

MX 58HD

Notice de fonctionnement
User's manual
Bedienungsanleitung
Libretto d'istruzioni
Manual de instrucciones

ENGLISH - page 16

Chapter

II



Multimètre digital portable

LEGENDE / CAPTION / BESCHREIBUNG / LEGENDA / LEYENDA

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1. **GENERAL INSTRUCTIONS**

You have just acquired a 5000 count-portable digital multimeter and we thank you for your confidence.

This instrument complies with the specification of EN publication 61010-1, concerning safety requirements for electronic measuring apparatus. To get the best service from this instrument, read carefully this user's manual and respect the detailed safety precautions.

1.1. **Precautions and safety measures**

1.1.1. **Before use**

- This instrument has been designed for use indoors:
 - in an environment with pollution level 2,
 - at an altitude of less than 2000 m,
 - at a temperature between 0°C and 50°C,
 - with relative humidity of less than 80 % up to 40°C.
- It can be used for measurements on the following types of circuits:
 - Measurement category III for voltages no higher than 600 V (AC or DC) in relation to the earth and between input terminals.
 - Measurement category IV for voltages no higher than 600 V (AC or DC) in relation to the earth and between input terminals.

- Definition of measurement categories :

CAT I : Measurement category I is for measurements performed on circuits not directly connected to mains.

E.g.: protected electronic circuits

CAT II : Measurement category II is for measurements performed on circuits directly connected to the low voltage installation.

E.g.: power supply to domestic appliances and portable tools.

CAT III : Measurement category III is for measurements performed in the building installation

E.g.: machine or industrial apparatus power supply.

CAT IV : Measurement category IV is for measurements performed at the source of the low-voltage installation.

E.g.: energy inputs

- * For your own safety, only use the measuring probes which have been delivered with the instrument : they conform to the EN 61010-031 safety standard. Before use, check that they are in good condition.
- * The safety of any system incorporating this instrument is the responsibility of the system assembler.

1.1.2. **During use**

- * Never exceed the protection limit values indicated in the specifications for each type of measurement.
- * When the multimeter is linked to measurement circuits, do not touch unused terminals.
- * When the scale of the value to be measured is unknown, check that the scale initially set on the multimeter is the highest possible or, wherever possible, choose the autoranging mode.
- * Before changing functions, disconnect the test leads from the circuit under test.

- * When performing current measurements, never change of range, do not connect or disconnect leads without first isolating the current. If you do, there is a risk of generating surge currents which can blow the fuses or damage the instrument.
- * In TV repair work, or when carrying out measurements on power switching circuits, remember that high amplitude voltage pulses at the test count can damage the multimeter. Use of a TV filter will attenuate any such pulses.
- * Never perform resistance, condenser and diode measurements on live circuits.

1.1.3. Symbols

	WARNING : Risk of danger. Refer to the operating manual to find out the nature of the potential hazards and the action necessary to avoid such hazards.		Selective sorting of waste for recycling electric and electronic materials. In accordance with the WEEE 2002/96/EC directive : must not be treated as household waste.		
	Earth		Dual insulation		DANGER : Risk of electrical shock Consult the manual.

1.1.4. Opening the instrument

- Before opening the instrument, always disconnect from all sources of electric current and make sure not to be loaded with static electricity, which may destroy internal components.
- Fuses must be replaced with fuses of the same rating and type.
- Any adjustment, maintenance or repair work carried out on the multimeter should be carried out only by appropriately qualified personnel, after having taken into account the instructions in this present manual.
- A “**qualified person**” is one who is familiar with the installation, construction and operation of the equipment and the hazards involved. He is trained and authorized to energize, de-energize circuits and equipment in accordance with established practices.
- It is recommended to remove the battery from the instrument if not used.

1.2. Protection devices

ASYC II series instruments are fitted with various protection devices :

- * Varistor protection for limiting transients of over 1500 Vpk at the V Ω terminal, particularly 8 kV pulse streams as defined in French standard EN 61010-1 relative to safety.
- * A PTC (Positive Temperature Coefficient) resistor protects against overvoltages up to 600 V during resistance, capacitance and diode measurements. This protection is reset automatically once overload is over.
- * Two fuses provide protection during measurements of intensity type.
- * Maximum protection : 600 V
- * IP protection rating of 67

1.3. Safety devices

- * The battery unit and fuses cannot be accessed without first disconnecting the measuring leads.
- * When measuring voltages above 24 V, the symbol blinks  on the display.
- * If the maximum range is repeatedly exceeded, an intermittent audible signal indicates the risk of electric shock.

1.4. Warranty

This equipment is warranted against any defects of manufacture or materials according to the general conditions of sale.

During the warranty period (3 years), defective parts will be replaced, the manufacturer reserving the right to repair or replace the product. In the event of the equipment being returned to the after sale department or to a local agency, carriage to the centre shall be payable by the customer.

The warranty does not cover the following :

- Repairs necessitated by misuse of the equipment or use in association with incompatible equipment.
- Modification of the equipment or any related software without the explicit authorization of the manufacturer.
- Repairs necessitated by attempts to repair or maintain the product made by a person not approved by the manufacturer.
- Adaptation to a specific application not provided for in the specifications of the equipment or the user manual.
- Damage after a drop, a shock or flooding.

The contents of this manual must not be reproduced in any form whatsoever without the consent of the manufacturer.

1.5. Maintenance and metrological verification

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

1.6. Unpacking - Repacking

This equipment has been fully checked out mechanically and electrically before shipping. All precautions have been taken to ensure that the instrument arrives at its destination undamaged.

However, it is advisable to carry out a rapid check for damage sustained in shipping. If there is any evidence of damage, make this known immediately to the shipper.



Caution *Should you need to return the multimeter, preferably use the original packaging and indicate the reasons as clearly as possible on an accompanying note.*

2. DESCRIPTION

This multimeter is one of the ASYC II (Advanced Safety Concept, third generation) range, designed for a high degree of user safety, maximum protection and unrivalled performance.

2.1. Selector switch

It is a standalone, handheld professional measuring instrument, capable of measuring the following quantities (accessed by the eleven-position rotary selector switch) :

- AC voltages with AC (or RMS) capacitive coupling,
- AC voltages with AC+DC (or TRMS) direct coupling,
- DC voltages,
- AC currents with AC (or RMS) capacitive coupling
- AC currents with AC+DC (or TRMS) direct coupling,
- DC currents,
- resistance values,
- continuity (with beeper),
- capacitance,
- diode threshold voltage,
- frequencies,
- duty cycles

2.2. Keypad

A six-key keypad lets you :

- select the autoranging mode (RANGE key),
- freeze a value (HOLD key),
- measure fast peaks (Pk +/- key),
- set the measurement relative to a reference value (REL key),
- select a function derived from the main function, or switch on the multimeter again after it has been shut down automatically (SEL/ON key),
- activate sending data to a printer (PRINT key).

2.3. Display

The display provides :

- clearly legible figures (14 mm high),
- an analogue readout of the parameter being measured through a 34-segment bargraph,
- perform 5000-count measurements

2.4. Power supply

This multimeter is powered by a standard 9 V battery which provides approximately 500 hours of operation.

2.5. Input terminals

Measurements are performed using two measuring leads supplied with the instrument connected to input terminals 1, 2, 3 and 4, as indicated in section 3.1.

3. COMMISSIONING

3.1. Connecting the test leads

Connect the black lead to the COM socket (for all measurements). Depending on the position of the selector switch, connect the red lead as follows:

Rotary selector switch position	Input terminal
V_{AC} , mV_{DC} , V_{DC} , Ω , 	$V\Omega$
$10 A_{DC}$	10 A
$5 mA_{DC}$, $50 mA_{DC}$, $500 mA_{DC}$	500 mA

3.2. Switching on the instrument

Turn the selector switch to the required function.

All segments of the display come on for a few seconds. The instrument is then ready for measurements.

3.3. Switching off the instrument

The instrument can be switched off manually by returning the selector switch to the OFF position, or automatically after approximately half an hour if no key is pressed or the switch is not operated.



Note *Automatic shutdown of the instrument is disabled in order to avoid interrupting the peak value measurements (Pk +/-), or the data print out.*

For user safety, automatic shutdown is also disabled when a measured magnitude (voltage/current) present at the input exceeds dangerous level

( indicator displayed).

3.4. Special configurations

To adapt the configuration of the instrument to the measurement environment, the user can choose 50 Hz or 60 Hz rejection :

Switch on with the rotary switch while holding down the HOLD key.

The selection :

- is reversed from the last configuration
- is displayed for two seconds
- remains backed up in non-volatile memory.

3.5. Multimeter maintenance

3.5.1. Fuse self-test

When fuse F1 (0.63 A) or F2 (11 A) is blown, the display shows "FUSE.1" or "FUSE.2", accordingly.

If both fuses are blown, the display shows "FUSES".

Replace the fuse or fuses concerned.



Note *Fuse F1 cannot be tested unless the switch is set to a mA position. Fuse F2 is located in the common circuit. Therefore, all measurements become impossible when it is out of service.*

3.5.2. Battery self-test

When the BAT indication appears on the display, the instrument still has approximately 50 hours of operation, but specifications can no longer be guaranteed.

Replace the battery.

3.5.3. Replacing the battery or fuses

Disconnect the cords from the measured circuit, then multimeter.

Open the multimeter casing as follows (see last page of the manual) :

- 1 – Remove the stand from the back of the instrument. Figures 1 and 2
- 2 – Remove the front cover using the stand as a lever. Figures 3 and 4
- 3 – Remove the gasket.
- 4 – Replace the battery or fuse.

Before use, make sure that the gasket, then the front cover are carefully set back on the instrument.

3.5.4. Cleaning

Clean the multimeter using a damp cloth. Do not use abrasives or solvents.

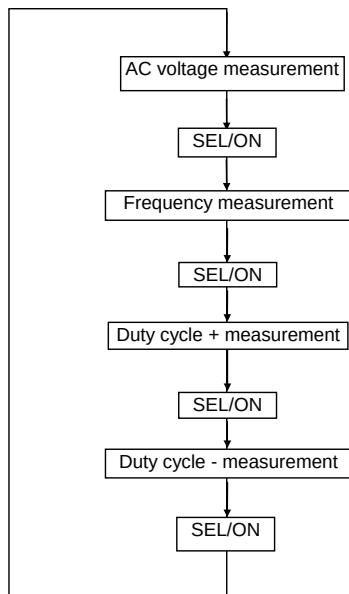
4. FUNCTIONAL DESCRIPTION

4.1. SEL/ON key

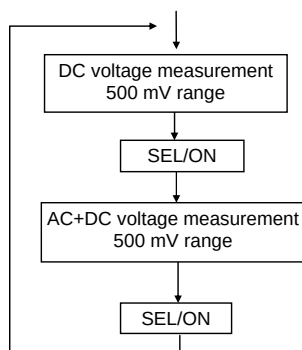
This can be used to switch on the multimeter again after an automatic shutdown. It can also be used to access secondary functions associated with the selector switch positions.

The flowcharts below define these various functions.

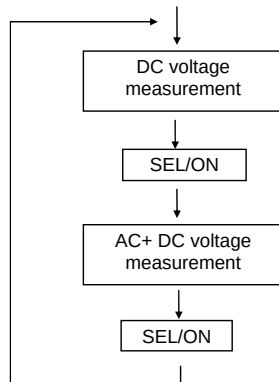
4.1.1. V_{AC} position



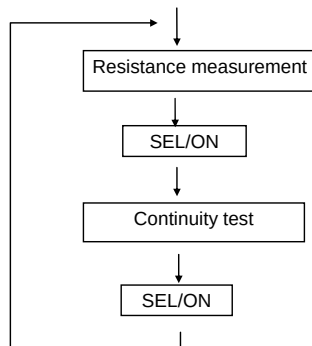
4.1.2. mV position



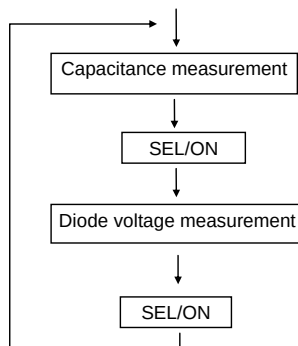
4.1.3. V_{DC} position



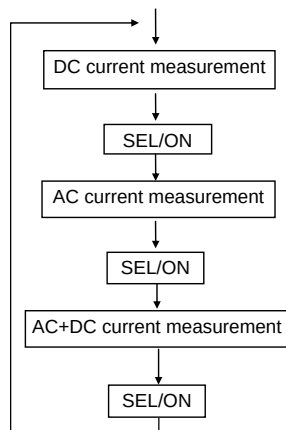
4.1.4. Ω position



4.1.5. $\parallel$ position



4.1.6. 5 mA / 50 mA / 500 mA / 10 A positions



4.2. RANGE key

- In AUTO mode to switch to MANUAL mode (short press).
- In MANUAL mode, to select the next range (short press) or return to AUTO mode (long press).
Measurements concerned : AC or DC voltages, capacitance, resistance.
- When making time measurement : if the range change made during previous measurements (voltage) was in manual mode, it may be necessary to adapt this measurement range to the signal level injected at the input. This is why the RANGE key is used to change from one range (voltage) to the next range. The new range is then displayed for 2 seconds.

4.3. REL key

Short press : Mode REL, the last value measured becomes the reference value derived from subsequent measurements.

Long press : When in REL mode, a long press displays the reference being used. This value may be adjusted using the SEL/ON key (selection of digits and a sign) and the RANGE key (increment the selected digit).

4.4. Pk +/- key

The fast positive or negative peak measurement functions (≥ 1 ms) can be accessed by repeatedly pressing this key in the V_{DC} , mV_{DC} , 5 mA_{DC} , 50 mA_{DC} , 500 mA_{DC} , and 10 A_{DC} functions.

4.5. HOLD key

Short press : Sets the display on the current value.

Long press : Accesses or quits the "autostore" mode. Can be accessed in the V_{DC} , mV, V_{AC} positions.

Autostore

Set the probes on the point to be measured. An audio signal indicates if the measurement is stable. When you remove the probes, a second audible signal indicates that this stable value displayed has been stored.

4.6. PRINT key

This key operates with the optional serial interface for printer or PC :

Short press : Activates / deactivates « send measures to printer » mode at the rate defined by the user.

Long press : Adjusts the rate varying from 00000 s (a single transmission) up to 9h 59min 59s, using the SEL/ON key (selection of digits) and the RANGE key (increment the selected digit).

5. TECHNICAL SPECIFICATIONS

Only those values assigned tolerances or limits are guaranteed values. Values without tolerances are given for information only (French standard NFC 42670).

The technical specifications are guaranteed only after 30 min warm-up period. Except special indication, they are valid from 5 to 100 % of the range of measurement.

{Accuracy : "n%R + nD" means "n% of the reading + n digits" as per IEC 485}

5.1. DC voltages

Selector switch position	Ranges	Accuracy	Input impedance	Protection	Resolution
mV	500 mV	0.1% R + 2D	10 MΩ	± 850 VPK*	100 μV
V _{DC}	5 V		11 MΩ	10 MΩ	± 850 VPK
	50 V	0.2% R + 2D	10 mV		
	500 V		100 mV		
	600 V	0.3% R + 2D	1 V		

* 1 mn max

Number of count :

5000

Range selection :

automatic or manual for the 5V, 50V, 500V, 600V ranges

Common mode rejection :

at 50 and 60 Hz, better than 120 dB

Serial mode rejection :

at 50 and 60 Hz, better than 60 dB

Additional error in Pk +/- mode for a pulse of ≥ 1 ms: 1% R ± 50 D

For measurements performed on alternative signals, the selected range must tally with the max. value of the signal peak.

5.2. AC voltages (AC and AC+DC)

Selector switch position	Ranges	Accuracy						Input impedance	Protection	Resolution	
		DC*	40Hz** to 200Hz	200 to 4 kHz	4 to 10 kHz	10 to 30 kHz	30 to 50 kHz				
		5 to 100 % of range			3 % typ.	10 % typ.***	//////////				
mV	500 mV*	1 % R + 3 D		1,5% R + 3 UR	3 % typ.	10 % typ.***	//////////	10 MΩ/1GΩ // 100 pF**	±850VPK	100 μV	
V _{AC} or V _{DC} + SEL/ON	5 V				2 % R + 3 D		3 % R + 3 D	11 MΩ // 100 pF		10 MΩ // 100 pF	1 mV
	50 V							10 mV			
	500 V							100 mV			
	600 V *****	1,5 % R + 3 D****		//////////	//////////			1 V			

*AC + DC only

**20 Hz to 40 Hz = 1,5 %

to 20 kHz **up to 1 kHz

***** applicable max. voltage : 600 VRMS CAT IV

Max. Frequency = 15 000 [V * kHz] / Input [V]

Number of count :

5000

Range selection :

automatic or manual for the 5V, 50V, 500V, 600V* ranges

Common mode rejection :

at 50 and 60 Hz, better than 80 dB

Additional error according to crest factor :

0 % for a crest factor < 1.5
1 % for a crest factor of 1.5 to 2
4 % for a crest factor of 2 to 3

5.3. DC current

Selector switch	Accuracy	Max. voltage drop	Protection	Fuses *	Resolution
5 mA	0.2 % R + 2 D	700 mV	600 VRMS	F1 + F2	1 μ A
50 mA		1.5 V			10 μ A
500 mA					100 μ A
10 A**	0.5 % R + 5 D	500 mV		F2	10 mA

* refer to fuse specifications section 6.1.1.

** acceptance overload: 20 A during 30 s. max. observing a break > 5 min between 2 tests

Number of count : 5000

Additional error in Pk +/- mode for a pulse width of ≥ 1 ms : 1 % R $\pm$ 50 D

For measurements performed on alternative signals, the selected range must tally with the max. value of the signal peak.

5.4. AC currents (AC and AC + DC)

Ranges	Accuracy			Protect.	Fuses*	Resol.	Max. Crest	Max. voltage drop
	40 Hz to 5 kHz	5 kHz to 20 kHz	20 kHz to 30kHz					
	5 % to 100 % of range							
5 mA	1%R+3D	1.5% typ.	4% typ.	600 VRMS	F1 + F2	1 μA	10 mA	700 mV
50 mA	1%R + 3 D	1.5% typ.	4% typ.			10 μA	100 mA	
500 mA		1.5% typ.	4% typ.			100 μA	1 A	
10 A**	1.5%R+3 D → 2 kHz	1.5% typ.	////////		F2	10 mA	30 A	500 mV

* refer to fuse specifications section 6.1.1.

** acceptance overload: 20 A during 30 s. max. observing a break > 5 min between 2 tests

Specification : from 5 % to 100 % of the range

Number of count : 5000

Additional error according to crest factor :
 0 % for a crest factor < 1.5
 1 % for a crest factor of 1.5 to 2
 4 % for a crest factor of 2 to 3

Additional error in IAC+DC with a direct current at input : 1 %

5.5. Resistance / Continuity

Ranges	Accuracy	Measur. current	Protection*	Resolution
500 Ω 	0.1% R + 3 D	1 mA	600 VRMS	100 m Ω
5 k Ω		100 μ A		1 Ω
50 k Ω		10 μ A		10 Ω
500 k Ω		1 μ A		100 Ω
5 M Ω **	0.3% R + 3 D	100 nA		1k Ω
50 M Ω **	1% R + 3 D	50 nA		10 k Ω

* Overload protection can be reset automatically.

** The use of very short and shielded test leads is highly recommended for measurements in this range (> 1 M Ω).

Number of count : 5000

Range selection : automatic or manual (set in continuity mode)

Maximum open circuit voltage : 7 V

Detection threshold in continuity mode : 10 Ω to 20 Ω

Response time in continuity mode : 1 ms

5.6. Capacitance

 Note *Discharge all capacitors before taking measurements.*

Ranges	Accuracy	Measurement current	Max measurement time	Protection*	Resolution
50 nF**	1% R + 2D	100 nA	0.5 s	600 V _{RMS}	10 pF
500 nF		1 µA			100 pF
5 µF		10 µA			1 nF
50 µF		100 µA			10 nF
500 µF	2% R + 2D	1 mA	1.5 s		100 nF
5000µF			3 s/mF		1 µF
50 mF			3 s/mF		10 µF

* Overload protection can be reset automatically.

**** It is highly recommended to use very short and shielded test leads for measurements in this range.**

Number of count :	5000
Range selection :	automatic or manual
Maximum open circuit voltage :	7 V

5.7. Diode threshold voltage measurement

Measurable voltages :	0 to 2 V
Measurement current :	1 mA typical
Resolution :	1 mV
Protection :	600 VRMS, can be reset automatically

5.8. Frequencies

Selector switch setting :	V _{AC} + SEL/ON
Measurement range :	0.62 Hz to 500 kHz
Accuracy :	0.03 %
Protection :	600 VRMS
Display :	50.000 count

Range	Sensitivity	
	5 V to 500 V	600 V
0.62 Hz to 5 kHz *	2 % of range	100 V
5 kHz to 50 kHz	5 % of range	250 V
50 kHz to 500 kHz	10 % of range	//////////

* Rectangular signals

5.9. Duty cycle %+, %-

$$\% + = \frac{\theta}{T} \times 100 \quad \text{and} \quad \% - = \frac{\theta}{T} \times 100$$

Resolution : 0.01 %
Min. duration for θ or T- θ : 2 μ s
Max. duration for T : 0.8 s
Min. duration for T : 100 μ s

Absolute error as a % : $\frac{3.10^{-4}}{T}$

Sensitivity : see frequency measurement mode
 Absolute additional error on θ , due to the zero crossing slope :
 $0.1 \times \frac{C}{P}$
 with C : range in V (C = 5000 V for 600V_{DC} or 600 V_{AC} ranges)
 with P : slope in V/s

6. GENERAL SPECIFICATIONS

Adjustment

This multimeter incorporates a non-volatile memory containing the adjustment characteristics for all measurement ranges. This enables the instrument to be re-adjusted via a serial link without opening the instrument. It is supplied with a certificate of verification.

Safety according to EN 61010-1

Environment

Indoor use

Altitude < 2000 m

Reference temperature 18°C to 28°C

Rated range of use 0°C to 50°C

Limit range of operation -10°C to 60°C

Storage temperature range -40°C to 70°C

Temperature coefficient max 0.1 x accuracy /°K

Relative humidity 0 to 80 % from 0 to 40°C (70 % max for 5 M Ω / 50 M Ω)

0 to 70 % from 40°C to 50°C

60 % above 50°C

Casing and circuit self-extinguishing materials

Operating quality IEC 359

Electromagnetic compatibility Emission & Immunity : EN 61326-1
Max. influence in electromagnetic fields at 3 V/m
according to EN 61000-4-3 :
3 % end of scale in V_{DC} and V_{AC}, A_{DC} and A_{AC} ranges
5 % end of scale in Ω range
20 % end of scale in capacity range

Power supply

9 V alkaline battery (6LF22) typical life of 500 hours in V_{DC} mode

Mechanical

Dimensions 189 x 82 x 40 mm

Weight 400 g

Packaging

Dimensions 230 x 155 x 65 mm

Weight 500 g

Display

Liquid crystal display comprising:

- a 5000-count display + sign (digits 14 mm high)
- a 34-bar analogue bargraph display
- appropriate units for each type of measurement
- triggered mode indicators (relative, ranging)
- battery discharged indicator

Measurement rate

Digital display 2 measurements/s

Bargraph 20 measurements/s

6.1.1. Supplied with the multimeter

One set of test leads with safety probes
One 6F22 9 V battery
One spare 11 A fuse, 10 x 38 mm, rupture capacity 30 kA / 1000 V
One spare 0.63 A fuse, 5 x 20 mm, rupture capacity 1.5 kA / 500 V
One operating manual
One rubber shock-absorber sheath

6.1.2. Optional

Current clamps

0,5 to 240 AAC, Ø 20 mm	MN09
0,1 to 1200 AAC, Ø 52 mm	CI03
0,5 to 1000 AAC, Ø 39 mm	PAC 20
0,5 to 1000 AAC, Ø 39 mm	PAC 21

Shunts

30 A / 300 mV	HA030-1
50 A / 100 mV	HA050

Miscellaneous

Set of RS232 serial link	SX-ASYC2CHD
ASYC II acquisition software	SX-DMM2
ASYC II adjusting software	SX-ASYC2C/B