

# Beaver Electrical Machinery

## TECO Westinghouse

### A510

## Heavy Duty AC Drives



1-100 HP (208/230V)

1-200 HP (460V)

1-10 HP (575V)

15-250 HP (575/690V)



# Control Mode Application and Selection Guide

The **A510 Heavy Duty AC Drive** is an easily configured versatile drive product that will control all general applications such as fans, pumps, conveyors, and mixers. It comes standard with a simple to select preset application parameters for many commonly used applications. A preset application menu designed to **simplify start-up** is provided for the following applications:

<b>Pump</b>	<b>Conveyor</b>
<b>Exhaust</b>	<b>HVAC</b>
<b>Compressor</b>	<b>Hoist</b>
<b>Crane</b>	

Despite its simple and easy approach, the A510 is loaded with features to solve tough and demanding applications such as reciprocating pumps, compressors and high torque/ high inertia loads. Advanced algorithms allow the A510 to perform tight and precise speed control when coupled with encoder feedback on the motor being controlled.

Application Type	V/F Mode (Open-Loop)	V/F Mode with PG Feedback	SLV Sensorless Vector Mode	SV* Closed-Loop Vector Mode	PMSV* Closed-Loop Vector Mode w/ Permanent magnet Motor
Fans and Blowers	X				
Centrifugal Pumps	X				
Mixers	X				
Conveyors	X	X	X		
Compressors	X	X	X		
Hoist/ Elevator			X	X	
Stamping / Punch Press			X		
Dynamometers			X	X	
Extruders			X	X	
Injection Molding				X	
Web/ Roll Processes				X	X
Torque Trim				X	X
Torque Control				X	X
Indexing Operations				X	X
Positioning				X	X
Servo Functions					X
Winder / Unwinder				X	

\*Requires optional PG encoder feedback

# Intelligent LCD Keypad

A complete **keypad** that will control, configure, and closely monitor the A510 unit as it controls operations. LCD Operators Keypad can save the configuration file for easy upload/ download.



Display	Description
LCD Display	Monitor over 50 inverter signals, view/ edit parameters, fault/ alarm display
<b>LED Indicators</b>	
FAULT	LED ON when a fault or alarm is active
FWD	LED ON when inverter is running in forward direction, flashing when stopping
REV	LED ON when inverter is running in reverse direction, flashing when stopping
SEQ	ON when RUN command is from the external control terminals or from serial communication
REF	ON when Frequency reference is from external control terminals or from serial communication
<b>Keys</b>	
RUN	RUN inverter in local mode
Stop	STOP inverter
▲	Parameter navigation up, increase parameter or reference value
▼	Parameter navigation down, decrease parameter or reference value
FWD / REV	Used to switch between Forward and Reverse direction
DSP / FUN	Used to scroll to next screen Frequency screen > Function selection > Monitor parameter
◀ / RESET	Selects active seven segment digit for editing with the UP/DOWN keys Used to reset fault condition
READ / ENTER	Used to read and save the value of the active parameter

# Applications

The A510 is loaded with features to solve demanding applications and control more common ones such as fans, pumps, conveyors, and mixers. Demanding application examples are listed below.

- **Compressors**
  - High starting torque with sensorless vector mode
  - Stable torque at low speed
- **Metals processing including industrial saws, punch press, and screw and bolt manufacturing**
  - Attains the high torques required by these applications
  - Hardware design handles the high in-rush currents that are produced
  - High braking torque and regenerative overvoltage protection
- **Machine tool operations such as grinding, milling and lathes**
  - Capable of output frequencies to 599 Hz
  - Smooth operation and minimal ripple at any speed
  - High braking torque capabilities
  - High resolution analog input for demanding precision
- **Plastics and rubber process machines such as extruders and rubber compounding**
  - Smooth operation at low speeds
  - High starting torque to produce consistent product
- Hardware design handles the high in-rush currents that are produced
- **Cranes, hoists, and materials handling**
  - Four quadrant operation for motoring and regenerative situations
  - High torque for instant lifting
  - High braking torque, precise control and operation
  - Easily incorporates mechanical and safety interlocks



# Features and Highlights

- **Selectable Control Modes designed to cover almost all motor driven applications**
  - V/F Mode with constant and variable torque settings
  - V/F Mode with PG encoder feedback to improve speed regulation
  - Sensorless Vector for more dynamic applications
  - Sensorless Vector with permanent magnet motors for more dynamic applications
  - Closed Loop Vector for the most demanding applications involving both speed and torque control
    - 1000:1 Speed control range — 5% Torque regulation
  - Closed Loop Vector with Permanent Magnet Motors for servo-type control
  - Sensorless vector control with dynamic control and rotational tuning
- **Attains high levels of torque**
  - 200% Starting torque in sensorless vector modes
  - 200% Holding torque in closed-loop vector modes
- **Select matching application type for quick setting of parameter defaults**
- **Advanced regenerative energy handling capabilities with overvoltage suppression**
  - Reduce the need for costly braking resistor units
- **Extensive Monitoring and Display capabilities**
  - Display over 40 different operating and status information variables including
    - Input and output frequency, current, and voltage
    - Analog and digital I/O status
    - PID related data
    - Vector PID loop control information
  - Retains 4 most recent faults in a log
    - Operating information at instant of occurrence of most recent fault
- **PLC functionality built-in to enhance application flexibility**
- **Advanced tuning/ motor matching capabilities**
  - Control induction or permanent magnet motors
  - 5th generation tuning algorithms for optimized vector control and motor coordination
  - Static and dynamic tuning
- **Pulse Width Modulation (PWM) technology to reduce motor noise**
- **Digital I/O**
  - 8 configurable digital inputs
    - 24V power on board
    - Over 40 available selections per input
    - Assign each input as a normally open or closed input
  - 3 digital outputs
    - 1 form C relay and 1 form A relay (3-100 HP @ 230V, 5-200 HP @ 460V,
    - 1-10 HP @ 575V, 15-250 HP @ 690V)
    - 1 photocoupler output (Qty 2 at 1-2 HP @ 230V, 1-3 HP @ 460V)
    - All digital outputs are assignable as normally open or normally closed contacts
  - Safety input contact for user's interlock circuit
- **Analog I/O (2 inputs)**
  - One channel selectable as 0-10VDC or -10-0-10VDC
  - One channel selectable as 0-10VDC or 4-20mA
- **Assignable as speed reference, PID feedback, gains, bias, and torque control-related parameters**
  - Qty 1 0-10VDC analog output and Qty 1 0-10VDC/ 4-20mA output
    - Over 25 assignable selections for each channel
    - Assignable gain and bias on each channel
- **Pulse I/O**
  - 1 pulse input channel capable of up to 32 kHz
  - 1 pulse output channel capable of up to 32 kHz
    - Can sync channels between A510 units for primary/ secondary configuration

# Models and Ratings

## 230 VAC

Model No.	HP		Amps		Height	Width	Depth	Weight	Diagram
	CT	VT	CT	VT	In / mm	In / mm	In / mm	Lbs / Kg	
*†A510-2001-CU	1	1.5	5	6	9.61/244	5.12/130	5.91/150	5.5/2.5	A
*†A510-2002-CU	2	3	8	9.6	9.61/244	5.12/130	5.91/150	5.5/2.5	A
*†A510-2003-CU	3	3	11	12	12.40/315	5.51/140	6.97/177	8.8/4.0	A
†A510-2005-C3-U	5	5-7.5	17.5	22	12.40/315	5.51/140	6.97/177	8.8/4.0	A
†A510-2008-C3-U	7.5	10	25	30	12.40/315	5.51/140	6.97/177	8.8/4.0	A
†A510-2010-C3-U	10	15	33	42	11.81/300	8.27/210	8.46/215	13.6/6.2	B
†A510-2015-C3-U	15	20	47	56	14.17/360	10.43/265	8.86/225	22.0/10.0	B
†A510-2020-C3-U	20	25	60	69	14.17/360	10.43/265	8.86/225	22.0/10.0	B
†A510-2025-C3-U	25	30	73	79	14.17/360	10.43/265	8.86/225	22.0/10.0	B
A510-2030-C3-U	30	40	85	110	20.67/525	11.18/284	9.92/252	66.1/30.0	C
A510-2040-C3-U	40	50	115	138	20.67/525	11.18/284	9.92/252	66.1/30.0	C
**†A510-2050-C3-U	50	60	145	169	22.83/580	13.54/344	11.81/300	102.9/46.7	D
**†A510-2060-C3-U	60	75	180	200	22.83/580	13.54/344	11.81/300	102.9/46.7	D
**†A510-2075-C3-U	75	100	215	250	31.10/790	18.08/459	12.78/324.5	194.0/88.0	D
**†A510-2100-C3-U	100	125	283	312	31.10/790	18.08/459	12.78/324.5	194.0/88.0	D

## 460 VAC

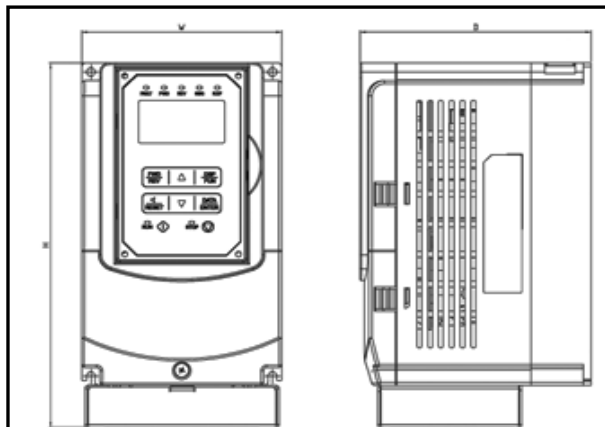
Model No.	HP		Amps		Height	Width	Depth	Weight	Diagram
	CT	VT	CT	VT	In / mm	In / mm	In / mm	Lbs / Kg	
†A510-4001-C3-U	1	2	3.4	4.1	9.61/244	5.12/130	5.91/150	5.5/2.5	A
†A510-4002-C3-U	2	3	4.2	5.4	9.61/244	5.12/130	5.91/150	5.5/2.5	A
†A510-4003-C3-U	3	3	5.5	6.9	9.61/244	5.12/130	5.91/150	5.5/2.5	A
†A510-4005-C3-U	5	5-7.5	9.2	12.1	12.40/315	5.51/140	6.97/177	8.8/4.0	A
†A510-4008-C3-U	7.5	10	14.8	17.5	12.40/315	5.51/140	6.97/177	8.8/4.0	A
†A510-4010-C3-U	10	15	18	23	11.81/300	8.27/210	8.46/215	13.6/6.2	B
†A510-4015-C3-U	15	20	24	31	11.81/300	8.27/210	8.46/215	13.6/6.2	B
†A510-4020-C3-U	20	25	31	38	11.81/300	8.27/210	8.46/215	13.6/6.2	B
†A510-4025-C3-U	25	30	39	44	14.17/360	10.43/265	8.86/225	22.0/10.0	B
†A510-4030-C3-U	30	40	45	58	14.17/360	10.43/265	8.86/225	22.0/10.0	B
A510-4040-C3-U	40	50	60	73	20.67/525	11.18/284	9.92/252	66.1/30.0	C
A510-4050-C3-U	50	60	75	88	20.67/525	11.18/284	9.92/252	66.1/30.0	C
A510-4060-C3-U	60	75	91	103	20.67/525	11.18/284	9.92/252	66.1/30.0	C
†A510-4075-C3-U	75	100	118	145	20.67/525	11.18/284	9.92/252	77.1/35.0	C
**†A510-4100-C3-U	100	125	150	168	22.83/580	13.7/344	11.81/300	102.9/46.7	D
**†A510-4125-C3-U	125	150	180	208	22.83/580	13.7/344	11.81/300	102.9/46.7	D
**†A510-4150-C3-U	150	200	216	250	31.10/790	18.08/459	12.78/324.5	194.0/88.0	D
**†A510-4215-C3-U	200	250	295	328	31.10/790	18.08/459	12.78/324.5	194.0/88.0	D

## 575 / 690 VAC

Model No.	HP		Amps		Height	Width	Depth	Weight	Diagram
	CT	VT	CT	VT	In / mm	In / mm	In / mm	Lbs / Kg	
***†A510-5001-C3-U	1	2	1.7	3	12.40/315	5.51/140	6.97/177	8.8/4.0	A
***†A510-5002-C3-U	2	3	3	4.2	12.40/315	5.51/140	6.97/177	8.8/4.0	A
***†A510-5003-C3-U	3	4	4.2	5.8	12.40/315	5.51/140	6.97/177	8.8/4.0	A
***†A510-5005-C3-U	5	5	6.6	8.8	11.81/300	8.27/210	8.46/215	13.6/6.2	B
***†A510-5008-C3-U	7.5	10	9.9	12.2	11.81/300	8.27/210	8.46/215	13.6/6.2	B
***†A510-5010-C3-U	10	10	11.4	14.5	11.81/300	8.27/210	8.46/215	13.6/6.2	B
†A510-6015-C3-U	15	20	15	19	14.17/360	10.43/265	8.86/225	22.0/10.0	B
†A510-6020-C3-U	20	25	19	22	14.17/360	10.43/265	8.86/225	22.0/10.0	B
†A510-6025-C3-U	25	30	22	27	14.17/360	10.43/265	8.86/225	22.0/10.0	B
†A510-6030-C3-U	30	40	27	34	14.17/360	10.43/265	8.86/225	22.0/10.0	B
†A510-6040-C3-U	40	50	34	42	14.17/360	10.43/265	8.86/225	22.0/10.0	B
A510-6050-C3-U	50	60	42	52	20.67/525	11.29/286.5	9.92/252	66.1/30.0	C
A510-6060-C3-U	60	75	54	62	20.67/525	11.29/286.5	9.92/252	66.1/30.0	C
A510-6075-C3-U	75	100	62	80	20.67/525	11.29/286.5	9.92/252	66.1/30.0	C
**†A510-6100-C3-U	100	125	86	99	22.83/580	13.54/344	11.81/300	102.9/46.7	D
**†A510-6125-C3-U	125	150	95	125	22.83/580	13.54/344	11.81/300	102.9/46.7	D
**†A510-6150-C3-U	150	175	131	147	22.83/580	13.54/344	11.81/300	102.9/46.7	D
**†A510-6215-C3-U	200	250	163	212	31.10/790	18.07/459	12.78/324.5	194.0/88.0	D
**†A510-6250-C3-U	250	270	193	216	31.10/790	18.07/459	12.78/324.5	194.0/88.0	D

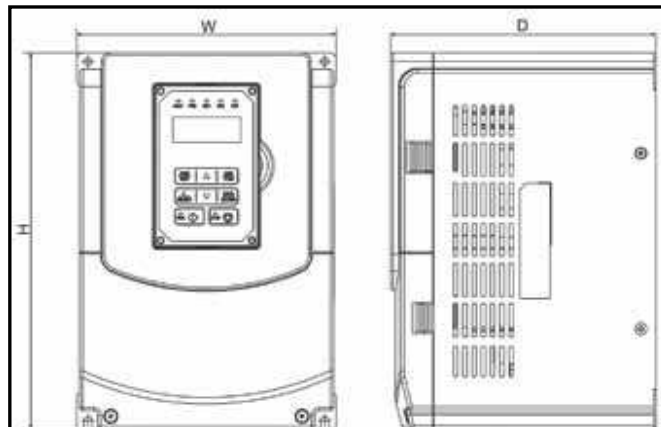
> Refer to model footnotes on next page <

# Dimension Drawings



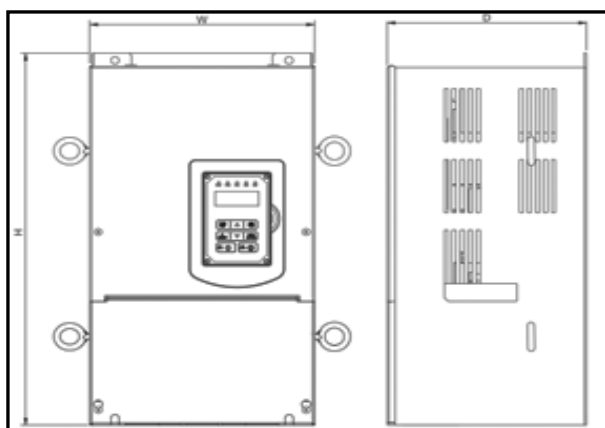
**Diagram A**

1-7.5 HP, 230V/1-7.5 HP, 460V (IP20/ NEMA 1)  
1-3 HP, 575V (IP20/ NEMA 1)



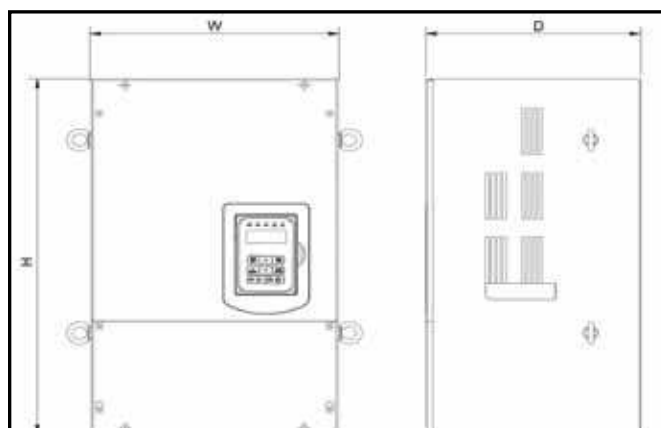
**Diagram B**

10-25 HP, 230V/ 10-30 HP, 460V (IP20/ NEMA 1)  
5-10 HP, 575V/ 15-40 HP, 690V (IP20/ NEMA 1)



**Diagram C**

30-40 HP, 230V/40-75 HP, 460V (IP20/ NEMA 1)  
50-75 HP, 690V (IP20/ NEMA 1)



**Diagram D**

50-100 HP, 230V/ 100-200 HP, 460V (IP00)  
100-250 HP, 690V (IP00)

*Open chassis rated. NEMA TYPE 1 kit available*

## Footnotes from previous page

† Models include built-in Braking Transistor.

‡ Models include built-in DC Link Reactor.

\* Models accept single phase input only.

\*\* Models are open chassis-rated (IP00). NEMA 1 kits are available as options.

\*\*\* 575VAC input only

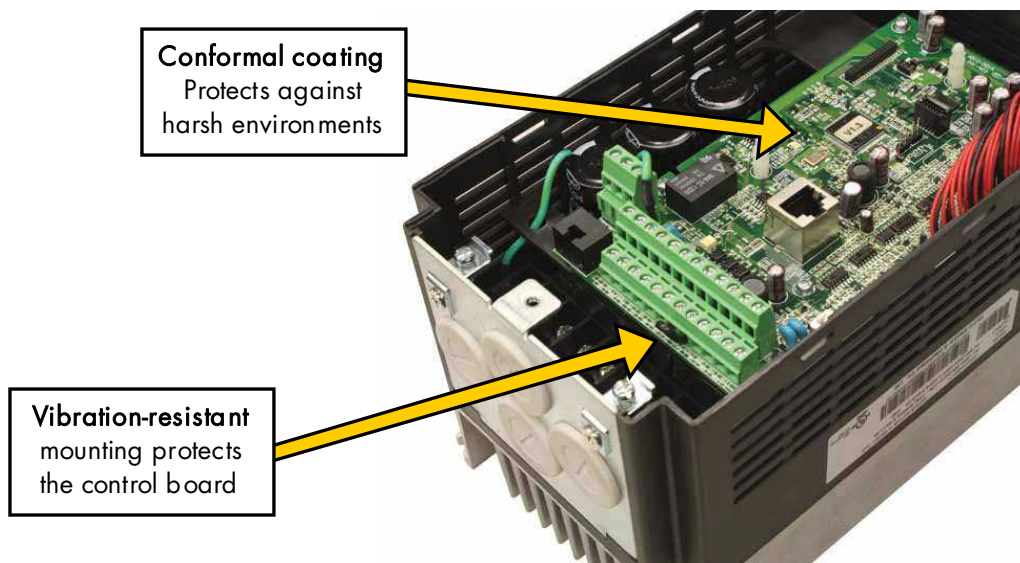
Constant Torque: 150% for 1 minute

Variable Torque: 120% for 1 minute



# Operating Features and Characteristics

Operation Mode	LCD keypad with parameter copy function
Control mode	V/F, V/F+PG, SLV, SV, PMSV, PMSLV, SLV2
Frequency control range	0.1Hz ~ 599.99Hz
Frequency accuracy (Temperature change)	Digital references: $\pm 0.01\%$ ( $-10^{\circ}\text{C}$ ~ $+40^{\circ}\text{C}$ ), Analog references: $\pm 0.1\%$ ( $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ )
Speed control accuracy	$\pm 0.1\%$ (closed loop vector control), $\pm 0.5\%$ (sensorless vector mode)
Frequency setting resolution	Digital references: 0.01Hz, Analog references: 0.06Hz/60Hz
Output frequency resolution	0.01Hz
Overload Tolerance rated output current	150%/1 min, 200%/2sec (CT mode), 120%/1 min (VT mode), factory setting of 150%/1 min, 200%/2 sec
Frequency setting signal	0 ~ +10VDC/4 ~ 20mA or -10VDC ~+10VDC and pulse-type frequency command
Acceleration/ deceleration time	0.0~6000.0 sec (separately set acceleration and deceleration times)
Voltage, frequency characteristics	Can set custom V/ F-curve based on parameters
Braking torque	Approx. 20%
Main control functions	Auto tuning Shaft lock Torque control Position control Droop control Soft-switching in PWM Over-voltage protection Dynamic braking Speed search Frequency traversing Instantaneous power fault restart PID control Automatic torque compensation Slip compensation





# Operating Features and Characteristics

Operation Mode		LCD keypad with parameter copy function
Protection Features	Stall protection	Threshold current can be set. In acceleration or constant speed, it can be set separately. In deceleration, it can be set on or off.
	Instantaneous Over Current (OC) and output Short Circuit (SC) protection	Inverter shuts off when the current exceeds 200% of the inverter related current.
	Inverter Overload protection (OL2)	Inverter rated current is 150%/1 min, at 200%/2 sec, inverter stops (CT type), Carrier frequency factory setting is 8~2 kHz. At 120%/1 min, Inverter stops (VT type), carrier frequency factory setting is 2 kHz.
	Motor Overload protection (OL1)	Electrical overload protection curve
	Over Voltage (OV) protection	When the main circuit DC voltage exceeds 410V (230V units)/ 820V (460V units), 1,050V (575V units)/ 1,230V (690V units), the drive faults out regardless of whether it is in run mode or stopped.
	Under Voltage (UV)	When the main circuit DC voltage is under 190V (230V units)/ 380V (460V units), 546V (575V units)/ 575V (690V units). The drive faults out regardless of whether it is in run mode or stopped. The DC voltage trigger level can be adjusted
	Automatic restart after instantaneous power fault	Power fault exceeds 15 ms. This is programmable to 2 seconds.
	Overheat protection (OH)	By direct temperature detection in the unit
	Ground Fault protection (GF)	Uses current feedback for protection
	Protection in charge state	When main circuit DC voltage exceeds 50V, the "CHARGE" LED is on.
	Output Phase Loss Protection (OPL)	Automatically stops motor rotation and faults
Environmental Specification	Location	Indoor (protected from corrosive gases and dust)
	Ambient temperature	-10~+40°C without de-rating (IP20/NEMA1), -10~+50°C (IP00) With de-rating, maximum operation temperature is 60°C
	Storage temperature	-20~+70°C
	Humidity	95%RH or less (no condensation)
	Altitude and vibration	Altitude of 1,000 m (3,300 ft) or lower, vibration below 5.9 m/s <sup>2</sup> (0.6G)
	Communication function	RS-485 standard with built-in (MODBUS) (RJ45)
	PLC function	Built-in
	EMI protection	The added noise filter complies with EM61800-3, 460V; 215 HP or below can be built-in.
	EMS protection	EN61800-3

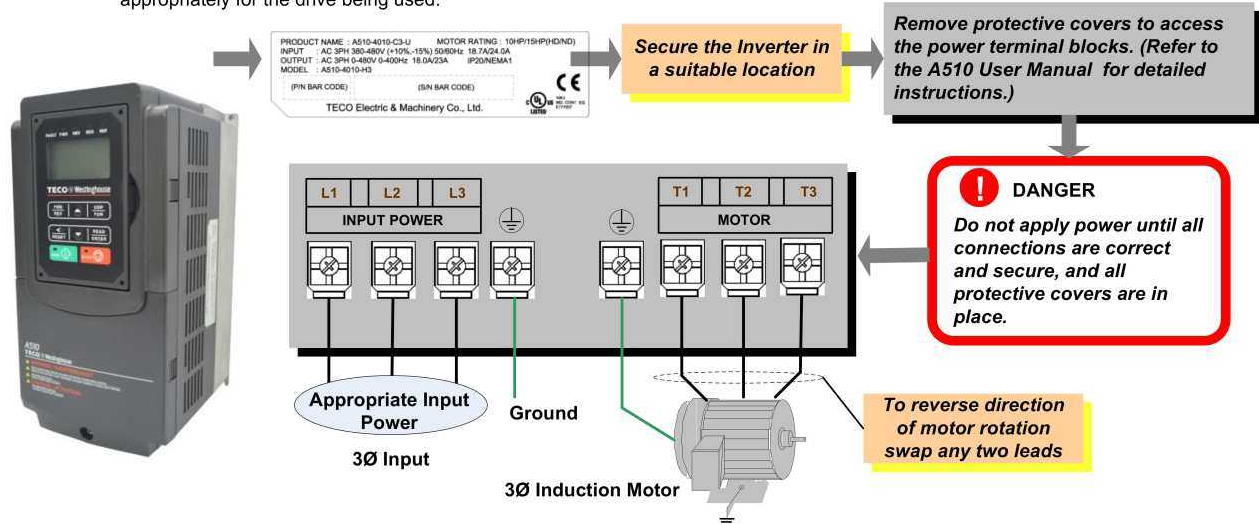
# A510 Quickstart guide

This document is intended as a quick start guide to get familiarity with keypad navigation, changing parameters, and setting the A510 drive up for external start/stop and external potentiometer signal.

This document is not a substitute for the full A510 User Manual or qualified electrician. It is important to be familiar with the full A510 user manual before proceeding.

## STEP 1 Check Nameplate and Connect Input / Output Wiring -

Check the inverter nameplate to insure that the information agrees with your order. Also insure that the power available is rated appropriately for the drive being used.



## STEP 2 Power-up the Inverter, check the Digital Operator

In this step, after the initial power-up you will become familiar with the indications and functions of the Digital Operator.



### KEYS (8) Description

**RUN:** RUN Inverter in Local Mode

**STOP:** STOP Inverter

**FWD/REV:** Switch between Forward and Reverse operation

**DSP/FUN:** Switches between available displays

**</RESET:** "<" Left Shift: Used to change parameters or values, RESET alarms and faults

**ENTER:** Used to display the preset value of parameters and to save changes

▲:Parameters navigation Up, Increase parameters or reference value

▼:Parameters navigation Down, decrease parameters or reference value

## A510 Control Settings (Factory Default)

### RUN/STOP Control: Keypad (RUN / STOP key)

Press RUN to start the drive or STOP to stop the drive.

See **step 5.** to change to RUN/STOP to external switch/contact.

### SPEED Control: Keypad (Default 5.00 Hz)

See **step 6.** to change to external potentiometer control.



### Changing Speed Reference

Press **ENTER** button and use ▲▼ to change reference.

Press **</RESET** button to shift cursor to the left

Press **ENTER** button to save





## ROLLED STEEL ODP & TEFC PREMIUM



- 1-40HP (ODP) / 1-10HP (TEFC)
- 60Hz, 230V/460V (Usable on 208V), 460V or 575V
- 3600, 1800 & 1200 RPM
- NEMA Premium Efficiency
- HPE™ High Pulse Endurance Spike Resistant Wire
- Rolled Steel Frame with Cast-Iron End Brackets



## OPTIM® VH



- 3-400HP (WPI Enclosure / High Thrust VHS)
- 60Hz, 230V/460V (Usable on 208V), 460V or 575V
- 3600, 1800 & 1200 RPM (\*up to 150HP only)
- NEMA Premium Efficiency
- HPE™ High Pulse Endurance Spike Resistant Wire
- Space Heater Terminated in Main Terminal Box
- Non-Reverse Ratchet with Heavy Duty Stainless Steel Balls
- Coupling and Gib Key Included



## OPTIM® TEFC



- 1-800HP (Totally Enclosed Fan Cooled)
- 60Hz, 230V/460V (Usable on 208V), 460V or 575V
- 3600, 1800, 1200 & 900 RPM
- NEMA Premium Efficiency
- HPE™ High Pulse Endurance Spike Resistant Wire
- Cast-Iron Frame and End Brackets
- CSA Certified for Class I, Division II, Groups B, C and D
- CSA Certified for Inverter Duty operation in a Class I, Division II Area



## OPTIM® ODP



- 1-500HP (Open Drip Proof)
- 60Hz, 230V/460V (Usable on 208V), 460V or 575V
- 3600, 1800 & 1200 RPM
- NEMA Premium Efficiency
- HPE™ High Pulse Endurance Spike Resistant Wire
- Cast-Iron Frame and End Brackets



## ADVANTAGE PLUS LINE



- 1-500HP (Totally Enclosed Fan Cooled)
- 60Hz, 460V or 575V
- 3600, 1800, 1200 & 900RPM
- Available in Ready\*, IEEE-841\* and Mine Duty Designs
- NEMA Premium Efficiency
- HPE™ High Pulse Endurance Spike Resistant Wire
- Cast-Iron Frame and End Brackets
- \*CSA Certified for Class I, Division II, Groups B, C and D
- \*CSA Certified for Inverter Duty operation in a Class I, Division II Area



## OPTIM® TEXP



- 1-300HP (Explosion Proof - Fan Cooled)
- 60Hz, 230V/460V (Usable on 208V), 460V or 575V
- 3600, 1800, 1200 & 900 RPM
- Meets or Exceeds NEMA Premium Efficiency levels
- HPE™ High Pulse Endurance Spike Resistant Wire
- Cast-Iron Frame and End Brackets
- CSA Certified for Class I, Division I, Group \*C & D; and Class II, Division I, Groups E, F & G (\* up to 256T)
- CSA Certified for Inverter Duty



## MAX-HT



- 200-600HP (Totally Enclosed Fan Cooled)
- 60Hz, 460V or 575V
- 1800, 1200 & 900 RPM
- NEMA Design C
- HPE™ High Pulse Endurance Spike Resistant Wire
- Cast-Iron Frame and End Brackets
- Roller Bearing on Drive End
- Thermal Protection (Thermistors, one/phase)
- High Strength Shaft Material (AISI 4140)



## GLOBAL XPE



- 150-2000HP (Totally Enclosed Fan Cooled)
- 60Hz, 2300V/4000V
- 3600, 1800, 1200 & 900 RPM
- NEMA Premium Efficiency
- Cast-Iron Frame and End Brackets
- Dynamically Balanced Copper/Copper Alloy Rotor Construction
- Stator RTD's (2/Phase)
- Space Heaters
- CSA Certified for Class I, Division II, Groups B, C and D



## CROWN SERIES



- 250 HP and Up
- 50/60Hz, 2300 – 13900V
- Premium Efficiency Designs
- State of the Art Insulation System
- Rugged Thru-Bolt Copper or Copper Alloy Rotor Bar Construction and End Rings
- Form Wound Windings with Complete VPI Treatment
- Anti-Friction or RENK Spherically Seated Self-aligning Split Sleeve Bearings
- API 541 Design Available

## WORLD SERIES



- 250 HP and Up
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