Seeing beyond

ZEISS Metrology Expert Tip

No Temperature Expansion with the ZEISS REACH CFX® Extensions.

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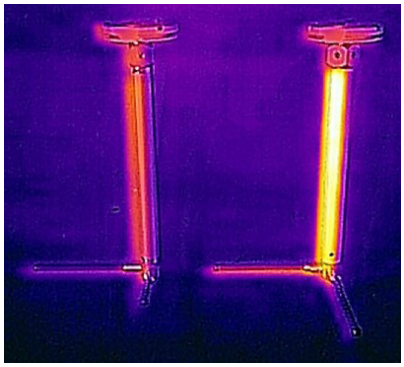
Why is there No Temperature Expansion with ZEISS REACH CFX® Extensions?

Reliable measurement results are an essential component of reliable production processes. There are various influences on measuring strategy: user, measuring device, workpiece and environment that affect the measuring result. The temperature plays a decisive role in the environment. The temperature of the measuring environment changes due to: windows, heat sources such as PCs, air conditioning, the workpiece and people present. Due to the physical properties of the relevant components, the temperature has an influence on many individual areas. Appropriate measures should therefore be taken to at least be aware of these influences and take them into account in the measurement uncertainty.

Different materials have different coefficients of thermal expansion (CTE). Thanks to their unique composition consisting of a carbon fibre with a unique winding and cut-in adapters, ZEISS REACH CFX® Extensions have a CTE of practically 0, which means that the ZEISS REACH CFX® Extensions maintain their constant length when the temperature changes.



Thermal imaging camera picture of two stylus systems (ZEISS REACH CFX® on the left and titanium extension on the right).

Thermal Expansion Coefficients of the Materials

Materials	Thermal Expansion Coefficient
Aluminium	23,4 µm / °C / m
Titanium	9,4 µm / °C / m
V2A	16,0 µm / °C / m
ZEISS REACH CFX® Portfolio	~0,0 µm / °C / m
Standard carbon fibre	- 1,4 µm / °C / m

Suitable for all measuring environments

Whether in the measuring room or in the production area, the ZEISS REACH CFX® Extensions are significantly more thermally stable than aluminium and up to 60 % stiffer than titanium. This enables more accurate measurements even when scanning the workpiece in the production environment.

Comparison of Thermal Expansion between Titanium and ZEISS REACH CFX® Extension

ZEISS REACH CFX® Extension

Titanium 9,4 µm / °C / m	+	Carbon Fibre -1,4 µm / °C / m	+	Titanium 9,4 µm / °C / m	→	**ZEISS REACH CFX®** **ΔI ~ 0**

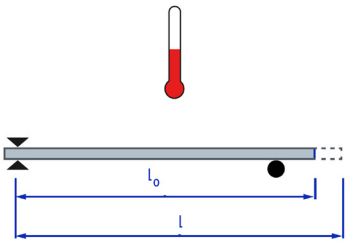
Titanium Extension

Titanium
l_0 = 200 mm
α = 9,4 µm / °C / m
Δt = 1 °C

$\Delta l = l_0 * \alpha * \Delta t$
Δl = Length change
l_0 = Original length
α = linear expansion coefficient
Δt = Temperature change

→ **Δl = 1,88 µm**

Result:
- A 200 mm titanium extension expands by 1,88 µm with a temperature change of 1°C → Deviation of the measurement result.
- A 200 mm ZEISS REACH CFX® Extension remains constant and therefore it has no resulting loss of precision.



Aluminium has a heat coefficient that is more than twice as high, resulting in significantly higher thermal expansion.

ZEISS REACH CFX® Portfolio Compared to Aluminium and Titanium

Material	Expansion
Aluminium	★☆☆☆☆
Titanium	★★★★☆
ZEISS REACH CFX 1	★★★★★
ZEISS REACH CFX 3	★★★★★
ZEISS REACH CFX 5	★★★★★

ZEISS Original Accessories are available in the ZEISS Metrology Shop.

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