



# Power Protector Stabilizer

## MFS-L Series

- User Manual -

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The following document applies to PPS MFS-L/ -LR

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Thyatron started producing **Power Protector Stabilizer** in 1992. The company has over 1.000.000 pieces on the market. MFS series superiority originates from the **OEM design** of the product based on needs and demands born directly from field knowledge provided by the customer.



**PPS MFS-L** is a incorporated **Power Protector Stabilizer** that supervises voltage, frequency, temperature, current\* and stabilizes voltage for normal operation of **commercial refrigeration appliances** (*appliances falling into EN/IEC 60335-2-89 scope*). PPS MFS-L also has a function of randomized starting delay after the out of limits 3 minute cut off. PPS MFS-L uses soft start for smooth power connection. The product is split type - the **ECU** (Electronic Control Unit) and the **Trafo** (Autotransformer).

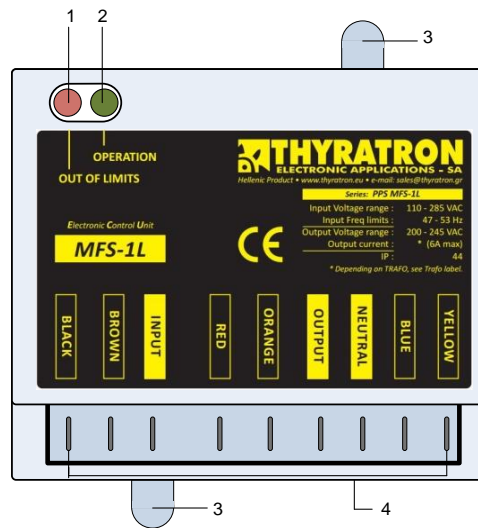
## PRODUCT FEATURES

- Voltage stabilizer <sup>1.4</sup>
- Voltage & Frequency supervisor <sup>1.5</sup>
- Intelligent ambient temperature protection <sup>1.6</sup>
- Intelligent Time delay 2'30" +0" to 30" random (*zero at start up on production*) <sup>1.7</sup>
- Surge protection <sup>1.8</sup>
- Reconnecting Voltage Hysteresis <sup>1.9</sup>
- Diagnostic connection self control <sup>1.11</sup>
- Zero Crossing
- Soft Start <sup>1.10</sup>
- Zero current change over (New)
- Wide ambient temperature range from -40 °C to +85 °C

**\*Current controlled output (on request)**

# 1. GETTING TO KNOW YOUR APPLIANCE

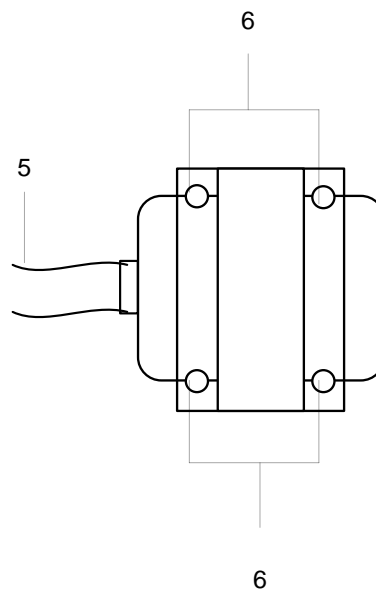
## 1.1. Electronic Control Unit - ECU



1. Red LED
2. Green LED
3. Mounting points
4. Fast on terminals

## 1.2. Autotransformer - Trafo

Electrical function: Non short circuit proof



5. Connection cables - Fast On female terminal (Installation Guide)
6. Mounting points

### 1.3. LED INDICATION

EVENT	RED LED	GREEN LED
Normal operation	Off	On
3 minutes delay	Blink slow	Off
Frequency out of limits	Blink fast	Off
Temperature out of limits	Blink slow	Blink slow
PPS MFS Failure or No Power	Off	Off

### 1.4. VOLTAGE STABILIZATION

PPS MFS-L performs voltage correction and stabilization using Autotransformer, Relays and Triac.

PPS MFS-L makes switching in order to keep the output voltage within limits.

Series / OUTPUT VOLTAGE limits			
PPS MFS-L	200 - 245 VAC $\pm 2\%$	PPS MFS-xxxLR	205 - 245VAC $\pm 2\%$

### 1.5. VOLTAGE & FREQUENCY MONITORING

PPS MFS-L monitors voltage and frequency of main power and cuts off the output when the values of main power (voltage or frequency) come out of limits.

Series	INPUT VOLTAGE limits	INPUT FREQUENCY limits
PPS MFS-L/ -LR	110 - 285VAC $\pm 2\%$	47 - 53 HZ $\pm 0.2\text{Hz}$ Or 57 - 63 Hz $\pm 0.2\text{Hz}$

### 1.6. TEMPERATURE MONITORING

PPS MFS-L has temperature sensor to monitor ambient temperature. When the temperature is higher than the upper limit or the curve of temperature rises abruptly over 10 minutes, then PPS MFS-L cuts off the output to protect the cooler and itself.

Series	TEMPERATURE limits	CURVE of TEMPERATURE
PPS MFS-L/ -LR	+80 °C	d $\theta$ > 15 °C / 15 min

## 1.7. INTELLIGENT TIME DELAY

- Delayed start allows the cooling circuit to balance the pressure of cooling gases, preventing startup under high pressure, increasing the lifetime of compressor.
- Intelligent time delay protects network overload and voltage drop, in case of many coolers are installed in the same power line.
- Intelligent time delay is activated after 30min of continuous operation. This function saves time on the production line, because there is no delay.

## 1.8. SURGE PROTECTION

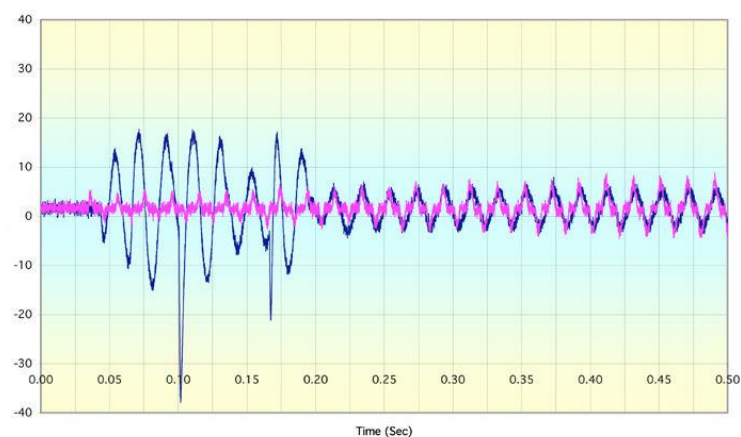
PPS MFS-L uses components to absorb surges in order to provide some protection to the commercial refrigerators from them.

## 1.9. RECONNECTING VOLTAGE HYSTERESIS

If PPS MFS-L reconnects after a cut off and the line voltage fluctuates near the limits, the device uses a voltage window in order to avoid continuous cutoffs due to voltage drop from connecting and igniting of the unit.

## 1.10. SOFT START

PPS MFS-L use “Voltage Zero - Crossing” and Triac to perform Soft-Start\*. The effect of this operation is to reduce the starting current, thereby avoid voltage drops in the network and smooth the mechanical start of compressor, increasing its lifetime.



\*Minimum Current for this operation is 0.06A.

### 1.11. DIAGNOSTIC CONNECTION SELF CONTROL

In order to secure the MFS-L against mistaken installation, the device is equipped with a correct sequence connection self-control diagnostic function. If during the installation procedure something goes wrong and the transformer cables will not be connected with the proper order to the ECU, then the device will not operate.

- Once the MFS-L will be activated for the first time, the diagnostic control will be performed so as dysfunctional operation to be prevented. If the MFS-L is turned-off in less than 30 minutes of continuous operation and then turned-on again, the diagnostic control will be performed again too. In case the MFS-L exceeds 30 minutes of continuous operation, the diagnostic self-control will be disabled and in the event of turn-off and turn-on situation the MFS-L will enter a three minute delay-on.
- The diagnostic control will be performed whenever the value of the input voltage is among 200 VAC to 250 VAC and ideally there should not be great fluctuations because that could affect the outcome of the diagnostic control.
- This particular diagnostic control does not cover the case in which there is linked another cable at the position of the yellow cable except the yellow one, as this would lead on to a certain destruction of the ECU.
- If there is a faulty cable connection or a cable is not linked at all (**except the yellow and the blue one, these cables must be always be properly connected**), then after the diagnostic control the output voltage will not be activated, and depending the scenario the red LED will be blinking ultra-fast or the device will reset and perform the diagnostic control (depending on the faulty cable connection).

### 1.12. STORAGE

Should not be stored in high temperature or high humidity condition. Usage, beyond the specified shelf life could compromise product long term reliability. The suitable condition is +5 to +35°C and less than 75%RH in Relative Humidity indoor. Shelf Life, 2 years.

### 1.13. APPROVALS

Approvals		
	LVD European Directive 2014/35/EU	EMC European Directive 2014/30/EU
CE	<ul style="list-style-type: none"> <li>• EN 61558-1</li> <li>• EN 61558-2-13</li> </ul>	<ul style="list-style-type: none"> <li>• EN 61000-6-1</li> <li>• EN 61000-6-2</li> <li>• EN 61000-6-3</li> <li>• EN 61000-6-4</li> <li>• EN 62041</li> </ul>

## 2. SPECIFICATIONS

### 2.1. Power Protector Stabilizer MFS-L/ -LR

#### 2.1.1. Series: PPS MFS-1L / -2L

PPS MFS-L Series :		PPS MFS-1L					PPS MFS-2L	
Model of PPS MFS-xxxL Series : <i>xxx: 040, 060, 070, 085, 100, 150, 200</i>		040	060	070	085	100	150	200
Power Supply	Nominal Voltage	220 - 240 VAC						
	Operation Voltage Bandwidth	90 - 310 VAC						
	Ambient Temperature	-40 - 85 °C						
	Humidity	0 - 85 %RH						
Input	Low Voltage	110 VAC ± 3% with hysteresis						
	High Voltage	285 VAC ±2% with hysteresis						
	Lower Freq. Limit (50/60 Hz)	47 Hz ±0.2Hz or 57 Hz ±0.2Hz						
	Upper Freq. Limit (50/60 Hz)	53 Hz ±0.2Hz or 63 Hz ±0.2Hz						
Output	Low Voltage	200 VAC ±2% ( 196V @ Lowest Input Voltage )						
	High Voltage	245 VAC ±2%						
	Max. Current (A)	1.7	2.6	3	3.6	4.3	6.5	8.5
	Continuous Operation (45°C) Current (A) @ Low Voltage	1.3	2	2.2	2.7	3.2	4.8	6.4
Start Up Time, Time Delay		- 3 minutes ( 2'30" + 0" to 30" random) - Zero on Production Line for first 30 minutes continuous operation of life cycle						
Thermal protection		- Temperature limits +80 °C - Temperature differential 15 °C / 15 minutes						
Plastic Housing		UL94 V-0 Flame Retardant						
IP Class		IP44						
Life time		Relay lifetime cycles 350,000						
Connections		6.3mm x 0.8mm flat, terminal						
Cable Harness - Lengths		250mm / 550mm / 1000mm / 1200mm versions						
Insulation Class, Transformer Windings		F ( 155 °C)						
Total weight (Kg) (ECU, Trafo with cable 1200mm)		2.4	2.9	3.5	3.9	4.2	6.3	7.4



**2.1.2. Series: PPS MFS-1LR / -2LR**

PPS MFS-LR Series :		PPS MFS-1LR			PPS MFS-2LR	
Model of PPS MFS-xxxLR Series :		070	085	100	150	200
<i>xxx: 070, 085, 100, 150, 200</i>						
Power Supply	Nominal Voltage	220 - 240 VAC				
	Operation Voltage Bandwidth	90 - 310 VAC				
	Ambient Temperature	-40 - 85 °C				
	Humidity	0 - 85 %RH				
Input	Low Voltage	110 VAC ± 3% with hysteresis				
	High Voltage	285 VAC ±2% with hysteresis				
	Lower Freq. Limit (50/60 Hz)	47 Hz ±0.2Hz or 57 Hz ±0.2Hz				
	Upper Freq. Limit (50/60 Hz)	53 Hz ±0.2Hz or 63 Hz ±0.2Hz				
Output	Voltage range	205 - 245 VAC ±2%				
	Max. Current (A)	3.0	3.6	4.3	6.5	8.5
	Continuous Operation (45°C) Current (A) @ Low Voltage	2.2	2.7	3.2	4.8	6.4
Start Up Time, Time Delay	- 3 minutes ( 2'30" + 0" to 30" random) - Zero on Production Line for first 30 minutes continuous operation of life cycle					
Thermal protection	- Temperature limits +80 °C - Temperature differential 15 °C / 15 minutes					
Plastic Housing	UL94 V-0 Flame Retardant					
Protection index (IP code)	IP44					
Life time	Relay lifetime cycles 350,000					
Connections	6.3mm x 0.8mm flat, terminal					
Cable Harness - Lengths	250mm / 550mm / 1000mm / 1200mm versions					
Insulation Class, Transformer Windings	F ( 155 °C)					
Total weight (Kg) (ECU, Trafo with cable 1200mm)	3.5	3.9	4.2	6.3	7.4	

### **3. FURTHER INFORMATION**

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