

FRAUNHOFER-SOCIETY

# **EXAMINATION REGULATIONS**

## Foundations of Battery Production

### Revision 2

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Fraunhofer Personnel Certification Authority  
Schloss Birlinghoven  
53757 Sankt Augustin

# **EXAMINATION REGULATIONS**

## Foundations of Battery Production

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# Inhalt

<b>1</b>	<b>Foreword .....</b>	<b>4</b>
<b>2</b>	<b>Scope of Application .....</b>	<b>5</b>
<b>3</b>	<b>GENERAL TERMS AND CONDITIONS .....</b>	<b>6</b>
<b>4</b>	<b>REQUIREMENTS FOR THE EXAMINATION AND CERTIFICATION PROCESS... 8</b>	
4.1	Goal.....	8
4.2	Application Submission .....	8
4.3	Admission .....	8
4.4	Examination Date and Location .....	8
4.5	Examination Procedure.....	9
4.5.1	Compilation and Provision of Examination Materials and Appointment of Examination Officials.....	9
4.5.2	Examination Officials.....	9
4.5.3	Conducting the Examinations .....	9
4.6	Exam questions and tasks .....	9
4.7	Evaluation and assessments of examinations .....	10
4.8	Repeating examinations .....	10
4.9	Review of the Examination .....	10
4.10	Certification .....	10
4.11	Monitoring.....	10
4.12	Recertification .....	11
<b>5</b>	<b>Rights and Obligations .....</b>	<b>13</b>
5.1	Preliminary information .....	13
5.2	Rights .....	13
5.3	Obligations .....	13
5.3.1	Diligence.....	13
5.3.2	Independence .....	14
5.3.3	Personal Performance.....	14
5.3.4	Permitted use of certificates .....	14
5.3.5	The Use of the Fraunhofer-Logo.....	14
5.3.6	Duty to give Notice .....	15
5.3.7	Duty to Disclose .....	15
5.4	Violation of Duties as Certificate Holder .....	15
<b>ANNEX A: Certification »Foundations of Battery Production«.....</b>		<b>16</b>
A1	Reference to other standards and documents .....	16
A 2	Requirement profile .....	16
A 2.1	Description of activities and tasks.....	16
A 2.2	Access requirements .....	17
A 2.2.1	Previous education .....	17
A 2.2.2	Additional trainings/qualifications and practical activities.....	17
A 2.2.3	Personal requirements.....	17
A 2.3	Required competencies (learning objectives).....	17

# 1

## Foreword

The certifications of the Fraunhofer Personnel Certification Authority in the field of battery production are open to all interested individuals. The certification Authority guarantees equal treatment of all applicants.

This document presents the examination regulations for certifications in the certification profile »Foundations of Battery Production«. The certification is a micro-certification (see section General Terms and Conditions). The following describes the process for personnel certifications in the field of battery production, in accordance with the requirements of EN ISO 17024 »General Requirements for Bodies operating Certification of Persons«, thereby establishing a uniform certification system.

## 2 Scope of Application

Scope of Application \_\_\_\_\_  
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The scope of application of these examination regulations extends to personnel certifications in the field of »Foundations of Battery Production« by the Fraunhofer Certification Authority.

A detailed description of the certification profile »Foundations of Battery Production« can be found in Appendix A.

### 3 GENERAL TERMS AND CONDITIONS

#### ■ Fraunhofer-Personenzertifizierungsstelle

Authority that certifies the conformity of normative specifications and the actual qualification of persons.

#### ■ Fraunhofer Certificates Foundation Level

Fraunhofer certificates on a foundation level are personal certificates at the level of »knowledge« and »understanding« according to Bloom (1972). These are issued by the Fraunhofer Personnel Certification Authority when the participants have demonstrated the competencies defined by a group of experts by passing an examination. Fraunhofer certificates on a foundation level differ from Fraunhofer personal certificates in their level of ambition and scope. The latter have a higher level of requirements and relate to more comprehensive job profiles.

#### ■ Certification program

Certification programs are all certifications to be achieved in a specific subject area (both certificates on a foundation level and Fraunhofer personal certificates).

#### ■ Certification profile

The Term »certification profile« covers the individual qualification levels that can be achieved in the course of a certification program.

#### ■ Term »know«

According to Bloom's Taxonomy of Educational Objectives (Taxonomy of educational objectives, 1974, 5th edition, Beltz Verlag, Weinheim 1976), it is positioned at the first and second levels of the six-level scale. Characteristic of this is the recall from memory triggered by keywords. The skills associated with this are knowledge, recognition, and imitation.

The goal »know« for examinations in the field of battery production includes different contents for each certification. These are described in the appendices to this document.

#### ■ Term »apply«

It is a synonym for the learning objective level »reorganization«. It is also a synonym for the third and fourth learning objective levels of Bloom's Taxonomy. Characteristic of this is the individual's processing and arrangement of what has been learned. The skills associated with this are understanding, responding, and practicing.

The goal »apply« in examinations in the field of battery production includes different contents for each certification profile. Certifications on the foundation level typically do not encompass the goal »apply«.

#### ■ Term »evaluate«

It is a synonym for the learning objective level »transfer« and »problem-solving thinking«. It is also a synonym for the fifth and sixth learning objective levels of Bloom's

Taxonomy. Characteristic of this is the application of fundamental principles to new, similar tasks or to performances that are new to the learners. The skills associated with this are applying, evaluating, coordinating, and problem-solving, as well as living values and automating.

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GENERAL TERMS AND  
CONDITIONS  
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The goal »evaluate« in examinations in the field of battery production includes different contents for the certification profiles. Certifications on the foundation level typically do not encompass the goal »evaluate«.

## 4 REQUIREMENTS FOR THE EXAMINATION AND CERTIFICATION PROCESS

The following describes the procedure for examinations within the framework of certification in the certification profile »Foundations of Battery Production« of the Fraunhofer Personnel Certification Authority.

### 4.1 Goal

In the context of certification examinations, it is assessed whether the participants meet the predefined requirements for the respective certification profile set by an expert panel. The certification decision is made based on the examination results.

### 4.2 Application Submission

Applicants can be certified if they successfully pass an examination of the Fraunhofer Personnel Certification Authority on »Foundations of Battery Production« and meet the defined access requirements according to the annexes of the certification handbook.

Individuals wishing to participate in a certification examination or re-examination must submit a written application to the Fraunhofer Personnel Certification Authority. This application must include the following information about the exam participant:

- Name, date of birth, and private postal address
- Certification profile to be certified
- Indication of whether it is an initial certification, re-examination, or recertification

The examination dates are set by the Fraunhofer Personnel Certification Authority.

### 4.3 Admission

Applicants will be admitted to the examination if they have submitted their complete application documents and provided proof of the access requirements (if required). The access requirements are listed in the appendix of this document for the certification profile. Comparable access requirements can be recognized by the Fraunhofer Personnel Certification Authority with appropriate documentation.

### 4.4 Examination Date and Location

The examination dates are set by the Fraunhofer Personnel Certification Authority.

Examinations can be conducted online with supervision or in person. In-person examinations take place at a location approved by the Fraunhofer Personnel Certification Authority. Online-supervised examinations are typically conducted using a learning management system in combination with online proctoring software.



## 4.5 Examination Procedure

The examination procedure is described below.

### 4.5.1 Compilation and Provision of Examination Materials and Appointment of Examination Officials

The Fraunhofer Personnel Certification Authority compiles the examination questions for the certification examination from a pool of questions developed by subject matter experts for the respective certification profile.

In the case of in-person examinations, the examination materials are provided to the examination officials in a timely manner before the examination date and protected from unauthorized access.

The management of the Fraunhofer Personnel Certification Authority appoints the examination officials to administer and correct the examination.

### 4.5.2 Examination Officials

The examination officials are appointed by the Fraunhofer Personnel Certification Authority to administer and correct the examination. The examination officials must not have served as instructors for the examinee within the last two years.

One person is appointed for the administration and correction of in-person examinations. Similarly, one person is appointed for the administration and correction of online-supervised examinations.

### 4.5.3 Conducting the Examinations

The examinations are generally conducted in writing as multiple-choice tests. Participants can choose between in-person and online-supervised examinations.

The examination questions/ tasks are to be answered by hand for face-to-face examinations. In the case of online supervised examinations, the questions are answered using a keyboard.

Aids are generally not permitted.

The examination lasts 60 Minutes.

## 4.6 Exam questions and tasks

The exam questions differ depending on the certification profile. The same applies to the number of questions and tasks per subject area.

The examination questions are developed and continuously optimized by a panel of experts.

## 4.7 Evaluation and assessments of examinations

The examination results are assessed as follows:

The examination consists of closed multiple-choice questions with four alternative answers. For each correctly marked (or unmarked) alternative answer, 0.5 points are awarded. Accordingly, 2 points can be achieved per task.

The examination is deemed to have been passed if 67% of the required points have been achieved.

The examination results are determined by the examination officer and then forwarded to the Fraunhofer Personnel Certification Authority.

## 4.8 Repeating examinations

Examinations that have not been passed can be repeated up to two times. After three unsuccessful attempts, a new certification procedure must be applied for.

## 4.9 Review of the Examination

Participants have the right to review the examination once within four weeks after notification of the examination results at the Fraunhofer Personnel Certification Authority, in the presence of a qualified staff member from the Fraunhofer Personnel Certification Authority.

## 4.10 Certification

After successfully passing the examination and meeting the access requirements, the examination participants will be issued the micro-certification intended for the respective certification profile by the Fraunhofer Personnel Certification Authority.

Participants have the opportunity to provide proof of any missing access requirements within one year after taking the respective certification examination. The certificate will be issued as soon as the access requirements (see appendix) have been fully met. The certificate issuance must occur no later than one year after the last partial examination.

The validity of the certificate begins on the date of the certification decision by the management of the Fraunhofer Personnel Certification Authority and ends three years minus one day after the examination.

To maintain the validity of the certificate, recertification is required. The modalities for recertification are outlined in the chapter »Recertification«.

## 4.11 Monitoring

For certifications »Foundations of Battery Production«, there is no surveillance during the certificate period.

## 4.12 Recertification

For certifications in »Foundation of Battery Production«, recertification is required after a validity period of three years minus one day after the last partial examination.

### The objectives of recertification are:

- Proof of maintenance of the required level of knowledge and expertise (recognized rules of technology) in the respective certification profile.

### Evidence to be provided for recertification

Must be submitted for recertification:

- Re-participation in the certification examination **or**
- Proof of participation in a subject-specific further training event during the certificate period, in which current subject-specific information relating to the competences specified in the examination regulations is demonstrably imparted or current advanced topics in the context of battery production are imparted.

### Requirements for Subject-Specific Training Events are:

The event must cover a minimum duration of four hours.

The submitted certificates of attendance must clearly indicate the relevant content related to topics in the field of battery production.

### Procedure for Recertification

The certificate holder must formally apply for recertification within the period of two years minus one day after the certification examination up to 2.5 years minus one day after the certification examination or the last partial examination (This means: from 2 years to a maximum of 2.5 years after certification; thus, up to six months before the expiration of the certificate). During this time, they must either apply for re-participation in the examination or provide proof of participation in a training event.

The recertification examination must be completed and passed within the last six months before the end of the certificate validity period.

The recognition of the training event is determined by the management of the Fraunhofer Personnel Certification Authority.

In exceptional cases, participation in a training event can also be recognized within the last six months before the expiration of the certificate. This must be applied for in writing and justified to the Fraunhofer Personnel Certification Authority by 2.5 years minus one day after the last partial examination. The management of the Fraunhofer Personnel Certification Authority will decide on the granting of this exception on a case-by-case basis.

If the recertification conditions are not met, the validity of the certificate expires on the expiration date. The certificate must be newly obtained (see initial certification).

In justified exceptional cases, a postponement of a maximum of six months may be granted (e.g., in the case of serious illness or parental leave). This postponement must

also be applied for in writing and justified. The decision to grant a postponement rests with the management of the Fraunhofer Personnel Certification Authority.

### **Proof of Participation in a Training Event**

Proof of participation in the **training event** is provided by a certificate of attendance from the training provider, along with the submission of an agenda that outlines the subject-specific topics covered.

### **Recertification**

If the recertification requirements are met, the respective certificate will be extended for an additional three years minus one day.

If the recertification requirements are not met, the validity of the respective certificate will expire.

## 5 Rights and Obligations

As of: March 2024

The rights and obligations of the Certificate Holder are described below.

### 5.1 Preliminary information

Upon written request (e.g. from potential clients of a Certificate Holder), the Fraunhofer Personnel Certification Authority may provide information on whether this person is legally holding the certificate by stating the certificate number. The name, date of birth and place of birth of the Certificate Holder are stored for identification purposes. With the registration, participants declare by their signature their intention to accept these regulations in the event of the certificate being issued. The Fraunhofer Personnel Certification Authority is bound by the provisions of the German Federal Data Protection Act.

### 5.2 Rights

Within the scope of his/her occupation in »NAME OF THE CERTIFICATE«, the Certificate Holder is entitled to

- on personal letterheads, in other printed matter in connection with their person and on the Internet in connection with their person to refer to their certification as follows: »examined in NAME OF CERTIFICATE, by the Fraunhofer Personnel Certification Authority« or »examined in NAME OF CERTIFICATE« (e.g. »examined in Battery Manufacturing Fundamentals«). When using variant 1, it must be ensured that the designation »by the Fraunhofer Personnel Certification Authority« is not larger than the corresponding name of the person.
- use the certificate as a whole referring to the certification
- view the document »Certification Handbook« of the respective certification profile, which explains the certification system of the Fraunhofer Personnel Certification Authority at Fraunhofer FIT.

Further details are regulated under the obligations.

### 5.3 Obligations

The following principles must be complied with by the Certificate Holder while performing the tasks in the area of the respective certification profile:

#### 5.3.1 Diligence

The Certificate Holder shall exercise his/her occupation in accordance with the »State of the Art«.

The actions of the certificate-holder are characterized by the principle of always achieving an error-free and high-quality work result. The Certificate Holder is obliged to not use the certification in an improper manner and to not make any statements that must be considered misleading or unauthorized by the Fraunhofer Personnel Certification Authority.

### **5.3.2 Independence**

The Certificate Holder shall act without regard to official relations within the company and/or its employees or their desired results (personal independence).

### **5.3.3 Personal Performance**

The Certificate Holder shall perform all required services with regard to preparation, execution and evaluation of projects in the field of the respective certification profile in person. He/she shall not use the deed of the certification falsely or in any misleading way.

### **5.3.4 Permitted use of certificates**

The following regulations shall also apply for the use of certificates:

- The certificate shall be granted to the Certificate Holder. The actual certificate/document shall remain the property of the Fraunhofer Personnel Certification Authority.
- Only valid certificates shall be used.
- The certificate shall not be abused inappropriately.
- The actual certificate may only be used in its unmodified and complete form.
- The certificate shall be returned to the Fraunhofer Personnel Certification Authority
  - after expiration of the certificate,
  - after the Certificate Holder has been informed by the Fraunhofer Personnel Certification Authority about the withdrawal.
- In case of suspension, withdrawal or lapse of the certification the Certificate Holder shall immediately cease the use of the certificate. References of the Certificate Holder to the certification and/or the Fraunhofer Personnel Certification Authority shall be removed immediately. In this event letterhead or other printed material shall be destroyed immediately or in case of suspension shall not be used during suspension.
- The use of the certificate or references to it are only permitted within the scope of the certificate.
- The certificate may only be used in connection with the person who is mentioned as certified in the certificate.
- The use of the certificate and references to it are only permitted if the observer explicitly recognizes who has been examined and certified.
- By using the certification or making references to it he/she shall not give the impression that the certified person is an employee of Fraunhofer-Gesellschaft or that he/she acts on behalf of Fraunhofer-Gesellschaft.
- The Certificate Holder is responsible for the correct use of the Certificate. Possible doubts shall be the responsibility of the Certificate Holder.

### **5.3.5 The Use of the Fraunhofer-Logo**

The certificate of the Fraunhofer Personnel Certification Authority contains the Fraunhofer-Logo. The Logo shall exclusively be used as a part of the certificate in that way that the certificate as a whole may be copied or made available in the internet as proof of the issuing Fraunhofer Personnel Certification Authority for e.g. clients or employers. Any further use beyond this of the Fraunhofer-Logo or the use of the name Fraunhofer as trademark is expressly prohibited. In case of violation Fraunhofer-Gesellschaft is entitled to apply for injunctive relief or damage claims.

### 5.3.6 Duty to give Notice

The Certificate Holder shall notify the Fraunhofer Personnel Certification Authority without delay of:

- any changes of name (e.g. in case of marriage),
- any change of place of residence,
- the loss of the certificate.

In addition, the Certificate Holder must inform the Fraunhofer Personnel Certification Authority immediately of any matters that may affect their ability to continue to fulfil the certification requirements (e.g. newly occurring physical limitations).

### 5.3.7 Duty to Disclose

Upon request of the Fraunhofer Personnel Certification Authority at Fraunhofer FIT, the Certificate Holder shall disclose and furnish all necessary particulars and documents regarding the monitoring of activities and compliance with the a forementioned duties within a set deadline and without compensation.

He/she may refuse to provide self-incriminating information or such information that may incriminate his/her relatives.

## 5.4 Violation of Duties as Certificate Holder

Depending on the gravity of the violation of a duty stated in this document the certification may be suspended or revoked, which is communicated to the Certificate Holder in written form. For the duration of the suspension or after the certification has been revoked, the Certificate Holder is no longer entitled to refer to his/her certification and the Fraunhofer Personnel Certification Authority.

## **ANNEX A: Certification »Foundations of Battery Production«**

### A1 Reference to other standards and documents

- DIN EN ISO 17024

### A 2 Requirement profile

#### **A 2.1 Description of activities and tasks**

The requirement profile »Foundations of Battery Production« is derived from the characteristics and description of its field of activity.

A certified person »Foundations of Battery Production«

- has an overview of the key developments in the battery sector in Europe.
- is able to discuss market forecasts considering the most important market parameters and the underlying uncertainties
- is able to compare the key battery KPIs considering possible future developments.
- has an overview of the battery value chain including the main actors (industry, major players, regional hotspots) and markets.
- can identify and discuss opportunities for cost reduction
- is familiar with the political strategies of the key countries involved in battery cell production and can compare them.

The certificate designation is: »Foundations of Battery Production«



## A 2.2 Access requirements

### A 2.2.1 Previous education

All examination participants must have sufficient proficiency in the examination language to understand and answer the questions.

### A 2.2.2 Additional trainings/qualifications and practical activities

A certified person in the field of »Foundations of Battery Production« does not need to provide evidence of additional trainings, experiences, or qualifications.

### A 2.2.3 Personal requirements

None

## A 2.3 Required competencies (learning objectives)

In the following subject areas, a certified person in »Foundations of Battery Production« must demonstrate competencies during the examination.

Subject area	Competencies (learning objectives)	Know (Knowledge and Understanding)	Apply and Analyze	Synthesize and Evaluate
The battery market	The participants can describe market forecasts considering the three most important market parameters and the underlying uncertainties.	x		
	The participants can identify the various steps of the battery value chain and understand the market structures.	x		
Structure and functionality of batteries	The participants can identify and describe the components and structure of batteries.	x		
	The participants can identify and describe the functionality of batteries (including discharging and charging), as well as the basic electrochemical and physical processes that occur in a battery.	x		
	The participants can identify and describe the relationship between battery properties and battery performance.	x		

Subject area	Competencies (learning objectives)	Know (Knowledge and Understanding)	Apply and Analyze	Synthesize and Evaluate
Battery materials	The participants can identify and describe the materials used for the production of batteries/cells.	x		
	The participants can identify active and inactive components of a battery cell and describe their differences.	x		
	The participants are familiar with critical battery materials and potential future solutions.	x		
Battery production process	The participants can identify and describe the process steps in cell production.	x		
	The participants are familiar with approaches for greener battery production.	x		
Electrode and cathode production	The participants can identify and describe the process steps in electrode production.	x		
	The participants can identify and describe criteria for quality and safety in process steps of electrode production.	x		
Assembly of cells	The participants can identify and describe the process steps in the assembly of cells.	x		
	The participants can identify and describe quality and safety criteria for each process step in the assembly of cells.	x		
Completion of cells	The participants can identify and describe the process steps involved in the completion of cells.	x		
	The participants can identify quality and safety criteria for each process step in the completion process.	x		
Battery recycling and reuse	The participants are familiar with the basic principles and main challenges of battery recycling.	x		
	The participants are familiar with reuse and lifecycle strategies.	x		

Subject area	Competencies (learning objectives)	Know (Knowledge and Understanding)	Apply and Analyze	Synthesize and Evaluate	ANNEX A: Certification »Foundations of Battery Production«
	The participants can identify regulatory and legal requirements for battery recycling.	x			

The certification profile »Foundations of Battery Production« does not include subject areas that must be achieved at the levels of Apply or Evaluate.