

CABLE TEST TERMINATIONS

- Cost-reduced routine and type testing of extruded high- and ultra-high voltage cables
- Lowest PD levels (down to < 1 pC)
- Modular concept



CABLE TEST TERMINATION SYSTEMS



Fig. 1 Water-filled test terminations, type CET



Fig. 2 Oil-filled test terminations, type EKP

APPLICATION

Routine and type testing of medium, high and ultra-high voltage cables at the manufacturer's factory includes a withstand test combined with a sensitive PD measurement.

Open cable ends without suitable terminations cause strong partial discharges or even flashovers due to a lack of field control. Standard cable terminations used as part of the cable assembly require long installation times and must be destroyed during removal, which makes them unsuitable for routine testing. The test terminations are:

- Easy to assemble
- Reusable
- Standard-compliant with PD levels < 1 pC up to 400 kV, < 2 pC up to 800 kV

and suitable for AC voltage tests up to 100 kV AC (EKP) and 800 kV (CET) as well as impulse voltage tests (CET only) up to 1,900 kV LI and 1,200 kV SI. All tests and PD measurements are performed in accordance with IEC 60502, 60840, 62067, 60060-1, -2 and 60270, and the corresponding IEEE standards.

ADVANTAGES

- EASY INSTALLATION AND USE
- EXTENDABLE WITH ADDITIONAL MODULES
- PD LEVEL < 1 pC UP TO 400 kV, < 2 pC UP TO 800 kV
- TESTS ACC. TO IEC AND IEEE STANDARDS

OIL-FILLED TEST TERMINATIONS (EKP)

For medium-voltage cables with test voltages of up to 100 kV AC, oil-filled cable test terminations provide sufficient insulation. Both cable ends are simply plugged into an oil-filled cable termination. The oil around the end of the cable provides higher electric strength in critical ranges.

The oil-filled test terminations come with adapters for cable cross-sections from 35 mm² to 2,000 mm².

Other components such as conditioning units or cooling systems are not required.

Since the oil itself is an excellent insulating medium, the terminations consume virtually no additional electrical energy. Transparent tubes facilitate cable mounting.

FACTS IN BRIEF

- TEST VOLTAGES UP TO 100 kV AC
- EXTREMELY EASY TO USE
- NO ADDITIONAL TESTING POWER REQUIRED



Fig. 3 Water-filled test terminations, type CET, several nominal voltages



Fig. 4 Water conditioning unit, type CEU

WATER-FILLED CABLE TEST TERMINATION SYSTEMS (CETS)

General

For test voltages > 100 kV, deionized water offers a much better possibility for field control at the cable ends. Water-filled test termination systems can therefore be used for test voltages up to 800 kV AC.

Type tests are possible on request.

Main components

Each system consists of two water-filled test terminations, type CET, and, depending on the required cooling capacity, one or two water conditioning units, type CEU.

Working principle

The electric field strength is reduced in critical ranges at the end of the cable, mainly by the conductivity of the water. In order to maintain a balance between field control and occurring losses, the conductivity of the water is optimally adjusted in the water conditioning unit, which also serves for process water recooling.

FACTS IN BRIEF

- TEST VOLTAGES UP TO 800 kV AC/1900 kV LI/1200 kV SI
- FULLY AUTOMATED WATER CONDUCTIVITY CONTROL
- CAN BE INTEGRATED INTO SAFETY CONCEPTS

Features

- Closed water circuit with automatic conductivity adjustment ($\pm 0.01 \mu\text{S/cm}$)
- Deionized water is recovered after each test to save resin and water
- Easy lifting and lowering of the terminations for test preparation and execution, optionally with motor drive
- Quick couplings for connecting the water hoses that link terminations and conditioning system
- Quick-lock system at both pipe ends for quick cable mounting
- Condensation at cable test terminations is prevented by automatic water temperature control
- System is optimized for closed external cooling circuits
- Water-filled terminations with reduced length (on request) can be used for AC voltage tests
- High operational safety: CEU can provide the test system controller with a shutdown signal in an emergency
- Extendible with additional modules

Scope of delivery of accessories

- Resin cartridge for process water deionization
- Silicone compound for cable end sealing
- Mold for silicone sealings
- Electrodes for dissipation factor measurement ($\tan \delta$) optionally

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TECHNICAL SPECIFICATIONS

Oil-filled cable test terminations*		
Type designation	Nominal AC voltage	Cable peeling length
EKP 75	75 kV	1000 mm
EKP 100	100 kV	1300 mm

*One system consists of two terminations

Water conditioning unit		
Type designation	CEU 60	CEU 120
Cooling capacity	60 kW	120 kW
Conductivity range	0.1 ... 2.0 $\mu\text{S}/\text{cm}$	0.1 ... 2.0 $\mu\text{S}/\text{cm}$
External cooling water supply	70 l/min, $\leq 20^\circ\text{C}$	180 l/min, $\leq 20^\circ\text{C}$
Power supply	230 V/16 A	230 V/16 A

Accessories for water-filled cable test termination systems	
Motorized drive (optional)	To lift the terminations, in particular with large types
Guard ring electrode (optional)	To minimize losses in the terminations during tan delta measurement
Silicon-based pourable compound and molds	To pour seals for the pipe ends
Resin package	To deionize the process water

Water-filled cable test termination systems*				
Type designation CETS**	Nominal AC voltage	Nominal impulse voltage	Cable peeling length***	Required water conditioning unit
100/120-60	100 kV	250 kV	1250 mm	CEU 60
150/120-60	150 kV	500 kV	1550 mm	CEU 60
200/120-60	200 kV	600 kV	2050 mm	CEU 60
250/120-60	250 kV	700 kV	2050 mm	CEU 60
300/120-60	300 kV	800 kV	2300 mm	CEU 60
350/120-60	350 kV	850 kV	2450 mm	CEU 60
350/160-60	350 kV	850 kV	2450 mm	CEU 60
400/120-60	400 kV	950 kV	2800 mm	CEU 60
400/160-120	400 kV	950 kV	2800 mm	CEU 120
500/120-120	500 kV	1200 kV	3300 mm	CEU 120
500/160-120	500 kV	1200 kV	3300 mm	CEU 120
600/120-120	600 kV	1400 kV	3900 mm	CEU 120
600/160-120	600 kV	1400 kV	3900 mm	CEU 120
700/120-240	700 kV	1650 kV	4300 mm	2 x CEU 120
700/160-240	700 kV	1650 kV	4300 mm	2 x CEU 120
800/160-240	800 kV	1900 kV	4950 mm	2 x CEU 120

* One system consists of two terminations and the above number of water conditioning unit.

** The cable test termination systems can be used with various cable diameters (across extruded insulation):

Types CETS .../120-... for cables from 30 to 120 mm

Types CETS .../160-... for cables from 55 to 160 mm

*** Shorter stripping lengths on request (for AC tests only)



Fig. 5 Water-filled test terminations used for an AC routine test of a high-voltage cable

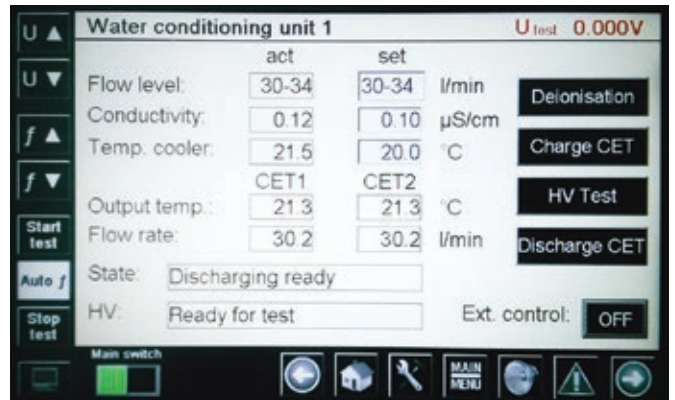


Fig. 6 Screen shot of the control software

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