Servo-systems & Process Control

didalab
GÉNIE ÉLECTRIQUE

D_SciL

ERD 540

D_REG

Practical works manuals
Ref: ERD540041

Operating part
Ref: ERD 540 000

ERD 540 000

Régulation Débit / Température d'Air

Made in France

AIR FLOW & TEMPERATURE – BASIC OR CASCADE CONTROL

CHARACTERISTICS:

▸ This **ERD 60 000** module enables a very progressive study of the air pressure control principles.

TOPICS (ERD540C package):

▪ Study of a current loop
▪ Test in **O**pen **L**oop (air flow)
▪ Test in **O**pen **L**oop (air temperature)
▪ Flow process control with corrector:
- **P**, **P I**, **PID**
- **Z-**transform
▪ Flow process control with corrector:
- **P**, **P I**, **PID**
- **Z-**transform
- Negative action on the flow
- Cascade control or dual loop

Service functions:

In addition to the control and display functions, the software also enables:

▪ Signal generation: step, ramp, sine

▪ Test and time display of flow and temperature outputs (comparator, **P**roportional, **I**ntegral, **D**erivate, **A**dder)

▪ Automatic measurements of time constants, 5% response time, overlap, phase shift, attenuation

▪ Recording

▪ Tests comparison

Optional extra:

D_Scil, creation of new correctors, real-time, prototyping

AREAS OF APPLICATION:

Initial training and in-service training:

Quick training very close to technical reality in process control:

▸ **Vocational training**
Secondary schools for vocational training, Vocation training centers

▸ **Technical high schools, polytechtnics**
Technical high schools, Polytechnics

▸ **Technical Universities, Engineering Schools, Universities.**

SECURITIES:

The control module meets the due safety standards (laboratory equipment, 611010 standard). It is double insulated, all connections are made by 4-mm leads (double sink), no high temperature part is accessible to the student.

CONSTITUTION:

The ERD540000 consists of 1 PVC frame that supports the operating part (tunnel with moto-fan and heating element, 2 disturbances for flow and heating power), 1 high power electronic board (ARM9 + 400000-gate FPGA) for the control of power interfaces and the 4/20 mA current loop adaptations, 1 embedded power supply.

Characteristic quantities:

▪ Time constant: 380 ms (flow)
▪ Time constant: 22 s (temperature)
▪ 1 flap for flow disturbance, modifying the inlet diameter
▪ Temperature disturbance by heat power variation
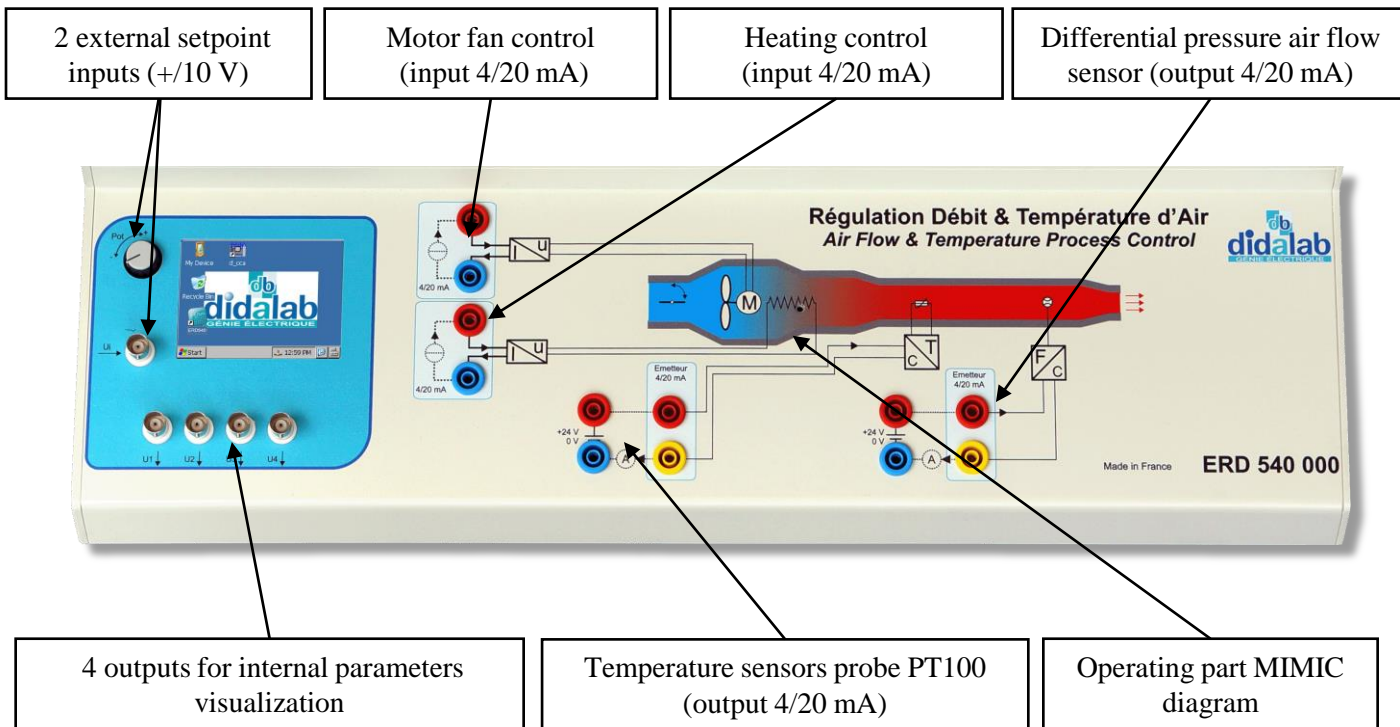
REQUIRED EQUIPMENT:

→ PC with Windows
→ Ammeter
Optional: industrial corrector with 2 channels
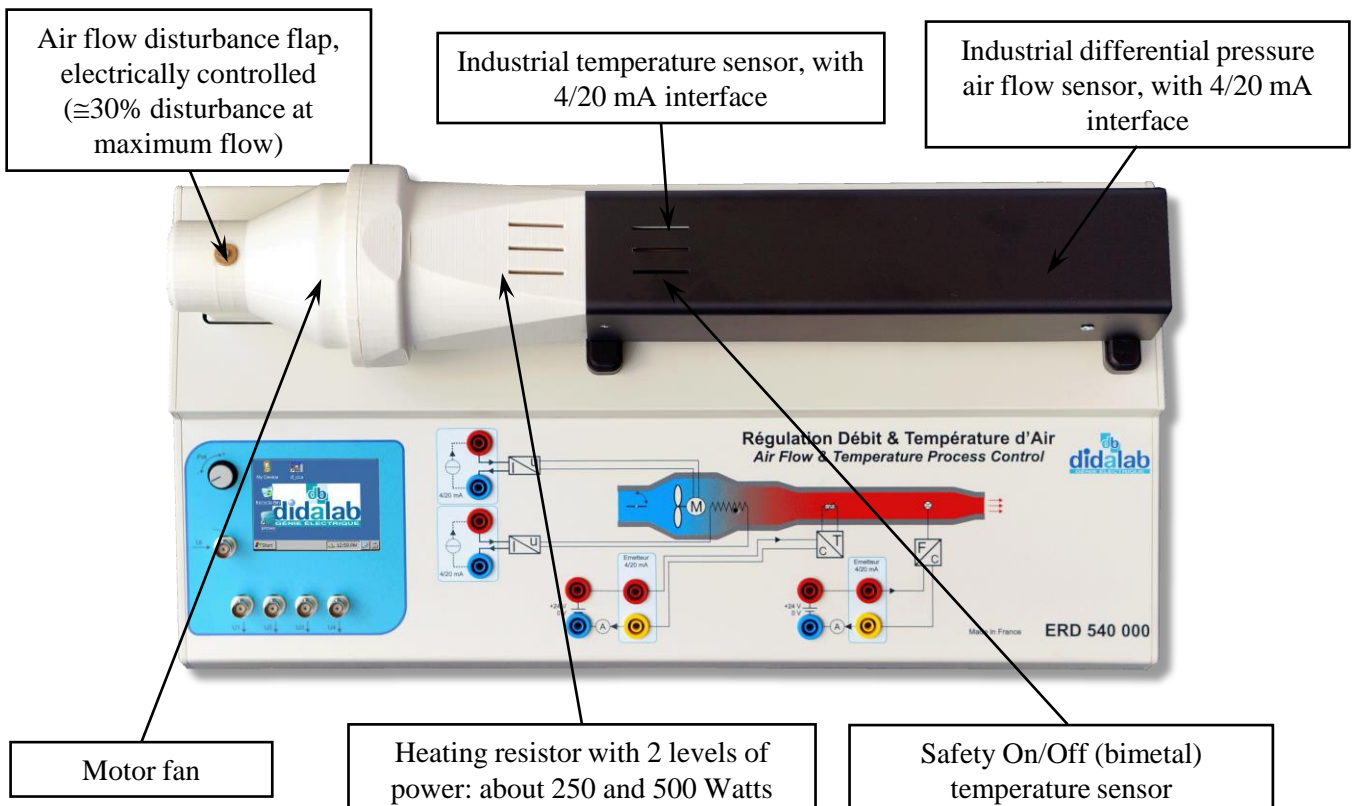
MADE IN FRANCE
FABRICATION FRANÇAISE

ERD 540 000 AIR FLOW/TEMPERATURE PROCESS is composed of:

1 CONTROL PANEL, with 1 pedagogical front panel, including the necessary connections to sensors/actuators, and the internal power.

I/O variables are accessible by Ethernet link in the case for a control through D_REG software or by external control with PLCs or electronic device.

| 2 external setpoint inputs (+/10 V) | Motor fan control (input 4/20 mA) | Heating control (input 4/20 mA) | Differential pressure air flow sensor (output 4/20 mA) |

| 4 outputs for internal parameters visualization | Temperature sensors probe PT100 (output 4/20 mA) | Operating part MIMIC diagram |

1 OPERATING UNIT:

| Air flow disturbance flap, electrically controlled (≅30% disturbance at maximum flow) | Industrial temperature sensor, with 4/20 mA interface | Industrial differential pressure air flow sensor, with 4/20 mA interface |

| Motor fan | Heating resistor with 2 levels of power: about 250 and 500 Watts | Safety On/Off (bimetal) temperature sensor |

ERD 540 100: D_REG, LOGICIEL DE REGULATION:

It enables the user, via an ergonomic graphical interface, to configure the system:

- ▪ selection of the system structure: flow or temperature open loop / closed loop systems.
- ▪ selection of control type and specific values: constant step, ramp, sine, trapezoid signals.
- ▪ selection of the corrector and its adjustments (can be modified during operation).
- ▪ selection of acquisition and recording settings.
- ▪ selection of measurements units.

It also enables the structured running of experimental work:

- ▪ request of time response display of one (or several) characteristic parameter(s): flow, temperature, spacing, corrector output, etc…
- ▪ modification of time diagram scales (X or Y zoom).
- ▪ recording of the running test, comparison with the previous tests.
- ▪ response curves recording.
- ▪ transfer of result curves to be controlled by others process software such as *MATLAB*
- ▪ determination of automatic control characteristic values:
  - ✓ response to a constant level: time constant, 5% response time, overflow
  - ✓ sine excitement: average value, amplitude, frequency, period
  - ✓ harmonics: average and amplitude ratios, phase difference

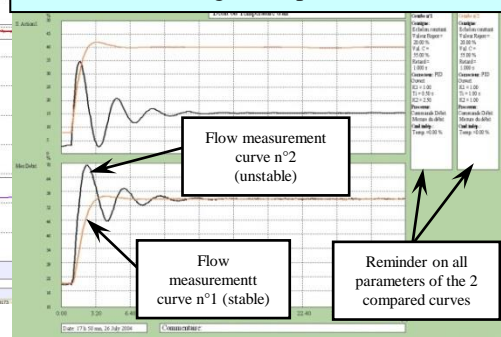## Examples of curves through *D_REG*:

Main page window – Closed loop in air flow control with PI correction
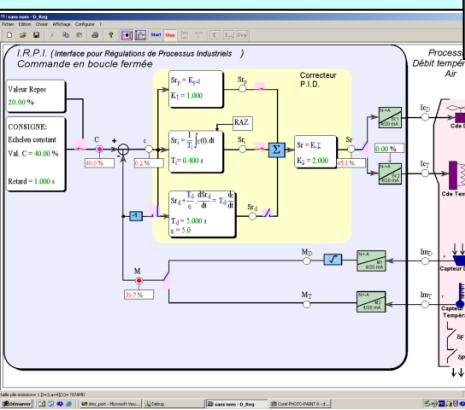
Closed loop response (PI) in air flow control without disturbance, automatic harmonic calculation at 5%

Measurement
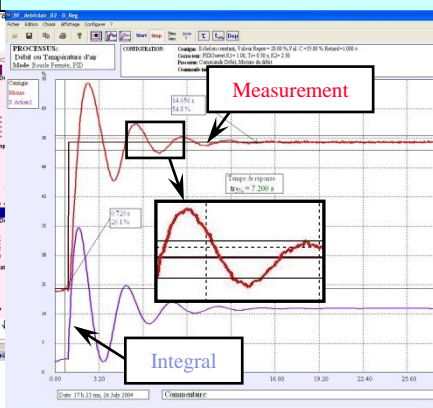
Integral

Comparison between two types of parameters (air flow measurement and integral output)

Flow measurement curve n°2 (unstable)

Flow measurementt curve n°1 (stable)

Reminder on all parameters of the 2 compared curves

ERD 540 800: D_Scil Creation module of real-time correctors under Scilab/XCOS

D_Scil: Complete development process, representative of current methods in automation developments. This method is described here after in 5 main successive steps. It is a tangible representation of development in the industrial technology field, as its aim is to achieve cost optimization in both software development and hardware prototyping.

STRENGTHS

- ▸ Automatic generation of real-time corrector
- ▸ Creation of new real-time correctors
- ▸ Knowledge in real-time computing aren't required
- ▸ Convenient for research studies

STANDARD CONFIGURATIONS:

Reference	Designation	Qty
ERD540B : « AIR FLOW & TEMPERATURE PROCESS CONTROL » Basic package		
ERD540000	Air temperature & flow process control actuator	1
ERD540011	Technical/User manual	1
ERD001000	Kit of 20 security patch leads Ø4 mm (4 yellow, 6 blue, 6 red, 2 black, 2 purple)	1
ERD540041	Practical works manual: Air flow process control (student's manual), with files on CDROM	1
ERD540051	Practical works manual Air flow process control (teacher's manual), with files on CDROM	1
ERD540061	Practical works manual: Air temperature process control (student's manual), with files on CDROM	1
ERD540070	Practical works manual : Air temperature process control (teacher's manual), with files on CDROM	1

Reference	Designation	Qty
ERD540C: « AIR FLOW & TEMPERATURE PROCESS CONTROL » Complete package		
ERD 540 B	**« Air temperature & flow process control » Basic Package**	**1**
ERD540100	CDROM including the software D_REG, process control & acquisition under Windows	1
EGD000010	UTP RJ45 lead	1

Reference	Designation	Qty
ERD540S : **« ETUDE D'UNE REGULATION DE DEBIT ET TEMPERATURE D'AIR & PROTOTYAGE RAPIDE »**		
ERD 540 C	**« Air temperature & flow process control » Complete package**	**1**
ERD540800	D_Scil Creation module of real-time correctors under Scilab/XCOS	1

OPTIONAL:

AUTONOMOUS COMMAND

ERD540300: Command in autonomous mode (choice and configuration of: the corrector, the set point value, the visualized measures)

Nota: this option is factory-fitted.

POWER SUPPLY:

Electric single-phase 240 V 50 Hz 1A

PACKING:

Packed equipment dimension: (L, W, H) 600 × 300 × 250 mm
Gross weight: 9 kg