



OPERATION MANUAL

CP inverter

CP100TR, CP200TR, CP200TL & CP140TR-LV

CENTRAL POWER GRID CONNECTED SOLAR INVERTER



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1 GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

Congratulations for choosing the Mastervolt CP inverter, The CP inverter is a grid connected solar inverter, suitable for conversion and injection of power generated by PV modules into the AC grid. The CP inverter is not suitable for stand-alone use (i.e. use without public grid).

1.2 USE OF THIS MANUAL

This manual contains important safety and operating instructions for the safe and effective operation, maintenance and possible correction of minor malfunctions of the CP inverter. This manual is valid for the following models:

Part number	Model
131400100	CP100TR
131400200	CP200TR
131420200	CP200TL
131430140	CP140TR-LV

These models are further referred to as "CP inverter" or "inverter".

Every person who works with the CP inverter must be completely familiar with the contents of this manual, and must carefully follow the instructions contained herein. Store the manual in a user accessible place. This English manual has 16 pages.

1.3 VALIDITY OF THIS MANUAL

All the specifications, provisions and instructions contained in this manual apply solely to the Mastervolt-delivered standard versions of the CP inverter.

1.4 GUARANTEE SPECIFICATIONS

The correct functioning of the CP inverter is subject to guarantee. The conditions of this guarantee are laid down in the general conditions of delivery as registered with the Chamber of Commerce and Industries in Amsterdam number 33279951 and are available on request. The standard guarantee period is two years, under condition that all instructions and warnings given in this manual are taken into account during installation and operation. Among other things, this means that all instructions and warnings given in this manual are taken

into account during installation, that commissioning is carried out by a Mastervolt authorized service agent, that installation and maintenance are executed according to the stated instructions and correct working sequence and that no changes or repairs have been performed on the CP inverter other than by Mastervolt or its authorized representatives.

The standard guarantee is limited to the costs of repair and/or replacement of the product by Mastervolt only. Costs for installation labour or shipping of the defective parts are not covered by the standard guarantee.

The standard guarantee can be extended by means of a Service Insurance & Loss Pricing Contract (SILC). Please contact Mastervolt for details.

1.5 LIABILITY

Mastervolt accepts no liability for:

- consequential damage due to use of the CP inverter;
- possible errors in the manuals and the results thereof.
- loss of revenue due to possible defects

1.6 IDENTIFICATION LABELS



Figure 1

The identification label is placed at the inner side of the cabinet door. Important technical information required for service, maintenance & secondary delivery of parts can be derived from the identification labels (figure 2).



CAUTION!

Never remove the identification label(s).

2 SAFETY GUIDELINES AND WARNINGS

2.1 WARNINGS AND SYMBOLS

Safety instructions and warnings are marked in this manual by the following pictograms:



ATTENTION

An attention describes a procedure, circumstance, etc which deserves extra attention.



CAUTION

A caution refers to special information, commands and prohibitions in order to to protect the inverter or other equipment against damage and/or destruction.



WARNING

A warning draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in damage or destruction of equipment, severe personal injury or lethal accidents.

2.2 USE FOR INTENDED PURPOSE

The CP inverter is constructed as per the applicable safety-technical guidelines. Use the CP inverter only in installations that meet the following qualifications:

- in permanent installations;
- in accordance with locally applicable regulations and standards
- the electrical installation must be carried out correctly and must be in a good condition.
- according to the specifications as stated in the user's manual.
- installed in accordance with the instructions in the installation manual.



WARNING

Never use the CP inverter in situations where there is danger of gas or dust explosion or potentially flammable products!

Use of the CP inverter other than as mentioned under § 2.2 is not considered to be consistent with the intended purpose. Mastervolt is not liable for any damage if the above qualifications are not met.

2.3 ORGANISATIONAL MEASURES

The installer must always:

- have access to this manual;
- be familiar with the contents of this manual. This applies particularly to Chapter 2, Safety Guidelines & Warning.

2.4 INSTALLATION, MAINTENANCE AND REPAIR



WARNING

As lethal voltages and currents are present in the CP inverter, allow installation, maintenance and repair of the CP inverter and changes in your electrical system to be carried out by qualified and trained electricians only. The successful and safe operation of the inverter is dependent on proper installation, handling, installation and operation. Unauthorized personnel must not have access to the inverter.

Connections and safety features must be executed according to the locally applicable regulations.

Changes on the CP inverter may be carried out only after the written permission of Mastervolt. If such are required, use only original spare parts.



WARNING

After switching off the inverter or pushing the emergency button, the DC link remains charged. High lethal voltages (up to 900 VDC) may exist inside the cabinet! Before opening the cabinet, the DC-link must be discharged. You have to wait at least 30 minutes before the DC link is discharged. After opening the cabinet, check the voltage of the DC link with a suitable voltage meter before you start working on the inverter. The DC voltage of the DC link must be less than 60 Volts DC.

**WARNING**

Never work alone on the inverter. When working on the CP inverter someone should be near you to come to your aid.

**CAUTION!**

The inverter must not operate in an unsafe condition. Make sure that you made all necessary checks before running the system.

Make sure that all cable connections are tightened with the correct torque.

3 HOW IT WORKS

The CP inverter converts the energy from a photovoltaic array (PV array) and feeds this energy back to a three phase electric grid.

See figure 4. The PV array is connected on the left side, From here the DC power passes the optional DC fuses, DC disconnecter Q1, EMC filter and DC-link.

From the DC-link DC power is converted to AC power at the three phase IGBT power bridge. After the IGBT power bridge the DC input is galvanically isolated from the AC power by means of the insulation transformer T4. From this transformer, the AC power passes the EMC filter and

the AC circuit breaker and contactors. Islanding protection according to national standards is implemented in the control software on the control card [A1]. Opening the circuit breaker Q2 in front of the cabinet will automatically open the DC-disconnector Q1.

The auxiliary AC power supply can be sourced internally from the main terminals (with bridges on terminal 1) or externally by removing the bridges connecting an external 230VAC source.

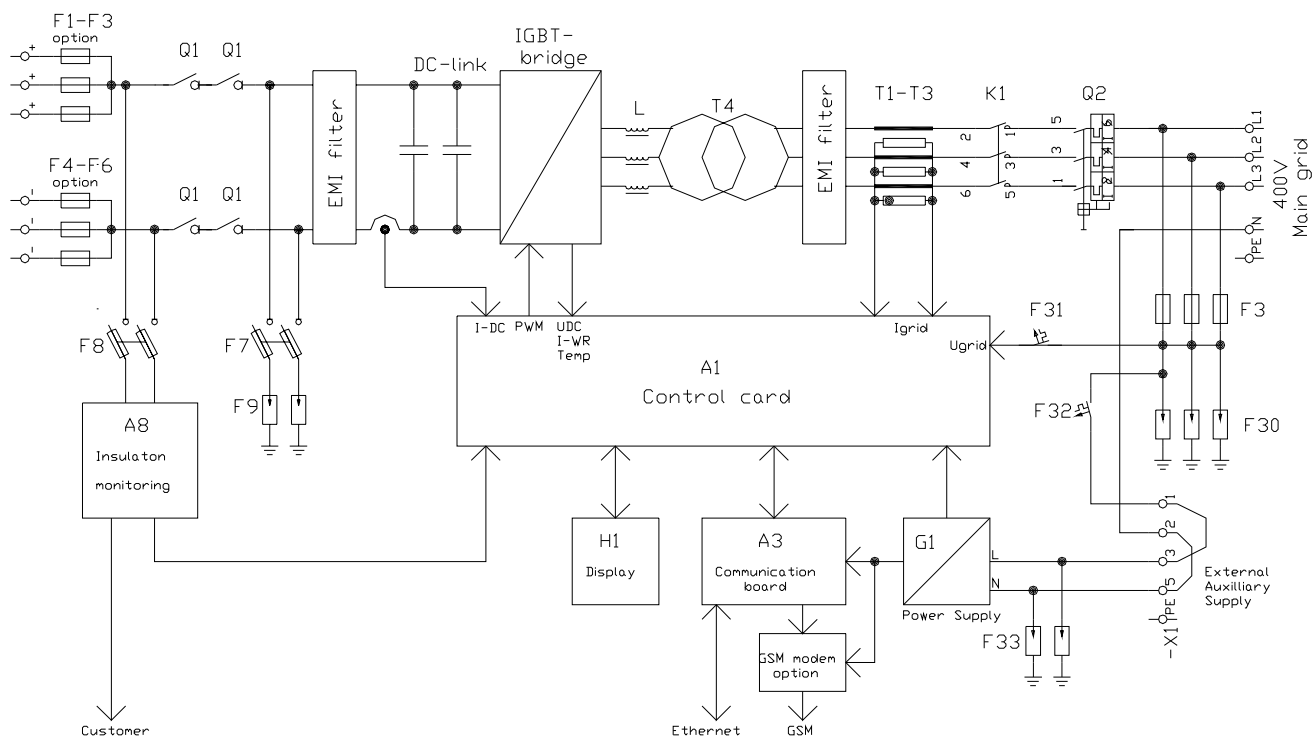


Figure 2: principle schematics of the CP inverter

3.1 OPERATION MODES

The CP inverter operates automatically: there is no need for operating it. Figure 3 shows the operation modes of the CP inverter. Details of the operation modes are described in the sections below.

After finishing the installation (see installation manual) and the commissioning (see chapter 5), the CP inverter will wait in the 'Standby' mode.

If solar irradiation is sufficient the CP inverter will start up ("Start up" mode) followed by the normal feedback operation ("MPP Mode"). The "Start up" mode and the "MPP mode" are part of the Maximum Power Point Tracker (MPPT).

If the irradiation of the PV-array is insufficient, for instance after sunset, the DC Supply decreases and the CP inverter stops all normal operations ("Shutdown" mode) and waits till dawn. Then it switches back to the "Standby" mode.

During all operation modes the operation of the inverter is continuously monitored. If a malfunction is detected the CP-inverter switches off automatically. When switched off due to a malfunction, the CP inverter will switch to the "Failure" mode and an error code will be displayed on the display (see figure 4). Refer to chapter 6 for troubleshooting

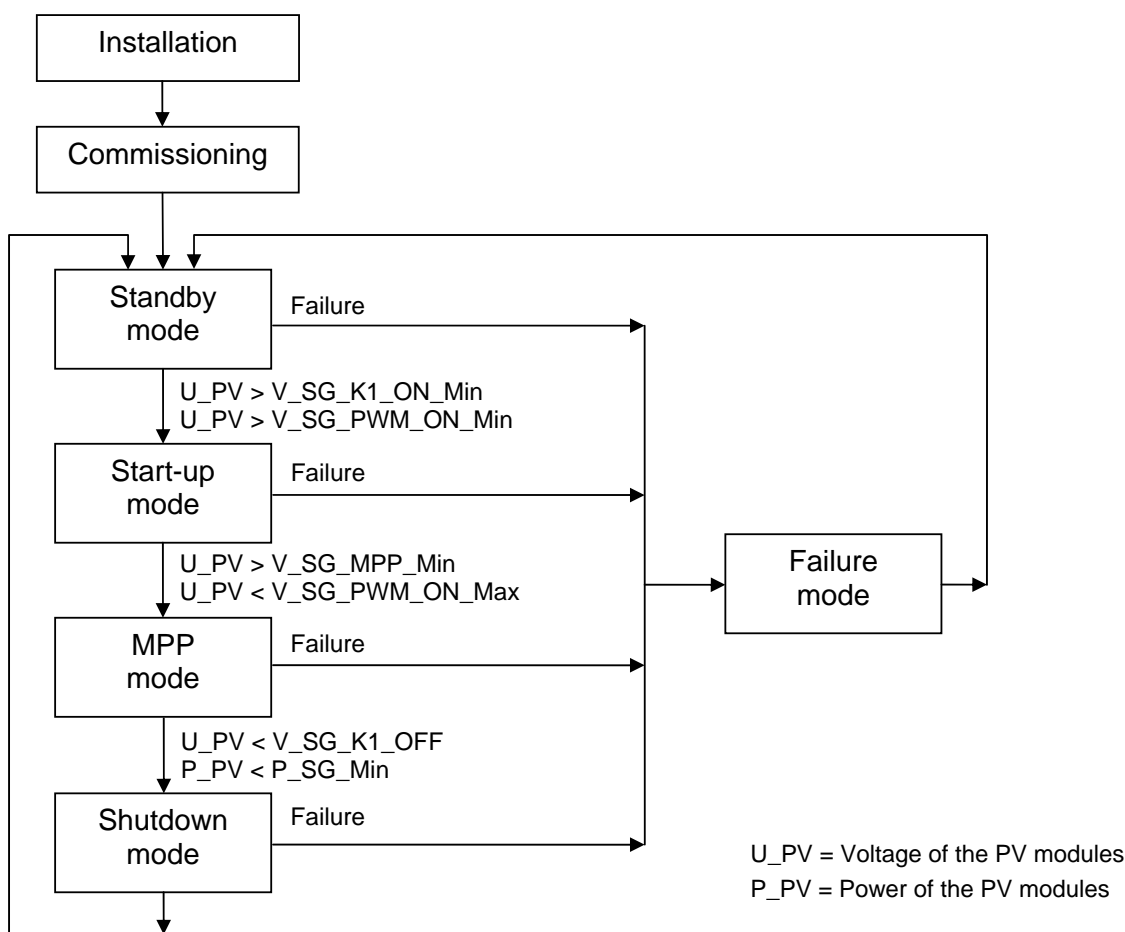


Figure 3: Operation modes of the CP inverter

3.1.1 Stand-by mode

This is the default operation mode if irradiation of the PV-array is insufficient, for instance at night. To reduce the idle AC power consumption, most functions of the CP inverter are disabled. As soon as the DC input voltage increases again at sunset ($U_{PV} > V_{SG_K1_ON_Min}$), normal operation of the CP inverter starts again by switching on the AC contactor. When the DC input voltage reaches the next level ($U_{PV} > V_{SG_PWM_ON_Min}$) the CP inverter will switch to the next operation mode (i.e. Start-up mode)

3.1.2 Start-up mode

After achieving the start-up conditions (see section 3.1.1), the converter will start with the normal feedback supply operation. Initially the inverter tries to keep the DC voltage on the defined value ($V_{SG_Soll_Start}$). This is controlled by increasing the feedback power. After reaching this voltage level the CP inverter will continue normal operation with the Maximum Power Point Tracker (MPP-Mode)

3.1.3 MPP mode

The point at which solar panels deliver maximum energy is called the maximum power point (MPP). The CP inverter has three trackers, making it possible to achieve the highest MPP efficiency anytime: the First MPP-Tracker ('Start Up' mode), the Continuous and the Cyclic MPPT.

The First MPPT is to increase the feedback power of the converter in one step to the normal operation area of the PV array.

The Continuous MPPT is for the optimization of the actual feedback taking into consideration the maximum possible output of the PV-array. It works continuously with only small variances of the feedback power. Finally, the Cyclic MPPT is for the prevention for possible inhomogeneous characteristic of the PV array and significant variances of the irradiation of the PV-array. It is only active for every 20 minutes and scans a defined PV module voltage area (normally $\pm 5\%$ of the present PV array voltage from the start point of the Cyclic MPPT) in larger steps. If a higher DC voltage was found during this scan, the continuous tracker will start again from this point.

Refer to the APPENDIX for more details and configuration possibilities of the MPPT

3.1.4 Shut down mode

During dusk of the day the voltage and power of the PV array will decrease continuously. The Maximum Power Point of the PV array will follow this behaviour and with it the MPPT. When the power of the PV array drops below a defined value ($P_{PV} < P_{SG_min}$) the converter stops the normal feedback operation. Later, when the voltage of the PV drops also below the shutdown level of the AC contactor ($U_{PV} < V_{SG_K1_OFF}$), the CP-inverter tries to start the normal feedback operation. If the irradiation of the PV array increases again, the CP inverter will return to the "Start Up" mode and the 'MPP Mode'. Otherwise the CP inverter will switch to the "Shutdown"-mode. At the "Shutdown"-mode the AC contactor will switch off, followed by the "Standby" mode for the night.

3.1.5 Failure mode

See chapter 6 for details.

4 OPERATION

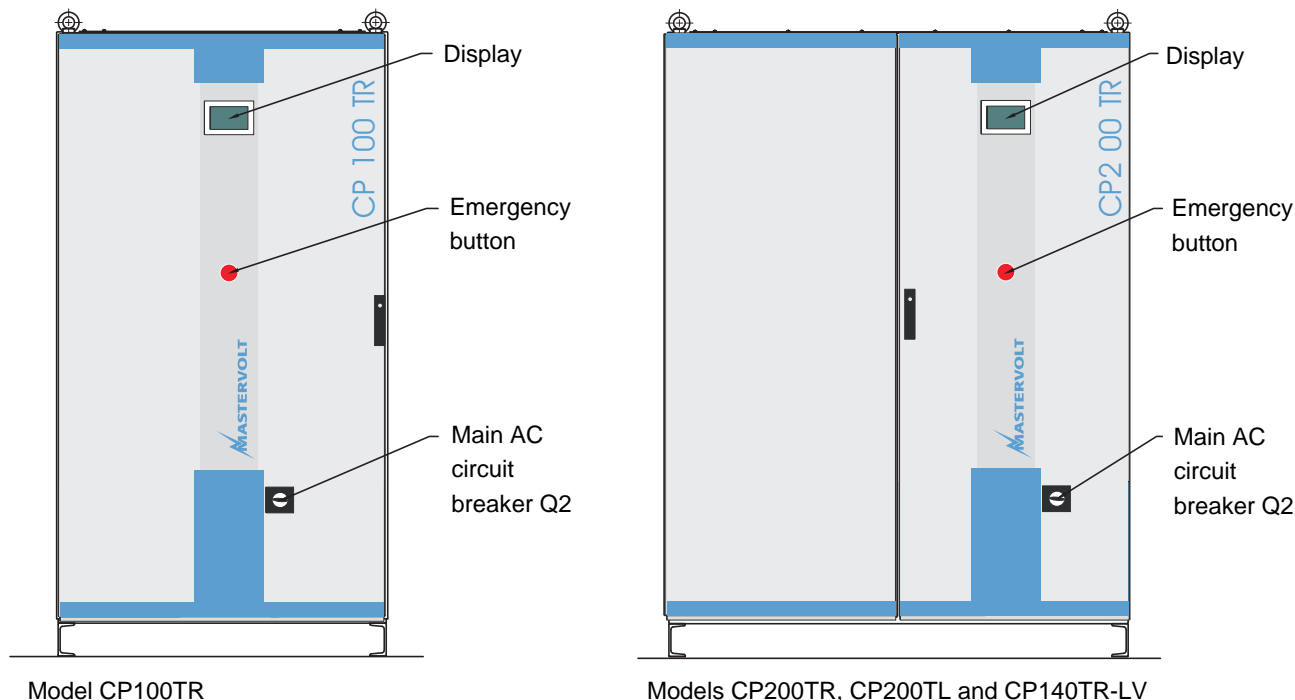


Figure 4: Operation controls of the CP inverter



WARNING

After pushing the emergency button, high AC voltages may still be inside the cabinets as the control electronics may be connected to AC grid by means of the auxiliary AC power supply.



WARNING

After pushing the emergency button, the DC link remains charged. High voltages (up to 900 VDC) may exist inside the cabinet! Before opening the cabinet, the DC-link must be discharged. You have to wait at least 30 minutes before the DC link is discharged.



WARNING

During installation, commissioning, de-commissioning, service and maintenance of the CP inverter, the Safety Guidelines & Measures are applicable at all times. See chapter 2 of this manual.

Before working on the inverter, check with a suitable voltage meter whether all possible sources of power (AC and DC) are voltage free.

After installation and commissioning the CP inverter will switch on automatically if solar irradiation is sufficient. The CP inverter operates automatically: there is no need for user action. If the irradiation of the PV-modules is insufficient, for instance at night, the CP inverter switches off automatically.

The CP inverter is provided with the following operation controls (see figure 4):

- Emergency button, see section 4.1
- Main AC circuit breaker Q2, see section 4.2
- Display, see section 4.3

Position and availability may differ, depending on the model.

4.1 EMERGENCY BUTTON

See figure 4. Pushing the emergency button will immediately disconnect the CP inverter from the AC grid and the DC stings.

Unlocking the emergency button will immediately lead to a restart of the inverter.

4.2 MAIN AC CIRCUIT BREAKER Q2

The Main AC circuit breaker Q2 is for the manual connection of the CP inverter to the AC power supply. This breaker is designed for high power operations, so it can be used for disconnection or connection of converter during maximum power operations. If the breaker is in the 'OFF' position an error will be detected and displayed by the control units of the converter. After the release of the breaker ('ON' position) the converter continues the normal operation: if the DC voltage is high enough, the converter starts immediately by switching on of the AC main contactor and after 10 seconds the feedback supply operation starts.

4.3 DISPLAY

The touch screen display makes it possible to monitor and control several functions of the CP inverter. Below displayed values may differ from your situation.

Use the tip of your finger to operate the touch screen. Never use any brute forces or sharp objects.

4.3.1 Initial screen

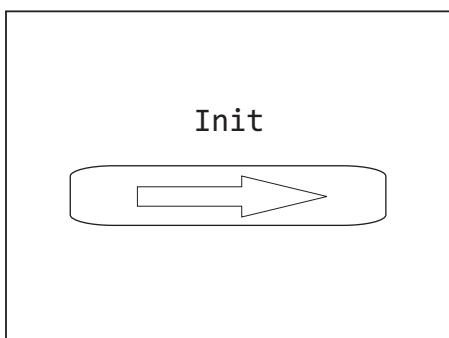


Figure 5: Initial screen

This screen is only shown during start-up of the inverter, for instance after first commissioning or after sunrise. It will disappear when the inverter is operating normally

4.3.2 Start screen

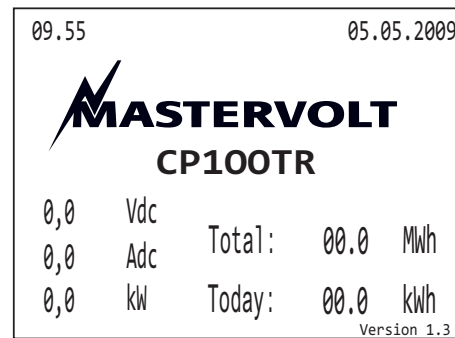


Figure 6: Start screen

This screen is shown after start-up or after pressing "Return to start screen" from the Main menu

It shows the following actual values:

- DC Voltage (Vdc) from the PV-string
- DC Current (Adc) from the PV-string
- Solar power (kW) supplied to the inverter by the PV-strings
- Total amount of generated energy (MWh) since commissioning of the inverter.
- Energy (kWh) generated today

From this screen, touch any part of the screen to go to the Main menu.

4.3.3 Main menu

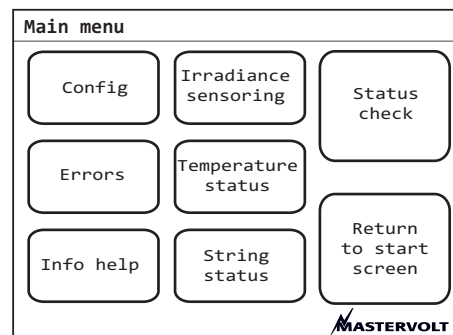


Figure 7: Main menu

From the main menu you can navigate to the submenus by touching one of the fields.

4.3.4 Status check

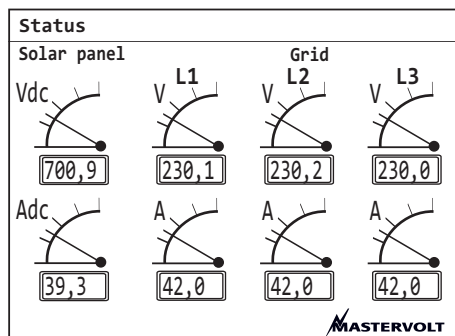


Figure 8: Status check

The Status screen shows the following actual values:

- DC Voltage (Vdc) from the PV-string
- DC Current (Adc) from the PV-string
- AC grid voltage of phases L1, L2 and L3.
- AC current of phases L1, L2 and L3 supplied to the AC grid

From this screen, touch any part of the screen to return to the Main menu

4.3.5 String status

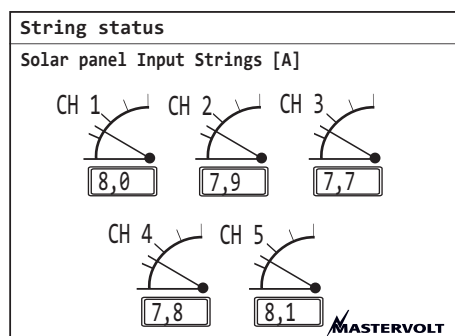


Figure 9: String status

This screen is only available when the inverter is provided with optional multiple DC inputs. Depending on the configuration of the inverter, the number of DC displayed inputs may vary from 2 till 5 inputs (model CP100TR) or from 2 till 10 inputs (models CP200TR, CP200TL and CP140TR-LV)

The screen shows the actual DC current for each input.

From this screen, touch any part of the screen to return to the Main menu

4.3.6 Temperature status

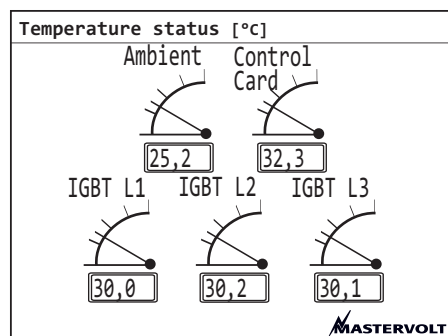


Figure 10: Temperature status

The airflow of the inverter is from bottom to top. This screen shows the internal temperatures of the inverter. The temperature is measured at the following spots:

- Ambient: in the lower part of the cabinet, measuring the temperature of the incoming air
- IGBT: in the middle part of the cabinet, measuring the temperature of the main semiconductors
- Control card: in the top part of the cabinet, measuring the temperature of the air that is blowing out of the cabinet.

From this screen, touch any part of the screen to return to the Main menu

4.3.7 Errors

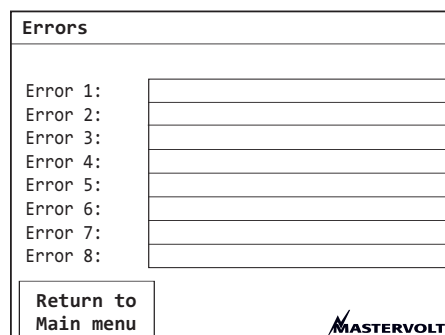


Figure 11: Errors

This screen shows a listing of the eight latest occurred errors. See chapter 6 for trouble shooting and an overview of all possible error codes.



ATTENTION

Several errors listed in this screen can occur during normal operation as well. Such errors do not indicate a failure of the inverter and are no reason for any worry. See also section 6.1.

Touch the “Return to Main menu” section to return to the Main menu

4.3.8 Configuration

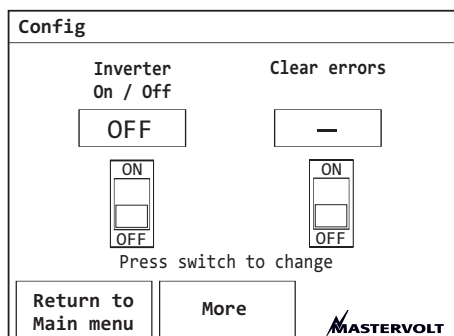


Figure 12: Configuration – first screen

With this screen you can control two functions by touching the displayed switch:

- Inverter on/off: Switching the inverter on/off
- Clear errors: Reset the listing of errors (see section 4.3.7)

Touch the “More” section to go to the next screen, or touch the “Return to Main menu” section to return to the Main menu

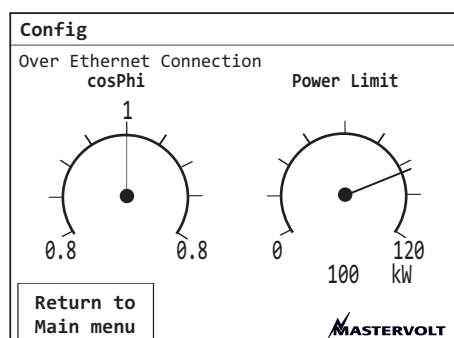


Figure 13: Configuration – second screen

The next screen shows the following settings:

- Cos phi of the inverter
- AC power limitation of the inverter

These settings can only be changed by means of an Ethernet connection; see installation manual.

Touch the “Return to Main menu” section to return to the Main menu

4.3.9 Irradiance sensing

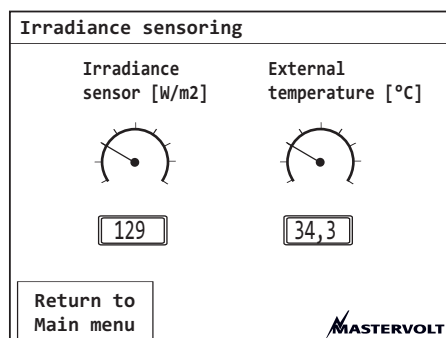


Figure 14: Irradiance sensing

This screen is only available when an optional irradiance / temperature sensor is used. It shows the actual irradiance and environmental temperature measured by the sensor\

Touch the “Return to Main menu” section to return to the Main menu

4.3.10 Info help



Figure 15: Info help screen

This screen shows the contact information of Mastervolt. Touch any part of the screen to return to the Main menu

4.4 SETTING DATE AND TIME



ATTENTION

Adjusting the internal clock of the display will not affect date and time settings of the Control Card [A1]

Proceed as follows to adjust the internal clock of the display:

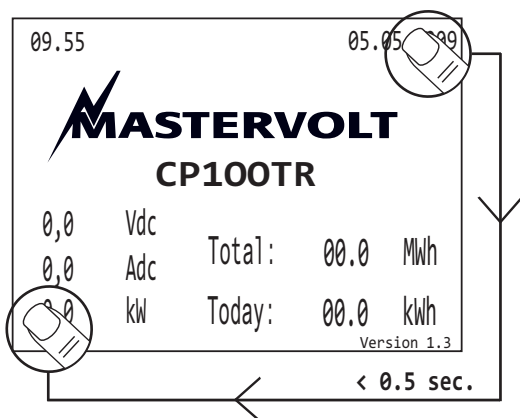


Figure 16

Figure 16: From the Start screen, touch the upper right corner of the display, immediately followed by the lower left corner. This should be done within 0.5 seconds

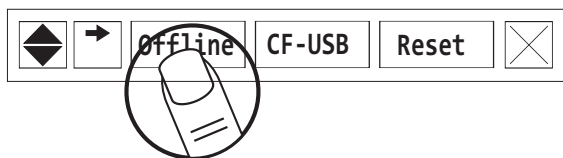


Figure 17

Then touch the "Offline" section at the bottom of the display (Figure 17)

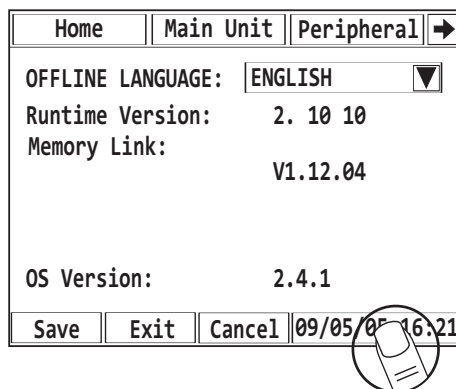


Figure 18

Figure 18: Press the Date / time section at the lower right corner of the display to adjust the date and time

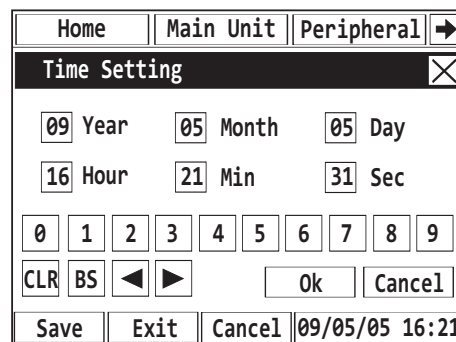


Figure 19

Figure 19: Confirm each setting by pressing OK. After adjusting the date and time, touch the "Save" section, followed by touching the "Exit" section to reboot the display

5 COMMISSIONING AFTER INSTALLATION

**WARNING**

Commissioning of the CP inverter may only be performed by a Mastervolt authorized service agent.

**WARNING**

Before commissioning, read and understand the entire contents of chapters 1, 2, 3 and 4 of this manual.

After completing the entire installation process (see installation manual), follow the steps in order of succession as described below for first start-up of the CP inverter:

- 1 Check with a suitable voltage meter whether all possible power sources (AC and DC) are voltage free.
- 2 Check the position of the Main AC circuit breaker Q2. This switch must be in the "OFF" position;
- 3 Check the position of the mode switch of the DC main contactor Q1. This switch must be in the "Auto" position;
- 4 Check the position of the Emergency button. This button must be in the "Unlocked" position;
- 5 Check all DC wiring for correct polarity and tightened connections;

**WARNING**

Short circuiting, miswiring or reverse polarity of a single DC input may damage the inverter and may result in fire.

- 6 Check all AC wiring for correct sequence of the phases (L1, L2, L3) and tightened connections;
- 7 Check all auxiliary wiring;
- 8 Close the door of the cabinet. While closing, be aware that the shaft of the Main AC circuit breaker Q2 snaps into its rotary knob on front of the cabinet's door. Secure the lock by turning its key.
- 9 Connect the inverter to the DC supply. Depending on the installation, this can be done by closing the external DC switch or by inserting the string fuses;
- 10 Connect the inverter to the AC main supply;
- 11 After a few seconds the display will show information. Check the operational state of the inverter. See section 4.3.
- 12 Move the AC main contactor Q2 of the CP inverter to the ON position to connect the inverter to the AC grid; Now the switching of the DC main switch Q1 can be heard loud and clearly;
- 13 Now the CP inverter will start up. The operation mode of the CP inverter will be shown on the display;
- 14 If solar irradiation of the PV modules is sufficient, the feedback operation of the CP inverter will start automatically after approximately 90 seconds;
- 15 After sunset or disconnection of the DC supply the inverter will automatically stop all normal operations ("Shutdown" mode) and will switch back to the "Standby" mode

6 TROUBLE SHOOTING

6.1 GENERAL

If a malfunction is detected during any of the operation modes, the CP-inverter switches off automatically. The inverter will go to the "Shutdown"-mode. This means that the AC contactor will switch off. At the same time an error code will be shown on the display (see section 4.3.7). Refer to section 6.5 for an overview of all possible error codes.

After solving the origin of the malfunction, the CP inverter restarts the normal operation. The error code will remain displayed for another 60 seconds. Restarting will be delayed for a while by the Stand-by mode (normally one minute).



CAUTION

Under specific circumstances, the CP-inverter will switch to the "Service Request mode". At this mode, all DC and AC contactors will switch to the OFF position. If such happens, it is strongly recommended to consult a Mastervolt authorized service agent for support.

Several kinds of error messages can be displayed:

- Hardware errors (these can be identified by the letters HW in the error code on the display)
- Software errors
- Other errors

When a hardware error is displayed, it is most likely caused by damage in the inverter system. If such happens, it is strongly recommended to consult a Mastervolt authorized service agent for support.

Software errors as well as some specific hardware errors indicate a disturbance in the normal feedback operation mode. Only if such errors are shown more than once, the inverter will generate a "Service Request". Also in these cases, it is strongly recommended to consult a Mastervolt authorized service agent for support.

Other errors include several kinds of AC grid errors which are caused by external factors. In most cases such errors will be solved instantly when the AC grid parameters are within range again. Then the inverter will switch on automatically.

6.2 RESTART OF THE CP INVERTER



CAUTION

A wrong working sequence may lead to severe damage. Therefore if the CP-inverter needs to be restarted, it is strongly recommended to consult a Mastervolt authorized service agent for support.

In some cases it is necessary to reset the Error system of the CP inverter. To do so the CP inverter needs to be restarted. Follow the steps in order of succession as described below:

- 1 Push the emergency button (to the OFF position)
- 2 Cut off the AC grid voltage by moving the Main AC circuit breaker Q2 to the "OFF" position
- 3 Wait for at least 30 minutes until the internal DC link is discharged
- 4 Follow all steps as described in chapter 5.

6.3 DE-COMMISSIONING

If it is necessary to put the CP100 inverter out of operation, follow the instructions below:

**CAUTION**

Follow below mentioned instructions in order of succession as described.

- 1 Switch off the inverter by means of the display, see section 4.3.8
- 2 Push the Emergency button on front of the cabinet
- 3 Cut off the AC grid voltage by moving the Main AC circuit breaker Q2 to the "OFF" position
- 4 If applicable, move the external DC switch to the OFF-position. If such is not applied the DC input must be made voltage free in any other way (installation dependent)
- 5 Switch off the AC grid externally.
- 6 Wait for at least 30 minutes until the internal DC link is discharged
- 7 Open the door of the cabinet
- 8 Check with a suitable voltage meter whether the inputs and the outputs of CP100 inverter are voltage free.
- 9 Disconnect both DC and AC wiring.

Now the CP100 inverter can be demounted in a safe way.

6.4 EXPLANATION OF THE ERROR CODES

The table below gives an overview of possible errors that can be shown on the display of the CP inverter. Consult a Mastervolt authorized service agent for support if you cannot solve the problem by means of this table.

Error	Description	What to do?
Temperature	Temperature of the inverter is too high.	Check whether the airflow is not obstructed or whether the environmental temperature is not too high. See also installation manual for specifications of the allowed ambient conditions
Overcurrent	In general hardware over current errors indicate a damaged inverter system	Consult a Mastervolt authorized service agent for support
	Software overcurrent errors which lead to a service request may indicate a wrong design of the PV array or/and the inverter	Check the design of the installation if such errors happen more than once. Sporadic over current errors may occur from time to time and are may be ignored.
Overvoltage	AC overvoltage errors indicate too high grid voltage.	Check the grid connection. Consult the local electric utility company for support.
	DC overvoltage errors may indicate a wrong design of the PV array	Check the design of the installation. Consult your PV array supplier for support
Undervoltage	AC undervoltage errors indicate too low grid voltage or loss of grid voltage.	Wait for the return of grid voltage. If this error happens more than once, consult the local electric utility company for support.
	DC undervoltage errors are normal for night and dawn conditions.	Wait till the irradiation is sufficient. Then the CP inverter will start working normally.
	DC undervoltage errors during daytime conditions may indicate a wrong design of the PV array	Check the design of the installation. Consult an installer if this error is displayed more than once during daytime
Contactor	One of the switches is set to the OFF position.	Check the correct state of all switches.
Hardware	This error is most likely caused by damage in the inverter system.	Consult a Mastervolt authorized service agent for support
Grid	Wrong connection of the AC grid	Check the connection to the AC grid
Software	This error will be shown if the number of software errors exceeds a certain value, resulting in a "Service request".	Consult a Mastervolt authorized service agent for support

6.5 ERROR CODES LISTING

Code	Error description	Possible cause
0	No error	
1		
2		
3		
4		
5		
6		
7		
8		
9		
10	Temperature errors	
11	Temperature Inverter Phase L1, HW-driver	Temperature IGBT L1 > 90°C; check the fan.
12	Temperature Inverter Phase L1, Software	
13	Temperature Inverter Phase L2, HW-driver	Temperature IGBT L2 > 90°C; check the fan.
14	Temperature Inverter Phase L2, Software	
15	Temperature Inverter Phase L3, HW-driver	Temperature IGBT L3 > 90°C; check the fan.
16	Temperature Inverter Phase L3, Software	
17	n.a.	
18	Temperature ambient	Ambient temperature > 50°C; check airflow.
19	n.a.	
20	Temperature water	
21	Temperature controlcard	Ambient temperature > 50°C; check airflow.
22	No error	
23	No error	
24		
25		
26		
27		
28		
29		
30	General Overcurrent errors	
31	Overcurrent Inverter Phase L1, HW-driver	Phase current too high
32	Overcurrent Inverter Phase L1, HW controlcard	Phase current too high
33	Overcurrent Inverter Phase L1, Software	Phase current L1 > 400A
34	Overcurrent Phase L1, Software	Grid current L1 > 180A
35	Overcurrent Inverter Phase L2, HW-driver	Phase current too high
36	Overcurrent Inverter Phase L2, HW controlcard	Phase current too high
37	Overcurrent Inverter Phase L2, Software	Phase current L2 > 400A
38	Overcurrent Phase L2, Software	Grid current L2 > 180A
39	Overcurrent Inverter Phase L3, HW-driver	Phase current too high
40	Overcurrent Inverter Phase L3, HW controlcard	Phase current too high
41	Overcurrent Inverter Phase L3, Software	Phase current L3 > 400A
42	Overcurrent Phase L3, Software	Grid current L3 > 180A
43	Overcurrent I_DC, HW-controlcard	IDC too high
44	Overcurrent I_DC, Software	IDC > 280A
45	Unsymmetry Inverter currents	
46	n.a.	
47		

Code	Error description	Possible cause
48		
49		
50	Overvoltage errors	
51	No error	
52	No error	
53	No error	
54	No error	
55	No error	
56	No error	
57	No error	
58	No error	
59	No error	
60	No error	
61	No error	
62	No error	
63	No error	
64	No error	
65	No error	
66	Overvoltage grid Phase L1, stage 1	
67	Overvoltage grid Phase L1, stage 2	
68	Overvoltage grid Phase L1, stage 3	
69	Overvoltage grid Phase L1, stage 4	
70	Overvoltage grid Phase L1, stage 5	Grid voltage L1 > 110% x U nominal
71	Overvoltage grid Phase L2, stage 1	
72	Overvoltage grid Phase L2, stage 2	
73	Overvoltage grid Phase L2, stage 3	
74	Overvoltage grid Phase L2, stage 4	
75	Overvoltage grid Phase L2, stage 5	Grid voltage L2 > 110% x U nominal
76	Overvoltage grid Phase L3, stage 1	
77	Overvoltage grid Phase L3, stage 2	
78	Overvoltage grid Phase L3, stage 3	
79	Overvoltage grid Phase L3, stage 4	
80	Overvoltage grid Phase L3, stage 5	Grid voltage L3 > 110% x U nominal
81	Overvoltage DC Link, HW control card	DC input voltage > 900 V
82	Overvoltage DCLink, Software	DC input voltage > 900 V
83		
84		
85		
86		
87		
88		
89		
90		
91		
92		
93		
94		
95		
91		
92		
93		

Code	Error description	Possible cause
94		
95		
96		
97		
98		
99		
100	Undervoltage Errors	
101	No error	
102	No error	
103	No error	
104	No error	
105	No error	
106	No error	
107	No error	
108	No error	
109	No error	
110	No error	
111	No error	
112	No error	
113	No error	
114	No error	
115	No error	
116	Undervoltage grid Phase L1, stage 1	
117	Undervoltage grid Phase L1, stage 2	
118	Undervoltage grid Phase L1, stage 3	
119	Undervoltage grid Phase L1, stage 4	
120	Undervoltage grid Phase L1, stage 5	Grid voltage L1 < 90% x U nominal
121	Undervoltage grid Phase L2, stage 1	
122	Undervoltage grid Phase L2, stage 2	
123	Undervoltage grid Phase L2, stage 3	
124	Undervoltage grid Phase L2, stage 4	
125	Undervoltage grid Phase L2, stage 5	Grid voltage L2 < 90% x U nominal
126	Undervoltage grid Phase L3, stage 1	
127	Undervoltage grid Phase L3, stage 2	
128	Undervoltage grid Phase L3, stage 3	
129	Undervoltage grid Phase L3, stage 4	
130	Undervoltage grid Phase L3, stage 5	Grid voltage L3 < 90% x U nominal
131	Undervoltage DC Link, HW control card	
132	Undervoltage DC Link, Software	
133		
134		
135		
136		
137		
138		
139		
140		
141		
142		
143		
144		

Code	Error description	Possible cause
145		
146		
147		
148		
149		
150	Contactor Errors	
151	Q1 tripped	DC disconnecter Q1 tripped. Is the emergency button pressed?
152	Q2 tripped	AC main switch is open
153	Q3 tripped	
154	No error	
155	K1 open	
156		
157		
158		
159		
160	Hardware Errors	
161	Inverter Phase L1	Change IGBT driver L1
162	Inverter Phase L2	Change IGBT driver L2
163	Inverter Phase L3	Change IGBT driver L3
164	Error_X103	Check the cable to the IDC sensor
165		
166	Shortcircuit DC Link	
167	Insulation error	Insulation problem at the DC side
168	Over voltage protection	
169		
170	Grid errors	
171	Grid rotation	Check the correct sequence L1 - L2 - L3
172	No error	
173	No error	
174	Grid frequency	Check the grid frequency
175		
176		
177		
178		
179		
180	Software Errors	
181	Wrong Systemparamter	
182	No error	
183	Errorcounter overrun (x errors / hour)	
184	User switched off Inverter via Display or Ethernet	See section xx

7 SPECIFICATIONS

GENERAL SPECIFICATIONS

Model:	CP100TR	CP200TR	CP200TL	CP140TR-LV
Article number:	131400100	131400200	131420200	131430140
Operating temperature	0°C to 50°C ambient (no power derating)			
Relative humidity	maximum 95% non-condensing			
Protection degree	IP20			
Safety class	Class I			
Galvanic isolation	yes, transformer	yes, transformer	no	yes, transformer
Dimensions (HxWxD)	1900x1000x850 mm	1900x1400x850 mm	1900x1400x850 mm	1900x1400x850 mm
Weight	< 1050 kg	< 1330 kg	< 1000 kg	< 1200 kg
Standard product warranty	2 years, extended Service Insurance & Losses Contract (SILC) as option.			
Cooling system	Active air cooling			

PV ARRAY INPUT (DC)

Model:	CP100TR	CP200TR	CP200TL	CP140TR-LV
Recommended PV power	115 kWp	230 kWp	230 kWp	165 kW
Nominal input power	104 kW	208 kW	204 kW	147 kW
Maximum input power	115 kW	230 kW	230 kW	162 kW
Start of power conversion	530 W	900 W	350 W	700 W
Operating voltage range	450 - 900 V	450 - 900 V	450 - 900 V	300 - 600 V
MPP voltage range at nom. Power	450 - 820 V	450 - 820 V	450 - 820 V	300 - 550 V
Maximum voltage	900V	900V	900V	600 V
Number of inputs	1 / 5 optional	1 / 10 optional	1 / 10 optional	1 / 10 optional
maximum current	250A	500 A	500 A	500 A
MPP tracker	1	1	1	1
MPP efficiency	> 99,9%			
DC connection	Tubular cable lugs for M8 bolts (Standard connection) or cable end sleeves, max 70mm ² (Connection to DC circuit breakers)			

GRID OUTPUT (AC)				
Model:	CP100TR	CP200TR	CP200TL	CP140TR-LV
Voltage	400 V, 3phase	400 V, 3phase	270 V, 3phase	400 V, 3phase
Earthing system (IEC60364-3)	TN	TN	IT	TN
Nominal output power	100 kW	200 kW	200 kW	140 kW
Maximum output power	110 kW	220 kW	224 kW	154 kW
Nominal current	160 A	320 A	480 A	500 A
Frequency	45 - 65 Hz, country dependent			
Power Factor	> 0,99 at full power			
Harmonic distortion (THD)	< 3% at full power			
Standby power	< 30 W			
European efficiency (excl / incl aux supply)	96,5% / 96,3%	96,4% / 96,2%	97,5% / 97,3%	95,5% / 95,3%
Maximum efficiency	97.1%	97.0%	98.0%	96.20%
Partial efficiency				
5%	89,5%	89,99%	92,3%	89,8%
10%	93.9%	94,5%	96%	93,5%
20%	96.2%	96,32%	97,5%	95,7%
30%	96.9%	96,9%	97,5%	96,1%
50%	97.1%	97%	98%	96,2%
100%	96,7%	96,1%	95,3%	95,3%
AC connection	Tubular cable lugs for M8 bolts			
MONITORING				
User Interface	Intergrated touchscreen display			
Datalogger	365 days			
External communication	Ethernet			
SAFETY FEATURES				
Island protection	According to national grid requirement			
Temperature protection	Thermal switch-off at internal over temperature			
Safety devices DC side	Motor driven disconnecter, Isolation resistance monitoring, overvoltage detection			
Safety devices AC side	Surge protection, over- undervoltage protection, overcurrent protection			
REGULATIONS AND DIRECTIVES				
CE conformity	yes			
Type approval	TÜV			
EMC directive	89/336/EWG + 93/31/EWG			
Emissions	EN61000-6-4			
Grid quality requirements	VDEW compliant			
Immunity	EN61000-6-2			
LV directive	73/23/EWG			
Electrical safety	EN50178			
National grid interface req.	VDEW compliant			



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