WM20

INSTRUCTION MANUAL

MANUALE D'ISTRUZIONI

BETRIEBSANLEITUNG

MANUEL D'INSTRUCTIONS

MANUAL DE INSTRUCCIONES

BRUGERVEJLEDNING

EN

Introduction 7

Information property 7
Safety messages 7
General warnings 7
Service and warranty 7
Description 8
Components 8
Breakdown of code key of main unit (rear of unit) 8
Breakdown of code key of compatible accessory modules (rear of module) 9
Breakdown of code key of pre-assembled WM20 (rear of main unit) 9
Possible configurations 10

Description of main unit 11

Main unit - front 11
Main unit - rear 11
Main unit - accessories 12
Measurement menu display 12
Settings and reset menu display 12
Information menu display 13
Information and warnings 13

Description of accessory modules 14

Digital output modules 14
Communication modules 14

EN

Use: Menu description 15

Measurement menu 15
List of meters 15
List of measurement pages 15
Settings menu 19
Default values of alarm parameters 27
Default values of digital output parameters 27
Information menu 27
Reset menu 29

Use: how to work 30

Navigating the menus 30
Common operations 30
Specific operations 31
Setting a parameter 32
Running a pulse transmission test 32
Resetting maximum and average values 33
Resetting total energy meters 34
Identifying the variable in alarm status 35
Troubleshooting 35

Essential information 39

Numerical parameters 39
Address parameters 40
Alarm settings 41
Filter settings 42
Configuration mode 43
Enabling the accessory modules 44

Configuring digital output modules 45

Maintenance and disposal 46

Cleaning 46
Responsibility for disposal 46

Common specifications 47

General features 47
Input and output insulation 48
Environmental specifications 48

Main unit specifications 49

General features 49
Electrical specifications 50
Measurement accuracy 52
Power supply 53
LED 54

Digital output module specifications 55

General features 55
Static output module (M O O2) 55
Relay output module (M O R2) 56

Communication module overview 56

General features 56
M C 485232 module 58
M C ETH module 59
M C BAC IP module 59

M C BAC MS module..... 60
M C PB module..... 61

Conformity 62

Firmware revision 63

Download 63

FIGURES 381

WM20 - Instruction manual

Power analyzer for three-phase systems

EN

Introduction

Information property

CARLO GAVAZZI Controls SpA reserves the right to apply modifications or make improvements to the relative documentation without the obligation of advance notice.

Safety messages

The following section describes the warnings related to user and device safety included in this document:

***NOTICE**: indicates obligations that if not observed may lead to damage to the device.*

General warnings

THIS manual is an integral part of the product. It should be consulted for all situations related to installation and use. It must be kept in good condition and in a clean location accessible to all operators.

***NOTICE**: no person is authorized to open the analyzer. This operation is reserved exclusively for CARLO GAVAZZI technical service personnel.*

Service and warranty

In the event of malfunction, fault, requests for information or to purchase accessory modules, contact the CARLO GAVAZZI branch or distributor in your country.

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WM20

Description

WM20 is a modular power analyzer for single, two and three-phase systems.
It is made up of a maximum of three components: main unit that displays measurements on the LCD display with management of two alarms, and two accessory modules, one with digital outputs and the other for communication. The digital output module associates alarms with static or relay outputs and/or transmits pulses proportional to energy consumption. The communication module lets you configure the analyzer and transmit data using a different communication protocol according to the version.

Components

The WM20 is made up of the following components:

Module	Description
WM20	Main unit, measures and displays main electrical variables. With LCD display and touch keypad, it lets you set measurementparameters, configureaccessory modules and manageup to two alarms.
Digital outputs	Accessory module with two digital outputs. Expands main unit capacity, specifically allowing you to: • transmit pulses proportional to energy consumption • control digital outputs (static or relay according to the module)
Communication	Accessory module that lets you transmit data to other systems or configure the analyzer from remote

Breakdown of code key of main unit (rear of unit)

WM20	**AVx**	**3**	**a**

Model	**AV4:** From 380 to 690 V L-L ac, 1(2) A, connection via CT **AV5:** From 380 to 690 V L-L ac, 5(6) A, connection via CT **AV6:** From 100 to 230 V L-L ac, 5(6) A, connection via CT **AV7:** From 100 to 230 V L-L ac, 1(2) A, connection via CT	System: • balanced and non-balanced three-phase with 3 or 4 wires • Two-phase (3-wire) • Single-phase (2-wire)	**H:** auxiliary power supply from 100 to 240 V ac/dc **L:** auxiliary power supply from 24 to 48 V ac/dc

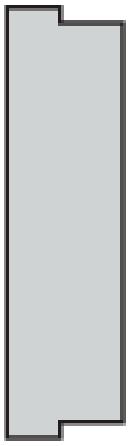
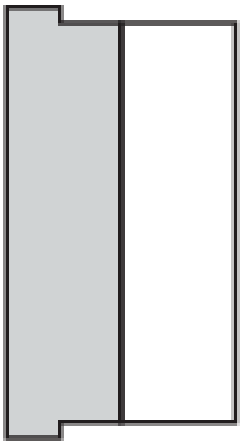
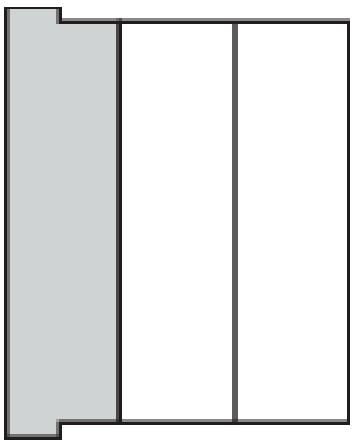
Breakdown of code key of compatible accessory modules (rear of module)

Code key	Type	Module description
M O O2	Digital outputs	Double static output
M O R2		Double relay output
M C 485232	Communication	Modbus RTU communication on RS485/RS232
M C ETH		Modbus TCP/IP communication on Ethernet
M C BAC IP		BACnet IP communication on Ethernet
M C BAC MS		BACnet MS/TP communication on RS485
M C PB		Profibus DP V0 communication on RS485

Breakdown of code key of pre-assembled WM20 (rear of main unit)

WM20 AVx 3a	**aa**	**aa**	**XX**

Same as code key of main unit, see "Key to code key of the main unit (rear of unit)" on page 8	Output type: **XX**: none **O2**: double static output **R2**: double relay output	Communication type: **XX**: none **S1**: RTU Modbus communication on RS485/RS232 **E2**: TCP/IP Modbus communication on Ethernet **B1**: BACnet IP communication on Ethernet **B3**: BACnet MS/TP communication on RS485 **P1**: Profibus DP V0 on RS485	No option included

Possible configurations		
WM20 only	**WM20 + 1 module**	**WM20 + 2 modules**
		

***NOTICE**: maximum 1 module per type. In the configuration with 2 modules, the communication module is installed last.*

Description of main unit

Main unit - front		
Fig. 1	**Area**	**Description**
	A	Optical port and plastic support for OptoProg (CARLO GAVAZZI) connection
	B	Backlit LCD display
	C	LED that blinks with frequency proportional to active energy consumption, see "LED" on page 54
	D	Touch keypad

Main unit - rear		
Fig. 2	**Area**	Description
	A	Detachable power supply terminals
	B	Detachable current input terminals
	C	Detachable voltage input terminals
	D	Rotary selector to lock configuration: position **1**: configuration via keypad or communication enabled (icon on display) position **7**: configuration via keypad or communication locked (icon on display)
	E	Local bus port for accessory modules
	F	Power supply status LED, see "LED" on page 54

Main unit - accessories		
Fig. 3	**Area**	**Description**
	A	Sealable terminal caps
	B	Lateral brackets

Measurement menu display		
Fig. 4	**Area**	**Description**
	A	Area for energy meters and operating hours with relative unit of measurement, see “List of meters” on page 15. These are displayed independently from the contents displayed in area **C**.
	B	Area for warnings and messages, see “Information and warnings” on page 13
	C	Area for electrical variable measurements and relative units of measurement (x 3 lines), “List of measurement pages” on page 15. These determine the measurement page.

Settings and reset menu display		
Fig. 5	**Area**	**Description**
	A	Page title, see “Settings menu” on page 19 and “Reset menu” on page 29
	B	Page title, see “Settings menu” on page 19 and “Reset menu” on page 29
	C	Current value/option. Blinks when in edit mode.
	D	Possible value/option range

Information menu display

Fig. 6	Area	Description
	A	Page title, see “Information menu” on page 27
	B	Area for warnings and messages, see “Information and warnings” on page 13
	C	Information on current page

Information and warnings

Symbol	Description
	Configuration status: • locked: rotary selector at rear of main unit in position **7** • enabled: rotary selector at rear of main unit in position **1**
	Communication status (reception/transmission)
	Voltage connection error (inverted sequence)
	The measurements displayed are total harmonic distortions (THD) expressed as a percentage
	The measurements displayed are average values
	The measurements displayed are maximum values
	Warning of at least one active alarm: • permanent: on the information menu page related to the active alarm and activated digital output where relevant • blinking: on the measurement menu pages

Symbol	Description
	Feedback after pressing a button

Description of accessory modules

Digital output modules

Fig.7	Area	Description
	A	Main unit fastening pins
	B	Detachable digital output terminals
	C	Local bus port for communication module
	D	Local bus port for main unit connection

Communication modules

NOTE: *the image refers to the M C BAC MS module.*

Fig.8	Area	Description
	A	Communication port area ***NOTE:*** *the communication ports depend on the communication module, see "Communication module overview" on page 56.*
	B	Main unit fastening pins
	C	Communication status LED (M C 485232, M C BAC MS, M C PB), see "Communication module overview" on page 42.
	D	Local bus port for main unit or communication module connection

Use: Menu description

Measurement menu

The measurement menu contains all pages used to display meters and other electrical variables.

List of meters

A list of the meters displayed is provided below:

- **kWh** Total imported active energy
- **kvarh** Total imported reactive energy
- **kWh** -- Total exported active energy
- **kvarh** -- Total exported reactive energy
- **h** Load operating hours with current absorption exceeding the set threshold, see “Settings menu” on page 19

NOTE: *the analyzer also manages the partial meters of active and reactive energy, both imported and exported. Partial meters can only be viewed and reset via communication.*

List of measurement pages

NOTE: *the measurements available depend on the type of system set, see “**Settings menu**” on page 19*.

Measurements displayed on page	Page code
$\mathbf{V_{LL\sum}}$ System phase-phase voltage $\mathbf{A_{\sum}}$ System current $\mathbf{W_{\sum}}$ System power	01

Measurements displayed on page	Page code
W_1 Phase 1 active power **W_2** Phase 2 active power **W_3** Phase 3 active power ***NOTE:*** *the button*  *can be used to display the average, the maximum values and the average maximum values.*	02
VA_1 Phase 1 apparent power **VA_2** Phase 2 apparent power **VA_3** Phase 3 apparent power ***NOTE:*** *the button*  *can be used to display the average, the maximum values and the average maximum values.*	03
VAr_1 Phase 1 reactive power **VAr_2** Phase 2 reactive power **VAr_3** Phase 3 reactive power ***NOTE:*** *the button*  *can be used to display the average, the maximum values and the average maximum values.*	04

Measurements displayed on page	Page code
$W_{\sum}$ System active power **$VA_{\sum}$** System apparent power **$VAr_{\sum}$** System reactive power ***NOTE:*** *the button*  *can be used to display the average, the maximum values and the average maximum values.*	05
PF_1 Phase 1 power factor **PF_2** Phase 2 power factor **PF_3** Phase 3 power factor	06
Hz Frequency **$PF_{\sum}$** System power factor **A_N** Neutral current	07
thd% * **A_1** THD of phase 1 current **A_2** THD of phase 2 current **A_3** THD of phase 3 current	08
thd% * **V_1** THD of phase 1 voltage **V_2** THD of phase 2 voltage **V_3** THD of phase 3 voltage	09

Measurements displayed on page	Page code
thd% * **V_{12}** THD of phase 1-phase2 voltage **V_{23}** THD of phase2-phase3 voltage **V_{31}** THD of phase3-phase1 voltage	10
$V_{LL\sum}$ System phase-phase voltage **$V_{LN\sum}$** System phase-neutral voltage **$A_{\sum}$** System current	11
A_1 Phase 1 current **A_2** Phase 2 current **A_3** Phase 3 current ***NOTE:*** *the button*  *can be used to display the average, the maximum values and the average maximum values.*	12
V_1 Phase 1 voltage **V_2** Phase 2 voltage **V_3** Phase 3 voltage	13
V_{12} Phase 1-phase2 voltage **V_{23}** Phase 2-phase3 voltage **V_{31}** Phase 3-phase1 voltage	14

***NOTE** *: up to 32nd harmonic.*

Settings menu

The settings menus contain all pages used to set parameters of the main unit and accessory modules.

NOTE: *default values are underlined. Presence of the pages depends on the installed accessory modules. For more information on configuration methods, see "Configuration mode" on page 43.*

Page title	Sub-menu title	Description	Values
Password?	**-**	Enter current password	Current password
Change pass	**-**	Change password	Four digits (from 0000 to 9999)
Backlight	**-**	Display backlight time (min)	0: always on From 1 to 255 (2)
Modules	**M O R2** **M O O2** **MC485232** **MCETH** **MCBAC IP** **MCBAC MS** **MCPB**	Module enable	**Yes/No** **Auto:** indicates that the module is automatically recognized by the system, see "Enabling accessory modules" on page 44

Page title	Sub-menu title	Description	Values
System	**-**	System type	**1P**: single-phase system (2-wire)/ **2P**: two-phase system (3-wire)/ **3P**: three-phase system (3-wire)/ **3P.1**: three-phase system (3-wire), balanced load/ **3P.2**: three-phase system (**4-**wire), balanced load/ **3P.n**: three-phase system (**4-**wire)
Ct ratio	**-**	Current transformer ratio (CT)	From 1 to 9999
Pt ratio	**-**	Voltage transformer ratio (VT/PT)	From 1 to 9999
Dmd	**-**	Average power calculation range (min)	From 1 to 30 (15)
Home page	**-**	Measurement page displayed on access to measurement menu and after 120 seconds of disuse	0: measurement pages displayed in sequence with an interval of 5 s From 1 to 14 To check the page codes, see “List of measurement pages” on page 15

Page title	Sub-menu title	Description	Values
Filter *	**Filter s**	Interval of filter intervention with respect to full scale (%)	From 0 to 100 (2)
	Filter co	Filter coefficient	From 1 to 256 (2)
Run hour	**–**	Current threshold for calculating load operating hours	From 0.001A to 9999 MA
Optical	**Baudrate**	Baud rate (kbps)	**9.6/ 19.2/ 38.4/ 115.2**
	Parity	Parity	**None/ Odd/ Even**

Page title	Sub-menu title	Description	Values
RS485232	**Address**	Modbus address	From 1 to 247
	Baudrate	Baud rate (kbps)	**9.6/19.2/38.4/115.2**
	Parity	Parity	**None/ Odd/ Even**
Ethernet	**IP add 1/2** **IP add 2/2**	IP address	From 0.0.0.0 to 255.255.255.255 **
	Subnet 1/2 **Subnet 2/2**	Subnet mask	
	Gateway 1/2 **Gateway 2/2**	Gateway	
	TCP IP Prt	TCP/IP port	From 1 to 9999 (502)

Page title	Sub-menu title	Description	Values
BACnet	**Device id**	Instance number	From 0 to 9999 (via keypad) From 0 to 4194302 (via communication) (9999)
	Baudrate	Baud rate (kbps)	**9.6/ 19.2/ 38.4/ 57.6/ 76.8**
	MAC add	MAC address	From 0 to 127 (1)
BACnet *(continues)*	**Device id**	Instance number	From 0 to 9999 (via keypad) From 0 to 4194302 (via communication) (9999)
	FD Enable	Foreign Device enable	**Yes/ No**
BACnet	**BBMD 1/2** **BBMD 2/2**	BBMD address	From 0.0.0.0 to 255.255.255.255
	UDP Port	UDP port	From 0001 to FFFF (BAC0)
	Time out s	WM20 time-to-live recording as Foreign Device on specified BBMD server (s)	From 1 to 60 (10)

Page title	Sub-menu title	Description	Values
Profibus	**Address**	Address	From 2 to 125 (126)
Virt al 1 ***	**Enable**	Enable of alarm 1	**Yes/ No**
	Variables	Variable controlled by the alarm	All variables controlled by the system except for meters and maximum power values.
	Set 1	Alarm activation threshold	The unit of measurement and range of admissible values depend on the controlled variable.
	Set 2	Alarm activation threshold	
Virt al 1 ***	**On delay**	Alarm activation delay (s)	From 0 to 3600
Virt al 2 ***	**–**	Same pages as sub-menu Virt Al 1, for alarm 2.	-

Page title	Sub-menu title	Description	Values
Dig out 1 ****	**Function**	Function of digital output 1	**Alar/ Remo/ Puls**
	Al link	Associated alarm	**Al 1**: associates alarm 1/ **Al 2**: associates alarm 2
	Al status	Normal output status	**Ne**: normally closed/ **Nd**: normally open
	Pulse type	Type of energy (kWh or kvarh)	**kWh Pos**: imported active energy/ **kvarh Pos**: imported reactive energy/ **kWh Neg**: exported active energy/ **kvarh Neg**: exported reactive energy
	Pulse weig	Weight of pulse (kWh/ kvarh per pulse)	-
Dig out 1 ****	**Out test**	Enable of test re-transmission	**Yes/No**
	Power test	Power value for test	From 0.001 W to 9999 MW
Dig out 2 ****	**–**	Same pages as sub-menu Dig out 1, for digital output 2.	-

Page title	Sub-menu title	Description	Values
Reset	**Reset max**	Resets maximum values	**Yes**: resets values/ **No**: cancels reset
	Reset dmd	Resets average values	
	Res dmd max	Resets average maximum values	
	Energy pos	Resets values of imported active and reactive energy	
	Energy neg	Resets values of exported active and reactive energy	
End	**–**	Return to measurement menu	-

***NOTE** *: for details on the address parameters, see “Address parameters” on page 40.*

***NOTE** **: for details on the filter, see “Filter settings” on page 42.*

***NOTE** ***: for details on the alarm, see “Alarm settings” on page 41. For default values, see “Default values of alarm parameters” on page 27.*

NOTE** *: for details on the digital output, see “Configuring digital output modules” on page 45. For default values, see “Default values of digital output parameters” on page 27.*

Default values of alarm parameters					
Alarm	**Enable**	**Variables**	**Set 1**	**Set 2**	**On delay**
1	No	VL1N	40	40	0
2	No	Wsys	40	40	0

Default values of digital output parameters							
Digital output	**Function**	**AI link**	**AI status**	**Pulse type**	**Pulse weig**	**Out test**	**Power test**
1	Puls	AI 1	Ne	kWh	0.1	No	0.001
2	Alar	AI 2	Ne	kWh	0.1	No	0.001

Information menu

The information menu contains all pages that display information and parameters entered without password protection.

NOTE: *presence of the pages depends on the installed accessory modules.*

Page title	Information displayed
12345678	• Serial number (page title) • Year of manufacture • Firmware revision
Conn *(2 pages)*	• System type (in title) • Current transformer ratio (**Ct**) • Voltage transformer ratio (**Vt**)
Dmd	Interval for average power calculation (min)
Led pulse	Weight of pulse of front LED (kWh/kvarh per pulse)
Run hour	Current threshold for calculating load operating hours (A)

<table>
<tr><th>Page title</th><th colspan="2">Information displayed</th></tr>
<tr><td rowspan="4">Pulse / Alarm / Remote
(2 pages)</td><td colspan="2">• Output function (in title)
• Specific information for output function:</td></tr>
<tr><td>If the function is...</td><td>the information displayed is...</td></tr>
<tr><td>Puls</td><td>• unit of measurement of energy transmitted with pulse
• reference output (out1= output 1, out2 = output 2)
• weight of pulse (kWh/kvarh per pulse)
• type of energy transmitted (imported Pos or exported Neg)</td></tr>
<tr><td>Alarm</td><td>• reference output (out1= output 1, out2 = output 2)
• if the alarm is active, the symbol  appears permanently on display</td></tr>
<tr><td>Remote</td><td>• reference output (out1= output 1, out2 = output 2)
• output status (ON = closed, OFF = open)</td></tr>
</table>

Page title	Information displayed
AI 1 *(2 pages)*	• Data of alarm 1 (in title): • **None:** alarm 1 disabled • **No out**: alarm 1 enabled but not associated with a digital output • **Out 1.NE**: alarm associated with digital output 1, normally closed • **Out 1.ND**: alarm associated with digital output 1, normally open • **Out 2.NE**: alarm associated with digital output 2, normally closed • **Out 2.ND**: alarm associated with digital output 2, normally open • Alarm activation threshold (**Set1**) • Alarm deactivation threshold (**Set2**) • Controlled variable • If the alarm is active, the symbol  appears permanently on display
AI 2 *(2 pages)*	Same information as pages **AI 1**, for alarm 2
Optical	Baud rate of optical port
Com port *(2 pages)*	Modbus address Baud rate of RS485/RS232 port
IP add ½ **IP add 2/2**	IP address

Reset menu

The reset menu is made up of two pages used to reset the maximum and average power values respectively (active, apparent and reactive).

Use: how to work

Navigating the menus		
Fig.9	**Section**	**Function**
	A	Measurement menu
	B	Information menu
	C	Reset menu
	D	Settings menu

The measurement menu is always displayed on start-up. This menu gives access to the information, reset and parameters menus.
On access to the measurement menu or after 120 seconds of disuse, the measurement page is then displayed as set in the **Home Page**.
A password is requested on access to the settings menu and confirmation on exit.

Common operations	
Operation	**Button**
Confirm operation	
View the previous/next page	

Operation	Button
Cancel operation	

Specific operations

Measurement menu

Operation	Button
View the next meter	
View the measurement page set in the **Home page**	
View the value **dmd** and then **Max** (if available) and lastly the new instant value	

Settings menu

Operation	Button
Enter the sub-menu/Modify parameter of the page on display	

Operation	Button
Increase a parameter value / View the next value option/ Modify the value in the fields **dP** and **Sign***	
Decrease a parameter value/ View the previous value option/ Modify the value in the fields **dP** and **Sign***	
Move between value fields *	
Exit the sub-menu and view relative title page	

***NOTE** *: for details, see "Numerical Parameters" on page 39 and "Address parameters" on page 40.*

Setting a parameter

Fig.10 Procedure example: how to set **Run hour**=14000.

***NOTE:** the procedure requires entry of the multiplier **K**. The initial status of the procedure is the **Run hour** page of the settings menu.*

Running a pulse transmission test

If the digital output is configured to transmit energy consumption via pulses, a test transmission can be run.

1. In the settings menu, enter the sub-menu **Dig out 1** or **Dig out 2** (depending on the digital output concerned)
2. Ensure that the output is configured for pulse transmission (**Function = Puls**)
3. Define the pulse weight (**Pulse weig**) and test power (**Power test**)
4. To start the test, set **Yes** in the **Out test** page: the test is then run immediately.
5. To terminate the test, set **No** in the **Out test** page.

NOTE: *during the test, another power value may be set if required. On confirmation of the value, the test transmission is then updated.*

Resetting maximum and average values

The analyzer calculates the maximum, average and average maximum value for measurements of active, apparent and reactive power and current. These values can be reset in two ways, with or without password access.

Resetting with password access, from the settings menu

1. From any page in the measurement menu, enter the settings menu: the **Password?** page is then displayed.
2. Enter the password and confirm.
3. Scroll through the pages to display the **Reset** page and enter the sub-menu: the **Reset max** page is then displayed.
4. Modify the parameter and select the option **YES**.
5. Confirm the operation: the message “Saving” is displayed and the maximum values of active, apparent and reactive energy are reset.
6. View the next page (**Reset dmd**).
7. Modify the parameter and select the option **YES**.
8. Confirm the operation: the message “Saving” is displayed and all the average values are reset.
9. View the next page (**Res dmd max**).

10. Modify the parameter and select the option **YES**.
11. Confirm the operation: the message “Saving” is displayed and all the average maximum values are reset.

Resetting without password access, from the reset menu

1. From any page in the measurement menu, enter the reset menu: the **Reset dmd ?** page is then displayed
2. Select the option **YES**.
3. Confirm the operation: the message “Resetting” is displayed and then the page **Reset max?**.
4. Select the option **YES**.
5. Confirm the operation: the message “Resetting” is displayed and then the page **Res dmd max?**.
6. Select the option **YES**.
7. Confirm the operation: the message “Resetting” is displayed and then the measurements page set in the **Home page**.

Resetting total energy meters

The analyzer measures the active and reactive energy, both imported and exported. The total meters are displayed and can be reset directly via the main unit, while partial meters are via communication.
The following section outlines the procedure to simultaneously reset the total meters for active and reactive energy imported and/or exported.

1. From any page in the measurement menu, enter the settings menu: the **Password?** page is then displayed.
2. Enter the password and confirm.
3. Scroll through the pages to display the **Reset** page and enter the sub-menu: the **Reset max** page is then displayed.
4. Scroll through the pages to display the page **Energy pos**.

5. Modify the parameter and select the option **YES**.
6. Confirm the operation: the message “Saving” is displayed and the energy meters for imported active and reactive energy are reset.
7. View the next page (**Energy neg**).
8. Modify the parameter and select the option **YES**.
9. Confirm the operation: the message “Saving” is displayed and the energy meters for exported active and reactive energy are reset.

Identifying the variable in alarm status

If at least one alarm is present, the symbol  blinks on display on the measurement page. To identify which variable is in the alarm status, enter the information menu, on page Al **1/Al 2** and/or **Alarm** and if the relative alarm is active, the symbol  remains permanently lit. For a description of the alarms see “Information menu” on page 27.

NOTE: *the alarm trips even if the measurement of the variable is in the status EEEE, see “Troubleshooting” on page 35.*

Troubleshooting

NOTE: *In the event of malfunction, fault, contact the CARLO GAVAZZI branch or distributor in your country.*

Measurement

Problem	Cause	Possible solution
The text ‘EEEE’ appears in place of a measurement	The settings of CT and/or VT are not correct and therefore the measurement exceeds the maximum admissible value, or is the result of calculations with at least one measurement in the status EEEE	Modify the parameters CT and VT
	The analyzer is not used within the expected range and therefore the measurement exceeds the maximum admissible value, or is the result of calculations with at least one measurement in the status EEEE	Uninstall the analyzer
	The analyzer has just been switched on and the set interval for calculating the average power values (default: 15 min) has not yet elapsed	Wait. To modify the interval, go to the page **Dmd** in the settings menu, see “Settings menu” on page 19
‘Err’ appears while the parameter is being set	The value entered is out of range	Check the range of admissible values on the relative page displayed or see “Settings menu” on page 19 and re-enter the value.

Problem	Cause	Possible solution
The values displayed are not as expected	Electrical connections are incorrect	Check the connections
	The CT and/or VT settings are incorrect	Check the parameters set in the settings menu, see “Settings menu” on page 19

Alarms

Problem	Cause	Possible solution
An alarm has tripped but the measurement has not exceeded the threshold	The value used to calculate the alarm variable is in the status EEEE	Ensure that the settings of parameters CT and VT are correct
	The analyzer is not used within the expected measurement range	Uninstall the analyzer
The alarm is not activated or deactivated as expected	The alarm settings are incorrect	Check the parameters set in the settings menu, see “Settings menu” on page 19

Communication

Problem	Cause	Possible solution
Communication not possible with analyzer	The communication module settings are incorrect	Check the parameters in the settings menu, see “Settings menu” on page 19
	The communication module connections are incorrect	Check the connections
	Communication settings (PLC or third party software) are incorrect	Check communication with the UCS software

Settings

Problem	Cause	Possible solution
It is impossible to change the settings (via keypad)	The password entered is incorrect	Enter the correct password
	The rotary selector at rear of main unit is in position **7**	Set the selector to position **1**
It is impossible to change the settings (via UCS software)	The rotary selector at rear of main unit is in position **7**	Set the selector to position **1**
	The user is in the settings menu	Exit the settings menu by pressing  for 1.5 s

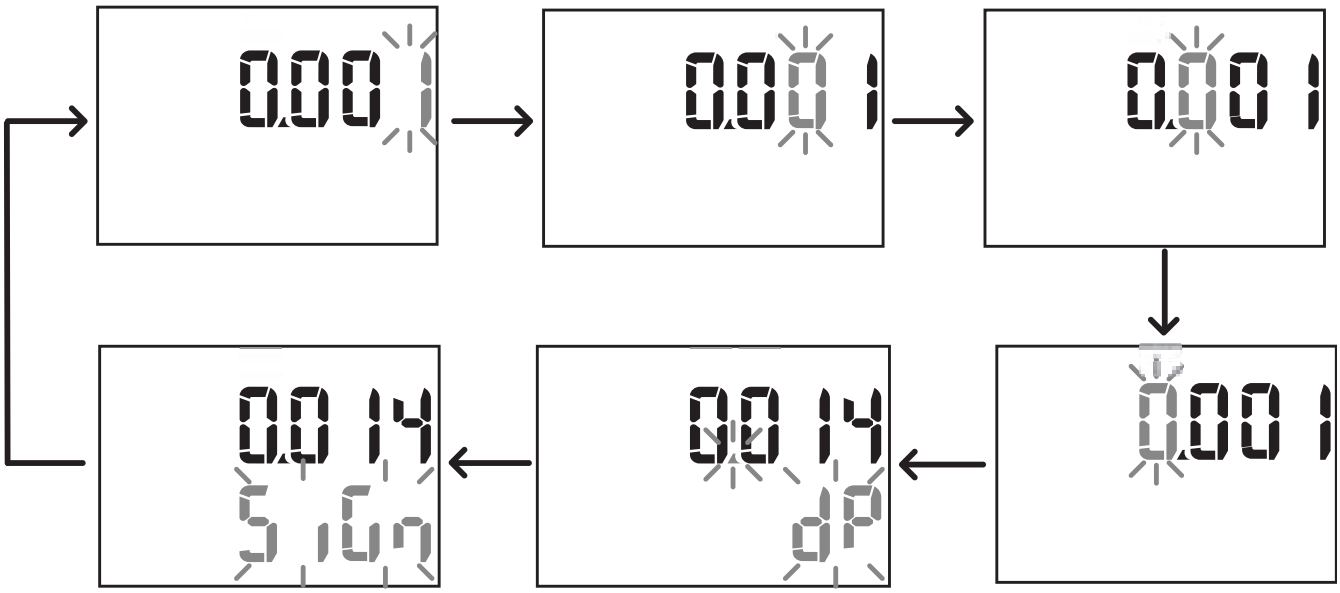
Essential information

Numerical parameters

Order of positions

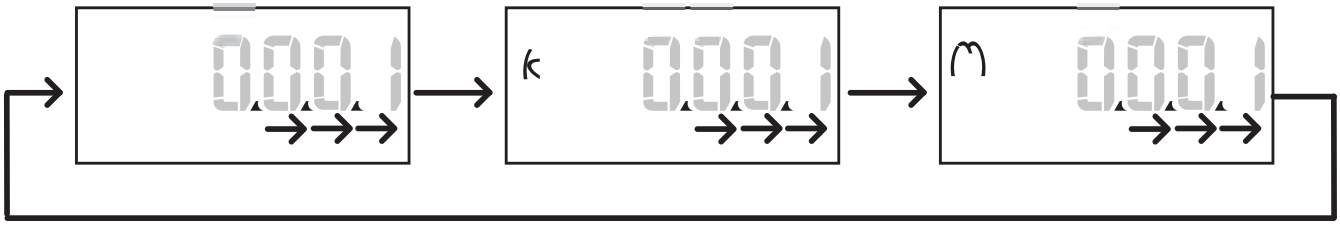
The value of a numerical parameter is made up of six positions: four digits, **dP** and **Sign**.

The button  is used to select the positions in the following order:



Position dP

In the position **dP** (decimal point) the buttons ▲ and ▼ can be used to enable movement of the decimal point and set a multiplier (**k** x 1000, **M** x 1000000) in the following order:



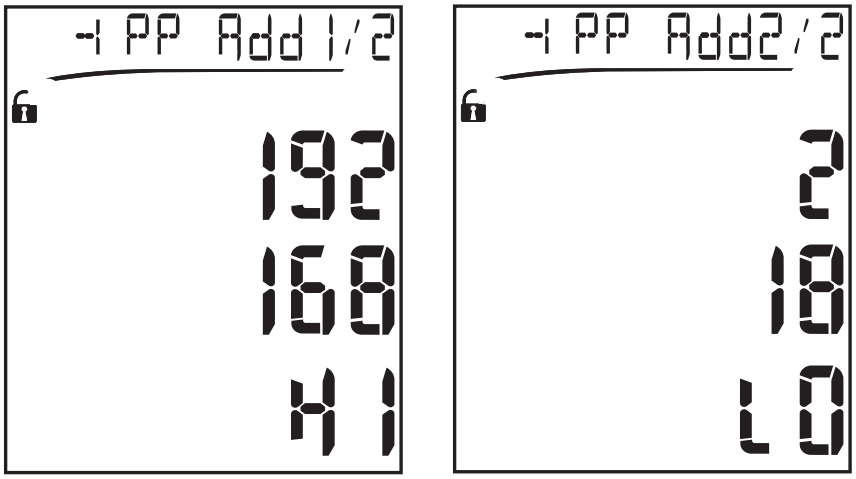
Sign position

NOTE: *the Sign position is only available for the parameters* ***Set 1*** *and* ***Set 2*** *in the sub-menus* **Virt AI 1** *and* **Virt AI 2***.

The value sign can be set in the position **Sign**. The value is positive by default.

Address parameters

The address parameters are divided into two parts: first part (**HI**) on page **1/2** and second part (**LO**) on page **2/2**. For example the pages **IP add 1/2** and **IP add 2/2** with the address set as 192.168.2.18 will be as follows:



The order of digit selection is from right to left on the firstline and then on the second line.

Alarm settings

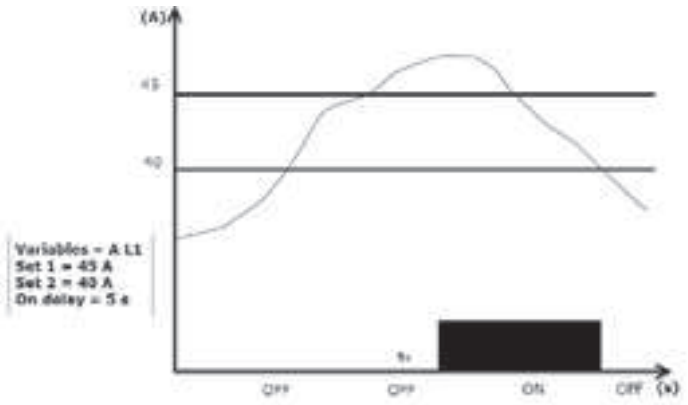
WM20 manages two alarms. The following is defined for each alarm:

- variable to be controlled (**Variables**), selectable from all measured electrical variables excluding the maximum power values
- alarm activation threshold (**Set1**)
- alarm activation delay (**On delay**)
- alarm deactivation threshold (**Set 2**)

To set the alarms, see “Settings menu” on page 19, to check the status of set alarms, see “Information menu” on page 27.

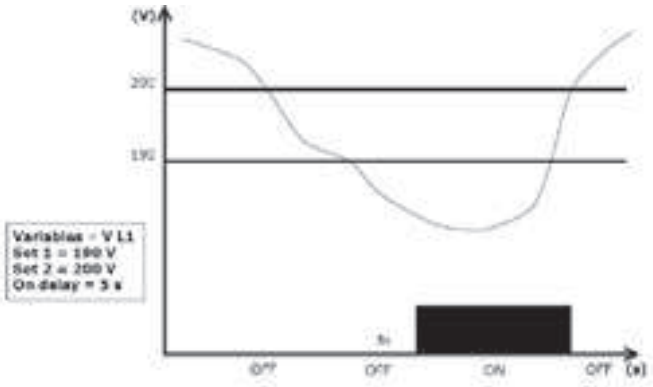
Up alarm (Set 1 > Set 2)

If **Set 1** > **Set 2**, the alarm is activated when the controlled variable exceeds the value of **Set 1** for a time equal to **On delay** and is deactivated when it falls below **Set 2**.



Down alarm (Set 1 < Set 2)

If **Set 1** < **Set 2**, the alarm is activated when the controlled variable falls below the value of **Set 1** for a time equal to **On delay** and is deactivated when it rises above **Set 2**.



Filter settings

Operation

A filter can be set to stabilize the display of measurements (both on display and transmitted to external systems).

NOTE: *the filter is applied to all measurements in read-only mode and for data transmission, without influencing calculations of energy consumption or intervention of alarms. Two parameters are envisaged*:

- **Filter s:** filter intervention range. Value between 0 and 100, expressed asa percentage of the full scale of the variable.
- **Filter co:** filter coefficient. Value between 1 and 255, where 255 is the coefficient that enables maximum stability of the measurements.

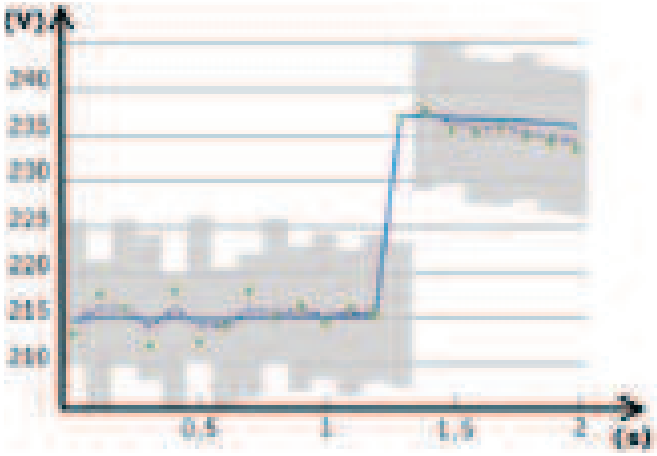
If the measured value is outside the range defined by the parameter **Filter s** the filter is not applied.
To set a filter, see “Settings menu” on page 19.

Example
The following section outlines the behavior of the filter for measuring voltage in the version

AV5 with:

- **Filter s** = 2
- **Filter co** = 2 or 10

On the version AV5 the full scale is 400 V, therefore with **Filter s** = 2 the intervention range is +/- 8 V (2% of 400 V). It should also be noted that the greater the value of **Filter co**, the greater stability is obtained in measurements.



Element	Description
	Intervention range with Filter s = 2
	Measured value
	Measurements displayed with Filter co = 2
	Measurements displayed with Filter co = 10

Configuration mode

Configuration of the accessory modules and settings of the main unit parameters can be performed before or after installation, but only when the icon is displayed.
Parameters for the accessory modules can only be set when the modules are connected

to the main unit.
The parameters can be set in two ways:

- via the keypad of the main unit, see “Settings menu” on page 19
- using the UCS configuration software via the communication module with Modbus protocol, see “Communication module overview” on page 56 or front optical port via OptoProg (see relative documentation).

Enabling the accessory modules

The accessory modules must be enabled. The enable command can be automatic or manual.

Enable	Description	Modules
Automatic	The module is automatically detected and enabled	• **M C ETH** • **M C BAC IP** • **MC BAC MS** • **M C PB**
Manual	The module must be enabled via the settings menu, see “Settings menu” on page 19	• **M O R2** • **M O O2** • **M C 485232 ***

***NOTE** *: module enabled only if no other communication module has been installed.*

Configuring digital output modules

The digital outputs of modules M O R2 and M O O2 canbe assigned with three different functions:

Function	Description	Parameters
Alar	Alarm: output associated with an alarm and directly managed by WM20	• Alarm associated (**Al link**) * • Status of the digital output in non-alarm status (**Al status**)
Remo	Remote control: output status managed via communication	-
Puls	Pulse: pulse transmission output on active or reactive, imported or exported energy consumption. A pulse transmission test can be run.	• Type of energy (**Pulse type**) • Pulse weight (**Pulse weig**) • Test transmission enable (**Out test**) • Power value for test (**Power test**)

***NOTE** *: the alarms must be set in pages Virt al 1 and Virt al 2.*

To set alarm parameters, see “Settings menu” on page 19.

EN

Maintenance and disposal

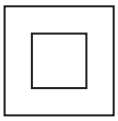
Cleaning

Use a slightly dampened cloth to clean the display.
Do not use abrasives or solvents.

Responsibility for disposal

The product must be disposed of at the relative recycling centres specified by the government or local public authorities. Correct disposal and recycling will contribute to the prevention of potentially harmful consequences to the environment and persons.

Common specifications

General features	
Material	Front: ABS, self-extinguishing V-0 (UL 94) Back and accessory modules: PA66, self-extinguishing V-0 (UL 94)
Protection degree	Front: IP65 NEMA 4x NEMA 12 Terminals: IP20
Terminals	Type: detachable Section: max. 2.5 mm2 Torque: 0.5 Nm
Overvoltage category	Cat. III
Pollution degree	2
Noise rejection (CMRR)	100 dB, from 42 to 62 Hz
Insulation	 double electrical insulation on areas accessible to the user. For insulation between inputs and outputs, see "Input and output insulation" on page 48.

Input and output insulation

NOTE: *test conditions: 4 kV rms ac for one minute.*

Type	Power supply (H or L) [kV]	Measurement inputs [kV]	Digital outputs [kV]	Serial port [kV]	Ethernet port [kV]
Power supply (H or L)	-	4	4	4	4
Measurement inputs	4	-	4	4	4
Digital outputs	4	4	-	4	4
Serial port	4	4	4	-	NP
Ethernet port	4	4	4	NP	-

Breakdown

- **NA** : combination not possible
- **4:** 4 kV rms insulation (EN 61010-1, IEC 60664-1, overvoltage category III, pollution degree 2, double insulation on system with maximum 300 Vrms to ground)

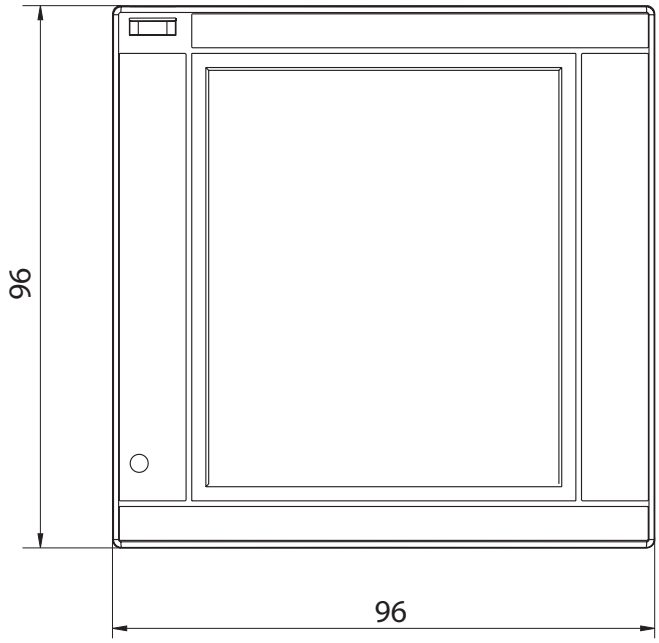
Environmental specifications

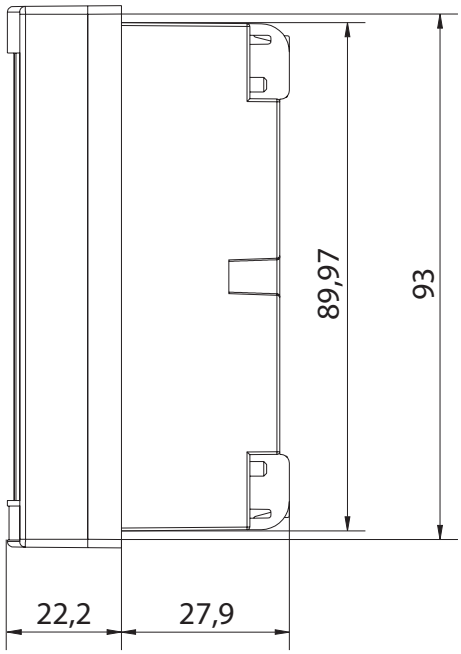
Operating temperature	From -25 to +55 °C/from -13 to +131 °F
Storage temperature	From -30 to +70 °C/from –22 to +158 °F

NOTE: *R.H. < 90 % non-condensing @ 40 °C / 104 °F.*

Main unit specifications

General features	
Mounting	Panel mounting
Dimensions (mm)	See figure





Electrical specifications

Voltage inputs

	AV4	AV5	AV6	AV7
Voltage connection	Direct or via VT/PT			
VT/PT transformation ratio	From 1 to 9999			
Rated voltage L-N (from Un min to Un max)	From 220 to 400 V	From 220 to 400 V	From 57.7 to 133 V	From 57.7 to 133 V
Rated voltage L-L (from Un min to Un max)	From 380 to 690 V	From 380 to 690 V	From 100 to 230 V*	From 100 to 230 V*
Voltage tolerance	-20%, + 15%			
Overload	Continuous: 1.2 Un max For 500 ms: 2 Un max			
Input impedance	>1.6 MΩ			
Frequency	From 40 to 440 Hz			

NOTE*: in case of two-phase or wild leg system: rated voltage L-L up to 240 V

Current inputs

	AV4	AV5	AV6	AV7
Current connection	Via CT			
CT transformation ratio	From 1 to 9999			
Rated current (In)	1 A	5 A	5 A	1 A
Minimum current (Imin)	0.01 A	0.05 A	0.05 A	0.01 A
Maximum current (Imax)	2 A	6 A	6 A	2 A
Start-up current (Ist)	1 mA	5 mA	5 mA	1 mA
Overload	Continuous: Imax For 500 ms: 20 Imax			
Input impedance	< 0.2 VA			
Maximum CT x VT ratio	9999 x 9999			

Measurement accuracy	
Current	
From 0.05 In to Imax	±(0.5% rdg + 2dgt)
From 0.01 In to 0.05 In	±(0.2% rdg + 2dgt)
Phase-phase voltage	
From Un min -20% to Un max + 15%	±(0.5% rdg +1dgt)
Phase-neutral voltage	
From Un min -20% to Un max + 15%	±(0.2% rdg +1dgt)
Active and apparent power	
From 0.05 In to Imax (PF=0.5L, 1, 0.8C)	±(0.5% rdg +1dgt)
From 0.01 In to 0.05 In (PF=1)	±(1% rdg +1dgt)
Reactive power	
From 0.1 In to Imax (sinϕ=0.5L, 0.5C) From 0.05 In to Imax (sinϕ=1)	±(1% rdg + 1 dgt)
From 0.05 In to 0.1 In (sinϕ=0.5L, 0.5C) From 0.02 In to 0.05 In (PF=1)	±(1.5% rdg + 1 dgt)

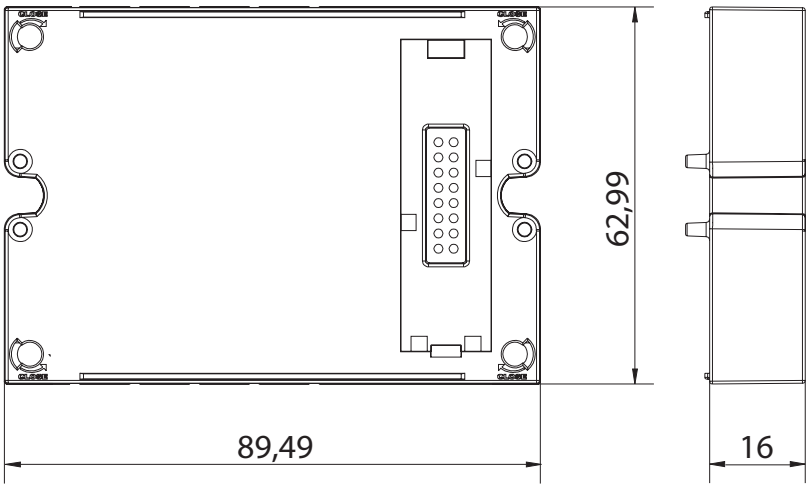
Power factor	±[0.001+0.5%(1 – PF rdg)]
Active energy	Class 0.5S (EN62053-22, ANSI C12.20)
Reactive energy	Class 2 (EN62053-23, ANSI C12.1)
THD	±1%
Frequency	
From 40 to 65 Hz	±(0.02% rdg + 1 dgt)
From 65 to 340 Hz	±(0.05% rdg + 1 dgt)
From 340 to 440 Hz	±(0.1% rdg + 1 dgt)

Power supply		
	H	**L**
Auxiliary power supply	From 100 to 240 V ac/dc ± 10%	From 24 to 48 V ac/dc ± 15%
Consumption	10 W, 20 VA	

<table>
<tr><th colspan="3">LED</th></tr>
<tr><td rowspan="8">Front</td><td colspan="2">Red. Weight: proportional to energy consumption and depending on the CT and VT/PT ratio product (16 Hz maximum frequency):</td></tr>
<tr><td>Weight (kWh per pulse)</td><td>CT*VT/PT</td></tr>
<tr><td>0.001</td><td>< 7</td></tr>
<tr><td>0.01</td><td>From 7.1 to 70</td></tr>
<tr><td>0.1</td><td>From 70.1 to 700</td></tr>
<tr><td>1</td><td>From 700.1 to 7000</td></tr>
<tr><td>10</td><td>From 7001 to 70 k</td></tr>
<tr><td>100</td><td>> 70.01 k</td></tr>
<tr><td colspan="2">The page Led pulse in the information menu displays the weight of the pulse.</td></tr>
<tr><td>Back</td><td colspan="2">Green. Lit when WM20 is powered.</td></tr>
</table>

Digital output module specifications

General features	
Mounting	On main unit
Dimensions (mm)	See figure
Power supply	Self power supply via local bus

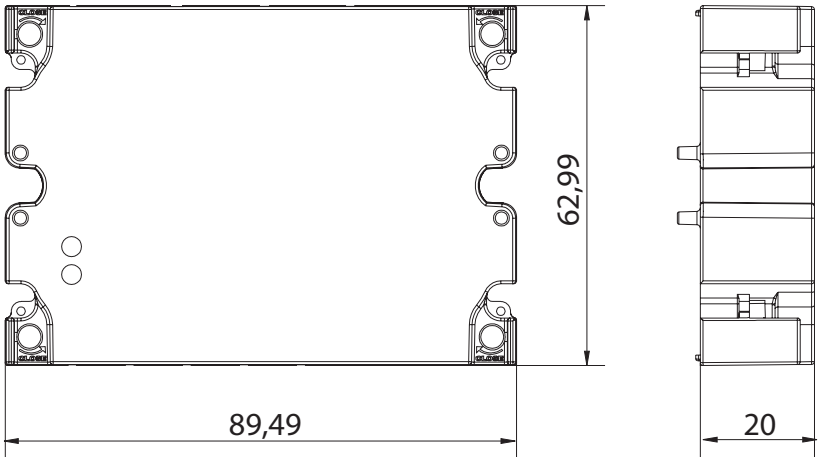


Static output module (M O O2)	
Maximum number of outputs	2
Type	Opto-mosfet
Features	V_{ON}: 2.5 V dc, 100 mA max V_{OFF}: 42 V dc max
Configuration parameters	Settings menu, sub-menus **Dig out 1** and **Dig out 2**, see “Settings menu” on page 19
Configuration mode	Via keypad or UCS software

Relay output module (M O R2)	
Maximum number of outputs	2
Type	SPDT relay
Features	AC1: 5 A @ 250 V ac AC15: 1 A @250 V ac
Configuration parameters	Settings menu, sub-menus **Dig out 1** and **Dig out 2**, see “Settings menu” on page 19
Configuration mode	Via keypad or UCS software

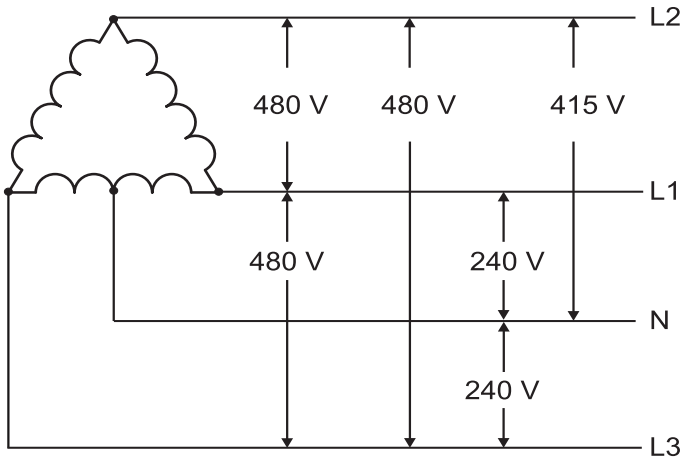
Communication module overview

General features	
Mounting	On main unit (with or without digital output module)
Dimensions (mm)	See figure
Power supply	Self power supply via local bus

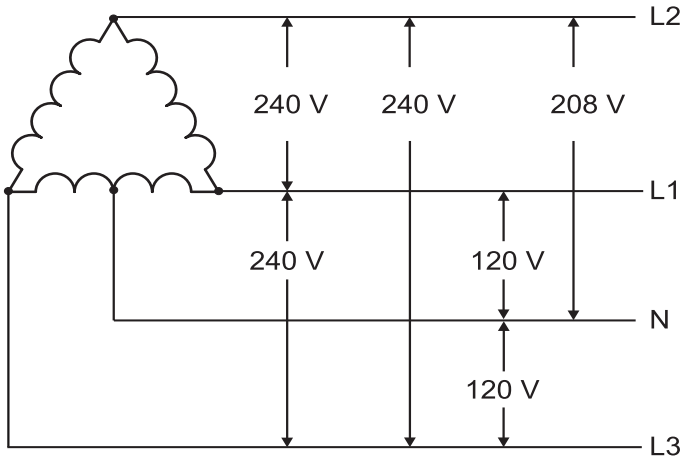


NOTE: in case of wild leg system (three-phase, four-wire delta) one of the line-to-neutral voltage can exceed the rated range in the table up to:

• 415 V (AV4, AV5)



• 208 V (AV6, AV7)



M C 485232 module

RS485 port

Protocol	Modbus RTU
Devices on the same bus	Max 160 (1/5 unit load)
Communication type	Multidrop, bidirectional
Connection type	2 wires, maximum distance 1000 m
Configuration parameters	Settings menu, sub-menu **RS485232**, see “Settings menu” on page 19
Configuration mode	Via keypad or UCS software

RS232 port

Protocol	Modbus RTU
Communication type	Two-way
Connection type	3 wires, maximum distance 15 m
Configuration parameters	Settings menu, sub-menu **RS485232**, see “Settings menu” on page 19
Configuration mode	Via keypad or UCS software

NOTE: *the RS485 and RS232 ports are alternative.*

LED

Meaning	Communication status: • Yellow: receiving • Green: transmitting

M C ETH module

Ethernet port

Protocol	Modbus TCP/IP
Client connections	Maximum 5 simultaneously
Connection type	RJ45 connector (10 Base-T, 100 Base-TX), maximum distance 100 m
Configuration parameters	Settings menu, sub-menu **Ethernet**, see “Settings menu” on page 19
Configuration mode	Via keypad or UCS software

M C BAC IP module

Ethernet port

Protocols	BACnet IP (reading) Modbus TCP/IP (reading and configuration)
Client connections	(Modbus only) Maximum 5 simultaneously
Connection type	RJ45 connector (10 Base-T, 100 Base-TX), maximum distance 100 m

Configuration parameters	Settings menu, sub-menus **Ethernet** and **BACnet**, see “Settings menu” on page 19
Configuration mode	Via keypad or UCS software

M C BAC MS module

RS485 port

Protocol	BACnet MS/TP (measurement reading and object description writing)
Communication type	Multidrop, one-way
Connection type	2 wires, maximum distance 1000 m
Supported services	“I-have”, “I-am”, “Who-has”, “Who-is”, “Read-property (multiple)”
Supported objects	Type 2 (analogue value including COV property), type 5 (binary value, for alarm transmission), type 8 (device)
Configuration parameters	Settings menu, sub-menu **BACnet**, see “Settings menu” on page 19
Configuration mode	Via keypad or UCS software

Ethernet port

Protocols	Modbus TCP/IP (configuration)
Client connections	Maximum 5 simultaneously
Connection type	RJ45 connector (10 Base-T, 100 Base-TX), maximum distance 100 m

Configuration parameters	Settings menu, sub-menu **Ethernet**, see “Settings menu” on page 19
Configuration mode	Via keypad or UCS software

LED

Meaning	Communication status: • Yellow: receiving • Green: transmitting

M C PB module

Profibus port

Protocols	Profibus DP V0 slave
Connection type	9-pin D-sub RS485 socket
Configuration parameters	Settings menu, sub-menu **Profibus**, see “Settings menu” on page 19 Other parameters available with the UCS software via serial communication (see relative illustration sheet)
Configuration mode	Via keypad or UCS software

Micro-USB port

Protocols	Modbus RTU
Type	USB 2.0 (USB 3.0 compatible)
Connection type	Micro-USB B
Baud rate	Any (maximum 115.2 kbps)
Address	1

LED

Red	Communication status between module and main unit: • Lit: communication error • Off: communication OK
Green	Communication status between module and Profibus master: • Lit: data exchange in progress • Blinking: communication ready • Off: communication error

Conformity

Directives	• 2014/35/EU (Low Voltage) • 2014/30/EU (Electromagnetic compatibility) • 2011/65/EU (Electric-electronic equipment hazardous substances)
Standards	• Electromagnetic compatibility (EMC) - emissions and immunity: EN62052-11 • Electrical safety: EN61010-1 • Metrology: EN62053-22, EN62053-23 • Pulse outputs: IEC62053-31, DIN43864

Approvals	CE cULus LISTED

Firmware revision

Firmware revision	Option/function
	A max, Admd, A dmd max. W dmd max, VA dmd max, var dmd max. Suitable for Wild leg system installation.

Download

The site www.productselection.net enables users to download:

- UCS software
- datasheets and manual of the WM20 in PDF format
- other files useful for accessory modules

FIGURES

FIGURE

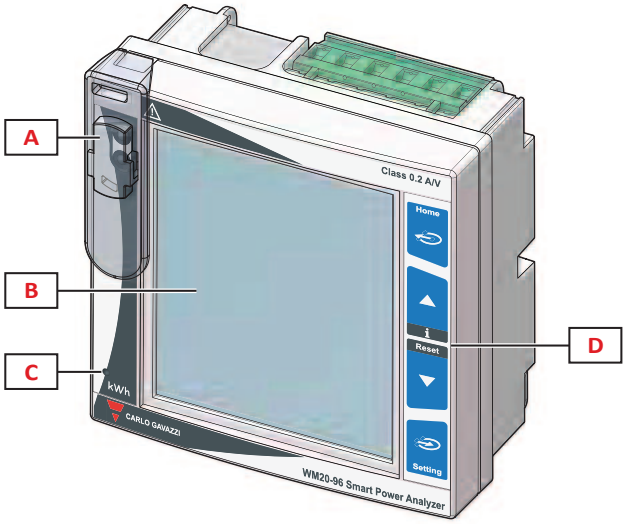
ABBILDUNGEN

FIGURES

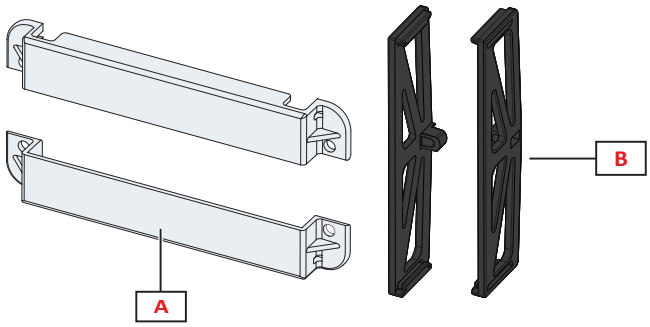
FIGURAS

FIGURER

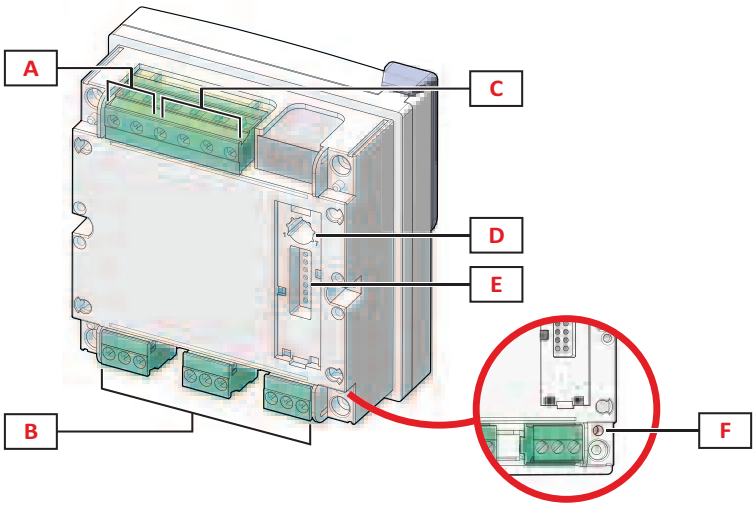
1


A
B
C
D
Class 0.2 A/V
Home
Reset
Setting
kWh
CARLO GAVAZZI
WM20-96 Smart Power Analyzer

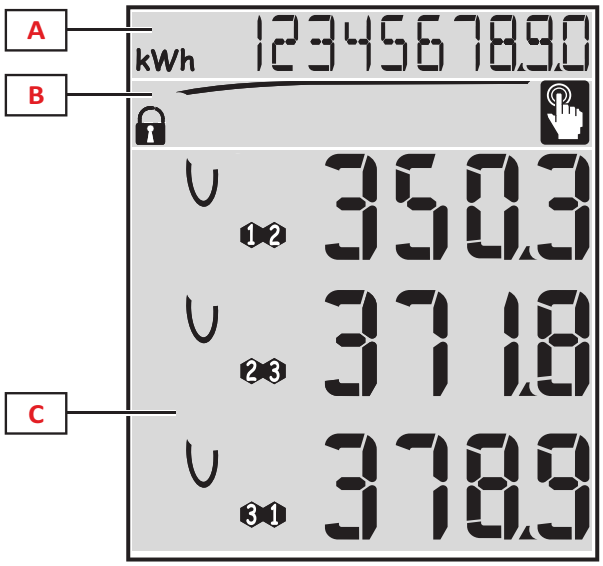
3


A
B

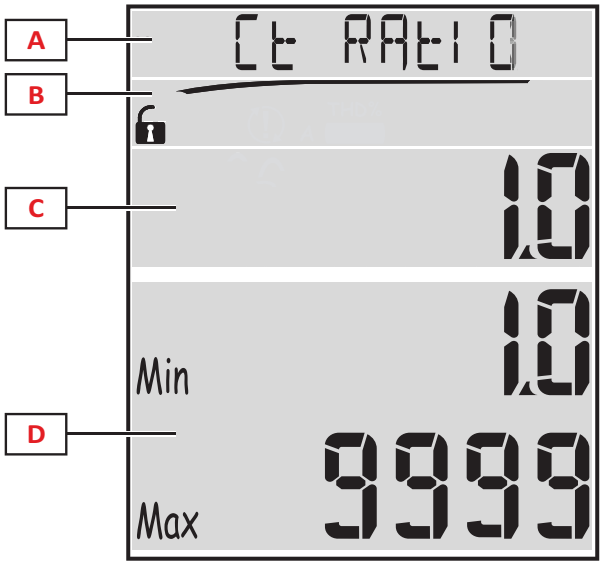
2


A
B
C
D
E
F

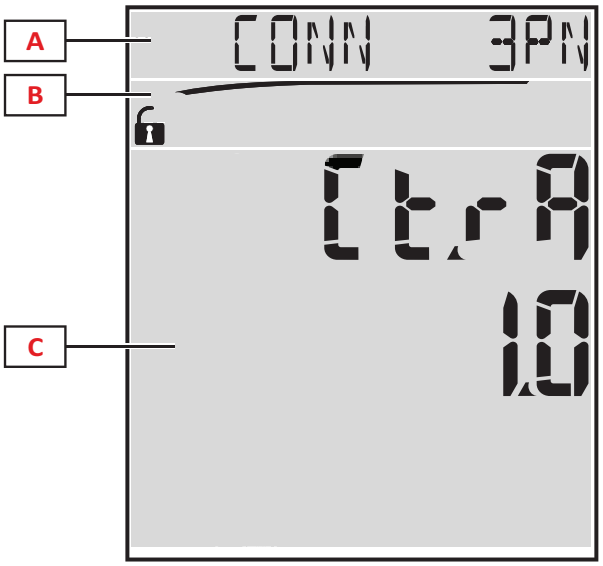
4


A
B
C
kWh
123456789.0
350.3
1 2
371.8
2 3
378.9
3 1

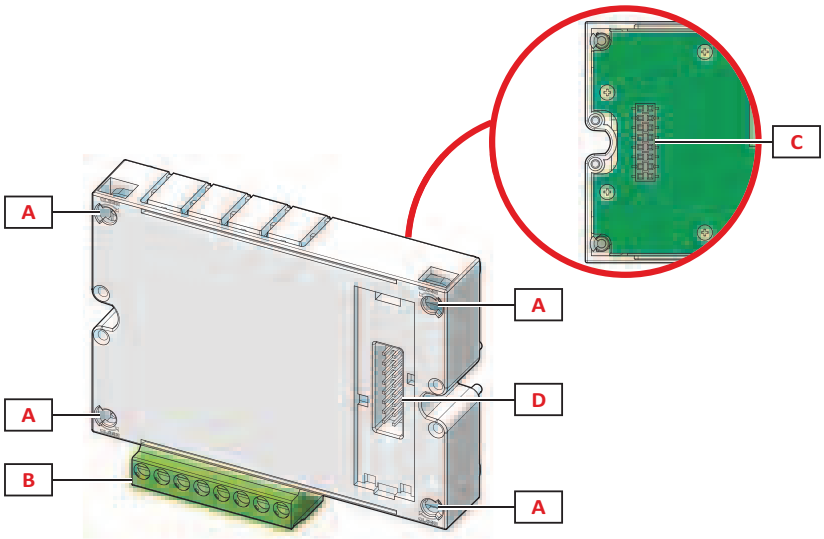
5


A
B
C
D
Ct RAtI O
1.0
Min
1.0
Max
9999

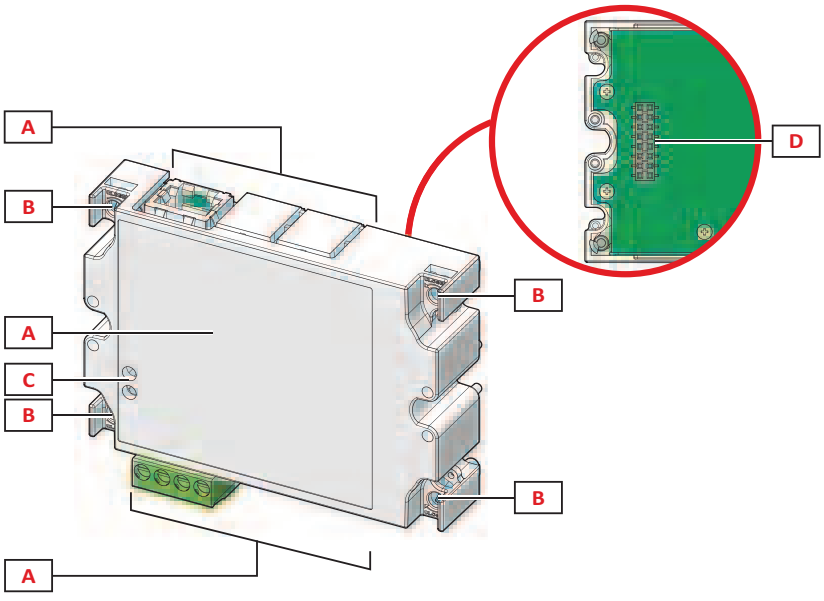
6


A
B
C
CONN 3PN
Ctr A
1.0

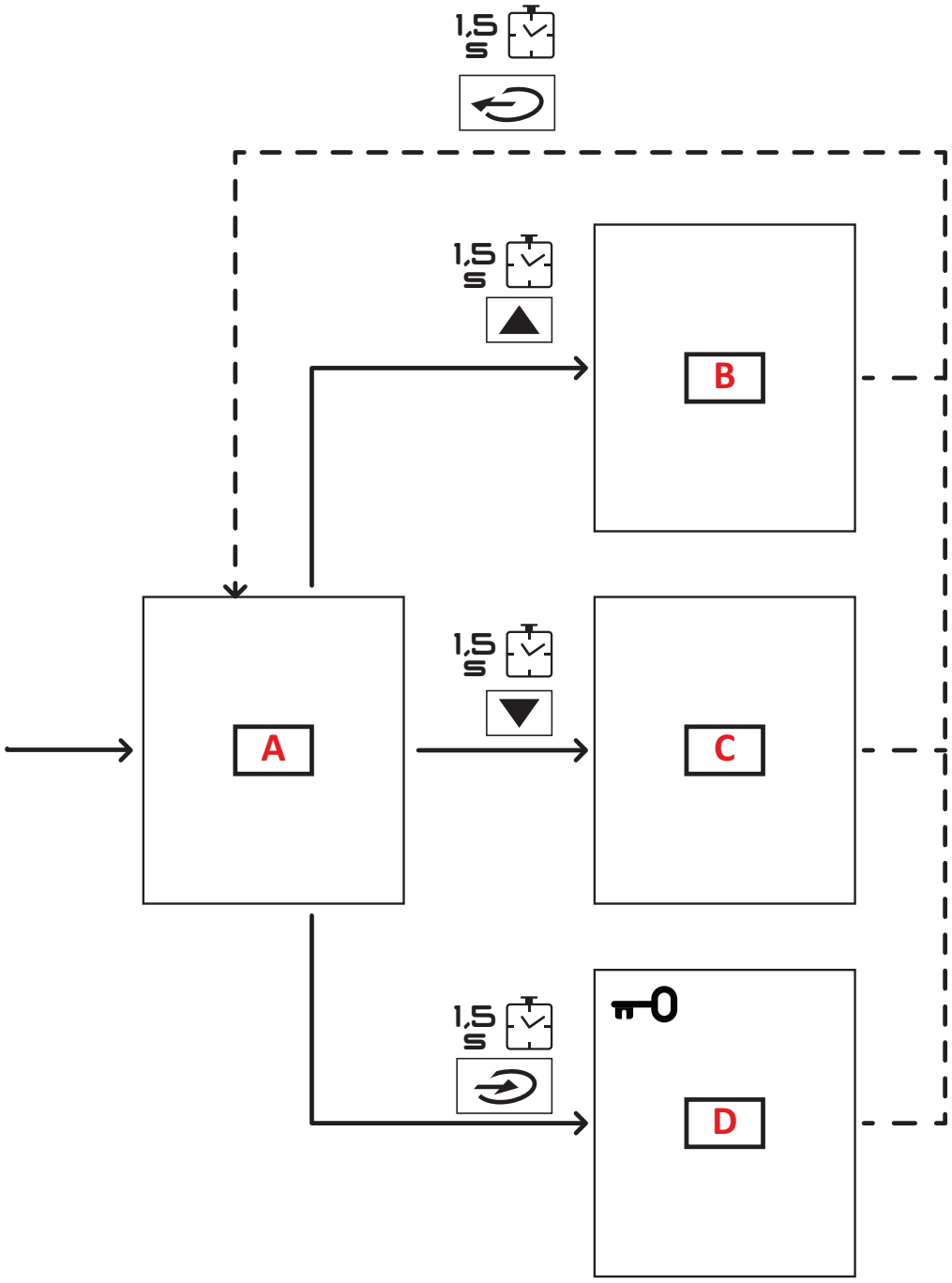
7



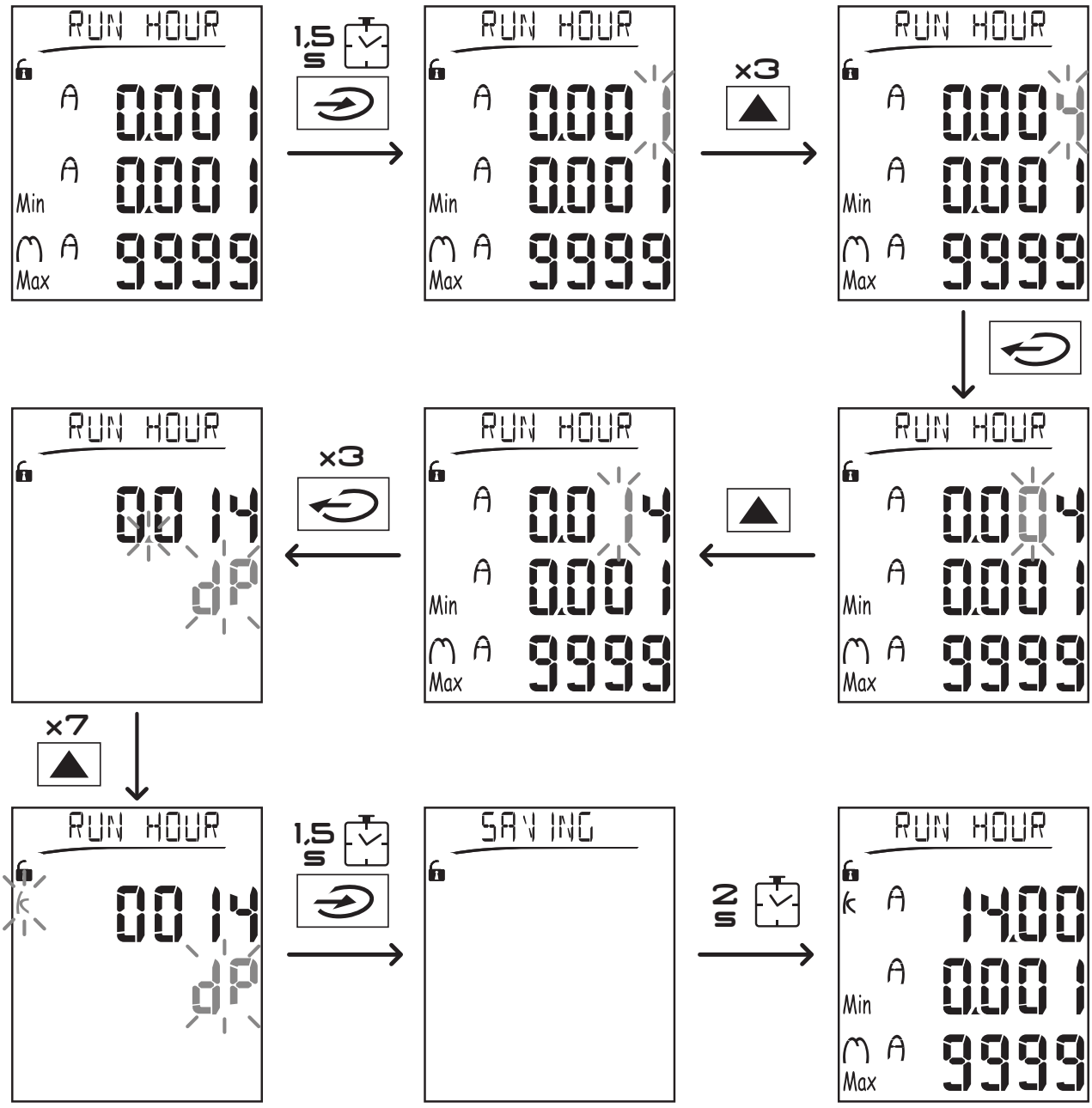
8



9



10



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WM20