

Christ

ELEKTRONIK

Instruction manual

Wattmeter CPM138-AC



Document-No.	E461605
Issue	02
Dated	15.02.2012
Postal address	Christ-Elektronik GmbH Alpenstraße 34 DE-87700 Memmingen
Phone	+49 (0)8331 8371 – 0
Fax	+49 (0)8331 8371 – 99
eMail	info@christ-elektronik.de
Internet	http://www.christ-elektronik.de
Copyright	It is forbidden to reproduce or process (using electronic systems), copy or distribute any part of this document. Translation into another language requires written authorisation. This document is for the personal use of the owner of the device or Christ-Elektronik GmbH personnel only.
Technical modifications	Christ-Elektronik GmbH reserves the right to modify the designations, specifications and technical data without prior notice.

Table of contents

	Seite
1 Description	2
1.1 General Description.....	2
1.2 Safety instructions	2
1.3 Repairs	2
2 Operation.....	3
2.1 Installation instructions	3
2.2 Inbetriebnahme.....	3
2.3 Controls.....	3
2.4 Modes of operation	4
2.5 Operating Philosophy.....	5
2.5.1 Access Code Verification.....	5
2.5.2 Selection Lists	5
2.5.3 Editing of Parameters	6
2.6 Menu diagram	6
2.8 Deleting the stored Min and Max Values	7
2.9 Tara value.....	8
3 Beschreibung der Ausgänge	9
3.1 Threshold contacts (Relays)	9
3.1.1 Alarm mode.....	9
3.1.2 Regular and inverted switching	9
3.2 Selection of analogue output/RS232 interface (only CPM 138 2S)	9
3.2.1 Analogue output	9
3.2.2 Serial interface.....	10
3.3 Operation via the serial interface.....	10
3.3.1 Data format.....	10
3.3.2 Interface commands.....	11
4 Error handling	14
5 Technical specifications	15

1 Description

1.1 General Description

The measuring instrument **CPM138-AC** allows universal measurements of electrical parameters. Its six-digit display is freely scalable. There is also an optional standard-signal output (voltage 0...10 V, current 0(4)...20 mA) for the measurement values. The measurement values can also be used to control two relay switches using pre-defined thresholds.

The operator can select and set the desired input and output configuration using the push buttons on the front panel of the instrument to navigate a set-up menu.

The device parameters can be polled and modified via specific menu items. All settings are stored in an EEPROM automatically.

The model **CPM138 2S** comes with an electrically isolated analogue output with an adjustable signal range of 0...10 V or 0(4)...20 mA. Alternatively, it also offers output of the measurement results via an electrically isolated RS-232 interface. Additionally, this model can also be configured and operated via this interface.

1.2 Safety instructions

This instrument was designed in accordance with DIN 57411/VDE 0411 Part 1, Safety Measures for Electronic Measurement Instruments, and left our production plant in perfect condition in respect to safety technology. The notes and warnings contained in this instruction manual must be followed to ensure the continued safe operation of this instrument. The instrument has to be protected from splash water. In case of damage to its housing, this instrument has to be switched off and disconnected.

1.3 Repairs

Any repairs needed to this instrument are restricted to a qualified repair shop. If for any repair it is inevitable that the instrument remain open and connected to the power supply, such a repair may only be performed by a specialist who is familiar with any associated risks and hazards.

We will not assume any liability for damages resulting from inappropriate operation or unintended use.

2 Operation

2.1 Installation instructions

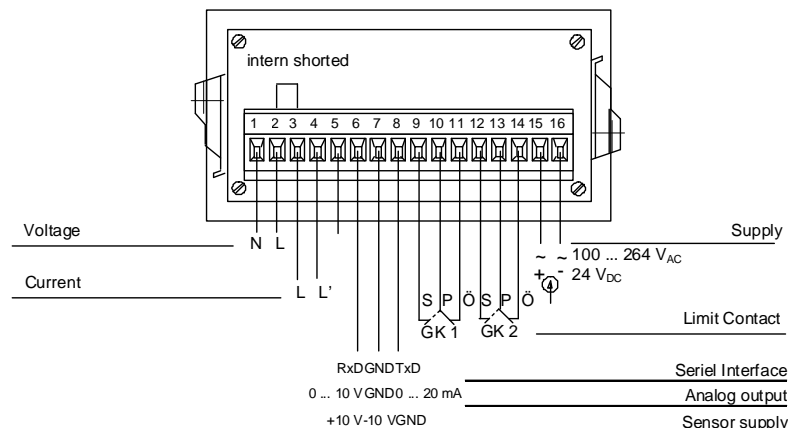
Place the measuring instrument into the designated cut-out (according to DIN 43 700, dimensions: 92mm x 45mm) on the front of your device frame. Please use the enclosed fastening parts to attach the instrument. Tighten the fastening bolts alternately until the instrument is securely fastened. When placing this instrument, consider any radiant heat of neighbouring devices, and also take into account the permissible ambient temperature.

Respect any applicable regulations (e.g. VDE 0100) when making electrical connections. The power supply voltage, as indicated on the electrical rating label, is connected to terminals 15 and 16.

2.2 Inbetriebnahme

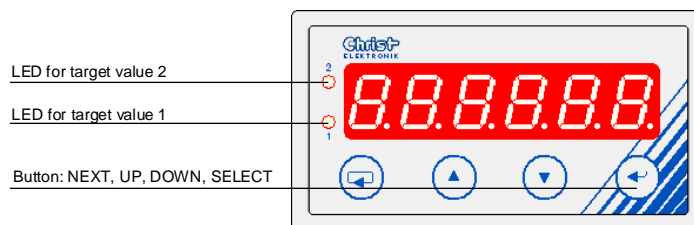
Connect the measurement and power-supply lines to the appropriate terminals and switch on the power supply. The instrument will first perform an automatic display segment test, and all LEDs and display segments will light up for about one second. After this test, the previously active mode of operation is set. Any measured values will then be shown on the display continuously.

Terminal pin assignment:



2.3 Controls

The CPM 138 is controlled by four push buttons on the front of the instrument.



2.4 Modes of operation

Setting the mode of operation (**E_Mod**) will select which measurement parameter is to be displayed permanently. Depending on the settings, the measured values will either be displayed with 0 to 4 positions after the decimal point or, automatically, with 6 digits (automatic display range selection). Only the "minus" sign for negative values will be displayed as a leading sign.

Tabelle 1 shows the possible modes of operation for the **CPM 138**:

Nr.	Display Text	Input parameter (mode of operation set-up via E_Mod)	Measurement range ⁽¹⁾	Display range ⁽²⁾	Resolution
0	<i>U</i>	Voltage [V] RMS	30...250 V _{AC}	30 ...999999	0,1...1 V _{AC}
1	<i>A</i>	Current [A] RMS	0,03...16 A _{AC}	0,03 ...999999	0,01...1 A _{AC}
2	<i>P</i>	Active power [W]	-4000...+4000 W	- 99999 ...999999	0,1...1 W
3	<i>S</i>	Apparent power [VA]	0...+4000 VA	0.. 999999	0,1...1 VA
4	<i>Q</i>	Reactive power [var]	-4000...+4000 var	- 99999 ...999999	0,1...1 var
5	<i>PF</i>	Power factor	-1,000...1,000	-1,000 ... 1,000	0,001
6	<i>EP</i>	Activeenergy [kWh]	-99999...+999999 kWh	- 99999 ...999999	0,0001...1kWh
7	<i>ES</i>	Apparentenergy [kVAh]	0...+999999 kVAh	- 99999 ...999999	0,0001...1kWh
8	<i>EQ</i>	Reactiveenergy [kvarh]	-99999...+999999 kvarh	- 99999 ...999999	0,0001...1kWh
9	<i>t</i>	Time ⁽³⁾	0...999999 h	0 ...999999	0,00001...1 h
10	<i>Const</i>	Simulation value	-99999...999999 h	-99999...999999	0,00001

⁽¹⁾ Measurement without Curren- or Voltage transformer

⁽²⁾ Measurement with Curren- or Voltage transformer

⁽³⁾ Measurementtime

In "*Const*" mode, the value of the device parameter **E_SiM** is displayed instead of a measured value. This parameter can also be used to control the threshold contacts and the analogue output. This allows easy testing of the pre-set device parameters or, if needed, operation of an integrated system even without connected measurement signals.

The display value is based on the average factor **E_MFA** and the pre-set tare value **E_tAr**, and is computed as follows:

$$\text{Display} = \frac{((\mathbf{E_MFA} - 1) * \text{old display value}) + (\text{new measurement value} - \mathbf{E_tAr})}{\mathbf{E_MFA}}$$

For the display value, this results in a PTn behaviour, which only affects the display of the measurement value in the selected mode of operation. This function can be switched off by choosing an average factor of 1.

2.5 Operating Philosophy

This instrument can be controlled using the push buttons on the front panel, or the optional interface. Manual control is done via a menu interface, which is divided into a **Display** and a **Setup Menu**.

For easier differentiation, the decimal point (the point in the right 7-segment digit for integer values) is flashing in the display menu. The display automatically changes back to measurement-value monitoring if no button has been pushed for 10 seconds. The push buttons perform the following functions, see Table 2 below:

Table 2

Symbol	Function	Explanation
⬆	UP	Previous menu item / confirm selection, increase value
⬇	DOWN	Next menu item / confirm selection, decrease value
⊞	NEXT	Menu item / go to selection, edit next digit
⊞	SELECT	Current selection / confirm setting, go to the higher-level menu item
⊞/⬇	TARE	Tare function – copies the current measurement value to the parameter E_tArA .
⊞/⬆	BREAK	Cancel, leave the current selection/setting, without changing the value
⬆/⬇	RESET	For ALArM1 / ALArM2 : Acknowledge alarm, open relay For error messages: Acknowledge error message Display min/max value: Delete min and max values Display wire resistance: Perform electrical adjustment (calibration)

The **display menu** allows monitoring the mode of operation, the min/max values, the tare value, the switch thresholds and the version.

2.5.1 Access Code Verification

The **setup menu** allows changing the device parameters. A 4-digit access code has to be entered to open the setup menu, which should prevent unintentional changes to any device parameters. Pressing the button ⊞ (NEXT) changes the display from measurement-value monitoring to code verification (**Code** is displayed). Pressing the button ⊞ (NEXT) again will display **0000**. The digit to the right is flashing and can be set using the buttons ⬆ and ⬇. Press button ⊞ to select the next digit. You can verify the stored code by pushing the ⊞ button, which will compare the stored code with the value of device parameter **E_CodE** (at delivery: **0831**). If 0 is the value stored in **E_CodE**, code verification is omitted. Once the right code has been put in, the setup menu is opened at the menu item **E_Mod**. If a wrong code is put in, the display will show **Code** again. At any time, code verification can be cancelled by pressing the buttons ⊞/⬆ (BREAK) simultaneously.

2.5.2 Selection Lists

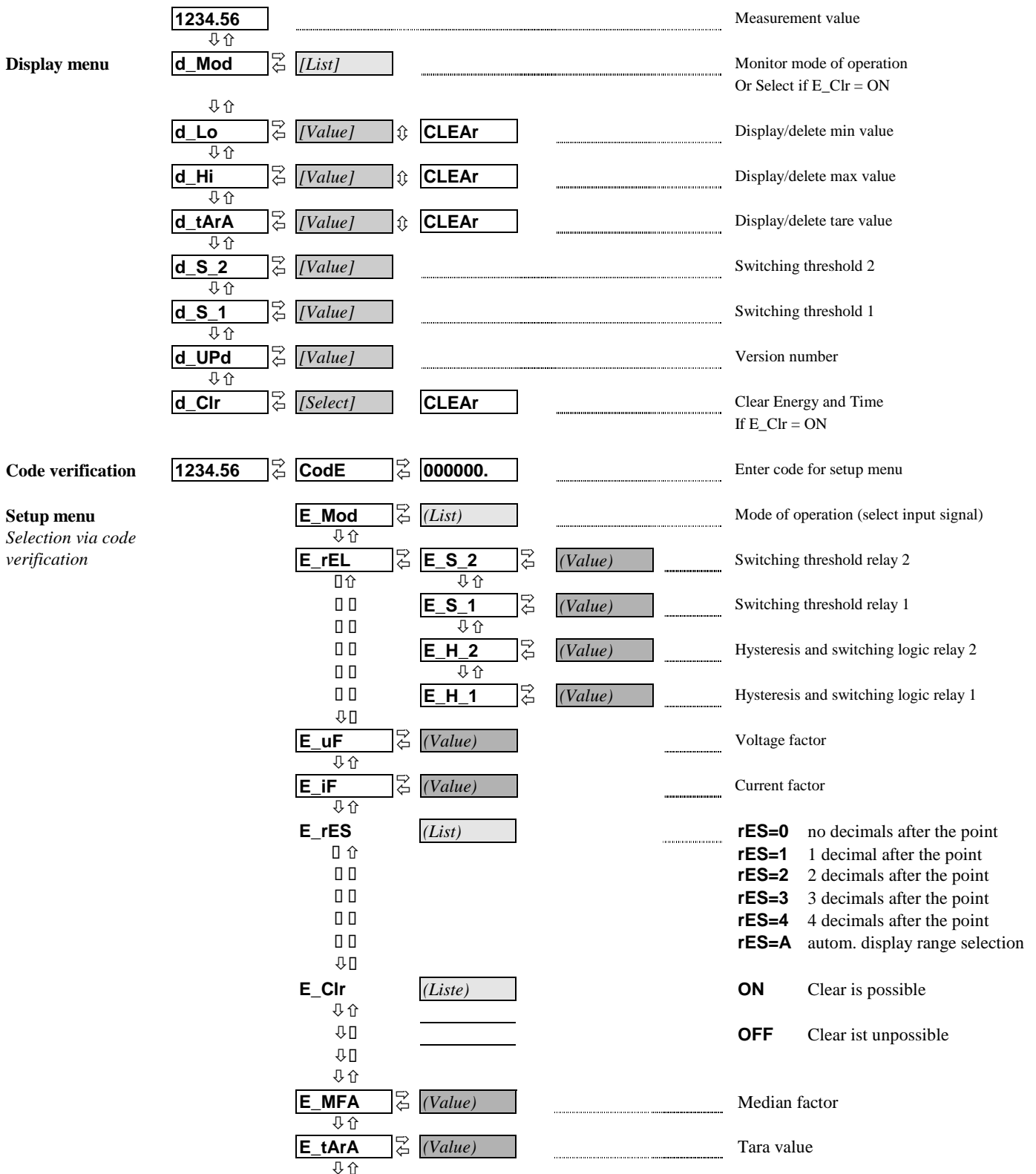
The mode of operation, temperature unit, reference-point mode, number of decimals after the point, measuring rate, as well as, the selection of the analogue output and the baud rate can be set using the appropriate selection lists. The current setting can be changed using the buttons ⬆ and ⬇. The selection is confirmed and stored in the EEPROM with the button ⊞, or cancelled by pressing the buttons ⊞/⬆ (BREAK) simultaneously.

2.5.3 Editing of Parameters

When editing parameters, the current value is displayed with the highest resolution possible. The least-significant position (digit) is flashing and can be increased or decreased by 1 using the buttons \uparrow and \downarrow , while the validity of the settings range is continuously verified. The next position, and its leading sign if applicable, can be selected by pressing the button \leftarrow .




















Changes are confirmed and stored in the EEPROM with the button \rightarrow , or cancelled by pressing the buttons \leftarrow/\rightarrow (BREAK) simultaneously.

2.6 Menu diagram



	E_tM ⇄ (List)		tM=0.5 Measurement rate 0.5 s tM=1.0 Measurement rate 1.0 s
	⇄ ⇄ ⇄		
	E_CodE ⇄ (Value)		Code assignment (default 0831.)
	⇄ ⇄		
	E_SiM ⇄ (Value)		Simulation value for ConSt mode
	⇄ ⇄		
	E_ConF ⇄ (List)		nonE No interface A-oUt Analogue output rS-232 RS232 interface
	⇄ ⇄ ⇄		
only CPM138 2S	A_oUt ⇄	A_SiG ⇄ (List)	U0_10 Analogue output 0...10 V A0_20 Analogue output 0...20 mA A4_20 Analogue output 4...20 mA
	⇄ ⇄ ⇄ ⇄ ⇄ ⇄ ⇄ ⇄ ⇄ ⇄	ASiGH ⇄ (Value) ⇄ ASiGL ⇄ (Value) ⇄ AdiSH ⇄ (Value) ⇄ AdiSL ⇄ (Value)	Analogue output, max. signal value Analogue output, min. signal value Analogue output, max. scaling Analogue output, min. scaling
only CPM138 2S	E_bd ⇄ (List)		9600 Baud rate 9,600 baud 19200 Baud rate 19,200 baud 38400 Baud rate 38,400 baud 57600 Baud rate 57,600 baud 115200 Baud rate 115,200 baud



Key:

Symbol	Explanation	Remarks
1234.56	Device display	Current measurement value
↑	UP button	Press button  once
↓	DOWN button	Press button  once
⇒	NEXT button	Press button  once
⇄	SELECT button	Press button  once
⇄	TARE button combination	Press buttons  /  simultaneously once
⇄	BREAK button combination	Press buttons  /  simultaneously once
⇄	RESET button combination	Press buttons  /  simultaneously once
[list]	<u>P</u> oll list item	Setting cannot be changed Quit polling: 
(list)	<u>S</u> elect list item	Select next list item:  or  Save changes: 
[value]	<u>P</u> oll value	Value cannot be changed Quit polling: 
(value)	<u>E</u> dit value	Change flashing digit/leading sign:  or  Select flashing position:  Save changes: 

Note:

Changes to the mode of operation (**E_Mod**) will automatically result in deleting the current min, max and tare values, as well as any associated error messages, if applicable.

2.8 Deleting the stored Min and Max Values

The stored min and max values can be deleted (cleared) by pressing the buttons / (RESET) simultaneously during the appropriate display menu items. As a confirmation, **CLEAR** is displayed for a short time.

2.9 Tara value

The display menu item **d_tArA** allows polling the current tare value (scale offset/correction). The stored tare value can be deleted (cleared) by pressing the buttons \odot/\odot (RESET) simultaneously. As a confirmation, **CLEAR** is displayed for a short time.

The current tare value can either be changed via the setup menu (**E_tArA**), or set to the currently displayed value by pressing the buttons \oplus/\odot (TARE) simultaneously. As a confirmation, **S_tArA** is displayed for a short time. The tare value is stored until the mode of operation **E_Mod** is changed.



3 Beschreibung der Ausgänge

3.1 Threshold contacts (Relays)

The relays are triggered depending on the currently measured values. The threshold values (switch thresholds), the hysteresis/alarm mode and the switching type (close or open relay) can be set for each of the two relays separately.

The device parameters **E_H_1** and **E_H_2** (hysteresis for relay 1 and 2) allow switching between alarm mode, regular and inverted switching mode. If inverted switching is desired, the hysteresis cannot equal 0. Use terminals 9 to 14 for connection (see terminal pin assignment).

3.1.1 Alarm mode

If either hysteresis value (**E_H_1**, **E_H_2**) equals 0, the corresponding relay is used as an alarm relay. In this case, when the value increases over the threshold value (**E_S_1**, **E_S_2**), the corresponding relay is switched, and the text **ALArM1** or **ALArM2**, respectively, is displayed in alternation with the current measurement value, until the alarm gets acknowledged by pressing the buttons / (RESET). Alarm states are not stored when the device is switched off.

3.1.2 Regular and inverted switching

The leading sign of either hysteresis value (**E_H_1**, **E_H_2**) determines the switching mode of the corresponding relay:

Positive hysteresis: regular switching mode,

Relay is closed when measured value > threshold value

Relay opens, when measured value < threshold value – |hysteresis|

Negative hysteresis: inverted switching mode,

Relay is closed when measured value < threshold value – |hysteresis|

Relay opens, when measured value > threshold value

3.2 Selection of analogue output/RS232 interface (only CPM 138 2S)

The model **CPM 138 2S** allows selection of analogue output (**A-oUt**) or RS232 interface (**rS-232** or **nonE**) via menu item **E_ConF**. Depending on the settings, the menu items for either configuration of the analogue output (**A_oUt**) or setting the baud rate (**E_bd**) are available.

3.2.1 Analogue output

At the electrically isolated analogue output, there is a continuous voltage within the range 0...10 V between terminals 6 and 7, and a current within the range 0(4)...20 mA between terminals 8 and 7.

The analogue output is configured in the submenu **A_oUt**. The signal mode is chosen via the device parameter **A_SiG**. The signal range and the output scaling can be mapped to the measurement range (see chapter 2.5). The following values will be set automatically when the signal mode is changed:

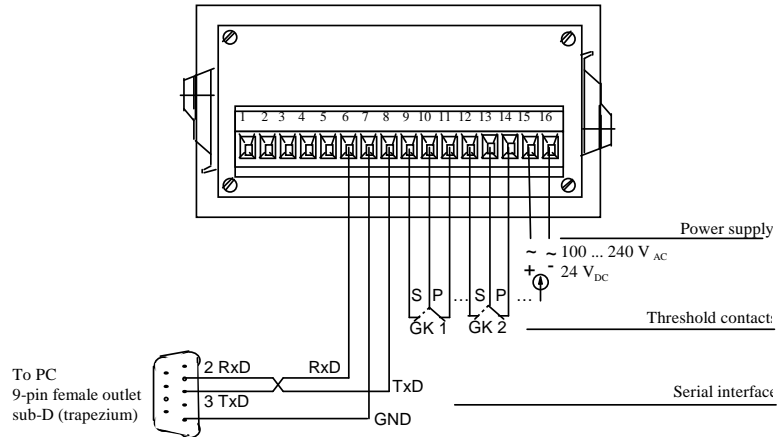
Table 4

A_SiG	Analogue Output	ASiGH	ASiGL	AdiSH	AdiSL
U0_10	Voltage output, scaled to 0...10 V _{DC}	10.0	0.0	10.0	0.0
A0_20	Current output, scaled to 0...20 mA	20.0	0.0	20.0	0.0
A4_20	Current output, scaled to 4...20 mA	20.0	4.0	20.0	4.0

3.2.2 Serial interface

This device provides an electrically isolated, bidirectional RS232 interface.

Connection diagram for use with a PC:



3.3 Operation via the serial interface

3.3.1 Data format

Transfer format: 1 start bit, 8 data bits, 1 stop bit, no parity.

The baud rate can be set to 9,600, 19,200, 38,400, 57,600 or 115,200 baud.

Measurement values are transferred with six significant digits plus decimal point (including automatic range selection). Only the minus sign gets transferred as a leading sign.

The **CPM 138** can be operated completely via the interface using the commands described below ("command mode").

With the Blockmode Command „L1“ the CPM138-AC send the measurement data in the following format:

Datastring:

Voltage[V];Current[A];Activepower[W];Apparentpower[VA];Reactivepower[var];Powerfactor; Activeenergy[kWh];Apparentenergy[kVAh];Reactiveenergy[kvarh];Time[h];

Data example:

230.0;1.00;230.0;230.0;0.0;1.000;125.25;222.1;150.1;12.54;

3.3.2 Interface commands

A transfer control mechanism in the form of an XON/XOFF protocol is necessary for bidirectional operation of the interface because the computer needs to know whether the most recently transferred command has already been interpreted and executed. If not, a command could be overwritten. The ASCII character 13 (CR) is used to mark the end of a command sequence in both directions.

Polling commands

Polling commands serve to poll the device identification, the measurement value and the device parameter settings.

Parameter settings and measurement values are transferred with six significant digits plus decimal point (including automatic display range selection). Only the minus sign gets transferred as a leading sign. The polling commands do not carry any arguments.

Setup commands

Setup commands are used to change device parameter settings and to delete the min and max values. They can include an argument (value), which is separated from the command by a space character (32 dec.). After any command, an error polling can be performed. Setup commands do not have an echo.

Push-button emulation

The push-button emulation allows the same operation as done via the push buttons on the device. These commands do not have an echo.

Polling of the command set

The complete command set of the **CPM 138** can be polled via the interface using the two polling commands "cm1" (first command description) and "cmn" (next command description).

The response string has the following structure:

- 4 characters setup command (if applicable)
 - 4 characters polling command (if applicable)
 - 4 characters command type (decimal)
 - 8 characters command description
- For commands with integer or floating-point parameters, additionally:
- 8 characters min. parameter value
 - 8 characters max. parameter value

The indication of the command type results from the sum of the following codes:

1	Setup command
2	Polling command
4	Integer parameter
8	Floating-point parameter
16	String parameter
32	Time parameter

Verification of interface commands

The device verifies for all interface commands if they are known. In case a command is unknown (e.g. capitalisation of letters wrong), or the argument value is not within the allowed range for the command, an error variable is set, which can be polled using the command "o" (output error).

Table 5 All interface commands in alphabetical order:

Setup Command	Polling Command	Command Type	Command Description	Min. Parameter Value	Max. Parameter Value	Preset Value	Explanation	Corresponds to Menu Item or Buttons
	a	0A	Minimum				Minimum value	d Lo
An	an	07	AA-Norm	0.	2.	0.	Analogue output type 0: 0 ... 10 V 1: 0 ... 20 mA 2: 4 ... 20 mA	A_SiG
Aoh	aoh	0B	AA-Out-H	-99999.0	999999.0	10.00000	Max. scaling for AA	AdiSH
Aol	aol	0B	AA-Out-L	-99999.0	999999.0	0.000000	Min. scaling for AA	AdiSL
Ash	ash	0B	AA-Sig-H	0.000000	20.00000	10.00000	Max. signal value for AA	ASiGH
Asl	asl	0B	AA-Sig-L	0.000000	20.00000	0.000000	Min. signal value for AA	ASiGL
	b	0A	Maximum				Maximum value	d Hi
B		01	BREAK				Break button combination	
	cm1	12	Get-1Cmd				Command description, see page 11	-
	cmn	12	Get-nCmd				Command description, see page 11	-
Co	co	07	Code	0.	9999.	831.	Code assignment	E_CodE
Ca		1	Clr_All				Clear Time, Energy, Min/Max	-
Ce		1	Clr_Ener				Clear Energy	-
Cs		01	ClrMinMa				Clear Min/Max	
Ct		01	ClrTime				Clear time	t
D		01	DOWN				Down button	
F	f	07	DispMode	0.	15.	0.	Mode of operation, see table 1	E_Mod
	i	12	Revision				Software version	d_UPd
If	if	0B	CurrrentF	1.	255.	1.	Current factor	IF
K	k	07	M-Factor	1.	255.	1.	Madian factor	E_MFA
	l	12	Producer				Producer	-
L0		1	CmdMode			aktiv	Command mode	-
L1		1	BlockMode				Block mode	-
	n	12	Dev.Name				Device name	-
N		01	NEXT				Next button	
	o	06	Error-Nr				Error message (no.), see table 6	-
	r	0A	MeaValue				Poll measurement value	-
R		01	RESET				Reset button combination	
R1	r1	07	Rel1Valu	0.	1.	0.	Switch state relay 1 0: relay open 1: relay closed	-
R2	r2	07	Rel2Valu	0.	1.	0.	Switch state relay 2 0: relay open 1: relay closed	-
Ra	ra	07	Rel.auto	0.	1.	1.	Relay control 0: via RS232 1: automatic	-
Rh1	rh1	0B	Rel1Hyst	-99999.0	999999.0	5.000000	Hysteresis relay 1	E_H_1
Rh2	rh2	0B	Rel2Hyst	-99999.0	999999.0	5.000000	Hysteresis relay 2	E_H_2
Rs1	rs1	0B	Rel1Set	-99999.0	999999.0	100.0000	Switch threshold relay1	E_S_1
Rs2	rs2	0B	Rel2Set	-99999.0	999999.0	200.0000	Switch threshold relay2	E_S_2
S		01	SELECT				Select button	
Sim	sim	0B	SimValue	-99999.0	999999.0	10000.00	Simulation value	E_SiM
Ta	ta	0B	TaraValu	-99999.0	999999.0	0.000000	Tara value	E_tArA
Tr	tr	07	MeasRate	0.	2.	2.	0: Messrate 0.5 s 1: Messrate 0.5 s 2: Messrate 1.0 s	E_tM
U		01	UP				Up-button	
Uf	uf	0B	VoltageF	1.	255.	1.	Spannungsfaktor	UF
V	v	07	Baudrate	0.	4.	1.	0: 9600 Baud 1: 19200 Baud 2: 38400 Baud 3: 57600 Baud 4: 115200 Baud	E_bd
	v0	10	Voltage				Voltage value	U
	v1	10	Current				Current value	I
	v2	10	Power_P				Activepower value	P
	v3	10	Power_S				Apparentpower value	S
	v4	10	Power_Q				Reactivepower value	Q
	v5	10	PF				Powerfactor	PF
	v6	10	Energy_P				Activeenergy	Ep

	v7	10	Energy_S				Apparentenergy	Es
	v8	10	Energy_Q				Reactiveenergy	Eq
	v9	10	Time				Time	t
Z	z	07	Resolut.	0.	5.	5.	0...4 decimals after the point (fixed) 5: automatic display range selection	E_rES

4 Error handling

Error messages can be acknowledged by pressing the buttons \triangle/∇ (RESET) simultaneously. Errors are displayed for approximately 10 seconds without prioritisation. If an error message does not get acknowledged, all further messages are lost. Error messages are not stored when the device is switched off.

Table 6 Error messages

Error Message		Explanation and Additional Remarks
No.	Display	
0		No error occurred
1	<i>E.01.EE</i>	EEprom: Error found in EEPROM content during self-test after the device was switched on. The accuracy of the device cannot be guaranteed.
6	Max. display value flashing <i>999999.</i>	Overflow: Value exceeds display range maximum. This error is acknowledged automatically when the value decreases back into the given range.
7	Min. display value flashing <i>-99999.</i>	Underflow: Value below display range minimum. This error is acknowledged automatically when the value increases back into the given range.
8	<i>E.08.d ,</i>	Division by zero: Division error as a result of an inappropriate scaling of the analogue output.
10	<i>E.10.Ad</i>	ADjust error: Adjustment (calibration) error
11	<i>E.11.Ft</i>	FormaT error: Format error (formatting of a measurement value failed)
64		Command: Unknown command encountered during control operation via the serial interface; command is ignored
65		Serial parameter: Faulty parameter encountered during control operation via the serial interface (argument cannot be interpreted); command is ignored
		Para range: Argument is not in allowed range. The argument can be interpreted but is not within the given thresholds.
255	<i>Error</i>	Undefined error – no additional information

5 Technical specifications

Display:	Six-digit, 7-segment display, 13 mm red LEDs; display range: -99999 to 999999 digits
Decimal point:	Menu-based choice between 0 and 4 positions after the decimal point, and automatic display range selection
Threshold contact display:	2 red LEDs, 3 mm
Controls:	4 foil push buttons
Measurement principle:	A/D conversion; automatic measurement range selection
Measurement rate:	0.5 or 1.0 s can be selected
Sample rate:	500 Hz
Measurement delay:	Ptn-behaviour adjustable via menu
Input parameters:	U Measurement range: 30...250 V _{AC} Error: $\leq \pm 0.5V \pm 1\%$ of displayed value R _{in} : > 1 M Ω I Measurement range: 0,03...16 A _{AC} Error: $\leq \pm 20\text{ mA} \pm 1\%$ of displayed value R _{in} : 0,02 Ω
Measure values:	P Measurement range: -4000 ...4000W ($\leq \pm 5\text{ W} \pm 1\%$ of displayed value) S Measurement range: 04000W ($\leq \pm 5\text{ VA} \pm 1\%$ of displayed value) Q Measurement range: -4000 ...4000W ($\leq \pm 5\text{ var} \pm 1\%$ of displayed value) PF Measurement range: 0.000...1.000
Min and max values:	Polling via menu or serial interface
Tare function	Editable offset value or storing of a measurement value as an offset correction
EEPROM storage:	Configuration settings, counter states and min/max values are stored even when the device is switched off

Threshold contacts:	Two electrically isolated relay contacts (change-over contacts), max. load: 250 V _{AC} , 8 A, switching delay depending on measurement rate. Switch mode can be selected from min/max contact or alarm. Threshold value, hysteresis and switching logic can be set freely; in case of broken sensors or short circuits, both relays are open (basic state)
Analogue output: (Option)	Electrically isolated; signal range can be chosen from 0...10 V, < 5 mA or 0(4)...20 mA; influence of the working resistance: $\leq \pm 0.1 \%$; $R_b < 500 \Omega$; residual AC waves: $\leq \pm 0.2 \%$; scaling range -99999...999999; inaccuracy: $\leq \pm 0.2 \%$ (of the upper range value); temperature influence: $\leq \pm 100$ ppm/K (at 25 °C); display value in case of broken sensors: 10 V, 20 mA; display value in case of short circuit: 0 V, 0(4) mA
Interface: (Option)	RS232 bidirectional, electrically separated via photocoupler; ASCII characters at 9,600, 19,200, 38,400, 57,600 or 115,200 baud, 1 start bit, 8 data bits, 1 stop bit, no parity
Operational temperature:	0...50 °C, no condensation
Power supply:	100...264 V _{AC} , 47...63 Hz, approx. 7 VA; 24 V _{DC} , +10/-10 %, max. 350 mA, electrically isolated; residual AC waves: max. 100 mV _{PP} ; DC supply with reverse-polarity protection
Electrical terminals:	Attached screw-in terminals with wire protection for max. 1.5 mm ²
Housing:	Fibre-glass reinforced Noryl, flame-resistant; dimensions: approx. 96 x 48 x 135 [mm] (W x H x L) above terminals; installation depth approx. 126 mm; installation cut-out needed 92 x 45 [mm]; instrument panel thickness max. 40 mm
Protection category:	In front of front panel: IP 54 (comes with gasket for front panel); housing: IP 50, terminals: IP 20 (DIN 40050, IEC144)
Protection class:	II (protective insulation)
CE:	CE certified according to European directive 89/336/EEC, Electromagnetic Compatibility, and 73/23/EEC, Low-Voltage Directive. Satisfies EN 50081, EN 50082 and EN 61010 for unrestricted industrial applications
Mass (weight):	Approx. 320 g
Delivery includes:	Device with two fastening parts, attached screw-in terminal, gasket and instruction manual