2. PARTICULARITY OF RPE POWER FACTOR CONTROLLER

2.1 INTRODUCTION

The RPE regulator is a special version of the RPA power factor controller especially designed for real-time static power factor compensation. It is equipped with a total of 12 outputs, 11 static outputs with SSR (solid state relay) and one, the last, with a standard electromechanical relay with changeover contact. A dedicated software allows to react very fast to load variations, modifying the output configuration to compensate the reactive power in the shortest time possible. All the measurements (voltage, current, power etc) are sampled and recalculated in a time of about 20ms. The reaction time of the controller after a load variation can vary from 40 to 60ms. See technical characteristics for a more detailed description. It is also possible to configure the device to control a "mixed" configuration, that is with some static steps together with some electromechanic steps in the same panel.

2.2 DIFFERENCES FROM STANDARD RPA

The measures available on the device are identical to the standard RPA, and so are most of the operative modes and procedures accessible from the front keyboard. The main differences compared to the standard device are listed in the following points:

- The 12th and last output, equipped with a electromechanic relay, can be programmed only as Normally open alarm, Normally closed alarm or cooling fan.
- The parameter P.05 Sensitivity is used to set the number of subsequent averages, from 1 to 8, that are carried out on the needed reactive power value. Setting this parameter to 1, the device will react immediately, while setting to values from 2 to 8 the regulation is proportionally smoother.
- A new menu has been inserted, called Static setup menu, that is added to the already existing Base, Advanced and Function menus. See the following pages for access instructions and parameter list.
- The reconnection time is not used for the static outputs steps.
- The switching counters of the static steps are not retentive, that is they are reset to 0 every time the device is switched off.
- The Automatic setup procedure is not available.
- The parameter P.14 Step trimming is not available and remains set to OFF.
- The parameter P.18 Disconnection sensitivity is not available and remains set to OFF.

2.3 MIXED CONFIGURATION

The RPE device can be configured to drive a panel with some static steps and some electromechanic steps. In this case the static steps must be opportunely sized, in order to be able to "cover" the rapid load variations, while the standard electromechanic steps are used to compensate the reactive power need that is almost constant.

To control traditional contactors, the SSR outputs must be interfaced with external relays, as indicated in the example wiring diagrams in the following pages.

When using a mixed configuration like this, some rules must be followed:

- The electromechanic steps must be all of the same power.
- The “border” between static and electromechanic steps is defined with a dedicated parameter in the static setup menu.
- The power of a standard electromechanic step must be equal to or higher than the biggest static step.

The setting of the step power is carried out as usual, setting in P.02 the kvar of the smallest step and in P.06.. the coefficients of the various steps, both static and standard.

2.4 STATIC MENU SETTINGS

With the device in MANU mode, press key MODE for 5 consecutive seconds. The wording SET is viewed on the display to confirm access to the basic menu parameters.

Starting from this position, press at the same time the keys +, - and SCROLL for 5 seconds, until the display will show St.S indicating the access to Static setup menu.

Press the MANU/AUTO key to enter the subsequent parameter.
Press the MODE key to return to the previous parameter.
Press the + and - keys to view and change the setting of the selected parameter.
The setup exit is automatic once the last parameter is exceeded.

2.5 STATIC SETUP TABLE

<table>
<thead>
<tr>
<th>PARAM.</th>
<th>FUNCTION</th>
<th>RANGE</th>
<th>DEFAULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.71</td>
<td>Static contactor closing time</td>
<td>0 ... 250ms</td>
<td>60</td>
</tr>
<tr>
<td>P.72</td>
<td>Static contactor opening time</td>
<td>0 ... 250ms</td>
<td>60</td>
</tr>
<tr>
<td>P.73</td>
<td>Number of static steps</td>
<td>2 ... 10</td>
<td>ALL</td>
</tr>
<tr>
<td>P.74</td>
<td>Minimum time between electromechanic step switching</td>
<td>0 ... 60sec</td>
<td>5</td>
</tr>
</tbody>
</table>

After having closed one step output, the measure acquisition is suspended for the time specified by this parameter, in order to allow the external static contactor to connect the capacitors. This function allows to avoid regulation oscillations. Set this value according to the technical characteristics (closing time) declared by the manufacturer of the static contactor.

- Same as previous note, referred to disconnection.
- Number of static steps. If set to ALL, all of the 11 outputs are treated as static steps.
- Otherwise, setting for instance 6, steps from 1 to 6 are considered static, while step from 7 to 11 are considered electromechanic.
- Minimum time between two switching of the electromechanic steps.

2.6 DIAGNOSTIC READINGS

To estimate the behaviour of the regulation, it is possible to access two diagnostic readings that indicate the average distance from the setpoint in the last 5 seconds. This indication helps to find the parameter setting that gives the best results on a certain plant.
It is not correct to compare readings coming from two different plants, because the typical load variation can be different, providing non-homogeneous indications. The available readings are:
- The average absolute (without sign) deviation from the cosφ setpoint, expressed in cosφ points.
- The average absolute deviation from the setpoint, expressed in phase angle degrees.

### 2.7 Diagnostic Readings Table

<table>
<thead>
<tr>
<th>LED</th>
<th>Function</th>
<th>PRESSING -</th>
<th>PRESSING +</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLTAGE</td>
<td>RMS voltage</td>
<td>MAX Voltage</td>
<td>Average cosφ difference of last 5 sec</td>
</tr>
<tr>
<td>CURRENT</td>
<td>RMS current</td>
<td>MAX Current</td>
<td>Average displacement angle difference of last 5 sec</td>
</tr>
</tbody>
</table>