



## PJ 6301

High precision multifunction  
benchtop calibrator with  
documenting capabilities

PJ 6301 multifunction benchtop calibrator is a high precision instrument which can simultaneously measure and simulate of physical and electrical values: DC voltage and current, resistance and temperature from thermocouples and RTDs.

## Description

PJ 6301 multifunction benchtop calibrator is a high precision instrument which can simultaneously measure and simulate of physical and electrical values: DC voltage and current, resistance and temperature from thermocouples and RTDs.

Its graphical dual display enables INPUT and OUTPUT values to be simultaneously displayed and leads to keyboard simplification. On-line help messages are available at any time in case additional information on displayed options is needed.

Extended functionalities: data processing, customized signal linearization, transmitter function, ramp and step function, relative measurements...

It is fully programmable via RS 232 and IEEE 488 (option) interfaces, which makes it the perfect instrument for test benches and automatic test equipment applications. PJ 6301 is also available with a battery in option.

PJ 6301 is offered into a compact benchtop housing for on-site use as well as benchtop or panel mounted use. It is widely used in metrological departments, quality-control departments, research and development laboratories and also by maintenance and approval companies.

## Applications:

Due to its outstanding performances and quality, PJ 6301 meets the requirements of a wide range of applications:

- Accurate measurement for calibration of signal generators such as sensors, voltage and current sources, resistance, and for the verification of general process control instruments
- Temperature simulation, voltage and current sourcing, resistance simulation for calibration of measuring equipment such as chart recorders, logical controllers, PLC analogue inputs...
- Test of signal conditioners or transmitters, using PJ 6301 simultaneous sensor simulation and output signal measurement capability.

# Specifications

## Specifications and performances in temperature @23°C ±1°C

Uncertainty is given in % of reading (PJ 6301 display) + fixed value.

### Resistive probes: Measurement and simulation

| Sensor | Measurement range                                 | Resolution                  | Accuracy / 1 year in measurement           | Simulation range              | Resolution       | Accuracy / 1 year in simulation  |
|--------|---|-----------------------------|--|-------------------------------|------------------|----------------------------------|
| Pt100  | -220°C to 0°C<br>0 to +630°C<br>+630°C to +1200°C | 0.01°C<br>0.005°C<br>0.01°C | 0.04°C<br>0.015% RDG<br>+ 0.04°C<br>0.2°C  | -220°C to 0°C<br>0 to +1200°C | 0.01°C<br>0.01°C | 0.06°C<br>0.015% RDG<br>+ 0.06°C |
| Pt200  | -220°C to 0°C<br>0 to +630°C<br>+630 to +798°C    | 0.01°C<br>0.005°C<br>0.01°C | 0.04°C<br>0.015% RDG<br>+ 0.04°C<br>0.15°C | -220°C to 0°C<br>0 to +590°C  | 0.01°C<br>0.01°C | 0.04°C<br>0.015% RDG<br>+ 0.04°C |
| Pt500  | -220°C to 0°C<br>0 to +1200°C                     | 0.01°C<br>0.01°C            | 0.06°C<br>0.015% RDG<br>+ 0.06°C           | -220°C to 0°C<br>0 to +1200°C | 0.01°C<br>0.01°C | 0.1°C<br>0.015% RDG<br>+ 0.1°C   |
| Pt1000 | -220°C to 0°C<br>0 to +630°C<br>+630°C to +1200°C | 0.01°C<br>0.005°C<br>0.01°C | 0.05°C<br>0.015% DG<br>+ 0.05°C<br>0.3°C   | -220°C to 0°C<br>0 to +1200°C | 0.01°C<br>0.01°C | 0.06°C<br>0.015% RDG<br>+ 0.06°C |
| Ni100  | -60°C to +180°C                                   | 0.05°C                      | 0.15°C                                     | -60°C to +180°C               | 0.01°C           | 0.4°C                            |

Accuracies are given for 4-wire mounted probes

Measuring current: 1 mA for Pt100, Pt200, Ni100 and 0.1 mA for Pt500 and Pt1000

Take into account additional uncertainty of 0.02 to 0.05°C in 3-wire measurement and 0.02 to 0.2°C in 2-wire measurement according to the type of sensor.

In simulation mode, accuracy is given for external current between 0.5 mA and 2.5 mA for Pt 100, Pt 200 and Ni 100 simulation and 1 mA for Pt 500 and Pt 1000 simulation

Temperature coefficient: < 10% of accuracy /°C

Display unit: °C, °F and K.

### Thermocouples: Measurement and simulation

| Type | Input range | Resolution | Accuracy / 1 year (Measurement) | Output range | Resolution | Accuracy / 1 year (Simulation) |
|------|-------------|------------|---------------------------------|--------------|------------|--------------------------------|
|------|-------------|------------|---------------------------------|--------------|------------|--------------------------------|

|   |  |                                    |  |  |                            | )                                       |
|---|--|------------------------------------|--|--|----------------------------|---|
| K | -250 to<br>-200°C<br>-200 to<br>-120°C<br>-120 to 0°C<br>0 to<br>+1372°C | 0.2°C<br>0.1°C<br>0.05°C<br>0.05°C | 1.5°C<br>0.5°C<br>0.3°C<br>0.015% RDG<br>+ 0.2°C | -240 to<br>-200°C<br>-200 to 0°C<br>+0 to<br>+1372°C         | 0.01°C<br>0.01°C<br>0.01°C | 1.5°C<br>0.5°C<br>0.015% RDG<br>+ 0.2°C |
| T | -250 to<br>-200°C<br>-200 to -0°C<br>+0 to<br>+400°C                     | 0.2°C<br>0.05°C<br>0.05°C          | 1.5°C<br>0.5°C<br>0.2°C                          | -240 to<br>-200°C<br>-200 to +0°C<br>+0 to<br>+400°C         | 0.01°C<br>0.01°C<br>0.01°C | 1.5°C<br>0.5°C<br>0.2°C                 |
| J | -210 to<br>-100°C<br>-100 to<br>+1200°C                                  | 0.05°C<br>0.05°C                   | 0.4°C<br>0.2°C                                   | -210 to<br>-100°C<br>-100 to<br>+1200°C                      | 0.01°C<br>0.01°C           | 0.5°C<br>0.015% RDG<br>+ 0.2°C          |
| E | -250 to<br>-200°C<br>-200 to<br>-100°C<br>-100 to<br>980°C               | 0.1°C<br>0.05°C<br>0.05°C          | 1°C<br>0.3°C<br>0.2°C                            | -240 to<br>-200°C<br>-200 to<br>-100°C<br>-100 to<br>+1000°C | 0.01°C<br>0.01°C<br>0.01°C | 1°C<br>0.3°C<br>0.2°C                   |
| R | -50 to<br>+150°C<br>+150 to<br>+550°C<br>+550 to<br>1768°C               | 0.5°C<br>0.2°C<br>0.1°C            | 2.0°C<br>1.0°C<br>1.0°C                          | -50 to<br>+120°C<br>+120 to<br>+1768°C                       | 0.01°C<br>0.01°C           | 2.0°C<br>1.0°C                          |
| S | -50 to<br>+150°C<br>+150 to<br>+550°C<br>+550 to<br>+1768°C              | 0.5°C<br>0.2°C<br>0.1°C            | 1.5°C<br>1.0°C<br>1.0°C                          | -50 to<br>+120°C<br>+120 to<br>+1768°C                       | 0.01°C<br>0.01°C           | 2.0°C<br>1.0°C                          |
| B | +400 to<br>+900°C<br>+900 to<br>+1820°C                                  | 0.2°C<br>0.1°C                     | 1.5°C<br>1.0°C                                   | +0 to<br>+400°C<br>+400 to<br>900°C<br>+900 to<br>+1820°C    | 0.01°C<br>0.01°C<br>0.01°C | -<br>1.5°C<br>1.0°C                     |
| U | -200 to 0°C<br>0 to +600°C   | 0.05°C<br>0.05°C                   | 0.5°C<br>0.3°C                                   | -200 to<br>-10°C<br>-100 to<br>+900°C                        | 0.01°C<br>0.01°C           | 0.4°C<br>0.2°C                          |
| L | -200 to<br>-100°C<br>-100 to<br>+900°C                                   | 0.05°C<br>0.05°C                   | 0.3°C<br>0.2°C                                   | -200 to<br>+900°C  | 0.01°C                     | 0.3°C<br>0.2°C                          |

|         |   |                           |                               |                                   |                  |                               |
|---------|---|---------------------------|-------------------------------|-----------------------------------|------------------|-------------------------------|
| C       | -20 to +900°C<br>+900 to 2310°C                     | 0.1°C<br>0.1°C            | 1.0°C<br>0.05% RDG<br>+ 0.2°C | -20 to +900°C<br>+900 to 2310°C   | 0.01°C           | 0.5°C<br>0.05% RDG<br>+ 0.2°C |
| N       | -240 to -190°C<br>-190 to -110°C<br>-110 to +1300°C | 0.20°C<br>0.1°C<br>0.05°C | 1.5°C<br>1.0°C<br>0.3°C       | -240 to -100°C<br>-100 to +1300°C | 0.01°C<br>0.01°C | 1.5°C<br>0.4°C                |
| Platine | -100 to +1400°C                                     | 0.05°C                    | 0.4°C                         | -100 to +1395°C                   | 0.01°C           | 0.4°C                         |
| Mo      | +0 to +1375°C                                       | 0.05°C                    | 0.2°C                         | +0 to +1375°C                     | 0.01°C           | 0.3°C                         |

Accuracy is given for reference @ 0°C.

Accuracy when using the internal reference junction: front terminal board:  $\leq 0.2^\circ\text{C}$  and rear terminal board:  $\leq 0.4^\circ\text{C}$

Normal rejection for 10 mV, 50 / 60 Hz:  $< 0.1^\circ\text{C}$  over R and S thermocouples and  $< 0.03^\circ\text{C}$  over the others

Common mode rejection for 10 V, 50 / 60 Hz:  $< 0.03^\circ\text{C}$  over R and S thermocouples and  $< 0.01^\circ\text{C}$  over the others

Temperature coefficient:  $< 10\%$  of accuracy /°C

## Specifications and performances in process @23°C $\pm 1^\circ\text{C}$

### DC current: Measurement

With or without loop supply

| Range       | Res.              | Accuracy / 1 year              |
|-------------|-------------------|--------------------------------|
| $\pm 60$ mA | 0.1 $\mu\text{A}$ | 0.020% RDG + 0.6 $\mu\text{A}$ |

Temperature coefficient:  $< 10$  ppm/°C beyond reference domain

Loop supply: 24 V  $\pm 10\%$  at 25 mA max

Max voltage drop: 1.2 V

Normal mode rejection: 80 dB

### DC voltage: Measurement

| Range   | Res.              | Accuracy / 1 year              |
|---------|-------------------|--------------------------------|
| +60 mV  | 0.1 $\mu\text{V}$ | 0.010% RDG + 6 $\mu\text{V}$   |
| +600 mV | 1 $\mu\text{V}$   | 0.010% RDG + 6 $\mu\text{V}$   |
| +6 V    | 10 $\mu\text{V}$  | 0.010% RDG + 30 $\mu\text{V}$  |
| +60 V   | 100 $\mu\text{V}$ | 0.010% RDG + 300 $\mu\text{V}$ |

Temperature coefficient:  $< 10$  ppm/°C beyond reference domain

Input resistance: over 60 mV / 600 mV / 6 V ranges:  $> 1000$  M $\Omega$ , input current:  $< 200$  pA and

over 60 V range: 10 M $\Omega$   
 Max permissible voltage on all ranges: 100 V or AC peak  
 Max permissible common mode voltage: 250 V AC or 350 V peak  
 Normal mode rejection (60 mV range): > 80 dB  
 Common mode rejection (60 mV range): > 150 dB

### Resistance: Measurement

| Range              | Measurement range | Res.          | Connection                    | Accuracy / 1an  |
|--------------------|-------------------|---------------|-------------------------------|---|
| 0 to 600 $\Omega$  | 1 mA              | 1 m $\Omega$  | 4 wires<br>3 wires<br>2 wires | 0.010% RDG + 6 m $\Omega$<br>0.010% RDG + 20 m $\Omega$<br>0.010% RDG + 50 m $\Omega$   |
| 0 to 6000 $\Omega$ | 0.1 mA            | 10 m $\Omega$ | 4 wires<br>3 wires<br>2 wires | 0.010% RDG + 40 m $\Omega$<br>0.010% RDG + 80 m $\Omega$<br>0.010% RDG + 100 m $\Omega$ |

4 wires: permissible line resistance over wires  $\Omega$ 3 or  $\Omega$ 4: < 10 k $\Omega$  per wire, over wires + or -: < 350  $\Omega$  per wire  
 3 wires: add error: < 50  $\Omega$   
 2 wires: add error due to resistance of connection wires (+ and -). Measurement line resistance and unit internal residual can be taken into account: < 20 m $\Omega$   
 Max voltage in open circuit: 10 V  
 Max applicable voltage: 100 V DC or AC peak

### DC current: Emission

With or without loop supply

| Range   | Resolution  | Accuracy / 1 year        |
|---------|-------------|--------------------------|
| 0-60 mA | 0.1 $\mu$ A | 0.020% RDG + 0.8 $\mu$ A |

Temperature Coefficient < 10 ppm/ $^{\circ}$ C beyond reference domain  
 Max output voltage: 30 V  
 Possible external supply:  $\leq$  30 V  
 Source resistance: > 100 MW  
 Protection against external voltage : between -20 and 100 V

### DC voltage: Emission

| Range   | Emission range     | Res.        | Accuracy / 1an           |
|---------|--------------------|-------------|--------------------------|
| +600 mV | -100 mV to +600 mV | 1 $\mu$ V   | 0.015% RDG + 6 $\mu$ V   |
| +6 V    | - 1V to +6 V       | 10 $\mu$ V  | 0.015% RDG + 30 $\mu$ V  |
| +60 V   | -10 V to +60 V     | 100 $\mu$ V | 0.015% RDG + 300 $\mu$ V |

|         |                    |           |                        |
|---------|--------------------|-----------|------------------------|
| +600 mV | -100 mV to +600 mV | 1 $\mu$ V | 0.015% RDG + 6 $\mu$ V |
|---------|--------------------|-----------|------------------------|

Max current for positive output: 60 mA (except: 60 V range: 30 mA)

Max current for negative output: -5 mA

Internal resistance: < 0.5 mW at front terminals and < 2 mW at rear terminals.

Max permissible overvoltage on output terminals: from -18 V to 100 V DC or AC peak.

### Resistance: Emission

| Range         | Emission range     | Res.          | Accuracy / 1 year           | Nota lext         |
|---------------|--------------------|---------------|-----------------------------|-------------------|
| 600 $\Omega$  | 0 to 600 $\Omega$  | 1 m $\Omega$  | 0.010% RDG + 10 m $\Omega$  | 0.5 mA / 2.5 mA   |
| 6000 $\Omega$ | 0 to 6000 $\Omega$ | 10 m $\Omega$ | 0.010% RDG + 100 m $\Omega$ | 0.05 mA / 0.25 mA |

Temperature coefficient: < 10 ppm/ $^{\circ}$ C beyond reference domain

Max permissible current and voltage:

600  $\Omega$  range: 100 mA or 60 V DC or peak

6000  $\Omega$  range: 10 mA or 60 V DC or peak

lext : Current received by the calibrator

### Further features

|   |   |
|---|---|
| Analogue output                             | 0 to 2.55 V with load > 2.5 k $\Omega$<br>Resolution: 10 mV<br>Accuracy: $\pm$ 10 mV  |
| Establishing time                           | < 25 ms over every function   |
| Alarm thresholds                            | 2 alarms with sound signal and relay output (1 A, 220 V~, 60 VA max)  |
| Scaling in measurement and simulation modes | Linear scaling ( $X = aY + b$ ) or programmable segments to create a response curve (9 segments)  |
| Relative measurement                        | The features allows the following : <ul style="list-style-type: none"> <li>• Programming a reference value different from the one of the instrument (NUL function).</li> <li>• Subtracting of constant value by measuring or programming it from a measured value (TARE function).</li> </ul> |
| Digital filter                              | A programmable digital filter enables the PJ 6301 to display a smoothed value taking into account previous measurements.  |
| Square root                                 | In current measurement and simulation, this function allows taking into account a quadratic signal coming from transmitter of type $\Delta P$ .   |
| Trigger function                            | Acquisition on request can be replaced by   |

|                       |  |
|-----------------------|--|
|                       | triggered acquisition, one by one or with an acquisition procedure where number of measurements and time interval between measurements can be programmed. Measurements of a burst are stored and can be processed off-line in the various ways described in the following paragraph. |
| Statistical functions | Continuous display of average, minimum and maximum value of the signal under monitoring, as well as number of measurements.  |
| 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      | Emitted value can vary by steps, whose amplitude, direction, and number of iterations are user programmable.   |
| Synthesizer           | With 100 values manually set, CALYS 150 enables users to draw a generation curve.  |
| Transmitter function  | PJ 6301 is able to be used as a transmitter. Measurement input is copied on the output with scaling.   |

## General specifications

|                     |   |
|---------------------|---|
| Size                | 225 x 88 x 310  |
| Weight              | 2 to 3 kg according to the configuration  |
| Display             | Graphical back-lit LCD display, 600,000 counts  |
| Power supply        | 115 / 230 V $\pm$ 10%, 50/400 Hz  |
| Battery (option)    | Type: 12 V<br>Battery life: 2 to 3.5 hours<br>Charging time: 12 to 14 hours   |
| Communication ports | RS 232<br>IEEE488 in option   |
| Storage capacity    | Up to 5 full configurations<br>1,000 measurements in one burst or up to 128 bursts of one measurement. Bursts are tagged with an item number and can be identified with a label.<br>100 different emission values can be stored, values are entered by keyboard or via RS 232 |

## Environmental specifications

|                           |   |
|---------------------------|---|
| Reference range           | 23°C $\pm$ 1°C (RH: 45 to 75% w/o condensing) |
| Operating reference range | 0 to 50°C (RH: 20 to 75% w/o condensing)      |



|                            |  |
|----------------------------|--|
| Limit operating range      | -10°C to +55°C (RH: 10 to 80% w/o condensing)                |
| Storage temperature limits | -30°C to +55°C (-15 to +50°C for model with battery charged) |
| IP protection              | IP40 according to EN60529                                    |

### Safety specifications

|                       |  |
|-----------------------|--|
| Class                 | In accordance with EN 61010-1<br>Category III, pollution 2   |
| Rated voltage         | 60 V   |
| Chocks and vibrations | EN 61010-1   |
| EMC conformity        | <p>Immunity:</p> <ul style="list-style-type: none"> <li>• EN 61000-4-2</li> <li>• EN 61000-4-3</li> <li>• EN 61000-4-5</li> <li>• EN 61000-4-6</li> <li>• EN 61000-4-11</li> </ul> <p>EN 61000-4-4<br/>Conducted and radiated emissions:</p> <ul style="list-style-type: none"> <li>• EN 55022, class B</li> <li>• EN 61000-3-2</li> <li>• EN 61000-3-3</li> </ul> |

# Models and accessories

## Instrument:

PJ 6301-1 High accurate benchtop multifunction calibrator

Delivered in standard with:

- Carrying case
- Factory test report
- RS 232 interface

PJ 6301-2 High accurate benchtop multifunction calibrator

Delivered in standard with:

- Carrying case
- Factory test report
- RS 232 interface
- Battery + charger

PJ6301-3 High accurate benchtop multifunction calibrator

Delivered in standard with:

- Carrying case
- Factory test report
- RS 232 and IEEE 488 interface

PJ6301-4 High accurate benchtop multifunction calibrator

Delivered in standard with:

- Carrying case
- Factory test report
- RS 232 and IEEE 488 interface
- Battery + charger

## Accessories:

AN6901 Soft case for benchtop instruments

AN5836 IEEE 488 cable

Length: 2 m

AN5875 RS232 9p F cable

AN5883 Bracket mounting for panel installation (T2 box type)



AN5884                Rack mounting kit for rack installation (T2 box type)

LCL301-OFA        PC software in English

Available for free download from our web site

## Certification:

QMA11EN            COFRAC certificate of calibration

With all relevant data points where the device has been tested

## Packing information:

Size                    255 x 88 x 310 mm

Weight (gross)      2 to 3 kg according to the configuration chosen