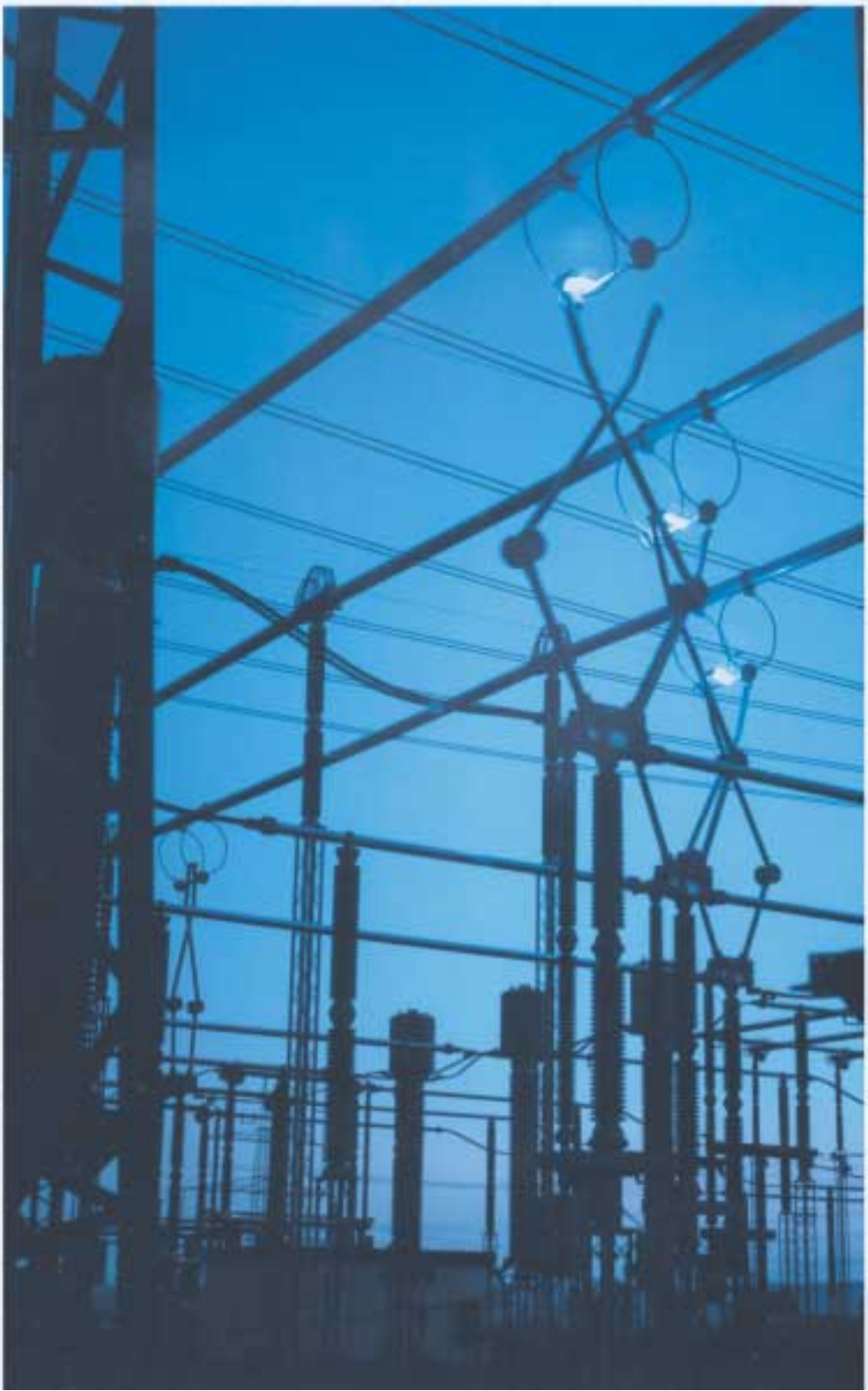
RUHRTAL

REG

Disconnectors and Earthing Switches



36 kV – 800 kV

RUHRTAL Product Range

Disconnectors and Earthing Switches from 36 kV to 800 kV

Rated Voltages	Currents	Centre Break Disconnectors	Pantograph Disconnectors	Knee-Type Disconnectors	Vertical Break Disconnectors	Double Side Break Disconnectors
36 kV	I_n [A]	-	-	-	-	≤ 4000
	I_s [kA]	-	-	-	-	≤ 100
	$I_{th(1s)}$ [kA]	-	-	-	-	≤ 50
	$I_{th(3s)}$ [kA]	-	-	-	-	≤ 31.5
72.5 kV	I_n [A]	≤ 3150	-	-	-	≤ 2500
	I_s [kA]	≤ 100	-	-	-	≤ 100
	$I_{th(1s)}$ [kA]	≤ 50	-	-	-	≤ 50
	$I_{th(3s)}$ [kA]	≤ 31.5	-	-	-	≤ 31.5
123 kV	I_n [A]	≤ 4000	≤ 3150	≤ 3150	≤ 2500	≤ 2500
	I_s [kA]	≤ 160	≤ 125	≤ 125	≤ 100	≤ 100
	$I_{th(1s)}$ [kA]	≤ 100	≤ 50	≤ 50	≤ 50	≤ 50
	$I_{th(3s)}$ [kA]	≤ 63	≤ 31.5	≤ 31.5	≤ 31.5	≤ 31.5
145 - 170 kV	I_n [A]	≤ 4000	≤ 3150	-	≤ 3150	≤ 2500
	I_s [kA]	≤ 160	≤ 125	-	≤ 135	≤ 100
	$I_{th(1s)}$ [kA]	≤ 100	≤ 50	-	≤ 63	≤ 50
	$I_{th(3s)}$ [kA]	≤ 63	≤ 31.5	-	≤ 31.5	≤ 31.5
245 - 300 kV	I_n [A]	≤ 4000	≤ 4000	-	≤ 4000	≤ 3150
	I_s [kA]	≤ 160	≤ 160	-	≤ 160	≤ 125
	$I_{th(1s)}$ [kA]	≤ 100	≤ 100	-	≤ 100	≤ 100
	$I_{th(3s)}$ [kA]	≤ 63	≤ 63	-	≤ 63	≤ 63
362 - 550 kV	I_n [A]	≤ 4000	≤ 4000	-	≤ 4000	≤ 4000
	I_s [kA]	≤ 200	≤ 200	-	≤ 200	≤ 160
	$I_{th(1s)}$ [kA]	≤ 100	≤ 100	-	≤ 100	≤ 100
	$I_{th(3s)}$ [kA]	≤ 63	≤ 63	-	≤ 63	≤ 63
800 kV	I_n [A]	-	-	-	≤ 4000	≤ 4000
	I_s [kA]	-	-	-	≤ 160	≤ 200
	$I_{th(1s)}$ [kA]	-	-	-	≤ 80	≤ 100
	$I_{th(3s)}$ [kA]	-	-	-	≤ 50	≤ 63

- Earthing switches for all voltage ranges, see page 8
- Switch disconnectors for special purposes from 72.5 kV to 245 kV, see page 8
- Operating mechanisms for all types of disconnectors and earthing switches, see page 9
- Commutating contacts for bus-transfer current switching according to IEC 61128 are available for all types of disconnectors.
  Subsequent installation is possible, for **RUHRTAL** switches as well as for disconnectors from other manufacturers, see page 10.

RUHRTAL

Partner of Energy Suppliers since 1922

RUHRTAL is a company with decades of experience in the field of high voltage switchgear. A large number of innovations is the basis for **RUHRTAL**'s world-wide reputation.
With our large production range of high voltage switchgear and the corresponding services, we offer our customers technologically and economically optimal solutions for their requirements.
The extensive testing system and the quality system certified in accordance with DIN EN ISO 9001have guaranteed the reliability of our disconnectors and earthing switches for many decades.
RUHRTAL high voltage switchgear meet all requirements regarding an economic operation and a long lifetime. **RUHRTAL** disconnectors and earthing switches have proved to be successful in areas with unfavourable climatic conditions. They are used in industrial and in coastal areas as well as in regions with extreme variations in temperature and with heavy ice loads.

The use of components with high mechanical strength leads to a high seismic withstand capability of the disconnectors and earthing switches.

Our experience and service

Your economic advantage

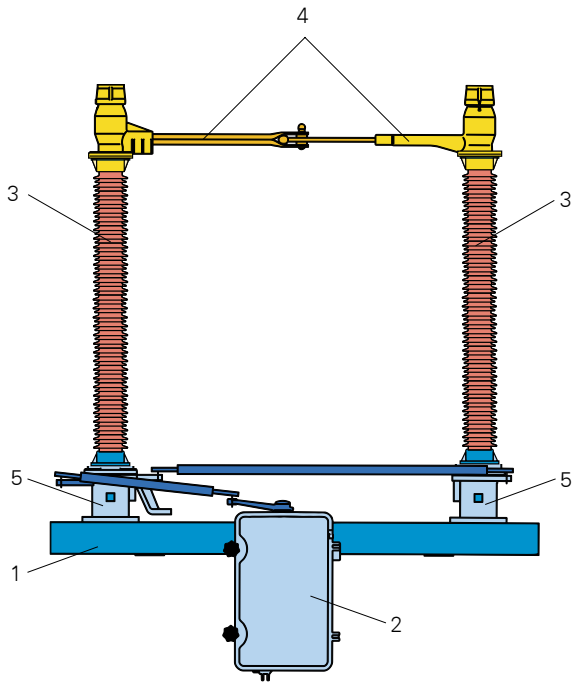
- Delivery of the high voltage switchgear in pre-assembled and pre-adjusted main components
- Easy installation and commissioning
- Low maintenance effort
- Availability of spare parts for at least 25 years
- Life expectancy of more than 40 years
- Availability of complete services at short notice
- Technical support for the whole lifetime

Certified quality management in accordance with DIN EN ISO 9001

Centre Break Disconnectors

The centre break disconnector is the most frequently used disconnector type.
The switch base (1) carries the operating mechanism (2) and two rotatable supporting insulators (3).
The current path arms (4) which are fixed to the insulators open in the middle.

Each rotating unit (5) comprises two high-quality ball bearings and is designed for high mechanical loads. It is greased for life and therefore maintenance-free.



Centre break disconnector

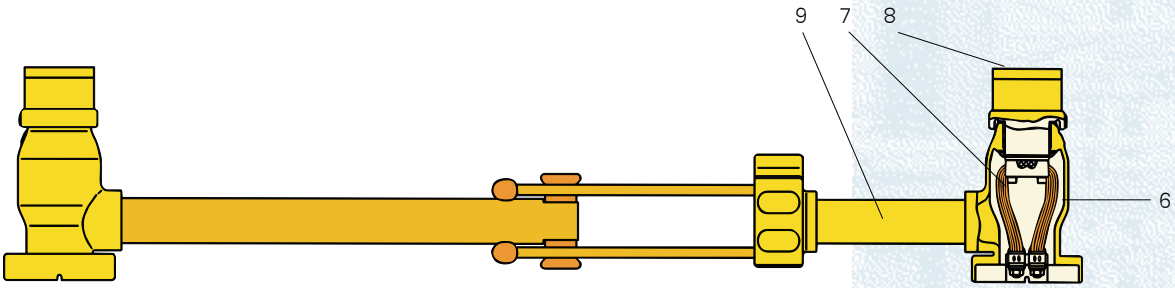
The current path of the **RUHRTAL** centre break disconnectors consists of only a few components; thus the number of contact resistances is reduced to a minimum.

In the contact head (6) the current is transferred from the terminal palm (8) to the current path tube (9) by high-flexible copper leads (7). The bearing is not loaded by the current flow. The copper leads guarantee the smooth running of the bearings at the high voltage terminal palms. The high voltage conductors remain in their position during the switching operation.

The main contact system consists of block contacts and spread contact fingers. **RUHRTAL** contact systems guarantee a steady contact force even after years of operation. This is the reason why we intentionally avoid the use of any type of springs for the contact system.

The modular design of the **RUHRTAL** centre break disconnectors offers various possibilities to adapt the switchgear to changed requirements in substations, even while the units are in service :

- Modification from side-by-side into in-line arrangement or vice versa
- Refurbishment to higher rated currents and short-circuit capabilities
- Later installation of earthing switches
- Modification from earthing switch no. 1 to earthing switch no. 2 or vice versa



Current path for 2500 A with copper leads in the contact head

Pantograph Disconnectors

The photo on the right illustrates the most important components of the pantograph disconnector:

1 Scissors arms
2 Bearing frame
3 Support insulator
4 Rotating insulator
5 Motor operating mechanism

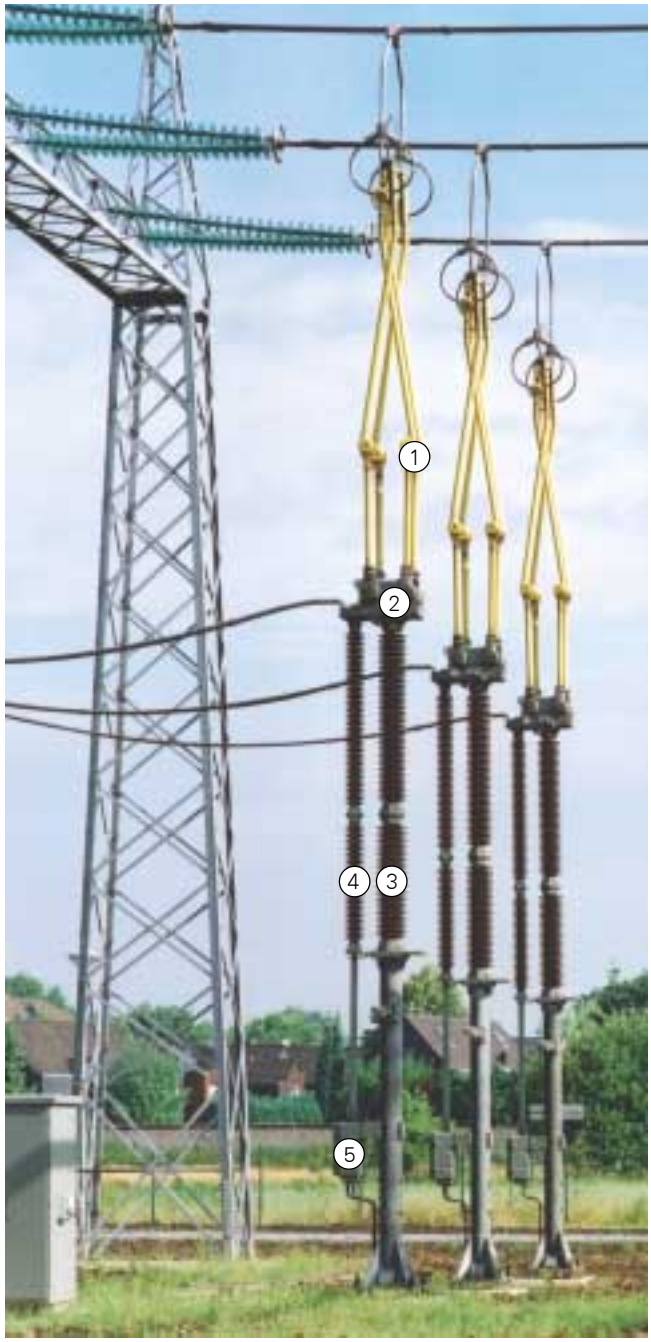
In the joints rotary contact systems with high thermal and dynamic current carrying capacity, are used for current transfer. The geometry of the pantograph ensures an optimal operating behaviour. The rigidity of the scissors arms prevents an opening during a short-circuit. Ice loads of up to 20 mm can be broken without difficulty.

The position of the fixed contact can change, depending on weather conditions (solar radiation or ice load) and substation design. **RUHRTAL** pantograph disconnectors provide a large catch range in which the scissors arms are short-circuit-proof in all positions.

The smooth movement during the switching operation is typical for the **RUHRTAL** pantograph disconnectors. The specific contact force is pre-adjusted at our factory and remains unchanged during the entire lifetime.

In both end positions of the disconnector the lever gear unit in the bearing frame is switched beyond the dead-centre position. A change of the switching position caused by external forces is thus not possible.

The **RUHRTAL** production programme for pantograph disconnectors covers the voltage ranges from 123 kV up to 300 kV, alternatively with a common operating mechanism or with one operating mechanism per phase. For voltages above 300 kV disconnectors with single pole operating mechanisms are used.



Components of the pantograph disconnector

Vertical Break Disconnectors

Vertical break disconnector, ON position

The current path of the vertical break disconnector opens in the vertical direction and thus makes small phase distances possible.
The current path of the **RUHRTAL** vertical break disconnector carries out two movements:

- A vertical swinging movement
- A rotary movement around its own longitudinal axis

The rotary movement produces the contact force and breaks possible ice coatings.

In both end positions the lever gear unit is switched beyond the dead-centre position. As a result, in the closed position (switching position ON) the current path is locked, even in the case of a short-circuit. In the switching position OFF the current path always remains open.

The great distance between supporting and rotating insulator guarantees the dielectric strength of the parallel insulation, even in the case of high loads under saline fog conditions.

The moving part of the current path is one single subassembly which is assembled and pre-adjusted at our factory.

Vertical break disconnector, OFF position

Double Side Break Disconnectors

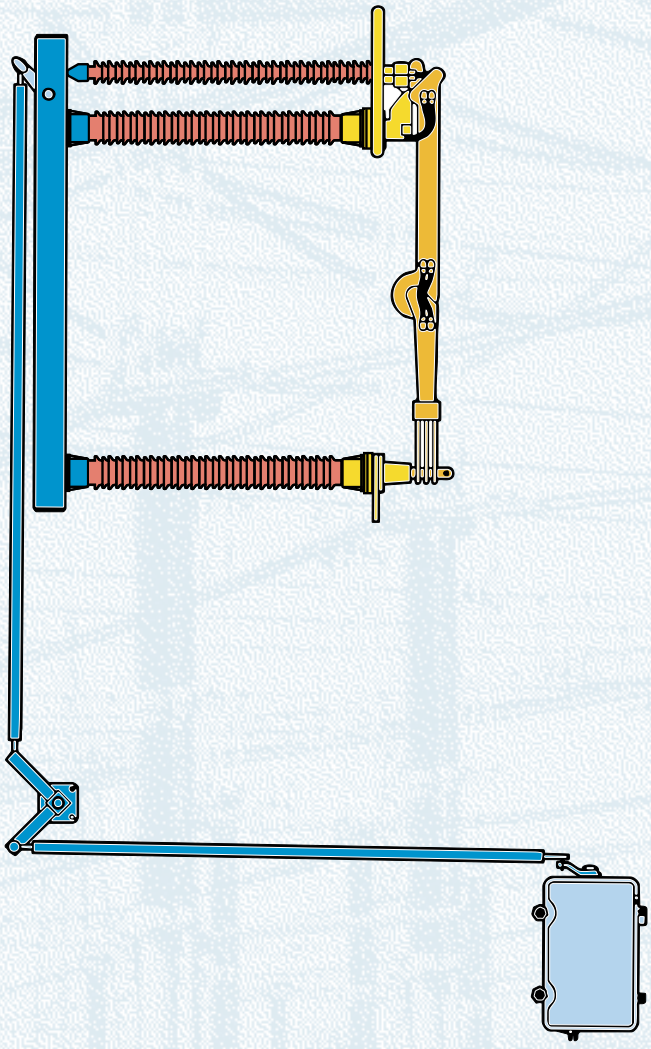
Double side break disconnector, special design for 800 kV

This disconnector type consists of three supporting columns, the middle one is rotatable and carries the main current path.

Double side break disconnectors are mainly used in substations where small phase distances must be kept and a vertical opening of the current path is not possible. In the same way as for the other types of disconnectors the contact force is produced by the spread type contact fingers.

Knee-Type Disconnectors

This disconnector type requires small space, in the horizontal as well as in the vertical direction.
RUHRTAL knee-type disconnectors are mainly used in 123 kV indoor substations. Typical arrangements are wall or underslung mountings.
Due to the middle joint of the main current path, the distance of the opened disconnector to adjacent substation components is extended.



Wall-mounted knee-type disconnector, ON position

Switch Disconnectors

Switch disconnector

The **RUHRTAL** product range comprises also double side switch disconnectors from 72.5 kV up to 245 kV for special purposes. They are suitable for switching low currents, for instance magnetising currents of transformers operating at no-load.

We can advise you on the decision whether our switch disconnectors are suitable for your specific requirements.

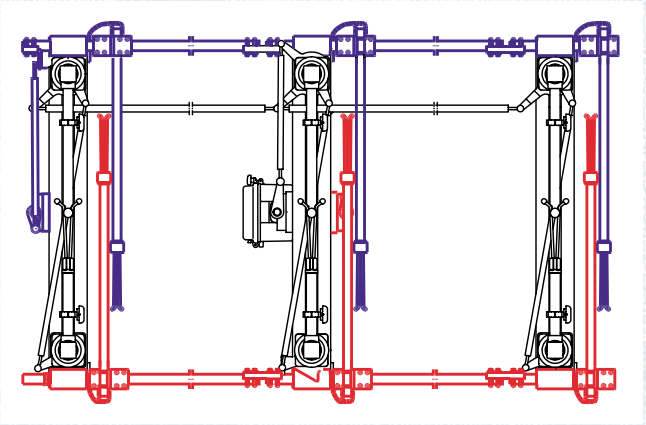
Earthing Switches

The use of earthing switches ensures that the switchgear or other parts of the electric circuit are de-energised and grounded.

RUHRTAL free-standing earthing switches can be offered for all voltage levels up to 800 kV.

If necessary, **RUHRTAL** disconnectors can be equipped with one or two built-on earthing switches.

Additionally, it is possible to design the earthing switches for switching of induced inductive and capacitve currents in accordance with IEC 61129.



Top view of a centre break disconnector with two earthing switches (first earthing switch red, second earthing switch blue)

Motor Operating Mechanisms

The reliability of our high voltage switchgear is mainly determined by the high quality of the **RUHRTAL** motor operating mechanisms.

The **RUHRTAL** motor operating mechanisms consist of three main subassemblies:

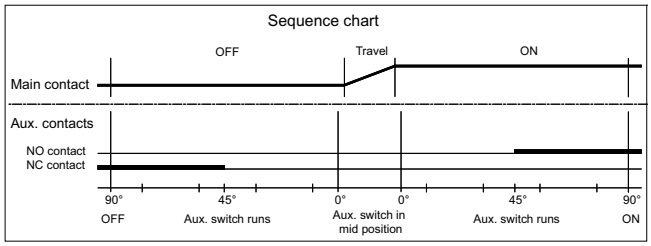
- Aluminium casting housing with door (1), degree of protection IP55
- Gear unit (2) with motor
- Electrical equipment with auxiliary switch (3)

Motor operating mechanism

The motor operating mechanism can also be operated manually. For this a hand crank is inserted into an opening easily accessible from the ground.

The opening is secured by a swivel-mounted shutter. Opening the shutter automatically interrupts the motor and control circuit, protecting the site personnel against inadvertent operation of the high-voltage switchgear by remote control.
For maintenance work the operating mechanism can be blocked additionally by an interlocking device.

The **RUHRTAL** auxiliary switch is form-fit connected to the gear and indicates the switching position absolutely reliably, thereby guaranteeing the safe operation of the substation.



The auxiliary switch moves and the position indication is cancelled. Then the disconnector operates until the end position is reached. Only after the main contacts have reached the end position, does the auxiliary switch move again to indicate the switching position.

This process guarantees that the ON position is only indicated, when the switchgear can carry rated currents safely and withstand short circuit currents.

Further advantages of the **RUHRTAL** motor operating mechanisms:

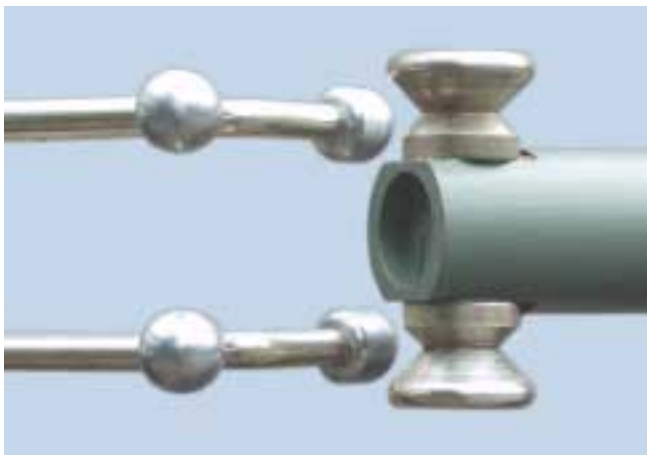
- The complete electrical equipment is fixed on a mounting plate. In case of replacement of the motor, this plate can be swung out of the housing by loosening three bolts without removing the wiring.
- The **RUHRTAL** motor operating mechanisms are equipped with a diagnostic interface for measuring motor current and motor voltage. This measuring device can be procured from **RUHRTAL** on request.

Contact Systems

The **RUHRTAL** contact systems have proved their reliability during decades of operation.

The most important characteristic features are:
- The contact systems consist of only a few parts
- They are self-cleaning
- The contact fingers are of highly welding-resistant material
- The contact fingers are self-resilient
- The contact force remains stable throughout its lifetime
- No adjustment is ever necessary
- The contact system can withstand heavy ice conditions
- In case of short-circuits the contact force increases automatically

On request we offer dry-lubricated contact systems, which allow 20 years of maintenance-free operation. 2500 operating cycles have been verified. Re-greasing which is admissible according to IEC 60129 after 1000 operating cycles is not necessary. Thus the maintenance costs for all **RUHRTAL** centre break disconnectors, double side break disconnectors, vertical break disconnectors, knee-type disconnectors and earthing switches are reduced considerably. The optimised geometry of the current paths and the contacts guarantees their efficiency and a maximum lifetime.



Opening main contacts of a centre break disconnector

Commutating Contacts

Contact system of a pantograph disconnector with commutating contacts

Commutating contacts are available for all types of disconnectors. They are also suitable for later installation.
They are capable of transferring load currents from one busbar to another without interruption in accordance with the requirements of IEC 61128.

RUHRTAL commutating contacts for non-destructive load transfer as per IEC 61128 can also be used for switchgear of other manufacturers.

Innovative Technology of **RUHRTAL**

- Since 1971 **RUHRTAL** 245 kV disconnectors for 400 kA peak current and 160 kA-1s short- time current have been used in the KEMA test laboratories.
- **RUHRTAL** 150 kV disconnectors with earthing switches for 400 kA peak current and 160 kA-1s short-time current are in use at the PEHLA high-power testing station of Siemens AG in Berlin
- 420 kV **RUHRTAL** disconnector with integrated surge arrester of Siemens AG
- 300 kV and 420 kV **RUHRTAL** earthing switches for quenching ferroresonance currents
- 245 kV **RUHRTAL** five-columns switch disconnector with four isolating distances in series and one common operating mechanism. This type of disconnector is used for switching cable-charging currents.

Centre break disconnector with integrated surge arrester

Five-columns switch disconnector

For further Information

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Please send more detailed information to the following subjects:

- ☐ **RUHRTAL** Centre Break Disconnector
- ☐ **RUHRTAL** Pantograph Disconnector
- ☐ **RUHRTAL** Vertical Break Disconnector
- ☐ **RUHRTAL** Double Side Break Disconnector
- ☐ **RUHRTAL** Knee-Type Disconnector
- ☐ **RUHRTAL** Earthing Switches
- ☐ **RUHRTAL** Switch Disconnectors
- ☐ **RUHRTAL** Motor Operating Mechanisms
- ☐ **RUHRTAL** Contact Systems

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