



## Assembly set of the indicator MEg61.4



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## 1/ CHARACTERISTICS

The assembly set of the indicator MEg61.4, see Fig. 1, is designed to indicate ground faults and short circuits on MV lines beyond the place where it is installed. It creates a separate power-supply independent component, which is linked to the information system of the control station through GSM remote communication. Cooperating with other indicators, it allows the most reliable system identification of an affected section of a compensated MV network or a MV network with grounded neutral point.

The assembly set consists of the indicator unit MEg61.4, the power supply unit MEg103, a waterproof case and construction components. It shall be installed on an overhead MV line pole not shielded from the south and with plane arrangement of phase conductors. The corresponding antenna type is to be selected depending on GSM signal level.

The advantage of the assembly set of the indicator MEg61.4 is that it can be also installed using LW technology due to the use of sensors of electric and magnetic fields located at a defined distance from the phase conductors on composite insulators. When instrument transformers or capacitive dividers are in the place where this set is installed, signals of these units can be also used to operate the indicator MEg61.4.

## 2/ TECHNICAL PARAMETERS

Dimensions of the assembly set:	750 × 330 × 300 mm (including solar panels)
Dimensions of the case:	400 × 300 × 200 mm
Weight:	13 kg
Voltage level:	22 kV / 35 kV
Method of pole attachment:	a pair of Bandimex tapes (width 16 mm)
Case protection rating:	IP66
Resistance of mounting accessories:	against UV radiation
Operating temperature:	from -25 °C to +60 °C

### 3/ CONSTRUCTION AND WIRING

The assembly set of the ground faults indicator MEg61.4, see Fig. 2, consists of a plastic waterproof lockable case Minipol, onto which a holder is secured, holding solar panels and a vertically placed whip antenna tube. The case Minipol is to be secured to the pole through a circularly shaped reduction with holes to secure it fast to the pole. There is a rail TC35 inside the case, on which the indicator unit MEg61.4, the power supply unit MEg103 and a pair of one-pole disconnectors are fixed, see Fig. 3. There is an accumulator fixed to the bottom of the case using two wing nuts through a non-conductive flange with a temperature sensor so that the second accumulator can be placed on the right next to it. The case is to be fixed through a grounding screw to grounding of the pole. There is a sleeve in the bottom of the case to fix it. There are two angle bushings on the sides of the upper part of the rear wall of the case, rotated downwards; the left bushing diameter is 16mm and the right one is 25 mm. There are flexible plastic pipes inserted into them to form a deflection, on whose lower part a water outlet hole shall be made during installation because of the water that can get into the plastic pipes. The left flexible pipe ends in the upper part of the solar panel holder, while another flexible pipe is placed next to it that runs into the lower part of the whip antenna tube. If a whip antenna is used in the assembly set, its coaxial cable is installed through the above mentioned pipe system by the manufacturer. There are also two twin leads A and B running through the left angle bushing and the flexible pipe into the solar panel holder. The red wire of the twin lead is the positive pole of the panel and the black one is the negative pole.

There is an angle bushing (diameter 25 mm) placed on the right, and a follow-up flexible deflection pipe. It ends in a vertically placed plastic pipe (diameter 25 mm). This runs about 2 m below the MV pole bracket and it is secured to it using 9.53 mm Bandimex tapes. If necessary, the 3 m long plastic pipe is extended using another pipe so that the upper end of the lower tube is inserted into the widened end of the upper tube. This prevents the water from leaking into the pipe.

Three four-wire shielded cables of the individual field sensors and an antenna coaxial cable if a YAGI antenna is used run through the right bushing and subsequent plastic pipes. Free color-coded ends of the individual cable wires are to be connected into the indicator unit MEg61.4 according to Tab. 1.

Or the used YAGI antenna is secured to the pole near the upper outlet using a circular sleeve allowing you to rotate the antenna in direction of the strongest GSM signal. To detect it, use the communication unit MEg202 and the service program M202Param.

The plastic waterproof box with sensors is secured by means of two screws to the duralumin arm, which is screwed to the bottom of the composite insulator for the voltage of 22 kV or 35 kV. There is a grounding screw and screws M5x12 and spring washers on the

duralumin arm to secure the ground wires. There is a fixture attached to the top of the insulator, using which the insulator shall be secured to the phase conductor of the MV line. The fixture type depends on the LW technology used to mount the assembly set MEg61.4, see Fig. 8.

*Place the insulator with the sensor marked L1 underneath when looking at the MV line from the power supply switching station to the left phase conductor. The insulator with the sensor L2 shall be placed on the middle conductor of the MV line and the insulator with the sensor L3 on the rightmost conductor.*

The assembly set includes two outer copper ground wires long 1.5 m and one middle ground wire long 3 m. The wires are always at one end provided with an eye. The two free eyes included in the delivery shall be pressed on the free shortened ends of the outer wires. The outer ground wires shall be shortened so that the sag is not more than 50 mm. The outer ground wires run from the arms of the outer phase conductors to the arm of the middle phase conductor, from which the middle ground wire runs to the ground strip of the MV pole. If it is required to connect the copper ground wire to the Al ground wire of the MV pole, it is necessary to use a CUPAL washer. The middle ground wire must have a sag too because of the flowing off water. The sensor cables that are mouthed into the straight bushing of the upper flexible protective pipe are fixed to the ground wires in 25 cm distances. The cables must be protected against abrasion there.

## 4/ INSTALLATION PRINCIPLES

### 4.1 Installation on a MV line pole

The field sensors of the indicator MEg61.4 can be installed when the MV line is off or using LW technology.

To install the sensors using LW technology, the installation of the sensors onto live parts of the MV line is a subject of special procedures defined by the user. They include principles that must be observed during installation in order to ensure correct operation of the indicator MEg61.4.

Before installation, it is necessary to specify a type of the antenna used in the place of installation. When a directional YAGI antenna is used, it is necessary to specify the direction of its installation. This is possible e.g. using the testing communication GPRS unit MEg202 and its service program.

1. The assembly set of the indicator MEg61.4 shall be installed on an overhead MV line pole not shielded from the south and having plane arrangement of phase conductors and grounded bracket. The situation is in Fig. 1.
  2. To install sensors of the indicator MEg61.4, use composite insulators corresponding to the voltage level and provided with phase conductor fixtures, which are approved for the voltage level and the installation environment.
  3. The insulators with the sensors L1, L2 and L3 are to be installed on the phase conductors at least 2 m from the pole. There must be a straight wire section long at least 1 m where the insulators with the sensors are installed. All of the three insulators with the sensors shall be placed in a straight line perpendicular to the phase conductors and the insulator with the sensor L1 shall be installed in direction from the power supply transformer station to the leftmost phase conductor, the insulator with the sensor L2 onto the middle phase conductor and the insulator with the sensor L3 onto the rightmost phase conductor. The sensors on the insulators are put out in direction of the pole and their signal cables are directed toward the pole, see Fig. 6.
  4. Warning! No other constructional elements are allowed to be near the composite insulators with the sensors that could reduce air distances specified for the given voltage level.
  5. Press the delivered eyes onto the extreme ground wires whose length must be adjusted according to the distance between the phase conductors of the MV line to make a sag of about 50 mm.
  6. Connect the outer ground wires between the grounding screw of the duralumin arm of the outer sensor and the grounding screw of the duralumin arm of the middle sensor.
- When installing, place the copper eyes between galvanized washers to prevent the duralumin arm and the copper rope from direct contact.
7. Connect the ground wire of the middle sensor long 3.5 m between the grounding screw of the arm and the grounding strip of the MV pole to make a sag. If an Al wire is used to ground the MV pole bracket, it is necessary to use the delivered CUPAL washer during installation.
- The insulators with the sensors are not allowed to be deviated from the vertical direction due to installation of the ground wires.
8. The signal conductors of the sensors shall be secured to the ground connections in 25 cm distances using tightening tapes resistant to UV radiation and long 235 mm.

9. The plastic case with the indicator and solar panels is to be secured to the MV pole at the min. height 3 m above the ground in the south direction using two tapes Bandimex 16 mm. To determine the south direction, it is recommended to use a compass.
10. At the level of the angle bushing of diameter 25 mm located in the upper right corner of the case designed for the signal cables of the sensors shall be placed the widened end of the lower 3 m long firm protective pipe attached to the pole with the tape Bandimex 9.53 mm.
11. The widened end of the upper firm protective pipe shall be put on the end of the lower firm pipe that is not widened up. The length of the pipe is adjusted so that its upper not widened end is about 2 m below the pole bracket. The pipe joint shall be sealed. The upper firm protective pipe shall be also secured to the pole using the tape Bandimex 9.53 mm.
12. The firm coupling shall be put on and sealed on the not widened end of the upper firm protective pipe so that the 0.6 m long upper flexible protective pipe provided with the straight bushing on the other end can be inserted in and sealed.
13. Free ends of signal cables of the sensors shall run through protective pipes.
14. When a YAGI antenna is used, secure the antenna with its sleeve using the tape Bandimex 9.53 mm onto the MV pole near the upper end of the upper firm protective pipe so that it can be directed to the selected relay point of the GSM operator. Its coaxial cable shall also run through the protective pipes.
15. The flexible pipe shall be bent downwards; the bending diameter is 30 cm. The resulting bend shall be secured by fixing the flexible pipe to the pole using a pair of tightening tapes put on themselves; length 0.55 m.
16. Screw the removable part of the straight bushing in the bent flexible pipe to fix the signal cables and possibly also the coaxial antenna cable and to create a sag so that the cables do not touch the bushing edges. The bushing mouth shall be sealed.
17. The lower flexible pipe with 25 mm diameter and 0.4 m long shall be put on the group of three threaded signal cables and possibly also on the coaxial antenna cable. The flexible pipe shall be inserted into the widened lower end of the lower firm pipe and sealed.
18. At first cables shall be threaded through the angle bushing in the plastic case and then also the flexible pipe of the 25 mm diameter shall be inserted into the bushing.
19. A small water outlet hole shall be drilled in the lowest bend point of the lower flexible pipe.

## 4.2 Electrical wiring in the plastic case

The wiring in the plastic case of the assembly set MEg61.4 is shown in Fig. 5.

The indicator MEg61.4 is power supplied by a 12VDC lead-acid battery. The square USB connector **IND** is used to locally set parameters of the indicator MEg61.4 and the USB connector **GSM** is used to locally set and check the communication function. The local setting is recommended using a 5 m long USB communication cable from the ground.

1. According to the local situation, if necessary, the free ends of the long signal cables can be shortened. When shortening the cables, respect the color coding of the individual wires.
2. The conductors **A - E** of the signal cables of the sensors L1, L2 and L3 shall be connected under the screw terminals of the unit MEg61.4; see Fig. 3.

The wiring is in Tab. 1.

Tab. 1: Connection of sensor cables to contacts of the unit MEg61.4

PHASE	SIGNAL	CONDUCTOR	CONTACT MEg61.4
L1	A	Green	38
	B	Blue	37
	C	Red	36
	D	Black	35
	E	White	34
L2	A	Green	31
	B	Blue	30
	C	Red	29
	D	Black	28
	E	White	27
L3	A	Green	24
	B	Blue	23
	C	Red	22
	D	Black	21
	E	White	20

3. When a whip antenna is used, its coaxial cable is connected to the circular antenna connector **ANT** by the manufacturer. In case of a weak GSM signal, the coaxial cable of the YAGI antenna shall be connected during installation. The coaxial cable is not allowed to be shortened.

4. Connect the grounding screw of the plastic case using the ground wire of the case or the ground wire of the pole grounding with the eye with the grounding strip; the ground wire of the case is 50 cm long. If no grounding of the pole is available, it is necessary to make it in the place of installation for safety reasons. However, the max. allowable grounding resistance as for safety is also sufficient for correct operation of the indicator MEg61.4.

 **If the assembly set of the ground faults indicator unit MEg61.4 is not used for intended purpose, the protection provided by the device can be reduced.**

## **5. INDICATION, CONTROL, REQUIREMENTS FOR OPERATION AND MAINTENANCE**

There are two indicating LEDs on the front panel of the indicator unit MEg61.4 built-in in a plastic case. The upper LED marked GSM indicates the following states of GSM communication:

- LED flashes briefly
  - once per 3 seconds – perfect condition
- LED flashes alternately
  - once and twice – not logged in GPRS network
- LED flashes alternately
  - once and thrice – no communication with the connected MEg61.4
- LED flashes once and twice,
  - once and thrice
    - not logged in GPRS network and no communication with the connected indicator
- LED does not flash
  - communication out of operation

The below located LED is marked **IND** and is enabled only when the communication USB cable connected to the laptop is inserted into the connector **IND**. During correct operation of the indicator, the LED flashes once per second.

After removing the front panel of the unit MEg61.4, see Fig. on the back side of the cover, you can insert the parameterized SIM card on the middle communication card, or remove the parameterized SIM card of the selected operator by pressing the button next to the connector.

The uninterruptible power supply unit MEg103 does not include any indicating element because of the electrical energy saving.

To completely disconnect the lead-acid battery from the other circuits, open the right one-pole fuse disconnector AKU with fuse 2A/T. To turn off the power supply of the unit MEG61.4, turn off the one-pole fuse disconnector MEg61 with the fuse 1A/T.

The ground faults indicator MEg61.4 does not require any other maintenance except for checking the unit MEg61.4 and the power supply unit MEg103 for splashing water protection and common cleaning the unit and the panel. Every two years check the external components of the assembly set, i.e. solar panels, field sensors and their installations and possibly YAGI antenna, for completeness and integrity. It is recommended to remotely check the communication and accumulator for condition.

## **6/ CONTENT OF THE ASSEMBLY SET MEG61.4**

The following components are delivered for installation of the assembly set of the indicator MEg61.4:

- 1 pc plastic case Minipol of the assembly set of the indicator MEg61.4 including:
  - indicator unit MEg61.4
  - power supply unit MEg103
  - gas-tight maintenance-free lead-acid accumulator B-WP 12-12 (12 V, 12Ah)
  - fuse disconnector AKU of type OPV 10/1 with fuse PV10 2A/T, 10 × 38 mm
  - fuse disconnector MEg61 of type OPV 10/1 with fuse PV10 1A/T, 10 × 38 mm
- 3 pcs sensors L1, L2, L3 with signal 10 m long four-wire shielded cables
- 3 pcs sensor arm with screws M5×12 and flexible washers
- 2 pcs outer ground wire with prolonged eye and screw, length 1.5 m
- 2 pcs separate prolonged eyes of ground wire
- 1 pc middle ground wire with prolonged eye and screw, length 3.5 m
- 1 pc ground wire of the case with eye, length 50 cm
- 2 pcs CUPAL washer
- 18 pcs tightening tapes DL 235, black (UV radiation resistant)
- 2 pcs protective pipe, firm, gray UPRM-Turbo 25 3.0 m
- 1 pc protective pipe, flexible, gray FXP-Turbo 25 0.6 m
- 1 pc protective pipe, flexible, gray FXP-Turbo 25 0.4 m
- 1 pc protective pipe coupling, gray SN 25
- 1 pc straight bushing SGL 2525
- 2 pcs tightening tapes DL 510, black (UV radiation resistant), 0.55 m
- 1 tube PVC adhesive
- 1 pc CD with control and calibration program INDICATOR MEg61, including user specification,

- 1 pc user guide Assembly set MEg61.4
- 1 pc user guide Indicator of ground faults and short-circuit currents MEg61.4
- 1 pc user guide Uninterruptible power supply unit MEg103.

The following can be ordered as options:

- 3 pcs selected type of fixture for MV conductor insulator
  - composite insulator FAVEO CBSZ 2-24-00 is delivered for level 22 kV
  - composite isolator FAVEO FZY 2-35/4 for level 35 kV
- 3 pcs fixture ENSTO, approved for E.ON
- 3 pcs fixture, approved for ČEZ
- 1 pc additional gas-tight lead-acid accumulator B-WP12-12 (12 V, 12 Ah)
- 1 pc USB communication cable, 5 m
- 1 pc outdoor antenna GSM YAGI120, 12 dB with coaxial cable long 10 m and connector
- 2 pcs clamp, belt-wire to secure grounding connection
- 2 pcs clamp, wire-wire to secure grounding connection.

## **7/ DELIVERY, HANDLING AND TRANSPORTATION**

The place of delivery of the assembly set of the ground faults indicator MEg61.4, unless otherwise specified, is the seat of the manufacturer. Components of the basic set of the indicator MEg61.4 are delivered in two five-layer cardboard boxes. The boxes are recyclable. The optional accessories are delivered in packages corresponding to their weights and mechanical dimensions. When it is specified in the order, it is possible to send the ground faults indicator MEg61.4 with accessories through a transport service selected by the orderer.

Because the weight of the individual packaged parts of the indicator is less than 15 kg, no special precautions are required to handle the delivery. One box contains plastic pipes long 3 m.

Each of the parts of the delivery is marked from the outside and contains a delivery note for components.

## **8/ GUARANTEE**

Two year guarantee is provided for the set of the indicator MEg61.4 and its accessories from its sale. Defects incurred during this period due to a provably defective construction, faulty workmanship or inappropriate materials will be repaired free of charge by the manufacturer and the place of performance is the seat of the manufacturer of the assembly set of the indicator MEg61.4.

It is not allowed to open the indicator unit MEg61.4 and the power supply unit MEg103 during the guarantee period.

The guarantee becomes invalid if the user carries out unauthorized modifications or changes on the assembly set of the indicator MEg61.4, connects the set incorrectly or if the assembly set is operated contrary to the technical specification.

Defects of the assembly set of the indicator MEg61.4 incurred during the guarantee period shall be claimed by the user to the manufacturer of the assembly set. Claims without the enclosed letter of guarantee shall not be admitted.

In no case the manufacturer shall be liable for consequential damage caused by the use of the assembly set of the indicator MEg61.4. No liability of the manufacturer shall result from this guarantee exceeding the price of the assembly set of the indicator MEg61.4.

## **9/ ORDERING DATA**

Basic:

- Number of assembly sets of the indicator MEg61.4 with specification of optional accessories referred according to Chapter 6.

Upon request, the following can be delivered:

- a different type of fixture for phase conductor insulator,
- a different type of grounding terminal,
- a different type of agreed non-standardized insulator.

The buyer can order a training and calibration of the assembly set of the indicator MEg61.4 by the manufacturer in the place of installation.

## **10/ MANUFACTURER**

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Fig. 1: Installation of the assembly set of the indicator MEg61.4 on a MV line pole

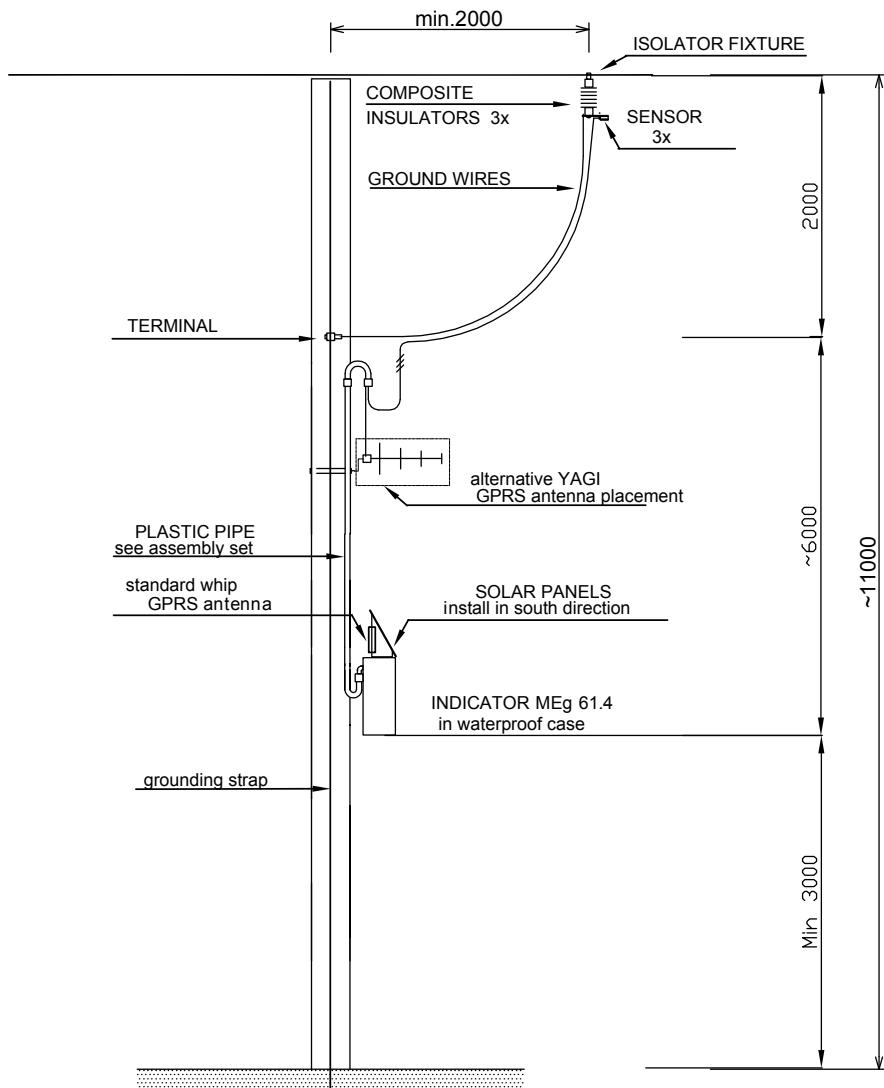


Fig. 2: Case with solar panels of the assembly set of the indicator MEG61.4



Fig. 3: View into the case of the assembly set of the indicator MEg61.4 with a whip YAGI antenna cable



Fig. 4: Attachment of the outdoor antenna GSM YAGI120 to the MV line pole

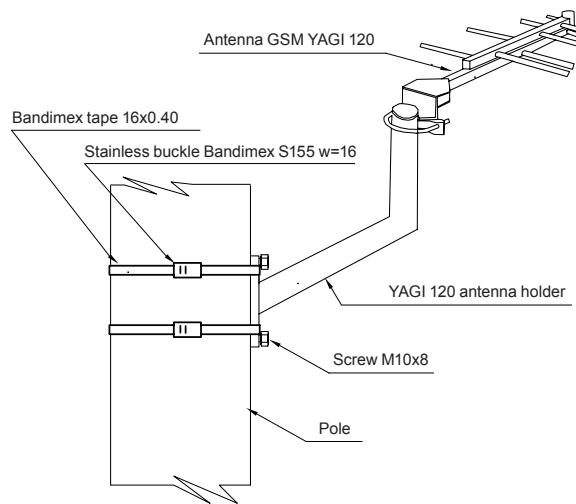


Fig. 5: Wiring in the case of the assembly set of the indicator MEg61.4

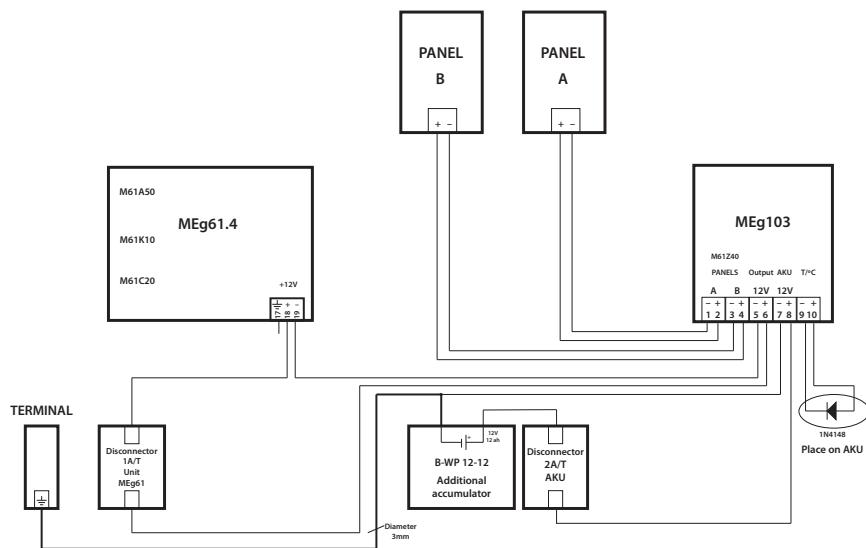


Fig. 6: Detail of the insulator and sensor set

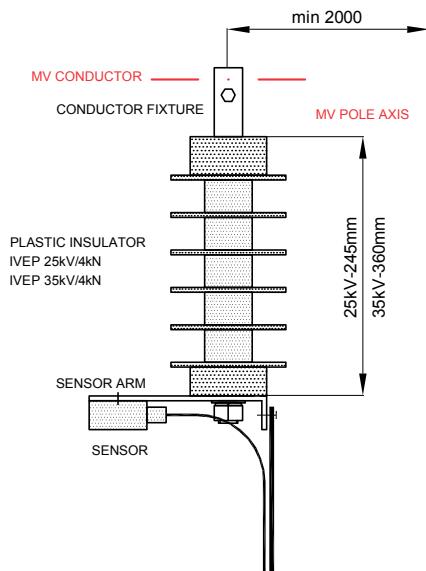


Fig. 7: Assembly set of protective components for sensor cable drop

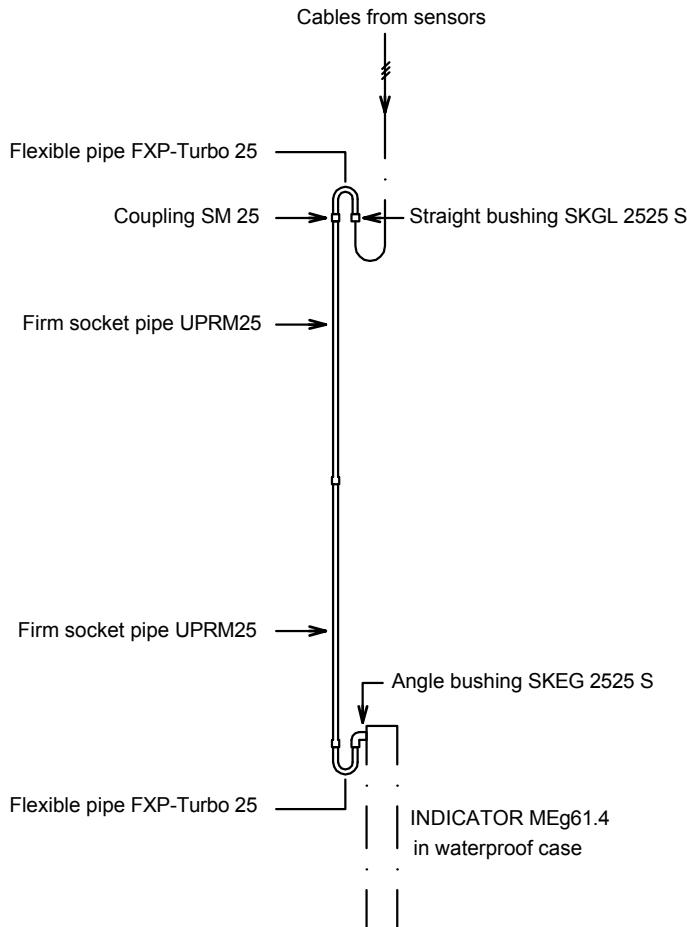
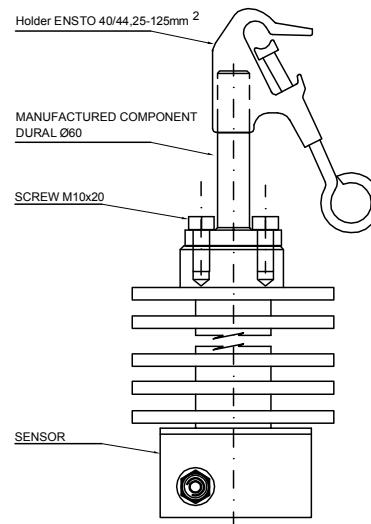
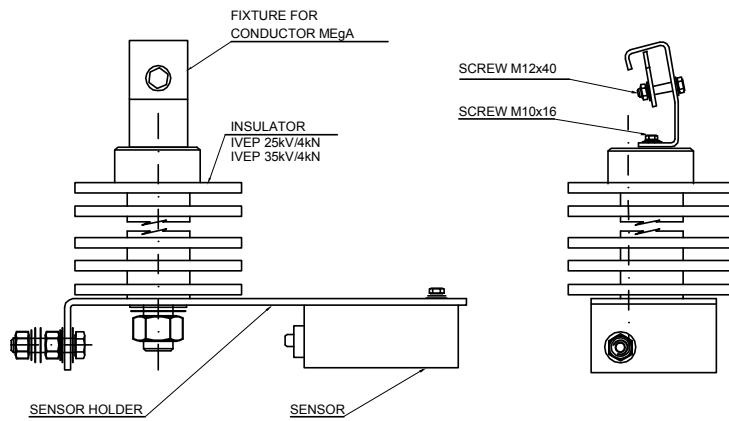


Fig. 8: Fixtures to fix the insulator and sensor onto the phase conductor of a MV line, LW

a) Fixture ENSTO, approved for E.ON



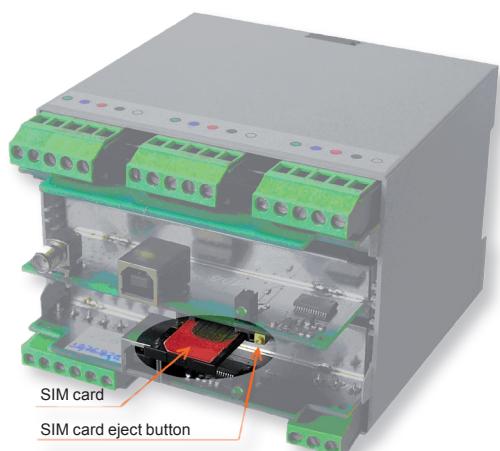
b) Fixture approved for ČEZ







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