

ES 17.5-800 kV Earthing switches

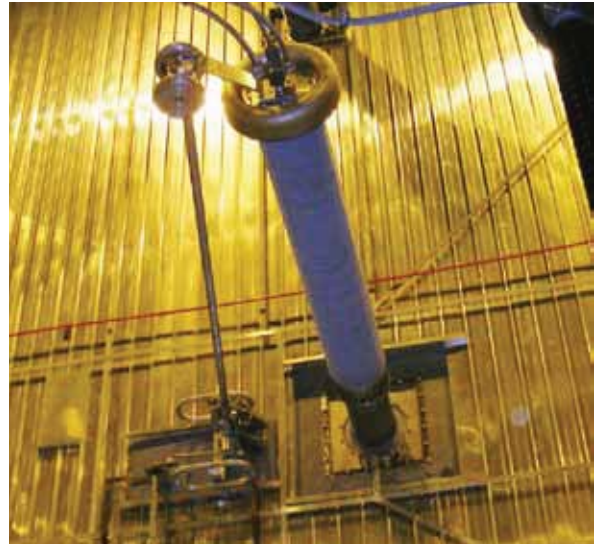
HV Switching



We know how

Our range of disconnectors and earthing switches is designed to ensure the best performances and reliability, which are the result of our 70-year-old experience.

Over 100,000 disconnectors, with and without integrated earthing switches, installed in more than 100 countries worldwide are the guarantee of best-buys.



The ES earthing switches

ES are "Class E0" (ref. to IEC 62271-102) earthing switches, suitable for the installation both combined with disconnectors and as "stand-alone" equipment.

The "stand-alone" type is described in this brochure, but all construction features and ratings are also valid (with the obvious differences) for earthing switches combined with disconnectors.

According to their ratings, the ES can be supplied in the following types:

- "Single-motion" (or "direct entry")
- "Double-motion"

Both types are composed of three-poles, operated simultaneously either by a single operating mechanism and mechanical linkages between the poles, or by one mechanism for each pole.

To adapt to various layout of substations, earthing switches the poles can be erected traditionally (horizontally) or wall-mounted, and even upside down.

Like all our products, ES earthing switches meet the latest international standards (IEC, ANSI) and they can also be customised according to clients' particular specifications.

Special earthing switches

Upon request, special earthing switches can be designed and supplied to satisfy any particular need.

Examples of special earthing switches are:

- "Transformer neutral earthing switches", provided with insulated base-frame and linkages, to allow the direct connection to earth of the neutral terminal of power transformers, without involving supporting structures and operating shafts;
- "Semi-pantograph earthing switches", the ideal solution when post insulators are very high, which is quite common in EHVDC installations;
- "Valve hall earthing switches", highly custom-tailored, to solve any issue related to the specific layout of HVDC valve halls.

Construction features

Each pole consists of a moving arm and a fixed contact.

The moving arm is made of an aluminium alloy tube (for the lower ratings only, the arm is made of hot-dip galvanised steel) with a copper flat bar bolted at its end, suitably shaped for its correct engagement with the fixed contact; the moving arm is supported and hinged at the other end and it is electrically connected to the base-frame by means of flexible tinned copper braids (in special cases, aluminium straps are provided instead of copper braids).

The fixed contact consists of an aluminium alloy support, with copper fingers bolted to it; the number and dimensions of fingers depend on the rated short-time withstand current. Contact pressure, which is assured by stainless steel springs, is low under normal circuit conditions but, in case of short circuit, it increases rapidly, thanks to the finger reverse-loop design: this guarantees both low operating efforts and very high short-time withstand currents.

The support of the fixed contact, which is bolted to the top flange of a post insulator, also includes the HV terminal.

The post insulator, when supplied, ensures a good withstand to terminal loads and complies with either IEC or ANSI standards; special heights and creepage distances are also available upon request.

The base-frame of each pole is made of hot-dip galvanised steel and supports the post insulator, the moving arm and the mechanism that allows the rotation of the arm around an horizontal shaft; each base-frame is provided with suitable earthing terminals for the connection to the earthing system of the substation (customised terminal are available upon request).

The transmission system consists of a set of shafts, rods and levers, made of hot-dip galvanised steel and suitably linked to each other to transmit the power from the operating mechanism to the moving arms.

When integrated in disconnectors, the earthing switch (one or two per pole), is electrically and/or mechanically interlocked with the main switch.

The whole design and manufacturing process are ruled by ISO 9001 certified procedures, to guarantee a perfect reproducibility of performances from type-testing to series production.



Operating principle

The base-frame supports one post insulator ① and the moving arm ②, whose horizontal shaft ③ is directly linked to the transmission system.

In open position, the moving arm is perpendicular to the post insulator.

The rotation of the horizontal shaft makes the arm rotate for about 90°, until the moving contact ④ (male) gets in touch with the fixed one ⑤ (female), which is bolted to the top of the post insulator; then:

- for the “single-motion” type, the moving contact enter the fixed one directly, until the fully closed position is reached;
- for the “double-motion” type, the moving contact starts a vertical movement (along the axis of the arm), which makes it enter the fixed one.

When necessary for a smooth and low power-demanding motion, the weight of the moving arm is balanced by a spring.

The HV terminal ⑥ is as shown in the next page figure; customised terminal is also available upon request.



Ratings and dimensions

The values in the table refer to IEC standards, unless explicit reference to ANSI is made; for missing ANSI ratings, refer to C37.32

Rated voltage		U _r (kV)	24	36	52	72.5	123	145	170
Rated power-frequency withstand voltage	TE	U _d (kV)	50	70	95	140	230	275	325
Rated lightning impulse withstand voltage	TE	U _p (kV _p)	125 (IEC) 150 (ANSI)	170 (IEC) 200 (ANSI)	250	325 (IEC) 350 (ANSI)	550	650	750
Dimensions (mm)		A	525	665	780	1100	1500	1800	2000
	B	IEC	305	445	560	770	1220	1500	1700
		ANSI	-	-	-	762	1143	1372	1575
	C	IEC	360	500	615	1016	1466	1746	1946
		ANSI	-	-	-	1008	1389	1618	1821
	D		4 ø14	4 ø14	4 ø14	4 ø14	4 ø14	4 ø14	4 ø14
	E		60	60	60	240	240	240	240
Rated voltage		U _r (kV)	245	245	300	362	420	550	800
Rated power-frequency withstand voltage	TE	U _d (kV)	395	460	395	450	520	620	830
Rated lightning impulse withstand voltage	TE	U _p (kV _p)	950 (IEC) 900 (ANSI)	1050	1050	1175	1425	1550	2100
Rated switching impulse withstand voltage	TE	U _s (kV _p)	-	-	850	950	1050	1175	1550
Dimensions (mm)		A	2400	2600	2600	3300	3750	4400	5450
	B	IEC	2100	2300	2300	2900	3305	3650	5000
		ANSI	2032	2337	2337	3099	-	3861	-
	C	IEC	2392	2592	2592	3220	3670	3970	5320
		ANSI	2324	2629	2629	3319	-	4181	-
	D		4 ø18	4 ø18	4 ø18	4 ø18	4 ø18	4 ø18	4 ø18
	E		270	270	270	340	340	340	340

TE: To Earth

Rated short-time withstand current

I_k (kA)

up to 80 / 1-3s (depending on rated voltage)

Rated peak withstand current

I_p (kA_p)

up to 208 (depending on rated voltage)

Reliability and maintenance

Due to lifetime greased or self-lubricated hinges and to self-wiping contacts, the maintenance of ES metallic parts is ensured by their own motion.

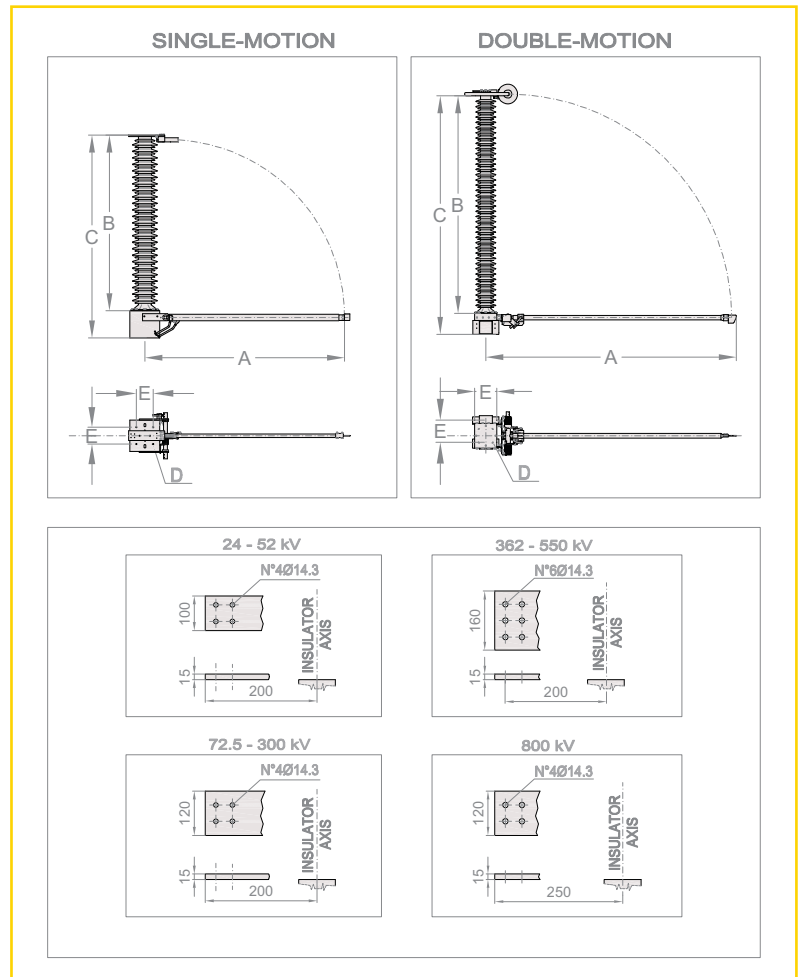
The use of corrosion-free (or coated) materials for all components ensures an exceptional reliability over many years of service.

The mechanical endurance performance exceeds the IEC standard requirements.

Optional devices

Upon request, earthing switches can be equipped with an induced current switching device, compliant with IEC 62271-102; for the highest ratings of induced current to be switched (or upon request) it can be of the "arc-free" type.

For operation under severe ice conditions (up to 20 mm), ice shields are available for protection of the equipment (where needed).



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