

Product SPECIFICATION SHEET

ED8-96



The power factor controller ED8 provides visual indication of the power system $\cos\phi$ and the automatic connection and disconnection of capacitors suitable to the function of the $\cos\phi$.

The built in microprocessor based on FCP (Fast Computerise Programming) ensures that the ED8 accurately and speedily informs about the power system status and provides the control actions (switching of capacitors) based on the internal calculations

1.1 MAIN FEATURES

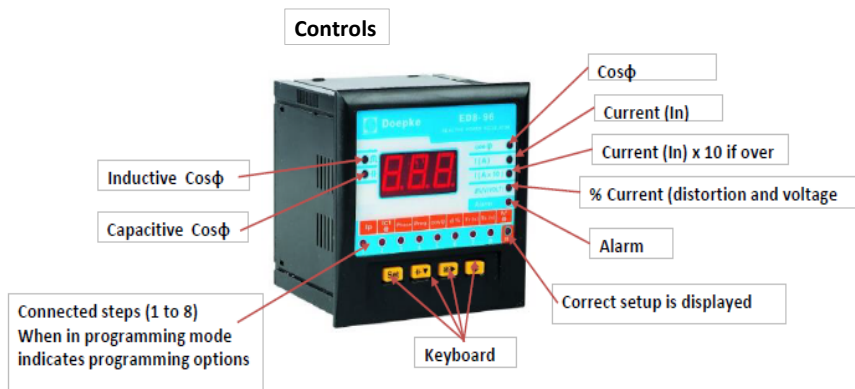
- a) True RMS measurements: The controller measures the reactive power in the facility and will connect or disconnect available capacitors according to the setup data.
- b) Controls from 4 to 8 output relays with the possibility of an additional alarm relay
- c) LED display with three digits.
- d) Single phase or three phase configurable control.
- e) Setting actions from the front panel (4 keys).
- f) Alarms for current harmonic distortion and for improper power factor correction.
- g) Size 96 x 96mm

1.2 CONNECTIONS

The manual supplied with the instrument provides information and warnings about the ED8, and should be read prior to installation to guarantee proper operation of the instrument functions and to ensure safe operating procedures.

2. GENERAL DESCRIPTION

2.1 INDICATIONS : The instrument provides the following indications from the front panel.



There are two display modes.

SCAN: Provides an automatic and sequential display of all parameters with a 4 second interval

NORMAL: Provides a static display of one parameter. pressing the  key changes the display parameter.

The instrument automatically enters the SCAN mode when switched on pressing the  key returns the unit to NORMAL mode.

2.2 keyboard

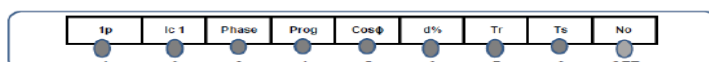
The controller has the following keys on the front panel.

Other functions can be assigned to the keys depending upon the operational mode



SETUP	Press both  and  to display the configuration set up at any time, but the configuration can only be changed during the setup procedure (LED SET is on) The  key provides access to the diverse configuration sections. Press both  and  keys to exit, (if no key entry is detected within 1 minute the unit automatically enters setup display). Note: During setup display mode the instrument continues monitoring the power system, and capacitor connect or disconnect are carried out as required.
 	These keys provide the ability for MANUAL CONNECTION and DISCONNECTION of the capacitors. If the key is held pressed the capacitors will be sequentially connected or disconnected according to the defined delay times (Tr(s) and TS(S)). When the key is released the controller automatically returns to the operation mode after 20 seconds. In the SETUP mode diverse configuration options can be selected by repeated pressing of these keys.
	Switches the display between Cosφ, Current value (In A or In A x 10), Voltage value and current distortion. In SETUP mode this key validates configuration choices.

2.3 User Programmable Parameters (SETUP menu)



- | | |
|--|-------------------|
| 1> Current transformer setting, choice of standard values. | |
| 2> Rated current of first capacitor (Ic 1). | |
| 3> Choice of voltage phase. | |
| 4> Operation program | 5 programs |
| 5> Cos ϕ setting | 0.8OL to 0.9C |
| 6> Distortion factor | 0 to 999% |
| 7> Connection time | 4 to 999 seconds |
| 8> Safety time | 20 to 999 seconds |
| 9> Number of output relays | 1 to 8 |

SETUP Options

1. **Current Transformer (CT) primary current**
> Set the current transformer primary current (5A to 999A)
Secondary is fixed for the instrument at 5A
2. **First Capacitor Rated Current**
> Set the rated current for the first capacitor in the bank.
> From this current and the CT ratio the controller automatically calculates the C/K value.
3. **Phase Connection Selection**
> The user can select the configuration of the controller installation to perform the power factor measurement.

Product SPECIFICATION SHEET

ED8-96

2.4. Selection Of Operation Program

Available program operations are:

- 1 > 1. 1. 1. 1. 1
- 2 > 1. 2. 2. 2. 2
- 3 > 1. 2. 4. 4. 4
- 4 > 1. 2. 4. 8. 8
- 5 > 1. 1. 2. 2. 2

2.5. Cos ϕ Setting

> Programmable from 0.80 inductive to 0.95 capacitive.

2.6. Distortion Factor

> Setting from 1 to 999% distortion.

2.7 & 2.8 Time Settings

> Connection time from 4 to 999 seconds, > Discharge time from 20 to 999 seconds

When the controller is powered on, delay time for the connection of the first capacitor is the safety time Ts

2.9. Number Of Capacitors

> When selecting this option the number of capacitors selected is displayed.

Other points to consider:

- > If no current is measured (0.00 on display) and any relay is closed the controller will automatically open them.
- > If a high capacitive Cos ϕ is measured all steps are automatically disconnected.

3. INSTALLATION AND START-UP: If the instrument is not used to the manufacturers specification damage to the instrument may result. If for any reason damage to the instrument is suspected it should be serviced by a qualified technician.

3.1 Installation

> Before applying power check the following:

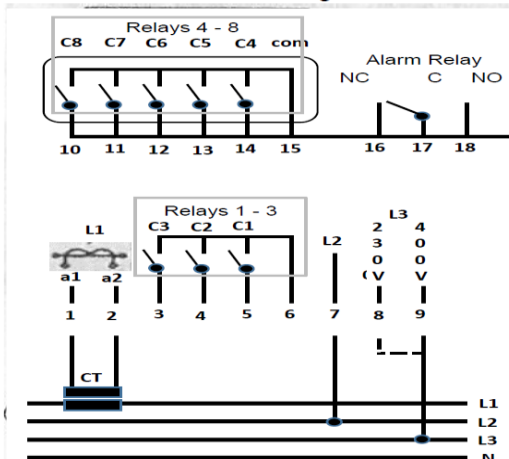
- | | |
|----------------------------------|---------------------------------------|
| a) Supply voltage ($\pm 15\%$) | See rear of instrument |
| b) Frequency of the supply | 45 to 65Hz |
| c) Connection terminals | 7 - 8 or 7 - 9 See rear of instrument |
| d) Current Measurement | In / 5A AC (current transformer) |
| e) Ambient Temperature | -10°C to 50°C, 25 to 80% RH |

3.2 Connections

The controller should be connected to a fused supply (0.5 to 2A) equipped with an On/Off switch.

All wiring to the controller should be 2.5mm².

Connect the controller according to the connection diagram on the rear of the housing.



Terminal No. and Description

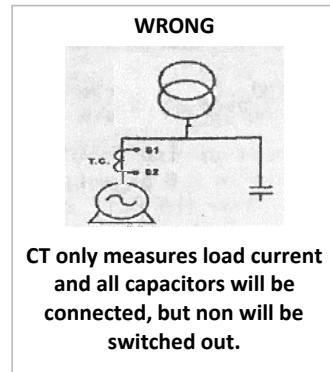
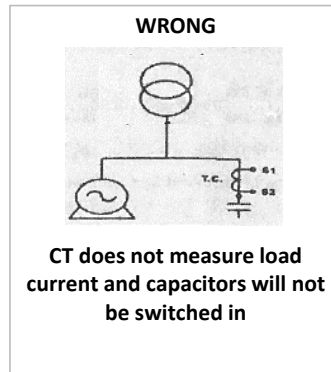
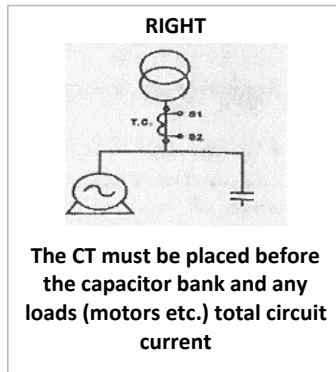
Lower Terminals

- | | |
|---|-----------------------|
| 1 | Current input S1 |
| 2 | Current input S2 |
| 3 | Output relay 3 |
| 4 | Output relay 2 |
| 5 | Output relay 1 |
| 6 | Relay common C1,C2,C3 |
| 7 | Voltage input 0V |
| 8 | Voltage input 230VAC |
| 9 | Voltage input 400VAC |

Upper Terminals

- | | |
|----|-----------------------|
| 10 | Output relay 8 |
| 11 | Output relay 7 |
| 12 | Output relay 6 |
| 13 | Output relay 5 |
| 14 | Output relay 4 |
| 15 | Relay common C4 to C8 |
| 16 | Alarm relay NC |
| 17 | Alarm relay Common |
| 18 | Alarm relay NO |

The CT should be connected to a point in the supply system where the whole current of the supply can be measured (including the current of power factor equipment).



Connect the CT secondary (S1-S2) to the terminals marked S1-S2 (9 & 8).

If the display shows an incoherent value for the Cos ϕ a discrepancy with the set phase relationship may exist, access the set-up mode, then option "Phase" to correct (See related section).

If the display shows "0.00" not enough signal is reaching the controller and therefore Cos ϕ cannot be measured. Check the CT is connected correctly.

4. SETTING UP

To access the controller set-up menu both **SET** **[-]** keys are simultaneously pressed within 5 seconds of application of power. SET-UP options are now available to be modified.



If the process is correctly done the word "SET" is displayed for several seconds and the LED "SET" is on.

Different program options can now be accessed

- a > Use the **SET** key to select the required parameter.
- b > Use the **[<]** key to confirm the selected parameter.
- c > Use the **[-]** and **[>]** keys to change the selected parameter as shown on the display.
- d > When changes are completed press **[<]** again to exit to general SET-UP menu and validate changes.

the same actions is required for all programming sections.

If more than 5 seconds from power on have passed the controller configuration parameters can be displayed but not changed.

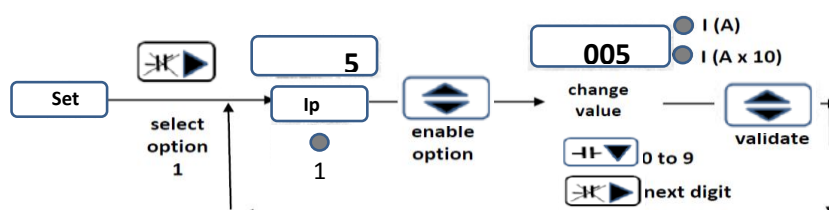
4.1 CT Primary Setting

For a value between 5A and 999A the current readout is direct, from 1000A readout will be the total current divided by 10 and the LED I(Ax10) will be on.

The secondary value of the CT is fixed and cannot be changed (standard */5A AC)

Once in setup mode (red LED "SET" will be on)

- a > Use the **SET** key to select option 1 (LED 1 is on)
 - b > Use the **[<]** key to enable the CT primary setting
 - c > The value of the previously set primary is shown in the display and the first digit flashes
- Use the **[-]** **[>]** to change the value displayed.



When the last digit is set the LEDs I(A) and I(Ax10) start to flash pressing  key selects the scale i.e. x1 up to 999A or x10 up to 9990A. (Note: if the scale x10 is selected the value programmed on the display must be multiplied by 10)

Example: The value 1000 is set as 100 on the display and the LED I(Ax10) is on then the real value is the displayed value x 10.

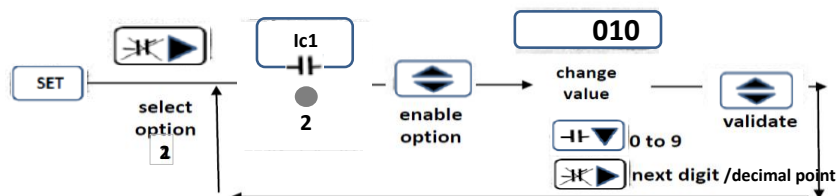
Press  to validate the changes and to exit to General SET-UP menu.

4.2 Rated Current Of First Capacitor

In setup mode (red LED "SET") is on

a > Use  key to select option 2, LED 2 is on

b > Use  key to enable setting the current for the first capacitor in the bank.



Note: From this option 2 and the CT ratio (option 1) the controller automatically calculates the C/K value.

The value of the previously set primary current is displayed and the first digit flashes.

c > Press   to change the value in the display, repeatedly pressing  increases the displayed value, the  selects the next digit. When the last digit is set press the  key again to set the decimal point.

d > Press the  key to exit this menu to the general SETUP menu and to validate the changes.

4.3 Choice of Phase Connection.

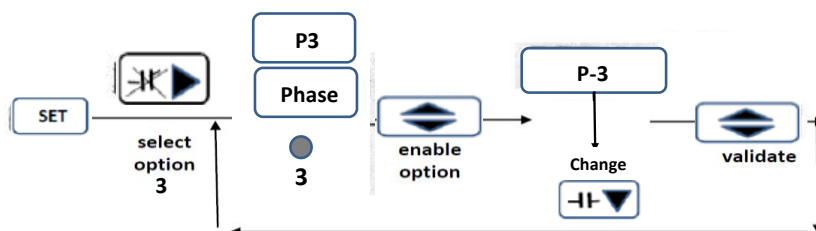
selection of either three phase or single phase, The three phase configuration places the CT in one phase and the voltage is taken across the other two phases. The single phase configuration places the CT in the same phase as the voltage

Once in setup mode the red LED "SET" is on.

a > Use the  key to select option 3, the red LED 3 is on.

b > Use the  Key to enter the phase setting menu.

The previous choice is shown on the display together with the Cosφ readout of the installation



c > Use the  key to change the displayed option P3 Three phase, P1 Single phase

d > The  key returns to the general SETUP menu and validates the changes.

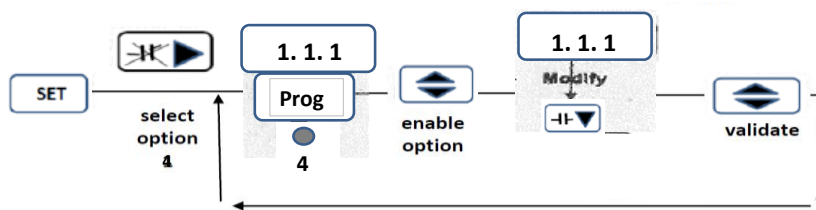
4.4 Operation Program Setup (Capacitor Switching)

In setup mode with the red LED "SET" On.

a > Use the  key to select option 4, the LED 4 is on.

b > Use the  key to enable the operation mode setting (relationship between the capacitors in the automatic bank).

The previously set choice is shown in the display



c > Use the  key to change the parameters as follows

Program 1. 1. 1. 1. 1 → 1. 1. 1.

Program 1. 2. 2. 2. 2. → 1. 2. 2.

Program 1. 2. 4. 4. 4. → 1. 2. 4.

Program 1. 2. 4. 8. 8. → 2. 4. 8.

Program 1. 1. 2. 2. 2. → 1. 1. 2.

d > Use the  to exit to the general SETUP menu and to validate the changes.

4.5 Cosφ Setting

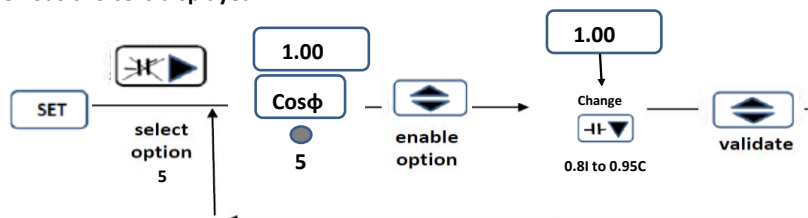
Setting the value for Cosφ for the system values are 0.8 Inductive TO 0.95 Capacitive.

Once in the setup mode red LED "SET" is On.

a > Use the  key to select option 5 the LED 5 is On.

b > Use the  key to enable the Cosφ setting.

The previous choice is displayed.



c > Use the  key to make the changes.

d > Use the  to exit to the general SETUP menu and to validate the changes.

4.6 Distortion Factor Setting.

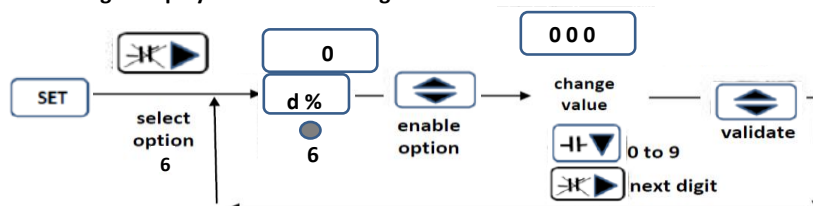
Sets the value for the distortion alarm from 1% to 999%.

Once in the setup mode the red LED "SET" is On.

a > Use  key to select option 6, LED 6 is On.

b > Use  to change to the required setting.

The previous setting is displayed and the first digit flashes.



c > Use the  and  keys to change the parameter.

D > Press the  to exit to the general SETUP menu and validate the changes.

4.7 CONNECTION TIME

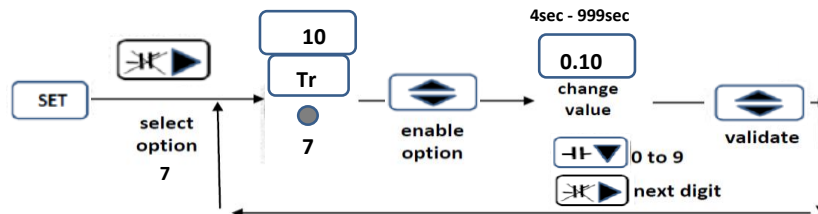
Set the delay time for capacitor bank automatic connection steps.

Once in setup mode red LED "SET" is On.

a > Use the  key to select option 7, LED 7 is On.

b > Use the  key enable the seconds setting mode.

The previous setting is displayed and the first digit will flash.



c > Keys  and  to change the parameter setting.

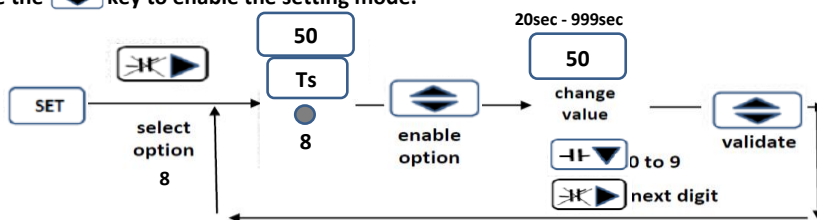
d > Press the  to exit to the general SETUP menu and validate the changes.

4.8 RECONNECTION SAFETY TIME

Safety delay time for reconnection of the same capacitor back into the active bank.

a > Use the  key to select option 8, LED 8 is On.

b > Use the  key to enable the setting mode.



c > Use the  and  keys to change the parameter value.

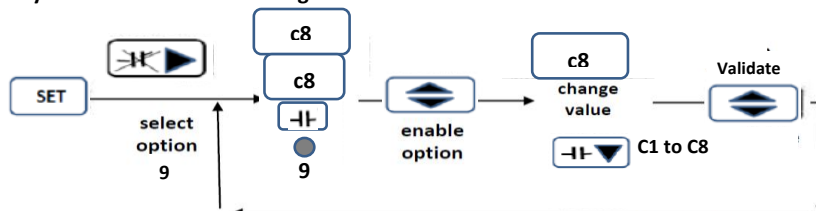
d > Press the  key to exit to the general SETUP menu and validate the changes.

4.9 NUMBER OF CAPACITORS

This sets the number of output relays used (1 to 8) and therefore the number of capacitors.

a > Use key  to select option 9 the red led "SET" is On.

b > Use Key  to enable the setting mode.



d > Press the  key to exit to the general SETUP menu and validate the changes.

Product SPECIFICATION SHEET



ED8-96

5. ALARMS

The controller is equipped with various alarms that will trip if the following conditions occur

Cause	Indication	Alarm Description
Ineffective power factor correction	"— C.E." Correction Error	Alarm is set if a reactive power 2 x higher than the set value is detected for longer than 100 seconds. Time consideration for this alarm starts when all programmed relays are on and a higher demand is detected, or when all relays are off and a capacitive power is still in excess
Distortion Alarm	"— d.E." Distortion Alarm	This alarm trips when user defined alarm conditions occur for a least 10 seconds. When this alarm is activated, the controller successively switches off capacitor steps until alarm conditions no longer exist
Over Current Alarm	"—A.E."	This alarm trips when an overload higher than 5.8A is detected at the current input for at least 10 seconds
Over Voltage Alarm	"—U.E."	This alarm instantaneously trips when an over voltage is detected at the controller power supply

For all above cases, the alarm LED (H) is on, and the related message is shown on the display to indicate the alarm type. If the controller is fitted with an alarm output relay (depending on type) under normal conditions (no alarm) then contacts 10-11 are normally open and contacts 11-12 are normally closed.
Note: When any key is pressed during an alarm condition the alarm message will be removed to display the key press information, the alarm message will reappear after 100 seconds.

6. INTERNAL PERFORMANCE OF THE FCP SYSTEM.

With data received from the external circuit (voltage and current), the controller calculates the phase angle and the capacitor value necessary to reach the pre-set target $\cos\phi$.

Once this value has been obtained, the FCP system automatically switches on the appropriate steps.

In case that for example the operating system is 1. 2. 2. The controller will calculate according to the reactive demand, if it is more convenient to connect the first step or to directly switch double-power one (this system avoids unnecessary switching operations of the first step thus increasing the life of the whole power factor correction unit).

In order to keep a uniform wear of the automatic bank, the FCP system holds in memory the time each capacitor remains switched off, so that when a capacitor is required to be connected the one with the longest off time will be selected.

A safety system avoids a capacitor to be re-connected if the user defined safety time (T_s) has not passed.

Example: Required switching operation for a 100% demand from zero for a controller set at 6 steps.

Standard System						FCP System					
Steps	1	2	2	2	2	Steps	1	2	2	2	2
1	x					1	x				
2		x				2	x	x			
3	x	x				3	x	x	x		
4		x	x			4	x	x	x	x	
5	x	x		x		5	x	x	x	x	x
6		x	x	x		6	x	x	x	x	x
7	x	x	x	x							
8		x	x	x	x						
9	x	x	x	x	x						
10		x	x	x	x						
11	x	x	x	x	x						
Total Number of Steps = 16						Total number of steps = 8					

Product SPECIFICATION SHEET



ED8-96

Supply Voltage	230 / 400VAC
Voltage Circuit	
Tolerance	± 15%
Burden	5VA
Frequency	45 - 65 Hz
Current Circuit Isolated	
Rated Current	In / 5A AC
Permanent Overload	2 x In
Short Time Overload	5 x In for 10 seconds
Burden	0.5VA
Control System	FCP
Cosφ Setting	0.80 Inductive - 0.95 Capacitive
Cosφ Visualisation	3 Digit display
Operating Programs	1:1:1:1 / 1:2:2:2 / 1:2:4:4 / 1:2:4:8 / 1:1:2:2
Output Relays	(Model Dependant), 8 + Alarm Relay
Connection Time (Tr)	4 to 999 seconds
Safety Time (Ts)	20 to 999 seconds
Output Relay	
Maximum Voltage (Ui)	400VAC / 250VDC
Thermal Current (Ith)	8A
ACII Le/Ue	4A / 250VAC
DC11 Le/Ue	1A/110VAC
Mechanical Life	30000000 Operations
Electrical Life	200000 Operations
Safety	Installation Class II
Environmental Conditions	
Working Temperature	-10°C - 50°C
Maximum Relative Humidity	95% RH (No Condensation)
Mechanical Specifications	
Connection	Plug
Housing Material	Self extinguishing VO. Plastic
Protection Class	IP54
Size	96 x 96mm
Weight	0.52kg

8. SAFETY WARNINGS

The user should take note of all installation instructions referred to within this manual

9. MAINTENANCE

The ED8 does not require any special maintenance. All repair work should be undertaken by a qualified service technician.

Ensure the instrument is disconnected from the supply prior to any maintenance, service or repair work.

BRANCH CONTACT DETAILS

Johannesburg	010 202 3300
Germiston	011 418 9600
Cape Town	021 510 0710
Pinetown	031 700 4215
Riverhorse	031 492 4800

NATIONAL CALL CENTRE

Sales	010 202 3400
Technical	010 202 3500

www.acdc.co.za