HUBBS
OPTICAL TARGETING SPECIALTIES
FOR METROLOGY SUPPORT SYSTEMS
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: Theodolite, Photogrammetry, Laser Scanner, Laser Tracker, and other emerging coordinate measurement systems.

Hubbs Machine & Manufacturing, Inc. is the original and most trusted manufacturer of quality targeting, accessories, and tooling components. Our designs and part numbers are recognized as the industry standard.

The products shown in our catalog are examples of many variations which are possible in Standard Theodolite, Retro-Reflective Targeting, Laser Tracker Adaptors and Accessories. Many items are available in stainless steel as well as 1144 steel. We offer the largest and most diverse selection of targets and accessories in the market.

Even with the diversity of products, we recognize and support the customer’s needs for specialized targets and accessories. Our customers have the ability to speak with a member of our team that is directly involved with the production of your order. This unique and direct approach provides for a smooth and correct transfer of requirements that reduce the risk of misinformation, raises consumer confidence, and makes your critical deadline possible.
Hubbs Machine & Manufacturing has been certifying, serializing, & satisfying for years. We will certify any critical dimensions you require & list them on the Hubbs official certified product report.
When specifying shank sizes on Target or Liner Bushing orders, please identify decimal sizes to four places. 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 .3120
If a .0008 undersize is required, specify as .2180

---

**STANDARD THEODOLITE TARGET EXAMPLE:**

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>TSO</th>
<th>&quot;H&quot; TO CENTERLINE</th>
<th>&quot;A&quot; SHANK DIAMETER</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSO STANDARD BUILD</td>
<td>TSO</td>
<td></td>
<td></td>
<td></td>
<td>1144 steel, black oxide finish</td>
</tr>
<tr>
<td>CUSTOMER PROVIDES INFO</td>
<td>TSO</td>
<td>500</td>
<td>2500</td>
<td>020</td>
<td></td>
</tr>
</tbody>
</table>

**STANDARD THEODOLITE TARGET SIZES IN RED FOR EXAMPLE ONLY: PUT YOUR OWN DIMENSIONS IN THIS AREA**

- Fill in area below arrows with dimensions as well as any white box that gives more than one option.
- Order part using the completed structure. EX: TSO-500-2500-020

---

**RETRO-REFLECTIVE TARGET EXAMPLE:**

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>TSOR</th>
<th>&quot;H&quot; TO CENTERLINE</th>
<th>&quot;A&quot; SHANK DIAMETER</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSOR STANDARD BUILD</td>
<td>TSOR</td>
<td></td>
<td></td>
<td></td>
<td>1144 steel, black oxide finish</td>
</tr>
<tr>
<td>CUSTOMER PROVIDES INFO</td>
<td>TSOR</td>
<td>500</td>
<td>2500</td>
<td>125</td>
<td></td>
</tr>
</tbody>
</table>

**RETRO-REFLECTIVE SIZES IN RED FOR EXAMPLE ONLY: PUT YOUR OWN DIMENSIONS IN THIS AREA**

- Fill in area below arrows with dimensions as well as any white box that gives more than one option.
- Order part using the completed structure. EX: TSOR-500-2500-125
HOW TO ORDER (cont’d)

SPHERE MOUNT EXAMPLE:

1.5 SM ORDERING INFORMATION

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;H&quot; TO CENTERLINE OF SPHERE</th>
<th>&quot;A&quot; SHANK DIAMETER</th>
<th>MATERIAL (OPTIONS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 SM</td>
<td>1.000 or 25mm</td>
<td>1144 steel</td>
<td>or (SS)</td>
</tr>
</tbody>
</table>

CUSTOMER PROVIDES INFO

1.5 SM = 1.000 = 2500 = 1144 steel

REFERENCE NOTES

SPHERE MOUNT SIZES IN RED FOR EXAMPLE ONLY: PUT YOUR OWN DIMENSIONS IN THIS AREA

• Fill in area below arrows with dimensions as well as any white box that gives more than one option.

• Order part using the completed structure. EX: 1.5SM-1.000-2500-1144 steel

GENERAL NOTES FOR THEODOLITE AND PHOTOGRAMMETRY TARGETING

• Material is 1144 STEEL with BLACK OXIDE FINISH.

• Target dots are located within +/- .0005 on height (unless otherwise noted) or + / -.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 to 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. The most commonly stocked dot size is .020. The dots and rings are filed with a hard colored filler that holds up well to handling, dirt, oils, solvents and other related shop environments. Target faces have a light textured finish to reduce glare.

• Retro-Reflective dot 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 .062, .092, .125, .157, .187, .200, .250, .312, 9mm, .375, 10mm, .500 and .787 (20mm)

• Standard “H” dimensions are: .3125, 12mm, .500, 24mm, and 1.000

FOR SPECIAL REQUIREMENTS, PLEASE CALL FOR QUOTE. Minimum quantities may apply.
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TARGET, 90° THEODOLITE T90</td>
<td>16</td>
<td>TOTAL STATION 90 TOTAL STATION 90 MAGNET TS90 TS90M</td>
</tr>
<tr>
<td>2</td>
<td>TARGET, 90° MAGNETIC THEODOLITE T90M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>TARGET, CORNER 90° (LEFT or RIGHT HAND) TC/90 LH or RH</td>
<td>17</td>
<td>TOTAL 1.5 SPHERE TOTAL 1.5S</td>
</tr>
<tr>
<td>4</td>
<td>TARGET, CORNER 90° (NEG or POS) TC/90 NEG or POS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>TARGET, STRAIGHT-ON THEODOLITE TSO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>TARGET, MAGNETIC THEODOLITE TM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>TARGET, 45° THEODOLITE T45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>TARGET, 45° MAGNETIC THEODOLITE T45M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FLUSH MOUNT THEODOLITE FM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>TARGET, CORNER 45° (LEFT or RIGHT HAND) TC45 LH or RH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>TARGET, CORNER 45° (NEG or POS) TC45 NEG or POS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>TARGET, BUTTON TB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TARGET BUTTON VARIABLE TBV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>DOUBLE VECTOR TARGET THEODOLITE DVT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TARGET, CORNER THEODOLITE TC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>45° DOUBLE VECTOR TARGET THEODOLITE 45 DVT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>DOUBLE VECTOR TARGET MAGNETIC DVTM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>THEODOLITE 1.5 SPHERE T 1.5 S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
T90
Used with computer-aided Theodolite for targeting holes approximately 90° to line of sight.

T90 ORDERING INFORMATION

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;H&quot; TO CENTERLINE</th>
<th>&quot;A&quot; SHANK DIAMETER</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>T90</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1144 steel, black oxide finish</td>
</tr>
</tbody>
</table>

CUSTOMER PROVIDES INFO
T90

REFERENCE NOTES

TARGET, 90° THEODOLITE

NOTE: DRAWING NOT TO SCALE

T90 - .500

T90 - 1.000

T90 FEATURES
1144 STEEL, BLACK OXIDE FINISH (standard)

T90 ORDERING
Normal offsets for targets are:

.3125
.5000
1.000
12mm
24mm

Other special offsets available, subject to quote.
T90M

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

T90M FEATURES

1144 STEEL, BLACK OXIDE FINISH (standard)

T90M ORDERING

Normal offsets for targets are:

- .3125
- .500
- 1.000
- 12mm
- 24mm

Other special offsets available, subject to quote.

T90M ORDERING INFORMATION

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;H&quot; TO CENTERLINE</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>T90M</td>
<td></td>
<td></td>
<td>1144 steel, black oxide finish</td>
</tr>
</tbody>
</table>

CUSTOMER PROVIDES INFO

T90M  

REFERENCE NOTES

TARGET, 90° MAGNETIC THEODOLITE

NOTE- DRAWING NOT TO SCALE

T90M

1144 STEEL, BLACK OXIDE FINISH (standard)

T90M ORDERING

Normal offsets for targets are:

- .3125
- .500
- 1.000
- 12mm
- 24mm

Other special offsets available, subject to quote.

CAD on file
TC / 90
(LH or RH)
Used with computer-aided Theodolite for targeting edges and/or surfaces.

TC / 90 - LH or RH ORDERING INFORMATION

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>LEFT or RIGHT HAND</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC / 90-LH or RH</td>
<td>LH or RH</td>
<td>0.2500 +/- 0.0005</td>
<td>1144 steel, black oxide finish</td>
</tr>
<tr>
<td>TC / 90-LH or RH</td>
<td>LH or RH</td>
<td>0.2500 +/- 0.0005</td>
<td>1144 steel, black oxide finish</td>
</tr>
</tbody>
</table>

CUSTOMER PROVIDES INFO
TC / 90

REFERENCE NOTES

TARGET CORNER, 90° (LEFT HAND or RIGHT HAND)

NOTE - DRAWING NOT TO SCALE

TC / 90-LH

TC / 90-RH

TC / 90
LH or RH
FEATURES
1144 STEEL, BLACK OXIDE
FINISH (standard)
TC / 90 (NEG or POS)
Used with computer-aided Theodolite for targeting edges and/or surfaces.

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>TC / 90-NEG or POS</th>
<th>TC / 90-negative or positive</th>
<th>&quot;D&quot; dot diameter</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD BUILD</td>
<td>TC / 90</td>
<td>TC / 90-Neg or POS</td>
<td>.2500 +/- .0005</td>
<td>1144 steel, black oxide finish</td>
</tr>
</tbody>
</table>

TC / 90-NEG
TC / 90-POS

TARGET CORNER, 90° (NEGATIVE or POSITIVE)

NOTE- DRAWING NOT TO SCALE

1144 steel, black oxide finish (standard)
TARGET, STRAIGHT-ON THEODOLITE

TSO FEATURES
1144 STEEL, BLACK OXIDE FINISH (standard)

TSO ORDERING
Normal offsets for targets are:

- .3125
- .500
- 1.000
- 12mm
- 24mm

Other special offsets available, subject to quote.
TARGET, MAGNETIC THEODOLITE

NOTE- DRAWING NOT TO SCALE

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

1144 STEEL, BLACK OXIDE FINISH (standard)

Normal offsets for targets are:
- .3125
- .500
- 1.000
- 12mm
- 24mm

Other special offsets available, subject to quote.

SM® & R® are registered trademarks of Hubbs Machine & Mfg. Inc.
T45 FEATURES
1144 STEEL, BLACK OXIDE FINISH (standard)

T45 ORDERING
Normal offsets for targets are:

-0.3125
-0.5000
1.000
12mm
24mm

Other special offsets available, subject to quote.

TARGET, 45° THEODOLITE

Used with computer-aided Theodolite for targeting holes approximately 45° to the line of sight.
**T45M**

Used to target above steel surfaces when a 45° target face is more applicable. The side of the body may be used to target surfaces, edges, or steps .2500 away.

**FM**

Used for targeting holes when a zero height value is required. See FM notes for ordering specifications on this product.

---

**TARGET, 45° MAGNETIC THEODOLITE**

- **T45M FEATURES**
  - 1144 STEEL, BLACK OXIDE FINISH (standard)

**FLUSH MOUNT THEODOLITE**

- **FM FEATURES**
  - 1144 STEEL, BLACK OXIDE FINISH (standard)
  - **FM ORDERING**
    - STANDARD SHANK SIZES: .1250, .1875, .2500, .3125, .3750, .4375, .5000, .6250, .7500, 1.000, 6mm, 8mm
  - Other Shank sizes possible, but subject to call-out quote.
TC / 45 - LH or RH

FEATURES

1144 STEEL, BLACK OXIDE FINISH (standard)

TC / 45 - LH

TC / 45 - RH

TARGET CORNER, 45° THEODOLITE (LEFT HAND or RIGHT HAND)

NOTE- DRAWING NOT TO SCALE

TC / 45 - LH or RH

USED WITH COMPUTER-AIDED THEODOLITE FOR TARGETING EDGES AND/OR SURFACES.

CUSTOMER PROVIDES INFO

REFERENCE NOTES

TC / 45 = = =

FAMILY

LEFT OR RIGHT HAND

“D” DOT DIAMETER

MATERIAL

TC / 45-LH or RH

STANDARD BUILD

TC / 45

DATUM “A” ALIGNED WITH C/L OF DOT WITHIN .0005

.DOT DIAMETER

.17 REFERENCE RING

C/L OF DOT

MAGNET

NOTE - DRAWING NOT TO SCALE
TC / 45
(NEG or POS)
Used with computer-aided Theodolite for targeting edges and/or surfaces.

TC / 45 - NEG or POS
ORDERING INFORMATION

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>NEGATIVE or POSITIVE</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC / 45</td>
<td>NEG or POS</td>
<td>.2500 +/- .0005</td>
<td>1144 steel, black oxide finish</td>
</tr>
</tbody>
</table>

CUSTOMER PROVIDES INFO

REFERENCE NOTES

TARGET CORNER, 45° THEODOLITE (NEGATIVE or POSITIVE)

NOTE - DRAWING NOT TO SCALE

TC / 45-NEG

TC / 45-POS

TC / 45
NEG or POS
FEATURES
1144 STEEL, BLACK OXIDE FINISH (standard)

CAD on file
**TB ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB</td>
<td>1144 steel, black oxide finish</td>
<td></td>
</tr>
</tbody>
</table>

**TBV ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;A&quot; SHANK DIAMETER</th>
<th>&quot;B&quot; SHANK LENGTH</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBV</td>
<td>1144 steel, black oxide finish</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REFERENCES**

**TB and TBV**

Used with computer-aided theodolite for targeting .125 diameter tooling holes. For any other requirements, refer to TBV design.

**TB FEATURES**

1144 STEEL, BLACK OXIDE FINISH (standard)

**TB ORDERING**

Can only select dot diameter.

**TBV FEATURES**

1144 STEEL, BLACK OXIDE FINISH (standard)

**TBV ORDERING**

Customer has more call-out options than TB.

---

**TARGET, BUTTON THEODOLITE**

**TARGET, BUTTON VARIABLE THEODOLITE**

**NOTE - DRAWING NOT TO SCALE**
DVT
Used to measure location and angularity of a hole.

TC
Used with computer-aided Theodolite for targeting straight edges.

DVT ORDERING INFORMATION

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;A&quot; SHANK DIAMETER</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVT STANDARD BUILD</td>
<td>DVT</td>
<td></td>
<td>1144 steel, black oxide finish</td>
</tr>
</tbody>
</table>

CUSTOMER PROVIDES INFO

DVT = = = =

REFERENCE NOTES

TC ORDERING INFORMATION

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC STANDARD BUILD</td>
<td>TC</td>
<td>1144 steel, black oxide finish</td>
</tr>
</tbody>
</table>

CUSTOMER PROVIDES INFO

TC = =

NOTE - DRAWING NOT TO SCALE

DOUBLE VECTOR, TARGET THEODOLITE

DVT FEATURES
1144 STEEL, BLACK OXIDE FINISH (standard)

TARGET, CORNER THEODOLITE

TC FEATURES
1144 STEEL, BLACK OXIDE FINISH (standard)
45° DOUBLE VECTOR TARGET THEODOLITE

45 DVT
Used to measure location and angularity of a hole.

FEATURES
1144 STEEL, BLACK OXIDE FINISH (standard)

PRODUCT INFORMATION

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;A&quot; SHANK DIAMETER</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 DVT</td>
<td>=</td>
<td>=</td>
<td>1144 steel, black oxide finish</td>
</tr>
</tbody>
</table>

NOTE- DRAWING NOT TO SCALE

CAD on file

P. 636.285.4388  F. 636.285.5970 | 6282 Rocky Grove / P.O.Box 540 Cedar Hill, Missouri 63016 | hubbsmachine.com
DVTM
Used to measure location and angularity of a surface.

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;H&quot; TO FIRST DOT</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVTM</td>
<td></td>
<td></td>
<td>1144 steel, black oxide finish</td>
</tr>
</tbody>
</table>

**DVTM FEATURES**

- **1144 STEEL, BLACK OXIDE FINISH** (standard)

**DOUBLE VECTOR, TARGET MAGNET**

**NOTE - DRAWING NOT TO SCALE**

<table>
<thead>
<tr>
<th>CAD on file</th>
<th>DVTM - .500</th>
</tr>
</thead>
</table>

- Magnet
- .500 +/- .0005
- .17 reference ring
- "D" dot diameter (2 places)

<table>
<thead>
<tr>
<th>CAD on file</th>
<th>DVTM - 1.000</th>
</tr>
</thead>
</table>

- Magnet
- 1.000 +/- .0005
- .17 reference ring
- "D" dot diameter (2 places)

<table>
<thead>
<tr>
<th>CAD on file</th>
<th>DVTM FEATURES</th>
</tr>
</thead>
</table>

- 1144 STEEL, BLACK OXIDE FINISH (standard)
Provides same centerline value as a Spherically Mounted Retro-Reflector. This allows interchangeability from Laser Trackers to computer-aided Theodolite systems.

### T1.5S FEATURES

**HARDENED STAINLESS STEEL SHELL/Sphere**

R/C 53 – 55 with 1144 Steel, Black Oxide Insert.

### T1.5S ORDERING INFORMATION

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>“D” DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.5S</td>
<td>.01, .02, .03, .04</td>
<td>stainless steel (ss) and 1144 steel</td>
</tr>
</tbody>
</table>

**NOTE – DRAWING NOT TO SCALE**
### TS90

**Used with Total Station for targeting holes approximately 90 degrees to line of sight.**

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;H&quot; TO CENTERLINE</th>
<th>&quot;A&quot; SHANK DIAMETER</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS90 STANDARD BUILD</td>
<td>TS90</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CUSTOMER PROVIDES INFO**

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;H&quot; TO CENTERLINE</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS90M STANDARD BUILD</td>
<td>TS90M</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

**TS90M FEATURES**

- 1144 STEEL BLACK OXIDE FINISH

### TS90M

**Used with Total Station to target above and 90 degrees to surface. Magnetic base securely attaches target to steel surface.**

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;H&quot; TO CENTERLINE</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS90M STANDARD BUILD</td>
<td>TS90M</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

**CUSTOMER PROVIDES INFO**

### TOTAL STATION 90

**NOTE - DRAWING NOT TO SCALE**

- "H" +/-.0005
- "A" diameter +.0000 -.0005
- reflective material
- "D" dot diameter

**TOTAL STATION 90 MAGNET**

**NOTE - DRAWING NOT TO SCALE**

- "H" +/-.0005
- reflective material
- "D" dot diameter

**TS90 FEATURES**

- 1144 STEEL BLACK OXIDE FINISH

**TS90M FEATURES**

- 1144 STEEL BLACK OXIDE FINISH
TOTAL1.5S

Provides same centerline value as a Spherically Mounted Retro-Reflector. This allows interchangeability from Laser Tracker systems to Total Station systems.

TOTAL1.5S ORDERING INFORMATION

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>&quot;D&quot; DOT DIAMETER</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL1.5S</td>
<td>.040</td>
<td>stainless steel(ss) and 1144 steel</td>
</tr>
</tbody>
</table>

CUSTOMER PROVIDES INFO

TOTAL1.5S = =

REFERENCE NOTES

TOTAL STATION 1.5 SPHERE

CAD on file

NOTE- DRAWING NOT TO SCALE

TOTAL1.5S FEATURES

HARDENED STAINLESS STEEL SHELL/SPHERE
R/C 53 – 55 with 1144 STEEL, BLACK OXIDE INSERT.

45°

1.500 +.0000 -.0005

0.530

"D" dot diameter

reflective material

c/l of sphere

45°

target face on c/l within +/-.0005