

Start-up Guide Axpert-Opti torque

200V System, 25Hp (18kW) ~ 600Hp (450kW)
400V System, 50Hp (37kW) ~ 844Hp (630kW)
500V System, 60Hp (45kW) ~ 950Hp (710kW)
600V System, 75Hp (55kW) ~ 1075Hp (800kW)



NOTICE

1. Read this guide thoroughly before using the Axpert-Opti torque, and store in a safe place for reference.
2. Make sure that this guide is delivered to the final user.

The Xpert-Opti torque Start-Up Guide is not meant to replace the complete Instruction Manual. This is a supplementary document intended to provide concise instructions covering the most common installation and configuration options. For detailed instructions, safety precautions, proper mounting, installation, configuration and operation, please refer to the appropriate revision of the Xpert-Opti torque Instruction Manual IMAOT-01.

WARNING: Only qualified personnel should plan or implement the installation, start-up, operation and maintenance of this equipment. Personnel must read the entire Xpert-Opti torque INSTRUCTION MANUAL before attempting to install, operate or troubleshoot the Xpert-Opti torque.

There are ten key elements to the basic installation and start up of Soft Starter. In this Start-Up Guide we will cover the following steps. For more information, please refer to the Xpert-Opti torque Instruction Manual IMAOT-01.

Ten Key Elements to a Successful Installation

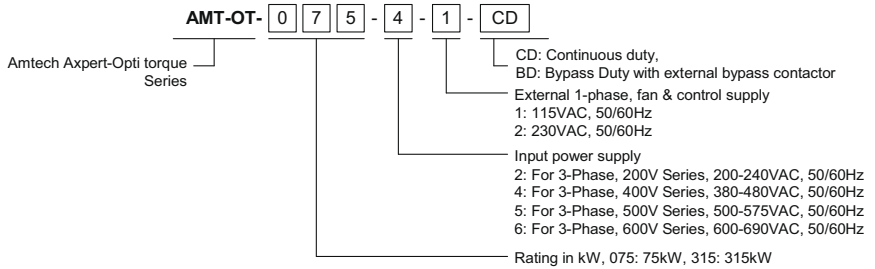
1. Physically install the Soft Starter with consideration for ambient temperature and proper cooling, adequate room around the Soft Starter for airflow and mounting properly to protect the Soft Starter for the specific environment. If mounted inside or outside of another enclosure, make sure the environment that the Soft Starter is mounted in is properly evaluated and the correct NEMA rated soft stator or enclosure is used to suit the application. For example, if outside, a NEMA3R, clean room, NEMA1 or IP20, a dirty, dusty environment, a NEMA12.
2. Check that the Soft Starter is of the correct voltage and current rating to suit the application.
3. Use the required peripheral devices, such as Circuit Breaker or Input Fuses, Over Load Relay, Bypass Contactor, push buttons and selector switches to suit the application.
4. Connect the AC input voltage, AC motor and control wiring using proper sized cables and wires with appropriate grounding and shielding to proper operation. Make sure that the requirements of the local electrical codes are adhered to for a proper installation.
5. Power up the Soft Starter and familiarize yourself with the operation of the keypad, such as navigating through the parameters and how to change parameters.

IMPORTANT NOTE! Whenever undertaking the start-up of Soft Starter, especially if anyone has been operating the Soft Starter prior to the start-up, it is advisable to set all of the parameter values to their factory default values. By knowing that all of the parameters are at the default values, this can save a lot of troubleshooting later on through mis-operation by having a parameter set to a value not needed by the application. An incorrectly programmed parameter can look like a defective Soft Starter. Setting parameter B311 to “333” will reset all user parameters to default.

6. Review the parameters and determine which ones need to be changed to meet the requirements of your application. The motor parameters (B101 – B108) must be entered for precise protection of the AC motor used. The method for start/stop, Start Mode Selection, Stop Mode Selection and values for the ramp-up/ramp-down time according to start mode selection and stop mode selection, set different protection parameters like current limit, over current level etc. are all important parameters to be considered.
7. Start the motor and assure proper rotation and the expected load currents are displayed, (See Parameter M101 - Output Current in %, M102 – R-Phase Current, M103 – Y Phase Current, M104 – B Phase Current). Find the read-only parameters that display information like a digital meter to show operational parameters such as input and output voltages, Current of all phases and input frequency, power used and run time.
8. Review the Fault Codes and what they mean. Look at the Fault History parameters and how the Soft Starter will display the last ten faults and operational values that existed at the time of the fault.
9. Test all of the system operators, such as pushbuttons, remote keypad, selector switches, to assure proper operation and control. Verify starting and stopping and correct speed control.
10. Once the installation is complete and the system operates as desired, store the parameters into the Soft Starter's memory. (Set parameter B311 to a value of “111”). This will allow downloading the saved parameters in case of any accidental improper changes that could affect operation. It is advised

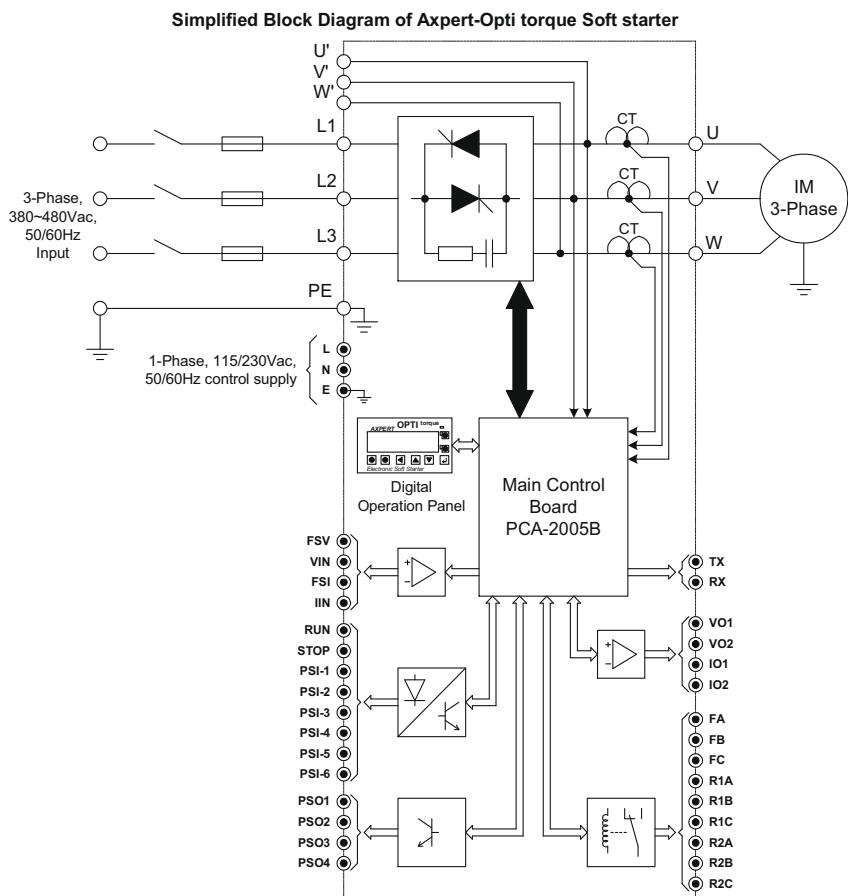
to fully document all parameter value changes, jumper changes and control wiring to simplify troubleshooting or system duplication in the future. When working with technical support the first questions asked would be to let them know what parameters were changed, what the new values are and what control wires are connected to the terminal strips.

Details Of Rating Nameplate And Type Display Method:



Installation

1. First, visually inspect the Soft Starter and ensure that the Soft Starter has not been damaged in transport. If any damage has occurred, do not energize the Soft Starter, and contact the supplier.
2. Mount the Soft Starter according to the Instruction Manual, Chapter 2 "Installation and Wiring".
3. Be aware of the ambient temperature. Use the Soft Starter within the specified ambient temperature $\leq 50^{\circ}\text{C}$ ($\leq 122^{\circ}\text{F}$).
4. Connect the main circuit terminals L1, L2, L3 to the line side and terminals U, V, W to the motor side. Tighten the terminals with the specified torque as specified in Table-2-1 of the IMAOT-01, Instruction manual for the Axpert-Opti torque Soft Starter.



5. Connect the system ground to the ground terminal of the Soft Starter.

6. Switch on the supply voltage.

7. The Digital Readout on the Keypad shall appear as in the figure on the next page.

External Control & Fan supply requirement.

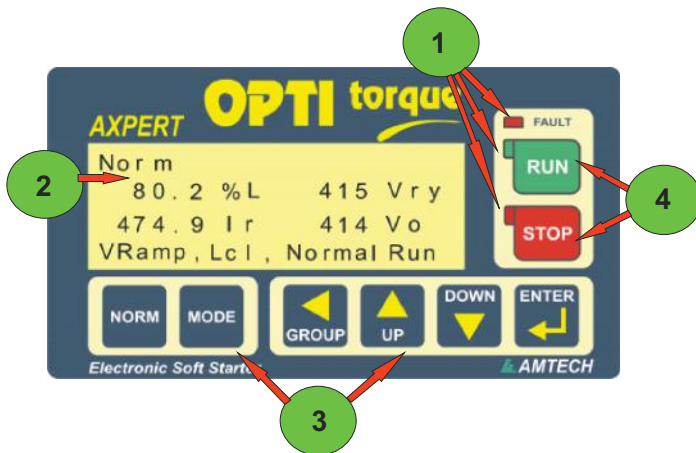
External control and fan supply must be 1-Ph, 50/60Hz, 115VAC/230VAC. Current requirement is defined as per below table.

| KW RATING | I/P VOLTAGE (VAC)* | I/P CURRENT (AMP) |
|------------------------|---------------------------|--------------------------|
| 45 / 55 | 115 | 0.5 |
| | 230 | 0.25 |
| 75 / 90 / 110 | 115 | 0.70 |
| | 230 | 0.35 |
| 132 / 160 | 115 | 1.1 |
| | 230 | 0.60 |
| 200 / 250 / 315 | 115 | 1.55 |
| | 230 | 0.95 |
| 400 / 450 | 115 | 1.65 |
| | 230 | 0.95 |
| 500 / 585 / 630 | 115 | 1.65 |
| | 230 | 0.95 |

* - UL and cUL approval is applicable only with 115V control supply.

PARAMETER NAVIGATION AND SETTING

The configuration of the Digital Operation Panel (LCD Keypad Module) is shown in the below figure.



- 1- Status Indicating LEDs
(FAULT, RUN and STOP)
- 2- LCD Back-lit Display: 80-Character, 4-Line.
- 3- Navigation Keys (6 Keys).
- 4- Start and Stop keys for LOCAL mode.

The Digital Operation Panel (LCD Keypad Module) is equipped with 8-keys as shown in the above figure. The function of each key is described below.

- NORM** The NORM key is utilized to return to the Normal screen of the Digital Keypad from any Parameter Group or Mode. The Normal screen displays four different user-selectable parameters, selected start mode, selected start control mode and the soft starter status. This is the screen that is displayed at power on.
- MODE** The MODE key, when pressed, passes the control to successive modes i.e. NORM (Normal), MODE-M (Monitor), MODE-A, MODE-B, MODE-C ... & METER mode. After reaching the METER Mode, it will "roll-over" to the NORMAL mode. When selecting a Mode, the last accessed parameter of the last accessed Group in that Mode will be displayed.
- GROUP** The GROUP key changes the display to the next Group in the same mode. The Groups can be accessed only in a numerically ascending order. After the last Group in a Mode, it will roll over to the first Group in that Mode. Also, when editing a parameter value, this key will change the position of flashing digit to be modified.



The UP and DOWN keys are used to change parameter numbers & parameter values. When the ENTER key is pressed, these keys are used to change the parameter value, otherwise it is used to navigate to different parameters in an upward or downward direction within the Group.



The ENTER key is used to change and save the parameter value. When pressed the first time, it will allow the user to change the parameter value using the up and down keys. The digit to be changed will flash. The GROUP key is used to change the position of the digit that is flashing. Once the desired value is set, press the ENTER key again to save the changed value. Press the NORM key instead of ENTER, to discard the change.



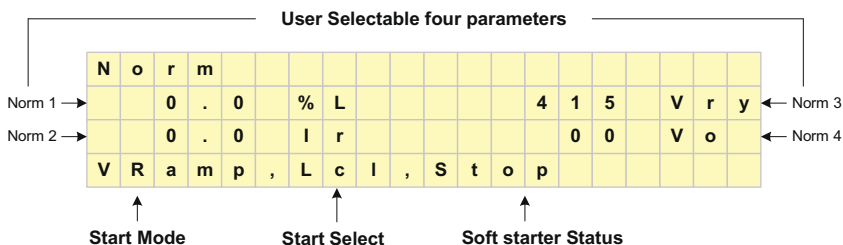
The RUN key is used to start the SOFT STATER when the start/stop control is in LOCAL and controlled through the Digital Operation Panel (Keypad). The key is equipped with the RUN status indicating LED. It will glow green when the Soft starter is running



The STOP key is used to stop the SOFT STATER regardless of the start control source, as it is always active. It is also used to reset an active fault. The STOP key is equipped with STOP status indicating LED. It will glow red when the Soft starter is off.

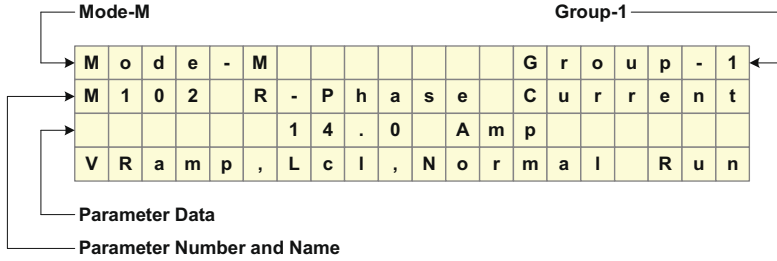
The Digital Operation Panel (LCD Keypad Module) is also equipped with a FAULT indicating LED. It will flash when there is an active fault. It is equipped with 80-Character, 4-Line LCD (Liquid Crystal) display for user-friendly parameter navigation, monitoring and setting.

Pressing the NORM key will show the screen in the figure below.



The above figure also indicates the selected start mode, start selection and soft starter status. The four user selectable parameters can be configured using parameters A601 ~ A604.

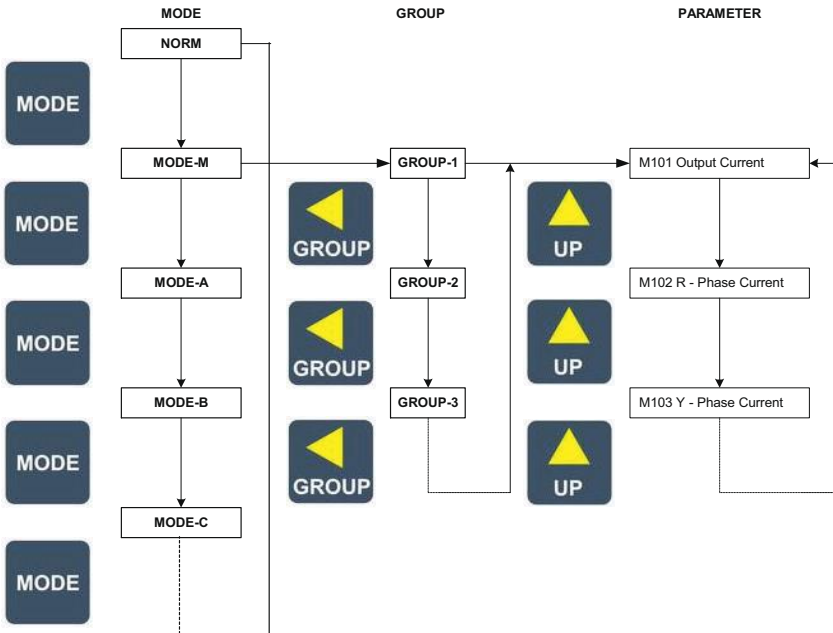
When the MODE key is pressed, the last accessed parameter of the last accessed group of Mode-M will appear with its data. The figure below shows parameter M102 of Mode-M and Group-1.



The first line of the display indicates the present Mode and Group. The second line indicates the parameter number and its function. The third line shows its value. The fourth line shows the present soft-starter status and is displayed except when there is an active fault, or displaying fault history or contact information.

Modes & Parameters

The parameters are grouped into Modes and Groups according to their functions. The configuration of the parameters is as displayed in the figure below. Each press of the MODE key moves to the next Mode. Pressing it again after reaching to METER mode will return you to the Mode you started from. The GROUP key moves through the different Parameter Group within each Mode. The UP and DOWN keys change the parameters displayed within each Group.



BASIC PARAMETER PROGRAMMING (OPERATING FROM THE KEYPAD IN LOCAL)

Once you are familiar with the parameter navigation system, the next step is to set the basic parameters for your application. To view a specific parameter, first use the MODE key get to the desired mode; Mode's A, B, C contain the parameters that are programmable. Mode M contains the read-only parameters that provide system information such as output voltage and current, input voltage. Then use the GROUP key to reach the desired group within that mode. Use the UP or DOWN keys to reach the desired parameter.

During the initial start-up, you must program the key soft starter and motor parameters. First press the NORM key to display the "Normal" screen. Now press the MODE key three times to reach the Mode-B parameters. If Group-1 parameters are not displayed, press the GROUP key until you reach Group-1. Now use the UP or DOWN keys to reach the specific parameter. To change a parameter value, press the ENTER key and the digit flashing can be changed with the UP or DOWN key. Press the GROUP key to change the position of the flashing digit. When the new value has been entered, press the ENTER key again to load the new parameter value. The number will stop flashing. If you press the NORM key instead of the ENTER key, the old parameter value will remain.

| MOTOR COMPANY | |
|---------------|---------------|
| HP 100 | NEMA DESIGN B |
| RPM 1750 | INS. CLASS B |
| VOLTS 460 | S. F. 1.15 |
| PHASE 3 | FRAME 405T |
| Hz 60 | |
| AMPS 114 | |

The figure to the left shows the information provided on a typical AC motor nameplate. There are several important motor values that will be used to program the soft-starter to provide accurate motor operation and protection. The motor HP will be programmed in kW. To change from HP to kW, multiply by 0.746. The 100HP shown would be $100 \times 0.746 = 74.6\text{kW}$.

Use the table below for the number of poles.

| No Load Motor Speed (RPM) | Typical Rated Motor Speed (RPM) | Number of Poles |
|---------------------------|---------------------------------|-----------------|
| 900 | 860 | 8 |
| 1200 | 1165 | 6 |
| 1800 | 1750 | 4 |
| 3600 | 3480 | 2 |

The Rated Motor Speed on the motor nameplate is an example and each motor may be slightly different since this is the speed the motor is expected to run at full load. Use the actual nameplate value shown on the motor for Rated Motor RPM. For the 1750RPM motor in the example nameplate above, Parameter **B105** Motor Rated RPM would be "1750" and **B107** Number of Motor Poles would be "4". **B103** Motor Rated Current would be "114". Now go to Step 1 and enter motor parameters B101 through B108.

1. Motor Parameters

In Mode-B, Group-1, select parameter **B101** and enter the rated input voltage. Now enter the following motor parameters; motor voltage **B102**, motor rated current **B103**, motor frequency **B104**.

motor rated rpm **B105**, motor kW rating **B106** and the number of motor poles **B107**, SS Connection Type **B108**.

Refer Chapter-10 of Axpert-Opti torque Instruction Manual IMAOT-01 for the power wiring connections for inside delta connections.

2. Selection of Start / Stop modes

With the Axpert-Opti torque, three start modes and four stop modes can be selected. These are set with the parameter 'A104: Start Mode Selection' and 'A105: Stop Mode Selection'.

Normally, V-Ramp is used in almost 90% applications. However, where the load has to reach to the full speed within short time, I-Ramp is the preferred start mode. Where, reduction in the current peak and linear rise of speed is required, use T-Ramp mode. For the test operation, select V-Ramp Start as start mode and Coast-to-stop as stop mode.

A104: Start Mode Selection
=1: V-Ramp Start
=2: I-Ramp Start
=3: T-Ramp Start

A105: Stop Mode Selection
=1: V-Ramp Stop
=2: T-Ramp Stop
=3: Brake Stop
=4: Coast-to-Stop

3. Selection of Start Control

The unit can be controlled from various places like Digital Operation Panel (Local), Terminal or from PC. Select appropriate start control in A101. Use Digital Operation Panel (Local) during the test operation.

A101: Start Control
=1: Local
=2: Terminal
=3: Serial

4. Adjusting the ramp time

The ramp time needs to be adjusted according to the applications and start/ stop mode. Do not keep long ramp time when using the V-Ramp and I-Ramp start mode.

For the V-Ramp start / stop adjust the below parameters. For the test operations, you can continue with the default settings and later on change as per the application requirements.

A106: V-Ramp Up Time1

A107: V-Ramp Down Time1

If using the dual ramp function, adjust A204: V-Ramp Up Time2 and A208: Ramp Down Time2

For the I-Ramp start, adjust

A301: I-Ramp Up Time

For T-Ramp start / stop, adjust

A401: T-Ramp Up Time

A406: T-Ramp Down Time

5. Monitoring the Motor operation.

Use the soft-starter to run the motor at various speeds and press the NORM key to display the Normal screen which shows the Motor Current of R phase in Amp and percent load of the AC motor FLA (full load amp) rating, input Vry line voltage and output voltage. These are the default parameters on the Normal screen.

There are three ways to view operational parameters to monitor operating values such as input frequency (Hz), motor current of all three phases (I_r, I_y, I_b) (Amps), output voltage, input voltage (AC Volts), motor power factor (PF), output power (kW), and soft starter heat sink temperature in both °C and °F.

- A. Press the NORM key and see four monitoring parameters in the Normal screen
- B. Press the MODE key until you reach the METER Mode and eight monitoring parameters are displayed.
- C. Press the MODE key until you reach the MODE-M Monitor Parameters. There are five groups of monitoring parameters including the Fault History of the last ten faults and contact information of Amtech Drives.

Now, stop the Soft Starter and switch off the AC input. Now complete the necessary connections and parameter changes as per your application using the Instruction Manual. Refer Chapter-10 of Xpert-Opti torque Instruction Manual IMAOT-01 for the power wiring connections.

If you are going to use only the Digital Operation Panel (LCD Keypad Module) to operate the soft starter, you can skip the next section and jump to page 13. If you are going to use Terminal mode and the Digital Inputs (PSI) on the terminal strip to start and stop the soft starter. Please continue reading on the next page at step 8.

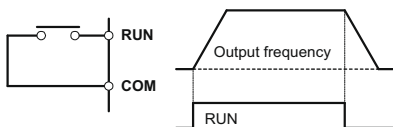
6. Setting the Start / Stop Control with a Terminal Input

To use a digital input for start/stop control, select a value of "2" Terminal mode in A101 Start Control. Then you have a choice to select either maintained (2-wire) or momentary (3-wire) start/stop control in parameter A102 Maintained Start/Stop. The default setting is "0" Maintained type (2-wire).

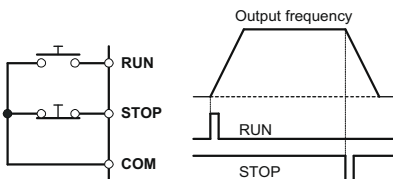
7. Connecting the digital inputs to either COM (Default) or +24VDC (programmable).

Sink Logic (JP1 on main control board PCA-2005B is placed at sink position – Default position. See the page 12 for information on the JP1 jumper.)

By default the Electronics Soft-starter is supplied with sink logic (the digital input connected to common). When maintained type is selected, connect a toggle switch or contact between the RUN terminal input and COM terminal on the main control board PCA-2005B. Close the switch to start the Electronics Soft-starter. When the switch is opened, the motor will stop.



If the momentary type (3-wire) control is selected, connect a NC (normally closed – momentary open) type push button between STOP and COM and a NO (normally opened – momentary closed) type push button between RUN and COM. When the push button between RUN and COM is pressed (closed) the Soft Starter will start. To stop the motor, press (open) the push button between STOP and COM.

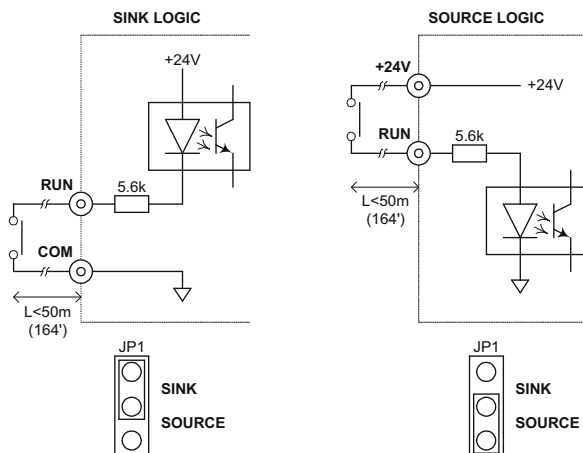


Example of a 3-wire Start/Stop with Sink Logic

If Source Logic is selected with JP1 (shown on p.12) and the maintained type of start/stop (2-wire) is selected, connect a toggle switch or contact between the RUN input and the +24V terminals of the main control board PCA-2005B. Close the switch to start the soft-starter. When the toggle switch or contact is opened, the soft-starter will stop the motor.

In the case of the momentary type (3-wire) control, connect a NC (normally closed – momentary open) type push button between STOP and +24V and a NO (normally opened – momentary closed) type push button between RUN and +24V. When the push button connected between RUN and +24V is pressed (closed) the Soft Starter will start. To stop the Soft Starter, press (open) the push button connected between STOP and +24V.

Example of Sink & Source Logic (Connecting the Digital Inputs to COM or +24VDC)



Serial Communications

- When serial is selected in A101 Start Control, the user can start/stop the Soft Starter from a PC or PLC using serial communication. Use the TX and RX terminal inputs on main control board PCA-2005B. Refer to the Serial Communication Guide for detailed information on the protocol and parameter setting.

8. Key Parameters.

Listed here are the key parameters used to set up the electronics soft-starter to meet the requirements of most applications. Typically, only a few of these parameters are changed from their default values. Please refer to the Amtech AExpert-Opti torque Electronics Soft-starter Instruction Manual for the complete parameter listing and Fault Codes.

| | |
|------------------------------|--|
| M101–M307 Monitor Group | Read-only Soft Starter Monitor parameters |
| M101 Output Current | Output Current in percentage of full load current of the AC motor. |
| M102 R-Phase Current | It displays the current of R-Phase in ampere. |
| M103 Y-Phase Current | It displays the current of R-Phase in ampere. |
| M104 B-Phase Current | It displays the current of R-Phase in ampere. |
| M105 Output Voltage | It displays the Output Voltage. |
| M106 Input Voltage Vry | Input AC Voltage from L1 to L2 (R to S, r to y) |
| M107 Input Voltage Vyb | Input AC Voltage from L2 to L3 (S to T, y to b) |
| M201 Heatsink Temperature | Temperature of the heat sink in °C. |
| M216 Heatsink Temperature | Temperature of the heat sink in °F. |
| FLT1–FLT10 Fault History | Provides fault history for 10 faults and 4 values at time of each fault. The Fault History is located in Mode M Group 4. |
| A101 Start Control | Starting from Keypad (Local), Terminal or Serial Comm. |
| A102 Maintained Start/Stop | Selects 2 or 3 wire start/stop control |
| A104 Start Mode Selection | Select the starting mode from V-Ramp Start, I-Ramp Start, T-Ramp Start. |
| A105 Stop Mode Selection | Select the stop mode from V-Ramp Stop, T-Ramp Stop, Brake Stop, Coast to Stop. |
| A106 V-Ramp Up Time1 | Sets the ramp up time for V-Ramp Start and Jogging. |
| A107 V-Ramp Down Time1 | Sets the ramp down time for V-Ramp Stop. |
| A301 I-Ramp Up Time | Sets the ramp up time for I-Ramp Start. |
| A302 Initial Current | Sets the initial current level for I-Ramp Start |
| A401 T-Ramp Up Time | Sets the ramp up time for T-Ramp Start. |
| A402 Initial Torque | Sets the initial torque level for T-Ramp Start. |
| A403 Torque Limit | Sets the torque limit for T-Ramp Start. |
| A406 T-Ramp Down Time | Sets the ramp down time for T-Ramp Stop. |
| A407 End Torque | Sets the end torque level at stop as a % of motor nominal torque. |
| B101 – B108 Motor Parameters | Key motor values that must be programmed at start-up. |
| B301 I-Limit Level | Sets the current limit as a % of motor rated current. |
| B302 I-Limit Time | Sets the time limit for which the current limit can be active. Unit will trip if the total time of current limit operation exceeds the set time. |
| B307 I-Trip Level | This parameter sets the threshold of the instantaneous over-current trip as % of motor rated current |
| B309 Parameter Lock | Password to control parameter changes |
| B310 Change Password | Allows selection of user selectable password |
| B311 Default Value Load | multiple functions; reset parameters to default, store user parameters, load user parameters from memory, clear fault history |

| | |
|---------------------------------|--|
| C101-106 PSI 1-6 Digital Inputs | Selects the function of the Digital Inputs (Prog. Seq. Inputs) |
| C107-110 PSO 1-4 Digital Output | Selects the function of the Open Collector Outputs |
| C111-112 Prog. Relays 1-2 | Selects the function of the Programmable Relays |
| C201-202 Vout 1 – 2 | Selects function of the two 0-10VDC Analog Outputs |
| C203-204 Iout 1 – 2 | Selects function of the two 4-20mA Analog Outputs |
| C301-314 PID Parameters | PID Setpoint Controller functions |

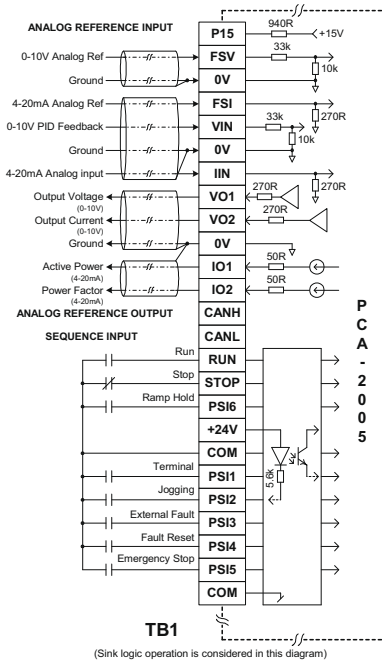
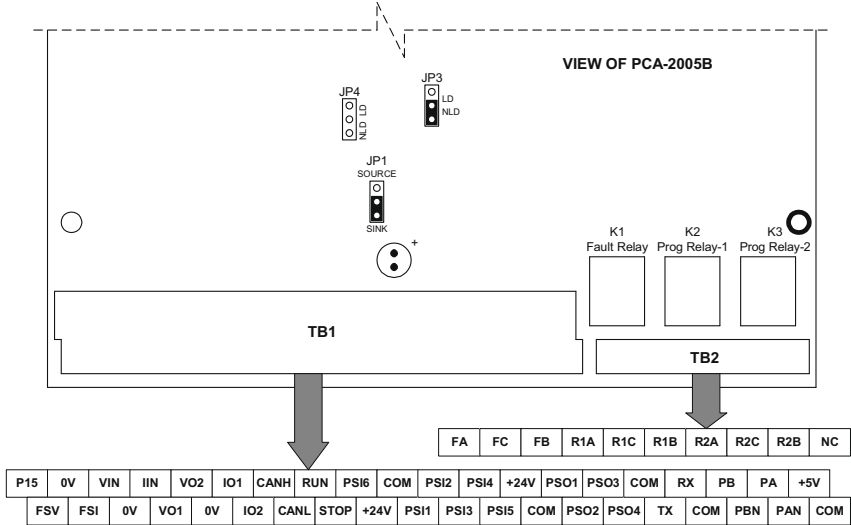
9. Start-Up Parameter Check List.

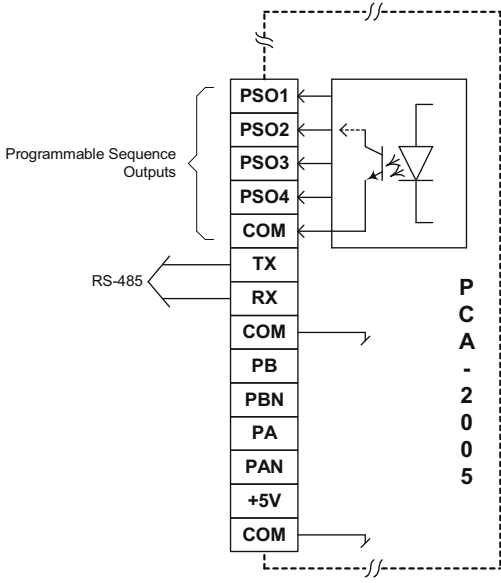
Shown below is a list of the typical parameters used for general Soft Starter applications. Please write in the specific User's settings that make your installation unique. This information will be invaluable in the future for Soft Starter duplication, troubleshooting or replacement.

| Motor Parameters | | Default | User's Values |
|------------------|---------------------|-----------|---------------|
| B101 | Rated Input Voltage | 415V | _____ VAC |
| B102 | Motor Voltage | 415V | _____ VAC |
| B103 | Motor Current | M301 | _____ Amps |
| B104 | Motor Frequency | 50Hz | _____ Hz |
| B105 | Motor Speed | 1500RPM | _____ RPM |
| B106 | Motor Output | M302 | _____ kW |
| B107 | Motor Poles | 4 | _____ |
| B108 | SS Connection Type | 1: Inline | _____ |

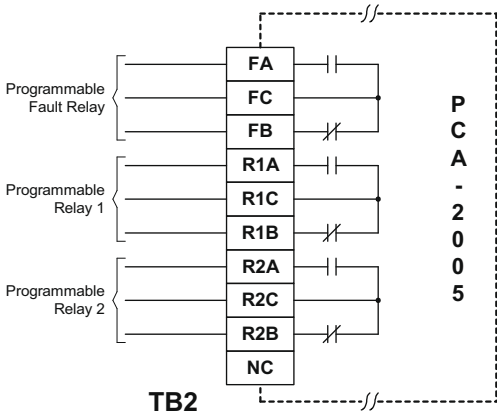
| Start and Stop Control Method | | | |
|-------------------------------|-----------------------|---------------|-------|
| A101 | Start Control | Local | _____ |
| A102 | Maintained Start/Stop | Maintained | _____ |
| A104 | Start Mode Selection | V-Ramp Start | _____ |
| A105 | Stop Mode Selection | Coast to Stop | _____ |

User Terminal Block and Jumper Position on Main Control Board PCA-2005B





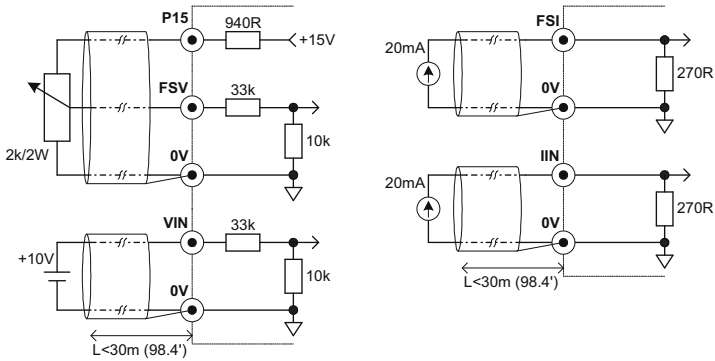
TB1



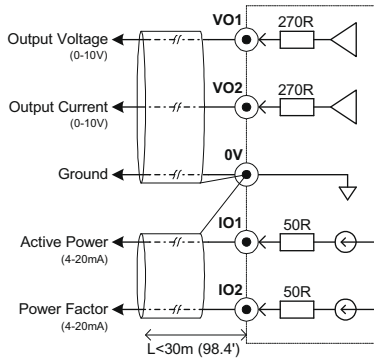
TB2

Control Terminal Strip Connections

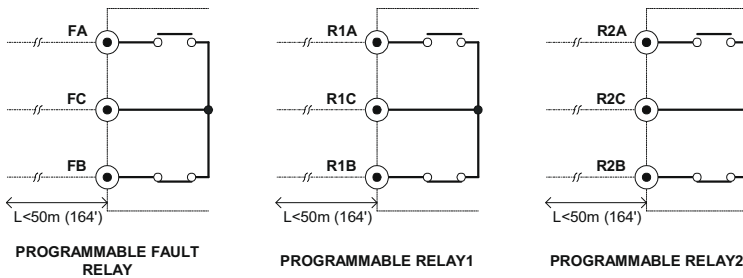
Programmable Analog Input (PAI) Wiring (Speed pot., 0-10VDC and 4-20mA)



Programmable Analog Output (PAO) Wiring (Two 0-10VDC and two 4-20mA outputs)



Programmable Sequence Output (Relay) Wiring (All three are Programmable Relays)



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