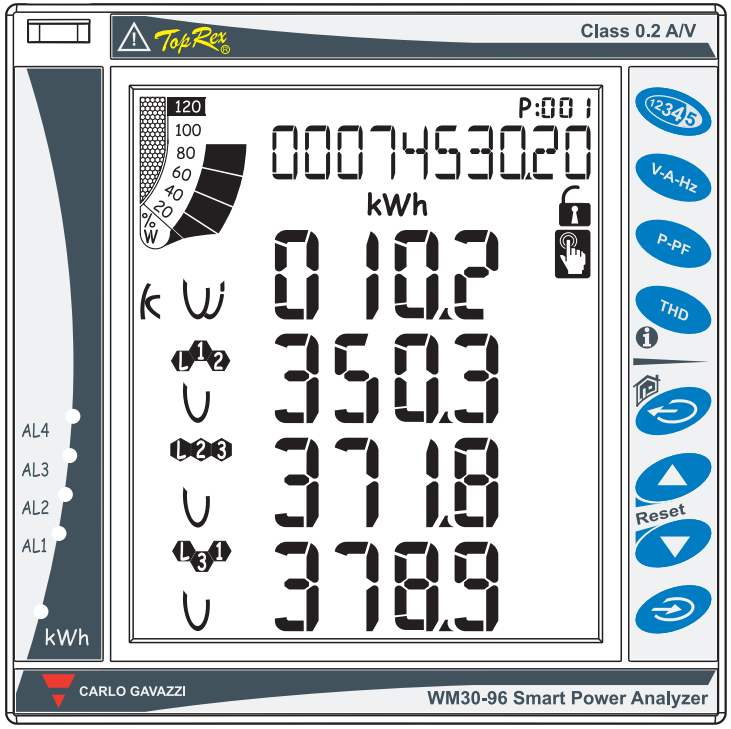
WM30-96

Instruction Manual

Display, Programming

Modular system

Class 0.2 A/V



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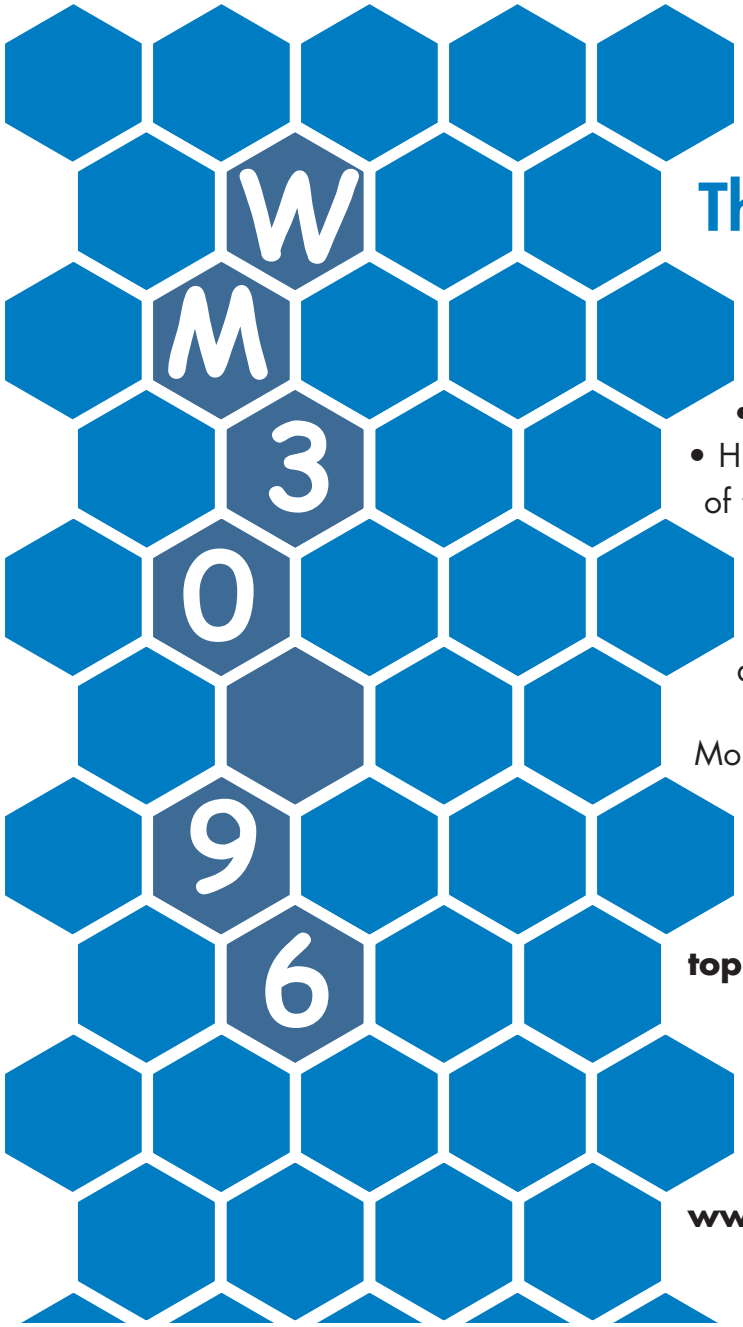

Thank you for choosing our products

WM30 96:

- High accuracy (class 0.2 A/V);
- High calculation performances for a fast analysis of the signal (FFT up to the 32nd harmonics);
- high connection capabilities.

WM30-96 is the state-of-the-art tecnological answer to your needs of power quality analysis.

Moreover, you can count on a ISO9001/VISION 2000 certified company structure, an experience of many years and a wide-spread presence both in Europe and all over the world. All this in order to guarantee the customer with a **top-quality service** and the best products.

Welcome in Carlo Gavazzi and our compliments for your choice. You can evaluate the complete range of our products on the CARLO GAVAZZI web-site:

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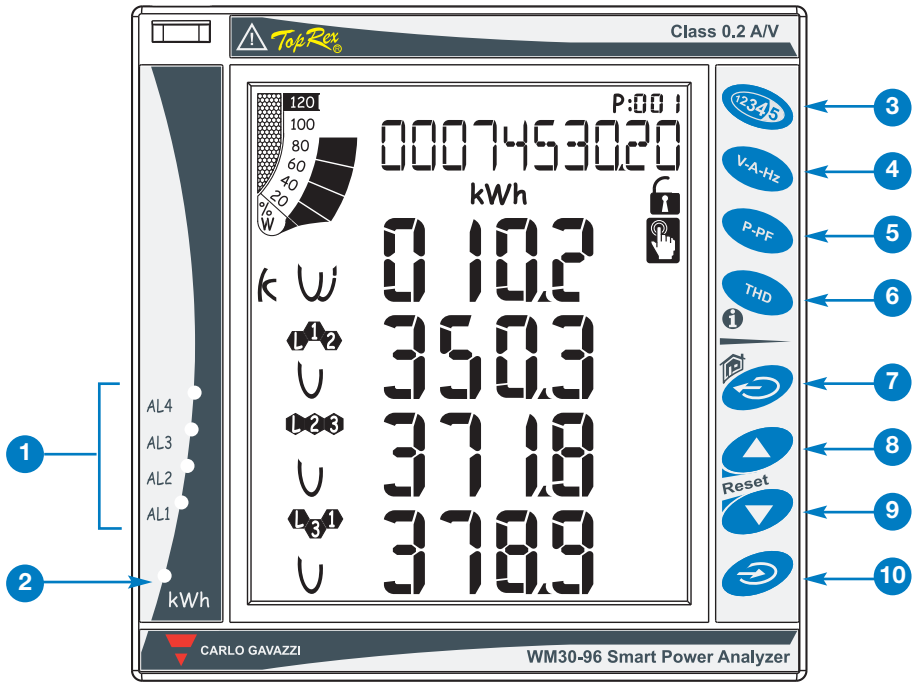


ADDITIONAL FUNCTIONS OF THE BUTTONS

The buttons featuring a double icon have two functions, to access the secondary function, hold pressed for a long time the button corresponding to the desired secondary function.

Access to the instrument information screens: reference standards, firmware version, year of manufacturing.

"Home" button: from any measurement screen, from any menu, returns to the main measurement screen (customizable by the user). **If you are in the programming menu, any data entered is lost.**

Reset

Holding pressed the button 8, you access the reset of the MAX of the displayed variables.
Holding pressed button 9, you access the reset of the dmd's of the displayed variables.
The reset must be confirmed by button 10.

DESCRIPTION OF THE INSTRUMENT

1. Active virtual alarms warners.
2. Current energy drain indicator (kWh) by means of flashing, proportional to the measured energy (the higher the flashing frequency, the higher the energy drained. Max. frequency 16Hz pursuant to standard EN5047-1).

The keyboard is divided into two areas, the top area is dedicated to the measurements with direct access to specific visualization screens.

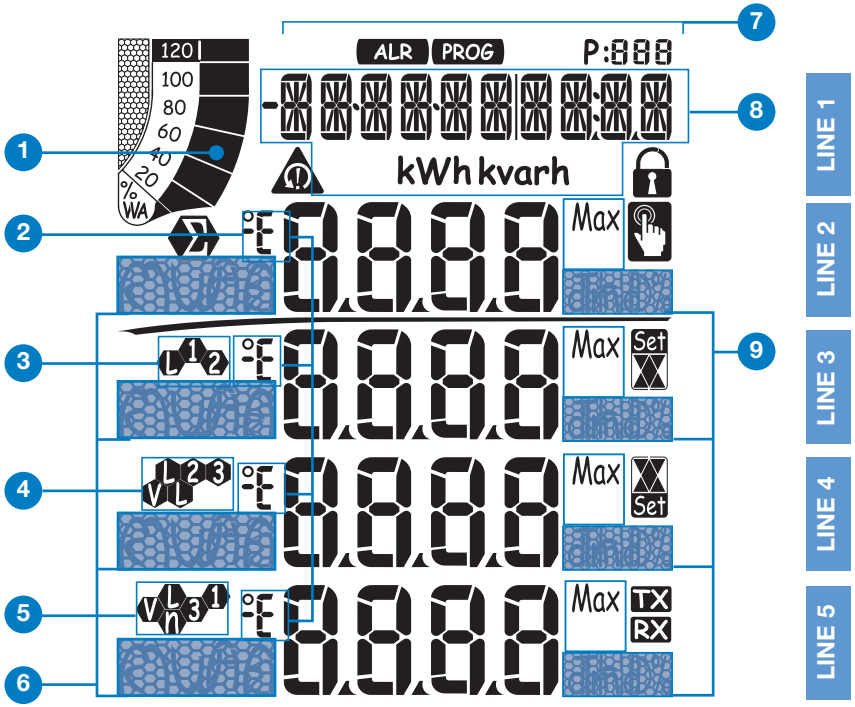
3. Visualization of the counters screens: each pressure of the button corresponds to the visualization of a screen with counters related to different energies (see the table with the measurement screens below).
4. Visualization of the current voltage and frequency (see the table with the measurement screens below).
5. Visualization of the instant cosf and powers (see the table with the measurement screens below).
6. Visualization of the harmonics (see the table with the measurement screens below).

The keyboard in the bottom area is especially dedicated to instrument programming.

7. Exits the submenus, exits programming.
8. "Up" button, enables to browse the menus and to increase the values to be set.
9. "Down" button, enables to browse the menus and to decrease the values to be set.
10. Access to the programming menu: **hold pressed for at least 2 seconds to access the programming menu.**

In measurement mode, buttons 8 and 9 enable to display the MAX and dmd values of the displayed variables.

The buttons are enhanced touch buttons. To check their actual engagement, a specific icon on the display turns on each time a button is pressed.



ICONS OF THE DISPLAY

ALARM SETPOINT	
Set	Set
Up alarm.	Down alarm.

DESCRIPTION OF THE DISPLAY

1. Graphic bar which displays the active and the apparent power drained with relation to the installed power.
2. Indications of inductive phase displacement L, -L, or capacitive phase displacement C, -C.
3. Indication of the measurement phase-neutral L1 or phase-phase L12.
4. Indication of the measurement phase-neutral L2 or phase-phase L23 or of the asymmetry phase-phase VLL.
5. Indication of the measurement phase-neutral L3 or phase-phase L31 or of the asymmetry phase-neutral VLn.
6. Indication of the engineering unit and of the multiplier: k, M, V, W, A, var (VAr), PF (Pf), Hz, An.
7. ALR: the alarm display function is active. PROG: the programming function is active.
8. Area dedicated to the visualization of counters, text messages, date and time (format: dd.mm.yy/hh:mm). Energy counters (see table on the following screen).
9. Indication of: dmd, THD% or Max.
10. Indicates that all the instant values displayed are system values.
11. Phase sequence error alarm.
12. Instrument programming enabled.
13. Instrument programming disabled.
14. Data transmission (TX) and reception (RX), via network communication, in progress.

Notes: the display is backlighted with lighting time programmable from 0 minutes (always on) to 255 minutes.

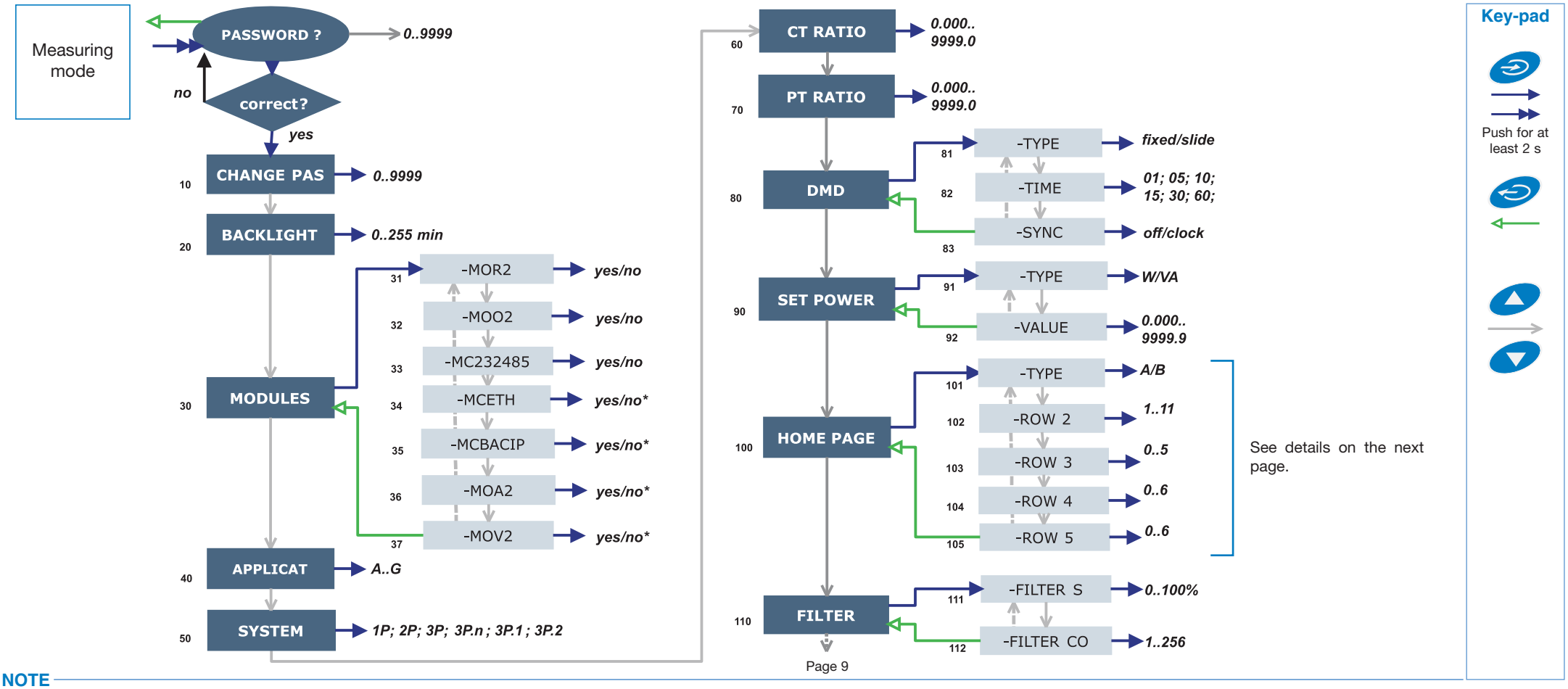
Selection	Application	Note
A	Cost allocation	Imported energy metering
B	Cost control	Imported and partial energy metering
C	Complex cost allocation	Imported/exported energy (total and partial)
D	Solar	Imported and exported energy metering with some basic power analyzer function
E	Complex cost and power analysis	Imported/exported energy (total and partial) and power analysis
F	Cost and power quality analysis	Imported energy and power quality analysis
G	Advanced energy and power analysis for power generation	Complete energy metering and power quality analysis

NOTE

WM30-96 is provided with the "Easy-prog" function which enables a simple, quick, clear and immediate visualization of the instrument measurements, making available only specific variables depending on the application of the instrument. The available applications are described above.
To leverage all the capacities of the instrument, select the application G which enables a complete and detailed analysis of the electric energy.

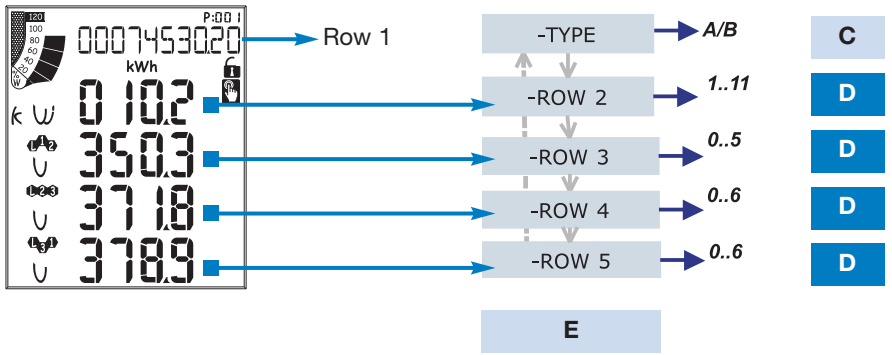
	No	Line 1	Line 2	Line 3	Line 4	Line 5	Note	Application						
								A	B	C	D	E	F	G
	0	Total kW (+)	Programmable					x	x	x	x	x	x	x
12345	1	Total kW (+)	Depending on the last displayed page of instantaneous variables.					x	x	x	x	x	x	x
	2	Total kvarh (+)						x	x	x	x	x	x	x
	3	Total kWh (-)								x	x	x		x
	4	Total kvarh (-)								x	x	x		x
	5	kWh (+) part.							x	x		x	x	x
	6	kvarh (+) part.							x	x		x	x	x
	7	kWh (-) part.								x		x		x
	8	kvarh (-) part.								x		x		x
	9	Run Hours (99999999.99)								x	x	x	x	x
V-A-Hz	10	Phase seq.	VLN Σ	VL1	VL2	VL3	Max, dmd				x	x	x	x
	11	Phase seq.	VLN Σ	VL1-2	VL2-3	VL3-1					x	x	x	x
	12	Phase seq.	An	AL1	AL2	AL3					x	x	x	x
	13	Phase seq.	Hz	"ASY"	VLL sys (% asy)	VLL sys (% asy)					x	x	x	x
P-PF	14	Phase seq.	VA Σ	VA L1	VA L2	VA L3						x	x	x
	15	Phase seq.	var Σ	var L1	var L2	var L3						x	x	x
	16	Phase seq.	W Σ	WL1	WL2	WL3					x	x	x	x
	17	Phase seq.	PF Σ	PF L1	PF L2	PF L3						x	x	x
THD	18	Phase seq.		THD V1	THD V2	THD V3							x	x
	19	Phase seq.		THD V12	THD V23	THD V31							x	x
	20	Phase seq.		THD A1	THD A2	THD A3							x	x

	No	Line 1	Line 2	Line 3	Line 4	Line 5	Note	Applications						
								A	B	C	D	E	F	G
	1	Lot n. (text) xxxx	Yr. (text) xx	SYS (text)	x (1/2/3)	1...60 (min) “dmd”		x	x	x	x	x	x	x
	2	Conn. xxx.x (3ph.n/3ph/3ph./ 3ph.2/1ph/2ph)	CT.rA (text)	1.0 … 99.99k	PT.rA (text)	1.0...9999		x	x	x	x	x	x	x
	3	LED PULSE (text) kWh	xxxx kWh per pulse					x	x	x	x	x	x	x
	4	PULSE out1 (text) kWh/kvarh	xxxx kWh/kvarh per pulse	+/- tot/PAr				x	x	x	x	x	x	x
	5	PULSE out2 (text) kWh/kvarh	xxxx kWh/kvarh per pulse	+/- tot/PAr				x	x	x	x	x	x	x
	6	Remote out	out1 (text)	on/oFF	Out2 (text)	on/oFF		x	x	x	x	x	x	x
ℹ	7	Alarm 1 nE/nd	None / out 1 / out 2	Set 1	Set 2	(measurement)					x	x	x	x
	8	Alarm 2 nE/nd	None / out 1 / out 2	Set 1	Set 2	(measurement)					x	x	x	x
	9	Alarm 3 nE/nd	None / out 1 / out 2	Set 1	Set 2	(measurement)					x	x	x	x
	10	Alarm 4 nE/nd	None / out 1 / out 2	Set 1	Set 2	(measurement)					x	x	x	x
	11	Analogue 1	Hi:E	0.0 ... 9999	Hi.A	0.0 ... 100.0%					x	x	x	x
	12	Analogue 2	Hi:E	0.0 ... 9999	Hi.A	0.0 ... 100.0%					x	x	x	x
	13	COM port	None / out 1 / out 2	xxx (address)	bdr (text)	9.6/19.2/ 38.4/115.2		x	x	x	x	x	x	x
	14	IP address	XXX	XXX	XXX	XXX		x	x	x	x	x	x	x



NOTE

10 CHANGE PAS: this function allows the user to modify the PASS value with a new value (from 0 to 1000).
20 BACKLIGHT: backlight time from 0 (always on) to 255 minutes.
30 MODULES: the WM30 96 does not support the automatic acknowledgment of the installed modules, therefore this information must be entered using the “MODULES” menu.
40 APPLICAT.: this function which enables a simple, quick, clear and immediate visualization of the instrument measurements, making available only specific variables (page 4/5) depending on the application of the instrument. **50 SYSTEM:** this function allows the user to select the type of electrical system. **60 CT RATIO:** this function allows the user to select the value of the CT ratio (primary/secondary ratio of the current transformer being used). Example: if the CT primary (current transformer) has a current of 300A and the secondary a current of 5A, the CT ratio corresponds to 60 (obtained using the following calculation: 300/5.
70 PT RATIO: this function allows you to select the value of the VT-PT ratio (primary/secondary ratio of the voltage transformer being used). Example: if the primary of the connected VT (voltage transformer) is 20kV and the secondary is 100V, then the VT-PT ratio corresponds to 200 (obtained carrying out the following calculation: 20000/100).
80 DMD: This function allows the user to select the calculation method of the DMD/AVG value of the selected variable. 81 TYPE: select the type of calculation mode to be used for the DMD/AVG calculation FIXED: if, for example, a time interval of 15 minutes has been selected, the instrument will calculate the AVD/DMD value of the measured variable and updates its value every 15 minutes. SLIDE: if for example a time interval of 15 minutes has been selected, the instrument calculates the AVG/DMD value and updates its value at the beginning after the first 15 values and then after every minute, thus generating a window whose width is of 15 minutes and that moves forward every minute. 82 TIME: select the time interval for the DMD/AVG calculation 83 SYNC: select the synchronization mode, that is the method that controls the calculation method of the average/demand according to the selected time.
90 SET POWER: This menu allows you to set a power value (installed power) that, in the measuring phase, will represent 100% of the graph indicator.
100 HOME PAGE: This function allows the user to select the variables to be displayed on first page (home page). 101 TYPE: A, you can select the variable for each row. B, you can select a preset combination of variables.
110 FILTER: Thanks to the digital filter, it’s possible to stabilize the measurements which are too instable when displaying the relevant values. 111 FILTER S: set the operating range of the digital filter. The value is expressed as a %. 112 FILTER CO: set the filtering coefficient of the instantaneous measures. By increasing the value, also the stability and the settling time of the measures are increased.
Some specific menus display only if the relevant modules are installed
* Self-recognize.



How to costumize the home page of WM30-96

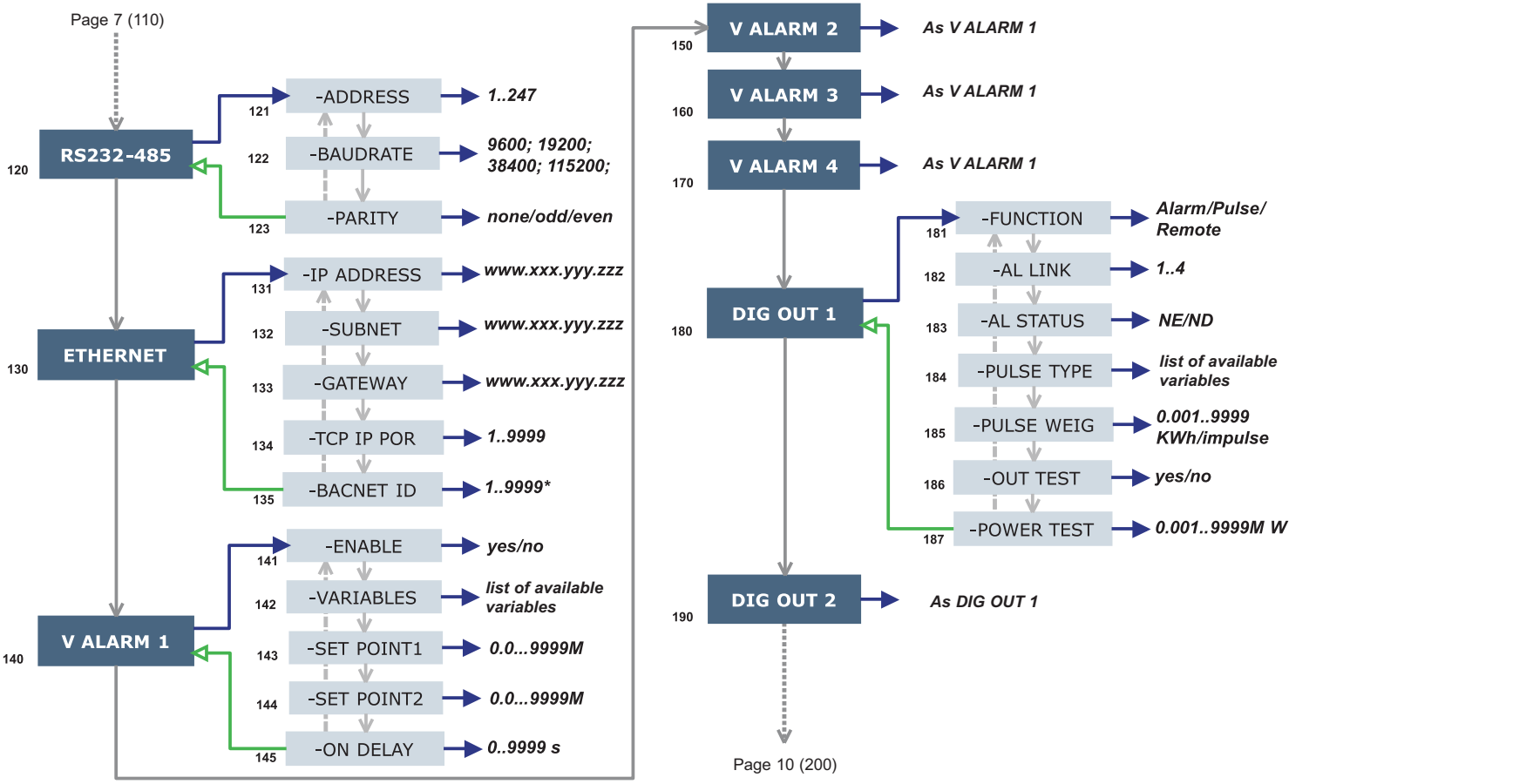
Menu “101 TYPE”: A, you can select the variable for each row. B, you can select a preset combination of variables. Moreover, the selectable variables depend on the selected electric system, if 1P (one phase) system is selected, the available variables are different.

Note: when the B type is selected all the A selections on row 3, 4, 5 are irrilevant.

E	C	D											
	Type Selection	0	1	2	3	4	5	6	7	8	9	10	11
Row 2	Type **A**	AN	W	var	VA	PF	Hz	AN	AN	AN	AN	AN	AN
	Type **A** with System **1P**	V1	A1	W1	var1	VA1	PF1	Hz	V1	V1	V1	V1	V1
	Type **B**	Select one of the preset combination of variables											
	Type **B** with System **1P**	Select one of the preset combination of variables											
Row 3	Type **A**	AN	W	var	VA	PF	Hz	AN	AN	AN	AN	AN	AN
	Type **A** with System **1P**	V1	A1	W1	var1	VA1	PF1	-	-	-	-	-	-
Row 4	Type **A**	VL-L	AN	W	var	VA	PF	VL-L	-	-	-	-	-
	Type **A** with System **1P**	V1	A1	W1	var1	VA1	PF1	Hz	-	-	-	-	-
Row 5	Type **A**	VL-N	AN	W	var	VA	PF	VL-L	-	-	-	-	-
	Type **A** with System **1P**	V1	A1	W1	var1	VA1	PF1	Hz	-	-	-	-	-

E	D											
	0	1	2	3	4	5	6	7	8	9	10	11
Row 2	-	V LN Σ	V LN Σ	An	Hz	VA Σ	var Σ	W Σ	PF Σ	-	-	-
Row 3	-	V LN Σ	V L1-2	A L1	“ASY”	VA L1	var L1	W L1	PF L1	THD V1	THD V12	THD A1
Row 4	-	V L2	V L2-3	A L2	VLL sys (% asy)	VA L2	var L2	W L2	PF L2	THD V2	THD V23	THD A2
Row 5	-	V L3	V L3-1	A L3	VLL sys (% asy)	VA L3	var L3	W L3	PF L3	THD V3	THD V31	THD A3

E	D											
	0	1	2	3	4	5	6	7	8	9	10	11
Row 2	V 1					VA				THD_V1		
Row 3	A 1					VAR 1				THD_A1		
Row 4	Hz					W 1				-		
Row 5	-					PF 1				-		

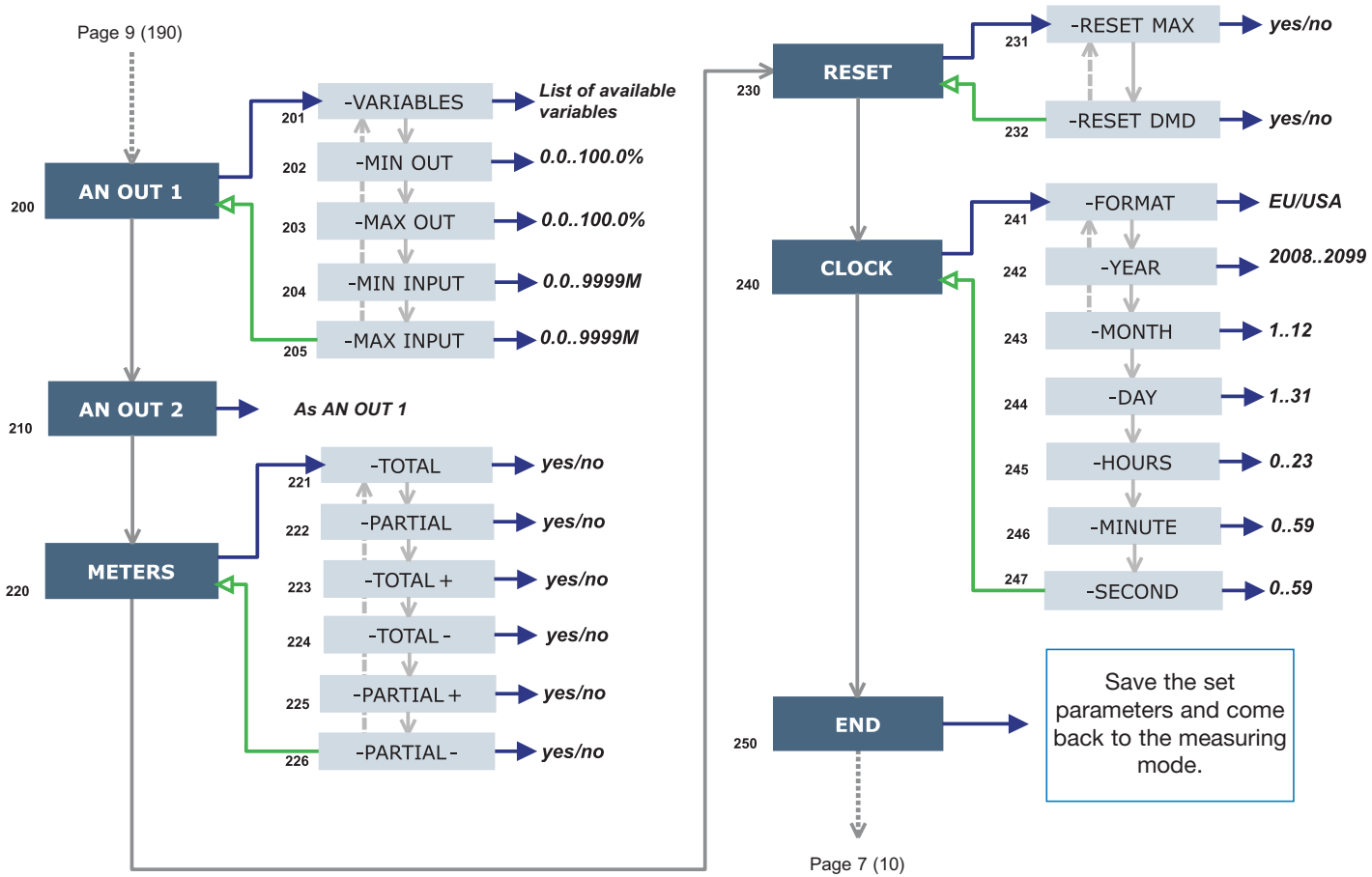


Key-pad

NOTE

120 RS232-458: This function allows the user to set the RS232 and RS485 serial ports as well as the optical port.
130 ETHERNET: This function allows the user to set the Ethernet port.
140 V ALARM 1: This function allows you to set the alarm parameters. 141 ENABLE: enable (YES) or disable (NO) the alarm. 142 VARIABLES: set the variable to be coupled to the alarm. 143 SET POINT 1:set the first alarm set point of the variable. 144 SET POINT 2: set the second alarm set point of the variable. 145 ON DELAY: set a delay on activation of the alarm.
180 DIG OUT 1: This function allows the selected function to be coupled to the selected digital output. 181 FUNCTION: *Alarm*, the digital output is enabled only if the expected alarm status occurs. *Pulse*, the measured energy is retransmitted by the digital output by means of pulses. *Remote*, the digital output can be enabled by means of a command sent by means of serial port. 182 AL LINK: select the reference alarm. 183 AL STATUS: “ND” (normally de-energized relay) or “NE” (normally energized relay) 185 PULSE WEIG: selects the pulse weight (kWh per pulse). 186 OUT TEST: active the TEST (YES), deactivate the TEST (NO). 187 POWER TEST: sets the simulated power value (kW) to which a proportional pulse sequence according to “PULSE WEIG” corresponds. The function is active until you remain within the menu.

Some specific menus display only if the relevant modules are installed.



Key-pad

NOTE

200 AN OUT 1: this submenu allows the programming of the analog outputs (0-20mA, 0-10V). 201 VARIABLES: select the variable to be retransmitted by means of the analog output. 202 MIN OUT: set the value expressed as % of the output range (0-20mA, 0-10V) to be coupled to the minimum measured value. 203 MAX OUT: select the value expressed as % of the output range (0-20mA, 0-10V) to be coupled to the maximum measured value. 204 MIN INPUT: minimum value of the variable input range to which the “MIN OUT” value, retransmitted by the analog output, will be coupled. 205 MAX INPUT: maximum value of the variable input range to which the “MAX OUT” value, retransmitted by the analog output, will be coupled.

220 METERS: reset the ENERGY METERS choosing among: TOTAL, PARTIAL: resets all energy meters, both total and partial. TOTAL +: resets the total meters of imported energy. TOTAL -: resets the total meters of exported energy. PARTIAL +: resets the partial meters of imported energy. PARTIAL -: resets the partial meters of exported energy.

230 RESET: carry out the reset of the MAX or dmd stored values.

240 CLOCK, 241 FORMAT: UE, set the time format as 24h european (00:00) or USA as 12h american (12:00 AM). 242 TIME: set the current time. 243 DATE: set the current date.

Some specific menus display only if the relevant modules are installed.

DIGITAL FILTER PROGRAMMING EXAMPLES

Example 1

How to stabilize the value of the VL-N variable displayed on the display, fluctuating from 222V and 228V.

The parameters of the digital filter have to be programmed as follows:
FILTER S: the variable has fluctuations within the mean value whose amplitude is equal to ±0,75% of the full scale rated value of the variable itself (obtained by the following calculation: (228-222)/ 2= ±3V, then ±3*100/400V= ±0,75% where 400V is the phase-neutral rated value of an AV5 input). The “range” parameter, representing the action range of the digital filter, is to be programmed to a value which must be slightly higher than the percentage amplitude of the fluctuation: ex. 1.0%.
FILTER CO: if the new value measured by the instrument is within the action range of the filter, the new displayed value is obtained by adding algebrically the previous value to the variation divided by the filtering coefficient. As a consequence, a value higher than this coefficient implies a longer settling time and therefore a better stability. You generally obtain the best result by setting the filtering coefficient to a value equal to at least 10 times the range parameter value.
In the following example: 1,0*10=10, the stability of the filtering coefficient can be improved by increasing the filtering coefficient, the admitted values are included within 1 and 255.

Example 2

How to stabilize the value of the displayed System Active Power (W∑), fluctuating between 300kW and 320kW (the load is connected to the instrument by means of a 300/5A CT and a direct measure of the voltage).

The parameters of the digital filter must be programmed as follows:
FILTER S: the variable has fluctuations within the mean value whose amplitude is equal to ±2,78% of the full scale rated value of this variable. This value is obtained by the following calculation: (320-300)/ 2= ±10kW, then ±10*100/360kW= ±2,78%, where 360kW is the rated value of the System Active Power of an AV5 input, at the above mentioned CT and VT ratios and obtained by means of the following formula: (320-300)/ 2= ±10kW, then ±10*100/360kW= ±2,78%, where 360kW is the rated value of the System Active Power of an AV5 input
at the above mentioned CT and VT ratios and obtained by means of the following formula: “VLN * VT * IN * CT * 3” where VLN = rated input voltage (400V for the AV5 input), VT= primary/secondary ratio of the voltage transformer being used, IN = rated current (5A for the AV5 type input), CT = primary/secondary ratio of the voltage transformer being used (in this example “400*1*5*60*3=360kW).
The RANGE parameter, representing the digital filtering coefficient action range, is to be programmed to a value which must be slightly higher than the percentage of the fluctuation: ex. 3.0%.
FILTER CO: if the new value acquired by the instrument is within the filtering action range, the new displayed value is obtained by adding algebrically the previous value to the variation divided by the filtering coefficient. As a consequence, a value higher than this coefficient implies an higher settling time and therefore a better stability. Generally speaking the best result is obtained setting the filtering coefficient to a value equal to at least 10 times the value of the range parameters. In the example: 3.0*10=30. In order to improve the stability you can increase the filtering coefficient, the admitted values are included within 1 and 255.

Example 3.

It’s necessary to stabilize the value of the displayed variable AL 1 (phase current 1), fluctuating within 470V and 486V.

To be able to manage the alarm function and following activation and deactivation of the relay, this value is not to be subject to continuous fluctuations. In this example we have considered using a 500/5A CT. The paramters of the digital filter is to be programmed as follows:
FILTER S: the variable has fluctuations within the mean value whose amplitude is equal to ±1,60% of the full scale rated value of this variable (obtained by means of the calculation: (486-470)/ 2= ±8A, then ±8*100/500V= ±1,60% where 500A is the value referred to the primary of the transformer being used). The “range” parameter, which represents the action range of the digital filter, is to be programmed to a value slightly higher than the pourcentage amplitude of the fluctuation: for example 2.0%.
FILTER CO: if the new value acquired by the instrument is within the filtering action range, the new displayed value is calculated algebrically adding to the previous value the variation divided by the filtering coefficient. As a consequence, a higher value of this coefficient implies a higher settling time and therefore a better stability. Generally speaking, the best result is obtained setting the filtering coefficient at a value equal to at least 10 times the value of the range parameter. In the example: 2.0*10=20. To improve the stability you can increase the filtering coefficient, the admitted values are within 1 and 255.

PROGRAMMING EXAMPLES OF THE ANALOGUE OUTPUTS

Power retransmission by means of a 0-20mA analog output.

It's necessary to measure a consumed power up to 100kW and retransmit this value by means of a signal from 4 to 20 mA: the module to be used is AO2050 (2x from 0 to 20mA), the instrument is to be programmed as follows:

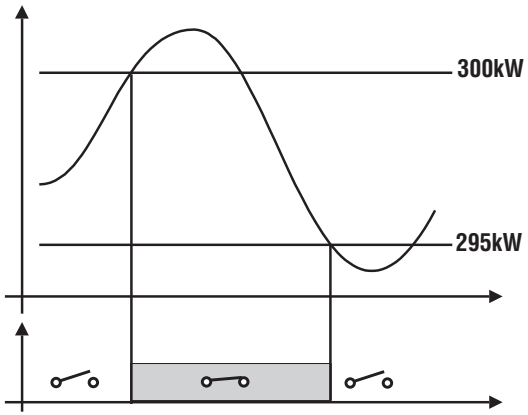
VARIABLE: W∑ (system active power).
MIN OUT: 20.0% means 4 mA the calculation to be carried out is the following: (100*minimum output) / fullscale output =100*4mA/ 20mA=20%.
MAX OUT: 100.0% means 20mA, the calculation to be carried out is: (100*maximum output) / fullscale output = 100*20mA/20mA= 100.
MIN INPUT: 0,0k; the multiple k,M,G can be selected on the instrument according to the chosen VT and CT values.
MAX INPUT: 100.0k; the k, M, G multiples can be selected on the instrument according to the selected VT and CT values.

Retransmission of the POWER FACTOR (PF) by means of the 0-20mA analog output.

It's necessary to retransmit the whole range of the admitted values for the PF with a signal from 0 to 20mA. Particular attention must be paid to the value of the PF variable which may vary from C0,001 and L0,000 (for each phase): these values will be retransmitted and will then correspond to 0 and 20 mA. When the PF will have a value equal to 1, being in the middle between C0,001 and L0,000, the value of the output will correspond to the middle of the scale, that is 10mA. As a consequence, the instrument will have to be programmed as follows:

VARIABLE: PF L1 (or L2 or L3 or PF∑).
MIN OUT: 0,0%.
MAX OUT: 100,0%.
MIN INPUT: C0,001 (the C symbol shows a CAPACITIVE value).
MAX INPUT: L0,001 (the L symbol shows an INDUCTIVE value). L0,001 has been chosen as minimum value to be set in order to avoid any undesirable swifting of the repeated outputs.

EXAMPLE OF ALARM PARAMETERS PROGRAMMING



The disconnection of a load when a set value of absorbed power is required. For example when 300kW are exceeded, the alarm occurs and a set load is disconnected. An UP alarm is selected. Below you'll find the recommended programming:

ENABLE: YES
VARIABLES: W system (WΣ)
SET POINT 1: 300kW
SET POINT 2: 295kW
ON DELAY: set the desired number of seconds: "5 seconds".

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Control