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AC Drives
Selection Guide

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DURA PULSE

weg

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AC Drives offer the following advantages:

- **Reduce start up current** - controlling the inrush current at motor start-up allows the use of smaller fuses, and reduces electrical peak load.
- **Reduce mechanical stress** - controlled/smooth starting and stopping minimize mechanical shock and wear and tear on the system.
- **Power Factor** - Motors have very poor power factors (especially at light loading). Drives significantly increase power factor (even at light loading) and can eliminate the need for power factor correction capacitors and/or utility power factor charges.
- **Variable Speed and integrated functionality** - AC drives can vary motor speed and direction by operator input (keypad buttons/speed control knob) or by digital and analog inputs (from pushbuttons/switches/pots or PLC outputs) or by communication from a PLC or master controller. Basic machine control can sometimes be performed in the drive (limit switches/sensors can be wired to the drive's inputs to control motor speed or direction).

go to: CFW

CFW100 AC micro drive

WEG CFW100 drives are the smallest variable frequency drives in the world. Although small in size, it is big on features such as a built-in PLC and sensorless vector control. When space is at a premium, the WEG CFW100 is a great partner for OEMs. CFW100 series drives are available in ratings from ¼ to 1hp.

- Smallest AC drive in the world
- Single-phase input power (110/230 VAC)
- Scalar Volts/Hertz (V/Hz) and sensorless vector (also called Voltage Vector (VVW)) control modes
- Built-in operator interface (HMI)
- PID control function
- Fire mode function

GS1 AC mini drive

If all you need is basic scalar control and you want simplicity, the GS1 series can get the job done. All models offer an integrated keypad with speed control knob and built-in Modbus communications. GS1 series drives are available in ratings from ¼ to 2 hp

- Simple Volts/Hertz (V/Hz) control
- 130% starting torque at 5 Hz
- External analog input (0-10V, 0-20 mA or 4-20 mA)
- Four programmable digital inputs, One programmable relay output
- One programmable relay output
- DIN-rail mountable

CFW300 AC micro drive

WEG CFW300 variable frequency drives are high-performance VFDs for three-phase induction motors. The CFW300 series features a com¬pact size with contactor-style elec¬trical connections (top in / bottom out). The CFW300's performance can be scaled to match the application by selecting sensorless vector or scalar control. CFW300 series drives are available in ratings from ¼ to 5 hp.

- Scalar Volts/Hertz (V/Hz) and sensorless vector (also called Voltage Vector (VVW)) control modes
- Remote Keypad (optional)
- Side-by-side zero-stack mounting
- 5 digital I/O built-in with 4 digital & analog I/O option modules
- PID control (built-in)
- PLC (built-in)

For the latest prices, please check AutomationDirect.com.

DURAPULSE GS20(X) AC sensorless vector drive

The GS20 and GS20X drives have taken what has worked well in the GS2 series drives, added sensorless vector and field oriented control as well as expanded on the built-in I/O, added a built-in PLC and offers the option for Ethernet communications. The GS20X versions offer a NEMA 4X enclosure so you can install it in a washdown or harsh location. You are going to have a hard time believing that a drive this feature-rich costs as little as it does. DURApulse GS20 drives are available in ratings from from ¼ to 30 hp; GSX20 versions are available from ½ to 10 hp. Both series offer 575VAC rated models.

- V/Hz, sensorless vector control and field oriented control modes
- Torque Control Mode
- STO – Safe Torque Off
- Built-in PLC (up to 2,000 steps)
- USB programming
- Optional Ethernet communications for Modbus TCP and EtherNet/IP
- GS2 mode to ease with migration from GS2 VFDs (not supported on GS20X)
- GS20X models offer NEMA 4X enclosure and optional NEMA 4X disconnect

DURAPULSE GS3 AC sensorless vector drives

The DURApulse GS3 series offers sensorless vector control with autotune and many other advanced features such as Modbus communications, PID control, motor autotune and DC injection braking. A detachable keypad with Forward/Reverse control can store/transfer up to four separate drive parameter configurations. DURApulse GS3 drives are available in ratings from 1 to 100 hp.

- V/Hz and sensorless vector control modes
- 150% starting torque
- Removable keypad
- Optional encoder feedback card
- 11 programmable digital inputs, four programmable outputs and three analog inputs
- Optional Ethernet communications

DURAPULSE GS4 AC sensorless vector drives

The DURApulse GS4 series is our most advanced sensorless vector AC Drive with all the features of the GS3, plus enhancements such as 100kA SCCR Rating, 50°C rating, circulatory control mode and field upgradeable firmware. The DURApulse GS4 can operate off of single-phase power up to the 100 hp size, and is available in ratings from 1 hp to 300 hp.

- Single-phase models up to 100 hp
- V/Hz control or sensorless vector
- STO -Safe Torque Off (TUV certified)
- Flange-Mount Capability for frame sizes A to F (1 to 215 hp)
- Built-in PLC (up to 10k rungs)
- Expanded I/O capability – 110V Inputs, Relay Outputs, and DC I/O
- Analog I/O: 3 Inputs and 2 Outputs
- Fire mode
- High-speed communication interfaces with MODBUS RTU and BACnet protocols built-in, plus optional communication cards: MODBUS TCP, EtherNet/IP

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3 Steps to Selecting the Right AC Drive

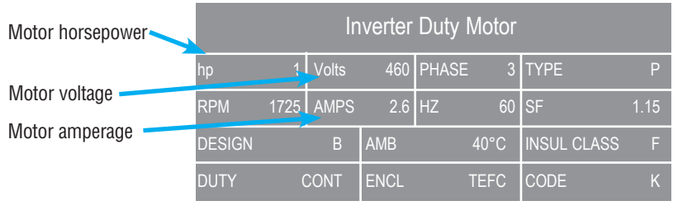
STEP 1 - Select The Right Model

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

AC Drive Models

	CFW100	GS1	CFW300	GS20/GS20X	GS3	GS4
Horsepower	1/4 - 1*	1/4 - 2	1/4 - 5*	1/4 - 30*	1-100*	1-300*
Input voltage	115/230 VAC	115/230 VAC	115/230 VAC	115/230/460/575 VAC	230/460 VAC	230/460 VAC
Motor voltage	230 VAC	230 VAC	230 VAC	230/460/575 VAC	230/460 VAC	230/460 VAC
	* 115V up to 1.5 hp 230V up to 1 hp		* 115V up to 1.5 hp 230V up to 5 hp	*115V up to 1 hp 230V up to 20 hp (7.5hp for GS20X) 460V up to 30 hp (10 hp for GSX20) 575V up to 10 hp	* 230V up to 50 hp 460V up to 100 hp	*230V up to 100 hp 460V up to 300 hp

Check the nameplate on the motor for specs needed:



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 application and/or control mode

	CFW100	GS1	CFW300	GS20/GS20X	GS3	GS4
Volts/Hertz Control	✔	✔	✔	✔	✔	✔
Sensorless Vector Control	✔		✔	✔	✔	✔
Encoder Feedback			Optional		Optional	
Integral PID Control	✔		✔	✔	✔	✔
Built-in PLC	✔		✔	✔		✔
Integral Dynamic Braking Unit			3 to 5 hp	Up to 30 hp*	Up to 15 hp*	Up to 30 hp*
	Pump	Conveyor	Pump	Conveyor	Conveyor	Conveyor
	Fan / Blower	Pump	Fan / Blower	Pump	Pump	Pump
	Blender / Mixer	Fan	Blender / Mixer	Fan	Fan	Fan
	Centrifuges	Shop tools	Centrifuges	Material handling	Material handling	Material handling
	Compressors		Compressors	HVAC	HVAC	HVAC
	Material handling		Material handling	Mixing	Mixing	Mixing
	Granulators		Granulators	Compressor	Compressor	Compressor
	Rotary Fillers		Rotary Fillers	Shop tools	Shop tools	Shop tools
	Shop tools		Shop tools			

Either choose your application from those listed or select the control mode that meets your application's requirements. For applications not listed, either select the control mode that offers the same or higher level of performance as the existing control, or call us and ask for assistance.

Control Mode

	Volts/Hertz	Sensorless Vector	Encoder Feedback
Complexity	Low	Moderate	Complex
Performance	Good	Good	High
Starting Torque	175%	200%	200%
Speed Regulation	+/- 2%	+/- 1%	+/- 0.2%

Larger systems require external braking units

For the latest prices, please check AutomationDirect.com.

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

AC Drive Models

	CFW100	GS1	CFW300	GS20/GS20X	GS3	GS4
Digital Inputs	4/4*	4	4/8*	7	11	8/12*
Digital Inputs (110VAC)						0/6*
Digital Outputs - Transistor				2	3	2/4*
Digital Outputs - Relay	0/1*	1	3/4*	1	1	0/8*
Digital Output - Frequency pulse				1	1	1
Analog Input	0/1*	1	1/1*	2	3	3
Analog Output	0/1*		0/2*	1	1	2
Thermister Input			0/1*			
Encoder Input			0/1*		0/1*	

* built-in / optional I/O capacity

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

AC Drive Models

	CFW100	GS1	CFW300	GS20/GS20X	GS3	GS4
Removable Keypad				✔	✔	✔
Remotely Mountable 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. Also available for the DURApulse drives is a remote, panel-mount bezel.

E. Determine communications requirements

AC Drive Models

	CFW100	GS1	CFW300	GS20/GS20X	GS3	GS4
MODBUS Serial RTU	Optional	✔	✔	✔	✔	✔
BACnet Serial						✔
MODBUS Ethernet TCP		Optional		Optional	Optional	Optional
Ethernet I/P				Optional		Optional
USB	Optional		Optional	✔		✔

A serial 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.

The WEG CFW300, GS1 and *DURA*pulse AC drives have a standard Modbus RS-485 interface.

The GS1 and *DURA*pulse drives also have the optional capability to communicate through a remote Ethernet interface (GS-EDRV100). The *DURA*pulse GS4 drive also has the BACnet protocol built-in. The GS20, GS20X and GS4 have the ability to add Ethernet communications (either MODBUS TCP or EtherNet/IP via internal option card). Please refer to the technical section of each GS or DURApulse model to determine the required Ethernet interface adapter and compatible Ethernet devices.

The WEG CFW100 and CFW300 offer optional RS-232 or 485 Modbus communications modules for connecting to peripheral devices or for programming and monitoring. An optional USB v2.0 port is also available for programming and monitoring only.

F. Select the proper series

After you have selected the AC drive series that meets your requirements, you need to determine the correct rating. Turn the page and proceed to Step two.

STEP 2 - Select the Proper Rating

STEP 1 | STEP 2 HERE | STEP 3

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.

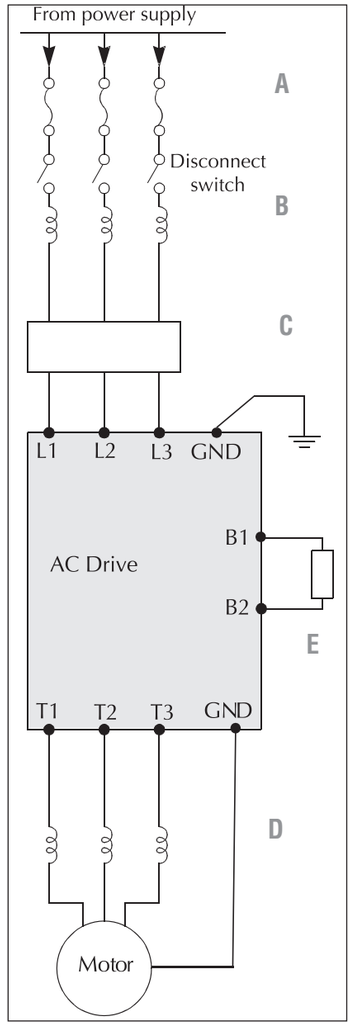
Example 1: Motor FLA=4, Overload=200%@45 secs, Altitude=800m, MEIT=45° C, **GS1**
Example 2: Motor FLA=6, Overload=120%@80 secs, Altitude=326m, MEIT=45° C, **CFW300**
Example 3: Motor FLA=8, Overload=135%@75 secs, Altitude=1100m, MEIT=35° C, **GS3**
Example 3: Motor FLA=12, Overload=145%@45 secs, Altitude=800m, MEIT=55° C, **GS4 Open Type***

		Ex. 1	Ex. 2	Ex. 3	Ex. 4
			WEG	DURAPULSE	
		GS1	CFW300/100	GS20 zero-stack/ GS20X/GS3	GS20 open style/ GS4
	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%)**		1.20	1.35	
	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)**			1.01	
	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 GS1 up to 5 hp **Then ENTER 1**	1			
	IF 40° C < MEIT< 50° C and GS20 zero-stack, GS20X or GS3 **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 GS20 opebn 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 1 | STEP 2 | STEP 3 HERE

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. Input fuse kits and replacement fuses are available for GS series and DURAPULSE AC drives.

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 protect the motor insulation against drive short circuits and IGBT reflective wave damage. Output line reactors also "smooth" the motor current waveform, allowing the motor to run cooler. The line reactor can be used for either input or output applications.

Output line reactors are recommended for operating "noninverter-duty" motors and when the length of wiring between the AC drive and motor is longer than the recommended max length of a given motor model. Inverter-duty rated motors support longer lead length than do non-inverter duty motors.

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. The GS3 AC drives have built-in braking circuits on all units below 15 hp, the GS20, GS20X and GS4 drives have built-in braking on units up to 30 hp (up to 40 hp for 480VAC models). These drives usually require the addition of a braking resistor 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.

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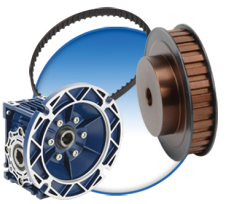
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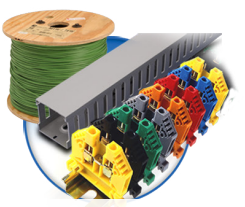
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