DYNA® Force - a Reliable Elasto-Magnetic Sensor for Force Measuring for Post-Tensioning Tendons and Anchors

On many occasions during construction and the service life of structures, it is crucial to know the exact loads and forces in posttensioning tendons and anchors. Although there are many methods to measure the tendon force, most of them are cumbersome, expensive and unreliable.

The DYNA® Force Sensor System is a new development that allows the quick and easy monitoring of load changes both during performance tests and during the entire service life of tendons in any kind of structure. The DYNA® Force System can determine the load along the bonded length of anchors at any time so that anchorage lengths can be flexibly adapted to clients' needs.

The DYNA® Force System uses a combination of elasto magnetic technology (EM) and non destructive testing (NDT) to directly measure the interior stress level in prestressed strands, bars, post-tensioning tendons and anchors. The system is based on the principle that the permeability of steel to a magnetic field changes with the stress level in the steel. This means that, by measuring the change in a magnetic field, the magnitude of the stress in the steel element can be determined. With a monitoring accuracy of +/-1%, the DYNA® Force Sensor permits a measurement of actual forces which is very reliable.

The sensor system consists of a solenoid composed of a primary coil and a secondary coil that are insulated from each other by plastic or other polymers and which work together to formalize the elastic, magnetic characterization of the material. Pulsed current passes through the primary coil, and the secondary coil picks up the induced electromotive force that is directly proportional to the change rate of the applied magnetic flux and the relative permeability of the prestressed steel. The secondary coil is linked to a power stress reading device. The DYNA® Force Sensor is designed as a selfcontained unit which can be directly applied to the strand or bar anchor whose properties are to be measured. The system can be applied over uncoated, epoxy coated, greased, extruded or HDPE sheathed tendons.

The materials used for the DYNA® Force System are flexible in order to allow an adaptation of the sensor to the service life of individual structures. Durable materials such as copper wire or special steel alloys for the sensor's shell steel cover can be used as required.

Furthermore, the system has a temperature compensating function in order to avoid perturbations due to variations in ambient temperature. The calibration process also takes into account the altered characteristics of the tendon which are caused by magnetization. In order to ensure an exact accuracy of measurement at all times, every single sensor is calibrated in the laboratory prior to use.

DYNA® Force is an exceptionally robust and maintenance free system that permits installation and reading of results by a single person.

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