



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 K Ω 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
- Pressure: With an external pressure module (comparison calibration with a pressure pump)

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 | 4000 Ω | | 4000 Ω | 50 K Ω |

| | Accuracy | 0.012% RDG | 0.010% RDG | 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 ($\alpha = 3851$) | -220°C to +850°C | 0.01°C | 0.006% RDG + 0.04°C | 0.006% RDG + 0.04°C |
| Pt100 ($\alpha = 3851$) | -220°C to +850°C | 0.01°C | 0.006% RDG + 0.03°C | 0.006% RDG + 0.03°C |
| Pt100 ($\alpha = 3916$) | -200°C to +510°C | 0.01°C | 0.006% RDG + 0.03°C | 0.006% RDG + 0.03°C |
| Pt100 ($\alpha = 3926$) | -210°C to +850°C | 0.01°C | 0.006% RDG + 0.03°C | 0.006% RDG + 0.03°C |
| Pt200 ($\alpha = 3851$) | -220°C to +850°C | 0.01°C | 0.006% RDG + 0.04°C | 0.006% RDG + 0.04°C |
| Pt500 ($\alpha = 3851$) | -220°C to +850°C | 0.01°C | 0.006% RDG + 0.03°C | 0.006% RDG + 0.03°C |
| Pt1000 ($\alpha = 3851$) | -220°C to +850°C | 0.01°C | 0.006% RDG + 0.03°C | 0.006% RDG + 0.03°C |
| Ni100 ($\alpha = 618$) | -60°C to 180°C | 0.01°C | 0.006% RDG + 0.05°C | 0.006% RDG + 0.05°C |
| Ni120 ($\alpha = 672$) | -40°C to +205°C | 0.01°C | 0.006% RDG + 0.05°C | 0.006% RDG + 0.05°C |
| Ni1000 ($\alpha = 618$) | -60°C to +180°C | 0.01°C | 0.006% RDG + 0.05°C | 0.006% RDG + 0.05°C |
| Cu10 ($\alpha = 427$) | -50°C to 150°C | 0.10°C | 0.006% RDG + 0.18°C | 0.006% RDG + 0.18°C |
| Cu50 ($\alpha = 428$) | -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)

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 | 0.05°C | 0.10% RDG | -200°C | 0.01°C | +0.10°C |
| -190 to | 0.01°C | 0.04% RDG | -200 to | 0.01°C | +0.08°C |
| -110°C | 0.01°C | + 0.06°C | +10°C | 0.01°C | 0.008% RDG |
| -110 to +0°C | 0.01°C | 0.08°C | +10 to | | + 0.05°C |
| +0 to | | 0.005% RDG | +250°C | | |
| +400°C | | + 0.06°C | +250 to | | |
| +400 to | | | +1300°C | | |
| +1300°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.

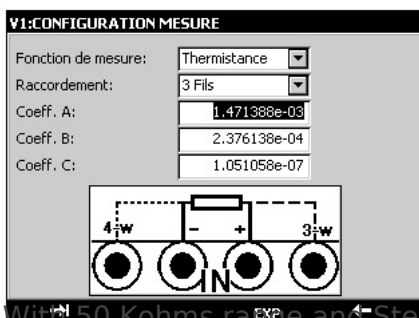
When using the internal reference junction (except couple B) add an additional uncertainty of 0.2 °C at 0 °C.

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 / 1 year | 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 / 1 year | 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 M Ω |

Frequency, counting: Measurement

| Range | Resolution | Accuracy / 1 year |
|---------|------------|-------------------|
| 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 / 1 year |
|---------------|--------------------|----------------|----------------------------|
| 400 Ω | 0 to 400 Ω | 1 m Ω | 0.006% RDG + 8 m Ω |
| 3600 Ω | 0 to 3600 Ω | 10 m Ω | 0.006% RDG + 50 m Ω |
| 50 k Ω | 0 to 50 k Ω | 100 m Ω | 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 / 1 year |
|---------|-----------------|--------------------------------|
| 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/ $^{\circ}\text{C}$ from 0 $^{\circ}\text{C}$ to 18 $^{\circ}\text{C}$ and 28 $^{\circ}\text{C}$ to 50 $^{\circ}\text{C}$

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 / 1 year | 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 / 1 year |
|---------|------------|-------------------|
| 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 / 1 year | 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

Models and accessories

Instrument:

CALYS 150 On-site documenting multifunction calibrator

Delivered in standard with:

- Quick start 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:

DATA CAL 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

DENVER
metrología electrónica, S.L.

Tel: +34 91 569 8006
info@denver.es - www.denver.es