SABA KHAZEN manufacturing & industrial co. ltd

SABA CAPACITOR
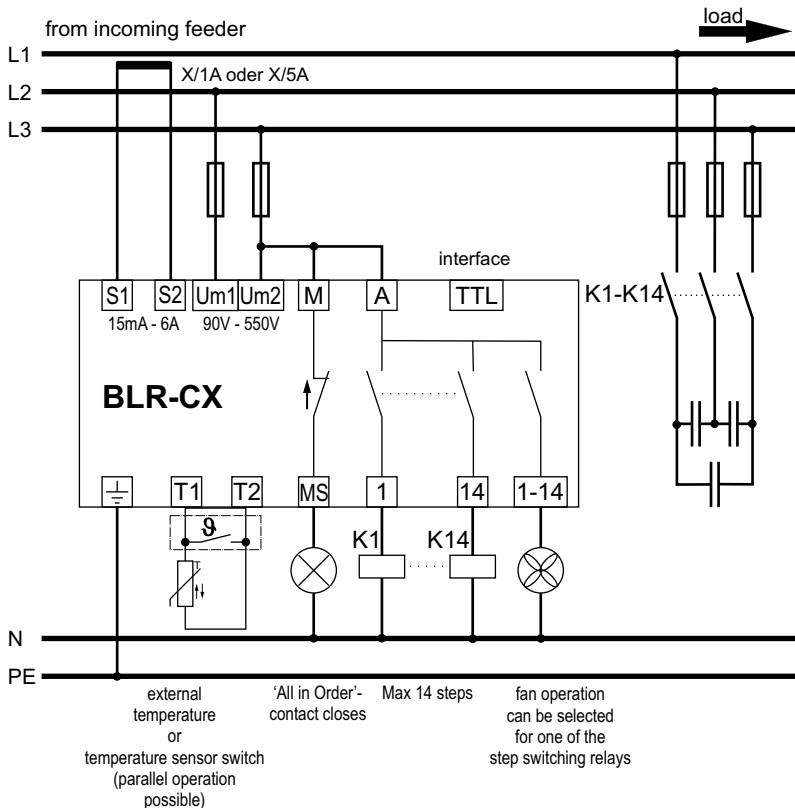
Operation Manual BLR-CX

ATTENTION!

Installation of the BLR-CX must only be undertaken by technically qualified persons, since live terminals can cause electric shock.

The appropriate safety regulations in the country of installation must be strictly adhered to.

Equipment with damaged casing or terminals must not be used and must be disconnected from the mains supply immediately.

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from incoming feeder

load

L1
L2 X/1A oder X/5A
L3

| S1 | S2 | Um1 | Um2 | M | A | interface TTL | K1-K14 |

S1 S2 — 15mA - 6A
Um1 Um2 — 90V - 550V

BLR-CX

| ⏚ | T1 | T2 | MS | 1 | 14 | 1-14 |

K1   K14

N

PE

external temperature
or
temperature sensor switch
(parallel operation possible)

'All in Order'-contact closes

Max 14 steps

fan operation can be selected for one of the step switching relays

Installation and Commissioning:

1) Check that the mains voltage and CT current input are suitable for the relay!

2) Disconnect panel from mains voltage, and check that the voltage is off

3) Ensure CT short-circuited or not in operation. An open circuit CT produces a high voltage which endangers people and equipment. It will also damage the CT and affect ist accuracy.

4) Disconnect and remove any previous pfc-relay.

5) Mount BLR-CX in the control panel with the two mounting clips. (cutout 138x138mm)

6) Connect the earth protection cable to 'PE' on BLR-CX metal case.

7) Connect BLR-CX according to wiring diagram. (CT/P1 towards incoming feeder, CT/P2 towards load!)

8) Remove short-circuit from CT

9) Connect mains voltage to panel.

10) If relay has been correctly connected and the mains voltage and CT output comply with the ratings and settings of BLR-CX, the LCD will show **AUTO** and the control function will start automatically!

FAQ during Commissioning:

1) **No indication AUTO** → the relay does not switch
   Cause: Relay set to manual operation
   In SETUP/100 menu the selection for PFC is on OFF or HOLD
   temperature is too high,
   current < 15mA, voltage or THD U is out of tolerance.

2) **Indication U ALARM** → voltage out of tolerance
   Check settings for nominal voltage (SETUP/Un) and
   voltage transformer (SETUP/Pt)

3) **Indication I Lo ALARM** → CT current < 15mA
   Cause: connection error of CT; short-link of CT is not removed;
   CT-ration is too high compared to real current; no current

4) **Indication EXPORT** → kW export
   if there is no real kW export, voltage and current connection to
   BLR-CX has to be checked! See Wrong Connections / AI

5) **Wrong Cos** φ **indication** → wrong connection
   voltage and current connection to BLR-CX has to be checked!
   See Wrong Connection / AI

6) **Steps switch in and then quickly switch out again**
   See Stepsize Detection / Defective Capacitors

7) **Frequent switching of steps**
   size of capacitors has not been completly detected

Display:

INFO: step database information
AUTO: relay is working in AUTO mode
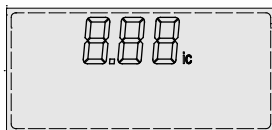**MANUAL:** relay is working in manual mode
SETUP: Setup of parameters

EXPORT: kW export
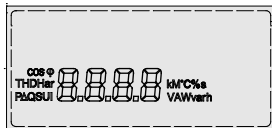**NT:** 2nd target-cosφ is working
ALARM: blinking during alarm

1. line:
cosφ
menu items
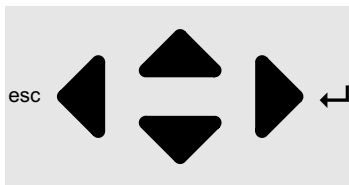
2. line:
measuring values
parameters
alarm codes

Step indication:
state of step (on/off)
step defective (blinking)

Handling:

BLR-CX has 4 keys for navigation and input of parameters.

increase values
select menu items

exit menu
move cursor left
reset alarm
(hold for 5 sec)

esc

open menu
move cursor right
confirm input

Decrease values
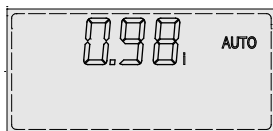select menu items

Input parameter:

- ▲, ▼   setting of number
- ▶   selection of next digit
- ▲, ▼   after setting of last digit, selection of:
  - multiplier **k** (kilo) or **M** (Mega)
  - leading sign **I** (induktive) or **C** (capacitive) (blinking of I or C)
- ▶   storage of setting
- ◀   abort input

Main Menu:

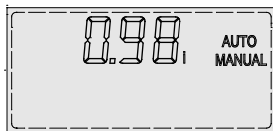Select menu items by pressing ▲, ▼, enter submenu by pressing ▶

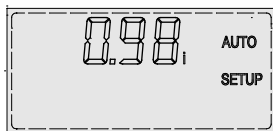|	
`0.98` AUTO	**Measuring Values:** (selcted using ▲, ▼) U_{LL}, U_{LN}, A (I), kW (P), kVar (Q), ΔkVar (ΔQ), kVA (S), THD U, 3. -19. Har. U, $\cos\varphi$, Λ (PF), $\phi\Lambda$ (APF), $\tan \varphi$ (tAn), Hz (F), °C(t), °Cmax (thi), operation hours (OPh)
`0.98` INFO AUTO	**INFO Step Database:** size and derating of steps, switch cycles, steptype (see INFO Step Database)
`0.98` AUTO MANUAL	**MANUAL Operation:** Selective switching in and out of control exits (see MANUAL Operation)
`0.98` AUTO SETUP	**SETUP Parameters:** Nominal voltage (Un),CT-ratio Ct, VT-ratio (Pt), Automatic Initialising (Ai), PFC ON/OFF/HOLD (PFC), target-$\cos\varphi$ (CP1), switch time delay (St), steptype (Out) (see SETUP Parameters)

INFO Step Database:

Attention: Actual state of control outputs is not shown!

Choose step by ▲, ▼ and enter by ▶ . The selected step is blinking. By using ▲, ▼ following information can be selected:
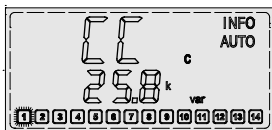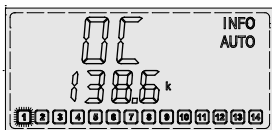
Actual Size of Capacitor
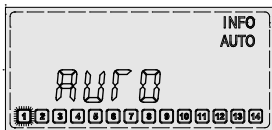the value is rated to nominal voltage
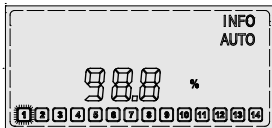
Derating of Capacitor:
present kvar value / original kvar value in %

Switch Cycles of Contactor:

Step Setting:
AUTO: automatically switched step
Fon: step is permanently switched on
Foff: step is permanently switched off
AL: step used for fan control
FLty: defective step

MANUAL Operation:

For manual operation ▶ has to be pressed for 3 seconds!

Selection of step by ▲, ▼. Number of selected step is shown in line 2 of LCD. By pushing ▶ selected step will switch on / off.

Manual operation escape by pressing ◀ .
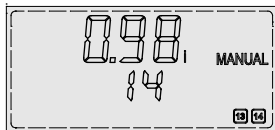
Important Information:

- Menu Manual Operation cannot be opend in modes LIFO and Combi-Filter. (see Reference book!)

- Discharging lockout time is also active during manual operation (steps are locked in to allow for discharge time after switching-off)

- If voltage is out of tolerance all steps are disconnected.

- THD U-alarm and over temperature alarms will prevent steps switching in on manual mode.

- Only steps with step type AUTO can be switched!

- After leaving manual operation menu, relay sitches to the actual load.

SETUP Parameters:

Choosing SETUP, sub menu 100 is indicated. Pressing ▶ opens menu 100.
▲, ▼ menue 200-600 (protected by pin, see reference book)

Un Nominal voltage (very important!)
OV / UV monitoring, reference for step database.

Ct CT-ratio
indication of measuring values. (enables many measuring values)

Pt VT-ratio
important base for nominal voltage

AI Automatic Initialising
see wrong connection / AI

PFC PFC ON / OFF / HOLD
on, off, freezing of automatic pfc-correction

CP1 Target-cosφ 1
base for compensation target

St Switch time delay of each step
definition of speed of regulation

OUt Step type
definition of step type: AUTO, Fon, Foff, AL
reset of defective steps (FLty)

Wrong Connection / AI - Automatic Initialising:

A pfc-relay demands correct connection of voltage and current (polarity and phase) to function correctly. If this is not the case, the connection must be corrected. As this is not always possible, BLR-CX is offering the following possibilities:

Manual Correction: SETUP / 200 see Reference book

Automatic Initialising: SETUP/ 100 / Ai

Ai is connecting and disconnecting all control exits several times by switching them on and off. This lasts several minutes! Exits which are not connected are designated as Foff (permanently off). Stepsizes are not detected by this function!

After Ai is complete, the BLR-CX has to be checked for correct operation!

Requirements for successful operation of Ai:

- voltage is within tolerance
- CT is connected (no simulation!)
- capacitor banks are installed and fuses are inserted

Possible problems for function of Ai:

- load variations
- small current signals (big CT-ratio, small stepsizes)

Failure indication Ai / Abrt:

Ai is aborted, as no clear result could be achieved, PFC = OFF.

Step Size Detection:

At each switching operation, step size is measured (except this function is not active SETUP / 300 see Reference book)

Setting of c/k value is not necessary. Switching sequence is carried out automatically by selecting capacitor steps with the most suitable kvar value to match the load requirement.

The recognised values are stored in a step data base. Loss of output of each capacitor step can be seen there.

If a step fails to function during the first 3 switching operations after a reset of the step data base, steptype **Foff** is set automatically.

Defective Steps:

When a step is switched 3 times in series without measured size, it is detected as defective and it is blocked for 24h.

Step state: flashing
Status: Flty, step is blocked

Failure analysis:

After commissioning, all steps have step type Foff:
Is short link of CT secondary removed?
Is position of CT correct?
Are all fuses present and in order?

In normal operation, one or more steps are flashing?
Check condition of fuses, contactors and capacitors of this faulty step.

Reset in SETUP / 100 / OUt or by re-start (interruption of supply voltage) of BLR-CX!

Alarms:

Settings of alarm system: SETUP / 500 see Reference book

U $_{ALARM}$: Voltage out of tolerance

I LO $_{ALARM}$: Current < 15mA (check current path)

I Hi $_{ALARM}$: Current > 6A. (CT rating is too small)

PFC $_{ALARM}$: Target cannot be reached (check panel)

HAr $_{ALARM}$: Limit of THD U is exceeded

StEP/FLtY $_{ALARM}$: Defective steps

SPL/Nr $_{ALARM}$: Derating of stepsize (< 70% of original size) stepnumber and code are flashing in rotation

thi $_{ALARM}$: Over temperature - disconnection of steps

OPH $_{ALARM}$: max. operation hours are reached (maintenance)

OPC/Nr $_{ALARM}$: max. switch cycles per step (maintenance) stepnumber and code are flashing in rotation

AI/Abrt $_{ALARM}$: Abort of automatic initialising Start AI again at more quiet load conditions or do manual setting of phase offset (SETUP / 200 see Reference book)

Factory Default Settings when delivered by Beluk

SETUP / 100 - for user
(open access-no password needed)

Important paramters

Un:	400V
Ct:	1
Pt:	1
Ai:	(no setting)
PFC:	ON
CP1:	1
St:	10s
OUt:	Auto

SETUP / 200 - MEASURING
(locked access - password needed)

201/nominal voltage:	400V
202/CT-ratio	1
203/VT-ratio:	1
204/tolerance voltage:	10%
205/Ph-Ph/Ph-N:	(automatic)
206/phase offset:	0°
207/Ai:	(no setting)
208/countdown with Ai:	NO
209/synchronising:	AUTO
210/temperature offset:	0°C

SETUP / 300 - CONTROL
(locked access - password needed)

301/sensitivity:	60%
302/target-$\cos\varphi1$:	1.00
303/target-$\cos\varphi2$:	i0.95
304/EXPORT $\cos\varphi2$:	NO
305/switch time delay:	10s
306/St step exchange:	2s
307/step exchange:	YES
308/step recogn. off:	NO
309/lock defective steps:	YES
310/PFC:	ON
311/Algorithm:	Automatik
312/kvar offset:	0kvar
313/asymmetric St:	1
314/Qcap steps off:	NO

SETUP / 400 - STEP DATABASE
(locked access - password needed)

401/discharge lock time:	75s
402/nom. stepsize CT=1:	5var
403/step type:	Auto
404/switch cycles:	0

Factory settings from Beluk

SETUP / 500 - ALARM SETTINGS
(locked access - password needed)

501/Reset manual	NO
502/THD U alarm	NO
503/THD U limit	20%
504/THD steps off	NO
505/delay time THD, temp2	60s
506/I=0 freeze PFC	NO
507/maintenance alarm	NO
508/limit switch cycles	262k
509/limit operation hours	65.5k
510/target-cosφ2 by DI=1	NO
511/DI=1 when T1/T2 closed	NO
512/temperature alarm	NO
513/temp1 limit	30°C
514/temp2 limit	55°C
515/control alarm	NO
516/defective steps alarm	NO
517/derating alarm	NO

SETUP / 600 - **RESET**
(locked access - password needed)

601/factory settings
602/reset step database
603/reset operation hours
604/reset APF
605/reset max. temperature
606/reset alarm
607/info software version
608/change password

Technical Data:

Voltage:	90-550V, 1ph., 50/60Hz, 6VA
Current:	15mA-6A, 1ph., <1VA,
Control exits:	relay, N/C, common root 250V AC / 5A, 400V AC / 2A
Temperaturemeasuring:	by plug-in thermistor
Alarm contact:	relay, voltfree, N/C operated, 250V AC / 5A, 400V AC / 2A
Fan control:	using of control exit
Interface:	TTL, rear (standard) optional: RS485 Modbus, USB
Ambient temperature:	operation: -20°V - 70°C storage: -40°C - 85°C
Humidity:	0% - 95%, without condensation
Overvoltage:	II, dirt class 3
Connection:	screw type, pluggable
Case:	front: instrument case plastic rear: metal
Protection:	front: IP50, (IP54 by using a gasket) rear: IP20
Weight:	ca. 0,6kg
Size:	144x144x58mm hxwxd cutout: 138 (+0,5) x 138 (+0,5)mm