**INSPECTpro**

Mobile measuring and evaluation unit for process inspection and quality monitoring

The INSPECTpro is a portable, battery-powered measuring and evaluation unit for recording analog and incremental measurands. The (random-sample) tests can be performed, analyzed and documented quickly and effectively and thereby contribute to optimum quality in bolted joint assembly and a variety of other applications. Optional software modules expand the INSPECTpro to create an individual, custom testing system.

- Portable, battery-operated measuring and evaluation unit
- Connectivity for a range of sensors
  (with optional adapter cable, depending on type)
- Optional two measuring channels
- Optional software modules for extended function
- Touchscreen
- Optional connection of wireless sensors

**Description**

INSPECTpro consists of a two-part housing, the display unit and the base unit. The display unit with 7.7 inch TFT color display can be pivoted in increments of 10° from 0° to 100° relative to the base unit. The device is intuitively operated via the touchscreen on the display unit and the speed buttons. The easy-to-change lithium-ion battery is located beneath a cover in the base unit. Sensors and interface cables are simply connected on the rear of the device. Various sensors with passive analog, active analog and incremental measurement signals can be connected to the INSPECTpro. A range of sensors can be connected via optional adapter cables.

Whether as a stationary testing system for maintenance, in a lab or during in-process testing, the INSPECTpro offers ergonomic and comfortable handling. The scope of application of the INSPECTpro with the basic license can be expanded through optional software modules. Thanks to the integrated AUTOCODE system, automatic sensor detection of appropriately equipped sensors is ensured to minimize errors in the application. Upon request, the INSPECTpro is calibrated with the desired optional sensors as a measuring chain in our calibration lab.
**Technical data**

- **Measuring channels**
  - Channel 1 Passive, analog (0.4 ... 5 mV/V)
  - Incremental (quadrature signal 5
    ... 24 V, max. counting frequency 40 kHz, switching level 2.5 V)
  - Optional Channel 1 active, analog (1 ... 10 V)
  - Optional Channel 2 passive, analog (0.4 ... 5 mV/V)
- **Integrated calib. resistance**
  - 40 kΩ, 43.58 kΩ, 87.15 kΩ, 174.65 kΩ
- **Interfaces**
  - Optional Mini USB, USB, RS-232, RJ45
  - Optional Wireless with 2.4 GHz and 5 GHz
- **Power supply**
  - Lithium-ion battery 7.2 V, 4.5 Ah
  - (external charging device)
  - Optional Power supply for continuous operation
- **Mains supply**
  - Charging device 100 ... 240 V
  - Power supply 100 ... 240 V
- **Operating system**
  - Windows Compact Embedded 7.0
- **Display**
  - 7.7-inch TFT color display, pivotable
- **Operation**
  - Touchscreen, speed buttons
- **Software**
  - INSPECTpro basic
  - Optional Software modules (see application)
- **User languages**
  - Multiple languages: CZ, DE, GB, ES, FR, IT, NL, PL, TR, CN; online selection
- **Achievable meas. uncertainty**
  - ≤ 0.5 %
- **Resolution**
  - 16-bit
- **Sampling rate**
  - 100 Hz ... 5 kHz with data reduction
  - 100 Hz ... 5 kHz freely adjustable by operator
  - (HQ-Graphic software module)
- **Memory card**
  - SD 4 GB, permanently installed
- **Operating temp. range**
  - (Nominal temp. range) 10 ... 40 °C
- **Service temp. range**
  - 0 ... 50 °C
- **Storage temp. range**
  - –20 ... 70 °C
- **Relative humidity**
  - max. 70 %, non-bedewing/non-condensing
- **Level of protection**
  - IP 50
- **Protection class**
  - III (protective extra-low voltage)
- **Weight**
  - 1.5 kg (4.5 kg including case and supplied accessories)

**Basic application**

For random-sample testing during the assembly process, the INSPECTpro records all influencing quantities directly at the bolted joint. This is done by inserting the torque or torque/angle of rotation sensor with rotating measuring shaft into the application between the output drive of the fastening assembly tool and the tool for torque application to the test item. The INSPECTpro connects to the sensor and, with appropriately equipped sensors, detects the sensor via AUTOCODE and adjusts automatically; no further adjustments are needed, and the measurement can begin immediately.

During the measurement, the measured values are displayed numerically and evaluated based on tolerance specifications. Furthermore, it is possible to depict measurement processes graphically to identify effects while screwing in, joining or during assembly.

The INSPECTpro is equipped with a statistics module for evaluating the measurement results. The stored measured values can be documented; statistical characteristic values are calculated automatically and are depicted as a histogram or Gaussian distribution curve.

Random-sample testing with the INSPECTpro and a torque sensor
The system components

An overview of the system components for mobile process inspection and quality monitoring:

1. Measuring and evaluation unit INSPECTpro
2. Optional software modules
3. Sensors for torque and torque/angle of rotation with rotating measuring shaft
4. Sensors for torque with fixed measuring shaft
5. Analysis wrench (handheld torque/angle of rotation wrench) – cable connected or as wireless version
6. Sensors for clamping force
7. PC for evaluating and documenting the tests with higher-level software

The optional software modules are subject to the following license dependencies: Each optional license requires the underlying license.
Optional software modules expand the scope of application:

**Route transfer fastening point**
The optional “Route transfer fastening point” software module on the INSPECTpro can be used with the Windows CEUS software.

In “Route transfer fastening point” software module peak values can be determined and carry-on-tightening torques can be measured according to VDI/VDE 2645 Part 3. An additional module is not required for this.

With the CEUS software, fastening points can easily be specified on a PC, organized and the test intervals planned. After a route has been created, it is exported to the INSPECTpro via a USB cable, selected there and then processed. The graphical process analysis and documentation are then performed on the PC after the data have been re-imported.

The graphical process analysis indicates at a glance whether the process is capable or if measures are necessary.

**Carry-on-tightening (in accordance with VDI/VDE 2645 Part 3)**
With the optional “Carry-on-tightening” software module on the INSPECTpro, carry-on-tightening torques can be determined together with the Analysis wrench Type 5413-1500/...

**Analog channel 2 passive**
The optional “Analog channel 2 passive” software module on the INSPECTpro enables testing with a second, passive analog sensor, such as a clamping force sensor Type 5413-1952/..., fastener force sensor Type 5413-1900/... or tension/compression force sensor Type 5413-1940/...
Friction test according ISO 16047

The optional “Friction test according ISO 16047” software module on the INSPECTpro (requires activation of the “Analog channel 2 passive” software module) enables measurement of the total friction coefficient of a bolt or nut with a clamping force sensor Type 5413-1952/... and an Analysis wrench Type 5413-1500/... as well as the corresponding mechanical accessories. This calculation is performed automatically following a one-time entry of the bolt parameters according to DIN EN ISO 16047 with the INSPECTpro.

Tool testing (6 test points)

With the optional “Tool testing (6 test points)” software module on the INSPECTpro, tools such as torque wrenches and nutrunners can be tested and calibrated on the basis of VDI/VDE 2645 Part 2 and DIN EN ISO 6789:2003 - Method B for various target torques. As an option, the “Tool management” module can also be activated.

HQ-Graphic

With the optional “HQ-Graphic” (High Quality Graphic) software module on the INSPECTpro, the sample rate can be freely set from 100 Hz to 5 kHz. In addition, an INSPECTpro with this module is equipped with a testXpert export function. Together with the Windows testXpert software, measurement data can be professionally analyzed, logged and archived.

Tool management

For the optional “Tool management” software module on the INSPECTpro, the “Tool testing (6 test points)” software module must also be activated. Tools can be created and the test specified. For the tool test, tools that have been created then only need to be selected for the test. If there are a number of tools, this saves time and eliminates incorrect entries.

Fastening point management

With the optional “Fastening point management” software module on the INSPECTpro, fastening points can be created and specified for testing. For the measurement of carry-on-tightening torques or peak-value measurements, for example, fastening points that have already been created then only need to be selected for the test. If there are a number of fastening points, this saves time and eliminates incorrect entries.
Tolerance classes
If the optional “Tolerance classes” software module is used on the INSPECTpro, one of the following software modules must also be activated: “Fastening point management”, “Tool testing (6 test points)” or “Door energy measuring”. The repeated input of an upper and lower limit for tolerances is thereby eliminated. Tolerance classes can be defined and then only need to be selected for the respective measuring task.

Statistic parameters
For use of the optional “Statistic parameters” module on the INSPECTpro, either the “Fastening point management” or the “Tool testing (6 test points)” software module must be activated. The repeated input of the individual statistics parameters for the evaluation of the measurement results is thereby eliminated. Statistics parameters can be defined collectively one time and then only need to be selected for the respective measuring task.

Door energy measuring
With the optional “Door energy measuring” software module on the INSPECTpro, comfort measurements for determining the door closing energy on vehicles can be performed. Specifications of various vehicle types can be created one time.

Route transfer tool testing
The optional “Route transfer tool testing” software module on the INSPECTpro can be used with the CEUS software. In “Route transfer tool testing” software module regular tests with 1 ... 6 measuring points can be performed. An additional module is not required for this. With the CEUS software, tools can be easily be specified on a PC, organized and the test intervals planned. After a route has been created, it is exported to the INSPECTpro via a USB cable, selected there and then processed. The graphical process analysis and documentation are then performed on the PC after the data have been re-imported.
INSPECTpro - Mobile measuring and evaluation unit for process inspection and quality monitoring,
Type 5413-2071/...

Dimensions

Connections

1 Channel 2 passive, analog, such as clamping force sensor, (optional), digital IO
2 Channel 1 passive, analog/incremental, such as torque/angle of rotation sensor
3 Connection for active analog sensor, channel 1 and CAN-bus (optional)
4 External calibration resistance for channel 1 or 2 (optional)
5 RS-232 data output
6 Mini USB for data transfer, e.g., route transfer, software modules, backup
7 USB mouse, keyboard or barcode scanner (optional)
8 Ethernet - not used
9 Connection of external power supply for continuous operation (optional)

The information corresponds to the current state of knowledge. Kistler reserves the right to make technical changes without advance notice. Liability for consequential damages arising from the application of Kistler products is excluded.

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Included accessories
- INSPECTpro with rechargeable battery
- Transport case for secure storage
- Mini USB cable
- Second rechargeable battery
- Charging cradle and charging power supply
- Carrying strap

Optional accessories
- Plug-in power supply for continuous operation
- Additional rechargeable battery
- Communication cable RS-232
- Protective cover
- Analysis wrench (handheld torque/angle of rotation wrench)
- Wireless analysis wrench (wireless handheld torque/angle of rotation wrench)
- Torque sensors with rotating measuring shaft
- Torque/angle of rotation sensors with rotating measuring shaft
- Torque sensors with fixed measuring shaft
- Hand crank system
- Clamping force sensors
- Tension/compression force sensors
- Fastener force sensors
- Software modules INSPECTpro (Upgrade)
- Hardware modules INSPECTpro (Upgrade)

Ordering key

Active analog measuring channel
- no
- Channel 1 (1 ... 10 V) A

Wireless sensor connection
- no
- 2,4 GHz and 5 GHz W

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