LABORATORY PLANNING GUIDE

L12 Properties of Materials Laboratory

Content

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Covered subjects according to the curriculum

Major topics of learning content:

- Tensile tests
- Recording of stress-strain diagrams
- Brinell hardness testing
- Compressive strength tests
- Bending tests
- Cupping tests
- Shear tests
- Testing of disc and helical springs
- Determination of notched bar impact work
- Determination of notched bar impact strength
- Evaluation of fracture surface characteristics
- Notched bar impact work-temperature curve
- Influence of notch shape on the notched bar impact work
- Influence of materials and their prior heat treatment on the notched bar impact work
- Influence of specimen temperature on the notched bar impact work
- Torsion tester for metallic test bars, loading to destruction of the specimens
- Effect of specimen material, specimen cross-section and specimen length
- Creep experiment with a lead specimen
- Creep experiment with a plastic probe
- Fatigue strength of bars subject to cyclic bending load
- Influence of different curvature radii and surface
- Finish on fatigue strength
- Stress-number (S-N) curve

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
- 18 workstations with 26 different experiment units
- 12 laboratory tables and storage space required for alternating use
- 12 workstations are 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 30 power sockets distributed according to lab lay-out

Laboratory computer network:

- 2 internet connections for staff
- 12 internet connections 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	Material testing, 20kN	6 pcs.
Item 1.1	Data acquisition system	6 pcs.
Item 1.2	Set of 4 tension test rods: aluminum, copper, steel, brass	30 pcs.
Item 1.3	Bending device	2 pcs.
Item 1.4	Compression plates, set of 2, with fastening elements	2 pcs.
Item 1.5	Coil spring test, 2 sets	2 pcs.
Item 1.6	Disk spring test	2 pcs.
Item 1.7	Device for shearing experiments	2 pcs.
Item 1.8	Device for cupping experiments	2 pcs.
Item 1.9	Measuring magnifier for Brinell impression	2 pcs.
Item 2	Impact test, 25Nm	3 pcs.
Item 2.1	System for data acquisition	3 pcs.
Item 2.2	Safety cage for impact tester	3 pcs.
Item 2.3	Set of 10 ISO-V specimens, free cutting steel, 5mm	3 pcs.
Item 2.4	Set of 10 ISO-V specimens, brass, 5mm	3 pcs.
Item 2.5	Set of 10 ISO-V specimens, brass, 10mm	3 pcs.
Item 2.6	Set of 10 ISO-U specimens, free cutting steel, 5mm	3 pcs.
Item 3	Torsion test, 30Nm	3 pcs.
Item 3.1	Torsiometer	3 pcs.
Item 3.2	Set of 6 torsion specimens	3 pcs.
Item 4	Creep rupture test	3 pcs.
Item 4.1	Set of 10 test specimens, PE	3 pcs.
Item 4.2	Set of 10 test specimens, Pb	3 pcs.
Item 5	Fatigue strength test	3 pcs.
Item 5.1	Data acquisition system	3 pcs.
Item 5.2	Set of 3 specimens steel	10 pcs.

Laboratory drawing