For the latest prices, please check AutomationDirect.com.

Online at Auton

Fast Shi

St Money Back

AUTOMATIONDIRECT

IRONHORSE



TOSHIBA



www.automationdirect.com/support

FREE Videos: www.automationdirect.com/videos

FREE Documentation: www.automationdirect.com/documentation

> FREE CAD drawings: www.automationdirect.com/cad



Шер

P

omationdirect.com/

Selection Guide

For the latest prices, please check AutomationDirect.com.

InterfaceMateConcent PurposeMath PurposeMath PurposeMath PurposeMath PurposeMath PurposeMath PurposeMath PurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePurposePur						
Drive SeriesDrive Series </td <td></td> <td>Micro</td> <td>General Purpose</td> <td>High Performanace</td> <td colspan="2">NEMA 4X</td>		Micro	General Purpose	High Performanace	NEMA 4X	
Protect and affordable for low pay and programmed with the segment of the law and programmed programmed and pr	Drive Series		DURA INPULSE GSZOWI IRONHORSE ACG CFW320		DURA INDILSE GSZOX ACN IRONHORSE ACN CFW500 IP66	
Descriptionreedsaccurant advanced nortods(be latest technology advances)Wasdwarn rated VEDs151V111P112P <td< td=""><td></td><td>Compact and affordable for low hp applications and basic</td><td>Still compact yet very powerful VFDs with better</td><td>High-performance VFDs supporting full closed loop and</td><td colspan="2">1</td></td<>		Compact and affordable for low hp applications and basic	Still compact yet very powerful VFDs with better	High-performance VFDs supporting full closed loop and	1	
115 via116 via116 via117 via117 via1230 via7,51P2,01P5,01P2,01P4600 via10HP10,01P3,01P5750 viaNo0005750 viaNo0NoNo5361 Graye OffNo0NoNo5361 Graye OffNo00NoNoMax Speed AccuracyGoodBetterNoBestBester/BestMax Speed AccuracyGoodNo0NoNoFreede Cold Loop ControlNoNoStandardStandardStandardMultiple Motor ComptibilityZ MotorStandardStandardYes (XMS0 only)Discrete Inputs5 orles-StandardYes (XMS0 only)Discrete Inputs5 orles-StandardYes (XMS0 only)Analog Inputs5 orles-StandardYes (XMS0 only)Analog Inputs5 orles-StandardYes (XMS0 only)Analog Inputs5 orles-StandardYes (XMS0 only)Pulse Houl/Othy1StandardYes (XMS0 only)Analog Inputs1StandardStandardPulse Houl/Othy1StandardStandardStandar Congenerer FindedNo-StandardStandardStandar Congenerer Finded Standard-StandardStandardStandardStandar Congenerer Finder Standard-Standa	Description	needs	acccuracy and advanced controls	the latest technology advances	Washdown rated VFDs	
230V7.54P204P204P504P204PA460V104P304P304P304P575VNo104PNoNo575VNo0NoNoSde Torque OffNo0NoNoMax Speed AccuracyGoodBeterBestBetter/BestPrecise Closed Log OchtrioNoNoYes (No GS4)Yes (CRVS00 ohly)KeypadStandardStandardEnhance Graphics and DataStandardMultiple Motor Compatibility2 MotorYes (GS20 only)YesYesDiscrete Inguls5 or less	115V	1HP	1HP	-	-	
460V10HP30HP30HP30HP30HP $575V$ No10HPNo0HSafe Torge OffNo $Set Torge OffNoSet Set Set Set Set Set Set Set Set Set $	230V	7.5HP	20HP	50HP	20HP	
575 (%)NoNoNoSafe Torque OffNo $-Yes (Not Gor GFV320)$ Max Speed AccuracyGoodBetterBestBest GS4 (SP430)Precise Closed Loop ControlNoNoYes (Not GS4)Yes (CFW500 only)KeypadStandardStandardBhanced Graphisa and DataStandardMultigle Motor CompatibilityNoYes (GS20 only)YesYesDiscrete OutputsSo riessSo riessSo riessYesDiscrete Outputs2 $$	460V	10HP	ЗОНР	300HP	30HP	
Safe Torque Off Max Speed AccuracyNo $- Ves (Not AG or CFW320)$ Max Speed AccuracyGoodBetterBesterBesterPrecise Closed Loop ControlNoOYes (CFW300 only)KeypadStandardChanaced Graphics and DataYes (CFW300 only)KeypadNoYes (GS20 only)Chanaced Graphics and DataStandardTorque ControlNoYes (GS20 only)Yes (GS20 only)Yes (GS20 only)Yes (GS20 only)Multiple Motor Compatibility2 MotorObjecte InputsSo rolessDiscrete OutputsSo rolessAnalog Inputs1 (Voltage)1 (Volt/Current)Pulse Input/Output1 (Voltage)1 (Volt/Current)<	575V	No	10HP	No	No	
Max Speed AcuracyGoodBetterBetterBestBetter/BestMax Speed AcuracyNoNoNoMeter/BestKeypadStandardStandardEnhanced Graphics and DataStandardTorque ControlNoYes (Sto2 only)YesYesMultiple Motor CompatibilityQ MotorYes (Sto2 only)YesYesDiscrete InputsS or lessImage: StandardYesYesDiscrete OutputsQQImage: StandardYesAnalog Inputs1Image: StandardYesYesAnalog Ouptis1Image: StandardYesYesPuts Input/Output10kHzImage: StandardYesYesPuts Input/OutputNoImage: StandardYesYesTotal ParametersImage: StandardImage: StandardStandardPuts Input/OutputNoImage: StandardStandardYesSpecial FunctionalityPump ModeImage: StandardStandardFree Software ConfiguratioImage: StandardImage: StandardStandardFree Software ConfiguratioNoImage: StandardNoNoEtherer AnaliableNoImage: StandardNoNoEtherer AnaliableNoYes (CFW320 only)YesNoEtherer AnaliableNoYes (CFW320 only)Image: StandardNoEtherer AnaliableNoYes (CFW320 only)YesNoEther AnaliableNoYesNoNo </td <td>Safe Torque Off</td> <td>No</td> <td></td> <td>Yes (Not ACG or CFW320)</td> <td></td>	Safe Torque Off	No		Yes (Not ACG or CFW320)		
Predse Closed Loop ControlNoYes (CFWS50 only)KeypadStandardEnhanced Graphics and DataStandardTorque ControlNoYes (GS20 only)Financed Graphics and DataStandardMultiple Motor CompatibilityQ MotorYes (GS20 only)Yes (GS20 only)Yes (GS20 only)Discrete InputsS or less $- S + S + S + S + S + S + S + S + S + S $	Max Speed Accuracy	Good	Better	Best	Better/Best	
KepadStandardStandardEnhanced Graphics and DataStandardTorque ControlNoYes (6S20 only)YesYesMultiple Motor Compatibility2 Motor4 MotorYesDiscrete InputsS or less- 5 - 8Discrete Ouputs2 2 - 3	Precise Closed Loop Control	No	No	Yes (Not GS4)	Yes (CFW500 only)	
NoteYes (6520 only)YesYesMultiple Motor Ompatibility2 Motor4 MotorDiscret Inputs5 or less	Keypad	Standard	Standard	Enhanced Graphics and Data	Standard	
Multiple Motor Compatibility2 Motor4 MotorDiscrete Dupts5 or less5.8O Discrete Outputs22.3Analog inputs1-1.3Analog Outputs10 (Voltage)3.3 kHz-Pulse Input/Output10 kHz3.3 kHz-PUse Input/Output10 kHz-3.3 kHz-Total Parameters-3.3 kHzSpecial Functionity-0Free SoftwarconfigurationEthernet AvailableNoEthernet AvailableNo-YesNoNo-Expansion IO AvailableNoYes (CFW320 onty)Yes (CFW320 onty)-No-Expansion IO AvailableNoYes (CFW320 onty)Yes (CFW320 onty)-No-	Torque Control	No	Yes (GS20 only)	nly) Yes Yes		
Discrete huputsSor lessSor lessDiscrete outputs2<	Multiple Motor Compatibility	2 Motor		4 Motor		
Discrete Outputs2CCCCAnalog inputs1IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII </td <td>Discrete Inputs</td> <td>5 or less</td> <td></td> <td>5 - 8</td> <td></td>	Discrete Inputs	5 or less		5 - 8		
Analog inputs1I1-3Analog Ouputs1 (Voltage) $2 \cdot 3 \cdot 4 \cdot 5 \cdot 5$	Discrete Outputs	2	2 - 3			
Anlag Ouputs1 (Voltage)1 (Volt/Current) $2 \cdot 3 (Verrent)$ Pube Input/Output1000 $3 \cdot 3 \cdot$	Analog inputs	1	1-3			
Pulse Input/Output 10kHz 33kHz PLC or Sequence Embedded No Yes Total Parameters 400 600 800+ 800+ Special Functionality Pump mode 900+ 800+ 900+ Free Software Configuration Pump mode 900+ 900+ 900+ 900+ Ethernet Available No Second Software Softw	Analog Ouputs	1 (Voltage)	1 (Volt/Current)	1 - 3 2 - 3 (Volt/Current)		
PLC or Sequencer EmbeddedNoYesTotal Parameters"400"600800+Special FunctionalityPump Mode / Fan mode Tension ControlPump Mode / Fan mode Tension ControlFree Software Configuration	Pulse Input/Output	10kHz	33kHz			
Total Parameters"""""""""""""""""""""""""""""""""	PLC or Sequencer Embedded	No	Yes			
Special FunctionalityPump ModeFan mode Tension ControlPump Mode / Fan mode Tension ControlFree Software Configuration<	Total Parameters	~400	~600	~600 800+		
Free Software ConfigurationYesEthernet AvailableNoEther CAT AvailableNoEther CAT AvailableNoExpansion IO AvailableNoNoYes (CFW320 only)State Software ConfigurationYes (CFW320 only)	Special Functionality	Pump mode		Pump Mode / Fan mode Tension Control	Pump Mode	
Ethernet Available No Yes EtherCAT Available No No Expansion IO Available No Yes (CFW320 only)	Free Software Configuration			ſes		
EtherCAT AvailableNoNoExpansion IO AvailableNoYes (CFW320 only)Yes	Ethernet Available	No	Yes			
Expansion IO AvailableNoYes (CFW320 only)Yes	EtherCAT Available	N	No		No	
	Expansion IO Available	No	Yes (CFW320 only)	Ye	S	

			DRIVE CATEGORIES & SERIES		
Drive Family	Brand Summary	Configuration Software	Micro	General Purpose	High Performanace
	All the latest industry features and an industry best low price, Durapulse is the flagship brand of ADC for over 20 years.		GS 10	GS 20	GS 30 GS 4
IRONHORSE"	The basic features at a great price. Ironhorse has you covered.	VFD Suite		ACG	
шед	A Brazilian company, operating worldwide in the electric engineering, power and automation technology areas. WEG drives provide great features and pair perfectly with WEG motors	NPS	CFW100	CFW320	CFW500
TOSHIBA	Legendary quality and ease of use, Toshiba drives offer robust performance for any application. For longevity and ease of mind, pair with Toshiba motors for a 3 year warranty	ASD Pro			AS3®



Selection Guide



3 Steps to Selecting the Right AC Drive



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

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 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	Field Oriented	Closed-Loop Flux Vector
Complexity	Low	Moderate	Moderate	Complex
Performance	Good	Very Good	High	Very High
Starting Torque	150%	200%	200%	200%
Speed Regulation	+/- 2%	+/- 1%	0.5%	0.1%

*Larger systems requir ternal braking units

For the latest prices, please check AutomationDirect.com.



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 Toshiba AS3 offers an optional 120 VAC digital I/O module.

D. Determine location of AC drive's keypad

If the AC drive is installed in a location that the operator cannot easily access, some drives offer the option of remotely mounting the drives keypad or adding an additional keypad. Mounting kits or cables may be needed. In addition, some additional keypads provide more informational displays and can be used to transfer programming from one drive to another, allowing for faster drive commissioning.

E. Determine communications requirements

Communication interfaces allow the drive to be connected to remote devices such as PLCs and HMIs, in place of using hardwired digital and analog I/O. The remote devices provide the advantage of real-time monitoring and flexibility of altering drive control without the need to re-wire.

F. Determine Enclosure Requirements

Most drives are IP20 finger safe standards Many drives feature NEMA 1 enclosures, suitable for panel mount or free-standing installation. And we carry a good selection of NEMA 4X washdown enclosure drives that are machine mountable for washdown applications.

G. Select the proper series

Now that you've gathered the: motor info, application info, determined the control mode, I/O, communication needs and enclosure requirements it's time for to select the right drive for your project.

Use the selection guide on page 2 to determine which drive series meets your requirement and go to Step 2 in the process.

Analog inputs and outputs connect the drive to external -10 -10VDC, 0-10VDC, 0-20mA or 4-20mA, depending on model. GS30 and AS3 offer additional cards for more analog capacity. Analog input signals are commonly used for PID feedback, speed control and flow-rates. Analog output signals are commonly used for speed indication, and scaled drive operation values.



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, GS30 and AS3 Drives have EtherCAT communications.





 $\bigcirc 2 \bigcirc 3$



1 2 3





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

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 existinOg motor starters with AC drives may require up to 600% overload.

C. Installation altitude

AC drives rely upon ambient air for cooling. As the altitude increases, the air becomes less dense. This decrease in air density decreases the cooling properties of 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 without proper panel sizing and ventilation techniques, may lead to drive over-heating. Enclosure ventilation and/or cooling may be required. For zero stack installation, any temperature over 40°C requires derating.

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

	1 0	Ex. 1	Ex. 2	Ex. 3	Ex. 4
Example 1: Motor FLA=4, Overload=200%@45 secs, Altitude=800m, MEIT=45° C, C Example 2: Motor FLA=6, Overload=120%@80 secs, Altitude=326m, MEIT=45° C, C Example 3: Motor FLA=8, Overload=135%@70 secs, Altitude=1100m, MEIT=35° C, Example 4: Motor FLA=12, Overload=145%@45 secs, Altitude=800m, MEIT=55° C, Applications where the AC drive is replacing existing across-the-line motor state may need to be upsized to 600% of the overload.	GS10 GFW300 GS20X GS4 orters, ENTER Motor FLA	6510 4	ШЕС CFW320/100 6	DURAPU GS20/30 zero-tack GS20X 8	LSE (/ GS20/30 open sty GS4 12
Overload is less than 150% and less than 60 second	^{/S,}	1.333			1
0verload is greater than 150% and less than 60 sec	onds, n e n ENTER (overload/150%)				
Overload is greater than 60 seconds,	ENTER (overload/100%)		1.20	1.35	
(This	entry is the overload result)	5.32	7	10.8	12
E M Altitude is less than 1000m	Then ENTER 1 1	1	1		1
E If Altitude is more than 1000m and less than 3000m	ER 1+ ((altitude -1000) x 0.0001)			1.01	
Multiply ove (This	erload result x altitude entry s entry is the altitude result)	5.32	7	10.91	12
Max enclosure internal temperature (MEIT) is less than 4					
40°C < MEIT< 50°C and CFW300 or GS4 Open Type	2* Then ENTER 1		1		
$\frac{1}{8}$ $4^{\circ}C < MEIT < 5^{\circ}C$ and GS10/20/30 zero-stack or	GS20X				
1 40°C < MEIT< 50°C and GS4 Type 1	200 ENTER 1 + ((MEIT - 40) x 0.2)				
ff 50°C < MEIT< 60°C and GS10/20/30 open style or	GS4 Open Type* ENTER 1 + ((MEIT - 50) x 0.2)	1			1.08
Multiply (This resu	altitude result x MEIT entry It is the required drive FLA)	5.32	7	10.91	12.96



Input fuses or circuit breaker 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 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

D. Output line reactor/filter

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

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), GS30, GS4, WEG CFW320 and CFW500, and IronHorse ACG and ACN drives have built-in braking on units up to 40 hp. Higher HP models require an external DBU. The Toshiba AS3 has built in braking up to 100HP. 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.

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

VAUTOMATIONDIRECT

STEP 3 - Options, Options, and more Options

A. Input line circuit protection

B. Input line reactor

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.

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

