



**DENVER**  
*metrología electrónica, S.L.*



## CALYS 1500

Advanced laboratory electrical  
calibrator / Dual input thermometer

CALYS 1500, most advanced and accurate laboratory electrical calibrator of the range, 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) and thermistors.

## Description

CALYS 1500, most advanced and accurate laboratory electrical calibrator of the range, 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) and thermistors.

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.

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.

10 full configurations can be saved and recalled by the user or the user group, making CALYS 1500 the ideal tool for regular and repeated tasks.

High performances in measurement and simulation for CALYS 1500:

- Temperature Up to 0.005 % RDG
- Resistance Up to 0.006 % RDG and 50 K $\Omega$  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)

## Calibration procedures and DATACAL software

Using this user-friendly instrument, calibration tasks can be quickly carried out over the whole process chain. Take the 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 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.

## Innovative and ergonomic design

- Metal housing for enhanced robustness
- Capacitive touch panel
- USB communication
- Carrying handle
- Battery and main powered

## Graphic screen and display resolution

CALYS 1500 allows the digit number after the dot to be selected: This function is justified by the needs of users who want or not to display the best resolution for calibration or on the contrary limit it for simple verifications.

CALYS 1500 dual display indicates permanently the measurement value, and also the emitted value, the gauge and the used functions.

On the top date, time and also external temperature are also indicated.

During measuring average, maximum, minimum and the number of measurements are displayed on the left. While for 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 to make easier connections of probes and wires.

# Specifications

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

Uncertainty is given in % of reading (CALYS 1500 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 + 0.035°C           |
| Pt100 ( $\alpha = 3916$ )  | -200°C to +510°C                               | 0.01°C                       | 0.006% RDG + 0.03°C             | 0.006% RDG + 0.035°C           |
| Pt100 ( $\alpha = 3926$ )  | -210°C to +850°C                               | 0.01°C                       | 0.006% RDG + 0.03°C             | 0.006% RDG + 0.035°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 + 0.04°C            |
| Pt1000 ( $\alpha = 3851$ ) | -220°C to +850°C                               | 0.01°C                       | 0.006% RDG + 0.03°C             | 0.006% RDG + 0.035°C           |
| Ni100 ( $\alpha = 618$ )   | -60°C to +180°C                                | 0.01°C                       | 0.006% RDG + 0.05°C             | 0.006% RDG + 0.04°C            |
| Ni120 ( $\alpha = 672$ )   | -40°C to +205°C                                | 0.01°C                       | 0.006% RDG + 0.05°C             | 0.006% RDG + 0.04°C            |
| Ni1000 ( $\alpha = 618$ )  | -60°C to +180°C                                | 0.01°C                       | 0.006% RDG + 0.05°C             | 0.006% RDG + 0.04°C            |
| Cu10 ( $\alpha = 427$ )    | -50°C to +150°C (Mes)<br>-70°C to +150°C (Sim) | 0,10°C (Mes)<br>0.01°C (Sim) | 0.006% RDG + 0.18°C             | 0.006% RDG + 0.1°C             |
| Cu50 ( $\alpha = 428$ )    | -50°C to +150°C                                | 0.01°C                       | 0.006% RDG + 0.05°C             | 0.006% RDG + 0.05°C            |

Temperature coefficient: < 10% of accuracy /°C beyond reference domain

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: 0.25 mA (Measurement) or 0.1 mA to 1 mA (Emission)

## Thermocouples: Measurement and simulation

| Type | Input range                                                                        | Resolution                           | Accuracy /<br>1 year (Measurement)                                  | Output range                                                                      | Resolution                           | Accuracy /<br>1 year (Simulation)                                        |
|------|------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------|--------------------------------------------------------------------------|
| K    | -250 to<br>-200°C<br>-200 to<br>-120°C<br>-120 to<br>+1372°C                       | 0.10°C<br>0.05°C<br>0.01°C           | 0.50°C<br>0.15°C<br>0.005% RDG<br>+ 0.08°C                          | -250 to<br>-50°C<br>-50 to<br>+120°C<br>+120 to<br>+1020°C<br>+1020 to<br>+1370°C | 0.01°C<br>0.01°C<br>0.01°C<br>0.01°C | 0.15% RDG<br>0.06°C<br>0.005% RDG<br>+ 0.05°C<br>0.007% RDG<br>+ 0.05°C  |
| T    | -250 to<br>-200°C<br>-200 to<br>-100°C<br>-100 to<br>+80°C<br>+80 to<br>+400°C     | 0,1°C<br>0,01°C<br>0,01°C<br>0,01°C  | 0.50°C<br>0.05% RDG<br>+ 0.06°C<br>0.015% RDG<br>+ 0.07°C<br>0.06°C | -250 to<br>-100°C<br>-100 to +0°C<br>+0 to<br>+400°C                              | 0.01°C<br>0.01°C<br>0.01°C           | 0.1% RDG +<br>0.05°C<br>0.02% RDG<br>+ 0.06°C<br>0.055°C                 |
| J    | -210 to<br>-120°C<br>-120 to<br>+60°C<br>+60 to<br>+1200°C                         | 0.01°C<br>0.01°C<br>0.01°C           | 0.15°C<br>0.005% RDG<br>+ 0.07°C<br>0.0025%<br>RDG +<br>0.06°C      | -210 to -0°C<br>+0 to +50°C<br>+50 to<br>+1200°C                                  | 0.01°C<br>0.01°C<br>0.01°C           | 0.03% RDG<br>+ 0.08°C<br>0.05% RDG<br>+ 0.07°C<br>0.005% RDG<br>+ 0.04°C |
| E    | -250 to<br>-200°C<br>-200 to<br>+100°C<br>+100 to<br>1000°C                        | 0,05°C<br>0,01°C<br>0,01°C           | 0.30°C<br>0.06°C<br>0.005% RDG<br>+ 0.05°C                          | -250 to<br>+40°C<br>+40 to<br>+550°C<br>+550 to<br>+1000°C                        | 0.01°C<br>0.01°C<br>0.01°C           | 0.15°C<br>0.005% RDG<br>+ 0.12°C<br>0.005% RDG<br>+ 0.13°C               |
| R    | -50 to<br>+150°C<br>+150 to<br>+550°C<br>+550 to<br>1768°C                         | 0,2°C<br>0,1°C<br>0,01°C             | 0.60°C<br>0.30°C<br>0.30°C                                          | -50 to +0°C<br>+0 to<br>+350°C<br>+350 to<br>1768°C                               | 0.01°C<br>0.01°C<br>0.01°C           | 0.35% RDG<br>+ 0.4°C<br>0.04°C<br>0.25°C                                 |
| S    | -50 to<br>+150°C<br>+150 to<br>+550°C<br>+550 to<br>+1450°C<br>+1450 to<br>+1768°C | 0.20°C<br>0.10°C<br>0.05°C<br>0.05°C | 0.80°C<br>0.30°C<br>0.30°C<br>0.35°C                                | -50 to +0°C<br>+0 to<br>+350°C<br>+350 to<br>+1768°C                              | 0.01°C<br>0.01°C<br>0.01°C           | 0.25% RDG<br>+ 0.4°C<br>0.30°C<br>0.25°C                                 |
| B    | +400 to<br>+900°C<br>+900 to                                                       | 0.1°C<br>0.05°C                      | 0.005% RDG<br>+ 0.4°C<br>0.005% RDG                                 | +400 to<br>+900°C<br>+900 to                                                      | 0.01°C<br>0.01°C                     | 0.005% RDG<br>+ 0.4°C<br>0.005% RDG                                      |

|           | +1820°C                                                                                       |                                                | + 0.2°C                                                                             | +1820°C                                                                          |                                      | + 0.2°C                                                 |
|-----------|-----------------------------------------------------------------------------------------------|------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------|
| U         | -200 to<br>-100°C<br>-100 to<br>+660°C                                                        | 0,01°C<br>0.01°C                               | 0.13°C<br>0.09°C                                                                    | -200 to<br>+400°C<br>+400 to<br>+660°C                                           | 0.05°C<br>0.05°C                     | 0.09°C<br>0.11°C                                        |
| L         | -200 to<br>+900°C                                                                             | 0.01°C                                         | 0.10°C                                                                              | -200 to<br>+900°C                                                                | 0.05°C                               | 0.15°C                                                  |
| C         | -20 to<br>+900°C<br>+900 to<br>+1730°C<br>+1730 to °C                                         | 0.05°C<br>0,05°C<br>0,05°C                     | 0.15°C<br>0.008% RDG<br>+ 0.12°C<br>0.015% RDG<br>+ 0.12°C                          | -20 to<br>+1540°C<br>+1540 to<br>+2310°C                                         | 0.10°C<br>0.10°C                     | 0.25°C<br>0.012% RDG<br>+ 0.1°C                         |
| N         | -240 to<br>-190°C<br>-190 to<br>-110°C<br>-110 to +0°C<br>+0 to 400°C<br>+400°C to<br>+1300°C | 0,10°C<br>0.05°C<br>0.01°C<br>0.01°C<br>0.01°C | 0.25% RDG<br>0.10% RDG<br>0.04% RDG<br>+ 0.06°C<br>0.08°C<br>0.005% RDG<br>+ 0.06°C | -240 to<br>-200°C<br>-200 to<br>+100°C<br>+10 to<br>+250°C<br>+250 to<br>+1300°C | 0.01°C<br>0.01°C<br>0.01°C<br>0.01°C | 0.15% RDG<br>0.10°C<br>0.08°C<br>0.008% RDG<br>+ 0.05°C |
| Platine   | -100 to<br>+100°C<br>+100 to<br>+1400°C                                                       | 0.01°C<br>0.01°C                               | 0.15°C<br>0.005% RDG<br>+ 0.06°C                                                    | -100 to<br>+1400°C                                                               | 0.05°C                               | 0.10°C                                                  |
| Mo        | +0 to<br>+1375°C                                                                              | 0.01°C                                         | 0.005% RDG<br>+ 0.06°C                                                              | +0 to<br>+1375°C                                                                 | 0.05°C                               | 0.005% RDG<br>+ 0.06°C                                  |
| NiMo/NiCo | -50 to<br>+1410°C                                                                             | 0.01°C                                         | 0.005% RDG<br>+ 0.30°C                                                              | -50 to<br>+1410°C                                                                | 0.05°C                               | 0.005% RDG<br>+ 0.3°C                                   |

Temperature coefficient: < 5% of accuracy /°C beyond reference domain

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.

Display unit: °C? F and K.

Thermocouples: G, D: For specifications, refer to the instruction manual (Available on request)

### 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 1500 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   | Resolution | Accuracy / 1 year   | Nota: Rin |
|---------|------------|---------------------|-----------|
| 0-20 mA | 0.1 µA     | 0.007% RDG + 0.8 µA | < 30 Ω    |
| 4-20 mA | 0.1 µA     | 0.007% RDG + 0.8 µA | < 30 Ω    |
| ±100 mA | 0.1 µA     | 0.007% RDG + 2 µA   | < 30 Ω    |

Temperature coefficient: < 7% of accuracy /°C beyond reference domain

Loop supply: 24 V ±10%

HART® compatibility: Input impedance Rin = 280 Ω

CALYS 1500 also allows linear or quadratic signals to be linearized.

Specifications given for CALYS 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)

### Direct voltage: Measurement

| Range   | Full range       | Resolution | Accuracy / 1 year  | Nota: Rin |
|---------|------------------|------------|--------------------|-----------|
| 100 mV  | -10 mV to 100 mV | 1 µV       | 0.005% RDG + 2 µV  | > 10 MΩ   |
| 1 V (1) | -100 mV to 1 V   | 10 µV      | 0.005% RDG + 8 µV  | > 10 MΩ   |
| 10 V    | -1 V to 10 V     | 100 µV     | 0.007% RDG + 80 µV | = 1 MΩ    |
| 50 V    | -5 V to 50 V     | 1 mV       | 0.007% RDG + 0.5   | = 1 MΩ    |

|  |  |  |    |  |
|--|--|--|----|--|
|  |  |  | mV |  |
|--|--|--|----|--|

Temperature coefficient: < 5% of accuracy /°C beyond reference domain

### Frequency and counting: Measurement

| Range   | Full range       | Resolution | Accuracy / 1 year  |
|---------|------------------|------------|--------------------|
| 10 KHz  | 1 Hz to 10 KHz   | 0.1 Hz     | 0.005% RDG + 5 mHz |
| 100 KHz | 10 Hz to 100 KHz | 0.1 Hz     | 0.005% RDG + 5 mHz |

Temperature coefficient: < 5 ppm/°C beyond reference domain

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     | Resolution | Accuracy / 1 year  |
|-----------|------------|--------------------|
| 400 Ω     | 1 mΩ       | 0.006% RDG + 8 mΩ  |
| 3600 Ω    | 10 mΩ      | 0.006% RDG + 50 mΩ |
| 50 KΩ (1) | 100 mΩ     | 0.008% RDG + 1 Ω   |

(1) Range on channel 1 only.

Temperature coefficient: < 7 ppm/°C beyond reference domain

2, 3 or 4 wires resistance measurement: automatic recognition of number of connected wires, with indication on screen

Accuracies are given for 4-wire mounted probes

Open circuit terminal voltage: < 10 V

Continuity test: Open circuit for R > 1000 Ω and closed circuit for R < 1000 Ω

### DC current: Emission

| Calibre | Résolution | Précision / 1 an  | Note                               |
|---------|------------|-------------------|------------------------------------|
| 24 mA   | 1 µA       | 0,007% L + 0,8 µA | With or without loop supply (24 V) |
| 4-20 mA | 1 µA       | 0,007% L + 0,8 µA |                                    |
| 0-20 mA | 1 µA       | 0,007% L + 0,8 µA |                                    |

Temperature coefficient: < 7 ppm/°C beyond reference domain

Settling time: < 5 ms

Specifications given for CALYS 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 |

### Direct voltage: Emission

| Range  | Full range      | Resolution  | Accuracy / 1 year       | Minimum output load |
|--------|-----------------|-------------|-------------------------|---------------------|
| 100 mV | -5 mV to 100 mV | 1 $\mu$ V   | 0.005% RDG + 2 $\mu$ V  | 1 K $\Omega$        |
| 1 V    | -5 mV to 1 V    | 10 $\mu$ V  | 0.005% RDG + 8 $\mu$ V  | 2 K $\Omega$        |
| 10 V   | -100 mV to 10 V | 100 $\mu$ V | 0.007% RDG + 80 $\mu$ V | 4 K $\Omega$        |
| 50 V   | -100 mV to 50 V | 1 mV        | 0.007% RDG + 0.5 mV     | 4 K $\Omega$        |

Temperature coefficient: < 5 ppm/°C beyond reference domain

### Frequency and pulses: Emission

| Range   | Resolution | Accuracy / 1 year  |
|---------|------------|--------------------|
| 1000 Hz | 0.01 Hz    | 0.005% RDG + 5 mHz |
| 100 KHz | 1 Hz       | 0.005% RDG + 5 mHz |

Temperature coefficient: < 5 ppm/°C beyond reference domain

Scale unit: Pulse / min and Hz

Pulse emission and dry contact simulation

Max amplitude: 20 V selectable by user

### Resistance: Emission

| Range                                   | Full range                 | Resolution    | Accuracy / 1 year          | Notes                |
|-----------------------------------------|----------------------------|---------------|----------------------------|----------------------|
| 400 $\Omega$ - 1 mA<br>(Direct current) | 1 $\Omega$ to 400 $\Omega$ | 10 m $\Omega$ | 0.006% RDG + 20 m $\Omega$ | Iext : 0.1 mA - 1 mA |
| 400 $\Omega$ - 1 mA<br>(Pulsed current) | 1 $\Omega$ to 400 $\Omega$ | 10 m $\Omega$ | 0.006% RDG + 30 m $\Omega$ | Iext : 0.1 mA - 1 mA |
| 400 $\Omega$ - 4 mA<br>(Direct current) | 1 $\Omega$ to 400 $\Omega$ | 10 m $\Omega$ | 0.006% RDG + 20 m $\Omega$ | Iext : 1 mA - 4 mA   |
| 400 $\Omega$ - 4 mA<br>(Pulsed current) | 1 $\Omega$ to 400 $\Omega$ | 10 m $\Omega$ | 0.006% RDG + 30 m $\Omega$ | Iext : 1 mA - 4 mA   |

|                                   |                              |                |                                |                    |
|-----------------------------------|------------------------------|----------------|--------------------------------|--------------------|
| 3600 $\Omega$<br>(Direct current) | 10 $\Omega$ to 3600 $\Omega$ | 100 m $\Omega$ | 0.006% RDG +<br>100 m $\Omega$ | ltext : 0.1 / 1 mA |
| 3600 $\Omega$<br>(Pulsed current) | 10 $\Omega$ to 3600 $\Omega$ | 100 m $\Omega$ | 0.006% RDG +<br>200 m $\Omega$ | ltext : 0.1 / 1 mA |

Temperature coefficient: < 5 ppm/°C beyond reference domain

ltext : Current received by the calibrator

## Further functionalities

### File Menu

Users can save up to 10 full configurations of the instruments and recall them. Configurations include all programming done on instrument.

### 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 1500      Benchtop precision documenting multifunction calibrator

Delivered in standard with:

- Quick start manual
- Battery charger
- Set of 6 testing leads
- Factory test report

### Accessories:

ACL433      External digital pressure sensor, range to be specified at the order:

Absolute or relative pressure: Range from -1 -> 1; 3; 10; 30 bar

Absolute pressure: Range from -1 -> 100; 300; 1000 bar

ACL9311      Set of 6 measuring cables with removable crocodile clips

ER 49504-000      USB cable

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*

### Logiciel :

### Software:

DATACAL      Calibration software for CALYS 1000 / 1200 / 1500

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      340 x 320 x 160 mm

Weight without packing 4,6 Kg



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