**KISTLER**

measure. analyze. innovate.
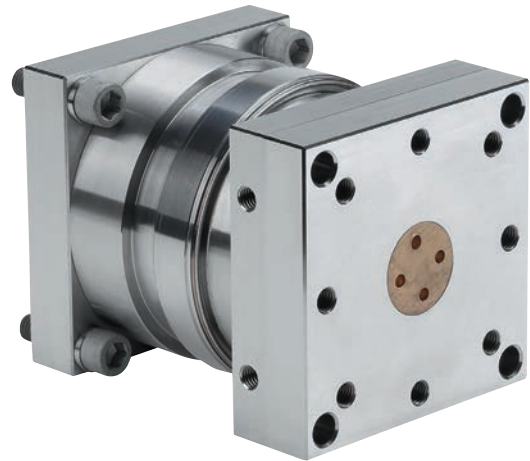
# SmartCrash® Force Measuring Element    Type 9350B1

## With Digital Data Output

The piezoelectric SmartCrash® force measuring element with integrated electronics is able to measure 3 orthogonal components $F_x$, $F_y$ and $F_z$ of dynamic forces in any direction. It is predestinated for measuring high dynamic impact forces e.g. during crash test procedures for automotive R&D. Each piezoelectric force measuring with integrated data acquisition and data storage element is preloaded and calibrated.

- Wide measuring range
- High sensitivity
- Excellent linearity over total measuring range
- High rigidity/natural frequency
- Easily mounted and removed from front
- Integrated data preprocessing and data storage
- Digital data output
- D-Sub 9 pin connector
- TEDS functionality (calibration data and sensor identification)

## Description

The SmartCrash® force measuring element consists of a top and base plate, the piezoelectric quartz sensor preloaded by a hollow expansion screw between base plate and top plate and an integrated electronics for data preprocessing. Each individual SmartCrash® force measuring element measures the 3 orthogonal forces $F_x$, $F_y$ and $F_z$ of the forces affecting during the crash. The piezoelectric sensor in the force measuring element generates a proportional charge on the force, which is amplified and processed. A unit for digitization of the analog signals (DiMod module) is incorporated in each individual SmartCrash® force measuring element. The charge signals are converted into a voltage signal, digitized by an A/D converter and stored in a central data recorder which simultaneously executes the parametrization and control. Before the actual measurement is performed, an automatic system check is carried out to check that the entire measuring chain is operating properly. The individual force measuring element is connected by a corresponding connection cable to the data recorder via an RS-485 interface.

The SmartCrash® force measuring element is supplied calibrated ready to be used for taking measurements immediately after being mounted. The power supply for a SmartCrash® force measuring element is provided by the power unit/industrial PC (controller).

## Application

The SmartCrash® force measuring element is used generally in the automotive R&D to instrument crash barriers, as well as drop towers, where high dynamic longitudinal and shear forces have to be measured quickly, easily and very precisely.

**KISTLER**

measure. analyze. innovate.

## Technical Data

| Measuring range | $F_x$ | kN | 0 ... 500 |
|---|---|---|---|
| Measuring ranges relate to the nominal sensor sensitivity | $F_y$ | kN | −100 ... 100 |
| $F_x \approx -0,65$ pC/N, $F_y$, $F_z \approx -1,32$ pC/N | $F_z$ | kN | −100 ... 100 |
| Calibrated range | $F_x$ | kN | 0 ... 500 |
| | $F_y$ | kN | 0 ... −50[1] |
| | $F_z$ | kN | 0 ... 50[1] |
| Calibrated partial range | $F_x$ | kN | 0 ... 200[1] |
| Bending moments | $M_y$ | kN·m | on request |
| | $M_z$ | kN·m | on request |
| Linearity (FSO) | | % | ≤±1,0 |
| Crosstalk (FSO) – [typical values] | $x \rightarrow y, z$ | % | ≤±2 [≤±1,0] |
| | $z \leftrightarrow y$ | % | ≤±3,5 [≤±1,0] |
| | $y, z \rightarrow x$ | % | ≤±3,5 [≤±1,0] |
| Operation temperature range | | °C | 0 ... 40 |
| Natural frequency of the crash force element alone | $F_x$ | Hz | ≈4 000[2] |
| | $F_y$, $F_z$ | Hz | ≈1 700 |
| Weight standard element | m | kg | 12,1 |
| Material standard element | | | 1.2316+S |
| Protection (IEC) | | | IP65 |

[1] Measuring ranges for determining the correction factors for crosstalk
[2] Mounted on foundation plate

## Electronics

| Selectable measuring ranges | $F_x$ | kN | 20 ... 500 |
|---|---|---|---|
| | $F_y$ | kN | 4 ... 100 |
| | $F_z$ | kN | 4 ... 100 |
| Self test signal | | %FS | 2 ... 50 |
| Frequency range of charge amplifier (–3 dB) | | kHz | >10 |
| ADC resolution | | Bit | 16 |
| Sampling rate (synchronous per channel) | | kHz | 20 |
| Flash memory, per channel | | Samples | 1 306 624 |
| Data processing | RS-485 bus | | |
| Data processing (external: host controller, TCP/IP) | Ethernet | 100 BaseT | |
| Power supply (per element) | | VDC | 5,2 ... 6,0 |
| | | mA | ≈50 |

## Functions

| Reset/Operate | all channels simultaneously |
|---|---|
| Test signal ON/OFF | all channels simultaneously |
| Measuring range setting | individually selectable ranges |

## Application Software (on Request)

• Preparation and execution software CrashDesigner
• Others on request

SmartCrash® is a registered trademark of Kistler Holding AG.
CrashDesigner is a product of Kistler Holding AG.

**KISTLER**

measure. analyze. innovate.



Fig. 1: Back view of the SmartCrash® Force Measuring Element

**Ordering Code**

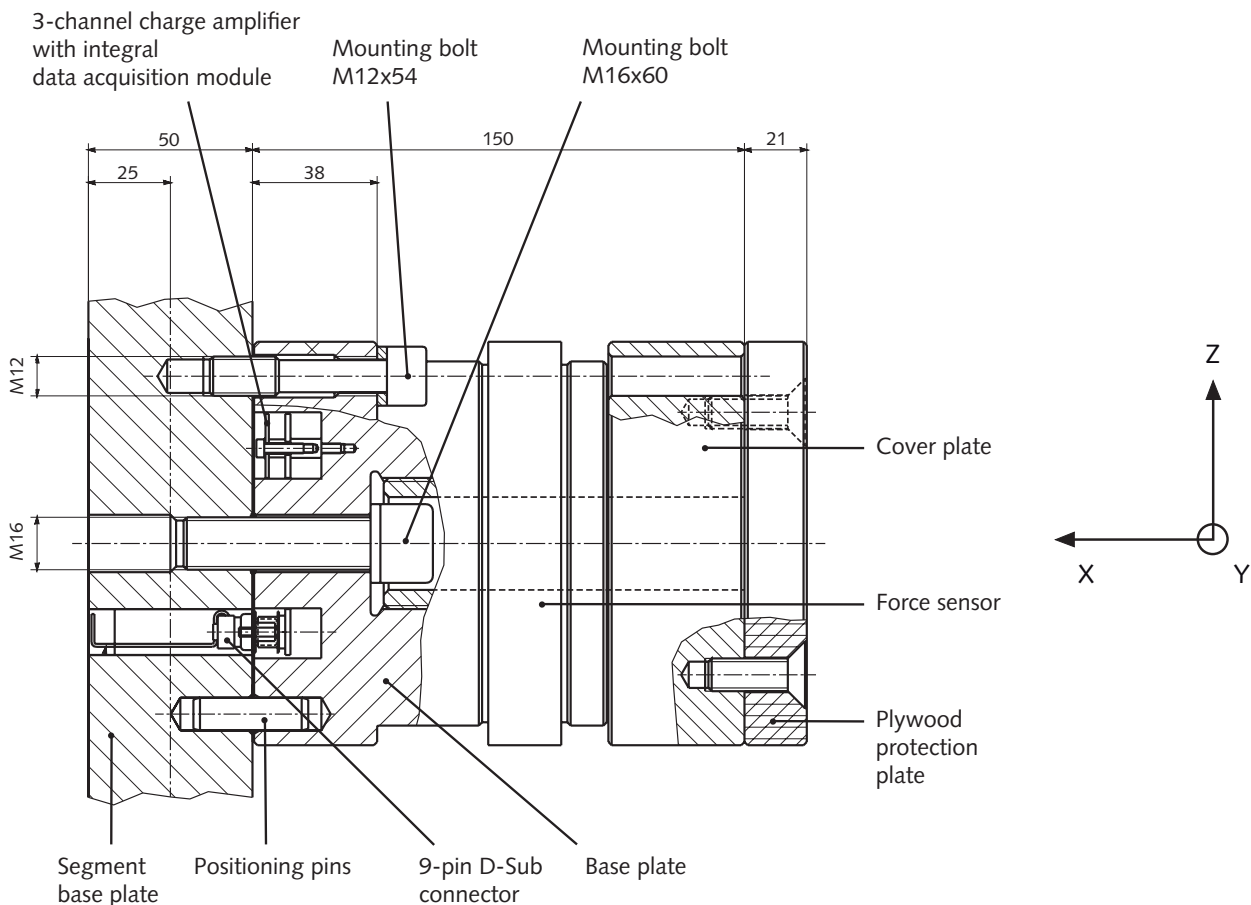- SmartCrash Force Measuring Element
  With Digital Data Output **Type 9350B1**



Fig. 2: SmartCrash® Force Measuring Element

Labels:
3-channel charge amplifier with integral data acquisition module
Mounting bolt M12x54
Mounting bolt M16x60
50 · 25 · 38 · 150 · 21
M12 · M16
Cover plate
Force sensor
Plywood protection plate
Segment base plate
Positioning pins
9-pin D-Sub connector
Base plate
Z · X · Y

9350B1_003-254e-04.16

This information corresponds to the current state of knowledge. Kistler reserves the right to make technical changes. Liability for consequential damage resulting from the use of Kistler products is excluded.

©2016, Kistler Group, Eulachstrasse 22, 8408 Winterthur, Switzerland
Tel. +41 52 224 11 11, Fax +41 52 224 14 14, info@kistler.com, www.kistler.com
Kistler is a registered trademark of Kistler Holding AG.