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Vocational training

Commissioning as per DIN VDE 0100–600



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Vocational training –

Commissioning as per DIN VDE 0100-600

Section: Trainer

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Dr.-Ing. Paul Christiani GmbH & Co. KG

Foreword

“Commissioning as per DIN VDE 0100-600” is an important component of the vocational training, but it can also be applied separately.

The primary objective is to ensure that trainees are optimally prepared for the specialist tests part 1 and 2, in which the testing of electrical systems plays a key role. This involves studying not only the actual manual action itself (e.g. measurement), but also correctly assessing the system to be tested and critically evaluating the test results. This assessment and evaluation work requires a high level of specialist expertise. These qualifications also form part of the discussion that accompanies the test.

The training is comprised of four sections:

The training material is used to prepare for the tests. In addition to information on performing the tests, it contains all of the necessary background information. It should be used by the trainees as a source of information before the execution of the tests.

The trainer is free to decide whether the individual tests should be performed separately or as a series. The trainer also determines the object of the tests. The test objects used in the specialist tests are likely candidates.

The trainee section provides all of the relevant questions to support the trainee during the tests. Before executing the test, the trainee should answer all of the questions to prove that he/she is qualified to proceed. The training material or specialist literature can be used for this purpose.

In this case, too, the trainer is solely responsible for deciding how the training is organised. The *project process flow* in this document is intended as a suggestion only.

The trainer section contains suggested answers for the tasks set in the trainee section. These questions may also form part of the discussion accompanying the test. The main points of focus are decided by the trainer. The suggested answers are available in digital format in MOLA. ¹⁾

The accompanying media includes assessment forms and slides. The slides can be a useful aid for the trainer when working through the content with the trainees; they can also be used by the trainees as the basis for presentations.

¹⁾ MOLA: My Own Learning App

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Commissioning as per DIN VDE 0100-600			
Planning sheet	Project process flow (proposal)		
<i>Company</i>	<i>Division</i>	<i>Date</i>	<i>Name</i>
	<i>Points</i>	<i>Percentage</i>	<i>Carry-over/grade</i>

No.	Topic	Training aims assessment	Time needed	Media/explanation
1	Initial situation	10 tasks	30 min	Info section from page 7 Slides F01, F02, F03 Tasks 1 to 10 (from page 1)
2	Inspection	19 tasks	60 min	Info section from page 11 Slide F04 Tasks 1 to 19 (from page 6)
3	Testing	6 tasks	20 min	Info section from page 16 Slides 05, F06 Tasks 1 to 6 (from page 21)
4	Low-impedance consistency	20 tasks	60 min	Info section from page 18 Slides F06, F07 Tasks 1 to 20 (from page 25)
5	Insulation resistance	15 tasks	45 min	Info section from page 39 Slides 08, 09 Tasks 1 to 15 (from page 42)
6	Voltage measurement	5 tasks	15 min	Info section from page 48 Slide F10 Tasks 1 to 5 (from page 53)
7	Fault current protection device	28 tasks	75 min	Info section from page 50 Slides F11, F12, F13, F14 Tasks 1 to 28 (from page 56)
8	Loop impedance ¹⁾	16 tasks	45 min	Info section from page 64 Slide F15 Tasks 1 to 16 (from page 74)
8	Internal network resistance ¹⁾	8 tasks	20 min	Info section from page 70 Slide F16 Tasks 1 to 8 (from page 85)

¹⁾ Not part of the specialist tests.

A test protocol can be found in the training material from page 73 onwards.
It is also a good idea to use an internal company test protocol.

The trainee must be familiarised with the relevant installation tester.
Before performing the measurement exercises, an introduction into the tester and its use should be provided.

Commissioning as per DIN VDE 0100-600			
Exercises	Introduction		
<i>Company</i>	<i>Division</i>	<i>Date</i>	<i>Name</i>
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01

The standard DIN VDE 0100-600 forms the basis for commissioning.

What statement does this standard make in section 6.1?

Setting up low-voltage systems; Requirements for the initial testing of these systems.

Testing before commissioning. Determining that the requirements of the standards have been complied with during system setup and that the setup will remain electrically safe if an existing system is expanded.

02

What are the primary objectives of tests carried out in accordance with DIN VDE 0100-600?

The tests encompass all measures implemented to prove that the entire system satisfies the requirements of the VDE 0100 series of standards.

The tests ensure that the system is operating correctly and safely.

Commissioning as per DIN VDE 0100-600			
Exercises	Introduction		
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03

Who is permitted to perform tests in accordance with DIN VDE 0100-600? Why is this the case?

The test may only be carried out by a qualified electrician.
 During the test, background information on the tested electrical system must be taken into account.
 This includes, for example, the influence of the current ratings of the overcurrent protection devices and the line cross-sections used.

04

What does the term “electrical safety” describe?

A piece of operating equipment or a system is classed as electrically safe when it presents no direct or indirect risk to the user when operated correctly and in line with its intended purpose.
Direct risks: For example electric shock.
Indirect risks: Noise, light arc formation.

05

What is the definition of the term “initial testing”?

Before an electrical system is commissioned by a user, an initial test or initial commissioning test must be performed.

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Exercises	Introduction		
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06

What are the components of initial testing in accordance with DIN VDE 0100-600?

- Inspection
- Testing and: measurement

In practice, it is more logical to divide the process into three parts:

- Inspection
- Testing
- Measurement

In the German text of the standard, the English term “testing” has been translated as “Erproben” and “Messen”, depending on the context.

07

Evaluation takes place after testing. This evaluation requires the qualified electrician to possess a high level of expertise and experience in the testing of electrical systems.

Why are these standards set at such a high level? Give some examples.

The measured values, which have been carefully determined by a professional, must be evaluated in the context of the electrical system in question.

The same measured value may be “OK” or “not OK” depending on the electrical system to which it applies. An experienced qualified electrician must take this background information into account.

Depending on the overcurrent protection device used, a loop impedance of 1Ω may be good or bad.

The measured low-impedance value for the protective conductor must also be assessed in the context of the line cross-section and length.

What may be acceptable in one case may indicate a faulty terminal connection in another set of circumstances.

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08

What are the requirements for measurement devices used in initial testing as defined in DIN VDE 0100?

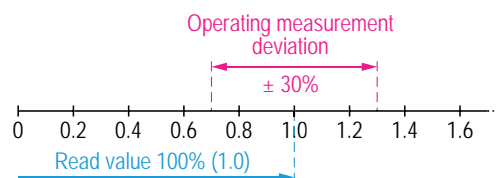
Suitable measurement devices must be used. Measurement devices that satisfy the requirements of DIN 61557-6 (Equipment for testing, measuring or monitoring of protective measures) are considered suitable:

- The tester and other persons are protected during the measurement process.
- Measurement devices made by different manufacturers produce comparable measurement results.
- The expense incurred and effort required is appropriate.

09

The operating measurement deviation is $\pm 30\%$.

Explain what the diagram shows.



Measure the low-impedance consistency of the protective conductor: **Factor 1.3**

Measure the insulation resistance: **Factor 0.7**

The aim of using a specified operating measurement deviation is to determine the worst technical scenario.

Low-impedance measurement

The value should be as low as possible and must not exceed a specific threshold.

To eliminate all risk, the measured value is multiplied by a factor of 1.3 (+ 30%).

Insulation resistance measurement

The value should be as high as possible and must not fall below a specific threshold.

To eliminate all risk, the measured value is multiplied by a factor of 0.7 (- 30%).

The operating measurement deviation must be interpreted in the context of the measurement task at hand.

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09

Continued from page 4.

10

Operating systems generally use the TN system to obtain power.

State some of the characteristics of this network system.

The fault current (in the event of a fault to frame) flows not via earth, but via copper wires.
 This allows low resistances to be achieved in the fault current loop (loop impedance).
 The resulting fault currents are high and, in some cases, may cause the upstream overcurrent protection device to trigger within the prescribed shutdown time.
 If the above conditions are met, there is no need to use a fault current protection device.