

## REACTIVE POWER REGULATOR S5-60D,S5-120D



S5-60D/S5-120D

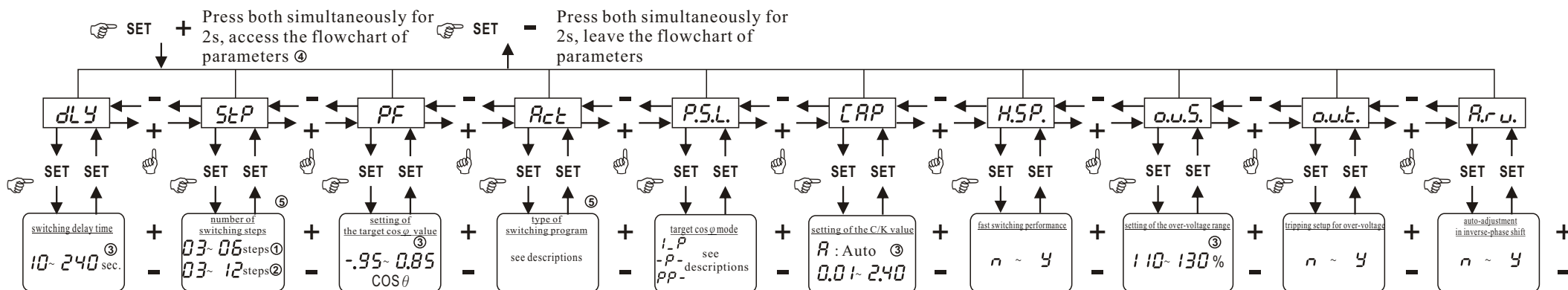
### SETTING PROCEDURE

#### ● VIEW SETTING VALUE

By pressing **SET** for 2s, and then the following symbols will be shown on the display subsequently:

$dLY$  (switching delay time)  $\rightarrow$   $StP$  (number of switching steps)  $\rightarrow$   $PF$  (setting of the target  $\cos \phi$  value)  $\rightarrow$   $Act$  (type of switching program)  $\rightarrow$   $P.S.L.$  (target  $\cos \phi$  mode)  $\rightarrow$   $CAP$  (setting of the C/K value)

#### ● FLOWCHART OF PARAMETERS



Remark ①: Setting is applied to S5-60D  
 Remark ②: Setting is applied to S5-120D  
 Remark ③: Press for over 3s during setting the desired value, the value will be increased/decreased by 5 numerical value  
 Remark ④: Access to the flowchart of parameters, it will leave out the flowchart of parameters automatically after 2 minutes without any operation on keypads

Remark ⑤: All connected capacitors will be switched off in order once any setting has been changed

### FRONT VIEW

- ① Manual operation
- ② Switching on capacitor
- ③ Switching off capacitor
- ④ Fault alarm
- ⑤ Power factor value
- ⑥ Energized capacitor steps
- ⑦ Keypad
- ⑧ Fault status

### DESCRIPTION OF FAULT STATUS

- $Er.1$ : sensitivity of the low current
- $Er.2$ : the measured voltage exceeds the limiting volt.
- $Er.3$ : the measured voltage is less than the limiting volt.
- $Er.4$ : the measured current exceeds the limiting amp.
- $Er.5$ : incorrect frequency range
- $Er.3$ : the measured voltage is less than the limiting volt.
- $Er.5$ : incorrect phase position

### MANUAL MODE

- Press **+ -** simultaneously for 2s, the LEDs "MANUAL" will light up after accessing the manual mode.
- Press **+** for 1s, the LEDs "IND" will light up once switching on capacitor manually.
- Press **SET** for 1s, the LEDs "IND" will put out once stopping switching on capacitor.
- Press **-** for 1s, the LEDs "CAP" will light up once switching off capacitor manually.
- Press **SET** for 1s, the LEDs "CAP" will put out once stopping switching off capacitor.
- Press **+ -** simultaneously for 2s, the LEDs "MANUAL" will put out, meanwhile the auto mode will replace the manual one.

## DESCRIPTION OF THE PARAMETERS

1. **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.
2. **STEP**: The number of switching steps can be set from 03 to 06(12) steps respectively.  
This H.S.P 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.
3. **PF**: The target power factor can be set in the range of 0.85 inductive up to (-.95) capacitive.  
The target power factor has to be adjusted to reach a proper controlling program in accordance with the setting of the parameter in the P.S.L. Mode.
4. **Act**: The type of switching program has to be set in compliance with the capacity of the installed capacitors on the network distribution.

111 : 1:1:1 (switching in circular sequence)

122 : 1→2.2. (SICS)

124 : 1→2→4.4. (SICS)

148 : 1→2→4→8.8. (SICS)

1122 : 11 (Alternate Switching)→2.2. (SICS)

1124 : 11(AS)→2→4.4. (SICS)

1148 : 11(AS)→2→4→8.8 (SICS)

1124 : 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 | .....4444444              |
| Step 4 | .....4444444444           |
| Step 3 | .....4444444444           |
| Step 2 | ..22..22..222..2..22..2.. |
| Step 1 | .1.1.1.1.1.1.1.1.1.1.1.1  |

+++++++-----++

148 : 1→2→4→8.8. (SICS)

|        |                               |
|--------|-------------------------------|
| Step 6 | .....888.....                 |
| Step 5 | .....888.....                 |
| Step 4 | .....8888888888..8888888888   |
| Step 3 | .....4444..4444.4.4.4444..... |
| Step 2 | ..22..22..2..22.2.2.22..22..  |
| Step 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 |

+++++++-----

1124 : 11(AS)→22(AS)→4.4. (SICS)

|        |                                  |
|--------|----------------------------------|
| Step 6 | .....4444444444444444.444.       |
| Step 5 | .....444444444444444444.44.....  |
| Step 4 | .....22.....22222222.....22..    |
| Step 3 | ..22.....22222222.....2.....2    |
| Step 2 | ...1...1...1...1...1...1...1..   |
| Step 1 | .1...1...1...1...111...1...1...1 |

+++++++-----+-----

5. **P.S.L.**: The precise setting of the target cos φ 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.

- 1-P**: The setting range can be set from 1.00 to the target power factor. And further, this mode represents a fixed detecting range. (only set as positive inductive)
- P-**: The target power factor can be permitted to set in the range of capacitive power factor. And further, this mode represents a fixed setting point.
- PP-**: This mode comprises the above two modes with their specific features, but the target power factor can not be set to capacitive power.

6. **CRP**: The setting of the C/K value has two types of operating modes, which includes the manual and automatic. /R(auto-detecting) mode. The C/K value can be set from 0.01~240 during the manual mode.

In case of selecting the manual mode, the calculation of the C/K value has to be done in compliance with the capacity of the first capacitor.

$$Ck = IC / k \quad \text{Var} : \text{KVar (the first capacitor)}$$

$$IC = \frac{\text{Var}}{\sqrt{3} \times U} \quad U : \text{Line-Volt (in the system)}$$

$$K : \text{C.T. transformation ratio}$$

For example : Var=10KVar , U = 380V , k = 400:5 =80

$$Ck = 10K / (1.732 \times 380 \times 80) = 0.19$$

※Please refer to page 3, table of C/K value

7. **H.S.P.** : Fast switching performance,  $n \sim y \circ y$  : Start-up

In order to replace the gradual switching on/off capacitor step, there are two solutions to an extended life of both the contactors and the capacitors as follows.

1. Switching on/off the largest possible capacitor step is in order to reduce the frequent switching operations. And the switching program will directly start entering the step in circular sequence for switching on/off capacitor if the actual load is fitted in with the circular sequence. Furthermore, the rest of the switching program should be activated in compliance with the selected  $R_{ct}$  mode.
2. After starting this procedure, in case of the subsequent connection/ disconnection to capacitor again, a half of the preset switching delay time under the  $dL \ y$  model will be activated; meanwhile, the decimal point of the unit place also flashes. If no longer switched on/off capacitor, the switching delay time will recover the standard setting.

✳ This H.S.P. mode will be de-activated for switching on/off capacitor if the setting of the number of switching steps is less than the switching step in circular sequence.

For example:  $dL \ y = 30 \cdot S_{tP} = 6 \cdot R_{ct} = 112 \ y$  (step 4 as circular sequence)

In case a compensation demand for the reactive power value (KVar) is 10 times of the CK value, the following explanations are as follows:  
The controller will directly switch on the capacitor (step 4) after 30 seconds because the reactive power value (KVar) is higher than 4 times of the C/K value, thus the KVar value in the system should be derived from the designed formula as  $10-4=6$ .

This way, the derived value ( $10-4=6$ ) in KVar is still higher than 4 times of the C/K value, a half of the preset switching delay time under the  $dL \ y$  mode will be activated for switching on again (new default value has been automatically changed as 15s), and meanwhile, the decimal point of the unit place also flashes.

Following up the designed formula, now the latest derived value ( $6-4=2$ ) in KVar in the system is less than the step 4 in circular sequence so the H.S.P. mode should be de-activated.

✳ Select the Auto mode, the H.S.P. mode is de-activated.

8. **o.v.s.** : Setting of the over-voltage range :  $110 \sim 130\%$

It is no longer switched on capacitor once the measured mains supply exceeds the preset range.

9. **o.v.t.** : Tripping setup for over voltage:  $y$  : Start-up

All the steps will be switched off in order once the legend  $E-r^2$  is shown on the display. This tripping setting must be activated according to the settings of the  $dL \ y$  and  $R_{ct}$  mode.

10. **R.r.u.** : Auto-adjustment in inverted-phase shift

$n \sim y \circ y$  : Start-up

The phase-shift will be automatically reversed at 180 degrees as the measured phase angle exceeds 90 degrees, and the displaying screen indicates  $E-r5$  after 3 seconds. Moreover, it is unnecessary to alternate the cable in the electrical network system except for the phase error.

✳ This procedure is only applied to the following conditions.

1. The connected voltage terminals with the reverse polarity
2. The direction of the measured current flow has been inverted

■ Table of the C/K values for 380V

| CT 比   | KV AR |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|        | 2.5   | 5    | 7.5  | 10   | 15   | 20   | 25   | 30   | 37.5 | 40   | 50   | 60   | 80   | 100  |
| 150/5  | 0.13  | 0.25 | 0.38 | 0.51 | 0.76 | 1.01 | 1.27 | 1.52 | 1.90 | 2.03 |      |      |      |      |
| 200/5  | 0.09  | 0.19 | 0.28 | 0.38 | 0.57 | 0.76 | 0.95 | 1.14 | 1.42 | 1.52 | 1.90 | 2.28 |      |      |
| 250/5  | 0.08  | 0.15 | 0.23 | 0.30 | 0.46 | 0.61 | 0.76 | 0.91 | 1.14 | 1.22 | 1.52 | 1.82 |      |      |
| 300/5  | 0.06  | 0.13 | 0.19 | 0.25 | 0.38 | 0.51 | 0.63 | 0.76 | 0.95 | 1.01 | 1.27 | 1.52 | 2.03 |      |
| 400/5  | 0.05  | 0.09 | 0.14 | 0.19 | 0.28 | 0.38 | 0.47 | 0.57 | 0.71 | 0.76 | 0.95 | 1.14 | 1.52 | 1.90 |
| 500/5  | 0.04  | 0.08 | 0.11 | 0.15 | 0.23 | 0.30 | 0.38 | 0.46 | 0.57 | 0.61 | 0.76 | 0.91 | 1.22 | 1.52 |
| 600/5  | 0.03  | 0.06 | 0.09 | 0.13 | 0.19 | 0.25 | 0.32 | 0.38 | 0.47 | 0.51 | 0.63 | 0.76 | 1.01 | 1.27 |
| 800/5  | 0.02  | 0.05 | 0.07 | 0.09 | 0.14 | 0.19 | 0.24 | 0.28 | 0.36 | 0.38 | 0.47 | 0.57 | 0.76 | 0.95 |
| 1000/5 | 0.02  | 0.04 | 0.06 | 0.08 | 0.11 | 0.15 | 0.19 | 0.23 | 0.28 | 0.30 | 0.38 | 0.46 | 0.61 | 0.76 |
| 1500/5 |       | 0.03 | 0.04 | 0.05 | 0.08 | 0.10 | 0.13 | 0.15 | 0.19 | 0.20 | 0.25 | 0.30 | 0.41 | 0.51 |
| 2000/5 |       | 0.02 | 0.03 | 0.04 | 0.06 | 0.08 | 0.09 | 0.11 | 0.14 | 0.15 | 0.19 | 0.23 | 0.30 | 0.38 |
| 2500/5 |       |      | 0.02 | 0.03 | 0.05 | 0.06 | 0.08 | 0.09 | 0.11 | 0.12 | 0.15 | 0.18 | 0.24 | 0.30 |
| 3000/5 |       |      |      | 0.03 | 0.04 | 0.05 | 0.06 | 0.08 | 0.09 | 0.10 | 0.13 | 0.15 | 0.20 | 0.25 |
| 4000/5 |       |      |      | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.11 | 0.15 | 0.19 |
| 5000/5 |       |      |      |      | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.06 | 0.08 | 0.09 | 0.12 | 0.15 |

■ Table of the C/K values for 220V

| CT 比   | KV AR |      |      |      |      |      |      |      |      |      |      |      |      |  |
|--------|-------|------|------|------|------|------|------|------|------|------|------|------|------|--|
|        | 2.5   | 5    | 7.5  | 10   | 15   | 20   | 25   | 30   | 40   | 50   | 60   | 80   | 100  |  |
| 150/5  | 0.22  | 0.44 | 0.66 | 0.87 | 1.31 | 1.75 | 2.19 |      |      |      |      |      |      |  |
| 200/5  | 0.16  | 0.33 | 0.49 | 0.66 | 0.98 | 1.31 | 1.64 | 1.97 |      |      |      |      |      |  |
| 250/5  | 0.13  | 0.26 | 0.39 | 0.52 | 0.79 | 1.05 | 1.31 | 1.57 | 2.10 |      |      |      |      |  |
| 300/5  | 0.11  | 0.22 | 0.33 | 0.44 | 0.66 | 0.87 | 1.09 | 1.31 | 1.75 | 2.19 |      |      |      |  |
| 400/5  | 0.08  | 0.16 | 0.25 | 0.33 | 0.49 | 0.66 | 0.82 | 0.98 | 1.31 | 1.64 | 1.97 |      |      |  |
| 500/5  | 0.07  | 0.13 | 0.20 | 0.26 | 0.39 | 0.52 | 0.66 | 0.79 | 1.05 | 1.31 | 1.57 | 2.10 |      |  |
| 600/5  | 0.05  | 0.11 | 0.16 | 0.22 | 0.33 | 0.44 | 0.55 | 0.66 | 0.87 | 1.09 | 1.31 | 1.75 | 2.19 |  |
| 800/5  | 0.04  | 0.08 | 0.12 | 0.16 | 0.25 | 0.33 | 0.41 | 0.49 | 0.66 | 0.82 | 0.98 | 1.31 | 1.64 |  |
| 1000/5 | 0.03  | 0.07 | 0.10 | 0.13 | 0.20 | 0.26 | 0.33 | 0.39 | 0.52 | 0.66 | 0.79 | 1.05 | 1.31 |  |
| 1500/5 | 0.02  | 0.04 | 0.07 | 0.09 | 0.13 | 0.17 | 0.22 | 0.26 | 0.35 | 0.44 | 0.52 | 0.70 | 0.87 |  |
| 2000/5 |       | 0.03 | 0.05 | 0.07 | 0.10 | 0.13 | 0.16 | 0.20 | 0.26 | 0.33 | 0.39 | 0.52 | 0.66 |  |
| 2500/5 |       | 0.03 | 0.04 | 0.05 | 0.08 | 0.10 | 0.13 | 0.16 | 0.21 | 0.26 | 0.31 | 0.42 | 0.52 |  |
| 3000/5 |       | 0.02 | 0.03 | 0.04 | 0.07 | 0.09 | 0.11 | 0.13 | 0.17 | 0.22 | 0.26 | 0.35 | 0.44 |  |
| 4000/5 |       |      | 0.02 | 0.03 | 0.05 | 0.07 | 0.08 | 0.10 | 0.13 | 0.16 | 0.20 | 0.26 | 0.33 |  |
| 5000/5 |       |      | 0.02 | 0.03 | 0.04 | 0.05 | 0.07 | 0.08 | 0.10 | 0.13 | 0.16 | 0.21 | 0.26 |  |

■ TECHNICAL DATA

- Voltage range : AC 220V ±15% & AC380V ±15%
- Power consumption : ≤4.5 VA(S5-60D), ≤7.5 VA(S5-120D)
- Current range : AC 0.05 ~ 5A
- Current consumption: ≤0.5VA
- LEDs display : Digital display, red LED, 14.2mm high, 0.01 PF resolution
- Power factor setting range : Cap.0.95~ Ind.0.85 PF.

The default value (0.97) set by factory

Power factor setting mode : Setting value to 1.00 PF. or setting point mode

C/K value setting : Auto/Man setting for the C/K value

Switching delay time: 10 ~ 240 sec. the default value (30s) set by factory

Number of steps : 3 ~ 6 steps for S5-60D, 3 ~ 12 steps for S5-120D

Over voltage setting : the default value (120%) set by factory

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

Wistanding impulse voltage: IEC 1000-4-5

Wave damping : IEC 1000-4-4

Electrostatic discharge : IEC 1000-4-2

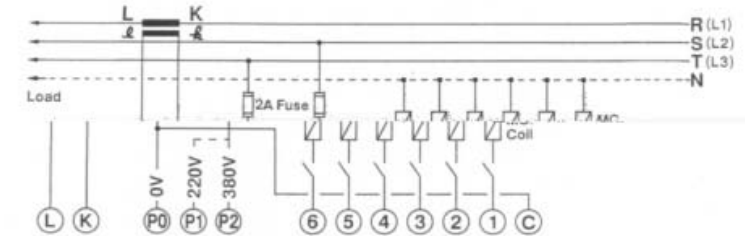
Electrical transient in burst : IEC 1000-4-11

Connection : Plug-in terminal block

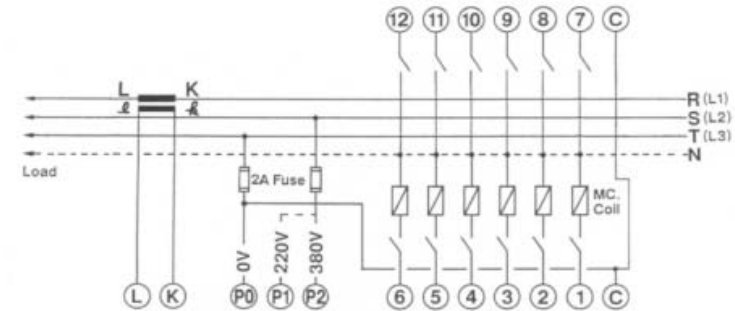
Weight : About 0.85kg for S5-60D, 1 kg for S5-120D

■ CONNECTION DIAGRAM

S5-60D



S5-120D



■ DIMENSIONS (mm)

