



Patented AirShield™ Technology

ProMetrix™ Belt Driven Spindles

- *Custom Spindle Designs & Accessories*
- *Block, Cartridge & Cluster Configurations*

SETCO™

ProMetrix™ Belt-Driven Spindles

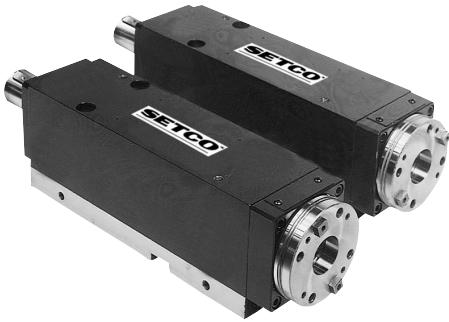
Rapid Market Response

- Many components are pre-machined and stocked to provide quick delivery.
- Proven and pre-engineered spindle designs take the guess work out of your spindle selection process.
- ProMetrix's computer-directed design process allows for rapid prototyping and eliminates the need to check and recheck drawings.

The ProMetrix™ Design System Addresses Your Customized Spindle Needs

With the proprietary design system developed for **ProMetrix**, you get a spindle customized to your requirements with a delivery time that meets your requirements.

To create your customized ProMetrix spindle, you specify key parameters: housing width and length, nose extension, spindle nose configuration and mounting bolt pattern are examples of key parameters. A SETCO engineer enters your parameters into the **ProMetrix** design system. The program then modifies the spindle to your exact specifications and generates several hundred other parameters to define the spindle geometry. CAD drawings can be e-mailed to you for review and approval.



Technical Assistance

This catalog contains reference information including charts, dimensional drawings and design data to assist you in selecting the spindle that meets your exact needs. A certified outline drawing is supplied with each order. If you need more information or would like assistance with an application challenge, contact SETCO's Design Team at **1-800-543-0470**.

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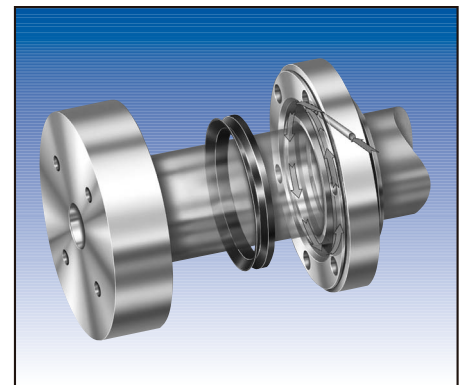
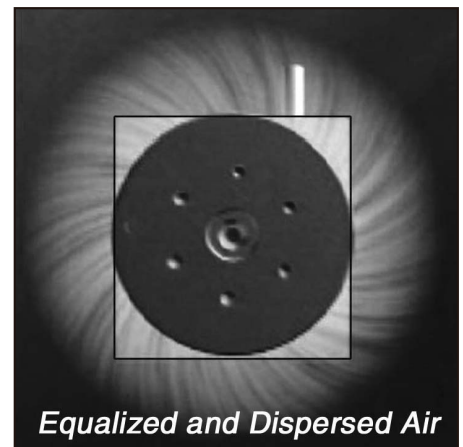
Patented AirShield™ Technology

Most Reliable Spindle Seal in the Industry

With over 2,000 AirShield-equipped spindles in the field, over 5 years of runtime **without a failure**, the SETCO AirShield sealing system is the most reliable spindle seal in the industry!

As standard, an AirShield-equipped SETCO spindle delivers:

- 3-year limited warranty on standard speed spindles
- Increased Spindle reliability
- Reduced Maintenance
- Increased runtime
- Increased production
- Protection from coolant ingress in dynamic and static modes
- Corrosion-resistant design



ProMetrix

Metric, Belt-driven spindles for:

- Drilling • Boring
- Milling • Turning
- Grinding • Assembly
- Balancing • Winding
- Other non-machining applications

For processing:

- Metal • Composite
- Glass • Wood
- Process Equipment

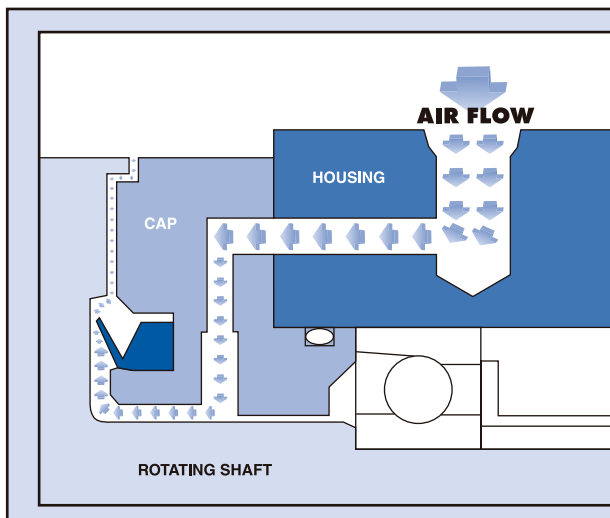
For a range of industries, including:

- Aerospace • Automotive
- Medical • Research
- Communication

Eliminates #1 Cause of Spindle Failures:

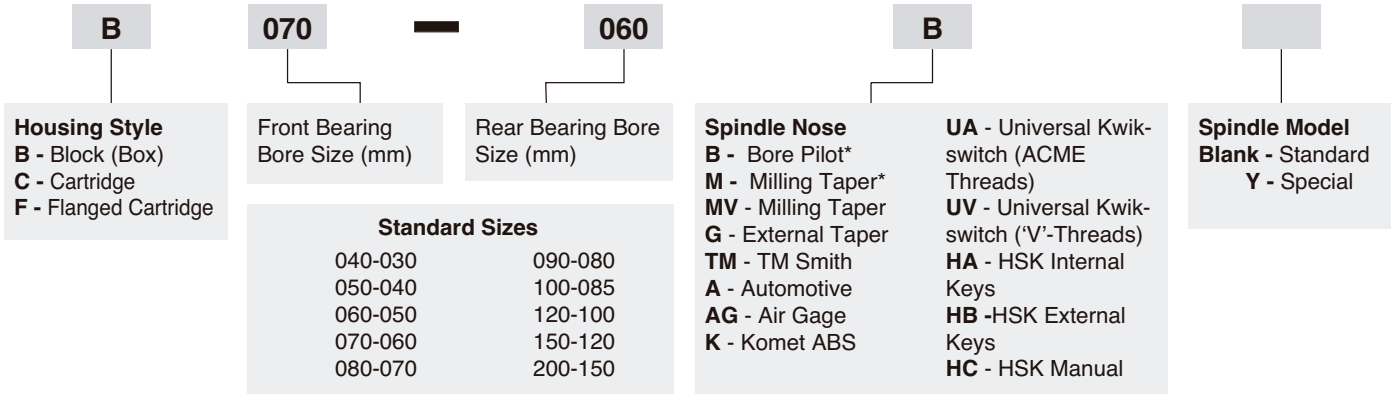
Bearing Failure, due to:

- Coolant
- Condensation
- Contamination
- Chip Damage



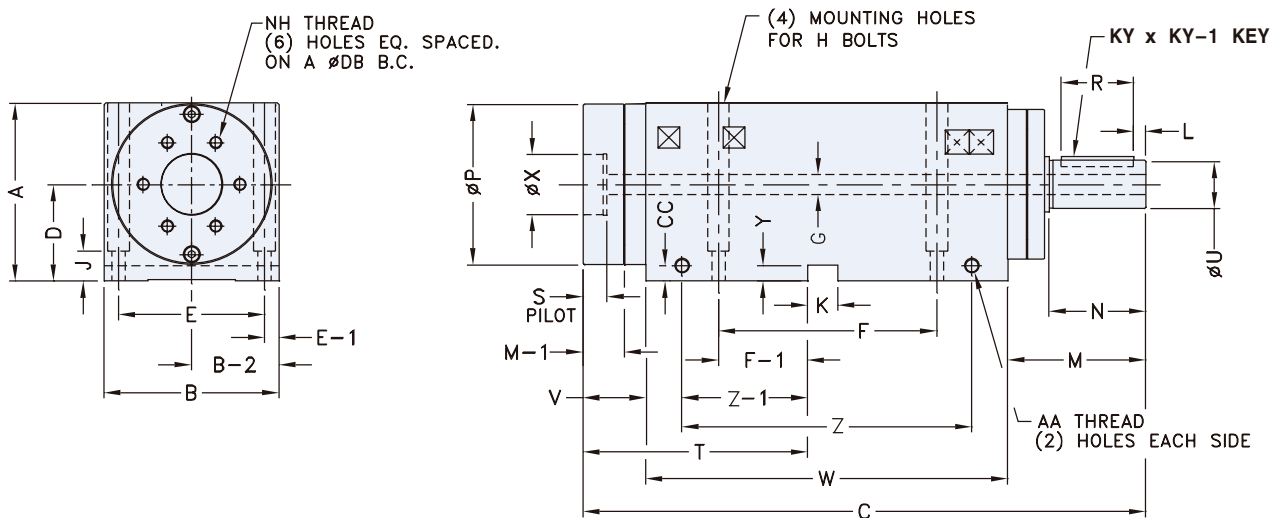
- ✓ **100% elimination of front & rear bearing contamination!**
- ✓ **Reduces manufacturing costs by reducing spindle maintenance!**
- ✓ **Increases machine uptime!**
- ✓ **Standard on SETCO Sentry™, ProMetrix™ and selected Motorized spindles!**

Spindle Designation

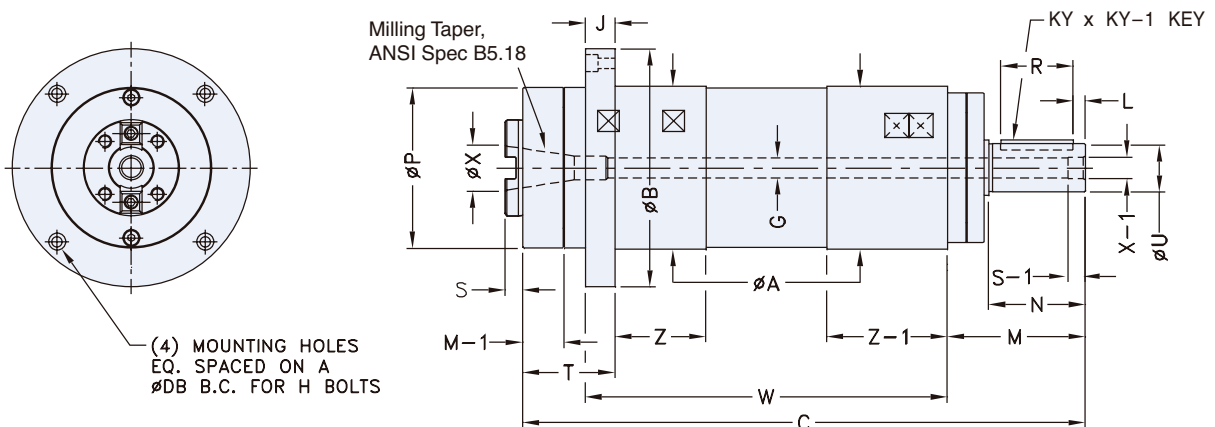


***Note:** These nose styles are standard for the cartridge, flanged cartridge and block housings; see page 20-24 for alternate nose styles.

Block Style (Parameter Designations)



Flanged Cartridge Style (Parameter Designations)



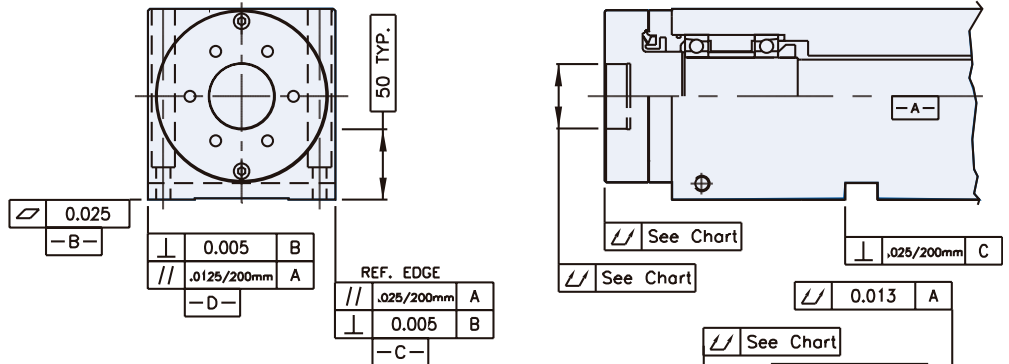
***Note:** Cartridge housing style identical to flanged cartridge less the mounting flange.

Standard Features

The **ProMetric** spindle has the following standard features:

1. Permanently grease lubricated heavy duty anti-friction angular contact ABEC-7 extra precision steel ball bearings.
2. **SETCO AirShield** front and rear.
3. Capable of reversible rotation.
4. Designed for horizontal, vertical and angular mounting attitudes.
5. Keyway or mounting flange held to $\pm .050$ mm in relation to the nose.
6. Pulley shaft comes with single key to accommodate various pulley styles.
7. Both sides of housing machined parallel with spindle centerline (block type).
8. Jackscrew holes in both sides of the block housing.
9. All manufactured components made from high alloy hardstock carbon steel.
10. The housings are G2 Grey Iron that are stress relieved and normalized.
11. Vibration transducer mounting locations (block type).
12. Vibration displacement 1.0 micron Pk-Pk Max.
13. Each spindle is registered with the SETCO exclusive Gold Line TCT certificate verifying tested performance.
14. Two standard nose configurations: flange diameter with internal pilot and mounting hole pattern or an ANSI standard taper.

Standard Precision 'Run-Outs'

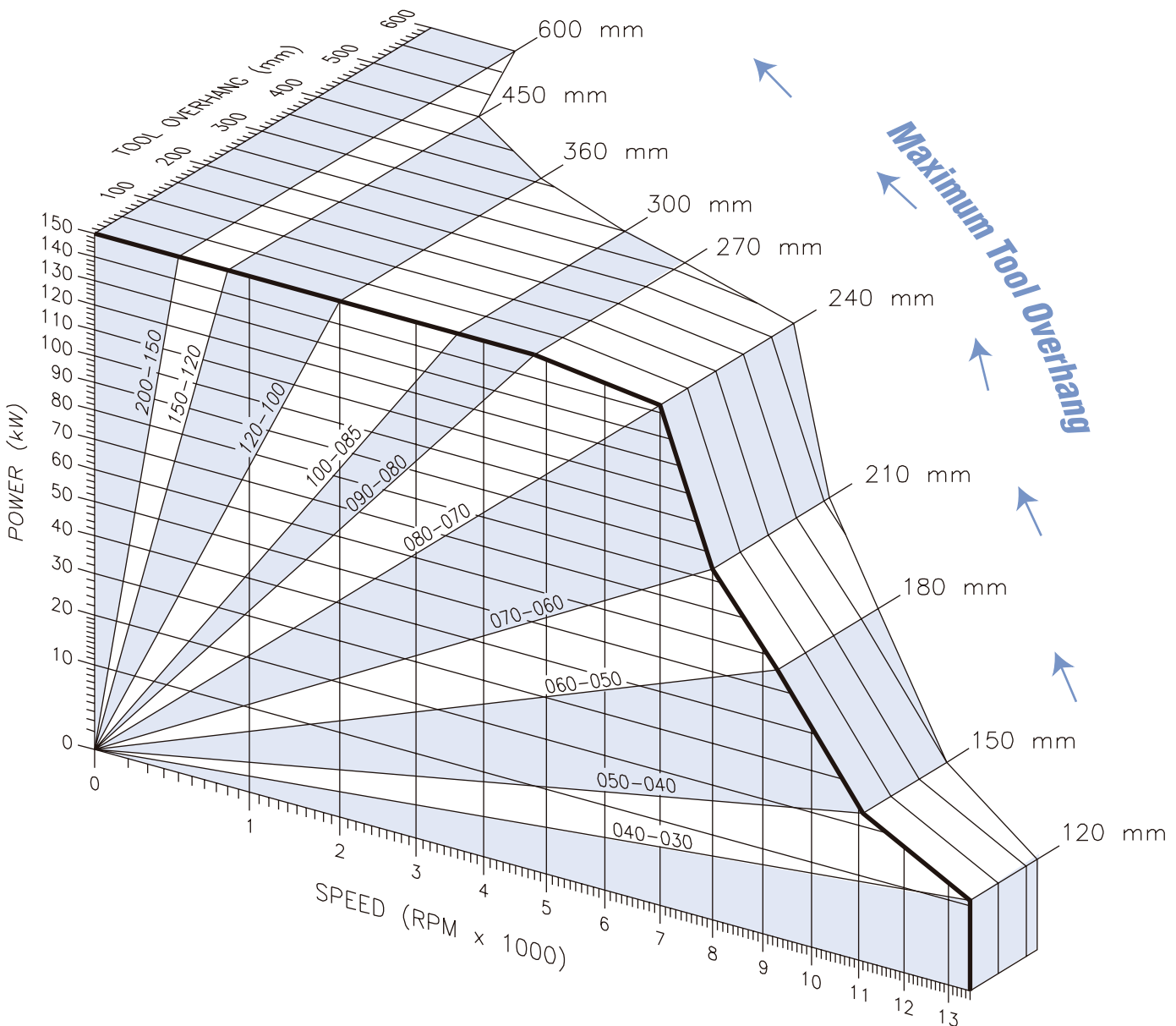


Spindle Size	RUNOUT TOLERANCES					
	BORE PILOT		MILLING TAPER			Cartridge Housing Mounting Face
	Pilot Diameter	Spindle Mounting Face	Internal Taper	Pilot Diameter	Spindle Mounting Face	
040-030	.0025	.0025	.0025	.0050	.0050	.0127
050-040	.0025	.0025	.0025	.0050	.0050	.0127
060-050	.0025	.0025	.0025	.0050	.0050	.0127
070-060	.0025	.0025	.0025	.0050	.0050	.0127
080-070	.0050	.0050	.0050	.0075	.0075	.0127
090-080	.0050	.0050	.0050	.0075	.0075	.0127
100-085	.0050	.0050	.0075	.0101	.0101	.0127
120-100	.0050	.0050	.0075	.0101	.0101	.0254
150-120	.0101	.0101	.0075	.0101	.0101	.0254
200-150	.0101	.0101	.0075	.0101	.0101	.0254

Spindle Size Selection Chart

Selection Procedure:

1. If not known, determine power and speed requirements from the Design Data section, pages 29-31.
2. Locate the speed (RPM) on the chart and follow this line until it intersects the power (kW).
3. Continue up until it crosses the spindle size line. This is the minimum spindle size recommended for the power and speed requirements.
4. Verify tool overhang, measured from spindle nose, falls within the maximum for the selected spindle. If tool overhang exceeds the limit for the selected spindle, size spindle based on tool overhang.
5. Verify that spindle front bearing bore is as large or larger than the bore being machined.



Note: The maximum RPM noted is based upon grease lubrication and light preload bearings.

Spindle Size Selection Chart Examples

Chart Based on the Following ProMetrix Spindle Characteristics:

1. **ProMetrix** Standard Spindle Series
2. Tool overhang from spindle nose
3. Independent of housing type. Based on kW vs. RPM plus tool overhang.

Note: As a general rule the spindle nose bearing bore should be approximately as large or larger than the bore to be machined. If tool overhang is greater than the maximum allowed for a spindle size, go to the next largest spindle to accommodate tool overhang.

Example No. 1: Customer's boring operation (50.00mm bore) requires 22 kW at 5000 RPM with 125.0mm tool overhang.

Selection Procedure:

1. Locate 5000 RPM on the chart and follow this line until it intersects 22kW (it is within the 060-050 Spindle Size).
2. Locate 125.0mm tool overhang on the chart and follow until it intersects the 060-050 Spindle line. This intersection falls within the 180mm tool overhang limitation of a 060-050 spindle.
3. Check to make sure the front bearing of the spindle is greater than or equal to the bore being machined (60mm > 50mm).
4. Therefore a 060-050 spindle is recommended for the customer's operation.

Example No. 2: Customer's end milling operation (50.0mm end mill diameter) requires 4 kW at 500 RPM with 100.0mm tool overhang.

Selection Procedure:

1. Locate 500 RPM on the chart and follow this line until it intersects 4kW (it is within the 070-060 Spindle Size).
2. Locate 100.0mm tool overhang on the chart and follow until it intersects the 070-060 Spindle line. This intersection falls within the tool overhang limitation of a 070-060 spindle.
3. Tool overhang is not applicable for traditional milling operations.
4. Therefore a 070-060 spindle is recommended for the customer's operation.

Example No. 3: Customer's grinding operation (200.0mm grinding wheel) requires 3 kW at 3000 RPM.

1. Convert 3000 RPM with a 200mm grinding wheel to meters per minute (m/min).
2. Check that grinding operations m/min is within the grinding wheels m/min specifications.
3. Locate 3000 RPM on the chart and follow this line until it intersects 3kW (it is within the 050-040 Spindle Size).
4. Tool overhang is not applicable for traditional grinding operations.
5. Therefore a 050-040 spindle is recommended for the customer's operation.

ProMetrix Belt Driven

The **ProMetrix** Standard Spindle is offered in three (3) types of housings; block style, cartridge and flanged cartridge. The standard tool interface is either a flanged nose with precision pilot diameter and standard mounting holes, or an ANSI standard milling taper.

See pages 20-24 for alternate nose designs.

The **ProMetrix** Standard Spindle consists of 10 basic sizes. The standard bearing construction makes them ideal for radial and axial thrust loads associated with single and multiple point boring tools, milling cutters, and grinding wheels. Front bearing spacers are designed to add bearings for a triplex or quad set for heavy duty applications without additional machining of spindle housing or shaft, see Figure 1.



Standard Block Housings

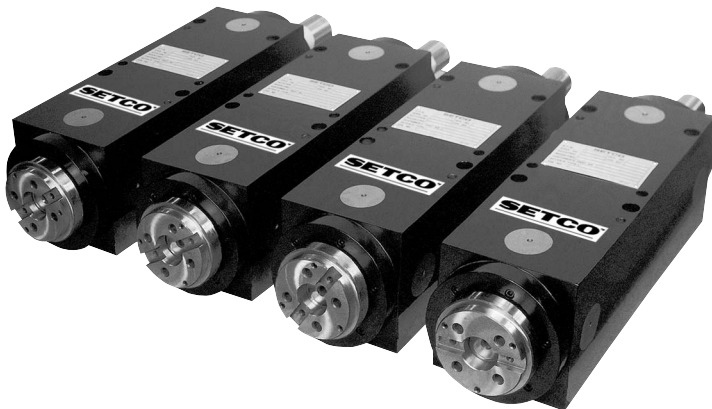
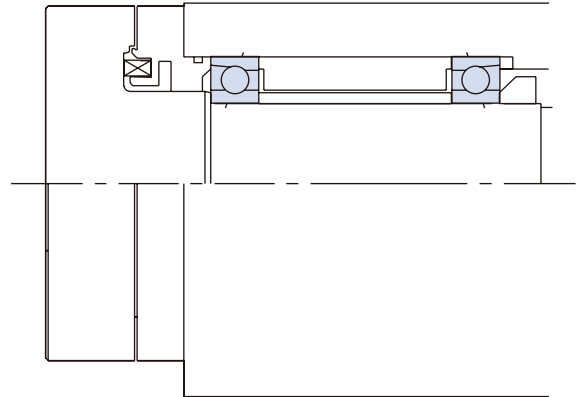
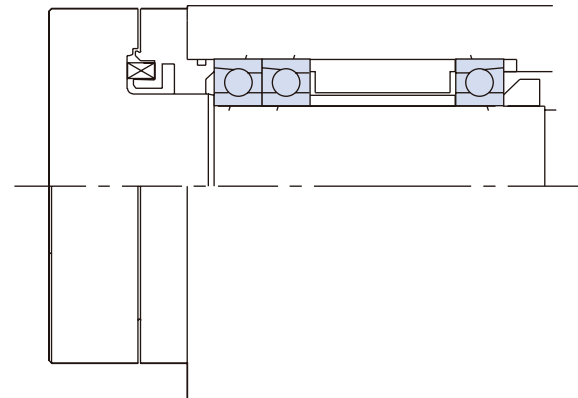


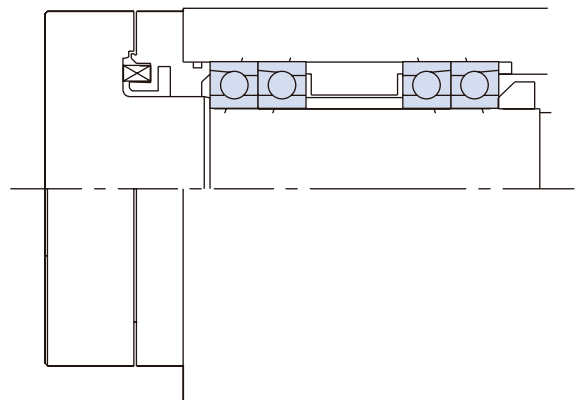
Figure 1



Duplex DB Mounting
Light to Moderate Combined Loading
High Rigidity

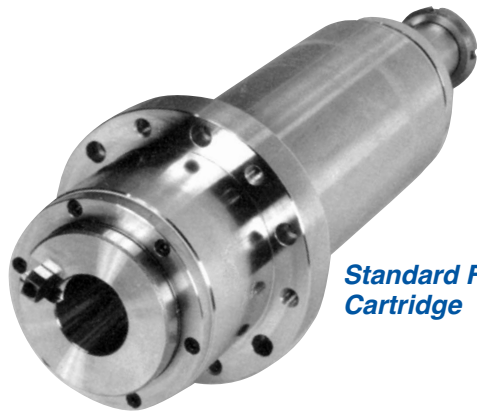


Triplex DT-DB Mounting
Moderate to Heavy Loading Thrust
Higher Rigidity



Quad 2DT-DB Mounting
Moderate to Heavy Combined Loading
Highest Rigidity

Standard and Custom Spindle Styles



Standard Flanged Cartridge

Flanged Cartridge Spindle

The **ProMetrix** Standard Spindle flanged cartridge style is designed identical to the block style except for the housing configuration, allowing exchangeability between parts to reduce delivery time and quantity of parts. Mounting flange to nose relationship makes it possible to group spindles in a single housing, pairs, or clusters for multi-task machining.



Custom Piggyback Block Style Housings—Top Is Belt Driven; Bottom is Motorized

Block Spindle

The **ProMetrix** Standard Spindle, block style has jack screw holes both sides and keyway in housing. Keyway to nose relationship is controlled, making it possible to group spindles in pairs or clusters for multi-task machining.



Custom Cluster Unit

Cluster Spindle

Custom engineered multi-center line, integral housing spindle for multi-task machining.



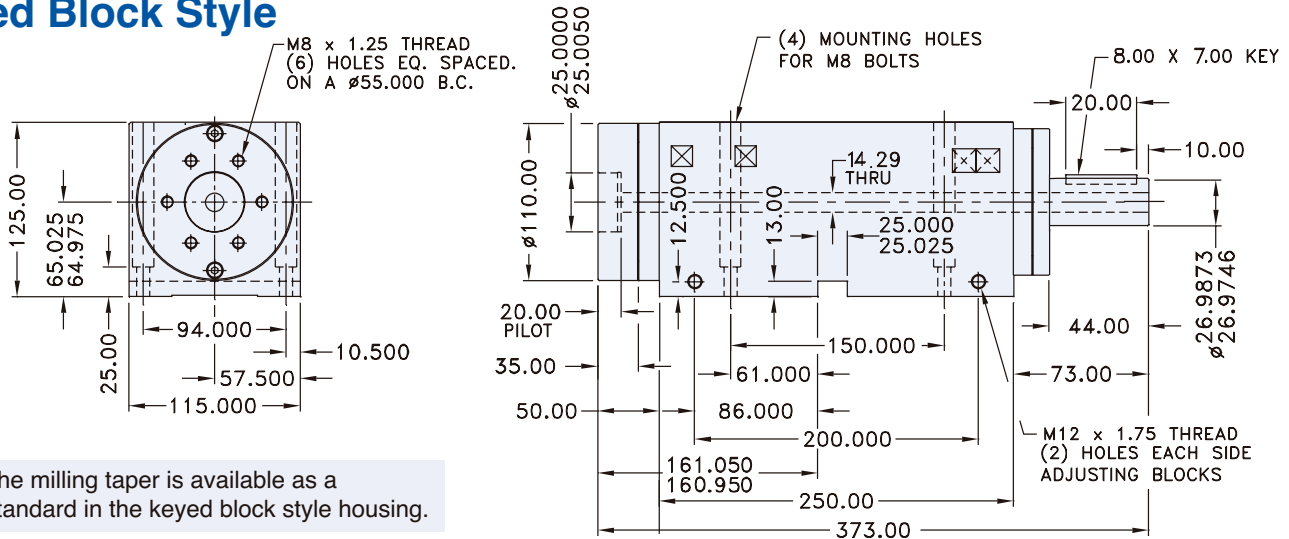
Custom Liquid Cooled Housing

Custom Flanged Cartridge Spindle

Custom engineered flanged cartridge spindles are available to meet customer's specific design requirements. From alternate spindle noses to arrangement of spindle housing for recirculating liquid cooling, SETCO can provide a spindle design to meet the application.

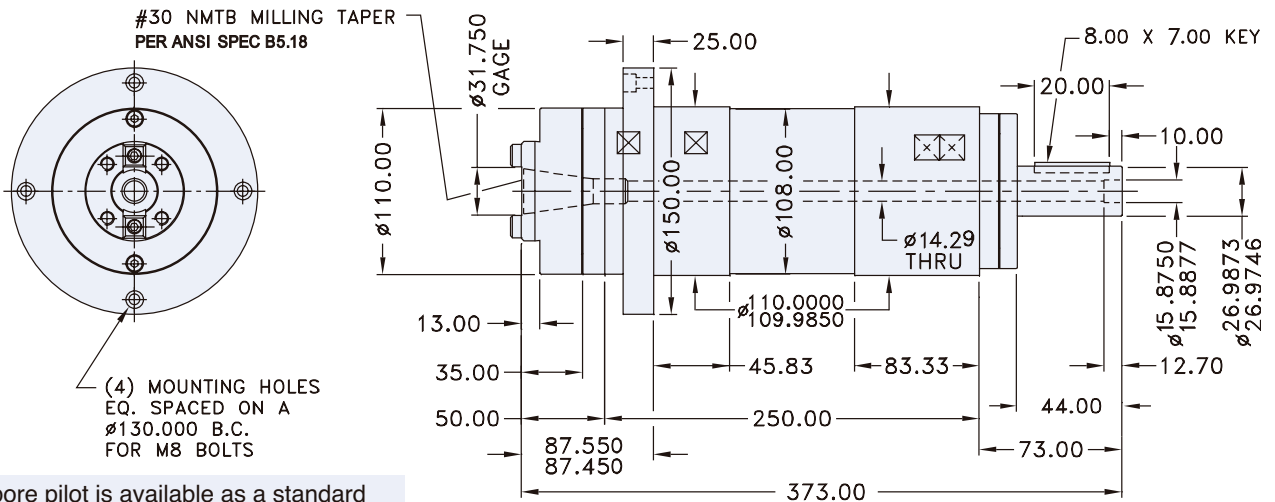
040-030 Belt Driven Spindle

B040-030B Keyed Block Style



Note: The milling taper is available as a standard in the keyed block style housing.

F040-030M Flanged Cartridge Style



Note: The bore pilot is available as a standard in the flanged cartridge style housing.

040-030 TECHNICAL DATA

Torque-MTDR	7.5 N-m	66 in-lbs
Torque-Max.	106.1 N-m	939 in-lbs
Power/Revolution-Max.	.0008 kW/rev	.0011 hp/rev
Spindle Weight-Max.	34 kg	75 lbs
Radial Runout-Max.	.0025 mm	.0001 in
Axial Runout-Max.	.0025 mm	.0001 in

RPM for Steel-Max.*	15,000
RPM for Hybrid-Max.*	19,500
Spindle Inertia-wk ²	5,100 kg-mm ²
Static Radial Stiffness	37 N/ μ m
Static Axial Stiffness**	45 N/ μ m
Seal Type	AirShield™

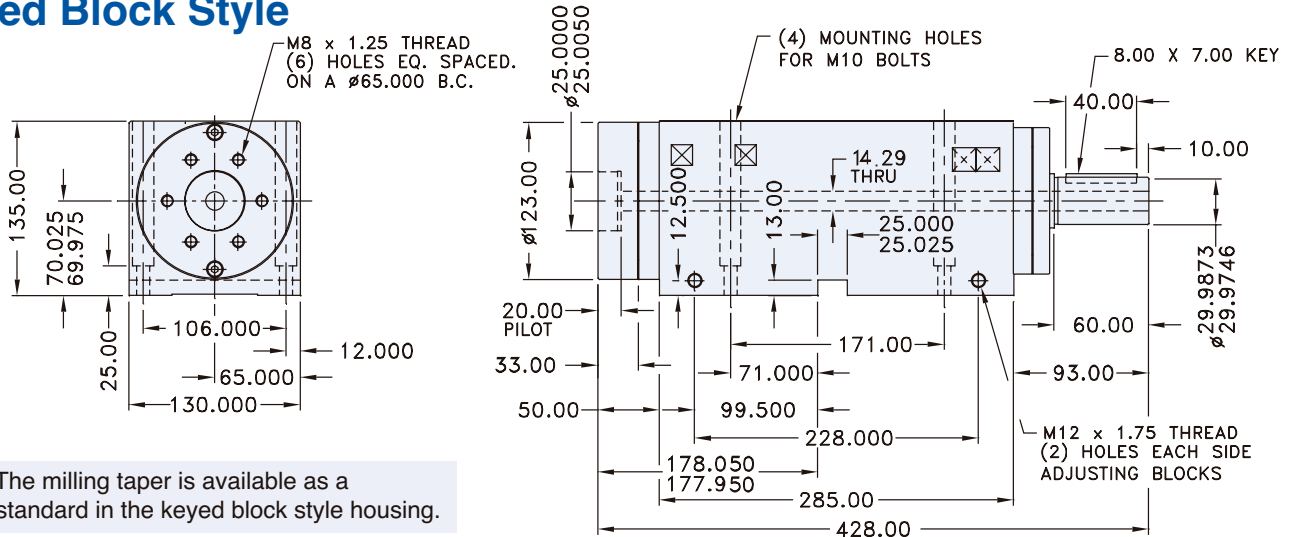
*All data is based upon light preload, duplex bearing setup.

**Spindle stiffness calculated using 445N radial load applied at the spindle nose.

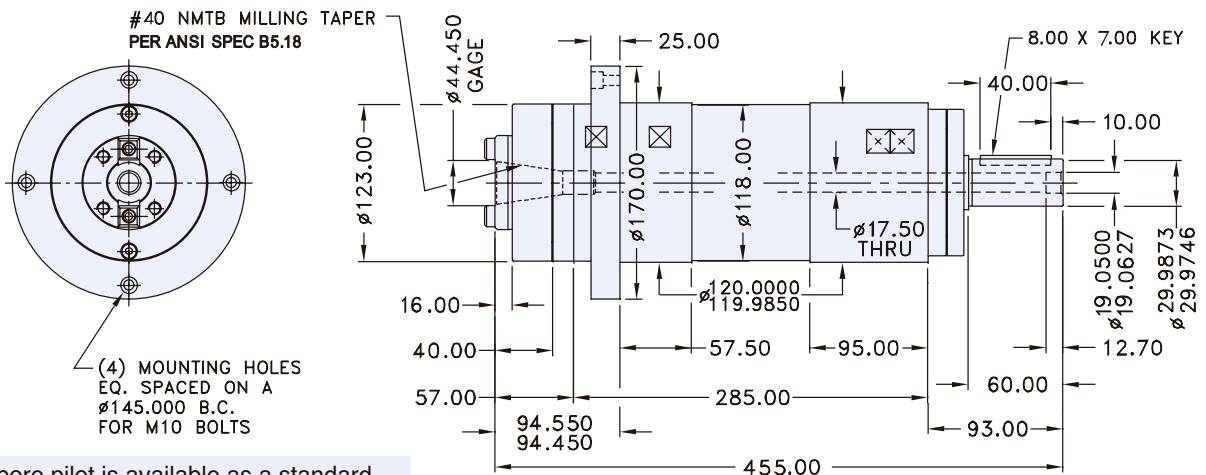
Please refer to the Design Data Section of this catalog for english and metric conversions, page 29.

050-040 Belt Driven Spindle

B050-040B Keyed Block Style



F050-040M Flanged Cartridge Style



050-040 TECHNICAL DATA

Torque-MTDR	20 N-m	177 in-lbs
Torque-Max.	145.6 N-m	1,289 in-lbs
Power/Revolution-Max.	.0021 kW/rev	.0028 hp/rev
Spindle Weight-Max.	45 kg	99 lbs
Radial Runout-Max.	.0025 mm	.0001 in
Axial Runout-Max.	.0025 mm	.0001 in

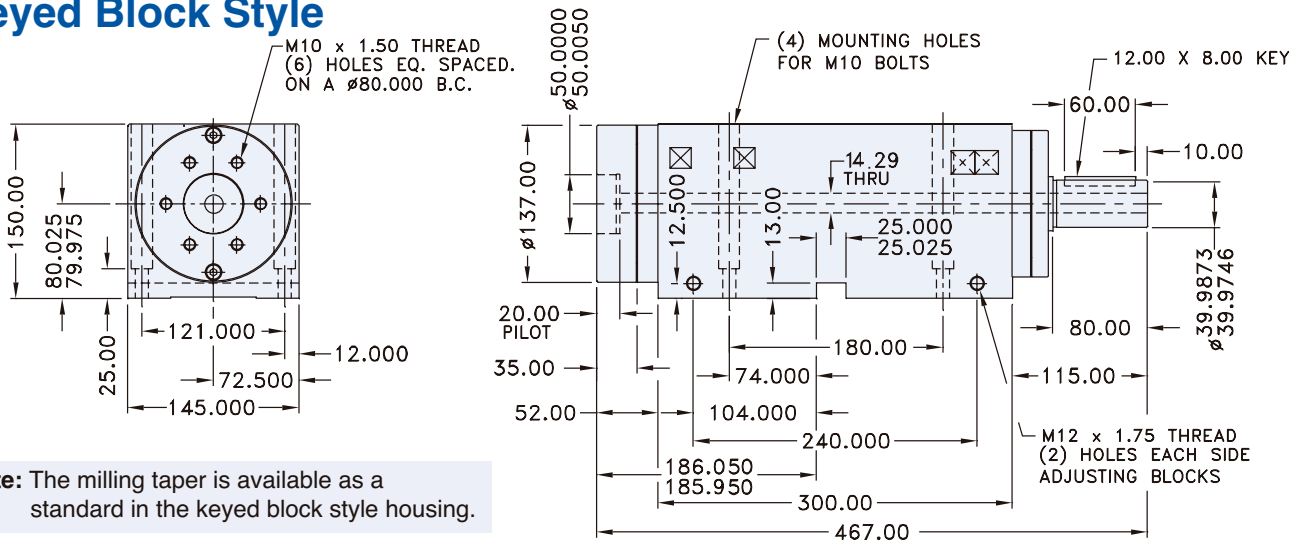
*All data is based upon light preload, duplex bearing setup.

RPM for Steel-Max.*	12,000
RPM for Hybrid-Max.*	16,500
Spindle Inertia-wk ²	8,500 kg-mm ²
Static Radial Stiffness	58 N/ μ m
Static Axial Stiffness**	56 N/ μ m
Seal Type	AirShield™

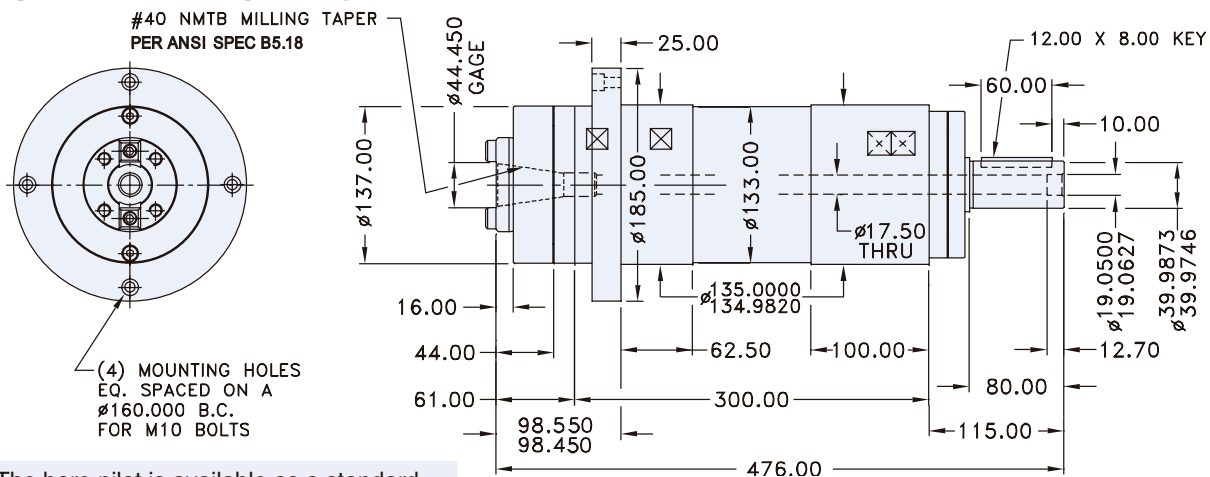
**Spindle stiffness calculated using 445N radial load applied at the spindle nose.

060-050 Belt Driven Spindle

B060-050B Keyed Block Style



F060-050M Flanged Cartridge Style



060-050 TECHNICAL DATA

Torque-MTDR	55 N-m	487 in-lbs
Torque-Max.	345.4 N-m	3,057 in-lbs
Power/Revolution-Max.	.0060 kW/rev	.0080 hp/rev
Spindle Weight-Max.	60 kg	132 lbs
Radial Runout-Max.	.0025 mm	.0001 in
Axial Runout-Max.	.0025 mm	.0001 in

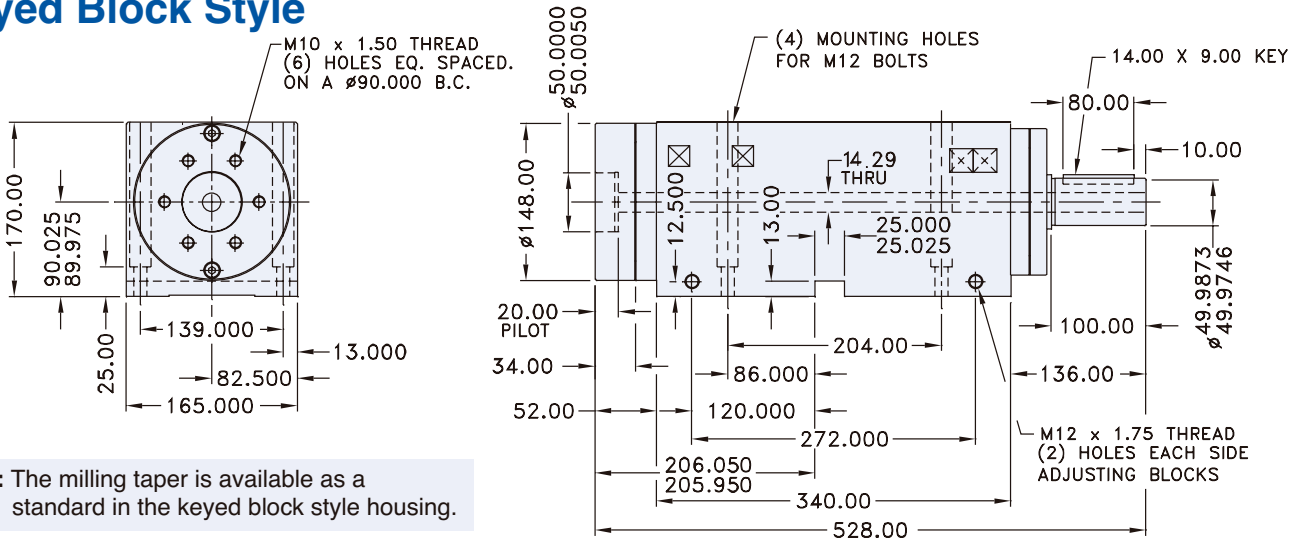
RPM for Steel-Max.*	10,000
RPM for Hybrid-Max.*	13,500
Spindle Inertia-wk ²	15,000 kg-mm ²
Static Radial Stiffness	84 N/ μ m
Static Axial Stiffness**	68 N/ μ m
Seal Type	AirShield™

*All data is based upon light preload, duplex bearing setup.

**Spindle stiffness calculated using 445N radial load applied at the spindle nose.

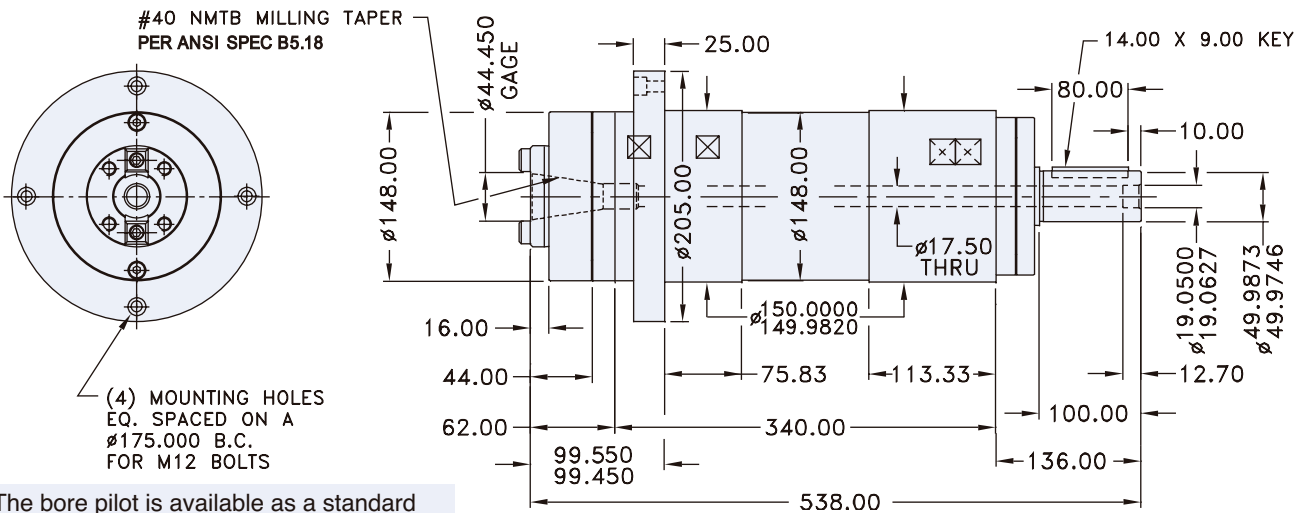
070-060 Belt Driven Spindle

B070-060B Keyed Block Style



Note: The milling taper is available as a standard in the keyed block style housing.

F070-060M Flanged Cartridge Style



Note: The bore pilot is available as a standard in the flanged cartridge style housing.

070-060 TECHNICAL DATA

Torque-MTDR	110 N-m	974 in-lbs
Torque-Max.	675 N-m	5,974 in-lbs
Power/Revolution-Max.	.0115 kW/rev	.0155 hp/rev
Spindle Weight-Max.	86 kg	190 lbs
Radial Runout-Max.	.0025 mm	.0001 in
Axial Runout-Max.	.0025 mm	.0001 in

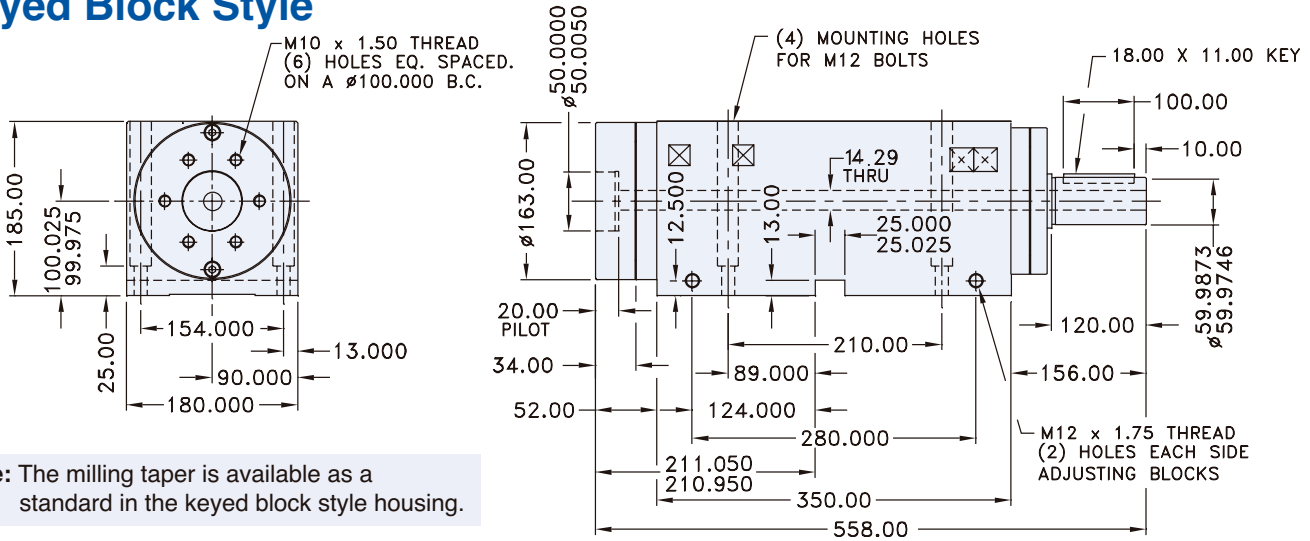
*All data is based upon light preload, duplex bearing setup.

RPM for Steel-Max.*	8,500
RPM for Hybrid-Max.*	12,000
Spindle Inertia-wk ²	25,000 kg-mm ²
Static Radial Stiffness	124 N/ μ m
Static Axial Stiffness**	84 N/ μ m
Seal Type	AirShield™

**Spindle stiffness calculated using 890N radial load applied at the spindle nose.

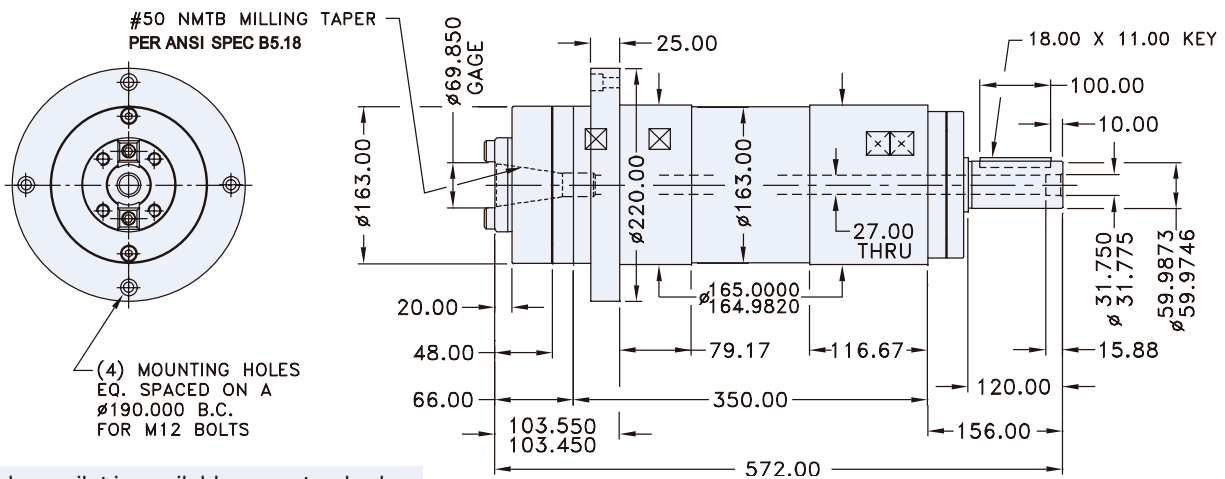
080-070 Belt Driven Spindle

B080-070B Keyed Block Style



Note: The milling taper is available as a standard in the keyed block style housing.

F080-070M Flanged Cartridge Style



Note: The bore pilot is available as a standard in the flanged cartridge style housing.

080-070 TECHNICAL DATA

Torque-MTDR	190 N-m	1,682 in-lbs
Torque-Max.	1166.6 N-m	10,325 in-lbs
Power/Revolution-Max.	.0204 kW/rev	.0274 hp/rev
Spindle Weight-Max.	104 kg	229 lbs
Radial Runout-Max.	.0050 mm	.0002 in
Axial Runout-Max.	.0050 mm	.0002 in

RPM for Steel-Max.*	7,500
RPM for Hybrid-Max.*	10,500
Spindle Inertia-wk ²	39,000 kg-mm ²
Static Radial Stiffness	153 N/ μ m
Static Axial Stiffness**	93 N/ μ m
Seal Type	AirShield™

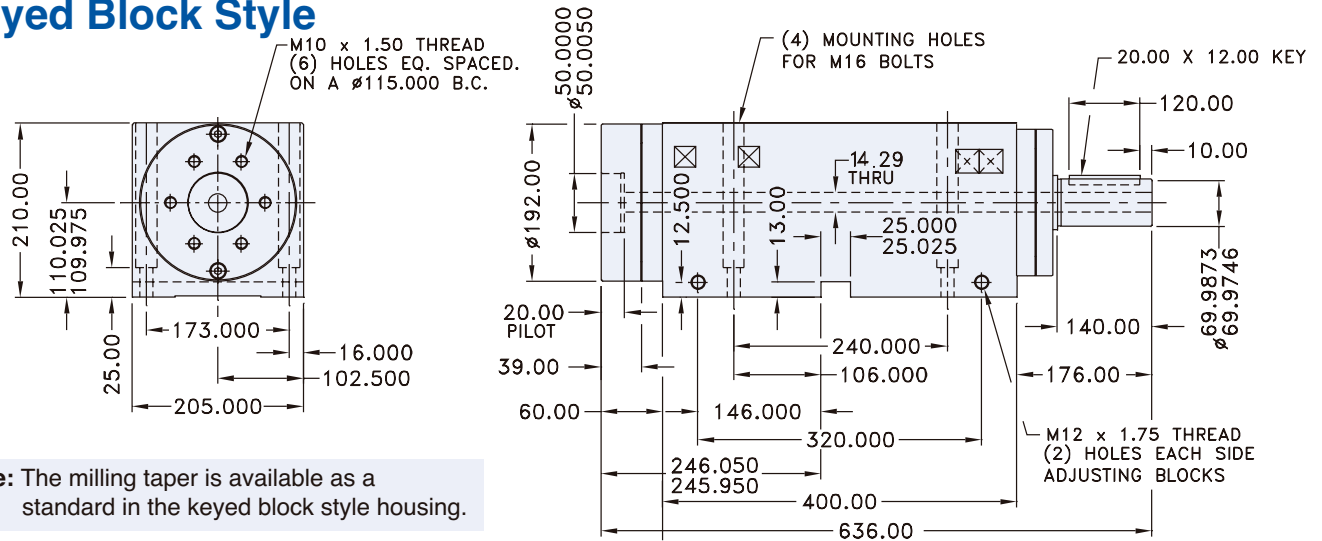
*All data is based upon light preload, duplex bearing setup.

**Spindle stiffness calculated using 890N radial load applied at the spindle nose.

Please refer to the Design Data Section of this catalog for english and metric conversions, page 29.

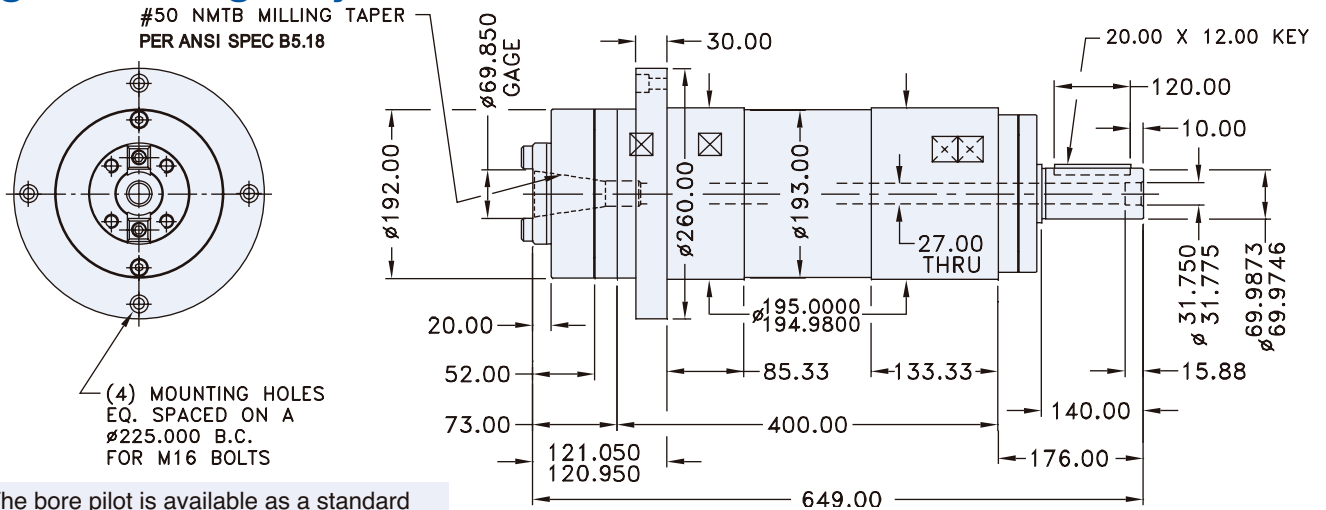
090-080 Belt Driven Spindle

B090-080B Keyed Block Style



Note: The milling taper is available as a standard in the keyed block style housing.

F090-080M Flanged Cartridge Style



Note: The bore pilot is available as a standard in the flanged cartridge style housing.

090-080 TECHNICAL DATA

Torque-MTDR	295 N-m	2,611 in-lbs
Torque-Max.	1852.8 N-m	16,399 in-lbs
Power/Revolution-Max.	.0309 kW/rev	.0414 hp/rev
Spindle Weight Max.	154 kg	340 lbs
Radial Runout-Max.	.0050 mm	.0002 in
Axial Runout-Max.	.0050 mm	.0002 in

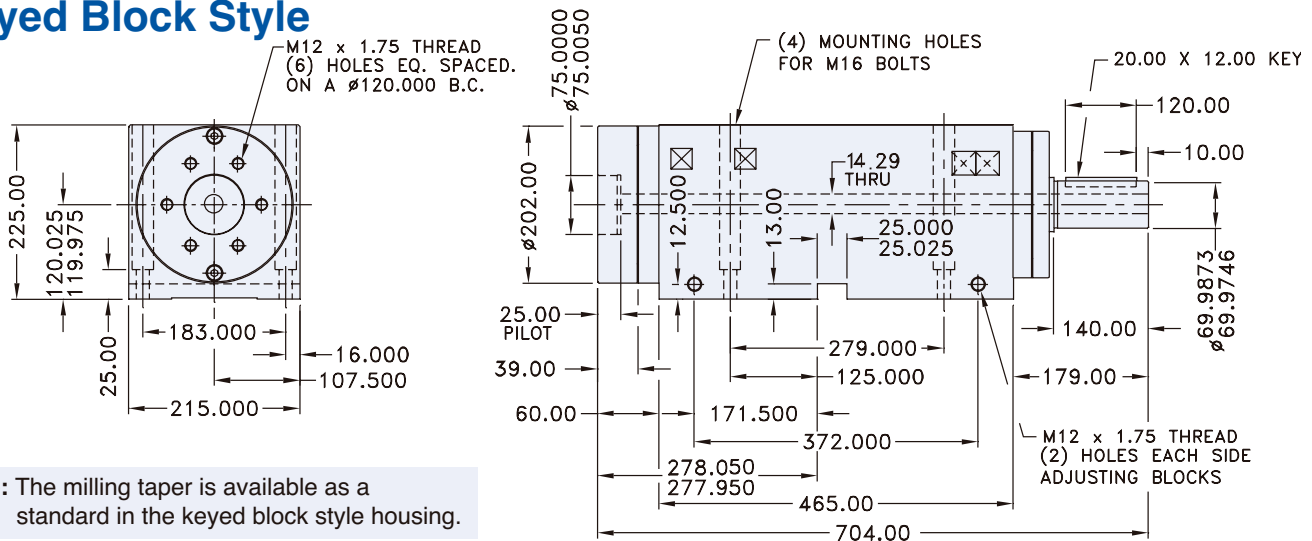
*All data is based upon light preload, duplex bearing setup.

RPM for Steel-Max.*	6,600
RPM for Hybrid-Max.*	9,000
Spindle Inertia-wk ²	78,000 kg-mm ²
Static Radial Stiffness	169 N/ μ m
Static Axial Stiffness**	106 N/ μ m
Seal Type	AirShield™

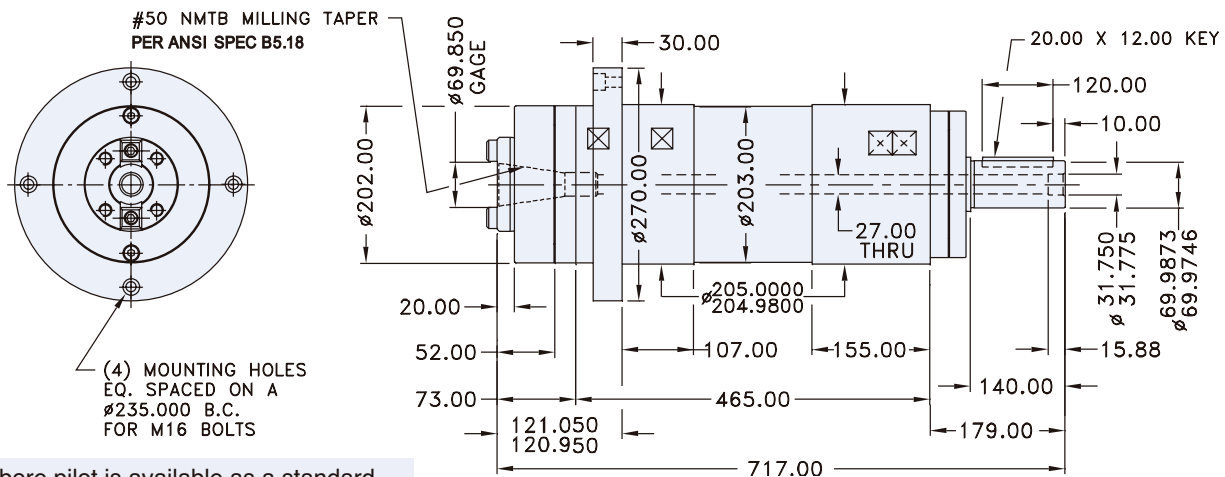
**Spindle stiffness calculated using 890N radial load applied at the spindle nose.

100-085 Belt Driven Spindle

B100-085B Keyed Block Style



F100-085M Flanged Cartridge Style



100-085 TECHNICAL DATA

Torque-MTDR	400 N-m	3,540 in-lbs
Torque-Max.	1852.8 N-m	16,399 in-lbs
Power/Revolution-Max.	.0419 kW/rev	.0562 hp/rev
Spindle Weight-Max.	198 kg	437 lbs
Radial Runout-Max.	.0050 mm	.0002 in
Axial Runout-Max.	.0050 mm	.0002 in

*All data is based upon light preload, duplex bearing setup.

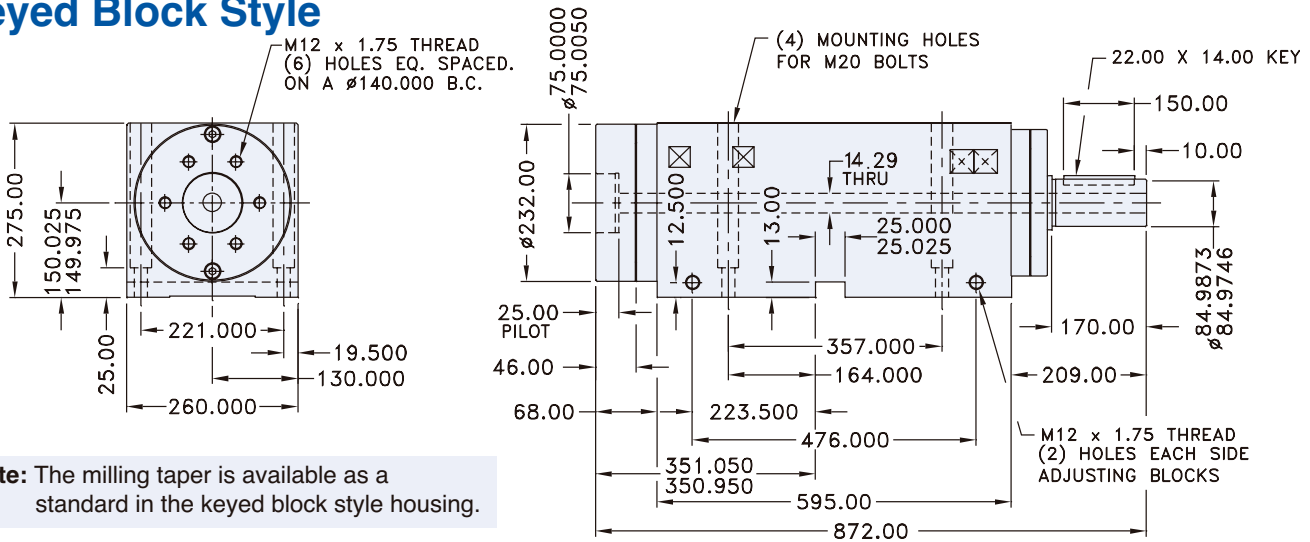
RPM for Steel-Max.*	6,000
RPM for Hybrid-Max.*	8,250
Spindle Inertia-wk ²	110,000 kg-mm ²
Static Radial Stiffness	229 N/ μ m
Static Axial Stiffness**	123 N/ μ m
Seal Type	AirShield™

**Spindle stiffness calculated using 890N radial load applied at the spindle nose.

Please refer to the Design Data Section of this catalog for english and metric conversions, page 29.

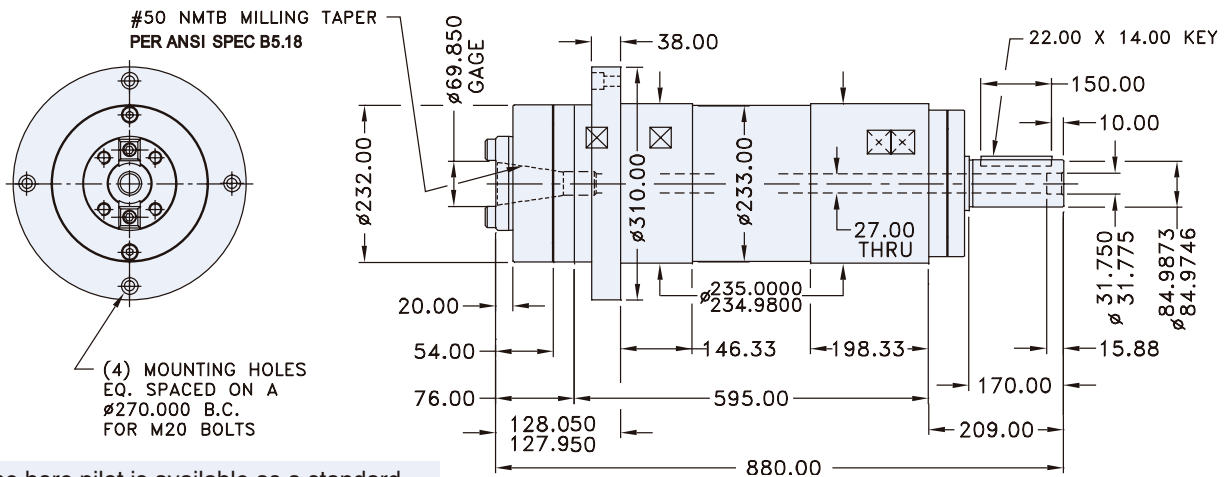
120-100 Belt Driven Spindle

B120-100B Keyed Block Style



Note: The milling taper is available as a standard in the keyed block style housing.

F120-100M Flanged Cartridge Style



Note: The bore pilot is available as a standard in the flanged cartridge style housing.

120-100 TECHNICAL DATA

Torque-MTDR	720 N-m	6,373 in-lbs
Torque-Max.	3318.1 N-m	29,368 in-lbs
Power/Revolution Max.	.0754 kW/rev	.1011 hp/rev
Spindle Weight-Max.	370 kg	816 lbs
Radial Runout-Max.	.0050 mm	.0002 in
Axial Runout-Max.	.0050 mm	.0002 in

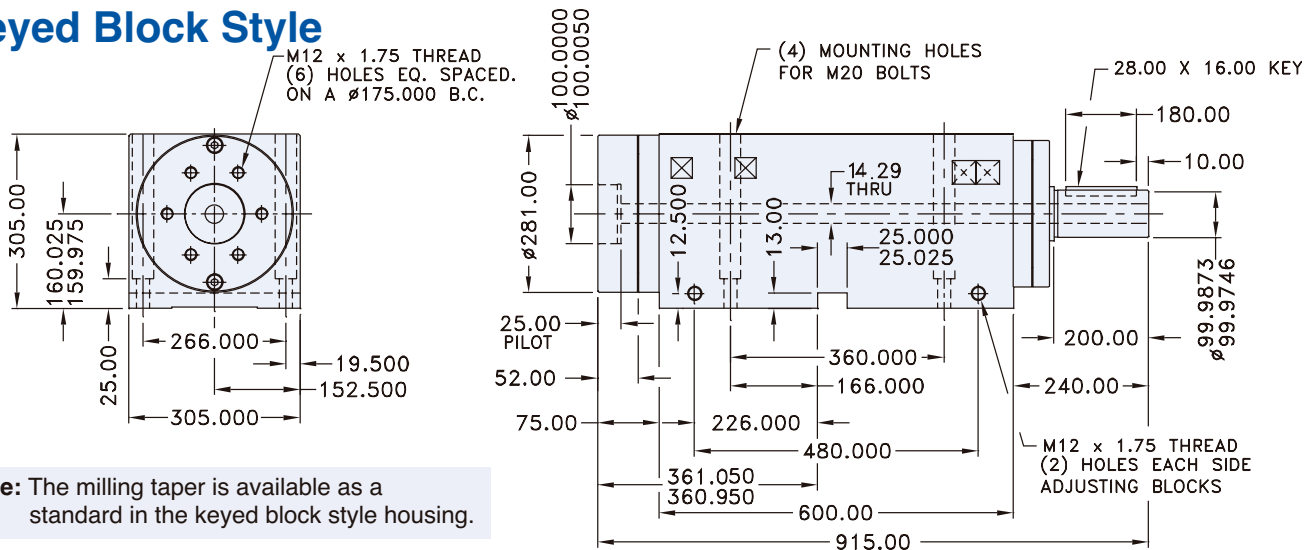
*All data is based upon light preload, duplex bearing setup.

RPM for Steel-Max.*	5,000
RPM for Hybrid-Max.*	6,500
Spindle Inertia-wk ²	240,000 kg-mm ²
Static Radial Stiffness	277 N/ μ m
Static Axial Stiffness**	151 N/ μ m
Seal Type	AirShield™

**Spindle stiffness calculated using 1,780N radial load applied at the spindle nose.

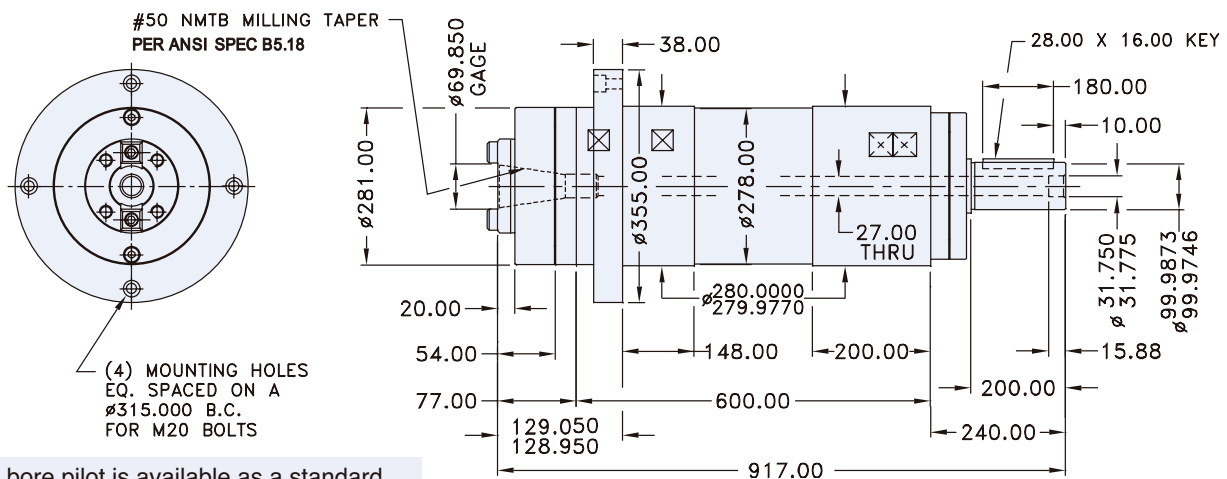
150-120 Belt Driven Spindle

B150-120B Keyed Block Style



Note: The milling taper is available as a standard in the keyed block style housing.

F150-120M Flanged Cartridge Style



Note: The bore pilot is available as a standard in the flanged cartridge style housing.

150-120 TECHNICAL DATA

Torque-MTDR	1,800 N-m	15,932 in-lbs
Torque-Max.	5403.5 N-m	47,825 in-lbs
Power/Revolution-Max.	.1885 kW/rev	.2528 hp/rev
Spindle Weight-Max.	490 kg	1,080 lbs
Radial Runout-Max.	.010 mm	.0004 in
Axial Runout-Max.	.010 mm	.0004 in

RPM for Steel-Max.*	4,000
RPM for Hybrid-Max.*	5,300
Spindle Inertia-wk ²	590,000 kg-mm ²
Static Radial Stiffness	327 N/ μ m
Static Axial Stiffness**	178 N/ μ m
Seal Type	AirShield™

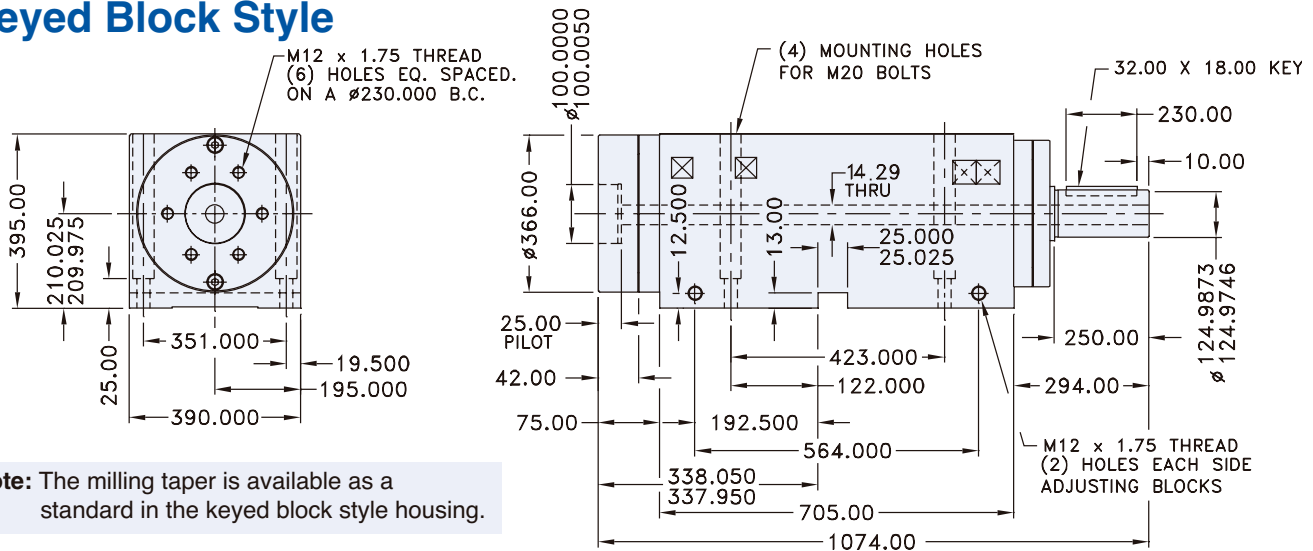
*All data is based upon light preload, duplex bearing setup.

**Spindle stiffness calculated using 1,780N radial load applied at the spindle nose.

Please refer to the Design Data Section of this catalog for english and metric conversions, page 29.

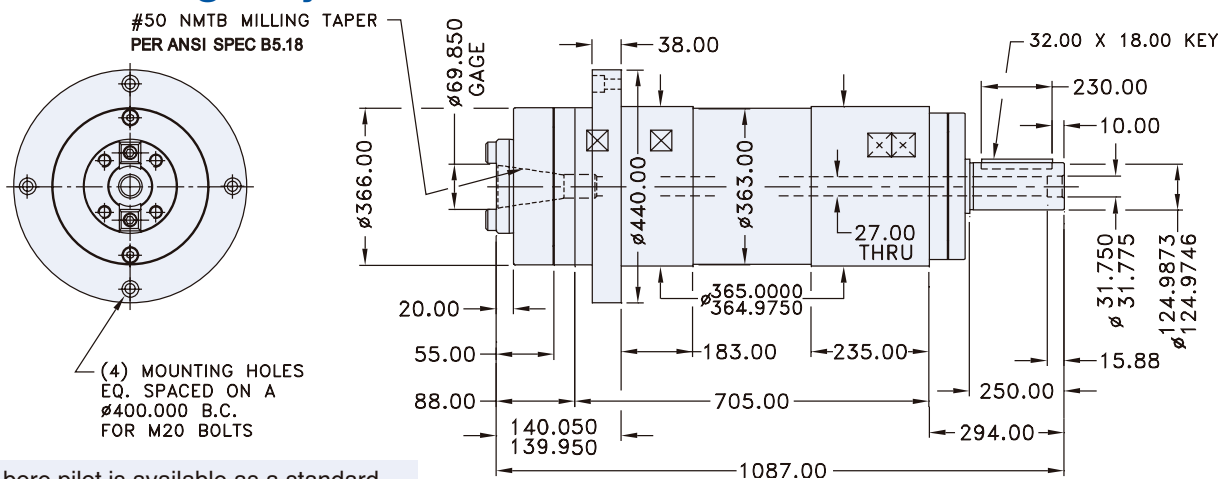
200-150 Belt Driven Spindle

B200-150B Keyed Block Style



Note: The milling taper is available as a standard in the keyed block style housing.

F200-150M Flanged Cartridge Style



Note: The bore pilot is available as a standard in the flanged cartridge style housing.

200-150 TECHNICAL DATA

Torque-MTDR	3,600 N-m	31,864 in-lbs
Torque-Max.	10 555.6 N-m	93,425 in-lbs
Power/Revolution-Max.	.3769 kW/rev	.5054 hp/rev
Spindle Weight-Max.	943 kg	2,079 lbs
Radial Runout-Max.	.010 mm	.0004 in
Axial Runout-Max.	.010 mm	.0004 in

*All data is based upon light preload, duplex bearing setup.

RPM for Steel-Max.*	3,000
RPM for Hybrid-Max.*	3,900
Spindle Inertia-wk ²	1,800,000 kg-m19m ²
Static Radial Stiffness	456 N/ μ m
Static Axial Stiffness**	241 N/ μ m
Seal Type	AirShield™

**Spindle stiffness calculated using 1,780N radial load applied at the spindle nose.

Alternate Nose Designs

Alternate Nose Designs

ProMetrix series super precision spindles illustrated in this catalog can accommodate various alternate spindle nose configurations. Described on the following pages are the most common alternate spindle nose designs.

Selection Table

The following table shows the more common alternate spindle nose designs in relation to the the **ProMetrix** series spindle size. Other alternate nose sizes can be accommodated at customers' request.

Spindle Size	Milling Taper ANSI B5.18	Milling Taper ANSI B5.50	External Taper	HSK per DIN 69893			Universal Kwik-Switch	Komet Connection	TM Smith Tru-Taper		Air Gage Fas-Loc Taper	Automotive Adapter
				Form A	Form B	Form C			Inch	Metric		
040-030	30	30	1.00	32A	x	32C	100	ABS32	0.75	20	2000	.075
050-040	40	40	1.62	40A	40B	40C	200	ABS40	1.06	28	3000	1.06
060-050	40	40	2.25	50A	50B	50C	300	ABS50	1.38	36	4000	1.38
070-060	40	40	2.62	63A	63B	63C	400	ABS63	x	x	5000	1.88
080-070	50	50	3.00	63A	63B	63C	400	ABS63	x	x	6000	x
090-080	50	50	3.00	80A	80B	80C	400	ABS80	x	x	x	x
100-085	50	50	3.75	80A	80B	80C	400	ABS80	x	x	x	x
120-100	50	50	4.50	100A	100B	100C	400	ABS100	x	x	x	x
150-120	50	50	4.50	100A	100B	100C	400	ABS100	x	x	x	x
200-150	50	50	4.50	100A	100B	100C	400	ABS100	x	x	x	x

"ABS" License KOMET®

In addition to the more common spindle nose designs illustrated on the following pages the following spindle nose designs can also be accommodated.

Lathe Nose 'Type A'

Lathe Nose 'Type B'

DeVlieg 'Flash Change'® Taper

Jarno Internal Taper

Brown & Sharpe Internal Taper

Morse Internal Taper

Universal 'Acura-Flex'® Collet

Universal 'Double Taper'® Collet

Erickson 'Double Angle'® Collet

Erickson 'Quick Change'®

TM Smith 'Super' Taper®

Air Gage 'Fas-Loc'® Straight Adapter

Standard '5C' Collet Nose

Adapter Plate

Straight Shaft with Wheel Screw

Deep Hole Grinding Nose

Straight Shaft with Threaded Nose

Flanged Grinding Nose

Extended Flanged Grinding Nose

Loose Piece Pilot Nose

Bridgeport® Collet Nose

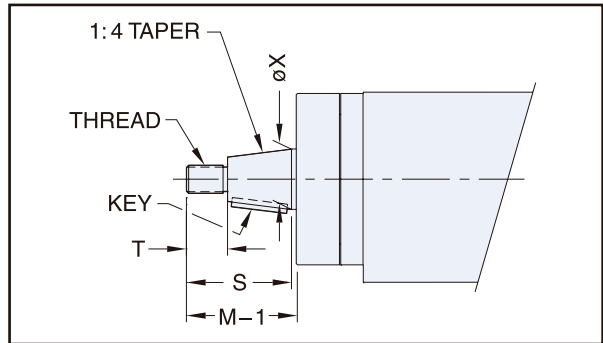
Kaiser® Tool Connectors

Alternate Nose Designs

External Taper - G

ProMetrix super precision spindles with optional external taper nose for adapting wheel holders in grinding applications. Standard thread is R.H. Collar nut furnished as standard with spindle.

Size*	Bearing**	X	M-1	S	T	Thread	Key
1.00	30	25.400	47.00	44.00	13.00	.500-13	None
1.25	35	31.750	60.00	57.00	19.00	.500-13	6.35
1.62	45	41.275	74.00	71.00	27.00	.750-16	6.35
2.25	60	57.150	99.00	96.00	39.00	1.125-12	6.35
2.62	70	66.675	114.00	111.00	45.00	1.500-12	9.53
3.00	80	76.200	123.00	120.00	45.00	1.500-12	9.53
3.75	100	95.250	162.00	159.00	64.00	2.250-12	9.53
4.50	120	114.300	194.00	191.00	77.00	2.750-12	9.53
5.00	140	127.000	207.00	204.00	77.00	2.750-12	9.53



*Size specifies gauge diameter (inches)

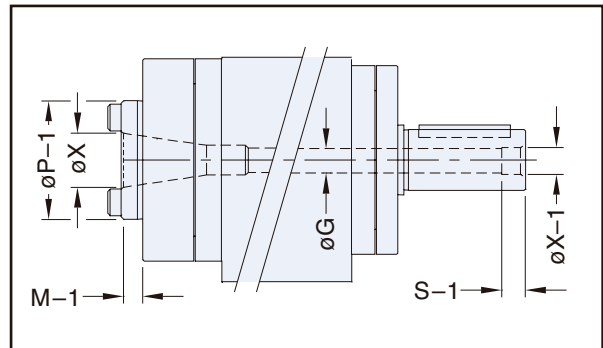
**Minimum front bearing bore size (mm).

Milling Taper per ANSI B5.18 - M

ProMetrix super precision spindles with optional milling taper nose for adapting milling tool shanks in milling applications. Includes drive keys and hole through arbor for optional manual drawbar.

Size	Bearing*	X	P-1	M-1	G	X-1	S-1
30	40	31.750	69.832	13.00	14.29	15.88	12.70
40	50	44.450	88.882	16.00	17.50	19.05	12.70
45	70	57.150	101.582	18.00	20.00	25.40	15.88
50	80	69.850	128.569	20.00	27.00	31.75	15.88
60	120	107.950	221.437	38.00	36.00	38.10	19.05

*Minimum front bearing bore size (mm)

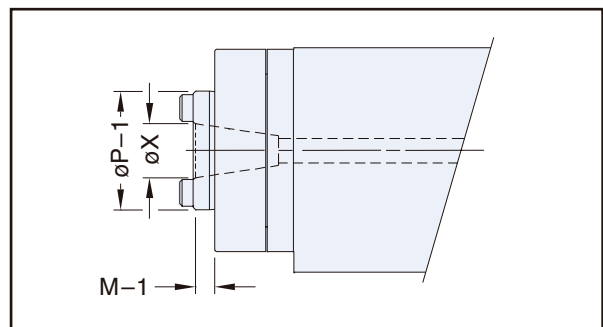


Milling Taper per ANSI B5.50 - MV

ProMetrix super precision spindles with optional milling taper nose for 'V' flange tool shanks for machining centers with automatic tool changers. Includes drive keys and machining of arbor to accept power drawbar.

Size	Bearing*	X	P-1	M-1
30	40	31.750	50.00	13.00
40	50	44.450	65.00	16.00
45	70	57.150	85.00	18.00
50	80	69.850	100.00	20.00
60	120	107.950	160.00	38.00

*Minimum front bearing bore size (mm)



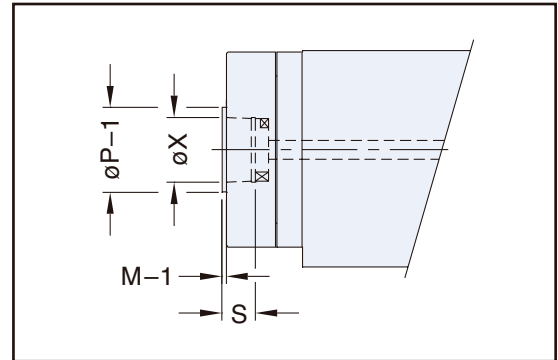
Alternate Nose Designs

HSK per DIN 69893 - HA

ProMetrix super precision spindles with optional HSK - A spindle nose contour for use with hollow shaft tooling for automatic tool change. Form A with internal keyways. Used with power drawbar.

Size	Bearing*	X	P-1	S	M-1
HSK 25A	30	19.000	25.00	9.40	10.00
HSK 32A	40	24.000	32.00	11.40	12.00
HSK 40A	50	30.000	40.00	14.40	15.00
HSK 50A	60	38.000	50.00	17.90	18.00
HSK 63A	70	48.000	63.00	22.40	23.00
HSK 80A	90	60.000	80.00	28.40	29.00
HSK 100A	110	75.000	100.00	35.40	36.00
HSK 125A	130	95.000	125.00	44.40	45.00
HSK 160A	170	120.000	160.00	57.40	58.00

*Minimum front bearing bore size (mm)

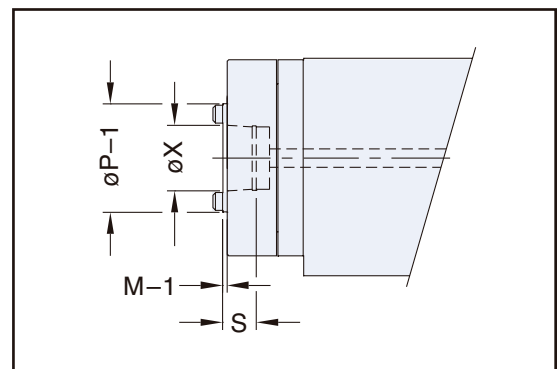


HSK per DIN 69893 - HB

ProMetrix super precision spindles with optional HSK - B spindle nose contour for use with hollow shaft tooling for automatic tool change. Form B with external keyways. Used with power drawbar.

Size	Bearing*	X	P-1	S	M-1
HSK 40B	50	24.000	40.00	20.50	21.00
HSK 50B	60	30.000	50.00	25.50	26.00
HSK 63B	70	38.000	63.00	25.50	26.00
HSK 80B	90	48.000	80.00	33.00	34.00
HSK 100B	110	60.000	100.00	41.00	42.00
HSK125B	130	75.000	125.00	51.00	52.00
HSK 160B	170	95.000	160.00	64.00	65.00

*Minimum front bearing bore size (mm)

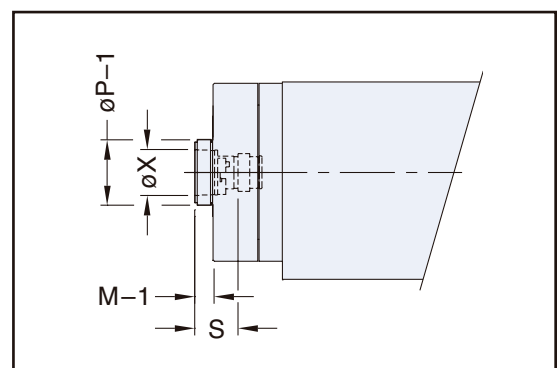


HSK per DIN 69893 - HC

ProMetrix super precision spindles with optional HSK - C spindle nose contour for use with hollow shaft tooling. Form C machined to tool manufacturers' manual tool clamping cartridge specifications. Specify manufacturer of clamping cartridge.

Size	Bearing*	X	P-1	S	M-1	Clamp Force (kN)	
						Guhring	Mapal
HSK 32C	40	24.000	32.00	11.40	12.00	9	11
HSK 40C	50	30.000	40.00	14.40	15.00	15	15
HSK 50C	60	38.000	50.00	17.90	18.00	23	21
HSK 63C	70	48.000	63.00	22.40	23.00	33	30
HSK 80C	90	60.000	80.00	28.40	29.00	50	38
HSK 100C	110	75.000	100.00	35.40	36.00	70	50

*Minimum front bearing bore size (mm)



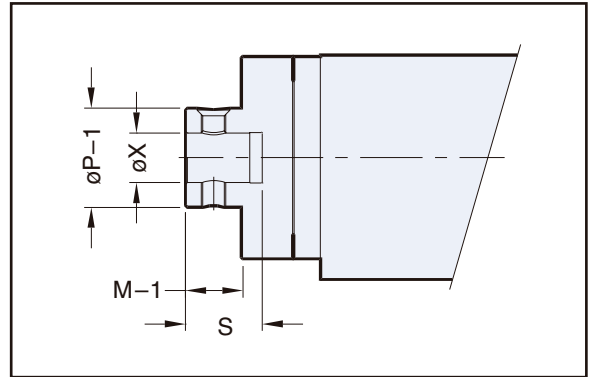
Alternate Nose Designs

Komet ABS® Connection - K

ProMetrix super precision spindles with optional Komet ABS connection for use with Komet ABS tool holder systems. For machining centers, FMS and dedicated machining systems. Includes thrust screw and receiving screw.

Size	Bearing*	X	P-1	S	M-1
ABS 25	30	13.000	25.000	24.00	20.00
ABS 32	35	16.000	32.000	27.00	23.00
ABS 40	40	20.000	40.000	31.00	27.00
ABS 50	50	28.000	50.000	36.00	32.00
ABS 63	60	34.000	63.000	43.00	39.00
ABS 80	80	46.000	80.000	48.00	44.00
ABS 100	100	56.000	100.000	60.00	52.00
ABS 125	130	70.000	125.000	76.00	64.00
ABS 160	160	90.000	160.000	96.00	80.00
ABS 200	200	112.000	200.000	116.00	100.00

*Minimum front bearing bore size (mm)

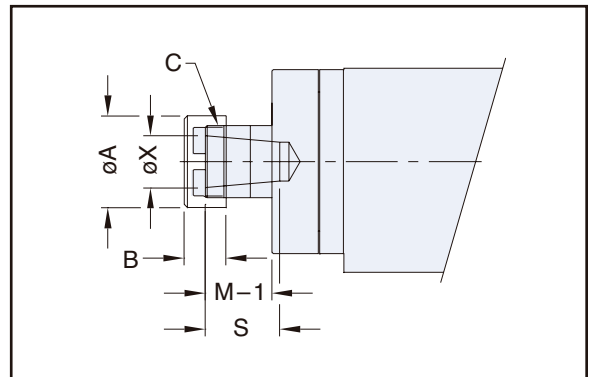


Universal Kwik-Switch® II (ACME Threads) - UA

ProMetrix super precision spindles with optional Universal Kwik-Switch II for use with Universal 'Kwik-Switch' tool adapters. Internal taper with ACME threads for manual locking. Includes spindle nut assembly.

Size	Bearing*	X	S	M-1	A	B	C
100	40	22.225	37.31	30.00	50.80	31.24	1.38-12
200	50	33.325	65.07	34.00	65.02	36.58	1.88-12
300	60	41.275	76.20	40.00	76.20	40.89	2.25-12
400	70	57.150	93.68	48.00	95.25	52.07	3.00-12
450	80	69.850	123.83	50.00	114.30	55.63	3.50-12

*Minimum front bearing bore size (mm)

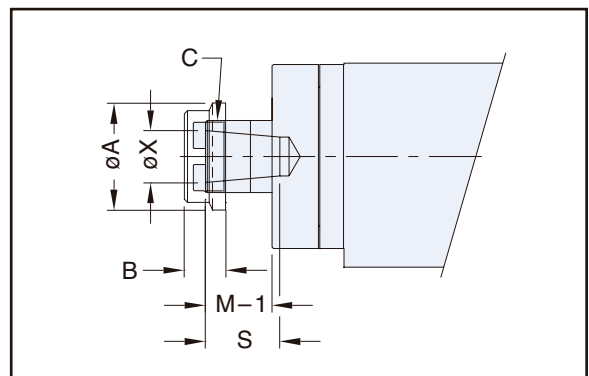


Universal Kwik-Switch® II ('V' - Threads) - UV

ProMetrix super precision spindles with optional Universal Kwik-Switch II for use with Universal 'Kwik-Switch' tool adapters. Internal taper with 'V'- threads for high speed applications. Includes spindle pawl-lock nut assembly.

Size	Bearing*	X	S	M-1	A	B	C
200	50	33.325	65.07	34.00	82.55	38.61	1.88-16
300	60	41.275	76.20	40.00	92.20	43.69	2.25-16

*Minimum front bearing bore size (mm)



Alternate Nose Designs

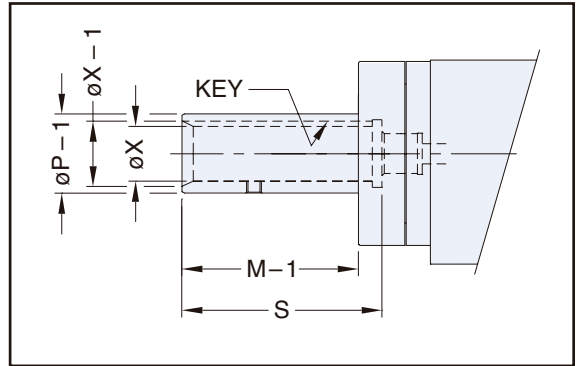
TM Smith 'Tru-Taper'® - TM

ProMetrix super precision spindles with optional TM Smith 'Tru-Taper' system for use with TM Smith Tru-Taper' quick change tool adapters. For operations requiring minimum runout in precision drilling applications.

Size	Bearing*	X	X-1	P-1	S	M-1	Key
0.75	30	19.058	23.622	31.37	66.55	70.00	4.11
1.06	40	26.998	32.301	40.89	82.55	88.00	4.90
1.38	50	34.935	41.910	50.42	107.95	115.00	6.50

Size	Bearing*	X	X-1	P-1	S	M-1	Key
20	30	20.010	24.570	31.37	66.50	70.00	5.03
28	40	28.010	32.320	40.89	82.60	88.00	6.03
36	50	36.010	42.980	50.42	108.00	115.00	8.04

*Minimum front bearing bore size (mm)

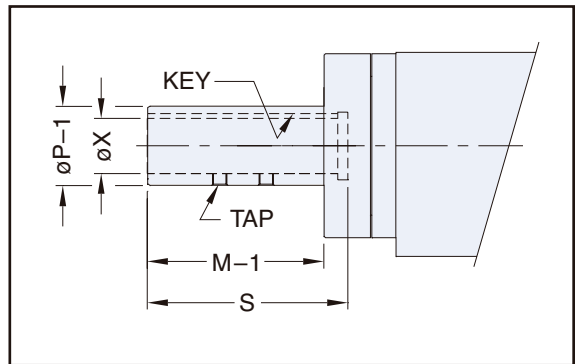


Automotive Adapter - A

ProMetrix super precision spindles with optional automotive adapter nose for drill, tap and ream tool adapters. Internal pilot with keyway and tapped holes.

Size	Bearing*	X	P-1	S	M-1	Tap	Key
0.62	30	15.888	25.40	66.55	55.00	.25-20	4.06
0.75	30	19.063	31.75	66.55	55.00	.31-18	4.06
0.88	30	22.238	31.75	82.55	70.00	.31-18	4.88
1.00	40	25.413	38.10	82.55	70.00	.31-18	4.88
1.06	40	27.000	39.62	82.55	70.00	.31-18	4.88
1.25	45	31.763	44.45	107.95	90.00	.31-18	6.45
1.38	50	34.938	47.75	107.95	90.00	.31-18	6.45
1.88	65	47.638	66.55	130.05	90.00	.31-18	8.05

*Minimum front bearing bore size (mm)

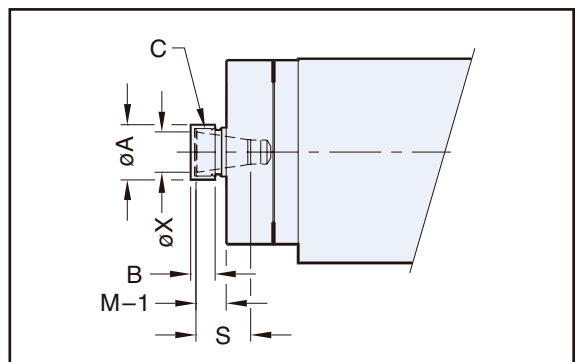


Air Gage 'Fas-Loc'® Taper - AG

ProMetrix super precision spindles with optional Air Gage 'Fas-Loc' taper for use with Air Gage Fas-Loc' quick change toolholders. For operations requiring toolholders to be accurately and securely positioned. Includes spindle collar and retaining ring assembly.

Size	Bearing*	X	S	M-1	A	B	C
1000	30	17.463	18.644	30.00	27.18	32.64	.88-6
2000	40	25.400	32.664	30.00	27.94	41.91	1.25-5
3000	50	31.750	42.290	30.00	29.46	48.26	1.50-4
4000	60	44.450	57.252	30.00	29.46	60.96	2.00-4
5000	70	57.150	68.961	33.00	34.04	73.15	2.50-3
6000	80	69.850	86.360	33.00	34.04	85.85	3.00-3

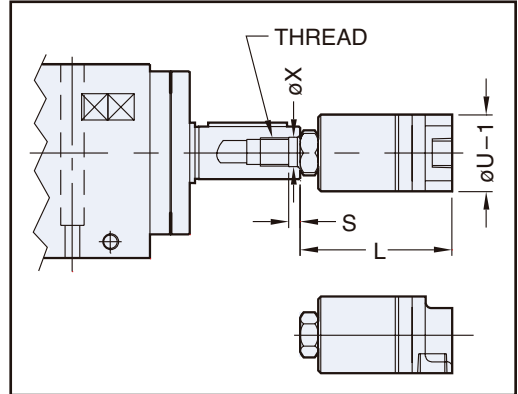
*Minimum front bearing bore size (mm)



Accessories

Rotating Coolant Union

Available on all **ProMetrix** series super precision spindles. Rotating coolant unions allow the coolant to enter by way of the rear of the spindle shaft and flow through the spindle to the tooling. Requires hole through and machining of spindle shaft to accommodate mounting of the union. Available as straight through or 90° union.



OPERATING DATA	
Coolant Pressure* (max.)	70 bar
Temperature (max.)	70° C
Speed RPM (max.)	15,000
Recommended Filtration	10 microns

*Operation at maximum pressure combined with maximum speed should be avoided. For optimal performance consult SETCO's design team.

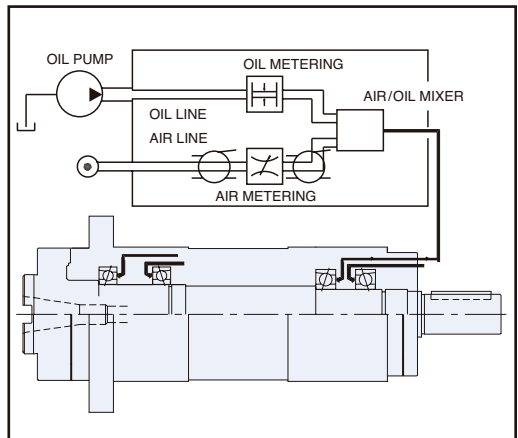
DIMENSIONS	X	S	Thread	U-1	L	Port
Straight Union	16.650	6.35	.62-18 UNF	43.65	98.43	3/8" NPT
90° Union	16.650	6.35	.62-18 UNF	43.65	98.43	3/8" NPT

Note: Specify direction of spindle rotation viewing rear of spindle.
Other makes and styles of unions are available upon request.

Air/Oil Metered Lubrication

Air/Oil metered lubrication is available on all **ProMetrix** series super precision spindles. Used mostly on high speed spindle applications where the 'DN' value is greater than 500,000. Arrangement for air/oil metered lubrication consist of machining of the spindle housing and outer bearing spacers for directing the air/oil lubrication precisely to the bearings. Requires very little oil consumption. The high volume of air provides additional cooling of the bearings.

OPERATING DATA	
Volume of oil/bearing (approx.)	0.03 cc/5 minute cycle
Oil Viscosity	160 SUS at 38° C
Air Pressure - Input	1.4 bar
Air Temperature - Input	21° - 27° C
Dew Point Temperature (max.)	0° C
Filtration (absolute)	0.1 micron
Filtration Efficiency	99.99%

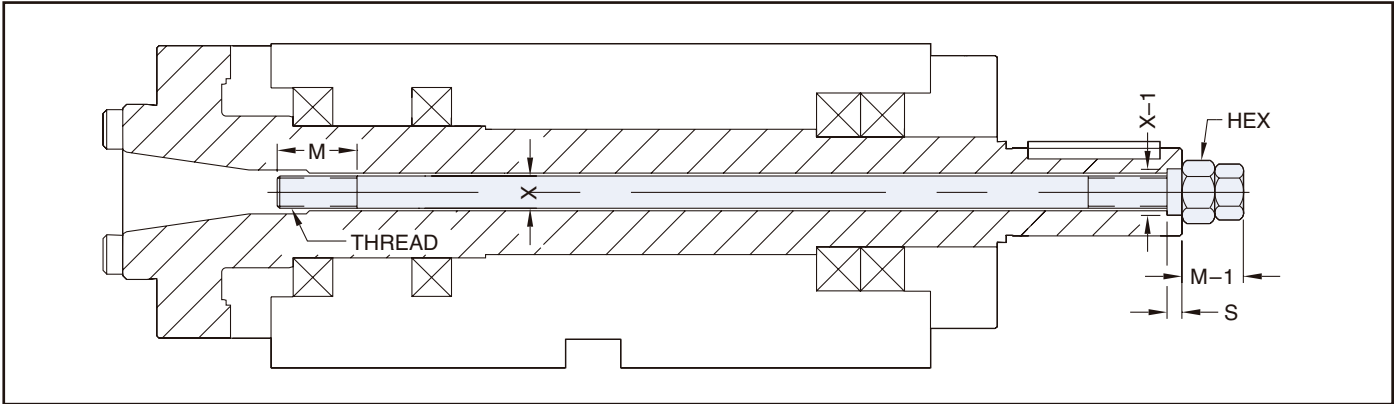


The above operating data is to used as a guide only.
Exact oil and air requirements will be determined during spindle runoff at SETCO.

Accessories

Manual Drawbar

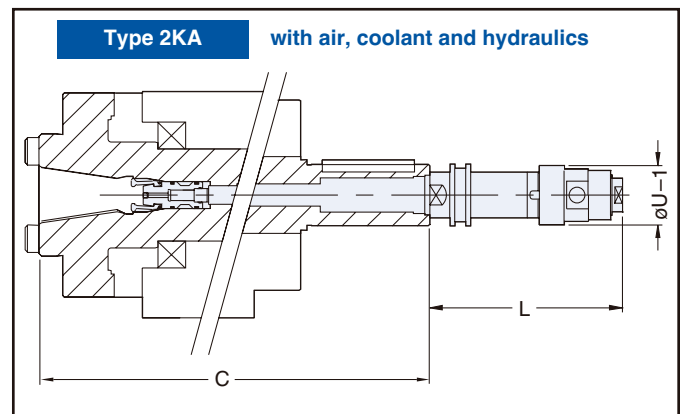
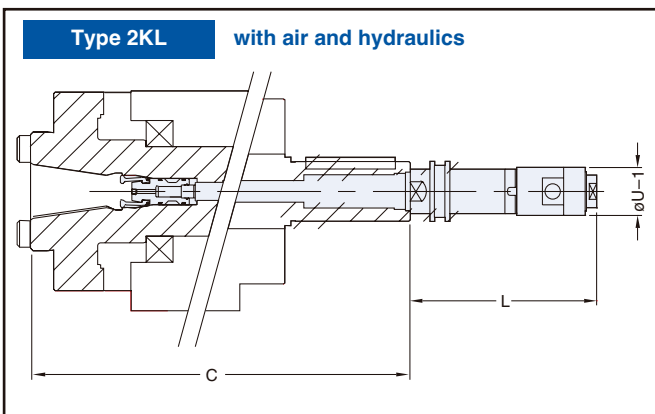
Commonly used for manual retention of milling taper adapters per ANSI B5.18.



Size	Thread	M	X	X-1	S	M-1	Hex
30	.50-13	31.75	12.700	15.875	12.70	25.40	22.23
40	.62-11	38.10	15.875	19.050	6.35	31.75	26.97
50	1.00-8	50.80	25.400	31.750	12.70	50.80	41.15

Power Drawbar

Commonly used for automatic quick change tool applications. These power drawbars provide high tool retention force. Available with dual passage rotary unions for air and hydraulics or air, coolant and hydraulics. Drawbar package includes gripper unit, drawbar, clamping cartridge, three position sensing signal ring, rotary union where available and machining of drawbar contour in spindle shaft. Specify ANSI, ISO or DIN tool standard.



Size	Rear Bearing *	RPM (max)	Retention Force (N)	Type '2KL'		Type '2KA'		C (min)
				U-1	L	U-1	L	
30	45	10,000	5500	42**	122**	-	-	260
40	50	8,000	10,500	55.5	219	60	233.5	415
50	60	8,000	23,000	55.5	219	60	233.5	500
60	90	8,000	60,000	94	259	60	273.5	780

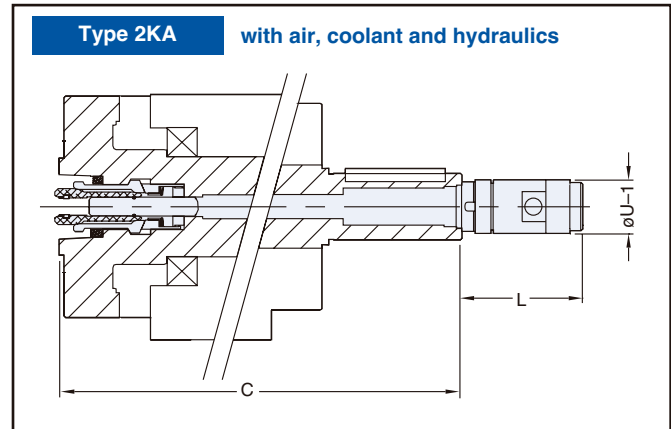
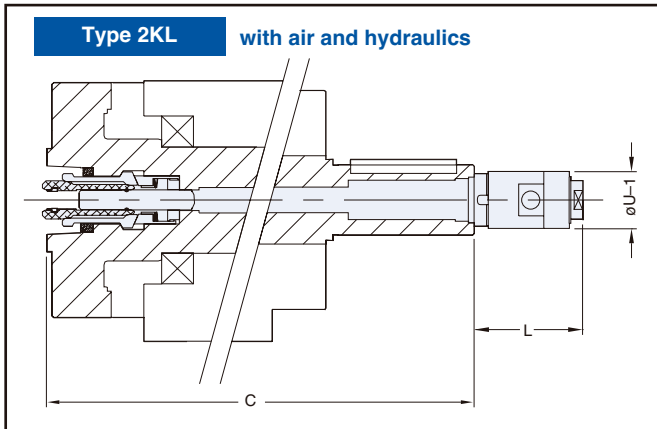
*Minimum rear bearing bore size (mm)

** Size 30 power drawbar only available with single rotary union for hydraulics

Accessories

HSK Power Drawbar for Hollow Shaft Tooling per DIN 69893

Used exclusively for hollow shaft tooling per DIN 69893. These power drawbars provide high static and dynamic stiffness generated by the high retention force and face contact of the tooling. Higher spindle speeds with greater axial and radial repeatability of hollow shaft tooling is achieved due to the face contact and clamping forces. Drawbar package includes gripper unit, drawbar, clamping cartridge, three position sensing signal ring, rotary union and machining of drawbar contour in spindle shaft.



Size	Rear Bearing*	RPM (max)	Retention Force (N)	Type '2KL'		Type '2KA'		C (min)
				U-1	L	U-1	L	
HSK 40A	55	10,000	6,800	55	101	60	115.5	270
HSK 50A	55	10,000	11,000	55	101	60	115.5	280
HSK 63A	55	10,000	18,000	55	101	60	115.5	340
HSK 80A	65	10,000	28,000	55	101	60	115.5	380
HSK 100A	65	10,000	45,000	55	101	60	115.5	535

*Minimum rear bearing bore size (mm)

Size	Rear Bearing*	RPM (max)	Retention Force (N)	Type '2KL'		Type '2KA'		C (min)
				U-1	L	U-1	L	
HSK 50B	55	10,000	6,800	55	101	60	115.5	270
HSK 63B	55	10,000	11,000	55	101	60	115.5	280
HSK 80B	55	10,000	18,000	55	101	60	115.5	340
HSK 100B	65	10,000	28,000	55	101	60	115.5	380
HSK 125B	65	10,000	45,000	55	101	60	115.5	535

*Minimum rear bearing bore size (mm)

Rotating Cylinder Power Drawbars – are available upon request. Package includes machining of the spindle contour, support bushings, drive pulley, adjustable stop collars, rotating cylinder, and can be configured to include position sensing limit switches.

Other styles and sizes of power drawbars are available upon request.

Accessories

Type 'B' Belt Drive Package

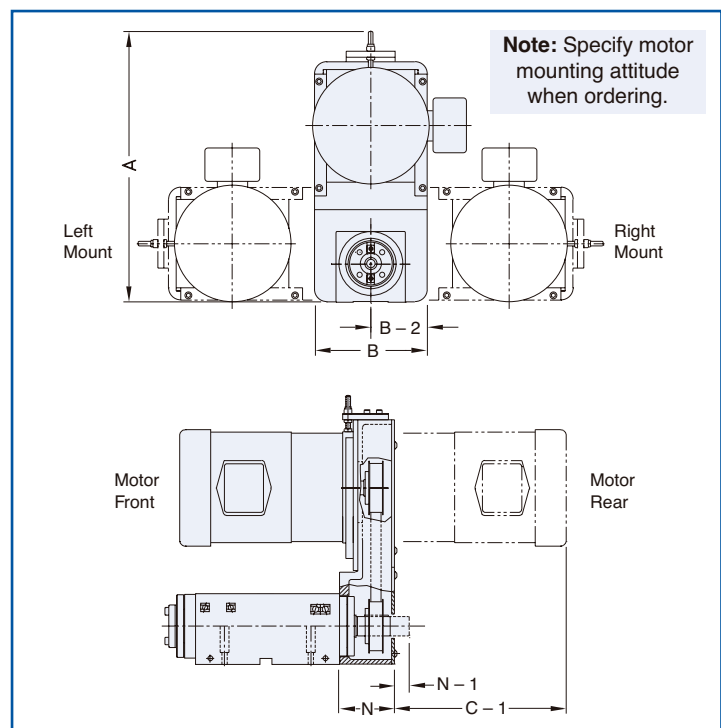
The type 'B' belt drive package provides a complete drive system for the **ProMetrix** series super precision spindles. Mounted on the rear of the spindle housing is an integral belt guard/mounting bracket with motor mounting plate having screw type belt adjustment. Belt guard/mounting bracket allows for mounting of the motor in various attitudes with the motor toward or away from the spindle nose. Belt and pulleys are included to provide a specific operating speed for the application. The motor plate accommodates 'C' – face mounted motors of either the T-frame or U-frame construction in addition to a wide range of servomotor mountings.



Size	Motor Frame Size (max.)	Spindle Size	Belt Drive Ratio (max.)	A	B	B-2	N	N-1
675	145 TC	040-030	2 to 1	432	171	85.5	100	-
925	215 TC	050-040	3 to 1	500	235	117.5	110	-
		060-050						-
		070-060						17
		080-070						37
1150	256 TC	060-050	3 to 1	635	292	146	140	-
		070-060						-
		080-070						7
		090-080						27
		100-085						27
1500	326 TC	080-070	3 to 1	720	381	190.5	150	-
		090-080						17
		100-085						17
		120-100						47

HP	BASE SPEED	FRAME SIZE	C-1
1	3600	56C	220
	1800	143TC	260
	1200	145TC	285
1.5	3600	143TC	260
	1800	145TC	285
	1200	182TC	310
2	3600	145TC	285
	1800	145TC	285
	1200	184TC	335
3	3600	182TC	310
	1800	182TC	310
	1200	213TC	370
5	3600	184TC	335
	1800	184TC	335
	1200	215TC	420
7.5	3600	213TC	370
	1800	213TC	370
	1200	254TC	485
10	3600	215TC	420
	1800	215TC	420
	1200	256TC	530
15	3600	254TC	485
	1800	254TC	485
	1200	284TC	550
20	3600	256TC	530
	1800	256TC	530
	1200	286TC	590

Note: Certain applications may require a riser under the spindle for belt guard/mounting bracket clearance.



Design Data

Metric to English Conversion Table

1 kW	=	1.341 hp	1 N	=	0.22481 lbs	1 m ³	=	61,023.76 in ³
1 mm	=	0.03937 in	1 cc	=	0.061 in ³	1 N/μm	=	5,710 lbs/in
1 kg	=	2.205 lbs	1 μm	=	0.00003937 in	°C	=	(°F - 32) ÷ 1.8
1 Nm	=	8.851 in-lbs	1 bar	=	14.50 psi	1 kg-mm ²	=	0.0034 lb-in ²

‘DN’ Value – the ‘DN’ value plays a significant role in the overall design of **ProMetrix** series super precision spindles. From the initial design stage to the finished product the ‘DN’ value determines bearing precision, bearing mounting arrangement, machining tolerances, bearing preload, type and method of lubrication, material and heat treat process, balancing requirement, vibration acceptance level, and final inspection method that a spindle is processed. The ‘DN’ value is calculated as follows (using the largest bearing in the spindle):

$$\text{‘DN’} = \text{bearing bore diameter (mm)} \times \text{spindle RPM}$$

The standard **ProMetrix** series super precision spindles as shown in this catalog are designed and manufactured to operate up to a ‘DN’ value of 600,000 utilizing steel ball. For spindles operating to higher ‘DN’ values consult SETCO’s Design Team.

Spindle Sizing - Power / Speed Requirements

For proper spindle sizing, the machining power and speed requirements must be known or determined. The optimum spindle size for a specific application is dependent on the operating speed of the spindle and the power that needs to be transmitted by the spindle to accomplish the machining operation.

A major factor in selecting the proper spindle for a specific machining application is the amount of power required to do the work. This power requirement, as recommended by SETCO, is defined as the Unit Power technique. The Unit Power technique utilizes published machining data, based on the machining operation, for recommended cutting speeds and feed rates as determined by the material and geometry of the cutter, material and hardness of the workpiece and the machining operation being performed. The tables, on page 30, provide approximate cutting speeds and feed rates for a specific machining application. After determining the recommended cutting speed and feed rate, the equations contained in the flowchart on page 31 provide a simple and easy method to calculate the power required to accomplish the machining operation.

Information provided in the Design Data section, pages 30 and 31, has been compiled to assist in applying the **ProMetrix** series super precision spindles in this catalog to specific application requirements. This information is provided as a guide for a quick and simple means of approximating machining application requirements. Consult a cutting tool specialist to obtain best results for final machining requirements. The Design Data section contains machining data tables and equations to calculate approximate power, speed and feed rates. The Flowchart for Selecting Optimum Spindle Sizing, on page 31, provides a step-by-step procedure to calculate the required spindle speed and power. The Spindle Selection Chart on page 5 of this catalog is provided to assist in proper spindle sizing selection for a specific application.

For grinding applications it is recommended that a grinding wheel manufacturer be contacted to determine the proper safe operating speeds and power requirements to ensure that the grinding wheel is not operated above the maximum rated speeds.

Cutting Speeds and Feeds

Recommended values for precision boring / turning

Workpiece material	Hardness [Bhn]	Cutting speed V_c [m/min]		Feed rate per rev f_t [mm]
		High speed steel	Carbide - uncoated	
Cast irons	190...320	5...60	10...150	0,080...0,500
Steel - plain carbon	85...200	15...120	60...280	0,080...0,500
Steel - alloys	35...50Rc	5...40	20...150	0,080...0,500
Steel - tool	50...58Rc	5...20	15...60	0,080...0,500
Steel - stainless	150...450	5...30	30...120	0,080...0,500
Aluminum alloys	30...150	150...360	150...800	0,080...0,500
Copper alloys	80...100Rb	30...180	50...420	0,080...0,500
Nickel alloys	80...360	5...40	5...120	0,080...0,500
Titanium	250...375	5...30	10...100	0,080...0,500

Recommended values for precision milling

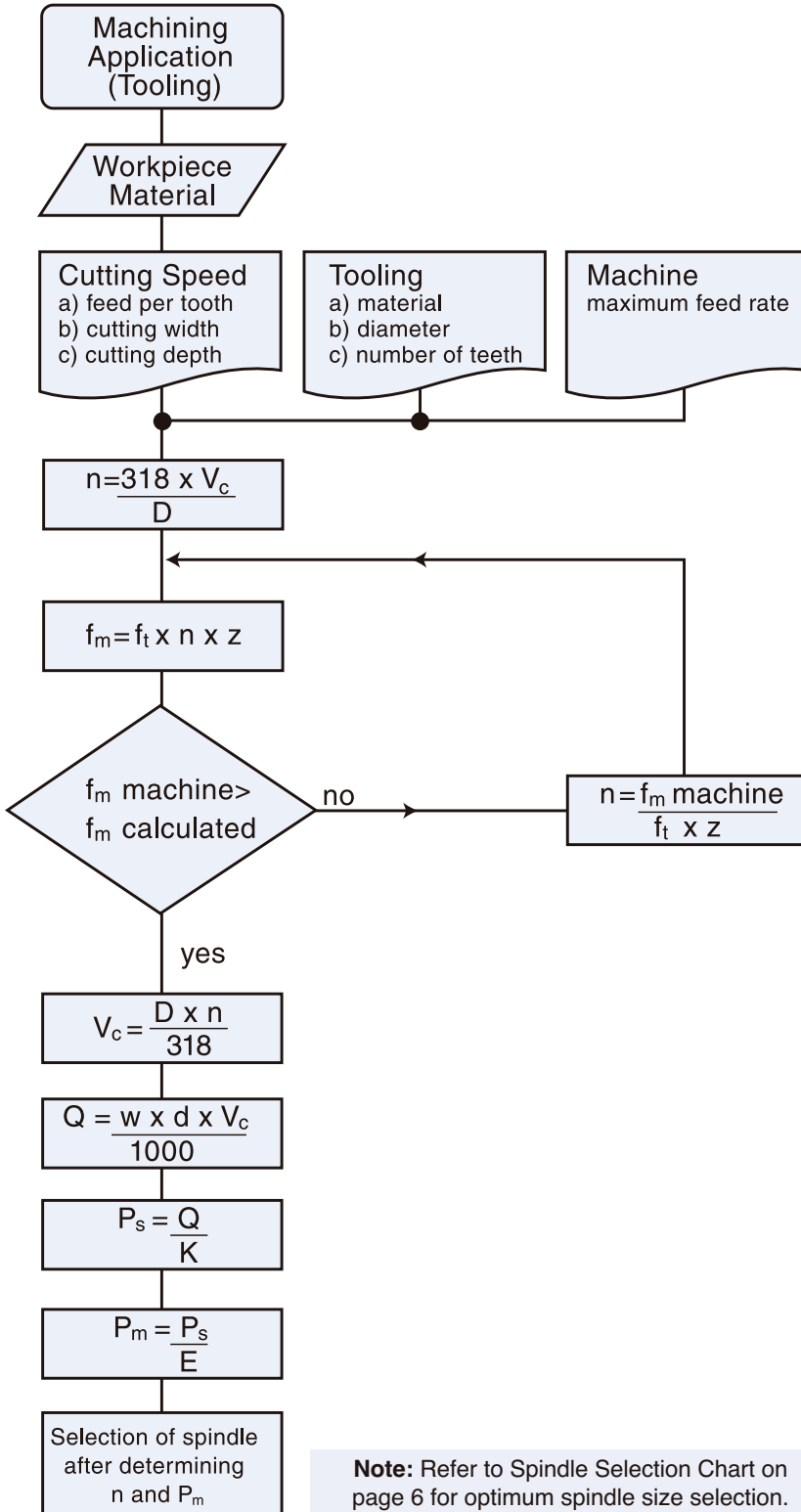
Workpiece material	Hardness [Bhn]	Cutting speed V_c [m/min]		Feed rate per tooth f_t [mm]
		High speed steel	Carbide - uncoated	
Cast irons	190...320	5...60	10...150	0,120...0,300
Steel - plain carbon	85...200	15...120	60...280	0,120...0,300
Steel - alloys	35...50Rc	5...40	20...150	0,120...0,300
Steel - tool	50...58Rc	5...20	15...60	0,120...0,300
Steel - stainless	150...450	5...30	30...120	0,120...0,300
Aluminum alloys	30...150	150...360	150...800	0,120...0,300
Copper alloys	80...100Rb	30...180	50...420	0,120...0,300
Nickel alloys	80...360	5...40	5...120	0,120...0,300
Titanium	250...375	5...30	10...100	0,120...0,300

Recommended values for drilling

Workpiece material	Hardness [Bhn]	Cutting material	Cutting speed V_c [m/min]	Feed rate per rev f_t [mm]
Cast irons	190...320	High speed steel	10...90	0,050...0,200
Steel - plain carbon	85...200	High speed steel	15...45	0,050...0,200
Steel - alloys	35...50Rc	High speed steel	5...20	0,050...0,200
Steel - tool	50...58Rc	High speed steel	5...20	0,050...0,200
Steel - stainless	150...450	High speed steel	5...10	0,050...0,200
Aluminum alloys	30...150	High speed steel	5...115	0,050...0,200
Copper alloys	80...100Rb	High speed steel	20...70	0,050...0,200
Nickel alloys	80...360	High speed steel	10...20	0,050...0,200
Titanium	250...375	High speed steel	5...15	0,050...0,200

**The recommendations in the above charts are intended as a starting point and may vary to fit different operating conditions.

Flowchart for Selecting Optimum Spindle Size



Note: Refer to Spindle Selection Chart on page 6 for optimum spindle size selection.

Variables Defined

D [mm]	Diameter of tool or workpiece
d [mm]	Depth of cut
E*	Efficiency of spindle drive
ft [mm]	Feed rate per tooth
fm [mm/min]	Feed rate
K [cm ³ /kW min]	Unit power constant
n [rpm]	Spindle speed
Ps [kW]	Power at spindle
Pm [kW]	Power at motor
Q [cm ³ /min]	Metal removal rate
Vc [m/min]	Cutting speed
w [mm]	Width of cut
z	Number of teeth in cutter

* for direct belt-drive use 90% (0.90)

Converting kW to torque (Nm):

$$T = \frac{\text{kW} \times 9550}{\text{rpm}}$$

Standard values for K

Cast irons	15...30
Steel - plain carbon	15...30
Steel - alloys	10...15
Steel - tool	5...10
Steel - stainless	5...10
Aluminum alloys	60...70
Cooper alloys	15...25
Nickel alloys	5...10
Titanium	10...15

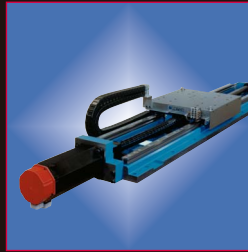
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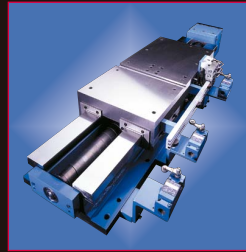
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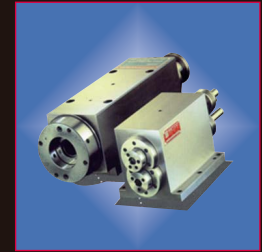
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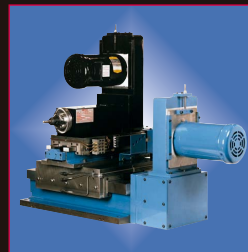
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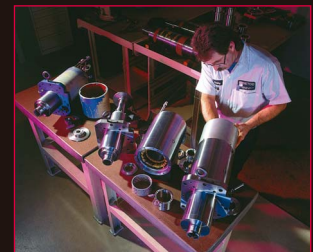
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