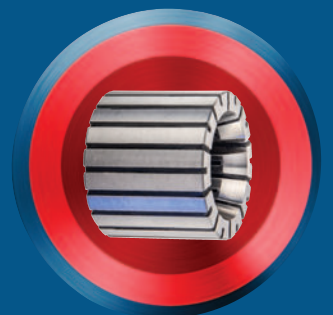
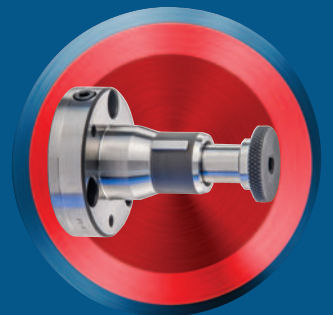
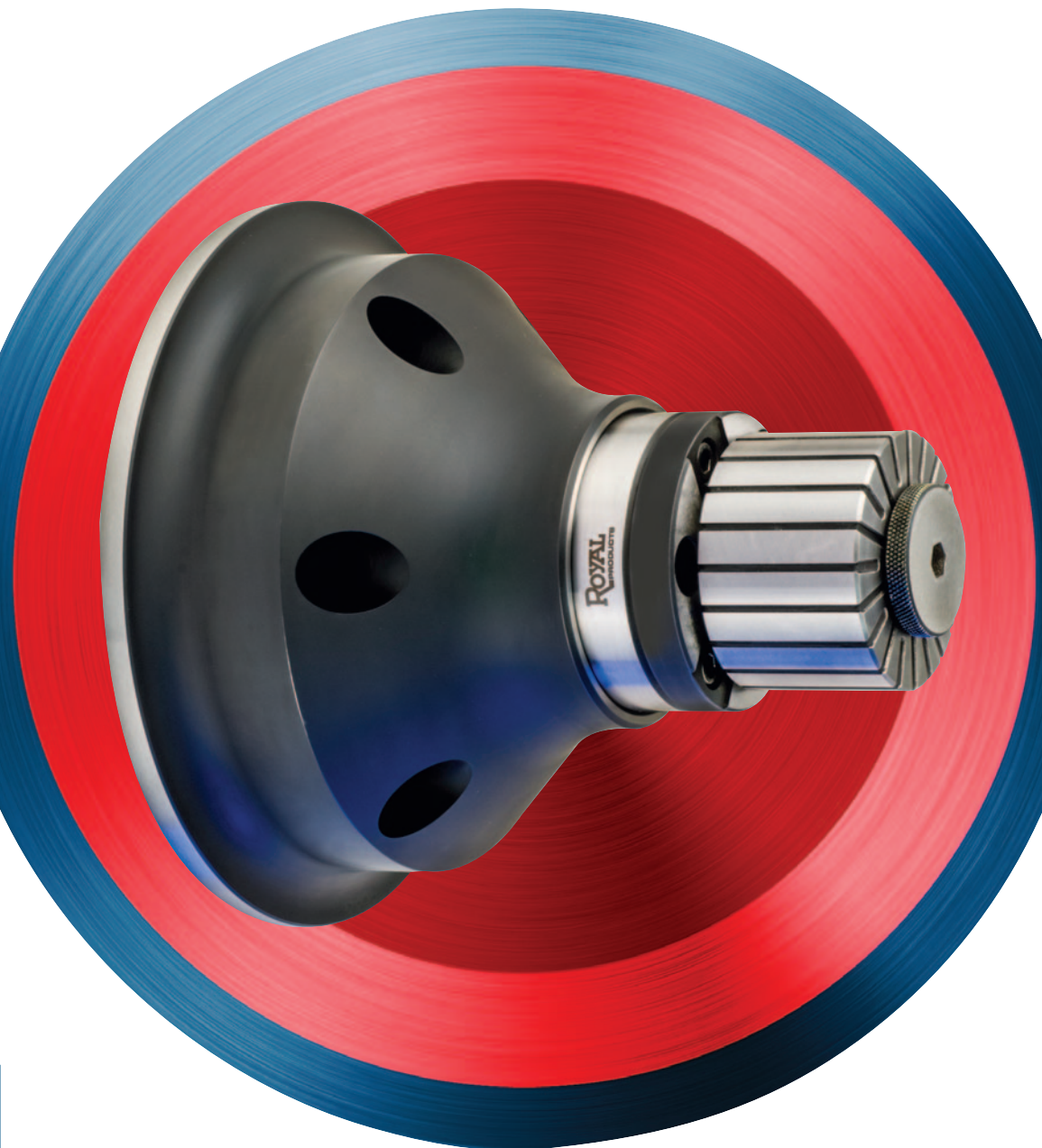




I.D. WORKHOLDING

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



ROYAL
PRODUCTS
Optimize everything.



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

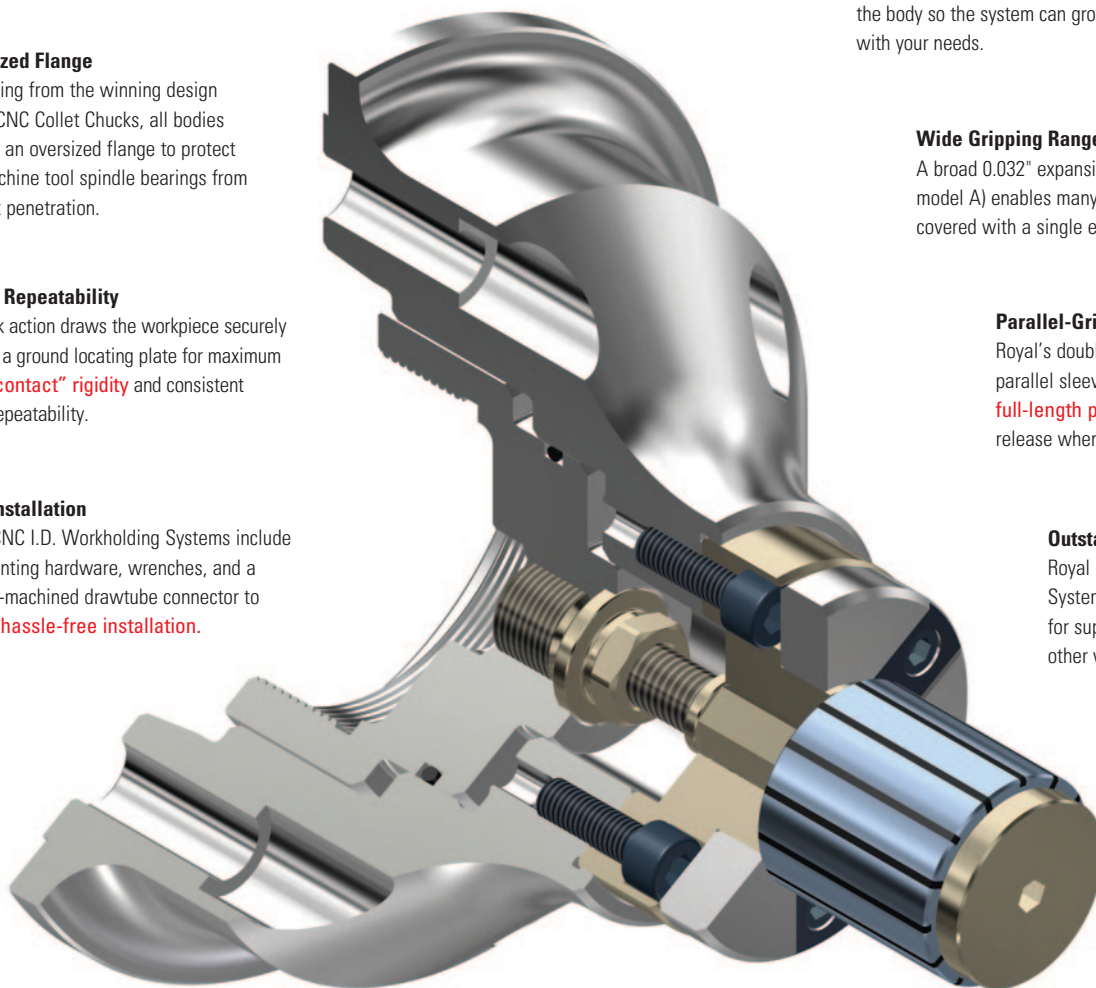
A broad 0.032" expansion range (0.020" for model A) enables many bore sizes to be covered with a single expanding sleeve.

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.



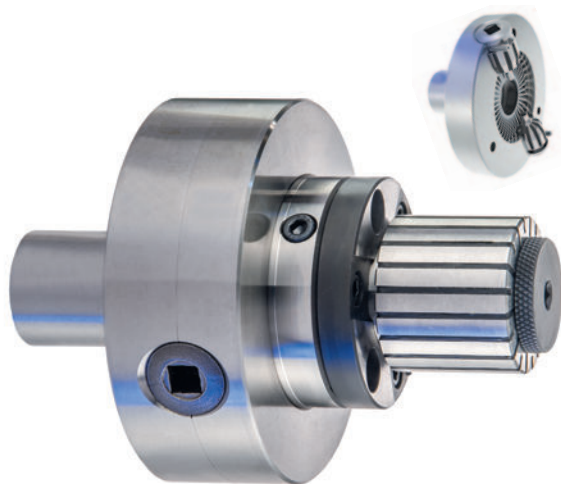
ROYAL POWER-BLOCK™ I.D. WORKHOLDING For Milling Applications



- ❑ 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 70-71.
- ❑ 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 70-71.
- ❑ 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 I.D. workholding system to be easily moved from machine to machine as jobs require.
- ❑ A great option for low-volume I.D. gripping.
- ❑ When ordering, be sure to also order the appropriate threaded expanding rod adapters sold separately.

ROYAL I.D. WORKHOLDING SYSTEMS

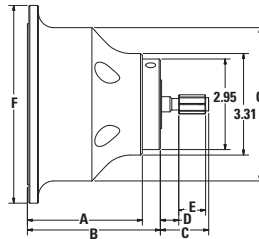


How to Order:

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.

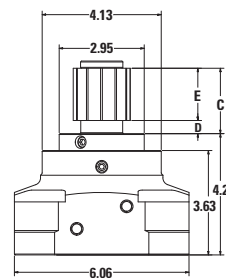
SPINDLE MOUNT	A	B	C	D	E	F	G
A2-5	3.75	4.34	See Mandrel Chart			6.45	5.00
A2-6	4.00	4.59				7.45	6.25
140mm	3.90	4.49				7.45	6.25
A2-8	5.00	5.59				9.45	8.00

- ❑ 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.

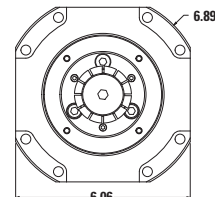
Royal CNC I.D. Body Assemblies

SPINDLE TYPE	PART NUMBER	PRICE
A2-5	47060	\$1,860
A2-6	47064	2,260
140mm	47068	2,410
A2-8	47072	3,030

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.

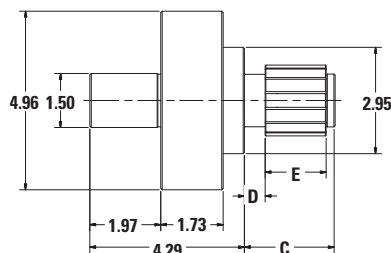
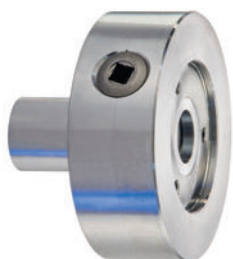
Royal Power-Block™ I.D. Assembly

DESCRIPTION	PART NUMBER	PRICE
Power-Block™ I.D. Body Assembly	47080	\$3,660



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	\$5,260
Expanding Rod Adapter – Fits Model A Mandrels	47310	394
Expanding Rod Adapter – Fits Models B&C Mandrels	47315	394
Expanding Rod Adapter – Fits Model D Mandrels	47325	394
Expanding Rod Adapter – Fits Model E Mandrels	47330	394

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	\$1,870
B	0.620 –0.901	1.81	0.59	1.06	2245	3820	47101	1,870
C	0.870 –1.151	2.05	0.61	1.26	2695	4580	47102	1,870
D	1.120 –1.651	2.32	0.60	1.50	4045	6875	47103	1,870
E	1.620 –3.276	2.52	0.58	1.69	5170	8785	47104	1,870

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.

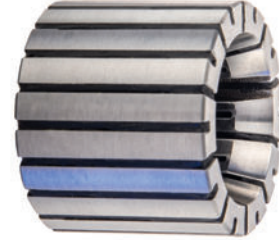
Royal Part Locators

FITS MANDREL MODEL	WIDTH	OUTER DIAMETER	PART NUMBER	PRICE
A	0.47	1.57	47110	\$378
B	0.47	1.57	47111	378
C	0.47	2.95	47112	435
D	0.47	2.95	47113	435
E	0.47	2.95	47114	435



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
	31/64"	0.479-0.499	47120*	\$549
	1/2"	0.495-0.515	47121*	549
	33/64"	0.510-0.530	47122	549
	17/32"	0.526-0.546	47123	549

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
35/64"	0.542-0.562	47124	\$549
9/16"	0.558-0.578	47125	549
37/64"	0.573-0.593	47119	549
19/32"	0.589-0.601	47127	549

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
39/64"	0.604-0.624	47126	\$549
5/8"	0.620-0.640	47129	549
41/64"	0.636-0.656	47128	549

MODEL B	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
	5/8"	0.620-0.651	47130*	\$598
	27/32"	0.651-0.682	47131	598
	11/16"	0.683-0.714	47132	598

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
23/32"	0.714-0.745	47133	\$598
3/4"	0.745-0.776	47134	598
25/32"	0.776-0.807	47135	598

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
13/16"	0.808-0.839	47136	\$598
27/32"	0.830-0.870	47137	598
7/8"	0.870-0.901	47138	598

MODEL C	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
	7/8"	0.870-0.901	47140	\$598
	29/32"	0.901-0.932	47141	598
	15/16"	0.933-0.964	47142	598

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
37/32"	0.964-0.995	47143	\$598
1"	0.995-1.026	47144	598
1 1/32"	1.026-1.057	47145	598

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 1/16"	1.058-1.089	47146	\$598
1 1/32"	1.089-1.120	47147	598
1 1/8"	1.120-1.151	47148	598

MODEL D	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
	1 1/8"	1.120-1.151	47150	\$652
	1 5/32"	1.151-1.182	47151	652
	1 3/16"	1.183-1.214	47152	652
	1 7/32"	1.214-1.245	47153	652
	1 1/4"	1.145-1.276	47154	652
	1 9/32"	1.276-1.317	47155	652

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 5/16"	1.308-1.339	47156	\$652
1 11/32"	1.339-1.370	47157	652
1 3/8"	1.370-1.401	47158	652
1 13/32"	1.401-1.432	47159	652
1 7/16"	1.433-1.464	47160	652
1 15/32"	1.464-1.495	47161	652

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 1/2"	1.495-1.526	47162	\$652
1 17/32"	1.526-1.557	47163	652
1 7/16"	1.558-1.589	47164	652
1 19/32"	1.589-1.620	47165	652
1 5/8"	1.620-1.651	47166	652

MODEL E	NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
	1 5/8"	1.620-1.651	47170	\$795
	1 21/32"	1.651-1.682	47171	795
	1 11/16"	1.683-1.714	47172	795
	1 23/32"	1.714-1.745	47173	795
	1 3/4"	1.745-1.776	47174	795
	1 25/32"	1.776-1.807	47175	795
	1 13/16"	1.808-1.839	47176	795
	1 27/32"	1.839-1.870	47177	795
	1 7/8"	1.870-1.901	47178	795
	1 29/32"	1.901-1.932	47179	795
	1 15/16"	1.933-1.964	47180	795
	1 31/32"	1.964-1.995	47181	795
	2"	1.995-2.026	47182	795
	2 1/32"	2.026-2.057	47183	795
	2 1/16"	2.058-2.089	47184	795
	2 3/32"	2.089-2.120	47185	795
	2 1/8"	2.120-2.151	47186	795
	2 5/32"	2.151-2.182	47187	795

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
2 3/16"	2.183-2.214	47188	\$795
2 7/32"	2.214-2.245	47189	795
2 1/4"	2.245-2.276	47190	795
2 9/32"	2.276-2.307	47191	795
2 5/16"	2.308-2.339	47192	795
2 11/32"	2.339-2.370	47193	795
2 3/8"	2.370-2.401	47194	795
2 13/32"	2.401-2.432	47195	795
2 7/16"	2.433-2.464	47196	795
2 15/32"	2.464-2.495	47197	795
2 1/2"	2.495-2.526	47198	795
2 17/32"	2.526-2.557	47199	898
2 9/16"	2.558-2.589	47200	898
2 19/32"	2.589-2.620	47201	898
2 5/8"	2.620-2.651	47202	898
2 21/32"	2.651-2.682	47203	898
2 11/16"	2.683-2.714	47204	898
2 23/32"	2.714-2.745	47205	898

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
2 3/4"	2.745-2.776	47206	\$898
2 25/32"	2.776-2.807	47207	898
2 13/16"	2.808-2.839	47208	898
2 27/32"	2.839-2.870	47209	898
2 7/8"	2.870-2.901	47210	898
2 29/32"	2.901-2.932	47211	898
2 15/16"	2.933-2.964	47212	898
2 31/32"	2.964-2.995	47213	898
3"	2.995-3.026	47214	898
3 1/32"	3.026-3.057	47215	898
3 1/16"	3.058-3.089	47216	898
3 3/32"	3.089-3.120	47217	898
3 1/8"	3.120-3.151	47218	898
3 5/32"	3.151-3.182	47219	898
3 3/16"	3.183-3.214	47220	898
3 7/32"	3.214-3.245	47221	898
3 1/4"	3.245-3.276	47222	898

*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.



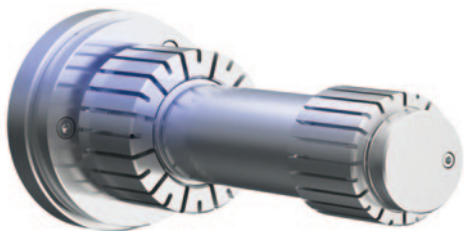
ROYAL CUSTOM I.D. WORKHOLDING

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

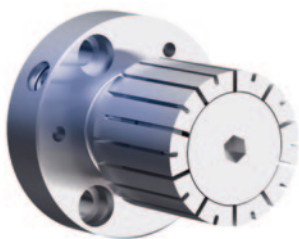


Commonly used for:

- ❑ 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

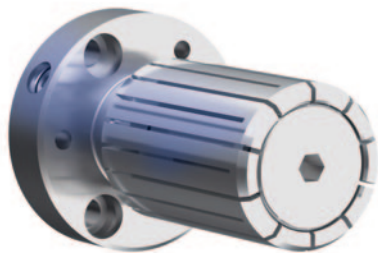


Commonly used for:

- ❑ 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