Motor Protection Analyzer

FEATURES

MEASUREMENT OF:

- Current
- Voltage
- Frequency
- Power Factor (PF)
- Reactive Power (KVA)
- Real Power (KW)
- Energy Consumption (KWH)

REPORTS:

- Voltage & Current report
- PF, KVA, KWH, KW report
- Adjusted Values report
- Total Motor Running Time report
- Start Mode report
- 20 Last Fault report
- Power Frequency report
- Motor Temperature report

COMMUNICATIONS:

- COM-LINK RS485@ 9600 baud output available (MODBUS RTU protocol)

PHYSICAL FEATURES:

- Din-Rail, Flat Surface or Flush mounting
- 16x2 LCD Display with current values, voltage values, and load report information on screen
- Four (4) push buttons for operation and protection parameter adjustments (I for START, 2 for ADJUST and I for SELECT)
- Enclosure material UL94V0

ADJUSTMENTS OF:

- Overload
- Undercurrent
- Overvoltage
- Undervoltage
- Current Unbalance
- Voltage Unbalance
- Frequency
- Trip Delay
- Start Up Delay after Voltage
- Fault Recovery
- Motor Thermal Class
- Clock Adjustment
- Control of Motor High-Inertia Load
- Schedule Timer
- AUTO / MANUAL Restart Mode
- Password

PROTECTION AGAINST:

- Overload / Undercurrent
- Overvoltage / Undervoltage
- Frequency Shift
- Voltage Unbalance
- Current Unbalance
- Single Phasing
- Phase Reversal
- Locked Rotor

OTHERS:

- Thermal memory

OVERVIEW

MPA2 is a micro-controlled based three-phase Motor Protection Analyzer Relay specifically designed to protect electric loads and motors from failure and damage due to common current and voltage faults.

MPA2 constantly supervises current and voltage values. When any harmful condition occurs, the output connection is deactivated until the fault disappears, power line conditions return to an acceptable level and the motor has been totally cooled. Specific timing such as Start Up Delay (TC) and Trip Delay (TD) are incorporated to prevent nuisance tripping due to rapid power fluctuations.

MPA2 provides LCD Display to indicate the output status voltage, current, unbalance, frequency and load status and failure conditions. It also provides four (4) push buttons (1 for START, 2 for ADJUST and 1 for SELECT) for operation and protection parameters adjustment. Besides these mentioned advantages, a Communication Port with MODBUS RTU protocol is included with MPA2.

An innovative mechanical design allows two (2) placement options:

- Symmetrical Din-Rail mounting.
- Flat Surface mounting, using an exclusive attachable mounting ear.

MPA2 has been developed using the most advanced technology and designed in accordance with the IEEE, IEC and NEMA protection standards and developed in compliance with IEC electromagnetic compatibility standards, working safely under the hardest electrical environments.

When you use a MPA2 Motor Protection Analyzer, you are working with the best solution to protect your most important investments.
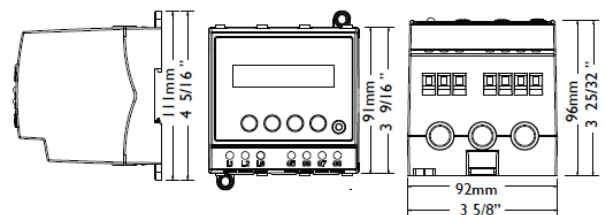
PRODUCT STANDARDS

Designed according to Ce Standards (LVD and EMC):		Designed according to:
IEC	61010-1	UL 60947-4-1
IEC	60255-6	IEEE C37.112
IEC	60255-8	
IEC	60947-1	

DIMENSIONS (INCHES/MILLIMETERS)

FUNCTIONS & RANGE OF APPLICATIONS

The MPA2 provides electrical protection through general functions and setting ranges for intended use listed as follows:

VOLTAGE DETECTION	Overvoltage: 5% up to 20% rated voltage
	Undervoltage: -20% up to -5% rated voltage
	Unbalance: 2% up to 10% rated voltage
	Single Phasing: (IN 33% - OUT 28%)
RECOVERY & DETECTION TIME	Start Up Delay after Voltage fault: 0 to 600 sec
	Voltage Fault detection time: 1 to 30 sec
	Phase Reversal detection time: <1 sec
FREQUENCY DETECTION	Frequency Shift: +/-2% up to +/-10% rated frequency
CURRENT DETECTION	Overcurrent: 5% up to 25%
	Undercurrent: Adjustable by PF or by I nominal
	Unbalance: CUB > 48 %
	Single Phasing: CUB > 60 %
POWER FACTOR DETECTION	Power Factor: 0.0 up to 1.0
THERMAL CLASS IEC 60255-8	Thermal Class: 5 to 30 (in step of one by one)

MODEL NUMBER

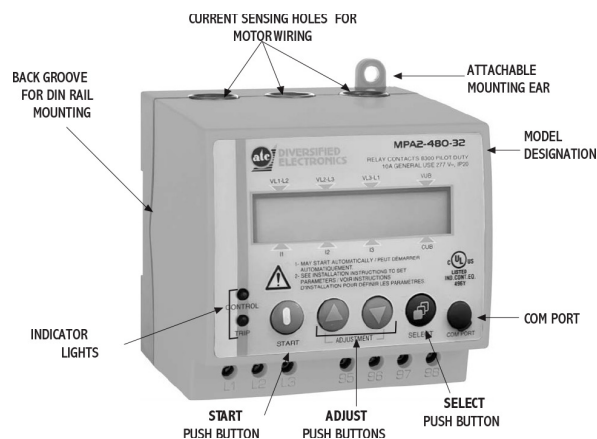| MODEL NUMBER	MPA2		
VOLTAGE			
208/220/240 V~		240	
440/480 V~		480	
AMPERAGE			
1-4 A			04
3.5-12.5 A			12
10-32 A			32
25-80 A			80
External Current Transformer			CT

ACCESSORIES

Standard RS485 Communications Cable	MPA2-COM
Current Transformer 30/5 amp	CT30/5
Current Transformer 50/5 amp	CT50/5
Current Transformer 100/5 amp	CT100/5
Current Transformer 200/5 amp	CT200/5
Current Transformer 500/5 amp	CT500/5
Current Transformer 1000/5 amp	CT1000/5

STANDARD STOCK

MPA2-240-CT

MPA2-480-32

MPA2-480-80

MPA2-480-CT

MPA2-COM

PHYSICAL FEATURES

CURRENT SENSING HOLES FOR MOTOR WIRING

BACK GROOVE FOR DIN RAIL MOUNTING

ATTACHABLE MOUNTING EAR

MODEL DESIGNATION

COM PORT

INDICATOR LIGHTS

START PUSH BUTTON

ADJUST PUSH BUTTONS

SELECT PUSH BUTTON

SAFETY INFORMATION

ATTENTION:

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

CONSIDERATION REGARDING EMC

NOTICE:

This product has been designed for industrial environments. Use of this product in residential enviroments may cause unwanted electromagnetic disturbances in which case the user may be required to take adequate mitigation measures. Failure to comply may result in equipment damage and/or personal injury.

➤ CONNECTION DIAGRAM

STANDARD CURRENT MODELS:
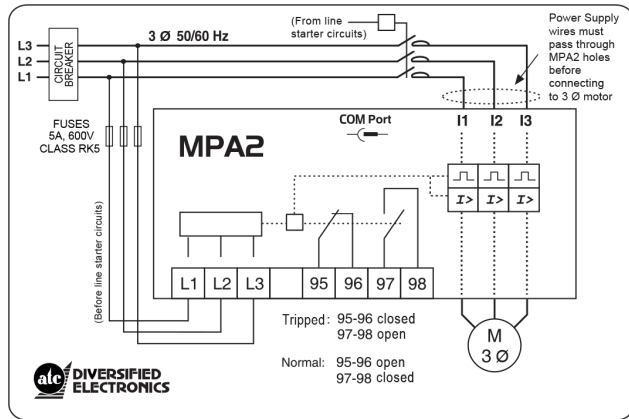
EXTERNAL CURRENT TRANSFORMERS (CTs):
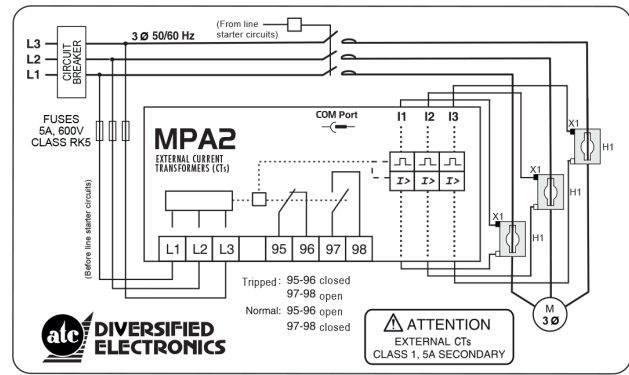
➤ SPECIFICATIONS

POWER SUPPLY CIRCUIT

Rated Voltage, Ue	208/220/240	440/480	VAC
Voltage Operation Limits, Ue	145 → 312	264 → 672	VAC
Average Consumption, In	45 mA		——
Rated Frequency, F_N	50/60 Hz		——
Frequency Operation Limits, F_N	42 → 70Hz		——
Rated Duty	Uninterrupted Duty		——

CONTROL CHARACTERISTICS

Output Contact Rating	B 300 Pilot Duty 1 A@240 VAC/0,5 A@480 VAC	US Standards
Electrical Life Expectancy	100,000 Operations	
Mechanical Life Expectancy	10,000.000 Operations	
Utilization Category	AC-15, Capacity for loads> 72 VA	IEC60947-5-1

RANGE SETTING, MEASURING

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

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

ENVIRONMENTAL CONDITIONS, OPERATION LIMITS, & INSTALLING

Designed according to European Standards	IEC61010-1, IEC60255-6 IEC60947-1	LVD & EMC
Designed according to US Standards	NKCR Auxiliary Devices	UL-60947-4-1
CE Marking	CE (pending), Low Voltage Devices	IEC60947-1
Ambient Air Temperature (Operation)	-5 °C to 55 °C (23 °F to 131 °F)	——
Ambient Air Temperature (Storage)	-10 °C to + 70 °C (14 °F to 158 °F)	——
Maximum Relative Humidity	85% R.H.	——
Vibrations	Class 1, Amplitude <0.035mm or 1G 10Hz < f < 150Hz	IEC 60255-21-1
Degree of Protection	IP20, Protected against objects > 12.5mm, but no protection against water	IEC 60529
Pollution Degree	Degree 3	IEC 60255-5
Overvoltage Category	Category III	IEC 60255-5
Rated Insulation Voltage	500V	IEC 60255-5
Impulse Voltage Test	5 KV	IEC 60255-5
Impulse Dielectric Test	2.5 KV 50/60 Hz@1min	US Standards
Flammability Rating of Enclosure	V-0	US Standards
Enclosure Material	Polymers: PC, ABS, NYLON	——
Mounting Position	Any Position	——
Mounting Features	Symmetrical DIN Rail	IEC 715, DIN 43880
	Flat surface mounting, screw 3/16" x1/2"	NEMA Style
Terminal Screw Type	Flat M3	——
Tightening Screw Torque	5.1 Kgf x cm (4.4 lb x in)	——
Terminals Wiring	10-18WG	——
Current Sensing holes for Motor Wiring	AWG 4 (Ø≤11mm)	——
Dimensions	92 x 91 x 96 (LxWxH)	——
Weight	494 (1.09)	g/lb

⬛➤ SPECIFICATIONS (CONT.)

ALGORITHMS & PROTECTION FUNCTIONS

(According to Operation Voltage)	240	480	VAC
Undervoltage (UV)@Imotor= 0 or OL	165 →225	350 →460	Level settings
Overvoltage (OV) @ Imotor=0 or OL	215 →270	460 →580	Level settings
Voltage Hysteresis Threshold	6	12	VAC
Voltage Unbalance Detection (VUB)	2% →10%		Level settings
Single Phasing (VSP)	IN VUB > 33%, OUT VUB < 28%		——
Rated Frequency	50 or 60 Hz		Level settings
Tolerance for Frequency Shift (FS)	2% →10%		Level settings
Phase Reversal (PR)	Normal Phase Sequence A>B>C , Reversed Phase Sequence C>B>A		——
Trip Delay because of Phase Reversal (PR)	< 1 s		——
Trip Delay because of Another Voltage Failure (TD)	1 → 30 s		Level settings
Start Up Delay (TC)	0 → 600 s		Level settings
Trip Delay because of VSP	3 s		——
Start Mode	Auto/Manual		User selection
Minimum Time Between Two Start Up	50 x Thermal Class		s

(According to Operation Current)	04	12	32	80	EXT (CT/5)	——
Nominal Current Setting	1.5 →4	3.5 →12.5	10→32	25 →80	25%→ 66% CT	A
Overload Level Setting (OL)	5% →25%					Inom. Level settings
Thermal Class Setting	5 →30					Level settings
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
Max Time Between Cold/Hot Curve	2 Hours (from 1 to 1/3 or from 1/3 to 1)					IEC 60255-8-1990
Trip Delay because of Overload	According to Overload level and Adjusted Class					IEEE Std. C37.112-1996
Heat Threshold b/c of Overload Failure	100%					——
Current Unbalance (CUB)	CUB > 48%					——
Current Stall Phase (CSP)	CUB > 60%					——
Accelerated Locked Rotor Detection (LR)	YES/NO					User selection Heat setting to 100%
Trip delay because of CSP	1					s
Trip Delay because of CUB	2					s
High-Inertia Load Option	YES/NO					User selection.
High-Inertia Load Heat Threshold	400%					——
High-Inertia Load Start up Delay	20 →120					s. Level settings
Thermal Machine Cooling Time	50 x Thermal Class					s
Undercurrent	YES/NO					——
Undercurrent Disconnection Type (UC)	% Inom / Power Factor (PF)					——
Undercurrent Adjusting (% Inom)	30% →90%					Inom. Level settings
Undercurrent Adjusting (PF)	0.3 →0.9					Level settings
Trip Delay because of UC	5 →600					s. Level settings
Start Up Delay because of UC	2 →500					Min. Level settings
Third Failure Detection	YES/NO					Level settings
Permanent disconnection because of Third Failure	3 Current failures in less than 105 min					IEEE Std C37.112-1996
Trip delay because of accelerated locked rotor	3					s

| Events control characteristics		
Real Time Clock	hh:mm mm/dd/yy	UMT
Load Control by Events (schedule)	YES/NO	User selection
Schedule Timer (events)	60	User selection
Schedule Timer (holidays)	20	User selection
Battery	Lithium metal battery contained in equipment, BR type 3V	——

COMMUNICATIONS & OTHER SPECIAL FUNCTIONS

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

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

IMMUNITY & EMISSIONS, ELECTROMAGNETIC INTERFERENCE (EMC) FOR HEAVY INDUSTRIAL ENVIRONMENT

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

⬛➤ TRIPPING COLD CURVE

Tripping Cold Curve (*1)

I load / I nom (*2)
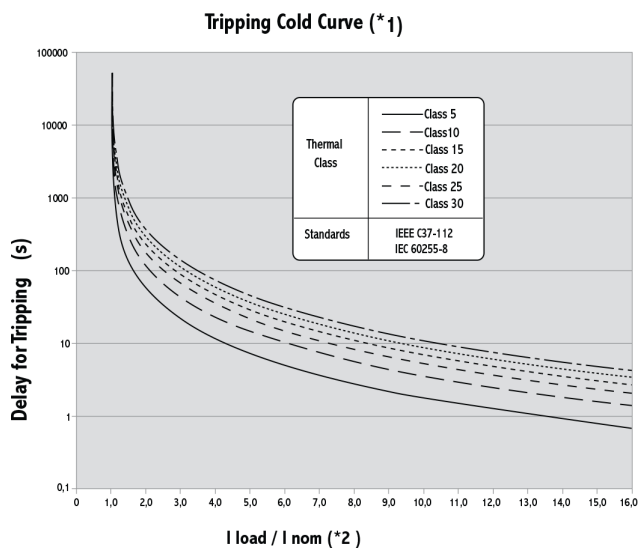
(*1) Hot Curve = Cold Curve / 3
(*2) I nom = Nominal current with overload level settings