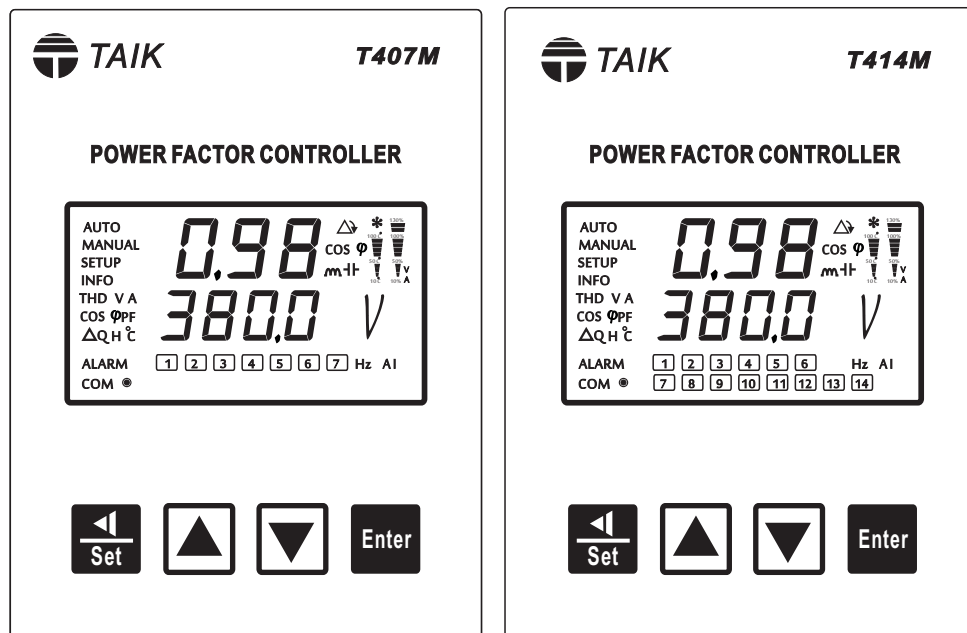




AUTO/MANUAL MODE

- + Enter AUTO/MANUAL Mode · Selected **AUTO** or **MANUAL** flashes
- Alter Mode: Selected **AUTO** , **MANUAL** , **MANUAL** m , **MANUAL** $\uparrow$ flashes
- Alter Mode: Selected **AUTO** , **MANUAL** , **MANUAL** m , **MANUAL** $\uparrow$ flashes
- Confirm: The flash will stop

Auto/Manual Mode Legends

Auto Mode



Manual Switch-in Mode



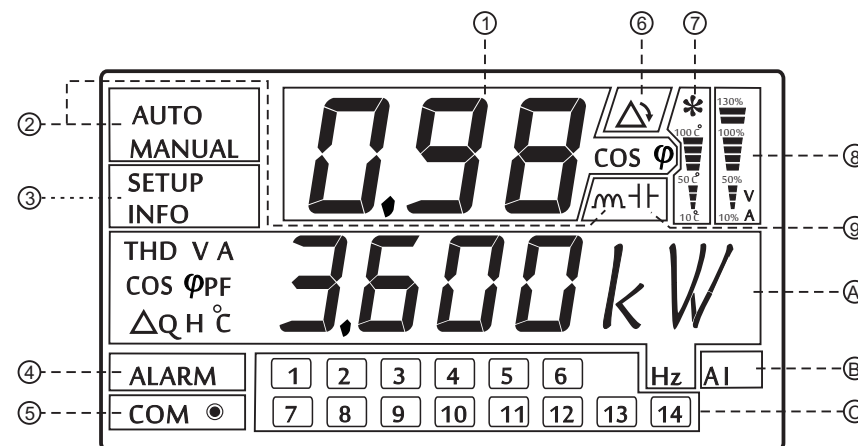
Manual Stop Mode



Manual Switch-out Mode



Front View



- ① Power Factor value
Lower than the set value in LRS shows C
- ② Auto/Manual indication is related to the status of m
- ③ Setup functions SETUP
Capacity check-up/ setup INFO
" Indications coordinate with the energized steps "
- ④ Fault Alarm
- ⑤ RS 485 communication
Black dot flashing is in communication
- ⑥ Fault phase sequence /correction indication
This legend keeps lighting up after correction
- ⑦ Temperature and fan energized indication
- ⑧ Voltage or current bargraph in %
- ⑨ Switch -in status m
Switch-out status $\uparrow$
- ⑩ Value and unit indication
Display examples :
380.0 V 060.0 A
360.0 kVA 360.0 kW
360.0 kV cos Φ -0.99
60.0 Hz t 25.0 l
THD V 03.1 / THD A 02.6 /
- ⑪ Initialization detection in capacity
- ⑫ Switch-in steps

Measured parameters

Display value as ⑩

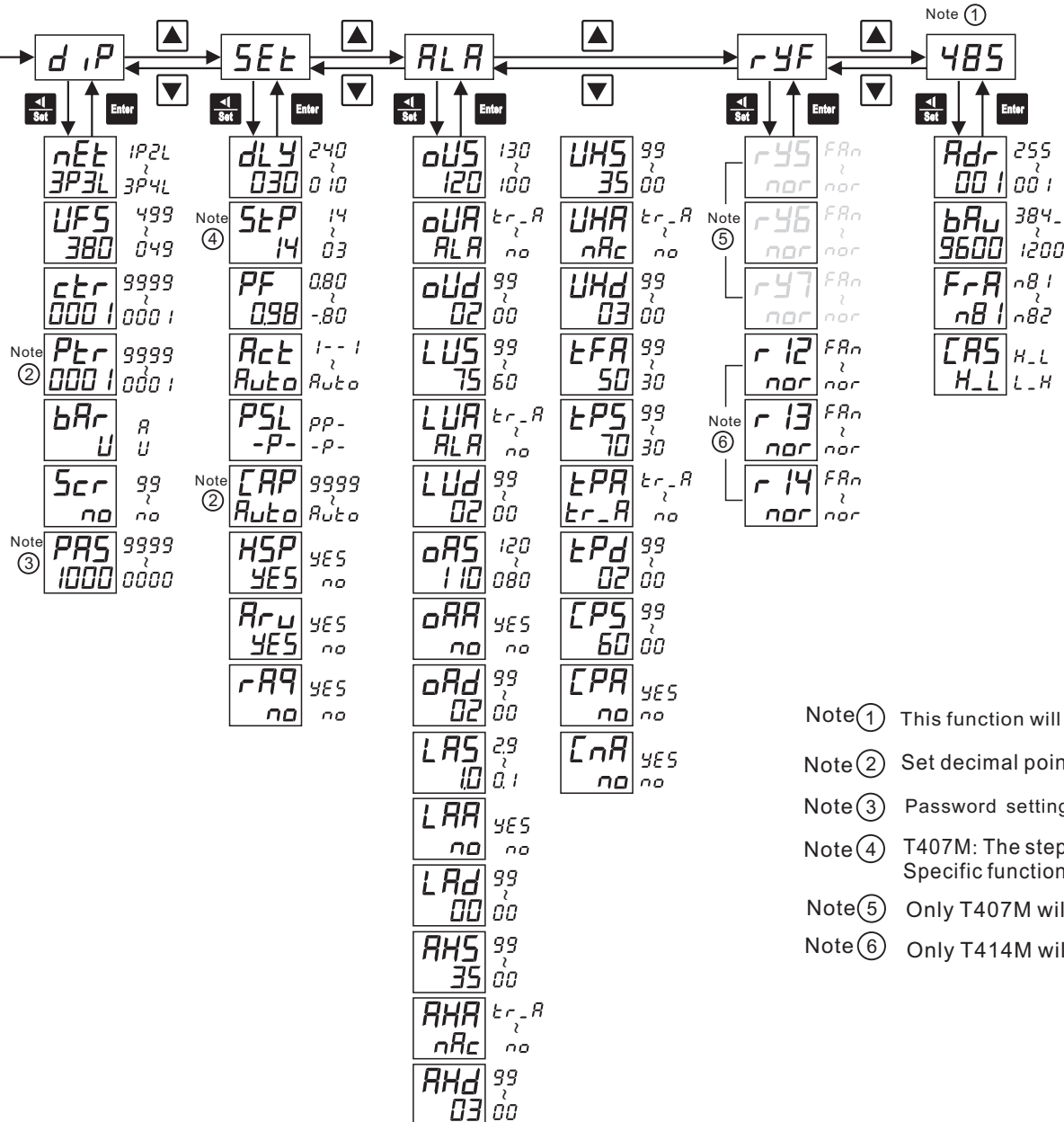
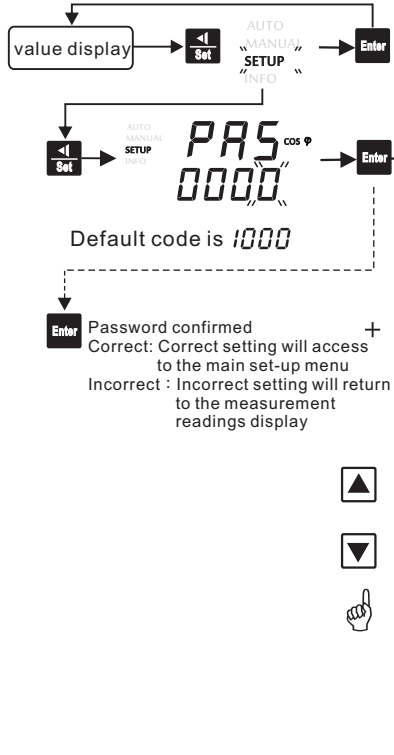
which shows subsequently : V 、 A 、 VA 、 W 、 Var 、 COS ° Hz 、 C 、 THDV 、 THDA

- Advance to next parameter
- Advance to previous parameter
- + Display individual harmonic content , and THDV/THDA flashes
- Next content
- Previous content
- Back to THD display

The presence of THDV or THDA, press:

Set-up Menu Explanation :

• Flowchart of menus :



• Keypads Operation

Main Set-up Menus :

- Enter** Return to the measured readings display
- ▲** Advanced to the next menu
- ▼** Advanced to the previous menu
- Set** Enter the Sub Set-up menus

Sub Set-up Menus :

- ▲** Advanced to the upward menu
- ▼** Advanced to the downward menu
- Enter** Return to the Main Set-up menu
- Set** Enter the value set-up, the selected value will keep flashing

Value Set-up :

- ▲** Value increase
- ▼** Value decrease
- Set** Vary digits position
- Enter** Confirm and return to the Sub Set-up menu

Note① This function will be displayed if RS485 is ordered

Note② Set decimal point position by pressing **▼** + **Enter** in the values setup

Note③ Password setting: Setting 0 is no need of password

Note④ T407M: The steps energized between 3~7
Specific functions for the relay activation can be set in the menu of **r.yf**

Note⑤ Only T407M will display

Note⑥ Only T414M will display

Description of Main Menus

d , P

Menus

- nEt** : The network system setup shall be set based on the actual wiring connection, otherwise the measured parameters in VA, W, Var will certainly be inaccurate.
- 3P4L** : VA, W, Var value x 3 , R phase voltage , R phase current
- 3P3L** : VA, W, Var value x $\sqrt{3}$, ST voltage , R phase current
- 1P3L** : VA, W, Var value x 2 , L1 voltage , L1 current
- 1P2L** : VA, W, Var value x 1
- UFS** : 100% Actual input voltage, this value will affect the bargraph indication in % and the ALARM activation
- ctr** : CT ratio
- Ptcr** : VT ratio, it can be set for the decimal point position
- bAr** : Bargraph indication in % of the input current or voltage
- Scr** : LCD backlight shut-off time (minutes)
- PR5** : Password setting: Setting 0 is no need of password

SEt

Menus

- dLY** : The switching delay time can be set from 10~240 seconds.
The setting of the switching delay time will be reset once a few conditions (Inductive/Capacitive/Normal Load) have been changed.
- StP** : The number of switching steps can be set from 03~06 (12) steps respectively.
This H.S.P (Fast switching-in Compensation) mode will be de-activated for proper operation if the setting of the number of switching steps is less than the switching step in circular sequence.
- PF** : The target power factor can be set in the range of -.95 capacitive to 0.85 inductive.
The target power factor has to be adjusted to reach a proper controlling program in accordance with the setting of the parameters in the P.S.L Mode.
- Act** : The type of switching program has to be set in compliance with the capacity of the installed capacitors on the network distribution.
- Auto** : Automatic detection; All the capacitors will be switched in successively for initialization detecting as the cap bank is just powered on
- 1111** : 1.1.1 (switching in circular sequence)
- 1222** : 1→2.2.(SICS)
- 1244** : 1→2→4.4. (SICS)
- 1248** : 1→2→4→8.8. (SICS)
- 11222** : 111 (Alternate Switching)→2.2. (SICS)
- 11244** : 11(AS)→2→4.4. (SICS)
- 11248** : 11(AS)→2→4→8.8 (SICS)
- 11224** : 11(AS)→22(AS)→4.4. (SICS)
- 1 - - 1** : 1.1.1 (switching in sequential sequence)

Example of switching steps:

124 : 1→2→4.4. (SICS)

Step 6	44
Step 5	44444444...
Step 4	444444444444.....
Step 3	444444444444.....
Step 2	..22..22..222..2...22..2..
Step 1	.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1
+++++++-----++	

1124 : 11(AS)→2→4.4. (SICS)

Step 6	444444444444.....
Step 5	444444444444.444444.
Step 4	444444.....444444444444
Step 3	..22..22.2..22..2..2.22..2
Step 2	...1...1...1...1...1...1...1..
Step 1	.1...1...1...1...1...1...1...1
+++++++-----	

PSL : The precise setting of the target PF mode for a variety of applications has to be set in compliance with the measuring threshold of the actual power factor value.
(Furthermore, the detecting band of the set C/K value is mainly derived from the actual load variations.)

-P- : The target power factor can be permitted to set in the range of capacitive power factor. Besides, this mode represents a fixed setting point.

PP- : This mode is the same as **-P-** , but the target PF can not be set to capacitive PF.

✖ It is only limited to set to the inductive PF value in the desired mode of **PP-** because it is not allowed to set to capacitive PF value (-0.97) in the **PP-** mode.

CAP : The smallest capacity/Kvar value setup in auto-detection mode

The smallest capacity/Kvar value setup shall be based on the first step of capacitor (smallest) if it is set to the manual mode.

✖ It shall not be adapted to auto-detection mode as the manual mode is set.

✖ It is available to set the decimal point position by pressing the buttons  +  simultaneously.

HSP : Fast switching-in compensation (Bigger Kvar compensated) **YES**: Start-up

1. The activation starts to be energized first based on the set SICS program if the activation mode is adapted to the SICS program. But, the rest shall follow up the set *Rct* mode for activation.
2. Follow up the above, it proceeds with the same activation again, the set delay time *dLY* will be decreased half for activation. The legend of $\cos\phi$ flashing represents that the delay time will be recovered if the same activation is not required again.

※ This mode is de-energized if the set steps of the installed capacitors is less than of the set SICS program.

※ This mode is de-energized in the manual mode.

Arru : Auto Reverse Correction **YES** : Start-up

The legend of Δ flashes around 3 secs for the phase angle in a reverse shift at 180 degree as the phase angle exceeds the normal requirements.

Being altered as normal status then indicated with Δ , it represents the phase sequence has been altered.

※ This mode is only limited to the input voltage in polarity and the input current in reverse flow direction(KL).

rrr : Clearing all the memorized values **YES**: Clear

- ※ The memorized parameters are inclusive of the Kvar capacity in %, Nos of times for switching-in and the relay activation running hour. After clearance, it starts to the initialization for re-detection.
- ※ If a clearance setup for the specific designated step of the capacitor, please refer to the functions under the menus of INFO Q , INFO Δ Q

ALA **Menus**

ous : Setting of the over-voltage range: 100 ~ 130 %

The input voltage exceeds the ratio of the set over voltage in percentage, the alarm activation mode can be energized based on the functions of **ouA**.

ouA : Over-voltage activation setup

no : De-energized

nAc : Stop switching-in the capacitor as the inductive load still needs to be compensated.

trP : Switching-out all the energized capacitors

ALA : Being appeared with ALARM, the relay contact is energized.

nA_A : $nAc + ALA$

tr_A : $trP + ALA$

※ An indication of ALARM is appeared on the screen, to press $\frac{1}{2}$ + ∇ simultaneously for checking back the fault records, which it can refer to the ALARM menus.

※ It will automatically be returned to the designated legend if a presence of ALARM is still stayed for 20 seconds without pressing the buttons

Example: It turns to the legend of over-voltage reading if the over-voltage is detected.
It turns to the legend of temp. reading if the over-temp. is detected.

oud : Over-voltage delay time setup (sec.)

It will be energized as the desired set time exceeds the threshold.

LUS : Setting of the under-voltage range: 50 ~ 99 %

The input voltage is under the ratio of the set under voltage in percentage, the alarm activation mode can be energized based on the functions of **LUA**.

LUA : Under-voltage activation setup

no : De-energized

nAc : Stop switching-in the capacitor as the inductive load still needs to be compensated.

trP : Switching-out all the energized capacitors

ALA : Being appeared with ALARM, the relay contact is energized.

nA_A : $nAc + ALA$

tr_A : $trP + ALA$

※ An indication of ALARM is appeared on the screen, to press $\frac{1}{2}$ + ∇ simultaneously for checking back the fault records, which it can refer to the ALARM menus.

※ It will automatically be returned to the designated legend if a presence of ALARM is still stayed for 20 seconds without pressing the buttons.

Example: It turns to the legend of under-voltage reading if the under-voltage is detected.
It turns to the legend of temp. reading if the over-temp. is detected.

Lud : Under-voltage delay time setup (sec.)

It will be energized as the input voltage is under the set threshold value, and meanwhile the signal status exceeds the set delay time.

oAS : Over-current ratio setup: 80 ~ 120 %

The input current exceeds the set ratio, the alarm activation mode can be energized based on the functions of **oAA**.

oAA : Over-current activation setup

no : De-energized

YES : Being appeared with ALARM, the relay contact is energized.

※ An indication of ALARM is appeared on the screen, to press $\frac{1}{2}$ + ∇ simultaneously for checking back the fault records, which it can refer to the ALARM menus.

※ It will automatically be returned to the designated legend if a presence of ALARM is still stayed for 20 seconds without pressing the buttons.

oAd : Over-current ratio setup (sec.)

It will be energized as the desired set time delay exceeds the threshold.

LAS : Under-current activation setup 0.1 ~ 2.9 %

The input current is under the ratio of the set under current in percentage, the alarm activation mode can be energized based on based on the functions of **LAA**.

LAA : Under-current activation setup

no : De-energized

YES : Being appeared with ALARM, the relay contact is energized.

※ An indication of ALARM is appeared on the screen, to press $\frac{1}{2}$ + ∇ simultaneously for checking back the fault records, which it can refer to the ALARM functions.

※ It will automatically be returned to the designated legend if a presence of ALARM is still stayed for 20 seconds without pressing the buttons.

※ The input current is under the set value, the legend of **C 3** will be indicated on screen.

LAd : Under-current delay time setup (sec.)

It will be energized as the desired set time delay exceeds the threshold.

***AHS* : THD A ratio setup 00 ~ 99 %**

The input THD A exceeds the set ratio, the alarm activation mode can be energized based on the functions of *AHA* .

***AHA* : Activation setup/THD A exceeds the set ratio.**

no : De-energized

nAc : Stop switching-in the capacitor as the inductive load still needs to be compensated.

trP : Switching-out all the energized capacitors

ALA : Being appeared with ALARM , the relay contact is energized.

nA_A : *nAc* + *ALA*

tr_A : *trP* + *ALA*

※An indication of ALARM is appeared on the screen, to press  +  simultaneously for checking back the fault records, which it can refer to the ALARM functions.

※It will automatically be returned to the designated legend if a presence of ALARM is still stayed for 20 seconds without pressing the buttons.

***AHd* : THD A delay time setup (sec.)**

It will be energized as the desired set THD ratio/time delay exceeds the thresholds simultaneously.

***UHS* : THD V ratio setup 00 ~ 99 %**

The input THD V exceeds the set ratio, the alarm activation mode can be energized based on the functions of *UHA* .

***UHA* : Activation setup/THD V exceeds the set ratio**

no : De-energized

nAc : Stop switching-in the capacitor as the inductive load still needs to be compensated.

trP : Switching-out all the energized capacitors

ALA : Being appeared with ALARM, the relay contact is energized.

nA_A : *nAc* + *ALA*

tr_A : *trP* + *ALA*

※ An indication of ALARM is appeared on the screen, to press  +  simultaneously for checking back the fault records, which it can refer to the ALARM functions.

※ It will automatically be returned to the designated legend if a presence of ALARM is still stayed for 20 seconds without pressing the buttons.

***U Hd* : THD V delay time setup (sec.)**

It will be energized as the desired set THD ratio/time delay exceeds the thresholds simultaneously.

***EPF* : Temperature threshold set for FAN energized**

※The activation mode set to *FAn* in the functions of *rYF* can be energized as the set temperature exceeds the threshold.

※The legend of * will be indicated on screen as the *FAn* activation is energized.

※The relay activation will be recovered as the temperature decreases around 5 °C below the set threshold in the energized status.

***EPS* : Over temperature range setup**

The temperature exceeds the set range, the alarm activation mode can be energized based on the functions of *EPF* .

***EPF* : Activation setup/Over temperature**

no : De-energized

nAc : Stop switching-in the capacitor as the inductive load still needs to be compensated.

trP : Switching-out all the energized capacitors

ALA : Being appeared with ALARM, the relay contact is energized.

nA_A : *nAc* + *ALA*

tr_A : *trP* + *ALA*

※An indication of ALARM is appeared on the screen, to press  +  simultaneously for checking back the fault records, which it can refer to the ALARM functions.

※It will automatically be returned to the designated legend if a presence of ALARM is still stayed for 20 seconds without pressing the buttons.

***EPd* : Over temperature delay time setup (sec.)**

It will be energized as the desired set temperature range/time delay exceeds the thresholds.

***CP5* : Capacitor's capacity decrease-ratio setup 00 ~ 99 %**

The capacity is under the set ratio, the alarm activation mode can be energized based on the functions of *CPF* .

***CPF* : Activation setup/Capacity decrease exceeds the set ratio**

no : De-energized

YES : Being appeared with ALARM, the relay contact is energized

※Checking back the legends of INFO_{INFO ΔQ} / INFO_Q which include the details in the memorized records.

***CnA* : Activation setup/Short of capacity after switching in the capacitor**

no : De-energized

YES : Being appeared with ALARM, the relay contact is energized.

***rYF* Menus (MPC-06 is designed as *rY5* *rY6* *rY7*) (MPC-12 is designed as *r12* *r13* *r14*)**

r12

r13

r14

: Specific functions for relay contact activation

nor : Not assigned to other functions

on : Switch-in the capacitor forever (Energized after the delay time)

ALA : Alarm contact (Extra alarm contact)

FAn : Fan energized

※ The added relay contact activation with specific functions doesn't relate with the *STEP* steps of relays for switching operation.

※Example of 14 steps

Relay 12 is assigned to on. Relay 14 is assigned to FAn. Relay 13 is assigned to nor (only for switching-in/out the capacitor)

485 Menus

Adr : Address setting *001~255*

baud : Baud rate *1200 2400 4800 9600 19200 38400*

Frame : Frame setting *n82 o81 E81 o81*

CRS : Hi-Lo WORD sequence setting *L_H H_L*

Legends flashing in AUTO mode

Fast switch-in

AUTO
MANUAL
SETUP
INFO

0.98 COS ϕ $\frac{m}{A}$ $\frac{V}{V}$

HSP set to *YES*

If it conforms to the fast switch-in mode, COS ϕ will flash

Auto switch-out

AUTO
MANUAL
SETUP
INFO

0.98 COS ϕ $\frac{m}{A}$ $\frac{V}{V}$

Any **RLR** set to *ErP* or *ErR*

The relay contact is automatically switched out after the delay time as it turns to a capacitive load, and the legend of $\frac{m}{A}$ flashes.

※The input current is under the set **CRS** (under-current activation setup), it automatically starts the Auto Switch-out mode.

Disabled switch-in/out

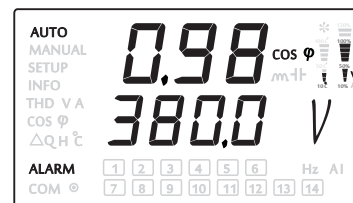
AUTO
MANUAL
SETUP
INFO

0.98 COS ϕ $\frac{m}{A}$ $\frac{V}{V}$

Any activation setup functioned in the menus of **RLR** is set to either *nRC* or *nR_R*

The switch-in activation is disabled as it turns to the inductive and capacitive load, and the legends of $\frac{m}{A}$ $\frac{V}{V}$ flash.

ALARM Messages

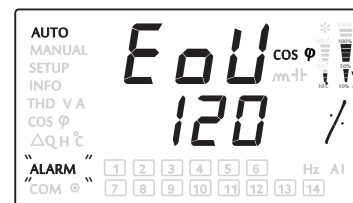


As the ALARM contact starts to be energized: The activation setup shall be set to **RLR** for alarming.

1. The alarm contact is energized
2. It will automatically be returned to the designated legend if a presence of ALARM is still stayed for 20 seconds without pressing the buttons.
3. Being appeared with the legend of ALARM
4. Press $\frac{m}{A}$ + $\frac{V}{V}$ simultaneously for checking back the faulty records, which it can refer to the ALARM functions.

※It doesn't have any faulty events happened without having the legend of ALARM shown on screen. In such a condition, the both buttons pressed is disabled.

Buttons function : Press $\frac{m}{A}$ + $\frac{V}{V}$ simultaneously for checking back the fault records



1. ALARM flashing represents for checking the ALARM faulty records
2. Buttons function

- $\frac{m}{A}$ Return to the measured values display
- $\frac{V}{V}$ Next faulty record
- $\frac{V}{V}$ Previous faulty record

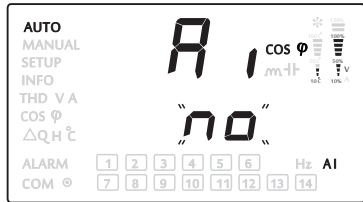
※ The activation setup assigned to the **RLR** mode will indicate with the faulty records and related settings as the ALARM starts to be energized. And relatively, it indicates nothing without having the ALARM faults.

ALARM faults check-up

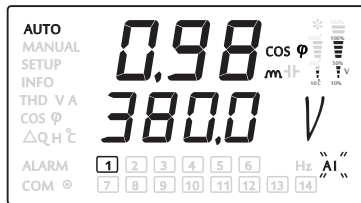
ELR	Under-current	EoR	Over-current
ELU	Under-voltage	EoU	Over-voltage
ERt	THD A ratio	EUt	THD V ratio
EtP	Over-temperature	ECn	Short of capacity after switching in
ECP	Capacitor's capacity decrease		

AI Operations/Functions (CT&VT ratio shall be set correctly)

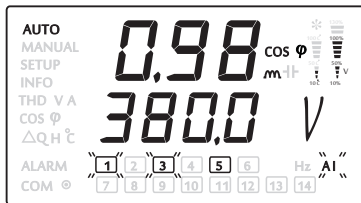
Startup AI for detection/initialization of each capacity of the installed capacitors, exclusive of the specific functions of r_{YF} .



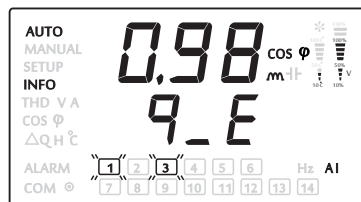
AI startup legends



Example of capacity detection



Abnormal capacity check-up



Startup AI only in the AUTO mode

1. Press $\frac{1}{2}$ + Enter simultaneously for AI startup, and meanwhile the displayed legends flash.
2. Press either $\frac{1}{2}$ or $\frac{1}{3}$ to alter SE , then press Enter for startup.
3. Memorize each capacity after the delay time for switching-in as the AI startup is energized.
4. By pressing Enter can stop initialization during the AI startup.

✱It will automatically stop the AI mode as the system is in a status of either the switch-in/out activation disabled or auto switch-out.

1. The legend of m and AI lights up/flashes individually after the delay time for switching in, and sequentially the legend of step 1 will be lit up like $\frac{1}{1}$.
2. It will turn to the next step for detection as the values detected are normal. Consequently it lasts for the set maximum step (SE), exclusive of the specific functions of r_{YF} .
3. The value detected is abnormal, then the legend of the assigned step flashes like $\frac{1}{1}$.
4. The detecting procedure is finalized or interrupted, then it will return to the measured values display after the legend of $F mH$ is lit up.

Steps $\frac{1}{1}$, $\frac{1}{3}$ flashing represents for abnormal status.

Steps $\frac{1}{2}$, $\frac{1}{4}$ aren't lit up that represents for normal status.

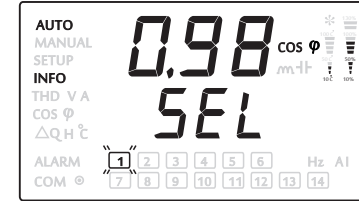
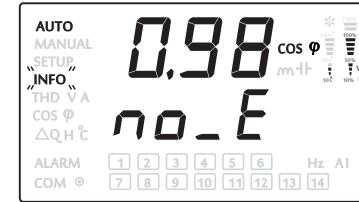
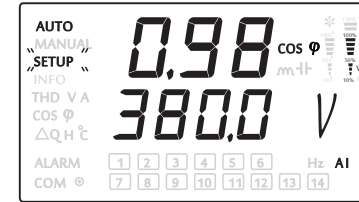
It is currently on detecting step $\frac{1}{5}$.

✱Detection is normal, then the capacity will be memorized in INFO Q.

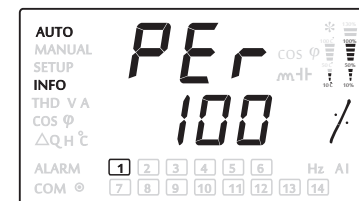
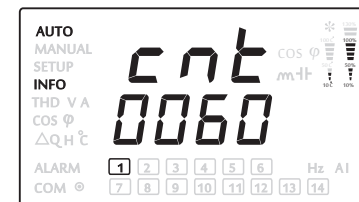
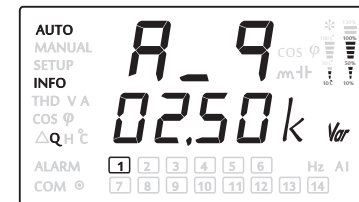
Capacity check-up/setup (CT&VT ratio shall be set correctly)

INFO Q : Capacity initialization detecting

INFO ΔQ : Detect current capacity



INFO Legends



1. Press $\frac{1}{2}$ to select SETUP for access, and meanwhile SETUP flashes. Press again to access the setup functions, and then the flashing varies with the selected the functions in INFO by pressing $\frac{1}{2}$ or $\frac{1}{3}$.

2. Press $\frac{1}{2}$ to select the functions in INFO, and meanwhile INFO flashes.

✱Being appeared with no_E represents for the capacity is normal, and it needs to access the abnormal capacity check-up if the abnormal status happens.

3. Press $\frac{1}{2}$ to select the number of step. Set example of $\frac{1}{1}$ flashing. Bargraph indication in % represents for the capacity decrease corresponding to the no. of step.

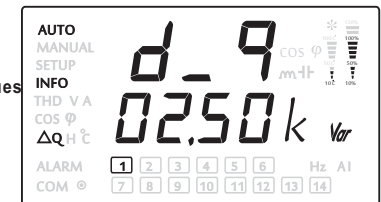
4. Press $\frac{1}{2}$ or $\frac{1}{3}$ to select the number of steps, and meanwhile the step flashes.

5. Press $\frac{1}{2}$ to access the related legends of the selected step.

6. Press $\frac{1}{2}$ or $\frac{1}{3}$ to display the related legends as follows.

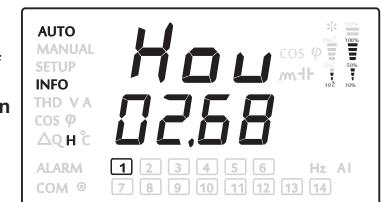
7. Leave INFO
Press Enter to return to the previous display toward the measured values display.

INFO Q
Measured values



INFO ΔQ
Measured values

Numbers of
times for
switching-in



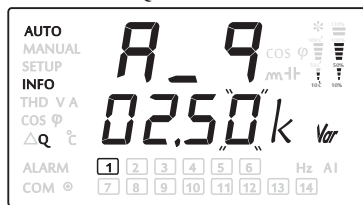
Relay activation
running hour

✱The unit/decimal point position will automatically vary with the measured values.

Bargraph indication
in % for the capacity
decrease

Capacity setup (CT&VT ratio shall be set correctly)

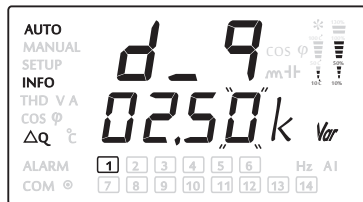
INFO Q Values setup



Buttons function

- Access to setup, and meanwhile the unit digit flashes
- Increase value
- Decrease value
- Alter the digit position
- + Alter the decimal point position
- Confirm then return to the measured values display

INFO ΔQ Values setup



Buttons function

- Access to setup, and meanwhile the unit digit flashes
- Increase value
- Decrease value
- Alter the digit position
- + Alter the decimal point position
- Confirm then return to the measured values display

Number of the times for switching-in



Buttons function

- + Hold both buttons longer for indicating CLR, and the value is reset to 0 after clearance

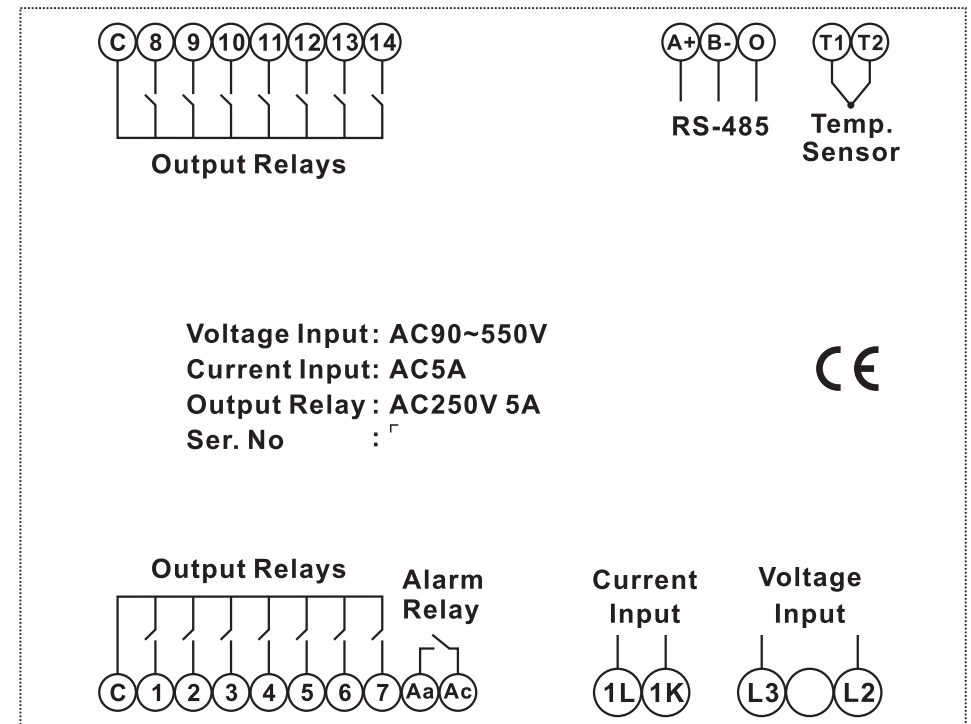
Relay activation running hour



Buttons function

- + Hold both buttons longer for indicating CLR, and the value is reset to 0 after clearance

Terminal Diagram

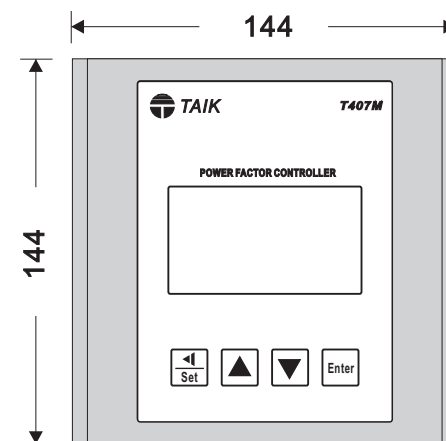


■ Specifications

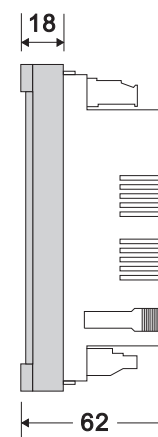
Voltage range : AC 90~550 V
 Power consumption : $\leq VA(T407M)$, $\leq 10 VA(T414M)$
 Current range : AC 0.05 ~ 5A
 Power consumption : $\leq 0.5VA$
 LCD screen : LCD backlight display, 12mm high, 0.01 PF resolution
 Power factor setting range: Cap.0.70~ Ind.0.70 PF.
 0.97 be set on delivery from factory
 Accuracy : $V, A : \pm 0.2\% F.S.$, $VA, W, Var : \pm 0.5\% F.S.$, $PF : \pm 0.02$
 Power factor setting mode: Setting value to 1.00 PF. or setting point mode

Switching delay time : 001 ~ 999 sec.
 delay time 30 sec. be set to factory's default value
 Number of steps : 3 ~ 7 steps for T407M 3 ~ 14 steps for T414M
 Over voltage setting : typical AC 250V 5A
 Relay contact capacity: Max. AC 380V, 5A, typical AC 220V 5A
 Operating temperature: 0 ~ 60 °C
 Storage temperature: -10 ~ 70 °C
 Dielectric strength : AC 2KV, 60Hz, 1 minute, INPUT/OUTPUT/CASE
 Surge immunity : IEC 1000-4-5 Level 4
 Electrical fast transient/burst: IEC 1000-4-4 Level 4
 Short interruptions and voltage variations : IEC 1000-4-11 70%/10mS, 40%/100mS
 Connection : Plug-in terminal block
 Weight : About 0.5kg.

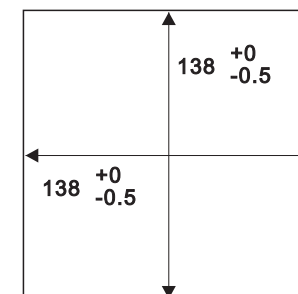
■ Front view



■ Side view

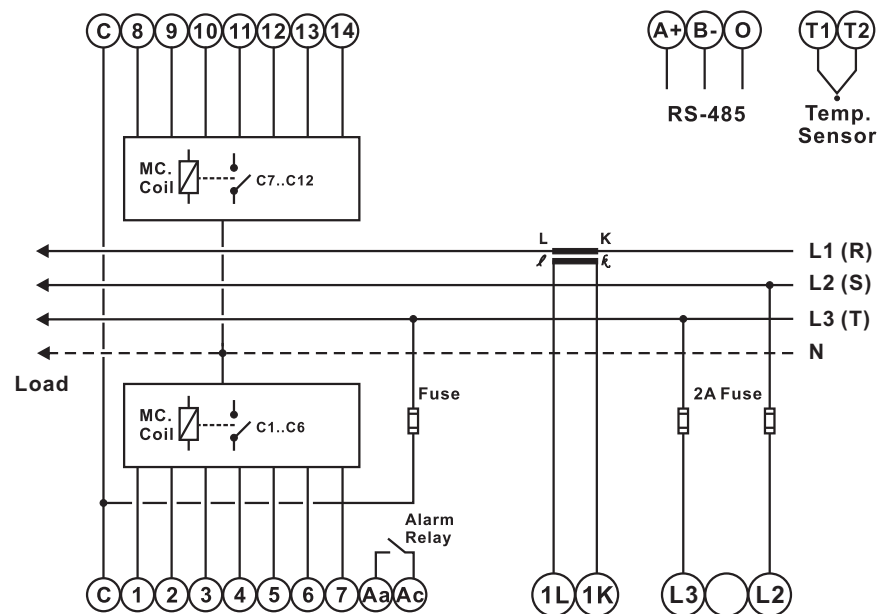


■ Cut-out size



■ Connection Diagram

$nEt = 3P3L$ Connection Diagram



$nEt = 3P4L, 1P2L$ Connection Diagram, voltage connect to VRN

