



LABORATORY PLANNING GUIDE

L52 v2 Instrumentation & Calibration Laboratory

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Covered subjects according to the curriculum

Major topics of learning content:

- transmission behaviour of electronic and pneumatic control loop components
- calibration of electronic and pneumatic control loop components
- calibration of manometers
- familiarisation with the design and operation of a piezo-resistive electronic pressure sensor
- mode of operation of control loop components: transducers, actuators and controllers
- familiarisation with different signals: pneumatic and electrical
- measuring methods for air humidity measurement
 - * psychrometric humidity measurement
 - * hygrometric humidity measurement
 - * capacitive humidity measurement
- changes of the state of humid air in the h-x diagram
- determination of the relative air humidity with different methods
- familiarisation with the various methods of temperature measurement
 - * non-electrical methods: gas- and liquid-filled thermometers, bimetallic thermometers and temperature measuring strips
 - * electric methods: thermocouple, resistance temperature detector Pt100, thermistor (NTC)
- calibrating electric temperature sensors
- principle of a Bourdon tube pressure gauge
- different flow meters and their principles of operation
 - * rotameter
 - * electromagnetic flow meter
 - * ultrasonic flow meter
 - * venturi nozzle
 - * pitot tube
 - * orifice plate flow meter
 - * measuring nozzle
 - * paddle wheel flow meter
 - * orifice plate flow meter with transducer
 - * baffle plate flow meter
- calibration of different flow meters
- position dependency of flow meters
- plotting and comparison of pressure loss curves
- plotting characteristics of industrial valves and fittings
- determining the Kvs value of the control valve
- characteristics of a centrifugal pump
- pressure losses at the dirt trap depending on the filter and its load
- planning, execution and assessment of maintenance and repair operations
- reading and understanding engineering drawings and operating instructions

Main concept

The laboratory is designed for accommodation of 24 students + 2 laboratory staff:

- 2 - 4 students form a team and work together at a workstation / training system
- 8 different workstations
- All workstations are floor standing or on a laboratory table
- 1 of the workstations is equipped with a PC
- Each workstation is equipped with a manual containing technical information, basic theory, experiment instructions, evaluation help and safety advice.
- Student teams are scheduled to change workstations from lab session to lab session in order to perform the entire range of experiments within the course duration.
- Average time per experiment: 90 to 120 minutes.
- 2 workstations for laboratory staff (with PC and internet access)
- 1 printer for common use
- 1 cupboard for small parts, consumables, tools, paper etc.

Initial training provided for laboratory personnel

Trainer: Specialized engineer of G.U.N.T. Gerätebau GmbH, Germany.

To be conducted immediately after installation and commissioning of the equipment.

General topics to be covered for any of the educational systems:

- Basic familiarization with the system.
- Functions and components.
- Overall system configuration aspects.
- Start-up and operational aspects.
- Conduction experiments, including evaluation and calculation.
- Using the system with and without the software (where applicable).
- Trouble shooting and maintenance aspects.
- Hands-on, practical familiarization aspects.
- Seminar participants with the delivered system.
- Details of the manuals.
- Safe operation and preventive maintenance.

Requirements / Utilities

Power supply:

- 230 V / 50 Hz / 1 phase – at least 20 power sockets
- 400 V / 50 Hz / 1 phase – at least 1 power socket

Others:

- 3 x compressed air

Laboratory computer network:

- 2 internet connections for staff
- 1 internet connection for students

Location:

- Laboratory space min 72 m²
- This laboratory could be installed on any floor (e.g. ground floor or 1st floor)

Schedule of requirements

Item No.	Description	Quantity
Item 1	Calibration trainer	2 pcs.
Item 1.1	Controller, electronic	1 pcs.
Item 1.2	Pressure transmitter, electronic	1 pcs.
Item 1.3	Differential pressure transmitter, electronic	1 pcs.
Item 1.4	Current-to-pressure converter	1 pcs.
Item 1.5	Pneumatic control valve with electro-pneumatic positioner	1 pcs.
Item 1.6	Control valve, electric	1 pcs.
Item 1.7	Thermocouple type K and calibrator	1 pcs.
Item 1.8	Bourdon tube pressure gauge	1 pcs.
Item 1.9	Diaphragm pressure gauge	1 pcs.
Item 1.10	Tool set	4 pcs.
Item 2	Calibration station	1 pcs.
Item 2.1	Pressure transmitter, pneumatic	1 pcs.
Item 2.2	Differential pressure transmitter, pneumatic	1 pcs.
Item 2.3	Square root extractor, pneumatic	1 pcs.
Item 2.4	Current-to-pressure converter	1 pcs.
Item 2.5	Pneumatic PID-controller	1 pcs.
Item 2.6	Pneumatic control valve with pneumatic positioner	1 pcs.
Item 2.7	Pressure transmitter, electronic	1 pcs.
Item 2.8	Differential pressure transmitter, electronic	1 pcs.
Item 2.9	Pneumatic control valve with electro-pneumatic positioner	1 pcs.
Item 2.10	24VDC motorised valve with resistance teletransmitter	1 pcs.
Item 2.11	Transmitter for Pt100, electronic	1 pcs.
Item 2.12	Transmitter for thermocouple Type K	1 pcs.
Item 2.13	Transmitter for thermocouple Type J	1 pcs.
Item 3	Calibrating a pressure sensor	1 pcs.
Item 4	Fundamentals of humidity measurement	1 pcs.
Item 5	Fundamentals of temperature measurement	1 pcs.
Item 6	Fundamentals of pressure measurement	1 pcs.
Item 7	Flow meter trainer	2 pcs.
Item 7.1	Rotameter	1 pcs.
Item 7.2	Electromagnetic flow meter	1 pcs.
Item 7.3	Ultrasonic flow meter	1 pcs.
Item 7.4	Venturi nozzle	1 pcs.
Item 7.5	Pitot tube	1 pcs.
Item 7.6	Orifice plate flow meter	1 pcs.
Item 7.7	Measuring nozzle	1 pcs.
Item 7.8	Paddle wheel flow meter	1 pcs.
Item 7.9	Orifice plate flow meter with transducer	1 pcs.
Item 7.10	Baffle plate flow meter	1 pcs.
Item 8	Pump and valves and fittings test stand	1 pcs.