FORM+TEST PRÜFSYSTEME

more than testing

# Essential for the Straight-line Testing - the Alignment Unit

ORIGINAL FORM+TEST PRÜFSYSTEME

# Description

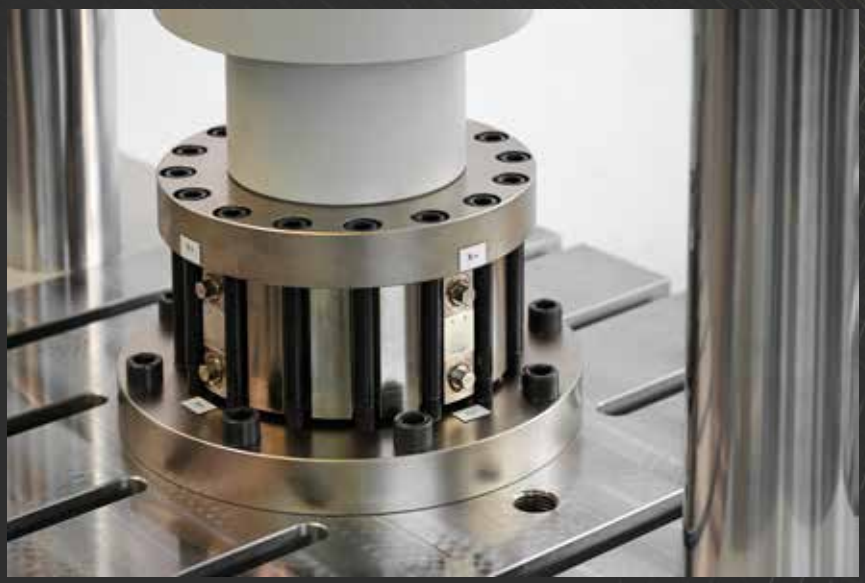
Material properties are determined on suitable samples under precisely defined loads. It is therefore necessary that the load is applied correctly. The usual calibration of the load cell can only check the force measurement, but not the alignment of the test axis. For reliable test results, however, an exact alignment of the load line is a basic requirement. This applies especially to materials that do not tolerate local overloads, such as brittle materials, fibre composites or for long-term tests.

Checking the load line must not be limited to the commissioning or after an unexpected overload such as the sudden buckling of the specimen. It is essential to do this at regular intervals between experiments. This is the only way to guarantee consistent accuracy of the test results.

The measurement and adjustment of the load line is prescribed by various standards such as ASTM 1012 or the NADCAP qualification. FORM+TEST has developed an alignment unit for this purpose, with which the alignment of the load line can not only be checked reliably and with repeat accuracy, but also the possible errors of axis and angle misalignment can be corrected.

FORM+TEST offers the alignment unit for static and dynamic testing machines between 50 kN and 500 kN nominal load. Other nominal load ranges can be considered on request. The alignment unit can be clamped backlash-free between the load line and the load frame via a flange connection or a bolt connection and is fatigue-proof for loading with the full nominal load.

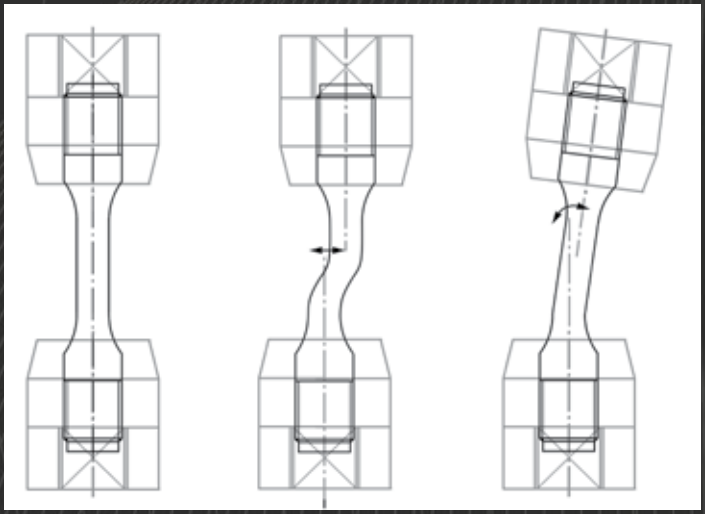
- sizes: 50 - 500 kN
- durable design
- easy handling
- complete accessories



our alignment unit

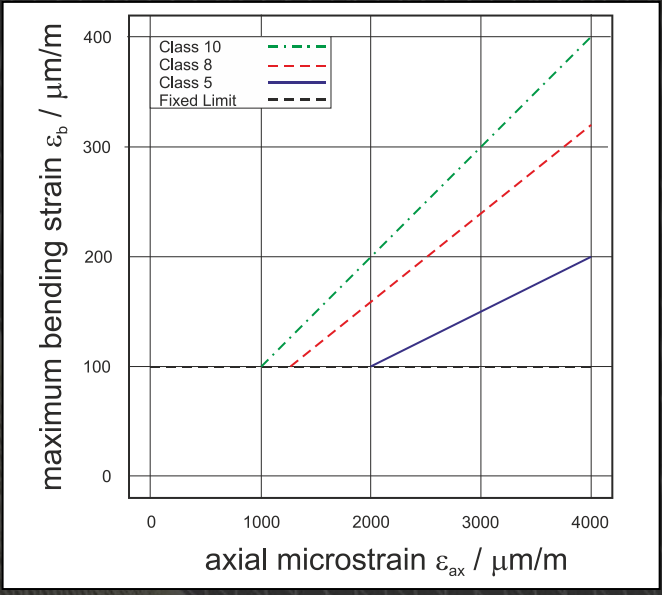
# Starting Base

The possible geometric errors in the alignment of the load string can be represented by a superposition of angular errors and misalignment errors. Each of the two errors can occur in any direction.



schematic representation of axis and angle misalignment

The occurring alignment errors superimpose additional bending moments to the uniaxial tension/compression loading. In order to achieve qualification of the test device according to the regulations, the bending must not exceed a certain ratio to the ideal tensile load. ASTM 1012, for example, determines different classes of accuracy and allows different levels of bending strain according to the respective class.




Classification of calibration classes according to ASTM 1012 and corresponding permissible bending strain (*)

(*) ASTM E1012-2019

# Accessories

FORM+TEST also offers the necessary accessories for measuring the alignment of the load string.

These include:

- calibration rod
- measuring electronics
- evaluation software

In order to be able to correct the alignment errors by means of the alignment unit, these must first be determined according to height and direction. For this purpose, corresponding test bars (with round or rectangular cross-section) are used, which are applied with strain gauges (DMS). The minimum number of strain gauges to be used is specified by the system of equations to be solved or the standard to be applied. According to ASTM 1012, a minimum number of 2 x 4 DMS is recommended.

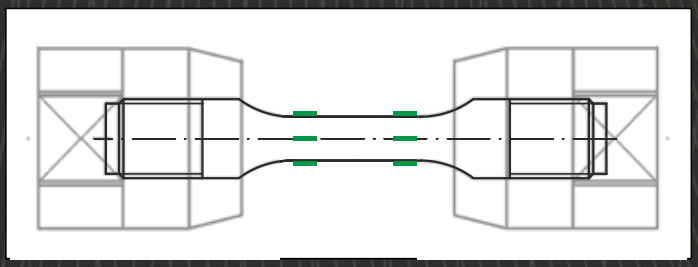
Our alignment unit in application

## Calibration Rod

The calibration rod is manufactured with high precision by FORM+TEST. It is then precisely applied with the required number of strain gauges according to the specifications to be met by the customer. A corresponding calibration protocol with measurement of the position of the strain gauges is created.

The test bar is of course dimensioned according to the  load height so that any bending stress that occurs does not lead to plastification of the test bar, but the height of the strain gauge measurement signals is still not too low to reliably resolve the necessary bending strain.

Example of an instrumented test bar



schematic representation of the DMS-arrangement of the calibration rod

## Measuring Electronics

The strains must then be recorded via suitable measuring electronics. By means of appropriate calculation algorithms, the axis errors are evaluated according to angular and axis misalignment. Via the assignment to the respective measuring points, the direction of the errors can be determined, which can then be eliminated by the alignment unit.

Measuring amplifier system MGC (*)...

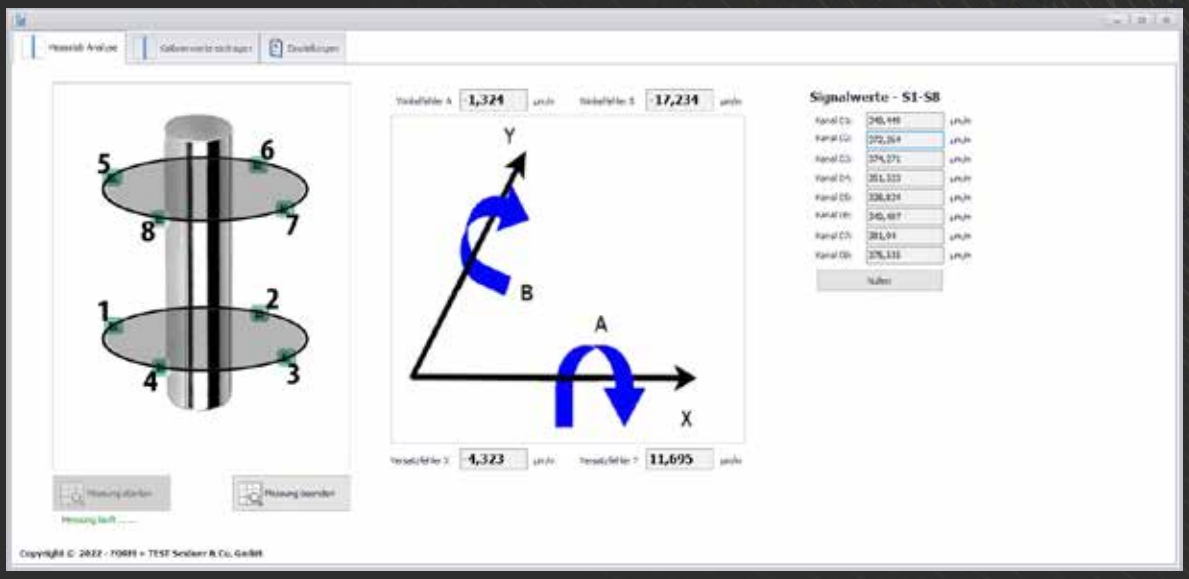
... and Quantum X from HBK (*)

(*) pictures with the kind support of HBK

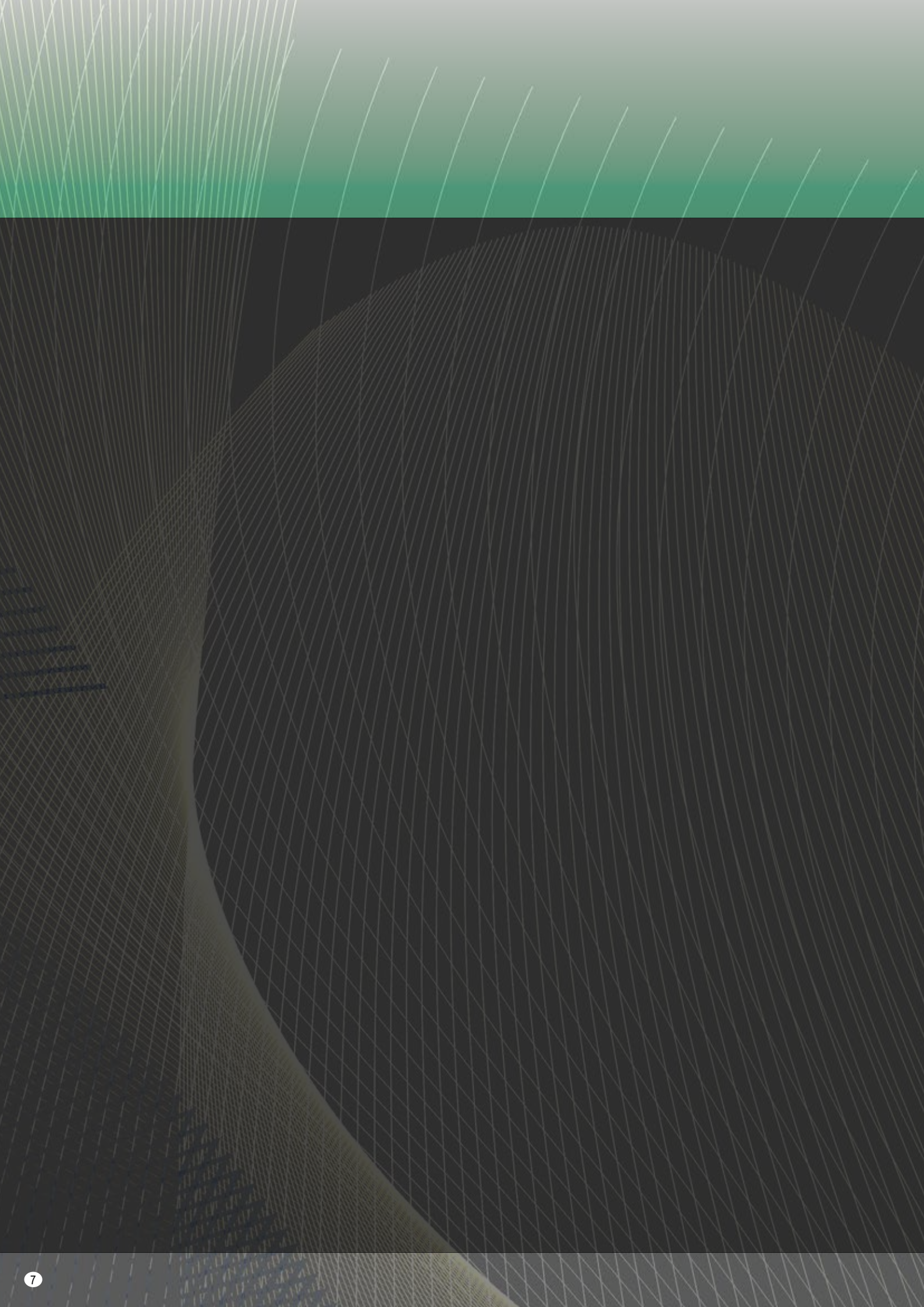
The measuring electronics must resolve the strain gauge signals stably and, as far as possible, compensate for temperature effects by means of an appropriate bridge circuit. Different measuring amplifiers can be used for this purpose. FORM+TEST relies on HBM's Quantum or MGC series measurement electronics.

## Evaluation Software

The evaluation software created by FORM+TEST enables the user to activate the respective adjustment screw on the alignment unit directly by means of the graphic display and local assignment of the two axis errors, angular offset and axis offset, in order to minimise the error. At the same time, the measured strain values are also displayed directly to provide an additional validation option. FORM+TEST thus offers the necessary complete package for checking and correcting axis errors of the load line.




Example representation of the user interface for determining the alignment errors



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