ASSEMBLY AND MAINTENANCE INSTRUCTIONS

PD 035/12/2012-A

OUTDOOR SWITCH DISCONNECTOR

horizontal working position

mounted into the MV power line on top of a pole

TYPE **CUB 2**

12, 25 a 38,5 kV, 400 A (630 A)

ISO 9001:2009
ISO 14001:2005

ivep®

GENERAL INFORMATION

The purpose of this assembly regulation is to specify conditions and procedures for:

- the replacement of inoperative switch disconnectors installed in the MV 22 kV outdoor power lines
- the installation of section switch disconnectors into the existing or to-be-constructed outdoor MV 22 kV power lines

This installation is a complement to the “Technical Conditions” for CUB 2 outdoor switch disconnectors of general-purpose design, for work in energized power systems, with horizontal or vertical working position and mounted below the overhead power lines. The quoted and the interrelated standards are specified in the Technical Conditions. The installation procedures have been extended to meet the CSN 33 3301 stipulations (Construction of outdoor overhead power lines with rated voltages up to 52 kV).

The assembly and connection guidelines for outdoor power lines, incl. the works procedures to apply for works carried out on energized systems and the protection by earthing are not subject of this assembly regulations. The above mentioned steps are carried out in accordance with regulations and standards of the installation and power utility companies.

DESCRIPTION

Normally the switching devices are equipped with insulators made of cycloaliphatic resin (on request also of ceramic or silicon insulators). They are classified as switching devices for general use, class E1.

The CUB outdoor switch disconnectors are intended to be used in outdoor 25 kV power networks to disconnect the MV/LV distribution transformers and overhead branch lines. They are especially suitable for mounting on poles installed at the transition points between MV overhead and cable lines. The installation procedure is quite easy. The switch disconnector of symmetrical phase pitch is fixed to the existing concrete pole of 9; 10.5 or 12 m height, and connected into the power line. The outdoor bare cables of the overhead line are fixed to tensile insulators anchored in the supporting structure of the switch disconnector.

The design and the quality of material used in the production, as well as the environmental issues are governed by the principles of quality control to the international standards ISO 9001 and ISO 14001.

Owing to its general-purpose design the switch disconnector features a lot of engineering advantages, such as:

- the installation of single-phase switching blocks to various types of supporting frames with symmetrical phase pitch;
- mounting the devices horizontally or vertically to various types of poles: concrete poles of 9; 10.5 or 12 m height, wooden poles, lattice type poles;
- the possibility of mounting the switching devices at various positions on the pole: at or above the pole cap. Switching devices fixed at or above the pole cap have a symmetrical pole pitch. When mounted below the pole cap the switching devices feature asymmetrical phase pitch.
- the possibility of replacement of the corresponding arc-quenching chambers and replacement of arcing contacts;
- the use of hand or motor operated drive mechanism supplied by various manufacturers;
- the possibility of mounting of sensors to monitor the limit ON or OFF positions of the switching device;
- minimum requirements on maintenance and revision, achieved by the adequate electrical and mechanical dimensioning of all parts of the Reliabreak type, maintenance free arc-quenching chamber;
- the easy installation and adjustment works that require only a minimum adjustment works on the pole itself. The adjustment of the phase pitch takes place at the manufacturer´s which also provides for the high accuracy of switching.

The CUB 2 three-pole switch disconnectors of outdoor design consist of three separate phase blocks, fixed via a carrying element of the frame to the support. The interconnection of the three separate phase blocks between themselves and the manual drive is done using the control shaft to which the control handle is fixed. The angle adjustment of the control handle on the shaft is done at the manufacturer´s. Switch disconnectors with plastic insulators feature a reduced weight of the movable part of the system, thus increasing the scope of usage of the switching device for both the horizontal and vertical mounting. The basic design of the switch disconnector is shown in Fig. 1.

Fig. 4 shows a three-pole switch disconnector secured to a pole using two supports and sleeves.

Fig. 3 shows a phase block of the switch disconnector:

The CUB 2...switch disconnector of outdoor design can be controlled using manual drive mechanisms of various manufacturers. The operating angle of control handle is 180°. The drive can be secured in its limit positions by a lock. The design of the manual drive mechanism is adequate for mounting the drive on wooden, concrete or lattice-type steel pole. Movement that occurs in the drive is transferred through tubular pull rods onto a control lever placed on the shaft of the switching device. The pull rods pass through the so called rocking bearings, fixed to the pole. The drive, together with the pull rods, prevents the switching device against spontaneous movement when it is set in the limit position, caused by gravity, shocks or earthquakes. On poles with total length of the pull rods of more than 12 m it is recommended to use the reversing inter-bearings – see Fig. 6. In such a case the weight of the pull rods placed in between the reversing bearings acts against the weight of the other pull rods, thus limiting the force necessary for the control of the switching device. The drive mechanism is capable of switching OFF the section switch, even in case of ice accretion, providing the ice thickness has not grown above 20 mm (class 20). All parts of the drive mechanism, incl. the pull rods and bearings, are protected with hot galvanization. The switching ON-OFF positions are marked on the drive mechanism in a permanent and durable way.

The recommended number of supporting bearings, depending on the total length of the pole, is shown in Table 1.

Both the supporting frame and the drive are equipped with the M12 earthing clamp for the connection of protective conductor. The connection points to connect the protective earthing conductors are identified in accordance with the stipulations of the CSN IEC 417-1 standard, label identifier 5019 (corresponds to IEC 417-1). The earthing system meets the requirements of the CSN 33 0360 standard.

The CUB 2... outdoor type switch disconnector features an adequate mechanical strength and service life, which has been verified by 2000 C-O no-load operating cycles.

The mode of fixing the overhead power lines is not subject of this description.

Table 1

Number of rocking bearings as a result of the pole length

Total length of the control pull rod	Recommended number of rocking bearings
up to 10.5 metres	1
up to 12 metres	2
up to 15 metres	3 (or 1 rocking bearing + 2x inversion bearings)

Fig. 2 shows a dimensional sketch of the CUB 2 switch disconnector with manual drive, mounted on a concrete pole of circular cross-section. Fig. 10 shows the dimensions and a list of diameters of the JCE and Elektrovod SENEC concrete poles, including the auxiliary sleeves and holders.

ASSEMBLY REGULATIONS

Basic works on site consist in the following work steps:

- mounting and securing the switch disconnector, the drive and guiding bearings onto the pole;
- establishing of mechanical links between the switch disconnector and the control pull rod; adjustment of limit positions;
- connection of power lines and earthing conductors;
- earthing of the switch disconnector and the drive.

The switch disconnector is mounted to the pole using 2 supports and the R120 (R130) sleeves - see Fig. 4 and 2, item H.

Installation of the drive mechanism

As a rule the manual drive (item 1, Fig. 2) and the control pull rods are fixed to the pole at a position which is turned round by 90° against the power line (position in parallel to the line is also allowed).

Installation of rocking bearings

The lower (item 2, Fig. 2) and upper (item 3, Fig. 2) rocking bearings are fixed to the pole using sleeves The upper rocking bearing is fitted out with a single-arm clamping end piece with barrel-shaped sleeve, which makes it possible to swing out the upper pull rod by up to 10° to either side.

Assembly of the pull rods and the adjustment of the section switch stroke

Common types of the poles, i.e. the 9/6; 10,5/6 and 12/6 types are each provided with three pull rods of various length, in accordance with the pole type. The lower operation pull rod (position 4, Fig. 2) is provided with the G1“ thread from one side. This threaded end is then screwed into the driving pull rod coupling, and the other end fixed in the stirrups of the lower rocking bearing clamping terminal. The middle position pull rod (position 5, Fig. 2) consists of a threadless tube coupling, clamped into the rocking bearing stirrups. The upper control pull rod (position 6, Fig. 2) is then clamped into the stirrups of the rocking clamping terminal (position 7, Fig. 2), linked through a bolt with the cut-in lever (position 8, Fig. 2). The clamping point is situated in the last but one hole, starting from the section switch shaft, at its one side, and into the single-arm rocking clamping terminal (position 7, Fig. 2) of the upper rocking bearing (position 3, Fig. 2) at its other lower side.

Adjustment of the drive mechanism

Put the section switch and the drive mechanism into ON switching position. The end stop for both the ON and OFF switching position has been carefully adjusted at the manufacturer´s plant.

Measure and adapt the length of the medium position pull rod pipe (position 5, Fig. 2), and fix temporarily the pull rod into the clamping terminals (using e.g. the central stirrup of each of the terminal).

ATTENTION!

Incorrect assembly of the sleeves with pull rod bearings results in the decrease of the stroke and the non-achievement of the load-break switche´s ON and OFF positions. Verify that a displacement of the hand drive lever to an angle of 90º from the pole axis causes the same angle deviation (90º) at all the interbearings.

In the B point inspect that the stop rocker arm on the section switch shaft bears on the stops in both the ON and OFF switching positions

Check in the **C** inspection point whether the barrel-shaped sleeve on the cut-in lever is linked via a pull rod with the barrel-type sleeve of the single-arm clamping end piece of the upper rocking bearing.

In the **F** inspection point (see Fig. 3) two positions have to be checked up:

- the **F1** position – the switch disconnector is ON. In this position it is to check whether the **U** carrier that forms a part of the main movable path, snaps in behind the adjustable breaking levers of the **H** arc-quenching chamber; the gap between the above points should be at least 5 mm;

- the **F2** position – the switch disconnector is in the intermediate position. In this position the current flowing through the main current-carrying path reverts to the arc-quenching path leading in parallel. The current passes now through the arc-quenching chamber. In this intermediate position, in which the main contact is closed (contact surfaces touching each other), a contact has to be established between the adjustable breaking lever of the **H** chamber and the **U** carrier.

The adjustment of the phase switching blocks takes place in the manufacturing plant. Changes in the contacting or arcing system, if any, that may be caused by the impact of transport, can be compensated for by means of:

- the adjustable breaking lever of the **H** arc-quenching chamber;
- by turning round the **D** arc quenching chamber using the clamping joint.

Improper assembly of the pull rod (caused by interchanging the rocking bearings with barrel-type and cylindrical sleeve, or incorrect assembly of the inter-bearing (turning the same round by 180°), can impair the control force acting on the manual drive (breaking out of the clamping end pieces on the pivots, bending of pull rods).

c) Correct adjustment is achieved when the making and breaking position of the switch disconnector is achieved also when moving the drive slowly, in both the drive and the switch simultaneously. The drive pull rod for switch disconnector in ON position has to be prestressed (by pressure generated by the drive) which causes the dog to be pressed permanently against the stop.

d) Following a few test making operations and checking the proper function of both the drive and the switch disconnector all the M10 nuts of the clamping end pieces and the M16 nuts to secure the rocking bearings and the manual drive have to be retightened.

e) Any intervention that contradicts to the manufacturer instructions may disturb the mechanical or electrical properties of the device, and causes the warranty provided by the manufacturer to be void and null.

NOTE:
Earthing bar of the pole is to be connected to the connecting point on the drive, marked off accordingly.

The assembly and connection of the overhead power line, and the mode of carrying through the earthing is not the subject of this assembly instructions. These steps are to be carried out in accordance with the regulations of the assembling companies or power utilities.

MAINTENANCE INSTRUCTIONS

The CUB 2 three-pole switch disconnectors a switching device which necessitates only a very limited extent of maintenance and revision works to have performed. In order to ensure the required reliability of the device it is recommended to check the device and the drive mechanism visually on a regular basis (approx. once a year).
The purpose of such a visual inspection is also the verification of the state of insulators.

Section switches being out of operation for a longer period should regularly be switched ON and OFF in no-load state, which provides for the cleaning of the contact surfaces and enables to verify the correct mechanical operation of the switching device.

In the course of the revision works, which are recommended to be performed once in 10 years in the voltage-free state of the switching device, the following servicing works are performed:

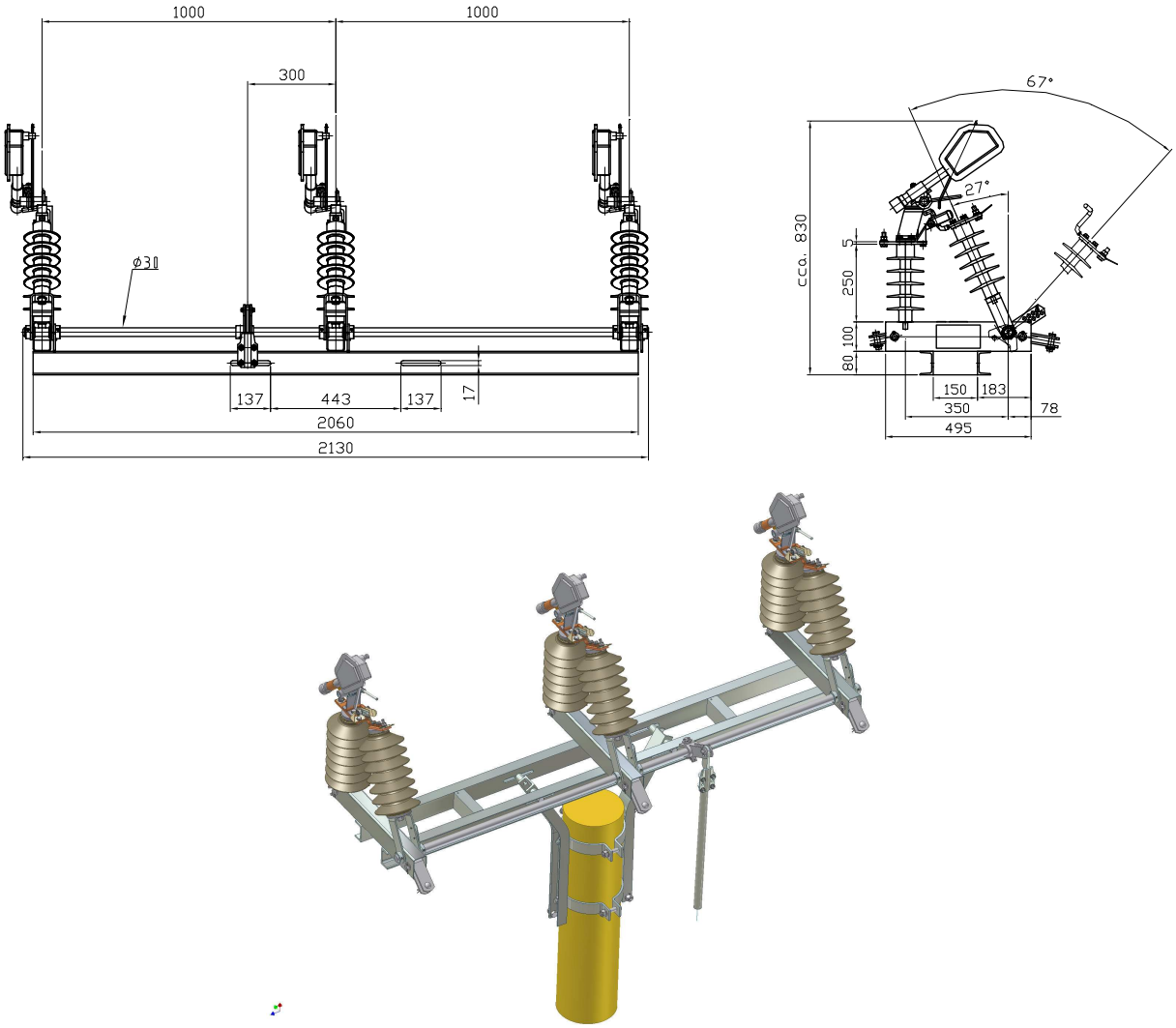
a) Verification of the state of main contacts, cleaning and greasing of the contact surfaces using the „Barrieta L 55/1“ grease (manufacturer: Klüber Lubrikation – Germany)
b) Verification of the state of bearings, cleaning and greasing with the „plastic MOGUL G 3 grease (to ČSN 656912).
c) Inspection of the state of supporting and tensile insulators. Cleaning of the insulators.
d) Verification of the mechanical operation of both the drive mechanism and the section switch.

PACKING AND TRANSPORT REGULATIONS

a) The packing takes place using transport crates made available by the manufacturer. During the transport the section switch is in ON switching position.
b) The transport may be carried out using any available transport means.
c) During the transport it is not necessary to protect the switching device against the atmosphere. Take care when depositioning the device. It is forbidden to unload the device by leaning it on the contact horns or other parts of the contact system.
d) The assembly procedures when mounting the section switch on the pole are described in the „Assembly rules“ section.

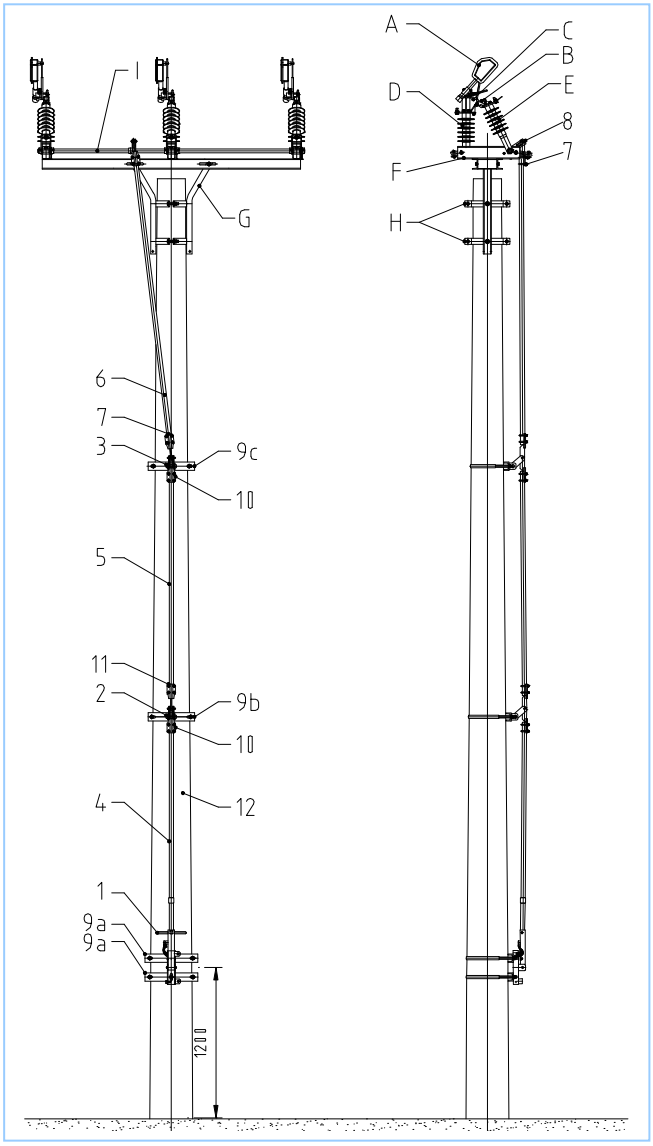
THREE POLE OUTDOOR SWITCH DISCONNECTOR OF CUB 2 25 KV MOUNTING INTO OVERHEAD LINE

Fig. 1



TYPICAL ARRANGEMENT OF CUB 2… SWITCH DISCONNECTOR WITH DRIVE ON TOP OF POLE

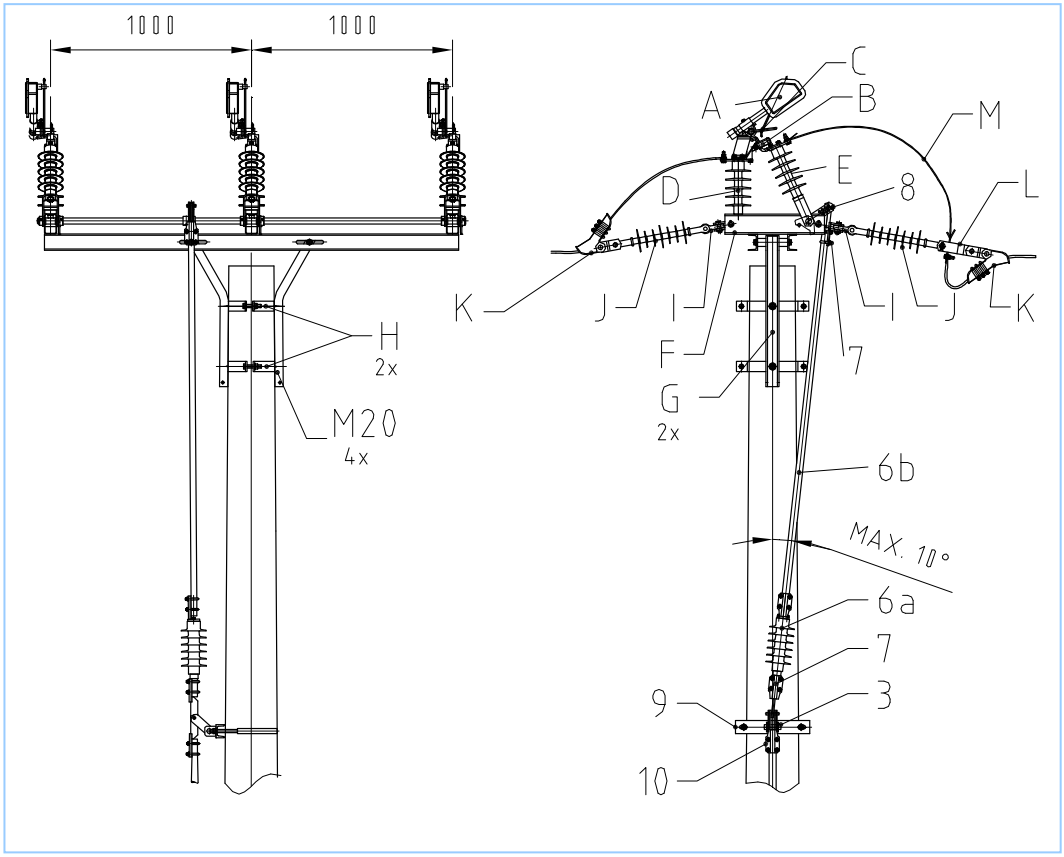
Fig. 2



A - breaking chamber
B – main current conducting path
C – supplementary or additional current path
(arc-quenching
system of contacts)
D – fixed supporting insulator
E – rocking supporting insulator
F – supporting frame
G.- fixing supports
H – fastening sleeves R120
I – operating shaft
1 – hand operated drive
2 - rocking bearing
3 – upper rocking bearing
4 – lower operating rod
5 – medium operating rod
6 – upper operating rod
7 – single-arm clamping terminal with barrel
8 – operating handle
9 – fixing sleeves (R 130; R 155; R 178)
10 – two-arm clamping terminal
11 – single-arm clamping terminal, without barrel
12 – concrete pole

TYPICAL ARRANGEMENT OF CUB 2... SWITCH DISCONNECTOR ON THE TOP OF CONCRETE POLE

Fig, 3

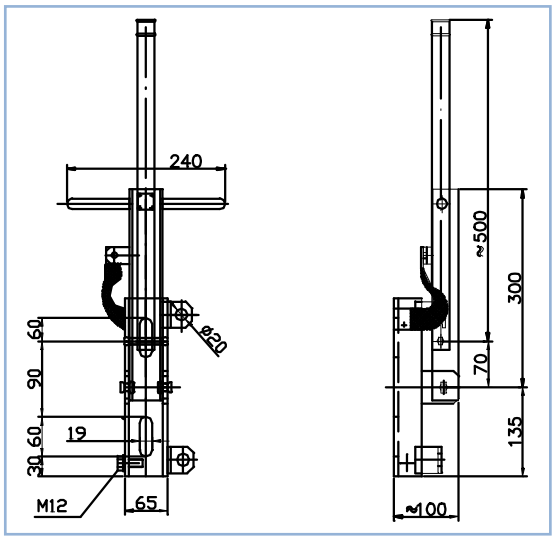


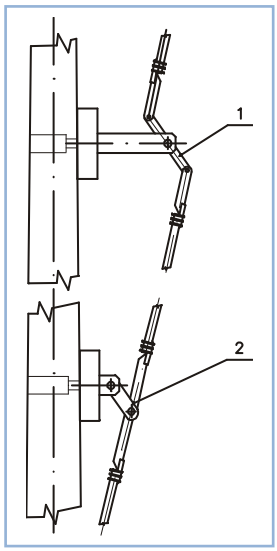
A - breaking chamber
B – main current conducting path
C – supplementary or additional current path (arc-quenching system of contacts)
D – fixed supporting insulator
E – rocking supporting insulator
F – supporting frame
G.- fixing supports
H – fastening sleeves
I – double cross lug
J – suspension insulator
K – guy shackle clamp
L – fork – type pull rod
M – flexible lead-in bands
3 - rocking bearing
6a – insulator in pull rod (for wooden poles only)
6b - – lower operating rod
7 - single-arm clamping terminal with barrel
8 – operating handle
9 - fixing sleeve
10 – two-arm clamping terminal

HAND OPERATED DRIVE

TYPES OF SUPPORTING BEARINGS USED

Fig, 4





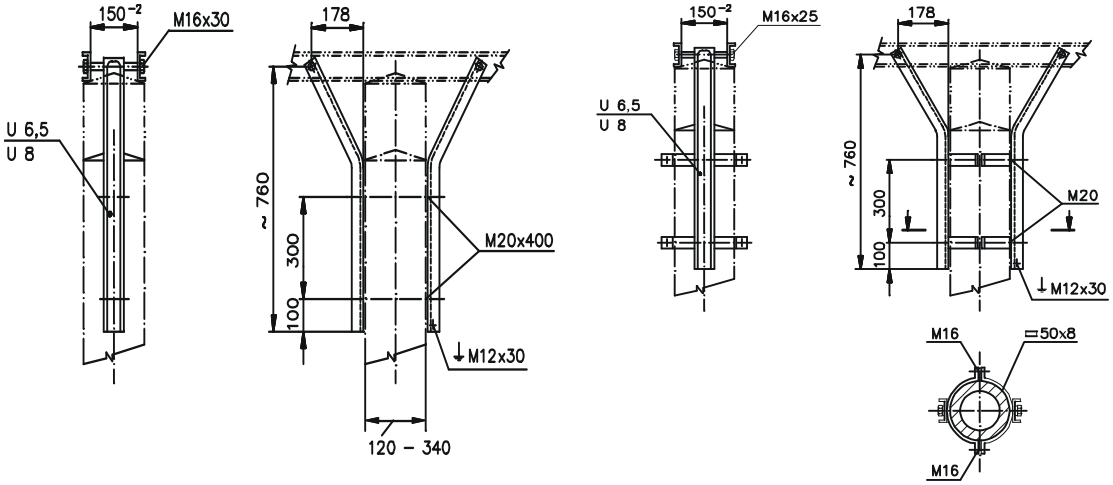
1 – Revolving bearing
2 – Rocking bearing

MOUNTING THE CUB 2 TYPE DISCONNECTING SWITCH ONTO THE POLE

Fig. 5

Sloup dřevěný

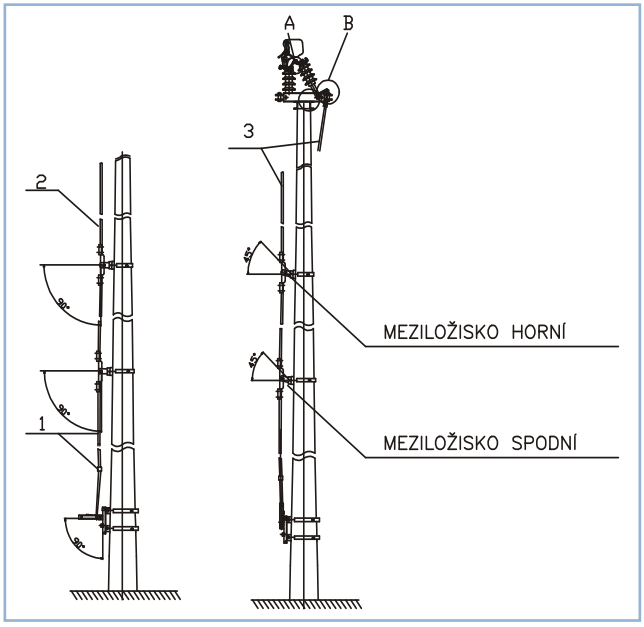
Sloup betonový



CORRECT ASSEMBLY STEPS

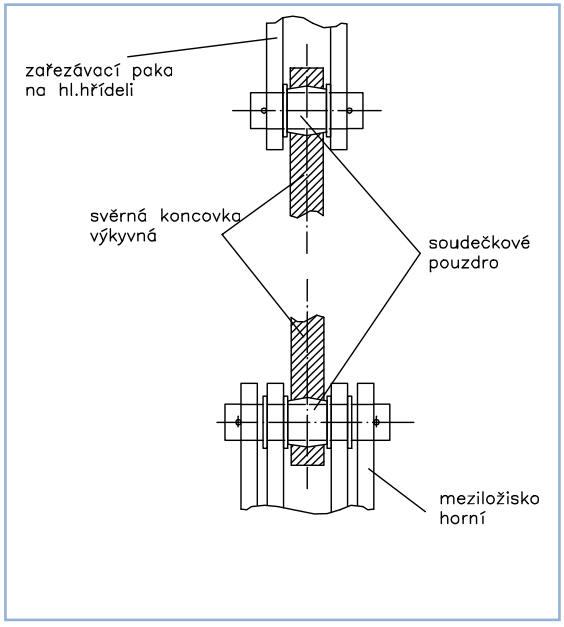
Fig. 6

Control pull rods - adjustment



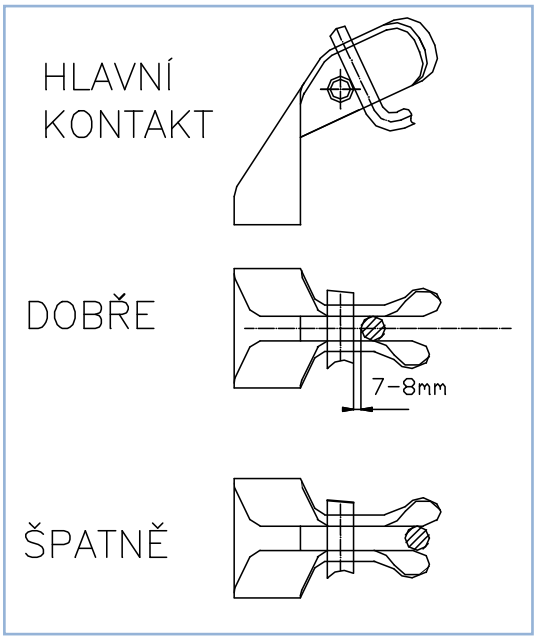
meziložisko horní – upper interbearing
meziložisko spodní – lower interbearing

Assembly of the No. 3 pull inspedtion point „C“



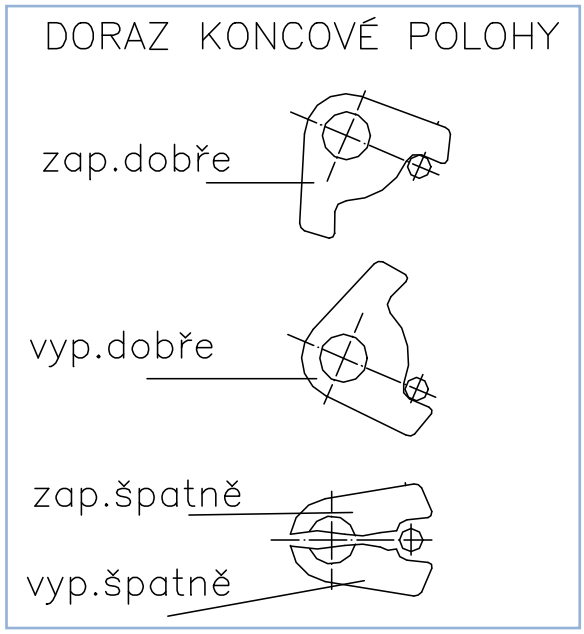
zařezávací páka na hl. hřídeli – cut-in lever on the main shaft
svěrná koncovka výkyvná – clamping rocking terminal
soudečkové pouzdro – barrel-type sleeve
meziložisko horní – upper interbearing

Main contact – „A“ inspection point



HLAVNÍ KONTAKT = MAIN CONTACT
DOBŘE = CORRECT
ŠPATNĚ = NOT CORRECT
DORAZ KONCOVÉ POLOHY = END POSITION STOP

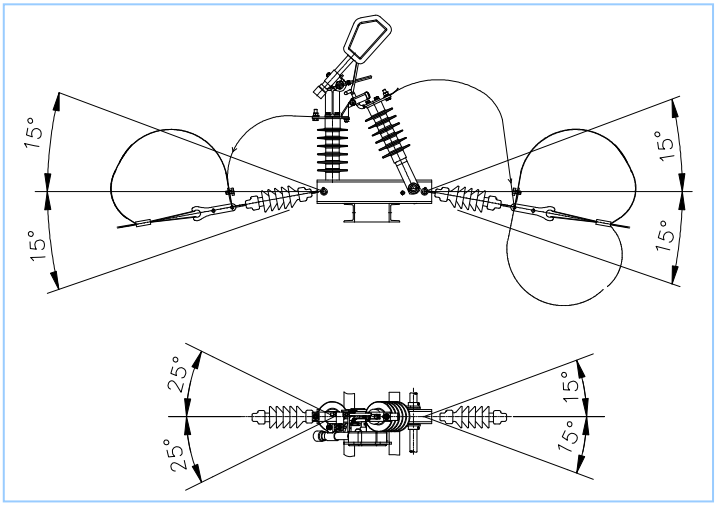
End position stop – inspection point „B“



ZAPNUTÍ DOBŘE = ON POSITION CORRECT
VYPNUTÍ DOBŘE = OFF POSITION CORRECT
ZAP. ŠPATNĚ = ON POSITION NOT CORRECT
VYP. ŠPATNĚ = OFF POSITION NOT CORRECT

SLOPE VALUES OF STRAIN INSULATORS

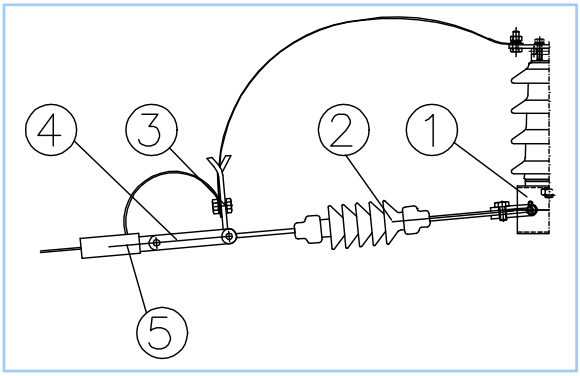
Fig. 7



Permitted strain of line wires - single side strain (terminal pole) - 5000 N on 1 line
- double side strain - 13000 N on 1 line

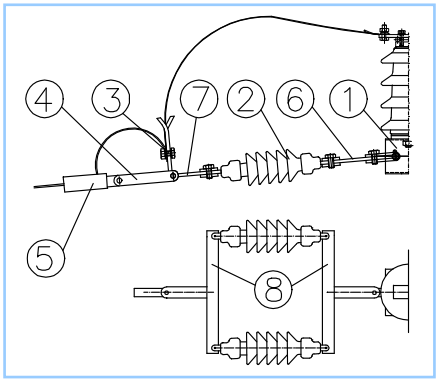
SINGLE TYPE SUSPENSION OF STRAIN INSULATORS

Fig. 8



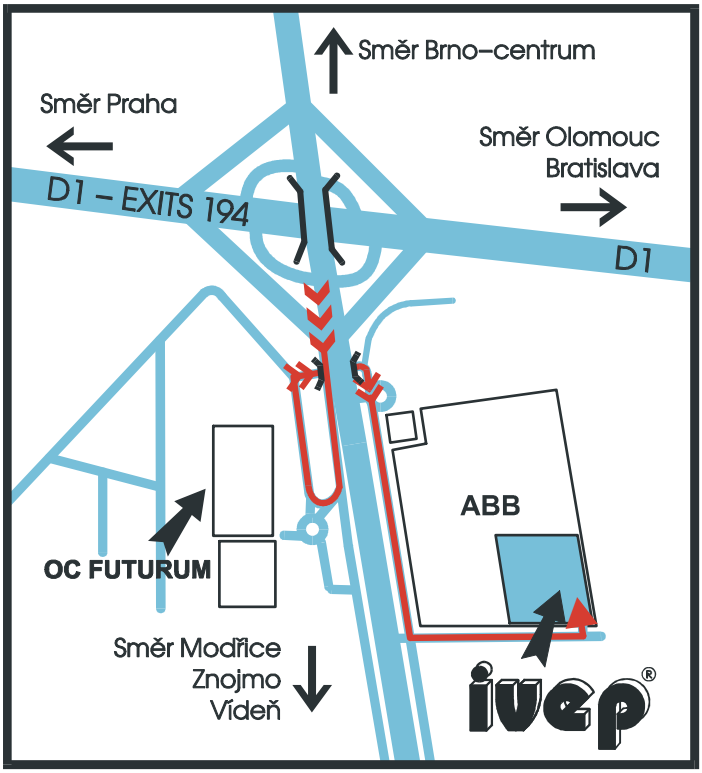
DOUBLE TYPE SUSPENSION OF STRAIN INSULATORS

Fig. 9



1. Disconnecting switch with suspension shackle and connecting bands
2. Suspension insulator
3. Clamp
4. Fork-type pull rod
5. Suspension
6. Fixture
7. Lug
8. Spacer

Items 2; 3; 5 to 8 are not part of the delivery



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