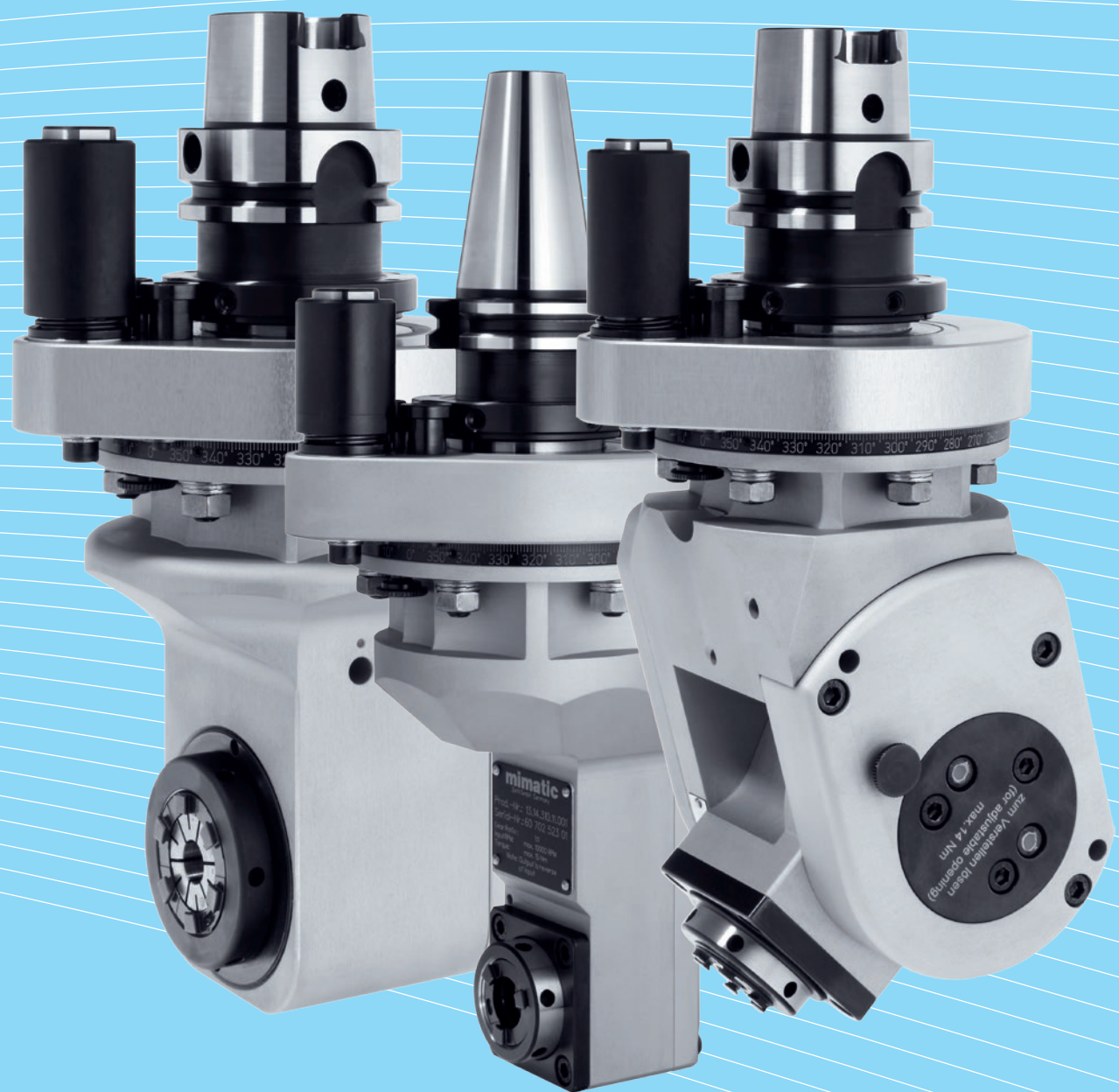


mimatic®

Tool Systems

角度头

Angle Heads



全球最好的刀具系统供应商

Tool Systems for Highest Demands

密麦特精密工具(上海)有限公司是一家服务全球的创新型机床应用工具及刀具制造企业，自1974年成立以来就一直致力于开发和生产角度头、动力刀座、固定刀座、螺纹铣刀、槽铣刀、锯片刀等产品，广泛用于汽车制造、航空和木材加工等领域。

Since 1974, we have been developing and producing cutting tools and driven tools for CNC machine tools. Our products are used in various fields of application for the machining industry for customers of the automotive industry, automotive suppliers, electrical engineering, vehicle construction, foundries, mechanical engineering and medical technology.



巴伐利亚州的阿尔高地区因其自然美景，纯天然的优美风景和田园史诗般的人文环境吸引了全世界的目光。同时它在工具制造业和机械工程领域的实力和创新思维也是众所周知的。我们在阿尔高的位置拥有强大的生产能力，拥有最现代化的生成设备。

The Allgäu region of Bavaria reputation reaches beyond its borders, because of its natural beauty, undisturbed nature and idyllic landscapes. It is also well known for its industrial power and innovative thinking in toolmaking and mechanical engineering. Our location in the Allgäu has a powerful production with all facilities of a modern industrial enterprise.



地理位置 Locations

总部位置 Headquarter

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www.mimatic.de

Forschung & Entwicklung / *Research & Development*
Produktion / *Production*
Vertrieb / *Sales*
Service / *Service*



分公司 Subsidiaries

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Vertrieb / *Sales*
Service / *Service*

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销售 / 服务
Service / *Service*



证书 Certificates



DIN EN ISO 9001:2015



AEO F

Zugelassener Wirtschaftsbeteiligter
Authorized Economic Operator

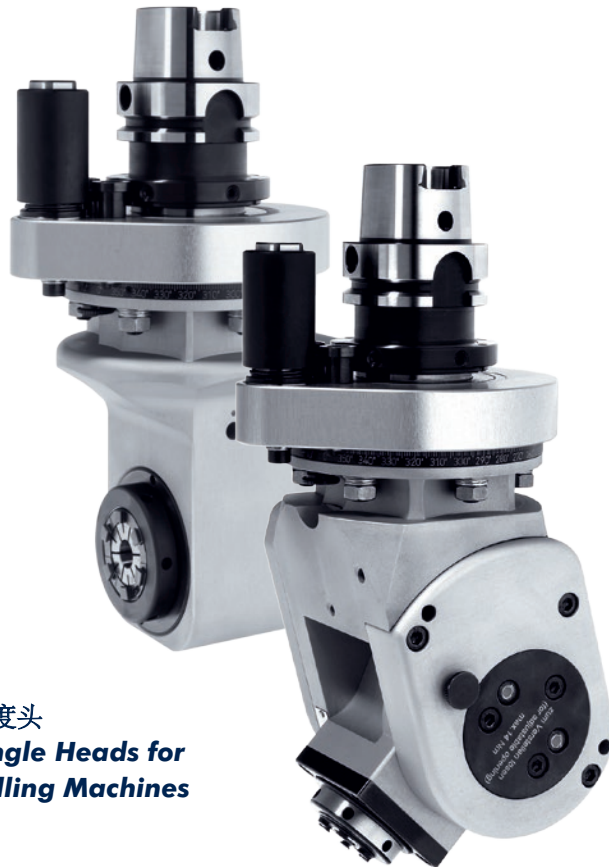
产品简介 Products



动力刀座
**Cutting Tools for Turning
Machines**



切削工具
Cutting Tools



角度头
**Angle Heads for
Milling Machines**

多轴刀座
Multi Spindle Units



超精刀柄
Clamping Technology



非标解决方案
Special Solutions



创新革命工业 4.0 (IIoT) Innovations for Industry 4.0 (IIoT)

Free Your Tool Monitoring with **eltimon**®



革命性的 **eltimon** 系统（电子实时工具集成监控），用于动力刀座和角度头的数字化实时监控

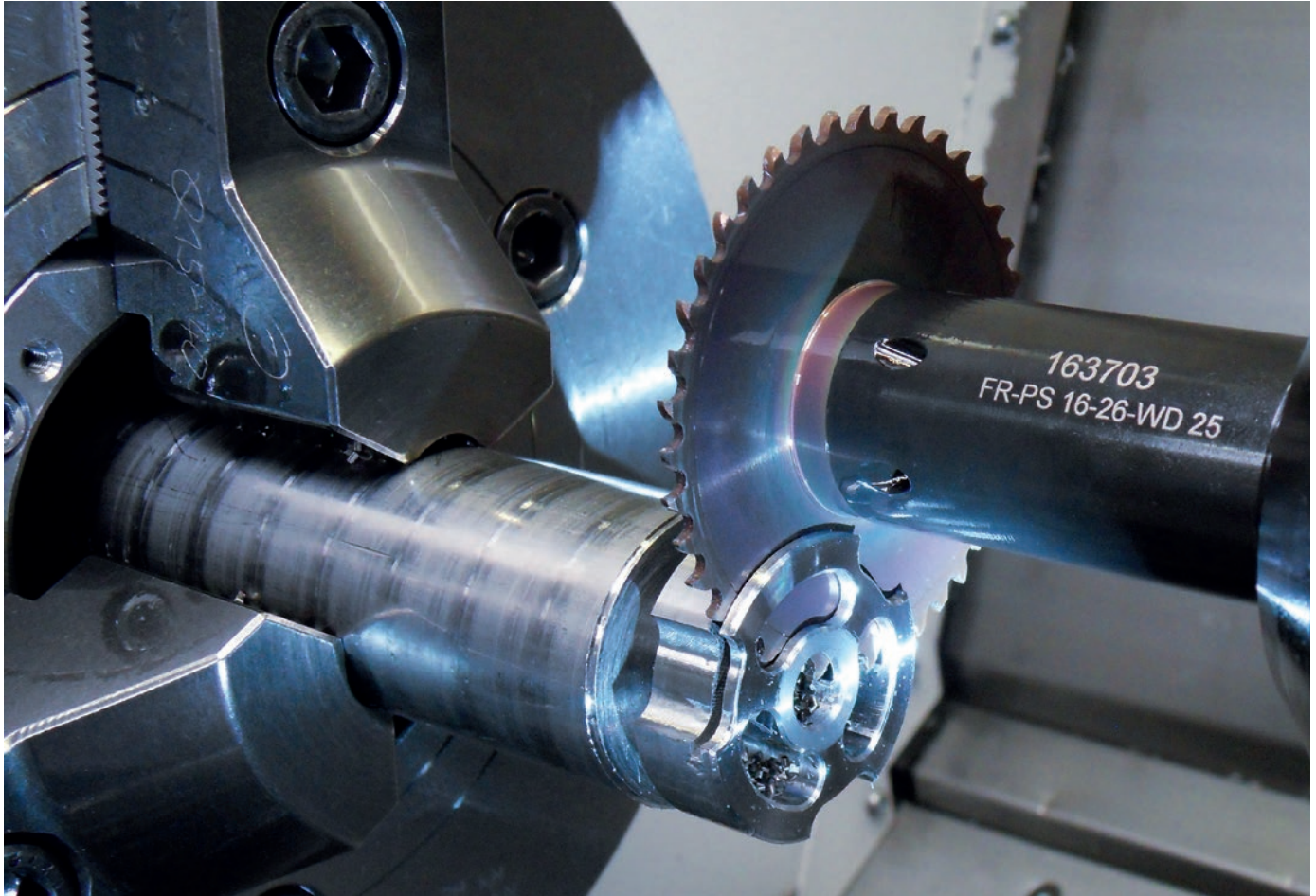
- 通过移动设备上的 **eltimon**-应用进行可视化操作
- 动力刀座中的核心数据通过 **eltimon** 内核存储
- 通过 **eltimon**-cloud 进行同步
- 实时分析，趋势和状态检测
- 维修辅助，工作记忆，状态透明化
- 实现动力刀座的最长生命周期

The Revolutionary System **eltimon** (electronic live tool integrated monitoring) for Digitization of Live Tools and Angle Heads

- Visualization using **eltimon**-app on your mobile phone
- Data storage in the **eltimon**-core in the live tool
- Synchronization through **eltimon**-cloud
- Real time analyses, trends and status
- Augmented operator, decision-support, reminders
- Maximum lifetime for your live tools

锯片刀具解决方案 Turn Cut Milling

mimaticDTF



- 加工时间快
- 工艺可靠性高
- 节省原材料
- 优化表面粗糙度
- 无毛刺
- 短刨花

- **Short processing times**
- **High process reliability**
- **Material saving**
- **High surface quality**
- **Absence of burrs**
- **Short chips**

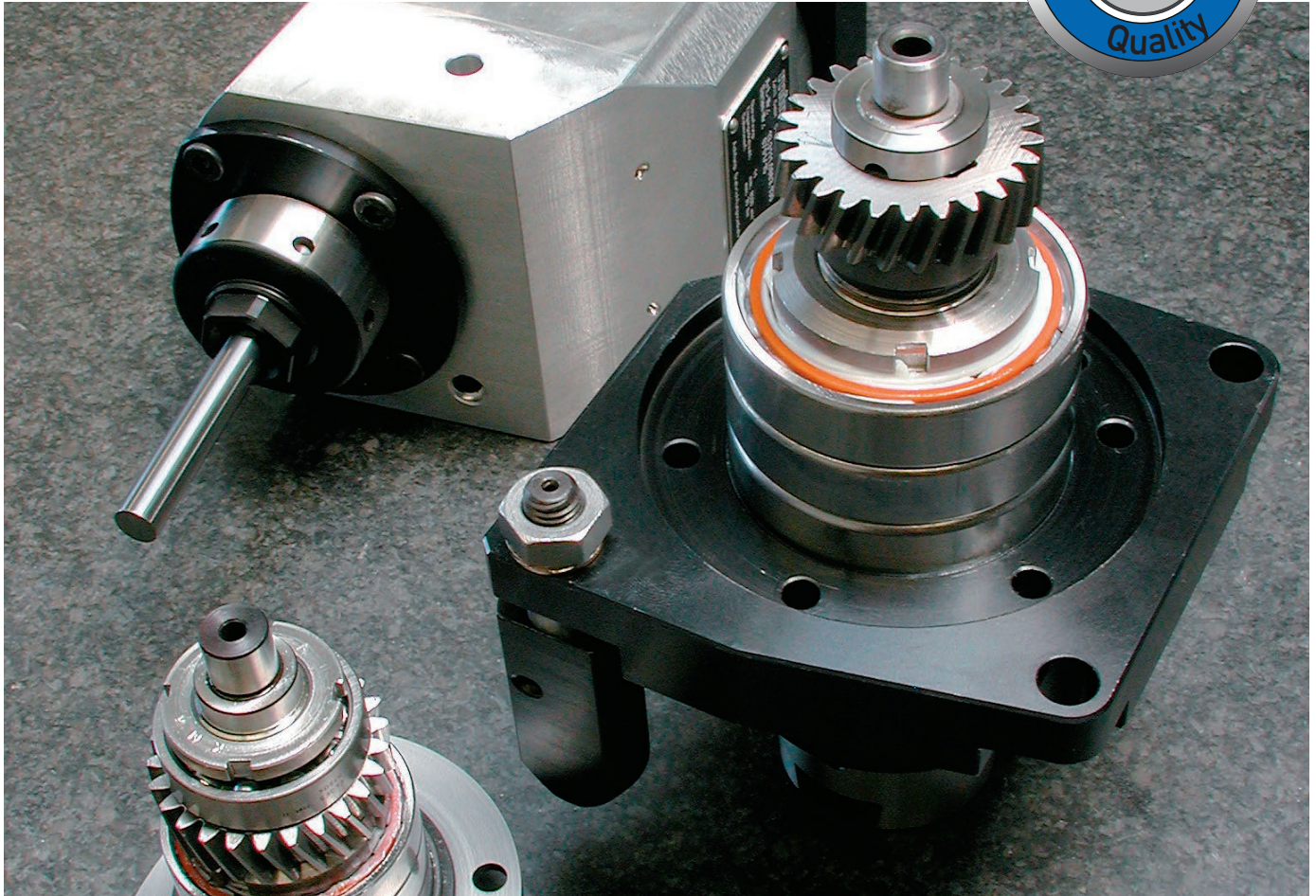
最快的切断方案！旋转切削铣削而不是车切。

Faster Parting Off Than Anybody Else!
Turn Cut Milling Instead of Parting Off.



服务保养
-角度头，动力刀座，所有品牌

Service and Maintenance of Live Tools and Angle Heads of All Brands



角度头和动力刀座的预防性
维修，保养的重要性：

- 1) 降低刀具使用成本
- 2) 确保刀具使用的可靠性
- 3) 确保加工工业的稳定性
- 4) 提高刀具使用寿命

所有轴承配件都会使用高品质的一线欧美产品，使用打磨优化的密封圈可以有效的保证动力刀座在维修后出于完美的工作状态，初次维修后我们可以继续为客户提供维修的部件提供维修质保 **mimatic-Garantie**。

**Preventive maintenance and repair
of driven tools and angle heads are important
factors to**

- 1) **Limit the tool cost**
- 2) **Ensure the tool availability**
- 3) **Ensure the continuing reliability**
- 4) **Increase the lifetime**

Only high-quality bearings and spindle bearings from German brand manufacturers are used. Together with high-quality friction-optimised seals, the proper functioning of your driven toolholder is ensured again. For this you will get the **mimatic warrenty seal**.

维修流程

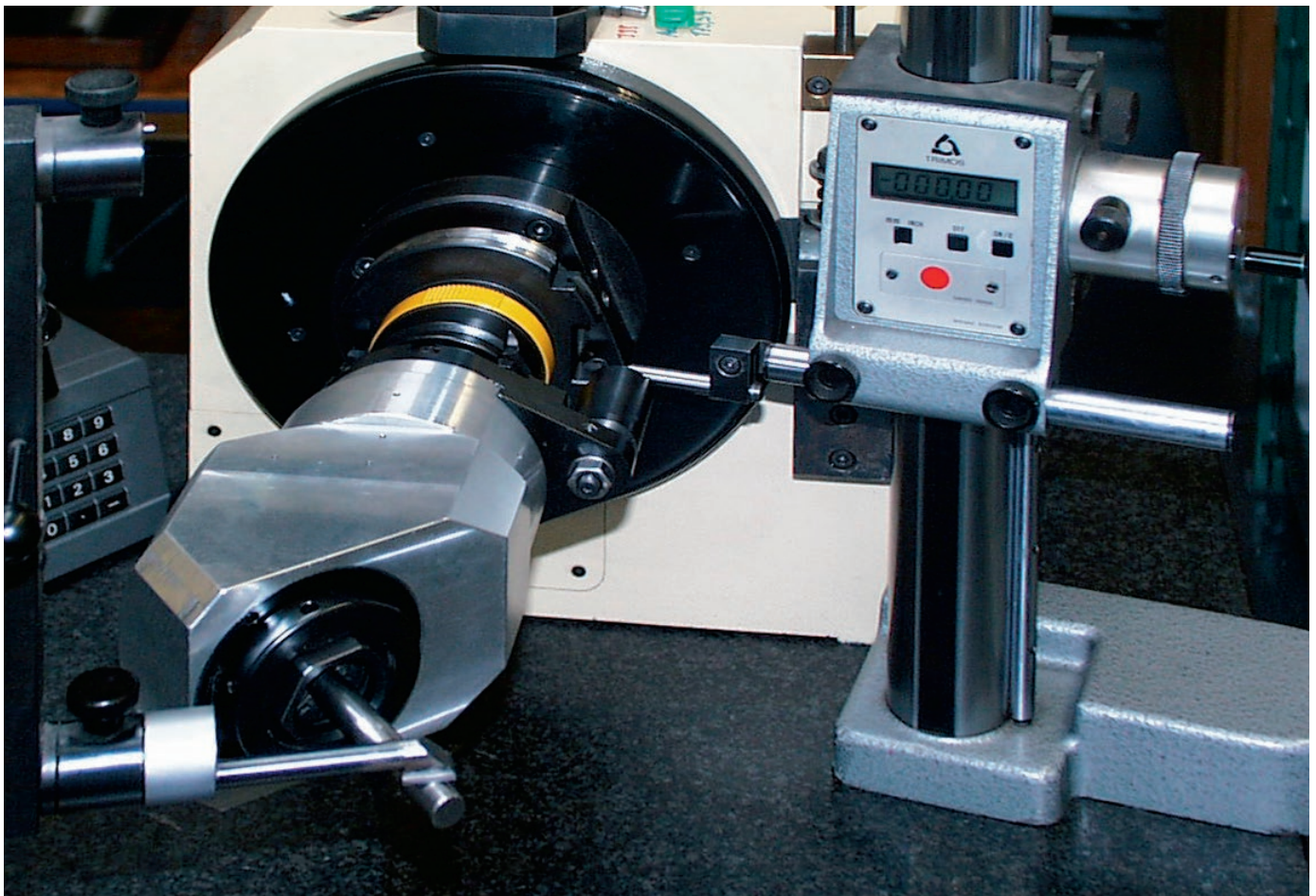
1. 客户将刀座，角度头发往mimatic上海分公司
2. 收到货后会在1-3个工作日给客户正式确认，在最多8个工作日内，向客户提供检测报告，注明损坏情况，以及受损原因，并作出相应报价。
3. 在收到客户正式的服务合同确认后，维修工作将在10个工作日内完成，并发回给客户。（非标部件损坏另计）

所有经由本公司维修的刀座和角度头，在出厂前，都会专业的设备上进行测试检测，以确保稳定工作。

Procedure

1. The driven toolholder is sent to mimatic.
2. You will receive a maintenance / repair offer info to the nature of the damage, the wear image and if possible, causes of wear (8 working days max).
3. You grant the repair order or determine the other use of the demounted parts (10 working days on your part).

All serviced or repaired driven toolholders are subjected to a long-time function test on the mimatic test bench.



产品介绍 Content

DIN 69871

通过
外型直径E和加工深度L
选型,

Selection by
Clearance Diameter E
and Milling Depth L,

90° 角度头

90° 双向-角度头

90° 内缩型角度头

90° 内缩细长型
角度头

0-98° 可调角度型
角度头

Angle Head 90°

Double
Angle Head 90°

Angle Head 90°
Offset Type

Angle Head 90°
Offset Slim Type

Angle Head,
Adjustable 0-98°



SK 40			SW			DW			ZW			ZWS			WS							
尺寸 Size	夹头 Tool holder	冷却 Coolant	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page					
0	ER 11				22			23			24	50	38	25			26					
1	ER 16	✓	91	80																		
3	ER 20	✓														75		80		-	91	
	mi	✓														100		80		-	91	
5	ER 25		110	80			125		80			103	80			82		76		-	96	
		✓	120	80			125		80			103	80			82		76		-	96	
	mi		138	80			200		80			130	80			125		76		-	96	
		✓	146	80			200		80			130	80			125		76		-	96	
7	ER 32		145	80			152		80			128	100									
		✓	155	80			152		80			128	100									
	mi		172	80		220	80		150	100												
		✓	178	80		220	80		150	100												

SK 50			SW			DW			ZW			ZWS			WS							
尺寸 Size	夹头 Tool holder	冷却 Coolant	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page					
0	ER 11				27			28			29	50	38	30			31					
5	ER 25		110	75			125		70			103	79			82		76		-	96	
		✓	120	75			125		70			103	79			82		76		-	96	
	mi		138	75			200		70			133	79			125		76		-	96	
		✓	146	75			200		70			133	79			125		76		-	96	
7	ER 32		145	75			152		70			128	94			102		100		-	108	
		✓	155	75			152		70			128	94			102		100		-	108	
	mi		172	75			220		70			152	94			135		100		-	108	
		✓	178	75			220		70			152	94			135		100		-	108	
9	ER 40		195	105			210		109			140	152									
		✓	195	105		210	109		140	152												
	mi		224	105		250	109		165	152												
		✓	224	105		250	109		165	152												

产品介绍 Content

DIN 69893 A

通过
外型直径E和加工深度L
选型

Selection by
Clearance Diameter E
and Milling Depth L,

90° 角度头

90° 双向-角度头

90° 内缩型角度头

90° 内缩细长型
角度头

0-98° 可调角度型
角度头

Angle Head 90°

Double
Angle Head 90°

Angle Head 90°
Offset Type

Angle Head 90°
Offset Slim Type

Angle Head,
Adjustable 0-98°



HSK 63			SW			DW			ZW			ZWS			WS		
尺寸 Size	夹头 Tool holder	冷却 Coolant	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page
0	ER 11											50	38				
1	ER 16	✓	91	80													
3	ER 20	✓										75	80		-	91	
	mi	✓										100	80		-	91	
5	ER 25		110	80	32	125	80	33	103	80	34	82	76	35	-	96	36
		✓	120	80		125	80		103	80		82	76		-	96	
		138	80	200		80	130		80	125		76	-		96		
	✓	146	80	200		80	130		80	125		76	-		96		
7	ER 32		145	80		152	80		128	100							
		✓	155	80	152	80	128	100									
		172	80	220	80	150	100										
	✓	178	80	220	80	150	100										

HSK 100			SW			DW			ZW			ZWS			WS		
尺寸 Size	夹头 Tool holder	冷却 Coolant	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page
0	ER 11											50	38				
5	ER 25		110	75		125	70		103	79		82	76		-	96	
		✓	120	75	125	70	103	79	82	76	-	96					
		138	75	200	70	133	79	125	76	-	96						
	✓	146	75	200	70	133	79	125	76	-	96						
7	ER 32		145	75	37	152	70	38	128	94	39	102	100	40	-	109	41
		✓	155	75		152	70		128	94		102	100		-	109	
		172	75	220		70	152		94	135		100	-		109		
	✓	178	75	220		70	152		94	135		100	-		109		
9	ER 40		195	109		210	109		140	152							
		✓	195	109	210	109	140	152									
		224	109	250	109	165	152										
	✓	224	109	250	109	165	152										

产品介绍 Content

MAS-BT JIS 6339

通过
外型直径E和加工深度L
选型,

Selection by
Clearance Diameter E
and Milling Depth L,

90° 角度头

90° 双向-角度头

90° 内缩型角度头

90° 内缩细长型
角度头

0-98° 可调角度型
角度头

Angle Head 90°

Double
Angle Head 90°

Angle Head 90°
Offset Type

Angle Head 90°
Offset Slim Type

Angle Head,
Adjustable 0-98°



MAS-BT 40			SW			DW			ZW			ZWS			WS		
尺寸 Size	夹头 Tool holder	冷却 Coolant	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page
0	ER 11											50	38				
1	ER 16	✓	91	80													
3	ER 20	✓										75	80		-	91	
	mi	✓										100	80		-	91	
5	ER 25		110	80	42	125	80	43	103	80	44	82	76	45	-	96	46
		✓	120	80		125	80		103	80		82	76		-	96	
		138	80	200		80	130		80	125		76	-		96		
	✓	146	80	200		80	130		80	125		76	-		96		
7	ER 32		145	80		152	80		128	100							
		✓	155	80	152	80	128	100									
		172	80	220	80	150	100										
	✓	178	80	220	80	150	100										

MAS-BT 50			SW			DW			ZW			ZWS			WS		
尺寸 Size	夹头 Tool holder	冷却 Coolant	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page
0	ER 11											50	38				
5	ER 25		110	75		125	70		103	79		82	76		-	96	
		✓	120	75		125	70		103	79		82	76		-	96	
		138	75		200	70		133	79		125	76		-	96		
	✓	146	75		200	70		133	79		125	76		-	96		
7	ER 32		145	75	47	152	70	48	128	94	49	102	100	50	-	109	51
		✓	155	75		152	70		128	94		102	100		-	109	
		172	75	220		70	152		94	135		100	-		109		
	✓	178	75	220		70	152		94	135		100	-		109		
9	ER 40		195	109		210	109		140	152							
		✓	195	109		210	109		140	152							
		224	109		250	109		165	152								
	✓	224	109		250	109		165	152								

产品介绍 Content

ANSI-CAT

通过
外型直径E和加工深度 L
选型,

Selection by
Clearance Diameter E
and Milling Depth L,

90° 角度头

90° 双向-角度头

90° 内缩型角度头

90° 内缩细长型
角度头

0-98° 可调角度型
角度头

Angle Head 90°

Double
Angle Head 90°

Angle Head 90°
Offset Type

Angle Head 90°
Offset Slim Type

Angle Head,
Adjustable 0-98°

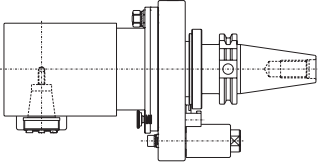
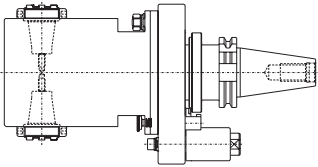
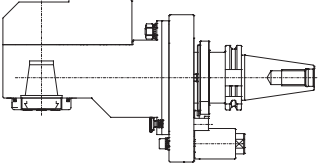
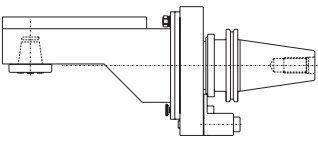
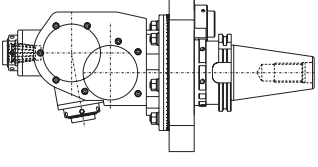
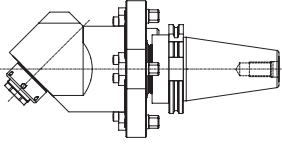


ANSI-CAT 40			SW			DW			ZW			ZWS			WS		
尺寸 Size	夹头 Tool holder	冷却 Coolant	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page
0	ER 11											50	38				
1	ER 16	✓	91	80													
3	ER 20	✓										75	80		-	91	
	mi	✓										100	80		-	91	
5	ER 25		110	80	52	125	80	53	103	80	54	82	76	55	-	96	56
		✓	120	80		125	80		103	80		82	76		-	96	
		138	80	200		80	130		80	125		76	-		96		
	✓	146	80	200		80	130		80	125		76	-		96		
7	ER 32		145	80		152	80		128	100							
		✓	155	80	152	80	128	100									
		172	80	220	80	150	100										
	✓	178	80	220	80	150	100										

ANSI-CAT 50			SW			DW			ZW			ZWS			WS		
尺寸 Size	夹头 Tool holder	冷却 Coolant	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page	E Ø mm	L ₁ mm	页码 Page
0	ER 11											50	38				
5	ER 25		110	75	57	125	70	58	103	79	59	82	76	60	-	96	61
		✓	120	75		125	70		103	79		82	76		-	96	
		138	75	200		70	133		79	125		76	-		96		
	✓	146	75	200		70	133		79	125		76	-		96		
7	ER 32		145	75		152	70		128	94		102	100		-	109	
		✓	155	75	152	70	128	94	102	100	-	109					
		172	75	220	70	152	94	135	100	-	109						
	✓	178	75	220	70	152	94	135	100	-	109						
9	ER 40		195	100		210	105		140	152							
		✓	195	100	210	105	140	152									
		224	100	250	105	165	152										
	✓	224	100	250	105	165	152										

产品介绍

Content

	型号	DIN	刀柄接口 Shank	页码 Page	
90° 角度头 传动比 $i = 1:1$ 冷却方式: 无/外冷/内冷 Angle Head 90° Gear Ratio $i = 1:1$ Coolant supply: without / external / internal		SW	DIN 69871	SK 40 SK 50	22 27
			DIN 69893 A	HKS 63 HSK 100	32 37
			MAS-BT JIS 6339	BT 40 BT 50	42 47
			ANSI-CAT	CAT 40 CAT 50	52 57
90° 双向-角度头 传动比 $i=1:1$ 冷却方式: 无/外冷 Double Angle Head 90° Gear Ratio $i = 1:1$ Coolant supply: without / external		DW	DIN 69871	SK 40 SK 50	23 28
			DIN 69893 A	HKS 63 HSK 100	33 38
			MAS-BT JIS 6339	BT 40 BT 50	43 48
			ANSI-CAT	CAT 40 CAT 50	53 58
90° 内缩型角度头 传动比 $i=1:1$ 冷却方式: 无/外冷/内冷 Angle Head 90° Offset Type Gear Ratio $i = 1:1$ Coolant supply: without / external / internal		ZW	DIN 69871	SK 40 SK 50	24 29
			DIN 69893 A	HKS 63 HSK 100	34 39
			MAS-BT JIS 6339	BT 40 BT 50	44 49
			ANSI-CAT	CAT 40 CAT 50	54 59
90° 内缩细长型角度头 传动比 $i=1:1$ 冷却方式: 无/外冷 Angle Head 90° Offset Slim Type Gear Ratio $i = 1:1$ Coolant supply: without / external		ZWS	DIN 69871	SK 40 SK 50	25 30
			DIN 69893 A	HKS 63 HSK 100	35 40
			MAS-BT JIS 6339	BT 40 BT 50	45 50
			ANSI-CAT	CAT 40 CAT 50	55 60
0-98° 可调角度型角度头 传动比 $i = 1:1$ 或者 $1:2,25$ 冷却方式: 内冷 Angle Head, Adjustable 0-98° Gear Ratio $i = 1:1$ or $1:2,25$ Coolant supply: internal		WS	DIN 69871	SK 40 SK 50	26 31
			DIN 69893 A	HKS 63 HSK 100	36 41
			MAS-BT JIS 6339	BT 40 BT 50	46 51
			ANSI-CAT	CAT 40 CAT 50	56 61
固定角度非标角度头 Angle Head with Fixed Angle		FW	Auf Anfrage lieferbar. Available on request.		

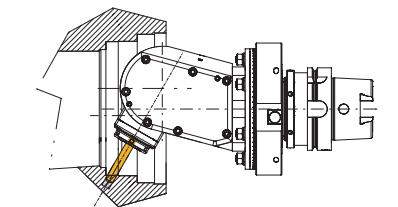
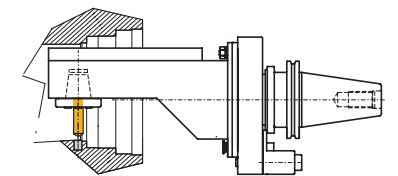
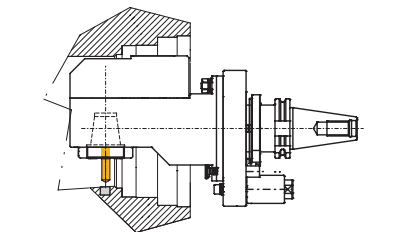
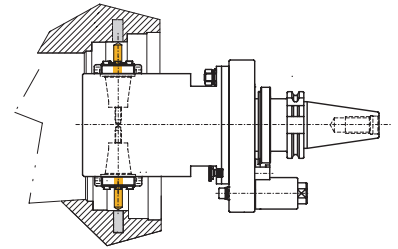
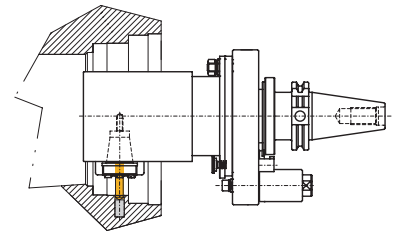
打孔，铣面，角度头 Angle Drilling Heads and Cutter Heads

用于完整加工的mimatic[®] 角度头不再需要二次装夹工件，从而显著降低整个生产过程中的生产成本，提供加工的合理性和灵活性。角形头还可以加工壳体或孔内难以达到的区域。

mimatic[®] 角度头可用于所有通用机器，自动或手动换刀的CNC加工中心和非标机床。使用角度头可以针对对应的加工工件进行了优化设计。

mimatic[®] angle heads for a complete, integrated machining: It is now no longer necessary to repeatedly relocate tools, which means a considerable reduction in production costs, rationalization and the increase in flexibility over the entire production process. They allow you to work on inaccessible areas within housings or bores.

mimatic[®] angle heads can be used in all popular machine concepts, such as CNC machining centers with automatic or manual tool change and special-purpose machines with fixed insert. They are optimally designed for the respective machining task.



mimatic® 角度头的产品优势 Features of the mimatic® Angle Heads

为了实现平稳运行和高效动力传动，我们的角度头使用斜齿轮和螺旋齿锥齿轮箱以及硬化和磨削的斜齿轮减速箱。

We use ground bevel gears with helical profile as well as hardened and ground spur gears to ensure smooth operation and high power transmission.

型号版本

- mimatic® 提供所有欧洲和国际刀柄型号的角度头：
- **SK** 依据 **DIN 69871, ANSI-CAT, MAS-BT** 和
- **HSK** 依据 **DIN 69893 - Form A**
- 以及其他标准和尺寸也可以提供
- 具有标准扭矩符合 **ISO 9524** (客户定制)
- 可按要求提供适合机床的3点支撑和挡块
- 自动或手动换刀
- 用于钻孔，铰孔，扩孔，螺纹加工和铣削加工
- 可以加工其他方式无法进入的工件区域（例如内部加工）
- 针对复杂加工问题的非标特殊结构
- 可提供单轴，双轴或多轴角度头
- 轴向角等于或不等于90°或可调节角度头
- 可根据要求通过主轴提供内部冷却系统(70 bar)
- 高扭矩传输
- 标准夹头**„ER“** 根据 **DIN 6499** 或模块化工具快速更换系统 **„mi“** – 适用于所有常用刀柄（夹头，Weldon，Whistle-Notch，Hydrodehn，收缩夹头，组合心轴等）
- 使用mimatic® **„SYNAX“** 螺纹快换夹头

Versions

- mimatic® angle heads are available in all European and international shank variants:
- **SK per DIN 69871, ANSI-CAT, MAS-BT and**
- **HSK to DIN 69893 – Form A**
- other standards and sizes are also available on request
- With **standard torque support according to ISO 9524** (to be adapted by the customer)
- Available on request with 3-point support adapted to the machine and stop block
- Tool changing manual or automatic
- For drilling, reaming, countersinking, threading and milling
- Allows the machining of sections of the workpiece which are otherwise inaccessible (e.g. internal machining)
- A large number of special, customized designs for complex machining problems
- Single, dual or multi-spindle variants are available
- Fixed angles can be made, as opposed to using Adjustables or standard 90° Heads
- Available on request with internal coolant supply via the spindle (70 bar)
- High torque transmission
- Available as **standard with collet chuck model „ER“ according to DIN 6499 or with our modular „mi“ quick-change tool system** – compatible with all popular tool fittings (collet chucks, Weldon, Whistle-Notch, hydraulic chucks, shrink fit chucks, combi milling arbors, etc.)
- with mimatic® **„SYNAX“ thread quick-change chuck**

mimatic „mi“

**Werkzeug-Schnellwechselsystem
Modular Quick-Change Tool System**



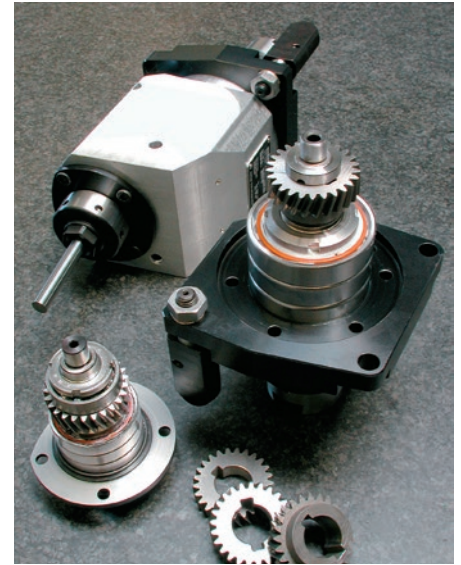
mimatic „SYNAX“

**Gewinde-Schnellwechselfutter
Tapping Quick-Change Holder**



mimatic[®] 角度头的结构 Design of the mimatic[®] Angle Heads

- 高精度主轴轴承质量 **P4**具有中等预载荷 (轴承润滑, 使用寿命), 适用于高速 (最大 15.000 U/min)
- 高刚性主轴轴承 (内部刀具接收主轴, 即壳体内部的力施加点, 因此杠杆作用小)
- 锥齿轮配合螺旋齿
- 采用高性能润滑脂永久润滑减速器 (低维护)
- 冷却系统选项:
 - 无冷却
 - 外冷, 喷头
 - i内冷通过轴柄 („i.K.“ – 包带密封衬套的, 硬化反向旋转盘, 硬质密封件和各种O形圈)
- 使用硬质优化密封件和PTFE 密封环, 以获得更高的速度, 耐高温
- 键槽位于挡块位置可自由调节 (0-360° 通过调节环上的6个固定螺丝)
- 角度头可**360°**旋转和无级调节 - 适用于角度旋转装置, 另外还有 6 x 15° 分度
- 标准角度头最大转速**15.000 U/min**和最大扭矩 **150 Nm**
- 扭矩支撑根据**ISO 9524**标准设计。可以由客户非标定制。
- 可提供各种标准定位块。如有必要, 客户须在机床上对其进行调整和安装。
- **High-precision spindle bearing, P4 quality with medium initial tension (lifetime lubrication of bearing), suitable for high speeds (up to 15,000 rpm)**
- **Stabilized spindle bearing (inside tool holding spindle, i.e. point of load incidence within the housing, therefore low leverage)**
- **Bevel gear sets with helical profile**
- **Permanent lubrication of the gear with heavy-duty lubricant (low-maintenance)**
- **Possibilities for coolant supply:**
 - **without**
 - **external via coolant pipe**
 - **internal via tool holding spindle („i.K.“ – package with packing sleeves, hardened upthrust washer, friction-optimized seals and various O-rings)**
- **Use of friction-optimized seals with PTFE sealing lips, for higher speeds, high temperature resistance**
- **Output orientation is fully adjustable (0–360° via the 6 setscrews on the adjusting ring)**
- **Angle head can be rotated through 360° and is infinitely variable – additional 6 x 15° index-ations for adjustable angle units**
- **High speeds up to 15,000 rpm and high torques up to 150 Nm**
- **The torque support is designed according to ISO 9524 as standard. This can be adapted by the customer**
- **Different standard stop block versions are available. If necessary, these are to be adapted and fitted to the machine tool by the customer.**



性能参数 Performance Values

下表中规定的扭矩 M_{max} 是指无冲击加工 (例如螺纹切削)。对于涉及主要冲击载荷 (例如铣削或多边撞击) 的过程, 需要考虑高达 50% 或更多的值降低。
呈现的值 n_{max} 和 P_{max} 是短时操作的准则值。

允许的相对运行持续时间取决于

- 在轴柄的型号上 (带或不带齿轮)
- 对于冷却系统和冷却类型 (通过轴柄外部或内部)
- 关于加工扭矩

在最大负载值的约 60% 情况下, 计算的工作寿命大约为 2000 小时, 带齿轮的轴柄在更高速度下产生更多噪音!

The torques M_{max} specified in the tables below refer to shock-free processing (e.g. threaded cutting). For processes involving major shock loads (e.g. milling or multi-edge knocking), a value reduction of up to 50% and more needs to be taken into account.

The values n_{max} and P_{max} rendered are guideline values for short-time operation.

The permissible relative operating duration depends

- on the version of the spindle unit (with or without gear)
- on the presence of a cooling system and the type of cooling (external or internal through the tool spindle)
- on the processing torque

At a charge of about 60% of the maximum values the working life calculated amounts to approx. 2000 hours Spindle units with gears produce more noise at higher speeds!

操作说明

初始启动: 为了确保提高使用寿命, 正确启动运行非常重要。该程序用于减少从单元中的内部摩擦并将润滑脂均匀分布在精密轴承中。

- 在最初运行的时候, 使用最高转速的 70% 开始。
- 切勿使角度头超过最大允许扭矩和/或最大允许转速 (请参见产品图纸)。

带内冷系统的角度头 (i.K.): 为避免过早磨损和损坏密封系统, 我们建议将冷却液过滤至最小 $40 \mu m$, 这样的过滤等级在运行中工作, 效果非常好。可以从动力刀座的技术数据中获取最大的每个可能的冷却压力。带内冷的动力刀座。

通过轴柄 (i.K.) 不应该没有冷却。在使用动力刀座之前, 冷却系统液应打开, 在干燥条件下运行会损坏内部密封。

服务时间: 动力刀座的使用寿命在很大程度上取决于应用。经常使用的部件, 如轴承和密封件, 需要更换。

我们建议您将动力刀座发送到我们的服务中心, 以便每年至少进行一次完整的清洁和重新润滑。

对于带内部冷却液供应的动力刀座, 维修间隔应缩短至 6 个月。

Operating Instructions

Initial Start-up: To ensure long tool life it is important to properly "run-in" the tools. This procedure serves to reduce the internal friction in the driven unit and to evenly distribute the grease in the precision bearings.

- Max. RPM in the first operation hour should not exceed 70% of the maximum permissible RPM.
- Never run the tool above the maximum permissible torque rate and/or maximum permissible RPM (see also the drawing of the unit).

Tools with internal coolant through the spindle (i.C.): To avoid premature wear and damage to the seal system we recommend to filter the coolant to $40 \mu m$ minimum. Filter grades of $40 \mu m$ worked in operation with very good results. The maximum permissible coolant pressure can be taken from the technical data of the driven toolholder. Driven Toolholders with internal coolant

through the spindle (i.C.) should never run without coolant. The coolant should flow through the tool, before the tool drive is switched on. Running in dry condition damages the internal seals.

Service interval: The tool life of the driven toolholder depends strongly on the application. Wear parts such as bearings and seals should be exchanged. We recommend to send the tools at least once annually to our service center for cleaning and regreasing. Tools with internal coolant through the spindle should be serviced every 6 months.

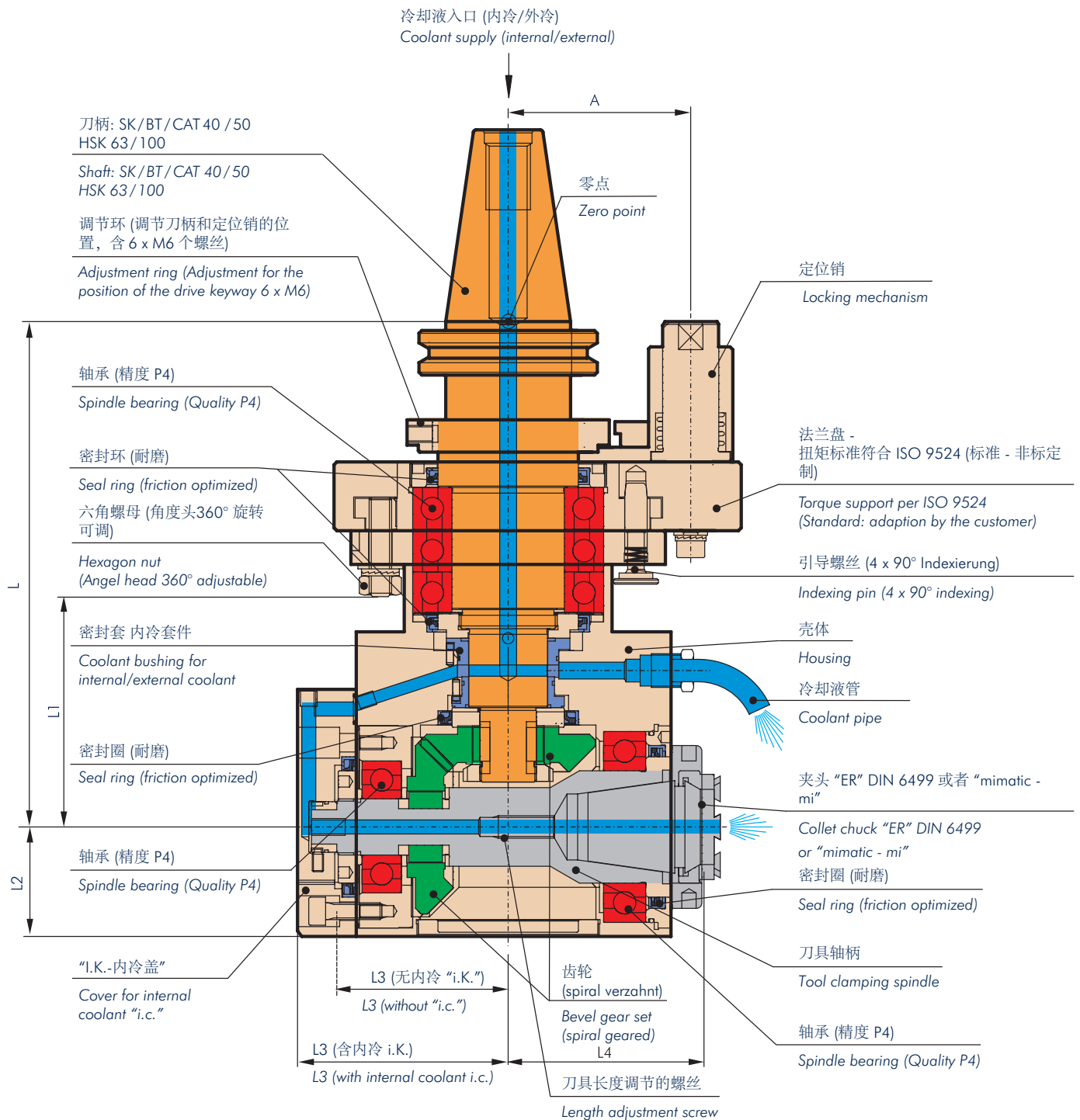
标准角度头的结构 Features of the Standard Angle Heads

- 高精度轴承技术
- 超精度圆跳
- 高刚性

mimatic® 角度头在技术上经过精心设计，可以提高工件的品质和刀具的使用寿命。

- **High-precision Bearing Technology**
- **High Concentricity**
- **High Rigidity**

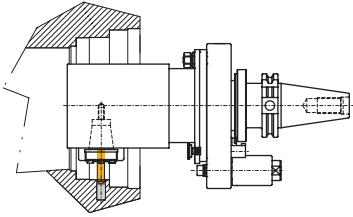
mimatic® angle heads are designed in such a way that they increase the quality of your workpieces and the service life of your tools.



SK 40

SW

90° 角度头 Angle Head 90°



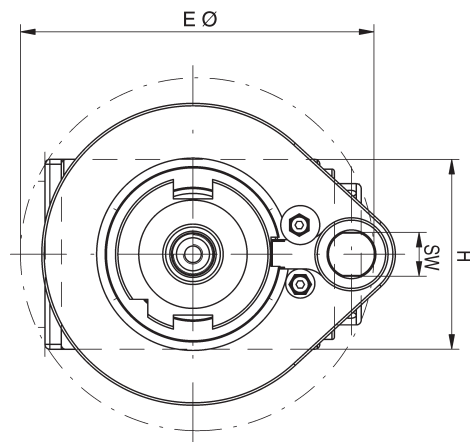
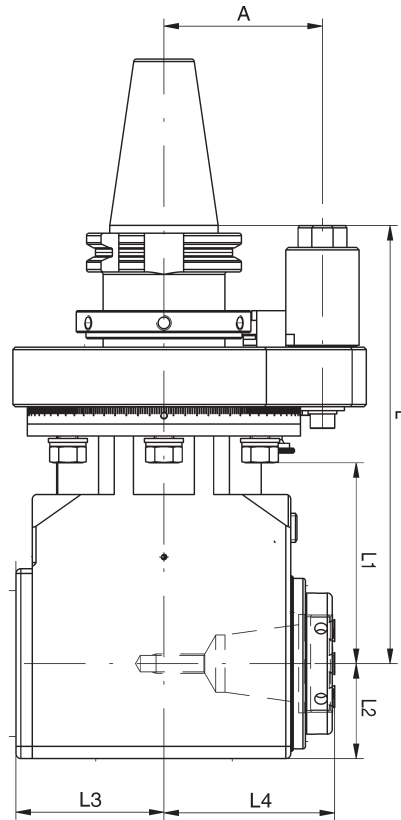
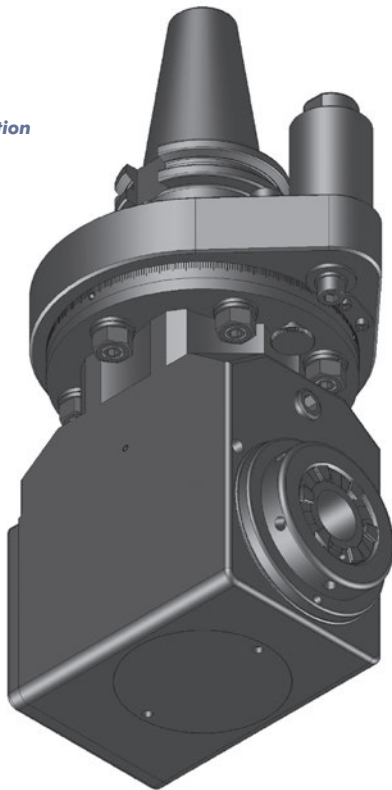
适用于单个打孔和铣削操作，空无间隙限制。

For single boring and milling operations without clearance issues.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation
direction



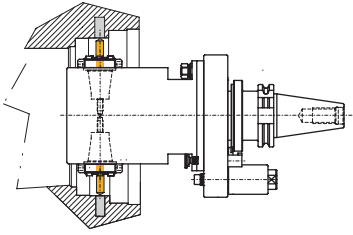
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
1	105485	105679	105695	ER 16	91	96	29,0	44	45,0	50
5	105493	162767	105507	ER 25	110	120	41,5	52	57,5	63
5	105490	162799	105513	mi 40	138	146	41,5	52	72,0	72
7	135486	105516	105539	ER 32	145	155	61,0	75	70,0	75
7	135453	162790	162791	mi 50	172	178	61,0	75	83,0	83

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
1	12 Nm	10.000	i = 1:1	180	80	22	44	65	6,0	18
5	30 Nm	8.000	i = 1:1	180	80	34	68	65	6,5	18
7	70 Nm	6.500	i = 1:1	180	80	39	78	65	8,0	18

SK 40

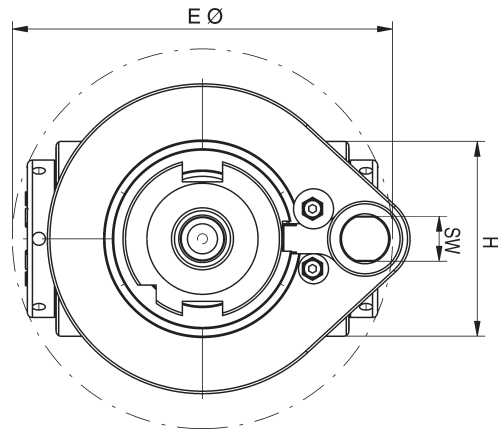
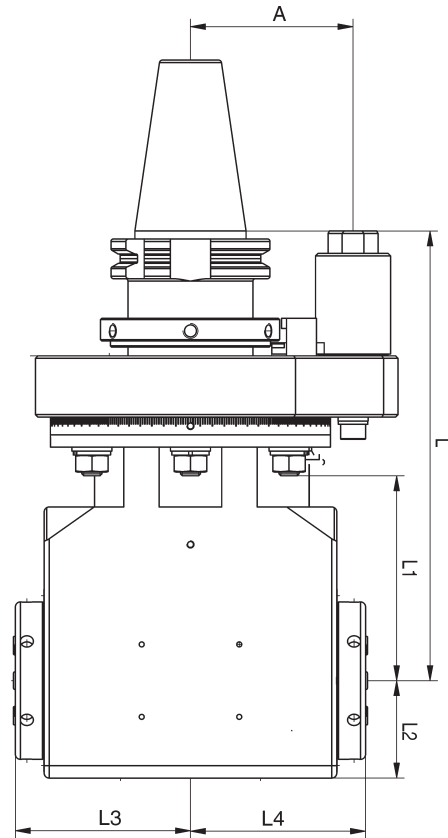
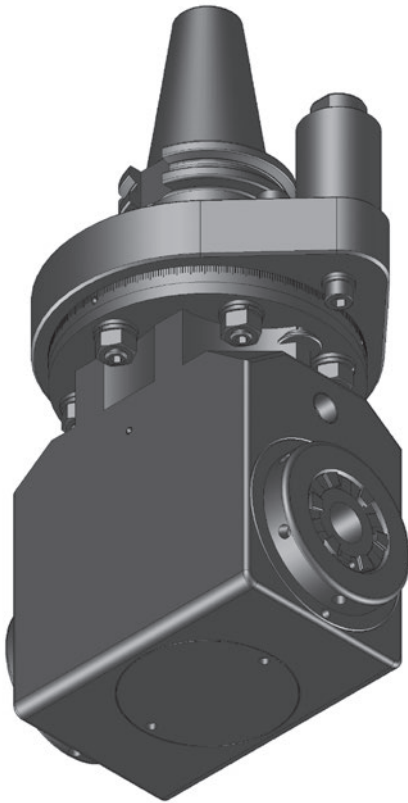
DW

90° 双向角度头 Double Angle Head 90°



双向角度头可在两个方向上进行两次打孔和铣削操作。

Double spindle unit to do two boring and milling operations in opposite directions.



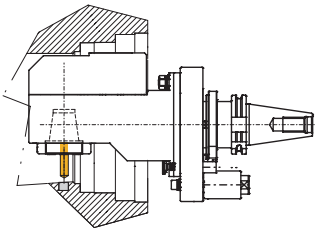
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135710	168317		2 x ER 25	125	125	62,0	62,0	62,0	62,0
5	173507	162838		2 x mi 32	200	200	76,5	76,5	76,5	76,5
7	135733	166009		2 x ER 32	152	152	71,2	71,2	71,2	71,2
7	105775	174400		2 x mi 40	220	220	88,0	88,0	88,0	88,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	180	80	39	78	65	7,5	18
7	70 Nm	6.500	i = 1:1	180	80	39	78	65	8,5	18

SK 40

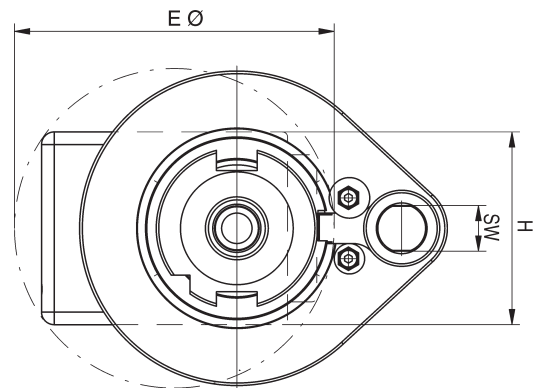
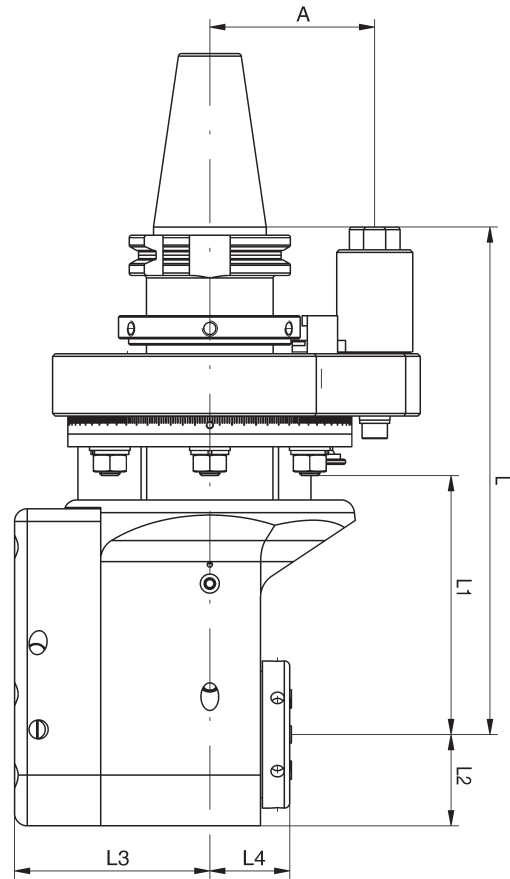
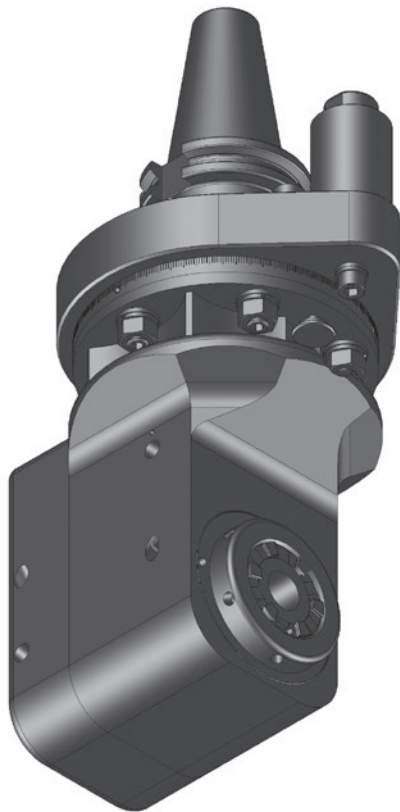
ZW

90° 内缩型角度头 Angle Head 90°, Offset Type



内缩型角度头可增加角度头长度和内冷系统

Rear offset unit with increased usable tool length and internal coolant is an option.



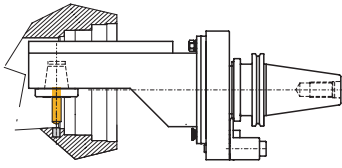
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135389	162855	168670	ER 25	103	103	57,0	57,0	35,8	41,6
5	105439	162879	162880	mi 40	130	130	57,0	57,0	50,3	50,3
7	105440	162868	105478	ER 32	128	128	77,5	77,5	32,2	38,0
7	105429	162894	162895	mi 50	150	150	77,5	77,5	55,0	55,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	180	80	28,5	57	65	6,5	18
7	70 Nm	6.500	i = 1:1	198	100	38,0	76	65	8,5	18

SK 40

ZWS

90° 内缩细长型角度头 Angle Head 90°, Offset Slim Type



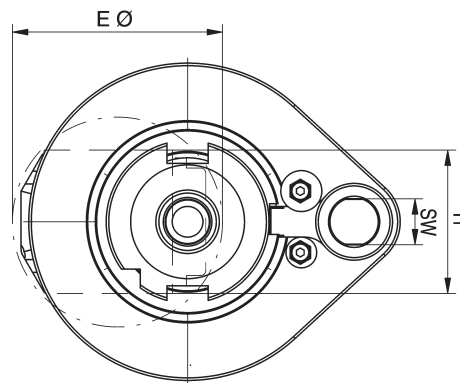
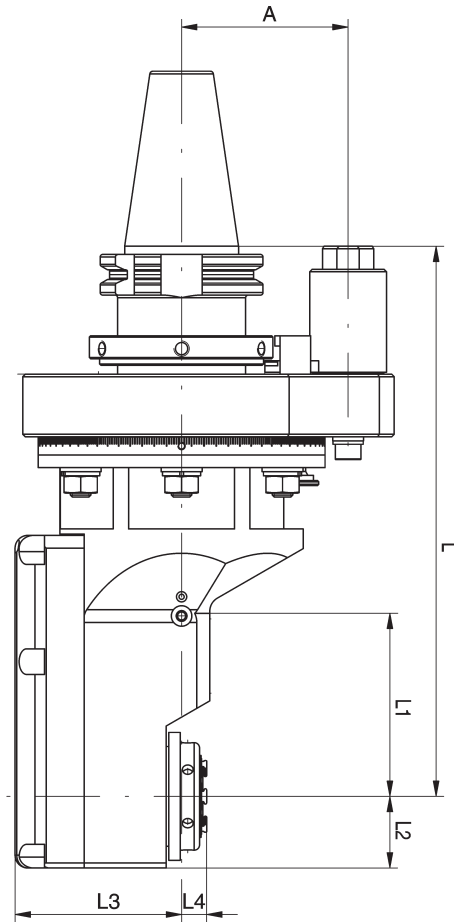
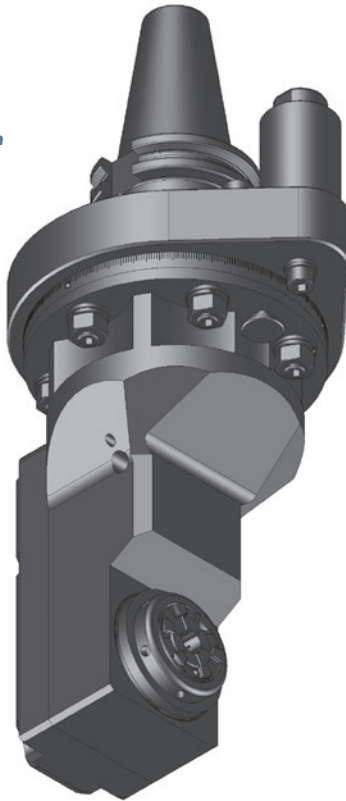
内缩细长型角度头适用于做小孔或有空间问题/空间受限制时。

Offset narrow form to slide into small bores or when clearance issues / space restrictions are issue.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation
direction



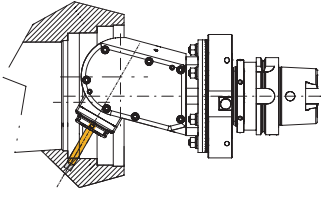
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
0	105631			ER 11	50		49,0		-8,0	
3	105665			ER 20	75		54,5		11,2	
3	173535			mi 32	100		54,5		26,0	
5	135615	162922		ER 25	82	82	65,0	65	10,0	10,0
5	135609	162934		mi 40	125	125	65,0	65	23,5	23,5

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
0	6 Nm	12.000	i = 1:1,67	213	38	20	36	65	7,0	18
3	15 Nm	10.000	i = 1:1	225	80	24	48	65	6,0	18
5	30 Nm	8.000	i = 1:1	215	76	28	56	65	6,5	18

SK 40

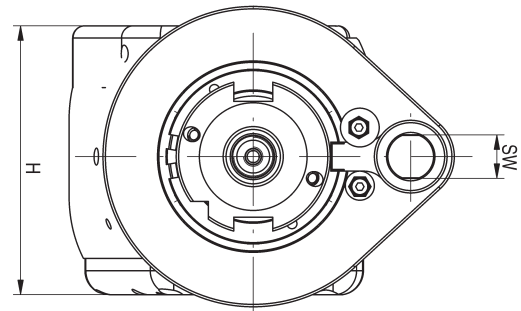
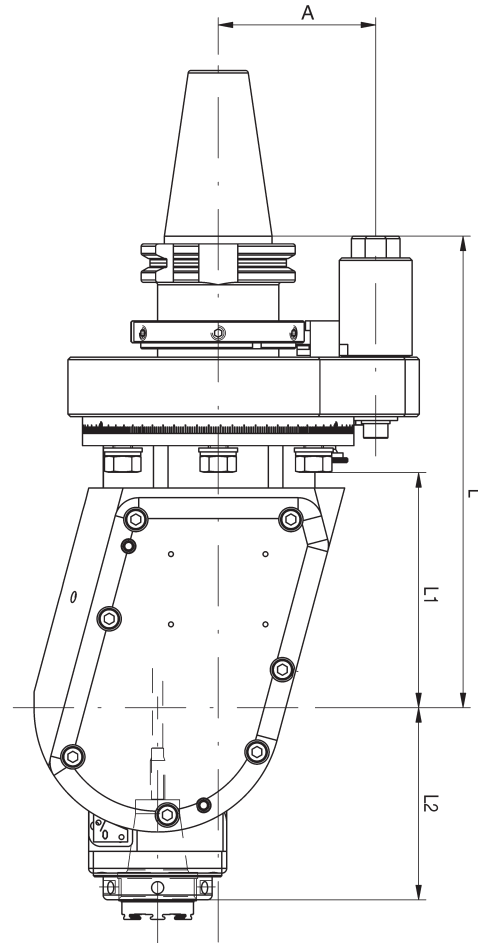
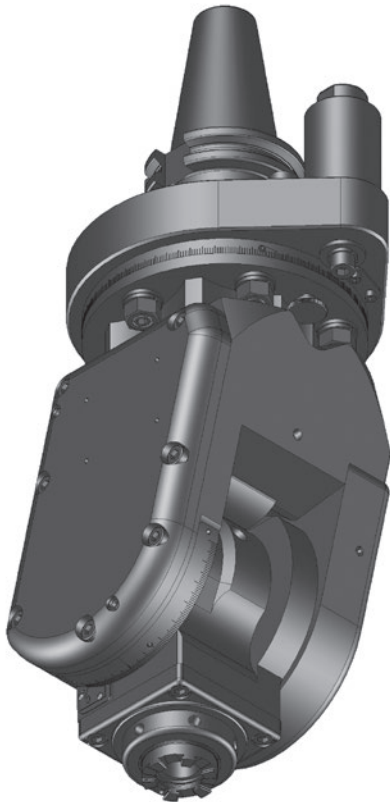
WS





0-98° 可调角度型角度头 Angle Head, Adjustable 0-98°



可调角度型角度头可在任何角度进行打孔和铣削加工。

Adjustable angle unit to do boring and milling applications at any angle.



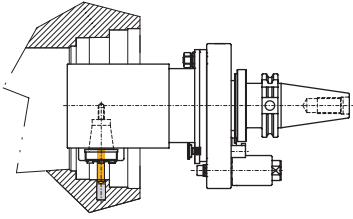
尺寸 Size	订货号 / Order No. (i=1:1)		订货号 / Order No. (i=1:2,25)		夹头 Toolholder	L2 mm	L4 mm
	 ohne / without	 intern / internal	 ohne / without	 intern / internal			
3	162793	105825	156560	105823	ER 20	75,0	20
3	156561	105832	156562	156563	mi 32	82,9	20
5	174413	105833	156580	105826	ER 25	84,0	25
5	162952	169975	162953	162954	mi 40	97,0	25

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	H mm	A mm	kg	SW
3	15 Nm	8.000 / 15.000	i = 1:1 / 1:2,25	189	91	96	65	8,0	18
5	30 Nm	7.000 / 13.500	i = 1:1 / 1:2,25	195	96	111	65	9,6	18

SK 50

SW

90° 角度头 Angle Head 90°



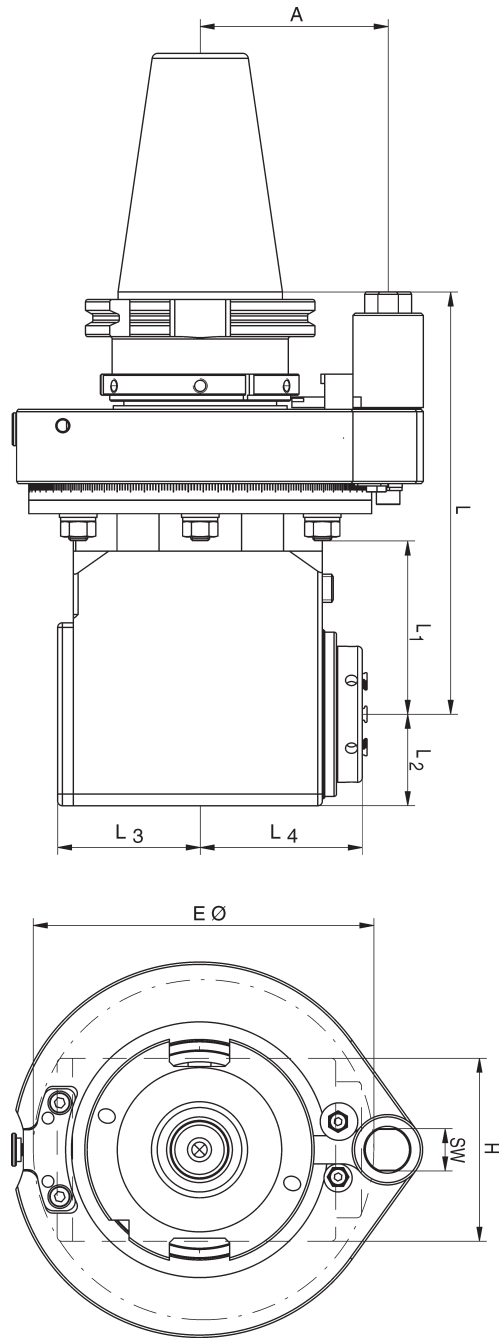
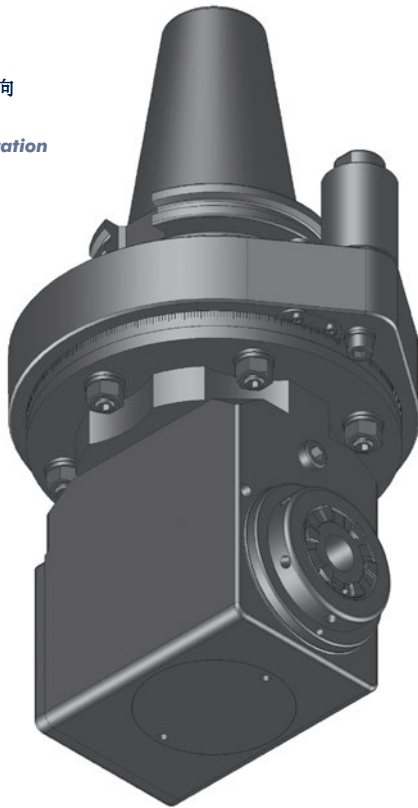
适用于单个打孔和铣削操作，空无间隙限制。

For single boring and milling operations without clearance issues.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation
direction



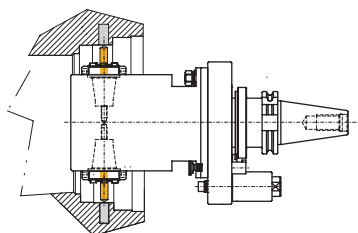
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135458	135446	135447	ER 25	110	120	41,5	52	57,5	63,0
5	167870	162806	105500	mi 40	138	146	41,5	52	72,0	72,0
7	135476	162778	166720	ER 32	145	155	61,0	75	70,0	75,0
7	105519	162795	105522	mi 50	172	178	61,0	75	83,0	83,0
9	105551	162780	169469	ER 40	195	195	81,0	81	92,0	96,0
9	173083	162784	166543	mi 63	224	224	81,0	81	111,5	111,5

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	180	75	34	68	80	10,5	18
7	70 Nm	6.500	i = 1:1	180	75	39	78	80	12,0	18
9	150 Nm	5.000	i = 1:1	215	105	52	104	80	18,0	18

SK 50

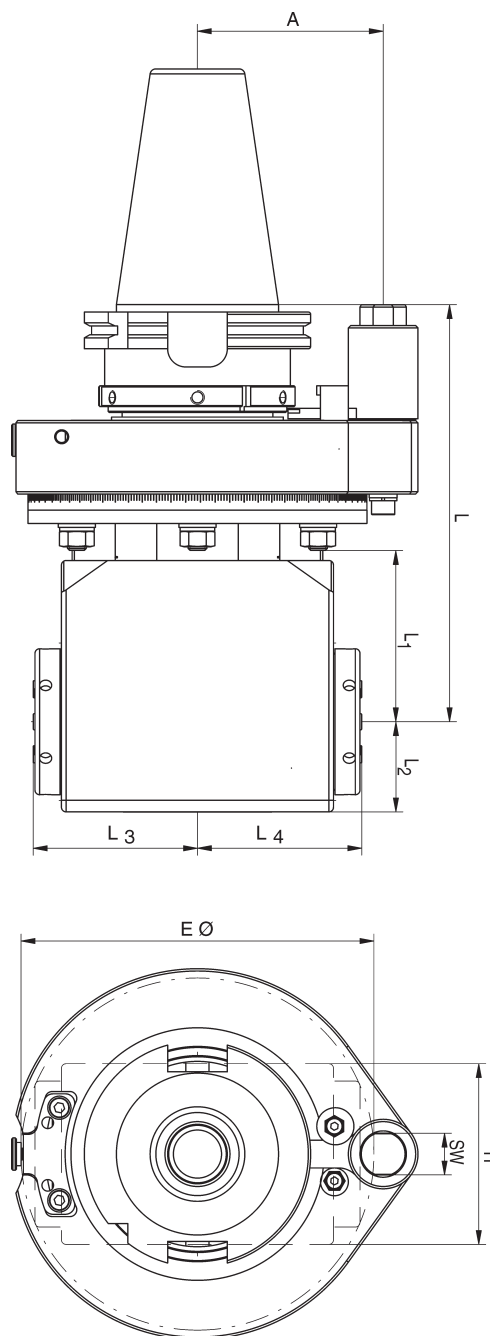
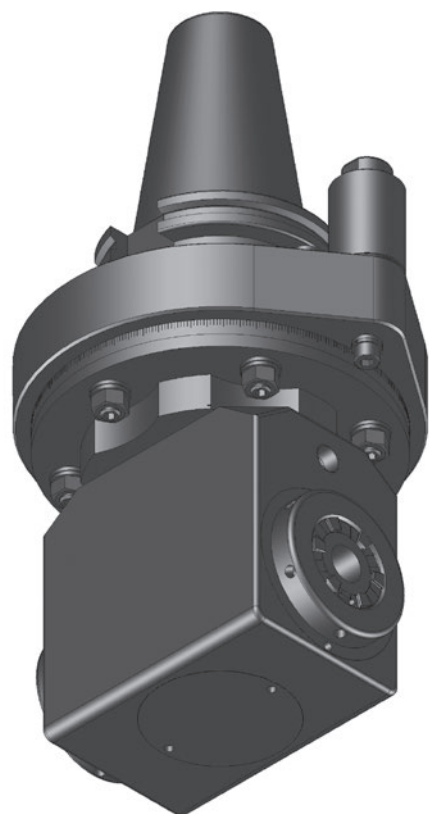
DW

90° 双向角度头 Double Angle Head 90°



双向角度头可在两个方向上进行两次打孔和铣削操作。

Double spindle unit to do two boring and milling operations in opposite directions.



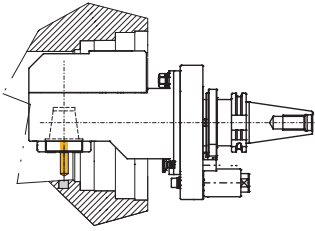
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135678	162825		2 x ER 25	125	125	62,0	62,0	62,0	62,0
5	173511	162842		2 x mi 32	200	200	76,5	76,5	76,5	76,5
7	135734	167532		2 x ER 32	152	152	71,2	71,2	71,2	71,2
7	167238	105776		2 x mi 40	220	220	88,0	88,0	88,0	88,0
9	105784	162834		2 x ER 40	210	210	103,0	103,0	103,0	103,0
9	167654	162851		2 x mi 50	250	250	116,0	116,0	116,0	116,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	180	70	34	68	80	11,5	18
7	70 Nm	6.500	i = 1:1	180	70	39	78	80	13,5	18
9	150 Nm	4.000	i = 1:1	215	109	58	108	80	20,0	18

SK 50

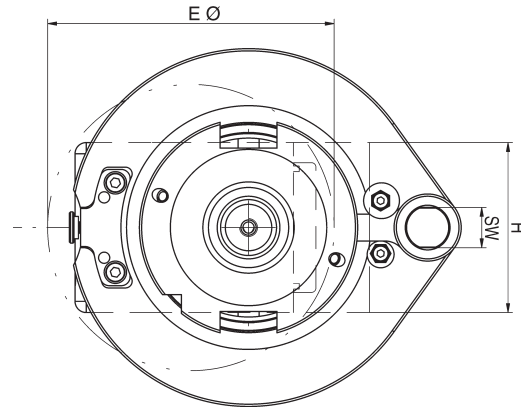
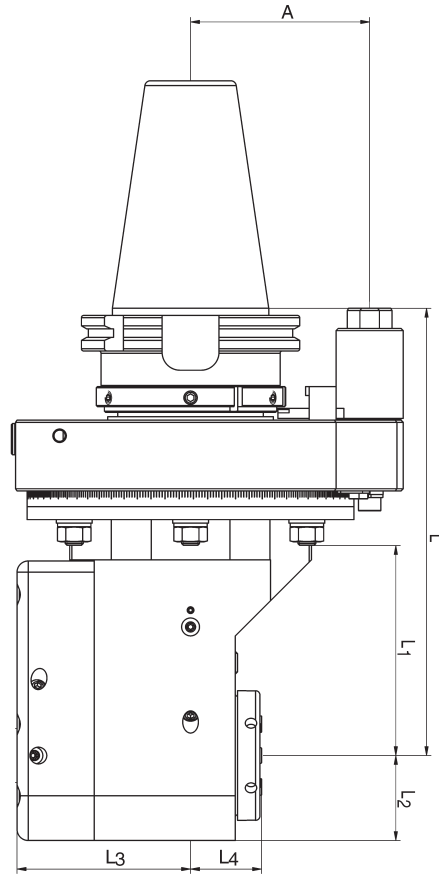
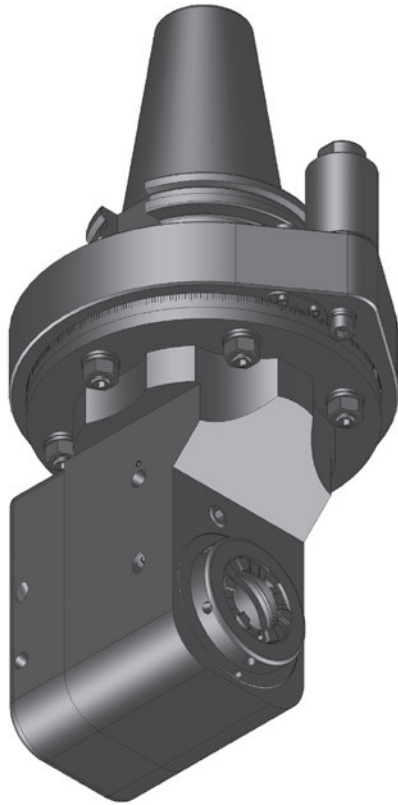
ZW

90° 内缩型角度头 Angle Head 90°, Offset Type



内缩型角度头可增加角度头长度和内冷系统

Rear offset unit with increased usable tool length and internal coolant is an option.



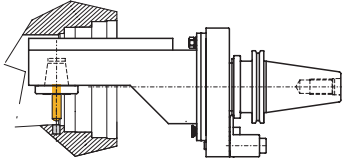
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	105416	162861	162862	ER 25	103	103	58,0	58,0	35,8	41,6
5	173523	162886	162887	mi 40	133	133	58,0	58,0	50,3	50,3
7	105430	162871	105479	ER 32	128	128	77,5	77,5	32,2	38,0
7	169908	162900	105475	mi 50	152	152	77,5	77,5	55,0	55,0
9	105482	162874	162876	ER 40	140	140	89,0	89,0	31,0	34,8
9	105468	162904	162905	mi 63	165	165	89,0	89,0	48,3	48,3

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
0	30 Nm	8.000	i = 1:1	185	79	28,5	57	80	11,5	18
3	70 Nm	6.000	i = 1:1	200	94	38,0	76	80	14,0	18
5	150 Nm	5.000	i = 1:1	260	152	52,0	104	80	19,0	18

SK 50

ZWS

Winkelkopf 90° 内缩细长型角度头 Angle Head 90°, Offset Slim Type



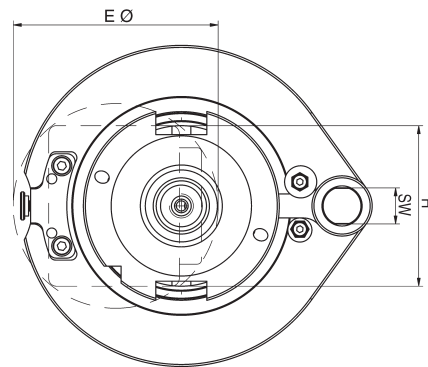
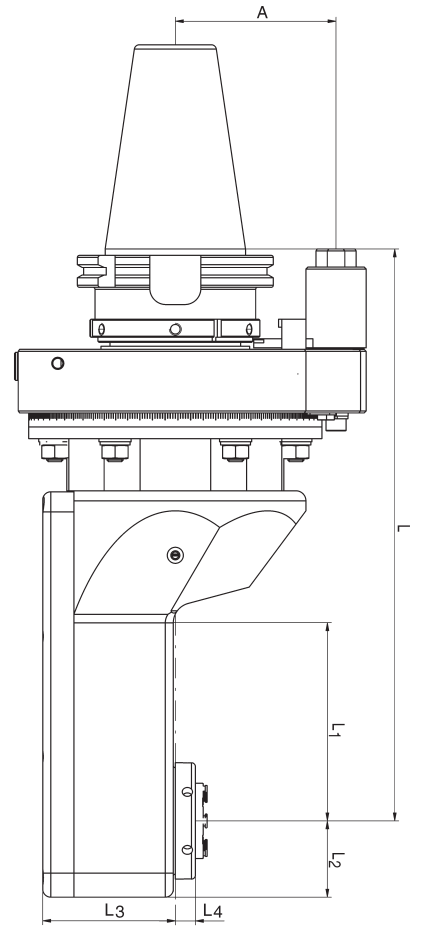
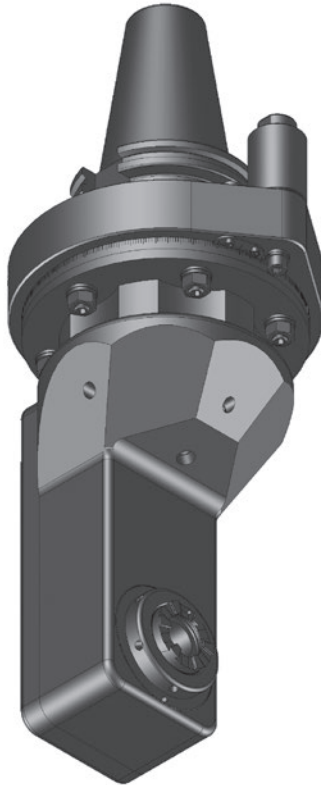
内缩细长型角度头适用于做小孔或有空间问题/空间受限制时。

Offset narrow form to slide into small bores or when clearance issues / space restrictions are issue.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation
direction



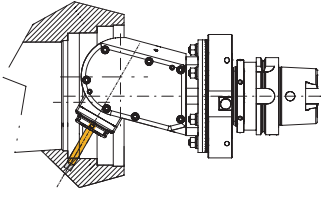
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
0	105650			ER 11	50		49		-8,0	
5	105682	162926		ER 25	82	82	65	65	10,0	10,0
5	173539	162938		mi 40	125	125	65	65	23,5	23,5
7	135643	105684		ER 32	102	102	66	66	13,0	13,0
7	167741	162942		mi 50	135	135	66	66	29,0	29,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
0	6 Nm	12.000	i = 1:1,67	227,5	38	20	36	80	11,0	18
5	30 Nm	8.000	i = 1:1	215,0	76	28	56	80	12,5	18
7	70 Nm	6.000	i = 1:1	285,0	100	38	80	80	13,5	18

SK 50

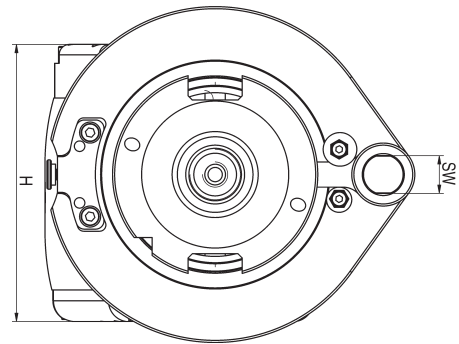
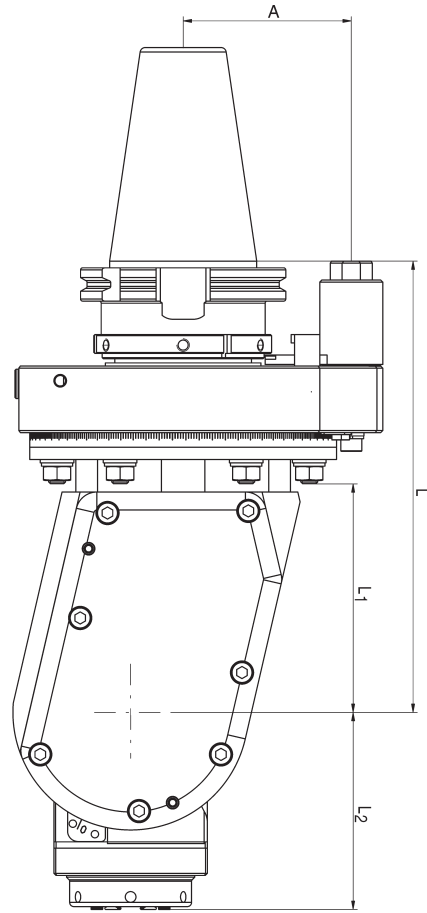
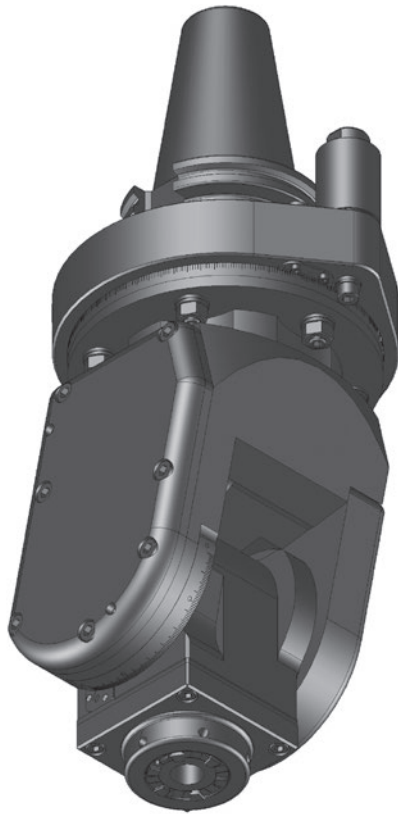
WS





0-98° 可调角度型角度头 Angle Head, Adjustable 0-98°



可调角度型角度头可在任何角度进行打孔和铣削加工。

Adjustable angle unit to do boring and milling applications at any angle.



尺寸 Size	订货号 / Order No. (i=1:1)		订货号 / Order No. (i=1:2,25)		夹头 Toolholder	L2 mm	L4 mm
	 ohne / without	 intern / internal	 ohne / without	 intern / internal			
5	162965	135816	135823	162966	ER 25	84	25
5	162967	167021	162968	162969	mi 40	97	25
7	162982	105864			ER 32	95	25
7	162989	166981			mi 50	108	25

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	H mm	A mm	kg	SW
5	30 Nm	7.000 / 13.500	i = 1:1 / 1:2,25	195	96	111	80	14,0	18
7	70 Nm	6.000	i = 1:1	215	108	132	80	16,0	18

HSK 63

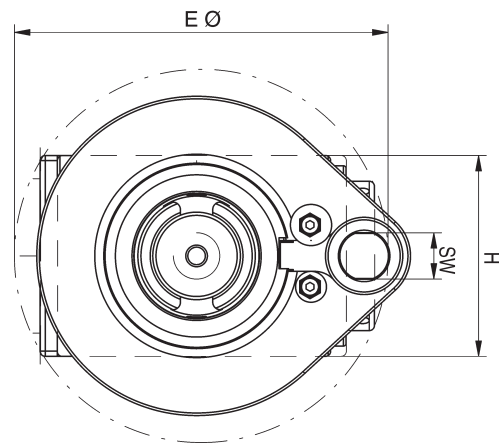
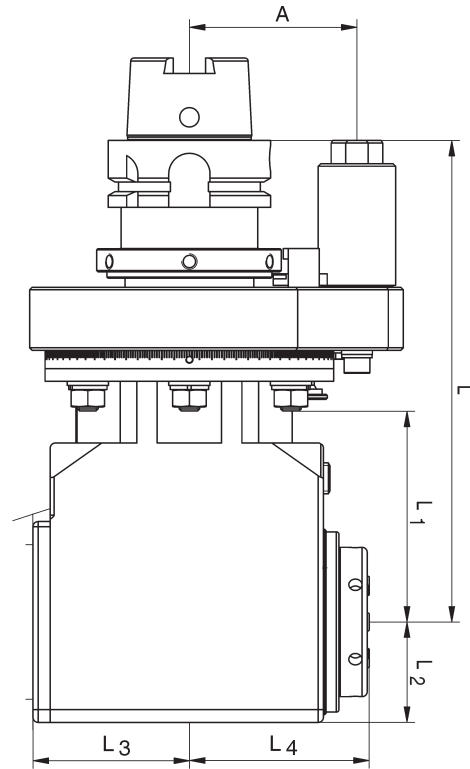
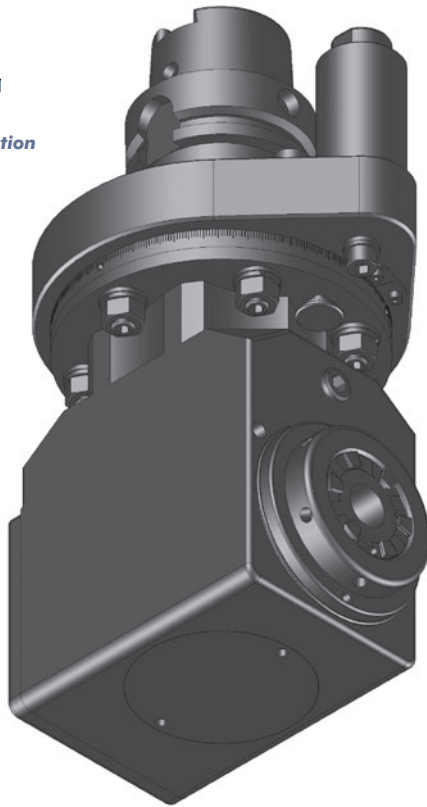
SW

90° 角度头 Angle Head 90°



注意：
逆转旋转运动方向

Attention!
Reversal of rotation direction



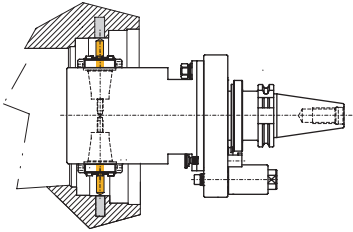
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
1	135456	162792	135452	ER 16	91	96	29,0	44	45,0	50
5	135433	105491	105501	ER 25	110	120	41,5	52	57,5	63
5	169846	162804	162805	mi 40	138	146	41,5	52	72,0	72
7	135489	105528	105533	ER 32	145	155	61,0	75	70,0	75
7	105504	162794	105540	mi 50	172	178	61,0	75	83,0	83

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
1	12 Nm	10.000	i = 1:1	187	80	22	44	65	6,0	18
5	30 Nm	8.000	i = 1:1	187	80	34	68	65	6,5	18
7	70 Nm	6.500	i = 1:1	187	80	39	78	65	8,0	18

HSK 63

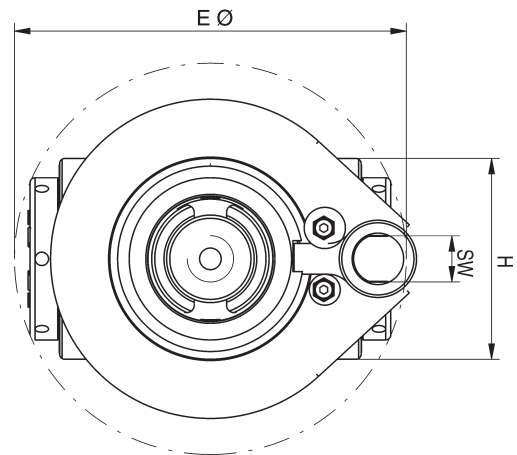
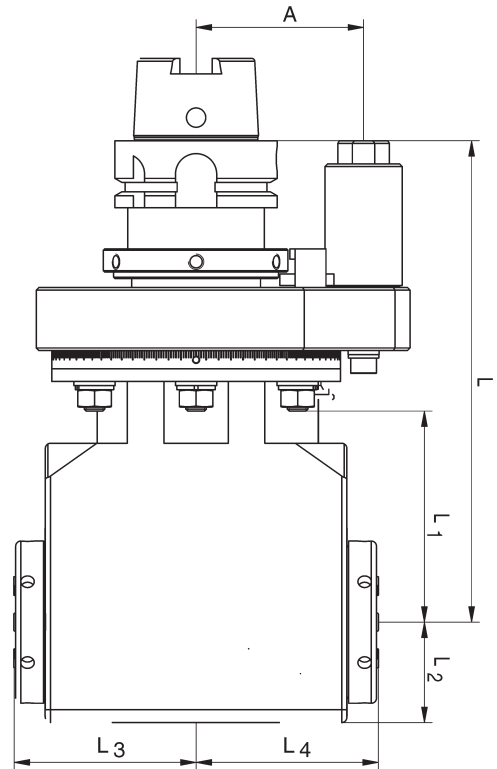
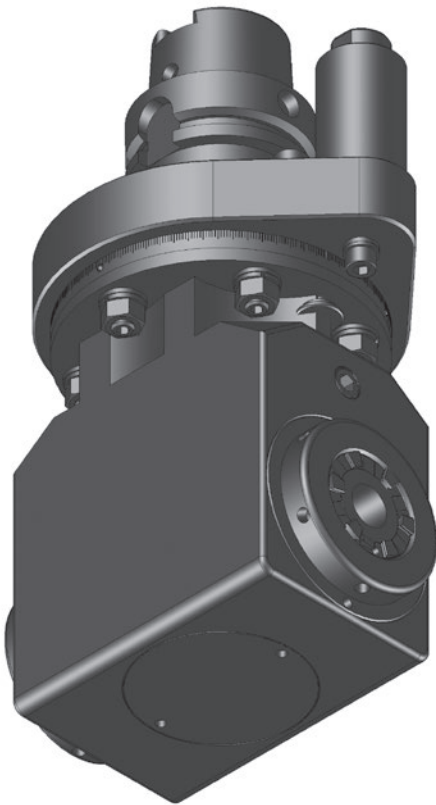
DW

90° 双向角度头 Double Angle Head 90°



双向角度头可在两个方向上进行两次打孔和铣削操作。

Double spindle unit to do two boring and milling operations in opposite directions.



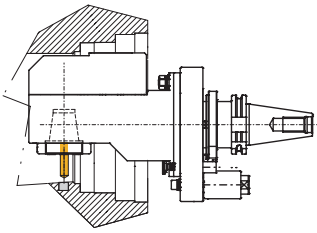
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135706	162824		2 x ER 25	125	125	62,0	62,0	62,0	62,0
5	173510	162841		2 x mi 32	200	200	76,5	76,5	76,5	76,5
7	135747	162830		2 x ER 32	152	152	71,2	71,2	71,2	71,2
7	170454	176644		2 x mi 40	220	220	88,0	88,0	88,0	88,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	187	80	39	78	65	7,5	18
7	70 Nm	6.500	i = 1:1	187	80	39	78	65	8,5	18

HSK 63

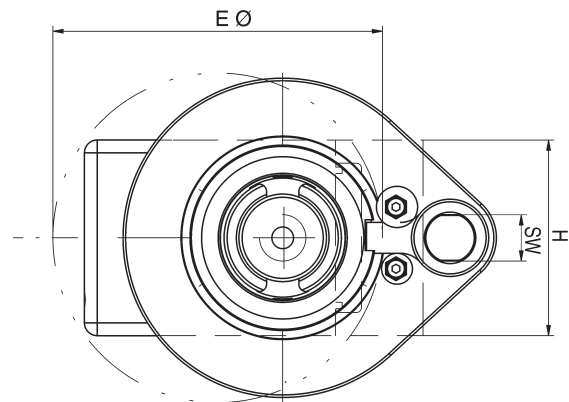
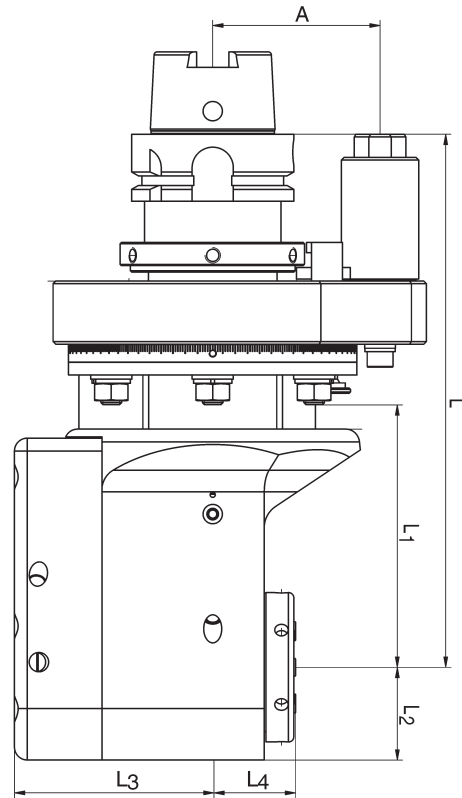
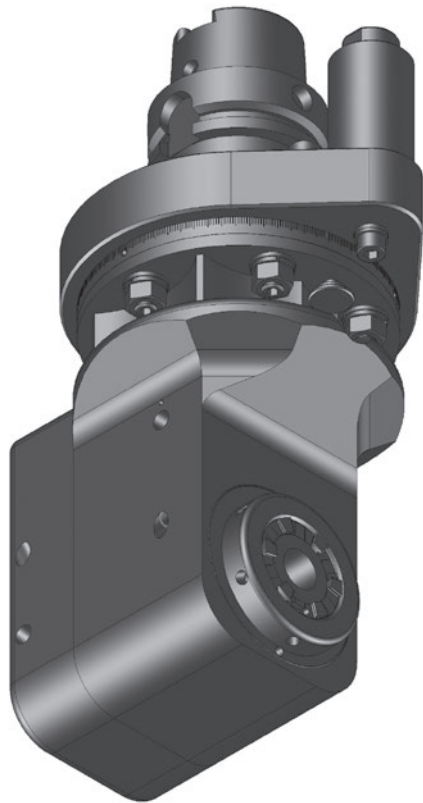
ZW

90° 内缩型角度头 Angle Head 90°, Offset Type



内缩型角度头可增加角度头长度和内冷系统

Rear offset unit with increased usable tool length and internal coolant is an option.



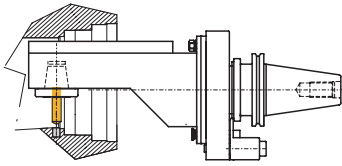
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135405	162860	167996	ER 25	103	103	57,0	57,0	35,8	41,6
5	105459	162884	162885	mi 40	130	130	57,0	57,0	50,3	50,3
7	135416	174283	135398	ER 32	128	128	77,5	77,5	34,0	38,0
7	173528	162899	167022	mi 50	150	150	77,5	77,5	55,0	55,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	187	80	28,5	57	65	6,5	18
7	70 Nm	6.000	i = 1:1	205	100	38,0	76	65	8,5	18

HSK 63

ZWS

90° 内缩细长型角度头 Angle Head 90°, Offset Slim Type



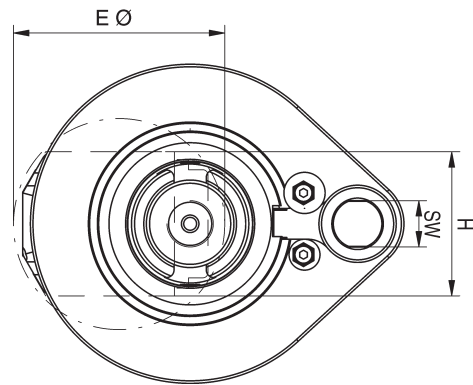
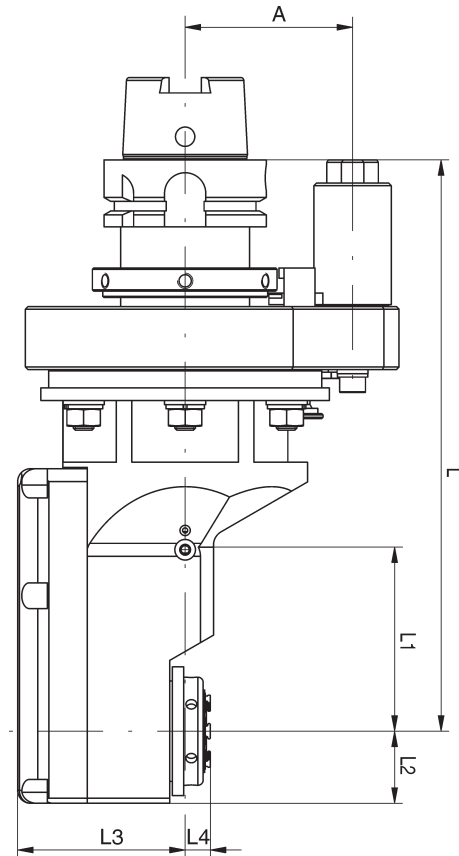
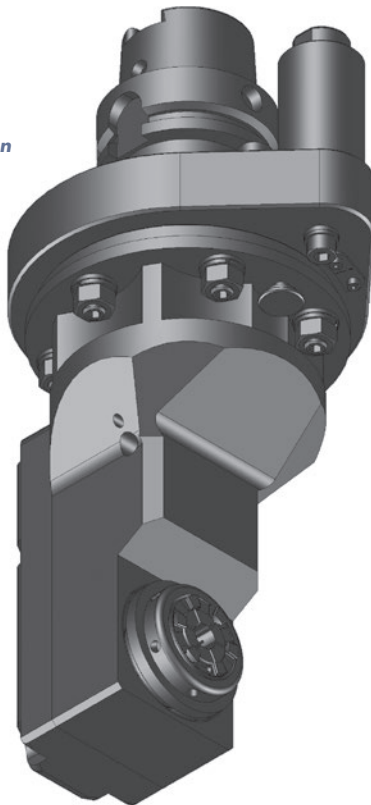
内缩细长型角度头适用于做小孔或有空间问题/空间受限制时。

Offset narrow form to slide into small bores or when clearance issues / space restrictions are issue.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation
direction



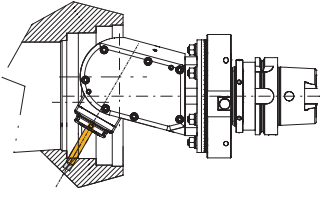
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
0	105670			ER 11	50		49,0		-8,0	
3	135633			ER 20	75		54,5		11,2	
3	105671			mi 32	100		54,5		26,0	
5	105674	162925		ER 25	82	82	65,0	65	10,0	10,0
5	105686	162937		mi 40	125	125	65,0	65	23,5	23,5

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
0	6 Nm	12.000	i = 1:1,67	220	38	20	36	65	7,0	18
3	15 Nm	10.000	i = 1:1	232	80	24	48	65	6,0	18
5	30 Nm	8.000	i = 1:1	222	76	28	56	65	6,5	18

HSK 63

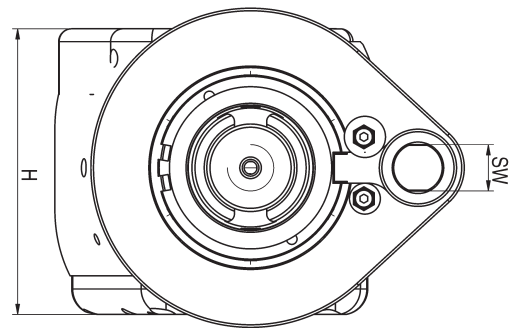
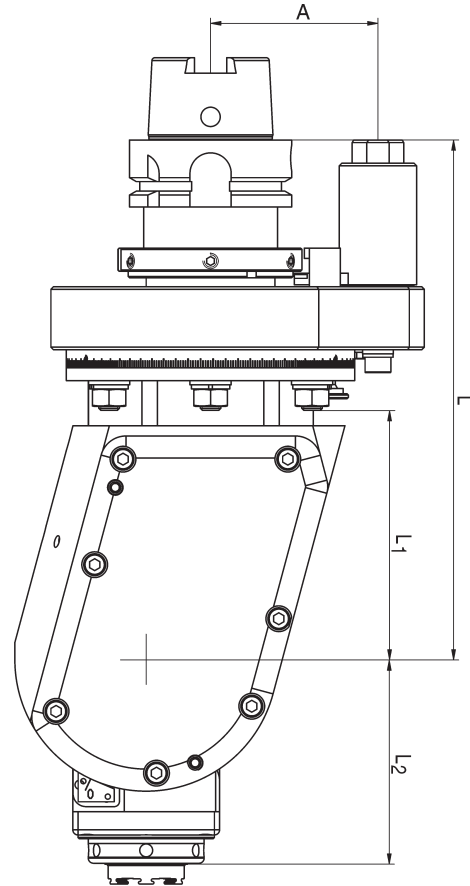
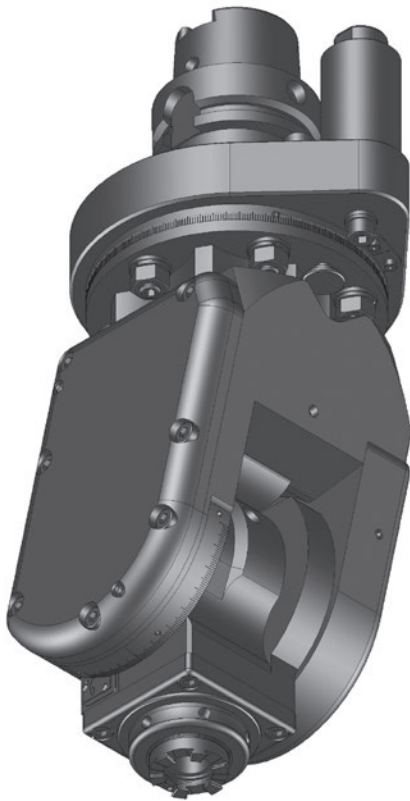
WS





0-98° 可调角度型角度头 Angle Head, Adjustable 0-98°



可调角度型角度头可在任何角度进行打孔和铣削加工。

Adjustable angle unit to do boring and milling applications at any angle.



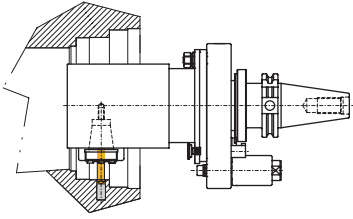
尺寸 Size	订货号 / Order No. (i=1:1)		订货号 / Order No. (i=1:2,25)		夹头 Toolholder	L2 mm	L4 mm
	 ohne / without	 intern / internal	 ohne / without	 intern / internal			
3	162945	105840	156558	156559	ER 20	75,0	20
3	156577	169142	156578	156579	mi 32	82,9	20
5	162961	135824	162962	135832	ER 25	84,0	25
5	162963	105853	162964	105858	mi 40	97,0	25

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	H mm	A mm	kg	SW
3	15 Nm	8.000 / 15.000	i = 1:1 / 1:2,25	196	91	96	65	8,0	18
5	30 Nm	7.000 / 13.500	i = 1:1 / 1:2,25	202	96	111	65	9,6	18

HSK 100

SW

90° 角度头
Angle Head 90°



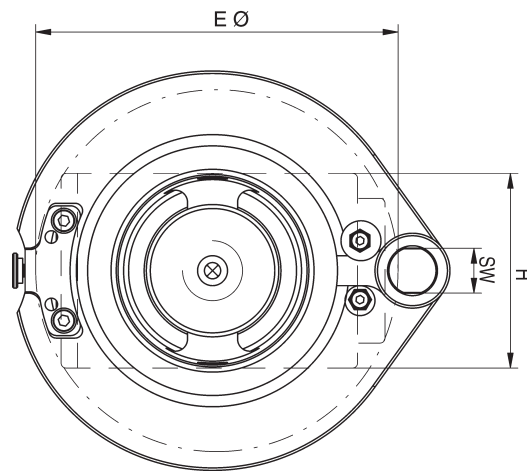
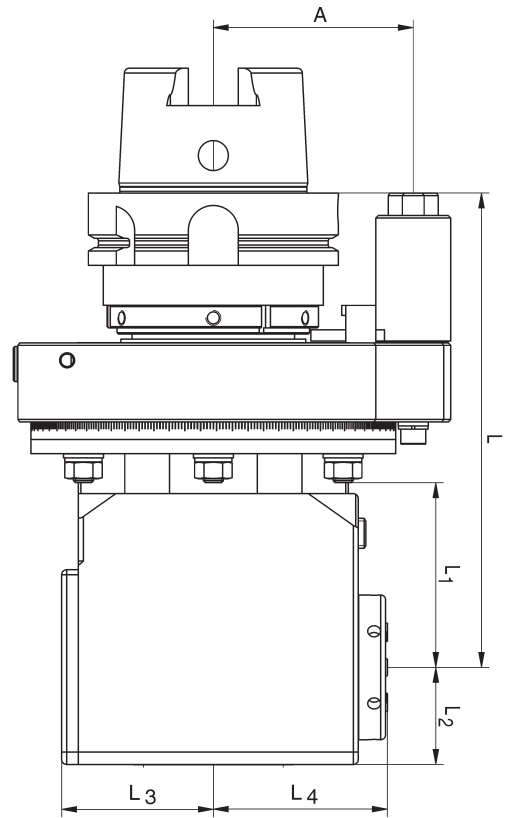
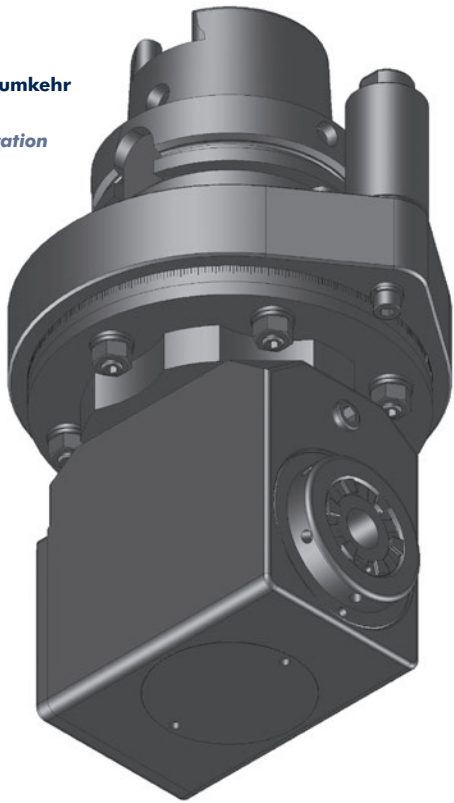
适用于单个打孔和铣削操作，空无间隙限制。

For single boring and milling operations without clearance issues.



Achtung:
Drehrichtungsumkehr

Attention!
Reversal of rotation
direction



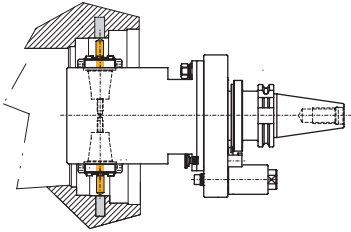
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	105499	162774	135462	ER 25	110	120	41,5	52	57,5	63,0
5	172644	162811	162812	mi 40	138	146	41,5	52	72,0	72,0
7	105515	169103	105506	ER 32	145	155	61,0	75	70,0	75,0
7	167699	176169	162798	mi 50	172	178	61,0	75	83,0	83,0
9	105557	169104	105544	ER 40	195	195	81,0	81	92,0	96,0
9	173506	162788	162789	mi 63	224	224	81,0	81	111,5	111,5

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	190	75	34	68	80	10,5	18
7	70 Nm	6.500	i = 1:1	190	75	39	78	80	12,0	18
9	150 Nm	5.000	i = 1:1	225	109	52	104	80	18,0	18

HSK 100

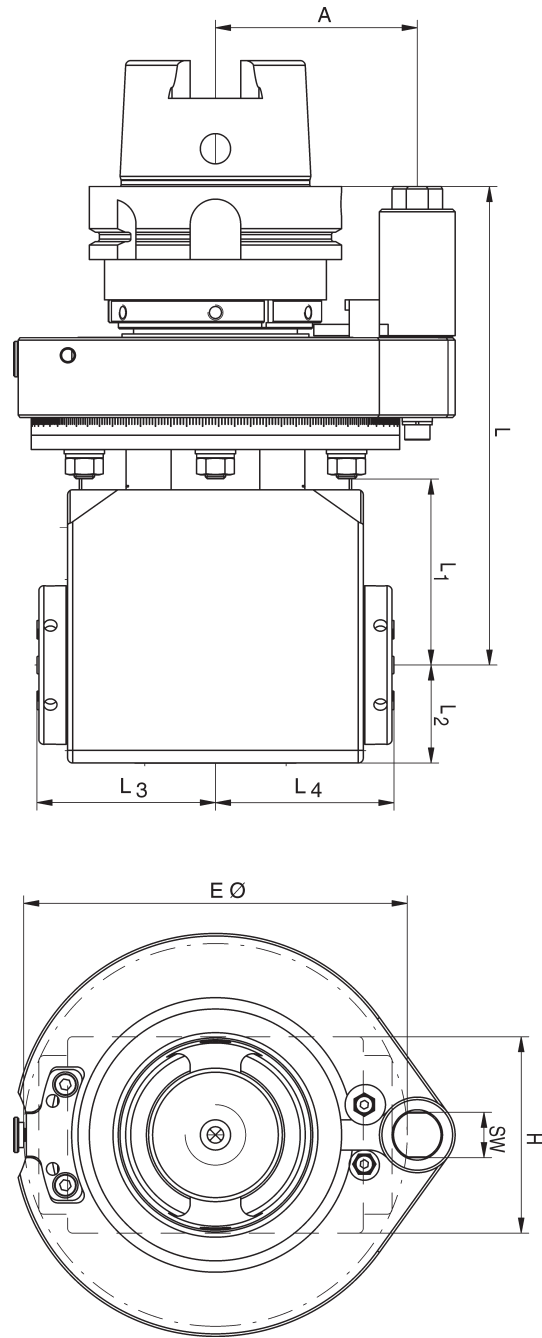
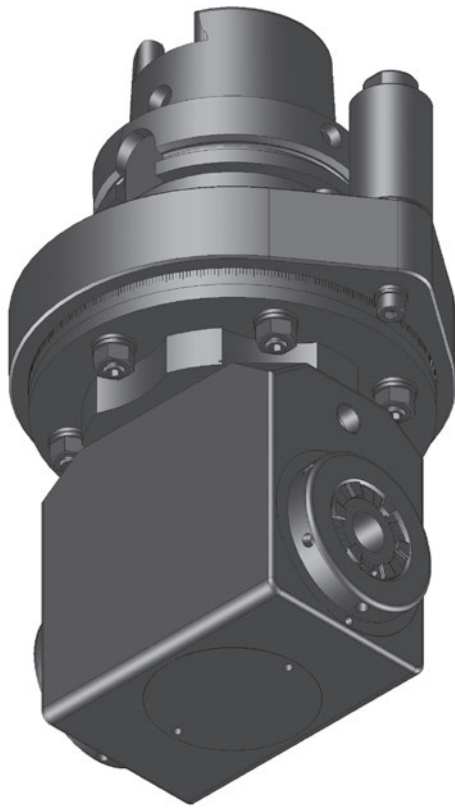
DW

90° 双向角度头 Double Angle Head 90°



双向角度头可在两个方向上进行两次打孔和铣削操作。

Double spindle unit to do two boring and milling operations in opposite directions.



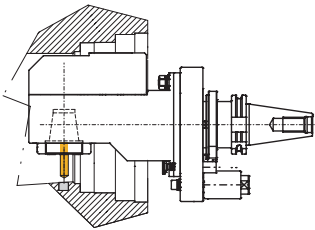
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135711	162827		2 x ER 25	125	125	62,0	62,0	62,0	62,0
5	173514	162845		2 x mi 32	200	200	76,5	76,5	76,5	76,5
7	135749	162833		2 x ER 32	152	152	71,2	71,2	71,2	71,2
7	167700	162850		2 x mi 40	220	220	88,0	88,0	88,0	88,0
9	105790	162837		2 x ER 40	210	210	103,0	103,0	103,0	103,0
9	167705	162854		2 x mi 50	250	250	116,0	116,0	116,0	116,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	190	70	34	68	80	11,5	18
7	70 Nm	6.500	i = 1:1	190	70	39	78	80	13,5	18
9	150 Nm	4.000	i = 1:1	225	109	58	108	80	20,0	18

HSK 100

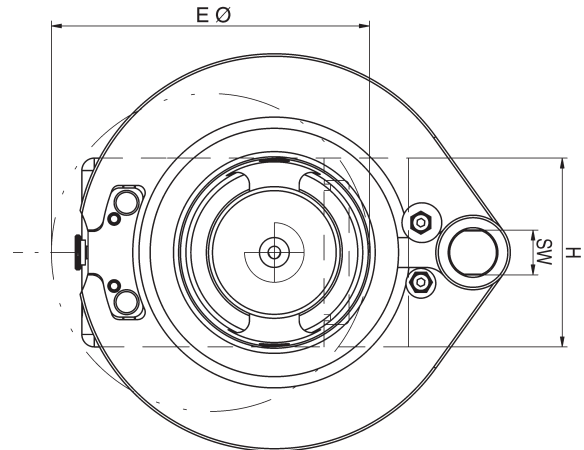
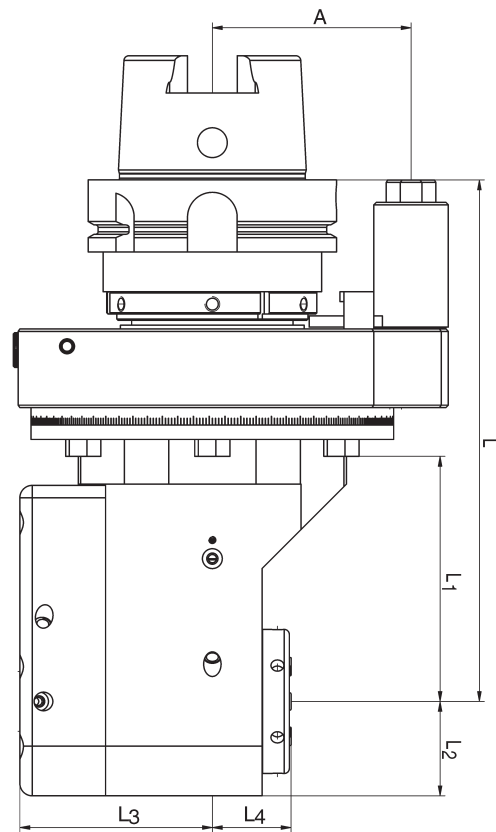
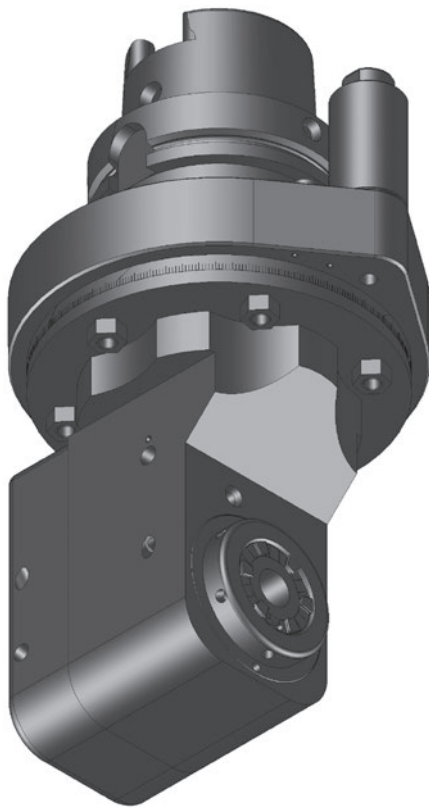
ZW

90° 内缩型角度头 Angle Head 90°, Offset Type



内缩型角度头可增加角度头长度和内冷系统。

Rear offset unit with increased usable tool length and internal coolant is an option.



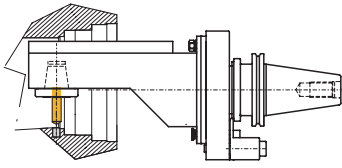
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	105466	162867	168564	ER 25	103	103	58,0	58,0	35,8	41,6
5	173522	162892	162893	mi 40	133	133	58,0	58,0	50,3	50,3
7	105431	162873	166868	ER 32	128	128	77,5	77,5	32,2	38,0
7	173529	162903	105469	mi 50	152	152	77,5	77,5	55,0	55,0
9	135375	105471	135399	ER 40	140	140	89,0	89,0	31,0	34,8
9	173534	162910	168369	mi 63	165	165	89,0	89,0	48,3	48,3

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	195	79	28,5	57	80	11,5	18
7	70 Nm	6.500	i = 1:1	210	94	38,0	76	80	14,0	18
9	150 Nm	5.000	i = 1:1	270	152	52,0	104	80	19,0	18

HSK 100

ZWS

90° 内缩细长型角度头 Angle Head 90°, Offset Slim Type



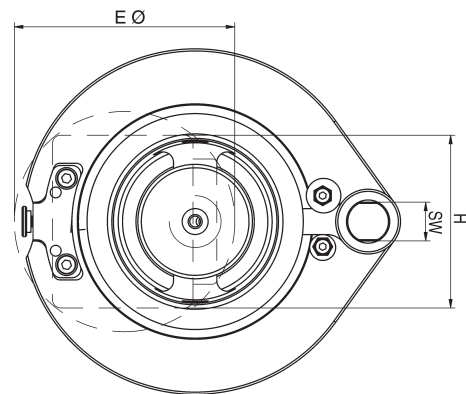
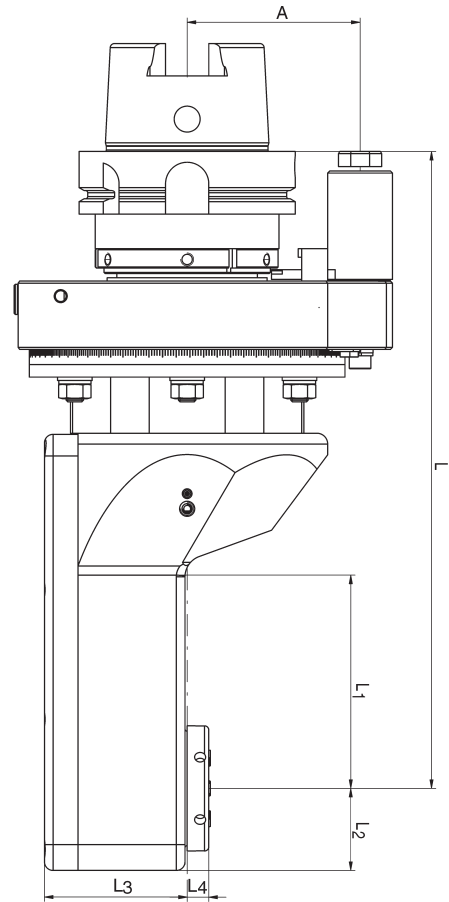
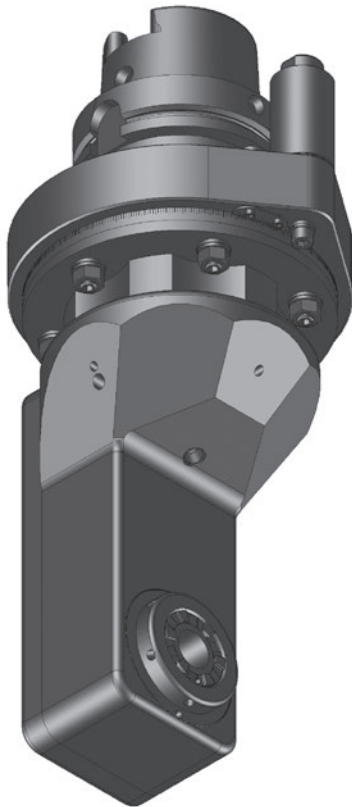
内缩细长型角度头适用于做小孔或有空间问题/空间受限制时。

Offset narrow form to slide into small bores or when clearance issues / space restrictions are issue.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation
direction



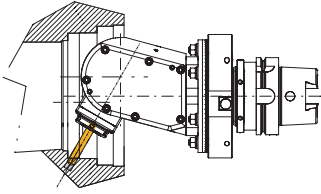
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
0	135592			ER 11	50		49		-8,0	
5	135651	105683		ER 25	82	82	65	65	10,0	10,0
5	173542	162941		mi 40	125	125	65	65	23,5	23,5
7	135656	162928		ER 32	102	102	66	66	13,0	13,0
7	105687	169062		mi 50	135	135	66	66	29,0	29,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
0	6 Nm	12.000	i = 1:1,67	237,5	38	20	36	80	11,0	18
5	30 Nm	8.000	i = 1:1	225,0	76	28	56	80	12,5	18
7	70 Nm	6.500	i = 1:1	295,0	100	38	80	80	13,5	18

HSK 100

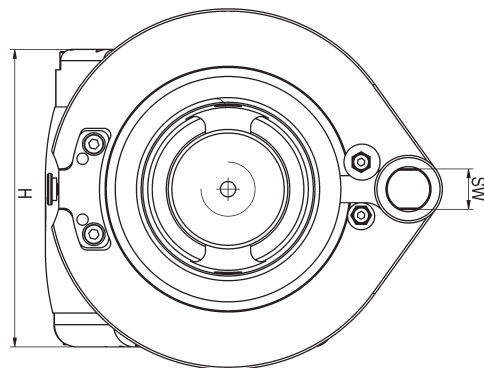
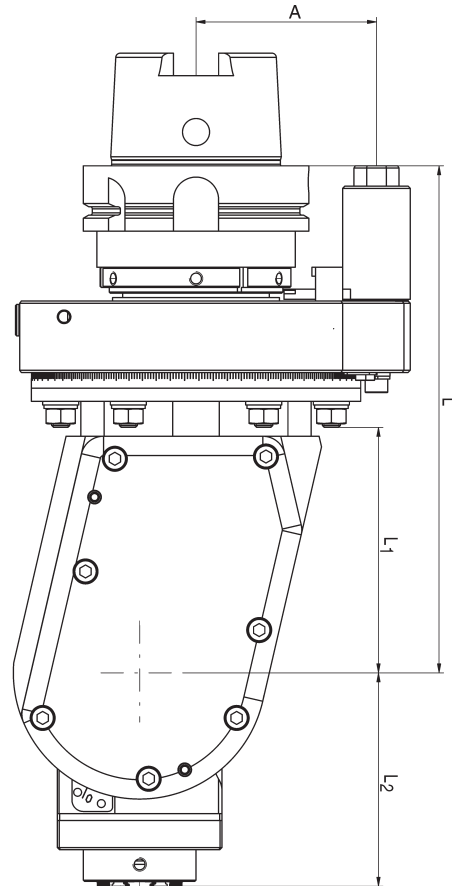
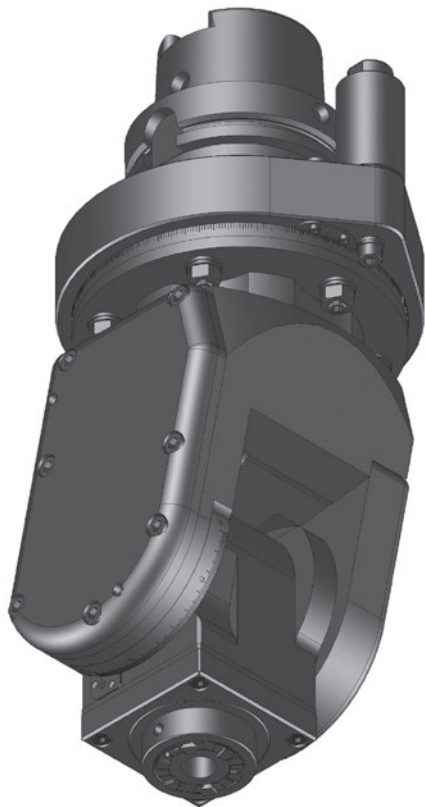
WS





0-98° 可调角度型角度头
Angle Head, Adjustable 0-98°



可调角度型角度头可在任何角度进行打孔和铣削加工。

Adjustable angle unit to do boring and milling applications at any angle.



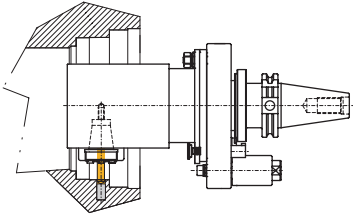
尺寸 Size	订货号 / Order No. (i=1:1)		订货号 / Order No. (i=1:2,25)		夹头 Toolholder	L2 mm	L4 mm
	 ohne / without	 intern / internal	 ohne / without	 intern / internal			
5	162976	135865	162977	162978	ER 25	84	25
5	162979	169980	162980	162981	mi 40	97	25
7	162986	105866			ER 32	95	25
7	162991	169942			mi 50	108	25

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	H mm	A mm	kg	SW
5	30 Nm	7.000 / 13.500	i = 1:1 / 1:2,25	205	96	111	80	14,0	18
7	70 Nm	6.000	i = 1:1	225	109	132	80	16,0	18

MAS-BT 40

SW

90° 角度头
Angle Head 90°



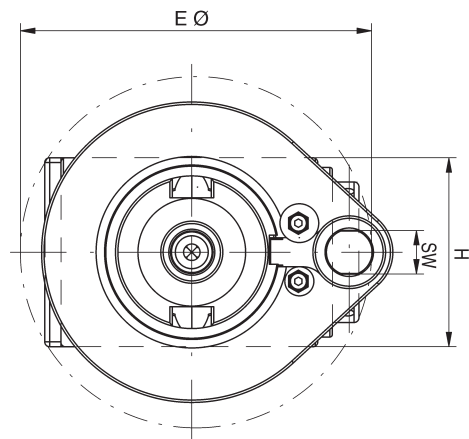
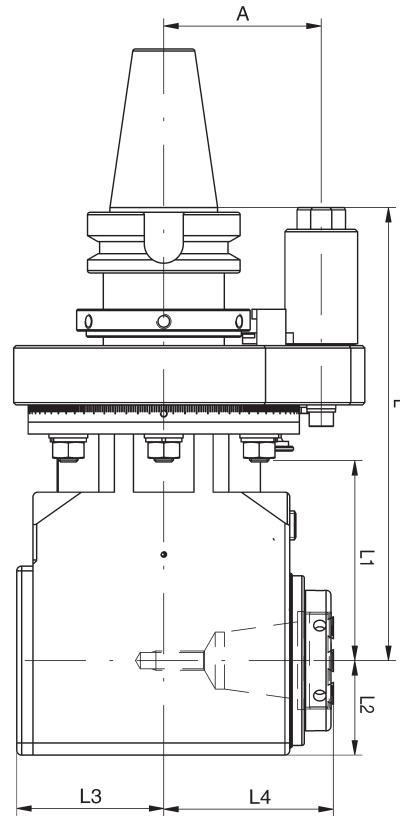
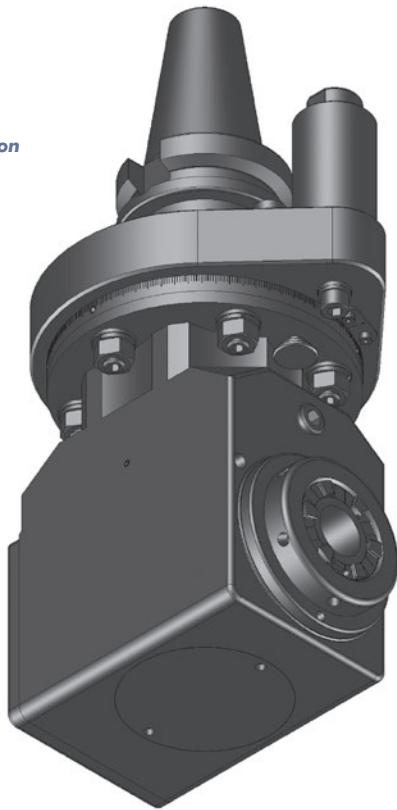
适用于单个打孔和铣削操作，空无间隙限制。

For single boring and milling operations without clearance issues.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation
direction



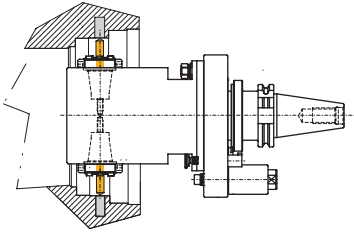
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
1	135431	135444	135451	ER 16	91	96	29,0	44	45,0	50
5	135459	105503	135435	ER 25	110	120	41,5	52	57,5	63
5	173000	162802	162803	mi 40	138	146	41,5	52	72,0	72
7	135470	162777	105505	ER 32	145	155	61,0	75	70,0	75
7	170653	176278	167889	mi 50	172	178	61,0	75	83,0	83

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
1	12 Nm	10.000	i = 1:1	187	80	22	44	65	6,0	18
5	30 Nm	8.000	i = 1:1	187	80	34	68	65	6,5	18
7	70 Nm	6.500	i = 1:1	187	80	39	78	65	8,0	18

MAS-BT 40

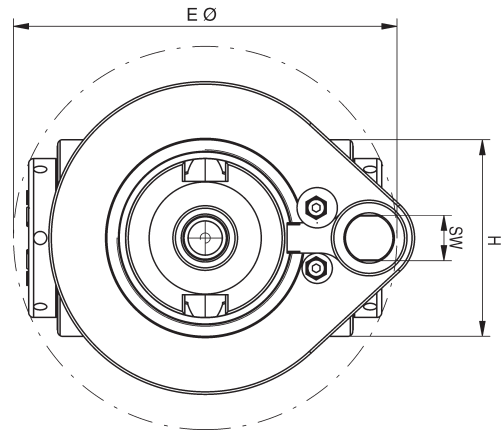
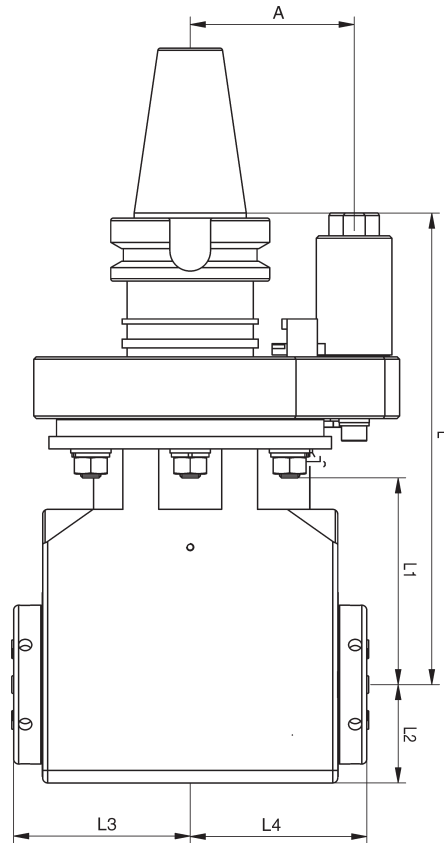
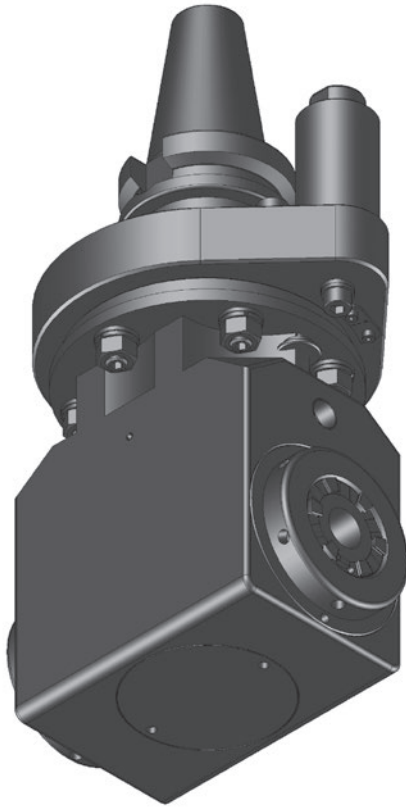
DW

90° 双向角度头 Double Angle Head 90°



双向角度头可在两个方向上进行两次打孔和铣削操作。

Double spindle unit to do two boring and milling operations in opposite directions.

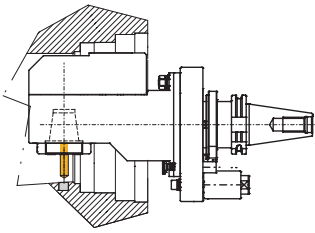


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135717	162823		2 x ER 25	125	125	62,0	62,0	62,0	62,0
5	173509	162840		2 x mi 32	200	200	76,5	76,5	76,5	76,5
7	135729	162829		2 x ER 32	152	152	71,2	71,2	71,2	71,2
7	173516	162847		2 x mi 40	220	220	88,0	88,0	88,0	88,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	187	80	39	78	65	7,5	18
7	70 Nm	6.500	i = 1:1	187	80	39	78	65	8,5	18

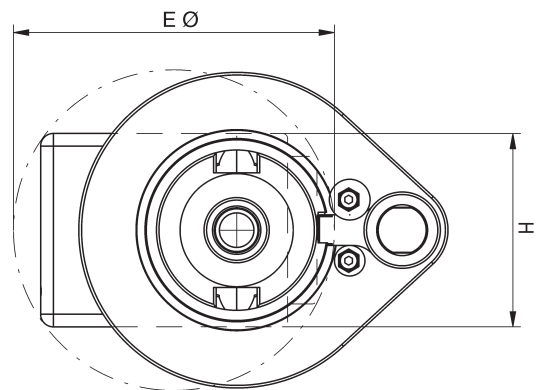
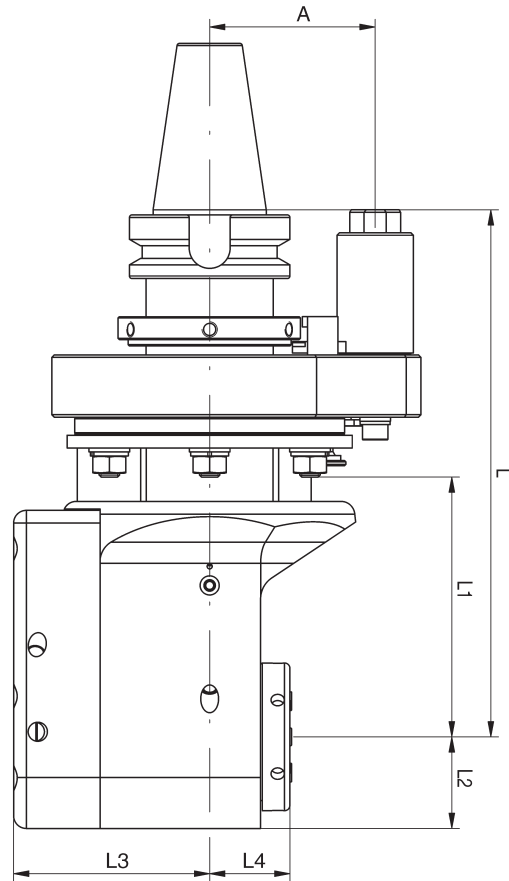
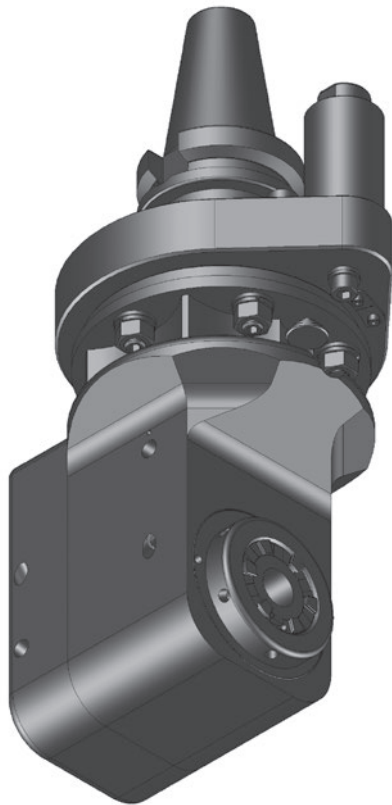
MAS-BT 40 ZW

90° 内缩型角度头
Angle Head 90°, Offset Type



内缩型角度头可增加角度头长度和内冷系统。

Rear offset unit with increased usable tool length and internal coolant is an option.

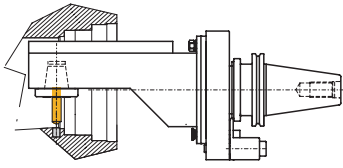


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	105435	162857	162859	ER 25	103	103	57,0	57,0	35,8	41,6
5	105458	162882	162883	mi 40	130	130	57,0	57,0	50,3	50,3
7	105477	162870	172498	ER 32	128	128	77,5	77,5	32,2	38,0
7	173527	162897	162898	mi 50	150	150	77,5	77,5	55,0	55,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	187	80	28,5	57	65	6,5	18
7	70 Nm	6.000	i = 1:1	205	100	38,0	76	65	8,5	18

MAS-BT 40 ZWS

90° 内缩细长型角度头
Angle Head 90°, Offset Slim Type



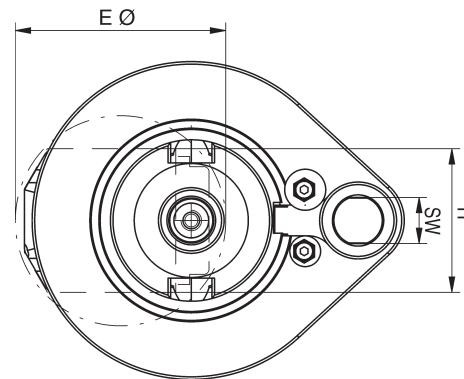
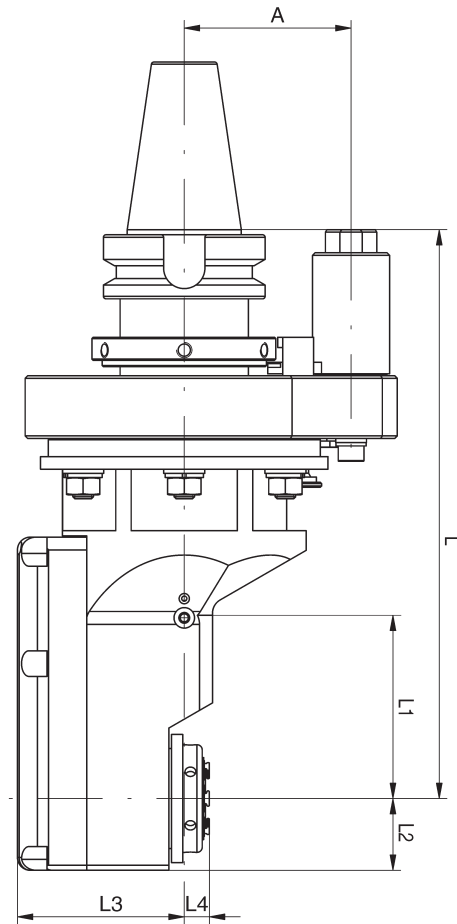
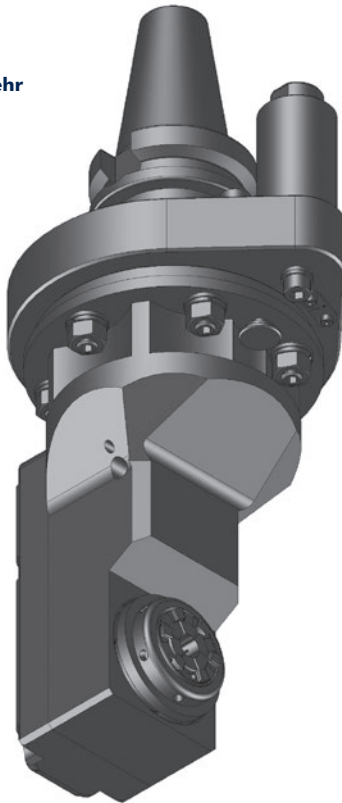
内缩细长型角度头适用于做小孔或有空间问题/空间受限制时。

Offset narrow form to slide into small bores or when clearance issues / space restrictions are issue.



Achtung:
Drehrichtungsumkehr

Attention!
Reversal of rotation direction



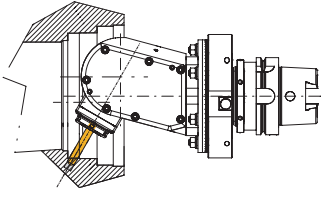
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
0	105651			ER 11	50		49,0		-8,0	
3	135629			ER 20	75		54,5		11,2	
3	173536			mi 32	100		54,5		26,0	
5	135649	162924		ER 25	82	82	65,0	65,0	10,0	10,0
5	173537	162936		mi 40	125	125	65,0	65,0	23,5	23,5

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
0	6 Nm	12.000	i = 1:1,67	220	38	20	36	65	7,0	18
3	15 Nm	10.000	i = 1:1	232	80	24	48	65	6,0	18
5	30 Nm	8.000	i = 1:1	222	76	28	56	65	6,5	18

MAS-BT 40

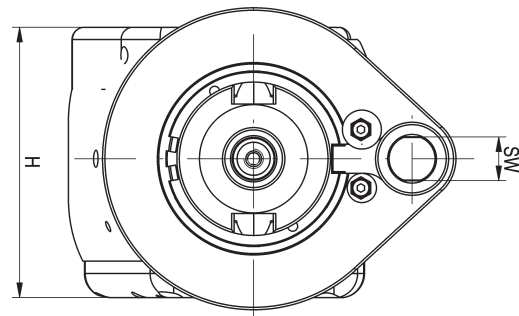
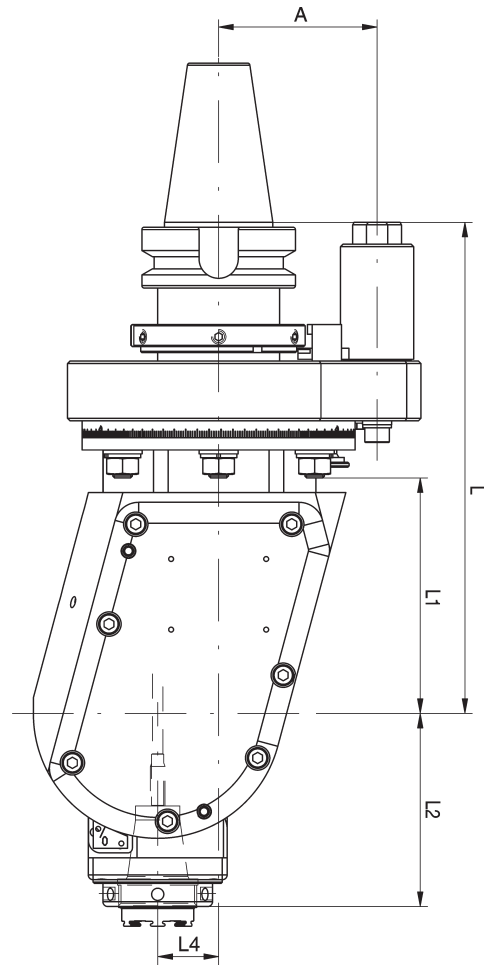
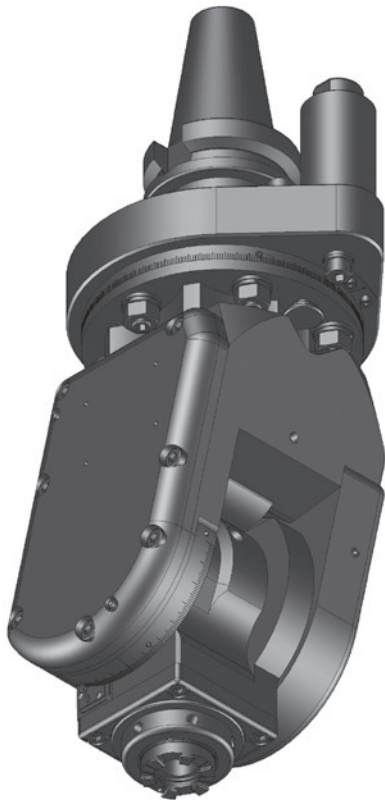
WS





0-98° 可调角度型角度头 Angle Head, Adjustable 0-98°



可调角度型角度头可在任何角度进行打孔和铣削加工。

Adjustable angle unit to do boring and milling applications at any angle.



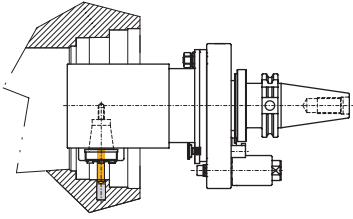
尺寸 Size	订货号 / Order No. (i=1:1)		订货号 / Order No. (i=1:2,25)		夹头 Toolholder	L2 mm	L4 mm
	 ohne / without	 intern / internal	 ohne / without	 intern / internal			
3	173907	105808	162858	162933	ER 20	75,0	20
3	156569	167418	156570	156574	mi 32	82,9	20
5	162955	135813	162957	162956	ER 25	84,0	25
5	162958	169976	162959	162960	mi 40	97,0	25

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	H mm	A mm	kg	SW
3	15 Nm	8.000 / 15.000	i = 1:1 / 1:2,25	196	100	96	65	8,0	18
5	30 Nm	7.000 / 13.500	i = 1:1 / 1:2,25	202	100	111	65	9,6	18

MAS-BT 50

SW

90° 角度头 Angle Head 90°



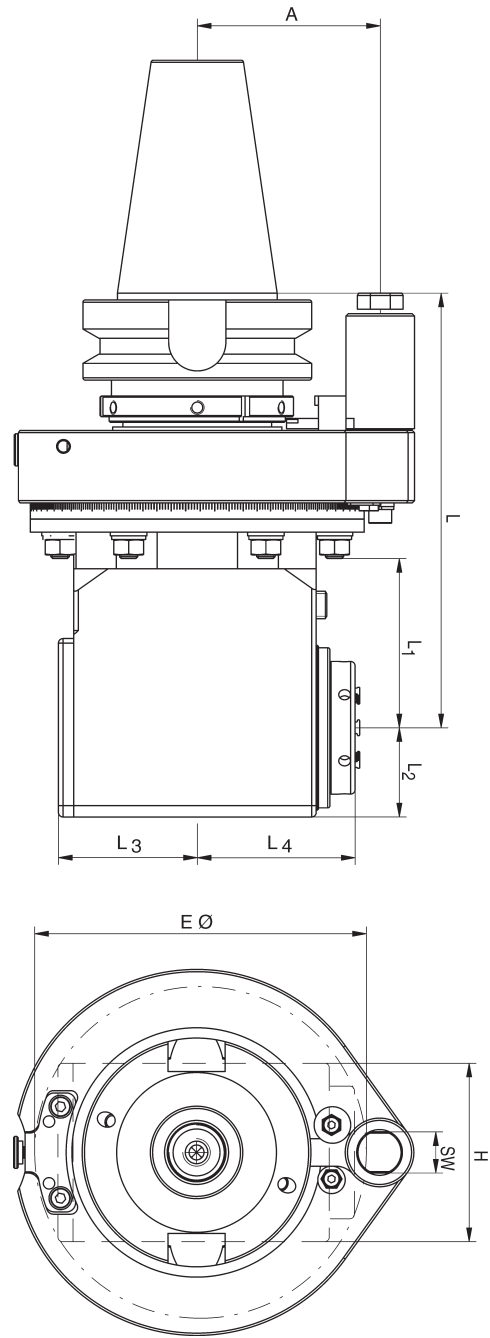
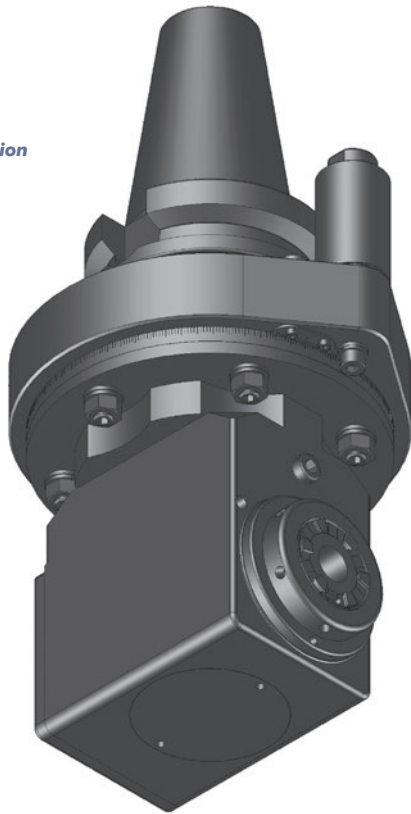
适用于单个打孔和铣削操作，空无间隙限制。

For single boring and milling operations without clearance issues.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation
direction

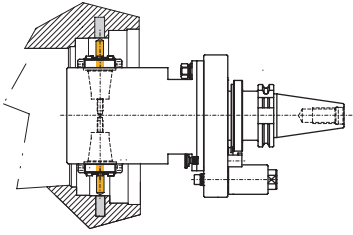


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	105494	162772	162773	ER 25	110	120	41,5	52	57,5	63,0
5	173014	162809	162810	mi 40	138	146	41,5	52	72,0	72,0
7	135482	105538	172558	ER 32	145	155	61,0	75	70,0	75,0
7	105520	105508	174169	mi 50	172	178	61,0	75	83,0	83,0
9	105512	162783	167210	ER 40	195	195	81,0	81	92,0	96,0
9	167208	162787	167211	mi 63	224	224	81,0	81	111,5	111,5

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	190	75	34	68	80	10,5	18
7	70 Nm	6.500	i = 1:1	190	75	39	78	80	12,0	18
9	150 Nm	5.000	i = 1:1	225	109	52	104	80	18,0	18

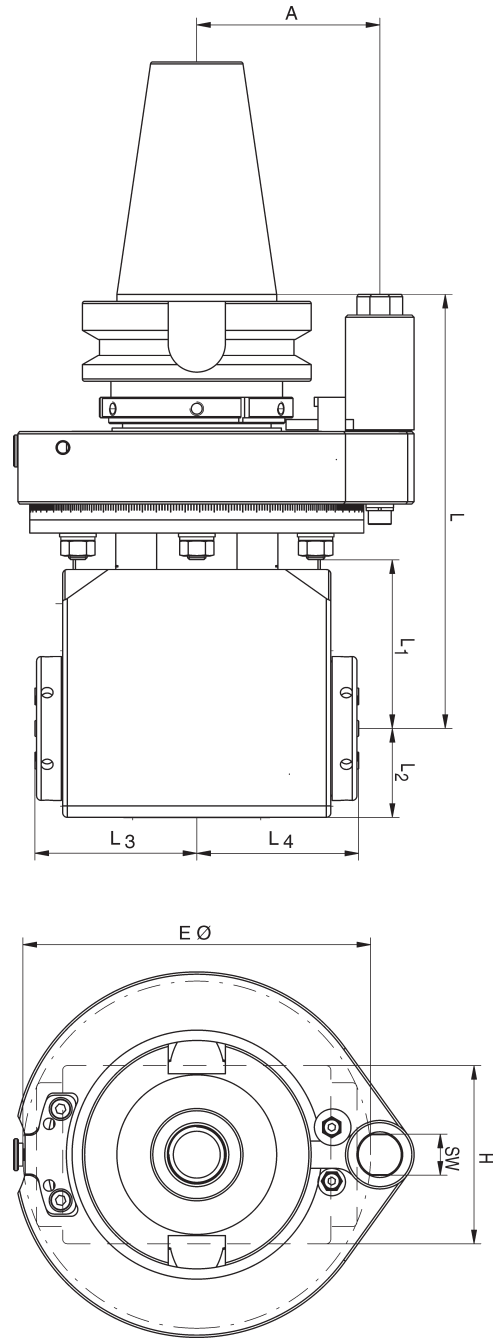
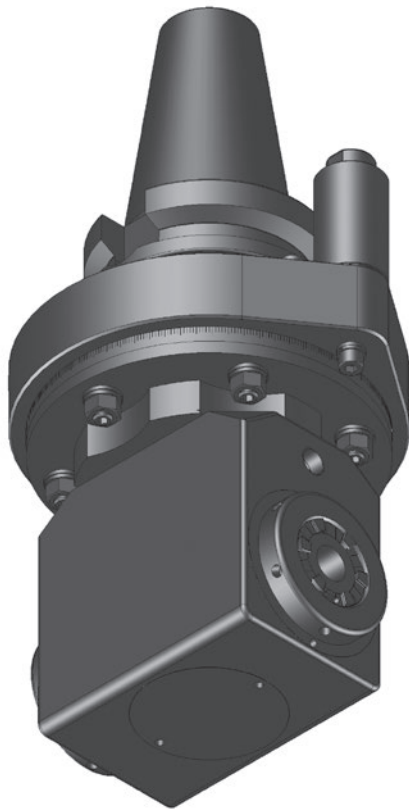
MAS-BT 50 DW

90° 双向角度头
Double Angle Head 90°



双向角度头可在两个方向上进行两次打孔和铣削操作。

Double spindle unit to do two boring and milling operations in opposite directions.



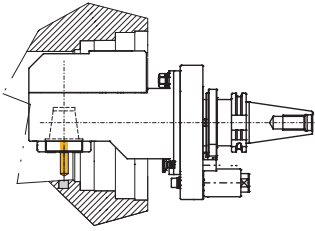
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135691	162826		2 x ER 25	125	125	62,0	62,0	62,0	62,0
5	173513	162844		2 x mi 32	200	200	76,5	76,5	76,5	76,5
7	135724	162832		2 x ER 32	152	152	71,2	71,2	71,2	71,2
7	173518	162849		2 x mi 40	220	220	88,0	88,0	88,0	88,0
9	105788	162836		2 x ER 40	210	210	103,0	103,0	103,0	103,0
9	173520	162853		2 x mi 50	250	250	116,0	116,0	116,0	116,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	190	70	34	68	80	11,5	18
7	70 Nm	6.500	i = 1:1	190	70	39	78	80	13,5	18
9	150 Nm	4.000	i = 1:1	225	109	58	108	80	20,0	18

MAS-BT 50

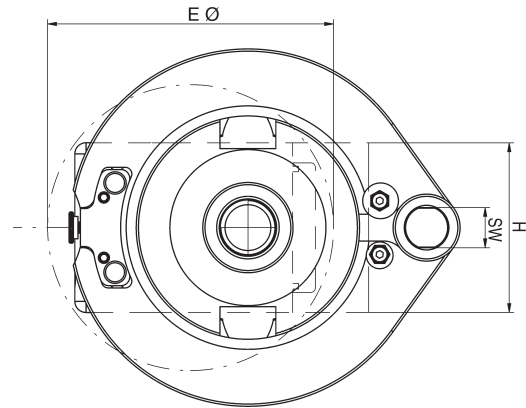
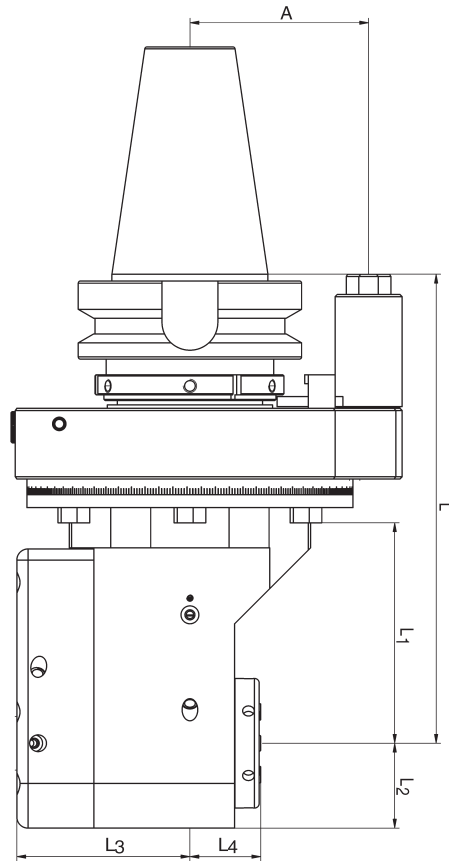
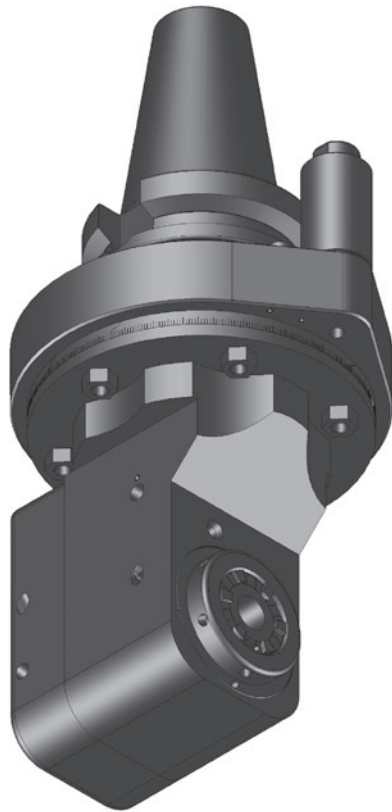
ZW

90° 内缩型角度头 Angle Head 90°, Offset Type



内缩型角度头可增加角度头长度和内冷系统。

Rear offset unit with increased usable tool length and internal coolant is an option.

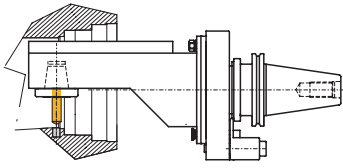


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	105417	162865	162866	ER 25	103	103	57,0	57,0	35,8	41,6
5	173525	162891	171760	mi 40	133	133	57,0	57,0	50,3	50,3
7	105460	162944	174661	ER 32	128	128	77,5	77,5	32,2	38,0
7	173531	162902	135378	mi 50	152	152	77,5	77,5	55,0	55,0
9	105470	168456	162878	ER 40	140	140	89,0	89,0	31,0	34,8
9	173533	162908	162909	mi 63	165	165	89,0	89,0	48,3	48,3

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	195	79	28,5	57	80	11,5	18
7	70 Nm	6.000	i = 1:1	210	94	38,0	76	80	14,0	18
9	150 Nm	5.000	i = 1:1	270	110	52,0	104	80	19,0	18

MAS-BT 50 ZWS

90° 内缩细长型角度头
Angle Head 90°, Offset Slim Type



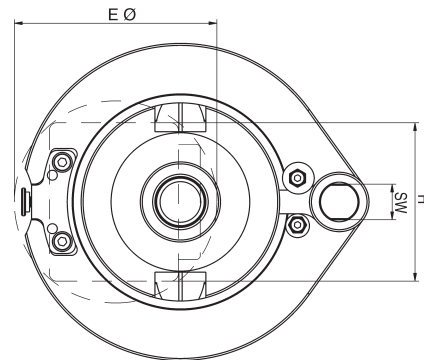
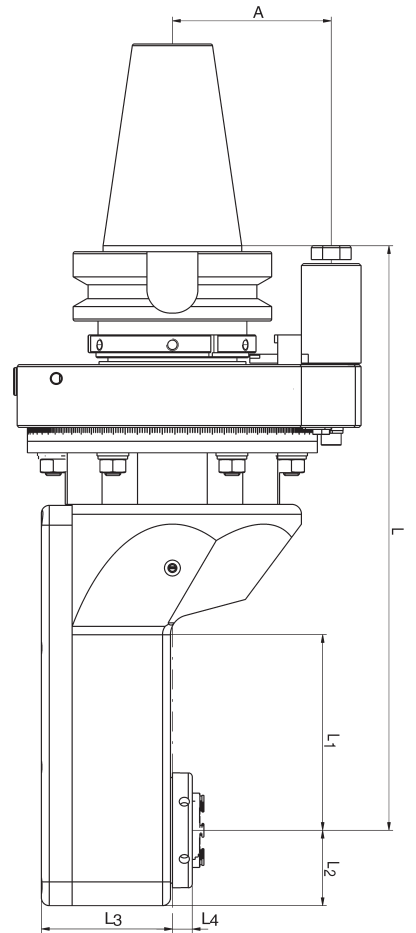
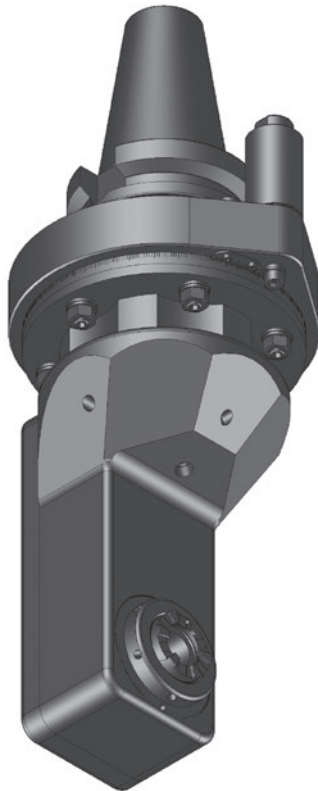
内缩细长型角度头适用于做小孔或有空间问题/空间受限制时。

Offset narrow form to slide into small bores or when clearance issues / space restrictions are issue.



注意:
逆转旋转运动方向

Attention!
Reversal of rotation direction



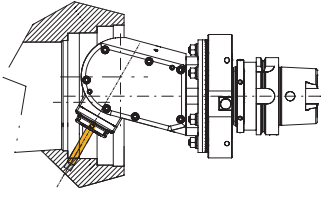
尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
0	105652			ER 11	50		49		-8,0	
5	135650	168453		ER 25	82	82	65	65	10,0	10,0
5	173541	162940		mi 40	125	125	65	65	23,5	23,5
7	105698	168454		ER 32	102	102	66	66	13,0	13,0
7	173544	168460		mi 50	135	135	66	66	29,0	29,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
0	6 Nm	12.000	i = 1:1,67	237,5	38	20	36	80	11,0	18
5	30 Nm	8.000	i = 1:1	225,0	76	28	56	80	12,5	18
7	70 Nm	6.000	i = 1:1	295,0	100	38	80	80	13,5	18

MAS-BT 50

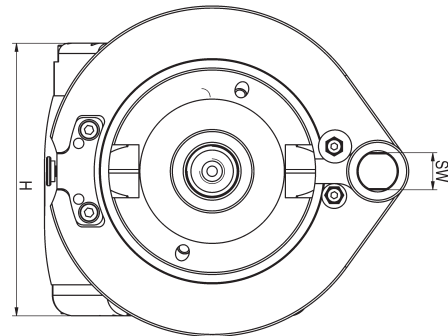
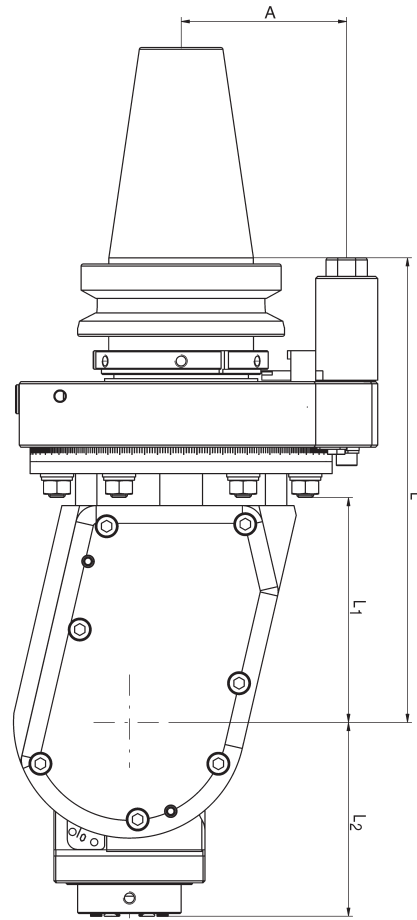
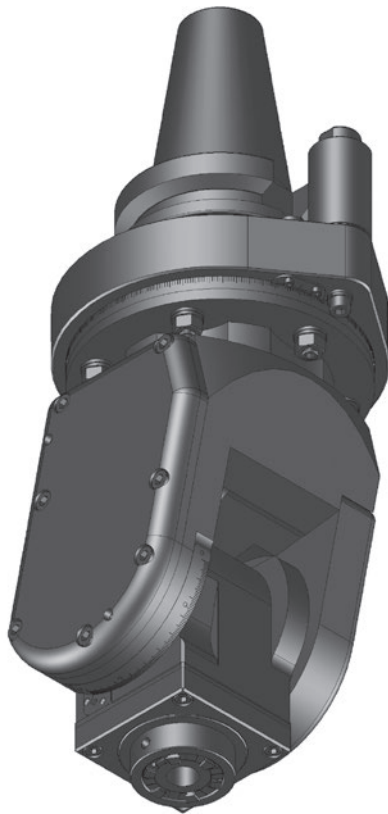
WS

0-98° 可调角度型角度头 Angle Head, Adjustable 0-98°



可调角度型角度头可在任何角度进行打孔和铣削加工。

Adjustable angle unit to do boring and milling applications at any angle.

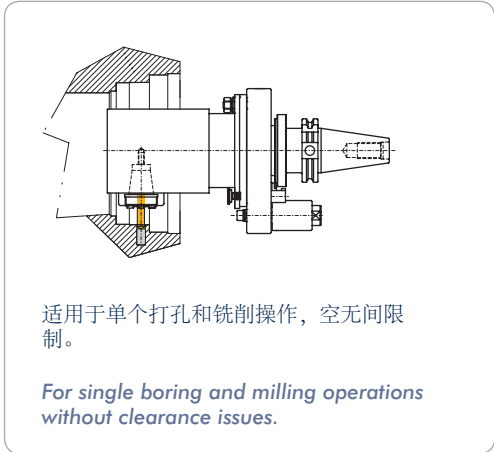


尺寸 Size	订货号 / Order No. (i=1:1)		订货号 / Order No. (i=1:2,25)		夹头 Toolholder	L2 mm	L4 mm
	ohne / without	intern / internal	ohne / without	intern / internal			
5	162970	105830	162972	162971	ER 25	84	25
5	162973	169979	162975	162974	mi 40	97	25
7	162985	105859			ER 32	95	25
7	162988	167553			mi 50	108	25

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	H mm	A mm	kg	SW
5	30 Nm	7.000 / 13.500	i = 1:1 / 1:2,25	205	100	111	80	14,0	18
7	70 Nm	6.000	i = 1:1	225	109	132	80	16,0	18

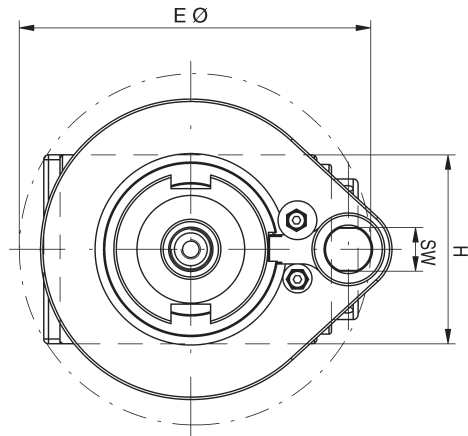
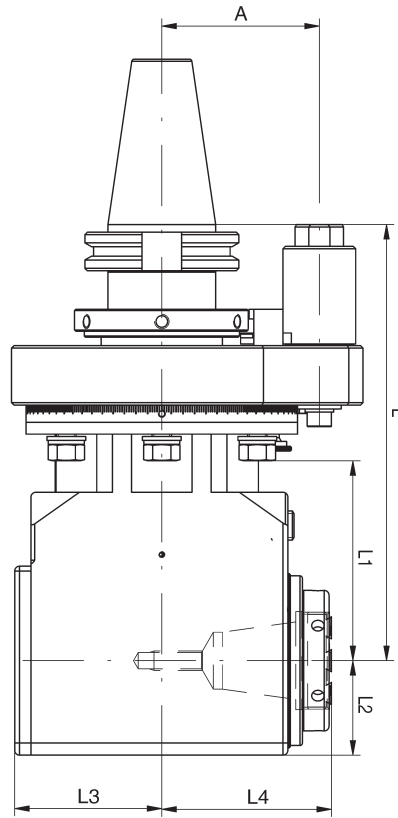
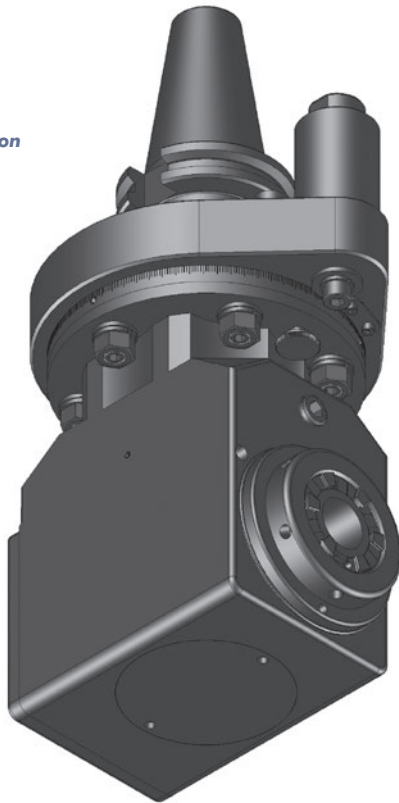
ANSI CAT 40 SW

90°角度头
Angle Head 90°



注意:
逆转旋转运动方向

Attention!
Reversal of rotation
direction

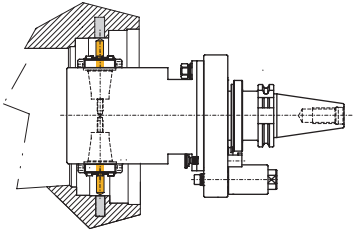


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
1	135465	162769	162776	ER 16	91	96	29,0	44	45,0	50
5	135432	183182	176443	ER 25	110	120	41,5	52	57,5	63
5	169839	173031	176540	mi 40	138	146	41,5	52	72,0	72
7	135477	162775	176444	ER 32	145	155	61,0	75	70,0	75
7	135485	105509	166537	mi 50	172	178	61,0	75	83,0	83

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
1	12 Nm	10.000	i = 1:1	180	80	22	44	65	6,0	18
5	30 Nm	8.000	i = 1:1	180	80	34	68	65	6,5	18
7	70 Nm	6.500	i = 1:1	180	80	39	78	65	8,0	18

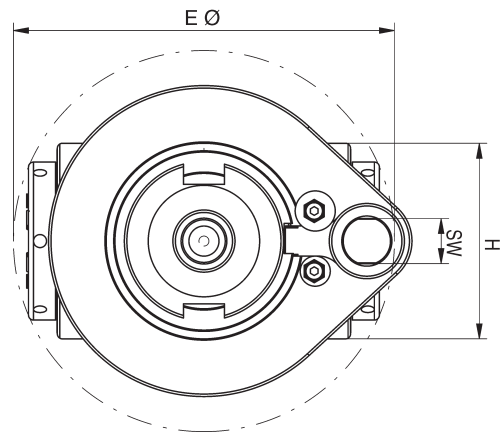
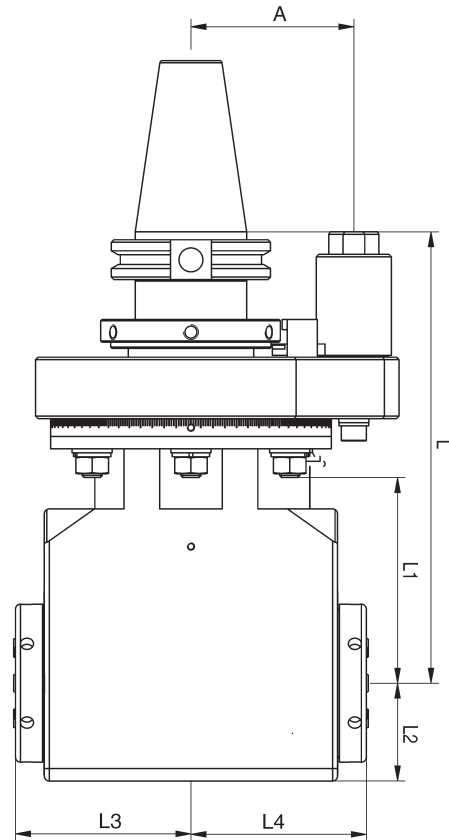
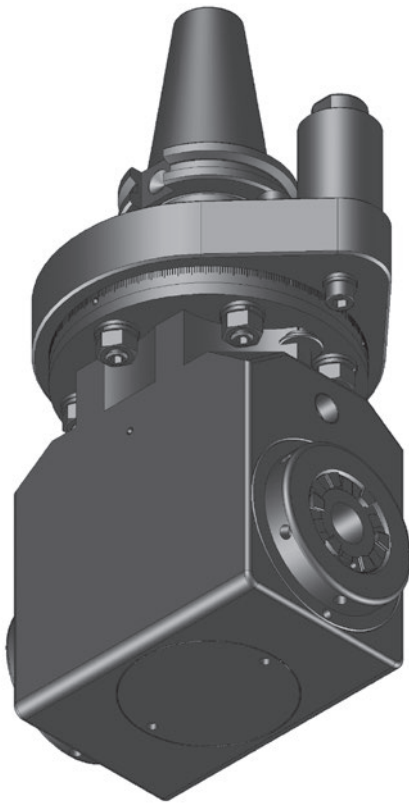
ANSI CAT 40 DW

90° 双向角度头
Double Angle Head 90°



双向角度头可在两个方向上进行两次打孔和铣削操作。

Double spindle unit to do two boring and milling operations in opposite directions.

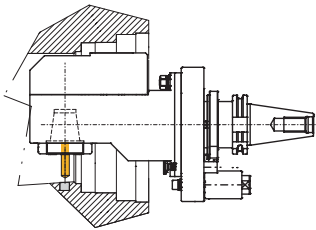


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135696	162822		2 x ER 25	125	125	62,0	62,0	62,0	62,0
5	173508	162839		2 x mi 32	210	210	92,0	76,5	76,5	76,5
7	135720	162828		2 x ER 32	152	152	71,2	71,2	71,2	71,2
7	173515	162846		2 x mi 40	220	220	88,0	88,0	88,0	88,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	180	80	39	78	65	7,5	18
7	70 Nm	6.500	i = 1:1	180	80	39	78	65	8,5	18

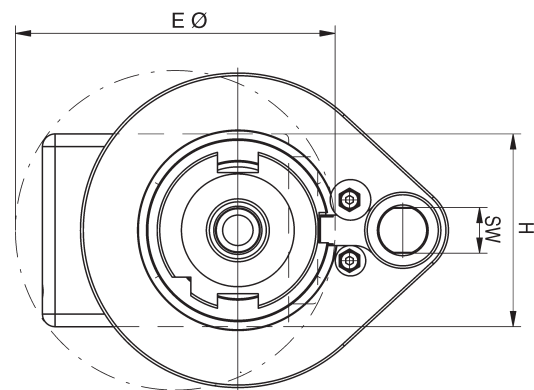
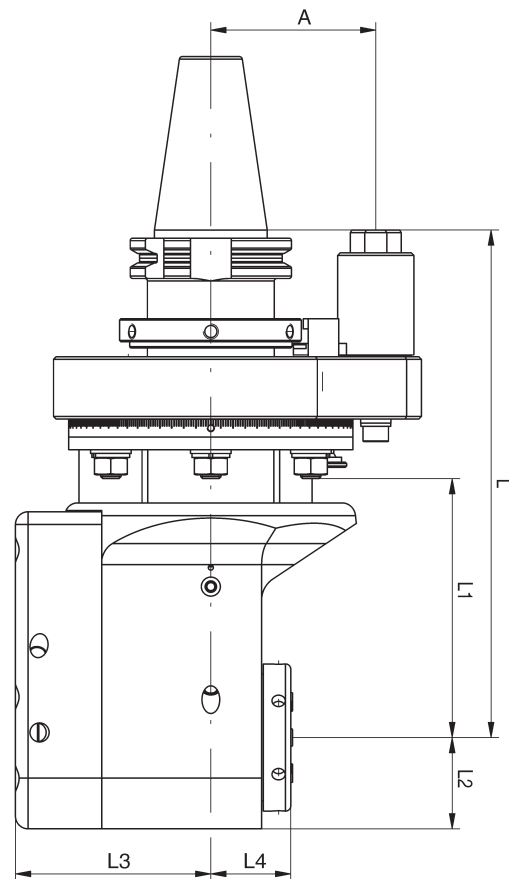
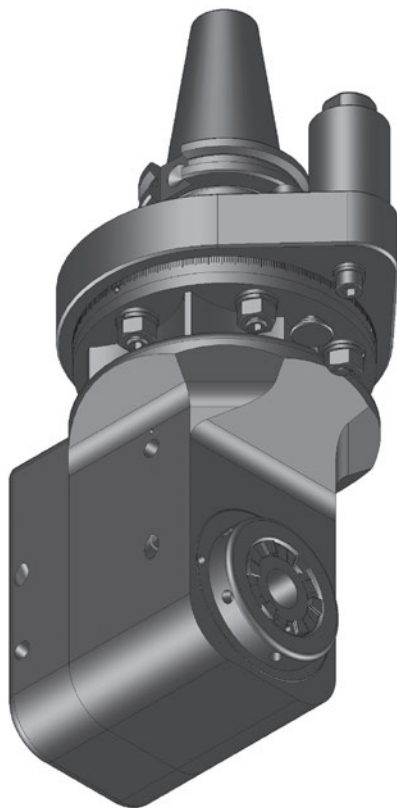
ANSI CAT 40 ZW

90° 内缩型角度头
Angle Head 90°, Offset Type



内缩型角度头可增加角度头长度和内冷系统。

Rear offset unit with increased usable tool length and internal coolant is an option.

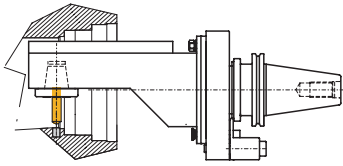


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135401	162856	135415	ER 25	103	103	57,0	57,0	35,8	41,6
5	173521	162881	105451	mi 40	130	130	57,0	57,0	50,3	50,3
7	135391	162869	135417	ER 32	128	128	77,5	77,5	32,2	38,0
7	173526	162896	166538	mi 50	150	150	77,5	77,5	55,0	55,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	180	80	28,5	57	65	6,5	18
7	70 Nm	6.000	i = 1:1	198	100	38,0	76	65	8,5	18

ANSI CAT 40 ZWS

90° 内缩细长型角度头
Angle Head 90°, Offset Slim Type



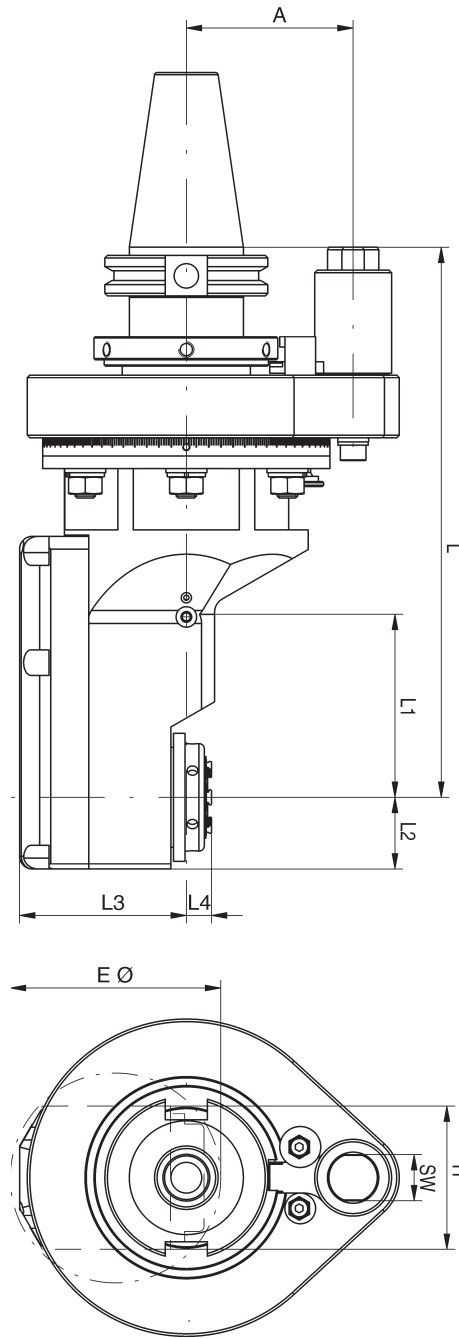
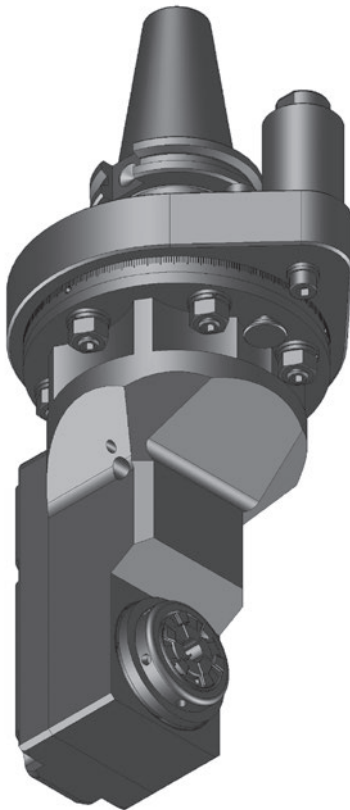
内缩细长型角度头适用于做小孔或有空间问题/空间受限制时。

Offset narrow form to slide into small bores or when clearance issues / space restrictions are issue.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation direction

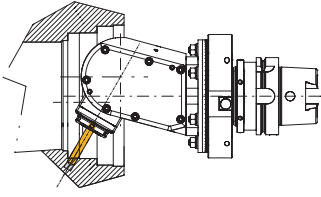


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
0	135613			ER 11	50		49,0		-8,0	
3	135614			ER 20	75		54,5		11,2	
3	162929			mi 32	100		54,5		26,0	
5	135619	162923		ER 25	82	82	65,0	65,0	10,0	10,0
5	173538	162935		mi 40	125	125	65,0	65,0	23,5	23,5

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
0	6 Nm	12.000	i = 1:1,67	213	38	20	36	65	7,0	18
3	15 Nm	10.000	i = 1:1	225	80	24	48	65	6,0	18
5	30 Nm	8.000	i = 1:1	215	76	28	56	65	6,5	18

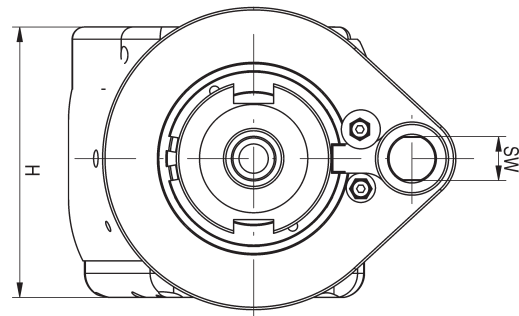
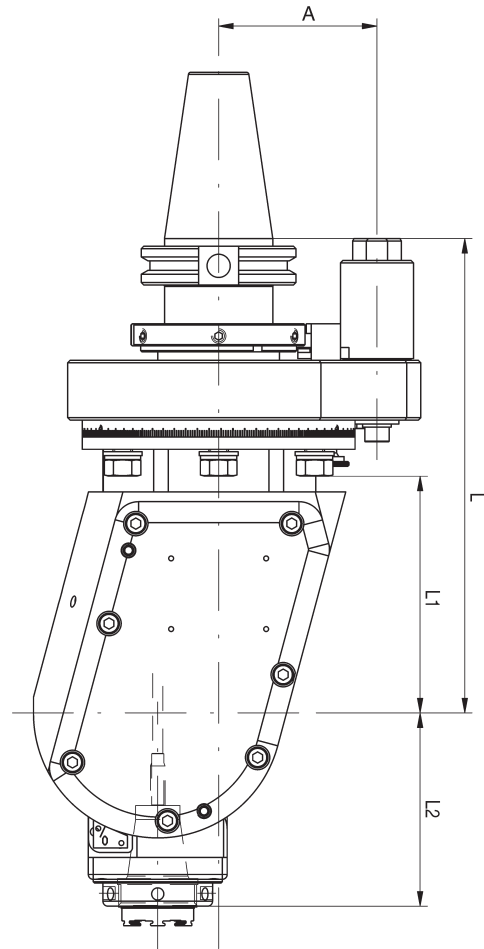
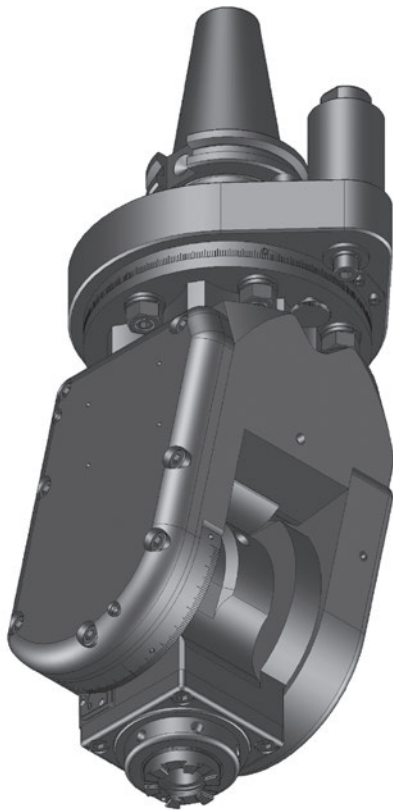
ANSI CAT 40 WS





0-98° 可调角度型角度头
Angle Head, Adjustable 0-98°



可调角度型角度头可在任何角度进行打孔和铣削加工。

Adjustable angle unit to do boring and milling applications at any angle.

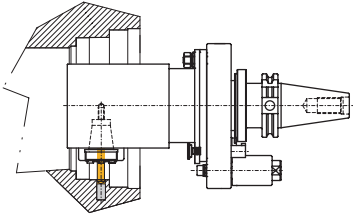


尺寸 Size	订货号 / Order No. (i=1:1)		订货号 / Order No. (i=1:2,25)		夹头 Toolholder	L2 mm	L4 mm
	 ohne / without	 intern / internal	 ohne / without	 intern / internal			
3	162797	135811	162800	162801	ER 20	75,0	20
3	156566	167896	156567	156568	mi 32	82,9	20
5	172227	135838	162717	135781	ER 25	84,0	25
5	162932	135817	162725	162724	mi 40	97,0	25

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	H mm	A mm	kg	SW
3	15 Nm	8.000 / 15.000	i = 1:1 / 1:2,25	189	91	96	65	8,0	18
5	30 Nm	7.000 / 13.500	i = 1:1 / 1:2,25	195	96	111	65	9,6	18

ANSI CAT 50 SW

90° 角度头
Angle Head 90°



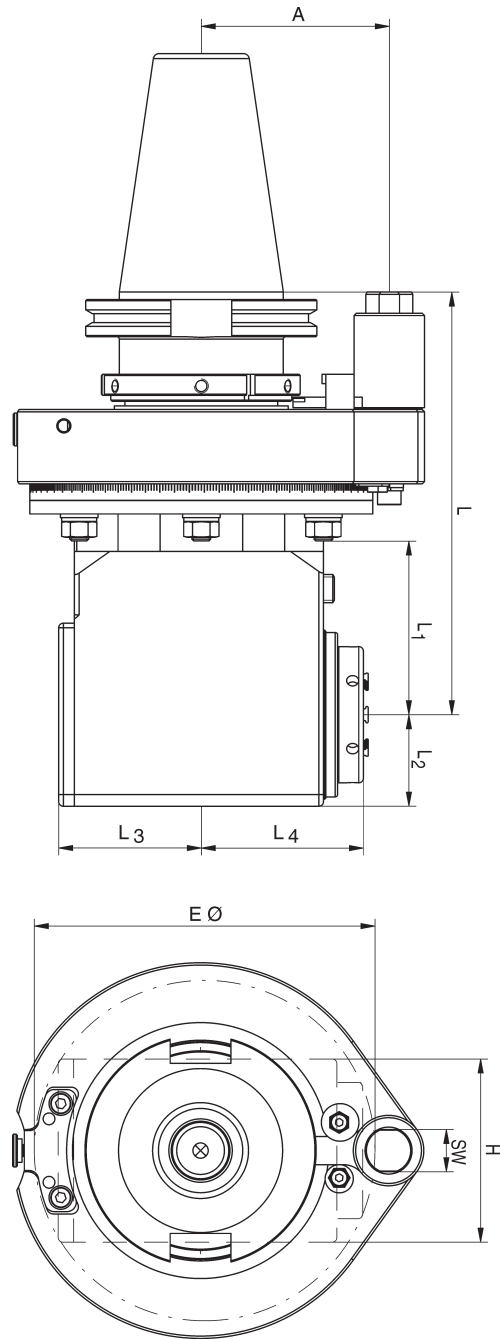
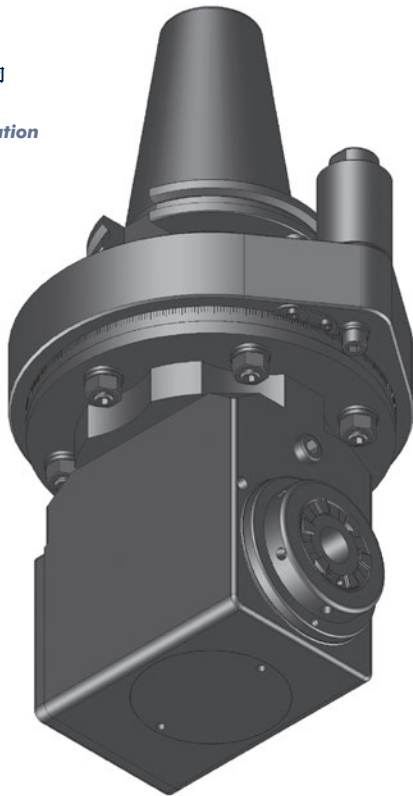
适用于单个打孔和铣削操作，空无间隙限制。

For single boring and milling operations without clearance issues.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation
direction

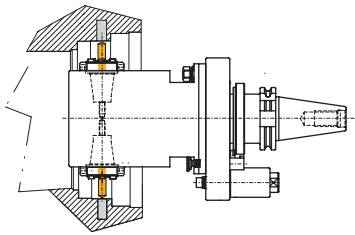


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135420	162770	162771	ER 25	110	120	41,5	52	57,5	63,0
5	173068	162807	162808	mi 40	138	146	41,5	52	72,0	72,0
7	135471	162779	172905	ER 32	145	155	61,0	75	70,0	75,0
7	135472	162796	105525	mi 50	172	178	61,0	75	83,0	83,0
9	105553	162781	162782	ER 40	195	195	81,0	81	92,0	96,0
9	173505	162785	162786	mi 63	224	224	81,0	81	111,5	111,5

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	180	75	34	68	80	10,5	18
7	70 Nm	6.500	i = 1:1	180	75	39	78	80	12,0	18
9	150 Nm	5.000	i = 1:1	215	105	52	104	80	18,0	18

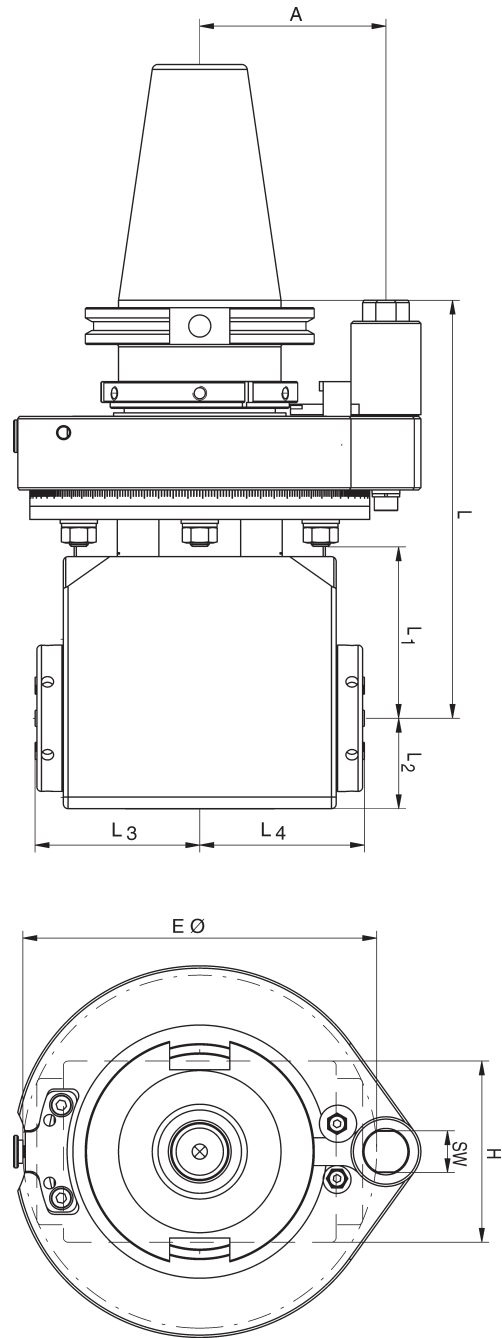
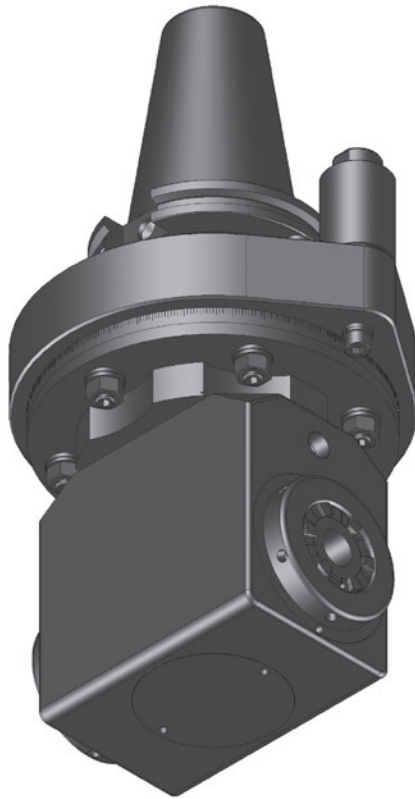
ANSI CAT 50 DW

90° 双向角度头
Double Angle Head 90°



双向角度头可在两个方向上进行两次打孔和铣削操作。

Double spindle unit to do two boring and milling operations in opposite directions.

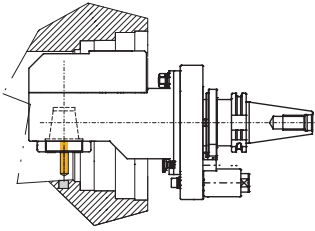


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135723	135718		2 x ER 25	125	125	62,0	62,0	62,0	62,0
5	173512	162843		2 x mi 32	200	200	76,5	76,5	76,5	76,5
7	135725	162831		2 x ER 32	152	152	71,2	71,2	71,2	71,2
7	173517	162848		2 x mi 40	220	220	88,0	88,0	88,0	88,0
9	105789	162835		2 x ER 40	210	210	103,0	103,0	103,0	103,0
9	173519	162852		2 x mi 50	250	250	116,0	116,0	116,0	116,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	180	70	34	68	80	11,5	18
7	70 Nm	6.500	i = 1:1	180	70	39	78	80	13,5	18
9	150 Nm	4.000	i = 1:1	215	109	58	108	80	20,0	18

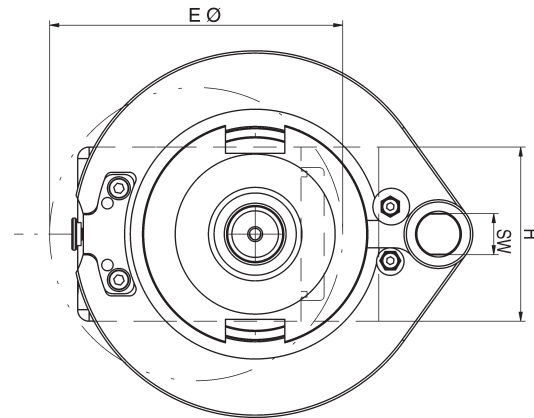
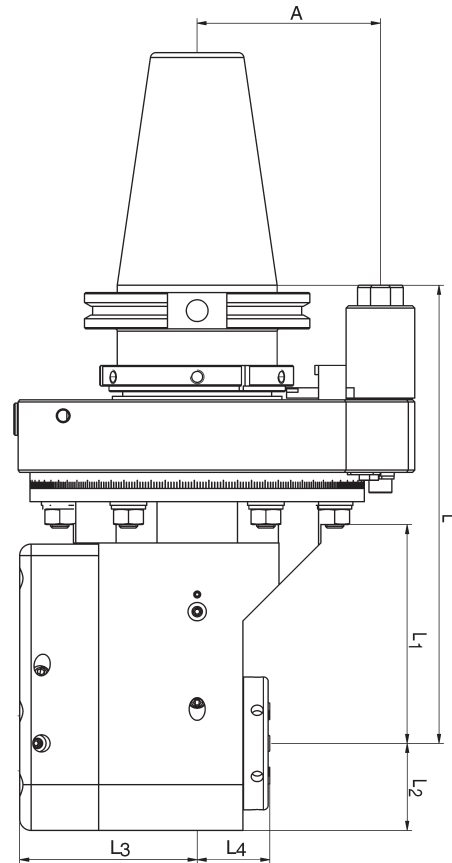
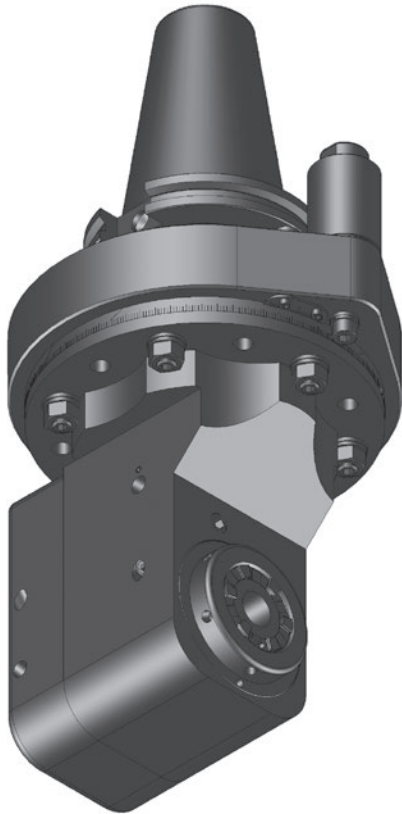
ANSI CAT 50 ZW

90° 内缩型角度头
Angle Head 90°, Offset Type



内缩型角度头可增加角度头长度和内冷系统。

Rear offset unit with increased usable tool length and internal coolant is an option.

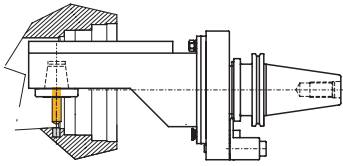


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
5	135371	162863	162864	ER 25	103	103	58,0	58,0	35,8	41,6
5	173524	162888	167846	mi 40	133	133	58,0	58,0	50,3	50,3
7	135374	162872	135379	ER 32	128	128	77,5	77,5	32,2	38,0
7	173530	162901	105480	mi 50	152	152	77,5	77,5	55,0	55,0
9	105448	162875	162877	ER 40	140	140	89,0	89,0	31,0	34,8
9	169045	162906	162907	mi 63	165	165	89,0	89,0	48,3	48,3

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
5	30 Nm	8.000	i = 1:1	185	79	28,5	57	80	11,5	18
7	70 Nm	6.000	i = 1:1	200	94	38,0	78	80	14,0	18
9	150 Nm	5.000	i = 1:1	260	152	52,0	104	80	19,0	18

ANSI CAT 50 ZWS

90° 内缩细长型角度头
Angle Head 90°, Offset Slim Type



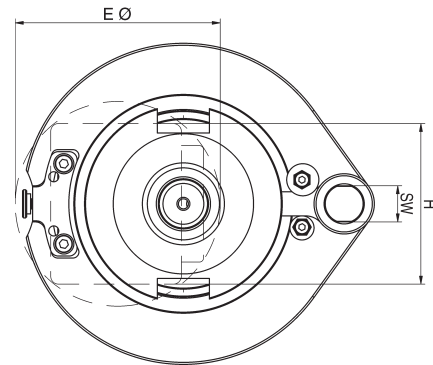
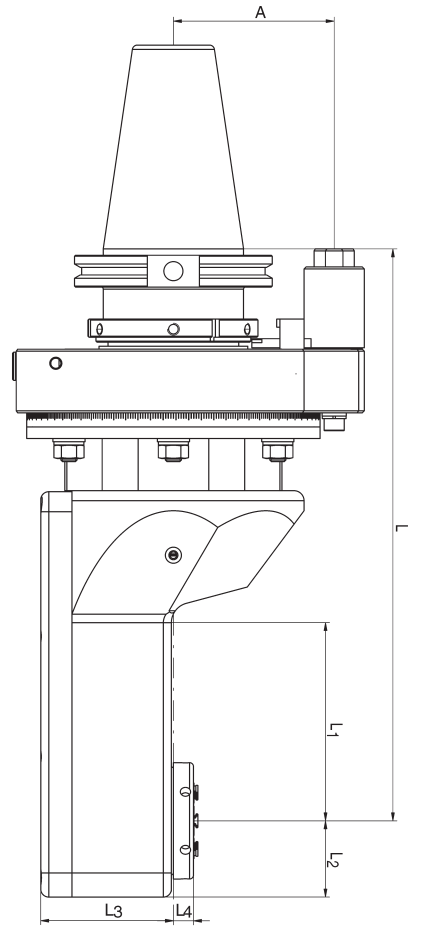
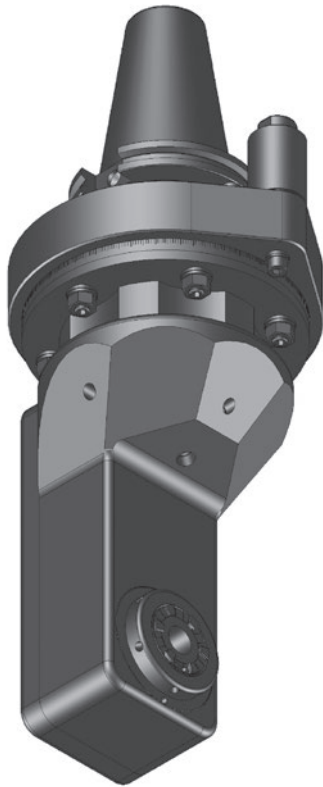
内缩细长型角度头适用于做小孔或有空间问题/空间受限制时。

Offset narrow form to slide into small bores or when clearance issues / space restrictions are issue.



注意：
逆转旋转运动方向

Attention!
Reversal of rotation direction

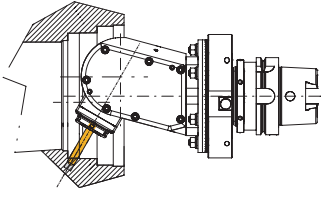


尺寸 Size	订货号 / Order No.			夹头 Toolholder	Eintauch / Clearance Ø E mm		L3 mm		L4 mm	
	ohne / without	extern / external	intern / internal							
0	135591			ER 11	50		49		-8,0	
5	135620	167467		ER 25	82	82	65	65	10,0	10,0
5	173540	162939		mi 40	125	125	65	65	23,5	23,5
7	135653	162927		ER 32	102	102	66	66	13,0	13,0
7	135638	162943		mi 50	135	135	66	66	29,0	29,0

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	L2 mm	H mm	A mm	kg	SW
0	6 Nm	12.000	i = 1:1,67	227,5	38	20	36	80	11,0	18
5	30 Nm	8.000	i = 1:1	215,0	76	28	56	80	12,5	18
7	70 Nm	6.000	i = 1:1	285,0	100	38	80	80	13,5	18

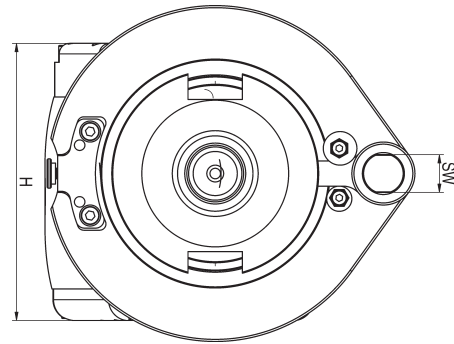
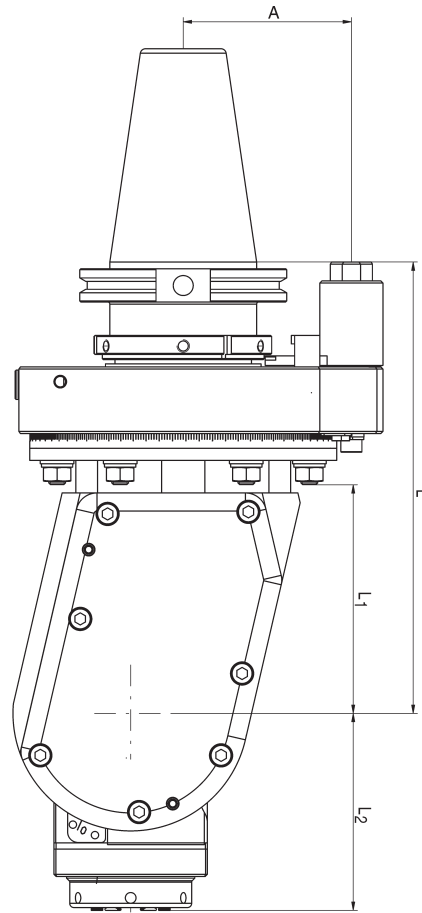
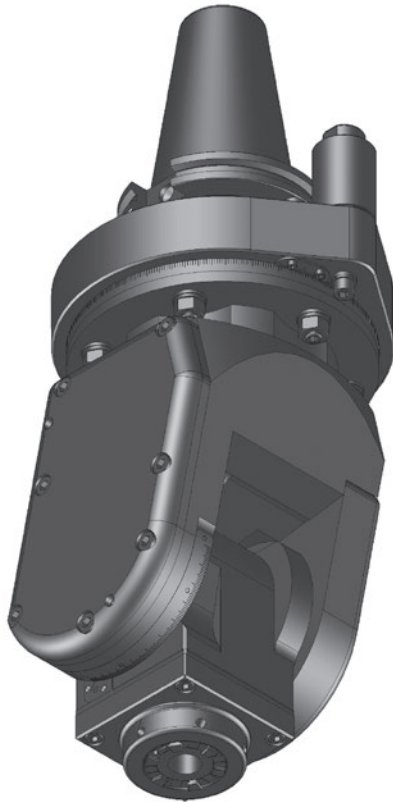
ANSI CAT 50 WS

0-98° 可调角度型角度头
Angle Head, Adjustable 0-98°



可调角度型角度头可在任何角度进行打孔和铣削加工。

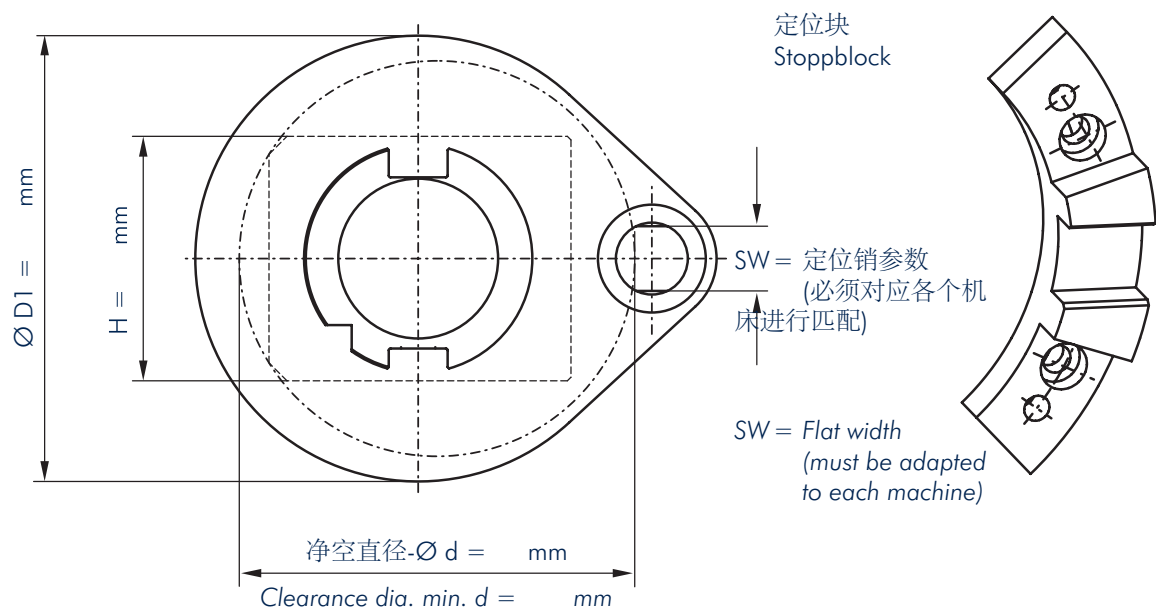
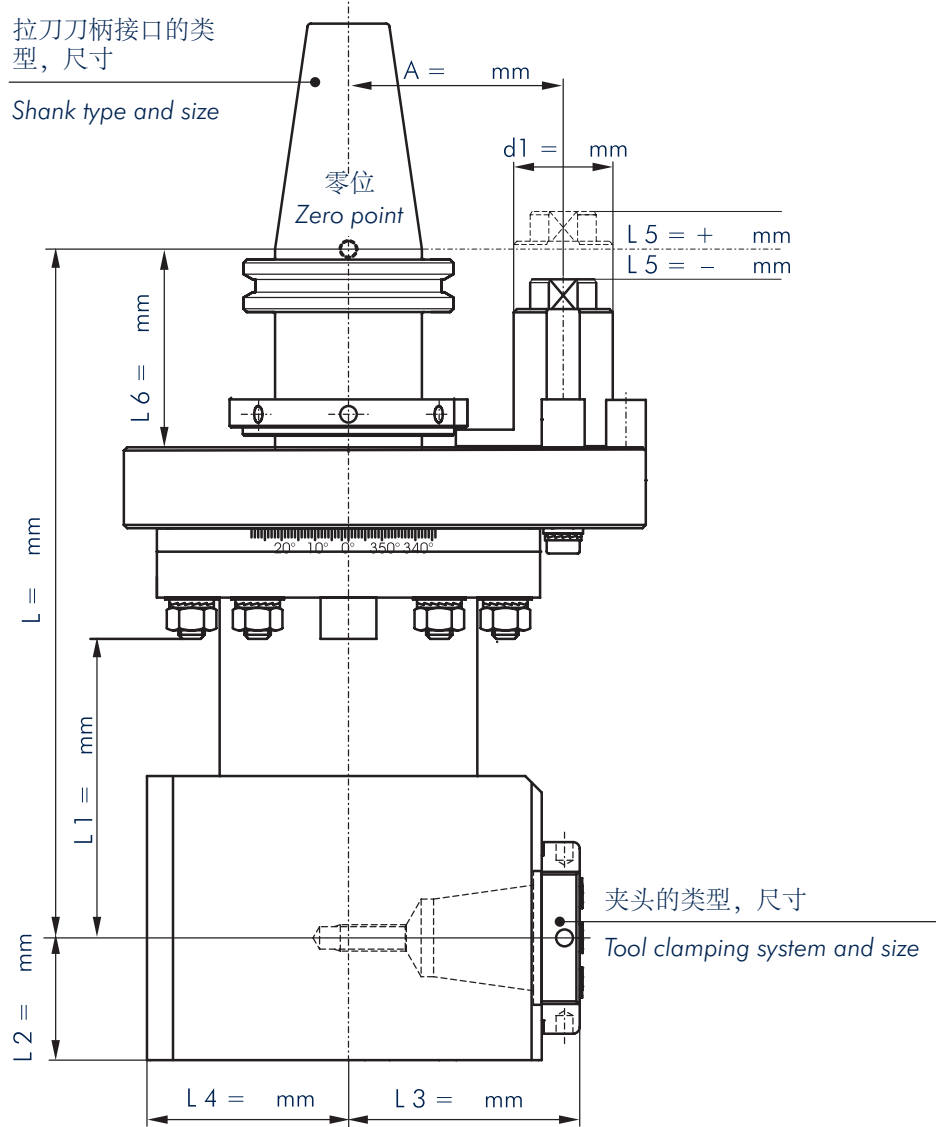
Adjustable angle unit to do boring and milling applications at any angle.



尺寸 Size	订货号 / Order No. (i=1:1)		订货号 / Order No. (i=1:2,25)		夹头 Toolholder	L2 mm	L4 mm
	ohne / without	intern / internal	ohne / without	intern / internal			
5	162946	135839	162947	162948	ER 25	84	25
5	162951	169978	162950	162949	mi 40	97	25
7	162984	162983			ER 32	95	25
7	162990	169941			mi 50	108	25

尺寸 Size	max. 最大扭矩 Torque max.	max. 最高转速 (U/min.) Rev. max. (RPM)	传动比 Gear Ratio	L mm	L1 mm	H mm	A mm	kg	SW
5	30 Nm	7.000 / 13.500	i = 1:1 / 1:2,25	195	100	111	80	14,0	18
7	70 Nm	6.000	i = 1:1	215	109	132	80	16,0	18

选型图纸尺寸 Checklist for Inquiry



选型问题列表 / Request Form

咨询电话: +86 21-57444-90

公司 / Company	
联系人 / Name	
地址 / Adress	
邮编/地址/ Zip/City	
电话 / Phone	
传真 / Fax	
E-Mail / eMail	

机床信息 / Machine Specs

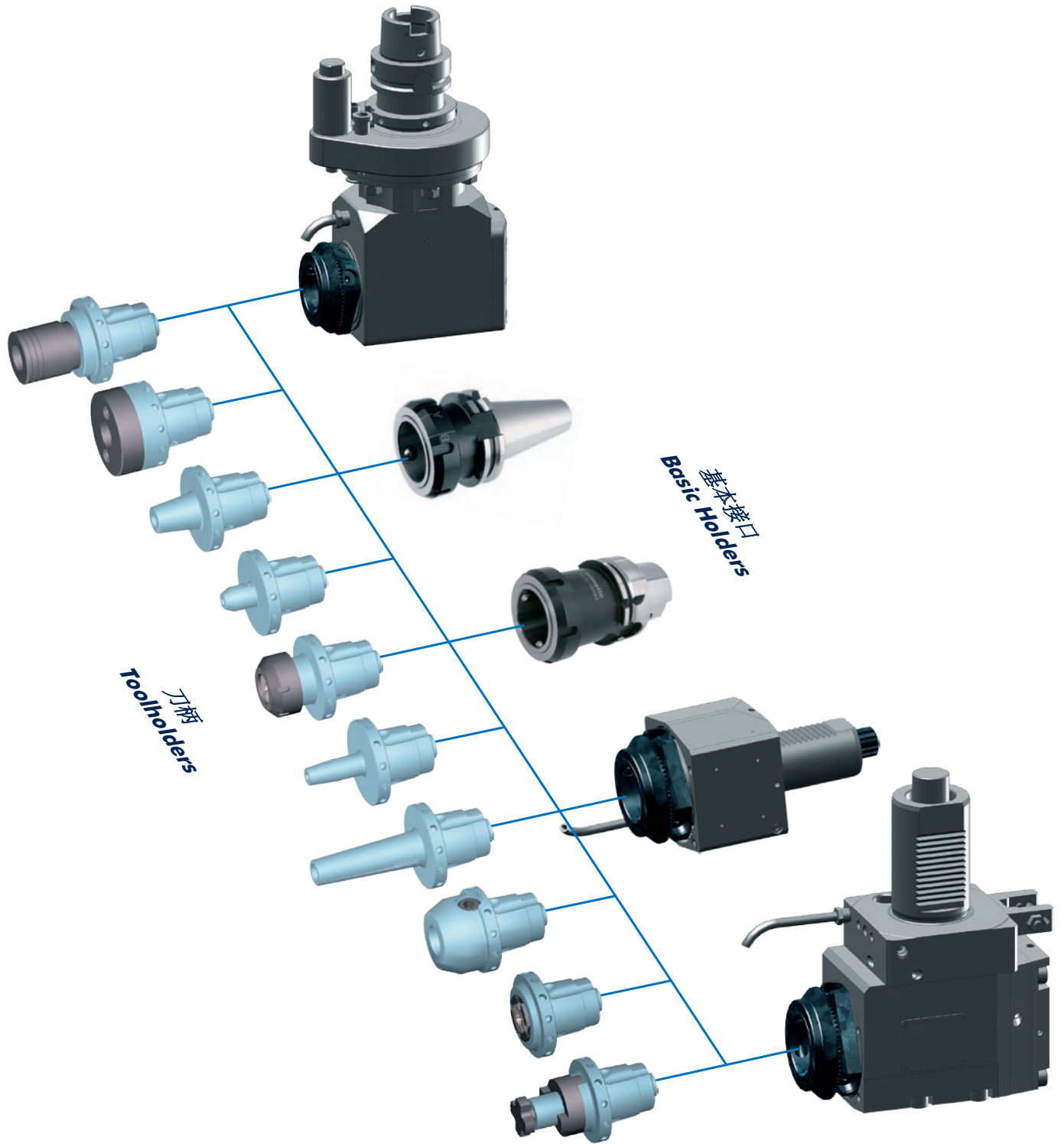
品牌 / Manufacturer	
型号, 年份 / Type, year of manufacturing	
机床编号. / Machine no.	
内冷压力 / Internal coolant pressure	
max. 最高主轴转速 / Spindle speed max.	U/min. / RPM
max. 主轴扭矩 / max. spindle torque	Nm
是否需要三点支撑 / Support available	ja / yes nein / no
是否需要定位块 / Stop block available	ja / yes nein / no
定位块图纸 / Stop block drawing	ja (bitte übersenden) / yes (please transmit) nein / no
刀库尺寸, 空间 / Tool places (magazine)	Stück / Pcs.

切削参数 / Operation Specs

何种加工 / Operation	
(转孔, 铣, 车) / (drilling, milling, turning)	
工件材料 / Material	
刀具信息 / Tool	
工件图纸 / Work piece drawing	ja (bitte übersenden) / yes (please transmit) nein / no
需要支撑的数量 / Number of supports	

角度头参数 / Angle Head Specs

刀柄接口 (Schaff) / Spindle connection (Shank)	SK	ANSI-CAT	MAS-BT	HSK
其他 / Others				
刀柄大小 (DIN) / Shank size (DIN)	Andere / Others			
传动比 / Gear ratio	i=			
图中尺寸 标注 / Add dimensions (drawing)				
刀具夹头 (单轴) / Holder (One-spindle)				
刀具夹头 (多轴) / Holder (Multi-spindle)				
旋转锁死 / Locking	ja / yes	nein / no		
设计转速需求 / Desired spindle speed	U/min. / RPM			
设计扭矩需求 / Desired torque	Nm			
定位销偏心距离 A / Offset A	mm			
锁销直径 Ø / Locking bolt Ø	mm			
离零位的距离 / Position to zero point	+	-	mm	
max. 最大重量 / Tool weight max.	kg			
max. 最大尺寸-Ø / Tool diameter max.	mm			
是否自动换刀 / Automatic tool change	ja / yes	nein / no		
是否手动换刀 / Manual tool change	ja / yes	nein / no		
冷却方式 / Coolant	ja / yes	nein / no		
max. 冷却液压力 (i.K.) / max. coolant pressure (int.)				
冷却喷嘴 / Coolant nozzle				
冷却管 / Coolant pipe				
配件 / Accessories				



		尺寸 Size	标准 Standard	页码 Page
基本接口 Basic Toolholders		SK 40/50 BT 40/50 HSK 63	DIN 69871 MAS-BT DIN 69893	67 67 67
夹头 Collet Chucks		ER 11 - ER 40	DIN 6499	68
整体夹头 Combination Shell End Mill Arbors		Ø 16-27 mm		68
Weldon-夹头 Whistle-Notch-夹头 Weldon Toolholders Whistle-Notch Toolholders		Ø 6-25 mm Ø 1/4"-1/0"	DIN 1835 B DIN 1835 B	69 69
Synax® 螺纹快换夹头 Synax® Tapping Quick Change Holders		Ø 3,5-16 mm		70
软件同步-夹头 (Lizenz Emuge) Softsynchro Chucks (Licence Emuge)		M4-M12		70
液压夹头 Hydraulic Chucks		Ø 12 + 20 mm		68
		Zubehör / Accessories		74
收缩夹头 Shrink Fit Chucks		Ø 8-20 mm		71
		Zubehör / Accessories		71
配件 Accessories		Rohling / Blank Prüfdorn / Test mandrel Werkzeug-Voreinstellung / Tool-presetting unit Montageblock / Wrench Schutzstopfen / Protection plug Spannschlüssel / Assembling jig		71 71 72 72 73 73

mimaticMi

角度头快换系统 "mimatic mi"

Modular Quick Change System "mimatic mi" for Angle Heads

优点

- 适用于所有生产区域的集成工具夹紧系统
- 通过长度调节螺钉在机床外部预设刀具
- 几秒钟内实现换刀
- 切削面跳动精度 < 0,002 mm
- 通过强制锁定实现完全扭矩传递
- 结构紧凑
- 各种尺寸的刀柄
- 所有夹头均可配内冷

适用于加工中心

适用于所有加工中心，铣床，车削/铣削中心以及走心机和特殊机床的动力刀座，角度头有许多不同的版本：

- 轴柄 SK, BT, CAT, HSK
- 增速-/减速
- 内冷/或外冷
- 90° 角度
- 单轴- 和 2-双轴
- 后缩型
- 后缩细长型
- 0-98° 可调角度

适用于所有生产区域的各种尺寸的模块化刀柄

- 攻丝夹头
- 弹性夹头 (内缩和外伸)
- 液压夹头
- 收缩夹头
- 旋风铣
- MK 套筒座
- Weldon- 和 Whistle-Notch 接头
- 整体铣刀解决方案

您还可以使用预置装置的刀柄以及标准 SK-/HSK 刀柄作为基本底座。

"mi" 功能介绍

- 将快换夹头插入动力刀座的轴柄
- 模块化mimatic[®]-mi 接口内的3个铁球将夹头导入正确的位置
- 扭转夹头接口直至其卡入到位
- 用mimatic[®] 单手扳手夹紧联管螺母
- 快速更换系统可以按相反的顺序轻松松开
- 预设和斜角系统设计保证最大的同心度
- 所有夹头都有含内冷，可提供不同尺寸和长度

Advantages

- Universal tool clamping system for all production areas
- Presetting of the tools off-line by length adjustment screw
- Tool change within seconds
- Concentricity of the interface < 0,002 mm
- Secure holding force by form-locking
- Very short design
- Toolholders in different sizes
- All toolholders with internal coolant

Use on Machining Centers

Driven toolholders for all machining centers, milling machines, turn / mill centers as well as transfer and special machines. Angle heads are available in many different versions:

- Shafts such as SK, BT, CAT, HSK
- Gear multiplication or reduction
- Internal and/or external coolant supply
- 90° angle
- Single and double spindle units
- Offset type
- Slim design
- Adjustable 0-98°

Modular Toolholders in Different Sizes for All Production Areas

- Tapping toolholders
- Collet toolholders (internal and external nut)
- Hydro-Flex hydraulic toolholders
- Thread tightening toolholder cutters
- Morse taper shank toolholders
- Weldon and Whistle Notch toolholders
- Shell mill toolholders

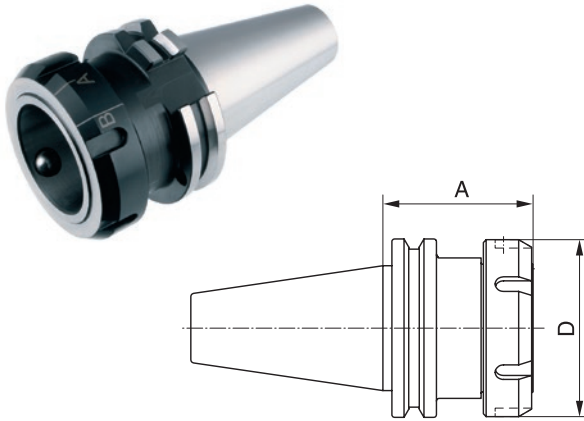
All toolholders are available for use with your presetter.

"mi" Operation

- Insert the toolholder into the spindle of the driven toolholder
- 3 balls inside the modular mimatic mi interface guide the toolholder into the proper position
- Turn the toolholder until it is locked
- Clamping the sleeve nut by using the mimatic one hand key
- To unclamp the toolholder just follow all steps in reverse order
- The axial and conical surface guarantee highest concentricity
- All toolholders are with internal coolant and available in different sizes

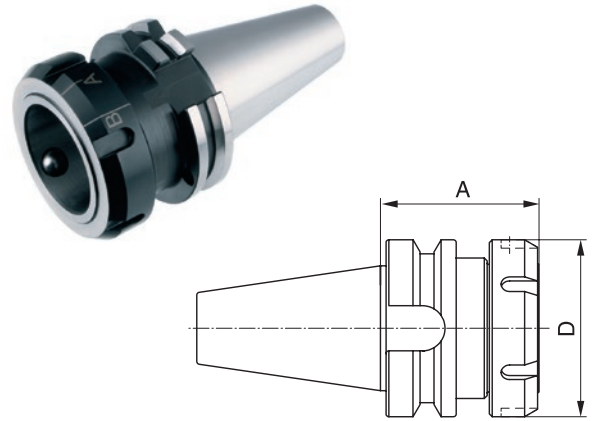
基本刀柄 Basic Holders

DIN 69871 AD/B



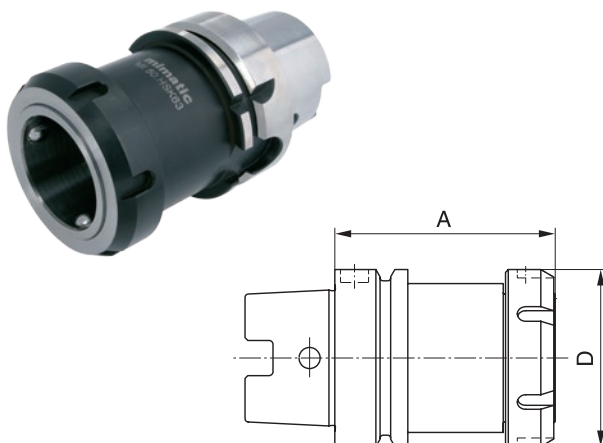
订货号 Order No.	尺寸 Size	SK	A mm	D mm
121454	mi 32	SK 30	53,5	45
155404	mi 40	SK 40	53,5	54
155502	mi 50	SK 40	53,5	63
155481	mi 50	SK 50	53,5	63
155477	mi 63	SK 50	58,5	77

MAS-BT JIS 6339



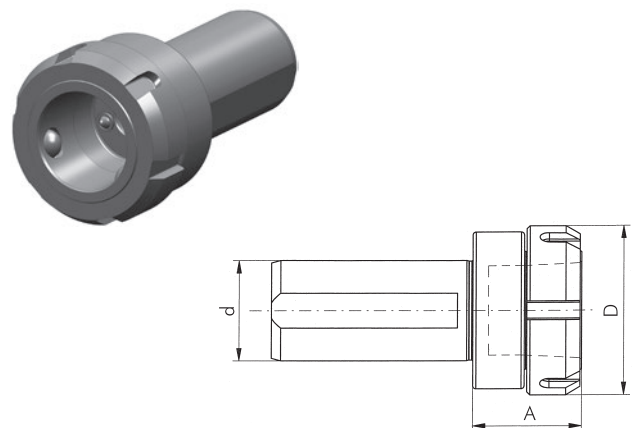
订货号 Order No.	尺寸 Size	BT	A mm	D mm
121481	mi 32	BT 30	45,0	45
121512	mi 40	BT 40	48,5	54
155469	mi 50	BT 40	56,5	63
155457	mi 50	BT 50	61,5	63
121552	mi 63	BT 50	70,0	77

DIN 69893 A



订货号 Order No.	尺寸 Size	HSK	A mm	D mm
155410	mi 40	HSK 50	60,0	54
155458	mi 50	HSK 63	78,5	63
121562	mi 50	HSK 100	85,0	63
121577	mi 63	HSK 100	100,0	77

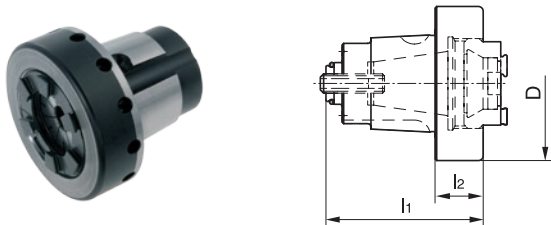
直柄刀柄带夹紧面 Cylindrical Shank With Clamping Surface



订货号 Order No.	尺寸 Size	Ø d mm	A mm	D mm
180538	mi 40	32	35	54

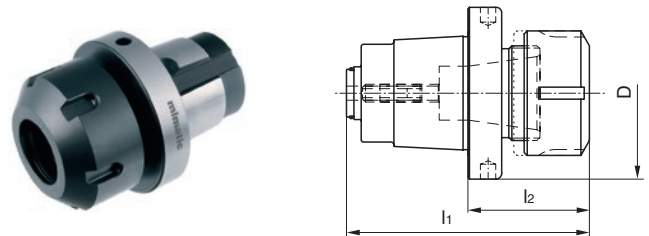
弹性夹头 DIN 6499, Typ ER Collet Chucks DIN 6499, Type ER

- 短款设计 / **Short Design**
- 内置夹紧螺母 / **Clamping Nut Inside**
- 含内冷 / **With Internal Coolant**



订货号 Order No.	尺寸 Size	夹头 Collet	l1 mm	l2 mm	D mm
121479	mi 32	ER 11	41,5	15	42
155357	mi 32	ER 16	41,5	15	42
171839	mi 32	ER 20	59,0	32	36
155388	mi 40	ER 16	45,0	11	48
155335	mi 40	ER 20	49,0	15	48
155367	mi 40	ER 25	55,0	21	48
155418	mi 50	ER 25	55,0	14	58
155460	mi 50	ER 32	59,0	18	58
155471	mi 63	ER 32	63,0	14	75
155496	mi 63	ER 40	69,0	20	75

- 长款设计 / **Long Design**
- 夹头外置 / **Clamping Nut outside**
- 含内冷 / **With Internal Coolant**

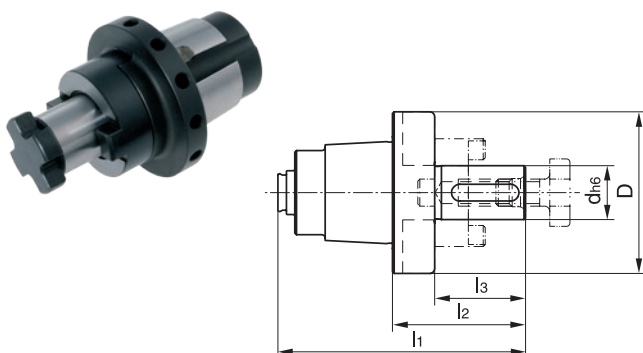


订货号 Order No.	尺寸 Size	夹头 Collet	l1 mm	l2 mm	D mm
155358	mi 32	ER 11	72,5	46,0	42
155319	mi 32	ER 16	64,5	38,0	42
121460	mi 40	ER 16	73,0	39,0	48
121502	mi 40	ER 20	80,0	46,6	48
155448	mi 50	ER 25	82,0	41,0	58
155445	mi 50	ER 32	88,0	47,0	58
155475	mi 63	ER 32	96,0	47,0	75
155451	mi 63	ER 40	94,5	45,5	75

整体铣刀解决方案

Combination Shell End Mill Arbor

含内冷 / **With Internal Coolant**

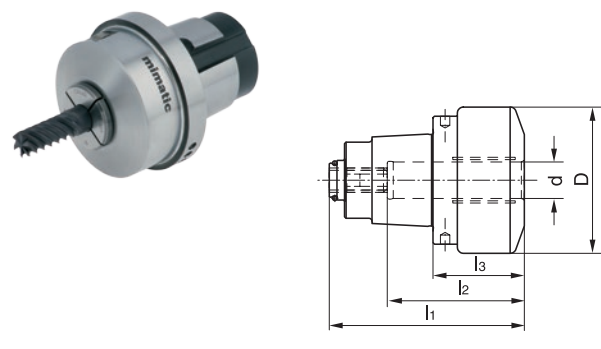


订货号 Order No.	尺寸 Size	l1 mm	l2 mm	l3 mm	d h6 mm	D mm
121486	mi 32	66,0	39,5	27	16	42
155365	mi 40	73,5	39,5	25	16	48
155447	mi 50	82,0	41,0	27	16	58
155413	mi 50	88,0	47,0	31	22	58
155512	mi 63	96,0	47,0	31	22	75
155465	mi 63	98,0	49,0	33	27	75

液压刀柄

Hydraulic Chuck

含内冷 / **With Internal Coolant**
扳手 74 页 / **Sleeves see page 74**

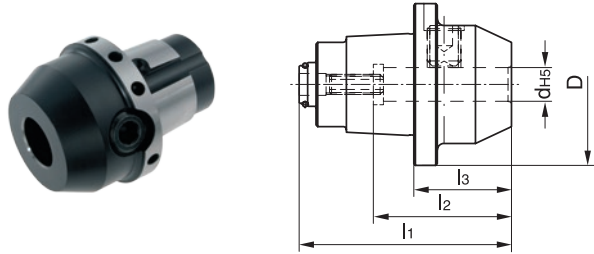


订货号 Order No.	尺寸 Size	l1 mm	l2 mm	l3 mm	d h6 mm	D mm
155391	mi 40	64	45	30	12	48
155417	mi 50	71	52	30	20	58

Weldon-接头 DIN 1835 B

Weldon Toolholder DIN 1835 B

舍内冷 / *With Internal Coolant*

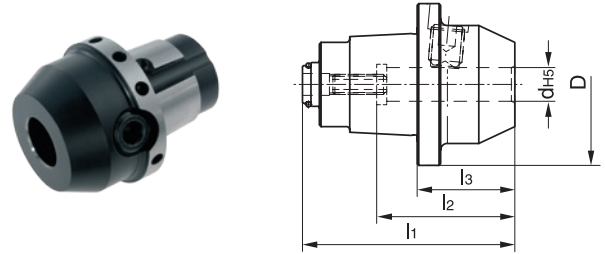


订货号 Order No.	尺寸 Size	l1 mm	l2 mm	l3 mm	dH5 mm / "	D mm
121436	mi 32	52,5	37	26,0	6	42
121478	mi 32	52,5	37	26,0	8	42
121469	mi 32	55,5	41	29,0	10	42
121439	mi 32	57,5	46	31,0	12	42
121449	mi 32	52,5	37	26,0	1/4"	42
121472	mi 32	55,5	41	29,0	3/8"	42
121448	mi 32	57,5	46	31,0	1/2"	42
155330	mi 40	60,0	37	26,0	6	48
155346	mi 40	60,0	37	26,0	8	48
155321	mi 40	63,0	41	29,0	10	48
155331	mi 40	65,0	46	31,0	12	48
155326	mi 40	65,0	46	31,0	14	48
155379	mi 40	68,0	49	34,0	16	48
121497	mi 40	60,0	37	26,0	1/4"	48
121475	mi 40	63,0	41	29,0	3/8"	48
121474	mi 40	65,0	46	31,0	1/2"	48
121499	mi 40	68,0	49	34,0	5/8"	48
155419	mi 50	65,0	37	24,0	6	58
155411	mi 50	66,0	37	25,0	8	58
155400	mi 50	70,0	41	29,0	10	58
155406	mi 50	73,0	46	32,0	12	58
155412	mi 50	73,0	46	32,0	14	58
155407	mi 50	74,0	49	33,0	16	58
155427	mi 50	78,0	51	37,0	20	58
121489	mi 50	65,0	37	24,0	1/4"	58
121529	mi 50	40,0	41	29,0	3/8"	58
121525	mi 50	73,0	46	32,0	1/2"	58
121520	mi 50	75,0	49	34,0	5/8"	58
121526	mi 50	78,0	51	37,0	3/4"	58
155470	mi 63	81,0	37	32,0	6	75
155459	mi 63	82,0	37	33,0	8	75
155490	mi 63	85,0	41	36,0	10	75
155509	mi 63	88,5	46	39,5	12	75
155463	mi 63	88,5	46	39,5	14	75
155482	mi 63	91,0	49	42,0	16	75
155474	mi 63	93,0	51	44,0	20	75
155464	mi 63	110	59	61,0	25	75
166815	mi 63	81,0	37	32,0	1/4"	75
166805	mi 63	85,0	41	36,0	3/8"	75
166813	mi 63	88,5	46	39,5	1/2"	75
166807	mi 63	91,0	49	42,0	5/8"	75
166804	mi 63	93,0	51	44,0	3/4"	75
166812	mi 63	110	59	61,0	1/0"	75

Whistle Notch-接头 DIN 1835 E

Whistle Notch Toolholder DIN 1835 E

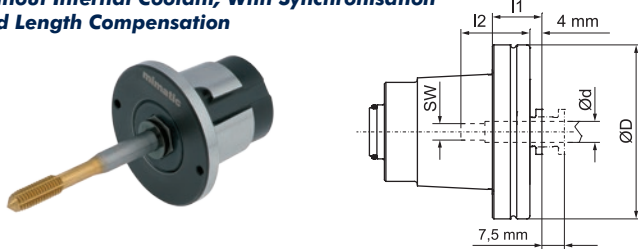
舍内冷 / *With Internal Coolant*



订货号 Order No.	尺寸 Size	l1 mm	l2 mm	l3 mm	dH5 mm / "	D mm
121463	mi 32	52,5	36	26,0	6	42
121464	mi 32	52,5	36	26,0	8	42
121443	mi 32	55,5	40	29,0	10	42
121453	mi 32	57,5	45	31,0	12	42
121442	mi 32	52,5	36	26,0	1/4"	42
121485	mi 32	55,5	40	29,0	3/8"	42
121480	mi 32	57,5	45	31,0	1/2"	42
155369	mi 40	60,0	36	26,0	6	48
155363	mi 40	60,0	36	26,0	8	48
155370	mi 40	63,0	40	29,0	10	48
155364	mi 40	65,0	45	31,0	12	48
155333	mi 40	65,0	45	31,0	14	48
155382	mi 40	68,0	48	34,0	16	48
121492	mi 40	60,0	36	26,0	1/4"	48
121493	mi 40	63,0	40	29,0	3/8"	48
121455	mi 40	65,0	45	31,0	1/2"	48
121494	mi 40	68,0	48	34,0	5/8"	48
169197	mi 40	89,0	50	55,0	20	52
155416	mi 50	65,0	36	24,0	6	58
155401	mi 50	66,0	36	25,0	8	58
155383	mi 50	70,0	40	29,0	10	58
155408	mi 50	73,0	45	32,0	12	58
155435	mi 50	73,0	45	32,0	14	58
155436	mi 50	75,5	48	34,5	16	58
155384	mi 50	78,0	50	37,0	20	58
166816	mi 50	65,0	36	24,0	1/4"	58
155440	mi 50	70,0	40	29,0	3/8"	58
155434	mi 50	73,0	45	32,0	1/2"	58
155428	mi 50	75,0	48	34,0	5/8"	58
155385	mi 50	78,0	50	37,0	3/4"	58
166104	mi 63	81,0	36	32,0	6	75
166105	mi 63	82,0	36	33,0	8	75
166110	mi 63	85,0	40	36,0	10	75
166112	mi 63	88,5	45	39,5	12	75
166113	mi 63	88,5	45	39,5	14	75
166114	mi 63	91,0	48	42,0	16	75
166115	mi 63	93,0	50	44,0	20	75
166116	mi 63	110	56	61,0	25	75
166797	mi 63	81,0	36	32,0	1/4"	75
166799	mi 63	85,0	40	36,0	3/8"	75
166796	mi 63	88,5	45	39,5	1/2"	75
166803	mi 63	91,0	48	42,0	5/8"	75
166798	mi 63	93,0	50	44,0	3/4"	75
166795	mi 63	110	56	61,0	1/0"	75

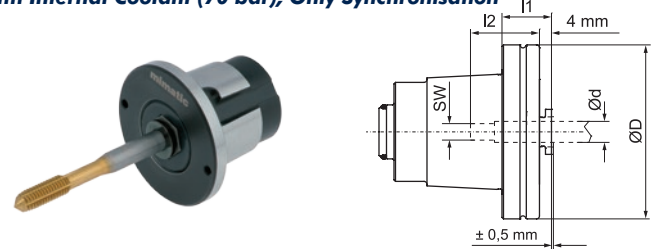
SYNAX® 螺纹快换夹头 SYNAX® Tapping Quick Change Holder

无内冷, 具有同步和长度补偿
Without Internal Coolant, With Synchronisation and Length Compensation



订货号 Order No.	尺寸 Size	l1 mm	l2 mm	d mm	D mm	SW
121510	mi 40	17,0	25	3,5	48	2,7
155397	mi 40	17,0	25	4,5	48	3,4
155377	mi 40	17,0	27	6,0	48	4,9
155378	mi 40	17,0	27	8,0	48	6,2
155403	mi 40	38,0	28	9,0	48	7,0
121451	mi 40	38,0	29	10,0	48	8,0
121498	mi 40	38,0	30	12,0	48	9,0
155450	mi 50	16,5	25	3,5	58	2,7
155487	mi 50	16,5	25	4,5	58	3,4
155422	mi 50	16,5	27	6,0	58	4,9
155497	mi 50	16,5	27	7,0	58	5,5
155455	mi 50	16,5	27	8,0	58	6,2
155423	mi 50	16,5	28	9,0	58	7,0
155466	mi 50	16,5	29	10,0	58	8,0
155472	mi 50	44,0	36	11,0	58	9,0
155449	mi 50	16,5	30	12,0	58	9,0
155479	mi 50	44,0	33	16,0	58	12,0

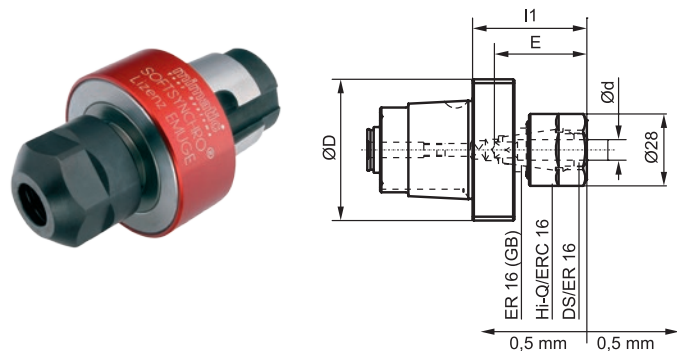
内冷系统(70 bar), 只有同步
With Internal Coolant (70 bar), Only Synchronisation



订货号 Order No.	尺寸 Size	l1 mm	l2 mm	d mm	D mm	SW
155389	mi 40	17,0	27	6	48	4,9
121522	mi 40	17,0	27	8	48	6,2
121515	mi 40	38,0	28	9	48	7,0
121504	mi 40	38,0	29	10	48	8,0
121517	mi 40	38,0	30	12	48	9,0
155432	mi 50	16,5	27	6	58	4,9
172720	mi 50	16,5	27	7	58	5,5
155498	mi 50	16,5	27	8	58	6,2
155473	mi 50	16,5	28	9	58	7,0
155467	mi 50	16,5	29	10	58	8,0
155446	mi 50	16,5	30	12	58	9,0
121534	mi 50	44,0	33	16	58	12,0

软件同步-夹头 (Lizenz Emuge) Softsynchro Chuck (Licence Emuge)

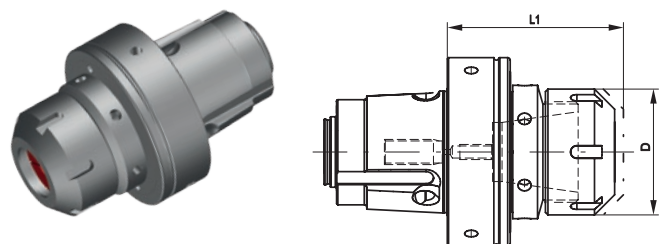
含内冷, 长度补偿 ±0,5 mm 至张力+压力
With Internal Coolant and Push + Pull Length Compensation ±0,5mm



订货号 Order No.	尺寸 Size	夹头 Collet	螺纹 Thread	l1 mm	d mm	D mm
121503	mi 40	ER-GB 16	M4-M12	47,5	4,5-10	45
121530	mi 50	ER-GB 16	M4-M12	44,5	4,5-10	50

长度补偿夹头 Chuck with Length Compensation for Collets

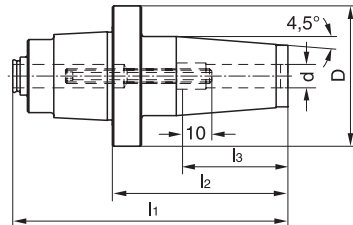
含内冷, 长度补偿 ±0,5 mm 至张力+压力
With Internal Coolant and Push + Pull Length Compensation ±0,5mm



订货号 Order No.	尺寸 Size	夹头 Collet	L1 mm	D mm
121518	mi 40	ER 20 GB(1-13)	60	28
155488	mi 50	ER 25 GB(1-16)	60	42
155491	mi 63	ER 32 GB(2-20)	70	50

收缩夹头
Shrink Fit Chuck

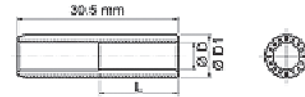
内冷系统
With Internal Coolant



订货号 Order No.	尺寸 Size	l1 mm	l2 mm	l3 mm	d h6 mm	D mm
155381	mi 40	94	60	36	8	48
121482	mi 40	94	60	42	10	48
155334	mi 40	99	65	47	12	48
121501	mi 40	104	70	50	16	48
155421	mi 50	101	60	36	8	58
155409	mi 50	101	60	42	10	58
155444	mi 50	106	65	47	12	58
155438	mi 50	106	65	47	14	58
155430	mi 50	111	70	50	16	58
155431	mi 50	116	75	50	18	58
155454	mi 50	116	75	52	20	58

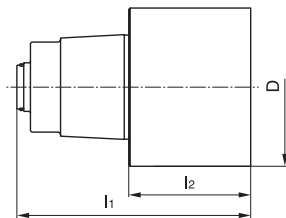
收缩夹头配件
Accessory for Shrink Fit Chucks

减少
Sleeve



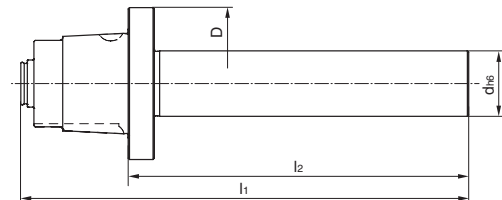
订货号 Order No.	L mm	L1 mm	d h6 mm	D mm
119807	30,5	7,5	2,5	8
119787	30,5	9,0	3,0	8
119808	30,5	10,5	3,5	8
119809	30,5	12,0	4,0	8
119788	30,5	13,5	4,5	8
119789	30,5	15,0	5,0	8
119796	30,5	16,5	5,5	8

检测棒
Blank



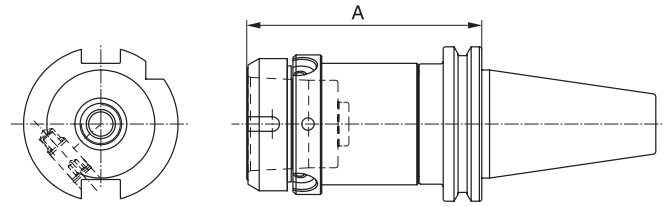
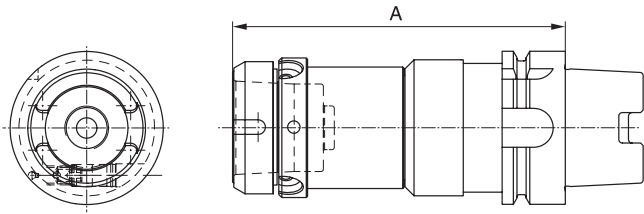
订货号 Order No.	尺寸 Size	l1 mm	l2 mm	D mm
121457	mi 32	76,5	50	42
166791	mi 40	94,0	60	48
166789	mi 50	111,0	70	58
121557	mi 63	129,0	80	75

检测棒
Test Mandrel



订货号 Order No.	尺寸 Size	l1 mm	l2 mm	d h7 mm	D mm
170569	mi 25		110	14	35
172991	mi 32		110	18	42
156208	mi 40		130	20	48
156082	mi 50		130	25	58
172992	mi 63		150	32	75

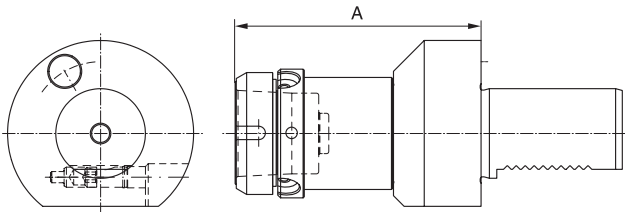
记录刀具预设
Tool Presetting Unit



订货号 Order No.	尺寸 Size	HSK	A mm
171098	mi 25	63	130,0
155352	mi 32	63	130,0
155380	mi 40	63	134,5
173224	mi 40	100	143,0
155429	mi 50	63	136,9
168301	mi 50	100	143,0
166990	mi 63	63	147,0
169267	mi 63	100	155,0

订货号 Order No.	尺寸 Size	SK	A mm
121471	mi 40	40	95
121491	mi 40	50	128
155405	mi 50	40	97
121527	mi 50	50	140
155504	mi 63	50	140

安装块
Assembling Jig



订货号 Order No.	尺寸 Size	VDI	A mm
155368	mi 40	40	108
155356	mi 50	40	110
155372	mi 40	50	108
121524	mi 50	50	110



订货号 Order No.	尺寸 Size
166774	SK 40
166775	HSK 63
121571	VDI 40
121558	VDI 30
121579	SK 50
168300	HSK 100

mi 配件
mi Accessories

整体夹紧扳手，单手操作
Complete Wrench for One-hand Operation



订货号 Order No.	尺寸 Size
170734	mi 25, mi 32, mi 40

扭矩扳手 mi
Torque Wrench for mi



订货号 Order No.	尺寸 Size	Nm
189909	mi 32, mi 40	8
183625	mi 50, mi 63	12

保护头
Protection Plug



订货号 Order No.	尺寸 Size
174460	mi 32
174458	mi 40
174457	mi 50
174459	mi 63

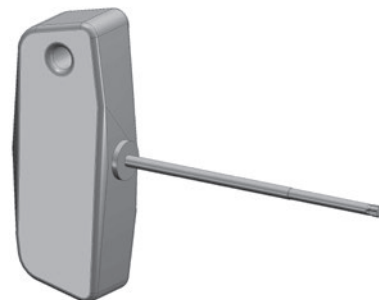
扭矩扳手的备件
Asseccory for Torque Wrench



订货号 Order No.	尺寸 Size	L mm	SW Wrench size
173985	mi 25 – mi 63	50	1/4"

Capto C4 配件
Capto C4 Accessories

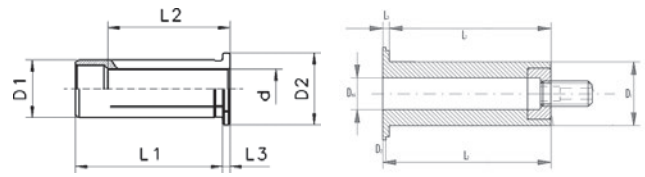
扳手
Wrench



订货号 Order No.	尺寸 Size
190203	C4

液压刀柄配件
Accessories for Hydraulic Chucks

衬套
Sleeve



不可长度调节型
without horizontal adjustment

可长度调节型
with horizontal adjustment

订货号 Order No.	D1 mm	d h6 mm / "	L1 mm	L2 mm	L3 mm	D2 mm
119790	12	3	40	29	4	16
119793	12	1/8"	40	29	4	16
119797	12	4	40	29	4	16
119798	12	3/16"	40	29	4	16
119819	12	5	40	29	4	16
119812	12	6	40	36	4	16
119813	12	1/4"	40	36	4	16
119791	12	7	40	37	4	16
119799	12	5/16"	40	37	4	16
119810	12	8	40	37	4	16
119792	12	9	40	37	4	16
119815	12	3/8"	40	40	4	16
119814	12	10	40	40	4	16
119816	20	3	50	28	4	25
119823	20	1/8"	50	28	4	25
119817	20	4	50	28	4	25
119837	20	3/16"	50	28	4	25
119800	20	5	50	28	4	25
119801	20	6	50	36	4	25
119822	20	1/4"	50	36	4	25
119818	20	7	50	38	4	25
119839	20	5/16"	50	37	4	25
119820	20	8	50	37	4	25
119802	20	9	50	38	4	25
119838	20	3/8"	50	38	4	25
119824	20	10	50	40	4	25
119825	20	11	50	40	4	25
119830	20	7/16"	50	45	4	25
119826	20	12	50	45	4	25
119821	20	1/2"	50	45	4	25
119827	20	14	50	45	4	25
119846	20	9/16"	50	45	4	25
119829	20	5/8"	50	48	4	25
119828	20	16	50	48	4	25
119847	25	3	56	29	4	30
119848	25	4	56	29	4	30
119831	25	5	56	29	4	30
119849	25	6	56	37	4	30
119832	25	7	56	37	4	30
119833	25	8	56	37	4	30
119834	25	9	56	38	4	30
119850	25	10	56	40	4	30

订货号 Order No.	D1 mm	d h6 mm / "	L1 mm	L2 mm	L3 mm	D2 mm
119835	25	12	56	46	4	30
119851	25	14	56	47	4	30
119836	25	16	56	48	4	30
119841	25	18	56	48	4	30
119842	25	20	56	50	4	30
119844	32	6	60	36	4	36
119857	32	1/4"	60	36	4	36
119845	32	7	60	37	4	36
119879	32	5/16"	60	36	4	36
119852	32	8	60	36	4	36
119855	32	9	60	37	4	36
119884	32	3/8"	60	37	4	36
119864	32	10	60	40	4	36
119853	32	11	60	40	4	36
119858	32	12	60	45	4	36
119856	32	1/2"	60	45	4	36
119859	32	13/16"	60	45	4	36
119865	32	14	60	46	4	36
119854	32	15/16"	60	46	4	36
119861	32	5/8"	60	46	4	36
119866	32	16	60	48	4	36
119870	32	18	60	49	4	36
119878	32	3/4"	60	50	4	36
119877	32	20	60	50	4	36
119867	32	25	60	56	4	36

可长度调节型 / with horizontal adjustment

119909	20	6	50	52	-	28
119889	20	8	50	52	-	28
152696	20	10	50	52	-	28
119910	20	12	50	52	-	28
119901	20	14	50	52	-	28
119911	20	16	50	52	-	28
119892	20	18	50	52	-	28
119893	25	10	56	59	-	32
119912	25	12	56	59	-	32
119894	25	14	56	59	-	32
119895	25	16	56	59	-	32
167144	25	18	56	59	-	32
167045	25	20	56	59	-	32

配件 Accessories

锁紧扳手 和 锁紧螺母 Wrenches and Clamping Nuts



ER螺母的锁紧扳手 Wrench for ER Clamping Nuts

订货号 Order No.	尺寸 Size	型号
112912	ER 11	内缩 / inlying
112954	ER 16	内缩 / inlying
112929	ER 20	内缩 / inlying
112913	ER 25	内缩 / inlying
112900	ER 32	内缩 / inlying
112867	ER 40	内缩 / inlying
107628	ER 40	外伸 / outlying

ER-螺母 ER Clamping Nuts

订货号 Order No.	尺寸 Size	型号	冷却 Coolant
112953	ER 11	内缩 / inlying	
112860	ER 16	内缩 / inlying	
112938	ER 20	内缩 / inlying	
112961	ER 25	内缩 / inlying	
112977	ER 32	内缩 / inlying	
112946	ER 40	内缩 / inlying	
112962	ER 16	内缩 / inlying	✓
112940	ER 20	内缩 / inlying	✓
112901	ER 25	内缩 / inlying	✓
112963	ER 32	内缩 / inlying	✓
112978	ER 40	内缩 / inlying	✓
112513	ER 40	外伸 / outlying	
117744	ER 40	外伸 / outlying	✓

对应的钩形扳手 Hook Wrench to Hold Against

DIN 1810 A 鼻
鼻销 / with nose



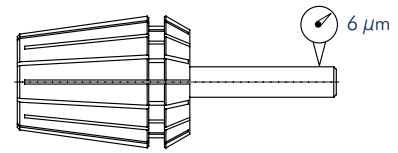
DIN 1810 B
锥销 / with pivot



订货号 Order No.	尺寸 Size	型号	DIN 1810
107557	ER 16	内缩 / inlying	B
107608	ER 20	内缩 / inlying	B
107446	ER 25	内缩 / inlying	B
107558	ER 25	外伸 / outlying	A
107642	ER 32	内缩 / inlying	B
107607	ER 32	外伸 / outlying	B
107566	ER 40	内缩 / inlying	A
107628	ER 40	外伸 / outlying	A
107605		旋转接头 / Circular saw holder	A
107447		铣刀接头 22 / Milling arbor 22	B

弹簧夹头 DIN 6499-B
Collets DIN 6499-B

■ 精度 6 μm
Concentricity 6 μm

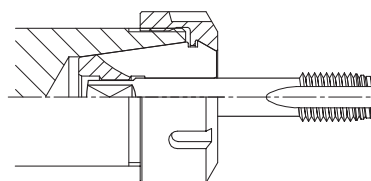


D mm	订货号 / Order No.					
	ER 11	ER 16	ER 20	ER 25	ER 32	ER 40
1,0	120006	120055				
1,5	119994	120084				
2,0	119995	120068	120166	120187		
2,5	120031	120078	120182	120161		
3,0	120013	120071	120175	120223	120431	120586
3,5	120022	120096	120191	120224	120465	120600
4,0	120000	120097	120168	120245	120473	120581
4,5	120023	120074	120209	120253	120475	120565
5,0	120002	120099	120176	120271	120491	120628
5,5	120004	120083	120145	120229	120523	120616
6,0	120015	120112	120210	120281	120448	120637
6,5	120008	120115	120192	120264	120449	120638
7,0	120048	120108	120193	120238	120540	120655
7,5		120119	120203	120298	120467	120673
8,0		120120	120205	120255	120514	120582
8,5		120122	120178	120299	120496	120682
9,0		120124	120151	120291	120532	120621
9,5		120125	120152	120217	120567	120649
10,0		120130	120218	120300	120568	120676
10,5			120211	120292	120515	120630
11,0			120212	120274	120517	120631
11,5			120207	120277	120518	120679
12,0			120208	120270	120571	120641
12,5			120196	120316	120572	120650
13,0			120180	120279	120544	120684
13,5				120317	120552	120667
14,0				120287	120545	120653
14,5				120353	120536	120642
15,0				120318	120508	120608
15,5				120355	120583	120658
16,0				120261	120546	120643
16,5					120592	120624
17,0					120561	120681
17,5					120562	120635
18,0					120528	120644
18,5					120595	120718
19,0					120584	120693
19,5					120585	120694
20,0					120578	120669
20,5						120695
21,0						120705
21,5						120727
22,0						120662
22,5						120715
23,0						120707
23,5						120670
24,0						120671
24,5						120745
25,0						120756
25,5						120738
26,0						120672
Satz / Set	120049	120131	120154	120349	120612	120730
Satz / Set *		152712	120174	152713	152715	152716

ER 止水垫片
ER Seal Disc


密封圈范围 mm Tightness range mm	订货号 / Order No. ER				
	ER 16	ER 20	25	ER 32	ER 40
3,0 - 2,5	172713	163519	112863	112704	112910
3,5 - 3,0	163517	160220	112838	112830	112927
4,0 - 3,5	173372	163518	112833	112705	112951
4,5 - 4,0	160212	160221	112888	112743	112883
5,0 - 4,5	163515	163520	112753	112726	112884
5,5 - 5,0	160214	160222	112707	112734	112899
6,0 - 5,5	112891	112744	112871	112831	112959
6,5 - 6,0	160215	160223	112889	112810	112936
7,0 - 6,5	163516	112855	112839	112832	112846
7,5 - 7,0	160216	160224	112814	112760	112919
8,0 - 7,5	112897	112865	112817	112834	112911
8,5 - 8,0	160217	160225	112864	112780	112960
9,0 - 8,5	178391	163521	112890	112835	112952
9,5 - 9,0	160218	160227	112708	112706	112945
10,0 - 9,5	172458	112844	112811	112725	112821
10,5 - 10,0		160228	112843	112732	112908
11,0 - 10,5		163522	112752	112779	112916
11,5 - 11,0		160230	112852	112803	112841
12,0 - 11,5		112892	112861	112733	112924
12,5 - 12,0		160231	112812	112825	112925
13,0 - 12,5		160232	112870	112804	112894
13,5 - 13,0			112836	112826	112909
14,0 - 13,5			112798	112827	112881
14,5 - 14,0			112813	112699	112933
15,0 - 14,5			112862	112688	112942
15,5 - 15,0			112879	112805	112856
16,0 - 15,5			112837	112806	112822
16,5 - 16,0				112828	112943
17,0 - 16,5				112809	112770
17,5 - 17,0				112716	112842
18,0 - 17,5				112769	112762
18,5 - 18,0				112807	112917
19,0 - 18,5				112797	112882
19,5 - 19,0				112689	112895
20,0 - 19,5				112829	112845
20,5 - 20,0					112857
21,0 - 20,5					112823
21,5 - 21,0					112896
22,0 - 21,5					112934
22,5 - 22,0					112918
23,0 - 22,5					112944
23,5 - 23,0					112926
24,0 - 23,5					112858
24,5 - 24,0					112935
25,0 - 24,5					112771
25,5 - 25,0					112950
26,0 - 26,5					112824
Satz / Set	167490	112907	112735	112715	166918

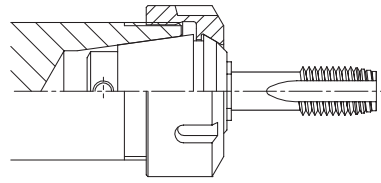
Typ GB 不含长度调节的螺纹夹头 Threading Collets Type BG Without Length Compensation



D mm	Vierkant Square	Norm Standard	订货号 / Order No.							
			ER 11	ER 16	ER 20	ER 25	ER 32	ER 40	ER 50	
2,8	2,1	DIN	120753							
3,5	2,7	DIN	120807							
4,0	3,0	DIN	120842							
4,0	3,15/3,2	ISO, JIS	161023	120822	120858	120830	120874			
4,5	3,4	DIN	120878	120823	120824	120903	120917			
5,0	4,0	ISO, JIS	161024	120879	120891	120911	120899			
5,5	4,3	DIN		120884	120897	120866	120919			
6,0	4,9	DIN	120821	120815	120902	120872	120918	161025		
6,3	5,0	ISO		120885	120849	120873	120913	161026		
7,0	5,5	DIN, JIS		120886	120859	120898	120875	161027		
7,1	5,6	ISO		120857	120828	120880	120876	161028		
8,0	6,2/6,3	DIN, ISO		120887	120850	120910	120867	161029		
9,0	7,0/7,1	DIN, ISO		120888	120871	120916	120892	161030		
10,0	8,0	DIN, ISO			120829	120831	120893	161031		
11,0	9,0	DIN			120909	120832	120868	161032		
11,2	9,0	ISO			120889	120904	120882	161033		
12,0	9,0	DIN			176418	120833	120877	161034		
12,5	10,0	ISO, JIS				120905	120900	178573		
14,0	11,0/11,2	DIN, ISO, JIS				120881	120901	161035		
16,0	12,0/12,5	DIN, ISO				120890	120894	169450		
18,0	14,0/14,5	DIN, ISO					120895	173480		
20,0	16,0	DIN, ISO					120906	161036		
22,0	18,0	DIN						161037	161038	
25,0	20,0	DIN							161039	
28,0	22,0	DIN							161040	
32,0	24,0	DIN							161041	

Typ ET 含长度调节的螺纹夹头

Threading Collets Type ET with Length Compensation



D mm	Norm Standard	订货号 / Order No.					
		ER 11	ER 16	ER 20	ER 25	ER 32	ER 40
1,4	DIN	120801	120724*				
1,6	DIN	120735	120786*				
1,8	DIN	120825	120818*				
2,0	ISO	161000	120802				
2,2	DIN	120817	120776*	120788			
2,24	ISO	161001	120834	161006			
2,5	DIN,ISO	120785	120747*	120726	120851		
2,8	DIN, ISO	120775	120797*	120778	120837*		
3,0	JIS		120725		120780		
3,15	ISO	161002	120787	161007	120811		
3,5	DIN	120723	120771*	120803	120804*		
3,55	ISO	161003	120748	161008	120844		
4,0	DIN, ISO, JIS		120810*	120779	120826*		
4,5	DIN, ISO		120798*	120789	120838*	120839*	
5,0	ISO, JIS		120835	161009	120805	161013	
5,5	DIN, ISO		120777	161010	120860	161014	
5,6	ISO		161004	161011	120869	161015	
6,0	DIN, JIS		120843	120836	120749*	120846*	120814*
6,2	JIS				120852		
6,3	ISO		161005	161012	120870	161016	161019
7,0	DIN, JIS			120819	120812*	120863*	120848*
7,1	ISO				120861	161017	161020
8,0	DIN, ISO, JIS				120853*	120864*	120752*
8,5	JIS				120845		
9,0	DIN, ISO				120750*	120865*	120856*
10,0	DIN, ISO				120820	120854*	120751*
11,0	DIN					120862*	120855*
11,2	ISO					161018	161021
12,0	DIN					120813*	120806*
12,5	ISO, JIS					166987	161022
14,0	JIS						120840*
16,0	DIN, ISO						120841*
Satz* / Set*			152717		152718	120847	120827

螺纹孔-轴柄尺寸 Tap Shank Dimensions

螺纹 Thread		ISO 529		ISO 2283		DIN 371		DIN 357/376		DIN 352		JIS B 4430 1998		ASME B 94.9 1999	
mm	寸 Inch	∅ mm	□ mm	∅ mm	□ mm	∅ mm	□ mm	∅ mm	□ mm	∅ mm	□ mm	∅ mm	□ mm	∅ mm	□ mm
M 1,0		2,50	2,00			2,50	2,10			2,50	2,10	3,00	2,50		
M 1,1		2,50	2,00			2,50	2,10			2,50	2,10	3,00	2,50		
M 1,2		2,50	2,00			2,50	2,10			2,50	2,10	3,00	2,50		
M 1,4		2,50	2,00			2,50	2,10			2,50	2,10	3,00	2,50		
M 1,6	1/16	2,50	2,00			2,50	2,10			2,50	2,10	3,00	2,50	0,141	0,110
M 1,7						2,50	2,10			2,50	2,10	3,00	2,50		
M 1,8		2,50	2,00			2,50	2,10			2,50	2,10	3,00	2,50	0,141	0,110
M 2,0		2,50	2,00			2,80	2,10			2,80	2,10	3,00	2,50	0,141	0,110
M 2,2		2,80	2,24			2,80	2,10			2,80	2,10	3,00	2,50	0,141	0,110
M 2,3						2,80	2,10			2,80	2,10	3,00	2,50		
M 2,5	3/32	2,80	2,24			2,80	2,10			2,80	2,10	3,00	2,50	0,141	0,110
M 2,6						2,80	2,10			2,80	2,10	3,00	2,50		
M 3,0	1/8	3,15	2,50	2,24	1,80	3,50	2,70	2,20		3,50	2,70	4,00	3,20	0,141	0,110
M 3,5		3,55	2,80	2,50	2,00	4,00	3,00	2,50	2,10	4,00	3,00	4,00	3,20	0,141	0,110
M 4,0	5/32	4,00	3,15	3,15	2,50	4,50	3,40	2,80	2,10	4,50	3,40	5,00	4,00	0,168	0,131
M 4,5	3/16	4,50	3,55	3,55	2,80	6,00	4,90	3,50	2,70	6,00	4,90	5,00	4,00	0,194	0,152
M 5,0		5,00	4,00	4,00	3,15	6,00	4,90	3,50	2,70	6,00	4,90	5,50	4,50	0,194	0,152
M 6,0	1/4	6,30	5,00	4,50	3,55	6,00	4,90	4,50	3,40	6,00	4,90	6,00	4,50	0,255	0,191
M 7,0	5/16	7,10	5,60	5,60	4,50	7,00	5,50	5,50	4,30	6,00	4,90	6,20	5,00	0,318	0,238
M 8,0		8,00	6,30	6,30	5,00	8,00	6,20	6,00	4,90	6,00	4,90	6,20	5,00	0,318	0,238
M 9,0		9,00	7,10	7,10	5,60	9,00	7,00	7,00	5,50	7,00	5,50	7,00	5,50		
M 10,0	3/8	10,00	8,00	8,00	6,30	10,00	8,00	7,00	5,50	7,00	5,50	7,00	5,50	0,387	0,286
M 11,0		8,00	6,30	8,00	6,30			8,00	6,20	8,00	6,20	8,00	6,00		
M 12,0	1/2	9,00	7,10	9,00	7,10			9,00	7,00	9,00	7,00	8,50	6,50	0,367	0,275
M 14,0	9/16	11,20	9,00	11,20	9,00			11,00	9,00	11,00	9,00	10,50	8,00	0,429	0,322
M 16,0	5/8	12,50	10,00	12,50	10,00			12,00	9,00	12,00	9,00	12,50	10,00	0,480	0,360
M 18,0	11/16	14,00	11,20	14,00	11,20			14,00	11,00	14,00	11,00	14,00	11,00	0,542	0,406
M 20,0	15/16	14,00	11,20	14,00	11,20			16,00	12,00	16,00	12,00	15,00	12,00	0,652	0,489
M 22,0	7/8	16,00	12,50	16,00	12,50			18,00	14,50	18,00	14,50	17,00	13,00	0,697	0,523
M 24,0	15/16	18,00	14,00	18,00	14,00			18,00	14,50	18,00	14,50	19,00	15,00	0,760	0,570
M 27,0	11/16	20,00	16,00					20,00	16,00	20,00	16,00	20,00	15,00	0,896	0,672
M 30,0	13/16	20,00	16,00					22,00	18,00	22,00	18,00	23,00	17,00	1,021	0,766

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