Outdoor switches for railway lines

single- and double-pole design
rated voltage up to 29 kV
rated current up to 2000 A

DRIBO, spol. s r.o.

Pražákova 36
619 00 Brno
Czech Republic

Tel.: +420 533 101 111, **Fax:** +420 543 216 619, **E-mail:** dribo@dribo.cz, **Internet:** http://www.dribo.eu

ISO 9001
BUREAU VERITAS
Certification

General

These outdoor switches are specially designed for railway applications. They meet the specifications according to the EN 50152-2.

The live parts are in silver-plated copper with galvanization. All steel parts are hot galvanized. Upon special request an additional coating of paint (RAL 7033) is available. There is increased resistance against corrosion through the use of non-rusting materials and surface protective coating.

Each switchgear is fitted with an earth connector screw. Optionally a fixed earthing switch can be mounted.

The types of outdoor switch-disconnector and outdoor disconnecting switch mostly differ through the application of different cast-resin insulators (length and height of creepage path) as well as in the base frames (sheet-metal and U-profile frame).

Operating conditions

The equipment can be installed in places at an altitude of up to 1000 meters above sea level. At an altitude above 1000 meters the rated insulation level of the switchgear must be adjusted accordingly.

The switchgears are designed for use under normal operating conditions in compliance with EN 62271-1.

According to this specification the following limit values apply:

- maximal ambient temperature: + 40°C,
- maximal 24 hours average temperature: + 35°C,
- minimal ambient temperature: – 40°C.

Outdoor load disconnectors for railway lines – Fla 15/97

Basic research on switching in a vacuum began in Germany during the Seventies. At this time low-oil switches had become firmly established in medium voltage networks, based on their reliable operation over decades, and were accepted by users as reliable devices. In laboratory tests it proved that the vacuum switches were superior by far to the conventionally applied switching principles.

All these requirements necessitate a switching unit with electrical properties that preferably do not change throughout its service life. The vacuum interrupter is hermetically sealed and fitted with the purest of materials. For reliable switching the required vacuum remains intact throughout the entire service life. Also the contact resistance remains at very low values and does not increase due to age because there is practically no oxidation process in a vacuum.

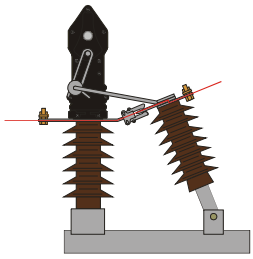
Based on an patented insulation system developed by us there is also no liquid or gaseous medium required for the external insulation strength of the vacuum interrupters.

Advantages:

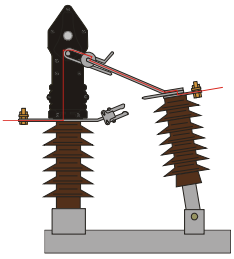
- distinct operating separation between main and switching contact system,
- patented switching kinematics,
- making and braking via the shunted vacuum interrupter,
- low contact erosion,
- no arcing effect on the main contact system.

Operating mode of Fla 15/97-1B (2B)

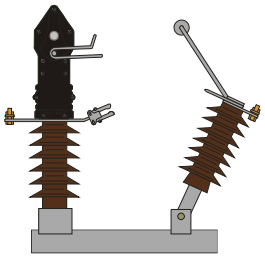
Breaking operation



Switch in "ON" position. Main and shunted circuit (vacuum interrupter) closed.

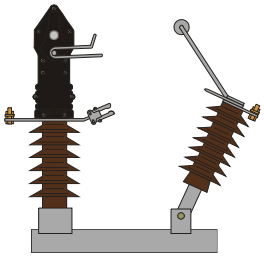


Switch during disconnection phase. The main circuit is opened, the operating current is commutated to the shunted circuit. Vacuum interrupter is shunted.

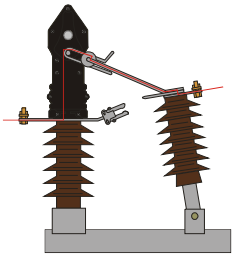


Switch in "OFF" position. Main and shunted circuit (vacuum interrupter) opened. Visible isolating distance is provided.

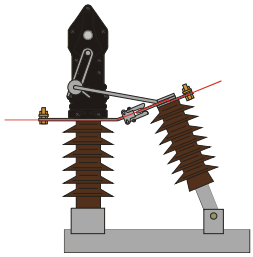
Making operation



Switch in "OFF" position. Main and shunted circuit (vacuum interrupter) opened.



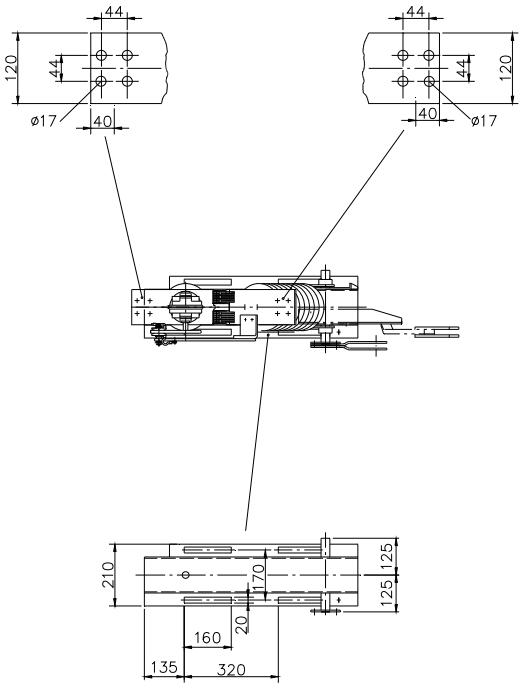
Switch during the making phase. The main circuit is still open while the operating or short-circuit current (max. 16 kA) is switched on via the shunted circuit.

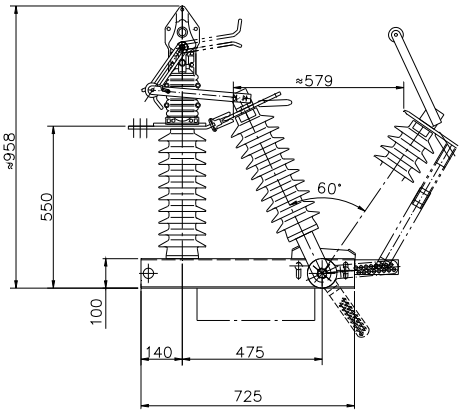


Switch in "ON" position. Main and shunted circuit (vacuum interrupter) closed. Vacuum interrupter is shunted.

Single-pole outdoor load disconnector Fla 15/97-1B

rated voltage	U_r	25 kV	15 kV	25 kV	27,5 kV	29 kV
rated current	I_r	2000 A	2000 A	2000 A	2000 A	630 A
rated insulation level	U_{Nm}	27,5 kV	17,5 kV	27,5 kV	29 kV	31,5 kV
rated impulse voltage	U_{Ni}	250 kV	125 kV	170 kV	185 kV	185 kV
short-duration power-frequency test level	U_a	95 kV	50 kV	95 kV	80 kV	80 kV
rated frequency	f_r	50 Hz	16 ⅔ Hz	50 Hz	50 Hz	50 Hz
rated breaking current	I_1	2000 A	2000 A	2000 A	2000 A	630 A
rated cable-charging breaking current	I_{4a}	32 A	-	32 A	32 A	32 A
rated short-time withstand current	I_k	20 kA	20 kA	20 kA	20 kA	20 kA
rated duration of short-circuit current	t_k	3 s	3 s	3 s	3 s	3 s
rated peak withstand current	I_p	50 kA	50 kA	50 kA	50 kA	50 kA
rated short-circuit making current	I_{ma}	16 kA	16 kA	16 kA	16 kA	16 kA
creepage distance approx.	s	964 mm	765 mm	765 mm	1200 mm	1200 mm
weight		48 kg	45 kg	45 kg	50 kg	50 kg



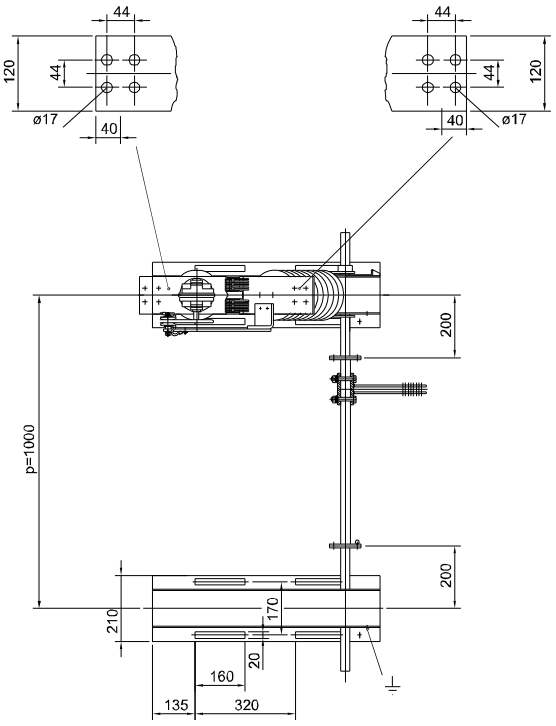


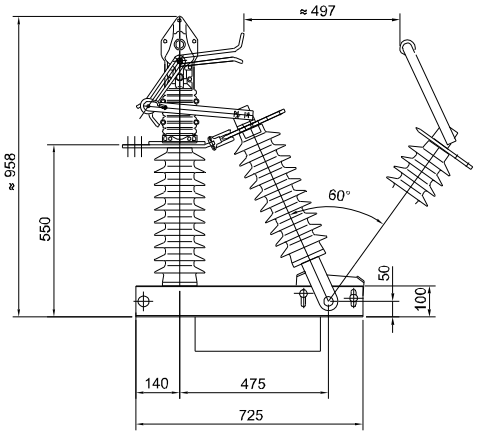
Version for Czech railways (in the table marked)
(U_r = 25 kV, I_r = 2000 A, s = 964 mm)

Double-pole outdoor load disconnector Fla 15/97-2B

- two load disconnectors Fla 15/97-1B coupled by shaft with adjustable square-head operating crank

rated voltage	U_r	25 kV	25 kV
rated current	I_r	2000 A	2000 A
rated insulation level	U_{Nm}	27,5 kV	27,5 kV
rated impulse voltage	U_{Ni}	250 kV	185 kV
short-duration power-frequency test level	U_a	95 kV	80 kV
rated frequency	f_r	50 Hz	50 Hz
rated breaking current	I_1	2000 A	2000 A
rated cable-charging breaking current	I_{4a}	32 A	32 A
rated short-time withstand current	I_k	20 kA	20 kA
rated duration of short-circuit current	t_k	3 s	3 s
rated peak withstand current	I_p	50 kA	50 kA
rated short-circuit making current	I_{ma}	16 kA	16 kA
creepage distance approx.	s	964 mm	1200 mm
distance between phases	p	1000 mm	1000 mm
weight		110 kg	110 kg



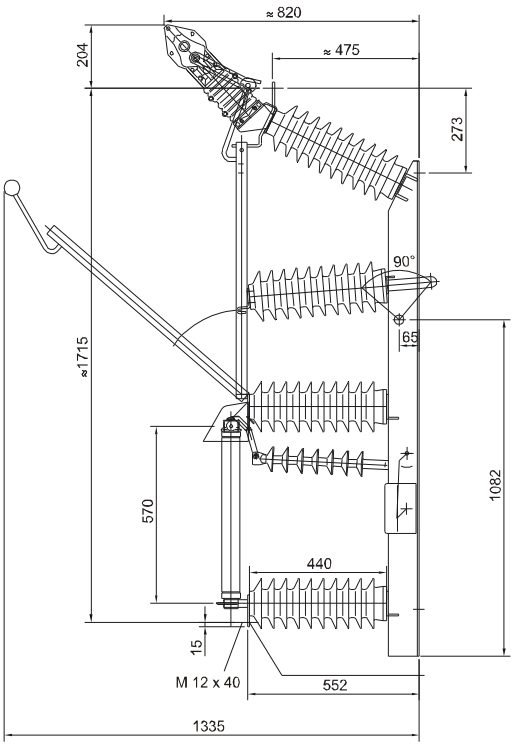


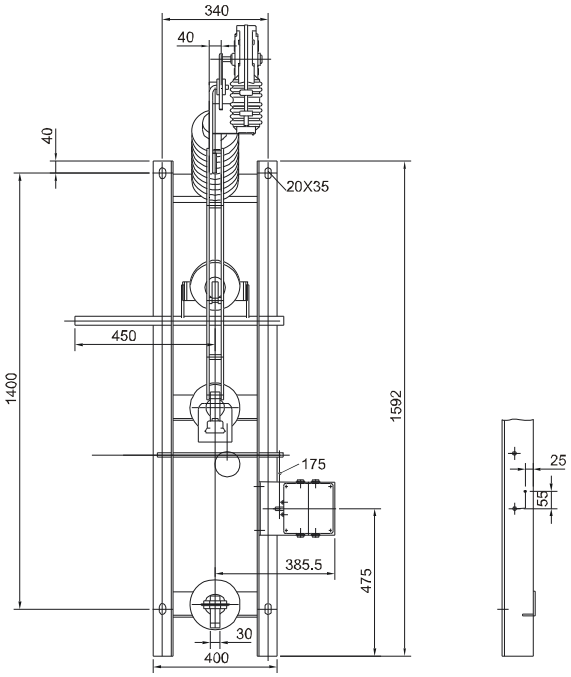
Version for Czech railways (in the table marked) (U_r = 25 kV, I_r = 2000 A, s = 964 mm)

Single-pole outdoor load disconnector Fla 15/97-6410

- for vertical assembly
- type Fla 15/97-6410 SM with fuse signalling via mounted auxiliary switch
- type Fla 15/97-6410-1B without fuse signalling

rated voltage	U_r	25 kV
rated current	I_r	400 A
rated insulation level	U_{Nm}	27,5 kV
rated impulse voltage	U_{Ni}	250 kV
short-duration power-frequency test level	U_a	95 kV
rated frequency	f_r	50 Hz
rated breaking current	I_1	400 A
rated cable-charging breaking current	I_{4a}	32 A
rated short-time withstand current	I_k	16 kA
rated duration of short-circuit current	t_k	1 s
rated peak withstand current	I_p	40 kA
rated short-circuit making current	I_{ma}	16 kA
creepage distance approx.	s	964 mm
weight		85 kg





Single- and double-pole outdoor load disconnector FlaV 25-2000-16-1B / -2B

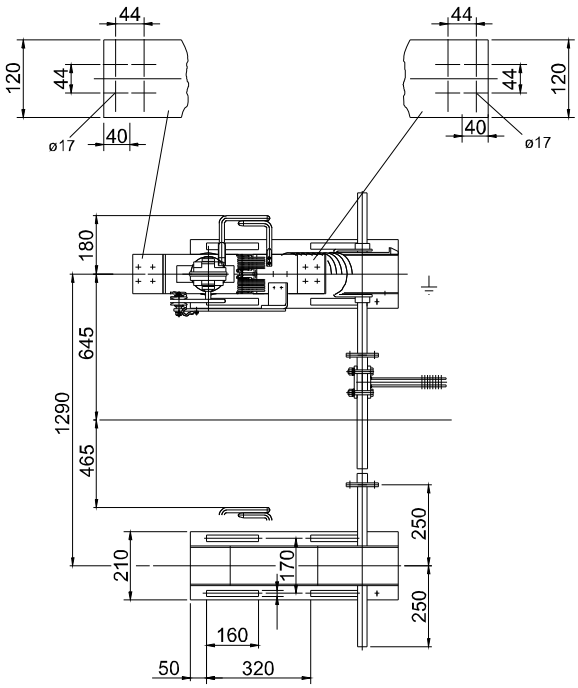
These load disconnectors are innovations developed specifically for the railway sector.

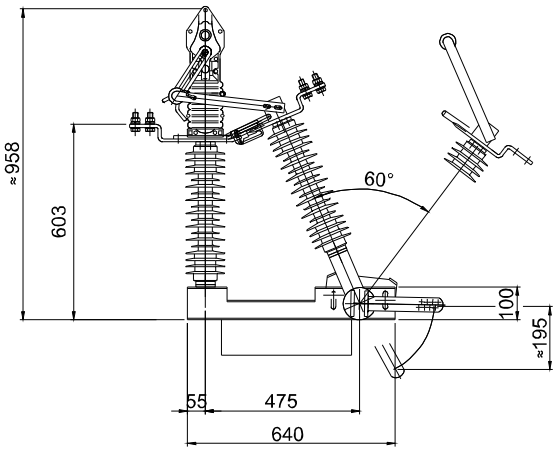
Compared with the Fla 15/97-1B type, they offer increased short-circuit withstand capability. For this to be realised, it was necessary to provide the switching device with additional pre-arcing electrodes.

Because of its modified functional characteristics, the switch-disconnector switch is capable of switching not only its rated making current of I_r 2000 A but also a short-circuit current of I_{ma} 40 kA. Load-breaking operations continue to be carried out by a vacuum tube integrated into the switchgear cabinet. The silicone compound insulators, with a minimum creepage path of 1420 mm, may be regarded as another significant innovation.

This will ensure the use of the switchgear even in extremely adverse atmospheric conditions.

FlaV 25-2000-16		-1B	-2B
rated voltage	U_r	25 kV	25 kV
rated current	I_r	2000 A	2000 A
rated insulation level	U_{Nm}	27,5 kV	27,5 kV
rated impulse voltage	U_{Ni}	250 kV	250 kV
short-duration power-frequency test level	U_a	95 kV	95 kV
rated frequency	f_r	50 Hz	50 Hz
rated breaking current	I_1	2000 A	2000 A
rated short-time withstand current	I_k	16 kA	16 kA
rated duration of short-circuit current	t_k	1 s	1 s
rated peak withstand current	I_p	40 kA	40 kA
rated short-circuit making current	I_{ma}	40 kA	40 kA
creepage distance approx.	s	1420 mm	1420 mm
distance between phases	p	-	1290 mm
weight		45 kg	100 kg





Outdoor disconnectors for railway lines – FTr

For many years now the assembled arc interrupting horns have proven to be most satisfactory, also with our three-pole horn-break switches used in power supply companies.

The disconnector is also used as a load disconnector for electrical connection and disconnection of contact line sections and is capable of reliably coping with small-type currents in dependence of the switching speed and atmospheric influences.

The large spacing offers maximum operational reliability. The open design means no special maintenance is required.

This outdoor disconnector is characterized by maximum security of supply and operational reliability.

A simple conversion of the FTr-1B to a load disconnector Fla 15/97-1B can be carried out subsequently, at any time.

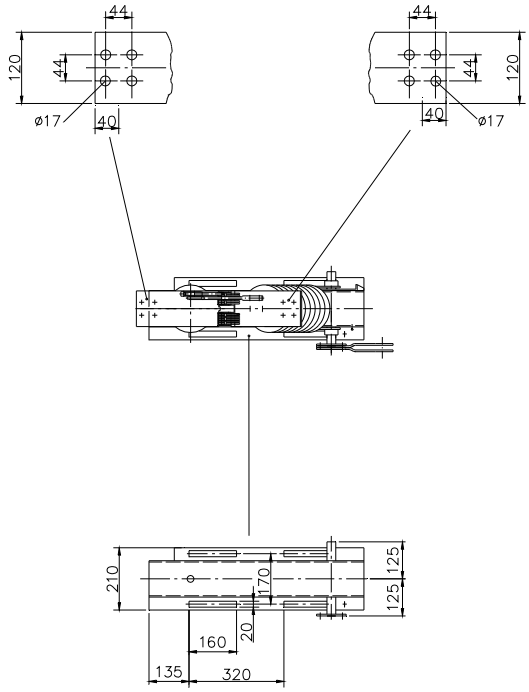
Operation is either carried out manually via a linkage actuator or with a motorized actuator (remote control).

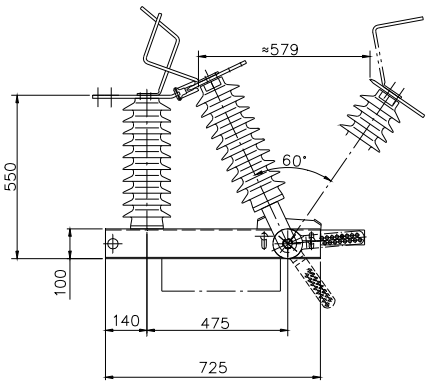
Advantages:

- maximum supply and operational reliability based on the familiar DRIESCHER quality,
- high degree of operator protection based on the large isolating distance,
- possibility to vary the rated insulation level,
- can be replaced at any time with the load-break switch Fla 15/97-1B,
- minimum amount of maintenance,
- optimised contact system.

Single-pole outdoor disconnector FTr 25-2000-1B

rated voltage	U_r	25 kV	25 kV	27,5 kV
rated current	I_r	2000 A	2000 A	2000 A
rated insulation level	U_{Nm}	27,5 kV	27,5 kV	29 kV
rated impulse voltage	U_{Ni}	250 kV	170 kV	185 kV
short-duration power-frequency test level	U_a	95 kV	90 kV	80 kV
rated frequency	f_r	50 Hz	50 Hz	50 Hz
rated transformer breaking current	I_3	9 A	9 A	9 A
rated cable-charging breaking current	I_{4a}	6 A	6 A	6 A
rated short-time withstand current	I_k	20 kA	20 kA	20 kA
rated duration of short-circuit current	t_k	3 s	3 s	3 s
rated peak withstand current	I_p	50 kA	50 kA	50 kA
creepage distance approx.	s	964 mm	775 mm	1200 mm
weight		45 kg	45 kg	45 kg



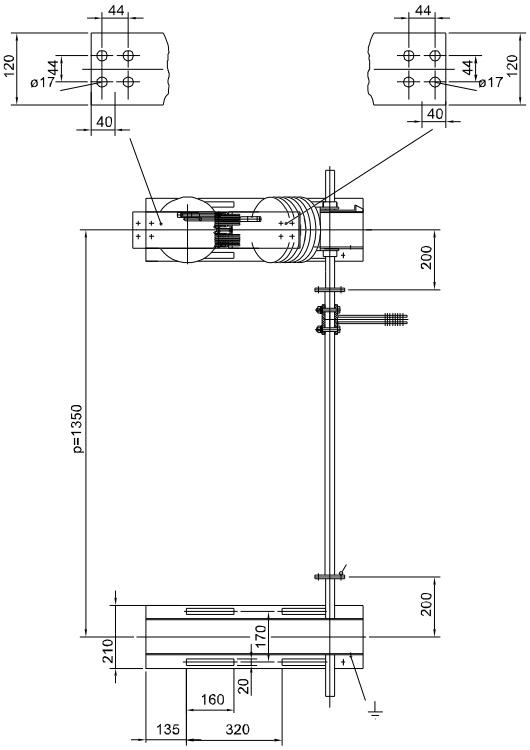


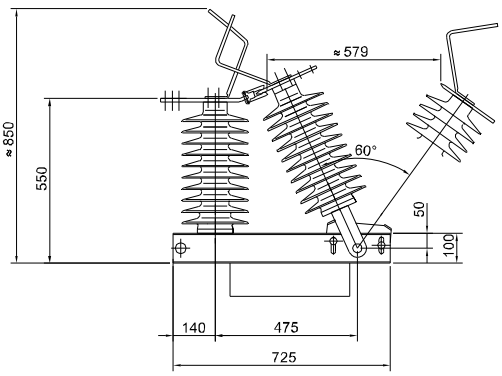
Version for Czech railways (in the table marked) (U_r = 25 kV, I_r = 2000 A, s = 964 mm)

Double-pole outdoor disconnector FTr 25-2000-2B

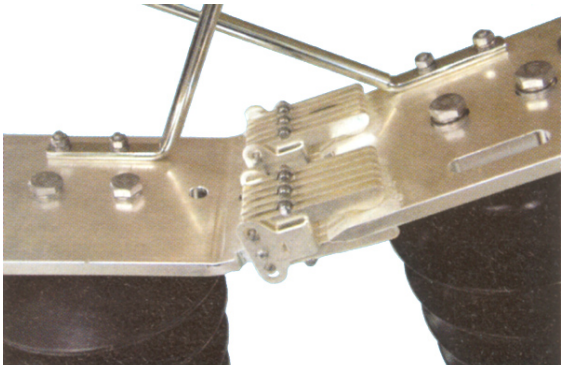
- two disconnectors FTr 25-2000-1B coupled by shaft with adjustable square-head operating crank

rated voltage	U_r	25 kV
rated current	I_r	2000 A
rated insulation level	U_{Nm}	27,5 kV
rated impulse voltage	U_{Ni}	250 kV
short-duration power-frequency test level	U_a	95 kV
rated frequency	f_r	50 Hz
rated transformer breaking current	I_3	9 A
rated cable-charging breaking current	I_{4a}	6 A
rated short-time withstand current	I_k	20 kA
rated duration of short-circuit current	t_k	3 s
rated peak withstand current	I_p	50 kA
creepage distance approx.	s	1600 mm
distance between phases	p	1350 mm
weight		100 kg



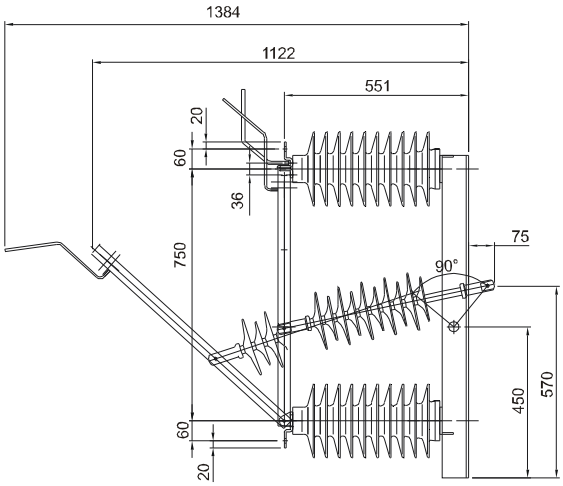


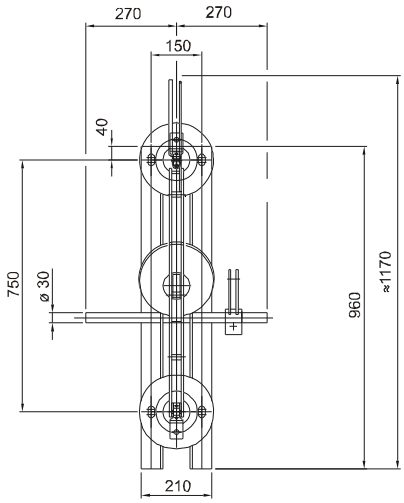
Contact system of load disconnectors Fla 15/97-1B and 2B and disconnectors FTr 25-2000-1B and 2B



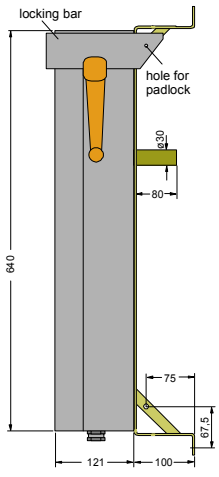
Single-pole outdoor load disconnector FTr 25-630-S1B

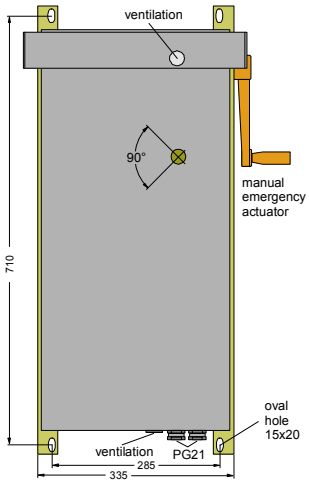
rated voltage	U_r	25 kV
rated current	I_r	630 A
rated insulation level	U_{Nm}	27,5 kV
rated impulse voltage	U_{Ni}	250 kV
short-duration power-frequency test level	U_a	95 kV
rated frequency	f_r	50 Hz
rated transformer breaking current	I_3	9 A
rated cable-charging breaking current	I_{4a}	6 A
rated short-time withstand current	I_k	20 kA
rated duration of short-circuit current	t_k	3 s
rated peak withstand current	I_p	50 kA
creepage distance approx.	s	1550 mm
weight		50 kg





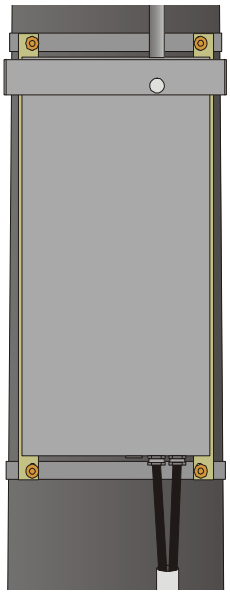
Universal motor operated drive UM 90





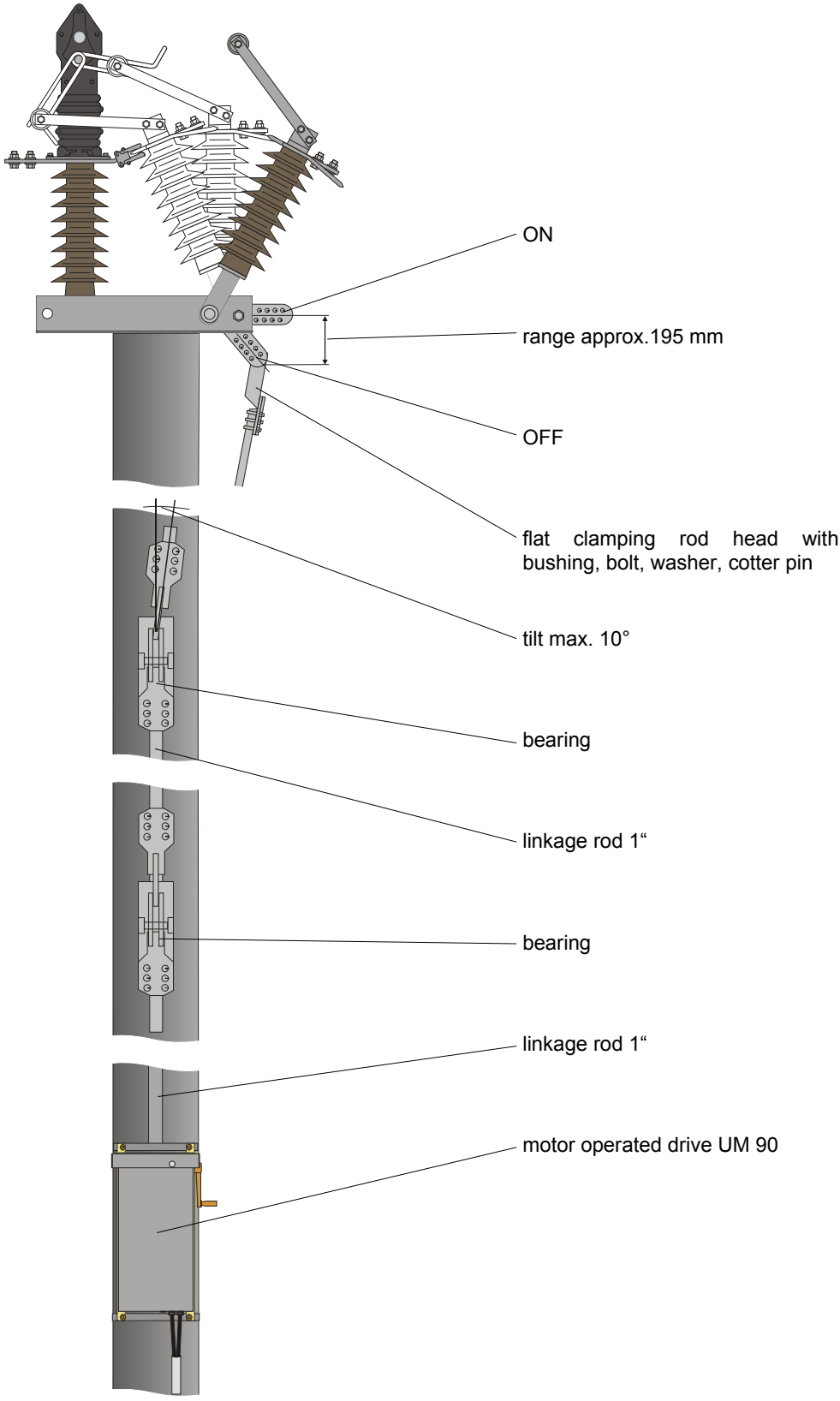
Universal motor operated drive UM 90

- for DC, alternatively 24, 60, 110 or 220 V, for AC, alternatively 110 or 230 V.
- rotation angle 90°,
- for load disconnectors Fla 15/97-1B and disconnectors FTr 25-2000-1B crank inter-measure approx 140 mm,
- weight approx. 35 kg.



Motor-operated mechanism UM-90 mounted on concrete pole. Motor-operated mechanism secured with a padlock against unauthorized operation and opening.

Operation arrangement



Maximal distance between bearings is 3.5 m. All operating components are hot galvanized.