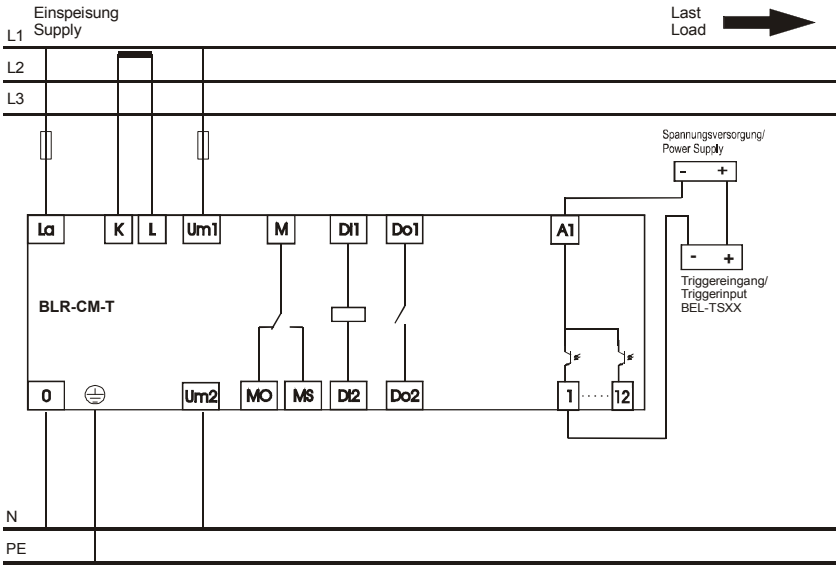
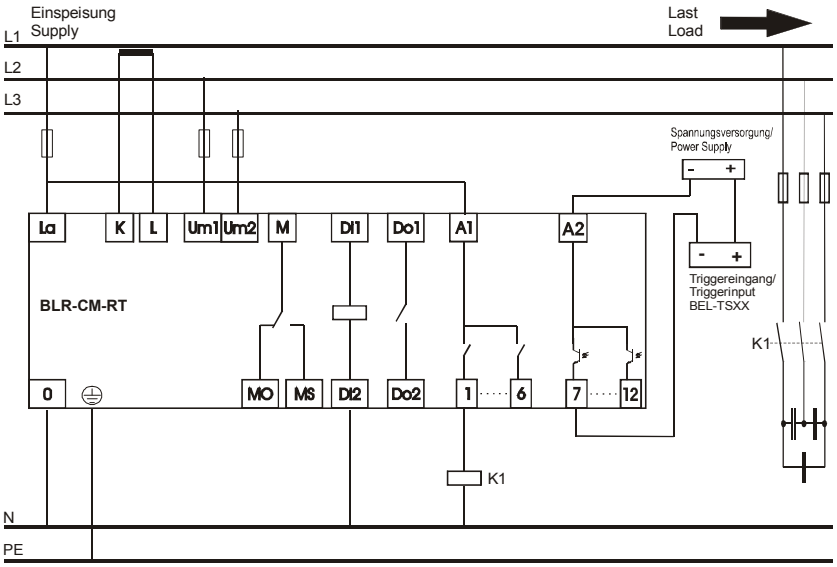




Connection

Only qualified staff is allowed to perform the installation. All legal rules have to be observed and technical standards have to be met. Before connecting the device check that all connecting leads are de-energized and that current transformers are bypassed.

1) Compare auxiliary-, measurement-, control voltage, frequency and the current path of the device (see type label) with the data of the electricity network.

2) Assemble the relay in the switch panel with the 2 mounting clips. If the device is not fitting in the cutout the small plastic bars on the side of the case can be removed with a knife.

3) Connect protective ground to the terminal link of the case.

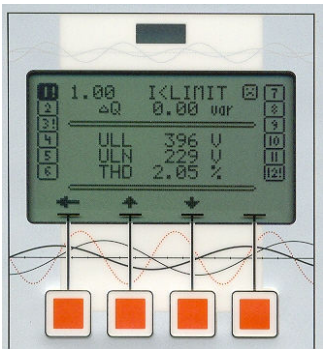
4) Connect in accordance to the wiring diagram. Pay special attention to the cross section size of the CT connections! An integrated voltage observation with regard to the auxiliary voltage in BLR-CM guarantees a safety disconnection of the capacitors in case of undervoltage. It must be ensured, that auxiliary voltage is taken from the identical phase as control voltage for the contactors, to guarantee that all switching elements are safely switched off in case of under voltage.

5) Remove short circuit links of the current transformer before commissioning!

Display

User Interface of BLR-CM is a graphical LCD and a membrane keyboard with 4 softkeys.

LCD is split into 4 areas:



Top area:

The two lines of top area are showing information about general status of the relay. The readings of this area are always available, independent from the menu which is used.
The readings of top area can be parametered in menu SETUP/DISPLAY.
The “sad face” indicates that there are problems with the level of voltage or current.
The “happy face” indicates that levels of voltage and current are ok.
The “serious face” indicates setting PFC OFF or PFC FREEZE.

Status columns: left and right column are showing the status of the control exits.

1	Step 1, status: off, type: NORMAL or FAST
2!	Step 2, status: off, type: NORMAL blocked or FIX OFF
F	Step 3, status: off, type: FAULTY
4	Step 4, status: on, type: NORMAL or FAST
5!	Step 5, status: on, type: FIX ON
	Step 6, status: off, type: OFF, not available or PFC OFF

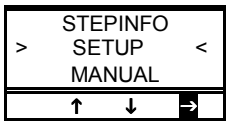
“NORMAL blocked” can be caused by discharging time
“PFC OFF” can be caused by voltage out of tolerance, by relay is off due to setting or due to Alarm system.

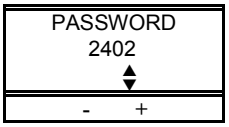
Main area: the three lines of main area are for menu navigation and display of information

Softkey area: the soft key area shows the function of the membrane-keyboard. Depending on the opened menu, the function is different.

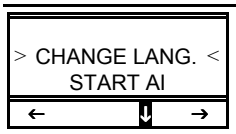
The present manual is for the commissioning. For further explanations and more possible settings, please check the reference manual.

To grant an easy commissioning for dynamic systems the following pages shows step by step how to set up the BLR-CM-T/RT. If you're following the highlighted arrows →, this manual will guide you trough the complete setup and explains all possible and necessary settings.

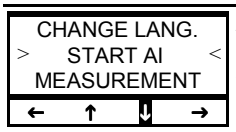




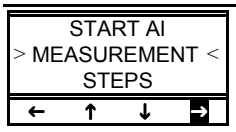
Hold the → button until PASSWORD appears in the display.
Default PASSWORD is 2402

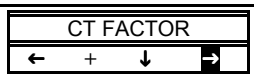


Standard version of BLR-CM is supporting English, German and French.

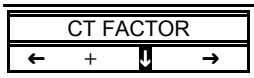


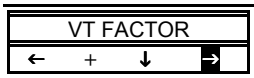
Automatic initialization is switching all exits. During this test it can get information, which exits are working and it can correct the connection of the measuring channels for voltage and current by internal settings.



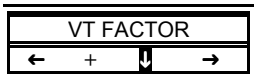


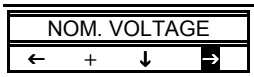
Pushing the → button opens the input window for the CT FACTOR. After changing the CT FACTOR confirm the adjustment via ◄┘. The CT FACTOR is the ratio of current transformer. (e. g. 1000/5 = ratio 200).
For current measuring a CT always have to be used!
For dynamic systems it's absolute necessary to adjust the correct CT FACTOR!



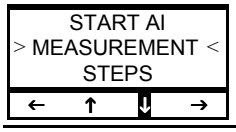


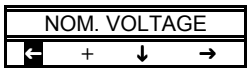
Pushing the → button opens the input window for the VT FACTOR. After changing the VT FACTOR confirm the adjustment via ◄┘. The VT FACTOR is the ratio of the voltage transformer. If the regulator is connected directly to the measurement voltage without VT the value 1 has to be used



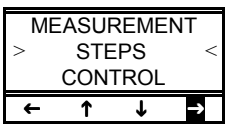


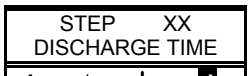
Pushing the → button opens the input window for the NOMINAL VOLTAGE. After changing the NOMINAL VOLTAGE confirm the adjustment via ◄┘. Function of the setting of nominal voltage is to make a definition about the nominal voltage of the system. The threshold levels for under- and overvoltage are based on this as well as the ratings of the capacitor sizes in step database, which are used for control and monitoring.
Independent of connection of the voltage measuring channel, nominal voltage is always the phase-phase voltage!





After setting the nominal voltage, push the ← button to leave the submenu "MEASUREMENT".





Pushing the → button opens the input window for the discharge time of the capacitor steps. Depending on the discharge device it can be set to 0 sec. After changing the discharge time confirm the adjustment via ◄┘. By pushing the + button you can select the desired step.

After setting the discharge time for all used steps, push the ↓ button to adjust the step type.

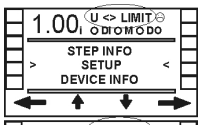
By pushing the ◄► button the desired step type can be adjusted. All steps which are used for fast control should use step type „FAST". Not used steps should be set on step type „FIX OFF" or „OFF" to avoid unecessary alarm. To select the steps use the + button.

After setting the step type for all used steps, push the ↓ button to adjust the nominal value for step size.

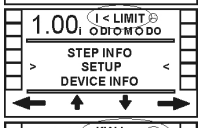
	STEP XX SWITCH CYCLES ← + ↓ →	
	STEP XX NOM. VALUE ← + ↓ →	Pushing the → button opens the input window for the nominal value for the step size of the capacitor steps. This setting should be done very accurate, because a wrong strored step size can disturb the controll behaviour of the regulator. To select the steps use the + button.
MEASUREMENT > STEPS < CONTROL ← ↑ ↓ →	STEP XX NOM. VALUE ← + ↓ →	After setting the nominal value for all used steps, push the ← button to leave the submenu “STEPS”.
STEPS > CONTROL < DISPLAY ← ↑ ↓ →	CONTROL ← ↓ →	ON: Automatic control is running FREEZE: Automatic control is stopped; status of exits is frozen OFF: Automatic control is stopped; all exits are off
	COS PHI 1 ← ↑ ↓ →	This is the setting for target COS PHI1. It will be valid during normal operation
	COS PHI 2 ← ↑ ↓ →	
	SWITCH INTERVAL ← ↑ ↓ →	The switch interval is the time delay between switching steps in regulation. The switch interval has two different functions: • Protecting the contactors by reducing the number of switching cycles. • Building of the average of the reactive power in the time of the switch interval. **The switch interval is only valid for steps with step type “NORMAL”. All steps with step type fast ignore the setting in item switch interval.**
	SWITCH INTERVAL STEP EXCHANGE ← ↑ ↓ →	
	ASYM. FACTOR ← ↑ ↓ →	
	STEP RECOGNITION ← ↑ ↓ →	
	SWITCH CYCLES BALANCING NO ← ↑ ↓ →	
	SWITCH CYCLES BALANCING --% ← ↑ ↓ →	
	STEP EXCHANGE ← ↑ ↓ →	
	CONTROL SENSITIVITY ← ↑ ↓ →	
	CONTROL ← ↑ ↓ →	
	Q OFFSET ← ↑ ↓ →	
	I < LIMIT FREEZE STEPS ← ↑ ↓ →	

Q CAPACITIVE STEPS TURN OFF ← ↑ ↓ →	
FAST CONTROL DELAY MEASURMENT 050 PER. ← ↑ ↓ →	After switching operations, voltage and current are oscillating. Measuring break shall avoid wrong measuring values after a switching operation. **This setting should be done carefully, because dependent on ambient conditions the compensation unit can hunt, when this setting is too small.**
FAST CONTROL MAX. STEP VAL. Q 0.00 var ← ↑ ↓ →	This setting limits the maximum capacitor power which can be switched-in in one switching operation. If too much capacity is switched-in in one operation, this can cause unmeant reactions in grid. The setting is done in kvar. If the setting is "0" (factory setting), there is no limitation.
FAST CONTROL MEAN Q 001 PER. ← ↑ ↓ →	The number of mains cycles which are used to build the average of control deviation. Start for building the average is after the measuring break is finished.
FAST CONTROL SYNC. IMP. NO ← ↑ ↓ →	**YES:** the trigger pulse for switching the thyristor-switches is synchronous to the zero-crossing of the mainsvoltage (rising sinus). This can cause a delay of the switching operation which is less one mains cycle. **NO:** the trigger pulse for switching the thyristor-switches is coming directly after finishing the measuring of one periode + run time for the algorithm (some µsec).

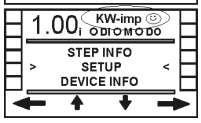
After completing the steps above, the controller will check the measured voltage and current. If all measured values are within the prescribed tolerances, the controller start will start normal operation.



If the controller remains in this setup status for more than 5 sec use the flowchart above to check the VT ratio the nominal voltage and the connection of the voltage measurement.



If the controller remains in this setup status, check the connection of the current transformer. e.g. has the short link been removed and is the respective CT ratio correctly set?



As soon the controller has acquired the measurement voltage and the measurement current it shows the current cos phi and starts with normal operation.

Menü BLR-CM

> MEAS. VALUES <	ULL		V	Voltage Phase-Phase	PF1			Power factor
HARMONICS	ULN		V	Voltage Phase-Neutral	CP1			Cos phi
↑ ↓ →	THD		%	Total Harmonic Distortion				
	← ↑ ↓				← ↑ ↓			
	I		A	Current	OPH			Operation hours counter
	THD		%	Total Harmonic Distortion	APF			Average power factor
					T-MAX		°C	Highest measured temp.
	← ↑ ↓				← ↑ ↓			
	P		W	active Power	WPI		WH	counter active work import
	Q		var	reactive Power	WPE		WH	counter active work export
	S		VA	apparent power				
	← ↑ ↓				← ↑ ↓			
	F		HZ	frequency	WQI		varH	counter reactive work ind.
	ΔQ		var	control deviation	WQE		varH	counter reactive work cap.
	T		°C	ambient temperature				
	← ↑ ↓				← ↑ ↓			

MEAS. VALUES
> HARMONICS <
STEPINFO
↑ ↓ →

Harmonics for current and voltage up to 31st order

HARMONICS
> STEPINFO <
SETUP
↑ ↓ →

Display Step type, switching operations, Step size.

STEPINFO
> SETUP <
MANUAL
↑ ↓ →

Hold the → button until PASSWORD appears in the display.
Default PASSWORD is 2402

CHANGE LANG. — BLR-CM comes with ENGLISH / FRENCH / GERMAN as menu language

↓

START AI — Starts the automatic initialization

↓

MEASUREMENT — Adjustment of all points concerning the measurement:

↓

CT FACTOR	**SYNCHRONISATION FREQUENCY**	**COUNTDOWN START AI**
VT FACTOR		
NOM. VOLTAGE	**PHASE COMP**	**TEMP. OFFSET**
CONNECTION MEASUREMENT	**V-TOLERANCE MIN**	**CT TYPE 1A**
	V-TOLERANCE MAX	**1PH MEASUREMENT**

STEPS — Adjustment and resetting of the Step parameters:

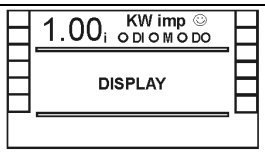
↓

DISCHARGE TIME	**SWITCH CYCLES**	**NOM. VALUE RESET**
STEP TYPE	**NOM. VALUE**	

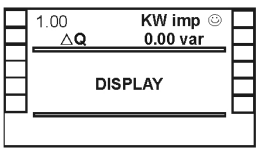
CONTROL — Adjustment of the control parameter:

CONTROL	**SWITCH CYCLES BALANCING**	**Q CAPACITIVE STEPS TURN OFF**
COS PHI 1		
COS PHI 2	**STEP EXCHANGE**	**FAST CONTROL DELAY MEASUREMENT**
SWITCH INTERVAL	**CONTROL SENSITIVITY**	
SWITCH INTERVAL STEP EXCHANGE		**FAST CONTROL MAX. STEP VAL.**
	CONTROL	
ASYM. FACTOR	**Q OFFSET**	**FAST CONTROL MEAN Q**
STEP RECOGNITION	**I < LIMIT FREEZE STEPS**	
SWITCH CYCLES BALANCING		**FAST CONTROL SYNC. IMP**

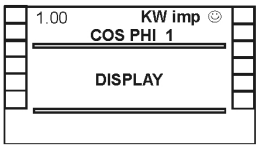
DISPLAY — Display setup, contrast, password (to deactivate the password set 0000)



Cos φ, DI, M, DO: Display of power factor and status of inputs and outputs (○=inactive, ●=active)
Use the ◀▶ button to change the display reading.



Cos φ, ΔQ: Display of power factor and control deviation.
Use the ◀▶ button to change the display reading.



Cos φ, valid Target cos φ (1 or 2): Showing of power-factor and of the active target power factor (e.g. tariff switching with digital input).
Use the ◀▶ button to change the display reading.

CONTRAST	The contrast of the LCD-display can be adjusted by pushing the **+** / **-** keys. After leaving this submenu the setting is stored automatically.

PASSWORD	By pushing the **+** / **-** keys the password can be changed. Reaching the last digit the new password is stored by pushing the ◄┘-key.(set the password to 0000 the password protection is switched off)

ALARM	Choose and activate alarms, the following alarms are possible:		
	CONTROL ALARM	**HARMONICS U**	**TEMP 1**
	NO CURRENT	**HARMONICS I**	**TEMP 2**
	STEP FAULT	**P OVERLOAD**	**DI INPUT**
	STEP WARNING	**Q OVERLOAD**	**FREQUENCY**
	COS PHI	**P-EXPORT**	

MODBUS	Adjustment of communication parameter:		
	BAUDRATE	**PARITY**	**ADDRESS**

DATALOGGER	Adjustment of the Datalogger:		
	DATE & TIME	**STORAGE INTERVAL**	**SETUP DI INPUT**

RESET	Reset menu:		
	RESET SETUP	**RESET STEPS**	**RESET OPH**
	RESET FAULTY STEPS	**RESET WORK COUNTER**	**RESET T-MAX**
		RESET APF	**DATALOGGER DELETE**

SETUP > MANUAL < DATALOGGER ↑ ↓ →	To enter in manual mode, please select “MANUAL” and push ► for 3 seconds. The automatic control is frozen and the exits can be switched manually. By the means of the **+** -key the referring step can be selected. Changing the switching state is possible by pushing the ◄►-key. **Manual switching is only possible when measurement voltage is in allowed range. Otherwise over- and undervoltage protection will block this function. After switching off an active step the discharging time is active. Only after this time is over the step can be switched on manually again.**

The menu item “DATALOGGER” is only visible when the device is equipped with option –DM.

MANUAL > DATALOGGER < DEVICE INFO ↑ ↓ →	**SETUP HISTORY**	→	In item “SETUP HISTORY” are all changes in the setup of the device stored. For each changed value are the following information’s with time stamp stored: Name of the setting, e.g. CT FACTOR and initial value and new adjusted value. For more detailed information’s, please check the reference book.
	ALARM HISTORY	→	In item “ALARM HISTORY” are all alarm events stored. For each alarm event are the following information’s with time stamp stored: Name of alarm e.g. Temp 1, adjusted threshold and max. value and voltage and current.

DATALOGGER > DEVICE INFO < ↑ →	**device type e.g.** BLR-CM **software:** z.B. V 02.07.02 **flag:** z.B. MB = Modbus

TECHNICAL DATA

Auxiliary voltage	100 - 132V / 207 - 253V, 45-65Hz, max. fuse 6A
Voltage measuring	50 – 530V, 45 – 65Hz, PT-ratio 1 - 350
Current measuring	0 – 5A, sensitivity 15mA, burden 15mΩ (option -3A: 3x 0 – 5A) overload 20% continuous, CT-ratio 1 - 6500
Control exits	6R, 12R, 6T, 12T, 12RT relays: N/O, one common point, max. fuse 6A breaking capacity: 250V AC / 5A, 400V AC / 2A, 110V DC / 0,4A, 30V DC / 5A static outputs: open-collector, breaking capacity: 8 – 48V DC / 100mA
Alarm contact	C/O, voltfree, programmable max. fuse 6A, breaking capacity 250V AC / 5A
Digital input DI0.1-DI0.2 (optional)	10 – 30V DC, for synchronization of data-logger
Digital input DI1.1-DI1.2	50 – 250V AC, programmable
Digital output	N/O, voltfree, programmable max. fuse 6A, breaking capacity 250V AC / 5A
Data-logger (optional)	2MB
Interface (optional)	RS485 Modbus RTU protocol (Slave)
Ambient temperature	operation: 0°C ... +70°C, storage: -20°C ... +85°C
Humidity	0% - 95%, without moisture condensation
Overvoltage class	II, pollution degree 3 (DIN VDE 0110, Teil 1 / IEC 60664-1)
Standards	DIN VDE 0110 Teil 1 (IEC 60664-1:1992) VDE 0411 Teil 1 (DIN EN 61010-1 / IEC 61010-1:2001) VDE 0843 Teil 20 (DIN EN 61326 / IEC 61326:1997 + A1:1998 + A2:2000)
Conformity and listing	CE, UL, cUL, GOST-R
Terminals	screw-type, plugable, max. 2,5mm^2
Casing	front: instrument casing plastic (UL94-VO), rear: metal
Protection class	front: IP 54, rear: IP 20
Weight	ca. 0,8 kg
Dimensions	144 x 144 x 58mm (h x w x d), cutout $138^{+0,5}$ x $138^{+0,5}$ mm

TROUBLE SHOOTING

Problem	Possible cause	Remedy
no display	auxiliary voltage missing	check correct connection of auxiliary voltage, if necessary rectify
display "U<>LIMIT"	measurement voltage out of range wrong settings for voltage measurement	check correct connection of measurement voltage, if necessary rectify check settings in menu "SETUP / MEASUREMENT", if necessary rectify
display "I<LIMIT"	measurement current too small	check connection of CT, probably there is a break in the line CT ratio too high, if necessary replace CT remove short circuit link of the CT
wrong display of current or voltage	wrong transformer ratio setting of Q offset	check settings PT- or CT-ratio in menu "SETUP / MEASUREMENT", if necessary rectify correct setting of Q offset
wrong power factor is displayed	wrong settings at the regulator setting of Q offset	check settings "NOMINAL VOLTAGE" and "CONNECTION" in menu "SETUP" and setting "PHASE COMPENSATION" in menu "EXTENDED", if necessary rectify correct setting of Q offset
power factor doesn't change after switching on a step, step is switched off again	CT mounted in wrong position	check mounting position referring circuit diagram (current of load and capacitors have to be measured!), if necessary rectify
alarm "overcurrent"	current higher than allowed	check CT ratio, probably replace by suitable transformer type
alarm "control"	permanent overcompensation permanent undercompensation	check settings check contactors, probably contact stick together check settings check capacitors, possibly fuse defective check dimensioning of the compensation unit
reversed control mode	current or voltage clamps interchanged	correct connection or adapt phase compensation
single steps are not switched on or off	wrong settings	check, if referring steps are defined as fix steps (permanently on or off)
steps are detected as defective	step defective	check capacitor steps, probably fuse, capacitor or contactor defective
steps are not switched on	step size too large	necessary reactive power smaller than switching threshold of step size of the smallest step