

Power Factor Control Relays – Beluk BLR-C Series

Technical Background for BLR-CA, BLR-CB & BLR-CC in addition to technical information presented in individual instrument bulletins.

Principle of Measurement

The Beluk family of power factor controllers operates exclusively on the measurement of reactive power. The primary function performed by the controller is to provide precise control of capacitor bank elements used to compensate for reactive power. As there is no reactive power at converter plants, the BLR-C series instruments are not proposed for use at these installations.

It is no longer necessary to enter the CT ratio as the instrument relies on the proportions of the power triangle. This is smaller with high transformer ratios than with small ratios, however the units of value stored by the controller are truly proportional to the real capacities.

Finding

With the new Beluk C series there is no manual inputting of the C/k value or of the capacitor size. The controller depends on the compensation effect of every single capacitor which is why only one step is switched at a time. The instrument measures reactive power before and after each capacitor is switched. The difference in these values is then stored in non volatile memory.

As it may be possible that the controller senses incorrect “units of value” (load variation during the switching operation), an average value is calculated after five switching cycles.

These average values can be displayed by putting the function switch 3 in position HEX8. Please note, these values are proportional values of capacitance, not actual capacitor values. If, at the time of commissioning, a note is taken of these “units of value” they may be compared at a later date to the average “units of value” displayed at the time and any decrease in capacity may be observed.

As was the case with older models BLR-MC and –MQ, the controllers have lowest sensitivity at 1% or below of the nominal transformer current (reactive). If the effect of one capacitor step is below this 1% (stored value, switch pos. 8) such as would be the case with extremely high transformer ratios, the step cannot be detected and will be excluded from the controlling process after three switching attempts. The same will occur if a capacitor is found by the controller to be defective or a step is not connected.

**ILLIMITE IS YOUR HEADQUARTERS
FOR THE BELUK FAMILY OF
POWER FACTOR CONTROLLERS !**

**ILLIMITE INCORPORATED
P. O. BOX 876
LOCKPORT, NY 14095**

tel: 716- 439- 8600 fax: 716- 439- 9474 [www .ILLIMITE .com](http://www.ILLIMITE.com) info@ILLIMITE.com

Principle of Control

The controllers no longer follow fixed switching programs. As soon as the instrument senses that compensation is required, the controller automatically selects the capacitor that will match the compensation to the target power factor. In the case of high reactive load demands, the highest value capacitors will be switched in first. With this “economic switching program” it may be possible that the controller selects a capacitor for use that is already switched in: in this case, the instrument will select the next size larger capacitor, switch it in and then switch out the previously selected size. If the capacitors for each step are of equal size, “circular switching” will be provided.

The BLR-C series instruments also record failed fuses; depending whether the current transformer is in the same phase as the failed fuse or if the transformer is in one of the other phases, there will be a difference in how the controller reacts. In the former case, the instrument will sense no compensation effect any more and the capacitor step will be excluded from the control process. The step will be checked automatically at weekly intervals and reactivated when it is sensed that the fuse has been replaced. In the latter case, the controller will sense a reduced unit of value (less than 50%). This may result in a change over to “economic switching” and this step viewed as a “fine step”. It is recommended that capacitor units of value are checked every two or three months to insure maximum efficiency of the controller, the capacitor banks and the overall compensation function.

Commissioning

As the BLR-C series were being developed, attention was paid to ease of set up and use. This means that the instruments can be put into operation (even if the instruction manual is missing!) as soon as they are correctly connected using the diagram on the back of the unit. Please note – the operating voltage that you apply to the instrument at the L2 and L3 terminals MUST match the voltage shown of the rear of the unit. This can be achieved by using a potential transformer if needed.

Except otherwise indicated, instruments are supplied with the following preset values:

1. Target $\cos \varphi = 1$
2. Switching time delay per step = 40 seconds
3. Reactive load reversal switching time = 30 seconds

Reactive load reversal switching time delay is that with every change of switching direction (up and down), an additional delay of 30 seconds is added to the preset switching time of 40 seconds (using the preset values stated above).

Please see product bulletins and installation instructions for additional detail.

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