

GX 305, GX 310 GX 320



Function generators

You have just purchased a Metrix GX 305, GX 310 or GX 320 function generator and we appreciate your confidence.

For best results from your instrument:

- read this user's manual carefully,
- comply with the precautions for use.



WARNING, risk of electric shock. The voltage on the parts marked with this symbol may be dangerous.



WARNING, risk of DANGER! The operator must refer to this user's manual whenever this warning symbol appears.



Useful information or tip.



USB



The CE marking certifies the product's compliance with the European Low Voltage Directive (2014/35/EU), Electromagnetic Compatibility Directive (2014/30/EU), Radio Equipment Directive (2014/53/EU), and Restriction of Hazardous Substances Directive (RoHS, 2011/65/EU and 2015/863/EU).



The rubbish bin with a line through it indicates that, in the European Union, the product must undergo selective disposal in compliance with Directive WEEE 2012/19/EU. This equipment must not be treated as household waste.

Definitions of the measurement categories

- Measurement category IV corresponds to measurements taken at the source of low-voltage installations.
Example: power feeders, meters and protection devices.
- Measurement category III corresponds to measurements on building installations.
Example: distribution panel, circuit-breakers, machines or fixed industrial devices.
- Measurement category II corresponds to measurements taken on circuits directly connected to low-voltage installations.
Example: power supply to domestic electrical appliances and portable tools.

PRECAUTIONS FOR USE

The instrument complies with standard IEC/EN 61010-2-030 and the measurement leads comply with standard IEC/EN 61010-031.
Max voltage. : 300 V (50 - 60 Hz) CAT I in relation to earth.

Failure to comply with the safety instructions may result in electric shock, fire, explosion, or destruction of the instrument and of the installations.

- The operator and/or the responsible authority must carefully read and clearly understand the various precautions to be taken for use. Sound knowledge and a keen awareness of electrical hazards are essential when using this instrument.
- If you use this instrument other than as specified, the protection provided may be compromised, thereby endangering you.
- Do not use the instrument on networks whose voltage or category exceeds those mentioned.
- Do not use the instrument if it seems to be damaged, incomplete, or incorrectly closed.
- Before each use, check the condition of the insulation on the leads, housing, and accessories. Any item whose insulation has deteriorated (even partially) must be set aside for repair or scrapping.
- Before using your device, check that it is perfectly dry. If it is wet, it must be thoroughly dried before being connected or being operated in any way.
- Use only the leads and accessories supplied. Using leads (or accessories) of a lower voltage or category reduces the voltage or category of the combined instrument + leads (or accessories) to that of the leads (or accessories).
- Use personal protection equipment systematically.
- When using the device, keep your fingers behind the physical guard.

CONTENTS

1. FIRST USE.....	5
1.1. State at delivery.....	5
2. GX 305 ET GX 310 DESCRIPTION.....	6
2.1. Presentation	6
2.2. Front face	6
2.3. Back Face.....	7
2.4. Display.....	8
2.5. Keys.....	9
3. GX 320 DESCRIPTION	12
3.1. Presentation	12
3.2. Front face	12
3.3. Terminals	13
3.4. Rear panel	13
3.5. Display.....	14
3.6. Keys.....	16
4. FUNCTIONAL DESCRIPTION.....	19
4.1. Commissioning	19
4.2. Stop	19
4.3. Activating the MAIN OUT terminal.....	20
4.4. Setting the screen contrast.....	20
4.5. Selection of the instrument function	21
4.6. Software version display.....	22
4.7. Automatic adjustment	22
4.8. Instrument Autotest	25
4.9. Saving a configuration (GX 320)	30
4.10. Reloading a configuration (GX 320)	31
4.11. Clearing a configuration (GX 320)	32
5. GENERATION OF BASIC “CONTINUOUS” PERIODIC SIGNALS	34
5.1. Available output waveforms	34
5.2. Waveform selection	34
5.3. Adjusting signal frequency.....	35
5.4. Setting the duty cycle	39
5.5. Setting the signal amplitude	39
5.6. Setting the offset and DC level	40
5.7. Setting signal logical levels.....	40
6. SHIFT KEYING FUNCTION “SHIFT K” (GX 320).....	42
6.1. Connections.....	43
6.2. FSK mode selection	43
6.3. PSK mode selection	43
6.4. Selection of the source	43
6.5. Setting frequencies in FSK mode.....	43
6.6. Setting phases in PSK mode.....	44
6.7. Other settings	44
7. SWEEP FREQUENCY SCAN FUNCTION.....	45
7.1. Connections.....	45
7.2. Selection of scan mode	45
7.3. Selecting the scan source	47
7.4. Setting the START / END frequencies.....	47
7.5. Setting the scan time using INTERNAL source	47
7.6. Other settings	47
8. MODUL MODULATION FUNCTION (GX 320).....	48
8.1. Connections.....	48
8.2. Selection of modulation source	48
8.3. Selection of the AM/FM modulation mode.....	48
8.4. Setting START / END FM frequencies.....	49
8.5. Other settings	49
9. FREQUENCY METER FUNCTION “FREQ”	50
9.1. Connections.....	50

10. SYNC SYNCHRONISATION FUNCTION (GX 320 ONLY).....	51
10.1. Connections.....	51
10.2. Selection of the Slave / Master mode.....	51
10.3. Adjusting phase offset	52
10.4. Activation of signal generation (Master)	53
10.5. Other settings	54
10.6. ExAmPles	54
11. GATE FUNCTION « GATE » (GX 320 ONLY).....	56
11.1. Connections.....	56
11.2. GATE activation	56
11.3. GATE de-activation	57
12. BURST PULSE BURST FUNCTION (GX 320 ONLY)	58
12.1. Connections.....	58
12.2. Selection of the BURST source	59
12.3. Setting the number of pulses Num	59
12.4. Setting the generation period using an INternal source.....	60
12.5. Manual triggering using EXternal source.....	60
12.6. Other settings	60
13. TECHNICAL SPECIFICATIONS	61
13.1. CONTinuous function	61
13.2. SWEEP scan function	62
13.3. MODUL modulation function (GX 320 only)	62
13.4. SHIFT KEY Function (SHIFT K) (GX 320 only)	63
13.5. SYNC synchronisation (GX 320 only)	63
13.6. BURST pulse generation function (GX 320 only).....	63
13.7. GATE Function (GX 320 only)	63
13.8. FREQ external frequency meter function	64
13.9. Other specifications	64
14. MAINTENANCE.....	65
14.1. Cleaning	65
15. WARRANTY	66

1. FIRST USE

1.1. STATE AT DELIVERY

Delivered in a cardboard box with:

- one power lead,
- one test report,
- one multilingual safety sheet.

For the accessories and spares, consult our web site:

www.chauvin-arnoux.com

2. GX 305 ET GX 310 DESCRIPTION

2.1. PRESENTATION

The GX 305 and GX 310 are alternating standard form wave generators, using the DDS (Direct Digital Synthesis) technology. They may simulate the operation and specifications of various electronic systems. They also include a frequency meter input.

2.1.1. SPECIFICATIONS

Wave form :	sinusoidal, square, triangle, logical, TTL, continuous		
Wave frequency :	GX 305 →	0.001 Hz to 5 MHz for the sinus and the square	
		0.001 Hz to 2 MHz for the triangle	
	GX 310 →	0.001 Hz to 10 MHz for the sinus and the square	
		0.001 Hz to 2 MHz for the triangle	
INT and EXT sweep:	GX 305 →	adjustable from 0.001 Hz to 5 MHz	
	GX 310 →	adjustable from 0.001 Hz to 10 MHz	
EXT freq. meter :	from 5 Hz to 100 MHz		

2.2. FRONT FACE

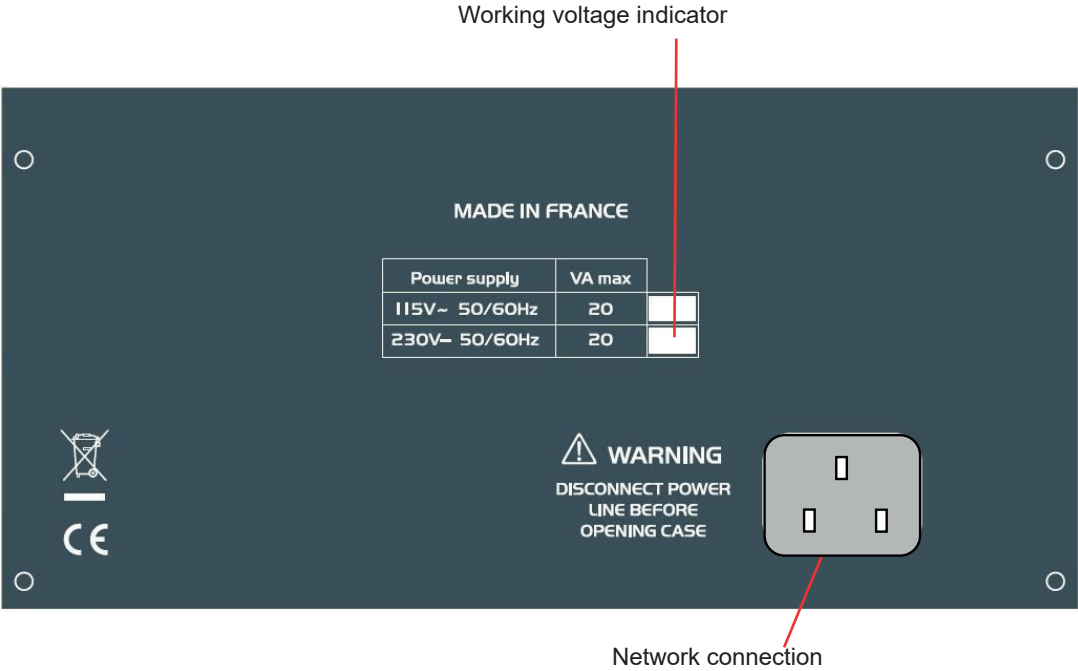


2.2.1. TERMINALS

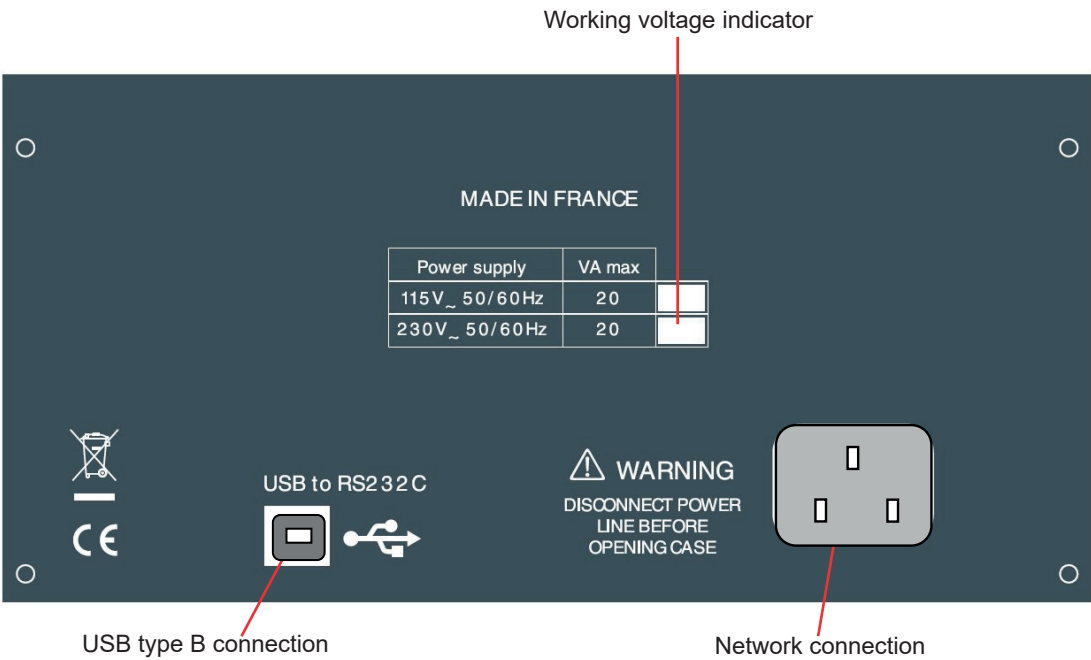
-  **MAIN OUT**
■ Main output
-  **VCF IN**
■ SWEEP input pilot signal in EXternal source
SWEEP OUT
■ Pilot output signal for INTERNAL SWEEP
-  **TTL OUT**
■ TTL output
-  **FREQ EXT**
■ Frequency meter input

2.3. BACK FACE

2.3.1. GX 305



2.3.2. GX 310



2.4. DISPLAY



	Sélection du signal : ■ Sinusoidal ■ square ■ logic ■ triangle ■ continuous
	Indication of the displayed frequency: ■ Freq, FreqSTART or FreqEND ■ Time (sweep interval)
	Frequency display (digit height: 20 mm) ■ Indication of the digit to which the wheel increments apply during adjustment.
	Unit of measure display ■ degree ■ MHz, kHz, Hz ■ seconds
	Function selection: : current function indicator ■ continuous ■ sweep ■ frequency
	Duty cycle value display
	Display of the amplitude value
	Display of the offset value or the DC level
	OFFSET display
	DUTY display
	AMPLITUDE display

	Logical HIGH / LOW display
	INTernal / EXTernal source selection
	LINear / LOGarithmic sweep display
	Sawtooth or triangle type sweep
	Indication that the MODE key is assigned: ■ to trigger the adjustment step when calibrating ■ to trigger the selected test in Autotest
	During calibration the  is assigned to saving the parameters.

2.5. KEYS



The keys with the « ⌚ » symbol have a specific action when pressed for more than 1 second.

- The white keys may have a backlight:

	Appliance under power but not turned on
	Appliance turned on
	Key lit ← MAIN OUT exit activated

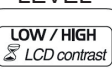
The other keys can be:

	unlit	keys not assigned to the wheel adjustment or having no action
	lit	the corresponding adjustment is assigned to the wheel.
	blinking	the corresponding adjustment can be assigned to the wheel.



Each time the WAVEFORM or FUNCTION is changed the keys that can be assigned to the wheel adjustment blink for 4 seconds; if no keys are used at this time the frequency adjustment (Freq or FreqSTART) is assigned to the wheel.

2.5.1. KEYS PRESSED FOR LESS THAN 1 SECOND

	Sinusoidal waveform selection
	Selects square or logical waveform by successive pressing on the key
	Triangular waveform selection or saves adjustments during calibration
	Continuous waveform selection
MAIN OUT 	Validation, or not, of the waveform on the MAIN OUT BNC
	Adjustment of the duty cycle using the wheel (square, triangle)
	Adjustment of the output signal amplitude using the wheel
	■ Offset adjustment using the wheel ■ DC level adjustment if the continuous  waveform is selected.
LOGIC LEVEL 	LOGIC waveform selected: Adjustment of the high or low signal level using the wheel
FUNCTION  	FUNCTION keys: Selection of one of the three available functions
	SWEEP selection of the INTERNAL or EXTERNAL command signal
	■ SWEEP activated: selection of LIN or LOG sweep ■ calibration: triggering of the selected adjustment step ■ Autotest: run the selected test
	SWEEP function activated in INT: assignment of the desired duration setting for carrying out the sweep using the wheel. Then, by pressing several times, selection of the digit on which to increment.
 	Division or multiplication by 10 of the current frequency value (decade change)
	■ Assignment of frequency adjustment to the wheel. Then, by pressing several times, selection of the digit on which to increment. ■ SWEEP function activated: same functions with FreqSTART and FreqEND frequencies.

2.5.2. KEYS PRESSED FOR MORE THAN 1 SECOND

	Pressing the key for more than 1 second forces the duty cycle to 50%.
	Pressing the key for more than 1 second switches from a peak to peak amplitude display to an RMS (root mean square) display.
	Pressing the key for more than 1 second forces the offset value to 0.
LOGIC LEVEL	Pressing the key for more than 1 second assigns the LCD contrast adjustment to the wheel.
	
	For the SWEEP function, pressing the key for more than 1 second switches from FreqSTART to FreqEND and vice versa.
 	These keys assign the selected frequency to the start or end of the current range.

Ranges	Press > 1 Second 'RANGE-'	Press > 1 Second 'RANGE+'
[0.001 Hz ; 0.01 Hz]	0.001 Hz	0.01 Hz
[0.01 Hz ; 0.1 Hz]	0.01 Hz	0.1 Hz
[0.1 Hz ; 1 Hz]	0.1 Hz	1 Hz
[1 Hz ; 10 Hz]	1 Hz	10 Hz
[10 Hz ; 100 Hz]	10 Hz	100 Hz
[100 Hz ; 1 kHz]	100 Hz	1 kHz
[1 kHz ; 10 kHz]	1 kHz	10 kHz
[10 kHz ; 100 kHz]	10 kHz	100 kHz
[100 kHz ; 1 MHz]	100 kHz	1 MHz
[1 MHz ; 5 MHz] (GX 305) [1 MHz ; 10 MHz] (GX 310)	1 MHz	5 MHz (GX 305) 10 MHz (GX 310)

3. GX 320 DESCRIPTION

3.1. PRESENTATION

The GX 320 is a standard alternating signal generator, using the DDS (Direct Digital Synthesis) technology. It may simulate the operation and the specifications of various electronic systems. It also includes a frequency meter input. The GX 320E is remote programmable via an USB or ETHERNET link.

3.1.1. SPECIFICATIONS

- Wave form: sinusoidal, square, triangle, logical, TTL, continuous
- Wave frequency:
 - 0.001 Hz to 20 MHz for the sinusoidal and square
 - 0.001 Hz to 2 MHz for the triangle
- INT and EXT sweep: adjustable from 0.001 Hz to 20 MHz
- EXT frequency meter: from 5 Hz to 100 MHz
- AM modulation: internal (1 kHz) and external (< 5 kHz)
- FM modulation: internal (1 kHz) and external (< 15 kHz)
- Frequency Shift Keying FSK: internal (1 kHz) and external (< 1 MHz)
- Phase Shift Keying PSK : interne (1 kHz) et externe (< 1 MHz)
- BURST function: internal or external (< 1 MHz)
- GATE function: external (< 2 MHz)
- Function to synchronise several generators
- 15 configurations can be saved and recalled

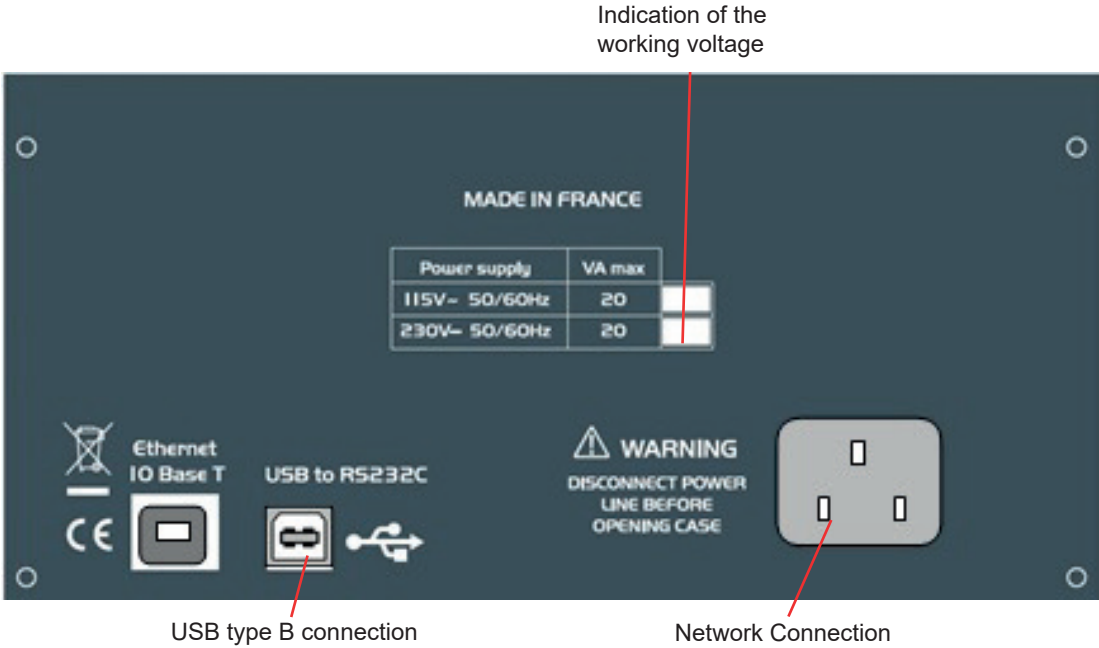
3.2. FRONT FACE



3.3. TERMINALS

1		MAIN OUT ■ Main output
2		VCG IN ■ External SWEEP, MODUL, SHIFT K, BURST piloting signal input ■ SYNC CTRL ■ Master synchronisation output signal in SYNC function ■ Slave synchronisation input signal in SYNC function ■ SWEEP OUT in SWEEP or SHIFT K INTERNAL source ■ Sweep piloting output signal for FSK and PSK
3		TTL OUT ■ TTL output ■ SYNC M CLK ■ in SYNC function, master clock output
4		FREQ EXT ■ Frequency meter input ■ SYNC S CLK ■ in SYNC function, slave synchronisation clock input ■ GATE IN ■ GATE piloting input signal

3.4. REAR PANEL



3.5. DISPLAY



	Sélection du signal : ■ Sinusoidal ■ square ■ logic ■ triangle ■ continuous ■ Current function indicator
Freq Phase START Time END Num	Display of the current frequency phase: ■ Freq, FreqSTART and FreqEND ■ Phase, PhaseSTART, PhaseEND ■ Time (sweep period, pulse period) ■ Num : number of pulses
	■ Frequency display (digit height 20 mm) ■ Underscores: Indicate to which digit the wheel increments apply during adjustment.
	Unit of measure display: ■ degree ■ MHz, kHz, Hz ■ seconds
► CONT ► SHIFT K ► SWEEP ► MODUL ► FREQ ► SYNC ► BURST	Function selection: ■ continue ■ Shift Key ■ sweep ■ modulation ■ frequency meter ■ synchronisation ■ Burst ■ Current function indicator
	Duty cycle value display
	Amplitude value display
	Offset value or DC level value display

	OFFSET type display
	DUTY type display
	AMPLITUDE type display
 	HIGH / LOW level logical type display
 	INTernal / EXTernal source selection
 	Mode display: ■ AM / FM Modulation ■ LINear / LOGarithmic sweep ■ Master / Slave synchronisation ■ Shift key Frequency / Phase
	Indication that the MODE key is assigned: ■ to triggering the adjustment step when calibrating ■ to the manual triggering of a set of pulses in BURST mode ■ to triggering the selected test in Autotest mode
	Sawtooth or triangle sweep type
	Modulation rate display AM 20 % or 80 %
	GATE mode activated display
	Master synchronisation activated display
	Slave synchronisation activated display
	For the synchronisation function: indicates that the frequency and phase adjustment on the slave are restricted by the master.
	■ During calibration the  key is assigned to saving the settings. ■ In normal mode selects save configuration mode
	Selects configuration recall mode
	Selects configuration clearing mode

3.6. KEYS

Keys with the  symbol have a specific action when pressed for more than 1 second.

The white keys may have a back light:

	Appliance under power but not turned on (red)
	Appliance turned on (green)
	Key lit → MAIN OUT exit activated
	Blinking key → MAIN OUT and GATE functions activated

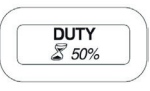
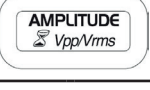
The other keys can be:

	unlit	keys not assigned to the wheel adjustment or having no action.
	lit	the corresponding adjustment is assigned to the wheel.
	blinking	the corresponding adjustment can be assigned to the wheel.



Each time the WAVEFORM or FUNCTION is changed the keys that can be assigned to the wheel adjustment blink for 4 seconds; if no keys are used at this time the frequency adjustment (Freq or FreqSTART) is assigned to the wheel.

Keys pressed for less than 1 second

WAVEFORM	WAVEFORM keys :
 	Selects the waveform to be generated
	Saves the current configuration or saves the settings when calibrating
	Recalls or clears a saved configuration
	Validation or not of the wave on the MAIN OUT BNC.
	Adjustment of the wave duty cycle (square, triangle) using the wheel.
	Adjustment of the output wave amplitude using the wheel.

	- Offset adjustment using the wheel. - Adjustment of the DC level if the continuous waveform is selected.
LOGIC LEVEL 	LOGIC waveform selected: adjustment of the high or low wave level using the wheel.
FUNCTION 	FUNCTION keys: Selection of one of the 7 available functions.
	SHIFT K, or SWEEP, or MODUL or BURST functions activated: selection of the INTERNAL or EXTERNAL command signal.
	- SHIFT K or SWEEP or MODUL or SYNC functions activated: selection of a specific function mode (see Function list and adjustment paragraph). - BURST function and EXTERNAL source activated: manual triggering of a set of pulses. - calibration: triggers the selected adjustment step. - Autotest: triggers the selected test.
	- SWEEP activated with INTERNAL source: assignment of the wheel to the desired timing adjustment to carry out a frequency sweep; then, by pressing several times, selection of the digit on which to apply the increment. - BURST function active: assignment of the wheel to the adjustment of the number of pulses or the burst generation period (INT source); then, by pressing several times, selection of the digit on which to apply the increment.
	Division or multiplication by 10 of the current frequency value (decade change).
	- Assignment of frequency adjustment to the wheel; then, by pressing several times, selection of the digit on which to apply the increment. - SWEEP or MODUL FM or FSK activated: same functions with the FreqSTART and Freqend frequencies.
	- SYNC function activated: adjustment of the de-phasing between the two generators using the wheel. - PSK function activated: by pressing several times, adjustment of the PhaseSTART or Phaseend using the wheel.

Keys pressed for more than 1 second

	Pressing for more than 1 second sets the GATE function.
	Pressing for more than 1 second forces the duty cycle to 50 %.
	Pressing the key for more than 1 second switches from a peak to peak amplitude display to an RMS (root mean square) display.
	Pressing the key for more than 1 second forces the offset value to 0.
LOGIC LEVEL 	Pressing the key for more than 1 second assigns the LCD contrast adjustment to the wheel.
	BURST function activated, INTERNAL source. Pressing the key for more than 1 second is used to switch the number of pulses Num in the pulse generation period Time, and vice versa.

 	These keys assign the selected frequency to the start or end of the current range.
	For the SWEEP or MODUL FM or FSK functions pressing the key for more than 1 second is used to switch between FreqSTART and FreqEND and vice versa.

Ranges	Press > 1 Second 'RANGE-'	Press > 1 Second 'RANGE+'
[0.001 Hz ; 0.01 Hz]	0.001 Hz	0.01 Hz
[0.01 Hz ; 0.1 Hz]	0.01 Hz	0.1 Hz
[0.1 Hz ; 1 Hz]	0.1 Hz	1 Hz
[1 Hz ; 10 Hz]	1 Hz	10 Hz
[10 Hz ; 100 Hz]	10 Hz	100 Hz
[100 Hz ; 1 kHz]	100 Hz	1 kHz
[1 kHz ; 10 kHz]	1 kHz	10 kHz
[10 kHz ; 100 kHz]	10 kHz	100 kHz
[100 kHz ; 1 MHz]	100 kHz	1 MHz
[1 MHz ; 10 MHz]	1 MHz	10 MHz
[10 MHz ; 20 MHz]	10 MHz	20 MHz

4. FUNCTIONAL DESCRIPTION

4.1. COMMISSIONING

Four start-up modes are possible depending on the key – or combination of keys - used.

4.1.1. NORMAL MODE



The instrument starts up using the last used configuration. By default the factory configuration is restored.

The key becomes:

4.1.2. VERSION MODE



+



The instrument starts up in Version mode and displays the current software version number and date.

The key becomes: (See Display of the software version).

4.1.3. CALIBRATION MODE

FUNCTION



+



The instrument starts up in Calibration mode with the selection of the calibration to be run: automatic mode CAL_AU, by default.

The key becomes: (See automatic calibration).

4.1.4. AUTOTEST MODE



+



The instrument starts up in Autotest mode with the selection of the test to be run: automatic mode tSt_AU, by default.

The key becomes: (See Autotest).

4.2. STOP



Whatever the mode, pressing this key puts the instrument on STANDBY.

When pressed while in Normal mode the context is saved:

- current settings in use for signal generation when the instrument was stopped,
- settings for other functions that may have been changed.

The key becomes:



Each time Normal mode start-up is used all the settings are reloaded.



In the event of a power failure (or if the power cable is unplugged ...), the instrument restarts using the last backup (backup made the last time the device was turned off using the ON/STANDBY key).

In the event of an error the default configuration is loaded:

- Signal sinusoidal
- Function CONTinuous
- Frequency 1 kHz
- Amplitude 1 Vpp
- Offset 0 V
- Output MAIN OUT ON not active
- No adjustments assigned to the wheel.



The key becomes:

4.3. ACTIVATING THE MAIN OUT TERMINAL



At start-up the MAIN OUT terminal is always de-activated.

MAIN OUT



Pressing the key activates the terminal and the key lights:

On the GX 320: the key may blink when the GATE function is activated (see GATE function).

MAIN OUT



De-activation of the MAIN OUT terminal, the key is no longer lit:

4.4. SETTING THE SCREEN CONTRAST

LOGIC LEVEL



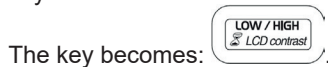
The display shows:





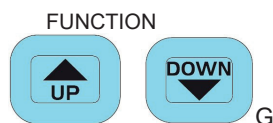
Adjustment of the contrast value from 0 to 99 using the coding wheel.

Exiting from this mode is made by pressing another key. The frequency display returns to the screen and the possible associated keys blink.

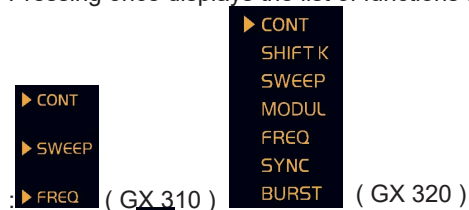


The contrast value is memorised in the device configuration once it is turned off (see left margin) or when the configuration is saved (GX 320).

4.5. SELECTION OF THE INSTRUMENT FUNCTION



Pressing once displays the list of functions available on the device in the top right hand corner:



The cursor indicates the selected function.

Pressing again moves the cursor towards the top or bottom to select another function.

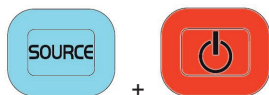
If, after 2 seconds, no keys have been pressed or when another key is pressed, the selected function is validated and is the only one remaining displayed:



When the function has been validated the keys that can be assigned to the wheel blink until one of them is selected; the key then lights up.

If no keys are used in the 4 seconds following the function validation the wheel is automatically assigned to frequency setting (Freq or FreqSTART depending on the function).

4.6. SOFTWARE VERSION DISPLAY



The following screen is displayed:

0.100 for version number: 1.00



08 - 11 - 23 for the version date: i.e. the 23rd November 2008



Exit Version mode.



The key becomes: .

4.7. AUTOMATIC ADJUSTMENT

The device has an automatic function that can be used to calibrate signal generation.

This function can be triggered:

- automatically (all settings are run automatically) or
- manually (individual selection and run of settings).

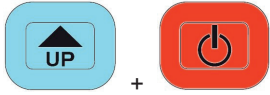
No specific wiring is needed for this function.



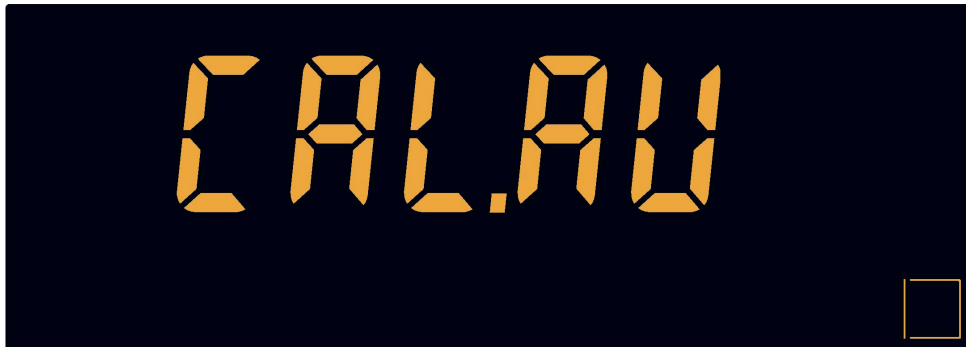
For optimal calibration the device must be at operating temperature (switched on for 30 minutes) before running calibration. In addition, when in manual mode it is recommended to respect the running order of the calibration steps.

4.7.1. ENTERING ADJUSTMENT MODE

FUNCTION



Entry into this mode is the CAL.AU. automatic mode. The display is as below:



Switching to manual mode is done by turning the wheel and selecting the calibration step to be run individually.



Selecting the calibration step to run:

- CAL.AU : automatic calibration (all settings are triggered automatically)
- CAL.00 : cancels offsets for sine and triangle signals
- CAL.01 : cancels offsets for square and LOGIC signals
- CAL.02 : calculates gains for the DC level offset setting
- CAL.03 : cancels the secondary offset for square and LOGIC signals
- CAL.04 : calculates gains for amplitude setting for sine, triangle, square and LOGIC
- CAL.05 : calibrates the duty cycle for square and LOGIC
- CAL.06 : sets AM and FM external modulation
- CAL.07 : sets AM modulation for square and LOGIC signals

4.7.2. RUNNING ADJUSTMENTS

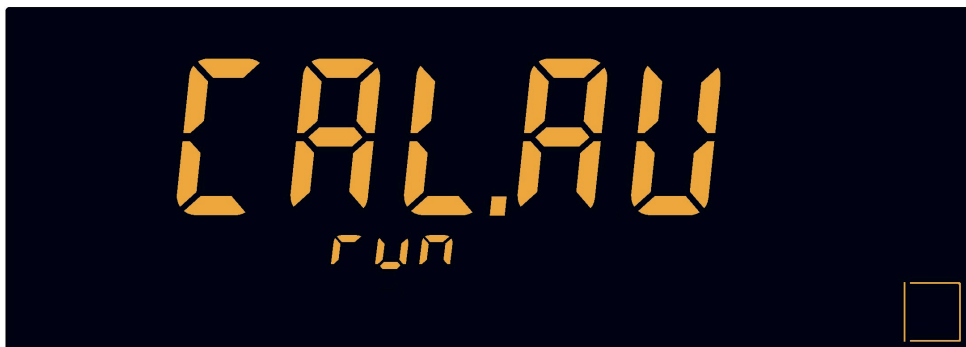


GX 305 - GX 310

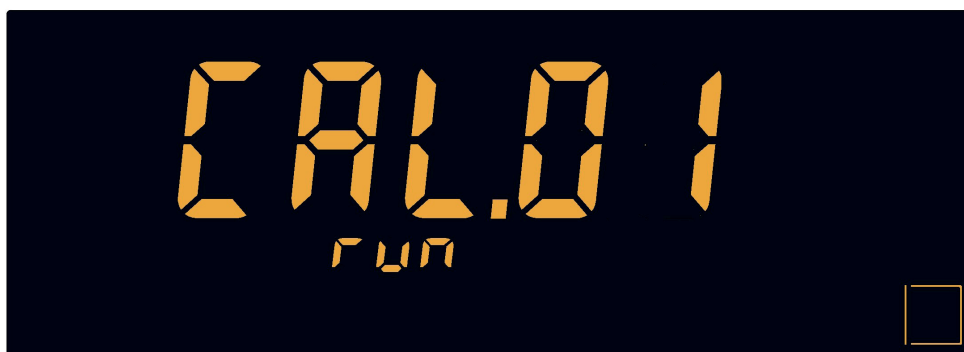


GX 320

Pressing the key triggers automatic calibration or the selected calibration step.
The display shows for automatic (then the adjustments are displayed in order):



Or in manual mode:



At the end of the run two situations are possible: the adjustment either succeeded or failed.

If the adjustment succeeded the display shows in automatic:



in manual:



The  display indicates that the adjustment settings may have changed and that the changes can be saved.

In the event of an error the automatic calibration stops at the step in error, it then switches to manual mode.
The display shows:



In the event of repeated errors contact your CHAUVIN-ARNOUX representative

4.7.3. SAVING SETTINGS



GX 320



GX 305 / GX 310

Pressing saves the calibration.



The ddisplay is cleared once the backup is made. It reappears if the calibration is changed.

4.7.4. EXIT ADJUSTMENT MODE



Exit this mode using this key.



The key becomes: .



To save settings a data backup should be made (see above) before exiting the mode, otherwise the settings are lost and the previous settings are re-loaded at start-up.

4.8. INSTRUMENT AUTOTEST

The device has an automatic electronics test function. This feature can be run automatically (all tests run automatically) or manually (individual selection and running of tests).

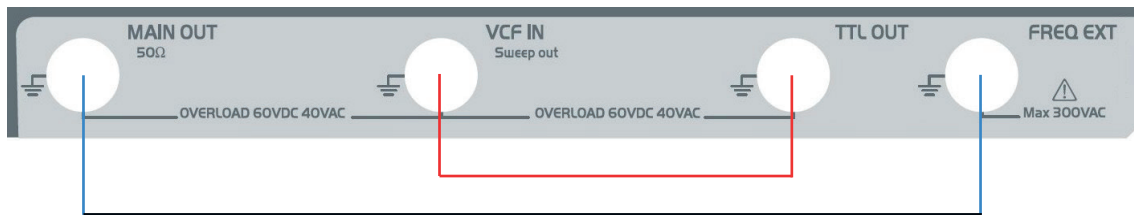
4.8.1. WIRING NEEDED

These tests require specific wiring of the device's input/output terminals.
Two wirings are needed.

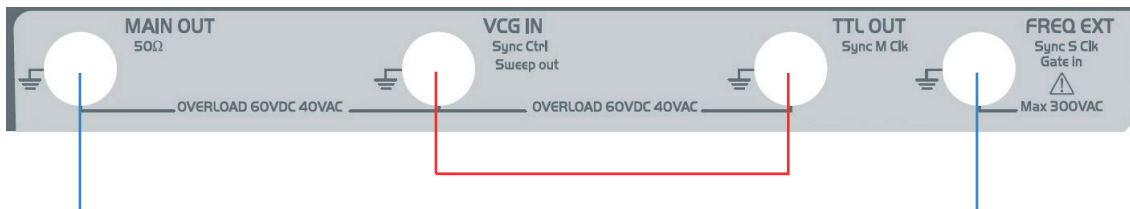
When needed they are indicated by the following messages:



for wiring n°1:
GX 305 and GX 310



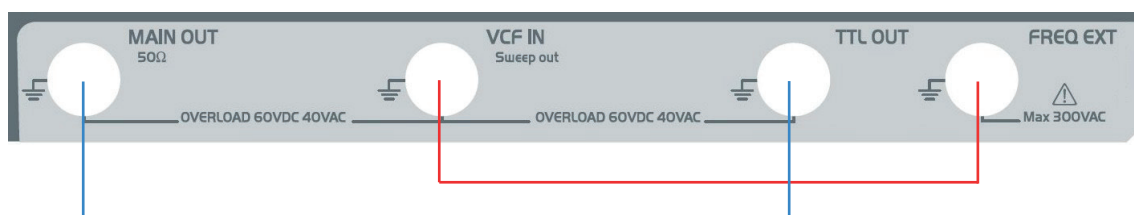
GX 320



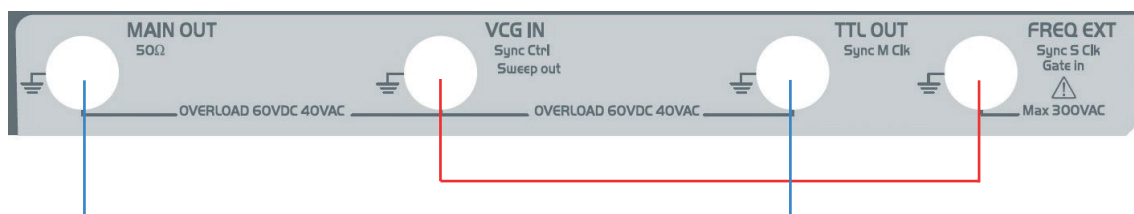
for wiring n°2:



GX 305 and GX 310 :



GX 320 :





GX 305 and GX 310



GX 320

Once the wiring has been made pressing the key continues the test.

4.8.2. ENTERING AUTOTEST MODE

MAIN OUT



+



GX 305 and GX 310

MAIN OUT



+



GX 320

By default this mode is entered using the automatic mode tSt.AU. The display is the following:



Switching to manual mode is done by turning the test step selection wheel and running individually.



Selection of the test step to run:

- tSt.AU : automatic test (all tests automatically sequenced)
- tSt.00 : LCD test (scrolls through all segment, even segment, odd segment displays by pressing the MODE key)
- tSt.01 : keyboard and key light test



(you must press all the keys except , each time a key is pressed an LCD segment is cleared).

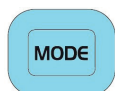
N° 1 wiring is needed:

- tSt.02 : frequency meter test
- tSt.03 : GATE IN test (GX 320)
- tSt.04 : CTRL IN test using SYNC function (GX 320)
- tSt.05 : FM modulation test (GX 320)
- tSt.06 : external AM test (GX 320)
- tSt.07 : Reset DDS pilot test
- tSt.08 : DDS FS register pilot test (frequency commutation)
- tSt.09 : DDS PS register pilot test (phase commutation)
- tSt.10 : triangle duty cycle test

N° 2 wiring is needed:

- tSt.11 : CTRL OUT test using SYNC function (GX 320)
- tSt.12 : SWEEP OUT test

4.8.3. RUNNING THE TESTS



GX 305 and GX 310

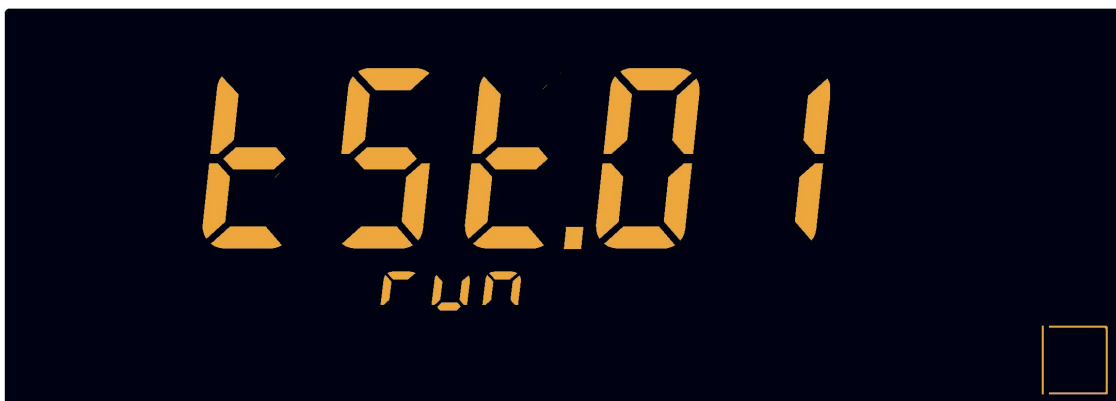


GX 320

Pressing the key triggers the automatic test or the selected test step.
The display shows in automatic mode (then scrolls through the tests):



In manual mode, The display shows:



At the end of the run 2 situations are possible: the test was successful or the test failed.

If the test succeeded the display shows in automatic mode:



in manual mode, The display shows:



If the test failed the automatic test stops at the failed test step or switches to manual mode.
The display shows:



If the error persists contact your MANUMESURE representative.

4.8.4. EXITING AUTOTEST



Pressing this key exits Autotest mode.



The current test is stopped and the instrument switches to STANDBY, the key becomes:

4.9. SAVING A CONFIGURATION (GX 320)

The GX 320 can save and reload user configurations.
A total of up to 15 files can be saved.
This backup is permanent (the data is saved even if the instrument is powered down).



Enters the configuration management mode.



is displayed on the screen with the current file number:
if file 3 is empty;



if file 3 already contains a configuration the data (other than frequency) is displayed on the screen:



Pressing another key than or exits the mode without saving.



Selects files from SEt.01 to SEt.15. The screen is updated with the data from the selected file.



Pressing the key again saves the current configuration in the selected file.



The display returns to its pre-backup status and the display is cleared.



When saving the content of the selected file is overwritten by the content of the current configuration without any warning messages..

4.10. RELOADING A CONFIGURATION (GX 320)

The GX 320 can reload 16 saved configurations:

- 15 user configurations,
- plus the default configuration ("factory" configuration see §. Stop).



Entering configuration reload mode.



L'item **SAVE CONFIG** is displayed on the screen with the current file number:

if file 3 is empty:



if file 3 contains a configuration the data (except frequency) is displayed on the screen:



Pressing a key other than exits the mode without making any changes.



Selects a file from SEt.00 to SEt.15 (Set.00 is the factory configuration). The screen is updated using the data from the selected file.



Pressing the key again reloads the configuration from the selected file.
If the file is empty or inconsistent the operation is cancelled:

- the settings used before the reload operation are maintained,
- the initial display is shown.

If the selected file is valid the configuration it contains is loaded and the display is updated with its data.



is no longer displayed indicating that the configuration reload mode has been exited.

4.11. CLEARING A CONFIGURATION (GX 320)

Clearing a user configuration file (Set.01 to Set.15) consists in saving a null configuration in the file.
This configuration is shown by displaying the file number only during file selection.

Reloading a null configuration has no effect (the existing settings are kept active).



It is not necessary to clear a file before saving a configuration since saving the configuration overwrites the data in the file.



Enters configuration mode.



is displayed with the current file number:

if file 3 is empty:



if file 3 already contains a configuration the data (except frequency) is displayed on the screen:





Pressing a key other than **SAVE** or **LOAD Erase** exits the mode without making any changes.



Selects file erase mode.

ERASE

is added to the display: is added to the display:



Pressing the key again unselects the file erase mode.



Selects a file from SEt.01 to SEt.15. The screen is updated with the data from the selected file.



Pressing the key again saves a null configuration in the selected file and returns to the current configuration display.

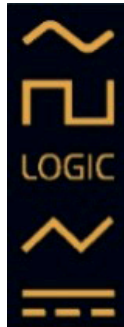
SAVE CONFIG

and **ERASE** are cleared from the screen.

5. GENERATION OF BASIC “CONTINUOUS” PERIODIC SIGNALS

5.1. AVAILABLE OUTPUT WAVEFORMS

The instrument generates the following waveforms:



- sine
- square
- TTL logic
- triangular
- continuous.

5.2. WAVEFORM SELECTION

5.2.1. GX 305 AND GX 310



Sine waveform



Square waveform
Logic output waveform



Triangular waveform



Continuous waveform

Each time a key is pressed the symbol is displayed on the screen and the keys that can be assigned to the wheel blink.

5.2.2. GX 320

WAVEFORM

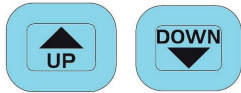


Pressing once displays the list of available waveforms at the top left of the screen:



The cursor  indicates the current waveform.

WAVEFORM



Pressing again moves the cursor up or down to select a new waveform.

If the keys are not pressed for 2 seconds or if another key is pressed the selected waveform is validated and remains displayed:



When the waveform is validated the keys that can be assigned to the wheel blink until one of them is selected; this key is then lit.
If no key is pressed within 4 s of validation the wheel is automatically assigned to frequency adjustment (Freq or FreqSTART).

5.3. ADJUSTING SIGNAL FREQUENCY

Frequency is set in two steps:

- Entry of the five significant digits
- Setting the decimal point and the unit multiplier
-

5.3.1. ENTERING THE 5 SIGNIFICANT DIGITS

The coding wheel and the following key can be used to enter the 5 significant digits.



+



Assign frequency setting to the wheel.

The  key lights.



Value adjustment.



By pressing several times, the digit from which wheel increments are added is selected..



By default the digit to which increments are applied is the unit digit (extreme right). This setting is programmed each time the instrument is started up.

5.3.2. POSITIONING THE DECIMAL POINT AND THE UNIT MULTIPLIER



These keys position the decimal point and the unit multiplier.

5.3.3. ENTRY SHORT CUTS



Assigns the minimum value for the current range (see Pressing keys for more than 1 second in the GX description paragraph).



Assigns the maximum value for the current range (see Pressing keys for more than 1 second in the GX description paragraph).

EXAMPLE 1

The wheel is not assigned to a setting (FREQ not lit or blinking), the current frequency value is:



We want to enter:

1st possibility



The FREQ key lights:



The display shows:

By pressing the button repeatedly, you can move the cursor to position it under the digit you wish to change:



The display shows:



The display shows:



The display shows:





The display shows:



The display shows:



2nd possibility



The FREQ key lights:



The display shows:



The display shows:



The display shows:



The display shows:



The display shows:



The display shows:



3rd possibility



The FREQ key



lights.

L'affichage montre :



2500

The display shows:



The display shows:



EXAMPLE 2

The wheel is not assigned to any settings (FREQ key unlit), the current frequency value is:



We want to enter:



1 s

The FREQ key lights:



The display shows:



5.4. SETTING THE DUTY CYCLE

The duty cycle can only be adjusted for square, logic or triangle forms using the “CONTinuous” function. The setting can be limited depending on the signal frequency.

Signal	Frequency	Possible adjustments
Square Logical	$\leq 200\text{ kHz}$	10 to 90 %
	$200\text{ kHz} < F \leq 1\text{ MHz}$	20 to 80 %
	$F > 1\text{ MHz}$	50 %
Triangle	$F < 0.2\text{ Hz}$	50%
	$0.2\text{ Hz} \leq F \leq 1\text{ kHz}$	10 to 90 %
	$1\text{ kHz} < F \leq 10\text{ kHz}$	30 to 70 %
	$F > 10\text{ kHz}$	50 %

or Assignment of the duty cycle to the wheel. The key lights:

 Setting the value.

1 s

 Forces the duty cycle value to 50 %.

The duty cycle is limited by the frequency, turning the wheel may have no effect.

5.5. SETTING THE SIGNAL AMPLITUDE

Amplitude indications are given in open circuit. Under 50 $\square$, amplitudes are divided by 2.

or Assignment of amplitude adjustment to the wheel. The key lights:

 Adjustment of the Vpp or Vrms value depending on the selected display.

5.5.1. VPP/VRMS DISPLAY

1 s

 Switches from Vpp to Vrms display and vice versa
The variation is from 0 to 20 Vpp in open circuit.

The sum of continuous voltage + alternating voltage cannot be $> \pm 10\text{ V}$.

5.6. SETTING THE OFFSET AND DC LEVEL

 or  Assignment of offset adjustment to the wheel.

The  key lights.

 Value adjustment.

The variation field is from -10 V to +10 V maximum in an open circuit.

  1 s Forces the offset value to 0.

 The sum of continuous voltage + alternating voltage cannot be > ± 10 V.

5.7. SETTING SIGNAL LOGICAL LEVELS

This function is only available if the “LOGIC” waveform has been selected.

 or  Assignment of the logic signal low level to the wheel.

The  key lights.

The «Adj.LO» message displays instead of the frequency value:



 By pressing several times the high or low level is selected, «Adj.HI» is displayed for high level adjustment:





Adjustment of the selected value.

The field of variation for these levels is from -10 V to +10 V by 100 mV intervals.

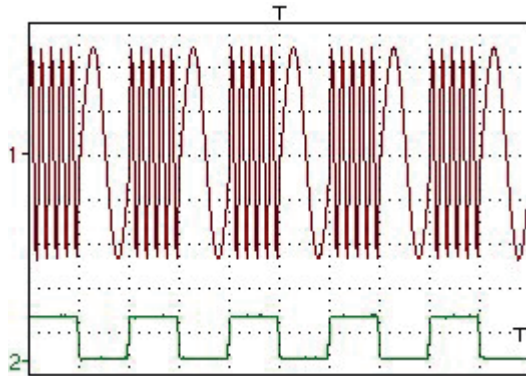


The high level is always greater than or equal to the low level.

6. SHIFT KEYING FUNCTION “SHIFT K” (GX 320)

The SHIFT KEY function can work with the signal frequency (FSK) or phase (PSK):

- “FSK” is a frequency commutation piloted either INTERNALly or EXTERNALly: switching from FreqSTART to FreqEND and vice versa.

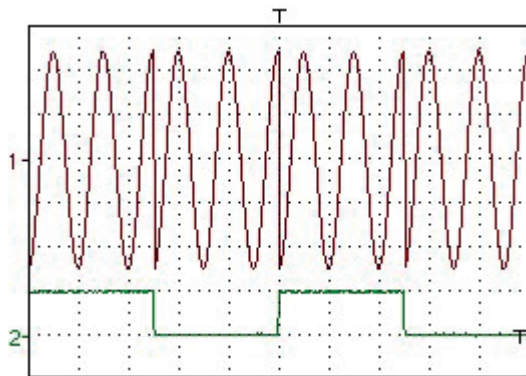


INTERNAL FSK :

Channel1 : MAIN OUT

Channel2 : VCG IN Sweep out

- “PSK” is a phase jump with value PhaseSTART and PhaseEND, piloted by a command signal that can be INTERNAL or EXTERNAL.



INTERNAL PSK:

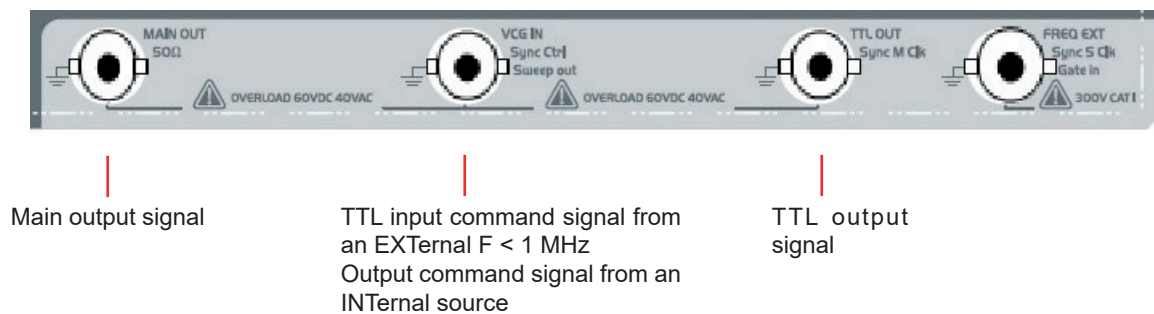
Channel1 : MAIN OUT

Channel2 : VCG IN Sweep out

At each change in signal status the programmed phase value (PhaseSTART or PhaseEND) is added to the current phase.

- With an INTERNAL source the command signal has a frequency of 1 kHz. It can be viewed on the generator SWEEP OUT terminal.
- With an EXTERNAL source the pilot signal is a TTL signal (0 - 5 V) with a frequency of < 1 MHz from the generator VCG IN terminal.

6.1. CONNECTIONS



6.2. FSK MODE SELECTION



Pressed successively, "F" mode selection (Frequency).

6.3. PSK MODE SELECTION



Pressed successively, "P" mode selection (Phase).

6.4. SELECTION OF THE SOURCE



Pressed successively, source selection:



6.5. SETTING FREQUENCIES IN FSK MODE



or



FreqSTART display and assignment of adjustment to the wheel.

The key lights:



1 s or



1 s

FreqEND display and assignment of adjustment to the wheel.

The key lights:



Pressed successively selects the digit from which the increment will be applied.



Adjustment of the selected value.



1 s Passage from FreqSTART adjustment to FreqEND adjustment.

6.6. SETTING PHASES IN PSK MODE

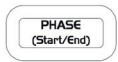


or



Assignment of PhaseSTART adjustment to the wheel.

The key lights:



1 s or



1 s

Assignment of PhaseEND adjustment to the wheel.

The key lights:



Adjustment of the selected value.

The field of phase variation is of -180° to $+180^\circ$ by intervals of 1° .



Pressed successively assigns PhaseSTART or PhaseEND adjustment to the wheel.



1 s

Forces the phase being set to 0.

6.7. OTHER SETTINGS

See "CONT" function.

7. SWEEP FREQUENCY SCAN FUNCTION

SWEEP is a frequency scan from FreqSTART to FreqEND piloted:

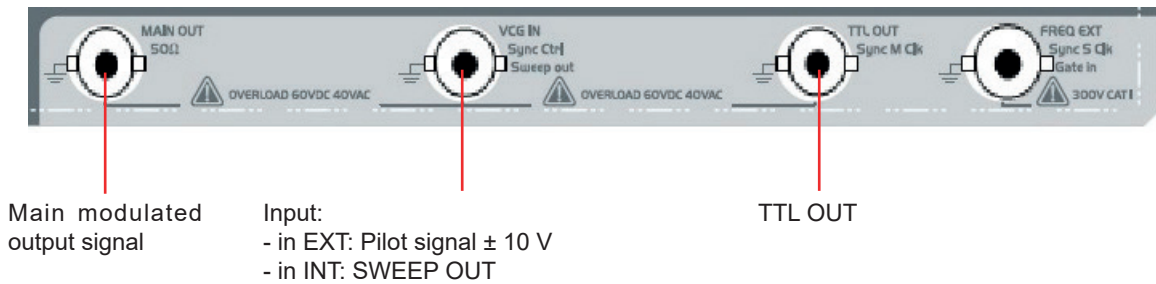
- either INTernally by the generator following a linear or logarithmic formula and a saw tooth  or triangle  variation. The user can choose a scan time from 10 ms to 100 s.
- either EXTernally using a voltage of ± 10 V applied to VCF IN (GX 305/310) or VCG IN (GX 320) with a frequency < 15 kHz.
- Depending on the values of FreqSTART and FreqEND the frequency scan will be in ascending or descending order.

Remarks

When using EXTernal SWEEP the signal level is read at a frequency of 60 kHz. This amplitude (coded on 256 values) is then converted into frequency.

When using INTernal SWEEP, the scan is made using a maximum of 256 values.

7.1. CONNECTIONS

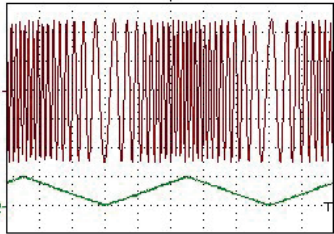
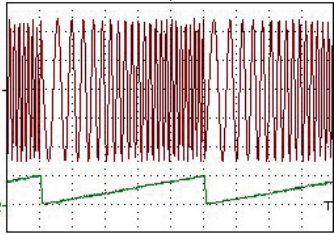


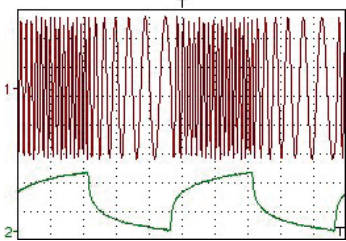
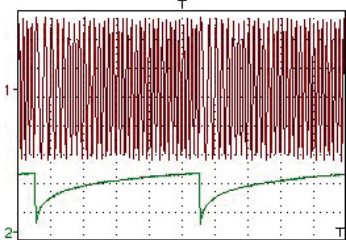
7.2. SELECTION OF SCAN MODE



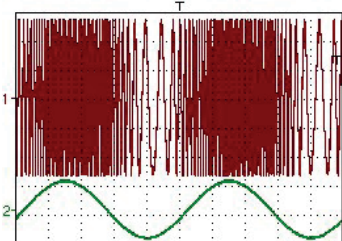
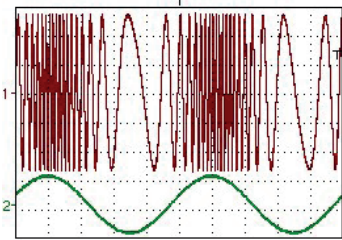
Pressed successively this key selects one of the following scan modes:

7.2.1. ASSIGNMENT SEQUENCE USING INTERNAL SOURCE

Display	Description	Channel1 : MAIN OUT, Channel2 : SWEEP OUT
	Linear rule, triangular variation	
	Linear rule, saw tooth variation	

	Logarithmic rule, triangular variation	
	Logarithmic rule, Saw tooth variation	

7.2.2. ASSIGNMENT SEQUENCE USING EXTERNAL SOURCE

Display	Description	Channel 1 : MAIN OUT(Fstart = 1 kHz, Fend = 100 kHz) Channel 2 : Modulant: SINUS, 1 kHz, 10 Vpp
	Linear rule between the command signal and the generated frequency	
	Logarithmic rule between the command signal and the generated frequency	

7.2.3. INTERNAL SOURCE

A SWEEP OUT signal is available on the VCF IN BNC (GX 305/GX 310) or VCG IN (GX 320).

It is a proportional signal with a generated frequency, amplitude from 0 to 2 V.

7.2.4. EXTERNAL SOURCE

- The generated output frequency is proportional (according to a linear or logarithmic rule) to the voltage on VCF IN (GX 305/310) or VCG IN (GX 320).
The command signal is sampled on 8 bits using a frequency of 60 kHz.
- For -10 V : the output frequency $F \approx \text{FreqSTART}$
For 10 V : $F \approx \text{FreqEND}$

7.3. SELECTING THE SCAN SOURCE

 Pressing the key successively selects the INTernal source

 or  .

7.4. SETTING THE START / END FREQUENCIES

 or 

Displays FreqSTART and assigns adjustment to the wheel.

The key lights: 

 1 s or  1 s

Displays FreqEND and assigns adjustment to the wheel.

The key lights: 



Pressing successively selects the digit from which the increment will apply.

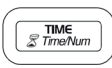


Adjusts the selected value.



1 s Switches from setting FreqSTART to setting FreqEND.

7.5. SETTING THE SCAN TIME USING INTERNAL SOURCE

 or 

Displays the Time and assigns adjustment to the wheel.

The key lights: 



Pressed successively selects the digit to which the increment will apply.



Adjusts the value using the wheel.

7.6. OTHER SETTINGS

See the CONT function.

8. MODUL MODULATION FUNCTION (GX 320)

The MODUL function modulates a carrier frequency (FM) or amplitude (AM).

The modulating signal can be:

- either internal (INTernal source, sinusoidal 1 kHz signal)
- or on VCG IN, for an EXTERNAL source.

The carrier specifications are defined in the same way as the CONT function.

Using an EXTERNAL source the signal must have an amplitude of ± 10 Vpp and a frequency of < 15 kHz (FM) and < 5 kHz (AM).

Depending on the voltage the modulation is as follows:

- AM : the output signal amplitude is typically

100 %	for	-10 V
50 %	for	0 V
null	for	+10 V
- FM : the output signal frequency is typically

Freqstart	for	-10 V
(Freqstart + Freqend)/2	for	0 V
Freqend	for	+10 V

Remarks

- For AM: with LOGIC and square signals modulation is digital: the modulating signal is read at a frequency of 150 kHz. This amplitude (256 values) pilots the output signal amplitude.
For the other types of signal modulation is analogue and the modulating signal cannot exceed 5 kHz.
- For AM: with the SINE and TRIANGLE signals, TTL OUT is not available
- For FM: modulation is digital: the modulating signal level is read at a frequency of 65 kHz.
This amplitude (256 values) is then converted into frequency.

8.1. CONNECTIONS



Modulated output
signal

Pilot signal
 ± 10 V; $F < 5$ kHz

TTL OUT

8.2. SELECTION OF MODULATION SOURCE



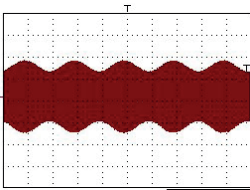
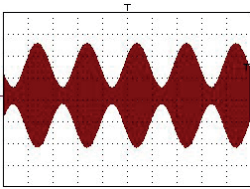
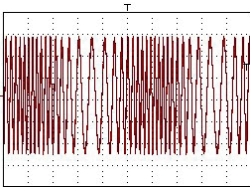
Pressed successively selects the INTERNAL source or the EXTERNAL source .

8.3. SELECTION OF THE AM/FM MODULATION MODE

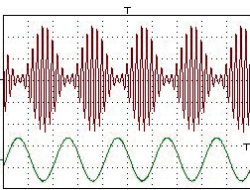
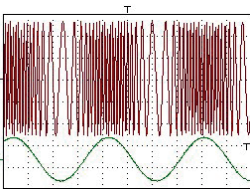


Pressing successively selects the following modulation modes:

8.3.1. INTERNAL SOURCE

Display	Description	
	20% amplitude modulation	
	80% amplitude modulation	
	Frequency modulation	

8.3.2. EXTERNAL SOURCE

Display	Description	
	Amplitude modulation	
	Frequency modulation	

8.4. SETTING START / END FM FREQUENCIES

 or  Displays FreqSTART and assigns adjustment to the wheel. The key lights: 

  1 s or   1 s Displays FreqEND and assigns the adjustment to the wheel.

 Pressed successively selects the digit to which the increment will be applied.

 Adjusts the selected value.

  1 s Switches from setting FreqSTART to setting FreqEND.

8.5. OTHER SETTINGS

See CONT function.

9. FREQUENCY METER FUNCTION “FREQ”

Selecting the FREQ function activates measurement of the frequency of the signal input to the FREQ EXT terminal.



The frequency meter can measure frequencies from 5 Hz to 100 MHz with the following precision:

- < 50 mV sensitivity $F \leq 30$ MHz
- < 60 mV sensitivity for $30 \text{ MHz} < F \leq 80 \text{ MHz}$
- < 90 mV sensitivity for $80 \text{ MHz} < F \leq 100 \text{ MHz}$

The maximum amplitude (*) of the measured signal is:

- 300 V sensitivity from 5 Hz to 5 kHz
- 30 V sensitivity from 5 kHz to 1 MHz
- 10 V sensitivity above this value

(*) signal with a 50% duty cycle.

Measurement stabilisation time depends on the input frequency:

- ≤ 1 s from 5 to 20 Hz (≥ 1 measurements per second)
- ≤ 100 ms from 20 to 400 Hz (2 measurements per second)
- ≤ 40 ms from 400 Hz to 100 MHz (2 measurements per second)

Indication of the 300 V protection (50 - 60 Hz) CAT I

9.1. CONNECTIONS



FREQ EXT terminal for
the measured signal

10. SYNC SYNCHRONISATION FUNCTION (GX 320 ONLY)

The SYNC function is used to synchronise several GX 320 set up in a cascade in order to create a variable phase multiple signal generator.

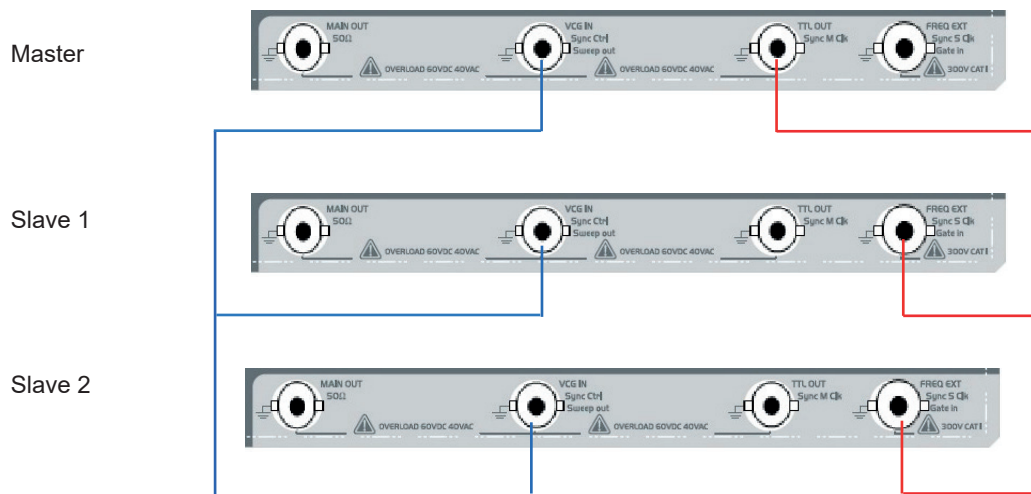
The frequency resolution of this function is: 37 mHz, the clock frequency of the DDS is set at 10 MHz.

To limit the sampling effect the maximum frequency of the output signal is set at 100 kHz.

The Master generator supplies the Slave generators with the clock (Clk) used to generate the signals (10 MHz) and a synchronisation signal (Ctrl). This allows all the generators to start at the same time and control their phase offset.

10.1. CONNECTIONS

Control signal (Ctrl) : Connect the Slave VCG IN BNCs to the Master.
Clock signal (Clk) : Connect the slave FREQ_EXT BNCs to the Master TTL OUT.



During signal generation disconnecting one of the Ctrl or Clk cables desynchronises the generators. To resynchronise them use the master's 'MAIN OUT ON/OFF' key to deactivate and then reactivate signal generation.

10.2. SELECTION OF THE SLAVE / MASTER MODE



Pressed successively selects S mode (Slave):



or M (Master) :

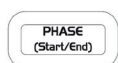


10.3. ADJUSTING PHASE OFFSET

Phase offset can be set on the master and on the slave (if it is not locked). Whatever the mode selected (M/S) the phase offset is that of the slave(s) related to the master.

The phase offset entered on the master is applied to all the slaves whereas the phase offset entered on the slave is limited to that slave:

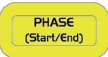
Phase offset (slave/master) = entered phase offset master + entered phasing slave



or



Displays phase offset and assigns the adjustment to the coding wheel.

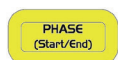
The  key lights.



Value adjustment.

The phase is in degrees and can have values between -180° and 180° , varying by 1° .

The master mode phase is reversed in relation to the slave mode.



1 Forces the phase to 0°

10.4. ACTIVATION OF SIGNAL GENERATION (MASTER)

On the master all adjustments are possible in real time because each change in the master commands resynchronisation of all the slaves.

As this is not possible on the slaves, changing waveform, frequency or phase are not possible when signal generation is activated. On the other hand as amplitude and offset have no effect on synchronisation they remain adjustable at all times.



The slave is said to be locked:  is displayed on the top right hand corner of the slave screen(s).

In order to change the waveform, frequency or phase on the slave you must stop signal generation on the master using its 'MAIN OUT ON/OFF' key.

MAIN OUT



- on the Master :
 - Activates MAIN OUT and signal generation on all devices on which MAIN OUT is activated.



The master key lights:

- Locking slaves: selecting waveform and adjusting frequency and phase are no longer possible on the slaves.



The  symbol is displayed on the slave screen as below:



- on the slaves:
 - Activation of the associated MAIN OUT (effective signal output is only possible if signal generation is activated on the master).



The slave key lights:

MAIN OUT



- on the Master:
 - Deactivation of MAIN OUT and halting of signal generation on all devices.



The master key is turned off:

- The master frees the slaves: waveform selection and frequency and phase adjustment are now possible.



The symbol disappears from the slaves.

- on the Slaves: the associated MAIN OUT is deactivated.



The slave key is turned off:

10.5. OTHER SETTINGS

See the CONT function.

10.6. EXAMPLES

10.6.1. EXAMPLE 1

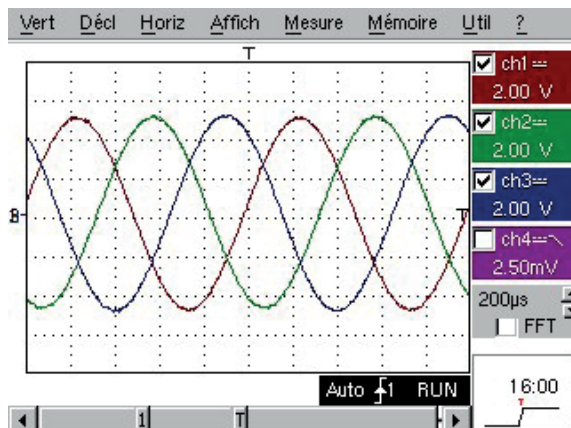
Generating three phase signals

Connect the three GX 320 generators as shown above (see Connections), identify a master and 2 slaves and then programme the 3 devices with:

- the same frequency 1 kHz,
- the same amplitude 10 Vpp
- the same offset 0 V
- the same sine waveform
- phases 0° (master), $+120^\circ$ and -120° .

Activate the 3 MAIN OUTs.

On an oscilloscope view the output signals from the three devices:



Channel 1 : master (0°)

Channel 2 : slave 1 (120°)

Channel 3 : slave 2 (-120°)

10.6.2. EXAMPLE 2

Fourier synthesis

A simple illustration of generator synchronisation is the synthesis of a square signal using its first harmonics. The square signal is broken down as follows:

$$f(x) = \frac{4}{\pi} (\sin x + \frac{\sin 3x}{3} + \frac{\sin 5x}{5} + \frac{\sin 7x}{7} + \dots \frac{\sin nx}{n} + \dots)$$

where n is always an odd number.

To synchronise multiple frequencies the values programmed in the DDS must also be multiple.

We are here faced with the problem of calculation rounding and programming resolution: it is highly probable that the direct entry on F on the master and $n \cdot F$ on the slaves will not give synchronous signals.

The DDS is programmed using a 28 bit register and is piloted by a 10 MHz clock (in the SYNC function).

The DDS frequency resolution for this function is therefore:

$10 \text{ MHz} / 228 = 0.037 \text{ Hz}$, which means that for a frequency F entered the resulting frequency is $F \pm 18.5 \text{ MHz}$.

The formula relating the user entered frequency to the value programmed in the DDS is the following:

$$\text{ValDDS} = \text{ENT}((\text{Frequency}(\text{Hz}) \times 2^{28}) / \text{DDS_Clock} + 0.5)$$

with: $\text{ENT}()$ function returning the whole part of the value
 $\text{DDS_Clock} = 10 \text{ MHz}$,
adding 0.5 rounds the value.

Thus when you programme a frequency of 100 Hz, the programmed value is:

$\text{ENT}((100 \times 228) / 107 + 0.5) = 2684$ which is the equivalent of a frequency of 99.987 Hz (obtained by reverse calculation).

If you wish to programme a synchronous $n \cdot 100 \text{ Hz}$ multiple frequency you must enter a frequency which results in a DDS programmed value of $n \cdot 2684$, or a true frequency equal to $n \cdot 99.987 \text{ Hz}$.

In our example we will generate a square 100 Hz signal using its first three harmonics: 3 sinusoids with a frequency of 100 Hz, 300 Hz and 500 Hz and an amplitude of A , $A/3$ and $A/5$.

For this example 3 GX 320 generators are needed:

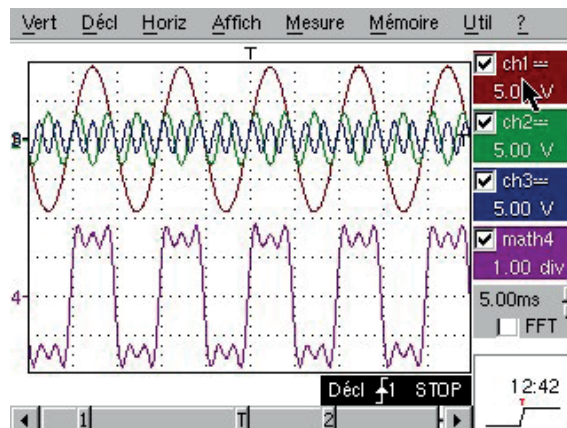
- one Master: on which the SINE waveform is selected, amplitude 20 Vpp, a null offset, a null phase and a frequency of 100 Hz (or 99.987 Hz).
- Slave 1: on which the SINE waveform is selected, amplitude 6.7 V, a null offset, a null phase and a frequency of $3 \cdot 99.987 = 299.96 \text{ Hz}$.
- Slave 2: on which the SINE waveform is selected, amplitude 4 V, a null offset, a null phase and a frequency of $5 \cdot 99.987 = 499.93 \text{ Hz}$.

Connect the generators as shown in the Connections paragraph, activate the slave outputs and then the master output (to ensure synchronisation do a master MAIN OUT OFF and then ON).

On the oscilloscope connect the device MAIN OUT (respectively Master, Slave1 and Slave 2) outputs on channels 1, 2, 3.

Select the same sensitivity of 5 V/div. on each channel (choose the weakest frequency signal as trigger: channel 1).

On channel 4 carry out the sum of Channel1 + Channel2 + Channel3, and observe the result:



A square signal forms: the higher the number of odd harmonics the better the signal quality obtained.

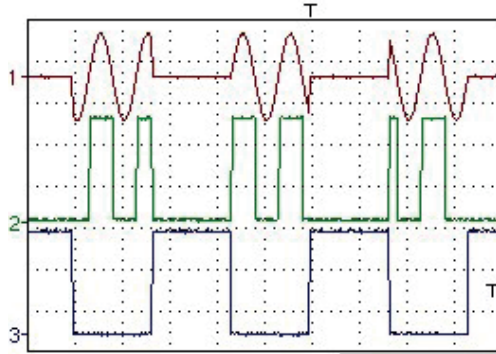
11. GATE FUNCTION « GATE » (GX 320 ONLY)

This function is only available with “CONT”, “SWEEP” and “MODUL”.

It superimposes a stop command for the alternating MAIN OUT signal component over the current function, piloted by a TTL input to the BNC FREQ EXT Gate in terminal.

When the TTL signal is at the 1 logical level (5 V), the alternating component of the MAIN OUT terminal is cut.

At 0 level it is generated freely.



Channel 1 : Main Out (sine, 1 kHz, 10 Vpp)

Channel 2 : TTL Out

Channel 3 : Gate In (LOGIC, 300 Hz, 10 V - 0 V)

The GATE has no effect on the direct component of the signal.
The command takes effect in approximately 100 ns.

11.1. CONNECTIONS



11.2. GATE ACTIVATION

MAIN OUT



Function activation, the **GATE** indication is displayed, the MAIN OUT terminal remains activated.

The key blinks:



MAIN OUT



Pressing the key for more than 1 second does not activate the MAIN OUT terminal but only the GATE function the key remains unlit.

GATE

11.3. GATE DE-ACTIVATION

MAIN OUT



Function is de-activated and the  , is cleared, the MAIN OUT terminal remains active.

The key lights:  .

MAIN OUT



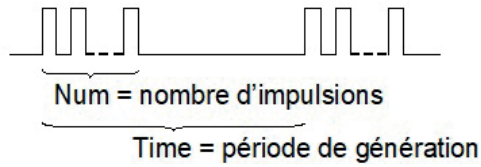
Function de-activation and the  , indication is cleared, the terminal is still not activated: the key remains unlit.

 At each function change (CONT, SHIFT K, SWEEP, MODUL, FREQ, BURST or SYNC), the GATE function is de-activated.

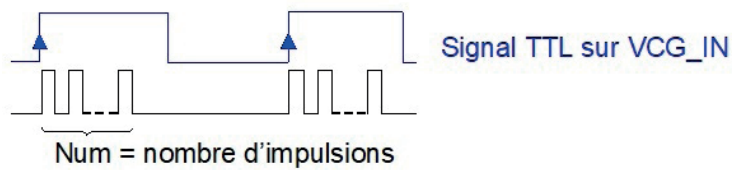
12. BURST PULSE BURST FUNCTION (GX 320 ONLY)

The BURST function generates sets of pulses:

- Using an INTERNAL source the user must enter a generation period and the number of pulses to generate.
The number of pulses Num is automatically limited so that the number cannot be greater than the number of pulses a period can contain.



- Using an EXTERNAL source the pulse bursts are piloted:
 - either by an external TTL with a frequency of less than 10 kHz on VCG IN



- or manually by pressing the 'MODE' key.

The minimum authorised window time is 2 μ s: the number of pulses is defined as follows:

$\text{Nummin} \geq F \cdot 2 \mu\text{s}$ where Nummin (whole number ≥ 1) is the minimum number of authorised pulses and F is the programmed pulse frequency.



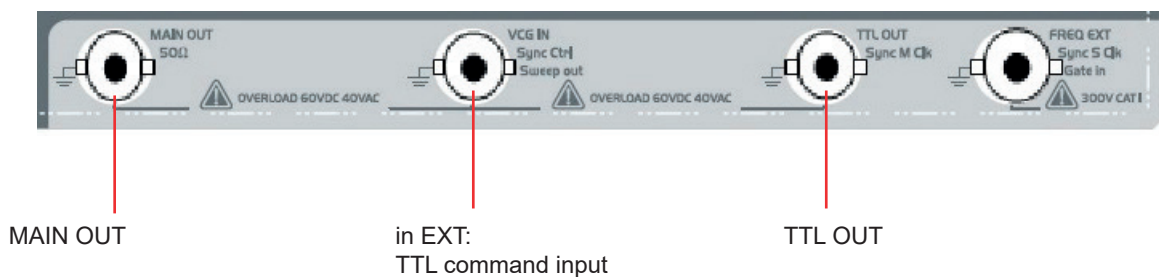
Changing the frequency can cause the modification of the programmed Num value in order to obey this rule.

Example

If $F = 2,6 \text{ MHz}$, then $F \cdot 2 \mu\text{s} = 5,2 \approx$ the minimum authorised value for $\text{NUMmin} = 6$.

If $F = 2 \text{ MHz}$, then $F \cdot 2 \mu\text{s} = 4 \approx$ the minimum authorised value for $\text{NUMmin} = 4$.

12.1. CONNECTIONS



12.2. SELECTION OF THE BURST SOURCE

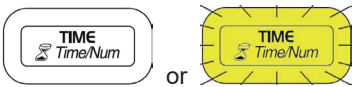


Pressed successively selects the source:



12.3. SETTING THE NUMBER OF PULSES NUM

The pulse number value (Num) can be limited in INTERNAL source by the value of the entered period (Time).
In both cases (INTERNAL or EXTERNAL), the Nummin value is set in order to avoid having a window of less than 2 μ s (see above).



Display of the number of pulses Num and assignment of the adjustment to the wheel.



The key lights:



Pressed successively selects the digit to which the wheel increments will be applied.



Value adjustment.

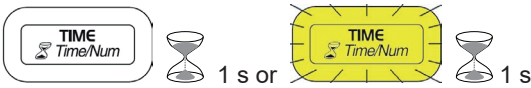


Pressed successively selects the digit to which the wheel increments will be applied.



Using an INT source pressing successively for more than 1 second switches from Num to Time and vice versa, otherwise selects Num setting.

12.4. SETTING THE GENERATION PERIOD USING AN INTERNAL SOURCE



Displays the Time and assigns the wheel to adjustment.



Pressed successively switches from Num to Time.



Pressed successively selects the digit to which the wheel increments are applied.



Switches from Num to Time and vice versa.

12.5. MANUAL TRIGGERING USING EXTERNAL SOURCE



Pressing this key triggers the generation of a pulse burst.

12.6. OTHER SETTINGS

See the CONT function.

13. TECHNICAL SPECIFICATIONS

13.1. CONTINUOUS FUNCTION

13.1.1. WAVEFORMS

- sine
- triangle
- square
- logic pulses (programmable high and low levels)
- positive pulses (TTL level)
- continuous (DC: offset)

13.1.2. SIGNAL FREQUENCY

- GX 305 : from 0.001 Hz to 5 MHz in 10 ranges (decades)
- GX 310 : from 0.001 Hz to 10 MHz in 10 ranges (decades)
- GX 320 : from 0.001 Hz to 20 MHz in 11 ranges (decades)
- 3 internal ranges, for DDS resolution:
 - $F \leq 1$ kHz the DDS resolution is approx. 1 mHz
 - $1 \text{ kHz} < F \leq 10 \text{ kHz}$ the DDS resolution is approx. 10 mHz
 - $10 \text{ kHz} < F \leq 20 \text{ MHz}$ the DDS resolution is approx. 280 mHz
- Frequency display on the LCD: 5 digits (units: Hz, kHz, MHz)
- Settings: direct using the encoder, automatic range switching
- Precision
 - ± 30 ppm for $F < 10$ kHz
 - ± 20 ppm for $F \geq 10$ kHz
 - for sine, square, LOGIC and triangle (duty cycle 50 %)
- Temperature ratio: ± 20 ppm / °C
- Long term derivation : ± 5 ppm / year

13.1.3. MAIN OUT SIGNAL

- Adjustable amplitude in open circuit: from 0 to 20 Vpp
 - Precision : from 0,1 to 20 Vpp < 5 % from 1 mHz to 10 MHz
 $\pm 1,5$ dB for $F > 10$ MHz ($\pm 0,5$ dB typical)
 - Accuracy guaranteed for Vpp readings; please note the display resolution for Vrms; for a sine wave, 1 Vrms equals $2\sqrt{2}$ Vpp ≈ 2.83 Vpp
- Impedance : $50 \Omega \pm 3$ %
- DC offset voltage: adjustable from -10 V to +10 V in open circuit (OFFSET).
Precision : ± 5 % amplitude (residual offset $< \pm 5$ mV)
- Protection from input voltage surge: 60 Vdc, 40 Vac

13.1.4. SINE SIGNAL

- Distortion :
 - for $F \leq 50$ kHz : typical distortion rate 0.05 %, $< 0,15$ % max.
 - for $50 \text{ kHz} < F \leq 1 \text{ MHz}$, harmonics < -41 dB / H1
 - for $F > 1 \text{ MHz}$, harmonics < -36 dB / H1
- Measuring conditions :
 - device operational for at least 1 hour

13.1.5. SINE SIGNAL

- Frequency : ≤ 2 MHz
- Linearity error: < 1 % max at 200 kHz from 10 % to 90 % of the signal amplitude
- Duty cycle: resolution 1 %
 - 10 to 90 % for $0,2 \text{ Hz} \leq F \leq 1 \text{ kHz}$
 - 30 to 70 % for $1 \text{ kHz} < F \leq 10 \text{ kHz}$
 - 50 % for $F < 0,2 \text{ Hz}$ and $F > 10 \text{ kHz}$
frequency error for duty cycle $\neq 50$ %, < 2 %

13.1.6. SQUARE SIGNAL

- Increase time : 7 ns typically, < 10 ns max.
- Duty cycle : resolution 1 %
 - 10 to 90 % for $F \leq 200$ kHz,
 - 20 to 80 % for $200 \text{ kHz} < F \leq 1 \text{ MHz}$
 - 50 % for $F > 1 \text{ MHz}$

13.1.7. SIGNAL LOGIC

- Increase time : 7 ns typically, < 10 ns max.
 - VHigh, VLow adjustable at $\pm 10 \text{ V}$ with a precision of $\pm 0,2 \text{ V}$
 - Duty cycle : resolution 1 %
 - 10 to 90 % for $F \leq 200 \text{ kHz}$
 - 20 to 80 % for $200 \text{ kHz} < F \leq 1 \text{ MHz}$
 - 50 % for $F > 1 \text{ MHz}$
- frequency error for duty cycle $\neq 50 \%$, < 2 %

13.1.8. TTL OUT SIGNAL

- Increase time : 5 ns typically, < 10 ns max.
- Max. admissible charge : > 10 charges TTL
- Protection from an input power surge: $\pm 60 \text{ VDC}$, 40 VAC

13.2. SWEEP SCAN FUNCTION

- Frequency resolution: 0.28 Hz, 10 mHz or 1 mHz depending on the selected range (depending on entered FreqSTART, FreqEND and Time)
- Linear Mode (LIN) or logarithmic mode (LOG)

13.2.1. EXT EXTERNAL SCAN

- Scan using a signal with a frequency of < 15 kHz and an amplitude between $\pm 10 \text{ V}$ on the BNC
 - 'VCF IN' (GX 305/GX 310) ($-10 \text{ V} \leftrightarrow \text{FreqSTART}$ and $+10 \text{ V} \leftrightarrow \text{FreqEND}$)
 - 'VCG IN' (GX 320) ($-10 \text{ V} \leftrightarrow \text{FreqSTART}$ and $+10 \text{ V} \leftrightarrow \text{FreqEND}$)
- Entry Impedance : $10 \text{ k}\Omega \pm 10 \%$

13.2.2. INT EXTERNAL SCAN

- FreqSTART to FreqEND scan using saw tooth or triangle mode
- Programmable scan period (Time) from 10 ms to 100 s, resolution 10 mS
- BNC 'SWEEP OUT' output of approx. 2 V continuous voltage proportional to the generated frequency
- 'SWEEP OUT' output impedance' = $10 \text{ k}\Omega \pm 10 \%$

13.3. MODUL MODULATION FUNCTION (GX 320 ONLY)

13.3.1. FM MODULATION

- Frequency resolution: 0.28 Hz, 10 mHz or 1 mHz depending on the selected range (depending on FreqSTART, FreqEND)..
- Digital modulation: the modulating signal is read at a frequency of 65 kHz. This amplitude (256 values) is then converted to a frequency.
- INTERNAL source: frequency modulation using a sine signal with a frequency of $1 \text{ kHz} \pm 1 \%$
- EXTERNAL: modulation using a signal with an amplitude between $\pm 10 \text{ V}$ on the BNC 'VCG IN' ($-10 \text{ V} \leftrightarrow \text{FreqSTART}$ and $+10 \text{ V} \leftrightarrow \text{FreqEND}$), with a frequency of < 15 kHz

13.3.2. AM MODULATION

- In sine and triangle, digital modulation using a frequency modulating signal of < 5 kHz
- In square and LOGIC, digital modulation: the modulating signal is read at a frequency of 150 kHz. This amplitude (256 values) pilots the output signal amplitude
- INTERNAL source: modulation using a sine signal with a frequency of $1 \text{ kHz} \pm 1 \%$ and an amplitude allowing to select a modulation at 20 % and 80 % of the total programmed amplitude
- EXTERNAL source: modulation using an amplitude signal between $\pm 10 \text{ V}$ on the BNC 'VCG IN', with a frequency of < 5 kHz ($-10 \text{ V} \leftrightarrow 100 \%$, $0 \text{ V} \leftrightarrow 50 \%$, $+10 \text{ V} \leftrightarrow 0 \%$ of the programmed amplitude)

13.4. SHIFT KEY FUNCTION (SHIFT K) (GX 320 ONLY)

13.4.1. INTERNAL FSK

- Frequency resolution: 0.28 Hz, 10 mHz or 1 mHz depending on the selected range (depending on FreqSTART, FreqEND)
- Frequency commutation using a TTL signal (0 - 5 V) 1 kHz $\pm$ 1 % (0 V $\leftrightarrow$ FreqSTART and + 5 V $\leftrightarrow$ FreqEND), viewable on SWEEP OUT

13.4.2. EXTERNAL FSK

- Frequency resolution: 0.28 Hz, 10 mHz or 1 mHz depending on the selected range (depending on FreqSTART, FreqEND).
- Frequency commutation using a TTL signal (0 - 5 V) with a frequency of < 1 MHz, on the BNC 'VCG IN' (0 V $\leftrightarrow$ FreqSTART and + 5 V $\leftrightarrow$ FreqEND)

13.4.3. INTERNAL PSK

- Phase resolution: approx. 0.08°, adjustable from $\pm$ 180° by 1° steps
- Phase switch using a TTL signal (0 - 5 V) 1 kHz $\pm$ 1 % (0 V $\leftrightarrow$ add PhaseSTART and + 5 V $\leftrightarrow$ add PhaseEND), viewable on SWEEP OUT

13.4.4. EXTERNAL PSK

- Phase resolution: approx 0.08°, adjustable from $\pm$ 180° by 1° steps
- Phase switch using a TTL signal (0 - 5 V) with a frequency of < 1 MHz, on the BNC 'VCG IN' (0 V $\leftrightarrow$ + PhaseSTART and + 5 V $\leftrightarrow$ + PhaseEND)

13.5. SYNC SYNCHRONISATION (GX 320 ONLY)

- Max. generated signal frequency: 100 kHz
- Phase adjustment $\pm$ 180° by steps of 1°
- Synchronisation precision dependent on generated signal frequency, $\Delta\phi = \pm F_{\text{signal}} \times 3.6 \times 10^{-5}$ (for a cable length of < 1 m)

13.6. BURST PULSE GENERATION FUNCTION (GX 320 ONLY)

- Entry of the number of signal periods (impulses) from 1 to 65535
- The minimum window for the signal is: 2 μ s (see details in BURST para.)
- Over 10 MHz the number of periods can vary by 1 and the phase on SQUARE and TTL_OUT can change by 180°
- Trigger Jitter: $\leq$ 15 ns

13.6.1. INTERNAL BURST

- Entry of the burst period from 10 ms to 100 s with a 10 ms resolution

13.6.2. EXTERNAL BURST

- Triggering of the burst using an external TTL signal with a frequency of less than 1 MHz on the BNC 'INPUT BURST' or triggered manually (MODE key)
- Trigger delay of approx. 1.5 μ s

13.7. GATE FUNCTION (GX 320 ONLY)

- Authorisation to output the alternating component of the MAIN OUT signal using a TTL signal with a frequency of $\leq$ 2 MHz on BNC 'INPUT GATE' (+ 5 V $\leftrightarrow$ Main out generated and 0 V $\leftrightarrow$ alternating component cut)
- Delay of approx 100 ns

13.8. FREQ EXTERNAL FREQUENCY METER FUNCTION

- Input on the front face BNC terminal (FREQ EXT)
- External frequency measurement from 5 Hz to 100 MHz
- Max. amplitude max. (*) of measured signals:
 - 300 V from 5 Hz to 5 kHz
 - 30 V from 5 kHz to 1 MHz
 - 10 V beyond these values(*) signal with a duty cycle at 50 %
- Precision of the measured frequency: $\pm 0.05\%$ + 1 digit
- Frequency display measured on 5 digits

13.8.1. SENSITIVITY

- < 50 mVrms for $F \leq 30$ MHz
- < 60 mVrms for $30 \text{ MHz} < F \leq 80 \text{ MHz}$
- < 90 mVrms for $80 \text{ MHz} < F \leq 100 \text{ MHz}$

13.8.2. MEASUREMENT STABILISATION TIME

- ≤ 1 s from 5 Hz to 20 Hz (≥ 1 measurement per second)
- ≤ 100 ms from 20 Hz to 400 Hz (2 measurements per second)
- ≤ 40 ms from 400 Hz to 100 MHz (2 measurements per second)

13.8.3. INPUT IMPEDANCE

- $1 \text{ M}\Omega // 22 \text{ pF}$ approx.

13.9. OTHER SPECIFICATIONS

13.9.1. ENVIRONMENTAL CONDITIONS

Indoor use

Altitude	< 2000 m
In use	5°C to 35°C / 45 to 65 % RH
Storage (without battery)	-20°C to $+70^{\circ}\text{C}$ 10 to 95 % RH
Influence de la température	voir §. Influences
pollution degree	2

13.9.2. POWER SUPPLY

- Voltage $230 \text{ V} \pm 10\%$ ($115 \text{ V} \pm 10\%$ hardware voltage selection)
- Frequency 50 - 60 Hz
- Consumption 20 VA max.
- Removable power supply cable

13.9.3. MECHANICAL SPECIFICATIONS

- Size (support folded): 190 x 227 x 130 mm
- Weight 2,850 kg

13.9.4. COMPLIANCE WITH INTERNATIONAL STANDARDS / ELECTRICAL SAFETY

The instrument complies with standard IEC/EN 61010-2-030 and the measurement leads comply with standard IEC/EN 61010-031.
Max voltage. : 300 V (50 - 60 Hz) CAT I in relation to earth.

13.9.5. ELECTROMAGNETIC COMPATIBILITY (EMC)

The instrument complies with standard IEC/EN 61326-1.

14. MAINTENANCE

The instrument contains no parts that can be replaced by personnel who have not been specially trained and accredited.

14.1. CLEANING

Disconnect the instrument completely and switch it OFF.

Use a soft cloth, dampened with soapy water. Rinse with a damp cloth and dry rapidly with a dry cloth or forced air. Do not use alcohol, solvents, or hydrocarbons.

Make sure that no foreign bodies interfere with the operation of the snap device of the sensor.

15. WARRANTY

Except as otherwise stated, our warranty is valid for **36 months** starting from the date on which the equipment was sold. The extract from our General Conditions of Sale is available on our website.

www.chauvin-arnoux.com/en/general-terms-of-sale

The warranty does not apply in the following cases:

- Inappropriate use of the equipment or use with incompatible equipment;
- Modifications made to the equipment without the explicit permission of the manufacturer's technical staff;
- Work done on the device by a person not approved by the manufacturer;
- Adaptation to a particular application not anticipated in the definition of the equipment or not indicated in the user's manual;
- Damage caused by shocks, falls, or floods.



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