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Grips for Universal Testing Machines

tension, compression, bending, peel, …

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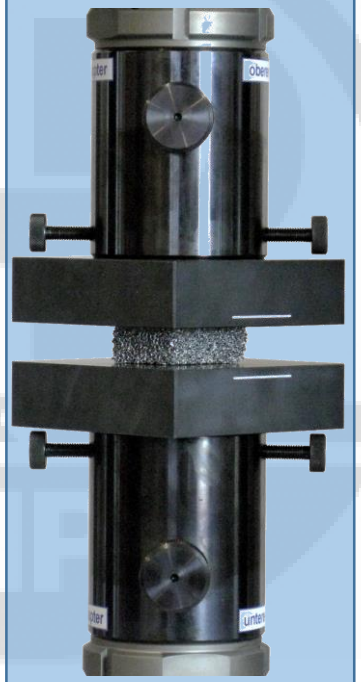
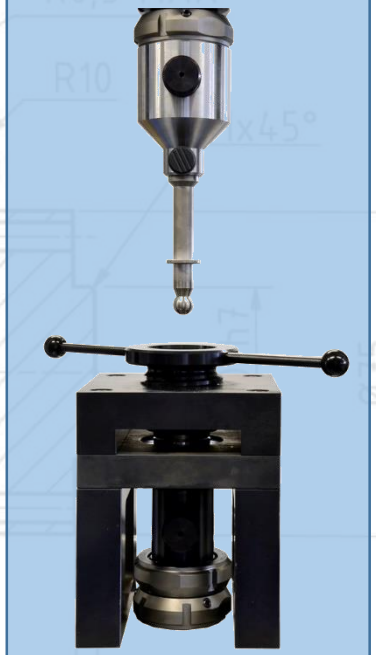
Load types

Tension	Compression	Bending	Peel	Special grips
				

Overview – Selection criterias

grips for tension

- Clamping/Fixation of specimen
- Breakage at jaws
- Axiality
- Material
- Specimen shape
- Maximum force and strength/hardness
- Price
- Maintenance requirements

grips for compression

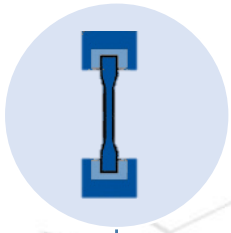
- Fixed or tiltable (plane parallelism of the specimen)
- Specimen Dimensions
- Required hardness
- Maximum force and strength/hardness
- Price

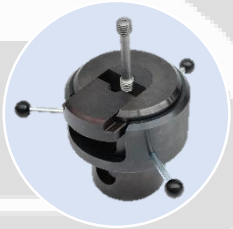
grips for bending

- 3 point/4 point bending
- Supports and fin: fixed, rotating, tiltable
- Dimensions of Supports
- Material
- Maximum force and strength/hardness
- Accuracy of displacement measurement
- Price

Overview – tensile grips

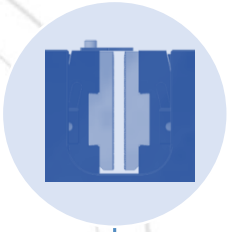
Tension grips





Form-fit

„Specimen holder“



Force-fit (Frictional grips)

self-tensioning

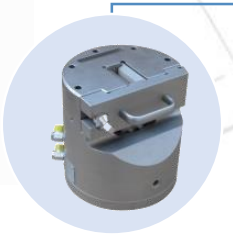
self- and external-tensioning

external-tensioning

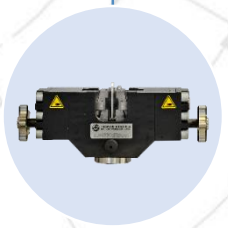
Pincer grip

Wedge type grip

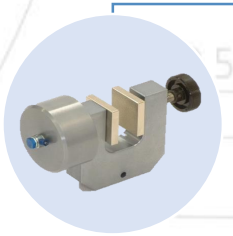
Excentric grip



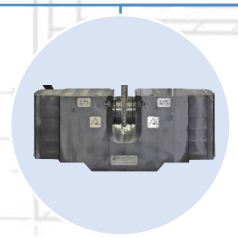
Hydraulic wedge type grip



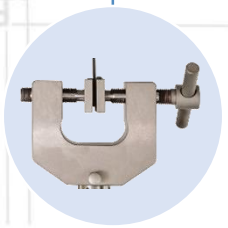
Screw type wedge action grip



Pneumatic grip



Hydraulic grip



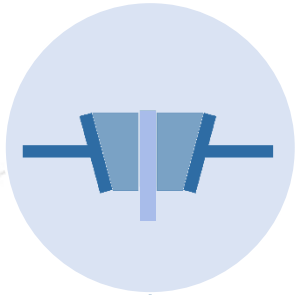
Vice grip

Bollard grip

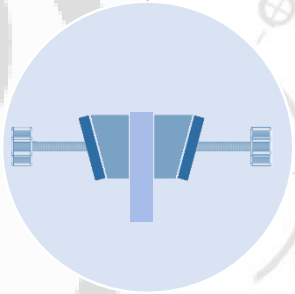
Tension grips – Wedge type grips

Functionality of wedge type grips:

The clamping force increases with inreasing tensile force due to the wedge effect. This enables propper clamping of various materials.

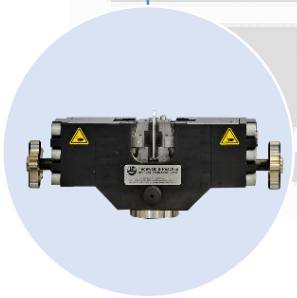


Wedge type grips



Wedge type grips with external-tensioning

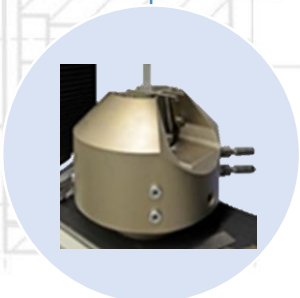
„classical“ self-tensioning wedge type grip



Screw type wedge action grip*

Pneumatic wedge type grip

Hydraulic wedge type grip



Special hydraulic wedge type grip*

„Body over wedge“

* External clamping of the specimens happens parallel, avoiding negative compression forces, which could damage the specimens.

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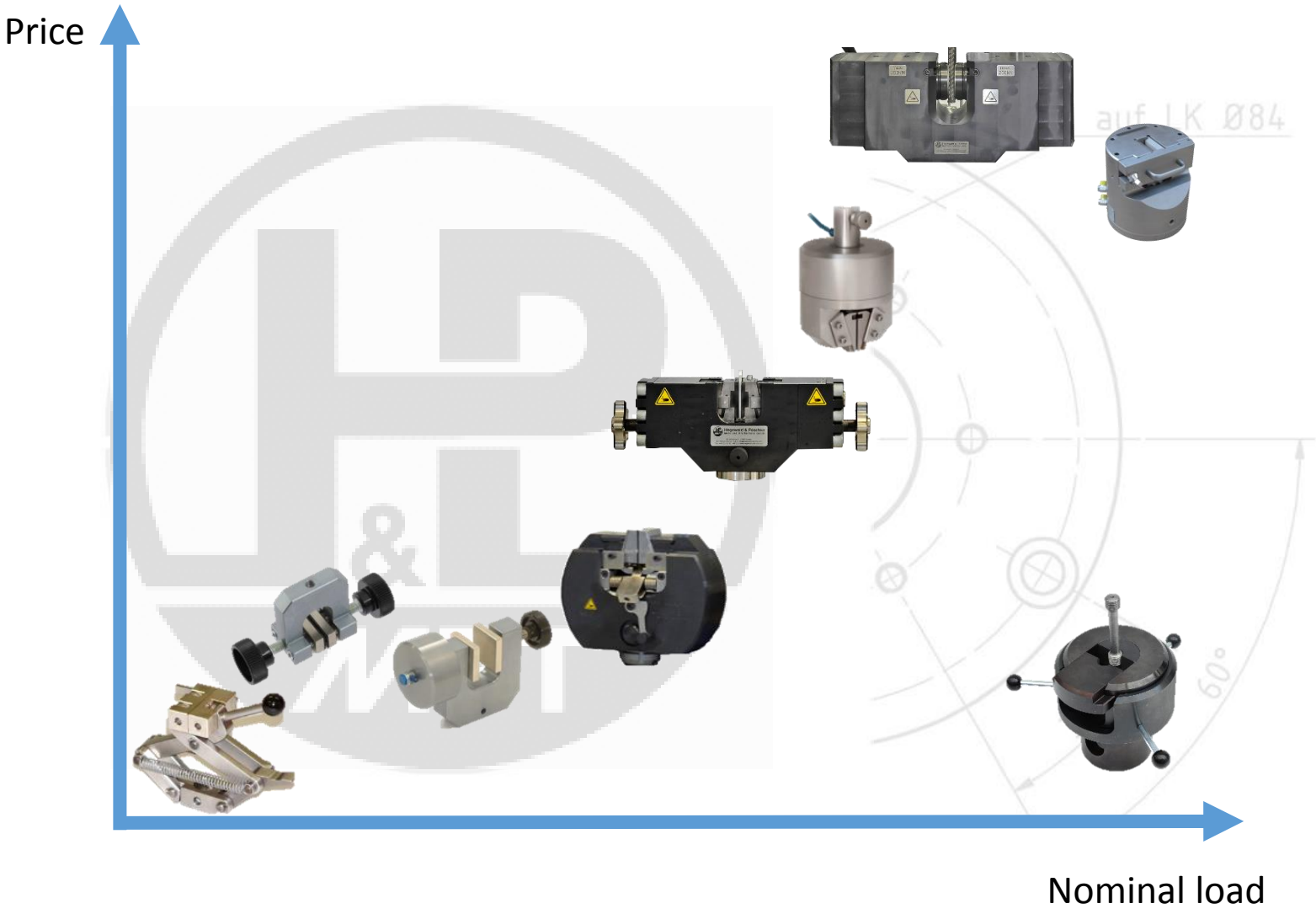
Tension/shear grips: Relation between price and nominal force



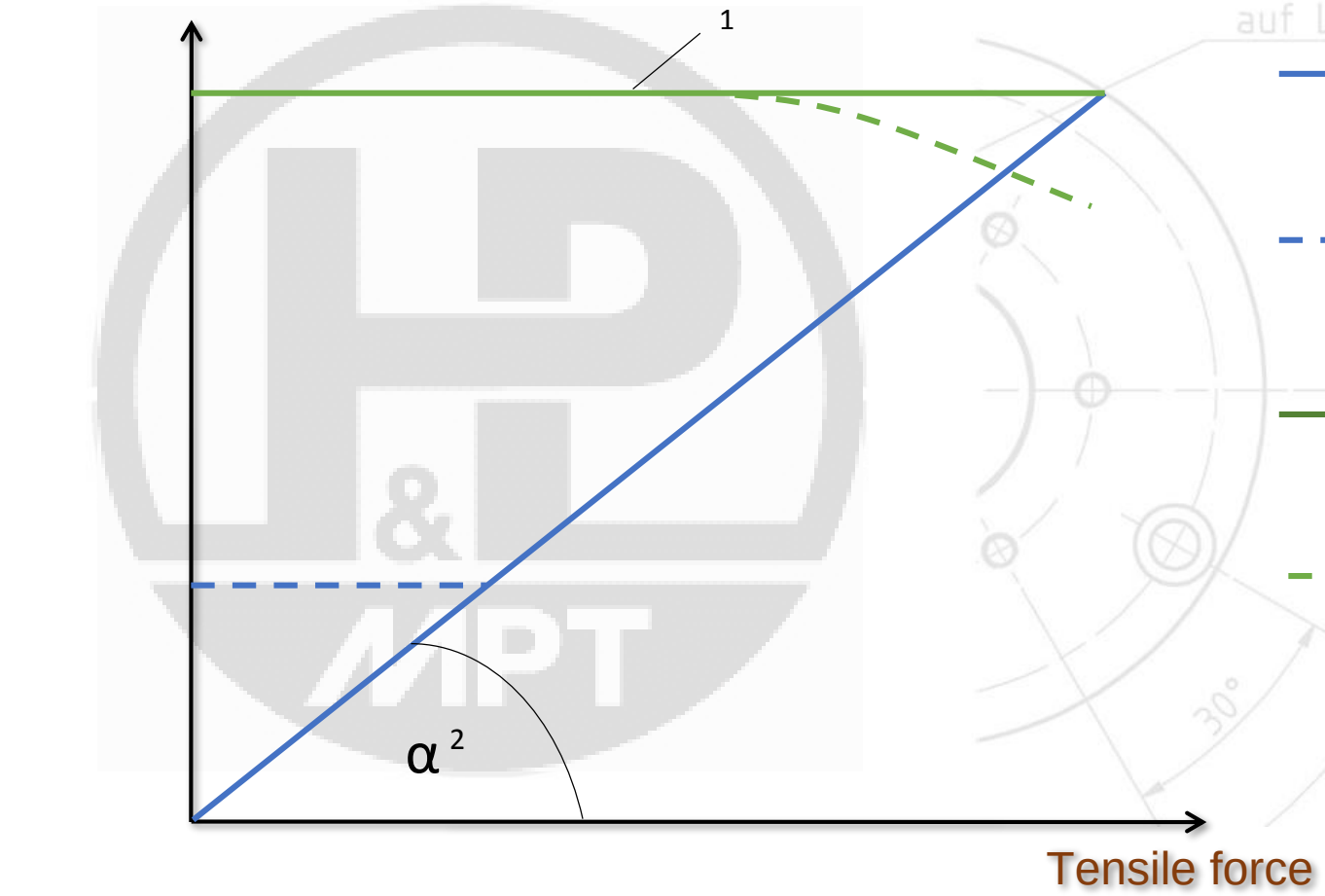
Hydraulic grips

Pneumatic grips

Mechanical grips

Increasing price

Tension grips: Relation between clamping force and tensile force



Self-tensioning (Wedge type grip, pincer grip, …)

Self- and external-tensioning (Screw type wedge action grip, …)

External-tensioning (Hydraulic grip, pneumatic grip, vice grip, …)

External-tensioning without retensioning (Vice grips, …)

[1] Hydraulic grips can also work with increasing clamping force with optional accessories

[2] Angle α is highly dependent on grip design (wedge angle, …)

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Mechanical grips: Applications, advantages and disadvanteges

Increasing Price

Vice grip	Pincer grip	Wedge type grip	Screw type wedge action grip
			
External-tensioning	Self-tensioning		External-tensioning + Self-tensioning
+ Symmetrical and Asymmetrical	- Only symmetrical Clamping possible	- Only symmetrical Clamping possible	+ Symmetrical and Asymmetrical
+ Light	+ Light	- Heavy	- Heavy
+ Adjustable clamping force (It is difficult to reach reproduceable clamping forces)	- Clamping force and pre clamping force cannot be adjusted	- Clamping force and pre clamping force cannot be adjusted	+ Adjustable clamping force (Reproduceable clamping forces can be reached with a torque wrench)
- For small forces		+ Up to high forces	+ Up to high forces
		- Spring back after brittle fracture	+ Frictional fixation after fracture
- Jaws needs be adjusted dependent of specimen diameter/thickness	- No need to adjust jaws dependent of specimen diameter/thickness	- No need to adjust jaws dependent of specimen diameter/thickness	- No need to adjust jaws dependent of specimen diameter/thickness
• Clamping force decreases during testing	• Clamping force increases during testing	• Clamping force increases during testing	• Clamping force increases during testing
- for Thermoplastic, Duroplast, foils,… - up to 20 kN	- for elastomers, plastics, textiles - up to 20 kN	- for metals - up to 600 kN	- for metals - up to 250 kN

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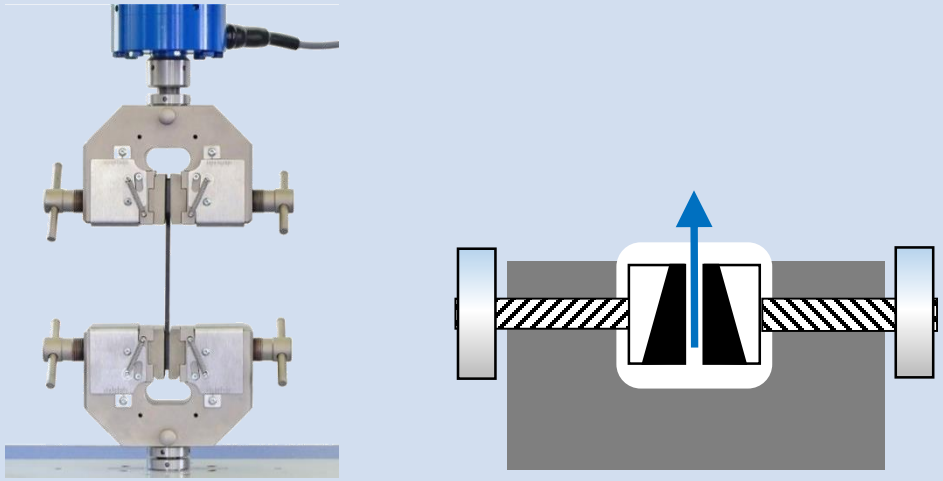
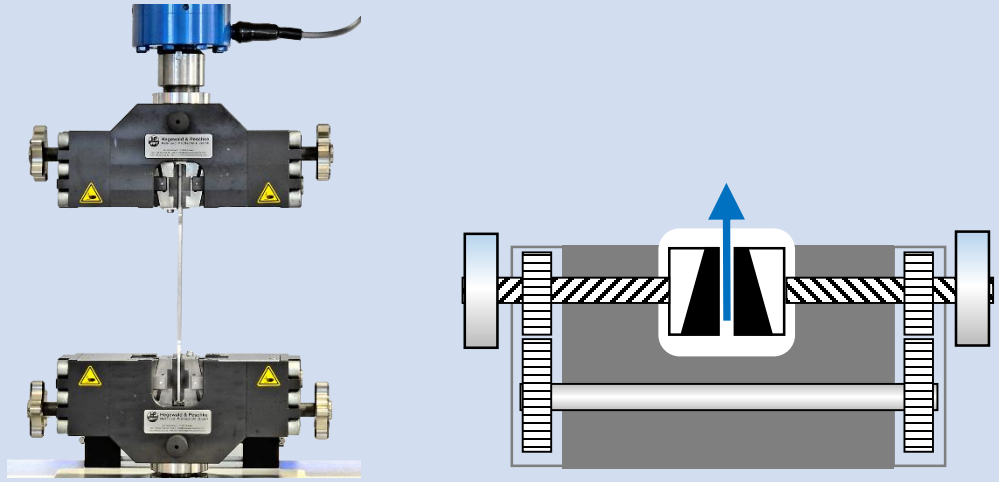
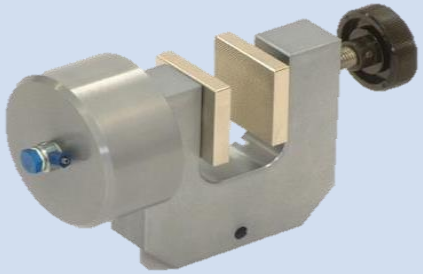
Screw type wedge action grip: Advantages and Characteristics

Non-synchronized Screw type wedge action grips	Synchronized Screw type wedge action grips
	

+ During clamping, the clamping jaws close horizontally, thus preventing damaging compression of the tensile specimens.
+ During testing clamping force increases with the tensile load due to the wedge effect, which allows safe clamping of very different materials.
+ Minimization of undesired stick-slip effects on the clamping wedge due to the high-pressure resistant polymer coating of the sliding surfaces
+ The jaw inserts can be changed easily and without tools.
+ Suitable for use in temperature chambers
+ Both symmetrical and asymmetrical clamping possible

+ The jaws can be adjusted independently of each other, allowing asymmetrical samples to be tested. → **Asynchronous clamping**	+ The grip can clamp specimens in both symmetrical and asymmetrical mode. When working in asynchronous mode, the set offset is kept constant. → Either **synchronous or asynchronous clamping** is possible

Pneumatic and hydraulic grips: Advantages and disadvantages

Pneumatic grips	Hydraulic grips
	
+ clamping force can be adjusted precisely and hold constantly + single-sided and double-sided versions available + pneumatical/hydraulic wedge type grips for usage in temperature chambers + specimen is fixed and immobile, even after fracture + broad variety of clamping jaws	
+ compressed air/compressors are much cheaper than hydraulic aggregates	- high costs for grip, hydraulic aggregate and maintenance
+ light and small in comparison to hydraulic grips	- grips are very heavy and thus difficult to dismount → + often direct adaptation of other grips possible
+ clean medium (air) without environmental hazards	- Oil necessary (Environmental issues and high service efforts)
- limited clamping forces	+ Maximum clamping force
• up to 20 kN (in rare cases up to 50kN) • suitable for fibres, foils, paper, textiles, plastics, sheets, wires	• for high load ranges and for complex clamping tasks • suitable for metals, CFRP/GFRC-materials, technical textiles, hard specimens

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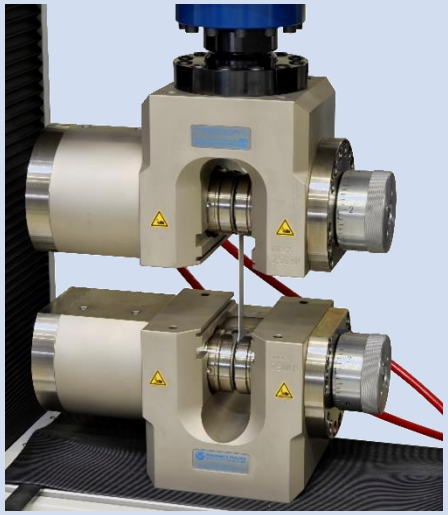
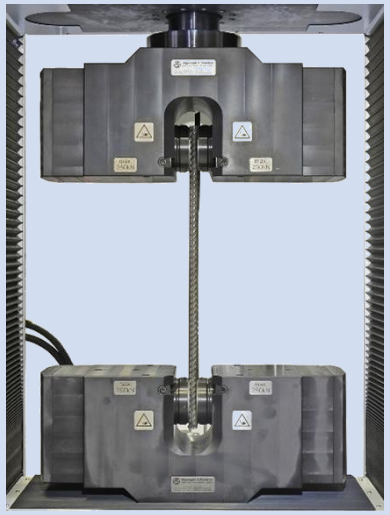
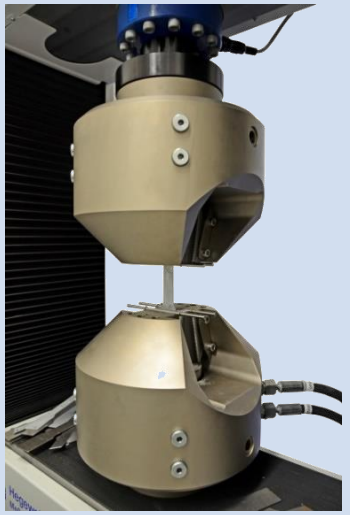
Selection of hydraulic grips

250 kN hydraulic grip – single-sided	250 kN hydraulic grip – double-sided	250 kN hydraulic wedge type grip	Special 250 kN hydraulic wedge type grip – body over wedge
			
• suitable for centric and acentric clamping • for welded and glued specimens - Jaws needs be adjusted dependent of specimen diameter/thickness 	• absolutely centrical clamping • for symmetrical specimens • for materials with low tolerance against lateral forces (composites) • No need to adjust jaws dependent of specimen diameter/thickness 	• compressive forces arise during clamping • less cost intensive • clamping force increases with increasing tensile force • No need to adjust jaws dependent of specimen diameter/thickness	• „Body over Wedge“ → jaws close parallel due to movement of grip body → no compressive forces during clamping • pre clamping force can be adjusted precisely • No need to adjust jaws dependent of specimen diameter/thickness

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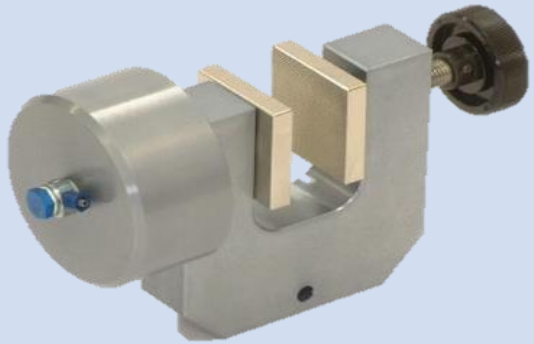
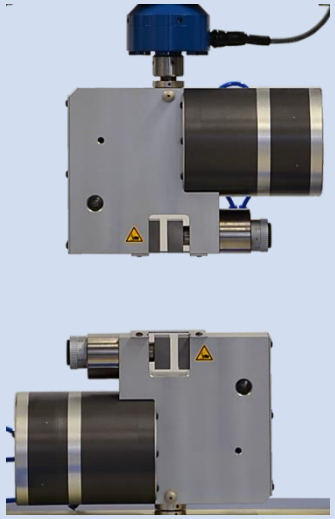
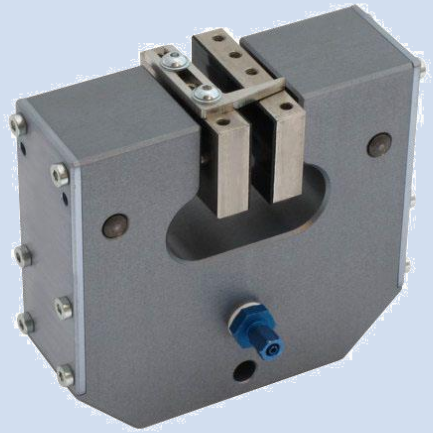
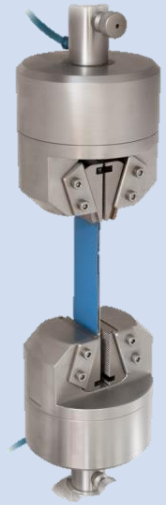
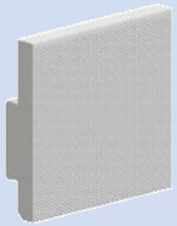
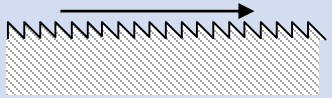
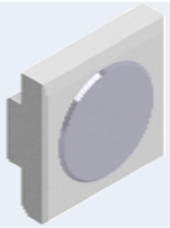
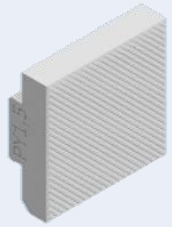
Selection of pneumatic grips

3.5 kN Single-sided pneumatic grip	20 kN Single-sided pneumatic grip	2.4 kN Double-sided pneumatic grip	10 kN /20 kN pneumatic wedge type grip
			
• centric and acentric clamping possible • direct-acting cylinder	• centric and acentric clamping possible • special design: indirect power transmission with cylinder mounted in opposite direction	• only for centric clamping • compact design	• suitable for usage in temperature chamber: -70 to 280°C • incl. Teflon seal • variable length of the extension rods

Clamping jaws for flat specimens and sheets

Application	Design	Description
- metals - wood - plastics - fibre-reinforces plastics - UTM up to 1300 N/mm²		- Flat jaws with saw teeth - Material: tool steel (56^{+2} HRC) 
- for fracture sensitive materials - for metal foil, sheets, wires, ...		- flat jaws with ceramic inlay
- for fracture sensitive materials - steel sheets - for non ferrous metals		- flat jaws with diamond coating (Graining D91 F0,2) 
- UTM up to 1900 N/mm²		- flat jaws with 90° pyramid profile - Material: tool steel (64^{-2} HRC) - different teeth sizes: 

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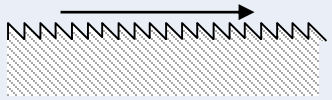
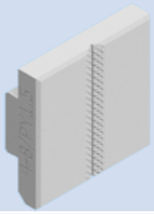
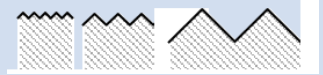
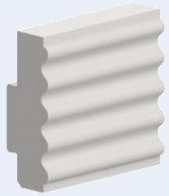
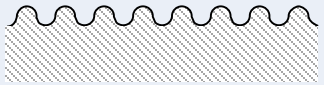
Clamping jaws for round specimens, pipes and others

Application	Design	Description
round specimens, bars, …		
- steels - UTM up to 1300 N/mm²		- prism jaws with different saw tooth grids - material: tool steel (56^{+2} HRC) 
- UTM up to 1900 N/mm²		- prism jaws with 90° pyramid tooth, optionally with different profile depths/grids - material: tool steel (64^{-2} HRC) 
sheets and foils		
- geo textiles - textiles - plastics - fabrics		- flat jaws with PU-coating (Vulkollan®) 
- fabrics - textiles - foils		- waved profile 

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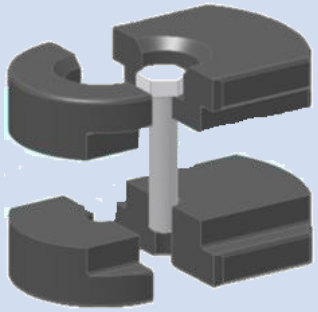
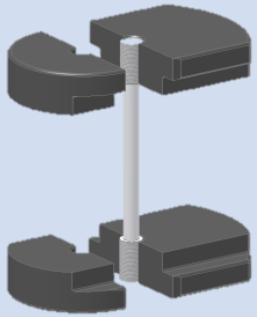
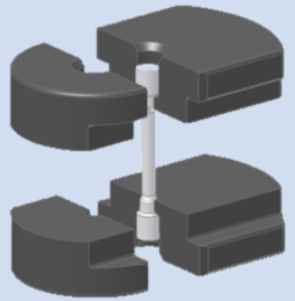
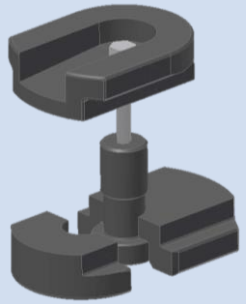
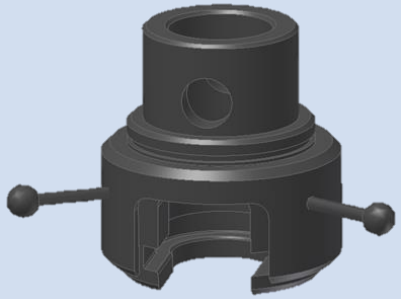
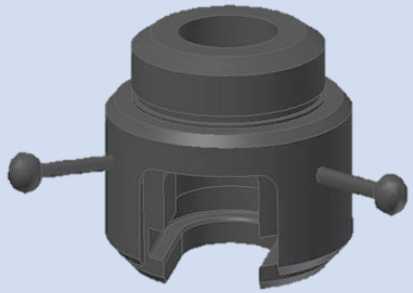
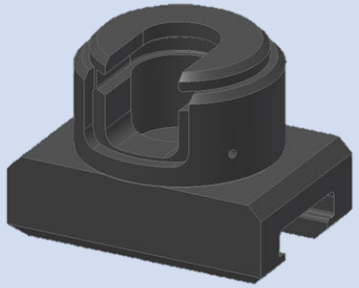
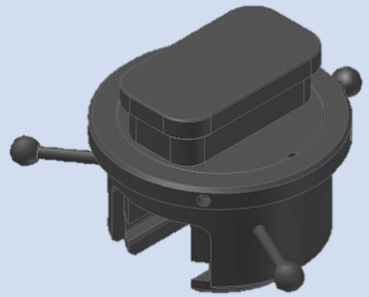
Mechanical Clamping system
Specimen holder for form-fit clamping

Specimen holder for shouldered-end/threaded-end specimens and screws
Clamping of tensile specimens that cannot be gripped directly with clamping jaws due to their size, geometry or composition

Insertion plates for Screws	Insertion plates for threaded-end specimens	Insertion plates for shouldere-end specimens	Insertion plates for wedge loading
			

Connector to R60/30	Connector M64x4	Connector AS60/61 to wedge type grip	Connector to hydraulic grip
			

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Bending jigs for 3-point, 4-point and folding tests

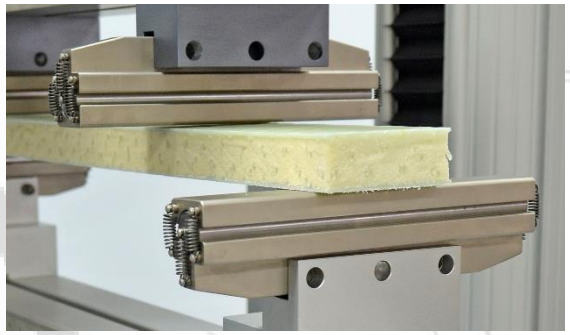
Application

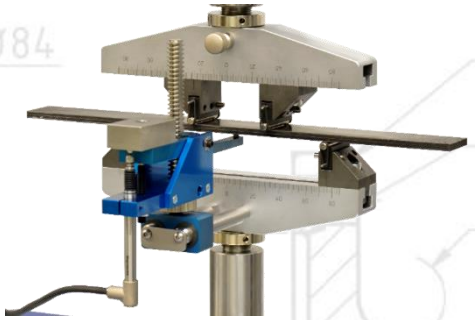
Determination of the elastic properties and maximum bending strength of brittle composites and ceramics, metals, wooden plates, rigid plastics, analysis of welded sheets.

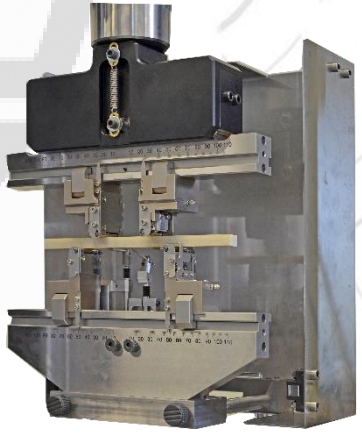
Selection criteria

- Supports fixed, rotating or tilting (to avoid transverse loads on non-symmetrical specimens) with radius at the bending edges
- Optionally equipped with displacement probes for displacement measurement on bending samples
- 4-point: Force is applied via 2 bending fins symmetrically aligned to the supports. The bending moments are constant between the bending fins.

Supports rotatable, tiltable and fixable







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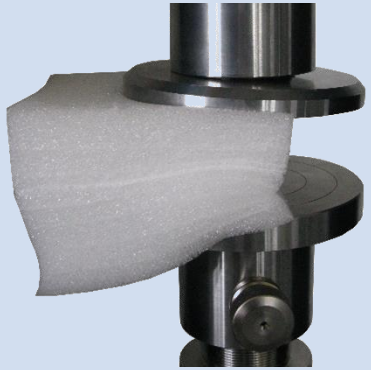
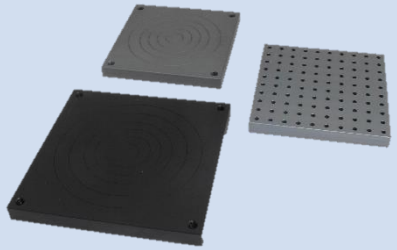
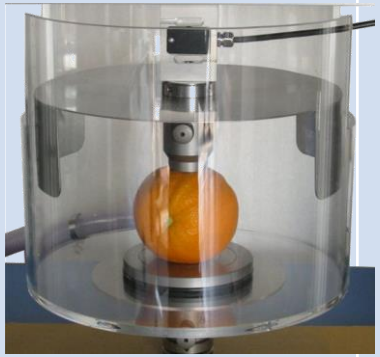
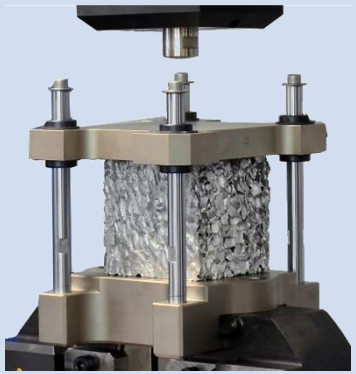
Applications of compression plates

round 20 kN compression plates for spring testing	tiltable round 250 kN compression plates	squaric compression plates	round 20 kN compression plates for food testing	round 250 kN compression plates	50 kN compression plates with guiding columns
					
- Ø 150 mm - both plates are fixed - Optional with exchangeable mandrel	- Ø 150 mm - upper plates can be tilted by max. +/-3° - suitable for application in temperature chamber	- different sizes available - different engravings/drill patterns possible (foam testing according to ISO2439, ISO3386)	- Ø 150 mm - including drip pan and splash guard	- Up to 3 measuring probes possible (individual evaluation or averaging) - Splinter protection	- compression plates with different hardness are available

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Peel test devices
Determination of friction coefficient

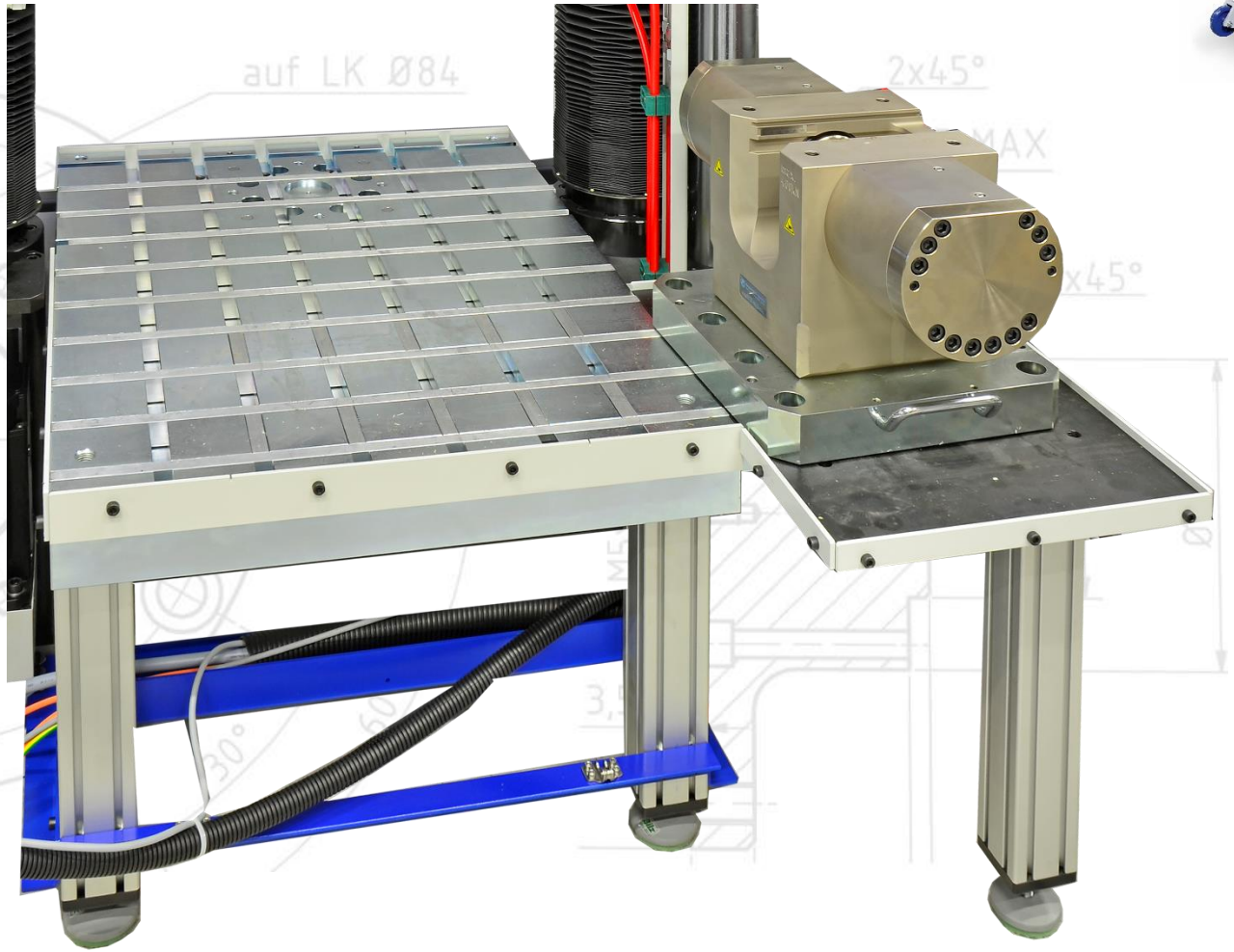
Application

Determination peel forces and of the coefficient of sliding friction on films and textiles, adhesion test
- Different trigger angles, e.g. 45°, 90° and 180

T-groove plates

T-groove plates

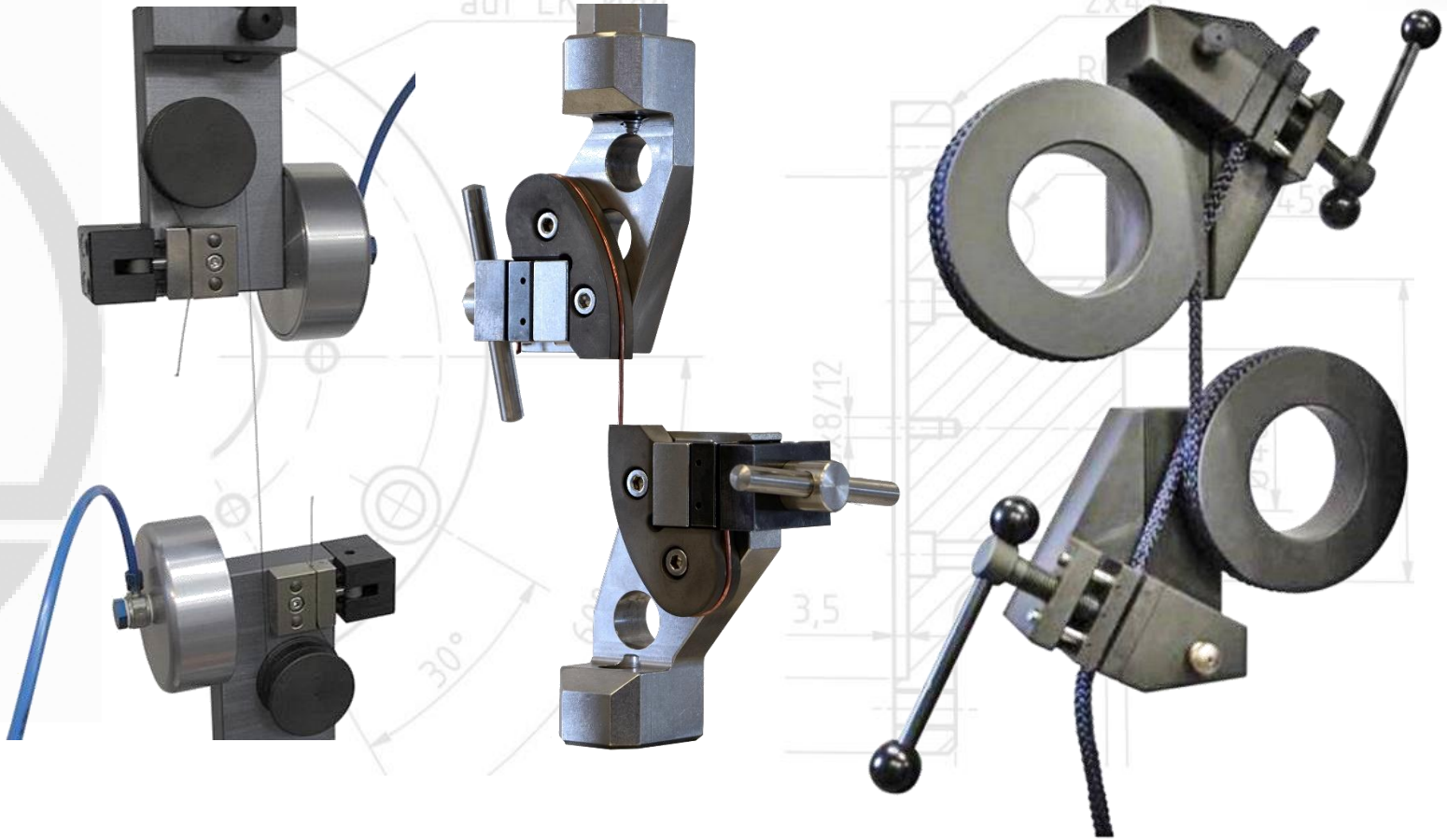
- for component testing
- adaption of various tools possible
- different sizes, different T-groove geometries and orientation
- Optionally with air cushion pallet and parking table for moving heavy fixtures in and out of the test chamber, making it easier to switch between different types of tests (see right)



Special grips / Bollard grips

Bollard grip / grips with force reduction curve

+ Deflection of the wire/rope for indirect clamping
+ Prevention of breakage of the clamping jaw (clamping crack)
+ Clamping with screw, pneumatic, hydraulic, etc. possible
+ Cost-effective
- Only possible for small diameters (up to 4 mm)
- A long sample is required
- Big difference between machine stroke and specimen elongation



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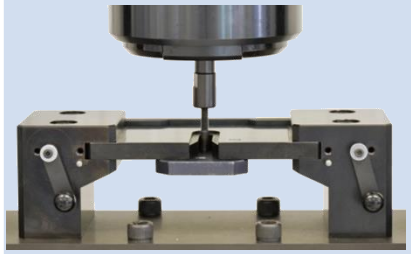
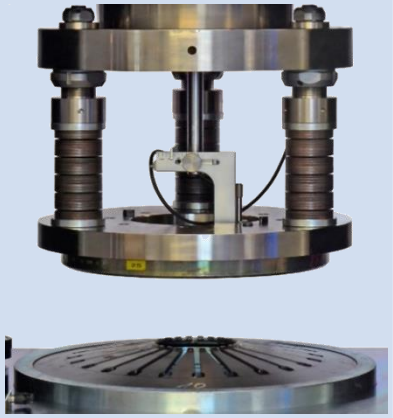
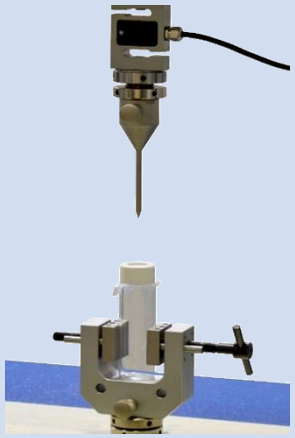
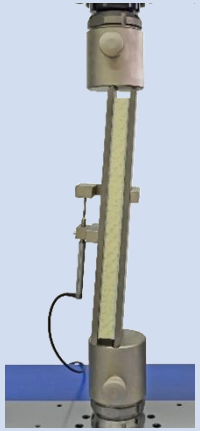
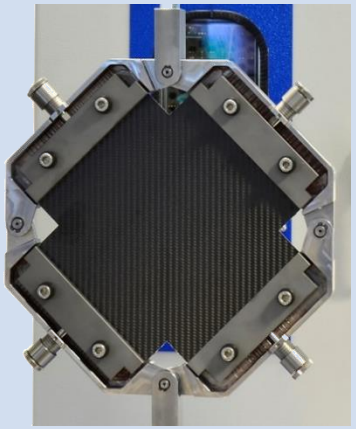
Selection of special test grips

Special grip for pull-off tests of welding studs	Testing device for clutch springs	Puncture test on protective gloves	Floating roller peel test fixture	Shear test device up to 150 kN	Device for Erichsen/Cupping tests	Shear frame
						
• testing of welded joints, e.g. on sheet metal parts	• incl. three load cells and three displacement sensors • Fmax=100kN	Based on: • EN863 (puncture test) • EN388 (tear resistance) • EN374-4 (for protective gloves)	• for drum-peeling tests • determination of pull-off speed and peeling resistance	• testing of composites; shear test according to DIN53294	• evaluation of the deepening capacity of sheet metal	• for tensile loading of textile semi-finished products and fibre-reinforced • composite materials / composites