

DYNAMIC ENERGY UNIT DEU-SU

MANAGING BRAKING ENERGY



OPERATION MANUAL

Rev. B, April 2014

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1. INTRODUCTION

1.1 Preface

You have chosen a forward-looking energy technology from Moog. Thank you for choosing a Moog product. As a system provider, we set reliable standards in energy technology with innovative products. With the certification of our environmental management program according to EMAS III and our quality management system according to DIN EN ISO 9001:2008, we are committed to maintaining a sustainable corporate culture.

1.2 Environmental protection

Packaging	The packaging consists of environmentally friendly materials and can be disposed of through municipal waste disposal facilities.
Devices	Moog takes back faulty devices and devices that are no longer in use.

1.3 Working with this Operation Manual

1.3.1 Target group

This Operation Manual was created for qualified electricians who will be working with the Dynamic Energy Unit DEU-SU throughout its lifecycle.

1.3.2 Basic information

This Operation Manual is subdivided into individual sections.

Please note the following:

- Before using the DEU-SU for the first time, carefully read the entire Operation Manual. It will be too late to do so if the device is already in use.
- Make every effort to understand the Operation Manual completely. This is the only way to ensure that the DEU-SU can be operated safely and as intended.
- Always follow the instructions specified in the Operation Manual.
- Store this Operation Manual in the vicinity of the device. The storage location must be known.

1.3.3 Abbreviations

BGV	Berufsgenossenschaftliche Vorschrift (Occupational Health and Safety Regulations)
DEU-SU	Dynamic Energy Unit
EEPROM	Electrical Erasable Programmable Read Only Memory
EC	European Community
DEU-EM	Expansion Module
EN	European Norm
LED	Light-emitting diode
PLC	Programmable logic controller


1.3.4 Symbols

Cross-reference	A cross-reference to another page in this Operation Manual begins with the double arrow symbol "►►".
Action and reaction	<p>The symbol "☒" indicates an action taken by personnel, while the symbol "✓" indicates the reaction of the device to this action.</p> <p>Example:</p> <p>☒ Turn on the main switch.</p> <p>✓ The lamp lights up.</p>
Image labels and image-text association	<p>Important details in the graphics are identified with numbers (e.g. ①).</p> <p>In the text, this number is located after the description of the detail it identifies.</p>

1.3.5 Definitions

Safety instructions A safety instruction consists of several parts:

- A pictogram,
- A signal word that indicates the degree of danger,
- A text indicating the type of danger and
- Information on how to avoid the danger, indicated by the symbol "☒".

Pictogram	Signal word	Danger	Consequence
	Danger	Indicates an imminent danger to persons (danger to life).	Death or very serious injury.
	Warning	Indicates a potential danger to persons or property (danger of injury).	Damage to health or serious property damage.
	Caution	Indicates a potential danger to property (danger of property damage).	Property damage.



Example of a safety instruction:



WARNING!

Danger of injury!
 Touching of hot surfaces may lead to burn injuries.
 ☒ Before cleaning, switch off the device for at least 30 minutes.

Other notes Notes regarding events that do not involve personal or property damage are used as follows:

Pictogram	Note
	Note regarding additional instructions or other useful information.
	Note regarding proper disposal.

Application In this Operation Manual, "application" refers to a "drive unit with a frequency converter" or a "servo drive."

2. DESCRIPTION OF THE DEVICE

2.1 Intended use

Device (DEU-SU)	<p>The Dynamic Energy Unit (DEU-SU) is used to supply a DC link of applications (frequency converters or servo drives) with electric voltage independent of the main power supply. The DEU-SU does not require a separate power supply. It is possible to operate multiple DEU-SU units in parallel to increase maximum power.</p> <p>To increase the energy storage capacity, it is also possible to connect optional Expansion Modules (DEU-EM). The DEU-SU is delivered on a customer-specific basis and may only be operated in compliance with these specifications.</p>
Expansion Module (DEU-EM)	<p>The Expansion Module (DEU-EM) is connected to the DEU-SU and increases the energy storage capacity of the DEU-SU.</p> <p>If multiple DEU-SU units are connected in parallel, the additional DEU-EM units must be distributed symmetrically.</p>
Safeguards	The safeguards (e.g. cover) must not be removed.
Area of use	<p>The DEU-SU is to be used inside electrical switching cabinets in industrial facilities.</p> <p>It is not permissible to operate these devices in potentially explosive areas.</p>
Modifications	<p>It is not permissible to modify the device without authorization.</p> <p>Doing so will render the warranty and any liability claims invalid.</p>
Maintenance	Maintenance work may only be performed by the manufacturer.

2.2 Applied regulations

The DEU-SU meets the basic requirements of Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC.

2.3 Type designation

Dynamic Energy Unit DEU-SU	CB33256-001
Expansion Module DEU-EM	CB33255-001 (DEU-EM 2.0) CB33255-002 (DEU-EM 4.0)

2.4 Overview

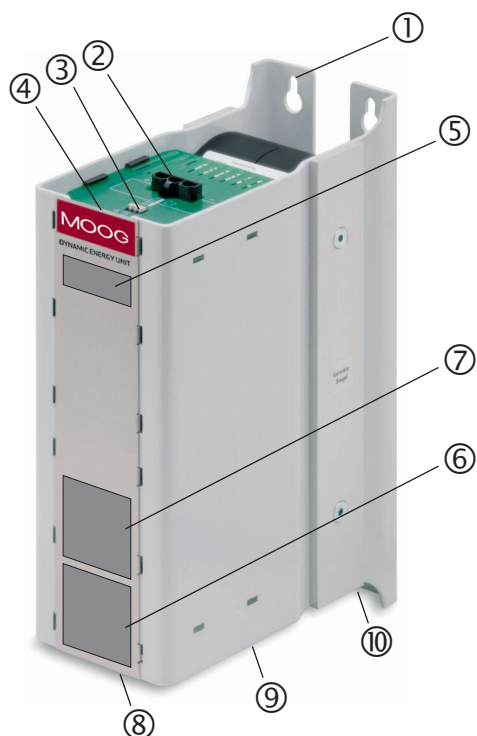


Fig. 1: Overview of the Dynamic Energy Unit DEU-SU

- | | |
|--|---|
| 1 Fastening holes (4 pieces), Ø 6.5 (0.26 in) | 6 Nameplate |
| 2 Connection terminal DEU-EM (X1) | 7 Warning labels |
| 3 Connection terminal for monitoring interface | 8 EIA422 communication interface (connector X4) |
| 4 Control LED | 9 Connection terminal for DC link |
| 5 Indicator of installation direction | 10 Ground connection |

2.5 Nameplate

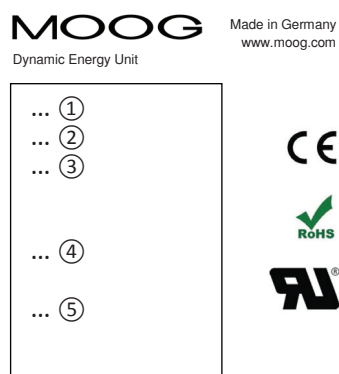





Fig. 2: Nameplate

- | | |
|-----------------------|--|
| 1 Article designation | 4 Production date (calendar week/year) |
| 2 Article number | 5 Technical data |
| 3 Serial number | |

2.6 Labels on the housing

Symbol	Text and meaning
	<p>Text: "Caution! After the DC link is switched off, the capacitor discharge is > 5 minutes. Please read the Operation Manual."</p> <p>Meaning: The converter must be switched off. The energy storage must be discharged. The charge state can be checked using the LED at the top. The blink frequency must decrease as the unit becomes discharged. If in doubt, measure the voltage at the "DC link" connection terminals at the bottom of the DEU-SU. A forced discharge may only be performed with a suitable resistor. The effective discharge resistor of the entire system must be > 22 ohm.</p>
	<p>Text: "Warning! Hot surface."</p>
	<p>Text: "Danger! Risk of electric shock. Dangerous operating voltage levels remain after the power supply is switched off. Please read the Operation Manual."</p> <p>Meaning: High DC voltage levels on live parts are discharged slowly.</p>

2.7 Ambient conditions

Ambient temperature	-10 °C to +85 °C (+14 °F to +185 °F) (transport, storage) 0 °C to +40 °C (+32 °F to +104 °F) (operation)
Relative humidity	≤ 95 % (transport, storage) ≤ 85 % (operation)
Cooling method	Air cooling (convection)
Housing degree of protection	IP20
Contamination class at installation location	2

2.8 Electrical connection values

Maximum continuous DC link voltage	800 VDC
Maximum output power	18 kW
Power loss during standby	< 10 W
Usable storage capacity	Approx. 2 kW
Built-in discharge resistor	PTC, 120 ohm, 105 W (see also data sheet "Moog PTC800666")
Overvoltage category	III (erection altitude up to 2,000 m (6562 ft) above sea level) II (erection altitude above 2,000 m (6562 ft) above sea level)
Interference immunity	Industrial area as per EN 6100-6-2-2005 and EN 6100-6-4-2007

2.9 Size and weight

Width	100 mm (3.94 in)
Depth	201 mm (7.91 in)
Height	300 mm (11.81 in)
Weight	Approx. 6.9 kg (15.21 lb)

2.10 Noise emissions

The DEU-SU does not create any significant noise emissions (< 70 dB (A)).

3. BASIC SAFETY INSTRUCTIONS

3.1 Personnel

Minimum age	Not defined.
Duty of care	<p>Personnel must:</p> <ul style="list-style-type: none"> • Be qualified electricians. • Have read and understood the Operation Manual. • Be instructed in how the DEU-SU functions. • Know how to perform the individual tasks.
Conduct in case of an emergency	<p>The following points must be adhered to:</p> <ul style="list-style-type: none"> • The locations of the first aid stations must be known. • Personnel must be informed about how to conduct themselves in case of an emergency. • Proper conduct must be checked regularly and recorded accordingly. <p>In an emergency:</p> <ul style="list-style-type: none"> • Perform first aid on the injured person. • Call a doctor or the company medic. • Inform the superiors. • Follow the instructions of superiors or support staff.

3.2 Device

Functional state	The DEU-SU may only be operated when it is fully functional. Before using the device, ensure that the DEU-SU is in the proper condition.
Brake	If the application includes a brake that is not supplied via the DC link, then a loss of power may cause the application to work against the dead brake.
Hot surfaces	The device may reach temperatures up to +80 °C (+176 °F) during operation. Do not touch the housing.
Warning symbols	Warning symbols are affixed to the housing. Damaged warning symbols must be replaced immediately.
Housing	The housing must not be opened.
Malfunctions	<p>Electrical devices that could influence the functioning of the DEU-SU may not be used in the vicinity of the DEU-SU.</p> <p>The DEU-SU must not be exposed to mechanical shock or vibrations.</p>

4. TRANSPORT/STORAGE/INSTALLATION

4.1 Checking the delivery

The DEU-SU leaves the factory after it is checked and found to be in perfect condition. Special packaging consisting of a carton, corrugated cardboard and protective film ensures that the device can be transported safely. A packaging label is found on the outside of the packaging. Note the instructions on transport, storage and appropriate handling. Transport damage is the responsibility of the shipping company.

Scope of supply

- 1 × Dynamic Energy Unit DEU-SU
- 1 × Dynamic Energy Unit DEU-SU Operation Manual

The exact scope of delivery can be found on the delivery slip.

Check the delivery:

- ☒ Check the packaging for damage.
- ☒ Immediately notify the shipping company of any damage to the packaging and/or the DEU-SU.
 - ✓ The damage notification must be received by the shipping company in writing within seven days.

4.2 Transporting the DEU-SU

- ☒ Transport the DEU-SU to the installation location in its original packaging.
- ☒ Avoid strong vibrations and hard impacts.

4.3 Storing the DEU-SU

The DEU-SU must be stored in clean, dry rooms.
Temperatures between -10 °C and +85 °C (+14 °F and +185 °F) are permissible.
Temperature fluctuations must not exceed 30 K per hour.

4.4 Unpacking the DEU-SU

- ☒ Remove the DEU-SU from the packaging carefully.
- ☒ Check that the device is complete and undamaged.
- ☒ Dispose of the packaging in accordance with local regulations for cardboard and recyclable materials.

4.5 Installing the DEU-SU



CAUTION!

Property damage!
The DEU-SU must not be installed upside down.
☒ Install the DEU-SU in an upright position.

Basic information

foreign objects.

- The DEU-SU is designed for installation in an electrical switching cabinet.
- The DEU-SU requires the protection of the switching cabinet against penetration by foreign objects.
- The unit must be installed directly on a mounting surface in the switching cabinet or on a base frame supplied by Moog for this purpose.
- Due to the length of the connection cable (1 m (3.28 ft) maximum), the DEU-SU must be installed directly next to the application (frequency converter, servo drive).

Distances

The following distances from other modules must be maintained when installing the unit:

- Side: 20 mm (0.79 in) minimum
- Top and bottom: 100 mm (3.94 in) minimum

Installation

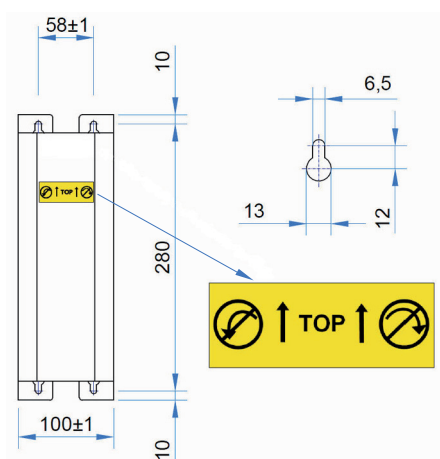


Fig. 3: Drilled hole template

- ☒ Install the DEU-SU upright using four screws (M6) according to the drilled hole template.
 - ✓ The power connection is at the bottom.
- ☒ Check that it is firmly seated.

4.6 Grounding the DEU-SU

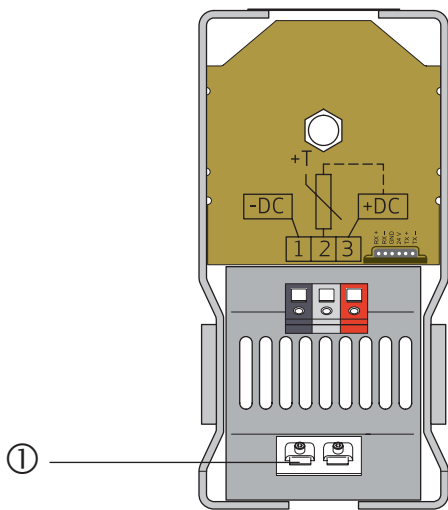


Fig. 4: Ground connection (underside of housing)

- ☒ Ground the DEU-SU at the ground connection ① (cross section according to the national standard).
- ☒ When using shielded lines, the shield must also be connected to the ground connection.
- ☒ Perform a safety check as per BGV A3.

5. SETTING UP THE DEVICE



WARNING!

Danger of injury!

The housing may reach temperatures up to +80 °C (+176 °F) during operation.

☒ If work on the DEU-SU should become necessary, wear heat-resistant gloves.

5.1 Connecting the DEU-SU

Basic information

- The operating location must be dry and dust free.
- The supplied air must not contain dust, gases or steam that will endanger the proper functioning of the device or that are electrically conductive. If necessary, appropriate remedies must be taken.
- The DEU-SU must only be operated in an ambient climate of 0 to +40 °C (+32 to +104 °F).
- The DEU-SU can only be operated in combination with applications which have direct access to the DC link capacity.
- The connection lines (cross section as per national standard) between the DEU-SU and the application must not be longer than 1.0 m (3.3 ft) and must be routed such that they are twisted and secure against short-circuiting.

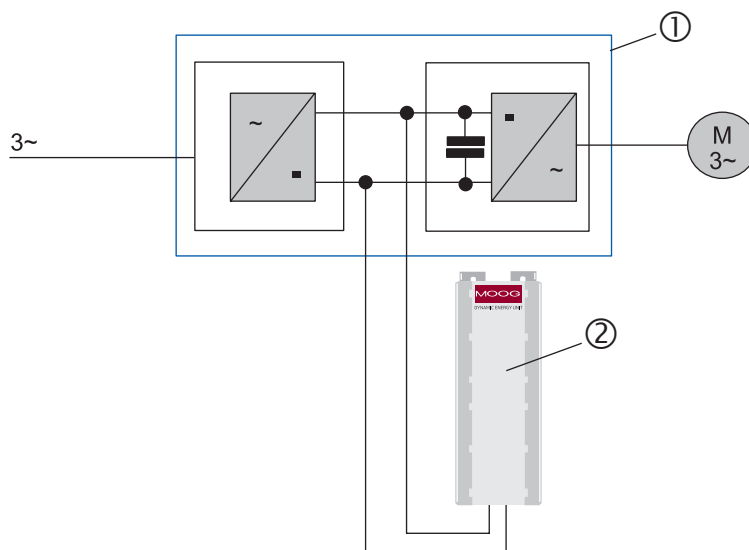


Fig. 5: Connection diagram

- 1 Application
- 2 DEU-SU

Procedure

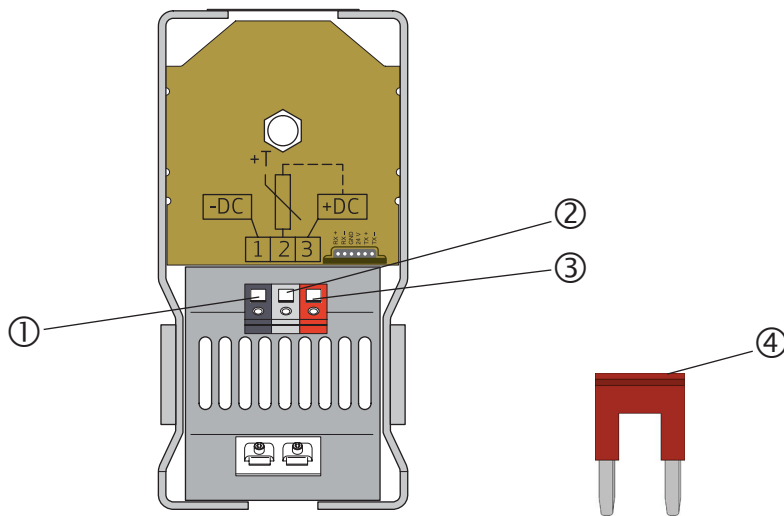


Fig. 6: Connection terminals, underside of housing

- ☒ Determine the polarity of the DC link connections.
- ☒ De-energize the DC link.
- ☒ Establish that the DC link is de-energized.
- ☒ Remove the discharge bridge ④ between terminals "-DC" ① (black terminal) and "BR" ② (gray terminal).
- ☒ Establish that no voltage is applied between terminals "-DC" ① (black terminal) and "+DC" ③ (red terminal).
- ☒ Connect the negative terminal on the DC link output of the application with "-DC" ① (black terminal) on the DEU-SU.
- ☒ Connect the positive terminal on the DC link output of the application with "+DC" ③ (red terminal) on the DEU-SU.

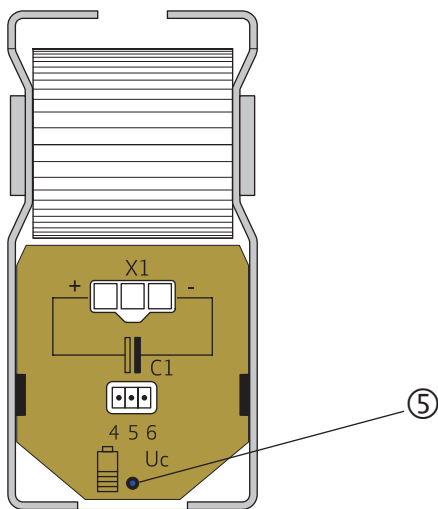


Fig. 7: Control LED, top of housing

- ☒ Supply the DC link with voltage.
 - ✓ The control LED ⑤ on the top of the housing flashes after approx. 10 seconds (flashes more rapidly as the energy increases).
 - ✓ After another 10 seconds, the DEU-SU is ready for operation. (depending on the Expansion Module, this amount of time may increase by an additional 5 seconds)
 - ✓ The DEU-SU is connected to the DC link.

5.2 Connecting two or more DEU-SU units in parallel

It is also possible to connect multiple DEU-SU units to the DC link in parallel via the terminals "-DC" (black terminal) and "+DC" (red terminal). Proceed as described in (► Section 5.1).

5.3 Connecting the EIA422 communication interface

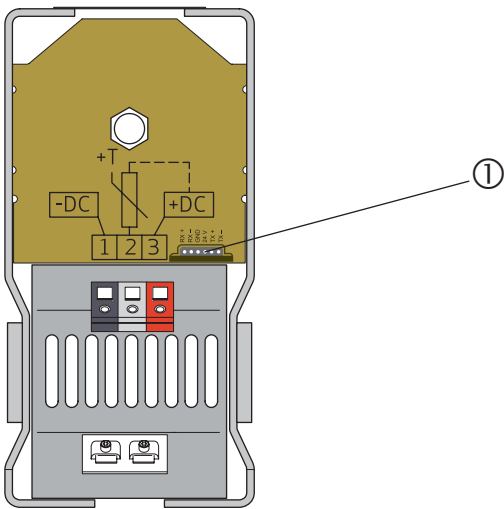


Fig. 8: Underside of housing, EIA422 communication interface X4

Basic information

- The communication interface ① is used to exchange data with the DEU-SU.
- The interface must be connected with an external EIA422 communication interface.

Connector X4 pin assignment

Pin	Signal	Description
1	RX+	Connected with TX+ external interface
2	RX-	Connected with TX- external interface
3	GND	Connected with GND
4	+24V	Connected with power supply +5...26 V
5	TX+	Connected with RX+ external interface
6	TX-	Connected with RX- external interface



Fig. 9: Connector X4 pin assignment and external interface

5.4 Connecting the monitoring interface

Basic information

- The monitoring interface controls the available energy in the energy storage.
- The external wiring (e.g. PLC input) must supply the switching signal (+24 V) with a ground reference via a high-impedance resistor (1 k Ω - 100 k Ω).
- Typical fall times at 1 k Ω - 100 k Ω : level below 5 V < 4 ms.

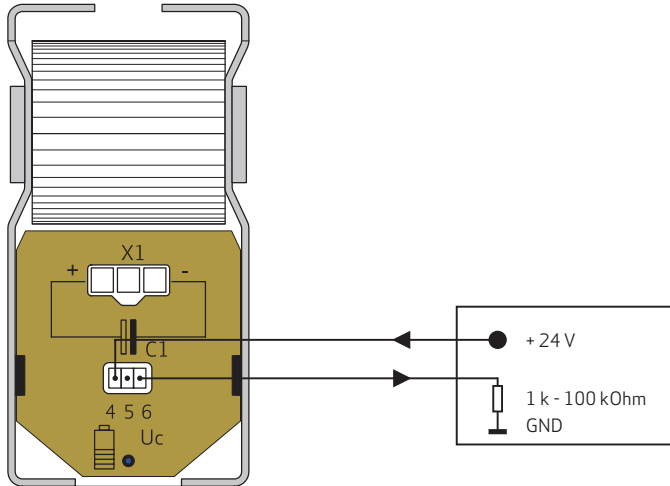


Fig. 10: Monitoring interface, top of housing

- ☒ Connect switching signal "+24 V" to terminal "4."
- ☒ Connect the output signal from terminal "6" to ground via a resistor (1 k Ω - 100 k Ω).

Evaluate output signal

High signal at terminal "6"

- The available energy is within the permissible tolerance band for standby mode.
- The DEU-SU is ready for operation.

Low signal at terminal "6"

- The available energy is outside the tolerance band for standby mode.

The following causes are possible:

- The DEU-SU is in charging mode and is not yet ready for operation.
- Loss of power.
- The DEU-SU is faulty.

This context is further illustrated in the following figure (Fig. 11).

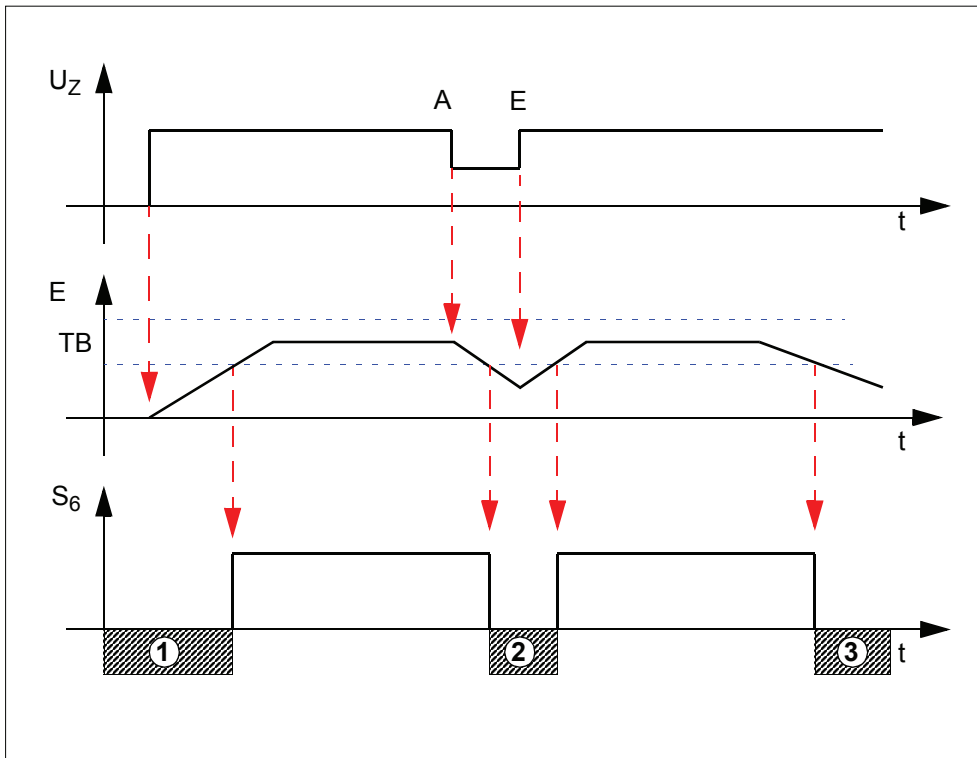


Fig. 11: Monitoring interface signal at terminal "6"

U_z	DC link voltage	1	DEU-SU in charging mode
E	Available energy	2	Loss of power
TB	Tolerance band for standby mode	3	DEU-SU faulty
S_6	Output signal at terminal "6"		
A	Begin power loss		
E	End power loss		

The DEU-SU is in charging mode ①

☒ Check whether there has been a loss of power.

☒ If power was not lost:

Wait approx. 10 seconds until the energy storage is charged
(if DEU-EM units are connected, the waiting time will increase accordingly).

✓ After approx. 10, the low signal switches to a high signal.

Loss of power ② (Fig. 11)

- If a loss of power is detected by the monitoring interface, at least 80 % of the stored energy will remain. This energy can be used to securely stop the application.
- Be sure to keep in mind that shutting down the application may release energy which will cause the DC link voltage to increase.
- If the increase in DC link voltage is large enough, the energy will be used to recharge the energy storage. If the energy storage is charged enough so that the energy is once again within the permissible tolerance band for standby mode, the result will be a high signal at terminal "6", which could be misinterpreted as a return of the power supply.
☒ Check whether there has been a loss of power.

The DEU-SU is not working properly ③ (Fig. 11)

If there is a low signal at terminal "6", even though

- the DEU-SU has been in operation (charged) for some time, and
 - there has not been a loss of power,
- then the DEU-SU is faulty.

☒ Contact the manufacturer immediately for information on how to proceed.

5.5 Disconnecting the DEU-SU

Basic information

- As long as the energy storage of the DEU-SU (with or without a DEU-EM) is charged with energy, the DEU-SU must **not** be disconnected from the DC link. This is indicated by the flashing control LED on the top of the housing.
- To rule out a malfunction by the LED, it is essential that you actually observe the LED flashing before it goes out. This is the only way to ensure that it is safe to work on the DEU-SU.

Procedure

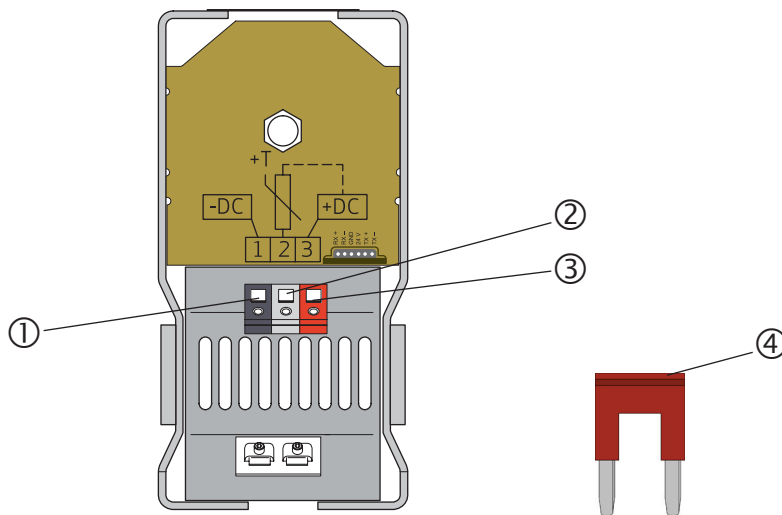


Fig. 12: Discharging the DEU-SU

- ☒ Disconnect the application from the power supply.
- ☒ Connect the discharge bridge ④ between terminals "-DC" ① (black terminal) and "BR" ② (gray terminal) on the DEU-SU.
 - ✓ The DEU-SU is then discharged.
 - ✓ After the DEU-SU has been fully discharged, the control LED no longer flashes.
- ☒ Once it is fully discharged, wait at least another 30 seconds.
- ☒ Using a voltmeter, establish that no voltage is applied between terminals "-DC" ① (black terminal) and "+DC" ③ (red terminal).
- ☒ Disconnect the DEU-SU from the DC link.
 - ✓ The discharge bridge should remain connected as long as the DEU-SU is disconnected from the DC link.
- ☒ Reconnect the application to the power supply.

5.6 Forming the DEU-SU

Basic information

- If the DEU-SU has gone without voltage for more than one year, it needs to be formed. If this is not done, the DEU-SU could be damaged when the power supply is switched on.
- The production date is indicated on the nameplate (►► page 7, Fig. 2).
- During forming, the DEU-SU is connected to the DC link voltage but is not operational.

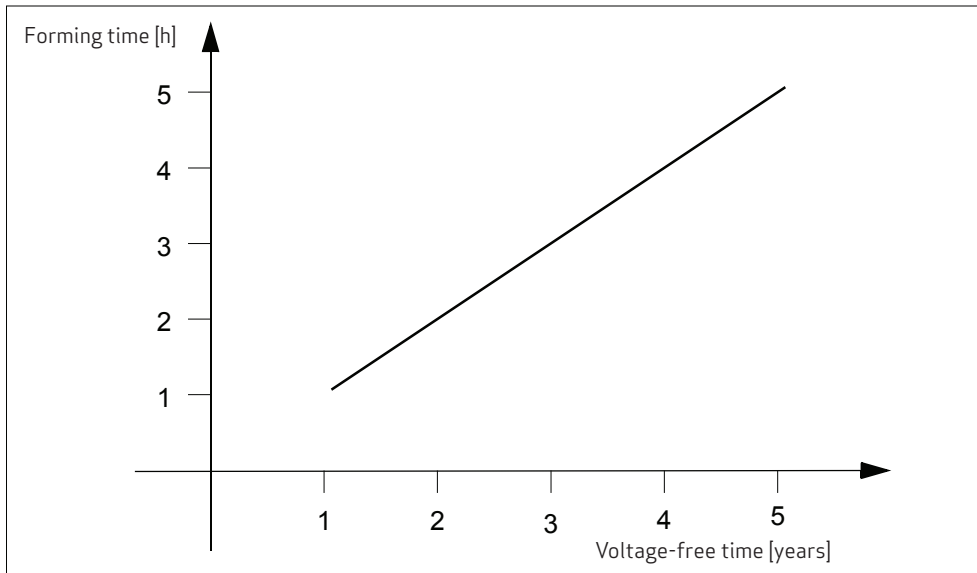


Fig. 13: Forming time as a function of the voltage-free time

Procedure

- ☒ Connect the DEU-SU to the DC link (►► Section 5.1, page 14).
 - ✓ The DEU-SU is formed (charged).
- ☒ Allowed the unit to be formed for a period that corresponds to the voltage-free time (►► Figure 13).
 - ✓ After this, the application can be released.

6. OTHER ACTIVITIES

6.1 Cleaning the DEU-SU



DANGER!

Danger to life!
Cleaning fluids may penetrate into the housing and cause a short circuit.
☒ Only clean the housing if it is de-energized.



DANGER!

Danger to life!
Cleaning fluids containing alcohol may lead to explosions.
☒ Only use cleaning agents that do not contain alcohol.



WARNING!

Danger of injury!
Touching of hot surfaces may lead to burn injuries.
☒ Before cleaning the DEU-SU, switch off the device for at least 30 minutes.



CAUTION!

Property damage!
Cleaning fluids may penetrate into the housing and cause a short circuit or damage components.
☒ Wipe down the housing with a moist cloth only.

- ☒ Only use cleaning agents that do not contain alcohol.
- ☒ Only clean the housing when it is de-energized.
- ☒ Wipe down the DEU-SU using a moist cloth only.

6.2 Servicing the DEU-SU

The DEU-SU does not require servicing.
If the DEU-SU has gone without voltage for more than one year, it needs to be formed
(► page 20, Section 5.6 "Forming the DEU-SU").

6.3 Repairing the DEU-SU

A faulty DEU-SU can only be repaired by the manufacturer.

6.4 Disposing of the DEU-SU

- ☒ Disconnect the DEU-SU (► page 19, Section 5.5 "Disconnecting the DEU-SU").
- ☒ Remove the DEU-SU.
- ☒ Send the DEU-SU back to the manufacturer.

7. EXPANSION MODULE DEU-EM (OPTION)

The optionally available Expansion Module (DEU-EM) increases the energy storage capacity of the DEU-SU. It is supplied with a connection cable featuring connectors that are protected against polarity reversal.

7.1 Technical data

Ambient conditions	See DEU-SU (▶ Section 2.7, page 8)
Usable storage capacity	Approx. 2 kW _s (CB33255-001) Approx. 4 kW _s (CB33255-002)
Width	100 mm (3.94 in)
Depth	201 mm (7.91 in)
Height	300 mm (11.81 in)
Weight	Approx. 4.1 kg (9.03 lb) (CB33255-001) Approx. 6.2 kg (13.67 lb) (CB33255-002)

7.2 Transport/storage/installation

See DEU-SU (▶ Section 4, page 11).

7.3 Connecting an Expansion Module to the DEU-SU



CAUTION!

Property damage!
If the DEU-SU is connected to the DC link, this may destroy the Expansion Module.
☒ Before connecting the expansion model, disconnect the DEU-SU from the DC link.
(▶ page 19, "Disconnecting the DEU-SU").

☒ Disconnect the DEU-SU from the DC link (▶ page 19, "Disconnecting the DEU-SU").

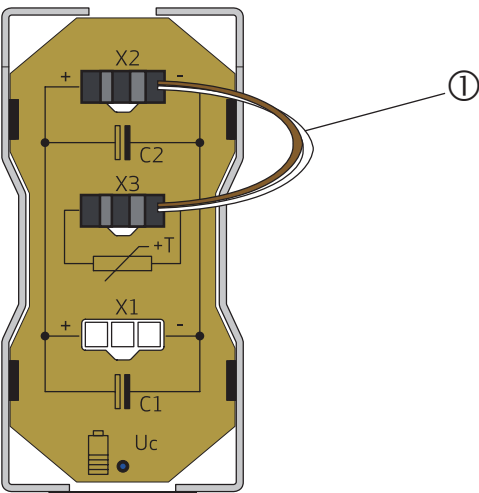


Fig. 14: Discharging the Expansion Module (top of housing)

- ☒ Connect the supplied connection cable ① to X2 and X3 on the Expansion Module and wait approx. 30 seconds.
 - ✓ The Expansion Module is discharged.

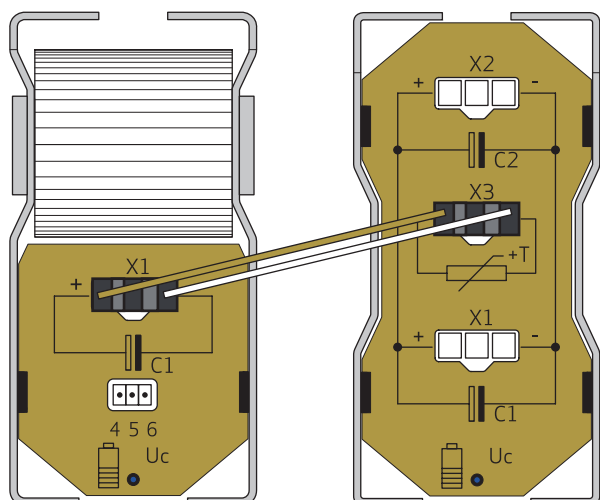


Fig. 15: Discharging the DEU-SU (top of housing)

- ☒ Disconnect the connection cable from X2 on the Expansion Module, connect it to X1 on the DEU-SU and wait approx. 30 seconds.
- ✓ The DEU-SU is then discharged.

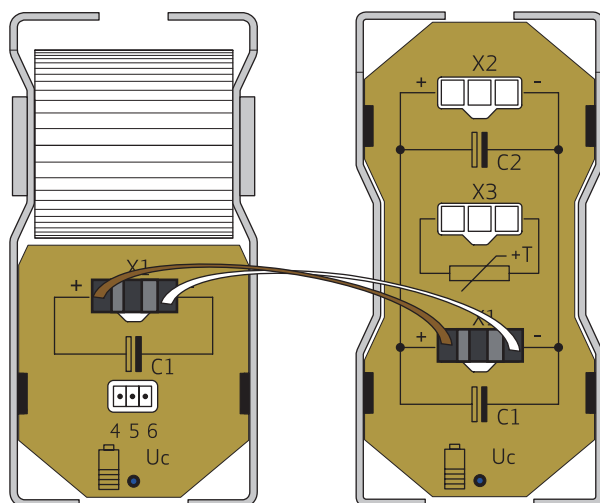


Fig. 16: Connecting the DEU-SU and Expansion Module (top of housing)

- ☒ Disconnect the connection cable from X3 and connect it to X1 on the Expansion Module.
- ✓ The DEU-SU and Expansion Module are now connected.

7.4 Connecting an additional Expansion Module

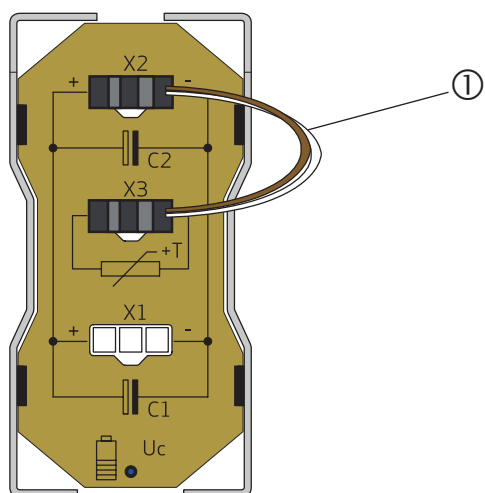


Fig. 17: Discharging the Expansion Module 2 (top of housing)

- ☒ Connect the supplied connection cable ① to X_2 and X_3 on the Expansion Module 2 and wait approx. 30 seconds.
- ✓ The Expansion Module 2 is discharged.

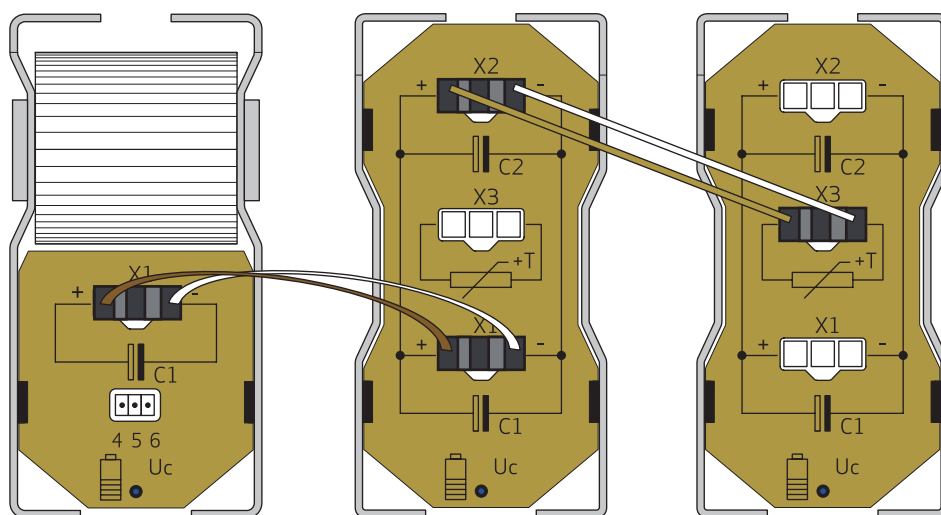


Fig. 18: Discharging the Expansion Module 1 (top of housing)

- ☒ Disconnect the connection cable from X_2 on Expansion Module 2, connect Expansion Module 1 to X_2 and wait approx. 30 seconds.
- ✓ The Expansion Module 1 is discharged.

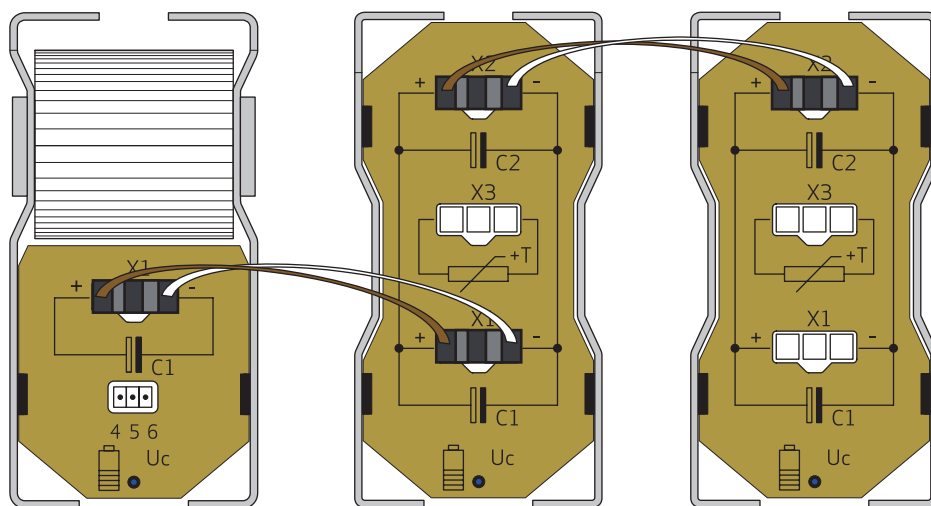


Fig. 19: Connecting the DEU-SU and two Expansion Modules

- ☒ Disconnect connection cable from X3 on the Expansion Module 2 and connect it with X2.
- ✓ The DEU-SU and two Expansion Modules are now connected.

7.5 Disconnecting the Expansion Module

See DEU-SU (► Section 5.5, page 19).

7.6 Other activities

See DEU-SU (► Section 6, page 21).

NOTES

NOTES

TAKE A CLOSE LOOK.

Moog develops a range of products for drive technology that superbly supplement the services described in the catalog. More information can be obtained on our website or from our office in your vicinity.

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