INSTALLATION MANUAL

S91 / S91-400

Multi-protection relay for motors

EN



CE

SENECA

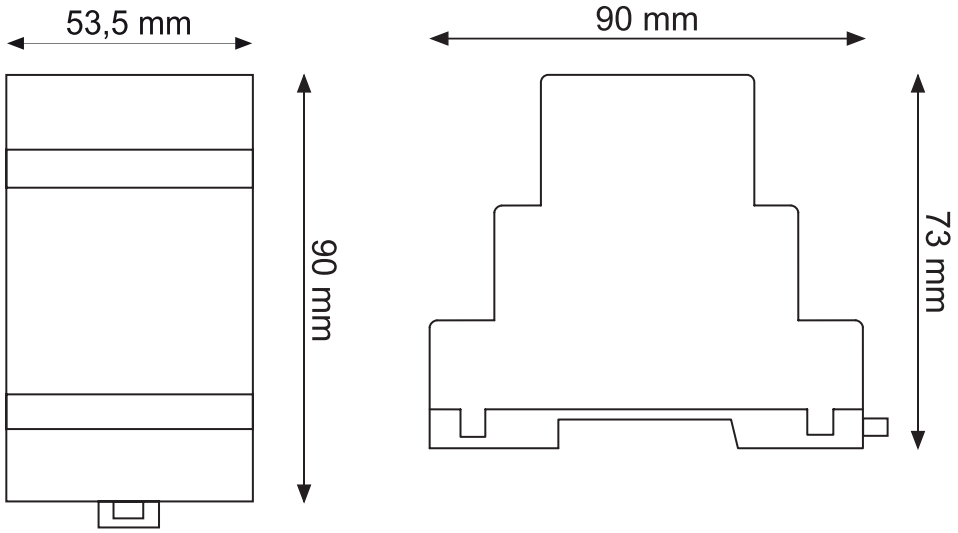
ISO 9001:2015

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For manuals in other languages, configuration software and accessories, visit www.seneca.it/products/s91

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MODULE LAYOUT



Dimensions LxHxD 53.5 x 73 x 90 mm; **Weight:** 250 g; **Enclosure:** UL94 VO, colour ral 7035

SIGNALS VIA LED ON FRONT PANEL

LED	STATUS	LED meaning
OUT (Red)	On	Energized relay
	Off	De-energized relay

FRONT DISPLAY

Display	Meaning	Display	Meaning
-	Device disabled	U	Phase failure or minimum voltage alarm
0	Inhibition time (slow rotation)	S	Phase sequence alarm
0	Motor rotating (fast rotation)	A	Overcurrent alarm
L	PTC sensor line short circuited	P	Minimum P.F. alarm
H	PTC sensor line interrupted	T	Temperature alarm

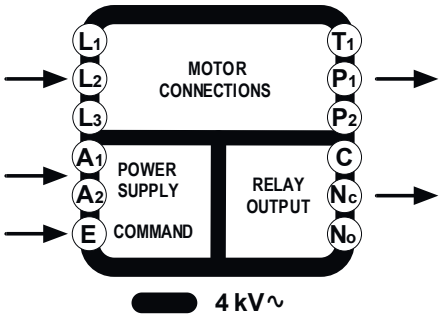
PRELIMINARY WARNINGS

The word **WARNING** preceded by the symbol ⚠ indicates conditions or actions that put the user's safety at risk. The word **ATTENTION** preceded by the symbol ⚠ indicates conditions or actions that might damage the instrument or the connected equipment.
The warranty shall become null and void in the event of improper use or tampering with the module or devices supplied by the manufacturer as necessary for its correct operation, and if the instructions contained in this manual are not followed.

	**WARNING**: The full content of this manual must be read before any operation. The module must only be used by qualified electricians. Specific documentation is available at www.seneca.it/products/s91
	The module must be repaired and damaged parts replaced by the Manufacturer. The product is sensitive to electrostatic discharges. Take appropriate measures during any operation.
	Electrical and electronic waste disposal (applicable in the European Union and other countries with recycling). The symbol on the product or its packaging shows the product must be surrendered to a collection centre authorized to recycle electrical and electronic waste.

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TECHNICAL SPECIFICATIONS

STANDARDS	**EN61000-6-4** Electromagnetic emissions, industrial environment. **EN61000-6-2** Electromagnetic immunity, industrial environment. **EN61010-1** Safety
INSULATION	 Withstand voltage: 2.5 kV Impulse withstand voltage: 4 kV Rated insulation voltage: 300 V (Cat III) 600 V (Cat II) Pollution rating 2
ENVIRONMENTAL CONDITIONS	*Temperature*: -20 – + 65°C *Humidity*: 30%– 90% non condensing. *Storage temperature:* -20 + 85° *Protection rating:* IP20
ASSEMBLY	IEC EN60715, 35mm DIN rail in vertical position.
CONNECTIONS	Screw terminals, 7.5 mm pitch, cable with <2.5 mm^2 section, 0.5 Nm tightening torque
POWER SUPPLY	*Rated voltage*: 195 ÷ 255 Vac (S91) / 400 Vac ± 10 % (S91-400) *Rated frequency:* 50 - 60 Hz ± 5% *Maximum absorbed power:* 1.5 W
CURRENT MEASUREMENT	*Type of insertion*: Direct or through an Ammeter Transformer *Rated operational current (Ie):* 16 Aac *Current measurement limits:* 0.1 ÷ 16 Aac, measurement precision < 5% *Input type:* Shunt *Type of measurement:* TRMS *Continuous thermal limit:* 16 Aac *Impulsive thermal limit:* 45 Aac for 1 sec *Dynamic limit:* 200 Aac for 10 msec *Self-consumption:* 1.3 W *Phase failure intervention*: < 200 msec
VOLTAGE MEASUREMENT	*Rated UE voltage* 347 (L-N) / 600 (L-L) Vac Cat II; 277 (L-N) / 480 (L-L) Vac Cat III *Voltage measurement limits:* 60 ÷ 660 Vac, measurement precision < 5% *Frequency limits:* 50 – 60 Hz ± 5% *Connection methods:* L1-L2-L3 or L-N *No voltage intervention threshold:* 80 Vac (single- and three-phase) *Only for three-phase:* the difference between max. phase and min. phase compared to the middle phase is > 20%
MOTOR CONTROL INPUT	*Rated voltage:* 195 ÷ 255 Vac (S91) / 400 Vac ± 10 % (S91-400) *Operating limits:* 0.85 ÷ 1.1 of rated voltage *Absorbed/dissipated power:* 0.17 W *Minimum command duration:* ≥40 ms
RELAY OUTPUT	*Type of output:* 1 exchange *Working voltage:* 400 Vac *Working current:* 8 A
PTC MEASUREMENT	*Input not isolated from the mains, maximum cable length 30 m* *Precision:* range 1650 ÷ 3100 Ω; error < 5% *Short circuit detection:* < 30Ω ± 5Ω *Open circuit detection:* > 14 KΩ ± 0,2 KΩ

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GENERAL DESCRIPTION

Protection device for electric motors capable of detecting the wrong sequence of phases, the lack of a phase, the excess of absorbed current and the no-load operation with the measurement of the power factor.
It is also equipped with a PTC input for the protection of the motor from over temperature and an enabling input to start the motor.
The main use is the protection of single-phase or three-phase pumps, protecting them against dry running, possible rotor blockage and over temperature (if equipped with PTC).
It is also suitable for detecting the breakage of mechanical transmission devices, for example belts or chains and to protect against transmission system block.
The following operating modes can be set using the panel selector:

- single-phase or three-phase measurement
- maximum current range 5 or 16 A
- operation with or without PTC

FRONT SELECTOR CONFIGURATION

SELECTOR		PARAMETER	DESCRIPTION
MODE		Type of operation	⚠ **ATTENTION: This selector must be set with the device off because it is only read when the device is switched on.**
Mode	**Selected function**	**Mode**	**Selected function**
1	Single phase 5A without temperature control	**5**	Single phase 16A without temperature control
2	Single phase 5A with PTC motor control	**6**	Single phase 16A with PTC motor control
3	Three phase 5A without temperature control	**7**	Three phase 16A without temperature control
4	Three phase 5A with PTC motor control	**8**	Three phase 16A with PTC motor control

FRONT TRIMMER ADJUSTMENT

TRIMMER	PARAMETER	RANGE	DESCRIPTION
AR	Autoreset time	0 = disabled 1 ÷ 100 min	Setting the Auto Restart time in minutes. If automatic restart is not desired, set to 0.
TD	Inhibition time	1 ÷ 30 sec	Setting the inhibition time in seconds. Disables the IMAX% (overcurrent) and PF (power factor lower than minimum) alarms during engine start.
PF	Minimum power factor	0 ÷ 1	Threshold value below which the minimum Power Factor alarm is generated. (low load operation).
OT	Intervention time	0.2 ÷ 10 sec	Setting the attack time in seconds, indicates how long the IMAX% measurement can exceed the set threshold or how long the P.F. can drop below the minimum set value.
IMAX%	Maximum current:	0% ÷ 100% of full scale	Setting in percentage. Threshold value that, when exceeded, triggers the overcurrent alarm.

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ENABLE INPUT

The device is equipped with an enable input that allows you to activate/deactivate the motor.
During the first start-up or if there are no alarms, the absence of the enable signal causes the "-" symbol to appear on the display and the motor control relay to de-energize.
In normal conditions, when enabled, a segment is turned on on the display which rotates along the "0" and the command relay is energized to activate the motor.
On power-up, the rotation speed with which the segment lights up is low: this indicates that the motor is starting up for the set DT inhibition time (IMax and PFmin are not measured).
In the following phase, the segment rotates at a higher speed: this indicates that the motor is operating normally and that the alarm control is again active.
If the enable signal is removed after the appearance of any alarm, the latter signal remains fixed on the display. When the enable signal returns, the alarm is cancelled and the control relay is energized to restart the motor.

ALARM DISPLAY

Alarm messages are shown on the display in two different ways with the following meaning:
1 - Alarm with flashing display: indicates that the device will attempt to restore operation at the end of the AR autoreset time.
This mode is active only if the AR autoreset time is greater than zero.
2 - Alarm with fixed display: Autoreset disabled, no automatic restart or reset.
An external action by an operator is required to restart.
Possible actions: Turn the device off and on again or deactivate and reactivate the enabling input.

TEMPERATURE ALARM THROUGH PTC

This function involves the use of a thermistor housed near the windings of the motor connected to terminals P1 and P2 of the device.
The intervention temperature depends on the type of PTC installed in the motor;
The over-temperature alarm is signalled with the symbol t on the display, moreover the device also checks for the presence of a short circuit on terminals P1 and P2 (Alarm L on the display) or the interruption of the connection with the sensor (Alarm H on the display). This alarm is automatically reset if the temperature drops below the set threshold if the AR autoreset time is greater than zero.
⚠ **WARNING:** The PTC input is not isolated from the line that powers the motor: use the necessary precautions to prevent an electric shock. **If you do not want to use this protection, you must set the MODE selector appropriately before turning on the device.**

MAXIMUM CURRENT ALARM

This function involves selecting a current scale between 5A and 16A using the MODE selector before switching on the device. The over-current alarm is signalled with the symbol A on the display when the current absorbed by the motor exceeds the percentage threshold set on the device. This alarm is automatically reset when the current drops below the set threshold if the AR autoreset time is greater than zero.
During the autoreset time the symbol A flashes and at the end the motor restarts.
N.B.: During normal operation, when the set IMax threshold is exceeded, the symbol *A* alternates with the symbol *0* during the set OT trip time.

POWER FACTOR ALARM

This function has a threshold adjustable between 0 and 1. The power factor alarm is signalled with the symbol P on the display when the Power Factor drops below the minimum threshold set on the device. This alarm is automatically reset when the Power Factor returns or exceeds the set threshold if the AR autoreset time is greater than zero. During the autoreset time the P symbol flashes and at the end the motor starts.
N.B.: During normal operation, when the set PFmin threshold is exceeded, the symbol *A* alternates with the symbol *0* during the set OT trip time.

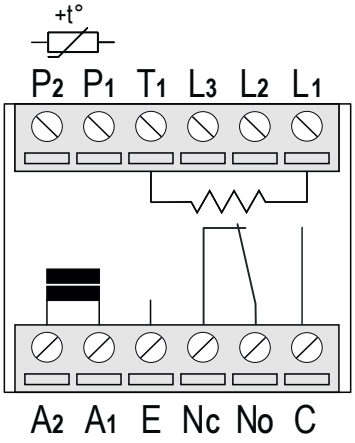
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MINIMUM VOLTAGE OR PHASE FAILURE ALARM

This function involves selecting the type of operation between three-phase and single-phase using the MODE selector before turning on the device. The alarm highlighting that the voltage is below the minimum threshold or a phase is failing is shown by the U symbol on the display. The thresholds of this alarm are internally preset and cannot be changed by the user.
The intervention of this alarm is immediate (detection time <200ms) and can be automatically reset if the AR autoreset time is greater than zero. In this case, the U symbol flashes on the display for the entire set autoreset time and then the device tries to restart the motor.

ELECTRICAL CONNECTIONS

TERMINAL BLOCK LAYOUT

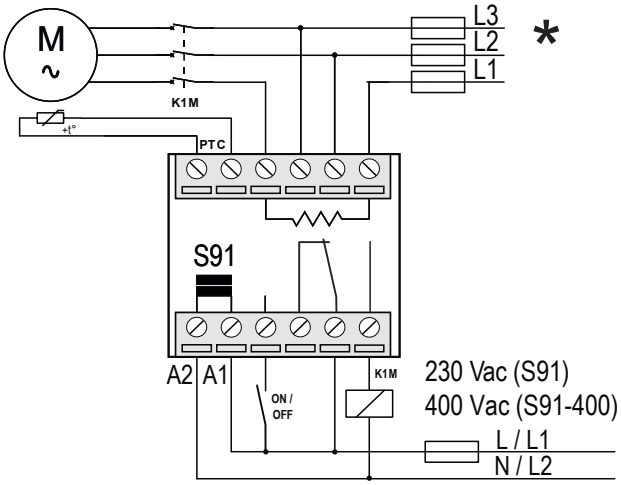


NB: it is always necessary to install a suitable protection upstream

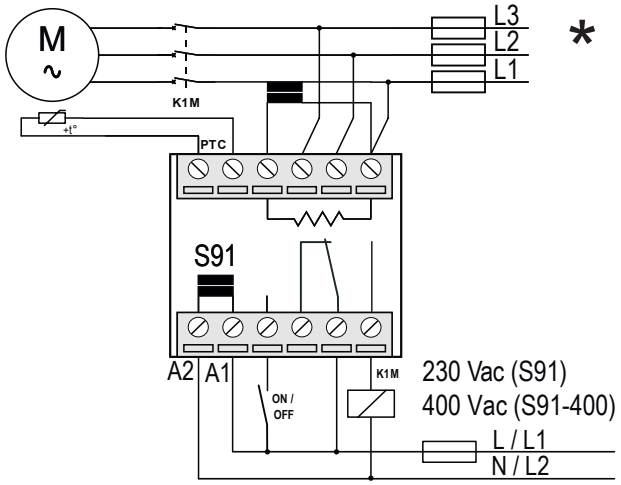
TERMINAL DESCRIPTION

P1 = Motor protection input (PTC) *
P2 = Motor protection input (PTC) *
T1 = L1 output
L1 = Line 1 input
L2 = Line 2 input
L3 = Line 3 input
A2 = Auxiliary power 230 Vac / 400 Vac
A1 = Auxiliary power 230 Vac / 400 Vac
E= Motor control input
Nc = Normally closed contact relay
C = Contact common relay
No = Normally open contact relay
(*) ⚠ WARNING: input not isolated from the mains

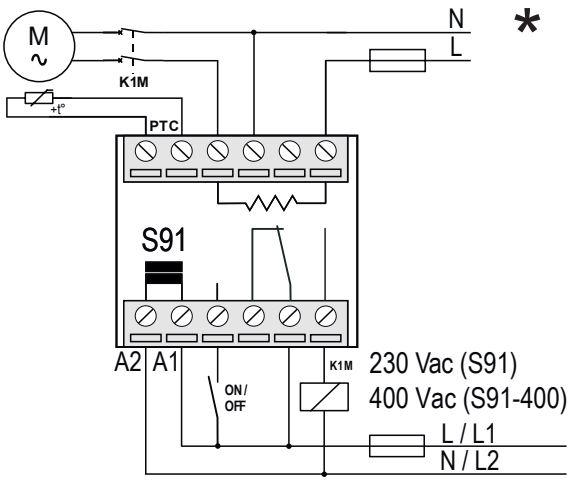
THREE-PHASE MOTOR WITH DIRECT CURRENT MEASUREMENT



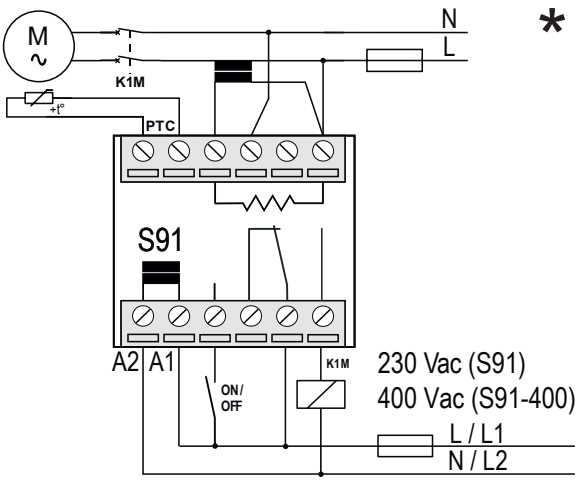
THREE-PHASE MOTOR WITH CURRENT MEASUREMENT WITH AMMETER TRANSFORMER



SINGLE-PHASE MOTOR WITH DIRECT CURRENT MEASUREMENT

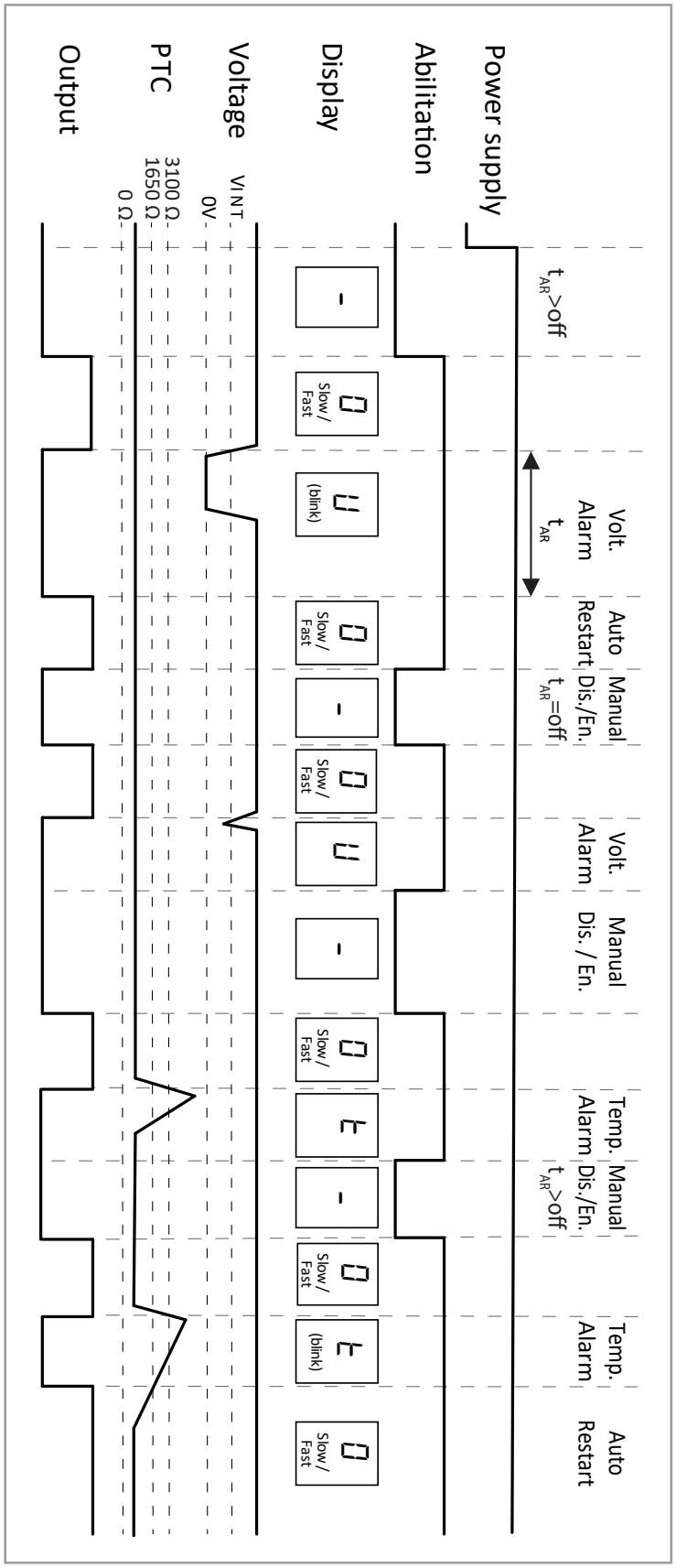


SINGLE-PHASE MOTOR WITH CURRENT MEASUREMENT WITH AMMETER TRANSFORMER



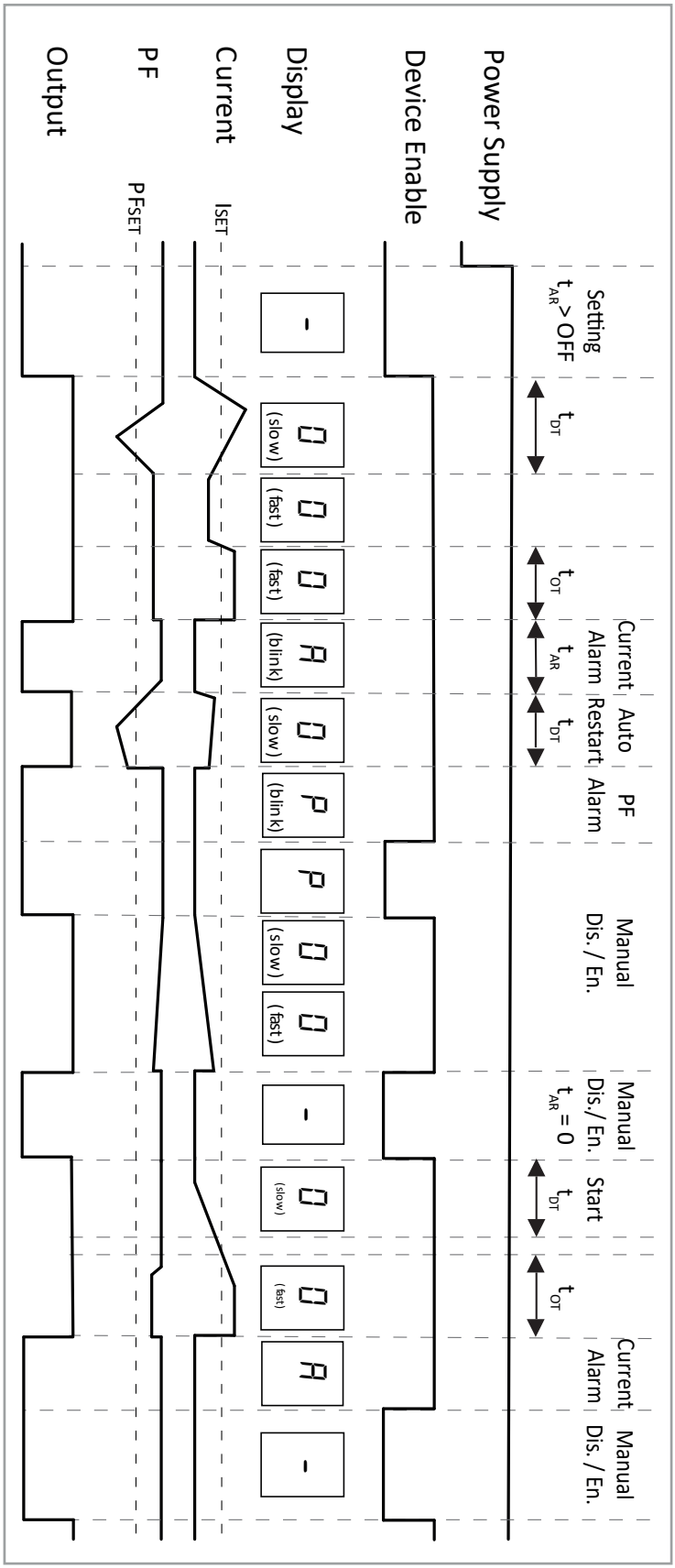
*** A thermal magnetic switch must be inserted near the device**

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CURRENT AND PF (POWER FACTOR) OPERATING DIAGRAM



CONTACT INFORMATION

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