

# BÖLLHOFF

## SNAPLOC®

Vibration and noise decoupling plug-in connections



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**SNAPLOC®** The system



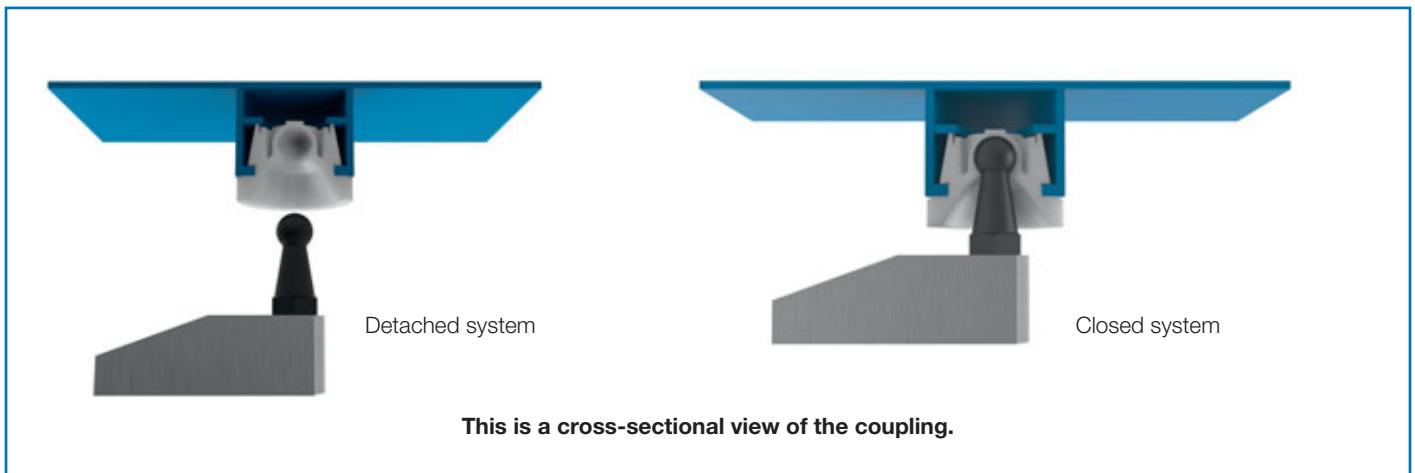
SNAPLOC® is a two-piece system consisting of ball stud and coupling. Joining occurs easily by plugging in and disassembly by pulling apart. Since no additional tool is needed, the assembly time is reduced significantly.

**The function**

SNAPLOC® is based on the simple principle of a snap connection. The coupling is installed in the designated mounting geometry on the component to be mounted, thus creating a positive connection. Inside the coupling there is a ball socket which the ball stud as the counterpart can snap into. The ball stud is installed on the mating component.

What is special about SNAPLOC®: the joint ensures tolerance compensation as well as vibration and noise decoupling.

<https://www.boellhoff.com/video/snaploc>



**Your benefits**

**Fast and easy assembly**

- Easy plug-on to assemble
- Unplug to disassemble

**Cost saving**

- Small number of parts
- Reduction of assembly time

**Decoupling fastening**

- Decoupling of vibration and noises
- Tolerance compensation in the centre distances

**Easy integration**

- Many variants thanks to diverse fastening options
- Design benefit: integration of the parts in the component

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## Ball studs

SNAPLOC® ball studs are available in six basic designs. They may be distinguished in the form of their fastening:

- Ball studs with external thread
- Ball studs with internal thread
- Ball studs with K' in K' (plastic in plastic) thread
- Ball studs in clip form
- Ball studs for injection moulding
- Ball studs for insertion

## Ball studs in metal/plastic combination

### SNAPLOC® ball studs with external thread

The ball studs with metallic external threads are available in different thread forms. These include for example metric threads, American/British threads, self-tapping threads etc., according to the corresponding standards or special variants.

Please find detailed information on page 14 and 15.



### SNAPLOC® ball studs with internal thread

The ball studs with metallic internal threads are also available in different thread forms. By way of example, metric threads, American/British threads, self-tapping threads etc. according to the corresponding standards or special variants can be mentioned.

Please find the dimensions on page 16 and 17.

If you are interested in other thread forms, please contact us.



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## Ball studs in solid plastic

### SNAPLOC® K' in K' ball studs for direct screwing

These SNAPLOC® K' in K' ball studs can be screwed directly into plastic components – K' in K' = German for: plastics in plastics (Kunststoff in Kunststoff).

Our developed and patented K' in K' thread forms or cuts a holding thread into a cylindrical drill-hole. Due to the special thread form of the K' in K' thread, the screw is locked against loosening.

In combination with the receiving component, a self-locking device is realised. The specialty: To unscrew the thread, a higher torque is necessary than during installation.



### SNAPLOC® ball studs in clip form

Due to the special geometry of the parts, these ball studs may be fastened by simply being clipped in an opening. A fastening solution which is highly suitable for applications in which a thread or bolt cannot be inserted into the part.

### SNAPLOC® ball studs for insertion

Compared to clipping, this version is inserted sideways by an open geometry into the component.

### SNAPLOC® ball studs for injection moulding

In order to produce economically, we offer especially for low-strength materials ball studs suitable for the insertion into injection moulding tools and for the process of in-moulding.

For a secure system function, the adjustment between ball stud and coupling is decisive. Hereby, the quality is assured.



Four product variations are currently available which are defined by the characteristic of the ball head diameter.

The available ball head diameters are 7, 8, 10 and 15 mm.

The following parameters are variable – shaft length, thread diameter and thread length, material, colour, material of the blank and various drives. Two drives may also be realised per ball stud.

The ball studs may be combined, in all ways, with the coupling designs within one ball diameter.

### SNAPLOC® ball studs material

The ball studs are produced of high quality plastics, such as PA6, PA66 and PPA with 30 and 50 % glass fiber.

The forces to be transmitted in the connection are restricted by the couplings. Furthermore, a ball stud made of plastics offers the advantages of thermal and electrical insulation.

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## Coupling

SNAPLOC® couplings are available in three basic designs. They vary in the type of fastening:

- Couplings for mounting dome with collar
- Couplings for mounting dome without collar
- Couplings for plate fastening

Four product variants are currently available which are defined through the characteristic main feature of the ball stud: the ball head diameters in 7, 8, 10 and 15 mm.

The following parameters are variable – external diameter, collar, collar depth, material, colour and their special designs.

The couplings may be combined, in all ways, with the ball stud designs within one ball diameter.



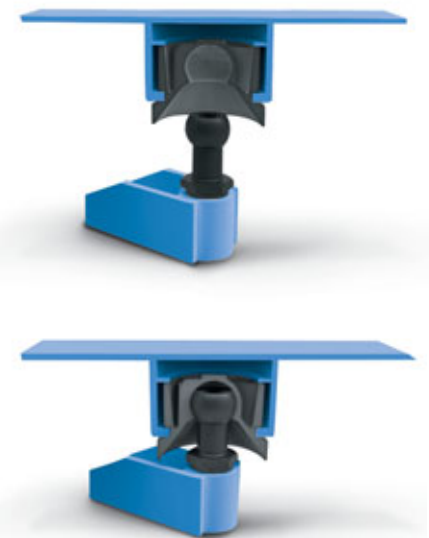
### SNAPLOC® couplings for mounting dome

The couplings for mounting domes are designed so that they can be inserted automatically or manually into the corresponding locating holes, without requiring any additional tools. Thus, manual and automatic assembly is possible within a very short time.

The couplings are available with or without a collar.

Couplings with a collar are primarily designed for the fastening in mounting domes, but could be also fastened in plates. Due to the component geometry, an open bore is preferable.

Example: view of installation and assembled condition



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**SNAPLOC® couplings for plate fastenings**

Due to the geometry, these couplings may be mounted by simply being pushed into a specified bore or square opening.

The couplings can be assembled by pressing them easily into a mounting geometry. To simplify the assembly, we offer an installation tool.

Example: view of assembled condition



**SNAPLOC® angular coupling**

Partially, the insertion direction of the connection and the fastening level are not arranged to each other in a right angle.

Especially for the complex shaped parts with the free formed surfaces, it is not easy to generate these surfaces.

To compensate angular differences, we offer the angular couplings.

These couplings are mounted as well as those for plate fastening into the sheet and compensate additionally the angular difference.

Thus, an assembly in insertion direction is again possible.

Available on request.



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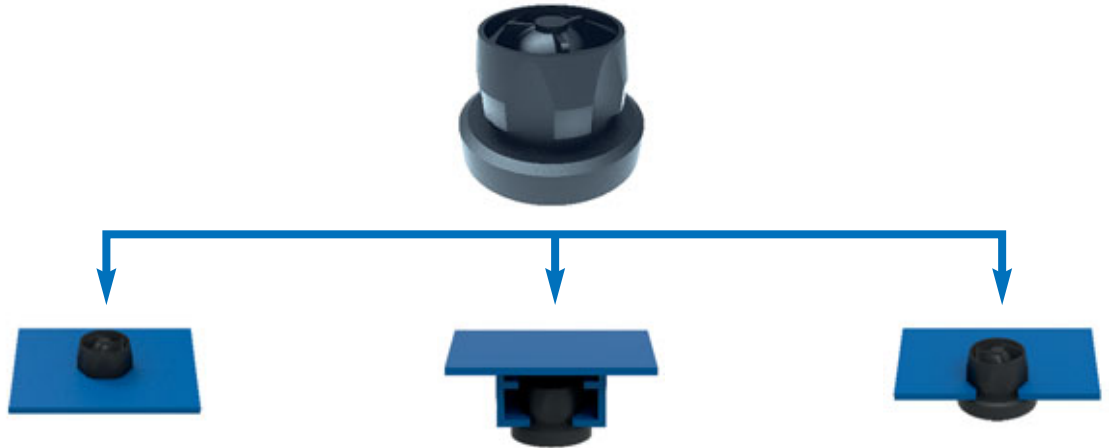
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**NEW**

## SNAPLOC® couplings with multi-retainer

Advantage of the universal mounting geometry: simply being pushed in axial direction or inserted from side into the mounting. Due to the new special part geometry of the couplings, new standards are set regarding the ease of assembly.

The benefit is the possible fastening in mounting domes (side insertion) as well as in plate fastenings (easy push-in).



## SNAPLOC® silicone couplings

Silicone couplings (VMQ) are used for applications with special requirements on temperature resistance. By the use of solid silicone, higher continuous operating temperatures (up to 180 °C) can be achieved compared to couplings made of thermoplastic elastomer or EPDM. Moreover, solid silicone couplings show constant material characteristic on the temperature range (see page 10).



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## Couplings – material choice

Depending on the thermal and mechanical requirements, as well as fluid resistance, crosslinked elastomers/rubber or thermoplastic elastomers are used in injection moulding.

### EPDM-X+PP or TPE-E

#### Thermoplastic processed elastomer

- Very good compression set
- Good resistance to chemicals
- Good resistance to mineral oils and greases

### VMQ / LSR

#### Silicon on solid or liquid base

- Excellent compression behaviour
- High temperature resistance
- Low influence of temperature changes on mechanical characteristics

### EPDM peroxide

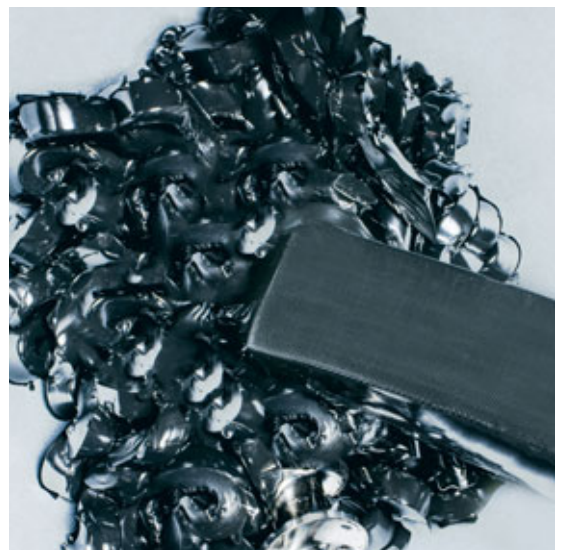
#### Elastomer processed by vulcanising

- Very good compression set
- Good resistance to chemicals
- Good resistance to mineral oils and greases
- High temperature resistance

## Comparison of TPE class properties

Properties	Cross-linked elastomers/rubber		Thermoplastic elastomers
	EPDM peroxide	VMQ	EPDM-X+PP
Hardness (shore)	30A - 90A	30A - 80A	35A - 50D
Temperature resistance °C	-40 to 140	-45 to 180	-40 to 100
Temperature behaviour	+	++	0
Abrasion	+/0	-	-
Compression set (at room temperature)	++	++	+
Oil resistance	-	0	-
Acid resistance	++	-	++
Alkali resistance	++	++	++
Ozone and weathering resistance	++	++	++

++ very good  
 + good  
 0 average  
 - poor



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## Shore hardnesses

The Shore hardness defines the material hardness of elastomers and rubber elastic polymers.

Depending on the requirements for thermal and mechanical properties as well as media resistance, cross-linked elastomers/rubber or thermoplastic elastomers are used for injection moulding of SNAPLOC® couplings.

**Our range comprises the most different hardnesses for Shores A and D (blue marking).**

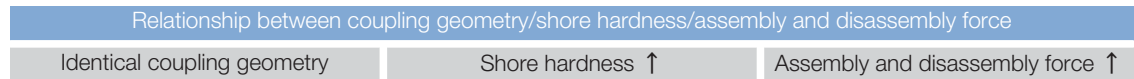
Hardness indicators	Very soft	Soft	Medium soft	Medium hard	Hard	Very hard
Shore OO	20 30 35 40 50 55 60	70	80	90	95 98	
Shore A		10 20 30	40 <b>50</b>	<b>60 70 80</b>	<b>90</b> 95 100	
Shore D					22 25	<b>35 45</b> 55 65 75

Usually, Shore hardnesses ranging between 50 and 80 Shore A are recommended for SNAPLOC® couplings, depending on the application. Within this range, the ideal functional properties of our SNAPLOC® fasteners are achieved.

**The table below provides an overview of the Shore hardnesses which can be realised for the available materials:**

Properties	Cross-linked elastomers/rubber		Thermoplastic elastomer
	Peroxide-cured EPDM	VMQ + LSR	EPDM-X + PP
Hardness (Shore)	30A – 90A	30A – 80A	35A – 50D

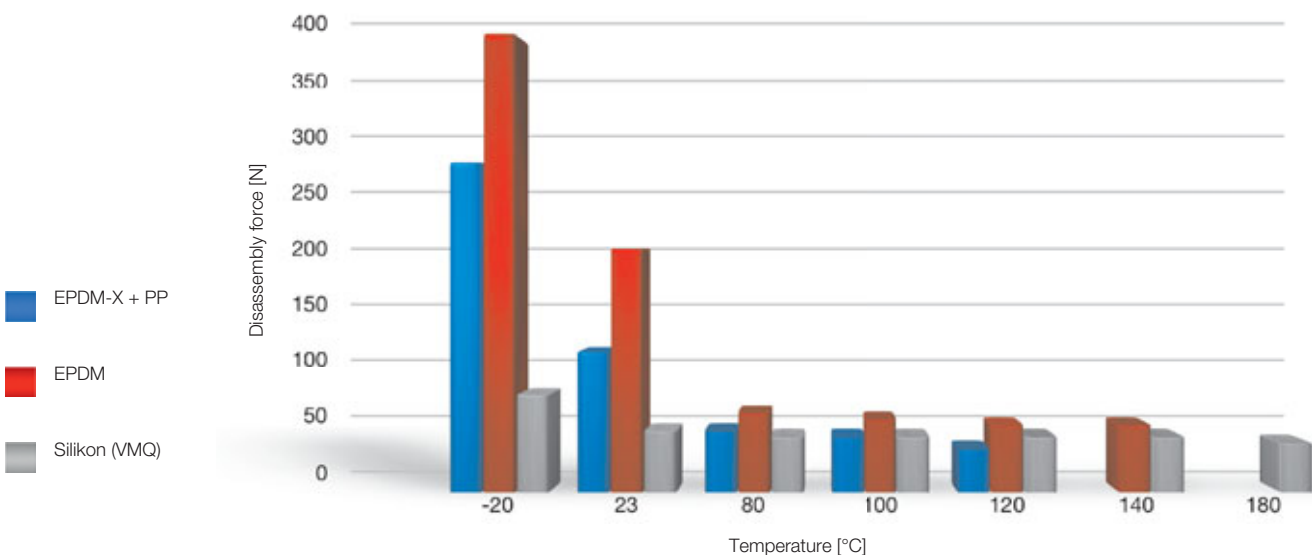
Please note that, with increasing Shore hardness, identical coupling geometries require higher assembly and disassembly forces.



## Thermal behaviour of the SNAPLOC® couplings

In general, there is a strong interdependence between the temperature and the forces to transmit. Overall, the used materials have a diverging thermal behaviour (see figure).

EPDM-X+PP and peroxide-cured EPDM show a changed disassembly force for different temperatures. The silicone materials, however, show a rather constant thermal behaviour.



Comparison of thermal behaviour for SNAPLOC® couplings using the example of a 10-mm ball diameter

**SNAPLOC®** Installation tool for plate fastening

During the pushing of a SNAPLOC® coupling into a drill-hole, the coupling is compressed. Therefore, the assembly can be varied at different Shore hardnesses or geometries.

By using an installation tool, the coupling is stretched during the assembly, so that it is tapered in the outer diameter. This aids the assembly.



Pos.	Part number	Description
1	4099 999 9999	Handle
2	4099 999 9998	Large nozzle (standard)
7	4099 999 9997	Small nozzle for limited space
3	4099 999 9996	Shaft d = 15 mm
4	4099 999 9995	Shaft d = 10 mm
5	4099 999 9994	Shaft d = 8 mm
6	4099 999 9993	Shaft d = 7 mm

A complete installation tool consists of a handle, a nozzle and a shaft according to the required SNAPLOC® ball diameter.

**Diverse industries:**

**Plant engineering**

- Extraction channel at calender plant

**Store construction**

- Bar lighting

**Filter technique**

- Fastening filter frame

**Medical technology**

- Dialysis machine

**Consumer electronics**

- Decoration strip fastening for television sets
- Speaker fastening

**Mechanical engineering**

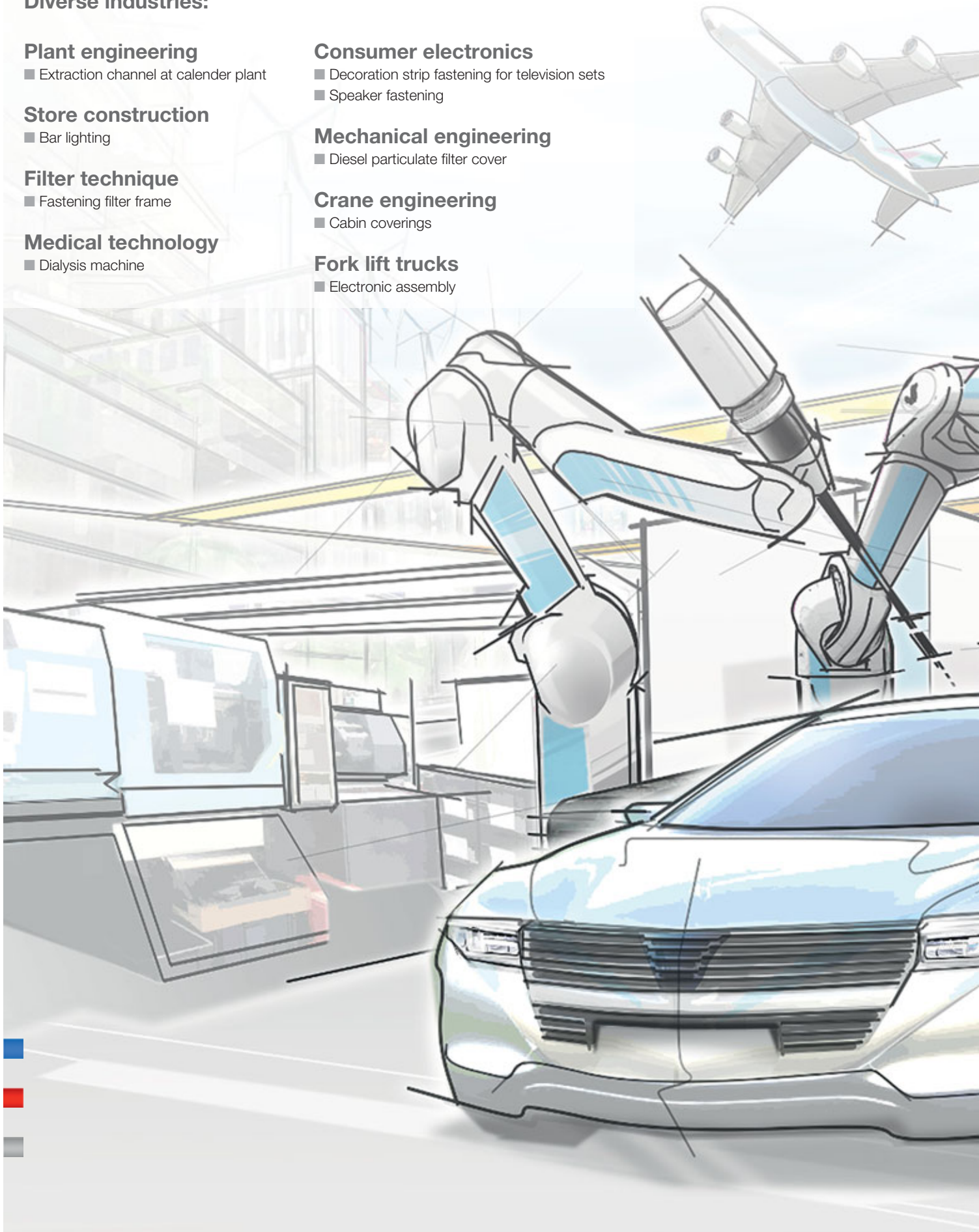
- Diesel particulate filter cover

**Crane engineering**

- Cabin coverings

**Fork lift trucks**

- Electronic assembly



**Automotive:****Engine and aggregates**

- NVH design hoods
- Engine cover
- Air filter fastening to suction pipe
- Fastening valve cover
- Fastening induction manifold
- Fastening engine control unit

**Interior**

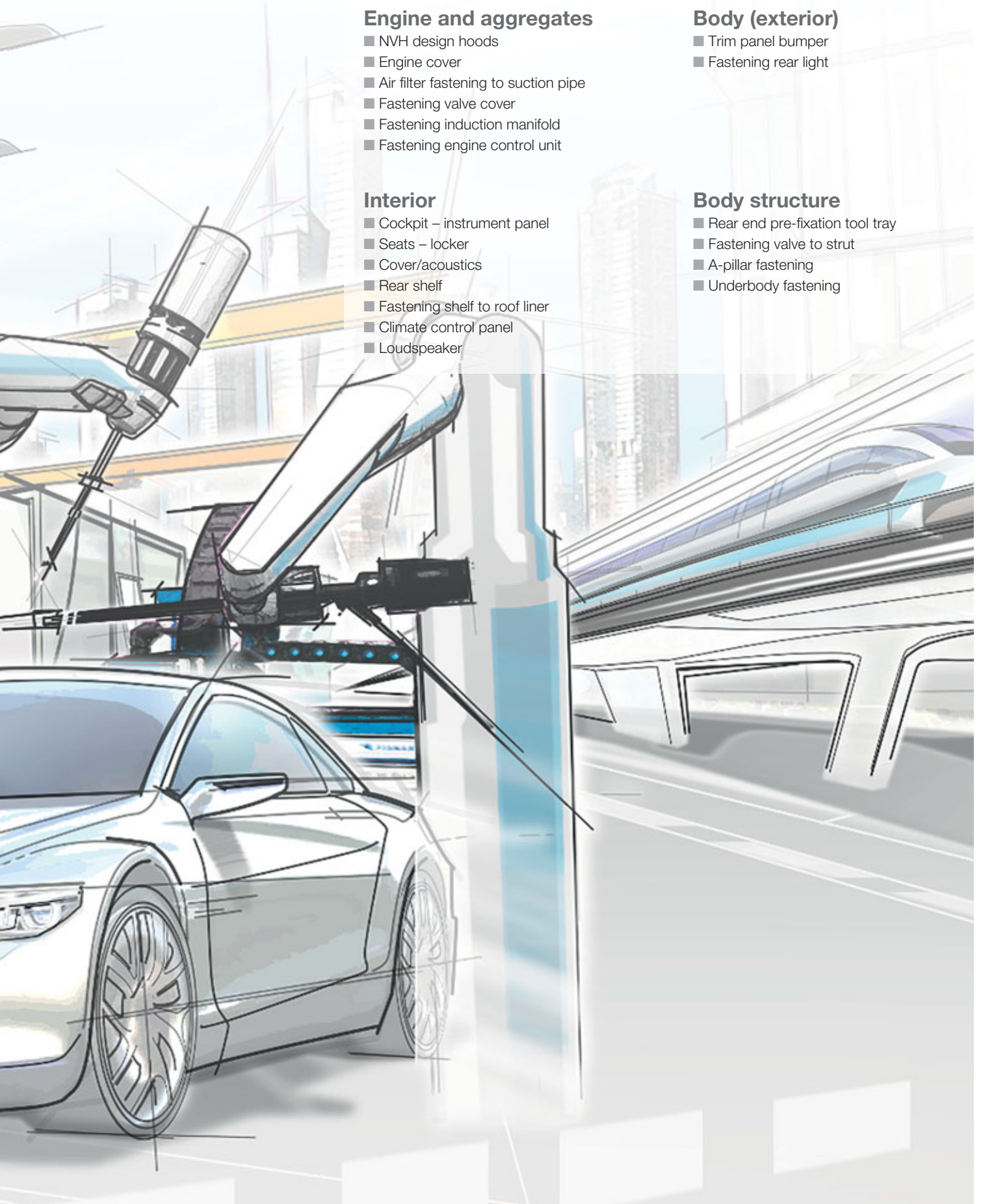
- Cockpit – instrument panel
- Seats – locker
- Cover/acoustics
- Rear shelf
- Fastening shelf to roof liner
- Climate control panel
- Loudspeaker

**Body (exterior)**

- Trim panel bumper
- Fastening rear light

**Body structure**

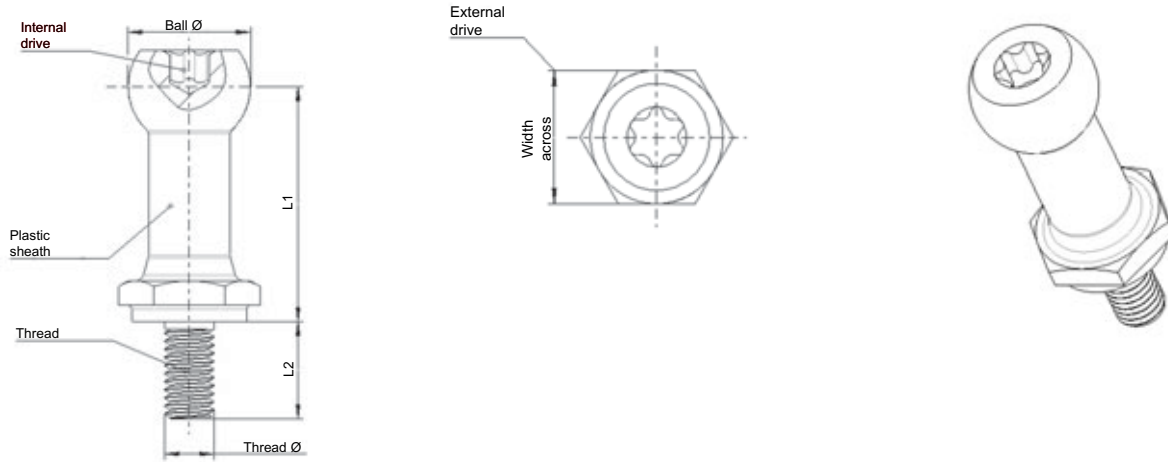
- Rear end pre-fixation tool tray
- Fastening valve to strut
- A-pillar fastening
- Underbody fastening



**Ball studs in metal/plastic combination**  
– with metrical external thread  
– with self-tapping external thread



Part number	Ball Ø in mm	Depth L1 (to ball center)	Type of thread	Thread dimensions	Thread length	Internal hex socket round ISO 10664
4039 015 0602	7	11.9	metrical	M 6	10	–
4030 007 0006	7	11.9	metrical	M 6	9	–
4039 007 0604	8	9.9	metrical	M 6	9	–
4039 008 0016	8	18	metrical	M 6	14	–
4039 008 0045	8	26.2	metrical	M 6	8	–
4039 008 0041	8	30.8	metrical	M 6	16	–
4039 008 0047	8	40	metrical	M 6	15	–
4031 100 3905	10	16	metrical	M 6	12	–
4039 007 0605	10	19.4	metrical	M 6	8	–
4039 006 0601	10	28	metrical	M 6	12	–
4039 010 0057	10	34	metrical	M 6	10	–
4030 010 0049	10	35.1	metrical	M 6	12	–
4039 017 0603	10	43.5	metrical	M 6	12	–
4039 001 0602	10	51	metrical	M 6	8	–
4030 015 0007	15	12	metrical	M 6	8	40
4030 015 0005	15	21	metrical	M 6	12	40
4039 015 0018	15	24	metrical	M 6	12	–
4034 150 3901	15	29	metrical	M 6	12	40
4039 005 0605	15	32	metrical	M 6	12	40
4039 003 0604	15	61	metrical	M 6	12	–
4030 007 0027	7	11.9	self-tapping	6	13.7	–
4039 007 0032	7	22	self-tapping	ST 4.2	13	–
4030 080 3902	8	9.9	self-tapping	6	13.7	–
4039 008 0048	8	20	self-tapping	5	20	–
4030 010 0019	10	16	self-tapping	6	13.7	–
4030 010 0039	10	20.3	self-tapping	6	13.7	–
4032 150 3904	15	18	self-tapping	ST 6.3 DIN ISO 1478	30	40
4039 019 0601	15	61	self-tapping	6	13.7	–



External drive	Material	Property class	Thread surface	Colour bolt
WS 10	PPA-GF50	solid plastics	Zn/Ni	black
WS 10	PPA-GF50	4.8	Zn/Ni	black
WS 10	PPA-GF50	4.8	Zn/Ni	black
WS 13	PPA-GF50	8.8	Zn/Ni	black
WS 17	PPA-GF50	4.8	Zn/Ni	black
WS 13	PPA-GF50	8.8	Zn/Ni	black
WS 10	PA66-GF50	8.8	Zn/Ni	black
WS 13	PPA-GF50	8.8	Zn/Ni	black
WS 13	PPA-GF50	4.8	Zn/Ni	black
WS 13	PPA-GF50	8.8	Zn/Ni	black
WS 13	PPA-GF50	8.8	Zn/Ni	black
WS 12	PPA-GF50	8.8	Zn/Ni	black
WS 12	PPA-GF50	8.8	Zn/Ni	black
WS 13	PPA-GF50	8.8	Zn/Ni	black
WS 15	PPA-GF50	4.8	Zn/Ni	black
WS 15	PPA-GF50	4.8	Zn/Ni	black
-	PPA-GF50	4.8	Zn/Ni	grey
WS 15	PPA-GF50	4.8	Zn/Ni	black
WS 15	PPA-GF50	4.8	Zn/Ni	black
WS 15	PA66-GF30	8.8	Zn	black
WS 10	PPA-GF50	-	ZNS 3	black
-	PA66-GF30	-	ZNS 3	black
WS 10	PPA-GF50	-	Zn	black
WS 13	PPA-GF50	-	Zn/Ni	black
WS 13	PPA-GF50	-	ZNS 3	black
WS 13	PPA-GF50	-	Zn/Ni	black
WS 15	PPA-GF50	-	ZNS 3	black
WS 15	PA66-GF30	-	Zn/Ni	black

**Ball studs in metal/plastic combination  
– with internal thread**



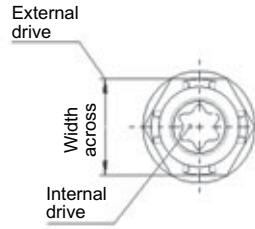
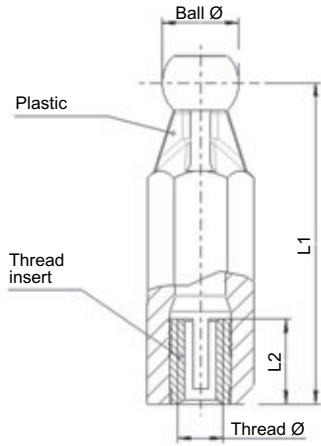
Part number	Ball Ø in mm	Depth L1 (to ball center)	Type of thread	Thread dimensions	Thread length	Internal hex socket round ISO 10664
4029 005 0601	8	18	metrical	M 6	10	–
4029 008 0002	8	25	metrical	M 6	17	–
4029 013 0504	10	37	metrical	M 5	10	–
4020 010 0009	10	42	metrical	M 6	10	–
4029 029 0601	10	54	metrical	M 6	11	–
4020 010 0006	10	62.6	metrical	M 6	10	–
4029 016 0604	10	78	metrical	M 6	11	–
4029 016 0605	10	113	metrical	M 6	11	–
4029 007 0601	15	12	metrical	M 6	8	–
4029 001 0601	15	97	metrical	M 6	11	40

**Adjustable solid plastic ball studs**

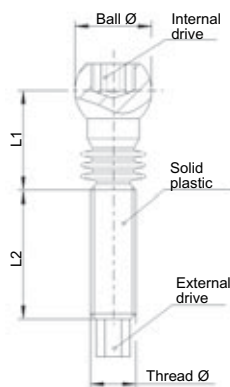


Part number	Ball Ø in mm	Depth L1 (to ball center)	Type of thread	Thread dimensions	Thread length	Internal hex socket round ISO 10664
4039 007 0601	10	12	metrical	M 6	21	25
4039 010 0031	10	13.1	metrical	M 6	14.4	30





External drive	Material	Property class	Thread surface
WS 13	PA6-GF50	plastics	black
WS 10	PA6-GF50	plastics	black
WS 12	PA66-GF30	CuZn38Pb2	black
WS 12	PA66-GF30	CuZn38Pb2	black
WS 13	PA66-GF30	CuZn38Pb2	natural-coloured
WS 12	PA66-GF50	CuZn38Pb2	black
WS 15	PPA-GF50	CuZn38Pb2	black
WS 15	PPA-GF50	CuZn38Pb2	natural-coloured
WS 15	PA66-GF30	plastics	black
-	PA66-GF30	CuZn38Pb2	black



External drive	Material	Property class	Thread surface	Colour bolt
-	PA66-GF30	solid plastics	Iges = 60	black
-	PA66/6GF30	solid plastics	Iges = 14.4	black

**Solid plastic ball studs  
– with K' in K' thread**



Part number	Ball Ø in mm	Depth L1 (to ball center)	Type of thread	Thread dimensions	Thread length	Internal hex socket round ISO 10664
4010 081 3612	8	9.9	K' in K'	Size 6	12	–
4019 008 0009	8	21	K' in K'	Size 8	12	–
4010 010 0004	10	16	K' in K'	Size 8	15	–
0419 008 0801	15	14.5	K' in K'	Size 8	15	Form Z size 4*
4012 150 3815	15	18	K' in K'	Size 8	15	Form Z size 4*

**Solid plastic-ball studs  
– in clip form**



Part number	Ball Ø in mm	Depth L1 (to ball center)	Type of thread	Thread dimensions	Thread length	Internal hex socket round ISO 10664
4009 018 1301	7	11	d = 10 mm	t = 2.3 ± 0.1 mm	–	–
4001 082 3084	8	10	8 x 10	t = 2 + 0.3 mm	–	–

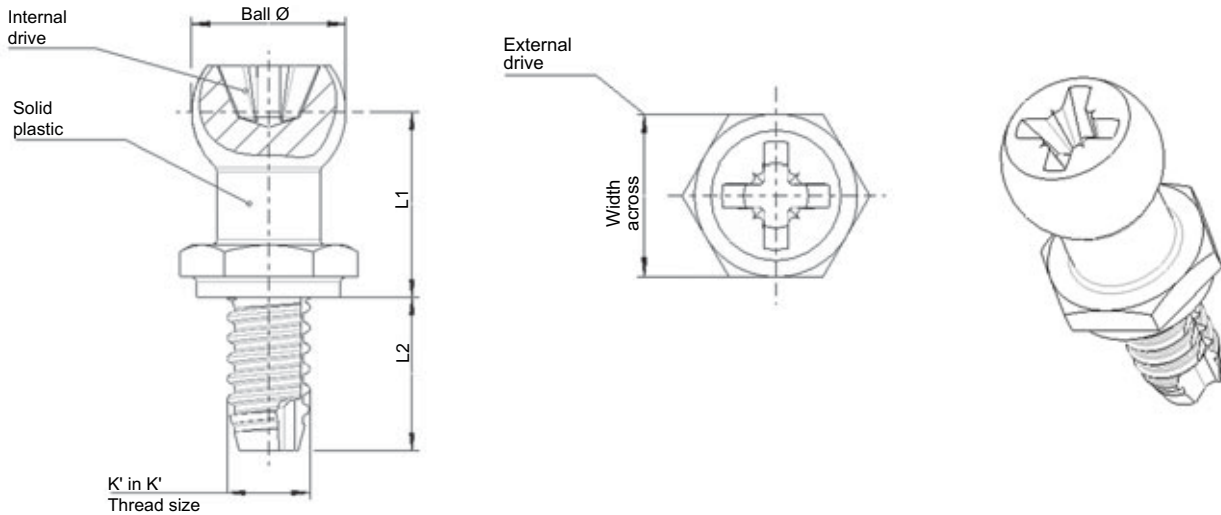
\* Here cross recess as internal drive

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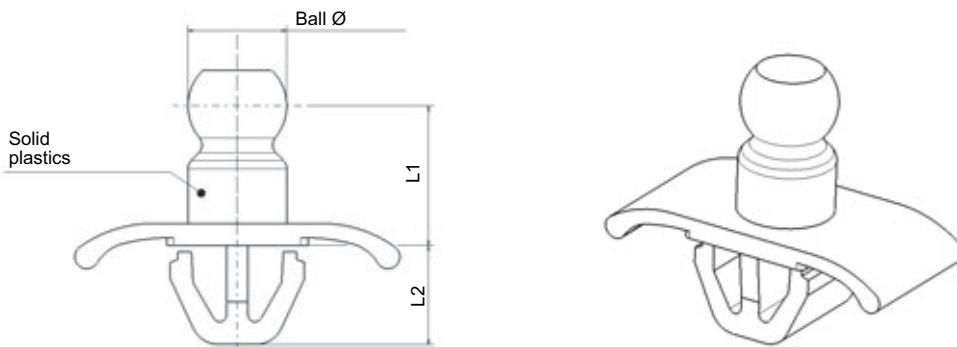
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External drive	Material	Property class	Thread surface
WS 8	PEI-GF30	solid plastics	black
WS 12	PPA-GF50	solid plastics	black
WS 13	PPA-GF50	solid plastics	black
WS 15	PPA-GF45	solid plastics	black
WS 15	PPA-GF50	solid plastics	black



External drive	Material	Property class	Thread surface
-	PA6-GF50	solid plastics	black
-	PA6-GF50	solid plastics	black

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**Solid plastic-ball studs  
– for injection moulding**



Part number	Ball Ø in mm	Depth L1 (to ball center)	Type of thread	Thread dimensions	Thread length	Internal hex socket round ISO 10664
0499 085 0003	7	7	–	plate d = 12	–	–

**Solid plastic-ball studs  
– for insertion**

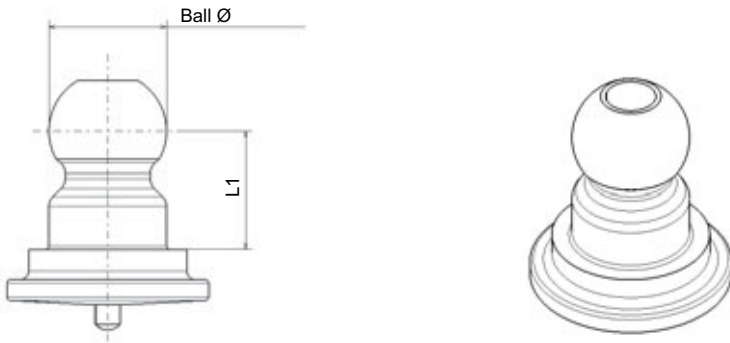
Part number	Ball Ø in mm	Depth L1 (to ball center)	Type of thread	Thread dimensions	Thread length	Internal hex socket round ISO 10664
4029 010 0001	7	10	–	b = 4	–	–

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External drive	Material	Thread surface
-	PA66-GF30	black

External drive	Material	Thread surface
-	PPA-GF50	black

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**Couplings with collar for mounting dome**



Part number	Design	Ball Ø D	Outer Ø d2	Mounting hole Ø d3	Collar Ø d4	Depth (to ball center L1)
4040 100 2324	collared	10	24	22	32	16
4040 100 3024	collared	10	24	22	32	16
4040 101 3024	collared	10	24	22	32	16
4040 010 0012	collared	10	26	22	32	16
4050 015 0040	collared	15	31.5	27	34	26
4040 150 3032	collared	15	32	28	36	19
4040 153 3032	collared	15	32	28	36	19

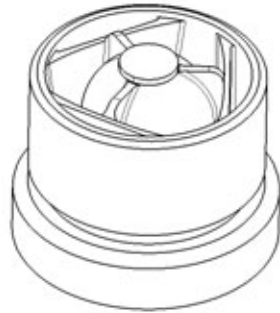
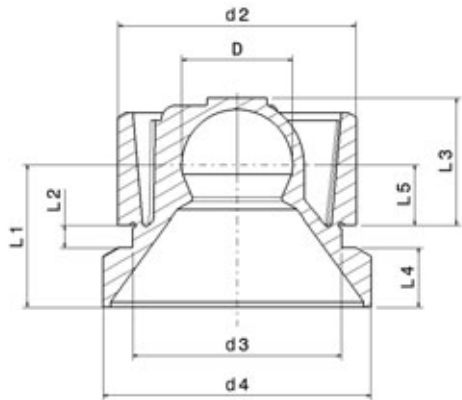
**Coupling with collar for mounting dome  
High temperature applications**

Part number	Design	Ball Ø D	Outer Ø d2	Mounting hole Ø d3	Collar Ø d4	Depth (to ball center L1)
4040 010 0030	collared	10	24	22	32	16

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Wall thickness L2	Mounted depth L3	Collar depth L4	Depth L5	Material	Shore hardness	Thread surface
3	12	7	6	EPDM-X+PP	59 Shore A	black
3	12	7	6	EPDM-X+PP	78 Shore A	black
3	12	7	6	EPDM-X+PP	86 Shore A	black
3	12	7	6	EPDM-X+PP	78 Shore A	black
3-3.5	approx. 17.7	3.5	8	EPDM-X+PP	86 Shore A	black
3	15	8	8	EPDM-X+PP	78 Shore A	black
3	15	8	8	EPDM-X+PP	93 Shore A	black

Wall thickness L2	Mounted depth L3	Collar depth L4	Depth L5	Material	Shore hardness	Thread surface
3	12	7	6	EPDM peroxide	70 Shore A	black

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**Couplings with collar for mounting dome**



Part number	Design	Ball Ø D	Outer Ø d2	Mounting hole Ø d3	Collar Ø d4	Depth (to ball center L1)
4041 080 3018	collarless	8	18	14	–	7.9
4041 100 3024	collarless	10	24	22	–	9
4041 101 3024	collarless	10	24	22	–	9
4041 152 3032	collarless	15	32	28	–	11
4041 150 3032	collarless	15	32	28	–	11

**Couplings without collar for mounting dome**  
**High temperature applications**

Part number	Design	Ball Ø D	Outer Ø d2	Mounting hole Ø d3	Collar Ø d4	Depth (to ball center L1)
4040 010 0031	collarless	10	24	22	–	9
4040 015 0010	collarless	15	40	36	–	21
4040 015 0032	collarless	15	32	28	–	10.3

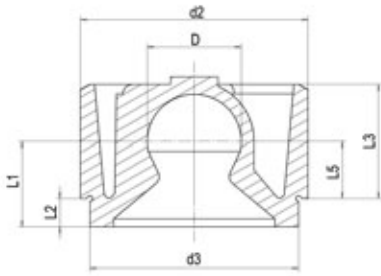
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Wall thickness L2	Mounted depth L3	Collar depth L4	Depth L5	Material	Shore hardness	Thread surface
3	10	–	4.9	EPDM-X+PP	78 Shore A	black
3	12	–	6	EPDM-X+PP	78 Shore A	black
3	12	–	6	EPDM-X+PP	86 Shore A	black
3	15	–	8	EPDM-X+PP	59 Shore A	black
3	15	–	8	EPDM-X+PP	78 Shore A	black

Wall thickness L2	Mounted depth L3	Collar depth L4	Depth L5	Material	Shore hardness	Thread surface
3	12	–	6	EPDM peroxide	70 Shore A	black
3	18	–	16	EPDM peroxide	70 Shore A	black
3	15	–	7.3	VMQ	60 Shore A	grey

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**Couplings with multi-retainer**



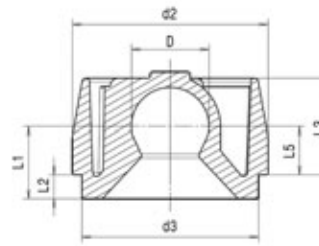
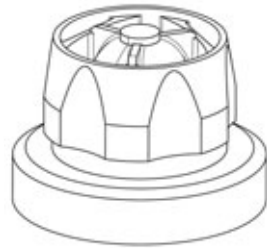
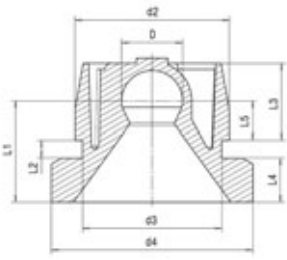
Part number	Design	Ball Ø D	Outer Ø d2	Mounting hole Ø d3	Collar Ø d4	Depth (to ball center L1)
4049 010 0034	collarless	10	24.5	22.1	–	9
4049 010 0035	collarless	10	24.5	22.1	–	9
4049 010 0036	collared	10	24.5	22.1	32	16
4049 010 0037	collared	10	24.5	22.1	32	16

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Wall thickness L2	Mounted depth L3	Collar depth L4	Depth L5	Material	Shore hardness	Thread surface
2 – 3	12	–	6	EPDM peroxide	70 Shore A	black
2 – 3	12	–	6	VMQ	70 Shore A	black
3	12.15	6.85	6.15	EPDM peroxide	70 Shore A	black
3	12.15	6.85	6.15	VMQ	70 Shore A	black

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**Couplings for plate fastening**



Part number	Design	Ball Ø D	Outer Ø d2	Mounting hole Ø d3	Collar Ø d4	Depth (to ball center L1)
4070 070 4312	plate fastening	7	17	14	20	6.7
4070 070 3012	plate fastening	7	17	14	20	6.7
4070 070 1312	plate fastening	7	17	14	20	6.7
0499 085 0006	plate fastening	7	11	10	14	7
0499 085 0001	plate fastening	7	11	10	14	7
4062 070 0310	plate fastening	7	11	10	14	8.2
4050 007 0027	plate fastening	7	11	10	14	8.5
4050 007 0026	plate fastening	7	11	10	14	8.2
4060 070 4310	plate fastening	7	11.5	10	14	8.7
4050 007 0038	plate fastening	7	11	10	14	6.2
4059 011 0801	plate fastening	8	22	18	25	10.9
4050 080 3018	plate fastening	8	22	18	25	7.9
4050 010 0069	plate fastening	10	21.5	18	25	10.9
4059 010 0029	plate fastening	10	21.5	18	25	10.9
4050 010 0070	plate fastening	10	21.5	16 – 18.5	25	10.9
4050 010 0008	plate fastening	10	25.5	22	32	16
4050 015 0009	plate fastening	15	31.5	27	34	16
4250 015 0001	plate fastening	15	37	33	38	13.5

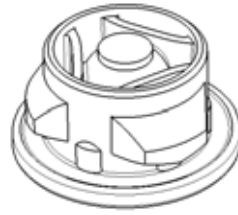
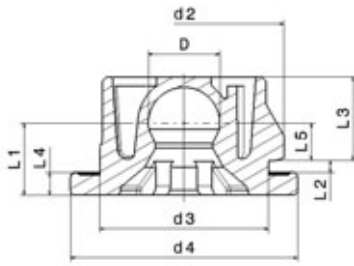
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Wall thickness L2	Mounted depth L3	Collar depth L4	Depth L5	Material	Shore hardness	Thread surface
0.8 – 2	–	2.2	4.5 – L2	EPDM-X+PP	69 Shore A	black
0.8 – 2	–	2.2	4.5 – L2	EPDM-X+PP	78 Shore A	black
0.8 – 2	–	2.2	4.5 – L2	EPDM-X+PP	86 Shore A	black
0.9	–	2	4.1	EPDM-X+PP	78 Shore A	black
0.9	–	2	4.1	EPDM-X+PP	93 Shore A	black
1.5	–	2	4.7	EPDM-X+PP	78 Shore A	black
1.5	–	2.6	4.6	EPDM-X+PP	86 Shore A	black
2	–	2	4.2	EPDM-X+PP	38 Shore A	black
2	–	2.5	4.2	EPDM-X+PP	69 Shore A	black
2	–	2	4.2	EPDM-X+PP	93 Shore A	black
2	–	5.5	3.4	EPDM-X+PP	69 Shore A	black
2	–	2.5	3.4	EPDM-X+PP	78 Shore A	black
2 – 3	–	3.5	6	EPDM-X+PP	69 Shore A	black
2 – 3	–	3.5	6	EPDM-X+PP	78 Shore A	black
2 – 3	–	3.5	6	EPDM-X+PP	86 Shore A	black
3	–	7	6	EPDM-X+PP	78 Shore A	black
3 – 3.5	–	5.2	8	EPDM-X+PP	78 Shore A	black
2 – 2.5	–	3.5	8	EPDM-X+PP	69 Shore A	black

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**Couplings for plate fastening**  
**High temperature applications**



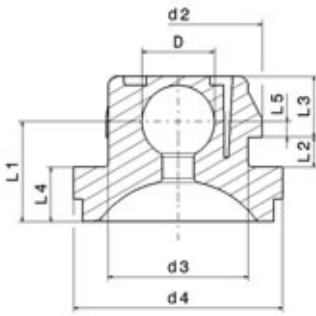
Part number	Design	Ball Ø D	Outer Ø d2	Mounting hole Ø d3	Collar Ø d4	Depth (to ball center L1)
4269 023 0701	plate fastening	7	12.4	10	16	8
4059 007 0010	plate fastening	7	16.5	14	20	8
4059 008 0083	plate fastening	8	18.5	16	26	10.5
4059 008 0084	plate fastening	8	18.5	15.4	23	11
4059 010 0082	plate fastening	10	22.5	16	25	11
4059 010 0080	plate fastening	10	21.5	16	25	10.9
4059 010 0081	plate fastening	10	21.5	16	25	10.9
4059 010 0079	plate fastening	10	16.5	14	20	7.5

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Wall thickness L2	Mounted depth L3	Collar depth L4	Depth L5	Material	Shore hardness	Thread surface
1 – 2	–	1.5	5.2	TPE-E	33 Shore D	black
2 – 2.5	–	3.5	2	ECO according to TL 52052	60 Shore A	black
2 – 2.5	–	3.5	4.6	VMQ	50 Shore A	grey
3.3	–	6	1.55	VMQ	70 Shore A	grey
2.5 – 3.2	–	3.1	6	VMQ	70 Shore A	grey
2 – 3	–	3.5	6	EPDM peroxide	65 Shore A	black
2 – 3	–	3.5	6	EPDM peroxide	70 Shore A	black
2 – 2.5	–	3.5	3.2	EPDM peroxide	70 Shore A	black

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