

# SmartCrash pole segment

## with 3-component force measuring elements

Type 9665B

The SmartCrash pole segment with 3-component force measuring elements and integrated electronics for data acquisition and storage was developed for the force measurement of a vehicle crash in side impact tests. Each calibrated, preloaded crash force element measures the time-changing three orthogonal force components  $F_x$ ,  $F_y$  and  $F_z$  that are effective over the period of the crash in any direction.

- Segment and crash force elements easily mounted to and removed from front and rear. Rear assembly/disassembly refers to area of corner elements
- Single connecting cable per segment
- High rigidity and natural frequency make system ideal for dynamic measurement
- Wide measuring range
- Excellent linearity and high degree of overload protection
- Integral data acquisition and storage
- TEDS functionality (calibration data and automatic sensor identification)

### Description

A SmartCrash pole segment (254x1 000 mm) consists of 8x3-components of the SmartCrash force elements Type 9350B1. To create the pole geometry, the SmartCrash standard elements are equipped with a  $\varnothing 254$  mm (10") shim (Fig. 4). Each individual crash force element measures the 3 orthogonal forces  $F_x$ ,  $F_y$  and  $F_z$ . The piezoelectric measuring elements in the force sensor output yield a force-proportional charge, which is amplified and processed.

A unit for digitization of the analog signals (DiMod) is incorporated in each individual crash force 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. Each individual force measuring element is connected by a corresponding connection cable to the data recorder via an RS-485 interface.

The SmartCrash segment is supplied calibrated ready to be used for taking measurements immediately after being mounted on the load-bearing structure.



The power supply for a SmartCrash segment (data recorder, UPS, crash force elements, integral charge amplification and data acquisition modules) is provided by the connection box through a single connecting cable.

Communication with the host computer relies on an Ethernet using the TCP/IP protocol. This combination includes device drivers and configuration/control software for the electronics of the crash force elements. The data acquisition as well as the test preparation is then processed with our standard software.

The simple calibration concept allows speedy recalibration on the customer's site for minimum downtime.

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## Application

The SmartCrash pole segment is mainly used in the vehicle development for the instrumentation of rigid poles for tests according to the NHTSA and EuroNCAP side impact rigid pole test protocol, where high dynamic forces must be recorded quickly, simply and very precisely.

## Application Samples

Typical configurations of standard SmartCrash pole segment.

## Technical Data

Measuring range Measuring ranges relate to the nominal sensor sensitivity	$F_x$	kN	0 ... 500
	$F_y$	kN	-100 ... 100
	$F_z$	kN	-100 ... 100
Bending moments	$M_y$	kN·m	on request
	$M_z$	kN·m	on request
Linearity (FSO)		%	$\leq \pm 1,0$ [ $\leq \pm 0,5$ ]
Crosstalk (FSO) – [typical values]	$x \rightarrow y, z$	%	$\leq \pm 2,0$ [ $\leq \pm 1,0$ ]
	$z \leftrightarrow y$	%	$\leq \pm 3,5$ [ $\leq \pm 1,0$ ]
	$y, z \rightarrow x$	%	$\leq \pm 3,5$ [ $\leq \pm 1,0$ ]
Crosstalk (FSO) – [typical values]	$x \rightarrow y, z$	%	$\leq \pm 1,0$ [ $\leq \pm 0,3$ ] <sup>1)</sup>
	$z \leftrightarrow y$	%	$\leq \pm 1,0$ [ $\leq \pm 0,3$ ] <sup>1)</sup>
	$y, z \rightarrow x$	%	$\leq \pm 1,0$ [ $\leq \pm 0,3$ ] <sup>1)</sup>
Operating temperature range		°C	0 ... 40
Natural frequency of the crash force element alone	$F_x$	Hz	$\approx 4\,000$
	$F_y, F_z$	Hz	$\approx 1\,700$
Weight of segment (with 8 crash force elements)		kg	$\approx 290$
Material	Crash element 1.2316+S Segment base plate: Ck45 chemically nickel-plated		
Protection (IEC)	IP65		

<sup>1)</sup> By correction of crosstalk

## 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 (150 s @ 20 kHz sampling rate)		Samples	1 306 624
Data processing	RS-485 bus		
Data processing (external: host controller, TCP/IP)	Ethernet	100 BaseT	
Power supply (per segment)		VDC	5,2 ... 6,0
		mA	$\approx 50$

## Functions

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

### 3-Component SmartCrash pole segment



Fig. 1: SmartCrash pole segment 200x1 000x252 mm with 8 force measuring elements

### Application software (not included in scope of delivery)

- CrashDesigner
- DTI Control
- Others on request

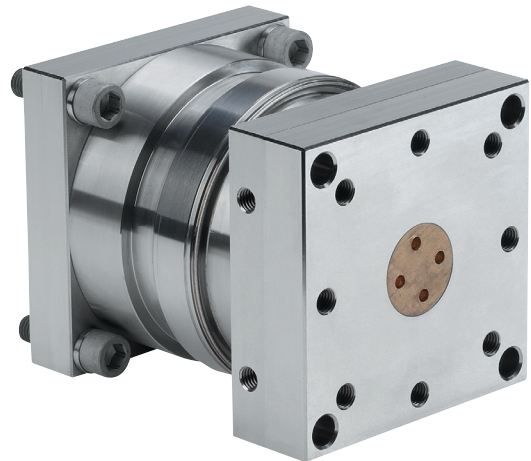


Fig. 2: Front view of the SmartCrash force measuring element 125x125 mm

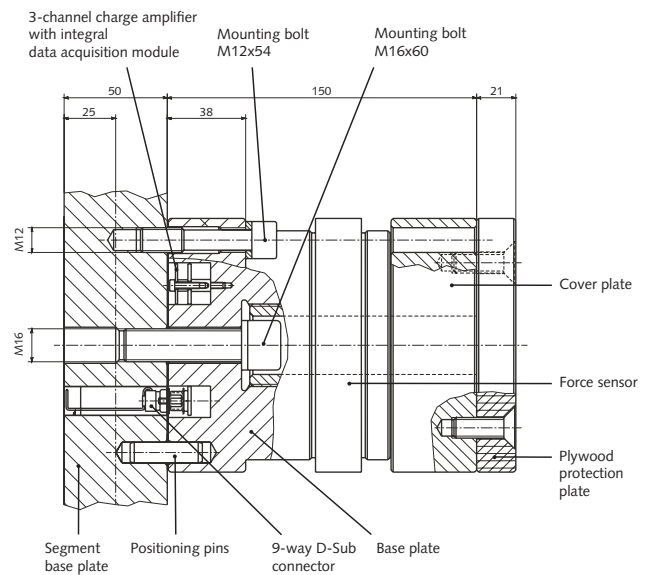


Fig. 3: Standard SmartCrash force measuring element 125x125 mm

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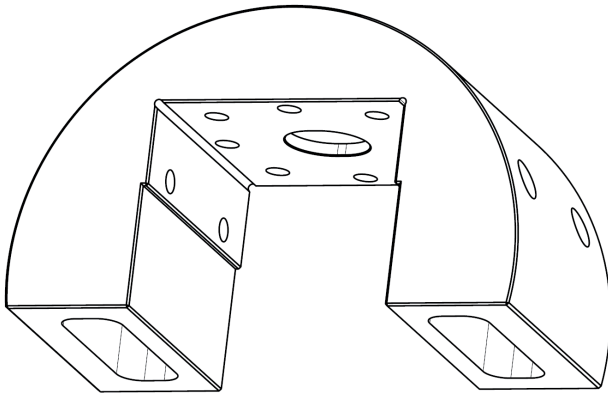


Fig. 4: Dimensions of the shield element

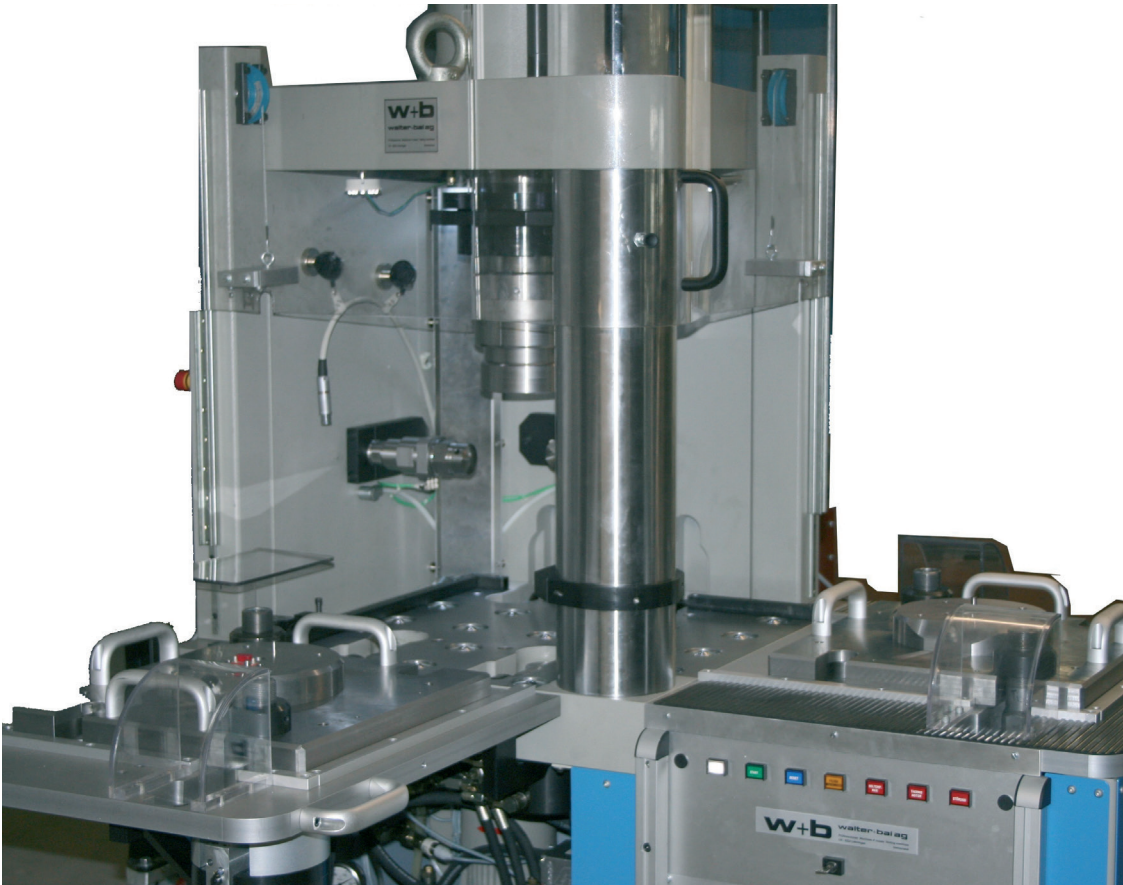


Fig. 5: Movable 3-component calibration unit for full scale recalibration (100 %FSO) of SmartCrash force measuring elements on customer's site

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## System configuration

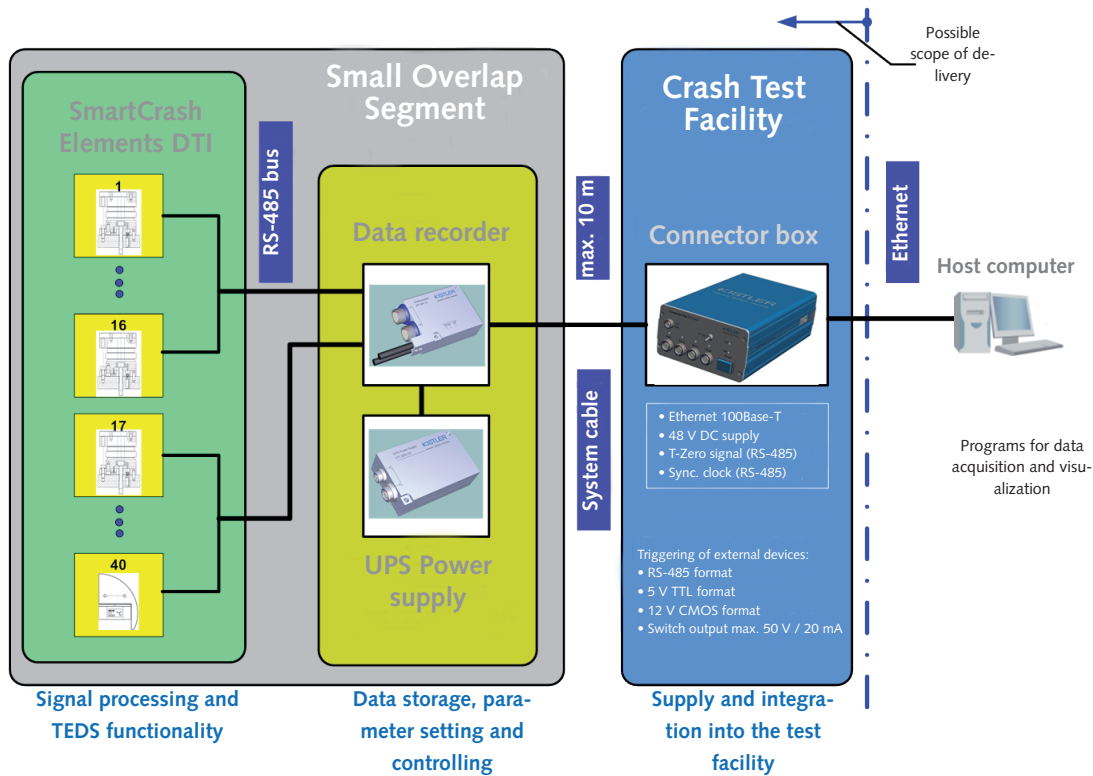


Fig. 6: General configuration of crash barrier

### Included accessories

Special assembly tool

- Guide bar  
D17/M16x240
- Guide cover  
D36g6717, 5x21
- Socket wrench
- Sleeve D35,8/18,2x65
- Wrench SW10, L = 130 mm

### Type (Mat. No.)

- Z17431-613 (65017356)
- Z18722-614 (65017357)
- Z17431-651 (65017036)
- Z17243-658 (65017005)
- Z18722-632 (65017358)

Other spare parts

- Adaptations and accessories  
to customer specs

on request

### Optional accessories

- None

### Ordering code

- SmartCrash pole segment

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