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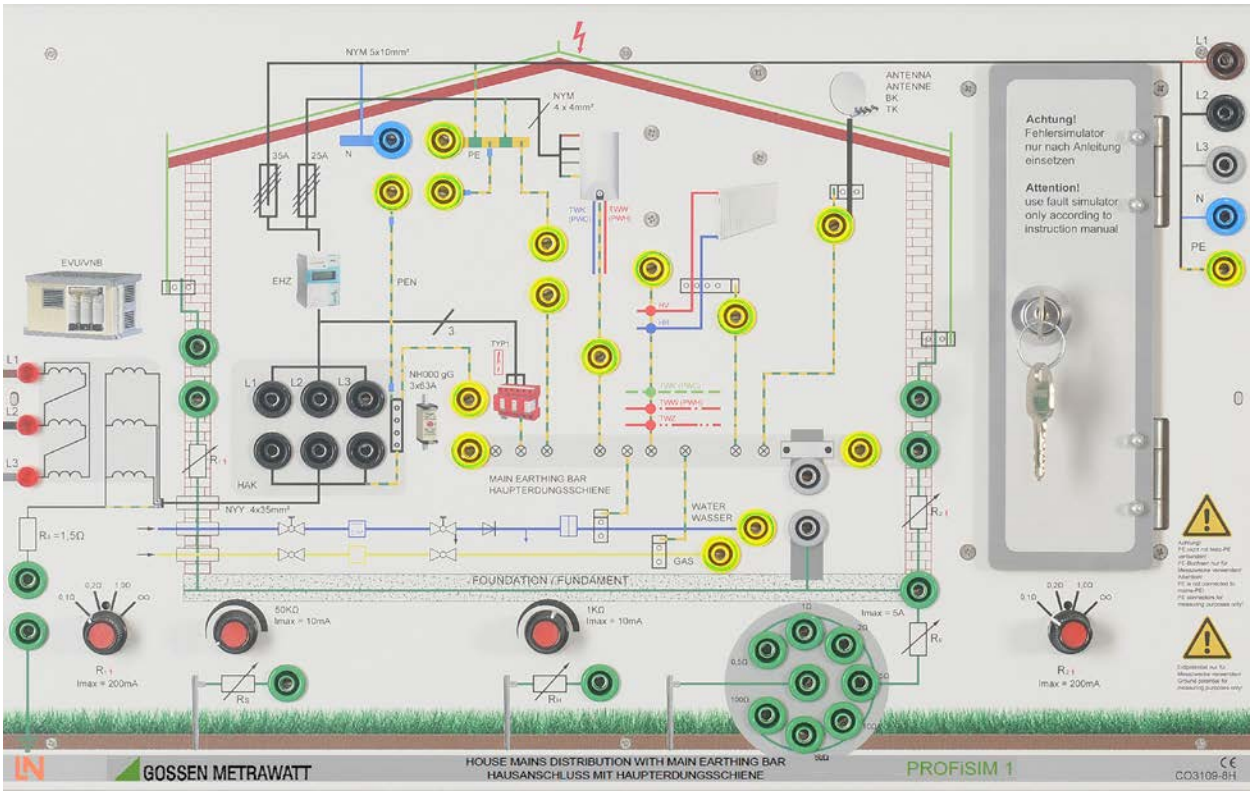

PROFiSIM 1 Installation Board

"Service Line with Main Grounding Busbar – Measurements per DIN VDE 0100-600"

Manufacturer no. CO3109-8H
GMC-I material no. M560A

Preface

These operating instructions are intended to be read, understood and complied with in full by persons who will work with the training system.

They include basic information and instructions which must be observed during the course of installation, operation, maintenance, dismantling and disposal of the training system.

It is therefore essential for trainers, trainees and other users to read these operating instructions carefully before installation and initial start-up. Errors can only be prevented, and trouble-free operation can only be assured, by familiarization with these operating instructions.

Manufacturer's Name and Address

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1 Legal Aspects

1.1 Limitation of Liability

GMC-I Messtechnik GmbH assumes no liability for damage resulting from:

- Unsuitable or incorrect use
- Unauthorized, faulty installation and/or initial start-up by the operating entity or any third party
- Subsequent modifications executed by the operating entity or any third party
- Natural wear and tear
- Negligent or incorrect handling, maintenance or repair
- Non-compliance with the operating instructions
- Inappropriate operating equipment

1.2 Copyrights

These operating instructions are intended for trainers and trainees.

These operating instructions include stipulations and drawings of a technical nature which may not be duplicated, distributed, exploited or disclosed to others without authorization for the purpose of competition, either in part or in their entirety.

The operating entity is only permitted to prepare copies ─ even of excerpts only ─ for the purpose of internal use in conjunction with operation of the training system.

1.3 Target Groups

The target groups of the operating instructions are described as follows:

Target Groups — Tasks — Qualifications

Target Group 1	Tasks	Qualification
Training personnel ▪ Teachers ▪ Trainers ▪ Instructors ▪ Laboratory supervisors	▪ Supervision of trainees ▪ Setup of the training system ▪ Initial instruction on the training system for trainees ▪ Safety instructions for trainees ▪ Enable supply power ▪ Eliminate minor malfunctions ▪ Observe sequences ▪ Recognize malfunctions and safety problems, and assure functional operation of the training system	▪ Electrician

Target Group 2	Tasks	Qualification
Learner ▪ Trainee ▪ Student ▪ Apprentice	▪ Setup of the training system ▪ Training system changeovers ▪ Start up and shut down the training system ▪ Eliminate minor malfunctions ▪ Observe sequences ▪ Recognize malfunctions and safety problems, and assure functional operation of the training system	▪ Must be electro-technically trained persons ▪ Specifically semiskilled persons with reading and writing skills in their national language ▪ Initial instruction on the training system provided by training personnel

1.4 Utilized Symbols

Danger Symbols

Degree of Danger	Usage
⚠ DANGER	This symbol indicates immediate danger for the life and health of persons. Noncompliance with these instructions may result in severe health consequences, up to and including life threatening injuries.
⚠ WARNING	This symbol indicates immediate danger for the life and health of persons. Noncompliance with these instructions may result in health consequences, up to and including dangerous injuries.
⚠ CAUTION	This symbol identifies important instructions for correct, economic work with the training system. Noncompliance with these instructions may result in minor injuries and/or health impairments, as well as disturbances at the training system or in its environment.

2 Basic Safety Precautions

2.1 Safety Information

⚠ DANGER

The training system has been manufactured in accordance with the state-of-the-art and recognized technical safety rules. Nevertheless, incorrect use or use for purposes other than those intended may result in danger to life and limb of the user or third parties, or impairment of the training system or other property.

The training system may only be used when it's in technically flawless condition, and only for its intended purpose in a safety-conscious fashion in full awareness of all possible dangers. Malfunctions which might impair safety must be eliminated immediately.

These operating instructions must be kept in close proximity to the training system, where they must be available to everyone at all times.

Scope of Validity

In addition to the applicable laws of the operating entity's country and internal company or school safety rules for operation, maintenance and installation, the following instructions must also be adhered to.

Each person who is entrusted with use, initial start-up, operation, maintenance and/or repair of the training system must first of all read and understand the corresponding operating instructions and any experimentation instructions.

Valid accident prevention regulations must be kept in close proximity to the training system such that they're plainly visible and accessible to everyone. Instruction must be provided at regular intervals by the responsible employee of the operating entity.

Modifications

Conversion or modification of the training system may only be carried out by the operating entity after consulting with the supplier. The supplier assumes no liability for damage resulting from unauthorized measures. This does not include use of the training system for its intended purpose (setup/changeover and the conducting of experiments with the training system).

Accident-Free Operation

When used for its intended purpose, operation of the training system is safe and is in compliance with the state-of-the-art. The training system may result in danger if:

- The training system is operated by persons without electro-technical training
- The training system is operated incorrectly
- The training system is used for purposes other than those intended

The Operating Entity

⚠ WARNING

All of the safety devices, as well as compliance with the operating instructions provided by the manufacturer, are prerequisites for safe, accident-free operation of the training system.
The operating entity and the training personnel, who must work with the training system in accordance with its assigned tasks, are responsible for accident-free operation.

The operating entity must assure that:

- Training personnel has been trained for its specific tasks in consideration of applicable safety regulations
- Training personnel and trainees are made familiar with the safety regulations for the respective work area, and familiarity is documented
- The safety regulations are always available for examination
- The safety regulations are complied with

Legal Accident Prevention Regulations

In addition to the safety regulations described herein and all of the texts included in these operating instructions which are identified with safety symbols, the following general stipulations for handling the training system are binding as well:

- Safety regulations of the EU member states
- The corresponding safety regulations of countries outside of the EU

Users of the Training System

⚠ WARNING

The device is not equipped with a protective conductor which is fed in from the outside. It may only be used for measuring purposes in accordance with the experimentation instructions.

The supplied training system corresponds with the state-of-the-art, is safe to operate and must be operated by electro-technically trained persons under the supervision of training personnel.

⚠ DANGER

Noncompliance results in danger to life and limb of the operator and/or third parties, impairment of the training system and/or other property, and the risk of working inefficiently with the training system.

Function Tests and Maintenance Work

⚠ DANGER

Function tests and maintenance work conducted at regular intervals promote safety!

Training personnel should first inspect the training system for externally detectable damage and defects. Any safety impairing changes which might occur must be immediately corrected.

The training personnel must assure that the training system is only operated in flawless condition.

Maintenance and cleaning work is not permissible while the training system is being operated.

Protective Devices

Included protective devices may only be removed while setting up or changing over experiments with electrical power switched off, and must be properly reinstalled after completion of such work and before the system is switched on.

Securing the Work Location

During maintenance, cleaning and changeover work at the training system, the work location must be secured in accordance with the respective conditions.

Supply power must be switched off and secured against being switched back on.

Components which cannot be switched off electrically must be secured against inadvertent start-up by removing the respective fuses.

The housings at the back of the device may not be covered, because this could result in overheating of the devices, thus leading to possible failure of the training system.

⚠ WARNING

Fuses may only be removed and replaced by personnel authorized to do so!

2.2 Safety Devices

Safety devices may not be modified, removed or rendered inoperative. Unprotected components can cause life endangering injury.

All safety devices such as safety switches, covers and barriers must always be functional. Operation of the training system with defective or missing safety devices in impermissible. Before starting the training system, the required safety devices must be tested for correct functioning.

2.3 Work Safety Measures

Personal Safety

⚠ CAUTION

Required personal safety equipment must be worn at the workplace.
Wearing loose clothing or jewelry which could get caught up in the training system is impermissible. Long hair must be kept in a hairnet.
Gloves may not be worn while working in direct proximity to moving or turning system components.

⚠ CAUTION

Persons under the influence of drugs, alcohol or medications which effect their ability to react may neither operate, maintain nor repair the training system.

Foot Protection

⚠ CAUTION 

Danger of pinching

Plates have sharp edges and may fall onto the feet if not handled correctly!
Always wear suitable safety shoes.

2.4 Specific Safety Requirements

Danger due to electrical current!

Life endangering current may occur if the training system is not properly grounded!
The training system must be correctly grounded!
Devices with mains plugs are grounded via the mains plug. Devices without mains plugs must be connected to the protective conductor via the green-yellow sockets.

Danger due to electrical current!

It must be assured that the colors of the plug connection cables and sockets of the training system are always matched to each other!
Use green-yellow sockets only for connecting the protective conductor!
Use only green-yellow cables for the protective conductor!

Danger due to electrical current!

Life endangering current may occur if the included cables are not used correctly!
The training system may only be operated with the cables intended for this purpose!
Always use safety cables and safety plugs! Make sure that the measurement cables are in flawless condition.
All experimentation cables must have continuous double insulation.

Danger due to electrical current!

The training system may only be used in electrical circuits which are protected by fuses or circuit breakers with a maximum rating of 16 A!

Danger due to electrical current!

Use the training system's devices with the specified operating voltages only!

3 Description of the Module

3.1 Product Identification and Type Designation

The board is suitable for training with regard to issues covered by DIN VDE 0100-600 or VDE 0105.
The board is a compact building service line with main grounding busbar for consumer systems including a fault simulator, primarily for use involving training measures and project work covering all aspects of "testing systems in accordance with DIN VDE 0100-600". The board is equipped with all of the necessary modules of a building service line including an extended main grounding busbar for the implementation of the listed testing and fault options.
The device is predestined for use as a student training system due to its fault simulation options and compact design.
The console-like design permits use in the experimentation frame or as a benchtop device.

Supplements to the type designation such as CH or B at the end of the device identification number are strictly country IDs which indicate adaptation to the respective national standard (mains outlets).

3.2 Range of Applications and Use for Intended Purpose

The device described in the operating instructions is intended exclusively for training purposes at schools, universities, companies with training programs and other educational institutes which deal with the issues of installation technology, automation technology and electrical machines.

Us of the training system is only permitted in rooms which comply with local regulations concerning classrooms and training rooms (see DIN VDE 0100-723).

The following content is imparted:

⚠ DANGER

Operation of the training systems is only possible within the scope of the listed technical data!
Other use, or use which goes above and beyond this scope, is deemed use for other than the intended purpose!
GMC-I Messtechnik GmbH assumes no liability for damage resulting from use for other than the intended purpose. The risk of use for other than the intended purpose is borne solely by the operating entity.
Use for intended purpose also includes continuous compliance with these operating instructions!

3.3 Recommended Experiments

Simulation of a building service line with main fuse – measuring exercises

Simulation of external and internal lightning protection – measuring exercises

Main grounding busbar with all important equipotential bonding cables and earth strips – measuring exercises

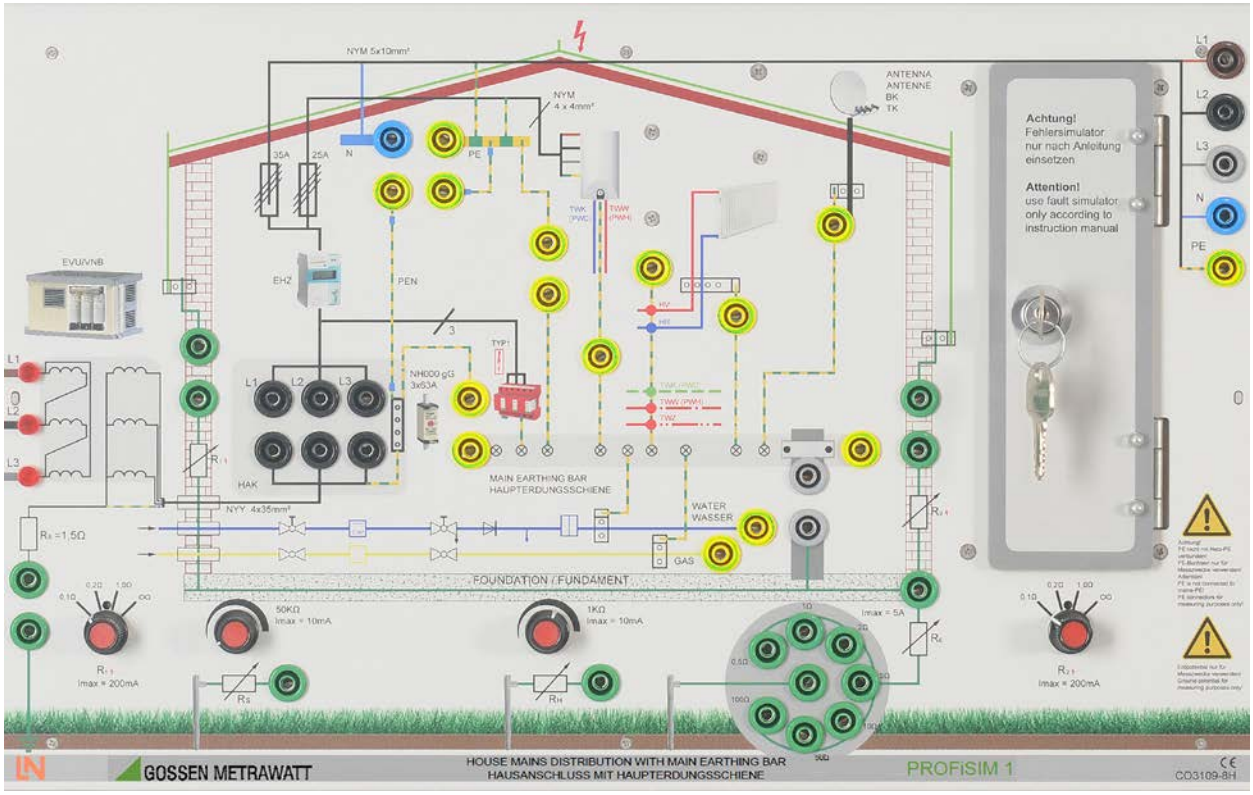
Implementation of various mains systems (TT, TN) – measuring exercises

Preparation of test reports in accordance with DIN VDE 0100 – measuring exercises

Execution of the individual measuring exercises is described in detail in the handbook with part number SH5001-1S (not included in scope of delivery).

3.4 Technical Data

PROFiSIM1 M560A **Installation Test Board – Service Line with Main Grounding Busbar**



- Mains connection: CEE plug, 16 A
- Connector cable: approx. 2.5 m
- Nominal voltage: 3 x 230/400 V
- Frequency: 50/60 Hz
- Protection category: PC1
- Simulation of external and internal lightning protection: R1, R2 = 0.1 Ω, 0.2 Ω, 1.0 Ω, ∞, Imax. = 200 mA
- Earth simulation: RE = 0.5 Ω, 1.0 Ω, 2.0 Ω, 5.0 Ω, 10 Ω, 50 Ω, 100 Ω, Imax.= 5 A
- Simulation of the auxiliary earth electrode: RH = 0 to 1 kΩ, Imax. = 10 mA
- Simulation of the earth probe: RS = 0 to 50 kΩ, Imax. = 10 mA
- Simulation of the operational earth electrode: RB = 1.5 Ω, Imax. = 10 A
- Connection panel for downstream sub-distributors of a consumer system
- Fault simulator with 12 fault options, lockable (see section 3.4)
- Inputs and outputs: 4 mm safety sockets
- Dimensions: 297 x 456 x 80 mm
- Weight: 2.2 kg

3.5 Fault Simulator

The fault simulator has 12 switches by means of which various single and double faults can be selected. The switches are off in the "0" position (fault inactive) and on in the "I" position (fault active).

The fault simulator must be locked again after setting a fault!

After the exercise has been completed, all faults must be reset to "0"!

DANGER

The fault simulator may only be used by the responsible training personnel. In the case of multiple faults, it's absolutely essential to consider interaction of the faults! Not all fault combinations make good sense, and some are unsafe for the system!

Fault switches:

No.	Fault Description	Comment
1	Interruption of the equipotential bonding cable from the main grounding busbar to the water pipe	R = ∞
2	Contact resistance in the equipotential bonding cable from the main grounding busbar to the gas pipe	R approx. 4 Ω
3	Interruption of the equipotential bonding cable from the main grounding busbar to the heater	R = ∞
4	Contact resistance in the equipotential bonding cable from the main grounding busbar to the continuous-flow water heater	R approx. 3 Ω
5	Insulation resistance L1-PE	$R_{L1\text{-}PE}$ approx. 780 kΩ
6	Insulation resistance L2-PE	$R_{L2\text{-}PE}$ approx. 780 kΩ
7	Insulation resistance L1-PE and L3-PE	$R_{L1\text{-}PE}$ approx. 780 kΩ, $R_{L3\text{-}PE}$ approx. 440 kΩ
8	Voltage-dependent insulation resistance	Measurement with a multimeter: resistance is OK Measurement with a VDE tester with rising test voltage: voltage dip occurs at approx. 300 V. ▶ overvoltage protection type 3
9	Protective conductor resistance in PEN too high	R_{PE} approx. 5.6 Ω
10	Protective conductor resistance, output, plate	R_{PE} approx. 3.0 Ω
11*	Loop impedance too high	$Z_{L1\text{-}PE}$ approx. 5.6 Ω
12*	Loop impedance too high	$Z_{L1\text{-}PE}$ approx. 5.6 Ω , $Z_{L3\text{-}PE}$ approx. 8.6 Ω

* Measurement at the 4 mm output sockets (top right)

3.6 Ambient Conditions

Max. rel. humidity:	60%, no condensation
Max. ambient temperature:	35 °C

4 Initial Start-Up

DANGER

Section 2.1, "Safety Information", on page 6 must be observed!

The laboratory setup should be fully connected and ready for operation before initial start-up.

The devices may only be connected to the approved experimentation sockets provided to this end (DIN VDE 0100-723).

Use 4 mm safety measurement cables and 4 mm safety jumper plugs only.

The circuits may only be changed in the voltage-free state.

Please refer to the handbook with part number SH5001-1S (not included in scope of delivery) or other suitable experimentation instructions for details on completing the individual exercises.

The fault simulator may only be operated by authorized personnel and must be reset to "0" after the exercises have been completed.

When used in combination with other devices, please consider the effects of the fault simulator on these devices.

5 Maintenance and Cleaning

5.1 Maintenance and Customer Service

DANGER

Section 2.1, "Safety Information", must be observed!

Address of the manufacturer and for repair and replacement part services:
See "Manufacturer's Name and Address" on page 3.

5.2 Replacement Parts

GMC-I Messtechnik GmbH excludes any and all liability and guarantee claims for damage resulting from the use of replacement parts and accessories which have not been supplied by ourselves!

In this respect, please refer to *"Safety Information" on page 6!*

Placing Replacement Part Orders with GMC-I Messtechnik

Please provide the following information when ordering replacement parts:

- Article number
- Order number / delivery date
- Designation of the replacement part
- Quantity required

Our address for replacement part sales can be found under *"Manufacturer's Name and Address" on page 3*.

Opening the Instrument / Repairs

The instrument may only be opened by authorized, trained personnel in order to ensure flawless operation and to assure that the guarantee is not rendered null and void.
Even original replacement parts may only be installed by authorized, trained personnel.
If it can be ascertained that the instrument has been opened by unauthorized personnel, no guarantee claims can be honored by the manufacturer with regard to personal safety, measuring accuracy, compliance with applicable safety measures or any consequential damages.

6 Dismantling and Disposal

6.1 Removal from Service

DANGER

Section 2.1, "Safety Information", on page 6 must be observed!
Noncompliance results in:
danger to life and limb of the operator and/or third parties,
impairment of the training system and/or other property and the
risk of working inefficiently with the training system!

6.2 Dismantling and Disposal

Dismantling

CAUTION

Dismantling may only be carried out by correspondingly qualified personnel!

Disposal

CAUTION

When disposing of components, the regulations stipulated by the respective legislative bodies must be complied with!