

SICAT 8WL6144 FOR OVERHEAD CONTACT LINE SYSTEMS IN MAIN-LINE RAILWAYS

Disconnectors and earthing switches up to 25 kV AC

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 waterrepellent surfaces of the insulators
- Easy installation and resistant against vandalism due to shatter-proof composite insulators



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Design

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

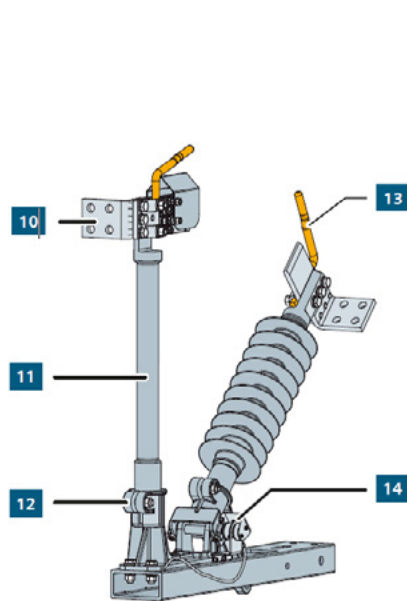
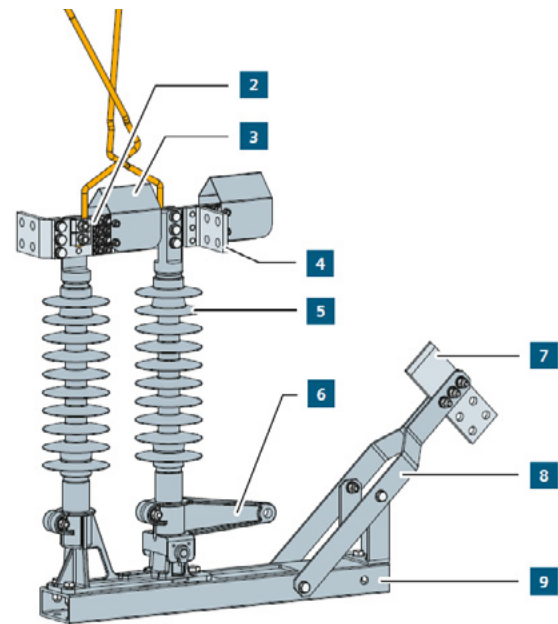
- Arcing horns and pre-arcing horns (depending on variant)
- Contact set with stainless steel protective cover
- Silicone composite insulators or support tube
- Baseplate with swivel socket

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.



- 1 Arcing horn
- 2 Main contact set
- 3 Protective cover
- 4 Contact spring for earthing¹
- 5 Silicone composite insulator
- 6 Swivel socket
- 7 Contact blade for earthing¹
- 8 Earthing contact support¹
- 9 Baseplate
- 10 Connection piece
- 11 Support tube
- 12 Socket
- 13 Pre-arcing horn²
- 14 Drehwinkelsensor SIL1

¹ Only for disconnector with earth contact
² Only for earthing switch with pre-arcing horns

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

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

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

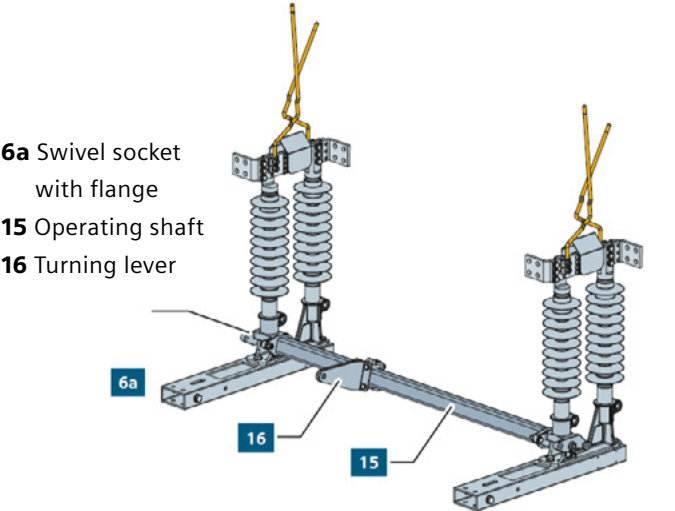
For autotransformer systems, two disconnectors are axially mechanically connected by means of an operating shaft. Synchronous switching movement of the two disconnectors is achieved by means of the movable turning lever on the operating shaft.

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.



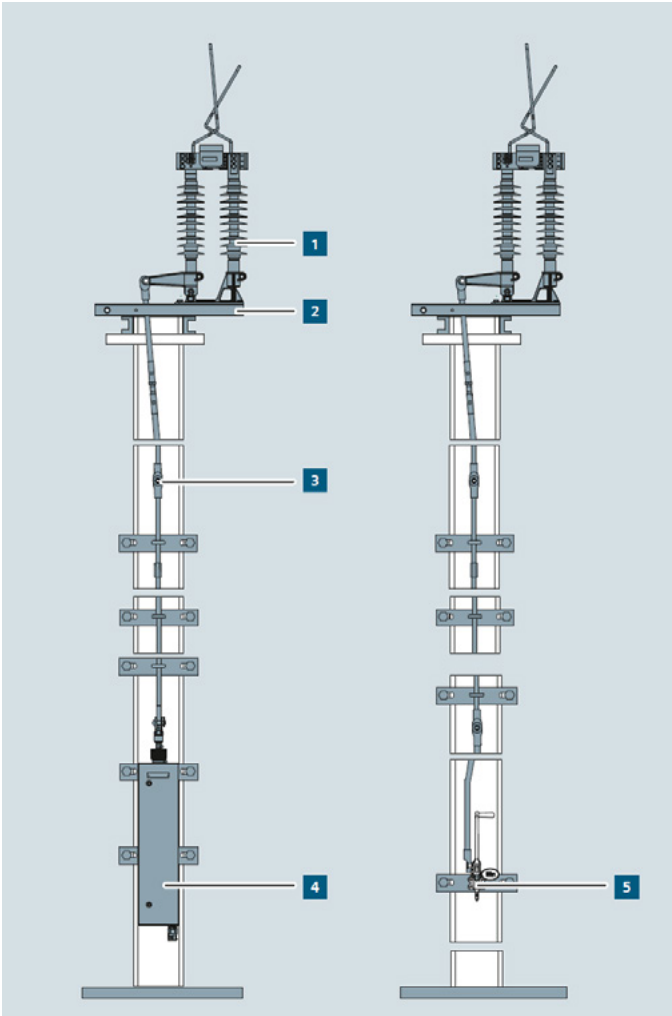
Application in autotransformer system

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.



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

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

- Portfolio:**
- Electromechanical operated mechnism 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)

Selection criteria and technical data

| Mechanical data (part II) 8WL6144-.. | -0 | -0E | -1 | -E | -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 | | | | | | | | |

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

| Mechanical data (part I) 8WL6144- ... | |
|--|--------------------|
| Stroke | [mm] 200 |
| Ice coverage category ² | [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 ³ of the operated mechanism | [kN] 1.0 |
| Installation height | [m] ≤1,000 |

| Mechanical data (part II) 8WL6144- ... | -0 | -0E | -1 | -E | -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 | [°C] 22.7 | 21.1 | 30.1 | 30.1 | 22.5 | 20.9 | 29.9 | 29.9 |

1 at main contact and earth contact for disconnectors with earth contact
2 Test in accordance with IEC 62271-102, Section 6.103
3 If covered with ice, this value can be exceeded.

Earthing switch

| Selection criteria | 8WL6144-1A | 8WL6144-1D |
|--|-------------|-------------|
| With pre-arcing horns and restricted making capacity | | <div></div> |
| Connection for operating linkage at swivel socket of earthing switch | <div></div> | <div></div> |

| Selection criteria | | 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 contactsto earth | [mm] | 460 | 460 |
| | [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} <ul style="list-style-type: none">between the main contactsto earth | [kV] | 290 | 290 |
| | [kV] | 250 | 250 |
| Rated short-time withstand AC voltage, wet <ul style="list-style-type: none">between the main contactsto earth | [kV] | 110 | 110 |
| | [kV] | 95 | 95 |

| Mechanical data | | 8WL6144-1A | 8WL6144-1D |
|--|------|-------------|-------------|
| Stroke | [mm] | 200 | 200 |
| Ice coverage category ¹ | [mm] | 10 | 10 |
| Ambient temperature up to | [°C] | -40 ... +50 | -40 ... +50 |
| Minimum switching force ² of the operated mechanism | [kN] | 1.0 | 1.0 |
| Installation height | [m] | ≤1,000 | ≤1,000 |
| Dimensions <ul style="list-style-type: none">LengthWidthHeight | [mm] | 760 | 1,070 |
| | [mm] | 232 | 232 |
| | [mm] | 1,400 | 1,400 |
| Weight | [kg] | 20.9 | 22.2 |

¹ Test in accordance with IEC 62271-102, Section 6.103
² If covered with ice, this value can be exceeded.

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/-38WL6144-0E/-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 | • For Sicat DMS disconnecter monitoring system | 8WL6144-7 |
| | • SIL 1 for Sicat DMS disconnecter monitoring system for earthing switch | 8WL6144-7D |
| Operating shaft | For disconnecter distance 1,500 mm* | 8WL6144-2F |
| Schalterantriebe | • Electromechanical operated mechanism, GRP casing, linear stroke | 8W6243, 8WL6244 |
| | • Electromechanical operated mechanism, stainless steel casing, linear stroke | 8WL6253, 8WL6254 |
| | • Electric operated mechanism, radial stroke | 8WL6200 |
| | • Manual operated mechanism | 8WL6214 |
| Operating linkage | ¾" | |
| Adjusting socket | ¾" for operating linkage | on request |
| Other distances on request | | 8WL6229-0 |

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

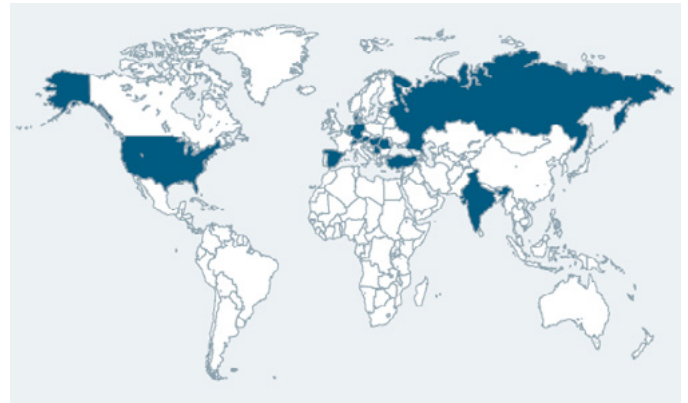
The silicone composite insulators used have been tested in compliance with the following standards:

- 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 6,893 Sicat 8WL6144 type disconnectors and earthing switches have been delivered worldwide (status as of September 2019).



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Sicat 8WL6144/Product information
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