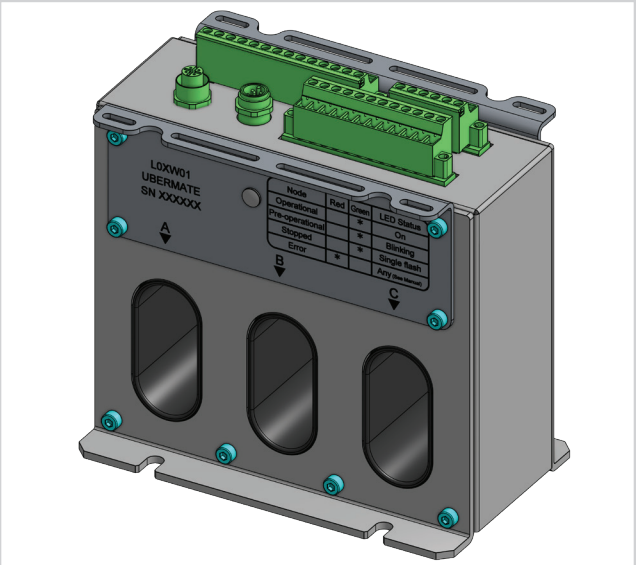
L0XW0101 UberMate 1.0 CAN Motor Current Monitor 110VAC Digital Inputs

The UberMate is a CANOpen SIL2 rated, 3-phase motor management module designed for mobile electric plant.

With integrated I/O features needed to terminate a vacuum contactor, monitor 3-phase induction motor current and RTD inputs, electrical installation and maintenance has never been easier.

With additional I/O for peripheral devices, the UberMate makes for an exceptionally capable control system addition.



MECHANICAL	
Housing	Plated, mild steel enclosure, 3mm stainless steel mounting flanges
Dimensions – Volume	(W)166mm x (H) 165mm x (D) x 97mm
Dimensions – Mounting	(W)100mm x (D) 82.3mm
Conductor Aperture	25mm x 50mm (A comfortable fit for lugged 120mm2)
Mass	1.1kg
Installation	4 x M6 x 12mm + Pressure Washer
	Recommended Max. Torque = 9Nm

ENVIRONMENTAL	
IP Rating	N/A
Temperature Rating – Component	-40°C..+85°C
Temperature Rating – Ambient Operating	-35°C..+75°C

SUPPLY / INTERFACE	
Voltage / Power	18..30 VDC / < 5W
Polarity Safe	YES
Network	CAN 2.0B, CANOpen Compliant

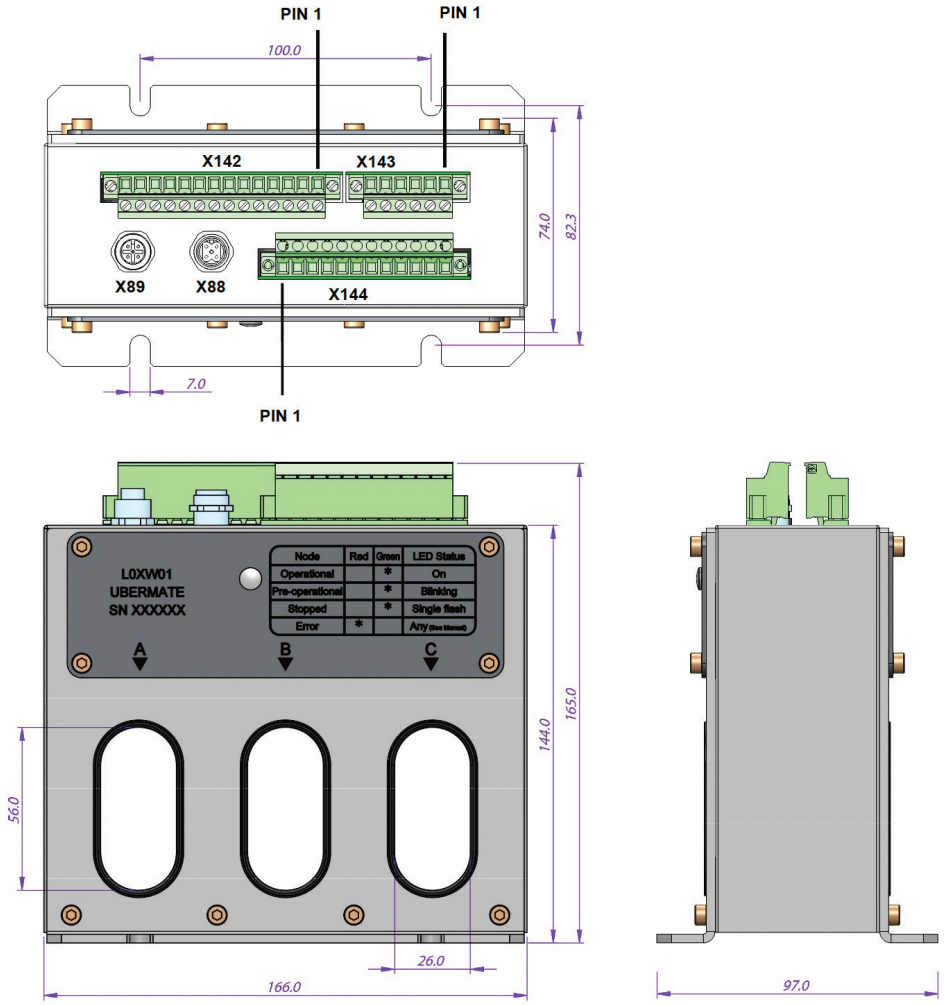
INPUTS	
Current	3 x True RMS Rogowski Coils – 1..1000A @ 1% Linear Scale (2000A peak)
Analog	3 x 4-20mA (12-bit 390Ω)
Digital	2 x 110VAC + 8 x 24VDC
RTD	3 x PT100 Line Fault Protected
Frequency	2 x Frequency / Counter (to 5KHz, 3.2kΩ)

OUTPUTS	
Relays	2 x Contact(s) Voltage Free – Forward / Reverse Configuration
Relays	x Contact(s) Voltage Free – Auxiliary
	All contacts are 240V / 16A rated, make/break 4000VA

L0XW0101 UberMate 1.0 CAN Motor Current Monitor 110VAC Digital Inputs

TEST STANDARDS	
Climatic Test	EN 60068-2-30 (Damp heat, non-condensing)
Mechanical Stability	EN 60068-2-6 (Vibration)
Immunity to Interfering Fields	EN 61000-6-2 2005
Interference Emission	EN 61000-6-4 2007

REGION OF ORIGIN	
Design & Manufacture	Australia



Dimensions (mm)

Electrical Interface

The electrical interface comprises two (2) x M12 connectors (comms) + three (3) x locking, plugin terminals supportive of 2.5mm2 conductors.

Type M12-5 M	SIGNAL	DESCRIPTION
A88-1	SHIELD	Collective Screen
A88-2	SUPPLY	Supply Input – 24VDC (Nominal)
A88-3	SUPPLY	Supply Input – 0VDC
A88-4	COMMS	CAN-H
A88-5	COMMS	CAN-L

Type M12-5 F	SIGNAL	DESCRIPTION
A89-1	SHIELD	Collective Screen
A89-2	SUPPLY	Supply Input/Output – 24VDC (Nominal)
A89-3	SUPPLY	Supply Input/Output – 0VDC
A89-4	COMMS	CAN-H
A89-5	COMMS	CAN-L

Type Term. 2.5mm2	SIGNAL	DESCRIPTION
A142-1	110VAC	110VAC Digital Input #1
A142-2	110VAC	110VAC Digital Input #2
A142-3	REF	110VAC Neutral
A142-4	24VDC	24VDC Digital Input #1
A142-5	24VDC	24VDC Digital Input #2
A142-6	24VDC	24VDC Digital Input #3
A142-7	24VDC	24VDC Digital Input #4
A142-8	24VDC	24VDC Digital Input #5
A142-9	24VDC	24VDC Digital Input #6
A142-10	24VDC	24VDC Digital Input #7
A142-11	24VDC	24VDC Digital Input #8
A142-12	24VDC	24VDC Digital Input #9
A142-13	24VDC	24VDC Digital Input #10
A142-14	REF	Common Return (24VDC Digital Inputs)

Type M12-5 F	SIGNAL	DESCRIPTION
A143-1	Voltage Free	Supply Input – Forward/Reverse (240VAC Maximum)
A143-2	Voltage Free	Output – Forward
A143-3	Voltage Free	Output – Reverse
A143-4	Voltage Free	Output – Auxiliary N/C
A143-5	Voltage Free	Supply Input – Auxiliary (240VAC Maximum)
A143-6	Voltage Free	Output – Auxiliary N/O

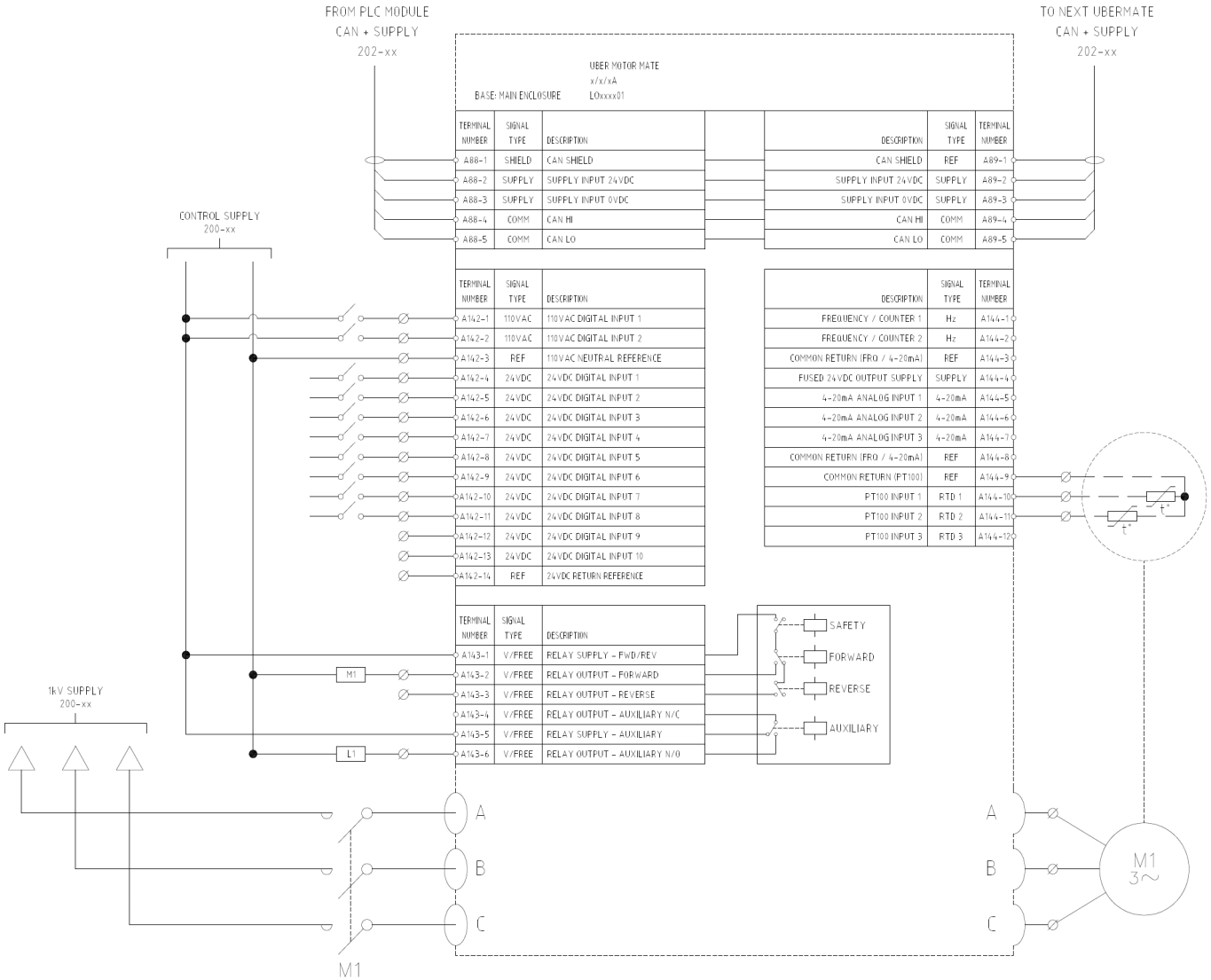
L0XW0101 UberMate 1.0 CAN Motor Current Monitor 110VAC Digital Inputs

Type Term. 2.5mm2	SIGNAL	DESCRIPTION
A144-1	Hz	Frequency / 16-bit Counter Input #1 (to 5KHz)
A144-2	Hz	Frequency / 16-bit Counter Input #2 (to 5KHz)
A144-3	REF	Common Return (FRQ / 4-20mA)
A144-4	24VDC	24VDC Supply Output (Fused 250mA)
A144-5	4-20mA	4-20mA Input #1
A144-6	4-20mA	4-20mA Input #2
A144-7	4-20mA	4-20mA Input #3
A144-8	REF	Common Return (FRQ / 4-20mA)
A144-9	REF	Common Return (PT100)
A144-10	PT100	PT100 Input #1
A144-11	PT100	PT100 Input #2
A144-12	PT100	PT100 Input #3

Example Circuit

The following example shows the vacuum contactor M1 and motor M1 switched and monitored directly by the UberMate. Support for auxiliary I/O clearly labeled.

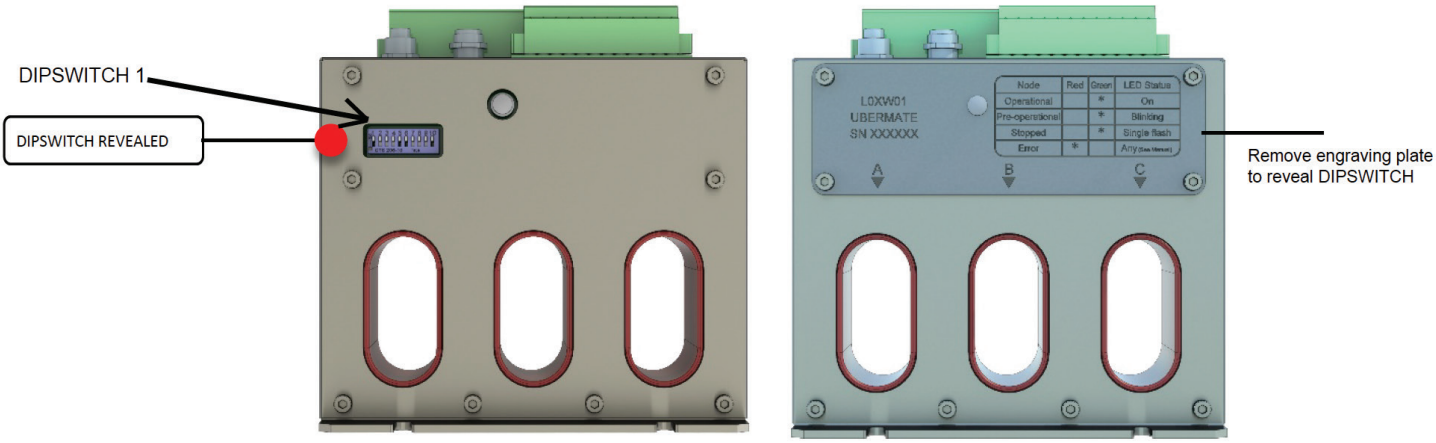
Figure 1.1 – Function Block with DOL motor application

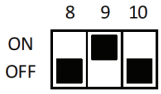
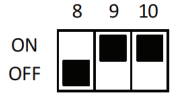
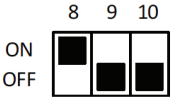
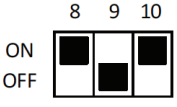


L0XW0101 UberMate 1.0 CAN Motor Current Monitor 110VAC Digital Inputs

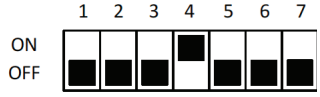
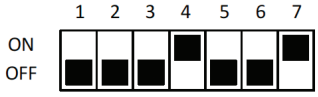
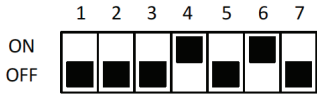
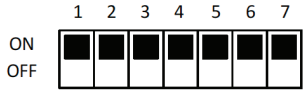
Node ID & Baud Rate

The UberMate's Node ID and Baud Rate are configured via a dipswitch that is located under the access panel (see below). Defaults for Node ID and Baud Rate is 127 and 250kbps respectively.



NODE ID	DIPSWITCH SETTING	Baud	
LSS		X	All combinations for Baud rate selection other than those shown below are illegal.
1		1mbps	
2		500kbps	
3		250kbps Default	
4		125kbps	
5		50kbps	

L0XW0101 UberMate 1.0 CAN Motor Current Monitor 110VAC Digital Inputs

NODE ID	DIPSWITCH SETTING	Baud
6		
7		
8		
9		
10		
...	BINARY PATTERN COMBINATIONS	
127 Default		

L0XW0101 UberMate 1.0 CAN Motor Current Monitor 110VAC Digital Inputs

CANOpen Definition

The standard suite of CANOpen messaging is supported inclusive of RPDO, TPDO, SDO, NMT, Node Guarding, Heartbeat and LSS. The Über Motor Mate EDS file includes all object definitions but for overview, the PDOs are defined here.

TPDO 0				
BYTE	**MASK**	**TYPE**	**DESCRIPTION**	**UOM**
0	0x01	BYTE	Digital Input #7 – 24VDC	ON/OFF
	0x02	BYTE	Digital Input #8 – 24VDC	ON/OFF
	0x04	BYTE	Digital Input #9 – 24VDC	ON/OFF
	0x08	BYTE	Digital Input #10 – 24VDC	ON/OFF
	0x10	BYTE	Digital Input #11 – 24VDC	ON/OFF
	0x20	BYTE	Digital Input #12 – 24VDC	ON/OFF
	0x40	BYTE	-	-
	0x80	BYTE	-	-
1	0x01	BYTE	Digital Input #1 – 110VAC	ON/OFF
	0x02	BYTE	Digital Input #2 – 110VAC	ON/OFF
	0x04	BYTE	Digital Input #1 – 24VDC	ON/OFF
	0x08	BYTE	Digital Input #2 – 24VDC	ON/OFF
	0x10	BYTE	Digital Input #3 – 24VDC	ON/OFF
	0x20	BYTE	Digital Input #4 – 24VDC	ON/OFF
	0x40	BYTE	Digital Input #5 – 24VDC	ON/OFF
	0x80	BYTE	Digital Input #6 – 24VDC	ON/OFF
2	-	UINT16_T	Phase A Current LSB	AMPS
3	-		Phase A Current MSB	
4	-	UINT16_T	Phase B Current LSB	AMPS
5	-		Phase B Current MSB	
6	-	UINT16_T	Phase C Current LSB	AMPS
7	-		Phase C Current MSB	

TPDO 0				
BYTE	**MASK**	**TYPE**	**DESCRIPTION**	**UOM**
0	-	UINT16_T	4-20mA Input #1 LSB	uA1
1	-		4-20mA Input #1 MSB	
2	-	UINT16_T	4-20mA Input #2 LSB	uA
3	-		4-20mA Input #2 MSB	
4	-	UINT16_T	4-20mA Input #3 LSB	uA
5	-		4-20mA Input #3 MSB	
6	-	UINT16_T	Frequency Counter Input #1 LSB	Hz
7	-		Frequency Counter Input #1 MSB	

L0XW0101 UberMate 1.0 CAN Motor Current Monitor 110VAC Digital Inputs

TPDO 2				
BYTE	**MASK**	**TYPE**	**DESCRIPTION**	**UOM**
0	-	INT16_T	PT100 Input #1 LSB	°C
1	-		PT100 Input #1 MSB	
2	-	INT16_T	PT100 Input #2 LSB	°C
3	-		PT100 Input #2 MSB	
4	-	INT16_T	PT100 Input #3 LSB	°C
5	-		PT100 Input #3 MSB	
6	-	INT16_T	Frequency Counter Input #2 LSB	Hz
7	-		Frequency Counter Input #2 MSB	

TPDO 3				
BYTE	**MASK**	**TYPE**	**DESCRIPTION**	**UOM**
0	-	INT32_T	Pulse Counter Input 1 LSB	Numerical
1	-		Pulse Counter Input 1	
2	-		Pulse Counter Input 1	
3	-		Pulse Counter Input 2 MSB	
4	-	INT32_T	Pulse Counter Input 2 LSB	Numerical
5	-		Pulse Counter Input 2	
6	-		Pulse Counter Input 2	
7	-		Pulse Counter Input 2 MSB	

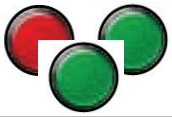
RPDO 0				
BYTE	**MASK**	**TYPE**	**DESCRIPTION**	**UOM**
0	0x01	BYTE	Relay – Safety[2]	ON/OFF
	0x02	BYTE	Relay – Forward	ON/OFF
	0x04	BYTE	Relay – Reverse	ON/OFF
	0x08	BYTE	Relay – Auxiliary	ON/OFF
	0x10	BYTE		-
	0x20	BYTE		-
	0x40	BYTE		-
	0x80	BYTE		-
1	-	-		-
2	-	-		-
3	-	-		-
4	-	-		-
5	-	-		-
6	-	-		-
7	-	-		-

[2] Relay Safety is wired line-side of the FWD/REV contacts.

L0XW0101 UberMate 1.0 CAN Motor Current Monitor 110VAC Digital Inputs

Control Basics

The UberMate incorporates a CANOpen state machine for operation and this is indicated via the integrated LED visible at the access panel. The following table summarizes LED status:

Operational State Indication		
	ALTERNATING	Initializing
	FAST FLASH	Pre-Operational, Waiting
	ON	Operational, Ready
	SLOW FLASH	Stopped
	ANY	Error State

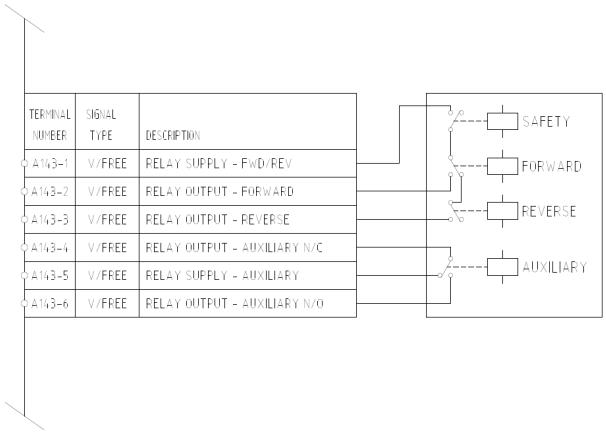
Functional Association

Where used for safety critical applications, it is recommended that the PLC associate the UberMate's unique serial number, accessible via the Identify Object (refer to EDS) with the assigned Node ID for a given function. This adds a systematic layer of protection preventing unexpected results associated with incorrect installation. E.g. Node ID misalignment of two UberMates during maintenance.

Contact Logic

There are three (3) switching relay contacts with two (2) configured to operate mutually exclusive – typically supportive of forward/reverse functionality. These forward/reverse relays incorporate a redundant Safety relay configured in-series (line side). The Safety relay must be commanded to operate in addition to the Forward/ Reverse command to complete a switched output.

Figure 1.1 – Output Block Extract



The Auxiliary relay is configured with Normally Open and Normally Closed contacts and is intended for any switching function NOT requiring a safety rating or to interpose with other contacts to form a safety function.

Recommendation

To promote higher diagnostic coverage for safety rated applications, it is recommended that the PLC sequence the command of the Safety and Forward/Reverse relays to obtain a continuous proof check of operation.

Motor Protection

Motor overload protection is implemented in the firmware of the UberMate. Motor protection routines include Instantaneous Overload, Locked Rotor Overload, Thermal Rating Overload, Phase Imbalance, Phase Loss and Under Load.

When required, the host PLC should configure motor overload protection in accordance with the motor rating and the NEMA Trip Class Curve (10, 15, 20 or 30). Class 10 characteristically trips sooner than Class 15 and so on.

Notes:

If a Thermal Rating Overload occurs, the UberMate will inhibit motor restart for a period of 4-minutes to facilitate cooling (equivalent to 50% thermal capacity recovery). Powering off or cycling power will only delay the count down.

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