

SIEMENS

Medium-Voltage Switchgear

Type 8DJ10/8DJ20

up to 24 kV, Gas-Insulated



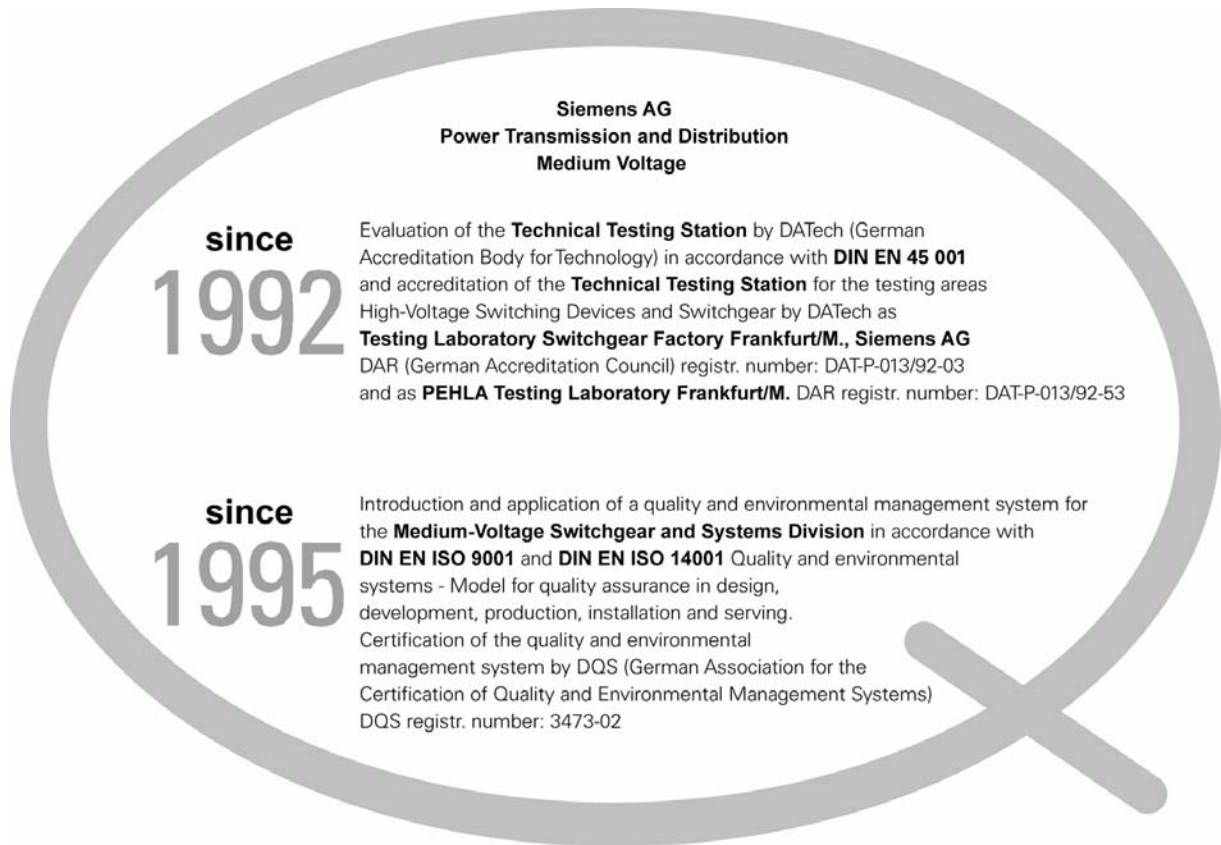
Medium-Voltage
Switchgear

INSTALLATION AND OPERATING INSTRUCTIONS

Order No.: 817-6638.0

Revision: 09

Issue: 24.10.2008



About these Instructions

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation or operation. For details about technical design and equipment like e.g. technical data, secondary equipment, circuit diagrams, please refer to the order documents. The switchgear is subject to continuous technical development within the scope of technical progress. If not stated otherwise on the individual pages of these instructions, we reserve the right to modify the specified values and drawings. All dimensions are given in mm. For further details, e.g. about additional equipment and information about other switchgear types, please refer to catalogues HA 45.11 (8DJ10),


HA 45.31 (8DJ20) and HA 40.1 (Switchgear 8DJ und 8DH: General Part). Should further information be desired or should particular problems arise which are not covered sufficiently by these instructions, the matter should be referred to the competent Siemens department. The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The Sales Contract contains the entire obligations of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.


Contents


Safety instructions	4	11.3	Intermediate storage.....	39	
1	Signal terms and definitions.....	4	11.4	Unloading and transport to the place of installation	40
2	General instructions	4	11.5	Checking the ready-for-service indicator	42
3	Due application.....	5	12	Switchgear installation	43
4	Qualified personnel	5	12.1	Tools/auxiliary means	43
Description	6	12.2	Floor openings and fixing points	43	
5	Features	6	12.3	Pressure relief options	44
6	Switchgear design.....	8	12.4	Switchgear earthing	45
7	Components.....	10	12.5	Installation of cable brackets for switchgear with low subframe	45
7.1	Three-position switch-disconnector	10	13	Electrical connections	46
7.2	Three-position disconnecting circuit-breaker	11	13.1	Connecting high-voltage cables	46
7.3	Operating mechanisms	12	13.2	Cable connection with cable-type current transformers	52
7.4	HV HRC fuse assembly.....	14	13.3	Connecting secondary equipment	53
7.5	Interlocks.....	16	14	Commissioning	54
7.6	Cable connection.....	18	14.1	Final tests after installation	54
7.7	Ready-for-service indicator	20	14.2	Mechanical and electrical function test.....	55
7.8	Voltage detecting systems	21	14.3	Instructing the operating personnel	56
7.9	Short-circuit/earth-fault indicators.....	24	14.4	Applying operating voltage	56
7.10	Accessories.....	25	Operation	58	
8	Technical data.....	26	15	Indicators and control elements.....	59
8.1	Switchgear versions (examples): Dimensions and weights.....	26	16	Operating the three-position switch	61
8.2	Electrical data for 8DJ10/8DJ20.....	28	16.1	Operations	62
8.3	Standards and guidelines	28	16.2	Protection tripping for the three-position switch-disconnector with spring-operated/ stored-energy mechanism	64
8.4	Rating plates	30	16.3	Protection tripping for three-position disconnecting circuit-breaker	64
8.5	Three-position switch-disconnector	31	17	Verification of safe isolation from supply	65
8.6	Three-position disconnecting circuit-breaker	32	18	Replacing HV HRC fuses	66
8.7	Selection of HV HRC fuse links.....	33	19	Cable testing.....	68
9	Switchgear maintenance.....	36	19.1	Cable testing via cable plugs	68
10	End of service life.....	37	19.2	Cable sheath testing	70
Installation	38	Index	71		
11	Before installation.....				
11.1	Packing				
11.2	Completeness and transport damage				

Safety instructions

1 Signal terms and definitions

	DANGER!
	<p>as used in these instructions, this means that personal injuries can occur if the relevant precautionary measures are not taken.</p> <p>⇒ Observe the safety instructions.</p>

	ATTENTION!
	<p>as used in these instructions, this means that damage to property or environment can occur if the relevant precautionary measures are not taken.</p> <p>⇒ Observe the safety instructions.</p>

	NOTE!
	<p>as used in these instructions, this points at facilitations of work, particularities for operation or possible maloperation.</p> <p>⇒ Observe the notes.</p>

- Symbols used**
- ⇒ Operation symbol: Identifies an operation. Asks the operator to perform an operation.
 - ✓ Result symbol: Identifies the result of an operation.

2 General instructions

Independently of the safety instructions given in these operating instructions, the local laws, ordinances, guidelines and standards for operation of electrical equipment as well as for labor, health and environmental protection apply.


Five Safety Rules of Electrical Engineering

The Five Safety Rules of Electrical Engineering must generally be observed during operation of the products and components described in these operating instructions:

- Isolating.
- Securing against reclosing.
- Verifying safe isolation from supply.
- Earthing and short-circuiting.
- Covering or barriering adjacent live parts.

3 Due application

The switchgear corresponds to the relevant laws, prescriptions and standards applicable at the time of delivery. If correctly used, they provide a high degree of safety by means of logical mechanical interlocks and shockproof metal enclosure of live parts.

	DANGER!
	<p>The perfect and safe operation of this switchgear is conditional on:</p> <ul style="list-style-type: none"> ⇒ Observance of operating and installation instructions. ⇒ Qualified personnel. ⇒ Proper transportation and correct storage of the switchgear. ⇒ Correct installation and commissioning. ⇒ Diligent operation and maintenance. ⇒ Observance of the instructions applicable at site for installation, operation and safety.

4 Qualified personnel

Qualified personnel in accordance with these instructions are persons who are familiar with transport, installation, commissioning, maintenance and operation of the product and have appropriate qualifications for their work, e.g.:

- Training and instruction or authorisation to switch on, switch off, earth and identify power circuits and equipment / systems as per the relevant safety standards.
- Training and instruction about the relevant specifications for prevention of accidents and the use of appropriate safety equipment.
- Training in first aid and behaviour in the event of possible accidents.



Description

5 Features

Typical uses Switchgear 8DJ10/8DJ20 is used for power distribution in substations – even under severe environmental conditions – such as:

- Industrial environments
- Damp, sandy or dusty areas
- Simple outdoor substations

Technology

- Factory-assembled, type-tested, metal-enclosed switchgear for indoor installation
- Partition class PM
- Switchgear design with up to 6 feeders



- Welded switchgear vessel without seals, made of stainless steel, with welded-in bushings for electrical connections and mechanical operating mechanism
- Insulating gas SF₆
- Maintenance-free
- Climate-independent
- Three-position switch-disconnector with load-break and make-proof earthing function
- Disconnecting circuit-breaker for rated voltages from 7.2 to 24 kV (in switchgear type 8DJ20)
- Cable connection for bushings with outside cone
- Fuse assembly with withdrawable HV HRC fuses for easy fuse replacement
- Comprehensive special equipment or accessories
- Easy installation without gas work
- Ecological manufacture and recycling

Personal safety

- Safe-to-touch and hermetically sealed primary enclosure
- HV HRC fuses and cable sealing ends are only accessible when outgoing feeders are earthed
- Operation only possible when enclosure is closed
- Logical mechanical interlocking
- Capacitive voltage detecting system to verify safe isolation from supply

- Security of operation and availability**
- Hermetically sealed primary enclosure independent of environmental effects such as pollution, humidity and small animals
 - Welded switchgear vessel, sealed for life
 - Operating mechanisms of switching devices located outside the switchgear vessel
 - Switchgear interlocking system with logical mechanical interlocks
 - Loss of service continuity category: LSC 2
- Cost-efficiency** Extremely low "life-cycle costs" and maximum availability thanks to:
- Maintenance-free concept
 - Climatic independence
 - Minimum space requirements
 - Long service life

6 Switchgear design

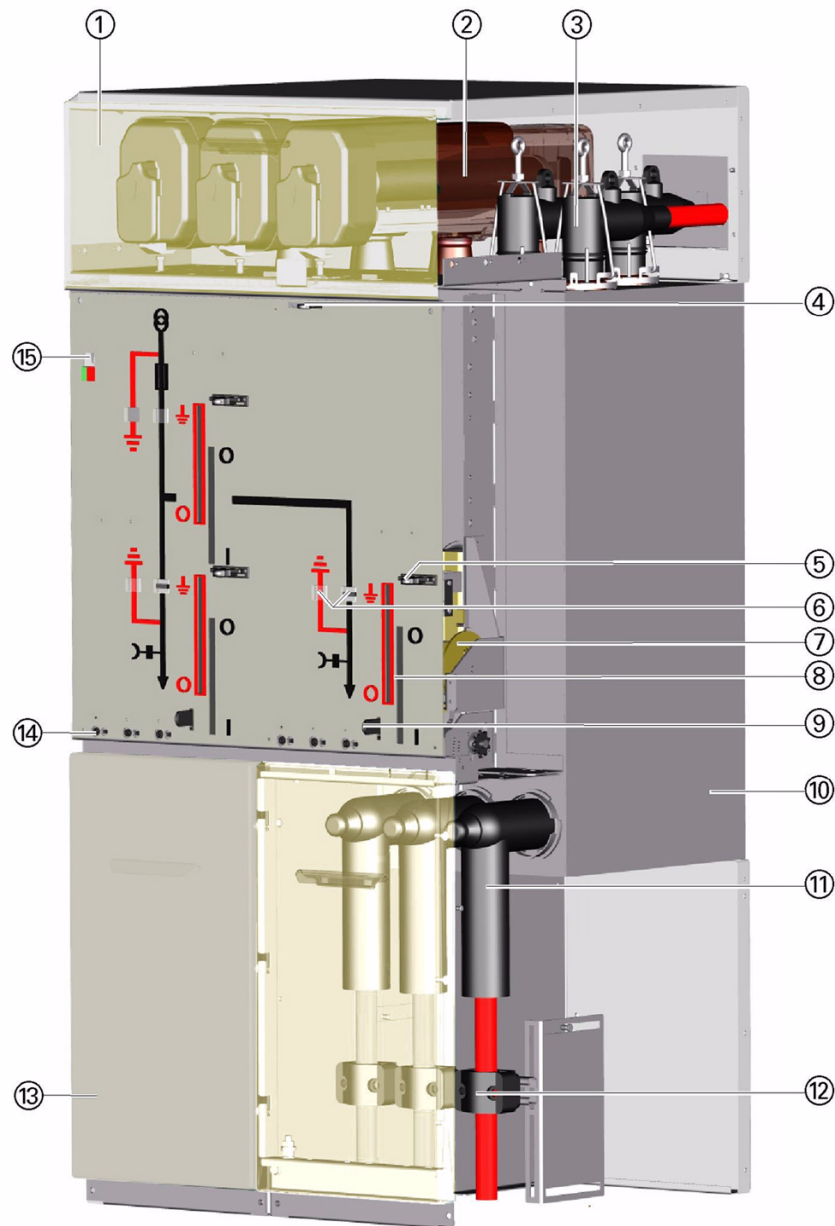


Fig. 1: 8DJ10 scheme 10 (2 ring-main feeders/1 transformer feeder)

- | | |
|---|--|
| ① HV HRC fuse compartment cover | ⑨ Lock for cable compartment cover |
| ② HV HRC fuse in fuse assembly | ⑩ Switchgear vessel (gas-insulated) with switching devices |
| ③ Transformer cable connection | ⑪ Ring-main cable connection |
| ④ Lock for HV HRC fuse assembly | ⑫ Cable bracket |
| ⑤ Locking device (option) | ⑬ Cable compartment cover |
| ⑥ Mimic diagram with switch position indicators | ⑭ Sockets of capacitive voltage detecting system |
| ⑦ Operating mechanism for three-position switch-disconnector | ⑮ Ready-for-service indicator |
| ⑧ Switching gate for operating mechanism of three-position switch | |

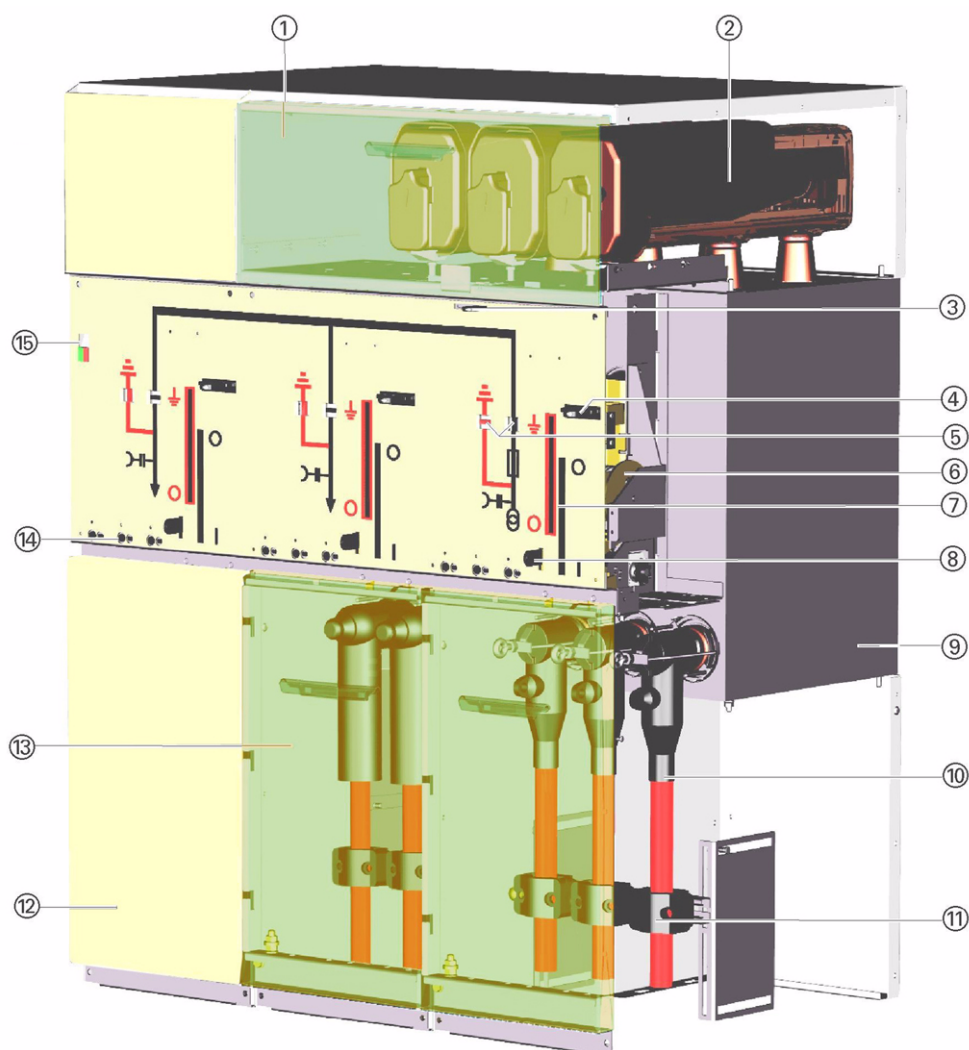


Fig. 2: 8DJ20: Scheme 10 (2 ring-main feeders/1 transformer feeder)

- | | |
|--|--|
| ① HV HRC fuse compartment cover | ⑨ Switchgear vessel (gas-insulated) with switching devices |
| ② HV HRC fuse in fuse assembly | ⑩ Transformer cable connection |
| ③ Lock for HV HRC fuse assembly | ⑪ Cable bracket |
| ④ Locking device (option) | ⑫ Cable compartment cover |
| ⑤ Mimic diagram with switch position indicators | ⑬ Ring-main cable connection |
| ⑥ Operating mechanism for three-position switch-disconnector / disconnecting circuit-breaker | ⑭ Sockets of capacitive voltage detecting system |
| ⑦ Switching gate for operating mechanism of three-position switch | ⑮ Ready-for-service indicator |
| ⑧ Lock for cable compartment cover | |

7 Components

7.1 Three-position switch-disconnector

- Features**
- Designed as a multi-chamber switch incorporating the functions of a switch-disconnector and a make-proof earthing switch with the switch positions: "CLOSED - OPEN - EARTHED"
 - Operation via gas-tight, welded metal bellows bushing at the front of the switchgear vessel

Mode of operation The switch shaft with the moving contact pieces rotates inside the chamber containing the fixed contact pieces. Compression vanes, which rotate in conjunction with the switch shaft, divide the arcing chamber into two subchambers, each of which changes in conjunction with the rotation. During the switching movement, the compression vanes generate a pressure difference between the subchambers. The gas flows through a nozzle, causes a directional blow-out of the breaking arc and quenches it rapidly. Interlocking is not necessary as the "CLOSED" and "EARTHED" functions cannot be implemented simultaneously.

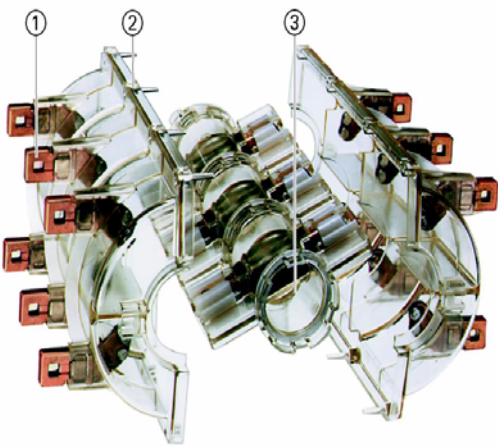


Fig. 3: Three-position switch-disconnector (separated components)

- ① Fixed contact
- ② Arcing chamber
- ③ Operating shaft with compression vanes and nozzles

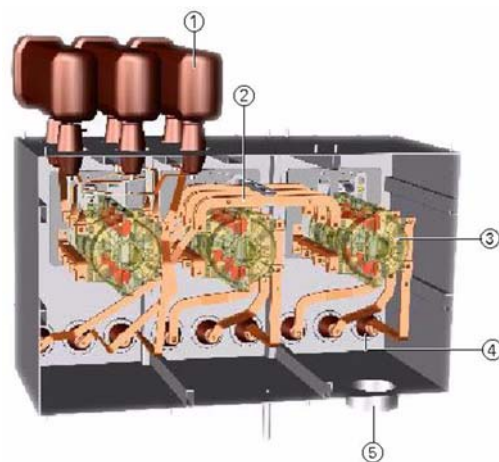
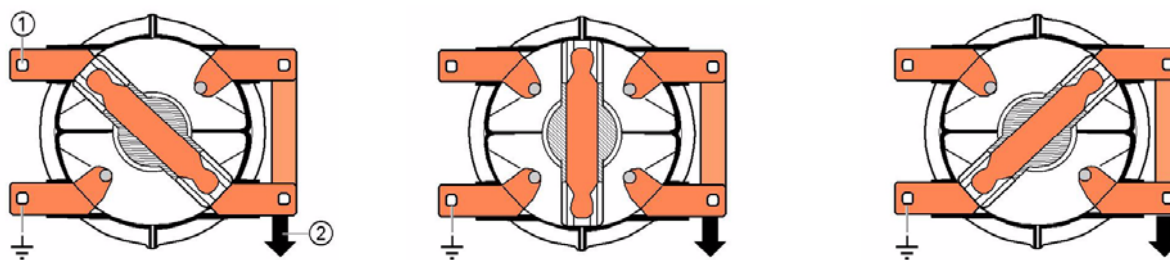


Fig. 4: Example for installation in 8DJ20

- ① HV HRC fuse box
- ② Busbar
- ③ Three-position switch-disconnector
- ④ Ring-main cable connection
- ⑤ Switchgear vessel (gas-insulated) with pressure relief device

Switch positions of three-position switch-disconnector



CLOSED position

OPEN position

EARTHED position

① Busbar connection

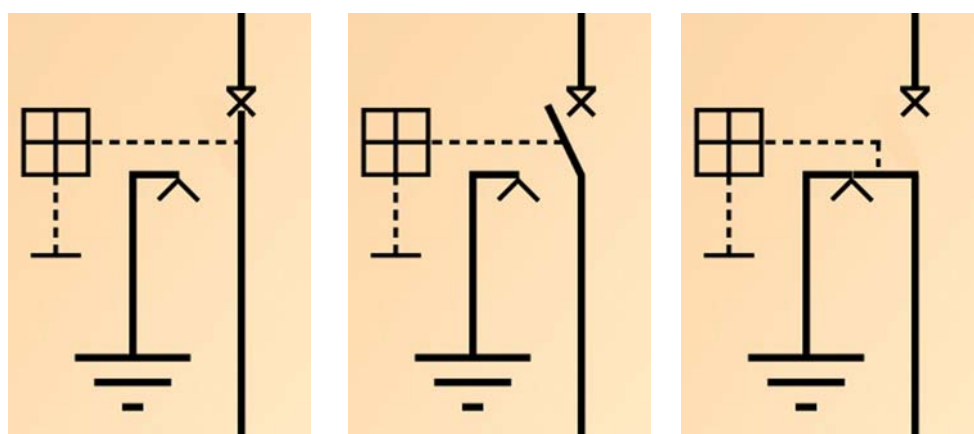
② Ring-main cable connection

7.2 Three-position disconnecting circuit-breaker

- Features**
- Disconnecting circuit-breaker with the switch positions "CLOSED - OPEN - EARTHED"
 - Operation via gas-tight, welded metal bellows bushing at the front of the switchgear vessel

Mode of operation In a gas-tight welded stainless-steel vessel without seals, the disconnecting circuit-breaker breaks rated currents up to 630 A and short-circuit currents up to 20 kA. The rotating arc principle breaks short-circuit currents safely. For example, the disconnecting circuit-breaker can be used in feeder panels for transformer ratings above 630 kVA or in feeder or transfer panels in secondary distribution systems.

Switch positions of disconnecting circuit-breaker



CLOSED position

OPEN position

EARTHED position

7.3 Operating mechanisms

The three-position switch-disconnector as well as the disconnecting circuit-breaker are operated from the switchgear front.

Detachable lever mechanism (standard for 8DJ10/20)

- Spring-operated mechanism for ring-main feeders
 - with "spring-operated CLOSED" and "spring-operated OPEN" for installation on the switch-disconnector



- Spring-operated/stored-energy mechanism for transformer feeders
 - with "spring-operated CLOSED" and "spring-operated OPEN" for installation on the switch-disconnector
 - with additional energy store for the function "stored-energy OPEN" after tripping by HV HRC fuse (striker pin tripping) or shunt release
- Spring-operated/stored-energy mechanism for circuit-breaker feeders in switchgear type 8DJ20
 - with "spring-operated CLOSED" and "spring-operated OPEN" for installation on the disconnecting circuit-breaker
 - with additional energy store for the function "stored-energy OPEN" after tripping by protection relay or shunt release

Rotary operating mechanism

Option for standard switchgear type 8DJ20 (design without disconnecting circuit-breaker):

- Locking devices



- Closing lock-out for ring-main feeders
- Anti-reflex lever (reversing the switching direction requires re-inserting the operating lever)

Options • **Motor operating mechanism for the switching functions "CLOSE" and "OPEN"**

Operation:

- Remote operation (standard) applied to terminal
- Local operation by momentary-contact rotary control switch (option)
- Switching to EARTH and emergency operation with normal operating lever by hand

• **Shunt release (F-release)**

- Spring-operated/stored-energy mechanisms for three-position switch-disconnectors can be equipped with a shunt release. Remote electrical tripping of the three-position switch-disconnector is possible via the magnetic coil of the shunt release, e.g. by transformer overtemperature tripping.
- Spring-operated/stored-energy mechanisms for disconnecting circuit-breakers are equipped with a shunt release or a c.t.-operated release.

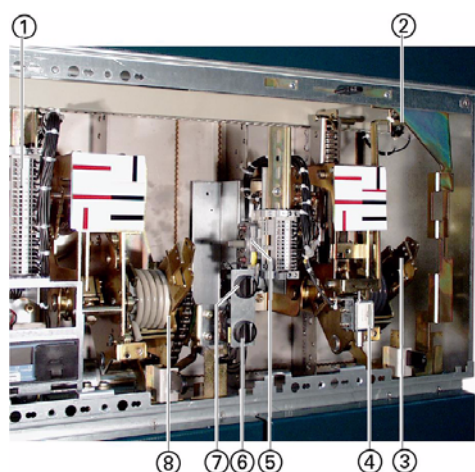
• **Auxiliary switch**

Each operating mechanism of the three-position switch-disconnector / disconnecting circuit-breaker can optionally be equipped with an auxiliary switch for the position indication. For secondary distribution switchgear type 8DJ:

- Function switch-disconnector CLOSED and OPEN: 1NO + 2 NC
- Function earthing switch CLOSED and OPEN: 1NO + 1NC

• **Wiring**

- Auxiliary switches, motor operating mechanisms or shunt-releases are wired to terminal strips. These are feeder-related and located next to the operating mechanism module of the feeder concerned. Customer-side cable routing is done from the side, if required from the rear (if low-voltage niche available) to the terminal strip arranged at the operating mechanism module.



- ① Terminal strip
- ② Fuse tripping with auxiliary switch
- ③ Spring-operated/stored-energy mechanism
- ④ Shunt release
- ⑤ Auxiliary switch
- ⑥ ON/OFF momentary-contact rotary control switch for motor operating mechanism
- ⑦ Local/remote switch for motor operating mechanism
- ⑧ Spring-operated mechanism for detachable lever mechanism with motor

7.4 HV HRC fuse assembly

- Features**
- HV HRC fuse-links according to DIN 43 625 (main dimensions) with striker in "medium" version according to IEC 60 282-1
 - as short-circuit protection before transformers,
 - with selectivity to upstream and downstream connected equipment,
 - single-phase insulated
 - Requirements according to IEC 62 271-105 fulfilled by combination of HV HRC fuses with the three-position switch-disconnector
 - Thermal striker tripping when the corresponding HV HRC fuse-link is used
 - Climate-independent and maintenance-free, with fuse boxes made of cast resin
 - Fuse assembly arranged above the switchgear vessel
 - Fuse assembly connected to the three-position switch-disconnector via welded bushings and connection bars
 - Fuses can only be replaced if feeder is earthed
 - Option: "Tripped indication" of the transformer switch for remote electrical indication with 1NO contact



Fig. 5: Inserting an HV HRC fuse-link

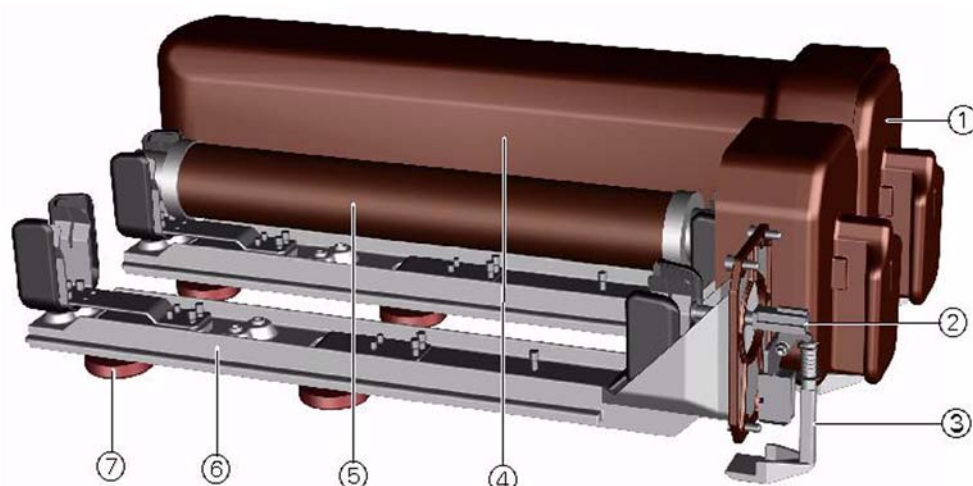


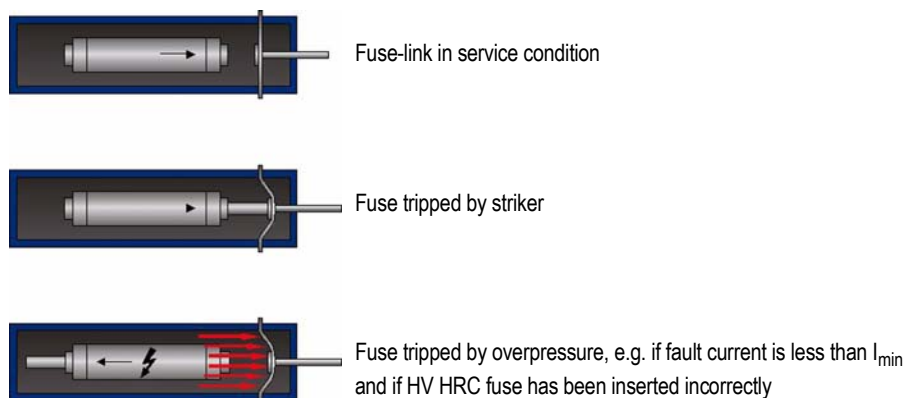
Fig. 6: HV HRC fuse assembly

- | | |
|---|---------------|
| ① Cover with seal | ④ Fuse box |
| ② Striker of the HV HRC fuse-link and articulation for tripping the spring-operated/stored-energy mechanism | ⑤ HV HRC fuse |
| ③ Tripping pin for spring-operated/stored-energy mechanism | ⑥ Fuse slide |
| | ⑦ Bushing |

Mode of operation In the event that a HV HRC fuse-link has tripped, the switch is tripped via an articulation which is integrated into the cover of the fuse box.

In the event that fuse tripping fails, e.g. if the fault current is less than I_{min} or if the fuse has been inserted incorrectly, the fuse box is protected by thermal protection. The overpressure generated by overheating trips the switch via a diaphragm in the cover of the fuse box and via the articulation. This breaks the current before the fuse box incurs irreparable damage. The above thermal protection works independently of the type and design of the HV HRC fuse used. Like the fuse itself it is maintenance-free and independent of any outside climatic effects.

Schematic sketches for fuse tripping

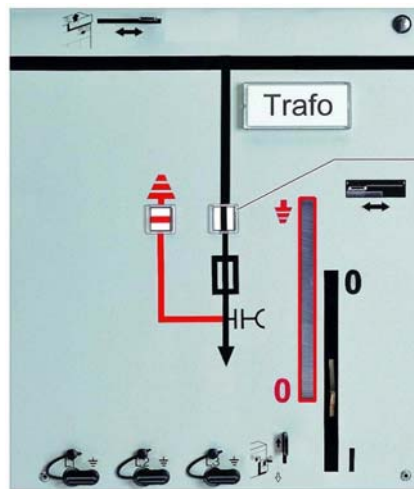


Furthermore, the specified HV HRC fuses release the striker depending on the temperature and trip the switch-disconnector as early as in the fuse overload range. Impermissible heating of the fuse box can be avoided in this way.

Description

Replacing HV HRC fuses

- Isolate and earth the transformer feeder
- Then, replace the HV HRC fuse-link by hand



- ① "CLOSED" indication, manual or motor operation
- ② "OPEN" indication
- ③ Indication "HV HRC fuse tripped" or "f-release tripped" if the stored-energy mechanism has tripped. First, the operating mechanism must be switched to "OPEN" position to charge the spring. Then you can earth with the three-position switch-disconnector and replace fuses, for example.

7.5 Interlocks

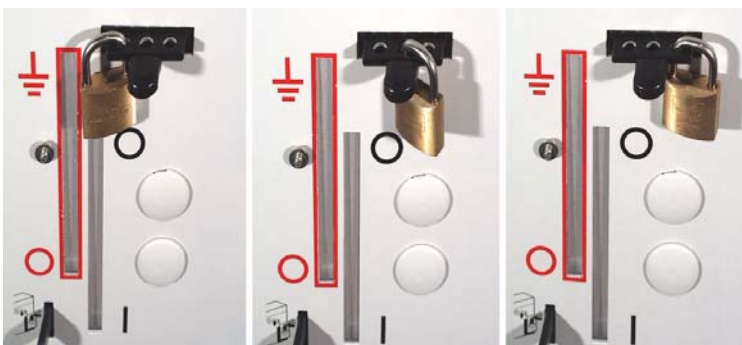
- The switching gate prevents switching straight from "CLOSED" to "EARTHED" resp. from "EARTHED" to "CLOSED", as the operating lever must be re-inserted in the "OPEN" position.
- The HV HRC fuse compartment cover can only be removed if the transformer feeder is earthed and the operating lever is removed. The three-position switch-disconnector can only be switched from the "EARTHED" position to another position if the HV HRC fuse compartment cover is closed and locked.



- The cable compartment covers can only be removed if the associated feeder is earthed.



- A closing lock-out (option) prevents the three-position switch-disconnector or the disconnecting circuit-breaker from being switched to the "CLOSED" position if the cable compartment cover is removed.
- The locking device (option) of the switching gate can be padlocked in all three switch positions.



Padlock	left	centre	right
Lever positions	right or centre	centre	left or centre
Possible switching operation	only earthing or de-earthing possible	no switching operations possible	only switch-disconnector or disconnecting circuit-breaker can be operated

7.6 Cable connection

Cable connection in ring-main and disconnecting circuit-breaker feeders

- Features**
- Bushings with bolted contact (M16) as interface type "C" according to DIN EN 50 181
 - For rated normal currents 400/630 A (250 A for disconnecting circuit-breaker panel)
 - Cable routing downwards, cable connection at the front
 - For thermoplastic-insulated cables with cross-sections up to 300 mm² (standard)
 - For cable T-plugs or cable elbow plugs
 - For paper-insulated mass-impregnated cables with adapter systems
 - For conventional cable sealing ends via elbow adapter AKE 20/630 (make Siemens)



- ① Phase L1: Make Euromold, type K400LB as cable elbow plug
- ② Phase L2: Make Euromold, type K400 TB as cable T-plug
- ③ Phase L3: Elbow adapter, make Siemens type AKE 20/630

Fig. 7: Ring-main cable connection

- Options**
- Suitable for connection of surge arresters
 - Mounted cable clamps
 - Double cable connection with deep cable compartment cover

Transformer cable connection

- Features**
- Bushings with plug-in contact as interface type "A" according to DIN EN 50 181
 - For rated normal current of 200 A
 - Cable routing according to switchgear type and order
 - For thermoplastic-insulated cables with cross-sections up to 120 mm²
 - For cable elbow plugs or straight cable plugs with plug-in contact



Fig. 8: 8DJ10 with transformer cable routing to the rear (make Euromold, type K158LR)

Selection table for cable sets

Manufacturer	Plug type for ring-main or circuit-breaker feeders	Plug type for transformer feeders
Euromold	(K) 400 TB (S)	(K) 158 LR
	(K) 400 LB	(K) 151 SR
	AGT (L)10(20)	AGW (L) 10 (20); AGG (L) 10 (20)
nkt cables	AV 20	EASW 10/250
	EAVI 20	EASW 20/250
Südkabel (ABB)	SEH DT 13 (23)	SEHDG 11.1 (21.1)
	SEHDT 13.1 (23.1)	SEHDW 11.1 (21.1)
Prysmian Kabel (Pirelli)	FMCTs(m)-400	FMCE(m)-250
Siemens	AKE 20/630	-
Tyco-Electronic/Raychem	RICS 51...	RSES; RSSS
Cooper	DT 400 P	DE 250; DS 250
Other plug types on request		

7.7 Ready-for-service indicator

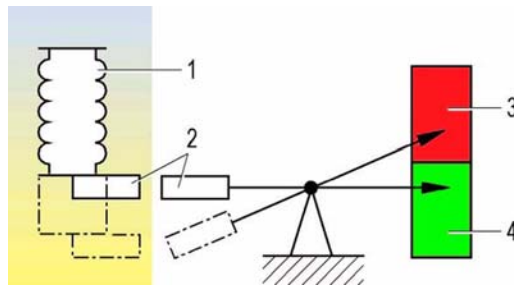
The switchgear is filled with insulating gas at a relative pressure. The ready-for-service indicator at the switchgear front shows through the red/green indication if the gas density is in order.



Fig. 9: Ready-for-service indicator

- Features**
- Self-monitoring, easy to read
 - Independent of temperature and outside pressure variations
 - Only responds to changes in gas density
 - Option: Alarm switch 1 NO +1 NC for remote electrical indication

Mode of operation



Principle of gas monitoring with ready-for-service indicator

- ① Measurement box in filled stainless-steel vessel
- ② Magnetic coupling
- ③ Red indication: not ready for service
- ④ Green indication: ready for service

For the ready-for-service indicator, a gas-tight measurement box is installed on the inside of the switchgear vessel.

A coupling magnet, which is fitted to the bottom end of the measurement box, transmits its position to an outside armature through the non-magnetizable switchgear vessel. This armature moves the ready-for-service indicator of the switchgear.

While changes in the gas density during the loss of gas, which are decisive for the insulating capacity, are displayed, changes in the gas pressure dependent on temperature and external pressure variations are not. The gas in the measurement box has the same temperature as that in the switchgear.

The temperature effect is compensated via the same pressure change in both gas volumes.

7.8 Voltage detecting systems

For voltage detection according to IEC 61243-5/VDE 0682-415 with:

- HR system (standard)
- LRM system (option)
- Integrated voltage detecting system CAPDIS-S1 +/-S2+ (option)

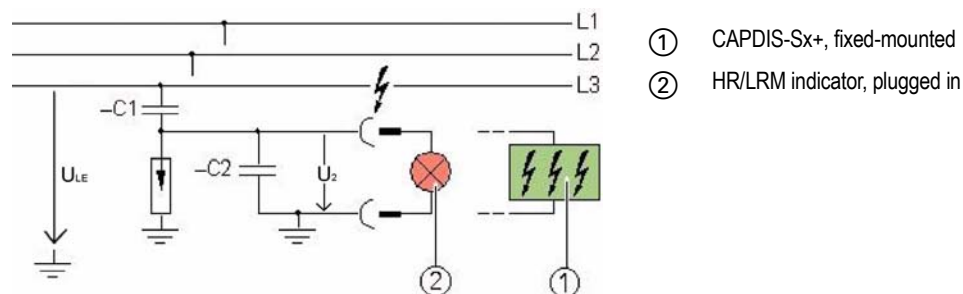
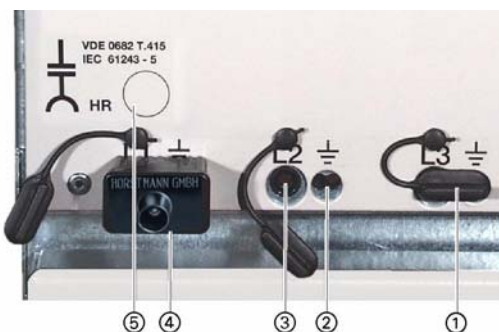


Fig. 10: Voltage detecting system via capacitive voltage divider (principle)

- -C1: Capacity integrated into bushing
- -C2: Capacity of the connection leads and of the voltage indicator to earth
- $U_{LE} = U_N / \sqrt{3}$ during rated operation in the three-phase system
- $U_2 = U_A =$ Voltage at the capacitive interface of the switchgear or at the voltage indicator

Features of HR/LRM system



- ① Cover of test sockets
- ② Earthing socket
- ③ Capacitive test socket for L2
- ④ Voltage indicator type HR, make Horstmann
- ⑤ Documentation to repeat test of interface condition

- With voltage indicator
 - HR system (standard) or
 - LRM system (option)
- Verification of safe isolation from supply phase by phase through insertion in each socket pair
- Voltage indicator flashes if high voltage is present
- Indicator suitable for continuous operation
- Safe-to-touch
- Measuring system and voltage indicator can be tested

Description

Features of CAPDIS -S1+/- S2+

- Maintenance free
- Integrated repeat test of the interfaces (self-monitoring)
- Without auxiliary power
- Option: CAPDIS S2+ with remote indication of voltage state (auxiliary power required)
- With test sockets (LRM system) for phase comparison behind the cover



Fig. 11: CAPDIS-S2+: Cover closed
















Fig. 12: CAPDIS-S2+: Cover open

- ① LC display
- ② Button "Display Test"
- ③ Cover
- ④ Test socket L1

- ⑤ Test socket L2
- ⑥ Test socket L3
- ⑦ Earthing socket
- ⑧ Short instruction

Display of CAPDIS -S1+/-
S2+

CAPDIS-S1+				CAPDIS-S2+		
L1	L2	L3		L1	L2	L3
			Operating voltage not present (CAPDIS-S2+)			
			Operating voltage present			
			- Operating voltage not present - Auxiliary power not present (CAPDIS-S2+)			
			Earth fault or failure in phase L1, operating voltage at L2 and L3			
			Voltage (not operating voltage) present			
			Indication "Device-Function-Test" passed			
			Indication "ERROR", e.g. in case of missing auxiliary voltage (CAPDIS-S2+)			

7.9 Short-circuit/earth-fault indicators

All ring-main feeders can **optionally** be equipped with a 3-phase short-circuit or earth-fault indicator.

- Features**
- Indication at the switchgear front
 - Factory-assembled including sensor mounted on ring-main cable bushing
 - Short-circuit pickup values: see table
 - Optical signals when a pre-selected pickup value is exceeded
 - Option: remote electrical indication via passing contact (changeover contact), connected to terminals (rear side of device).

Selection of short-circuit/earth-fault indicators

Make Horstmann ¹⁾



Fig. 13: Alpha E indicator

Indicator type	Reset	Short-circuit current ²⁾ [A]	Earth-fault current ³⁾ [A]
ALPHA M	manually	400, 600, 800, 1000	–
ALPHA E	manually/automatically after 2 or 4 h	400, 600, 800, 1000	–
GAMMA 4.0 ³⁾	manually/after return of power supply/after 2 or 4 h	400, 600, 800, 1000	–
ALPHA automatic	manually (by pushbutton), remote reset (by auxiliary voltage), automatically after 3 h	Change of current DI= 150 A – 300 A (depending on the load current) at t=20 ms	–
Earth-fault/short-circuit indicator			
EKA - 3 ³⁾	after return of power supply	450	40, 80, 160
DELTA M	manually	400, 600, 800, 1000	200
DELTA E	manually, automatically after 2 or 4 h	400, 600, 800, 1000	200
Earth-fault indicator			
EKA - 3/1 ³⁾	after return of power supply	–	40, 80, 160

¹⁾ Further types and other makes available on request.

²⁾ Standard values. Other values on request.

³⁾ External auxiliary voltage AC 240 V required.

7.10 Accessories

Standard accessories

- Operating lever for the three-position switch

Other accessories According to order documents/purchase order (selection):

- HV HRC fuse-links
- Cable plugs / adapter systems
- Surge arresters
- Test fuses for mechanical simulation of the striker of HV HRC fuse-links in transformer feeders



Fig. 14: Test fuse with extension tube

- HR/LRM voltage indicators
- Test units to check the capacitive interface and the voltage indicators (e.g. make Horstmann).

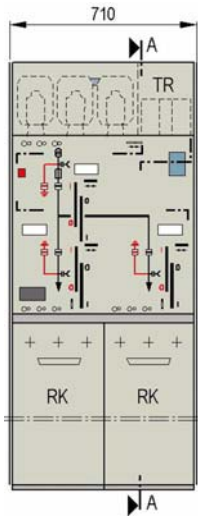


- Phase comparison test units (e.g. make Pfisterer, type EPV)

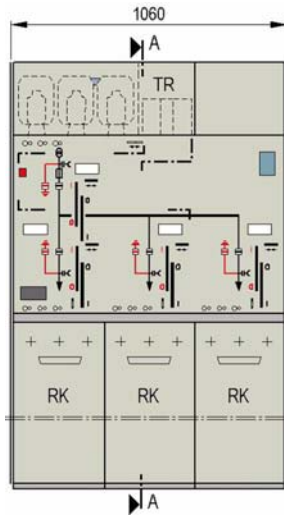


8 Technical data

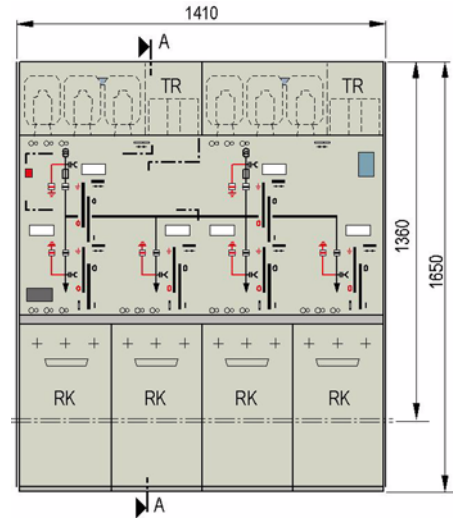
8.1 Switchgear versions (examples): Dimensions and weights



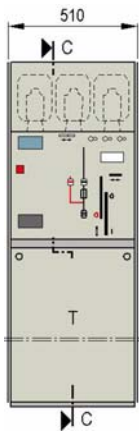
8DJ10: Scheme 10 (2 RK + 1 TR)



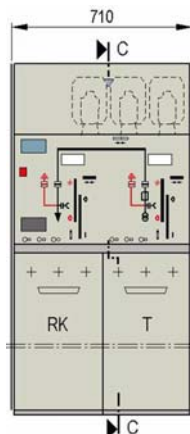
8DJ10: Scheme 71 (3 RK + 1 TR)



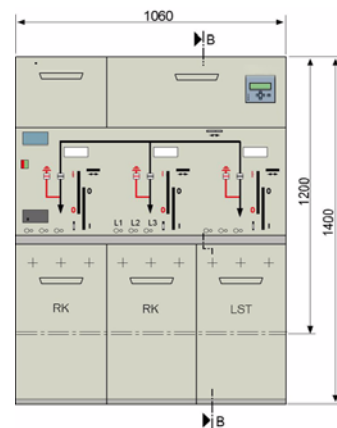
8DJ10: Scheme 62 (4 RK + 2 TR)



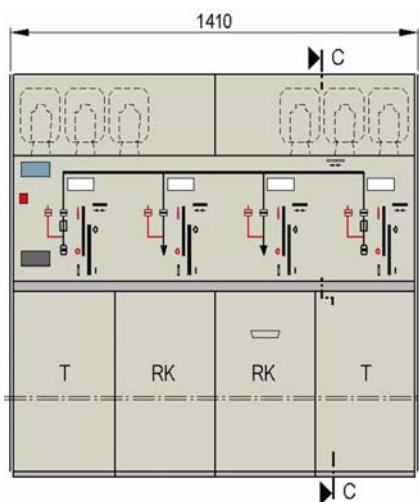
8DJ20: Scheme 01 (1 TR)



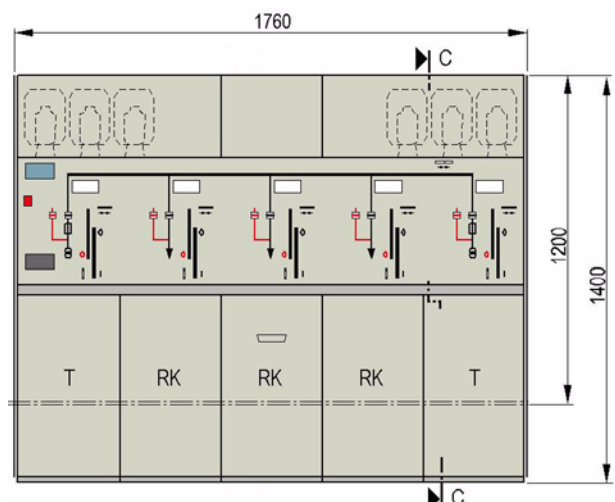
8DJ20: Scheme 20 (1 RK + 1 TR)



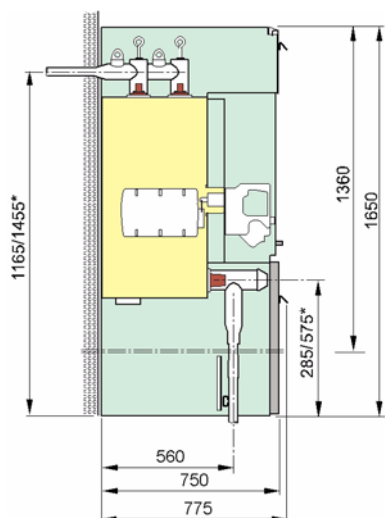
8DJ20: Scheme 10 LST (2 RK + 1 LST)



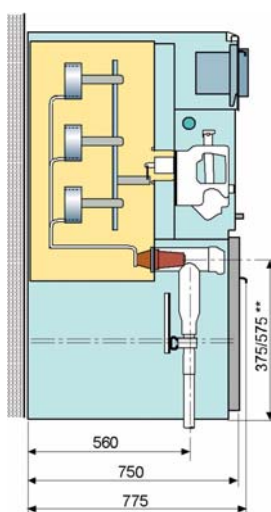
8DJ20: Scheme 81 (2 RK + 2 TR)



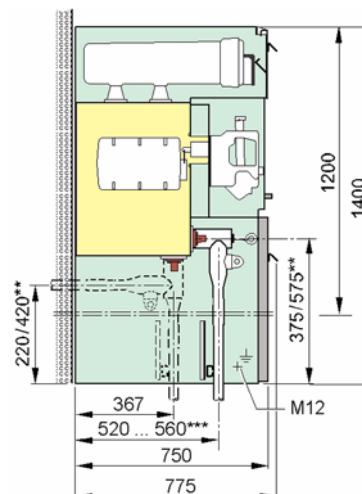
8DJ20: Scheme 82 (3 RK + 2 TR)



8DJ10: Section A-A



8DJ20: Section B-B



8DJ20: Section C-C

* Dimensions depending on switchgear height 1360 mm and 1650 mm

** Dimensions depending on switchgear height 1200 mm and 1400 mm

*** Dimensions depending on bushing size

Overview: Dimensions and weights												
Switchgear type	Scheme (Function)	Switchgear dimensions [mm]			National packing [mm]				Export packing [mm]			
		Width	Height	Depth	Width approx	Height approx.	Depth approx.	Weight [kg]	Width approx.	Height approx.	Depth approx.	Weight [kg]
8DJ10	10 (2RK+1TR)	710	1360/1650	775	1100	1560/1850	1100	300/330	1100	2000	1150	350/380
	71 (3RK+1TR)	1060	1360/1650	775	1400	1560/1850	1100	380/430	1450	2000	1150	460/510
	62 (4RK+2TR)	1410	1360/1650	775	1780	1560/1850	1100	580/660	1800	2000	1150	680/760
8DJ20	01 (1TR)	510	1200/1400/1760	775	1100	1400/1600/1960	1100	170/180/210	1100	2000	1150	230/250/270
	02 (1RK)	710	1200/1400/1760	775	1100	1400/1600/1960	1100	210/230/260	1100	2000	1150	270/290/320
	10 (2RK+1TR)	1060	1200/1400/1760	775	1450	1400/1600/1960	1100	370/400/440	1450	2000	1150	450/470/510
	10 (2RK+1LST)	1060	1200/1400/1760	775	1450	1400/1600/1960	1100	400/420/460	1450	2000	1150	480/500/540
	11 (2RK)	710	1200/1400/1760	775	1100	1400/1600/1960	1100	210/230/260	1100	2000	1150	280/290/320
	20 (1RK+1TR)	710	1200/1400/1760	775	1100	1400/1600/1960	1100	260/280/310	1100	2000	1150	320/340/370
	20 (1RK+1LST)	710	1200/1400/1760	775	1100	1400/1600/1960	1100	330/350/390	1100	2000	1150	370/390/420
	21 (K(E)+1TR)	710	1200/1400/1760	775	1100	1400/1600/1960	1100	260/280/310	1100	2000	1150	310/340/370
	21 (K(E)+1LST)	710	1200/1400/1760	775	1100	1400/1600/1960	1100	330/350/390	1100	2000	1150	370/390/420
	32 (3RK)	1060	1200/1400/1760	775	1450	1400/1600/1960	1100	300/330/370	1450	2000	1150	380/400/440
	70 (4RK)	1410	1200/1400/1760	775	1800	1400/1600/1960	1100	380/420/470	1800	2000	1150	470/500/550
	71 (3RK+1TR)	1410	1200/1400/1760	775	1800	1400/1600/1960	1100	440/480/530	1800	2000	1150	530/560/610
	71 (3RK+1LST)	1410	1200/1400/1760	775	1800	1400/1600/1960	1100	470/490/540	1800	2000	1150	580/610/660
	72 (4RK+1TR)	1760	1200/1400/1760	775	2050	1400/1600/1960	1100	510/560/620	2050	2000	1150	640/670/730
	81 (2RK+2TR)	1410	1200/1400/1760	775	1800	1400/1600/1960	1100	500/540/590	1800	2000	1150	610/640/690
82 (3RK+2TR)	1760	1200/1400/1760	775	2050	1400/1600/1960	1100	570/620/680	2050	2000	1150	700/730/790	
84 (5RK)	1760	1200/1400/1760	775	2050	1400/1600/1960	1100	450/500/560	2050	2000	1150	580/610/670	

RK = Ring-main feeder TR = Transformer feeder K(E) = Cable feeder for radial connection with make-proof earthing switch LST = Circuit-breaker feeder

8.2 Electrical data for 8DJ10/8DJ20

Electrical data The technical data of the switchgear supplied is shown on the rating plate.

Rated								
voltage		U_r	kV	7.2	12	15	17.5	24
insulation level	Rated short-duration power-frequency withstand voltage	U_d	kV	20	28/42*	36	38	50
	Rated lightning impulse withstand voltage	U_p	kV	60	75/95*	95	95	125
frequency		f_r	Hz	50/60	50/60	50/60	50/60	50/60
normal current for	ring-main feeders	I_r	A	400/630	400/630	400/630	400/630	400/630
	transformer feeders	I_r^{**}	A	200	200	200	200	200
short-time withstand current	for switchgear with $t_k = 1$ s	I_k	up to kA	25	25	25	25	20
	for switchgear with $t_k = 3$ s	I_k	up to kA	20	20	20	20	20
peak withstand current		I_p	up to kA	63	63	63	63	50
	transformer feeders	I_D^{***}	up to kA	25	25	25	25	25

* 42kV/95kV according to some national requirements

** Depending on fuse type used

*** Maximum let-through current of fuse

8.3 Standards and guidelines

The medium-voltage switchgear types 8DJ10/8DJ20 comply with the following prescriptions and standards:

		IEC/EN standard	VDE standard
Switchgear		62 271-1	0670-1
		62271-200	0671-200
Switching devices	Circuit-breakers	62271-100	0671-100
	Disconnectors/earthing switches	62271-102	0671-102
	Switch-disconnectors	60265-1	0670-301
	Switch-disconnector/fuse combination	62271-105	0671-105
Voltage detecting systems		61243-5	0682-415
Surge arresters		60099	0675
Degree of protection		60529	0470-1
Instrument transformers	Current transformers	60044-1	0414-1
	Voltage transformers	60044-2	0414-2
SF₆		60376	0373-1
		60480	0373-2
Installation and earthing		61 936-1 / HD 637 -S1	0101
Environmental conditions		60721-3-3	DIN EN 60721-3-3

Electromagnetic compatibility - EMC

The a.m. standards as well as the "EMC Guideline for Switchgear"* are applied during design, manufacture and erection of the switchgear. Installation, connection and maintenance have to be performed in accordance with the stipulations of the operating instructions. For operation, the legal stipulations applicable at the place of installation have to be observed additionally. In this way, the switchgear assemblies of this type series fulfill the basic protection requirements of the EMC guideline.

The switchgear operator / owner must keep the technical documents supplied with the switchgear throughout the entire service life, and keep them up-to-date in case of modifications of the switchgear.

* (Dr. Bernd Jäkel, Ansgar Müller; Medium-Voltage Systems - EMC Guideline for Switchgear; A&D ATS SR/PTD M SP)

Protection against solid foreign objects, electric shock and water

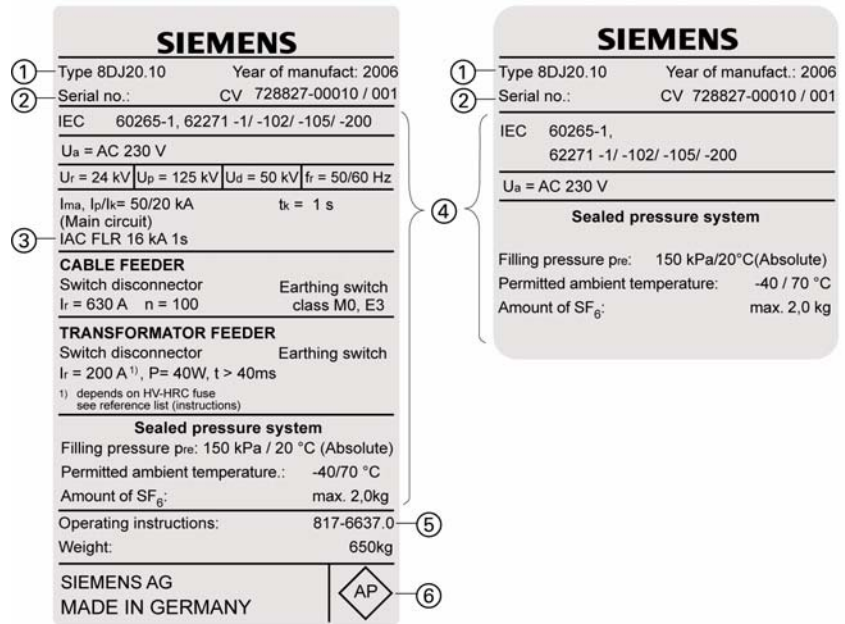
The medium-voltage switchgear fulfils the following degrees of protection according to IEC 62271-1, IEC 62271-200 and IEC 60529:

Degree of protection	Type of protection
IP 2X (standard)	Parts under high voltage in switchgear with HV HRC fuses
IP3X (option)	Enclosure of parts under high voltage in switchgear with locking device
IP3XD (on request)	Parts under high voltage in switchgear with locking device
IP65	Parts under high voltage in switchgear without HV HRC fuses

Transport regulations

According to "Annex 1 of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) dated September 30th, 1957" Siemens gas insulated medium-voltage switchgear does not belong to the category of dangerous goods regarding transportation, and is exempted from special transport regulations according to ADR, Clause 1.1.3.1 b.

8.4 Rating plates



Rating plate on the front (example)

Rating plate inside the operating mechanism box (example)

- | | |
|---|---|
| ① Switchgear type and year of manufacture | ④ Technical data |
| ② Serial number | ⑤ Number of operating instructions |
| ③ Internal arc classification (option) | ⑥ Test mark for the performed acceptance test (German: Abnahme-Prüfung) (pressure test) of the vessel |

IAC classification The data (see item ③) describes the internal arc classification (option) of the panel according to IEC 62271-200. The entries **IAC A FLR 16 kA 1 s** in the example shown mean:

- **IAC:** Internal Arc Classification
- **A:** Type of accessibility A; for authorized personnel only; switchgear in closed electrical service location; access for expert personnel only.
- **F:** Internal arc classification for the front side (Front)
- **L:** Internal arc classification for the lateral sides (Lateral)
- **16 kA:** Tested short-circuit current
- **1 s:** Test duration

The IAC classification (option) is referred to each panel. The data on the rating plate (see item ③) describes the areas classified for the corresponding panel.

8.5 Three-position switch-disconnector

Switching capacity for general-purpose switches (class E3) according to IEC 60265-1					7.2	12	15	17.5	24
Test duty 1	Rated mainly active load breaking current	100 operations	I_1	A	630	630	630	630	630
	Rated mainly active load breaking current	20 operations	I_1	A	31.5	31.5	31.5	31.5	31.5
Test duty 2a	Rated closed-loop breaking current	20 operations	I_{2a}	A	630	630	630	630	630
Test duty 3	Rated transformer breaking current	20 operations	I_3	A	40	40	40	40	40
Test duty 4a	Rated cable-charging breaking current	10 operations	I_{4a}	A	68	68	68	68	68
	Rated cable-charging breaking current	10 operations	$(0.2...0.4)I_{4a}$	A	15	15	15	15	15
Test duty 4b	Rated line-charging breaking current	10 operations	I_{4b}	A	68	68	68	68	68
Test duty 5	Rated short-circuit making current	5 operations	I_{ma}	up to kA	63	63	63	63	50
Test duty 6a	Rated earth-fault breaking current	10 operations	I_{6a}	A	60	60	60	60	60
Test duty 6b	Rated cable-charging breaking current and line-charging breaking current under earth-fault conditions	10 operations	I_{6b}	A	35	35	35	35	35
–	Cable-charging breaking current under earth-fault conditions with superimposed load current	10 operations	I_1+I_{6b}	A	630+50	630+50	630+50	630+50	630+50
Switching capacity according to IEC 62271-105									
Rated transfer current			$I_{transfer}$	A	1150	1150	830	830	830
Rated take-over current			I_{to}	A	1150	1150	830	830	830
Make-proof earthing switch according to IEC 62271-102									
Rated short-circuit making current			I_{ma}	up to kA	63	63	63	63	50
Operating voltages for motor operating mechanisms:					Auxiliary and control voltages U_d:				
DC 24, 48, 60, 110, 220 V					24 to 220 V DC or				
AC 50/60 Hz, 110 and 230 V					110 to 230 V AC (50/60 Hz)				

Endurance classes and number of operating cycles

Function	Class	Standard	Property
DISCONNECTING	M0	IEC 62271-102	1000 times mechanically without maintenance
LOAD BREAKING	M1	IEC 60265-1	1000 times mechanically without maintenance
	E3	IEC 60265-1	100 times rated mainly active load breaking current I_1 1) without maintenance 5 times rated short-circuit making current I_{ma} without maintenance
EARTHING	E2	IEC 62271-102	5 times rated short-circuit making current I_{ma} without maintenance

1) In addition to I_1 , class E3 covers the test currents I_{2a} , I_{4a} , I_{4b} , I_{6a} and I_{6b}

8.6 Three-position disconnecting circuit-breaker

Electrical data

Rated													
voltage		U_r	kV	7.2		12		15		17.5		24	
short-duration power-frequency withstand voltage		U_d	kV	20		28 / 42 *		36		38		50	
lightning impulse withstand voltage		U_p	kV	60		75 / 95 *		95		95		125	
frequency		f_r	Hz	50		50		50		50		50	
normal current		I_r	A	250/630									
short-time withstand current	at $t_k=1$ s	I_k	up to kA	16	20	16	20	16	-	16	-	16	-
	at $t_k=3$ s	I_k	up to kA	-	20	-	20	16	-	16	-	16	-
peak withstand current		I_p	up to kA	40	50	40	50	40	-	40	-	40	-
short-circuit making current		I_{ma}	kA	40	50	40	50	40	-	40	-	40	-
short-circuit breaking current		I_{SC}	kA	16	20	16	20	16	-	16	-	16	-
cable-charging breaking current		I_C	A	63									

* 42kV/95 kV according to some national requirements

Endurance classes and numbers of operating cycles

Electrical number of operating cycles "n" for circuit-breaker at:	Rated voltage U_r	kV	7.2		12		15		17.5		24	
	Rated normal current I_r	n	2000		2000		2000		2000		2000	
	Rated short-circuit making current I_{ma}	n	4	4	4	4	4	-	4	-	4	-
	Rated short-circuit breaking current I_{SC}	n	6	6	6	6	6	-	6	-	6	-
	Optional Class	n	20	-	20	-	20	-	17.5	-	20	-
Class		E2 (IEC 62271-100)										
Mechanical number of operating cycles "n" for circuit-breaker		n	2000									
	Class	M1 (IEC 62271-100)										
Mechanical number of operating cycles "n" for disconnecting function		n	2000									
	Class	M1 (IEC 62271-102)										
Electrical number of operating cycles "n" for earthing switch at rated short-circuit making current I_{ma}		n	5									
	Class	E2 (IEC 62271-102)										
Mechanical number of operating cycles "n" for make-proof earthing switch		n	1000									
	Class	M0 (IEC 62271-102)										
Classification "C" for circuit-breaker: Low probability of strikes for capacitive currents	Class	C1 (IEC 62271-100)										

Rated operating sequence Rated operating sequence according to IEC 62271-100 (T 100 s):

O - t - CO - t' - CO, t=t'=3 min

8.7 Selection of HV HRC fuse links

Allocation of HV HRC fuses and transformers

The three-position switch-disconnector in the transformer feeder (transformer switch) was combined with HV HRC fuse-links and tested in accordance with IEC 62 271-105.

The transformer protection table below shows HV HRC fuse-links recommended for transformer protection. Furthermore, the switchgear also permits fuse protection of transformers up to ratings of 2000 kVA. Please contact us for such applications.

The **protection table** applies to:

- Maximum ambient air temperature in the switchgear room of 40°C according to IEC 62 271-1 considering the influence of the switchgear enclosure
- Requirements according to IEC 62271-105
- Protection of distribution transformers according to IEC 60787
- Rated power of transformer (no overload operation)

The specified HV HRC fuses make SIBA are type-tested partial range fuses according to IEC 60 282-1. The dimensions correspond to DIN 43625. The HV HRC fuses have a thermal protection in form of a temperature-limiting striker tripping operating in case of defective HV HRC fuse-links or high overload currents.

Please contact us if you want to use HV HRC fuses from other manufacturers.

Basis for selection of HV HRC fuse-links:

- IEC 60282-1
- IEC 62271-105
- IEC 60787
- Recommendations and data sheets of fuse manufacturers
- Permissible power loss in the switchgear enclosure at an ambient air temperature of 40° C

Transformer protection table: Recommendation for allocation of HV HRC fuse-links make SIBA and transformers

Transformer				HV HRC fuse			
U [kV]	S _N [kVA]	u _k [%]	I ₁ [A]	I _S [A]	U _S [V]	e [mm]	Order No.
6 - 7,2	50	4	4,8	10	3 - 7,2	292	30 098 13.10
				10	6 - 12	292	30 004 13.10
				10	6 - 12	442	30 101 13.10
	75	4	7,2	16	3 - 7,2	292	30 098 13.16
				16	6 - 12	292	30 004 13.16
				16	6 - 12	442	30 101 13.16
	100	4	9,6	16	3 - 7,2	292	30 098 13.16
				16	6 - 12	292	30 004 13.16
				16	6 - 12	442	30 101 13.16
				20	3 - 7,2	292	30 098 13.20
	125	4	12	20	3 - 7,2	292	30 098 13.20
				20	6 - 12	292	30 004 13.20
				20	6 - 12	442	30 101 13.20
				25	3 - 7,2	292	30 098 13.25
	160	4	15,4	31,5	3 - 7,2	292	30 098 13.31,5
				31,5	6 - 12	292	30 004 13.31,5
				31,5	6 - 12	442	30 101 13.31,5
				31,5	6 - 12	442	30 101 13.31,5
	200	4	19,2	31,5	3 - 7,2	292	30 098 13.31,5
				31,5	6 - 12	292	30 004 13.31,5
				31,5	6 - 12	442	30 101 13.31,5
				40	3 - 7,2	292	30 098 13.40
	250	4	24	40	3 - 7,2	292	30 098 13.40
				40	6 - 12	292	30 004 13.40
				40	6 - 12	442	30 101 13.40
				50	3 - 7,2	292	30 098 13.50
	315	4	30,3	50	3 - 7,2	292	30 098 13.50
				50	6 - 12	292	30 004 13.50
50				6 - 12	442	30 101 13.50	
63				6 - 12	292	30 012 43.63	
400	4	38,4	63	6 - 12	292	30 012 43.63	
			80	6 - 12	292	30 012 43.80	
			80	6 - 12	442	30 102 43.80	
			63	3 - 7,2	292	30 099 13.63	
			63	6 - 12	292	30 012 13.63	
				63	6 - 12	442	30 102 13.63

Transformer				HV HRC fuse							
U [kV]	S _N [kVA]	u _k [%]	I ₁ [A]	I _S [A]	U _S [V]	e [mm]	Order No.				
6 - 7,2	500	4	48	80	6 - 12	292	30 012 43.80				
				80	6 - 12	442	30 102 43.80				
				80	3 - 7,2	292	30 099 13.80				
				80	6 - 12	292	30 012 13.80				
				80	6 - 12	442	30 102 13.80				
				100	6 - 12	292	30 012 43.100				
				100	6 - 12	442	30 102 43.100				
				630	4	61	100	6 - 12	442	30 102 43.100	
				10 - 12	50	4	2,9	10	6 - 12	292	30 004 13.10
								10	6 - 12	442	30 101 13.10
								10	10 - 17,5	292	30 255 13.10
10	10 - 17,5	442	30 231 13.10								
10	10 - 24	442	30 006 13.10								
75	4	4,3	10		6 - 12	292	30 004 13.10				
			10		6 - 12	442	30 101 13.10				
			10		10 - 17,5	292	30 255 13.10				
			10		10 - 17,5	442	30 231 13.10				
			10		10 - 24	442	30 006 13.10				
100	4	5,8	16	6 - 12	292	30 004 13.16					
			16	6 - 12	442	30 101 13.16					
			16	10 - 17,5	292	30 255 13.16					
			16	10 - 17,5	442	30 231 13.16					
125	4	7,2	16	6 - 12	292	30 004 13.16					
			16	6 - 12	442	30 101 13.16					
			16	10 - 17,5	292	30 255 13.16					
			16	10 - 17,5	442	30 231 13.16					
160	4	9,3	20	6 - 12	292	30 004 13.20					
			20	6 - 12	442	30 101 13.20					
			20	10 - 17,5	292	30 221 13.20					
			20	10 - 17,5	442	30 231 13.20					
200	4	11,5	25	6 - 12	292	30 004 13.25					
			25	6 - 12	442	30 101 13.25					
			25	10 - 17,5	292	30 221 13.25					
			25	10 - 17,5	442	30 231 13.25					
				25	10 - 24	442	30 006 13.25				


Transformer				HV HRC fuse						
U [kV]	S _N [kVA]	u _K [%]	I ₁ [A]	I _S [A]	U _S [V]	e [mm]	Order No.			
10 - 12	250	4	14,5	25	6 - 12	292	30 004 13.25			
				25	6 - 12	442	30 101 13.25			
				25	10 - 17,5	292	30 221 13.25			
				25	10 - 17,5	442	30 231 13.25			
				25	10 - 24	442	30 006 13.25			
				31,5	6 - 12	292	30 004 13.31,5			
				31,5	6 - 12	442	30 101 13.31,5			
				31,5	10 - 17,5	292	30 221 13.31,5			
				31,5	10 - 17,5	442	30 231 13.31,5			
				31,5	10 - 24	442	30 006 13.31,5			
				315	4	18,3	31,5	6 - 12	292	30 004 13.31,5
							31,5	6 - 12	442	30 101 13.31,5
31,5	10 - 17,5	292	30 221 13.31,5							
31,5	10 - 17,5	442	30 231 13.31,5							
31,5	10 - 24	442	30 006 13.31,5							
40	6 - 12	292	30 004 13.40							
40	6 - 12	442	30 101 13.40							
40	10 - 17,5	292	30 221 13.40							
40	10 - 17,5	442	30 231 13.40							
40	10 - 24	442	30 006 13.40							
400	4	23,1	40				6 - 12	292	30 004 13.40	
			40				6 - 12	442	30 101 13.40	
			40	10 - 17,5	292	30 221 13.40				
			40	10 - 17,5	442	30 231 13.40				
			40	10 - 24	442	30 006 13.40				
500	4	29	50	6 - 12	292	30 004 13.50				
			50	6 - 12	442	30 101 13.50				
			50	10 - 17,5	292	30 221 13.50				
			50	10 - 17,5	442	30 232 13.50				
			50	10 - 24	442	30 014 13.50				
			63	6 - 12	292	30 012 43.63				
			63	10 - 24	442	30 014 43.63				
630	4	36,4	63	6 - 12	292	30 012 43.63				
			80	10 - 24	442	30 014 43.80				
			63	6 - 12	292	30 012 13.63				
			63	6 - 12	442	30 102 13.63				
			63	10 - 17,5	442	30 232 13.63				
			80	6 - 12	292	30 012 43.80				
			80	6 - 12	442	30 102 43.80				
800	5 - 6	46,2	80	6 - 12	292	30 012 43.80				
			80	6 - 12	442	30 102 43.80				
1000	5 - 6	58	100	6 - 12	442	30 102 43.100				

Transformer				HV HRC fuse							
U [kV]	S _N [kVA]	u _K [%]	I ₁ [A]	I _S [A]	U _S [V]	e [mm]	Order No.				
13,8	50	4	2,1	6,3	10 - 17,5	442	30 231 13.6,3				
				6,3	10 - 24	442	30 006 13.6,3				
				75	4	3,2	6,3	10 - 17,5	442	30 231 13.6,3	
				100	4	4,2	10	10 - 17,5	442	30 231 13.10	
				125	4	5,3	10	10 - 17,5	442	30 231 13.10	
				160	4	6,7	16	10 - 17,5	442	30 231 13.16	
				200	4	8,4	16	10 - 17,5	442	30 231 13.16	
				250	4	10,5	20	10 - 17,5	442	30 231 13.20	
				315	4	13,2	25	10 - 17,5	442	30 231 13.25	
				400	4	16,8	31,5	10 - 17,5	442	30 231 13.31,5	
							31,5	10 - 24	442	30 006 13.31,5	
				500	4	21	40	10 - 17,5	442	30 231 13.40	
							40	10 - 24	442	30 006 13.40	
				630	4	26,4	50	10 - 17,5	442	30 232 13.50	
							50	10 - 24	442	30 014 13.50	
				800	5 - 6	33,5	63	10 - 24	442	30 014 43.63	
				1000	5 - 6	41,9	80	10 - 24	442	30 014 43.80	
				15 - 17,5	50	4	1,9	6,3	10 - 17,5	442	30 231 13.6,3
								6,3	10 - 24	442	30 006 13.6,3
								75	4	2,9	6,3
100	4	3,9	10					10 - 17,5	442	30 231 13.10	
125 ¹⁾	4	4,8	16					10 - 17,5	442	30 231 13.16	
			16					10 - 24	442	30 006 13.16	
160	4	6,2	16					10 - 17,5	442	30 231 13.16	
200 ¹⁾	4	7,7	20					10 - 17,5	442	30 231 13.20	
			20					10 - 24	442	30 006 13.20	
250 ¹⁾	4	9,7	25					10 - 17,5	442	30 231 13.25	
			25					10 - 24	442	30 006 13.25	
315 ¹⁾	4	12,2	31,5					10 - 17,5	442	30 231 13.31,5	
			31,5					10 - 24	442	30 006 13.31,5	
400	4	15,5	31,5	10 - 17,5	442	30 231 13.31,5					
			31,5	10 - 24	442	30 006 13.31,5					
500	4	19,3	31,5	10 - 17,5	442	30 231 13.31,5					
			31,5	10 - 24	442	30 006 13.31,5					
630	4	24,3	40	10 - 17,5	442	30 231 13.40					
			40	10 - 24	442	30 006 13.40					
800 ¹⁾	5 - 6	30,9	63	10 - 24	442	30 014 43.63					
1000 ¹⁾	5 - 6	38,5	80	10 - 24	442	30 014 43.80					
1250 ¹⁾	5 - 6	48,2	100	10 - 24	442	30 022 43.100					

Transformer				HV HRC fuse			
U [kV]	S _N [kVA]	u _K [%]	I ₁ [A]	I _S [A]	U _S [V]	e [mm]	Order No.
20 - 24	50	4	1,5	6,3	10 - 24	442	30 006 13.6,3
	75	4	2,2	6,3	10 - 24	442	30 006 13.6,3
	100	4	2,9	6,3	10 - 24	442	30 006 13.6,3
	125	4	3,6	10	10 - 24	442	30 006 13.10
	160	4	4,7	10	10 - 24	442	30 006 13.10
	200	4	5,8	16	10 - 24	442	30 006 13.16
	250	4	7,3	16	10 - 24	442	30 006 13.16
					20	10 - 24	442
	400	4	11,6	20	10 - 24	442	30 006 13.20
					25	10 - 24	442
	500	4	14,5	25	10 - 24	442	30 006 13.25
					31,5	10 - 24	442
	630	4	18,2	31,5	10 - 24	442	30 006 13.31,5
					40	10 - 24	442

Transformer				HV HRC fuse				
U [kV]	S _N [kVA]	u _K [%]	I ₁ [A]	I _S [A]	U _S [V]	e [mm]	Order No.	
20 - 24	800	5 - 6	23,1	31,5	10 - 24	442	30 006 13.31,5	
	1000	5 - 6	29	50	10 - 24	442	30 014 13.50	
	1250	5 - 6	36	50	10 - 24	442	30 014 13.50	
	1600 ¹⁾	5 - 6	46,5	100	10 - 24	442	30 022 43.100	
	2000	5 - 6	57,8					on request
U	Rated system voltage							
S _N	Rated power							
u _K	Relative impedance voltage							
I ₁	Rated current							
I _S	Rated current of fuse							
U _S	Rated voltage of fuse							
e	Reference dimension							

1) Mechanical time delay required (for switchgear ordered with 17.5 kV, this time delay is installed automatically)

	NOTE!
	<ul style="list-style-type: none"> - For switchgear with rated voltages up to 12 kV, a fuse slide for HV HRC fuse-links with dimension 292 mm is normally provided. - 7.2 kV fuse-links with dimension 192 mm as well as 24 kV fuse-links with dimension 292 mm are not permissible.

9 Switchgear maintenance

Maintenance Medium-voltage secondary distribution 8DJ10/8DJ20 switchgear is maintenance-free. Inspection/testing of secondary equipment such as voltage detecting systems is done within the scope of customer specifications.


Replacement of components Due to the fact that all parts of this switchgear have been optimized to last the normal service life, it is not possible to recommend particular spare parts.

Information required for spare part orders of single components and devices:

- Type and serial number of the switchgear (see rating plates)
- Description/identification of the device or component on the basis of a sketch/photo or a circuit diagram.

10 End of service life

SF₆ gas

	<p>NOTE!</p> <p>The equipment contains the fluorized greenhouse gas SF₆ registered by the Kyoto Protocol with a global warming potential (GWP) of 22 200. SF₆ has to be reclaimed and must not be released into the atmosphere.</p> <p>⇒ For use and handling of SF₆, IEC 62271-303 has to be observed: High-voltage switchgear and controlgear - Part 303 Use and handling of sulphur hexafluoride (SF₆) zu beachten.</p>
---	---

Before recycling the materials, evacuate the gas professionally and prepare it for further use.

Recycling The switchgear is an environmentally compatible product.

The components of the switchgear can be recycled in an environmentally compatible way by dismantling into sorted scrap and residual mixed scrap.

After evacuating the SF₆ gas, the switchgear mainly consists of the following materials:

- Sheet-steel, galvanized (enclosure and operating mechanisms)
- Stainless steel (vessel)
- Copper (conductor bars)
- Silver (contacts)
- Cast-resin based on epoxy resin (bushings and fuse boxes)
- Plastic material (arcing chamber and fuse slide)
- Silicone rubber

The switchgear can be recycled in ecological manner in compliance with existing legislation.

Auxiliary devices such as short-circuit indicators have to be recycled as electronic scrap.

Batteries have to be recycled professionally.

As delivered by Siemens, the switchgear does not contain hazardous materials as per the Hazardous Material Regulations applicable in the Federal Republic of Germany. For operation in other countries, the locally applicable regulations must be followed.

For further information please contact your regional Siemens representative.

Installation

11 Before installation

11.1 Packing

The transport units can be packed as follows:

- On pallets, covered with PE protective foil
- In seaworthy crates (the switchgear is sealed in PE protective foil containing desiccant bags)
- Other packing types in special cases (e.g. latticed crate, cardboard box for airfreight)

11.2 Completeness and transport damage


Checking for completeness


- ⇒ Check whether the delivery is complete and correct using the delivery notes and packing lists.
- ⇒ Compare the serial number of the switchgear on the delivery note with that on the packing and the rating plate.
- ⇒ Check whether the accessories in the switchgear subframe are complete.


Checking for transport damage

- ⇒ Temporarily open the packing in a weatherproof place to check for hidden damages. Do not remove the PE foil until reaching the mounting position in order to keep the switchgear as clean as possible.
- ⇒ Check the switchgear for damages.
- ⇒ Check the gas density (see Page 42, "Checking the ready-for-service indicator").
- ⇒ Refit the packing as far as possible and useful.
- ⇒ Immediately determine any defects and transport damages and document them, e.g. on consignment notes.
- ⇒ As far as possible, document larger defects and transport damages photographically.
- ⇒ Repair transport damages or have them repaired.

11.3 Intermediate storage

	DANGER!
	<p>Risk of injury and damage to the stored goods if the storage space is overloaded.</p> <ul style="list-style-type: none"> ⇒ Observe the load-bearing capacity of the floor. ⇒ Do not stack the transport units. ⇒ Do not overload lighter components by stacking.

	ATTENTION!
	<p>Fire risk. The transport unit is packed in flammable materials.</p> <ul style="list-style-type: none"> ⇒ No smoking. ⇒ Keep fire extinguishers in a weatherproof place. ⇒ Mark the location of the fire extinguisher.

	ATTENTION!
	<p>Supplied desiccant bags lose their effectiveness if they are not stored in the undamaged original packings.</p> <ul style="list-style-type: none"> ⇒ Do not damage or remove packing of desiccant bags. ⇒ Do not unpack desiccant bags before use.

If the comprehensive accessories, the delivered switchgear or parts thereof have to be stored before installation, a suitable storage room or place has to be selected and prepared.

Intermediate storage of the transport units:

- In original packing as far as possible
- Switchgears with secondary equipment: Observe the permissible storage temperature from -25°C to $+70^{\circ}\text{C}$ in accordance with the installed secondary devices.
- Switchgears without secondary equipment: Observe the permissible storage temperature from -40°C to $+70^{\circ}\text{C}$.
- In a weatherproof place
- Protected against damage
- If packed in seaworthy crates, the switchgear can be stored for a maximum of 6 months (desiccant bags)
- Store transport units in such a way that they can be taken out later in the correct order for installation.

Switchgear storage in closed rooms

As a rule, the switchgear should be stored in a closed room. The storage room must have the following characteristics:


- Floor with adequate load-bearing capacity (weights as per delivery note)
- Even floor to enable stable storage.
- Well-ventilated and free of dust
- Dry and protected against humidity and vermin (e.g. insects, mice, rats)
- Check humidity in the packings every 4 weeks (condensation)
- Do not unpack small parts to avoid corrosion and loss.

Outdoor storage of switchgear packed in seaworthy crates

If the switchgear or parts thereof are delivered in seaworthy crates, these can also be stored up to 6 months in other rooms or outdoors. The storage place must have the following characteristics:

- Floor with adequate load-bearing capacity (weights as per delivery note)
- Protected against humidity (rain water, flooding, melting water from snow and ice), pollution, vermin (rats, mice, termites, etc.) and unauthorized access
- Place all crates on planks and square timber for protection against floor humidity.
- After 6 months of storage, have the desiccant agent regenerated professionally. To do this, ask for expert personnel via your regional Siemens representative.

11.4 Unloading and transport to the place of installation

	DANGER!
	<p>If incorrectly transported, the switchgear can fall down and endanger people or the transport units may be damaged.</p> <ul style="list-style-type: none"> ⇒ Make sure that the lifting and transport gear used meets the requirements as regards construction and load-bearing capacity. ⇒ Observe even weight distribution and high centre of gravity of the switchgear. ⇒ Dimensions and weight: See delivery note. ⇒ Unload the transport units in packed condition and leave packed for as long as possible. ⇒ Attach ropes far enough on the hoisting tackle so that they cannot exert any forces on the switchgear walls under load. ⇒ Tie ropes around the ends of the wooden pallets. ⇒ Do not climb onto the roof of the switchgear. ⇒ Do not damage the PE protective foil. ⇒ Move the switchgear as far as possible on the wooden pallets.

Unloading and transport in original packing

- ⇒ Transport the switchgear with crane or fork-lift truck.



Removing wooden pallets The transport units are screwed onto the wooden pallets with transport angles or directly through the switchgear subframe.

- ⇒ Remove the PE foil; remove seaworthy crate or latticed crate before, if required
- ⇒ If applicable, remove the cable compartment cover from the switchgear subframe using the interlocking lever.
- ⇒ Remove the fixing screws from the transport angle / pallet.

If the switchgear cannot be lifted directly from the wooden pallet onto its mounting position, please proceed as follows:

- ⇒ Lower the transport units at the lateral transport angles onto roller pads (reinforced rollers) or tubes.
- ⇒ Lift the switchgear at the side edges with roller crowbars and slowly lower it onto the mounting position.

Switchgear transport by means of transport lugs

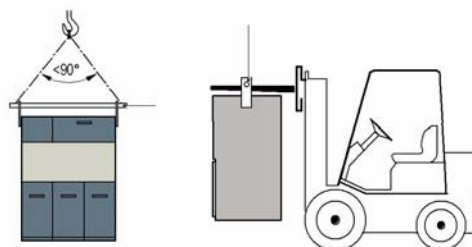


Fig. 15: Switchgear transport with crane or fork-lift truck

- ⇒ Undo fixing bolts of transport lugs.
- ⇒ Lift transport lugs and bolt tight again.
- ⇒ Hang in the hook or insert rods.
- ⇒ Transport the switchgear.
- ⇒ After reaching the final position of the switchgear, bring the lugs to their initial position again.

11.5 Checking the ready-for-service indicator

The switchgear is filled with insulating gas at a relative pressure. Before starting installation, please verify that the gas filling of the switchgear is sufficient on the ready-for-service indicator located on the left side of the control board.

⇒ Read the ready-for-service indicator.



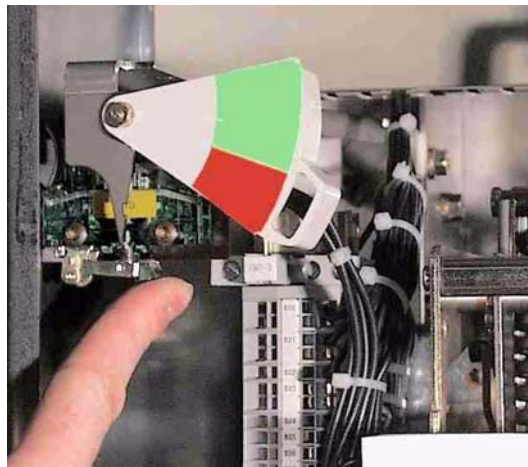
If the indicator is in the green area, the gas density is in order. If the indicator is in the red area:

⇒ Check the auxiliary switch of the ready-for-service indicator.

Ready-for-service indicator/ Checking the auxiliary switch

During transport, the auxiliary switch of the ready-for-service indicator can latch tight due to extreme vibrations. Then, the ready-for-service indicator is in the red area.

⇒ Remove the front plate of the switchgear. Push the lever of the auxiliary switch carefully towards the switch.



✓ The ready-for-service indicator must return to the green position. If not, please stop installation and contact the Siemens representative.

12 Switchgear installation

12.1 Tools/auxiliary means

- Standard tools, such as a torque wrench
- Compensation shims with a thickness of 0.5 - 1 mm for floor unevenness
- Cleaning agent (e.g. make ARAL 4005 or make HAKU 1025/90)

12.2 Floor openings and fixing points

The switchgear must be fastened to the foundation so as to guarantee sufficient pressure resistance. We recommend to fasten the switchgear using at least 4 bolts M8 for each end panel and at least 2 bolts M8 for each intermediate panel.

- ⇒ Remove the front cable compartment cover from the switchgear subframe. To do this, push the unlocking lever down and keep it in this position, then lift the cover and remove it to the front.
- ⇒ For direct fastening to the concrete, drill holes into the foundation and insert dowels.
- ⇒ Place shims in the spaces between the switchgear frame and the foundation in the area of the fastening cutouts, so that the switchgear is not distorted when it is bolted tight.
- ⇒ Bolt the switchgear onto the foundation or the foundation rails.

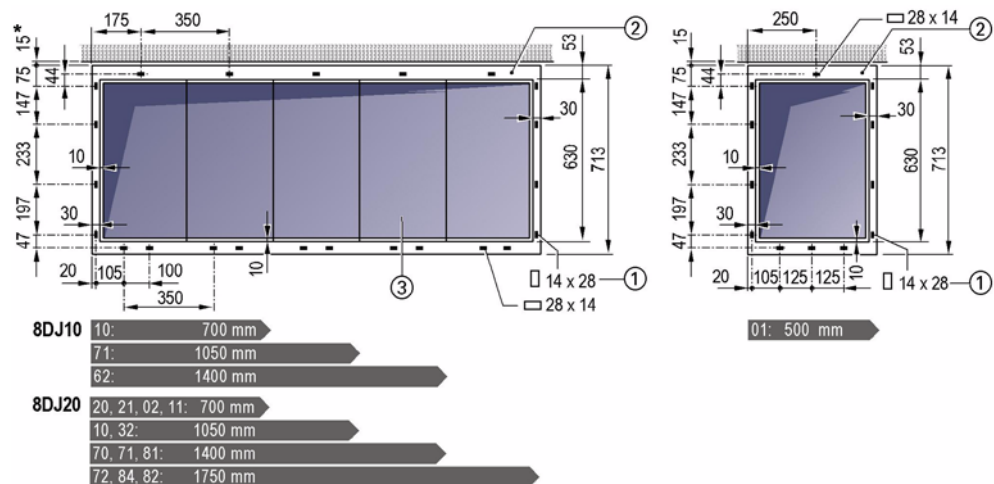


Fig. 16: Dimensions and floor openings of the different schemes

- ① Possible fixing points
- ② Fixing frame (standing surface) of the switchgear
- ③ Recommended floor opening for pressure relief to the bottom

* For switchgear type 8DJ10, scheme 62:

- Wall distance (standard): ≥ 15 mm
- Wall distance for IAC A FL according to IEC 62271-200 (option): > 50 mm

12.3 Pressure relief options

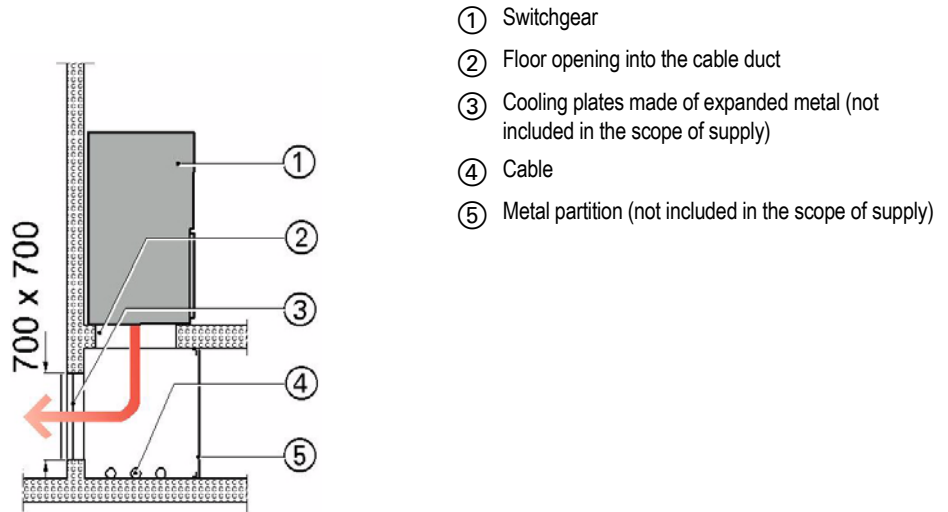


Fig. 17: Pressure relief downwards into the cable duct

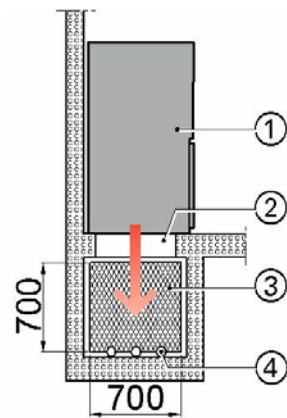


Fig. 18: Pressure relief downwards into the cable duct

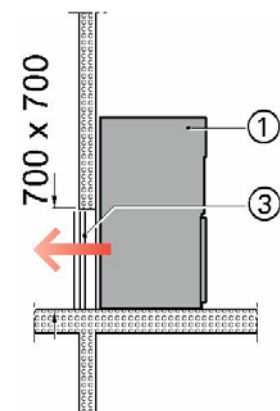


Fig. 19: Pressure relief to the rear (e. g. into the transformer room)

12.4 Switchgear earthing

- ⇒ Connect the earthing terminal (M12 bolt) to the station earth.



12.5 Installation of cable brackets for switchgear with low subframe

To install a cable bracket (accessories), the side walls are extended by means of mounting plates. Some parts will reach into the cable duct.


- ⇒ Remove the front cable compartment cover from the switchgear subframe. To do this, push the interlocking lever down and keep it in this position, then lift the cover and remove it to the front.
- ⇒ If necessary, detach cross members to simplify installation.
- ⇒ Install mounting plates and cable brackets.





13 Electrical connections

13.1 Connecting high-voltage cables

For common features and suitable cable sets (see Page 18, "Cable connection").

	ATTENTION!
	<p>The high-quality joints at the bushings can easily be damaged by incorrect handling.</p> <ul style="list-style-type: none">⇒ Observe extreme cleanliness.⇒ Avoid damages caused by the threaded bolt while pushing on.

	ATTENTION!
	<p>If there are any spare feeders without connected cables, please observe the following:</p> <ul style="list-style-type: none">⇒ Switch the three-position switch to "EARTHED" position and lock it.⇒ Alternatively: Mount surge-proof caps.

	ATTENTION!
	<p>During metal work, please ensure the following:</p> <ul style="list-style-type: none">⇒ Do not drill into the vessel.⇒ Do not leave any metal cuttings on the vessel in order to avoid rust layers.

Connecting RK / LST feeder cables



Fig. 20: Ring-main cable connection

- ⇒ Push the interlocking lever ① of the cable compartment cover down, lift the cable compartment cover and remove it to the front. The feeder must be earthed (see Page 61, "Operating the three-position switch").
- ⇒ If necessary, detach the cross members ⑤ to swing in the cables.
- ⇒ Pre-adjust the cable bracket ⑦ and the lower part of the cable clamps.
- ⇒ If available, mount cable-type current transformers (see Page 52, "Cable connection with cable-type current transformers").
- ⇒ Fit the plugs on the conductor ends according to the manufacturer's instructions.
- ⇒ Carefully coat the push-on surfaces (high-quality joints) in the plug sets and the bushing cone with mounting paste (supplied with the plug set).
- ⇒ Push the plug sets ② to ④ on the bushings and fix them according to the manufacturer's instructions. Observe phase sequence!
- ⇒ Fit the upper part of the cable clamps ⑥, align the cable bracket and bolt it tight.
- ⇒ Connect the earthing facility of the cable shield and the plug housing at the front cross member ⑤.

Remarks for installation of
Siemens adapters AKE 20/
630



Fig. 21: Adapter for conventional cable sealing end

- ⇒ Assemble the cable sealing end ⑦ (not included in the scope of supply) according to the manufacturer's instructions.
- ⇒ Tighten the connection bolt ④ in the bushing ⑤ with 25 Nm.
- ⇒ Coat the cup ⑥ thoroughly on the inside with mounting paste and push it on the elbow adapter ③.
- ⇒ Slip the pre-assembled cable sealing end ⑦ from below through the cup ⑥ into the elbow adapter ③.
- ⇒ Coat the bushing ⑤ and the inside cone in the elbow adapter ③ with mounting paste.
- ⇒ Push the elbow adapter ③ onto the bushing ⑤ and fix it with the M16 nut ⑧ (tightening torque: 50 Nm).
- ⇒ Coat the stopper ① with mounting paste and screw it in as far as it will go (tightening torque: 10 Nm).

Connecting transformer feeder cables to switchgear type 8DJ10

The bushings are located on the upper side of the vessel, on the right of the fuse assembly. Cables can be routed to the rear (standard), top or right (see order documents).

Cable routing to the right:

- Only for plugs without metal enclosure
- Lateral metallic cover included in the scope of supply



Fig. 22: Cable routing to the rear

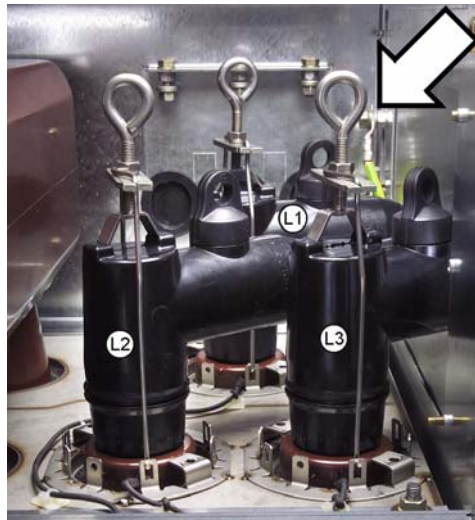


Fig. 23: Cable routing to the right



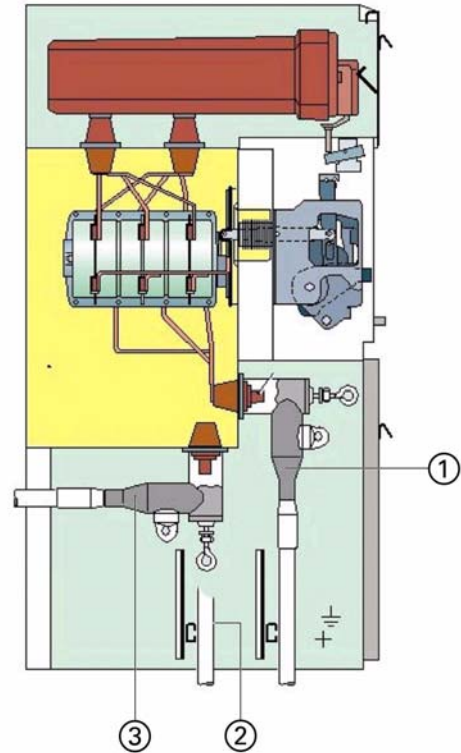
Fig. 24: Cable routing to the top

- ⇒ Earth the feeder.
- ⇒ Unlock the fuse cover and remove it.
- ⇒ Dismantle comb sheets of cable bushing (in case of cable routing to the right: Remove the side cover as well).
- ⇒ Fit the plug sets on the conductor ends according to the manufacturer's instructions (align the plug contact element centrally before pressing or screwing on).
- ⇒ Carefully coat the push-on surfaces (high-quality joints) in the plug sets with mounting paste (supplied with the plug set). Please check right before pushing on if the contact pin is centred in the plug. Align if necessary, and then push the plug onto the bushing.
- ⇒ Fit the plug mounting elements according to the manufacturer's instructions.
- ⇒ Mount strain relief for plugs and transformer cables at a distance of 500 mm from the bushing (outside the switchgear, not included in the scope of supply).
- ⇒ Connect the earthing facility of the cable shield (marked with arrows in the illustrations) and the plug housing, if applicable.
- ⇒ Refit the comb sheets with the rubber bushings (and, if applicable, the side cover) and mount and lock the fuse cover again.

Connecting transformer feeder cables to switchgear type 8DJ20

Possible cable routing:

- ① to the bottom with cable elbow plug
- ② to the bottom with straight elbow plug
- ③ to the rear with cable elbow plug




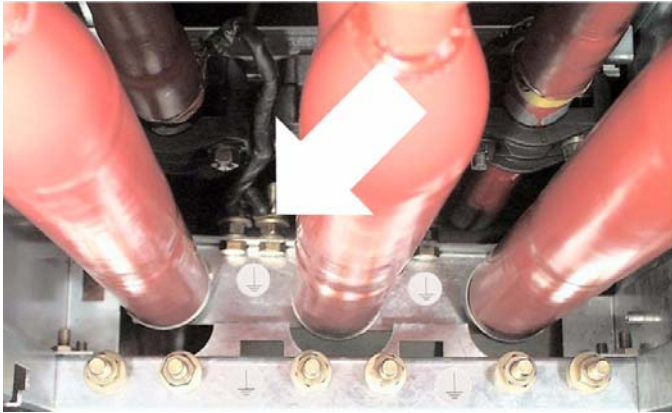
- ⇒ If the cables are brought out of the panel at the rear: Remove comb sheets with rubber bushings.
- ⇒ Pre-assemble the cable bracket and the lower part of the cable clamps.
- ⇒ Fit the plug sets on the conductor ends according to the manufacturer's instructions (align the plug contact element centrally before pressing or screwing on).
- ⇒ Carefully coat the push-on surfaces (high-quality joints) in the plug sets with mounting paste (supplied with the plug set). Please check right before pushing on if the contact pin is centred in the plug. Align if necessary, and then push the plug onto the bushing.
- ⇒ Fit the plug mounting elements according to the manufacturer's instructions.
- ⇒ Fit the upper part of the cable clamps. Align the cable bracket and bolt it tight.
- ⇒ Connect the earthing facility of the cable shield and the plug housing, if applicable.
- ⇒ If the cables are brought out of the panel at the rear: Refit the two comb sheets of the cable bushing. Mount strain relief for plugs and transformer cables at a distance of 500 mm from the bushing (outside the switchgear, not included in the scope of supply).

Connecting double cables and surge arresters

Double cables and surge arresters can be connected to ring-main and circuit-breaker feeders using adequate plug-in cable systems.



Fig. 25: Cable plug make Raychem RICS 5xxx with surge arrester type RDA 24

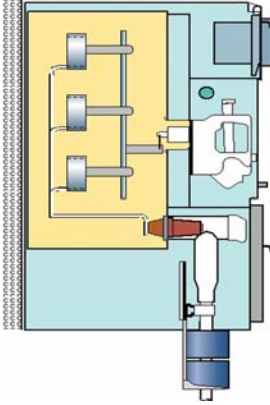
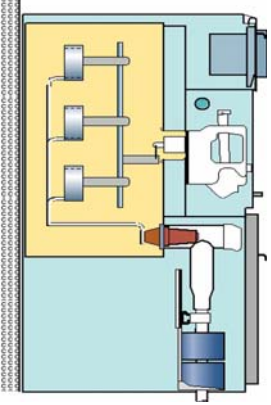
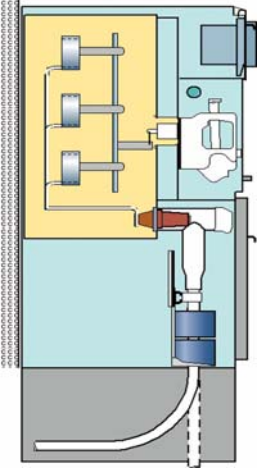
	<p>NOTE!</p> <p>⇒ When connecting cable plugs type Raychem RICS5xxx with surge arresters type RDA 24, earth the cable as shown below.</p> 
---	---

- ⇒ Details are given in the order documents.
- ⇒ For connection of unscreened cable plugs / surge arresters, keep the necessary minimum distances according to the manufacturer's instructions.
- ⇒ If the minimum distances cannot be kept, please contact your local Siemens representative.

13.2 Cable connection with cable-type current transformers

Installation position of cable-type current transformers

The transformer mounting plates are pre-assembled on the cable bracket at the factory. The cable-type current transformers are delivered inside the cable compartment and must be mounted on the high-voltage cables at site.

			
Switchgear height	1200 mm	1400 mm	1760 mm
Installation position	underneath the switchgear	inside or sometimes underneath the switchgear *	inside or sometimes underneath the switchgear *

* depending on the height of the cable-type current transformers

Mounting cable-type current transformers

- ⇒ Remove the cable compartment cover.
- ⇒ If necessary, remove the lower cross member of the switchgear frame.
- ⇒ Take the delivered cable-type current transformers out of the cable compartment.
- ⇒ Push the cable-type current transformers onto the high-voltage cables.
- ⇒ Fit the plugs according to the manufacturer's instructions.
- ⇒ Position the pre-assembled transformer mounting plates on the cable bracket, so that all three cable-type current transformers can be assembled.
- ⇒ Swing the high-voltage cables in together with the cable-type current transformers, and connect the cable plugs to the cable feeder (see Page 46, "Connecting high-voltage cables").

13.3 Connecting secondary equipment

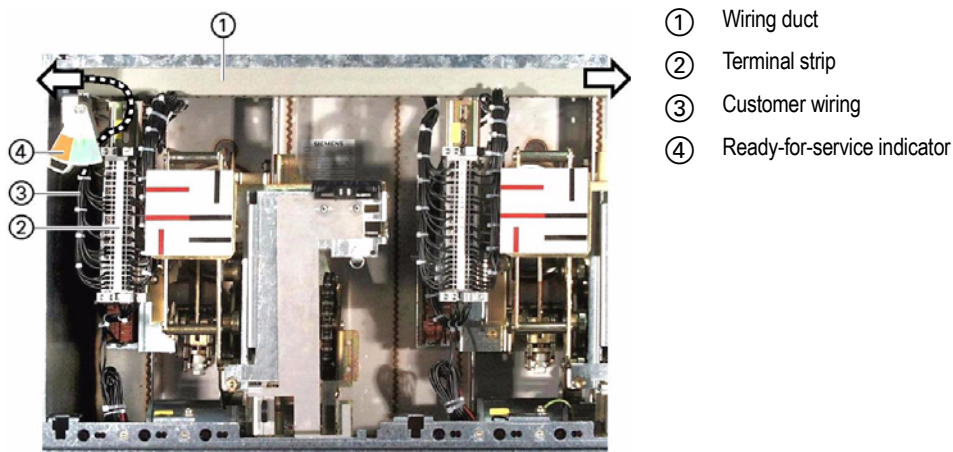


Fig. 26: 8DJ20: Operating mechanism box

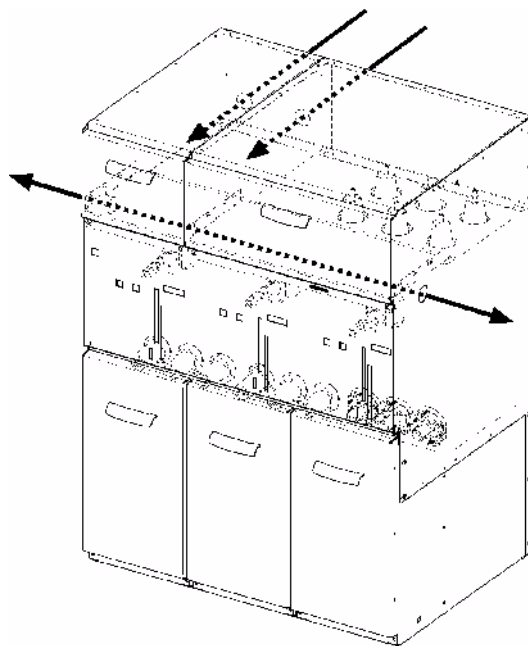




Fig. 27: Possible cable routing for secondary equipment.
Access from the rear not available in switchgear type 8DJ with LST.

The terminal strips of the secondary equipment supplied are assigned to the associated operating mechanisms/feeders. For external connections you will require the circuit diagrams supplied with the switchgear.

	<p>ATTENTION!</p>
	<p>The transmission linkage of the ready-for-service indicator ④ must always move freely.</p> <p>⇒ Lay the cables along the dotted line ③.</p>

- ⇒ Remove the fixing bolts of the front plate.
- ⇒ Remove the front plate of the switchgear to the front.
- ⇒ If the low-voltage niche is used for customer wiring: Unlock the fast-acting locks of the niche cover and remove the niche cover upwards.
- ⇒ Following the circuit diagrams, connect the wires ③ either to the terminal strip ② or directly to the terminals of the devices (e. g. CAPDIS S2+, short-circuit indicator) and lay them thoroughly. Lay wires to be routed outside to the side (arrow) (in case of 8DJ20 also to the rear through the low-voltage niche, if applicable) through the cut-out stopper. Use the wiring duct ① as far as possible.
- ⇒ Do not apply auxiliary voltage yet.

14 Commissioning

	ATTENTION!
	<p>During operation of electrical equipment and switchgear, parts of this equipment are under dangerous electrical voltage. Mechanical components may move quickly, even remotely controlled.</p> <ul style="list-style-type: none"> ⇒ Do not remove covers. ⇒ Do not reach into openings.


14.1 Final tests after installation

- | | |
|--|--|
| Rating plate | ⇒ Check the data on the rating plate and the auxiliary voltage of the control and end devices according to the requirements. |
| Ready-for-service indicator | ⇒ Check the ready-for-service indicator (see Page 42, "Checking the ready-for-service indicator"). |
| Switchgear fastening/
Switchgear earthing | <ul style="list-style-type: none"> ⇒ Check switchgear fastening. ⇒ Check connection to substation earth. |
| High-voltage connections | <ul style="list-style-type: none"> ⇒ Check earthing of cable terminations on all connected high-voltage cables. ⇒ If requested by the customer, test the cables (see Page 68, "Cable testing"). |
| Feeder without cables | ⇒ Switch the switching device to EARTHED position and lock it, or cover the bushings with surge-proof caps. |
| Bolted joints | <ul style="list-style-type: none"> ⇒ Check the tightening torques of the bolted joints of the low-voltage equipment at random. ⇒ Check all parts of the switchgear that have been disassembled and assembled again at site during installation, or that have been installed subsequently, to verify correct assembly and completeness. |
| Auxiliary cable connections | <ul style="list-style-type: none"> ⇒ Check correct wiring according to the circuit diagrams. ⇒ Check clamping and plug-in connections at random (perfect contact, labels, etc.). |

- Final work**
- ⇒ Remove any hanging instruction labels, documents, that are not required anymore for operation.
 - ⇒ Remove any tools, materials etc. that are not required anymore from the area of switchgear.
 - ⇒ Remove any dirt from the area of the switchgear (cleaning agent ARAL 4005 or HAKU 1025/90 and lint-free cloth / brush).
 - ⇒ Fit all covers.
 - ⇒ Put the covers on the capacitive test sockets.
 - ⇒ Touch up scratches and impacts in the surface painting. Available kit: Touch-up set (spatula and paint) and paint pen.

- Checking the accessories**
- ⇒ Ensure that the following accessories are ready to hand:
 - Operating instructions
 - Operating lever to operate the switchgear
 - Circuit diagrams
 - Warning signs

14.2 Mechanical and electrical function test

	DANGER!
	Putting defective switchgear into operation can endanger the life of people and damage the switchgear.
	<ul style="list-style-type: none"> ⇒ Never put switchgear into operation if you notice during test operation that a part of it does not work as described in here. ⇒ Perform test operations with auxiliary voltage only!

Mechanical function test The mechanical function is tested without high voltage.

- ⇒ Operate the mechanism several times by hand. Check position indicators and interlocks as well as covers regarding smooth operation.
- ⇒ Test fuse tripping with test fuse.
- ⇒ Check HV HRC fuse-links.
- ⇒ Check ready-for-service indicator. The indicator must be in the green area

Test operation / Electrical function test Test operation helps you to verify the perfect operation of the switchgear without high voltage before commissioning.

- ⇒ Switch the three-position switch disconnecter or the disconnecting circuit-breaker with motor operating mechanism several times to CLOSED and OPEN position.
- ⇒ Make sure that the three-position switch is in OPEN position after having completed test operation.
- ⇒ Switch on all auxiliary and control voltages and verify correct polarity.
- ⇒ Check whether the mechanical - and, if applicable, electrical - interlocking conditions are fulfilled without using excessive force.
- ⇒ Check whether the switch positions of the three-position switches are indicated correctly.

Malfunction during test operation

If there are any faults that cannot be cleared at site:

- ⇒ Do not put the switchgear into operation.
- ⇒ Inform the competent Siemens representative.

14.3 Instructing the operating personnel

- ⇒ Instruct operating personnel in theory and practice of switchgear operation.

14.4 Applying operating voltage


Preparations before switching on

The operating personnel must have been instructed, the installation work checked, and test operation must have been performed without faults.

- ⇒ Close all covers.
- ⇒ Make sure that the capacitive test sockets are covered.
- ⇒ Switch switching devices in feeders without connected cables to EARTHED position and lock them, or cover the bushings with surge-proof caps.
- ⇒ Reset short-circuit indicators.
- ✓ Now you can apply operational high voltage and put the switchgear into operation as described hereafter.

Switching on the first outgoing/incoming feeder

- ⇒ First, apply voltage from opposite substation, then switch feeder from OPEN to CLOSED position.

	DANGER!
	<p>Short-circuit in case of different phase sequence of the incoming feeders.</p> <ul style="list-style-type: none"> ⇒ Make sure that all incoming feeders have the same phase sequence. ⇒ To check the phase sequence, use only phase comparison test units which are adequate for HR or LRM test sockets.

- ⇒ Verify correct phase sequence of the next incoming feeder and switch on.
- ⇒ Switch on the tested incoming feeder.

The three-position switch-disconnector / disconnecting circuit-breaker of the feeder to be tested must be in "OPEN" position. The opposite substation must be de-earthed and live.

Verify correct phase sequence using a phase comparison test unit at the capacitive test sockets of the panel to be tested and a switched-on panel.

- ⇒ Plug the measuring cables of the phase comparison test unit into the test sockets "L1" of the two panels.




- ⇒ Read the indication.
- ⇒ Proceed in the same way with the test sockets of the other two phases ("L2" and "L3").
- ✓ If the phase comparison test unit shows "coincidence" in any case, the phase sequence of the tested feeder is correct.

Switching on consumer feeders

When all incoming feeders are switched on:

- ⇒ One after the other, switch on all outgoing feeders that are connected to consumers only.
- ✓ Now, all feeders are switched on; the switchgear is totally in operation.

Operation

	<p>DANGER!</p>
	<p>The internal arc classification of the switchgear according to IEC 62271-200 has only been proved by tests for the switchgear sides with internal arc classification and with closed high-voltage compartments.</p> <ul style="list-style-type: none"> ⇒ Determine the IAC of the switchgear by means of the data on the rating plate (see Page 30, "Rating plates"). ⇒ Regulations for access to switchgear areas without internal arc classification according to IEC 62271-200 must be defined by the entrepreneur or the switchgear owner.

15 Indicators and control elements

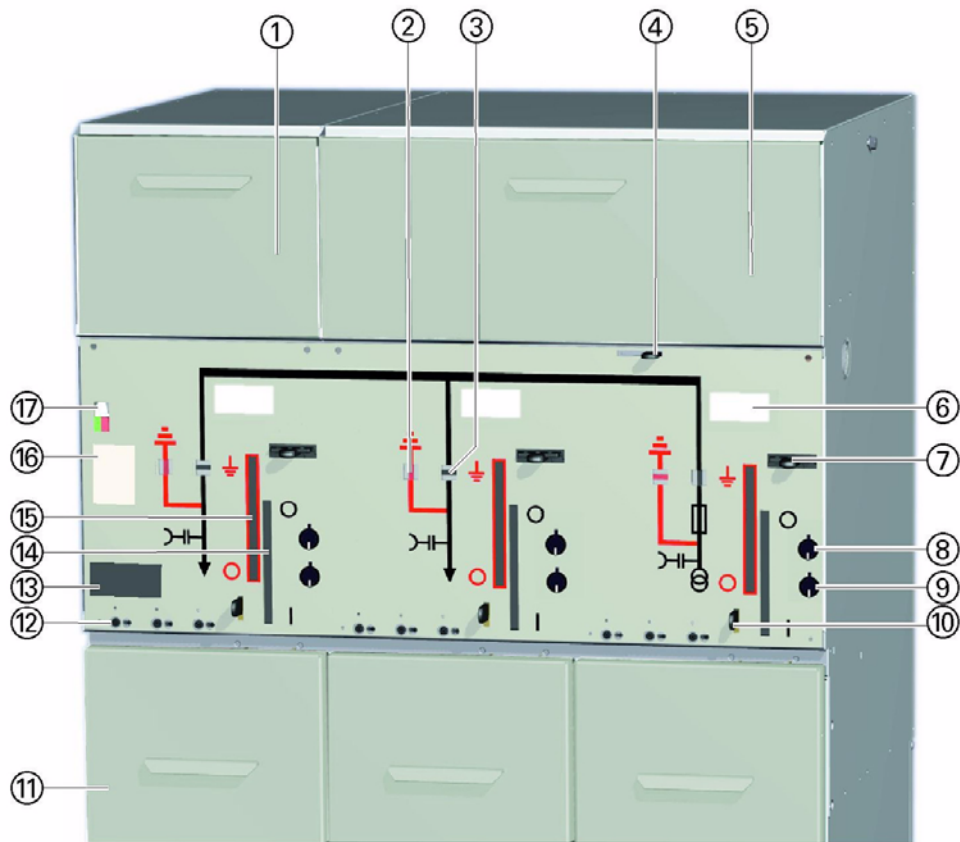
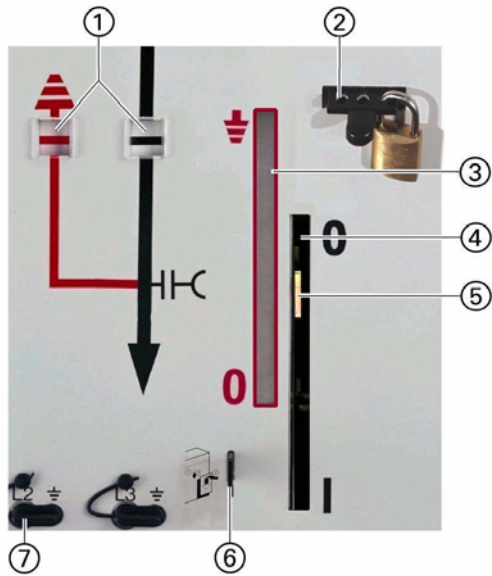


Fig. 28: 8DJ20: Scheme 10

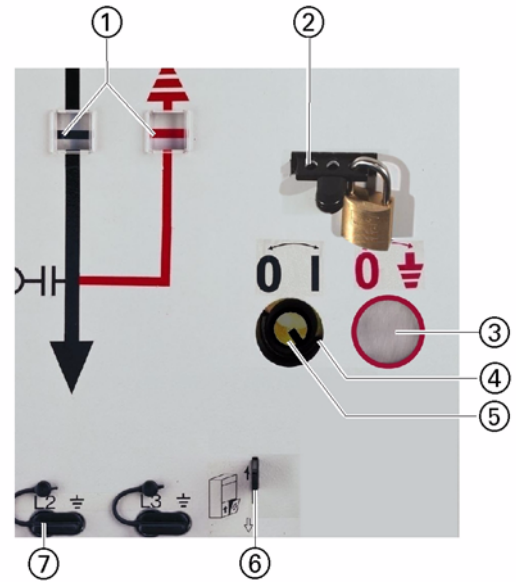
- | | | | |
|---|--|---|--|
| ① | Cover of low-voltage compartment | ⑩ | Lock for cable compartment cover |
| ② | Switch position indicator of the earthing switch | ⑪ | Cable compartment cover |
| ③ | Switch position indicator of the disconnecter | ⑫ | Sockets of capacitive voltage detecting system |
| ④ | Lock for HV HRC fuse assembly | ⑬ | Short-circuit / earth-fault indicator |
| ⑤ | HV HRC fuse compartment cover | ⑭ | Manual operation for load breaking / circuit breaking function |
| ⑥ | Feeder designation labels | ⑮ | Manual operation for earthing function |
| ⑦ | Locking device (option for three-position switch-disconnector / disconnecting circuit-breaker) | ⑯ | Rating plate |
| ⑧ | Local-remote switch for motor operating mechanism (option) | ⑰ | Ready-for-service indicator |
| ⑨ | ON/OFF momentary-contact rotary control switch for motor operating mechanism (option) | | |

Detachable lever operation



- ① Mimic diagram with position indicators
- ② Locking device with control gate and padlock (optional)
- ③ Switching gate to earthing and de-earthing (closed)
- ④ Switching gate for load breaking (open)

Rotary lever operation (for load breaking function only)



- ⑤ Operating lever resp. operating shaft
- ⑥ Interlock for cable compartment cover
- ⑦ Capacitive test socket with cover






Fig. 29: Detachable lever with red handle for earthing and de-earthing, with black handle for load breaking / circuit breaking. Alternatives: One-lever operation and anti-reflex lever (reversing the switching direction requires re-inserting the operating lever)




Fig. 30: Rotary lever with red handle for earthing and de-earthing, with black handle for load breaking

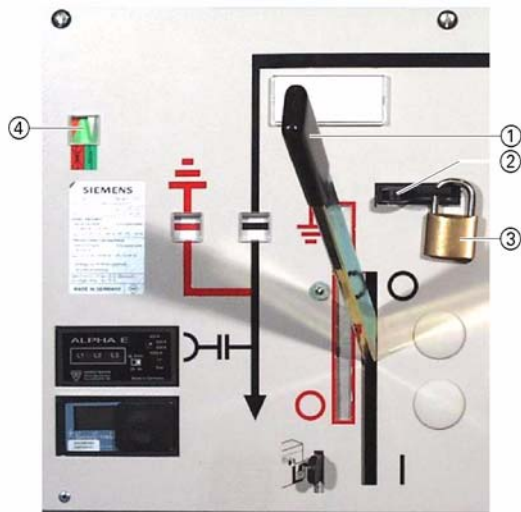
16 Operating the three-position switch

	DANGER!
	<p>During operation of electrical equipment and switchgear, parts of this equipment are under dangerous electrical voltage. Mechanical components may move quickly, even remotely controlled.</p> <ul style="list-style-type: none"> ⇒ Do not remove covers. ⇒ Do not reach into openings.

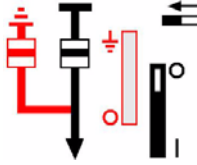
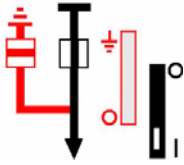
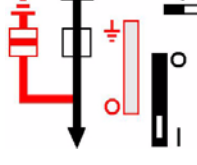
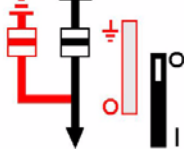
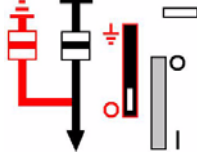
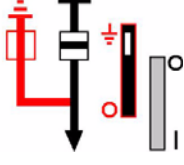
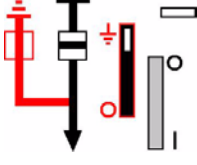
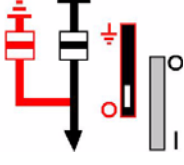
	DANGER!
	<p>If the gas filling is insufficient, this can cause personal injuries and material damages.</p> <ul style="list-style-type: none"> ⇒ Check ready-for-service indicator before performing any switching operation: the ready-for-service indicator must be in the green area. <div style="text-align: center; margin: 10px 0;">  </div> <ul style="list-style-type: none"> ⇒ If the indicator is in the red area: <ul style="list-style-type: none"> - Do not operate the switchgear. - Isolate the switchgear and put it out of service.

	DANGER!
	<p>Earthing a live incoming cable will trip the upstream circuit-breaker.</p> <ul style="list-style-type: none"> ⇒ Verify safe isolation from supply of the feeder before earthing.



16.1 Operations



- ⇒ Check ready-for-service indicator ④
- ⇒ Remove padlock ③ (optional)
- ⇒ Operate control gate ② (if available) to release the switching gate and hold it.
- ⇒ Insert operating lever ① and move (or turn in case of rotary operation) continuously to the desired switch position.
- ⇒ Remove operating lever. Control gate ② will automatically return to central position.
- ⇒ Refit padlock at desired position (see Page 16, "Interlocks").

Switching operation	Switching state before operation	after operation
<p>Closing switch-disconnector/ disconnecting circuit-breaker</p>	 <p>OPEN</p> <p>OPEN</p>	 <p>CLOSED</p> <p>OPEN</p>
<p>Opening switch-disconnector/ disconnecting circuit-breaker</p>	 <p>CLOSED</p> <p>OPEN</p>	 <p>OPEN</p> <p>OPEN</p>
<p>Earthing</p>	 <p>OPEN</p> <p>OPEN</p>	 <p>OPEN</p> <p>CLOSED</p>
<p>De-earthing</p>	 <p>OPEN</p> <p>CLOSED</p>	 <p>OPEN</p> <p>OPEN</p>



16.2 Protection tripping for the three-position switch-disconnector with spring-operated/ stored-energy mechanism

	<p>NOTE!</p> <p>If the opening spring of the transformer switch was tripped by a shunt release or a fuse-link:</p> <ul style="list-style-type: none"> ⇒ The switch position indicator of the switch-disconnector shows an additional red bar. ⇒ The operating lever at the operating mechanism is still in CLOSED position. ⇒ The motor operating mechanism (option) is out of operation. <div style="text-align: center;">  </div>
---	--

Re-establishing service readiness



- ⇒ Insert the operating lever and switch the operating mechanism from CLOSED to OPEN. The opening spring is recharged and earthing is prepared.
- ⇒ If required, replace fuse-links, otherwise the operating mechanism will immediately be tripped again as the tripping command is still active through the striker.

16.3 Protection tripping for three-position disconnecting circuit-breaker

	<p>NOTE!</p> <p>Manual operating mechanism: If the opening spring of the three-position disconnecting circuit-breaker (type LST) was tripped by the protection relay or the shunt release:</p> <ul style="list-style-type: none"> ⇒ The switch position indicator of the disconnecting circuit-breaker (type LST) shows an additional red bar ⇒ The operating lever at the operating mechanism is still in CLOSED position. <div style="text-align: center;">  </div>
---	--


Re-establishing service readiness

- ⇒ Insert the operating lever and switch the operating mechanism from CLOSED to OPEN position. The opening spring is recharged when the operating mechanism is operated.
- ✓ The disconnecting circuit-breaker (type LST) is ready for the next closing operation.

	NOTE!
	<p>Motor operating mechanism: If the opening spring of the three-position disconnecting circuit-breaker was tripped by the protection relay or the shunt release:</p> <ul style="list-style-type: none"> ⇒ The faulty position indication is cleared automatically by the motor operating mechanism. ⇒ The operating mechanism is immediately reset to OPEN position, recharging the stored-energy spring at the same time. <div style="text-align: center;">  </div>

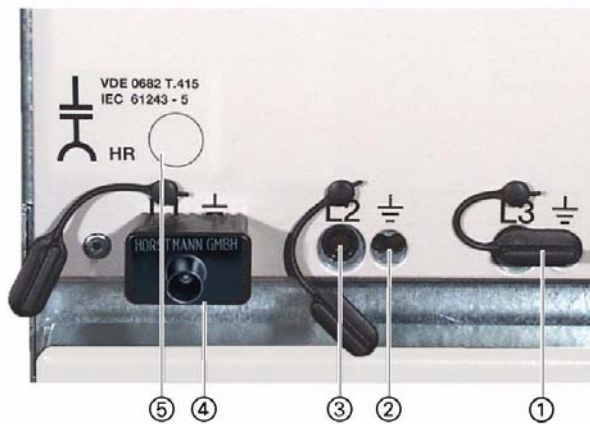
- ⇒ Check the switch position indicator.
- ✓ The disconnecting circuit-breaker is ready for the next closing operation.

17 Verification of safe isolation from supply

	DANGER!
	<p>Mortal danger if safe isolation from supply is verified incorrectly!</p> <ul style="list-style-type: none"> ⇒ Verify the perfect function of the voltage indicator and the coupling section in accordance with national standards <ul style="list-style-type: none"> - on live equipment - with a test unit according to IEC 61243-5/EN 61243-5 - on all poles ⇒ Use only voltage indicators or devices to test the function of the coupling section according to EN 61 243-5 / IEC 61 243-5 / VDE 0682-415. (There have been no changes as against the old standard VDE 0681 Part 7 regarding the interface conditions, so that the corresponding indicators can still be used.) ⇒ Perform repeat test of interface conditions at the capacitive interfaces, as well as on the indicators according to the customer's specifications or national standards. ⇒ Do not use short-circuiting jumpers as separate plugs. The function of the surge arrester installed is not guaranteed anymore if short-circuiting jumpers are used (see Page 21, "Voltage detecting systems").

Safe isolation from supply can be verified either with an HR or LRM voltage indicator or with a CAPDIS system.

HR/LRM system Safe isolation from supply of the feeder is verified at the capacitive interface. The test sockets are assigned to the corresponding feeders.



- ① Cover of capacitive test sockets
- ② Earthing socket
- ③ Capacitive test socket for L2
- ④ Voltage indicator type HR, make Horstmann
- ⑤ Documentation to repeat test of interface condition

- ⇒ Remove cover from capacitive interface.
- ⇒ Insert voltage indicators in sockets of capacitive interface. If the indicator does not flash or light up in any case, the feeder is not live. Now you can earth the feeder. If the indicator flashes or lights up, the feeder is live.
- ⇒ Refit covers of capacitive interface to protect the sockets against pollution.

Indicators CAPDIS-S1+/-S2+ ⇒ Verify safe isolation from supply on the display of CAPDIS-S1+/-S2+ (see Page 21, "Voltage detecting systems").

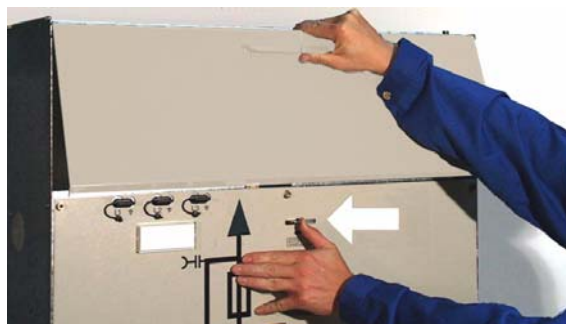
18 Replacing HV HRC fuses

For information about applicable HV HRC fuse-links (see Page 14, "HV HRC fuse assembly" and see Page 25, "Accessories").

Removing the HV HRC fuse compartment cover The HV HRC fuse compartment cover can only be unlocked if the earthing switch is in "EARTHED" position.

When the HV HRC fuse compartment cover is unlocked, the earthing switch is interlocked in the "EARTHED" position.

- ⇒ Isolate and earth the transformer feeder.
- ⇒ Push the interlocking lever of HV HRC fuse compartment cover to the left, unhinge cover and remove upwards.



Withdrawing the fuse slide



	<p>ATTENTION!</p>
	<p>HV HRC fuse-links can be hot!</p> <p>⇒ Withdraw HV HRC fuse slide with fuse-link (all 3 phases).</p>

Replacing HV HRC fuse-links

⇒ Take HV HRC fuse-links out of the contact springs.



- ⇒ Fit new HV HRC fuse-links into the contact springs observing the striker position. The arrow on the HV HRC fuse points at the box cover.
- ⇒ If extension tubes are necessary, these must always be mounted on the opposite side of the box cover.

Inserting HV HRC fuse slide

	<p>ATTENTION!</p>
	<p>Incorrectly selected or mounted fuse-links and extension tubes can damage the fuse box or the switchgear.</p> <p>⇒ 7.2 kV fuse-links with a dimension of 192 mm and 24 kV fuse-links with a dimension of 292 mm are not permissible.</p>

⇒ Push the HV HRC fuse slide through the guide slot into the HV HRC fuse box until it latches tight.





Locking the HV HRC fuse compartment cover

- ⇒ Fit the HV HRC fuse compartment cover from above and let it slip down. The HV HRC fuse compartment cover will protrude approx. 3 cm at the bottom.
- ⇒ Press the lower part of the HV HRC fuse compartment cover against the switchgear. Due to the rail provided at the rear, the cover can only be closed if the HV HRC fuse slides have latched in correctly.
- ⇒ Push the lock at the control board to the right. In this way, the cover is locked again and the interlock of the earthing switch is released.

19 Cable testing

19.1 Cable testing via cable plugs

	DANGER!
	<p>Cable testing with connected cables always represents a special stress for the isolating distance. If the busbar of the switchgear under test or the opposite substation are live with operating voltage, overvoltages must be prevented by taking adequate measures. During cable testing, the switch-disconnector is normally not interlocked.</p> <ul style="list-style-type: none"> ⇒ Place switching prohibition signs. ⇒ Padlock the locking device (option).

	ATTENTION!
	<p>In scheme 01 (radial transformer panel 1T) and scheme 02 (1R + 1 K), a switching operation for the EARTHED position has no influence on the voltage state of the radial cable behind the screwed-on cable compartment cover.</p> <ul style="list-style-type: none"> ⇒ Before removing the screwed-on cable compartment cover, isolate and earth the radial cable in the opposite substation.

Isolating and earthing the feeder under test

- ⇒ Disconnect the feeder under test.
- ⇒ Make sure that the feeder in the opposite substation has also been isolated and secured against reclosing.
- ⇒ Verify safe isolation from supply.
- ⇒ Earth the feeder.

Preparations

- ⇒ Remove the cable compartment cover.
- ⇒ Undo the screw-type cone at the T-plug or at the adapter.
- ⇒ Fit the cable test elements (e.g. measuring bolts) according to the operating instructions of the plug manufacturers.

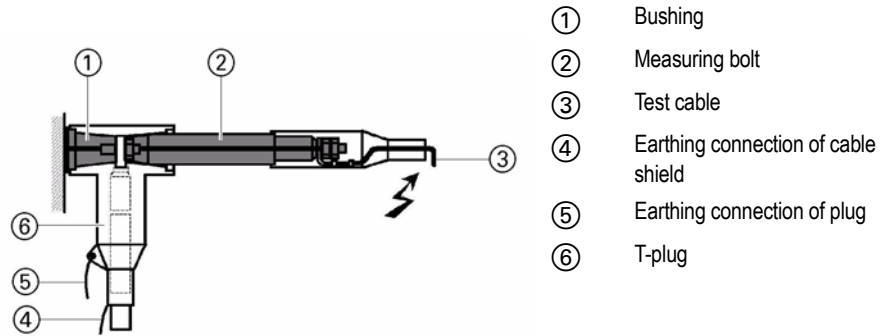


Fig. 31: Test arrangement




Fig. 32: Mounted test adapter

Testing **Maximum values for the test voltage:**

Rated voltage of the switchgear [kV]	DC test voltage, maximum value [kV]	AC test voltage VLF* 0.1 Hz, maximum value [kV]
12	48	19
24	70	38

* Very Low Frequency


	<p>ATTENTION!</p> <p>Cables, cable plugs and voltage detecting systems may be damaged by too high test voltages.</p>
	<p>⇒ Observe the manufacturer's instructions for the cables, cable plugs and voltage detecting systems (maximum test values).</p>


⇒ De-earth.

⇒ Perform the test in accordance with the cable manufacturers' recommendations or the customers' specifications.

- After completion of test**
- ⇒ Earth the feeder under test
 - ⇒ Remove cable test elements.
 - ⇒ Clean the screw-type cone, apply mounting paste and mount it on the T-plug according to the manufacturer's instructions.
 - ⇒ Fit and lock the cable compartment cover.
 - ⇒ De-earth the feeder in the switchgear and in the opposite substation and switch the feeder on again.

19.2 Cable sheath testing

	DANGER!
	<p>Normally, the switch-disconnector panel is not interlocked during the cable sheath test. Prevent switching to OPEN or CLOSED as follows:</p> <ul style="list-style-type: none"> ⇒ Place switching prohibition signs. ⇒ Padlock the locking device (option).

	ATTENTION!
	<p>In scheme 01 (radial transformer panel 1T) and scheme 02 (1R + 1 K), a switching operation for the EARTHED position has no influence on the voltage state of the radial cable behind the screwed-on cable compartment cover.</p> <ul style="list-style-type: none"> ⇒ Before removing the screwed-on cable compartment cover, isolate and earth the radial cable in the opposite substation.

- Work operations**
- ⇒ Isolate and earth the feeder under test.
 - ⇒ Remove the cable compartment cover.
 - ⇒ De-earth the cable shield at the cross member of the subframe as well as in the opposite substation.
 - ⇒ Perform the cable sheath test according to the manufacturer's instructions or the customer's specifications.
 - ⇒ Earth the cable shield again at the cross member of the subframe as well as in the opposite substation.
 - ⇒ Refit and lock the cable compartment cover.
 - ⇒ De-earth the feeder in the switchgear and in the opposite substation and switch the feeder on again.

20 Index

A

Accessories	25
Applying, operating voltage	56
Auxiliary switch.....	12

C

Cable connection.....	18
Cable sheath testing.....	70
Cable testing	68
CAPDIS.....	21
Checking ready-for-service indicator	61
Closing switch-disconnector.....	61
Commissioning.....	54
Completeness, checking for.....	38
Components.....	10
Control elements.....	59

D

De-earthing.....	61
Description	6
Dimensions	26
Due application.....	5

E

Earthing	61
Electrical data	28

F

Features.....	6
Fixing points	43
Floor openings.....	43
Function test, mechanical and electrical.....	55
Fuse-links, replacing	66

H

High-voltage cables, connection.....	46
HV HRC fuse assembly	14
HV HRC fuse-links, replacing.....	66

I

Indicators	59
Installation	38
Installation, preparations	38
Interlocks	16
Intermediate storage	39

L

Locking devices	16
-----------------------	----

Low subframe	45
--------------------	----

M

Maintenance	36
Motor operating mechanism.....	61

O

Opening switch-disconnector	61
Operating mechanisms	12
Operating voltage, applying	56
Operation	58

P

Packing.....	38
Pressure relief	44
Protection table.....	33

Q

Qualified personnel	5
---------------------------	---

R

Rating plates	30
Ready-for-service indicator	20
Ready-for-service indicator, checking	42
Recycling.....	37
Ring-main cable connection	18
Ring-main feeder cables, connection	47

S

Safe isolation from supply, verification.....	65, 66
Safety instructions	4
Schemes	8
Seaworthy crate, preparing storage	39
Secondary equipment, connection	53
Selection of HV HRC fuse links.....	33
Service life, end.....	37
Short-circuit/earth-fault indicator	24
Shunt release	12
Signal terms and definitions.....	4
Spring-operated mechanism	12
Standards and guidelines	28
Storage room/space, preparing	39
Stored-energy mechanism	12
Switch position indicator	59
Switchgear design.....	8
Switchgear earthing	45
Switching	61

T		
Technical data	26	
Technical data, three-position switch-disconnector	31	
Three-position disconnecting circuit-breaker	11	
Three-position switch, operation.....	61	
Three-position switch-disconnector	10	
Three-position switch-disconnector, technical data	31	
Tools	43	
Transformer cable connection.....	18	
Transformer feeder cables, connection.....	49, 50	
		Transformer protection table
		33
		Transport damage, checking for
		38
		Transport regulations
		29
		Transport to place of installation.....
		40
		U
		Unloading
		40
		V
		Voltage detecting systems
		21
		W
		Weights
		26

Impressum

Siemens AG

Energy Sector

Division Power Distribution

Schaltanlagenwerk Frankfurt

Carl-Benz-Str. 22

D-60386 Frankfurt

© Siemens AG 2008