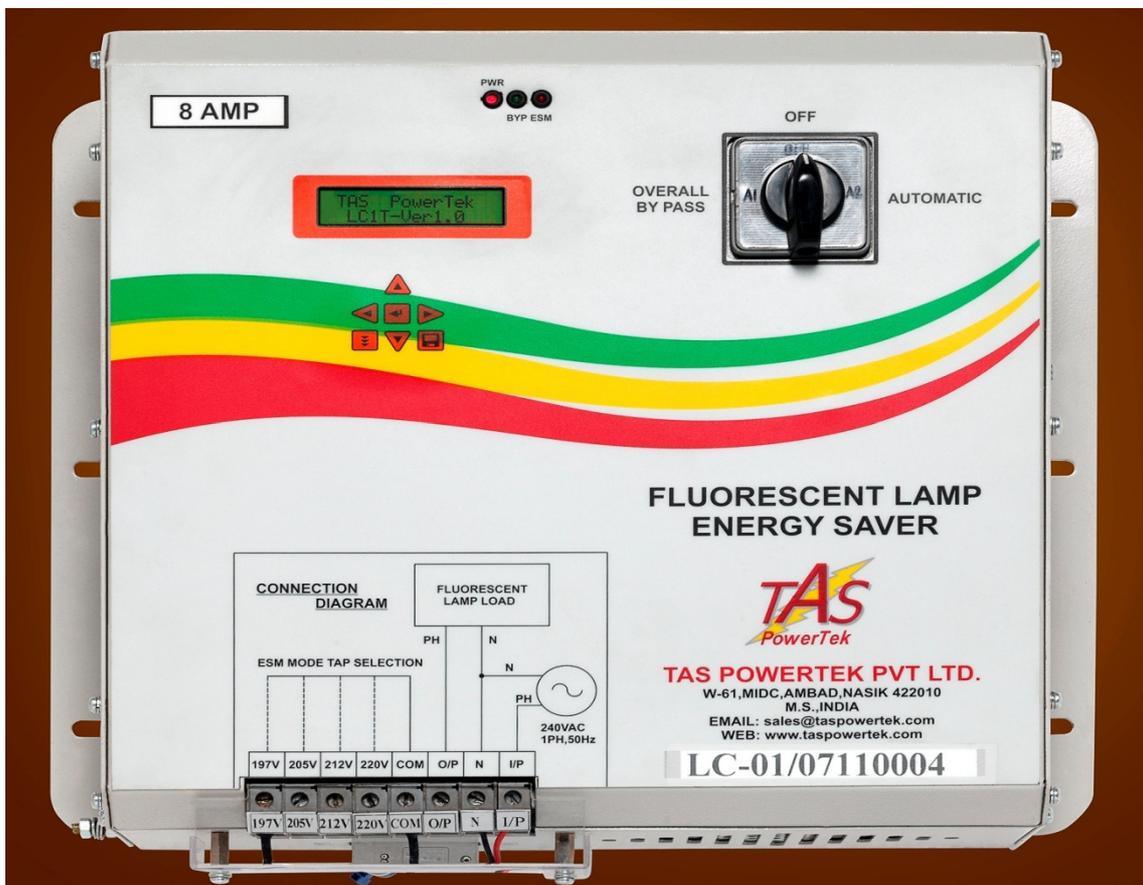




# USER MANUAL

## (LC01T)

### LIGHTING CONTROL ENERGY SAVER FOR FLUORESCENT LAMPS.



Manual  
Version 1.0, NOV. 2011

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**NOTE**

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired or should particular problems arise which are not covered sufficiently for the purchasers purposes, the matter should be referred to our factory.

The contents of this instruction Manual shall not become part of or modify any prior or existing agreement or relationship. Any statements contained herein do not create new warranties or modify the existing warranty.

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**CAUTIONS:**

1. 240 voltage !

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## Features :

- ❖ The Lighting Controller unit offers a complete solution for Fluorescent Lighting applications with energy saving and PF improvement.
- ❖ The unit comprises of controller , a high efficiency voltage reduction unit, **Smart switching unit** and PF improvement unit .
- ❖ Energy Saving is achieved by the advanced design and intelligent logic of the controller .

They come equipped with following outstanding features :

- 1) **ON/OFF Controls of Lamps** : Fix time as per preset in controller.
- 2) **Energy Saving** : By reducing the voltage applied to lamps during non peak hours (programmable) and during over voltage condition.
- 3) **Flicker Free Operation** : Using fast and highly advanced high speed thyristorised switching logic called **“Gapless Changeover”**.
- 4) **PF Improvement** : By adding capacitor to compensate for inductive VAR for approximately 50 % of load.
- 5) **Manual Operation** : For “Out of Schedule” operation and testing of unit during commissioning.
- 6) **Easy Installation** : Wall mounting and only three connection --  
I/P, O/P And N.
- 7) **Response To Load Variation** – It gives response to load variation in Energy Saving Mode. If new load is switched-on, then unit comes to bypass mode from ESM mode so lamps are on at full voltage (The levels are user settable).
- 8) Powder Coated cabinet- RAL 7035. (ie- Siemens gray color).
- 9) Complete unit bypass switch for operational redundancy.

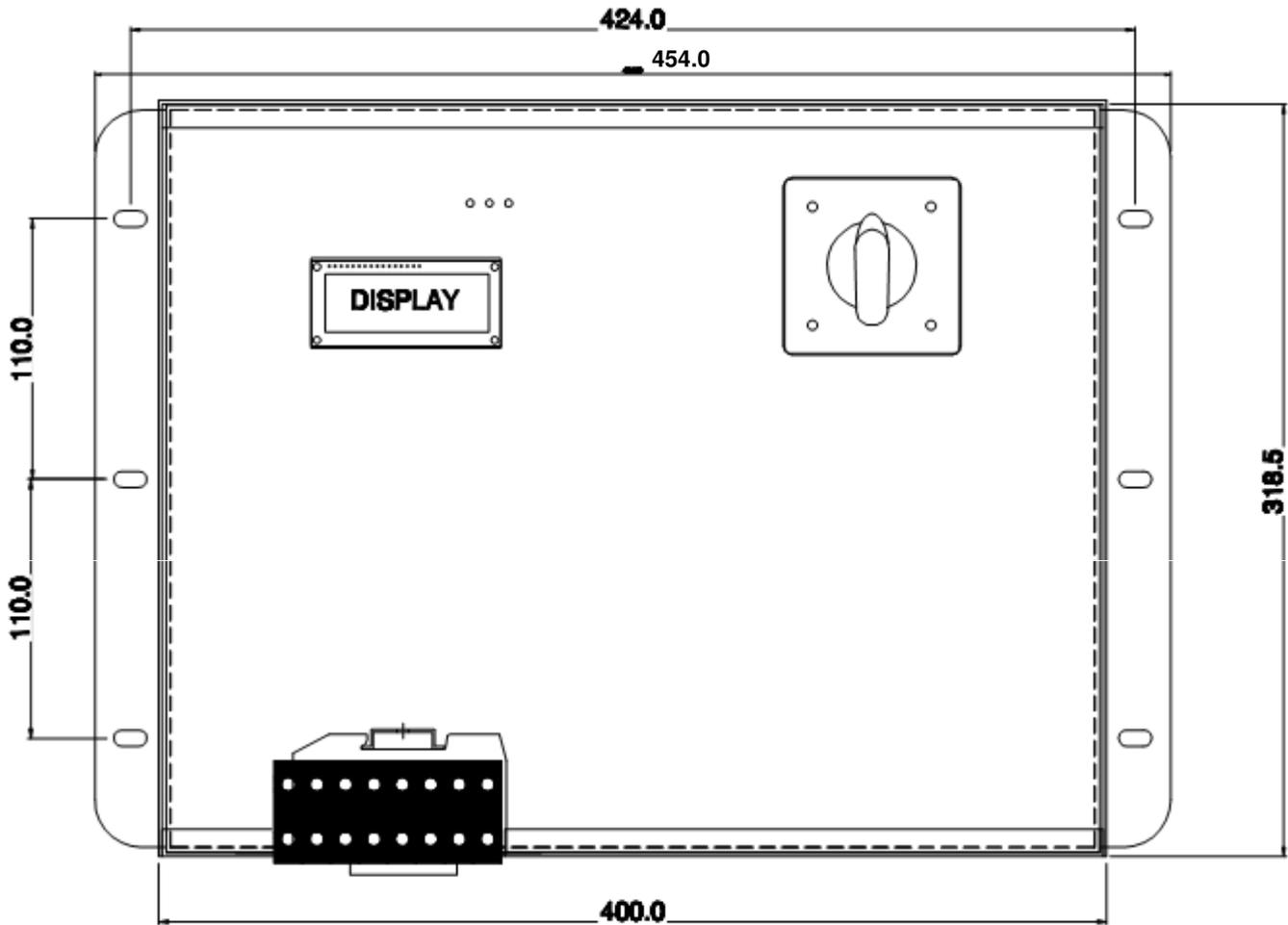
## **User Benefits :**

- Reduction in energy consumption up to 15 % to 40% ( 28% typical ) in energy saving mode. Reduction in units consumed by the lamps assembly and hence reduction in electricity bill.
  
- Reduction in power line losses because of reduction of line current due to improved power factor. Even better benefits as per supply company given PF limit rules.
  
- Enhanced life of lamps: Because of lower peak voltage across the lamps and cooler operation of lamps due to lower power.

# MECHANICAL DIMENSION

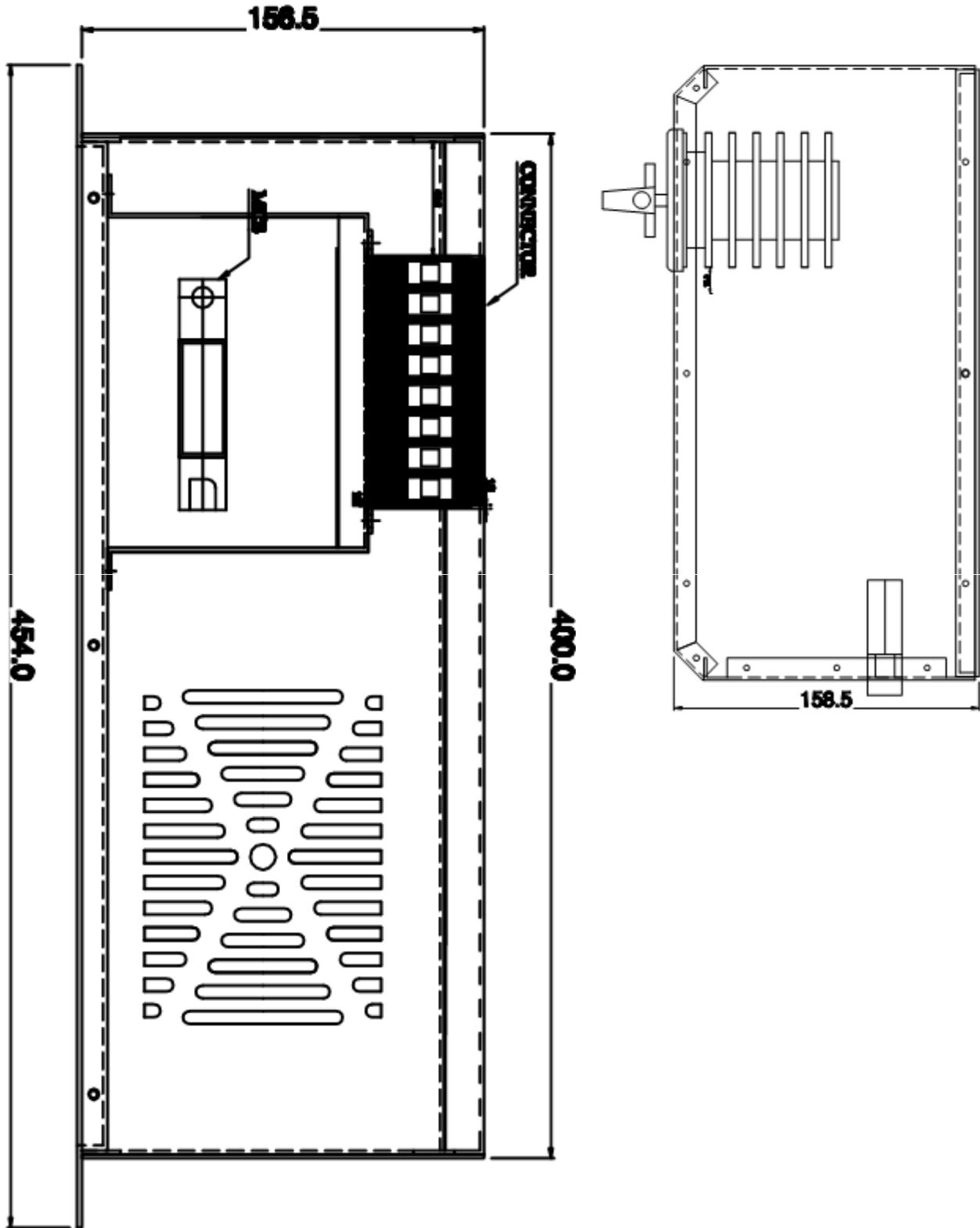
All Dimensions given are in mm.

## A) FRONT VIEW : ( For 18 & 24 Amps Unit )



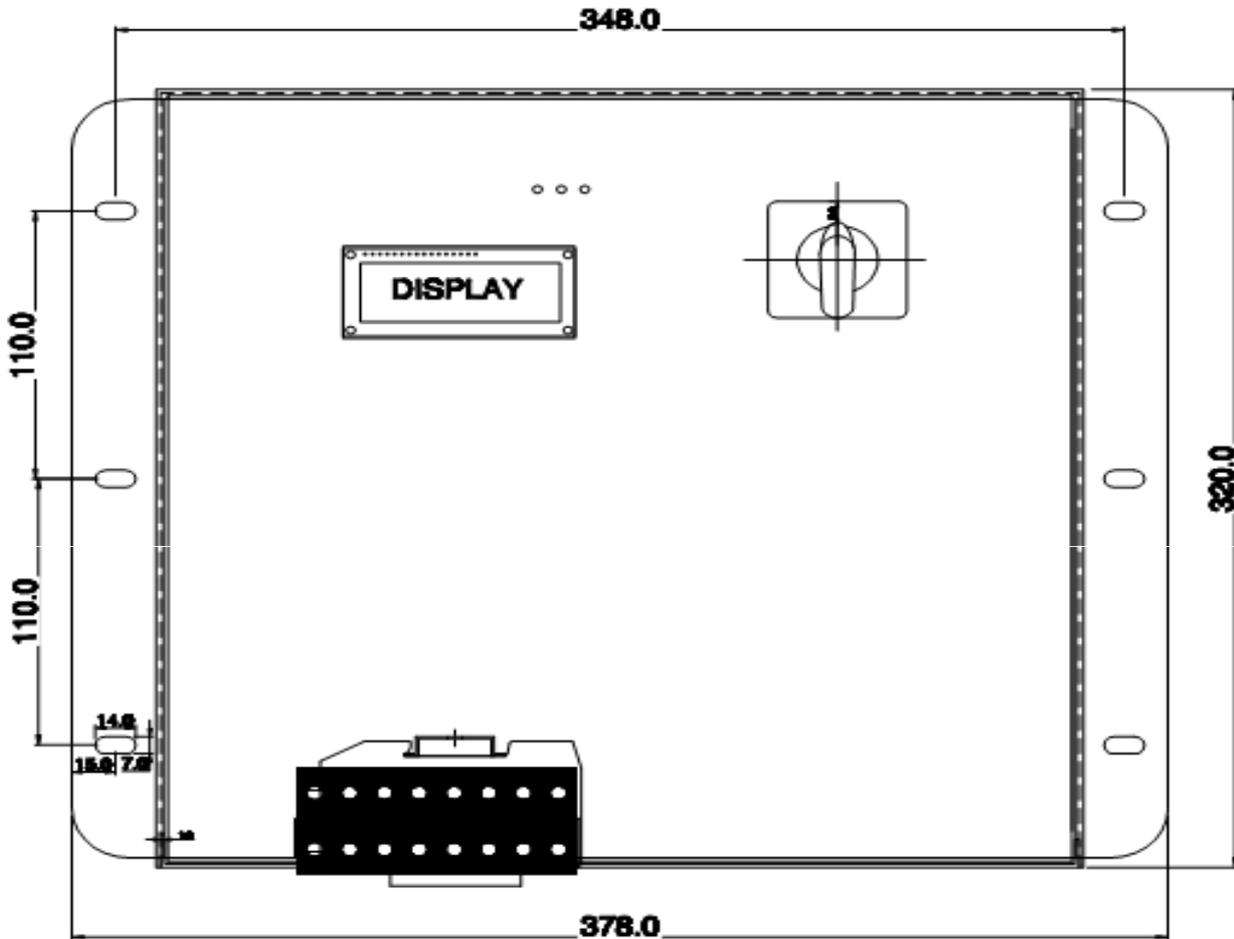
UNIT TYPE	APPROX .WEIGHT
18 AMP	20 Kgs
24 AMP	23 Kgs

### SIDE VIEW :



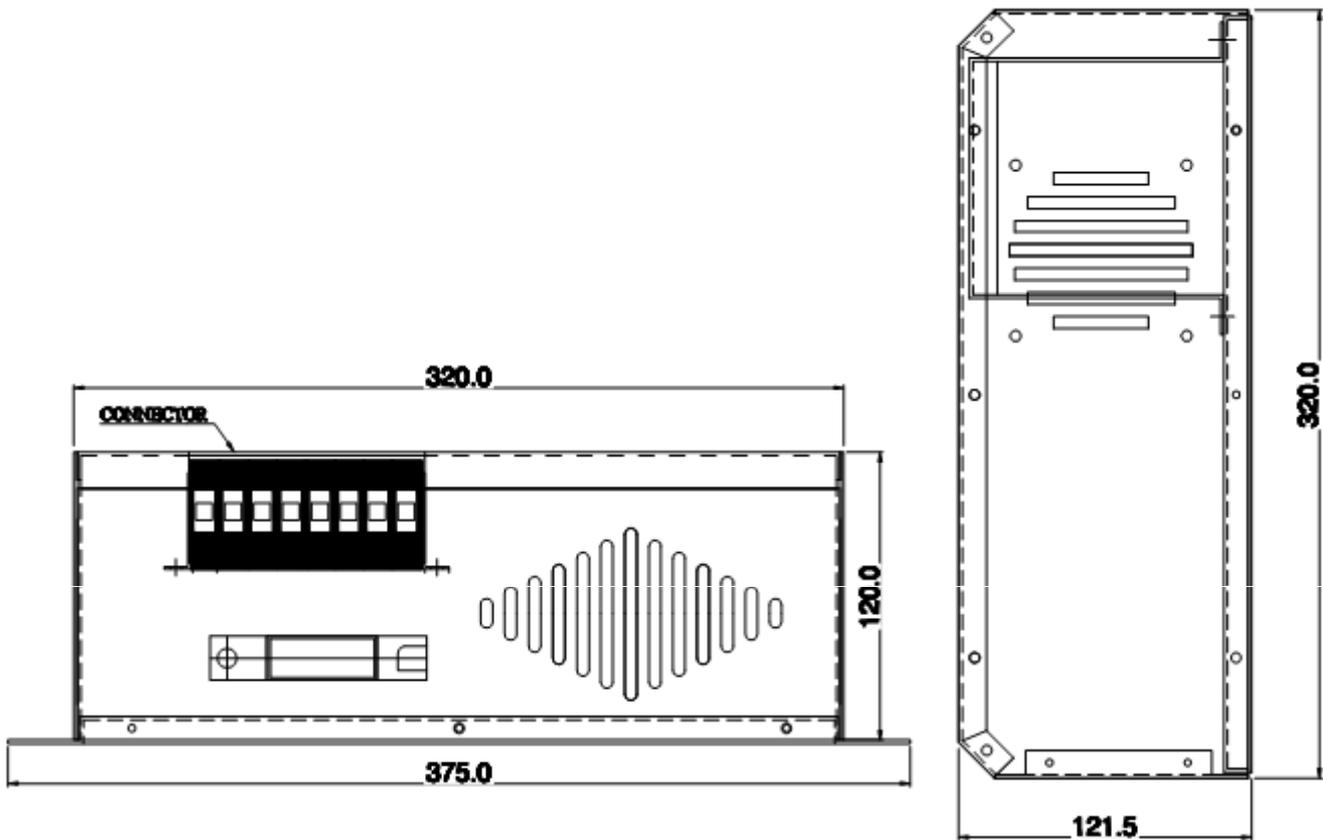
# MECHANICAL DIMENSION

## B) FRONT VIEW : ( For 4 , 8 ,12 Amps Unit )

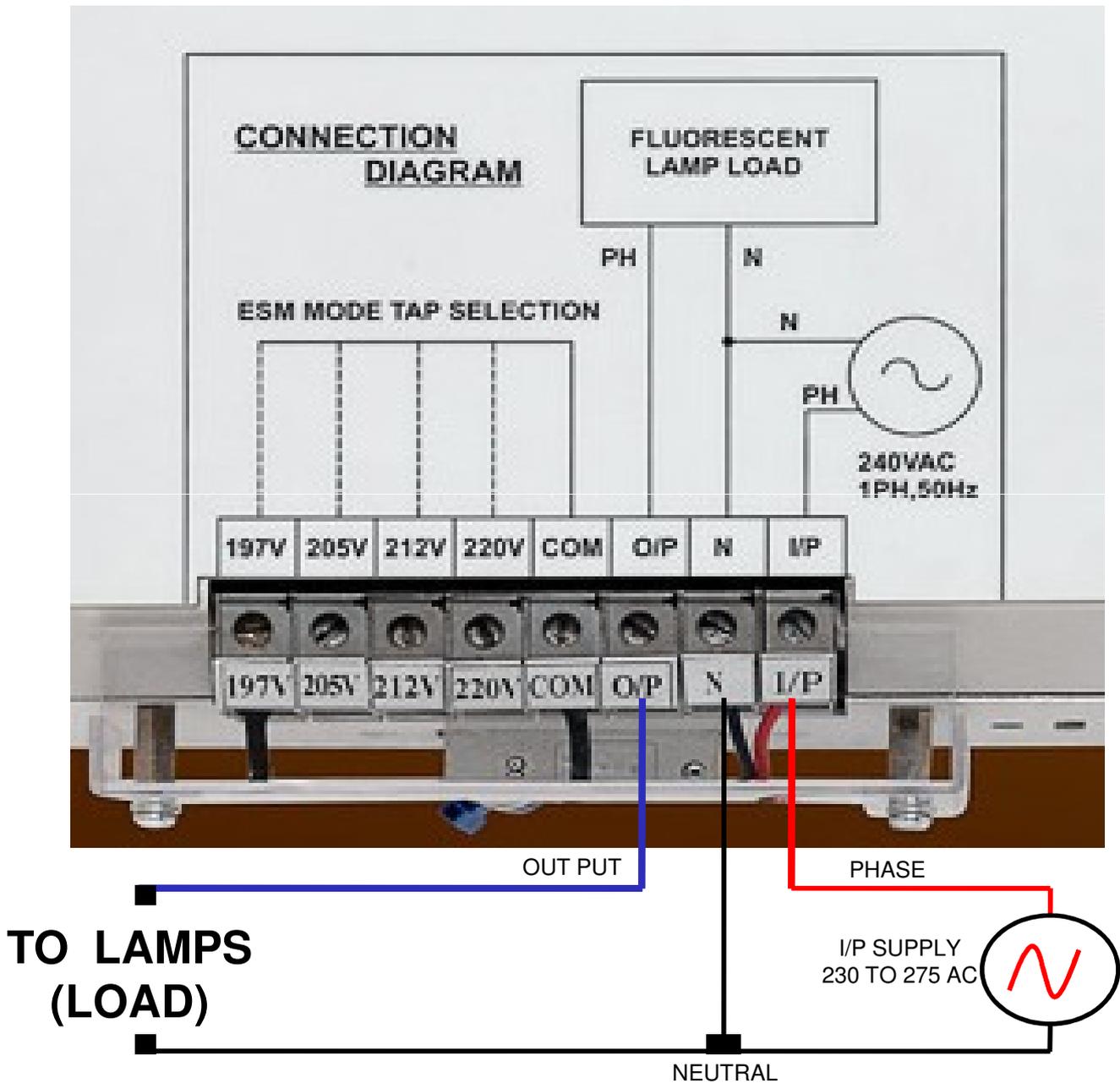


UNIT TYPE	APPROX .WEIGHT
4 AMP	12 Kgs
8 AMP	14 Kgs
12 AMP	15 Kgs

**Side View :**

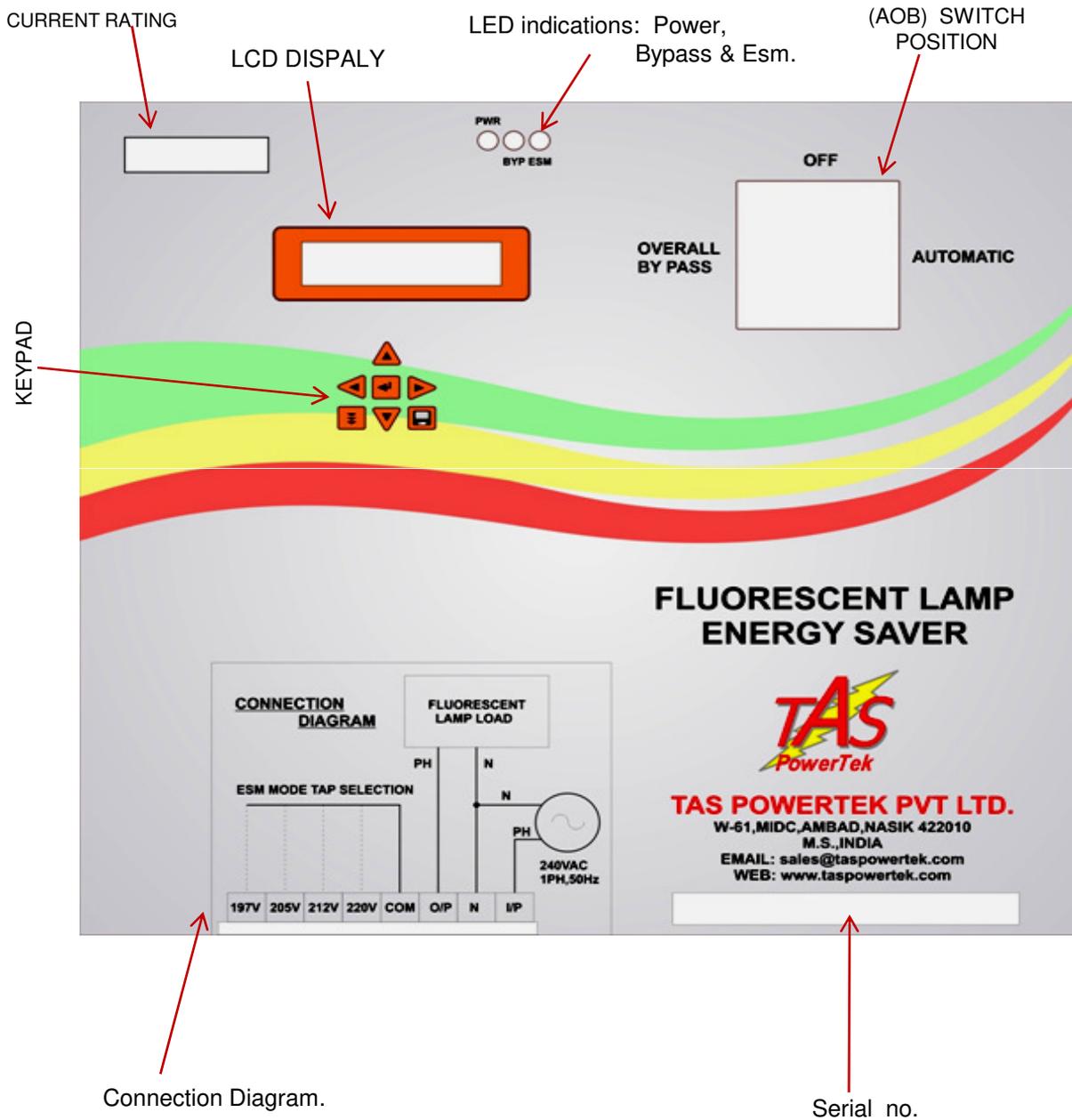


# Typical wiring diagram :



# Front fascia

(Various Component / Display Information)



## Front fascia :

Example of a typical LCD display screen is show below:

V=000.0 I=000.0A
Vo=000 B Y P M OK

Meaning of this screen contents:

**First** line of display indicates the input Voltage value, output Current, **Second** line output voltage(V0), state of system, mode of operation and fault / OK status:

“V=000.0” indicates the Input Voltage of the system.

“ I=000.0 A” indicates Output Current of the system.

“Vo=000” indicates Output voltage of the system.

“BYP” indicates the state of the system

i.e. BYP-> BYPASS

ESM-> ENERGY SAVING MODE

OFF-> OUTPUT VOLTAGE ZERO

“A” or “M” indicates the Auto and Manual mode of operation respectively.

“OK” (blinking) indicates status of the system, healthy or faulty.

Last two characters on second line represent one of the following status:

VA	Measurement voltage is absent
OK	Controller status is okay.
OL	Over Load
UV	Under voltage
OV	Over voltage

## LED Indication :

Above the LCD display there are 3 LED whose notations are as given below:

Symbol LED Description	
	POWER ON state.
	BYPASS state.
	ESM state

## Front fascia – **Keyboard**

Keyboard with soft touch keys are provided on the front fascia of the controller. The various keys are:



UP key. Used to scroll up the menu screen; Increment values when entering numbers.



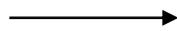
DOWN key. Used to scroll down the menu screen; Decrement values when entering numbers.



RIGHT key. Used to shift the cursor to right;



LEFT key. Used to shift the cursor to left;



ENTER key. Used for entering a sub-menu or for setting up values.

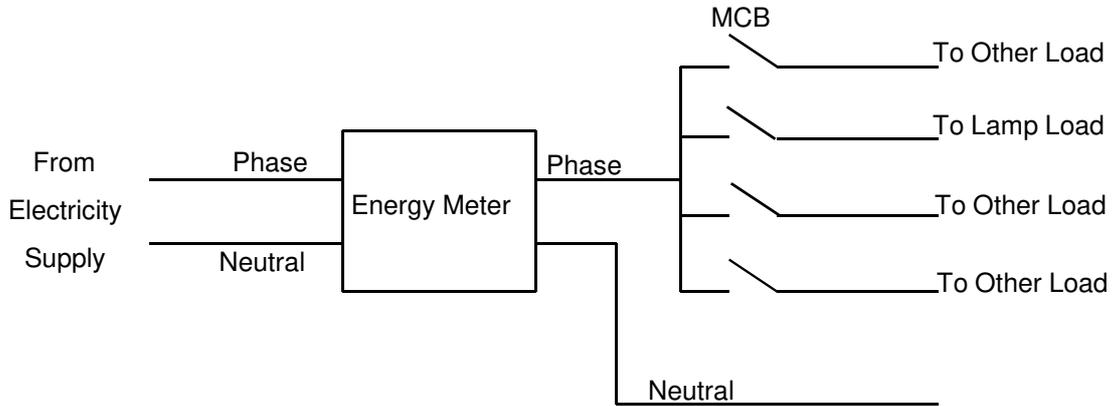


PROGRAM key. Used for selecting modes of operation and editing of parameters

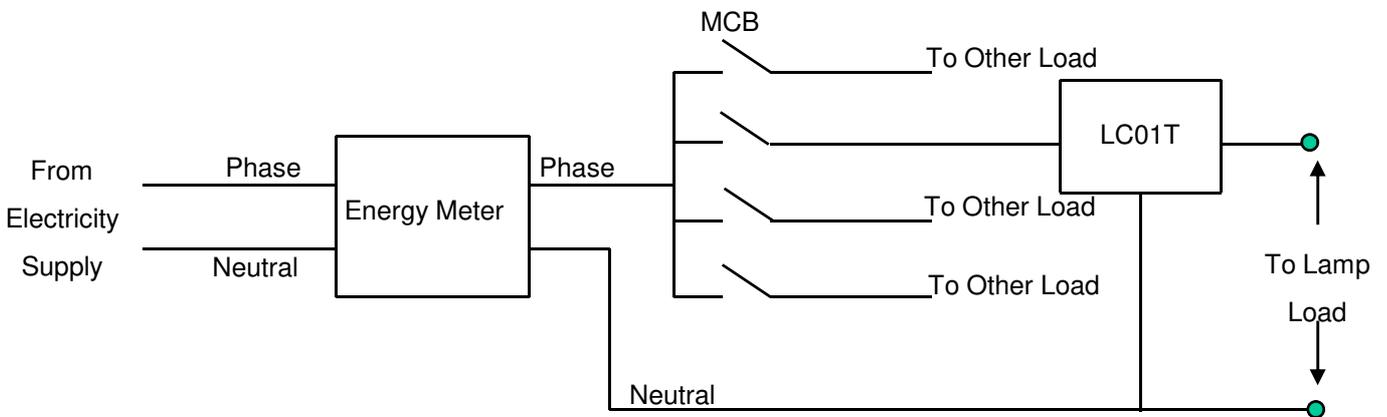


MEMORY key. Used to save all changes made in Edit Parameters menu.

## Installation Guideline



Basic Connection Diagram.



New Connection Diagram.

Above is showing where LC01T has to install. LC01T is very easy to install as it has only three connections. Please follow the steps given on next page

**Step 1 :** Make the connection as shown in wiring diagram. Select the tap to correct position . The tap selection voltage values are given with input voltage condition as 240 VAC depending upon the lamps wattage/Voltage / Lux characteristic (As given in annexure –A at last Page.)

Select the correct tap for energy saving option.

**Eg.→** As given in annexure -A for the “metal halide lamp” marked by red arrow on page no 30. Energy saving is 30% at 195 Volts with respect to 240 Volts. Please refer the chart.

Here ,

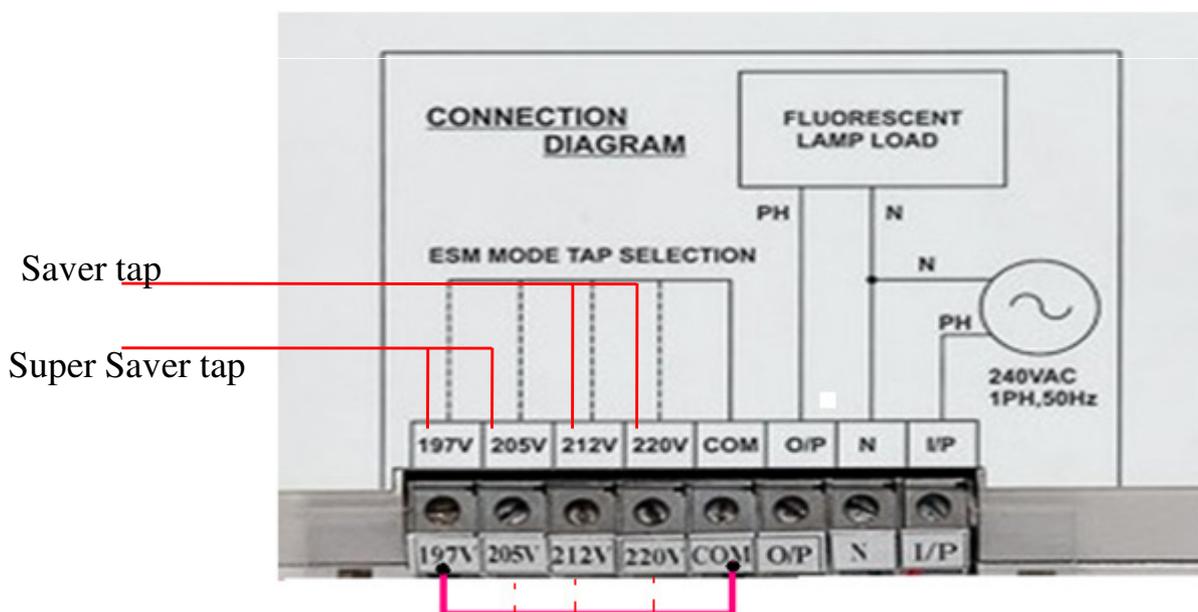
$$195/240 * 100 = 81.25 \%$$

( Use this value for saver / supersaver tap ratio you have to select)

voltage is reduced by about 19 % of rated (240 volts) and energy is saved by about 30% due to reduction in voltage.

So select the tap 197 volts given on the terminal .short the 197 V tap and COM

As shown in below diagram.



**Step 2 :** Keep the AOB switch to overall bypass position. Switch the MCB to ON position. Turn on mains supply and check that all lamps load are in on condition.

**Step 3 :** Change the AOB switch to 'Auto' position. Switch the MCB to ON position. Turn on mains supply and check that LCD is ON and showing Voltage ,current and other parameters. Also check that 'Power On' LED is on.

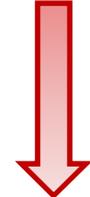
**Step 4 :** Do the setting of various parameters as per requirement. Schedule, Lamp heating time, Load variation etc. Edit the Fix on/ Fix off, ESM on /ESM off time save them and check unit is operating as per schedule.

**Step 5 :** After the complete setting put unit in Manual mode and check changeover of BYP >ESM>OFF. After off unit goes to BYP mode immediately but not going to ESM mode till lamp heating time is not completed.

Note : - Please insure that there should be at least 15cm free space all around the panel for air ventilation .

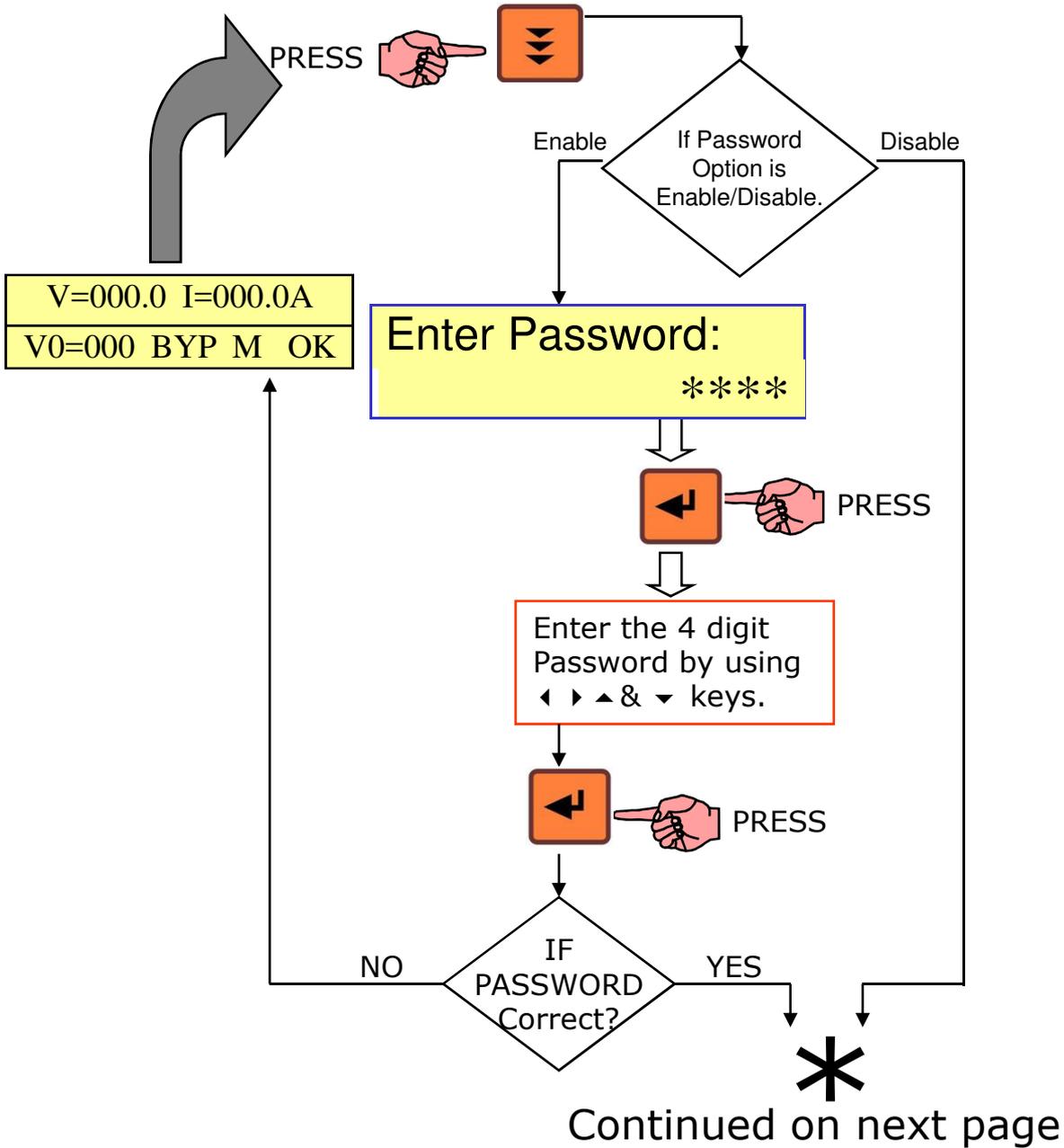
## Display of various parameters

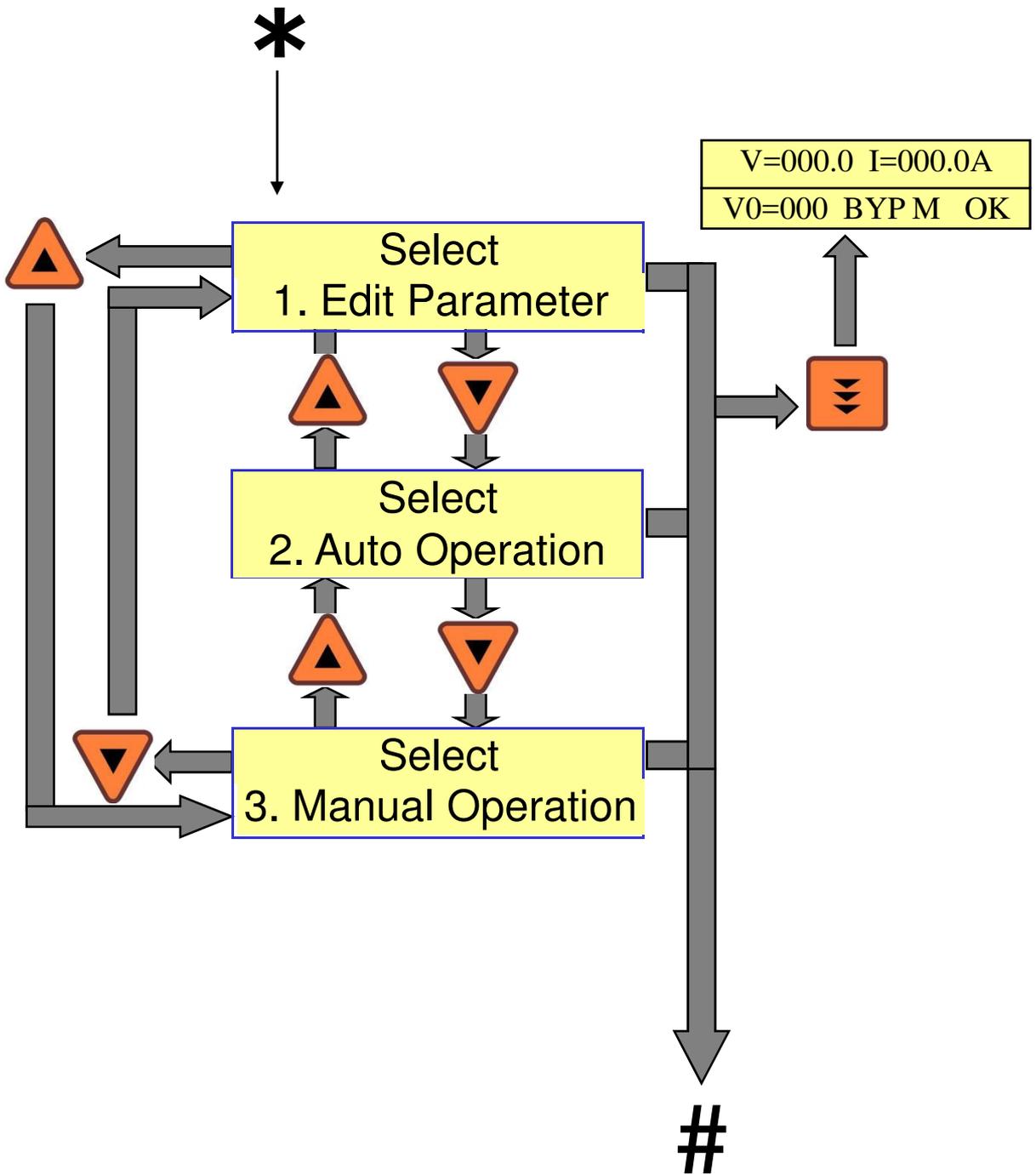
Values of various parameters can be viewed by using UP / DN keys & then pressing ENT key. To exit a sub-menu, press MODE.

	<p>V=000.0 I=000.0A Vo=000 OFF M OK</p>	<p>V = Input Voltage' Vo = Output Voltage I = I/P Current ESM / BYP / OFF - Lamp Load status M =Manual/ A =Auto- Working Mode of Unit OK = Fault Display</p>
	<p>SKW=00%= 0.000 KW PF=0.95 KW=0.000</p>	<p>BYP /ESM /BYP - Lamp Load status KW = Load Power. SKW = 00 % Saved KW &amp; its value. PF- PF at LC01T input (-Ve- Capacitive, +Ve - Inductive)</p>
	<p>KVAR=000.0 FREQ KVA=000.0 49.5Hz</p>	<p>KVAR = Reactive Power. KVA = Apparent Power. Hz = Freq (HERTZ)</p>
	<p>KWH=000000400.0 SKWH=000000102.0</p>	<p>KWH = KWH Consumed By Load. SKWH = Saved KWH Due To Energy Saving By LC01T.</p>
	<p>INT-TEMPERATURE 30 DEG C</p>	<p>Internal Temperature of LC01T .</p>
	<p>DATE: 30/11/11 TIME: 13:59:59</p>	<p>Displays time &amp; date.</p>

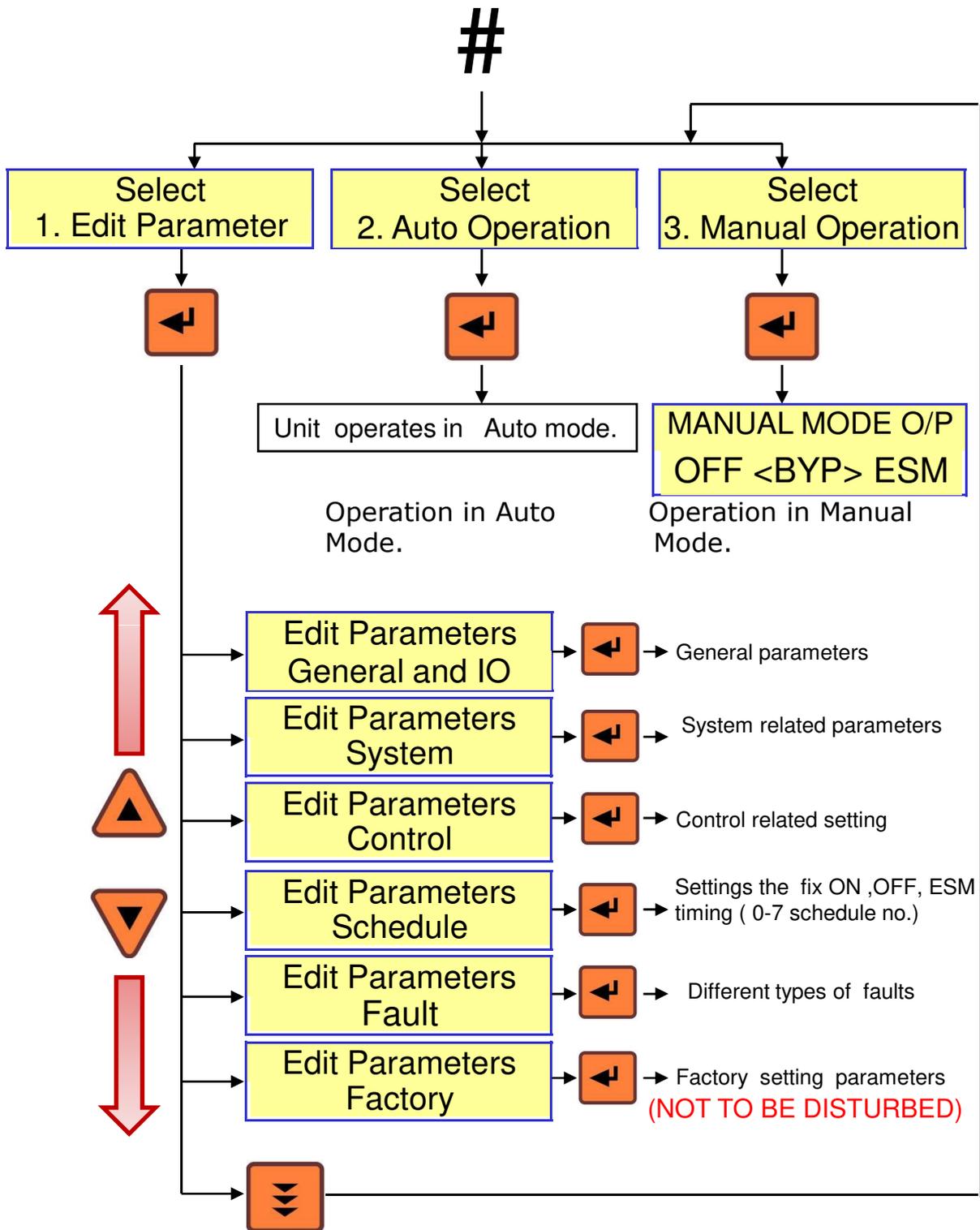
## Method for keyboard / display usage

Flowchart for entering into different modes:





Continued on next page



## Keyboard / Display operations

### Mode Selection:

Press “MODE”

Enter Password (If enabled) by using ◀ ▶ ▲ ▼ keys then press ↵

Now using ▲ ▼ keys, select the Mode of operation:

- **AUTO OPERATION**
- **MANUAL OPERATION**
- **EDIT PARAMETERS**

Then press ↵ to enter the specific mode.

### Auto Operation:

For functioning in automatic mode.

### Manual Operation:

Pressing “ENT” button on this key board in Manual mode. This mode would continue to run till it is purposefully changed or Power down occurs.

This mode is normally used to perform the operations like:

- “Out of Schedule” operation.
- Checking o/p turning ON /OFF /ESM for commissioning/ Testing.

### Edit Parameters:

This mode is used to carry out system settings. In this mode, various system settings can be carried out. To do the same, use the ▲ ▼ keys and select the type of parameters to be edited. The types of parameters that can be edited are:

<b>General &amp; IO</b>	: For General settings.
<b>System</b>	: For System Parameters.
<b>Control</b>	: volt control, lamp heating time settings.
<b>Schedule</b>	: On, Off, ESM time settings.
<b>Fault</b>	: Different types of fault settings.
<b>Factory</b>	: <b>These parameter’s set in factory.</b> <b>(Not Recommended To Be Disturbed)</b>

continued..

After selecting the type, press  to enter the sub-menu of that specific type. The details of these sub-menus for every type is given further.

You can edit all these sub-menu settings by using the , , , , and  keys

To come out of the sub-menu, press  key once.

To store the edited parameters permanently, press “SAVE” when you are either in the Edit Parameters or any sub-menu area.

To come out of EDIT Parameters without saving the changes, press  key again.

Note: In the Edit Parameters area, if no keys are pressed for more than a minute, the default display screen comes on and the changes done till that time are discarded.

## General & IO

<b>Password:</b> Enable : 1	❖ <u>Password:</u> Enable or disable password. Value: 0=Disable, 1=Enable.
<b>Change Password:</b> Enable : 1	❖ <u>Change Password:</u> Set new value of password (4 digit). Factory default password is "0000".
<b>Load Default :</b> No : 0	❖ <u>Load Default:</u> Loads factory set default parameters. 0=No, 1=Yes.
<b>Reset Energy CNTR:</b> No : 0	❖ <u>Reset Energy Counter:</u> Reset all energy counters to zero. 0=No, 1=Yes.
<b>Default Mode:</b> Auto : 0	❖ <u>Default Mode:</u> Here we set the default mode i.e. 0=Auto and 1 = Manual.
<b>Date :</b> 08/11/11	❖ <u>Date:</u> Defines the date setting.
<b>Time :</b> 15:13:54	❖ <u>Time:</u> Defines the time setting.
<b>Set Date/Time :</b> No:0	❖ <u>Set Date/Time :</u> 0-No, 1 -Yes . defining Yes, actually sets the RTC to new values.
<b>Clear NVRAM:</b> No:0	❖ <u>Clear NVRAM:</u> 0 – No, 1 – Yes Defining 'Yes', Clears NVRAM & Enables RTC.

## SYSTEM

<b>Meas. Voltage :</b> : 240	<u>Measured Voltage:</u> Factory set parameter dependent on hardware. (For viewing only. Can not be edited)
<b>Rated Current :</b> Mains : 0000 A	<u>Rated Current:</u> defines the rated current. (For viewing only. Can not be edited)
<b>ESM Tap Select :</b> Super Saver: 0	<u>ESM TAP Select:</u> 0- Super Saver Tap, 1-Saver Tap Defines the tap of auto transformer is selected.
<b>Saver Tap</b> <b>Ratio : 0.86</b>	<u>Saver Tap Ratio :</u> Defines step down ratio of auto transformer.
<b>Super Saver Tap</b> <b>Ratio : 0.89</b>	<u>Super Saver Tap Ratio :</u> Defines step down ratio of auto transformer

## CONTROL

<p><b>Voltage Control</b> Disable : 0</p>
<p><b>Volt. Control Limit</b> Lower : 220</p>
<p><b>Volt. Control Limit</b> Upper : 230</p>
<p><b>Load Variation</b> Disable : 0</p>
<p><b>Load Variation</b> Percent : 00.9%</p>
<p><b>Lamp Heating</b> Delay : 0010 Sec</p>
<p><b>BYP-ESM Off Check</b> Disable : 0</p>

❖Voltage Control: Enable or disable voltage control within set limits. Value: 0=Disable, 1=Enable.

❖Voltage Control Limits: (Under this ,the unit goes out of ESM to Bypass.) Lower : it can set 000V to 230V.  
– Lamps in BYP below Lower Limit .

❖Voltage Control Limits: (Above this, if the unit is in BYP mode will go to ESM if desired as in schedule.)  
Upper: it can set 220V to 299V. Lamps in ESM above Upper Limit.

❖Load Variation : Disable =0, Enable =1 This feature enables automatic jump to BYP from ESM , If increase in KW load is seen.

❖Load Variation: This parameter is valid if previous load variation 'Enabled'. It defines to load variation % in terms of KW for ESM To BYPASS. It senses % change in KW.  
Percent : 00.1 to 99.9 %

❖Lamp Heating : After lamp turn ON , this time defines it for attaining full intensity of the lamps.  
Delay : 0000 to 6000 seconds.

❖:BYP ESM Off\_CHK : This is added redundancy check feature for "Gapless Changeover". It check if lamps switches off at BYP-ESM change over.

## Schedule

In schedule parameter, we can set the schedule time in 24 hours format. There are 8 different schedule that is Schedule0, schedule1..... Up to schedule7.

Each schedule consist of four event which are as below;

- Fix On (switch on lamp load)
- Fix Off (switch off lamp load)
- ESM On (switch to Energy saving mode)
- ESM Off (switch Off Energy saving mode)

When “ESM Master control” parameter is enabled ,then your “ESM control” parameter setting will be applicable otherwise it will not work.

Sample schedule time table is given for just understanding purpose which is as below:

<b>Different Schedule (08 No.)</b>							
<b>ESM Master Control(Enable/Disable)</b>	<b>Schedule No.</b>	<b>Fix Control (Enable/Disable)</b>	<b>Fix On Time</b>	<b>Fix Off Time</b>	<b>ESM Control (Enable/Disable)</b>	<b>ESM On Time</b>	<b>ESM Off Time</b>
	0	Enable	7:00	12:00	Enable	8:00	11:40
	1	Enable	12:05	17:00	Enable	12:10	16:50
Enable	2	Enable	18:00	23:30	Enable	18:10	23:00
	3	Disable	01:00	01:01	Disable	01:01	01:01
	4	Disable	01:00	01:01	Disable	01:01	01:01
	5	Disable	01:00	01:01	Disable	01:01	01:01
	6	Enable	3:00	06:00	Disable	3:01	4:01
	7	Disable	01:00	01:01	Disable	01:01	01:01

## Schedule

ESM Master Control Disable : 0	❖ <u>ESM Master Control:</u> Disable = 0 ; Enable = 1. Lamps will be ON in ESM only if master is enabled.
Select Schedule No : n	❖ <u>Select</u> Schedule No = 0 . Select the no. of the schedule to be edited. from 0 to 7 no.
Fix[n] Control Disable : 0	❖ <u>Fix Control :</u> Disable = 0 ; Enable = 1 . Enable /Disable `n` schedule no.
Fix[n] On time [00] : 00	❖ <u>Fix[n] On time :</u> Set `On` time of lamps [00] : 00 Hours can set from 00 to 23.
Fix[n] On time 00 : [00]	❖ <u>Fix[n] On time :</u> Set on time of lamps 00 : [00] minutes can set from 00 to 59.
Fix[n] Off time [00] : 00	❖ <u>Fix[n] Off time :</u> Set `Off` time of lamps [00] : 00 Hours can set from 00 to 23.
Fix[n] Off time 00 : [00]	❖ <u>Fix[n] Off time :</u> Set `Off` time of lamps 00 : [00] minutes can set from 00 to 59.
ESM[n] Control Enabled: 0	❖ <u>ESM Control:</u> Disable = 0 ; Enable = 1. Lamps will go in ESM only if ESM control is enabled for this schedule.
ESM [n] On time [00] : 00	❖ <u>ESM[n] On time :</u> Set ESM time of lamps [00] : 00 Hours can set from 00 to 23.
ESM [n] On time 00 : [00]	❖ <u>ESM[n] On time :</u> Set ESM time of lamps 00 : [00] minutes can set from 00 to 59
ESM [n] Off time [00] : 00	❖ <u>ESM[n] Off time :</u> Set ESM time of lamps [00] : 00 Hours can set from 00 to 23.
ESM [n] On time 00 : [00]	❖ <u>ESM[n] Off time :</u> Set ESM time of lamps 00 : [00] minutes can set from 00 to 59

## Fault

Over Voltage flt Disable : 0
Over Voltage Limit :110 %
Over Voltage Resume : 107 %
Under Voltage flt Disable : 0
Under Voltage Limit : 090 %
Under Voltage Resume : 095 %
Over Load flt Disable : 0
Over Load Limit : 130 %
Over Load Reset No : 0
Temperature Fault Disable : 0
Temperature Limit ( ) : 00
Temperature Resume() : 00

For most of the types of faults defined here, the options available are as here under:

**0**=Disable

**1**=Indicate (Display a Fault Message)

**2**=Off Lamps (Switch Off Lamps)

For all the faults, normally two limits are defined. One is Detection Limit and another Resume Limit. Detection Limit if exceeded by the parameter would mean the action as defined by parameter in type of fault (as given here-above). Resume Limit defines the parameter value below which the fault is deactivated.

- Over Voltage: As name suggests, its for Over-Voltage conditions.
- Under Voltage: For Under-Voltage conditions.
- Over Load: If the output current goes more than over load limit then, unit take action as set in 'Over Load Fault' parameter.
- Over Load Reset : If 'Over Load' fault occurs then it will reset only through this fault by saying 'yes' in this parameter. Otherwise action taken on 'over load ' fault will be continue in action.
- Temperature fault : It activates if internal temperature goes beyond set limit

## Factory

Mains Current li Rated li :0008
Load Regulation Ratio : 1.001

These parameters are set in factory

**(Not Recommended To Be Edited Unless By Company Trained Person)**

Rated current can be edited from 0001 to 6500A.

Load regulation ratio can be vary from 1.000 to 1.999

### **Warranty Conditions for TAS's product ranges:**

1)The product/system is warranted against any manufacturing and design defects. Any other defects in the product/system due to wrong handling, transportation damages, usages of product beyond the specified electrical supply conditions, wrong application, wrong working conditions etc are not covered under the warranty clause.

2)TAS Powertek Private Limited will not accept any liabilities, liquidated damages claims due to usage of these equipments. The proper usage of these products/systems would be sole responsibility of the purchaser of these products and TAS would only give the guidelines for the proper usage.

3)Product is warranted against failure of any component as specified in clause no.1 and TAS Powertek Private Limited would be replacing any faulty components free of cost which would be including the cost of the component and the direct engineering services that are involved with the repair of the said product/system.

4)The warranty services offered would be only applicable in the specified territory of our service centers. Any services required outside the specified territory would be on chargeable basis.

5)Some of the products, can only be serviced at our Manufacturing works at Nasik. With such products, the transportation cost of faulty product to and fro Nasik would be to purchaser's account.

6)Normally, the products offered are warranted for a period of **12 months** from the product invoice date or 15 months from the first usage date, whichever is earlier. This is valid unless extended term of warranty is explicitly agreed between TAS and the purchaser.

7)The warranty is applicable is for rectification of the defective product/system and would not be applicable for the entire product/system replacement.

**NOTE:** Panel is designed to work in electrical supply environment without major harmonic distortion. If capacitor current %THD-F (Total Harmonic Distortion) exceeds 8% of the rated current value; the warranty would not be applicable for capacitors and thyristor units for performing untimely protection tripping.

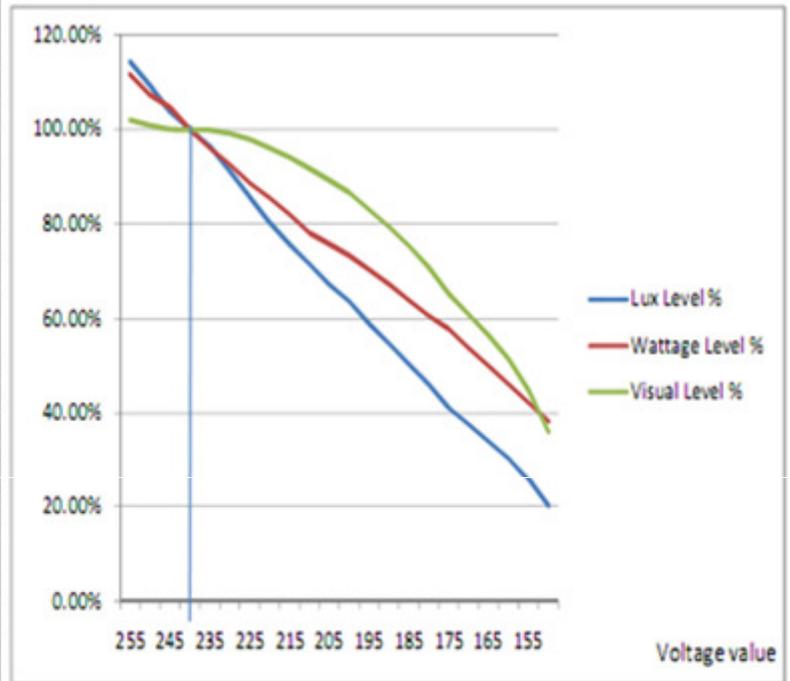
## Important notes

The following applies to all products named in this publication:

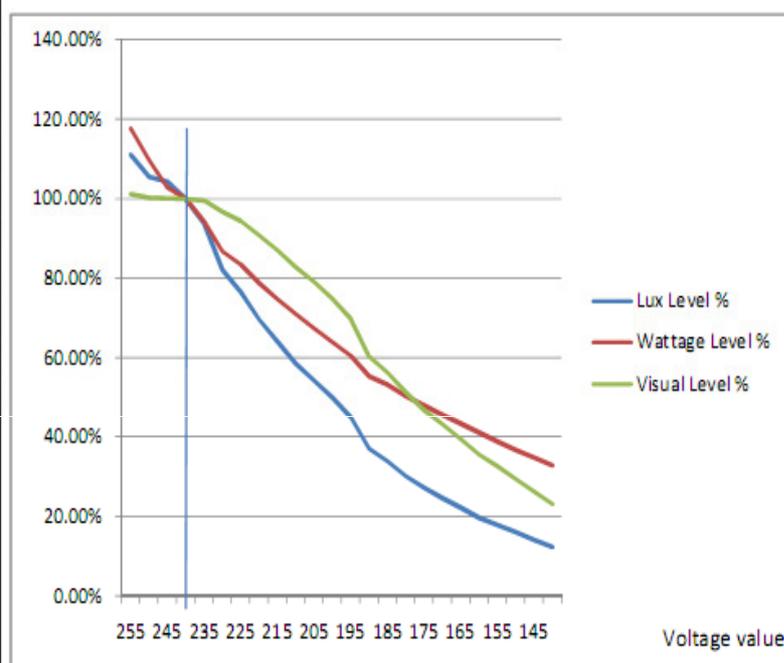
1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule, TAS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an TAS product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet ([www.taspowertek.com](http://www.taspowertek.com)). Should you have any more detailed questions, please contact our factory.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.  
We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available.  
The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.
6. Unless otherwise agreed in individual contracts, **all orders are subject to the current version of the "General Terms of Delivery for Products and Services in the Electrical Industry" published by the German Electrical and Electronics Industry Association (ZVEI)**.
7. The trade name TAS PowerTek further information will be found on the Internet at [www.taspowertek.com](http://www.taspowertek.com)

## **Annexure - A**

METAL HALLIDE LAMP (250W) CHARACTERISTICS					
V	LUX (x100)	W (Watt)	LUX % value	Wattage % value	Visual % value
255	320	317.8	114.29%	111.72%	102.04%
250	308	305.6	109.29%	107.42%	100.86%
245	290	297.8	103.57%	104.69%	100.13%
240	280	284.4	100.00%	100.00%	100.00%
235	270	273.3	96.43%	96.09%	99.87%
230	255	263.3	91.07%	92.58%	99.20%
225	240	252.2	85.71%	88.67%	97.96%
220	225	243.3	80.36%	85.55%	96.14%
215	212	233.3	75.71%	82.03%	94.10%
210	200	222.2	71.43%	78.13%	91.84%
205	188	215.6	67.14%	75.78%	89.20%
200	178	208.9	63.57%	73.44%	86.73%
195	165	200.0	58.93%	70.31%	83.13%
190	153	191.1	54.64%	67.19%	79.43%
185	141	181.7	50.36%	63.87%	75.36%
180	129	172.2	46.07%	60.55%	70.92%
175	115	164.2	41.07%	57.73%	65.27%
170	105	152.8	37.50%	53.71%	60.94%
165	95	142.2	33.93%	50.00%	56.35%
160	85	131.1	30.36%	46.09%	51.50%
155	72	120.0	25.71%	42.19%	44.82%
150	56	108.9	20.00%	38.28%	36.00%

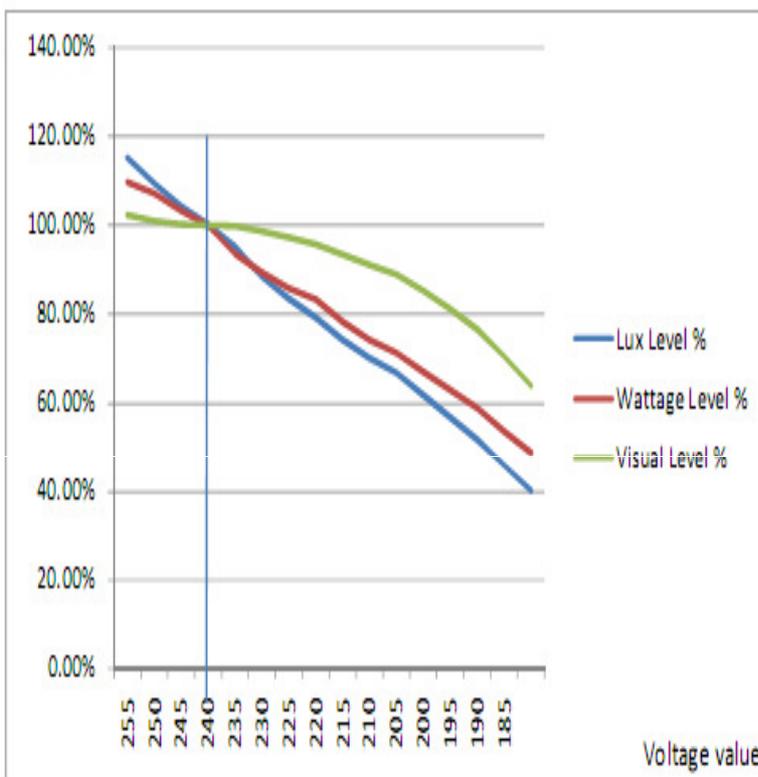


SODIUM VAPOUR LAMP (250W) CHARACTERISTICS					
V	LUX (x100)	W (Watt)	LUX % value	Wattage % value	Visual % value
255	180	343.3	111.11%	117.71%	101.23%
250	171	320.0	105.56%	109.71%	100.31%
245	169	300.0	104.32%	102.86%	100.19%
240	162	291.7	100.00%	100.00%	100.00%
235	152	275.0	93.83%	94.29%	99.62%
230	133	253.3	82.10%	86.86%	96.80%
225	124	243.3	76.54%	83.43%	94.50%
220	113	230.0	69.75%	78.86%	90.85%
215	104	218.3	64.20%	74.86%	87.18%
210	95	207.3	58.64%	71.09%	82.90%
205	88	196.7	54.32%	67.43%	79.13%
200	81	186.7	50.00%	64.00%	75.00%
195	73	176.7	45.06%	60.57%	69.82%
190	60	161.7	37.04%	55.43%	60.36%
185	55	155.3	33.95%	53.26%	56.37%
180	49	146.7	30.25%	50.29%	51.35%
175	44	140.0	27.16%	48.00%	46.94%
170	40	133.3	24.69%	45.71%	43.29%
165	36	126.7	22.22%	43.43%	39.51%
160	32	120.0	19.75%	41.14%	35.60%
155	29	113.3	17.90%	38.86%	32.60%
150	26	107.3	16.05%	36.80%	29.52%
145	23	101.7	14.20%	34.86%	26.38%
140	20	96.0	12.35%	32.91%	23.17%

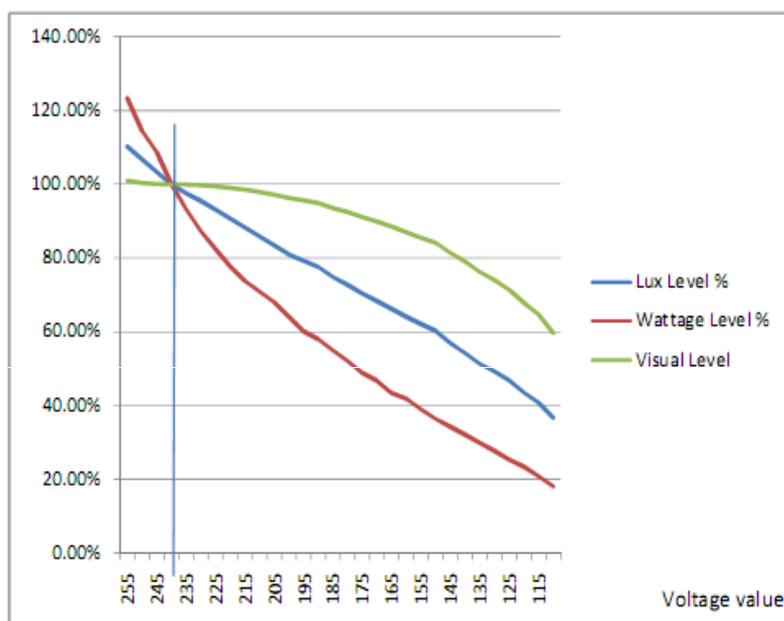


MERCURY VAPOUR LAMP (250W) CHARACTERISTICS

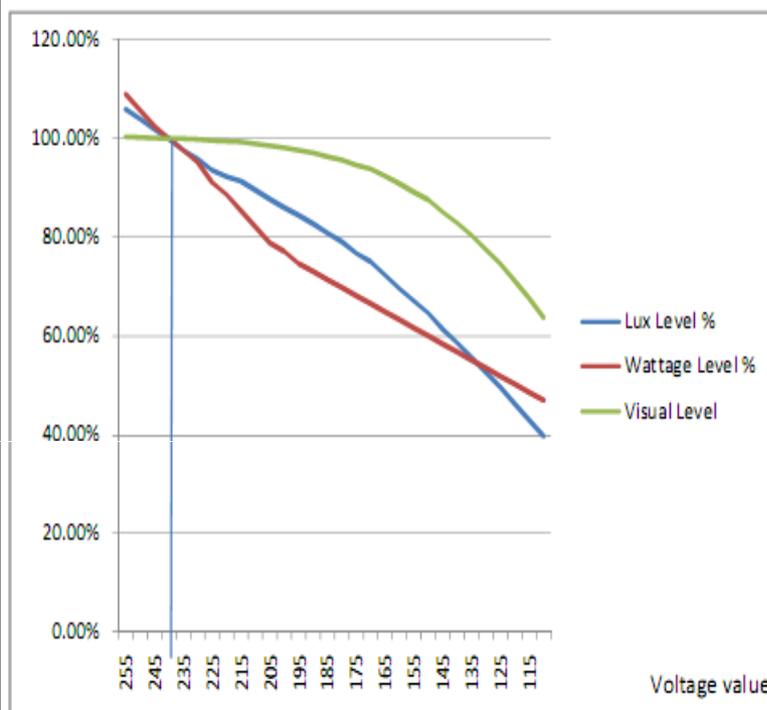
V	LUX (x100)	W (Watt)	LUX % value	Wattage % value	Visual % value
255	138	360	115.00%	109.64%	102.25%
250	131	352	109.17%	107.11%	100.84%
245	125	339	104.17%	103.15%	100.17%
240	120	328	100.00%	100.00%	100.00%
235	114	307	95.00%	93.60%	99.75%
230	106	293	88.33%	89.34%	98.64%
225	100	282	83.33%	85.79%	97.22%
220	95	274	79.17%	83.35%	95.66%
215	89	257	74.17%	78.17%	93.33%
210	84	243	70.00%	74.11%	91.00%
205	80	234	66.67%	71.27%	88.89%
200	74	220	61.67%	67.01%	85.31%
195	68	207	56.67%	62.94%	81.22%
190	62	193	51.67%	58.88%	76.64%
185	55	176	45.83%	53.60%	70.66%
180	48	160	40.00%	48.73%	64.00%



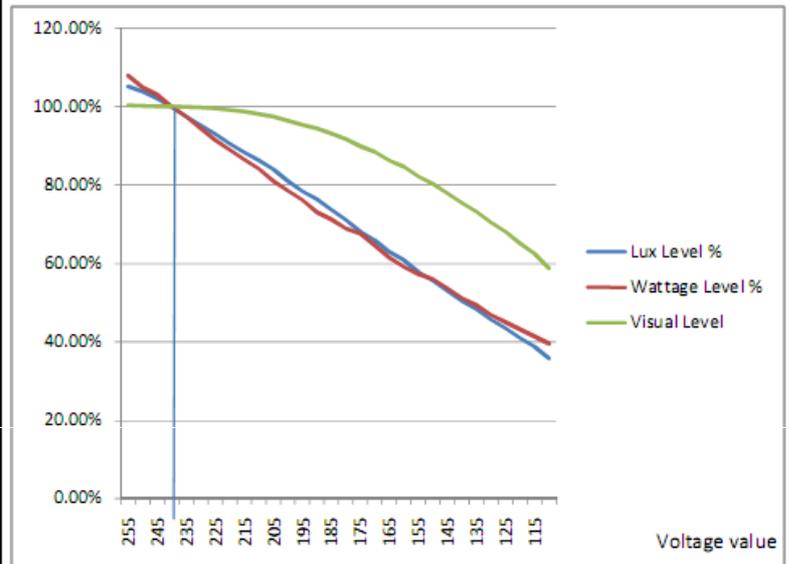
FTL with Cu Ballast (20W X 4nos) CHARACTERISTICS					
V	LUX (x100)	W (Watt)	LUX % value	Wattage % value	Visual % value
255	320	211.7	110.34%	123.30%	101.07%
250	310	196.7	106.90%	114.56%	100.48%
245	300	186.7	103.45%	108.74%	100.12%
240	290	171.7	100.00%	100.00%	100.00%
235	283	160.0	97.59%	93.20%	99.94%
230	277	150.0	95.52%	87.38%	99.80%
225	270	141.7	93.10%	82.52%	99.52%
220	263	133.3	90.69%	77.67%	99.13%
215	256	126.7	88.28%	73.79%	98.63%
210	249	121.7	85.86%	70.87%	98.00%
205	242	116.7	83.45%	67.96%	97.26%
200	235	110.0	81.03%	64.08%	96.40%
195	230	103.3	79.31%	60.19%	95.72%
190	225	99.7	77.59%	58.06%	94.98%
185	217	94.3	74.83%	54.95%	93.66%
180	211	89.3	72.76%	52.04%	92.58%
175	204	83.7	70.34%	48.74%	91.21%
170	198	80.0	68.28%	46.60%	89.94%
165	192	74.3	66.21%	43.30%	88.58%
160	186	71.7	64.14%	41.75%	87.14%
155	180	66.7	62.07%	38.83%	85.61%
150	175	62.3	60.34%	36.31%	84.27%
145	165	58.7	56.90%	34.17%	81.42%
140	157	55.0	54.14%	32.04%	78.97%
135	149	51.0	51.38%	29.71%	76.36%
130	142	47.3	48.97%	27.57%	73.95%
125	135	43.3	46.55%	25.24%	71.43%
120	126	40.0	43.45%	23.30%	68.02%
115	118	35.7	40.69%	20.78%	64.82%
110	106	31.0	36.55%	18.06%	59.74%



CFL Lamp 20W		CHARACTERISTICS			
V	LUX (x100)	W (Watt)	LUX % value	Wattage % value	Visual % value
255	965	22.3	105.81%	108.94%	100.34%
250	947	21.7	103.84%	105.69%	100.15%
245	928	21.0	101.75%	102.44%	100.03%
240	912	20.5	100.00%	100.00%	100.00%
235	890	20.0	97.59%	97.56%	99.94%
230	873	19.5	95.72%	95.12%	99.82%
225	853	18.7	93.53%	91.06%	99.58%
220	842	18.2	92.32%	88.62%	99.41%
215	833	17.5	91.34%	85.37%	99.25%
210	816	16.8	89.47%	82.11%	98.89%
205	800	16.2	87.72%	78.86%	98.49%
200	785	15.8	86.07%	77.24%	98.06%
195	770	15.3	84.43%	74.80%	97.58%
190	755	15.0	82.79%	73.17%	97.04%
185	737	14.7	80.81%	71.54%	96.32%
180	721	14.3	79.06%	69.92%	95.61%
175	700	14.0	76.75%	68.29%	94.60%
170	685	13.7	75.11%	66.67%	93.80%
165	660	13.3	72.37%	65.04%	92.36%
160	635	13.0	69.63%	63.41%	90.77%
155	612	12.7	67.11%	61.79%	89.18%
150	590	12.3	64.69%	60.16%	87.53%
145	560	12.0	61.40%	58.54%	85.10%
140	535	11.7	58.66%	56.91%	82.91%
135	508	11.3	55.70%	55.28%	80.38%
130	480	11.0	52.63%	53.66%	77.56%
125	453	10.7	49.67%	52.03%	74.67%
120	422	10.3	46.27%	50.41%	71.13%
115	393	10.0	43.09%	48.78%	67.61%
110	363	9.7	39.80%	47.15%	63.76%



T5 fluorescent Lamp 20W			CHARACTERISTICS		
V	LUX (x100)	W (Watt)	LUX % value	Wattage % value	Visual % value
255	244	177.0	105.17%	107.93%	100.27%
250	241	172.0	103.88%	104.88%	100.15%
245	237	169.0	102.16%	103.05%	100.05%
240	232	164.0	100.00%	100.00%	100.00%
235	226	160.0	97.41%	97.56%	99.93%
230	221	155.0	95.26%	94.51%	99.78%
225	216	150.0	93.10%	91.46%	99.52%
220	210	146.0	90.52%	89.02%	99.10%
215	205	142.0	88.36%	86.59%	98.65%
210	200	138.0	86.21%	84.15%	98.10%
205	195	133.0	84.05%	81.10%	97.46%
200	188	129.0	81.03%	78.66%	96.40%
195	182	125.0	78.45%	76.22%	95.36%
190	177	120.0	76.29%	73.17%	94.38%
185	171	117.0	73.71%	71.34%	93.09%
180	165	113.0	71.12%	68.90%	91.66%
175	158	111.0	68.10%	67.68%	89.83%
170	153	106.0	65.95%	64.63%	88.40%
165	146	101.0	62.93%	61.59%	86.26%
160	141	97.0	60.78%	59.15%	84.61%
155	134	94.0	57.76%	57.32%	82.16%
150	129	92.0	55.60%	56.10%	80.29%
145	123	88.0	53.02%	53.66%	77.93%
140	117	84.0	50.43%	51.22%	75.43%
135	112	81.0	48.28%	49.39%	73.25%
130	106	77.0	45.69%	46.95%	70.50%
125	101	74.0	43.53%	45.12%	68.12%
120	95	71.0	40.95%	43.29%	65.13%
115	90	68.0	38.79%	41.46%	62.54%
110	83	65.0	35.78%	39.63%	58.75%





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