

# SmartCrash® Overlap Segment

## With 3-Component Force Measuring Elements

Type 9661B40

The SmartCrash® overlap segment with 3-component force measuring elements and integrated electronics for data acquisition and storage was developed for the power measurement of a vehicle crash in crash tests with little cover. Each calibrated, preloaded crash force element measures the time-varying three orthogonal force components  $F_x$ ,  $F_y$  and  $F_z$  that impact the element during 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
- On-site calibration
- Excellent linearity and high degree of overload protection
- Integral data acquisition and storage
- TEDS functionality (calibration data and automatic sensor-identification)



### Description

A SmartCrash overlap segment (650x1 000 mm) consists of 32x3-components of the SmartCrash force elements Type 9661B40 and of 8x3-components of the SmartCrash corner elements Type 9359B1. Its dimensions and the number of crash force elements can be tailored to the customer's technical requirements. 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 crash barrier or the offset block.

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.

9661B40\_003-271e-10.16

### Application

The SmartCrash corner element is mainly used in the vehicle development for the instrumentation of crash barriers for tests according to the IIHS Small Overlap test protocol, where high dynamic forces must be recorded quickly, simply and very precisely.

### Application Samples

Typical configurations of standard SmartCrash segments.

### Technical Data

Measuring range Measuring ranges relate to the nominal sensor sensitivity	F <sub>x</sub>	kN	0 ... 300 <sup>1)</sup>
	F <sub>y</sub>	kN	-100 ... 100
	F <sub>z</sub>	kN	-100 ... 100
Bending moments	M <sub>y</sub>	kN·m	on request
	M <sub>z</sub>	kN·m	on request
Linearity (FSO)		%	≤±1,0 [≤±0,5]
Crosstalk (FSO) – [typical values]	x → y, z	%	≤±2,0 [≤±1,0]
	z ↔ y	%	≤±3,5 [≤±1,0]
	y, z → x	%	≤±3,5 [≤±1,0]
Crosstalk (FSO) – [typical values]	x → y, z	%	≤±1,0 [≤±0,3] <sup>2)</sup>
	z ↔ y	%	≤±1,0 [≤±0,3] <sup>2)</sup>
	y, z → x	%	≤±1,0 [≤±0,3] <sup>2)</sup>
Operating temperature range		°C	0 ... 40
Natural frequency of the crash force element alone	F <sub>x</sub>	Hz	≈4 000
	F <sub>y</sub> , F <sub>z</sub>	Hz	≈1 700
Weight of segment (with 64 crash force elements)		kg	≈1 250
Material	Crash element 1.2316+S Segment base plate: Ck45 chemically nickel-plated		
Protection (IEC)	IP65		

<sup>1)</sup> Limited by angle elements

<sup>2)</sup> By correction of crosstalk

### Electronics

Selectable measuring ranges	F <sub>x</sub>	kN	20 ... 500
	F <sub>y</sub>	kN	4 ... 100
	F <sub>z</sub>	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	≈50

### Functions

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

### 3-Component SmartCrash Overlap Segment



Fig. 1: SmartCrash® Overlap Segment 650x1 000 mm with 40 force measuring elements

#### Applikation Software (not Included in Scope of Delivery)

- CrashDesigner
- DTI Control
- Others on request

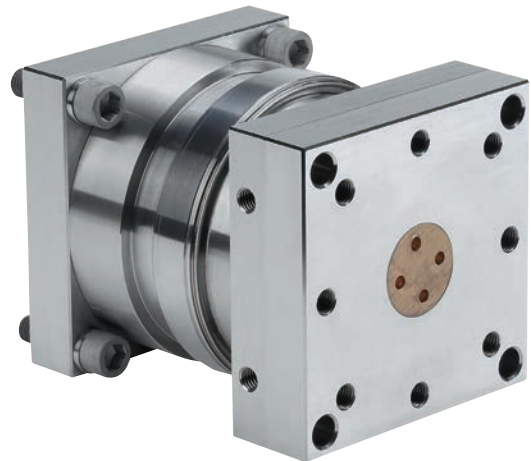


Fig. 2: Front view of the SmartCrash® force measuring element 125x125 mm

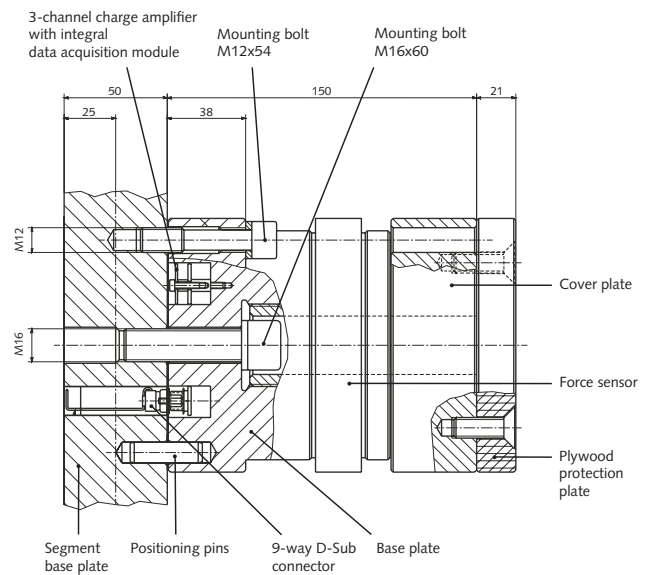


Fig. 3: Standard SmartCrash® force measuring element 125x125 mm

9661B40\_003-271e-10.16



Fig. 4: Back view of the SmartCrash® corner element R150

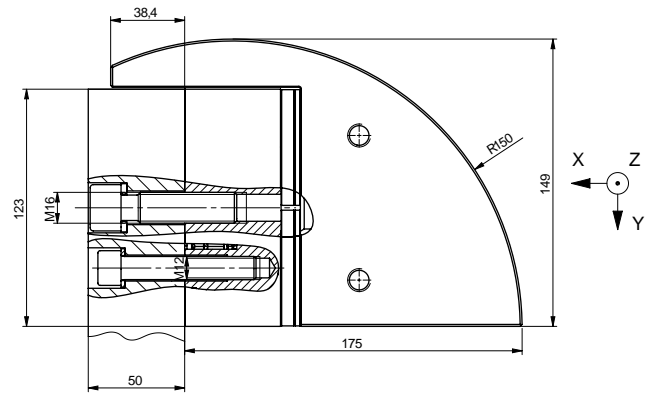


Fig. 5: Dimensions of the SmartCrash® corner element R150



Fig. 6: Movable 3-component calibration unit for full scale recalibration (100 %FSO) of SmartCrash® force measuring elements on customer's site

9661B40\_003-271e-10.16

**System Configuration**

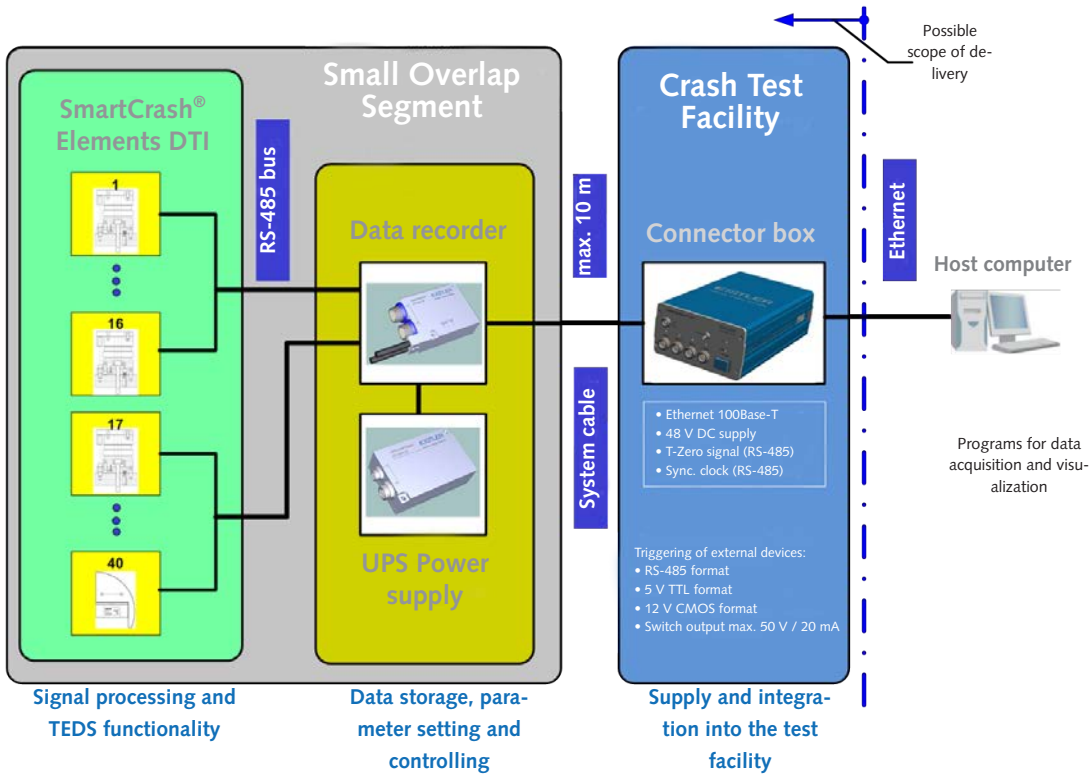


Fig. 7: General configuration of crash barrier

**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 Overlap Segment **Type 9661B40**

9661B40\_003-271e-10.16