Checking HBM torque flanges using the shunt signal and the zero point

Users often ask whether they may continue using a torque flange that has not been in use for an extended period of time. For this reason, HBM has extensively investigated the behavior of torque flanges.

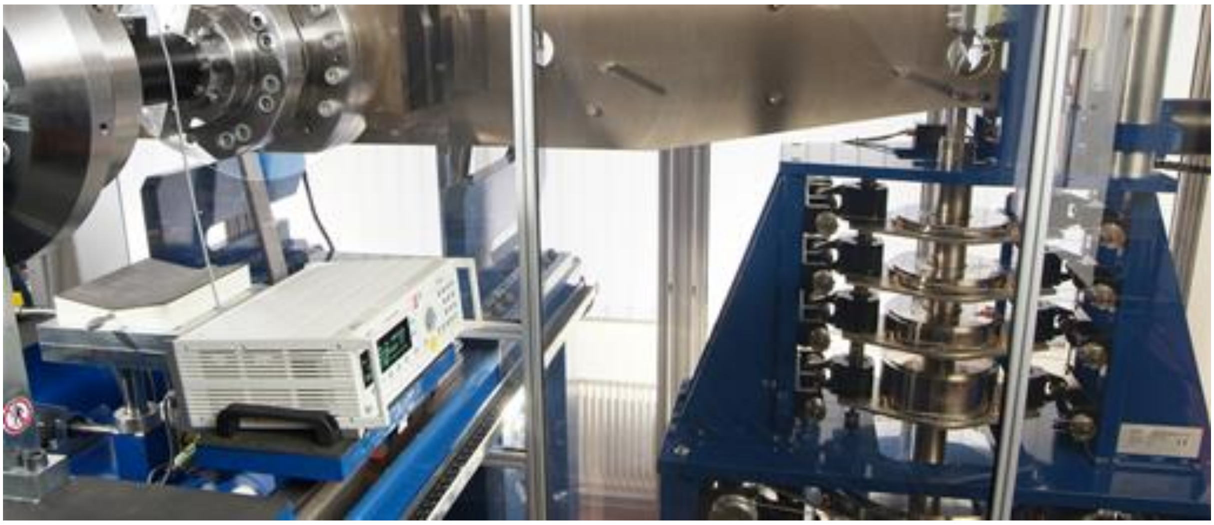
The only way to be absolutely sure is by having it checked and calibrated in a DakkS (German Calibration Service)-accredited calibration laboratory, eg at HBM. In most cases, however, getting a quick assessment for less critical measurements is what is required.

This technical article provides users with practical tips for checking torque flanges using the shunt signal and the zero point, explained using the example of the T40B torque flange. With respect to the center frequency, the statements apply mutatis mutandis to all measurement flanges. Settings for downstream electronics have not been taken into account and need to be considered separately.

Shunt signal

All HBM torque flanges with contactless measurement signal transmission (eg T40B, T12) have a shunt signal [1]. It is approx. 50% of the nominal (rated) measuring range and is an absolute value (eg N•m) specified on the type plate and in the manufacturing certificate.

When this shunt signal is used for checking a torque flange, actual shunting is carried out on the rotor of the measurement shaft. This means that a fixed resistor is electronically connected in parallel to a bridge arm of the Wheatstone Bridge circuit. The resulting bridge unbalance value is converted to the shunt signal specified on the type plate using the data resulting from the mechanical calibration on our accredited calibration machine (see fig. 1). In general, the resulting values are "non-uniform" and the shunt signals differ from transducer to transducer.



25 kN•m torque reference standard measurement system. One of a total of 4 accredited torque reference standard measurement systems at HBM.

The shunt signal serves two purposes:

1. Adjustment of downstream instruments and adaptation to the individual torque transducer.
2. Checking and monitoring of torque transducers in conjunction with zero point monitoring.

Relevance of the shunt signal and zero point - Example: T40B

The shunt signal is connected in addition. Therefore, we recommend not to load the measurement flange when activating the shunt signal.

When using the shunt and zero signal to check and monitor the T40B, we recommend that you return it to HBM for testing if the following changes occur:

- Deviation of the zero signal when the transducer is not mounted > ± 1 % (> ± 40 Hz), ie zero point not within the frequency range of 9,960 Hz to 10,040 Hz at 10,000 Hz center frequency.
- Zero signal variation resulting from mounting > ± 3 % (> ± 150 Hz).
- Additional change in zero signal after balancing of the zero signal variation resulting from mounting > ± 1 % (> ± 50 Hz).
- Deviation of the shunt signal > ± 0.1% compared to the value specified on the type plate or manufacturing certificate.

These values apply for stable reference temperature conditions and a transducer warm-up phase of 15 minutes. When the transducer has been mounted it is essential to make sure that no additional torque is applied, eg resulting from distortion in the shaft train. Since the shunt signal is connected in addition, it is essential to take into account any shifting of the zero point.

Determining and using the shunt signal is a merely electrical method. Theoretically, there is a possibility that the detachment of strain gages without a change in their resistance or in the Expanded Kreuzer circuit (compensation of modulus of elasticity) is not recorded. Practical experience, however, has shown that this is not the case with properly manufactured strain gages and that, in general, this only happens as a result of abnormal operating conditions, eg rupture of the measuring point. Measurements taken on every product during production and calibration ensure correct manufacture of strain gages.

Using the shunt signal and the zero point, it is very easy to assess whether the T40B torque flange functions properly within the specifications. Plastic deformation of the rotor as a result of overload due to bending moments and/or radial forces can be eliminated through correct installation, since these overloads are not always reflected by the zero or shunt signal.

Shunting or calibration

Shunting and checking using the shunt signal provide many benefits and can significantly reduce calibration effort. However, depending on the application or quality standards, eg in terms of traceability of test equipment, there might be requirements prescribing mechanical calibration at regular intervals. HBM as a supplier of components, of course, cannot suspend such requirements. Furthermore, the calibration intervals can only be defined by the users themselves, based on their requirements and knowledge of the conditions of use.

HBM recommends calibration intervals of one year for transducers and two years for electronics. According to DIN 51309 [2] a calibration certificate for torque measuring instruments is valid for max. 26 months. Shorter calibration intervals would make sense to meet special traceability requirements or quality assurance standards. A torque measuring instrument needs to be recalibrated

- after having been subjected to overload,
- after repair,
- after improper handling.

Conclusion

To sum it up: The shunt signal may be used for checking and adaptation of torque flanges; depending on the application, however, it cannot be a substitute for actual, mechanical calibration.

References:

[1] Rainer Schicker, Georg Wegener: Measuring Torque Correctly, ISBN 3-00-008945-4
Published by Hottinger Baldwin Messtechnik GmbH, Darmstadt
[2] DIN 51503, Werkstoffprüfmaschinen – Kalibrierung von Drehmomentmessgeräten für statische Drehmomente,
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