95%, no water condensation	
Air Pressure	86–106 kPa	70–106 kPA	
Pollution Level	IEC 60721-3, concentrate prohibited		
	Class 3C2; Class 3S2	Class 2C2; Class 2S2	Class 1C2; Class 1S2
Altitude	<1000 m (For altitudes > 1000 m, derate to use it.)		
Package Drop	n/a	ISTA procedure 1A (according to weight) IEC 60068-2-31	
Vibration	1.0 mm, peak to peak value range from 2–13.2 Hz; 0.7–2.0 G range from 13.2–55 Hz; 2.0 G range from 55–512 Hz; complies with IEC 60068-2-6.	2.5 G peak, 5 Hz–2 kHz 0.015" maximum displacement	
Impact	15 G, 11 ms, compliance with IEC/EN60068-2-27	30G	
DO NOT expose the GS20X AC Drive to harsh environments such as direct contact with chemical substance and solvent, and exposure to direct sunlight.			

GS20 & GS20X General Specifications

General Specifications for GS20(X) AC Drives				
Control Characteristics	Control Method		V/F, Sensorless Vector (SVC), Field Oriented Control (FOC) Sensorless, Volt/Frequency with Pulse Generator intput (VFPG), Torque (TQC Sensorless)	
	Applicable Motor		IM (Induction Motor), Simple PM motor control (IPM and SPM)	
	Starting Torque[1]		150% / 3 Hz 100% / (motor rated frequency/20) 200% / 0.5 Hz	(V/F, SVC control for IM, CT, rated) (SVC control for PM, CT, rated) (FOC control for IM, CT, rated)
	Torque Accuracy		± 15% TQC Sensorless	
	Torque Limits	120/230/460V	VT: 160% of output current, max CT: 180% of output current, max	
		575V	200% of output current, max	
	Speed Control Range[1]		1: 50 (V/F, SVC control for IM, CT, rated) 1: 20 (SVC control for PM, CT, rated) 1: 100 (FOC control for IM, CT, rated)	
	Max. Output Frequency		0.00–599.00 Hz	
	Overload Capacity		VT: rated output current of 120% 60 sec., 150% 3 sec. CT: rated output current of 150% 60 sec., 200% 3 sec.	
	Frequency Setting Signal		0–10 V / -10–10 V 4–20 mA / 0–10 V 1 channel pulse input (33 kHz), 1 channel pulse output (33 kHz)	
	Digital Inputs		Seven (7) - 24VDC NPN or PNP, includes 1 frequency input 33kHz	
	Digital Outputs		Three (3) - (2)-48VDC, (1) Relay-250VAC/30VDC	
	Analog Inputs		Two (2) - (1) voltage, (1) selectable Voltage or Current	
	Analog Outputs		One (1) - selectable voltage or current	
	Frequency Output		One (1) - 30VDC, 33kHz	
	Safe Torque Off		STO1 and STO2 inputs- 24VDC	
	Main Functions		Multiple motor switching (a maximum of four independent motor parameter settings), Fast start-up, Deceleration Energy Back (DEB) function, Wobble frequency function, Fast deceleration function, Master and Auxiliary frequency source selectable, Restart after momentary power loss, Speed tracking, Over-torque detection, 16-step speed (including the master speed), Accel./decel. time switch, S-curve accel./decel., three-wire operation control, JOG frequency, Frequency upper/lower limit settings, DC brake at start-up and stop, PID control, Built-in PLC (2000 steps), and Simple positioning function.	
	Application Macro		Built-in application parameter groups (selected by industry) and user-defined application parameter groups.	
Protection Characteristics	Motor Protection		Over-current, Over-voltage, Over-heating, Phase loss.	
	Stall Prevention		Stall prevention during acceleration, deceleration and running (independent settings).	
Accessory	Communication Cards		EtherNet/IP and Modbus TCP (GS20A-CM-ENETIP, GS20A-CM-EIPS, single card)	
	External DC Power Supply		GS20A-BPS (24V power backup supply card)	
Agency Approvals[2]	UL, CE, TÜV (SIL 2), RoHS, REACH			

1: Control accuracy may vary depending on the environment, application conditions or different motors. For more information contact AutomationDirect.

2: See CE declaration here: https://support.automationdirect.com/docs/GS20A-GS20AX-CE.pdf

Efficiency Class

The EU Ecodesign regulation directive establishes a framework to set mandatory ecological requirements for energy-using and energy-related products. The IEC 61800-9-2 standard defines the efficiency classes for AC drives. The efficiency classes range (low to high) from IE0 to IE2. These classes apply to AC drives rated 100 to 1000 V and 0.12 to 1000 kW (1/6 to 1,340 HP).

Drive manufacturers must declare power losses in terms of percentage of rated apparent output power at eight different operating points, as well as standby losses. The International Efficiency (IE) level is given at the nominal point.

The power losses of GS20(X) drives shall not exceed the maximum power losses corresponding to the IE2 efficiency level. For specific power losses of each drive model, see the specification tables.

DURApulse GS20 AC Drive Specifications

120V Class – 1-Phase Model-Specific Specifications

GS20 120V Class Specifications; Frame Size A, C[1,3]						
Model Name: GS21-1xxx				**GS21-10P2**	**GS21-10P5**	**GS21-11P0**
Frame Size				**A**	**A**	**C**
Output Rating	**Max Motor Output**		**hp**	1/4	1/2	1
			kW	0.2	0.4	0.75
	CT	**Rated Output Capacity**	**kVA**	0.6	1	1.8
		Rated Output Current	**A**	1.6	2.5	4.8
		Carrier Frequency[2]	**kHz**	2–15 (default 4)		
	VT	**Rated Output Capacity**	**kVA**	0.7	1	2.1
		Rated Output Current	**A**	1.8	2.7	5.5
		Carrier Frequency[2]	**kHz**	2–15 (default 4)		
Input Rating	**CT**	**Rated Input Current**	**A**	6	9.4	18
	VT	**Rated Input Current**	**A**	6.8	10.1	20.6
	Rated Voltage/Frequency			One-phase: 100–120 VAC (-15% to +10%), 50/60 Hz		
	Operating Voltage Range (VAC)			85–132		
	Frequency Tolerance (Hz)			47–63		
IE2 Efficiency – Relative Power Loss				4.9%	3.5%	3.0%
Weight (kg)				0.65	0.74	1.24
Cooling Method				Convective		Fan
IP Rating				IP20		

1 - For use with three-phase motors only.

2 - The value of the carrier frequency is a factory default. Decrease the current value if you need to increase the carrier frequency. Refer to "Derate Output Current Based on Carrier Frequency (if necessary)" on page 1–15

3 - DC Common bus and DC reactor terminals are not available on 120V models. See "Main terminals" section for more details.

230V Class – 1-Phase Model-Specific Specifications

GS20 230V Class Specifications; Frame Size A, B, C[1]								
Model Name: GS21-2xxx				**GS21-20P2**	**GS21-20P5**	**GS21-21P0**	**GS21-22P0**	**GS21-23P0**
Frame Size				**A**	**A**	**B**	**C**	**C**
Output Rating	**Max Motor Output**		**hp**	1/4	1/2	1	2	3
			kW	0.2	0.4	0.75	1.5	2.2
	CT	**Rated Output Capacity**	**kVA**	0.6	1.1	1.8	2.9	4.2
		Rated Output Current	**A**	1.6	2.8	4.8	7.5	11
		Carrier Frequency[3]	**kHz**	2–15 (default 4)				
	VT	**Rated Output Capacity**	**kVA**	0.7	1.2	1.9	3.2	4.8
		Rated Output Current	**A**	1.8	3.2	5	8.5	12.5
		Carrier Frequency[3]	**kHz**	2–15 (default 4)				
Input Rating[2]	**CT**	**Rated Input Current**	**A**	5.1	7.3	10.8	16.5	24.2
	VT	**Rated Input Current**	**A**	5.8	8.3	11.3	18.5	27.5
	Rated Voltage/Frequency			One-phase 200-240 VAC (-15% to +10%), 50/60 Hz				
	Operating Voltage Range (VAC)			170–265				
	Frequency Tolerance (Hz)			47–63				
IE2 Efficiency – Relative Power Loss				5.2%	3.4%	2.9%	2.6%	2.4%
Weight (kg)				0.65	0.76	0.95	1.24	1.24
Cooling Method				Convective			Fan	
IP Rating				IP20				

1 - For use with three-phase motors only.

2 - Please refer to "Appendix A - Accessories" for input fusing information.

3 - The value of the carrier frequency is a factory default. Decrease the current value if you need to increase the carrier frequency. Refer to "Derate Output Current Based on Carrier Frequency (if necessary)" on page 1–15

230V Class – 3-Phase Model-Specific Specifications

GS20 230V Class Specifications; Frame Size A, B, C[1]								
Model Name: GS23-2xxx				**GS23-20P2**	**GS23-20P5**	**GS23-21P0**	**GS23-22P0**	**GS23-23P0**
Frame Size				**A**	**A**	**A**	**B**	**C**
Output Rating	**Max Motor Output (3-phase [1-phase])[4]**		**hp**	0.25 [0.1]	0.5 [0.25]	1 [0.5]	2 [1]	3 [1.5]
			kW	0.2 [0.1]	0.4 [0.2]	0.75 [0.375]	1.5 [0.75]	2.2 [1.1]
	CT	**Rated Output Capacity (3-phase [1-phase])**	**kVA**	0.6 [0.3]	1.1 [0.55]	1.8 [0.9]	2.9 [1.5]	4.2 [2.1]
		Rated Output Current (3-phase [1-phase])	**A**	1.6 [0.8]	2.8 [1.4]	4.8 [2.4]	7.5 [3.75]	11 [5.5]
		Carrier Frequency[3]	**kHz**	2–15 (default 4)				
	VT	**Rated Output Capacity**	**kVA**	0.7	1.2	1.9	3	4.8
		Rated Output Current	**A**	1.8	3.2	5	8	12.5
		Carrier Frequency[3]	**kHz**	2–15 (default 4)				
Input Rating[2]	**CT**	**Rated Input Current**	**A**	1.9	3.4	5.8	9	13.2
	VT	**Rated Input Current**	**A**	2.2	3.8	6	9.6	15
	Rated Voltage/Frequency			3-phase or 1-phase 200-240 VAC (-15% to +10%), 50/60 Hz				
	Operating Voltage Range (VAC)			170–265				
	Frequency Tolerance (Hz)			47–63				
IE2 Efficiency – Relative Power Loss				5.2%	3.4%	2.9%	2.5%	2.5%
Weight (kg)				0.65	0.65	0.81	1.05	1.24
Cooling Method				Convective			Fan	
IP Rating				IP20				

1 - For use with three-phase motors only.

2 - If three-phase power source is non-symmerical, refer to "Circuit Connections – RFI Jumper" on page 2–16. Please refer to "Appendix A - Accessories" for input fusing information.

3 - The value of the carrier frequency is a factory default. Decrease the current value if you need to increase the carrier frequency. Refer to "Derate Output Current Based on Carrier Frequency (if necessary)" on page 1–15

4 - Three phase models can be powered with 1-phase or 3-phase input power. If using 1-phase input power, GS21 models up to 3HP provide higher output power than equivalent GS23 model with 1-phase.

230V Class – 3-Phase Model-Specific Specifications

GS20 230V Class Specifications; Frame Size C, D, E, F[1]								
Model Name: GS23-2xxx				**GS23-25P0**	**GS23-27P5**	**GS23-2010**	**GS23-2015**	**GS23-2020**
Frame Size				**C**	**D**	**E**	**E**	**F**
Output Rating	**Max Motor Output (3-phase [1-phase])[4]**		**hp**	5 [2.5]	7.5 [3.5]	10 [5]	15 [7.5]	20 [10]
			kW	3.7 [1.85]	5.5 [2.75]	7.5 [3.75]	11 [5.5]	15 [7.5]
	CT	**Rated Output Capacity (3-phase [1-phase])**	**kVA**	6.5 [3.25]	9.5 [4.75]	12.6 [6.3]	18.7 [9.35]	24.8 [12.4]
		Rated Output Current (3-phase [1-phase])	**A**	17 [8.5]	25 [12.5]	33 [16.5]	49 [24.5]	65 [32.5]
		Carrier Frequency[3]	**kHz**	2–15 (default 4)				
	VT	**Rated Output Capacity**	**kVA**	7.4	10.3	13.7	19.4	26.3
		Rated Output Current	**A**	19.5	27	36	51	69
		Carrier Frequency[3]	**kHz**	2–15 (default 4)				
Input Rating[2]	**CT**	**Rated Input Current**	**A**	20.4	30	39.6	58.8	78
	VT	**Rated Input Current**	**A**	23.4	32.4	43.2	61.2	82.8
	Rated Voltage/Frequency			3-phase or 1-phase 200-240 VAC (-15% to +10%), 50/60 Hz				
	Operating Voltage Range (VAC)			170–265				
	Frequency Tolerance (Hz)			47–63				
IE2 Efficiency – Relative Power Loss				2.2%	2.3%	2.5%	2.2%	2.1%
Weight (kg)				1.24	2.07	3.97	3.97	6.25
Cooling Method				Fan				
IP Rating				IP20				

1 - For use with three-phase motors only.

2 - If three-phase power source is non-symmerical, refer to "Circuit Connections – RFI Jumper" on page 2–16. Please refer to "Appendix A - Accessories" for input fusing information.

3 - The value of the carrier frequency is a factory default. Decrease the current value if you need to increase the carrier frequency. Refer to "Derate Output Current Based on Carrier Frequency (if necessary)" on page 1–15

4 - Three phase models can be powered with 1-phase or 3-phase input power. If using 1-phase input power, GS21 models up to 3HP provide higher output power than equivalent GS23 model with 1-phase.

460V Class – 3-Phase Model-Specific Specifications

GS20 460V Class Specifications; Frame Size A, B, C[1]								
Model Name: GS23-4xxx				**GS23-40P5**	**GS23-41P0**	**GS23-42P0**	**GS23-43P0**	**GS23-45P0**
Frame Size				**A**	**A**	**B**	**C**	**C**
Output Rating	**Max Motor Output**		**hp**	1/2	1	2	3	5
			kW	0.4	0.75	1.5	2.2	3.7
	CT	**Rated Output Capacity**	**kVA**	1.1	2.1	3.2	4.2	6.9
		Rated Output Current	**A**	1.5	2.7	4.2	5.5	9
		Carrier Frequency[3]	**kHz**	2–15 (default 4)				
	VT	**Rated Output Capacity**	**kVA**	1,4	2.3	3.5	5	8
		Rated Output Current	**A**	1.8	3	4.6	6.5	10.5
		Carrier Frequency[3]	**kHz**	2–15 (default 4)				
Input Rating[2]	**CT**	**Rated Input Current**	**A**	1.7	3	5.8	6.1	9.9
	VT	**Rated Input Current**	**A**	2	3.3	6.4	7.2	11.6
	Rated Voltage/Frequency			Three-phase 380-480 VAC (-15% to +10%), 50/60 Hz				
	Operating Voltage Range (VAC)			323-528				
	Frequency Tolerance (Hz)			47–63				
IE2 Efficiency – Relative Power Loss				4.0%	2.6%	2.3%	2.3%	2.0%
Weight (kg)				0.76	0.81	1	1.24	1.24
Cooling Method				Convective		Fan		
IP Rating				IP20				

1 - For use with three-phase motors only.

2 - If three-phase power source is non-symmerical, refer to "Circuit Connections – RFI Jumper" on page 2–16. Please refer to "Appendix A - Accessories" for input fusing information.

3 - The value of the carrier frequency is a factory default. Decrease the current value if you need to increase the carrier frequency. Refer to "Derate Output Current Based on Carrier Frequency (if necessary)" on page 1–15

460V Class – 3-Phase Model-Specific Specifications

GS20 460V Class Specifications; Frame Size D, E, F[1]									
Model Name: GS23-4xxx				**GS23-47P5**	**GS23-4010**	**GS23-4015**	**GS23-4020**	**GS23-4025**	**GS23-4030**
Frame Size				**D**	**D**	**E**	**E**	**F**	**F**
Output Rating	**Max Motor Output**		**hp**	7 1/2	10	15	20	25	30
			kW	5.5	7.5	11	15	18.5	22
	CT	**Rated Output Capacity**	**kVA**	9.9	13	19.1	24.4	29	34.3
		Rated Output Current	**A**	12	17	25	32	38	45
		Carrier Frequency[3]	**kHz**	2–15 (default 4)					
	VT	**Rated Output Capacity**	**kVA**	12	15.6	21.3	27.4	31.6	37.3
		Rated Output Current	**A**	15.7	20.5	28	36	41.5	49
		Carrier Frequency[3]	**kHz**	2–15 (default 4)					
Input Rating[2]	**CT**	**Rated Input Current**	**A**	14.3	18.7	27.5	35.2	41.8	49.5
	VT	**Rated Input Current**	**A**	17.3	22.6	30.8	39.6	45.7	53.9
	Rated Voltage/Frequency			Three-phase 380-480 VAC (-15% to +10%), 50/60 Hz					
	Operating Voltage Range (VAC)			323-528					
	Frequency Tolerance (Hz)			47–63					
IE2 Efficiency – Relative Power Loss				2.0%	1.9%	1.8%	1.7%	1.5%	1.5%
Weight (kg)				2.07	2.07	3.97	3.97	6.25	6.25
Cooling Method				Fan					
IP Rating				IP20					

1 - For use with three-phase motors only.

2 - If three-phase power source is non-symmerical, refer to "Circuit Connections – RFI Jumper" on page 2–16. Please refer to "Appendix A - Accessories" for input fusing information.

3 - The value of the carrier frequency is a factory default. Decrease the current value if you need to increase the carrier frequency. Refer to "Derate Output Current Based on Carrier Frequency (if necessary)" on page 1–15

575V Class – 3-Phase Model-Specific Specifications

GS20 575V Class Specifications; Frame Size A, B, C, D[1]									
Model Name: GS23-5xxx				**GS23-51P0**	**GS23-52P0**	**GS23-53P0**	**GS23-55P0**	**GS23-57P5**	**GS23-5010**
Frame Size				**A**	**B**	**C**	**C**	**D**	**D**
Output Rating	**Max Motor Output**		**hp**	1	2	3	5	7 1/2	10
			kW	0.75	1.5	2.2	3.7	5.5	7.5
	CT	**Rated Output Capacity**	**kVA**	1.7	3	4.2	6.6	9.9	12.2
		Rated Output Current	**A**	1.7	3	4.2	6.6	9.9	12.2
		Carrier Frequency[3]	**kHz**	2–15 (default 4)					
	VT	**Rated Output Capacity**	**kVA**	2.1	3.6	5	8	11.5	15
		Rated Output Current	**A**	2.1	3.6	5	8	11.5	15
		Carrier Frequency[3]	**kHz**	2–15 (default 4)					
Input Rating[2]	**CT**	**Rated Input Current**	**A**	2	3.5	4.9	7.7	11.5	14.2
	VT	**Rated Input Current**	**A**	2.4	4.2	5.8	9.3	13.4	17.5
	Rated Voltage/Frequency			Three-phase 500-600 VAC (-15% to +10%), 50/60 Hz					
	Operating Voltage Range (VAC)			425–660					
	Frequency Tolerance (Hz)			47–63					
IE2 Efficiency – Relative Power Loss				3.9%	2.7%	2.3%	1.9%	2.0%	1.9%
Weight (kg)				0.85	0.87	1.18	1.29	2.04	2.04
Cooling Method				Convective	Fan				
IP Rating				IP20					

1 - For use with three-phase motors only.

2 - If three-phase power source is non-symmerical, refer to "Circuit Connections – RFI Jumper" on page 2–16. Please refer to "Appendix A - Accessories" for input fusing information.

3 - The value of the carrier frequency is a factory default. Decrease the current value if you need to increase the carrier frequency. Refer to "Derate Output Current Based on Carrier Frequency (if necessary)" on page 1–15

DURAPULSE GS20X AC DRIVE SPECIFICATIONS

230V CLASS – 1-PHASE MODEL-SPECIFIC SPECIFICATIONS

GS20X 230V Class Specifications; Frame Size A, B[1]							
Model Name: GS21X-2xxx				**GS21X-20P5**	**GS21X-21P0**	**GS21X-22P0**	**GS21X-23P0**
Frame Size				**A**	**A**	**A**	**B**
Output Rating	**Max Motor Output**		**hp**	1/2	1	2	3
			kW	0.4	0.75	1.5	2.2
	CT	**Rated Output Capacity**	**kVA**	1.1	1.7	2.9	4.2
		Rated Output Current	**A**	2.8	4.8	7.5	11
		Carrier Frequency[3]	**kHz**	2–15 (default 4)			
	VT	**Rated Output Capacity**	**kVA**	1.2	1.9	3.2	4.8
		Rated Output Current	**A**	3.2	5	8.5	12.5
		Carrier Frequency[3]	**kHz**	2–15 (default 4)			
Input Rating[2]	**CT**	**Rated Input Current**	**A**	7.3	10.8	16.5	24.2
	VT	**Rated Input Current**	**A**	8.3	11.3	18.5	27.5
	Rated Voltage/Frequency			One-phase 200-240 VAC (-15% to +10%), 50/60 Hz			
	Operating Voltage Range (VAC)			170–264			
	Frequency Tolerance (Hz)			47–63			
IE2 Efficiency – Relative Power Loss				3.4%	2.9%	2.5%	2.5%
Weight (kg)				2.25	2.6	3.1	3.5
Cooling Method				Convective			Fan
IP Rating				IP66 / NEMA 4X			

1 - For use with three-phase motors only.

2 - If three-phase power source is non-symmerical, refer to "Circuit Connections – RFI Jumper" on page 2–16. Please refer to "Appendix A - Accessories" for input fusing information.

3 - The value of the carrier frequency is a factory default. Decrease the current value if you need to increase the carrier frequency. Refer to "Derate Output Current Based on Carrier Frequency (if necessary)" on page 1–15

230V Class – 3-Phase Model-Specific Specifications

GS20X 230V Class Specifications; Frame Size A, B, C[1]									
Model Name: GS23X-2xxx				**GS23X-20P5**	**GS23X-21P0**	**GS23X-22P0**	**GS23X-23P0**	**GS23X-25P0**	**GS23X-27P5**
Frame Size				**A**	**A**	**A**	**B**	**B**	**C**
Output Rating	**Max Motor Output (3-phase [1-phase])[4]**		**hp**	0.5 [0.25]	1 [0.5]	2 [1]	3 [1.5]	5 [2.5]	7.5 [3.5]
			kW	0.4 [0.2]	0.75 [0.375]	1.5 [0.75]	2.2 [1.1]	3.7 [1.85]	5.5 [2.75]
	CT	**Rated Output Capacity (3-phase [1-phase])**	**kVA**	1.1 [0.55]	1.8 [0.9]	2.9 [1.5]	4.2 [2.1]	6.5 [3.25]	9.5 [4.75]
		Rated Output Current (3-phase [1-phase])	**A**	2.8 [1.4]	4.8 [2.4]	7.5 [3.75]	11 [5.5]	17 [8.5]	25 [12.5]
		Carrier Frequency[3]	**kHz**	2–15 (default 4)					
	VT	**Rated Output Capacity**	**kVA**	1.2	1.9	3	4.8	7.4	10.3
		Rated Output Current	**A**	3.2	5	8	12.5	19.5	27
		Carrier Frequency[3]	**kHz**	2–15 (default 4)					
Input Rating[2]	**CT**	**Rated Input Current**	**A**	3.4	5.8	9	13.2	20.4	30
	VT	**Rated Input Current**	**A**	3.8	6	9.6	15	23.4	32.4
	Rated Voltage/Frequency			3-phase or 1-phase 200-240 VAC (-15% to +10%), 50/60 Hz					
	Operating Voltage Range (VAC)			170–264					
	Frequency Tolerance (Hz)			47–63					
IE2 Efficiency – Relative Power Loss				3.4%	2.9%	2.5%	2.5%	2.2%	2.3%
Weight (kg)				2.3	2.45	2.75	3.4	3.5	4.25
Cooling Method				Convective			Fan		
IP Rating				IP66 / NEMA 4X					

1 - For use with three-phase motors only.

2 - If three-phase power source is non-symmerical, refer to "Circuit Connections – RFI Jumper" on page 2–16. Please refer to "Appendix A - Accessories" for input fusing information.

3 - The value of the carrier frequency is a factory default. Decrease the current value if you need to increase the carrier frequency. Refer to "Derate Output Current Based on Carrier Frequency (if necessary)" on page 1–15

4 - Three phase models can be powered with 1-phase or 3-phase input power. If using 1-phase input power, GS21 models up to 3HP provide higher output power than equivalent GS23 model with 1-phase.

460V Class – 3-Phase Model-Specific Specifications

GS20X 460V Class Specifications; Frame Size A, B, C[1]									
Model Name: GS23X-4xxx				GS23X-40P5	GS23X-41P0	GS23X-42P0	GS23X-43P0	GS23X-45P0	GS23X-47P5	GS23X-4010
Frame Size				A	A	A	A	B	C	C
Output Rating	Max Motor Output		hp	1/2	1	2	3	5	7 1/2	10
			kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5
	CT	Rated Output Capacity	kVA	1.1	2.1	3.2	4,2	6.9	9.9	13
		Rated Output Current	A	1.5	2.7	4.2	5.5	9	13	17
		Carrier Frequency[3]	kHz	2–15 (default 4)						
	VT	Rated Output Capacity	kVA	1,4	2.3	3.5	5	8	12	15.6
		Rated Output Current	A	1.8	3	5.6	6.5	10.5	15.7	20.5
		Carrier Frequency[3]	kHz	2–15 (default 4)						
Input Rating[2]	CT	Rated Input Current	A	2.1	3.7	5.8	6.2	9.9	14.3	18.7
	VT	Rated Input Current	A	2.5	4.2	6.4	7.2	11.6	17.3	22.6
	Rated Voltage/Frequency			Three-phase 380-480 VAC (-15% to +10%), 50/60 Hz						
	Operating Voltage Range (VAC)			323–528						
	Frequency Tolerance (Hz)			47–63						
IE2 Efficiency – Relative Power Loss				4.0%	2.6%	2.3%	2.3%	2.0%	2.0%	1.9%
Weight (kg)				2.35	2.6	2.8	3.6	3.45	4.25	4.25
Cooling Method				Convective				Fan		
IP Rating				IP66 / NEMA 4X						

1 - For use with three-phase motors only.

2 - If three-phase power source is non-symmerical, refer to ""Circuit Connections – RFI Jumper" on page 2–16. Please refer to "Appendix A - Accessories" for input fusing information.

3 - The value of the carrier frequency is a factory default. Decrease the current value if you need to increase the carrier frequency. Refer to "Derate Output Current Based on Carrier Frequency (if necessary)" on page 1–15

Receiving and Inspection

Drive Package Contents

After receiving the GS20(X) AC drive, please check the following:

1) Make sure that the package includes the DURApulse GS20 or GS20X AC drive and the Quick-Start Guide that matches your product.
2) Please inspect the unit after unpacking to assure it was not damaged during shipment. Make sure that the part number printed on the package corresponds with the part number indicated on the nameplate.
3) Make sure that the part number indicated on the nameplate corresponds with the part number of your order.
4) Make sure that the voltage for the wiring lies within the range as indicated on the nameplate. Please install the GS20(X) AC drive according to this manual.
5) Before applying the power, please make sure that all the devices, including power, motor, control board, and digital keypad are connected correctly.
6) When wiring the GS20(X) AC drive, please make sure that the wiring of input terminals "R/L1, S/L2, T/L3" and output terminals "U/T1, V/T2, W/T3" are correct to prevent drive damage.
7) When power is applied, select the language and set parameter groups via the digital keypad. When executing a trial run, please begin with a low speed, and then gradually increase the speed until the desired speed is reached.

The GS20(X) AC drive should be kept in the shipping carton before installation. In order to retain the warranty coverage, the GS20(X) AC drive should be stored properly when it is not to be used for an extended period of time. Refer to the preceding "Environmental Information" section for proper storage conditions.

Model Number Explanation

GS21(x)- 4 7P5

Applicable Motor Capacity*

0P2: 0.25hp	0P5: 0.5hp	1P0: 1.0hp	2P0: 2.0hp
3P0: 3.0hp	5P0: 5.0hp	7P5: 7.5hp	010: 10hp
015: 15hp	020: 20hp	025: 25hp	030: 30hp

*Not all capacities are available in each voltage.

Input Voltage
1: 120VAC
2: 230VAC
4: 460VAC
5: 575VAC

Model Line
<blank>: Standard GS20
X: NEMA 4X
A: Accessories

Phase
1: One-phase
3: Three-phase

Series Name

Nameplate Information