Operating and Commissioning Instructions BLR-CA (Common point switching) & BLR-CA (A) (Volt Free switching)
Power Factor Control Relay

As with all electrical equipment, the appropriate specifications governing electrical installation must be followed when Power Factor Correction Equipment is installed. When removing the front nameplate to adjust the function switch and DIP switches, always ensure that your body is not carrying any electrostatic charge. This can be accomplished by simply touching a grounded object, such as the switchboard metal casing to dissipate any electrical charge before removing the cover plate.

1. Check thet the Measurement and Control Voltage, Supply Frequency and Current transformer rating comply with the ratings given on the back of the relay.

2. Mount the relay in the switch panel. The cut out size is 138 x138 mm. The relay is secured either with two fixing bolts on the side of the relay, or with side mounting right angled brackets, for fixing to a flat surface.

3. Connect up in accordance with the wiring diagram. **Pay special attention to the cross section size of the C.T. Connections. We recommend for runs up to 10 metres 2.5mm^2 cross section**. The BLR-CA constantly monitors the mains supply voltage. If this falls below 280V all capacitor steps are disconnected. Voltage sensing is made on terminal "A" which is connected to phase L2. In case of volt free switching this connection is made at Step1 (see wiring diagram)

4. Check the coding switch (1) for the C.T. Settings is correct – x/1A=off (DIP switch down) – x/5A=ON (DIP switch up)

5. Adjust DIP switch (2) to select p.f. Alarm function ON (in circuit) or OFF (out of circuit).

6. Apply the measurement and control voltages. Connect the Current Transformer, and then remove any short circuit link. Indication "I –0": no current flowing, resp. <1% of nominal secondary c.t. Current. A minimum of 1% of nominal secondary C.T. Current must be reactive before controlling will start.

7. Rotate function switch to 8 and press + - buttons together. Hold for at least 20 seconds. This will clear the memory and delete any capacitor step values that were stored during factory test.

8. Wait for the 90 sec. Lockout time to elapse. During this time the required parameters can be set as listed below, using the +/- buttons (4/5). Each set value is stored in the memory, once the function switch is moved onto the next position.

9. With function switch (3) in **position 1**, select the required target p.f. Using +/- buttons

10. With function switch (3) in **position 2**, select the required switching step time delay, using +/- buttons

11. With function switch in **position 5**, select the number of switching steps, using +/- buttons. The relay is delivered with this setting on its maximum number of steps. If the max. number of steps is selected, but capacitors are not connected to all steps, the relay will recognise this, and will make three switches to verify there is no connection. The disconnected step(s) will then be excluded from the sequence switching process. In the event of power failure, the disconnected steps will be re-activated, and the three test switches will be made again to determine the number of disconnected steps.

12. **Set function switch (3) in position 3, so that the installation is in "Automatic" operation.**

13. The digital indicator will show the system power factor e.g. i 0.87 for lagging or c 0.94 for leading load.

14. After the lock out time, with an inductive load on the system, if the relay is correctly connected, the + LED will start to flash.

15. If the installation is correctly connected, the relay will now switch successive steps, following the selected step time delay until the target power factor is obtained. Each energised step will be indicated on the LED display 6. As each step switches in, so the digital display of power factor will change. If the installation p.f. Is above or below the target p.f., the "+" LED (Below Target) or "-" LED (Above Target) will flash.

16. The BLR-CA does not require any adjustment of C/k and so this is not fitted. The relay measures the output of each capacitor step in the form of "units of value" (inquiry in **position 8**). This measurement is made during the normal switching function according to reactive load requirement. These "units of value" are stored in the relay memory and the appropriate unit is called up in order to meet the changing reactive load demand.

17. A flashing display segment indicates that the relay is searching for a suitable capacitor size (ind. Or cap.) in order to meet the required target power factor. If no suitable size is available, then no switching will take place, and the segment will continue to flash until the target p.f. Is obtained.

18. It is often necessary to commission an installation when there is no other load on the system. In this case, put the function switch (3) to **position 4**. Capacitors can be switched with the aid of the +/- buttons. Please note that when performing this manual switching function, the "units of value" (see 15 above) will not be stored in the memory. **When manual operation is not required any more, set the function switch back to position 3 (Automatic).**

19. With the function switch in **position 9** two types of Low Power Factor Alarm can be selected.

a) With **"A 0"** in the display, the alarm indication can only be cancelled by moving **DIP switch (2)** briefly into the off position (down)

b) with **"A 1"** in the display the alarm will extinguish itself automatically once the correct target power factor has been obtained again.

c) If the target power factor is not obtained, on account of insufficient capacitors, after a time delay of 75 times the step switching time, the symbol **"AL"** will appear at 5 sec. Intervals in the display.

d) If the capacitors are being subjected to a distorted waveform which is producing dangerous harmonic over currents, then this will be shown as an alarm in the display: **"HA"** will flash at 5 second intervals

e) If both alarms are signalling, together then the symbols **"AH"** will flash in the display.

f) If external fault signalling contacts for low power factor (m) are fitted the alarm contact is given between terminals **M-MR (AL)**.

g) If external fault signalling contacts for harmonic current overload (z) are fitted the alarm contact is given between terminals **M-MZ(HA or AH)**.

20. Exit port (7), TTL interface, enables connection of a data logger type DS01/DS02/DS03 – exit RS232 or an interface, type UMS-C-exit RS232 to a PC. Using software "BSTO_E" it is possible to record and analyse data, such as power factor cos #, date and time of each switching step, connected and disconnected steps and any activated alarm function.

Once the required settings and alterations have been made, set the function switch to position 3 "Automatic" and replace the front cover plate, so as to inhibit unauthorised interference with relay settings

check before commissioning

DIP Switch (1)

Current – path: **x/1A or x/5A**
switch position **OFF= x/1A**
ON= x/5A

If requested data are not indicated on order, relay will be shipped in position "ON" (x/5A)

DIP Switch (2)

Fault signalling contact/alarm message "m" and/or "z"

switch position OFF= no status of alarm in LED display and or alarm re-set.
ON = status of alarm will be shown in display

Function Switch (3)

(Standard Version with 10 Switch Positions)

0 = Relay not in automaticfunction. All steps will be switched off after 20 secs. The digital display will show "OFF".

1 = Adjustment of pre-set target power factor within the range 0.70 lag ...1.0 … 0.90 lead. By means of the +/- buttons. Target level is shown in the display

2 = Adjustment of the switching time, 5 secs … 1200 secs, by means of the +/- buttons. For rapid digit change, hold the button down continuously. The display will show for example "50".

3 = **Relay in Automatic function,** with indication of system power factor in the digital display, I – ind., c = cap. If the +/- segments are flashing, this indicates that the target power factor has not been achieved. A suitable capacitor size will be selected.

4 = Manual operation. The display will show alternatively "**H**" (1 sec) and Power Factor (5 secs). Capacitor steps can be switched in rotation after the selected step switch time, using the +/- buttons.

5 = The number of switching steps can be limited, using +/- buttons. The display will indicate the number of steps – e.g. for 10 steps "CL10". **Do not exceed the number of steps on the relay!**

6 = Automatic indication in the display of the number of steps which are not connected or are not working. The indication will rotate through the non-functioning steps, e.g. "Cd 5" = 5 non-functioning steps. Display "Cd 0" means all steps are functioning. Automatic regulation is active during this time!

7 = The number of switchings each contactor has made is shown in the display, e.g."OC 4" for 2 secs, then "**250**". This indicates that contactor no.4 has completed 250 switchings. Other contactors can be selected using the +/- buttons. The microprocessor stores the data each time the contactor has completed 50 switchings. The stored data of all steps can be cancelled by depressing the +/- buttons **together**, for a period of>20 secs. Automatic regulation is active during this time!

8 = Indicates the measured "unit of value" of each step, which is proportional to the capacitor output in kVAr. For example the display will show "CC 12" for 2 secs., to indicate step No.12, and will then alternate to "125" units of value. Once the value falls below a level of < "8", the capacitor will be excluded from the regulation process. The "unit of value" for other steps is obtained by depressing the + or – buttons to select the required steps. Automatic regulation is active during this time! The stored data of all steps can be cancelled by depressing +/- buttons together for a period > 20 secs.

9 = Selects the mode of alarm signal required. If the display shows "A 0", the alarm is stored in the memory and can only be cancelled by briefly switching DIP switch 2 off. If the display shows "A 1", the alarm will be cancelled automatically, when the target power factor level is restored (Selection by means of +/- buttons).
The relay will be supplied in "A1" mode unless otherwise specified on the order.

Optional Setting Features

(Function Switch (3) with 16 Switch Positions)

A= Input of alternative target power factor level for low tariff operation. Setting range 0.70 lag … 1.0 … 0.90 lead. The required target level is adjusted in the display using the +/- buttons. In order to activate this feature a supply voltage of 150-240V AC must be applied across P-N. This could be accomplished using a time switch, or impulse relay etc. LED (9) will illuminate if this feature is active. This is a useful feature to reduce capacitor watt losses at those times when the utility gives no benefit for p.f.c. Improvement.

B = Input for asymetrical switching times. Using the +/- buttons, this can be adjusted between 0 … 50. For example, if the display shows "Y" 10" the factor displayed will multiply the switching off time in the capacitive direction. (Rapid switching on – slow switch off). The standard setting with equal on/off times is "Y 0".

C = Rapid contactor switching rate limiter. By using the +/- buttons a time delay can be set in seconds so as, to prevent the rapid on/off switching of a contactor on a constantly changing load. The standard setting would be 30 seconds, and the display would then show "L 30". The delay can be set up to 255 secs.

D = Input of a BUS address, within the limits 0 – 255, selected by using the +/- buttons, and shown in the display, e.g. "b 25". Using this function, relay data can be transferred through an RS485 interface over a distance of 1.2km (with separate BLR software and BUS channel) to transmit data such as Power Factor, Number of steps on/off, Date and time of switching and time and date of alarm(s) operated.

E/F = OFF same effect as function switch in Position 0 (see above).

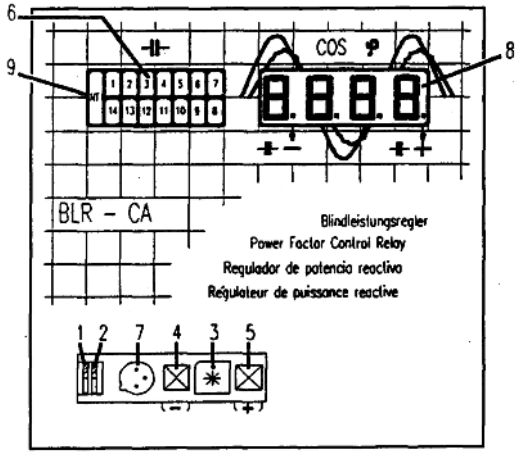
Testing the Relay at Switchboard Manufacturer's Premises Prior to Dispatch to Site

Normally this test take place with no capacitors connected. This test ensures that all contactors are operating correctly. We recommend the test is done in “manual” operation. (Function switch in position 4) as (17) overleaf.

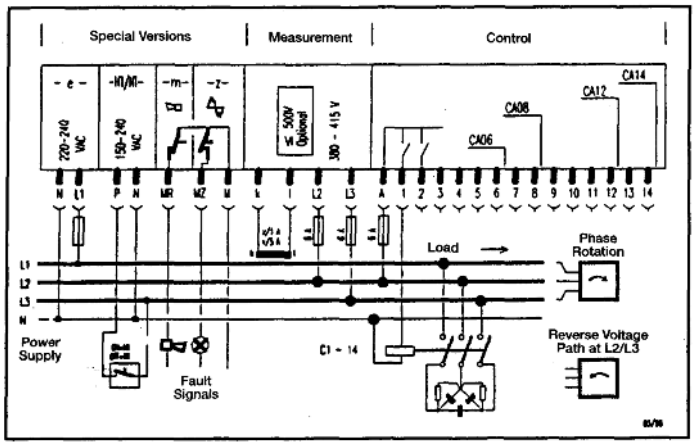
If it is required to do the test on automatic operation (function switch in position 3) ensure that the total switching time does not exceed 9 minutes to complete the test. Remember to allow for the initial lock out time of 90 seconds. The reason for this is that if the relay does not see any current input on terminals 1-k for 9 minutes or more, all steps are switched out. They are re-energised by putting the function switch to 8 and pressing + - buttons together for more than 20 seconds. This re-sets the CA memory function.

1. CT Settings 1A or 5A input. Up = 5ADown = 1A
2. Target p.f. Alarm Up = On Down = Off
3. Function Switch. Adjust positions normally 0.....9
4. - Button
5. + Button
6. LED Indicators showing active steps
7. TTL output for computer data logger vis RS232 interface
8. LED Digital display
9. Alternative Target PF selected indicator

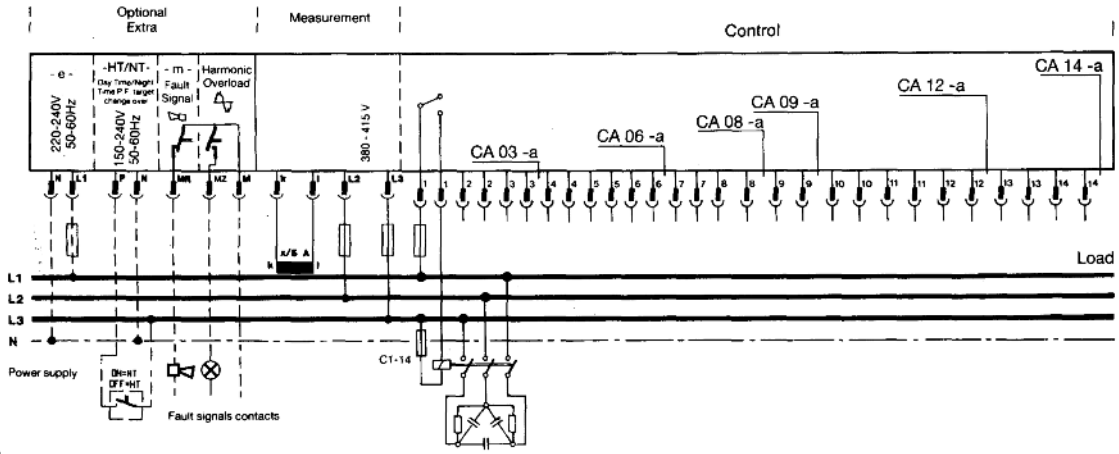
Facia: Operating Elements



Common Point Switching Type CA



Connection diagram - Volt Free Switching Type CA - A



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