

# MOOG ENERGY STORAGE UNIT



Rev. A, August 2023

Energy Storage Unit  
ESU-C

WHAT MOVES YOUR WORLD

MOOG

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This catalog is for users with technical knowledge. To ensure all necessary characteristics for function and safety of the system, the user has to check the suitability of the products described herein. The products described in this document are subject to change without notice. In case of doubt, please contact Moog.

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## FUNCTIONS AND FEATURES

### Product description

The energy storage unit ESU-C is a compact DC bus buffer for storing and retrieving power peaks. The unit absorbs regenerative power from the inverters, which is generated during braking of servo motors or fluid decompression via EPU axes. This avoids the dissipation of regenerative energy via clocking resistors and greatly increases efficiency. Furthermore, the peak power demand of the infeed is considerably reduced and thus the connected load of the machine is significantly reduced (peak shaving).

### Specified Features

- Highest performance density
- Up to 250.000 operation hours
- Integrated quick discharge
- Fused intermediate circuit connection
- Integrated pre-charge
- Protection class IP20 (finger safe)
- Voltage display
- UL compliant according to UL61800-5-1

## GENERAL SAFETY INSTRUCTIONS AND WARNINGS

|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DANGER!</b>                                                                     | <b>Voltages up to 900 V! Risk of injury due to electrical power!</b>                                                                                                                                                                                                                                                                                              |
|   | <ul style="list-style-type: none"> <li>• Carelessness will result in serious injuries or death.</li> <li>▪ Do not work on the device when it is switched on!</li> <li>▪ Before working on the device: Ensure that the DC link is de-energized!</li> <li>▪ After switching off the device, wait for the discharge time and observe the voltage display!</li> </ul> |
| <b>WARNING!</b>                                                                    | <b>Risk of injury due to electrical power!</b>                                                                                                                                                                                                                                                                                                                    |
|   | <ul style="list-style-type: none"> <li>• Carelessness may result in serious injuries or death.</li> </ul> <p>Follow safety instructions and warnings in this documents and on the device.</p>                                                                                                                                                                     |
| <b>CAUTION!</b>                                                                    | <b>Risk of injury or damage to the device due to incorrect operation!</b>                                                                                                                                                                                                                                                                                         |
|   | <ul style="list-style-type: none"> <li>• Carelessness may result in minor injuries or damage.</li> </ul> <p>Follow safety instructions and warnings in this document and on the device.</p>                                                                                                                                                                       |
| <b>WARNING!</b>                                                                    | <b>Risk of injury due to hot surfaces and components!</b>                                                                                                                                                                                                                                                                                                         |
|  | <ul style="list-style-type: none"> <li>• Carelessness may result in serious burns.</li> <li>▪ Electronic components may become hot during operation!</li> <li>▪ Wear protective gloves when working on the device!</li> </ul>                                                                                                                                     |

### ATTENTION!



#### **Overheating due to excessive pre-charging and discharging Damage to electronics!**

Carry out pre-charging and discharging in such a way that the process does not exceed the permissible limits as specified for our specific unit.

As an example, the following applies to a standard CD24601-058-001 unit:  
The unit is rated for up to 5 pre- and discharge cycles in direct succession.  
After 5 pre- and discharge cycles in direct succession,

- wait at least 30 minutes and then carry out up to 2 further pre- and discharge cycles, or
- wait at least 60 minutes and then carry out up to 5 more pre- and discharge cycles!

In case of overheating ( $>+160\text{ }^{\circ}\text{C}$  ( $+320\text{ }^{\circ}\text{F}$ )), a waiting period of at least 90 minutes is required. **If the unit switches off due to overheating, this does not mean that it is defective!!**

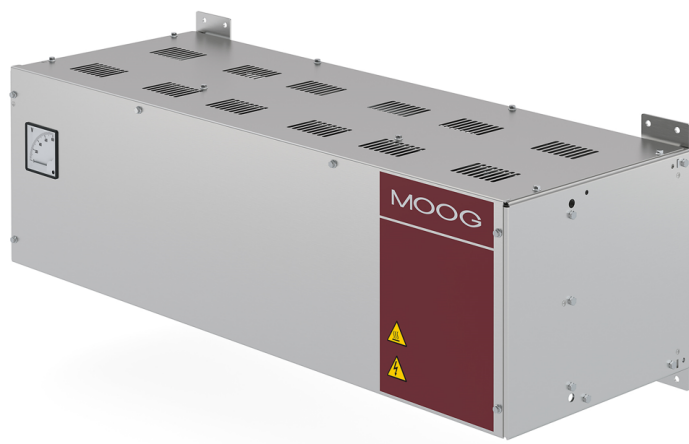
**SIZE S 1 storage size (capacity 58 mF)**



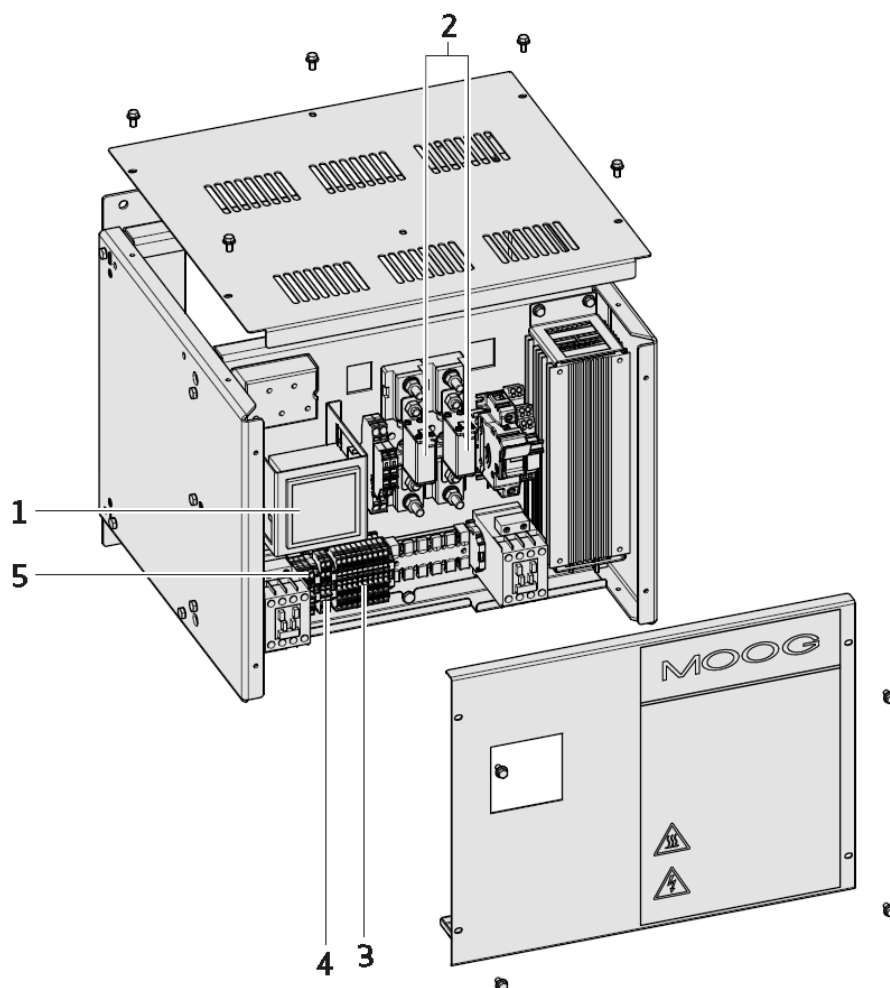
**SIZE M 1 storage size (capacity 87 mF)**



**SIZE L 1 storage size (capacity 131 mF)**



## DEVICE LAYOUT AND CONNECTIONS SIZE S



- 1** Analog display of DC link voltage
- 2** DC link connections  
DC link in/out 1  
100 A fuses  
-> see below: DC link connections
- 3** X11  
Logic connections  
-> see below: Logic connections (X11)
- 4** X1  
Connection for coupling the pre-charging circuits in parallel connection
- 5** X0  
Mains supply  
-> see below: Mains supply (X0)

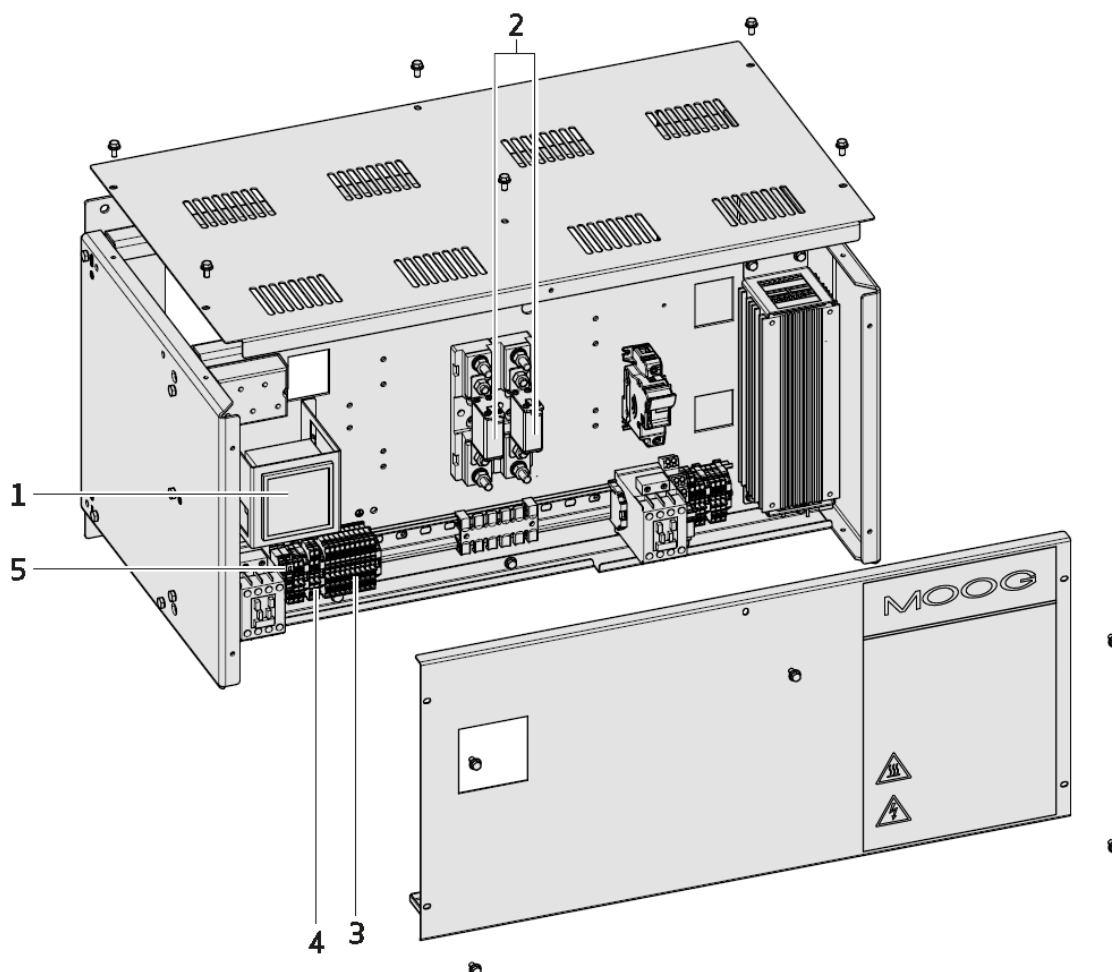


### NOTE

The lower edge of the housing front has perforations. These are intended for additional cutouts if the existing cutouts are too small for cable routing.

- Only use this option if it is necessary, as the extended cutouts may no longer provide IP20 protection!
- Pay attention to any sharp edges and take precautions to avoid any damage resulting from this (use of edge protection or abrading the edges)!

## DEVICE LAYOUT AND CONNECTIONS SIZE M



**1** Analog display of  
DC link voltage

**2** DC link connections  
DC link in/out 1  
315 A fuses  
→ see below: DC link connections

**3** X11  
Logic connections  
→ see below: Logic connections (X11)

**4** X1  
Connection for coupling the pre-charging  
circuits in parallel connection

**5** X0  
Mains supply  
→ see below: Mains supply (X0)

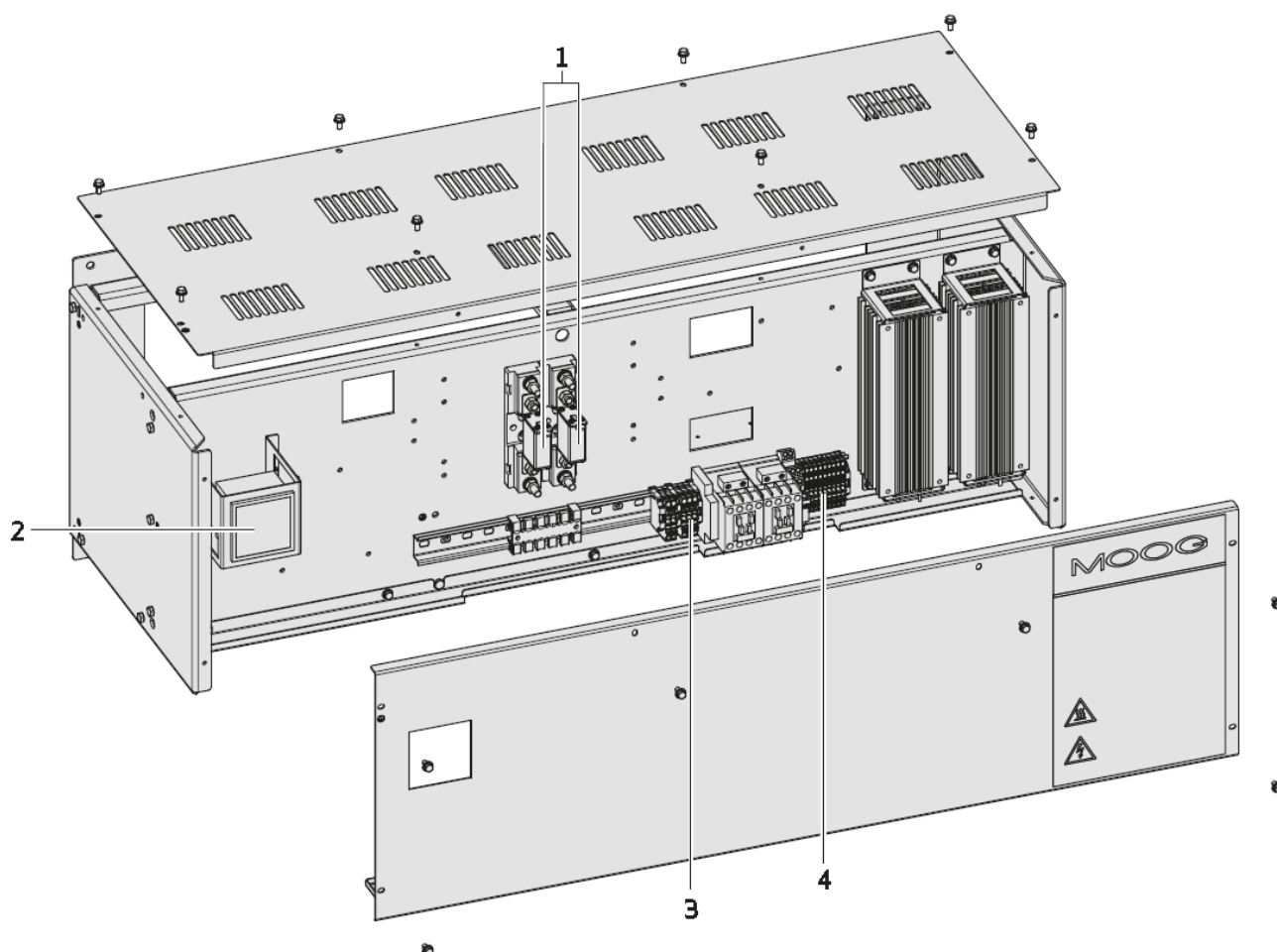


### NOTE

The lower edge of the housing front has perforations. These are intended for additional cutouts if the existing cutouts are too small for cable routing.

- Only use this option if it is necessary, as the extended cutouts may no longer provide IP20 protection!
- Pay attention to any sharp edges and take precautions to avoid any damage resulting from this (use of edge protection or abrading the edges)!

## DEVICE LAYOUT AND CONNECTIONS SIZE L



### 1 DC link connection

DC link in/out 1

315 A fuses

-> see below: DC link connections

### 2 Analog display of

DC link voltage

### 3 X0 + X1

Mains supply -> see below: Mains supply (X0) and connection for coupling the pre-charging circuits in parallel connection

### 4 X11

Logic connections

-> see below: Logic connections (X11)



### NOTE

The lower edge of the housing front has perforations. These are intended for additional cutouts if the existing cutouts are too small for cable routing.

- Only use this option if it is necessary, as the extended cutouts may no longer provide IP20 protection!
- Pay attention to any sharp edges and take precautions to avoid any damage resulting from this (use of edge protection or abrading the edges)!

## TECHNICAL DATA OF CONNECTIONS

### Protective conductor/grounding bolt connection:



#### NOTE

The conductor cross-section must:

- correspond at a minimum to the largest conductor cross-section at the connected servo drives,
- be at least 2,5 mm<sup>2</sup>

### Elektrical Data

| Ordering number<br>Size                                                           | CD24601-058-001<br>S                                                                                                                                                                                                                                              | CD24601-087-001<br>M | CD24601-131-001<br>L                                                 |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------|
| Input voltage                                                                     | 3 x 400 V AC to 3 x 480 V AC, 50 to 60 Hz                                                                                                                                                                                                                         |                      |                                                                      |
| Zwischenkreis-Betriebsspannung                                                    | 560 V DC (at 3 x 400 V AC mains supply)/<br>678 V DC (at 3 x 480 V AC mains supply)/<br>maximal 800 V DC (permanent)/900 V DC (for 30 seconds within an interval of 6 minutes in total)<br>The connected drive system must not exceed the specified limit values! |                      |                                                                      |
| Rated capacity of the DC link energy storage                                      | 58 mF                                                                                                                                                                                                                                                             | 87 mF                | 131 mF                                                               |
|                                                                                   | (-15 % to +20 % at +20 °C (+68 °F))                                                                                                                                                                                                                               |                      |                                                                      |
| Charging/discharging resistor                                                     | 94 Ω, 480 W                                                                                                                                                                                                                                                       |                      | 47 Ω, 480 W                                                          |
| Galvanic isolation between mains supply and DC link connections                   | No                                                                                                                                                                                                                                                                |                      |                                                                      |
| MTBF (as determined by capacitors)                                                | Useful life 250000 hours at +40 °C (+104 °F) ambient temperature                                                                                                                                                                                                  |                      |                                                                      |
| Short-circuit protection                                                          | Mains-side fuse protection using externally installed fuses:                                                                                                                                                                                                      |                      |                                                                      |
| Standard installation (not UL-compliant):<br>Fuse or motor protection switch      | 5 A                                                                                                                                                                                                                                                               |                      | 10 A                                                                 |
| for devices connected in parallel: depending on the number of devices (maximum3): | 2 devices 10 A, 3 devices 16 A                                                                                                                                                                                                                                    |                      | 2 devices 20 A,<br>3 devices 30 A                                    |
| Reverse polarity protection                                                       | Unnecessary                                                                                                                                                                                                                                                       |                      |                                                                      |
| Overload protection                                                               | Yes (by temperature sensors on discharge/precharge resistors), externally via X11. 5+6 to monitor                                                                                                                                                                 |                      |                                                                      |
| Wiring/cable cross section (X0)                                                   | nominal: 2,5 mm <sup>2</sup> /14 AWG                                                                                                                                                                                                                              |                      | 2 or more devices connected in parallel<br>4 mm <sup>2</sup> /11 AWG |
| Peak current                                                                      | 800 A                                                                                                                                                                                                                                                             | 1200 A               | 1800 A                                                               |
| Voltage range                                                                     | 0 - 900 V                                                                                                                                                                                                                                                         |                      |                                                                      |
| Peak performance                                                                  | 720 kW                                                                                                                                                                                                                                                            | 1080 kW              | 1620 kW                                                              |

**DC link connections (for drive system)**

| Ordering number                           | CD24601-058-001                          | CD24601-087-001 | CD24601-131-001 |
|-------------------------------------------|------------------------------------------|-----------------|-----------------|
| Conductor rail                            | + dc link in/out 1<br>- dc link in/out 1 |                 |                 |
| Short-circuit protection<br>Internal fuse | 100 A                                    | 315 A           | 315 A           |
| Reverse polarity protection               | No                                       |                 |                 |
| Overload protection                       | No                                       |                 |                 |

**NOTE**

Tighten the connection bolts (size M8) with a torque of 12 Nm!

**Mains supply (X0)**

| X0 | AC input |
|----|----------|
| L1 | L1       |
| L2 | L2       |
| L3 | L3       |

**Logic connections (X11)**

24 V DC system voltage, control inputs, floating contacts for status information:

| X11            | 24 V DC Logic                                                    |
|----------------|------------------------------------------------------------------|
| X11.1          | Elektronics supply 24 V DC, 0,5 A                                |
| X11.2          | Ground for electronics supply and control inputs 0 V, GND        |
| X11.3          | Control input "disable discharge", 24 V DC, 0,5 A                |
| X11.4          | Control input "enable charge", 24 V DC, 0,5 A                    |
| X11.5...X11.6  | Floating contact for "thermo ok" status, 24 V DC, 1 A            |
| X11.7...X11.8  | Floating contact for "charging active" status, 24 V DC, 1 A      |
| X11.9...X11.10 | Floating contact for "discharging inactive" status, 24 V DC, 1 A |

## DISPLAYS AND SIGNALS

### Analog display for DC link

Analog meter for clear indication of the current DC link voltage

### Temperature status

The Energy Storage Unit CD24601-058-001 and CD24601-087-001 contains 2 resistors for pre-charging and discharging and the Energy Storage Unit CD24601-131-001 contains a total of 4 resistors of pre-charging and discharging.

All resistors have a PTO160 switch, which switches at a temperature  $>+160\text{ °C}$  ( $+320\text{ °F}$ ) each. These PTO160 switches, connected in series, from the trigger signal for a temperature status relay („thermo ok“).

By means of a potential-free NO contact of this relay, the energy buffer provides the common temperature status signal at terminals X11.5 und X11.6.

- In the normal state of the Energy Storage Unit, all charging and discharging resistors have a temperature below  $+160\text{ °C}$  ( $+320\text{ °F}$ ) (relay contact closed).
- If the temperature at one of the charging or discharging resistors exceeds  $+160\text{ °C}$  ( $+320\text{ °F}$ ), the relay contact opens.

The relay contact is used for evaluation in the status diagnosis current path by the control cabinet or the control system.

|                                                   |                                              |
|---------------------------------------------------|----------------------------------------------|
| Temperature of charging/<br>discharging resistors | Floating contact "thermo ok" (X11.5 - X11.6) |
| $\leq +160\text{ °C}$                             | closed                                       |
| $> +160\text{ °C}$                                | open                                         |

### Elektrical data of floating contact „thermo ok“:

|                                     |                                                                            |
|-------------------------------------|----------------------------------------------------------------------------|
| Nominal voltage/rated current       | 24 V DC, 1 A                                                               |
| Maximum permitted current (t = 5 s) | 24 V DC, 6 A (ohmic load)                                                  |
| Verdrahtung/Leitungsquerschnitt     | nominal: 1 mm <sup>2</sup> /18 AWG<br>maximum: 2,5 mm <sup>2</sup> /14 AWG |

### Status signals "charging active" and "discharging inactive"

The Energy Storage Unit indicates the status of the internal charging circuit and the internal discharging circuit by way of a status signal.

|                                                                          |                                                    |
|--------------------------------------------------------------------------|----------------------------------------------------|
| Status of the internal charging circuit                                  | Floating contact "charging active" (X11.7 - X11.8) |
| Charging mode active<br>Charging circuit charges the DC link             | closed                                             |
| Charging mode not active<br>Charging circuit does not charge the DC link | open                                               |

|                                                                                    |                                                          |
|------------------------------------------------------------------------------------|----------------------------------------------------------|
| Status of the internal charging circuit                                            | Floating contact "discharging inactive" (X11.9 - X11.10) |
| Discharging mode active<br>Discharging circuit discharges the DC link              | open                                                     |
| Discharging mode not active<br>Discharging circuit does not discharges the DC link | closed                                                   |

**Electrical data of floating contacts "charging active" and "discharging inactive"**

|                                     |                                                                                                                      |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Nominal voltage/rated current       | 24 V DC, 1 A                                                                                                         |
| Maximum permitted current (t = 5 s) | 24 V DC, 9 A (ohmic load)<br>DC-1 (non inductive or weakly inductive load, resistance furnaces),<br>+60 °C (+140 °F) |
| Wiring/cable cross section          | nominal: 1 mm <sup>2</sup> /18 AWG<br>maximum: 2,5 mm <sup>2</sup> /14 AWG                                           |

## FUNCTIONAL DESCRIPTION (OPERATING MODES)

### Charging mode - DC link charging only (precharging)

Here, the DC link connections are outputs for charging the DC link in the connected drive system. The internal charging circuit with the charging resistors charges the DC link. The charge mode is activated via two control inputs "disable discharge" und "enable charge".

Prerequisites for the charge mode:

- Mains supply switched on
- Drive system on the DC link is operating without load (control is switched off)
- Discharging mode must not be selected

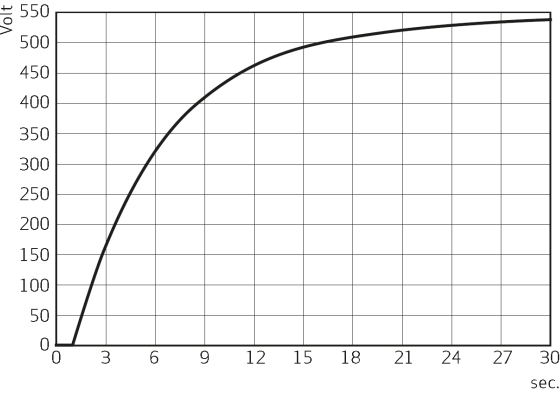
| <b>X11.3<br/>disable discharge</b> | <b>X11.4<br/>enable charge</b> | <b>Selected operating mode</b>                              |
|------------------------------------|--------------------------------|-------------------------------------------------------------|
| 0                                  | X                              | Discharging mode selected/Charging mode cannot be activated |
| 0                                  | X                              | Discharging mode selected/Charging mode cannot be activated |
| 1                                  | 0                              | Discharging mode not selected/Charging mode not activated   |
| 1                                  | 1                              | Discharging mode not selected/Charging mode activated       |

0 = LOW = 0-V-Signal  
1 = HIGH = 24-V-Signal

- The discharging mode is always selected via a LOW signal at input X11.3 "disable discharge". The signal at input X11.4 "enable charge" will then have no effects.
- To be able to activate the charge mode, a HIGH signal must be applied to input X11.3 "disable discharge". Then the signal at input X11.4 "enable charge" determines whether the charging mode is activated.

**Charging characteristics CD24601-058-001:**

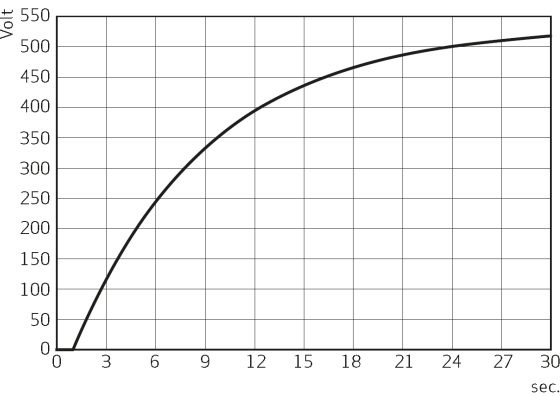
Actual charging characteristic at 3 x 400 V AC:



Example: Charging time to 90 % of the DC link voltage (nominal voltage): 17 s

**Charging characteristics CD24601-087-001:**

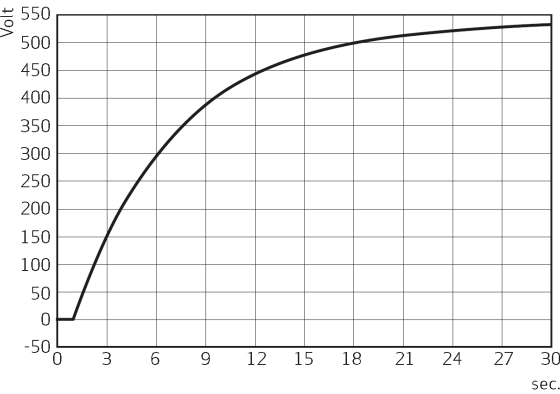
Actual charging characteristic at 3 x 400 V AC:



Example: Charging time to 90 % of the DC link voltage (nominal voltage): 26 s

**Charging characteristics CD24601-131-001:**

Actual charging characteristic at 3 x 400 V AC:



Example: Charging time to 90 % of the DC link voltage (nominal voltage): 20 s

## BUFFER MODE/ ENERGY REGENERATION

The DC link connections function as inputs or as outputs depending on the operating situation of the connected drive system. The connected drive system operates in normal mode.

During regenerative operation of the drive system, the energy buffer absorbs the electrical energy and stored electrical energy back to the drives. Charging and discharging modes are not activated.

Prerequisites for buffer mode:

- Drive system on the DC link is operating in normal mode
- Discharging mode must not be selected
- Charging mode must not be activated

| <b>X11.3</b><br><b>disable discharge</b> | <b>X11.4</b><br><b>enable charge</b> | <b>Selected operating mode</b>                              |
|------------------------------------------|--------------------------------------|-------------------------------------------------------------|
| 0                                        | X                                    | Discharging mode selected/Charging mode cannot be activated |
| 0                                        | X                                    | Discharging mode selected/Charging mode cannot be activated |
| 1                                        | 0                                    | Discharging mode not selected/Charging mode not activated   |
| 1                                        | 1                                    | Discharging mode not selected/Charging mode activated       |

0 = LOW = 0-V-Signal  
1 = HIGH = 24-V-Signal

## DISCHARGING MODE

The DC link connections are pure inputs for discharging all capacities in the connected drive system. The internal discharge circuit with the discharge resistors discharges the DC link and restores the voltage-free non-hazardous state.

The discharging mode is activated via the two control inputs "disable discharge" and "enable charge" or automatically **after switching off the mains supply (performance and Logic)**.

Prerequisites for the discharging mode:

- Drive system on DC link is operating without load (control is switched off)
- Mains supply switched off

| X11.3<br>disable discharge | X11.4<br>enable charge | Selected operating mode                                     |
|----------------------------|------------------------|-------------------------------------------------------------|
| 0                          | X                      | Discharging mode selected/Charging mode cannot be activated |
| 0                          | X                      | Discharging mode selected/Charging mode cannot be activated |
| 1                          | 0                      | Discharging mode not selected/Charging mode not activated   |
| 1                          | 1                      | Discharging mode not selected/Charging mode activated       |

0 = LOW = 0-V-Signal

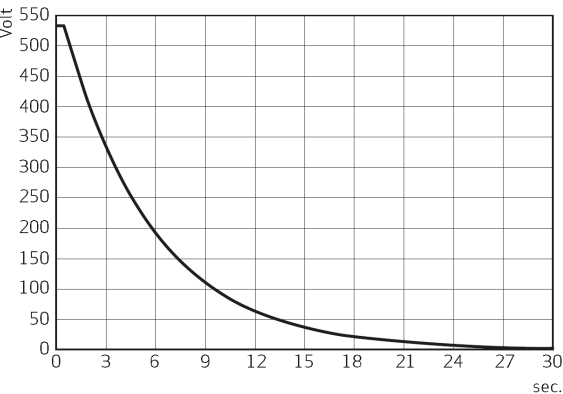
1 = HIGH = 24-V-Signal



### NOTE

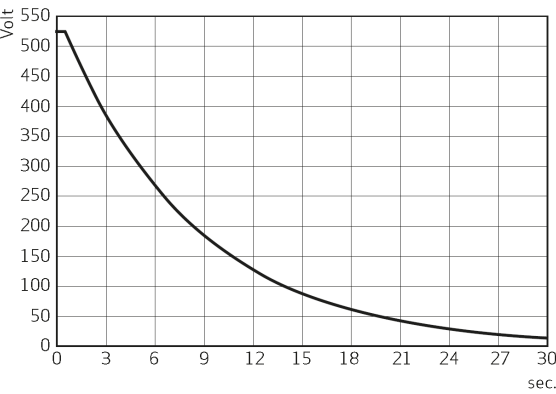
- A LOW signal at input X11.3 "disable discharge" always selects the discharging mode. The signal at input X11.4 "enable charge" will then have no effect.
- The DC link discharge may only be disabled after a complete discharge (< 60 V DC) of the capacitors.
- The two serial contacts of the discharge relay may switch/open a maximum voltage 110 V DC. At higher switching voltages, the relay wears out very quickly.
- Sequence: To activate the discharging mode, you must first switch off the mains supply and then apply a LOW signal to input X11.3 "disable discharge".

**Discharging characteristics CD24601-058-001**



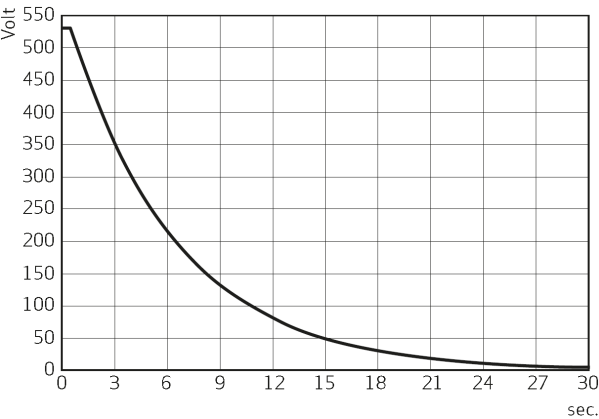
Example: Discharging time from 540 V DC to 60 V DC: 12 s

**Discharging characteristics CD24601-087-001:**



Example: Discharging time from 540 V DC to 60 V DC: 18 s

**Discharging characteristics CD24601-131-001:**

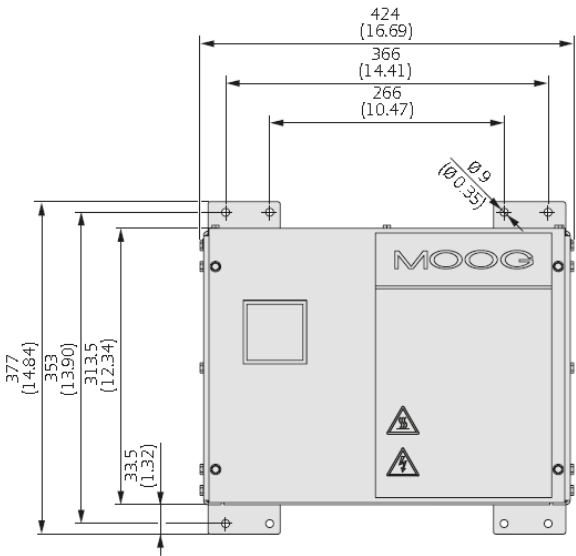


Example: Discharging time from 540 V DC to 60 V DC: 14 s

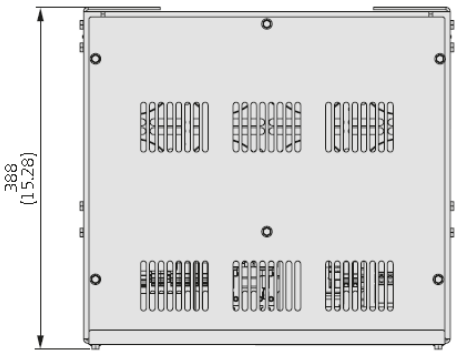
INSTALLATION

Size S

Front view



Top view

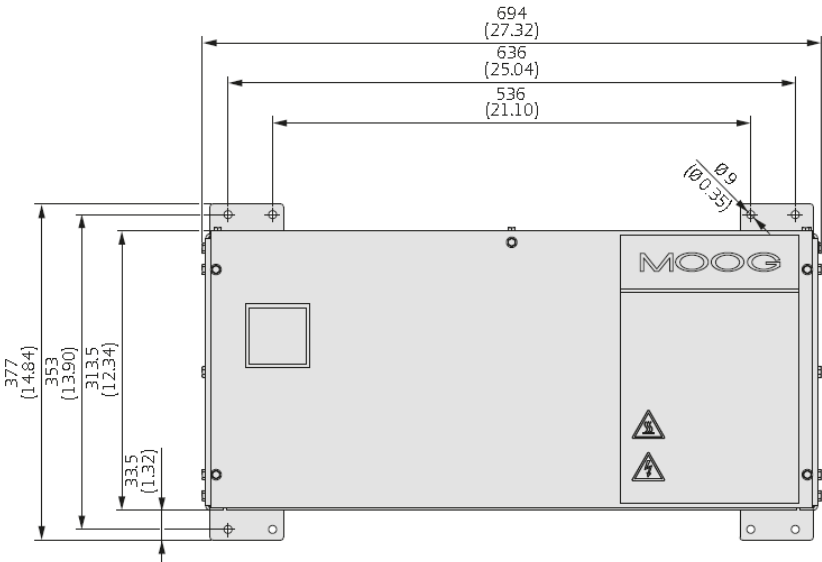


Mechanical data/installation instructions

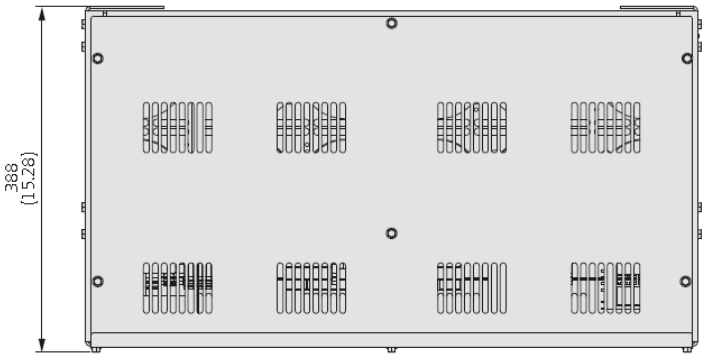
|                            |                                                                                                                         |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Dimensions W/H/D [mm (in)] | 424 (16.69) x 377 (14.84) x 388 (15.28)                                                                                 |
| Weight [kg (lb)]           | approx. 50 (110.23)                                                                                                     |
| Type of installation       | Only horizontal mounting permitted                                                                                      |
| Cooling method             | Convection                                                                                                              |
| Clearances                 | Above and below the energy buffer: 100 mm (3.94 in)<br>The ventilation holes on the top and bottom must not be covered! |
| Protection class           | IP 20 (when fully assembled and connecte in accordance with applicable specifications)                                  |

Size M

Front view



Top view

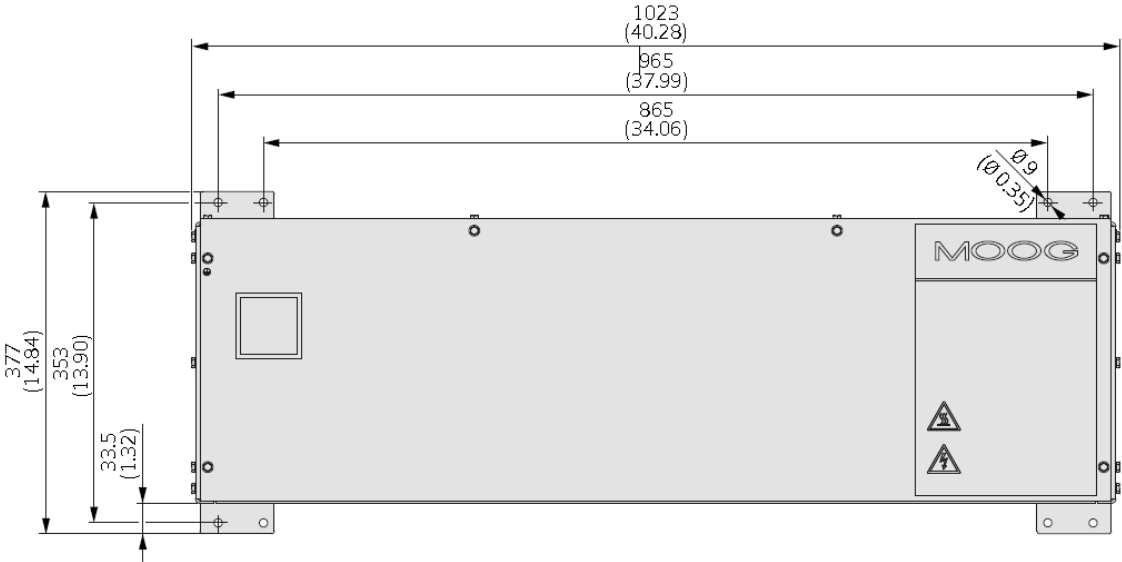


Mechanical Data/installation instructions

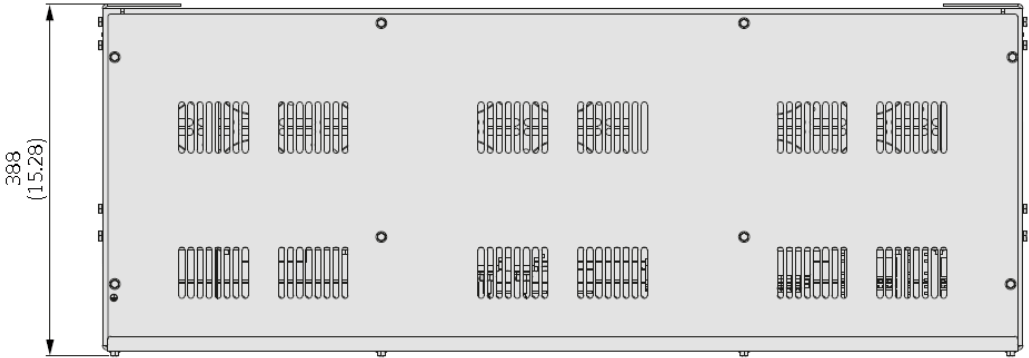
|                            |                                                                                                                         |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Dimensions W/H/D [mm (in)] | 694 (27.32) x 377 (14.84) x 388 (15.28)                                                                                 |
| Weight [kg (lb)]           | approx. 70 (154.32)                                                                                                     |
| Type of installation       | Only horizontal mounting permitted                                                                                      |
| Cooling method             | Convection                                                                                                              |
| Clearances                 | Above and below the energy buffer: 100 mm (3.94 in)<br>The ventilation holes on the top and bottom must not be covered! |
| Protection class           | IP 20 (when fully assembled and connecte in accordance with applicable specifications)                                  |

Size L

Front view



Top view



Mechanical data/installation instructions

|                            |                                                                                                                         |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Dimensions W/H/D [mm (in)] | 1023 (40.28) x 377 (14.84) x 388 (15.28)                                                                                |
| Weight [kg (lb)]           | approx. 105 (231.49)                                                                                                    |
| Type of installtion        | Only horizontal mounting permitted                                                                                      |
| Cooling method             | Convection                                                                                                              |
| Clearances                 | Above and below the energy buffer: 100 mm (3.94 in)<br>The ventilation holes on the top and bottom must not be covered! |
| Protection class           | IP 20 (when fully assembled and connecte in accordance with applicable specifications)                                  |

**Ambient conditions**

|                                                                            |                                                            |
|----------------------------------------------------------------------------|------------------------------------------------------------|
| Permissible ambient temperature:<br>- Operation and transport<br>- Storage | 0 to +55 °C (0 to +131 °F)<br>+5 to +35 °C (+41 to +95 °F) |
| Installation altitude                                                      | Typ. 2000 m a. s. l.                                       |
| Humidity                                                                   | maximum 90 % at +40 °C (+104 °F) (non-condensing)          |
| Pollution level                                                            | PD2                                                        |

**Conformity**

|    |                                                                                                       |
|----|-------------------------------------------------------------------------------------------------------|
| CE | EMC conformity must be safeguarded in the application in conjunction with the connected drive system. |
| UL | Compliant with UL 61800-5-1                                                                           |

## ABOUT MOOG

Moog Inc. is a worldwide designer, manufacturer and integrator of precision control components and systems. Moog's Industrial Group designs and manufactures high performance motion control solutions combining electric, hydraulic, and hybrid technologies with expert consultative support in a range of applications including energy production and generation machinery, industrial production machinery and simulation and test equipment. We help performance-driven companies design and develop their next-generation machines.

This vast scope ensures that our engineers remain close to the needs of machine builders and provide flexible design solutions and technical expertise tailored to our customers' toughest challenges.

Moog experts work in close collaboration with machine builders and application engineers to design motion control systems for greater productivity, higher reliability, superior connectivity, less costly maintenance and more effective operations. Our regional presence, industry knowledge and design flexibility ensures Moog motion control solutions are tailored to their environment — from meeting operating regulations and performance standards, to taking machine performance to a higher level.

### Products

At the heart of every Moog solution is an array of products engineered for precision, high performance and reliability. For more than six decades, Moog products have been specified for critical machine applications hergestellt.

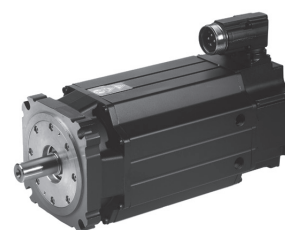
Some are developed specifically for unique operating environments. Others are standard equipment on machines across many industries. All are continuously improved to take advantage of the latest technology breakthroughs and advancements.

Moog products include:

- Servo Valves and Proportional Valves
- Servo Motors and Servo Drives
- Motion Controllers and Software
- Radial Piston Pumps
- Actuators
- Integrated Hydraulic Manifold Systems and Cartridge Valves
- Slip Rings
- Motion Bases



Servo Drives



Servo Motors



Servo Valves



Radial Piston Pumps

## ABOUT MOOG

### Hydraulic Solutions

Since Bill Moog invented the first commercially viable servo valve in 1951, Moog has set the standard for world-class hydraulic technology. Today, Moog products are used in a variety of applications - providing high power, enhanced productivity and ever better performance for some of the worlds most demanding applications.

### Electric Solutions

Clean operation, low noise generation, less maintenance and reduced power consumption make Moog electric solutions ideal for applications worldwide. Moog is the ideal partner for applications where transitioning technologies requires special expertise.

### Hybrid Solutions

By incorporating the advantages of existing hydraulic and electric technologies - including modular flexibility, increased efficiency and cleanliness - into innovative hybrid solutions, Moog offers new performance potential in specialized applications.



Flight Simulation



Formula One Simulation Table

## MOOG GLOBAL SUPPORT

Moog Global Support is our promise to offer world-class Repair and Maintenance Services delivered expertly by our trained technicians. With the reliability only available from a leading manufacturer with facilities around the world, Moog offers you service and expertise you can count on to keep your equipment operating as it should.

This promise offers many benefits to our customers including:

- Reduce your downtime by keeping critical machines running in peak performance
- Protect your investment by ensuring reliability, versatility and long-life of products
- Better plan your maintenance activities and make systematic upgrades
- Leverage our flexible programs to meet the unique service requirements of your facility

Look to Moog for global support including:

- Repair services using OEM parts are performed by trained technicians to the latest specification
- Stock management of spare parts and products to prevent unplanned downtime
- Flexible programs, tailored to your needs such as upgrades, preventative maintenance and annual/multi-year contracts
- On-site services bring the expertise to you, providing quicker commissioning, set-up and diagnostics
- Access to reliable services that are guaranteed to offer consistent quality anywhere in the world

For more information on Moog Global Support visit [www.moog.com/industrial/service](http://www.moog.com/industrial/service).



NOTES

# MORE PRODUCTS. MORE SUPPORT.

Moog designs a range of motion control products to complement those featured in this document. Moog also provides service and support for all of our products. For more information, contact the Moog facility closest to you.

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For service information, visit **[www.moogglobalsupport.com](http://www.moogglobalsupport.com)**

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Moog Energy Storage Unit  
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