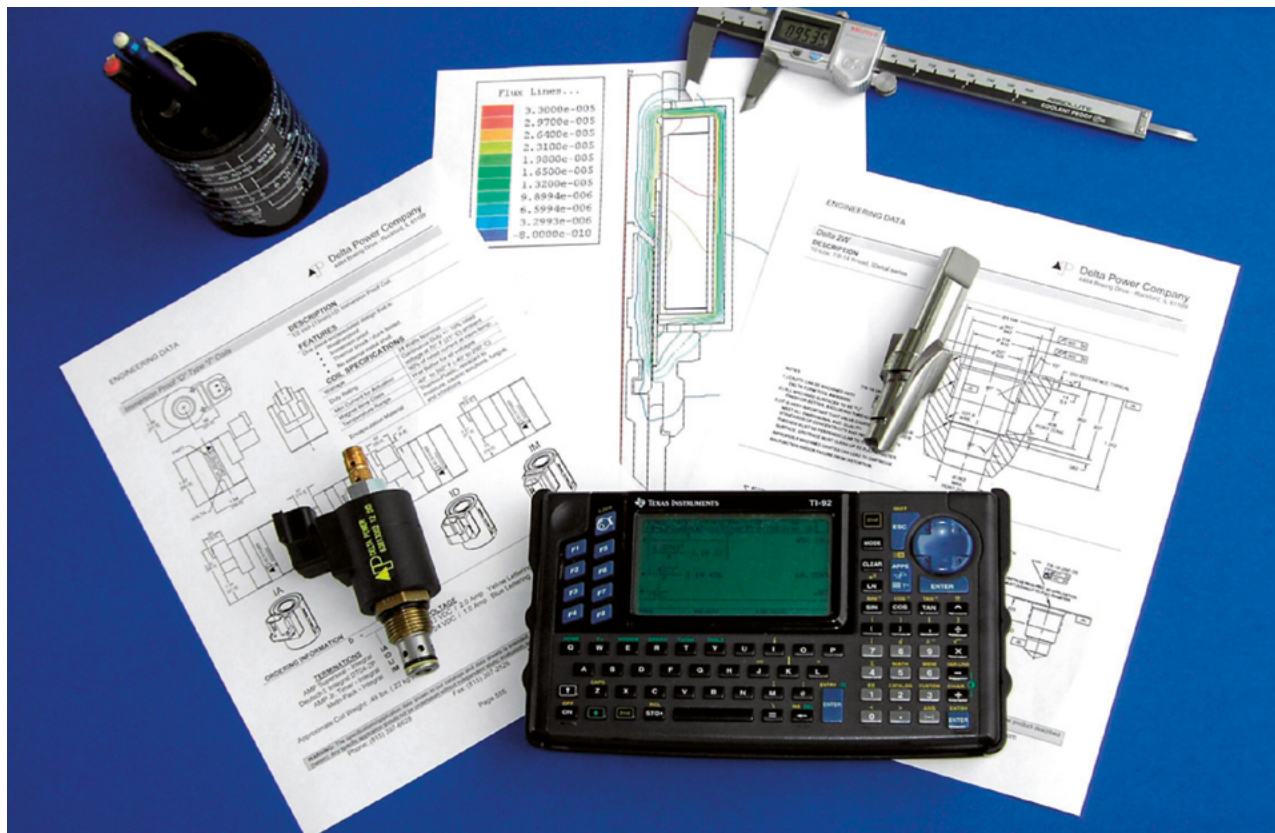


ENGINEERING DATA



Section / Description	page
CAVITY DATA	ED2
GENERAL INSTALLATION NOTE	ED28
VALVE MNEMONIC CODE	ED30

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CAVITY DATA

SERIES	SIZE	THREAD SIZE	TOOLS KIT	PAGE
T043		SLIP-IN	K-T043	ED3
T059		SLIP-IN	K-T059	ED4
T042		7/8-14 UNF 2B	K-T042	ED5
MINI 2 WAY	7	5/8-18 UNF 2B	40500003	ED6
MINI 3 WAY	7	5/8-18 UNF 2B	40500004	ED7
MINI 4 WAY	7	5/8-18 UNF 2B	40500006	ED8
POWER 2 WAY	8	3/4-16 UNF 2B	40500005	ED9
POWER 3 WAY	8	3/4-16 UNF 2B	40500024	ED10
POWER 4 WAY	8	3/4-16 UNF 2B	40500029	ED11
DELTA 2 WAY	10	7/8-14 UNF 2B	40500000	ED12
DELTA 2 WAY SPECIAL	10	7/8-14 UNF 2B	40500028	ED13
DELTA 3 WAY	10	7/8-14 UNF 2B	40500001	ED14
DELTA 4 WAY	10	7/8-14 UNF 2B	40500002	ED15
TECNORD 2 WAY	12	1 1/16-12 UNF 2B	40500032	ED16
TECNORD 3 WAY SHORT	12	1 1/16-12 UNF 2B	40500033	ED17
TECNORD 3 WAY	12	1 1/16-12 UNF 2B	40500034	ED18
TECNORD 4 WAY	12	1 1/16-12 UNF 2B	40500035	ED19
TECNORD 5 WAY SHORT	12	1 1/16-12 UNF 2B	40500037	ED20
SUPER 2 WAY	16	1 5/16-12 UNF 2B	40500017	ED21
SUPER 3 WAY SHORT	16	1 5/16-12 UNF 2B	40500021	ED22
SUPER 3 WAY	16	1 5/16-12 UNF 2B	40500018	ED23
SUPER 4 WAY	16	1 5/16-12 UNF 2B	40500019	ED24
SUPER 5 WAY SHORT	16	1 5/16-12 UNF 2B	40500020	ED25
SUPER 5 WAY	16	1 5/16-12 UNF 2B	40500038	ED26
QS SPECIAL 3W	10	M20 X 1.5-H6	40500012	ED27

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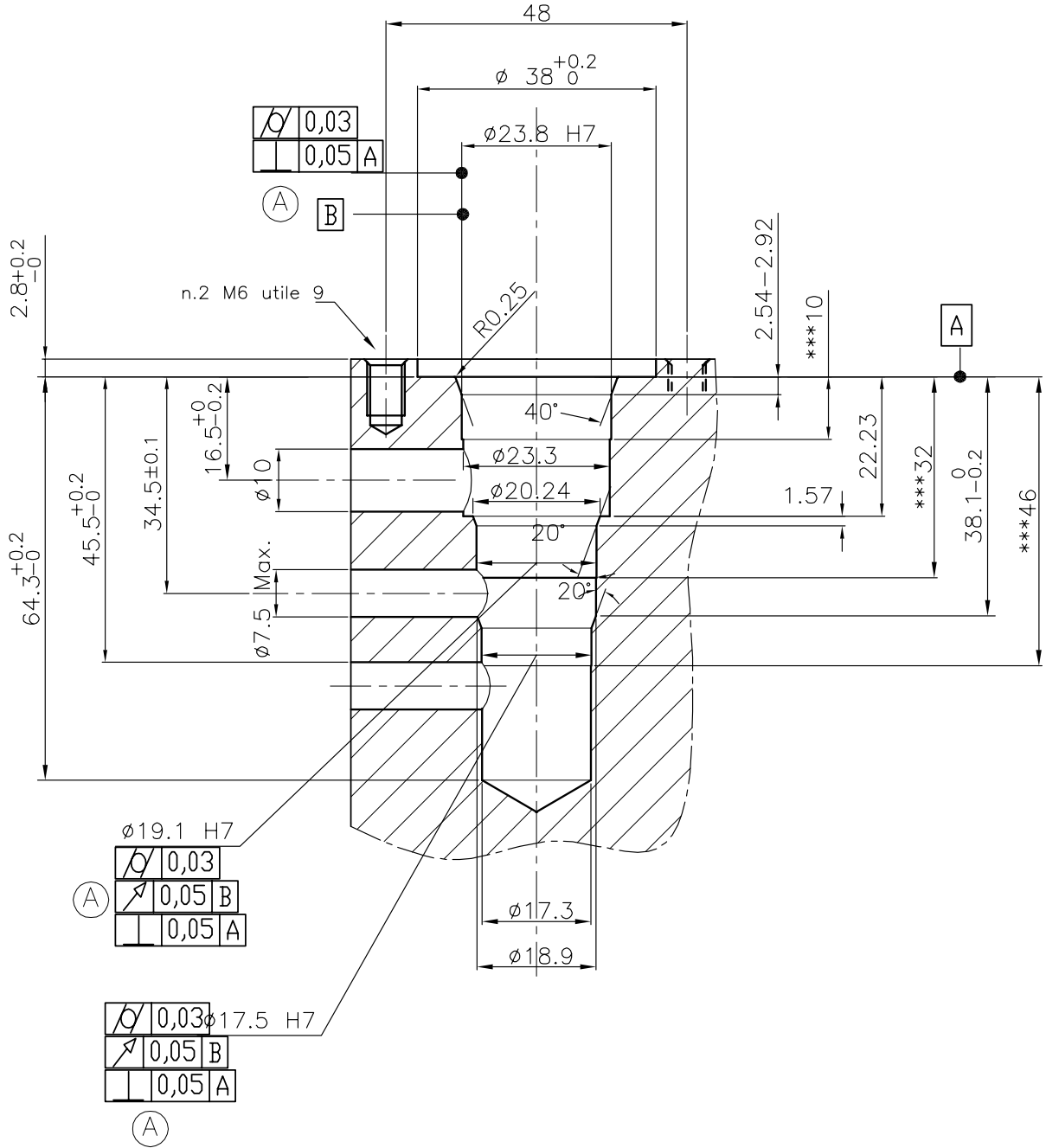


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T059 SLIP-IN CAVITY FOR IP-PRZ-59 CARTRIDGE



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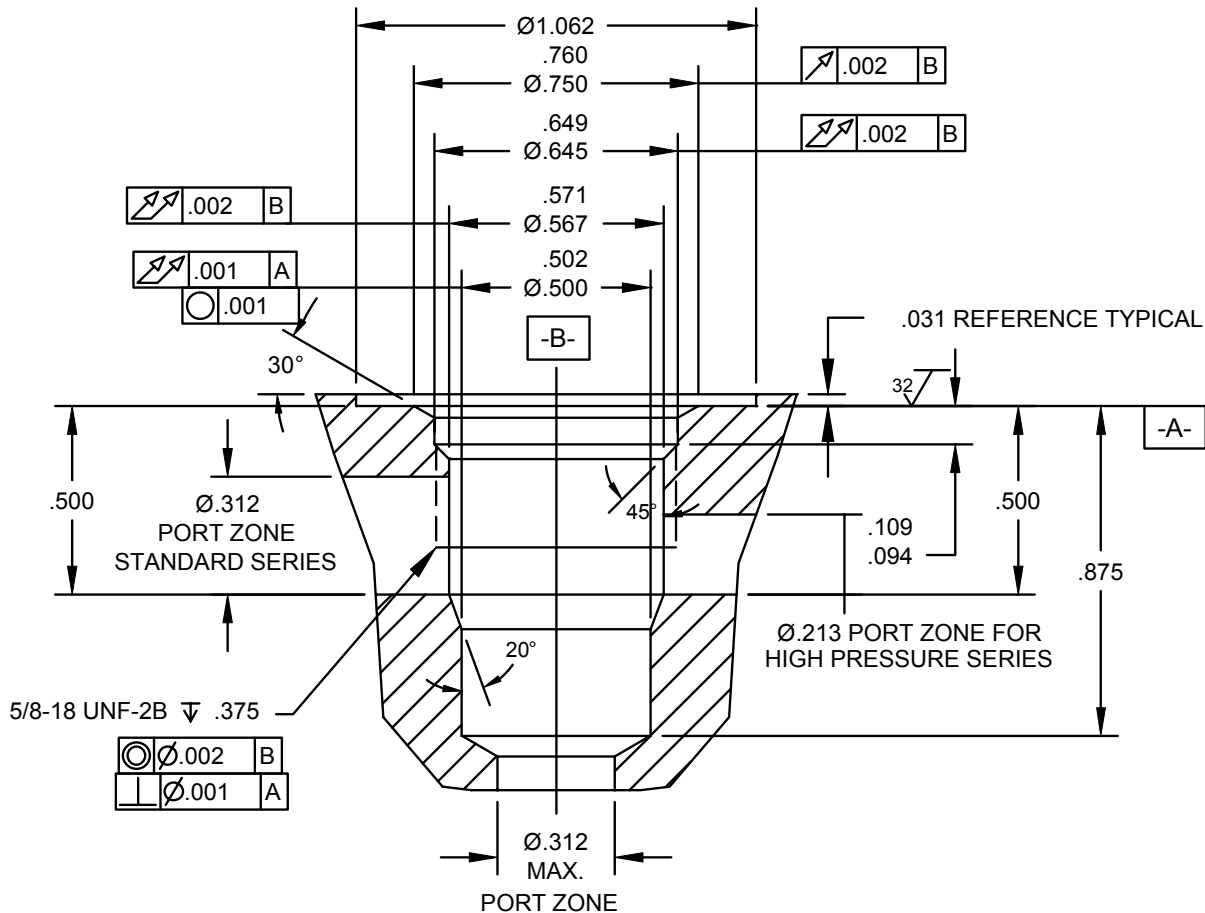
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MINI 2W 7 SIZE, 5/8-18 THREAD "MINI" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500003.
2. ALL MACHINED SURFACES TO BE $32\sqrt{Rz}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.
4. PORT ZONE IS $\varnothing 0.213$ MAXIMUM AT PORT #1 ONLY FOR HIGH PRESSURE SERIES MINI VALVES (HA-***-**).

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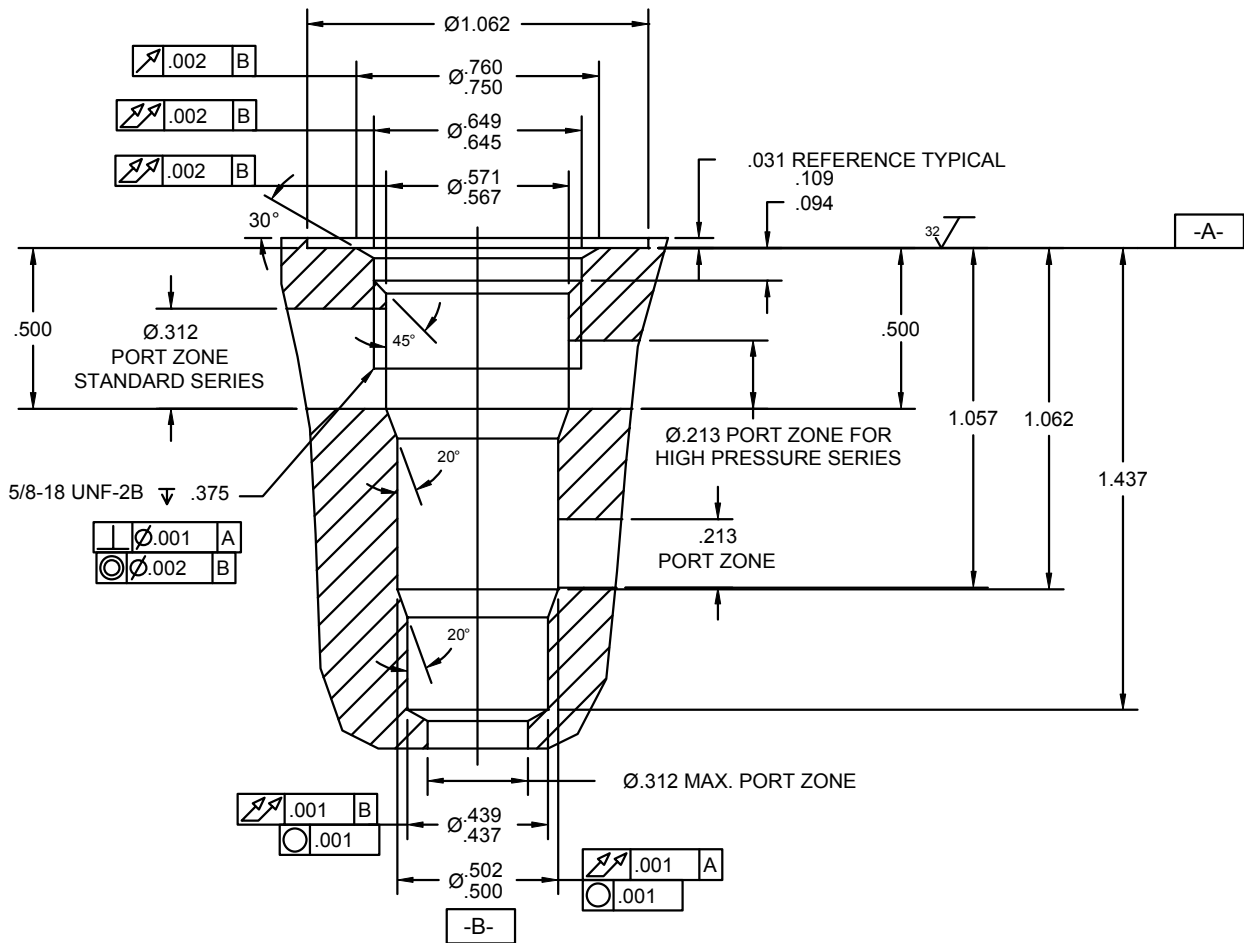
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MINI 3W 7 SIZE, 5/8-18 THREAD "MINI" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500004.
2. ALL MACHINED SURFACES TO BE $32\sqrt{\text{Ra}}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.
4. PORT ZONE IS $\varnothing .213$ MAXIMUM AT PORT #1 ONLY FOR HIGH PRESSURE SERIES MINI VALVES (HA-***-***).

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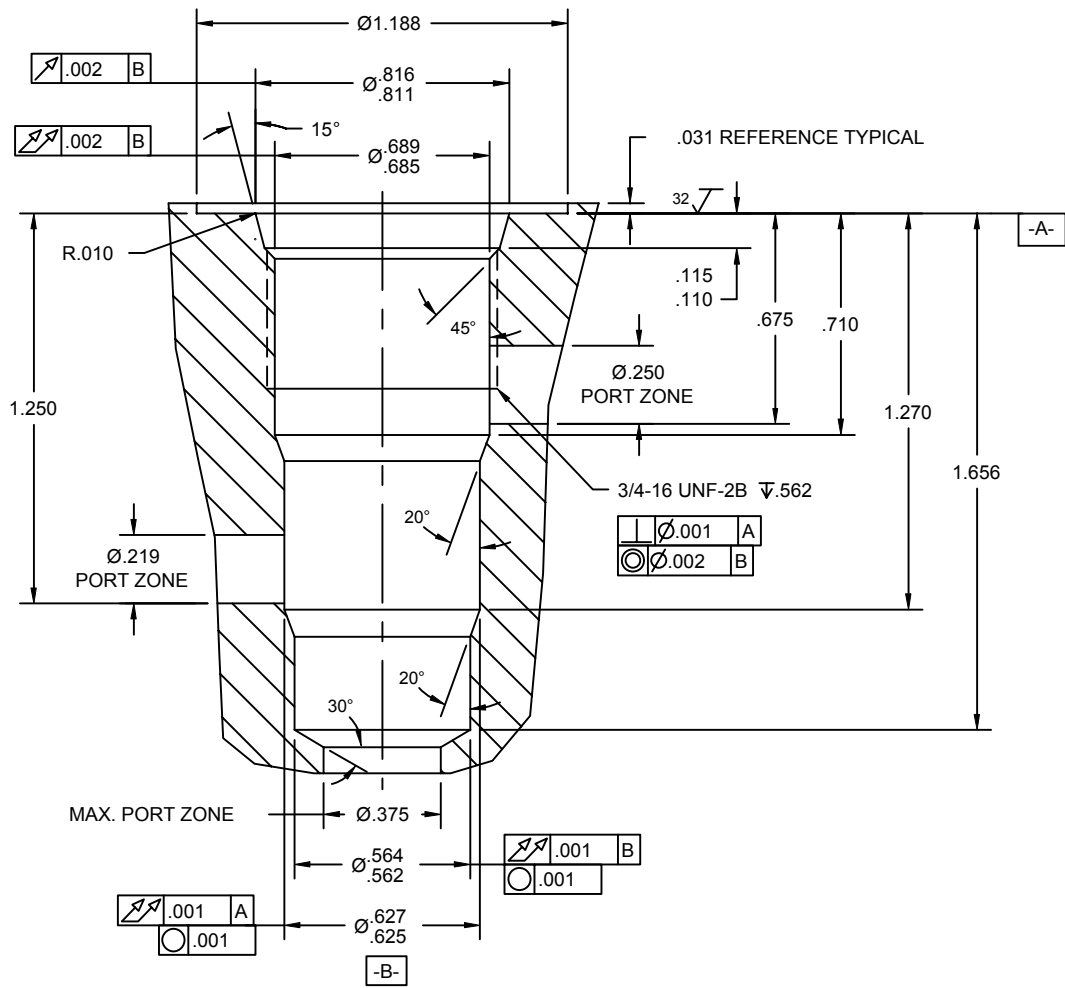


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POWER 3 WAY 8 SIZE, 3/4-16 THREAD "POWER" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500024.
2. ALL MACHINED SURFACES TO BE $32 \sqrt{\text{}}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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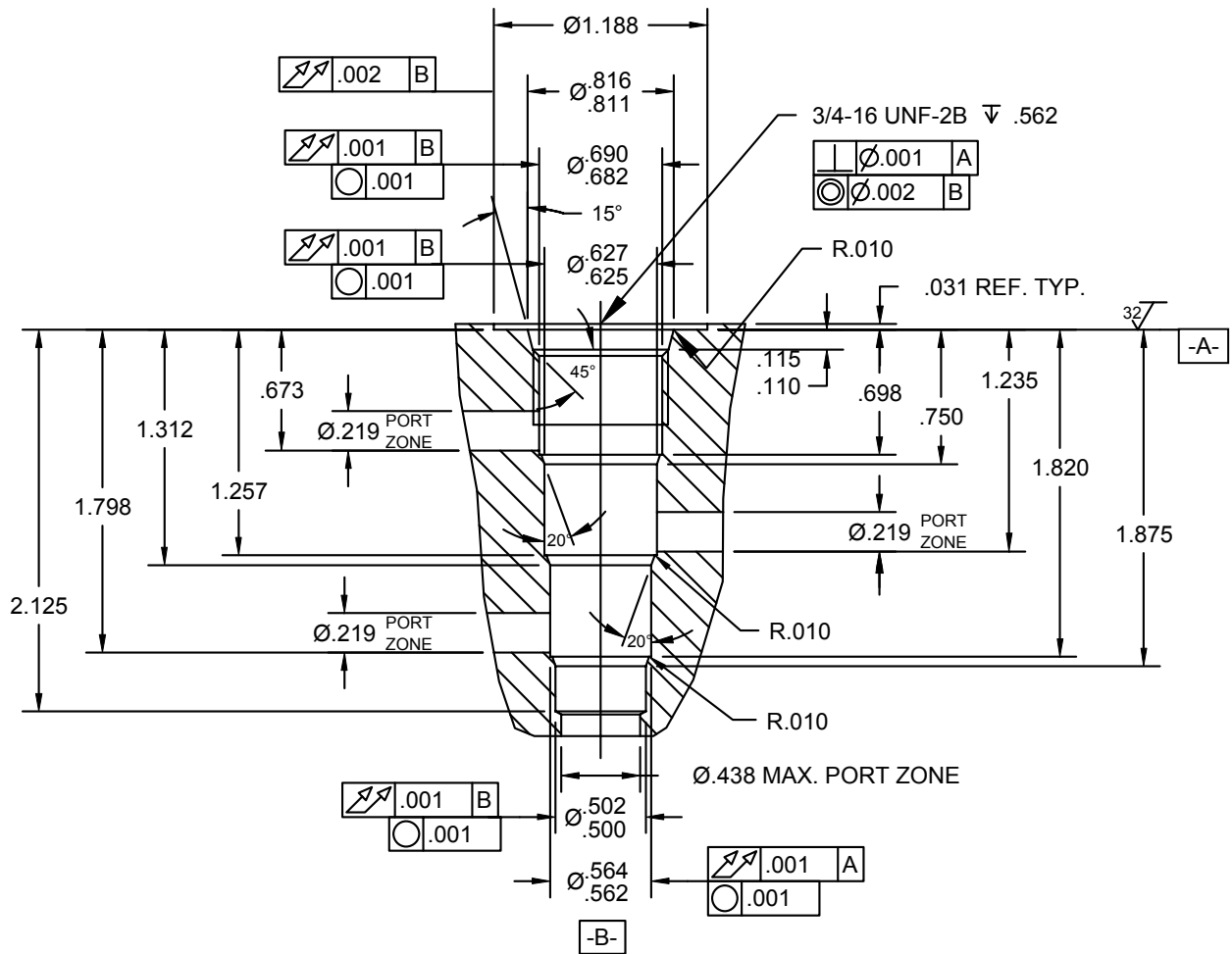


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POWER 4 WAY 8 SIZE, 3/4-16 THREAD "POWER" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500029.
2. ALL MACHINED SURFACES TO BE 32 $\sqrt{}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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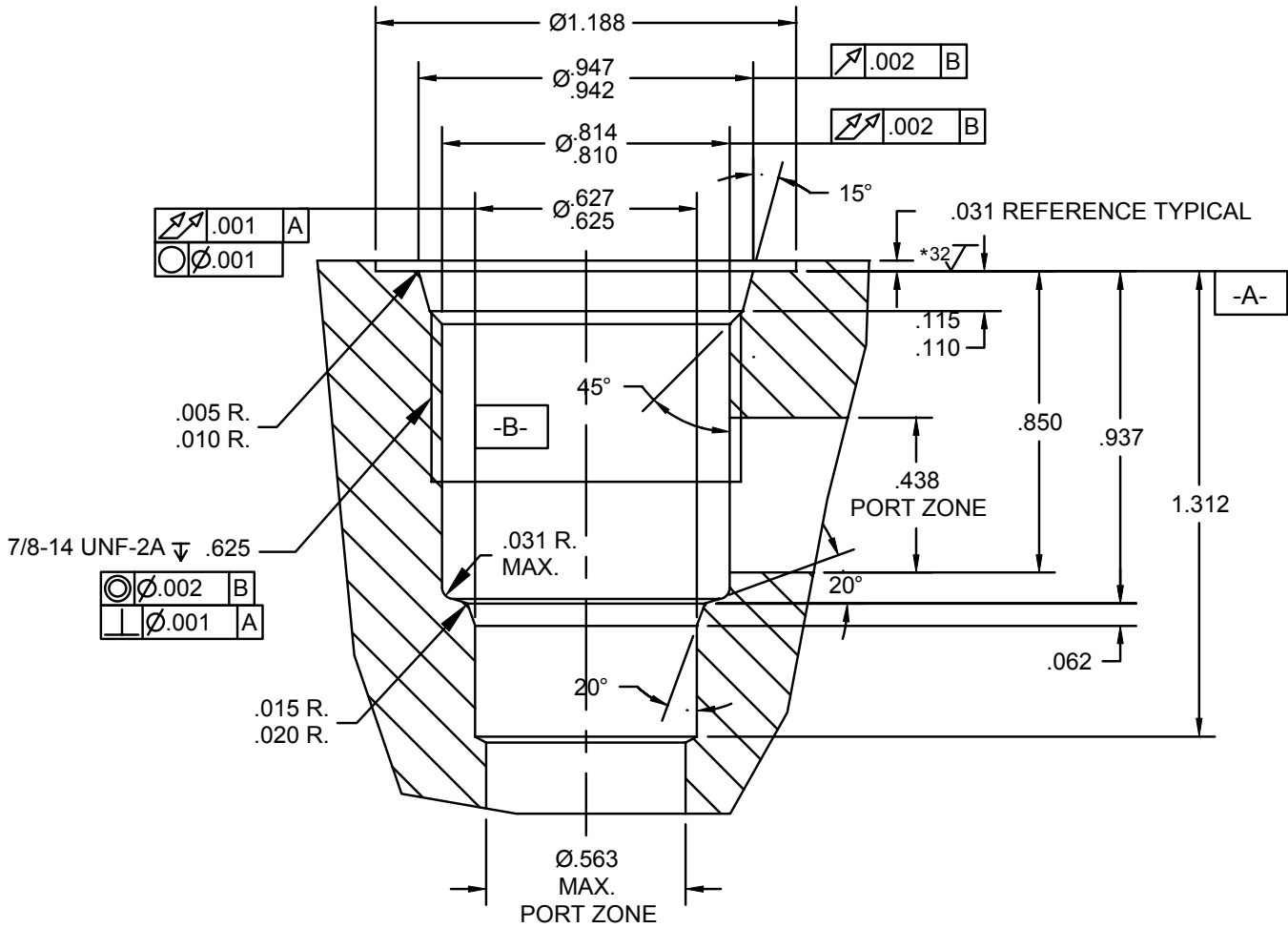


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DELTA 2 WAY 10 SIZE, 7/8-14 THREAD "DELTA" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500000.
2. ALL MACHINED SURFACES TO BE $\sqrt{32}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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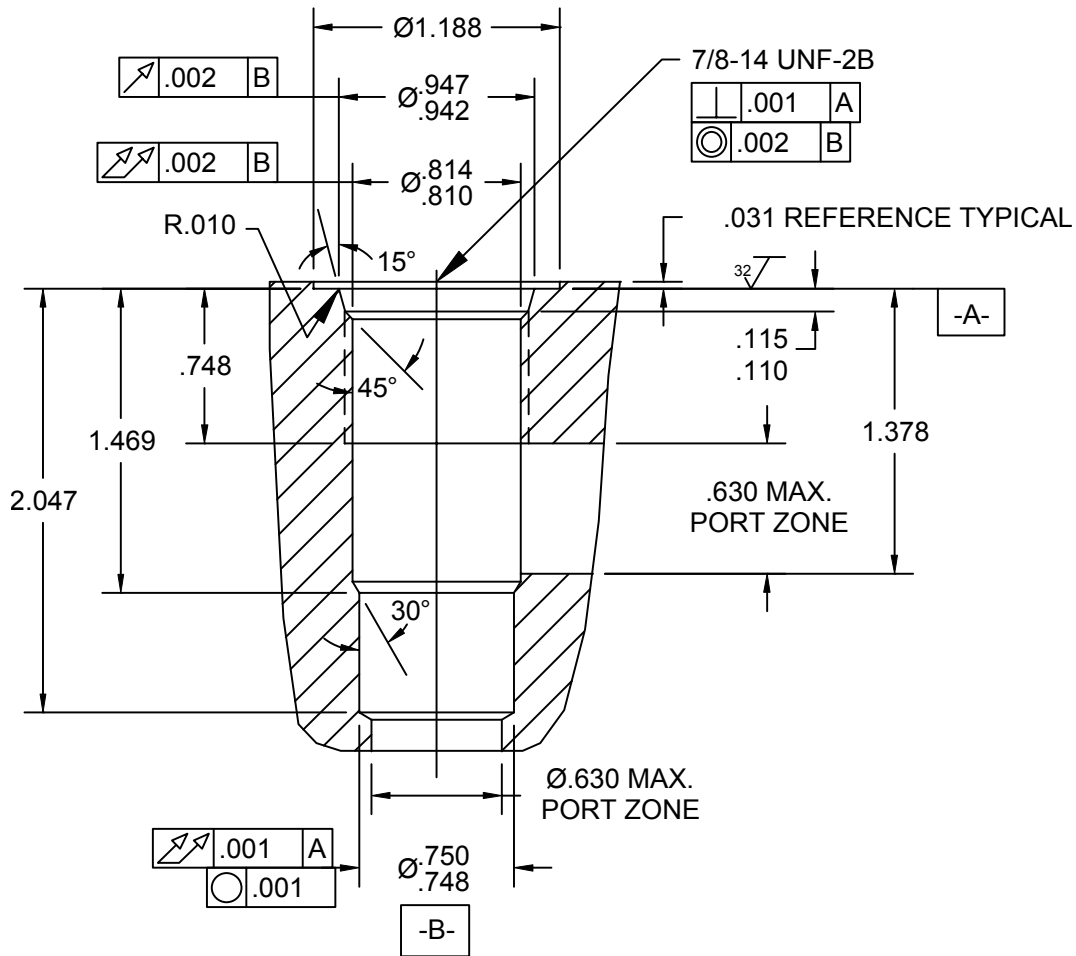


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DELTA 2 WAY SPECIAL 10 SIZE, 7/8-14 THREAD "DELTA" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500028.
2. ALL MACHINED SURFACES TO BE $32\sqrt{\text{ }}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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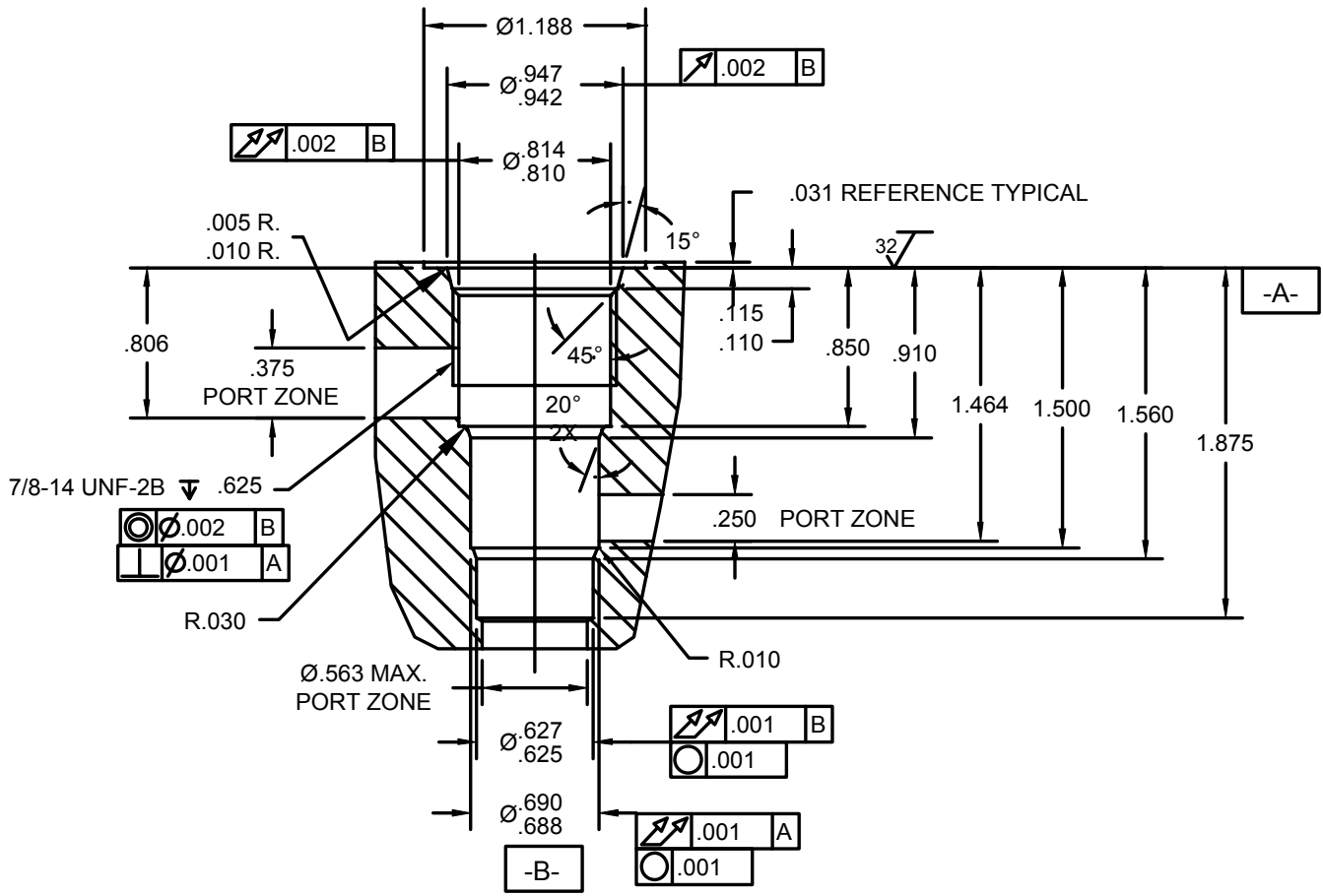


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DELTA 3 WAY 10 SIZE, 7/8-14 THREAD "DELTA" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500001.
2. ALL MACHINED SURFACES TO BE 32√ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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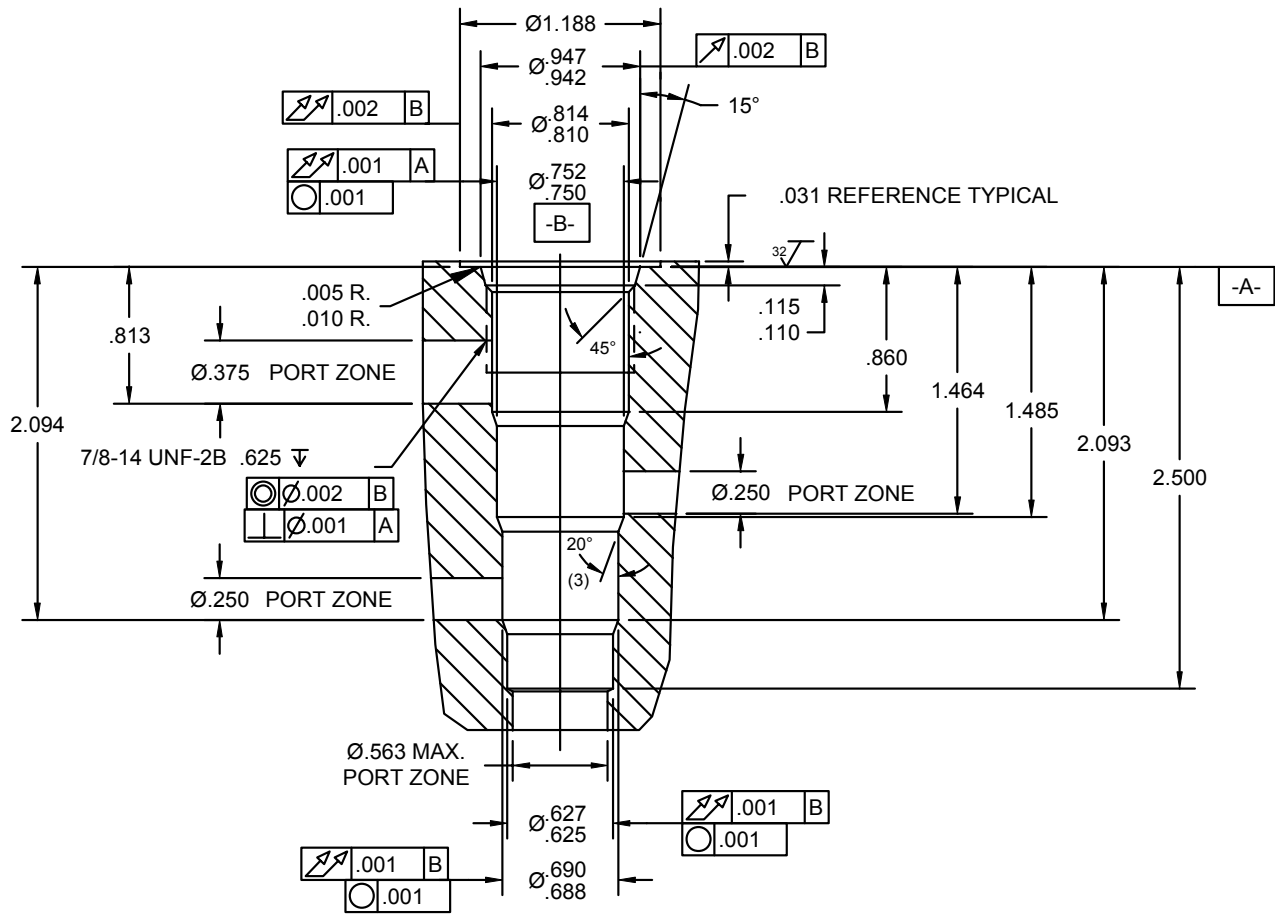


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DELTA 4 WAY 10 SIZE, 7/8-14 THREAD "DELTA" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500002.
2. ALL MACHINED SURFACES TO BE 32 \sqrt FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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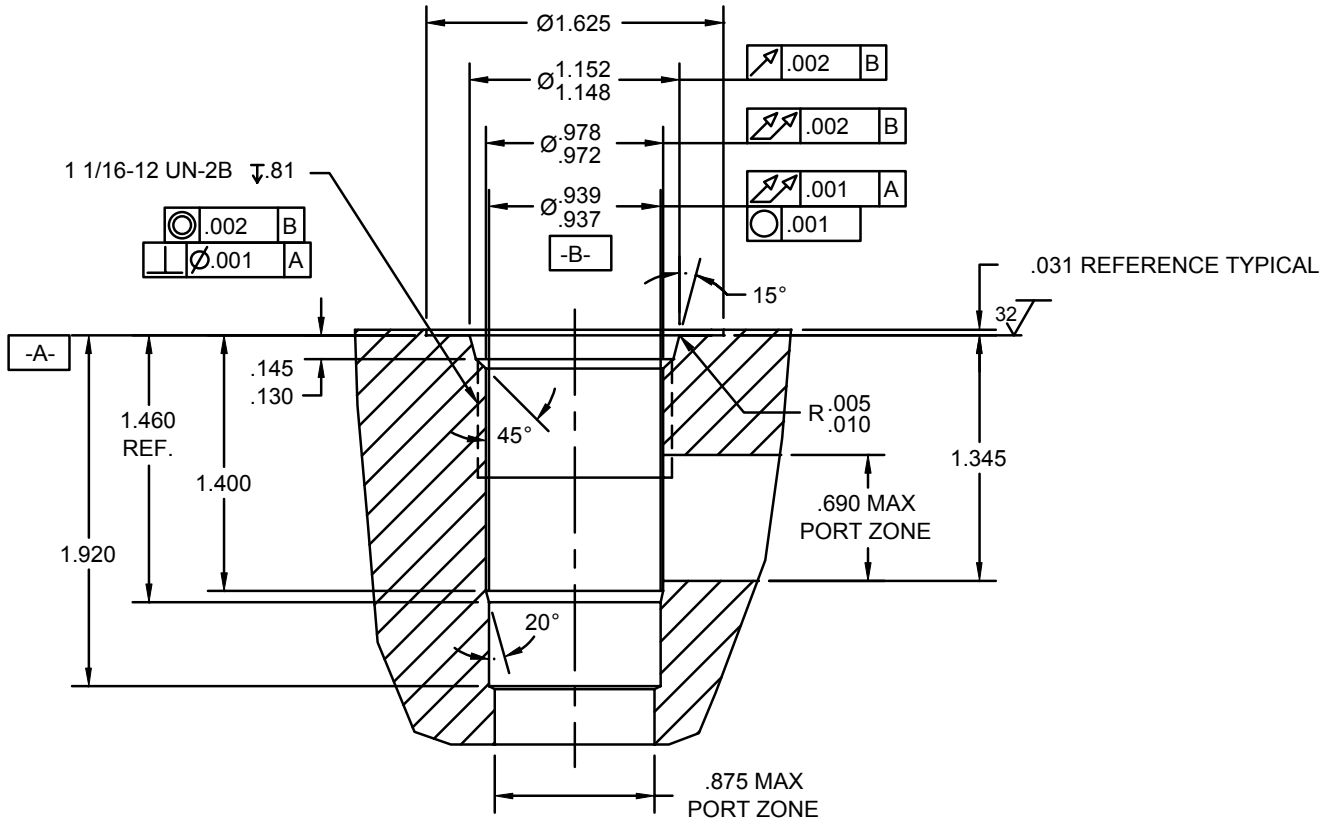


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TECNORD 2 WAY 12 SIZE, 1 1/16-12 THREAD "TECNORD" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500032.
2. ALL MACHINED SURFACES TO BE $\sqrt{32}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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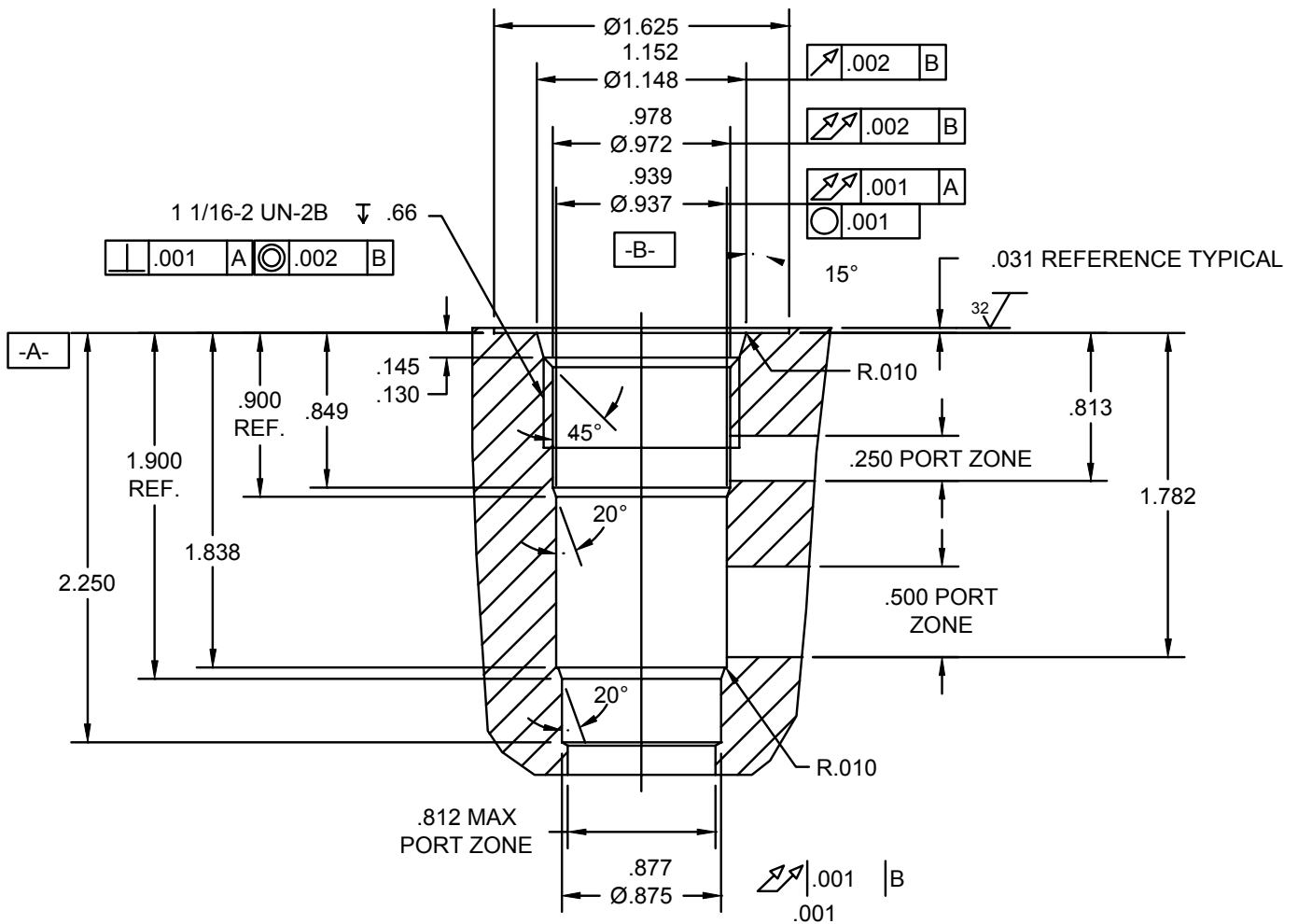


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TECNORD 3 WAY SHORT 12 SIZE, 1 1/16-12 THREAD "TECNORD" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500033.
2. ALL MACHINED SURFACES TO BE 32[√] FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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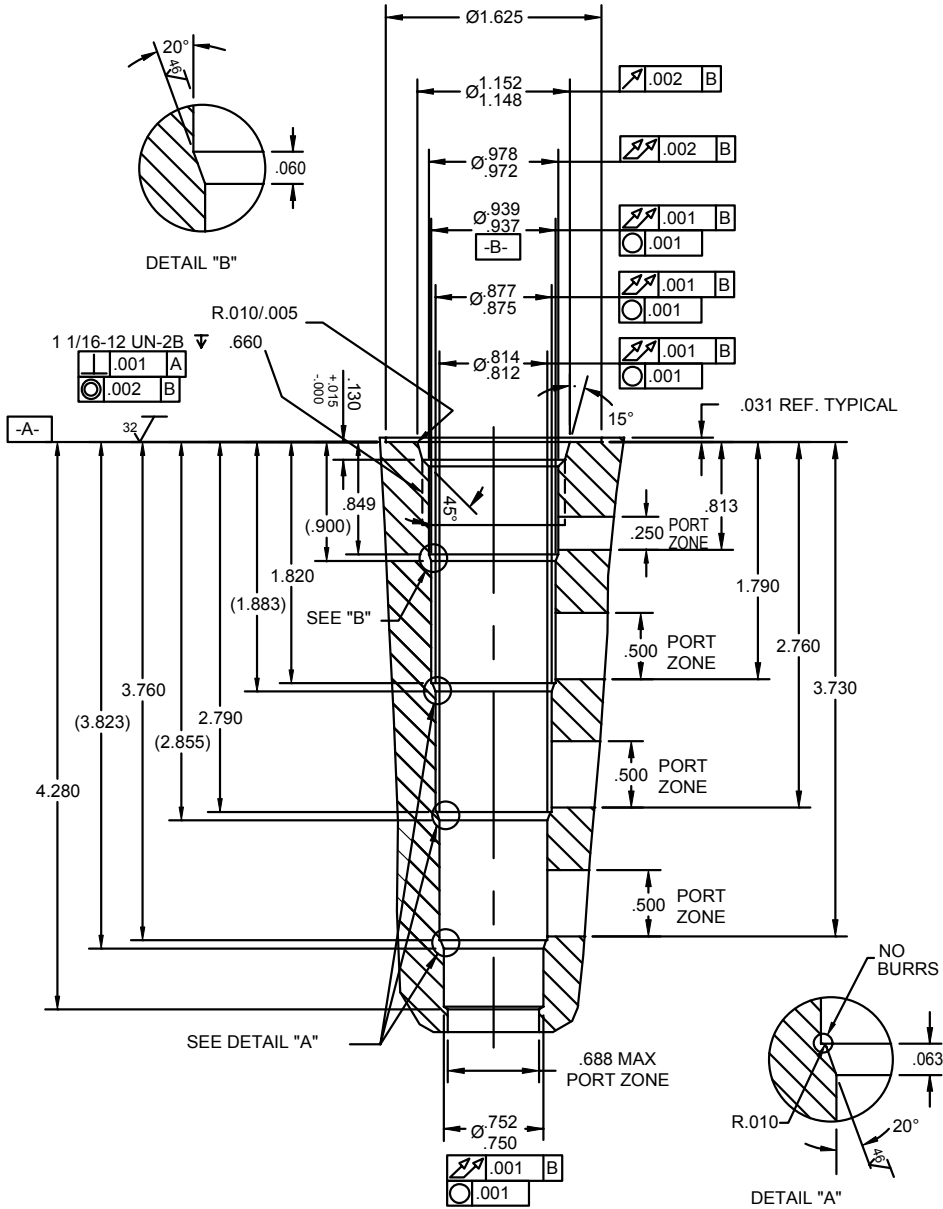


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TECNORD 5 WAY SHORT 12 SIZE, 1 1/16-12 THREAD "TECNORD" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500037.
2. ALL MACHINED SURFACES TO BE $32\sqrt{}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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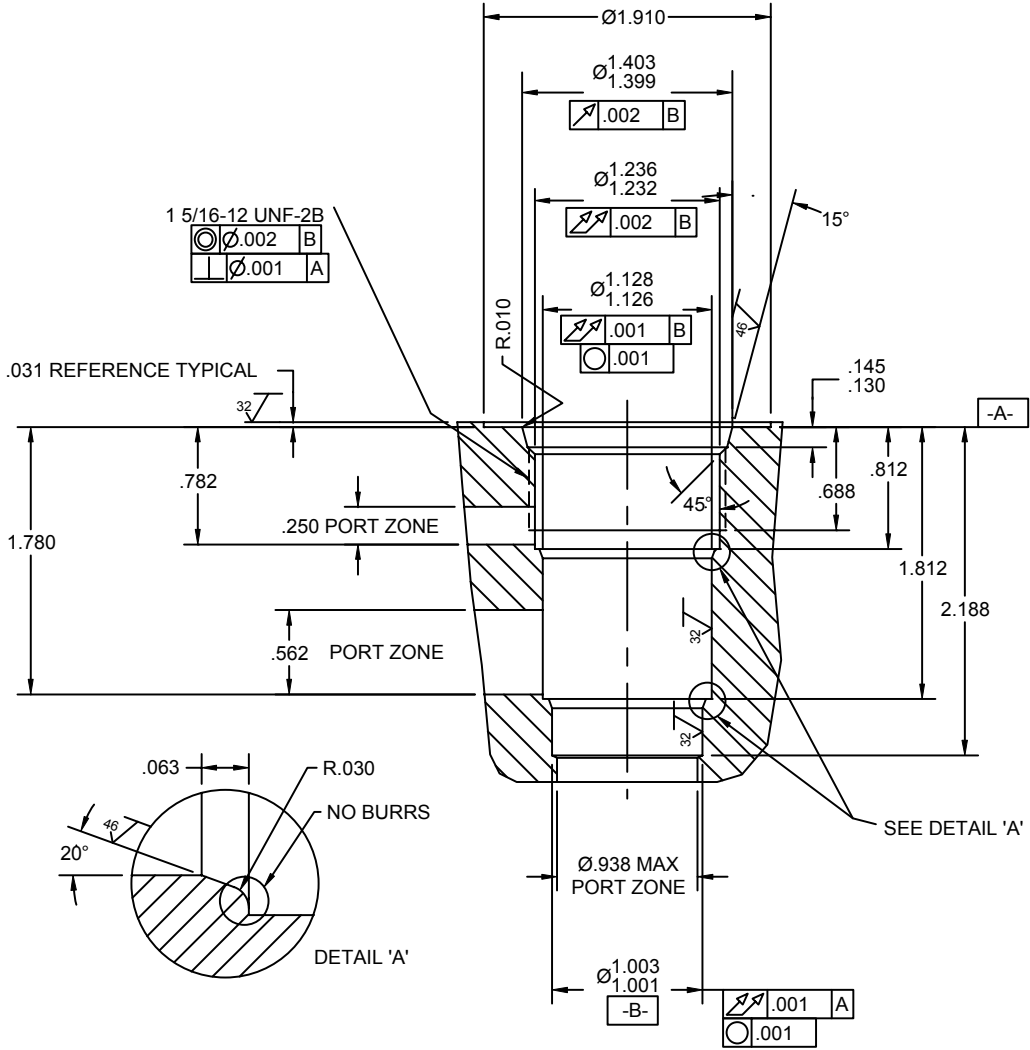
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SUPER 3 WAY SHORT 16 SIZE, 1 5/16-12 THREAD "SUPER" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500021.
2. ALL MACHINED SURFACES TO BE $32\sqrt{\text{ }}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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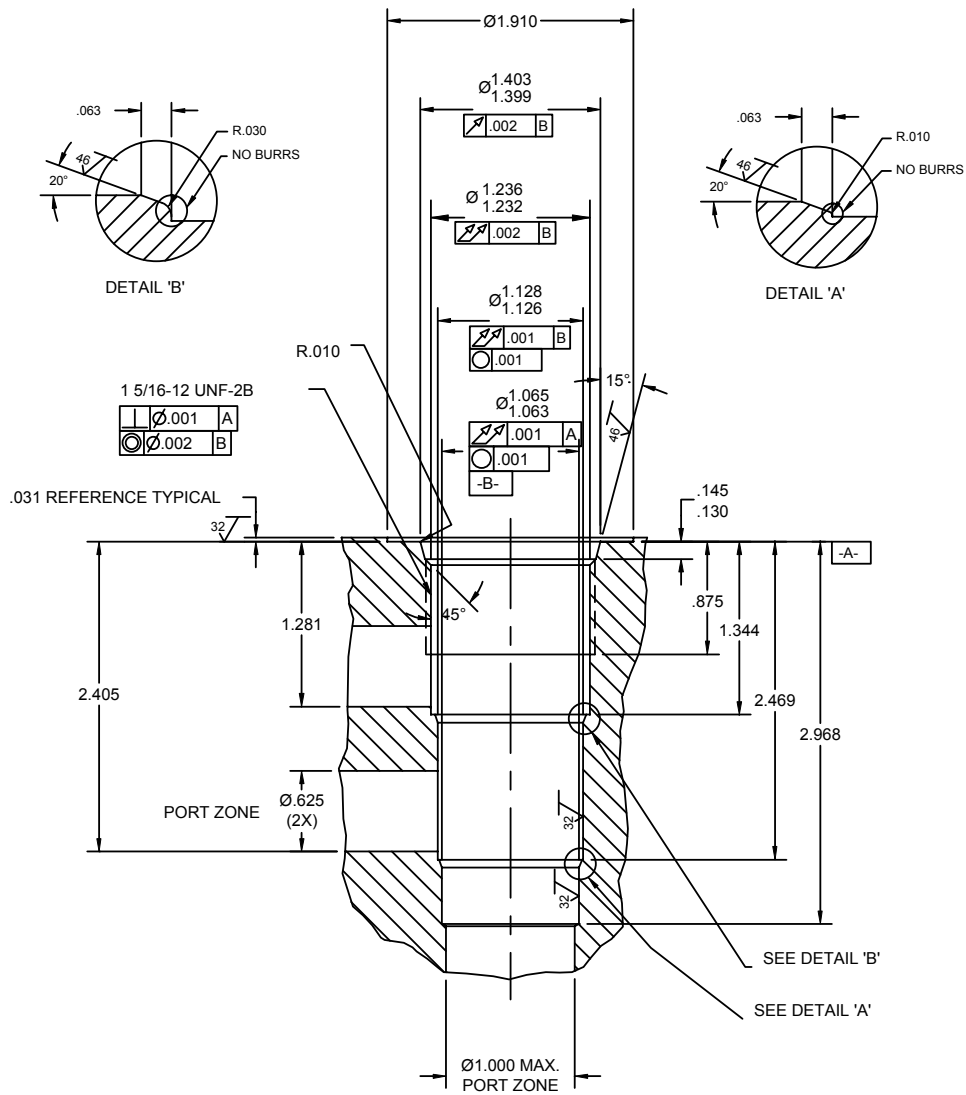
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SUPER 3 WAY 16 SIZE, 1 5/16-12 THREAD "SUPER" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500018.
2. ALL MACHINED SURFACES TO BE 32/ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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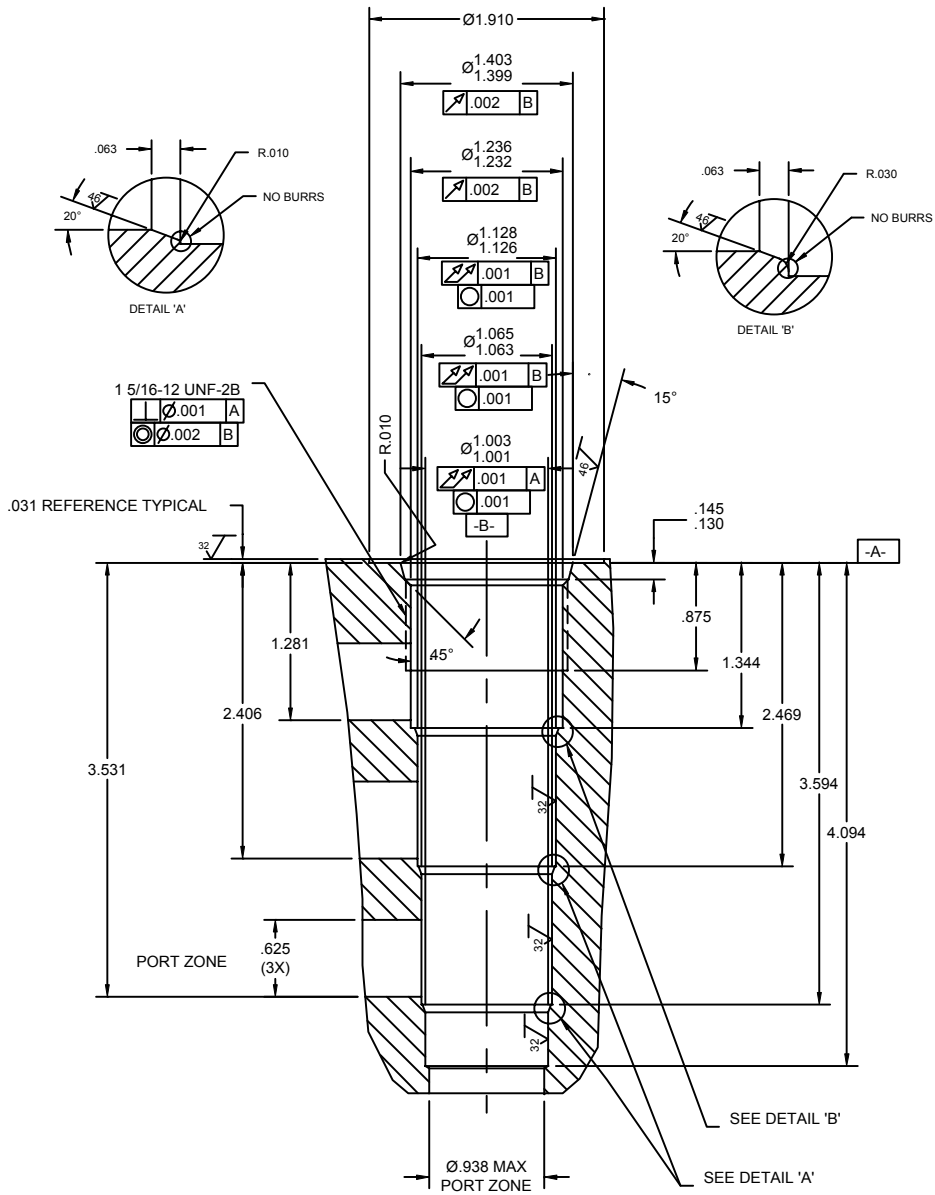


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SUPER 4 WAY 16 SIZE, 1 5/16-12 THREAD "SUPER" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500019.
2. ALL MACHINED SURFACES TO BE $32\sqrt{}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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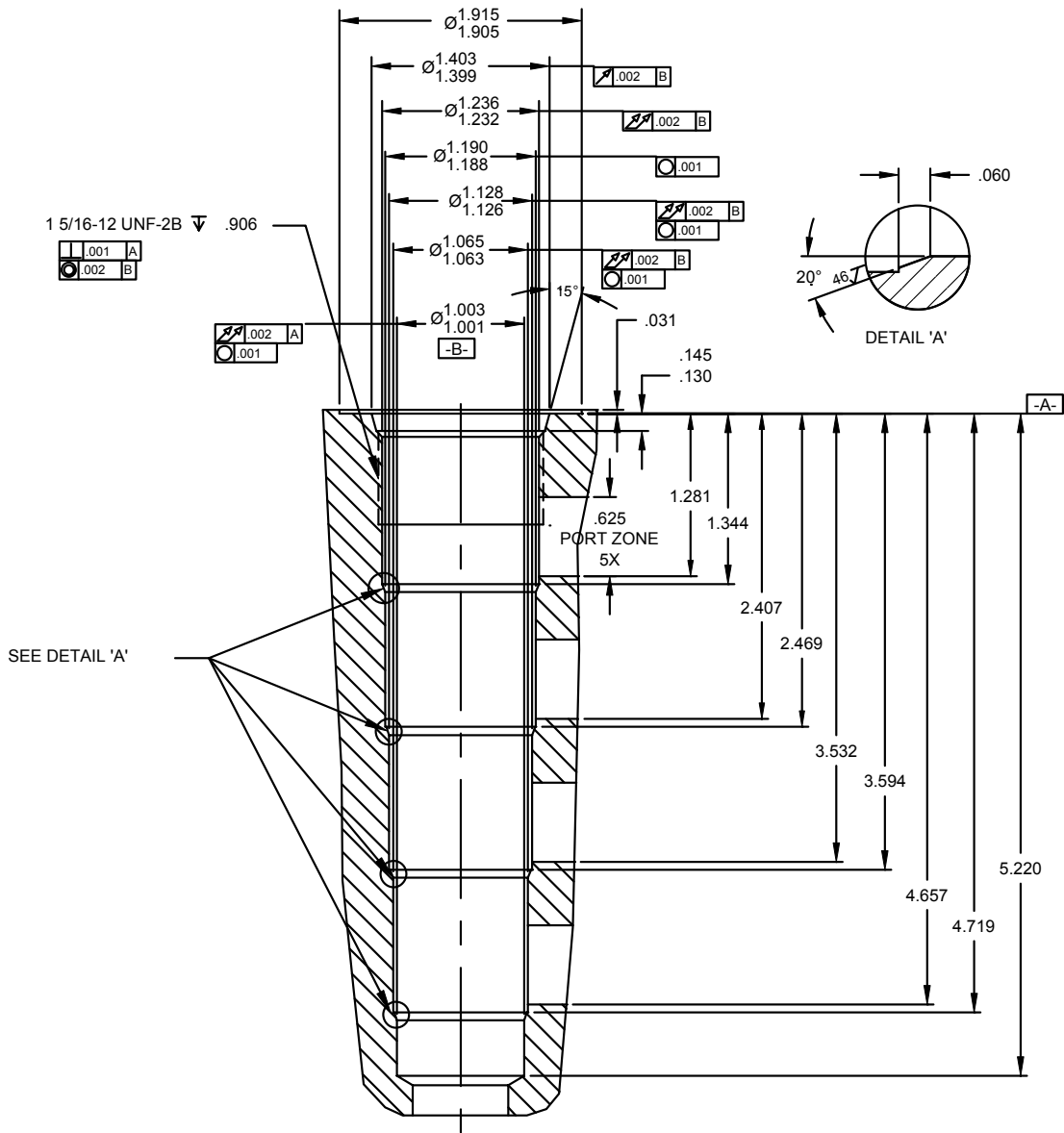
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SUPER 5 WAY 16 SIZE, 1 5/16-12 THREAD "SUPER" SERIES



NOTES:

- 1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500038.
- 2. ALL MACHINED SURFACES TO BE $\sqrt{32}$ FINISH OR BETTER, EXCLUDING THREADS.
- 3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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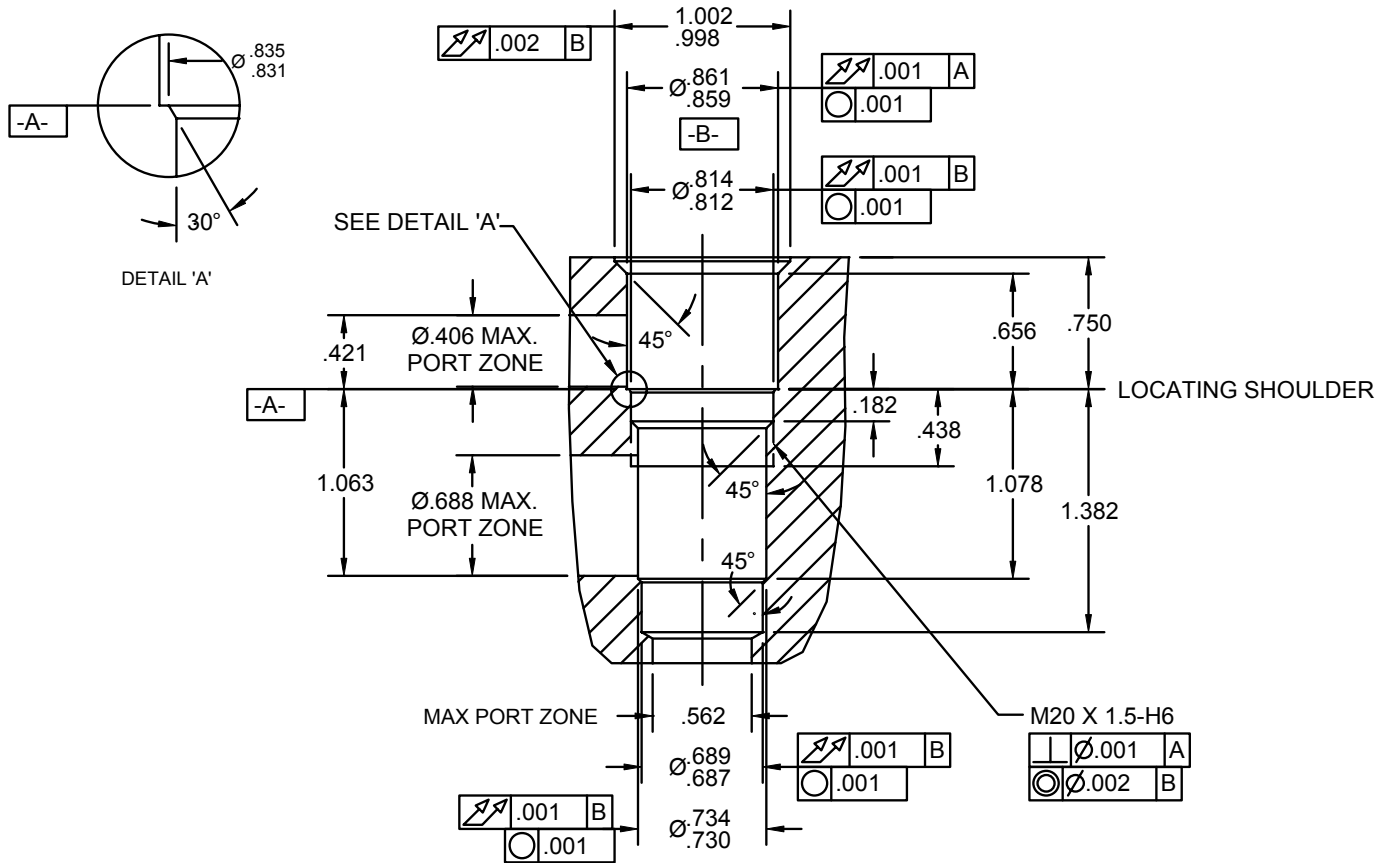
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QS SPECIAL 3 WAY METRIC M20-1.5-H6 THREAD "SPECIAL" SERIES



NOTES:

1. CAVITY CAN BE MACHINED WITH DELTA FORM TOOL #40500012.
2. ALL MACHINED SURFACES TO BE $32\sqrt{}$ FINISH OR BETTER, EXCLUDING THREADS.
3. IT IS VERY IMPORTANT THAT VALVE CAVITIES MEET ALL DIMENSIONAL AND QUALITY STANDARDS OF CONCENTRICITY AND PERPENDICULARITY. THREADS MUST BE PERPENDICULAR TO THE SPOTFACE SURFACE. SPOTFACE MUST CLEAN UP TO FULL DIAMETER. IMPROPERLY MACHINED CAVITIES CAN LEAD TO CARTRIDGE MALFUNCTION AND/OR FAILURE FROM DISTORTION.

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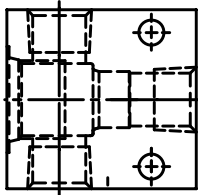
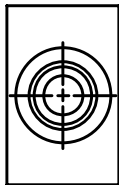


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GENERAL INSTALLATION NOTE



VALVE BODIES

Check the cartridge brochure to assure correct plumbing.

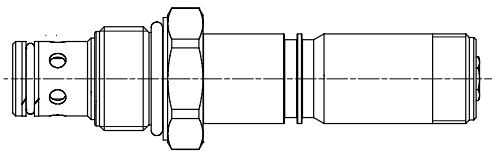
Inspect the cavity for burrs and any irregular machining which would damage O-rings at assembly.

Shims may be required behind the block for panel mounting.

ASSEMBLY

Dip the cartridge in clean oil before installing.

Screw the cartridge in by hand until the top O-ring is touching to the proper torque specification the manifold, then wrench tighten given below.



TORQUE SPECIFICATIONS

Final Cartridge Tightening:

Series	Torque
5/8 MINI	14-20 Nm (10-15 ft-lbs)
3/4 POWER	27-34 Nm (20-25 ft-lbs)
7/8 DELTA	34-40 Nm (25-30 ft-lbs)
1 1/16 TECNORD	81-95 Nm (60-70 ft-lbs)
1 5/16 SUPER	108-122 Nm (80-90 ft-lbs)

Adjusting Holding Parts:

Part	Torque
Nut	4-8 Nm (3-5 ft-lbs)
Knob	4-8 Nm (3-5 ft-lbs)

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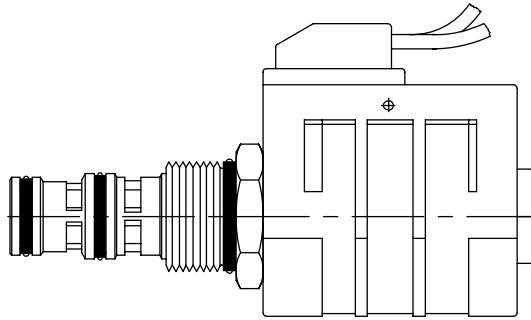


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GENERAL CARTRIDGE VALVE INSTALLATION NOTES

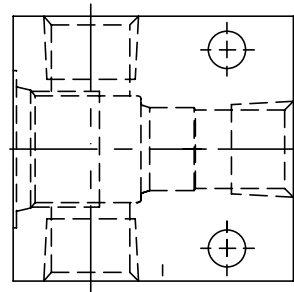
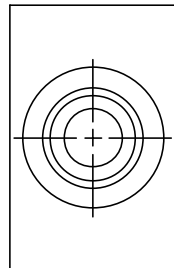


CARTRIDGES

Inspect the cartridge to assure there is no external contaminant present.
 Check O-rings and back-up rings to assure they are intact and in the correct position. The O-rings should always be toward the high pressure port or between doubled back-up rings on bidirectional applications.

COILS

It is sometimes easier to remove the coil from the cartridge valve to install terminations or make connections with conduit, etc. If this is the case, reinstall the coil by tightening the coil nut to 4-6 ft lbs per spec sheet. **CAUTION: DO NOT OVER TORQUE** Tube will be stretched and damaged, causing valve to fail.



VALVE BODIES

Check the cartridge brochure to assure correct plumbing.
 Inspect the cavity for burrs and any irregular machining which would damage O-rings at assembly. Shims may be required behind the block for panel mounting.

ASSEMBLY

Dip the cartridge in clean oil before installing.
 Screw the cartridge in by hand until the top O-ring is touching the manifold, then wrench tighten to the proper torque specification given below.

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VALVE MNEMONIC CODE

First letter is the valve series:

- M** = MINI (5/8")
- P** = POWER (3/4")
- D** = DELTA (7/8")
- T** = TECNORD (1 1/16")
- S** = SUPER (1 5/16")
- I** = INLINE/UNITIZED
- E** = ELECTRONIC PROPORTIONAL
- A** = MOTORIZED
- Q** = SPECIALS
- H** = 4000/5000 PSI RATED

The second letter is the cavity:

M= Inline S= Special

	MINI	POWER	DELTA	TECNORD	SUPER
2 WAY	A	B	E	T	J
3 WAY	C	P	F	U	K
3 Way Short				R	L
4 WAY	D	Q	G	V	N
5 Way Short				X	O
5 Way					I

The third letter is the type of valve:

- R** = RELIEF
- C** = CHECK & LOAD HOLDING
- N** = NEEDLE
- P** = PRESSURE CONTROLLED
- S** = SOLENOID
- M** = MANUAL
- F** = FLOW CONTROL

The third, fourth, and fifth characters combined describe the valve function. It is these characters that are stamped on the valve. Examples:

- S2A** = SOLENOID 2 WAY POPPET
- S3A** = SOLENOID 3 WAY SPOOL
- S4A** = SOLENOID 4 WAY CRISS SPOOL
- RVA** = RELIEF DIRECT ACTING
- MCB** = MAN NC DETENT
- P2A** = PROPORTIONAL 2 WAY
- PRP** = PRESSURE REDUCING
- CVC** = GUIDED BALL CHECK
- FCH** = FLOW CONT REV FLOW
- NVB** = NEEDLE COARSE ADJ

The sixth and seventh characters combined cover the o-ring, screen, override, knob and other options. Example:

- 00** = STANDARD DEFAULT CONFIGURATION
- VK** = VITON O-RINGS, KNOB ADJUSTMENT
- B3** = BUNA, SCREEN, OVERRIDE NONDETENT

The eighth through eleventh characters describe the solenoid, flow range, or pressure range. Pressure or flow is specified as a range or a particular setting. Example:

- DL12** = DUAL LEAD 12 VDC
- DS24** = DUAL SPADE 24VDC
- HC24** = HIRSCHMANN 24 VDC
- CL11** = CONDUIT LEAD 120VAC
- 0005** = 5 PSI CRACK
- 1500** = 1500 MAX PRESS
- 03.0** = 3 GPM MAX FLOW
- 6-10** = 6 TO 10 G.P.M. FLOW RANGE

The final character is the body port style:

- N** = BSP / NPT
- S** = SAE

M A - R V A - V K - 1 5 0 0 - S
D E - S 2 A - 0 M - H C 1 2 - N
1 2 - 3 4 5 - 6 7 - 8 9 10 11 - 12

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