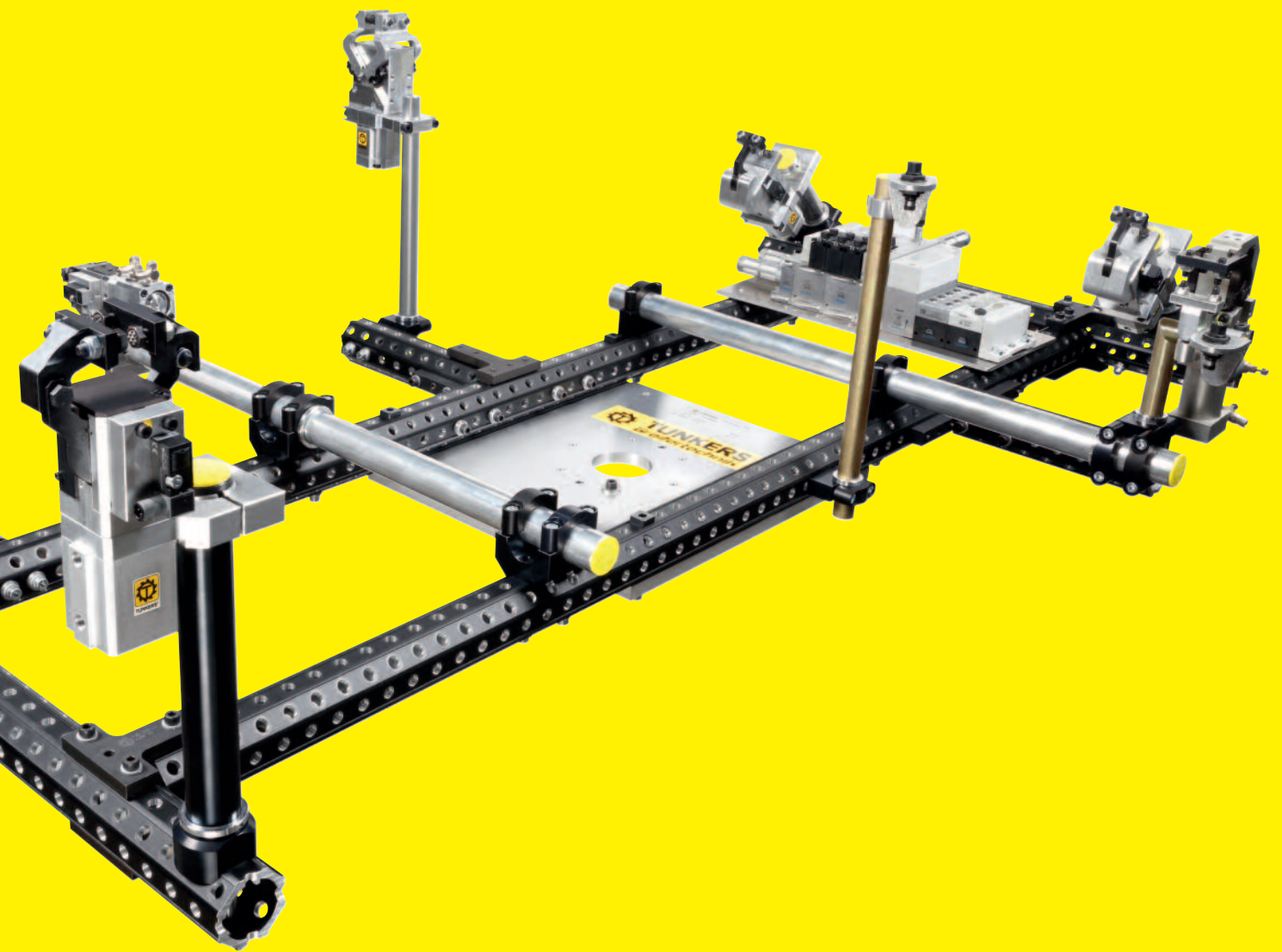


GRIPPING





TÜNKERS Gripper Systems – the arms and hands of the industrial robot

Robotic gripper systems have become a standard in today's automotive body assembly lines. With increased performance, robotic handling has replaced conventional transport systems like shuttle and conveyor systems. They do not only move small and add-on parts, but also side panels, complete underbody groups and - for the first time now - even entire car bodies.

In special designs, robotic grippers are now also used for processes including handling procedures using welding guns, glueing or clinching units and in some cases, they even have geometric functions.

While until a couple of years ago, steel welding frames used to be the backbone of robotic grippers, modular systems are the state of the art now.

GRIPPING



TÜNKERS Round Tube System (TRR) _____		3-7
TÜNKERS Carbon Fibre Tube System (TCR) _____		3-11
TÜNKERS One Screw System (TOS) _____		3-17
Euro-Gripper-Tooling System (EGT) _____		3-23
TÜNKERS Machine Tools for Gripping, Clamping and Positioning _____		3-28
Special Products _____		3-29
Services _____		3-30



Introduction

Gripper and handling technology is the core competency of the comprehensive TÜNKERS product range. The portfolio includes a variety of system solutions, based on force-closed and form-closed concepts. The principal application for these grippers is the body in white production, in which handling, process and geometric applications are implemented. Due to the flexible nature of the car body, gripper tasks can also be performed in other aspects of automobile technology.

Versatility and flexibility

In addition to standard TÜNKERS® Round tube, Carbon tube, One Screw or Euro-Gripper-Tooling, we also offer customer-specific products in customised form. On request, our sphere of competence also includes special products.

Worldwide experience and problem-solving expertise

With eight production plants for grippers around the world and a total of approx. 14,000 gripper systems supplied to date, TÜNKERS is a strong business partner. Our handling systems are used by many original equipment manufacturers in the automobile sector, including, for example, Audi, BMW, Daimler, Ford, GM, Land-Rover, Renault, Volvo, Volkswagen or Skoda. As specialists in gripper systems, with this background experience we are able to react flexibly to problems of any kind and to offer you prompt and competent potential solutions to design challenges, for example.

TÜNKERS as system supplier

In implementing gripper projects, if required we can offer you integrated solutions. These include:

- Design consultancy and the creation of gripper system concepts
- Project management and ongoing contract implementation
- Mechanical assembly, including the production of special components and the procurement of parts
- Installation of pneumatically- and electrically-operated components
- 3D measurement and documentation
- On-site commissioning

In the first instance, please make direct contact with your local Field Service Team or send an e-mail to gripper@tuenkers.de.

In designing a gripper system, the user is faced with the choice of either a modular system or a gripper of welded construction. The advantages of modular construction are self-evident:

Key factors

Maintenance:

- No need for replacement systems, as is frequently the case with welded-construction gripper systems
- Faster replacement of components
- For maintenance, modular grippers only require a small number of standard spare parts

Weight:

- Lightweight precision round tubes out of aluminum, thin-walled steel or carbon fibre semi-finished products
- Weight reduction to retain or downgrade the category of robot

Flexibility:

- Rapid adaptation to short-notice modifications to components, for example expansion to accommodate an additional clamping station
- Combination of the various round tube gripper systems is possible → similar tube diameter and offsets of the clips
- Weight reduction due to the use of carbon fibre components

Delivery times:

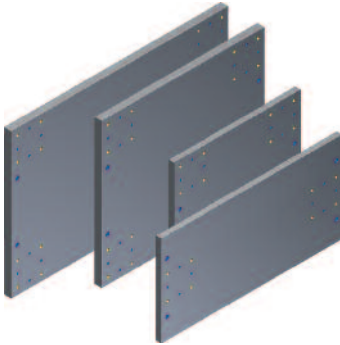
- Standard components in stock
- Available worldwide

Costs:

- Design costs - Standardised 3D-CAD libraries mean the design becomes simply 'composition'
- Storage costs – Small variety of parts, few special-production parts required
- Project costs – Volume production in high numbers at low prices

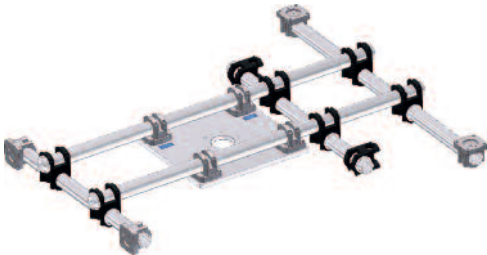
1. Gripper base plate

Versions in the form of sheet aluminum or sheets of composite material in a variety of material thicknesses and dimensions, compatible with the size of the gripper and the weight of the component.



2. Modular base frame

Mainly responsible for the overall rigidity of the system. Depending on the system, the base frame can be in the form of circular- or octagonal-section tubing.



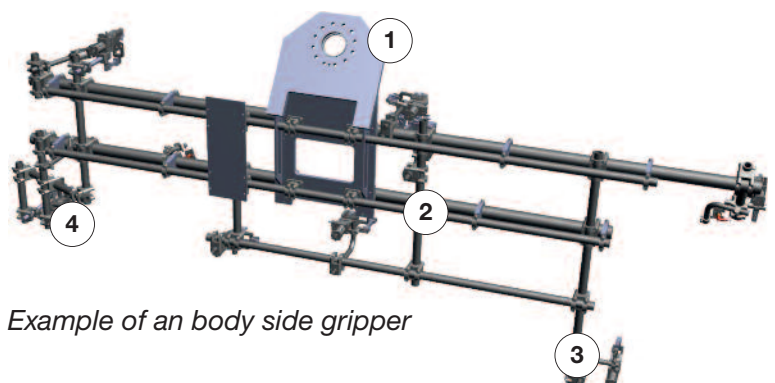
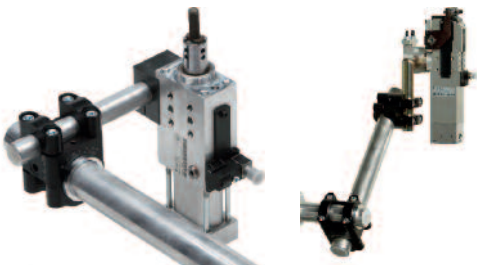
3. Connections

Extensions/gripper arms for connecting actuators and pins to the base frame.



4. Machines for gripping, clamping and positioning

Lightweight Tünkers actuators provide for a dynamic approach.



Example of an body side gripper

GRIPPING

TÜNKERS Round Tube System (TRR)





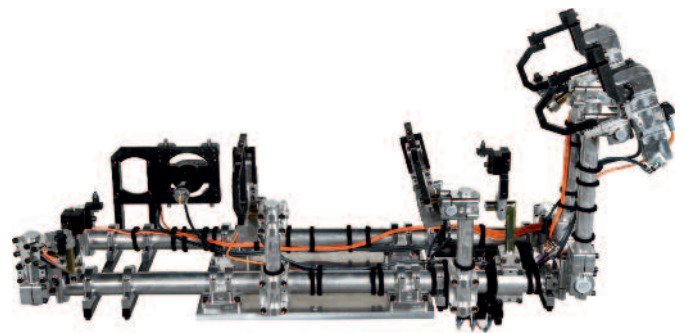
TÜNKERS Round Tube System (TRR)

From a technical viewpoint, the force-closed TÜNKERS® Round Tube System makes use of the optimum moment of inertia of tubes and, in comparison with square-section forms, they exhibit the ideal relationship between low weight, high rigidity and low vibration levels.

- System consisting of precision aluminum tubes in diameters of 25, 40 and 60 mm
- High geometric flexibility → optimum accessibility to components → positioning possible in all directions
- Similar offset with both aluminum and carbon fibre joints (hybrid system possible)
- Safety in case of a crash → the clips rotate without destroying the machines
- Reproducibility → Scale on GSKN clips or optional reference holes



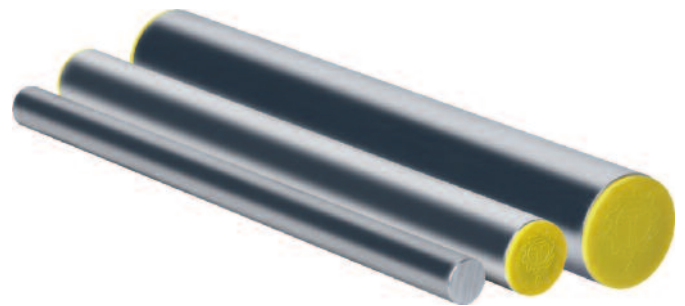
Gripper system for handling a body side



Round Tube Gripper System



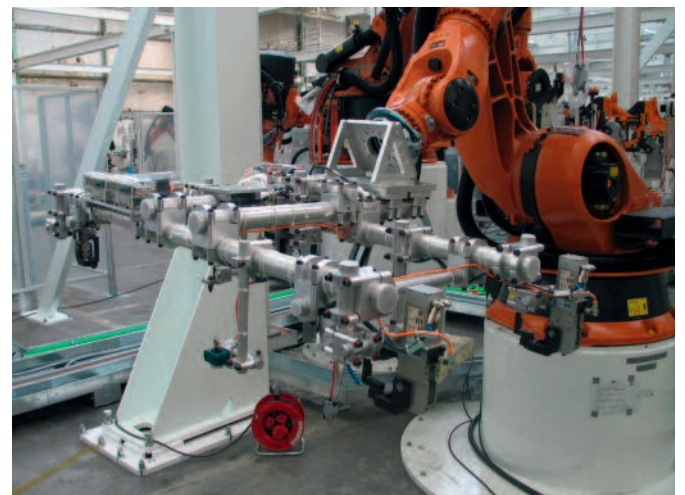
Aluminum cross joints – GSKN Series



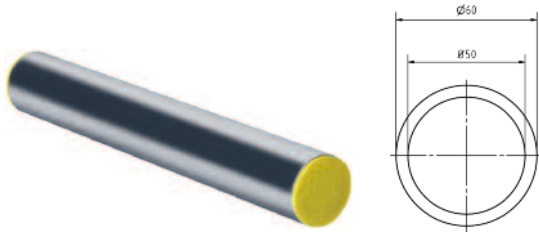
Precision aluminum tubes Ø 25, 40 and 60 mm



Nonius for precise adjustment



Round Tube Gripper System



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x
GR 60	EN AW 2007	2,50 kg/m	329376 mm ⁴	10979 mm ³

Ordering information: GR60-...

Profile lengths in 10 mm increments (maximum length 6000 mm)



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x
GR 40	EN AW 2007	1,83 kg/m	95492 mm ⁴	4775 mm ³

Ordering information: GR40-...

Profile lengths in 10 mm increments (maximum length 6000 mm)



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x
GR 25	EN AW 2007	1,40 kg/m	19175 mm ⁴	1534 mm ³

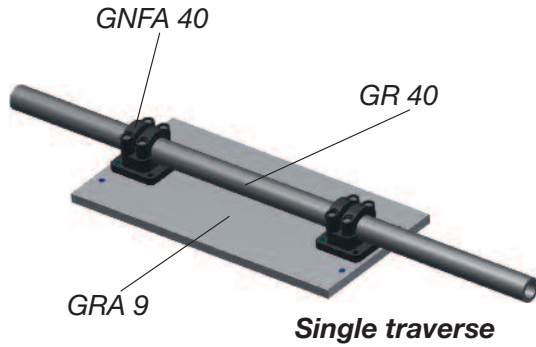
Ordering information: GR25-...

Profile lengths in 10 mm increments (maximum length 3000 mm)

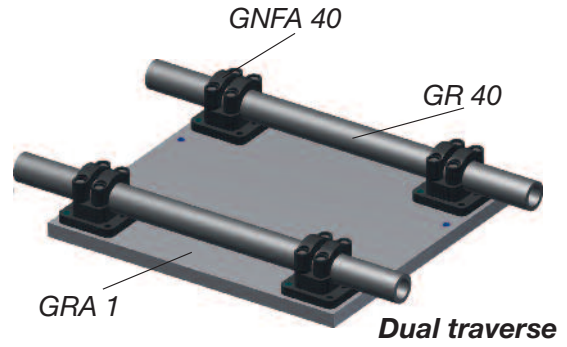
Please Note:

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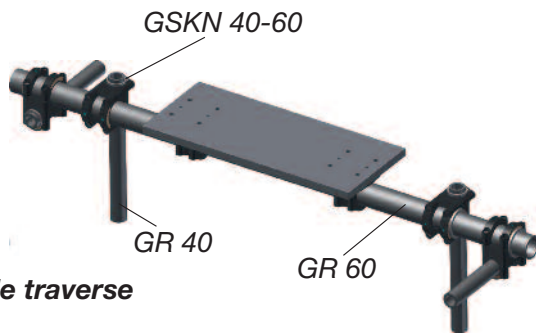
System configuration – Base Frames and Gripper Arms



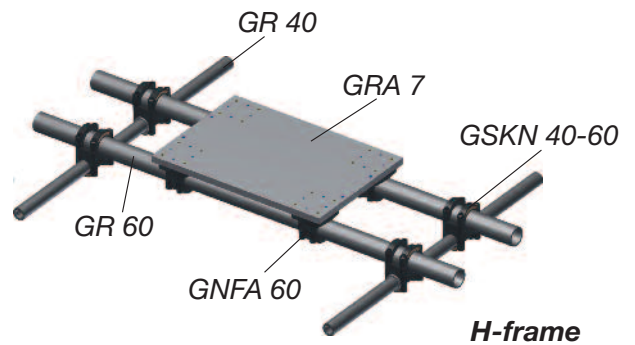
Single traverse



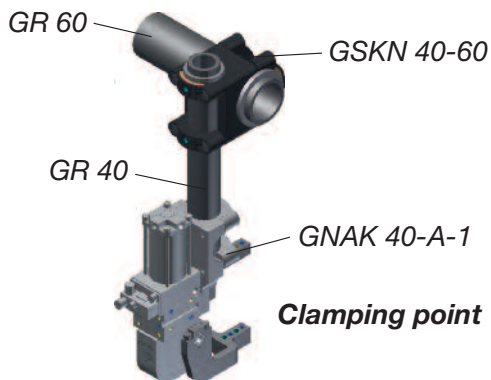
Dual traverse



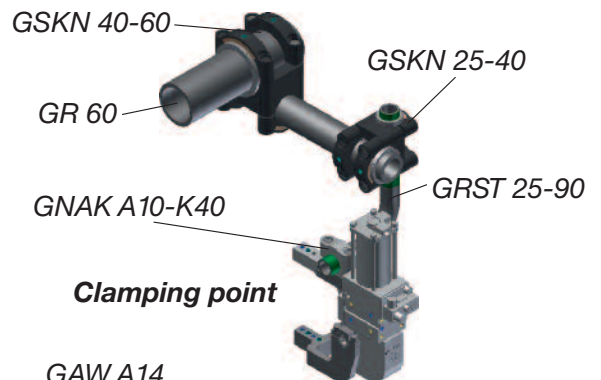
Single traverse



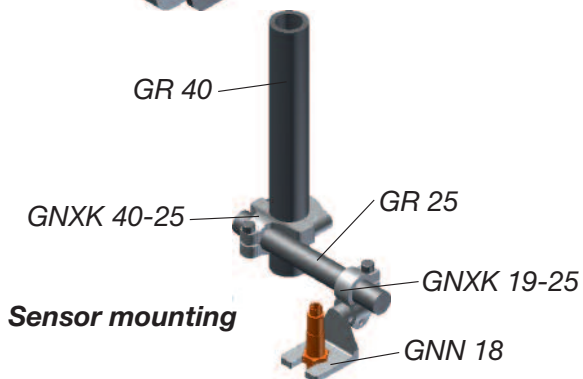
H-frame



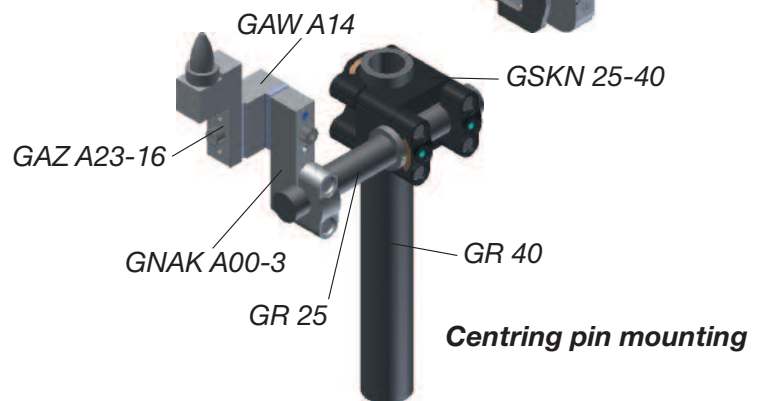
Clamping point



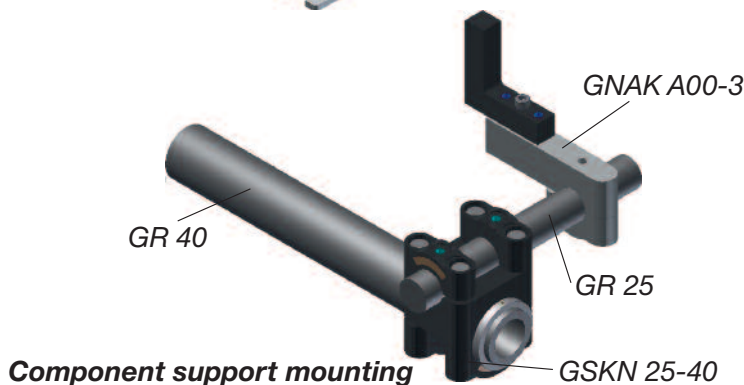
Clamping point



Sensor mounting



Centring pin mounting



Component support mounting



Suction pad mounting

GRIPPING

TÜNKERS Carbon Fibre Tube System (TCR)



From a technical viewpoint, the force-closed TÜNKERS® Carbon Fibre Tube System makes use of the optimum moment of inertia of tubes and, at the same time, the special properties of carbon fibres.

Right at the beginning of the project phase and without knowledge of the component or gripper weight in question, the maximum permissible weight category is defined by determining the type of robot. If this weight category of the gripper solution designed for the actual application is exceeded, apart from selective measures to reduce weight, the designer must resort to using a larger robot, with negative consequences in terms of investment, space requirement (footprint) and cycle time.

With potential weight savings of up to 50%, the TÜNKERS® Carbon Fibre Tube System is a genuine alternative and creates new design leeway, as both a complete system and a hybrid solution, in which aluminum, steel and carbon fibre components can be flexibly combined in one product.

- System consisting of precision carbon fibre tubes in diameters of 25, 40 and 60 mm
- Combination and integration in existing gripper systems possible → similar offset between aluminum and carbon fibre joints
- Weight reduction → Use of a lower category of robot
- In comparison with an aluminum system: weight reduction of 40%, price supplement approx. 20% in terms of the complete gripper system



Precision carbon fibre tubes -
GRC Ø 25, 40 and 60 mm



Carbon fibre cross joints - GKC



'Stingray' – the lightweight carbon fibre bracket
Weight: from 6 kg



Stingray as gripper system –
total weight approx. 30 kg



Example application – transporting 115 kg floor pan



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x	Surface treatment
GRC 60	CFK	0,85 kg/m	218780 mm ⁴	7293 mm ³	ground

Ordering information: GRC60-...

Profile lengths in 10 mm increments (maximum length 3000 mm)



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x	Surface treatment
GRC 40	CFK	0,64 kg/m	67450 mm ⁴	3372 mm ³	ground

Ordering information: GRC40-...

Profile lengths in 10 mm increments (maximum length 3000 mm)



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x	Surface treatment
GRC 25	CFK	0,33 kg/m	12778 mm ⁴	1022 mm ³	ground

Ordering information: GRC25-...

Profile lengths in 10 mm increments (maximum length 3000 mm)

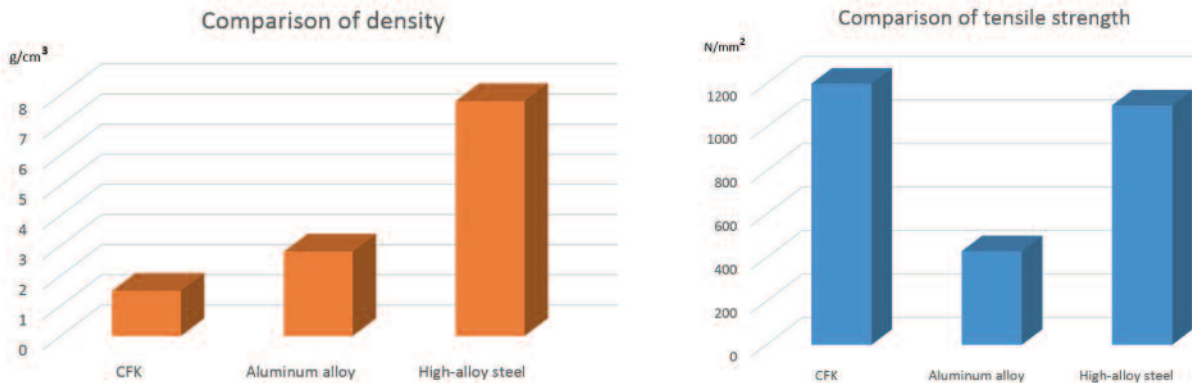
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Characteristics of CFK in comparison with steel or aluminum

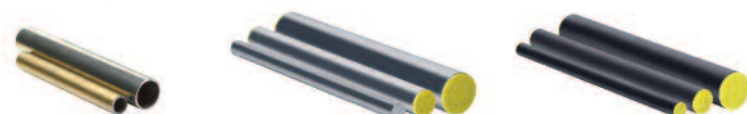
- Exceptional strength to weight ratio (low weight, high tensile strength)
- High modulus of elasticity, high strength, rigidity and dynamic load-bearing capacity
- Good vibration absorption and dimensional stability
- Heat and corrosion resistance
- Minimal heat expansion
- High fatigue strength, high residual safety

Properties of construction materials in comparison with CFK



* Exact values are dependent on the alloy material

Tube Ø	Steel (kg/m)	Aluminum (kg/m)	Carbon (kg/m)
25 mm	1,63	1,40	0,33
40 mm	2,31	1,83	0,64
60 mm	(6,78)	2,50	0,85



100 %	≈	52 - 86 %	≈	18 - 26 %
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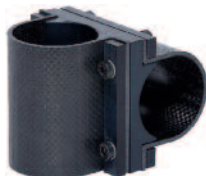
Weight reduction of more than 50 %

GSKN – Cross Joint
(Aluminum)



GSKN 60-60
Weight: 1400 g

GKC – Cross Joint
(Carbon & Aluminum)



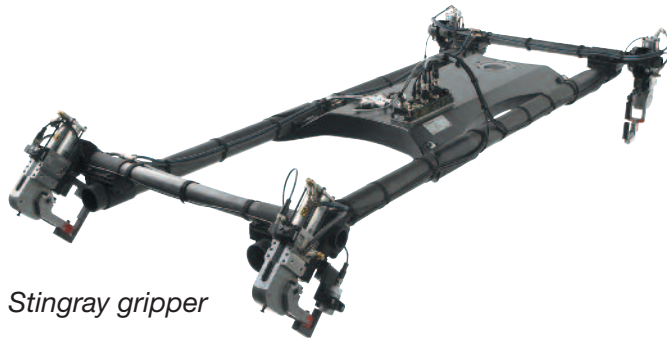
GKC 60-60
Weight: 750 g



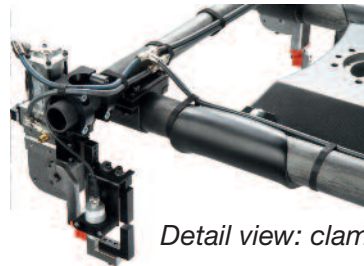
- + Rigidity – optimised design
- + Installation space – low interference contour
- + Flexibility – integration into existing systems possible
- + Compatibility – transfer of the existing design

Stingray

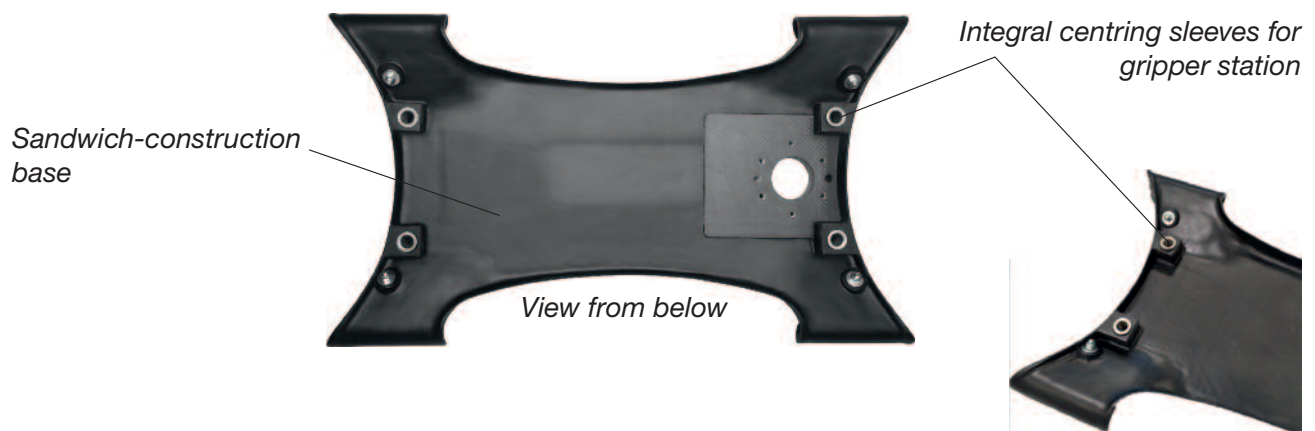
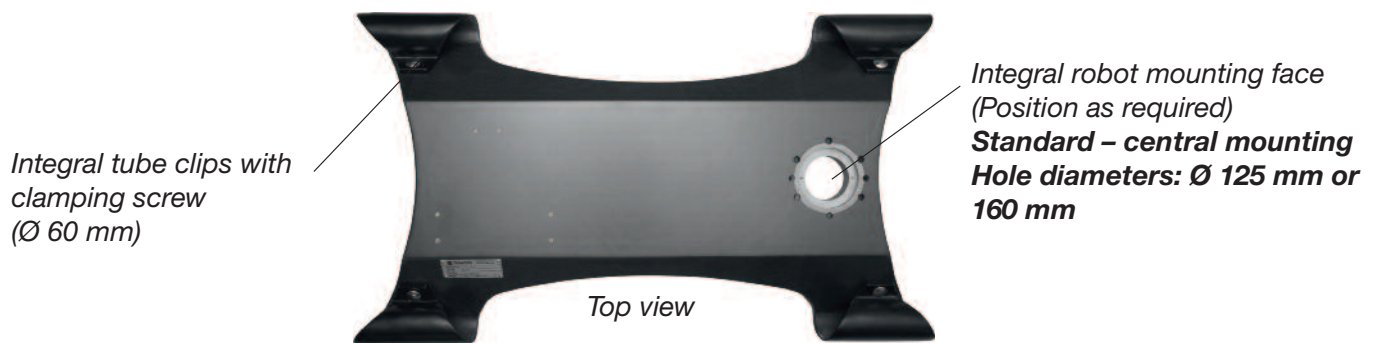
- Innovative gripper console
- Weight from 6 kg
- Integral tube clips, robot mounting face and centring sleeve for gripper station



Stingray gripper



Detail view: clamp connection



GRIPPING

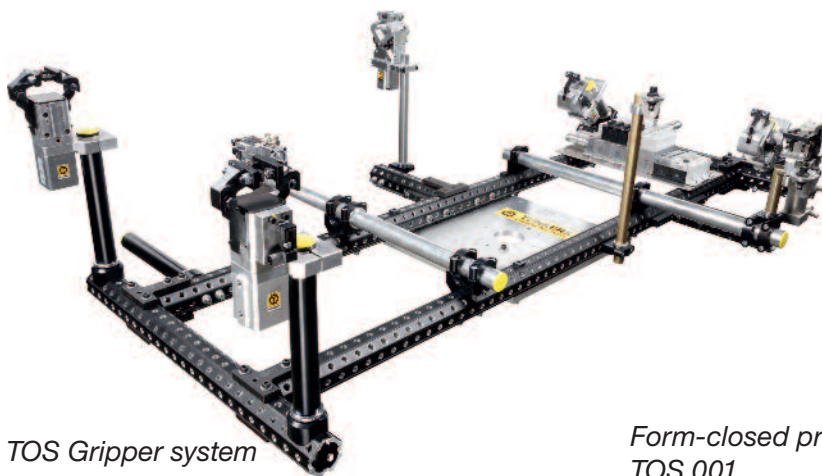
TÜNKERS One Screw System (TOS)



TÜNKERS®
Ingenuity in series.

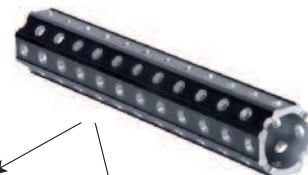
The TÜNKERS® One Screw System combines the advantages of form-closed situation in the main frame (Level 1) with that of force-closed in the gripper arms (Level 2). Due to the ability to attach the joints in the main frame with one screw on the octagonal main frame profile, in certain applications this results in an extremely rapid assembly time. In order to guarantee a predefined clamping situation, each threaded connection should incorporate a clearance sleeve. The joints are optimally positioned by means of alternating hole templates at a distance of 30 mm from each surface and 15 mm offset from the adjacent surface.

- Octagonal-section aluminum profile in Level 1 and round tube in Level 2
- One of the fastest systems in automation in terms of MTTR
- Variable threaded connection concept
- Slim design in Level 1
- Small number of components
- No special tools required for assembly, no blind rivet nuts



TOS Gripper system

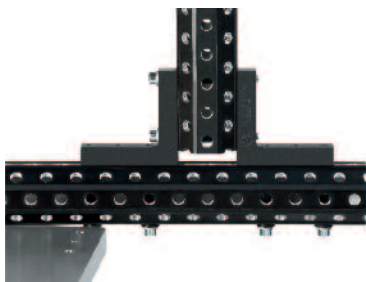
Form-closed profile
TOS 001
for main frame



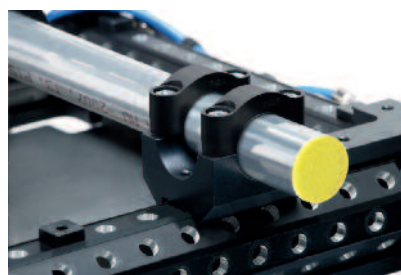
Force-closed
aluminum tubes GR 25/40 for
gripper arms



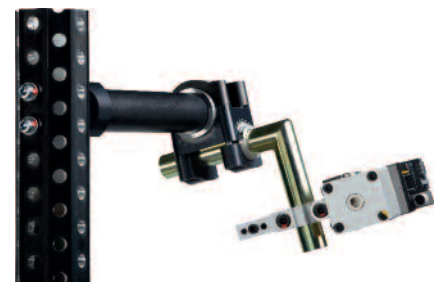
Optional: CFK tubes
GRC 25/40



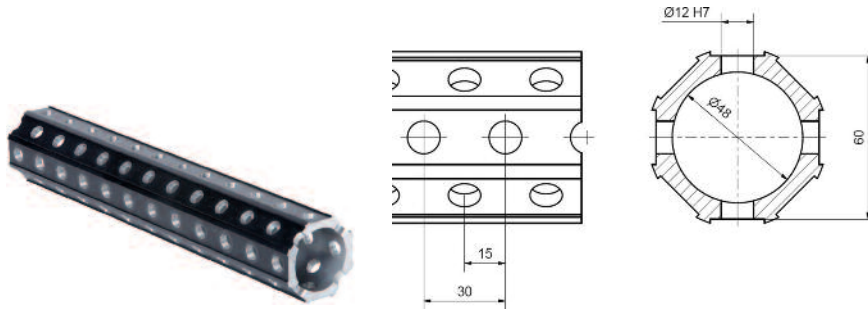
Detail view – Base frame
connector
TOS 023 / TOS 024



Detail view – Cross joint
TOS 040



Detail view – clamp connection



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x
TOS 001 - Octagonal profile	EN AW 6063 T66	2,8 kg/m	359886 mm ⁴	11990 mm ³

Ordering information: TOS001-...

Profile lengths in set 30 mm increments (maximum length 4078 mm)



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x
GR 40 - Circular-section tube	EN AW 2007	1,83 kg/m	95492 mm ⁴	4775 mm ³

Ordering information: GR40-...

Profile lengths in 10 mm increments (maximum length 6000 mm)



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x
GR 25 - Round bar	EN AW 2007	1,4 kg/m	19175 mm ⁴	1534 mm ³

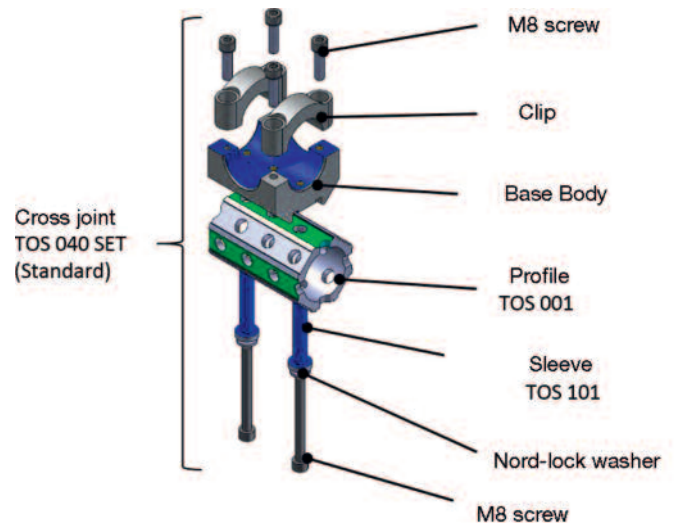
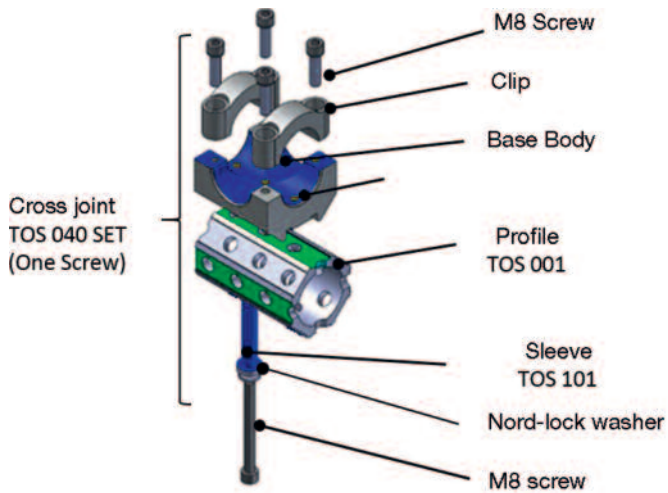
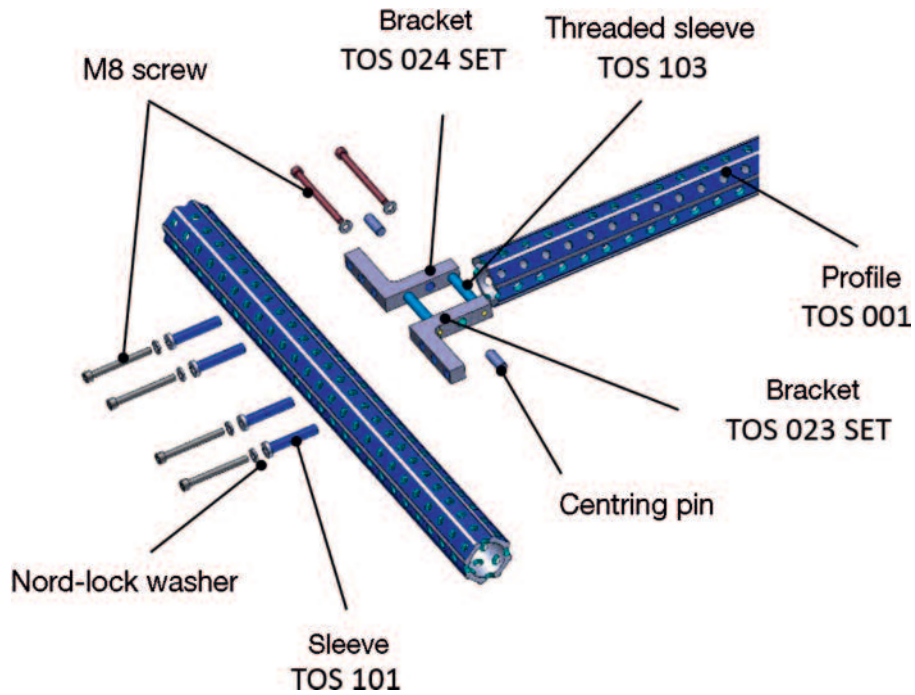
Ordering information: GR25-...

Profile lengths in 10 mm increments (maximum length 3000 mm)

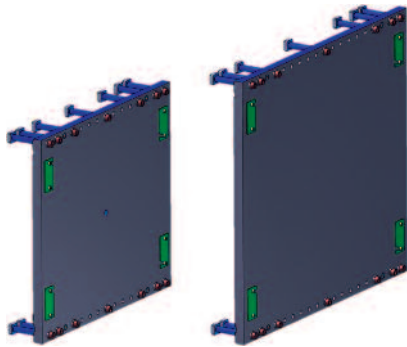
Please Note:

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System configuration – base frame and cross joints

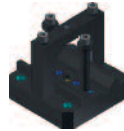


Components of the base frame (Level 1):



Base plate
TOS 010

Base plate
TOS 011



Flange
connection SW60
TOS 015 SET



Basic profile
TOS 001



TOS 023 SET
TOS 024 SET



T-connector
TOS 021 SET



Cross joint 40
TOS 040 SET



Joint 40 LW
TOS 041 SET



Cross joint 25
TOS 044 SET



Joint 25 LW
TOS 045 SET



Extension arm 40
TOS 043 SET

GRIPPING

Joints for gripper arms (Level 2):



GSKN Cross joint



GSKN Series

Typical adapter / clamping unit connections



GNAK A10



GNAK A00



GNXK



GNAK 40-A-1

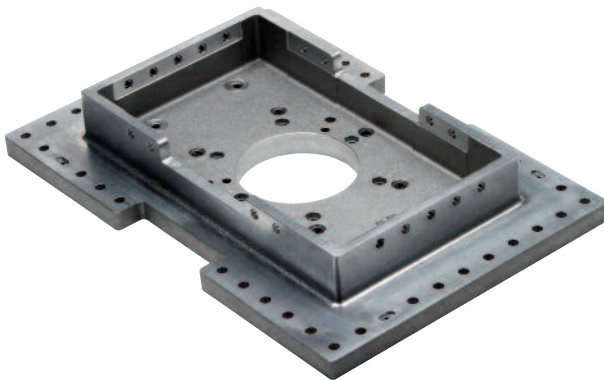
GRIPPING

Euro-Gripper-Tooling System (EGT)

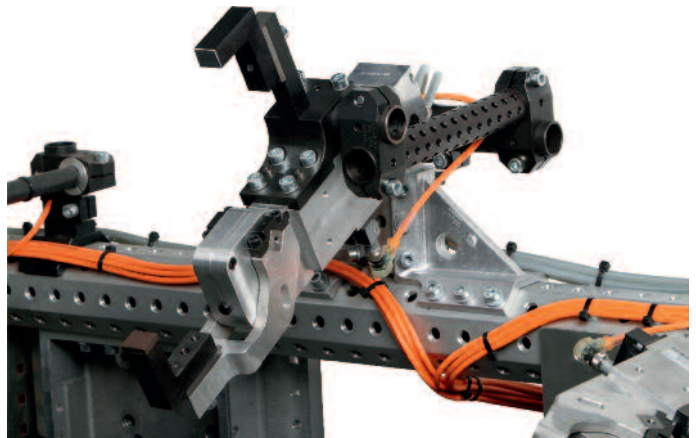


The Euro-Gripper-Tooling System (EGT) was developed by the Euro-Gripper Working Group (current members: Audi, BMW, Daimler, Porsche and Volkswagen) and is now exclusively intended for use in the factories of these OEMs. The concept is based on an octagonal profile which, with connectors, adapters and tubes, facilitates the modular attachment of clamping or centring units for fixture building grippers. Apart from a few shared standard components, the specific versions vary from OEM to OEM. Consequently, there is a basic catalogue which varies according to the OEM.

- TÜNKERS is a licensed supplier of EGT components to German car manufacturers and the manufacturer of complete EGT gripper systems
- They are based on SW 80/50 octagonal aluminum profiles with hole patterns
- Connections are attached by means of blind rivet nuts and screws to the profiles
- Reproducibility in the event of a crash provided by holes



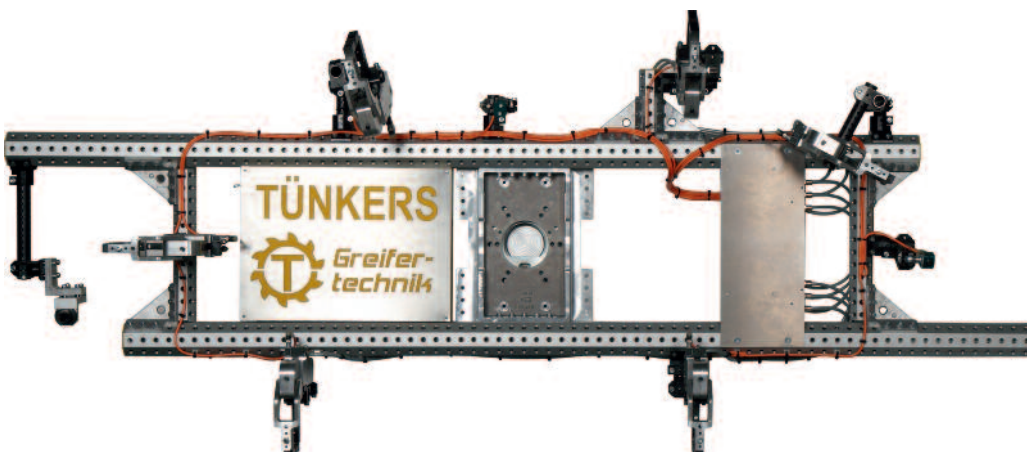
Base plate

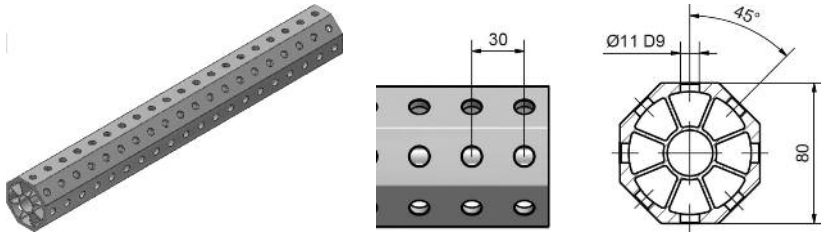


Clamp connection



Profile of the Euro-Gripper system

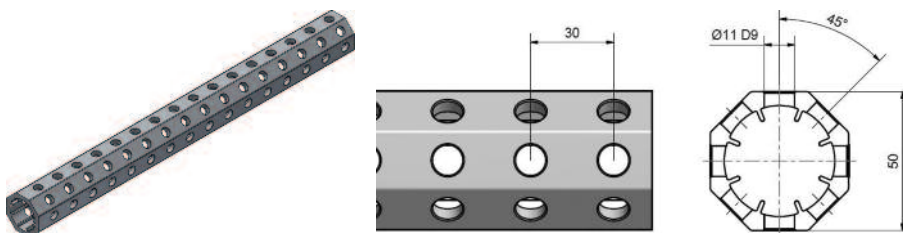




Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x
EGT 001 - Octagonal profile	EN AW 6063 T66	4,89 kg/m	874065 mm ⁴	21851 mm ³

Ordering information: EGT 001 SW80X...

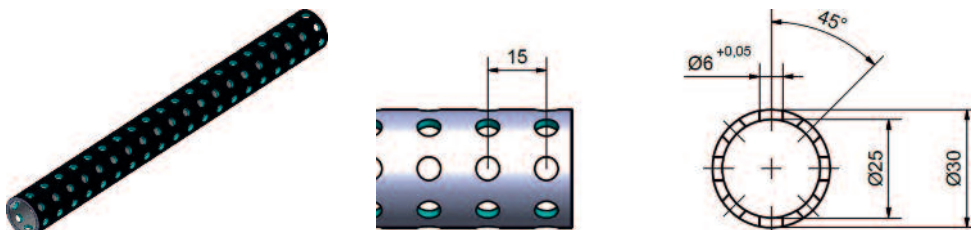
Profile lengths in preset 30 mm increments (maximum length 4078 mm)



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x
EGT 002 - Octagonal profile	EN AW 6063 T66	2,05 kg/m	96624 mm ⁴	3864 mm ³

Ordering information: EGT 002 SW50X...

Profile lengths in preset 30 mm increments (maximum length 4078 mm)



Type	Material	Weight	Geometrical moment of inertia I _x	Section modulus W _x
EGT 006 - Precision steel tube	E355-N	1,45 kg/m	9119 mm ⁴	2745 mm ³

Ordering information: EGT 006 Version M D30X2,5X...

Profile lengths in preset 15 mm increments

Version M: 73 mm to 448 mm

Version S: 86 mm to 446 mm

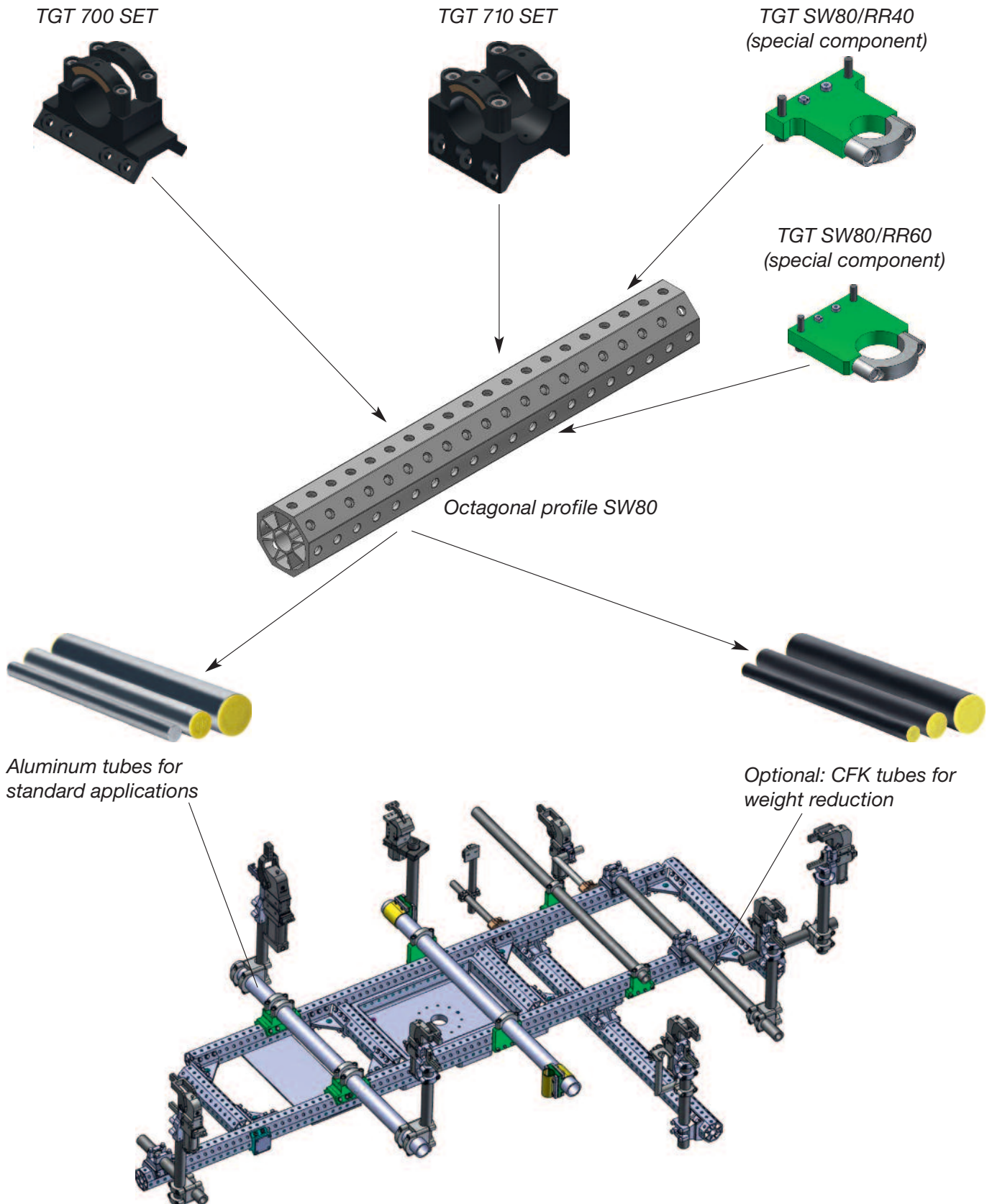
(maximum length 1000 mm)

Please Note:

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Components as practical extensions to the EGT System

- TGT joints for attaching the TÜNKERS® Round Tube System (TRR) to the EGT SW80 octagonal profile
- Use of the entire TÜNKERS® Round Tube System (TRR) for the gripper arms
- Weight reduction by using the TÜNKERS® Carbon Fibre Tube System (TCR)



Components as practical extensions to the EGT System

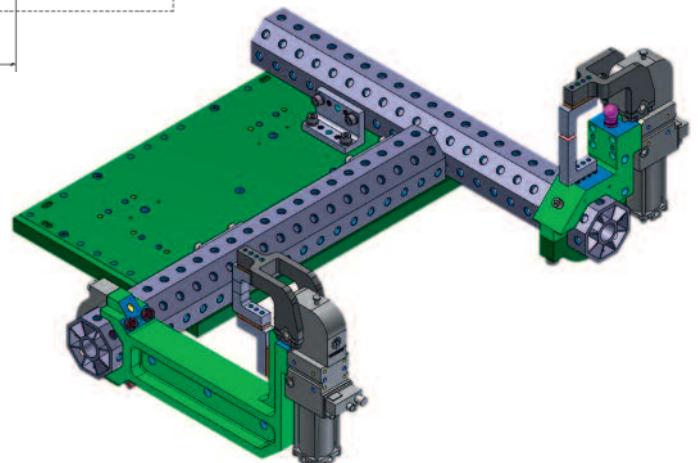
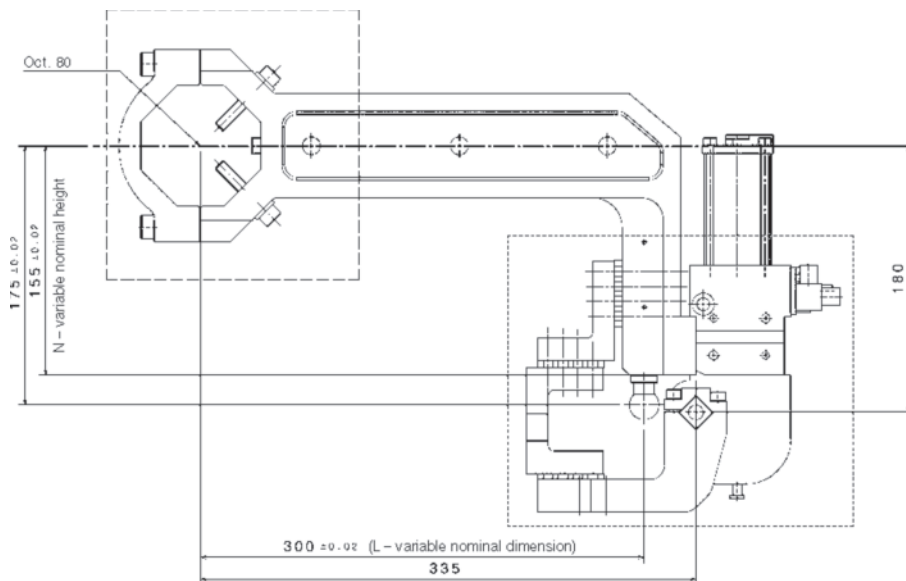
- High-precision GEO blades (TGT 650) for the Euro-Gripper-Tooling System
- Application for GEO Grippers for direct attachment of clamping units to the base frame
- Variable lengths in the x- and y-directions
- Manufactured out of high-strength aluminum
- Maximum repetitive accuracy when replacing the GEO blade with a centring pin
- Optional: clip can be mounted on the reverse side in the case of high loadings



TGT 650 – GEO blade (300 mm x 155 mm)



Detail view – Attachment using a centring pin



Typical configuration – GEO blade integration



TÜNKERS Machine Tools for Gripping, Clamping and Positioning

- Lightweight pneumatic clamps for use with gripper systems
 - Reduction of the weight of the gripper
 - Lower category of robot
 - Reduction of vibrations on the gripper
 - Improve cycle times

Typical grippers



GN 40 · 2,38 kg



APG 40.1 BR2 A10 · 1,6 kg



GN 40 AS · 2,36 kg



APG 40.1 BR2 AS · 2 kg

Typical pneumatic clamps



V 40 LW · 1,7 kg



APH 40.5 H · 2,4 kg

Typical retractable pin units



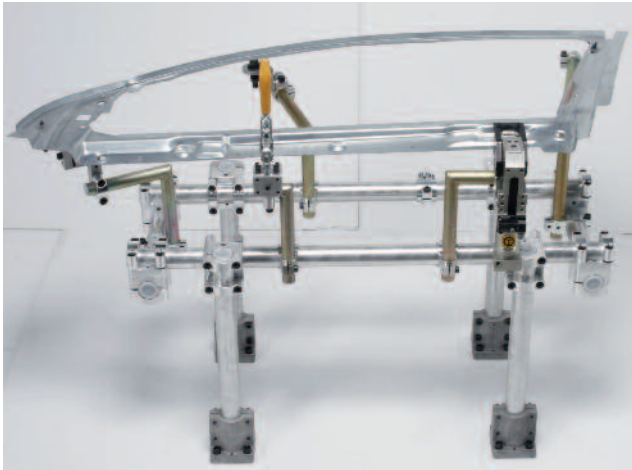
SZK 25 · 0,4 kg



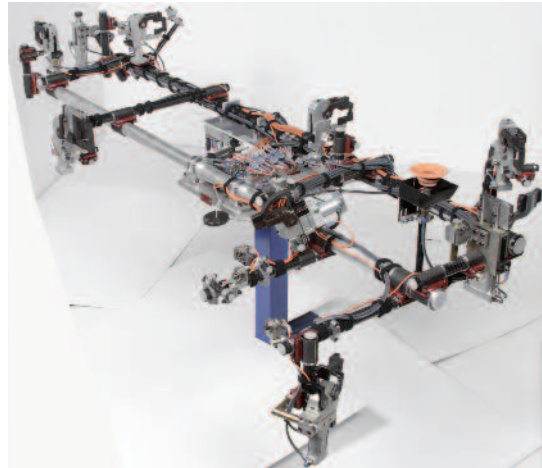
SZKT 40 · 1,7 kg



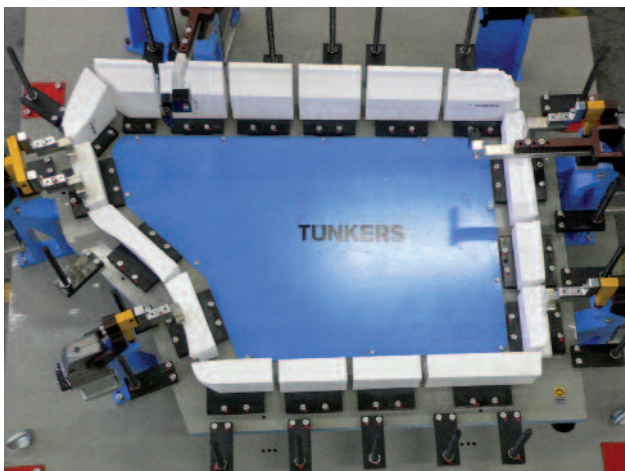
SZK 30.8 · 1,3 kg



Fixture structure made from the Round Tube System (TRR)



Hybrid Gripper (carbon fibre/aluminum)



Clamping fixture to client's specification

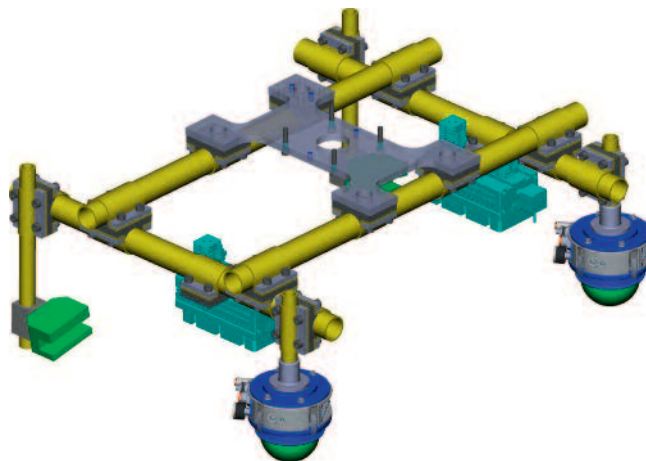


Manipulator gripper made from the Round Tube System (TRR)

Design training for our modular gripper systems



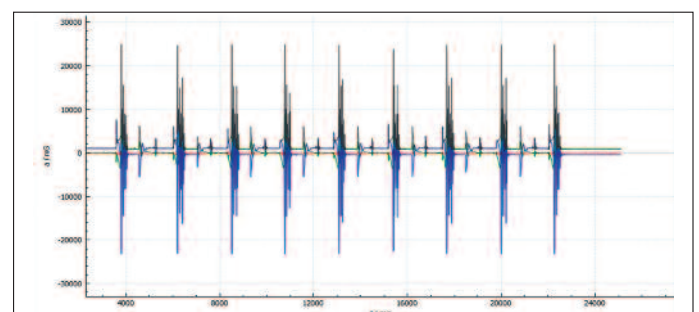
Development of gripper concepts



Measurement of vibrations on gripper systems while in operation



TREC accelerometer



Acceleration diagram