

calibrator-tester CMU 310 - CMU EX

The CMU performs tests, calibration, on-site or laboratory, in all departments: maintenance department, control, quality, engineering, commissioning, thermal, electrical, energy, after-sales services.

The CMU EX is intrinsically safe and ideal for the chemical and petroleum industries.



- Measurement and test on site
- Temperature and process output
- Transmitter test with calibration report
- Measurement memory and processing software
- Intrinsically safe version EEx ia IIc T4

Overview.....
The CMU calibrator is designed for checking, calibration and maintenance in all industrial environments including hazardous areas.

This calibrator is perfect for test and calibration of all control loop: sensors, transducers, transmitters, indicators, recorders, controllers, PLC input cards ...
It performs calibration of transducers or transmitters, by generating, on the input, signals which simulate sensors and simultaneously measuring, on the output, signals in current and voltage.
It has many other applications, especially monitoring of physical quantities.

Description.....
Functions include:
- DC voltage and current measurement, temperature measurement with thermocouple or RTD,
- DC voltage and current generation,
- resistance measurement,
- resistance, thermocouple and RTD simulation.
Measurement and sourcing can be performed simultaneously with dual display. Input and output circuits are galvanically isolated

The CMU has many auxiliary functions: relative measurements, linearized display, measurement triggering with logging function, step and simple or cyclic ramp gen-

eration, sourcing values from memory and curve synthesis function.

A series of technical enhancements make all these functions easy: quick function access, help messages, connection via standard terminals and safety plug, protection against overloads, rechargeable battery pack allowing permanent usage on mains without discharge.

CMU are programmable units, with measurement memory and RS 232 interface. Windows® compatible software is included, allowing data transfer and processing on PC, configuration set-up and automatic editing of transmitter calibration reports.



functions

Measurement and emission/simulation are simultaneous, and independent of each other.

DC voltage

VDC			Measurement			Emission	
Range	Resolution	Measurement range	Accuracy (1)	Input resistance	Emission range	Accuracy (1)	
50 mV	1 μ V	± 60 mV	0.025 % + 5 μ V	> 1000 M Ω	- 10 to 50 mV	0.025 % + 5 μ V	
0.5 V	10 μ V	± 600 mV	0.025 % + 30 μ V	> 1000 M Ω	- 100 to 500 mV	0.025 % + 30 μ V	
5 V	100 μ V	± 6 V	0.025 % + 0.3 mV	10 M Ω	- 1 to 5 V	0.025 % + 0.3 mV	
30 V	1 mV	± 30 V	0.025 % + 3 mV	10 M Ω	- 1 to 15 V	0.025 % + 3 mV	

(1) \pm (% rdg + n units) at 23 ± 5 °C over 90 days.

In measurement mode

Maximum permissible voltage on all ranges: 250 VDC or AC.

Common mode rejection: > 120 dB in DC or 50 Hz AC.

In emission mode

Load resistance: ≥ 100 k Ω .

Output current: ≤ 6 mA.

Output circuits protected against 250 VDC or AC.

DC current

IDC			Measurement		Emission		
Range	Resolution	Accuracy(1)	Measurement range	Voltage drop	Range	Emission range	Accuracy (1)
50 mA	1 μ A	0.025 % + 3 μ A	± 60 mA	< 1.2 V	20 mA	0 to 24 mA	0.025 % + 3 μ A

(1) \pm (% rdg + n units) at 23 ± 5 °C over 90 days.

Electronic protection: 250 VDC or AC.

When measuring over a circuit with passive transmitter, the CMU can power the loop. (15 V approx.).

Resistance

Ω			Measurement			Emission	
Range	Resolution	Accuracy (1)	Measuring range	Measuring current	Simulation range	Nominal current (2)	
500 Ω	0.01 Ω	0.025 % + 3 m Ω	0 to 600 Ω	1 mA	0 to 500 Ω	1 mA	
5 k Ω	0.1 Ω	0.025 % + 0.3 Ω	0 to 6000 Ω	0.1 mA	0 to 5000 Ω	0.1 mA	

(1) \pm (% rdg + n units) at 23 ± 5 °C over 90 days.

(2) Permissible measuring current: from 0.5 to 3 nominal current.

2- or 3- balanced wire measurement method.

Protection: 250 VDC or AC.

Response ≤ 5 ms.



Temperature with thermocouples

Sensor	Measurement		Emission	
	Measurement range	Max. accuracy (1)	Simulation range	Max. accuracy (1)
K	-250 to + 1 372 °C	0.1 °C	-240 to + 1 372 °C	0.1 °C
T	-250 to + 400 °C	0.2 °C	-240 to + 400 °C	0.2 °C
J	-210 to + 1 130 °C	0.1 °C	-210 to + 1 200 °C	0.1 °C
E	-250 to + 860 °C	0.1 °C	-240 to + 890 °C	0.1 °C
N	-240 to + 1 300 °C	0.3 °C	-240 to + 1 300 °C	0.3 °C
U	-200 to + 600 °C	0.2 °C	-200 to + 600 °C	0.2 °C
L	-200 to + 900 °C	0.2 °C	-200 to + 900 °C	0.2 °C
S	-50 to + 1 768 °C	0.7 °C	-50 to + 1 768 °C	0.7 °C
R	-50 to + 1 768 °C	0.8 °C	-50 to + 1 768 °C	0.8 °C
B	+ 400 to + 1 820 °C	0.8 °C	+ 400 to + 1 820 °C	0.8 °C
C	-20 to + 2 316 °C	0.4 °C	-20 to + 2 310 °C	0.4 °C
Pt	-100 to + 1 375 °C	0.3 °C	-100 to + 1 395 °C	0.2 °C
Mo	0 to + 1 285 °C	0.2 °C	0 to + 1 375 °C	0.2 °C

(1) ± (n °C) at 23 ± 5 °C over 90 days. Temperature coefficient: < 10 % accuracy/ °C.

For all thermocouples, either in measurement or emission, the best resolution is 0.1 °C.
The accuracy is given for a reference junction at 0 °C and a load resistance ≥ 100 kΩ.

Using internal reference junction (except thermocouple B) from - 50 °C up to the full scale gives an additional uncertainty of 0.2 °C.

In measurement mode, the sensor uncertainty must be taken into account.
Protection: 250 VDC or AC.

Temperature with RTDs

In measurement and emission, the resolution is 0.1 °C.

In measurement mode
The accuracy is given for a 3- balanced wire sensor connection. The sensor uncertainty must be taken into account.

Measuring current:
1 mA for Pt 100 and Pt 200.
0.1 mA for Pt 500 and Pt 1000.

In simulation mode
Permissible measuring current: 0.5 to 3 nominal current (uncertainty x 2).

Simulation can be performed with a measuring current between 0.2 and 0.5 nominal current with less accuracy.
Response time: ≤ 5 ms.
Protection: 250 VDC or AC.

RTD	Measurement		Emission		Nominal current
	Measurement range	Accuracy (1)	Simulation range	Accuracy (1)	
Pt 100	-220 °C to + 0 °C + 0 °C to + 1 200 °C	0.2 °C 0.04 % + 0.2 °C	-220 °C to + 0 °C + 0 °C to + 1 200 °C	0.2 °C 0.04 % + 0.2 °C	1 mA
Pt 200	-220 °C to + 0 °C + 0 °C to + 557 °C	0.1 °C 0.3 °C	-220 °C to + 0 °C + 0 °C to + 408 °C	0.1 °C 0.3 °C	1 mA
Pt 500	-220 °C to + 0 °C + 0 °C to + 1 200 °C	0.3 °C 0.04 % + 0.3 °C	-220 °C to + 0 °C + 0 °C to + 1 200 °C	0.3 °C 0.04 % + 0.3 °C	0.1 mA
Pt 1000	-220 °C to + 0 °C + 0 °C to + 1 200 °C	0.2 °C 0.04 % + 0.2 °C	-220 °C to + 0 °C + 0 °C to + 1 200 °C	0.2 °C 0.04 % + 0.2 °C	0.1 mA

(1) ± (% rdg + n °C) at 23 ± 5 °C over 90 days. Temperature coefficient: < 10% accuracy %C.

additional functions

In measurement and emission/simulation modes

Temperature in °C, °F, K.....
User selectable.

Scaling according to a conversion algorithm $Y = f(X)$
In measurement mode, this function enables the user to display a value Y for a different measured value X but linked to Y with relation $Y = f(X)$.

Two possibilities:
• 1st case: the relation between the displayed value and the measured or emitted value is linear; a and b being constants, the function is in the form $Y = aX + b$.

played value and the measured or emitted value is linear; a and b being constants, the function is in the form $Y = aX + b$.

• 2nd case: the relation between the displayed value and the emitted value is non linear but known as a table or curve. The calibrator enables the user to realize an approached linearization by segments.



Couples of points defining segments can then be determined and entered using the keypad.
Maximum number of segments: 9.

Languages
All messages on graphical display are available in English, French and German.

In measurement mode

Relative measurements
The unit reads the deviation D (read value) between the measured value M and a reference value R which can be measured (null) or entered on keypad.
 $D = M - R$.

Triggered measurements
This function allows:
• to acquire measurement bursts selected one by one;
• to start automatic burst acquisition after set-up of number of measurements and acquisition period;
• to program a threshold to trigger a burst.

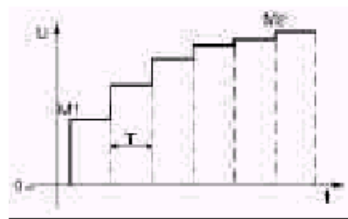
Measurement memory
The acquired burst are stored in a non-volatile memory which can hold up to 1000 measurements in a total of 128 bursts. These bursts are labelled by position.

Contents of memory can be recalled and displayed together with additional data such as minimum, maximum and average values.

These values can be viewed in table form or transferred via RS 232 interface to printer or computer.

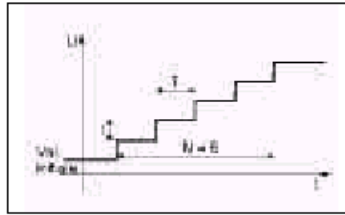
In emission/simulation mode

Emission value memory
Curve synthesis



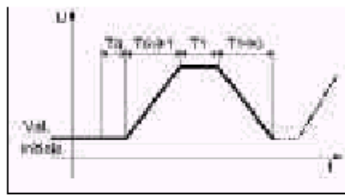
This function allows storage in a non-volatile memory up to 100 emission values that can be recalled one by one in the form of curve; emission of values is automatic at programmable time intervals.

Step generation



This function allows a step by step progression. Amplitude, number and duration of steps as well as direction of the signal can be programmed.

Ramp generation



This mode generates a variable signal according to time. Time, amplitude and number of cycles can be programmed.

Transmitter tests

The CMU is well-suited for this function because of its ability to emit and measure at the same time, but also because its embedded software is designed to make it easier to use.

Test procedures can be prepared ahead of time. Each procedure can contain up to 10 set-point values.

During the test, the CMU sends the corresponding signals, either in an automatic sequence or on manual request, and measures the transmitter's output voltage or current at the same time. It then keeps the results stored in memory and displays on the screen the set-point values together with deviations between them and the measured values.

12 test procedures can be prepared and results of 58 tests can be stored. Data can be transmitted via the RS 232 interface, either to a PC for processing by the software (see below) or to a printer which prints out a calibration report indicating the set-point values, the measured values in electrical and original units, the deviations and the conformity conclusion.

CALIBRATION REPORT
Document: "SAMPLE.PPT"

DESCRIPTION: WATER TEST
Serial Number: 707187 - Manufacturer: My unit - type: 00124
Command: Sample test
Input: 0V to 150 V_{DC} - Output: 4 mA to 20 mA
Maximum allowable deviation: $\pm 1.00\%$ @ 5.0 V_{DC}
Calibrated on: 04/06 by user
Next calibration date: 04/08

MEASUREMENT INSTRUMENT
Serial Number: 707187 - Manufacturer: ACS - type: CMU10
Self-calibration: True; Model: 1305.03

ID	Setpoint		Measured		Percentage Error	
	V _{DC}	mA	V _{DC}	mA	%	Units
01	00.00	4.00	4.00	-0.00	0.00	0.00
02	00.00	8.00	8.00	-0.00	0.00	0.00
03	00.00	12.00	12.00	-0.00	0.00	0.00
04	00.00	16.00	16.00	-0.00	0.00	0.00
05	00.00	20.00	20.00	-0.00	0.00	0.00
06	00.00	24.00	24.00	-0.00	0.00	0.00
07	00.00	28.00	28.00	-0.00	0.00	0.00
08	00.00	32.00	32.00	-0.00	0.00	0.00
09	00.00	36.00	36.00	-0.00	0.00	0.00
10	00.00	4.00	4.00	-0.00	0.00	0.00

Fig 141185

REPORT:
Status: PASS OK
Comments:
Water stability
Date: 02/06/06 Name: G. Smith
Signed:

Calibration report

Indicator tests
 The CMU can test numerical, analog and other indicators in the same way as it does for transmitters, i.e. by running programmable procedures: each set-value is emitted on user's prompt, the corresponding measured value displayed by the indicator is entered on the keypad. The results are stored, transferred and processed in the same way as for transmitter tests, so calibration reports can also be printed out.

Pressure measurement and calibration ..
 Relative, differential or absolute pressures can be measured by HM 28 or PM 28 type external modules.
 The module used determines the pressure range, which extends from 0-25 mbar to 0-70 mbar.
 Several accuracy classes are available. The table below summarizes the various modules available.
 These self-contained modules display various pressure units with a programmable measurement rate.
 The connection between the HM 28 and CMU is performed via the RS 232 link (ACL284 cable) thus allowing additional functions such as: conversions, lineariza-

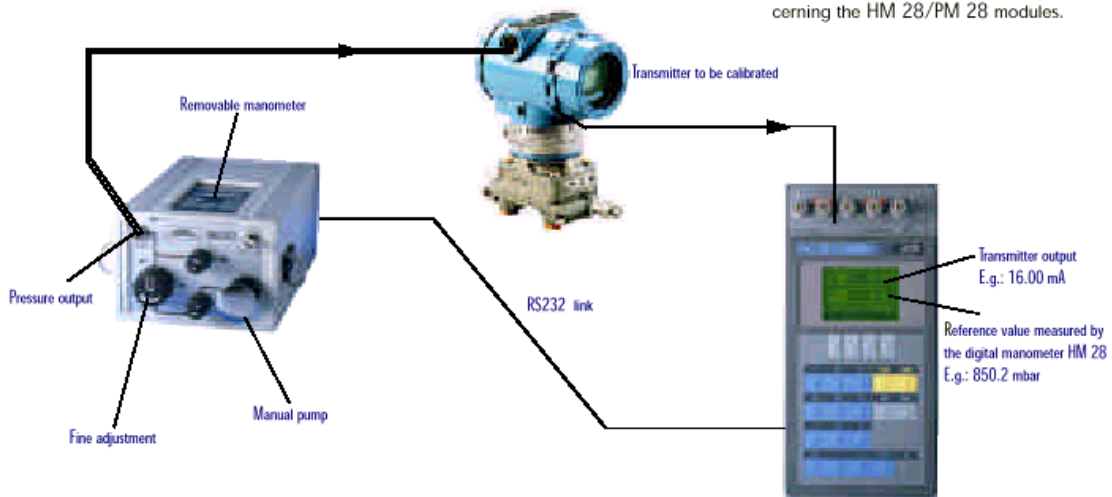
HM 28 manometers

Measurement range	Relative, differential or vacuum measurement			Absolute measurement		
	Accuracy			Accuracy		
- 25 to 25 mbar	0.2 %	0.1 %				
- 70 to 70 mbar	0.2 %	0.1 %	0.05 %			
- 200 to 200 mbar	0.2 %	0.1 %				
- 300 to 300 mbar	0.2 %	0.1 %	0.05 %			
- 500 to 500 mbar	0.2 %	0.1 %				
- 1 000 to 1 000 mbar	0.2 %	0.1 %	0.05 %			
0 to 1 100 mbar				0.2 %	0.1 %	
0 to 2 000 mbar	0.2 %	0.1 %	0.05 %	0.2 %	0.1 %	0.05 %
0 to 7 000 mbar	0.2 %	0.1 %	0.05 %	0.2 %	0.1 %	
- 1 000 to 10 000 mbar	0.2 %	0.1 %				
- 1 000 to 17 bar	0.2 %	0.1 %	0.05 %			
- 1 000 to 30 bar	0.2 %	0.1 %				
- 1 000 to 70 bar	0.2 %	0.1 %				

tions, "null" function and especially the transmitter testing possibility with a calibration report printout.

Transmitter calibration:
 The pressure generated by a pump is sent to the HM 28 (standard) and to the transmitter to be calibrated.

The measurements issued from the HM 28 are memorized by the CMU which uses them as references. In that case, the calibration is performed in manual mode for emission and in automatic mode for measurement.
 The software will edit, process and generate calibration reports directly to a printer or PC.
 For full details, refer to the catalog concerning the HM 28/PM 28 modules.



general specifications •

Display
 - Graphical backlit LCD display.
 - 60 000 measurement counts.

Protection
 Over voltage protection on all ranges, input or output, 250 VDC or AC max.

Operating conditions
 Nominal operating range: 0 to + 50 °C, 10 to 80 % relative humidity (RH).
 Operating limit range: - 1 to + 55 °C, 10 to 80 % RH.
 Protection: IP 41.

Standards (ITS 90)
 - K, T, J, E, N, S, R, B: according to DIN-IEC 584-1 (NF C 42321), ANSI/MC96, JISC 1602.
 - U and L: DIN 43710 standard.
 - C according to Hoskins curve.
 - Platineel: according to Engelhard.
 - Mo thermocouple.
 RTDs Pt: according to DIN-IEC 751 (NF C 42330).

Power requirements
 Ni-Cd rechargeable battery pack, 1.7 Ah.
 Life: 8 hours.

Mains supply with separated 12/220 V charger.

Presentation.....
 Rugged ABS casing for site or bench use.
 Dimensions: 120 x 65 x 245 mm.
 Weight: 1.1 kg.

Accessories delivered with the unit
 - Rugged carrying case.
 - Stabilized supply for mains usage and battery charger.
 - Processing software.



programming and processing software

Delivered with CMU EX this software manages the operating configurations and processing of the measurement results as well as exporting data to other applications. It runs on compatible PC connected to the unit via the RS 232C insulated serial link.

This software runs in Windows environment.

Configurations
They can be edited without the need of the unit and then downloaded according to the user's requirements

Processing the measurement results
The results are transferred in processing files. They can be processed with simple mathematical procedures.
Processed or not, the results can be displayed in the form of tables, curves or histograms.
They can be exported to other software such as spreadsheet for example.

Transmitter test.....
One special feature of the software is the possibility of preparing transmitter test procedures including identification elements, test set-values, tolerances and date.
After the test is transferred and executed by the calibrator, the results can be read back and printed out in the form of calibration reports with error diagrams. They are stored test by test in the form of files.

traceability

AOIP has a metrology department qualified by COFRAC, in electricity/magnetism and in temperature. Our instruments can therefore be delivered with calibration or test reports, showing the traceability of the above mentioned AOIP instruments to the international standards.

Calibration, test reports and calibration certificates are recognized by the following

signatories of the EA (European Accreditation):
BMWVA - Austria
BKO-OBE - Belgium
CAI - Czech Republic
DANAK - Denmark
DKD - Germany
NAB - Ireland
SIT - Italy
RVA - The Netherlands

NA - Norway
IPQ - Portugal
ENAC - Spain
SWEDAC - Sweden
SAS - Switzerland
UKAS - United Kingdom
NIST - USA
NATA - Australia
MRA - South Africa
IANZ - New Zealand.

accessories

- Buckle protection case (ACL 310).
- RS 232 lead 9/9 male-female pins (AN 5875).
- Set of 5 leads with crocodile clip: 2 red, 2 black and 1 blue (ACL 9310).

- Connection lead HM 28-CMU (ACL 284).

- For the intrinsically safe HM 28 module, refer to the specific documentation.

ordering instructions

Universal calibrator-tester CMU310-1
Universal calibrator-tester with RS 232 CMU310-2
Universal calibrator-tester intrinsically safe CMU EX

Accessories.....
Protection case ACL 3108
RS 232 lead (9/9 male-female) AN 5875
Set of 5 leads ACL 9310
HM 28/CMU connection lead ACL 284
COFRAC checking report Contact us



The above specifications are subject to modification.

