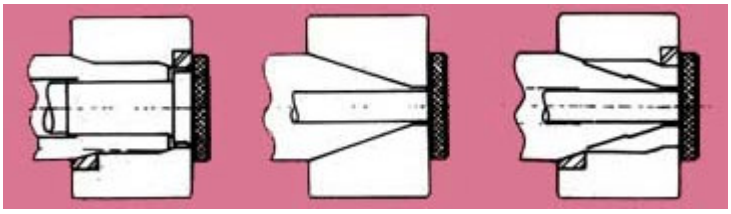
EXPANDING MANDRELS AND SLEEVES

DOUBLE ANGLE ADVANTAGES

The continuing advancement in production methods in the Metalworking Industry has created a need for precision workholding devices capable of automatic clamping in component bores. In addition, the equipment must transmit the high accuracy of the latest machine tools and develop sufficient holding power to resist the cutting forces imposed on the workpiece.

Such capabilities are possible by using a BIRLA PRECISION TECH Expanding mandrel system. The BIRLA PRECISION TECH Expanding Mandrels, a development of the Erickson Tool Company, Ohio, USA patented double angle princle for precision expansion, have been proved over a number of years as the most versatile and troublefree Mandrels for jobs requiring internal chucking where accuracy positive grip are necessary



Double Angle verses Single Angle

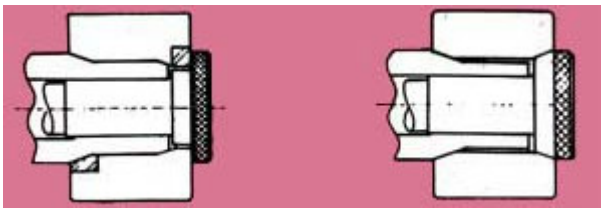
Double Angle Principle

- Stronger uniform body.
- Uniform sleeve wall sections.
- Stronger drawpin

- Weak body at small end.
- Uneven wall sections on sleeve make it difficult to get uniform expansion.
- Weak drawpin

- Double-angle design has same effect as single-angle with relief.
- Right-hand end is moved up into new position, and relief becomes parallel to centreline.

Both angles are supported from the body;giving maximum support



Only on angle is supported from the body. The outboard angle is supported from the drawpin which is, in turn, supported from small, slip-fit diameter.

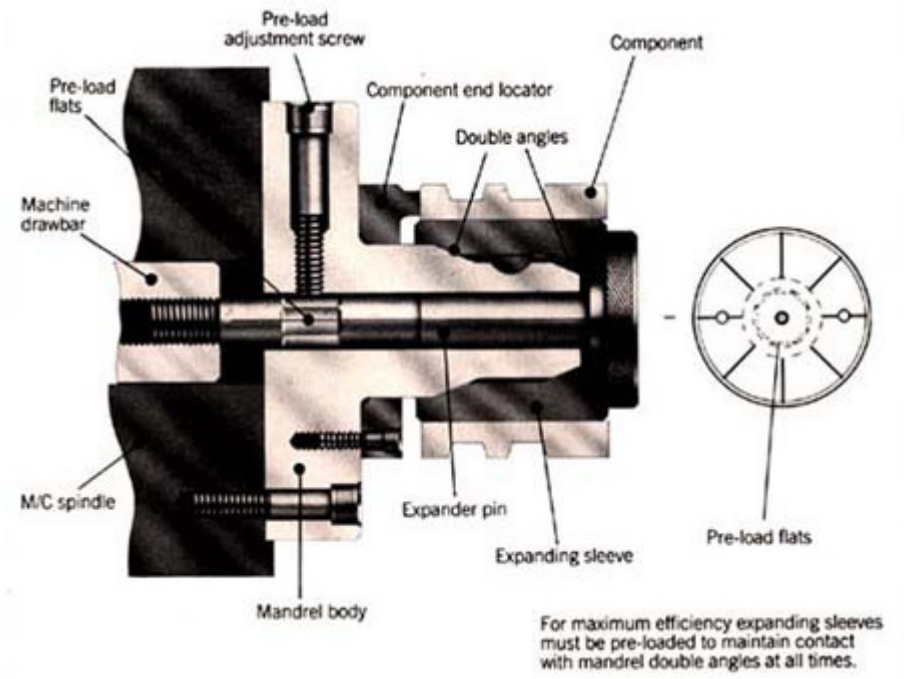
Double- Angle verses Two Opposed Angles

The patented Double angle design when used for expanding sleeves incorporates the following vital features:

- Each sleeve has an expansion range of 0.8mm (0.32") as standard.
- Delivers guranteed accuracy of 0.013mm (0.0005") T.I.R. or closer if desired.
- Delivers greater holding power because the sleeve grips along its entire length.
- Eliminates need initially to hold the work to close bore tolerance where not required on completed job.
- Accuracy is constantly maintained as mating surfaces wear to continuous gauge fit.
- Patented double angle permit self release of sleeve, giving fast loading and unloading of components.

- One Mandrel accommodates a wide range of sleeve sizes.
- Multiple sleeve models are available for work with great length to diameter ratio. Stops wobble and chatter.
- Sleeves can be specially machined to grip non-cylindrical or stepped or splined inside diameters.
- All arbors can generally be reconditioned by having the angles re-ground by us to bring back to original accuracy.
- Sleeve sliding on Double Angles Provides pull-back of components on to end locator for positive location.

MOUNTING AND PRELOADING INSTRUCTIONS

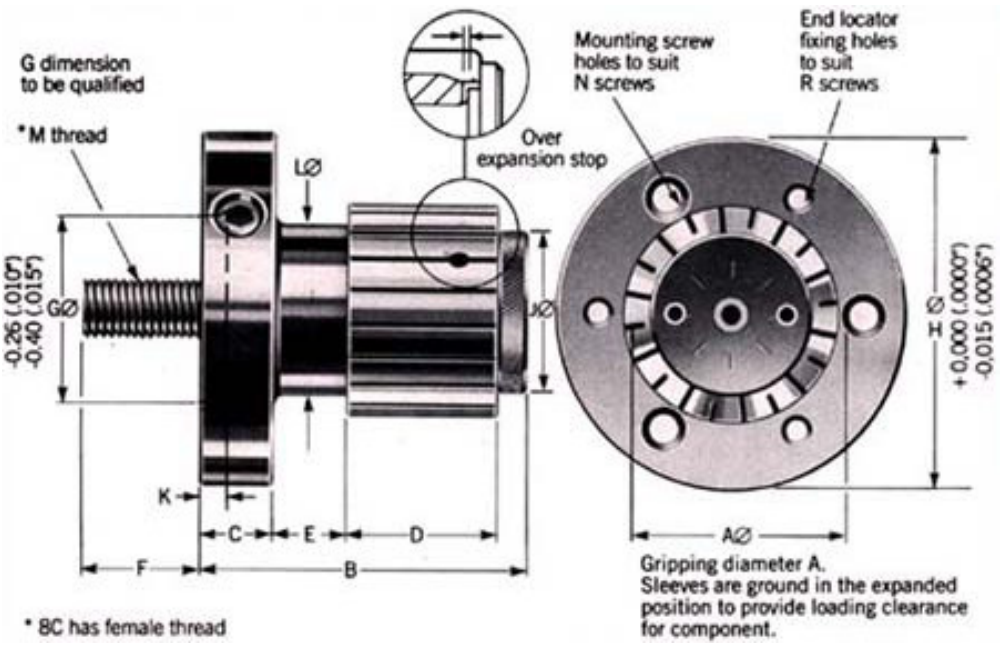


ASSEMBLY INSTRUCTIONS

- Ensure machine drawbar is fully forward.
- Load mandrel body to machine spindle (using clock register or double angle form check concentricity).
- Fit end locator to mandrel body (if not already fitted).
- Ensure double angles are clean. (Mandrel body and sleeve.)
- Place expanding sleeve on mandrel body.
- Ensure pre-load adjustment screw is retracted. Place expander pin in mandrel body. Screw pin clockwise into drawbar until head of pin contracts with sleeve. (Ensure pin **does not** expand sleeve.)
- Load component on to mandrel assembly in working position.
- Screw expander pin clockwise into drawbar until sleeve grips component.
- Back off expander pin anti-clockwise until first available pre-load flat is adjacent to pre-load adjustment screw.(Cross lines on expander pin head cioncide with pre-load flats.)
- Remove component and check loading clearance to ensure easy loading.
- Tighten pre-load adjustment screw ensuring expander pin ahs slight radial movement, to allow pin to slide freely.
- Finally check by loading component and operate drawbar ensuring component is satisfactorily held. Make sure drawbar pressure is sufficient to stop slippage.
- Mandrel is now ready for operation.

Birla Precision Tech engineers are always available to assist if required

Face plate drawbar operated (standard length)

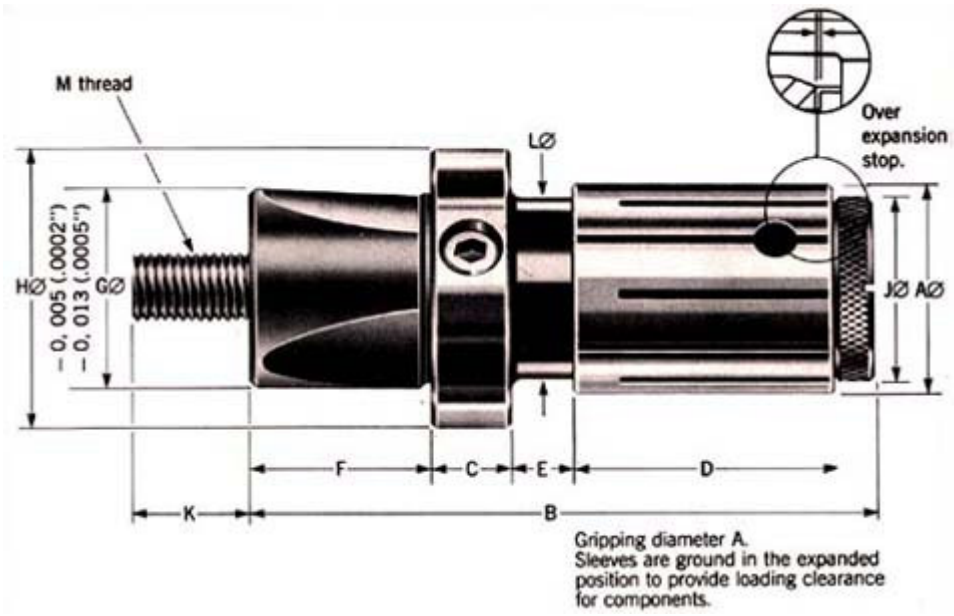


The faceplate drawbar operated expanding mandrel can be used on any machine with drawbar facility, for general turning and grinding operations. Adaptor plates can be made to suit the machine mounting if necessary. Component end locators, solid type or compensating (for out-of-square locating faces) can be supplied or manufactured by customer. The natural pull-back action of the sleeve ensures the component is hard against the location face. There is an over-expansion stop built into the expander pin to avoid over-stressing the expanding sleeve.

Model	A		B	C	D	E	F	G	H	J	K	L	M	N		R		Too Nr
	Min	Max												DP	Ø	DP	Ø	
3A	12,5	16,0	60	20,0	22,0	14,6	20	40	75	11,0	6	12,6	M4	58	M8	28,0	M4	90.800.210.1
2C	16,0	22,0	66	20,0	27,0	15,0	22	40	75	15,0	6	14,1	M8	58	M8	28,0	M4	90.800.215.1
1C	22,0	28,0	72	20,0	32,0	15,5	30	40	75	20,0	6	20,7	M8	58	M8	58	M6	90.800.221.1
18C	28,0	41,0	79	20,0	38,0	15,3	31	40	75	26,5	6	26,3	M10	58	M8	58	M6	90.800.227.1
4C	41,0	63,5	84	20,0	43,0	14,8	36	40	75	37,5	6	36,0	M12	58	M8	58	M6	90.800.234.1
5C	63,5	76,2	109	25,0	51,0	25,3	36	60	120	55,0	6	57,3	M20	94	M10	94	M8	90.800.241.1
6C	76,2	89,0	118	25,0	57,0	24,7	37	60	120	74,5	6	71,1	M20	94	M10	94	M8	90.800.248.1
7C	89,0	130,0	133	30,0	63,5	25,2	47	100	180	86,5	6	84,1	M24	150	M12	150	M10	90.800.253.1
8C	130,0	178,0	153	30,0	79,5	24,6	22	100	180	124,5	6	123,0	M36	150	M12	150	M10	90.800.259.1

For maximum effciency expansion sleeves must be preload to maintain contact with mandrel double angles at all times.

Spigot drawbar operated (standard length)

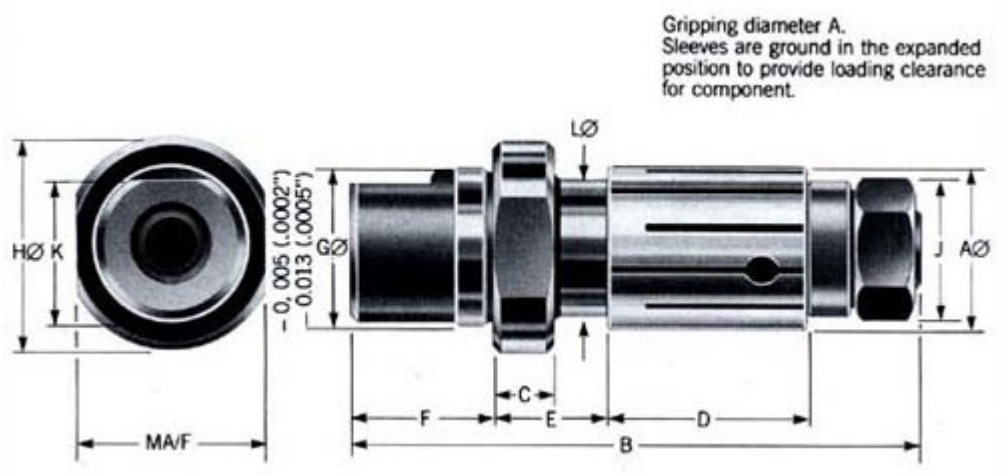


The spigot drawbar operated expanding mandrel can be used on any machine with drawbar facilities for general turning and grinding operations. Adaptors plates made to suit machine mounting, can be manufactured by BIRLA PRECISION TECH or customer. Component end locators, solid type or compensating (for out-of-square locating faces) can be supplied or manufactured by customer. The natural pull-back action of the sleeve ensures the component is hard against the location face. There is an over-expansion stop built into the expander pin to avoid over-stressing the expanding sleeve.

Model	A		B	C	D	E	F	G	H	J	K	L	M	Tool Nr
	Min	Max												
3A	12,5	16,0	66	11,0	22	9,8	20	20	26	11,0	14	9,5	M4	90.810.210.1
2C	16,0	22,0	70	11,0	27	8,0	20	20	26	15,0	18	14,1	M8	90.810.215.1
1C	22,0	28,5	85	11,0	32	10,0	27	30	40	20,0	17	20,7	M8	90.820.221.1
18C	28,5	41,0	92	11,0	38	10,5	27	30	40	26,3	18	26,3	M10	90.820.227.1
4C	41,0	63,5	99	13,0	43	9,5	27	30	50	37,0	21	37,0	M12	90.820.234.1

For maximum effciency expansion sleeves must be preload to maintain contact with mandrel double angles at all times.

Between centres (standard length)

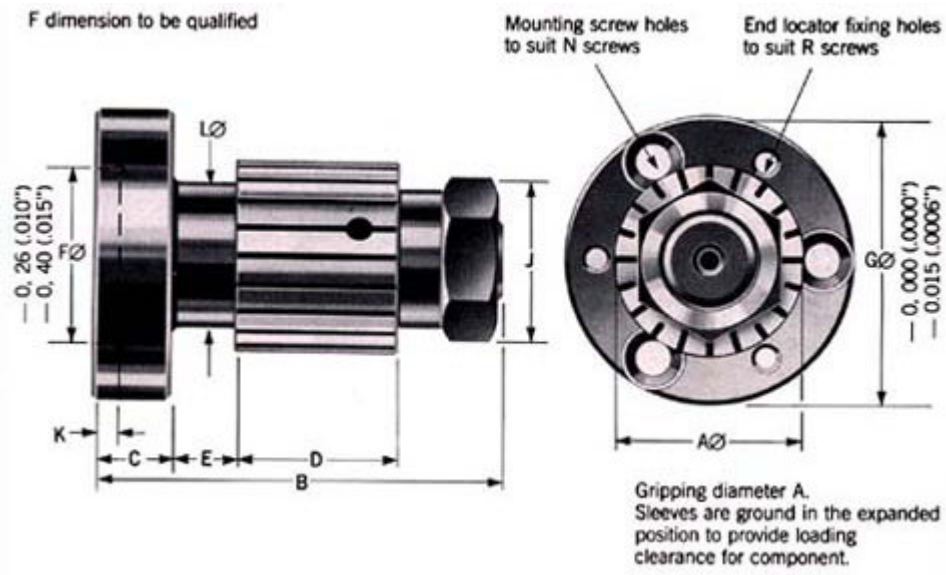


The thread operated between centres expanding madrel is generally used mounted betwen 60 degree centres, and can be driven from drive flats witha carrier or drive plates. It is possible to attach a simple component end locator, if required, at diameter L. These Mandrels are generally used for small batch grinding operations. There is a ground diameter to adapt this mandrel to face plate mounted, if required, by use of an adaptor plate. These Mandrels are hand operated by use of conventional spanners. These mandrels are often used for inspection purposes.

Model	A		B	C	D	E	F	G	H	J A / F	K	L	M	Tool Nr
	Min	Max												
3A	12,5	16,0	77	11,0	22,0	21,0	20	20	26,0	10	18	9,5	22	90.811.110.1
2C	16,0	22,0	83	11,0	27,0	20,0	20	20	26,0	13	18	14,1	22	90.811.115.1
1C	22,0	28,0	99	11,0	32,0	21,5	27	30	40,0	19	27	20,7	36	90.821.121.1
18C	28,5	41,0	107	11,0	38,0	21,2	27	30	40,0	24	27	26,3	36	90.821.127.1
4C	41,0	63,5	120	13,0	43,0	23,0	27	30	50,0	36	27	37,0	46	90.821.134.1
5C	63,5	76,2	145	--	51,0	26,0	35	40	57,3	55	35	57,3	50	90.831.141.1
6C	76,2	89,0	155	--	57,0	26,3	35	50	71,1	65	45	71,1	60	90.841.148.1
7C	89,0	130,0	205	--	63,5	44,0	50	60	84,1	85ø	55	84,1	70	90.851.153.1
8C	130,0	178,0	235	--	79,5	55,5	50	80	123,0	124ø	73	123,1	105	90.861.159.1

For maximum effciency expansion sleeves must be preload to maintain contact with mandrel double angles at all times.

Modular Expanding Mandrels
Nut operated face-plate (standard length

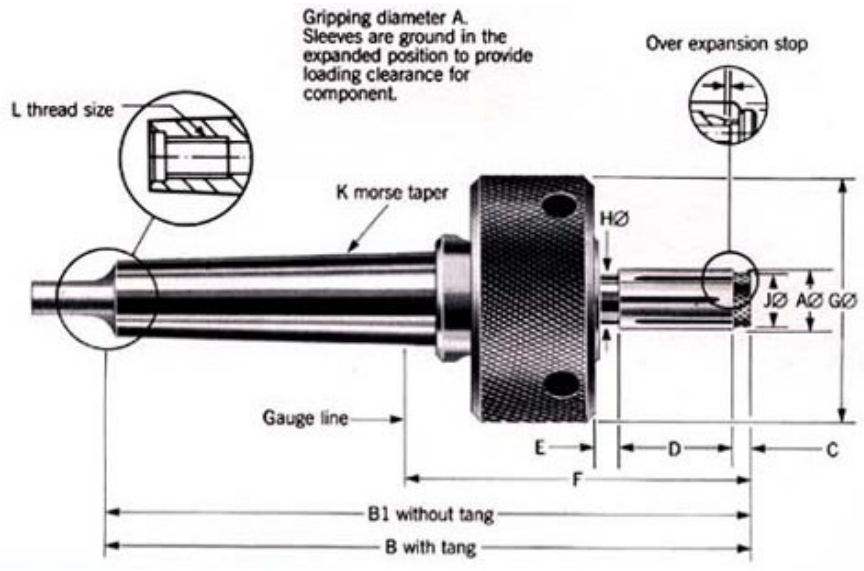


The faceplate thread operated expanding mandral can be used on any machine with no drawbar facility, for general turning and grinding operations. Adaptor plates can be made to suit the machine mounting if necessary. Component end locators, solid type or compensating (for out-of-square locating faces) can be supplied or manufactured by customer. The natural pull-back action of the sleeve ensures the component is hard against the location face.

Model	A		B	C	D	E	F	G	J	K	L	N		R		Too Nr
	Min	Max							A/F			DP	ø	DP	ø	
3A	12,5	16,0	73	20,0	22,0	15,0	40	75	10	6	12,6	58	M8	28	M4	90.800.110.1
2C	16,0	22,0	79	20,0	27,0	15,0	40	75	13	6	14,1	58	M8	28	M4	90.800.115.1
1C	22,0	28,5	86	20,0	32,0	15,5	40	75	19	6	20,7	58	M8	58	M6	90.800.121.1
18C	28,5	41,0	94	20,0	38,0	15,2	40	75	24	6	26,3	58	M8	58	M6	90.800.127.1
4C	41,0	63,5	105	20,0	43,0	15,0	40	75	36	6	37,0	58	M8	58	M6	90.800.134.1
5C	63,5	76,2	134	25,0	51,0	25,0	60	120	55	6	57,3	94	M10	94	M8	90.800.141.1
6C	76,2	89,0	144	25,0	57,0	25,0	60	120	65	6	71,1	94	M10	94	M8	90.800.148.1
7C	89,0	130,0	166	30,0	63,5	25,0	100	180	85ø	6	84,1	150	M12	150	M10	90.800.153.1
8C	130,0	178,0	185	30,0	79,5	25,0	100	180	124ø	6	123,0	150	M12	150	M10	90.800.159.1

For maximum effiiciency expansion sleeves must be preloaded to maintain contact with mandral double angles at all times

Cantilever operated (standard length)



The Cantilever model expanding mandrel is used on machines with morse taper machine mounting. These mandrels can be used for general turning or grinding operations. Particularly useful for blind bores. These Mandrels are hand operated by use of a 'C' spanner , and are suitable for small batch work. There is an over-expansion stop built into the expandar pin to avoid over-stressing the expanding sleeve.

Model	A		B	B1	C	D	E	F	G	H	J	K	L	* Tool Nr	# Tool Nr
	Min	Max													
3A	12,5	16,0	141,0	127,0	3,2	22,0	4,0	66,0	48	9,5	11	2	M10	90.592.510.1	90.582.510.1
2C	16,0	22,0	155,0	141,0	4,0	27,0	10,0	80,0	50	14,1	15	2	M10	90.592.515.1	90.582.515.1
1C	22,0	28,5	189,0	171,0	5,0	32,0	14,0	95,0	60	20,6	20	3	M10	90.593.521.1	90.583.521.1
18C	28,5	41,0	202,5	184,5	5,5	38,0	15,0	108,0	70	26,3	27	3	M12	90.593.527.1	90.583.527.1
4C	41,0	63,5	246,5	224,5	6,0	43,0	25,5	129,0	90	37,0	37	4	M16	90.594.534.1	90.584.534.1
5C	63,5	76,2	260,0	238,0	8,0	51,0	24,5	142,5	100	57,3	55	4	M16	90.594.541.1	90.584.541.1
6C	76,2	89,0	320,0	292,0	11,0	57,0	23,5	170,5	110	71,1	75	5	M20	90.595.548.1	90.585.548.1
7C	89,0	130,0	323,0	295,0	14,0	63,5	27,0	173,5	130	84,1	86	5	M20	90.595.553.1	90.585.553.1

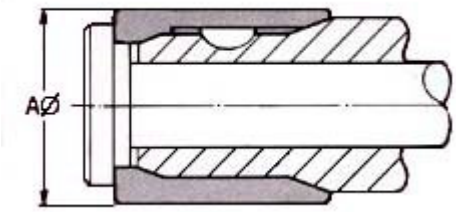
For maximum efficiency expansion sleeves must be prepoaded to maintain contact with mandral double angles at all times.

**** Can be supplied with or without tang***

 # If without tang will be drawbar held

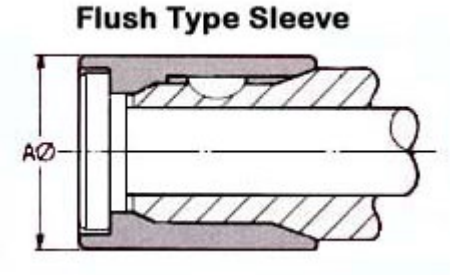
Standard length sleeve specification

Standard Type Sleeve



Model	A		Length	Tool Nr
	Min	Max		
3A1	12,5	16,0	22,0	92.000.20.x.x.xxx
2C1	16,0	22,0	27,0	92.050.20.x.x.xxx
1C1	22,0	28,5	32,0	92.100.20.x.x.xxx
18C1	28,5	41,0	38,0	92.150.20.x.x.xxx
4C1	41,0	63,5	43,0	92.200.20.x.x.xxx
5C1	63,5	76,0	51,0	92.250.20.x.x.xxx
6C1	76,0	89,0	57,0	92.300.20.x.x.xxx
*7C1	89,0	130,0	63,5	92.350.20.x.x.xxx
*8C1	130,0	178,0	80,0	92.400.20.x.x.xxx

Flush Type Sleeve



Model	A		Length	Tool Nr
	Min	Max		
3A2	16,5	22,0	26,0	92.001.20.x.x.xxx
2C2	22,0	28,5	32,0	92.051.20.x.x.xxx
1C2	28,5	40,0	38,0	92.101.20.x.x.xxx
18C2	40,0	51,0	45,0	92.151.20.x.x.xxx
4C2	51,0	73,0	50,0	92.201.20.x.x.xxx
5C5	73,0	89,0	60,0	92.251.20.x.x.xxx
6C2	89,0	102,0	69,5	92.301.20.x.x.xxx
*7C2	101,0	143,0	78,5	92.351.20.x.x.xxx
*8C2	143,0	178,0	99,5	92.401.20.x.x.xxx

* These itmes will be stocked as turned blanks only, and will therfore require an extended delivery.

x . x . xxx = Sleeve Dia in mm, i.e. 123.26mm=1.2.326, i.e. 30mm = 0.3.000

These sleeves can be used with all types of mandrel, and are interchangeble within the range of each type. Example: The 3A drawbar operated mandrel will accept a 3A1 or 3A2 sleeve which may have been originally used on a 3A thread operated mandrel.

Order Information

To enable BIRLA PRECISION TECH to provide a prompt service, we would recommend customer's orders should specify the type and model number of the Mandrel. Additionally, when ordring sleeves, the type and model number, with the component diameter to be held. All sleeve orders must specify type, model number. The component bore and tolerance to be gripped. All sleeves will be held in stock in a semi-finished condition ready for qualification to customers required gripping diameter.

Example : 1off face plate expanding mandrel, Type 18C. Tool No. 90.800.227.1
1off standard sleeve, Type 18C1 to grip 38.1mm dia. bore Tool No 92.150.200.3.810

Instructions for Grinding Sleeves to Size

When Sleeves are purchased, unqualified by BIRLA PRECISION TECH, they must be ground to size, preferably on a Birla Precision Tech between centres mandrel. If a between centres mandrel is not available, the sleeves may be ground on the mandrel on which they are to be used.

Between centres type : Mount between centres on grinding machines.

Face plate drawbar operated type : Make slave nut for drawbar to expand sleeve. Mount on face plate or in a jaw chuck

Cantilever type : Mount in grinding machine with morse taper bore.

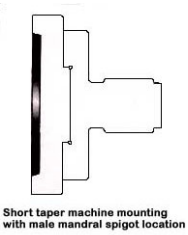
1. Ensure mandrel and sleeve double angles are clean and free of any burrs.
2. Check size of sleeve in relaxed condition.
3. Expand sleeve as per schedule.
4. Rough grind outside diameter to size required plus 0,07/0,10mm (.003/.004"). Note that grinding should be done carefully to avoid distortion at this stage.
5. Remove sleeve and clean throughly. Outside diameter should be 0,025/0,050mm (.001/.002") below required size.
6. Reload sleeve on mandrel and expand to (Stage4) size it was rough ground.
7. Check concentricity (to make sure no distortion has taken place.)
8. Finish grind outside diameter to required size.
9. Check final size and concentricity.

Recommended expanded positions

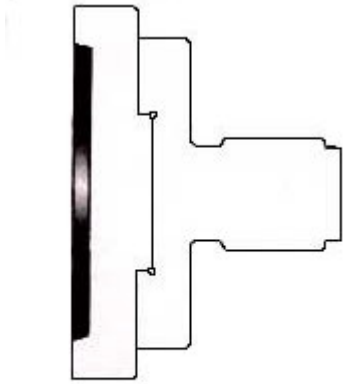
Sleeve Range	Expanded Position
3A	0,13mm (.005")
2A	0,13mm (.005")
1C	0,13mm (.005")
18C	0,13mm (.005")
4C	0,26mm (.010")
5C	0,26mm (.010")
6C	0,26mm (.010")
7C	0,39mm (.015")
8C	0,39mm (.015")

End locators and adaptors plates

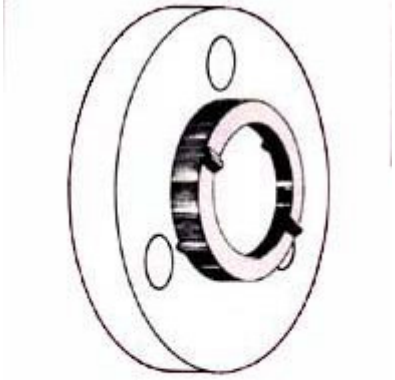
The examples shown below cover the three basic designs of end locators and adaptors plates. These are generally designed to customer requirements. Therefore they can be suplied by BIRLA PRECISION TECH manufactured by the customer. These designs can be adapted for use on various types of mandrels.



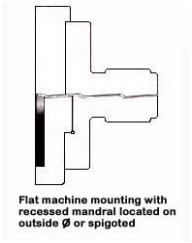
Short taper machine mounting with male mandral spigot location



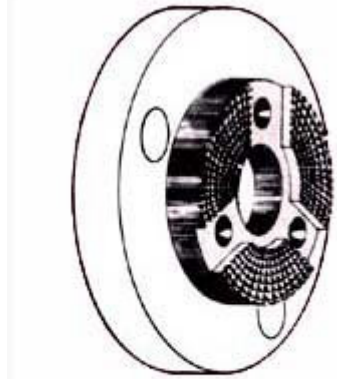
Short taper machine mounting with male mandral spigot location



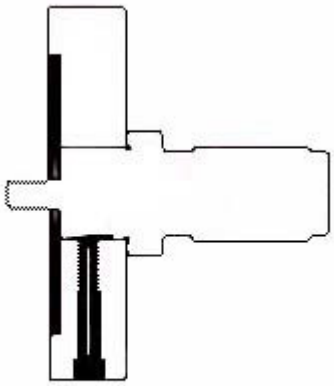
Compensating component end locator used when end face is not necessary square with bore



Flat machine mounting with recessed mandral located on outside Ø or spigoted



Serrated component end locator to give added driving power



Spigot mounted mandral with male spigot location

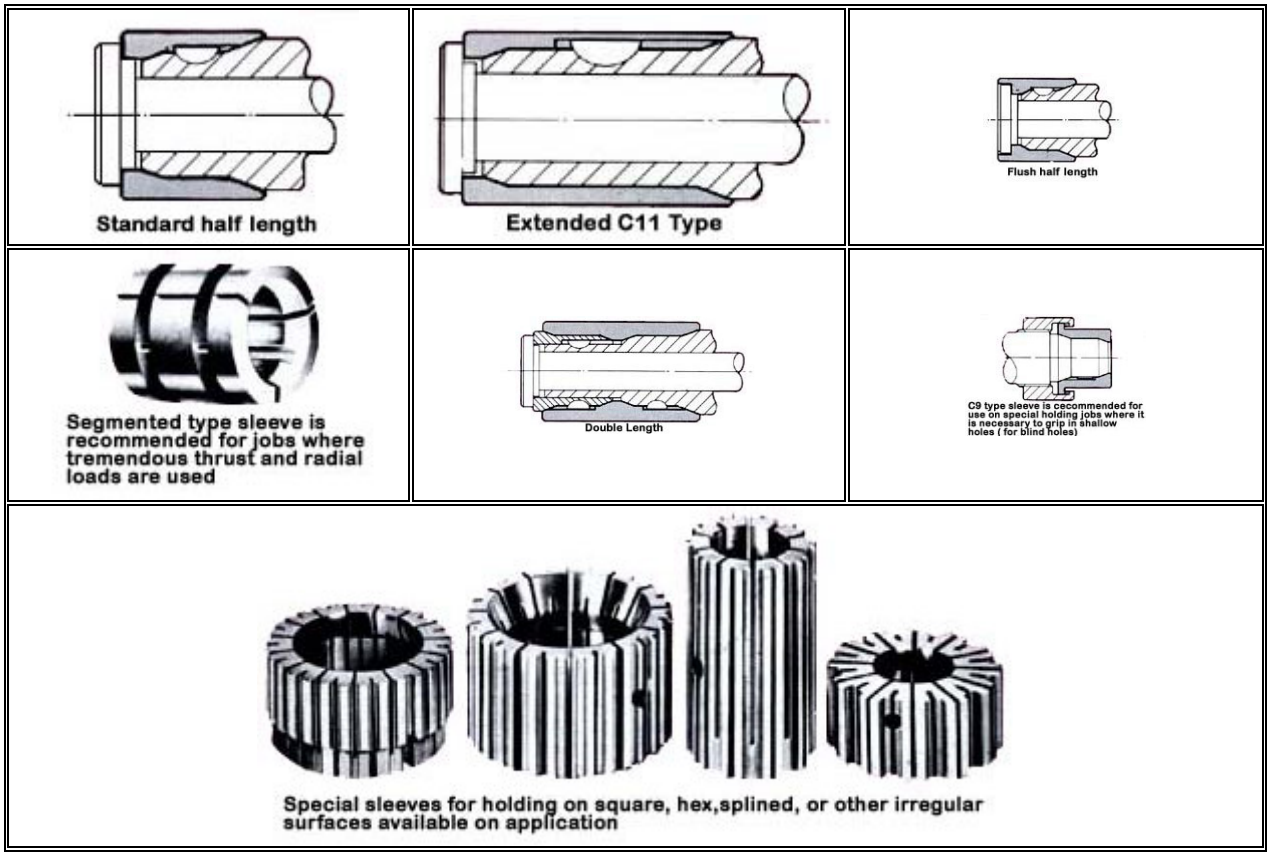
Special Sleeves

BIRLA PRECISION TECH are available in a comprehensive range of special sleeves that have been developed to accommodate the varying conditions and the more difficult work holding problems modern industry is faced with. This range includes:-

- Flush types in all lengths.
- Half length types.
- Double length types.
- Segmented types for large expansion and excessive driving requirements.
- Serrated types for spline location and holding on internal gear forms (either minor or
- pitch line diameter location)and types for holding on irregular forms.
- Types to give expansion up to 6.3mm (1/4") on diameter for large diameter components.

Certain applications demand that the unit to be supplied must be capable of transmitting high torque to resist heavy cutting forces. In these instances we supply segmented type sleeves which take the form of solid segments held together with spring steel retainer rings. Each segment is located on the mandrel body by location keys to determine the radial position of each segment.This style of sleeve provides an item which has increased hardness to prevent wear and less ability to fracture in the event of a machine malfunction.

All sleeves, other than segmented types, can be supplied with the slots bonded with Ericplast as specials. This is recommended to swarf away from double angle from to prolong life and accuracy.



Special Applications

Engineering Service : Whilst most holding operations can be successfully obtained by using the modular system and good tool design following the basic instructions, BIRLA PRECISION TECH offer to you the engineering 'know-how' that has solved thousands of workholding porblems world-wide by our collaborator Kennametal Erickson.

Special mandrel Applications : BIRLA PRECISION TECH have, at your disposal, an experienced engineering team, who, over the years, have solved many thousands of workholding problems.

The very problem you face may have been solved by us for some other manufacturer. With some basic details supplied as below, BIRLA PRECISION TECH would be able to establish your requirement and promptly offer a recommendation and quotation.

The Details are:-

1. Full component details.
2. Previous machine operations.
3. Machining operation required.
4. Stock removal.
5. Feeds and speeds.
6. Type of machine.
7. Machine mounting details.
8. Quantity required.