590PR
SERIES

FRAME 1, 2

HA860001U001

ISSUE 1

DC590PR Series DC Digital Drive

This QuickStart will:

- Provide basic installation details.
- Select right field current
- Start the motor and perform an Autotune

Provided with every Drive is a:

- QuickStart
- Safety Information
- Keypad (optional)
- Compact disk containing the Product Manual and Configuration Tool
- Option cards (optional)

This QuickStart assumes that:

- You have read and understood the Safety Information provided separately.

Parker

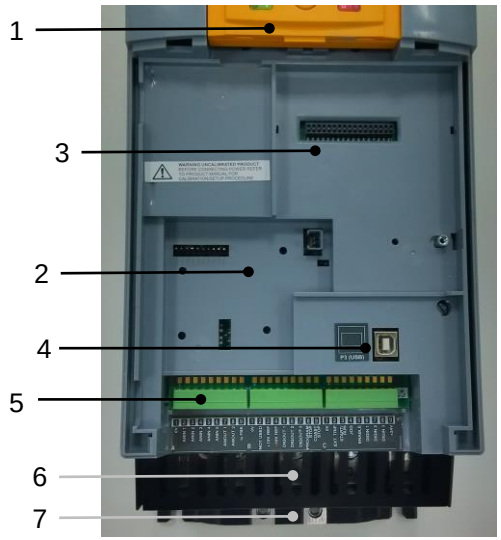
QuickStart

Mechanical Installation

NOTE **Refer to the Safety and EMC sheets provided with the drive.**

Mount the unit vertically inside a suitable cubicle. Drill mounting holes accurately. Check for material that could damage/restrict operation.

- Fit 4 x inserts into the back panel
- Fit bolts/washers loosely into lower inserts
- Engage the drive's lower mounting slots onto the bolts
- Fit the top bolts and tighten - M5 : 2.7Nm (2 ft.lbf), M6 : 4.5Nm (3.3 ft.lbf)



1 Keypad
2 Speed Feedback Option
3 Communications Option
4 USB Port
5 Control Terminals
6 Power Terminals
7 Drive Earth/Ground

(Frame 1 illustrated)

Ventilation

The Drive gives off heat during normal operation and requires:

- Adequate cooling air to enter and exit the cubicle
- Free flowing air through the drive's ventilation slots and heatsink
- A normally cool mounting surface
- Minimum air clearances to be maintained above and below drives and other equipment (additive when two units are mounted together)

Frame	Current Rating (A)	Weight Kg (lbs)	Overall Dimensions			Fixing Centres		Fixing	Air Clearance (above&below)
			Width	Height	Depth	Width	Height		
1	20	5.2 (11.4)	170(6.69)	415(16.34)	175(6.9)	140(5.51)	400(15.75)	M5	100(3.94)
	35-45	7.2（15.8）	170(6.69)	415(16.34)	202(7.95)	140(5.51)	400(15.75)	M5	100(3.94)
2	75	8.3（18.2）	170(6.69)	439(17.28)	202(7.95)	140(5.51)	400(15.75)	M5	100(3.94)
	110-165	10.4（22.8）	170(6.69)	439(17.28)	240(9.45)	130(5.12)	400(15.75)	M5	100(3.94)
			Dimensions are in millimetres (inches)					*mm (inches)*	

Electrical Installation

NOTE **Refer to the Safety and EMC sheets provided with the drive.**

An EMC compliant installation is shown.

Earth/Ground Connections

IMPORTANT *Refer to "Permanent Earthing" on the Installation Diagram.*

Earth/Ground Rails

Provide a (dirty) earth/ground rail (**11**) inside the cubicle. Connect it to an external earth/ground, **PE.**

Provide a (clean) earth/ground rail (**2**) inside the cubicle, connected directly to the (dirty) earth/ground rail and insulated from the mounting panel. This is used for all signal and control cabling.

Motor Earth/Ground

Connect an earth/ground wire to the motor from the (dirty) earth/ground rail. Connect shield between the motor and (dirty) earth/ground rail.

Drive Earth/Ground

Connect an earth/ground wire from the (dirty) earth/ground rail to the drive's power terminal(s) marked PE .

Frame 1 (20, 35, 45A units)	10 AWG, 8 Nm (6 lb-ft)
Frame 2 (75A, 110A units)	8 AWG, 8 Nm (6 lb-ft)
Frame 2 (165A units)	6 AWG, 8 Nm (6 lb-ft)

Environmental Conditions

Surrounding air temperature	Frame 1: 0ºC to 45ºC (32ºF to 113ºF), Frames 2: 0ºC to 40ºC (32ºF to 108ºF),
Enclosure rating	Frame 1/2: IP20
Atmosphere	Dust free, non flammable, non corrosive, <85% humidity, Pollution Degree 2 non-condensing

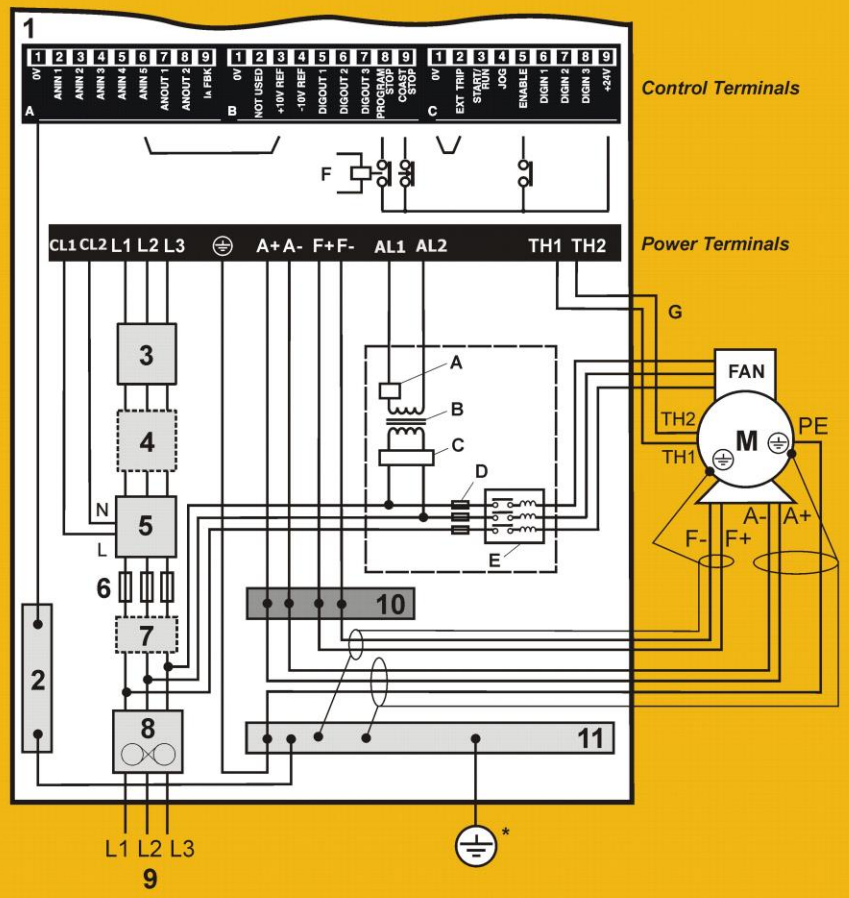
Installation Diagram

*** Permanent Earthing**

The unit must be permanently earthed according to EN 50178:

A cross-section conductor of at least 10mm^2 is required.

This can be achieved by using a single conductor (PE) or by laying a second conductor through separate terminals (PE2 where provided) and electrically in parallel.



1	Cubicle
2	Clean Earth/Ground Rail
3	AC Line Choke
4	Capacitor filter (optional)
5	AC Contactor
6	3Ø Semi-Conductor Fuses
7	External AC Supply EMC Filter (optional)
8	Branch Protection Fuses or Circuit Breaker
9	3Ø Power Supply Cable
10	Terminal Rail
11	Dirty Earth/Ground Rail
A	1 Pole MCB
B	Control Transformer
C	2 Pole MCB
D	Fan Fuses
E	Motor Overload Protection
F	Emergency Stop Relay
G	Isolated Motor Thermistor
M	Motor

Control Connections for Local Control

Refer to the Installation Diagram

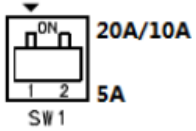
- Control wiring must have a minimum cross-section area of 0.75mm^2 (18AWG)
- Use screened control cables to comply with EMC requirements

Current Limit (fixed)	**A6** **B3**	Connection to allow the MAIN CURR. LIMIT parameter to adjust the current limit.
Program Stop/ Coast Stop	**B8** **B9** **C9**	Removing B8 from C9 (24V) causes a Program Stop (regenerative drive only) Removing B9 from C9 (24V) causes a Coast Stop The Emergency Stop relay (normally-open, delay on de-energisation) is not sequenced via the drive. It is a separate control feature.
Enable	**C5** **C9**	The contact between terminals C5 (ENABLE) and C9 must be closed for the drive to run.
External Trip	**C1** **C2**	Terminals C1 and C2 must be linked for the drive to run (External Trip interlock not required in this simple set-up).
Clean Earth	**A1**	Via the clean earth rail which originates directly from the main incoming earth rail.

Power Connections

Refer to the Installation Diagram

- Minimum rating of 1.1 x full load current (Europe)
- Minimum rating of 1.25 x full load current (UL)

3-Phase Supply	**L1** **L2** **L3**	Connect via branch protection fuses, filter (optional), 3∅ semi-conductor fuses, contactor, capacitor box (optional), and AC Line Choke/Reactor. Refer to Manual Specification E
Motor Armature	**A+** **A-**	Connect shield between motor and earth rail: ⏚
Field Output	**F+** **F-**	Connect shield between motor and earth rail⏚. These terminals provide an internal motor field supply fused by 10A (Frame 1) / 20A (Frame 2) fuses. Note the nominal field current from the motor rating plate The range can be set to 5A or 20A/10A by the switch SW1 in the Power Board, The setting of the field current range switch (SW1) must not be changed when the drive is powered on, and the P- code may need to be reset. 
Auxiliary Supply	**AL1** **AL2**	Single phase, 110/240V ac, 50/60Hz. Match auxiliary supply to the contactor coil voltage. Protect with external fuses determined by the contactor holding VA, or MCB. Connect auxiliary supply terminals directly to the incoming supply. No series sequencing switches or contacts are permitted without consultation from Parker
External Contactor	**CL1** **CL2**	Connect the contactor coil to terminals CL1& CL2
Motor Thermistor	**TH1** **TH2**	Connect motor thermal switch or thermistor to TH1, TH2. Drive will trip when the thermal switch opens, or when the thermistor resistance exceeds 4kΩ maximum (PTC Type A: IEC 34-11 Part 2). If the motor does not have a protective device (thermistor), link these terminals. Thermistor inputs must be connected for the drive to run.

Drive Set-Up in Local Control

IMPORTANT *You must not exceed the maximum drive and motor ratings. Refer to the Product Code or rating label, and the motor rating plate*

The instructions are written in logical order. Complete each stage successfully before progressing to the next.

This simple start-up routine assumes that:

- The Drive is direct from the factory and thus using all factory default settings, including SW1
- The Keypad is fitted, and you know how to operate and navigate the Keypad
- The drive's control terminals are wired as shown in the Installation diagram
- This simple set-up uses ARMATURE VOLTAGE (default setting) as the speed feedback method

1: Pre-Operation Checks

Completely disconnect the drive before point-to-point checking with a buzzer, or when checking insulation with a Megger.

Prepare to energise the drive and system as follows:

- **ISOLATE THE DRIVE** using branch circuit protection or circuit breaker (**8**)
- Disconnect the load from the motor shaft, if possible
- If there is any doubt about the integrity of a particular installation, insert a high wattage resistor, i.e. fire elements, in series with the motor armature

Initial checks before applying power:

- Mains power supply voltage is correct for drive
- Auxiliary power supply voltage is correct for drive
- Motor is of correct armature voltage and current rating
- Check for damage to equipment
- Check that cooling fans are intact and free from obstruction
- Check all external wiring circuits - power, control, motor and earth connections
- Check for loose ends, clippings, drilling swarf etc. lodged in the Drive and system

Ensure the safety of the complete system before the drive is energised:

- Ensure that rotation of the motor in either direction will not cause damage
- Ensure that other equipment will not be adversely affected by powering up
- Ensure that nobody else is working on another part of the system which will be affected by powering up

2: Calibrating the Control Board

2.1 **CONNECT THE AUXILIARY SUPPLY:** Remove 3-phase fuses (**6**). Re-instate branch circuit protection or circuit breaker (**8**). Check that the auxiliary voltage is correct. The Keypad will now display the Welcome screen.

AUXILIARY POWER ONLY IS CONNECTED AT THIS STAGE

Press M, M, ▲ to display the CONFIGURE DRIVE menu. Press M again to display the first parameter. Set the following parameters in the menu:

CONFIGURE ENABLE	Set to ENABLED. All LEDS on the Keypad will flash.
NOM MOTOR VOLTS	Enter Armature Voltage value (VACAL) from the motor rating plate
ARMATURE CURRENT	Enter the armature current value (IA CAL) from the motor rating plate.
FIELD CURRENT	Enter the nominal field current (IF CAL) from the motor rating plate.
FLD.CTRL MODE	Check that the field control mode is set to VOLTAGE CONTROL.
FLD.VOLTS RATIO $100 \times \frac{\text{FIELD VOLTS}}{\text{RMS AC INPUT VOLTS}}$	Enter the calculated ratio into the parameter given by the equation. The default setting of 90% is the maximum value obtainable, i.e. field output = 0.9 x Vac.
CONFIGURE ENABLE	Set to DISABLED. The Keypad's LEDs will stop flashing.
PARAMETER SAVE	Exit the CONFIGURE DRIVE menu and press the ▲ (UP) key to display the PARAMETER SAVE menu. Press M. Press the ▲ (UP) key as instructed to save your settings. Refer to 3.3.

MMI Menu Map

1 CONFIGURE DRIVE
- CONFIGURE ENABLE
- NOM MOTOR VOLTS
- ARMATURE CURRENT
- FIELD CURRENT
- FLD.CTRL MODE
- FLD.VOLTS RATIO
- CUR.LIMIT/SCALER
- AUTOTUNE
- SPEED FBK SELECT
- ENCODER LINES
- ENCODER RPM
- ENCODER SIGN
- SPD.INT.TIME
- SPD.PROP.GAIN

Refer to the Product Code on the drive's Rating Label to confirm the drive's specification.

3: Initial Start-Up Routine

AUXILIARY POWER ONLY IS CONNECTED AT THIS STAGE

Complete steps 3.1 to 3.12

3.1 Write down the MAIN CURR. LIMIT parameter's value here:

.....

Set to 0.00%

MMI Menu Map

1 CONFIGURE DRIVE
└ MAIN CURR. LIMIT

3.2 Check that ANIN 5 (A6) is +10V. If not, check the wiring link between terminals A6 and B3.

MMI Menu Map

1 DIAGNOSTICS
└ ANIN 5(A6)

3.3 Save your settings.
Press the ▲ (UP) key, as instructed.

MMI Menu Map

1 PARAMETER SAVE
└ PARAMETER SAVE

3.4 Press the L/R key and select Local mode (the SEQ and/or REF LEDs are lit). The Keypad will be used to start, stop, and control the speed of the drive.

3.5 With +24V present at terminals B8 and B9 (Program Stop and Coast Stop):

Press the Start key on the Keypad.

The main 3-phase contactor should close and remain energised.

Quickly press the Stop key on the Keypad.

The main 3-phase contactor should open and remain de-energised.

IMPORTANT
The main contactor should never be operated by any means other than the drive's internal controls, nor should any additional circuitry be placed around the contactor coil circuit.

Didn't work? Remove the auxiliary power and check start/stop sequencing and contactor wiring.

3-Phase Alarm? The drive has tripped because there is no 3-phase supply connected. To clear the alarm press the Stop key. Repeat the test at **3.5** again, but quickly press the Stop key before the alarm has time to initiate.

WARNING
Do not continue until the stop/start circuits and contactor operate correctly.

3.6 **ISOLATE THE DRIVE** using branch circuit protection or circuit breaker (**8**).

Install the 3-phase fuses (**6**).

Re-instate branch circuit protection or circuit breaker (**8**)

3.7 Select Local Control on the Keypad. Refer back to **3.4** for how to do this.

This will display the local speed setpoint: 0.00%.

FORWARD
REF: 0.00 %

IMPORTANT *Do not change any of the previously made calibration settings once the main contactor is energised.*

MAIN & AUXILIARY POWER ARE CONNECTED AT THIS STAGE

3.8 *Use a Voltmeter that conforms to IEC 61010 (CAT III or higher).*

- ***Press the Start key on the Keypad***
- ***Ensure that "Enable" (C5) is ON.***

Check that 3-phase mains is applied to the power terminals L1, L2 and L3.

Check the correct field voltage appears between the field output terminals F+ and F-.

If the Field Voltage is incorrect do not continue. Switch off all supplies and check connections.

This is high voltage DC. Proceed with caution.

START

The drive can run provided that:

B8 & B9 are TRUE (+24V)
C5 is ON (+24V)
MAIN CURR. LIMIT ≠ 0
Speed Setpoint ≠ 0

STOP

At 20% setpoint:

The 590PR drive (4Q) can stop in approximately 2 seconds (the drive decelerates the motor to zero speed at a rate determined by the STOP TIME and MAIN CURR.LIMIT parameter values).

The 591PR drive (2Q) can coast stop.

3.9 Check that the **OK** (Health) and (Start key) LEDs on the Keypad are now lit, indicating that the motor is capable of rotating.

Also, either the ►(forward) or ◄ (reverse) led will be lit, indicating the direction of rotation.

Caution

During the following set-up instructions, be ready to STOP the drive should the motor try to overspeed.

3.10	Set the speed setpoint to 5%. Press the PROG key to display (toggle) the main menu system.	FORWARD REF: 5.00 %
3.11	Refer back to 2.1 to display the CONFIGURE DRIVE menu. Slowly increase the MAIN CURR.LIMIT parameter towards a maximum of 20%. At some point the motor will begin to rotate as the parameter value is increased. The motor speed will settle at 5% of full speed. If the motor is loaded it may require more than 20% current limit to turn the motor.	**MMI Menu Map** 1 CONFIGURE DRIVE MAIN CURR. LIMIT
3.12	Stop the drive. Now Autotune the drive.	

4: Autotuning

This process tunes the drive to the connected motor. Initial conditions must be:

- Main contactor open, i.e. Stop key pressed
- Program Stop (terminal B8) and Coast Stop (terminal B9) high, i.e. 24V.
- No field voltage: Autotune automatically quenches the (default) internally supplied field.

4.1	Set AUTOTUNE to ON. **MMI Menu Map** 1 CONFIGURE DRIVE AUTOTUNE	**4.2** Close the main contactor, i.e. press the Start key to begin the Autotune.
• *When Autotune is complete (after approximately 10 seconds), the main contactor is opened and the AUTOTUNE parameter is reset to OFF. Ensure that "Enable" (C5) is OFF.*		
4.3	**Perform a PARAMETER SAVE now**. Refer back to **3.3** for how to do this.	

The drive is powered-up and operating under Local Control using Armature Volts Feedback.
Opposite are details for converting to a very simple form of Remote Control.

Insert the CD into a computer to refer to the Product Manual.

In the Product Manual refer to the sections below to make the installation application specific:

CHAPTER 3	Connection Diagrams
	Control Connections
	Optional Equipment
	Motor Field current range switch selection (SW1 on power board)
CHAPTER 4	Selecting Speed Feedback
	Initial Start-up Routine (the full routine will help with any additions you make)
	Performance Adjustment (any parameter changes will require another Autotune)

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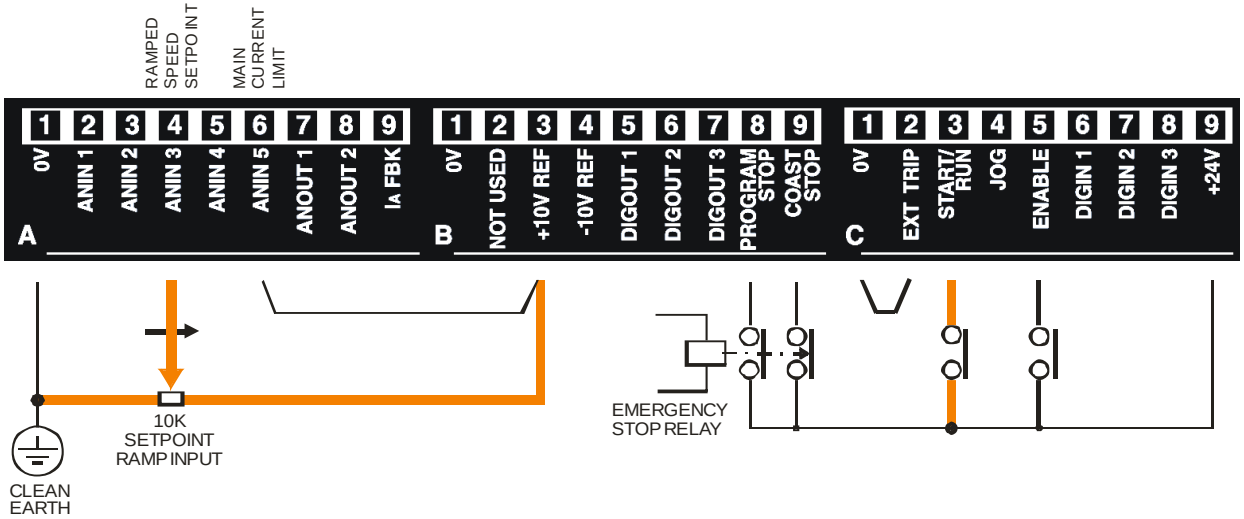
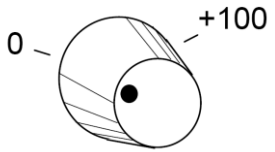
Converting to Remote Control

ISOLATE THE DRIVE using branch circuit protection or circuit breaker (**8**).

This description assumes you have completed the "Drive Set-Up in Local Control".



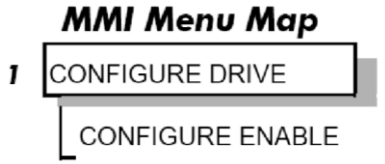
Speed Demand (Uni-directional)	**A1** **A4** **B3**	The 10K potentiometer adjusts the speed setpoint: Zero speed = Terminal A1, 0V input Maximum forward speed (+100%) = Terminal B3, 10V input
Start/Run	**C3** **C9**	When C3 (START/RUN) is connected to C9 the drive can run provided that: B8 & B9 are TRUE (+24V) — C5 "Enable" is ON (+24V) MAIN CURR. LIMIT ≠ 0 — Speed Setpoint ≠ 0



1 Re-instate branch circuit protection or circuit breaker (**8**).

2 By default, Remote Control is already selected on the Keypad (the SEQ and REF LEDs are not lit). Your control connections will be used to start, stop, and control the speed of the drive.

Refer back to 2.1 to display the CONFIGURE DRIVE menu.



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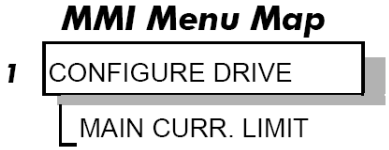
3 Set the MAIN CURR. LIMIT parameter to 0.00%.



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4 Ensure that "Enable" (C5) is ON.

Set the potentiometer to 5%. To check this, 0.5V (the Total Speed Setpoint) can be measured at terminal A8, Analog Output 2.

Start the drive by closing the "Start/Run" contact (C3).

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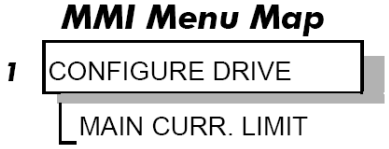
5 Slowly increase the MAIN CURR.LIMIT parameter towards a maximum of 20%. At some point the motor will begin to rotate as the parameter value is increased. The motor speed will settle at 5% of full speed if the motor is unloaded. If the motor is loaded it may require more than 20% current limit to turn the motor.

Now stop the drive by opening the "Start/Run" contact (C3).

Ensure that "Enable" (C5) is OFF.



Electrical Ratings - Power Circuit

Refer to Chapter 3: "Earth Fault Monitoring Systems" for circuit breaker details.

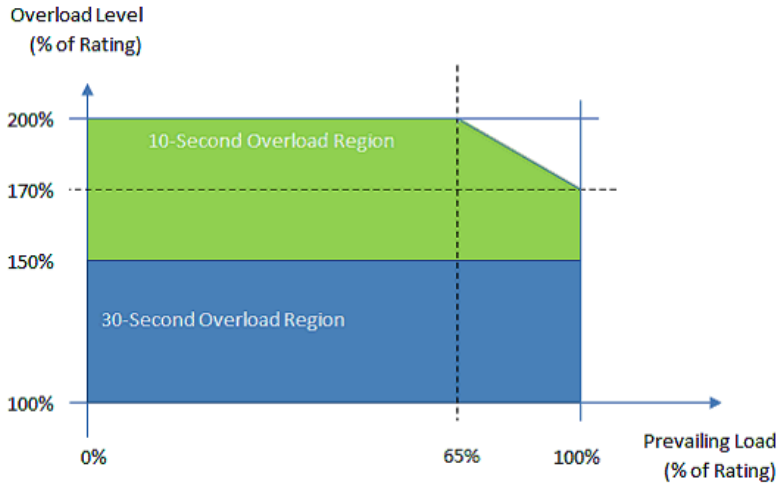
Motor HP ratings as NEC Table 430-247: "Full Load Current in Amperes, DC Motors

The ratings assume that the armature discontinuous current level is at or below the armature average current rating.

Surrounding Air Temp.	**Output Current @ 150% and 200% * (A)**	**Output Current @ 100% Continuous * (A)**	**Motor HP @ 500V dc (HP)**	**Internal Field Current supply (A)[1]**	**Total Losses @ Full Load (W)**	**Symmetrical Fault Current rms (kA)**
45℃	20	20	7.5	$5/10^2$	57	5
45℃	20	20	10	$5/10^2$	57	5
45℃	35	35	15	$5/10^2$	57	5
45℃	35	35	20	$5/10^2$	117	5
45℃	45	45	25	$5/10^2$	132	5
40℃	75	75	30	$5/20^3$	234	5
40℃	75	75	40	$5/20^3$	234	5
40℃	110	110	50	$5/20^3$	354	10
40℃	110	110	60	$5/20^3$	354	10
40℃	165	165	75	$5/20^3$	519	10
40℃	165	165	100	$5/20^3$	519	10

See section 4 for the internal field / external field current setting

* The output current figures are given at 100% Continuous (no overload), and with overloads of 150% for 30 seconds or 200% for 10 seconds (starting from 65% load stabilized)



1. Field current range switch (SW1) has been provided on power board for improved resolution at low field current
2. The maximum externally supplied field current is 15A for Frame1 but requires de-rating of the armature output current (amp for amp) above 10A, and only apply for operation at or below 35°C ambient.
3. The maximum externally supplied field current is 20A for Frame2.

Power Supply Details

3-Phase Supply	**LV Build**			
	MV Build	220-500V ac ±10%, 50/60Hz ±5%, line-to-line, ground referenced (TN) and non-ground referenced (IT)		
Supply Current		Supply current due to armature = (0.9 x Idc) A ac rms. Total ac rms current including motor field current is listed below.		
Frame 1		20A unit: 23.5A;	35A unit: 36.5A;	45A unit: 45.0A
Frame 2		75A unit: 76.5A;	110A unit: 107.5A;	165A unit: 156.5A
Field Supply Voltage		Build-related, Internally derived from L1 and L2 phases. When externally supplied - Max. 1-phase 500V line-to-line, phase aligned to the armature L1-L2 supply.		
3 Phase Input		3-phase rotation insensitive, no adjustment necessary for frequency change		

Auxiliary Power Supply Details

Auxiliary Supply	110-240V ±10%, 50-60Hz ±10%, single phase, Overvoltage Category II 3A ac rms maximum. Nominal current used for power supplies: 0.5A at 110V ac, 0.25A at 240V ac
Contactor Output	3A maximum at the auxiliary voltage

The drive is powered-up and operating safely under Remote Control using Armature Volts Feedback.