# AUTOMATION

# SENSORS AND TRANSDUCERS TRAINER



**DL 2312HG**

## DIDACTIC EXPERIENCE:

**Sensor:**
- Slider potentiometric sensor
- Rotary potentiometer sensor
- Linear Variable Differential Transformer Characteristics
- Integrated circuit-based accurate sensor
- Negative Temperature Coefficient sensor - fast response sensor
- Diode temperature sensor - one centigrade, precision design
- Ready-to-use K type sensor Detector, wide range sensor
- Photovoltaic cell – EM radiation intensity sensor
- Photodiode – fast light sensor
- Phototransistor – simple light sensor
- Light Dependent Resistor – total light sensor
- Slotted optical switch - digital sensor
- Reflexive, accurate rotational position sensor
- Hall, non-contact switching sensor
- Inductive proximity sensor
- Tachogenerator, the oldest, the simplest sensor
- Servo-potentiometer
- Strain gauge measurements

This sensors and transducers trainer is designed to teach the operating principles of the most important sensors/transducers. It is subdivided in two sections: in the lower section there are all the input and output transducers, while in the upper side there are all the signal conditioning systems as well as the instrumentation.

**TECHNICAL FEATURES:**
In a compact structure the DL 2312HG includes sensor and transducers, signal conditioning components and instruments.

**Sensors and transducers:** IC transducer, Thermistor, RTD, Phototransistor, Photovoltaic cell, Photoinductive cell, Photodiode, Slotted optosensor, Reflective optosensor, Hall effect sensor, Inductive sensor, Tachogenerator, DC motor, Servo potentiometer, Strain gauge, Logarithmic slide potentiometer, LVDT, Wheatstone bridge, Carbon track potentiometer, Conductive plastic potentiometer, Linear slide potentiometer, Relay, Microphone, Loudspeaker, Humidity sensor, Ultrasonic sensor, Buzzer, Flow sensor, Pressure sensor.

**Signal conditioning components:** DC amplifiers, AC amplifiers, power amplifiers, current amplifiers, buffer amplifier, inverting amplifier, differential amplifier, V/F converter, F/V converter, I/V converter, V/I converter, complete wave rectifier, hysteresis switchable comparator, alarm oscillator, electronic switch, oscillator, filter, switchable low-pas filter, adding amplifier, integrator with switchable time constant, instrumentation amplifier, sample & hold circuit, gain and off set control amplifier.

**Instruments:**
Digital voltmeter, timer, frequency meter, counter, bargraph.
Communication via RS485 serial interface using Modbus RTU protocol.

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- Humidity sensor
- Piezoelectric sensor.
- Sound sensor using a dynamic microphone
- Obstacle and distance detector
- Mass air flow, with superior resistance to environments sensor
- Pressure sensor

**Actuators:**

- The study of the relay
- Study of the electronic switch
- Study of the sample and hold function
- The motor controlled by three input signals
- Additional considerations in conditioning. Load impedance effect compensation
- Additional considerations in conditioning. The use of the gain for accurate control

**Process control:**

- Alarming circuit in over-temperature condition Page
- Optical alarm for over-speed regime of the DC motor
- Level monitoring for pump control

Complete with manuals, connecting cables and data acquisition software.
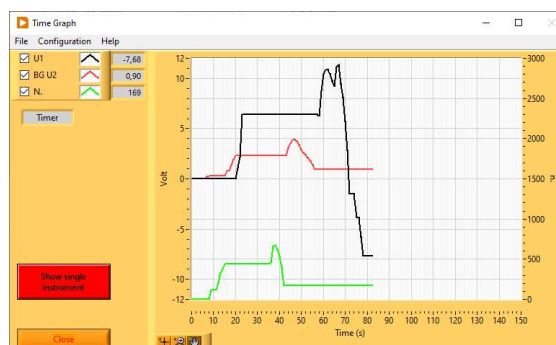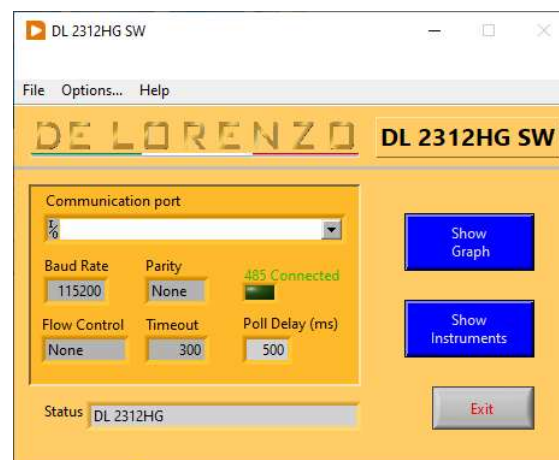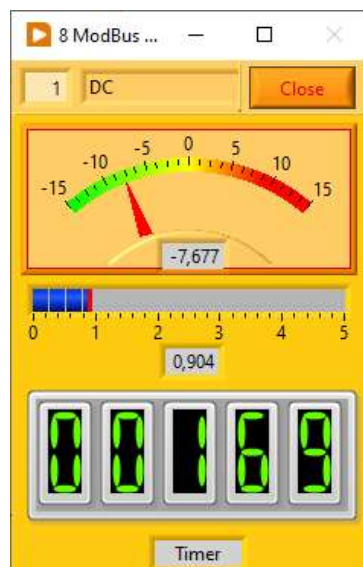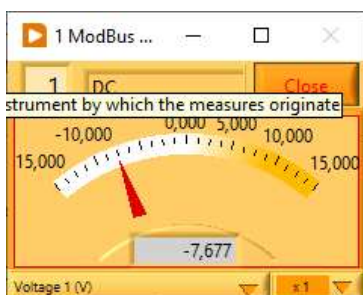
**The components have the following technical features:**

The trainer must include the following input sensors/transducers:
linear slide potentiometer, rotary potentiometer, precision servo potentiometer, Wheatstone bridge circuit, thermistors NTC, RTD platinum sensor, IC temperature sensor, thermocouple, phototransistor, PIN photodiode, photoconductive cell, photovoltaic cell, LVDT, extensiometric transducer, linear position sensor, air flow sensor, air pressure sensor, humidity sensor, opto-electronic sensor, opto-reflecting sensor, inductive sensor, Hall effect sensor, dc tachogenerator, microphone;

**Resistance transducers for applications in linear or angular position.**
- Linear slide potentiometer 10 KΩ
- Rotary potentiometer 100 KΩ linear
- Conductive plastic potentiometer 1 KΩ linear
- Precision servo potentiometer 20 KΩ Wheatstone Bridge Circuit

**Temperature applications**
"Thermistors NTC:
- resistance @ 25°C: 400 kΩ
- resistance @ 50°C: 118 kΩ
- B-constant (B25/50(K)): 4700 ±7%

RTD platinum sensor
- Temperature range: -50°C to +600°C
- Nominal resistance @ 0°C: 100Ω

IC temperature sensor
- Scale factor: +10mV/°C
- Accuracy: ±0.5°

Thermocouple: ""K"" type, 260°C max. continuous Light applications

**"Phototransistor**
- V(BR) ceo: 30 V; I(c) abs: 25mA
- P(D) max: 100mW ; V(CE) sat: 400mV max
- Tresp.: 5ms

PIN Photodiode , I = 1 nA/Lux
Photoconductive cell, R(dark) = 10 MΩ
Photovoltaic cell, V(insulated) = 3V"
Linear position and force

**"LVDT, Linearly Variable Differential Transformer:**
- Primary: 69Ω
- Secondary: 200Ω

**Extensiometric transducer:**
- Resistance. 320Ω ±20% linear
- Linearity:  ±2%
- Operating force: from 2 to 7.5 N

Linear Position Sensor, Resistance: 5kΩ ±20% linear "

**Environmental measurements:**
- Air flow sensor, Flow Range +/- 200sccm
- Air pressure sensor, Pressure Range 30 psi, gauge type
- Humidity sensor"

**Rotational velocity and position control:**
- Opto-electronic sensor Slot width: 3.15 mm

- Opto-reflecting sensor:
- Diode (Vf: 1.8V max, Vr: 2V max, Pd: 50mV)
- Transistor (Vceo: 15V max, Vceo: 5V max)"

**Inductive sensor:**

- Diameter: 6.35mm
- Length: 22mm
- Coil resistance: 130 Ω
- Coil inductance: 12mH±10%
- Output: 10Vpp"

**Hall effect sensor:**

- Supply voltage: 25 Vmax.
- Output: 5V @ 5V supply and zero magnetic flow
- Output current: 10mA"

**DC tachogenerator, DC motor 12 V**

**Pneumatics application:**

- Solenoid valve, 3/2-way valve NC, 7 bar max
- pneumatic cylinder, Stroke 10mm, 6 bar max.
- pneumatic switch, 3/2 valve NC, stem actuated"

**Sound measurements:**

- Microphone, 50Hz – 10KHz

**The following output sensors/transducers**:
electric resistance, incandescent lamp, buzzer, moving coil loudspeaker, ultrasonic transmitter, ultrasonic receiver, dc solenoid, dc relay, dc motor; and the following signal conditioning components:

**Electric resistance**

**Incandescent lamp**

**Sound output applications:**

- Buzzer, Frequency: 2.5kHz
- Moving coil loudspeaker, Impedance: 8Ω
- Rated power: 200mW
- Bandwidth: 400Hz to 5kHz"

**Ultrasonic transmitter:**

- Frequency: 40kHz
- Bandwidth: 4kHz/112 dB
- Sound pressure level: 119 dB/40

**Ultrasonic receiver:**

- Frequency: 40kHz
- Bandwidth: 3.5kHz/71 dB
- Sound pressure level: 65 dB/40"

**Linear or angular movement applications**