

WM50

Multichannel power analyzer for single, two and three-phase systems

INSTRUCTION MANUAL

Contents

WM50 and TCD12	5
Introduction	5
Description	5
Architecture	5
Components	6
Component descriptions	6
Main unit - front	6
Main unit - rear	7
Main unit LED status	7
Accessory modules	8
TCD12	9
TCD12 LED status	9
TCD12WS	10
UCS (Universal Configuration Software)	10
UCS function overview	10
WM50 use	11
Interface	11
Introduction	11
Measurement menu display	11
Settings menu display	11
Reset menu display	12
Information menu display	12
Information and warnings	12
Working with WM50	13
Navigating the menus	13
Navigation features	13
Working with the measurement menu	13
Working with the settings menu	14
Common operations	14
Setting a parameter	15
Setting numeric parameters	16
Saving settings	16
Menu description	17
Measurement menu - meters	17

Measurement management	22
Measurement error	22
Average value calculation (dmd)	22
Synchronization types	22
Total demand distortion calculation (TDD)	22
Voltage asymmetry calculation	23
Filter	23
Alarms	24
Introduction	24
Alarm settings for main line variables	24
Alarm settings for channel or load variables	24
Alarm types	24
Start-up condition management	25
Latch function	25
Output activation logic	25
Setting alarms	26
	00
Enclose accessory modules	20
	20
Notos on digital inputs	20
	20
Digital outputs	21
Tariff management	27
Tariff management mode	27
Managing tariffs via Modbus command	27
Managing tariffs via internal calendar and clock	27
Managing tariffs via digital input	27
Disabling tariff management	28
Database	28
Introduction	28
Database content	28
Date and time	28
Settings	28
Daylight savings time	28
LCD display	29
Back lighting	29
LCD bar graph	29
Home page	29
TCD12	29
TCD12 identification	29
	29
Configure the system	30
Configure WM50	30
Configuration mode	30
Configuration requirements via UCS	30

Measurement menu - measurement pages

Channel and load measurement (TCD12)

Settings menu

Introduction

Information Menu

Essential information

Managed measurements

Main line measurements

17

19

20

21 21

21

21

21

Configuring WM50 via touch keypad Configuring WM50 via PC or smartphone	30 30
Settings from WM50 General settings Accessory modules settings Running a pulse transmission test Checking accessory module enabling	31 34 34 34
Configure TCD12s Configure TCD12 layout connected to WM50 Moving a TCD12 Replacing a TCD12	34 34 35 35
Other operations	36
Manage alarms Reset an alarm via digital input Reset an alarm via UCS Recognize active alarms	36 36 36 36
Reset meters and values Reset energy meters and totalizers Reset minimum, maximum, dmd and max dmd values	36 36 36
Communicating with other devices Communicated via M C ETH module Communicated via M C 485 232 module Communicate via OptoProg	37 37 37 37
Maintenance and disposal	38
Troubleshooting Measurement problems Alarms Communication problems Problems during settings LED	38 38 38 38 38 38 39
Cleaning	39
Responsibility for disposal	39
Features	40
WM50 common specifications General features Environmental specifications Input and output insulation Main unit specifications	40 40 40 40 40
Electrical specifications	40
Power supply	40

Main line measurement precision (main unit)	41
Channel and load measurement precision (TCD1	2) 41
Optical port	41
Memory	41
Digital input/output module specifications	41
M F I6 06 module features	41
M F I6 R4 module features	42
Analog input module features	42
M A TPN module input features	42
Communication module features	42
M C 485232 module	42
M C ETH module	43
TCD12 current sensor features	43
General features	43
Environmental specifications	43
Electrical specifications	43
Conformity	43
Part numbers key	43
Main unit part number (rear of unit)	43
Compatible accessory modules part numbers (re	ar of
TCD12 port number	43
TCD12 part number	44
	44

Information property

Copyright © 2017, CARLO GAVAZZI Controls SpA

All rights reserved in all countries.

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.



CAUTION! Indicates a risky situation which, if not avoided, may cause data loss.



IMPORTANT: provides essential information on completing the task that should not be neglected.

General warnings

This manual is an integral part of the product and accompanies it for its entire working life. It should be consulted for all situations tied to configuration, use and maintenance. For this reason, it should always be accessible to operators.

NOTICE: no one is authorized to open the analyzer or remove the MABC module. 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.

Installation and use of analyzers other than those indicated in the provided instructions and removal of the MABC module void the warranty.

Download

This manual	www.productselection.net/MANUALS/UK/WM50_im_use.pdf
Installation instruction - WM50	www.productselection.net/MANUALS/UK/WM50_im_inst.pdf
Installation instruction - TCD12	www.productselection.net/MANUALS/UK/TCD12_im.pdf
Accessory module user manual	www.productselection.net/MANUALS/UK/WM40MODULES_im.pdf
UCS desktop	www.productselection.net/Download/UK/ucs.zip
UCS Mobile	Google Play Store
Modbus communication protocol	www.productselection.net/Download

WM50 and TCD12

Introduction

Description

WM50 is a multichannel power analyzer for single, two and three-phase systems. Using TCD12 split core current sensors, it can monitor up to 96 single-phase loads or any combination of single and three-phase loads or two and single-phase loads for a maximum of 96 channels. The system can be set up, measurements viewed and up to 16 alarms managed from WM50 and UCS. Main unit functions can be expanded with a maximum of two of the following available modules: digital input/output module, analog input module and communication module.

Architecture



WM50 and TCD12

Components			
Component	Description		
WM50	Main unit, measures and displays the main line electrical variables via current sensors. With LCD display and touch keypad, it lets you set measurements parameters, configure accessory modules and manage up to 16 alarms. It communicates with TCD12 current sensors via pre-installed MABC module to monitor up to 96 channels.		
Accessory modules	Connected to the main unit via	a local bus, the following expand WM50 functions:	
(optional)	Туре	Module description	Part number
	Digital inputs/outputs	Six digital inputs and six static outputs	M F 16 06
		Six digital inputs and four relay outputs	M F 16 R4
	Analog inputs	Three analog inputs (neutral current, temperature probe, 20 mA input)	M A TPN
	Communication	Modbus RTU communication on RS485/RS232	M C 485 232
		Modbus TCP/IP communication on Ethernet	M C ETH
TCD12	12-channel current sensor. Measures main electrical variables on the single channels and loads and transmits them to WM50. A maximum of eight TCD12s can be connected in series on two TCD buses to each WM50 via TCD12WS cables.		
UCS	Configuration and diagnostics software. Available for both PC and Android mobile devices.		
OptoProg (optional)	Optical communication interface to configure the analyzer and TCD12s or to read data in real-time from PC or mobile devices via UCS.		
Master Modbus (optional)	Supervision system for WM50 data analysis and monitoring.		

Component descriptions

Main unit - front



Part	Description
Α	Optical port and plastic support for OptoProg connection
В	Backlit LCD display. The backlight time, color and behavior in the event of alarm can be set.
С	Alarm LEDs, see "Main unit LED status" on page 7
D	MABC module status LED
	refer to the instructions for use, see "Main unit LED status" on page 7
E	Touch keypad



Part	Description
Α	Detachable power supply terminal block
В	Detachable voltage input terminal block
С	Detachable functional grounding terminal block
D	MABC module (irremovable) for communications with TCD12 current sensors
E	Local bus port for accessory modules
F	B port for TCD12 bus
G	A port for TCD12 bus
н	Detachable current input terminal block
I	Power supply status LED, see "Main unit LED status" below

Main unit LED status

G1	Alarm 1, 2, 3, 4 status	Off: no active alarm.
G2	G2 Alarm E 6 7 8 status	On: at least one active alarm.
Alarin 5, 6, 7, 8 status	Note: to identify which alarm is activated, use UCS.	
G3	Alarm 9, 10, 11, 12 status	All blinking: TCD12 configuration inconsistent with set electrical system.
G4	Alarm 13, 14, 15, 16 status	Note: for details on the type of inconsistency, see the warning page in "Settings menu" on page 19.

BCM	TCD12 monitoring status	Off: TCD12 monitoring on.
		On: TCD12 monitoring not working.
		Blinking: communication error with at least one TCD12 or at least one TCD12 not configured or inconsistent with the set configuration.
Back	Power supply status	On: WM50 power on.
		Off: WM50 power off.

Note: for problem solutions, see "Troubleshooting" on page 38.

Accessory modules



Part	Description
Α	Detachable terminal block for inputs/outputs or area specific to communication ports
В	Fastening pins to main unit or other accessory module
С	Internal local bus port for communications with main unit or other accessory module
D	External local bus port for communication with communication module. Not included in communication modules.

TCD12



Part	Description
A	Indicator of the channel considered by default as the first one of the managed channel group. The order can be reversed during configuration.
В	Тор
С	Device identification marking area
D	Top and bottom fastening screws
E	Connection port with WM50 or other TCD12 via TCD12WS cable
F	Bottom
G	Status LED, see "TCD12 LED status" below
н	Removable clips for cable fastening
I	Removable adapters for DIN rail mounting

TCD12 LED status

СОМ	Communication status with WM50	Off: communications correctly working On: communication error Blinking: TCD12 not configured or not consistent with the set configuration
ON	Power supply status	Off: no power supply On: powered Blinking: TCD12 identification function on

Note: for problem solutions, see "Troubleshooting" on page 38.

TCD12WS



Part	Description
Α	Connection cables with WM50 or TCD12
В	Tab for connector removal

UCS (Universal Configuration Software)

UCS is available in desktop and mobile versions.

It can connect to WM50 via accessory communication modules (Modbus TCP/IP or Modbus RTU protocol) or via OptoProg (via USB or Bluetooth).

The following is possible with UCS:

- configure WM50, including accessory modules and current sensors
- view system status for diagnostics and configuration checks

UCS function overview

Function	UCS desktop	UCS Mobile
Configure the system with WM50 connected (online configuration)	x	х
Configure the system with WM50 disconnected (offline configuration)	x	х
View main measurement *	x	х
View input and output status *	x	х
View main unit, channel and load alarm status *	x	х
Record selected variable measurements *	x	-
View help to install WM50 and connect with OptoProg	-	х

Note *: functions only available with WM50 connected.

WM50 use

Interface

Introduction

WM50 is organized in four menus:

- measurement menu: pages used to display meters and other electrical variables
- settings menu: pages used to set parameters of the main unit and accessory modules
- reset menu: pages to reset minimum, maximum, average (dmd) and maximum among averages values (max dmd) for variables in measured pages
- information menu: pages that display general and set parameter information

Measurement menu display



Part	Description
Α	Graph with percentage of active or apparent real-time power, see "LCD bar graph" on page 29
В	Meters, see "Measurement menu - meters" on page 17. These are displayed independently from the contents displayed in area D.
С	Warning and information area, see "Information and warnings" on page 12
D	Measurement page area with electric variables and relevant units of measure (for four rows), see "Measurement menu - measurement pages" on page 17.

Settings menu display



Part	Description
Α	Page identification number
В	Page title, see "Settings menu" on page 19
С	Warning and information area, see "Information and warnings" on page 12
D	Current value/option
E	Possible value/option range

Reset menu display



Part	Description
Α	Page identification number
В	Page title with reset object
С	Warning and information area, see "Information and warnings" below
D	Current values

Information menu display



Part	Description
Α	Page identification number
В	Page title, see "Settings menu" on page 19
С	Warning and information area, see "Information and warnings" below
D	Current page information

Information and warnings

Symbol	Description
ALR	Alarm information page
PROG	Settings menu page
	Voltage connection error (inverted sequence)
~);m3)	Hot water totalizer (m³)
* *) m3)	Cold water totalizer (m ³)
$\frac{2}{m^{3}}$ kWh	Hot water energy totalizer (kWh)

Symbol	Description
m3	Gas totalizer (m³)
P	Feedback after pressing a button
RX/TX	Serial or optical communication status (receiving/ transmitting)

Working with WM50

Navigating the menus



Section	Function
A	Measurement menu
В	Information menu
С	Reset menu for displayed measurement page
D	Settings menu



CAUTION! If you exit the settings menu by pressing button — per 1.5 s or automatically after 2 minutes of inactivity, changes will not be saved.

Navigation features

The measurement menu home page is displayed when the device is turned on. The home page appears after 120 s of inactivity. The information menu, settings menu and relevant reset menu can be opened from any menu page.

Note: the settings menu is password protected.

Working with the measurement menu

Operation	Button
Scroll meters. See "Measurement menu - meters" on page 17.	12345
Scroll voltage, current, frequency group pages. See "Voltage, current, frequency group" on page 17.	V-A-Hz
Scroll power, power factor group pages. See "Power, power factor group" on page 17.	P-PF
View the temperature and analog input value of the MATPN accessory module. See "M A TPN module page" on page 18.	P-PF '들⊡
Scroll THD group pages. See "THD group" on page 18.	THD i
View the measurement page set as the Home page.	Ð
Scroll minimum, maximum, average (dmd) and maximum among averages values (max dmd) for variables in displayed page.	A 1 V

Working with the settings menu

Operation	Button
Move among value positions *	12345
Exit the sub-menu and view relative title page	Ð
Increase a parameter value / View the next value option/ Modify the value in positions dP and Sign*	
Decrease a parameter value / View the previous value option/ Modify the value in positions dP and Sign*	
Enter the sub-menu/Modify parameter of the page on display	€
Save changes and exit the menu	in the End page
Exit the menu without saving changes	, then in the Exit menu? page



Common operations

Operation	Button
Confirm operation	(\mathbf{r})
View the previous/next page	
Cancel operation	Ç

Setting a parameter

When setting a parameter, **E** indicates the edited row, the blinking dash the number. Example procedure: how to set **Filter co**=25 and save changes.

Note: the initial procedure status is the *Filter co* page in the settings menu.



Setting numeric parameters

Order of positions

The value of a numerical parameter is made up of six positions: four digits, decimal point (**dP**) and sign (**Sign**). The button **value** is used to select the positions in the following order:



Decimal point position (dP)

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



Sign position (Sign)

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

Saving settings

To save settings, scroll the settings menu pages until the **End** page is displayed and press \mathfrak{D} .



CAUTION! Changes are not saved if you exit the settings menu in another way.

Menu description

Measurement menu - meters

A list of the meters displayed is provided below:

Note: displayed meters depend on whether M F I6 06 and M F I6 R4 module inputs are installed and their settings and whether tariff management is enabled.

Symbol	Description
tot (kWh)	Total imported active energy
tot (kvarh)	Total imported reactive energy
tot (- kWh)	Total exported active energy
tot (- kvarh)	Total exported reactive energy
PAr (kWh)	Partial imported active energy
PAr (kvarh)	Partial imported reactive energy
PAr (- kWh)	Partial exported active energy
PAr (- kvarh)	Partial exported reactive energy
t0x (kWh)	Active energy per tariff x
t0x (kvarh)	Reactive energy per tariff x

Symbol	Description
t0x (- kWh)	Active energy per tariff x
t0x (- kvarh)	Reactive energy per tariff x
C1	Pulse totalizer 1, associated with digital input 4
C2	Pulse totalizer 2, associated with digital input 5
C3	Pulse totalizer 3, associated with digital input 6
HrS	Total load operating hours
d t	Date and time

Measurement menu - measurement pages

The minimum, maximum, average (dmd) and maximum among average values (max dmd) for each displayed variable can be viewed for each measurement, touching keys \blacktriangle / $\mathbf{\nabla}$.

Note: the available measurements depend on the type of system set.

Voltage, current, frequency group

Displayed measurements	Description
V	System phase-neutral voltage
V _{L1}	Phase 1 voltage
V _{L2}	Phase 2 voltage
V _{L3}	Phase 3 voltage
ν _{ιιΣ}	System phase-phase voltage
V _{L12}	Phase 1-phase 2 voltage
V _{L23}	Phase 2-phase 3 voltage
V _{L31}	Phase 3-phase 1 voltage
A _N	Neutral current
A	Phase 1 current
A _{L2}	Phase 2 current
A _{L3}	Phase 3 current

Displayed measurements	Description
Hz	Frequency
ASY	-
V _{LL} %	Phase-phase voltage asymmetry
V_ _{LN} %	Phase-neutral voltage asymmetry
Α _Σ	System current
A _{L1}	Phase 1 current
A _{L2}	Phase 2 current
A _{L3}	Phase 3 current

Power, power factor group

Displayed measurements	Description
VA _Σ	System apparent power
VA _{L1}	Phase 1 apparent power
VA _{L2}	Phase 2 apparent power
VA _{L3}	Phase 3 apparent power
VAr _Σ	System reactive power
VAr _{L1}	Phase 1 reactive power
VAr _{L2}	Phase 2 reactive power
VAr _{L3}	Phase 3 reactive power

Displayed measurements	Description
w _Σ	System active power
W _{L1}	Phase 1 active power
W _{L2}	Phase 2 active power
W _{L3}	Phase 3 active power
PF _Σ	System power factor
PF _{L1}	Phase 1 power factor
PF _{L2}	Phase 2 power factor
PFL3	Phase 3 power factor

THD group

Note: single harmonic values can also be viewed from UCS.

Displayed measurements	Description
V₁ THD %	THD of phase 1 voltage
V ₂ THD %	THD of phase 2 voltage
V ₃ THD %	THD of phase 3 voltage
V _{L12} THD %	THD of phase 1-phase2 voltage
V _{L23} THD %	THD of phase2-phase3 voltage
V _{L31} THD %	THD of phase3-phase1 voltage
A _{L1} THD %	THD of phase 1 current
A _{L2} THD %	THD of phase 2 current
A _{L3} THD %	THD of phase 3 current
EVEn	
V₁ THD %	Even THD of phase 1 voltage
V ₂ THD %	Even THD of phase 2 voltage
V ₃ THD %	Even THD of phase 3 voltage
EVEn	
V _{L12} THD %	Even THD of phase 1-phase2 voltage
V _{L23} THD %	Even THD of phase2-phase3 voltage
V _{L31} THD %	Even THD of phase3-phase1 voltage
EVEn	
A _{L1} THD %	Even THD of phase 1 current
A _{L2} THD %	Even THD of phase 2 current
A _{L3} THD %	Even THD of phase 3 current

Displayed measurements	Description
odd	
V₁ THD %	Odd THD of phase 1 voltage
V₂THD %	Odd THD of phase 2 voltage
V ₃ THD %	Odd THD of phase 3 voltage
odd	
V _{L12} THD %	Odd THD of phase 1-phase2 voltage
V _{L23} THD %	Odd THD of phase2-phase3 voltage
V _{L31} THD %	Odd THD of phase3-phase1 voltage
odd	
A _{L1} THD %	Odd THD of phase 1 current
A _{L2} THD %	Odd THD of phase 2 current
A _{L3} THD %	Odd THD of phase 3 current
A _{∟1} TDD %	TDD of phase 1 current
A _{L2} TDD %	TDD of phase 2 current
A _{L3} TDD %	TDD of phase 3 current

M A TPN module page

Displayed measurements	Description
Matp	
	Analog input
°C/°F	Temperature

Settings menu



Note: for the description of all settings, possible and default values, see "Settings from WM50" on page 31.

Information Menu

Note: in general, presence of the pages depends on the installed accessory modules. The **Data events** page is only included if the relevant database is enabled.

Page title	Information displayed		
12345678	 Serial number (page title) Year of manufacture Firmware revision Average value calculation interval (dmd) 		
Conn	 System type (in title) Current transformer ratio (Ct) 		
Pulse out x	 x = output number (in title) none: output not set as pulse output If the output is set as pulse output, it displays: Associated energy meter Pulse weight 		
Remot out (3 pages)	Outputs set as remote control and relevant status		
Warning	 TCD12 warnings: none: no warnings E001: channels associated to a phase not foreseen by the set electrical system E002: two-phase or three-phase load set with two channels associated with the same phase E003: set load inconsistent with the set electrical system (i.e.: three-phase load two-phase electrical system) 		
	 x = alarm number (in title) Alarm data x (in title): None: alarm disabled Virt: alarm enabled but not associated with any output Out x YY: alarm enabled, associated with digital output x with normal YY output status (ND = normally open or NE = normally closed) Controlled variable Alarm activation threshold (Set 1) Alarm deactivation threshold (Set 2) Alarm type: 		
	Symbol Description Symbol Description		
	Set Up ▲▲ Up Up Set Up Up Up		
	Set Down ▼▼ Down Set In window		
Optical	Baud rate of optical port		
Com port	Modbus address		
	Baud rate of RS485/RS232 port		
IP address	IP address		
Date	Date		
time	Hour		
Data events	Number of events recorded in the main unit event database.		

Essential information

Managed measurements

Introduction

WM50 calculates and displays both main line and single channel and load measurements.

All measurements are displayed by UCS or via Modbus communications (Carlo Gavazzi VMU-C monitoring system or other data acquisition system). Main line measurements are also available on screen.

Main line measurements

Note: the following values are available for all measurements: minimum, maximum, average (dmd) and maximum average (max dmd). The available variables depend on the type of system set. Minimum and maximum values are calculated only considering valid values and not out of range values.

Active energy/Reactive energy	Total, partial and by tariff. • Imported • Exported
Totalizers	Up to three totalizers. • Gas • Cold water • Hot water • Heat • Protection trips
Current	Neutral Phase System
Voltage	Phase-phasePhase-neutralSystem
Total harmonic distortion (THD)	Up to 32 nd harmonic. Total, even and odd. • Phase current • Phase-phase voltage • Phase-neutral voltage Note: even single harmonics from UCS.

Total demand distortion (TDD)	Phase current	
Power	Reactive, active, apparent. • Phase • System	
Power factor	PhaseSystem	
Frequency	System	
Voltage asymmetry	Phase-phasePhase-neutral	

Note: main line energy meter values may differ from the total of single channel energy meters. This is because they are measured with a different precision class (main line: class 0.55, channels: class 2).

Channel and load measurement (TCD12)

Single channel	 Current Current THD (up to 15th harmonics) Active/reactive/apparent power Power factor Active energy
Load	 Voltage Each phase current Each phase current THD (up to 15th harmonics) Active/reactive/apparent power Power factor Active energy
Variable selected for advanced monitoring	 Daily minimum and maximum values Real-time minimum, maximum and average values (dmd)

Note: the single channel and load variable can be selected via UCS to manage alarms with differentiated thresholds for each channel/load and view daily minimum and maximum values and real-time minimum, maximum and average values (dmd). Minimum and maximum values are calculated only considering valid values and not out of range values.

Note: a Modbus protocol table can be set from UCS to customize and facilitate TCD12 variable reading. See "Modbus communication protocol" on page 4 for further information.

Measurement management

Measurement error

If a measurement is not available or out of range, it is displayed as "EEEE" on WM50 display and as "--" on UCS. See "Troubleshooting" on page 38.

Average value calculation (dmd)

The system calculates the average value of electrical variables in a set integration interval (15 min by default). The average value will not be available if the variable measurement is out of range.

By default, the integration interval is calculated from when the analyzer is turned on. To guarantee calculation alignment, it can be synchronized using the internal clock. In turn, the internal clock can be synchronized with an external reference via digital input (i.e.: from the electric manufacturer's device).

Synchronization types

Following is information on average value calculation rules based on the type of synchronization:

Synchronization type	Integration interval start	First displayed value	Digital input effect with synchronization function	Example
Disabled	When turned on, at the end of	At the end of the first	None	On: at 11:28
	start-up	integration interval		Set integration time: 15 min
				First value displayed: at 11:43 for the 11:28 to 11:43 interval
By internal clock	At the first multiple of the	At the end of the first	None	On: at 11:28
	integration interval, using the	integration interval		Set integration time: 15 min
	starting from 00:00			First displayed value: at 11:45 for the interval from 11:30 (first integration interval multiple) to 11:45
Via internal clock	At the first multiple of the	At the end of the first	The internal clock moves to	On: at 11:28
synchronized via	integration interval, using the	integration interval	the closest set integration	Set integration time: 15 min
digital input "	starting from 00:00, or at the first digital input contact	after integration starts	00:00	CAUTION! The interval between synchronism contacts must be an integer multiple of the set integration interval.
				Synchronism contact: at 12:00 of the external reference corresponding to 11:59 on the internal WM50 clock
				First displayed value: at 11:45 for the interval from 11:30 (first integration interval multiple) to 11:45.
				Note: after synchronism contact, WM50 clock moves to 12:00:00 and the average value is updated with the value calculated between 11:45 and 11:59.

Note: function only available with M F I6 06 or M F I6 R4 accessory module. A digital input must be set with synchronization function.

From WM50: See "Settings from WM50" on page 31, sub-menu DMD.

Total demand distortion calculation (TDD)

You can set the reference factor from UCS to calculate the current TDD, meaning the maximum current demand value absorbed by the load.



Voltage asymmetry calculation

The system calculates the phase-phase and phase-neutral voltage asymmetry dividing the total of the voltage maximum and minimum value by the system voltage. If voltages are all the same, asymmetry will be 0.

Following is the formula used:

$$AsyLL = \frac{V_{LLMax}(t_i) - V_{LLMin}(t_i)}{V_{LLsys}(t_i)}$$
$$AsyLN = \frac{V_{LNMax}(t_i) - V_{LNMin}(t_i)}{V_{LNsys}(t_i)}$$

Filter

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 intervention range. Value between 0 and 100, expressed as a percentage of the full scale of the variable.
- 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 set intervention range, the filter is not applied.

Example

Following is filter behavior with:

- range = 2
- coefficient = 2 or 10

The full scale is 277 V, therefore with range = 2 the intervention range is +/- 5.5 V (2% of 277 V). The higher the coefficient value, the higher the measurement stability.



Element	Description
	Intervention range = 2
•	Measured value
	Measurements displayed with coefficient = 2
	Measurements displayed with coefficient = 10

From WM50: See "Settings from WM50" on page 31, sub-menu Filter.

Alarms

Introduction

WM50 manages:

- up to 16 independent alarms for the variables measured on the main line
- up to 96 channel alarms for a variable selected for advance channel monitoring (with different set points for each channel)
- up to 48 alarms for a variable selected for advance load monitoring (with different set points for each load)

Alarm settings for main line variables

The following parameters must be set for each alarm:

- enable alarm
- variable to be monitored
- alarm type: up, down, out of window, in window (see "Alarm types" below)
- set 1: alarm activation threshold
- set 2: alarm deactivation threshold
- alarm activation delay
- start-up condition management mode (see "Start-up condition management" on page 25)
- alarm retention, latch function (see "Latch function" on page 25)
- any associated digital output and activation logic in the event of several alarms associated with the same output (see "Output activation logic" on page 25)

Note: the associated digital output must be set with Alarm function in the relevant settings.

Alarm settings for channel or load variables

Note: alarms only concern the variable selected for advanced channel/load monitoring.

The following parameters must be set for the alarm:

Parameter type	Parameters
Shared by all channels/loads	 General function enable Alarm type: up, down, out of window, in window (see "Alarm types" below) Alarm activation delay Start-up condition management mode (see "Start-up condition management" on page 25) Alarm retention, latch function (see "Latch function" on page 25)
Specific to each channel/load	 Single alarm enable Set 1: alarm activation threshold Set 2: alarm deactivation threshold

Alarm types

Up alarm

The alarm is activated when the monitored variable exceeds the Set 1 value for a time equal to the activation delay (**Delay**) and is deactivated when it drops under Set 2 (if the latch function is not on).



Down alarm

The alarm is activated when the monitored variable drops under the Set 1 value for a time equal to the activation delay (**Delay**) and is deactivated when it exceeds Set 2 (if the latch function is not on).



Alarm in window

The alarm is activated when the monitored variable remains between Set 1 and Set 2 for a time equal to the activation delay (**Delay**) and is deactivated when it is not in this range (if the latch function is not on).



Alarm out of window

The alarm is activated when the monitored variable exits Set 1 and Set 2 range for a time equal to the activation delay (**Delay**) and is deactivated when it returns within this range (if the latch function is not on).



Start-up condition management

Alarm behavior can be set if the variable alarm is active at start-up. The alarm condition can be:

- considered and thus the alarm is immediately activated
- ignored and the variable is only monitored after the first time it exits the alarm condition

Latch function

When the latch function is enabled, the alarm remains active even if the monitored variable exits the alarm condition. The alarm can only be reset by the digital input or UCS command.

Output activation logic

If several alarms are associated with an output, the output will only activate if all the alarms set with AND logic are active or if at least one of the alarms set with OR logic is active.

Setting alarms

To set an alarm for	Then	WM50 keypad	UCS
a main line or M A TPN analog input variable	 set: variable to be monitored = the desired variable all other parameters at will 	x	x
wrong voltage connection condition	 set: variable to be monitored = PHS (phase sequence) alarm type = down set 1 = 0 set 2 = 0 	x	x
single channel or load alarms	set:		
Note: the alarm will activate if alarms were set and at least one of the channels or loads are in alarm conditions.	 variable to be monitored = BCM 	x	x
variable selected for the single channels or loads	 Select the variable for advanced channel/load monitoring. Set parameters shared by all alarms. Enable and set the set point for each single channel or load. 	-	x

From WM50: See "Settings from WM50" on page 31, sub-menu Virt al x (x = alarm number).

Accessory modules

Enabling accessory modules

Accessory modules are automatically recognized by WM50. They only need to be manually set if configuring the system from UCS in offline mode.

Note: by default, the M C 485 232 communication module is always enabled even if not actually connected.

Digital inputs

Digital inputs can run various functions, according to the following table:

Input	Possible functions
1	 Tariff Interval synchronization for average value calculation (dmd) Input status reading
2	Tariff Input status reading
3	 Tariff Exported active energy meter pulse counting (kWh-) Input status reading
4	 C1 totalizer pulse counting (water, gas, heat) C1 totalizer pulse counting (protection trip) Imported active energy meter pulse counting (kWh+) Alarm reset Input status reading

Input	Possible functions
5	 C2 totalizer pulse counting (water, gas, heat) Imported reactive energy meter pulse counting (kvarh+) Input status reading
6	 C3 totalizer pulse counting (water, gas, heat) Input status reading

Notes on digital inputs

To manage tariffs via digital inputs, all three inputs must run the tariff function, see "Tariff management" on page 27. Inputs with pulse counting function for the energy meter replace calculated (voltage and current measurement) energy meters (total, partial and tariff).

The pulse weight must be set for inputs with counting function. The type must also be set for inputs with water, gas, heat count function.

From WM50: See "Settings from WM50" on page 31, sub-menu Dig in x.

Digital outputs

Each digital output can run one of the following functions:

Function	Description	Parameters
Alarm	Output associated with one or more of the 16 virtual alarms managed by the main unit	Status of the digital output in non- alarm status
Remote	Output status managed via Modbus	-
Pulse output	Pulse transmission output on active or reactive, imported or exported energy consumption. Only from WM50, a pulse transmission test can be run, see "Running a pulse transmission test" on page 34.	 Energy type Pulse weight Enable of transmission test Power value for test

From WM50: See "Settings from WM50" on page 31

Tariff management

Tariff management mode

Tariffs can be managed:

- via Modbus command
- via internal calendar and clock
- via digital inputs

Managing tariffs via Modbus command

- 1. Set tariff management via Modbus command.
- 2. Change the tariff by entering the value corresponding to the current tariff according to the following table in the **143Fh** registry:

Current tariff	Register value	Current tariff	Register value
1	0	4	3
2	1	5	4
3	2	6	5

Managing tariffs via internal calendar and clock

Note: this operation requires UCS desktop use.

- 1. Set tariff management via internal calendar and clock.
- 2. Set the date and time.
- 3. From UCS desktop, set the tariff calendar, setting:
 - default tariff to be applied for the periods when no tariff is set
 - weekends and the relevant tariff
 - tariff to be applied on working days (up to six daily intervals, for two periods)
 - current year holidays, manually or automatically set

Managing tariffs via digital input

- 1. Set tariff management via digital input.
- 2. Set digital inputs 1, 2 and 3 with tariff function.
- 3. Change the tariff by changing the input status according to the following table (0 = open contact, 1 = closed contact):

Current tariff	Digital input 1	Digital input 2	Digital input 3
1	0	0	0
2	1	0	0
3	0	1	0

Current tariff	Digital input 1	Digital input 2	Digital input 3
4	1	1	0
5	0	0	1
6	1	0	1

Disabling tariff management

Set tariff management as disabled or enter 6 in the **143Fh** register.

From WM50: See "Settings menu" on page 19, sub-menu Tariff and Dig in x.

Database

Introduction

Database can be exported to .xls file and databases and single variables, events and values to be saved can be enabled/disabled from UCS.

CAUTION! if database settings are changed, previously saved data is deleted.

Database content

Database	Description	Data recorded for each record
Main line electrical variables	Recording of minimum, maximum and average values of main line variables selectable by the user.	 Record ID Time stamp * Type (min, max, average) Variable Value
Main unit events	Recording of main unit events and alarms	 Record ID Time stamp * Type (on, off, configuration change, programming login, new minimum, maximum among average values reached, value reset, meter/totalizer reset, database reset, digital input/output status change) Variable associated with the event
TCD12 events	Recording of TCD12 events and alarms	 Record ID Time stamp * Type (single channel alarm, load alarm, TCD12 configuration change or load configuration change) Other information according to event type: single channel alarm: channel alarm load alarm: load alarm TCD12 configuration change: set channel, phase pattern and associated phase, selected advanced monitoring variable, energy meter reset and/or minimum and maximum values load configuration change: set load, selected advanced monitoring variable
TCD12 daily maximums/ minimums	Recording of TCD12 variable daily minimum and maximum values set in advanced monitoring	 Record ID Time stamp * Value Note: if the date and time are changed, the saved values are deleted.

Note *: to record time stamp information in the databases, the analyzer date and time must be set.

Date and time

Settings

The date and time can be set either via WM50 keypad or UCS.

CAUTION! If the average value calculation interval synchronization (dmd) is enabled via internal clock, changing the time clears the interval and sets the average values as not available until the end of the first interval.

CAUTION! Changing the time clears the daily minimum and maximum values from the database.

Daylight savings time

The following is possible with UCS:

- disable daylight savings time management.
- set automatic time change. Select the time zone in which the analyzer is installed and UCS saves the time change rule in the analyzer for the next 20 years. The user must update the rule in the event of governmental change after first configuration.

LCD display

Back lighting

The backlight time, color and behavior in the event of alarm can be set.

Note: if the alarm is active, blinking is only visible in the measurement menu and not in settings and information menus.

From WM50: See "Settings menu" on page 19, sub-menu Backlight and Color.

LCD bar graph

The bar graph in the measurement pages (see "Measurement menu display" on page 11) can display the current active or apparent current value. The value is expressed as a percent of the set full range.

From WM50: See "Settings menu" on page 19, sub-menu SET POWER.

Home page

The measurement page displayed by default when the analyzer is turned on or after 120 s of disuse can be set. The home page can be selected from the default pages or customized row by row.

From WM50: See "Settings menu" on page 19, sub-menu Home page.

TCD12

TCD12 identification

TCD12 configured and connected to WM50 is identified by the system via the combination of its three features:

- serial number (on the top of the sensor)
- physical position on the TCD bus (i.e.: A1 for TCD A bus TCD12 closest to WM50)
- monitored channel group

The physical position and channel group are set in the configuration phase. The serial number is read and automatically associated when the system detects it in the position indicated in configuration when connected with WM50.

Configure WM50

Configuration mode

The configuration modes for each component are provided below:

Component	WM50 keypad	UCS desktop	UCS Mobile
Main unit	x (excluding daylight savings time, tariff calendar and database)	x	x (excluding tariff calendar and database)
Accessory modules	x	x	x
TCD12	-	x	x

Configuration requirements via UCS

To configure the system with UCS:

• Acquire a PC or smartphone with one of the following applications installed:

Application	Compatibility	Where to find it
UCS Mobile	Smartphone Android	Google Play Store
UCS Desktop	PC Windows 7 or later	www.productselection.net/Download/UK/ucs.zip

• Equip WM50 with one of the following communication interfaces:

Component	Compatibility	Description
MCETH	UCS desktop	Modbus TCP/IP communication module
	UCS Mobile	
MC485232	UCS desktop	Modbus RTU communication module
OptoProg	UCS desktop	Optical interface for Bluetooth or USB communications
	UCS Mobile	







Configuring WM50 via touch keypad

1. Open the settings menu.

2. Set parameters and save.

To learn how to interact with WM50, see "WM50 use" on page 11.

To learn more about settings pages, see "Settings from WM50" on page 31.

Configuring WM50 via PC or smartphone

Note: communication parameters may need to be set via touch keypad to communicate with WM50.

- 1. Meet all the requirements indicated in "Configuration requirements via UCS" before.
- 2. Follow the instructions according to how you want the analyzer and PC/smartphone to communicated:

To communicate	Then
via RS485 network (Modbus RTU) or Ethernet (Modbus TCP/IP)	set WM50 communication parameters via touch keypad
via direct point to point connection or via OptoProg	skip to the next step

- 3. Start UCS and connect to WM50 via automatic scan or by manually setting correct communication parameters.
- 4. Open the settings section, set parameters and save changes.
- 5. Check correct system operations using the data display and read tools included in UCS.

Settings from WM50

General settings

CAUTION! The settings menu automatically closes after 120 s of disuse and all changes are lost.

Note: default values are underlined. Presence of the pages depends on the installed accessory modules, see "Accessory modules settings" on page 34. To learn more about settings, see "Essential information" on page 21.

Page title/sub- menu	Page title	Description	Values
Password?	-	Enter current password	Current password
Change pass	-	Change password	Four digits (from <u>0</u> to 9999)
Backlight	-	Display backlight time (min)	0: always on
			From 1 to 255 (<u>2</u>)
Color	-	Back lighting	<u>0</u> : off
			1: white
			2 : blue
			3: blinking if an alarm is active, otherwise off
			4: blinking if an alarm is active, otherwise white
			5: blinking if an alarm is active, otherwise blue
Modules	MFI6O6	Module enable	Yes/ No
	MFI6R4		Auto: indicates that the module is automatically recognized by the
	MATPN		system
	MC485232		
	MCETH		
	MABC	Enable LED ON blinking of TCD12 that	1.12: channels from 1 to 12
		monitors the set channels	13.24 : channels from 13 to 24
			25.36 : channels from 25 to 36
			37.48 : channels from 37 to 48
			49.60 : channels from 49 to 60
			61.72: channels from 61 to 72
			73.84: channels from 73 to 84
			85.96: channels from 85 to 96
System	-	System type	1P : single-phase system (2-wire)
			2P : two-phase system (3-wire)
			3P.n: three-phase system (4-wire)
Ct ratio	-	Current transformer ratio (CT)	From <u>1</u> to 2000
Ctn ratio	-	Neutral current transformer ratio	From <u>1</u> to 9999
Dmd	Time	Average values calculation interval (min)	1/ 5/ 10/ <u>15</u> / 20/ 30/ 60
	Sync	Synchronization type for average value	Off: synchronization disabled
		calculation	CloC: via internal clock
			inP : via internal clock synchronized via digital input
Set power	Туре	Power displayed in the LCD bar graph	VA: apparent power
			<u>W</u> : active power
	Value	Full range (W or VA)	From <u>1000</u> to 9999M
L			1

Page title/sub- menu	Page title	Description	Values
Home page	Туре	Measurement page type displayed on	VArS: row by row customized page
		access to measurement menu and after 120 s of inactivity	PAGE: default page
	Page	With Type = PAGE , default page selected	The available measurement pages, recognizable via the units of measure for
	Line 2	With Type = VArS , variable according to row selected	Managed variable selection
	Line 3	With Type = VArS , third row variable selected	Managed variable selection
	Line 4	With Type = VArS , forth row variable selected	Managed variable selection
	Line 5	With Type = VArS , fifth row variable selected	Managed variable selection
Filter	Filter s	Interval of filter intervention with respect to full scale (%)	From 0 to 100 (<u>2</u>)
	Filter co	Filter coefficient	From 1 to 256 (<u>2</u>)
Optical	Baudrate	Baud rate (kbps)	9.6/ 19.2/ 38.4/ <u>115.2</u>
	Parity	Parity	None/ Odd/ <u>Even</u>
RS485232	Address	Modbus address	From <u>1</u> to 247
	Baudrate	Baud rate (kbps)	<u>9.6</u> / 19.2/ 38.4/ 115.2
	Parity	Parity	None/ Odd/ <u>Even</u>
Ethernet	IP add	IP address	From 0.0.0.0 to 255.255.255.255 (<u>192.168.0.1</u>)
	Subnet	Subnet mask	From 0.0.0.0 to 255.255.255.255 (255.255.255.0)
	Gateway	Gateway	From <u>0.0.0.0</u> to 255.255.255.255
	TCP IP Prt	TCP/IP port	From 1 to 9999 (<u>502</u>)
Virt al x	Enable	Enable of alarm x	Yes/ <u>No</u>
(x = alarm number)	Variables	Variable controlled by the alarm	All managed real-time variables
	Туре	Alarm type	<u>uP</u> : up alarm
			down: down alarm
			in : alarm in window
	l stab		out: alarm out of window
		Alarm retention enabled	res/ <u>No</u>
	Start cond	Benavior if in alarm conditions at start-up	No: signals the alarm
	On delay	Alarm activation delay (s)	From 0 to 3600
	Set 1	Alarm activation threshold or upper window limit	 The unit of measurement and range of admissible values depend on the controlled variable.
	Set 2	Alarm deactivation threshold or lower window limit	
	Out link	Associated digital output	0: no output associated From 1 to 6
	Out logic	Output activation logic	AND/ <u>OR</u>
Dig out x	Function	Function of digital output x	Remo: remote control
(x = output number)			Alar: alarm
			Puls: pulse output
	Puise type	Type of energy (kwn or kvarn)	energy/ kWh Neg: exported active energy/ kvarh Neg: exported reactive energy/ kvarh Neg: exported reactive energy
	Pulse weig	Weight of pulse (kWh/kvarh per pulse)	-
	Al status	Normal output status	Ne: normally closed/ Nd: normally open
	Out test	Enable of transmission test	Yes/ No
	Power test	Power value for test	From 0.001 W to 9999 MW
Tariff	-	Tariff management	none: disabled
			Cloc: via internal calendar and clock
			Inp: via digital inputs
			Remo: via Modbus command

Page title/sub- menu	Page title	Description	Values
Dig in x	Function	Digital input x function	remo: input read status
(x = input number)			Tari: tariff management
			Puls: pulse totalizer
			Rst: alarm reset
			Trip: protection trip totalizer
			Sync: average value calculation interval synchronization command (dmd)
			Cont : pulse meter associated with total imported, exported or imported reactive energy according to the selected input
			IMPORTANT: check which functions are available for each input, see "Digital inputs" on page 26
	Pulse type	Value associated with the pulse totalizer	Gas: gas
		for Puis selection	H2OC: cold water
			H2OH: hot water
			HEAT: heat
	Pulse weig	Pulse weight	From 0.001 to 9999
			Value expressed in kWh, kvarh, m3 or number of trips per pulse
Process	Unit	Temperature unit of measure	C: degrees Celsius
			F : degrees Fahrenheit
	Probe	Temperature probe type	0 : PT100 (3-wire)
			1 : PT100 (2-wire)
			2 : <u>PT1000 (3-wire)</u>
			3 : PT 1000 (2-wire)
	Min elect	Minimum analog input value	From - 20mA to 20 mA
	Max elect	Maximum analog input value	From - 20mA to 20 mA
	Min displ	Value displayed for minimum analog input	From -9999 to 9999M
	Max displ	Value displayed for maximum analog input	From -9999 to 9999M
Meters	Total	Resets main line total energy meters	Yes: resets values/ <u>No</u> : no action
	Partial	Resets partial energy meters	
	Total +	Resets total positive energy meters	
	Total -	Resets total negative energy meters	
	Partial +	Resets partial positive energy meters	
	Partial -	Resets partial negative energy meters	
	Tariff	Resets tariff energy meters	
	Heating	Resets C1, C2, C3 pulse totalizers with Puls function	
	Trip	Resets C1 totalizer with protection trip function	
Reset	Reset max	Resets maximum values	Yes: resets values/ <u>No</u> : no action
	Reset DMD	Resets DMD values	
	Reset DMax	Resets Max DMD values	
	Reset MIN	Resets minimum values	

Page title/sub- menu	Page title	Description	Values
Clock	Format	Time format	Eu: European
			uSA: American
	Year	Year	Up to 2099
	Month	Month	From 1 to 12
	Day	Day	From 1 to 31
	Hour	Hour	From 0 to 23
	Minute	Minute	From 0 to 59
	Second	Second	From 0 to 59
End	-	Saves changes and returns to measurement menu	-

Accessory modules settings

Accessory module	Sub-menu/Page
M A TPN	Ct ratio
	Process
M F 16 06	Dig in x
M F 16 R4	Dig out x
M C 485 232	RS485232
M C ETH	Ethernet

Running a pulse transmission test

Note: function only available from WM50.

If a digital output is configured as a pulse output, a pulse transmission test can be run.

- 1. In the settings menu, open the **Dig out x** sub-menu (where x is the concerned digital output).
- 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, in the **Out test** page, set **Yes**.
- 5. Exit the **Dig out x** sub-menu and scroll settings to the **End** page and confirm exit: the test starts.
- 6. To end the test, open the **Dig out x** sub-menu, **Out test** page and set **No**.

Checking accessory module enabling

You can check whether modules are enabled from WM50 settings menu in sub-menu **Modules**. "Auto" means that the module is automatically recognized and its status can no longer be changed.

Configure TCD12s

Configure TCD12 layout connected to WM50

Note: function only available via UCS.

- 1. Meet all the requirements indicated in "Configuration requirements via UCS" on page 30.
- 2. Start UCS.
- 3. Follow the instructions depending on how you want to configure:

If	Then
you want to create an offline configuration	 Create an offline configuration. Open TCD12 settings.
you want to directly change settings	 Connect to WM50. Open TCD12 settings.

4. Select the layout that represents the physical TCD12 positions.

- 5. Select TCD12s connected to port A (TCD A bus) and those connected to port B (TCD B bus) in the order they are connected to WM50 (i.e.: A1 for TCD A bus TCD12 closest to WM50).
- 6. Assign a channel group to each TCD12: group 1-12 is assigned to the first selected, group 13-24 to the second and so on.

7. Select each TCD12:

- rotate it or reverse the channel order, if necessary (by default, the first channel is the one identified on TCD12, see "TCD12" on page 29).
- check/assign the correct phase to each channel.
- optional. Create load groups.
- 8. Save changes.
- 9. If necessary, download the configuration on WM50 and check settings, see "TCD12 LED status" on page 9 and "Troubleshooting" on page 38.

Moving a TCD12

If TCD12 position on the TCD bus changes, the system recognizes it: from UCS, view the warning on the involved TCD12. The configuration must be reset accordingly.

Replacing a TCD12

If a TCD12 is replaced, the system indicates that the newly connected TCD12 is not expected and the **BCM** LED blinks on the main unit. The configuration must be reset: the system will associate the physical position serial number and channel group that used to be associated with the replaced TCD12 to the new one.

Other operations

Manage alarms

Reset an alarm via digital input

Note: function only available with M F I6 06 or M F I6 R4 accessory module.

- 1. Set digital input 4 as remote reset alarm.
- 2. Close the digital input 4 contact.

Note: the alarm is only deactivated if the alarm condition no longer exists, otherwise the command has no effect. The command only affects main line and M A TPN variable alarms.

From WM50: Sub-menu Dig in 4, page Function = Rst.

Reset an alarm via UCS

- 1. Connect WM50 to UCS.
- 2. In settings, open the reset section and send the concerned command (main line and M A TPN variable alarms or TCD12 alarms).

Note: the alarm is only deactivated if the alarm condition no longer exists, otherwise the command has no effect.

Recognize active alarms

Active alarms can be recognized as follows:

- at the single alarm level, in the specific UCS section.
- on the alarm group level, by WM50 G1, G2, G3, G4 LED status, see "Main unit LED status" on page 7

Tip: to set up to four alarms only, associate them with virtual alarm 1, 5, 9 and 13. This way, the **G1**, **G2**, **G3** and **G4** LEDs turn on to indicate whether the single alarm is active.

Note: the alarm also activates if the variable measurement is not available.

Reset meters and values

Reset energy meters and totalizers

Energy meters for the main line and totalizers can be reset from both WM50 and UCS. TCD12 energy meters can only be reset from UCS.

From WM50: See "Settings from WM50" on page 31, sub-menu Meters.

From WM50

In the settings menu, sub-menu Meters select the page for the meter/totalizer to be reset. See "Settings from WM50" on page 31, sub-menu Meters.

From UCS

- 1. Connect WM50 to UCS.
- 2. In settings, open the reset section.

Reset minimum, maximum, dmd and max dmd values

Minimum, maximum, average (dmd) and maximums among averages (max dmd) values can be reset for the main line from both WM50 and UCS.

Daily minimum and maximum values and real-time minimum, maximum and average values for the single channels and loads can only be reset via serial communication.

From WM50

To reset	Then
all variable values	in the settings menu, in sub-menu Reset select the page for the values to be reset
values concern only the variables in a measurement page	 in the variable measurement page to reset values: press and hold down (1.5 s) the key ▲ or ▼. scroll the pages until the values to be reset are displayed and confirm.

From UCS

1. Connect WM50 to UCS.

2. In settings, open the reset section.

Communicating with other devices

Communicated via M C ETH module

- 1. Make sure the module is correctly installed.
- 2. Set network parameters via WM50 keypad or from USC mobile connected with OptoProg.
- 3. Connect WM50 to the master via Ethernet cable to the LAN or directly (point to point connection).
- 4. Create communications via mater (PC, VMU-C, PLC, etc.) connected to the same LAN or connected point to point.

Note: the module starts to communicate about 15-30 s after WM50 is turned on.

Communicated via M C 485 232 module

- 1. Make sure the module is correctly installed.
- 2. If necessary, set serial communication parameters via WM50 keypad or from USC mobile connected with OptoProg.
- 3. Connect WM50 to the master.
- 4. Create communications via master (PC; VMU-C, PLC, etc.).

Communicate via OptoProg

See relevant instruction manual.

Troubleshooting

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

Measurement problems

Problem	Cause	Possible solution
'EEEE' (on WM50) or "" (on UCS) appears instead of the measurement	The current transformer settings are not correct and therefore the measurement exceeds the maximum admissible value, or is the result of calculations with at least one measurement error.	Change the current transformer ratio
	The analyzer is not used within the expected measurement range and therefore the measurement exceeds the maximum admissible value, or is the result of calculations with at least one measurement error.	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. If required, change the integration interval.
Frequency and voltage values are zero	No data received from the phase used to calculate frequency	Check line status and analyzer connections, see WM50 installation instructions
The values displayed are not as expected	Electrical connections are incorrect	Check line status and analyzer connections, see WM50 installation instructions
	The current transformer settings are incorrect	Check the set current transformer ratio value
	There are more than four TCD12s per TCD bus	Check TCD bus composition and reorganize TCD12 buses
The values displayed differ from those expected and G1, G2, G3, G4 LEDs blink	TCD12 configuration error	From UCS check the configuration

Alarms

Problem	Cause	Possible solution
An alarm has activated but the measurement has not exceeded the	The value used to calculate the alarm variable is in error conditions	Check the set current transformer ratio value
threshold	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 set parameters. Check measured value consistency with analyzer features

Communication problems

Problem	Cause	Possible solution
Communication not possible with analyzer	The communication module/OptoProg settings are incorrect	Check set parameters.
	The communication module/OptoProg connections are incorrect	Check connections, see accessory module manual
	Communication device settings (PLC or third party software) are incorrect	Check communication with UCS

Problems during settings

Problem	Cause	Possible solution
'Err' appears while the parameter is being set	The value entered is out of range	Check the admissible value range and enter the correct value.
It is impossible to change the settings (via keypad)	The password entered is incorrect	Enter the correct password

Problem	Cause	Possible solution
It is impossible to change the settings (via UCS)	WM50 is displaying the settings menu or information menu	Return to measurement menu

LED

See "Main unit LED status" on page 7 and "TCD12 LED status" on page 9.

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 centers 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.

WM50 common specifications

General features

Material	Front: ABS, self-extinguishing V-0 (UL 94); PC, self-estinguishing V-2 (UL 94) Back and accessory modules: PA66, self- extinguishing V-0 (UL 94)
Protection degree	Front: IP65 NEMA 4x NEMA 12 Terminals: IP20
Overvoltage category	Cat. III
Pollution degree	2
Noise rejection (CMRR)	100 dB, from 42 to 62 Hz
MTBF/MTTF	Minimum 80 years*
Insulation	double electrical insulation on areas accessible to the user. For insulation between inputs and outputs, see "Input and output insulation" below.

Environmental specifications

Operating temperature	From -25 to +40 °C/from -13 to +104 °F
Storage temperature	From –30 to +70 °C/from –22 to +158 °F

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

*Calculated according to Siemens SN 29500, taking into consideration the following condition: mean ambient temperature: 50 °C.

Input and output insulation

Туре	Power supply	Voltage measurement inputs	Current measurement inputs	Digital outputs/ inputs	Analog inputs	Serial port	Ethernet port	TCD12 bus port	Functional ground connector
Power supply	-	Double **	Reinforced	Double **	Double **	Double **	Double **	Base	Base
Voltage measurement inputs	Double **	-	Reinforced	Double **	Double **	Double **	Double **	Base	Base
Current measurement inputs	Reinforced	Reinforced	-	Reinforced	Reinforced	Reinforced	Reinforced	Reinforced	Reinforced
Digital outputs/ inputs	Double **	Double **	Reinforced	-	NP	Double **	Double **	Base	Base
Analog inputs	Double **	Double **	Reinforced	NP	-	Double **	Double **	Base	Base
RS485 serial port	Double **	Double **	Reinforced	Double **	Double **	-	NP	Base	Base
Ethernet port	Double **	Double **	Reinforced	Double **	Double **	NP	-	Base	Base
TCD12 bus port	Base	Base	Reinforced	Base	Base	Base	Base	-	Base
Functional ground connector	Base	Base	Reinforced	Base	Base	Base	Base	Base	-

NP: combination not possible

Note **: 2.5 kV ac 1 min (4 kV pk 1.2/50 μ S) and limiter impedance.

Main unit specifications

Electrical specifications

Electrical system	
Managed electrical system	 Single-phase (2-wire) Two-phase (3-wire) Three-phase (4-wire)
<u>Voltage inputs</u>	
Voltage connection	Direct
VT/PT transformation ratio	-
Rated voltage L-N (from Un min to Un max)	From 120 to 277 V
Rated voltage L-L (from Un min to Un max)	
Voltage tolerance	-20%, + 15%
Overload	Continuous: 1.2 Un max For 500 ms: 2 Un max
Input impedance	>1.6 MΩ
Frequency	50/60 Hz

Current inputs		
Current connection	Via CT	
CT transformation ratio	From 1 to 2000	
Rated current (In)	5 A	
Minimum current (Imin)	0.05 A	
Maximum current (Imax)	6 A	
Start-up current (lst)	5 mA	
Overload	Continuous: Imax For 500 ms: 20 Imax	
Input impedance	< 0.2 VA	

Power supply

Auxiliary power supply	From 100 to 277 V ac/dc ± 10%
Consumption	≤20 VA (approx), 9 W(dc)

Main line measurement precision (main unit)

Current			
From 0.05 In to Imax	±(0.2% rdg + 2dgt)		
From 0.01 In to 0.05 In	±(0.5% 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)		

Channel and load measurement precision (TCD12)

Current		
From 0.1 lb to Imax	±(0.5% rdg + 2dgt)	
From 0.05 lb to 0.1 lb	±(1% rdg + 2dgt)	
Active and apparent power		
From 0.1 lb to Imax (PF=1) From 0.2 lb to Imax (PF=0.5L, 0.8C)	±(2% rdg +1dgt)	
From 0.05 In to 0.1 lb (PF=1) From 0.1 lb to 0.2 lb (PF=0.5L, 0.8.5C)	±(2.5% rdg +1dgt)	

Optical port

Compatible accessories	OptoProg
Configuration parameters	 Baud rate (9,6/ 19,2/ 38,4/ 115,2 kbps) Parity (None/ Odd/ Even)
Configuration mode	Via keypad or UCS

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)
Reactive energy	Class 2 (EN62053-23)
THD	±1%
Frequency	
From 45 to 65 Hz	±0.1 Hz

Reactive power	
From 0.1 lb to Imax (sinφ=1)	±(3% rdg + 2 dgt)
From 0.2 lb to Imax (sinφ=0.5L, 0.5C)	±(3% rdg + 1 dgt)
Power factor	±[0.001+0.5%(1 – PF rdg)]
Active energy	Class 2 (EN62053-21)
THD	±1%

Memory

Main line electrical variable database	Log interval: from 1 to 60 min Maximum number of records saved: from 10,000 to 260,000 according to the number of monitored variables Memory management: FIFO
Main unit event database	Number of events: 10 000 Memory management: FIFO
TCD12 event database	Number of events: 10 000 Memory management: FIFO
Daily maximum/minimum database for each channel and load	Log interval: daily Maximum number of records saved: 366 Memory management: FIFO

Digital input/output module specifications

M F I6 06 module features

<u>Inputs</u>	
Number of inputs	6
Input type	Voltage free
Features	Open contact voltage: ≤ 3.3 V dc Closed contact voltage: < 1 mA dc Open contact resistance: ≥ 50 k Ω Closed contact resistance: ≤ 300 Ω
Configuration parameters	 Input function: remote input status reading/rate management/pulse counting/alarm rest/average value calculation interval synchronization (dmd) Pulse type and pulse weight ("pulse counting" function only)
Configuration mode	Via keypad or UCS

<u>Outputs</u>	
Number of inputs	6
Input type	Opto-mosfet
Features	$V_{_{ON}}$: 2.5 V dc, 100 mA max $V_{_{OFF}}$: 42 V dc max
Configuration parameters	 Output function: alarm/ remote control/ pulse Normal output status ("alarm" function only) Pulse weight, transmitted energy type, test transmission settings ("pulse" function only)
Configuration mode	Via keypad or UCS

M F I6 R4 module features

<u>Inputs</u>

Number of inputs	6
Input type	Voltage free
Features	Open contact voltage: $\leq 3.3 \text{ V}$ dc Closed contact voltage: $< 1 \text{ mA}$ dc Open contact resistance: $\geq 50 \text{ k}\Omega$ Closed contact resistance: $\leq 300 \Omega$
Configuration parameters	 Input function: remote input status reading/rate management/pulse counting/alarm rest/average value calculation interval synchronization (dmd) Pulse type and pulse weight ("pulse counting" function only)
Configuration mode	Via keypad or UCS

<u>Outputs</u>

Outputs	
Number of inputs	4
Input type	SPDT relay
Features	AC1: 5 A @ 250 V ac AC15: 1 A @ 250 V ac
Configuration parameters	 Output function: alarm/ remote control/ pulse Normal output status ("alarm" function only) Pulse weight, transmitted energy type, test transmission settings ("pulse" function only)
Configuration mode	Via keypad or UCS

Analog input module features

M A TPN module input features

<u>Analog input</u>

Input type	From -20 to 20 mA dc
Accuracy	From 0% to 25% full scale: ±(0.2% rdg + 2dgt) From 25% to 110% full scale: ±(0.1% rdg + 2dgt)
Overload	Continuous: 50 mA dc For 1 s: 150mA dc
Temperature drift	≤ 150ppm/°C
Input impedance	< 12 Ω
Configuration parameters	address, baudrate, odd, bit stop
Configuration mode	Via keypad or UCS

Neutral current input

1 A
$\pm(0,5\%\ rdg$ + 2dgt) from 0.01 ln to 0.05 ln; $\pm(0,2\%\ rdg$ + 2dgt) from 0.05 ln to 1.2 ln.
Continuous: 1.2 ln For 500 ms: 10 ln
≤ 150ppm/°C
0.5 Ω
Current transformer ratio
Via keypad or UCS

Temperature probe input	
Probe type	Two or three-wire PT100 or PT1000
Measurement range	From -60 to 300 $^\circ C$ (from -76 to 572 $^\circ F$) with PT100 probe; from -60 to 300 $^\circ C$ (from -76 to 572 $^\circ F$) with PT1000 probe
Accuracy	±(0,5% rdg + 5dgt)
Compensation	Up to 10 Ω
Temperature drift	≤ 150 ppm/°C
Configuration parameters	address, baudrate, odd, bit stop
Configuration mode	Via keypad or UCS

Communication module features

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	
Configuration mode	Via keypad or UCS

RS232 port	
Protocol Modbus RTU	
Communication type	Bidirectional
Connection type 3 wires, maximum distance 15 m	
Configuration parameters	
Configuration mode	Via keypad or UCS

NOTE: the RS485 and RS232 ports are alternative.

<u>LED</u>

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	IP address, subnet mask, default gateway, TCP port
Configuration mode	Via keypad or UCS

TCD12 current sensor features

General features

Material	PPO, self-estinguishing V-0 (UL 94)
Protection degree	Front: IP50
Overvoltage category	Cat. III
Pollution degree	2
MTBF/MTTF	Minimum 80 years*
Insulation	60 s, 1500 V ca (with TCD12WS cables connected)
Power supply	Self power supply via TCD bus

Environmental specifications

Operating temperature	From -25 to +40 °C/from -13 to +104 °F
Storage temperature	From -25 to +70 °C/from -22 to +158 °F

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

Conformity

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

Part numbers key

Main unit part number (rear of unit)

WM50	AV5	3	Н	BC
Model	From 208 to 480 V L-L ac, 5(6) A, connection via TA	System: • three-phase (4-wire) • two-phase (3-wire) • single-phase (2-wire)	Auxiliary power supply from 100 to 277 V ac/dc	Pre-installed MABC module for communications with TCD12s

Compatible accessory modules part numbers (rear of module)

Part number	Туре	Module description	
M F 16 O6	Digital inputs/outputs	Six digital inputs and six static outputs	
M F 16 R4		Six digital inputs and four relay outputs	
ΜΑΤΡΝ	Analog inputs	A 1 A input for neutral current, a temperature probe input, a 20 mA analog input	
M C 485232	Communication	Modbus RTU communication on RS485/RS232	
M C ETH		Modbus TCP/IP communication on Ethernet	

Electrical specifications

Current connection	Bus cable
CT transformation ratio	-
Rated current (In)	32 A
Base current (lb)	10 A
Minimum current (Imin)	0.5 A
Maximum current (Imax)	40 A
Start-up current (lst)	40 mA
Overload	Continuous: 2 Imax For 500 ms: 20 Imax
Input impedance	-

*Calculated according to Siemens SN 29500, taking into consideration the following condition: mean ambient temperature: 50 °C.

TCD12 part number

TCD12	BS	32A	x
Model	Split core sensor	Rated current 32 A	No option included

TCD12WS cable part number

TCD12WSS2TI	ХХХ
Model	Length:
	030: 30 cm
	050: 50 cm
	100: 100 cm
	200: 200 cm
	300: 300 cm
	500: 500 cm



CARLO GAVAZZI Controls SpA

via Safforze, 8 32100 Belluno (BL) Italy

www.gavazziautomation.com info@gavazzi-automation.com info: +39 0437 355811 fax: +39 0437 355880



WM50 - Instruction manual 2017-09 | Copyright © 2017