

1 GENERAL DESCRIPTION

MPA2 is an electronic **Motor Performance Analyzer** that constantly monitors motor current and power supply voltage, using a thermal model algorithm to protect your motor against undercurrent, overload conditions, and voltage failures.

WARNING: Only qualified technicians with knowledge about overload relays and associated machinery should do the installation, starting up, and maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

CAUTION: This product may start automatically, the user must take cautions to avoid hazards to people.

CAUTION: This product has been designed for industrial environments. Use of this product in residential environment may cause unwanted electromagnetic disturbances in which casethe user may be required to take adequate mitigation measures.

CAUTION: An incorrectly applied or installed product can result in damage to the components or reduction in product life. Wiring or application errors, or operating/storing in excessive ambient temperatures may result in malfunction.

2 PARTS LIST

FRONT SIDE VIEW

BACK SIDE VIEW

1. LCD display
2. Indicator light (LEDs):
- Status Relay.
- Failure .
3. START Push Button.
4. ADJUST Push Buttons (Up & Down).
5. SELECT Push Button.
6. Back Groove for DIN Rail mounting.
7. Attachable Mounting Ear for Flat Surface mounting.
8. Supporting Brackets for DIN Rail mounting.
9. Current Sensing Holes for motor wiring.
10. Power Supply Voltage Input (L1 L2 L3).
11. Contacts for Relay (95-96) and (97-98).
12. COM Port. (for Serial Communication).
13. COM PORT cover.

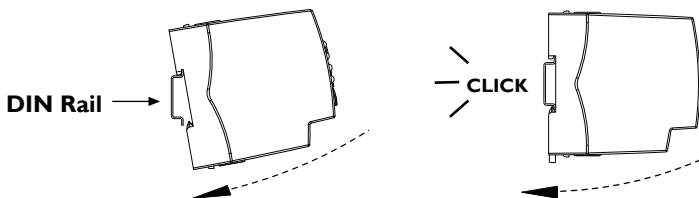
Tripped { 95-96 closed | 97-98 open } Normal { 95-96 open | 97-98 closed }

3 DIN RAIL MOUNTING

CAUTION: product must be installed in an accessible position free from dust, dirt, dampness, and vibration. Allow enough space for air circulation around the enclosure and easy access to all operator controls. Indoor use only.

Instructions for Mechanical Installation

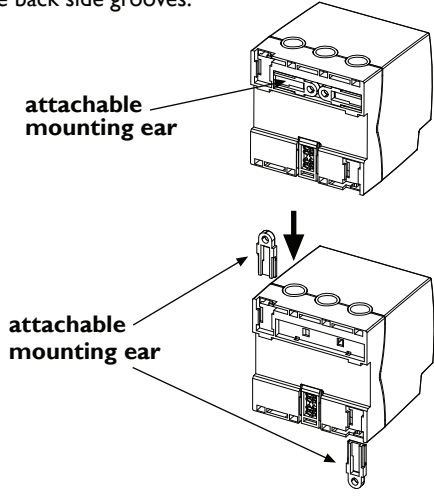
Place product at inclined position with its back side placed toward the upper edge of the DIN Rail and push down relay, as shown in figure until it does **CLICK** on the rail.



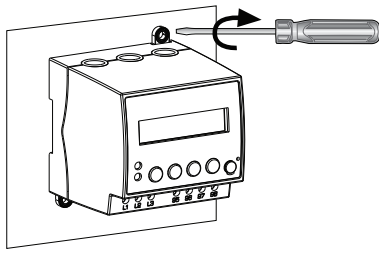
4 FLAT SURFACE MOUNTING

Instructions for Mechanical Installation

a) Take off the two (2) attachable mounting ears located on the back side, insert and slip both attachable mounting ears into the back side grooves.

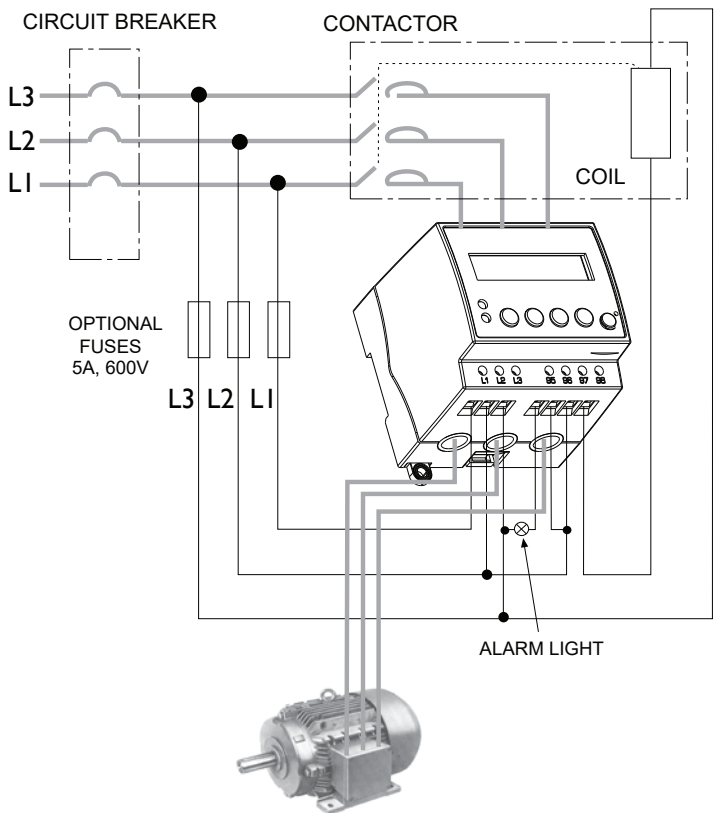
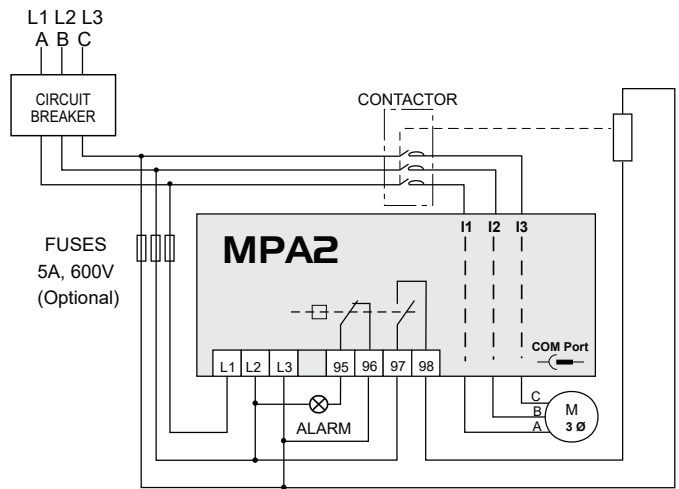


b) Place over flat surface panel and install it using a screwdriver suitable for screws 3/16" x 1/2".

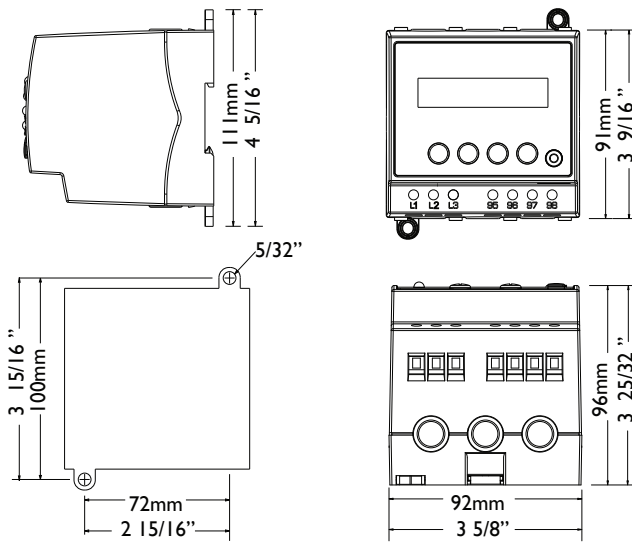


Recommendation for Flat Surface Mounting:
Make two (2) holes (5/32") on panel surface before installing. See as reference the Guide for Flat Surface Mounting shown in point 5 (General Dimensions).

6.2 Basic Diagram Installation



5 GENERAL DIMENSIONS



Guide for Flat Surface Mounting

6 CONNECTION DIAGRAM



WARNING: (Risk of Electric Shock). Disconnect power supply before installing. Electric Shock will result in serious injury or death.



CAUTION: Check that the voltage and current of chosen model corresponds to the line voltage and motor current.

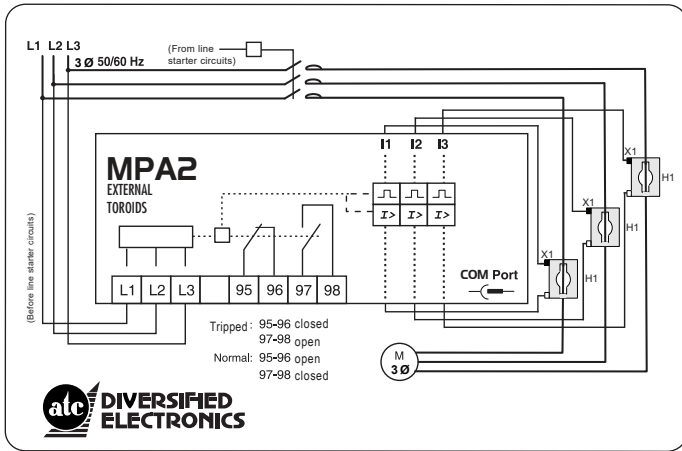
6.1 Terminal designation

TERMINAL	DESCRIPTION
L1	Voltage Input (Phase A)
L2	Voltage Input (Phase B)
L3	Voltage Input (Phase C)
95 } 96 }	Contact for Auxiliary Relay
97 } 98 }	Contact for Trip Relay
95-96 } 97-98 }	Closed / Open } Tripped
95-96 } 97-98 }	Open / Closed } Normal

Recommendations for Wiring:

- Avoid over tightening the M3 screws upon terminals during wiring connection. Tightening Torque: 4.4 lbf-in, 5.1 Kgf - cm.
- Wire Strip Length 1/4" (6-7 mm).
- Terminal wiring size: between AWG 10 and AWG 18.
- Current wiring size: ≤ AWG 4, Ø: 7/16" (11mm).
- Connect L1L2L3 terminal for Voltage Input in parallel connection before line starter circuit through Contactor (as shown in Basic Diagram Installation).
- Use three Current Sensing Holes for passing wires before connection to 3 phases motor. Using less than three (3) wires shall cause current unbalance wrong measures.

6.3 Diagram installation for external toroids



Refer to point 10 for detail explanation.

7 OPERATION

MPA2 constantly monitors current and voltage values. When any harmful condition occurs, the output connection is deactivated until the fault disappears and power line conditions return to an acceptable level. Specific timing such as Start Up Delay and Fault Detection Delay are incorporated to prevent nuisance tripping due to rapid power fluctuations.

Provides LCD Display to indicate the output status (voltage, current, unbalance, frequency and load status). Also provides four (4) push buttons (On/Off, Up, Down and Select) for electrical parameter adjustment such as Voltage, Current, Frequency, Fault Detection Delay and others. Besides these mentioned advantages, a Communication Port with MODBUS RTU protocol is included.

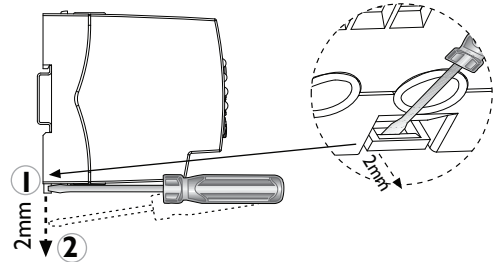
8 DISMOUNTING INSTRUCTIONS



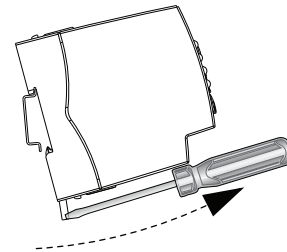
WARNING: Disconnect power supply (Circuit Breaker OFF) and electrical wiring before dismantling. Electrical shock will result in serious injury or death.

8.1 Instructions for Mechanical Dismounting (DIN RAIL)

a) Handling a Flat Screwdriver, pull downward the mounting bracket that you can see at rear and down side as shown in figure.



b) With screwdriver at position (2), pull out from DIN Rail as shown in figure:

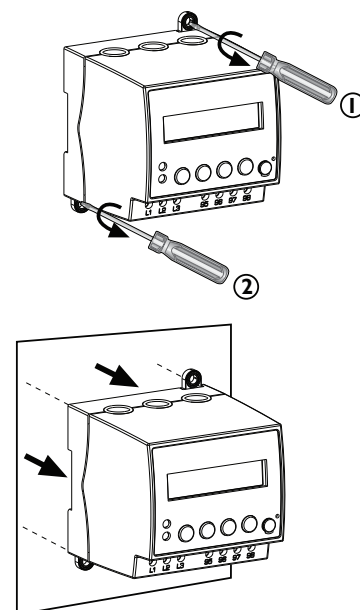


Recommendation for DIN Rail Dismounting:

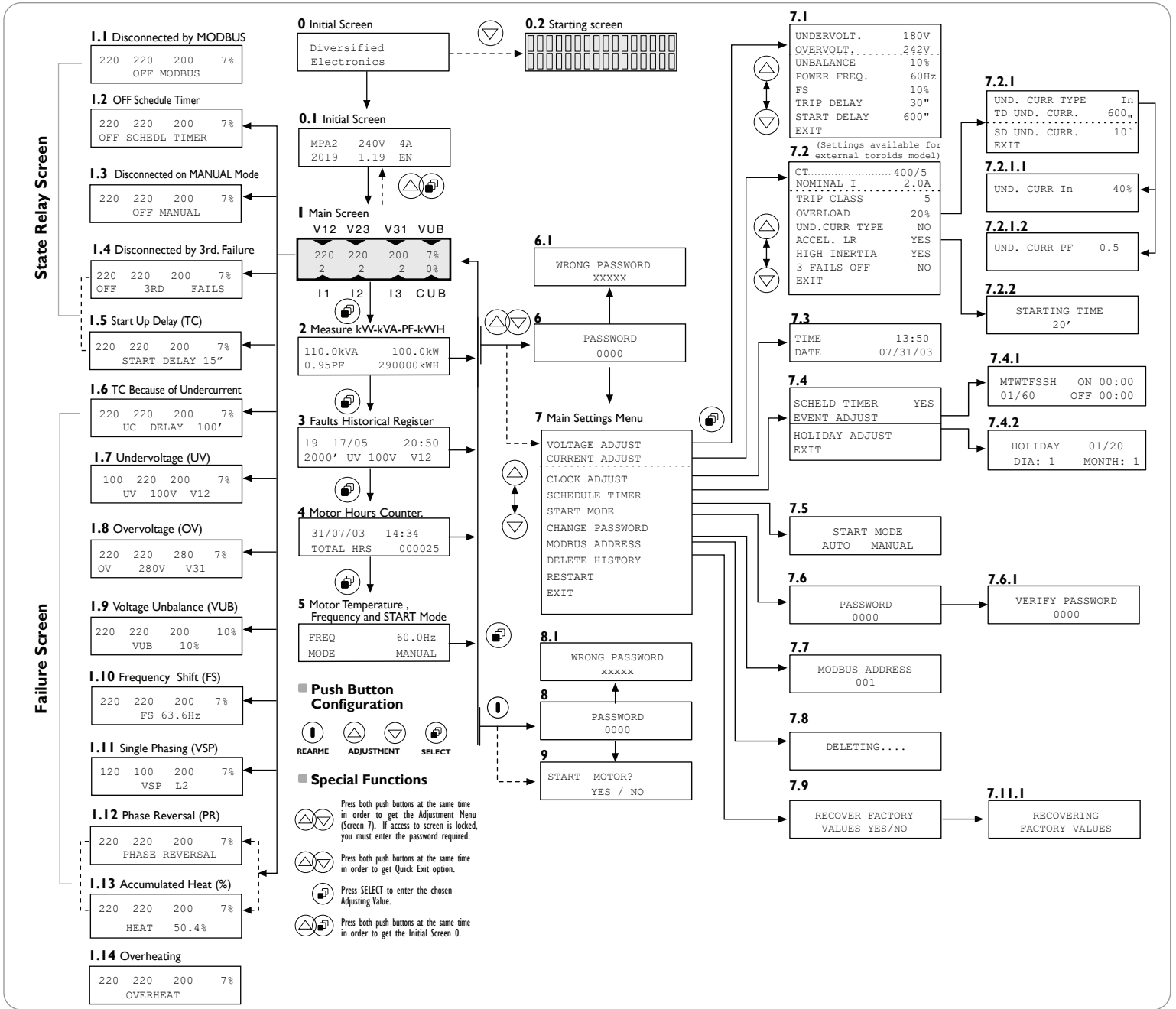
Pull downward 2 mm with a soft movement when using screwdriver for dismounting. Strong movement could break the supporting bracket.

8.2. Instructions for Mechanical Dismounting (FLAT SURFACE)

Unscrew both screws fixed on Flat Surface through attachable mounting ears and then pull out the relay from flat surface as shown in figure.

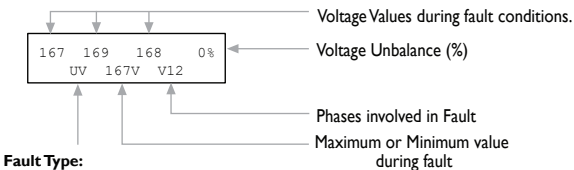


9 SCREEN ADJUSTMENT



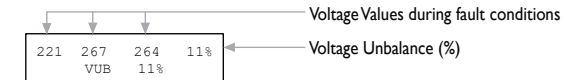
■ Fault Screen Description:

·Undervoltage / Overvoltage (No. 1.7 and No. 1.8)



Fault Type:
UV for Undervoltage
OV for Overvoltage

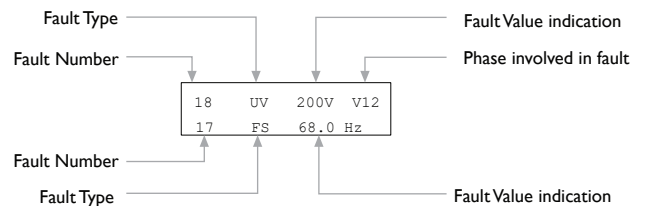
·Voltage, Frequency and Heat (No 1.9 to 1.14)



Fault Type:
VUB for Voltage Unbalance
FS for Frequency Shift
VSP for Voltage Single Phasing
PHASE REVERSAL

Fault Indication:
Phases involved in fault
Unbalance Percent (%)
Centigrade Degree
Measured Value

■ Fault History Screen Description:



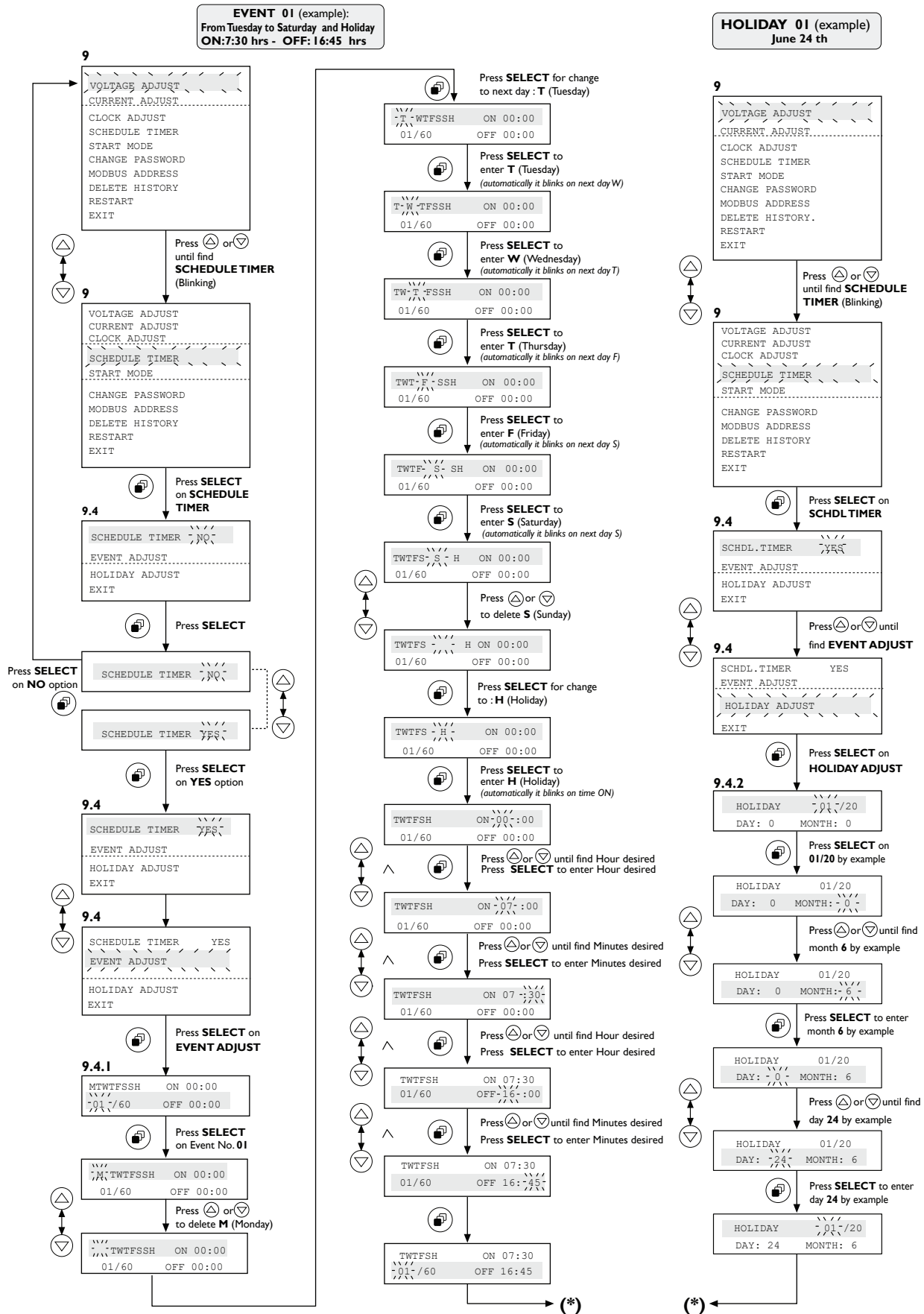
■ ABBREVIATIONS

TEMP. TEMPERATURE
OVERVOLT. OVERVOLTAGE
UNDERVOLT. UNDERVOLTAGE
UND.CURR. UNDERCURRENT
ADJ. ADJUST
HRS HOURS

■ GLOSSARY

OL OVERLOAD
UC UNDERCURRENT
CSP CURRENT SINGLE PHASE
CUB CURRENT UNBALANCE
FS FREQUENCY SHIFT
PR PHASE REVERSAL
VSP VOLTAGE SINGLE PHASE
LR LOCKED ROTOR
VUB VOLTAGE UNBALANCE
UV UNDERVOLTAGE
OV OVERVOLTAGE
V VOLTAGE
I CURRENT
PF POWER FACTOR
TD TRIP DELAY
TC START UP DELAY
TEF TOTAL ENERGY FAULT
SM START MOTOR

9.1 Schedule Timer Adjustment Guide



9.2 Technical specifications

A) Power Supply Circuit

a.1	Rated Voltage, U _e	208/220/240	440/480	VAC
a.2	Voltage Operation Limits, U _e	145 → 312	264 → 672	VAC
a.3	Average Consumption, I _n	45 mA		—
a.4	Rated Frequency, F _N	50/60 Hz		—
a.5	Frequency Operation Limits, F _N	42 → 70 Hz		—
a.6	Rated Duty	Uninterrupted Duty		—

B) Environmental Conditions, Operation Limits and Installing

b.1	Designed according to European Standards	IEC61010-1, IEC60255-6 IEC60947-1	LVD & EMC
b.2	Designed according to US Standards	—	—
b.3	CE Marking	CE (pending), Low Voltage Devices	IEC60947-1
b.4	Ambient Air Temperature (Operation)	-5 °C to 55 °C (23 °F to 131 °F)	—
b.5	Ambient Air Temperature (Storage)	-10 °C to + 70 °C (14 °F to 158 °F)	—
b.6	Maximum Relative Humidity	85% R.H.	—
b.7	Vibrations	Class 1, Amplitude <0.035mm or 1G 10Hz < f < 150Hz	IEC 60255-21-1
b.8	Degree of Protection	IP20, Protected against objects > 12.5mm, but no protection against water	IEC 60529
b.9	Pollution Degree	Degree 3	IEC 60255-5
b.10	Overvoltage Category	Category III	IEC 60255-5
b.11	Rated Insulation Voltage	500V	IEC 60255-5
b.12	Impulse Voltage Test	5 KV	IEC 60255-5
b.13	Impulse Dielectric Test	2.5 KV 50/60 Hz@1min	US Standards
b.14	Flammability Rating of Enclosure	V-0	US Standards
b.15	Enclosure Material	Polymers: PC, ABS, NYLON	—
b.16	Mounting Position	Any Position	—
b.17	Mounting Features	Symmetrical DIN Rail	IEC 715, DIN 43880
		Flat surface mounting, screw 3/16" x1/2"	NEMA Style
b.18	Terminal Screw Type	Flat M3	—
	Tightening Screw Torque	5.1 Kgf x cm (4.4 lb x in)	—
	Terminals Wiring	10-18WG	—
b.19	Current Sensing holes for Motor Wiring	Ø ≤ 11mm AWG 4	—
b.20	Dimensions	92 x 91 x 96 (LxWxH)	—
b.21	Weight	494 (1,09)	g/lb

C) Control Characteristics

c.1	Output Contact Rating	B 300 Pilot Duty 1 A @ 240 VAC/0.5 A @ 480 VAC	US Standards
c.2	Electrical Life Expectancy	100.000 Operations	—
c.3	Mechanical Life Expectancy	10.000.000 Operations	—
c.4	Utilization Category	AC-15, Capacity for loads > 72 VA	IEC60947-5-1

D) Range Setting, Measuring

(According to Voltage Model)		240		480		VAC
d.1	Voltage Measurement Range, U _m	0 → 312		0 → 672		VAC ± 2% accuracy
(According to Current Model)		04	12	32	80	EXT (CT/5)
d.2	Current Measurement Range, I _m	1.5 → 40	0.3 → 125	1 → 320	2.5 → 800	5% → 333% CT A, ± 2% accuracy

Other measured parameters			
d.3	Frequency Range	45.0 → 70.0 Hz	1%
d.4	Instantaneous Power Factor	0.00 → 1.00	8%
d.5	Instantaneous Reactive Power KVA	0.0 → 999.9 KVA	4%
d.6	Instantaneous Real Power KW	0.0 → 999.9 KW	4%
d.7	Energy KWH	0 → 999999 KW/H	4%
d.8	Total Motor Running Time (hours)	0 → 999999 H	1%

E) Algorithms and Protection Functions

(According to Operation Voltage)		240	480	VAC			
e.1	Undervoltage (UV) @ I _{motor} =0 or OL	165 → 225	350 → 460	Level settings			
e.2	Overvoltage (OV) @ I _{motor} =0 or OL	215 → 270	460 → 580	Level settings			
e.3	Voltage Hysteresis Threshold	6	12	VAC			
e.4	Voltage Unbalance Detection (VUB)	2% → 10%		Level settings			
e.5	Single Phasing (VSP)	IN VUB > 33%, OUT VUB < 28%		—			
e.6	Rated Frequency	50 or 60 Hz		Level settings			
e.7	Tolerance for Frequency Shift (FS)	2% → 10%		Level settings			
e.8	Phase Reversal (PR)	Normal Phase Sequence A>B>C, Reversed Phase Sequence C>B>A		—			
e.9	Trip Delay because of Phase Reversal (PR)	< 1 s		—			
e.10	Trip Delay because of Another Voltage Failures (TD)	1 → 30 s		Level settings			
e.11	Start Up Delay (TC)	0 → 600 s		Level settings			
e.12	Trip Delay because of VSP	3 s		—			
e.13	Start Mode	Auto/Manual		User selection			
e.14	Minimum Time Between Two Start Up	50 x Thermal Class		s			
(According to Operation Current)		04	12.5	32	80	EXT (CT/5)	—
e.15	Nominal Current Setting	1.5 → 4	3.5 → 12.5	10 → 32	25 → 80	25% → 66% CT	A
e.16	Overload Level Setting (OL)	5% → 50%				Inom. Level settings	
e.17	Thermal Class Setting	5 → 35				Level settings	
e.18	Dynamic Setting of Motor Model (Cold Curve/Hot Curve)	Thermal class varies from 1 → 1/3 of adjusted class according to start up time and motor load level				IEC 60255-8	
e.19	Maximum Time Between Cold/Hot Curve	2 Hours (from 1 to 1/3 or from 1/3 to 1)				IEC 60255-8-1990	
e.20	Trip Delay because of Overload	According to Overload level and Adjusted Class				IEEE Std. C37.112-1996	
e.21	Heat Threshold because of Overload Failure	100%				—	
e.22	Current Unbalance (CUB)	CUB > 48%				—	
e.23	Current Stall Phase (CSP)	CUB > 60%				—	
e.24	Accelerated Locked Rotor Detection (LR)	YES/NO				User selection Heat setting to 100%	
e.25	Trip delay because of CSP	1				s	
e.26	Trip Delay because of CUB	2				s	
e.27	High-Inertia Load Option	YES/NO				User selection.	
e.28	High-Inertia Load Heat Threshold	400%				—	
e.29	High-Inertia Load Start up Delay	20 → 120				s. Level settings	
e.30	Thermal Machine Cooling Time	50 x Thermal Class				s	
e.31	Undercurrent	YES/NO				—	
e.32	Undercurrent Disconnection Type (UC)	% Inom / Power Factor (PF)				—	
e.33	Undercurrent Adjusting (% Inom)	30% → 90%				Inom. Level settings	
e.34	Undercurrent Adjusting (PF)	0.3 → 0.9				Level settings	
e.35	Trip Delay because of UC	5 → 600				s. Level settings	
e.36	Start Up Delay because of UC	2 → 500				Min. Level settings	
e.37	Third Failure Detection	YES/NO				Level settings	
e.38	Permanent disconnection because of Third Failure	3 Current failures in less than 105 min				IEEE Std C37.112-1996	
e.39	Trip delay because of accelerated locked rotor	3				s	

Events control characteristics			
	Real Time Clock	hh:mm mm/dd/yy	UMT
e.39	Load Control by Events (schedule)	YES/NO	User selection
e.41	Schedule Timer (events)	60	User selection
e.42	Schedule Timer (holidays)	20	User selection

G) Immunity and Emissions, Electromagnetic Interference (EMC) for Heavy Industrial Environment (B)

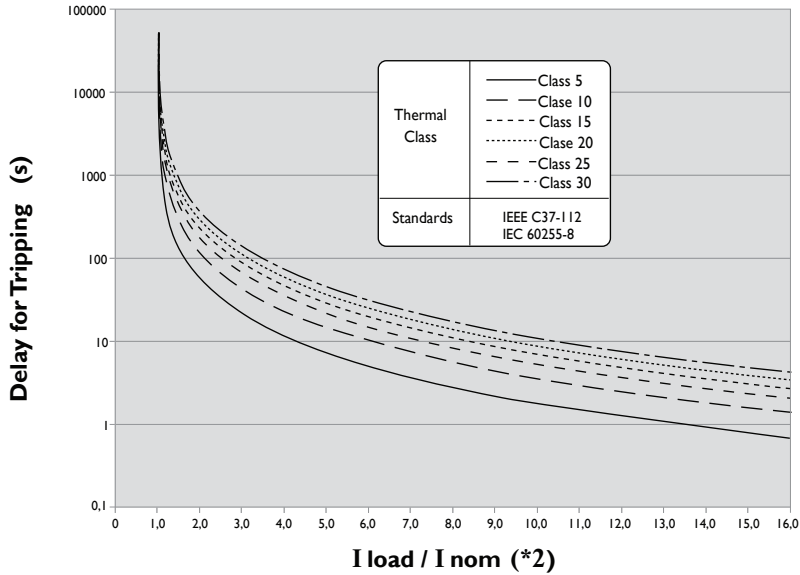
g.1	Electrostatic Discharge	IEC 61000-4-2
g.2	Immunity to Ratio Frequency Test	IEC 61000-4-3
g.3	Electrical Fast Transients	IEC 61000-4-4
g.4	Surge Immunity Test	IEC 61000-4-5
g.5	Ratio-Frequency Continuous Conducted	IEC 61000-4-6
g.6	Power Frequency Magnetic Field	IEC 61000-4-8
g.7	Voltage Dips, Short Interruptions and Voltage Variations	IEC 61000-4-11
g.8	Harmonics and Interharmonics Immunity Tests	IEC 61000-4-13
g.9	Voltage Fluctuation Immunity	IEC 61000-4-14
g.10	Unbalance Immunity Test	IEC 61000-4-27
g.11	Variation of Power Frequency	IEC 61000-4-28

F) Communications and Other Special Functions

f.1	Communication Protocol	MODBUS RTU @ 9600 8N1	See User Manual
f.2	Communication Ports	Port COM PORT (*)	See User Manual
f.3	Address Range	1 →127	—
f.4	History Buffer Memory	20 last faults report (failure type, value, date, hour and time elapsed)	See User Manual
f.5	Parameters Block	0000 Free, 0001 → 9999 Blocked	User selection

(*) Requires a separately sold adapter model COMPlug to convert the COMPort into RS485 modbus port.

Tripping Cold Curve (*1)



(*1) Hot Curve = Cold Curve / 3

(*2) I nom = Current value adjusted previously by the user

HOW TO ORDER ACCORDING TO CUSTOMER NEEDS

MPA2

VOLTAGE

240 – 208/220/240V~
480 – 440/480V~

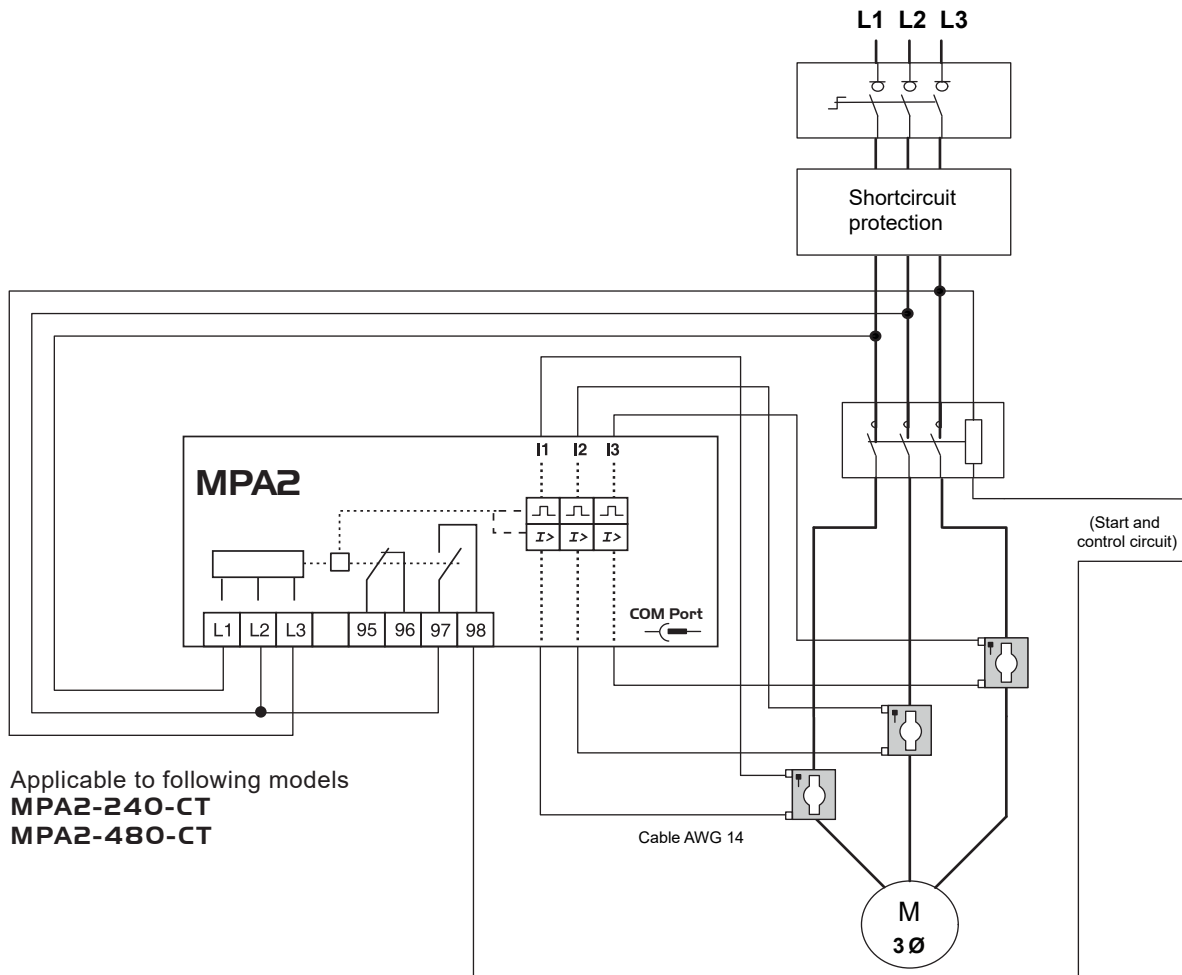
AMPERAGE

4 - 1-4 A
12.5 - 3.5-12.5 A
32 - 10-32 A
80 - 25-80 A
CT - CT EXTERNAL *

* Review notes on page 8.

NOTES: Technical data is valid at the time of printing. We reserve the right to subsequent alterations.

10 External toroids connection diagram



* NOTES:

- 1) Model identified as MPA2-240-CT and MPA2-480-CT is exclusively used with external CTs. This model protects motors with rated current up to 660 A. The CTs are not included.
- 2) User must specify motor rated current. With this data select a Nominal current range accordingly to adjacent table, getting then /5 relationship required external CTs to install.
- 3) Then user must program with external CT adding the adjustment instructions contained in this application.
- 4) Calibration is kept guaranteed as long as external CTs are Commercial Class I Secondary 5A.

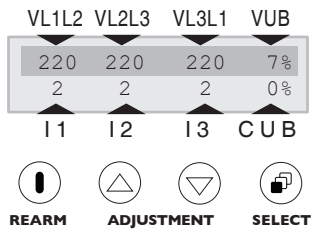
Suggested external CTs according to nominal current

Nominal current range		Toroid
Min	Max	Ratio /5
13	17	50
15	20	60
19	25	75
25	33	100
31	42	125
38	50	150
50	67	200
63	83	250
75	100	300
100	133	400
125	167	500
150	200	600
190	250	750
200	260	800
250	330	1000
300	350A	400 → 1200
375	500	1500
500	660	2000

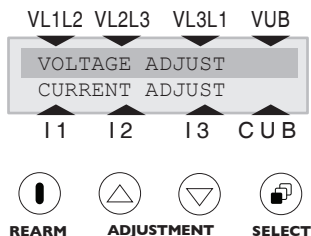
Example: if a motor consume a nominal current of 350 amperes, the external toroids to select will be a value of 1200/5.

II Adjusting external CTs and Nominal current

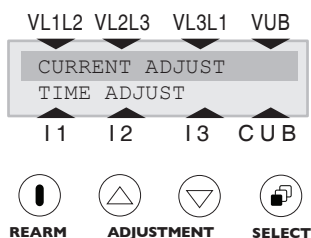
Press both **ADJUSTMENT** pushbuttons from main screen



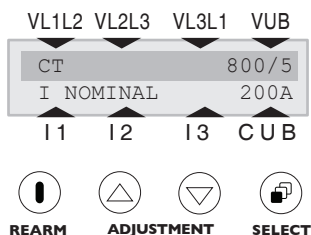
Press one **ADJUSTMENT** pushbutton to get to **CURRENT ADJUST**



On **CURRENT ADJUST** press **SELECT** pushbutton

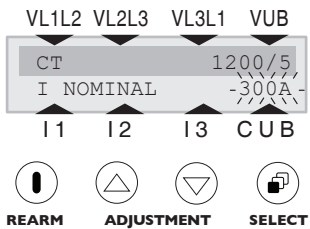
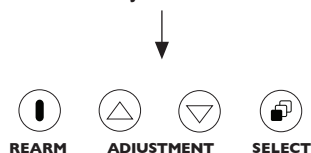
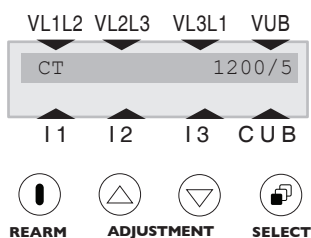


On **CT** press **SELECT** pushbutton



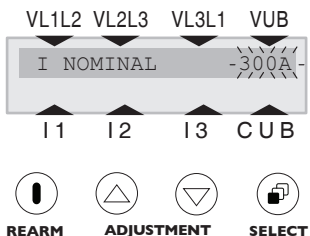
On **CT** press one **ADJUSTMENT** pushbutton to get to desired ratio (see **Suggested external CTs according to nominal current table**).

Eg.: For motor with nominal current FLA = 350A, change ratio to 1200/5 then press pushbutton **SELECT**.



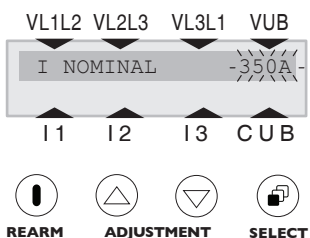
Press both **ADJUSTMENT** pushbuttons to get to **I NOMINAL**.

On **I NOMINAL** press **SELECT**

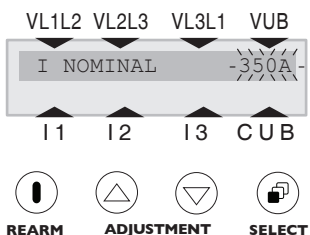


Press one **ADJUSTMENT** pushbutton to get to desired value..

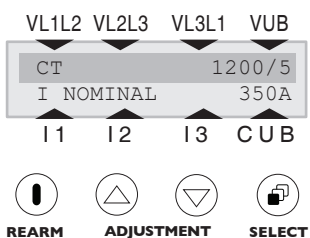
e.g. change 300 to 350A



Adjust desired value pressing pushbutton **SELECT**



Back to **CURRENT MENU**



Follow with other current adjustments or back to main menu

MPA2

MODBUS REGISTER MAPPING

GROUP	REGISTER ADDRESS	NAME	READ/ WRITE	MIN	MAX	SIZE	UNITS	DESCRIPTION / FORMAT	FACTORY SETTING	
PRODUCT ID	0000	PRODUCT ID	R	12	12			F0	13	
	00001	MODEL	R	162	252	1				
	00002	VERSION	R	0	255	1		F2		
	00003	MODBUS_ADDRESS	R/W	1	127	1		F3	1	
	00004	RESTORE SYSTEM	R/W	0	1	1		F7		
SECURITY	00005	ACCESS PASSWORD	R/W	0	65535	1		F4	0	
	00006	SERIAL_L	R	0	65535	1				
CALIBRATION	00008	WARNING: THESE REGISTERS SHOULD NOT BE MODIFIED BY THE USER								
	00010									
	00012									
	00014									
	00016									
	00018									
	00020									
	00032	ADDRESSES ARE RESERVED.								
ADJUSTMENTS	00033	(UV) UNDER VOLTAGE SETTING	R/W	350	460	1	VAC	F35	432	
	00034	(OV) OVER VOLTAGE SETTING	R/W	469	580	1	VAC	F20	560	
	00035	(VUB) VOLTAGE UNBALANCE SETTING	R/W	2	10	1	%	F7	6	
	00036	(AC) POWER FREQUENCY SETTING	R/W	0	1	1		F42	1	
	00037	(FS) FREQUENCY SHIFT SETTING	R/W	2	10	1	%	F7	2	
	00038	(TD) TRIP DELAY SETTING	R/W	1	30	1	Sec	F7	10	
	00039	(TC) STAR UP DELAY SETTING	R/W	0	600	1	Sec	F7	60	
	00040	ADDRESSES ARE RESERVD.								
	00064	ADDRESSES ARE RESERVD.								
		00065	(FLA) NOMINAL CURRENT SETTING	R/W	15	180	1	AMP	F39	
		00066	MOTOR THERMAL CLASS SETTING	R/W	5	30				
		00067	(OL) OVERLOAD LEVEL SETTING	R/W	5	50				
		00068	UNDERCURRENT DETECTION	R/W	0	1				
		00069	HIGH-INERTIA LOAD DETECTION	R/W	0	1				
	00070	(LR) ACCEL. LOCKED ROTOR DETECTION	R/W	0	1					
	00071	(3F) THIRTD FAILURE DETECTION	R/W	0	1					
	00072	ADDRESSES ARE RESERVD.								
PRODUCT ID	00073	UNDERCURRENT TYPE SETTING	R/W	0	1	1		F52	0	
	00074	TRIP DELAY BECAUSE OF UC	R/W	5	600	1	Sec	F7	50	
	00075	START UP DELAY AFTER UC	R/W	2	500	1	Min	F7	5	
	00076	ADDRESSES ARE RESERVED.								
		00077	(PF) UNDERCURRENT PF	R/W	3	9	1	PF/10	F7	5
	00078	(IN) UNDERCURRENT IN	R/W	30	90	1	%	F7	80	
	00079	TRIP DELAY BECAUSE OF LOCKED ROTOR	R/W	20	120	1	Sec	F7	20	
CLOCK	00128	MINUTE	R/W	0	59	1	Min	F7		
	00129	HOUR	R/W	0	23	1	Hours	F7		
	00130	DAY WEEK	R	1	7	1		F41		
	00131	DAY	R/W	1	31	1	Day	F7		
	00132	MONTH	R/W	1	12	1	Month	F7		
	00133	YEAR	R/W	0	45	1	Year	F7		
STATUS	00160	FAULT	R	0				F18		
	00161	(TC) STAR UP DELAY	R	0	30000	1	Sec	F7		
	00162	RELAY	R	0	1	1		F7		
	00163	START MODE	R/W	0	1	1		F19	0	
	00164	CONTROL_ON_OFF	R/W	0	6	1		F10		
	00165	TOTAL NUMBER OF STARTS	R/W	0	65535	1		F7	1	
	00166	NUMBER OF STARTS MANUAL	R/W	0	65535	1		F42		
MEASUREMENT	00192	FREQUENCY	R	400	700	1	Hz 10	F7		
	00193	PERIOD	R	14280	25000	1	uSec	F7		
	00194	VL1L2	R	0		1	VAC	F7		
	00195	VL2L3	R	0		1	VAC			
	00196	VL3L1	R	0		1	VAC			
	00197	V AVERAGE	R	0		1	VAC	F7		
	00198	IA	R	0		1	AMP/100	F7		
	00199	IB	R	0		1	AMP/100	F7		
	00200	IC	R	0		1	AMP/100	F7		
	00201	I AVERAGE	R	0		1	AMP/100	F7		
	00202	(PF) POWER FACTOR	R	0	100	1	FP/100	F7		
00203	TEMPERATURE CAPACITY	R	0	65535	1	%	F7			
	00204	REAL POWER (kW)	R	0	9999	1		F45	0	
	00205	REACTIVE POWER (kVA)	R	0	9999	1		F45	0	

MPA2

MODBUS REGISTER MAPPING

GROUP	REGISTER ADDRESS	NAME	READ/ WRITE	MIN	MAX	SIZE	UNITS	DESCRIPTION / FORMAT	FACTORY SETTING
MEASUREMENTS	00206	TOTAL_ENERGY_L	R	0	99999999	1	10xW/H	F8	0
	00208	TOTAL_HOURS_L	R	0	59999940	1	Min	F8	0
	00210	THERMAL_CAPACITY_L	R			1		F5	
	00213	DYNAMIC_CLASS	R	6	20	1		F7	
PRODUCT ADJUSTMENT	01536	TIME_CONTROL	R/W	0	1	1		F7	0
	1537-2017	EVENT 01/60 - 60/60	R/W	0				F48	
	3072-3152	HOLIDAY 01/20 - 20/20	R/W	0				F49	
HYSTORICAL	04096	NUMBER_TOTAL_FAILS	R/W	0	20	1		F7	0
	04097	POINTER_FAILS	R	0	19	1		F7	
	4098-4418	FAILS 01/20 - 20/20	R	0				F50	

MPA2

DATA FORMAT

CODE	TYPE	DESCRIPTION
F0	8 bits	PRODUCT ID
	13	MPA2
F2	8 bits	SOFTWARE VERSION
	bits 4...0	Software Version - Minor Number(0 a 31)
	bits 7...5	Software Version - Major Number (0 a 7)
		<i>VERSION= 0x20 0x04 = 0x24</i>
F3	16 bits	MODBUS ADDRESS
	byte 0	Address (1 a 127)
	byte 1	null. not used
F4	16 bits	Unsigned int - WRITE PROTECTION INDICATOR
		Adjustmets Calibration
	0x0000	Unprotected Protected
	0x0001	Protected Protected
	0xFFFF	Protected Unprotected
	0x0002 a 0xFFFE	Encrypted Password Code - Adjustments and Calibration Protected
F5	32 bits	Float 24 bits
	0xNNNNNN00	Float 24 bits
		<i>Example: Value1 = 1,023 = 0x003F82F1</i>
F7	16 bits	Unsigned int
F8	32 bits	Unsigned Long
F10	16 bits	ADJUSTMENT - CONTROL ON/OFF
		MPA2
	0	ON
	1	OFF - FAILURE MODE
	2	OFF - TRIP DELAY BECAUSE OF VOLTAGE FAILURES
	3	OFF - MODBUS
	4	OFF - MANUAL MODE
	5	OFF - 3RD FAILURE
	6	OFF - SCHEDULER TIMER
	7	OFF - TRIP DELAY BECAUSE OF CURRENT FAILURES
8	OFF - TRIP DELAY BECAUSE OF (UC)	
F18	16 bits	FAULT REGISTER
	0	No Fail
	bit 0	Fail - FS - Frequency Shift
	bit 1	Fail - PR - Phase Reversal
	bit 2	Fail - VSP - Voltage Single Unbalance
	bit 3	Fail - VUB - Voltage Unbalance
	bit 4	Fail - UV - Undervoltage
	bit 5	Fail - OV - Overvoltage
	bit 6	Fail - RL - Locked Rotor
	bit 7	Fail - PF - Power Factor
	bit 8	Fail - CUB - Current Unbalance
	bit 9	Fail - UC - Undercurrent
bit 10	Fail - OL - Overload	
bit 11	Fail - CSP - Current Single Phase	

**MPA2
DATA FORMAT**

CODE	TYPE	DESCRIPTION
F19	1 bits	START MODE
	0	MANUAL
	1	AUTO
F35	16 bits	Unsigned int - UNDER VOLTAGE SETTING - UV
	Valor	Factory Setting = 187V - Min = 165V - Max = 225V @ model = 240 - 208/220/240V
		Factory Setting = 432V - Min = 350V - Max = 460V @ model = 480 - 440/480V
F36	16 bits	Unsigned int - OVER VOLTAGE SETTING - OV
	Valor	Factory Setting = 229V - Min = 215V - Max = 276V @ model = 240V - 208/220/240V
		Factory Setting = 528V - Min = 460V - Max = 580V @ model = 480V - 440/480V
F39	16 bits	Unsigned int - NOMINAL CURRENT SETTING
	Valor	Factory Setting = 2A - Min = 1,5A - Max = 4A @ model = 4A
		Factory Setting = 4,5A - Min = 3,5A - Max = 12,5A @ model = 12,5A
		Factory Setting = 20A - Min = 25A - Max = 80A @ model = 32A
		Factory Setting = 40A - Min = 10A - Max = 32A @ model = 80A
		Factory Setting = 31A - Min = 31A - Max = 42A - Model CT = 125/5 @ model = CTs EXT
F41	16 bits	DAY OF THE WEEK
	1	MONDAY
	2	TUESDAY
	3	WEDNESDAY
	4	THURSDAY
	5	FRIDAY
	6	SATURDAY
	7	SUNDAY
F45	16 bits	Unsigned int - VALUE OF REAL POWER (kW) AND REACTIVE POWER (kVA)
	Value	Real Power W = Value * 10W @ model = 4A,12,5A, 32A, 80A
		Real Power W = Value * 100W @ model = CTs EXT
		Reactive Power VA = Value * 10VA @ model = 4A,12,5A, 32A, 80A
		Reactive Power VA = Value * 100VA @ model = CTs EXT
F48	16 bits	EVENT - Indicate how "Events" are stored
		<i>Note: Each "event" configuration occupies 8 registers in modbus</i>
		Weekday
		Bit 0 - MONDAY
		Bit 1 - TUESDAY
		Bit 2 - WEDNESDAY
		Bit 3 - THURSDAY
		Bit 4 - FRIDAY
		Bit 5 - SATURDAY
		Bit 6 - SUNDAY
		Bit 7 - HOLIDAY
	Unsigned Int 0	
	Unsigned Int 1	ON Hour - 0 to 23 - Hour to start the event
	Unsigned Int 2	ON Minute - 0 to 59 - Minute to start the event
	Unsigned Int 3	OFF Hour - 0 to 23 - Hour to stop the event
	Unsigned Int 4	OFF Minute - 0 to 59 - Minute to stop the event
F49	16 bits	HOLIDAY - Indicate how "Holiday" are stored
		<i>Note: Each "event" configuration occupies 8 registers in modbus</i>
	Unsigned Int 0	Month
	Unsigned Int 1	Day
F50	16 bits	Setting YES / NO
	0	NO
	1	YES



8019 Ohio River Blvd Newell, WV 26050
 Phone: 304-387-1200 / 800-727-5646
 Fax: 304-387-1212
 www.ATCDiversified.com
 www.marshbellofram.com