

"R" Zero Collet Chucks PAT.

Having run out problems at the tool tip?

NT's patented R-Zero collet chucks offer the solution to your T.I.R. problems!

With conventional holders the run out cannot be adjusted, however by utilizing the NT patented R-Zero collet chucks you have the ability to adjust the run out to zero at the tool tip, not at the tool holder nose.

With "R-Zero" function

HDZ

HDZ

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"R" Zero setter

Features

Consistent hole diameters

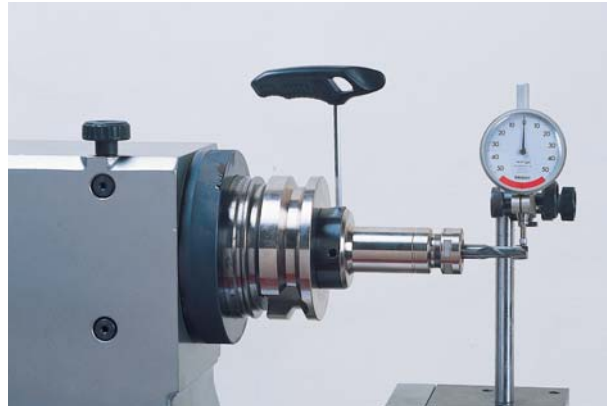
Improved surface finish

Extended tool life

Consistent cutting depth and width

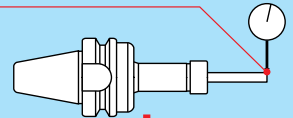
Elimination of out-of-tolerance parts

Note: GDZ (High Balanced Type) is available upon request.

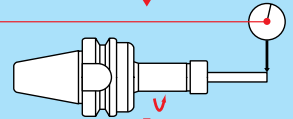


How to adjust

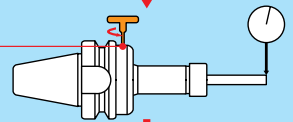
Dial gauge is set at the tip of a tool.



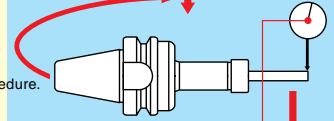
Locate where runout is maximum.



Turn the rotor ring and put the adjustment screw to the "maximum runout" position. Then tighten four screws slightly.

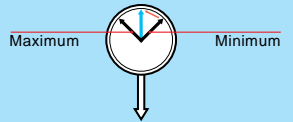


Repeat the same procedure.

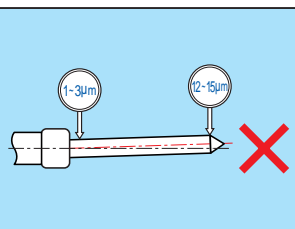
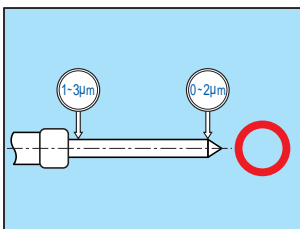


Tighten the adjustment screw at the "maximum runout" position until the maximum value decreases to a half.

Runout adjustment to the median between maximum and minimum.



Comparison of runout accuracy



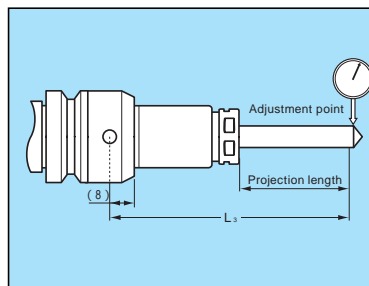
"R" Zero collet chuck

Run out at the tool tip can be adjusted to zero resulting in consistent hole diameter, improved surface finish, and longer tool life.

Conventional collet chuck

Even if T.I.R. at the tool holder nose is as small as 1~3µm, run out at the tool tip may be much greater.

Adjustable amount



Guideline for maximum adjustable amount (μm)

$$= \frac{L_3 \times Z (\mu\text{in}/4\text{in})}{4\text{in}}$$

Z : Adjusted amount per 4in ($\mu\text{in}/100\text{in}$)

	Z (Adjusted amount per 4in) ($\mu\text{in}/4\text{in}$)
HDZ07	1040 μin (26 μm)
HDZ09	800 μin (20 μm)
HDZ12	960 μin (24 μm)
HDZ16	800 μin (20 μm)
HDZ22	640 μin (16 μm)

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Tool length adjustment

GDZ Type

Preset screw is not included in the holder. If necessary purchase separately. Insert the screw from the tool holder head and screw it in clockwise. For adjusting cutter's projection length, follow the same procedure as that of HDC.

Suitable preset screws

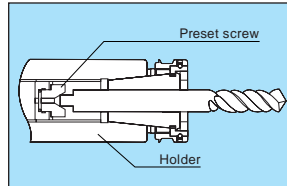
Type	Preset screw no.
GDZ07	HDS-07
GDZ09	HDS-09
GDZ12	HDS-12
GDZ16	HDS-16
GDZ22	HDS-22

Note: GDZ (High Balanced Type) is available upon request.

HDZ Type

Preset screw is included with the holder. Press down on the tool shank toward the preset screw and rotate the tool for length adjustment.

(Clockwise) Tool length shortened
(Counterclockwise) Tool length extended



Recommended tightening torque for the cap nut

When the desired tool projection length is reached, tighten the cap nut with a special spanner wrench (sold separately) securely.

Holder size	Spanner size	Recommended torque
07	S-0	89 ~ 133 lbf-in
09	S-1L	22 ~ 26 lbf-ft (266 ~ 310 lbf-in)
12	S-3L	26 ~ 30 lbf-ft (310 ~ 354 lbf-in)
16	S-4L	30 ~ 33 lbf-ft (354 ~ 398 lbf-in)
22	S-5L	41 ~ 44 lbf-ft (487 ~ 531 lbf-in)

R-Zero holder cutting example

Before: Conventional Collet chuck

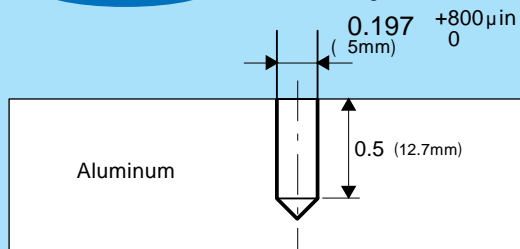
Process 1 centering



Process 2 0.190 drilling



Process 3 0.197 reaming



There were 3 manufacturing processes before introducing R-zero collet chuck.

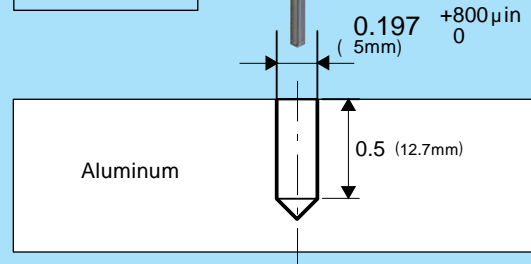
Now: R-zero is in use.

Runout accuracy is adjusted to 200µin during a single process to perform this job.

Manufacturing processes have been decreased from

3 to 1!!

BT30-HDZ12-105
S=6,400rpm
F=.0032 /rev



Small hole drilling for stainless steel electronic parts manufacturer

Before: Conventional Collet chuck

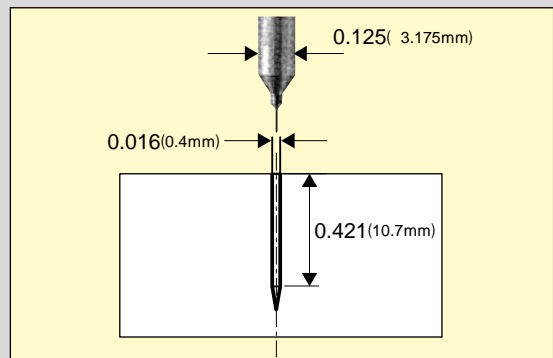
It took more than 20 minutes and 3 - 4 rechucking adjustments to achieve 120µin runout accuracy.

Effectiveness of "R"-zero collet chuck

Holder: BT40-HDZ12-120/3.175
(S/FDC-0317512AA)

① Runout accuracy adjustment 80 ~ 120µin (2 ~ 3µm)
20 minutes → 2 minutes

② Longer tool life
100 holes/drill → 300 holes/drill



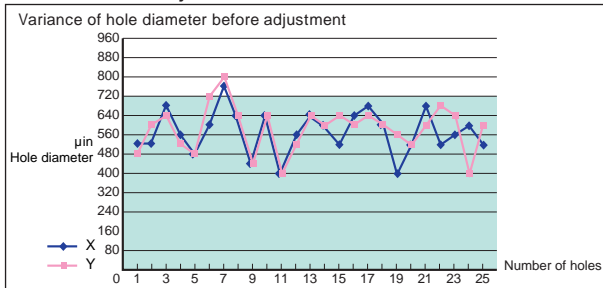
"R" Zero Collet Chucks PAT.

Cutting data comparison

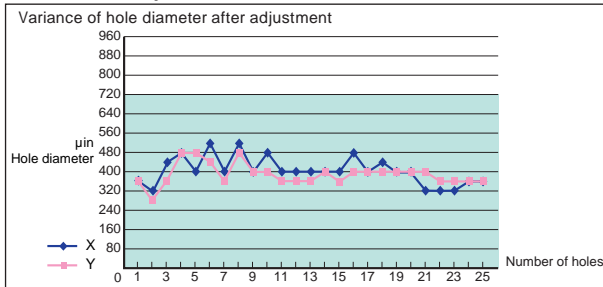
Variable hole diameter



Before adjustment



After adjustment



Because of small variance of inside diameters, H7 holes can be achieved.

Improved surface finish



Surface finish before adjustment Rz 84 ~ 188 μin

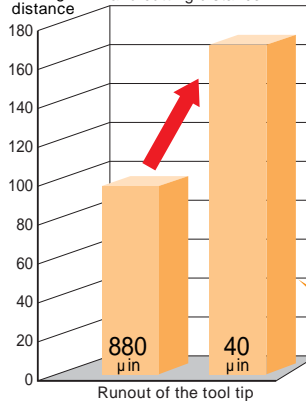


Surface finish after adjustment Rz 40 ~ 100 μin



Surface finish is significantly improved.

Runout accuracy and cutting distance



Longer tool life



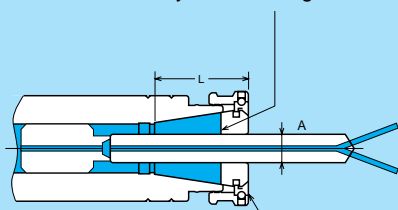
Tool life is increased by 75%

Coolant supply



Cutter with oil hole
FDC-OH type
R.P.M. 8 000rpm
Coolant 580psi
Pressure

Completely sealed by short slotting

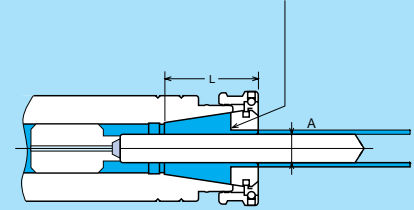


No damage to ball bearings from coolant leakage



Cutter without oil hole
FDC-C type
R.P.M. 8 000rpm
Coolant 580psi
Pressure

Effective coolant flow thru 2 coolant nozzles (grooves)



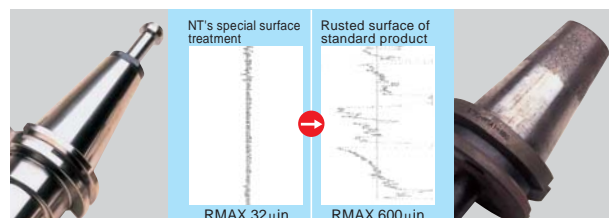
Special surface treatment

Special coating (Thickness: 200 μin) prevents spindle from wearing abnormally. Under normal use conditions, our specially treated holders will be rust free.

Ordinary tooling

Without proper maintenance for rust prevention, tool holders will begin to rust after several days' use. This rust has a negative effect on machining and spindle accuracy.

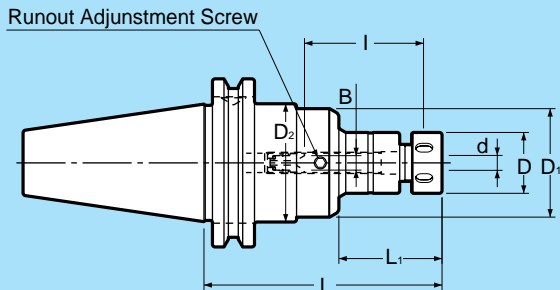
When the taper area gets rusty, the runout accuracy of the tip of a cutting tool will deteriorate by 400-800 μin .



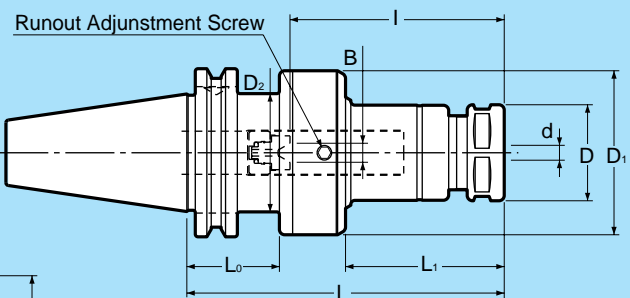
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CAT / HDZ

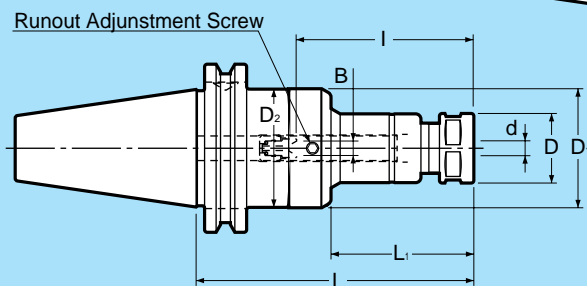
Type 1



Type 3



Type 2



Part Number	Type	d	L	I	B	D	L ₁	L ₀	D ₁	D ₂	Preset Screw	Nut	Spanner	Collet	Hexagon Wrench (Size)	
CAT 40	1	-90	0.020	3.543	0.866	0.0~	0.906	1.535				HDS-07	HDP-07	S-0	FDC-07	
		-105	~0.276	4.134	~1.772	0.157		2.126		1.614						
	2	-90		3.543				1.535								L-3T (3mm)
		-105	0.098	4.134	1.063	0.0~		2.126	-							
		-120	~0.354	4.724	~2.244	0.157	1.024	2.717		1.772		HDS-09	HDP-09	S-1L	FDC-09	
		-135		5.315				3.307								
		-165		6.496				4.488								
	3	-105		4.134				1.772								L-4T (4mm)
		-120	0.098	4.724	1.299	0.0~		2.362								
		-135	~0.472	5.315	~2.677	0.197	1.260	2.953		2.205		HDS-12	HDP-12	S-3L	FDC-12	
		-165		6.496				4.134			1.750					
		-195		7.677				5.315								
		-105		4.134				1.772								
		-120	0.138	4.724	1.496	0.0~		2.362								
		-135	~0.630	5.315	~3.189	0.236	1.417	2.953	1.378	2.441		HDS-16	HDP-16	S-4L	FDC-16	
	3	-165		6.496				4.134								
		-195		7.677				5.315								
		-105		4.134				1.220								
		-120	0.138	4.724	1.850	0.0~		1.811								
	3	-135	~0.866	5.315	~4.055	0.315	1.811	2.402		2.717		HDS-22	HDP-22	S-5L	FDC-22	L-5T (5mm)
-165			6.496				3.583									
-195			7.677				4.764									

"R" Zero Collet Chucks PAT.

CAT / HDZ

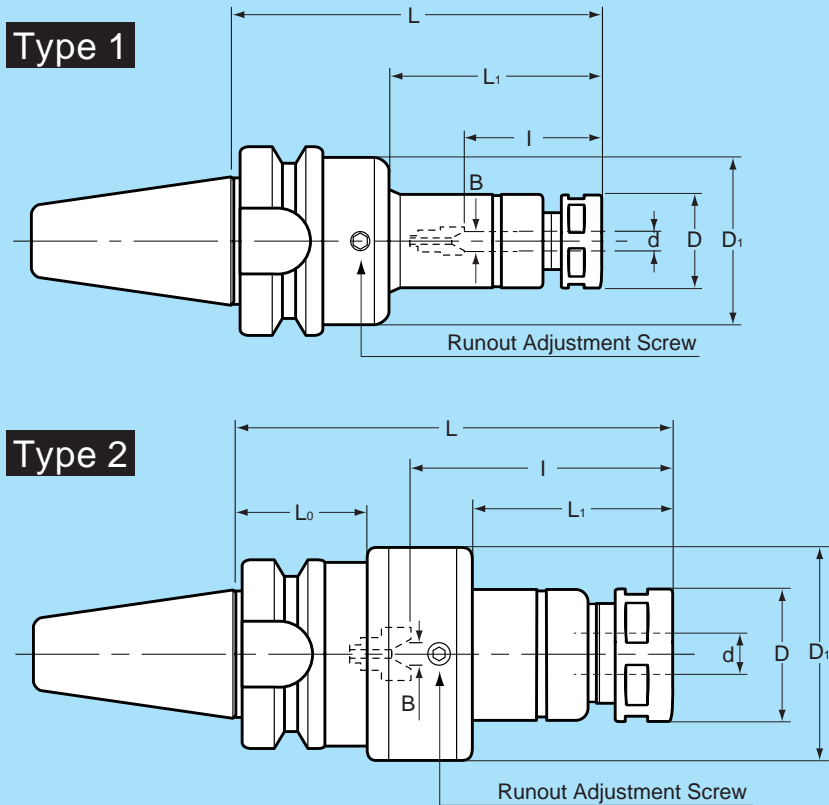
Part Number	Type	d	L	I	B	D ₁	L ₁	L ₀	D	D ₂	Preset Screw	Nut	Spanner	Collet	Hexagon Wrench (Size)	
CAT 50	-HDZ07	-90	3.543				1.535									
		-105	4.134				2.126									
		-120	0.020	4.724	0.866	0.0	0.906	2.717								
		-135	~0.276	5.315	~1.772	~0.157		3.307		1.614		HDS-07	HDP-07	S-0	FDC-07	
		-165		6.496				4.291								
		-195		7.677				5.669								
		-90	3.543					1.378								L-3T (3mm)
	-HDZ09	-105	4.134				1.969									
		-120	4.724				2.559									
		-135	0.098	5.315	1.063	0.0	1.024	3.150								
		-165	~0.354	6.496	~2.244	~0.157		4.331		1.772		HDS-09	HDP-09	S-1L	FDC-09	
		-195		7.677				5.512								
		-225		8.858				6.693								
		-255		10.039				7.874								
	-HDZ12	-90	3.543				1.378									
-105		4.134				1.969										
-120		4.724				2.559										
-135		0.098	5.315	1.299	0.0	1.260	3.150									
-165		~0.472	6.496	~2.677	~0.197		4.331		2.205 2.750		HDS-12	HDP-12	S-3L	FDC-12		
-195			7.677				5.512									
-225			8.858				6.693									
-HDZ16	-255	10.039				7.874									L-4T (3mm)	
	-90	3.543				1.378										
	-105	4.134				1.969										
	-120	4.724				2.559										
	-135	0.138	5.315	1.496	0.0	1.417	3.150									
	-165	~0.630	6.496	~3.189	~0.236		4.331		2.441		HDS-16	HDP-16	S-4L	FDC-16		
	-195		7.677				5.512									
-HDZ22	-225		8.858			6.693										
	-255		10.039			7.874										
	-105	4.134				2.205										
	-120	4.724				2.795										
	-135	0.138	5.315	1.850	0.0	1.811	3.386									
	-165	~0.866	6.496	~4.055	~0.315		3.976	1.378 2.992								
	-195		7.677				5.157								L-5T (3mm)	

Ordering Example CAT40-HDZ09-105

Collet and spanner wrench (page 45 ~ 50) are sold separately.

"R" Zero Collet Chucks PAT.

BT / HDZ



Part Number	Type	d	L	I	L ₁	B	D	D ₁	L ₀	Preset Screw	Nut	Collet	Spanner	Hexagon Wrench (Size)	
BT 30	1	- 60	2.362	0.866										L-3T (3mm)	
		- 75	0.020	2.953	0.866	1.457	0.0	0.906	1.614		HDS-07	HDP-07	FDC-07		S-0
		- 90	~0.276	3.543	~1.772	2.047	~0.157								
		-105		4.134		2.638									
		- 75	0.098	2.953	1.063	1.457	0.0	1.024	1.772		HDS-09	HDP-09	FDC-09		S-1L
		- 90	~0.354	3.543	~2.244	2.047	~0.157								
	-105		4.134		2.638										
	2	- 90	0.098	3.543	1.299	1.299	0.0	1.260	2.047	1.260	HDS-12	HDP-12	FDC-12	S-3L	L-4T (4mm)
		-105	~0.472	4.134	~2.677	1.890	~0.197								
		- 90	0.138	3.543	1.496	1.299	0.0	1.417	2.205	1.260	HDS-16	HDP-16	FDC-16	S-4L	
		-105	~0.630	4.134	~3.189	1.890	~0.236								
		-120		4.724		2.480									
BT 40	1	- 75	0.020	2.953	0.866	1.260	0.0	0.906	1.614		HDS-07	HDP-07	FDC-07	S-0	L-3T (3mm)
		- 90	~0.276	3.543	~1.772	1.850	~0.157								
		-105		4.134		2.441									
		- 90	0.098	3.543	1.063	1.850	0.0	1.024	1.772		HDS-09	HDP-09	FDC-09	S-1L	
		-120	~0.354	4.724	~2.244	3.031	~0.157								
		-135		5.315		3.622									
	-165		6.496		4.803										
	2	- 90		3.543		1.693									L-4T (4mm)
		-105		4.134		2.283									
		-120	0.098	4.724	1.299	2.874	0.0	1.260	2.205		HDS-12	HDP-12	FDC-12	S-3L	
		-135	~0.472	5.315	~2.677	3.465	~0.197								
		-165		6.496		4.646									
-195			7.677		5.827										

"R" Zero Collet Chucks PAT.

BT / HDZ

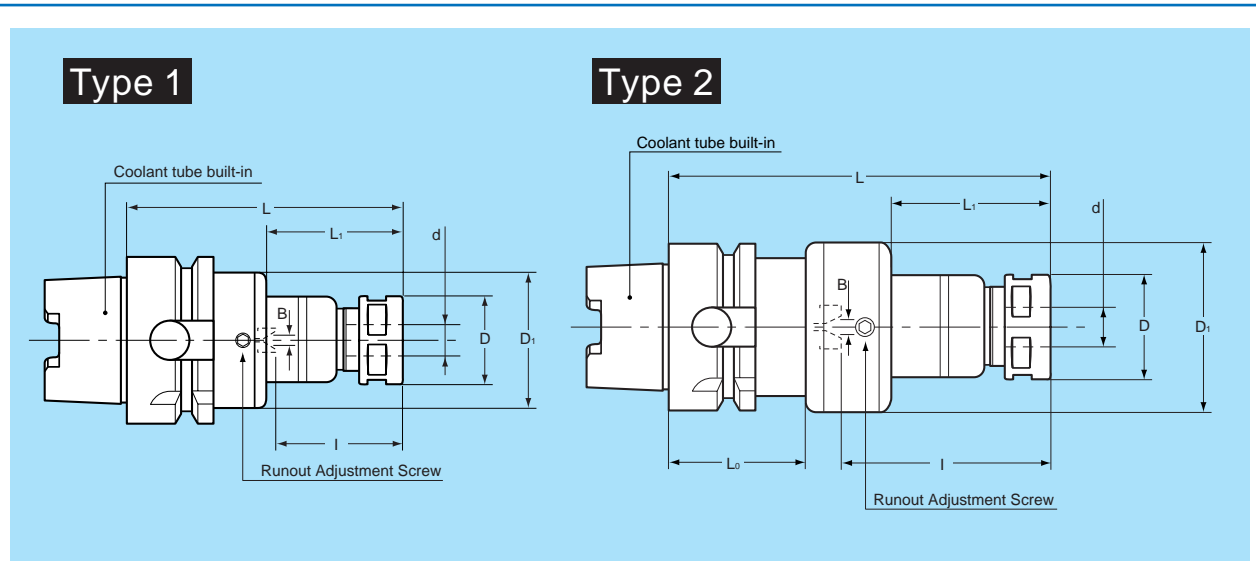
Part Number	Type	d	L	I	L ₁	B	D	D ₁	L ₀	Preset Screw	Nut	Collet	Spanner	Hexagon Wrench (Size)		
BT 40	-HDZ16	-90			3.543									L-4T (4mm)		
		-105			4.134											
		-120	0.138	4.724	1.496	2.874	0.0		1.417	2.441	-	HDS-16	HDP-16		FDC-16	S-4L
		-135	~0.630	5.315	~3.189	3.465	~0.236									
		-165		6.496		4.646										
	-195		7.677		5.827											
	-HDZ22	-105				4.134									L-5T (5mm)	
		-120				4.724										
		-135	0.138	4.724	1.850	1.811	0.0		1.811	2.717	1.772	HDS-22	HDP-22	FDC-22		S-5L
		-165	~0.866	5.315	~4.055	2.402	~0.315									
-195			6.496		3.583											
			7.677		4.764											
BT 50	-HDZ07	-90			3.543									L-3T (3mm)		
		-105			4.134											
		-120	0.020	4.724	0.866	2.598	0.0		0.906	1.614	-	HDS-07	HDP-07		FDC-07	S-0
		-135	~0.276	5.315	~1.772	3.189	~0.157									
		-165		6.496		4.370										
		-195		7.677		5.551										
	-HDZ09	-90				3.543									L-3L	
		-105				4.134										
		-120				4.724										
		-135	0.098	5.315	1.063	3.189	0.0		1.024	1.772	-	HDS-09	HDP-09	FDC-09		S-1L
		-165	~0.354	6.496	~2.244	4.370	~0.157									
		-195		7.677		5.551										
	-HDZ12	-90				3.543									L-4T (4mm)	
		-105				4.134										
		-120				4.724										
		-135	0.098	5.315	1.299	3.031	0.0		1.260	2.205	-	HDS-12	HDP-12	FDC-12		S-3L
		-165	~0.472	6.496	~2.677	4.213	~0.197									
		-195		7.677		5.394										
-HDZ16	-90				3.543									L-4T (4mm)		
	-105				4.134											
	-120				4.724											
	-135	0.138	5.315	1.496	3.031	0.0		1.417	2.441	-	HDS-16	HDP-16	FDC-16		S-4L	
	-165	~0.630	6.496	~3.189	4.213	~0.236										
	-195		7.677		5.394											
-HDZ22	-90				4.134									L-5T (5mm)		
	-105				4.724											
	-120				5.315											
	-150	0.138	5.906	1.850	3.465	0.0		1.811	2.992	-	HDS-22	HDP-22	FDC-22		S-5L	
	-165	~0.866	6.496	~4.055	4.055	~0.315										
	-195		7.677		5.236											
			8.858		6.417											
			10.039		7.598											

Ordering Example BT40-HDZ09-105

Collet and spanner wrench (page 45 ~ 50) are sold separately.

"R" Zero Collet Chucks PAT.

HSK / HDZ



Part Number	Type	d	L	I	L ₁	B	D	D ₁	L ₀	Preset Screw	Nut	Collet	Spanner	Hexagon Wrench (Size)	
HSK 40A	1	-75	2.953	0.866-1.496	1.535	0.0	0.906	1.339		HDS-07	HDP-07	FDC-07	S-0	L-3T (3mm)	
		-90	3.543	0.866-1.929	2.126	~0.157									
		-120	4.724	0.866-1.929	3.307										
		-90	3.543	1.063-1.811	1.339	0.0	1.024	1.614	1.378		HDS-09	HDP-09	FDC-09		S-1L
		-120	4.724	1.063-2.402	2.520	~0.157									
		-90	3.543	1.299-1.969	1.181	0.0	1.260	2.047	1.378		HDS-12	HDP-12	FDC-12		S-3L
	2	-120	4.724	1.299-2.874	2.362	~0.197									L-4T (4mm)
		-150	5.906	1.299-2.874	3.543										
		-90	3.543	1.496-2.087	1.181	0.0	1.417	2.205	1.378		HDS-16	HDP-16	FDC-16	S-4L	
		-120	4.724	1.496-2.795	2.362	~0.236									
		-150	5.906	1.496-3.346	3.543										
		-90	3.543	1.850-2.441	1.929	0.0	1.811	2.717	1.654		HDS-22	HDP-22	FDC-22	S-5L	
HSK 63A	1	-75	2.953	0.866-1.339	1.299	0.0	0.906	1.614		HDS-07	HDP-07	FDC-07	S-0	L-3T (3mm)	
		-90	3.543	0.866-1.772	1.890	~0.157									
		-120	4.724	0.866-1.772	3.071										
		-75	2.953	1.063-1.339	1.299	0.0	1.024	1.772			HDS-09	HDP-09	FDC-09		S-1L
		-90	3.543	1.063-1.654	1.890	~0.157									
		-120	4.724	1.063-2.244	3.071										
	2	-90	3.543	1.299-1.850	1.732	0.0	1.260	2.047			HDS-12	HDP-12	FDC-12	S-3L	L-4T (4mm)
		-120	4.724	1.299-2.717	2.913	~0.197									
		-150	5.906	1.299-2.717	4.094	~0.197									
		-90	3.543	1.496-1.850	1.102	0.0	1.417	2.205	1.654		HDS-16	HDP-16	FDC-16	S-4L	
		-120	4.724	1.496-2.402	2.283	~0.236									
		-150	5.906	1.496-2.402	3.465										
HSK100A	1	-75	2.953	0.866-1.024	1.024	0.0	0.906	1.614		HDS-07	HDP-07	FDC-07	S-0	L-3T (3mm)	
		-90	3.543	0.866-1.772	1.614	~0.157									
		-120	4.724	0.866-1.772	2.795										
		-75	2.953	1.063	1.024	0.0	1.024	1.772			HDS-09	HDP-09	FDC-09		S-1L
		-90	3.543	1.063-1.850	1.614	~0.157									
		-120	4.724	1.063-2.244	2.795										
	2	-90	3.543	1.299-1.614	1.614	0.0	1.260	2.205			HDS-12	HDP-12	FDC-12	S-3L	L-4T (4mm)
		-120	4.724	1.299-2.323	2.795	~0.197									
		-150	5.906	1.299-2.717	3.976	~0.197									
		-90	3.543	1.496-1.614	1.614	0.0	1.417	2.441			HDS-16	HDP-16	FDC-16	S-4L	
		-120	4.724	1.496-2.323	2.795	~0.23									
		-150	5.906	1.496-2.717	3.976										
2	-90	3.543	2.205	1.457	—									L-5T (5mm)	
	-120	4.724	1.850-2.283	2.638	0.0	1.811	2.992			HDS-22	HDP-22	FDC-22	S-5L		
	-150	5.906	1.850-3.228	3.819	~0.315										
	-90	3.543	1.850-2.441	1.929	0.0	1.811	2.717	1.654		HDS-22	HDP-22	FDC-22	S-5L		
	-120	4.724	1.850-3.622	3.110	~0.315										
	-150	5.906	1.850-3.622	4.301											

Ordering Example

HSK63A-HDZ09-120

HSK63A-H-HDZ09-120 (HSK Type A with manual clamping hole.)

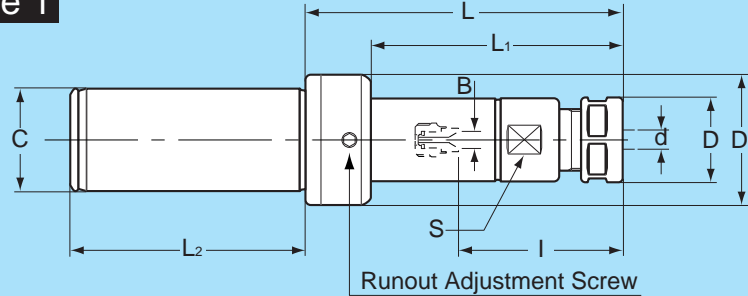
Collet and spanner wrench (page 45 ~ 50) are sold separately.

Coolant tube built-in.

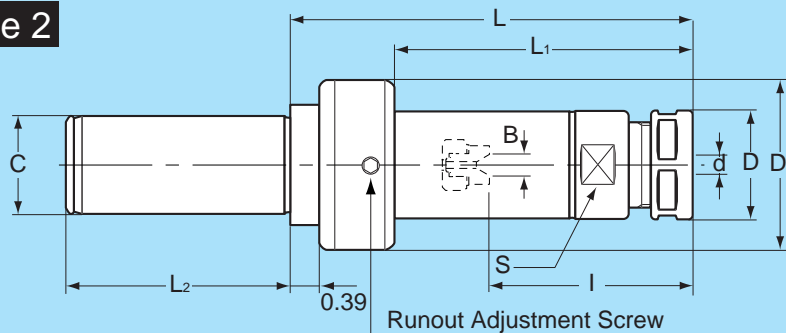
"R" Zero Collet Chucks PAT.

ST / HDZ Straight Shank Type (Metric)

Type 1



Type 2



"R" Zero Collet Chucks ST/HDZ

Part Number	Type	d	L	I	L ₁	B	D	D ₁	C	L ₂	S	Preset Screw	Nut	Collet	Spanner	Hexagon Wrench (Size)	
ST 20	2	- 75	2.953		1.732												
		-HDZ07 -120	0.020 ~ 0.276	4.724	0.866 ~ 1.772	3.504		0.906				0.748 (19mm)	HDS-07	HDP-07	FDC-07	S-0	
		-165	6.496		5.276	0.0						0.787 (20mm)					L-3T (3mm)
	2	-HDZ09 -120	0.098 ~ 0.354	4.724	1.063 ~ 2.244	3.504	~ 0.157	1.614	1.024	0.787 (20mm)	2.24	0.945 (24mm)	HDS-09	HDP-09	FDC-09	S-1L	
		-165	6.496		5.276												
		-HDZ12 -135	0.098 ~ 0.472	5.315	1.299 ~ 2.677	3.937	~ 0.197	1.260	2.047	1.260 (32mm)	2.76	1.181 (30mm)	HDS-12	HDP-12	FDC-12	S-3L	L-4T (4mm)
ST 32	1	- 60	2.362		1.535												
		-HDZ07 -105	0.020 ~ 0.276	4.134	0.866 ~ 1.772	3.307	0.0	0.906				0.748 (19mm)	HDS-07	HDP-07	FDC-07	S-0	
		-150	5.906		5.079	~ 0.157	1.614										L-3T (3mm)
	2	-HDZ09 -120	0.098 ~ 0.354	4.724	1.063 ~ 2.244	3.898	~ 0.157	1.024				0.945 (24mm)	HDS-09	HDP-09	FDC-09	S-1L	
		-165	6.496		5.669												
		-HDZ16 -135	0.138 ~ 0.630	5.315	1.496 ~ 3.189	3.937	~ 0.236	1.417	2.205	1.654 (42mm)	2.95	1.181 (30mm)	HDS-16	HDP-16	FDC-16	S-4L	L-4T (4mm)
2	-HDZ22 -150	0.138 ~ 0.866	5.906	1.850 ~ 4.055	4.370	~ 0.315	1.811	2.717	1.654 (42mm)		1.654 (42mm)	HDS-22	HDP-22	FDC-22	S-5L	L-5T (5mm)	
	-195	7.677		6.142													
	-HDZ12 -135	0.098 ~ 0.472	5.315	1.299 ~ 2.677	4.331	~ 0.197	1.260	2.047			1.181 (30mm)	HDS-12	HDP-12	FDC-12	S-3L	L-4T (4mm)	
ST 42	1	- 90	3.543		2.559												
		-HDZ16 -135	0.138 ~ 0.630	5.315	1.496 ~ 3.189	4.331	~ 0.236	1.417	2.205	1.654 (42mm)	2.95	1.181 (30mm)	HDS-16	HDP-16	FDC-16	S-4L	L-4T (4mm)
	-180	7.087		6.102													
	2	-HDZ22 -150	0.138 ~ 0.866	5.906	1.850 ~ 4.055	4.370	~ 0.315	1.811	2.717	1.654 (42mm)		1.654 (42mm)	HDS-22	HDP-22	FDC-22	S-5L	L-5T (5mm)
-195		7.677		6.142													

Ordering Example ST32-HDZ09-120

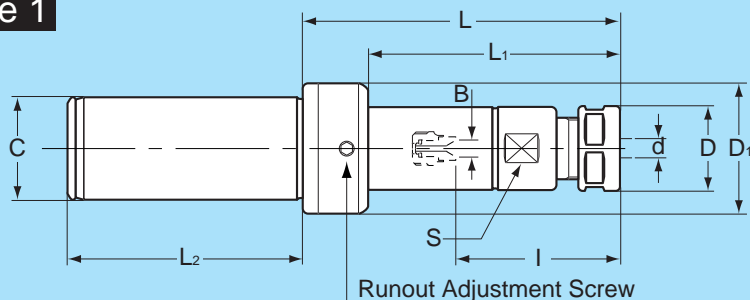
Collet and spanner wrench (page 45 ~ 50) are sold separately.

"R" Zero Collet Chucks PAT.

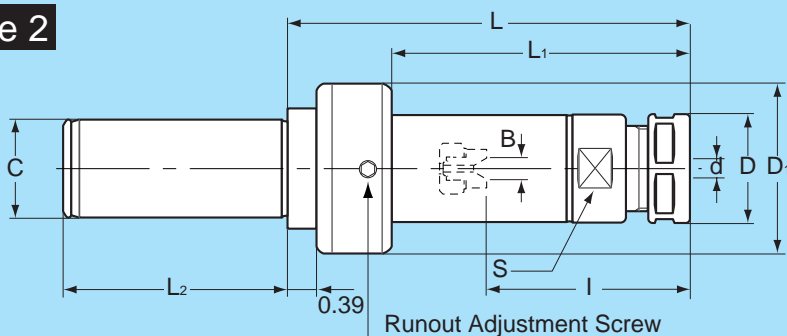
ST / HDZ Straight Shank Type (Inch)

"R" Zero Collet Chucks ST/HDZ

Type 1



Type 2



Part Number	Type	d	L	I	L ₁	B	D	D ₁	C	L ₂	S	Preset Screw	Nut	Collet	Spanner	Hexagon Wrench (Size)	
ST 0750	-75		2.953		1.732												
	-120	0.020 ~ 0.276	4.724	0.866 ~ 1.772	3.504		0.906				0.748 (19mm)	HDS-07	HDP-07	FDC-07	S-0	L-3T (3mm)	
	-165		6.496		5.276	0.0		1.614	0.750	2.24							
	-75		2.953		1.732	~0.157											
ST 1250	-120	0.098 ~ 0.354	4.724	1.063 ~ 2.244	3.504		1.024				0.945 (24mm)	HDS-09	HDP-09	FDC-09	S-1L	L-3T (3mm)	
	-165		6.496		5.276												
	-60		2.362		1.535												
	-105	0.020 ~ 0.276	4.134	0.866 ~ 1.772	3.307		0.906				0.748 (19mm)	HDS-07	HDP-07	FDC-07	S-0	L-3T (3mm)	
-150		5.906		5.079	0.0		1.614										
ST 1250	-75		2.953		2.126	~0.157											
	-120	0.098 ~ 0.354	4.724	1.063 ~ 2.244	3.898		1.024				0.945 (24mm)	HDS-09	HDP-09	FDC-09	S-1L	L-3T (3mm)	
	-165		6.496		5.669												
	-90		3.543		2.165	0.0											
ST 1250	-135	0.098 ~ 0.472	5.315	1.299 ~ 2.677	3.937	~0.197	1.260	2.047	1.250	2.76	1.811 (30mm)	HDS-12	HDP-12	FDC-12	S-3L	L-4T (4mm)	
	-180		7.087		5.709												
	-90		3.543		2.165	0.0											
	-135	0.138 ~ 0.630	5.315	1.496 ~ 3.189	3.937	~0.236	1.417	2.205				HDS-16	HDP-16	FDC-16	S-4L	L-4T (4mm)	
-180		7.087		5.709													
HDZ22	-105		4.134	1.850 ~ 2.874	2.598	0.0											
	-150	0.318 ~ 0.866	5.906	1.850 ~ 4.055	4.370	~0.315	1.811	2.717			1.654 (42mm)	HDS-22	HDP-22	FDC-22	S-5L	L-5T (5mm)	
	-195		7.677		6.142												

Ordering Example ST1250-HDZ09-120

Collet and spanner wrench (page 45 ~ 50) are sold separately.