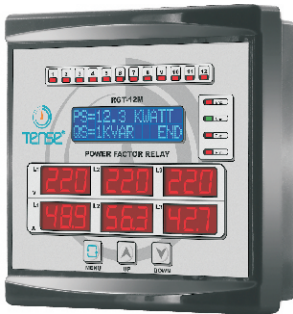
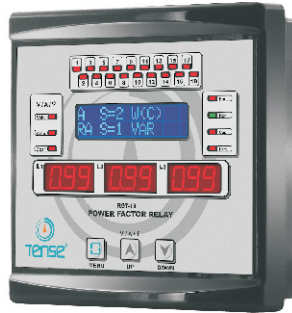


## **REACTIVE POWER CONTROL RELAYS MANUAL**



- Compensating inductive and capacitive systems
- 2 x 16LCD display
- 3-phase/3-current transformer
- Single-phase, two-phase or three-phase capacitor or shunt reactor can be connected
- Harmonic LED display
- WATT and VAR metering
- Cos  $\phi$  indicator
- Manual level control
- Power Flow Graphic
- The number of contacts in use can be seen
- Password-protected menu option
- Setting the level value manually (capacitor and shunt reactor)

### 1- Three-phase Connection Diagram

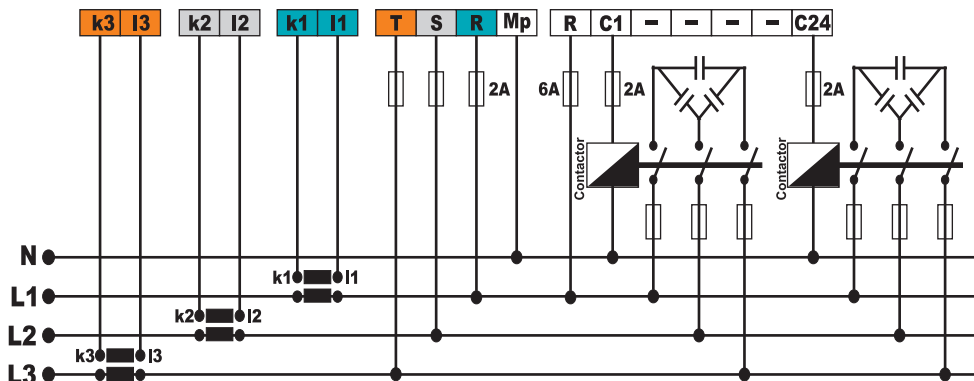


Figure-1

### 2- Diagram Showing Single-phase Connection on Three-phase System

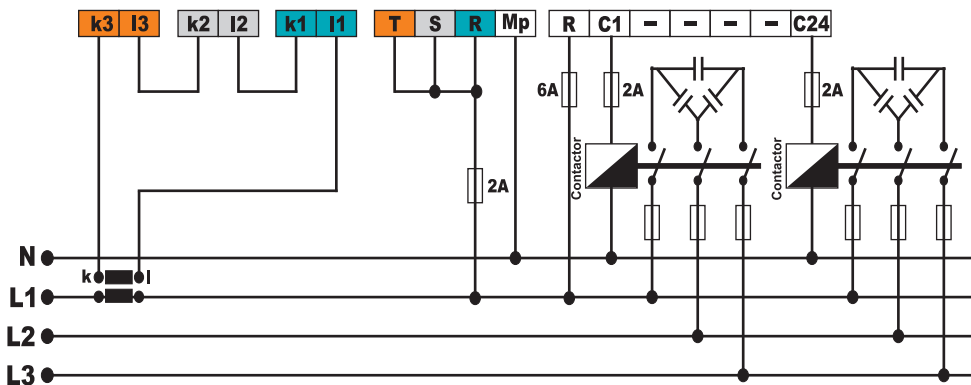


Figure-2

- Select the values of automat fuse used in the levels in accordance with the capacitor or the reactor powers.
- Single-phase connections on a three-phase system are only suitable with balanced power draw. Otherwise, the desired rates cannot be obtained.
- Make sure that the connections of the systems in which single-phase or three-phase will be used are in parallel with the ones shown on the figure above.
- Make sure that there is no power before the current transformers.
- Make sure that the value of the current transformer to be used is higher than the maximum current drawn from the system.
- It must be exposed by sunlight directly in order to get harm. Otherwise it will get harm.

### 3- First Startup of The Device



Figure-3



Figure-4

Before energizing the device, please read the warning section. When the device is energized for the first time, figure-3 will be displayed. Enter the current transformer value by using up-down button and push the menu button. Figure-4 will be displayed. The device will give a warning which shows that there should not be a sudden load change on the system for a more proper test. Then, the device starts the current transformer test by drawing the first three levels.



```
L1 1 L2 1 L3 1
L1 1 L2 1 L3 1
```

Figure-5

When the device performs the current transformer test, 1 or -1 sign is displayed near each phase. In order to confirm the connection, it performs a second test, and if it performs the test successfully, figure-5 is displayed on the screen.



```
LVL CURRENT LOW
L1 L2 L3
```

Figure-6

If the device cannot obtain enough power for level current, figure-6 is displayed on the screen and it tries to obtain the required power by increasing level. If there is a single-phase or two-phase capacitors on the first levels, the device will display them on the screen. If it still gives this warning although all levels are drawn, it can be thought that **capacitors are discharged or phase or phases cannot reach to the level**. The phase or phases with low level current are displayed on the screen.



```
INVERSE L1 L2 L3
or load not stabl
```

Figure-7

If figure-7 is displayed during the current transformer test, the class of the current transformers (cl.,kl.,class) may be high (1 or 3). **The maximum class must be 0.5. In addition, the phase inputs of the device and the transformer outputs of that phase are not in the same group.** For example; the transformer outputs of L1 phase should be connected to k1-1. In such a situation, stop the device and interchange the locations of the phases displayed on the screen and start the test again.



```
LEVEL TEST
STABL LOAD NEED
```

Figure-8

After the current transformer test has finished, the device automatically starts the level test and figure-8 is displayed on the screen. When the level measurement is started and for a faster and more proper measurement, the device will give a warning which shows that there should not be a sudden load change on the system. When the level is drawn, figure-9 is displayed. The first line shows the drawn level. The second line shows the measured level (as MONO-PHASE, TWO-PHASE and THREE-PHASE). If there is sudden load change on the system, the device makes the same level drawn again and again for a more proper measurement.



```
1.LEVELTESTING
1.THREE
```

Figure-9



```
1 MANUEL ENTRY
> 0.00 0.00 0.00
```

Figure-10

**In order to enter value to the level manually.** If you push the up button continuously during the level measurement, figure-10 will be displayed on the screen. In the first line, the level to which you will enter value is displayed. And in the second line, L1(R), L2(S) and L3(T) phases are displayed from left to right. In order to enter value, push the up button when the phase you want is displayed. In order to switch to the other phase, push the menu button. In order to enter single-phase or two-phase level value, enter value for only the phase you connected and enter 0 for the values of the other phases. If you push the menu button when L3 phase is displayed, figure-11 will be displayed. In order to save the value you entered, select yes by using up-down button and push the menu button. After the level test has been finished, figure 12 will be displayed on the screen. After the level test has been finished, control whether the level values are measured in a way that you connected them by using menu bottom.



```
ENTRY OK?
YES >>NO
```

Figure-11



```
LEVEL TEST DONE
```

Figure-12

#### 4- Display Images



```
Pr=12.3 Kwatt
Qr=1KVAR IND
```

Figure-13

When the device is in normal operation; active, reactive, Cos  $\phi$  and harmonic information of each phases are displayed alternately on LCD screen. In figure-13, active (P) power value of L1(r) phase is displayed on the first line. And the second line displays the reactive (Q) power value of this phase and either the phase is IND(inductive) or CAP(capacitive) are displayed.



```
Cos L1 L2 L3
0.98 0.99-0.97
```

Figure-14

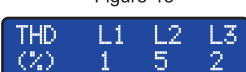
In figure-14, Cos  $\phi$  value of each phase is displayed on the first line.



```
IND % CAP%
5.2 6.0
```

Figure-15

Figure-15 Shows the total inductive/active and capacitive/active rates.



```
THD L1 L2 L3
(%) 1 5 2
```

Figure-16

Figure-16 Shows the Total Harmonic Distortion (THD) rate of each phase. It shows the current harmonics. When it is over %30, Har led on the right side of LCD screen lights up.



```
Active Energy +P
0000000000 W.h
```

Figure-17

In figure-17 it shows the total active energy that comes from the main source. You can reset the energy value by getting into Menu.



```
Active Energy -P
0000000000 W.h
```

Figure-18

In figure-18 it shows total active energy that is given to the main source. You can reset the energy value by getting into Menu.



```
Induc. Energy +Q
0000000000 Var.h
```

Figure-19

In figure-19 it shows the inductive energy that comes from the main source. You can reset the energy value by getting into Menu.



```
Capac. Energy -Q
0000000000 Var.h
```

Figure-20

In figure-20 it shows the capacitive energy that comes from the main source. You can reset the energy value by getting into Menu.

## 5- Using of Menu

Push the menu button to enter the menu. Push the menu button to advance in the menu. Push the up and down button together for 2 seconds to exit the menu. Push the up or down buttons to change a value in the menu and then push the menu button to save the value change.



```
LEVEL VALUES
L1 L2 L3
```

Figure-21

When you push the menu button, the level values in Figure-21 come as first and Figure-22 is displayed about 5 seconds later. In the first line, the number of its level and the phase (1, 2 or 3) of level are shown. In the second line, the power values in the phases of L1(R), L2(S) and L3(T) are shown the left. If there is (-) sign before the power value, it shows that it is shunt reactor (inductive). If there are both capacitor and reactor values or there is no value, it cancels the level and cannot use this level. If there is a difference by %20 between the phases in the level, it shows the level as faulty, but it uses this level. **Figure-23 will be displayed when you push the menu button.**



```
LV 01THREE kVAR
0.55 0.54 0.53
```

Figure-22



```
LEVEL TEST?
YES >>NO
```

Figure-23



```
TEST TYPE?
>>ALL SINGLE
```

Figure-24



```
SELECKT LEVEL
1. LEVEL
```

Figure-25



```
1 MANUAL ENTRY
> 0.00 0.00 0.00
```

Figure-26

Figure-23- This menu is used if a change is made in the levels. Select Yes by pushing the up and down button and push the menu button to make level measurement. Figure-24 will be displayed. Select Single by pushing the up-down button and then push the menu button if a single level measurement will be made. Figure-25 will be displayed. In here, select the level that you want to measure by using up or down buttons and push the menu button. The device releases the drawn levels and starts to measure the selected level only. If you want to enter a value in the level manually, wait for the Figure-26 to be displayed by continuously pushing the up button. After it is displayed, you can enter the values.

If the measurement will be made for all levels, select All by pushing the up button and push the menu button. In this way, the device releases the drawn levels and starts to measure from the 1st level. If there is a value desired to be entered manually during the measurement, you can enter the value in Figure-26 after pushing the up button continuously. **Push the menu button to advance in the menu.**



```
C.T. TEST?
YES >>NO
```

Figure-27

Figure-27- Current transformer value is made from here when a change is made in current transformer or its connections. Select Yes (Evet) by pushing up or down button and then push the menu button. The device draws the first three level after releasing the drawn levels. If the test is made accurately, L1=1 L2=1 L3=1 is displayed and the device repeat the test for the second time. If it is successful in the second test, an inscription is displayed as in figure-5. If there is (-) sign in the inscription displayed, it shows that k and l ends are opposite and the device corrects this automatically. **Push the menu button to advance in the menu.**



```
LEVEL CONTROL
YES >>NO
```

Figure-28



```
LV.01 STATUS :Of
Usage... : 0
```

Figure-29



```
1.LEVEL ON?
YES >>NO
```

Figure-30



```
1.LEVEL OFF
YES >>NO
```

Figure-31

Figure-28-The device performs the level control and shows the number of used level. **Push the menu button to advance in the menu.** Select Yes by using up or down buttons and push the menu button to perform level control or learn the number of used levels. Figure-25 will be displayed. In the first line, it shows your level and whether the level is drawn or not. In the second line, it shows the number of used levels.



Select the level you want by pushing up and down button to check the level and push the menu button, Figure-30 will be displayed. Select Yes by using up or down button and push the menu button and make sure that the level is drawn. Select the drawn level by using up or down buttons to have it release the same level and push the menu button. Figure-31 will be displayed. Select Yes and push the menu button. It releases the drawn level. If the level is drawn, it becomes "on-position". If it is released, it becomes "off-position". **Push the up and down buttons together to exit from here.**

```
LOAD FLOW GRAPH
16.SAMP. DIFF=%15
```

Figure-32

Figure-32 Shows the number of the samples of power flow graphic and the percentage difference for sampling. Figure-33 will be displayed in about 3 seconds. Figure -33 -Shows what is the sample's rank in the first line, the sampling duration (second-s, minute-d ) and the rate according to the total sampling time. It shows the reactive powers of the phases in the second line. It takes maximum 60 samples with their times depending on the power change in the system. After 60 samples are completed, it keeps sampling by increasing the percentage difference by 1. Push the up-down buttons to navigate between the samples. **Push the menu button to advance in the menu.**

```
1.SAMP %94 16m
1.0 1.1 1.7
```

Figure-33

```
PASSWORD VALUE
OFF
```

Figure-34

Figure-34 Adds password protection to enter the menu. There is no password protection when the password value is "off". Enter the password you want by pushing up-down buttons and push the menu button to save. The device will ask for your password if you want to enter the menu again. Enter the password that you used before by pushing up or down buttons and push the menu button. If the password is valid, it enters the menu. If it is not valid, the previous screen will be shown.

```
RESET ENRG INDEX?
YES >>NO
```

Figure-35

In figure-35 it resets and adjusts the energy into ZERO total (+)active energy, (-)active energy Please adjust the sign to 'YES' and press the menu button. To forward in menu press "menu" button.

```
SET DEFAULTS?
YES >>NO
```

Figure-36

Figure-36 Saves the power flow graphic, password value, end, set (inductive setting) value, cap, set (capacitive setting) value, intervention time and level discharging time values to the factory settings. Choose "Yes" to restore factory settings and push the menu button. **Push the menu button to advance in the menu.**

```
C.T. VALUE
5/5 Ampere
```

Figure-37

Figure-37 Current transformer value is entered. Enter the current transformer values by pushing up or down button and push the menu button when the current transformer value is changed. The device releases the drawn level, if any, and starts the current transformer test. Factory setting=30/5, Setting range: 5/5,-10000/5. **Push the menu button to advance in the menu.**

```
INDUCTIVE LIMIT
%5
```

Figure-38

Figure-38 Desired inductive/active rate is set. You can change the set value by pushing up or down button. Then, push the menu button to save. Factory setting=%5, Setting range: %1, - 99 **Push the menu button to advance in the menu.**

```
CAPACITIVE LIMIT
%13
```

Figure-39

Figure -39 Desired capacitive/active rate is set. You can change the set value by pushing up or down button. Then, push the menu button to save. Factory setting:13, Setting range: %1, - 99 **Push the menu button to advance in the menu.**

```
RESPONSE TIME
Time 0.80 Sec.
```

Figure-40

Figure-40 Determines the response time for the power change in the system. You can change the response time by pushing up or down button. Then, push the menu button to save. Factory setting: 0.8 sec, Setting range: 0.4sec,-20sec. **Push the menu button to advance in the menu.**

```
LEVEL DISCHARGE
Time: 14.00 Sec.
```

Figure-41

Figure-41 Determines the discharge time for the capacitor. You can change the time by pushing up or down button. Then, push the menu button to save. Factory setting: 14 sec, Setting range: 0.4 sec, -20 sec. **Push the menu button to advance in the menu.**

## 6-Information Messages

```
OTO LVL TST TIME
```

Figure-42

Figure-42 The device automatically performs level test every three months as the powers of the system are stable. It informs that level test time is approaching or the test will start.

```
CAPACITOR NEEDED
```

Figure-43

Figure -43 The device informs that the capacitors in the level fail to satisfy the requirements and additional capacitor is required for the level.

## CAPACITIVE LOAD

Figure-44

Figure-44 The device informs that there are capacitive powers in the system. It is required to add the shunt reactor to response to capacitive loads such as air conditioners, heaters, UPS, night lights etc. in the level. Also check the contact adhesion.

## CURRENT EXCEED

Figure-45

Figure-45 The device informs that the current passing from the current transformer outlets is over 5 Ampere. The current transformer values are required to be increased; otherwise the current transformers and the device may be damaged.

## INDUCTIVE EXCEED

Figure-46

Figure-46 Informs that the inductive limit of the device is exceeded. The technical service is required to be informed.

## CAPACITIV EXCEED

Figure-47

Figure -47 Informs that the capacitive limit of the device is exceeded. The technical service is required to be informed.

## 7- General Structure

- 1- **2X16 LCD display**: It shows the information about the system to which it is connected and the use of device.
- 2- **Volt LED**: Informs that the tensions of the phases are shown in the group of display.
- 3- **Cos  $\phi$  LED**: Informs that the Cos  $\phi$  of the phases are shown in the group of display.
- 4- **Menu button**
- 5- **Up button**
- 6- **Down button**
- 7- **3X4 digit display**: It shows Volt, Cos  $\phi$  values of the phases.
- 8- **3X4 digit display**: It shows Ampere values of the phases.
- 9- **Harmonic LED**: It lights up when it is over 30% in the system.
- 10- **Capacitive LED**: It shows that the capacitive set value is exceeded.
- 11- **Normal LED**: It shows that the capacitive and inductive set values are reached.
- 12- **Inductive LED**: It shows that the inductive set value is exceeded.
13. **Level LEDs**: They show the active levels. They light up when they are drawn.

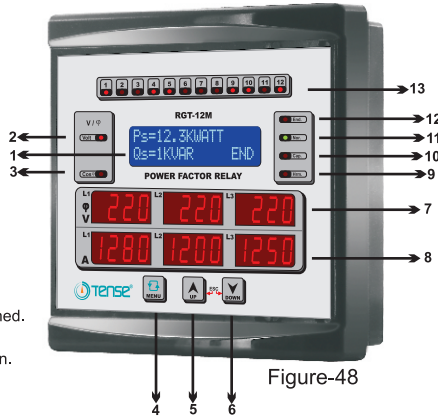


Figure-48

## 8- Use of Buttons

**Menu button**: It is used to enter the menu, advance in the menu, confirm the selections and save the changes.

**Up button**: It is used to change the values in the menu, switch among Volt, Current and Cos  $\phi$  values in the group of display and navigate among the samples in power flow graphic.

**Down button**: It is used to change the values in the menu and navigate among the samples in power flow graphic. Every push ensures the transition between the screen images without any latency.

**Up and Down button**: When up and down buttons are pushed together, it is used to cancel or exit. It cancels the test as the Current and Level test is being performed. It enables to exit the menu.

## 9- System Control

After finishing the current transformer and capacitor tests, the device starts to respond to the system. It will draw the level that it needs in accordance with the power drawn by the system as it doesn't operate with hold-release method.

**If the counter shows the inductive value** and the capacitive set value is below the limit, increase the capacitive set value by 2 units. Wait for 5 minutes. If the counter still shows the inductive value, increase by 2 units more. Repeat this until it comes to the limit value. As the device mainly operates capacitively, the higher the capacitive set value is, the better it responds to the inductive. Check if there is a load connected before the current transformer. If there is no problem with the connections, add the required capacitor values displayed on the screen to the levels.

**If the counter shows the capacitive** decrease the capacitive set value by 2 units. Wait for 5 minutes. If the counter still shows the capacitive value repeat this until it drops below the limit value. If your system is not available for this check if there is a load connected before the current transformer. If there is no problem with the connections, add the required capacitor values displayed on the screen to the levels.

If there are faulty capacitors, replace them for a better compensate and test the respective level again by choosing from the menu. After tests, the device will automatically start to compensate.

## 10- Contact Usage

Intense use of some levels in the systems shortens the life of contactors and capacitors of the relevant level. Additionally, the capacitors are required to be suspended for a while to discharge. If the system requires a capacitor that has not been discharged during this period, the device will affect the compensation negatively as it will wait for this period. The discharge time of the capacitor may be kept short, but this situation shortens the life of the contactor and the capacitor. In such cases, it is required to add levels equal to those used intensely. The device will draw the levels taken as equal by the device in the same number which extends the life of the contactor and the capacitor and helps the compensation by responding to the system instantly when necessary. The device takes the two levels as equal if the difference between them is less than %10.

## 11- Power Flow Graphic

It is an application especially for the unstable systems. It takes samples with different powers from the system and saves them. If the difference between the samples is less than %15, the device takes these samples as equal and sums up their times. If the difference is more than %15, it saves the samples as different. The device keeps maximum 60 samples. The number of the samples reaches maximum in a short time if there is a sudden load change in the system. The device tries to extend the sampling time by increasing the rate by %15 in such systems.

The samples give information about the number of levels in accordance with power distribution of the system, the capacitor and reactor values to be used in the levels and the connection types (three-phase, two-phase and single-phase) of the levels. In this way, it becomes possible to compensate the unstable loads more effectively.

Figure-33 Shows the order of the sample and the value of its percentage difference. After the device stays in stand-by mode for 2 seconds, Figure-34 will be displayed. Figure-29 shows the number, values and time of samples. You can see the other samples by pushing the up or down button. **Number of samples: 60**

## 12- How to Graph the Power Flow?

Select power graphic by pushing the menu button of the device. Write down the order of the sample in the 1st line, the values and times of each phase individually in an empty paper starting from the first sample. If the samples have capacitive values, you see the (-) sign before the value. You can write down as in the Sample -1.

Example-1

	R	S	T	
1.samp	1,20	1,15	1,65	50m
2.samp	1,15	1,00	1,50	10m
3.samp	0,50	0,55	0,65	5m
4.samp	1,00	0,75	0,51	15s
5.samp	1,25	1,15	1,40	25s
6.samp	2,00	1,70	1,90	12m
7.samp	2,20	1,75	1,70	17m
8.samp	0,25	0,01	0,45	22m
9.samp	0,16	-0,04	-0,10	20m.
10.samp	0,25	0,18	0,30	25m
11.samp	-0,27	0,02	-0,05	100s
12.samp	0,50	0,65	0,53	32m
13.samp	0,75	0,80	0,62	19m
14.samp	2,62	1,99	2,40	24m
15.samp	3,01	2,55	2,90	11m
16.samp	3,25	3,00	3,17	35s
17.samp	1,32	0,83	0,92	47s
18.samp	2,51	1,00	1,25	66s
19.samp	2,00	1,70	1,78	5s
20.samp	2,20	2,10	2,10	54s
21.samp	1,40	2,10	1,50	26s
22.samp	1,00	1,87	1,35	96s
23.samp	0,04	-0,01	0,65	50m
24.samp	0,10	0,08	0,52	7m
25.samp	0,35	0,40	0,35	11m
26.samp	0,62	0,52	0,75	5s
27.samp	0,62	0,73	0,61	75m
28.samp	0,22	0,25	0,17	14m
29.samp	0,17	0,23	0,21	120m
30.samp	0,33	0,51	0,39	72m
31 SAMP	DIFF=%15			

Total period of the sample is to be close to the operation time of the system. Otherwise compensation will not be healthy if the values of the other period are different.

- The device is to take sample of power flow graphic over 24 hours for 1 day long at least.
- The values in Sample-1 belong to 30 samples and covers a period of more than 8,5 hours. Let's determine the number and values of levels by considering these values.
- Firstly, pay your attention to the samples in minute. It is such a period that may affect the total power of the system.
- Take account of the samples with high values in seconds during level selection.
- Note that the power of the capacitor per phase is equal or close or less than the minimum phase of the sample as you are selecting three-phase capacitor. Otherwise the device will draw that level in order not to fall into the capacitive limit. It will respond to the system through the levels with lower values.
- We can get the highest three-phase capacitor value from the samples- 15 and 16. **Three-phase capacitor has 7,5Kvar** which is 2,50Kvar per phase. Three-phase capacitor to respond to the lowest phase of the sample having the highest power.
- The second highest three-phase capacitor can respond to the 6th, 7th, 14th, 19th and 20th samples with **5Kvar**. It is 1.66Kvar power per phase.
- The third highest three-phase capacitor can respond to the 1st, 2nd, 5th, 17th, 18th and 22nd samples with **2,5Kvar**. It is 0,83Kvar power per phase.
- The fourth highest three-phase capacitor can respond to the 3rd, 4th, 12th, 13th, 16th, 20th, 21st, 26th and 27th samples with **1,5Kvar**. It is 0,50Kvar power per phase.
- The fifth highest three-phase capacitor can respond to the 5th, 14th, 20th, 25th and 30th samples with **1Kvar**. It is 0,33Kvar power per phase.
- The sixth highest three-phase capacitor can respond to the 10th, 13th, 18th, 22nd, 28th, 29th samples with **0,5Kvar**. It is 0,16Kvar power per phase.

Level Number	R (L1)	S (L2)	T (L3)	Total Value
1.Level	2,50Kvar	2,50Kvar	2,50Kvar	7,5Kvar three phase
2.Level	1,66Kvar	1,66Kvar	1,66Kvar	5Kvar three phase
3.Level	0,83Kvar	0,83Kvar	0,83Kvar	2,5Kvar three phase
4.Level	0,50Kvar	0,50Kvar	0,50Kvar	1,5Kvar three phase
5.Level	0,33Kvar	0,33Kvar	0,33Kvar	1Kvar three phase
6.Level	0,16Kvar	0,16Kvar	0,16Kvar	0,5Kvar three phase
7.Level	0,50Kvar	-	-	0,5Kvar mono phase
8.Level	-	-	0,50Kvar	0,5Kvar mono phase
9.Level	0,25Kvar	-	0,25Kvar	1Kvar three phase double phase connection
10.Level	0,37Kvar	-	0,37Kvar	1,5Kvar three phase double phase connection
11.Level	0,25Kvar	0,25Kvar	-	1Kvar three phase double phase connection

**Table-1**

- While choosing the values and phase of single-phase capacitor, subtract the lowest phase in each example. Add the available single-phase capacitors to the level.

-In the 7<sup>th</sup> example, **0,5Kvar single-phase capacitor** will be connected to R phase.

-In the 1<sup>st</sup>, 2<sup>nd</sup> and 23<sup>rd</sup> examples, **0,5Kvar single-phase capacitor** will be connected to T phase.

-In the 6<sup>th</sup> and 8<sup>th</sup> examples, **1Kvar three-phase capacitor** will be connected to R and T phases via **two-phase**. There is a value of 0,25Kvar for each phase.

-In the 14<sup>th</sup> and 15<sup>th</sup> examples, **1,5Kvar three-phase capacitor** will be connected to R and T phases via **two-phase**. There is a value of 0,25Kvar for each phase.

-In the 13<sup>th</sup> example, **1Kvar three-phase capacitor** will be connected to R and S phases via **two-phase**.

The level values to be connected to the 12-level reactive power control relay are given in Table-1 in accordance with the list in Example-1.

### 13- Problems that may Occur in Systems

**Unbalanced powers on phases:** In this situation, try to connect the power on the system balancedly or add the single-phase capacitor values recommended by the device. If two- phase is unbalanced, you can use the capacitor connections by connecting them according to the unbalanced two-phase.

**Harmonical systems:** Devices forming harmonic systems (inverter, electronic ballasts, etc.) affect the power factor negatively. It is required to use harmonic filters in these systems.

**Fast load changes:** If there are loads on the system which change very quickly, reduce the capacitor intervention and discharge times. The device will response to the system more quickly. However, this application may shorten the service life of capacitors. Add at least two levels with the same value to the mostly used levels.

**Capacitor insufficiency:** If the capacitor value required by the system is insufficient, a warning will be shown on the display. In this situation, increase the number of levels and capacitor values.

**Determining the improper capacitor values:** It is required to determine the capacitor values as different powers. A level should be formed in a way that will provide the device can find the required intermediate values within the capacitor combination.

**Example:** The capacitor combination which is suitable and not suitable to use in a system with 100Kvar nearly.

	Level											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>Wrong</b>	25KVar	15KVar	10KVar	5KVar	2,5KVar	1,5KVar						
<b>Right</b>	25KVar	15KVar	10KVar	7,5KVar	5KVar	2,5KVar	1,5KVar	1KVar	0,5KVar			

Figure-49

**Defects on connection terminals:** The devices do not operate or make measurement in this situation.

**Unable to perform current transformer test:** The compensator may be connected before the current transformer. There may be a defect on transformer connection or on the supplies of the compensator. The level capacitor may be faulty. One of the current transformers may be faulty.

**Unable to perform capacitor test:** : The compensator may be connected before the current transformer. There may be a defect on the supplies of the compensator. The level capacitor may be faulty. Fast load change on the system prolongs the duration of this test.

### 14- Matters to be Considered for Compensation:

- The compensation starts by regulating the load distribution balancedly on the electric installation of the system.

- Do not determine the level number and capacitor values randomly in the systems where there is fast load changes and the loads are distributed imbalancedly.

- While preparing a compensating panel, make sure that new levels can be added easily by considering the changes (adding or subtracting load) that may occur on the loads afterwards.
  - Control the level measurements in every 3 months. Replace the capacitors which have lower values or which are faulty with new ones.
  - The capacitors which have lower values or one phase of which is faulty can be used in unbalanced systems.
  - Make sure that the load values do not change quickly during the current transformer and level measurements.
  - Make sure that the power transformer values are higher than the current to be drawn from the system.
- Otherwise, the current transformer or the device may be damaged.
- Make sure that the class of the current transformer is 0,5 (Class= 0.5 or cl=0.5) at most. Otherwise, the power calculations will be wrong.

## 15- Warnings

- Make sure that the temperature of the environment where the device has been mounted is not below 0°C.
- The current transformers should be connected to the system input. If the current transformers are connected after any load, since the current drawn by that load cannot be read, it will be compensated insufficiently.
- Connect the terminals of the current transformer correctly. (Connect the k-I terminals of the current transformer connected to the L1 phase to k1-I1 terminals, the k-I terminals of the current transformer connected to the L2 phase to k2-I2 terminals and the k-I terminals of the current transformer connected to the L3 phase to k3-I3 terminals)
- Make sure that the compensator is connected after the current transformer.
- Connect three phases and a capacitor with a big value to the first level for the current transformer test.
- If possible, don't draw load from the system while performing device capacitor test, but if it is not possible, please avoid from sudden load draws. Otherwise, the test time will be longer and the accuracy of measurements will reduce. In addition, **level value** can be entered manually.
- The device does not operate with receive and drop method. It will make the level it needs drawn in accordance with the capacitor values.
- It is recommended to add new levels in order to prolong the service life of the contactor and the capacitor in the frequently used levels.
- In order to compensate the unbalanced loads that occur in the system more effectively, you can benefit from the examples shown in the Power Flow Diagram.

Calculation Table for Capacitor Values According to Connection Type

## 16- Technical Specifications:

Rating Voltage	: 140V - 290V AC
Operating Frequency	: 50 / 60 Hz
Operating Power	: <12VA
Operating Temperature	: 0°C - 55°C
Current Measurement Range	: 5mA - 5,5A
Voltage Measurement Range	: 150V - 280V
Measurement Precision	: %±1
Current Transformer Ratio	: 5/5A.....10000/5A
Connection Type	: Quick-fit connector
Contact	: 3A 250V AC
Display	: 2x16LCD(blue),4 digit display, leds
Cable Diameter	: 2.5mm <sup>2</sup> (current,voltage inputs), 1.5mm <sup>2</sup> (contactor outputs)
Number Levels	: 8, 12, 18, 24
Mounting	: Panel front- mounted
Operating Altitude	: <2000metre
Weight	: 900Gr.
Protection Class	: IP40(Panel front)
Panel Hole Sizes	: 139mm x 139mm





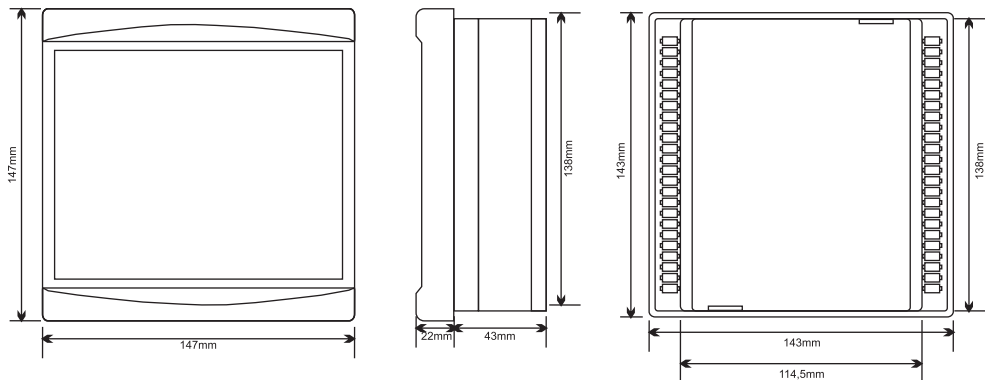
				
Capacitor Powers	3 Phase Connection (Q/3)	2 Phase Connection (Q/4)	Phase-Neutral Bridge Connection (2xQ/9)	Phase-Neutral Connection (Q/6)
0,5 KVAR	0,16 KVAR	0,12 KVAR	0,11 KVAR	0,08 KVAR
1 KVAR	0,33 KVAR	0,25 KVAR	0,22 KVAR	0,16 KVAR
1,5 KVAR	0,5 KVAR	0,37 KVAR	0,33 KVAR	0,25 KVAR
2,5 KVAR	0,83 KVAR	0,62 KVAR	0,55 KVAR	0,41 KVAR
5 KVAR	1,66 KVAR	1,25 KVAR	1,11 KVAR	0,83 KVAR
7,5 KVAR	2,5 KVAR	1,87 KVAR	1,66 KVAR	1,25 KVAR
10 KVAR	3,33 KVAR	2,5 KVAR	2,22 KVAR	1,66 KVAR
15 KVAR	5 KVAR	3,75 KVAR	3,33 KVAR	2,5 KVAR
20 KVAR	6,66 KVAR	5 KVAR	4,44 KVAR	3,33 KVAR
25 KVAR	8,33 KVAR	6,25 KVAR	5,55 KVAR	4,16 KVAR
30 KVAR	10 KVAR	7,5 KVAR	6,66 KVAR	5 KVAR

Table-2

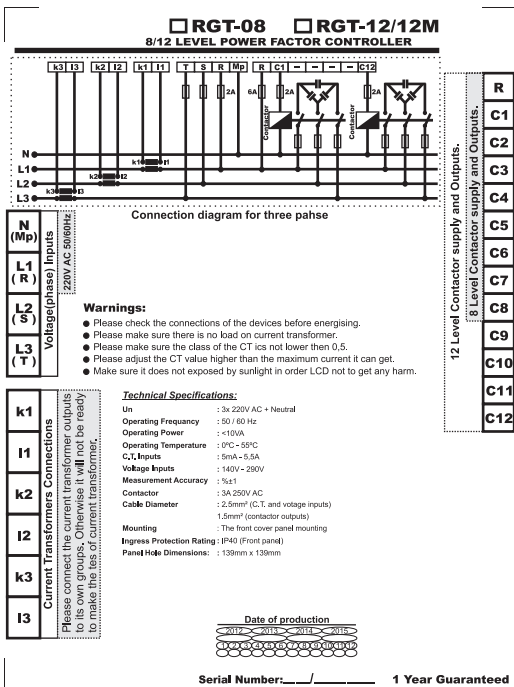


## 17- Dimensions:



- Mount the device on the front cover of the panel by inserting it from front to back.
- When mounting the device, make sure that the terminals and the fasteners are affixed.
- After mounting the device on the front cover, fix it to the panel via the fasteners.
- After mounting the device, make sure that a space of 50 cm at least is available behind it.
- Protect the front panel of the device (LCD display) against sunlight.
- Protect the device against temperatures over 55°C. Otherwise the LCD display will dry.

## 18- Electrical Terminals



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