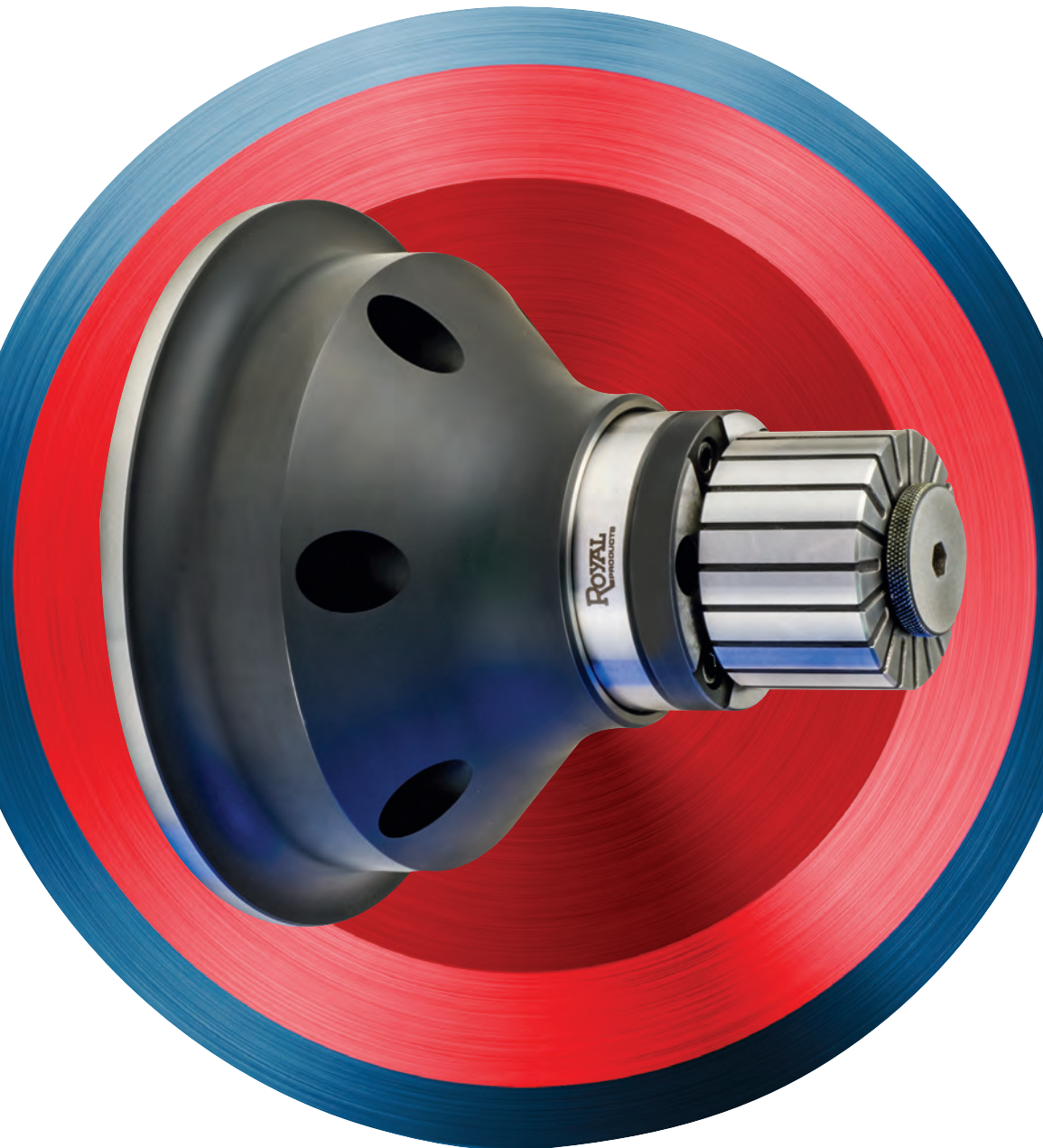




# I.D. WORKHOLDING

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





## ROYAL CNC EXPANDING MANDRELS

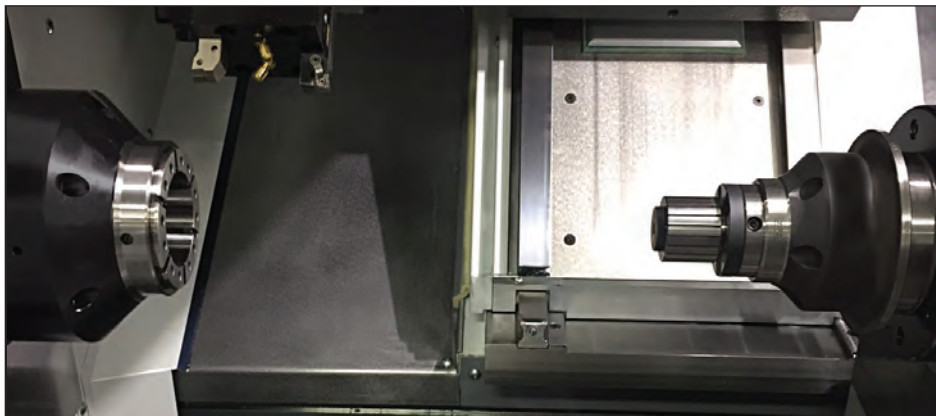
### Rigid and Accurate ID Workpiece Gripping



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

#### **ID Workholding Advantages:**

- ✓ Allows for full access to the entire length of the workpiece so **all external diameters can be turned in a single operation**, guaranteeing perfect concentricity.
- ✓ On sub-spindle machines, ID gripping on the second spindle eliminates the risk of surface damage that can be caused by second-op OD gripping of a previously-turned diameter.
- ✓ For many parts, the engagement-length of an ID bore can be greater than what is available for OD gripping, resulting in **superior rigidity and torque transmission**.
- ✓ ID systems tend to be more streamlined than OD systems, enabling better part access – especially important for use on machines with live tooling.



**Perfect Combination** – A Royal Quick-Grip™ CNC Collet Chuck on the main spindle and a Royal CNC Expanding Mandrel System on the sub.

# ROYAL CNC EXPANDING MANDRELS

## Rigid and Accurate ID Workpiece Gripping



### 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 Expanding Mandrel 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

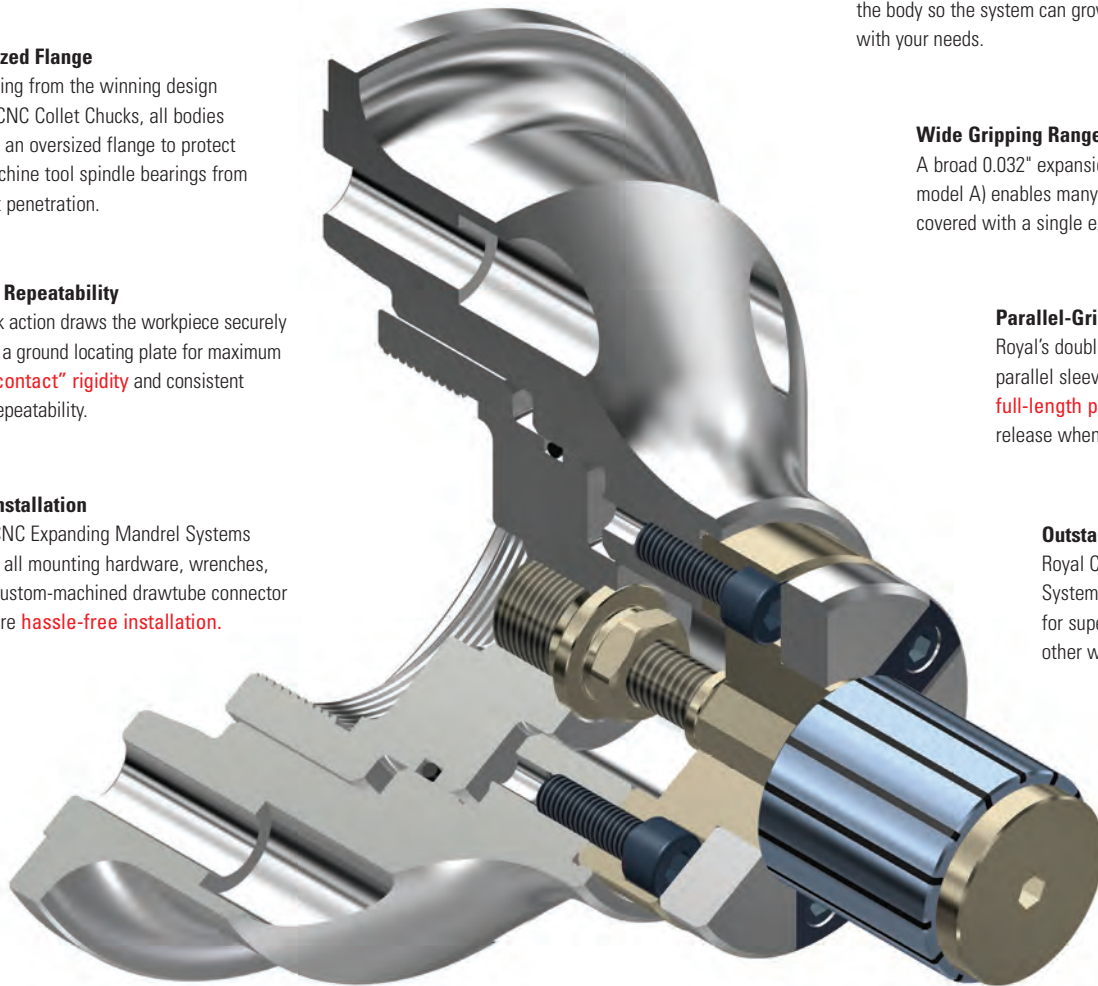
A broad 0.032" expansion range (0.020" for model A) enables many bore sizes to be covered with a single expanding sleeve.

### 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 Expanding Mandrel 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:

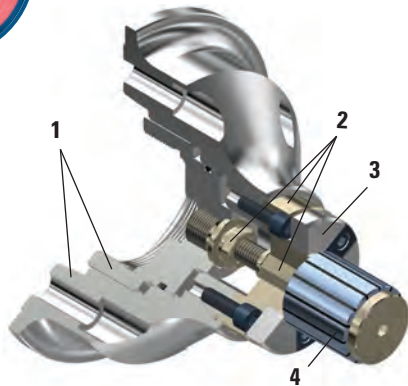
- Larger sizes – up to 25" diameter
- Extended-length systems
- Multi-step systems for locating on multiple bore diameters
- Automation enhancements such as ejector rings, part confirmation, etc.

### 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 CNC EXPANDING MANDRELS



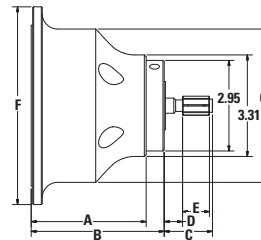
## How to Order:

1. Choose the appropriate **body assembly** based upon the lathe spindle it will be mounted to. Just like with Royal CNC Collet Chucks, each ID gripping system includes a custom-machined drawtube connector to ensure **hassle-free installation**.
2. Choose the appropriate **mandrel** based upon the diameter you plan to grip. All mandrels and bodies share a common mounting interface for full interchangeability. Each mandrel includes the expanding rod and an expanding rod adapter.
3. If required, choose **part locator** to provide a banking surface for the workpiece.
4. Choose the appropriate expanding sleeve based upon the diameter you plan to grip.

## Dimensions

Note – dimensions shown without optional part locator.

SPINDLE MOUNT	A	B	C	D	E	F	G
A2-5	3.75	4.34	See Below			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



### 1. Choose the appropriate body assembly.

- The body provides a **precision interface** for connecting the mandrel to the lathe spindle.
- Assembly includes body, custom-machined drawtube connector, and mounting hardware.
- Order mandrels, sleeves, and part locators separately.

## Royal Body Assemblies

SPINDLE TYPE*	PART NUMBER	PRICE
A2-5	47060	<b>\$1,200</b>
A2-6	47064	<b>1,450</b>
140mm	47068	<b>1,550</b>
A2-8	47072	<b>1,960</b>

\*Bodies with other spindle mounts available. Contact Royal for additional information.

### 2. Choose the appropriate mandrel.

- Mandrel models are defined by their gripping range.
- Expanding rod, expanding rod adapter, and mounting hardware included with each mandrel.
- Order expanding sleeves separately.

## Royal Mandrels

MANDREL MODEL	GRIPPING RANGE	C	D	E	PART NUMBER	PRICE
A	0.479–0.640	1.57	0.57	0.87	47100	<b>\$1,262</b>
B	0.620–0.901	1.81	0.59	1.06	47101	<b>1,262</b>
C	0.870–1.151	2.05	0.61	1.26	47102	<b>1,262</b>
D	1.120–1.651	2.32	0.60	1.50	47103	<b>1,262</b>
E	1.620–3.276	2.52	0.58	1.69	47104	<b>1,262</b>

### 3. Choose part locator.

- Part locators are an optional accessory.
- Locator bolts to the front of the mandrel and provides a square surface for the workpiece to locate against.
- Wider locators available to accommodate short parts.

## Royal Part Locators

FITS MANDREL MODEL	WIDTH	OUTER DIAMETER	PART NUMBER	PRICE
A	0.47	1.57	47110	<b>\$246</b>
B	0.47	1.57	47111	<b>246</b>
C	0.47	2.95	47112	<b>284</b>
D	0.47	2.95	47113	<b>284</b>
E	0.47	2.95	47114	<b>284</b>

# ROYAL CNC EXPANDING MANDRELS



## 4. Choose the appropriate expanding sleeve.

- Order expanding sleeves according to mandrel models A thru E.
- All 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.

## Royal Expanding Sleeves – Model A

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
31/64"	0.479–0.499	47120*	<b>\$344</b>
1/2"	0.495–0.515	47121*	<b>344</b>
33/64"	0.511–0.531	47122	<b>344</b>
17/32"	0.526–0.546	47123	<b>344</b>

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
35/64"	0.542–0.562	47124	<b>\$344</b>
9/16"	0.558–0.578	47125	<b>344</b>
39/64"	0.604–0.624	47126	<b>344</b>
19/32"	0.589–0.609	47127	<b>344</b>

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
41/64"	0.636–0.656	47128	<b>\$344</b>
5/8"	0.620–0.640	47129	<b>344</b>

## Royal Expanding Sleeves – Model B

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
5/8"	0.620–0.651	47130*	<b>\$380</b>
21/32"	0.651–0.682	47131	<b>380</b>
11/16"	0.683–0.714	47132	<b>380</b>

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
23/32"	0.714–0.745	47133	<b>\$380</b>
3/4"	0.745–0.776	47134	<b>380</b>
25/32"	0.776–0.807	47135	<b>380</b>

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
13/16"	0.808–0.839	47136	<b>\$380</b>
27/32"	0.830–0.870	47137	<b>380</b>
7/8"	0.870–0.901	47138	<b>380</b>

## Royal Expanding Sleeves – Model C

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
7/8"	0.870–0.901	47140	<b>\$380</b>
29/32"	0.901–0.932	47141	<b>380</b>
15/16"	0.933–0.964	47142	<b>380</b>

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
31/32"	0.964–0.995	47143	<b>\$380</b>
1"	0.995–1.026	47144	<b>380</b>
11/32"	1.026–1.057	47145	<b>380</b>

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 1/16"	1.058–1.089	47146	<b>\$380</b>
1 1/32"	1.089–1.120	47147	<b>380</b>
1 1/8"	1.120–1.151	47148	<b>380</b>

## Royal Expanding Sleeves – Model D

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 1/8"	1.120–1.151	47150	<b>\$409</b>
1 1/32"	1.151–1.182	47151	<b>409</b>
1 3/16"	1.183–1.214	47152	<b>409</b>
1 1/32"	1.214–1.245	47153	<b>409</b>
1 1/4"	1.145–1.276	47154	<b>409</b>
1 3/32"	1.276–1.317	47155	<b>409</b>

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 5/16"	1.308–1.339	47156	<b>\$409</b>
1 1/32"	1.339–1.370	47157	<b>409</b>
1 3/8"	1.370–1.401	47158	<b>409</b>
1 13/32"	1.401–1.432	47159	<b>409</b>
1 1/16"	1.433–1.464	47160	<b>409</b>
1 5/32"	1.464–1.495	47161	<b>409</b>

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 1/2"	1.495–1.526	47162	<b>\$409</b>
1 17/32"	1.526–1.557	47163	<b>409</b>
1 9/16"	1.558–1.589	47164	<b>409</b>
1 19/32"	1.589–1.620	47165	<b>409</b>
1 7/8"	1.620–1.651	47166	<b>409</b>

## Royal Expanding Sleeves – Model E

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 5/8"	1.620–1.651	47170	<b>\$497</b>
1 31/32"	1.651–1.682	47171	<b>497</b>
1 11/16"	1.683–1.714	47172	<b>497</b>
1 23/32"	1.714–1.745	47173	<b>497</b>
1 3/4"	1.745–1.776	47174	<b>497</b>
1 25/32"	1.776–1.807	47175	<b>497</b>
1 13/16"	1.808–1.839	47176	<b>497</b>
1 21/32"	1.839–1.870	47177	<b>497</b>
1 7/8"	1.870–1.901	47178	<b>497</b>
1 29/32"	1.901–1.932	47179	<b>497</b>
1 15/16"	1.933–1.964	47180	<b>497</b>
1 33/32"	1.964–1.995	47181	<b>497</b>
2"	1.995–2.026	47182	<b>497</b>
2 1/32"	2.026–2.057	47183	<b>497</b>
2 1/16"	2.058–2.089	47184	<b>497</b>
2 3/32"	2.089–2.120	47185	<b>497</b>
2 1/8"	2.120–2.151	47186	<b>497</b>
2 5/32"	2.151–2.182	47187	<b>497</b>

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
2 3/16"	2.183–2.214	47188	<b>\$497</b>
2 1/32"	2.214–2.245	47189	<b>497</b>
2 1/4"	2.245–2.276	47190	<b>497</b>
2 3/32"	2.276–2.307	47191	<b>497</b>
2 5/16"	2.308–2.339	47192	<b>497</b>
2 11/32"	2.339–2.370	47193	<b>497</b>
2 3/8"	2.370–2.401	47194	<b>497</b>
2 13/32"	2.401–2.432	47195	<b>497</b>
2 1/16"	2.433–2.464	47196	<b>497</b>
2 15/32"	2.464–2.495	47197	<b>497</b>
2 1/2"	2.495–2.526	47198	<b>497</b>
2 17/32"	2.526–2.557	47199	<b>564</b>
2 9/16"	2.558–2.589	47200	<b>564</b>
2 19/32"	2.589–2.620	47201	<b>564</b>
2 5/8"	2.620–2.651	47202	<b>564</b>
2 21/32"	2.651–2.682	47203	<b>564</b>
2 11/16"	2.683–2.714	47204	<b>564</b>
2 23/32"	2.714–2.745	47205	<b>564</b>

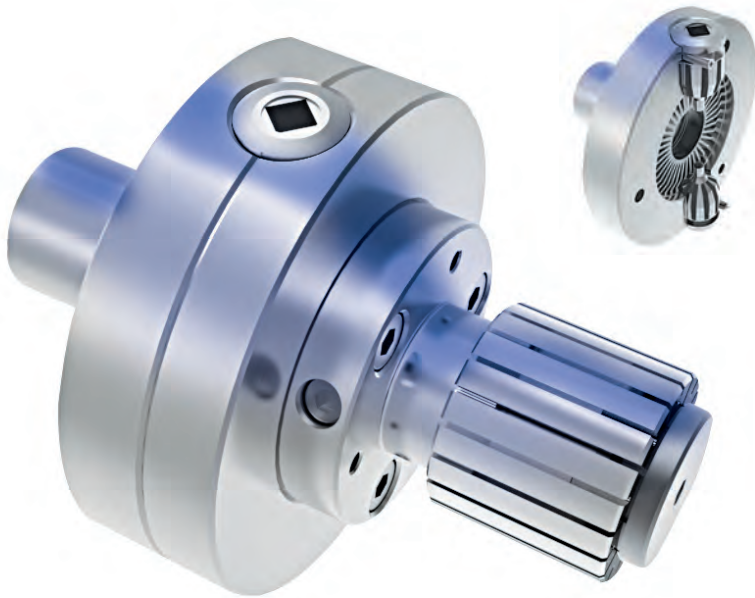
NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
2 3/4"	2.745–2.776	47206	<b>\$564</b>
2 25/32"	2.776–2.807	47207	<b>564</b>
2 13/16"	2.808–2.839	47208	<b>564</b>
2 27/32"	2.839–2.870	47209	<b>564</b>
2 7/8"	2.870–2.901	47210	<b>564</b>
2 29/32"	2.901–2.932	47211	<b>564</b>
2 15/16"	2.933–2.964	47212	<b>564</b>
2 31/32"	2.964–2.995	47213	<b>564</b>
3"	2.995–3.026	47214	<b>564</b>
3 1/32"	3.026–3.057	47215	<b>564</b>
3 1/16"	3.058–3.089	47216	<b>564</b>
3 3/32"	3.089–3.120	47217	<b>564</b>
3 1/8"	3.120–3.151	47218	<b>564</b>
3 5/32"	3.151–3.182	47219	<b>564</b>
3 3/16"	3.183–3.214	47220	<b>564</b>
3 7/32"	3.214–3.245	47221	<b>564</b>
3 1/4"	3.245–3.276	47222	<b>564</b>

\*Not sealed due to limited wall thickness.



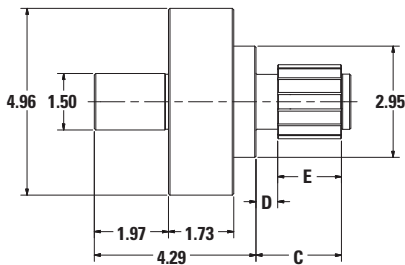
# ROYAL KEY-OPERATED EXPANDING MANDREL ACTUATOR

## Manual Operation, Universal Mounting



Royal's manually-operated mandrel actuator has a 1.5" diameter straight shank, enabling to be quickly and easily moved from machine to machine as jobs require. In this application the unit is gripped in a Royal QG-80 CNC collet chuck.

- ❑ Royal's Manually-Operated Expanding Mandrel Actuator 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.
- ❑ These models utilize the same precision mandrels, expanding sleeves and locators as our CNC Expanding Mandrels (sold separately – see previous pages).
- ❑ Side-actuated with an included square-drive key means that this unit can accommodate parts with blind bores as well as those with thru-holes.
- ❑ 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/medium-volume production. For high-production environments, Royal's line of CNC Expanding Mandrels featured on the previous pages is recommended.
- ❑ When ordering, be sure to also order the appropriate threaded expanding rod adapter(s) sold separately.



See page 52 for dims C, D, & E

### Royal Key-Operated Expanding Mandrel Actuator

DESCRIPTION	PART NUMBER*	PRICE
Key-Operated Operated Expanding Mandrel Actuator	47300	<b>\$3,695</b>
Expanding Rod Adapter – Fits Model A Mandrels	47310	<b>255</b>
Expanding Rod Adapter – Fits Model B Mandrels	47315	<b>255</b>
Expanding Rod Adapter – Fits Model C Mandrels	47320	<b>255</b>
Expanding Rod Adapter – Fits Model D Mandrels	47325	<b>255</b>
Expanding Rod Adapter – Fits Model E Mandrels	47330	<b>255</b>

\*Order mandrels, locators, and expanding sleeves separately.

Note – mounting plates also available for stationary applications.

# ROYAL CUSTOM ID WORKHOLDING



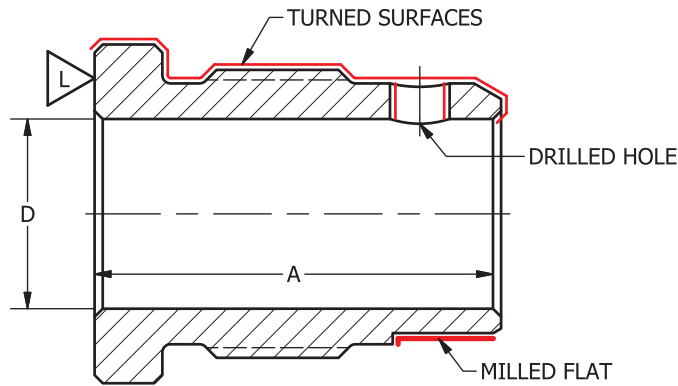
Many common ID workholding applications are easily handled by Royal's large inventory of off-the-shelf expanding mandrels and sleeves. However, **sometimes the parameters of the workpiece and/or process are such that a custom ID workholding system is a better choice.**

In order for Royal's engineering team to make the best recommendation for your specific application, a number of parameters must be considered. If you would like our input on an **ID workholding system that is optimized for your needs**, please take a minute to consider the information outlined below and provide a solid model or drawing of your part that visually identifies these parameters.

Company Name _____	Contact Name _____
Contact Email _____	Contact Phone _____
Description or Ref Number of Part to be Gripped _____	Typical Run Size _____
Workpiece Material _____	How is part Loaded? _____
Machine Make and Model _____	Orientation – vertical or horizontal? _____

**Be sure that your drawing includes the parameters listed below.  
The more info you supply – the better we will be able to help you.**

**Example:**



Note that in this example, a cross-drilled hole breaks into the gripping area. Some might assume that this would require the use of a short sleeve. However, an alternative solution could be a full-length sleeve with a clearance hole or slot machined into it.

**We've seen it all – give us a call!**

_____ Diameter to be gripped, including tolerance (D).	Description of machining processes to be performed, tooling clearance requirements, etc.: _____ _____ _____ _____
_____ Max bore length available to grip (A).	
_____ Blind bore (Y/N)?	
_____ Locating surface (L) - if applicable.	
_____ Max diameter of machined surfaces.	
_____ Max depth of cut.	
_____ Max rpm.	

**Email this form and your part drawing to [orders@royalproducts.com](mailto:orders@royalproducts.com)**



# ROYAL CUSTOM ID WORKHOLDING

When a standard off-the-shelf ID 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

Systems typically starting at \$8,700

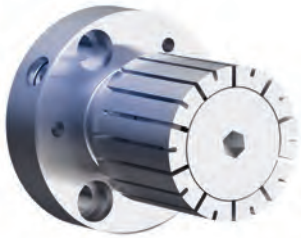


### Commonly used for:

- ❑ 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

Systems typically starting at \$3,200

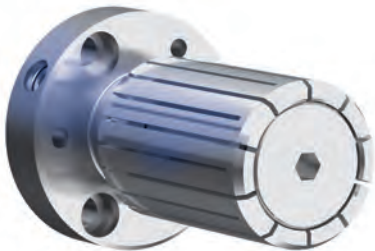


### Commonly used for:

- ❑ 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

Systems typically starting at \$3,500



### 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