

USER'S MANUAL

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1. GENERAL INSTRUCTIONS

You have just purchased a 30 MHz oscilloscope; we congratulate you on your choice of this high quality product.


This apparatus complies with IEC safety standard 61010-1 1993, + A2 1995 (BS 4743 - VDE 411), 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, installation category II.
- 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
- Check that your electricity distribution network is within the range 105 to 240 V.
- Earth all metallic parts that are accessible to touch (including the working table).
- The three-phase network power supply cable (phase, neutral and earth) delivered with the apparatus is conform with IEC standard 61010 1993, + A2 1995. Check that it is in perfect working condition before use.
- Plug the cable into a socket fitted with an earth connection.

1.1.2. During use

- For your own safety, only use the cables, measurement probes and appropriate accessories delivered with the apparatus or approved by the manufacturer as optional accessories.
- Select vertical sensitivity and timebase ranges adapted to the measurement or use the AUTOSET.
- Never touch an unused terminal when the apparatus is connected to measurement circuits.
- Carefully read all notes preceded by the  symbol.

1.1.3. Symbols



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



Earth



Risk of electric shock



Ground

1.1.4. Instructions

- 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.
- **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.
- 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.**
- **The replacement fuse must be identical to the original fuse: ceramic, T, 2.5 A, 230 V, 5x20.**

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.

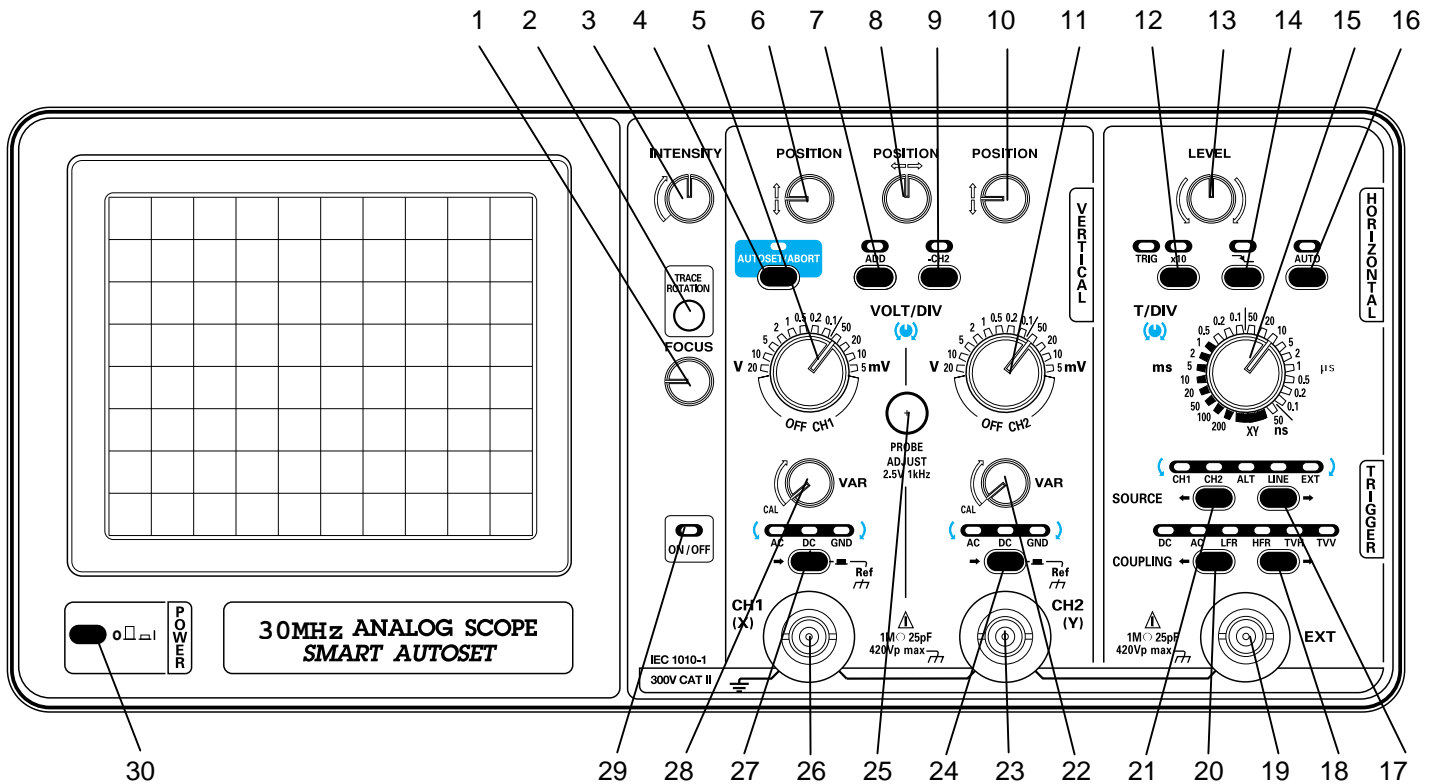
1.3. Maintenance and metrological verification

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. DESCRIPTION OF THE APPARATUS



Description of marks:

1 -	FOCUS	Trace focusing adjustment potentiometer
2 -	TRACE ROTATION	Access hole to the trace rotation adjustment potentiometer
3 -	INTENSITY	Trace intensity adjustment potentiometer
4 -	AUTOSET/ABORT	Intermittent start key for the AUTOSET function or ABORT the result of the AUTOSET
5 -	VOLT/DIV CH1	Selection switch for vertical sensitivity or switching channel CH1 off (CH1 OFF pos.)
6 -	POSITION ↓↑	Vertical framing potentiometer for the CH1 trace
7 -	ADD	Key for activation of the channel addition mode
8 -	POSITION ↔	Horizontal framing potentiometer for the CH1 and CH2 traces
9 -	-CH2	Channel CH2 inversion selection key
10 -	POSITION ↓↑	Vertical framing potentiometer for the CH2 trace
11 -	VOLT/DIV CH2	Selection switch for vertical sensitivity or switching channel CH2 off (CH2 OFF pos.)
12 -	x10	Horizontal expansion by 10 selection key
13 -	LEVEL	Trigger level adjustment potentiometer
14 -		Trigger slope selection key
15 -	T/DIV XY	Horizontal sweep speed selection key for traces and selection of XY mode
16 -	AUTO	Triggered or automatic scanning mode selection key
17 -	SOURCE →	Trigger source scanning/selection left/right key
18 -	COUPLING →	Trigger filter scanning/selection left/right key
19 -	EXT	External trigger input BNC plug
20 -	COUPLING ←	Trigger filter scanning/selection left/right key
21 -	SOURCE ←	Trigger source scanning/selection left/right key
22 -	VAR CH2	Gain adjustment potentiometer for vertical channel CH2
23 -	CH2 (Y)	BNC input plug for channel CH2 (or for the Y channel in XY mode)
24 -	COUPLING CH2 →	Input coupling scanning key or selection of the channel CH2 ref.
25 -	PROBE ADJUST	Access hole to the calibration signal
26 -	CH1 (X)	BNC input plug for channel CH1 (or for the X channel in XY mode)
27 -	COUPLING CH1 →	Input coupling scanning or selection of the channel CH1 ref. key
28 -	VAR CH1	Gain adjustment potentiometer for vertical channel CH1
29 -	ON/OFF	On/Off indicator
30 -	POWER	On/Off switch

3. STARTUP




- Set the eight control potentiometers as shown on previous page.
- Push in the POWER key (30): the most recent memorized configuration will be restored.
- Apply a signal to the CH1 (26) or CH2 (23) BNC input plug.

4. FUNCTIONAL DESCRIPTION

4.1. AUTOSET

- AUTOSET/ABORT light On: when the User presses on the AUTOSET key (4), the oscilloscope searches for the vertical sensitivity, the horizontal sweep speed and trigger conditions that will display the signals present at the CH1 and CH2 inputs.
 NOTE: If there is no signal, the oscilloscope will keep the ranges indicated by the manual vertical sensitivity switches (5) - (11) and the timebase switch (15).
- AUTOSET/ABORT indicator flashes: the AUTOSET light flashes if the ranges found by AUTOSET are not the same as the ranges indicated by the sensitivity and timebase switches. The ranges found by AUTOSET can be found by turning switches (5) (11) and (15) in the direction shown by the corresponding blue arrows closest to the two illuminated coupling or source lights. The corresponding two lights go OFF when the manual sensitivity or timebase switch changes to the position found by AUTOSET. The AUTOSET/ABORT light goes OFF when all AUTOSET positions have been found.
- ABORT: The result of AUTOSET can be canceled by pressing on the AUTOSET/ABORT key (4) again.
- Other functions modified by the AUTOSET function:
 - AC coupling for active channels, otherwise coupling unchanged
 - CH2 never changed
 - AUTO trigger imposed
 - x10 invalid
 - DC source coupling

4.2. Vertical channel

- | | | |
|-------------|---|--|
| (6) - (10) | POSITION | Vertical framing of traces plus horizontal framing in XY for POSITION (6) |
| (8) | POSITION | Horizontal framing of traces |
| (5) - (11) | VOLT/DIV | Vertical sensitivity / start the channel:
12 positions (5 mV to 20 V/div.).
CH1 OFF position: channel CH1 is not displayed.
CH2 OFF position: channel CH2 is not displayed. |
| (22) - (28) | VAR | Continuous adjustment of vertical sensitivity. When the button is locked at the left stop, the corresponding channel is calibrated. Decalibration is signaled by the active coupling light flashing. |
| (24) - (27) | AC DC GND | Intermittent press : Selection of input coupling |
| |  | Display the AC component (eliminate the DC component). |
| |  | Display the complete signal (0 to 30 MHz). |
| |  | Display the zero volt reference for the channel (without short circuiting the input signal). Enables precise positioning of the trace on the screen using the POSITION controls (6) and (10). |
| | | Continuous press : display the 0 V reference, coupling unchanged. |
| (23) - (26) | CH1 CH2 | Input signals to be observed on BNC connectors. |

4.3. Display modes

The CH1 - CH2 - ALT - CHOP vertical modes are selected using vertical sensitivity switches (5) (11) and the timebase switch (15).

- | | |
|--|---|
| <div style="border: 1px solid black; border-radius: 5px; padding: 2px 10px; display: inline-block;">CH1 mode</div> | <p>Display channel CH1 only:
 Set the CH1 switch (5) to one of the twelve positions from 20 V to 5 mV/div, and set the CH2 switch (11) to the OFF position.</p> |
| <div style="border: 1px solid black; border-radius: 5px; padding: 2px 10px; display: inline-block;">CH2 mode</div> | <p>Display channel CH2 only:
 Set the CH2 switch (11) to one of the twelve positions from 20 V to 5 mV/div, and set the CH1 switch (5) to the OFF position.</p> |
| <div style="border: 1px solid black; border-radius: 5px; padding: 2px 10px; display: inline-block;">ALT mode</div> | <p>Display channels CH1 and CH2 in alternate mode:
 Set the CH1 (5) and CH2 (11) switches to one of the 12 positions from 20 V to 5mV/div, and the timebase switch (15) to one of the 13 positions between 0.5 ms and 50 ns.</p> |
| <div style="border: 1px solid black; border-radius: 5px; padding: 2px 10px; display: inline-block;">CHOP mode</div> | <p>Display channels CH1 and CH2 in CHOP mode:
 In a single scan, the channel changes from CH1 to CH2 at the chopping frequency (about 200 kHz).
 Set the CH1 (5) and CH2 (11) switches to one of the 12 positions from 20 V to 5 mV/div. and the timebase switch (15) to one of the 8 positions between 200 ms and 1 ms.</p> |
| (7) | <div style="border: 1px solid black; border-radius: 5px; padding: 2px 10px; display: inline-block;">ADD</div> <p>Display channels CH1+CH2:
 The difference between channels CH1-CH2 is displayed if -CH2 mode is active.
 To obtain this mode, set the CH1 (5) and CH2 (11) sensitivity switches to one of the 12 positions 20 V to 5 mV and press on the ADD key.</p> |
| <div style="border: 1px solid black; border-radius: 5px; padding: 2px 10px; display: inline-block;">Mode XY</div> | <p>Display channels CH1 and CH2 in orthogonal coordinates (CH1 in X, CH2 in Y):
 The timebase is disabled, vertical framing is done using the POSITION control (10), and horizontal framing is done using the POSITION control (6).
 This mode is obtained by setting switch (15) to one of the 3 XY positions.</p> |
| (9) | <div style="border: 1px solid black; border-radius: 5px; padding: 2px 10px; display: inline-block;">-CH2</div> <p>Inversion of channel CH2:
 Press on key (9) to invert CH2.</p> |

4.4. Timebase

- | | |
|------|---|
| (15) | <div style="border: 1px solid black; border-radius: 5px; padding: 2px 10px; display: inline-block;">T/DIV</div> <p>Sweep speed: 21 positions from 50 ns to 200 ms/div.
 XY: When the switch is on the XY position, channels CH1 and CH2 are displayed in orthogonal coordinates (CH1 in X, CH2 in Y); the timebase is disabled.</p> |
| (12) | <div style="border: 1px solid black; border-radius: 5px; padding: 2px 10px; display: inline-block;">x10</div> <p>Horizontal expansion (x10):
 Horizontal expansion magnifies some details and reaches 10 ns/div. (control disabled at 50 ns/div.).</p> |

4.5. Trigger

(17) (21) SOURCE - Trigger source

Selection by pressing on the → key (17) or ← (21):

The indicator corresponding to the selected source is lit.



Synchronization by channel CH1.



Synchronization by channel CH2.



Trigger source defined according to the display mode

<u>Display mode:</u>	<u>Trigger channel:</u>
CH1 mode	CH1
CH2 mode	CH2
ALT mode	Channel 1 synchronized with CH1 Channel 2 synchronized with CH2
CHOP mode	same as ALT mode, since this mode is forced.
ADD (light On)	CH1
-CH2 (light On)	CH2



Synchronization by the mains power supply frequency.

The coupling control is disabled. The phase may be adjusted using the LEVEL control (13).



Synchronization by the external source connected to the BNC plug (19).

(16) 

Automatic trigger of the timebase.

Traces visible even if there is no trigger event.

(13) **LEVEL**

Trigger level adjustment potentiometer.

The TRIG light is on when a trigger event is detected (timebase activated).

(14) 

Trigger slope

Light On: trigger on rising slope

Light Off: trigger on falling slope

(18) (20) COUPLING - Coupling of the trigger source

Select by pressing on the → (18) or ← (20) key:

The indicator corresponding to the selected source is lit.



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 an undesirable 50 Hz low frequency component, etc.).



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



Trigger on TV line synchronization pulse.

Sweep speed recommended for examination of a TV line:
0.5 μs to 20 μs/div.



Trigger on TV frame synchronization pulse.

Sweep speed recommended for examination of a TV frame:
50 μs to 200 μs/div.

4.6. Other functions

- (25) **PROBE ADJUST** - Outputs a rectangular signal (2.5 V peak to peak; 1 kHz).
 This signal is used for compensation of measurement probes or for checking vertical amplifiers and the timebase.
- (2) **TRACE ROTATION** - Adjustment of the parallelism of traces with respect to horizontal axes (this adjustment is made using a screwdriver).

5. APPLICATIONS

5.1. Adjustment of probes with the calibration signal

- Connect the PROBE ADJUST output (25) to the CH1 input (26) using a measurement probe with a ratio of 1/10.
- Select the following functions:

↺	CH1 sensitivity (5):	50 mV/div. (1/10 probe)
↺	sweep speed (15):	0.2 ms/div.
↺	trigger source (17) (21):	CH1
↺	trigger mode (16):	AUTO
- If necessary, perform horizontal framing using the POSITION control (8) and stabilize the trace using the LEVEL potentiometer (13):
- Adjust the probe compensation capacitor:

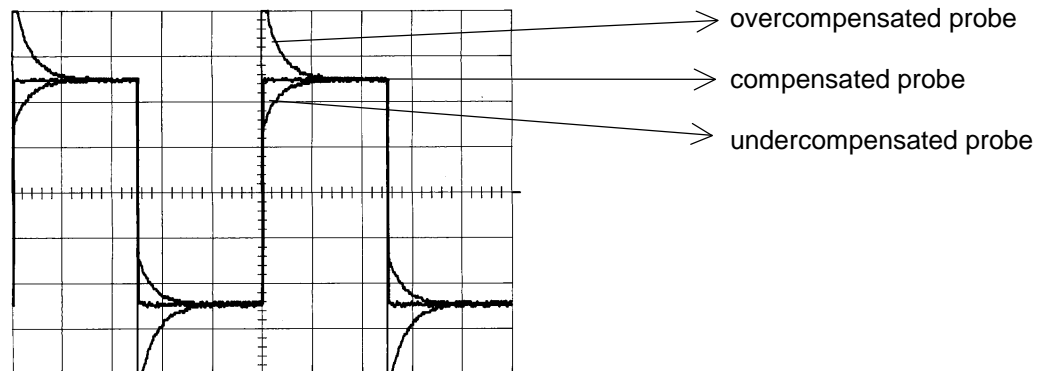


figure 1



The calibration signal may also be displayed on channel CH2.

5.2. Display a video signal

5.2.1. Examination of a TV line

- Select:
 - ↺ CH1 display mode
 - ↺ the CH1 trigger source
 - ↺ the TVH coupling
 - ↺ the positive trigger slope (light off)
 - ↺ the sweep speed 20 μ s/div.
- Inject a TV composite video signal with the following characteristics on channel CH1:
 - ↺ positive modulation
 - ↺ vertical bands in grey scale.

- Select the appropriate vertical sensitivity for the signal amplitude, such that the image covers about 80% of the screen height. Adjust the framing control if necessary.

The observed image corresponds to three complete 64 μs TV lines. The synchronization pulse, the chrominance burst and the video content are clearly visible (figure 2).

- Lower the sweep speed to 2 $\mu\text{s}/\text{div}$. The beginning of the line is expanded, the trigger point is unchanged (line synchronization pulse) (figure 3).

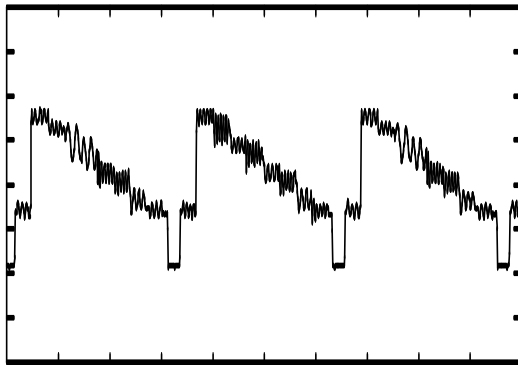


figure 2

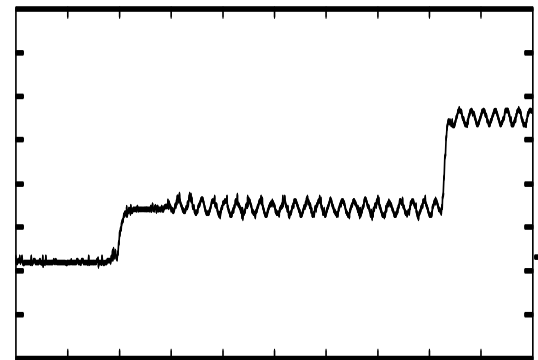


figure 3

5.2.2. Examination of a TV frame

- Select TVV coupling.
- Select a sweep speed of 1 ms/div .
- The observed image corresponds to the first 10 milliseconds of the TV frame. The synchronization stream is perfectly visible at the beginning of the screen (figure 4).

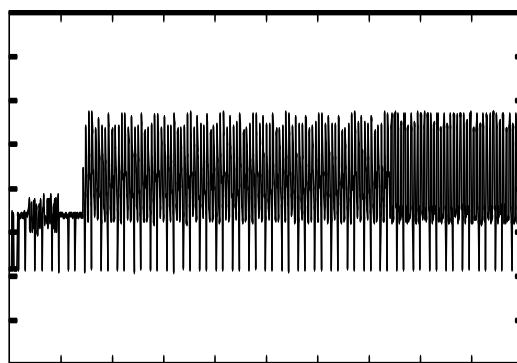


figure 4

6. TECHNICAL CHARACTERISTICS

The only guaranteed values are values to which tolerances or limits are assigned (after a half hour warming up period). Values without tolerances are given for guidance.

6.1. Vertical deviation

CH1 - CH2	Specifications	Comments
Bandwidth at - 3 dB	30 MHz	
Bandwidth at - 6 dB	35 MHz	
Rise time	< 11.7 ns	
Vertical deviation coefficients (sensitivity)	Ranges: 5 mV/div. to 20 V/div. \pm 3%	12 positions, sequences 1-2-5
Variable vertical deviation coefficients	Multiplication of the V/div range by 1 to 2.5 (reduction of the amplitude of the displayed signal)	Calibrated position (control at left stop) Uncalibrated position: coupling light flashes
Max input voltage.	Protection: \pm 420 V (DC + AC peak at 1 kHz)	
Thickness of the focussed trace	< 2 mm	
Chopping frequency (CHOP)	About 200 kHz	
Input coupling	DC : 0 to 30 MHz AC : 10 Hz to 30 MHz GND : 0 V reference	
Input impedance	1 M Ω \pm 1% // 25 pF	
Response to rectangular signals	Overrun < 3% Aberration at 10 mV/div. : • constant value < 1 mm • before the edge < 2 mm	1 kHz to 1 MHz 1 MHz (T _m < 100 ps)
Crosstalk	5 mV/div. to 20 V/div. 36 dB typ.	Reference to 30 MHz same sensitivity on CH1 and CH2, 6 div.
Display	CH1 mode: CH1 only CH2 mode: CH2 only ALT mode: CH1 then CH2 alternating (0.5 ms to 50 ns/div.) CHOP mode: CH1 and CH2 chopped (200 ms to 1 ms/div.) ADD: CH1+CH2 or CH1-CH2 (if -CH2 is selected) XY mode: CH1 in X and CH2 in Y	

6.2. Horizontal deviation (timebase CH1 and CH2)

CH1-CH2	Specifications	Comments
Sweep speed	Ranges 50 ns to 200 ms/div. \pm 3%	21 sequence positions 1-2-5
Expansion x 10	Precision: \pm 5%	Used to obtain 10 ns/div. The x 10 key is disabled at 50 ns/div.
XY mode	X channel in CH1 Y channel in CH2	DC coupling: 0 Hz to 2 MHz AC coupling: 10 Hz to 2 MHz DC coupling: 0 Hz to 30 MHz AC coupling: 10 Hz to 30 MHz
	Phase shift < 3° at 120 kHz	

6.3. Trigger system

	Specifications		Comments
Sources	<i>Sensitivity in normal mode - Trigger from 0 to 40 MHz</i>		
CH1 or CH2	0.5 div.	0 to 10 MHz	
	1 div.	10 to 20 MHz	
	1.5 div.	20 to 40 MHz	
ALT	Source depending on display mode: CH1 trigger CH1 CH2 trigger CH2 ALT trigger CH1 then CH2 CHOP ditto ALT mode ADD trigger CH1 -CH2 trigger CH2		
LINE	synchronization on mains		
EXT	50 mVrms	0 to 10 MHz	protection ± 420 V (DC + AC peak, $f < 1$ kHz)
	100 mVrms	10 to 20 MHz	input impedance: $1\text{ M}\Omega // 25\text{ pF}$
	700 mVrms	20 to 40 MHz	
Filters (coupling)	<i>Bandwidth</i>		
	AC	10 Hz to 40 MHz	
	DC	0 Hz to 40 MHz	
	LFR (rejection)	10 kHz to 40 MHz	
	HFR (rejection)	0 Hz to 10 kHz	
Horizontal mode	AUTO	Automatic mode	
	Normal	Triggered mode	
Slope	Falling edge Rising edge		
Level	<i>Adjustment range:</i> Normal mode: ± 12 divisions		

6.4. Calibration signal

Shape	rectangular
Amplitude	$2.5\text{ V} \pm 1\%$
Frequency	$1\text{ kHz} \pm 1\%$

6.5. AUTOSET mode

- Signal search time ≈ 5 s
- $25\text{ Hz} \leq \text{signal frequency} \leq 30\text{ MHz}$
- $50\text{ mVpp} \leq \text{amplitude without probe} \leq 160\text{ Vpp}$

6.6. General characteristics

Cathode ray tube

Type	rectangular 13 cm diagonal with internal grid
Graticule	8 vertical divisions with 5 sub-divisions 10 horizontal divisions with 5 sub-divisions 1 division = 1 cm
Screen	GY phosphorus with average persistence
Trace	adjustment of trace rotation, focusing, light intensity
Total acceleration voltage	2 kV

Power supply

Mains: universal mains 105 to 240 Vrms, 48 Hz to 400 Hz
 Consumption: 35 W maximum
 Removable mains power supply cable

Electromagnetic compatibility

Transmission according to EN 61326-1 (1997) + A1 (1998)
 Immunity according to EN 61326-1 (1997) + A1 (1998)

Safety

According to IEC 61010-1 1993, + A2 (1995) (NFC 42020 ; VDE 0411)
 Overvoltage categories: CAT II inputs, 300 V CAT II power supply, 264 V

Environment

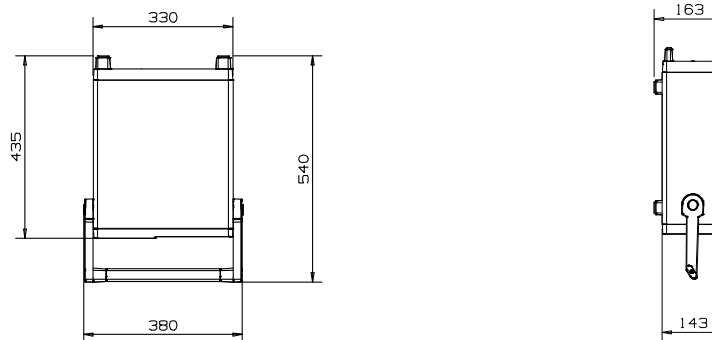
Usage	indoors	
Elevation	< 2 000 m	
Insulation	class 1	
Degree of pollution	2	
Reference temperature	+ 18°C	to + 28°C
Usage temperature	+ 10°C	to + 40°C
Operating temperature	0°C	to + 40°C
Storage temperature	- 20°C	to + 70°C
Relative humidity	< 80% RH	up to 31°C

Mechanical properties

Stackable apparatus with handle used as stand

Mass: \approx 5.5 kg

Dimensions:



Packaging

Dimensions: 550 x 460 x 280 mm Mass: \approx 7 kg

7. SUPPLIES AND OPTIONS

Delivered with the apparatus :

Operating instructions
 Mains power supply cable european mains (depending on model)
 1/10, 250 MHz, 600 V attenuating probe (2 pieces) (depending on model)

Delivered on request :

1/1-1/10, 25-150 MHz, 600 V attenuating probe	HX0003
1/10, 250 MHz, 600 V attenuating probe	HX0004
1/100, 200 MHz, 2 kV attenuating probe	HA1317
1/10, 450 MHz, 600 V attenuating probe	HA1323
30 MHz, 700 V differential probe	MX9003
100 A, 100 kHz AC/DC current clamp for oscilloscope	AM0030N
600 A, 10 kHz AC/DC current clamp for oscilloscope	AM0031N
Isolated cable, 50 Ω BNC / 2 male banana, 1 m (10 pieces)	AG1042
Isolated cable, 50 Ω BNC / BNC, 1 m (10 pieces)	AG1044
Safety adapter male BNC / 2 female banana (2 pieces)	HA2053
1 male / 2 female BNC-T (3 pieces)	HA2004
50 Ω BNC passage load	PA4119-50
Carrying bag	AE0189