Grid and system protection

Installation and setup manual

Applicable for:

XOLTA BAT-79

XOLTA BAT-80

XOLTA BAT-80 AC

Contents

Chapter 1: About this manual

This installation manual guides you through configuring grid and system protection - also known as **NA Schutz**[1] and *NS protection* - for the following XOLTA battery systems:

- BAT-79
- BAT-80 (passive cooling)
- BAT-80 AC (active cooling)

It is intended for certified installers working with XOLTA Commercial & Industrial (C&I) battery systems, as well as for internal XOLTA production use.

The document is organized as follows:

- Chapter 2: *Grid protection relay for XOLTA battery systems* on page 4 - introduces the role of an external grid protection relay in XOLTA battery systems.
- Chapter 3: *Installing the grid protection relay* on page 5 - provides guidelines for installing a grid protection relay, including recommended components and wiring schematics.
- Chapter 4: *Country-specific grid protection configuration* on page 20 - details the grid protection settings for Denmark, Germany, Sweden, and the Netherlands.
- Chapter 5: *Configuring grid codes settings for ABB CM-UFD.M31(M)* on page 28 - instructions on configuring the grid protection relay according to different country grid codes, including general and specific settings.
- Chapter 6: *Terminology* on page 68 - provides a glossary of terms used in this manual and general XOLTA terms.

[1] A grid protection relay monitors the public grid for anomalies and ensures compliance with grid codes by automatically disconnecting and reconnecting the battery system when necessary. Synonyms: "NA Schutz" and "NS protection relay".

Chapter 2: Grid protection relay for XOLTA battery systems

XOLTA battery systems, such as BAT-80, feed power into the grid as decentralized energy sources. To maintain grid stability, voltage and frequency must remain within acceptable limits. Every decentralized energy system requires grid and system protection, also referred to as **NA Schutz**[1] or *NS protection*.

The XOLTA inverters are pre-configured to comply with the specific grid codes of their respective country or region, for example, frequency response settings. However, to achieve full grid code compliance, an external, standalone grid protection relay is required for the entire battery system installation. This relay continuously monitors voltage and frequency at the **point of common coupling**[2] (PCC), acting as a safeguard against grid instability.

If grid parameters deviate from permitted thresholds, the grid protection relay will automatically disconnect the battery system to prevent potential disruptions. Once grid conditions stabilize, the relay safely reconnects the system, ensuring seamless operation while maintaining regulatory compliance.

[1] Synonym for "grid and system protection" and "NS protection".
[2] The connection point between a generating facility (e.g., a battery system) and the utility grid, where power exchange occurs.

Chapter 3: Installing the grid protection relay

This chapter outlines the installation process for grid protection relays in XOLTA C&I battery systems. It specifies recommended devices (ABB CM-UFD.M31/M31M and Schneider iCT contactors), explains wiring schematics for various market scenarios (with and without **LVRT**[1]), and details component requirements based on system size. The chapter includes single-line diagrams and connection legends to support correct and compliant installations.

3.1 Recommended grid protection relays

To ensure compatibility and compliance, XOLTA recommends using one of the tested and certified grid protection relay models listed below. Other suppliers may be used if their products comply with specific grid code requirements. These relays do not require a Modbus connection.

The ABB CM-UFD.M31 and CM-UFD.M31M are the preferred choices for XOLTA C&I battery systems and will be detailed in this document.

Supplier	Version without Modbus	Version with Modbus
ABB	CM-UFD.M31 (or CM-UFD.M33)	CM-UFD.M31M (or CM-UFD.M33M)
Ziehl	UFR1001E	UFR1002IP

Table 3-1 - Recommended grid protection relay types

The grid codes supported (certified) for these grid protection devices as of April 19, 2024, are listed in the table below. All device settings can be adjusted to comply with additional grid code requirements.

[1]Short for "low voltage ride through". LVRT is the ability of an electrical device - typically a wind turbine or solar inverter - to stay connected to the grid during short periods of low voltage, such as those caused by faults or disturbances. The purpose is to support the grid by remaining online and helping restore normal conditions.

> **Note**: Always consult the manufacturer's manual to confirm the latest certified grid codes.

Grid feeding monitoring model	Supported grid codes
Ziehl 1001E, UFR1002IP	Selectable grid codes: • Australia: AS4777.2 • Austria: TOR A, B, C, D • Belgium: Synegrid C10/C11 • Finland: SFS-EN50549-1+2:2019 • France: VDE 0126, VFR2019 • Germany: VDE 4105:2018, VDE 4110:2018 • Ireland: EN50549-+2 • Netherlands: NEN-EN50549-1:2019 • Switzerland: NA/EEA-NE7 CH 2020 • United Kingdom: G98, G99
ABB CM-UFD.M31, ABB CM-UFD.M31M	Selectable grid codes: • Germany: VDE 4105:2018, VDE 4110:2018

Table 3-2 - Supported grid codes for the recommended grid protection relays.

> **Note**: Only the grid codes listed in the table are preconfigured. You need to enter other grid codes manually, for example, for Denmark and Sweden.

3.2 Recommended coupling contactor

XOLTA recommends using one Schneider Contactor iCT 100a 4no 230V AC (**coupling contactor**[1]) per XOLTA battery rack for all C&I installations.

[1] A coupling contactor is a switching device used to connect or disconnect a power source to the main electrical grid. In grid protection systems, it enables safe synchronization and isolation during faults or maintenance.

Figure 3-1 - Schneider 100 A contactor.

The table below lists the maximum AC current per rack, based on system voltage:

Product	Maximum AC current (at 400 VAC)	Maximum AC current (at 380 VAC)
BAT-80/25	37 A	38 A
BAT-80/30	45 A	45 A
BAT-80/50	74 A	76 A
BAT-80/60	90 A	90 A

Table 3-3 - Maximum AC current for different battery system versions

3.3 Connection schematics – single-line diagrams and components

The following figures show single-line diagrams for a single and multi-rack installation of XOLTA battery systems.

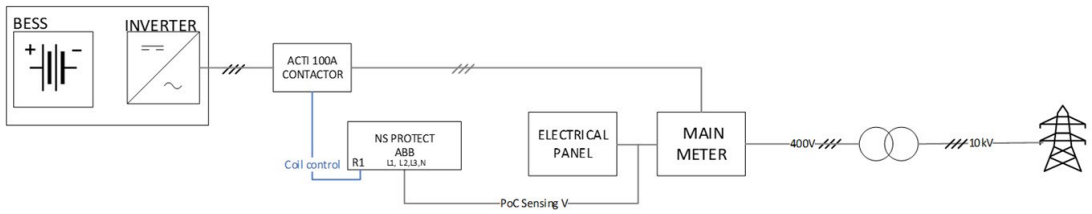


Figure 3-2 - Single-line diagram showing the grid protection wiring in a single rack installation

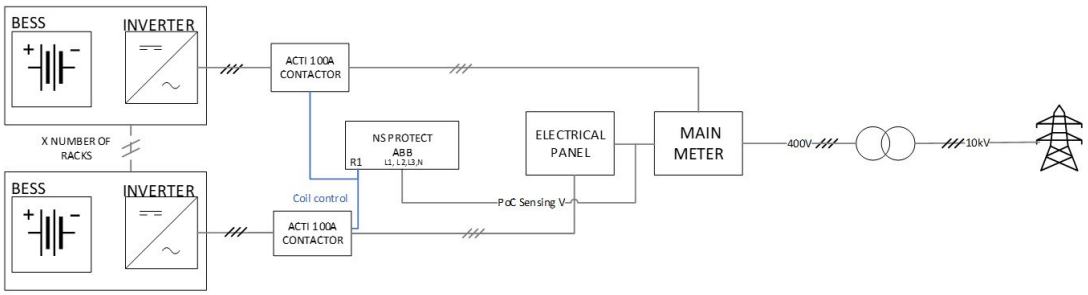


Figure 3-3 - Single-line diagram showing the grid protection wiring in a multi-rack installation

Each battery rack requires a single Schneider ACTI 100A contactor.

The ABB grid protection relay (CM-UFD.M31) includes three relay outputs (R1, R2, R3). Each output can control up to six Schneider iCT 100A contactors. This allows a single ABB relay to support installations with up to 18 racks.

Use the table below to determine the required components:

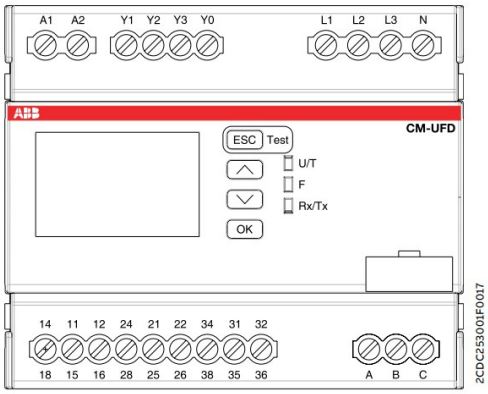
Example	Required installation	Required Schneider ICT 100A contactors	Required number of ABB CM-UFD.M31 grid protection devices
1	1 x BAT-80	1	1 (1x ICT 100A wired to R1)
2	6 x BAT-80	6	1 (6x ICT 100A wired to R1)
3	12 x BAT-80	12	1 (6x ICT 100A wired to R1) (6x ICT 100A wired to R2)
4	18 x BAT-80	18	1

Example	Required installation	Required Schneider ICT 100A contactors	Required number of ABB CM-UFD.M31 grid protection devices
			(6x ICT 100A wired to R1) (6x ICT 100A wired to R2) (6x ICT 100A wired to R3)
5	24 x BAT-80	24	2 (6x ICT 100A wired to R1 of grid protection 1) (6x ICT 100A wired to R2 of grid protection 1) (6x ICT 100A wired to R3 of grid protection 1) (6x ICT 100A wired to R1 of grid protection 2)

Table 3-4 - Required number of components for different BAT-80 installations

Next, connect the ABB CM-UFD.M31(M) relay according to the diagram below. For a complete overview of terminal functions, see the table below.

Electrical connection



A1-A2	Control supply voltage
Y1-Y0	Control input 1, for feedback from switching device 1
Y2-Y0	Control input 2, for feedback from switching device 2
Y3-Y0	Control input 3, configurable
L1, L2, L3, N	Measuring input
11_{15}-12_{16}/14_{18}	Relay R1, c/o (SPDT) contact
21_{25}-22_{26}/24_{28}	Relay R2, c/o (SPDT) contact
31_{35}-32_{36}/34_{38}	Relay R3, c/o (SPDT) contact
A, B, C	Modbus RTU interface A / D0 B / D1 C / Common*

* For CM-UFD.M31M only

Figure 3-4 - Electrical connections for the ABB CM-UFD.M31M grid protection device

A detailed description of the connectors that are used with the XOLTA battery systems are shown in the table below:

Electrical connection	Description
A,B,C	Modbus RTU (only in versions CM-UFD.M31M and CM-UFD.M33M) **Note**: Not to be connected.
Y1, Y2, Y3, Y0	Feedback signals from switching devices corresponding to relays R1, R2, R3 **Note**: Not to be connected.
A1, A2	Supply voltage (either 230V AC or 24V DC).

Electrical connection	Description
	Note: • Power systems where **LVRT**[1] isn't required directly with 230V AC. • For systems requiring LVRT, supply power via one of the following devices: 1. 1SVR360563R1001 – ABB CP-C.1 24/5.0 2. 1SVR427060R0300 – ABB CP-B 24/3.0
L1, L2, L3, N	Input for voltage monitoring at **PCC**[2].
11_{15}-12_{16}/14_{18}	Electrical connections for Relay R1: 11_{15} - Common 12_{16} – NC **Note**: Not to be connected. 14_{18} – NO
21_{25}-22_{26}/24_{28}	Electrical connections for Relay R2: 21_{25} - Common 22_{26} – NC **Note**: Not to be connected.

[1]Short for "low voltage ride through". LVRT is the ability of an electrical device - typically a wind turbine or solar inverter - to stay connected to the grid during short periods of low voltage, such as those caused by faults or disturbances. The purpose is to support the grid by remaining online and helping restore normal conditions.
[2]The connection point between a generating facility (e.g., a battery system) and the utility grid, where power exchange occurs.

Electrical connection	Description
	24_{28} – NO
31_{35}-32_{36}/34_{38}	Electrical connections for Relay R3. You need to enable it in the settings. 31_{35} - Common 32_{36} – NC **Note**: Not to be connected. 34_{38} – NO

Table 3-5 - Description of the electrical connections for ABB CM-UFD.M31M

3.4 Wiring schematics for different markets and system types

The following wiring scenarios help ensure proper installation of NA Schutz for different system configurations and market requirements:

1. **Scenario 1**: Single or multi-rack without **LVRT**[1] requirement:
    - Denmark DK1 Type A *up to 125 kW* (TF331).
    - Denmark DK2 Type B *up to 125 kW* (TF331).
    - Sweden Type A *up to 1.5 MW* (EIFS:2018).
    - Netherlands *up to 1 MW* (Regulering 20).
2. **Scenario 2**: Single or multi-rack with LVRT requirement:
    - Germany (VDE 4105).
3. **Scenario 3**: Multi-rack with LVRT requirement:
    - Denmark DK1 Type B *from 125 kW and up to 3 MW* (TF331).
    - Denmark DK2 Type B *from 125 kW and up to 3 MW* (TF331).

[1]Short for "low voltage ride through". LVRT is the ability of an electrical device - typically a wind turbine or solar inverter - to stay connected to the grid during short periods of low voltage, such as those caused by faults or disturbances. The purpose is to support the grid by remaining online and helping restore normal conditions.

- Germany (VDE 4110).

> **Note**: When LVRT is required, power the grid protection device using one of the following:
>
> - ABB CP-C.1 24/5.0 (1SVR360563R1001).
> - ABB CP-B 24/3.0 (1SVR427060R0300).

3.4.1 Scenario 1: Single or multi-rack without LVRT requirement

The figure below shows the wiring schematics for grid protection and coupling contactor for a single or multiple BAT-80/BAT-80 AC battery racks and without LVRT requirement. You'll find a figure legend later in this section.

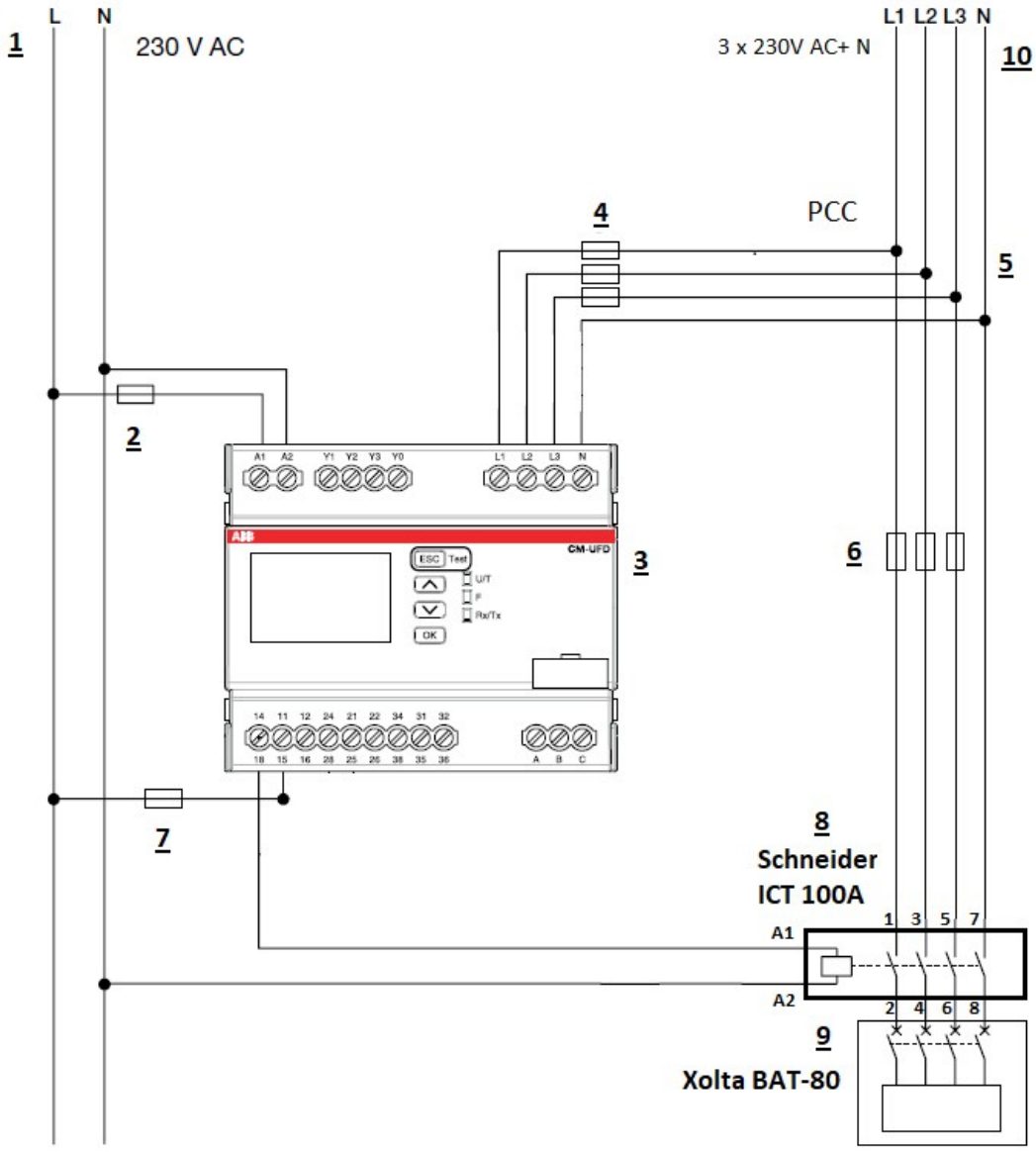


Figure 3-5 - Wiring schematics for a single-rack setup without LVRT.

The following table is a legend for the figure above:

Number	Description
1	Single-phase supply from the public grid – used to power the ABB grid protection relay.

Number	Description
2	1P 6A protection fuse (or **MCB**[1]) – protects the power supply to the ABB CM-UFD.M31(M) grid protection device.
3	ABB CM-UFD.M31(M) grid protection relay – monitors voltage and frequency at the point of common coupling (PCC).
4	3P 10A protection fuses (or 3-phase MCB) – secure the measuring circuit of the CM-UFD.M31(M) relay.
5	Point of Common Coupling (PCC) – the grid connection point for voltage and frequency monitoring.
6	Protection fuses for XOLTA BAT-80. See the XOLTA BAT-80 and BAT-80 AC installation manuals for specifications: https://x-olta.com/manuals/.
7	1P 10A protection fuse (or MCB) – required for each active relay (R1, R2, R3) on the grid protection device.
8	Schneider Electric Acti 9 iCT contactor – 4-pole, 100 A, 230 V AC coil, 4NO, used for battery coupling.
9	XOLTA BAT-80 is used in this example, but it can also be BAT-79 or BAT-80 AC.
10	Three-phase grid connection – 3 × 230 V AC + Neutral from the public grid.

Table 3-6 - Legend for the wiring schematics showing single or multi-rack without LVRT

3.4.2 Scenario 2: Single or multi-rack with LVRT requirement

The figure below shows the wiring schematics for grid protection and coupling switch for a single or multiple battery racks and with LVRT requirement. You'll find a figure legend later in this section.

[1]Miniature Circuit Breaker

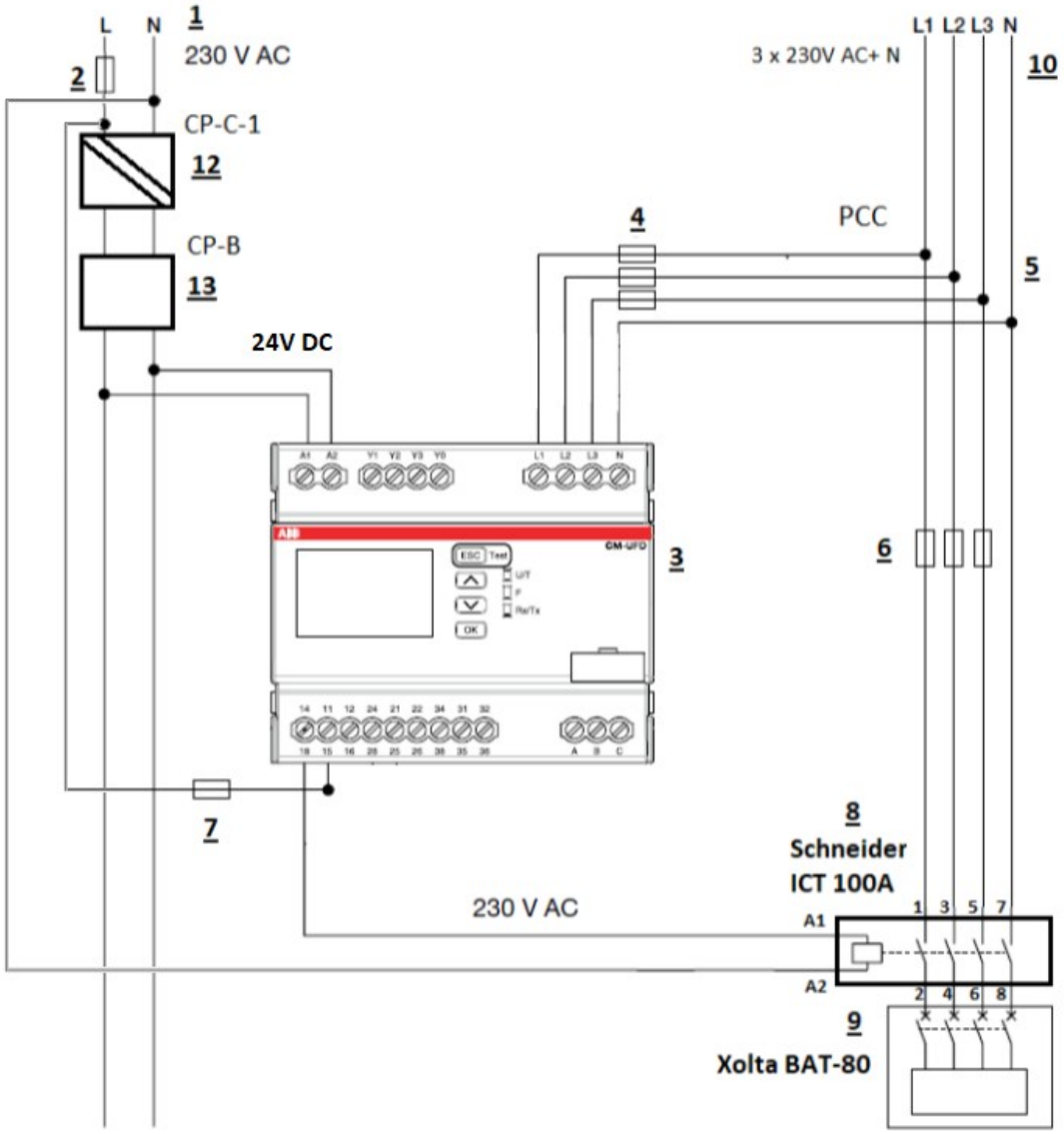


Figure 3-6 - Wiring schematics for a single-rack setup with LVRT.

The following table is a legend for the figure above:

Number	Description
1	Single-phase 230V AC supply from the public grid – powers the ABB grid protection relay.

Number	Description
2	Protection fuse (or **MCB**[1]) 1P, 6A for the ABB CM-UFD.M31(M) grid protection device.
3	ABB CM-UFD.M31(M) grid protection relay.
4	Voltage measuring circuit – protected by 3P, 10A protection fuses (or 3-phase MCB), connected to L1, L2, L3 inputs of the CM-UFD.M31(M).
5	Point of common coupling (**PCC**[2]).
6	Protection fuses for the connection between grid and XOLTABAT-80/BAT-80 AC. See the XOLTA BAT-80 and BAT-80 AC installation manuals for specifications: https://xolta.com/manuals/.
7	Protection fuse (or MCB) 1P, 10A for each utilised relay (R1, R2, R3) of the CM-UFD.M31(M).
8	Schneider Electric Acti 9 iCT 4-pole contactor – 100 A, 230 V AC coil, 4NO (used as coupling contactor).
9	XOLTA BAT-80 is used in this example, but it can also be BAT-79 or BAT-80 AC.
10	Public grid three-phase voltage: 3 × 230V AC + Neutral.
12	ABB CP-C.1 24/5.0 power supply (1SVR360563R1001) – provides 24V DC.
13	ABB CP-B 24/3.0 power supply (1SVR427060R0300) – provides 24V DC.

Table 3-7 - Legend for the wiring schematics showing single or multi-rack with LVRT

3.4.3 Scenario 3: Multi-rack with LVRT requirement

The figure below shows the wiring schematics for grid protection and coupling switch for three parallel-connected BAT-79, BAT-80, BAT-80 AC battery racks with LVRT requirement. You'll find a figure legend later in this section.

[1]Miniature Circuit Breaker
[2]Short for "Point of Common Coupling". The PCC is the connection point between a generating facility (e.g., a battery system) and the utility grid, where power exchange occurs.

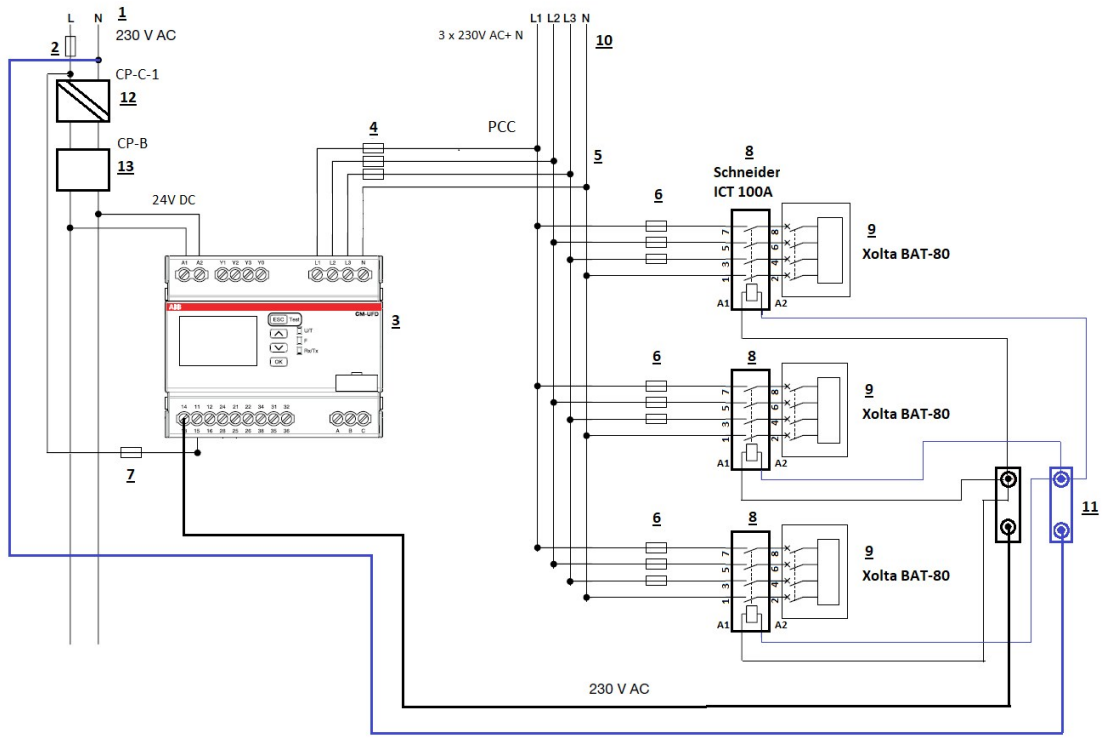


Figure 3-7 - Wiring schematics for three parallel-connected battery racks with LVRT.

The following table is a legend for the figure above:

Number	Description
1	Public grid single-phase voltage – supplies power to the ABB CM-UFD.M31(M) grid protection device.
2	Protection fuse (or MCB) 1P, 6A – for powering the ABB CM-UFD.M31(M) grid protection device.
3	ABB CM-UFD.M31(M) grid protection device.
4	Measuring circuit input – protected by 3P, 10A fuses (or 3-phase **MCB**[1]) for voltage monitoring (L1, L2, L3).

[1]Miniature Circuit Breaker

Number	Description
5	Point of Common Coupling (PCC).
6	Protection fuses for XOLTABAT-80. See the XOLTA BAT-80 and BAT-80 AC installation manuals for specifications: https://x-olta.com/manuals/.
7	Protection fuse (or MCB) 1P, 10A – for each utilised relay (R1, R2, R3) on the grid protection device.
8	Schneider Electric Acti 9 iCT 4-pole contactor – 100 A, 230 V AC coil, 4NO (used as coupling contactor per battery rack).
9	XOLTA BAT-80 is used in this example, but it can also be BAT-79 or BAT-80 AC.
10	Public grid three-phase voltage – 3 × 230V AC + Neutral.
11	Distribution terminals – for routing AC power across multiple battery racks.
12	ABB CP-C.1 24/5.0 power supply – (1SVR360563R1001), provides 24V DC.
13	ABB CP-B 24/3.0 power supply – (1SVR427060R0300), provides 24V DC.

Table 3-8 - Legend for the wiring schematics showing multiple parallel-connected battery racks.

> **Note**: For detailed information about the ABB and Ziehl grid connections, refer to the respective device manuals.

Chapter 4: Country-specific grid protection configuration

This section provides configuration instructions for the grid protection relay in accordance with national grid codes. Settings must be applied precisely to ensure regulatory compliance for XOLTA C&I battery installations.

Each country subsection includes:

- Grid zones or synchronous areas (where applicable).
- System types, for example Type A or B, with associated power thresholds.
- Relay protection thresholds for over/undervoltage, frequency, and **ROCOF**[1].
- Automatic reconnection rules for both frequency and voltage conditions.
- Reference to local regulatory documents for further guidance.

Settings apply to external grid protection relays installed as part of the BAT-79, BAT-80, or BAT-80 AC battery systems and must be aligned with the respective country's national connection code or energy authority requirements.

4.1 Denmark – grid protection settings for DK1 and DK2

Denmark is divided into two electrical regions:

- **DK1**:West Denmark, part of the Continental Europe synchronous area.
- **DK2**: East Denmark, part of the Nordic synchronous area.

System types and applicability:

- **Type A** systems: Installations up to 125 kW.
- **Type B** systems: Installations from 125 kW to 3 MW

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

> **Note**: For Type B, protection settings differ depending on the nominal voltage:
>
> - Systems ≤ 1 kV.
> - Systems > 1 kV.

Type A systems - protection settings

For Type A systems, install a grid monitoring relay, for example ABB CM-UFD.M31 or CM-UFD.M31M, and configure it with the protection settings shown below:

Relay protection setting	Time	Level
Overvoltage - step 1	60 s	1.1 x Un
Overvoltage - step 2	0.2 s	1.15 x Un
Undervoltage - step 1	50 s	0.85 x Un
Undervoltage - step 2	0.2 s	0.8 x Un
Overfrequency	0.2 s	51.5 Hz
Underfrequency	0.2 s	47.5 Hz
ROCOF[1]	0.08 ms	+/-2.5 Hz/s

Table 4-9 - Protection settings for Denmark Type A (DK1 and DK2)

Automatic reconnection settings for type A

DK1: Configure the relay to allow automatic reconnection only when the mains frequency has remained within the range of 49.8 Hz to 50.2 Hz for at least 180 seconds.

In addition, automatic reconnection based on voltage is only permitted when the grid voltage has remained within the range of 0.85 × Un to 1.1 × Un for a continuous period of 180 seconds.

DK2: Configure the relay to allow automatic reconnection only when the mains frequency has remained within the range of 49.5 Hz to 50.5 Hz for at least 180 seconds.

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

Likewise, automatic reconnection based on voltage is only permitted when the grid voltage remains within 0.85 × Un to 1.1 × Un for a minimum of 180 seconds.

Type B systems - protection settings

For Type B systems, configure the grid monitoring relay according to the following settings:

Relay protection setting	Time	Level
Overvoltage - step 1	60 s	1.1 x Un
Overvoltage - step 2	0.2 s	1.15 x Un
Undervoltage - step 1	60 s	0.85 (≤ 1 kV) 0.9 (> 1 kV)
Overfrequency	0.2 s	51.5 Hz
Underfrequency	0.2 s	47.5 Hz
ROCOF	0.08 s	2.5 Hz/s

Table 4-10 - Protection Parameters for Denmark Type B (DK1 and DK2)

Automatic reconnection settings for type B

DK1: Set the relay to allow automatic reconnection only when the mains frequency remains within the range of 49.8 Hz to 50.2 Hz continuously for at least 180 seconds.

Automatic reconnection based on voltage must be configured as follows:

- For systems with grid voltage ≤ 1 kV: Reconnection is allowed only after the voltage has been within the range of 0.85 × Un to 1.1 × Un for a continuous period of 180 seconds.
- For systems with grid voltage > 1 kV: Reconnection is allowed only after the voltage has been within the range of 0.90 × Un to 1.1 × Un for at least 180 seconds.

DK2: Apply the same reconnection logic, but adjust the frequency range to 49.5 Hz to 50.5 Hz. The voltage-based reconnection ranges and required timing remain identical to those specified above for DK1.

Note:

- For detailed configuration and parameter guidelines, refer to: *Teknisk Forskrift 3.3.1 for Elektriske Energilageranlæg – 2024, Version 5*.
- For detailed ABB relay-specific configuration, see the chapter *Configuring grid codes settings for ABB CM-UFD.M31(M)* on page 28.
- For settings related to Ziehl devices, consult the corresponding device manual.

4.2 Germany – grid protection settings according to VDE-AR-N 4105 and 4110

In Germany, the requirements for connecting BESS (Battery Energy Storage Systems) to the low- and medium-voltage grid are governed by two main technical connection rules:

- VDE-AR-N 4105: Applies to low-voltage connections (≤ 100 kW, < 1,000 V AC).
- VDE-AR-N 4110: Applies to medium-voltage connections (> 100 kW or ≥ 1,000 V AC).

These regulations define when and how grid protection relays must be installed and configured. Choosing the correct standard depends on the system's connection parameters, including voltage level, nominal power output, and installation location.

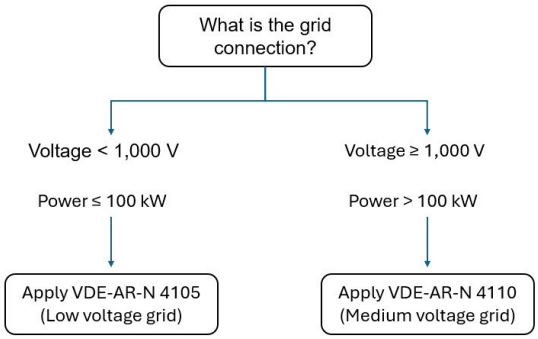
Selecting the right grid code

To determine whether VDE-AR-N 4105 or VDE-AR-N 4110 applies to your installation, refer to the official decision tree provided by the VDE FNN (Forum Netztechnik/Netzbetrieb):

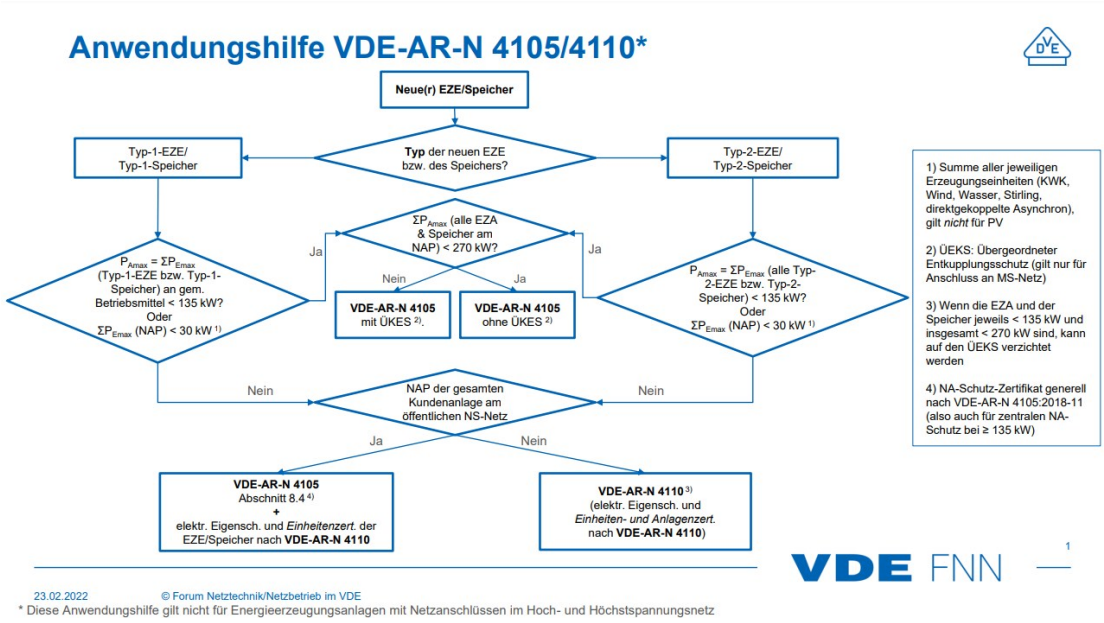
https://www.vde.com/de/fnn/aktuelles/2020-05-04-entscheidungshilfe-4105-4110

This guide helps clarify which technical rule applies based on factors such as plant type, power output, and grid connection point.

Here is a simplified decision tree:



The screenshots below show more detailed decision trees from VDE FNN:


Anwendungshilfe VDE-AR-N 4105/4110*
Neue(r) EZE/Speicher
Typ der neuen EZE bzw. des Speichers?
Typ-1-EZE/ Typ-1-Speicher
Typ-2-EZE/ Typ-2-Speicher
ΣPAmax (alle EZA & Speicher am NAP) < 270 kW?
PAmax = ΣPEmax (Typ-1-EZE bzw. Typ-1-Speicher) an gem. Betriebsmittel < 135 kW? Oder ΣPEmax (NAP) < 30 kW 1)
PAmax = ΣPEmax (alle Typ-2-EZE bzw. Typ-2-Speicher) < 135 kW? Oder ΣPEmax (NAP) < 30 kW 1)
VDE-AR-N 4105 mit ÜKES 2),
VDE-AR-N 4105 ohne ÜKES 2)
Ja
Nein
NAP der gesamten Kundenanlage am öffentlichen NS-Netz
VDE-AR-N 4105 Abschnitt 8.4 4) + elektr. Eigensch. und Einheitenzert. der EZE/Speicher nach VDE-AR-N 4110
VDE-AR-N 4110 3) (elektr. Eigensch. und Einheiten- und Anlagenzert. nach VDE-AR-N 4110)
1) Summe aller jeweiligen Erzeugungseinheiten (KWK, Wind, Wasser, Stirling, direktgekoppelte Asynchron), gilt nicht für PV
2) ÜEKS: Übergeordneter Entkupplungsschutz (gilt nur für Anschluss an MS-Netz)
3) Wenn die EZA und der Speicher jeweils < 135 kW und insgesamt < 270 kW sind, kann auf den ÜEKS verzichtet werden
4) NA-Schutz-Zertifikat generell nach VDE-AR-N 4105:2018-11 (also auch für zentralen NA-Schutz bei ≥ 135 kW)
VDE FNN
1
23.02.2022
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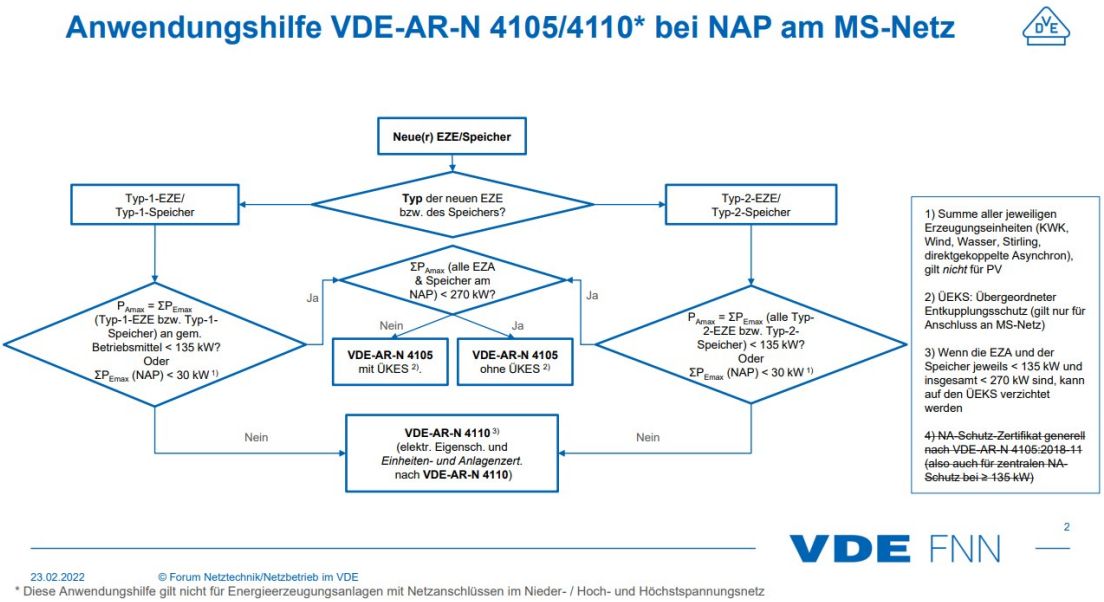
* Diese Anwendungshilfe gilt nicht für Energieerzeugungsanlagen mit Netzanschlüssen im Hoch- und Höchstspannungsnetz


Anwendungshilfe VDE-AR-N 4105/4110* bei NAP am MS-Netz
Neue(r) EZE/Speicher
Typ der neuen EZE bzw. des Speichers?
Typ-1-EZE/ Typ-1-Speicher
Typ-2-EZE/ Typ-2-Speicher
ΣPAmax (alle EZA & Speicher am NAP) < 270 kW?
PAmax = ΣPEmax (Typ-1-EZE bzw. Typ-1-Speicher) an gem. Betriebsmittel < 135 kW? Oder ΣPEmax (NAP) < 30 kW 1)
PAmax = ΣPEmax (alle Typ-2-EZE bzw. Typ-2-Speicher) < 135 kW? Oder ΣPEmax (NAP) < 30 kW 1)
VDE-AR-N 4105 mit ÜKES 2),
VDE-AR-N 4105 ohne ÜKES 2)
Ja
Nein
VDE-AR-N 4110 3) (elektr. Eigensch. und Einheiten- und Anlagenzert. nach VDE-AR-N 4110)
1) Summe aller jeweiligen Erzeugungseinheiten (KWK, Wind, Wasser, Stirling, direktgekoppelte Asynchron), gilt nicht für PV
2) ÜEKS: Übergeordneter Entkupplungsschutz (gilt nur für Anschluss an MS-Netz)
3) Wenn die EZA und der Speicher jeweils < 135 kW und insgesamt < 270 kW sind, kann auf den ÜEKS verzichtet werden
4) NA-Schutz-Zertifikat generell nach VDE-AR-N 4105:2018-11 (also auch für zentralen NA-Schutz bei ≥ 135 kW)
VDE FNN
2
23.02.2022
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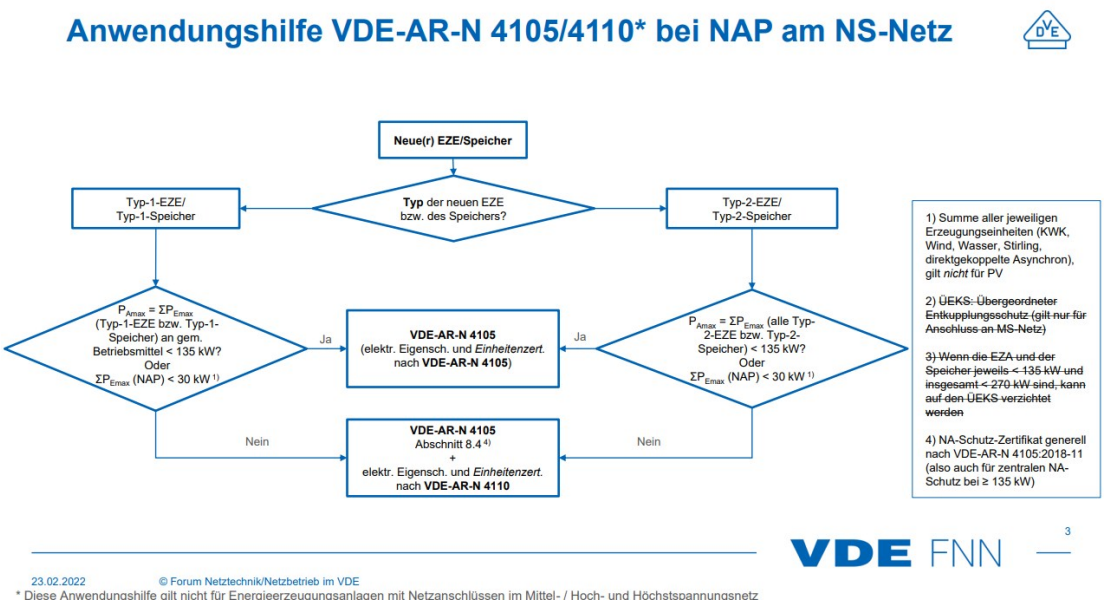


Note:

ABB:

- For detailed information about configuring the ABB CM-UFD.M31 relay for Germany, see the following sections later in this manual:
  - *Germany – VDE-AR-N 4105 (Low Voltage)* on page 54.
  - *Germany VDE-AR-N 4110 (Medium Voltage)* on page 58.
- Additionally, here you can find a manual that describes how to configure the ABB CM-UFD.M31 relay to comply with the German grid codes.

Ziehl:

- For Ziehl settings, refer to the device manual.
- On YouTube, you can view a video (in German) on how to set up the ZIEHL UFR1001E device: https://www.youtube.com/watch?v=Pany4lFwRro.

4.3 Sweden – grid protection settings according to EIFS 2018:2

In Sweden, battery energy systems up to 1.5 MW are classified as **Type A** installations.

Type A systems - protection settings

For Type A systems, install a grid monitoring relay and configure it with the protection settings shown below:

Relay protection setting	Time	Level
Overvoltage - step 2	60 s	1.1 x Un
Overvoltage - step 1	0.2 s	1.15 x Un
Undervoltage	0.2 s	0.85 x Un
Overfrequency	0.5 s	51.5 Hz
Underfrequency	0.5 s	47.5 Hz
ROCOF[1]	0.5 s	2.5 Hz/s

Table 4-11 - Protection settings for Sweden Type A

Automatic reconnection settings for type A

Configure the relay to allow automatic reconnection based on frequency only when the mains frequency has remained continuously within the range of 47.5 Hz to 50.1 Hz for a minimum of 180 seconds.

In addition, configure voltage-based automatic reconnection so that it is only permitted when the grid voltage has remained within the range of 207 V to 253 V for at least 180 seconds.

Note:

- For legal and regulatory reference, see: *Energimarknadsinspektionens föreskrifter om fastställande av generellt tillämpliga krav för nätanslutning av generatorer* (EIFS 2018:2).
- For detailed ABB relay-specific configuration, see the section *Sweden type A* on page 49 later in this manual.
- For settings related to Ziehl devices, consult the corresponding device manual.

4.4 Netherlands - grid protection settings according to NEN-EN 50549-1:2019

In the Netherlands, installations up to 1.0 MW are categorized as **Type A**.

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

Type A systems - protection settings

For Type A systems, install a grid monitoring relay, for example ABB CM-UFD.M31 or CM-UFD.M31M, and configure it with the protection settings shown below:

Relay protection setting	Time	Level
Overvoltage	0 s	1.15 x Un
Overvoltage - step 2	10 minutes	1.1 x Un
Undervoltage - step 1	2.0 s	0.8 x Un
Undervoltage - step 2	0.2 s	0.7 x Un
Overfrequency	2.0 s	51.5 Hz
Underfrequency	2.0 s	47.5 Hz

Table 4-12 - Protection settings for Netherlands Type A

Automatic reconnection settings for type A

Configure the relay to allow automatic reconnection only when the mains frequency has remained within the range of 49.9 Hz to 50.1 Hz for at least 60 seconds.

In addition, automatic reconnection based on voltage is only permitted when the grid voltage has remained within the range of 207 V to 253 V for a continuous period of 60 seconds.

Note:

- For detailed ABB relay-specific configuration, see the section *Netherlands type A* on page 63 later in this manual.
- For settings related to Ziehl devices, consult the corresponding device manual.
- For additional configuration and parameter guidelines, refer to the local Dutch grid code or the document *Regulering_20_1d4b9b30b6.pdf*.

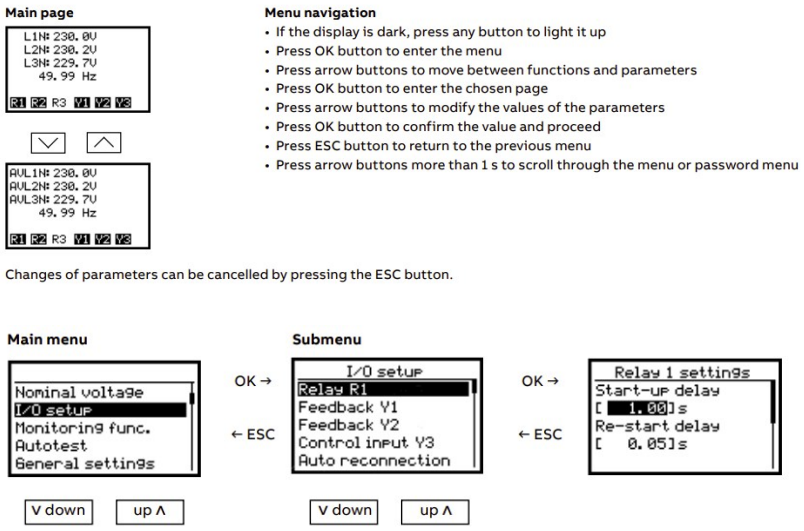
Chapter 5: Configuring grid codes settings for ABB CM-UFD.M31(M)

The ABB CM-UFD.M31(M) protection relay must be configured per the local grid code. This chapter provides:

1. General configuration steps.
2. Country-specific setting profiles.

These steps outline the flow:

1. Power the device with 230 V AC or 24 V DC.
2. Access the menu. It looks as follows:



3. Apply the general settings, independently of the grid codes.
4. Apply the country-specific settings.

5.1 General settings for ABB CM-UFD.M31(M)

Log into the menu of the ABB CM-UFD.M31(M) device and make the settings described in this section.

> **Note**:
>
> - The default password is *0000*.
> - Remember to save any setting you specify or change.

Menu	Submenu		Configuration option
Nominal voltage	Measuring principle		3L-N + 3L-L
Nominal voltage	Nominal voltage		230 V L-N 400 V L-L
I/O setup	Relay R3	Working principle	sync. with R1/R2
I/O setup	Relay R3	ON-delay	0 s
I/O setup	Relay R3	ON-time	0.5 s
I/O setup	Feedback Y1	Monitoring	disabled
I/O setup	Feedback Y1	Trip window	0.01 s
I/O setup	Feedback Y1	Release window	0.1 s
I/O setup	Feedback Y2	Monitoring	disabled
I/O setup	Feedback Y2	Trip window	0.01 s
I/O setup	Feedback Y2	Release window	0.1 s
I/O setup	Control Input Y3	Function	disabled
I/O setup	Auto reconnection	Number of attempts	0
General settings	Language	Language	English
General settings	Display	Switch-off delay	Leave the default value 10 s
General settings	Display	Contrast	Leave the default value 5 s
General settings	Plant Operator Password	Protection	enabled
General set-	Plant Operator	Change password	[****]

Menu	Submenu		Configuration option
tings	Password		**Note**: XOLTA recommends changing the default password for security reasons.
General settings	Grid Operator Password	Protection	enabled
General settings	Grid Operator Password	Change password	[****] **Note**: XOLTA recommends changing the default password for security reasons.
General settings	Load settings	"Setting name"	**Important**: Remember to save. Otherwise, the value is overwritten after device power cycling.

Menu	Submenu		Configuration option
General set-tings	Save settings	"Setting name"	**Important**: Remember to save. Other-wise, the value is over-written after device power cycling.
Modbus	Bus mode	Communication	disabled
Modbus	Bus mode	Remote trip via bus	disabled or enabled
Modbus	Bus mode	Fault reaction	trip R1/R2 or fault message
Modbus	Bus mode	Timeout	1 s
Modbus	Bus con-figuration	Slave address	1
Error memory	Error recording	Remote trip via Y3	Leave the default value
Error memory	Error recording	Remote trip via bus	Leave the default value
Error memory	Error recording	Power OFF	Leave the default value

Table 5-13 - General settings for ABB CM-UFD.M31(M)

5.2 Country-specific grid code settings for ABB CM-UFD.M31(M)

After configuring the general settings, log into the menu of the ABB CM-UFD.M31(M) device and configure the country-specific grid code settings.

> **Note**: The default password is *0000*.

- *DK1 type A* below.
- *DK2 type A* on page 36.
- *DK1 type B* on page 41.
- *DK2 type B* on page 45.
- *Sweden type A* on page 49.
- *Germany – VDE-AR-N 4105 (Low Voltage)* on page 54.
- *Germany VDE-AR-N 4110 (Medium Voltage)* on page 58.
- *Netherlands type A* on page 63.

5.2.1 DK1 type A

This section outlines the country-specific parameter settings for the ABB CM-UFD.M31 and CM-UFD.M31M grid monitoring relays, as required for compliance with the **DK1 Type A** grid connection requirements in Denmark. These settings ensure that the relay operates in accordance with national standards for voltage, frequency, and disconnection thresholds.

Menu	Submenu		Configuration option
Monitoring functions	Overvoltage >UAV	Monitoring	disabled
Monitoring functions	Overvoltage >UAV	Threshold value	0.005 xU_n
Monitoring functions	Overvoltage >UAV	Hysteresis	0.1 %

Menu	Submenu		Configuration option
Monitoring functions	Overvoltage >U1	Monitoring	enabled
Monitoring functions	Overvoltage >U1	Threshold value	1.15 x U_n
Monitoring functions	Overvoltage >U1	Hysteresis	1 %
Monitoring functions	Overvoltage >U1	Tripping delay	0.2 s
Monitoring functions	Overvoltage >U2	Monitoring	enabled
Monitoring functions	Overvoltage >U2	Threshold value	1.1 x U_n
Monitoring functions	Overvoltage >U2	Hysteresis	1 %
Monitoring functions	Overvoltage >U2	Tripping delay	60 s
Monitoring functions	Undervoltage <U1	Monitoring	enabled
Monitoring functions	Undervoltage <U1	Threshold value	0.85 x U_n
Monitoring functions	Undervoltage <U1	Hysteresis	1 %
Monitoring functions	Undervoltage <U1	Tripping delay	50 s
Monitoring functions	Undervoltage <U2	Monitoring	enabled

Menu	Submenu		Configuration option
Monitoring functions	Undervoltage <U2	Threshold value	0.8 x U_n
Monitoring functions	Undervoltage <U2	Hysteresis	1 %
Monitoring functions	Undervoltage <U2	Tripping delay	0.2 s
Monitoring functions	Overfrequency >F1	Monitoring	enabled
Monitoring functions	Overfrequency >F1	Threshold value	51.5 Hz
Monitoring functions	Overfrequency >F1	Hysteresis	0.1 Hz
Monitoring functions	Overfrequency >F1	Tripping delay	0.2 s
Monitoring functions	Overfrequency >F2	Monitoring	disabled
Monitoring functions	Overfrequency >F2	Threshold value	0.01 Hz
Monitoring functions	Overfrequency >F2	Hysteresis	0.01 Hz
Monitoring functions	Overfrequency >F2	Tripping delay	0.01 s
Monitoring functions	Underfrequency <F1	Monitoring	enabled
Monitoring functions	Underfrequency <F1	Threshold value	47.5 Hz

Menu	Submenu		Configuration option
Monitoring functions	Underfrequency <F1	Hysteresis	1 %
Monitoring functions	Underfrequency <F1	Tripping delay	0.2 s
Monitoring functions	Underfrequency <F2	Monitoring	disabled
Monitoring functions	Underfrequency <F2	Threshold value	0.01 Hz
Monitoring functions	Underfrequency <F2	Hysteresis	0.01 Hz
Monitoring functions	Underfrequency <F2	Tripping delay	0.01 s
Monitoring functions	**ROCOF**[1]	Monitoring	enabled
Monitoring functions	ROCOF	Threshold value	2.5 Hz/s
Monitoring functions	ROCOF	Number of cycles	50
Monitoring functions	ROCOF	Tripping delay	0.08
Monitoring functions	ROCOF	Error time	30 s
Monitoring func-	Vector Shift VS	Monitoring	disabled

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

Menu	Submenu		Configuration option
tions			
Monitoring functions	Vector Shift VS	Threshold value	0.1*
Monitoring functions	Vector Shift VS	Error time	0.01 s
Switch-on conditions	Switch-on delay	Switch-on delay	180 s
Switch-on conditions	Switch-on delay	Short interruption	enabled
Switch-on conditions	Voltage window	Monitoring	enabled
Switch-on conditions	Voltage window	Minimum	0.85 x U_n
Switch-on conditions	Voltage window	Maximum	1.1 x U_n
Switch-on conditions	Frequency window	Monitoring	enabled
Switch-on conditions	Frequency window	Minimum	49.8
Switch-on conditions	Frequency window	Maximum	50.2

Table 5-14 - DK1 Type A settings for ABB CM-UFD.M31(M)

5.2.2 DK2 type A

This section outlines the country-specific parameter settings for the ABB CM-UFD.M31 and CM-UFD.M31M grid monitoring relays, as required for compliance with the **DK2 type A** grid connection requirements in Denmark.

These settings ensure that the relay operates in accordance with national standards for voltage, frequency, and disconnection thresholds.

Menu	Submenu		Configuration option
Monitoring functions	Overvoltage >UAV	Monitoring	disabled
Monitoring functions	Overvoltage >UAV	Threshold value	0.005 xU_n
Monitoring functions	Overvoltage >UAV	Hysteresis	0.1 %
Monitoring functions	Overvoltage >U1	Monitoring	enabled
Monitoring functions	Overvoltage >U1	Threshold value	1.15 x U_n
Monitoring functions	Overvoltage >U1	Hysteresis	1 %
Monitoring functions	Overvoltage >U1	Tripping delay	0.2 s
Monitoring functions	Overvoltage >U2	Monitoring	enabled
Monitoring functions	Overvoltage >U2	Threshold value	1.1 x U_n
Monitoring functions	Overvoltage >U2	Hysteresis	1 %
Monitoring functions	Overvoltage >U2	Tripping delay	60 s
Monitoring functions	Undervoltage <U1	Monitoring	enabled
Monitoring functions	Undervoltage <U1	Threshold value	0.85 x U_n

Menu	Submenu		Configuration option
Monitoring functions	Undervoltage <U1	Hysteresis	1 %
Monitoring functions	Undervoltage <U1	Tripping delay	50 s
Monitoring functions	Undervoltage <U2	Monitoring	enabled
Monitoring functions	Undervoltage <U2	Threshold value	0.8 x U_n
Monitoring functions	Undervoltage <U2	Hysteresis	1 %
Monitoring functions	Undervoltage <U2	Tripping delay	0.2 s
Monitoring functions	Overfrequency >F1	Monitoring	enabled
Monitoring functions	Overfrequency >F1	Threshold value	51.5 Hz
Monitoring functions	Overfrequency >F1	Hysteresis	0.1 Hz
Monitoring functions	Overfrequency >F1	Tripping delay	0.2 s
Monitoring functions	Overfrequency >F2	Monitoring	disabled
Monitoring functions	Overfrequency >F2	Threshold value	0.01 Hz
Monitoring functions	Overfrequency >F2	Hysteresis	0.01 Hz

Menu	Submenu		Configuration option
Monitoring functions	Overfrequency >F2	Tripping delay	0.01 s
Monitoring functions	Underfrequency <F1	Monitoring	enabled
Monitoring functions	Underfrequency <F1	Threshold value	47.5 Hz
Monitoring functions	Underfrequency <F1	Hysteresis	1 %
Monitoring functions	Underfrequency <F1	Tripping delay	0.2 s
Monitoring functions	Underfrequency <F2	Monitoring	disabled
Monitoring functions	Underfrequency <F2	Threshold value	0.01 Hz
Monitoring functions	Underfrequency <F2	Hysteresis	0.01 Hz
Monitoring functions	Underfrequency <F2	Tripping delay	0.01 s
Monitoring functions	**ROCOF**[1]	Monitoring	enabled
Monitoring functions	ROCOF	Threshold value	2.5 Hz/s
Monitoring func-	ROCOF	Number of	50

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

Menu	Submenu		Configuration option
tions		cycles	
Monitoring functions	ROCOF	Tripping delay	0.08
Monitoring functions	ROCOF	Error time	30 s
Monitoring functions	Vector Shift VS	Monitoring	disabled
Monitoring functions	Vector Shift VS	Threshold value	0.1*
Monitoring functions	Vector Shift VS	Error time	0.01 s
Switch-on conditions	Switch-on delay	Switch-on delay	180 s
Switch-on conditions	Switch-on delay	Short interruption	enabled
Switch-on conditions	Voltage window	Monitoring	enabled
Switch-on conditions	Voltage window	Minimum	0.85 x U_n
Switch-on conditions	Voltage window	Maximum	1.1 x U_n
Switch-on conditions	Frequency window	Monitoring	enabled
Switch-on conditions	Frequency window	Minimum	49.5
Switch-on conditions	Frequency window	Maximum	50.5

Table 5-15 - DK2 Type A settings for ABB CM-UFD.M31(M)

5.2.3 DK1 type B

This section outlines the country-specific parameter settings for the ABB CM-UFD.M31 and CM-UFD.M31M grid monitoring relays, as required for compliance with the **DK1 Type B** grid connection requirements in Denmark.

These settings ensure that the relay operates in accordance with national standards for voltage, frequency, and disconnection thresholds.

Menu	Submenu		Configuration option
Monitoring functions	Overvoltage >UAV	Monitoring	disabled
Monitoring functions	Overvoltage >UAV	Threshold value	0.005 xU_n
Monitoring functions	Overvoltage >UAV	Hysteresis	0.1 %
Monitoring functions	Overvoltage >U1	Monitoring	enabled
Monitoring functions	Overvoltage >U1	Threshold value	1.15 x U_n
Monitoring functions	Overvoltage >U1	Hysteresis	1 %
Monitoring functions	Overvoltage >U1	Tripping delay	0.2 s
Monitoring functions	Overvoltage >U2	Monitoring	enabled
Monitoring functions	Overvoltage >U2	Threshold value	1.1 x U_n
Monitoring functions	Overvoltage >U2	Hysteresis	1 %
Monitoring func-	Overvoltage >U2	Tripping delay	60 s

Menu	Submenu		Configuration option
tions			
Monitoring functions	Undervoltage <U1	Monitoring	enabled
Monitoring functions	Undervoltage <U1	Threshold value	0.85 x $U_{n\ (<= 1\ kV)}$ or 0.85 x U_n (> 1 kV)
Monitoring functions	Undervoltage <U1	Hysteresis	1 %
Monitoring functions	Undervoltage <U1	Tripping delay	60 s
Monitoring functions	Undervoltage <U2	Monitoring	disabled
Monitoring functions	Undervoltage <U2	Threshold value	0.005 x U_n
Monitoring functions	Undervoltage <U2	Hysteresis	0.1 %
Monitoring functions	Undervoltage <U2	Tripping delay	0.01 s
Monitoring functions	Overfrequency >F1	Monitoring	enabled
Monitoring functions	Overfrequency >F1	Threshold value	51.5 Hz
Monitoring functions	Overfrequency >F1	Hysteresis	0.1 Hz
Monitoring functions	Overfrequency >F1	Tripping delay	0.2 s

Menu	Submenu		Configuration option
Monitoring functions	Overfrequency >F2	Monitoring	disabled
Monitoring functions	Overfrequency >F2	Threshold value	0.01 Hz
Monitoring functions	Overfrequency >F2	Hysteresis	0.01 Hz
Monitoring functions	Overfrequency >F2	Tripping delay	0.01 s
Monitoring functions	Underfrequency <F1	Monitoring	enabled
Monitoring functions	Underfrequency <F1	Threshold value	47.5 Hz
Monitoring functions	Underfrequency <F1	Hysteresis	1 %
Monitoring functions	Underfrequency <F1	Tripping delay	0.2 s
Monitoring functions	Underfrequency <F2	Monitoring	disabled
Monitoring functions	Underfrequency <F2	Threshold value	0.01 Hz
Monitoring functions	Underfrequency <F2	Hysteresis	0.01 Hz
Monitoring functions	Underfrequency <F2	Tripping delay	0.01 s

Menu	Submenu		Configuration option
Monitoring functions	ROCOF[1]	Monitoring	enabled
Monitoring functions	ROCOF	Threshold value	2.5 Hz/s
Monitoring functions	ROCOF	Number of cycles	50
Monitoring functions	ROCOF	Tripping delay	0.08
Monitoring functions	ROCOF	Error time	30 s
Monitoring functions	Vector Shift VS	Monitoring	disabled
Monitoring functions	Vector Shift VS	Threshold value	0.1*
Monitoring functions	Vector Shift VS	Error time	0.01 s
Switch-on conditions	Switch-on delay	Switch-on delay	180 s
Switch-on conditions	Switch-on delay	Short interruption	enabled
Switch-on conditions	Voltage window	Monitoring	enabled
Switch-on con-	Voltage window	Minimum	0.85 x U_n (<=1 kV)

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

Menu	Submenu		Configuration option
ditions			or 0.9 x U_n (>1 kV)
Switch-on conditions	Voltage window	Maximum	1.1 x U_n
Switch-on conditions	Frequency window	Monitoring	enabled
Switch-on conditions	Frequency window	Minimum	49.8
Switch-on conditions	Frequency window	Maximum	50.2

Table 5-16 - DK1 Type B settings for ABB CM-UFD.M31(M)

5.2.4 DK2 type B

This section outlines the country-specific parameter settings for the ABB CM-UFD.M31 and CM-UFD.M31M grid monitoring relays, as required for compliance with the **DK2 Type B** grid connection requirements in Denmark.

These settings ensure that the relay operates in accordance with national standards for voltage, frequency, and disconnection thresholds.

Menu	Submenu		Configuration option
Monitoring functions	Overvoltage >UAV	Monitoring	disabled
Monitoring functions	Overvoltage >UAV	Threshold value	0.005 xU_n
Monitoring func-	Overvoltage >UAV	Hysteresis	0.1 %

Menu	Submenu		Configuration option
tions			
Monitoring functions	Overvoltage >U1	Monitoring	enabled
Monitoring functions	Overvoltage >U1	Threshold value	1.15 x U_n
Monitoring functions	Overvoltage >U1	Hysteresis	1 %
Monitoring functions	Overvoltage >U1	Tripping delay	0.2 s
Monitoring functions	Overvoltage >U2	Monitoring	enabled
Monitoring functions	Overvoltage >U2	Threshold value	1.1 x U_n
Monitoring functions	Overvoltage >U2	Hysteresis	1 %
Monitoring functions	Overvoltage >U2	Tripping delay	60 s
Monitoring functions	Undervoltage <U1	Monitoring	enabled
Monitoring functions	Undervoltage <U1	Threshold value	0.85 x U_n (<=1 kV) or 0.9 x U_n (>1 kV)
Monitoring functions	Undervoltage <U1	Hysteresis	1 %
Monitoring functions	Undervoltage <U1	Tripping delay	60 s

Menu	Submenu		Configuration option
Monitoring functions	Undervoltage <U2	Monitoring	disabled
Monitoring functions	Undervoltage <U2	Threshold value	0.005 x U_n
Monitoring functions	Undervoltage <U2	Hysteresis	0.1 %
Monitoring functions	Undervoltage <U2	Tripping delay	0.01 s
Monitoring functions	Overfrequency >F1	Monitoring	enabled
Monitoring functions	Overfrequency >F1	Threshold value	51.5 Hz
Monitoring functions	Overfrequency >F1	Hysteresis	0.1 Hz
Monitoring functions	Overfrequency >F1	Tripping delay	0.2 s
Monitoring functions	Overfrequency >F2	Monitoring	disabled
Monitoring functions	Overfrequency >F2	Threshold value	0.01 Hz
Monitoring functions	Overfrequency >F2	Hysteresis	0.01 Hz
Monitoring functions	Overfrequency >F2	Tripping delay	0.01 s
Monitoring functions	Underfrequency <F1	Monitoring	enabled

Menu	Submenu		Configuration option
Monitoring functions	Underfrequency <F1	Threshold value	47.5 Hz
Monitoring functions	Underfrequency <F1	Hysteresis	1 %
Monitoring functions	Underfrequency <F1	Tripping delay	0.2 s
Monitoring functions	Underfrequency <F2	Monitoring	disabled
Monitoring functions	Underfrequency <F2	Threshold value	0.01 Hz
Monitoring functions	Underfrequency <F2	Hysteresis	0.01 Hz
Monitoring functions	Underfrequency <F2	Tripping delay	0.01 s
Monitoring functions	**ROCOF**[1]	Monitoring	enabled
Monitoring functions	ROCOF	Threshold value	2.5 Hz/s
Monitoring functions	ROCOF	Number of cycles	50
Monitoring functions	ROCOF	Tripping delay	0.08
Monitoring func-	ROCOF	Error time	30 s

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

Menu	Submenu		Configuration option
tions			
Monitoring functions	Vector Shift VS	Monitoring	disabled
Monitoring functions	Vector Shift VS	Threshold value	0.1*
Monitoring functions	Vector Shift VS	Error time	0.01 s
Switch-on conditions	Switch-on delay	Switch-on delay	180 s
Switch-on conditions	Switch-on delay	Short interruption	enabled
Switch-on conditions	Voltage window	Monitoring	enabled
Switch-on conditions	Voltage window	Minimum	0.85 x U_n (<=1 kV) or 0.9 x U_n (>1 kV)
Switch-on conditions	Voltage window	Maximum	1.1 x U_n
Switch-on conditions	Frequency window	Monitoring	enabled
Switch-on conditions	Frequency window	Minimum	49.5
Switch-on conditions	Frequency window	Maximum	50.5

Table 5-17 - DK2 Type B settings for ABB CM-UFD.M31(M)

5.2.5 Sweden type A

This section details the country-specific parameter settings for the ABB CM-UFD.M31 and CM-UFD.M31M grid monitoring relays, as required to comply with the Swedish **type A** grid connection

requirements. These parameters define the necessary thresholds for voltage, frequency, and disconnection timing, ensuring that the relay operates in accordance with Swedish national standards for low-voltage grid integration.

Menu	Submenu		Configuration option
Monitoring functions	Overvoltage >UAV	Monitoring	disabled
Monitoring functions	Overvoltage >UAV	Threshold value	0.005 xU_n
Monitoring functions	Overvoltage >UAV	Hysteresis	0.1 %
Monitoring functions	Overvoltage >U1	Monitoring	enabled
Monitoring functions	Overvoltage >U1	Threshold value	1.15 x U_n
Monitoring functions	Overvoltage >U1	Hysteresis	1 %
Monitoring functions	Overvoltage >U1	Tripping delay	0.2 s
Monitoring functions	Overvoltage >U2	Monitoring	enabled
Monitoring functions	Overvoltage >U2	Threshold value	1.1 x U_n
Monitoring functions	Overvoltage >U2	Hysteresis	1 %
Monitoring functions	Overvoltage >U2	Tripping delay	60 s
Monitoring functions	Undervoltage <U1	Monitoring	disabled

Menu	Submenu		Configuration option
Monitoring functions	Undervoltage <U1	Threshold value	0,005 xU_n
Monitoring functions	Undervoltage <U1	Hysteresis	0.1 %
Monitoring functions	Undervoltage <U1	Tripping delay	0.01 s
Monitoring functions	Undervoltage <U2	Monitoring	enabled
Monitoring functions	Undervoltage <U2	Threshold value	0.85 x U_n
Monitoring functions	Undervoltage <U2	Hysteresis	1 %
Monitoring functions	Undervoltage <U2	Tripping delay	0.2 s
Monitoring functions	Overfrequency >F1	Monitoring	enabled
Monitoring functions	Overfrequency >F1	Threshold value	51.5 Hz
Monitoring functions	Overfrequency >F1	Hysteresis	0.1 Hz
Monitoring functions	Overfrequency >F1	Tripping delay	0.5 s
Monitoring functions	Overfrequency >F2	Monitoring	disabled
Monitoring functions	Overfrequency >F2	Threshold value	0.01 Hz

Menu	Submenu		Configuration option
Monitoring functions	Overfrequency >F2	Hysteresis	0.01 Hz
Monitoring functions	Overfrequency >F2	Tripping delay	0.01 s
Monitoring functions	Underfrequency <F1	Monitoring	enabled
Monitoring functions	Underfrequency <F1	Threshold value	47.5 Hz
Monitoring functions	Underfrequency <F1	Hysteresis	0.1 Hz
Monitoring functions	Underfrequency <F1	Tripping delay	0.2 s
Monitoring functions	Underfrequency <F2	Monitoring	disabled
Monitoring functions	Underfrequency <F2	Threshold value	0.01 Hz
Monitoring functions	Underfrequency <F2	Hysteresis	0.01 Hz
Monitoring functions	Underfrequency <F2	Tripping delay	0.01 s
Monitoring functions	**ROCOF**[1]	Monitoring	enabled
Monitoring functions	ROCOF	Threshold value	2.5 Hz/s

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

Menu	Submenu		Configuration option
tions			
Monitoring functions	ROCOF	Number of cycles	50
Monitoring functions	ROCOF	Tripping delay	0.5 s
Monitoring functions	ROCOF	Error time	30 s
Monitoring functions	Vector Shift VS	Monitoring	disabled
Monitoring functions	Vector Shift VS	Threshold value	0.1*
Monitoring functions	Vector Shift VS	Error time	0.01 s
Switch-on conditions	Switch-on delay	Switch-on delay	180 s
Switch-on conditions	Switch-on delay	Short interruption	enabled
Switch-on conditions	Voltage window	Monitoring	enabled
Switch-on conditions	Voltage window	Minimum	0.85 x U_n
Switch-on conditions	Voltage window	Maximum	1.1 x U_n
Switch-on conditions	Frequency window	Monitoring	enabled
Switch-on con-	Frequency window	Minimum	47.5

Menu	Submenu		Configuration option
ditions			
Switch-on conditions	Frequency window	Maximum	50.1

Table 5-18 - Type A settings for ABB CM-UFD.M31(M)

5.2.6 Germany – VDE-AR-N 4105 (Low Voltage)

This section outlines the country-specific parameter settings for the ABB CM-UFD.M31 and CM-UFD.M31M grid monitoring relays, as required for compliance with the *German VDE-AR-N 4105* standard for low-voltage grid connections.

These settings ensure proper integration of distributed energy resources into the public grid by adhering to the national limits for voltage, frequency, and disconnection behavior, as defined for systems connected to the low-voltage distribution network.

Menu	Submenu		Configuration option
Monitoring functions	Overvoltage >UAV	Monitoring	enabled
Monitoring functions	Overvoltage >UAV	Threshold value	1.1 x U_n
Monitoring functions	Overvoltage >UAV	Hysteresis	0.1 %
Monitoring functions	Overvoltage >U1	Monitoring	enabled
Monitoring functions	Overvoltage >U1	Threshold value	1.25 x U_n
Monitoring func-	Overvoltage >U1	Hysteresis	1 %

Menu	Submenu		Configuration option
tions			
Monitoring functions	Overvoltage >U1	Tripping delay	0.1 s
Monitoring functions	Overvoltage >U2	Monitoring	disabled
Monitoring functions	Overvoltage >U2	Threshold value	0.005 x U_n
Monitoring functions	Overvoltage >U2	Hysteresis	0.1 %
Monitoring functions	Overvoltage >U2	Tripping delay	0.01 s
Monitoring functions	Undervoltage <U1	Monitoring	enabled
Monitoring functions	Undervoltage <U1	Threshold value	0.8 x U_n
Monitoring functions	Undervoltage <U1	Hysteresis	1 %
Monitoring functions	Undervoltage <U1	Tripping delay	1 s
Monitoring functions	Undervoltage <U2	Monitoring	enabled
Monitoring functions	Undervoltage <U2	Threshold value	0.45 x U_n
Monitoring functions	Undervoltage <U2	Hysteresis	1 %
Monitoring func-	Undervoltage <U2	Tripping delay	0.3 s

Menu	Submenu		Configuration option
tions			
Monitoring functions	Overfrequency >F1	Monitoring	enabled
Monitoring functions	Overfrequency >F1	Threshold value	51.5 Hz
Monitoring functions	Overfrequency >F1	Hysteresis	0.1 Hz
Monitoring functions	Overfrequency >F1	Tripping delay	0.1 s
Monitoring functions	Overfrequency >F2	Monitoring	disabled
Monitoring functions	Overfrequency >F2	Threshold value	0.01 Hz
Monitoring functions	Overfrequency >F2	Hysteresis	0.01 Hz
Monitoring functions	Overfrequency >F2	Tripping delay	0.01 s
Monitoring functions	Underfrequency <F1	Monitoring	enabled
Monitoring functions	Underfrequency <F1	Threshold value	47.5 Hz
Monitoring functions	Underfrequency <F1	Hysteresis	0.1 Hz
Monitoring functions	Underfrequency <F1	Tripping delay	0.1 s
Monitoring func-	Underfrequency <F2	Monitoring	disabled

Menu	Submenu		Configuration option
tions			
Monitoring functions	Underfrequency <F2	Threshold value	0.01 Hz
Monitoring functions	Underfrequency <F2	Hysteresis	0.01 Hz
Monitoring functions	Underfrequency <F2	Tripping delay	0.01 s
Monitoring functions	ROCOF[1]	Monitoring	disabled
Monitoring functions	ROCOF	Threshold value	0.005 Hz/s
Monitoring functions	ROCOF	Number of cycles	1
Monitoring functions	ROCOF	Tripping delay	0.01 s
Monitoring functions	ROCOF	Error time	0.01 s
Monitoring functions	Vector Shift VS	Monitoring	disabled
Monitoring functions	Vector Shift VS	Threshold value	0.1*
Monitoring functions	Vector Shift VS	Error time	0.01 s

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

Menu	Submenu		Configuration option
Switch-on conditions	Switch-on delay	Switch-on delay	60 s
Switch-on conditions	Switch-on delay	Short interruption	enabled
Switch-on conditions	Voltage window	Monitoring	enabled
Switch-on conditions	Voltage window	Minimum	0.85 x U_n
Switch-on conditions	Voltage window	Maximum	1.1 x U_n
Switch-on conditions	Frequency window	Monitoring	enabled
Switch-on conditions	Frequency window	Minimum	47.5
Switch-on conditions	Frequency window	Maximum	50.1

Table 5-19 - Germany VDE-AR-N 4105 settings for ABB CM-UFD.M31(M)

5.2.7 Germany VDE-AR-N 4110 (Medium Voltage)

This section describes the parameter configuration for the ABB CM-UFD.M31 and CM-UFD.M31M relays to comply with the *VDE-AR-N 4110* standard in Germany.

This standard governs grid connection requirements for systems connected to the medium-voltage network and defines precise thresholds for voltage, frequency, and fault detection to ensure system stability and safety within the public grid infrastructure.

Menu	Submenu		Configuration option
Monitoring functions	Overvoltage >UAV	Monitoring	disabled
Monitoring functions	Overvoltage >UAV	Threshold value	0.005 xU_n
Monitoring functions	Overvoltage >UAV	Hysteresis	0.1 %
Monitoring functions	Overvoltage >U1	Monitoring	enabled
Monitoring functions	Overvoltage >U1	Threshold value	1.25 x U_n
Monitoring functions	Overvoltage >U1	Hysteresis	1 %
Monitoring functions	Overvoltage >U1	Tripping delay	0.1 s
Monitoring functions	Overvoltage >U2	Monitoring	disabled
Monitoring functions	Overvoltage >U2	Threshold value	0.005 x U_n
Monitoring functions	Overvoltage >U2	Hysteresis	0.1 %
Monitoring functions	Overvoltage >U2	Tripping delay	0.01 s
Monitoring functions	Undervoltage <U1	Monitoring	enabled
Monitoring functions	Undervoltage <U1	Threshold value	0.8 x U_n

Menu	Submenu		Configuration option
Monitoring functions	Undervoltage <U1	Hysteresis	1 %
Monitoring functions	Undervoltage <U1	Tripping delay	2.4 s
Monitoring functions	Undervoltage <U2	Monitoring	enabled
Monitoring functions	Undervoltage <U2	Threshold value	0.3 x U_n
Monitoring functions	Undervoltage <U2	Hysteresis	1 %
Monitoring functions	Undervoltage <U2	Tripping delay	0.8 s
Monitoring functions	Overfrequency >F1	Monitoring	enabled
Monitoring functions	Overfrequency >F1	Threshold value	51.5 Hz
Monitoring functions	Overfrequency >F1	Hysteresis	0.1 Hz
Monitoring functions	Overfrequency >F1	Tripping delay	5 s
Monitoring functions	Overfrequency >F2	Monitoring	enabled
Monitoring functions	Overfrequency >F2	Threshold value	52.5 Hz
Monitoring functions	Overfrequency >F2	Hysteresis	0.1 Hz

Menu	Submenu		Configuration option
Monitoring functions	Overfrequency >F2	Tripping delay	0.1 s
Monitoring functions	Underfrequency <F1	Monitoring	enabled
Monitoring functions	Underfrequency <F1	Threshold value	47.5 Hz
Monitoring functions	Underfrequency <F1	Hysteresis	0.1 Hz
Monitoring functions	Underfrequency <F1	Tripping delay	0.1 s
Monitoring functions	Underfrequency <F2	Monitoring	disabled
Monitoring functions	Underfrequency <F2	Threshold value	0.01 Hz
Monitoring functions	Underfrequency <F2	Hysteresis	0.01 Hz
Monitoring functions	Underfrequency <F2	Tripping delay	0.01 s
Monitoring functions	**ROCOF**[1]	Monitoring	disabled
Monitoring functions	ROCOF	Threshold value	0.005 Hz/s
Monitoring func-	ROCOF	Number of	1

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

Menu	Submenu		Configuration option
tions		cycles	
Monitoring functions	ROCOF	Tripping delay	0.01 s
Monitoring functions	ROCOF	Error time	0.01 s
Monitoring functions	Vector Shift VS	Monitoring	disabled
Monitoring functions	Vector Shift VS	Threshold value	0.1*
Monitoring functions	Vector Shift VS	Error time	0.01 s
Switch-on conditions	Switch-on delay	Switch-on delay	600 s
Switch-on conditions	Switch-on delay	Short interruption	enabled
Switch-on conditions	Voltage window	Monitoring	enabled
Switch-on conditions	Voltage window	Minimum	49.9 Hz
Switch-on conditions	Voltage window	Maximum	50.1 Hz
Switch-on conditions	Frequency window	Monitoring	enabled
Switch-on conditions	Frequency window	Minimum	49.8
Switch-on conditions	Frequency window	Maximum	50.2

Table 5-20 - Germany VDE-AR-N 4110 settings for ABB CM-UFD.M31(M)

5.2.8 Netherlands type A

This section provides the required parameter settings for the ABB CM-UFD.M31 and CM-UFD.M31M grid monitoring relays in accordance with the *Type A* grid connection rules in the Netherlands. These parameters define the operational limits for voltage, frequency, and disconnection timing to meet national standards and ensure safe, compliant integration into the Dutch low-voltage distribution grid.

Menu	Submenu		Configuration option
Monitoring functions	Overvoltage >UAV	Monitoring	enabled
Monitoring functions	Overvoltage >UAV	Threshold value	1.1 x U_n
Monitoring functions	Overvoltage >UAV	Hysteresis	0.1 %
Monitoring functions	Overvoltage >U1	Monitoring	enabled
Monitoring functions	Overvoltage >U1	Threshold value	1.15 x U_n
Monitoring functions	Overvoltage >U1	Hysteresis	1 %
Monitoring functions	Overvoltage >U1	Tripping delay	0.1 s
Monitoring functions	Overvoltage >U2	Monitoring	disabled
Monitoring functions	Overvoltage >U2	Threshold value	0.005 x U_n
Monitoring functions	Overvoltage >U2	Hysteresis	0.1 %
Monitoring func-	Overvoltage >U2	Tripping delay	0.2 s

Menu	Submenu		Configuration option
tions			
Monitoring functions	Undervoltage <U1	Monitoring	enabled
Monitoring functions	Undervoltage <U1	Threshold value	0.8 x U_n
Monitoring functions	Undervoltage <U1	Hysteresis	1 %
Monitoring functions	Undervoltage <U1	Tripping delay	2 s
Monitoring functions	Undervoltage <U2	Monitoring	enabled
Monitoring functions	Undervoltage <U2	Threshold value	0.7 x U_n
Monitoring functions	Undervoltage <U2	Hysteresis	1 %
Monitoring functions	Undervoltage <U2	Tripping delay	0.2 s
Monitoring functions	Overfrequency >F1	Monitoring	enabled
Monitoring functions	Overfrequency >F1	Threshold value	51.5 Hz
Monitoring functions	Overfrequency >F1	Hysteresis	1 %
Monitoring functions	Overfrequency >F1	Tripping delay	2 s
Monitoring func-	Overfrequency >F2	Monitoring	disabled

Menu	Submenu		Configuration option
tions			
Monitoring functions	Overfrequency >F2	Threshold value	0.01 Hz
Monitoring functions	Overfrequency >F2	Hysteresis	0.01 Hz
Monitoring functions	Overfrequency >F2	Tripping delay	0.01 s
Monitoring functions	Underfrequency <F1	Monitoring	enabled
Monitoring functions	Underfrequency <F1	Threshold value	47.5 Hz
Monitoring functions	Underfrequency <F1	Hysteresis	1 %
Monitoring functions	Underfrequency <F1	Tripping delay	2 s
Monitoring functions	Underfrequency <F2	Monitoring	disabled
Monitoring functions	Underfrequency <F2	Threshold value	0.01 Hz
Monitoring functions	Underfrequency <F2	Hysteresis	0.01 Hz
Monitoring functions	Underfrequency <F2	Tripping delay	0.01 s

Menu	Submenu		Configuration option
Monitoring functions	ROCOF[1]	Monitoring	enabled
Monitoring functions	ROCOF	Threshold value	2.5 Hz/s
Monitoring functions	ROCOF	Number of cycles	50
Monitoring functions	ROCOF	Tripping delay	0.05
Monitoring functions	ROCOF	Error time	30 s
Monitoring functions	Vector Shift VS	Monitoring	disabled
Monitoring functions	Vector Shift VS	Threshold value	0.1*
Monitoring functions	Vector Shift VS	Error time	0.01 s
Switch-on conditions	Switch-on delay	Switch-on delay	60 s
Switch-on conditions	Switch-on delay	Short interruption	enabled
Switch-on conditions	Voltage window	Monitoring	enabled
Switch-on con-	Voltage window	Minimum	0.85 x U_n

[1]Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

Menu	Submenu		Configuration option
ditions			
Switch-on conditions	Voltage window	Maximum	1.1 x U_n
Switch-on conditions	Frequency window	Monitoring	enabled
Switch-on conditions	Frequency window	Minimum	49.9
Switch-on conditions	Frequency window	Maximum	50.1

Table 5-21 - Netherlands type A settings for ABB CM-UFD.M31(M)

Chapter 6: Terminology

This section lists the terms and abbreviations used in this manual, but it's also a general glossary of XOLTA terms.

A

AC
Alternating current

AC unit
An air-cooling unit in the battery energy storage system used to absorb and transfer heat inside the battery unit.

API
Short for "Application Programming Interface". A set of commands and protocols that enables different software applications to interact and exchange data by defining how requests and responses should be structured.

B

Battery protection unit
A unit containing switches and fuses for battery protection .

BESS
Battery energy storage system

black start mode
A system operation mode in which the battery energy storage system independently generates power without external grid support, allowing it to restart other power generation sources and restore grid operations following a blackout. See also “grid forming mode”.

BMS
Battery management system

BoL
Beginning of life

BPU
Battery protection unit

C

C&I
Short for "Commercial and Industrial" and refers to the larger XOLTA battery systems BAT-79, BAT-80, and BAT-80 AC. It can be a single battery rack or a multirack installation.

C3 classification
A corrosion category based on ISO 12944, indicating a moderate level of environmental corrosion risk. It applies to urban and industrial areas with moderate sulfur dioxide pollution or coastal areas with low salinity.

CAN
Controller area network

CMU
Cell monitoring unit of n-BMS

Controller area network
Serial communication protocol developed by Bosch.

coupling contactor
A coupling contactor is a switching device used to connect or disconnect a power source to the main electrical grid. In grid protection systems, it enables safe synchronization and isolation during faults or maintenance.

D

DC
Direct current

de-energize
To disconnect or isolate the battery energy storage system from any power source to prevent the flow of current. A de-energized battery might still be partially or fully charged.

DoD
Depth of discharge

DSO
Short for "distribution system operator", also known as "electricity distribution company". This is the company responsible for operating, maintaining, and developing the electrical distribution network, ensuring a reliable supply of electricity to end-users, and facilitating the integration of renewable energy sources and other distributed energy resources.

E

EES
Energy storage system

EMS
Energy management system

EoL
End of life

F

FCR
Short for "Frequency Containment Reserve". FCR is a primary frequency response service that stabilizes grid frequency deviations by automatically balancing generation and consumption within seconds after a disturbance. It is the first line of defense to maintain grid frequency near its nominal value.

FCR-D
Short for "Frequency Containment Reserve for Disturbances". FCR-D is activated during larger, more significant frequency disturbances that fall outside the range of normal operations. It provides a stronger, more targeted response to prevent the grid frequency from falling below critical thresholds.

FCR-N
Short for "Frequency Containment Reserve - Normal". FCR-N is a subtype of FCR designed to handle smaller frequency deviations during normal grid operation. It ensures continuous frequency stabilization within a defined tolerance band.

FFR
Short for "Fast Frequency Response". FFR provides rapid active power support to counteract significant frequency drops, acting faster than traditional FCR. It is often used to address high-inertia grids or during large, sudden power imbalances.

G

grid code
A set of technical regulations that power generation systems must comply with to connect to the grid. It defines operational limits for voltage, frequency, and disconnection criteria to ensure grid stability and reliability.

grid forming mode
An operational mode where a battery energy storage system actively controls voltage and frequency, creating a stable grid environment and maintaining power balance, even in the absence of external grid input or under weak grid conditions. See also “black start mode”.

grid protection relay
A grid protection relay monitors the public grid for anomalies and ensures compliance with grid codes by automatically disconnecting and reconnecting the battery system when necessary. Synonyms: "NA Schutz" and "NS protection relay".

GUI
Graphical user interface

I

IGBT
Insulated gate bipolar transistor

Inverter power rating
The inverter power rating indicates the maximum amount of power the inverter can deliver to the load or grid under specified conditions. It is measured in kilovolt-amperes (kVA) and determines the system’s capacity to convert and supply electrical energy.

IP
Ingress protection code according to International Electrochemical Commission

L

LVRT
Short for "low voltage ride through". LVRT is the ability of an electrical device - typically a wind turbine or solar inverter - to stay connected to the grid during short periods of low voltage, such as those caused by faults or disturbances. The purpose is to support the grid by remaining online and helping restore normal conditions.

M

Maximum power point tracker
A crucial component in photovoltaic systems that optimizes the performance of solar panels by maximizing the power they can deliver under varying conditions. It is typically part of a solar charge controller or inverter.

MCB
Miniature Circuit Breaker

MCU
Main Control Unit of n-BMS

Meter
A digital device that has been physically installed and is awaiting connection to the XOLTA server, measuring and recording real-time electricity consumption, generation, and grid interaction for efficient energy management in a battery storage system. Synonym: smart meter.

miniature circuit breaker
A circuit protection device that protects against overcurrent and short circuits.

MODBUS
Serial communication protocol developed by Modicon

MPPT
Maximum power point tracker

N

n-BMS
Battery Management System from Lithium Balance A/S

NA Schutz
Synonym for "grid and system protection" and "NS protection".

NTC
Negative temperature coefficient thermistor

O

OVC
Short for "over voltage category". The level of transient overvoltage the battery energy storage system can withstand based on its location in the electrical installation. It ranges from OVC I (low exposure, electronic devices) to OVC IV (high exposure, utility connections). Transient protection is achieved through a surge protection device.

Over voltage category
The level of transient overvoltage the battery energy storage system can withstand based on its location in the electrical installation. It ranges from OVC I (low exposure, electronic devices) to OVC IV (high exposure, utility connections). Transient protection is achieved through a surge protection device.

P

PCC
Short for "Point of Common Coupling". The PCC is the connection point between a generating facility (e.g., a battery system) and the utility grid, where power exchange occurs.

PCS
Power conditioning system

Peak shaving
The process of reducing short-term high power demand (peak loads) by using energy storage or alternative power sources to lower electricity costs and relieve grid stress.

photovoltaic
A technology that converts sunlight directly into electricity. It's a way of generating energy by using solar panels that capture sunlight and turn it into usable power for homes, businesses, or devices.

Point of Common Coupling
The connection point between a generating facility (e.g., a battery system) and the utility grid, where power exchange occurs.

POR
Power on reset

PV
Photovoltaic also know as solar energy

R

R134A
A type of refrigerant used in air conditioning and refrigeration systems.

RCBO
Residual Current Breaker with Overcurrent.

RCCB
Residual Current Circuit Breaker.

RCD
Residual current device

residual current breaker with overcurrent
A circuit protection device that combines the functions of RCCB and MCB into a single device.

residual current circuit breaker
A circuit protection device that detects earth faults or residual currents.

residual current device
A circuit protection device that detects leakage currents and cuts off the power to prevent electric shocks.

RJ45
Short for "Registered Jack 45". A standardized connector used for Ethernet networking, featuring an 8P8C (8 Position, 8 Contact) design. It is commonly found on twisted-pair cables like Cat5e and Cat6, enabling connections between devices such as computers, routers, and switches. RJ45 supports high-speed data transmission and adheres to wiring standards like TIA/EIA-568.

ROCOF
Short for "Rate of Change of Frequency". In grid monitoring relays, it refers to how quickly the electrical frequency is changing over time. It's used to detect unstable grid conditions - especially during events like load shedding or generator disconnection - and can trigger protective actions if the frequency changes too rapidly.

S

SC
Site controller

SoC
State of charge

SPD
Short for "Surge Protection Device". A device designed to protect batteries and other electrical components from voltage spikes or surges, for example, because of lightning strikes. It's installed between the power supply and the battery it's protecting. When a surge occurs, the device either diverts the excess voltage to the ground or limits it to a safe level that won't damage the system.

Surge arrester
A type of surge protection device (SPD) used in electrical power systems to limit voltage surges and divert excess current safely to the ground, preventing damage to equipment during events like lightning strikes or switching surges.

surge protection device
A device designed to protect batteries and other electrical components from voltage spikes or surges, for example, because of lightning strikes. It's installed between the power supply and the battery it's protecting. When a surge occurs, the device either diverts the excess voltage to the ground or limits it to a safe level that won't damage the system.

T

TCO
Total cost of ownership

TCP
Transmission control protocol

time of use
A pricing model used by utility companies where electricity rates vary depending on the time of day, day of the week, or season. Under TOU, electricity is typically more expensive during peak demand periods (when usage is high) and cheaper during off-peak times (when demand is lower). This pricing structure encourages consumers to shift their energy use to off-peak periods to lower costs and reduce strain on the electrical grid.

TMS
Thermal management system

ToU
Time of Use

XOLTA

About XOLTA

XOLTA is a Danish company specializing in the development and production of advanced battery systems for energy storage. The solutions are designed for both residential households and businesses, enabling efficient solar energy storage and energy consumption optimization. XOLTA's products promote energy efficiency, reduce dependency on the power grid, and support a sustainable future.

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