Force Sensors / Load Cells Terms and Definitions

The definitions of the technical characteristics of all sensors largely relate to the VDI/VDE/DKD - guideline 2638.

**Measuring Range**
The measuring range is the load range in which the guaranteed error limits may not be exceeded.

**Nominal Load**
Nominal load is the upper limit of the measuring range. Depending on the sensor type, the nominal load may be tension or compression load.

**Accuracy Class**
The maximum single error (indication in % for force sensors; for load cells according to OIML R60) of the sensors output signal is smaller than the value related to the accuracy class. The tolerance of the characteristic value is not being considered.

**Service Load**
Service load is the maximum load into the direction of the measurement’s axis of the sensor without changes of the specific characteristics. The service load range should be used in exceptional cases, only.

**Limit Load**
Limit load is the maximum permissible load of the sensor without expecting destruction of the measuring system. At limit load, the specific error limits no longer apply.

**Ultimate Load**
Ultimate load is the load at which a permanent change or destruction occurs.

**Max. Dynamic Load (according DIN 50100)**
The maximum dynamic load is the oscillation width, related to the nominal load, of sinusoidal changing force in the direction of the measurement axis of the sensor, which the sensor, when being repeatedly used, can bear at a load of $10^7$ stress cycles, without causing significant changes of its metrological characteristics to nominal load.

**Nominal Displacement**
Nominal displacement is the spring suspension of the outer load application points in the measurement direction when applying the nominal load.

**Input Resistance**
Input resistance is the ohmic resistance value between the supply voltage connections.

**Output Resistance**
Output resistance is the ohmic resistance value between the output voltage connections.

**Bridge Resistance**
Bridge resistance is the ohmic resistance of the complete measuring bridge.

**Insulation Resistance**
Insulation resistance is the ohmic resistance between the connection leads and the measuring body of the sensor.

**Temperature Coefficient of the Sensitivity**
The temperature coefficient of the sensitivity is the change related to the nominal sensitivity of the actual characteristic value by a temperature change of 10 K.

**Temperature Coefficient of the Zero Signal**
The temperature coefficient of the zero signal is the output signal change related to the nominal sensitivity of the unstressed sensor by a temperature change of 10 K.

**Reference Temperature**
Reference temperature is the ambient temperature related to the technical specifications of the sensor.

**Nominal Temperature Range**
The nominal temperature range is the range of the ambient temperature in which the sensor complies with the technical data and error limits.

**Service Temperature Range**
The service temperature range is the range of the ambient temperature in which the sensor can be operated without occurrence of permanent changes of the measurement characteristics. Within the service temperature range, specified error limits no longer apply.

**Supply Voltage**
The supply voltage is the required operating voltage which guarantees the error-free function of a passive sensor.

**Sensitivity**
Sensitivity is the output signal at nominal load less the preload signal.
Nominal Sensitivity
The nominal sensitivity is the theoretically predetermined rated value (sensitivity).

Storage Temperature Range
The storage temperature range is the range of the ambient temperature in which the sensor can be stored without electrical or mechanical stress and without permanent changes of its measurement characteristics.

Combined Error
Combined error $F_{comb}$ is half the distance $c$ between the limits of the tolerance band which encloses the characteristic line in the measurement range at increasing and decreasing load, based on the nominal sensitivity $C_n$. $F_{comb}$ consists of the linearity error and the hysteresis.

\[ F_{comb} = \frac{c}{C_n} \]

Creep Error
The creep error is the maximum admissible change of the sensor output signal over the specified time at constant load and stable environmental conditions.

Repeatability
The repeatability is a measure of the relative standard output signal deviation, resulting from ten repeated measurements at two points of the characteristic curve with the same size and same mechanical changes.

Level of Protection according to DIN EN 60529; VDE 0470
The level of protection of a housing is determined by the letters IP and a two-digits code number. The number includes the protection from contact, foreign bodies and water for electrical equipment.

Control Signal
By a control resistance, a signal, corresponding to the sensitivity of the sensor, is generated inside the sensor.

Advantages: Recalibrations are reduced. Zero point and sensitivity can be controlled before each measurement.

Function:
By parallel switching of the resistor $R_k$ to the measuring bridge $R_1$, the measuring bridge is electrically de-tuned, thus a measuring signal of 50 or 100% of the nominal value is available at the output.

Minimum Division / Resolution
The minimum division or resolution is the smallest measurable sub-step fragmentation.

Zero Signal
Zero signal is the output signal of the force sensor / load cell in unloaded condition.

Shift after Loading
Zero shift after loading is the maximum admissible change of the sensor output signal over a specified time after complete load relief under stable environmental conditions.

Tightening Torque
Tightening torque is the specified fastening torque of the mounting bolts for the fixation of the load cell.

Explanation of Abbreviations
S – Full Scale

Labels
- Label for the compliance with the safety requirements according to the CE-guidelines
- Label for the suitability of electrical devices in explosion endangered areas (certified by an EC inspection authority)
- Accuracy class according to OIML