

HUBBS MACHINE & MANUFACTURING, INC. ®

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Hubbs Machine & Manufacturing, Inc. was started in 1984 to manufacture and distribute targeting and accessories for support of Computer Aided Theodolite Systems. We now support several coordinate measuring systems including Theodolite, Photogrammetry, Videogrammetry, Laser Tracker, and other emerging coordinate measurement systems.

We, at Hubbs Machine & Manufacturing, Inc., offer Quality Targeting, Accessories and Tooling Components, allowing for many options and preferences in design.

The following sketches are some examples of many variations which are possible in Standard Theodolite, Retro-Reflective Targeting, Laser Tracker Adaptors and Accessories.

For any special applications regarding targeting, accessories and related items, please call, or fax us a sketch of your design.

Hubbs Machine & Manufacturing, Inc. will alter a current design to meet your targeting needs, when possible. We will design targets and/or accessories to meet your special applications.

Hubbs Machine & Manufacturing, Inc. will also work to your blueprints or sketches. In addition, feel free to call on us for your general machine work.

GENERAL NOTES

Material is 1144 Steel with Black Oxide Finish.

Target dots are located within:

±.0005 on Height (Unless otherwise noted)

±.0005 in relationship of C/L of shank or Body


All locating shoulders or locating bases are perpendicular to the centerline of the shank and / or body to within .0003 per inch.

Shank "A" diameter may be any size up and including 1.000 with a standard tolerance of +.0000 / -.0005. Some limitations apply.

Dot size, "D" diameter, for Standard Theodolite Targeting is approximately .010, .020, .030 and .040 with a single reference ring. Standard color is Yellow on Black Face. Most commonly stocked dot size is .020.

Dots and Rings are filled with a hard colored filler that holds up well to handling, dirt, oils, solvents and other shop environments.

Target faces have a light textured finish to reduce glare.

 size, "D" diameter, for hard bodied Retro-Reflective targeting, range from approximately up to and including .787 (20mm). Some target dot size limitations apply.

Dot sizes available are - .030, .062, .092, .125, .157, .187, .200, .250, .312, .375, .500 and .787 (20mm).

Standard height, "H" dimensions, are .3125, 12mm, .500, 24mm, and 1.000.

For special requirements, please call for quote.

Minimum quantities may apply.

Due to the limitless needs for special adaptive targeting and accessories to support unusual and special applications, it is sometimes necessary to make available, (when possible and practical), minor target design alterations. Examples, (extra long shanks, extra short shanks, extra large body diameters, etc. These needs are determined, and originated by the end users and does not alter the accuracy of the target or accessory. All HUBBS standard tolerancing still applies.

HOW TO ORDER

TO ORDER: STANDARD THEODOLITE TARGET

SPECIFY PART NO. AS SHOWN

EXAMPLE: TARGET, STRAIGHT-ON

TSO - 500 - 2500 - 020

"H" - HEIGHT  "D" - DOT DIAMETER 

"A" - SHANK DIAMETER 

TO ORDER: RETRO - REFLECTIVE TARGET



"R" - RETRO-REFLECTIVE

SPECIFY PART NO. AS SHOWN

EXAMPLE: TARGET, STRAIGHT ON, RETRO - REFLECTIVE

TSOR - 500 - 2500 - 125

"H" - HEIGHT  "D" - DOT DIAMETER 

"A" - SHANK DIAMETER 

IMPORTANT

When specifying shank sizes on Target or Liner Bushing orders, please identify sizes to a four (4) place decimal. Two examples are given below

CORRECT 5/16" = .3125

CORRECT 7/32" = .2188

INCORRECT .312

INCORRECT .218

IF A .0005 UNDERSIZE IS REQUIRED, SPECIFY
AS

IF A .0008 UNDERSIZE IS REQUIRED, SPECIFY AS

.3120

.2180

RETRO - REFLECTIVE NOTES

Retro-Reflective Targets have dots that are replaceable. In addition, dot diameters may be altered, as needed, when targets are refurbished.

Dot sizes may be made larger or smaller by the use of different size mask overlays which control the amount, clarity and location of retro-reflective material to be seen by the camera or instrument. As the dot size requirements change, only the retro-reflective material and masks have to be replaced, without the need of replacing the entire target.

Some limitations apply.

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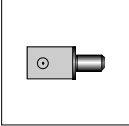
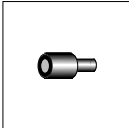
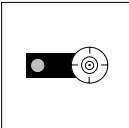
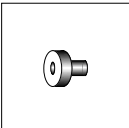
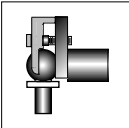
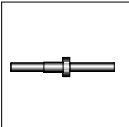
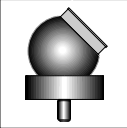
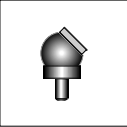
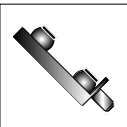
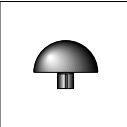
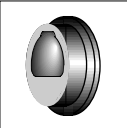
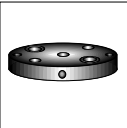
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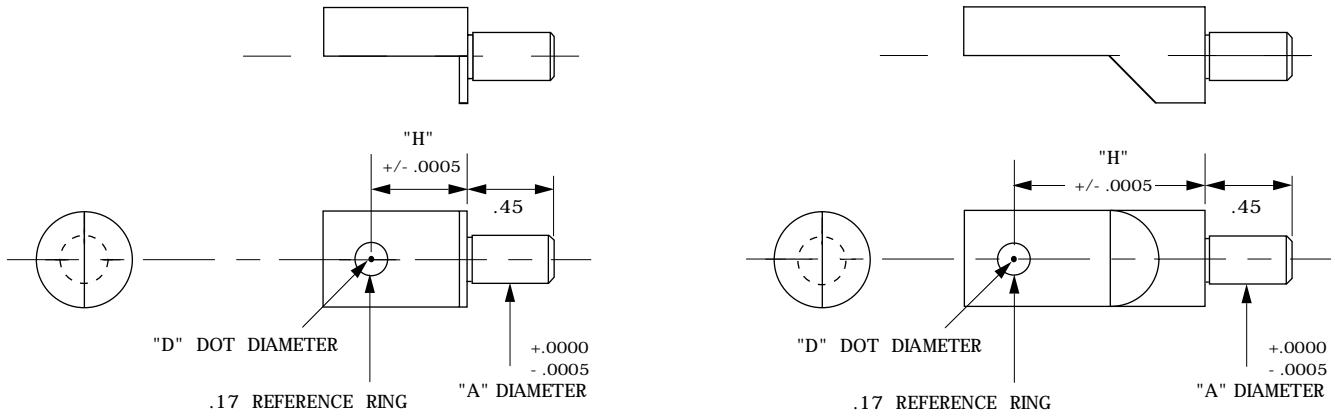
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TARGET, 90 DEGREE THEODOLITE

Used with Computer-Aided Theodolite for targeting holes approximately 90 degree to line of sight.



DRAWING NUMBER
T90

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: T90 - 500 - 2500 - 020
EXAMPLE: T90 - 12MM - 6MM - 020

↑ ↑ ↑
 "H" "A" "D"

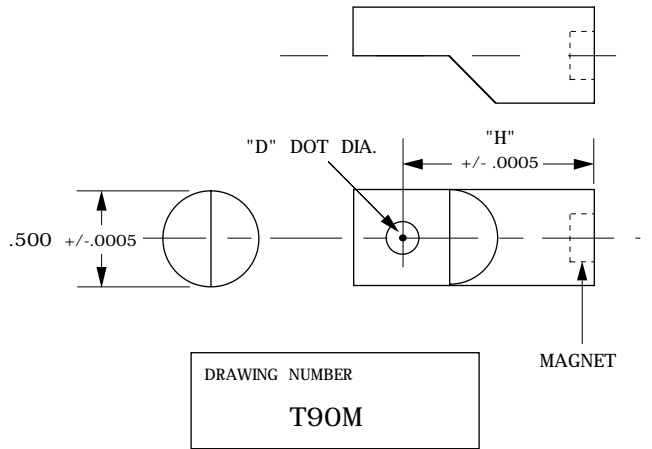
TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: T90 - 1.000 - 2500 - 020
EXAMPLE: T90 - 24MM - 6MM - 020

↑ ↑ ↑
 "H" "A" "D"

NORMAL OFFSETS FOR TARGETS ARE
 .3125, .500, 1.000, 12MM AND 24MM
 OTHER SPECIAL OFFSETS AVAILABLE, SUBJECT TO QUOTE

TARGET, 90 DEGREE MAGNETIC THEODOLITE

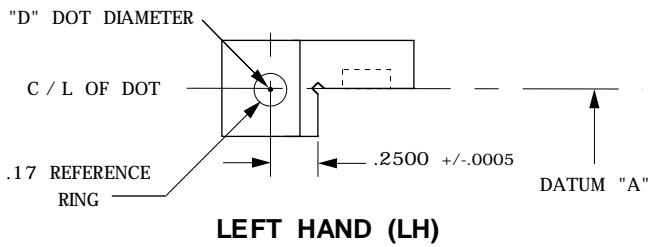
The T90M is used to target above and 90 degrees to steel surfaces. The side of the body may be used to target surfaces, edges or steps .2500 away.



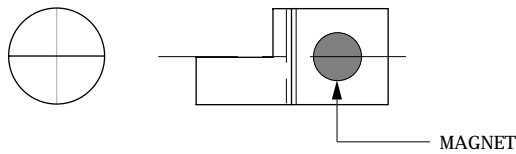
TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: T90M - 3125 - 020
EXAMPLE: T90M - 1.000 - 020
EXAMPLE: T90M - 12MM - 020

↑ ↑
 "H" "D"

**TARGET CORNER, 90 DEGREE
LEFT HAND OR RIGHT HAND THEODOLITE**



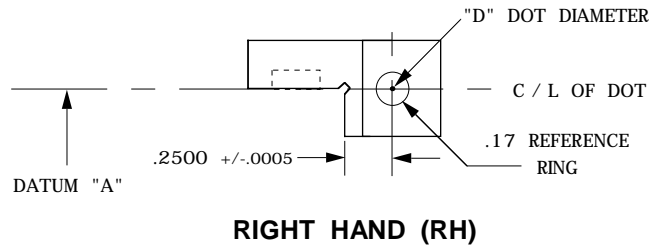
LEFT HAND (LH)



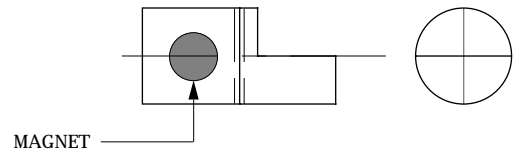
**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TC / 90 - LH - 020**

DRAWING NUMBER
TC/90-LH

"D" DOT DIA.



RIGHT HAND (RH)

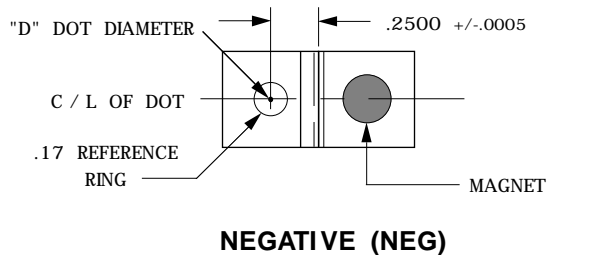


**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TC / 90 - RH - 020**

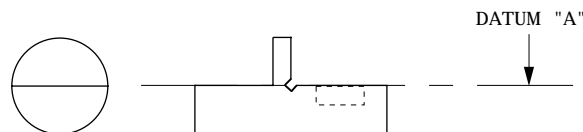
DRAWING NUMBER
TC/90-RH

"D" DOT DIA.

**TARGET CORNER, 90 DEGREE
NEGATIVE OR POSITIVE THEODOLITE**



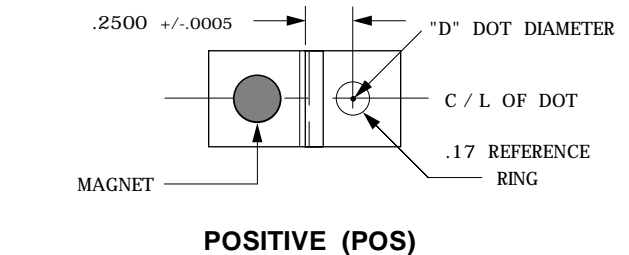
NEGATIVE (NEG)



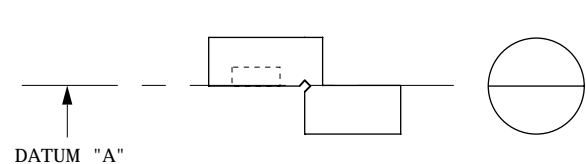
**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TC / 90 - NEG - 020**

DRAWING NUMBER
TC/90-NEG

"D" DOT DIA.



POSITIVE (POS)



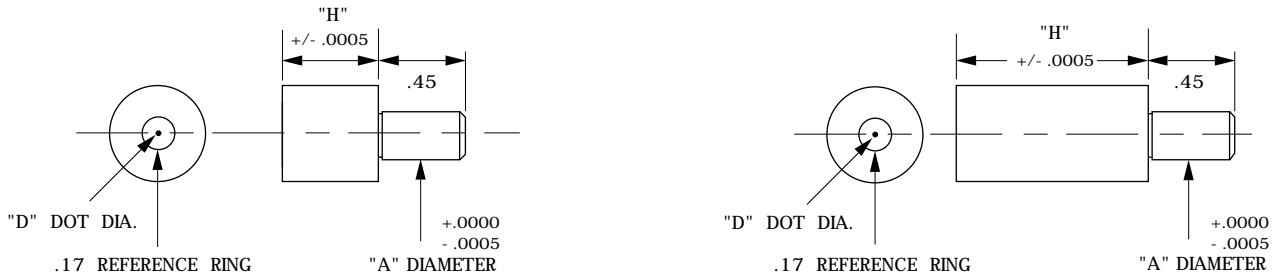
**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TC / 90 - POS - 020**

DRAWING NUMBER
TC/90-POS

"D" DOT DIA.

TARGET, STRAIGHT-ON THEODOLITE

Used with Computer-Aided Theodolite for targeting holes approximately in line with line of sight.



DRAWING NUMBER
TSO

TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: TSO - 500 - 2500 - 020

EXAMPLE: TSO - 12MM - 6MM - 020

↑ ↑ ↑
 "H" "A" "D"

TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: TSO - 1.000 - 2500 - 020

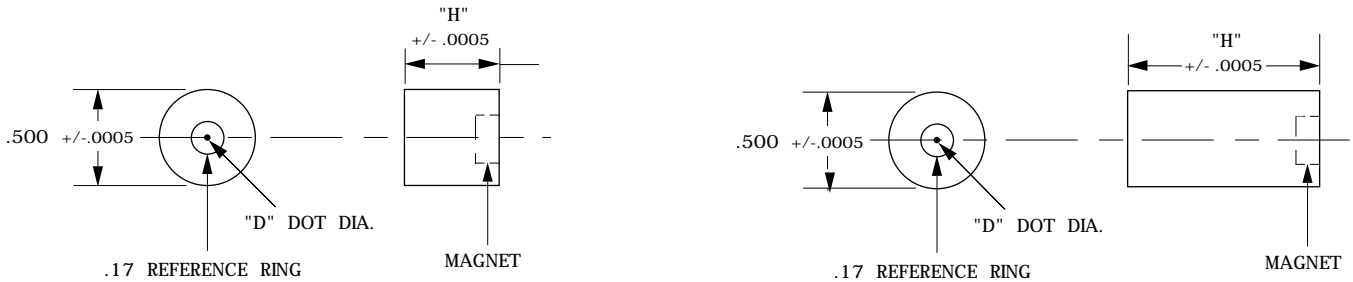
EXAMPLE: TSO - 24MM - 6MM - 020

↑ ↑ ↑
 "H" "A" "D"

NORMAL OFFSETS FOR TARGETS ARE
 .3125, .500, 1.000, 12MM AND 24MM
 OTHER SPECIAL OFFSETS AVAILABLE, SUBJECT TO QUOTE

TARGET, MAGNETIC THEODOLITE

*The TM is used to target above and 90 degrees to steel surfaces.
 The side of the body may be used to target surfaces, edges or steps .2500 away.*



DRAWING NUMBER
TM

DRAWN TO SCALE

DRAWN TO SCALE

TM - 5000 - 020
TM - 12MM - 020

↑ ↑
 "H" "D"

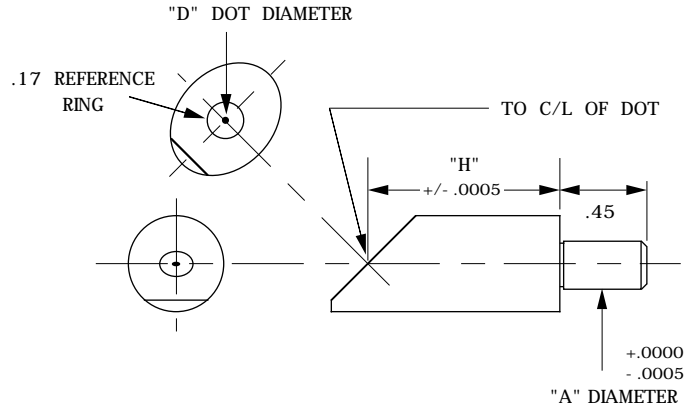
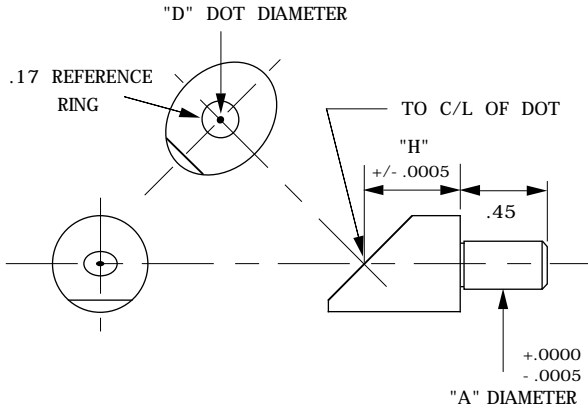
TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: TM - 1.000 - 020
EXAMPLE: TM - 24MM - 020

↑ ↑
 "H" "D"

TARGET, 45 DEGREE THEODOLITE

Used with Computer-Aided Theodolite for targeting holes approximately 45 degrees to line of sight.



DRAWING NUMBER

T45

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: T45 - 500 - 2500 - 020
T45 - 12MM - 6MM - 020

↑ "H"
↑ "A"
↑ "D"

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: T45 - 1.000 - 2500 - 020
T45 - 24MM - 6MM - 020

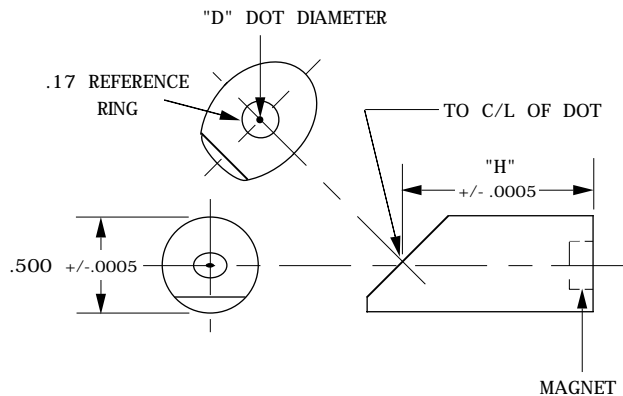
↑ "H"
↑ "A"
↑ "D"

NORMAL OFFSETS FOR TARGETS ARE
.3125, .500, 1.000, 12MM AND 24MM
OTHER SPECIAL OFFSETS AVAILABLE, SUBJECT TO QUOTE

TARGET, 45 DEGREE MAGNETIC THEODOLITE

The T45M is used to target above and 90 degrees to steel surfaces when a 45 degree target face is more applicable.

The side of the body may be used to target surfaces, edges or steps .2500 away.



DRAWING NUMBER

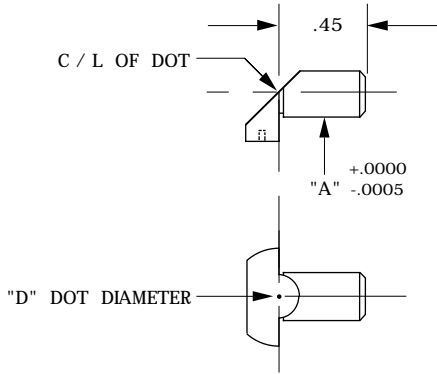
T45M

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: T45M - 12 MM - 020
T45M - 1.000 - 020

↑ "H"
↑ "D"

FLUSH MOUNT THEODOLITE

Use a FM for targeting holes when a zero height value is required



STANDARD SHANK SIZES

.1250	.3750	.7500
.1875	.4375	1.0000
.2500	.5000	6mm
.3125	.6250	8mm

OTHER SHANK SIZES POSSIBLE
SUBJECT TO QUOTE.

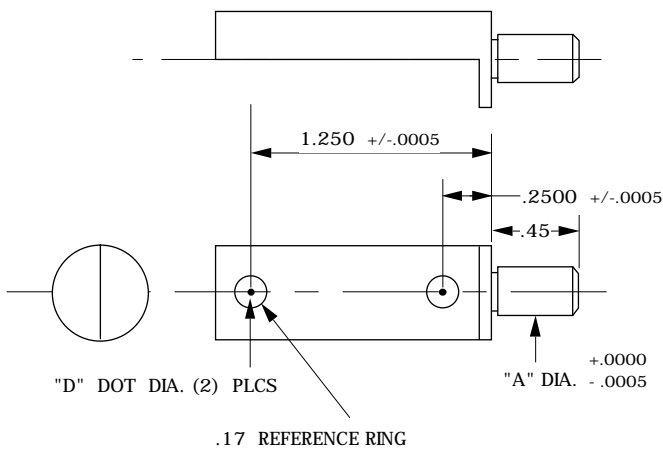
DRAWING NUMBER
FM

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: FM - 2500 - 020

↑ "A"
↑ "D"

DOUBLE VECTOR, TARGET THEODOLITE

Used to measure location and angularity of a hole



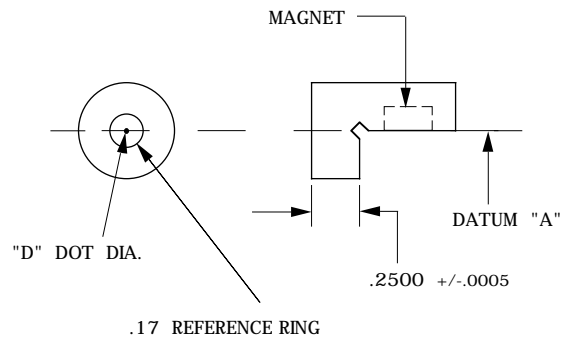
DRAWING NUMBER
DVT

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: DVT - 2500 - 020
DVT - 8MM - 020

↑ "A"
↑ "D"

TARGET, CORNER THEODOLITE

Used with Computer-Aided Theodolite for targeting straight edges.



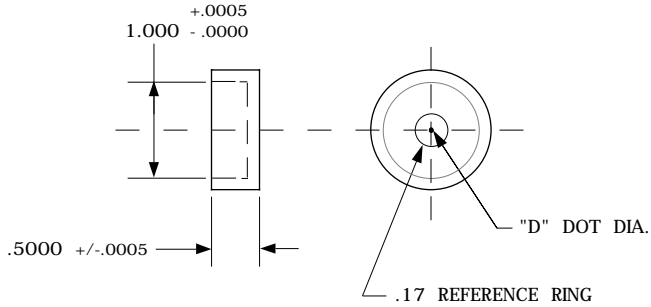
DRAWING NUMBER
TC

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TC - 020

↑ "D"

**LUG, STRAIGHT-ON
THEODOLITE**

The Lug, Straight On, (LSO), is slipped over leveling lugs to represent the centerline of the leveling lug at .500 offset.



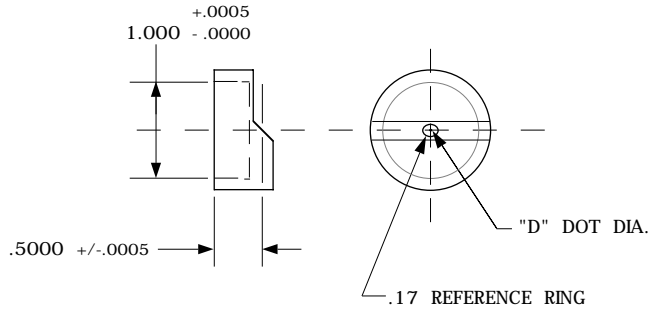
DRAWING NUMBER
LSO

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: LSO - 020

↑
"D"

**LUG, 45 DEGREE
THEODOLITE**

The Lug, 45 Degree, (L45), is slipped over leveling lugs to represent the centerline of the leveling lug at .500 offset, when a 45 degree target face is more applicable.



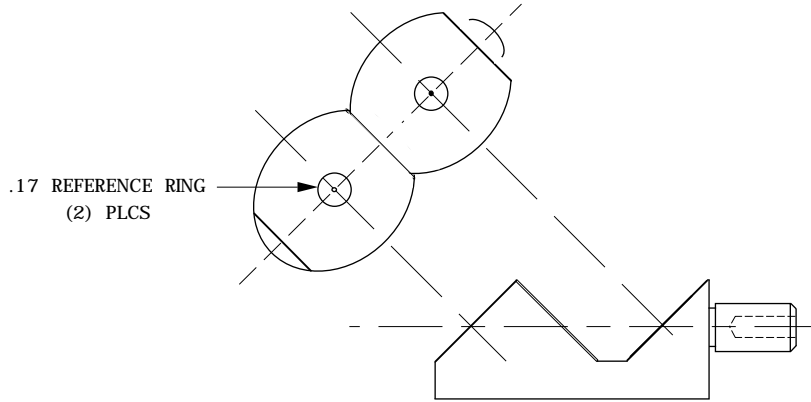
DRAWING NUMBER
L45

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: L45 - 020

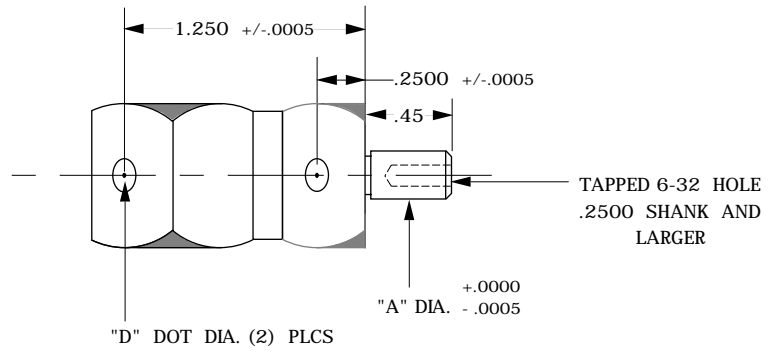
↑
"D"

45 DEGREE DOUBLE VECTOR TARGET THEODOLITE

Used to measure location and angularity of a hole



DRAWING: TO SCALE



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 45 DVT - 2500 - 020

↑ ↑
"A" "D"

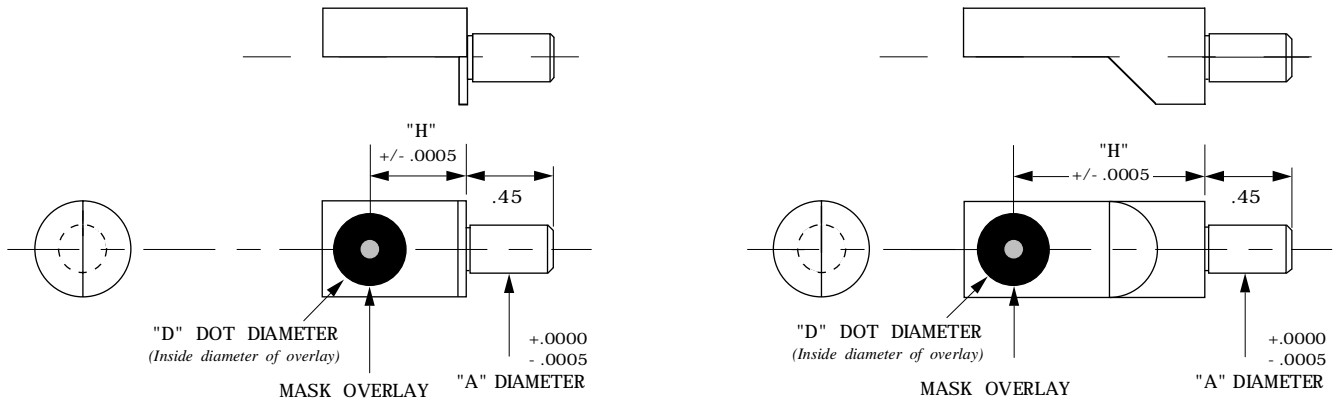
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45 DVT

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	Target Corner, Retro-Reflective, 45 Degree, Left Hand or Right Hand	(TCR/45-LH or RH)	Page	B-4
	Target Corner, Retro-Reflective, 45 Degree Negative or Positive	(TCR/45-NEG or POS)	Page	B-4
	Target, Button, Retro-Reflective	(TBR)	Page	B-5
	Target, Button, Retro-Reflective, Variable	(TBRV)	Page	B-5
	Flush Mount, Retro-Reflective	(FMR)	Page	B-6
	Double Vector Target, Retro-Reflective	(DVTR)	Page	B-6
	Target, Corner, Retro-Reflective	(TCR)	Page	B-6
	Lug, Straight-On, Retro-Reflective	(LSOR)	Page	B-7
	Lug, 45 Degree, Retro-Reflective	(L45R)	Page	B-7
	Double Vector Target Video	(DVTV)	Page	B-8
	45 Degree Double Vector Target, Retro-Reflective	(45 DVTR)	Page	B-8
	Double Target Edge Target	(DTET)	Page	B-9
	Target Button, Retro-Reflective Hidden Point Bar Adaptor	(TBR HPBA)	Page	B-10
NEW	Target Corner, Retro-Reflective, 90 Degree, Left Hand or Right Hand	(TCR/90-LH or RH)	Page	B-11
NEW	Target Corner, Retro-Reflective, 90 Degree Negative or Positive	(TCR/90-NEG or POS)	Page	B-11

CALL FOR QUANTITY PRICES

TARGET, 90 DEGREE, RETRO-REFLECTIVE

Used with Photogrammetry for targeting holes approximately 90 degrees to line of sight.



DRAWING NUMBER
T90R

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: T90R - 500 - 2500 - 125
T90R - 12MM - 6MM - 500

↑ "H"
 ↑ "A"
 ↑ "D"

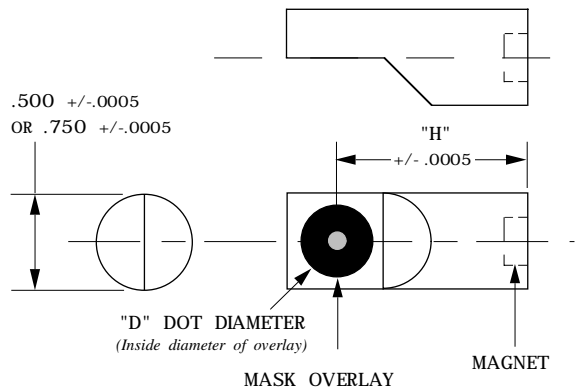
TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: T90R - 1.000 - 2500 - 375
T90R - 24MM - 6MM - 250

↑ "H"
 ↑ "A"
 ↑ "D"

NORMAL OFFSETS FOR TARGETS ARE
 .3125, .500, 1.000, 12MM AND 24MM
 OTHER SPECIAL OFFSETS AVAILABLE, SUBJECT TO QUOTE

TARGET, 90 DEGREE MAGNETIC RETRO-REFLECTIVE

The T90M is used to target above and 90 degrees to steel surfaces. The side of the body may be used to target surfaces, edges or steps .2500 or .3750 away.



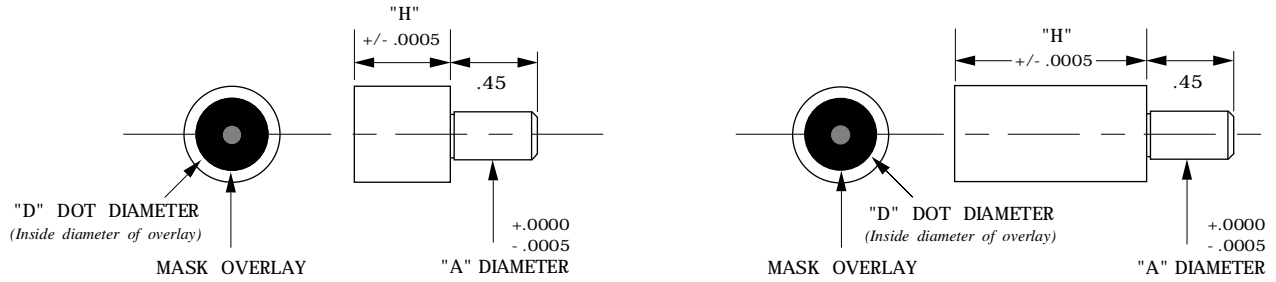
DRAWING NUMBER
T90MR

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: T90MR - 3125 - 125
T90MR - 24MM - 250
T90MR - 1.000 - 500

↑ "H"
 ↑ "D"

TARGET, STRAIGHT-ON , RETRO-REFLECTIVE

Used with Photogrammetry for targeting holes approximately in line with line of sight.



DRAWING NUMBER

TSOR

TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: TSOR - 500 - 2500 - 125
TSOR - 12MM - 6MM - 250

↑ ↑ ↑
"H" "A" "D"

TO ORDER: SPECIFY PART NO. AS SHOWN

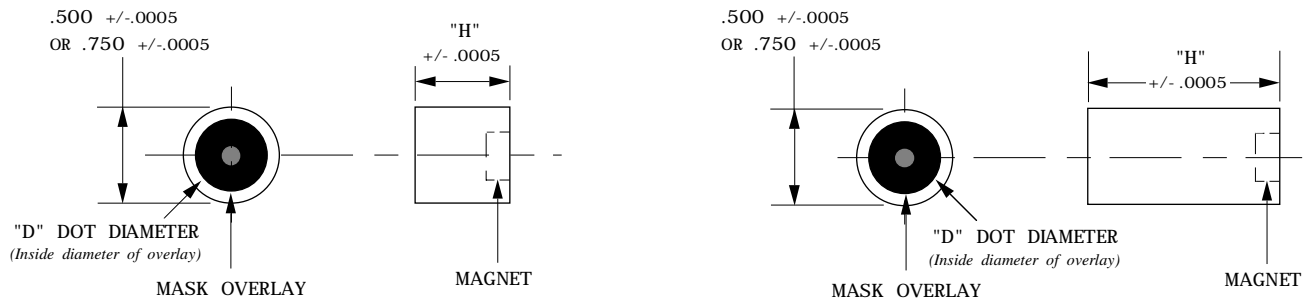
EXAMPLE: TSOR - 1.000 - 2500 - 125
TSOR - 24MM - 6MM - 250

↑ ↑ ↑
"H" "A" "D"

NORMAL OFFSETS FOR TARGETS ARE
.3125, .500, 1.000, 12MM AND 24MM
OTHER SPECIAL OFFSETS AVAILABLE, SUBJECT TO QUOTE

TARGET, MAGNETIC, RETRO-REFLECTIVE

*The TM is used to target above and 90 degree to steel surfaces
The side of the body may be used to target surfaces, edges or steps .2500 or .3750 away.*



DRAWING NUMBER

TMR

TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: TMR - 500 - 125
TMR - 12MM - 250

↑ ↑
"H" "D"

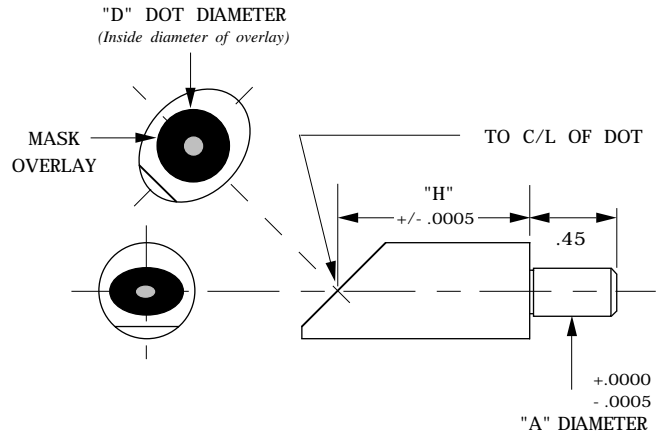
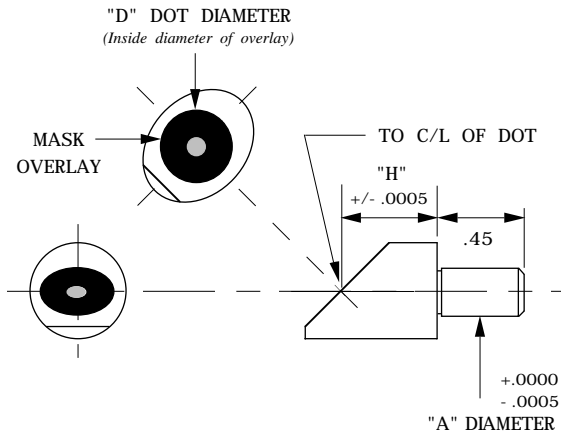
TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: TMR - 1.000 - 125
TMR - 24MM - 250

↑ ↑
"H" "D"

45 DEGREE TARGET, RETRO-REFLECTIVE

Used with Photogrammetry for targeting holes approximately 45 degrees to line of sight.



DRAWING NUMBER
T45R

TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: T45R - 500 - 2500 - 500

T45R - 12MM - 6MM - 250



TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: T45R - 1 .000 - 2500 - 125

T45R - 24MM - 6MM - 250

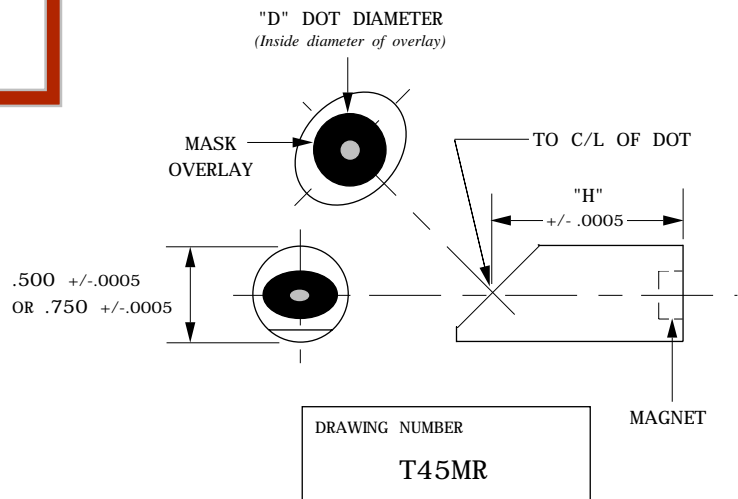


**NORMAL OFFSETS FOR TARGETS ARE
.3125, .500, 1.000, 12MM AND 24MM
OTHER SPECIAL OFFSETS AVAILABLE, SUBJECT TO QUOTE**

**TARGET, 45 DEGREE MAGNETIC
RETRO-REFLECTIVE**

The T45M is used to target above and 90 degrees to steel surfaces when a 45 degree target face is more applicable.

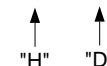
The side of the body may be used to target surfaces, edges or steps .2500 or .3750 away.



TO ORDER: SPECIFY PART NO. AS SHOWN

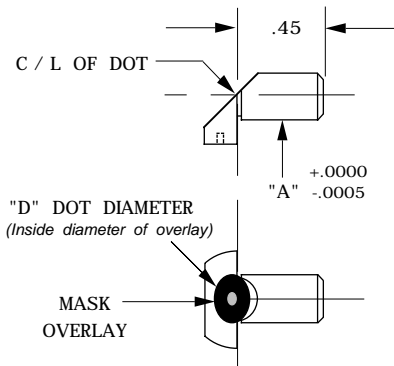
EXAMPLE: T45MR - 12MM - 125

T45MR - 1.000 - 500



FLUSH MOUNT, RETRO-REFLECTIVE

Use a FMR for targeting holes when a zero height value is required



STANDARD SHANK SIZES

.1875	.5000	6mm
.2500	.6250	8mm
.3125	.7500	
.3750	1.0000	
.4375	OTHER SHANK SIZES POSSIBLE. SUBJECT TO QUOTE.	

DRAWING NUMBER

FMR

NOTE:

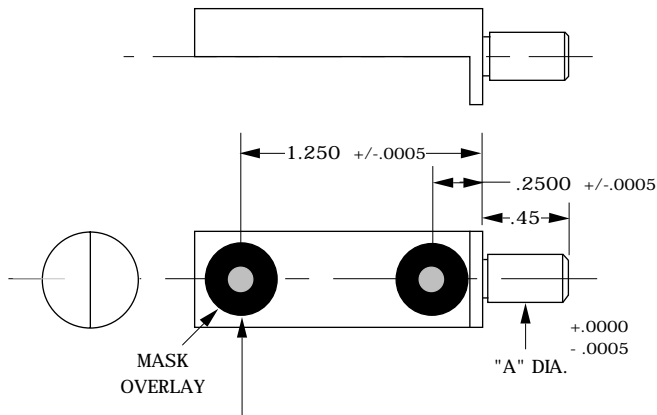
.1875 shank diameter and larger only
Some dot diameter limitations apply.

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: FMR - 2500 - 125



**DOUBLE VECTOR TARGET
RETRO-REFLECTIVE**

Used to measure location and angularity of a hole



"D" DOT DIAMETER (2) PLCS
(Inside diameter of overlay) **.250 MAXIMUM DOT DIAMETER**

FOR DOT DIAMETERS LARGER THAN .250, USE DVTV

DRAWING NUMBER

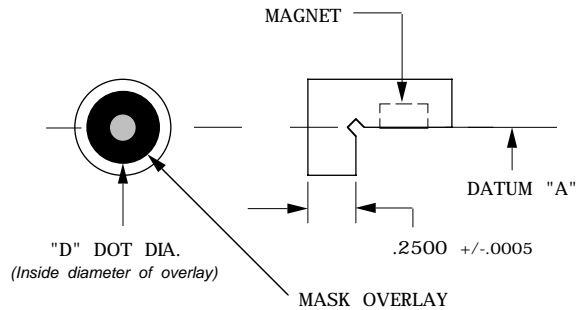
DVTR

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: DVTR - 2500 - 125
DVTR - 8MM - 157



**TARGET, CORNER,
RETRO-REFLECTIVE**

Used with Photogrammetry systems
for targeting straight edges.



TARGET DOT IN LINE WITH DATUM "A" W/IN +/- .0005

DRAWING NUMBER

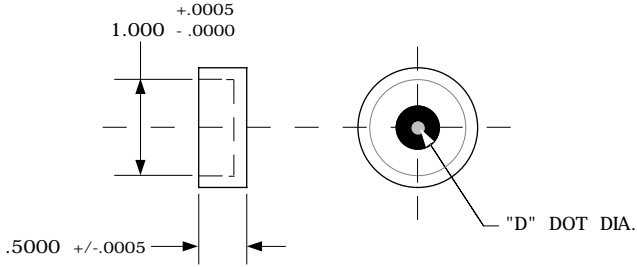
TCR

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TCR - 125
TCR - 500



**LUG, STRAIGHT ON
RETRO-REFLECTIVE**

The Lug, Straight On Retro-Reflective, (LSOR), is slipped over leveling lugs to represent the centerline of the leveling lug at .500 offset.



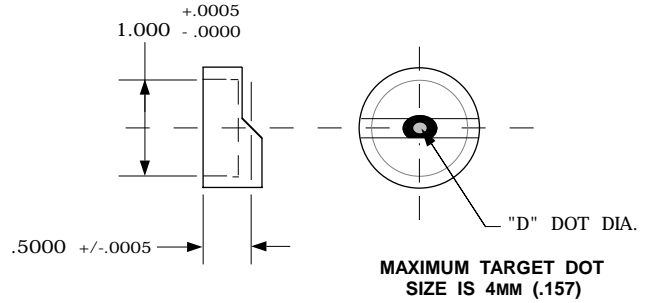
DRAWING NUMBER
LSOR

**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: LSOR - 250**

↑
"D"

**LUG, 45 DEGREE
RETRO-REFLECTIVE**

The Lug, 45 Degree Retro-Reflector, (L45R), is slipped over leveling lugs to represent the centerline of the leveling lug at .500 offset, when a 45 degree target face is more applicable.

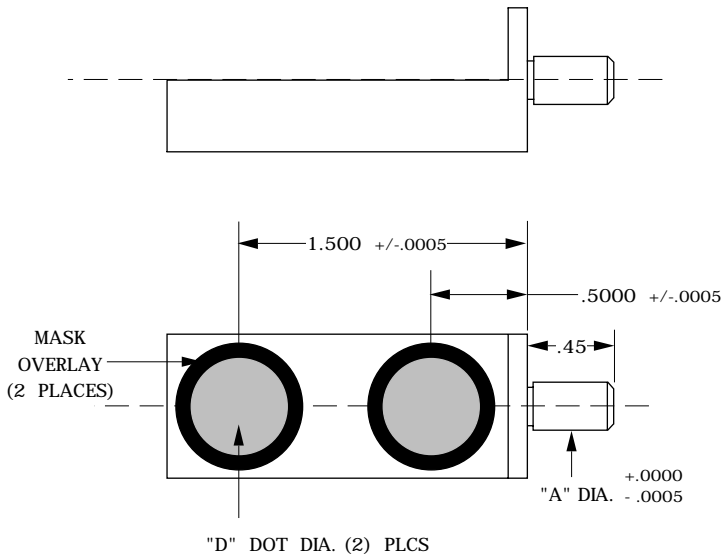


DRAWING NUMBER
L45R

**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: L45R - 125**

↑
"D"

DOUBLE VECTOR TARGET, VIDEO
Used to measure location and angularity of a hole



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: DDTV - 2500 - 312
DDTV - 2500 - 375
DDTV - 2500 - 500

"D" - DOT SIZES AVAILABLE

"A"

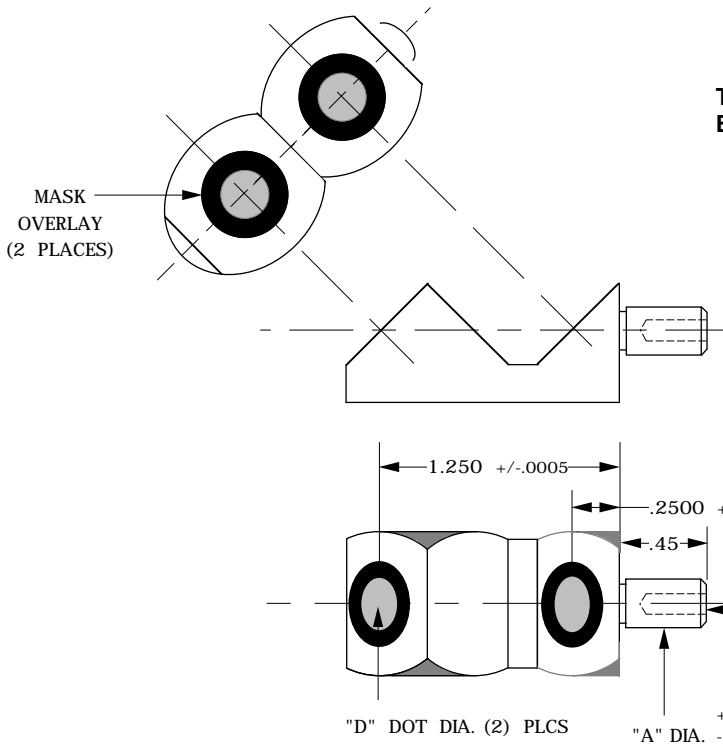
MAXIMUM SHANK SIZE UP TO AND INCLUDING .6250 SPECIAL OFFSETS AVAILABLE, SUBJECT TO QUOTE

DRAWING NUMBER

DDTV

DRAWING: TO SCALE

45° DOUBLE VECTOR TARGET RETRO-REFLECTIVE
Used to measure location and angularity of a hole



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 45 DVTR - 2500 - 250

"A"

"D"

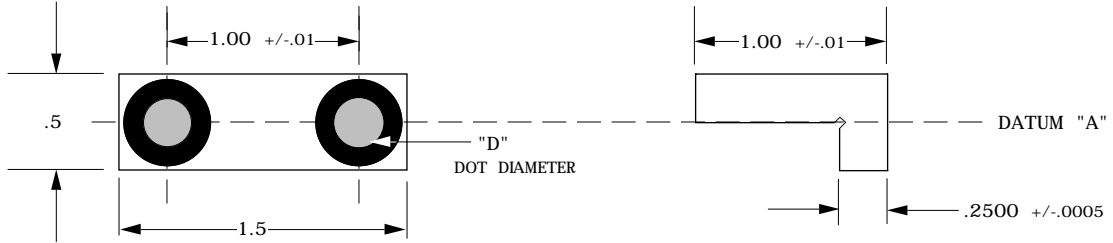
.2500 MAXIMUM DOT DIAMETER

DRAWING NUMBER

45 DVTR

DRAWING: TO SCALE

DOUBLE TARGET EDGE TARGET



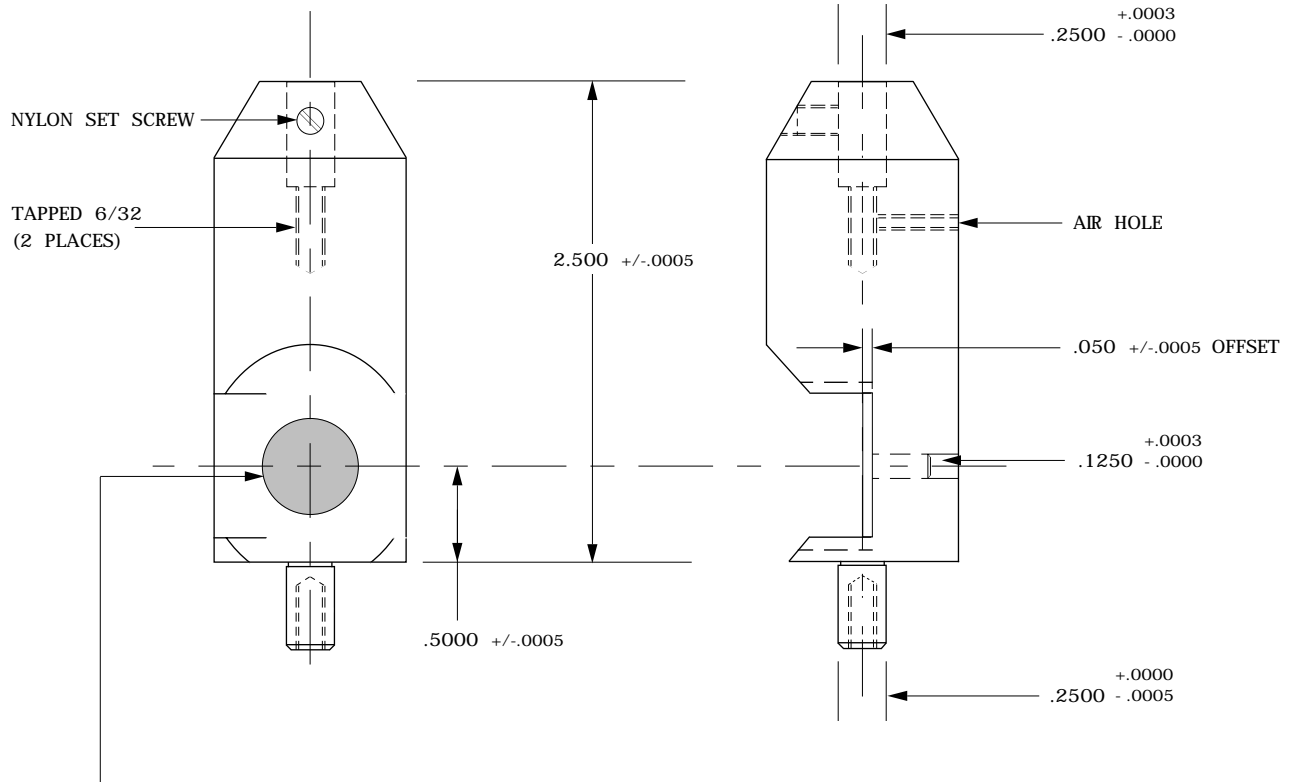
TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: DTET - 250

TARGET DOTS IN LINE WITH DATUM "A"
 W/IN +/- .0005

↑
 "D"
 MAXIMUM TARGET DOT
 SIZE IS .250

DRAWING NUMBER
DTET

**TARGET BUTTON RETRO-REFLECTIVE
HIDDEN POINT BAR ADAPTOR**



.1250 HOLE, TO ACCEPT A PHOTOGRAMMETRY OR VIDEOGRAMMETRY
TARGET BUTTON, WITH A .050 THICK HEAD, .1250 SHANK AND UP TO
.500 RETRO DOT DIAMETER,

.1250 HOLE ON CENTERLINE WITHIN +/- .0005

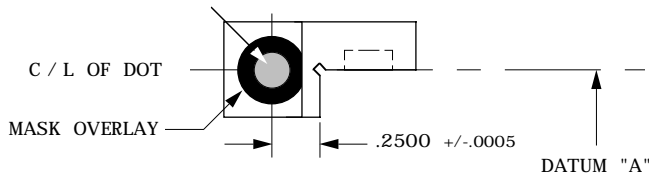
(TARGET BUTTON, RETRO - REFERENCE)

**MATERIAL: STRESSPROOF
BLACK OXIDE**

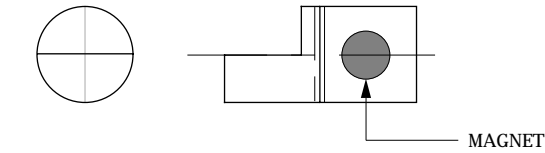
DRAWING NUMBER
TBR HPBA

**TARGET CORNER, RETRO-REFLECTIVE, 90 DEGREE
LEFT HAND OR RIGHT HAND THEODOLITE**

"D" DOT DIAMETER
(Inside diameter of overlay)
.200 MAXIMUM DOT DIAMETER



LEFT HAND (LH)



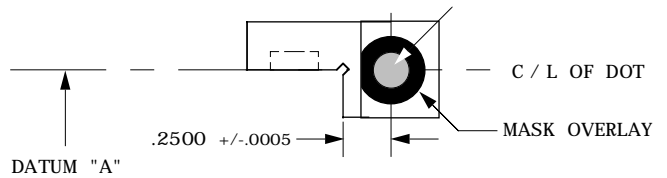
**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TCR / 90 - LH - 200**

DRAWING NUMBER

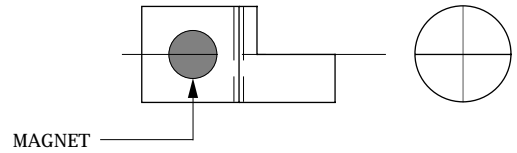
TCR/90-LH

"D" DOT DIA.

"D" DOT DIAMETER
(Inside diameter of overlay)
.200 MAXIMUM DOT DIAMETER



RIGHT HAND (RH)



**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TCR / 90 - RH - 200**

DRAWING NUMBER

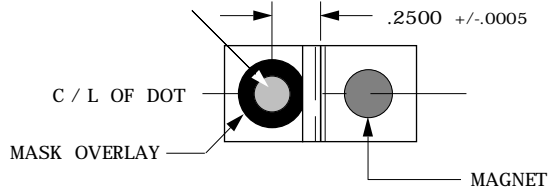
TCR/90-RH

"D" DOT DIA.

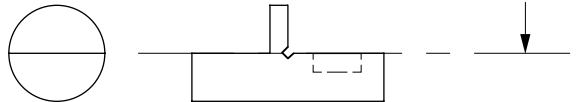
NEW

**TARGET CORNER, RETRO-REFLECTIVE, 90 DEGREE
NEGATIVE OR POSITIVE THEODOLITE**

"D" DOT DIAMETER
(Inside diameter of overlay)
.200 MAXIMUM DOT DIAMETER



NEGATIVE (NEG)



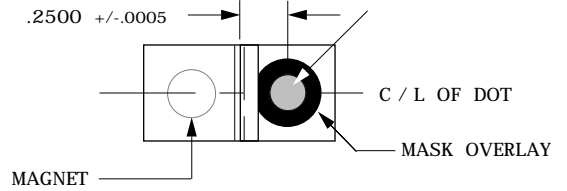
**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TCR / 90 - NEG - 200**

DRAWING NUMBER

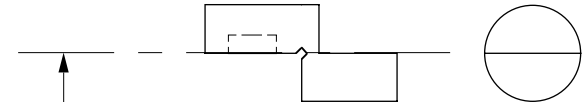
TCR/90-NEG

"D" DOT DIA.

"D" DOT DIAMETER
(Inside diameter of overlay)
.200 MAXIMUM DOT DIAMETER



POSITIVE (POS)



**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TCR / 90 - POS - 200**

DRAWING NUMBER

TCR/90-POS

"D" DOT DIA.

NEW

Adhesive Stick-On Targets

Page C-1

Scribe Line Theodolite Targets **(SLTT)**

Theodolite Tape - 2" **(TT-2)**

Theodolite Tape - 4" **(TT-4)**

Retro-Reflective Tape Options **(RTR)**

Page C-2 & C-3

.06, .08, .09, .12, .16 or .20 Dot

Retro-Reflective Tape Options **(RTR)**

Page C-4 - C-7

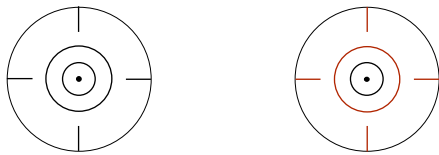
.25, .37, .50, .75 or 1.00 Dot

CALL FOR QUANTITY PRICES

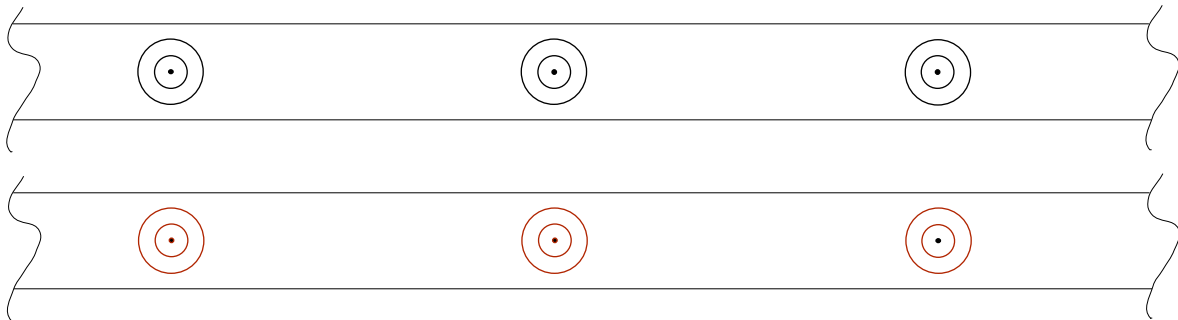
ADHESIVE STICK-ON TARGETS

For special requirements, call for quote.

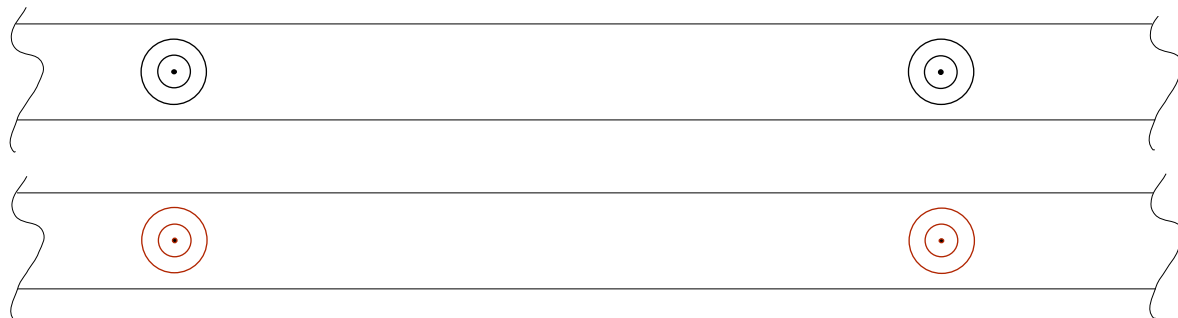
DESCRIPTION	1 - 9 rolls	10 - 24 rolls	25 - 49 rolls	50 or more rolls
Scribe Line Theodolite Targets (250 targets per roll) <i>Matt white 4 mil removable vinyl with black or red printed pattern</i>	\$52.25	\$41.25	\$36.30	\$32.50



Theodolite Tape - 2" (50 yards per roll) <i>Matt white 4 mil removable vinyl with black or red printed pattern</i>	\$57.00	\$45.00	\$40.50	\$36.35
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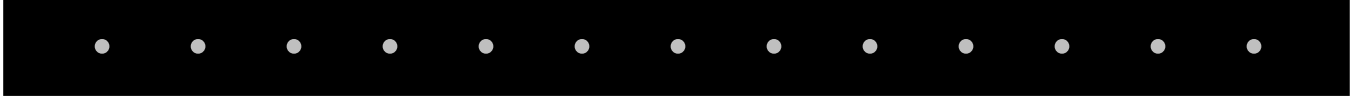
Theodolite Tape - 4" (50 yards per roll) <i>Matt white 4 mil removable vinyl with black or red printed pattern</i>	\$57.00	\$45.00	\$40.50	\$36.35
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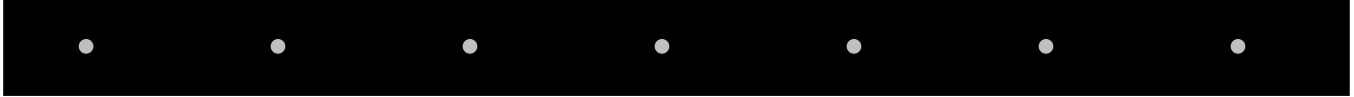
Items, on this page only, can be combined to receive quantity prices.

RETRO-REFLECTIVE TAPE OPTIONS
50 YARDS PER ROLL

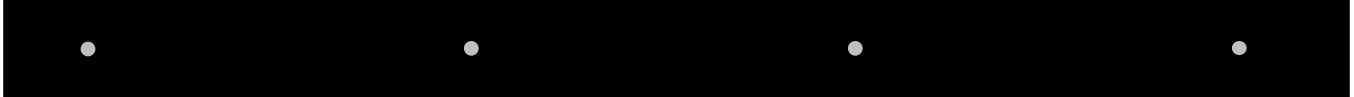
.06 DOT DIAMETER X .500 SPACING



.06 DOT DIAMETER X 1.00 SPACING



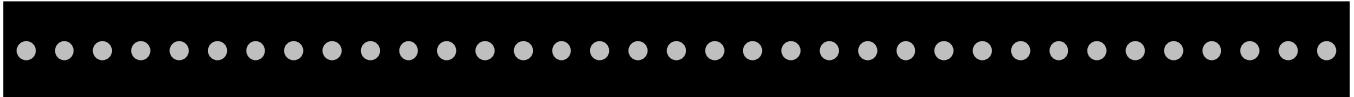
.06 DOT DIAMETER X 2.00 SPACING



.06 DOT DIAMETER X 4.00 SPACING



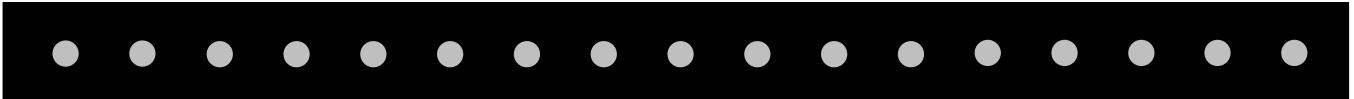
.08 DOT DIAMETER X .20 SPACING



.09 DOT DIAMETER X 2.00 SPACING



.12 DOT DIAMETER X .40 SPACING



.12 DOT DIAMETER X 1.00 SPACING



.12 DOT DIAMETER X 2.00 SPACING

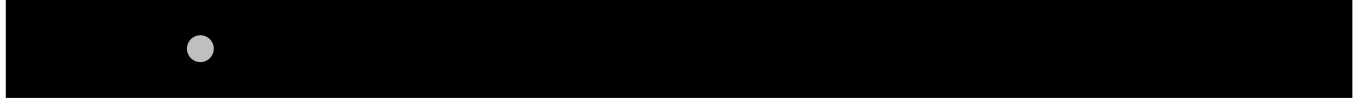


RETRO-REFLECTIVE TAPE OPTIONS
50 YARDS PER ROLL

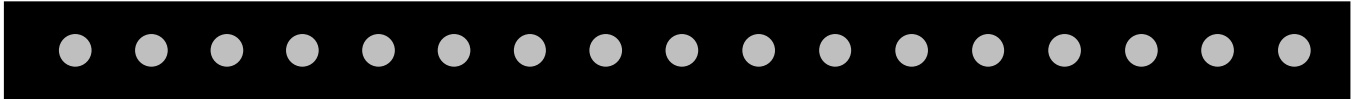
.12 DOT DIAMETER X 4.00 SPACING



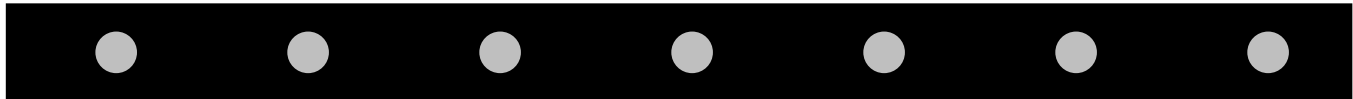
.12 DOT DIAMETER X 9.25 SPACING



.16 DOT DIAMETER X .40 SPACING



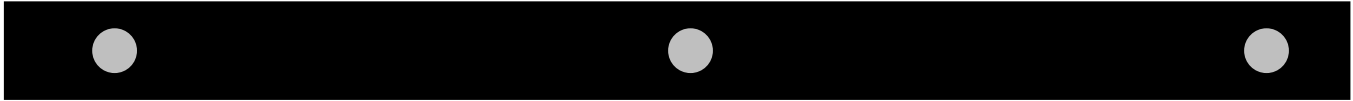
.20 DOT DIAMETER X 1.00 SPACING



.20 DOT DIAMETER X 2.00 SPACING



.20 DOT DIAMETER X 3.00 SPACING



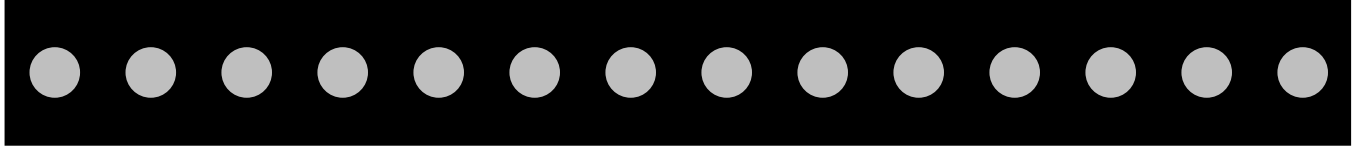
.20 DOT DIAMETER X 4.00 SPACING



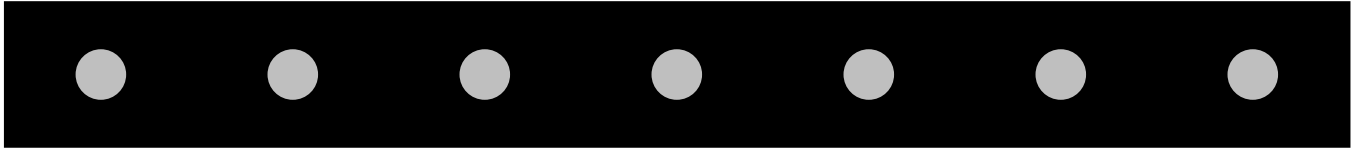
OTHER OPTIONS ARE POSSIBLE. SOME LIMITATIONS APPLY. CALL FOR QUOTE

RETRO-REFLECTIVE TAPE OPTIONS
50 YARDS PER ROLL

.25 DOT DIAMETER X .50 SPACING



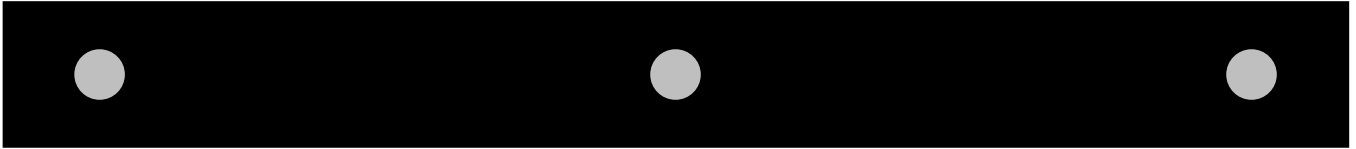
.25 DOT DIAMETER X 1.00 SPACING



.25 DOT DIAMETER X 2.00 SPACING



.25 DOT DIAMETER X 3.00 SPACING



.25 DOT DIAMETER X 4.00 SPACING

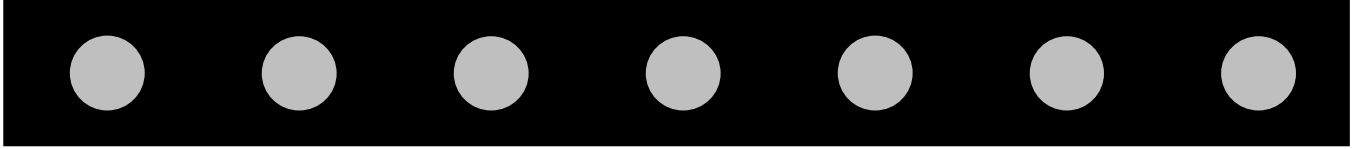


.25 DOT DIAMETER X 6.00 SPACING

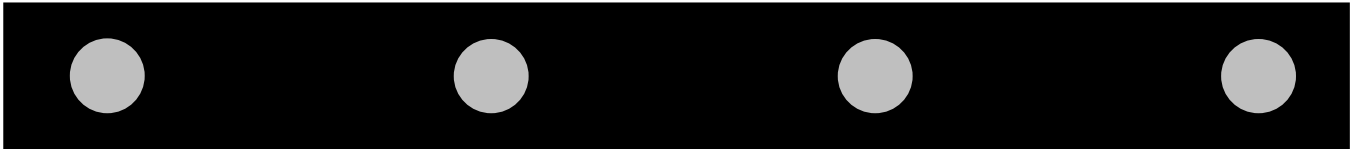


RETRO-REFLECTIVE TAPE OPTIONS
50 YARDS PER ROLL

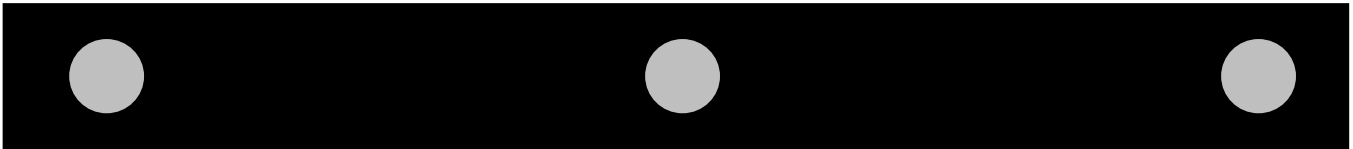
.37 DOT DIAMETER X 1.00 SPACING



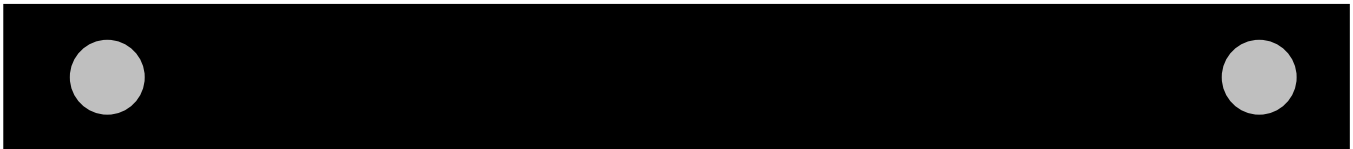
.37 DOT DIAMETER X 2.00 SPACING



.37 DOT DIAMETER X 3.00 SPACING



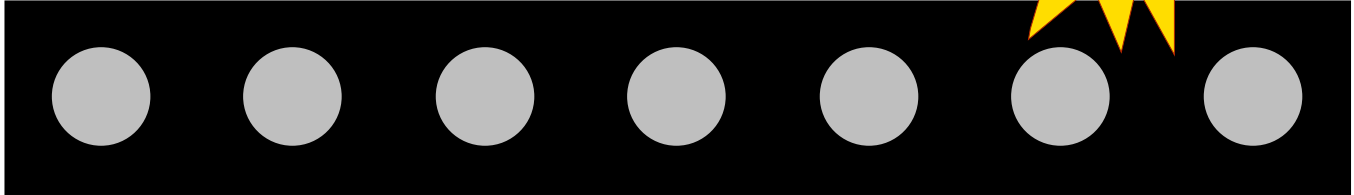
.37 DOT DIAMETER X 6.00 SPACING



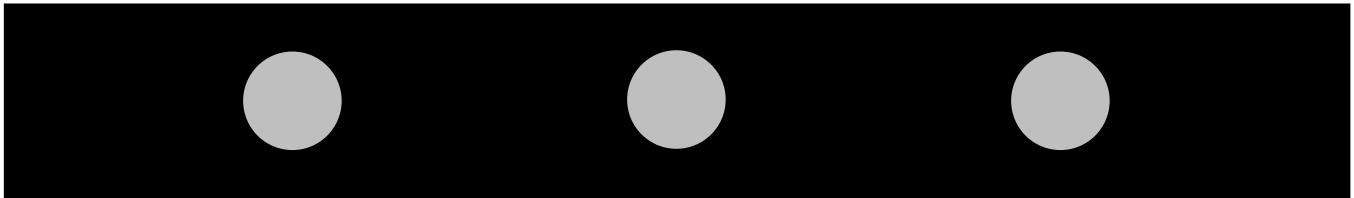
RETRO-REFLECTIVE TAPE OPTIONS
50 YARDS PER ROLL



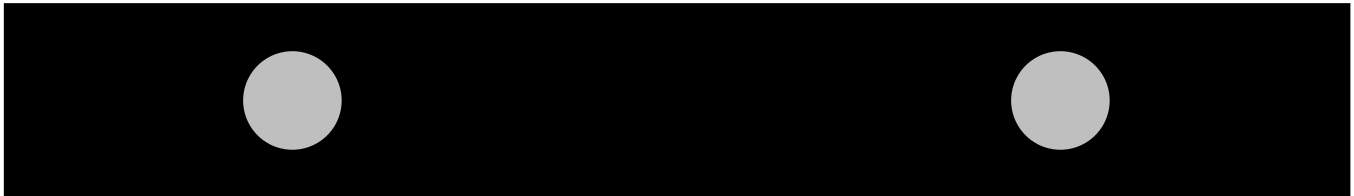
.50 DOT DIAMETER X 1.00 SPACING



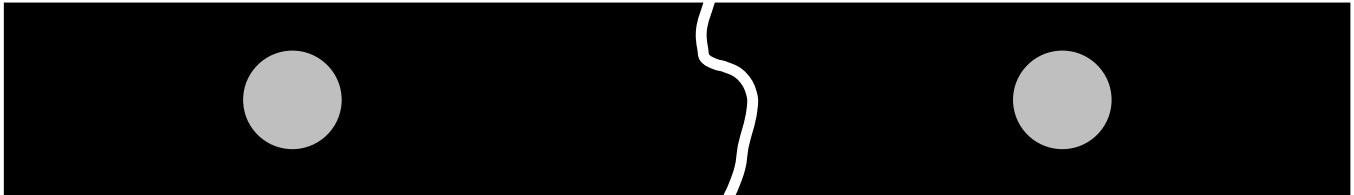
.50 DOT DIAMETER X 2.00 SPACING



.50 DOT DIAMETER X 4.00 SPACING



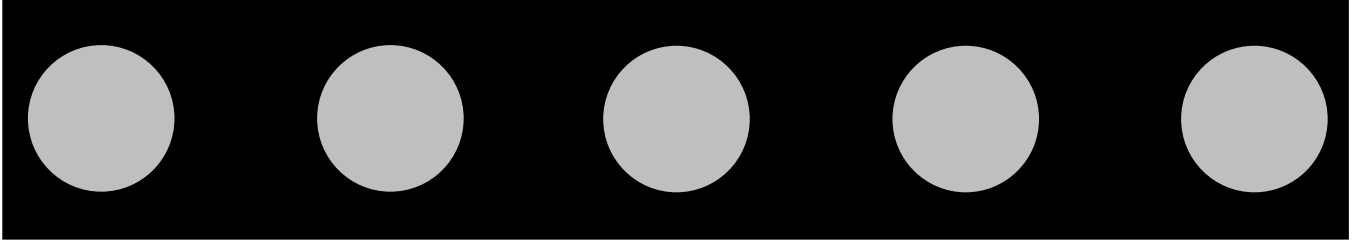
.50 DOT DIAMETER X 12.00 SPACING



For other options not shown, please call for quote.

RETRO-REFLECTIVE TAPE OPTIONS
50 YARDS PER ROLL

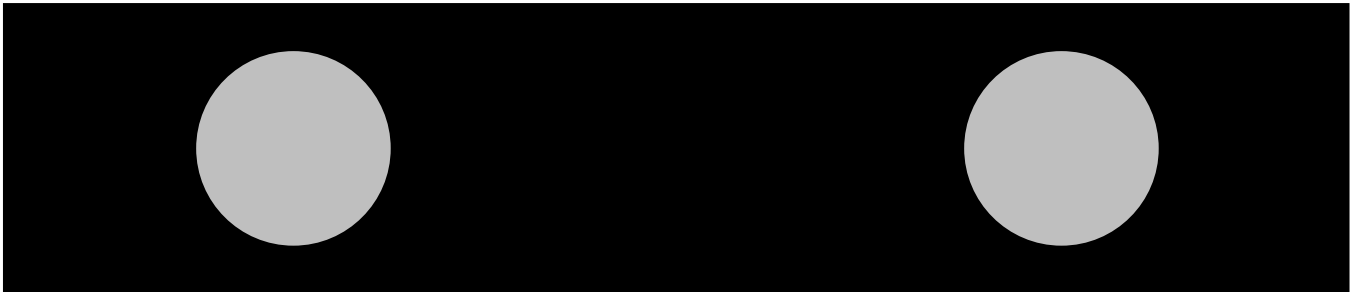
.75 DOT DIAMETER X 1.50 SPACING



.75 DOT DIAMETER X 4.00 SPACING



1.00 DOT DIAMETER X 4.00 SPACING



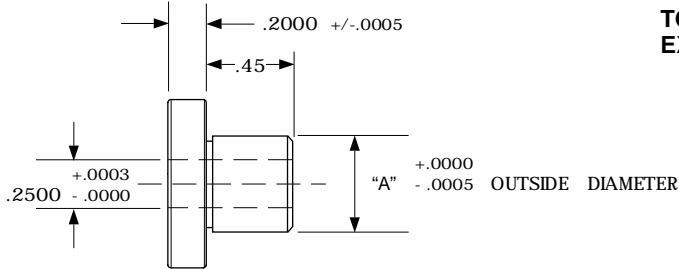
For other options not shown, please call for quote.

Liner Bushing (LB)	Page D-1
Liner Bushing Variable (LBV)	Page D-1
Threaded Liner Bushing (TLB)	Page D-2
Threaded Liner Bushing Variable (TLBV)	Page D-2
Headed Diamond Liner Bushing (HDLB)	Page D-3 & D-4
Headed Diamond Liner Bushing Variable (HDLBV)	Page D-5

CALL FOR QUANTITY PRICES

LINER BUSHING

*Use Liner Bushings for adapting standard .2500 shank targets to odd size holes, (allow .2000 for height difference).
Many nominal fractional sizes in stock.*

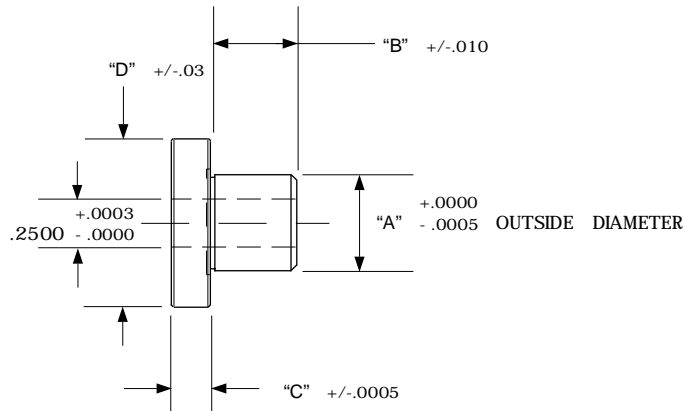


TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: LB - 5000
LB - 5015

↑
"A" - OUTSIDE DIAMETER

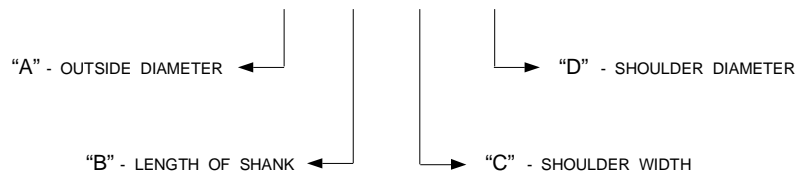
DRAWING NUMBER
LB

LINER BUSHING VARIABLE



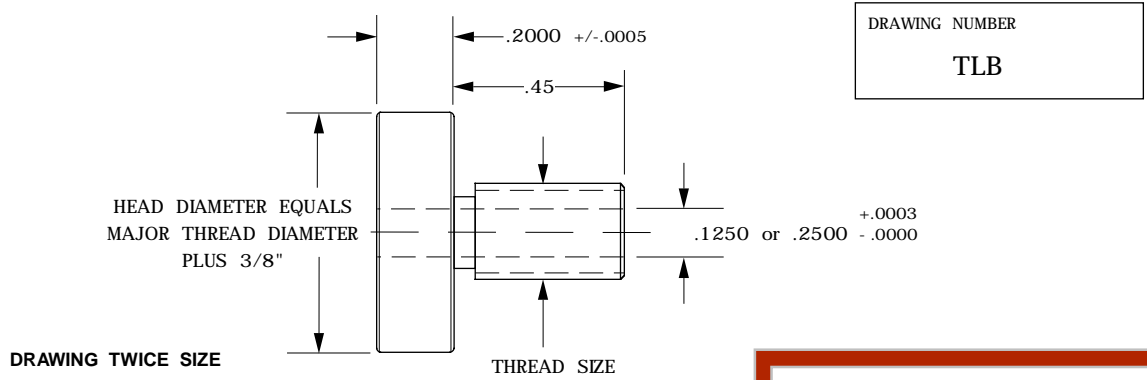
DRAWING NUMBER
LBV

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: LBV - 7500 - 500 - 1875 - 1.50



THREADED LINER BUSHING

Use Threaded Liner Bushings for adapting standard .2500 or .1250 shank targets to threaded holes, (allow .2000 for height difference).



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TLB - 1/4 - 20
TLB - 1/4 - 28

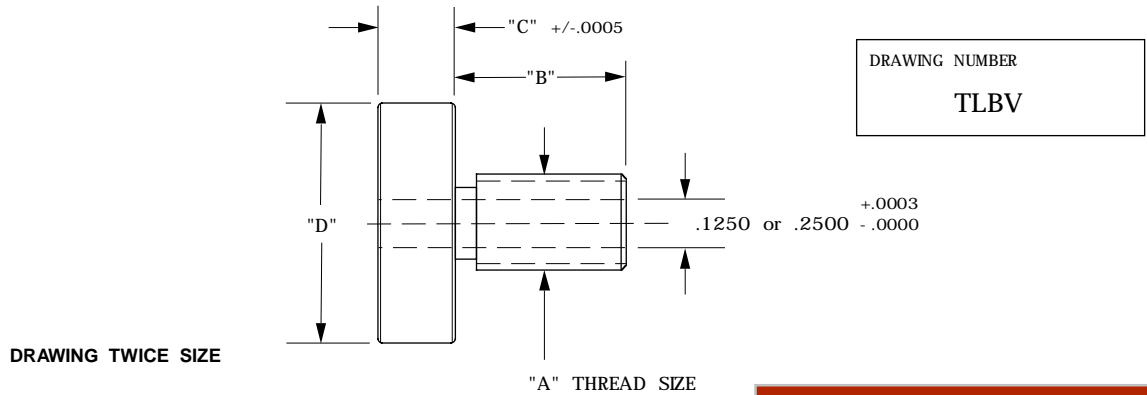
↑
THREAD SIZE

.1250 DIAMETER HOLE, +.0003/-.0000
FOR MAJOR THREAD DIAMETER .375 AND LESS

.2500 DIAMETER HOLE, +.0003/-.0000
FOR MAJOR THREAD DIAMETER OVER .375

THREADED LINER BUSHING VARIABLE

Use Threaded Liner Bushings for adapting standard .2500 or .1250 shank targets to threaded hole.



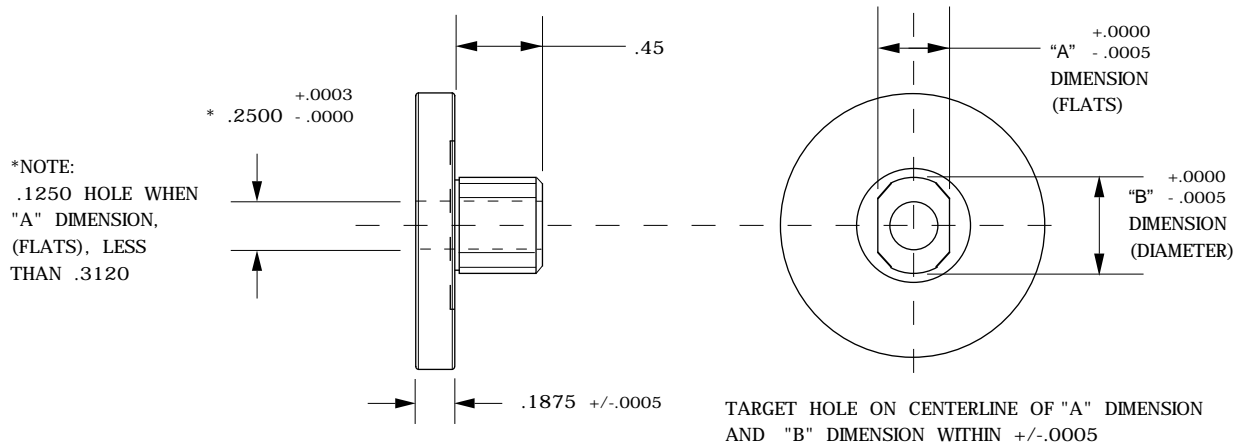
TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TLBV - 1/4 - 20 - 312 - 1875 - 750

↑ ↑ ↑ ↑
"A" "B" "C" "D"
THREAD SHANK HEAD HEAD
SIZE LENGTH THICKNESS DIAMETER

.1250 DIAMETER HOLE, +.0003/-.0000
FOR MAJOR THREAD DIAMETER .375 AND LESS

.2500 DIAMETER HOLE, +.0003/-.0000
FOR MAJOR THREAD DIAMETER OVER .375

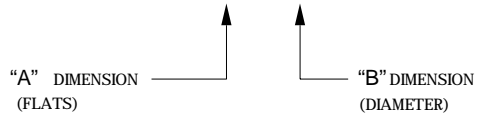
HEADED DIAMOND LINER BUSHING



Head diameters of HDLB's are 3/8" larger than OUTSIDE diameter of slotted bushings shown.

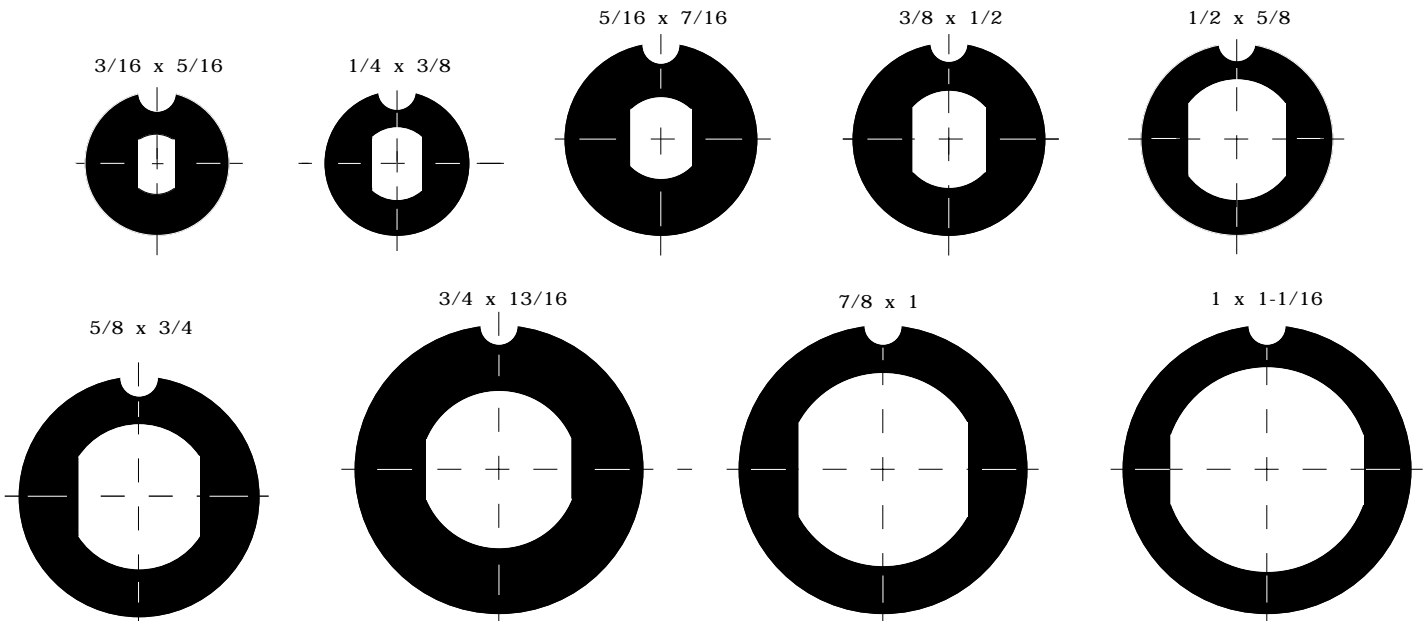
TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: HDLB - 3745 - 4995



DRAWING NUMBER
HDLB

NOTE: ACTUAL DIMENSIONS WILL BE .0005 SMALLER THAN FRACTIONAL SIZES SHOWN BELOW



NOMINAL SIZE EXAMPLES FOR REFERENCE ONLY

HEADED DIAMOND LINER BUSHING

NOTES

For best results, we recommend the following:

1. Make sure that the slotted bushing slot and locating surface around slotted bushing is clean.
2. Make sure locating surface around slotted bushing and the inside edges of the slotted bushing slot are free of burrs.

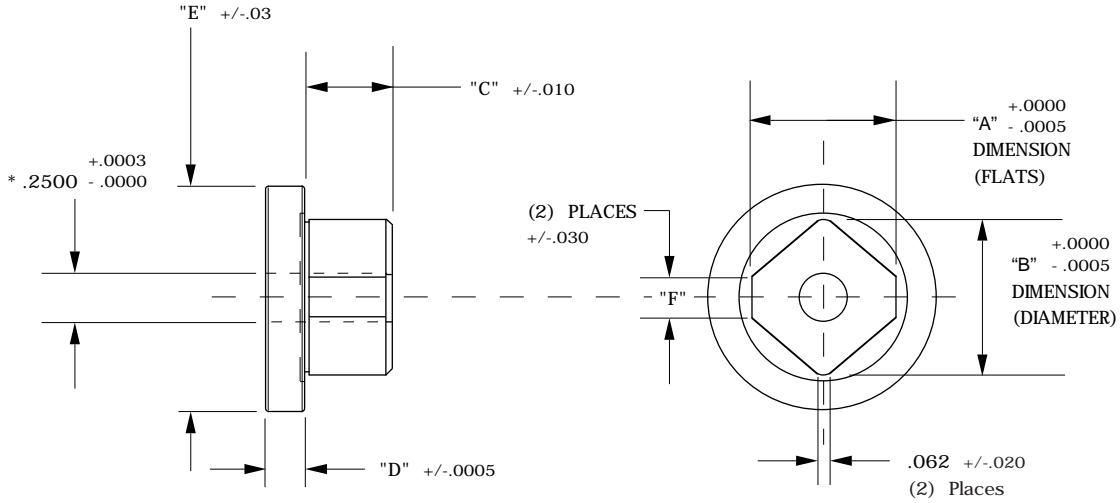
Burrs inside the slot may not allow the HDLB to fit freely and may cause damage to the HDLB if burrs are not removed.

3. Standard HDLB's are .0005 to .0010 inch under the nominal length and width sizes for minimal clearance. Sizes of the slotted bushing slots to allow for a free fit with minimal clearance. A light coat of grease around the diamond locating areas will help the HDLB to center themselves within the normal minimal clearance.

4. We suggest using .3125 high targeting in conjunction with the .1875 head thickness of the HDLB to achieve a .500 offset.

**HEADED DIAMOND
LINER BUSHING VARIABLE**

The variable design allows the end user to custom design the bushing for a specific need.

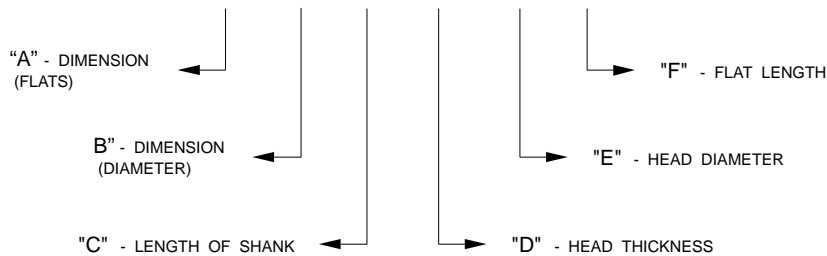


TARGET HOLE ON CENTERLINE OF "A" DIMENSION AND "B" DIMENSION WITHIN +/- .0005

***NOTE: .1250 HOLE WHEN "A" DIMENSION, (FLATS), IS LESS THAN .3120**

TO ORDER: SPECIFY PART NO. AS SHOWN

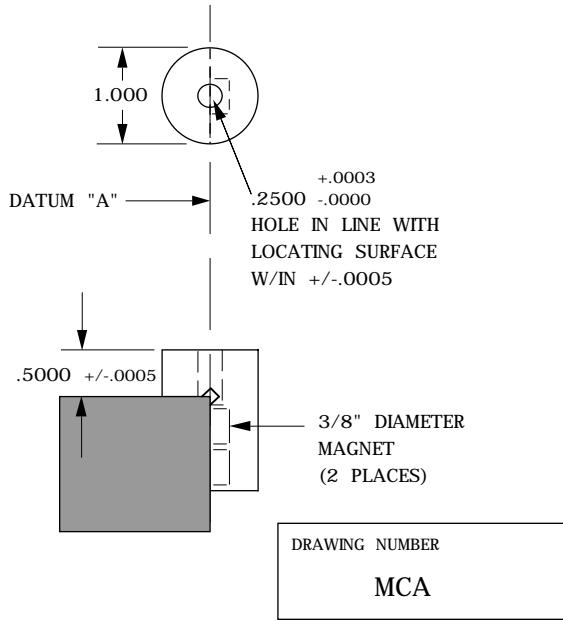
EXAMPLE: HDLBV - 3745 - 4995 - 650 - 2000 - 1.125 - 250



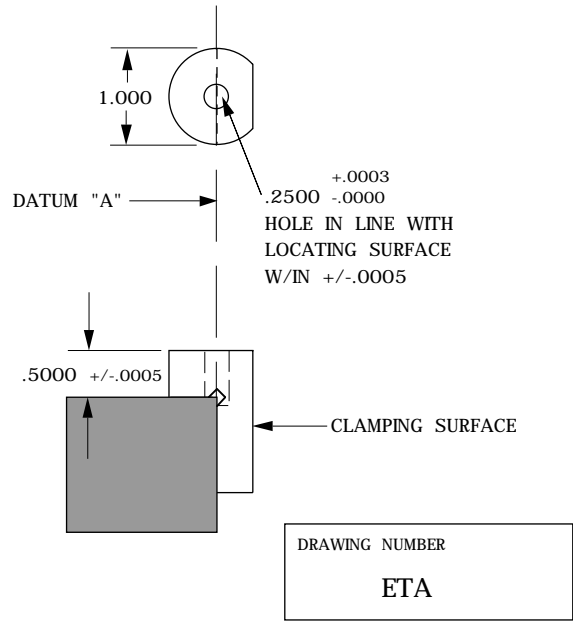
DRAWING NUMBER
HDLBV

Magnetic Corner Adaptor	(MCA)	Page E-1
Edge Target Adaptor	(ETA)	Page E-1
Invar Target Adaptor	(ITA-1), (ITA-24 mm), (ITA-2)	Page E-1
90 Degree Adaptor	(90 AD-3125), (90 AD-500)	Page E-2
Line Of Sight Adaptor	(LOSA)	Page E-3
Sphere Fit Adaptor	(SFA)	Page E-4
Hard Point	(HP)	Page E-4
Construction Ball Adaptor	(CBA)	Page E-4
Ball Point	(BP)	Page E-5
Invar Magnetic Base Adaptor	(IMBA)	Page E-6
Outside Corner Adaptor	(OCA)	Page E-7

MAGNETIC CORNER ADAPTOR

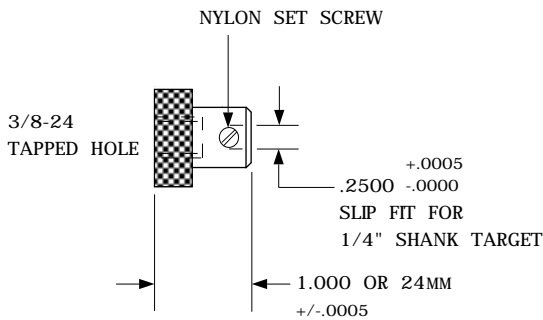


EDGE TARGET ADAPTOR



INVAR TARGET ADAPTOR

Invar Target Adaptor (ITA) is designed to adapt 90 degree targets to a Brunson Invar Scale Bar Kit.

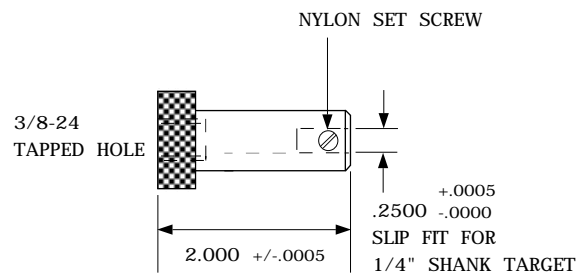


DRAWING NUMBER
ITA - 1

DRAWING NUMBER
ITA - 24MM

INVAR TARGET ADAPTOR - 2 INCH

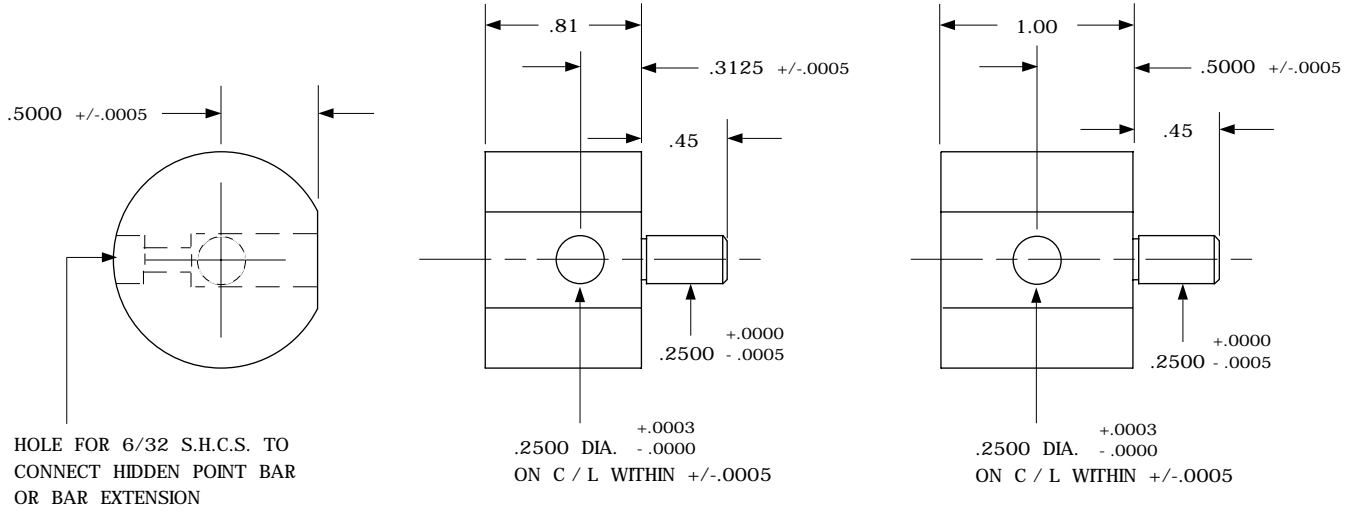
Invar Target Adaptor (ITA) is designed to adapt 90 degree targets to a Brunson Invar Scale Bar Kit.



DRAWING NUMBER
ITA - 2

90 DEGREE ADAPTOR

*90 Degree Adaptor represents the same centerline and height value as a construction ball.
It accepts a Hidden Point Bar (HPB) assembly and is used when it is needed to project 90 degrees to a point that is obstructed from view.*



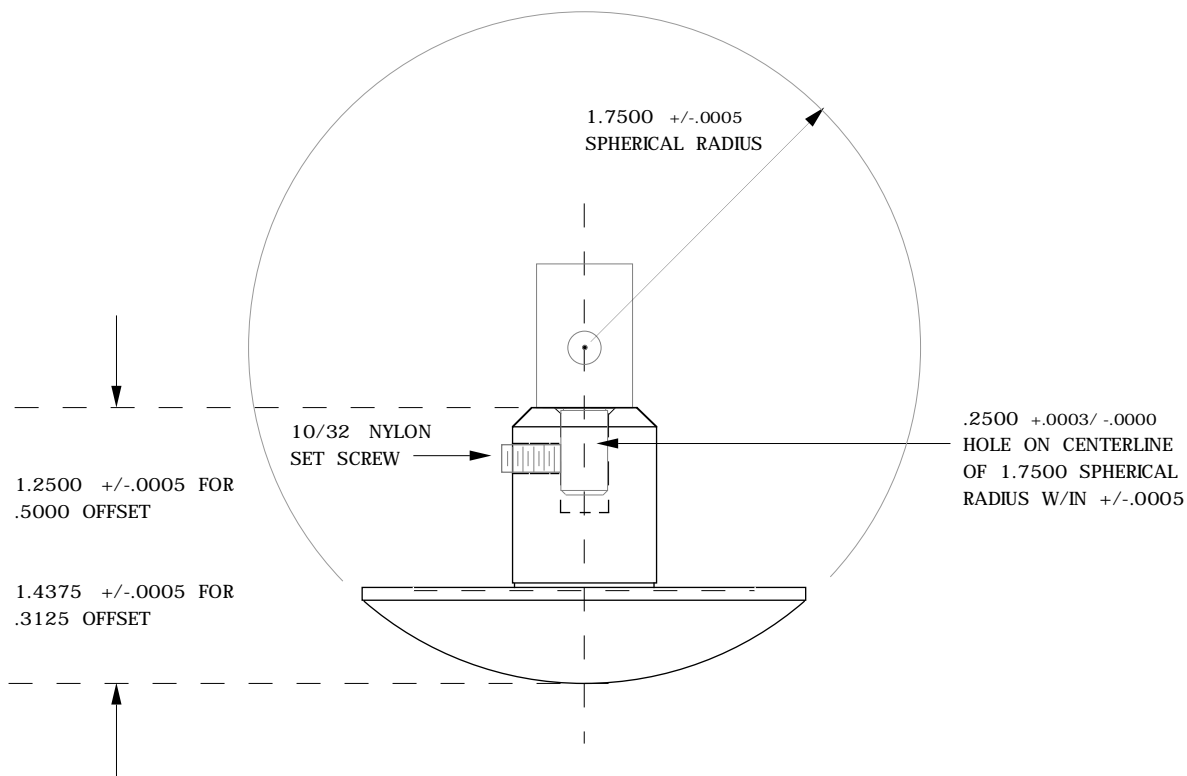
**.2500 SHANK DIAMETER STANDARD
OTHER SHANK SIZES, SUBJECT TO QUOTE.**

DRAWING NUMBER 90AD - 3125

DRAWING NUMBER 90AD - 500

LINE OF SIGHT ADAPTOR

LOSA replaces the standard optics 3-1/2" diameter Line Of Sight Spherical Target.



HARDENED TO R/C 53 - 55
90 DEGREE TARGET NOT INCLUDED

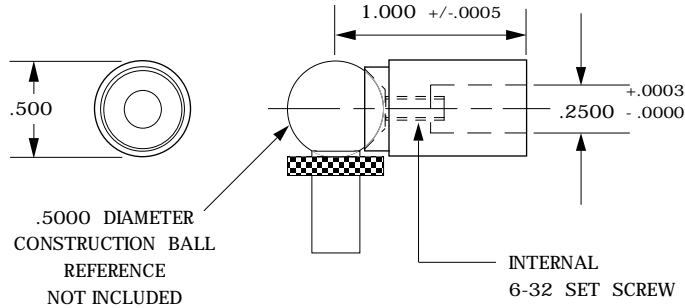
DRAWING NUMBER

LOSA

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: LOSA - 3125 OFFSET
LOSA - 5000 OFFSET

SPHERE FIT ADAPTOR

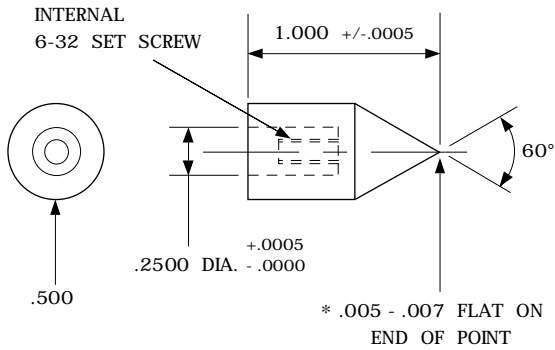
The Sphere Fit Adaptor screws onto the end of a Bar Extension similar to a Hard Point, and allows the user to locate the conical nest around a construction ball in order to generate a sphere fit routine.



DRAWING NUMBER
SFA

HARD POINT

Adapt to a Hidden Point Bar or Bar Extensions, to contact surfaces or scribe lines that are hidden from view.

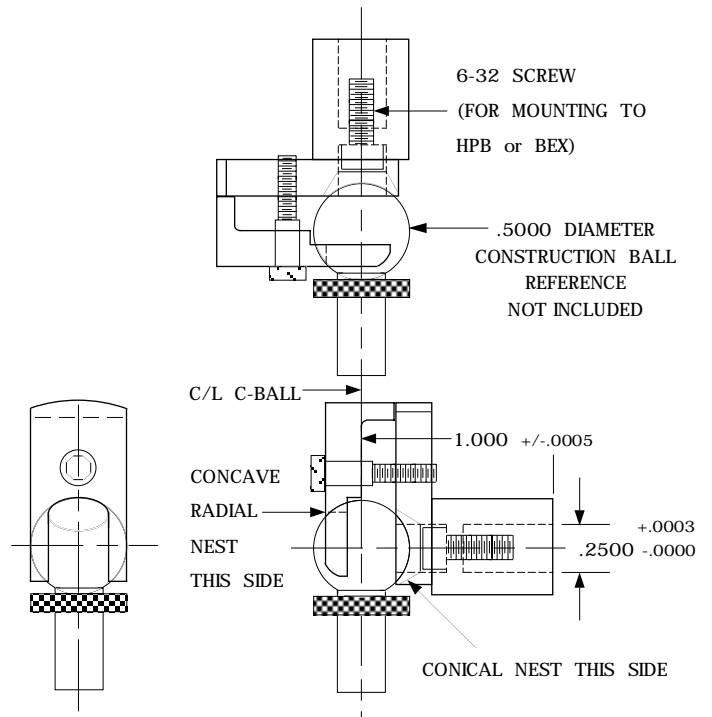


*** NOTE: POINT IS HARDENED TO R/C 53 - 55**

DRAWING NUMBER
HP

CONSTRUCTION BALL ADAPTOR

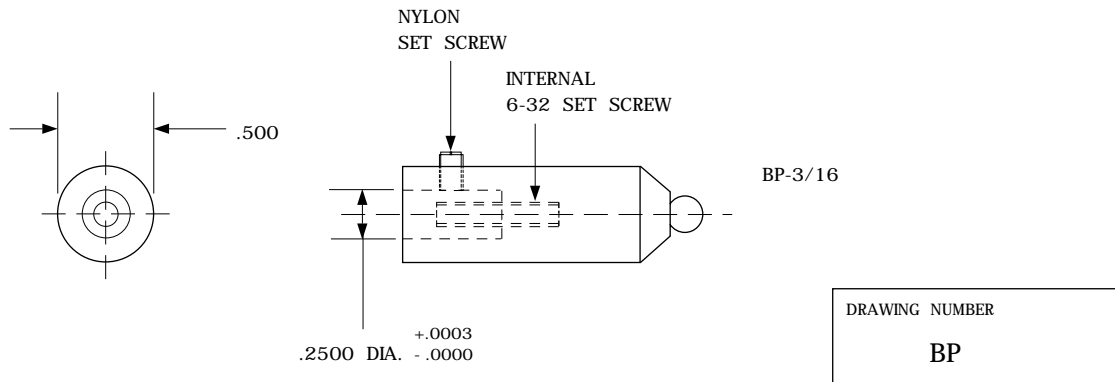
Construction Ball Adaptor mounts to Hidden Point Bar or Bar Extension similar to Hard Point. Connects to a Construction Ball and allows for 90 degree rotation.



DRAWING NUMBER
CBA

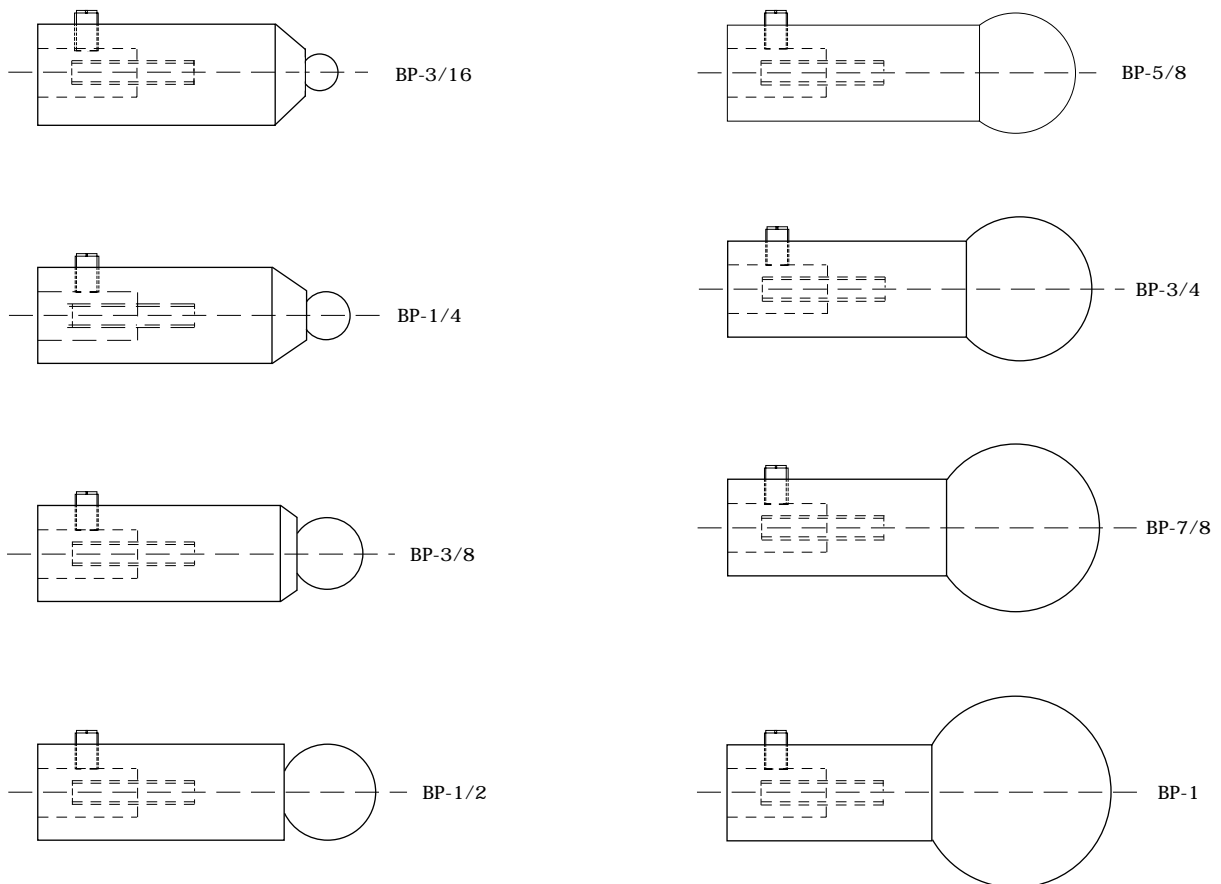
BALL POINT

The Ball Point can be screwed onto the shank end of a Bar Extension or Hidden Point Bar, similar to a Hard Point.

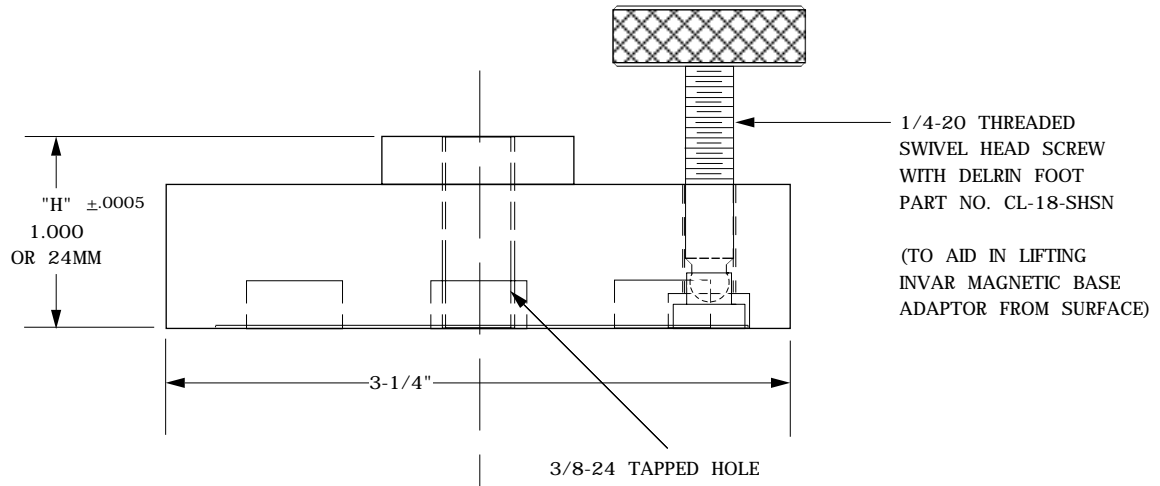


SPHERE ON CENTERLINE OF .2500 +.0003/-.0000 HOLE W/IN +/--.0005

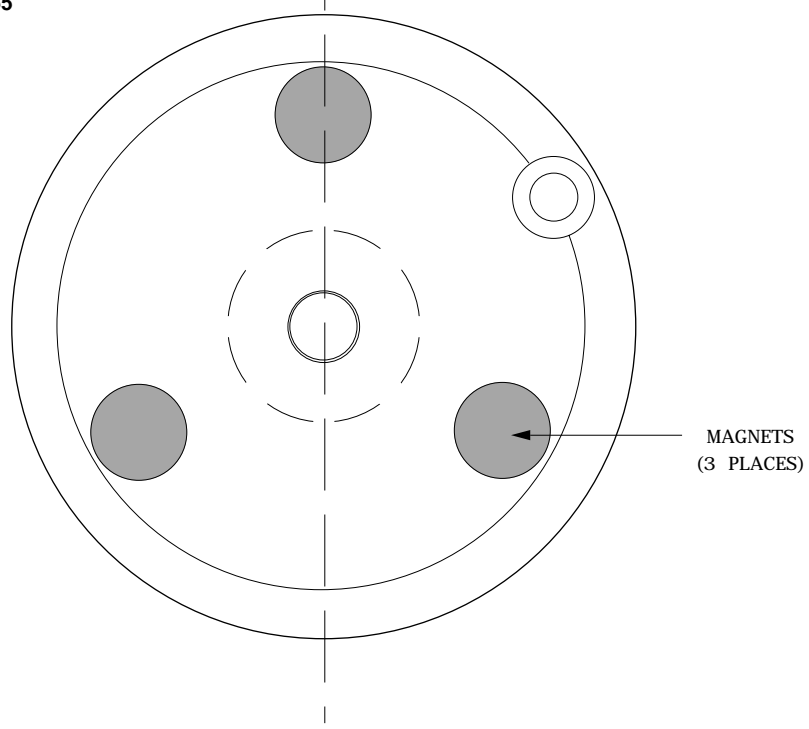
NOTE
HARDENED BALL IS BONDED TO BASE
HANDLE WITH CARE!



INVAR MAGNETIC BASE ADAPTOR



DRAWN TO SCALE
MATERIAL: 1144
BLACK OXIDE FINISH
HARDENED TO R/C 53 - 55



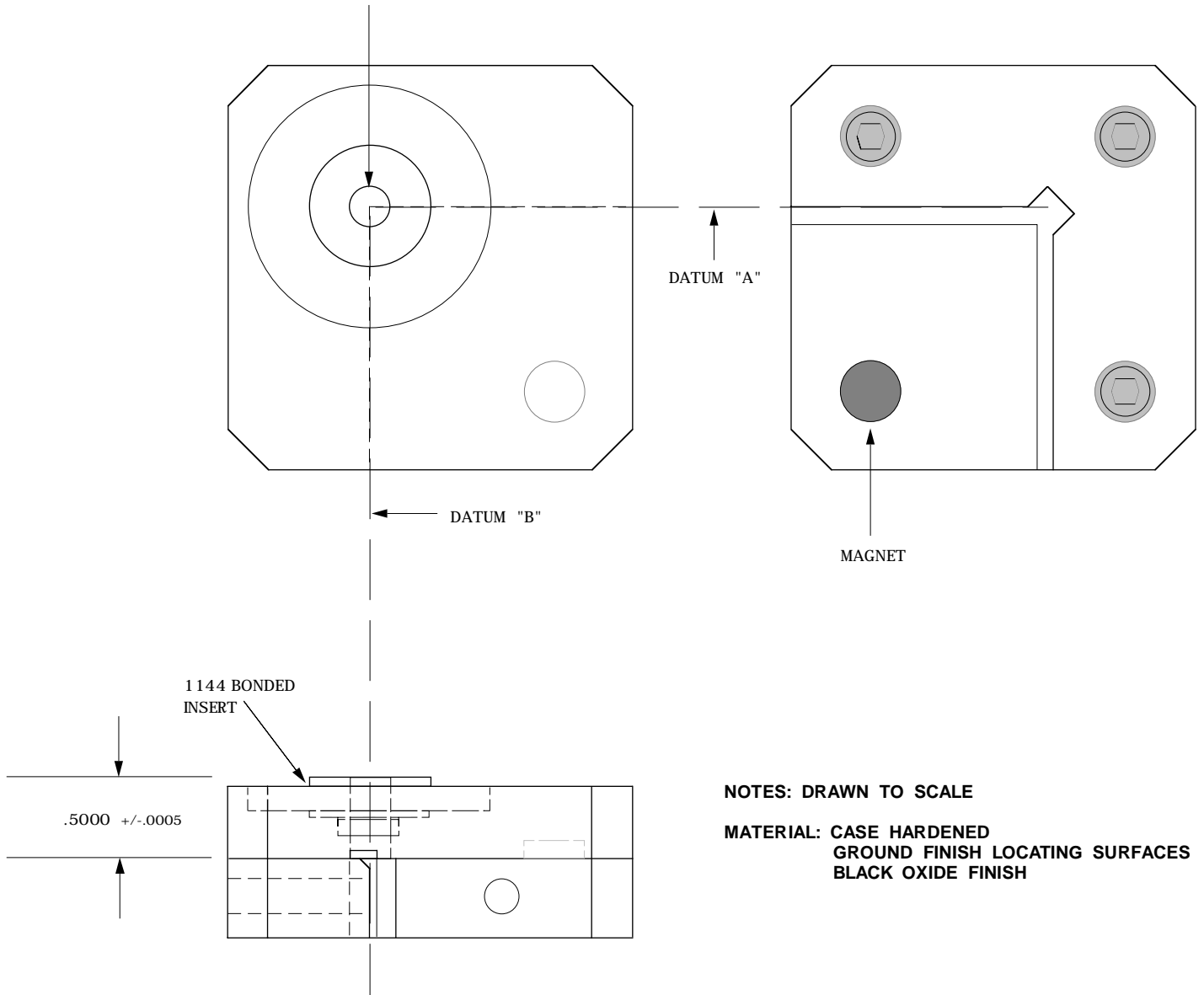
TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: IMBA - 1.000
IMBA - 24MM

↑
"H" - HEIGHT

DRAWING NUMBER
IMBA

OUTSIDE CORNER ADAPTOR

CENTERLINE OF HOLE IN LINE WITH
 DATUM "A" AND "B" WITHIN +/-0.0005



NOTES: DRAWN TO SCALE

**MATERIAL: CASE HARDENED
 GROUND FINISH LOCATING SURFACES
 BLACK OXIDE FINISH**

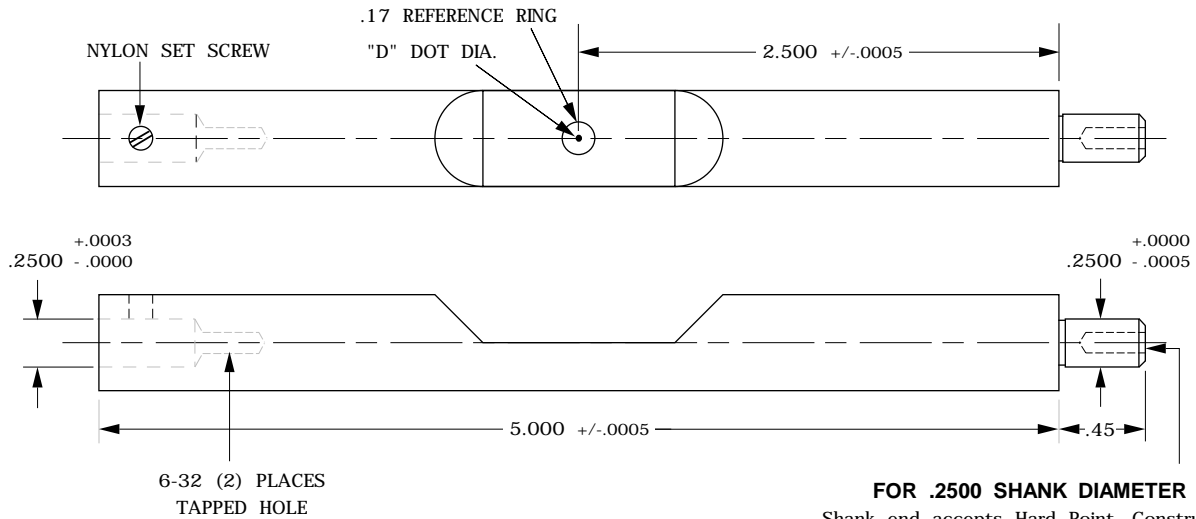
**TO ORDER: SPECIFY PART NO. AS SHOWN
 EXAMPLE: OCA**

DRAWING NUMBER
OCA

Hidden Point Bar - 2.5	(HPB-2.5)	Page F-1
Hidden Point Bar - 4.0	(HPB-4.0)	Page F-1
Bar Extension	(BEX-1, -3, -5, -10)	Page F-2
Hidden Point Bar Holder	(HPBH)	Page F-2
Single Sided Offset Rod	(SSOR)	Page F-3
Interchangeable Plug	(IP)	Page F-3
Single Sided Offset Rod Kit	(SSORK)	Page F-3
Insert Offset Rod	(IOR)	Page F-4
Insert Sine Bar	(ISB)	Page F-4
Insert Variable Offset Rod	(IVOR)	Page F-5
Insert Variable Sine Bar	(IVSB)	Page F-6
Reverse Hidden Point Adaptor	(RHPA)	Page F-7

HIDDEN POINT BAR

Use a Hidden Point Bar for projecting to a hidden hole or hidden surface. The .2500 hole accepts a 90 degree target or a bar extension. A Starrett 657TW fine adjustment flexible arm magnetic base or equivalent may be used with a Hidden Point Bar Holder, (HPBH), for support when necessary.



FOR .2500 SHANK DIAMETER ONLY
Shank end accepts Hard Point, Construction Ball Adaptor, 90 Degree Adaptor, Sphere Fit Adaptor

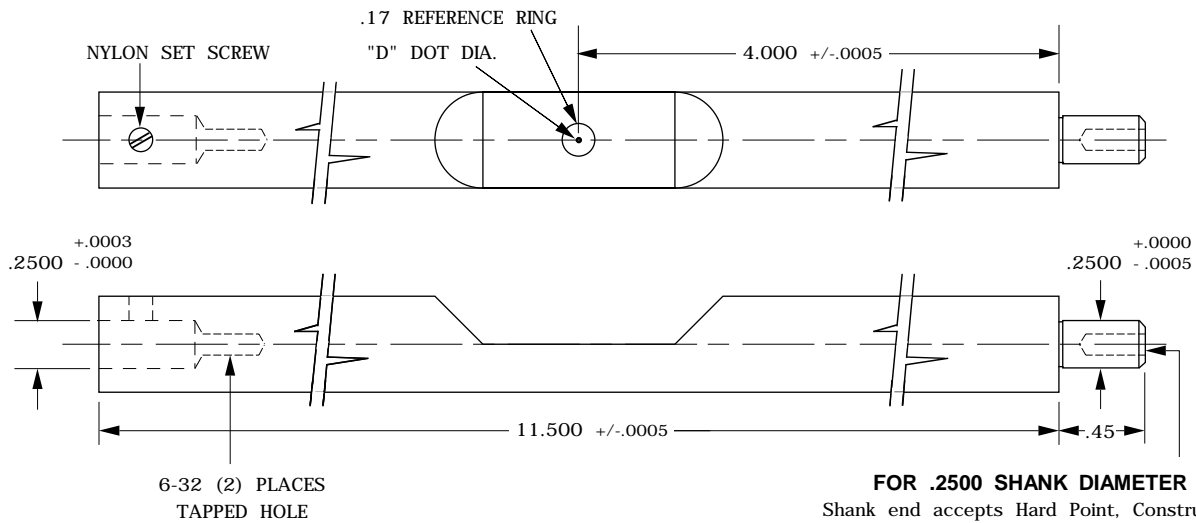
● "R" ALSO AVAILABLE IN RETRO-REFLECTIVE

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: HPB - 2.5 - 020
HPBR - 2.5 - 125

DRAWING NUMBER
HPB-2.5

↑ "A"
↑ "D"

IF A SHANK DIAMETER IS NEEDED OTHER THAN .2500, ADAPT BY USING A BAR EXTENSION 1", (BEX-1), WITH OPTIONAL SHANK SIZES. SEE PAGE F-2



FOR .2500 SHANK DIAMETER ONLY
Shank end accepts Hard Point, Construction Ball Adaptor, 90 Degree Adaptor, Sphere Fit Adaptor

● "R" ALSO AVAILABLE IN RETRO-REFLECTIVE

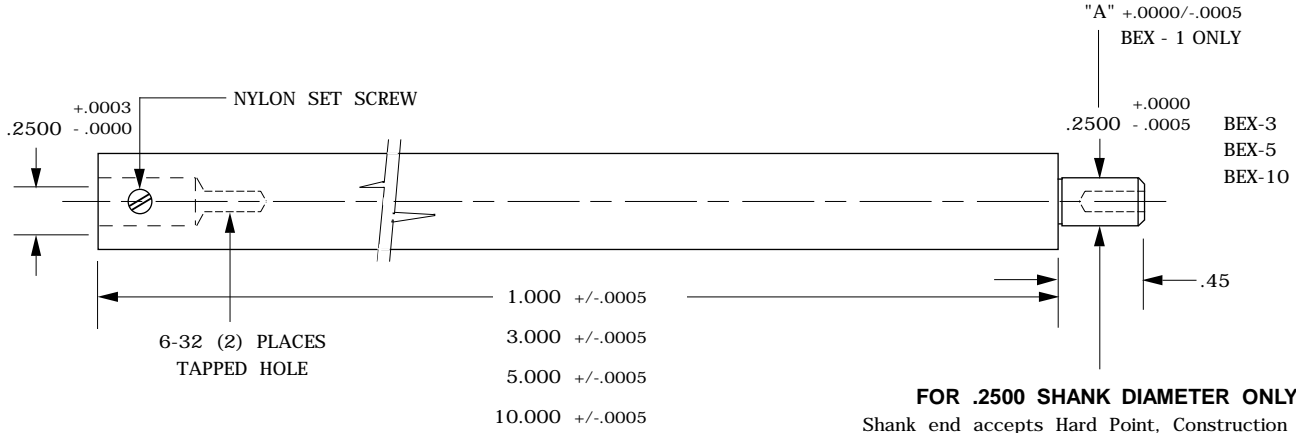
TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: HPB - 4.0 - 020
HPBR - 4.0 - 125

DRAWING NUMBER
HPB-4.0

↑ "A"
↑ "D"

BAR EXTENSION

Use with a Hidden Point Bar to extend lengths.



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: BEX - 1 - 1250
BEX - 1 - 5000

BEX - 3
BEX - 5
BEX - 10

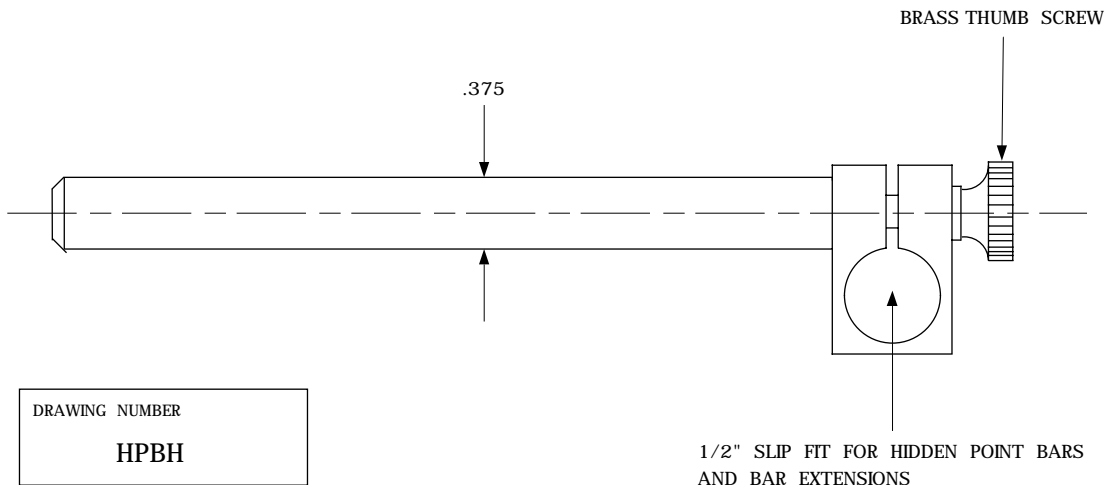
"A"

DRAWING NUMBER
BEX

"A" DIAMETER OPTIONS ON BEX - 1 ONLY

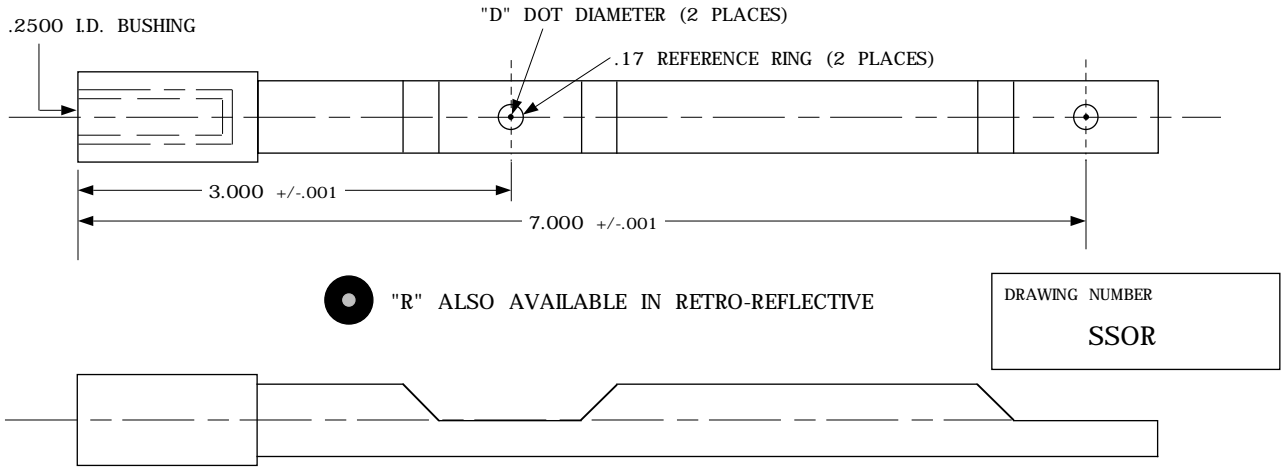
HIDDEN POINT BAR HOLDER

For adapting Hidden Point Bar or Bar Extension to a magnetic base for support.



SINGLE - SIDED OFFSET ROD

The Single - Sided Offset Rod is a hidden point bar that will accept various size interchangeable plugs in order to target and measure various size holes that are obstructed from view.



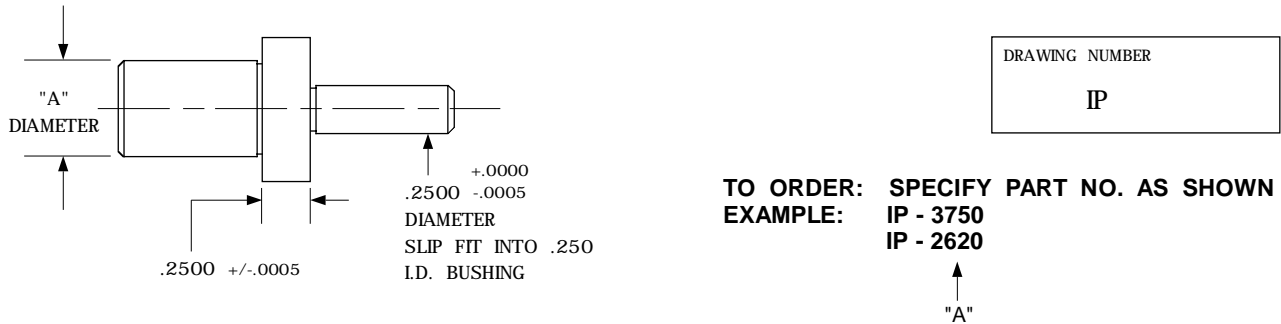
DRAWING NOT TO SCALE

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: SSOR - 020
SSORR - 125

↑
"D"

INTERCHANGEABLE PLUG

For inserting into Single-Sided Offset Rod in order to fit and measure to holes that are hidden from view.



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: IP - 3750
IP - 2620

↑
"A"

SINGLE - SIDED OFFSET ROD KIT

SINGLE - SIDED OFFSET ROD KIT consists of the following:

1 - SINGLE - SIDED OFFSET ROD (Specify dot diameter)

and the following INTERCHANGEABLE PLUGS

- 1 - .1250 "A" diameter
- 1 - .2500 "A" diameter
- 1 - .3125 "A" diameter
- 1 - .3750 "A" diameter
- 1 - .4375 "A" diameter
- 1 - .5000 "A" diameter

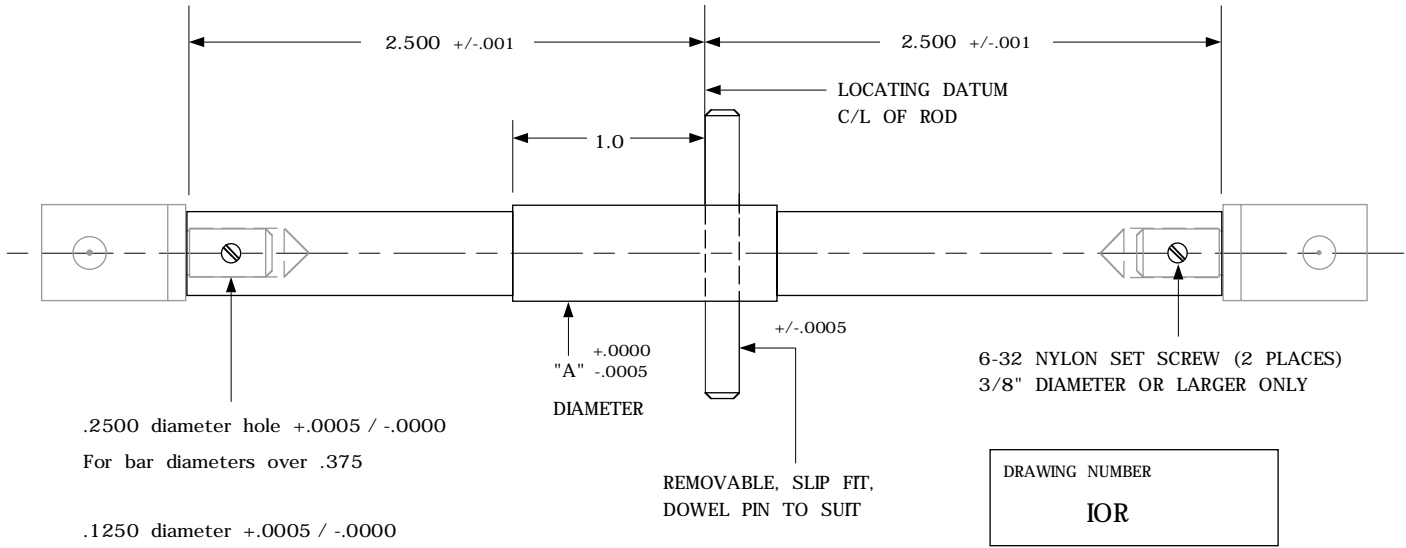
DRAWING NUMBER
SSORK

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: SSORK - 020
SSORKK - 125

↑
"D"

INSERT OFFSET ROD

*Insert Offset Rod accepts a 90 degree target, .500 high, .2500 shank or .1250 shank in each end to achieve a 3.000 inch offset in each direction.
For anything other than a 2.500 length in both direction, please refer to the IVOR drawing on page 20.*



DRAWING NUMBER
IOR

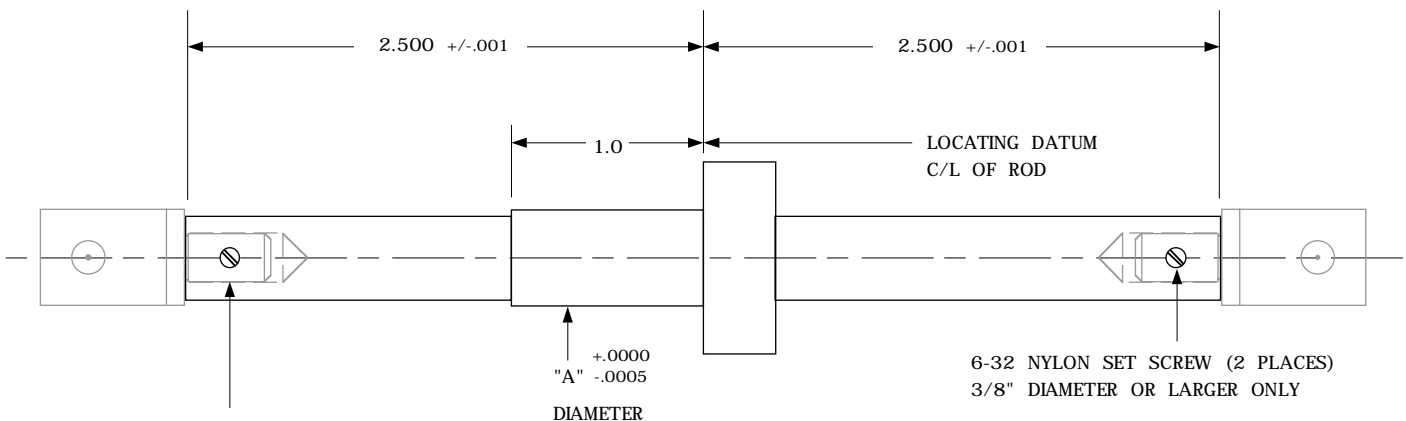
**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: IOR - 2.500 - 5000**

↑
"A"

For special lengths, please call for quote.

INSERT SINE BAR

*Insert Sine Bar accepts a 90 degree target, .500 high, .2500 shank or .1250 shank in each end to achieve a 3.000 inch offset in each direction.
For anything other than a 2.500 length in both direction, please refer to the IVSB drawing on page 21.*



DRAWING NUMBER
ISB

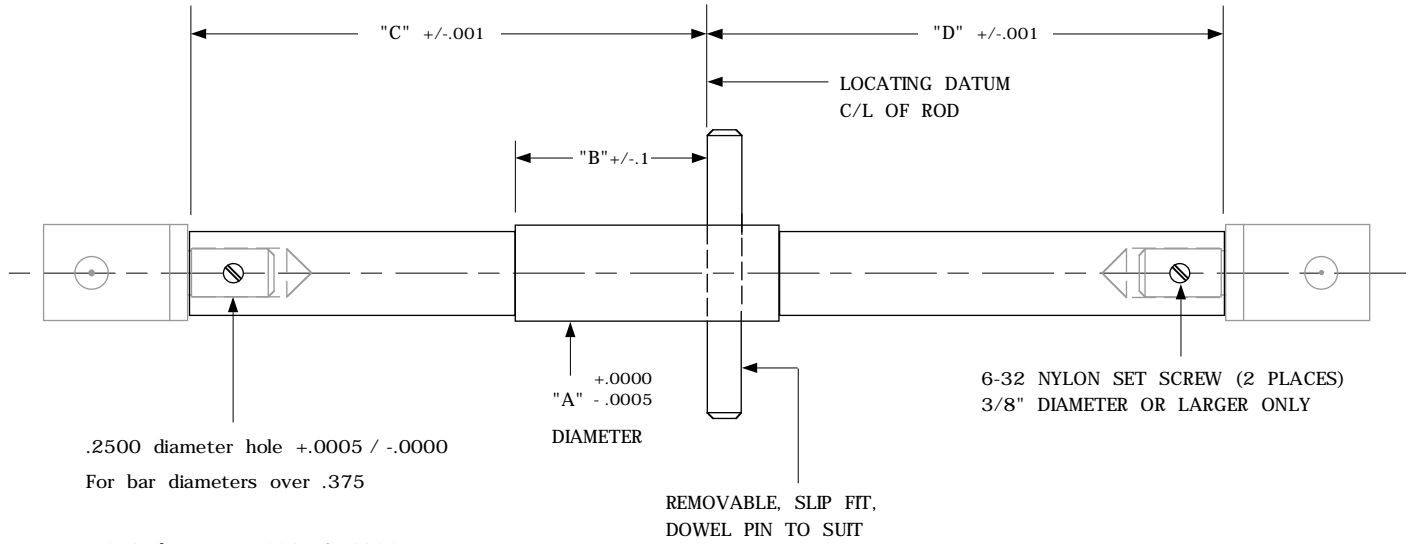
**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: ISB - 2.500 - 5000**

↑
"A"

For special lengths, please call for quote.

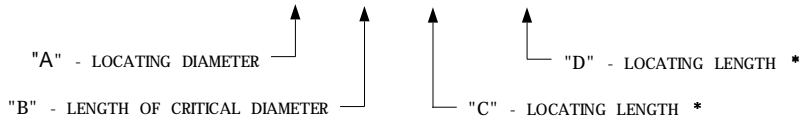
INSERT VARIABLE OFFSET ROD

Insert Variable Offset Rod will accept any type of stemmed target or tooling ball in each end to achieve an even inch increment offset in each direction.



DRAWING NUMBER
IVOR

**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: IVOR - 5000 - 1.0 - 3.6875 - 5.6875**



* NOTE: VALUE TO THE RIGHT OF DECIMAL POINT IS TO ACCOMMODATE TARGET OFFSET
EXAMPLES BELOW:

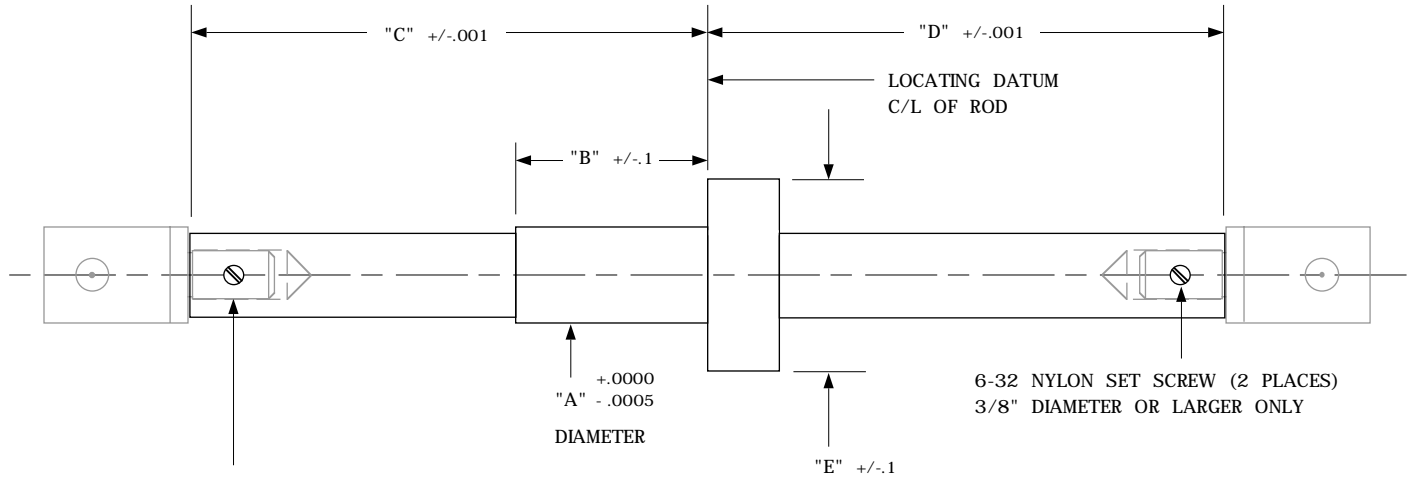
(2) .2500 Diameter Construction Balls included

3.6875	3.8000	3.5000	LOCATING LENGTH
+ .3125	+ .2000	+ .5000	TARGET OR CONSTRUCTION BALL OFFSETS
4.0000	4.0000	4.0000	TOTAL OFFSET FROM LOCATING DATUM PLANE

NON-STANDARD - CALL FOR QUOTE

INSERT VARIABLE SINE BAR

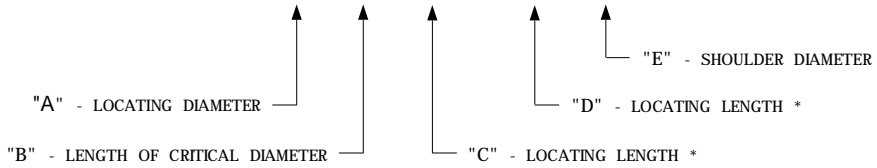
Insert Variable Sine Bar will accept any type of stemmed target or tooling ball in each end to achieve an even inch increment offset in each direction.



.2500 diameter hole +.0005 / -.0000, for bar diameters over .375
.1250 diameter +.0005 / -.0000, for bar diameters .375 and under.

DRAWING NUMBER
IVSB

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: IVSB - 5000 - 1.5 - 3.6875 - 5.6875 - 2.0



***NOTES: VALUE TO THE RIGHT OF DECIMAL POINT IS TO ACCOMMODATE TARGET OFFSET**
EXAMPLES BELOW:

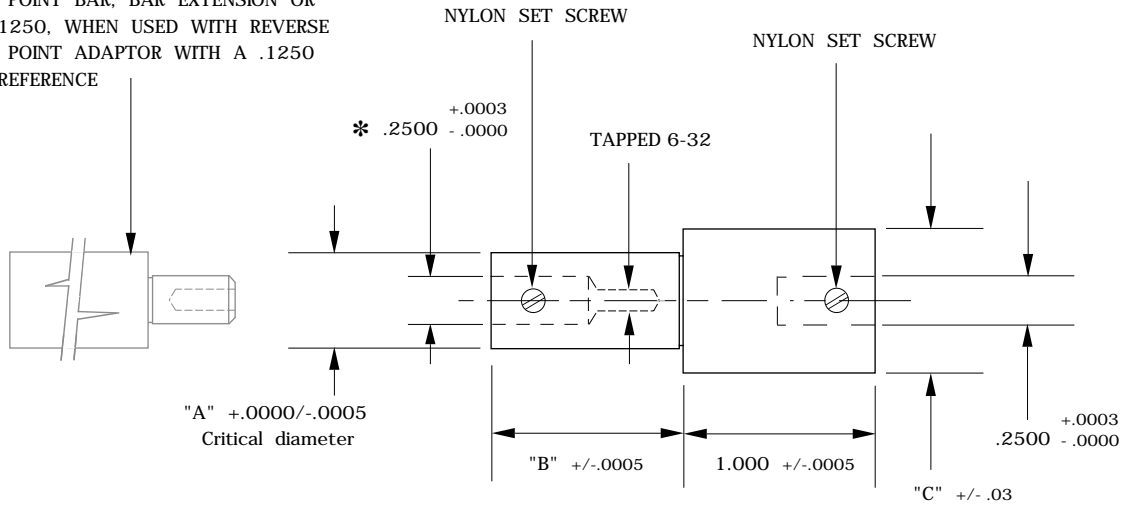
(2) .2500 Diameter Construction Balls included

3.6875	3.8000	3.5000	LOCATING LENGTH
+ .3125	+ .2000	+ .5000	TARGET OR CONSTRUCTION BALL OFFSETS
4.0000	4.0000	4.0000	TOTAL OFFSET FROM LOCATING DATUM PLANE

NON-STANDARD - CALL FOR QUOTE

REVERSE HIDDEN POINT ADAPTOR

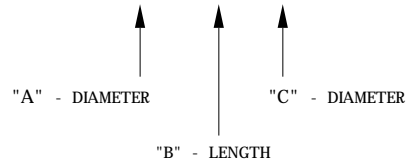
HIDDEN POINT BAR, BAR EXTENSION OR
(BEX-1-1250, WHEN USED WITH REVERSE
HIDDEN POINT ADAPTOR WITH A .1250
HOLE) REFERENCE



* .2500 DIAMETER HOLE +.0003/-.0000, FOR BAR DIAMETERS OVER .375
* .1250 DIAMETER +.0003 /-.0000, FOR BAR DIAMETERS .375 AND UNDER, TAPPED 6-32 HOLE OMITTED

TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: RHPA - 5000 - 1.000 - 75



DRAWING NUMBER
RHPA

DRAWING: TO SCALE

1.5 Sphere Mount	(1.5 SM-1.000)	(1.5 SM-25 MM)	Page	G-1
1.5 Sphere Mount Variable	(1.5 SMV)		Page	G-2
1.5 Sphere Mount Special Index	(1.5 SMSI-1.000)		Page	G-3
1.5 Non-Magnetic Sphere Mount	(1.5 NMSM-1.000)		Page	G-4
1.5 Sphere Mount - Hard Coat	(1.5 SM-HC)		Page	G-5
1.5 Shankless Sphere Mount	(1.5 SSM-1.000)	(1.5 SSM-25MM)	Page	G-6
1.5 Laser Tracker Reference Sphere Mount	(1.5 LTRSM)		Page	G-7
1.5 Foundation Sphere Mount	(1.5 FSM)		Page	G-8
1.5 Tripod Sphere Mount	(1.5 TSM)		Page	G-9
1.5 SMX Tripod Sphere Mount	(1.5 SMX TSM)		Page	G-9
1.5 Edge Sphere Mount	(1.5 ESM-1.000)	(1.5 ESM-25MM)	Page	G-10
1.5 Edge Sphere Mount - 2	(1.5 ESM-2)		Page	G-11
Theodolite 1.5 Sphere	(T1.5S)		Page	G-12
Retro-Reflective 1.5 Sphere	(R1.5S)		Page	G-13
Laser Tracker Line of Sight Adaptor	(LT-LOSA)		Page	G-14
SMR Lanyard Set	(SMR LANYARD SET)		Page	G-15
1.5 - .5 SMR Adaptor	(1.5 - .5 SMR AD)		Page	G-16
1.5 - .875 SMR Adaptor	(1.5 - .875 SMR AD)		Page	G-16
1.5 Shankless Sphere Mount Magnetic Base	(1.5 SSM/MB)		Page	G-17
1.5 Sphere Mount - Hard Coat Magnetic Base	(1.5 SM-HC/MB)		Page	G-18
Laser Tracker Leveling Lug Adaptor	(LT - LLA)		Page	G-19
1.5 SM Pole Adaptor	(1.5 SM PA)		Page	G-20

CALL FOR QUANTITY PRICES

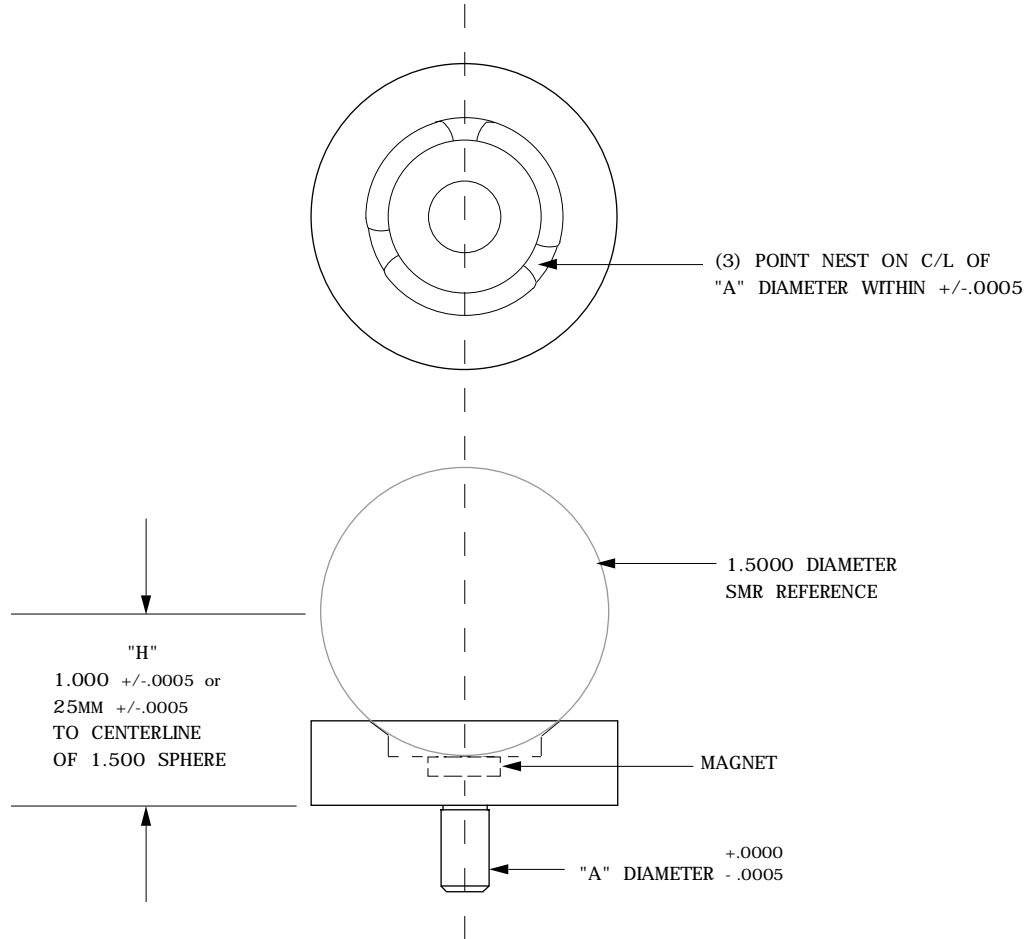
- continued -

	1.5 Edge Sphere Mount - 2 - 1/4	(1.5 ESM - 2 - 1/4)	Page	G-21
	1.5 Shankless Sphere Mount - M6	(1.5 SSM / M6)	Page	G-22
	1.5 Invar Sphere Mount	(1.5 ISM)	Page	G-23
	LEICA Lanyard Set	(LEICA Lanyard Set)	Page	
	Leveling Lug Sphere Target	(LLST)	Page	G-25
	1.5 Sphere Mount / Diamond Shank	(1.5 SM/DS-1.000)	Page	G-26
	1.5 Sphere Mount / Diamond Shank	(Notes)	Page	G-27
	1.5 Sphere Mount - Variable / Diamond Shank	(1.5 SMV/DS-1.000)	Page	G-28
	1.5 Edge Sphere Mount -Outside Corner	(1.5 ESM-OC)	Page	G-29
NEW	1.5 Sphere Mount Drift Nest	(1.5 SM-DN)	Page	G-30
NEW	1.5 SMR Magnetic Clamp	(1.5 SMR-MC)	Page	G-31
NEW	1.5 Sphere Mount Threaded	(1.5 SMT-1.000) (1.5 SMT-25mm)	Page	G-32
NEW	1.5 Retro-Probe Reset Sphere - BALL	(1.5 RRS)	Page	G-33
NEW	1.5 Retro-Probe Reset Sphere - POINT	(1.5 RRS - POINT)	Page	G-33
NEW	1.5 Track And Punch SMR Nest	(1.5 TPSN)	Page	G-34
NEW	1.5 Sphere Mount Drift Nest 3 Point Steel	(1.5 SM-DN-3PS)	Page	G-35
NEW	1.5 Sphere Mount Drift Nest 3 Point Aluminum	(1.5 SM-DN-3PA)	Page	G-36
NEW	1.5 Sphere Mount Negative	(1.5 SM-1.000 NEG) (1.5 SM-25mm NEG)	Page	G-37 PATENT PENDING

CALL FOR QUANTITY PRICES

1.5 SPHERE MOUNT

The 1.5 Sphere Mount is designed to hold a Spherically Mounted Retro-Reflector or Theodolite Sphere on centerline of a hole and 1.000 above or optional 25MM above



TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: 1.5 SM - 1.000 - 2500

1.5 SM - 25MM - 6MM



"A" - SHANK DIAMETER

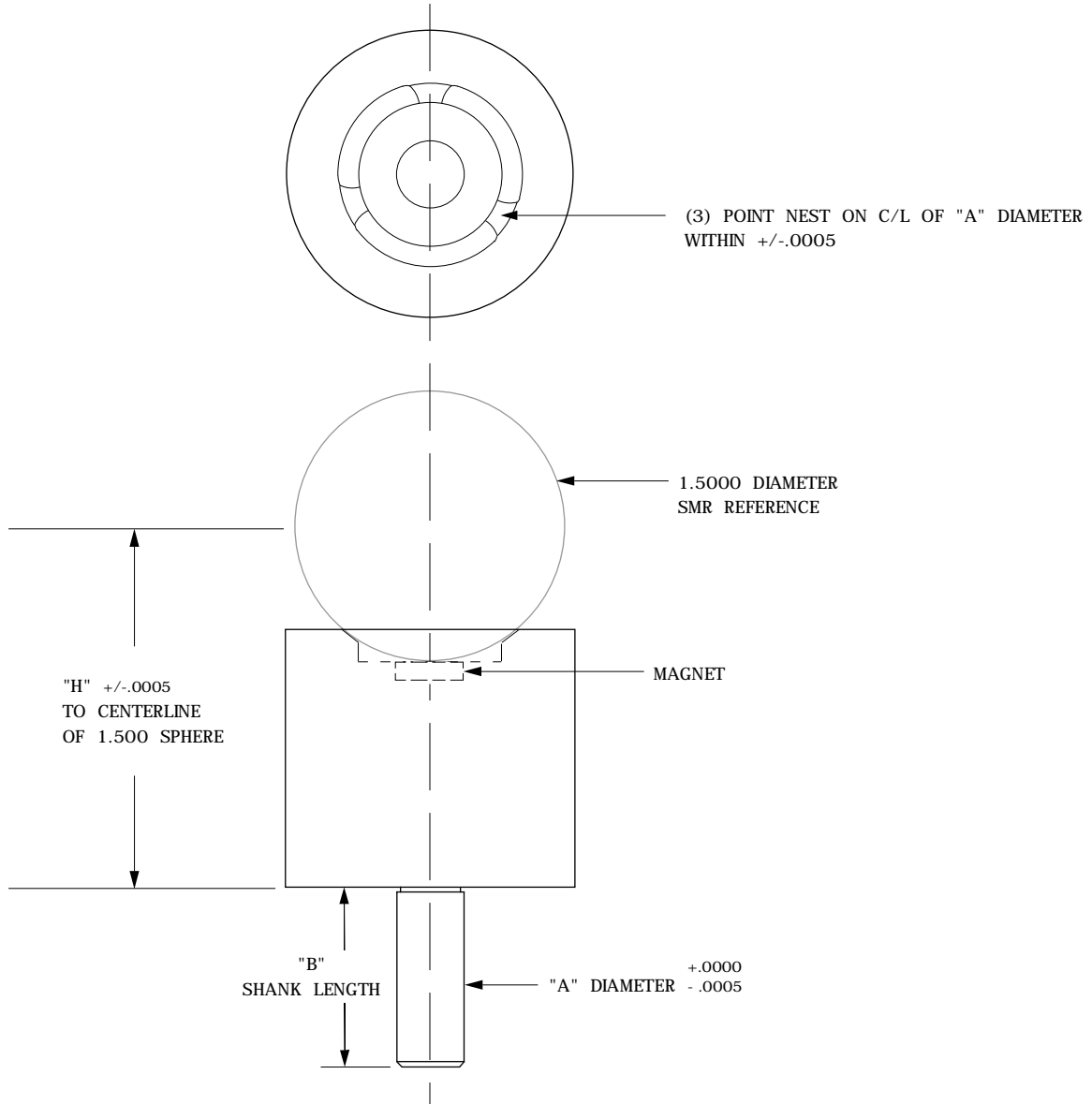
"H" - HEIGHT TO CENTERLINE OF SPHERE

DRAWING NUMBER
1.5 SM-1.000

DRAWING NUMBER
1.5 SM-25MM

1.5 SPHERE MOUNT - VARIABLE

The 1.5 Sphere Mount Variable is designed to hold a Spherically Mounted Retro-Reflector, Theodolite Sphere or Retro-Reflective 1.5 Sphere on centerline of a hole. Use the variable design to customize the sphere mount for your specific needs.



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 SMV - 2.000 - 3750 - 1.0

↑
" H " - HEIGHT TO CENTERLINE OF SPHERE

↑
" A " - SHANK DIAMETER

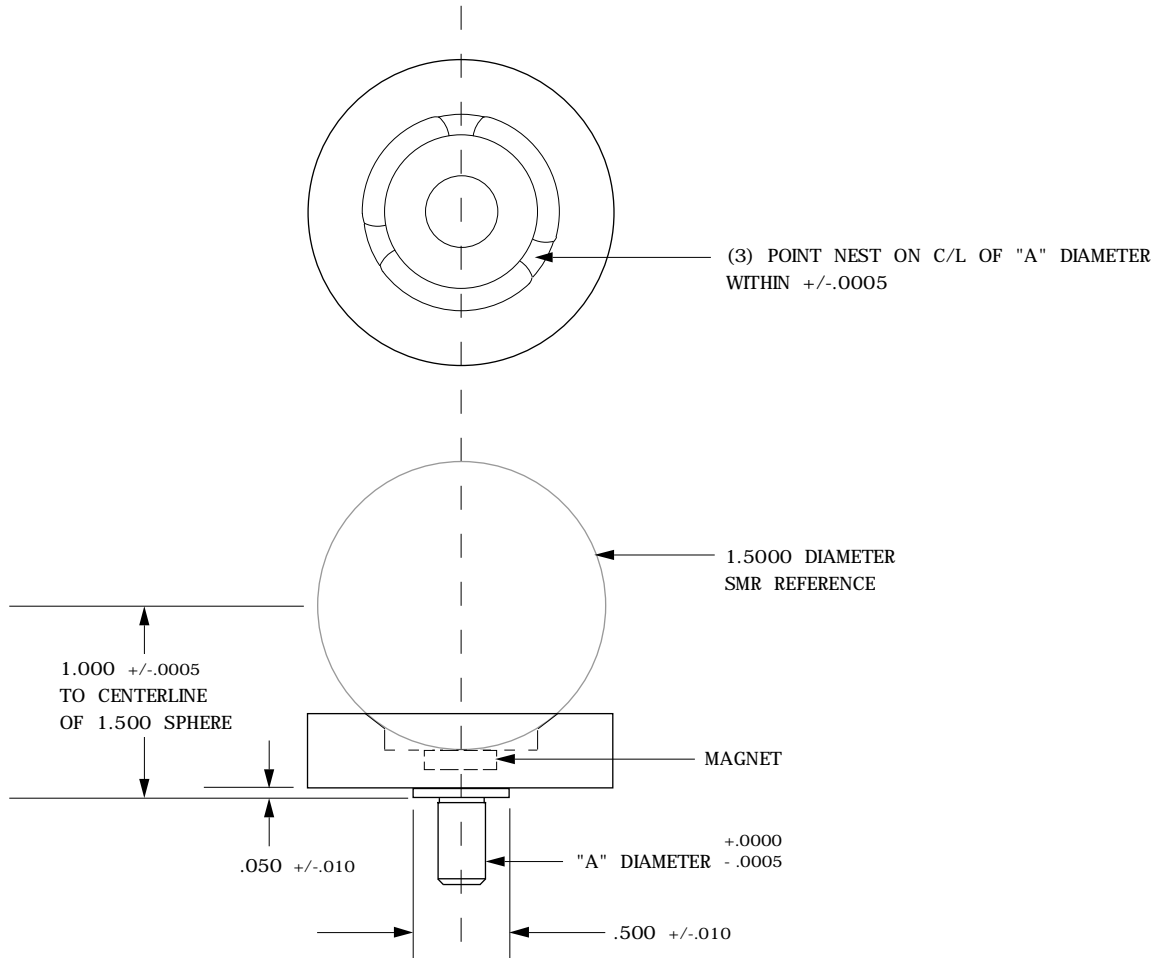
↑
" B " - SHANK LENGTH

DRAWING NUMBER
1.5 SMV

PLEASE CALL FOR QUOTE

1.5 SPHERE MOUNT SPECIAL INDEX

The 1.5 Sphere Mount Special Index is designed to hold a Spherically Mounted Retro-Reflector or Theodolite Sphere on centerline of a hole and 1.000 above where a smaller shoulder locating area is required. Boeing Wichita special request.



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 SMSI - 1.000 - 2500

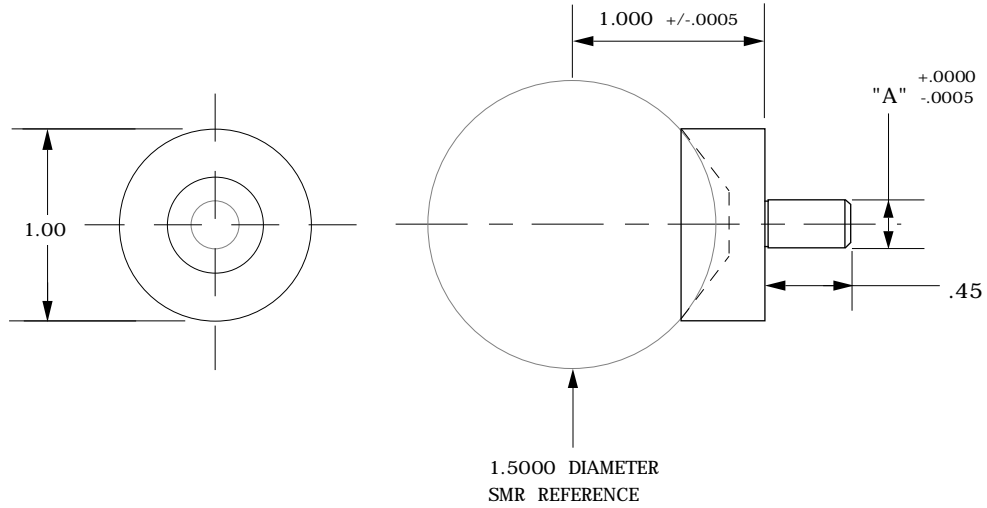
↑
 "H" - HEIGHT TO CENTERLINE OF SPHERE

↑
 "A" - SHANK DIAMETER

DRAWING NUMBER
1.5 SMSI-1.000

1.5 NON - MAGNETIC SPHERE MOUNT

The 1.5 Non - Magnetic Sphere Mount is designed to hold a Spherically Mounted Retro-Reflector or Theodolite Sphere on centerline of a hole when a magnet is not required.



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 NMSM - 1.000 - 2500

"H" - HEIGHT TO CENTERLINE OF SPHERE

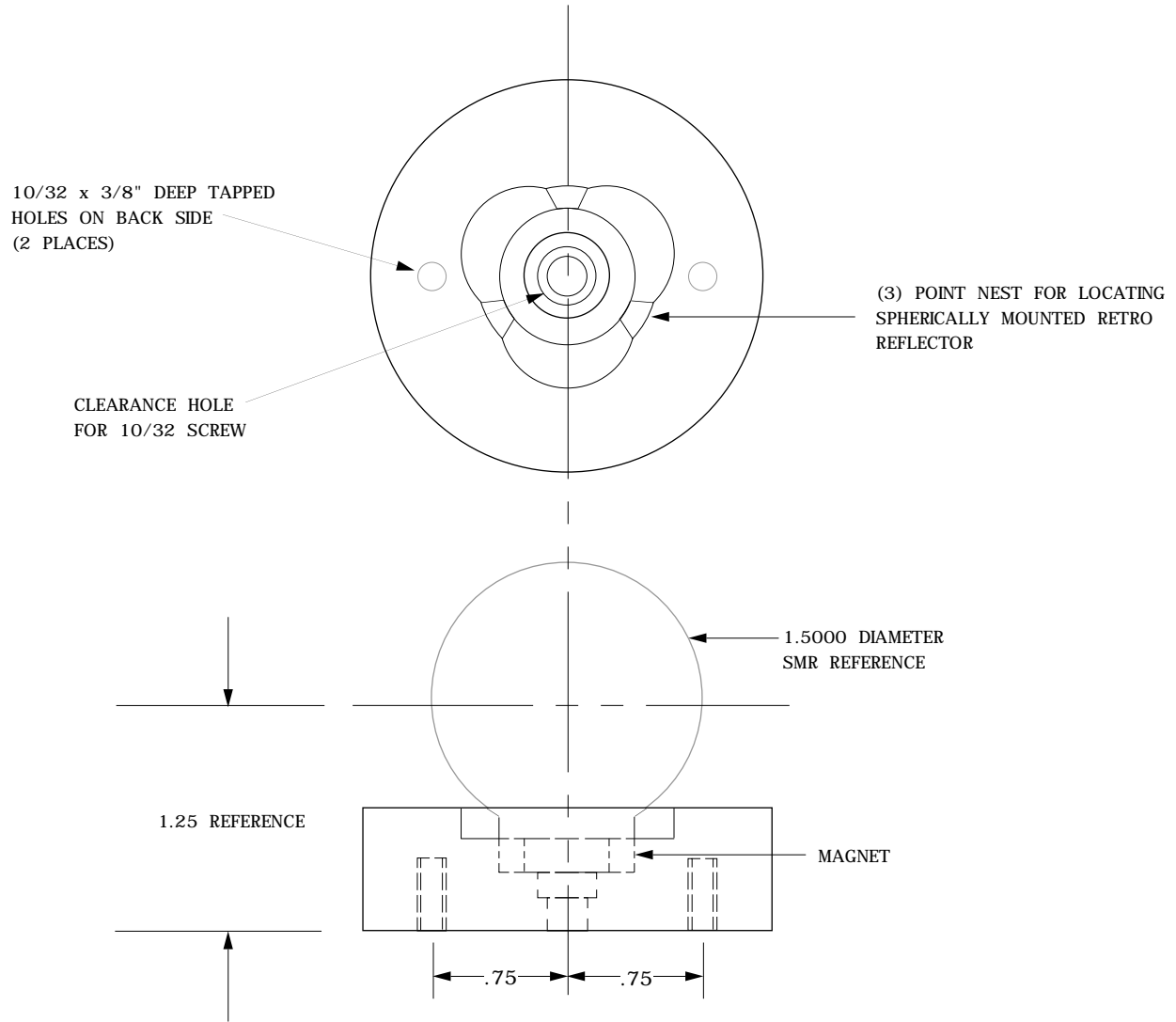
"A" - SHANK DIAMETER

DRAWING NUMBER

1.5 NMSM-1.000

1.5 SPHERE MOUNT - HARD COAT

The 1.5 Sphere Mount - Hard Coat is designed for mounting to a surface to securely hold a 1.500 diameter Spherically Mounted Retro-Reflector or Theodolite Sphere. The 1.5SM-HC is used for permanent reference only, not intended for critical offsets or concentricities.



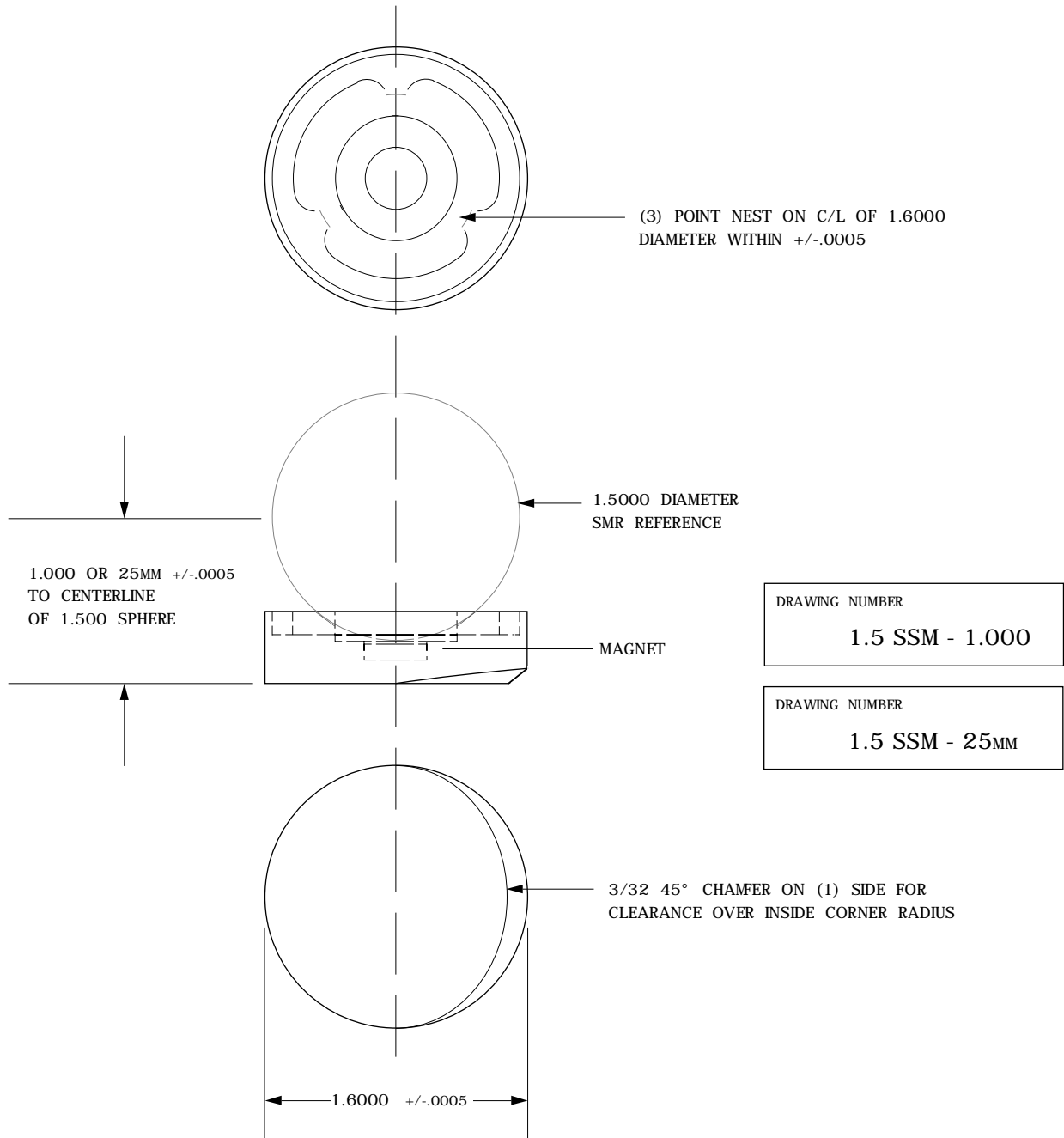
DRAWING TO SCALE

**MATERIAL: ALUMINUM
BLACK, HARD COAT FINISH**

DRAWING NUMBER
1.5 SM - HC

1.5 SHANKLESS SPHERE MOUNT

The 1.5 Shankless Sphere Mount supports a 1.5 Spherical Mounted Retro-Reflector or Theodolite Sphere for a critical height and centerline. The edge may be used to contact inside edges to give a value of .800 away.

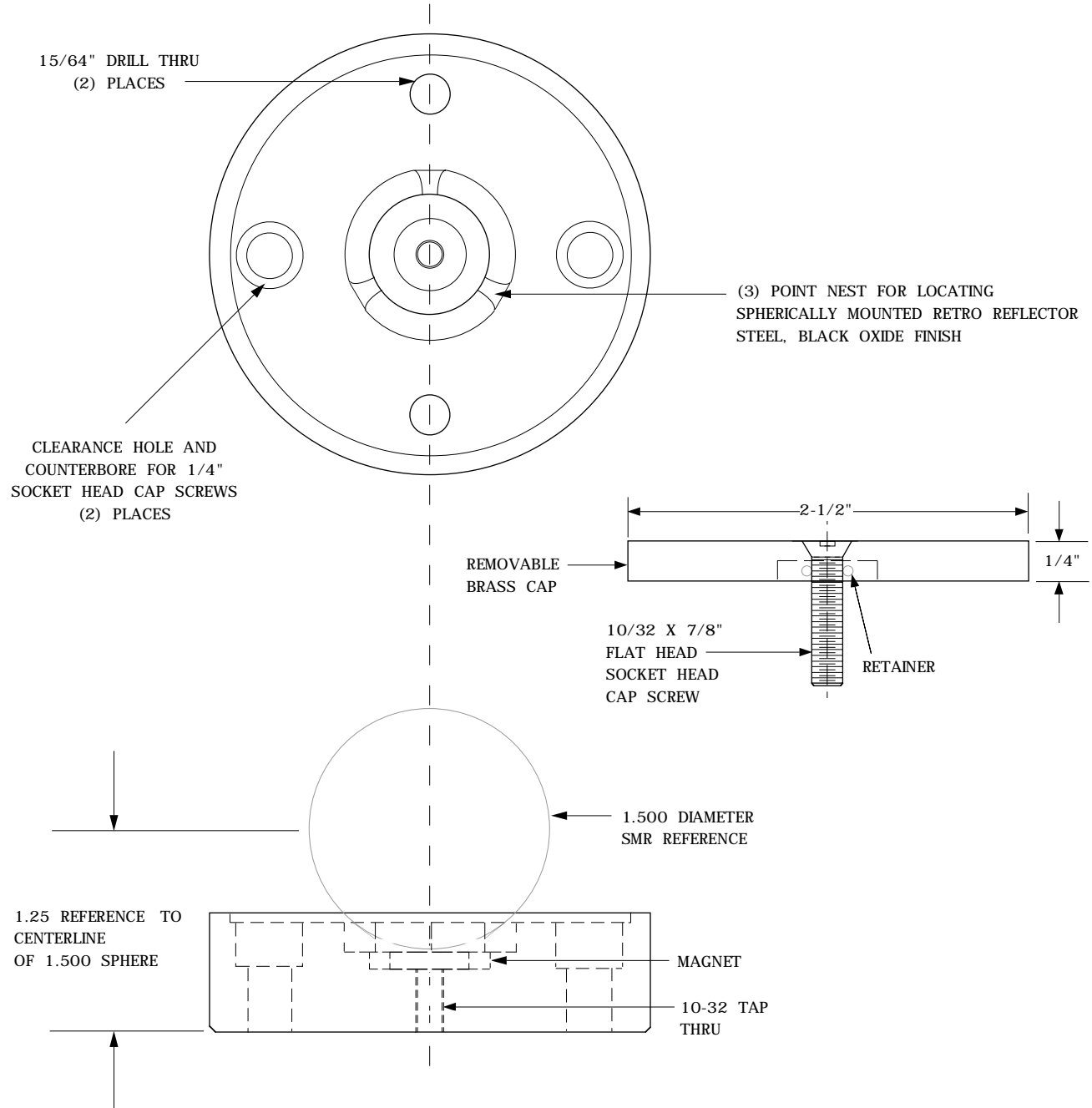


HARDENED TO R/C 53 - 55

FOR NON - CRITICAL APPLICATIONS, SUGGEST USING A 1.5 SPHERE MOUNT - HARD COAT, (1.5SM - HC), PAGE G-5.

1.5 LASER TRACKER REFERENCE SPHERE MOUNT

TOP VIEW SHOWN WITH CAP REMOVED



DRAWN TO SCALE

**MATERIAL: 1144 STEEL
BLACK OXIDE FINISH**

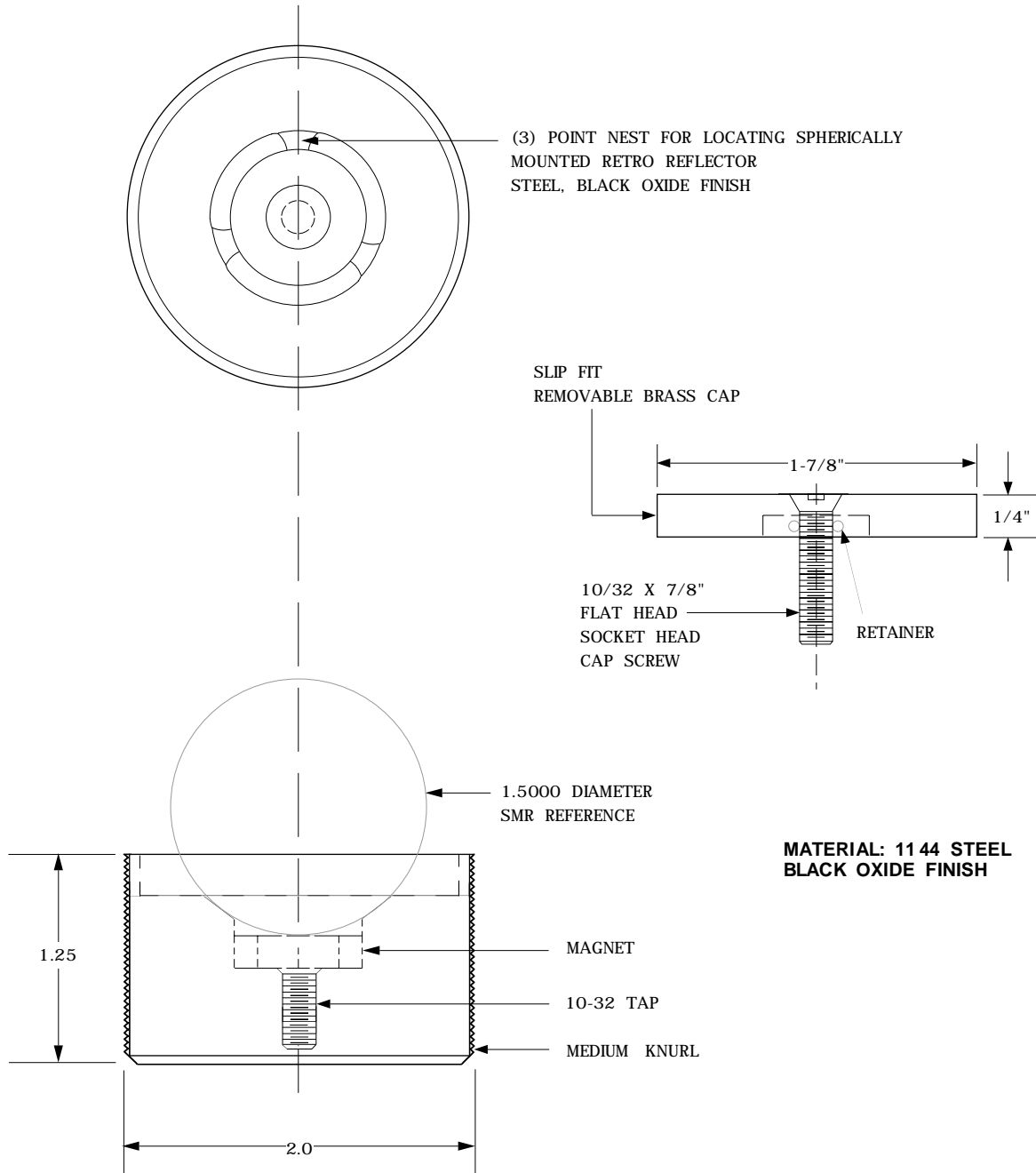
DRAWING NUMBER

1.5 LT-RSM

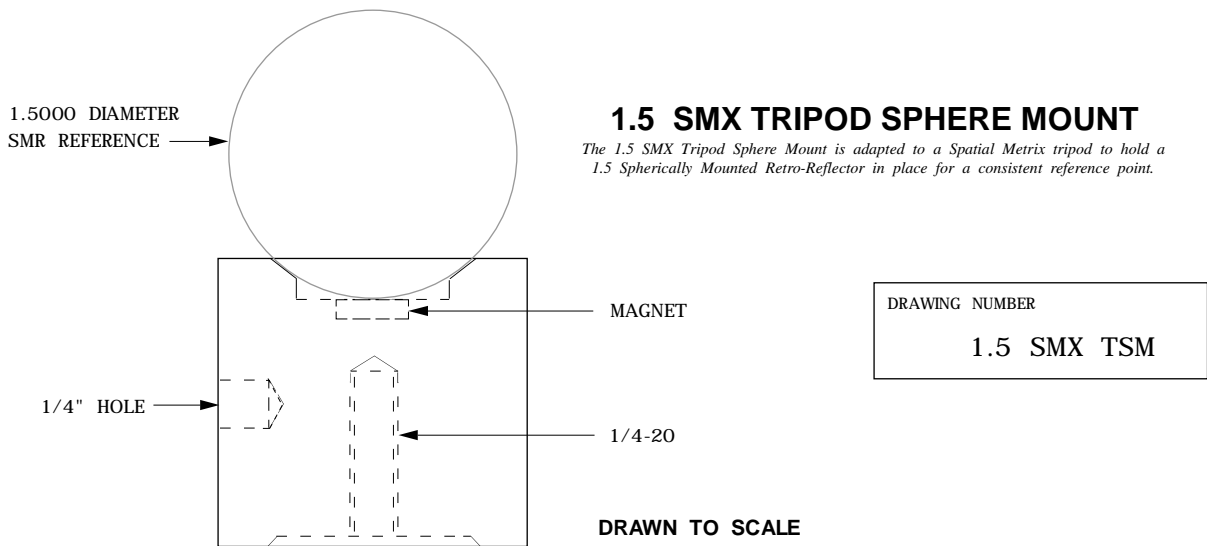
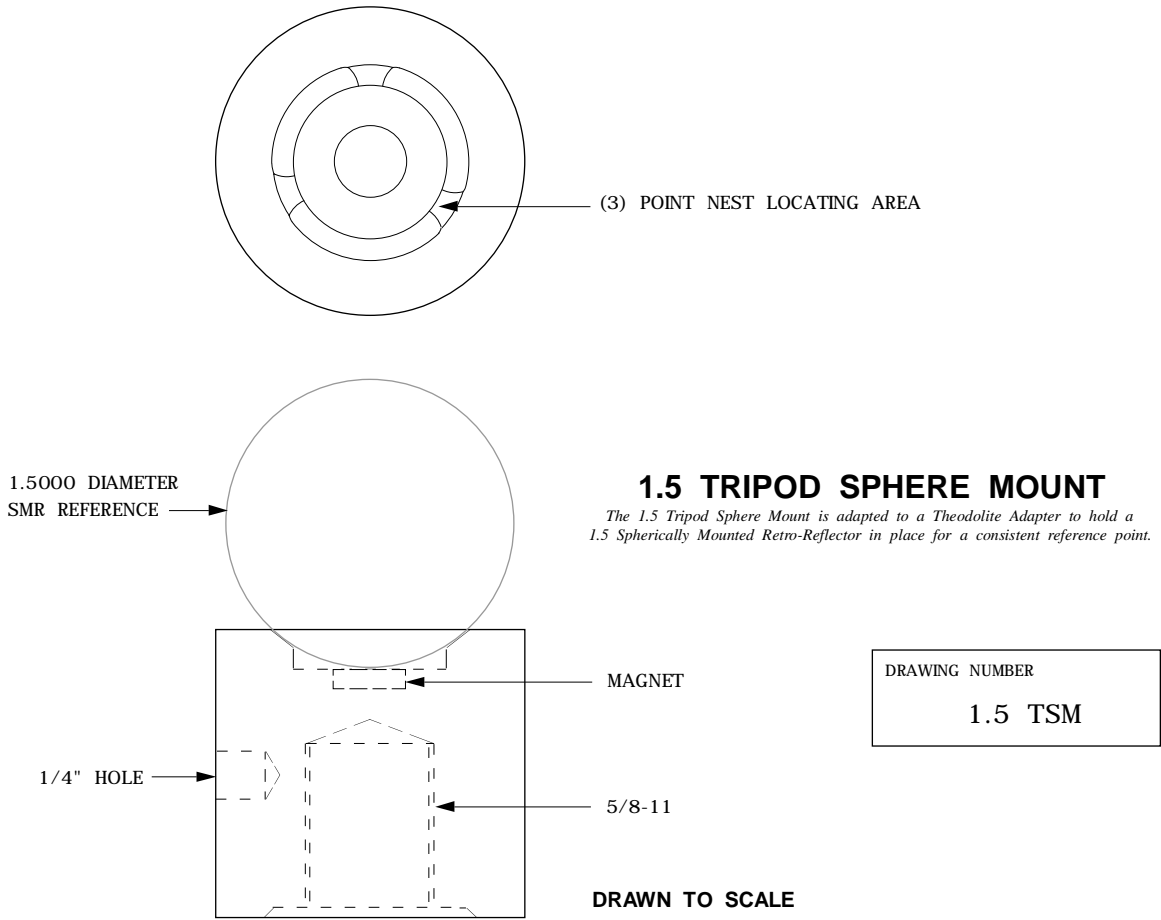
1.5 FOUNDATION SPHERE MOUNT

The 1.5 Foundation Sphere Mount is mounted in concrete flooring / foundations, etc., to allow for a permanent laser tracker target reference.

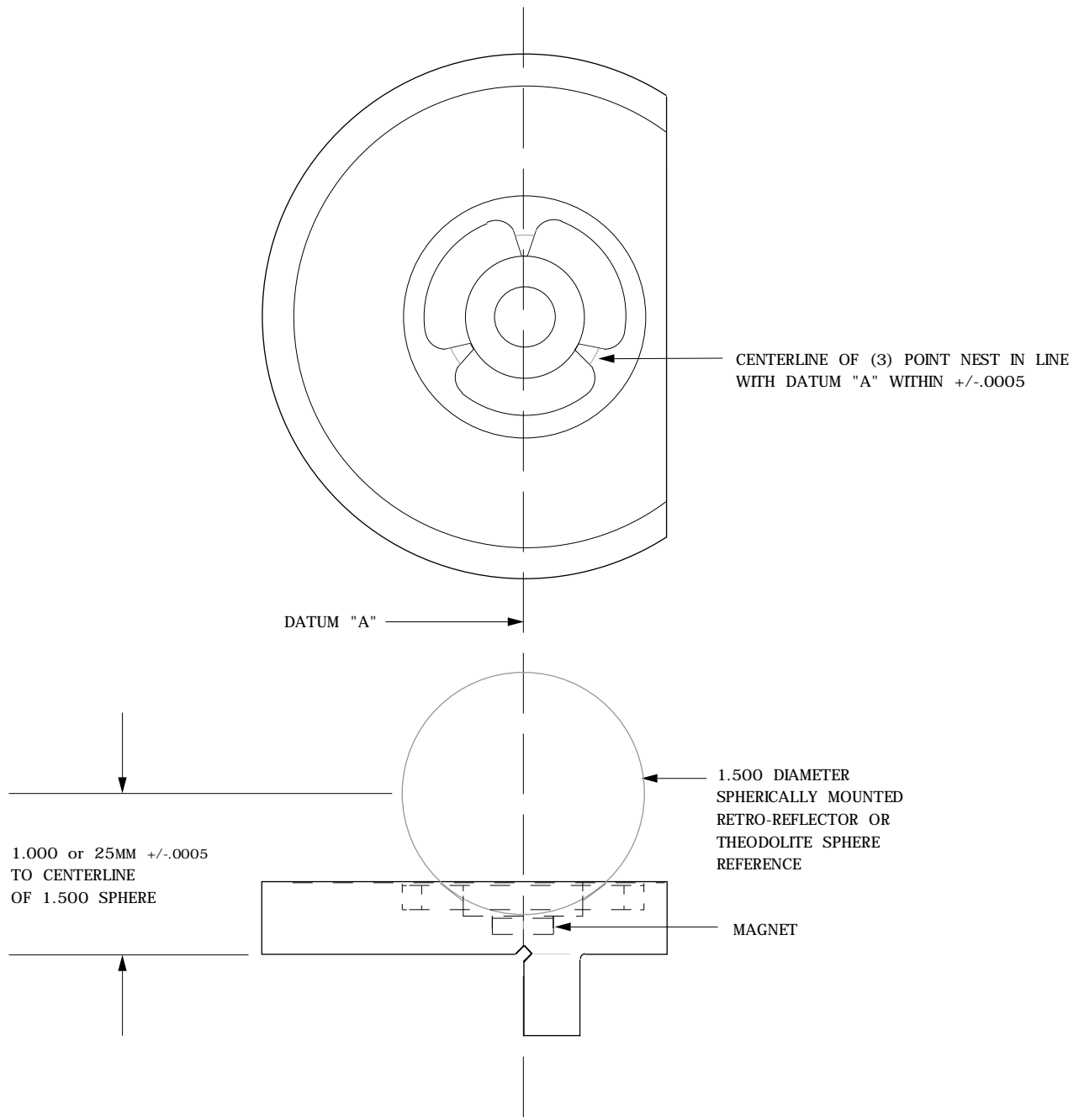
TOP VIEW SHOWN WITH CAP REMOVED



DRAWING NUMBER 1.5 FSM



1.5 EDGE SPHERE MOUNT



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 ESM - 1.000
1.5 ESM - 25MM

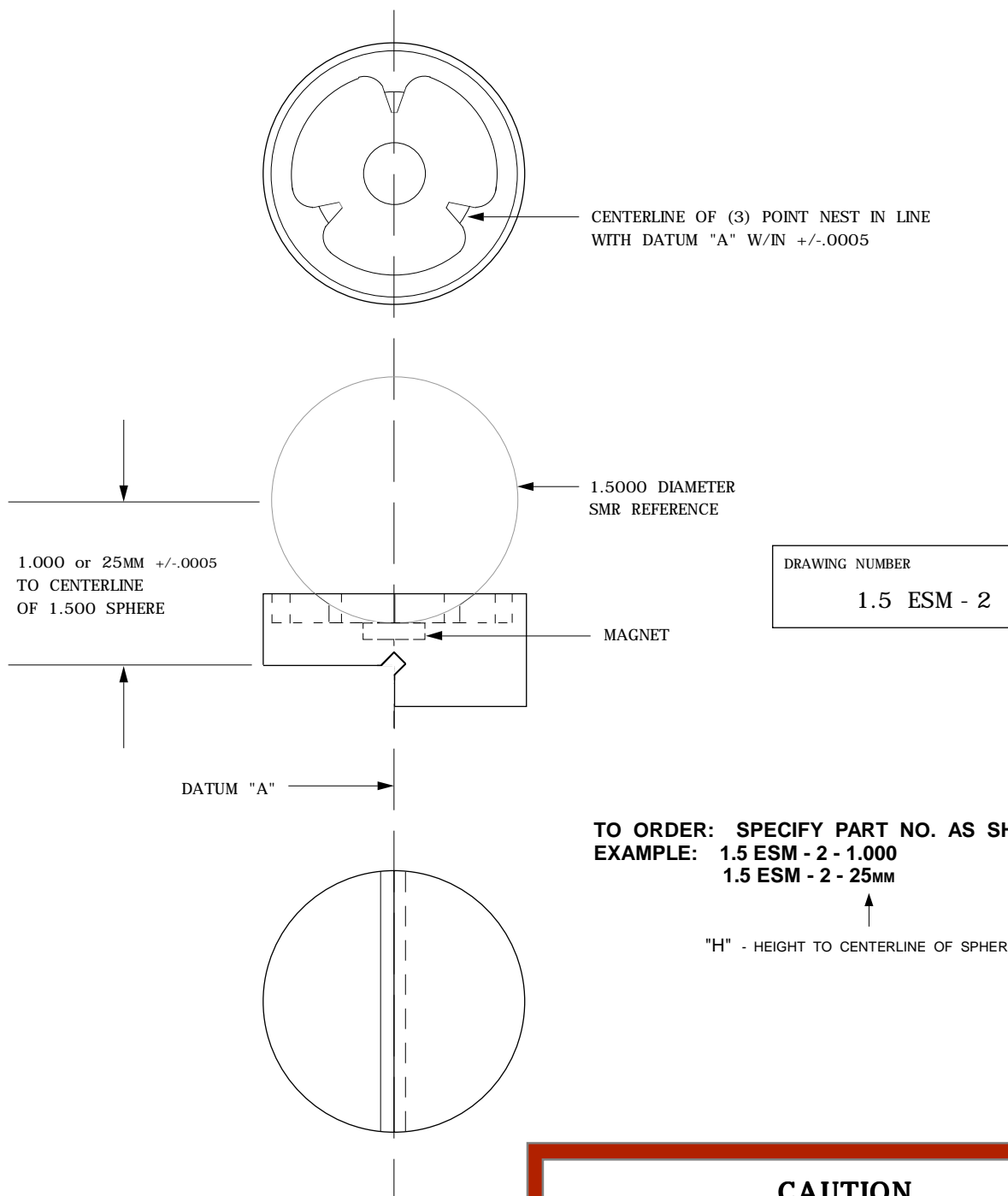
"H" - HEIGHT TO CENTERLINE OF SPHERE

DRAWING NUMBER
1.5 ESM - 1.000

DRAWING NUMBER
1.5 ESM - 25MM

HARDENED TO R/C 53 - 55

1.5 EDGE SPHERE MOUNT - 2



HARDENED TO R/C 53 - 55

CAUTION

THE 1.5 ESM-2 ITEM WILL NOT BALANCE OVER AN EDGE BY ITSELF.

THE 1.5 ESM-2 MUST BE HELD IN PLACE OR IT WILL FALL, POSSIBLY CAUSING DAMAGE TO THE SMR.

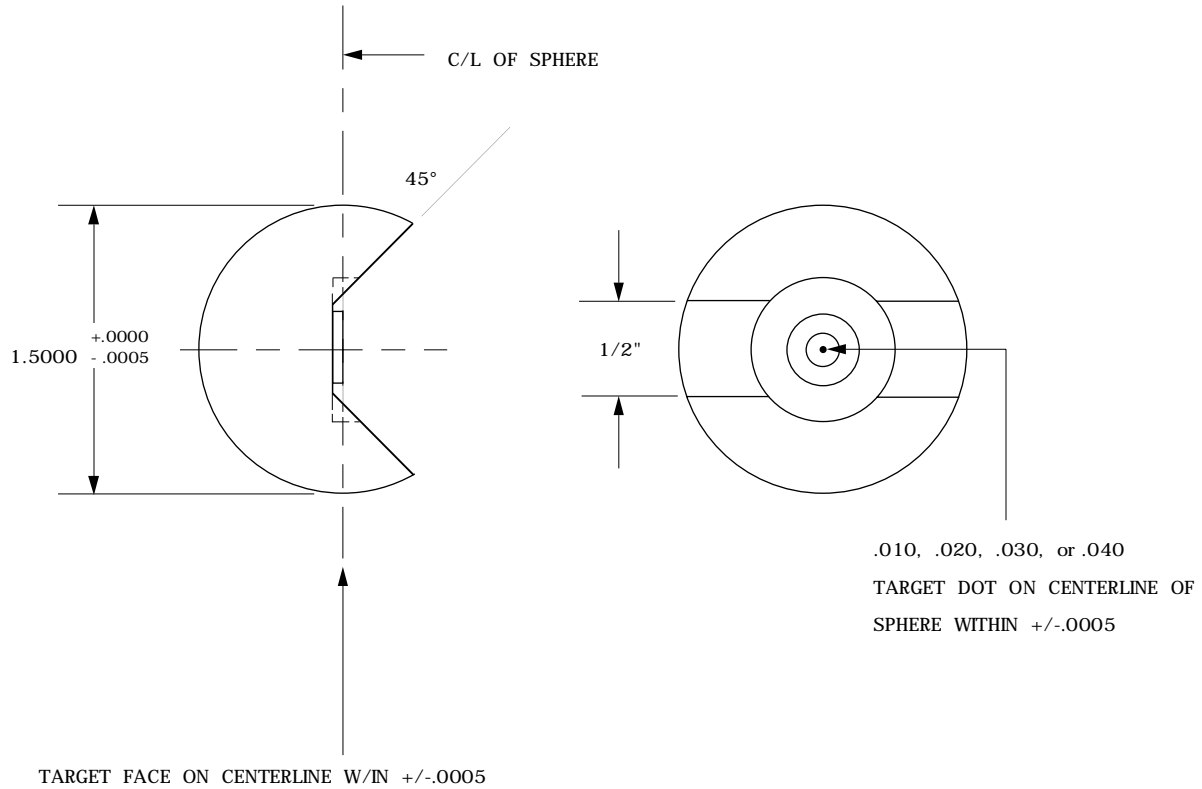
HUBBS MACHINE & MANUFACTURING, INC.®

P.O. BOX 540, Cedar Hill, Missouri 63016 (636) 285-4388 • (636) 285-5970 FAX

E-mail Address: Hubbstargt@aol.com

THEODOLITE 1.5 SPHERE

*The Theodolite 1.5 Sphere provides the same centerline value as a Spherically Mounted Retro-Reflector.
This allows interchangeability from a Laser Tracker system to Computer-Aided Theodolite.*



**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: T1.5S - 020**

↑
"D" - DOT DIAMETER

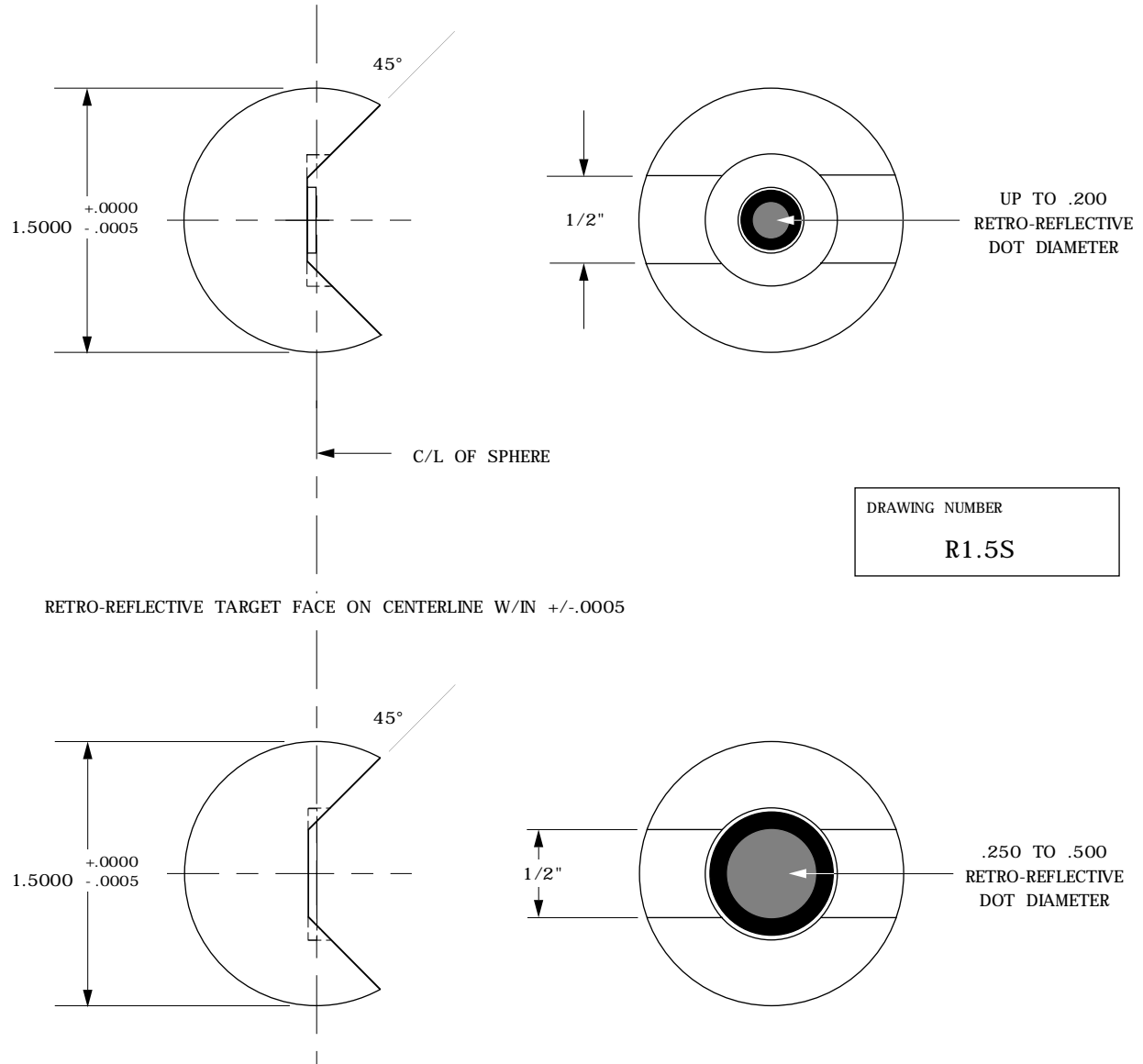
**MATERIAL: 1144
HARDENED R/C 53 - 55**

DRAWING NUMBER

T1.5S

RETRO-REFLECTIVE 1.5 SPHERE

The Retro-Reflective 1.5 Sphere provides the same centerline value as a Spherically Mounted Retro-Reflector. This allows interchangeability from a Laser Tracker System to a Photogrammetry or Videogrammetry system.

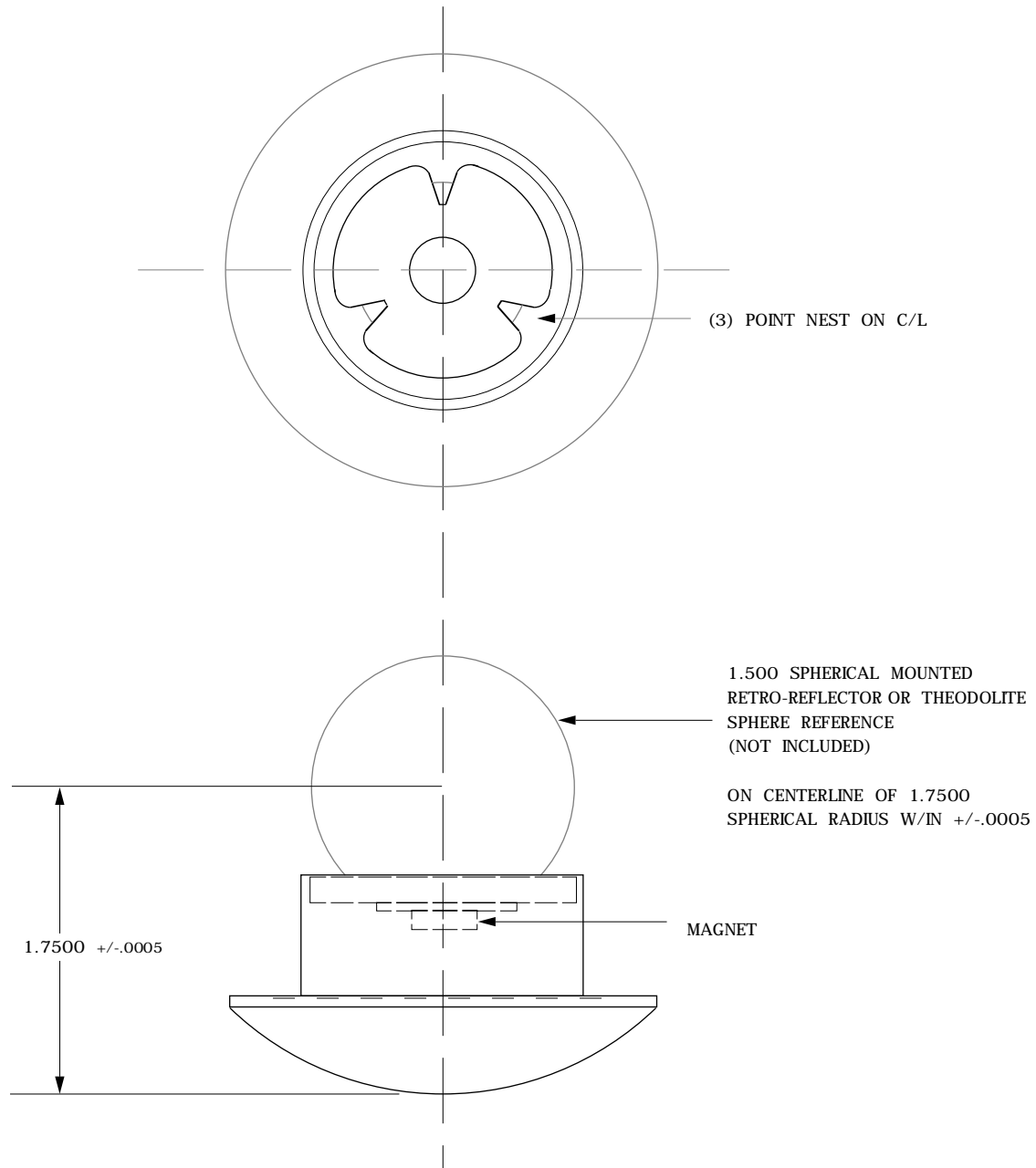


TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: R1.5S - 200
R1.5S - 500

↑
 "D" - DOT DIAMETER

MATERIAL: 1144
HARDENED R/C 53 - 55
BLACK OXIDE FINISH

LASER TRACKER LINE OF SIGHT ADAPTOR



HARDENED TO R/C 53 - 55

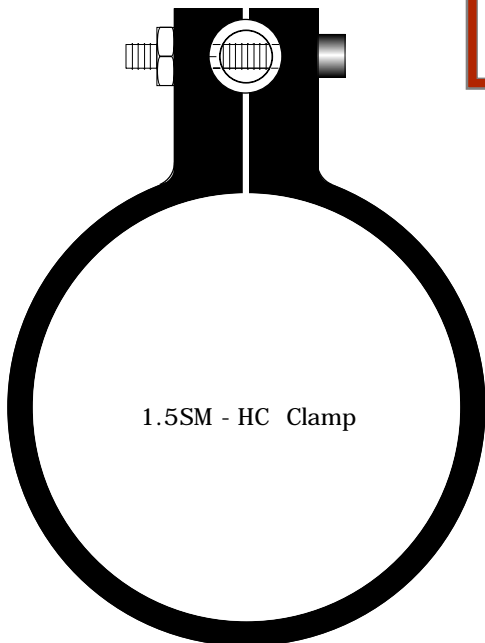
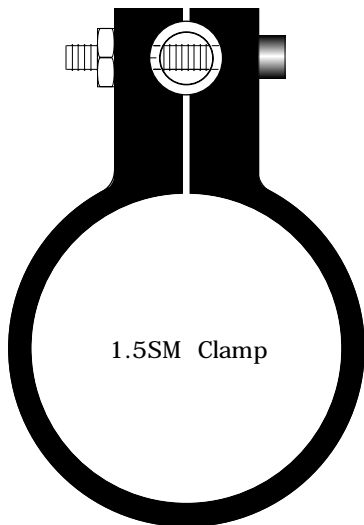
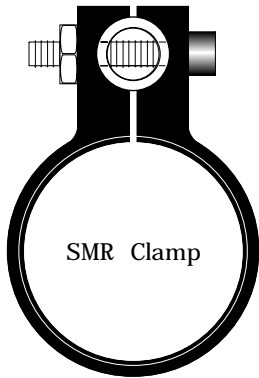
DRAWING NUMBER
LT - LOSA

SMR LANYARD SET

DRAWING TO SCALE

CLAMP MATERIAL

- BLACK DELRIN (FARO SMR)
- WHITE DELRIN (PLX SMR)



HOW TO ORDER:

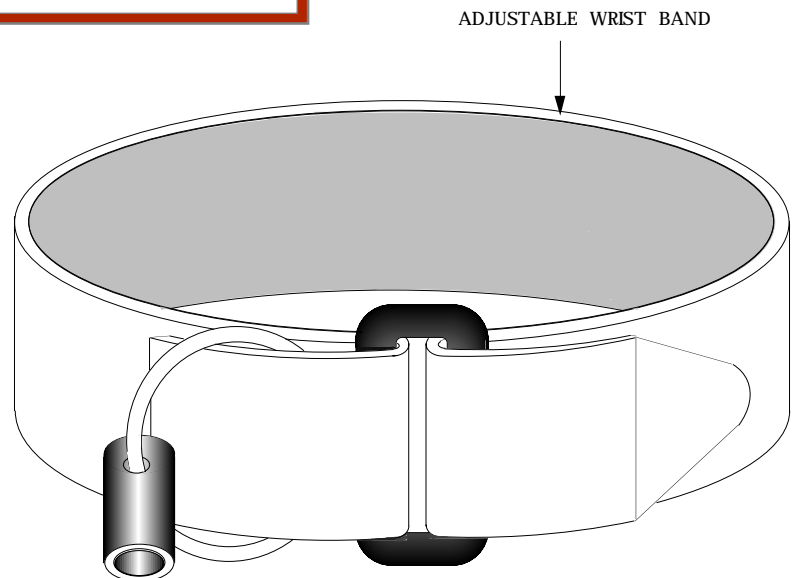
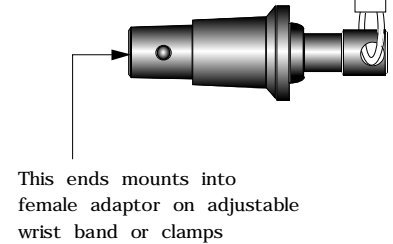
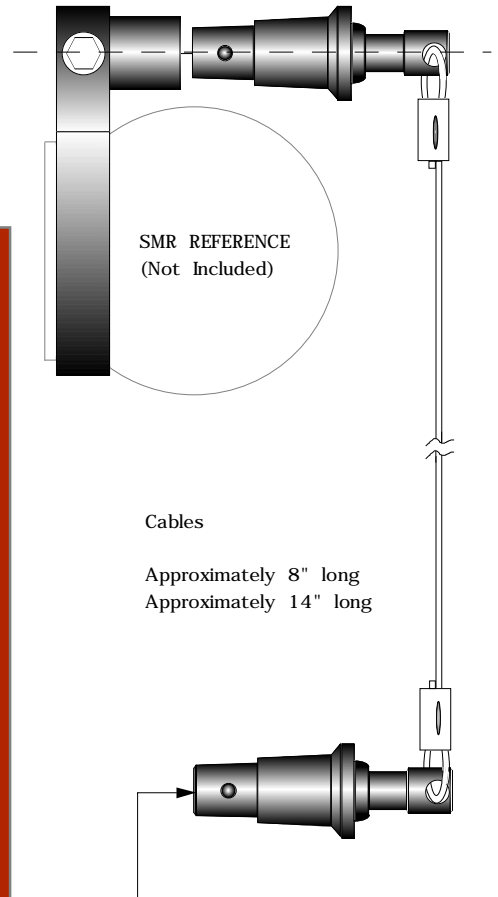
FULL LANYARD SET
Consists of the following:
1 - SMR Clamp
1 - 1.5 SM Clamp
1 - HD 1.5 SM / 1.5 SM - HC Clamp
1 - 8" Cable
1 - 14" Cable
1 - Adjustable Wrist Band

PARTIAL LANYARD SET
Consists of the following:
1 - SMR Clamp
1 - 8" Cable
1 - Adjustable Wrist Band

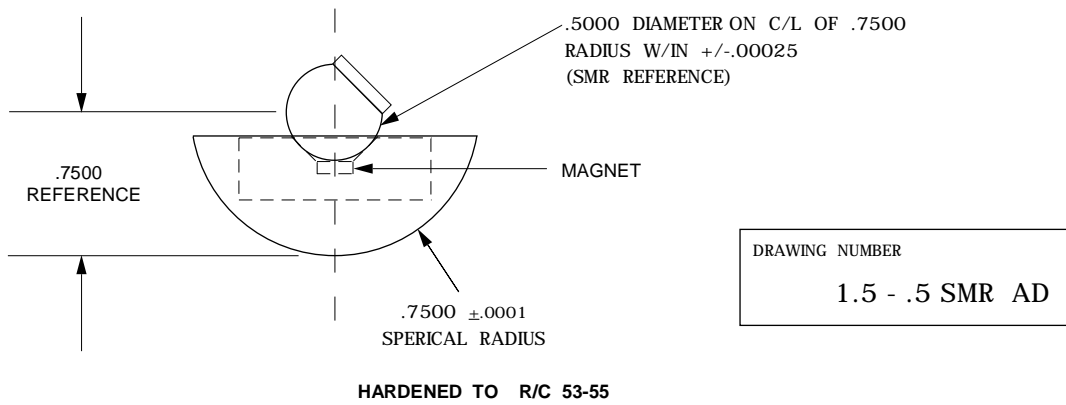
NOTE

PLEASE SPECIFY IF
USING FARO OR PLX SMR

IF USING LEICA SMR, SEE
LEICA LANYARD SET,
PAGE G-24

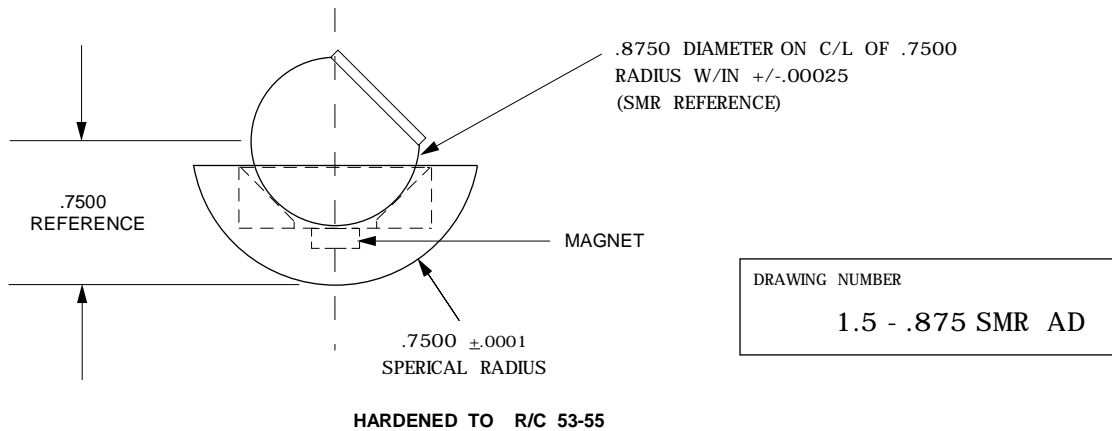


1.5 TO .5 SMR ADAPTOR



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 - .5 SMR AD

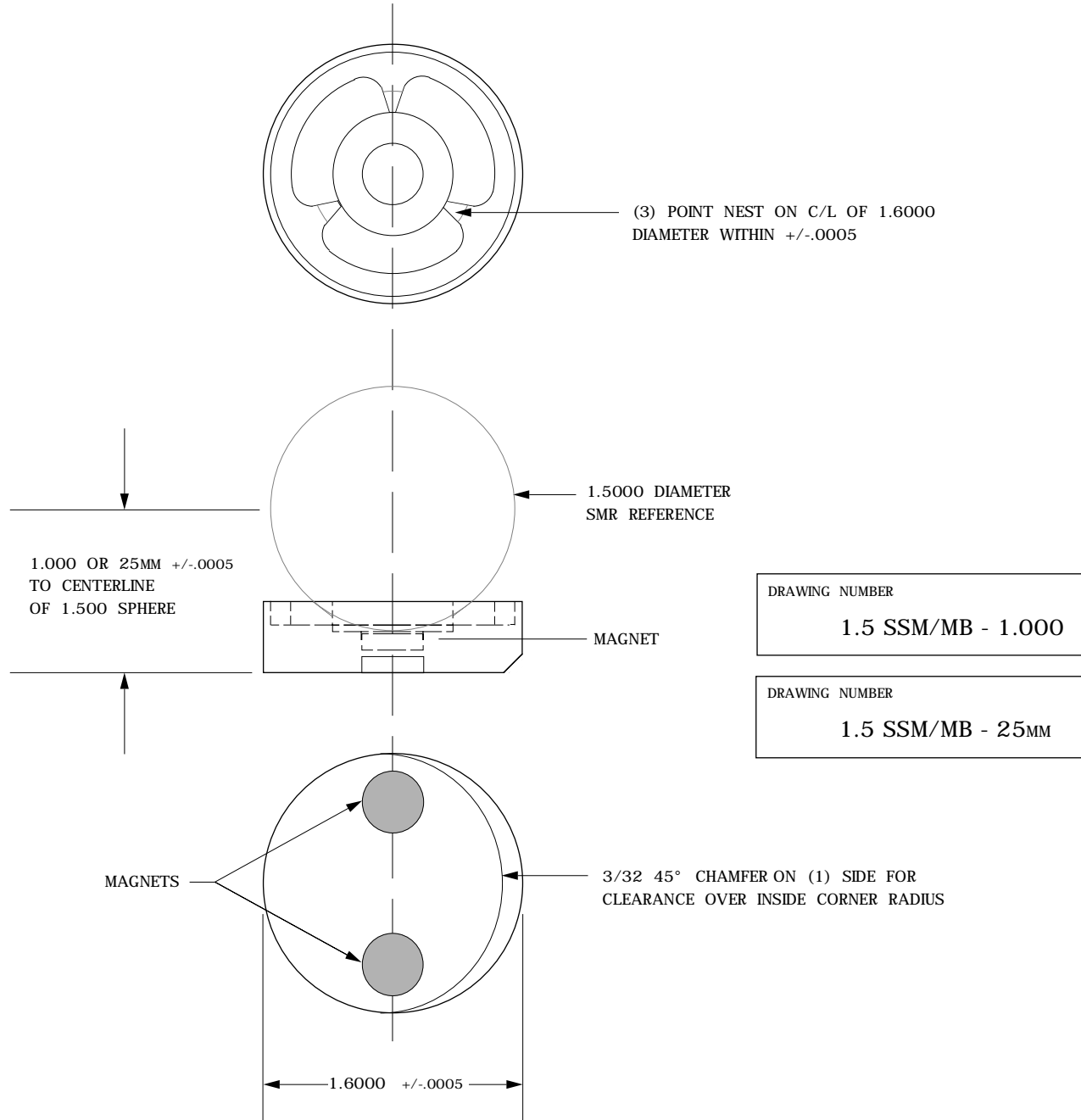
1.5 TO .875 SMR ADAPTOR



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 - .875 SMR AD

1.5 SHANKLESS SPHERE MOUNT MAGNETIC BASE

The 1.5 Shankless Sphere Mount Magnetic Base supports a 1.5 Spherical Mounted Retro-Reflector or Theodolite Sphere for a critical height and centerline. The edge may be used to contact inside edges to give a value of .800 away.

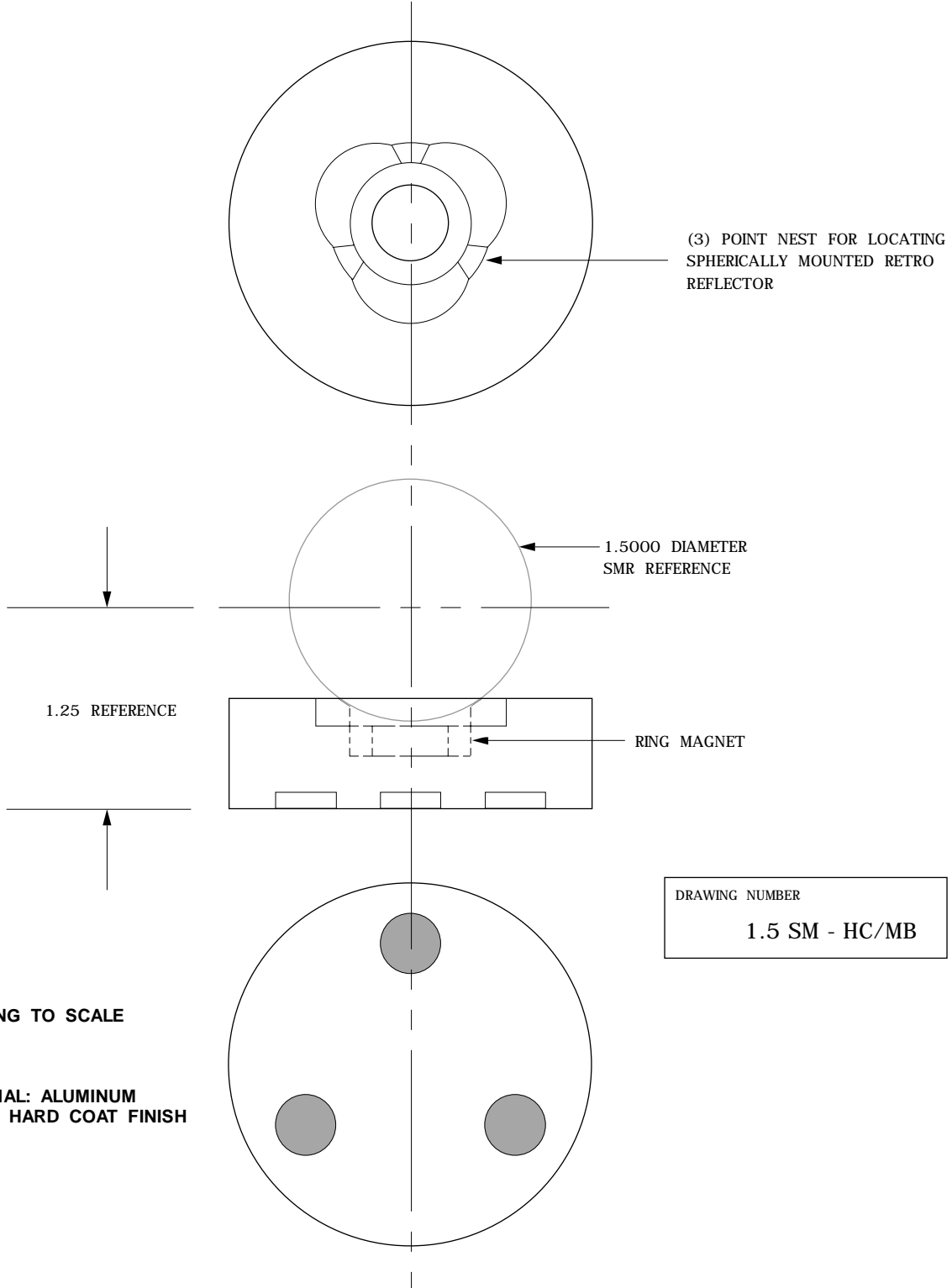


HARDENED TO R/C 53 - 55

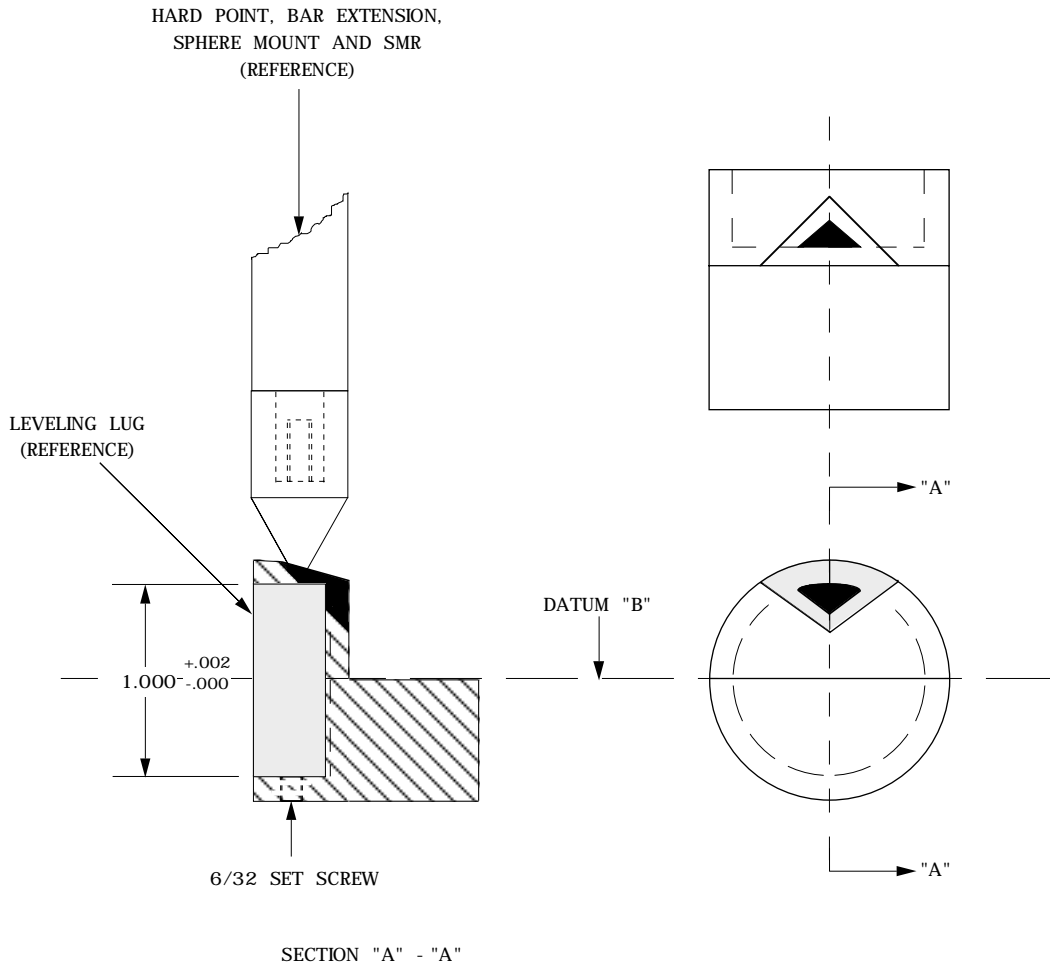
FOR NON - CRITICAL APPLICATIONS, SUGGEST USING A
1.5 SPHERE MOUNT - HARD COAT / MAGNETIC BASE, (1.5SM - HC/MB), PAGE G-18.

1.5 SPHERE MOUNT - HARD COAT MAGNETIC BASE

The 1.5 Sphere Mount - Hard Coat Magnetic Base is designed to adhering to a steel surface to securely hold a 1.500 diameter Spherically Mounted Retro-Reflector or Theodolite Sphere. Not intended for critical offsets or concentricities.



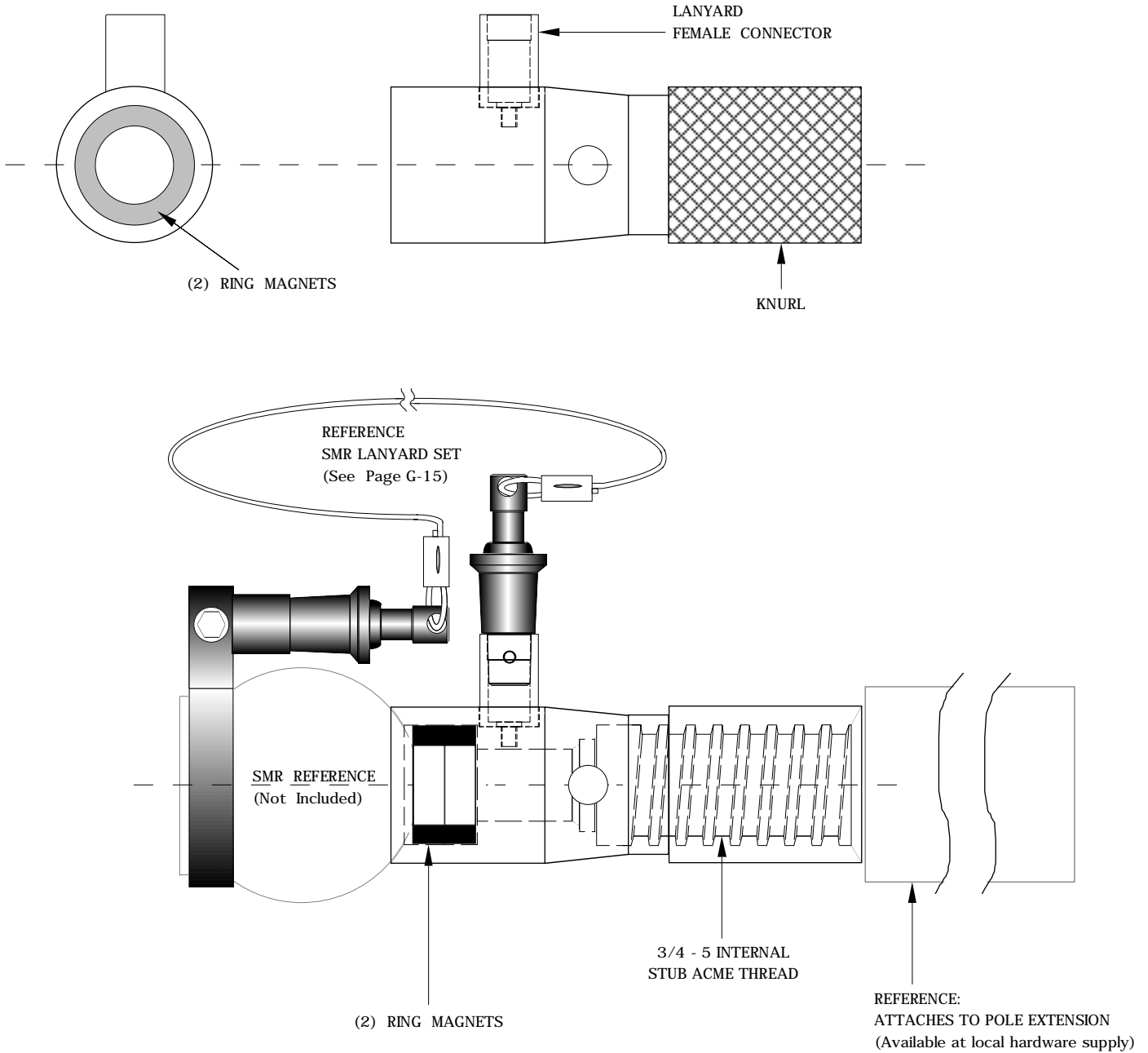
LASER TRACKER LEVELING LUG ADAPTOR



DRAWING NUMBER
LT-LLA

USE BUBBLE LEVEL, (COMBINATION SQUARE LEVEL), TO LEVEL DATUM "B", THEN INSERT HARD POINT, BAR EXTENSION, SPHERE MOUNT AND SPHERICALLY MOUNTED RETRO-REFLECTOR, (SMR), ASSEMBLY INTO "V" NOTCH AND GENERATE A SPHERICAL RADIUS. THE CENTER OF THE RADIUS WILL BE THE SAME AS THE TOP OF THE LEVELING LUG.

1.5 SM POLE ADAPTOR

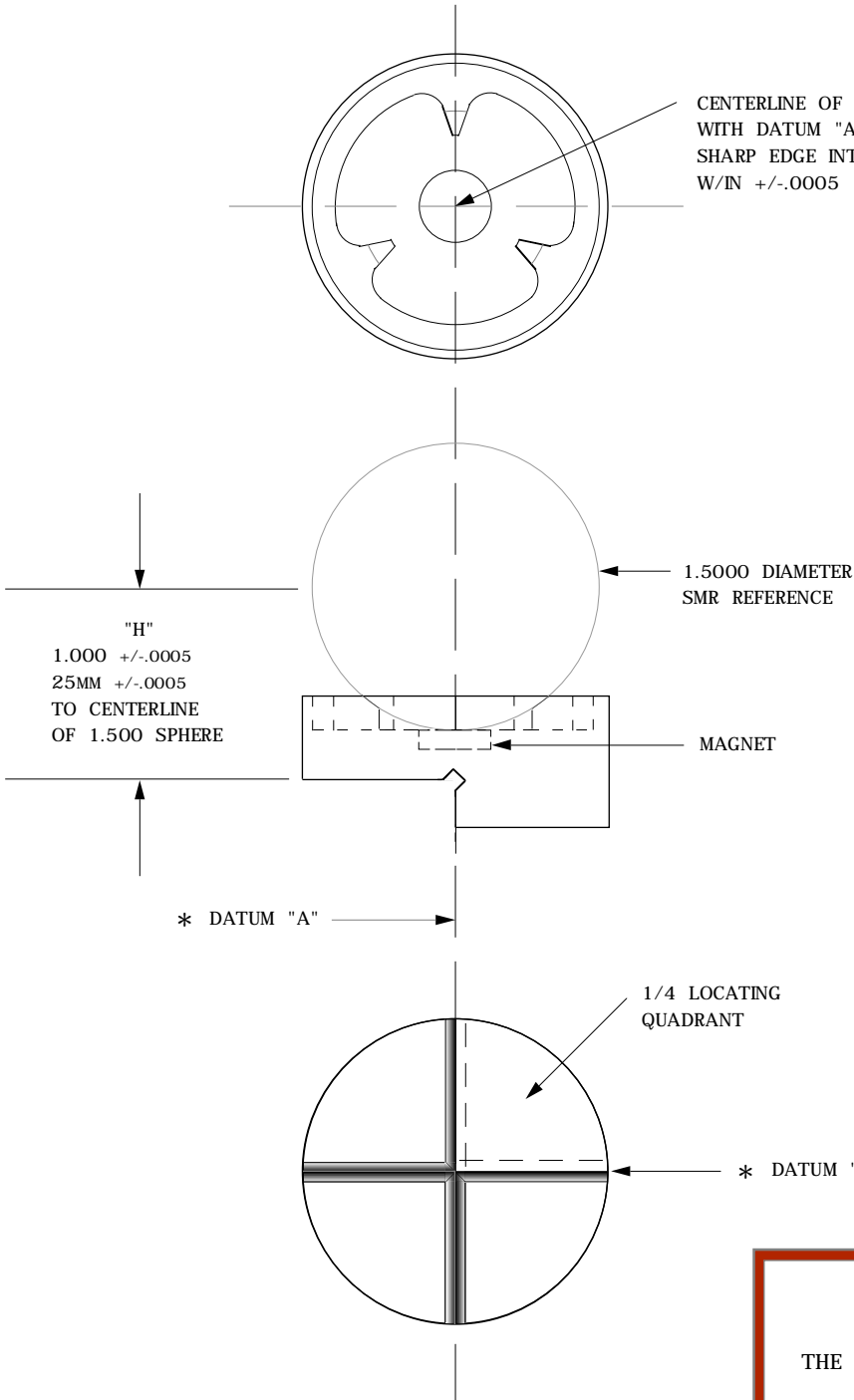


**MATERIAL - 6061 ALUMINUM
 BLACK ANODIZE, HARD COAT**

DRAWING NUMBER <p style="text-align: center;">1.5 SM PA</p>

DRAWING: TO SCALE

1.5 EDGE SPHERE MOUNT - 2 - 1/4



DRAWING NUMBER
1.5 ESM - 2 - 1.000 - 1/4

DRAWING NUMBER
1.5 ESM - 2 - 25MM - 1/4

HARDENED TO R/C 53 - 55

* INTERSECTION OF DATUM "A" & DATUM "B" IS A SHARP EDGE CRITICAL LOCATING SURFACE
HANDLE WITH CARE

CAUTION

THE 1.5 ESM - 2 - 1/4 ITEM WILL NOT BALANCE OVER AN EDGE BY ITSELF.

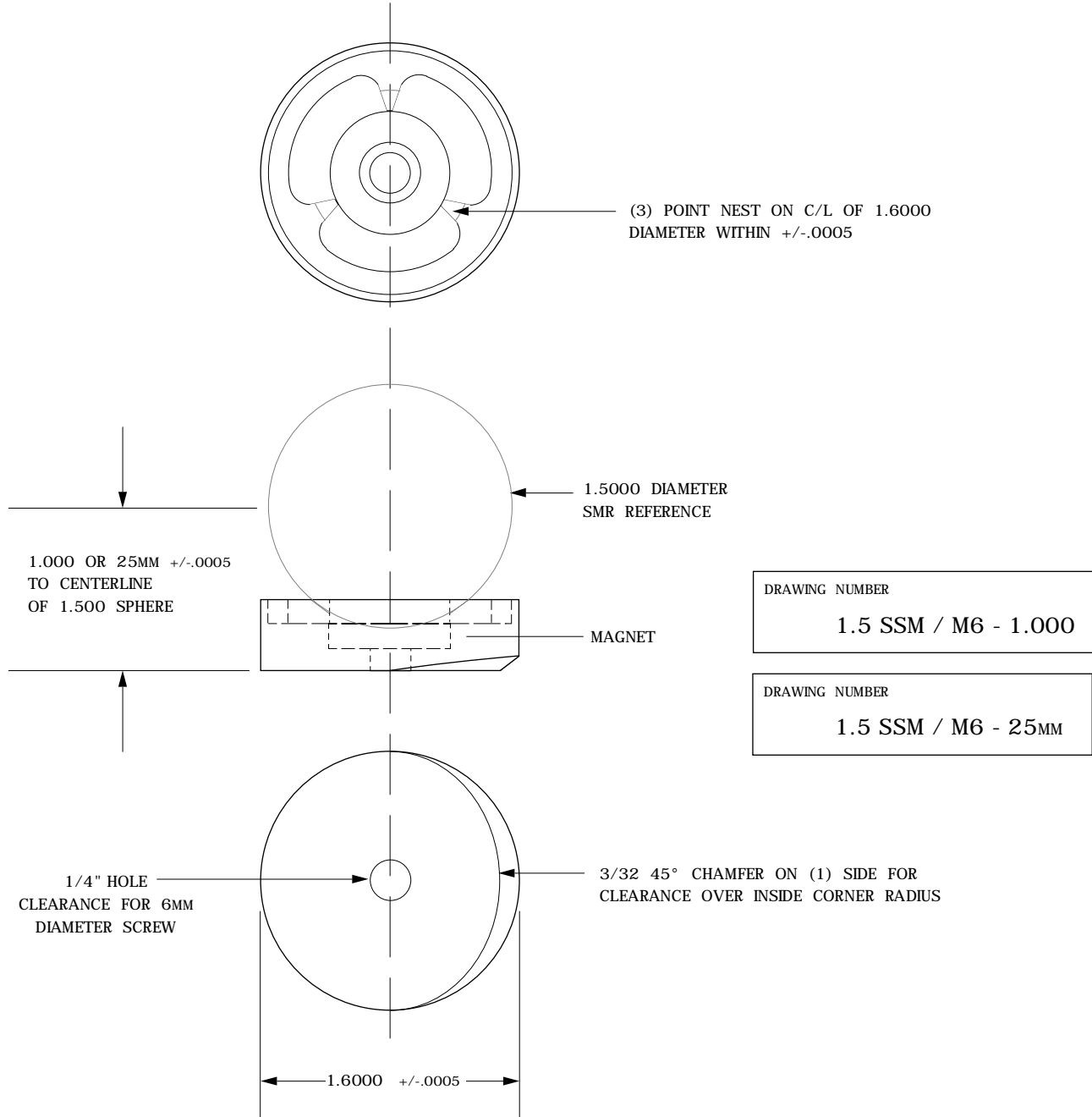
THE 1.5 ESM - 2 - 1/4 MUST BE HELD IN PLACE OR IT WILL FALL, POSSIBLY CAUSING DAMAGE TO THE SMR.

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 ESM - 2 - 1.000 - 1/4
1.5 ESM - 2 - 25MM - 1/4

↑
"H" - HEIGHT TO CENTERLINE OF SPHERE

1.5 SHANKLESS SPHERE MOUNT - M6

The 1.5 Shankless Sphere Mount supports a 1.5 Spherical Mounted Retro-Reflector or Theodolite Sphere for a critical height and centerline. The edge may be used to contact inside edges to give a value of .800 away.

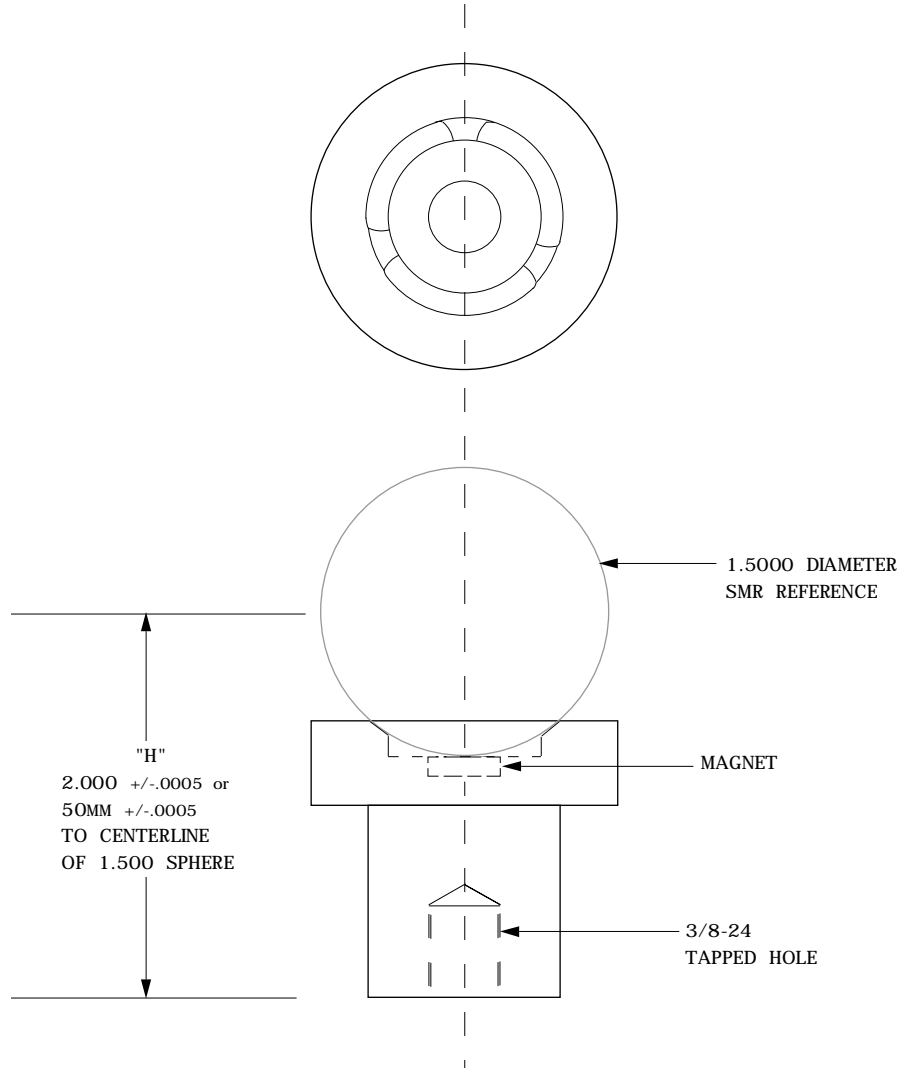


HARDENED TO R/C 53 - 55

FOR NON - CRITICAL APPLICATIONS, SUGGEST USING A 1.5 SPHERE MOUNT - HARD COAT, (1.5SM - HC), PAGE G-5.

1.5 INVAR SPHERE MOUNT

1.5 Invar Sphere Mount, (1.5 ISM), is designed to adapt a 1.5 Spherically Mounted Retro-Reflector, (1.5 SMR), or a Theodolite 1.5 Sphere, (T1.5S), to a Brunson Invar Scale Bar Kit.



TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: 1.5 ISM - 2.000
1.5 ISM - 50MM

"H" - HEIGHT TO CENTERLINE OF SPHERE

DRAWING NUMBER
1.5 ISM-2.000

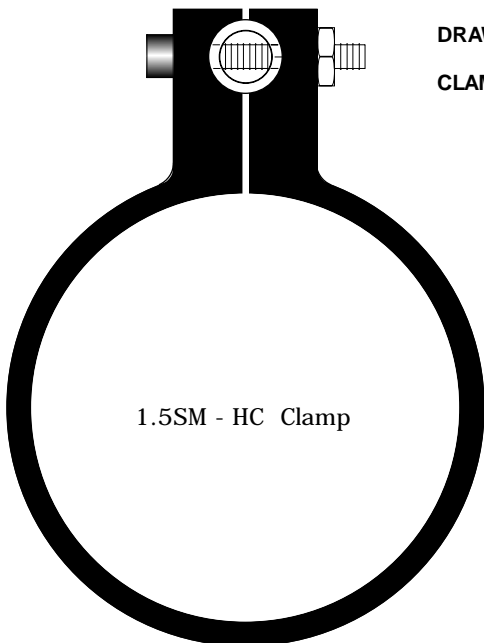
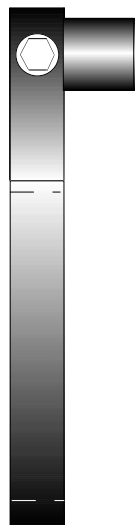
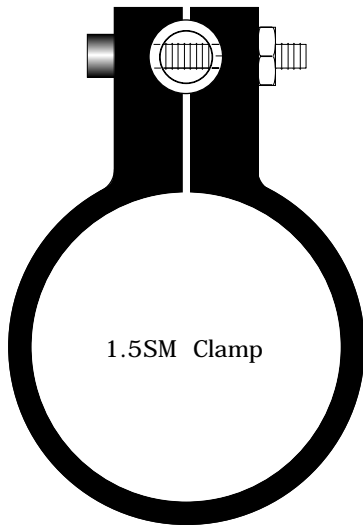
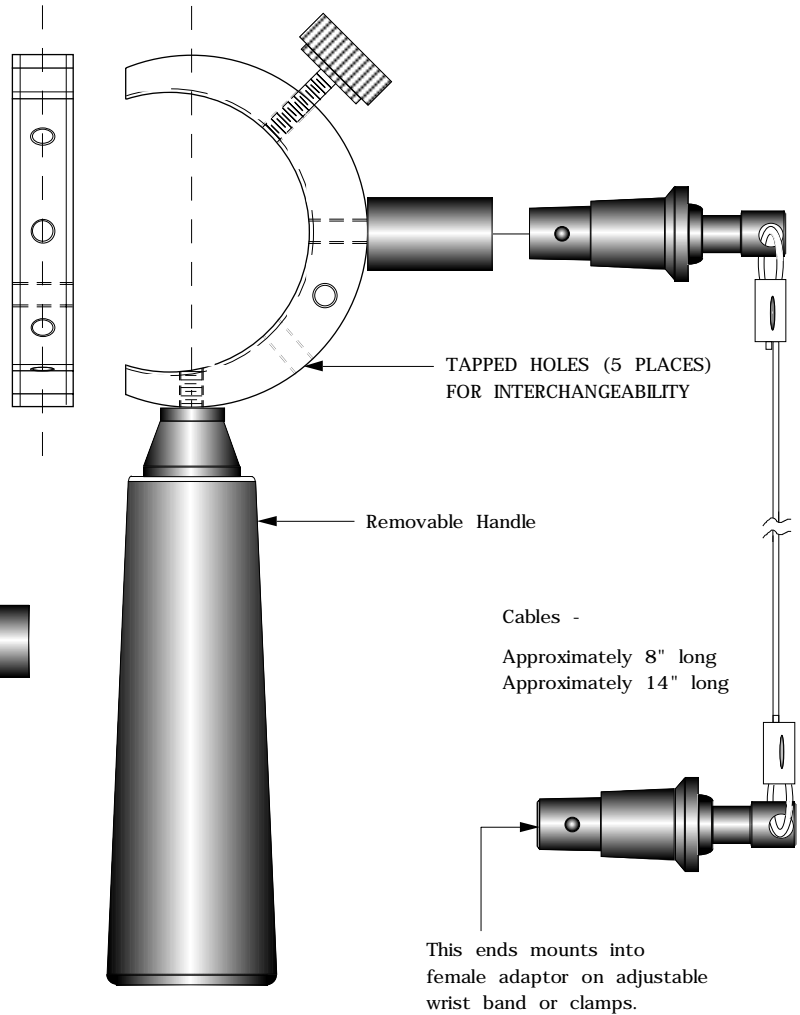
DRAWING NUMBER
1.5 ISM-50MM

LEICA LANYARD SET

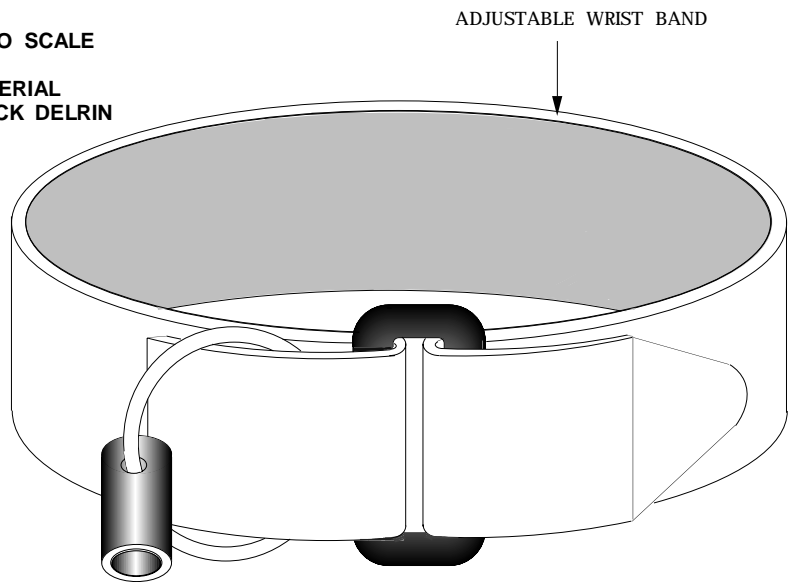
HOW TO ORDER:

LEICA FULL LANYARD SET
 Consists of the following:
 1 - LEICA SMR Cresent Clamp
 1 - 1.5 SM Clamp
 1 - 1.5 SM - HC Clamp
 1 - 8" Cable
 1 - 14" Cable
 1 - Adjustable Wrist Band
 1 - Removable Handle

LEICA PARTIAL LANYARD SET
 Consists of the following:
 1 - LEICA SMR Cresent Clamp
 1 - 8" Cable
 1 - Adjustable Wrist Band
 1 - Removable Handle

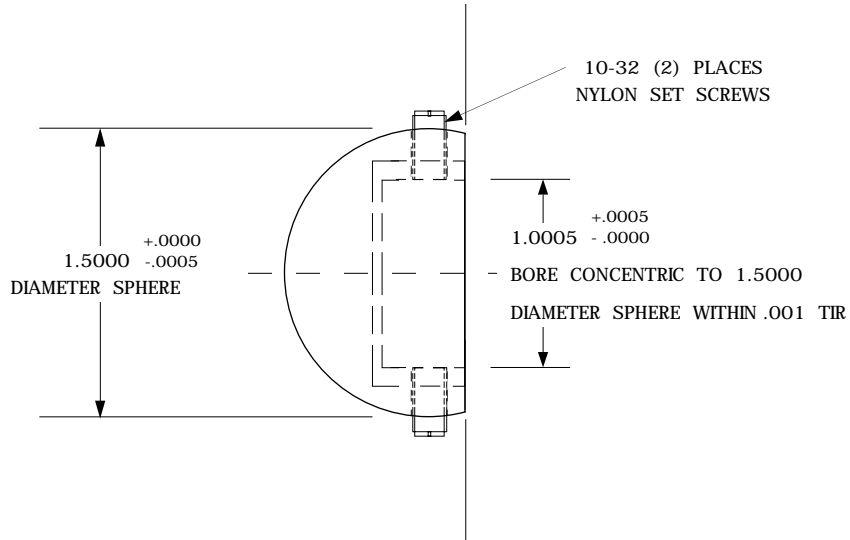


DRAWING TO SCALE
CLAMP MATERIAL
- BLACK DELRIN



LEVELING LUG SPHERE TARGET

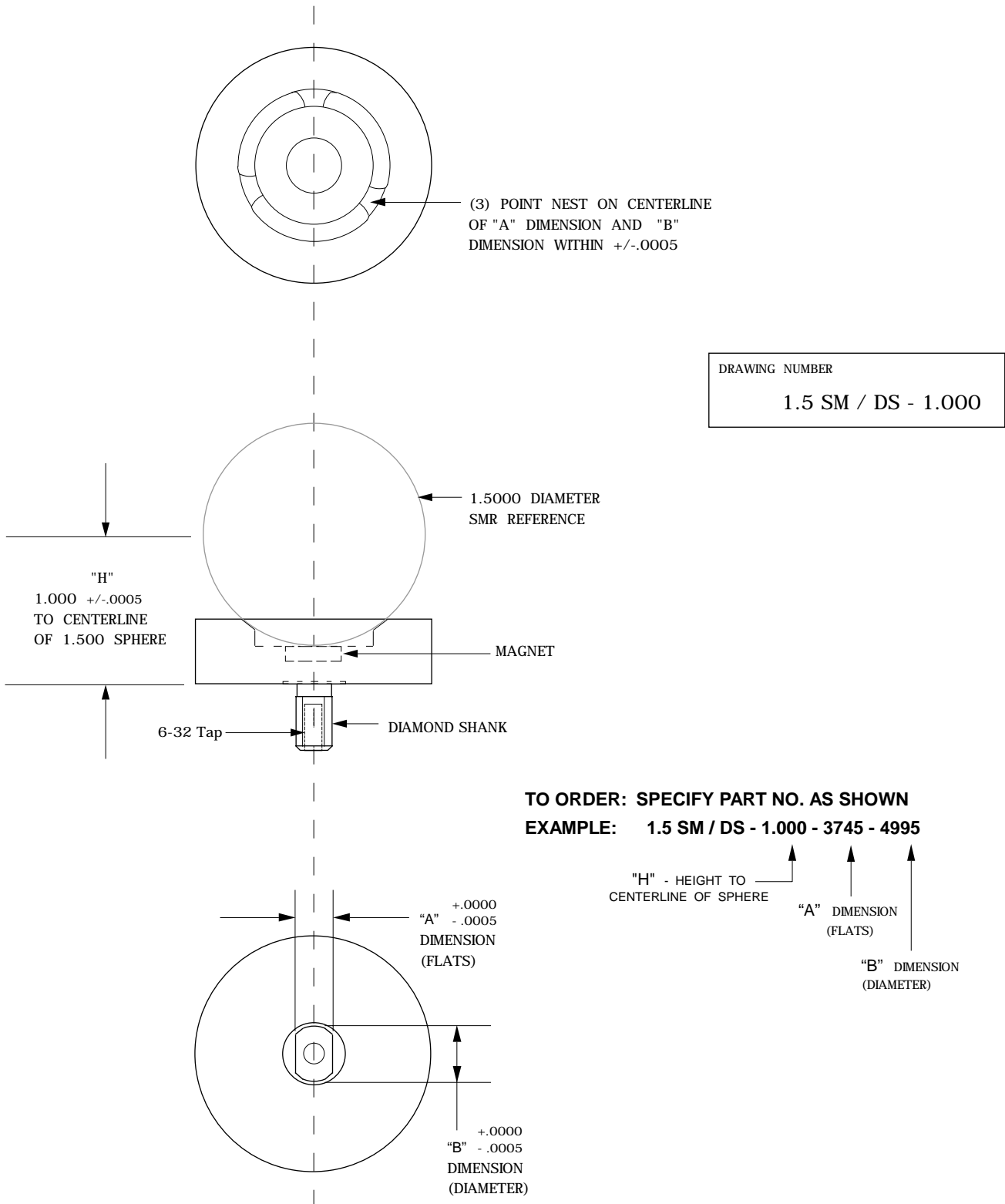
*Slide Leveling Lug Sphere Target over Leveling Lug and tighten set screws. Profile
1.5000 spherical area with SMR to achieve the centerline of Leveling Lug.*



DRAWING NUMBER
LLST

1.5 SPHERE MOUNT / DIAMOND SHANK

The 1.5 Sphere Mount is designed to hold a Spherically Mounted Retro-Reflector Theodolite Sphere or Retro-Reflective 1.5 Sphere on centerline of a hole and 1.000 above



1.5 SPHERE MOUNT / DIAMOND SHANK

NOTES

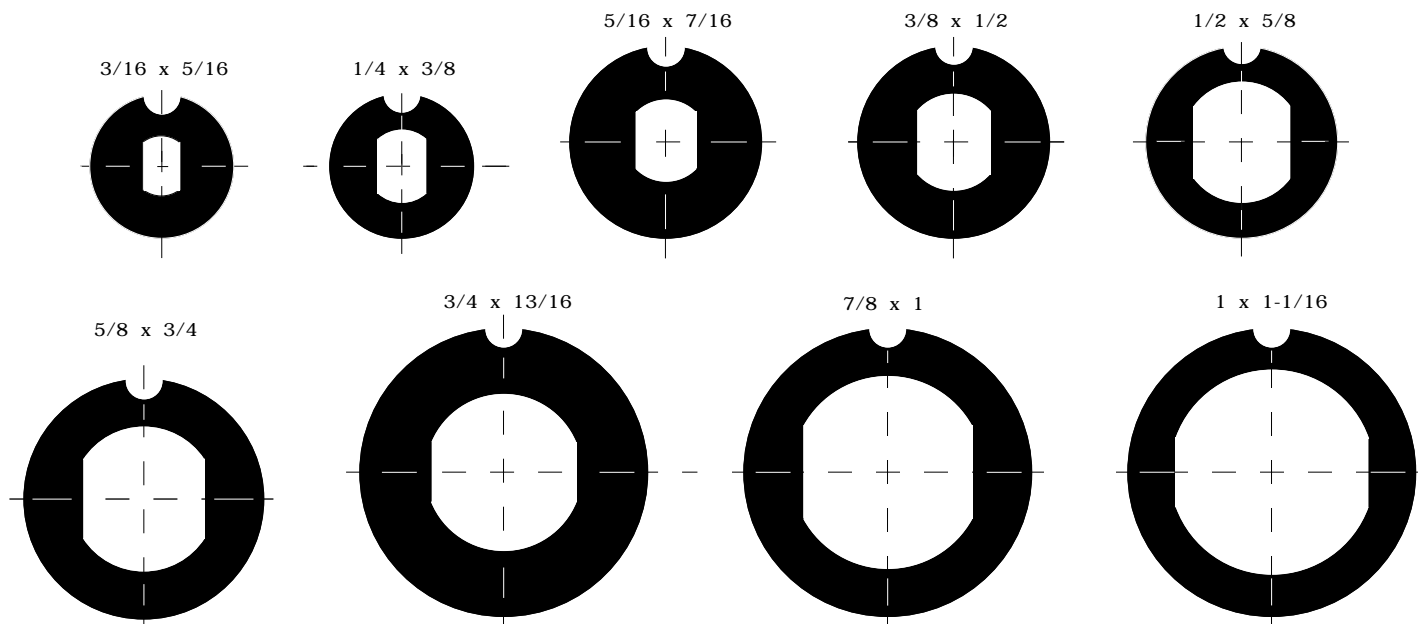
For best results, we recommend the following:

1. Make sure that the slotted bushing slot and locating surface around slotted bushing is clean.
2. Make sure locating surface around slotted bushing and the inside edges of the slotted bushing slot are free of burrs.

Burrs inside the slot may not allow the 1.5 SM/DS to fit freely and may cause damage to the 1.5 SM/DS if burrs are not removed.

3. Standard 1.5 SM/DS's are .0005 to .0010 inch under the nominal length and width sizes for minimal clearance. Sizes of the slotted bushing slots to allow for a free fit with minimal clearance. A light coat of grease around the diamond locating areas will help the 1.5 SM/DS to center themselves within the normal minimal clearance.

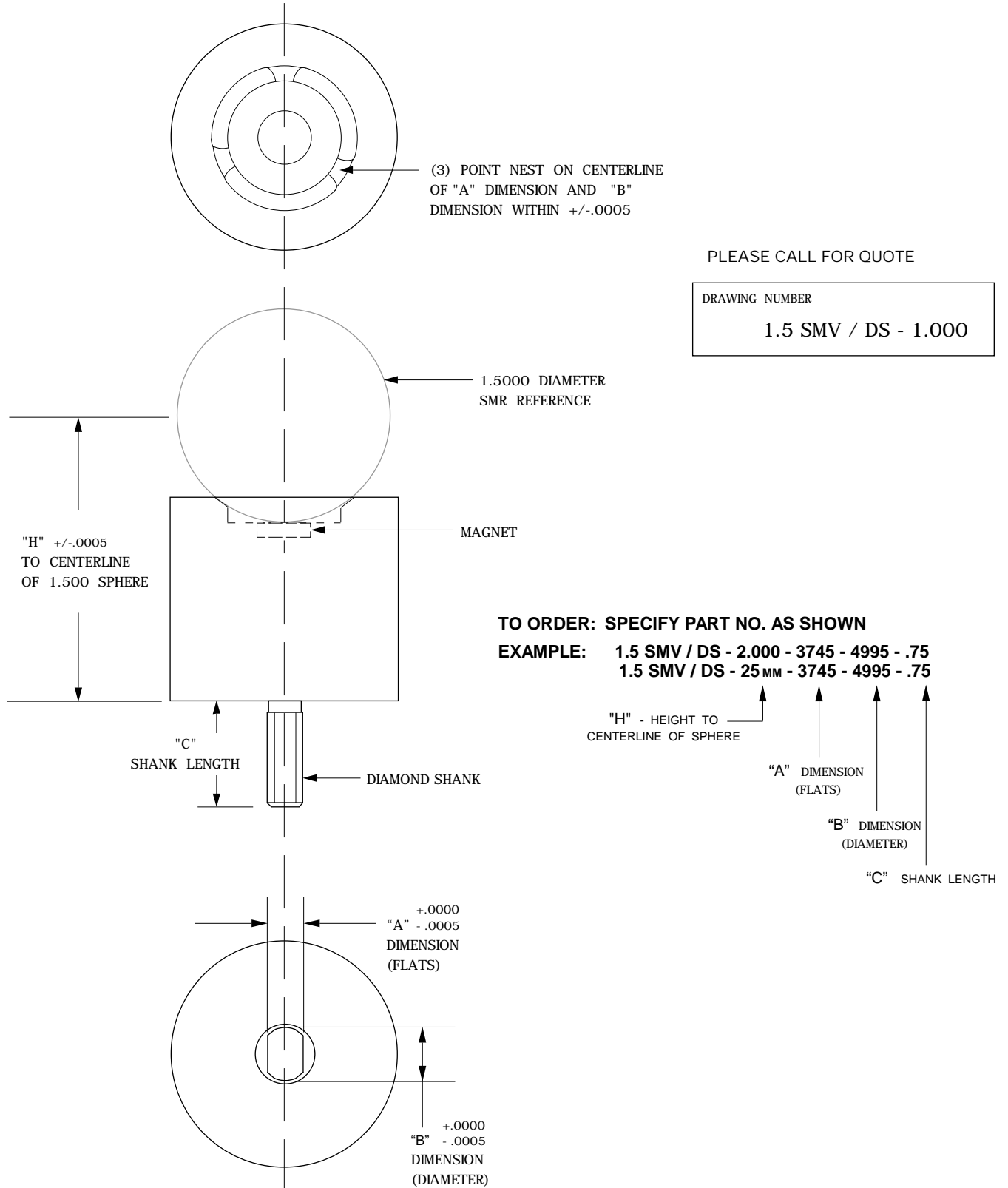
NOTE: ACTUAL DIMENSIONS WILL BE .0005 SMALLER THAN FRACTIONAL SIZES SHOWN BELOW



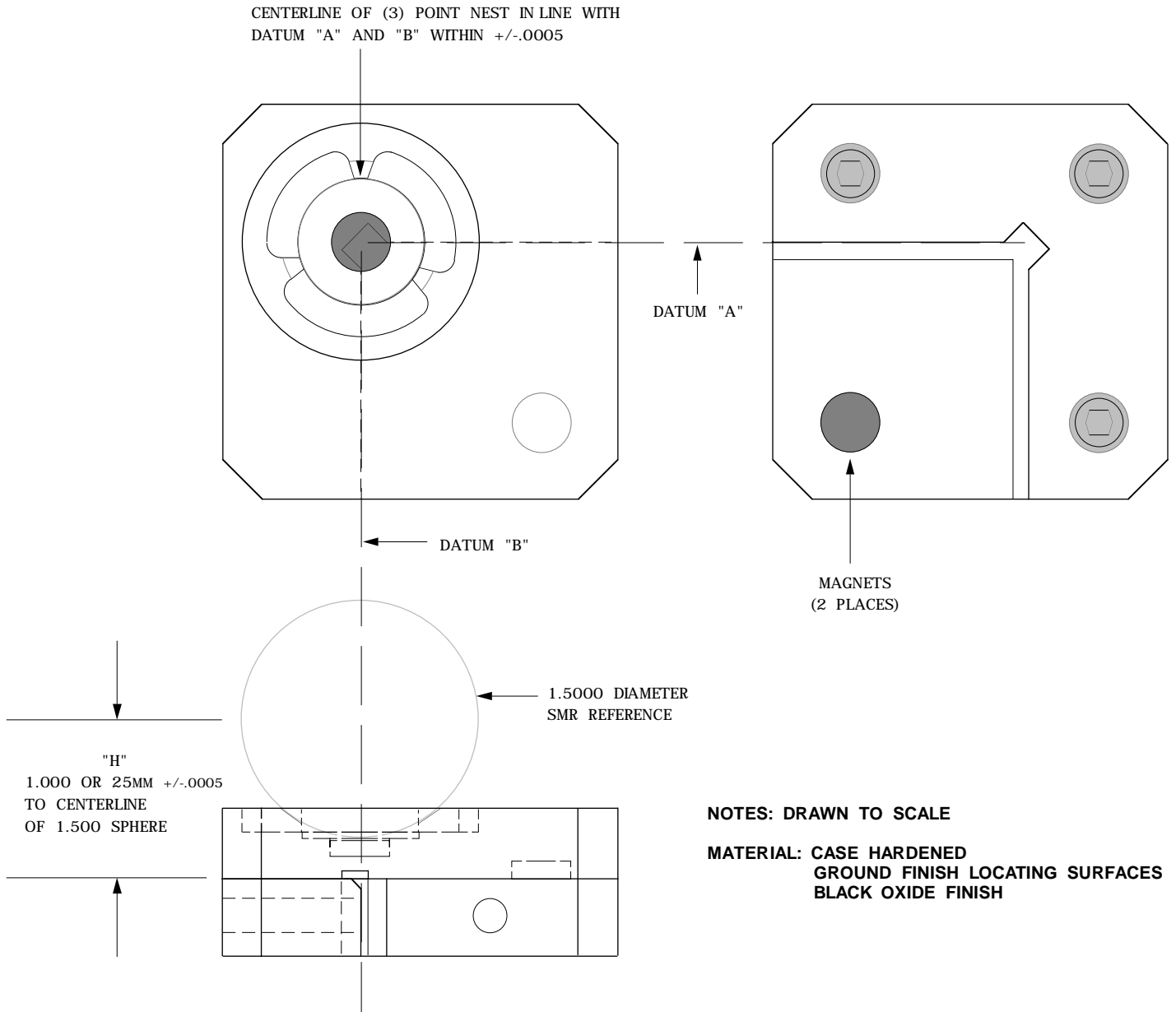
NOMINAL SIZE EXAMPLES FOR REFERENCE ONLY

1.5 SPHERE MOUNT - VARIABLE DIAMOND SHANK

The 1.5 Sphere Mount Variable / Diamond Shank is designed to hold a Spherically Mounted Retro-Reflector, Theodolite Sphere or Retro-Reflectove 1.5 Sphere on centerline of a slotted bushing. Use the variable design to customize the sphere mount for your specific needs.



1.5 EDGE SPHERE MOUNT OUTSIDE CORNER



NOTES: DRAWN TO SCALE

**MATERIAL: CASE HARDENED
GROUND FINISH LOCATING SURFACES
BLACK OXIDE FINISH**

**TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 ESM - OC - 1.000
1.5 ESM - OC - 25MM**

"H" - HEIGHT TO CENTERLINE OF SPHERE

DRAWING NUMBER
1.5 ESM - OC - 1.000

DRAWING NUMBER
1.5 ESM - OC - 25MM

1.5 SPHERE MOUNT DRIFT NEST

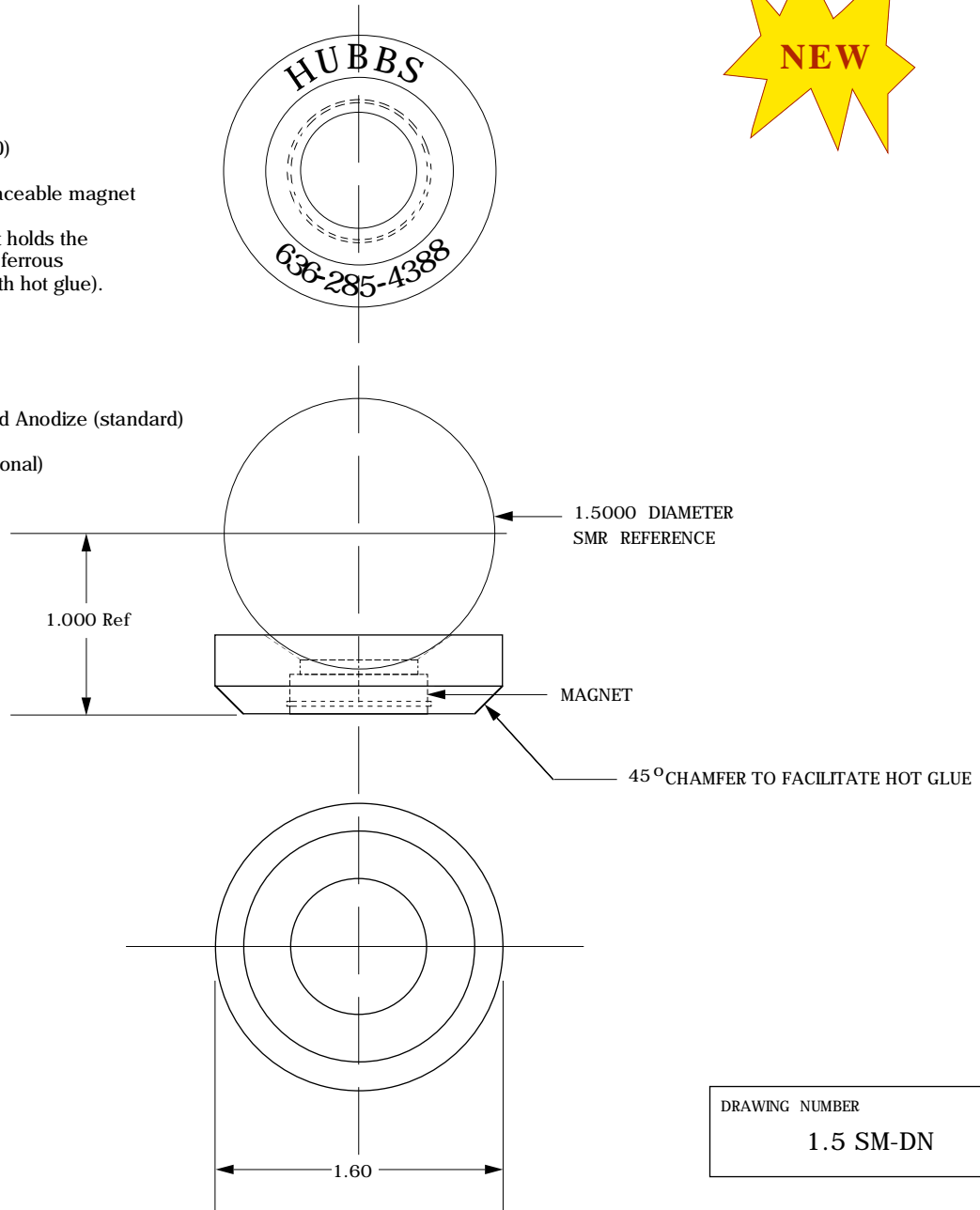
The 1.5 Sphere Mount Drift Nest is used for establishing non-critical temporary or permanent monuments using hot glue or permanent adhesives.

Features

- Low cost
- Lightweight
- Small diameter
- Shortest offset (1.000)
- Removable and replaceable magnet
- The powerful magnet holds the SMR and the nest to ferrous surfaces(reinforce with hot glue).

Material

- Aluminum Black Hard Anodize (standard)
- Stainless Steel (optional)



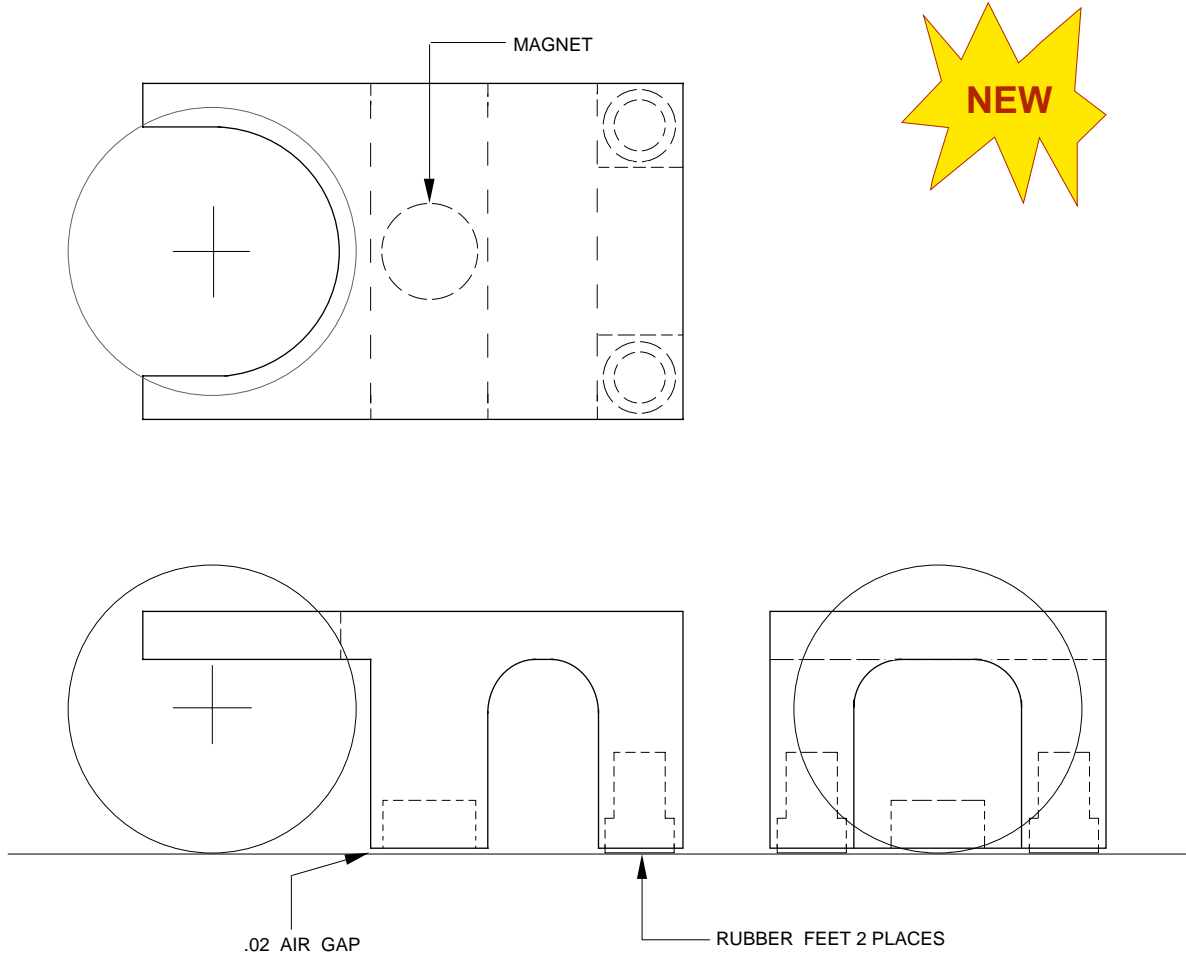
DRAWING NUMBER 1.5 SM-DN

TO ORDER : SPECIFY PART NO. AS SHOWN
1.5 SM-DN
1.5 SM-DN-SS (STAINLESS STEEL)

WE ALSO OFFER CUSTOM LASER ENGRAVING TO ADVERTISE YOUR SERVICE COMPANY. CALL FOR DETAILS.

1.5 SMR MAGNETIC CLAMP

The 1.5 SMR Magnetic Clamp holds a 1.5 inch SMR magnetically net to a flat ferrous surface. It can also hold a Theodolite or Photogrammetry sphere in some orientations.



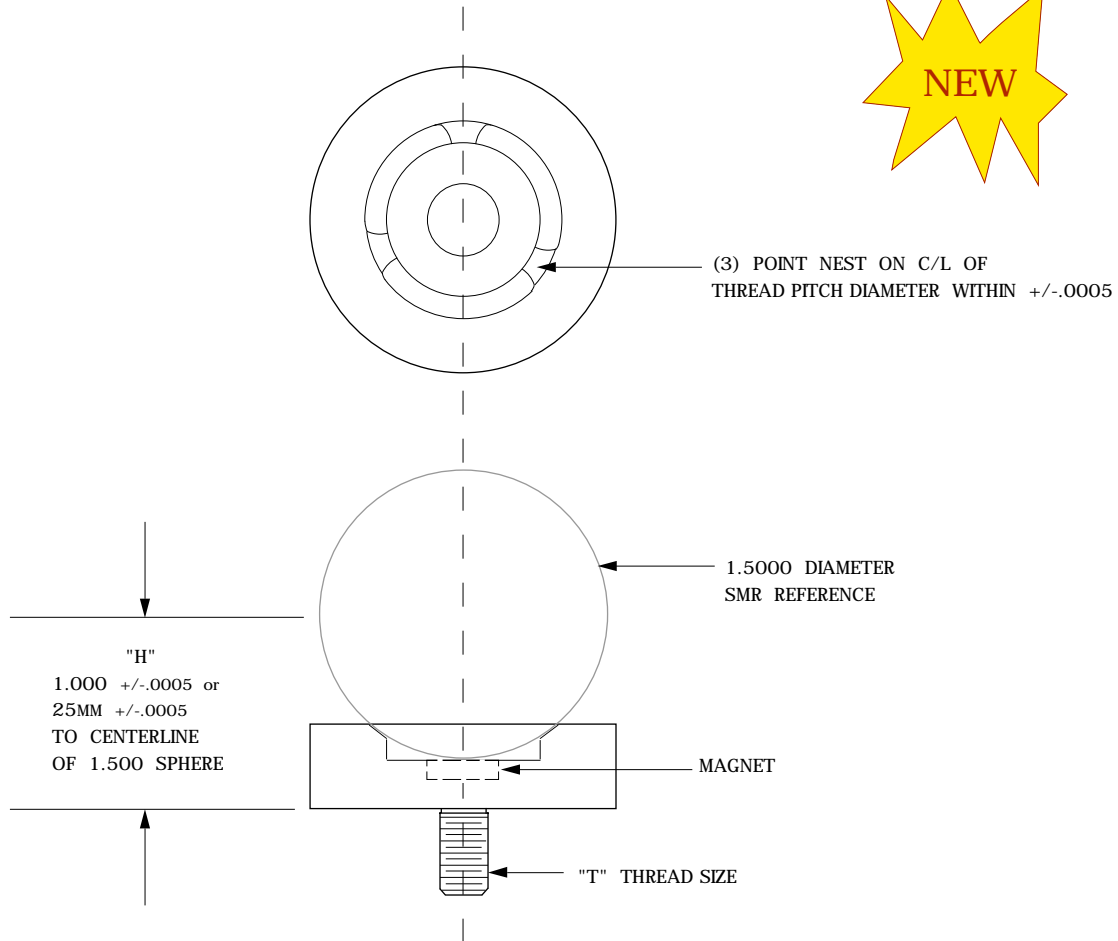
DRAWN TO SCALE
MATERIAL: ALUMINUM, BLACK ANODIZED

TO ORDER : SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 SMR-MC

DRAWING NUMBER
1.5 SMR MC

1.5 SPHERE MOUNT THREADED

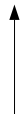
The 1.5 Sphere Mount Threaded is designed to hold a Spherically Mounted Retro-Reflector or Theodolite Sphere on centerline of a threaded hole and 1.000 above or optional 25MM above



TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: 1.5 SMT - 1.000 - 1/4-20

1.5 SMT - 25MM - 8MM



"T" - THREAD SIZE

"H" - HEIGHT TO CENTERLINE OF SPHERE

DRAWING NUMBER

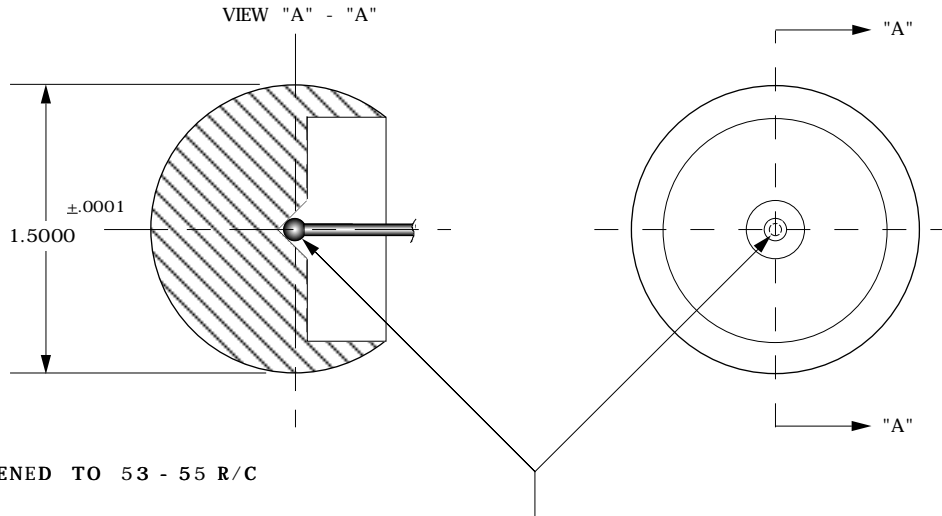
1.5 SMT-1.000

DRAWING NUMBER

1.5 SMT-25MM

1.5 RETRO-PROBE RESET SPHERE

BALL



HARDENED TO 53 - 55 R/C

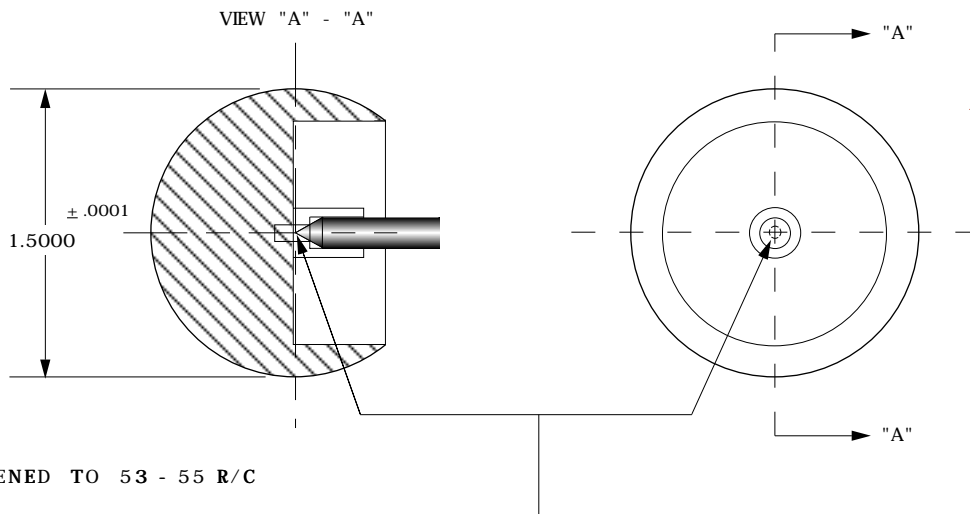
SPHERE ON CENTERLINE OF 1.5000 SPHERICAL DIAMETER WITHIN ±.00025

TO ORDER: SPECIFY PART NO. AS SHOWN

- EXAMPLE:** 1.5 RRS - 1MM
1.5 RRS - 3MM
1.5 RRS - 6MM
1.5 RRS - 1250
1.5 RRS - 2500

DRAWING NUMBER
1.5 RRS

POINT



HARDENED TO 53 - 55 R/C

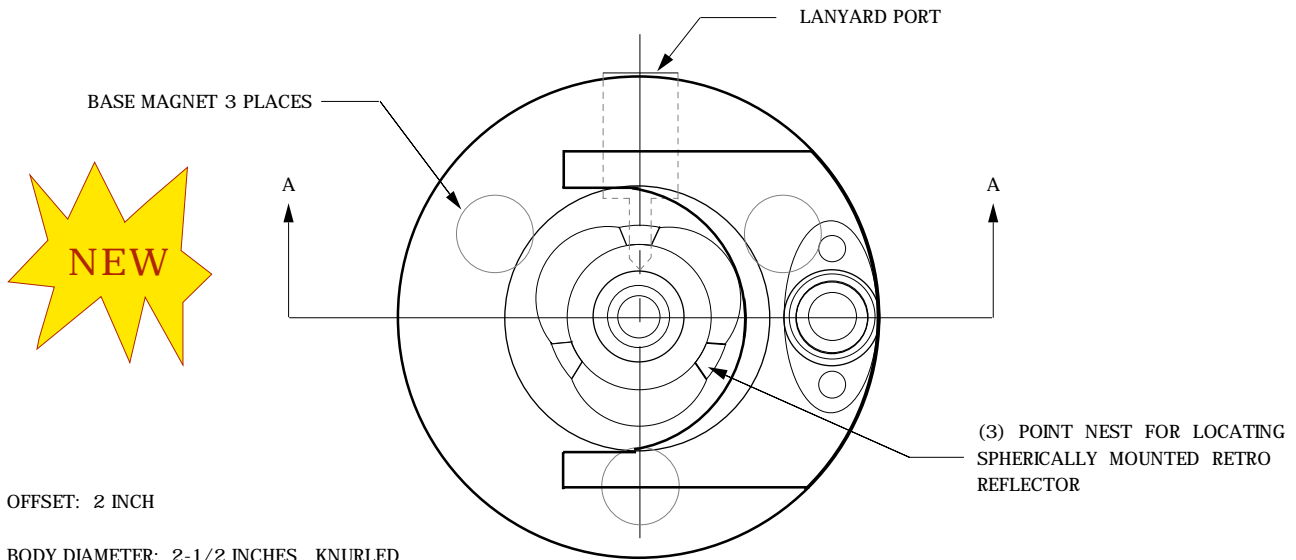
POINT ON CENTERLINE OF 1.5000 SPHERICAL DIAMETER WITHIN ±.00025

TO ORDER: SPECIFY PART NO. AS SHOWN

- EXAMPLE:** 1.5 RRS - POINT

1.5 TRACK AND PUNCH SMR NEST

The 1.5 Track and Punch Nest allows the SMR to be Tracked into a position, then a light tap with a small hammer on the striker will produce a small accurately located center punch mark under the SMR location without removing the SMR.



OFFSET: 2 INCH

BODY DIAMETER: 2-1/2 INCHES, KNURLED

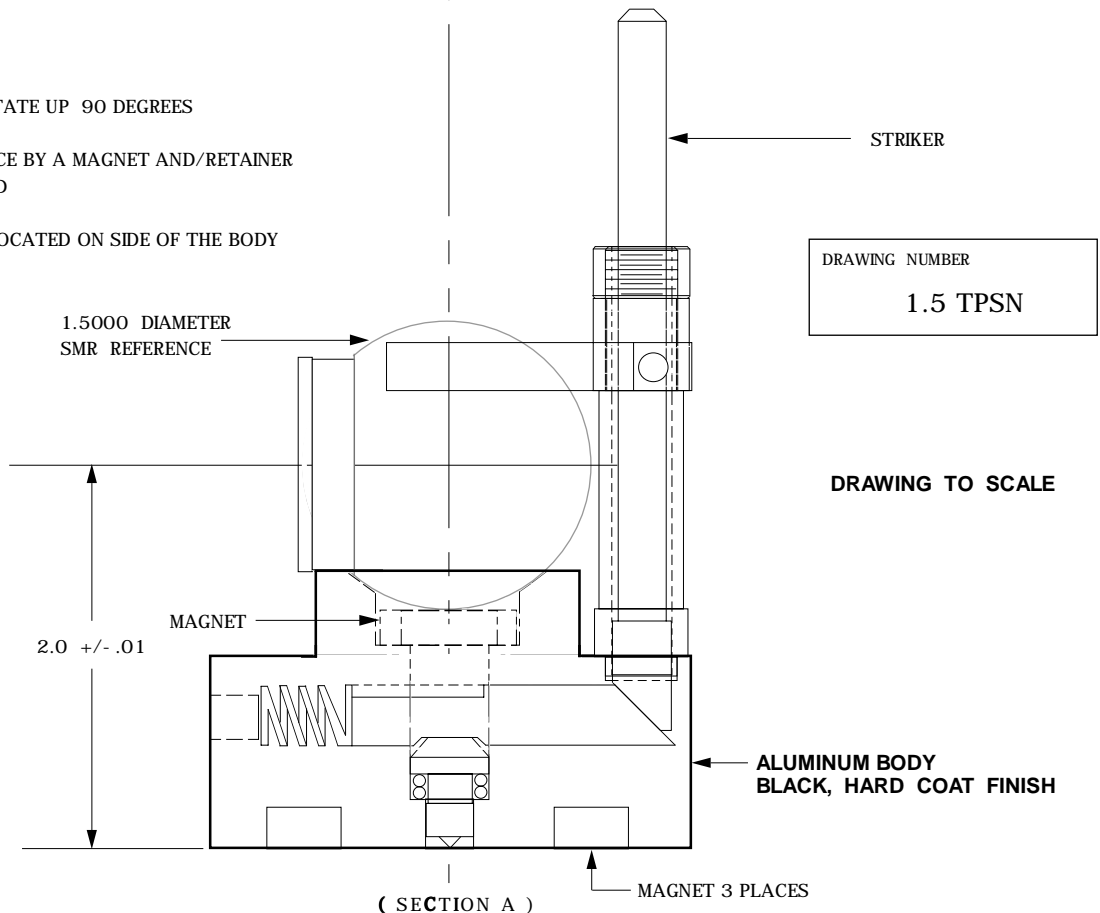
PUNCH: HARDENED TO 58-62 ROCKWELL

FEATURES:

SMR IS ABLE TO ROTATE UP 90 DEGREES

SMR IS HELD IN PLACE BY A MAGNET AND/RETAINER IF DESIRED

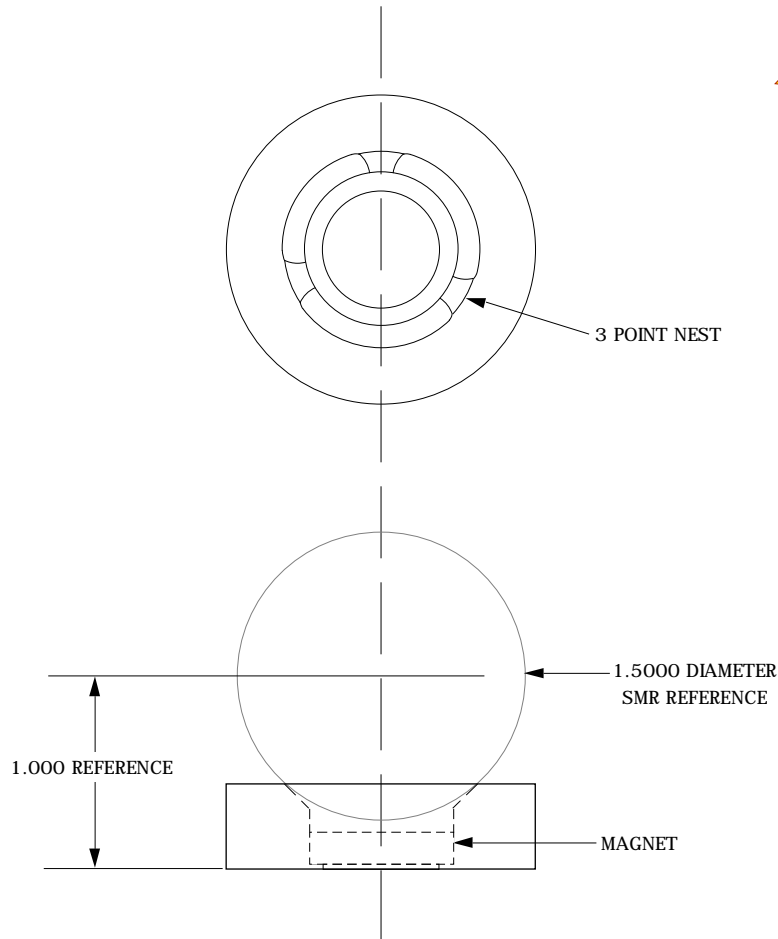
LANYARD PORT IS LOCATED ON SIDE OF THE BODY



PATENT PENDING

1.5 SPHERE MOUNT DRIFT NEST 3 POINT STEEL

The 1.5 Sphere Mount Drift Nest 3 Point Steel is used for establishing non-critical temporary or permanent monuments using adhesives or by tack welding.



MATERIAL: 1144 STEEL BLACK OXIDE FINISH

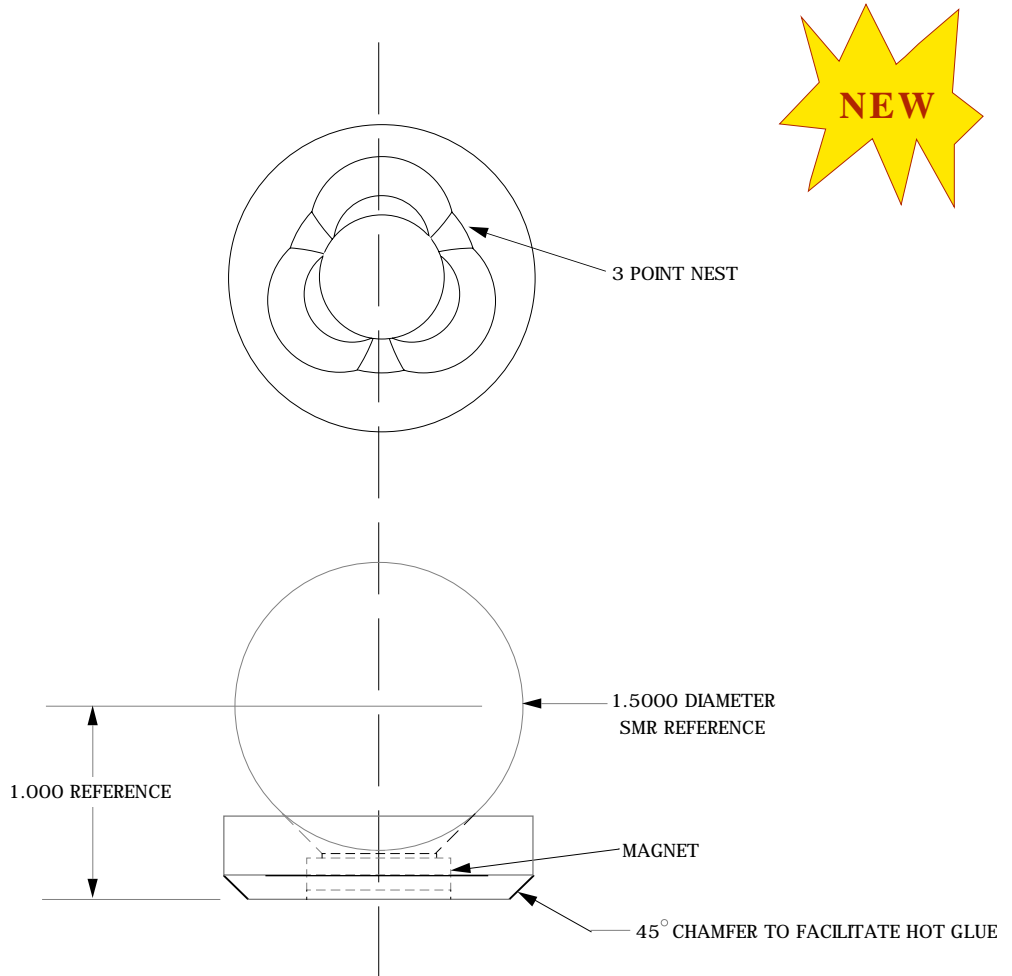
**TO ORDER : SPECIFY PART NO. AS SHOWN
1.5 SM-DN- 3PS**

DRAWING NUMBER

1.5 SM- DN-3PS

1.5 SPHERE MOUNT DRIFT NEST 3 POINT ALUMINUM

The 1.5 Sphere Mount Drift Nest 3 Point Aluminum is used for establishing non-critical temporary or permanent monuments using hot glue or permanent adhesives.



MATERIAL: ALUMINUM, BLACK HARD ANODIZE

**TO ORDER : SPECIFY PART NO. AS SHOWN
1.5 SM-DN- 3PA**

DRAWING NUMBER

1.5 SM- DN-3PA

1.5 SPHERE MOUNT NEGATIVE

The 1.5 Sphere Mount Negative is designed to hold a Spherically Mounted Retro-Reflector or other spherical target, on centerline of a hole and 1.000 above or optional 25MM above and allows for the SMR to be rotated below horizontal.

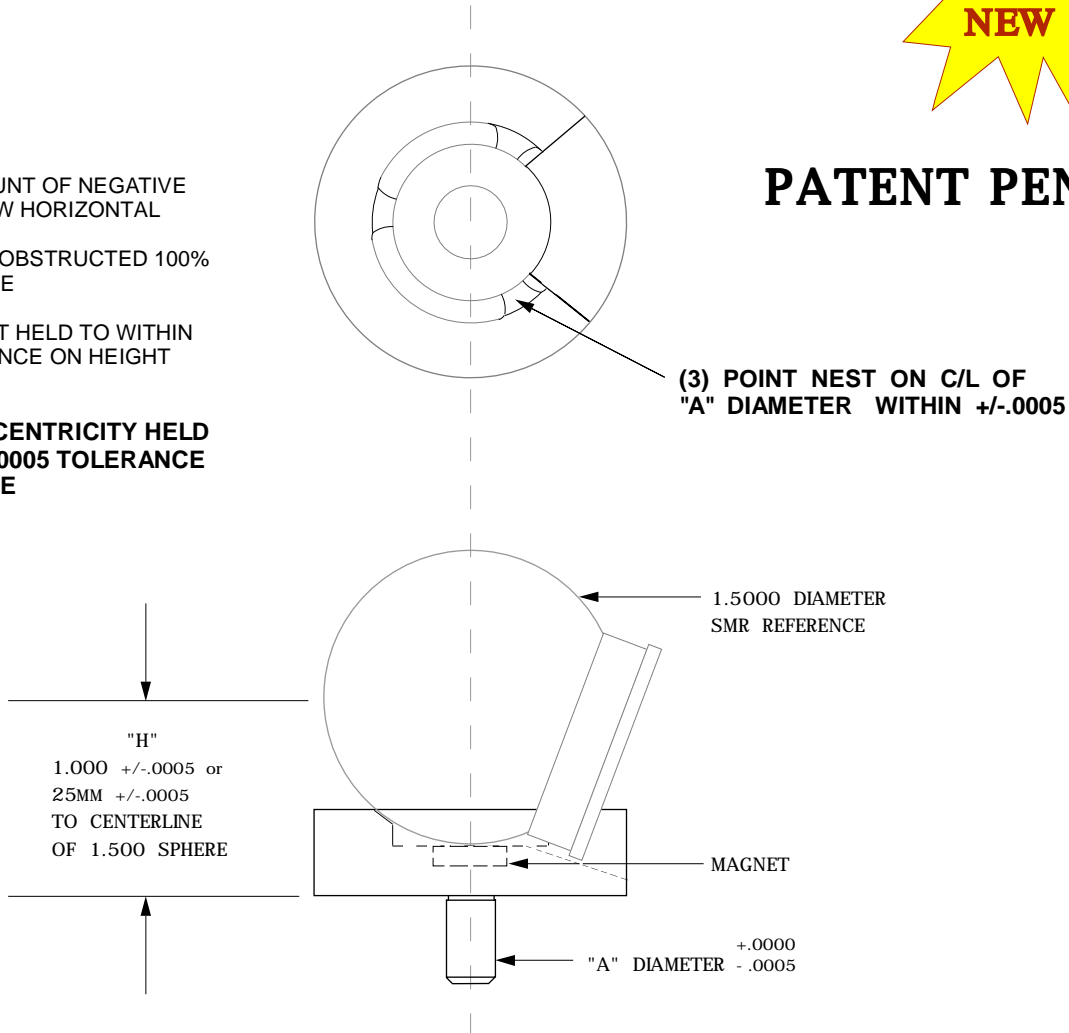


PATENT PENDING

FEATURES

- GREATEST AMOUNT OF NEGATIVE ROTATION BELOW HORIZONTAL
- ALLOWS FOR UNOBSTRUCTED 100% CLEAR APERTURE
- CRITICAL OFFSET HELD TO WITHIN +/- .0005 TOLERANCE ON HEIGHT

CRITICAL CONCENTRICITY HELD TO WITHIN +/- .0005 TOLERANCE ON CENTERLINE



TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: 1.5 SM - 1.000 - 2500 NEG

EXAMPLE: 1.5 SM - 25MM - 6MM NEG

"A" - SHANK DIAMETER

"H" - HEIGHT TO CENTERLINE OF SPHERE

DRAWING NUMBER
1.5 SM-1.000 NEG

DRAWING NUMBER
1.5 SM-25MM NEG

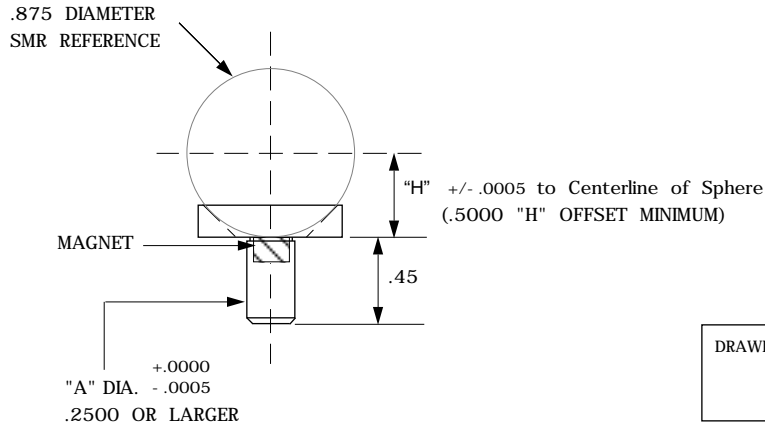
PATENT PENDING

H**LASER TRACKER - .875 SPHERE****H**

.875 Sphere Mount	(.875 SM)	Page H-1
.875 Sphere Mount - Hard Coat	(.875 SM-HC)	Page H-2
.875 Shankless Sphere Mount	(.875 SSM)	Page H-3
.875 SMR Adaptor	(1.5 - .875 SMR AD)	Page H-4

CALL FOR QUANTITY PRICES

.875 SPHERE MOUNT
(.500 "H" OFFSET MINIMUM)



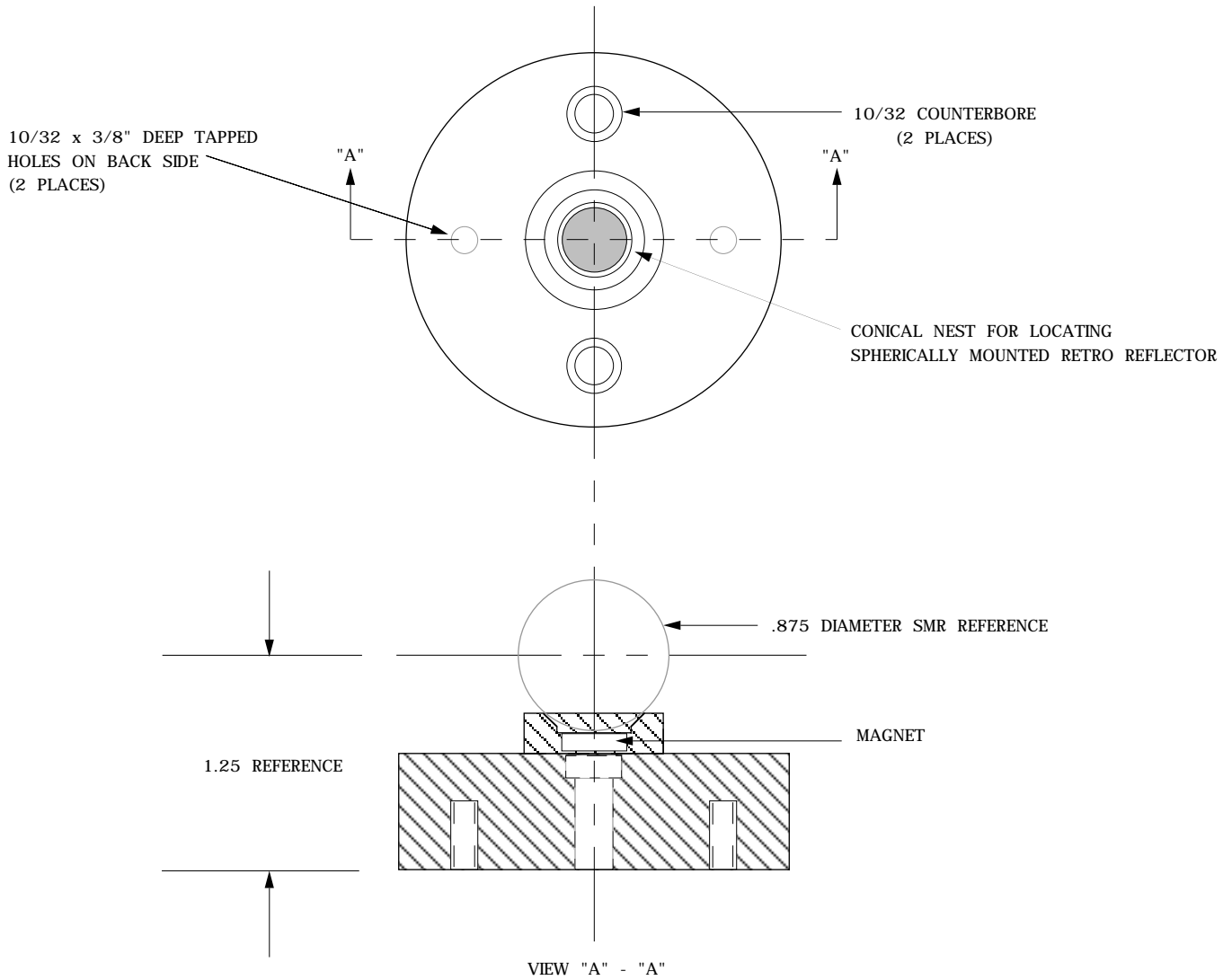
NOTE: "A" DIAMETER SMALLER THAN 6MM SHANK WILL BE NON-MAGNETIC

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: .875 SM - 5000 - 2500



.875 SPHERE MOUNT - HARD COAT

The .875 Sphere Mount - Hard Coat is designed for mounting to a surface to securely hold a .8750 diameter Spherically Mounted Retro-Reflector. The .875SM-HC is used for permanent reference only, not intended for critical offsets or concentricities.



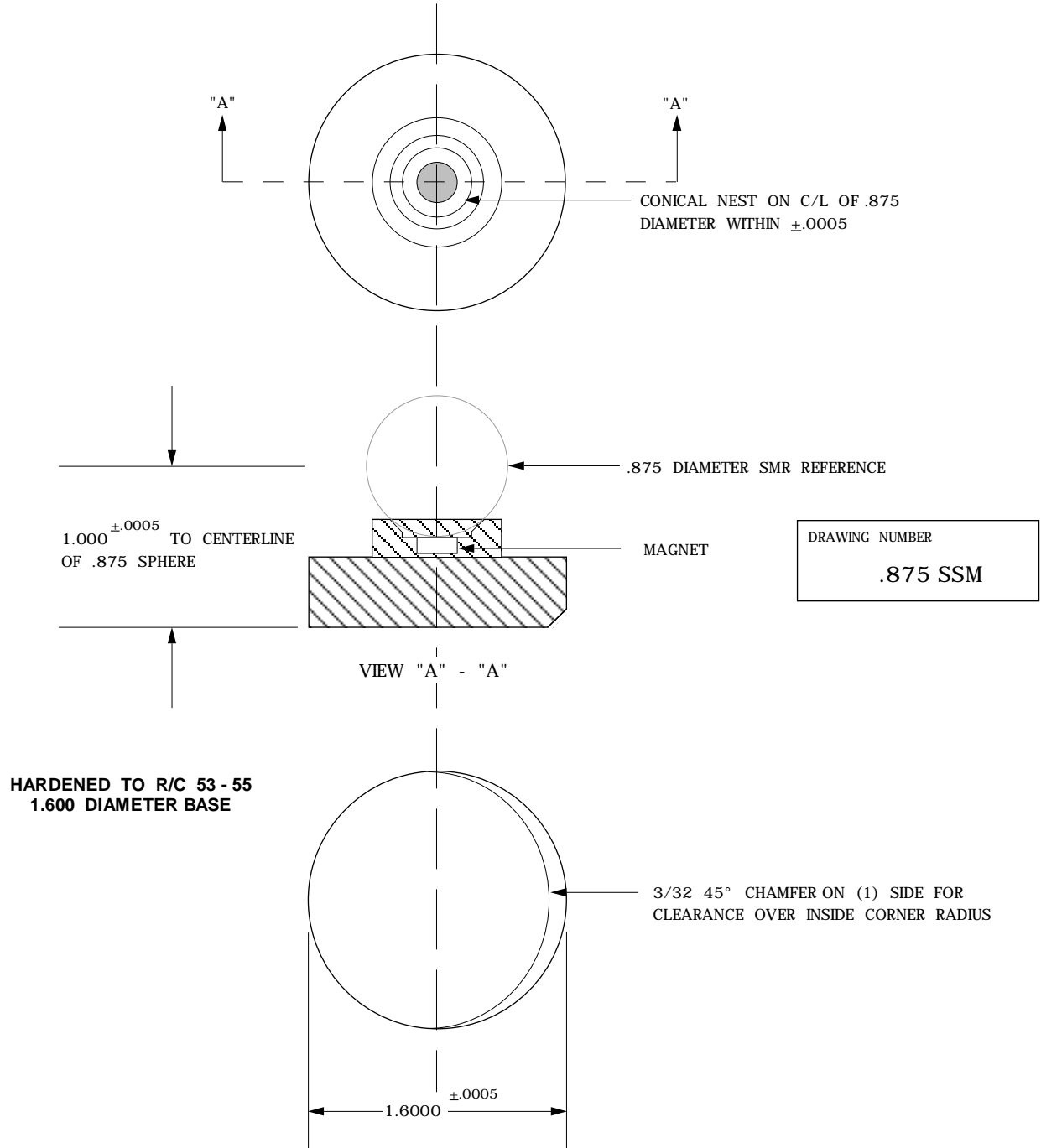
DRAWING TO SCALE

**MATERIAL: ALUMINUM
BLACK, HARD COAT FINISH**

DRAWING NUMBER
.875 SM - HC

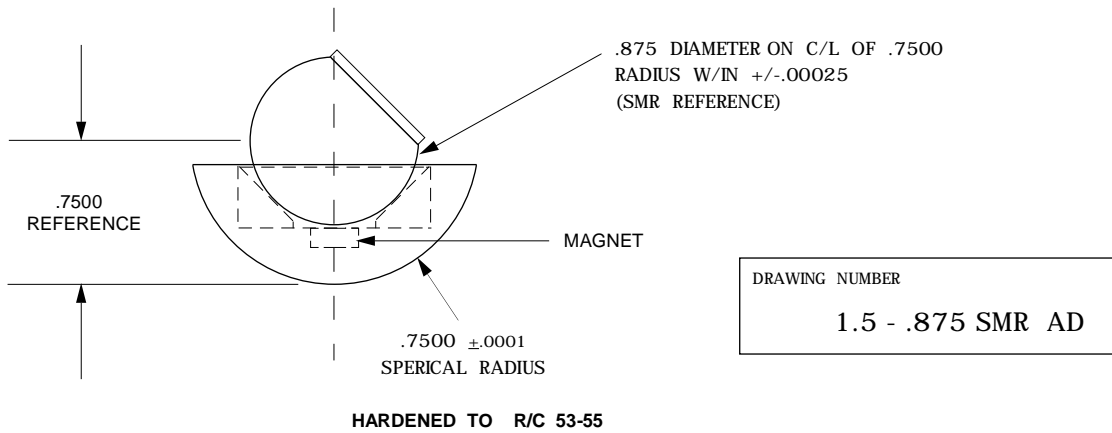
.875 SHANKLESS SPHERE MOUNT

The Shankless Sphere Mount supports a Spherical Mounted Retro-Reflector for a critical height and centerline. The edge may be used to contact inside edges to give a value of .800 away.



**FOR NON - CRITICAL APPLICAT IONS, SUGGEST USING A
.875 SPHERE MOUNT - HARD COAT (.875 SM - HC)**

1.5 TO .875 SMR ADAPTOR

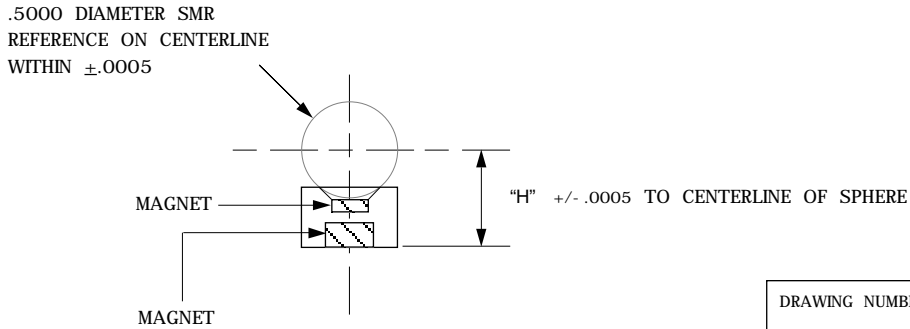


TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 - .875 SMR AD

.5 Shankless Sphere Mount	(.5 SSM)	Page	I-1
.5 Sphere Mount	(.5 SM)	Page	I-1
.5 Sphere Mount Hidden Point Bar Adaptor	(.5SM HPBA)	Page	I-2
.5 Sphere Mount Laser Radar	(.5 SM/LR)	Page	I-3
1.5 To .5 SMR Adaptor	(1.5 - .5 SMR AD)	Page	I-4
Double Vector Target, Spherically Mounted Laser Radar	(DVT/SMLR)	Page	I-4
.5 Tripod Sphere Mount	(.5 TSM)	Page	I-5
.5 SMX Tripod Sphere Mount	(.5 SMX TSM)	Page	I-5
.5 Drift Nest	(.5 DN)	Page	I-6
.5 Sphere Mount Target Corner	(.5 SM/TC)	Page	I-7
NEW .5 SMR Magnetic Clamp	(.5 SMR MC)	Page	I-8
NEW .5 SMR Support	(.5 SMR SUPPORT)	Page	I-8
NEW .5 Sphere Mount Threaded	(.5 SMT)	Page	I-9
NEW .5 Edge Sphere Mount Outside Corner	(.5 ESM-OC)	Page	I-10

CALL FOR QUANTITY PRICES

.5 SHANKLESS SPHERE MOUNT
 (1.0MM "H" OFFSET MINIMUM)

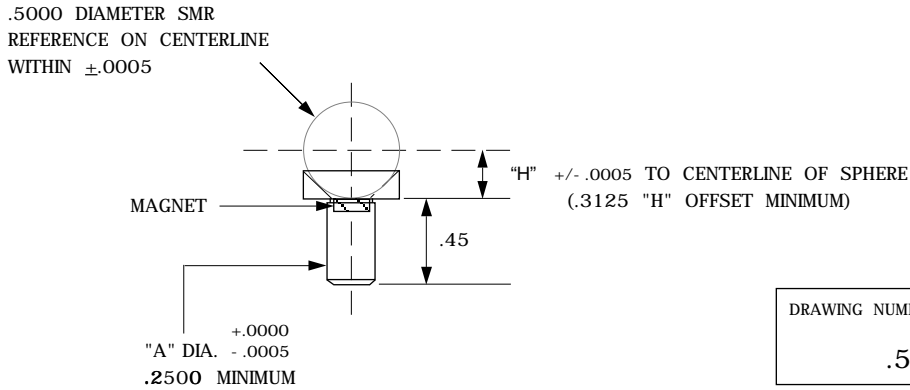


DRAWING NUMBER
.5 SSM

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: .5 SSM - 5000
.5 SSM - 1.000



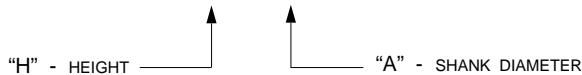
.5 SPHERE MOUNT
 (.3125 "H" OFFSET MINIMUM)



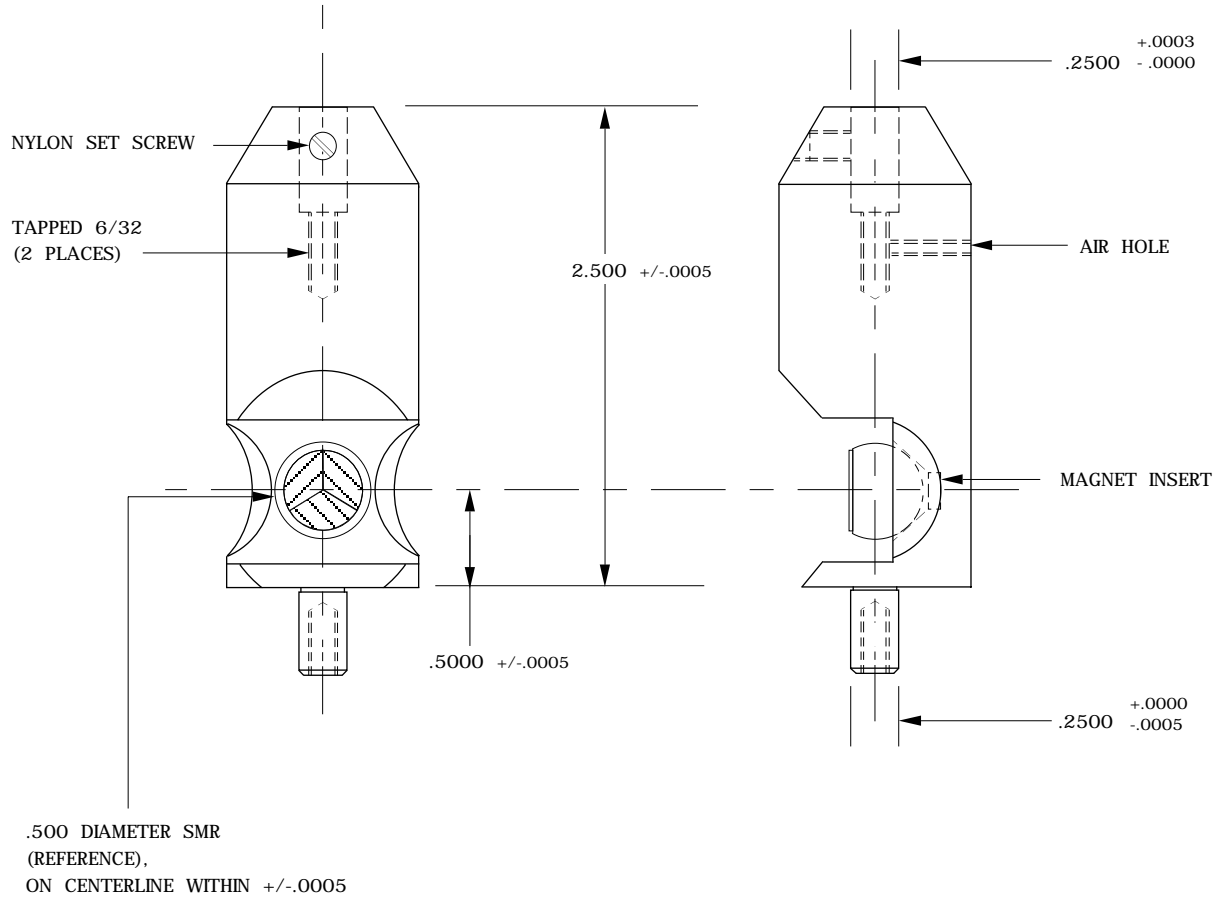
DRAWING NUMBER
.5 SM

NOTE: FOR A .3125 OFFSET ONLY, THE MINIMUM SHANK POSSIBLE WITH A MAGNETIC INSERT IS .2500 SHANK. FOR SHANK SIZES SMALLER THAN .2500 WITH A .3125 OFFSET, USE SMLR DESIGN

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: .5 SM - 3125 - 2500
.5 SM - 500 - 2500



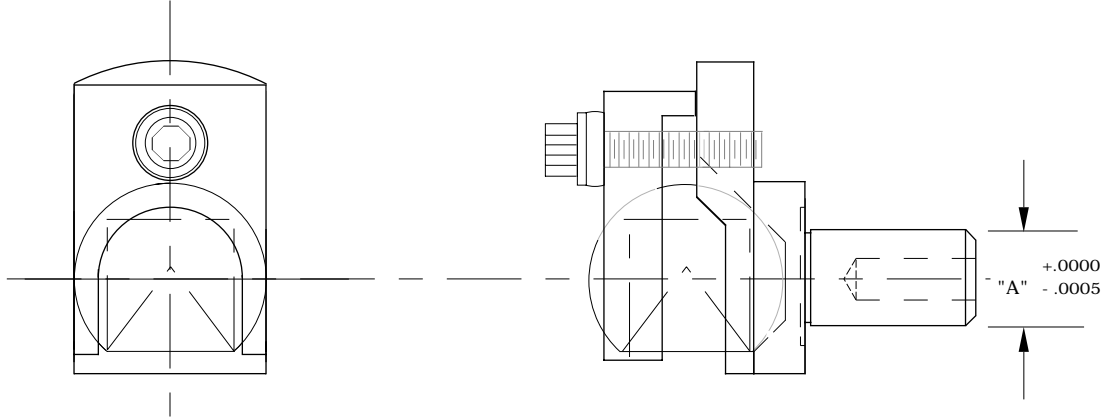
**.5 SPHERE MOUNT HIDDEN
POINT BAR ADAPTOR**



**MATERIAL: 1144 STEEL
BLACK OXIDE**

DRAWING NUMBER
.5SM HPBA

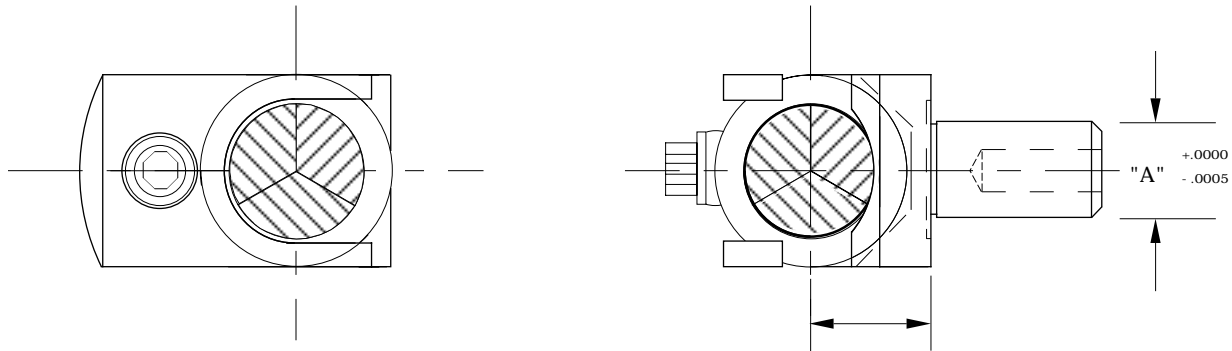
.5 SPHERE MOUNT, LASER RADAR



.5000 DIAMETER SMR (REFERENCE)
ON CENTERLINE OF SHANK WITHIN +/- .0005

6/32 TAPPED HOLE
.2500 DIAMETER SHANK OR
LARGER ONLY

4-40 TAP FOR SHANKS UNDER
.2500 DIAMETER, DOWN TO AND
INCLUDING .1875 DIAMETER



VIEW WITH SMR TURNED 90 DEGREE

.3125 "H" +/- .0005
TO CENTERLINE OF .500
DIAMETER GAGE SPHERE

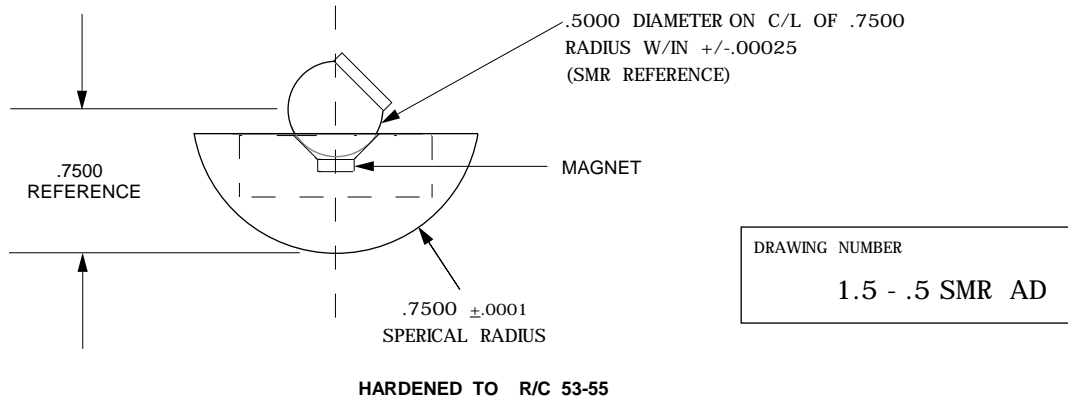
DRAWING TWICE SIZE

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: .5 SM/LR - 3125 - 2500

↑ ↑
 "A" - SHANK DIAMETER
"↑" - HEIGHT TO CENTERLINE OF SPHERE

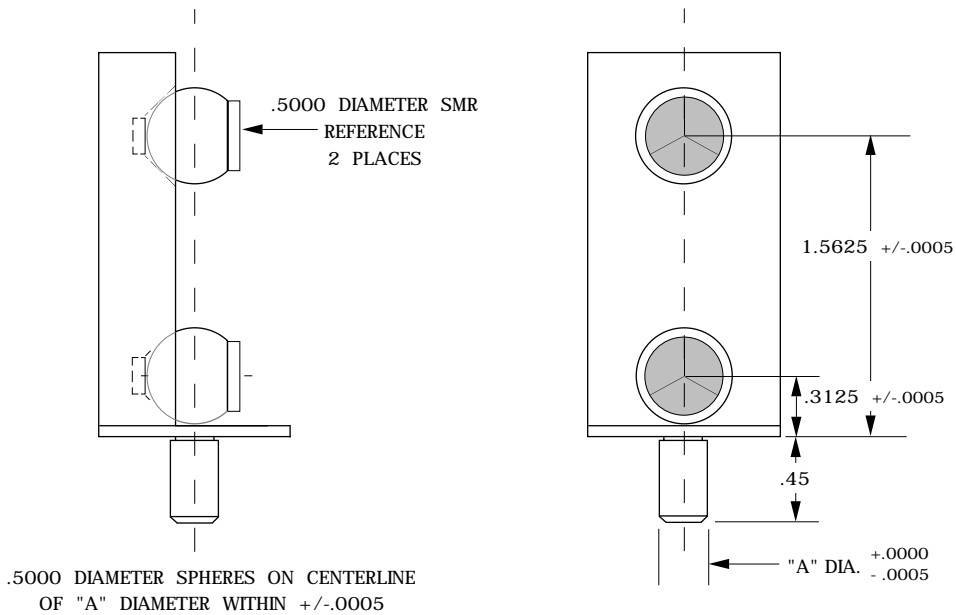
DRAWING NUMBER
.5 SM /LR

1.5 TO .5 SMR ADAPTOR



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: 1.5 - .5 SMR AD

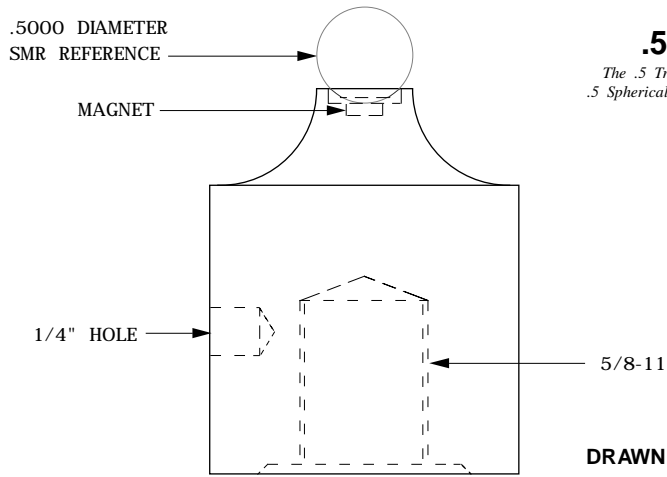
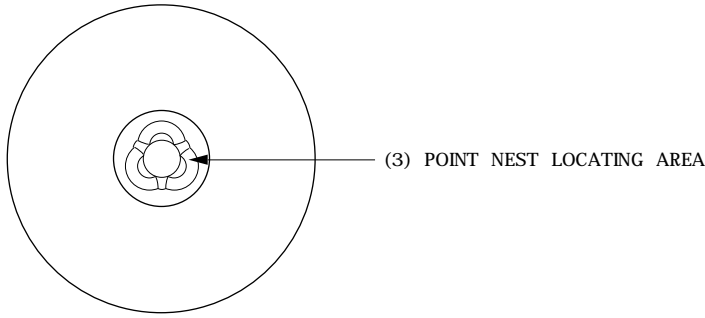
DOUBLE VECTOR TARGET SPHERICALLY MOUNTED LASER RADAR



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: DVT/SMLR - 2500
DVT/SMLR - 8 MM

↑
 "A" SHANK DIAMETER

DRAWING NUMBER
 DVT/SMLR



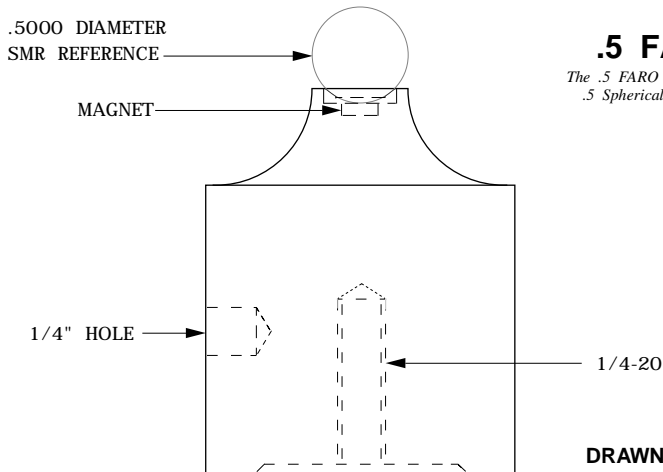
.5 TRIPOD SPHERE MOUNT

The .5 Tripod Sphere Mount is mounted to a Theodolite Adapter to hold a .5 Spherically Mounted Retro-Reflector in place for a consistent reference point.

DRAWING NUMBER

.5 TSM

DRAWN TO SCALE



.5 FARO TRIPOD SPHERE MOUNT

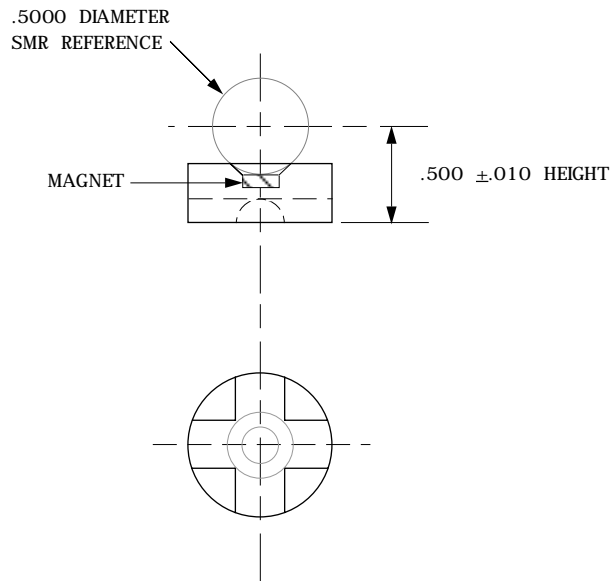
The .5 FARO Tripod Sphere Mount is mounted to a Spatial Metrix tripod to hold a .5 Spherically Mounted Retro-Reflector in place for a consistent reference point.

DRAWING NUMBER

.5 FARO TSM

DRAWN TO SCALE

.5 DRIFT NEST



DRAWING NUMBER

.5 DN

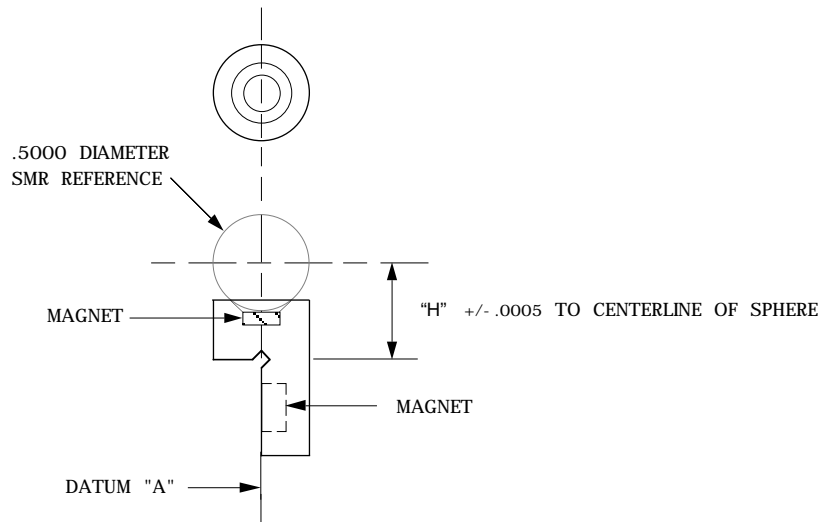
1144 STEEL
BLACK OXIDE

DRAWING TO SCALE

HOW TO USE:

HOLD .5 DN IN PLACE AND INJECT HOT GLUE INTO (1)
OF THE (4) TUNNELS UNTIL HOT GLUE PROTRUDES OUT
OF THE OTHER SIDES.

.5 SPHERE MOUNT TARGET CORNER



SMR REFERENCE IN LINE WITH DATUM "A"
W/IN +/- .0005

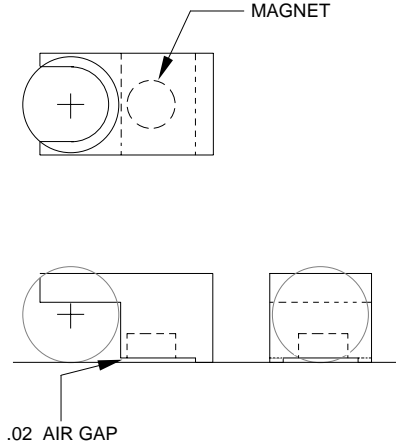
DRAWING NUMBER
.5 SM / TC

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: .5 SM / TC - 5000



.5 SMR MAGNETIC CLAMP

The .5 SMR Magnetic Clamp holds a .5 inch SMR magnetically net to a flat ferrous surface.



DRAWN TO SCALE

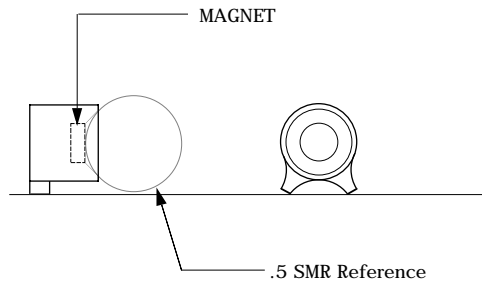
MATERIAL: 1144 BLACK OXIDED

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: .5 SMR-MC

DRAWING NUMBER .5 SMR MC

.5 SMR SUPPORT

Magnetically holds the SMR into a nest and stabilizes the SMR on horizontal surfaces.



DRAWN TO SCALE

MATERIAL : STEEL 1144 BLACK OXIDED

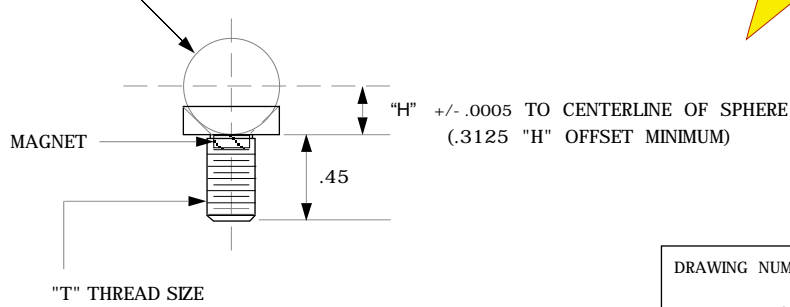
TO ORDER : SPECIFY PART NO. AS SHOWN
EXAMPLE : .5 SMR SUPPORT

DRAWING NUMBER .5 SMR SUPPORT

.5 SPHERE MOUNT THREADED
 (.3125 "H" OFFSET MINIMUM)



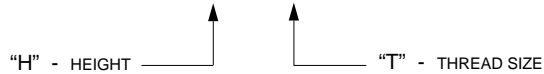
.5000 DIAMETER SMR REFERENCE ON
 CENTERLINE OF THREAD PITCH DIAMETER
 WITHIN $\pm .0005$



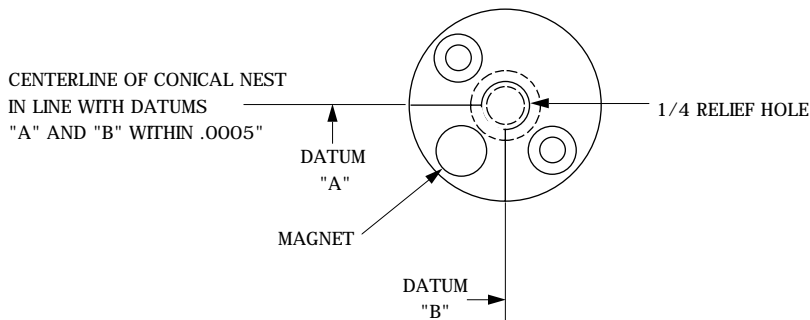
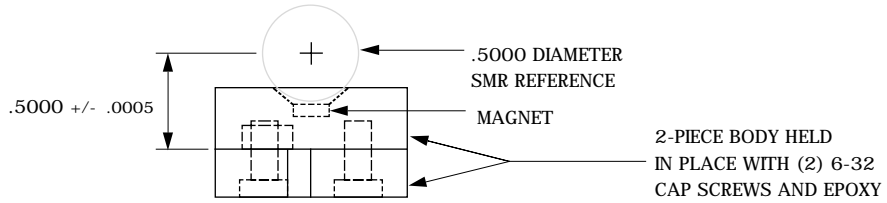
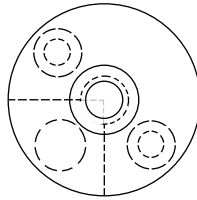
DRAWING NUMBER
.5 SMT

NOTE: FOR A .3125 OFFSET ONLY, THE MINIMUM THREAD POSSIBLE WITH A MAGNETIC INSERT IS ,
 5/16-18 THREAD.

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: .5 SMT - 3125 - 5/16-18
.5 SMT - 500 - 6-32



**.5 EDGE SPHERE MOUNT
 OUTSIDE CORNER**

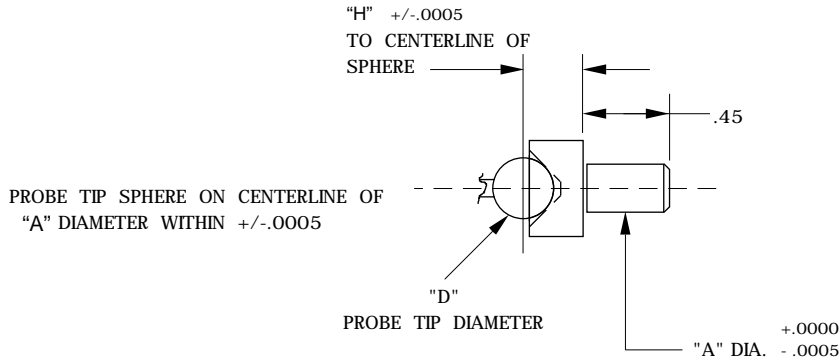


**TO ORDER: SPECIFY PART NO. AS SHOWN
 EXAMPLE: .5 ESM-OC**

DRAWING NUMBER .5 ESM-OC

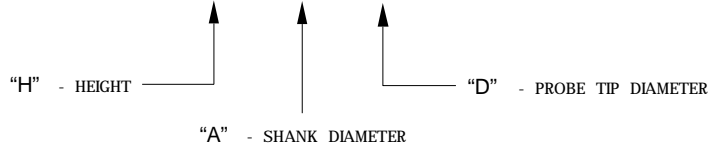
Probing Target, Straight-On	(PR/TSO)	Page J-1
Probing Target, Flush Mount	(PR/FM)	Page J-1
CMM Probe Target	(CPT)	Page J-2
CMM Probe Target - Insert	(CPT/INS)	Page J-3
Modified CMM Probe Target	(MCPT)	Page J-4
Flush Tooling Ball	(FTB)	Page J-5
Scribe Line Flush Tooling Ball	(SLFTB)	Page J-5

PROBING TARGET, STRAIGHT ON



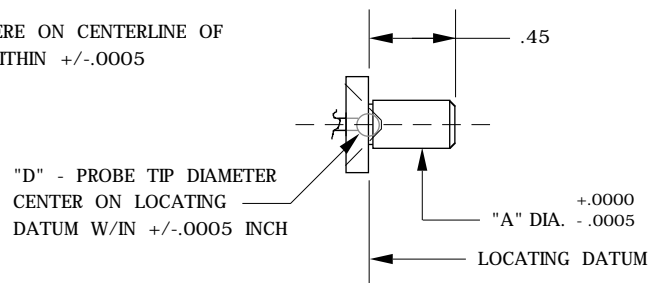
TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: PR/TSO - 3125 - 2500 - 3 MM
PR/TSO - 5000 - 3750 - 8 MM

DRAWING NUMBER
PR/TSO



PROBING TARGET, FLUSH MOUNT

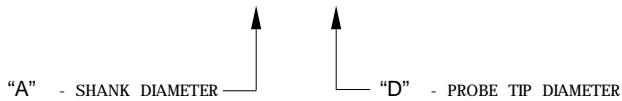
PROBE TIP SPHERE ON CENTERLINE OF
 "A" DIAMETER WITHIN +/-0.0005



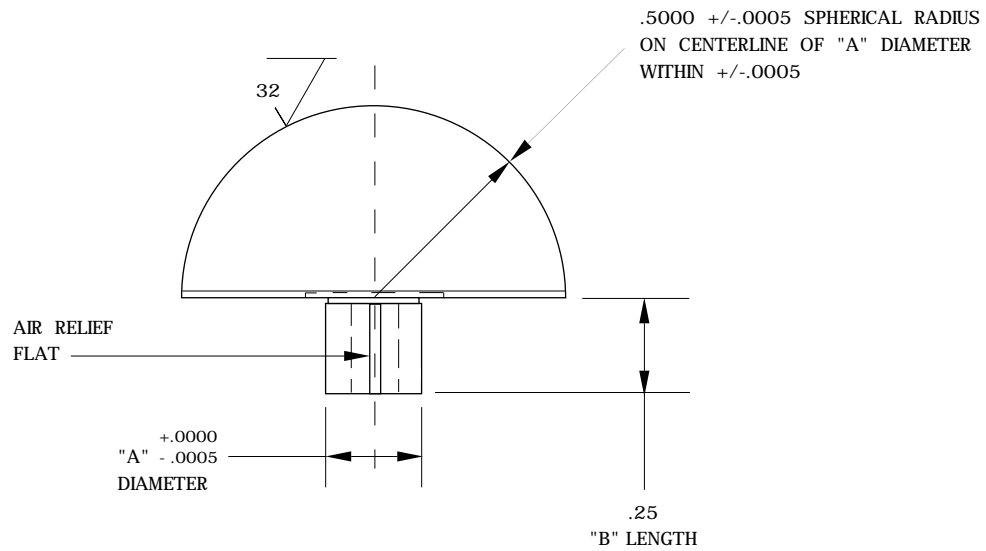
**SOME PROBE TIP SPHERE DIAMETER
 LIMITATIONS APPLY**

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: PR/FM - 2500 - 3 MM

DRAWING NUMBER
PR/FM



CMM PROBE TARGET



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: CPT - 5000R - 2500 - 25

↑ ↑
 "A" "B"

DRAWING NUMBER

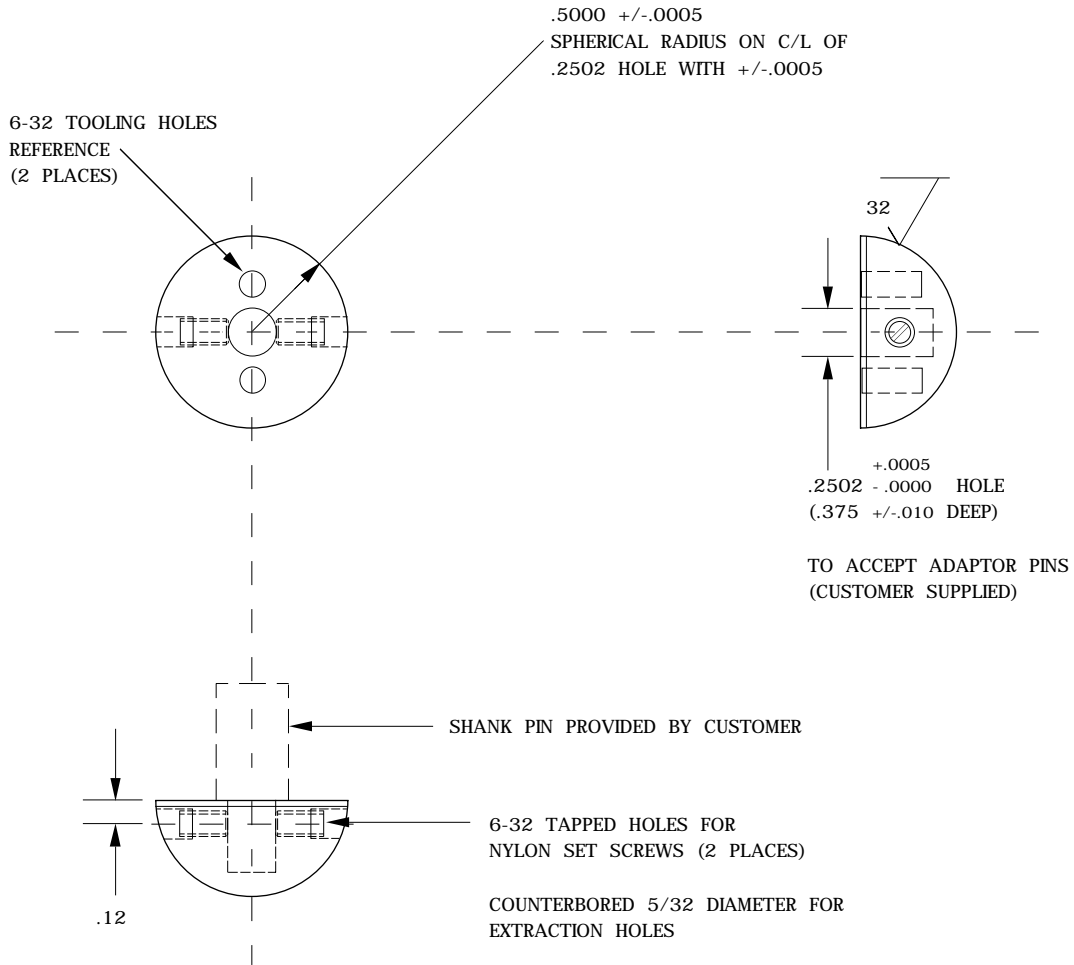
CPT

MATERIAL - 1144
HARDENED TO R/C 53 - 55

DRAWING: TWICE SIZE

CMM PROBE TARGET - INSERT

Use the Laser Tracker CMM Probe Target - Insert design, along with your own shop provided shank sizes.



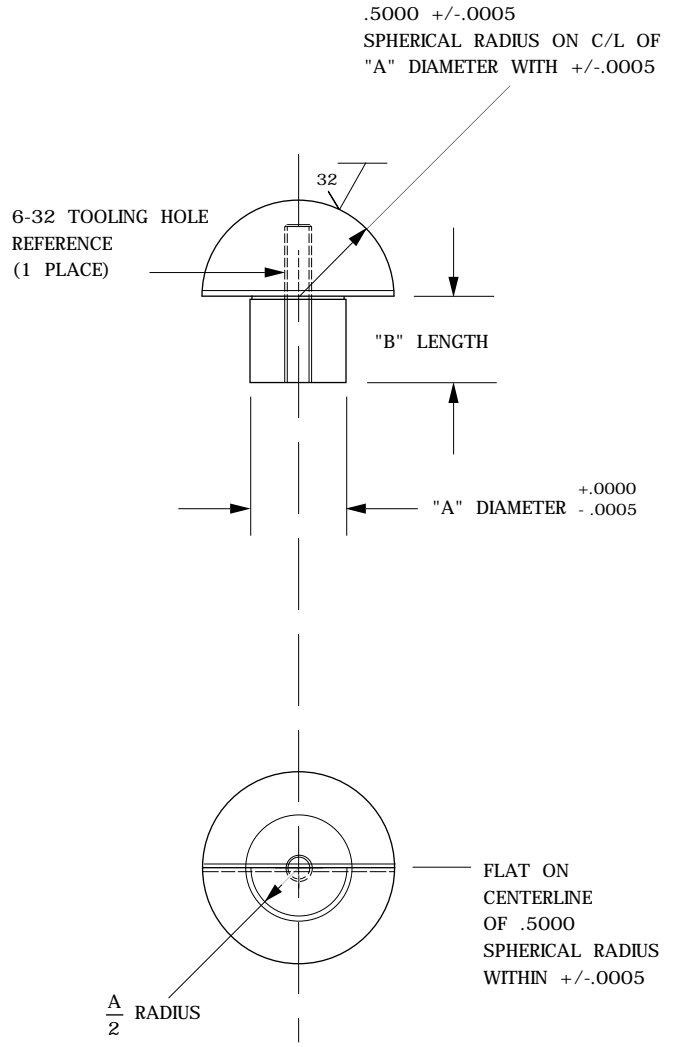
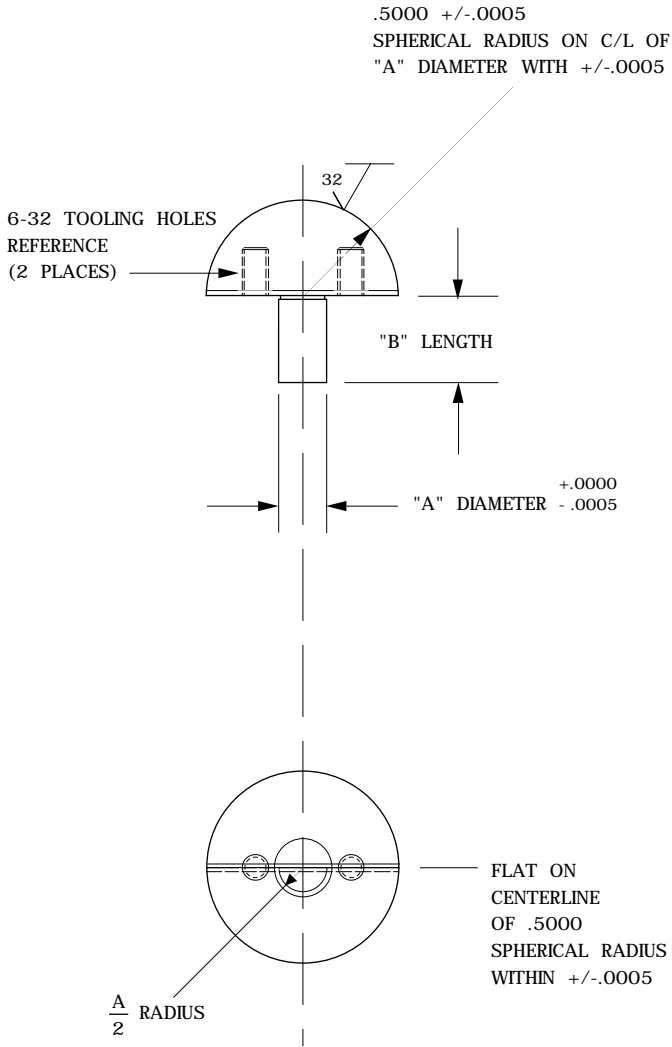
TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: CPT / INS

DRAWING NUMBER
CPT/INS

MATERIAL: 1144 STEEL
HARDENED: R/C 38 - 42

MODIFIED CMM PROBE TARGET

Use with the Laser Tracker to provide X, Y, and Z coordinate values for the intersection of a surface and an edge.



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: MCPT - 5000R - 2500 - 450
MCPT - 5000R - 5000 - 250

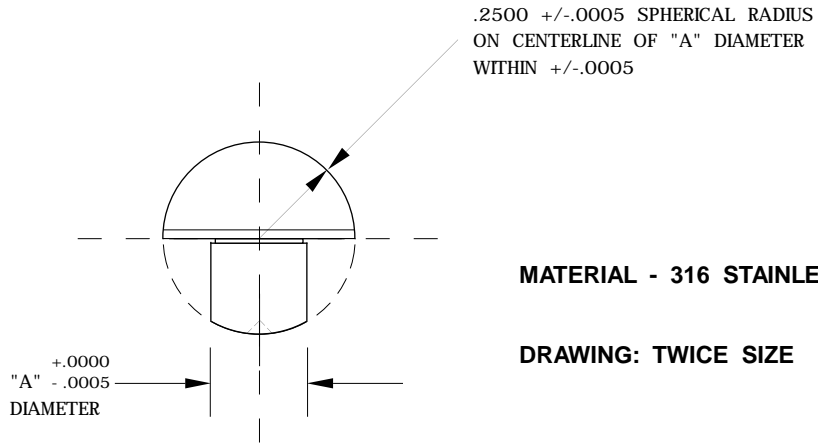
↑ ↑
 "A" "B"

DRAWING NUMBER
MCPT

MATERIAL: 1144 STEEL
 HARDENED: ROCKWELL "C" 52-55

FLUSH TOOLING BALL

The Flush Tooling Ball is used with the MetricVision measurement systems to represent the centerline of a hole with a zero offset height.



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: FTB - 1250
FTB - 2500
FTB - 1875

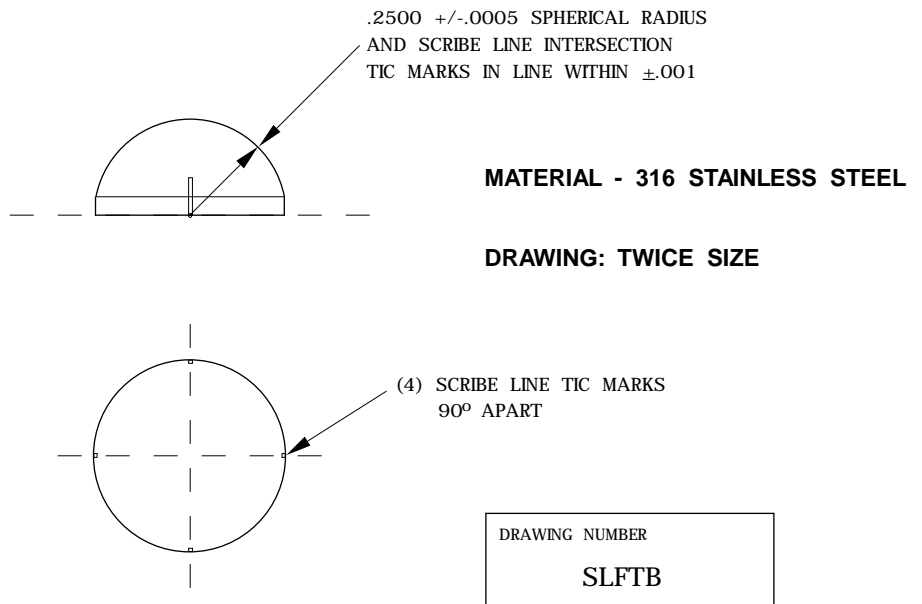
↑
"A"

DRAWING NUMBER

FTB

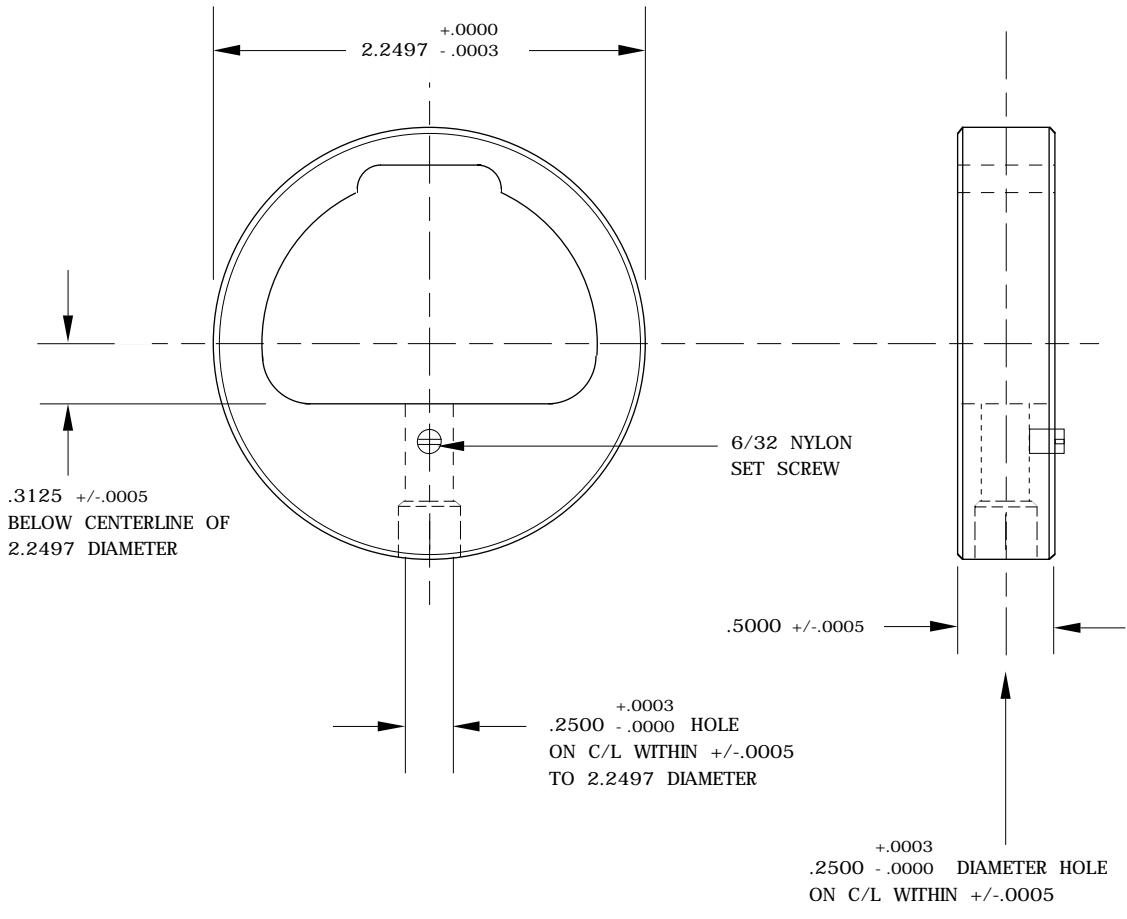
SCRIBE LINE FLUSH TOOLING BALL

The Scribe Line Flush Tooling Ball is used with the MetricVision measurement systems to represent the intersection of scribe lines with a zero offset height.



Boeing Header Target	(BHT)	Page	K-1
Boeing Header Target - 2	(BHT-2)	Page	K-2
Laser Tracker Boeing Header Target	(LT-BHT)	Page	K-3
Surface Edge Target Adaptor	(SETA)	Page	K-4
Cube Adaptor	(CA-500) (CA-3125)	Page	K-5
Boeing Cube Adaptor	(BCA-1) (BCA-2)	Page	K-6
Boeing Cube Adaptor Pin	(BCA PIN)	Page	K-6
Boeing Cube Adaptor Kit	(BCA KIT)	Page	K-6
Target, Skin Gap	(TSG)	Page	K-7
Target, Skin Gap, Retro	(TSGR)	Page	K-8

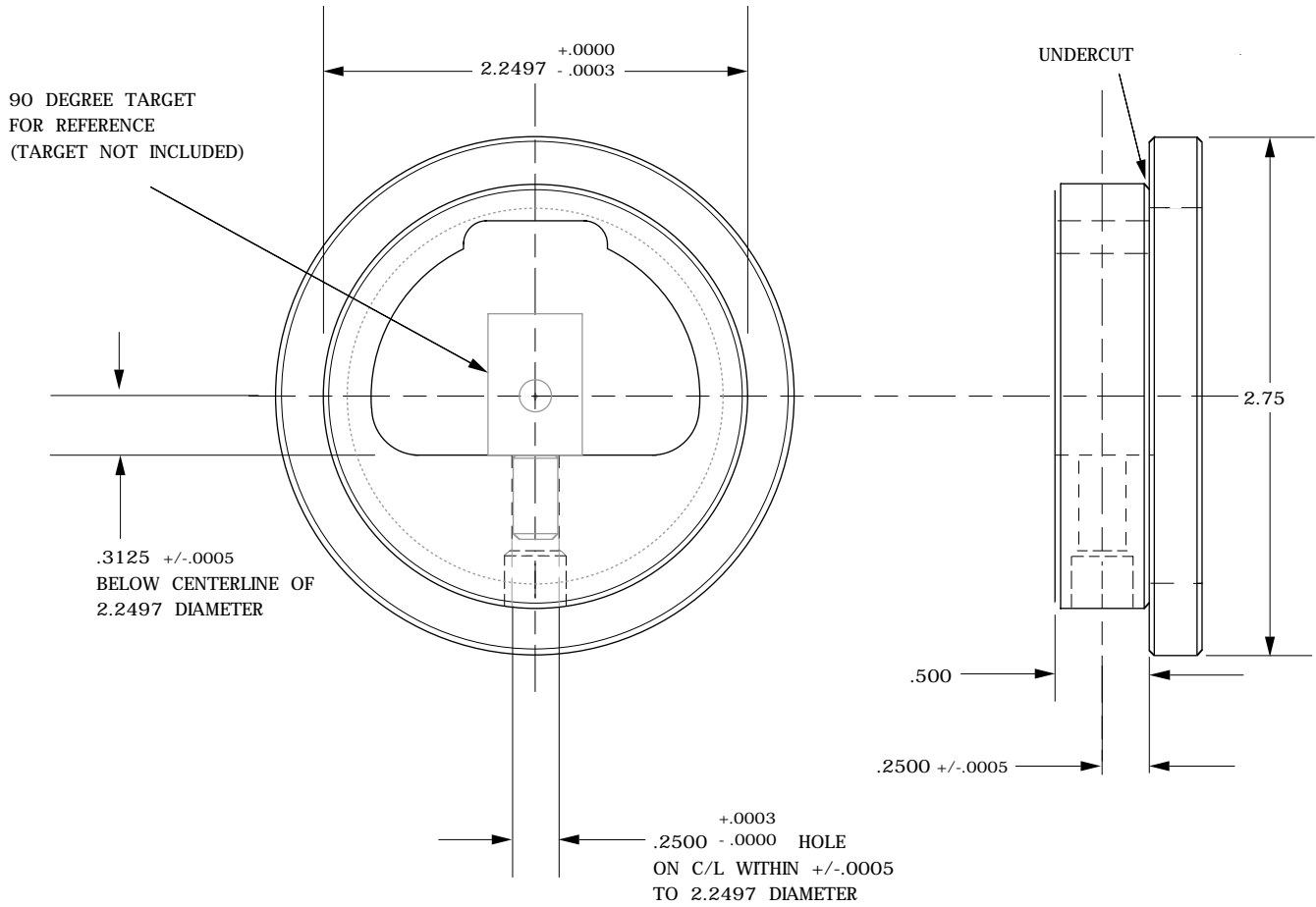
BOEING HEADER TARGET



HARDENED TO R/C 38 - 42

DRAWING NUMBER
BHT

BOEING HEADER TARGET - 2

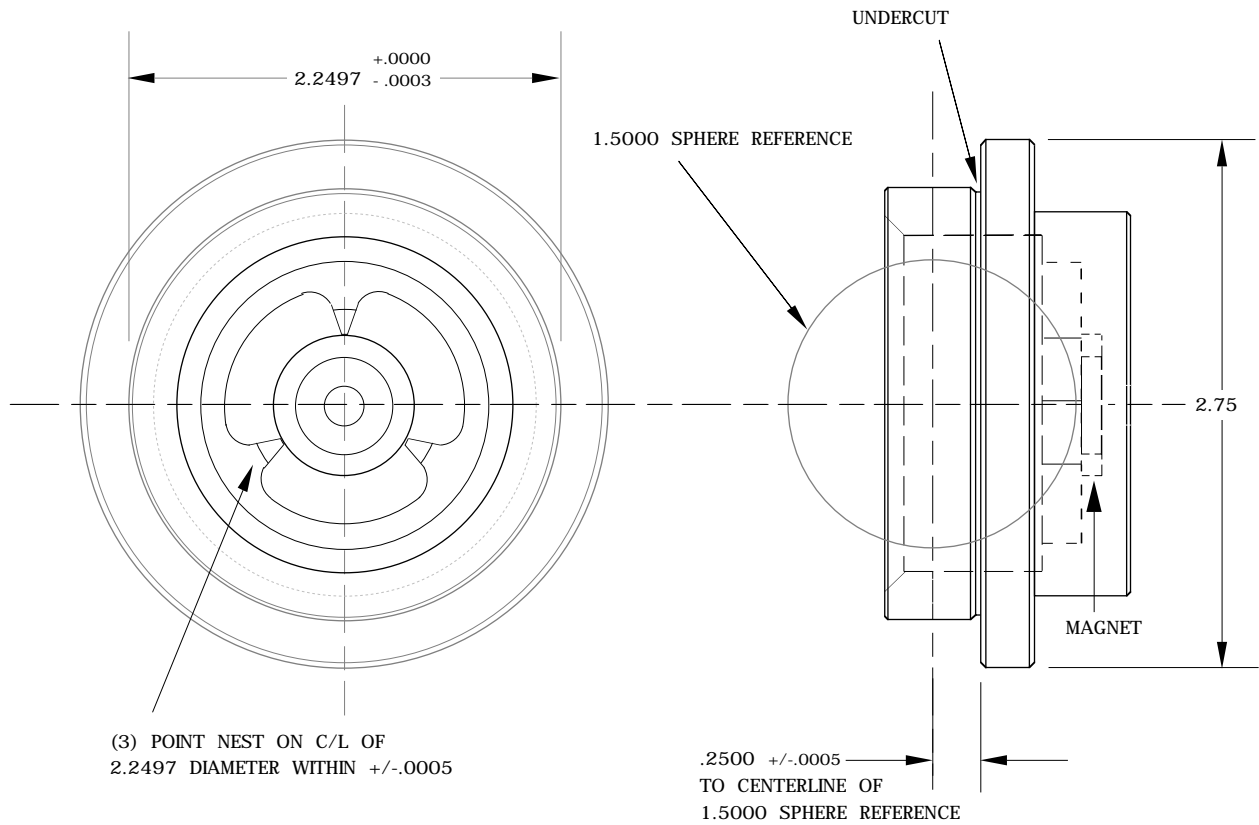


HARDENED TO R/C 38 - 42

DRAWING NUMBER

BHT-2

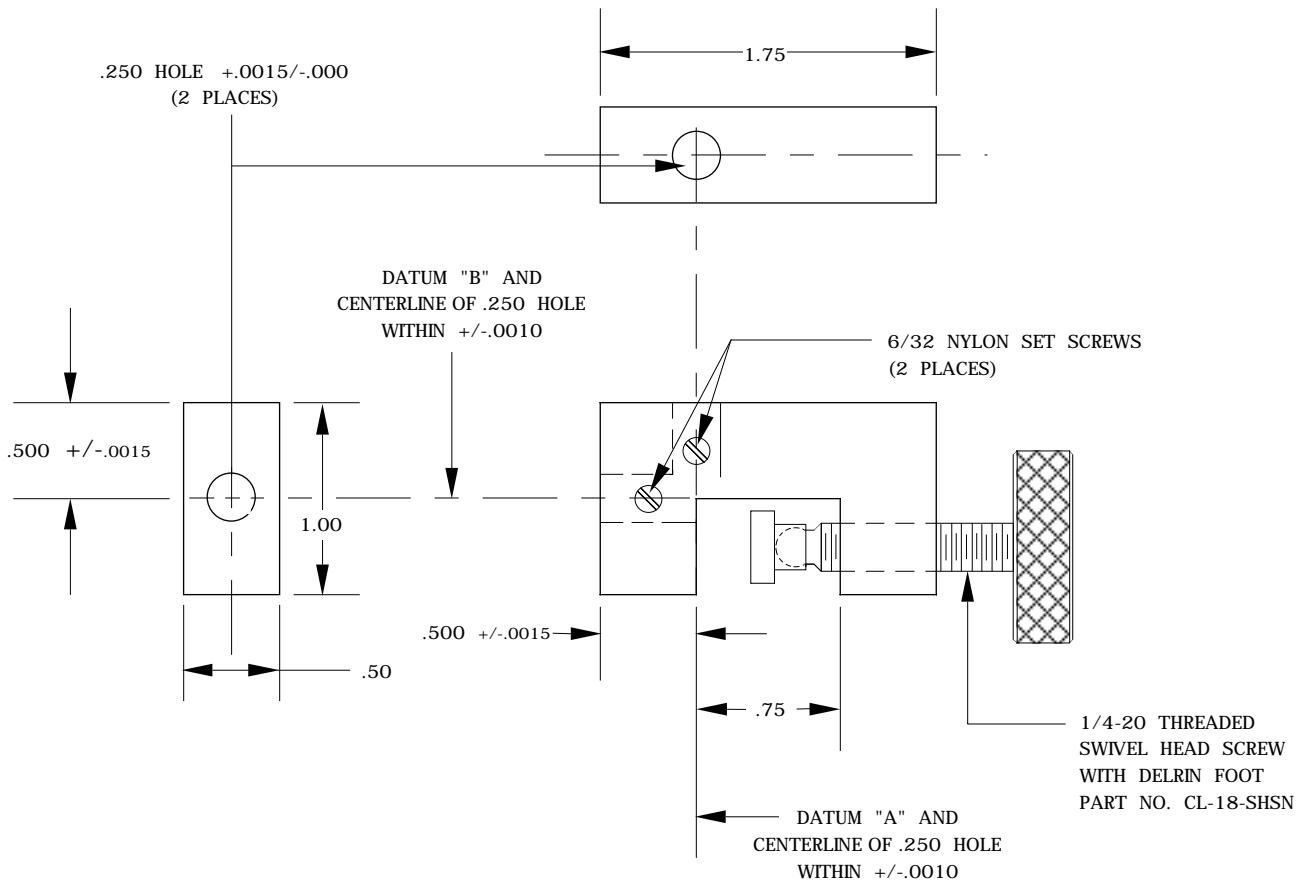
LASER TRACKER BOEING HEADER TARGET



HARDENED TO R/C 53 - 55

DRAWING NUMBER
LT-BHT

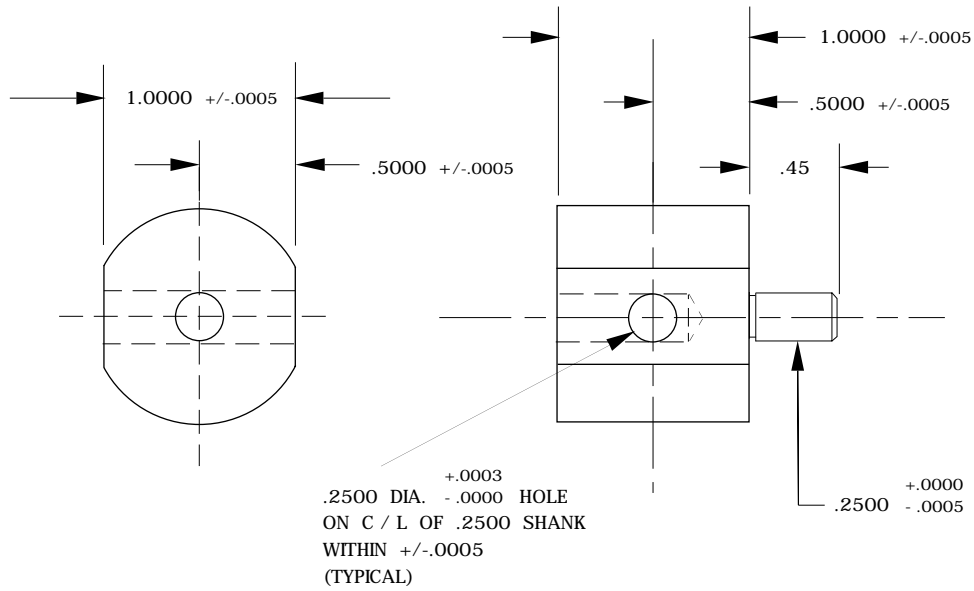
SURFACE EDGE TARGET ADAPTOR



**MATERIAL: ALUMINUM
BLACK ANODIZE**

DRAWING NUMBER
SETA

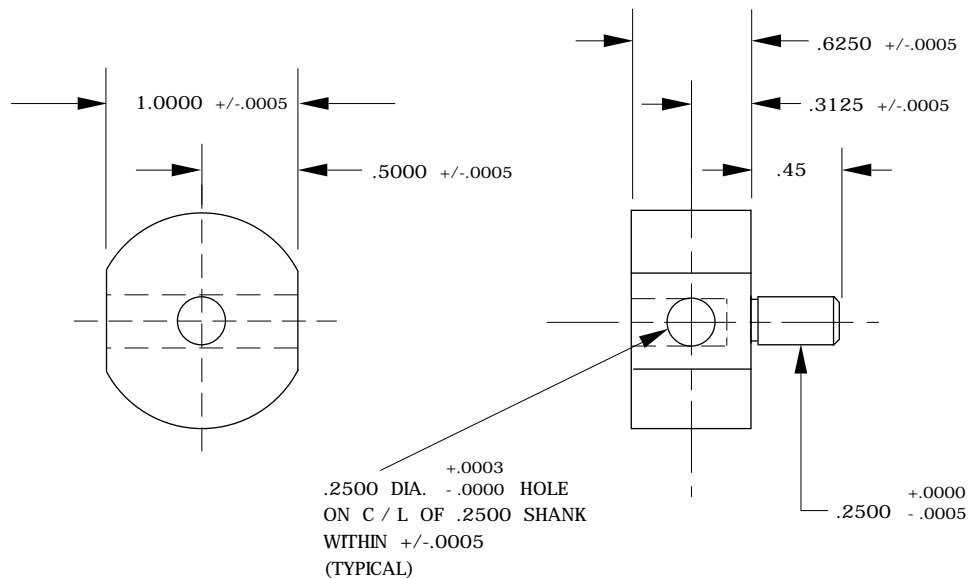
CUBE ADAPTOR - 500



HOW TO ORDER: CA-500

DRAWING NUMBER
CA - 500

CUBE ADAPTOR - 3125



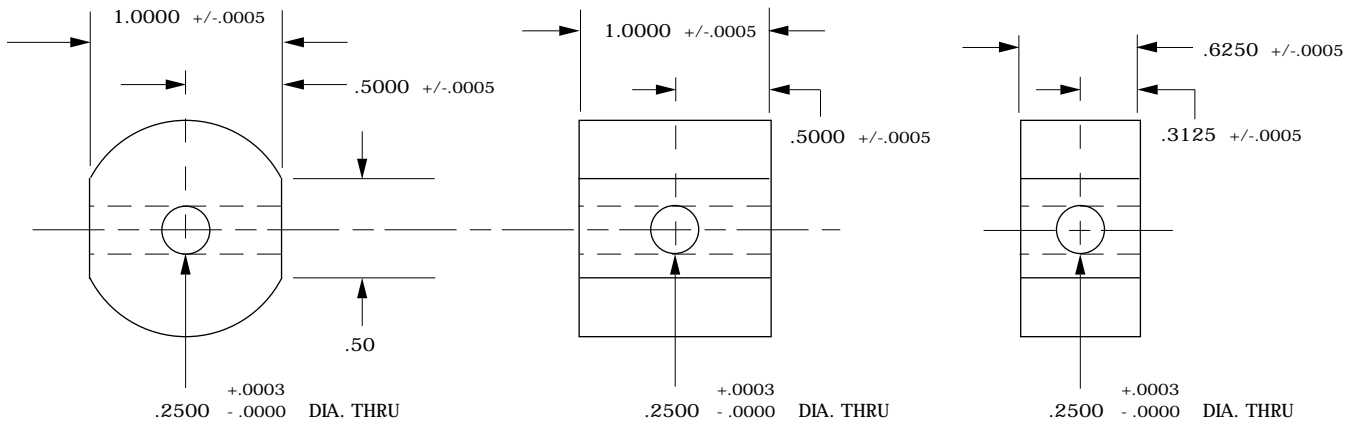
HOW TO ORDER: CA - 3125

DRAWING NUMBER
CA - 3125

BOEING CUBE ADAPTOR

CUBE - 1 1.000 OFFSET

CUBE - 2 .6250 OFFSET



TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: BCA - 1 (1.000 OFFSET)
BCA - 2 (.6250 OFFSET)

DRAWING NUMBER
BCA - 1

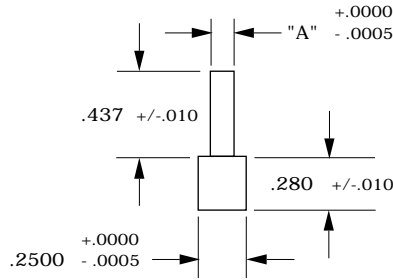
DRAWING NUMBER
BCA - 2

BCA PIN

DRAWING NUMBER
BCA PIN

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: BCA PIN - 1250

↑
"A"



"A" SIZES AVAILABLE

.1250	.4060
.1875	.4360
.2500	.5000
.2810	.7500
.3125	1.0000
.3750	

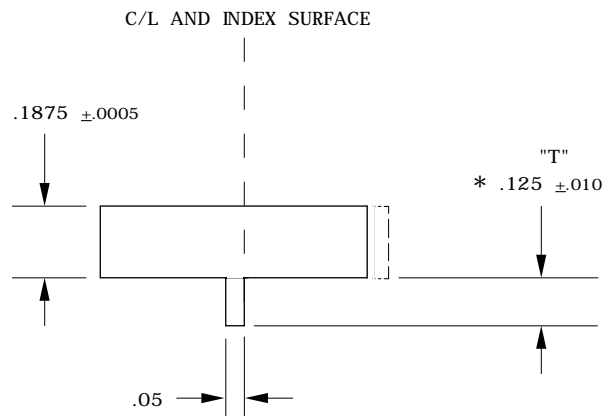
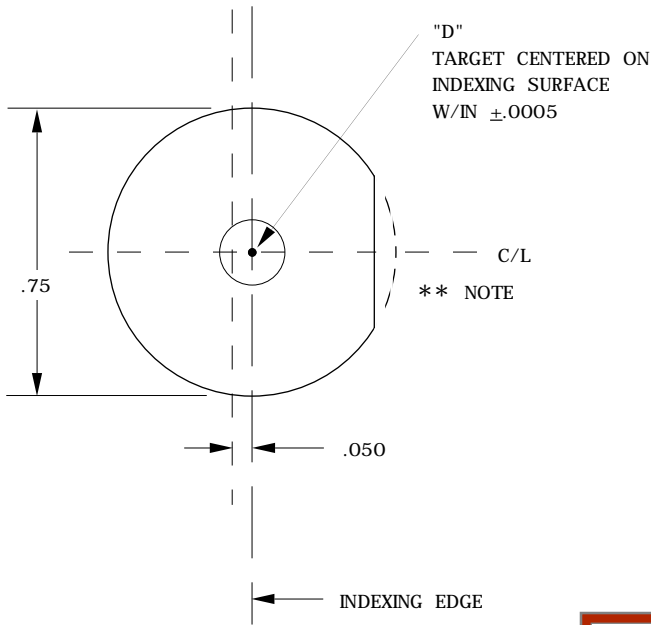
KIT CONSISTS OF THE FOLLOWING:

BOEING CUBE ADAPTOR KIT

- | | |
|--------------------------------|--------------------------|
| 1 each CUBE - 1 (1.000 OFFSET) | 1 each BCA PIN - 3750 |
| 1 each CUBE - 2 (.6250 OFFSET) | 1 each BCA PIN - 4060 |
| 2 each BCA PIN - 1250 | 1 each BCA PIN - 4360 |
| 2 each BCA PIN - 1875 | 1 each BCA PIN - 5000 |
| 1 each BCA PIN - 2500 | 1 each BCA PIN - 7500 |
| 1 each BCA PIN - 2810 | 1 each BCA PIN - 1.000 |
| 1 each BCA PIN - 3125 | 1 each Small Fitted Case |

DRAWING NUMBER
BCA KIT

TARGET, SKIN GAP



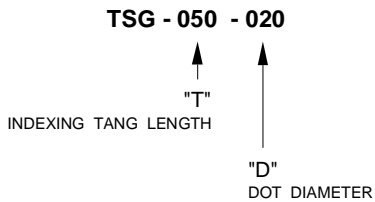
DRAWING: TWICE SIZE

* FOR APPLICATIONS THAT REQUIRE A LONGER OR SHORTER INDEXING TANG, CALL FOR QUOTE.

NOTE: .125 INDEXING TANG LENGTH IS CONSIDERED STANDARD

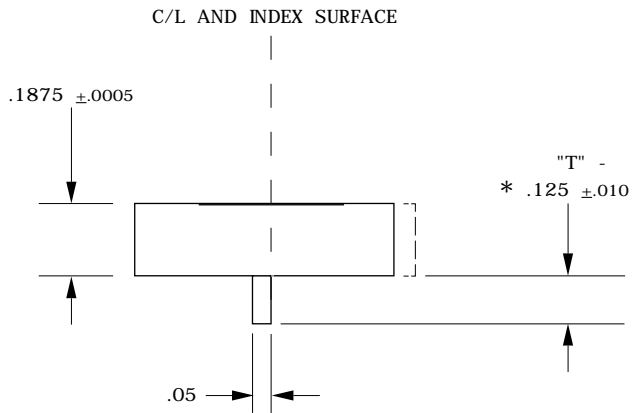
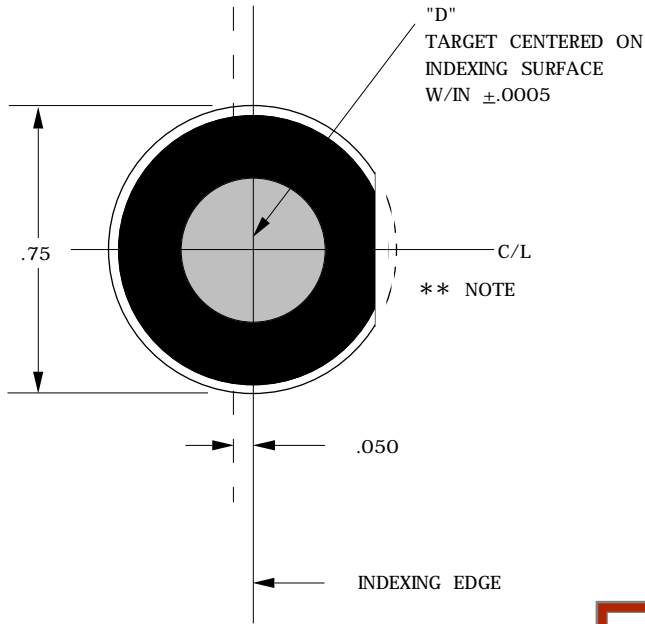
** NOTE: THE SIDE OF THE TARGET WITH THE FLAT REPRESENTS THE SIDE OF THE INDEXING SURFACE.

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TSG - 125 - 020 (.125 IS CONSIDERED STANDARD TANG LENGTH)



DRAWING NUMBER
TSG

TARGET, SKIN GAP, RETRO



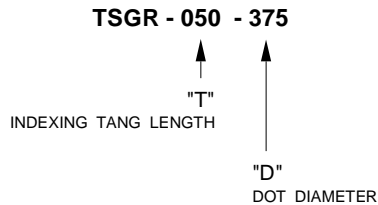
* FOR APPLICATIONS THAT REQUIRE A LONGER OR SHORTER INDEXING TANG, CALL FOR QUOTE.

NOTE: .125 INDEXING TANG LENGTH IS CONSIDERED STANDARD

** NOTE: THE SIDE OF THE TARGET WITH THE FLAT REPRESENTS THE SIDE OF THE INDEXING SURFACE.

DRAWING: TWICE SIZE

TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: TSGR - 125 - 312 (.125 IS CONSIDERED STANDARD TANG LENGTH)



DRAWING NUMBER
TSGR

L

MISCELLANEOUS

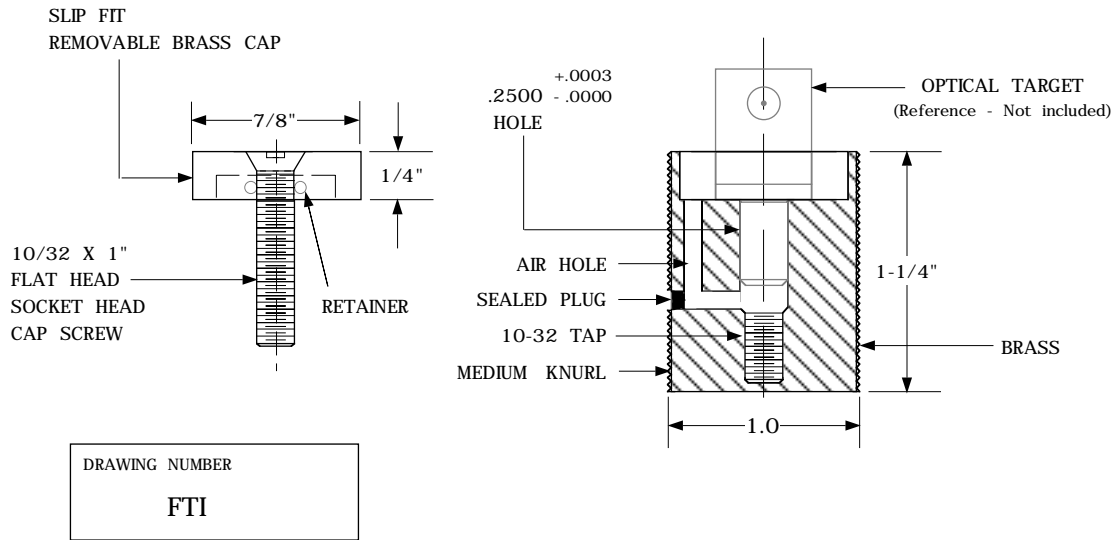
L

	Foundation Target Insert (FTI)	Page L-1
	Hard Point Spider (HPS)	Page L-1
	Magnetic Base Target Holder Adaptor (MBTHA)	Page L-2
	Construction Ball (CB)	Page L-2
	Construction Ball / Target Pad (CBTP)	Page L-3
	DVT Pipe Mount (DVT PIPE MOUNT)	Page L-4
NEW	Leica Stand Adapter Ring (LSAR - TOP and BOTTOM)	Page L-5

CALL FOR QUANTITY PRICES

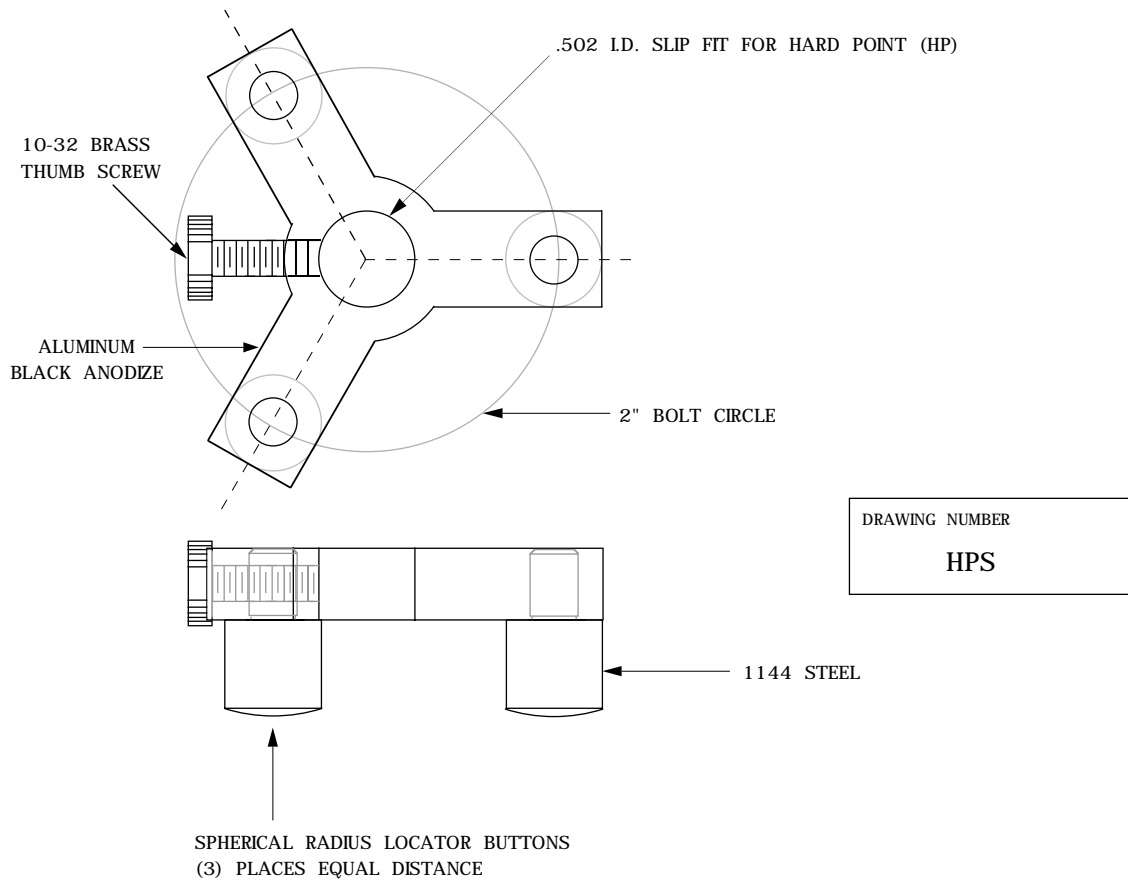
FOUNDATION TARGET INSERT

The Foundation Target Insert is mounted in concrete flooring/foundations, etc., to allow for a permanent targeting reference.

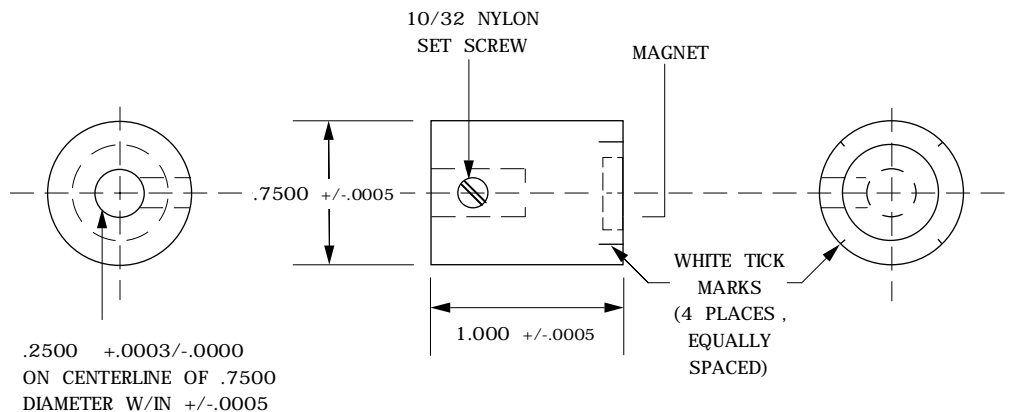


HARD POINT SPIDER

A Hard Point Spider holds a Hard Point and Hidden Point Bar 90 degrees for locating to identifier rivets, scribe lines, etc.



**MAGNETIC BASE
TARGET HOLDER ADAPTOR**

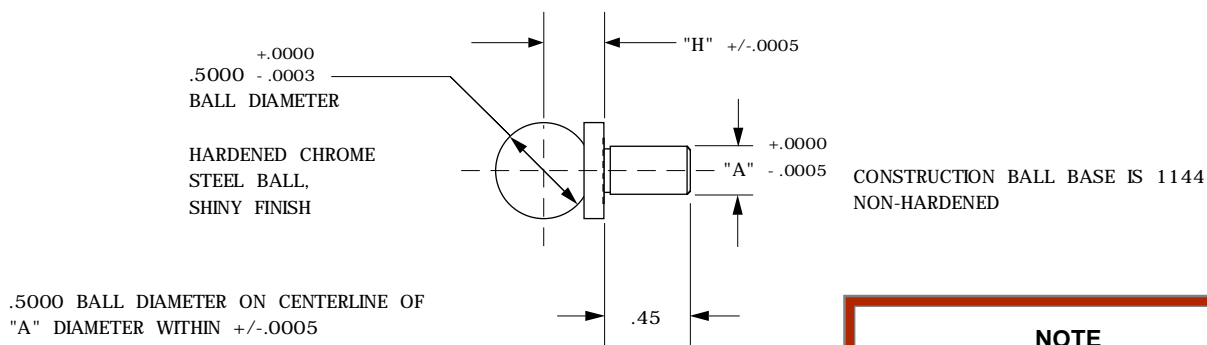


**DRAWING: TO SCALE
BLACK OXIDE FINISH
1144 STEEL**

DRAWING NUMBER
MBTHA

CONSTRUCTION BALL

This option is intended to be used when other than a standard, off the shelf, design cannot be used.



NOTE
HARDENED BALL IS BONDED TO BASE
NOT FOR HIGH TEMPERATURE USE

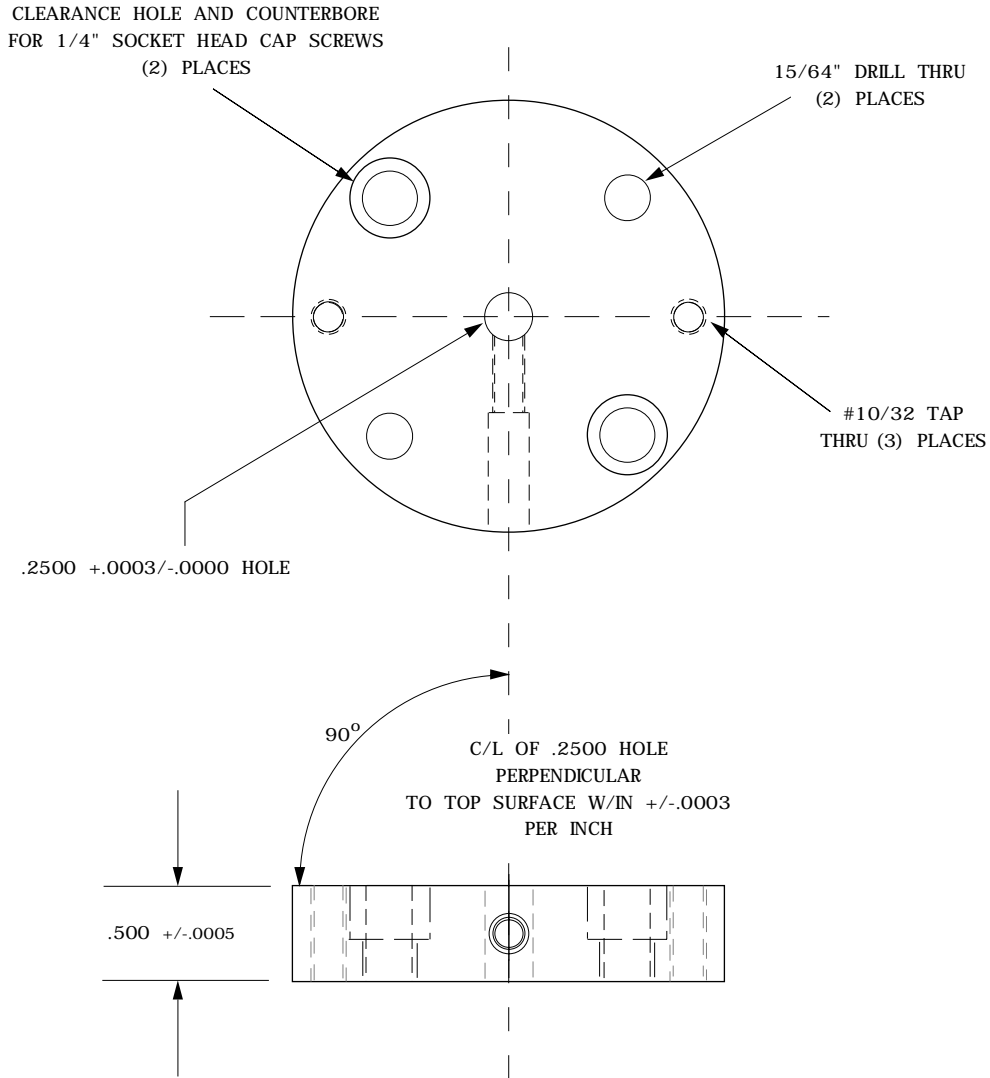
TO ORDER: SPECIFY PART NO. AS SHOWN
EXAMPLE: CB - 12 MM - 8MM - 500
CB - 3125 - 1250 - 500

↑ ↑ ↑
"H" "A" BALL DIAMETER

DRAWING NUMBER
CB

CONSTRUCTION BALL / TARGET PAD

Construction Ball/Target Pad has a .2500 \pm .0003 /-.0000 hole that is perpendicular to the top surface, which allow interchangeability with a standard construction ball, standard optical targeting or larger diameter items such as Laser Tracker Sphere Mounts.

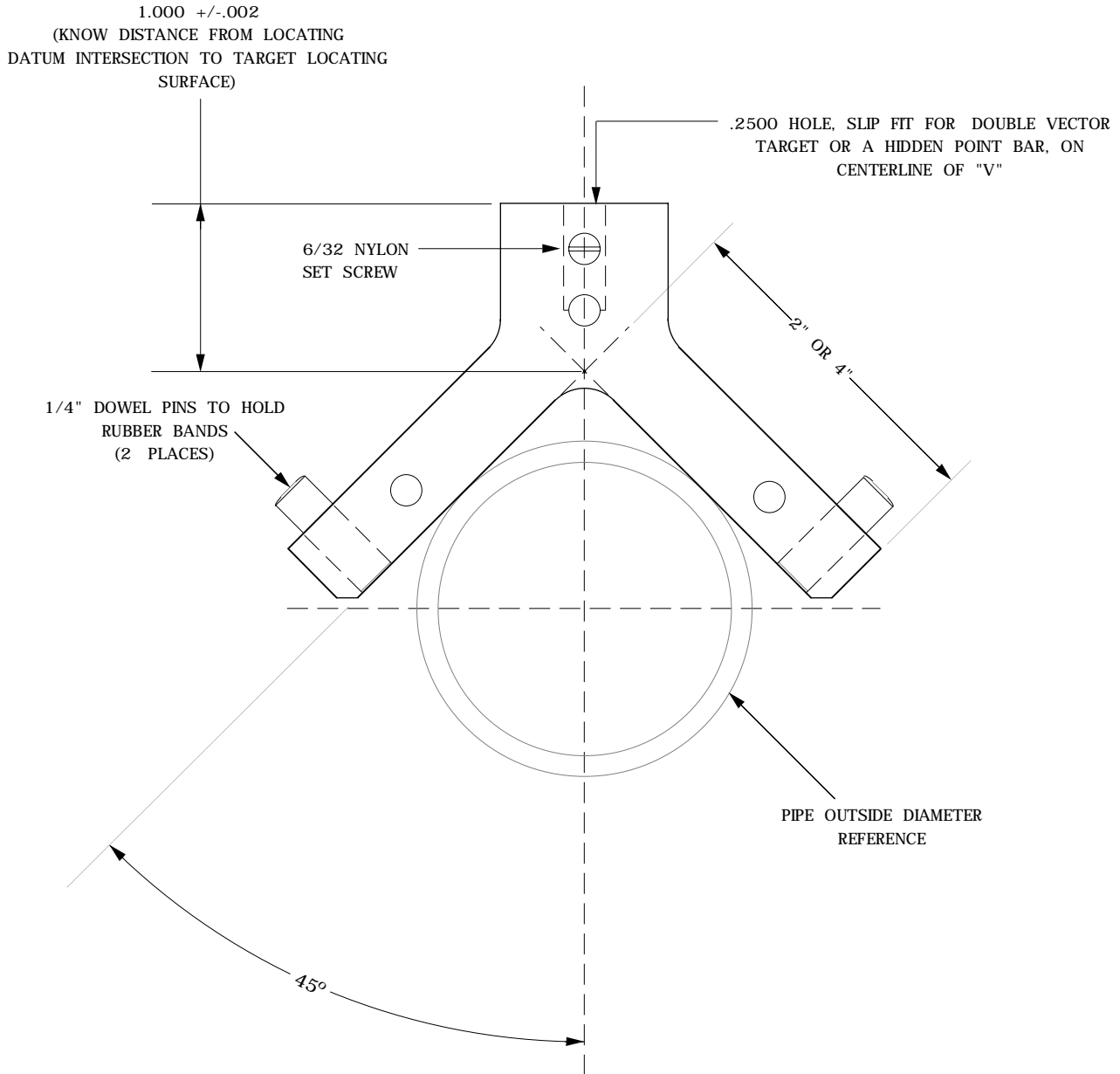


NOTES: DRAWN TO SCALE

**MATERIAL: 1144 STEEL
BLACK OXIDE FINISH**

DRAWING NUMBER
CBTP

DOUBLE VECTOR TARGET PIPE MOUNT



TO ORDER: SPECIFY PART NO. AS SHOWN

EXAMPLE: DVT PIPE MOUNT - 2"
DVT PIPE MOUNT - 4"

MATERIAL: ALUMINUM, 1" THICK
BLACK ANODIZED

DRAWING: TO SCALE

DRAWING NUMBER

DVT PIPE MOUNT

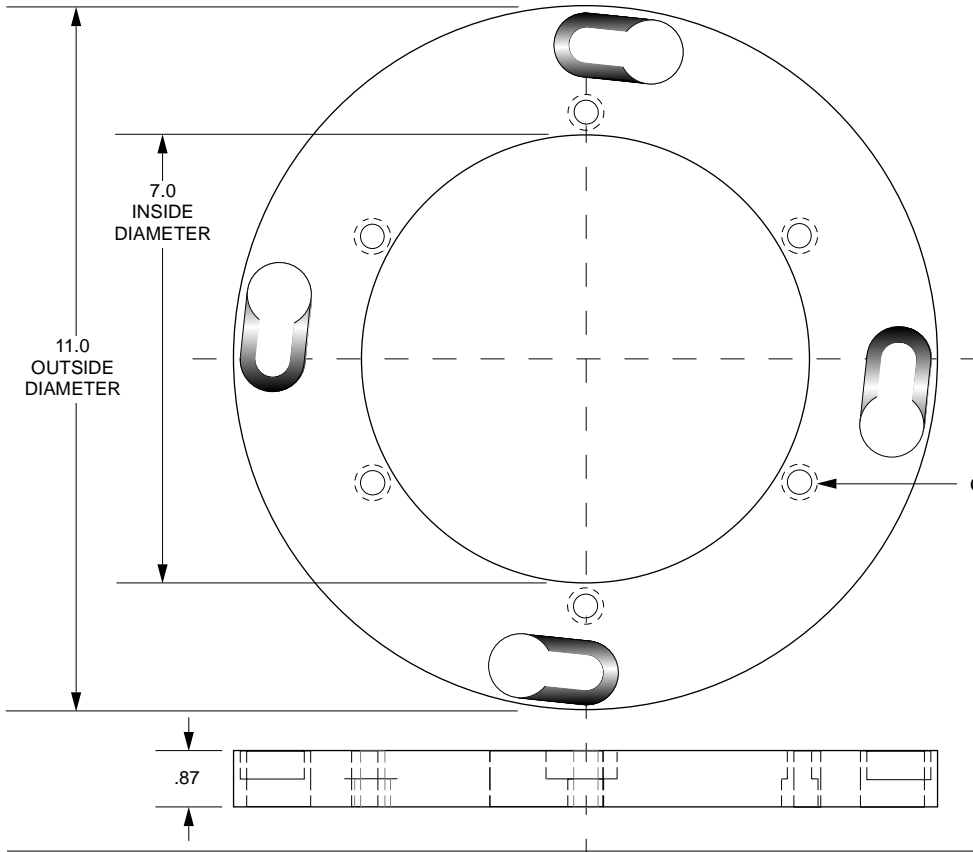


LEICA STAND ADAPTER RING

Used to adapt a Leica Laser tracker to a Leica Tracker Base or Brunson Optical Stand for quick mounting or removable.

DRAWING NUMBER
LSAR - TOP

**MATERIAL: 6061 ALUMINUM
 BLACK, HARD COAT FINISH**



DRAWING NUMBER
LSAR - BOTTOM

**MATERIAL: 6061 ALUMINUM
 BLACK, HARD COAT FINISH**

