



# STRUMENTAZIONE ELETTRONICA PROFESSIONALE

PROFESSIONAL ELECTRONIC INSTRUMENTS





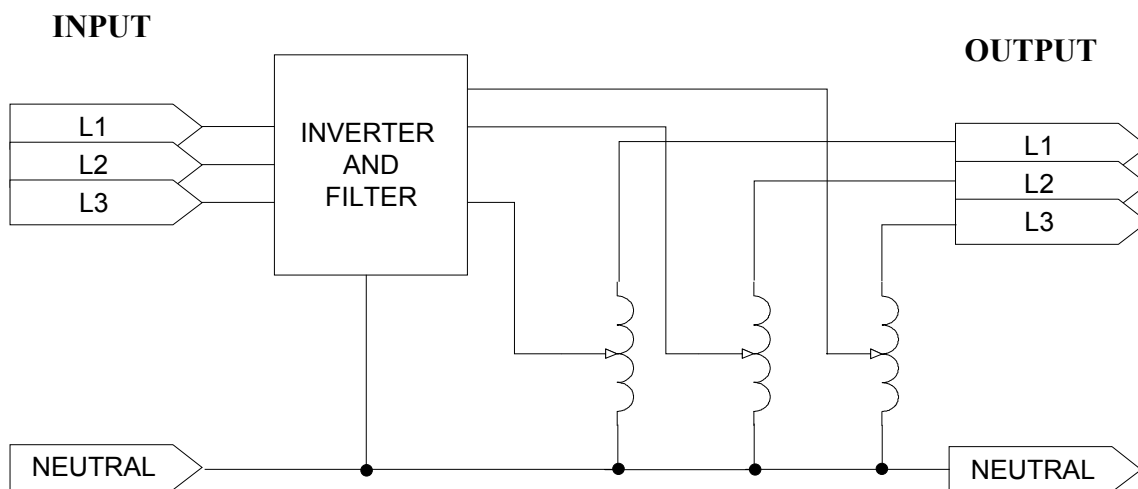
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## 1. VOLTAGE CHARACTERISTIC COMPACT POWER SUPPLY

### 1.1 GENERALITY

CPS is a piece of equipment that provides a perfectly sinusoidal and stable voltage, his voltage is adjustable in frequency and in amplitude.

In practice, CPS combines the advantage of the electrical line, of the variac and of the rotating converter, without having their defects!



**Pay attention: The neutral input is mandatory!!!**

### 1.2 VOLTAGE OUTPUT

The output voltage is guaranteed perfectly sinusoidal, with a distortion less than 0.6 % regardless of the load. The value of output voltage is kept perfectly stable within 0.1 % regardless of the load.

CPS is also able to compensate for possible voltage drops on the output wires, ensuring in this way the exact voltage you want on the load. The load that CPS is able to drive can vary from the pure capacity to the pure inductance not only, but also up to non simmetrical current loads, as for instance a single halfwave rectifier.

The output voltage is adjustable with continuity from zero to full scale of each range.

CPS can in fact provide the nominal power at various full scales and this allows the CPS to adapt himself to the disparate needs of the user, without having heavy limitations on the output current.

Furthermore CPS is capable to keep the voltage stable also with time variable loads, as for example the pulsating loads. Indeed CPS recovers the distortion of the waveform within 0.6 % and the amplitude of the voltage within 0.1% in less than half period.

Furthermore, CPS can bear a shortcircuit for an indefinite time without suffering any consequence

#### **CAUTION !!!!**

- **THE OUTPUT OF CPS IS NOT ISOLATED RESPECT TO THE GROUND**
- **NO ONE OF THE PHASES IN OUTPUT CAN BE CONNECTED TO THE GROUND**



### 1.3 FREQUENCY OUTPUT

CPS allows the regulation of the output frequency from 50Hz or 60Hz by panel and 50-80Hz by remote control.

This output frequency can be regulated with continuity within the above frequency's range and it has a stability of 0.01% with regards to the set frequency.

CPS also allows to synchronize the output frequency with the frequency of the supply line (from remote control). This allows a completely synchronous voltage output, with a far superior voltage stability.

It must be remarked that, in three phase version, through remote interface, it is possible to set a variable phase delay on all the three output. This feature is useful, for example, to study single phase motor with starting capacitor, or in all those cases where a different phase displacement than three phase is required. The resolution of phase setting is 0,088° (12 bits on 360°).

### 1.4 USER INTERFACE

CPS is intended to have an user friendly interface.

It is also featured the possibility of an host computer control, thus allowing to perform tests automatically.

CPS allows various usage selections: working range, wires drop compensation, working frequency, synchronization of the output frequency with the power line.

Furthermore, CPS gives the user clear information on the status of the output.

It is monitored both the set voltage, the set frequency and the output voltage is read with a precision of 0.3% and the output current.

The user is also warned in case of overcurrent obtainable by the CPS, or in case of high loss in the wires, that should not exceed 5% of the set voltage.

We underline again that CPS automatically limits the maximum allowed current, avoiding damages to the equipment; the only consequence is that in this case it is not guaranteed the precision of the output waveform neither the accuracy of the output voltage.

The user can set the output voltage through the knob, for the frequency you can choose 50Hz/60Hz.

### 1.5 MODELS

The CPS have two different configurations, you can change the configuration from the panel:

- Continuous: Maximum continuous output power no inrush capabilities.
- Inrush: The continuous output power is decrease to permit a double inrush power.

Under there is the characteristic of the different models

MODELS	NOMINAL POWER OUTPUT	SUPPLY VOLTAGE	INPUT POWER	INPUT CURRENT
CPS/T 5K 4K8S*	5KVA 1/3N ~	400Vac±10% 3PH+N	8.5KW max	12A/24A neutral
CPS/T 10K 8K16S	10KVA 1/3N~	400Vac±10% 3PH+N	16.5KW max	23A/23A neutral
CPS/T 20K 15K30S	20KVA 1/3N~	400Vac±10% 3PH+N	28KW max	42A/42A neutral
CPS/T 40K 30K60S	40KVA 1/3N~	400Vac±10% 3PH+N	51KW max	85A/85A neutral

\* Under development



## DIMENSIONS

MODEL	HEIGHT	WIDTH	DEPTH	WEIGHT
CPS/T 5K 4K8S*	6 U	84 TE	513 mm	45 kg
CPS/T 10K 8K16S	1040 mm	585 mm	600 mm	180 kg
CPS/T 20K 15K30S	1300 mm	585 mm	600 mm	300 kg
CPS/T 40K 30K60S	1300 mm	585 mm	600 mm	450 kg

\* Under development

## 1.6 GENERAL PERFORMANCES

All the following features are valid within the range of the normal operating limits; they are not valid during the limitation of the output current.

Parameters	Value
Distortion of the output waveform	<0.6%
Stability of the output voltage	<0.1%
Accuracy of the output voltage	<0.5%
Recovery- time of the output waveform	<10ms
Recovery-time of the output voltage	<10ms
Maximum compensated drop on wires	5% f.s
Recovery-time of drop on wires	<200ms.

## 1.7 GENERAL SPECIFICATIONS

In case of three phase output, the voltage is referred phase to neutral.

Parameters	Value
Output frequency range	50Hz - 80Hz
Range of synchronization	50Hz - 80Hz
Phase resolution	0.088°(12 bit su 360°)
Frequency resolution	0.02Hz
Frequency precision and time stability	100ppm
Output voltage at constant power	300V, 150V
Output voltage resolution	0.025% f.s. (12 bit su f.s.).
Operating temperature of function	0°C - 35°C



## 1.8. MAXIMUM OUTPUT CURRENT

### Model CPS/T 2.5K 2K4S

RANGE	Continuous 2.5K	Inrush 2K4S		Ø	LOAD
	Continuous	Continuous	Inrush 3 sec		
300 single phase output	8.3	6.7	13.5	0°	RESIST.
300 single phase output	7.3	5.7	12.4	-90°	CAPAC.
300 single phase output	9.5	7.8	14.6	+90°	INDUT.
150 single phase output	16.7	13.3	26.9	0°	RESIST.
150 single phase output	14.7	11.4	24.9	-90°	CAPAC.
150 single phase output	18.9	15.6	29.1	+90°	INDUT.
300 three phase output	2.8	2.2	4.5	0°	RESIST.
300 three phase output	2.4	1.9	4.1	-90°	CAPAC.
300 three phase output	3.2	2.6	4.9	+90°	INDUT.
150 three phase output	5.6	4.4	9.0	0°	RESIST.
150 three phase output	4.9	3.8	8.3	-90°	CAPAC.
150 three phase output	6.3	5.2	9.7	+90°	INDUT.

### Model CPS/T 5K 4K8S

RANGE	Continuous 5K	Inrush 4K8S		Ø	LOAD
	Continuous	Continuous	Inrush 3 sec		
300 single phase output	16.7	13.3	26.9	0°	RESIST.
300 single phase output	14.7	11.4	24.9	-90°	CAPAC.
300 single phase output	18.9	15.6	29.1	+90°	INDUT.
150 single phase output	33.3	26.7	53.8	0°	RESIST.
150 single phase output	29.4	22.8	49.8	-90°	CAPAC.
150 single phase output	37.8	31.2	58.2	+90°	INDUT.
300 three phase output	5.6	4.4	9.0	0°	RESIST.
300 three phase output	4.9	3.8	8.3	-90°	CAPAC.
300 three phase output	6.3	5.2	9.7	+90°	INDUT.
150 three phase output	11.1	8.9	17.9	0°	RESIST.
150 three phase output	9.8	7.6	16.6	-90°	CAPAC.
150 three phase output	12.6	10.4	19.4	+90°	INDUT.



**Model CPS/T 10K 8K16S**

RANGE	Continuous 10K	Inrush 8K16S		Ø	LOAD
	Continuous	Continuous	Inrush 3 sec		
300 single phase output	33.3	26.7	53.8	0°	RESIST.
300 single phase output	29.4	22.8	49.8	-90°	CAPAC.
300 single phase output	37.8	31.2	58.2	+90°	INDUT.
150 single phase output	66.7	53.3	107.7	0°	RESIST.
150 single phase output	58.7	45.5	99.5	-90°	CAPAC.
150 single phase output	75.7	62.5	116.5	+90°	INDUT.
300 three phase output.	11.1	8.9	17.9	0°	RESIST.
300 three phase output	9.8	7.6	16.6	-90°	CAPAC.
300 three phase output	12.6	10.4	19.4	+90°	INDUT.
150 three phase output	22.2	17.8	35.9	0°	RESIST.
150 three phase output	19.6	15.2	33.2	-90°	CAPAC.
150 three phase output	25.2	20.8	38.8	+90°	INDUT.

**Model CPS/T 20K 15K30S**

RANGE	Continuous 20K	Inrush 15K30S		Ø	LOAD
	Continuous	Continuous	Inrush 3 sec		
300 single phase output	66.8	50.5	101.8	0°	RESIST.
300 single phase output	60.1	43.9	94.9	-90°	CAPAC.
300 single phase output	74.3	58.1	109.1	+90°	INDUT.
150 single phase output	133.7	101.0	203.5	0°	RESIST.
150 single phase output	120.3	87.9	189.9	-90°	CAPAC.
150 single phase output	148.5	116.1	218.1	+90°	INDUT.
300 three phase output	22.3	16.8	33.9	0°	RESIST.
300 three phase output	20.0	14.6	31.6	-90°	CAPAC.
300 three phase output	24.8	19.4	36.4	+90°	INDUT.
150 three phase output	44.6	33.7	67.8	0°	RESIST.
150 three phase output	40.1	29.3	63.3	-90°	CAPAC.
150 three phase output	49.5	38.7	72.7	+90°	INDUT.





**Model CPS/T 40K 30K60S**

RANGE	Continuous 40K	Inrush 30K60S		Ø	LOAD
	Continuous	Continuous	Inrush 3 sec		
300 single phase output	134.3	101.0	203.5	0°	RESIST.
300 single phase output	120.9	87.9	189.9	-90°	CAPAC.
300 single phase output	149.1	116.1	218.1	+90°	INDUT.
150 single phase output	268.5	202.0	407.0	0°	RESIST.
150 single phase output	241.7	175.7	379.7	-90°	CAPAC.
150 single phase output	298.3	232.3	436.3	+90°	INDUT.
300 three phase output	44.8	33.7	67.8	0°	RESIST.
300 three phase output	40.3	29.3	63.3	-90°	CAPAC.
300 three phase output	49.7	38.7	72.7	+90°	INDUT.
150 three phase output	89.5	67.3	135.7	0°	RESIST.
150 three phase output	80.6	58.6	126.6	-90°	CAPAC.
150 three phase output	99.4	77.4	145.4	+90°	INDUT.

Notes:

Output current is continuous RMS current in a linear load, crest factor of output current is 1,41.

Peak current is 1,41 times of output current. With non linear load the maximum RMS output



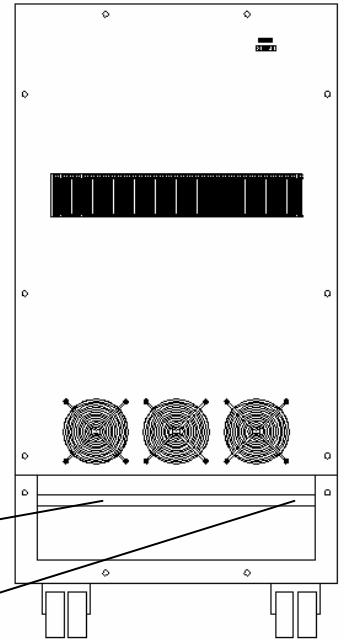


## 1.9 NOTES FOR THE INSTALLATION

**CPS 10K 8K16S | CPS 20K 15K30S | CPS 40K 30K60S**

Take off the rear bottom panel

- Connect a supply cable 3P+N+T of adequate size for the supported current of the model. **(see table on page 4).**
- Connect the load cable of adequate size to support the maximum current (load 1-phase/3-phase range 300/150).
- In case connect the sense cable, 1-phase/3-phase.
- At the end, close the rear panel.



INPUT					SENSE				OUT TRIF.				SEN.MON		OUT MONO		OUT
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
L1	L2	L3	N	PE	L1	L2	L3	N	L1	L2	L3	N	L	N	L	N	

**Pay attention: The neutral input is mandatory**



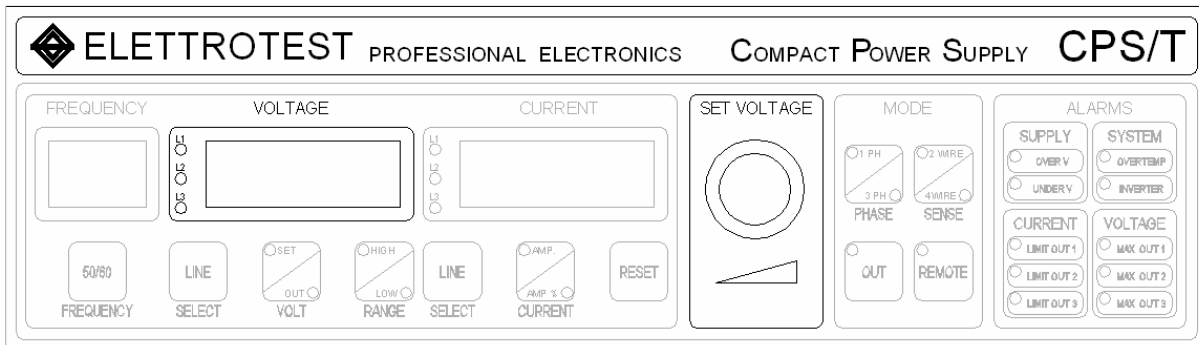
## 2. NOTES FOR USERS

### 2.1 SWITCHING ON

As soon as CPS switches on, through the switch placed on the control panel of the machine, it makes different cycles of test, indicated by the progression of the numbers from 0 to 9 on the displays. In case of bad working the test stops and the machine indicates on the control panel the type of alarm checked (see at the voice alarms). When the test ends CPS is set to 0 Volt in the range 300 Volt, 50 Hertz and regulation on the output terminals (2 wires). After the appearing of these indications CPS is ready to work.

**Caution: The front switch is not a security switch, It opens only the three phase power line also the neutral is connected. High dangerous voltage remain inside the machine.**

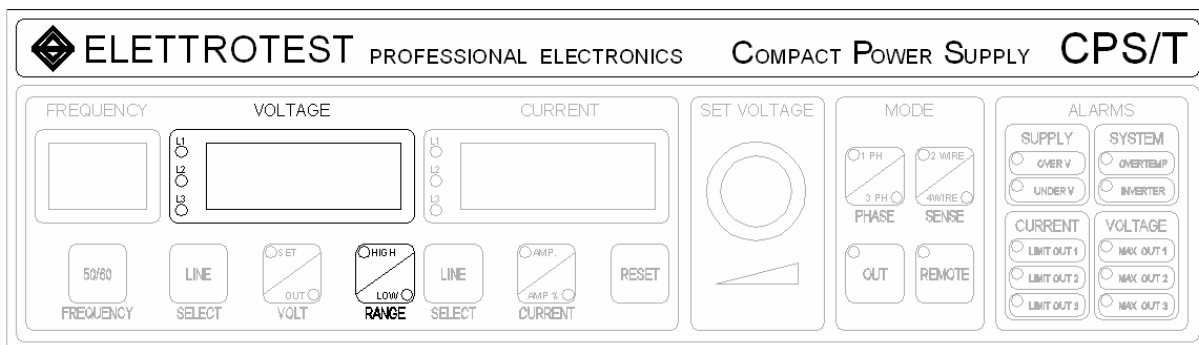
### 2.2 VOLTAGE MENU



#### SETTING VOLTAGE

To set the output voltage you must use the encoder that you see on the figure, after this step the set of voltage the display lamp until the output is going to the voltage set up.

### 2.3 RANGE SETTING



The ranges on CPS allow to make use of the full power output at different voltages.

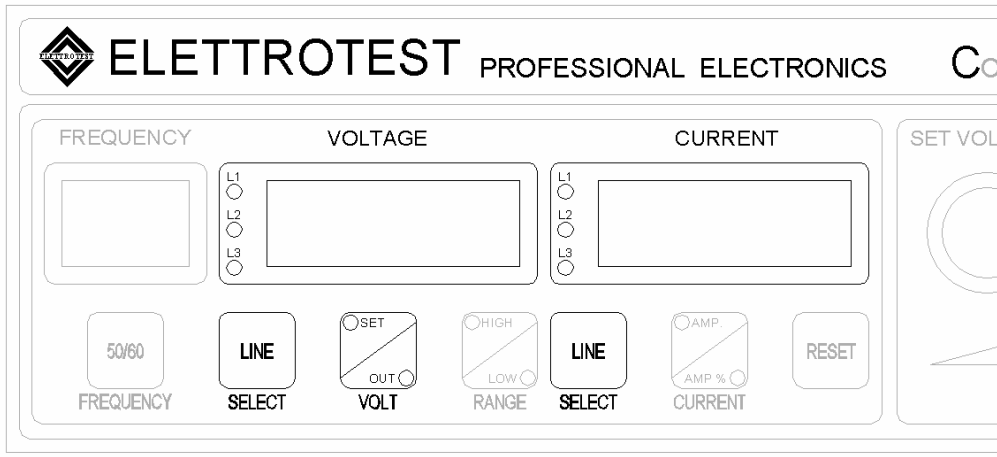
The maximum output power changes according to the nature of the connected load; in case of resistance loads the power is nominal, in case of pure inductive loads the power increases, in case of pure capacity load the power decreases. To change the range push the button RANGE that you can see on the figure.

When the range is changed, the voltage display turns off and the output voltage goes down slowly till zero, then the output power is switched off; after about 15 seconds the output is switched on again and the



Voltage display visualizes zero voltage (0.0); since that moment CPS is ready to receive commands on the new range.

## 2.4 VOLTAGE AND CURRENT VISUALIZATION

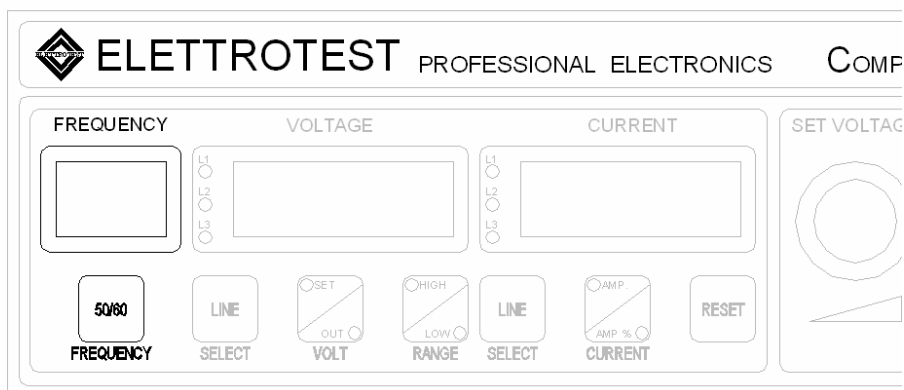


The display concerning the output voltage can visualize four values: the set voltage or the output voltage X of the each phase.

At turn on, the display visualizes the set voltage and this is indicated by the led SET on the button VOLT in the VOLTAGE section of the panel. In order to visualize the actual output voltage, push VOLT button and the SELECT button to choose the line; the visualized voltage indicates a precision of 0.3% full scale range. If the set voltage is changed, the display returns to show the set value. In case of 4 wires operation, the display shows the voltage on the sense inputs

You can see the output current on CURRENT display, push the SELECT bottom (under current display) to select the different lines.

## 2.5 FREQUENCY MENU



### 2.5.1. SETTING FREQUENCY

The output frequency of CPS can be 50 or 60 hertz, the FREQUENCY display shows the set up value and FREQUENCY button switch the set up value.

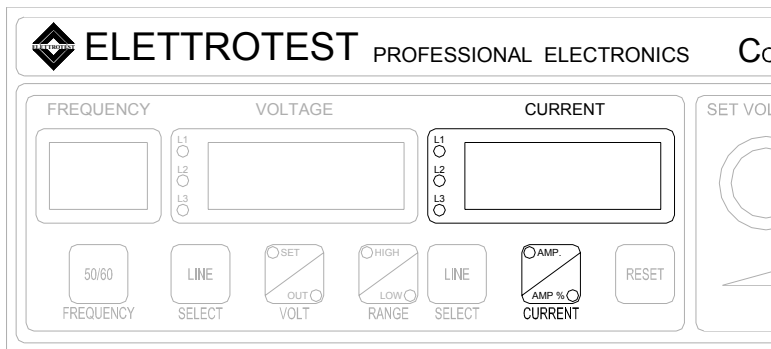


In this case too after pushing the button FREQUENCY the frequency display flashes until the output frequency coincides with the set one.

### 2.5.2. FREQUENCY REFERENCE SETTING

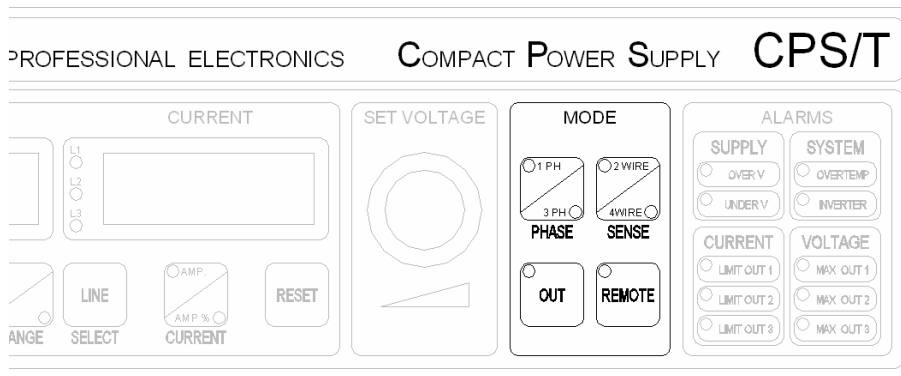
The output frequency can have two references: the first one is a inner frequency reference with a precision of 0.01%, the second one is the line of loading frequency.  
At turn on CPS is connected to the inner reference, you can change the reference to line only with PC remote interface.

### 2.7. Continuous and Inrush mode



Through the current key you can select the Continuous (Amp) or inrush (Amp%) configurations,so you can change the configuration of the machine during the function.

### 2.7 MENU MODE



#### 2.7.1 VOLTAGE REACTION

The output voltage's stabilization behave in the same way in both the configurations on the CPS (2 wires) output terminals and on a possible long distance outlet (4 wires), to eliminate the fall in voltage due to cable connections.

To operate the long distance stabilization first connect the opposite terminals on the back of the machine following the indications at the voice INSTALLATION.



The choice of the kind of long distance stabilization can be operated by pushing the buttons SENSE, the 4WIRE and 2WIRE configuration is indicated with a LED.

Notice that CPS corrects falls in voltage on the connections until 5% of the set up voltage to avoid possible overheatings of the same line. After exceeding this limit CPS doesn't guarantee that the value of the output voltage is equal to the set up voltage and an error signal is visualized (see at voltage alarms).

## 2.7.2 TYPE OF OUTPUT

The present output are single-phase and three-phase.

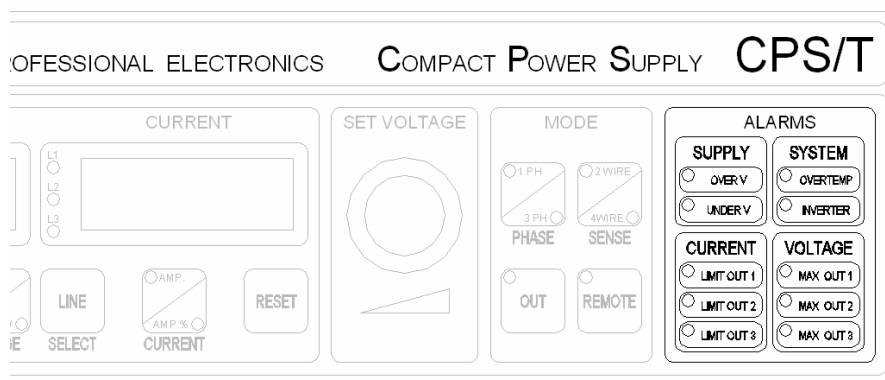
The output power is variable with the type of the load, for resistive load the output power is the nominal power, for inductor load is greater than the nominal power, for capacitor load is less than the nominal power. To change the type of output press the PHASE button and the 1 PH or 3 PH configuration is indicated with a LED. When the type of output is changed, the voltage display turns off and the output voltage goes down slowly till zero, then the output power is switched off; after about 15 seconds the output is switched on again and the Voltage display visualizes zero voltage (0.0); since that moment CPS is ready to receive commands on the new range.

**Caution: The single phase configuration connects together the three phase output, so if you select the single phase configuration there is voltage on the three phase output connectors.**

## 2.7.3 OUTPUT RELAY

If you press the button OUT you can turn-on or turn-off the output relay. Before the turn-off the output voltage is set to 0 voltage so the relay switch with low current. Also the turn-on is at 0 voltage and after the voltage goes to the setting value with a internal ramp. **The turn off of the output relay does not allow operations on the connection of the EUT because the neutral is not disconnected.**

## 2.8 ALARMS



### 2.8.1. LOADING ALARMS

CPS can work with network voltage variations of +/- 10%, if these limits are exceeded CPS stops and the led concerning the occurred alarm is on, in this case CPS can be unblocked by means of the button HARDWARE RESET or switching off and than switching on the machine.

If the network voltage is too low CPS stops and the led **UNDERVOLTAGE** turns on.

If the network voltage is too high CPS stops and the led **OVERVOLTAGE** turns on.



### 2.8.2 SYSTEM ALARMS

In case of high temperature inside of the CPS (more than 70°C) this one stops and the led **TMAX** is on; to set again the machine, see the voltage alarms sections.

In case of bad operations of the overload sections (inverter) CPS stops and the led **INVERTER** is on.

### 2.8.3 CURRENT ALARM

CPS implements an output current's control loop. This characteristic allows CPS to support for an indefinite time the output short circuit.

In case of loads that absorb a current greater than the nominal one CPS acts a limitation of the same current. This limitation is visualized by means of the led **LIMIT OUTX** at the voice **CURRENT**.

During the limitation of current the output sinusoidal wave is no more guaranteed and so it will show an harmonic distortion.

Not linear loads with an overload factor smaller than the nominal one but with a very high crest factor current allow the current defence.

Notice that, if someone is working with limitation current CPS keeps the effective value of the output voltage equal to the set value until the led concerning the voltage alarm switches on (see at **VOLTAGE ALARM** section).

This kind of alarm does not cause any block to CPS.

### 2.8.4 VOLTAGE ALARM

CPS implements a control loop of the effective value of the output voltage either in the c 2 wires or in the 4 wires configurations rather than a control of the output distortion.

If the output voltage is not equal to the set arranged a signal of error is displayed by means of the led **MAX OUTX** in the **VOLTAGE** section.

This kind of alarm does not cause any block to CPS.

## 3. REMOTE CONTROL

### 3.1 PROGRAMS OF STANDARD CONTROL

The CPS can be controlled on serial RS232 with a definite protocol.  
There are two DOS software for the control of CPS.

DEMO.exe     program demo for the global control of the machine

- Connect the CPS to the PC with a serial cable
- Run demo
- Select the serial port.
- Select the comand "Inizializzazione TPS"
- Select Remote control
- Select desired mode

TPS\_ENG     Dos program to execute sequence of comand (to realize a little sequential program)  
The commands are described in the floppy disk.



### 3.2 SERIAL CABLE

The serial cable is standard

<u>WIRING CONNESSION 1</u>		
PC		CPS
DB9 Female		DB9 Male
2	↔	2
3	↔	3
5	↔	5

<u>WIRING CONNESSION 2</u>		
PC		CPS
DB25 Female		DB9 Male
2	↔	2
3	↔	3
7	↔	5

## 4. Connection of the CPS to the LINE

The output of CPS is not isolated respect to the GROUND so **NO ONE OF THE PHASES IN OUTPUT CAN BE CONNECTED TO THE GROUND**. The installer off generator CPS is required to strictly observe the regulations of the appropriate field installation

### 4.1 Differential PROTECTIONS

Down there is the list of the differential PROTECTIONS for the machine

*Input Line -> Differential switch **A type** 1-phase/3-phase<sup>1</sup> of 30mA*

### 4.2 Magneto-thermic PROTECTIONS

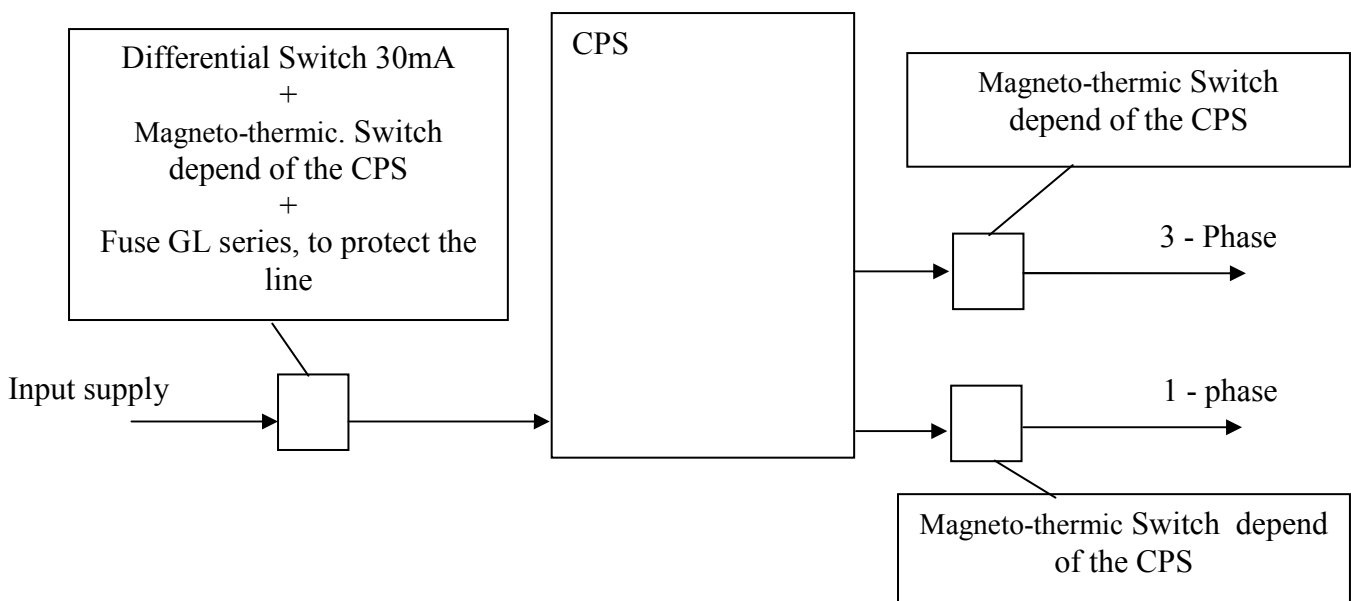
The Magneto-thermic Protections protect the input line to short-circuits current of forward circuit. Generally depend of the load, the section and length of the cable used for power connection. For the planning of the magneto-thermic switching refer to the Table of input and output current.

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<sup>1</sup> Depend of the supply type



### 4.3 Protections Wiring Diagram



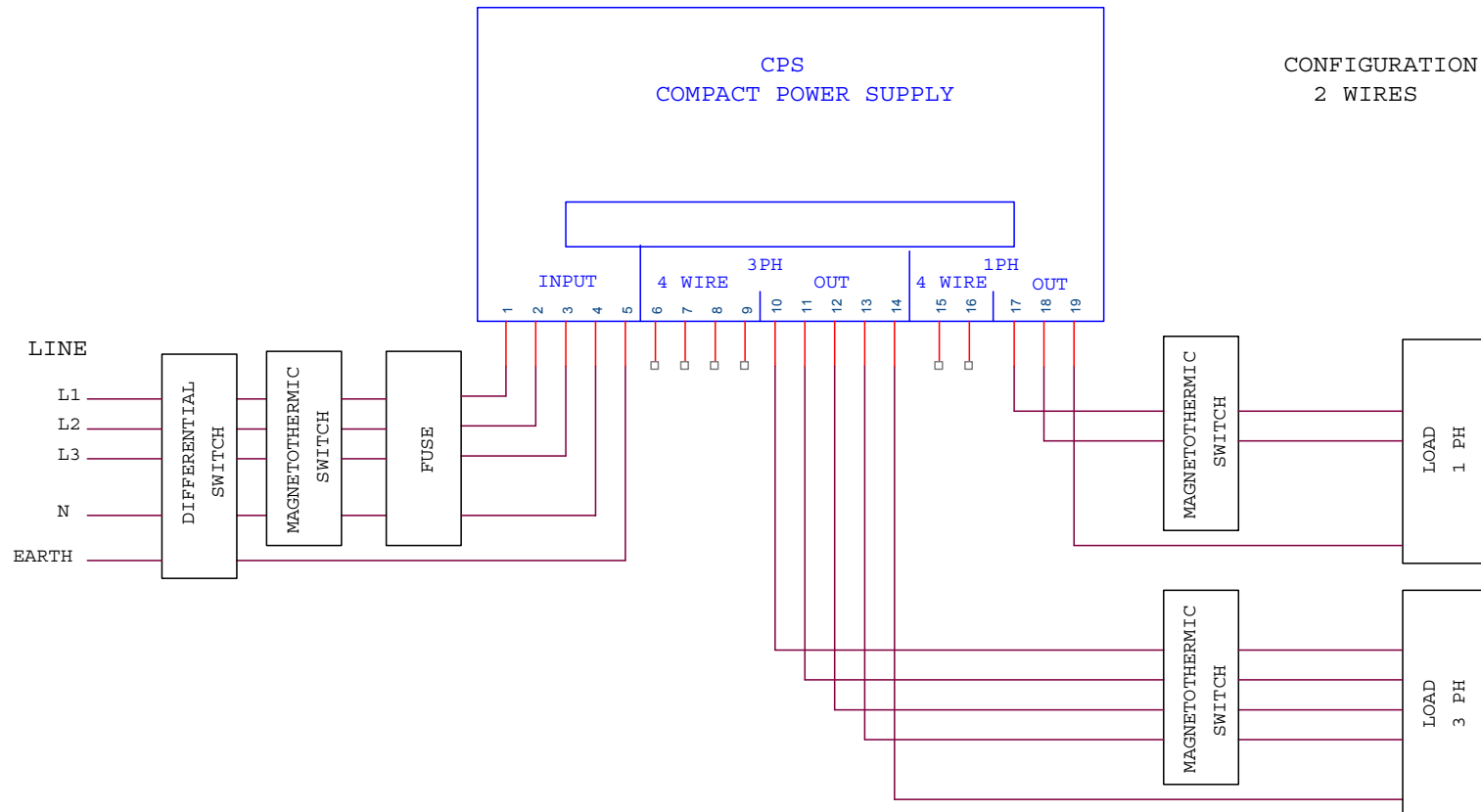
*Note 1: for the choice of protection, the output of CPS is*

- 300V<sub>eff</sub> maximum Phase to N
- 520V<sub>eff</sub> maximum Phase to phase

*Note 2: Outputs of the CPS are three autotransformers with star connection, the center of star is the Neutral of input.*



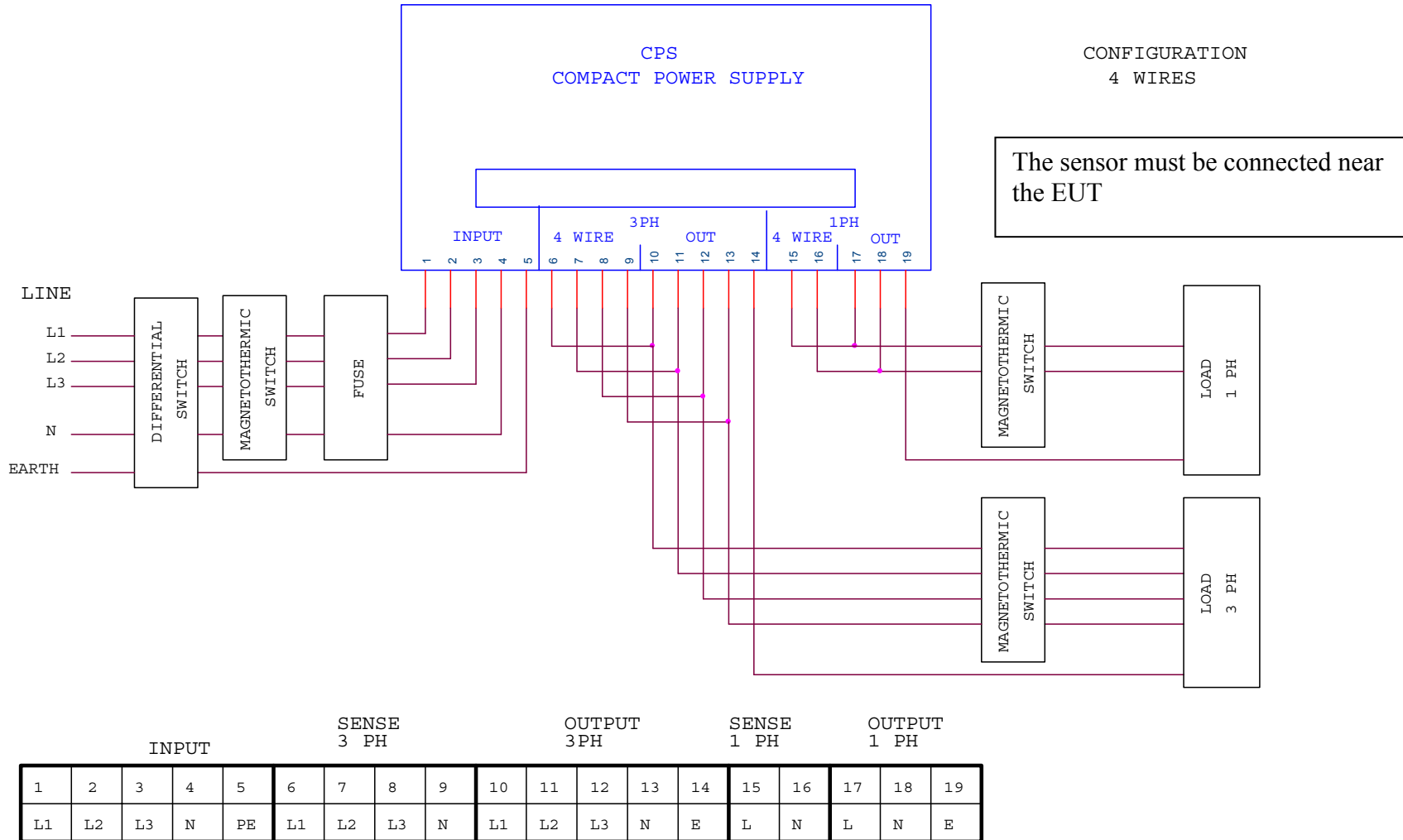
#### 4.4 Wiring diagram of 2 wire configuration



INPUT					SENSE 3 PH				OUTPUT 3 PH				SENSE 1 PH		OUTPUT 1 PH			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
L1	L2	L3	N	PE	L1	L2	L3	N	L1	L2	L3	N	E	L	N	L	N	E

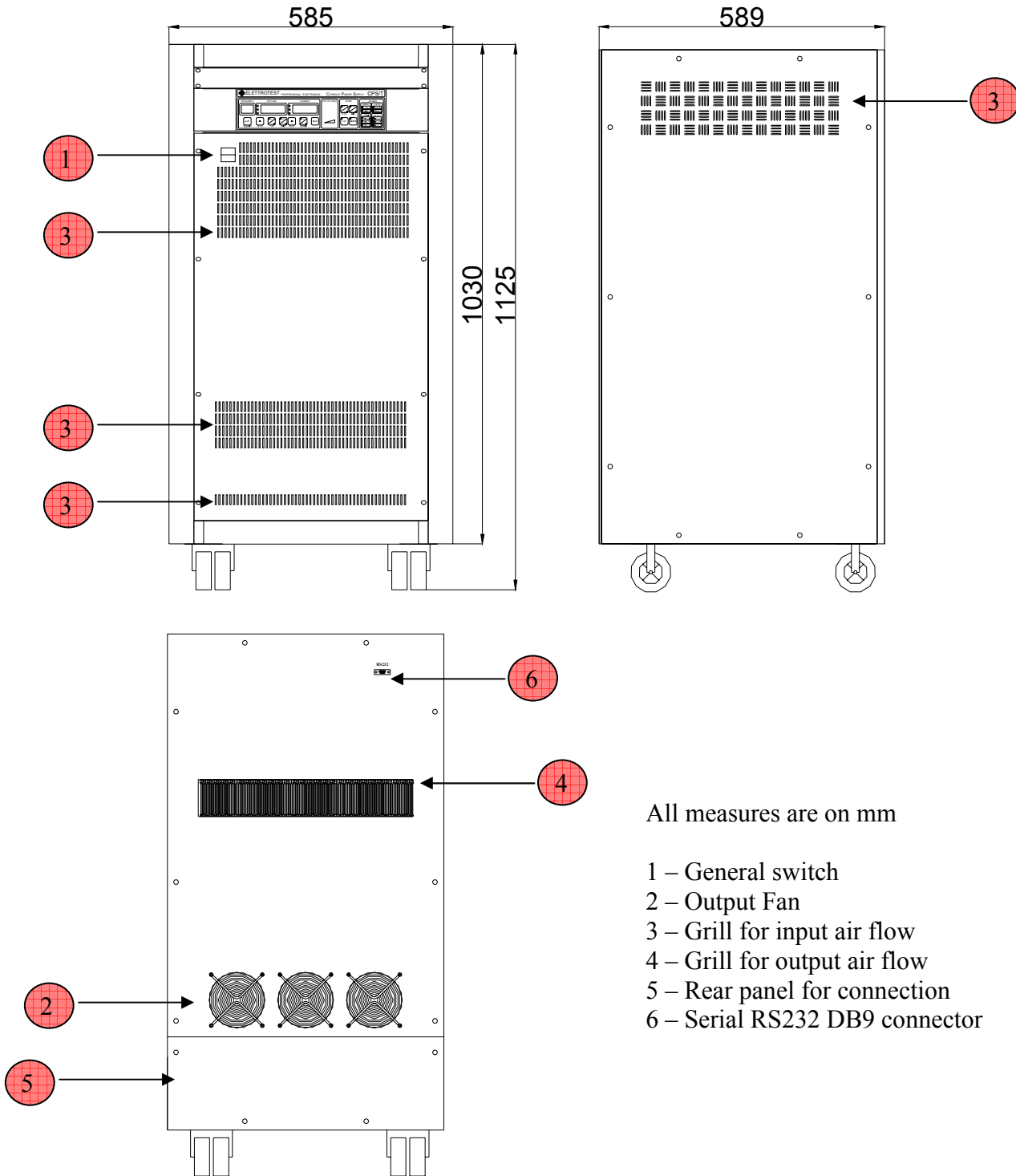


### 4.5 Wiring diagram of 4 wire configuration



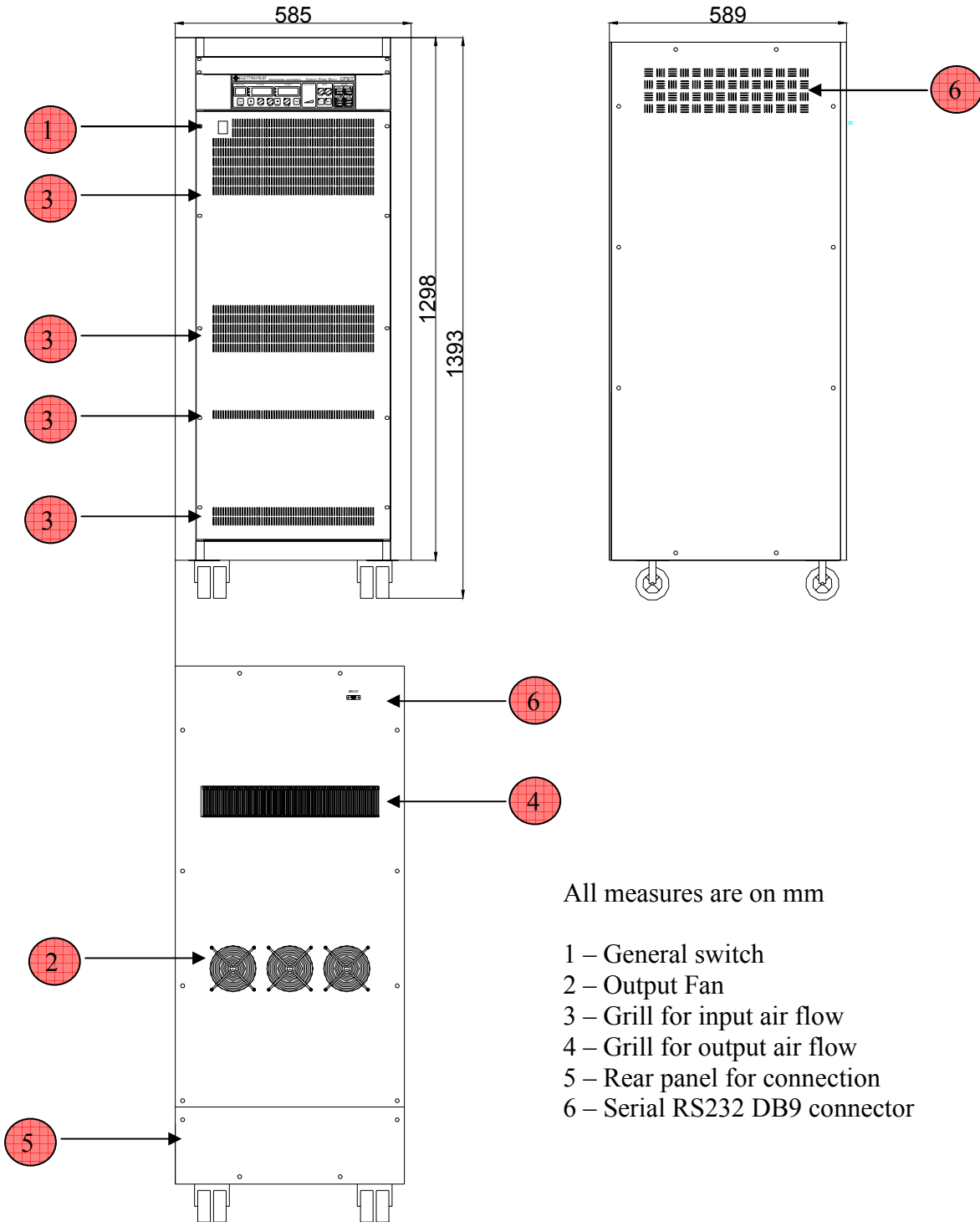
## 5. MECHANICAL DRAWING

### CPS/T 10K 8K16S





### CPS/T 20K 15K30S CPS/T 40K 30K60S

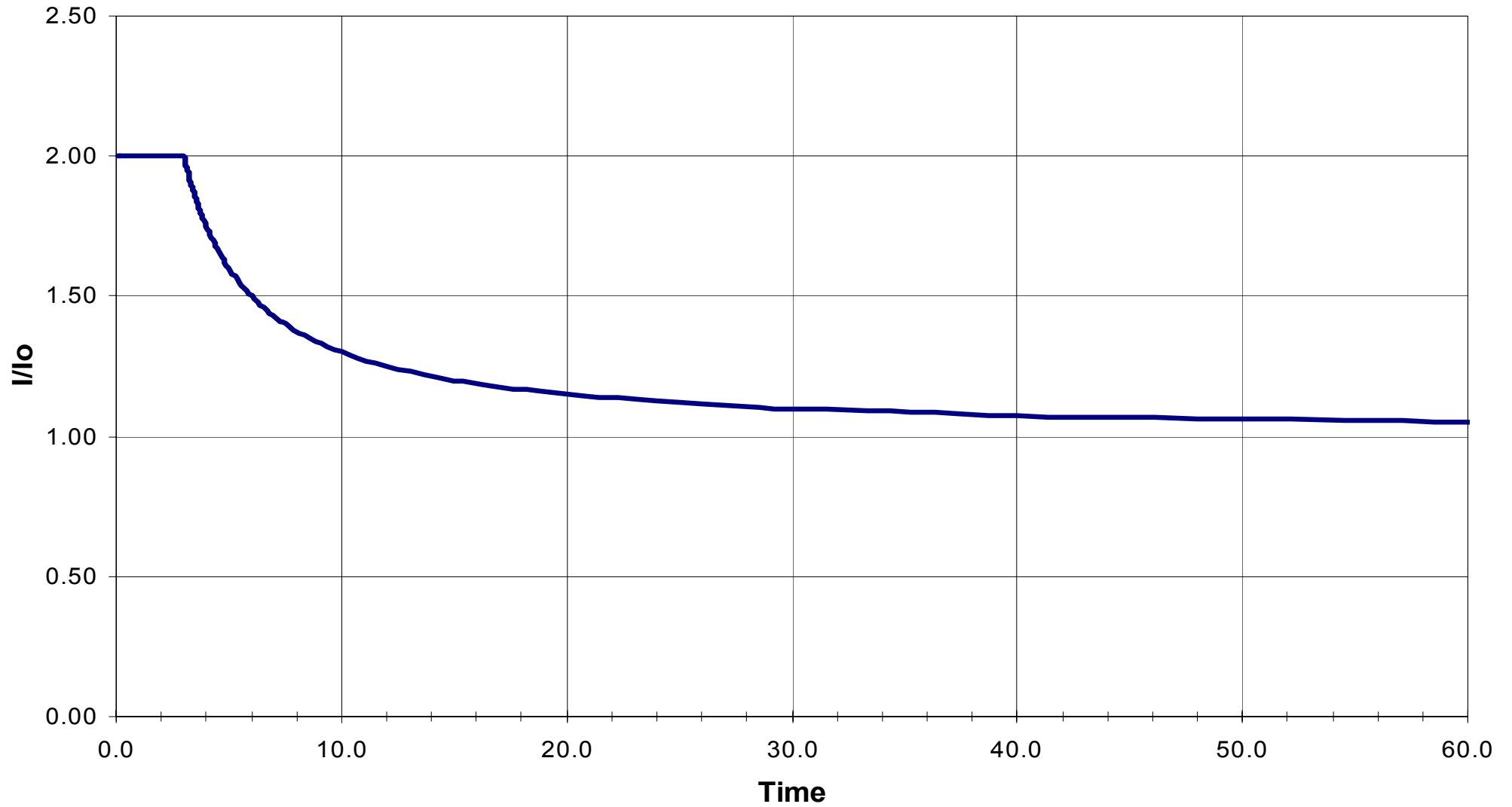


All measures are on mm

- 1 – General switch
- 2 – Output Fan
- 3 – Grill for input air flow
- 4 – Grill for output air flow
- 5 – Rear panel for connection
- 6 – Serial RS232 DB9 connector



### INRUSH LIMIT CURRENT





## Revision Table

Rev	Date	Descriptions
0.1	24/03/11	- Change of weight and size
0.0	30/04/09	- First Revision