

Force, Displacement, Flow, Speed

Technical Features of Force Transducers

The technical features of the force transducers are substantially fixed by VDI/VDE guideline 2637. The most important terms are described below:

Measuring range:

The load range, for which the guaranteed error limits will not be exceeded.

Nominal load:

The nominal load is the upper limit of the measuring range. Depending on the sensor, the nominal load can be a tension or compression load.

Working load:

The working load is the load that can be

applied to the sensor, as well as the nominal load, without affecting the specified characteristics. The working load range should only be used in exceptional cases.

Load limit:

The load limit is the maximum permissible load that can be applied to the measuring cell without expecting a destruction of the measuring system. At this load the specific error limits are no longer applicable.

Breaking load:

The breaking load is the load where a permanent change or destruction occurs.

Maximum dynamic load:

Rated force related oscillation amplitude of a sinusoidally changing force in direction of the measuring axis of the sensor. At a load of 10⁷ cycles the sensor, when being repeatedly used up to the rated force, is not subject to significant changes regarding the metrology characteristics.

Drift error:

The drift error is the maximum permissible change of the output signal of the sensor over the specified time at constant load and stable environmental conditions.

ALMEMO® Force Measurement

ALMEMO® force transducers allow to adjust the constant load (tare) to zero and to enter the final value as nominal value.

The correction value will be automatically calculated from this by the measuring instrument. An ALMEMO® connector

that switches on this resistor for the adjustment is available for force transducers with integrated reference resistor.

The Right Displacement Sensor For Any Measuring Task

Different methods can be used depending on the limiting and environmental conditions involved with the measuring task:

Linear inductive displacement transducers and tracers:

absolutely accurate, high resolution, robust, acceleration resistant, cost-efficient, noise resistant, good long term stability, environmentally stable (contamination, humidity/moisture), point-shaped, almost contactless measurement, easy mounting and handling

Non-contacting displacement measuring systems based on eddy current:

very accurate, very fast, high resolution, environmentally stable (contamination, moisture/humidity), noise resistant regarding EMI, temperature stable, long term stability, for devices under test made of

all types of electrically conducting materials, nonmagnetic and ferromagnetic, compact sensor designs, extensive application temperature range

Non-contacting inductive displacement measuring systems:

accurate, temperature stable, fast, cost-efficient, particularly for ferromagnetic test objects

Long-travel sensors based on eddy current:

large measuring paths, robust and compact, no mechanical wear, easy handling, compression-proof

Non-contacting inductive optical displacement measuring systems:

point-shaped measurement, accurate, fast, large base distance, material independent

Cable line displacement sensors:

very accurate, large measuring paths, easy mounting, cost-efficient

Non-contacting capacitive displacement measuring systems:

extraordinary accurate, very temperature stable, fast, high resolution, very good long term stability, material independent for metal objects under test, also suitable for insulating materials, easy to handle, extensive operating temperature range

Conductive plastic potentiometer:

high resolution, good linearity, cost-efficient, good temperature and humidity coefficients, extensive operating temperature range

ALMEMO® Displacement Measurement

Our Potentiometric displacement sensors have been pre-aligned in the factory by storing the correction values in the

ALMEMO® connector before delivery. The precise adjustment can be locally performed by the user with final measures

after the installation

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Turbine Flowmeters

The sensor contains a vane or paddle that starts rotating when a flow is present. Unlike the optical method, this method also allows for measurements in cloudy and non-transparent liquids. The rotational speed is proportional to the corresponding quantity of flow. The electrical output signal can be generated by two different methods:

- Inductive Proximity Switch:

The rotor blades are provided with

special steel caps, therefore, the rotor blades approaching the transducer cause a change of the inductance and the generation of a pulse type output signal.

- Hall Sensor:

The rotor is provided with permanent magnets that affect a Hall sensor, which is located on the transducer. The transducer electronics transforms the Hall signal into a pulse type electrical

output signal.

For measuring the volume flow rate or for dosing tasks, the ALMEMO® sensor range includes turbine flowmeters for different measuring ranges and operating conditions:

- Radial turbine flowmeters for large flow quantities.
- Axial turbine flowmeters with rotating vane for small flow quantities

Optical Rotational Speed Meters

The optical reflection method has become the most accepted method for the measurement of revolutions of shafts, wheels, fans etc.

With single unit retroreflective photoelectric sensors the transmitters and receivers form one single unit. The light sent by the transmitter is, by an opposite located object, reflected to the receiver. The sensor performs a switch when the reflected amount of light exceeds a specific, adjustable limit value at the receiver. This quantity of light depends on the size and the reflection properties of the object. Special reflective tapes are used to increase the sensing range and to improve the

signal-to-noise ratio.

ALMEMO® rotational speed sensors can be used in two measurement setups:

- Retroreflective photoelectric sensor (DIN EN 60947: Type D)
Detects only opaque objects.
The sensing range depends on the reflectivity of the object, i.e. on the surface quality and colour.
Sensitive with regard to contamination and against changes of the reflective properties of the object
These influences can (within limits) be compensated by means of a sensitivity adjustment control

Only small mounting efforts are required as the sensor is a single unit device and a rough alignment is sufficient in most cases.

- Retroreflective light barrier (DIN EN 60947: Type R)
Retroreflectors allow for long sensing ranges and an improved signal-to-noise ratio. Low susceptibility to interferences, therefore, highly suitable for use under harsh conditions, e.g. outdoor applications or dirty environments