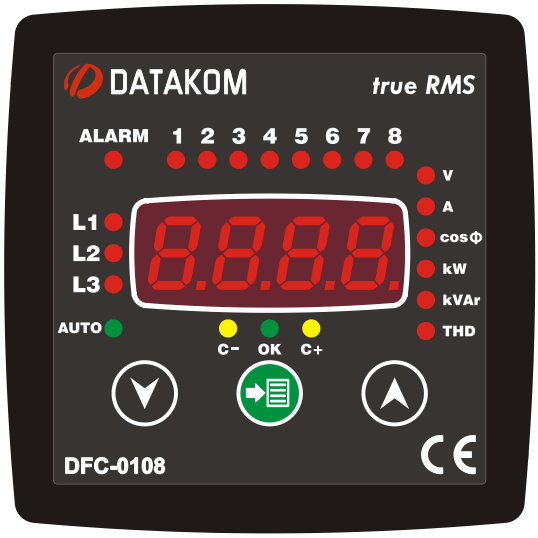
DKG-108 POWER FACTOR CONTROLLER

8 BANKS, HARMONIC DISTORTION DISPLAY



FEATURES

Small size
Cost effective and high performance
True RMS AC measurements,high accuracy
4096 samples/sec measurement rate
Easy commissioningthrough automatic setup
Automatic CT reverse polarity correction
Automatic detection of faulty banks
Electronic/mechanical power counter selection
Per-phase regulation capability
Supports both single-phase and triphasebanks
Connection/disconnection of all banks at once
Adjustable delay timers
Dynamic update of capacitor ratings
Equal aging of contactors
Per phase and total V-A-kW-kVAr-cosdisplay
THD display of all V-I parameters (31 harmonic)
Generator phase input
VT ratio for MV applications
kW and kVAr tick output possibility
Front panel programmable
Low panel depth, easy installation
Wide temperature range
Sealed front panel (IP54)
Plug-in connection system for easy replacement

DESCRIPTION

DFC-0108 is a high technology controller allowing the power factor of the installation to be stabilized to the requested value by switching capacitor banks through contactors. The unit allows also the visualization of various AC parameters like a network analyzer.

The unit makes harmonic analysis up to the 31th component. The THD values of all voltages and currents are available.

Stepping algorithms are selectable between various types. Thanks to the automatic setup function, the commissioning and programming are made easy.

The unit fits into a standard 96x96mm panel opening.

SAFETY NOTICE

Failure to follow below instructions will result i death or serious injury

- **Electrical equipment should be installed only by qualified specialist. No responsibility is assured by the manufacturer or any of its subsidiaries for any consequences resulting from the non-compliance to these instructions.**
- **Check the unit for cracks and damages due to transportation. Do not install damaged equipment.**
- **Do not open the unit. There is no serviceable parts inside.**
- **Fuses must be connected to the phase voltage inputs, in close proximity of the unit.**
- **Fuses must be of fast type (FF) with a maximum rating of 6A.**
- **Disconnect all power before working on equipment.**
- **When the unit is connected to the network do not touch terminals.**
- **Short circuit terminals of unused current transformers.**
- **Any electrical parameter applied to the device must be in the range specified in the user manual.**
- **Do not try to clean the device with solvent or the like. Only clean with a dump cloth.**
- **Verify correct terminal connections before applying power.**
- **Only for front panel mounting.**

Current Transformers must be used for current measurement.

No direct connection allowed.

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1. INSTALLATION

Before installation:

- Read the user manual carefully, determine the correct connection diagram.
- Remove all connectors and mounting brackets from the unit, then pass the unit through the mounting opening.
- Put mounting brackets and tighten. Do not tighten too much, this can brake the enclosure.Self mating brackets do not require tightening.
- Make electrical connections with plugs removed from sockets, then place plugs to their sockets.
- Make sure that relay outputs are not overloaded. If necessary use extra contactors.

Below conditions may damage the device:

- Incorrect connections.
- Incorrect power supply voltage.
- Voltage at measuring terminals beyond specified range.
- Current at measuring terminals beyond specified range.
- Overload or short circuit at relay outputs

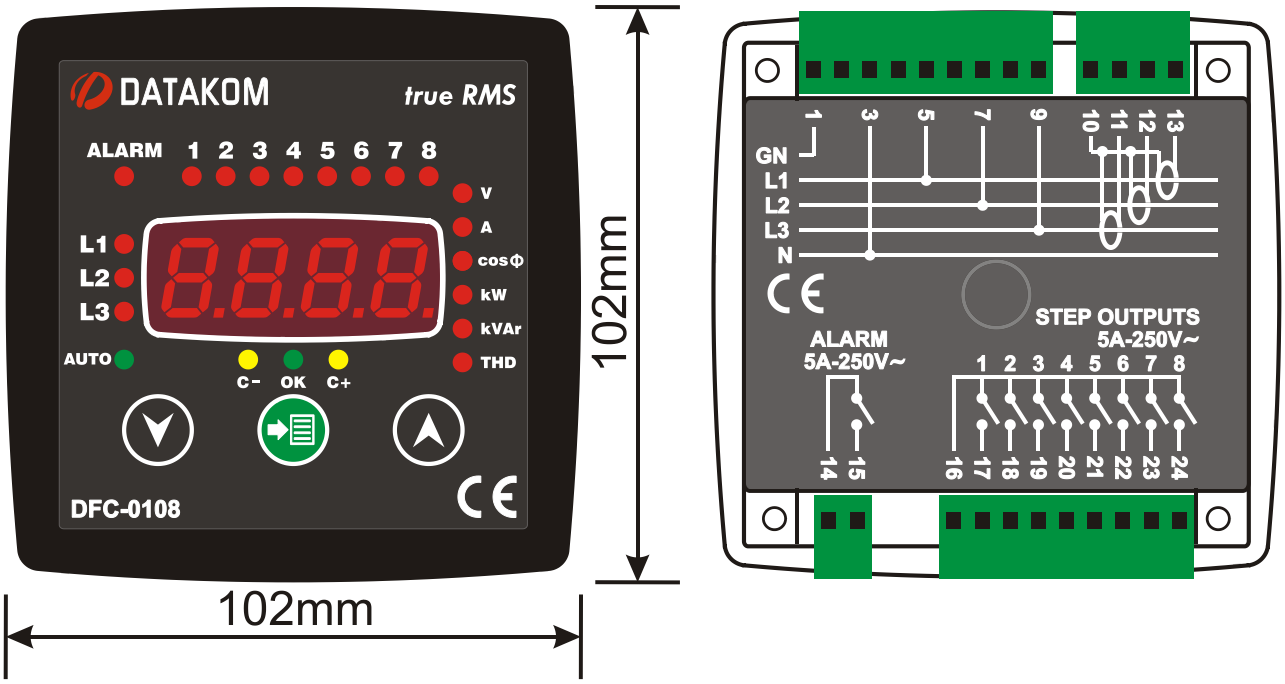
Current Transformers must be used for current measurement.

No direct connection allowed.

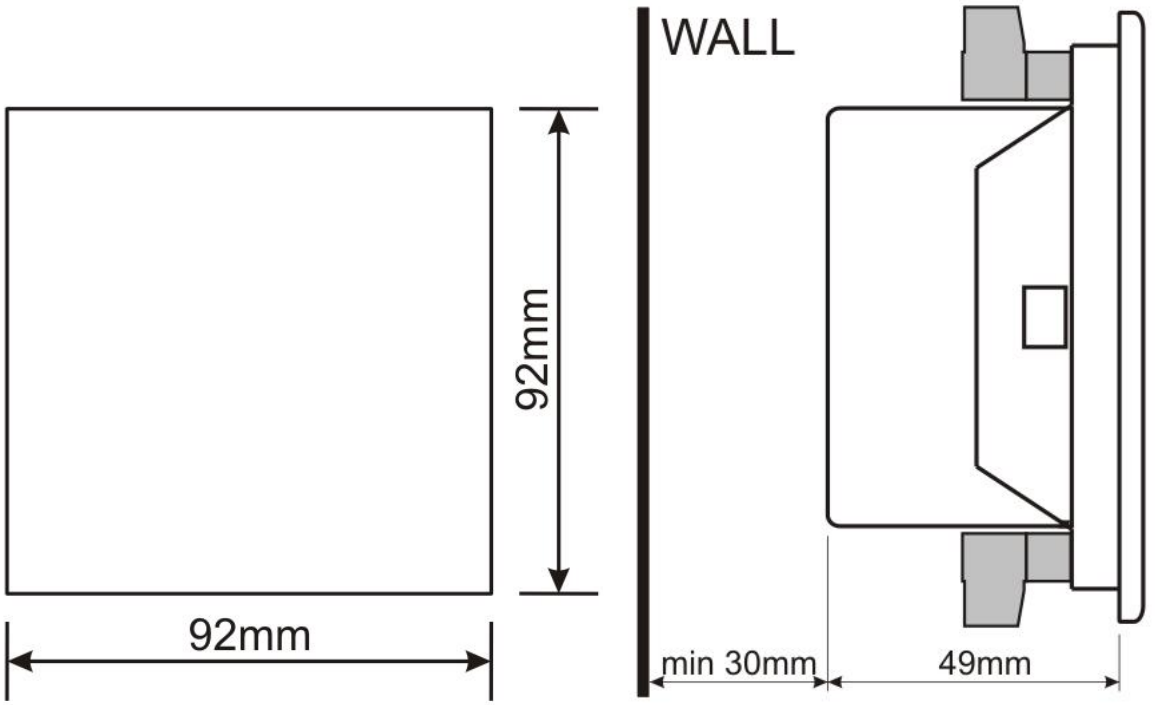
Below conditions may cause abnormal operation:

- Power supply voltage below minimum acceptable level.
- Power supply frequency out of specified limits
- Current transformers not matching related phases.
- Current transformer polarity incorrect. (if automatic correction is not applied).
- Inadequate on-delay setting
- Inadequate off-delay setting.

1.1 FRONT / REAR PANELS



1.2 MECHANICAL INSTALLATION



Panel Cutout **Required Panel Depth**

1.3 ELECTRICAL INSTALLATION

Do not install the unit close to high electromagnetic noise emitting devices like contactors, high current busbars, switchmode power supplies and the like.

Although the unit is protected against electromagnetic disturbance, excessive disturbance can affect the operation, measurement precision and data communication quality.

- **ALWAYS remove plug connectors when inserting wires with a screwdriver.**
- **Fuses must be connected to phase voltage inputs, in close proximity of the unit.**
- **Fuses must be of fast type (FF) with a maximum rating of 6A.**
- **Use cables of appropriate temperature range.**
- **Use adequate cable section, at least 0.75mm^2 (AWG18).**
- **For current transformer inputs, use at least 1.5mm^2 section (AWG15) cable.**
- **The current transformer cable length should not exceed 1.5 meters. If longer cable is used, increase the cable section proportionally.**
- **Follow national rules for electrical installation.**
- **Current transformers must have 5A output.**

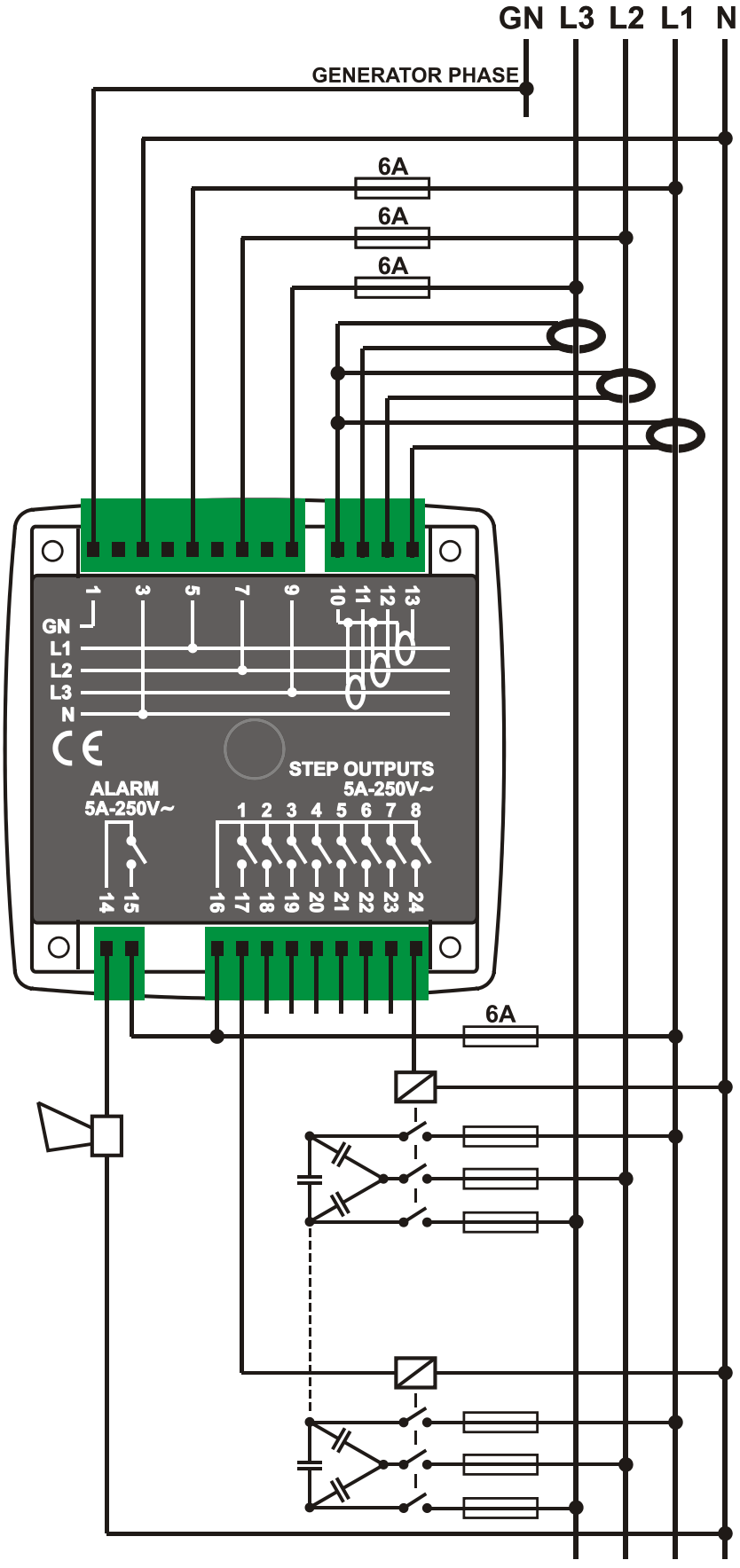
Current Transformers must be used for current measurement.

No direct connection allowed.

Make sure that relay outputs are not overloaded.

If necessary use extra contactors.

1.4 CONNECTION DIAGRAM



2. AUTOMATIC SETUP

In automatic setup mode, the unit :

-automatically detects and corrects reverse connected current transformers.

-automatically measures and memorizes capacitor bank ratings.

For a successful auto setup, voltage connections must be 3 phased.

Otherwise the unit will give ALARM_01 and will not perform automatic setup.

For a successful auto setup, STEP_1 capacitors must b 3 phased.

Otherwise the unit cannot detect connection errors, gives ALARM_02 and will not perform automatic setup.

For a successful auto setup, current transformers mus be connected to correct CT inputs.

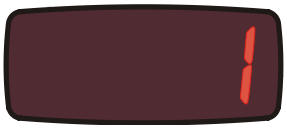
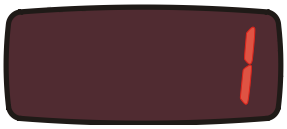
The connection polarity is not important.

Otherwise the unit will give ALARM_03 and will not perform automatic setup.

It is preferable that there should be no other load on t capacitor panel. However with constant or slow changing loads the unit is able to perform auto setup.

If there are fast changing loads, the unit may be unab to correct CT polarity errors or may read incorrect ba capacitor ratings. In such cases, auto setup should b repeated and capacitor ratings should be checked/corrected through PROGRAMMING menu.

STEP BY STEP AUTO SETUP

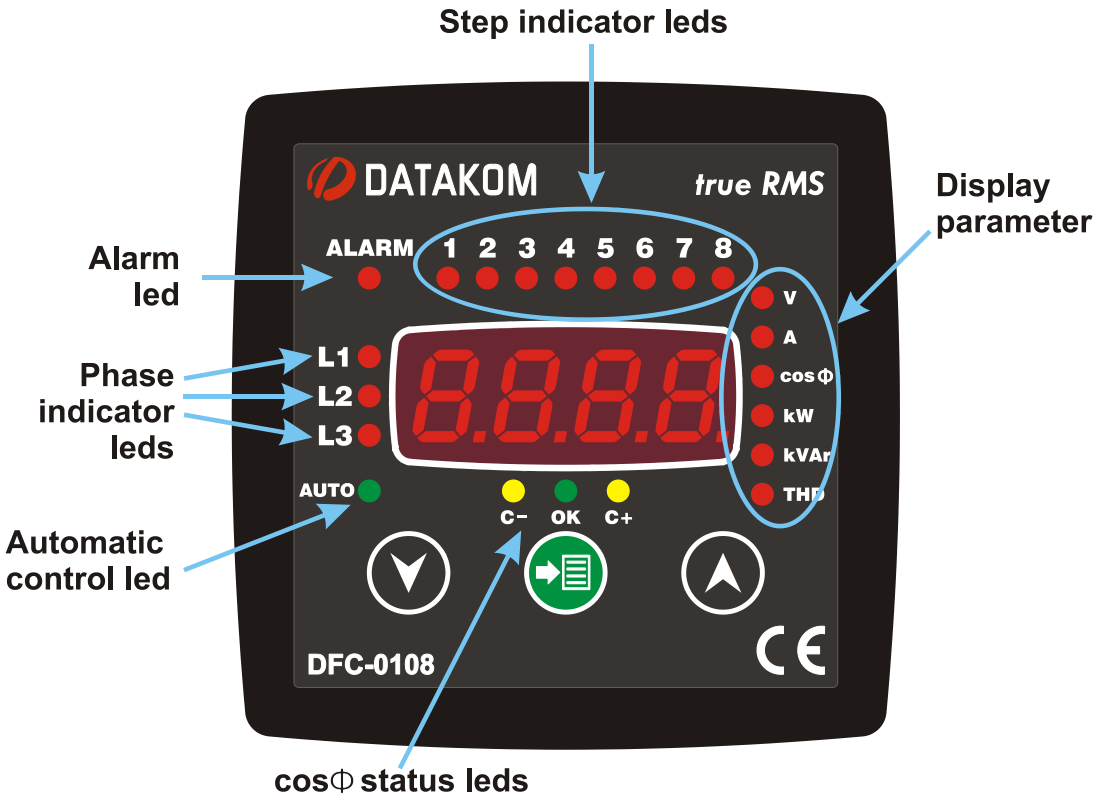
PUSHBUTTON	OPERATION	DISPLAY
	In order to enter the auto setup mode, power-up the unit with **MENU** button pressed and hold the button pressed for 10 seconds. The display will show **ctrF**and the unit will ask the current transformer primary rating.	
	Press again the **MENU** button. The display will show the CT primary rating.	
	Adjust required CT primary rating with arrow buttons. For fast increase/decrease please hold the button pressed.	
	Press again the **MENU** button. The display will show **MtEr**and the unit will ask the power meter type.	
	Press again the **MENU** button. The display will show the power meter type.	
	Adjust required power meter type with arrow buttons. 0 → analog power meter 1 → digital power meter	
	Press again the **MENU** button. The display will show **LErn**and the unit will ask to enter the quick commissioning mode.	
	Press again the **MENU** button. The display will show 0.	
	Set the parameter to 1 with arrow buttons.	
	Press again the **MENU** button. The display will show the total **kVAr**value. The unit will check **CT** connections, correct if necessary, then activate all banks (one by one) in order to determine capacitor ratings. When auto setup is finished successfully the unit will revert to normal operation.	

3. PUSHBUTTON FUNCTIONS

Access to programming and measurement displays is achieved through 3 pushbuttons on the front panel.

PUSHBUTTON	FUNCTION
	**In AUTO mode, acknowledges the displayed alarm.** **If the same alarm occurs again, it will not appear on the display.**
	**HELD PRESSED DURING 5 SEC:** **Resets all alarms and the alarm led.** **Any new coming alarm will appear on the display.**
	**HELD PRESSED DURING 10 SEC AT POWER-ON:** **The unit enters automatic setup mode.**
	**Switch to upper display or previous parameter** **or increase related value (programming mode)**
	**Switch to lower display or next parameter** **or decrease related value (programming mode)**
	**HELD PRESSED DURING 5 SEC:** **Switches between AUTO and MANUAL modes.In MANUAL mode the stepping is disabled. From the MANUAL mode TEST mode can be selected in order to test each step manually.**
	**HELD PRESSED DURING 5 SEC IN MANUAL MODE:** **Switches between MANUAL and TEST modes. In TEST mode, all steps may be turned on and off manually. For more detailed information please check chapter 4.2.**
	**HELD PRESSED TOGETHER DURING 5 SEC:** **Enters or exits programming mode.**
	NO PUSHBUTTON PRESSED DURING 15 MINUTES: **Returns to the programmed main display screen.**

4. DISPLAYS



Display parameter leds at **right** describe the measurement on the display.

Phase indicator leds at left describe the phase related to the display:

- 2 phase leds are on for Ph-Ph values.
- All 3 leds are on for totalcosø, kW, kVAr.
- All leds are off for frequency.
- For THD values, THD led,V or A led and related phase ledsare on together.

Alarm led turns on if any fault condition occurs. If the alarm list is displayed, this led flashes.

Step leds turn on if the related capacitor bank is activated. If the capacitor bank is faulty, the led flashes once every 5 seconds. When the step is about to become active or inactive the led flashes differently.

C- led shows insufficient regulation.

C+ led shown excessive regulation.
OK led indicates a balanced system.

Current display: If the current transformer (CT) ratio is lower than 200/5A, currents are displayed with 0.1A precision. Otherwise they are displayed with 1A precision.

Voltage display: If the voltage transformer (VT) ratio is lower than 50.0/1, voltages are displayed in volts. Otherwise they are displayed with in kV with 0.01kV precision.

kW, kVA, kVArdisplay: If the VTxCTproduct is lower than 1000, then values are shown with 0.1k precision. Otherwise they are shown with 1k precision.

Capacitor bank rating display: The display shows alternatively CAPxand the rating in kVAr. If the capacitor is single phase, the related phase led turns on. Otherwise all phase leds are on.

4.1 DISPLAYS IN AUTO AND MANUAL MODES

Holding the pushbutton pressed for 5 seconds switches betweenAUTO and MANUAL modes.

If AUTO mode is selected with a step output activated in MANUAL mode, then the AUTO position starts with this step activated. The step then may be deactivated following automatic stepping program.

In **AUTO**mode, the **AUTO** ledis on. If the **generator input** is active or if there is any alarm preventing automatic operation, then the AUTO led is flashing. In **MANUAL** mode, the **AUTO** led is off.

As default the unit displays the **total cosø**.

With pushbuttons various measured values are scrolled.

If no button is pressed during 15 minutes, the display reverts back to **total cosø** display

4.2 TEST MODE. MANUAL STEP CONTROL

Holding the pushbutton pressed for 5 seconds switches betweenTEST and MANUAL modes.

In TEST mode, if no button is pressed during 1 minute the unit will automatically return back to MANUAL mode.

In**TEST**mode only the **total kVAr** value is displayed.

When**TEST** mode is selected then the step-1 indicator led will flash. Pressing the pushbutton will activate this step.Pressing the pushbutton will deactivate this step. Pressing the MENUpushbutton will select the next step and the related step led will flash.Using pushbuttons the step may be activated or deactivated. Using the MENUpushbutton all steps may be scrolled manually.

5. STEPPING PROGRAMS

The unit is able to apply various stepping programs.

The stepping program is selected through “**ProG**” parameter.

It is advised to use the OPTIMAL program (10). Fastest and the most precise regulation is achieved wit this program.

ProG	BANK CONFIGURATION and STEPPING
1	1.1.1.1.1.1.1.1: standardconfiguration, legacy program (a single step is activated or deactivated at each period).
2	1.2.4.4.4.4.4.4 : standard configuration, legacy program (a single step is activated or deactivated at each period).
3	1.2.3.3.3.3.3.3 : standard configuration, legacy program (a single step is activated or deactivated at each period).
4	1.1.2.3.3.3.3.3 : standard configuration, legacy program (a single step is activated or deactivated at each period).
5	1.1.2.4.4.4.4.4 : standard configuration, legacy program (a single step is activated or deactivated at each period).
6	1.2.2.4.4.4.4.4 : standard configuration, legacy program (a single step is activated or deactivated at each period).
7	1.2.3.4.4.4.4.4 : standard configuration, legacy program (a single step is activated or deactivated at each period).
8	1.2.4.8.8.8.8.8 : standard configuration, legacy program (a single step is activated or deactivated at each period).
9	Free configuration(programmed or auto-configured),legacy program (a single step is activated or deactivated at each period).
10	Free configuration (programmed or auto-configured), optimal program (all necessary steps are activated/deactivated at once).

5.1 COMPARAISON OF LEGACY AND OPTIMAL PROGRAMS

Step configuration: 1.2.3.4.4.4.4.4

Step type: 3 Phase

Basic step rating: 1kVAr

Target CosØ= 1.000

Inductive reactive load: 20kVar

LEGACY PROGRAM

		STEPS								
	Request	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**kVAr**
1	↑	1								1
2	↑	1	2							3
3	↑	1	2	3						6
4	↑	1	2	3	4					10
5	↑	1	2	3	4	4				14
6	↑	1	2	3	4	4	4			18
7	↑	1	2	3	4	4	4	4		22
8	↓		2	3	4	4	4	4		21
9	↓			3	4	4	4	4		19
10	↑	1		3	4	4	4	4		20

The unit has reached the target **cosø** in 10 periods, by operating 1 step at each period.

During this time the **cosø**had been different from the target and the reactive power counter has recorded reactive power.

The unit has made 10 contactoroperations.

The unit has reached the target **cosø** with 6 banks in service.

OPTIMAL PROGRAM

		STEPS								
	Request	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**kVAR**
1	↑				4	4	4	4	4	20

The unit has reached the target **cosø** in 1 period. As the target **cosø**is reached faster, the reactive power counter has recorded less power.

The unit has made 5 contactoroperations. Thus longer contactor life is achieved.

The unit has reached the target **cosø** with 5 banks in service. Thus capacitor aging is kept at minimum.

6. ALARMS

The unit constantly monitors abnormal situations occurring in the system.

Every monitored parameter has programmable alarm limits and delay timer. Alarms may be of latching or unlatching types. The automatic operation may be programmed to be aborted or continued. For more details please consider the PROGRAMMING section of this manual.

When any alarm occurs the ALARM led turns on and the alarm code appears on the display. Following programming, the auxiliary relay output may be activated. The automatic operation may be aborted or continued, based on programming.

AL-01: NETWORK NOT 3 PHASED
Occurs if automatic setup is attempted with non 3 phased network.

AL-02:FIRST BANK NOT 3 PHASED
Occurs if automatic setup is attempted with non 3 phased capacitors at the fist bank.

AL-03:FAULTY CT ORDER
Occurs if automatic setup is attempted with CTs not connected to related phases.

AL-04:HIGH VOLTAGE
Occurs if at least 1 phase voltage is above **u-Hi** limit during **u-dU**period.

AL-05: LOW VOLTAGE
Occurs if at least 1 phase voltage is below **u-Lo** limit during **u-dU** period.

AL-06: HIGH FREQUENCY
Occurs if the frequency is above **F-Hi** limit during **F-dU** period.

AL-07: LOW FREQUENCY
Occurs if the frequency is below**F-Lo** limit during **F-dU** period.

AL-08:EXCESS kW
Occurs if the total active power is above **A-Hi** limit during **A-dU** period.

AL-09: LOW kW
Occurs if the total active power is below **A-Lo** limit during **A-dU** period.

AL-10:EXCESS INDUCTIVE kVAr
Occurs if the total reactive power is inductive and above **rInd** limit during **r-dU** period.

AL-11: EXCESS CAPACITIVE kVAr
Occurs if the total reactive power is capacitive and above **rCAP** limit during **r-dU** period. (Welded contactors)

AL-12:INDUCTIVE CosØ
Occurs if the total cosø is inductive and below **cInd** limit during **C-dU** period.

AL-13:CAPACITIVE CosØ
Occurs if the total cosø is capacitive and below **cCAP** limit during **C-dU** period. (Welded contactors)

AL-14: EXCESS CURRENT
Occurs if at least 1 phase current is above **CrHi** limit during **CrdU** period.

AL-15:EXCESS THD(V)
Occurs if at least 1 phase voltage THD is above **thdu** limit during **uhdU** period.

AL-16:EXCESS THD(I)
Occurs if at least 1 phase current THD is above **thdi** limit during **chdU** period.

rAt1...rAt8 CAPACITORVALUE LOSS
Occurs when the measured step rating is below **rtio** % compared to its nominal value. In order to enable this alarm **dYnC** parameter must be **1**.

AL-18:PHASE ORDER FAULT
Occurs if the voltage phase order is faulty.

Err1...Err8: CAPACITOR DEFECTIVE
Occurs when the measured capacitor rating is below 20% of its nominal value.

7. PROGRAMMING

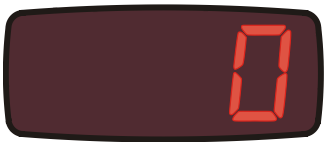
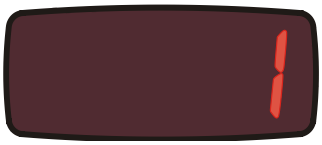
7.1 ENTERING AND EXITING PROGRAMMING

In order to provide the maximum flexibility to the user, the unit features many programmable parameters.

The parameters are recorded in a non-volatile memory and are not affected by power supply failures.

The entry to the programming menu is **password protected**. The factory set password value is "**1**" and can be modified with the program parameter "**PASS**".

Additionally the password "**3282**" is always valid and cannot be modified.

PUSHBUTTON	OPERATION	DISPLAY
	In order to enter PROGRAM mode please hold pressed arrow buttons for 5 seconds. The display will show**User**.	
	When **USEr** appears please press **MENU** pushbutton. The password entry display will come.	
	Use the arrow buttons to enter the password. The factory set password value is "**1**" In order to fast increase/decrease please hold arrow pushbuttons pressed.	
	Press **MENU** pushbutton. The first parameter name(**LErn**) will come to display.	

PUSHBUTTON	OPERATION	DISPLAY
	In order to leave the program mode please hold pressed both arrow buttons during 5 seconds.	

If no pushbutton is pressed during 3 minutes, the unit will automatically terminate the PROGRAM mode.

7.2 LAMP TEST

The unit makes a LAMP TEST when exiting the PROGRAM mode. During lamp test all lights turn on.

By pressing the MENU pushbutton, normal operation is resumed.

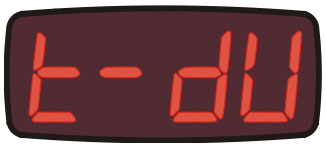
If no pushbutton is pressed for 3 minutes the unit will automatically terminate the PROGRAM mode <u>without lamp test</u>.

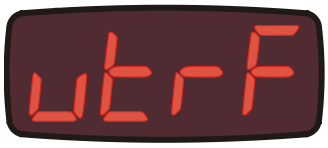
7.3 MODIFYING PROGRAM PARAMETERS

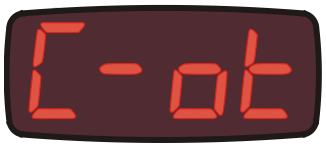
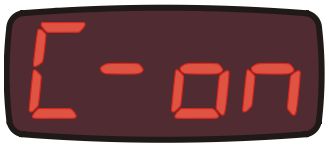
PUSHBUTTON	OPERATION	DISPLAY
	When parameter names are displayed, select required parameter with arrow buttons.	
	When the required parameter is found press **MENU** pushbutton. The parameter value will be displayed.	
	Adjust required value with arrow buttons. In order to fast increase/decrease please hold arrow pushbuttons pressed.	
	**Press MENU** pushbutton. The parameter value will be recorded and the parameter name will be displayed again.	

7.4 PROGRAM PARAMETER LIST

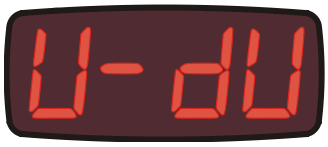
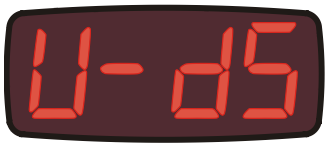
DISPLAY	DESCRIPTION	MIN	STD	MAX
	**PASSWORD ENTRY** The user password is required. The password is determined by the program parameter "**PASS**". The factory set value is "**1**". The password "**3282**" is always valid.	0	1	9999
	**AUTOMATIC SETUP** When this parameter is set to **1**, and if the unit is in **MANUAL** mode, steps are activated consecutively and bank ratings are measured.	0	0	1
	**RESETTING DYNAMIC STEP VALUES AND FAULT COUNTERS** When this parameter is set to **1**, fault counters and dynamic bank values are reset.	0	0	1
	**RESETTING STEP COUNTERS** When this parameter is set to **1**, step activation and operation counters are reset.	0	0	1
	**RETURN TO FACTORY SETTINGS** When this parameter is set to **1**, all program parameters return back to factory set values.	0	0	1
	**TARGETcosø** This is the target **cosø**value that the unit is trying to reach in **AUTO** mode. The value can be adjusted between 0.800 capacitive and 0.800 inductive. Capacitive values are shown in c.999 format. Inductive values are shown in 0.999 format.	0.800 cap.	0.999 ind.	0.800 ind.
	**ADJUSTING THE NUMBER OF STEPS** The number of used steps can be adjusted between 1 and 8. Unused steps are not taken into account in the stepping program.	1	8	8

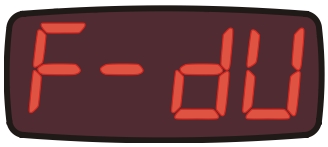
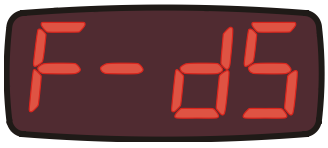
DISPLAY	DESCRIPTION	MIN	STD	MAX
	**STEPPING PROGRAM SELECTION** This parameter selects between**LEGACY** and **OPTIMAL** stepping programs. The unit is advised to be operated under **OPTIMAL** program. Program details are emphasized in chapter 5.	1	10	10
	**STEP TURN-ON DELAY** When a new capacitor combination is required, the unit continues measurements during this timer and the new combination found at the end of this timer is directed to step outputs.	1 sec	20 sec	2000 sec
	**STEP TURN-OFF DELAY** When a new capacitor combination is set to step outputs, stepping is disabled during this period.	1 sec	30 sec	2000 sec
	**DISCHARGE TIMER** Common discharge timer for all steps. A deactivated bank cannot be reactivated before this timer has expired.	3 sec	60 sec	2000 sec
	**CAPACITOR TYPE (CON1...CON8)** Selects capacitor connection type. If "**Prog**" parameter is selected between **1** and **8**, these parameters have no effect and all banks are supposed to be 3 phased. 0 → 3 phase capacitor 1 → single phase capacitor at phase L1 2 →single phase capacitor at phase L2 3 →single phase capacitor at phase L3	0	0	3

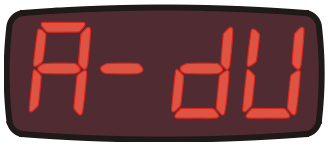
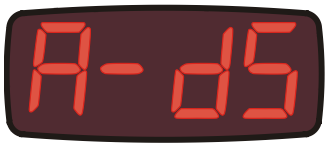
DISPLAY	DESCRIPTION	MIN	STD	MAX
	**CAPACITOR RATING (CAP1...CAP8)** This is thecapacitor bank rating, adjusted between 0.1 and 999.9 kVAr. If the parameter“**Prog**” is set to a value between **1** and **8**, then only **CAP1** parameter is used. Other **CAPx** parameters are don’t care.	0.0 kVAr	1.0 kVAR	999.9 kVAr
	**CURRENT TRANSFORMER RATIO** The CT ratio is the primary rating of both phase CTs, adjusted in 5A steps. The CT secondary rating must be 5A.	5 Amp	500 Amp	5000 Amp
	**VOLTAGE TRANSFORMER RATIO** The voltage transformer ratio is adjusted between 0.1 and 200.0 in 0.1 steps.	0.1	1.0	200.0
	**SELECTION OF POWER METER TYPE** For the correct operation of the controller, this parameter **must** be set properly. **0 → analog power meter** (the sum of all phases are regulated) **1 → digital power meter** (each phase is individually regulated)	0	1	1
	**DYNAMIC MEASUREMENT OF CAPACITOR kVArRATINGS** When this parameter is set to 1, capacitor kVAr ratings are continuously measured and modified in small amounts.	0	0	1
	**DEFAULT DISPLAY SCREEN** If no pushbutton is pressed during 15 minutes, the display switches automatically to this selection. The factory set value is the total **cosø** display. 0 →L1 voltage 1 →L2 voltage 2 →L3 voltage 3 → Frequency display The order is the same as the measurements display.	0	14	32

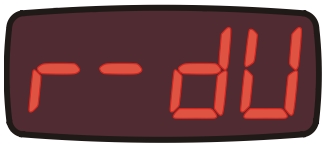
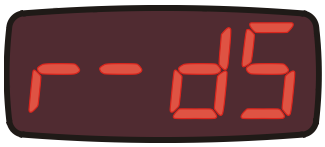
DISPLAY	DESCRIPTION	MIN	STD	MAX
	**REGULATION LIMIT FOR C-/C+ LEDS** This is the difference from the target **cosø** for C-,OK,C+ leds to turn on.	1 %	5 %	20 %
	**NOMINAL VOLTAGE** This is the phase-to-neutral voltage for which bank ratings are defined.	70 V	220V	9999 V
	**NOMINAL FREQUENCY** This is the network frequency for which bank ratings are valid.	30 Hz	50 Hz	400 Hz
	**NUMBER OF FIXED STEPS** This number of steps, starting from the step-1 will be always active.	0	0	4
	**TURN_ON ALERT TIMER** After a new step combination has been determined, the leds of steps to be modified start to flash and only after expiration of this timeout the steps are activated. During this timer no new step combination is calculated.	0 sec	3 sec	2000 sec
	**TURN_OFF ALERT TIMER** After a new step combination has been determined, the leds of steps to be modified start to flash and only after expiration of this timeout the steps are deactivated. During this timer no new step combination is calculated.	0 sec	1 sec	2000 sec

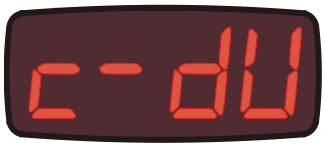
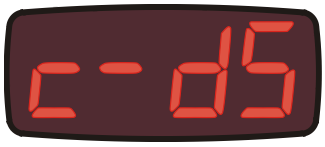
DISPLAY	DESCRIPTION	MIN	STD	MAX
	**AUTOMATIC TESTING OF DEFECTIVE BANKS** A defective bank is not used in regulation. But if the value of this timer is not zero, then defective banks are activated regularly with this period and tested again. If the bank is no more defective then the alarm will disappear and the bank will be used in regulation. A bank value below 20% of its nominal value is considered as defective. A bank value above 80% of its nominal value is considered as operational. In order to determine the capacitor's defective/healthy condition, this test is applied 3 times. If the same result is obtained at each test then the new capacitor condition is accepted.	3 hour	10 hour	200 hour
	**PHASE ORDER CHECK** 0 →Phase order is not monitored 1 →Phase order is monitored	0	0	1
	**SINGLE PHASE OPERATION** 0 →3 phased connection 1 →Single phase connection	0	0	1

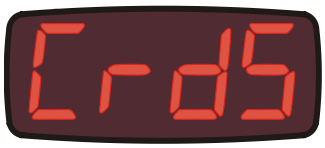
DISPLAY	DESCRIPTION	MIN	STD	MAX
	**HIGH VOLTAGE ALARM LIMIT** Any phase voltage above this limit will generate a high voltage alarm. If this limit is set to zero then the alarm is not monitored.	0 V	0 V	9999 V
	**LOW VOLTAGE ALARM LIMIT** Any phase voltage below this limit will generate a low voltage alarm. If this limit is set to zero then low voltage alarm is not monitored.	0 V	0 V	9999 V
	**VOLTAGE ALARM DELAY** For any voltage alarm, the limit must be overridden during this period.	0 sec	30 sec	200 sec
	**VOLTAGE ALARM FUNCTION** 0 →In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 1 →In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 2 →In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will persist and can be only reset manually. 3 →In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will persist and can be only reset manually.	0	0	3

DISPLAY	DESCRIPTION	MIN	STD	MAX
	**HIGH FREQUENCY ALARM LIMIT** If the frequency is above this limit, it will generate a high frequency alarm. If this limit is set to zero then the alarm is not monitored.	0 Hz	0 Hz	400 Hz
	**LOW FREQUENCY ALARM LIMIT** If the frequency is below this limit, it will generate a low frequency alarm. If this limit is set to zero then the alarm is not monitored.	0 Hz	0 Hz	400 Hz
	**FREQUENCY ALARM DELAY** For any frequency alarm, the limit must be overridden during this period.	0 sec	30 sec	200 sec
	**FREQUENCY ALARM FUNCTION** 0 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 1 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 2 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will persist and can be only reset manually. 3 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will persist and can be only reset manually.	0	0	3

DISPLAY	DESCRIPTION	MIN	STD	MAX
	**ACTIVE POWER HIGH LIMIT** If the active power is above this limit, it will generate an excess kW alarm. If this limit is set to zero then the alarm is not monitored.	0 kW	0kW	6500 kW
	**ACTIVE POWER LOW LIMIT** If the active power is below this limit, it will generate a low kW alarm. If this limit is set to zero then the alarm is not monitored.	0 kW	0 kW	6500 kW
	**ACTIVE POWER ALARM DELAY** For any kW alarm, the limit must be overridden during this period.	0 sec	30 sec	200 sec
	**ACTIVE POWER ALARM FUNCTION** 0 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 1 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 2 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will persist and can be only reset manually. 3 →In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will persist and can be only reset manually.	0	0	3

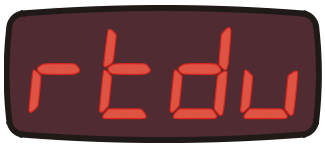
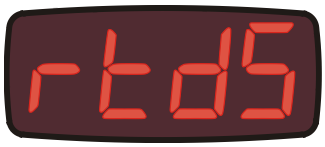
DISPLAY	DESCRIPTION	MIN	STD	MAX
	**CAPACITIVE REACTIVE POWER HIGH LIMIT** If the reactive power is capacitive and above this limit, it will generate an excess kVAr capacitive alarm. If this limit is set to zero then the alarm is not monitored.	0 kVAR	0 kVAR	6500 kVAR
	**INDUCTIVE REACTIVE POWER HIGH LIMIT** If the reactive power is inductive and above this limit, it will generate an excess kVAr inductive alarm. If this limit is set to zero then the alarm is not monitored.	0 kVAR	0 kVAR	6500 kVAR
	**REACTIVE POWER ALARM DELAY** For any kVAr alarm, the limit must be overridden during this period.	0 sec	30 sec	200 sec
	**REACTIVE POWER ALARM FUNCTION** 0 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 1 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 2 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will persist and can be only reset manually. 3 →In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will persist and can be only reset manually.	0	0	3

DISPLAY	DESCRIPTION	MIN	STD	MAX
	**CAPACITIVE POWER FACTOR (CosØ) LOW LIMIT** If the power factor is capacitive and below this limit, it will generate a low power factor capacitive alarm. If this limit is set to 0.000 then the alarm is not monitored.	0.000	0.000	0.999
	**INDUCTIVE POWER FACTOR (CosØ) LOW LIMIT** If the power factor is inductive and below this limit, it will generate a low power factor inductive alarm. If this limit is set to 0.000 then the alarm is not monitored.	0.000	0.000	0.999
	**LOW POWER FACTOR ALARM DELAY** For any low power factor alarm, the limit must be overridden during this period.	0 sec	30 sec	200 sec
	**LOW POWER FACTOR ALARM FUNCTION** 0 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 1 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 2 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will persist and can be only reset manually. 3 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will persist and can be only reset manually.	0	0	3

DISPLAY	DESCRIPTION	MIN	STD	MAX
	**OVERCURRENT ALARM LIMIT** Any phase current above this limit will generate an overcurrent alarm. If this limit is set to zero then the alarm is not monitored.	0 A	0 A	5000 A
	**OVERCURRENT ALARM DELAY** For an overcurrent alarm, the limit must be overridden during this period.	0 sec	30 sec	200 sec
	**OVERCURRENT ALARM FUNCTION** 0 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 1 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 2 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will persist and can be only reset manually. 3 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will persist and can be only reset manually.	0	0	3

DISPLAY	DESCRIPTION	MIN	STD	MAX
	**THD(V) HIGH ALARM LIMIT** Any phase voltage THD above this limit will generate a high THD(V) alarm. If this limit is set to zero then the alarm is not monitored.	0 %	0 %	99%
	**THD(V) ALARM DELAY** For a high THD(V) alarm, the limit must be overridden during this period.	0 sec	30 sec	200 sec
	**THD(V) ALARM FUNCTION** 0 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 1 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 2 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will persist and can be only reset manually. 3 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will persist and can be only reset manually.	0	0	3

DISPLAY	DESCRIPTION	MIN	STD	MAX
	**THD(I) HIGH ALARM LIMIT** Any phase current THD above this limit will generate a high THD(I) alarm. If this limit is set to zero then the alarm is not monitored.	0 %	0 %	99 %
	**THD(I) ALARM DELAY** For a high THD(I) alarm, the limit must be overridden during this period.	0 sec	30 sec	200 sec
	**THD(I) ALARM FUNCTION** 0 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 1 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 2 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will persist and can be only reset manually. 3 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will persist and can be only reset manually.	0	0	3

DISPLAY	DESCRIPTION	MIN	STD	MAX
	**CAPACITOR VALUE LOSS ALARM LIMIT** If the measured capacitor bank rating is less than the percent defined by this parameter, compared to its nominal value, then a capacitor value loss alarm is given. The low capacitor value must be measured at least 3 times below the limit. If this limit is set to zero then the alarm is not monitored.	0 %	0 %	80 %
	**CAPACITOR VALUE LOSS ALARM DELAY** For a value loss alarm, the limit must be overridden during this period.	0 sec	30 sec	200 sec
	**CAPACITOR VALUE LOSS ALARM FUNCTION** 0 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 1 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will disappear after the delay defined by the parameter "**MutE**". 2 → In the occurrence of alarm, stepping continues. When the alarm source is removed, the alarm will persist and can be only reset manually. 3 → In the occurrence of alarm, stepping stops. When the alarm source is removed, the alarm will persist and can be only reset manually.	0	0	3

DISPLAY	DESCRIPTION	MIN	STD	MAX
	**RELAY OUTPUT FUNCTION** 0: Regulation OK 1: Regulation not OK 2: Regulation failure 3: kWh tick 4: kVArh tick 5: High voltage alarm 6: Low voltage alarm 7: High frequency alarm 8: Low frequency alarm 9:Excess kW alarm 10: Low kW alarm 11: kVAr overregulation (capacitive load) 12: kVArunder regulation(inductive load) 13: cos overregulation (capacitive load) 14: cos under regulation(inductive load) 15: Overcurrent alarm 16: High THD-V alarm 17: High THD-I alarm 18: Capacitor value loss alarm 19: Phase order alarm 20: Defective capacitor alarm 21: Any alarm	0	21	21

DISPLAY	DESCRIPTION	MIN	STD	MAX
	**PROGRAMMING PASSWORD** The program mode entry password may be selected between 1 and 9999.	1	1	9999
	**kW-kVArPULSEFUNCTION** The unit is able to give a 100ms pulse for each kWh or kVArh. This parameter selects the condition for this pulse. 0 →Pulse is always given 1 → Pulse is given when the generator is off 2 →Pulse is given when the generator is on.	0	0	2
	**ALARM RESET DELAY** When the alarm source is removed, any non-latching alarm will disappear after the delay defined by this parameter.	0 sec	30 sec	200 sec
	**FIRMWARE VERSION / MANUAL CALIBRATION** Displays the unit's firmware version. If this parameter value is set to **3282**, then the unit enters manual calibration mode where all voltage and current inputs can be manually calibrated.	0	0	9999

8. TECHNICAL SPECIFICATIONS

Power Supply Input: 170 - 275VAC, 50 - 60Hz nominal (± 10%) between L1-N
Generator Input:
- **Voltage:** 10 - 300 V AC (Ph-N)
- **Detection limit:** 70V AC and above
- **Frequency:** 30 - 100 Hz

Measurement Input Range:
- **Voltage inputs:** 10 - 300 V AC (L-N)
  20 - 520 V AC (L-L)
- **Current inputs:** 0.2 – 5.5 A AC
- **Frequency:** 30 - 100 Hz

Accuracy:
- **Voltage:** 0.5%+1digit
- **Current:** 0.5%+1 digit
- **Frequency:** 0.5%+1 digit
- **Power(kW,kVAr):** 1.0%+2digit
- **Power factor:** 0.5%+1 digit

Measurement Range:
- **CT range:** 5**/**5A to 5000**/**5A
- **VT range:** 0.1**/**1 to 200.0**/**1
- **kW range:** 0.1 kW to 6.5 MW

Power Consumption: < 4 VA
Voltage burden: < 0.1VA per phase
Current burden: < 1VA per phase
Relay Outputs: 5A @ 250VAC
Operating Temperature: -20°C to +70°C (-4 to +158⌗F).
Maximum humidity: 95% non-condensing.
Degree of Protection: IP 54 (Front Panel), IP 30 (Back panel)
Enclosure: Non-flammable, ROHS compliant, ABS/PC (UL94-V0)
Installation: Flush mounting with rear retaining brackets
Dimensions: 102x102x53mm (WxHxD)
Panel Cutout: 92x92mm
Weight: 370 gr

EU Directives Conformity:
2006/95/EC (low voltage)
2004/108/EC (EMC)

Norms of reference:
EN 61010 (safety requirements)
EN 61326 (EMC requirements)

PACKAGING INFORMATION

Pieces per Package: 12 pieces
Package Size: 280 x 170 x 215mm (LxWxH)
Package Weight: 4.6 kg