CALIBRATION

CALYS 150

2 channels High accuracy calibrator

2 measurement channels
Protected for on-site use
Easy-Connect system
Data acquisition
HART protocol transmitter automatic calibration
21 CFR part11 compliant

Calys 150 is a very high accuracy instrument for onsite calibration. Very easy to use , all necessary process functions embedded, make CALYS150 the perfect instrument for maintenance, quality control, and calibration

This robust and reliable calibrator (housing for protection, easy-connect system, high contrast backlit display), makes the job of several units in one instrument.

- **Simulation, emission**
- **Pressure, temperature, process signal measurements.**

A Bluetooth interface, quick access to functions, on line help for connection, gives high performances for on site use to the CALYS150.

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CALYS 150: Introduction

CALYS 150 is a portable calibrator able to measure and to generate simultaneously on 2 isolated channels or to measure on two channels.
It has a wide backlit display to be used in all lightning conditions.
Fully protected by the housing with a polycarbonate keypad to protect it from dirt. The raised keys ease use when wearing protective gloves.
It is able to measure and generate voltage, current, frequency, resistance signals, resistive probes and thermocouples. Unit also measures pressure when used with optional external pressure modules and can perform calibration automatically on HART protocol transmitters.
It is able to **drive** some **dry block and temperature bath** for temperature sensor calibration.

Calys 150 is delivered in standard with a strap and a stand for desktop use, a quick battery charger, and a set of 6 measuring cables with crocodile clips

Main characteristics

Display: Backlight display with contrast settings
USB Connection
Recommended ambient conditions: 0 to 50°C, 10to 80% relative humidity
Maximum ambient conditions: -10 to 55°C. 10 to 80% relative humidity
Water protection rating: IP 54
Rechargeable NiMH Batteries
Dimensions: 210X110X50 mm (8.3x4.3x2.0 in.)
Weight: 200g (7 Oz.)

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"easy connect®" System

This unique system is used by pushing on the terminal's top and inserting:
- Wires with a diameter up to 3 mm or 10AWG
- Compensated thermocouple connectors

and by releasing.
Wires are held tight between 2 brass plates which provide thermal stability to create a very good cold junction compensation for thermocouples.

This system allows 4mm banana plugs and also security connectors to be connected on the front panel

Functions:

CALYS 150 allows the following physical values to be measured and simulated:

- **Voltage**
- **Current**
- **Resistance**
- **Temperature by thermocouples, RTD and thermistors Résistance**
- **Pressure measurement when used with optional external pressure module (simulation requires user supplied pressure pump)**
- **Frequency/counting from signal and dry contacts**

It allows scaling of process signals and corrections to temperature probes.
It is compatible with HART transmitters by inserting a 250ohms resistance which digital data transfer uninterrupted.
It stores data and can send them to PC for analysis.

HART Protocol:

CALYS 150 can work with HART Protocol instruments :

- Connection of 1 to 15 analogue sensors with 24V volts power supply
- Compatibility with Protocols « HART 5 » and « HART 6 ». Setting and configuration of these sensor through the CALYS150
- Loop supply with insertion of 250Ω internal resistance.
- "Verify " hart menu option: Verification of the current loops and the detectors (manually or automatically). All the informations are stored into the Verification report.
- Loop current and detectors can be adjusted from the calys 150
- HART Instrument status: Some informations about the behaviour of the instrument under test can be displayed: overload loop, out of limit variable…

Calibration :

➢ Sensor calibration :
- Calibration coefficient can be implemented in order to correct sensors.CALYS 150 is able to issue calibration reports.

➢ Electronic devices calibration:
- Calibration can be performed by comparison (2 probes and temperature generator driven) or using signal generation. Two methods are available: manual or automatic, with uncertainty taken into account. Calibration setpoints are entered by user.
- Transmitter mode : The measured value is emitted as 4-20mA or voltage.

Display

Calys 150 dual display continuously displays the measurement value, the emitted value, the gauge and the used functions.
On the toplines date, time and external temperature are indicated.
During measuring average, maximum, minimum and the number of measurements are displayed on the left. during emission this part of screen displays all details of ramps, steps and constant value emission functions.
Drop-down menus are used with the navigator, and an on-line help is available graphically display probe connections an wires

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Functions and performances: @23°C ±5°C

Uncertainty is in % of reading(CALYS 150 display) + fixed value

DC Current: Measure

CALYS can measure upto 100mA with/without loop supply (24V)

Range	Meas range	Res.	Accuracy /1yr	Remarks
0-20mA	0mA/24mA	0,1 µA	0,007%+0,8 µA	Rin < 30 Ω
4-20mA	3mA/24mA	0,1 µA	0,007% +0,8µA	Rin < 30 Ω
100 mA	0mA/100mA	0,1 µA	0, 009% + 2 µA	Rin < 30 Ω

Temperature Coefficient < 7 ppm/°C from 0°C to 18°C and 28°C to 50 °C.

- Loop supply = 24 V ± 10%.
- HART® Compatibility : Input Impedance Rin = 280 Ω
- Display with linear or quadratic scaling

DC Current: Emission

Range	Resolution	Accuracy / 1an
24 mA	1 µA	0,007% + 0,8µA
4-20 mA	1 µA	0,007% + 0,8µA
0-20 mA	1 µA	0,007% + 0,8µA

Temperature Coefficient < 7 ppm/°C from 0°C to 18°C and 28°C to 50 °C.
Specifications given for :
- Calys 150 active mode (+24V ON) ←→ DUT passive mode (+ 24V OFF).
- Calys 150 passive mode (+24V OFF) ←→ DUT active mode (+ 24V ON)

Emission avec ou sans alimentation de boucle (24V)

Pre-programmed steps

	0%	25%	50%	75%	100%
4-20mA linear	4	8	12	16	20
0-20mA linear	0	5	10	15	20
4-20mA quad	4	5	8	13	20
0-20Ma quad	0	1,25	5	11,25	20
4-20mA valves	3,8-4 -4,2		12		19,20,21

DC Voltage: Measure

Range	Meas range	Res.	Accuracy /1yr	Nota
+100mV	10mV+100µV	1µV	0,005% + 2µV	Rin>10M Ω
+1V	- 100mV+1V	0µV	0,005% +8µV	Rin>10M Ω
+10V	- 1V + 10V	100µV	0,007%+80µV	Rin=1MΩ
+50V	- 5V + 50V	mV	0,007%+0,5mV	Rin=1MΩ

Rin: Input resistance

DC Voltage: Emission

Range	Meas range	Res.	Accuracy /1yr	Min Load
+100mV	-5mV+100mV	1µV	0,005%+2 µV	1 K Ω
+1V	- 5mV + 1V	10µV	0,005%+8 µV	2 K Ω
+10V	- 100mV+10V	100µV	0,007%+80µV	4 K Ω
+50V	- 100mV+50V	1mV	0,007%+0.5mV	4 K Ω

Frequency , counting: Measure

Range	Resolution	Accuracy / 1yr
10 kHz	< 0,01 Hz	0,01% Rdg
100KHz	0,1 Hz	0,01%

Trigger level 1V
Unit scale in Pulse/min and Hz
Measurement on frequency signals or dry contacts
Counting will be performed on defined time or infinite time.

Frequency, pulse: Emission

Range	Resolution	Accuracy / 1yr
1000 Hz	0,01 Hz	0,01% Rdg
100 kHz	1 Hz	0,01%Rdg

Scale in Pulse/min and Hz
Pulse emission and dry contacts simulation
Max amplitude :20V (Selectable by user)

Resistance: Measure

Range	Input Range	Res.	Accuracy / 1yr	Nota
400Ω	0 to 400Ω	1mΩ	0,006%R+8mΩ	4wires
3600Ω	0 to3600Ω	10mΩ	0,006%R+50mΩ	4wires
50KΩ	0 to 50 kΩ	100mΩ	0,008%R+ 1 Ω	4wires

Resistance measurement with 2, 3 or 4 wires with automatic recognition; wires number displayed on the screen.

Resistance: Emission

Range	Output range	Res	Accuracy / 1yr	Remarks
400 Ω (DC current)	1 -400Ω	10 mΩ	0,006% R + 8 mΩ @1mA	Iext of 0.1 mA / 1 mA
3600 Ω (DC current)	1-3600Ω	100 mΩ	0,006%R + 50 mΩ @0,1mA	Iext of 0.1 mA / 1 mA
50 KΩ (DC current)	1 - 50KΩ	1 Ω	0,008% R + 1 Ω	Iext of 5 µA / 50µA

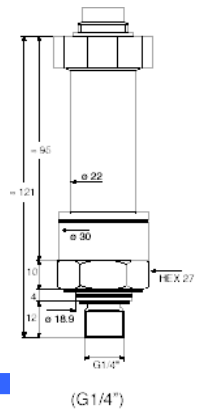
Emission with pulsed current available: refer to the instruction manual for specifications
Temperature Coefficient < 5 ppm/°C from 0°C to 18°C and 28°C to 50 °C.
Emission de résistance : establishing time <1ms: for compatibility with smart transmitters

Pressure: measurement with external digital sensor

Range	0-1 bar	0-3 bar	0-10 bar	0-30 bar	0-100 bar	, 0-300 bar	0-1 000 bar
Absolute	yes	yes	yes	yes	yes	yes	yes
Relative	yes	yes	yes	yes	Not available	Not available	Not available

Resolution :0,02 % of Full scale.
Accuracy :- 0,05 % of full scale for 10 and 40°C; - 0,1 % of full scale - 10 to + 10°C and 40 to 80°C.

This digital pressure module is connected through RS485 serial cable to the digital input connector.
All data are digital.
Measurement are compensated in temperature thanks to a polynomial correction implemented into the EEPROM at factory.



(G1/4")

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Temperature

RTD: Measure and Emission

Sensor	Input range	Resolution	Accuracy / 1yr (Measure)	Output range	Resolution	Accuracy / 1yr (emission)
Pt 50 (α = 3851)	- 220°C + 850°C	0,01°C	0.006% R + 0.04°C	- 220°C + 850°C	0,01°C	0.006% R + 0.04°C
Pt 100 (α=3851)	- 220°C + 850°C	0,01°C	0.006% R + 0.03°C	- 220°C + 850°C	0,01°C	0.006% R +0.035°C
Pt 100 (α=3916)	- 200°C + 510°C	0,01°C	0.006% R + 0.03°C	- 200°C + 510°C	0,01°C	0,006% R +0.035°C
Pt 100 (α=3926)	- 210°C + 850°C	0,01°C	0.006% R + 0.03°C	- 210°C + 850°C	0,01°C	0.006% R +0.035°C
Pt 200 (α=3851)	- 220°C + 850°C	0,01°C	0.006% R + 0.04°C	- 220°C + 850°C	0,01°C	0.006% R + 0.04°C
Pt 500 (α=3851)	- 220°C + 850°C	0,01°C	0.006% R + 0.03°C	- 220°C + 850°C	0,01°C	0.006% R + 0.04°C
Pt1000(α=3851)	- 220°C + 850°C	0,01°C	0.006% R + 0.03°C	- 220°C + 850°C	0,01°C	0.006% R +0.035°C
Ni100 (α = 618)	- 60°C + 180°C	0,01°C	0,006%R + 0.05°C	- 60°C + 180°C	0,01°C	0,006%R + 0.04°C
Ni 120 (α = 672)	- 40°C + 205°C	0,01°C	0,006%R + 0.05°C	- 40°C + 205°C	0,01°C	0,006%R + 0.04°C
Ni1000 (α= 618)	- 60°C + 180°C	0,01°C	0,006%R + 0.05°C	- 60°C + 180°C	0,01°C	0,006%R + 0.04°C
Cu 10 (α = 427)	- 50°C + 150°C	0,10°C	0.006% R + 0.18°C	- 50°C + 150°C	0,10°C	0.006% R + 0.1°C
Cu 50 (α = 428)	- 50°C + 150°C	0,01°C	0.006% R + 0.05°C	- 50°C + 150°C	0,01°C	0.006% R + 0.05°C

Resistive probes measurements in 2,3 or 4 wires: automatic recognition of number of connected wires, with indication on screen

- Accuracies are given for 4 wires mounted probes
- For RTD simulation accuracies are given for 1 mA current; Admissible Measurement current: 0.01mA to 1mA
- Temperature coefficient: < 10 % of accuracy /°C.
- Take into account particular error of temperature sensor used and implementation conditions
- Establishing time: <1ms for simulation (simulation on quick transmitters)

Thermocouples: Measure and Emission

Type	Input Range	Resolution	Accuracy / 1 yr (Measure)	Output Range	Resolution	Accuracy / 1 yr (Emission)
K	- 250 to - 200°C - 200 to - 120°C -120 to + 1 372°C	0,2°C 0,05°C 0,05°C	0,50°C 0.15°C 0.0050 % R + 0.08°C	- 250 to - 50°C - 50 to + 120°C + 120 to + 1020°C + 1020°C + 1370°C	0,2°C 0,1°C 0,05°C 0,05°C	0,15% R 0,06°C 0.005% R + 0,05°C 0.007% R + 0,05°C
T	- 250 to - 200°C - 200 to - 100°C - 100 to + 80°C + 80 to + 400°C	0,2°C 0,05°C 0,05°C 0,05°C	0,50°C 0.05% R + 0,06°C 0.015% R + 0,07°C 0,06°C	- 250 to - 100°C - 100 to + 0°C + 0 to + 400°C	0,2°C 0,05°C 0,05°C	0,1% R + 0,05°C 0,02% R + 0,06°C 0,055°C
J	- 210 to - 120°C - 120 to + 60°C + 60 to + 1 200°C	0,05°C 0,05°C 0,05°C	0.15°C 0.005% R + 0,07°C 0,0025 % R + 0,06°C	- 210 to + 0°C + 0 to + 50°C + 60 to + 1 200°C	0,05°C 0,05°C 0,05°C	0,03% R + 0,08°C 0,05% R + 0,07°C 0,005 % R + 0,04°C
R	- 50 to + 0°C + 0 to + 150°C + 150 to + 1 768°C	0,5°C 0,2°C 0,1°C	+ 0.60°C + 0,60°C + 0,3°C	- 50 to + 0°C + 0 to + 350°C + 350 to + 1 768°C	0,5°C 0,2°C 0,1°C	0.35% R + 0.4°C + 0,4°C + 0,25°C
S	- 50 to + 150°C + 150 to +1450°C + 1450 to + 1 768°C	0,5°C 0,2°C 0,1°C	0,80°C 0.30°C 0.35°C	- 50 to + 0°C + 0 to + 350°C + 350 to + 1 768°C	0,5°C 0,2°C 0,1°C	0.25% R + 0.4°C 0.30°C 0.25°C
B	+ 400 to + 900°C + 900 to + 1 820°C	0,2°C 0,1°C	0,005 % R + 0,4°C 0,005 % R + 0,2°C	+ 400 to + 900°C + 900 to + 1 820°C	0,2°C 0,1°C	0,005 % R + 0,4°C 0,005 % R+ 0,2°C
U	- 200 to - 100°C - 100 to + 660°	0,05°C 0,05°C	+ 0.13°C + 0.09°C	- 200 to + 400°C + 400°C to + 600°C	0,05°C 0.05°C	+ 0.09°C + 0.11°C
N	- 240 to - 190°C - 190 to - 110°C - 110°C to + 0°C + 0 to – 400°C + 400°C to + 1 300°C	0,2°C 0,1°C 0,05°C 0,05°C 0,05°C	0,25% R 0.1% R 0.04% R + 0,06°C 0,08°C 0.005% R + 0,06°C	- 240 to - 200°C - 200 to + 10°C + 10 to + 250°C + 250 to + 1300°	0,2°C 0,1°C 0,05°C 0,05°C	0,15 % R + 0,10°C + 0,08°C 0,008 % R + 0,05°C

Thermocouples: PlatineL, Mo, NiMo/NiCo, G, D, L, C**:** For specifications, refer to the instruction manual (Available on request)
Accuracy is given for reference @ 0°C.
With use of internal RJ (except couple B) add a additional uncertainty of 0.3°C
CJC localisation can be selected by keypad programming, except for thermocouple type B:

- External at 0°C, internal (temperature compensation of instrument's terminals) or by temperature programming
- Temperature coefficient: <10% of accuracy /°C. Display unit: °C and F.

Thermistors: Measure and Emission

Thanks to the 50Kohm range and the Steinhart –Hart equation, thermistors can be implemented in the CALYS150.
Steinhart-hart equation is:

where A, B, D are usually calculated according to temperature at 0°C, 25°C, and 70°C

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Other functions

File Menu:
User can save up to 10 full configurations of the instruments and recall them. Configurations can be saved and recalled by user or use. Configurations include all programming done on instrument.

Contrast adjustment:
Screen's contrast can be adjusted as needed to fit with measurement environment.

Battery life:
6 hours minimum

Screen Backlighting:
Time of backlighting can be programmed to save battery.

Scaling:
In measurement and simulation, scaling allows process signals to be displayed in % of FS or in all other units.
This function also allows sensors to be corrected after a calibration.

Relative measurement:
- Programming of a reference value different from the one of the instrument (NUL function).
- Subtracting of constant value by measuring or programming it from a measured value(TARE function).

Square root:
In current measurement and simulation, this function allows taking into account a quadratic signal coming from transmitter of type ΔP.

Transmitters tests:
Transmitters can be verified using user procedures.
20 procedures can be stored as well as test results.
Deviation curves are displayed.
Test reports editing.

Compatibility with 21 CFR part 11 standard:
Password, logins, login, audit trail are necessary to use the device.

Simulation Menu:
Simulation value is set by entering value on keypad or by changing the specific digit with the cursor.

Ramps generation:
Starting, ending and length time values of simple or cyclic ramps can be set to do simulation.
Number of ramps can also be adjusted in case of cyclic ramps for any signals.

Steps simulation:
2 modes are proposed.
- Program mode: Starting value, number of steps and the length time have to be set
- Manual mode: User has about a hundred preset values.

In current simulation, user will have some additional preset values in function of range and according to 0%, 25%, 50%, 75% and 100% from selected gauge. Choice is done between gauges:
0-20mA: linear or quadratic.
4-20mA: linear or quadratic.

Synthesizer:
With 100 values manually set, Calys 150 allows curve generation to be remade.

Transmitter function:
CALYS 150 is able to be used as a transmitter.
Measurement input is copied on the output with scaling.

Switch test:
In temperature or pressure Calys 150 can control electronic thermostats and pressostats trigger levels.

Memory
CALYS 100 can record data automatically or on user request. 10 000 data can be stored and displayed on the screen as curve or list.

CALYS150 is supplied in standard with 6 test leads, one Battery adapter, One instruction manual.

Ordering Instructions:

Process calibrator	CALYS 150
Transport case	ACL 6050
Pressure sensor	ACL 433
HART Modem	ACL 500
AOIP Temperature generator communication Cable	ACL 600

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