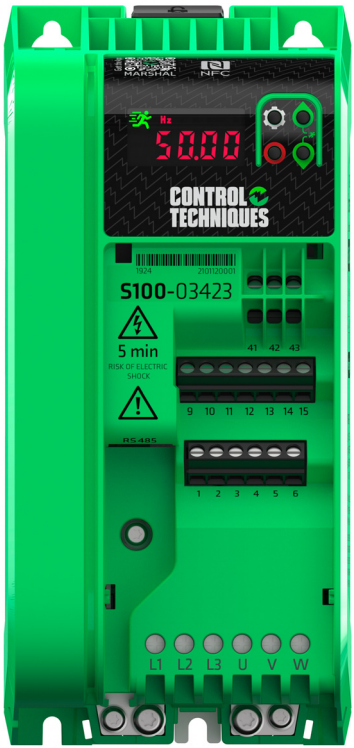
CONTROL TECHNIQUES



Step By Step Guide

COMMANDER S100

Part number: 0478-0644-01
Issue: 1

MARSHAL

Available on the App Store

GET IT ON Google Play

Important safety information

This variable speed drive product (drive) is intended for professional incorporation into complete equipment or systems. If installed incorrectly it may present a safety hazard. The product uses high voltages and currents, carries a high level of stored electrical energy, and is used to control mechanical plant which can cause injury. Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and the instruction manual carefully.

1 Enclosure The drive is intended to be mounted in an enclosure which prevents access except by trained and authorised personnel, and which prevents the ingress of contamination. It is designed for use in an environment classified as pollution degree 2 in accordance with IEC 60664-1. This means that only dry, non-conducting contamination is acceptable.

2 Lifting and handling Use appropriate safeguards when lifting these models. A full list of drive weights can be found in ***STEP 1***.

3 Terminal connections and torque settings Loose power connections are a fire risk. Always ensure that terminals are tightened to the specified torques. Refer to the tables in the relevant sections of this document.

4 General warning The voltages used in the unit can cause severe electric shock and/or burns, and could be lethal. Extreme care is necessary at all times when working with or adjacent to it. The installation must comply with all relevant safety legislation in the country of use.

5 Isolation device The AC supply must be removed from the drive using an approved isolation device before any servicing work is performed, other than adjustments to the settings or parameters specified in the manual. The drive contains capacitors which remain charged to a potentially lethal voltage after the supply has been removed. Allow at least 10 minutes from removing the supply until carrying out any work which may involve contact with electrical connections to the drive.

6 Products connected by plug and socket A special hazard may exist where the drive is incorporated into a product which is connected to the supply by a plug and socket. When unplugged, the pins of the plug may be connected to the drive input, which is separated from the charge stored in the capacitor only by semiconductor devices. To avoid any possibility of electric shock from the pins, if they are accessible, a means must be provided for automatically isolating the plug from the drive - e.g. a latching contactor.

7 Grounding / Earthing The drive must be grounded by a conductor sufficient to carry the prospective fault current in the event of a fault. The ground connections shown in the manual must be adhered to. The ground loop impedance must conform to the requirements of local safety regulations. The ground connections must be inspected and tested at appropriate intervals.

8 Fuses The AC supply to the drive must be installed with suitable protection against overload. Failure to observe this requirement will cause risk of fire. Integral solid-state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code (NEC), The Canadian Electrical Code, and any additional local codes. Opening of the branch-circuit protective device may be an indication that a fault has been interrupted. To reduce the risk of fire or electric shock, the equipment should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

9 Over-current protection The devices incorporate solid state overload protection for the motor load. The protection levels are expressed as a percentage of full-load current. For the motor protection to work properly, the motor rated current must be entered into P0.06 or P3.01. The protection level may be adjusted below 150 % if required. Refer to the User Guide for further information. All models are provided with thermal memory retention.

10 Isolation of control circuits The control circuits are isolated from the power circuits in the drive by basic insulation only. The installer must ensure that the external control circuits are insulated from human contact by at least one layer of insulation rated for use at the AC supply voltage. If the control circuits are to be connected to other circuits classified as Safety Extra Low Voltage (SELV) - for example, to a personal computer - an additional isolating barrier must be included in order to maintain the SELV classification.

11 Setting up, commissioning and maintenance It is essential that changes to the drive settings are given careful consideration. Depending on the application, a change could result in unexpected motor behaviour. Appropriate precautions must be taken against inadvertent changes or tampering. Some specific settings which require particular care are: automatic start (the drive may start unexpectedly in this mode); restore default parameter set (depending on the application this may cause unpredictable or hazardous operation); motor parameters (overheating and possible fire risk could result from seriously incorrect settings).

12 Safety of machinery, and safety-critical applications Within the European Union all machinery in which this product is used must comply with Machinery Directive 2006/42/EC. The drive hardware and software are designed and tested to a high standard, and failures are very unlikely. The level of integrity offered by the drive control functions (i.e. stop/start, forward/reverse and maximum speed) is not sufficient for use in safety-critical applications without additional independent channels of protection. All applications where malfunction could cause injury or loss of life must be subject to a risk assessment, and further protection provided where needed. The design of safety-related control systems must only be done by personnel with the required training and experience. The system must be subject to a risk assessment to confirm that the residual risk of an unsafe event is at an acceptable level for the application.

13 Electromagnetic compatibility (EMC) The product is designed to high standards of EMC, and data is provided in the EMC data sheet. Under extreme conditions the product might cause or suffer from disturbance due to electromagnetic interaction with other equipment. It is the responsibility of the installer to ensure that the equipment or system into which the product is incorporated complies with the relevant EMC legislation in the country of use. Within the European Union, equipment into which this product is incorporated must comply with the Electromagnetic Compatibility Directive 2014/30/EU.

14 Repairs Users must not attempt to repair a drive if it is faulty. It must be returned to the supplier of the drive.

~~**The UL file reference is: NMMS/7.E171230.** The product is UL listed for use on a circuit up to 10 kA maximum supply symmetrical fault current, when protected by fuses. 600 Volts AC Maximum.~~

Introduction

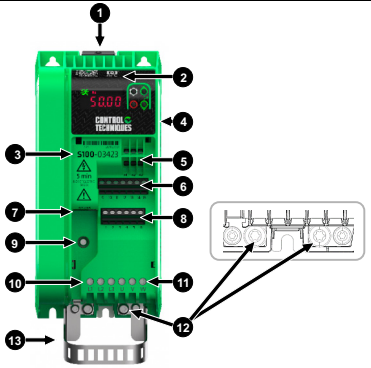
This guide provides step-by-step instructions on how to mount the drive, wire the drive using appropriate fuses and cables, program the drive and run the motor. The Commander S100 is fully compatible with the mobile app, Marshal, which can be found on Google Play and the App Store, or alongside the full Commander S100 User Guide at 'www.drive-setup.com'.

MARSHAL

- NFC powerless data transfer
- First time setup and commissioning
- Diagnostics and monitoring

Features of the drive

Figure 1-1 Feature diagram



1. Din Rail Release Clip
2. NFC Reader Location
3. Identification Information
4. Rating Information (side of drive)*
5. Relay Connections
6. Digital IO Connections
7. EIA 485 Communications Port
8. Analog IO Connections
9. EMC Filter Disconnect Screw **
10. AC Supply Connections
11. Motor Connections
12. Ground / Protective Earth Connections
13. Cable Screening Bracket

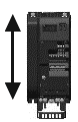
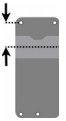
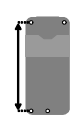
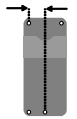
*Always check the drive voltage rating is suitable for the installation

**Read information in the User Guide before removal

STEP 1: Mount the drive

A drill template for wall mounting is included on the drive packaging for quick installation.

Table 1-1 Drive dimensions

Frame size	Overall Dimensions (±0.5 mm)				Mounting Dimensions (±0.5 mm)				
				Weight					Ø Maximum Diameter
1	**156 mm** 6.14 in	**68 mm** 2.70 in	**130 mm** 5.12 in	**0.6 kg** 1.2 lb	**40 mm** 1.56 in	**145 mm** 5.71 in	**45 mm** 1.77 in	**22 mm** 0.89 in	**4.8 mm** 0.19 in
2	**192 mm** 7.56 in	**68 mm** 2.70 in	**132 mm** 5.20 in	**0.7 kg** 1.5 lb	**40 mm** 1.56 in	**180 mm** 7.11 in	**45 mm** 1.77 in	**22 mm** 0.89 in	**4.8 mm** 0.19 in
3	**192 mm** 7.56 in	**90 mm** 3.54 in	**132 mm** 5.20 in	**0.7 kg** 1.5 lb	**40 mm** 1.56 in	**180 mm** 7.11 in	**65 mm** 2.56 in	**37 mm** 1.48 in	**4.8 mm** 0.19 in

Drives can be panel mounted with **0 mm** space between them. A minimum clearance of **45 mm** (1.77 in) is required above and below the drive except for frame size 1 drives with a power rating ≤0.55 kW. For these drives, a minimum clearance of **100 mm (3.94 in)** is required above and below the drive.

The drive should be mounted in an ambient temperature range of 0 °C to 60 °C (32 °F to 140 °F). If the drive needs to be mounted with reduced clearances, or in an ambient temperature > 40 °C (104 °F), the drive must be derated. Refer to the Technical Data section in the Commander S100 User Guide for derating information.

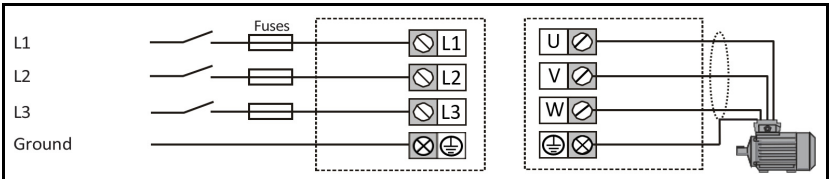
STEP 2: Wire the drive

Tool Tip: A 3 mm (1/8 in) flat-blade screwdriver can be used on all terminals.

Power Connections

Connect the supply and motor connections using the cables and fuses or MCB's quoted in the table 1-2. When using a single-phase supply, the supply should be connected to L1 and L2.

Figure 1-2 Power terminal connection



Drive Voltage Rating		110 V	230 V	400 V
Recommended Torque Setting	Power Connections	0.5 Nm	0.5 Nm	0.6 Nm
	Ground Connections	1.5 Nm	1.5 Nm	1.5 Nm

NOTE

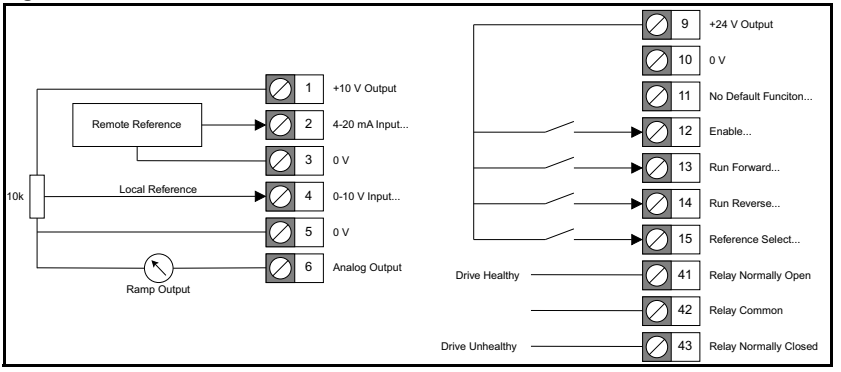
To meet UL requirements, UL Listed closed-loop connectors sized according to the field wiring must be used for ground connections.

Ground connections

Ground conductor size:- Either 10 mm² or two conductors of the same cross-sectional area as the input conductors. For location of ground connection refer to Figure 1-1.

Control connections

Figure 1-3 Helium control terminal connections (Default Configurations)



For other IO configurations see Control Connections section in the User Guide or use **Marshal**.

Table 1-2 Motor cable and fuse/MCB selection

Model Number	Input Phases	Max Input Current	Fuses		MCB rating*		Cables			
			IEC Class gG	UL Class CC, J or T	IEC	UL	IEC60364-5-52 mm^2		UL61800-5-1 AWG	
		A	A	A	A	A	Input	Output	Input	Output
110 V										
S100-01113	1	7.19	10	10	10	15	1.5	1.5	24	24
S100-01123	1	8.49	10	15	10	15	1.5	1.5	24	24
S100-01133	1	10.4	12	15	12	15	1.5	1.5	22	22
S100-03113	1	14.8	16	20	16	25	2.5	1.5	20	20
S100-03123	1	20.01	25	30	25	25	2.5	1.5	18	18
S100-03133	1	28.54	32	40	32	40	6	1.5	16	16
230 V										
S100-01S13	1	3.3	6	6	6	15	1.5	1.5	24	24
S100-01213	3	1.95	4	6	6	15	1.5	1.5	24	24
S100-02S11	1	3.3	6	6	6	15	1.5	1.5	24	24
S100-01S23	1	3.84	6	6	6	15	1.5	1.5	24	24
S100-01223	3	2.28	4	6	6	15	1.5	1.5	24	24
S100-02S21	1	3.84	6	6	6	15	1.5	1.5	24	24
S100-01S33	1	4.74	6	6	6	15	1.5	1.5	22	22
S100-01233	3	2.84	4	6	6	15	1.5	1.5	22	22
S100-02S31	1	4.74	6	6	6	15	1.5	1.5	22	22
S100-01S43	1	8.01	10	10	10	15	1.5	1.5	20	20
S100-01243	3	4.74	6	6	6	15	1.5	1.5	20	20
S100-02S41	1	8.01	10	10	10	15	1.5	1.5	20	20
S100-01S53	1	9.51	12	15	12	15	1.5	1.5	18	18
S100-01253	3	5.69	8	10	8	15	1.5	1.5	18	18
S100-02S51	1	9.51	12	15	12	15	1.5	1.5	18	18
S100-01D63	1 / 3	15.28 / 12.60	16 / 16	20 / 15	20 / 16	20 / 15	2.5	1.5	16	16
S100-02S61	1	15.28	16	20	20	20	2.5	1.5	16	16
S100-01D73	1 / 3	18.41 / 14.25	20 / 16	25 / 20	25 / 16	20 / 20	2.5	1.5	16	14
S100-02S71	1	18.41	20	25	25	20	2.5	1.5	16	14
S100-03D13	1 / 3	26.10 / 19.74	32 / 25	35 / 25	32 / 25	30 / 25	4	1.5	14	14
400 V										
S100-02413	3	1.92	4	6	6	15	1.5	1.5	24	24
S100-02423	3	2.5	4	6	6	15	1.5	1.5	22	22
S100-02433	3	3.04	4	6	6	15	1.5	1.5	22	22
S100-02443	3	4.54	6	6	6	15	1.5	1.5	20	20
S100-02453	3	5.59	8	10	8	15	1.5	1.5	20	20
S100-02463	3	8.18	10	15	16	15	1.5	1.5	18	18
S100-03413	3	13.18	16	20	16	15	2.5	1.5	16	16
S100-03423	3	16	20	25	20	20	2.5	1.5	14	14

* For UL installations, the circuit breaker must be listed under category control number DIVQ / DIVQ7, rated 600 Vac with a short circuit rating > 10 kA. In other countries, circuit breakers compliant with EN IEC 60947-2 are recommended, with > 10 kA short circuit breaking capacity.

IEC cable sizes assume Copper conductor, PVC insulation, installation method B2 and ambient temperature of 40 °C (104 °F). For UL, cables must be rated for 75 °C (167 °F) operation and copper only. To fit a ferrule, 90 °C (194 °F) rated cable with a reduced cross section is required for some drives.

The voltage rating of fuses and MCBs must be greater than or equal to the highest supply voltage of the system.

STEP 3: Run the Motor

It is recommended to use the FastStart option within Marshal to program the drive. Alternatively, the keypad can be used to edit drive parameters directly. For instructions on editing parameters with the drive keypad, refer to figure 1-4.

The following workflow uses the default settings of Frequency Reference Configuration P0.05 and Enable/Run Configuration P0.10. For information on the setup of these parameters see their descriptions in Marshal or the Parameter section of the Commander S100 User Guide.

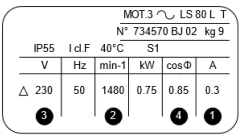
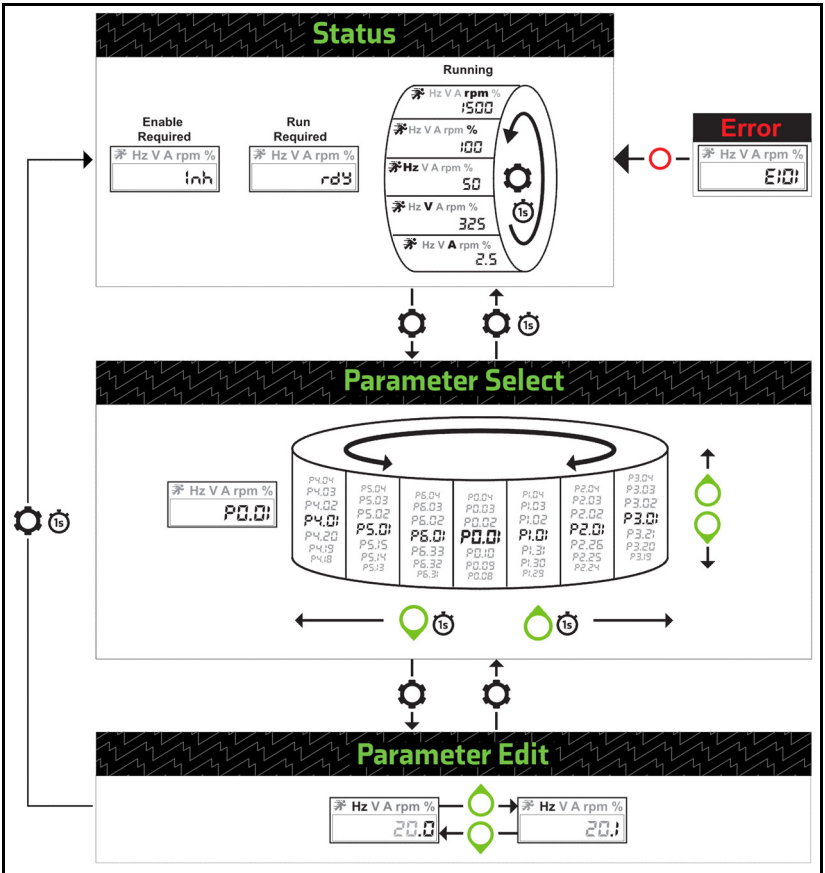
Action	Detail
Configure drive settings	
Power-up	Power-up the drive, ensure the drive is not enabled. (Display shows: inh)
Enter Minimum & Maximum Frequency	• Minimum Frequency Limit P0.01 (Hz) • Maximum Frequency Limit P0.02 (Hz)
Acceleration & Deceleration Rates	• Acceleration Rate 1 P0.03 (s) • Deceleration Rate 1 P0.04 (s) Define ramp times between 0 Hz and Maximum Frequency Limit P0.02
Enter Motor Nameplate Details	1. Motor Rated Current P0.06 (A) 2. Motor Rated Speed P0.07 (rpm) 3. Motor Rated Voltage P0.08 (V) 4. Motor Rated Power Factor P0.09 (cosΦ) 
Ready to Run (Default Configurations Only)	
Run	**Always ensure it is safe to start the motor before doing so.** Enable the drive with terminal 12 (T12). Provide the drive with a run signal with T13 (Run Forward) or T 14 (Run Reverse).
Increasing and Decreasing Motor Speed	Increase or decrease current to Analog Input 1 (T2) to increase or decrease the frequency reference. Close Digital Input 5 (T15) to switch to a reference from Analog Input 2 (T4).
Stopping	Remove the Run Forward (T13) or Run Reverse (T14) signal to stop the motor by following the selected deceleration rate. If the Enable signal (T12) is removed while the motor is running, the drive output is immediately disabled, and the motor will coast to a stop.
Made a mistake?	
Restore Factory Defaults	1. Ensure the drive is not enabled. (Display shows: inh) 2. Set P4.01 to 1 to load 50 Hz defaults or 2 to load 60 Hz defaults. 3. Press or hold the settings key to exit the parameter.
Troubleshoot	If the drive detects a fault, it will display an error code. All error codes for the drive and possible resolutions are available in the mobile app, **Marshal**. Alternatively, please view the diagnostics section in the **Commander S100 User Guide.**

Figure 1-4 Using the keypad



	Settings Key	Used to navigate through the drive's parameter settings and rotate displayed parameters when the drive is running.
	Stop / Reset Key	Used to reset the drive if there is an error and to stop the drive running if enable/run configuration is set appropriately.
	UP / DOWN Keys	Used Individually to increase or decrease edit-able values shown on the drive display
	UP & DOWN Keys	When both keys are pressed together, they provide the drive with a latched RUN signal if enable/run configuration is set appropriately.
1s	Press and Hold	On the diagram above this indicates that the key should be pressed and held for 1 second opposed to a normal short press.

Company information

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