

Sphere

4PVD
Service & Supply

3-fold Rotation with tilt Axle

Plates

Sleeves

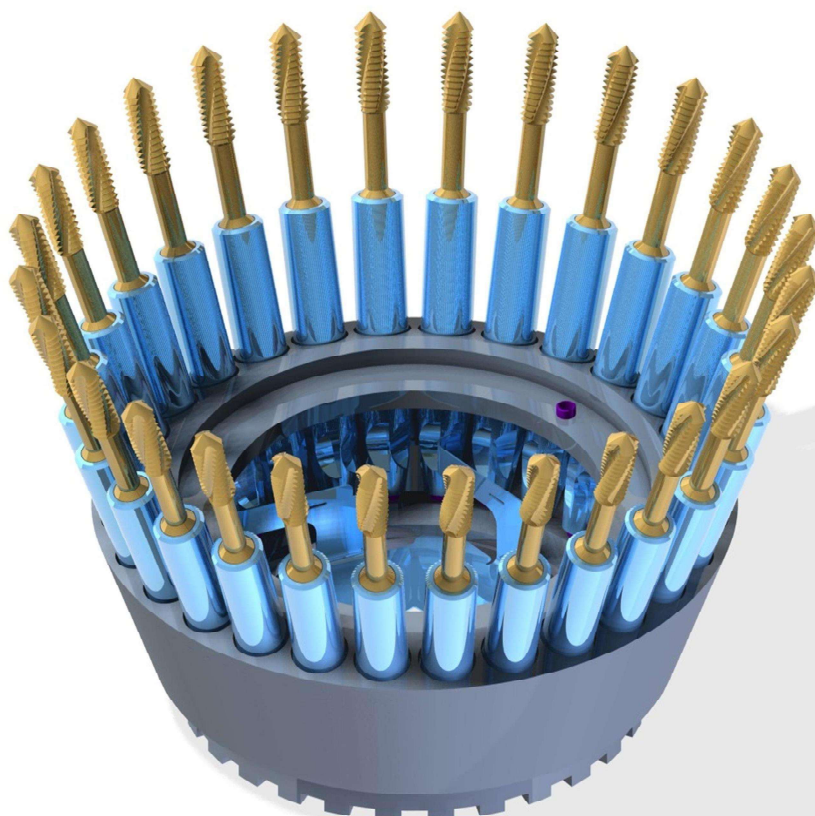
Adaptors

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Sphere fixture systems for rotating tools and machine elements

For rotating tools the Sphere fixture system offers the best economics and quality of all 4pvd-fixtures. It is specially designed for rotationally symmetrical substrates, which are mostly used on their face, but also on their circumference (For example, drills, mills, stamps or taps).

Lining up the substrate in a specific angle to the evaporator source gives advantage regarding the distribution of coating thickness. This angle is adjustable for different applications. There is nearly no other fixture system in our portfolio to enable such great numbers of products in one batch.

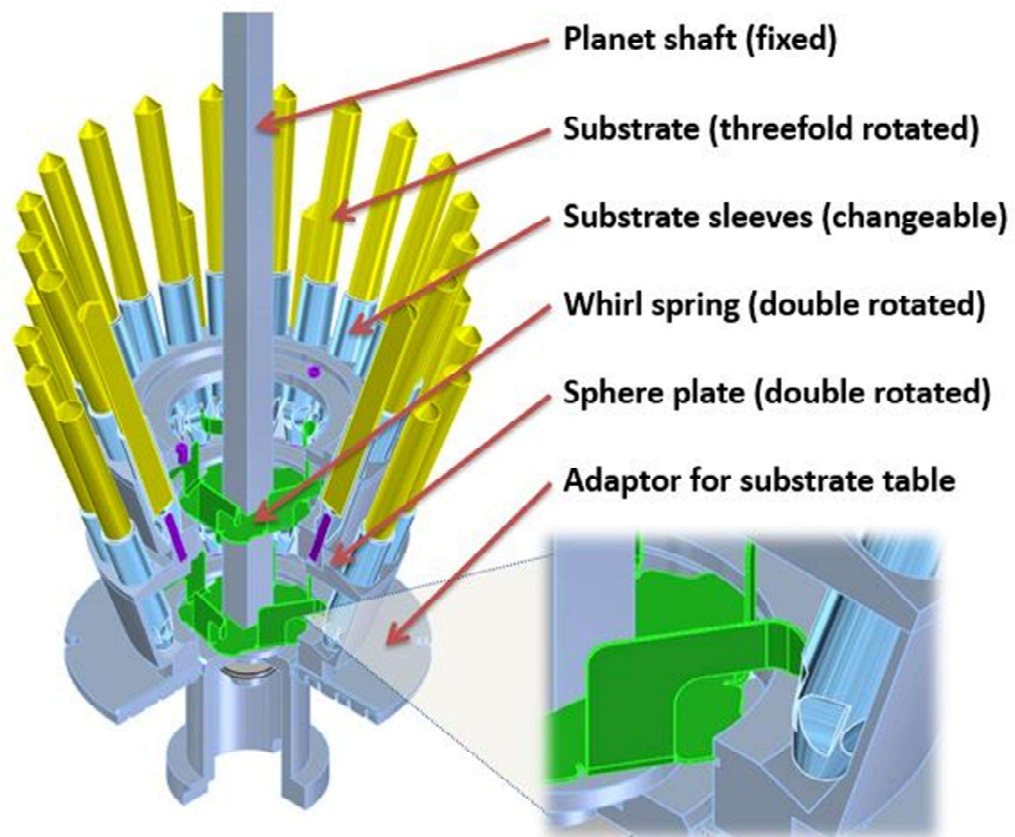


Sphere fixtures with twist drills

The Sphere fixture tilts the functional surface of the substrate towards the evaporators. The sleeves of these fixtures are rotated regularly from the inside to apply a homogeneous coating. At the same time it supports cleaning of substrates by plasma etching. Sphere fixtures are mostly used for coating of big lots of similar products.

Design of Sphere plates

The Sphere fixture housing in combination with its sleeves and the whirl build one unit. Adjusting the whirl (drive spring / kicker finger) is not necessary anymore. Placing the whirl, which is used as a third axle driver, inside of the fixture has several advantages which lead to higher reliability and durability. It is protected from plasma and coating material. Beside of this in PVD furnaces with a greater coating height, all the drive springs are precisely positioned.



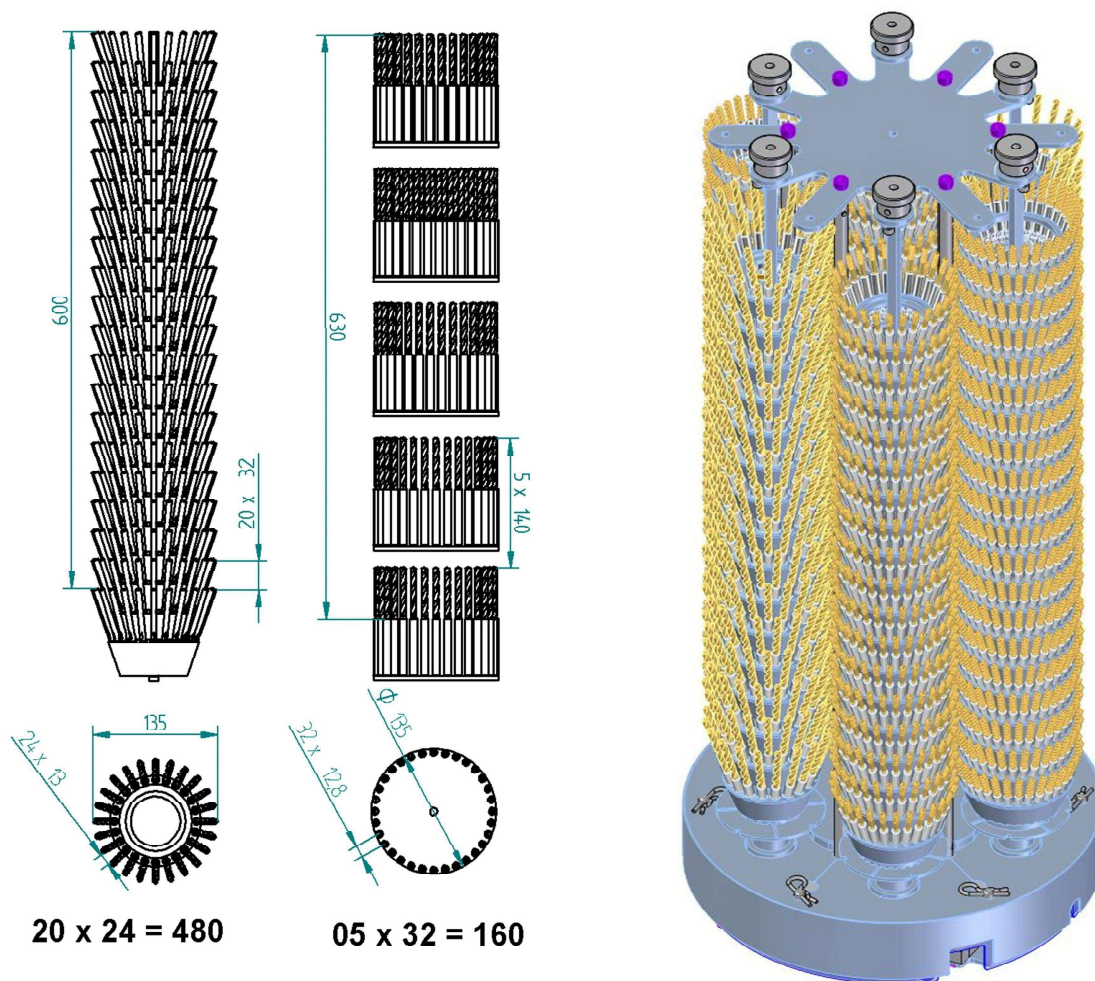
Function of a Sphere fixture

Inside of a PVD furnace the Sphere plate rotates around the axle of the planet. The planet shaft, which is a square rod, is placed in the middle and does **not** rotate. Because of that the whirl inside of the Sphere fixture starts to operate and rotates the sleeves precisely. Those whirls have several tongues which cause a regular and safe rotation.

There is no need of additional parts to stack the same Sphere plates' one upon each other. The design of the Sphere fixture will hide the housing, the gears and the tool shanks inside of the level underneath. This is why it is possible to pack very closely many levels. It is also possible to stack different Sphere plate sizes with an adapter disc in between.

Comparison of Sphere's and Colt's degree of efficiency

The size of the batch to coat - for example DIN 338 twisted drills - with Sphere fixtures is twice as high as with conventional fixtures. Also the coating time is reduced, because of the higher space between the substrates themselves and lower distance to the evaporators.



Left: Comparison of the charge SPHERE and COLT

Right: loading example table Ø400 with 6 x Ø130mm planets
(approx. 2900 tools Ø6 on 700mm coating depth)

Particularly when using PVD machines with a lower effective coating height the Sphere fixtures will increase the overall productivity. In several applications the thicker coating on the front (cutting) edge of the substrate leads to an improvement of performance.

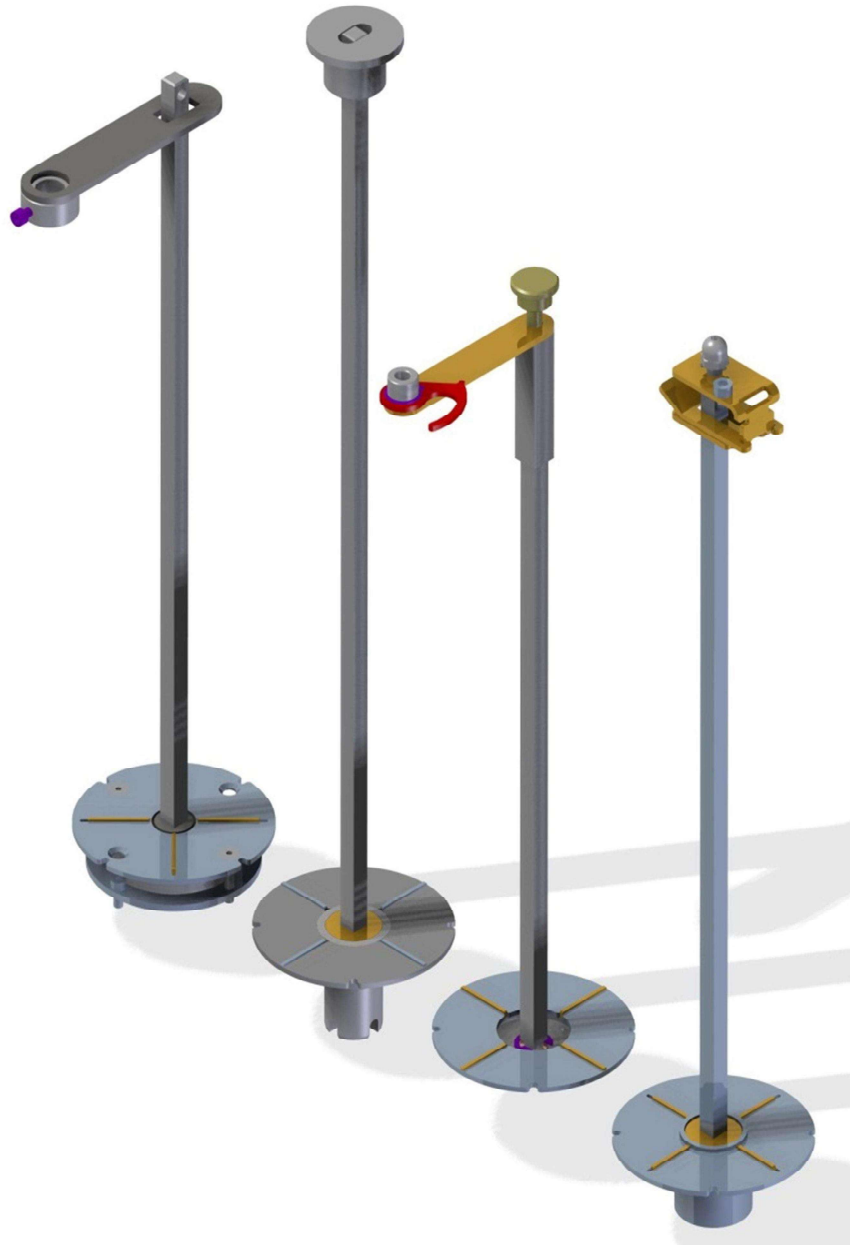
Four steps for choosing a suitable Sphere fixture:

1. Choose the Sphere adapter for your machine type
2. Choose the Sphere plate for tool diameter and length
3. Choose the right sleeve for your tool shank
4. Choose the end tube and if needed adaptor fittings

1. Choose the Sphere adapter

Every coating machine is different. It is necessary to use an adaptor, because the main axle of the Sphere fixture may **not** rotate. The adaptor fits with its bottom side on the planet of your substrate table. The 10x10mm square rods (main kicker tree) are pivot-mounted into the adaptors and are supported/stabilized by a torque arm.

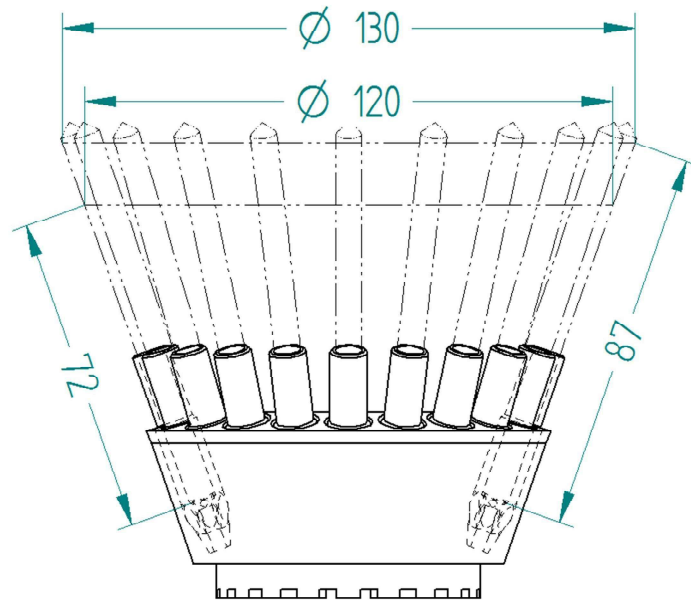
There are several adaptors available for different coating machine types, like CemeCon, Oerlikon, Platit and Hauzer. Dimensions and prices for all those adaptor parts are handed to you by inquiry. Other adaptors can be manufactured upon demand. For the height of coating zone we will send you the blueprints upon your request.



SPHERE adaptors for different coating machines

2. Choose the Sphere plate

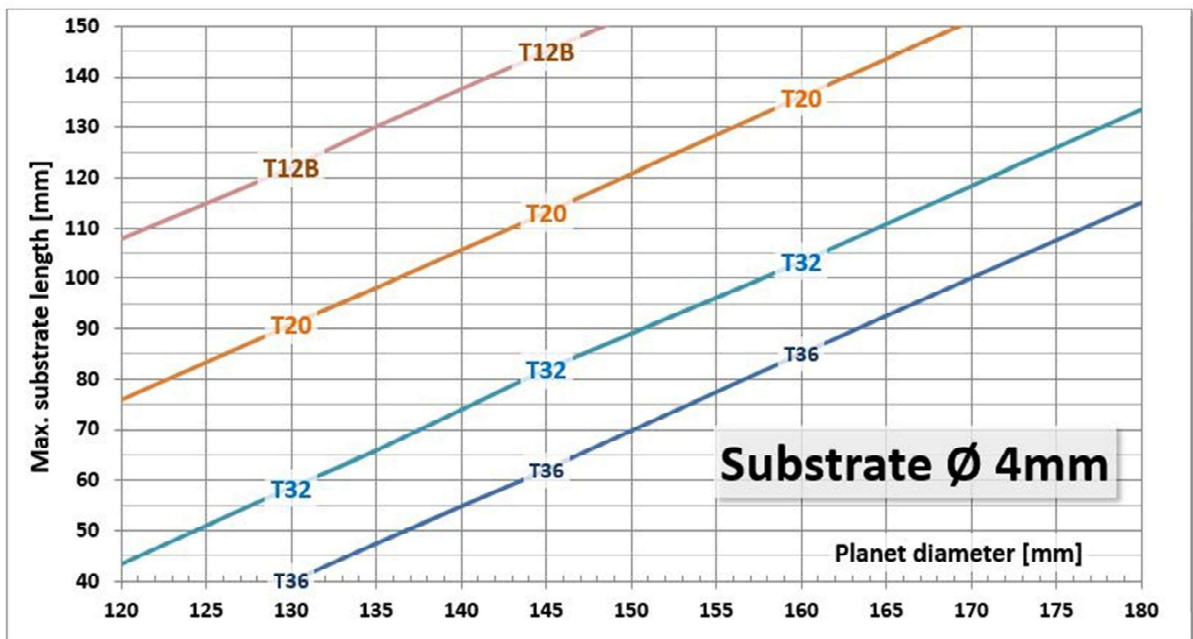
There is a main difference regarding the outer diameter (OD) of COLT and Sphere fixtures. While the circumference of COLT is always of the same size, for Sphere plates it grows proportional to the length of the tools. Because of this, the maximum (OAL) tool length needs to be included in the selection process.

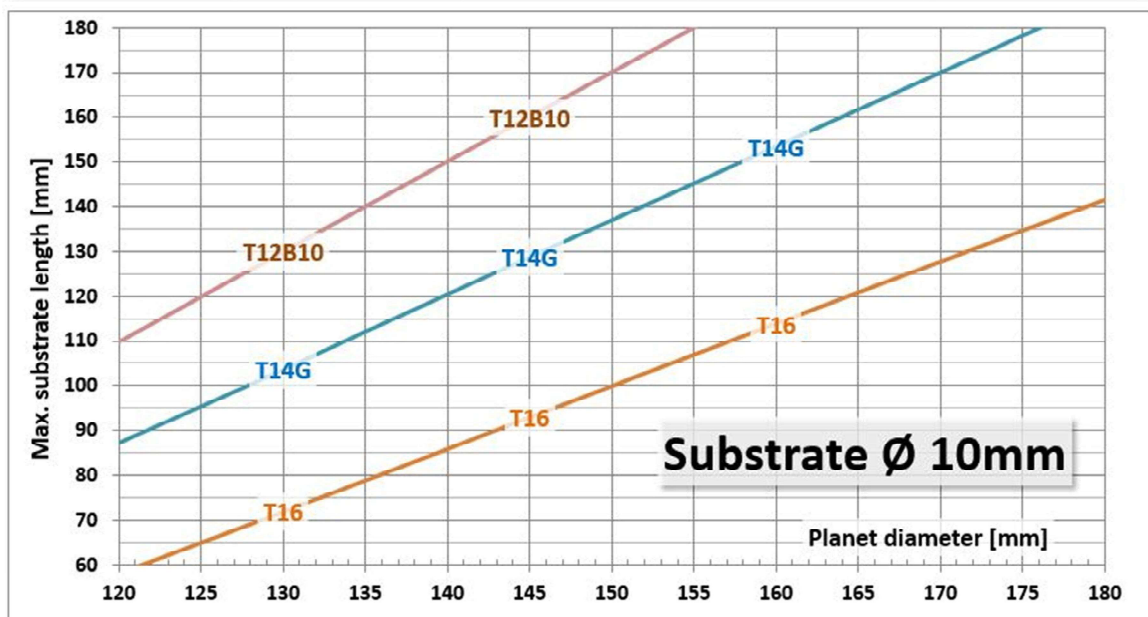
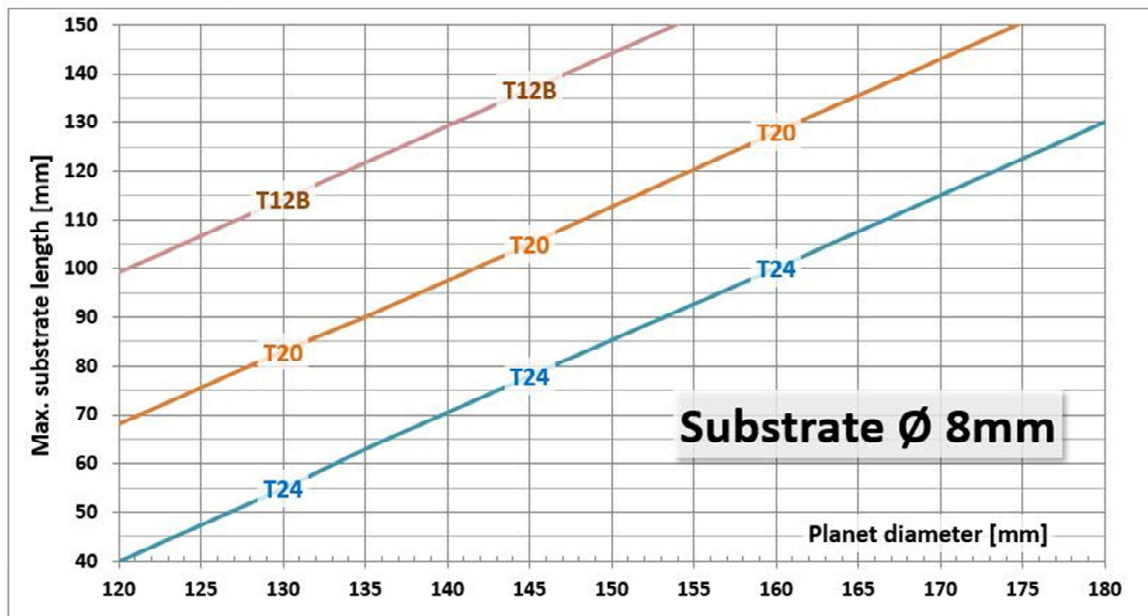
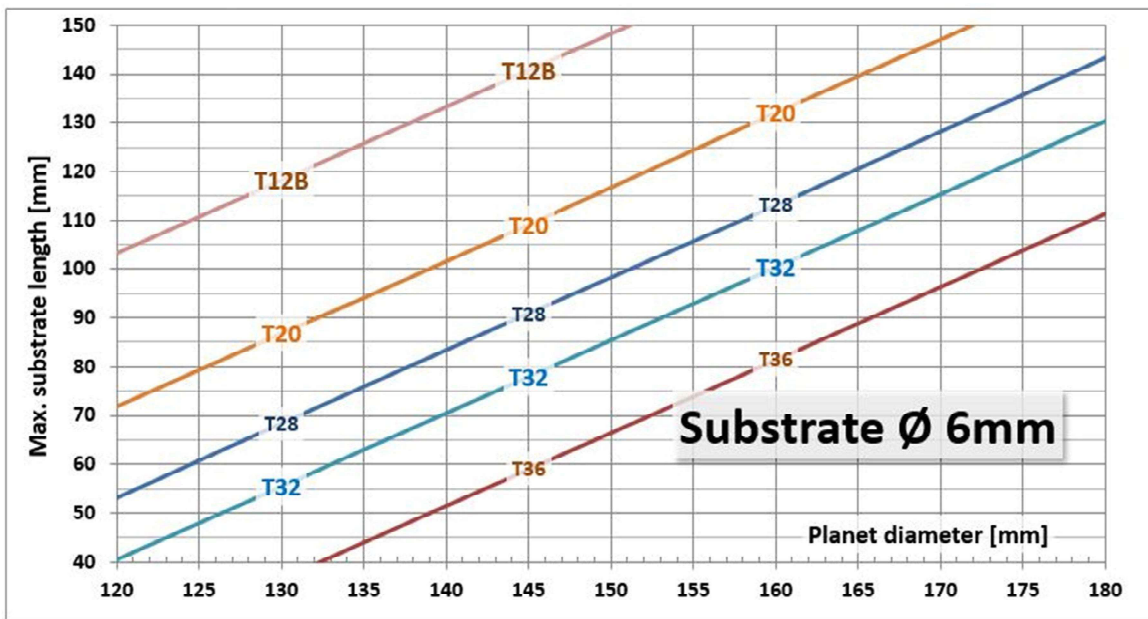


The following diagrams show the correct fit for your Sphere plate according to planet circumference, tool length (including the shank) together with its shank diameter.

With a given tool length, you follow the horizontal line of this maximum length to the point of intersection with your planet diameter. From this point you move up to the next coloured line / possible plate. The number behind the T shows the number of tools per level.

Even if there is no given tool length, pick the line of your planet diameter and the plate with the desired number of tools. The combination shows the potential maximum tool length.





Typical plates: Measurement and Prices

Plates	Height [mm]	Pins [mm]	Max. shaft-Ø [mm]	€ @ 5	€ @ 10	€ @ 20	Item number
T36	38	3	6,0	227,00	195,00	154,00	394361925
T32	33	3	6,0	212,00	183,00	163,00	391692144
T28	34	3	6,0	198,00	171,00	153,00	391691840
T24	39	3	8,0	194,00	159,00	142,00	391701147
T20	39	3	8,0	170,00	147,00	131,00	402801057
T16	42	4	10,0	156,00	134,00	120,00	390582233
T12B	39	4	8,0	128,00	110,00	98,00	398181745
T12F	52	4	12,0	142,00	122,00	109,00	391701549

3. Choose the Sphere sleeve

One size of sleeves usually fits to multiple plate sizes. The minimum wall thickness for these sphere sleeves is about 1mm. Because of that, the sleeve only needs to be 2mm bigger in diameter then the shaft of the substrate. If the shaft is thinner in diameter then sleeve, is it possible to use a reduction sleeve.

Sleeves for plates T36, T32, T28

The housings T36, T32 and T28 can be filled with sleeves of up to 8mm OD. They work for tools with a shank maximum diameter of 6mm. The following pages show some of the standard shank diameters and masking lengths. Significant dimensions are also encoded the item number: A Sphere sleeve 08-06 L38 is a sleeve with 8mm external and 6mm (shank diameter) internal diameter and a masking length of 38mm.

Sleeves for plates T24, T20, T12B

The housings T24, T20 and T12B can be filled with sleeves of up to 10mm OD. They work for tools with a shank maximum diameter of 8mm. The following pages show some of the standard shank diameters and masking lengths. Significant dimensions are also encoded the item number: A Sphere sleeve 10-08 L38 is a sleeve with 10mm external and 8mm (shank diameter) internal diameter and a masking length of 38mm.

Sleeves for plates T16 and T12F etc.

All other Sphere plates are able to hold sleeves with an external diameter of 15mm which allows them to work with shanks of diameter of up to 13mm. All those classifications refer to the diagrams above, special sizes are available on inquiry.

Price List



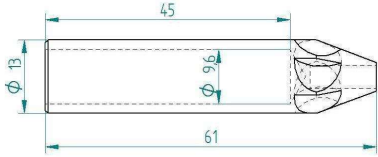
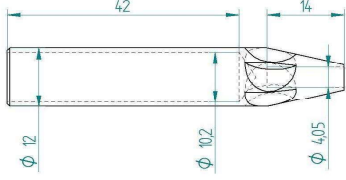
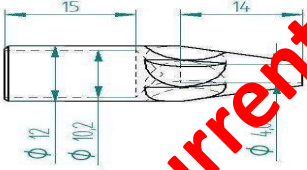

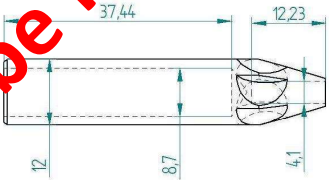
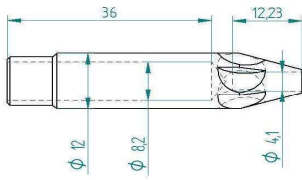
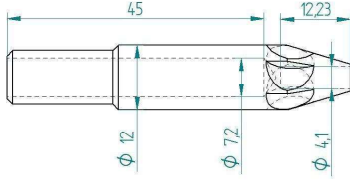
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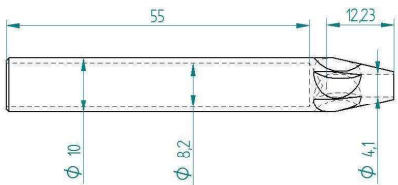
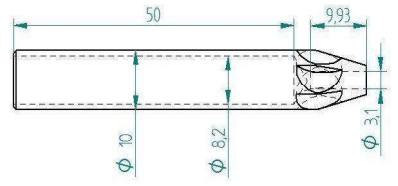
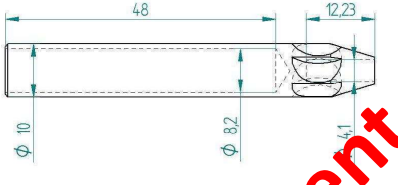
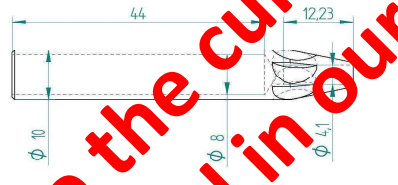
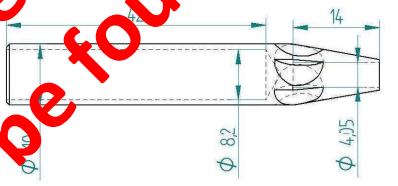
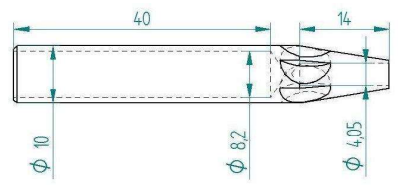
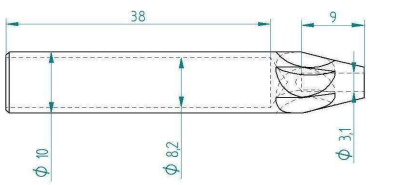
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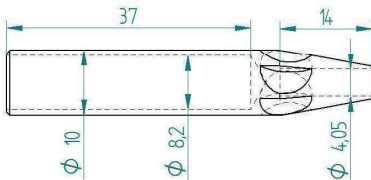
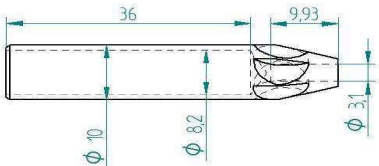
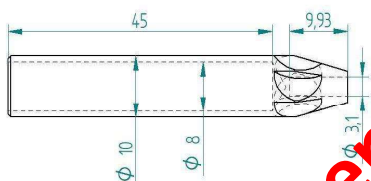

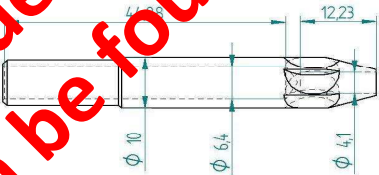
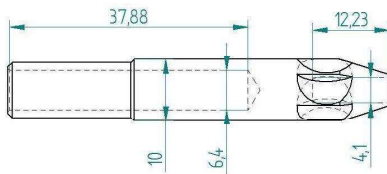
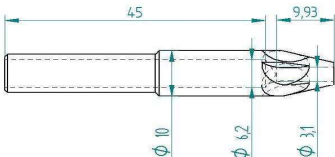
Sphere Discount List

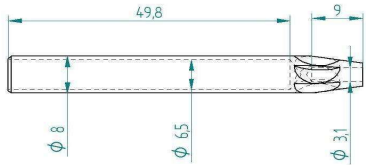
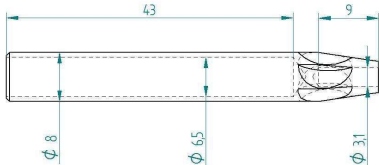
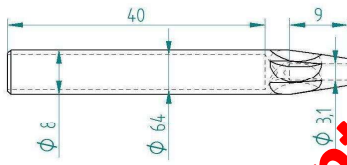

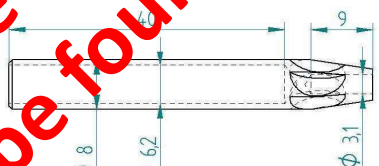
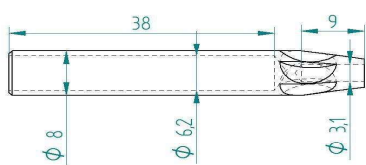
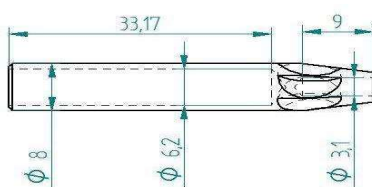
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399711249	Sphere Sleeve 15-12,7 L46		1,00	13,60 €
	Masking Length 46 mm		10,00	11,00 €
	for Shank 12,7 mm		50,00	9,50 €
			100,00	8,50 €
			500,00	7,80 €
410931735	Sphere Sleeve 15-12,5 L51		1,00	13,60 €
	Masking Length 51 mm		10,00	11,00 €
	for Shank 12,5 mm		50,00	9,50 €
			100,00	8,50 €
			500,00	7,80 €
411360955	Sphere Sleeve 15-10,5 L47		1,00	13,60 €
	Masking Length 47 mm		10,00	11,00 €
	for Shank 10,5 mm		50,00	9,50 €
			100,00	8,50 €
			500,00	7,80 €
391701551	Sphere Sleeve 14-12,0 L47		1,00	13,10 €
	Masking Length 47 mm		10,00	10,60 €
	for Shank 12,0 mm		50,00	9,10 €
			100,00	8,20 €
			500,00	7,50 €
410261151	Sphere Sleeve 13-10,8 L70		1,00	12,80 €
	Masking Length 70 mm		10,00	10,40 €
	for Shank 10,8 mm		50,00	8,90 €
			100,00	8,00 €
			500,00	7,30 €
415552646	Sphere Sleeve 13-10,8 L70		1,00	12,80 €
	Masking Length 70 mm		10,00	10,40 €
	for Shank 10,8 mm		50,00	8,90 €
			100,00	8,00 €
			500,00	7,30 €

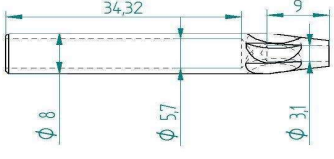
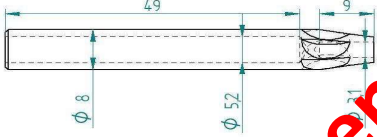

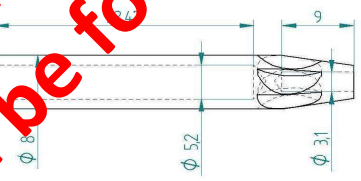
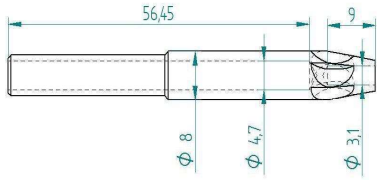
Prices not valid due to the current situation!
Valid prices can be found in our web shop.

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	Masking Length 45 mm		10,00	10,40 €
	for Shank 09,5 mm		50,00	8,90 €
			100,00	8,00 €
			500,00	7,30 €
390700851	Sphere Sleeve 12-10,0 L42		1,00	12,40 €
	Masking Length 42 mm		10,00	10,10 €
	for Shank 10,0 mm		50,00	8,70 €
			100,00	7,80 €
			500,00	7,10 €
415552382	Sphere Sleeve 12-10,0 L15		1,00	13,40 €
	Masking Length 15 mm		10,00	11,10 €
	for Shank 10,0 mm		50,00	9,70 €
			100,00	8,80 €
			500,00	8,10 €
396191018	Sphere Sleeve 12-08,5 L50		1,00	12,40 €
	Masking Length 50 mm		10,00	10,10 €
	for Shank 08,5 mm		50,00	8,70 €
			100,00	7,80 €
			500,00	7,10 €
403871124	Sphere Sleeve 12-08,5 L37		1,00	12,40 €
	Masking Length 37 mm		10,00	10,10 €
	for Shank 08,5 mm		50,00	8,70 €
			100,00	7,80 €
			500,00	7,10 €
402801112	Sphere Sleeve 12-08,0 L36		1,00	14,00 €
	Masking Length 36 mm		10,00	11,40 €
	for Shank 08,0 mm		50,00	9,80 €
			100,00	8,90 €
			500,00	7,90 €
396191204	Sphere Sleeve 12-07,0 L45		1,00	14,00 €
	Masking Length 45 mm		10,00	11,40 €
	for Shank 07,0 mm		50,00	9,80 €
			100,00	8,90 €
			500,00	7,90 €
396181152	Sphere Sleeve 10-08,0 L55 -4		1,00	11,20 €
	Masking Length 55 mm		10,00	9,10 €
	for Shank 08,0 mm		50,00	7,80 €
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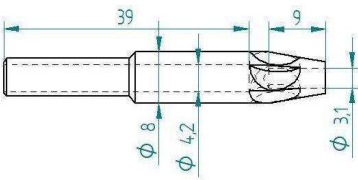
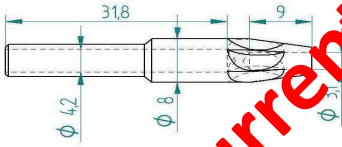
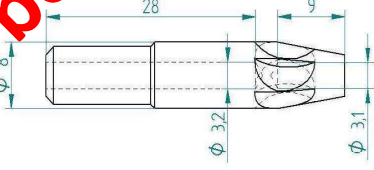
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	for Shank 08,0 mm		50,00	7,80 €
			100,00	7,00 €
			500,00	6,40 €
403731005	Sphere Sleeve 10-08,0 L48 -4		1,00	11,20 €
	Masking Length 48 mm		10,00	9,10 €
	for Shank 08,0 mm		50,00	7,80 €
			100,00	7,00 €
			500,00	6,40 €
411600627	Sphere Sleeve 10-08,0 L44 -4		1,00	11,20 €
	Masking Length 44 mm		10,00	9,10 €
	for Shank 08,0 mm		50,00	7,80 €
			100,00	7,00 €
			500,00	6,40 €
394571218	Sphere Sleeve 10-08,0 L42 -4		1,00	11,20 €
	Masking Length 42 mm		10,00	9,10 €
	for Shank 08,0 mm		50,00	7,80 €
			100,00	7,00 €
			500,00	6,40 €
398251029	Sphere Sleeve 10-08,0 L40 -4		1,00	11,20 €
	Masking Length 40 mm		10,00	9,10 €
	for Shank 08,0 mm		50,00	7,80 €
			100,00	7,00 €
			500,00	6,40 €
391701149	Sphere Sleeve 10-08,0 L38		1,00	11,20 €
	Masking Length 38 mm		10,00	9,10 €
	for Shank 08,0 mm		50,00	7,80 €
			100,00	7,00 €
			500,00	6,40 €
400001717	Sphere Sleeve 10-08,0 L37 -4		1,00	11,20 €
	Masking Length 37 mm		10,00	9,10 €
	for Shank 08,0 mm		50,00	7,80 €
			100,00	7,00 €

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402801059	Sphere Sleeve 10-08,0 L36		1,00	11,20 €
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	for Shank 08,0 mm		50,00	7,80 €
			100,00	7,00 €
			500,00	6,40 €
415552642	Sphere Sleeve 10-07,8 L45		1,00	11,20 €
	Masking Length 45 mm		10,00	9,10 €
	for Shank 07,8 mm		50,00	7,80 €
			100,00	7,00 €
			500,00	6,40 €
401690832	Sphere Sleeve 10-07,0 L43 -4		1,00	11,20 €
	Masking Length 43 mm		10,00	9,10 €
	for Shank 07,0 mm		50,00	7,80 €
			100,00	7,00 €
			500,00	6,40 €
403871017	Sphere Sleeve 10-06,2 L45 -4		1,00	13,00 €
	Masking Length 45 mm		10,00	10,50 €
	for Shank 06,2 mm		50,00	9,00 €
			100,00	8,20 €
			500,00	7,40 €
401961018	Sphere Sleeve 10-06,2 L38 -4		1,00	13,00 €
	Masking Length 38 mm		10,00	10,50 €
	for Shank 06,2 mm		50,00	9,00 €
			100,00	8,20 €
			500,00	7,40 €
414080807	Sphere Sleeve 10-06,0 L45		1,00	13,00 €
	Masking Length 45 mm		10,00	10,50 €
	for Shank 06,0 mm		50,00	9,00 €
			100,00	8,20 €
			500,00	7,40 €
415552842	Sphere Sleeve 08-06,3 L50		1,00	10,50 €
	Masking Length 50 mm		10,00	8,50 €
	for Shank 06,3 mm		50,00	7,30 €
			100,00	6,60 €

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403731002	Sphere Sleeve 08-06,3 L43		1,00	10,50 €
	Masking Length 43 mm		10,00	8,50 €
	for Shank 06,3 mm		50,00	7,30 €
			100,00	6,60 €
			500,00	6,00 €
396190934	Sphere Sleeve 08-06,2 L40		1,00	10,50 €
	Masking Length 40 mm		10,00	8,50 €
	for Shank 06,2 mm		50,00	7,30 €
			100,00	6,60 €
			500,00	6,00 €
391691842	Sphere Sleeve 08-06,0 L46		1,00	10,50 €
	Masking Length 46 mm		10,00	8,50 €
	for Shank 06,0 mm		50,00	7,30 €
			100,00	6,60 €
			500,00	6,00 €
396190938	Sphere Sleeve 08-06,0 L40		1,00	10,50 €
	Masking Length 40 mm		10,00	8,50 €
	for Shank 06,0 mm		50,00	7,30 €
			100,00	6,60 €
			500,00	6,00 €
			1.000,00	5,50 €
391692146	Sphere Sleeve 08-06,0 L38		1,00	10,50 €
	Masking Length 38 mm		10,00	8,50 €
	for Shank 06,0 mm		50,00	7,30 €
			100,00	6,60 €
			500,00	6,00 €
40387094	Sphere Sleeve 08-06,0 L33		1,00	10,50 €
	Masking Length 33 mm		10,00	8,50 €
	for Shank 06,0 mm		50,00	7,30 €
			100,00	6,60 €
			500,00	6,00 €
396182010	Sphere Sleeve 08-05,5 L40		1,00	10,50 €
	Masking Length 40 mm		10,00	8,50 €
	for Shank 05,5 mm		50,00	7,30 €
			100,00	6,60 €

Item-No.	Description		Quantity	Price per Piece
			500,00	6,00 €
403870938	Sphere Sleeve 08-05,5 L34		1,00	10,50 €
	Masking Length 34 mm		10,00	8,50 €
	for Shank 05,5 mm		50,00	7,30 €
			100,00	6,60 €
			500,00	6,00 €
415552631	Sphere Sleeve 08-05,0 L49		1,00	10,50 €
	Masking Length 49 mm		10,00	8,50 €
	for Shank 05,0 mm		50,00	7,30 €
			100,00	6,60 €
			500,00	6,00 €
			1.000,00	5,50 €
			2.000,00	4,90 €
396182006	Sphere Sleeve 08-05,0 L40		1,00	10,50 €
	Masking Length 40 mm		10,00	8,50 €
	for Shank 05,0 mm		50,00	7,30 €
			100,00	6,60 €
			500,00	6,00 €
403862315	Sphere Sleeve 08-05,0 L32		1,00	10,50 €
	Masking Length 32 mm		10,00	8,50 €
	for Shank 05,0 mm		50,00	7,30 €
			100,00	6,60 €
			500,00	6,00 €
405120844	Sphere Sleeve 08-04,5 L56		1,00	12,00 €
	Masking Length 56 mm		10,00	9,70 €
	for Shank 04,5 mm		50,00	8,40 €
			100,00	7,90 €
			500,00	6,90 €
407031653	Sphere Sleeve 08-04,5 L35		1,00	12,00 €
	Masking Length 35 mm		10,00	9,70 €
	for Shank 04,5 mm		50,00	8,40 €
			100,00	7,90 €
			500,00	6,90 €
			1.000,00	6,60 €
			2.000,00	6,30 €
414080755	Sphere Sleeve 08-04,0 L39		1,00	12,00 €
	Masking Length 39 mm		10,00	9,70 €
	for Shank 04,0 mm		50,00	8,40 €

Prices not valid due to the current situation!
Valid prices can be found in our web shop!

Item-No.	Description		Quantity	Price per Piece
			100,00	7,90 €
			500,00	6,90 €
415552383	Sphere Sleeve 08-04,0 L31,8		1,00	13,00 €
	Masking Length 31 mm		10,00	10,70 €
	for Shank 04,0 mm		50,00	9,40 €
			100,00	8,90 €
			500,00	7,90 €
415551598	Sphere Sleeve 08-03,5 L35		1,00	12,00 €
	Masking Length 35 mm		10,00	9,70 €
	for Shank 03,5 mm		50,00	8,40 €
			100,00	7,90 €
			500,00	6,90 €
			1.000,00	6,60 €
			2.000,00	6,30 €
394361927	Sphere Sleeve 08-03,0 L28		1,00	12,00 €
	Masking Length 28 mm		10,00	9,70 €
	for Shank 03,0 mm		50,00	8,40 €
			100,00	7,90 €
			500,00	6,90 €

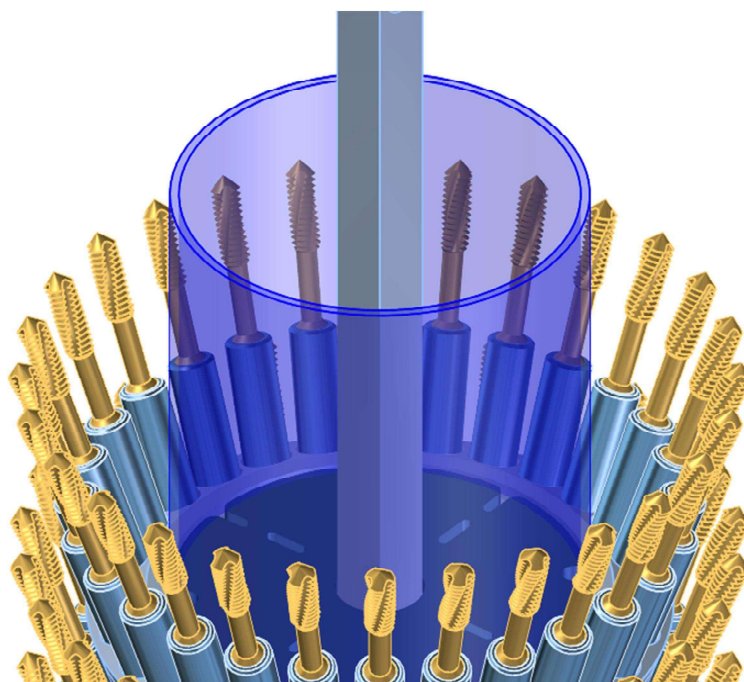


Roermonder Str.601
 D-52072 Aachen
 Tel.: +49 241 997 4467 0
 Fax: +49 241 997 4467 77
 Mail: info@4pvd.de
www.4pvd.de

4a. Complete the Sphere tree

The last level of the Sphere fixtures is an end tube. The tube simulates a neighbour for the tools of the last Sphere fixture. This is recommended to adapt the requirements of the coating thickness and plasma to those levels below.

Additionally those end tubes help to cover the inner parts of the Sphere plate from coating deposition, but without reducing degassing. End tubes or filling tubes need to fit to the Sphere plate diameter.



Sphere tree with end tube/ filling tube

Plates	Tube	OD [mm]	Height [mm]	€ @ 1	€ @ 5	€ @ 10	Order number
T36	R36	104	60	18,00	15,00	13,50	403982207
T32	R32	89	60	18,00	15,00	13,50	403982217
T28	R28	70	80	18,00	15,00	13,50	403982227
T24	R32	89	60	18,00	15,00	13,50	403982217
T20	R20	60	70	18,00	15,00	13,50	404010951
T16	R20	60	70	18,00	15,00	13,50	404010951
T12B	R12B	40	110	12,00	09,00	08,00	400090740
T12F	R20	60	70	18,00	15,00	13,50	404010951

4b. Accessory Sphere adaptor

Sphere plates of the same diameter are easily stack on each other without any adaptor. This means the most efficient and economical way is to stack the same size of Sphere fixtures on one tree. But it is possible to load Sphere plates with a different kind of sleeves.

If there is a need to stack different sizes of Sphere fixtures on each other, it is necessary to place an adaptor plate in between. The arrangement of the whole tree is from the biggest to smallest fixture. It is not possible to arrange in the opposite way or a random arrangement.

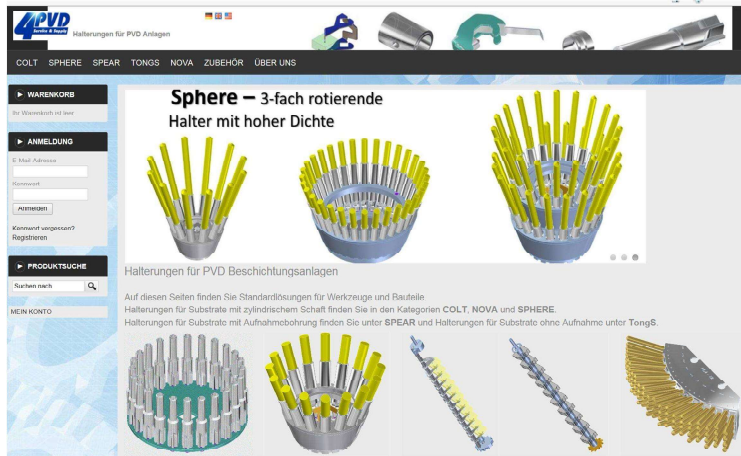
Plates	Adaptors	OD [mm]	€ @ 1	€ @ 5	€ @ 10	Order number
T36	A36	104	18,00	15,00	13,50	415550682
T32	A32	89	18,00	15,00	13,50	415550613
T28	A28	70	18,00	15,00	13,50	415551391
T24	A32	89	18,00	15,00	13,50	415550613
T20	A20	60	18,00	15,00	13,50	415551392
T16	A20	60	18,00	15,00	13,50	415551392

4c. Accessory Sphere whirl

The sleeves are driven from the inside with a five-arm whirl. The whirls can easily be replaced without any tools. For replacement, you need to specify the plate diameter and the sense of rotation.

Plates	Whirl	Bearing [mm]	€ @ 1	€ @ 5	€ @ 10	Order number
T36	W36	73,15	25,00	20,00	17,50	394361930
T32	W32	61,15	25,00	20,00	17,50	391692150
T28	W28	53,15	25,00	20,00	17,50	391691846
T24	W24	61,15	25,00	20,00	17,50	391701153
T20	W20	41,15	25,00	20,00	17,50	402801062
T16	W16	45,15	25,00	20,00	17,50	390941240
T12B	W12B	31,15	25,00	20,00	17,50	394571220
T12F	W12F	45,15	18,00	15,00	13,50	391701555

Easy product finding in our 4pvd Online Shop



On the main page our products are sorted according to our product lines Colt, Sphere, Spear, TongS, Nova and accessory.

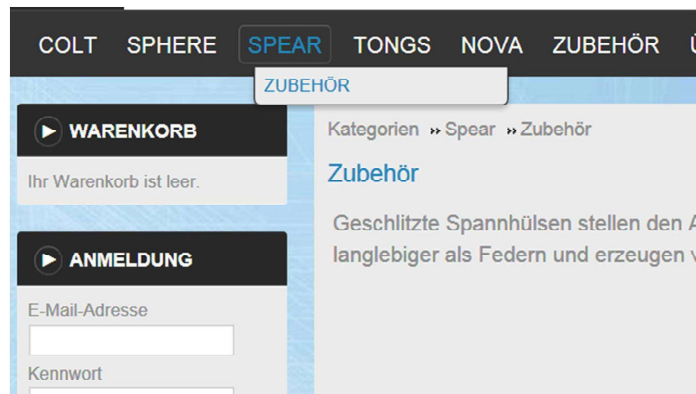
In the center some examples will appear in intervals.

You can browse through the shop with or without log-in.

Behind the main categories other menus are available.

You may also search for key words or item numbers.

A log in account is only necessary for ordering. If you are already a 4pvd customer, please let us fill your account data.



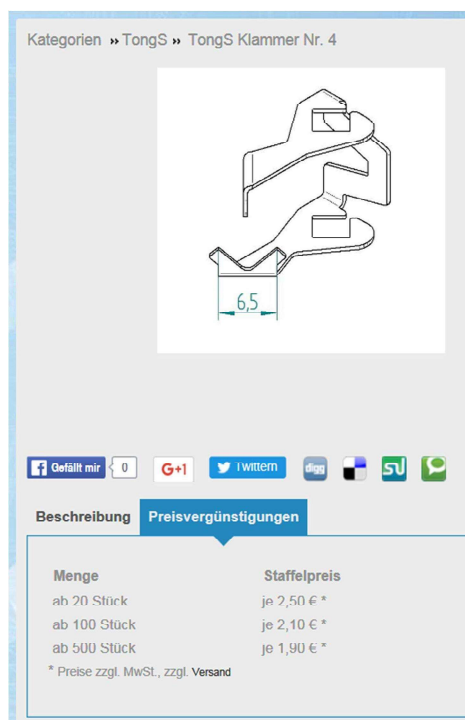
For each item you can find dimensions, prices and discounts as well as stock availability.

Corresponding accessory is listed at the bottom part of the item window.

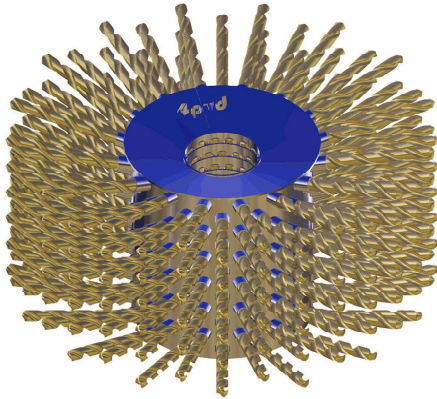
Get into the shop via the link for our website www.4pvd.de or directly via: www.webshop.4pvd.de

The pages and descriptions may be displayed in English and German language.

Earlier orders can be recalled and products can be place on the memory board until the next visit.



Other 4pvd Fixture systems



Nova fixtures position the products radial, so the tips face to the evaporators and get the highest coating thickness. Nova is most useful for products with short length of operation as end mills, micro drills, punches, etc.

If rotation along the products axle is not necessary, nova provides huge capacity for your furnace.

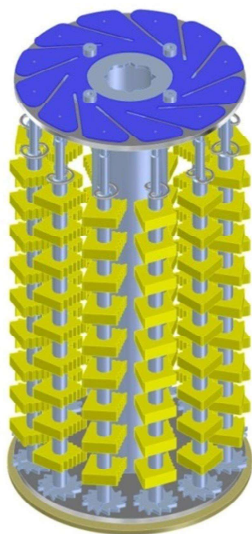
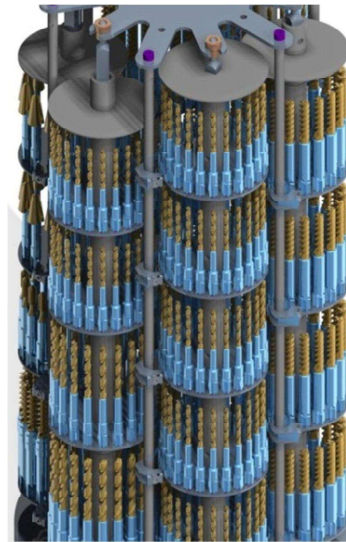
Nova is available for up to three rotation axes, with encoding and optional with integrated clinch.

Holders of the **COLT** series resemble the mostly used system of the manufacturer in the point of the arrangement of sleeves. Through a rotation with the maximum of the triple an even coat is applied at the perimeter of your products, a **must-have** for drills, cutter, taps and reamers.

It is available with up to four rotation axes, with a one - sided or overhung extension, with encoding and with integrated actuator.

Find out more at:

<http://www.4pvd.de/html/colt.html>



Spear fixtures hold a large quantity of small substrates as indexable inserts in a very compact space. If the substrates have holes the Spear holder is a very simple rod with gear for the third rotation axle at the bottom end.

For substrates without hole, Spear fixtures will be adapted individually on the substrate geometry and hold them with form fit. This form fit is one of the main differences to the TongS fixture series which take negative shaped substrates.

The standard Spear and Tongs fixture sizes fit to plates with a bearing on the lower and the upper end. They may rotate around two or three axes on the substrate table. A spring protects the rods against unwanted displacement. Please check also:

<http://www.4pvd.de/html/wendeplatten.html>

Other 4pvd Products

Table Systems

Substrate tables for 2-fold rotation with up to 18 planets, optionally on different PCD (e. g. for occasionally coating of bigger parts)

Flat design for maximum utilization of your coating zone. Modular concept for fast maintenance. Low weight, low torque.

Double shield set for better heat insulation available.

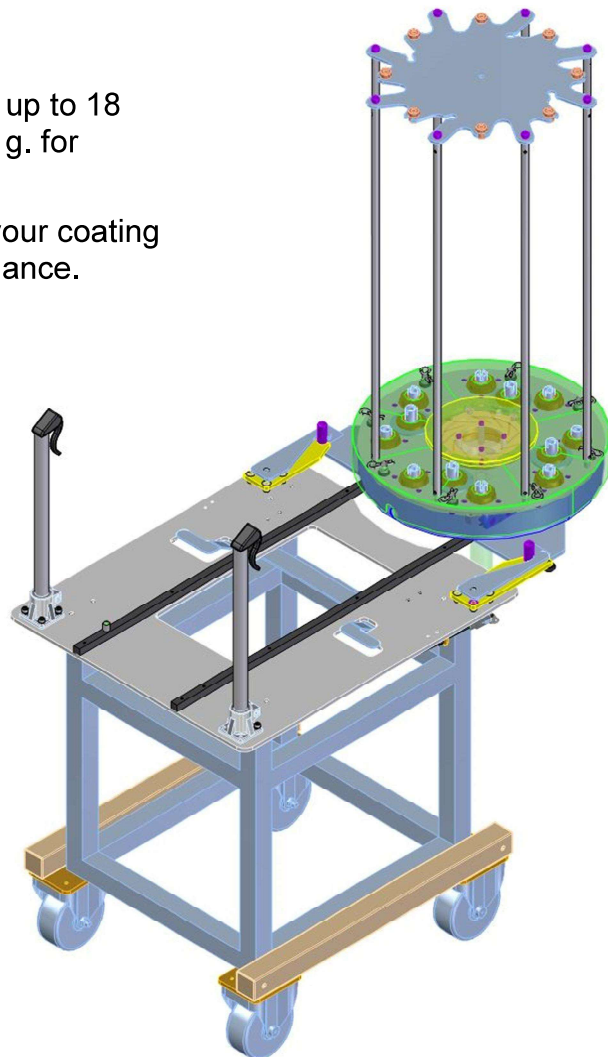
Exchangeable liners on floating potential.

Prepared with kicker rods and upper bearing plate for operation of third rotation axis.

Installation kits with rails and clutch system for easy roll-in and roll-out.

Batching cart with clutch system and brakes as well as parking stations for preloading.

Accessory as planet adaptors
High load platforms and
all fixtures from our supply.

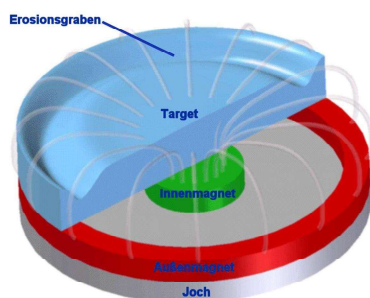
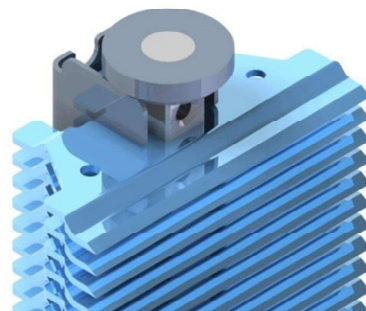


Custom Design Fixtures

Did not find your product here or
anything fitting for your application?

We will be happy to help you with your
challenge.

Be the No. 1 in terms of quality, economics
and speed. Use 4pvd know how and fixture
systems.



Consulting, Training and Design Work

4pvd assists you during development, marketing and distribution of your coated products as well as the related material flow and logistics.

With our experience you can place your products quickly, exactly and at reasonable cost. 4pvd will check your chances before you invest lots of money.

Sphere



3-fold Rotation with tilt Axle



4pvd
Dr. Ing. Stefan Esser
Roermonder Str. 601
D-52072 Aachen

Tel.: +49 241 997 446 7-0
Fax: +49 241 997 446 777
mailto: info@4pvd.de
www.4pvd.de