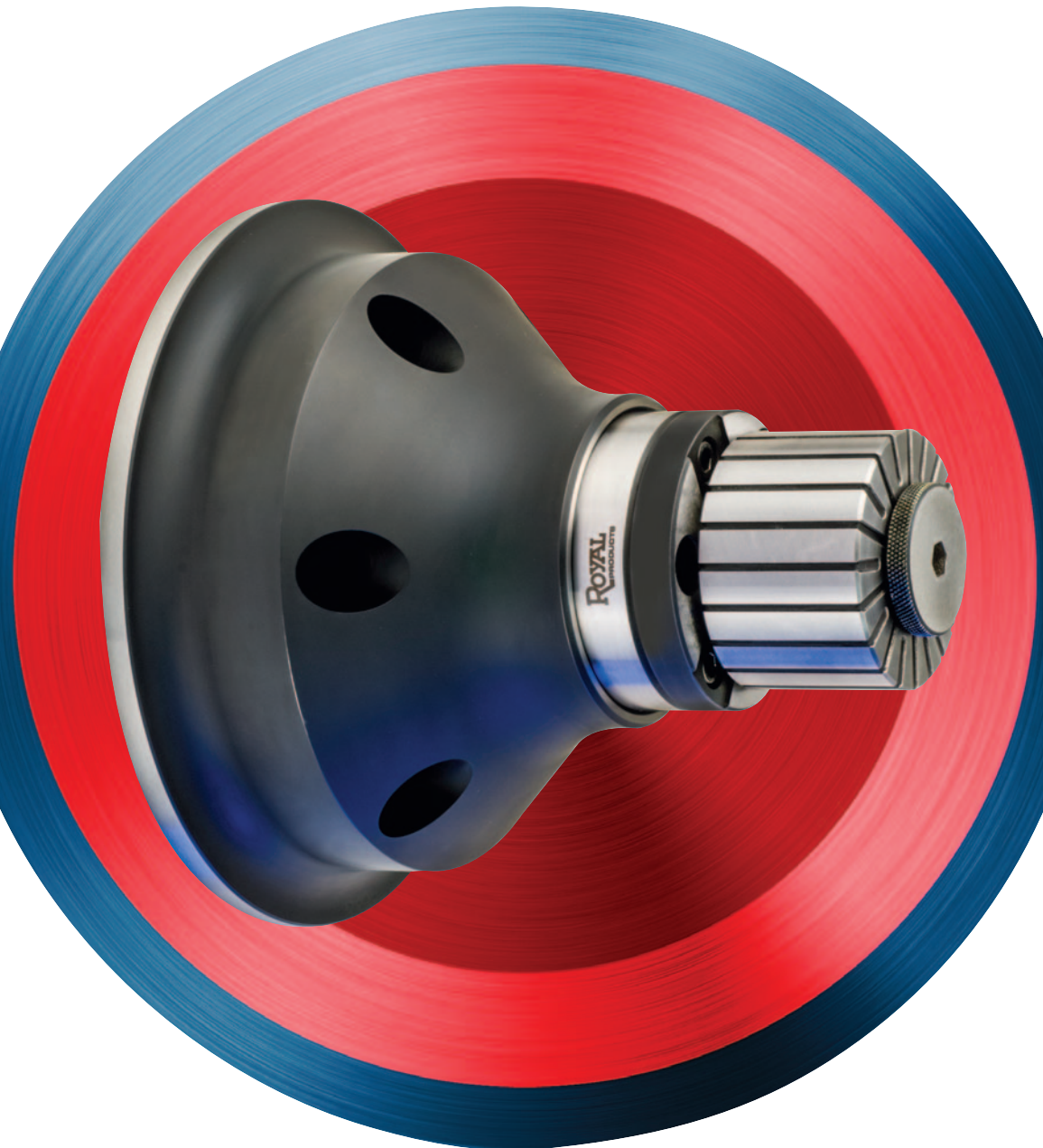




I.D. WORKHOLDING

- 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

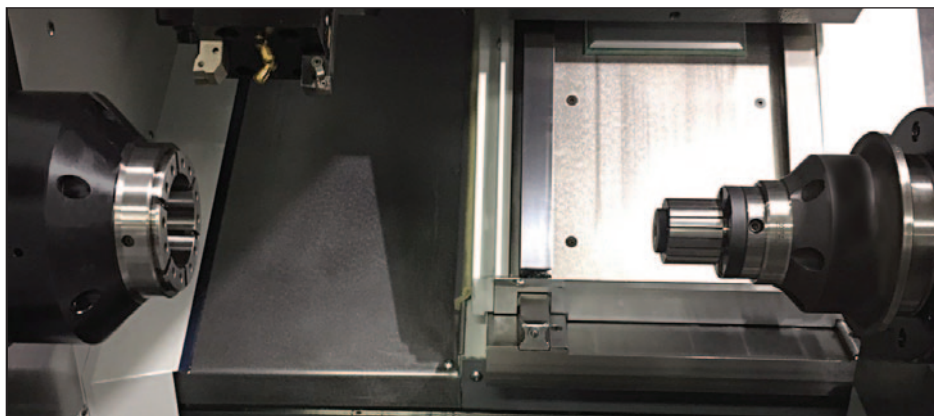
Rigid and Accurate ID Workpiece Gripping



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

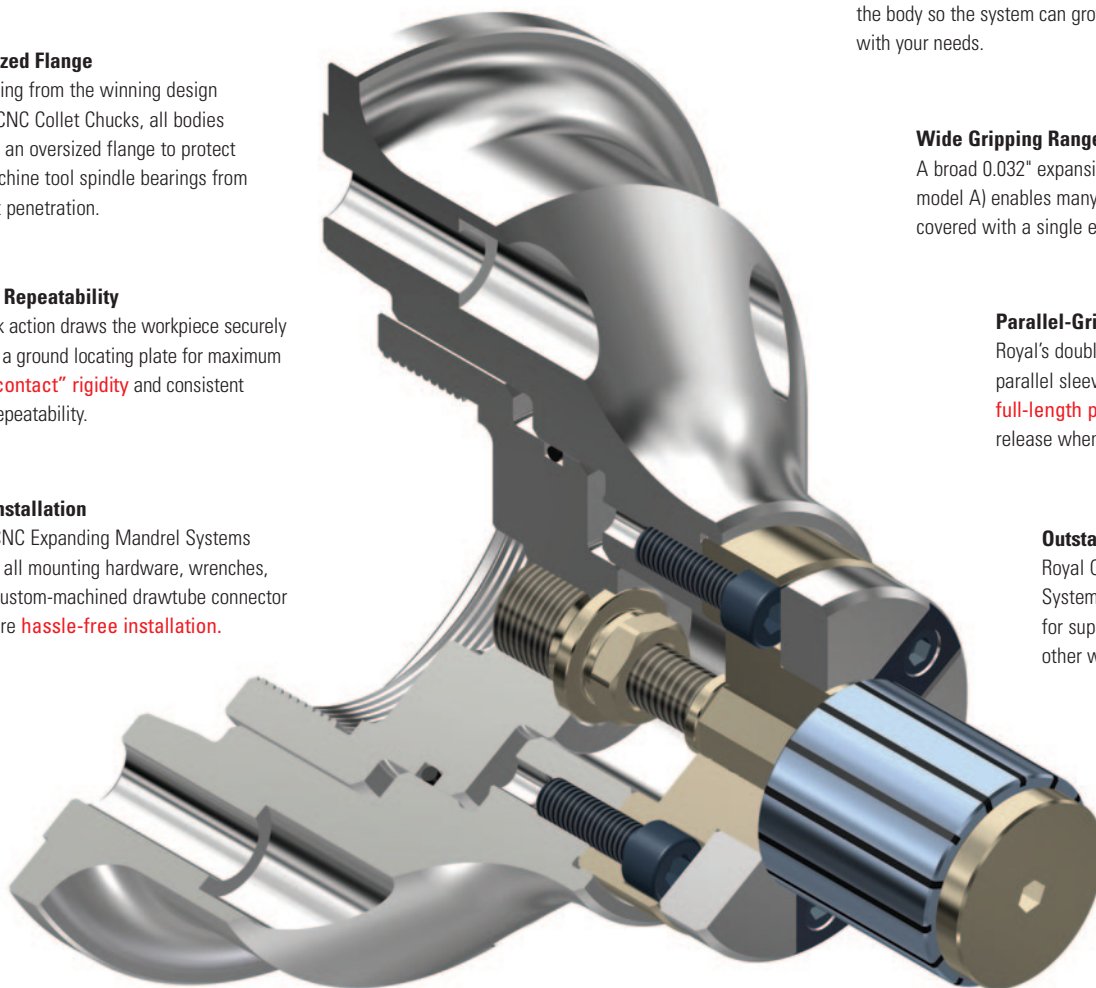
A broad 0.032" expansion range (0.020" for model A) enables many bore sizes to be covered with a single expanding sleeve.

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:

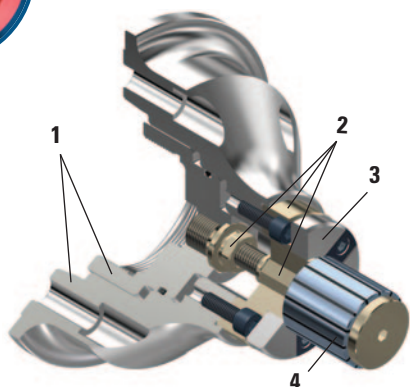
- Larger sizes – up to 25" diameter
- Extended-length systems
- Multi-step systems for locating on multiple bore diameters
- Automation enhancements such as ejector rings, part confirmation, etc.

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



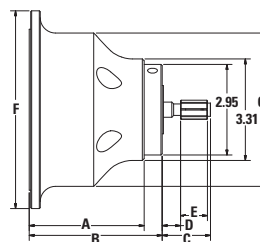
How to Order:

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



Royal Body Assemblies

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.

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

*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	\$1,262
B	0.620–0.901	1.81	0.59	1.06	47101	1,262
C	0.870–1.151	2.05	0.61	1.26	47102	1,262
D	1.120–1.651	2.32	0.60	1.50	47103	1,262
E	1.620–3.276	2.52	0.58	1.69	47104	1,262

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	\$246
B	0.47	1.57	47111	246
C	0.47	2.95	47112	284
D	0.47	2.95	47113	284
E	0.47	2.95	47114	284

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*	\$344
1/2"	0.495–0.515	47121*	344
33/64"	0.511–0.531	47122	344
17/32"	0.526–0.546	47123	344

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

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

Royal Expanding Sleeves – Model B

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

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

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

Royal Expanding Sleeves – Model C

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

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

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

Royal Expanding Sleeves – Model D

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 1/8"	1.120–1.151	47150	\$409
1 1/32"	1.151–1.182	47151	409
1 3/16"	1.183–1.214	47152	409
1 7/32"	1.214–1.245	47153	409
1 1/4"	1.145–1.276	47154	409
1 3/32"	1.276–1.317	47155	409

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 5/16"	1.308–1.339	47156	\$409
1 11/32"	1.339–1.370	47157	409
1 3/8"	1.370–1.401	47158	409
1 13/32"	1.401–1.432	47159	409
1 7/16"	1.433–1.464	47160	409
1 15/32"	1.464–1.495	47161	409

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 1/2"	1.495–1.526	47162	\$409
1 17/32"	1.526–1.557	47163	409
1 9/16"	1.558–1.589	47164	409
1 19/32"	1.589–1.620	47165	409
1 5/8"	1.620–1.651	47166	409

Royal Expanding Sleeves – Model E

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
1 5/8"	1.620–1.651	47170	\$497
1 21/32"	1.651–1.682	47171	497
1 11/16"	1.683–1.714	47172	497
1 23/32"	1.714–1.745	47173	497
1 3/4"	1.745–1.776	47174	497
1 25/32"	1.776–1.807	47175	497
1 13/16"	1.808–1.839	47176	497
1 27/32"	1.839–1.870	47177	497
1 7/8"	1.870–1.901	47178	497
1 29/32"	1.901–1.932	47179	497
1 15/16"	1.933–1.964	47180	497
1 31/32"	1.964–1.995	47181	497
2"	1.995–2.026	47182	497
2 1/32"	2.026–2.057	47183	497
2 1/16"	2.058–2.089	47184	497
2 3/32"	2.089–2.120	47185	497
2 1/8"	2.120–2.151	47186	497
2 5/32"	2.151–2.182	47187	497

NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
2 3/16"	2.183–2.214	47188	\$497
2 1/32"	2.214–2.245	47189	497
2 1/4"	2.245–2.276	47190	497
2 3/32"	2.276–2.307	47191	497
2 5/16"	2.308–2.339	47192	497
2 11/32"	2.339–2.370	47193	497
2 3/8"	2.370–2.401	47194	497
2 13/32"	2.401–2.432	47195	497
2 7/16"	2.433–2.464	47196	497
2 15/32"	2.464–2.495	47197	497
2 1/2"	2.495–2.526	47198	497
2 17/32"	2.526–2.557	47199	564
2 9/16"	2.558–2.589	47200	564
2 19/32"	2.589–2.620	47201	564
2 5/8"	2.620–2.651	47202	564
2 21/32"	2.651–2.682	47203	564
2 11/16"	2.683–2.714	47204	564
2 23/32"	2.714–2.745	47205	564

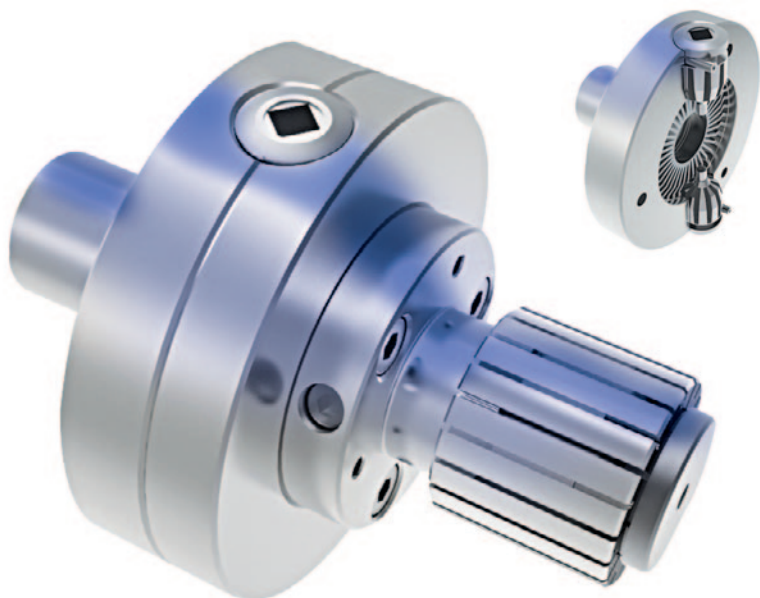
NOMINAL SLEEVE DIAMETER	GRIPPING RANGE	PART NUMBER	PRICE
2 3/4"	2.745–2.776	47206	\$564
2 25/32"	2.776–2.807	47207	564
2 13/16"	2.808–2.839	47208	564
2 27/32"	2.839–2.870	47209	564
2 7/8"	2.870–2.901	47210	564
2 29/32"	2.901–2.932	47211	564
2 15/16"	2.933–2.964	47212	564
2 31/32"	2.964–2.995	47213	564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

*Not sealed due to limited wall thickness.



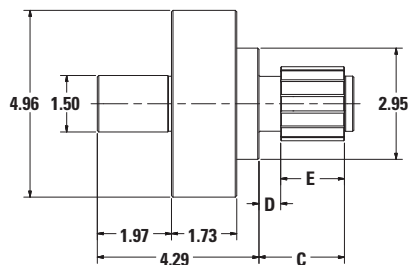
ROYAL KEY-OPERATED EXPANDING MANDREL ACTUATOR

Manual Operation, Universal Mounting



Royal's manually-operated mandrel actuator has a 1.5" diameter straight shank, enabling it 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	\$3,695
Expanding Rod Adapter – Fits Model A Mandrels	47310	255
Expanding Rod Adapter – Fits Model B Mandrels	47315	255
Expanding Rod Adapter – Fits Model C Mandrels	47320	255
Expanding Rod Adapter – Fits Model D Mandrels	47325	255
Expanding Rod Adapter – Fits Model E Mandrels	47330	255

*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 _____

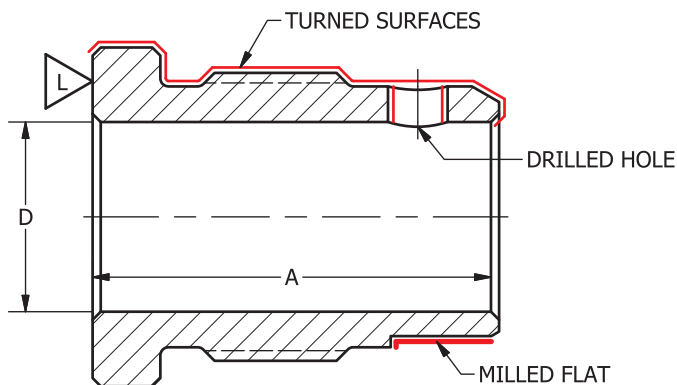
Description or Ref Number of Part to be Gripped _____ Typical Run Size _____

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).

_____ 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.

Description of machining processes to be performed, tooling clearance requirements, etc.:

Email this form and your part drawing to orders@royalproducts.com



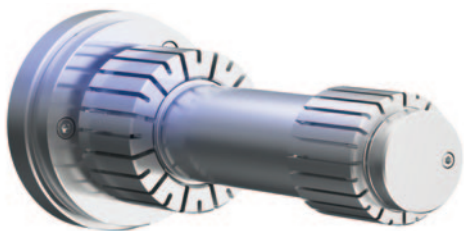
ROYAL CUSTOM ID WORKHOLDING

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

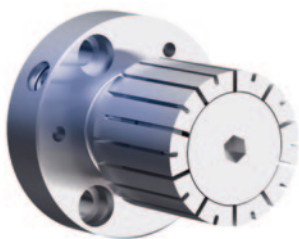


Commonly used for:

- ❑ 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

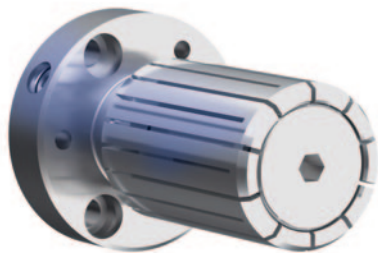


Commonly used for:

- ❑ 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