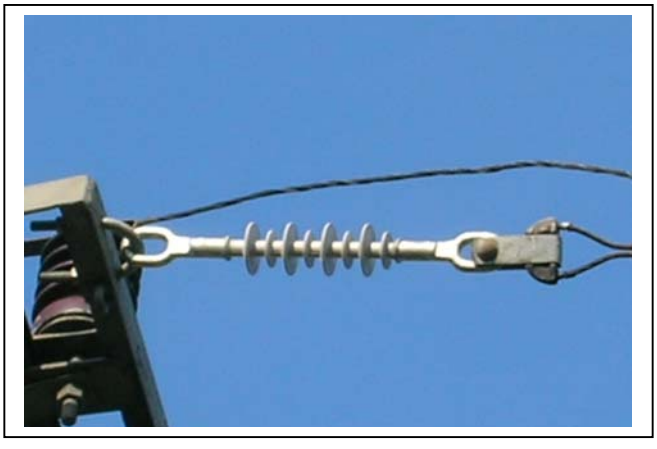
Article for Electrosystems

„LINEAR, OVER-HEAD, COMPOSITE INSULATORS, TYPE CS70… FOR VOLTAGE UP TO 36 kV"

Roman Kłopocki

Overhead insulators assort most important elements of the electro-energetic lines. They serve to the mutual insulation of live elements and earthed structural elements. They determine the new technical generation of insulators, prosperously substituting ceramic insulators.



Composite insulators, type CS are intended for aerial (overhead) electro-energetic lines with medium voltage up to 36kV and comply to requirements of PN - IEC 61109:1999 and PN -

IEC 383 - 1:1997 norms. These insulators have the certificate of the Institute of the Electrotechnics, No. 0046/NWM/04.
Composite insulators, type CS have modern construction, what provides steady and prolonged exploitation in electro-energetic lines. They are intended to work in the environment of pollution class l and ll and lll and lV and have rated mechanical load-carrying capacity of 70 kN.

Construction:

Insulators type CS have the isolating core glass-epoxies made from the ECR type glass fiber, free from boron, with good dielectric proprieties and the very high acidic corrosion resistance. High mechanical endurance of the core and flexibility of the core, ensure lack of the danger in case of insulator crack, during weather changes in autumn - winter and winter - early spring periods. Silicon gum protection cover is made in the high temperature vulcanization technology (HTV) and protects against environment influences, through shades and determines electric proprieties of the insulator. Silicone protection cover made uniformly, seamlessly equipped with shades, ensures high vitality and high resistance during different weather conditions. Forged and firely zinc-plated fittings are mounted on the core by the binding - there are available in the wide range of selection, shown on the Fig. 3. Fittings are additionally water-tight outside by vulcanizing in room temperature silicone.

Features:

- assembly- lengths of insulators type CS70 AA XX ensure the replacement possibility with existing porcelain-overhead type LP
- ecological
- increased resistance against vandalism - fire-arm shooting resistant
- several times smaller weight with relation to porcelain- equivalents
- shades made in the system of two diameters, oblique, assure good isolating proprieties of the covers
- blue-gray color not standing out with the environment
- high mechanical endurance and raised resistance on environmental threats
- hydrophobic proprieties of silicone cover
- wear resistance and UV rays resistant

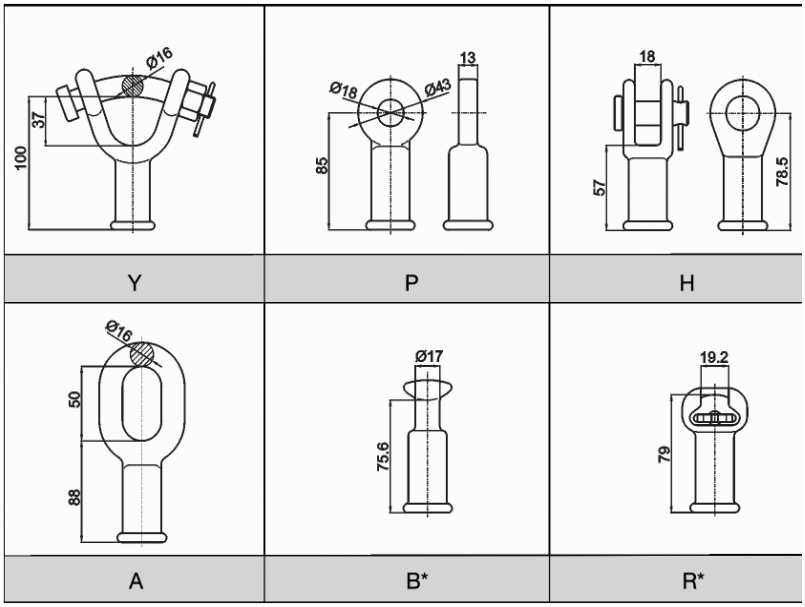


Fig. 3 Types of metal insulators fittings

Marking methodology:

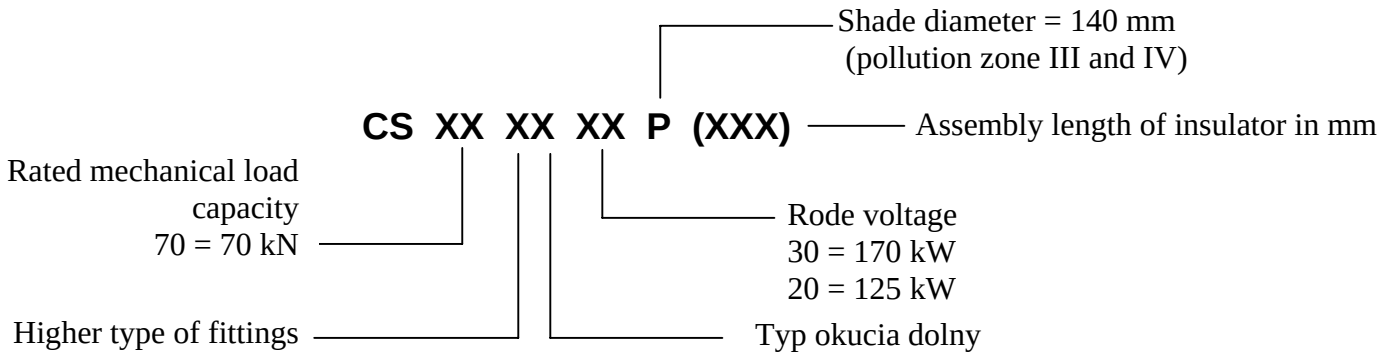


Table No 1 Basic technical data of CS70 insulators……..

Type	CS 70 XX 20	CS 70 XX 30	CS 70 XX 20 P	CS 70 XX 30 P
Rated voltage of the insulator (kV)	20 - 24	30 - 36	20 - 24	30 - 36
Rated flow length (mm)	520	765	903	1258
Jump length (mm)	240	340	224	298
Rated expansion endurance SML (kN)	70	70	70	70
Rated rode voltage 1,2/50µs (kV)	125	170	125	215
Rated testing voltage, wet 50 Hz (kV)	50	70	50	95
Number of shades – large + small	8	22	8	12
Pollution zone	I; II; III	I; II; III	III; IV	III; IV
Mass (kg)	1	1,1	1	1,1
Color	Szary RAL 7035			
Silicon cover	HTV			
Operational temperature	- 50°C do + 45°C			

Note: CS 70 AA 20 (515mm) insulator is equivalent to porcelain LP 60/5 insulator, CS 70 AA 30 (625 mm) insulator is equivalent to LP 60/8 insulator.

Fig 2 Basic dimensions of insulators CS 70 AA 20 (515 mm), CS 70 AA 30 (625 mm)

(Please turn in horizontal position)

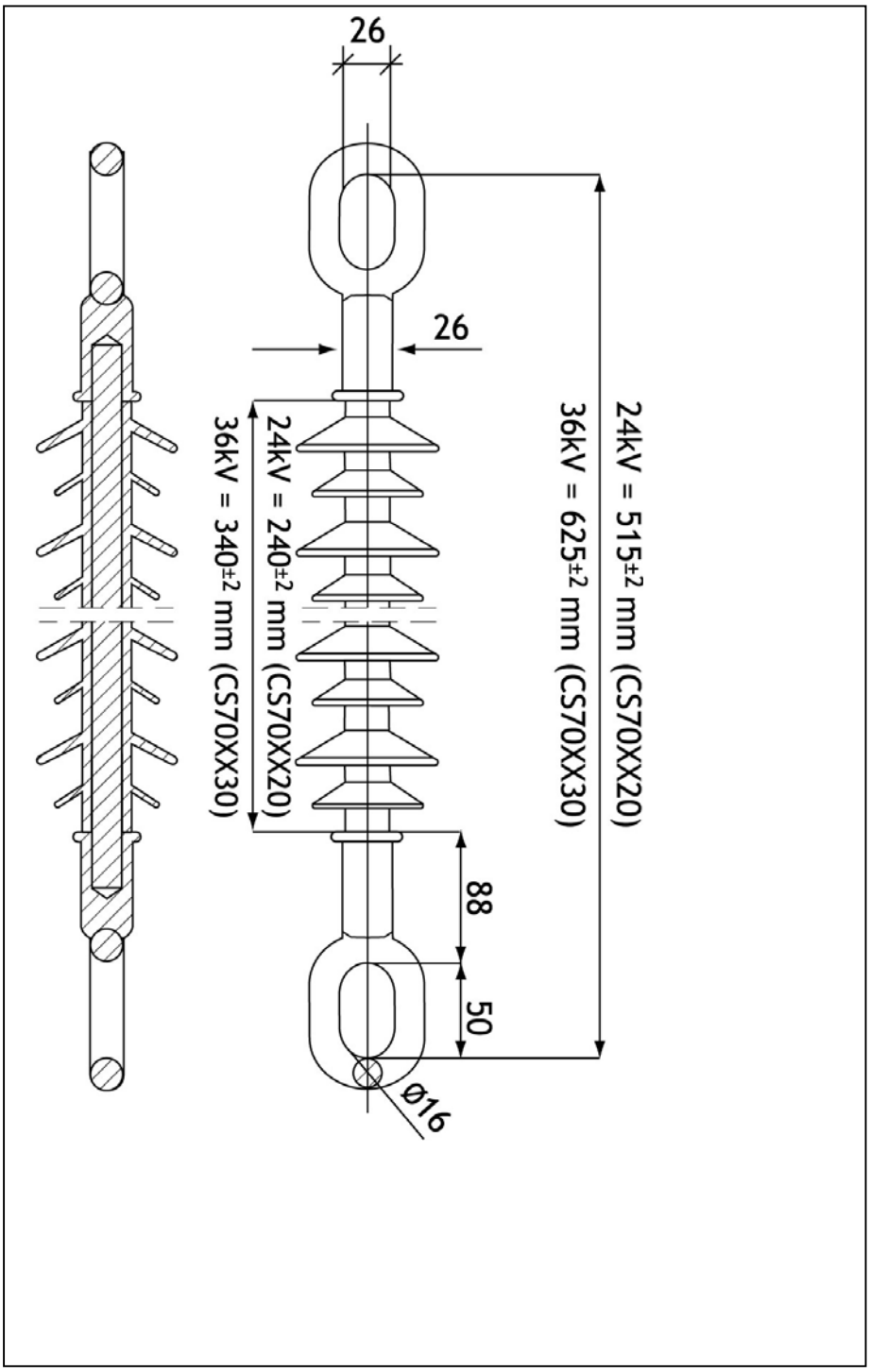


Fig. 3 Basic dimensions of linear insulators CS 70 AA XX P – for pollution zone III and IV

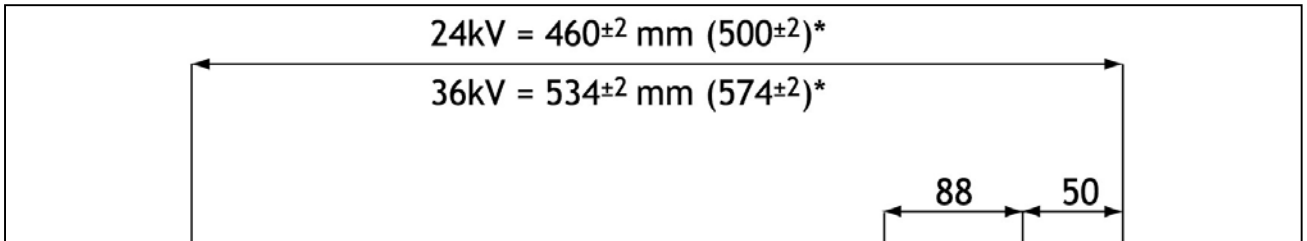


Table of insulators selection regarding pollution zone.

	Pollution zone – for zone IV line insulators							
	I		II		III		IV	
Rated voltage of the line (kV)	**Udop (kV)**	**Insulator type**	**Udop (kV)**	**Insulator type**	**Udop (kV)**	**Insulator type**	**Udop (kV)**	**Insulator type**
15	17,5	CS70XX20 CS70XX20P CS70XX30 CS70XX30P	17,5	CS70XX20 CS70XX20P CS70XX30 CS70XX30P	17,5	CS70XX20 CS70XX20P CS70XX30 CS70XX30P	17,5	CS70XX20P CS70XX30 CS70XX30P
20	24	CS70XX20 CS70XX20P CS70XX30 CS70XX30P	24	CS70XX20 CS70XX20P CS70XX30 CS70XX30P	24	CS70XX20P CS70XX30 CS70XX30P	24	CS70XX20P CS70XX30 CS70XX30P
30	36	CS70XX20 CS70XX20P CS70XX30 CS70XX30P	36	CS70XX20P CS70XX30 CS70XX30P	36	CS70XX20P CS70XX30P	36	CS70XX30P

Description of high temperature vulcanization technology HTV

The basic silicone mixture Rhodorsil MF 8970 U, from which protection cover of CS type insulators and surge limiters of type INZP is made, was created specially for the injection's

formation. The process consists from pressure forcing of the mixture to the form and the 10 minutes vulcanization in temperature of 170 C.
The filler determine: 0, 6 % di-methylo-hexan and 75 % tertiary - butilperoxidehexan. After finished process, the material is characterized by very high resistance against natural factors: dusts, waters, bad weather conditions, UV radiations, ozone and also factors relevant to the atmospherical and industrial pollution, considerably exceeding resistance of natural elastomers. It shows the superb voltaic arc and erosion resistance. Material is non-flammable is, with small quantity emitted vapors. It is also non-toxic. It supports temperatures within the range from- 60 C to + 200 C. Material has water-repellent proprieties: it pushes away water from the surface. If surface is dirty, it never acquire the conductible proprieties. It is believed, that silicon protection cover parameters remain on the same level approx. for 50 years.

Some parameter of finished material after wearing tests are show in table No 2:

Table 2

Parameter	**Heating state**	**After heating in temp. 200^{o}C – 4h**	**After 10 day aging in temp. 200^{o}C**
Shore's hardness	70	80	87
Tearing endurance (MPa)	6	6	6,5
Extension during tearing (%)	310	200	95
Cutting module with 100% extension (Mpa)	2,4	3,7	4,5
Laceration endurance (kN/m)	18	19	17

Dielectric properties:
Dielectric endurance: 21 kV/mm
Dielectric constant: 3,7
Electrical resistance: 4 x 10^{15} Ohm/cm