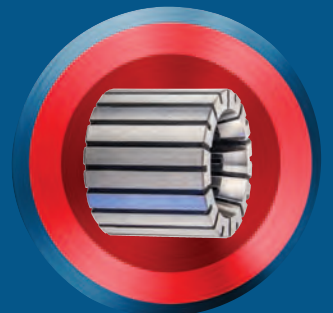
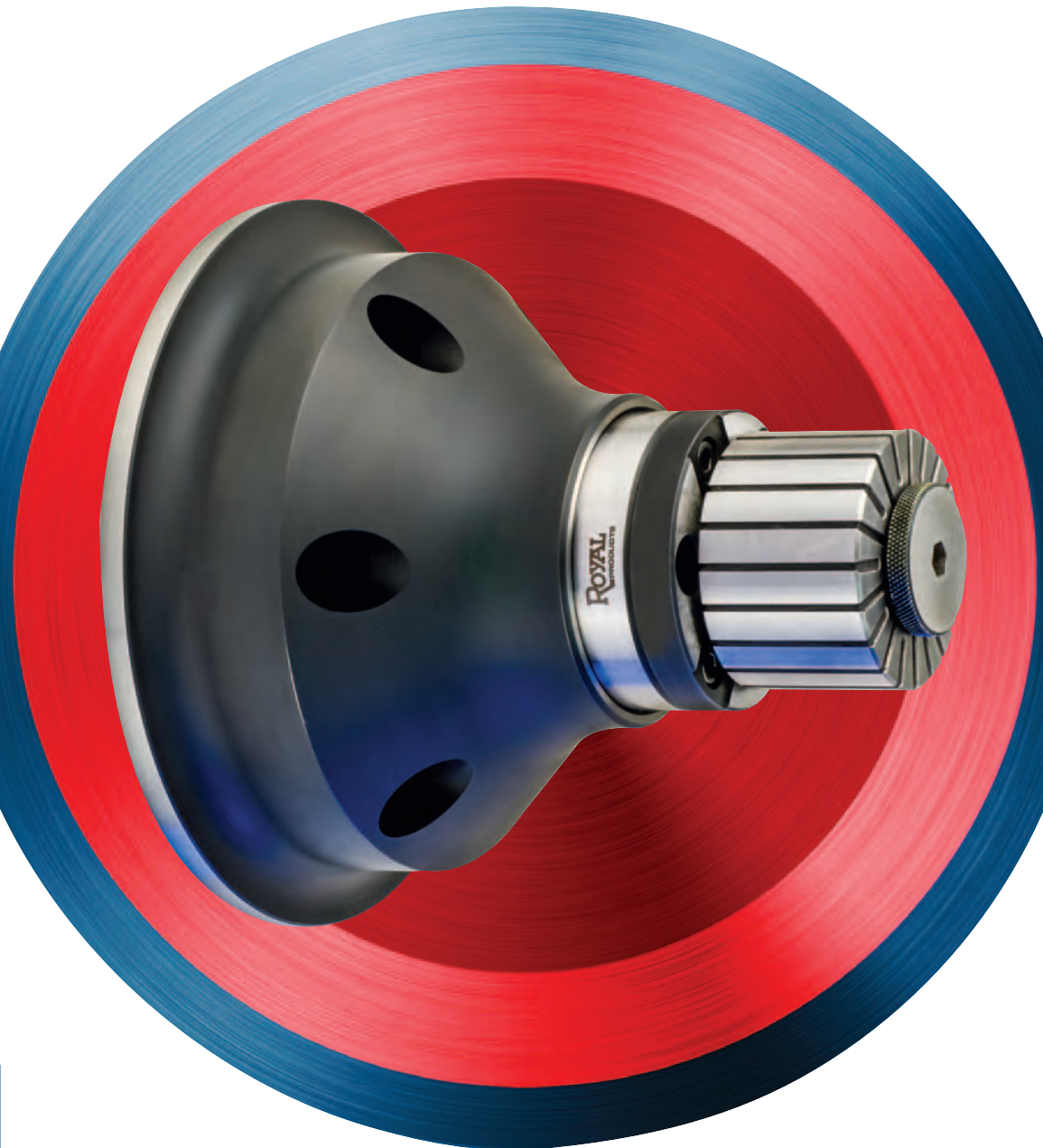




I.D. WORKHOLDING

- I.D. CLAMPING OFFERS FULL OD PART ACCESS
- PARALLEL EXPANSION FOR OPTIMUM ACCURACY AND GRIP FORCE
- LARGE RANGE IN STOCK FOR IMMEDIATE SHIPMENT





ROYAL I.D. WORKHOLDING SYSTEMS

Royal Offers Three Standard Off-the-Shelf I.D. Workholding Systems Designed to Suit a Wide Range of Applications:



CNC

- For use on all CNC Lathes.
- Actuated via machine's drawtube.
- Accu-Length™ design makes this system a great sub-spindle workholding option.
- Includes a custom-machined drawtube connector to fit your specific lathe.



Power-Block™

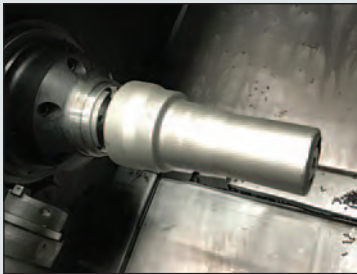
- For use on all Machining Centers.
- Can be used in both stationary and 4th/5th -axis applications.
- Hydraulic or pneumatic actuation.
- Well suited to auto-load applications.



Key-Operated

- Universal – can be used in virtually any turning, milling, or grinding application.
- 1-1/2" dia. shank is quickly and easily gripped in a chuck or collet.
- Manual actuation makes this model best suited to non-production applications.

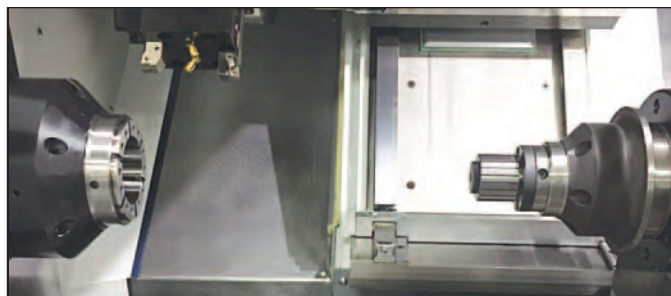
I.D. Gripping is Often Overlooked as a Workholding Option, Yet in Many Situations it is the Best Choice



Shown here, a long casting is gripped via the I.D. bore so the full O.D. can be machined in a single operation.

- ✓ A part's full length can be turned in a single operation, guaranteeing perfect concentricity of all O.D. features.
- ✓ I.D. gripping offers an alternative to gripping on a finished O.D. surface, reducing the risk of part damage.
- ✓ For many parts, the engagement-length of an internal bore can be greater than what is available for external gripping, resulting in superior rigidity and torque transmission.
- ✓ I.D. systems provide optimal tool clearance, making them a great option for lathes with live tooling.

Perfect Combination – A Royal Quick-Grip™ CNC Collet Chuck on the main spindle and a Royal CNC I.D. Workholding System on the sub.



ROYAL CNC I.D. WORKHOLDING

For Turning Applications



Bolt & Go™

Royal's exclusive Bolt & Go™ mounting feature **ensures maximum accuracy and rigidity** with no adjusting required. Other systems require the mandrel to be trammed in – a hassle that wastes valuable machining time.

Oversized Flange

Borrowing from the winning design of our CNC Collet Chucks, all bodies feature an oversized flange to protect the machine tool spindle bearings from coolant penetration.

Z-Axis Repeatability

Pullback action draws the workpiece securely against a ground locating plate for maximum **"dual-contact" rigidity** and consistent z-axis repeatability.

Easy Installation

Royal CNC I.D. Workholding Systems include all mounting hardware, wrenches, and a custom-machined drawtube connector to ensure **hassle-free installation**.

Heavy-Duty Construction

Royal consistently builds products that outlast the competition, especially in the most demanding environments. Bodies, mandrels, and expanding rods are all hardened to Rc 61-63 for maximum durability.

Same-Day Shipping

Royal maintains a huge inventory of standard bodies, mandrels, and sleeves to help us achieve our goal of same-day shipping on all orders.

Ultra-Precision Accuracy

System runout guaranteed to be **0.0005" TIR or better**.

Modular Design

Mandrel models A-E all have a common mounting interface with the body so the system can grow with your needs.

Wide Gripping Range

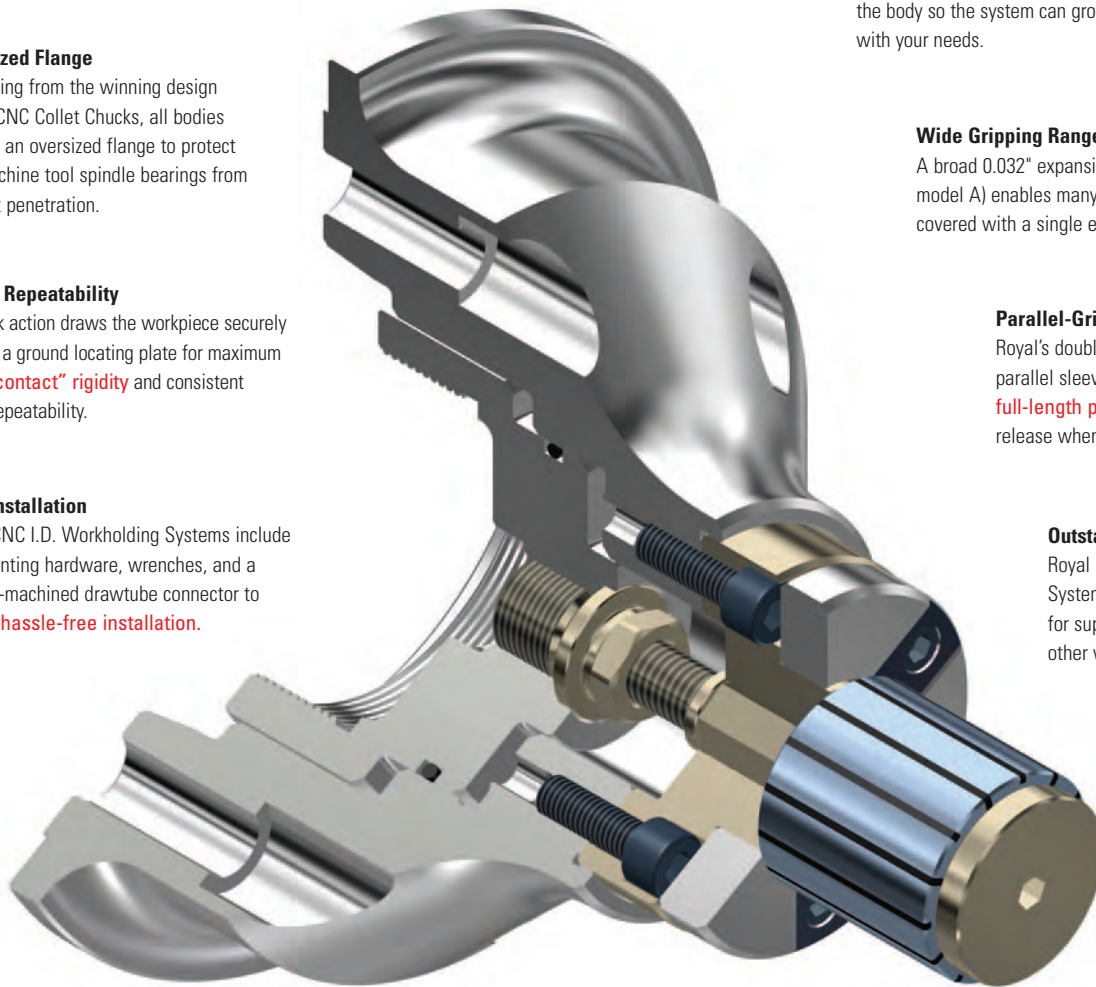
A broad 0.032" expansion range (0.020" for model A) enables many bore sizes to be covered with a single expanding sleeve.

Parallel-Grip

Royal's double-angle design provides parallel sleeve expansion, ensuring **full-length part contact** and positive release when the part is unclamped.

Outstanding Tool Clearance

Royal CNC I.D. Workholding Systems have been optimized for superior tool clearance over other workholding systems.



Custom Systems

If our standard line doesn't meet your needs, give us a call to discuss your special requirements.

Capabilities include:

- Larger sizes – up to 25" diameter
- Extended-length systems
- Multi-step systems for locating on multiple bore diameters
- Automation enhancements such as ejector rings, part confirmation, etc.

Completely Sealed

All expanding sleeve slots are sealed to prevent contaminants from accumulating on the mandrel surface – **ensuring years of trouble-free service**. An internal O-ring on the drawtube connector offers additional protection.



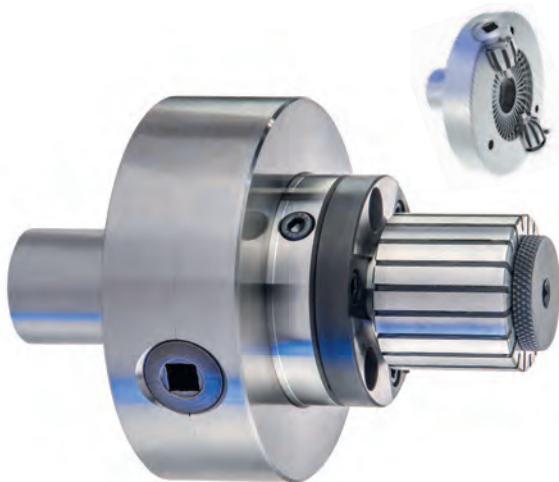
ROYAL POWER-BLOCK™ I.D. WORKHOLDING For Milling Applications



- The Royal Power-Block™ I.D. Workholding System enables secure gripping on the internal bore of a workpiece for full external machining access.
- Pullback action draws workpiece securely against a ground locator for precise, consistent z-axis positioning.
- Unit can be **mounted to a traditional machining center table and can also be used in 4th and 5th -axis applications.**
- Fixture is designed to be actuated via hydraulic pressure and may also be actuated pneumatically for lighter-duty applications (contact Royal for details).
- For use with all Royal precision mandrels, stops, and sleeves. These items are sold separately – please see pages 58-59.
- Heavy-duty all steel construction with a large double-acting piston provides high clamping force.
- Configured with both side and bottom ports for plumbing flexibility.
- Multiple units can be plumbed in series for single-source actuation.
- Ideal for high-production applications on vertical, horizontal, and five-axis machining centers.
- Tombstone and angle plate compatible.



ROYAL KEY-OPERATED I.D. WORKHOLDING For Turning, Milling and Grinding Applications



- Royal's Key-Operated I.D. Workholding System incorporates a precision-ground 1-1/2" diameter straight shank that enables the unit to be held in any collet or jaw chuck, **reducing setup times by eliminating the need to change out the machine's workholding device.**
- For use with all Royal precision mandrels, stops, and sleeves. These items are sold separately – please see pages 58-59.
- Side-actuated with an included square-drive key means that this unit can accommodate parts with blind bores.
- Precision-ground square and concentric within 0.0005". If higher accuracy is needed the mandrel can be clocked-in once the unit is gripped in a chuck.
- Universal straight shank mount enables this ID workholding system to be easily moved from machine to machine as jobs require.
- A great option for low-volume ID gripping.
- When ordering, be sure to also order the appropriate threaded expanding rod adapters sold separately.

ROYAL I.D. WORKHOLDING SYSTEMS

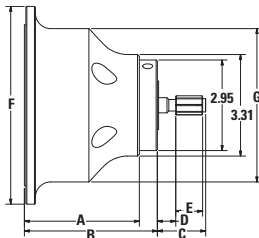


How to Order:

1. Choose the appropriate body assembly based upon your application.
2. Choose the appropriate mandrel (models A-E) based upon the diameter you need to grip. All mandrels and bodies share a common mounting interface for full interchangeability.
3. If required, choose the appropriate part locator to provide a ground banking surface for the workpiece.
4. Choose the appropriate expanding sleeve based upon the mandrel and diameter you need to grip.

Step 1 - Choose Body Assembly

CNC BODY – For CNC Lathes



Dimensions

Note – dimensions shown without optional part locator.

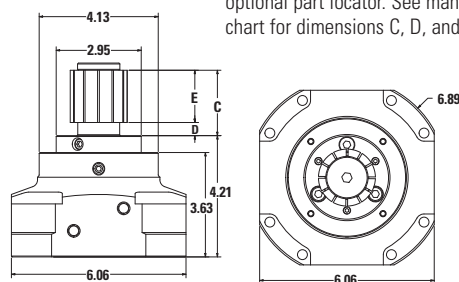
SPINDLE MOUNT	A	B	C	D	E	F	G
A2-5	3.75	4.34	See Mandrel Chart			6.45	5.00
A2-6	4.00	4.59				7.45	6.25
140mm	3.90	4.49				7.45	6.25
A2-8	5.00	5.59				9.45	8.00

- ❑ This body provides a precision interface for mounting the system to a CNC lathe spindle.
- ❑ CNC body assembly includes the hardened steel body, a **custom-machined drawtube connector for hassle-free installation**, and all mounting hardware.
- ❑ Order mandrels, locators, and sleeves separately.

Royal CNC I.D. Body Assemblies

SPINDLE TYPE	PART NUMBER	PRICE
A2-5	47060	\$1,750
A2-6	47064	2,130
140mm	47068	2,270
A2-8	47072	2,850

POWER-BLOCK™ BODY – For Machining Centers



Note – dimensions shown without optional part locator. See mandrel chart for dimensions C, D, and E.

- ❑ This body can be **mounted to any machining center table, 4th/5th-axis rotary tables, angle plates, tombstones, etc.**
- ❑ Body weight is 22 lbs.
- ❑ Order mandrels, locators, and sleeves separately.

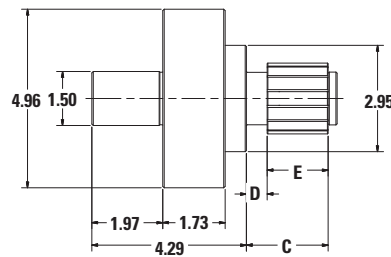
Royal Power-Block™ I.D. Assembly

DESCRIPTION	PART NUMBER	PRICE
Power-Block™ I.D. Body Assembly	47080	\$3,450



ROYAL I.D. WORKHOLDING SYSTEMS

KEY-OPERATED BODY – Universal



Note – dimensions shown without optional part locator. See mandrel chart for dimensions C, D, and E.

- This unit has a precision-ground shaft that can be held in any jaw chuck or 1.5" dia. collet, eliminating the need to change out the workholding and **enabling the system to be moved from machine to machine as jobs require.**
- Order mandrels, expanding rod adapters, locators, and sleeves separately.

Royal Key-Operated I.D. Body Assemblies

DESCRIPTION	PART NUMBER	PRICE
Key-Operated I.D. Body Assembly	47300	\$4,695
Expanding Rod Adapter – Fits Model A Mandrels	47310	371
Expanding Rod Adapter – Fits Models B&C Mandrels	47315	371
Expanding Rod Adapter – Fits Model D Mandrels	47325	371
Expanding Rod Adapter – Fits Model E Mandrels	47330	371

Step 2 - Choose Mandrel



- Choose appropriate mandrel model according to gripping range.
- All Royal mandrels have a common precision ground interface for **complete compatibility with all Royal I.D. body assemblies.**
- Order body assembly, locators, and sleeves separately.

Royal Mandrels

MANDREL MODEL	GRIPPING RANGE	C	D	E	MAX AXIAL FORCE (lbs.)	MAX CLAMPING FORCE (lbs.)	PART NUMBER	PRICE
A	0.479–0.640	1.57	0.57	0.87	1570	2670	47100	\$1,620
B	0.620–0.901	1.81	0.59	1.06	2245	3820	47101	1,620
C	0.870–1.151	2.05	0.61	1.26	2695	4580	47102	1,620
D	1.120–1.651	2.32	0.60	1.50	4045	6875	47103	1,620
E	1.620–3.276	2.52	0.58	1.69	5170	8785	47104	1,620

Step 3 - Choose Part Locator



- Optional part locator bolts to the front of the mandrel and provides a **precision banking surface** for the workpiece to locate against.
- Order body assembly, mandrels, and sleeves separately.

Royal Part Locators

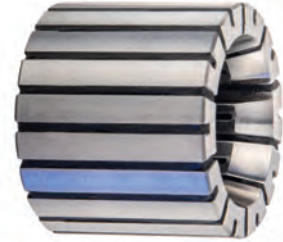
FITS MANDREL MODEL	WIDTH	OUTER DIAMETER	PART NUMBER	PRICE
A	0.47	1.57	47110	\$328
B	0.47	1.57	47111	328
C	0.47	2.95	47112	378
D	0.47	2.95	47113	378
E	0.47	2.95	47114	378

ROYAL I.D. WORKHOLDING SYSTEMS



Step 4 - Choose Expanding Sleeve

- Order expanding sleeves according to mandrel models A thru E.
- Royal expanding sleeves are fully sealed against coolant and chip penetration.
- Parallel grip ensures **full-length part contact for optimum accuracy and grip force.**
- All sleeves collapse 0.005" below nominal ground size to ensure easy part loading and unloading.
- Order body assembly, mandrels, and locators separately.



Royal Expanding Sleeves

MODEL A	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
		31/64"	0.479-0.499	47120*	\$457	35/64"	0.542-0.562	47124	\$457	39/64"	0.604-0.624	47126
	1/2"	0.495-0.515	47121*	457	9/16"	0.558-0.578	47125	457	5/8"	0.620-0.640	47129	457
	33/64"	0.510-0.530	47122	457	31/32"	0.573-0.593	47119	457	41/64"	0.636-0.656	47128	457
	11/32"	0.526-0.546	47123	457	19/32"	0.589-0.601	47127	457				

MODEL B	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
		5/8"	0.620-0.651	47130*	\$498	23/32"	0.714-0.745	47133	\$498	13/16"	0.808-0.839	47136
	21/32"	0.651-0.682	47131	498	3/4"	0.745-0.776	47134	498	27/32"	0.830-0.870	47137	498
	11/16"	0.683-0.714	47132	498	29/32"	0.776-0.807	47135	498	7/8"	0.870-0.901	47138	498

MODEL C	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
		7/8"	0.870-0.901	47140	\$498	31/32"	0.964-0.995	47143	\$498	11/16"	1.058-1.089	47146
	29/32"	0.901-0.932	47141	498	1"	0.995-1.026	47144	498	13/32"	1.089-1.120	47147	498
	15/16"	0.933-0.964	47142	498	1 1/32"	1.026-1.057	47145	498	1 1/8"	1.120-1.151	47148	498

MODEL D	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
		1 1/8"	1.120-1.151	47150	\$543	1 3/16"	1.308-1.339	47156	543	1 1/2"	1.495-1.526	47162
	1 5/32"	1.151-1.182	47151	543	1 11/32"	1.339-1.370	47157	543	1 7/32"	1.526-1.557	47163	543
	1 3/16"	1.183-1.214	47152	543	1 3/8"	1.370-1.401	47158	543	1 9/16"	1.558-1.589	47164	543
	1 1/2"	1.214-1.245	47153	543	1 13/32"	1.401-1.432	47159	543	1 19/32"	1.589-1.620	47165	543
	1 1/4"	1.145-1.276	47154	543	1 7/16"	1.433-1.464	47160	543	1 5/8"	1.620-1.651	47166	543
	1 3/32"	1.276-1.317	47155	543	1 15/32"	1.464-1.495	47161	543				

MODEL E	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
		1 5/8"	1.620-1.651	47170	\$662	2 3/16"	2.183-2.214	47188	\$662	2 3/4"	2.745-2.776	47206
	1 21/32"	1.651-1.682	47171	662	2 1/2"	2.214-2.245	47189	662	2 29/32"	2.776-2.807	47207	748
	1 11/16"	1.683-1.714	47172	662	2 1/4"	2.245-2.276	47190	662	2 19/16"	2.808-2.839	47208	748
	1 23/32"	1.714-1.745	47173	662	2 9/32"	2.276-2.307	47191	662	2 21/32"	2.839-2.870	47209	748
	1 3/4"	1.745-1.776	47174	662	2 5/16"	2.308-2.339	47192	662	2 7/8"	2.870-2.901	47210	748
	1 25/32"	1.776-1.807	47175	662	2 11/32"	2.339-2.370	47193	662	2 29/32"	2.901-2.932	47211	748
	1 19/16"	1.808-1.839	47176	662	2 3/8"	2.370-2.401	47194	662	2 15/16"	2.933-2.964	47212	748
	1 27/32"	1.839-1.870	47177	662	2 19/32"	2.401-2.432	47195	662	2 31/32"	2.964-2.995	47213	748
	1 7/8"	1.870-1.901	47178	662	2 7/16"	2.433-2.464	47196	662	3"	2.995-3.026	47214	748
	1 29/32"	1.901-1.932	47179	662	2 15/32"	2.464-2.495	47197	662	3 1/32"	3.026-3.057	47215	748
	1 15/16"	1.933-1.964	47180	662	2 1/2"	2.495-2.526	47198	662	3 1/16"	3.058-3.089	47216	748
	1 31/32"	1.964-1.995	47181	662	2 17/32"	2.526-2.557	47199	748	3 3/32"	3.089-3.120	47217	748
	2"	1.995-2.026	47182	662	2 3/8"	2.558-2.589	47200	748	3 1/8"	3.120-3.151	47218	748
	2 1/32"	2.026-2.057	47183	662	2 19/32"	2.589-2.620	47201	748	3 5/32"	3.151-3.182	47219	748
	2 1/16"	2.058-2.089	47184	662	2 5/8"	2.620-2.651	47202	748	3 3/16"	3.183-3.214	47220	748
	2 3/32"	2.089-2.120	47185	662	2 21/32"	2.651-2.682	47203	748	3 7/32"	3.214-3.245	47221	748
	2 1/8"	2.120-2.151	47186	662	2 11/16"	2.683-2.714	47204	748	3 1/4"	3.245-3.276	47222	748
	2 5/32"	2.151-2.182	47187	662	2 23/32"	2.714-2.745	47205	748				

*Not sealed due to limited wall thickness.

Note - sleeves larger than 2-1/2" dia. are 0.28" longer than dimension E and terminate flush with the face of the expanding rod.



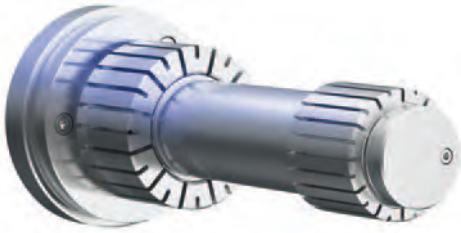
ROYAL CUSTOM I.D. WORKHOLDING

When a standard off-the-shelf I.D. workholding system won't quite work for your application, Royal has the expertise to design and build **custom systems that are optimized for your requirements.**

Below are some examples of some of the more common custom systems that we regularly supply.

Dual-Sleeve

Typically starting at \$12,500



Commonly used for:

- Long parts that need extra support.
- Very aggressive machining – sometimes incorporates knurled sleeves for castings and forgings.
- Large diameter-to-length ratios.

“Pressure Angle” Design

Typically starting at \$4,600

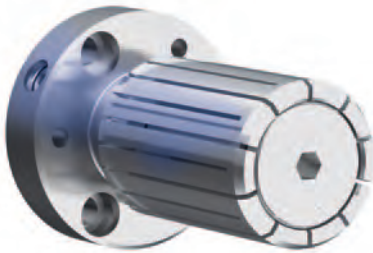


Commonly used for:

- Parts with short or blind bores.
- Very aggressive machining.
- Note that with this design, the head of expanding rod is recessed behind sleeve face to maximize grip-length.
- This design applies extra gripping torque along its length to keep the workpiece firmly seated.

Extended Sleeve

Typically starting at \$4,900



Commonly used for:

- Long parts that need extra support.
- Large diameter-to-length ratios.
- Great for thin-wall cylinder applications - load is distributed over a larger area to reduce risk of distortion.

Please keep in mind that in addition to the above systems, many other custom solutions/features are also available, including:

- Part ejectors
- Part confirmation
- Non-round bores
- Splined sleeves
- Radial orientation
- Positive-drive pins
- Center hole for tailstock support
- Custom locators
- Large diameters – up to 24”
- Surface-treated sleeves
- Knurled sleeves for castings and forgings
- Wide-range sleeves – to clear a small bore and expand into a larger bore