

Data Sheet 5.31/6

Compressed Gas Standard Capacitors, Type MCP

Application

Compressed gas standard capacitors are applied in voltage dividers for precise voltage measurements. Consequently, compressed gas standard capacitors are used in high-voltage laboratories as components of reference measuring systems for the calibration of alternating voltage measuring systems according to IEC 60060-2. Furthermore, compressed gas standard capacitors are the reference capacitance in bridge circuits for precise measurements of capacitances and dissipation factors. In National Institutes for Metrology, compressed gas standard capacitors are used as basis for alternating voltage national standards.

Design

Because of the use of the approved coaxial electrode arrangement compressed gas standard capacitors have the following advantages:

- high stability of capacitance
- negligible dielectric loss factor
- free of partial discharges
- two separate measuring capacitances for parallel measurements, for instance of voltage and capacitance

For achievement of the high internal breakdown strength the insulating gas sulfur hexafluoride SF₆ under operating pressure of 4 bar is used. Wound insulating tubes of glass-fiber-reinforced polyester resin provide the high mechanical strength of the pressure vessels, which is moveable on rollers.

With exception of a periodic cleaning of the surface of the insulating tube and periodic checks of the gas pressure compressed gas standard capacitors do not need any service.

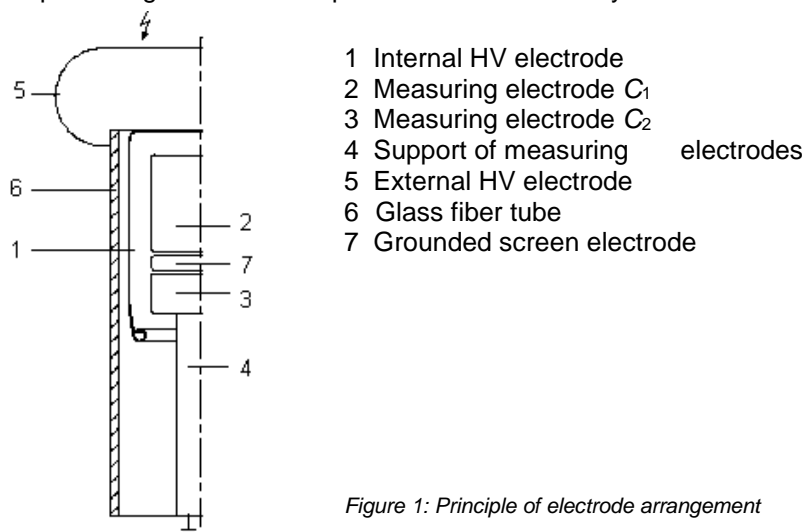


Figure 1: Principle of electrode arrangement

Table 1: Operating conditions

Temperature range	°C	5 ... 40
Relative humidity (at $\vartheta \leq 30$ °C)	%	≤ 75
Height above sea level	m	≤ 1000
Installation		Indoor to keep the temperature range
Operating pressure (overpressure)	bar	4
Test pressure (according to technical regulations of the German organization for technical inspection TÜV)	bar	6

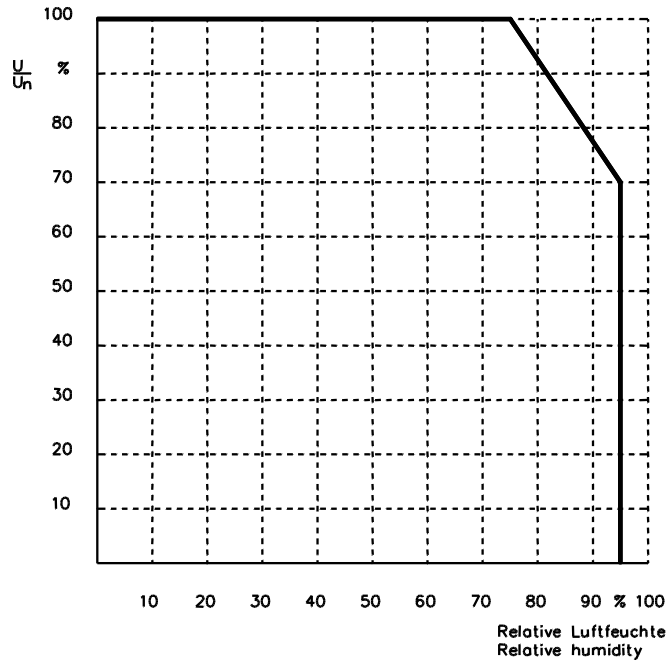


Figure 2: Admissible high voltage in function of relative humidity of the ambient air

Table 2: Conditions for storage

Ambient temperature for storage at operating pressure	°C	5 ... 40
Ambient temperature for storage at max. 0.5 bar overpressure	°C	- 25 ... 50
Relative humidity (at $\vartheta \leq 30$ °C)	%	≤ 75

Table 3: Conditions for transport

Ambient temperature	°C	≤ 20
Max. permissible pressure in the compressed gas standard capacitor	bar	< 2 (200 kPa)
Position in a transport box		<ul style="list-style-type: none"> MCP 100 and MCP 200: standing MCP 300 to MCP 800: lying
SF ₆ filling		<ul style="list-style-type: none"> After transportation refilling with SF₆ necessary

Table 4: Metrological data

Dissipation factor $\tan \delta$		$< 1 \cdot 10^{-5}$
Measuring uncertainty of C_1 measurement	%	± 0.05
Tolerance of capacitance	%	± 5
Metrological characteristic		$\Delta C/C = f(p) = 0.22 \cdot 10^{-2} / \text{bar}$ $\Delta C/C = f(\vartheta) < 3 \cdot 10^{-5} / \text{K}$ $\Delta C/C = f(U) < 3 \cdot 10^{-5}$ for $U = 0 \dots U_{\text{rated}}$

Table 5: Technical Parameters

Type	Rated Voltage	Test Voltage	Rated capacitance C ₁	Rated capacitance C ₂
	kV	kV	pF	pF
MCP 100	100	110	100	-
MCP 200	200	220	100	16
MCP 300	300	330	100	16
MCP 350	350	385	100	16
MCP 400	400	440	100	16
MCP 500	500	550	50	14
MCP 600	600	660	50	14
MCP 700	700	770	50	19
MCP 800	800	880	50	19

Insulating gas:
SF₆, quality according to IEC 60 376

Accessories (available on request):

- measuring cable, single screened or double screened, length 5 m, 10 m, 25 m or 50 m
- gas-filling equipment which contains a pressure reduction valve and connection armatures

Table 6: Dimensions and weight (approx.)

Type	Height (H)	Dimension (AxA)	Weight
	mm	mm	kg
MCP 100	950	420 x 420	46
MCP 200	1370	750 x 750	130
MCP 300	2350	1100 x 1100	220
MCP 350	2600	1200 x 1200	345
MCP 400	2600	1200 x 1200	345
MCP 500	3400	1400 x 1400	660
MCP 600	3400	1400 x 1400	660
MCP 700	4200	2000 x 2000	1450
MCP 800	4200	2000 x 2000	1450

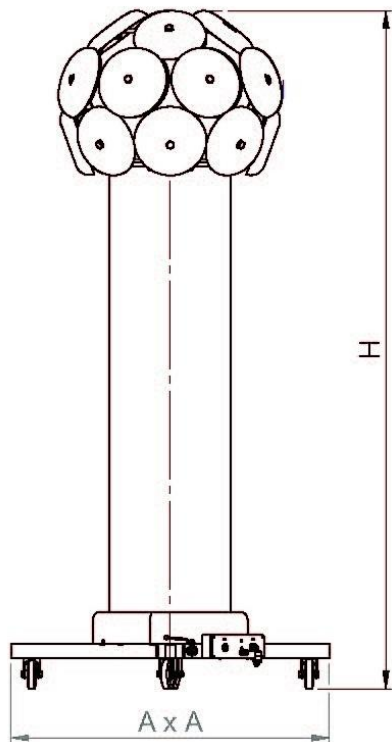


Figure 3: Dimensional drawing



Figure 4: MCP 800

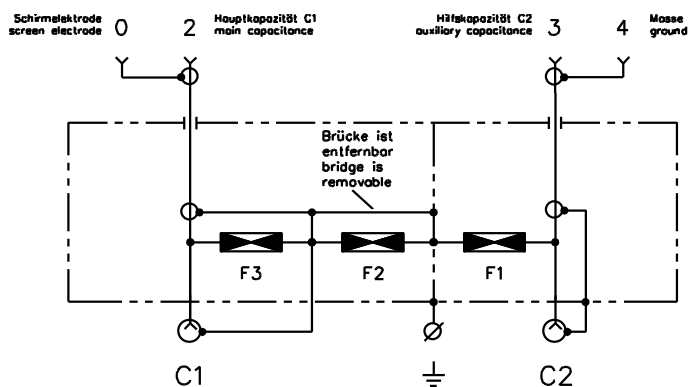


Figure 5: Circuit diagram of connection box

Calibration

The Compressed Gas Standard Capacitors are calibrated by the HIGHVOLT calibration laboratory D-K-19153-01-00. The calibration is documented by a DAkkS-calibration certificate. This calibration certificate documents the traceability to national standards, which realize the units of measurements according to the International System of Units (SI).

Germany's Accreditation Body DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.

If the application task demands a calibration at a National Institute for Metrology, on request, the compressed gas standard capacitors would be calibrated at the Physikalisch-Technische Bundesanstalt (PTB).

Type designation

MCP x

x = rated voltage in kV