



## LIST OF CALIBRATION COEFFICIENTS - EXAMPLE

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### EQUATIONS

#### STRAIN EQUATION

$$\Delta\epsilon = \frac{\Delta\lambda - B \cdot \Delta T}{A \cdot \Delta l} + \Delta T \cdot CTE_{SS304} \cdot \Delta l_2 - \Delta T \cdot CTE_{substrate}$$

$$\Delta\lambda = \frac{\lambda_{act} - \lambda_0}{\lambda_0} \quad \Delta l = \frac{l_{FAL}}{l_{FFL}}$$

$$\Delta T = (T_{act} - T_0) \quad \Delta l_2 = \frac{(l_{FAL} - l_{FFL})}{l_{FAL}}$$

Measurand	Description
$\Delta\epsilon$ [με]	Strain shift
$\lambda_{0,inst,strain}$ [nm] **1	Initial strain wavelength
$T_{0,inst}$ [°C] **1	Initial temperature
$L_{FAL}$ [m] **1	Anchoring length
$T_{act}$ [°C] **2	Actual temperature
$\lambda_{act,strain}$ [nm] **2	Actual strain wavelength
$L_{FFL}$ [m]	Free fiber length
CTE [με.°C <sup>-1</sup> ]	Coefficient of thermal expansion

#### STRING EXPRESSION

$$\Delta\epsilon = ((\Delta\lambda - B \cdot \Delta T) / (A \cdot \Delta l)) + (\Delta T \cdot CTE_{ss304} \cdot \Delta l_2) - (\Delta T \cdot CTE_{substrate})$$

$$\Delta\lambda = ((\lambda_{act} - \lambda_0) / \lambda_0) \cdot \Delta l = l_{FAL} / l_{FFL}$$

$$\Delta T = (T_{act} - T_0)$$

$$\Delta l_2 = (l_{FAL} - l_{FFL}) / l_{FAL}$$

For the determination of the strain sensitivity the free fiber length was used as a basis

#### TEMPERATURE EQUATION

$$T = T_{S1} \left( \frac{\lambda_{T,act} - \lambda_{T,ref}}{\lambda_{T,ref}} \right)^2 + T_{S2} \left( \frac{\lambda_{T,act} - \lambda_{T,ref}}{\lambda_{T,ref}} \right) + T_{S3}$$

Measurand	Description
T [°C]	Temperature
$\lambda_{T,act}$ [nm] **1	Actual temp. wavelength
$\lambda_{T,ref}$ [nm]	Reference temp. wavelength
$T_{S1}$ [°C]	Temperature sensitivity 1
$T_{S2}$ [°C]	Temperature sensitivity 2
$T_{S3}$ [°C]	Temperature sensitivity 3

#### STRING EXPRESSION

$$T = Ts1 * ((\lambda_{T,act} - \lambda_{T,ref}) / \lambda_{T,ref})^2 + Ts2 * ((\lambda_{T,act} - \lambda_{T,ref}) / \lambda_{T,ref}) + Ts3$$

\*\*1 To be measured after installation of the sensor \*\*2 Measured value during monitoring of the sensor

### CALIBRATION COEFFICIENTS

Nr.	Serial number	Customer code	Product	STRAIN COEFFICIENTS				TEMPERATURE COEFFICIENTS			
				A [με <sup>-1</sup> ]	B [°C <sup>-1</sup> ]	$L_{FFL}$ [m]	CTE [με.°C <sup>-1</sup> ]	$T_{S1}$ [°C]	$T_{S2}$ [°C]	$T_{S3}$ [°C]	$\lambda_{T,ref}$ [nm]
1	198701/0001		SC-01/T; GL: 1,5m; WL: 1530,9/1531,9nm; LCP-03: 1x0,5mtr; 1x FC/APC, 1x WCP-01	7,76981E-07	5,89292E-06	1,360	16	-2185344,339	53560,13848	22,50076233	1530,862759