

SmartCrash[®] Segment

Type 9655B...

With 3-Component Quartz Crash Force Elements

SmartCrash segments with 3-component piezoelectric crash force elements and integral electronics for measuring impact forces are used in crash tests, e.g. in automobile development. Each calibrated, preloaded crash force element incorporates a data acquisition and storage module for measuring three orthogonal components of a force in any direction.

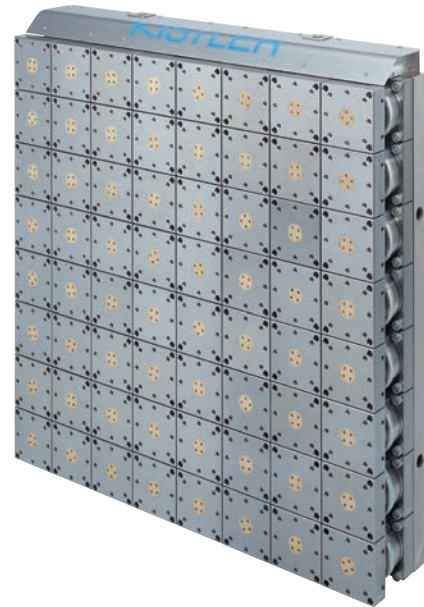
- Segment and crash force elements easily mounted to and removed from front
- Single connecting cable per segment
- High rigidity and natural frequency make system ideal for dynamic measurement
- Wide measuring range
- On-site calibration
- Excellent linearity and high degree of overload protection
-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

Description

A standard SmartCrash segment (1 000x1 000 mm) consists of 64 3-component crash force elements of Type 9350B1. 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 complete data acquisition and data storage is incorporated in each individual crash force segment.

The charge signals are amplified in the crash force element, digitized by an A/D converter, acquired and stored in an integrated data recorder. 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 crash force elements are connected to the integrated data recorder via serial RS-485 interface.

This compact design allows SmartCrash segments with up to 100 crash force elements and 300 channels to be installed quickly and easily. 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 connecting 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 acquired data is then processed with our standard software.

Front mounting of the entire SmartCrash[®] segment prepared to accept different cover plates and other accessories allows quick conversion for various crash standards, i.e. RCAR, US NCAP/TRL and EuroNCAP. Corner elements, aluminium honeycomb and protective timber facing can be adapted for these special applications. Suitable mounting adapters are available as an optional extra.

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

Application

The standard SmartCrash® segment is used vertically in the automotive industry and in vehicle crash test centers, and horizontally in towers for component drop tests, where impact and shear forces have to be measured quickly, easily and very precisely.

Typical Applications

Typical configurations of the standard SmartCrash® segment.

RCAR

Research Council for Automobile Repairs ($v=15$ km/h ± 1 km/h), determination of repair costs after an accident, Kas-ko classification test, 40 % offset crash.

EuroNCAP

European New Car Assessment Program ($v=64$ km/h ± 1 km/h), 40 % offset crash with deformable element honeycomb.

US NCAP/TRL

Transport Research Laboratory ($v=56$ km/h ± 1 km/h), full frontal accident with deformable element honeycomb.

The system can be adapted to meet other crash standards.

Technical Data

Measuring range Measuring ranges relate to the nominal sensor sensitivity $F_x \approx -0,65$ pC/N, $F_y, F_z \approx -1,32$ pC/N	F_x	kN	0 ... 500
	F_y	kN	-100 ... 100
	F_z	kN	-100 ... 100
Bending moments	M_y	kN·m	
	M_z	kN·m	
Linearity (FSO)		%	$\leq \pm 1,0$
Crosstalk (FSO) – [typical values]	$x \rightarrow y, z$	%	$\leq \pm 2$ [$\leq \pm 0,5$]
	$z \leftrightarrow y$	%	$\leq \pm 3,5$ [$\leq \pm 1,0$]
	$y, z \rightarrow x$	%	$\leq \pm 3,5$ [$\leq \pm 1,0$]
Crosstalk (FSO) – [typical values]	$x \rightarrow y, z$	%	$\leq \pm 1$ [$\leq \pm 0,3$] ¹⁾
	$z \leftrightarrow y$	%	$\leq \pm 1$ [$\leq \pm 0,3$] ¹⁾
	$y, z \rightarrow x$	%	$\leq \pm 1$ [$\leq \pm 0,3$] ¹⁾
Operation temperature range		°C	0 ... 40
Natural frequency of the crash force element alone	F_x	Hz	$\approx 4\,000$ ²⁾
	F_y, F_z	Hz	$\approx 1\,700$
Weight of segment (with 64 crash force elements)		kg	$\approx 1\,250$
Material	Crash element 1.2316+S Segment base plate Ck45chemically nickel-plated		
Protection (IEC)			IP65

¹⁾ By correction of crosstalk

²⁾ Mounted on foundation plate

Technical Data, Continuation

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	≈50

Functions

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

Applikation Software (not Included in Scope of Delivery)

- CrashDesigner
- DTI Control
- Others on request

SmartCrash Barrier, Consisting of 2 Standard SmartCrash Segments

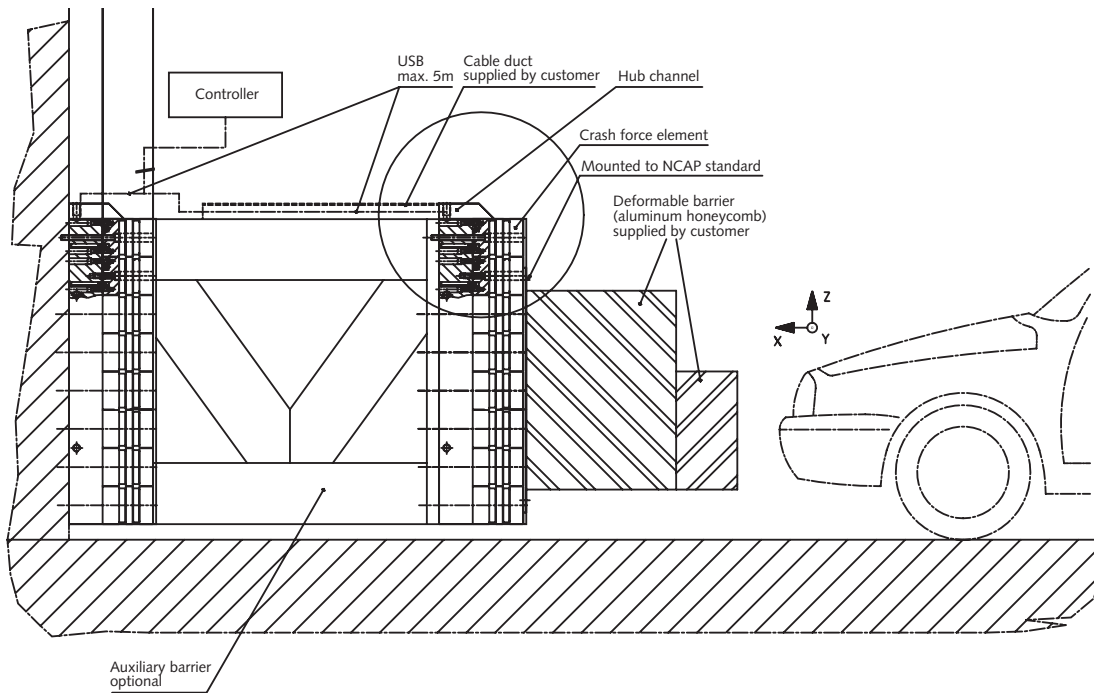


Fig. 1: SmartCrash® barrier

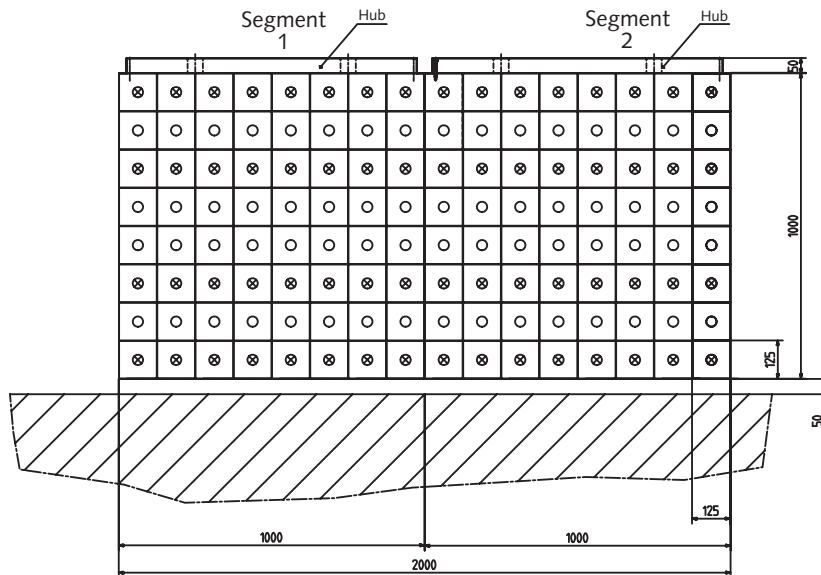


Fig. 2: Standard SmartCrash® segments

9655B_003-270e-10.16

3-Component Standard SmartCrash Segment

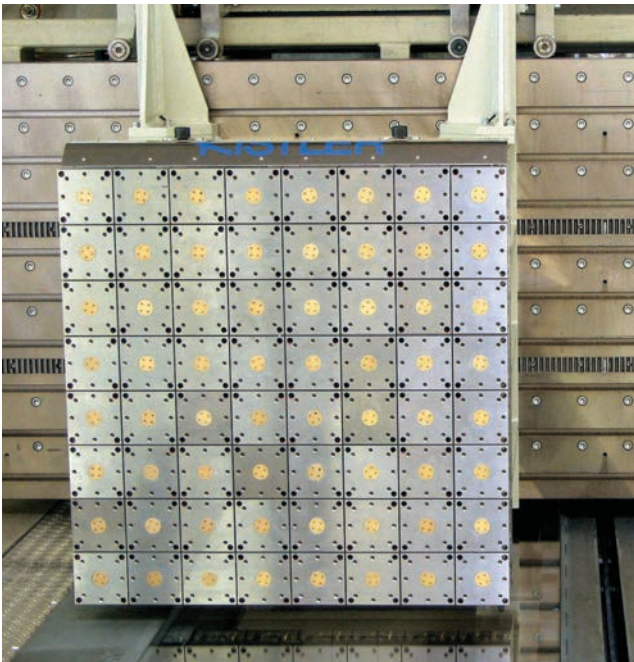


Fig. 3: Standard SmartCrash® segment 1 000x1 000 mm with 64 force measuring elements, mounted on optional offset-block



Fig. 4: Standard SmartCrash® segment, prepared for EuroNCAP with plywood protection plates, without deformable element (honey-comb)



Fig. 5: Standard SmartCrash® segment, prepared for RCAR with profiled aluminium corner elements $r=150$ mm and aluminium front protection plates 250x250 mm



Fig. 6: SmartCrash® segments with up to 100 SmartCrash® force measuring elements need only one single connecting cable to the controller (industrial PC)

9655B_003-270e-10.16

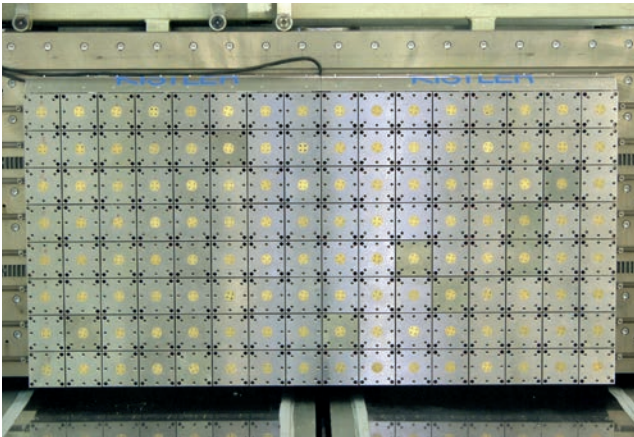


Fig. 7: Two standard SmartCrash® segments, prepared for US NCAP/TRL, without plywood protection plates, without deformable element (honeycomb)

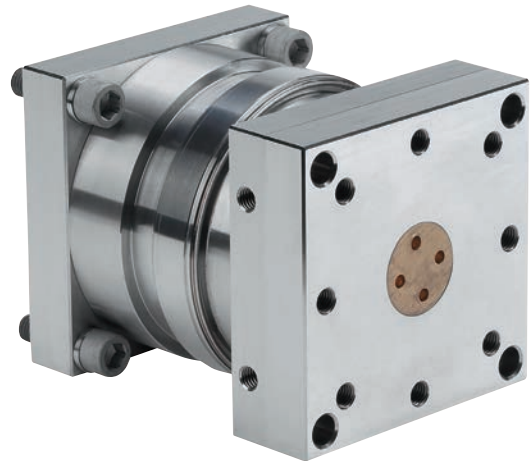


Fig. 8: Front view of the SmartCrash® force measuring element 125x125 mm



Fig. 9: Back view of the SmartCrash® force measuring element 125x125 mm

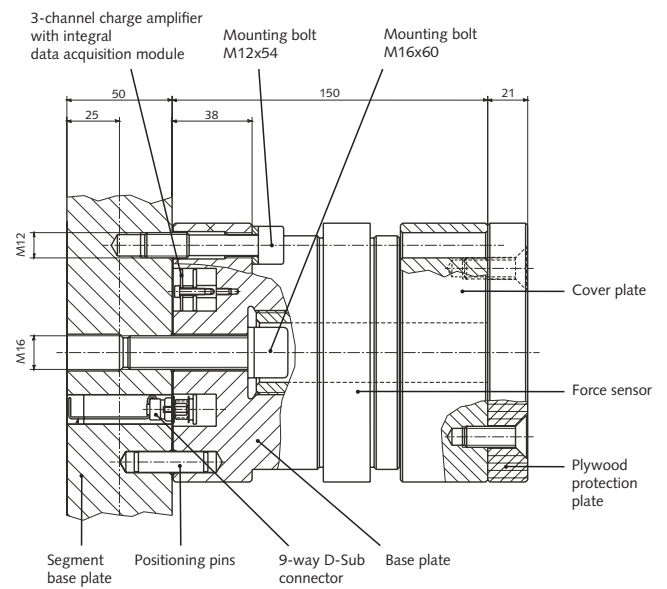


Fig. 10: Standard SmartCrash® force measuring element 125x125 mm



Fig. 11: Movable 3-component calibration unit for full scale recalibration (100 %FSO) of SmartCrash® force measuring elements on customer's site

9655B_003-270e-10.16

System Configuration

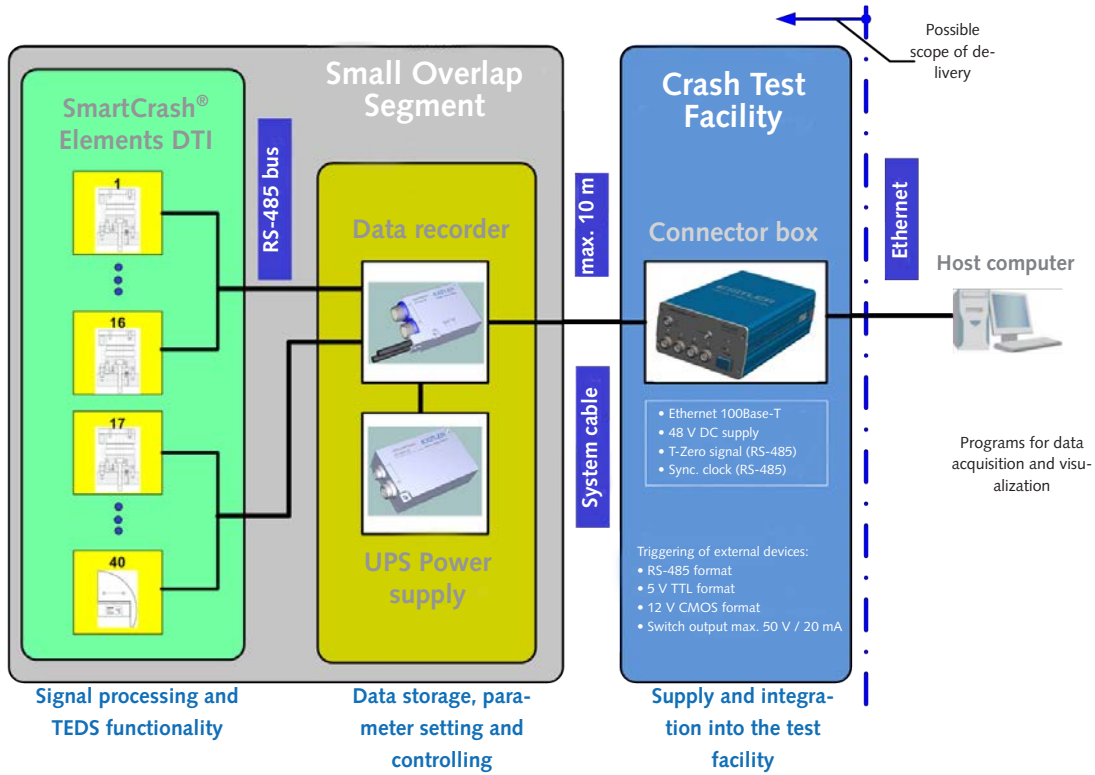


Fig. 12: General configuration of crash barrier

9655B_003-270e-10.16

SmartCrash® is a registered trademark of Kistler Holding AG.

Included Accessories

Special assembly tool

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

Type (Mat. No.)

- Z17431-613 (65017356)
- Z18722-614 (65017357)
- Z17431-651 (65017036)
- Z17243-658 (65017005)
- 9472 (18007831)
- Z18722-632 (65017358)

Optional Accessories

Protective facing for standard SmartCrash segment

- Plywood protection plates 123x123x21 mm, incl. mounting hardware

Type (Mat. No.)

- Z18722-180 (65017347)

Offset block for RCAR/EuroNCAP (standard SmartCrash element)

- Offset-Block 1 000x1 000x750 mm, incl. mounting hardware
- Other sizes to customer specification

on request
on request

RCAR 10 ° Test set (standard SmartCrash segment), consisting of:

- Front plate set (12x) 248x248x60 mm, incl. mounting hardware
- Corner element set (8x) r=150 mm, incl. mounting hardware

- Z20512-700 (18010155)
- Z20512-750 (18010064)

US NCAP/TRL test set (2 units standard SmartCrash segments), consisting of:

- Plywood protection plate 123x123x21 mm, Plywood protection plate 123x164x21 mm
- Clamping plates 998x36x8 mm (4 units), incl. mounting hardware

- Z21223-720 (18010408)

EuroNCAP test set (standard SmartCrash segment), consisting of:

- Mounting plate top 998x123x21 mm, Mounting plate bottom 998x123x21 mm
- Clamping plate 998x60x8 mm (2 units), incl. mounting hardware

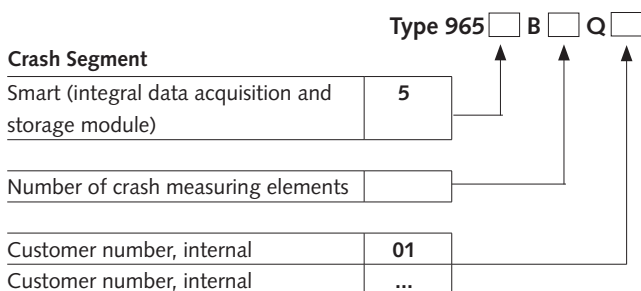
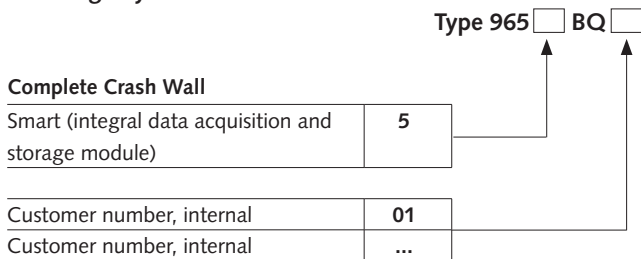
- Z20695-710 (18010104)

Other spare parts

- Adaptations and accessories to customer specs

on request

Ordering Key



9655B_003-270e-10.16