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Disconnectors and earthing switches up to 25 kV AC

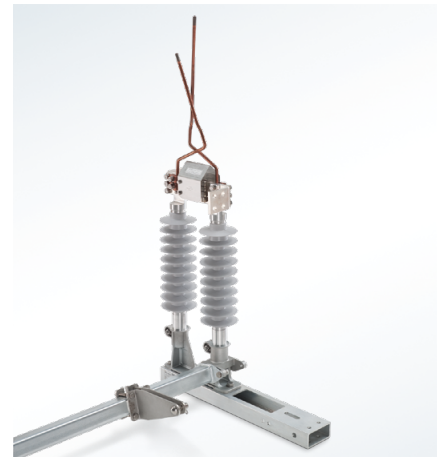
Sicat® 8WL6144 for overhead contact line systems in main-line railways

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The disconnectors and earthing switches of the Sicat® 8WL6144 product line are outdoor switchgears for fixed installations of AC railways with single-phase systems and autotransformer systems. The open disconnectors meet the requirement for a visible isolating distance.

Features

- Low maintenance thanks to contact set with contacts featuring a silver graphite coating with self-lubricating properties
- Thanks to their modular design, suitable as disconnectors with and without earth contact in single-phase AC systems and autotransformer systems and as earthing switch
- Simple and easy installation thanks to low weight
- Long service life thanks to corrosion-resistant materials and soil- and water-repellent surfaces of the insulators
- Easy installation and resistant against vandalism due to shatter-proof composite insulators



Design

The disconnectors and earthing switches consist of the following main components:

- Arcing horns and pre-arcing horns (depending on variant)
- Contact set with stainless steel protective cover
- Silicone composite insulators or support tube
- Baseplate with swivel socket

The disconnectors and earthing switches can be installed on all common cross arms and on brackets on tunnel walls and structures. They are supplied fully assembled and properly adjusted and are electrically connected to the overhead contact line or the feeders with switch cables.

Via a linkage, the disconnectors and earthing switches are operated electrically with a motor-operated mechanism or manually.

Flexible design and use

The disconnector's modular structure enables versions for single-phase current and autotransformer systems. Variable installation of the contact pieces is particularly suitable for diverse connection variants of feeder cables.

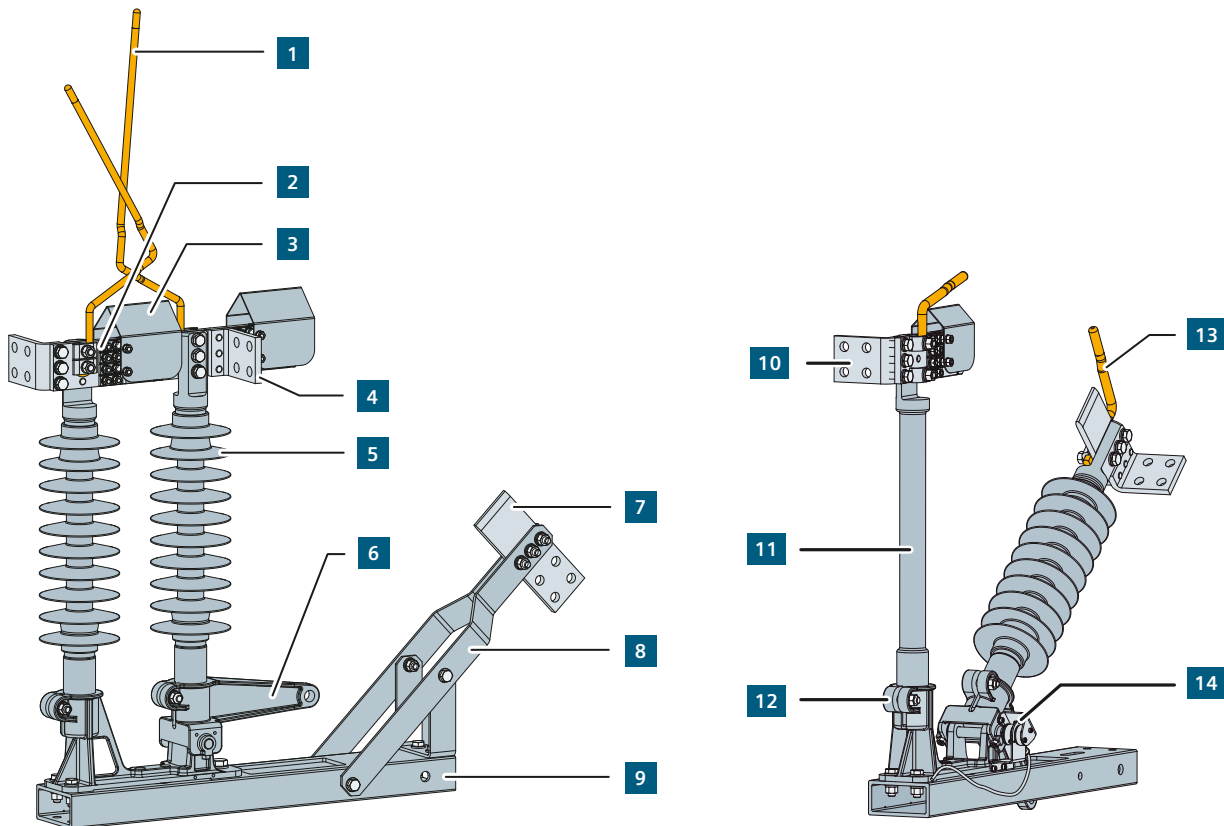
Disconnector monitoring system Sicat DMS

Optionally, the Sicat 8WL6144 disconnectors and earthing switches can be equipped with the Sicat DMS disconnector monitoring system to reliably detect and indicate the position of the switch. In combination with the control of the Sicat 8WL6243 and 8WL6244 electromechanical operated mechanisms with permanent power supply, the position is registered directly on the switching device and is forwarded to the control center.

By default, the earthing switches are equipped with a rotation angle sensor Sicat 8WL6144-7D.

For further information about the drive mechanisms and the disconnector monitoring system please refer to the corresponding product informations:

- „Electromechanical operated mechanisms Sicat 8WL6243, 8WL6244, 8W6253 and 8WL6254 for overhead contact line systems“, Document no. A6Z00030709176
- „Sicat DMS Disconnector monitoring system for overhead contact line systems“, Document no. A6Z00031617390



- | | | | |
|--------------------------------|--------------------------------|----------------------|---|
| 1 Arcing horn | 5 Silicone composite insulator | 9 Baseplate | 14 Drehwinkelsensor SIL1 |
| 2 Main contact set | 6 Swivel socket | 10 Connection piece | * only for disconnector with earth contact |
| 3 Protective cover | 7 Contact blade for earthing* | 11 Support tube | ** only for earthing switch with pre-arcing horns |
| 4 Contact spring for earthing* | 8 Earthing contact support* | 12 Socket | |
| | | 13 Pre-arcing horn** | |

Design of disconnector with earth contact (left) and earthing switch with pre-arcing horns (right)

Minimized maintenance

The disconnectors of the 8WL6144 product line are low maintenance and normally only need to be inspected visually and their functions checked:

- No greasing of contact sets necessary:
The graphite in the silver coating ensures permanent self-lubrication. Consequently, there is no need for regularly greasing the contact sets.

- Low maintenance arcing horns / pre-arcing horns:
Thanks to the arcing horns' tungsten tips at the disconnector and the special copper alloyed tips at the pre-arcing horns of the earthing switches, wear while quenching arcs during switching is minimized. If replacement of the arcing horns or pre-arcing horns should be necessary, this can be carried out on site while the disconnector or earthing switch is still fitted and the contact line in the section is deenergized and earthed.

Variants and scope of application

Disconnector without earth contact

The main contact set is held by two silicone composite insulators. The contact spring is located on the fixed insulator. The contact blade moves thanks to a swivel socket under the insulator. The contact spring and the contact blade are fitted with an arcing horn each. The contact set is protected by a stainless steel protective cover.

The disconnectors without earth contact serve to feed, disconnect or connect track sections and to join parallel contact lines.

Disconnector with earth contact

An earth contact support with contact blade is additionally fitted on the disconnector with earth contact. The corresponding contact spring is located on the moving part of the main contact set. When open, the disconnectors with earth contact additionally ensure earthing of the contact line section.

Disconnectors for autotransformer systems

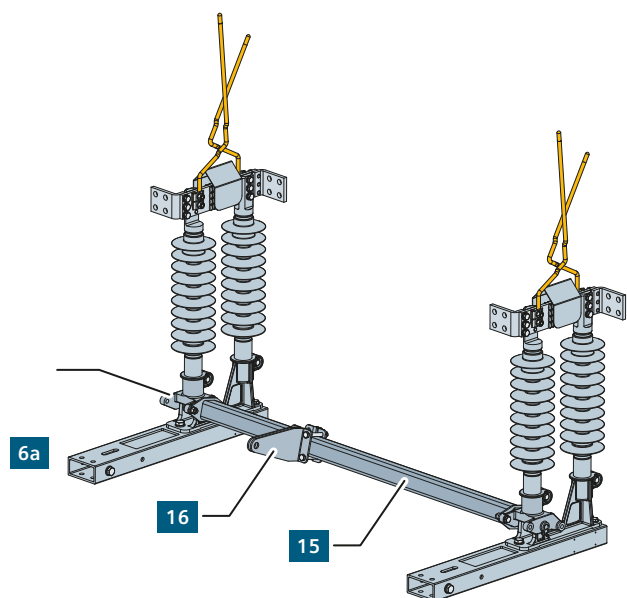
For autotransformer systems, two disconnectors are axially mechanically connected by means of an operating shaft. Synchronous switching movement of the two disconnectors is achieved by means of the movable turning lever on the operating shaft.

Earthing switch

Earthing switches are used for earthing deenergized contact line sections under special operating conditions.

The design of the earthing switches corresponds to the disconnector without earth contact. The composite insulator on the fixed contact is replaced by a metal support tube which realizes the earthing point. The earthing switches are equipped with a rotation angle sensor with SIL1 to meet the raised safety requirements.

The earthing switch Sicat 8WL6144-1A (class E0 according to EN 50152-2) is an earthing switch without making capacity. The earthing switch with pre-arcing horns Sicat 8WL6144-1D has a confined making capacity on base of class E1 in accordance with EN 50152-2.



6a Swivel socket with flange
15 Operating shaft

16 Turning lever

Application in autotransformer system

System integration

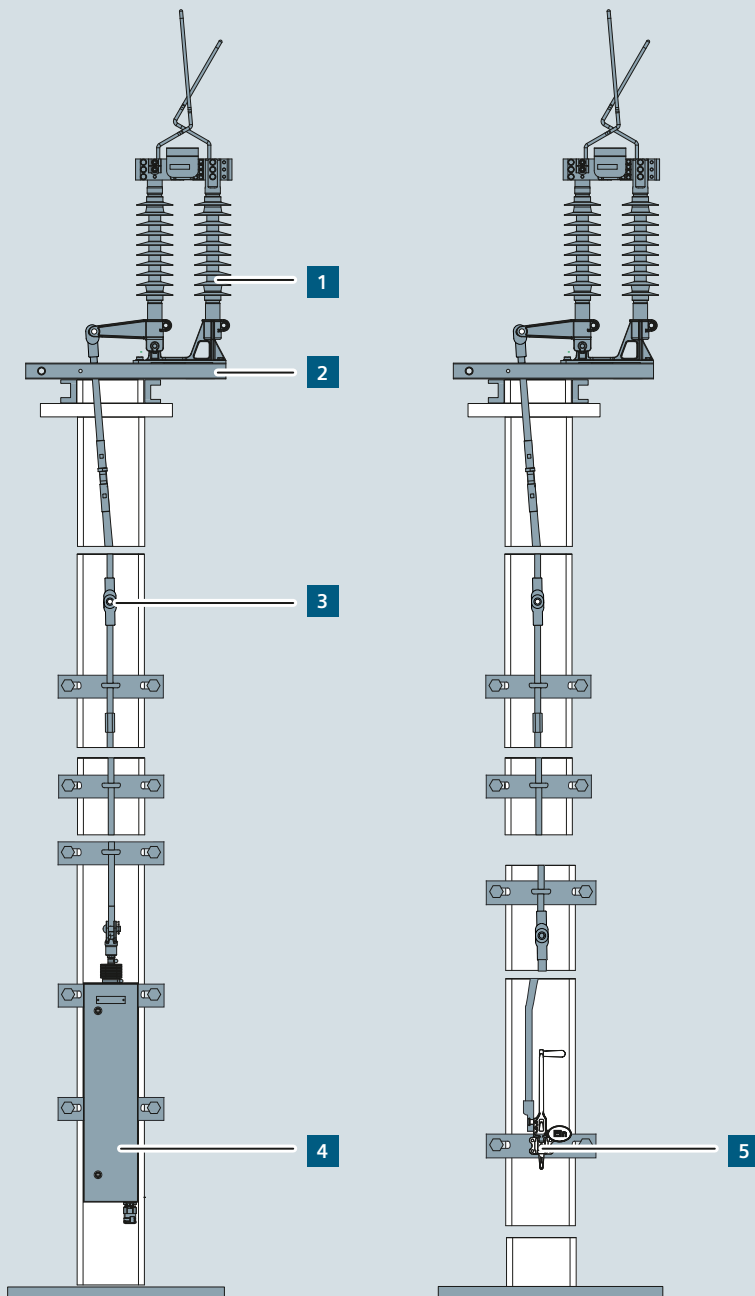
The disconnectors and earthing switches are installed at the top of contact line poles. A project specific or customer related disconnector bracket is available optionally.

Disconnectors and earthing switches are operated via an operating linkage with a drive mechanism.

For opening and closing the Sicat 8WL6144 disconnectors and earthing switches electromechanical operated mechanisms and manual operated mechanisms with a stroke of 200 mm are suitable.

The following types of drive mechanisms and the corresponding operating linkages are available in the Siemens Portfolio:

- Electromechanical operated mechanism in GRP or stainless steel casing, linear stroke, for remote control and local operation (see Figure below on the left side)
- Motor-operated mechanism, radial stroke for remote control and local operation
- Manual operated mechanism for local operation (see Figure below on the right side)



Examples for system integration with operating linkage and electromechanical operated mechanism (left) and manual operated mechanism (right)

Selection criteria and technical data

Disconnecter

Selection criteria 8WL6144-..	-0	-0E	-1	-1E	-2	-2E	-3	-3E
Earth contact			■	■			■	■
Arcing horn								
• with burn-off tips	■		■		■		■	
• without burn-off tips		■		■		■		■
Connection for operating linkage								
• at swivel socket of disconnector	■	■	■	■				
• at turning lever of operating shaft					■	■	■	■
Use in								
• Single-phase AC systemn	■	■	■	■				
• Autotransformer system					■	■	■	■

Electrical data 8WL6144-..		-0 / -1 / -2 / -3	-0E / -1E / -2E / -3E
Nominal voltage U_n	[kV]	15 and 25	15 and 25
Nominal frequency	[Hz]	16.7 and 50 / 60	16.7 and 50 / 60
Rated voltage U_{Nm}	[kV]	36	36
Rated current I_n	[kA]	2.5	2.5
Limited breaking capacity (switching in an emergency)	[kA]	1.7	–
Minimum creepage distance	[mm]	1,200	1,200
Clearance in air			
• between the main contacts	[mm]	460	460
• to earth	[mm]	420	420
Rated short-time withstand current I_k^*	[kA]	40	40
Rated impulse withstand current I_p^*	[kA]	100	100
Rated short-circuit duration*	[s]	1	1
Rated impulse withstand voltage U_{Ni}			
• between the main contacts	[kV]	290	290
• to earth	[kV]	250	250
Rated short-time withstand AC voltage, wet			
• between the main contacts	[kV]	110	110
• to earth	[kV]	95	95

* at main contact and earth contact for disconnectors with earth contact

Mechanical data (part I) 8WL6144-..		
Stroke	[mm]	200
Ice coverage category*	[mm]	10
Ambient temperature up to		
• Rated operating current $I_r = 2.5$ kA (60 Hz)	[°C]	-45 up to +45
• Rated operating current $I_r = 2.5$ kA (16.7 / 50 Hz)	[°C]	-45 up to +50
Minimum switching force** of the operated mechanism	[kN]	1.0
Installation height	[m]	≤1,000

* Test in accordance with IEC 62271-102, Section 6.103

** If covered with ice, this value can be exceeded.

Mechanical data (part II) 8WL6144-..		-0	-0E	-1	-1E	-2	-2E	-3	-3E
Dimensions									
• Length	[mm]	783	830	1,070	1,070	783	830	1,070	1,070
• Width	[mm]	232	144	232	232	232	144	232	232
• Height	[mm]	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402
Weight	[kg]	22.7	21.1	30.1	30.1	22.5	20.9	29.9	29.9

Earthing switch

Selection criteria	8WL6144-1A	8WL6144-1D
with pre-arcing horns and restricted making capacity		■
Connection for operating linkage		
• at swivel socket of earthing switch	■	■

Electrical data		8WL6144-1A	8WL6144-1D
Nominal voltage U_n	[kV]	15 and 25	15 and 25
Nominal frequency	[Hz]	16.7 and 50 / 60	16.7 and 50 / 60
Rated voltage U_{Nm}	[kV]	36	36
Minimum creepage distance	[mm]	1,200	1,200
Clearance in air	<ul style="list-style-type: none"> • between the main contacts [mm] • to earth [mm] 	460 420	460 420
Rated short-time withstand current I_k	[kA]	40	40
Rated impulse withstand current I_p	[kA]	100	100
Rated short-circuit duration	[s]	1	1
Rated impulse withstand voltage U_{Ni}	<ul style="list-style-type: none"> • between the main contacts [kV] • to earth [kV] 	290 250	290 250
Rated short-time withstand AC voltage, wet	<ul style="list-style-type: none"> • between the main contacts [kV] • to earth [kV] 	110 95	110 95

Mechanical data		8WL6144-1A	8WL6144-1D
Stroke	[mm]	200	200
Ice coverage category*	[mm]	10	10
Ambient temperature up to	[°C]	-40 to +50	-40 to +50
Minimum switching force** of the operated mechanism	[kN]	1.0	1.0
Installation height	[m]	≤1,000	≤1,000
Dimensions	<ul style="list-style-type: none"> • Length [mm] • Width [mm] • Height [mm] 	760 232 1,400	1,070 232 1,400
Weight	[kg]	20.9	22.2

* Test in accordance with IEC 62271-102, Section 6.103

** If covered with ice, this value can be exceeded.

Materials and accessories

Materials

Component	Material
Baseplate	aluminium
Insulators	Glass fiber-reinforced plastic, silicone
Fittings, support tube	Aluminium / Aluminium cast alloy
Arcing horns <ul style="list-style-type: none"> • 8WL6144-0 / -1 / -2 / -3 • 8WL6144-0E / -1E / -2E / -3E 	Electrolytic copper with tungsten tips Electrolytic copper
Pre-arcing horns <ul style="list-style-type: none"> • 8WL6144-1D 	Electrolytic copper with tips made of copper alloy
Contact set (contact blade, contact spring)	Electrolytic copper, silver-plated, silver graphite
Protective covers, earth contact support, standard parts	Stainless steel
Operating shaft	Hot-dip galvanized steel stainless steel

Accessories

Component	Order number
Rotation angle sensor <ul style="list-style-type: none"> • for Sicat DMS disconnecter monitoring system • SIL 1 for Sicat DMS disconnecter monitoring system for earthing switch 	8WL6144-7 8WL6144-7D
Operating shaft for disconnecter distance 1.500 mm*	8WL6144-2F
Schalterantriebe <ul style="list-style-type: none"> • electromechanical operated mechanism, GRP casing, linear stroke • electromechanical operated mechanism, stainless steel casing, linear stroke • electric operated mechanism, radial stroke • manual operated mechanism 	8W6243, 8WL6244 8WL6253, 8WL6254 8WL6200 8WL6214
Operating linkage	$\frac{3}{4}$ " on request
Adjusting socket	$\frac{3}{4}$ " for operating linkage 8WL6229-0
other distances on request	

Tests

The Sicat 8WL6144 disconnectors have been subjected to the following type tests:

- Dielectric tests
- Electrical resistance measurement
- Temperature rise test of the main circuit
- Restricted breaking capacity (breaking in case of emergency)
- Short-time current and impulse current testing
- Mechanical endurance testing
- Functional tests at low limit temperatures

in compliance with the following standards:

- DIN EN 50152-2: 2013
- DIN EN 50124-1: 2006
- DIN EN 62271-102: 2008
- DIN EN 62271-1: 2009
- DIN EN 60265-1: 1999

The Sicat 8WL6144-1D earthing switch has been subjected to the following type test:

- Restricted making capacity (making in case of emergency) on the basis of EN 50152-2: 2013

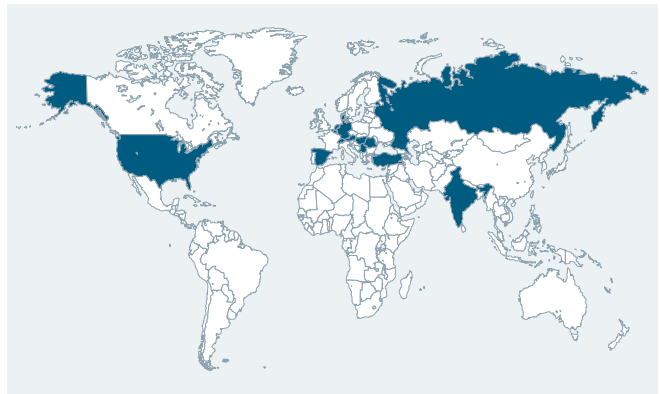
The silicone composite insulators used have been tested in compliance with the following standards:

- IEC 61952
- IEC 62217
- IEC 62621

Ice condition tests on the basis of IEC 62271-2, Section 6.103, Switching on / off disconnector.

References

Since market introduction in 2012 more than 4,550 Sicat 8WL6144 type disconnectors and earthing switches have been delivered worldwide (status as of September 2017).



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Sicat 8WL6144 / Product information
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