

# Standard Capacitors Type NK Type 3370



*The Haefely Test AG standard capacitor family from 5 kV to 800 kV*

## Description

The SF<sub>6</sub> insulated standard capacitor is used together with a C and tan delta measuring bridge (e.g. Tettex 2877) as a comparison standard for exact measurements of the capacitance and tan δ of HV equipment like cables, transformers, bushings, capacitors, etc. The capacitor is provided with a top electrode which allows partial discharge free interconnections to the other elements of the H.V. circuit. The SF<sub>6</sub> insulated standard capacitor is designed for indoor service and is of mobile design. The standard capacitors of the series NK or 3370 are used for:

- exact measurements of the capacitance and tan delta.
- exact measurements of AC voltages (AC divider) in the industrial frequency range (with add. internal electrode or add. secondary part).

The capacitor is built as steel pressure vessel with bushing for voltages up to 30 kV included. Above this voltage, the measuring capacitance C<sub>s</sub> is formed by the metallic pressure tank and the corresponding internal concentric electrode. The electrodes are insulated from each other with SF<sub>6</sub> gas. All capacitors are fitted with a pressure indicator and filling valve. Surge arrestors protect the measuring output from transients.

## Special features

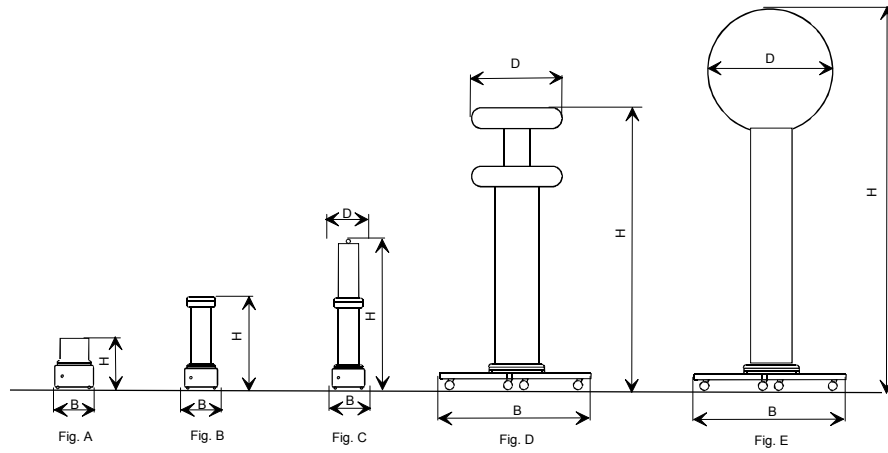
For very high voltages a grading with discrete capacitor elements achieves a linear field distribution. This results in higher voltage withstand capability even at humidity levels up to 95 % without condensation. High temperature and voltage coefficient stability is granted.

## Technical data of NK series

Type NK	Voltage	Capacitance ± 3 %	PD Level at U <sub>n</sub>	Type	Height H	Diameter top electrode D	Base frame dimension B	Weight net, approx.
U <sub>n</sub>	kV	pF	pC		mm	mm	mm	kg
5	5	1000	≤ 1*	A	255	---	200	10
30	30	1000	≤ 1	B	685	---	510	90
100	100	100	≤ 2	C	1340	270	400	40
200	200	100	≤ 2	D	2000	600	1200	180
300	300	50	≤ 3	D	2570	1200	1200	350
400	400	50	≤ 3	D	3120	1200	1200	400
600	600	33.3	≤ 3	D	4300	1200	2200	800
600	600	50	≤ 3	D	4300	1200	2200	800
800	800	50	≤ 10	D	6260	2200	2790	1300
1000	1000	20	≤ 10	E	7980	2500	3020	2000
1200	1200	20	≤ 10	E	8000	3400	3700	3000

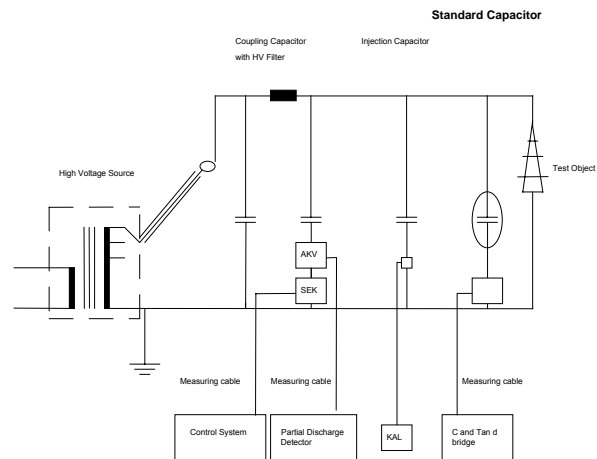
\* only up to 2500 V (for NK 5 only).

## Design



Standard capacitor 100 kV.

## Typical electrical diagram of standard capacitor



### Measuring of capacitance and $\tan \delta$

The standard capacitors are used in conjunction with bridges for measuring capacitance and  $\tan \delta$  due to their very stable capacitance and very low inherent losses.



*Capacitance and  $\tan \delta$  bridge type 2877.*

### Measuring of transformer losses

The standard capacitors are used in Transformer Measuring Systems (like TMS 580) due to their very high accuracy as voltage dividers. The components of a typical transformer measuring system are shown below:



*Power transformer loss measuring system type TMS 580-100-4000*

### Measuring of AC voltages

The secondary unit type SEK AC with standard output voltage 140 V RMS is used for voltage measurements with a DMI 551 or any other high precision instrument.

The formed high voltage AC divider will measure in a frequency range of 10 ... 1000 Hz with an accuracy of  $\pm 0.1 \%$ . For this the standard capacitor must be fitted with an additional electrode.

## General technical data

Stability of the capacitance	< 0,01 % / year
Loss of pressure	< 1 % / year
Service pressure (absolute)	450 ± 50 kPa
Test pressure (absolute)	1000 kPa
tan δ	< 1 x 10 <sup>-5</sup> -
Insulation resistance	> 500 MΩ
Voltage drift (0 ... U <sub>n</sub> )	< 3 x 10 <sup>-5</sup> -
Frequency drift (10 ... 1000 Hz)	< 1 x 10 <sup>-5</sup> -
Operating temperature	- 5 ... + 45 °C
Storage temperature	- 20 ... + 50 °C

## Colours

Insulating parts	grey-white RAL 9002
Top electrode	aluminium
Base frame	galvanised

## Basic scope of supply

- 1 standard capacitor with top electrode
- 1 mobile base frame
- 2 spare surge arrestors
  
- 1 instruction manual
- 1 test report

## Calibration

Our basic standard for calibrating each standard capacitor is a PTB (Germany) calibrated internal standard. A standard capacitor should be re-calibrated every year. Haefely Test AG can provide these services, in our Basel works or on-site.

## Routine tests in the factory

Normally, the capacitance, tan δ, and partial discharge values are tested before and after the 1,1 U<sub>n</sub> over-voltage test.

## Transportation

Usually, the capacitors having a rated voltage of less than 800 kV are shipped with their rated SF<sub>6</sub> pressure and are therefore ready for immediate use.

For higher voltages the internal pressure is reduced to 120 kPa (absolute) and must be pressurised on-site after installation.

## Accessories (not included)

- SF<sub>6</sub> filling device, including:
  - 1 SF<sub>6</sub> filling device with ... kg of SF<sub>6</sub> and
  - 1 connection hose with adapted fitting
- Set of HV connections type HSEV
- Secondary part for voltage measurements type SEK AC

## Special versions

- Additional capacitance C<sub>13</sub> for voltage measurement
- Outdoor version with porcelain insulator (example below)



*1000 kV outdoor & 600 kV indoor standard capacitors*



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Subject to technical modifications without notice.

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