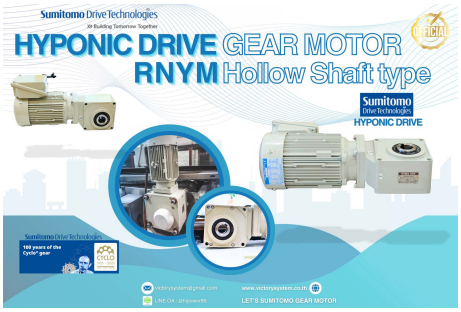
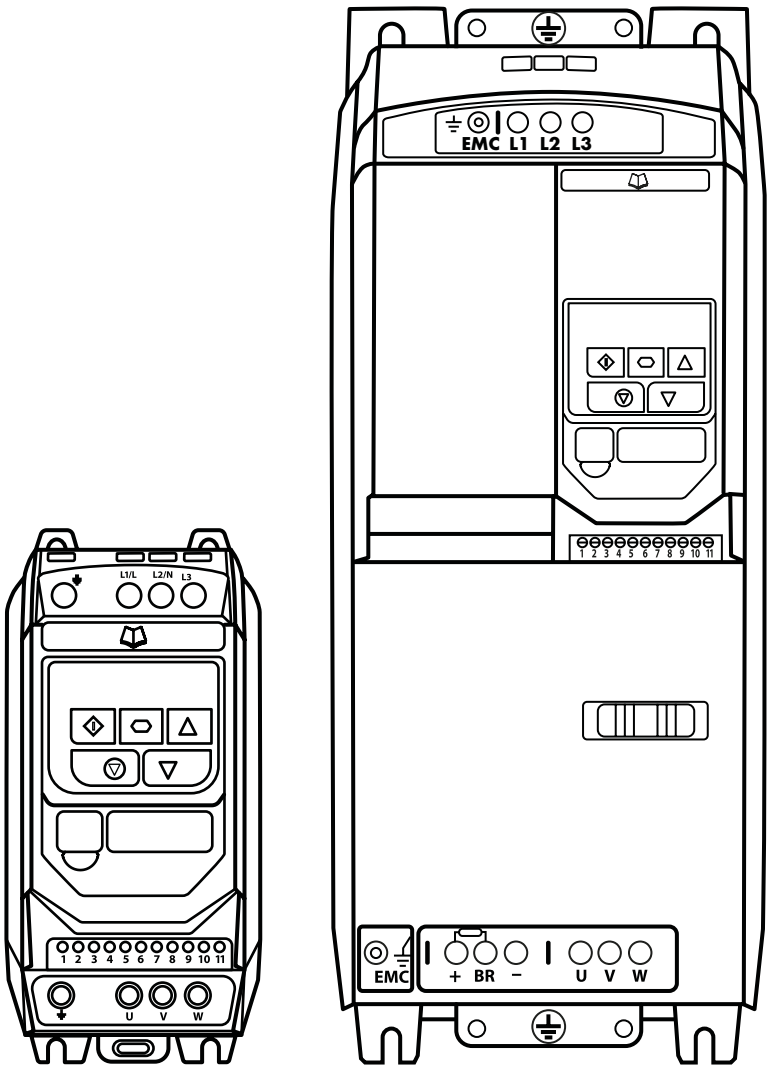
OPTIDRIVE™ E³

AC Variable Speed Drive

IP20

0.37kW – 37kW / 0.5HP – 50HP
110 – 480V Single and 3 Phase Input





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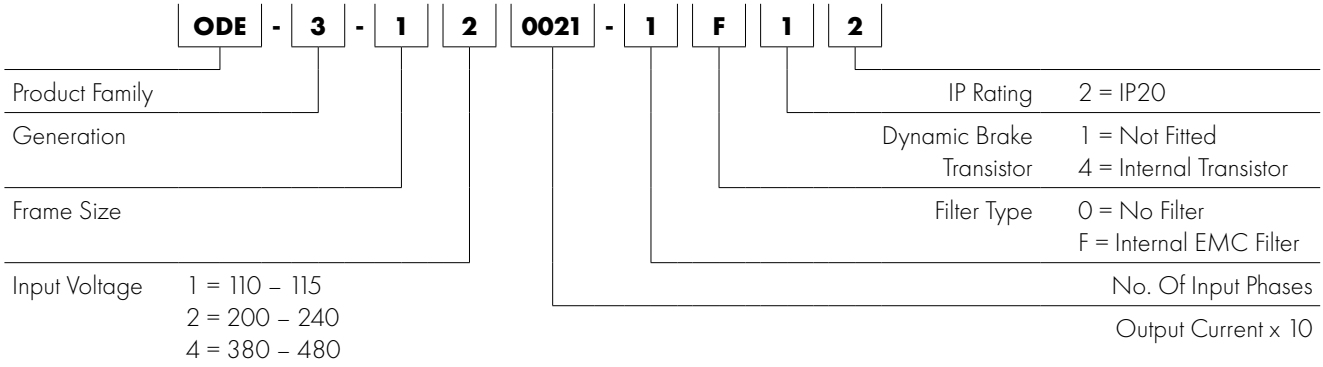
This chapter contains information about the Optidrive E3 including how to identify the drive

OPTIDRIVE **Drive** INVERTER ORDER CODE :

Each drive can be identified by its model number, as shown in the table below. The model number is on the shipping label and the drive nameplate. The model number includes the drive and any options.



2.2. Drive Model Numbers

110 – 115V ± 10% - 1 Phase Input – 3 Phase 230V Output (Voltage Doubler)					
Model Number		**kW**	**HP**	**Output Current (A)**	**Frame Size**
With Filter	**Without Filter**				
N/A	ODE-3-110023-1012		0.5 HP.	2.3	1
N/A	ODE-3-110043-1012		1 HP.	4.3	1
N/A	ODE-3-210058-1042		1.5 HP.	5.8	2
200 – 240V ± 10% - 1 Phase Input – 3 Phase Output					
Model Number		**kW**	**HP**	**Output Current (A)**	**Frame Size**
With Filter	**Without Filter**				
ODE-3-120023-1F12	ODE-3-120023-1012	0.37 kW.	0.5 HP.	2.3	1
ODE-3-120043-1F12	ODE-3-120043-1012	0.75 kW.	1 HP.	4.3	1
ODE-3-120070-1F12	ODE-3-120070-1012	1.5 kW.	2 HP.	7	1
ODE-3-220070-1F42	ODE-3-220070-1042	1.5 kW.	2 HP.	7	2
ODE-3-220105-1F42	ODE-3-220105-1042	2.2 kW.	3 HP.	10.5	2
N/A	ODE-3-320153-1042	4.0 kW.	5 HP.	15.3	3
200 – 240V ± 10% - 3 Phase Input – 3 Phase Output					
Model Number		**kW**	**HP**	**Output Current (A)**	**Frame Size**
With Filter	**Without Filter**				
N/A	ODE-3-120023-3012	0.37 kW.	0.5 HP.	2.3	1
N/A	ODE-3-120043-3012	0.75 kW.	1 HP.	4.3	1
N/A	ODE-3-120070-3012	1.5 kW.	2 HP.	7	1
ODE-3-220070-3F42	ODE-3-220070-3042	1.5 kW.	2 HP.	7	2
ODE-3-220105-3F42	ODE-3-220105-3042	2.2 kW.	3 HP.	10.5	2
ODE-3-320180-3F42	ODE-3-320180-3042	4.0 kW.	5 HP.	18	3
ODE-3-320240-3F42	ODE-3-320240-3042	5.5 kW.	7.5 HP.	24	3
ODE-3-420300-3F42	ODE-3-420300-3042	7.5 kW.	10 HP.	30	4
ODE-3-420460-3F42	ODE-3-420460-3042	11 kW.	15 HP.	46	4
ODE-3-520610-3F42	N/A	15 kW.	20 HP.	61	5
ODE-3-520720-3F42	N/A	18.5 kW.	25 HP.	72	5

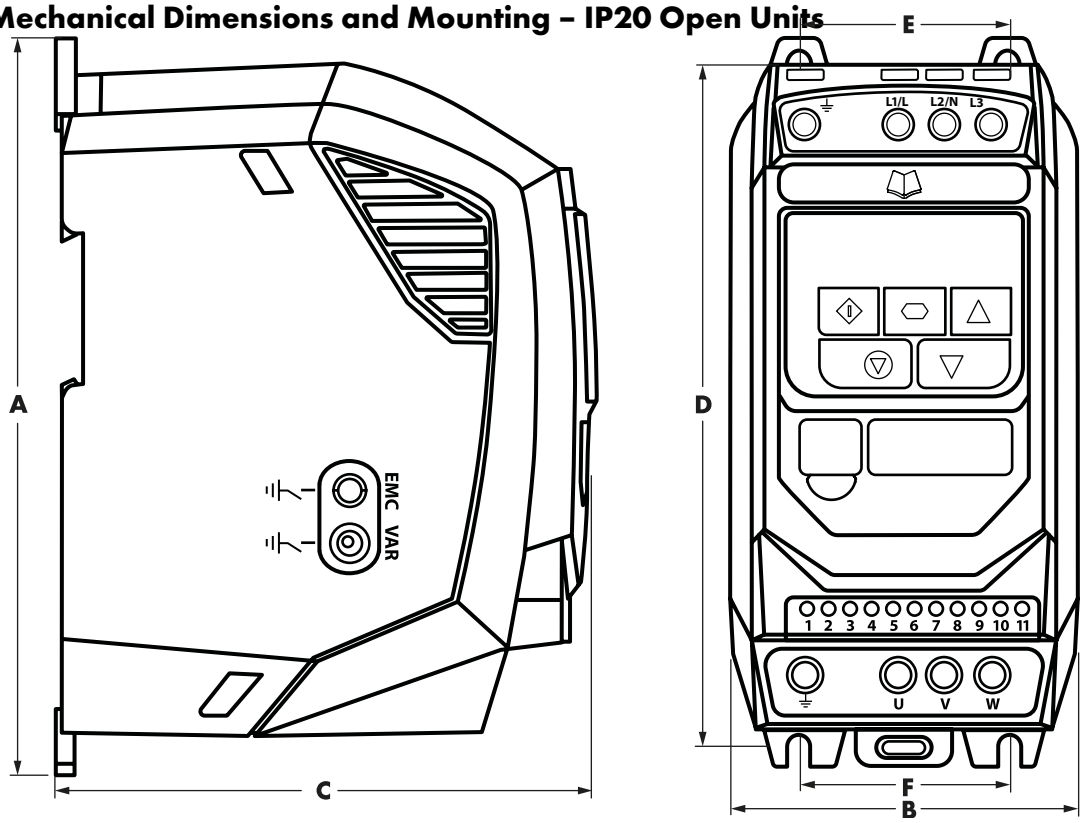
380 – 480V ± 10% - 3 Phase Input – 3 Phase Output					
Model Number		kW	HP	Output Current (A)	Frame Size
With Filter	Without Filter				
ODE-3-140012-3F12	ODE-3-140012-3012	0.37 kW.	0.5 HP.	1.2	1
ODE-3-140022-3F12	ODE-3-140022-3012	0.75 kW.	1 HP.	2.2	1
ODE-3-140041-3F12	ODE-3-140041-3012	1.5 kW.	2 HP.	4.1	1
ODE-3-240041-3F42	ODE-3-240041-3042	1.5 kW.	2 HP.	4.1	2
ODE-3-240058-3F42	ODE-3-240058-3042	2.2 kW.	3 HP.	5.8	2
ODE-3-240095-3F42	ODE-3-240095-3042	4 kW.	5 HP.	9.5	2
ODE-3-340140-3F42	ODE-3-340140-3042	5.5 kW.	7.5 HP.	14	3
ODE-3-340180-3F42	ODE-3-340180-3042	7.5 kW.	10 HP.	18	3
ODE-3-340240-3F42	ODE-3-340240-3042	11 kW.	15 HP.	24	3
ODE-3-440300-3F42	ODE-3-440300-3042	15 kW.	20 HP.	30	4
ODE-3-440390-3F42	ODE-3-440390-3042	18.5 kW.	25 HP.	39	4
ODE-3-440460-3F42	ODE-3-440460-3042	22 kW.	30 HP.	46	4
ODE-3-540610-3F42	N/A	30 kW.	40 HP.	61	5
ODE-3-540720-3F42	N/A	37 kW.	50 HP.	72	5

- The Optidrive should be mounted in a vertical position only, on a flat, flame resistant, vibration free mounting using the integral mounting holes or DIN Rail clip (Frame Sizes 1 and 2 only).
- IP20 Optidrives must be installed in a pollution degree 1 or 2 environment only.
- Do not mount flammable material close to the Optidrive.
- Ensure that the ambient temperature range does not exceed the permissible limits for the Optidrive given in section 9.1. Environmental.
- Provide suitable clean, moisture and contaminant free cooling air sufficient to fulfil the cooling requirements of the Optidrive.

UL Compliant Installation

Refer to section 9.4. Additional Information for UL Compliance on page 35 for Additional Information for UL Compliance.

Mechanical Dimensions and Mounting – IP20 Open Units



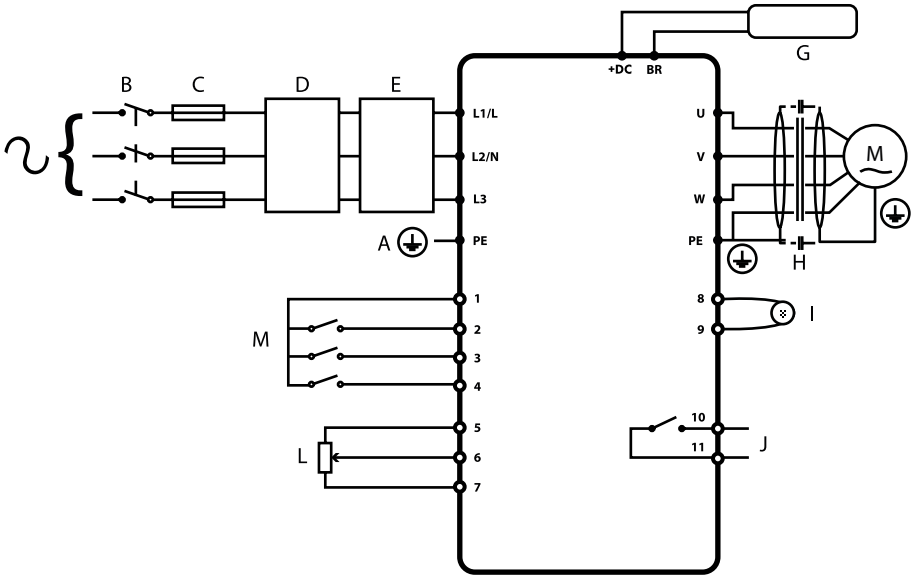
Drive Size	A		B		C		D		E		F		Weight	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	Kg	lb
1	173	6.81	83	3.27	123	4.84	162	6.38	50	1.97	50	1.97	1.0	2.2
2	221	8.70	110	4.33	150	5.91	209	8.23	63	2.48	63	2.48	1.7	3.8
3	261	10.28	131	5.16	175	6.89	247	9.72	80	3.15	80	3.15	3.2	7.1
4	420	16.54	171	6.73	212	8.35	400	15.75	125	4.92	125	4.92	9.1	20.1
5	486	19.13	222	8.74	226	8.89	463	18.22	175	6.88	175	6.88	18.1	39.9

Mounting Bolts	
Frame Size	
1 - 3	4 x M5 (#8)
4	4 x M8
5	4 x M8

Tightening Torques		
Frame Size	Control Terminals	Power Terminals
1 - 3	0.5 Nm (4.5 lb-in)	1 Nm (9 lb-in)
4	0.5 Nm (4.5 lb-in)	2 Nm (18 lb-in)
5	0.5 Nm (4.5 lb-in)	4 Nm (35.5 lb-in)

Power & Control Wiring

Connection Diagram



	Key	Sec.	Page
A	Protective Earth (PE) Connection	4.2	14
B	Incoming Power Connection	4.3	12
C	Fuse / Circuit Breaker Selection	4.3.2	14
D	Optional Input Choke	4.3.3	12
E	Optional External EMC Filter	4.10	15
F	Internal Disconnect / Isolator	4.3	12
G	Optional Brake Resistor	4.11	18
H	Motor Connection		
I	Analog Output	4.8.1	16
J	Auxiliary Relay Output	4.8.2	17
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Protective Earth (PE) Connection

Grounding Guidelines

The ground terminal of each Optidrive should be individually connected DIRECTLY to the site ground bus bar (through the filter if installed). Optidrive ground connections should not loop from one drive to another, or to, or from any other equipment. Ground loop impedance must confirm to local industrial safety regulations. To meet UL regulations, UL approved ring crimp terminals should be used for all ground wiring connections.

The drive Safety Ground must be connected to system ground. Ground impedance must conform to the requirements of national and local industrial safety regulations and/or electrical codes. The integrity of all ground connections should be checked periodically.

Protective Earth Conductor

The Cross sectional area of the PE Conductor must be at least equal to that of the incoming supply conductor.

Safety Ground

This is the safety ground for the drive that is required by code. One of these points must be connected to adjacent building steel (girder, joist), a floor ground rod, or bus bar. Grounding points must comply with national and local industrial safety regulations and/or electrical codes.

Motor Ground

The motor ground must be connected to one of the ground terminals on the drive.

Ground Fault Monitoring

As with all inverters, a leakage current to earth can exist. The Optidrive is designed to produce the minimum possible leakage current whilst complying with worldwide standards. The level of current is affected by motor cable length and type, the effective switching frequency, the earth connections used and the type of RFI filter installed. If an ELCB (Earth Leakage Circuit Breaker) is to be used, the following conditions apply:

- A Type B Device must be used.
- The device must be suitable for protecting equipment with a DC component in the leakage current.
- Individual ELCBs should be used for each Optidrive.

Shield Termination (Cable Screen)

The safety ground terminal provides a grounding point for the motor cable shield. The motor cable shield connected to this terminal (drive end) should also be connected to the motor frame (motor end). Use a shield terminating or EMI clamp to connect the shield to the safety ground terminal.

4.3. Incoming Power Connection

4.3.1. Cable Selection

- For 1 phase supply, the mains power cables should be connected to L1/L, L2/N.
- For 3 phase supplies, the mains power cables should be connected to L1, L2, and L3. Phase sequence is not important.
- For compliance with CE and C Tick EMC requirements, refer to section 4.9. EMC Compliant Installation on page 15.
- A fixed installation is required according to IEC61800-5-1 with a suitable disconnecting device installed between the Optidrive and the AC Power Source. The disconnecting device must conform to the local safety code / regulations (e.g. within Europe, EN60204-1, Safety of machinery).
- The cables should be dimensioned according to any local codes or regulations. Maximum dimensions are given in section 9.2. Rating Tables.

4.3.2. Fuse / Circuit Breaker Selection

- Suitable fuses to provide wiring protection of the input power cable should be installed in the incoming supply line, according to the data in section 9.2. Rating Tables. The fuses must comply with any local codes or regulations in place. In general, type gG (IEC 60269) or UL type J fuses are suitable; however in some cases type aR fuses may be required. The operating time of the fuses must be below 0.5 seconds.
- Where allowed by local regulations, suitably dimensioned type B MCB circuit breakers of equivalent rating may be utilised in place of fuses, providing that the clearing capacity is sufficient for the installation.
- The maximum permissible short circuit current at the Optidrive Power terminals as defined in IEC60439-1 is 100kA.

4.3.3. Optional Input Choke

- An optional Input Choke is recommended to be installed in the supply line for drives where any of the following conditions occur:
  - The incoming supply impedance is low or the fault level / short circuit current is high.
  - The supply is prone to dips or brown outs.
  - An imbalance exists on the supply (3 phase drives).
  - The power supply to the drive is via a busbar and brush gear system (typically overhead Cranes).
- In all other installations, an input choke is recommended to ensure protection of the drive against power supply faults. Part numbers are shown in the table.

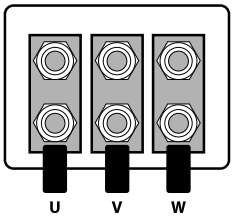
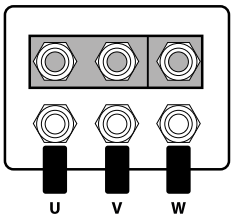
Supply	Frame Size	AC Input Inductor
230 Volt 1 Phase	1	OPT-2-L1016-20
	2	OPT-2-L1025-20
	3	N/A
400 Volt 3 Phase	1	OPT-2-L3006-20
	2	OPT-2-L3010-20
	3	OPT-2-L3036-20
	4	OPT-2-L3050-20
	5	OPT-2-L3090-20

Motor Connection

- The drive inherently produces fast switching of the output voltage (PWM) to the motor compared to the mains supply, for motors which have been wound for operation with a variable speed drive then there is no preventative measures required, however if the quality of insulation is unknown then the motor manufacturer should be consulted and preventative measures may be required.
- The motor should be connected to the Optidrive U, V, and W terminals using a suitable 3 or 4 core cable. Where a 3 core cable is utilised, with the shield operating as an earth conductor, the shield must have a cross sectional area at least equal to the phase conductors when they are made from the same material. Where a 4 core cable is utilised, the earth conductor must be of at least equal cross sectional area and manufactured from the same material as the phase conductors.
- The motor earth must be connected to one of the Optidrive earth terminals.
- Maximum permitted motor cable length for all models: 100 metres shielded, 150 metres unshielded.
- Where multiple motors are connected to a single drive using parallel cables, an output choke **must** be installed.

Motor Terminal Box Connections

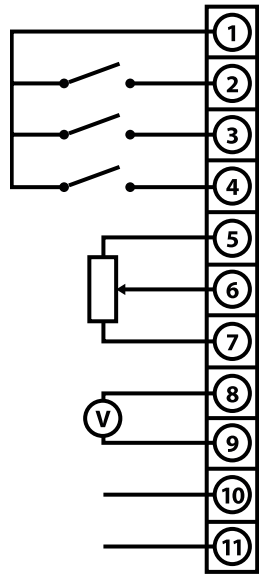
Most general purpose motors are wound for operation on dual voltage supplies. This is indicated on the nameplate of the motor. This operational voltage is normally selected when installing the motor by selecting either STAR or DELTA connection. STAR always gives the higher of the two voltage ratings.

Incoming Supply Voltage	Motor Nameplate Voltages	Connection	
230	230 / 400	Delta Δ	
400	400 / 690		
400	230 / 400	Star ʎ	

Control Terminal Wiring

- All analog signal cables should be suitably shielded. Twisted pair cables are recommended.
- Power and Control Signal cables should be routed separately where possible, and must not be routed parallel to each other.
- Signal levels of different voltages e.g. 24 Volt DC and 110 Volt AC, should not be routed in the same cable.
- Maximum control terminal tightening torque is 0.5Nm.
- Control Cable entry conductor size: 0.05 – 2.5mm2 / 30 – 12 AWG.

Control Terminal Connections

Default Connections	Control Terminal	Signal	Description	
	1	+24Vdc User Output	+24Vdc user output, 100mA. Do not connect an external voltage source to this terminal.	
	2	Digital Input 1	Positive logic "Logic 1" input voltage range: 8V ... 30V DC "Logic 0" input voltage range: 0V ... 4V DC	
	3	Digital Input 2		
	4	Digital Input 3 /Analog Input 2	Digital: 8 to 30V Analog: 0 to 10V, 0 to 20mA or 4 to 20mA	
	5	+10V User Output	+10V, 10mA, 1kΩ minimum	
	6	Analog Input 1 / Digital Input 4	Analog: 0 to 10V, 0 to 20mA or 4 to 20mA Digital: 8 to 30V	
	7	0V	0 Volt Common, internally connected to terminal 9	
	8	Analog Output / Digital Output	Analog: 0 to 10V, Digital: 0 to 24V	20mA maximum
	9	0V	0 Volt Common, internally connected to terminal 7	
	10	Auxiliary Relay Common		
	11	Auxiliary Relay NO Contact	Contact 250Vac, 6A / 30Vdc, 5A Intended to drive resistive load.	

4.7.1. Analog Output

The analog output function may be configured using parameter P-25, which is described in section 6.2. Extended Parameters on page 20.

The output has two operating modes, dependent on the parameter selection:

- Analog Mode
  - o The output is a 0 – 10 volt DC signal, 20mA max load current.
- Digital Mode
  - o The output is 24 volt DC, 20mA max load current.

4.7.2. Relay Output

The relay output function may be configured using parameter P-18, which is described in section 6.2. Extended Parameters on page 20.

4.7.3. Analog Inputs

Two analog inputs are available, which may also be used as Digital Inputs if required. The signal formats are selected by parameters as follows:

- Analog Input 1 Format Selection Parameter P-16.
- Analog Input 2 Format Selection Parameter P-47.

These parameters are described more fully in section 6.2. Extended Parameters on page 20.

The function of the analog input, e.g. for speed reference or PID feedback for example is defined by parameters P-15. The function of these parameters and available options is described in section 7. Analog and Digital Input Macro Configurations on page 27.

4.7.4. Digital Inputs

Up to four digital inputs are available. The function of the inputs is defined by parameters P-12 and P-15, which are explained in section 7. Analog and Digital Input Macro Configurations on page 27.

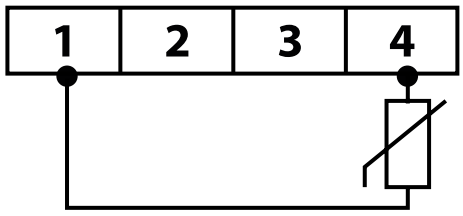
4.8. Motor Thermal Overload Protection

4.8.1. Internal Thermal Overload Protection

Optidrive E3 has internal motor overload protection / current limit set at 150% of FLA. This may be adjusted in parameter P-54. The drive has an in-built motor thermal overload function; this is in the form of an "I.t-trP" trip after delivering >100% of the value set in P-08 for a sustained period of time (e.g. 150% for 60 seconds).

4.8.2. Motor Thermistor Connection

Where a motor thermistor is to be used, it should be connected as follows:

Control Terminal Strip	Additional Information
	Compatible Thermistor: PTC Type, 2.5kΩ trip level. ▪ Use a setting of P-15 that has Input 3 function as External Trip, e.g. P-15 = 3. Refer to section 7. Analog and Digital Input Macro Configurations on page 27 for further details. ▪ Set P-47 = "PtC-th"