CALYS 150

Advanced documenting multifunction calibrator thermometer

CALYS 150, most advanced documenting multifunction instrument of the range, works not only as a simulator (IN / OUT) but also as a **dual channel thermometer (IN / IN)**. It calibrates **HART transmitters** (HART communicator integrated) and **thermistors**.

Description

CALYS 150 field documenting multifunction calibrator is the top instrument of the range. It is the perfect tool for advanced process maintenance and use on test bench in all industries. Suitable for all field and lab measurements, it can simultaneously measure and generate over two isolated channels various signals of temperature, resistance, process, pressure and frequency in one single instrument.

CALYS 150 does not only work as a simulator (IN / OUT) but also as a **dual channel thermometer (IN / IN)** to perform comparison calibration. It calibrates **HART transmitters** (HART communicator integrated into ACL500 modem) and **thermistors**.

Providing **extended functionalities** (temperature simulation, scaling, steps, synthesizer, statistical functions...) and audit trails, CALYS 150 complies with both 21 CFR Part 11 and NADCAP Heat Treatment standards and makes advanced data exploitation and full data traceability easier.

High performances for CALYS 150, for advanced use:

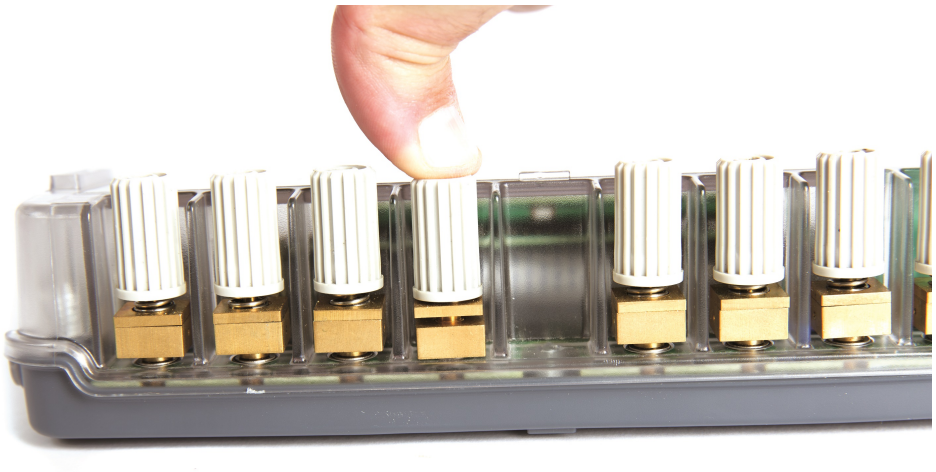
- Temperature Up to 0.005 % RDG
- Resistance Up to 0.006 % RDG and 50 KΩ range
- Current: Up to 0.007 % RDG and 100 mA range + Loop Supply 24 V
- Voltage: Up to 0.005 % RDG and 50 V range
- Frequency: Up to 0.01 % RDG and 100 KHz range

Using this user-friendly instrument, calibration tasks can be quickly carried out over the whole process chain. Take the 900 g documenting process calibrator to the field with you during the whole week with **10 calibration procedures stored** in the device. Run the procedure after connecting the probes to the instrument (Easy connect system®) and save the results for onsite easy and quick calibration. Back to the office, you can then upload the data on a computer in order to **issue customized calibration certificates** with dedicated calibration software DATACAL.

IP 54, fully protected by an antichoc rubber holster, CALYS 150 integrates "easyconnect" terminals and a wide backlite display that makes it easy to use in any severe or dark conditions. When used with an external pressure module (ref. ACL433), CALYS 150 can measure and simulate pressure (comparison calibration with a pressure pump).

CALYS 150 has also the capability to drive baths and dry-blocks when associated with the specific cable (ref. ACL600).

Easy connection system



Connect your probes by simply pushing on the terminal top and insert wires of up to 3 mm or 10 AWG diameter and compensated thermocouple connectors.

Wires are held tight between two brass plates ensuring thermal stability and a very good cold junction compensation for thermocouples.

This system also enables 4 mm banana plugs and security connectors to be connected on the terminal top.

CALYS series, 4 models from basic use to advanced performances

Specifications		CALYS 50	CALYS 75	CALYS 100	CALYS 150
Top accuracy		200 ppm		130 ppm	50 ppm
Temperature accuracy	Thermocouples (14) RTDs (12)	0.013% RDG for Tc K 0.012% RDG		0.01% RDG for Tc K 0.01% RDG	0.005% RDG for Tc K 0.006% RDG
DC current + Loop supply 24 V	Range Accuracy	50 mA 0.0175% RDG			100 mA 0.007% RDG
DC voltage	Range Accuracy	50 V IN / 20 V OUT 0.013% RDG	50 V 0.013% RDG	50 V 0.010% RDG	50 V 0.005% RDG
Frequency	Range Accuracy	20 KHz IN / 10 KHz OUT 0.005% RDG			100 KHz 0.01% RDG

Resistance	Range Accuracy	4000 Ω 0.012% RDG		4000 Ω 0.010% RDG	50 KΩ 0.006% RDG
Pressure	Range Accuracy		Relative pressure: 30 bar / Absolute pressure: 1,000 bar 0.05% RDG		
Compliance to standards			21 CFR Part 11		
					NADCAP Heat treatment AMS 2750
Additional functions		Advanced data exploitation: Scaling, relative measurement, simulation of ramps and steps, synthetizer, square root, statistical functions Transmitter function			
Additional functions			Switch test Calibration of transmitters		
Additional functions					Comparison calibration HART: Digital calibration and data transfer Calibration of thermistors
Software			DATACAL calibration software for configuration and data management		
Memory			10,000 data stored and recalled on screen as curve or list		

Specifications

Specifications and performances in temperature @23°C ±5°C

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

Resistive probes: Measurement and simulation

Sensor	Range (Input and Output)	Resolution	Accuracy / 1 year (Measurement)	Accuracy / 1 year (Simulation)
Pt50 (α = 3851)	-220°C to +850°C	0.01°C	0.006% RDG + 0.04°C	0.006% RDG + 0.04°C
Pt100 (α = 3851)	-220°C to +850°C	0.01°C	0.006% RDG + 0.03°C	0.006% RDG + 0.03°C
Pt100 (α = 3916)	-200°C to +510°C	0.01°C	0.006% RDG + 0.03°C	0.006% RDG + 0.03°C
Pt100 (α = 3926)	-210°C to +850°C	0.01°C	0.006% RDG + 0.03°C	0.006% RDG + 0.03°C
Pt200 (α = 3851)	-220°C to +850°C	0.01°C	0.006% RDG + 0.04°C	0.006% RDG + 0.04°C
Pt500 (α = 3851)	-220°C to +850°C	0.01°C	0.006% RDG + 0.03°C	0.006% RDG + 0.03°C
Pt1000 (α = 3851)	-220°C to +850°C	0.01°C	0.006% RDG + 0.03°C	0.006% RDG + 0.03°C
Ni100 (α = 618)	-60°C to 180°C	0.01°C	0.006% RDG + 0.05°C	0.006% RDG + 0.05°C
Ni120 (α = 672)	-40°C to +205°C	0.01°C	0.006% RDG + 0.05°C	0.006% RDG + 0.05°C
Ni1000 (α = 618)	-60°C to +180°C	0.01°C	0.006% RDG + 0.05°C	0.006% RDG + 0.05°C
Cu10 (α = 427)	-50°C to 150°C	0.10°C	0.006% RDG + 0.18°C	0.006% RDG + 0.18°C
Cu50 (α = 428)	-50°C to +150°C	0.01°C	0.006% RDG + 0.05°C	0.006% RDG + 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-wire mounted probes
Take into account particular error of temperature sensor used and implementation conditions
Admissible measuring current: 0.01 mA to 4 mA
In simulation mode, specifications given for 1 mA measuring current (Pt50 / 100, Ni100 / 120, Cu10 / 50) or 0.1 mA (Pt200 / 500 / 1000, Ni1000)
Establishing time: Temperature coefficient: < 10% of accuracy /°C

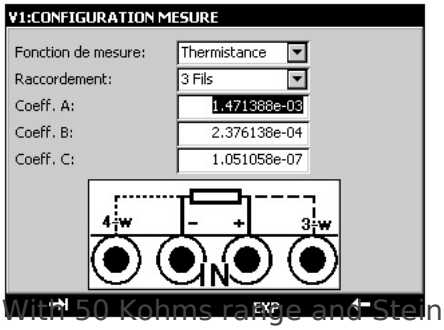
Thermocouples: Measurement and simulation

Type	Input range	Resolution	Accuracy / 1 year (Measurement)	Output range	Resolution	Accuracy / 1 year (Simulation)
K	-250 to -200°C -200 to -120°C -120 to +1372°C	0.10°C 0.05°C 0.01°C	0.50°C 0.15°C 0.005% RDG + 0.08°C	-250 to -50°C -50 to +120°C +120 to +1020°C +1020 to +1370°C	0.01°C 0.01°C 0.01°C 0.01°C	0.15% RDG 0.06°C 0.005% RDG + 0.05°C 0.007% RDG + 0.05°C
T	-250 to -200°C -200 to -100°C -100 to +80°C +80 to +400°C	0.1°C 0. 01°C 0.01°C 0.01°C	0.50°C 0.05% RDG + 0.06°C 0.015% RDG + 0.07°C 0.06°C	-250 to -100°C -100 to +0°C +0 to +400°C	0.01°C 0.01°C 0.01°C	0.1% RDG + 0.05°C 0.02% RDG + 0.06°C 0.055°C
J	-210 to -120°C -120 to +60°C +60 to +1200°C	0.01°C 0.01°C 0.01°C	0.15°C 0.005% RDG + 0.07°C 0.0025% RDG + 0.06°C	-210 to +0°C +0 to +50°C +50 to +1200°C	0.01°C 0.01°C 0.01°C	0.03% RDG + 0.08°C 0.05% RDG + 0.07°C 0.005% RDG + 0.04°C
R	-50 to +150°C +150 to +550°C +550 to 1768°C	0.20°C 0.10°C 0.01°C	+0.60°C +0.30°C +0.30°C	-50 to +0°C +0 to +350°C +350 to +1768°C	0.01°C 0.01°C 0.01°C	0.35% RDG + 0.4°C +0.4°C +0.25°C
S	-50 to +150°C +150 to +550°C +550 to +1450°C +1450 to +1768°C	0.20°C 0.10°C 0.05°C 0.05°C	0.80°C 0.30°C 0.30°C 0.35°C	-50 to +0°C +0 to +350°C +350 to +1768°C	0.01°C 0.01°C 0.01°C	0.25% RDG + 0.4°C 0.30°C 0.25°C
B	+400 to +900°C +900 to +1820°C	0.10°C 0.05°C	0.005% RDG + 0.4°C 0.005% RDG + 0.2°C	+400 to +900°C +900 to +1820°C	0.01°C 0.01°C	0.005% RDG + 0.4°C 0.005% RDG + 0.2°C
U	-200 to -100°C -100 to +660°C	0.01°C 0.01°C	+0.13°C +0.09°C	-200 to +400°C +400 to +600°C	0.05°C 0.05°C	+0.09°C +0.11°C
N	-240 to	0.10°C	0.25% RDG	-240 to	0.01°C	0.15% RDG

	-190°C -190 to -110°C -110 to +0°C +0 to +400°C +400 to +1300°C	0.05°C 0.01°C 0.01°C 0.01°C	0.10% RDG 0.04% RDG + 0.06°C 0.08°C 0.005% RDG + 0.06°C	-200°C -200 to +10°C +10 to +250°C +250 to +1300°C	0.01°C 0.01°C 0.01°C	+0.10°C +0.08°C 0.008% RDG + 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.
When using the internal reference junction (except couple B) add an additional uncertainty of 0.2 °C at 0 °C.
It is possible (thermocouple B excepted) to choose by programming the cold junction localization: External at 0°C, internal (temperature compensation of instrument's terminals) or manually entered.
Temperature coefficient: <10% of accuracy /°C
Display unit: °C and F.

Thermistors: Measurement (Channel 1)



With 50 Kohms range and Steinhart – Hart equation integrated, thermistors can be entered into CALYS 150 and tested.
Steinhart-hart equation is as follows:

$$\frac{1}{T} = A + B(\ln(R)) + C(\ln(R))3$$

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

Specifications and performances in pressure @23°C ±5°C

Pressure: Measurement by external digital sensor

Range	0-1 bar	0-3 bar	0-10 bar	0-30 bar	0-100 bar	0-300 bar	0-1000 bar
Absolute	X	X	X	X	X	X	X
Relative	X	X	X	X			

Available in relative, absolute and differential pressure.
Connector: ¼ gas
Resolution: 0.02% FS
Accuracy:
-0.05% FS from 10 to 40°C
- 0.1% FS from -10 to +10°C and from 40 to 80°C

This digital pressure module ACL433 is connected to CALYS 150 through RS485 serial cable to the digital input connector. All data are digital. Measurements are compensated in temperature by a polynomial correction implemented into the firmware at factory.

Specifications and performances in process @23°C ±5°C

DC current: Measurement

With or without loop supply

Range	Measurement range	Res.	Accuracy / 1an	Rin
0-20 mA	0 mA to 24 mA	1 µA	0.007% RDG + 0.8 µA	< 30 Ω
4-20 mA	3 mA to 24 mA	1 µA	0.007% RDG + 0.8 µA	< 30 Ω
100 mA	0 mA to 100 mA	1 µA	0.009% RDG + 2 µA	< 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 voltage: Measurement

Range	Measurement range	Res.	Accuracy / 1an	Rin
+100 mV	-10 mV to +100 mV	1 V	0.005% RDG + 2 µV	> 10 MΩ
+1 V	-100mV to +1 V	10 V	0.005% RDG + 8 µV	> 10 MΩ
+10 V	-1 V to +10 V	100 V	0;007% RDG + 80	= 1 MΩ

			µV	
+50 V	-5 V to +50 V	1 mV	0;007% RDG + 0.5 mV	= 1 MΩ

Frequency, counting: Measurement

Range	Resolution	Accuracy / 1an
10 kHz	< 0.01 Hz	0.01% RDG
100 kHz	0.1 Hz	0.01% RDG

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

Resistance: Measurement

Range	Measurement range	Resolution	Accuracy / 1an
400 Ω	0 to 400 Ω	1 mΩ	0.006% RDG + 8 mΩ
3600 Ω	0 to 3600 Ω	10 mΩ	0.006% RDG + 50 mΩ
50 kΩ	0 to 50 kΩ	100 mΩ	0.008% RDG + 1 Ω

Resistance measurement in 2, 3 or 4 wires: automatic recognition of number of connected wires, with indication on screen
Accuracies are given for 4-wire mounted probes

DC current: Emission

With or without loop supply

Range	Resolution	Accuracy / 1an
24 mA	1 µA	0.007% RDG + 0.8 µA
4-20 mA	1 µA	0.007% RDG + 0.8 µA
0-20 mA	1 µA	0.007% RDG + 0.8 µA

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

Specifications given for CALYS 150 configurations in:
- Active mode (+24V ON) 1 Meter in passive mode (+24 V OFF)
- Passive mode (+24 V OFF) 1 Meter in active mode (+24 V ON)

Pre-programmed steps

0%	25%	50%	75%	100%
4-20 mA linear	4	8	12	16	20
0-20 mA linear	0	5	10	15	20
4-20 mA quad	4	5	8	13	20
0-20 mA quad	0	1.25	5	11,25	20
4-20 mA valves	3.8-4—4.2		12		19, 20, 21

DC voltage: Emission

Range	Emission range	Res.	Accuracy / 1an	Min load
+100m V	-5m V to +100 mV	1 V	0.005% RDG + 2 V	1 kΩ
+1 V	-5mV to +1 V	10 V	0.005% RDG + 8 V	2 kΩ
+10 V	-100mV to +10 V	100 V	0.007% RDG + 80 V	4 kΩ
+50 V	-100 mV to + 50 V	1 mV	0.007% RDG + 0.5 mV	4 kΩ

Frequency, pulse: Emission

Range	Resolution	Accuracy / 1an
1000 Hz	0.01 Hz	0.01% RDG
100 kHz	1 Hz	0.01% RDG

Scale unit: Pulse / min and Hz
Pulse emission and dry contacts simulation.
Max. amplitude: 20 V (User selectable)

Resistance: Emission

Range	Emission range	Res.	Accuracy / 1an	Nota **Iext**
400 Ω	1 to 400 Ω	10 mΩ	0.006% RDG + 20 mΩ	0.1 mA / 4 mA
3600 Ω	10 to 3600 Ω	100 mΩ	0.006% RDG + 100 mΩ	0.1 mA / 4 mA

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.
Current establishing time: <1ms
Compatibility with smart transmitters
Iext : Current received by the calibrator

Further features

Scaling in measurement and simulation modes	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	The features allows the following : • Programming 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).
Simulation menu	Simulation value is set by entering value on keypad or by changing the specific digit with the cursor.
Square root	In current measurement and simulation, this function allows taking into account a quadratic signal coming from transmitter of type ΔP.
Statistical functions	Continuous display of average, minimum and maximum value of the signal under monitoring, as well as number of measurements.
Transmitters tests	Transmitters can be verified using user procedures. 20 procedures can be stored as well as test results. Deviation curves are displayed. Edition of comprehensive test reports.
Switch test	In temperature or pressure mode, CALYS 150 can control electronic thermostat and pressostat trigger levels.
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 available: • 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: 0-20 mA: linear or quadratic 4-20 mA: linear or quadratic
Synthesizer	With 100 values manually set, CALYS 150 enables users to draw a generation curve.
Transmitter function	CALYS 150 is able to be used as a transmitter. Measurement input is copied on the output with scaling.

General specifications

Size	210 x 110 x 50 mm
Weight	900 g

Display	240 x 320 pixel liquid crystal graphical display with backlite and contrast control Display of result as table of values or trend curve
Power supply	230 V ± 10 %, 50/60 Hz
Battery	Type:lithium-ion Charging Time: 3 hours lifetime: 8hours min
Communication ports	USB
Storage capacity	Up to 10 full configurations (Input / output type, range…) 10,000 data into one or several measurement campaigns, i.e. more than one week work with configurations, measurements, calibration procedures and reports

Environmental specifications

Reference range	23°C ± 5°C (RH: 45 to 75 % w/o condensing)
Operating reference range	-10 to 50°C (RH: 20 to 80 % w/o condensing)
Limit operating range	-15°C to +55°C (RH: 10 to 80 % w/o condensing) (70% at 55°C)
Storage temperature limits	-30°C to +60°C
Maximum height	0 to 2000 m
IP protection	IP54 according to EN60529

Safety specifications

Protections	• Electronic protection up to 250 V for ‘voltage’ wires • Fuse protection for ‘current’ wires • Protection against ‘current’ circuit breaking during inductive resistance measurements
Class	In accordance with EN 61010-1 Category II, pollution 2
Rated voltage	60 V
Chocks and vibrations	EN 61010-1
EMC conformity	Immunity: • EN 61000-4-2 • EN 61000-4-3 • EN 61000-4-5 • EN 61000-4-6 • EN 61000-4-11

	EN 61000-4-4 Conducted and radiated emissions: • EN 55022, class B • EN 61000-3-2 • EN 61000-3-3

Models and accessories

Instrument:

CALYS 150 On-site documenting multifunction calibrator

Delivered in standard with:

- User manual
- Battery charger
- Set of 6 testing leads
- Carrying strap
- Factory test report

Accessories:

ACL433 External digital pressure sensor for CALYS 75 / 100 / 150

(Absolute or relative pressure)

Different ranges available from 0 to 1,000 bar

Range from -1 -> 1; 3; 10; 30 (absolute or relative pressure)

Range from -1 -> 100; 300; 1,000 (absolute pressure only)

Standard accuracy: 0.05% FS

AN6050 Transport case for CALYS series

ACL9311 Set of 6 measuring cables with removable crocodile clips

ACL500 Hart modem for CALYS 150

ACL600 Cable to drive temperature dry blocks and baths for CALYS 150

Please ask before for compliance with your bath/dry block

Software:

DATACAL Calibration software for CALYS 75 / 100 / 150

Supplied with USB cable

Certification:

QMA11EN COFRAC certificate of calibration

With all relevant data points where the device has been tested

AMS 2750 Compliance certificate to NADCAP AMS 2750 standard

Packing information:

Size	210 mm x 110 mm x 50 mm
Weight without packing	900 g