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AC Drives Selection Guide



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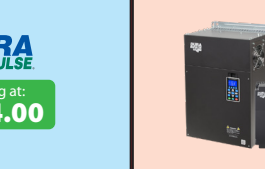




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MICRO AC DRIVES		GENERAL PURPOSE AC DRIVES		HIGH PERFORMANCE AC DRIVES		NEMA 4X RATED AC DRIVES		
 starting at: \$121.00	 starting at: \$112.00	 starting at: \$146.00	 starting at: \$144.00	 starting at: \$463.00	 starting at: \$205.00	 starting at: \$236.00	 starting at: \$189.00	 starting at: \$387.50
WEG CFW100	GS10	WEG CFW300	DURAPulse GS20	DURAPulse GS4	WEG CFW500	DURAPulse GS20X	IronHorse ACN	WEG CFW500 IP66
The smallest VFD in the world but still packed with features	Our most affordable VFD with sensorless vector and PID control	Still compact yet very powerful with built-in PLC and sensorless vector control	General purpose AC VFD that includes many features only found on more expensive and high-performance drives	High-performance VFD loaded with all of the features you need. Available in horsepower ratings up to 300 hp	The most feature rich VFD that we offer that supports closed-loop flux vector control for 100% torque output at 0 speed	Washdown rated general purpose VFD loaded with the same features as the GS20 but able to handle the toughest environments	Washdown rated general purpose VFD built to handle harsh installations. Available in horsepower ratings up to 30 hp	Washdown rated version of the high-performance CFW500. IP66/NEMA 4X enclosure and horsepower ratings up to 20 hp
Input/Output Voltages hp Range 120VAC 1-Phase/230VAC 0.25 - 0.5 hp 230VAC 1-Phase/230VAC 0.5 - 1 hp	Input/Output Voltages hp Range 120VAC 1-Phase/230VAC 0.25 - 1 hp 230VAC 1-Phase/230VAC 0.25 - 3 hp 230VAC/230VAC 0.25 - 7.5 hp 460VAC/460VAC 0.5 - 10 hp	Input/Output Voltages hp Range 120VAC 1-Phase/230VAC 0.25 - 1.5 hp 230VAC 1-Phase/230VAC 0.25 - 3 hp 230VAC/230VAC 0.25 - 5 hp	Input/Output Voltages hp Range 120VAC 1-Phase/230VAC 0.25 - 1 hp 230VAC 1-phase/230VAC 0.25 - 3 hp 230VAC/230VAC 0.25 - 20 hp 460VAC/460VAC 0.5 - 30 hp 575VAC/575VAC 1 - 10 hp	Input/Output Voltages hp Range 230VAC 1-phase/230VAC 1 - 25 hp 230VAC/230VAC 1 - 100 hp 460VAC/460VAC 1 - 300 hp	Input/Output Voltages hp Range 230VAC 1-phase/230VAC 0.25 - 3 hp 230VAC/230VAC 2 - 30 hp 460VAC/460VAC 0.33 - 150 hp	Input/Output Voltages hp Range 230VAC 1-phase/230VAC 0.5 - 3 hp 230VAC/230VAC 0.5 - 7.5 hp 460VAC/460VAC 0.5 - 10 hp	Input/Output Voltages hp Range 230VAC 1-phase/230VAC 0.5 - 3 hp 230VAC/230VAC 0.5 - 20 hp 460VAC 1-phase/460VAC 1/6 - 15 hp 460VAC/460VAC 0.5 - 30 hp	Input/Output Voltages hp Range 230VAC 1-phase/230VAC 0.25 - 3 hp 230VAC/230VAC 0.25 - 10 hp 460VAC/460VAC 0.33 - 20 hp
Supported Control Modes V/Hz Sensorless vector	Supported Control Modes V/Hz Sensorless vector	Supported Control Modes V/Hz Sensorless vector	Supported Control Modes V/Hz Sensorless vector Field Oriented Control (FOC) Torque control	Supported Control Modes V/Hz Sensorless vector	Supported Control Modes V/Hz Sensorless vector Field Oriented Control (FOC) Closed-loop flux vector Torque control	Supported Control Modes V/Hz Sensorless vector Field Oriented Control (FOC) Torque control	Supported Control Modes V/Hz Sensorless vector Slip compensation Torque control	Supported Control Modes V/Hz Sensorless vector Field Oriented Control (FOC) Closed-loop flux vector Torque control
Built-in I/O 4 built-on digital inputs 1 built-in relay output	Built-in I/O 5 built-on digital inputs 1 built-in relay output, 1 built-in digital output 1 built-in analog input 1 built-in analog output	Built-in I/O 4 built-on digital inputs 1 built-in relay output 1 built-in analog input	Built-in I/O 7 digital inputs 3 digital outputs, 1 relay output 2 analog inputs 1 analog output	Built-in I/O 8 digital inputs 2 digital outputs, 2 relay output 3 analog input channels 2 analog output channels	Built-in I/O 4 digital inputs 1 digital output, 1 relay output 1 isolated analog input 1 isolated analog output	Built-in I/O 7 digital inputs 3 digital outputs, 1 relay output 2 analog inputs 1 analog output	Built-in I/O 5 digital inputs 1 digital output, 1 relay output 2 analog inputs 1 analog output	Built-in I/O 4 digital inputs 1 digital output, 1 relay output 1 isolated analog input 1 isolated analog output
Optional I/O Expandable to 4 additional digital inputs with optional expansion card 1 additional relay output with optional expansion card 1 analog input possible with optional expansion card 1 analog output possible with optional expansion card	Optional I/O	Optional I/O Expandable to 4 additional digital inputs with optional expansion card Expandable to 3 additional relay outputs with optional expansion card 1 analog input possible with optional expansion card 2 analog outputs possible with optional expansion card	Optional I/O	Optional I/O Expandable to 6 additional digital inputs with optional expansion card Expandable to 6 additional relay outputs or 2 digital outputs with optional expansion card	Optional I/O Expandable to 8 additional digital inputs with optional expansion card Expandable to 4 additional relay outputs or digital outputs with optional expansion card 3 additional analog inputs possible with optional expansion card 2 additional analog outputs possible with optional expansion card Incremental encoder module Optional flash memory module	Optional I/O	Optional I/O expandable to 3 additional digital inputs with optional expansion card 2 additional relay outputs with optional expansion card 2 additional analog inputs possible with optional expansion card 1 additional analog output possible with optional expansion card	Optional I/O Expandable to 8 additional digital inputs with optional expansion card Expandable to 4 additional relay outputs or digital outputs with optional expansion card 3 additional analog inputs possible with optional expansion card 2 additional analog outputs possible with optional expansion card
Keypad Expandable to 4 additional digital inputs with optional expansion card	Keypad Non-removable keypad with optional remote keypad	Keypad Expandable to 4 additional digital inputs with optional expansion card	Keypad Removable and remote mountable keypad	Keypad Removable and remote mountable keypad.	Keypad Built-in keypad and optional remote keypads. Basic and advanced remote keypad options	Keypad Non-removable keypad. Optional advanced keypad can be remotely mounted	Keypad Non-removable keypad. Optional advanced keypad can be remotely mounted	Keypad Built-in keypad and optional remote keypads. Basic and advanced remote keypad options
Communication Supported	Communication Supported Modbus RTU over RS485	Communication Supported	Communication Supported Modbus RTU over RS485	Communication Supported Modbus RTU and BACnet	Communication Supported Modbus RTU over RS485	Communication Supported Modbus RTU over RS485	Communication Supported Modbus RTU over RS485	Communication Supported Modbus RTU over RS485
Optional Communications Optional Modbus RTU communications module and USB programming module	Optional Communications	Optional Communications Option Modbus RTU communications modules and USB programming module	Optional Communications EtherNet/IP and Modbus TCP with option card	Optional Communications EtherNet/IP and Modbus TCP with option card	Optional Communications EtherNet/IP and Modbus TCP with option card	Optional Communications EtherNet/IP and Modbus TCP with option card	Optional Communications EtherNet/IP and Modbus TCP with option card	Optional Communications EtherNet/IP and Modbus TCP with option card
Safety Ratings		Safety Ratings	Safety Ratings Safe Torque Off (STO) SIL2	Safety Ratings Safe Torque Off (STO) SIL2	Safety Ratings Safe Torque Off (STO) and Safe Stop 1 (SS1) SIL2 with optional CFW500-SFY2	Safety Ratings Safe Torque Off (STO) SIL2	Safety Ratings Safe Torque Off (STO) SIL2	Safety Ratings Safe Torque Off (STO) and Safe Stop 1 (SS1) SIL2 with optional CFW500-SFY2
Environmental Ratings IP20 environmental rating	Environmental Ratings IP20 environmental rating	Environmental Ratings IP20 environmental rating	Environmental Ratings IP20 rating, optional conduit box to rate assembly for NEMA 1	Environmental Ratings Open and IP20 models available	Environmental Ratings IP20 optional NEMA 1 conduit boxes available	Environmental Ratings NEMA 4X/IP66 environmental rating	Environmental Ratings NEMA 4X/IP66 environmental rating	Environmental Ratings NEMA 4X/IP66 environmental rating
Additional Features Built-in PLC PID Control Free WPS programming software for drive configuration and monitoring as well as PLC programming	Additional Features Built-in dynamic braking PID Control Free GSOFT2 for configuration	Additional Features Built-in dynamic braking on frame size B units Built-in PLC PID Control Free WPS programming software for drive configuration and monitoring as well as PLC programming	Additional Features Built-in dynamic braking Built-in PLC 2k steps PID Control Free GSOFT2 for configuration and GSLogic for PLC programming	Additional Features Built-in dynamic braking in lower hp ranges. Supported with external unit(s) in higher horsepower Built-in PLC 10k rungs PID Control Free GSOFT2 for configuration and GSLogic for PLC programming	Additional Features Built-in dynamic braking on most models Built-in PLC PID control with sleep and wake Free WPS programming software for drive configuration and monitoring as well as PLC programming	Additional Features Built-in dynamic braking Built-in PLC 2k steps PID Control Free GSOFT2 for configuration and GSLogic for PLC programming	Additional Features Built-in dynamic braking Built-in function block sequence controller, 18 steps max PID control with sleep and wake Free VFD Suite for configuration, programming and monitoring	Additional Features Built-in dynamic braking Built-in PLC PID control with sleep and wake Free WPS programming software for drive configuration and monitoring as well as PLC programming
Learn more about the WEG CFW100	Learn more about the GS10	Learn more about the WEG CFW300	Learn more about the GS20	Learn more about the GS4	Learn more about the CFW500	Learn more about the GS20X	Learn more about the ACN and ACNND	Learn more about the CFW500 IP66

3 Steps to Selecting the Right AC Drive



STEP 1 - Select The Right AC Drive Series

A. Determine motor voltage, horsepower and full-load amperage

Check the nameplate on the motor for specs needed:

		Inverter Duty Motor						
Motor horsepower	hp	1	Volts	460	PHASE	3	TYPE	P
Motor voltage	RPM	1725	AMPS	2.6	HZ	60	SF	1.15
Motor amperage	DESIGN DUTY	B CONT	AMB ENCL	40°C TEFC	INSUL CLASS CODE	F K		

Motor voltage, horsepower, and amperage can be found on the motor's nameplate.

Note: Most motors can be connected for multiple voltages and will have multiple amperages listed.

In the example to the left the motor can be connected for 460V only. The 460V amperage is 2.6.

B. Select your control mode

Choose the control mode that fits your application and corresponds to the performance chart below. Variable torque applications such as fans and pumps work fine with V/Hz control mode as do most general purpose constant torque applications such as conveyors that aren't going much slower than base speed. Applications that require 100% or close to 100% torque through their speed range should use sensorless vector or FOC modes. If 100% torque is needed at zero or near-zero speed then closed-loop flux vector control is recommended. Torque control mode is used when the motor torque will be controlled as opposed to speed.

	Control Mode				
	Volts/Hertz	Sensorless Vector	Encoder Feedback	Field Oriented	Closed-Loop Flux Vector
Complexity	Low	Moderate	Complex	Moderate	Complex
Performance	Good	Good	High	High	Very High
Starting Torque	150%	200%	200%	200%	200%
Speed Regulation	+/- 2%	+/- 1%	+/- 0.2%	0.5%	0.1%

*Larger systems require external braking units

C. Determine the I/O requirements of the AC drive

Digital inputs are used to interface the AC drive with devices such as pushbuttons, selector switches and PLC digital output modules, either DC or relay. These signals are typically used for functions such as Start/Stop, Forward/Reverse, External Fault, Preset Speed selection, Fault Reset, etc.

Digital outputs are typically used to connect the AC drive to devices such as pilot lights, alarms, auxiliary relays, solenoids, and PLC

digital input modules. Relay outputs are rated for both AC and DC voltages. Transistor outputs are rated for only DC voltages.

The analog input is used to interface the AC drive with an external 0-10 VDC or 4-20 mA signal. This signal can represent either a speed setpoint or if available, PID feedback.

D. Determine location of AC drive's keypad

If the AC drive is installed in a location that the operator cannot easily access, its keypad could be relocated to a more suitable location. Remote mounting may require the purchase of the appropriate cable or other accessories. Note from chart on previous pages that some drive series support remote keypad with various installation options. The keypad is also a handy tool to show advanced parameter information and to setup multiple drives quickly.



E. Determine communications requirements

A communication interface can be used to connect the AC drive to other devices. The device can control the AC drive with this interface instead of using the digital and analog I/O. The device can also use this interface to monitor the status of various AC drive parameters, speed, current, fault status, etc.

Most AC drives have a standard Modbus RS-485 interface. As noted in the chart on the previous page many newer drives also have the optional capability to communicate over Ethernet. The DURApulse GS4 drive also has the BACnet protocol built-in. Drives that can communicate over Ethernet support either Modbus TCP or EtherNet/IP, sometimes both.

F. Determine Enclosure Requirements

As noted in the selection chart there are options for the drive's enclosure. Most are an IP20 finger safe enclosure intended to be mounted in an enclosure or drive room. Some are an open style while there are NEMA 4X models available that are machine mountable and rated for washdown environments.



G. Select the proper series

Once you have gathered your motor information, your application information determined your control mode, Noted your I/O count, communications requirements and enclosure environmental ratings you can use the chart of the previous page to narrow down which series will work for you. After you have selected the AC drive series that meets your requirements, you need to determine the correct rating. Proceed to Step two.

STEP 2 - Select the Proper Rating



A. 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.

B. Determine 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.

C. Installation altitude

AC drives rely upon the cooling properties of air for cooling. As the altitude increases, the air becomes less dense. This decrease 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 up to altitudes of 1000 m. Above 1000 m, the AC drive must be derated.

D. Determine max enclosure internal temp

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. Enclosure ventilation and/or cooling may be required. Ambient temperature measurements/calculations should be made for the maximum expected temperature.

E. Calculate required output amperage

Use the chart below to calculate the required FLA of the AC drive. Select the rating that equals the motor's voltage and equals or exceeds the calculated amperage.

	Ex. 1	Ex. 2	Ex. 3	Ex. 4
Example 1: Motor FLA=4, Overload=200%@45 secs, Altitude=800m, MEIT=45° C, GS10				
Example 2: Motor FLA=6, Overload=120%@80 secs, Altitude=326m, MEIT=45° C, CFW300				
Example 4: Motor FLA=12, Overload=145%@45 secs, Altitude=800m, MEIT=55° C, GS4 Open Type*				
ENTER Motor FLA	4	6	8	12
Overload Derate (overload %)				
If Overload is less than 150% and less than 60 seconds, Then ENTER 1				
If Overload is greater than 150% and less than 60 seconds, Then ENTER (overload/150%)1.33	1.333			1
If Overload is greater than 60 seconds, Then ENTER (overload/100%) Multiply FLA x overload entry (This entry is the overload result)	5.32	7	10.8	12
Altitude Derate (meters)				
If Altitude is less than 1000m Then ENTER 1	1	1	1	1
If Altitude is more than 1000m and less than 3000m Then ENTER 1 + ((altitude -1000) x 0.0001) Multiply overload result x altitude entry (This entry is the altitude result)	5.32	7	10.91	12
Ambient Temperature (Celsius)				
If Max enclosure internal temperature (MEIT) is less than 40° C Then ENTER 1			1	
If 40° C < MEIT < 50° C and CFW300 or GS4 Open Type* Then ENTER 1		1		
If 40° C < MEIT < 50° C and GS10/GS20 zero-stack or GS20X Then ENTER 1.2				
If 40° C < MEIT < 50° C and GS4 Type 1 Then ENTER 1 + ((MEIT - 40) x 0.2)				
If 50° C < MEIT < 60° C and GS10/GS20 open style or GS4 Open Type* Then ENTER 1 + ((MEIT - 50) x 0.2)				1.08
Multiply altitude result x MEIT entry (This result is the required drive FLA)	5.32	7	10.91	12.96

*Open Type temperature ratings apply to GS4 frame sizes A-C with top covers removed, and frame sizes D-G without conduit boxes.



STEP 3 - Options, Options, and more Options

A. Input fuses

Input fuses protect the AC drive from excessive input current due to line surges, short circuits, and ground faults. They are recommended for all installations and may be required for UL-listed installations.

B. Input line reactor

Input line reactors protect the AC drive from transient overvoltage conditions, typically caused by utility capacitor switching. The input line reactor also reduces the harmonics associated with AC drives. Input line reactors are recommended for all installations.

C. Input EMI filter

Input EMI filters reduce electromagnetic interference or noise on the input side of the inverter. They are required for CE compliance and recommended for installations prone to or sensitive to electromagnetic interference.

D. Output line reactor

Output line reactors and dV/dT filters protect the motor insulation against drive short circuits and IGBT reflective wave damage. These devices also "smooth" the motor current waveform, allowing the motor to run cooler.

Output line reactors or dV/dT filters are recommended to protect the motor, especially with long cable lengths between drive and motor. A dV/dT filter is recommended for any wiring distance over 100 feet.

E. Dynamic braking

Dynamic braking allows the AC drive to produce additional braking (stopping) torque. AC drives can typically produce between 15% and 20% braking torque without the addition of any external components. DURAPULSE GS10, GS20(X),GS4 and IronHorse ACN/ACNND drives have built-in braking on units up to 30 hp (up to 40 hp for 480VAC models). These drives require the addition of a braking resistors to increase their braking torque capability. Larger drives require separate braking units in addition to the braking resistors to increase their braking torque capability. Dynamic braking may be required for applications requiring rapid deceleration or high inertia loads.

