CDT 2CH 4/100, CDT 18V/100A
Charge / Discharge Testers

USER MANUAL

Pi Em Si Ltd

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Contents

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DECLARATION OF CONFORMITY
CDT 2CH 4/100 A, CDT 18V/100 A

We, Pi Em Si Ltd, of Dobri Chintulov Str. 9,Sliven 8800, Bulgaria declare under our sole responsibility that the charge / discharge testers : CDT 2CH 4/100 and CDT 18V/100A comply with the provisions of the following European Directive and are eligible to bear the CE mark :

Low Voltage Directive : 2006/95/EC

Assurance of conformance of the described products with the provisions of the stated EC directive is given through compliance to the following standard :

Electrical Safety **IEC EN 61010-1 3rd Edition**

Name of Authorized Signatory	Valentin Petrov Vandev
Signature of Authorized Signatory	
Position of Authorized Signatory	Managing director, Pi Em Si Ltd, Sliven, Bulgaria
Date	20 Октомври 2014
Place where signed	Sliven, Bulgaria

"Пи Ем Си" СЛИВЕН ООД

WARRANTY 2

These products are warranted against defects in materials and workmanship for a period of thirty months from date of shipment. During the warranty period, Pi Em Si Ltd. will, at it's option, either repair or replace products which prove to be defective.

LIMITATION OF WARRANTY

The warranty shall not apply to defects resulting from locating and installing the testers that do not conform to requirements written in this manual.

The warranty shall not apply to defects resulting from improper or inadequate usage or maintenance by the buyer.

The warranty shall not apply to defects resulting from unauthorized modifications, or from operation exceeding the environmental specifications of these products.

WARRANTY SERVICE

These products must be returned to a Pi Em Si Ltd. service facility for repairs or other warranty service. For products returned to Pi Em Si Ltd. for warranty service, the buyer shall prepay shipping charges to Pi Em Si Ltd. If the unit is covered under the foregoing warranty then Pi Em Si Ltd. shall pay the shipping charges to return the product to the buyer.

CAUTION

The following safety precaution must be observed during all phases of operation, service and repair of this equipment. Failure to comply with the safety precautions or warnings in this document violates safety standards of design, manufacture and intended use of this equipment and may impair the built in protections within. Pi Em Si Ltd. shall not be liable for user's failure to comply with these requirements.

GROUNDING

If CDT 2CH 4/100 and CDT 18V/100A testers are used standalone, outside of the metal cabinet, they must be connected to to the AC power supply mains through a three conductor power cable (16 A, 3 pin plug - P, N,E).

If the testers are mounted inside a metal cabinet(delivered by Pi Em Si Ltd.) then the cabinet must be connected to the AC power supply mains through a five conductor power cable (32 A, 5 pin plug - 3P,N,E). To minimize shock hazard, the cabinet's chassis must be connected to an electrical ground.

In both cases, any interruption of the protective ground conductor will cause a potential shock hazard that might cause personal injury.

Grounding of the output cables of the testers is unacceptable.

FUSES

Fuses must be changed by authorized Pi Em Si Ltd. service personnel only. For continued protection against risk of fire, replace only with the same type and rating of the damaged fuse.

INPUT RATINGS

When used standalone, testers power supply is within 220 V / 50-60 Hz , with tolerance +10/-15 %.

If mounted inside a metal cabinet (delivered by Pi Em Si Ltd.) then the cabinet's power supply is within 3 x 380 V / 50-60 Hz, +10/-15 %.

Do not use AC supply, which exceeds the above input voltage and frequency ranges.

PARTS SUBSTITUTIONS & MODIFICATIONS

Parts substitutions and modifications are allowed by authorized Pi Em Si Ltd. service personnel only. Repairs and modifications of the testers can be performed only by personnel of Pi Em Si Ltd.

Do not replace components with power supply turned on. To avoid injuries, always disconnect power and batteries, before taking any action of replacing components.

CONNECTING TO BATTERIES

Connecting to batteries must be performed only when the tester is turned off and the output cables are connected to the tester first.

Never disconnect batteries when a test program is running!

Do not connect batteries with a voltage exceeding the output voltage range :

- for CDT 4/100 - 4 volts, and
- for CDT 18V/100 A - 18 volts.

OUTPUT CABLES

Section of the power output cables shall not be less than 50 mm^{2}. Do not use cables with corroded cable shoes and damaged insulation.

MEASUREMENT CABLES

The measurement cables are fuse protected (630 mA). If the fuse is damaged this means that measurement cables must be replaced.

Usage of fuse protected measurement cables is mandatory.

LOCATION, INSTALLATION AND VENTILATION

In discharge mode the energy is released as heat. There is fan cooling and the stream of cooling air is directed from the front to rear.

For the cooling to be effective, there must be at least 0.8 m. distance between the front and the rear of the testers, and any objects or walls.

Connecting and arranging cables should be done in such a way that they do not impede the flow of cooling air.

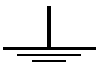
When in one room there are many testers it is necessary to provide air conditioning or ventilation.

ENVIRONMENTAL CONDITIONS

The CDT 2CH 4/100 and CDT 18V/100 charge discharge testers safety approval applies to the following operating conditions:

- indoor use;
- altitude up to 2000 m;
- temperature 5 ^{o}C to 40 ^{o}C;
- maximum relative humidity 80 % for temperatures up to 31^{o}C decreasing linearly to 50 % relative humidity at 40 ^{o}C;
- mains supply voltage fluctuations up to +10/-15 % of the nominal voltage;

• pollution degree 2;

	Direct current
	Alternate current
	Indicates ground terminal
	Indicates chassis or enclosure terminal
	On (Supply)
	Off (Supply)
	ATTENTION Observe Precautions for handling Electrostatic Sensitive Devices.
	CAUTION Risk of Electrical Shock
WARNING	The WARNING sign denotes a hazard. An attention to a procedure is called. Not following procedure correctly could result in personal injury. A WARNING sign should not be skipped and all indicated conditions must be fully understood and met.
CAUTION	The CAUTION sign denotes a hazard. An attention to a procedure is called. Not following procedure correctly could result in damage to the equipment. Do not proceed beyond a CAUTION sign until all indicated conditions are fully understood and met.

GENERAL INFORMATION 4

USER MANUAL CONTENT

This User's Manual contains :

- Technical data for CDT 2CH 4/100 and CDT 18V/100A charge/ discharge testers;
- Installation instruction;
- Operating instruction;
- Maintenance instruction;

This manual does not include a description of the option to manage and monitor the testers by PC. Information about this capability can be obtained in the operating manual for the relevant computer applications : "Battery Tester Manager v1.0" for the CDT 2CH 4/100, and "BTM for CDT 18V/100A" for the CDT 18V/100A testers.

INTRODUCTION

CDT are structurally and functionally complete reversible rectifiers with microprocessor control.

CDT 2CH 4/100 testers are specially designed to test single cells.

CDT 18V/100A are designed for testing batteries with total voltage up to 18 V. This type of testers have the option for connecting to external data logging system for measuring the parameters of each cell of the battery (voltage, reference voltage, temperature, pressure).

For these testers there is an auxiliary application software for PC that allows: creating, editing, storing and loading of test programs; control and visualization of the testing process; maintain records of all tests performed and for their subsequent review in tabular and graphical form.

Main features

- charge and discharge;
- supports the following operating modes :
  - constant current - CC;
  - constant voltage - CV;
  - constant power - CP;
- capability of working in parallel
  - for CDT 2H 4/100 - up to 12 circuits;
  - for CDT 18V/100A - up to 6 circuits;
- built-in LCD indication visualizing : current program and step, output current and voltage, amper and watt hours, power, program work time, program status etc;
- built-in LED indication for test status (Power,Ready, Run, Alarm);
- buffer memory for storing process data and events;
- programmable sample time;
- local and remote control (Start , Stop, Resume, End, etc.);
- real time clock with automatic adjustment from the PC;
- built-in protections : over current, overheat, current deviation;
- integrated galvanically isolated RS 485 serial interface that allows connection to PC;
- integrated galvanically isolated RS 485 serial interface for parallel

mode and connection to external data logging system;

- calibration using a system of parameters set by using a keypad and an alphanumeric display;
- Automatic resume of a test program in case of interrupted power supply and its subsequent restoration;

Accessories

The following accessories are shipped with the products :

- converter RS 485/RS232 with cable for connection with PC;
- twisted pair cable for connecting the converter with testers;
- termination resistor 120 ohms, mounted on connector RJ 45;
- on request : external data logging system, cable sets, metal cabinet.

CDT 2CH 4/100 and CDT 18V/100A have the features, described in the following table :

Feature types / device	CDT 2CH 4/100	CDT 18V/100A
Input characteristics		
Power supply voltage	220 V / 50-60 Hz +10%/-15%	220 V / 50-60 Hz +10%/-15%
Power	< 1500 VA	< 3200 VA
Output characteristics		
Circuits	2	1
Output current in charge and discharge mode	0 - 100 A	0-100 A
Max.output power in charge mode (per channel)	360 W	1800 W
Max.output power in discharge mode (per channel) *Depends on ambient temperature*	360 W	1600 W (t <=30°C) 1100 W (t=40°C)
Output voltage in charge mode	0 - 4 V	0 - 18 V

Feature types / device	CDT 2CH 4/100	CDT 18V/100A
Output voltage in discharge mode	0.9 - 4 V	4 - 16 V
Cells in output circuit	1	up to 8 (depends on battery type)
Output cables	>= 50 mm^2 length < 10 m.	>= 50 mm^2 length < 10 m.
Analog inputs		
Battery voltage measurement	1 (+/- 4 V)	1 (-5 - 20 V)
Potentials measurement with reference electrode for each channel	up to 2 *	up to 2 *
Temperature (for each channel)	1 * (Pt 100)	1 * (Pt 100)
Pressure (for each channel)	1 * (4 - 20 mA)	1 * (4 - 20 mA)
Support for external data logging system	No	Yes
Work modes		
Charge	(CC, CV,CP) **	(CC, CV,CP)**

Feature types / device	CDT 2CH 4/100	CDT 18V/100A
Discharge	(CC,CV,CP)**	(CC,CV,CP)**
Parallel mode support	yes (up to 12 circuits)	yes (up to 6 circuits)
Protections Over current, Over heat, Output current deviation		
Resolution		
Current	0.01 A	0.01 A
Voltage	0.001 V	0.001 V
Accuracy		
Current	0.2 % FS	0.2 % FS
Voltage	0.1 %	0.1 %
PC software CDT 2CH 4/100 - Battery Tester Manager CDT 18V/100A - BTM for CDT 18V/100A		
Communication		

Feature types / device	CDT 2CH 4/100	CDT 18V/100A
Interfaces	1 RS 485 - PC Control 1 RS 485 - Parallel mode	1 RS 485 - PC Control 1 RS 485 - Parallel mode and data logging
Max. number of testers	256 (8 lines with up to 32 devices)	256 (8 lines with up to 32 devices)
Design parameters		
Dimensions (width mm. x depth mm. x height mm.)	545 x 550 x 256	545 x 490 x 256
Weight (kg.)	40.6	36
Cooling - forced air cooling, directed from front to rear		

* Depends on client request

** CC -Constant Current
CV - Constant Voltage
CP - Constant Power

INSTALLATION 6

GENERAL

This chapter contains instructions for initial inspection, preparation for use and repackaging for shipment of the equipment.
Actions for providing PC connectivity and setting up a communication port are described in a separate chapter.

PREPARATION OF USE

To be operational the CDT 2CH 4/100 and CDT 18V/100A testers must be connected to a suitable power supply. The power supply must comply with the specifications of the equipment.
Do not turn on power before reading the following instructions!

Initial check

Before being sent, the equipment has been checked and no mechanical or electrical defects were found. When unpacking the equipment upon receipt, it is necessary to look for any damage that may occur during shipment. The check should confirm that there is no external damage like broken buttons and connectors, and that the front panel keypad and LCD screen are not scratched or cracked. Also, ensure that all necessary screws are tight and secure. In case a damage is found, immediately notify the manufacturer.

Location, mounting and ventilation

It is mandatory to comply with the following distances from the

testers to the surrounding objects and walls:

- front : 0.8 m;
- rear : 0.8 m.

The flow of cooling air is directed from the front to rear.

It is necessary to maintain the temperature of the environment (in the room) within the limits specified in the conditions of the environment in the safety instructions.

Power supply requirements

Testers run on single phase power 220 V / 50-60 Hz. Make sure that the mains power supply can provide power specified in the specifications within acceptable tolerance.

Connecting to power supply

Use for connecting to the power supply conductors with a cross section not less than that specified in the specification.

Connecting to PC

It is performed by a RS485 / RS232 converter connected to a PC serial port, using a standard cable. The connection between the testers and the converter is by using standard patch cables, CAT .5E. The connectors for connecting to the PC are placed on the rear side of the testers and are marked (RS 485 PC Control) .

To one communication channel can be connected :

-up to 16 CDT 2CH 4/100 testers, and

- up to 32 CDT 18V/100A testers.

At the end of the line a termination resistor is placed.

Inside the RS485/RS232 converter there are termination resistors built in.

If the number of devices exceeds the aforementioned limits then a converter supporting the necessary number of communication channels must be used.

Parallel mode and external data logger connection

The connection between testers working in parallel (and data logger for CDT 18V/100A, if available) is performed using separate serial interface RS485. Standard patch cables, CAT .5E are used. Termination resistors are placed at both ends of the communication line. If data logger is used, it has a built in termination resistor.

Notes :

Only devices placed in the same rack may be grouped to work in parallel. Only one group of devices from a single rack is allowed.

Connecting multiple devices to the same communication line is a necessary but not sufficient condition for work in parallel. The needed devices must also be selected and grouped in the PC application software. Also, the power output cables must be connected to the battery.

First time connection of output and measurement cables

The subsequent operations are executed before power is applied to the testers.

1. Plug the connectors of the measurement cables to the testers;
2. Mount the output power cables to the testers and put on the protection covers;
3. The output and measurement cables have to be marked. Make sure the marks are correct;
4. Connect the power supply cables of the testers to the sockets located at the top of the rack;
5. Arrange cables in such a way that they do not impede the flow of cooling air;
6. Connect the rack power supply to the mains.

Connecting to batteries

Connecting the output and measurement cables to the batteries must be performed according to their marks.

Note : When working in parallel mode the power output cables are connected in parallel to the battery.

Also, to the battery are connected only the measurement cables of the circuit with the least number. For example, if circuits 24,25,26 are grouped (from the PC software), then only the measurement cables of circuit No.24 must be connected to the battery.

First test

Before executing the following steps, please read the next chapter first.

1. First, verify that you have followed the above instructions and

everything is located, mounted and connected right;

2. Switch on the testers;
3. Start the respective PC application software (the two type of testers have different versions of the PC application software);
4. If there is no connection to the testers, select the respective serial port.
5. After connection between the PC and the testers is established a test program should be created, loaded and started for each tester in order to check if they work correctly.

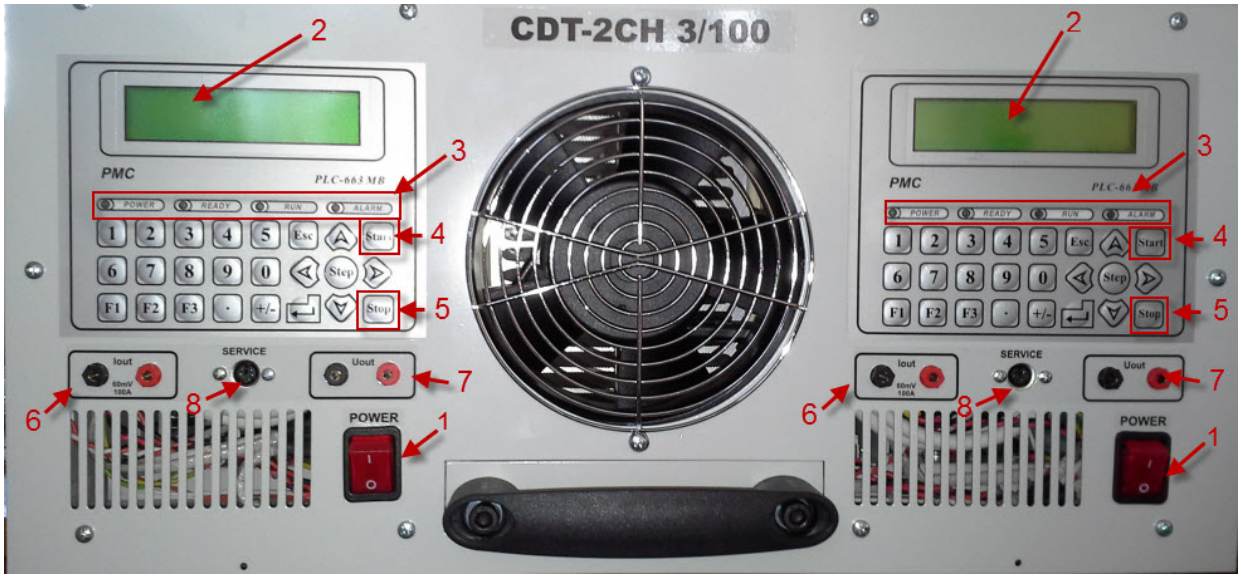
Note : 3) , 4) and 5) are explained in more detail in the operating manuals for "Battery test manager v1.0" (CDT 2CH 4/100) and "BTM for CDT 18V" (CDT 18V/100A).

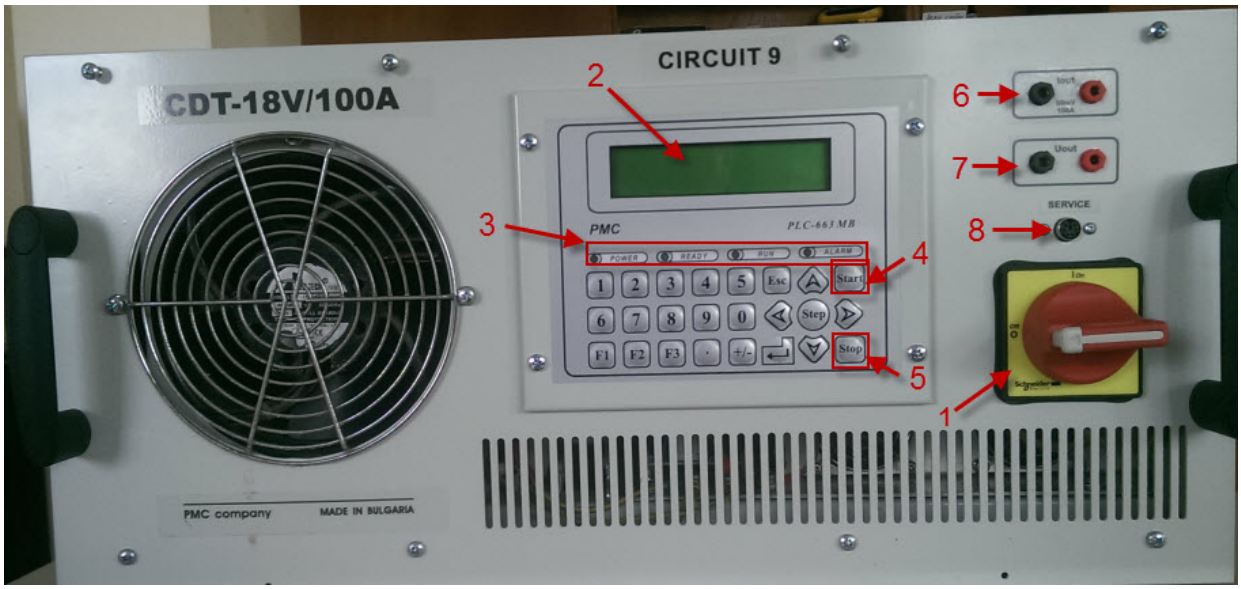
OPERATING INSTRUCTION 7

The CDT 2CH 4/100 and CDT 18V/100 charge-discharge testers have a full set of controls, indicators and connectors that allow the user to easily setup and operate the unit. Before starting to operate the unit, please read the following sections for explanation of the functions of the controls and connectors terminals.

MANAGEMENT AND DISPLAY CONTROLS

The management and display controls for CDT 2CH 3/100 and CDT 18V/100A testers are pointed on the pictures below. Descriptions are following below.





1. Main power switch ;

2. LCD display and keyboard - shows current and voltage values, and program status as well. Keyboard is used for checking current status, for adjustments and calibration;

3. LED status block - indicates the status of the tester

- *Power* - indicates the power supply status of the controller;
- *Ready* - starts blinking after a test program is uploaded from the PC. Lights constantly when the program is started, irrespective of its status. Stops lighting when the test program finishes its execution;
- *Run* - lights constantly when a program is running. Does not light if there is no program started or currently executing program is stopped;
- *Alarm* - indicates protection is turned on.

4. Start button - starts or resumes loaded program;

5. Stop button - stops currently executing program;

6. Control measurement points for current - allow for measurement directly from the current measurement shunt;

7. Control measurement points for voltage - allows for measurement directly from battery voltage measurement cables;

8. Socket for programming the programmable logical controllers

OPERATION

Before users start to work with the testers, it is highly recommended that they are familiar with this manual and with the relevant user manuals for the computer software.

The regular sequence of actions when using the devices is as follows :

1. First, connect the power output and measurement cables to the batteries. The tester must be switched off;
2. Switch on the power supply of the tester;
3. Testers execute test programs during their normal operation. Programs are created in the respective PC application software. The users should create test programs, and subsequently load a chosen program from the PC to the device.
4. After a program is loaded the "Ready" LED indicator starts blinking. This means that the program is ready to be started, so the next step is to actually start it. **The first start of a test program is always from**

the PC software! For CDT 18V/100 the software will ask for number of cells.

5. The execution of a program can be suspended by an operator or when there is a protection fault. The "Run" indicator stops lighting.
6. The program can be resumed after the reasons for its stopping are clarified and the problems solved. It is recommended that resume is made from the PC software as it supports continuation from chosen point in the program, and also (for CDT 18V/100A) the operator can change the number of cells the tester works with (for example if a cell is removed).

Note : the testers support auto restart of the test program after restoring of broken power supply.

7. A program can be ended prematurely if needed. This is done using the PC software.
8. If a change of batteries is needed the operator should first switch off the tester. Then he/she can start new test following the aforementioned steps.

MAINTENANCE 8

INTRODUCTION

This Chapter provides information about maintenance, calibration and troubleshooting.

UNITS UNDER WARRANTY

Units requiring repair during the warranty period should be returned to Pi Em Si Ltd. service facility. Unauthorized repairs performed by other than the company service facilities will void the warranty.

PERIODIC MAINTENANCE

No routine maintenance of the testers is required except for periodic cleaning. To clean, disconnect the unit from the AC supply and allow 60 seconds for discharging internal voltage. The metal surfaces should be cleaned using a damp cloth containing a mild solution of detergent and water. The solution should be applied onto a soft cloth, and not directly to the surface of the unit. Do not use aromatic hydrocarbons or chlorinated solvents for cleaning. Use low pressure compressed air to blow dust from the unit surface.

ADJUSTMENTS AND CALIBRATION

No internal adjustment or calibration is required. There is NO REASON to open the unit cover. **This will void the warranty!**

It is recommended to annually check the equipment and if adjustments and calibrations are needed they may be performed only by specialists of Pi Em Si Ltd.

MAINTENANCE 8

PARTS REPLACEMENTS AND REPAIRS

As repairs are made only by the manufacturer, no parts replacement information is provided in the manual. In case of failure, unusual or erratic operation of the unit, contact the manufacturer.

TROUBLESHOOTING

If a charge discharge tester appears to be operating improperly, use the troubleshooting guide to determine whether the power supply, load or external control circuit are the cause.

The table below provides the basic checks that can be performed to diagnose problems, and suggests certain actions that should be taken.

SYMPTOM	CHECK	ACTION
All displays and indicators are blank.	A. Is the AC power cord unplugged?	A. Plug the power cord.
	B .Check the fuses, located at top of the rack.	B. Switch the fuses on. If the fuses turn off again, contact the testers manufacturer.
	C. There is power supply to the tester.	C. Contact the manufacturer for repair.
No connection to PC. The shape describing the tester in the PC software is filled in white.	A. Is the tester power supplied? If yes, is it switched on ?	A. Connect to power supply, as described in chapter "Installation". Switch on the unit.
	B. Check if there are no LEDs lighted and/or blinking on the RS 485/232 converter.	B. Power supply the converter.

	C. Check the cables between the RS 485/232 converter and the PC, and between the converter and the tester. Are all plugged in the right sockets?	C. Plug the cables in the right sockets.
There is no output current.	A. Are the power cables properly connected to the testers and to the batteries? B. Check your test program for correctness.	A. Connect the cables properly. Refer to "Preparation for use" topic in chapter "Installation" for more information. B.Correct the erroneous step parameters or limit conditions. Refer to the relevant software manual for more detail.
No measured voltage	A. Check how the measurement cables are connected. B. Check the measurement cables fuses.	A. Connect the measurement cables properly. B. If damaged, replace the fuses. The new ones must be with proper nominal. Damaged fuses are indication for damaged measurement cables, so they may have to be replaced too.

If the users fail to diagnose the problem or the solutions described in this troubleshooting guide are not working, please contact the manufacturer.