



Digital Multimeter *ASYC IV* MTX 329 I 60,000 cts

Remote programming



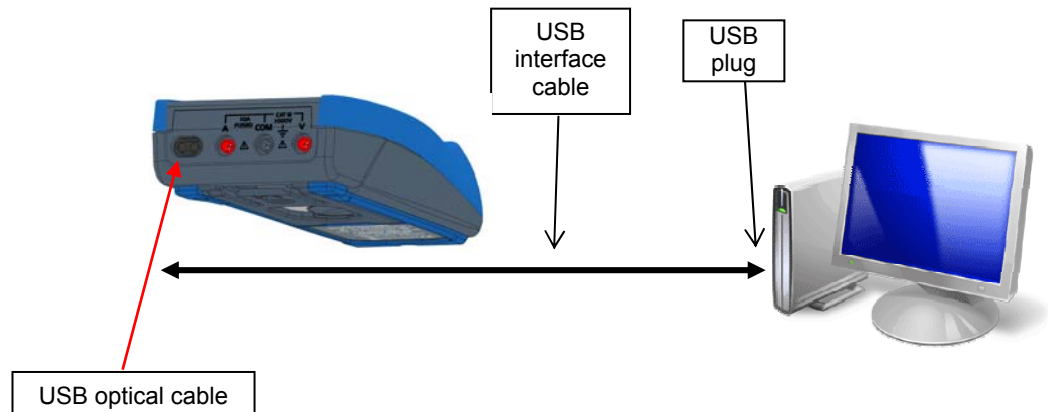
Pôle Test et Mesure CHAUVIN-ARNOUX

Remote programming

Connection of USB cable

The multimeter can be remotely programmed using a computer or PC with the programming kit.

1. Connect the USB cable at the rear of the unit to the USB input.
2. Connect the USB connector sur l'une des entrées « USB » du PC.



Configuration

- Communication : 9600 bauds
- 8 data bits,
- 1 stopbit,
- no parity,
- no flow control

Remote control

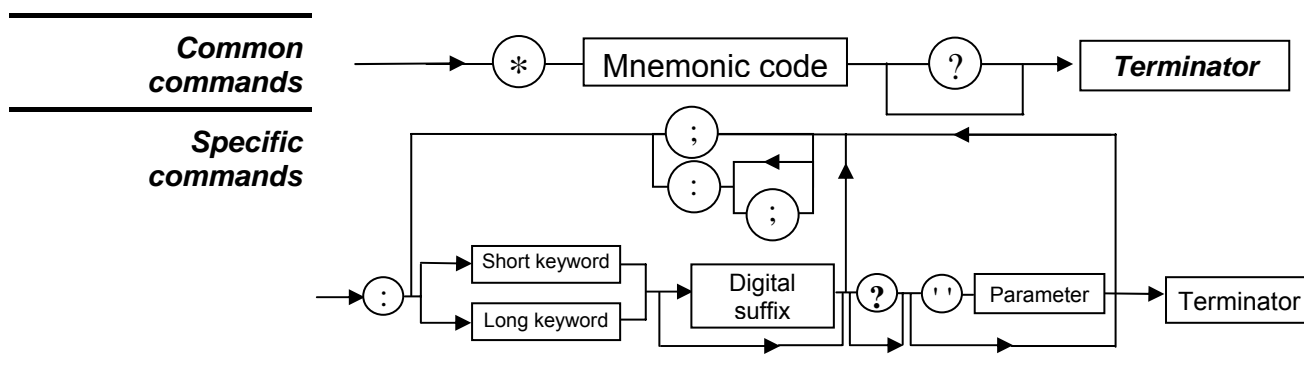
The programming instructions comply with standard IEEE488.2, protocol SCPI.

They provide the user with the possibility of checking the instrument remotely from simple standard controls.

Communication between a controller and a generator enables users to:

- Configure the instrument
- Perform measurements campaign
- Receive information (configuration)

Command syntax



Keywords

The brackets ([]) are used to frame a keyword which is optional during programming; i.e. the instrument will execute the command whether the keyword is optional or not. Uppercase and lowercase are used to differentiate the short form of the keyword (uppercase letters) and the long form (whole word).

The instrument accepts the uppercase or lowercase letters without distinction.



FUNC:SIN is equivalent to **SOURCE:FUNCTION:SHAPE SINUSOID**

Parameters

The parameters, if any, are separated from the keyword by a space (' '). A command can accept parameters of a defined type, a literal expression or a combination of both.

The defined-type parameters are marked by the characters < >.

The brackets ([]) mean that the parameters are optional.

The vertical bar (|) may be read as an "or", it is used to separate the various possible parameters.

Separators

The separator ' : ' descends in the next directory or returns under the root, if preceded by a ' ; '.

The separator ' ; ' separates two commands in the same directory or marks the end of a directory command, enabling a return to the root level by adding the separator ' ; '.

The separator ' ' (space) separates the keyword from the following parameter.

Terminators

<T> used as a general term designating a terminator.

T is the character CR (ASCII code 13 or 0x0D) or the CR character followed by the LF character (ASCII code 10 or 0x0A)

A command line must not exceed 80 characters; it is ended by a terminator.

Programming Convention

Tree structure

The command tree diagram includes all the commands specific to the instrument.

Common commands (standard IEEE 488.2) are listed separately, since they do not affect the position of the syntax analyzer in the tree.

When the terminator <NL> is sent to the instrument, the analyzer is positioned at root level.

When the analyzer is in a directory, both separators ' ; ' are necessary to return to the root.

IEEE 488.2 common commands

Commands	Functions
*CLS	erases the event, status registers and the error list.
*ESE[?]	reads or configures the event authorization.
*ESR?	reads the event status register.
*IDN?	reads the identifier.
*OPC[?]	reads or configures the command synchronizing.
*RST	re-initializes the instrument.
*SRE[?]	reads or configures the authorization of service demand.
*STB?	reads the state byte.
*TST?	reads the autoset result.
*WAI	waits until all running commands have ended their execution

**Multimeter
specific
commands**

Directory	Command	Function
DISPlay	:CONTRast[?]	reads or configures the display contrast.
HELP[?]		reads the command list.
INPut	:COUPling[?]	configures the coupling type of the running volt or ampere measure.
MEASure?		
READ?		
SENSe	:CLAMp:COEFficient[?]	
	:FILTer[:LPASs][:STATe][?]	authorizes or inhibits the multimeter filter.
	:FUNCTion[?]	configures the type of main measurement.
	:MENU:DBM:IMPedance[?]	
	:MENU:WATT:IMPedance[?]	
	:RANGe:AUTO[?]	
	:RANGe:[UPPer[?]]	
	:SECondary[?]	configures the type of secondary measurements.
	:TEMPerature:TRANsdncer[?]	
SYSTem	:BEEPer:STATe[?]	authorizes or inhibits the beeper of the multimeter.
	:ERRor[:NEXT]?	reads the error number.
	:LOCal	configures the multimeter in local mode, the front face is accessible again.
	:SOFTVERsion?	
	:VERSion?	reads the SCPI version.
UNIT	:TEMPerature[?]	configures the unit of the temperature measure.

Detailed description of commands	<i>IEEE 488.2 common commands</i>						
<div data-bbox="360 367 438 405">*CLS</div> <div data-bbox="244 409 438 439">(Clear Status)</div>	<div data-bbox="475 367 635 396">(Command)</div> <p data-bbox="475 416 1460 479">The *CLS command resets the event registries in all registry groups. It also resets the error queue.</p> <p data-bbox="475 499 807 528"><u>Command syntax</u> : *CLS</p>						
<div data-bbox="323 584 438 622">*ESE[?]</div> <div data-bbox="212 624 438 685">(Standard Event Status Enable)</div>	<div data-bbox="475 584 724 613">(Command/Query)</div> <p data-bbox="475 633 1414 696">To the query *ESE?, the instrument returns the event validation registry value.</p> <p data-bbox="475 734 759 763"><u>Query syntax</u> : *ESE?</p> <p data-bbox="475 801 715 864"><u>Response format</u> : <value><T></p> <p data-bbox="475 902 1265 931">The *ESE command configures the event validation registry.</p> <p data-bbox="475 952 906 981"><u>Command syntax</u>: *ESE <value></p> <p data-bbox="475 1019 1426 1081"><value>: decimal number between 0 and 255 which represents the event validation registry value.</p>						
<div data-bbox="339 1133 438 1171">*ESR?</div> <div data-bbox="212 1189 438 1256">(Standard Event Status Register)</div>	<div data-bbox="475 1133 576 1162">(Query)</div> <p data-bbox="475 1182 1401 1245">To the *ESR? question, the instrument returns the event status registry value.</p> <p data-bbox="475 1283 759 1312"><u>Query syntax</u> : *ESR?</p> <p data-bbox="475 1332 715 1395"><u>Response format</u> : <value><T></p> <p data-bbox="475 1433 1433 1496"><value>: Decimal number between 0 and 255 which represents the event validation registry value.</p>						
<div data-bbox="352 1554 438 1592">*IDN?</div> <div data-bbox="244 1594 438 1657">(Identification Number)</div>	<div data-bbox="475 1554 568 1583">(query)</div> <p data-bbox="475 1603 1422 1666">To the *IDN? question, the instrument returns the type of instrument and the soft version.</p> <p data-bbox="475 1686 751 1715"><u>Query syntax</u> : *IDN?</p> <p data-bbox="475 1736 1169 1798"><u>Response format</u> : "model", HV < hard version >, FV < soft version ><T></p> <table data-bbox="475 1818 1422 1982"> <tr> <td data-bbox="475 1818 576 1848">"model"</td> <td data-bbox="759 1818 1219 1848">Instrument name (ex: "MTX 3291").</td> </tr> <tr> <td data-bbox="475 1854 687 1883">< hard version ></td> <td data-bbox="759 1854 1422 1917">Version of the electronic board (a letter between 'A' and 'H').</td> </tr> <tr> <td data-bbox="475 1924 675 1953">< soft version ></td> <td data-bbox="759 1924 1230 1982">Embedded soft version such as x.xx (ex: 1.18).</td> </tr> </table>	"model"	Instrument name (ex: "MTX 3291").	< hard version >	Version of the electronic board (a letter between 'A' and 'H').	< soft version >	Embedded soft version such as x.xx (ex: 1.18).
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< hard version >	Version of the electronic board (a letter between 'A' and 'H').						
< soft version >	Embedded soft version such as x.xx (ex: 1.18).						

***OPC[?]**
(Operation complete)

(Command/Query)

To the ***OPC?** question, the instrument returns the value 1 once all pending commands have been executed.

Query syntax : *OPC?

Response format :

<1><T>

The ***OPC** command places the message « Operation complete » (bit 0) in the standard event registry at the end of the running operation.

Command syntax : *OPC

<value>: Decimal number between 0 and 255 which represents the event validation registry value.

***RST**
(Reset)

(Command)

The ***RST** command resets the instrument in the default factory status.

***SRE[?]**
(Service Request Enable)

(Command/Query)

To the ***SRE?** question, the instrument returns the register value of the service request activation.

Query syntax : *SRE?

Response format :

<value><T>

The ***SRE** command sets the service request activation registry.

Command syntax : *SRE <value>

<value>: Decimal number between 0 and 255 which represents the value of the service request activation register.

***STB?**
(Read Status byte)

(Query)

To the ***STB?** question, the instrument returns the value of the status byte.

Query syntax : *STB?

Response format :

<value><T>

<value>: Decimal number between 0 and 255 which represents the value of the status byte.

***TRG**
(Trigger)

(Command)

The ***TRG** command sends a trigger demand.

Command syntax : *TRG

TST?(Query)***(Self-Test)**

To the ***TST?** question, the instrument sends a full autoset procedure and returns the result.

Query syntax : *TST?

Response format :

<value><T>

<value>: 0 if successful, 1 if failed.

WAI(Command)***(Wait-to-Continue)**

The ***WAI** command prevents the instrument from performing further commands as long as the current command has not been terminated.

Command syntax : *WAI

Detailed description of commands	Commands specific to the instrument
DISPlay command	
CONTrast	<p>(Command/Query)</p> <p>The DISP:CONT <0 1 2 3> command selects the contrast of the LCD display (brightness).</p> <p>To the DISP:CONT? question, the instrument returns the display contrast (OFF, LEVEL 1, LEVEL 2, LEVEL 3).</p>
HELP command	<p>(Query)</p> <p>To the HELP[?] question, the instrument returns the list of the SCPI command tree directories.</p> <p>To the HELP[?] <"*" "DISPlay" "HELP" "INPut" "MEASure" "READ" "SENSe" "SYSTem" "UNIT"> question, the instrument returns the command list of the directory in parameter.</p>
INPut command	
COUPLing	<p>(Command/Query)</p> <p>The INP:COUP <DC AC ACDC> command selects the coupling type of the running volt, ampere or clamp measure.</p> <p>To the INP:COUP? question, the instrument returns the type of active coupling.</p>
MEASure? command	<p>(Query)</p> <p>To the MEAS? question, the instrument returns the result of the running measurement, without the units.</p> <p><u>Response format</u> : 2.7691e-01</p>
READ? command	<p>(Query)</p> <p>To the READ? question, the instrument returns the result of the running measurement.</p> <p><u>Response format</u> : +276.91 mVAC</p>
[SENSe:] commands	
CLAMp:COEFFicient	<p>(Command/Query)</p> <p>The CLAM:COEF <"1 10 100 1000"> command selects the multiplier coefficient used by the clamp function.</p> <p>To the CLAM:COEF? question, the instrument returns the multiplier coefficient used by the clamp function.</p>
FILTer[:LPASs][:STATe]	<p>(Command/Query)</p> <p>The FILT <0 1 OFF ON> command authorizes or inhibits the instrument filter.</p> <p>Values to inhibit : 0 or OFF, values to authorize : 1 or ON.</p> <p>A the FILT? question, the instrument returns the filter activation status.</p>

FUNCtion	<p><i>(Command/Query)</i></p> <p>The FUNC <"VOLTage" "VOLTAMP" "DBM" "VLOWz" "CURRent" "RESistance" "CONTinuity" "DIODE" "FREQuency" "POSDuty" "NEGDuty" "POSPulse" "NEGPulse" "CAPAcitor" "TEMPerature" "CLAMp"> command selects the type of main measurement.</p> <p>To the FUNC? question, the instrument returns the type of active main measurement.</p>
MENU:DBM:IMPedance	<p><i>(Command/Query)</i></p> <p>The MENU:DBM:IMP <0 1 2 3> command, selects the impedance of dBm measurement calculation (respectively 50 Ω, 75 Ω, 90 Ω and 600 Ω).</p> <p>To the MENU:DBM:IMP? question, the instrument returns the impedance value of the calculation selected for the dBm measurement.</p>
MENU:WATT:IMPedance	<p><i>(Command/Query)</i></p> <p>The MENU:WATT:IMP <value> command selects the calculation impedance of the power measurement. This value must be between 0.1 and 60.10⁶.</p> <p>To the MENU:WATT:IMP? question, the instrument returns the calculation impedance value of the selected power measurement.</p>
RANGe:AUTO	<p><i>(Command/Query)</i></p> <p>The RANG:AUTO <0 1 OFF ON> command authorizes or inhibits the autorange of the active main measurement.</p> <p>The values are 0 or OFF to inhibit, and 1 or ON to authorize.</p> <p><u>Reminder</u> : the frequency, power, dBm, duty cycle and impulse duration measurements are available only in autorange, while continuity, diode test and temperature measurements are mono-range.</p> <p>To the RANG:AUTO? question, the instrument returns the activation status of the autorange.</p>

RANGe[:UPPER] (Command/Query)

The **RANG <value>** command selects the range of the active main measurement.

In active main measurement, the ranges obtained according to the value of the parameter are :

- For voltage measurements
 - $\text{value} \leq 6^{E-2}$: 60 mV
 - $6^{E-2} < \text{value} \leq 0.6$: 600 mV
 - $0.6 < \text{value} \leq 6$: 6 V
 - $6 < \text{value} \leq 60$: 60 V
 - $60 < \text{value} \leq 600$: 600 V
 - $\text{value} > 600$: 1000 V
- For currnt measurements
 - $\text{value} \leq 6^{E-4}$: 600 μA
 - $6^{E-4} < \text{value} \leq 6^{E-3}$: 6 mA
 - $6^{E-3} < \text{value} \leq 6^{E-2}$: 60 mA
 - $6^{E-2} < \text{value} \leq 0.6$: 600 mA
 - $0.6 < \text{value} \leq 6$: 6 A
 - $\text{value} > 6$: 10 A
- For resistance measurements
 - $\text{value} \leq 600$: 600 Ω
 - $600 < \text{value} \leq 6^{E+3}$: 6 k Ω
 - $6^{E+3} < \text{value} \leq 6^{E+4}$: 60 k Ω
 - $6^{E+4} < \text{value} \leq 6^{E+5}$: 600 k Ω
 - $6^{E+5} < \text{value} \leq 6^{E+6}$: 6 M Ω
 - $\text{value} > 6^{E+6}$: 60 M Ω
- For capacity measurements
 - $\text{value} \leq 6^{E-9}$: 6 nF
 - $6^{E-9} < \text{value} \leq 6^{E-8}$: 60 nF
 - $6^{E-8} < \text{value} \leq 6^{E-7}$: 600 nF
 - $6^{E-7} < \text{value} \leq 6^{E-6}$: 6 μF
 - $6^{E-6} < \text{value} \leq 6^{E-5}$: 60 μF
 - $6^{E-5} < \text{value} \leq 6^{E-4}$: 600 μF
 - $6^{E-4} < \text{value} \leq 6^{E-3}$: 6 mF
 - $\text{value} > 6^{E-3}$: 60 mF
- For « clamp » measurements
 - $\text{value} \leq 0.6$: 600 mA
 - $0.6 < \text{value} \leq 6$: 6 A
 - $6 < \text{value} \leq 60$: 60 A
 - $60 < \text{value} \leq 600$: 600 A
 - $\text{value} > 600$: 6000 A

Note : in « clamp » measurement, all ranges are not authorized for all multiplier coefficients :

Multiplier coefficient	Authorized ranges
1 mV/A	60 A to 6000 A
10 mV/A	6 A to 600 A
100 mV/A	600 mA to 60 A
1000 mV/A	600 mA to 6 A

Reminder : the frequency, power, dBm, duty cycle and impulse duration measurements are available only in autorange, while continuity, diode test, and temperature measurements are mono-range.

To the **RANG?** question, the instrument returns the range number of the active main measurement.

SECondary (Command/Query)

The **SEC <0|1|2|3|4|5>** command selects the type of secondary measurements.

The values vary from 0 to 5 :

Display 2

0 →	Hz
1 →	Min/Max/Pk → MAX
2 →	Min/Max/Pk → MIN
3 →	Min/Max/Pk → PK+
4 →	Min/Max/Pk → PK-
5 →	delta MEM/ delta REL

To the **SEC?** question, the instrument returns the active secondary measurement.

TEMPerature:TRANsducer (Command/Query)

The **TEMP:TRAN <PT100|PT1000>** command selects the type of sensor used for the temperature measurement.

To the **TEMP:TRAN?** question, the instrument returns the type of sensor used for the temperature measurement .

SYSTem command**BEEPer:STATe** (Command/Query)

The **SYST:BEEP:STAT <0|1|OFF|ON>** command authorizes or inhibits the multimeter beeper.

The values are 0 or OFF to inhibit, and 1 or ON to authorize.

To the **SYST:BEEP:STAT?** question, the instrument returns the beeper activation status.

ERRor[:NEXT]? (Query)

To the **SYST:ERR?** question, the instrument returns the error number positioned at the top of the queue. The queue may have up to 10 numbers and it is managed according to the principle of first in, first out.

As the **SYST:ERR?** questions progress, the multimeter returns the error numbers in the order of their arrival, until the queue is empty. Any additional **SYST:ERR?** question will cause a negative response: "0,No error".

If the queue is full, the box located at the top of the queue takes the – 350 value (queue saturated).

The queue is emptied :

- on powering on
- on receipt of a *CLS
- on reading the last error

Response format : <error,message><T>

with: error = integer negative or null.
message = corresponding error message

Error list

* Command errors : (-199 to -100)

They indicate that a syntax error has been detected by the syntax analyzer and caused event register bit 5, called CME, CoMmand Error, to be set to 1

- 101 : Invalid character
- 103 : Invalid separator
- 104 : Data type error
- 108 : Parameter not allowed
- 109 : Missing parameter
- 111 : Header separator error
- 112 : Program mnemonic too long
- 113 : Undefined header
- 114 : Header suffix out of range
- 121 : Invalid character in number
- 128 : Numeric data not allowed
- 141 : Invalid character data
- 148 : Character data not allowed
- 151 : Invalid string data
- 154 : String data too long

* Execution error : (-299 to -200)

They indicate that an error has been detected at the moment of command execution, and cause event register bit 4, called EXE, Execution Error, to be set to 1.

- 200 : Execution error
- 203 : Command protected
- 221 : Settings conflict
- 222 : Data out of range

* Instrument specific errors : (-399 to -300)

They indicate that an abnormal error has been detected during execution of a task, and cause event registry bit 3, called DDE, Device Dependent Error to be set to 1.

- 300 : Device specific error
- 350 : Queue overflow
- 360 : Communication error

* Query errors : (-499 to -400)

They indicate that an anomaly in the information exchange protocol has occurred and cause event register bit 2, called QYE, QuerY Error, to be set to 1.

- 400 : Query error

LOCaI (Command)
 The command **SYST:LOC** configures the multimeter in local mode, so the front panel is accessible again
Reminder: The multimeter switches to REMOTE mode when it receives an SCPI command other than **SYST:LOC**.
 The multimeter can also be switched to local mode using the MENU key.

SOFTVERSion? (Query)
 To the question **SYST:SOFTVERS?**, the multimeter returns the version of the embedded software.
Response format: <X.Y><T>

VERSion? (Query)
 In response to the question **SYST:VERS?**, the multimeter returns the SCPI version that it supports. The response includes the year and the revision index.
Response format: <YYYY.V><NL>
 where Y = year and V = version.

UNIT command

TEMPerature (Command/Query)
 The **UNIT:TEMP <CELSIUS | FAHRENHEIT>** command selects the unit of the temperature measure.
 To the **UNIT:TEMP?** question, the instrument returns the unit of the selected temperature.



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DEUTSCHLAND - Chauvin Arnoux GmbH
Ohmstraße 1, 77694 KEHL am RHEIN
Tel: (07851) 99 26-0 - Fax: (07851) 99 26-60

SCHWEIZ - Chauvin Arnoux AG
Moosacherstrasse 15 - 8804 AU / ZH
Tel: 044 727 75 55 - Fax: 044 727 75 56

UNITED KINGDOM - Chauvin Arnoux Ltd
Unit 1 Nelson Ct - Flagship Sq - Shaw Cross Business Pk
DEWSBURY, West Yorkshire - WF12 7TH
Tel: 01924 460 494 - Fax: 01924 455 328

CHINA - Shanghai Pujiang Enerdis Instruments Co. Ltd
3 Floor, Building 1 - N° 381 Xiang De Road
Hongkou District - 200081 SHANGHAI
Tel: +86 21 65 21 51 96 - Fax: +86 21 65 21 61 07

中国 - 上海浦江埃纳迪斯仪表有限公司
上海市虹口区祥德路381号3号楼3楼
Tel: +86 21 65 21 51 96 - Fax: +86 21 65 21 61 07

ITALIA - Amra SpA
Via Sant'Ambrogio, 23/25 - 20846 MACHERIO (MB)
Tel: 039 245 75 45 - Fax: 039 481 561

ESPAÑA - Chauvin Arnoux Ibérica S.A.
C/ Roger de Flor, 293 - 1a Planta - 08025 BARCELONA
Tel: 902 20 22 26 - Fax: 934 59 14 43

ÖSTERREICH - Chauvin Arnoux GmbH
Slamastrasse 29/24 - 1230 WIEN
Tel: 01 61 61 9 61-0 - Fax: 01 61 61 9 61-61

MIDDLE EAST - Chauvin Arnoux Middle East
P.O. BOX 60-154 - 1241 2020 JAL EL DIB (Beirut) - LEBANON
Tel: (01) 890 425 - Fax: (01) 890 424

SCANDINAVIA - CA Mätsystem AB
Sjöflygvägen 35 - SE 18304 TÄBY
Tel: +46 8 50 52 68 00 - Fax: +46 8 50 52 68 10

USA - Chauvin Arnoux Inc - d.b.a AEMC Instruments
200 Foxborough Blvd. - FOXBOROUGH - MA 02035
Tel: (508) 698-2115 - Fax: (508) 698-2118

<http://www.chauvin-arnoux.com>

190, rue Championnet - 75876 PARIS Cedex 18 - FRANCE
Tél. : +33 1 44 85 44 85 - Fax : +33 1 46 27 73 89 - info@chauvin-arnoux.fr
Export : Tél. : +33 1 44 85 44 86 - Fax : +33 1 46 27 95 59 - export@chauvin-arnoux.fr