

**OX 822**  
**20 MHz-DIFFERENTIAL**  
**OSCILLOSCOPE**

**User's manual**

# **SOMMAIRE**

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## 1. GENERAL INSTRUCTIONS

You have just purchased a 20 MHz-differential oscilloscope; we congratulate you on your choice of this high quality product.

This apparatus complies with IEC safety standard 61010-1 +A1 +A2 (1995) single insulation, dealing with electronic measurement instruments. Please read these instructions carefully and respect the usage precautions, in order to obtain the best use from it. Failure to respect warnings and / or usage instructions may damage the apparatus and / or its components and may be dangerous to the user.

### 1.1. Safety precautions

#### 1.1.1. Before use

- This instrument was designed for use indoors in an environment with a degree of pollution 2 at an elevation of less than 2000 m, a temperature between 0°C and 40°C, and a relative humidity of 80 % up to 31°C.
- It can be used for measurements on 300 V category III and 600 V CAT II (inputs) installations and can be supplied by a 253 V CAT II network.
- Definition of installation categories (see publication IEC 664-1):
  - CAT I : CAT I circuits are protected by devices limiting transient overvoltages to a low level.  
Example: protected electronic circuits
  - CAT II : CAT II circuits are power supply circuits for domestic or digital devices that may include transient overvoltages with an average value.  
Example: power supply for household appliances and portable tools.
  - CAT III : CAT III circuits are power supply circuits for power equipment that may include large transient overvoltages.  
Example: power supply for industrial machines or equipment
  - CAT IV : CAT IV circuits may include very high transient overvoltages.  
Example: energy arrivals
- Depending on the position of the fuse on the basic board, this instrument may be powered by a 110 VAC or 230 VAC  $\pm 10$  % network. Before connecting up the instrument, check that the fuse position matches the rated voltage of your distribution network. To do this, remove the top cover from the oscilloscope.



***The replacement fuse must be identical to the original fuse. It is located inside the apparatus in a housing on the cathode ray tube support part.***

- Earth all metallic parts that are accessible to touch (including the working table).
- You are advised to use the accessories delivered with the instrument or proposed as options. Check that they are in perfect working condition before use.
- Plug the cable into a socket fitted with an earth connection.

#### 1.1.2. During use

- Select vertical sensitivity and timebase ranges adapted to the measurement.
- When carrying out a measurement, never touch an unused terminal of the instrument.

### 1.1.3. Symbols



Refer to the user's manual.  
Incorrect use may result in damage  
to the device or its components.



Risk of electric shock



Ground

### 1.1.4. Instructions

- **Before opening the apparatus**, always disconnect it from the mains power supply and measurement circuits, and make sure that you are not charged with static electricity which could damage internal components.
- Any repair, maintenance or adjustment of the oscilloscope when it is **powered** may only be done by qualified personnel, after reading the instructions in this manual.
- A "**qualified person**" is a person who is familiar with the installation, construction and use and the dangers present. He is authorized to switch the installation and equipment on and off in accordance with the safety rules.
- Take care not to obstruct ventilation holes when using the apparatus.



***Some internal capacitors may retain a dangerous potential, even after the apparatus has been switched off.***

### 1.2. Guarantee

This oscilloscope is guaranteed against any material defect or manufacturing vice in accordance with the general conditions of sale.

During the guarantee period (2 years), the apparatus may only be repaired by the manufacturer, and the manufacturer will be free to decide to repair or replace all or part of the apparatus. The guarantee conditions state that the manufacturer will pay for return transport.

The guarantee is not applicable in the following cases:

1. any improper use of the equipment or if it is used in association with incompatible equipment;
2. modification of the equipment without explicit authorization by the manufacturer's technical departments;
3. work done by a person not approved by the manufacturer;
4. adaptation to a specific application not included in the definition of the equipment or by the operating instructions;
5. a shock, drop or flooding.

### 1.3. Maintenance and metrological verification

Return your instrument to your distributor for any work to be done within or outside the guarantee.

### 1.4. Servicing

Clean the instrument with a wet cloth and soap. Never use abrasive products or solvents.

## 2. INSTRUMENT DESCRIPTION

This instrument is a 20 MHz portable differential oscilloscope with AUTOSET. Its technology has been designed to satisfy the most demanding users. It is intended for electrotechnicians and electronics experts (operation in normal or differential mode).

This oscilloscope's inputs can operate in both traditional and differential mode (independent switching accessible on the front):

### *in traditional mode*

- \* Inputs CH1+ and CH2+ are active.
- \* Inputs CH1- and CH2- are inhibited internally, but the impedance as seen from the input remains constant.

### *in differential mode*

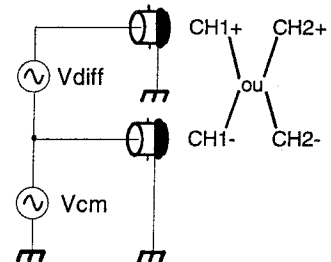
- \* Inputs CH1+ CH1- and CH2+ CH2- are active.
- \* The signal displays corresponds to the difference between the signals present on inputs CH 1+ and CH1- (and/or CH2+ and CH2-).



**The voltage common to the 2 inputs (CH1+, CH1-) or (CH2+, CH2-) is called the common mode voltage  $V_{cm}$ .**

- \* The peak common mode voltage max.  $V_{cm}$  depends on the calibre selected:

- 20 V for sensitivities from 10 mV to 0.5 V
- 200 V for sensitivities from 1 V to 5 V
- 600 V for sensitivities from 10 V to 200 V/div.



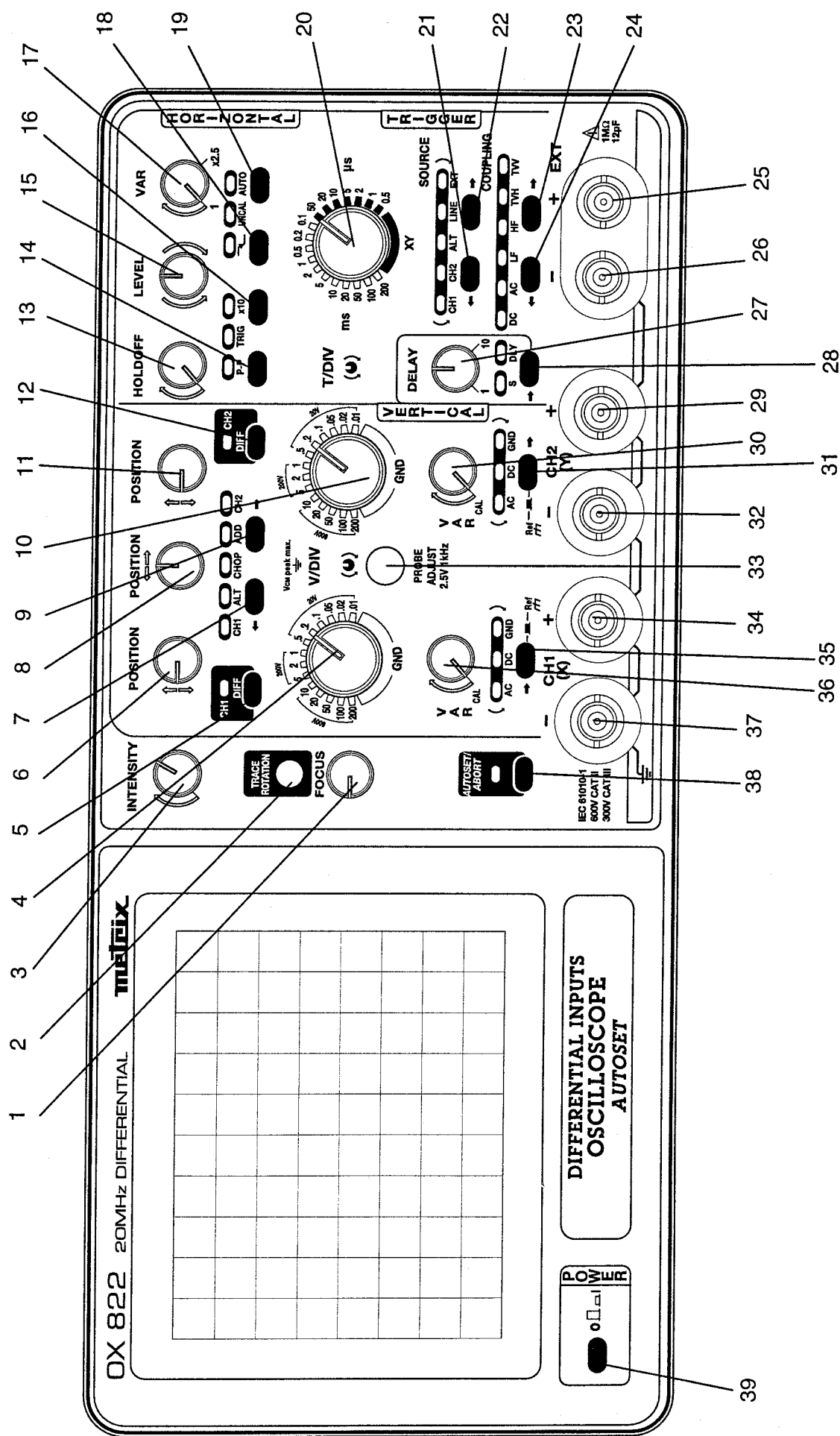
**The representation of the signal on the screen may be erroneous when the max. common mode voltage authorized for the calibre selected is exceeded.**

### **Performance of the oscilloscope**

- \* 2 channels at 20 MHz
- \* High input dynamic: 10 mV to 200 V/div. (14 calibres)
- \* Triggering up to 40 MHz
- \* Trigger delay function
- \* The AUTOSET function automatically searches for the vertical sensitivity and the scanning coefficient adapted to the signal present on channels CH1 and CH2.




The front panel is managed by an 8-bit microcontroller with FLASH memory which handles the following tasks:

- \* Reading of the absolute sensitivity and time base coders
- \* Management of the LEDs
- \* Configuration of the basic board by serial link
- \* Management of communication with the PC via the RS232C link with the HA1255 programming kit (optional)
- \* Generation of the calibration signal
- \* Saving of the instrument's configuration in EEPROM



**Figure 1 : Face avant**

## 2.1. Front panel description

1 -	<b>FOCUS</b>	• focus adjustment
2 -	<b>TRACE ROTATION</b>	• adjustment of the horizontal trace alignment
3 -	<b>INTENSITY</b>	• adjustment of the trace brightness
4 -	<b>VOLT/DIV</b>	• selection of the vertical sensitivity for CH1
5 -	<b>CH1 DIFF</b>	• switching to normal or differential operating mode of CH1 channel
6 -	<b>POSITION</b> ↑↓	• adjustment of the vertical position of CH1 trace
7 -	<b>MODE</b> ⇐	• right/left scroll of vertical modes
8 -	<b>POSITION</b> ⇐⇒	• adjustment of the horizontal position of CH1 or CH2 trace
9 -	<b>MODE</b> ⇒	• left/right scroll of vertical modes
10 -	<b>VOLT/DIV</b>	• selection of the vertical sensitivity for CH2
11 -	<b>POSITION</b> ↑↓	• adjustment of the vertical position of CH2 trace
12 -	<b>CH2 DIFF</b>	• switching to normal or differential operating mode of CH2 channel
13 -	<b>HOLDOFF</b>	• adjustment of HOLDOFF TIME (sweep holdoff)
14 -	<b>P-P</b>	• activation of peak-to-peak trigger mode
15 -	<b>LEVEL</b>	• adjustment of trigger level
16 -	<b>x 10</b>	• expansion by 10 of the horizontal sweep coefficient
17 -	<b>VAR</b>	• continuous adjustment of sweep coefficient of timebase
18 -		• activation of positive  or negative  trigger slope
19 -	<b>AUTO</b>	• activation of AUTO or triggered sweep mode
20 -	<b>T/DIV</b>	• selection of the sweep coefficient of timebase
21 -	<b>SOURCE</b> ⇐	• right/left scroll of trigger sources
22 -	<b>SOURCE</b> ⇒	• left/right scroll of trigger sources
23 -	<b>COUPLING</b> ⇒	• left/right scroll of trigger sources
24 -	<b>COUPLING</b> ⇐	• right/left scroll of trigger sources
25 -	<b>EXT +</b>	• external trigger + input
26 -	<b>EXT -</b>	• external trigger - input
27 -	<b>DELAY</b>	• adjustment trigger delay of timebase
28 -	<b>S / DLY</b>	• selection of SEARCH ou DLY (delayed) sweep modes
29 -	<b>CH2 +</b>	• CH2 channel input
30 -	<b>VAR</b>	• continuous adjustment of the CH2 vertical sensitivity
31 -	<b>COUPLING</b>	• selection of CH2 channel coupling or measurements on CH2
32 -	<b>CH2 -</b>	• CH2 channel - input
33 -	<b>PROBE ADJUST</b>	• sortie de calibration
34 -	<b>CH1 +</b>	• CH1 channel + input
35 -	<b>COUPLING</b>	• selection of CH1 channel coupling or measurements on CH1
36 -	<b>VAR</b>	• continuous adjustment of the CH1 vertical sensitivity
37 -	<b>CH1 -</b>	• CH1 channel - input
38 -	<b>AUTOSET/ABORT</b>	• activation/deactivation of the AUTOSET function
39 -	<b>POWER</b>	• ON/OFF key

## 2.2. Rear panel description

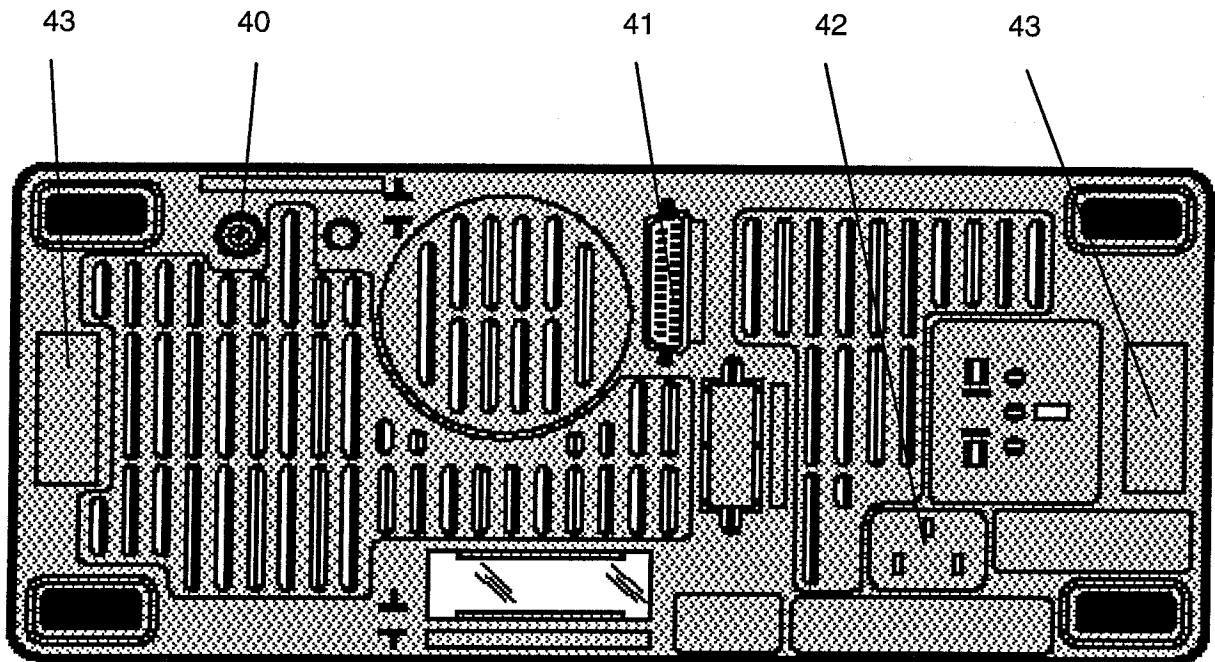


Figure 2

### (40) MODULATION Z

Input :	BNC on rear panel
Sensitivity :	TTL level for on/off modulation
High level :	on
Low level :	off
Max. frequency :	4 MHz
Input resistance :	$\approx 2 \text{ k}\Omega$
Max. voltage :	$\pm 20 \text{ VDC}$

### (41) Location of the optional HA1255 PROGRAMMING KIT connector

This RS232C serial link (41) establishes the communication between the oscilloscope and a PC or compatible computer. It enables :

- the remote programming of the oscilloscope
- the reading of the oscilloscope configuration

### (42) Mains plug

### (43) Cord winders

### (44) Mains plug location when carrying the oscilloscope



### 3. GETTING STARTED



***Respect the safety instructions indicated in Chapter 1.***

- Position the rotary controls as indicated in the figure 1.
- Press the POWER key (39): the last memorised configuration of the front panel is restored.
- Validate the AUTO key (19).
- Adjust :
  - brightness with the INTENSITY potentiometer (3),
  - the thickness of the traces with the FOCUS potentiometer (1),
  - the horizontalness of the traces with the potentiometer to be reached through the TRACE ROTATION hole (2).



***Adjust the brightness of the trace according to ambient lighting. Excessive brightness can damage the tube, particularly when there is no sweeping in process (spot stationary).***

- Apply the signal to be displayed to channel CH1 or CH2.
- Press on the AUTOSET key (3) .
- When using a 1/10 probe, use the PROBE ADJUST signal (33) (2.5 V, 1 kHz) to adjust the probe compensation (refer to § 4. APPLICATIONS).

#### 3.1. AUTOSET

- AUTOSET automatically carries out the following searches:  
active channel, vertical sensitivity, horizontal deflection coefficient, trigger slope.
- AUTOSET automatically puts the oscilloscope into the following configuration:  
synchro PTP, AC coupling of the connected channel, horizontal magnitude x 1, DC coupling of the trigger source.
- AUTOSET does not affect : POSITION (H and V), VAR, DELAY, INTENSITY.

The AUTOSET function is activated by pressing the AUTOSET/ABORT key (38) (key only active while pressed):

- The AUTOSET/ABORT LED remains on during the search phase.
- When the search phase ends, if the calibres found by the AUTOSET function are different from those indicated by the vertical sensitivity and time base switches, the AUTOSET/ABORT LED flashes.
- There are two ways of quitting the AUTOSET function:
  - ↳ Manual search for the ranges found by AUTOSET:
    - You search for the AUTOSET ranges by turning the (4) and/or (10) sensitivity and (20) time base switches in the direction indicated by the coupling or trigger-source LED which is flashing.
    - The AUTOSET LED goes out when all the ranges determined by the AUTOSET have been found.
  - ↳ Pressing the AUTOSET/ABORT key (38) again will cancel the AUTOSET function.



***Vertical adjustment is not set by the AUTOSET. You should ensure that position (6) and (11) rotary controls are correctly centred.***

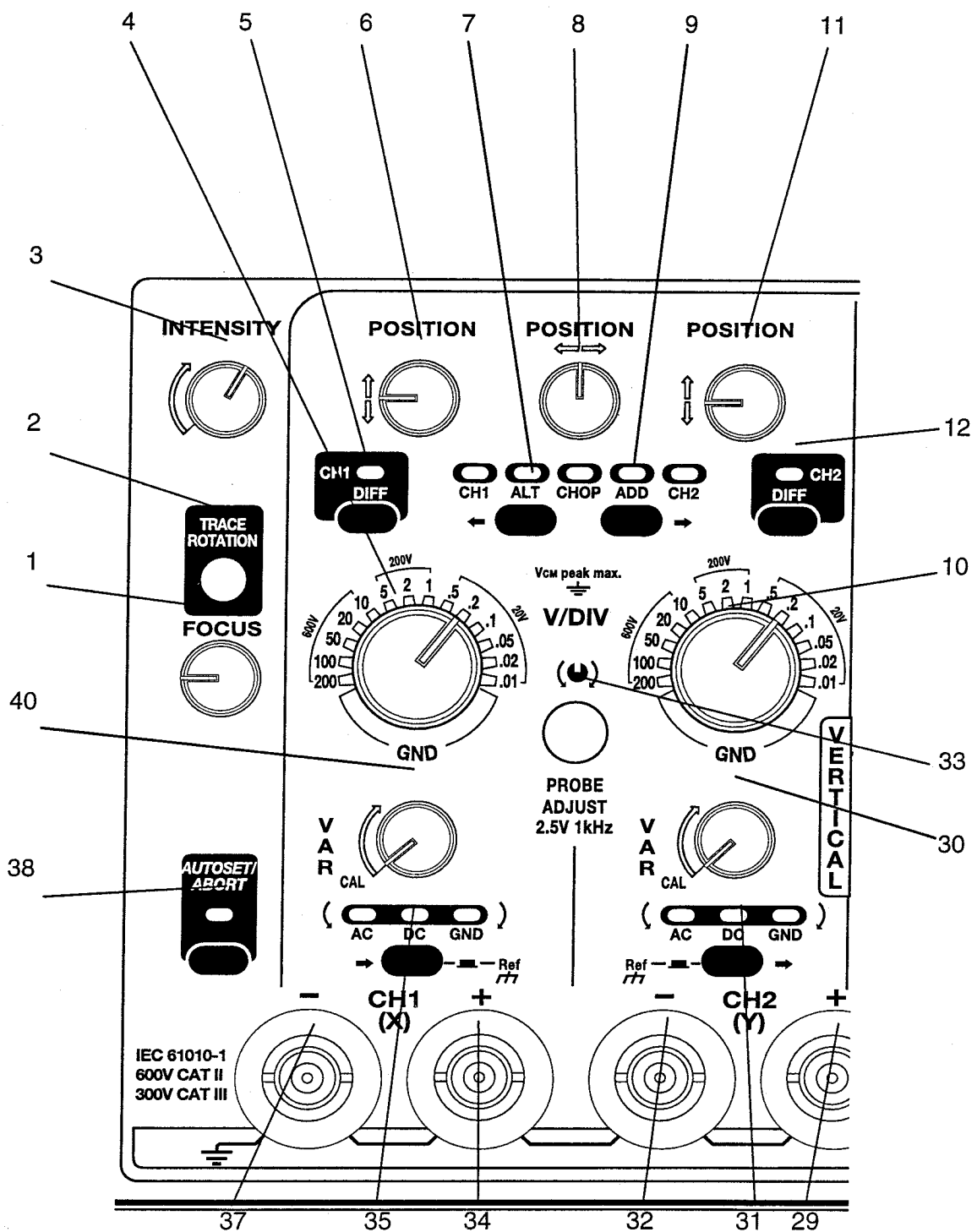


Figure 3

### 3.2. Vertical channels

Refer to figure 3.

(6) - (11) **POSITION** - Vertical centring of the CH1 and CH2 traces.

(8) **POSITION** - Horizontal centring of the traces.  
This command acts simultaneously on CH1 and CH2.

(4) - (10) **VOLT/DIV** - CH1 and CH2 vertical sensitivity : 14 positions (10 mV to 200 V/div.).

(30) - (36) **VAR** - Continuous adjustment of CH1 and CH2 vertical sensitivity. When the knob is locked in the left-hand position, the corresponding UNCAL indicator light is out.

(31) - (35) **AC - DC - GND**

Selection using the (31) key for the CH2 channel and (35) for the CH1 channel :



Visualisation of the AC component (deletion of the DC component).



Visualisation of the full signal



Coupling of the channel to earth (without short-circuiting the input signal). Enables accurate positioning of the trace on the screen using the POSITION controls (6) and (11).

(34) - (37) **CH1+ CH1-** + and - inputs of signals to be observed on BNC sockets of channel 1.

(29) - (32) **CH2+ CH2-** + and - inputs of signals to be observed on BNC sockets of channel 2.

### 3.3. Display modes

Refer to figure 3.

(5)



**CH1 DIFF** - Switch of channel CH1 to normal/differential mode.

In normal mode - LED not lit - the display corresponds to the signal present on channel CH1+.

In differential mode - LED lit - the display corresponds to the difference between the signals present on channel CH1+ and CH1-.

(7) - (9) **CH1 - ALT - CHOP - ADD - CH2**

Selection using the ← (7) or → (9) key:



Display of CH1 only.



Display of CH1 and CH2 in alternate mode.



Display of CH1 and CH2 in chopper mode; during one sweep the channel passes from CH1 to CH2 at the chopper frequency (500 kHz approximately).



Display of the sum of CH1 and CH2.



Display of CH2 only.

(20) **XY Mode**

Select by switching the XY timebase knob (20).

In this mode :

CH1 is the X horizontal input

CH2 is the Y vertical input.

(12)



**CH2 DIFF** - Switch of channel CH2 to normal/differential mode.

In normal mode - LED not lit - the display corresponds to the signal present on channel CH2+.

In differential mode - LED lit - the display corresponds to the difference between the signals present on channel CH2+ and CH2-.

### 3.4. Timebase (Refer to figure 4, next page).

- (20) **T/DIV** - Sweep coefficient selection : 18 positions (0.5  $\mu$ s to 200 ms/div.)
- (17) **VAR** - Continuous adjustment of the sweep coefficient of timebase  
When the knob is locked in the left-hand position, the UNCAL indicator is out.
- (13) **HOLDOFF** - Continuous adjustment of the minimum time between two successive sweeps. This control enables the holdoff of ill-timed triggering (multiple trigger conditions in the same period of the signal observed).  
In normal use the knob is locked in the left-hand position (click).
- (16) **x10** - Horizontal magnitude (x10).



**This function is not active in XY mode (indicator out).**

### 3.5. Trigger

- (21) - (22) **SOURCE** - Select by pressing on the  $\rightarrow$  (22) or  $\leftarrow$  (21) keys:



Synchronisation by CH1.



Synchronisation by CH1.



Trigger source defined according to the display mode:

Display mode	Trigger channel
CH1	CH1
CH2	CH2
ALT	channel 1 synchronised with CH1 channel 2 synchronised with CH2
CHOP	CH1
ADD	CH1



Synchronisation by the frequency of the mains supply. The trigger point can be adjusted using the LEVEL control. The trigger source coupling command is inoperative (LEDs coupling source off).



Synchronisation by the external source connected to the plugs EXT- (26) and/or EXT+ (25) BNC's.

- (19) **AUTO** - Automatic trigger of the timebase. Traces visible even in the absence of a trigger event.
- (15) **LEVEL** - Adjustment of the trigger level  
The TRIG indicator lights up when a trigger event is detected.
- (18) **Trigger edge (\*)**  
Indicator lights up : trigger on the negative slope.  
Indicator off: trigger on the positive slope.



**This function is not active in XY mode (indicator out).**

(\*) **NB :** When one of the TVH or TVV filters is activated, it is possible to trigger in positive video with a positive trigger slope or in negative video, with a negative trigger slope.

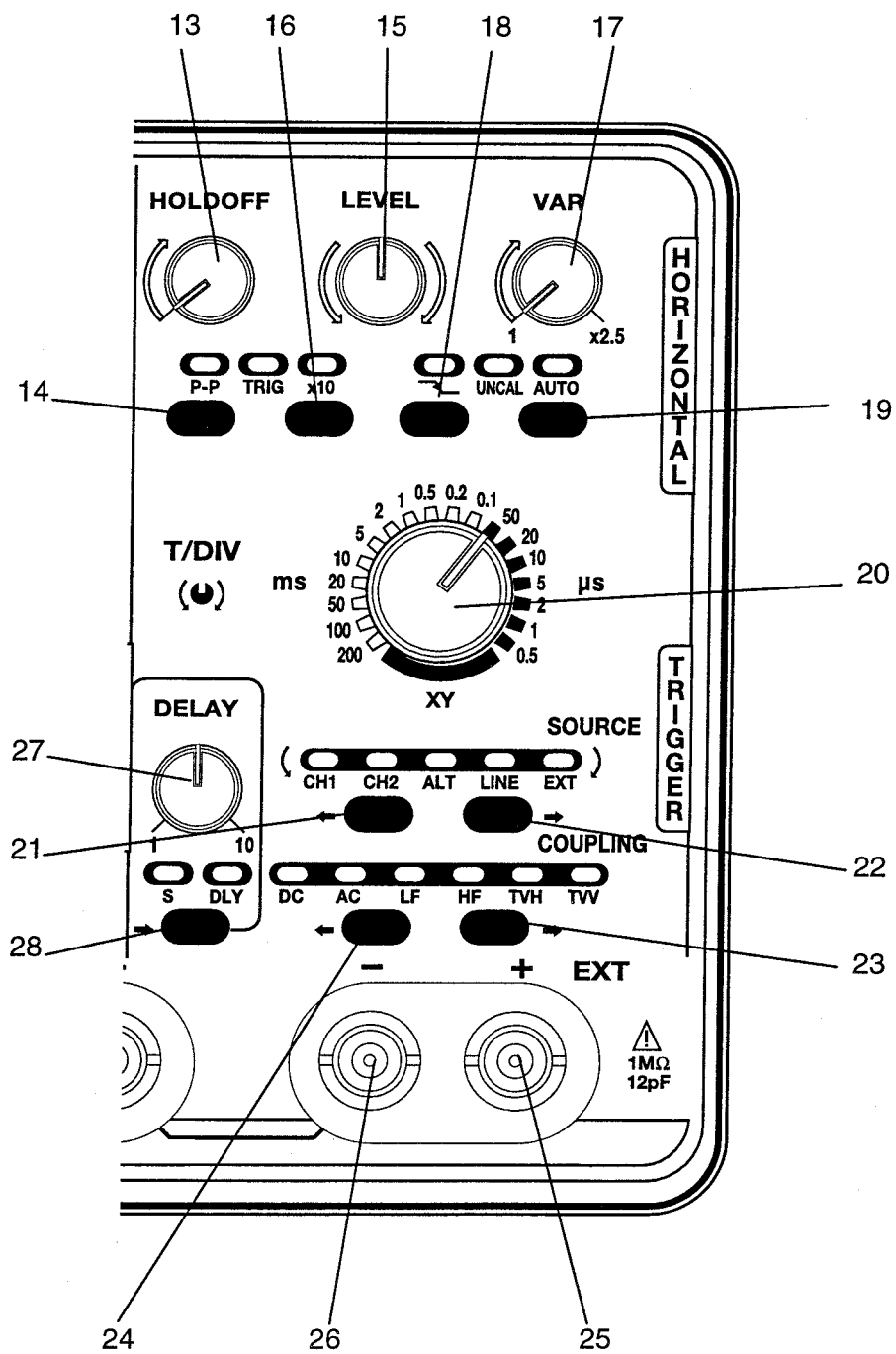



Figure 4

(26) - (25) **EXT- EXT+** Input of the external synchronisation signal by the + and - BNC sockets. (Refer to §. 6. SPECIFICATIONS).

(23) - (24) **COUPLING** - Coupling of the trigger source

 **The filtering activated only acts on the trigger channel, not on the display.**  
**This COUPLING function is inactive in XY mode (indicators out).**

Select by pressing on the → (23) or ← (24) key:



DC coupling (0 to 40 MHz)



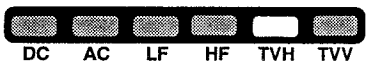
AC coupling (10 Hz to 40 MHz)



Rejection of source signal frequencies < 10 kHz  
(facilitates observation of signals with a DC component).



Rejection of source signal frequencies > 10 kHz  
(facilitates the observation of signals with high-frequency noise).




Trigger on the synchronisation pulse of the TV line  
(\*NB, page 13).  
Sweep coefficient recommended for the examination of a TV line: 0.5  $\mu$ s at 20  $\mu$ s/div.



Trigger on the synchronisation pulse of the TV raster  
(\* NB, page 13).  
Sweep coefficient recommended for the examination of a TV raster: 1 ms/div.

(14) **P - P** - Peak-to-peak trigger

The trigger reference (accurate adjustment by LEVEL) is automatically between the low and the high peaks of the sinewave chosen, which guarantees the trigger irrespective of the amplitude or the DC component of the source signal (80% of the peak-to-peak amplitude of the sinewave for  $f = 100$  Hz).

 **This COUPLING function is inactive in XY mode (indicators out). The use of P-P triggering is not recommended on very low-frequency signals or pulsed signals of very short duration.**

### 3.6. Trigger delay (DELAY)

This mode permits a portion of the signal to be examined in detail (at high sweep speed) after the trigger event chosen. The DELAY command (27) enables continuous adjustment of the delay (1 to 9 div.).

(28) **DELAY**- Select by pressing on key (28) :



Normal mode :

The sweep starts immediately (trigger event at the far left of the trace).



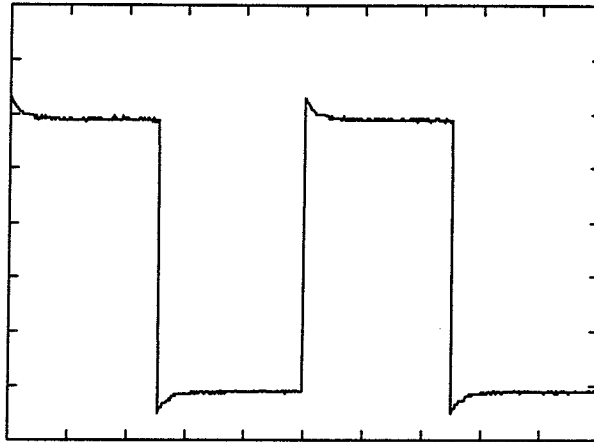
SEARCH mode (S) :

The plot(s) on the screen present an under-intensified part (equivalent to the trigger delay) adjustable using the DELAY potentiometer (27).

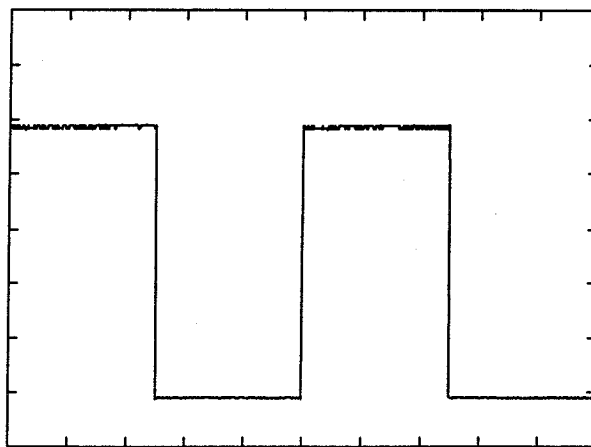


DLY delayed mode (DLY mode):

The sweep begins at the point corresponding to the end of the under-intensified zone in SEARCH mode.



**Figure 5 : Probe incorrectly compensated in low frequency**



**Figure 6 : Low frequency compensation correct**



## 4. APPLICATIONS

### 4.1. Visualisation of the calibration signal

- Connect the PROBE output (33) to CH1 input (34) by using a 1/1 or 1/10 measurement probe.
- Select the following functions:
  - CH1 sensitivity (4) or CH2 (10): 0.1 V/div. (1/1); 10 mV/div. (1/10)
  - Sweep speed (20): 0.2 ms/div.
  - Trigger source (21) or (22): CH1 or CH2
  - Trigger mode (19): AUTO
- If necessary, adjust vertically using the POSITION (6) or (11) control and stabilise the trace using the potentiometer LEVEL (15).
- Adjust the low-frequency compensation of the probe so that the impulse plateau is horizontal. See figures 5 and 6.



***To compensate, please refer to the instructions enclosed with the probe.***

### 4.2. Measurement of amplitude and frequency

Amplitude and frequency might be measured from the PROBE output (33) whose specifications are the following :

- Shape : rectangular
- Amplitude : 0 to + 2.5 V  $\pm$  1 %
- Frequency : 1 kHz  $\pm$  1 %
- Duty cycle :  $\frac{1}{2}$
- Connect the PROBE output (33) to the CH1+ (35) or CH2+ (29) input by using a 1/1 or 1/10 measurement probe.
- Adjust CH1 or CH2 sensitivity to 20 mV/div. (if a 1/10 probe) and the timebase to 1 ms/div.
- Check that the amplitude of the visualised signal is equal to 2.5 divisions and that its period is equal to 1 division.

## 5. SPECIFICATIONS

Only the values affected by tolerances or limits constitute guaranteed values (after half an hour's warming up). Values without tolerances are given for information.

### 5.1. Vertical deflection

CH1 - CH2	Specifications	Comments
<b>Characteristics</b>		
Bandwidth at - 3 dB	> 20 MHz on all ranges	measured on 6 divisions
Risetime 10 % 90 %	< 17 ns on all ranges	signal 5 div.
Accuracy of vertical deflection coefficients (sensitivity)	Sensitivities : 10 mV to 200 V/div. $\pm 3\%$	14 positions, sequences 1-2-5
Max. peak voltage of common mode	10 mV to 0.5 V/div. 20 V 1 V to 5 V/div. 200 V 10 V to 200 V/div. 600 V	
Variable vertical deflection coefficients	Multiplication of V/div. range by 1 to 2.5 (amplitude reduction)	Calibrated position : control in left-hand position
Input protection	Protection against transients 4 kV (1.2 $\mu$ s / 50 $\mu$ s)	Inputs : 300 V CAT III 600 V CAT II
Limitation of the F (frequency) level	from 0 to 2 MHz 600 V peak from 2 to 20 MHz -2 dB/decade	
Focused trace thickness	50 mV to 200 V/div. < 1 mm 10 mV and 20 mV < 3 mm	
Chopping frequency (CHOP)	$\approx 200$ kHz	
AC coupling cutoff frequency	< 10 Hz without probe	
Input impedance	1 M $\Omega$ $\pm 1\%$ // 12 pF	
Response in rectangular signals	Overflow < 3 % Aberration at 100 mV/div. : . on the plateau < 1 mm . before the edge < 2 mm	Square signal 1 kHz to 1 MHz 1 MHz (T <sub>m</sub> gene < 100 ps)
Crosstalk at 20 MHz	10 mV/div. to 50 mV/div. 30 dB typ. 100 mV/div. to 200 V/div. 36 dB typ.	Same sensitivity on CH1 and CH2, amplitude 6 div.
Display modes	CH1, ALT, CHOP, ADD, CH2, XY	ALT = alternate CHOP = chopped
NORMAL / DIFF CH1	CH1 the input -CH1 is inhibited in normal mode	CH1 channel switching in normal or differential mode
NORMAL / DIFF CH2	CH2 the input -CH2 is inhibited in normal mode	CH2 channel switching in normal or differential mode

### 5.1.1. Horizontal deflection

Characteristics	Specifications	Comments
Sweep coefficients Accuracy on all ranges	0.5 $\mu$ s to 200 ms/div. $\pm 3\%$ i. e. 18 positions	Sequences 1-2-5
Expansion x 10	Accuracy : $\pm 5\%$	used to obtain 20ns/div.
Variable coefficient	Division of the s/div. range 1 to 2.5	Calibrated position : control at left-hand stop (signal horizontal expansion)
Sweep disable time (HOLDOFF)	Variable from 1 to 10	for each of the 18 ranges in the timebase
XY mode Y bandwidth -3 dB X bandwidth -3 dB derating	0 to 20 MHz 0 to 2 MHz $\Delta\phi < 3^\circ$ to 120 kHz	

### 5.1.2. Trigger system

Characteristics	Specifications	Comments
CH1 / CH2 sensitivity 0 to 10 MHz 10 to 20 MHz 20 to 40 MHz	0.7 div. 1 div. 2 div.	
ALT		Source depending on vertical mode : <b>CH1</b> CH1 trigger <b>ALT</b> CH1 then CH2 trigger <b>CHOP</b> CH1 trigger <b>ADD</b> CH1 trigger <b>CH2</b> CH2 trigger
LINE	Synchro to mains	
EXT sensitivity 0 to 10 MHz 10 to 20 MHz 20 to 40 MHz	applicable min. amplitudes 100 mVpp 200 mVpp 400 mVpp	$Z_e = 1\text{ M}\Omega // 12\text{ pF}$ Protection against transients 4 kV (1.2 / 50 $\mu$ s) Common mode voltage 50 V peak max.
Filters AC LFR HFR TVH and TVV	Bandwidth to -3 dB 10 Hz to 40 MHz 10 kHz to 40 MHz 0 to 10 kHz synchronisation on a video line (TVH) or video frame (TVV)	
Horizontal mode AUTO Normal		relaxéd mode Freq > 5 Hz triggered mode
Slope	Falling edge Rising edge	
Level range P-P Normal	80 % of peak-peak amplitude of sinusoidal signal F > 50 Hz $\pm 12$ divisions	

### 5.1.3. Trigger delay coefficient

Scanning time range	Delay range (approx.)
0.5 $\mu$ s/div.	0.5 $\mu$ s to 5 $\mu$ s
1 $\mu$ s/div. 2 $\mu$ s/div. 5 $\mu$ s/div.	1 $\mu$ s to 10 $\mu$ s 2 $\mu$ s to 20 $\mu$ s 5 $\mu$ s to 50 $\mu$ s
10 $\mu$ s/div. 20 $\mu$ s/div. 50 $\mu$ s/div.	10 $\mu$ s to 100 $\mu$ s 20 $\mu$ s to 200 $\mu$ s 50 $\mu$ s to 0.5 ms
100 $\mu$ s/div. 200 $\mu$ s/div. 500 $\mu$ s/div.	100 $\mu$ s to 1 ms 200 $\mu$ s to 2 ms 500 $\mu$ s to 5 ms
1 ms/div. 2 ms/div. 5 ms/div.	1 ms to 10 ms 2 ms to 20 ms 5 ms to 50 ms
10 ms/div. 20 ms/div. 50 ms/div.	10 ms to 100 ms 20 ms to 200 ms 50 ms to 500 ms
100 ms/div. 200 ms/div.	100 ms to 1 s 100 ms to 2 s

### 5.1.4. AUTOSET function

Parameters searched for by AUTOSET	Configuration imposed by AUTOSET	Unchanged parameters
Presence of a signal on channels CH1 and CH2	PTP synchro	Horizontal and vertical position
Vertical sensitivities adapted to the signals	AC coupling of the channel	VAR
Time base calibre adapted to the signal	horizontal expansion coefficient: x1	DELAY
		INTENSITY
	AUTO scanning	FOCUS

#### 5.1.4.1. AUTOSET specifications

The AUTOSET function is activated by pressing the AUTOSET key; it automatically searches for the vertical sensitivity and the scanning coefficient adapted to the signal present on channels CH1 and CH2.

- Signal search time approx. 5 seconds
- Frequency range 25 Hz to 20 MHz
- Min. amplitude 200 mV
- Automatic switch to CHOP for T/DIV between 200 ms and 1 ms/div.

## 5.2. General characteristics

### ***Cathode ray ube***

Tube	mono-accelerator cathode-ray tube
Type	rectangular with 13 cm diagonal internal graticule
Graticule	8 vertical divisions with 5 subdivisions 10 horizontal divisions with 5 subdivisions 1 division = 1 cm
Screen	phosphor with average GY persistence
Trace	adjustment of trace rotation adjustment of focusing adjustment of intensity of brightness
Total acceleration voltage	2 kV
Contrast screen	BLUE

### ***Power supply***

Mains	two ranges (110 VAC - 230 VAC $\pm 10\%$ ) which can be selected by the position of the fuse on the main board
Frequency	50 to 60 Hz
Removable mains power cord	
Winder with plug holder at the back of the instrument	
Consumption	65 W maximum at 230 VAC



***Before connecting the instrument check that the position of the fuse corresponds to to your power supply network(230 VAC  $\pm 10\%$  or 110 VAC  $\pm 10\%$ ).***

### ***Electromagnetic compatibility***

Emission acc. to EN 50081-1, 1992

Immunity acc. to EN 50082-2, 1995

Influence parameter : RF field at 10 V/m : 1 div. max.

### ***Safety***

Acc. to EN 61010-1, 1993 + A2, 1995

### ***Environment***

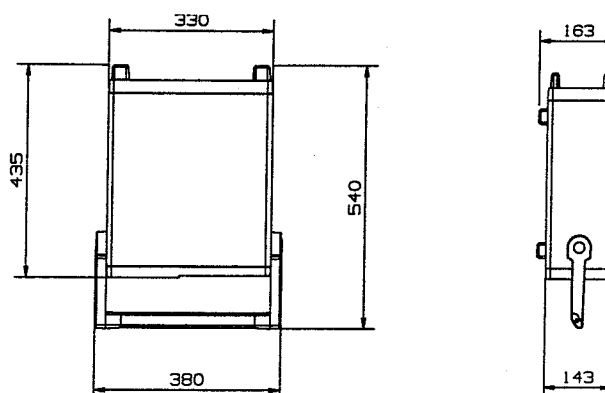
Usage	indoors
Altitude	< 2 000 m
Reference temperature	+ 18 °C to + 28 °C
Usage temperature	+ 10 °C to + 40 °C
Operating temperature	0 °C to + 40 °C
Storage temperature	- 20 °C to + 70 °C
Relative humidity	< 80 % HR up to 40 °C

## Mechanical characteristics

Stackable instrument, the handle being used as a stand

Weight:  $\approx 7$  kg

Dimensions :



## When packed

Dimensions : 550 x 460 x 280 mm

Weight:  $\approx 8.5$  kg

## 6. SUPPLIES AND OPTIONS

### 6.1. Accessories

#### 6.1.1. Provided with the apparatus

- User's manual 906121577
- Power cable AG0416
- Spare ceramic fuse T 0.315 A / 5x20 / 250 V  
located at the back of the instrument in a receptacle  
on the cathode ray tube stand AT0073
- 2 BNC/banana cords AG0438

#### 6.1.2. Provided as options

- 2 1/10 attenuator probes HA1315
- 1/10, 200 MHz attenuator probe HA1316
- 1/100, 200 MHz, 2 kV probe HA1317
- BNC male/banana female adaptater, 5 pins HA2022
- BNC male/female T, 3 pins HA2004
- 50  $\Omega$  BNC passage load PA4119-50
- BNC/BNC 50  $\Omega$  cable PA2249-C48
- 100 A clamp for oscilloscope AM0030N
- 600 A clamp for oscilloscope AM0031N
- 30 MHz differential probe MX9003
- Carry bag AE0189
- Programming kit (RS232C interface) HA1255

### 6.2. Options

- Rack assembly kit (4U - 19") RK0008