

# Instructions for assembly, operation and maintenance of remote controlled stations of outdoor reclosers – DOV1111



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## Remote control of circuit breakers for outdoor installation

The device described hereunder is a system used for the remote control of sectionalizers, circuit breakers and switching stations installed in MV power distribution networks with the voltage level of 25 and 38.5 kV.

The main components of the remote control equipment are:

- communication network installed at the area concerned
- central dispatching station (CDS)
- remote controlled station (Czech abbreviation DOV) – outdoor sectionalizer



The equipment of the central dispatching station as well as that of the communication network forms an integral part of the system.

The system is protected from interfering random signals, interferences and static electricity.

### Full description of a remote controlled circuit breaker (DOV)

Remote control of outdoor circuit breakers is a complement to the remote control of switch disconnectors and switching stations. In 22 kV MV power distribution networks it is a new power switching element capable of switching short-circuit currents and earth fault currents combined with another appropriate comprehensive protection.

The remote control networks are preferable using vacuum circuit breakers of the GVR Recloser type made by Hawker Siddeley Switchgear, OSM reclosers made by Tavrida, or the Recloser 3AD made by Siemens. These circuit breakers feature a lot of advantages such as compact design, low-energy magnetic actuator (drive), built-in current transformers and optionally also voltage dividers encapsulated straight on in the bushings.

The power pole constitutes a support for mounting the aerial, remote control cabinet, voltage transformer, current sensors and surge protection devices. Conductors on the pole are kept in protective piping with inlet into the remote control cabinet. The cabinet is made from hot galvanized steel sheets of 2.5 mm thickness, with double door and special locks to protect it from malicious damage.

Power to the control cabinet is supplied from a two-pole insulated MV transformer connected to the power line. There are backup batteries available capable to keep the telecommunication traffic for 24 hours without connection to the MV power line. The control voltage is generated by a special capacitive power source, the energy in which is sufficient for performing 30 C-O manipulations, even in cases of power line outage extending over 35 days.

Straight on the pole is a beam to which the aerial is fixed. The aerial down-lead enters the RCS cabinet and is linked to the radio installation. The radio station is coupled with the telecommunication and control module in which the telegrams are being processed and the inputs and outputs of which are used to control the circuit breaker and provide for data collection.

## DOV111G (R) actuator cabinet

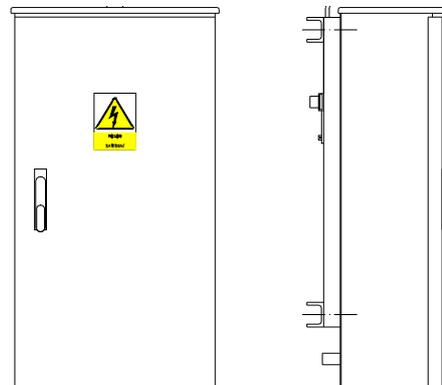
In its basic execution the DOV111G cabinet is tailored for the interception of GSM signal. The DOV111R cabinet is intended for radio communication and is being utilized only exceptionally at places, where the coverage of GSM signal is inadequate.

The remote control (DO) cabinet is designed to satisfy the challenging conditions of outdoor operation. It is a weldment made from hot galvanized steel sheet of 2.5 mm thickness, with 1000x525x230 mm (H x W x D) dimensions and with the protection degree of IP43. The cabinet upper wall is shaped as a roof preventing direct ingress of rain drops to the area of contact between the doors and the cabinet body. On the rear side of the cabinet there is one M12 screw serving as earthing point. The cabinet inside is provided with illumination and the cabinet double doors are opened independently from each other and provided with special locks.

The cabinet is mounted on a concrete or wooden pole using two commonly used stirrups and clamps. Attachment to lattice masts is done using special structures and holders.

The cabinet houses the RTU control electronics. The RTU panel features the ON and OFF control pushbuttons, and the local-remote changeover switch. In the cabinet bottom part are two maintenance free Pb gel batteries of 28 Ah capacity each.

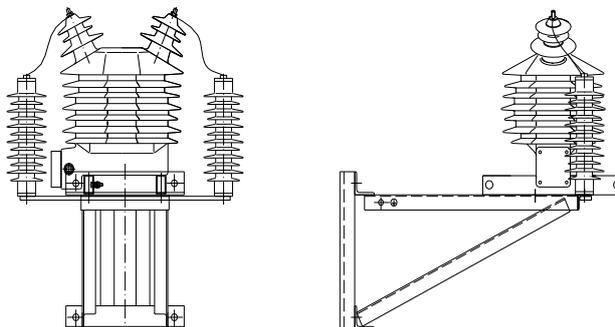
In case the temperature in the cabinet drops below 3°C the control unit automatically activates 60 W heating element to temper the cabinet inside.



## Other components of the DOV system

### Power supply transformer, overvoltage limiters

The line-up of the power supply transformer in combination with the overvoltage limiters and the bracket form a one single unit. The voltage instrument transformers of VTP 25 or VTP 38 type are single-phase two-pole insulated transformers intended to be used in MV power networks. In this particular case the voltage transformer serves as a power supply for the DOV cabinet and, at the same time, as a voltage indicator. Voltage limiters mounted close to the transformer provide protection from atmospheric overvoltages.



### Aerial

The DOV system is equipped with communication means via the GSM/GPRS network, and using an omnidirectional GSM aerial. At areas with weak GSM/GPRS signal directional GSM aerial can be used. If the GSM/GPRS signal is completely unavailable, then radio system is being used.

## Handling and storage

During transportation and handling take special care that damage is avoided to the cabinet or other DOV components.

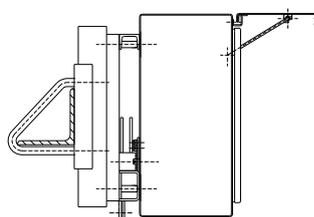
The DOV system can be stored indoors and outdoors, in a way to prevent ingress of water into the cabinet via ventilation openings located in the bottom of the cabinet.

## Circuit breaker installation

The installation steps are specified in separate installation instructions describing the particular type of circuit breaker and the type of concrete pole/lattice mast the circuit breaker belongs to.

## Installation of the DOV cabinet

The DOV cabinet is installed either in the axis of the power line, or turned round by 90° from the power line axis. The cabinet is fixed to the concrete pole using clamps installed at 900 mm distance from the ground. The fixing nuts are mounted from the cabinet inside. The clamps are tightened so no distortion of the cabinet takes place.



Regarding the fixing to a lattice mast – the cabinet with motor actuator (drive) is attached to the mast using special structural beams mounted to the PS lattice mast. The beams are fixed to the corner profile using V-shaped stirrups. The shape and type of the beam varies according to the lattice mast used.

Note: in case the DOV doors do not sit properly or cannot be closed, check whether the clamp nuts are tightened uniformly.

## Installation of bracket with the voltage transformer

The instrument voltage transformer supplies power to the actuator cabinet. The primary inlets of the transformer are protected with voltage limiters. In case the power inlet enters the cabinet from one side the bracket with the transformer should be located on the inlet side, in a way to provide power to the actuator cabinet also with the switch disconnector in OFF switching position.

The bracket for mounting the transformer and overvoltage limiter is fixed to the concrete pole using two clamps situated approx. 900 mm below the switch disconnector frame.

Brackets for mounting the equipment to a lattice mast vary in their attachment (right handed/ left handed), and the arrangement of the overvoltage limiters. Bracket for mounting the transformer and the overvoltage limiters is attached to the corner profile using two V-shaped stirrups.

After unscrewing the cover of the transformer terminal board the conductors are now connected to the terminal board as shown in table below.

Cables leading from the transformer (NYY-O 2x1.5) are passed through a system of fixed and flexible steel conduits and brought up until the DO cabinet.

Cable type	D(O)
terminal „a“	black
terminal „b“	blue

In the remote control cabinet the cable cores are connected to the FA1 small circuit breaker in the way as follows: black conductor leading from the “a” terminal, and blue conductor from the “b” converter into the blue terminal next to the FA1 circuit breaker.

## Aerial installation

The omnidirectional aerial of the GSM/GPRS system is fixed using a holder to the bottom inter-bearing of the CB drive mechanism. Directional GSM aerial and that for the reception of radio signal is attached to a special bracket mounted using a clamp to the concrete pole, or using a V-shaped stirrup to the lattice mast.

## Operation

The remote control system is operated via control pushbuttons accessible after opening the cabinet. The permission to open the DO cabinet should be agreed with the RD dispatcher. Any incoming signal informing of the opening of the DOV cabinet without previously having obtained a permit from the dispatcher is considered to be the intrusion of unauthorized persons.

The remotely controlled sectionalizer may be closed or opened in three ways described below:

- remotely from the control room; the condition is that the LOCAL – REMOTE changeover switch is in REMOTE position. In the LOCAL position the switching command is blocked both in the electronics, but also by software from the control room.
- locally using the ON or OFF pushbutton in the remote control cabinet. If the LOCAL – REMOTE changeover switch is in “REMOTE” position, the switching operation is blocked by the electronics installed in the cabinet.
- manually – the circuit breaker can only be switched OFF by pulling at the hook (manual trip operation mechanism) on the bottom side of the circuit breaker.

## Maintenance

If operated in normal operating conditions it is recommended once a year to check the DOV 1111 cabinet visually and perform the function test. The latter consists of the following:

- visual check of the actuator (drive) cabinet and the system of drawbars in terms of damage (wilful damage, theft, contamination),

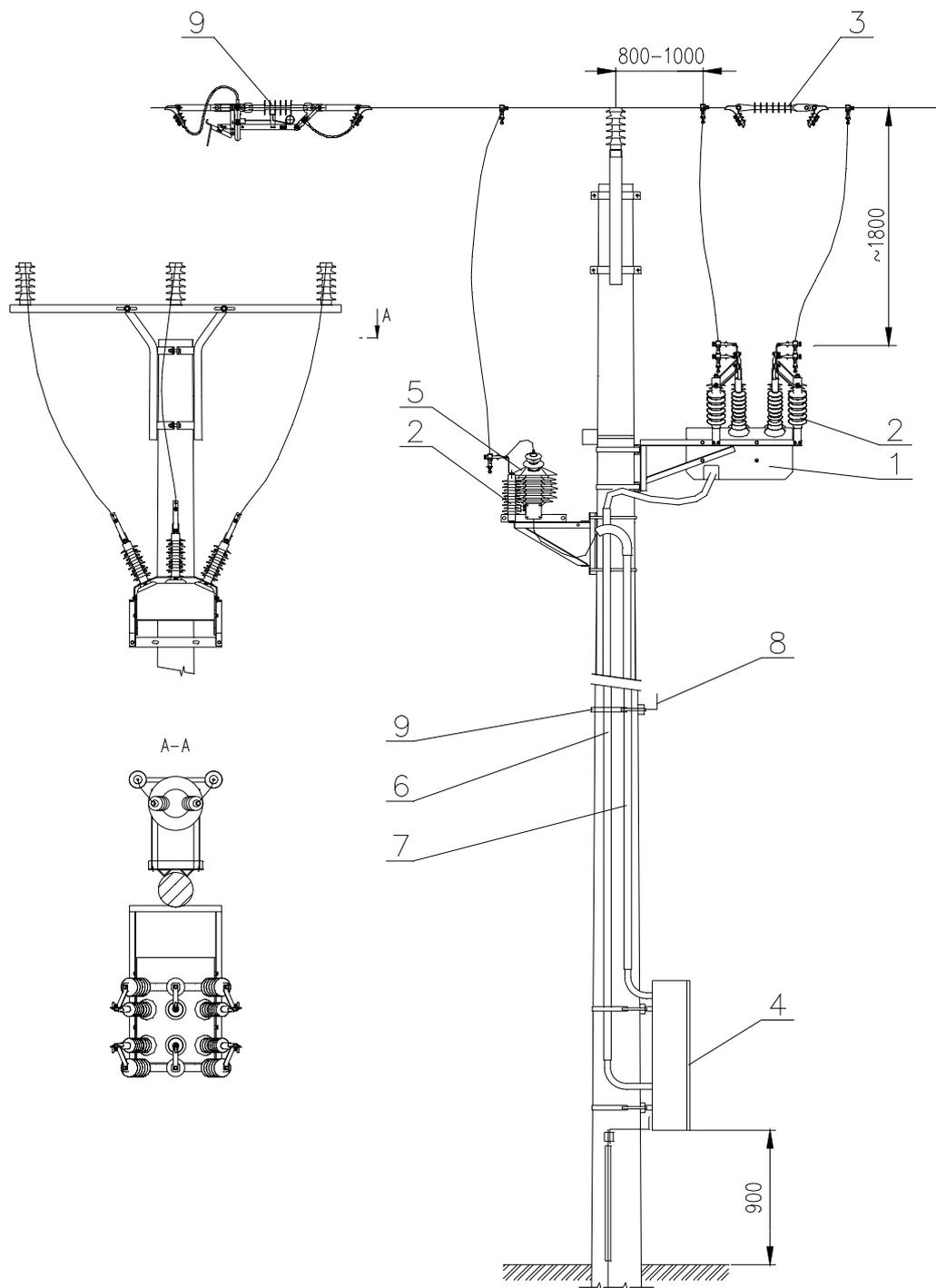
Dirt deposits on the insulated parts of the circuit breaker and the DOV components are removed in a way to restore its original insulation state.

In case of identified damage to the system (failure, partial flooding of the cabinet, other type of damage) you should contact the manufacturer.

The DOV 1111 cabinet incorporates cells to provide power to the motor drive. Low batteries (accumulators) should be replaced with new ones. The electronics monitors the condition of accumulators in terms of voltage drop and capacity decrease, by sending corresponding message to the control room which is to be followed with appropriate decision taking.

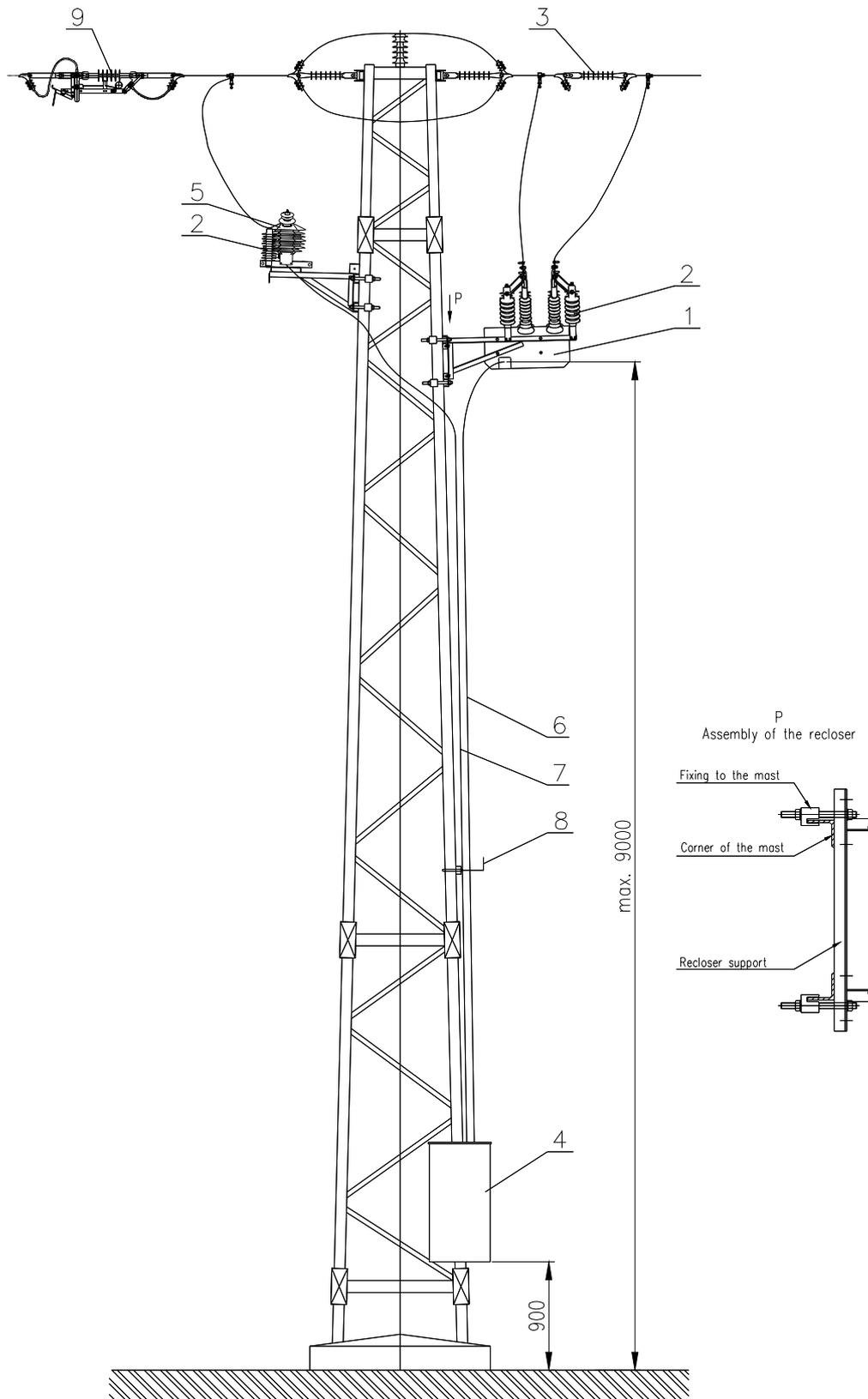
After 10 years of operation we recommend to perform a comprehensive inspection and maintenance of the actuator cabinet by manufacturer’s servicing staff.

## Assembly of the Tavrida OSM circuit breaker for mounting on concrete pole



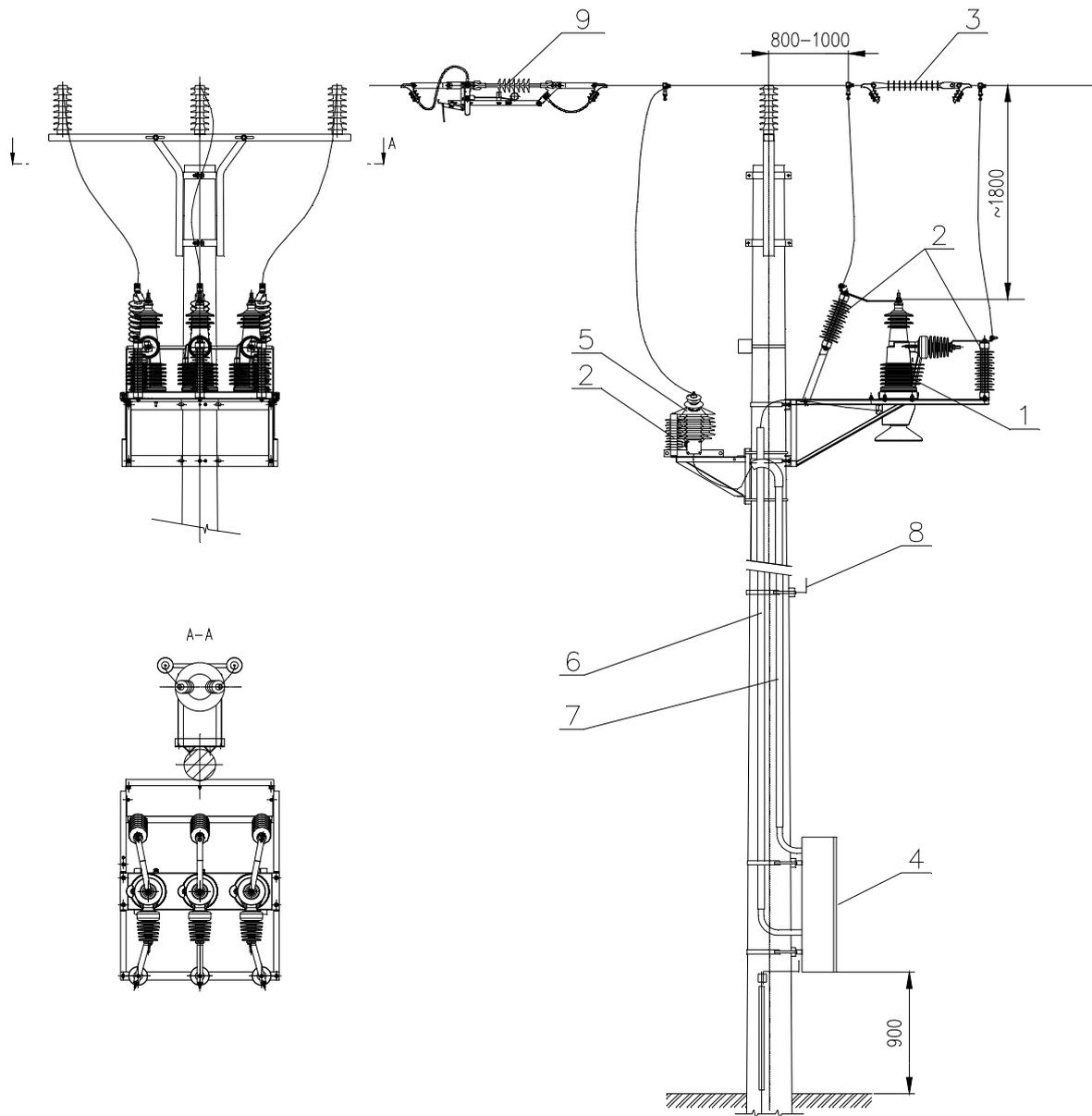
1. Tavrida OSM circuit breaker
2. Surge arrestors
3. Tension insulator
4. DOV 1111R remote control cabinet
5. Two-pole power supply transformer for the DOV cabinet
6. Cable to establish interconnection between circuit breaker and the DOV cabinet
7. Power supply cable for the DOV cabinet
8. Aerial for GSM-GPRS communication (or a radio network)
9. Flr disconnector (to achieve higher withstand voltage level during atmospheric impulse at the isolating distance; seen from the power supply side).

## Assembly of the Tavrida OSM circuit breaker for mounting on lattice mast



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| <ol style="list-style-type: none"> <li>1. Tavrida OSM circuit breaker</li> <li>2. Surge arrestors</li> <li>3. Tension insulator</li> <li>4. DOV 1111R remote control cabinet</li> <li>5. Two-pole power supply transformer for the DOV cabinet</li> </ol> | <ol style="list-style-type: none"> <li>6. Cable to establish interconnection between circuit breaker and the DOV cabinet</li> <li>7. Power supply cable for the DOV cabinet</li> <li>8. Aerial for GSM-GPRS communication (or a radio network)</li> <li>9. Fir disconnector (to achieve higher withstand voltage level during atmospheric impulse at the isolating distance; seen from the power supply side).</li> </ol> |
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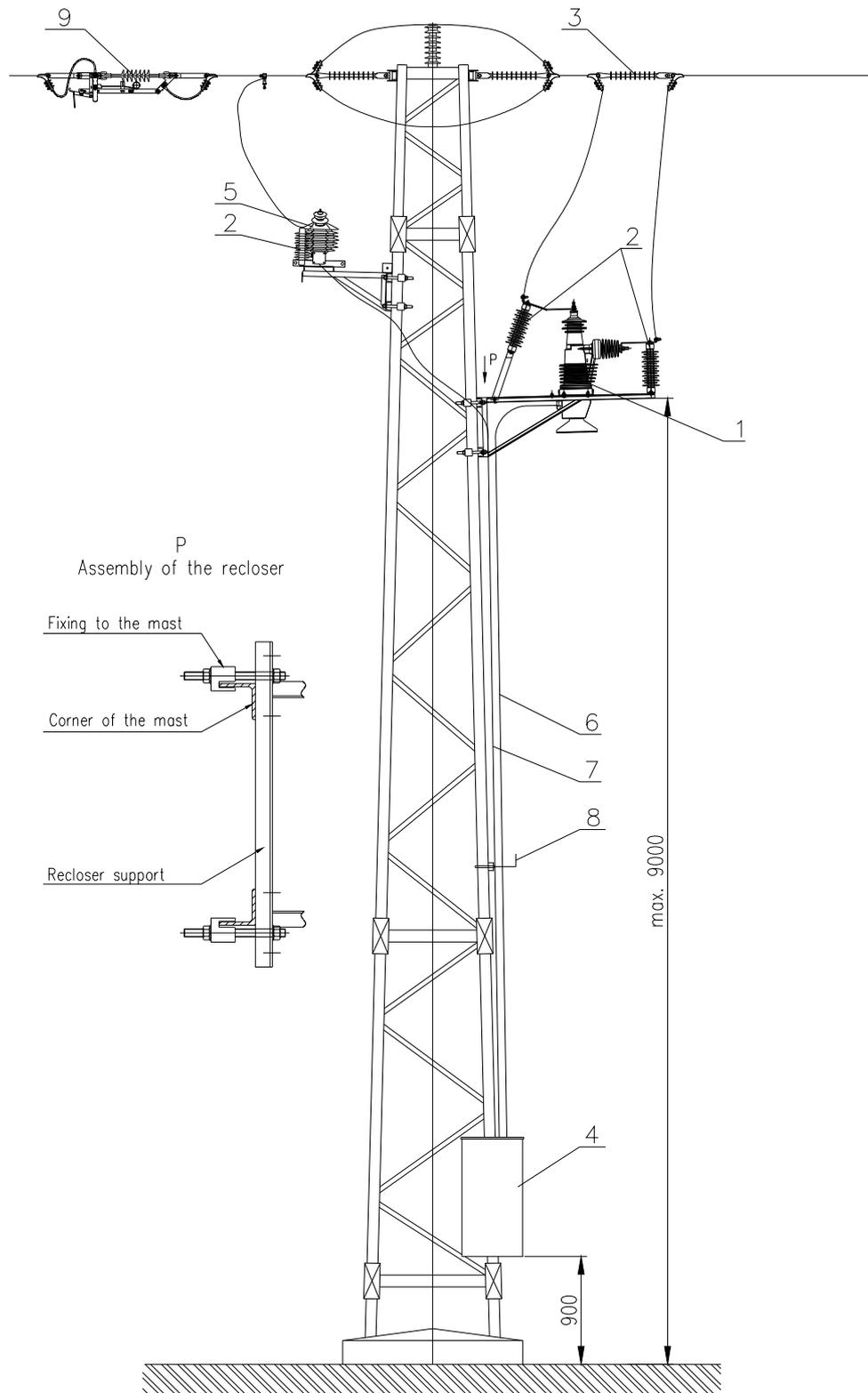
**Assembly of the Siemens 3AD circuit breaker for mounting on concrete pole**



1. Siemens 3AD circuit breaker
2. Surge arrestors
3. Tension insulator
4. DOV 1111R remote control cabinet
5. Two-pole power supply transformer for the DOV cabinet

6. Cable to establish interconnection between circuit breaker and the DOV cabinet
7. Power supply cable for the DOV cabinet
8. Aerial for GSM-GPRS communication (or a radio network)
9. Flr disconnector (to achieve higher withstand voltage level during atmospheric impulse at the isolating distance; seen from the power supply side).

**Assembly of the Siemens 3AD circuit breaker for mounting on lattice mast**



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|---|---|
| <ol style="list-style-type: none"> <li>1. Siemens 3AD circuit breaker</li> <li>2. Surge arrestors</li> <li>3. Tension insulator</li> <li>4. DOV 1111R remote control cabinet</li> <li>5. Two-pole power supply transformer for the DOV cabinet</li> </ol> | <ol style="list-style-type: none"> <li>6. Cable to establish interconnection between circuit breaker and the DOV cabinet</li> <li>7. Power supply cable for the DOV cabinet</li> <li>8. Aerial for GSM-GPRS communication (or a radio network)</li> <li>9. FIr disconnector (to achieve higher withstand voltage level during atmospheric impulse at the isolating distance; seen from the power supply side).</li> </ol> |
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