



Force measurement

Anchor force measurement in geotechnology



Smart in sensing

Anchor force measurement - the efficient solution

How can the forces that are acting in geo engineering and special civil engineering be measured: with precision, consistency and reliability at all times? Under extremely harsh conditions?

Anchor measuring technology from WIKA is the reliable answer. Benefit of advice on a partnership level and solutions based on more than 90 years of experience in measuring and sensor technology.

Our focus: Expertise for experts

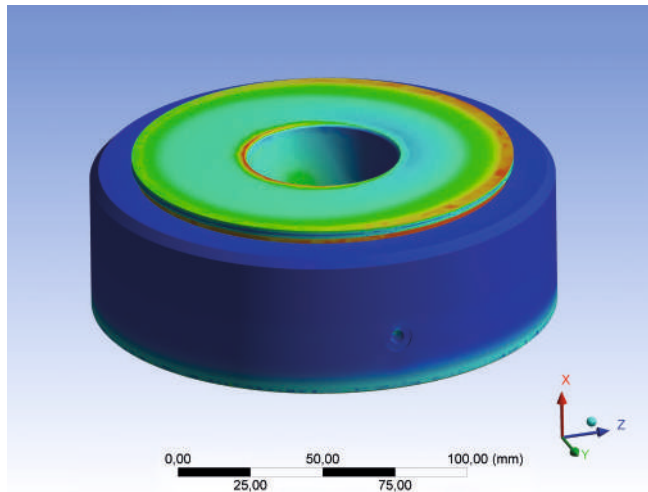
Subsoil and terrain anchorages, tension force removal, tunnel construction, sheeting for foundation ditches, slopes and rocks, route consolidation, construction monitoring, uplift prevention – the anchor technique plays an increasingly important part within the repertoire of geotechnics and underground engineering. And the demands tend towards „intelligent“ anchors.

Our products show the performance that the most demanding users expect

In many situations, anchors combined with special measuring systems can be the key for acquiring data that are absolutely necessary both for optimising the aspect of safety and for controlling planning calculations and monitoring geological changes.

WIKA anchor load measuring systems realise measurable advantages for the user thanks to the implemented combination of sensor system competence and a highly developed electronic know-how. Developed by experts. For experts.

We fulfil our business demand in anchor load measuring systems, too: All over the world, a powerful team is at our customers' disposal for the development, manufacture, consultancy, customised adaptation and distribution.





Harsh requirements? We develop solutions.

Special constructions, perfect manufacture, and best materials – WIKA gives to each anchor load measuring device a high degree of resistivity, toughness and permanent precision.

Modular product range for optimum adaptation

Exactly in exposed and difficult applications, such as load measuring at anchors, reliable data on the behaviour and faultlessness of all components and of the total system are expected. For this purpose, we evaluate the construction properties and measuring behaviour of the force transducers by means of the finite element method (FEM).

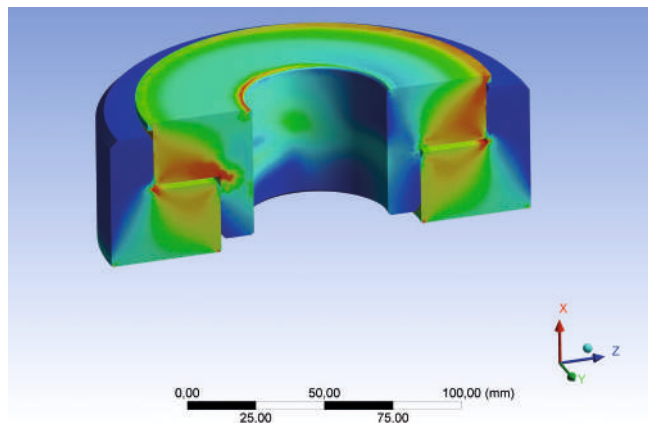
The basic elements of the system: hydraulic ring force transducers

A cylinder-piston combination made of steel with surface coating or stainless steel (option), filled with hydraulic medium is the basis of the anchor load measuring system.

For the nominal size of NG 146, the force transducing area of the piston is 146 mm² and the piston movement is max. 0.5 mm. Up to $F_{nom} = 1,500$ kN NG 146 is used, for higher values it is NG 383; nominal internal diameter of 90/105 mm for NG 146, 165 mm for NG 383, optimally adapted for corresponding anchor diameter.

Both the mechanical and the electrical versions are available with either a directly mounted pressure sensor, pressure gauge or an external type (capillary tube or “loss-free disconnection” adaptor).

For ensuring a maximum service quality and easy maintenance, we offer a connection solution that allows a lossless disconnection and replacement of the external pressure sensor/gauge under operating conditions.



Advantages of anchor force measurement

- Gain information about the actual behaviour of the subsurface
- Detect unexpected subsurface deformation in interaction with the anchoring at an early stage
- Acquire measuring data for evaluating stability, including location-dependent and time-dependent variability
- Obtain a decision-making basis for designing shuttering measures.
- Monitor the design and calculation basis
- Ability to make an in-depth evaluation of the effectiveness of individual anchoring measures
- Observation of long-term behaviour



▲ Hydraulic ring force transducer with integrated pressure sensor and electrical output of 4 ... 20 mA.

◀ Hydraulic ring force transducer with directly mounted pressure gauge and protection unit.



Model F61xx

Hydraulic ring force transducer
Geotechnics - version with pressure gauge

Nominal force F_{nom} 0 ... 80 kN up to 0 ... 6,000 kN

Nominal size ND 82 / NG 146 / NG 383 / NG 827

Relative linearity error d_{lin} analogue $< \pm 1,0 \% F_{nom}$

Output signal analogue display

Mounting mode direct

Protection class IP65

Data sheet DE 819

Model F61xx

Hydraulic ring force transducer
Geotechnics - version with pressure sensor

Nominal force F_{nom} 0 ... 80 kN up to 0 ... 6,000 kN

Nominal size ND 82 / NG 146 / NG 383 / NG 827

Relative linearity error d_{lin} digital $< \pm 0,5 \% F_{nom}$

Output signal digital

Mounting mode electronics in the force transducer

Protection class IP67

Data sheet DE 819

In difficult terrain more safety

In geotechnics – especially in rock operations and foundation works – permanent and reliable monitoring of anchor force matters a lot. Anchors are employed as constructional elements to stabilise the subsoil by taking up longitudinal and transverse forces. The metrological inspection and monitoring of the pretensioning force of anchors as load-bearing elements of a building structure therefore deserves particular importance in geotechnics applications – especially in the case of permanent anchors.

Monitoring anchor force with force transducers

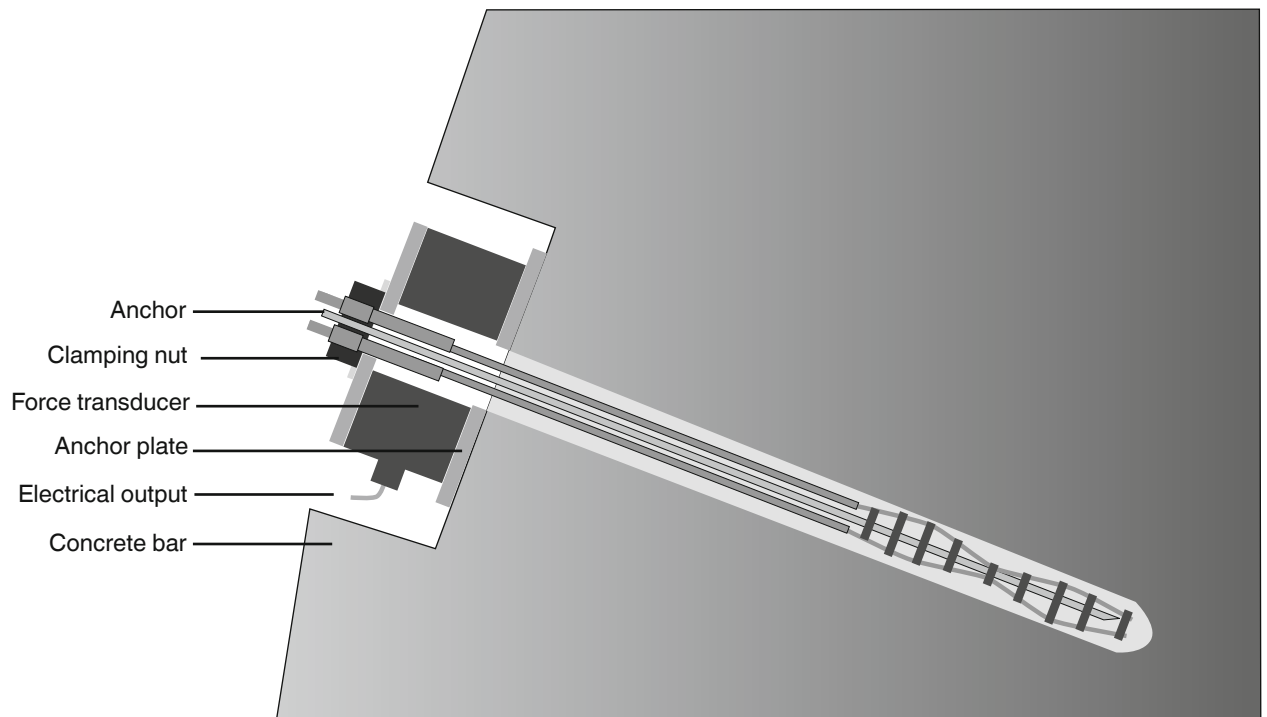
Anchor force measurement is used to obtain data that are important for safety optimization as well as for checking the planning calculations. If terrain is moved for structural or safety-related measures, this data is indispensable in many cases.

Force transducer are used for supporting slopes, excavating underground tunnels, securing foundations, special civil engineering and tunnel construction.

In between there are numerous other fields of application which require permanent or random monitoring of the terrain structures and movements. In all these applications, ground anchors are used to stabilize the earth or rock mass.

For especially inaccessible terrain, autonomous systems are used that do not require external power supply.





Measuring anchor

Anchors are used for protecting slopes or ceilings in tunnels as well as for anchoring railing posts, for example, which are anchored/fixed in the ground by concreting. The anchor is either inserted into the drilled reinforcement, flush with the surface and concreted or the anchor itself serves as a drill (self-drilling anchor). The anchor head is fixed using the wedge disk, anchor head plate and domed nut. The force transducer is placed between two adaptor plates in order to record the clamping force continuously. If a change occurs in the pretension of the anchor, it is detected immediately and appropriate action can be taken.



Formwork shuttering

The ring force transducer is prestressed on the reinforcing rod, against the shuttering. When the concrete is filled, it exerts a high force on the shuttering, but when the concrete has hardened, this force subsides. You can monitor the condition of the concrete and save time.



Tunnelling/construction supervision

In tunnel construction and structural monitoring, the force transducers ensure both: safety and that the correct tightening torque can always be adjust.



Bridge construction

Hydraulic ring force transducers are also used in bridge construction. They are used to monitor the rope tension e.g. at suspension bridges.

Put your trust in a leading manufacturer

Force measurement technology is all about protecting people, high asset values, reliability and manufacturing safety. And that's why a trustworthy partner is important to you: A manufacturer that is also a privately-owned company with a long-term perspective. Our products, solutions and engineering skills are convincing customers from practically every industry.

tecsis – a division of the WIKA Group

tecsis stands for innovative, quality solutions in measurement and sensor technology. For more than 90 years, tecsis has developed into a globally recognised manufacturer of measurement technology – for large corporations as well as medium-sized companies.

Through the integration of tecsis, the WIKA group of companies has been further strengthened and the extensive portfolio has been extended to include the measurand force.

Therefore we can offer you, in the breadth and depth of selection, an outstanding range of measurement technology solutions for a wide range of different applications.

Our production processes

We manufacture force transducers at facilities on three continents: an economically efficient operation with consistent quality and reliable service along the entire value creation and delivery chain. Depending on requirements, we make use of three important technologies: strain gauges, thin-film sensors and hydraulic force measurement technology.

Our extensive portfolio

The product range includes tension and compression force transducers, shear and bending beams, platform load cells, load pins, tension links, ring and special force transducers as well as electronics and complete systems. In every individual geometry and size.



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