As a global specialist in energy management with operations in more than 100 countries, Schneider Electric offers integrated solutions across multiple market segments, including leadership positions in energy and infrastructure, industrial processes, building automation, and data centers/networks, as well as a broad presence in residential applications. Focused on making energy safe, reliable, and efficient, the company’s 100,000 plus employees achieved sales of more than 15.8 billion Euros in 2009, through an active commitment to help individuals and organizations make the most of their energy.

**Schneider Electric EcoStructure™ Solutions**

With the professional know-how in multi markets we operate and the close care of our customers, as well as our best practices in energy management, Schneider Electric has grown up from a provider of best-in-class products into an integrated solution provider. This year, we launched Ecostructure™ an architectural approach which unites Schneider Electric’s unique expertise in power, datacenters, process and machines, building control and physical security to enable intelligent energy management solutions for customers seeking to optimize energy efficiencies across multiple domains of their business. By providing our customers with clear and comprehensive reference architectures across key environments and applications, we intend to reduce inefficiencies and save energy up to 30%. 
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Operation and maintenance may only be carried out by personnel who have received suitable authorisation for the operations and manoeuvres they are responsible for performing.

1.1 Remarks on this manual

This Technical Manual describes assembly and operation of medium voltage switchgear of the DNF7.

This Technical Manual is an integral part of the product and must be stored so that it is at all times readily accessible for and can be used by persons who are supposed to work on the switchgear. If the switchgear is sold to new owners, they must receive this document along with the switchgear.

The following additional documents must be observed for this switchgear:
- Purchase agreement containing the stipulations on the specific equipment of the switchgear and the legal details.
- The switchgear-specific circuit diagrams/documentation
- The operation Manuals of the main devices installed in the switchgear
- The Assembly and Operating Manuals of the switching device: Vacuum Interrupter HVX (or Gas Insulated Circuit Breaker FP)
- The configuration of DNF7
- Technical Manual DNF7

As our products are subject to continuous further development, we reserve the right to change regarding standards, illustrations and technical date.

All dimension not specified in detail in this manual are millimetres.

1.2 Terms and symbols used

This manual uses certain terms and symbols. They warn about dangers or provide important information which must be complied with to avoid danger to personnel and damage to equipment.

"WARNING"
This symbol warns of dangerous electrical voltage Contact with voltage may result in fatal injury!

"WARNING"
This symbol is used for instructions which must on all accounts be complied with because not doing so may result in serious injury, death or serious material damage.

"WARNING"
This symbol warns of risk of falling. Pay attention to floor ducts.

"IMPORTANT"
This symbol is used for information which is important to avoid damage.

1.3 Use in line with the intended purpose

DNF7 Metal-clad Switchgear are exclusively intended for switching and distributing electrical energies. They may only be used in the scope of the specified standards and the switchgear-specific technical data. Any other use constitutes improper use and may result in dangers and damage.

"IMPORTANT"
Operating reliability and useful life depend on correct operation.
Disclaimer of liability

The manufacturer shall not be held responsible for damage which occurs if:
· instruction in this manual are not complied with
· the switchgear is not operated to its intended use (ref. 2.3)
· the switchgear is assembled, connected or operated improperly
· accessories or spare parts are used which have not been approved by the manufacturer
· Modification or changes in parts or panel without manufacturer’s approval.

No liability is accepted for parts provide by customers, e.g. current transformers.

1.4 Applied standard

- Metal enclosed; operating availability acc. to IEC 62271-200; LSC 2B-PM
- Air-insulated
- Type-tested (CESI and KEMA)
- Tested for internal faults (IAC AFLR)

Environment and operating condition

DNF7 Metal-clad switchgear may only be operated under normal operating conditions according to the specification IEC 60694. The ambient air must be free of dust smoke or vapours.

Operation under conditions deviating from these is only admissible upon consultation and with the written approval of the manufacturer.

**Ambient conditions according to IEC 60694**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature min./max. °C</td>
<td>-15/401</td>
</tr>
<tr>
<td>Average value over 24 hours (max.) °C</td>
<td>+35</td>
</tr>
<tr>
<td>Average rel. air humidity: 24 hours / 1 month %</td>
<td>95/90</td>
</tr>
<tr>
<td>Maximum installation altitude above sea level m</td>
<td>1000</td>
</tr>
</tbody>
</table>

1) higher values on request

DNF7 Metal-clad switchgear meet the following standards and regulation:

<table>
<thead>
<tr>
<th>Item</th>
<th>IEC standard</th>
<th>GB standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switchgear</td>
<td>IEC 62271-200 - IEC 60694</td>
<td>GB3906-2006 - GB/T11022-1999</td>
</tr>
<tr>
<td>Internal arc classification</td>
<td>IEC 62271-200</td>
<td>GB3906-2006</td>
</tr>
<tr>
<td>Circuit Breaker</td>
<td>IEC 62271-100</td>
<td>GB1984-2003</td>
</tr>
<tr>
<td>H.V.H.R.C fuses</td>
<td>IEC 60282-1</td>
<td>GB15166-1994</td>
</tr>
<tr>
<td></td>
<td>IEC 60644</td>
<td></td>
</tr>
<tr>
<td>Earthing switch</td>
<td>IEC 62271-102</td>
<td>GB1985-2004</td>
</tr>
<tr>
<td>Isolation function</td>
<td>IEC 62271-102</td>
<td>GB1985-2004</td>
</tr>
<tr>
<td>Current transformer</td>
<td>IEC 60044-1</td>
<td>GB1208-1997</td>
</tr>
<tr>
<td>Voltage detection systems</td>
<td>IEC 61958</td>
<td>DL/T538-2006</td>
</tr>
<tr>
<td></td>
<td>IEC 61243-5 (optional)</td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IEC 60529</td>
<td>GB4208-1993</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degrees of protection against accidental contact and foreign objects according to IEC 60529</th>
</tr>
</thead>
<tbody>
<tr>
<td>External enclosure</td>
</tr>
<tr>
<td>With the panel open</td>
</tr>
</tbody>
</table>
1.5 Safety provisions

The work described in this manual may only be performed by the manufacturer’s fitters or persons who have been certified for the assembly of the DNF7 Metal-clad switchgear.

Applicable standards and regulations

Comply with:
- the locally applicable accident prevention, operating and work instructions,
- Installation: IEC 61936-1/HD 637 S1,
- Operation of electrical equipment: EN 50110-1.

Before performing work on the cubicle, make sure to comply with the following instructions:

"WARNING" Before starting work on high-voltage components, de-energize the system according to the application safety rules pursuant to EN 50110-1.

"WARNING" After removal of covers, operator safety acc. to IEC 62271-200 may be restricted if the appropriate part of the switchgear unit has not been isolated from the power supply.

"WARNING" Before performing work on the drive mechanism, switch off the supply voltage and prevent it from reclosing.

"WARNING" There is a risk of injury when working on the drive mechanism. Before commencing work, release the energy-storing device by:
- switching the vacuum contactor off or
- closing the ESW earthing switch.

Behaviour in case of incidents of accidents

The DNF7 Metal-clad switchgear feature pressure relief device for the case of an internal fault; these ensure operator safety according to IEC 62271-200.

In case of fire or internal faults, toxic and caustic decomposition products may be produced. Comply with the locally application accident and safety provisions.

1.6 Disposal after the end of the useful life

Upon request, a material and recycling data sheet is available for disposal of the switchgear units of the DNF7 at the end of its service life.

Disposal is performed as a service by the manufacturer’s Service Center.
2.1 Rating plate

The rating plate on the cubicle (Fig. 2.1) specifies essential technical data. It is located on the door of the circuit breaker compartment. The following data on the rating plate is relevant in case of any queries:

- Type designation
- Serial number
- Year of construction

<table>
<thead>
<tr>
<th>DNF7</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kV</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated lightning impuls withstand voltage</td>
<td>kV</td>
<td>170</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated power frequency withstand voltage</td>
<td>kV</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated frequency</td>
<td>Hz</td>
<td>50/60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated normal current</td>
<td>A</td>
<td>1250/1600/2000/2500/3150(^1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short-time current</td>
<td>kA</td>
<td>25/31.5 (3s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated peak withstand current (peak value)</td>
<td>kA</td>
<td>65/82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short-circuit making current</td>
<td>kA</td>
<td>65/82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal arc classification (IAC, AFLR)</td>
<td>kA</td>
<td>31.5 (1s)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Forced cooling ventilation is required.

For the technical data of HVX and FP, please refer to their separate operating Instructions.
3 Cubicle description

3.1 DNF7 description

Legend
- 1 Low-voltage compartment
- 2 Busbar compartment
- 3 Cable compartment
- 4 Circuit breaker compartment
- 5 Current transformer
- 6 Voltage transformer
- 7 Insulating screen
- 8 “z” Profile rail
- 9 Bushing
- 10 Busbar
- 11 Pressure relief flap for circuit breaker compartment
- 12 Pressure relief flap for busbar compartment
- 13 Pressure relief flap for cable compartment
- 14 Earthing switch

Fig 3.1 DNF7 Metal-clad switchgear
4.1 Shipping units

Delivery is effected in terms of single switchgear cubicles. And drawing unit (HVX or FP) will be packaged separately. All transport units should be fastened to the pallet. The busbars and busbar connection are mounted on site.

"IMPORTANT"

The weight of the entire transport unit rests on the packaging/wooden case.

![Fig. 4.1](image1.png) Packed in PE protective film on pallet.

- If packed exclusively for trolley transport, the cubicles are delivered on a pallet with PE protective film.

![Fig. 4.2](image2.png) Packed in a wooden case.

- For transport by sea, the cubicles are packed in sealed aluminium film with desiccant.
- Wooden case with tightly closed wooden base (also for container transport).

![Fig. 4.3](image3.png) The basics dimensions of DNF7.

<table>
<thead>
<tr>
<th>Dimensions and Weights</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>mm</td>
</tr>
<tr>
<td>Height</td>
<td>mm</td>
</tr>
<tr>
<td>Depth</td>
<td>mm</td>
</tr>
<tr>
<td>Max. Weight with HVX drawing unit, without packaging</td>
<td>kg</td>
</tr>
</tbody>
</table>
4.2 Transport

![Fig. 4.4](image) Do not tip the transport units.

![Fig. 4.5](image) Transport using forklift truck.

**WARNING**
When transporting the switchgear, it must be ensured that the units do not slip or tip.

**Transport using a forklift truck**

**WARNING**
Take the cubicle weight into account (see the inscription on the transport unit).

The cubicle may only be transported on a pallet. The entire length of the forks must be placed under the transport unit (Fig. 4.5).

**Delivery**

- Handle shipping units carefully when unloading and unpacking.
- Shipping units must be unpacked immediately after receipt. Any damage which may have occurred in transit must be recorded and reported immediately to the manufacturer.
- Check completeness of consignment based on the transport documents.
- The supplier must be notified in writing about any deviations.
- Store the switchgear cubicles only in vertical position and do not stack them on top of one another.

**WARNING**
Sufficient stability and evenness of the supporting area (floor) must be ensured!
4.3 Storage

If the cubicle are not installed completely upon delivery, they can be stored in packed condition (Fig. 4.6).

**In PE film hood: 6 months**
- In sealed aluminium film: 2 years (with desiccant).

Re-use and close the original packaging to store parts which have been unpacked for inspection.

The ambient condition for storage must comply with the admissible operating conditions (See section 1.4).

Protect switchgear cubicles and accessories against condensation.

---

**Fig. 4.6**
Storage conditions
5.1 Safety provisions

The switchgear cubicles may only be installed and assembled by the manufacturer’s staff or persons who have been certified for this work.

The switchgear cubicles are delivered in the following condition:
- Circuit breaker (HVX or FP) OFF.
- Circuit breaker packaged separately with cubicle.
- Earthing switch OFF.

**WARNING**
Comply with the safety provisions in section 1.5

**WARNING**
Risk of accident! Pay attention to flooring ducts!

**WARNING**
Risk of injuries! During installation, assembly and connection, the energy storing device must not be charged.

**IMPORTANT**
Condensation, dirt and dust should be avoided during assembly.

5.2 Requirements regarding the switchgear room

Before installing the switchgear cubicles make sure that the switchgear room is checked according to the switchgear documentation:
- Trench for high voltage and low voltage cables.
- Check position of the Basic Frame.
- The load-bearing capacity of the fastening areas must correspond to the weight of the switchgear (perform a stress analysis of the building).
- Observe the minimum distance between the switchgear and the wall of the building.
- Check basic frame for dimension and tolerances in position.

Before the switchgear is positioned on its site of installation, check that the fastening points are even. Any unevenness must not exceed ±1mm/m.

![Fig. 5.1 Plane diagram for switchgear arrangement scheme](image-url)
Fig. 5.2 Switch-room cable trench arrangement scheme

Fixing to the floor

Fig. 5.3 Switchgear scheme
5.3 Transporting the cubicles on the construction site

Transport by means of a crane

"WARNING"
Make sure the rope or chain is strong enough to bear the weight of the cubicle. The specific regulations applicable for hoisting equipment must be complied with.

"WARNING"
On lowering the cubicles, make sure that the supporting platform is sufficiently stable and even.

Important
Observe the maximum angle of 60° between the rope or chains.

1. Attach the rope or the chains to the four lift squares located on the top of the cubicle (Fig. 5.6).
2. Release the fastening of the cubicle on the transport pallet.
3. Lift the cubicle carefully with the crane.
4. Lower the cubicle slowly to the floor at its destination.

Fig. 5.5

Fig. 5.6
Attach the crane hooks to the lift squares.

Fig. 5.7
Maximum angle in case of transport by crane.
### 5.4 Installation of cubicles

1. Place the cubicle on the basic frame according to the switchgear specific space assignment plan and the single line diagram.

2. Align the cubicles. Check the cubicle front for correct horizontal and vertical position.

3. Continue to lay out the functional units whilst carrying the same verification.

4. Remove the lifting squares and match the correct drawing unit to each cubicle according to the switchgear specific space assignment plan and the single line diagram.

#### IMPORTANT

For a switchboard containing more than 8 units, it is recommended that the installation of the equipment be started in the middle of the switchboard. Sequence the function units in accordance with the single line diagram.

### 5.5 Screw-fastening the cubicles to one another

1. Screw-fasten the cubicles to the 14 front fastening points (Fig. 5.8), using:
   - 1 x bolt M8x20
   - 2 x washers M8
   - 1 x lock washer ES8

2 x nut M8 for each cubicle.

---

![Fig. 5.8](image_url)

Fig. 5.8
Screw-fastening the cubicles to one another

1. Cubicle (lateral view)
2. 15 fastening points
5.6 Busbar assembly

Access to the busbar compartment

The busbar compartment is accessible from the side and from the top.

For top access, the pressure relief flap of busbar compartment must be removed first.

1. Place a sufficient stable and non-slip cover over the pressure relief flap to step onto the top of cubicles (Fig. 5.9, 5.10).
2. Release the 8 securing bolts from the cover. Keep the securing bolts and the cover for the subsequent reassembly.

---

**Busbar assembly**

**IMPORTANT**
Comply with the specified tightening torques (refer to Annex).

**IMPORTANT**
Pre-coat the contact surfaces (refer to Annex).

**Busbar and busbar feeder arrangement**

<table>
<thead>
<tr>
<th>Number of busbars per phase</th>
<th>1 busbar</th>
<th>2 busbars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross section (mm²)</td>
<td>80x10</td>
<td>80x10</td>
</tr>
<tr>
<td>Busbar arrangement to the outgoing feeder</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mount the busbars as shown in Fig. 5.10

Fig. 5.10
Top access to the busbar compartment:
1. Pressure relief of busbar
2. Securing bolts (5 metallics and 3 plastic)
3. Sufficiently stable and non-slip cover for the pressure relief flap

Fig. 5.11
Busbar assembly:
1. Busbars 2x80x10
2. Branch busbar
3. Screw fastening (4 per connection)

Fig. 5.12
Earthing bus assembly:
1. Earthing system in DNF7
2. Earthing bar to the DNF7 circuit breaker
3. Connecting bar to another DNF7
4. Screw fastening M8

Fig. 5.13
Earthing system (from the rear side).

Per M12 screw fastening
1 x screw M12
1 x sealing ring
2 x washer
1 x nut M12

5.7 Connecting the earthing bus

"IMPORTANT"
Comply with the specified tightening torques (refer to Annex).

"IMPORTANT"
Pre-coat the contact surfaces (refer to Annex).

The earthing system of DNF7 (please see Fig. 5.13) and the earthing connection between circuit breaker and cubicle through the “x” rails.

The earthing connection between two DNF7
1. Slip the connecting bar (4) into the adjacent cubicle through the cut-out in the cubicle.
2. Screw-fasten the connecting bar, the earthing bar and the copper bracket to one another by M8.
6 High-voltage connection

"IMPORTANT"

Pre-coat the contact surfaces (refer to Annex).

1. Route the high-voltage cable from the power cable trench to the cable compartment through the reducing ring (1) and clamps (2).

2. Screw-fasten the cable lugs to the cable connections of the cubicles.

"IMPORTANT"

Comply with the tightening torques specified by the cable manufacturer.

Fig. 6.1
1. Clamps
2. Reducer ring


7.1 Connecting the ring circuits in the low-voltage cabinet

1. Open the door of the low-voltage compartment.

2. Route the cables to the adjacent cubicle through the lateral openings (Fig. 7.1).

3. Connect the ring circuits to the terminal strip according to the terminal drawings.

![Fig. 7.1](image1.png)

Fig. 7.1
Laying and connection of the ring circuits in the low-voltage cabinet.
1. Terminal strip
2. Bushings to the adjacent cubicle

![Fig. 7.2](image2.png)

Fig. 7.2

7.2 Connecting the external cables

External cables supplied by the customer may be routed upwards to the low-voltage cabinet through the left-hand cable duct in the inside of the cubicle (Fig. 7.6).

1. Remove the protective cover of the cable duct in the cubicle (Fig. 7.3).

2. Cut-out the reducer rings according to the number of control cables (Fig. 7.4).

3. Route the cable through the cable duct to the low-voltage compartment (Fig. 7.5).

![Fig. 7.3](image3.png)

Fig. 7.3
Protective cover

![Fig. 7.4](image4.png)

Fig. 7.4
Reducer rings

![Fig. 7.5](image5.png)

Fig. 7.5
Low-voltage compartment
8 Final steps - Commissioning

8.1 Final steps

"WARNING"  The high-voltage supply must not be connected. All active parts must be earthed.

Clean and check assembly

1. Clean the switchgear, removing contamination resulting from assembly work.
2. Remove all the attached information tags, cards, brochures and instructions no longer needed.
3. Check the tightening:
   - High-voltage connection
   - Earthing cable
   - Cubicle screw fastening
   - Busbar connections

Rack the drawing unit into the cubicle by transport trolley.

Re-mount the covers

Cable duct cover of the secondary circuit (See section 7.4).

Damage paint

Minor damage to the paint can be repaired using commercially available paint.

Inspection

Check the switchgear for damage which might be due to transport or assembly work.

Compare data on rating plate to the required ratings.

Check the connected cables for phase coincidence with the appliance couplers.

8.2 Commissioning

Check switching functions and interlocks.

"IMPORTANT"  Comply with section 9 (Operation).

1. Open or close the earthing switch as trial.
2. Rack the drawing unit in and out as a trial.
3. Check switch position indicators.
4. Check rated supply voltage of control and operating devices.
5. Check wiring laid on site.
6. Apply supply voltage.
7. Switch the circuit breaker HVX or FP

Check switch position indicators and interlocks (See section 9).
9.1 Operator interface of the cubicle

Legend
- 1 Handle for opening the door
- 2 Insertion opening for emergency opening of the circuit breaker
- 3 Inspection window
- 4 Interlock slide for manual actuation of the withdrawable unit
- 5 Insertion opening for manual racking in/out the withdrawable unit
- 6 Insertion for operating earthing switch

Fig. 9.1

Fig. 9.2
(See from the inside of the panel)

* Interlock for prevent circuit breaker being rack in/out if the door of circuit breaker compartment is opened.
9.2 Vacuum circuit breaker HVX

9.3 Interlocks

a) Intra-cubicle interlocks

<table>
<thead>
<tr>
<th>Interlock</th>
<th>Function</th>
<th>Method of operation of interlock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between drawing unit and low-voltage-connector</td>
<td>The drawing unit cannot be racked in unless the low-voltage connector is inserted and locked</td>
<td>Interlock mechanism on HVX</td>
</tr>
<tr>
<td></td>
<td>The low-voltage connector can only be inserted or removed while the drawing unit is its test position</td>
<td>The interlock for the low-voltage connector on the drive end has been activated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between drawing unit and earthing switch</td>
<td>The drawing unit cannot be racked in while the earthing switch of the switchgear panel is closed</td>
<td>The moving crank handle is uncoupled automatically</td>
</tr>
<tr>
<td></td>
<td>The earthing switch cannot be switched on once the drawing unit has left its test position</td>
<td>The slip sheet cannot be open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between drawing unit and operating state of the circuit breaker</td>
<td>The drawing unit cannot be racked in or out while the circuit breaker is switched on</td>
<td>Circuit breaker interlock</td>
</tr>
<tr>
<td></td>
<td>The circuit breaker cannot be switched on unless it is completely in its test or service position</td>
<td>The circuit breaker cannot be switched on or off</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between the doors and earthing switch</td>
<td>The door of cable compartment cannot be opened when the earthing switch is open.</td>
<td>The interlock on the earthing shaft</td>
</tr>
<tr>
<td></td>
<td>The earthing switch cannot be operated when the door of cable compartment is open.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between the doors and circuit breaker</td>
<td>The drawing unit cannot be racked into the service position from test position once the door of circuit breaker compartment is open</td>
<td>The interlock mechanism on the door and the circuit breaker</td>
</tr>
<tr>
<td></td>
<td>The door of circuit breaker compartment cannot be opened if the circuit breaker isn’t be racked out to test position.</td>
<td></td>
</tr>
</tbody>
</table>

9.4 Switching the vacuum contactor

General information

The switchgear may only be switched by specialist electricians. Specialist electricians in terms of this provision are persons who due to their electro-technical training, have knowledge in the handling of medium-voltage switchgear.
Voltage indicator

When the circuit is live, it will be indicated by voltage indicator (Fig. 9.4).

Status indicator

Whether the circuit breaker HVX is switched on or off is indicated (Fig. 9.5).

Switching

The circuit breaker HVX is switched on and off only by means of remote control device or the control and protection relay like MiCOM Pxx series.

There is a separate documentation for MiCOM series protection (Fig. 9.5).

Open/Close select switch (Fig. 9.5).

Local/Remote select switch (Fig. 9.5).

9.5 Rack in/out the withdrawable unit

Rack in the drawing unit from test position into service position initial situation

- Circuit breaker OFF
- Earthing switch OFF
- Withdrawable unit Test position

1. Using transport trolley transit the drawing unit to the test position (See section 10.2).
2. Close the door of circuit breaker and then insert operating crank to the square spigot and swing it clockwise to its stop. Check the position of the circuit breaker in the cubicle through inspection.
3. Remove crank.

Operation of the circuit breaker.
Rack out the withdrawable unit from service position into test position initial situation

- Circuit breaker      OFF
- Earthing switch    OFF
- Drawing unit       Service position

1. Insert operating crank to the square spigot and move it counter-clockwise to its stop.
   Check the position of the circuit breaker in the cubicle through inspection window.
2. Remove crank.

9.6 Operating the earthing switch manually

Closing the earthing switch initial situation

- Circuit breaker      OFF
- Earthing switch    OFF
- Withdrawable unit  Test position

1. Push the interlock slide down-wards to open the insertion opening for the operating lever.
2. Insert the operating handle (Fig. 9.9).
3. Swing the operating lever 180° (clockwise).
4. The position indicator of the earthing switch indicates earthing.
5. Remove operating handle.

Fig. 9.9
Operation of the earthing switch.

Opening the earthing switch initial situation

- Circuit breaker      OFF
- Earthing switch    ON
- Drawing unit       Test position

1. Directly insert the operating handle.
2. Swing the operating lever 180° (counter-clockwise).
3. The position indicator of the earthing switch indicates opening.
4. Remove operating handle.
10.1 Connection and removal of the low-voltage contactor

Initial situation

- Circuit breaker    Open
- Earthing switch   Open
- Withdrawable unit  Test position

Connection of the low-voltage connector

1. Pick up the low-voltage connector from the storage tray (1) above the circuit breaker compartment.
2. Insert the low-voltage connector into the circuit breaker (2) and lock the connector interlock (3).

Removal of the low-voltage connector

1. Unlock the interlock of the low-voltage connector and remove the connector (3).
2. Store the low-voltage connector in the storage tray above the circuit breaker compartment.

10.2 Racking withdrawable unit out of the cubicle

“IMPORTANT”
Observe the description of the transport trolley (Fig. 10.5).

Initial situation

- Circuit breaker    OFF
- Earthing switch   Close
- Withdrawable unit  Test position
- Low-voltage connector removed
(See section 10.1).

1. Move the transport trolley in front of the cubicle and lock it onto the cubicle.
2. Unlock the withdrawable unit in the cubicle and pull it onto the transport trolley using the handle (Fig. 10.6).

For racking the withdrawable unit in, reverse the above sequence of the operations.
Fig. 10.3
Transport trolley.

Fig. 10.4
Drawing unit on the transport trolley.

Fig. 10.5
Drawing unit is lifting from the pallet.

Fig. 10.6
Drawing unit is pulling into the cubicle.
11 Servicing

11.1 Servicing schedule

We recommend performing a visual inspection of the cubicles at least every 4 years, depending on the strain to which they are subject during operation and on the operating conditions.

"IMPORTANT"
In case of frequent condensation or air pollution with dust, smoke or corrosive gas, the maintenance intervals must be reduced accordingly. The switchgear cubicle operating company is responsible for complying with the specified maintenance intervals and for performing maintenance according to the actual operating and ambient conditions.

If dirt or condensation is detected, the cubicles must be cleaned professionally. To this effect, only the detergents which have been approved by the manufacturer may be used (see Annex).

When performing cleaning, make sure that the lubrication in the drive mechanisms is not removed. If the drive mechanisms are no longer sufficiently lubricated, a new lubrication must be applied.

"WARNING"
The drives must not be disassembled for service and maintenance work. Use in accordance with the intended purpose compromised (See section 1.3).

"IMPORTANT"
See the Operating manual of the circuit breaker for its servicing.

In case of ambiguities or irregularities, please contact the manufacturer’s Service Center immediately.

11.2 Safety provisions

Only specialist electricians certified by the manufacturer for maintenance work and who have the required knowledge regarding handling of DNF7 Metal-clad switchgear are permitted to perform maintenance and cleaning work.

"WARNING"
Refer to the safety provision in section 1.5.

<table>
<thead>
<tr>
<th>Maintenance interval for ambient conditions according to IEC 60694*</th>
<th>Work to be performed</th>
<th>Qualification/work perform by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every 4 years</td>
<td>Check cubicles for contamination, condensation and damage. If necessary, clean the cubicles (See section 11.3) and perform switching test of the drive mechanisms</td>
<td>Staff who have been certified for this work</td>
</tr>
<tr>
<td>After 20 years</td>
<td>Clean and lubricate the drive mechanisms and perform switching tests</td>
<td></td>
</tr>
<tr>
<td>After 1000 actuations of the drawing unit or the earthing switch</td>
<td>Replace the function unit</td>
<td>Manufacturer’s Service Center</td>
</tr>
</tbody>
</table>

11.3 Cleaning insulating components

To ensure the specified insulating level, the insulating components must be clean. On principle, general cleanliness of the circuit breaker and of its external parts should be ensured.

Use cleaning agents for severe soiling:
• Wear protective gloves.
• Use cleaning agent according to manufacturer’s instructions.
• Soak the cloth thoroughly and wipe the insulating components. Keep duration of the exposure as short as possible.
• Expose the cleaned surface to the air for at least two hours.

11.4 Corrosion protection

Drive mechanisms and covers have a long-term protection against corrosion. Any damage to the paint, scratches and other damage must be repaired immediately to avoid corrosion. Contact the manufacturer’s Service Center.

11.5 Avoid condensation

To ensure the specified insulating level, the cubicle especially its insulating components must not be exposed to condensation.
Measures to take in case of condensation:

1. If condensation of the cubicle of the circuit breaker is detected, the affected equipment must be cleaned according to section 11.3.
2. Inspection of the appropriate heating. It must provide sufficient heating performance to prevent condensation on the cubicle.

11.6 Lubrification instruction

**"IMPORTANT"**

All lubrication only can be done in de-energized situation (the cubicle is absolutely isolated from the power) and only approved lubricants may be used (See section 11.1).

**Lubrication procedure**

1. Clean the lubrication points using a lint-free cotton cloth; use detergent in case of serious soiling.
2. Apply a thin coat of lubricant, using e.g. a paintbrush.

**Lubrication**

1. Rack the circuit breaker out of the cubicle. The circuit breaker compartment is accessible.
2. Open the rear door. The earthing switch is accessible.
3. Lubricate the following points with lubricant KL:
   - In the circuit breaker compartment (Fig. 11.1):
     1. The guide bars of the shutter (1)
     2. The fixed contacts (2) in the spouts
   - On the earthing switch (Fig. 11.2):
     1. Contact blades (3)
     2. Strike contacts (4)

11.7 Replacement of components and cubicles

The drive mechanisms and the current transformers as well as the testing and monitoring systems can be replaced if necessary. Also, entire cubicles can be replaced.

The following data on the rating plate are relevant for replacement of components of cubicles or in case of any queries (See section 2.1):
- Type designation
- Serial number
- Year of construction.
12.1 Auxiliary Products

The auxiliary products are available from Schneider Electric.

<table>
<thead>
<tr>
<th>Auxiliary product</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaning agent</td>
<td>S008 152</td>
</tr>
<tr>
<td>KL lubricant, 0.5 kg can</td>
<td>ST312-111-835</td>
</tr>
</tbody>
</table>

12.2 How to treat the contact surfaces

For detergents and KL, see list above.

**IMPORTANT** Different lubricants must not be mixed on any account! Contact areas coated with lubricant KL should not be touched, if possible.

Contact areas must be subjected to preliminary treatment before screw-fastening

<table>
<thead>
<tr>
<th>Material of contact surfaces</th>
<th>Pre-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper, silver-plated</td>
<td>-</td>
</tr>
<tr>
<td>Copper</td>
<td>(1)</td>
</tr>
<tr>
<td>Aluminium, silver-plated</td>
<td>-</td>
</tr>
<tr>
<td>Aluminium</td>
<td>(2)</td>
</tr>
<tr>
<td>Steel or galvanized steel</td>
<td>(3)</td>
</tr>
<tr>
<td>Sheet metal, galvanized</td>
<td>-</td>
</tr>
</tbody>
</table>

1. Clean

- Use a lint-free cloth.
- In case of severe soiling: use detergent.

2. Polish to achieve a bright surface:

(1) - using emery cloth (grain size 100 or finer) or using a steel brush which is only used for copper
(2) - using emery cloth (grain size 100 or finer)
- or using a steel brush which is only used for aluminium
(3) - using emery cloth (grain size 100 or finer)
- or using a steel brush which is only used for steel

3. Immediately after cleaning the material metallically bright, coat it with lubricant KL so that the space between the contact surfaces is completely filled once the screws have been fastened

12.3 Screw fastenings

Following elements must be used for all screw fastenings.
- Screws and bolts: Grade ≥ 8.8
- Nuts: Grade 8

<table>
<thead>
<tr>
<th>Thread size</th>
<th>Tightening torque (Nm) Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>M4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>M5</td>
<td>3.8</td>
<td>5.6</td>
</tr>
<tr>
<td>M6</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>M8</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>M10</td>
<td>36</td>
<td>44</td>
</tr>
<tr>
<td>M12</td>
<td>63</td>
<td>77</td>
</tr>
</tbody>
</table>
Table 2: Screw fastening for current transfer, conductor material: copper

<table>
<thead>
<tr>
<th>Thread size</th>
<th>Tightening torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
</tr>
<tr>
<td>M6</td>
<td>5.5</td>
</tr>
<tr>
<td>M8</td>
<td>15</td>
</tr>
<tr>
<td>M10</td>
<td>30</td>
</tr>
<tr>
<td>M12</td>
<td>60</td>
</tr>
</tbody>
</table>

12.4 Tools and products (*not supplied*) required for the operations described in this notice

- Cutter
- Crow bar
- Open-ended spanners size 8, 13, 16, 18
- Socket wrenches 8, 13, 16, 18
- Allen key 8, 10, 12
- Torque wrench with sockets size: 10, 16, 18 and hexagon socket screw size 12
- Screwdriver
- TORX screwdriver 25
- Cutting pliers
- 4 crane straps (capacity: 1000 kg)
- Dry, clean cloths

12.5 Operation accessories

*Transport trolley for drawing unit*

*Legend*

1. Handle of the transport trolley
2. Rail
3. Adjustment lever
4. Bracket to lock and unlock the transport trolley on the cubicle
5. Rear wheel
6. Front wheel
7. Crank

*Fig. 12.1* Transport trolley for racking in/out the withdrawable unit into/from the cubicle
Fig. 12.2  
Bracket to lock and unlock the transport trolley on the cubicle.

Fig. 12.3  
Successfully connection with cubicle.

Fig. 12.4  
Locking the circuit breaker with cubicle.

Operating levers

Fig. 12.5  
Crank for racking the drawing unit in/out.

Fig. 12.6  
Operating lever of the earthing switch.

Fig. 12.7  
Operating rod to switch the circuit breaker manually (optional).

Fig. 12.8  
Double-bit key for locking and unlocking the door of cable compartment.

Fig. 12.9  
Key for locking and unlocking the low-voltage compartment.