Catalog 2017

TUFFALOY

Resistance Welding Products

Leader in the Industry Since 1937

Spot Weld, Inc., www.spotweldinc.com

QUOTE REQUEST SPECIALS AND CUSTOMS

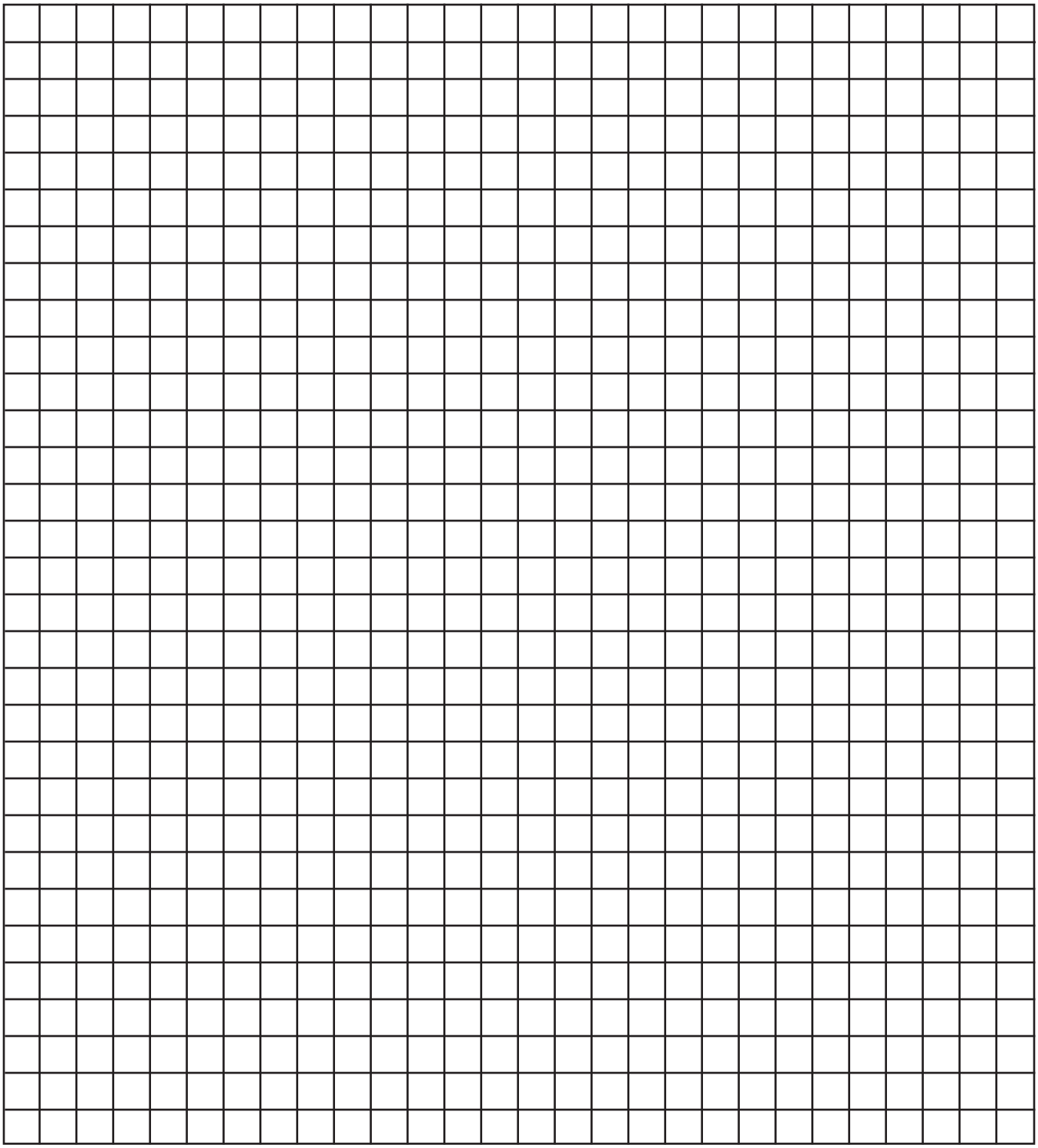
Contact Name: _____ Company: _____

Address: _____

Phone: _____ Fax: _____ Email: _____

Part Information: _____ Material/Alloy: _____

Part Number or Description: _____



Please send a photo of part laying on the grid area of this completed page to – customerservice@tuffaloy.com

RESISTANCE WELDING PRODUCTS

The little **"TUFFALOY man"** is now over eighty years old. It was in 1937 that Welding Sales & Engineering Company of Detroit introduced a new line of resistance welding alloys tradenamed TUFFALOY. What began as just a part of a general line of welding equipment soon became their main business, as electrode holders and other resistance welding accessories were added to the TUFFALOY product line. Today this now-familiar name represents the most innovative and respected resistance welding alloy and accessory company in the field.

Even a catalog as comprehensive as this one does not fully show everything TUFFALOY is capable of supplying. We have the ability to answer needs that we have yet to hear about. So, if you don't find the answers in these pages, tell us what you're looking for. Let us work with you in finding solutions.

Call your TUFFALOY distributor or TUFFALOY
Customer Services at **1-800-521-3722**
or **864-879-0763**. (Fax: **864-877-2212**)

Visit our Internet site at:
www.Tuffaloy.com

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RESISTANCE WELDING ALLOYS

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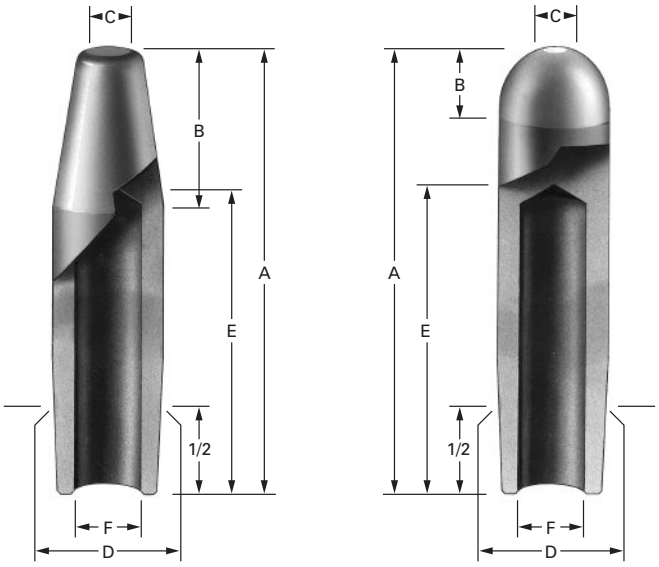
TUFFALOY STANDARD STRAIGHT TIPS

Straight tips from TUFFALOY are distinguished for their high conductivity and resistance to deformation, which are the two major requirements of resistance welding tips. Modern manufacturing methods and constant scientific quality control make the difference, starting with the alloying of pure copper, through bar extrusion, and the conversion of this high-quality bar stock into welding tips.

TUFFALOY ensures conformity to all standard dimensions. Before shipment, all tips must pass inspection by gage for uniform length, taper, and outline of point.

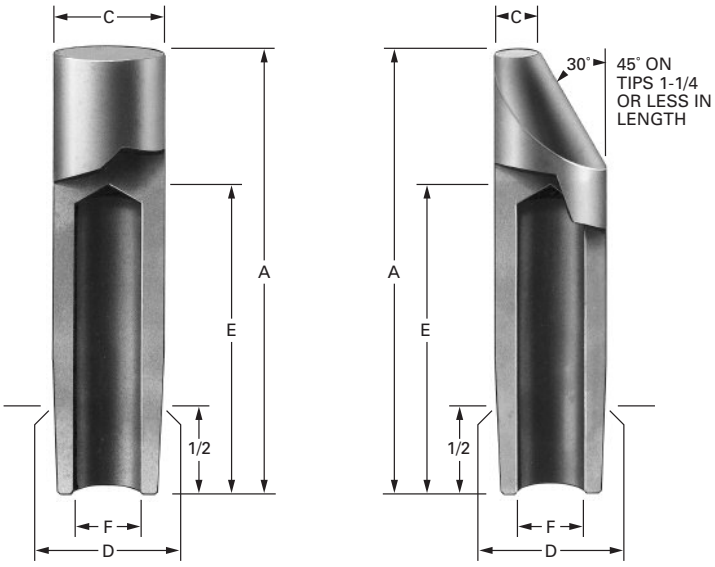


A Overall Length	C Welding Face Dia.	D Gauging Dia.	E Water Hole Depth	F Water Hole Dia.	'A' POINTED NOSE					'B' DOME NOSE				
						RWMA CLASS 1		RWMA CLASS 2			RWMA CLASS 1		RWMA CLASS 2	
					B Nose Length	Description	Part No.	Description	Part No.	B Nose Length	Description	Part No.	Description	Part No.
NO. 4 RW TAPER - 1/2" DIAMETER														
1	3/16	.463	1/2	9/32	3/8	A-1404	131-1404	A-2404	132-2404	1/4	B-1404	133-1404	B-2404	134-2404
1-1/4	3/16	.463	3/4	9/32	3/4	A-1405	131-1405	A-2405	132-2405	1/4	B-1405	133-1405	B-2405	134-2405
1-1/2	3/16	.463	1	9/32	3/4	A-1406	131-1406	A-2406	132-2406	1/4	B-1406	133-1406	B-2406	134-2406
1-3/4	3/16	.463	1-1/4	9/32	3/4	A-1407	131-1407	A-2407	132-2407	1/4	B-1407	133-1407	B-2407	134-2407
2	3/16	.463	1-1/2	9/32	3/4	A-1408	131-1408	A-2408	132-2408	1/4	B-1408	133-1408	B-2408	134-2408
2-1/4	3/16	.463	1-3/4	9/32	3/4	A-1409	131-1409	A-2409	132-2409	1/4	B-1409	133-1409	B-2409	134-2409
2-1/2	3/16	.463	2	9/32	3/4	A-1410	131-1410	A-2410	132-2410	1/4	B-1410	133-1410	B-2410	134-2410
2-3/4	3/16	.463	2-1/4	9/32	3/4	A-1411	131-1411	A-2411	132-2411	1/4	B-1411	133-1411	B-2411	134-2411
3	3/16	.463	2-1/2	9/32	3/4	A-1412	131-1412	A-2412	132-2412	1/4	B-1412	133-1412	B-2412	134-2412
3-1/4	3/16	.463	2-3/4	9/32	3/4	A-1413	131-1413	A-2413	132-2413	1/4	B-1413	133-1413	B-2413	134-2413
3-1/2	3/16	.463	3	9/32	3/4	A-1414	131-1414	A-2414	132-2414	1/4	B-1414	133-1414	B-2414	134-2414
3-3/4	3/16	.463	3-1/4	9/32	3/4	A-1415	131-1415	A-2415	132-2415	1/4	B-1415	133-1415	B-2415	134-2415
4	3/16	.463	3-1/2	9/32	3/4	A-1416	131-1416	A-2416	132-2416	1/4	B-1416	133-1416	B-2416	134-2416
NO. 5 RW TAPER - 5/8" DIAMETER														
1-1/4	1/4	.613	3/4	3/8	1/2	A-1505	131-1505	A-2505	132-2505	3/8	B-1505	133-1505	B-2505	134-2505
1-1/2	1/4	.613	3/4	3/8	7/8	A-1506	131-1506	A-2506	132-2506	3/8	B-1506	133-1506	B-2506	134-2506
1-3/4	1/4	.613	1	3/8	7/8	A-1507	131-1507	A-2507	132-2507	3/8	B-1507	133-1507	B-2507	134-2507
2	1/4	.613	1-1/4	3/8	7/8	A-1508	131-1508	A-2508	132-2508	3/8	B-1508	133-1508	B-2508	134-2508
2-1/4	1/4	.613	1-1/2	3/8	7/8	A-1509	131-1509	A-2509	132-2509	3/8	B-1509	133-1509	B-2509	134-2509
2-1/2	1/4	.613	1-3/4	3/8	7/8	A-1510	131-1510	A-2510	132-2510	3/8	B-1510	133-1510	B-2510	134-2510
2-3/4	1/4	.613	2	3/8	7/8	A-1511	131-1511	A-2511	132-2511	3/8	B-1511	133-1511	B-2511	134-2511
3	1/4	.613	2-1/4	3/8	7/8	A-1512	131-1512	A-2512	132-2512	3/8	B-1512	133-1512	B-2512	134-2512
3-1/4	1/4	.613	2-1/2	3/8	7/8	A-1513	131-1513	A-2513	132-2513	3/8	B-1513	133-1513	B-2513	134-2513
3-1/2	1/4	.613	2-3/4	3/8	7/8	A-1514	131-1514	A-2514	132-2514	3/8	B-1514	133-1514	B-2514	134-2514
3-3/4	1/4	.613	3	3/8	7/8	A-1515	131-1515	A-2515	132-2515	3/8	B-1515	133-1515	B-2515	134-2515
4	1/4	.613	3-1/4	3/8	7/8	A-1516	131-1516	A-2516	132-2516	3/8	B-1516	133-1516	B-2516	134-2516
NO. 6 RW TAPER - 3/4" DIAMETER														
2	9/32	.731	1-1/4	7/16	1	A-1608	131-1608	A-2608	132-2608	3/8	B-1608	133-1608	B-2608	134-2608
2-1/2	9/32	.731	1-3/4	7/16	1	A-1610	131-1610	A-2610	132-2610	3/8	B-1610	133-1610	B-2610	134-2610
3	9/32	.731	2-1/4	7/16	1	A-1612	131-1612	A-2612	132-2612	3/8	B-1612	133-1612	B-2612	134-2612
3-1/2	9/32	.731	2-3/4	7/16	1	A-1614	131-1614	A-2614	132-2614	3/8	B-1614	133-1614	B-2614	134-2614
4	9/32	.731	3-1/4	7/16	1	A-1616	131-1616	A-2616	132-2616	3/8	B-1616	133-1616	B-2616	134-2616
NO. 7 RW TAPER - 7/8" DIAMETER														
2	5/16	.844	1-1/4	1/2	1-1/8	A-1708	131-1708	A-2708	132-2708	3/8	B-1708	133-1708	B-2708	134-2708
2-1/2	5/16	.844	1-3/4	1/2	1-1/8	A-1710	131-1710	A-2710	132-2710	3/8	B-1710	133-1710	B-2710	134-2710
3	5/16	.844	2-1/4	1/2	1-1/8	A-1712	131-1712	A-2712	132-2712	3/8	B-1712	133-1712	B-2712	134-2712
3-1/2	5/16	.844	2-3/4	1/2	1-1/8	A-1714	131-1714	A-2714	132-2714	3/8	B-1714	133-1714	B-2714	134-2714
4	5/16	.844	3-1/2	1/2	1-1/8	A-1716	131-1716	A-2716	132-2716	3/8	B-1716	133-1716	B-2716	134-2716

The bright shiny look of TUFFALOY tips is the result of a passivation process that eliminates excessive oxidation. It reflects the deep-down quality built into these tips and into all TUFFALOY products.

Only RWMA Class 1 (TUFFALOY 88) and Class 2 (TUFFALOY 77) tips are listed here. Class 3 alloy (TUFFALOY 55) tips are also available. For recommended uses of these alloys, see page 49.

To order Class 3 alloy tips, change description code to indicate it: see "Key to Description", page 6.



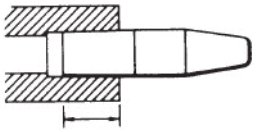
'C' FLAT NOSE

'D' OFFSET NOSE

A Overall Length	D Gauging Dia.	E Water Hole Depth	F Water Hole Dia.	C Welding Face Dia.	RWMA CLASS 1 Description	RWMA CLASS 1 Part No.	RWMA CLASS 2 Description	RWMA CLASS 2 Part No.	C Welding Face Dia.	RWMA CLASS 1 Description	RWMA CLASS 1 Part No.	RWMA CLASS 2 Description	RWMA CLASS 2 Part No.
NO. 4 RW TAPER - 1/2" DIAMETER													
1	.463	1/2	9/32	1/2	C-1404	135-1404	C-2404	136-2404	3/16	D-1404	137-1404	D-2404	138-2404
1-1/4	.463	3/4	9/32	1/2	C-1405	135-1405	C-2405	136-2405	3/16	D-1405	137-1405	D-2405	138-2405
1-1/2	.463	1	9/32	1/2	C-1406	135-1406	C-2406	136-2406	3/16	D-1406	137-1406	D-2406	138-2406
1-3/4	.463	1-1/4	9/32	1/2	C-1407	135-1407	C-2407	136-2407	3/16	D-1407	137-1407	D-2407	138-2407
2	.463	1-1/2	9/32	1/2	C-1408	135-1408	C-2408	136-2408	3/16	D-1408	137-1408	D-2408	138-2408
2-1/4	.463	1-3/4	9/32	1/2	C-1409	135-1409	C-2409	136-2409	3/16	D-1409	137-1409	D-2409	138-2409
2-1/2	.463	2	9/32	1/2	C-1410	135-1410	C-2410	136-2410	3/16	D-1410	137-1410	D-2410	138-2410
2-3/4	.463	2-1/4	9/32	1/2	C-1411	135-1411	C-2411	136-2411	3/16	D-1411	137-1411	D-2411	138-2411
3	.463	2-1/2	9/32	1/2	C-1412	135-1412	C-2412	136-2412	3/16	D-1412	137-1412	D-2412	138-2412
3-1/4	.463	2-3/4	9/32	1/2	C-1413	135-1413	C-2413	136-2413	3/16	D-1413	137-1413	D-2413	138-2413
3-1/2	.463	3	9/32	1/2	C-1414	135-1414	C-2414	136-2414	3/16	D-1414	137-1414	D-2414	138-2414
3-3/4	.463	3-1/4	9/32	1/2	C-1415	135-1415	C-2415	136-2415	3/16	D-1415	137-1415	D-2415	138-2415
4	.463	3-1/2	9/32	1/2	C-1416	135-1416	C-2416	136-2416	3/16	D-1416	137-1416	D-2416	138-2416
NO. 5 RW TAPER - 5/8" DIAMETER													
1-1/4	.613	3/4	3/8	5/8	C-1505	135-1505	C-2505	136-2505	1/4	D-1505	137-1505	D-2505	138-2505
1-1/2	.613	3/4	3/8	5/8	C-1506	135-1506	C-2506	136-2506	1/4	D-1506	137-1506	D-2506	138-2506
1-3/4	.613	1	3/8	5/8	C-1507	135-1507	C-2507	136-2507	1/4	D-1507	137-1507	D-2507	138-2507
2	.613	1-1/4	3/8	5/8	C-1508	135-1508	C-2508	136-2508	1/4	D-1508	137-1508	D-2508	138-2508
2-1/4	.613	1-1/2	3/8	5/8	C-1509	135-1509	C-2509	136-2509	1/4	D-1509	137-1509	D-2509	138-2509
2-1/2	.613	1-3/4	3/8	5/8	C-1510	135-1510	C-2510	136-2510	1/4	D-1510	137-1510	D-2510	138-2510
2-3/4	.613	2	3/8	5/8	C-1511	135-1511	C-2511	136-2511	1/4	D-1511	137-1511	D-2511	138-2511
3	.613	2-1/4	3/8	5/8	C-1512	135-1512	C-2512	136-2512	1/4	D-1512	137-1512	D-2512	138-2512
3-1/4	.613	2-1/2	3/8	5/8	C-1513	135-1513	C-2513	136-2513	1/4	D-1513	137-1513	D-2513	138-2513
3-1/2	.613	2-3/4	3/8	5/8	C-1514	135-1514	C-2514	136-2514	1/4	D-1514	137-1514	D-2514	138-2514
3-3/4	.613	3	3/8	5/8	C-1515	135-1515	C-2515	136-2515	1/4	D-1515	137-1515	D-2515	138-2515
4	.613	3-1/4	3/8	5/8	C-1516	135-1516	C-2516	136-2516	1/4	D-1516	137-1516	D-2516	138-2516
NO. 6 RW TAPER - 3/4" DIAMETER													
2	.731	1-1/4	7/16	3/4	C-1608	135-1608	C-2608	136-2608	9/32	D-1608	137-1608	D-2608	138-2608
2-1/2	.731	1-3/4	7/16	3/4	C-1610	135-1610	C-2610	136-2610	9/32	D-1610	137-1610	D-2610	138-2610
3	.731	2-1/4	7/16	3/4	C-1612	135-1612	C-2612	136-2612	9/32	D-1612	137-1612	D-2612	138-2612
3-1/2	.731	2-3/4	7/16	3/4	C-1614	135-1614	C-2614	136-2614	9/32	D-1614	137-1614	D-2614	138-2614
4	.731	3-1/4	7/16	3/4	C-1616	135-1616	C-2616	136-2616	9/32	D-1616	137-1616	D-2616	138-2616
NO. 7 RW TAPER - 7/8" DIAMETER													
2	.844	1-1/4	1/2	7/8	C-1708	135-1708	C-2708	136-2708	5/16	D-1708	137-1708	D-2708	138-2708
2-1/2	.844	1-3/4	1/2	7/8	C-1710	135-1710	C-2710	136-2710	5/16	D-1710	137-1710	D-2710	138-2710
3	.844	2-1/4	1/2	7/8	C-1712	135-1712	C-2712	136-2712	5/16	D-1712	137-1712	D-2712	138-2712
3-1/2	.844	2-3/4	1/2	7/8	C-1714	135-1714	C-2714	136-2714	5/16	D-1714	137-1714	D-2714	138-2714
4	.844	3-1/2	1/2	7/8	C-1716	135-1716	C-2716	136-2716	5/16	D-1716	137-1716	D-2716	138-2716

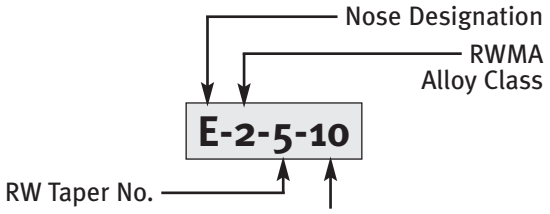
TUFFALOY STANDARD STRAIGHT TIPS

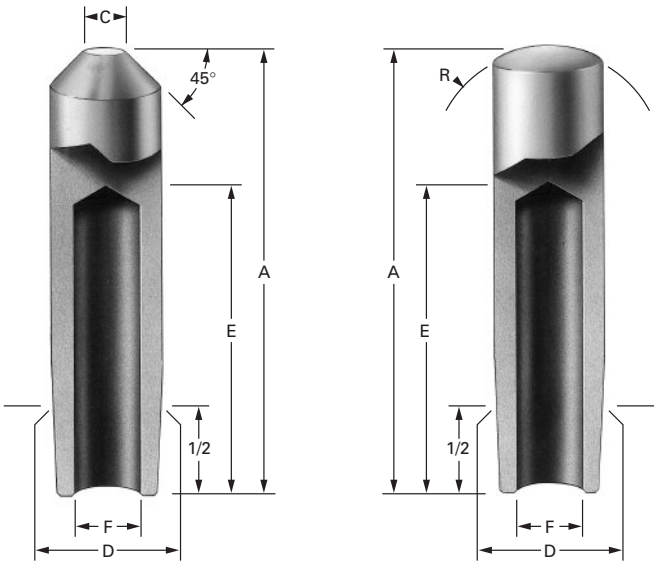
TAPER ENGAGEMENT



TIP SIZE	LENGTH
4 RW	1/2-in.
5 RW	3/4-in.
6 RW	7/8-in.
7 RW	1-1/8-in.

KEY TO DESCRIPTION





'E' TRUNCATED CONE

'F' RADIUS FACED

A Overall Length	D Gauging Dia.	E Water Hole Depth	F Water Hole Dia.	C Welding Face Dia.	RWMA CLASS 1 Description	RWMA CLASS 1 Part No.	RWMA CLASS 2 Description	RWMA CLASS 2 Part No.	R Nose Radius	RWMA CLASS 1 Description	RWMA CLASS 1 Part No.	RWMA CLASS 2 Description	RWMA CLASS 2 Part No.
NO. 4 RW TAPER - 1/2" DIAMETER													
1	.463	1/2	9/32	3/16	E-1404	140-1404	E-2404	140-2404	2	F-1404	141-1404	F-2404	141-2404
1-1/4	.463	3/4	9/32	3/16	E-1405	140-1405	E-2405	140-2405	2	F-1405	141-1405	F-2405	141-2405
1-1/2	.463	1	9/32	3/16	E-1406	140-1406	E-2406	140-2406	2	F-1406	141-1406	F-2406	141-2406
1-3/4	.463	1-1/4	9/32	3/16	E-1407	140-1407	E-2407	140-2407	2	F-1407	141-1407	F-2407	141-2407
2	.463	1-1/2	9/32	3/16	E-1408	140-1408	E-2408	140-2408	2	F-1408	141-1408	F-2408	141-2408
2-1/4	.463	1-3/4	9/32	3/16	E-1409	140-1409	E-2409	140-2409	2	F-1409	141-1409	F-2409	141-2409
2-1/2	.463	2	9/32	3/16	E-1410	140-1410	E-2410	140-2410	2	F-1410	141-1410	F-2410	141-2410
2-3/4	.463	2-1/4	9/32	3/16	E-1411	140-1411	E-2411	140-2411	2	F-1411	141-1411	F-2411	141-2411
3	.463	2-1/2	9/32	3/16	E-1412	140-1412	E-2412	140-2412	2	F-1412	141-1412	F-2412	141-2412
3-1/4	.463	2-3/4	9/32	3/16	E-1413	140-1413	E-2413	140-2413	2	F-1413	141-1413	F-2413	141-2413
3-1/2	.463	3	9/32	3/16	E-1414	140-1414	E-2414	140-2414	2	F-1414	141-1414	F-2414	141-2414
3-3/4	.463	3-1/4	9/32	3/16	E-1415	140-1415	E-2415	140-2415	2	F-1415	141-1415	F-2415	141-2415
4	.463	3-1/2	9/32	3/16	E-1416	140-1416	E-2416	140-2416	2	F-1416	141-1416	F-2416	141-2416
NO. 5 RW TAPER - 5/8" DIAMETER													
1-1/4	.613	3/4	3/8	1/4	E-1505	140-1505	E-2505	140-2505	2	F-1515	141-1505	F-2505	141-2505
1-1/2	.613	3/4	3/8	1/4	E-1506	140-1506	E-2506	140-2506	2	F-1506	141-1506	F-2506	141-2506
1-3/4	.613	1	3/8	1/4	E-1507	140-1507	E-2507	140-2507	2	F-1507	141-1507	F-2507	141-2507
2	.613	1-1/4	3/8	1/4	E-1508	140-1508	E-2508	140-2508	2	F-1508	141-1508	F-2508	141-2508
2-1/4	.613	1-1/2	3/8	1/4	E-1509	140-1509	E-2509	140-2509	2	F-1509	141-1509	F-2509	141-2509
2-1/2	.613	1-3/4	3/8	1/4	E-1510	140-1510	E-2510	140-2510	2	F-1510	141-1510	F-2510	141-2510
2-3/4	.613	2	3/8	1/4	E-1511	140-1511	E-2511	140-2511	2	F-1511	141-1511	F-2511	141-2511
3	.613	2-1/4	3/8	1/4	E-1512	140-1512	E-2512	140-2512	2	F-1512	141-1512	F-2512	141-2512
3-1/4	.613	2-1/2	3/8	1/4	E-1513	140-1513	E-2513	140-2513	2	F-1513	141-1513	F-2513	141-2513
3-1/2	.613	2-3/4	3/8	1/4	E-1514	140-1514	E-2514	140-2514	2	F-1514	141-1514	F-2514	141-2514
3-3/4	.613	3	3/8	1/4	E-1515	140-1515	E-2515	140-2515	2	F-1515	141-1515	F-2515	141-2515
4	.613	3-1/4	3/8	1/4	E-1516	140-1516	E-2516	140-2516	2	F-1516	141-1516	F-2516	141-2516
NO. 6 RW TAPER - 3/4" DIAMETER													
2	.731	1-1/4	7/16	9/32	E-1608	140-1608	E-2608	140-2608	4	F-1608	141-1608	F-2608	141-2608
2-1/2	.731	1-3/4	7/16	9/32	E 1610	140-1610	E-2610	140-2610	4	F-1610	141-1610	F-2610	141-2610
3	.731	2-1/4	7/16	9/32	E-1612	140-1612	E-2612	140-2612	4	F-1612	141-1612	F-2612	141-2612
3-1/2	.731	2-3/4	7/16	9/32	E-1614	140-1614	E-2614	140-2614	4	F-1614	141-1614	F-2614	141-2614
4	.731	3-1/4	7/16	9/32	E-1616	140-1616	E-2616	140-2616	4	F-1616	141-1616	F-2616	141-2616
NO. 7 RW TAPER - 7/8" DIAMETER													
2	.844	1-1/4	1/2	5/16	E-1708	140-1708	E-2708	140-2708	6	F-1708	141-1708	F 2708	141-2708
2-1/2	.844	1-3/4	1/2	5/16	E-1710	140-1710	E-2710	140-2710	6	F-1710	141-1710	F-2710	141-2710
3	.844	2-1/4	1/2	5/16	E-1712	140-1712	E-2712	140-2712	6	F-1712	141-1712	F-2712	141-2712
3-1/2	.844	2-3/4	1/2	5/16	E-1714	140-1714	E-2714	140-2714	6	F-1714	141-1714	F-2714	141-2714
4	.844	3-1/2	1/2	5/16	E-1716	140-1716	E-2716	140-2716	6	F-1716	141-1716	F-2716	141-2716

Tuffcap electrodes consist of two pieces: a shank and a replaceable cap. These two-part electrodes can offer major economies, because when the nose geometry is worn out, only the cap needs to be replaced. And it costs far less than a standard one-piece electrode. (A Tuffcap shank will normally outlast twenty caps.) Also, electrode inventory can be kept small because all nose designs will fit the same size shank.

TWO TYPES: TUFFALOY offers two kinds of Tuffcap electrodes. One uses a male cap that fits into the shank. The other has a female cap that fits over the shank.

FEMALE AND MALE CAPS are available in the widest range of sizes, alloys, and styles. They are made in both Class 1 and Class 2 alloy, and in sizes to fit- shanks sized 4 through 7 RW. Male caps are more effectively cooled than female caps.

ALL CAPS are made with the same nose designs in conformance with RWMA standards.

SHANKS are made of Class 2 alloy, either straight, or bent to provide an offset. Shanks other than those cataloged can be special ordered. Tuffcap, caps and shanks should be used only in a directly opposed, straight-line manner. They do not work as well as standard electrodes on heavily coated metal such as galvanized or tin-plate.

TUFFTRODE-Z CAPS FOR COATED STEELS

To avoid electrode sticking problems common when welding galvanized and aluminized materials, these copper chrome-zirconium alloy caps are offered. They give the same performance as dispersion-strengthened caps but cost far less. They are Class 2 caps in mechanical and physical properties.

Both male and female caps are offered in all the standard nose designs.

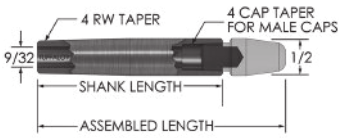
Female Cap Type Electrode Assembly

Male Cap Type Electrode Assembly

Size 5 RW straight and offset style shanks holding male type caps with swivel heads. These caps are cataloged on pages 8 & 15.

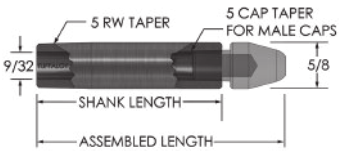
STRAIGHT SHANKS FOR MALE CAPS (CLASS 2*)

SHANKS 4 RW TAPER



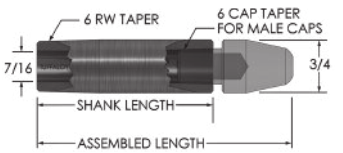
Shank Length	Assembled Length	Description	Part No.
1-1/4	2	TG-2405	161-2405
1-1/2	2-1/4	TG-2406	161-2406
1-3/4	2-1/2	TG-2407	161-2407
2	2-3/4	TG-2408	161-2408
2-1/4	3	TG-2409	161-2409
2-1/2	3-1/4	TG-2410	161-2410
2-3/4	3-1/2	TG-2411	161-2411
3	3-3/4	TG-2412	161-2412
3-1/4	4	TG-2413	161-2413

SHANKS 5 RW TAPER



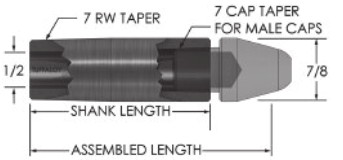
Shank Length	Assembled Length	Description	Part No.
1-1/4	2	TG-2505	161-2505
1-1/2	2-1/4	TG-2506	161-2506
1-3/4	2-1/2	TG-2507	161-2507
2	2-3/4	TG-2508	161-2508
2-1/4	3	TG-2509	161-2509
2-1/2	3-1/4	TG-2510	161-2510
2-3/4	3-1/2	TG-2511	161-2511
3	3-3/4	TG-2512	161-2512
3-1/4	4	TG-2513	161-2513

SHANKS 6 RW TAPER



Shank Length	Assembled Length	Description	Part No.
1-1/2	2-1/2	TG-2606	161-2606
2	3	TG-2608	161-2608
2-1/2	3-1/2	TG-2610	161-2610
3	4	TG-2612	161-2612

SHANKS 7 RW TAPER



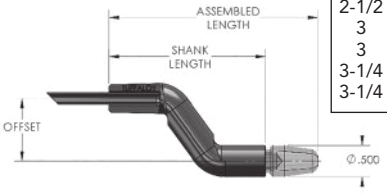
Shank Length	Assembled Length	Description	Part No.
1-1/2	2-1/2	TG-2706	161-2706
2	3	TG-2708	161-2708
2-1/2	3-1/2	TG-2710	161-2710
3	4	TG-2712	161-2712

'E' NOSE 4 AND 5 CAP

'F' NOSE 4 AND 5 CAP

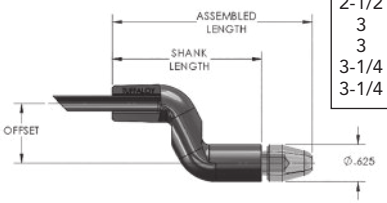
BENT SHANKS FOR MALE CAPS (CLASS 2*)

SHANKS 4 RW TAPER



Shank Length	Off-set	Length	Description	Part No.
2-1/2	1/2	3-1/4	TG-2410-08	162-2410
2-1/2	3/4	3-1/4	TG-2410-12	162-2420
2-1/2	1	3-1/4	TG-2410-16	162-2430
3	1/2	3-3/4	TG-2412-8	162-2450
3	1-1/4	3-3/4	TG-2412-20	162-2460
3-1/4	1	4	TG-2413-16	162-2470
3-1/4	1-1/4	4	TG-2413-20	162-2480

SHANKS 5 RW TAPER

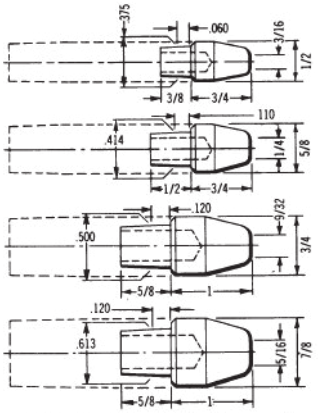


2-1/4	1/4	3	TG-2509-4	162-2505
2-1/2	1/2	3-1/4	TG-2510-8	162-2510
2-1/2	3/4	3-1/4	TG-2510-12	162-2520
2-1/2	1	3-1/4	TG-2510-16	162-2530
3	1/2	3-3/4	TG-2512-8	162-2550
3	1-1/4	3-3/4	TG-2512-20	162-2560
3-1/4	1	4	TG-2513-16	162-2570
3-1/4	1-1/4	4	TG-2513-20	162-2580

* Class 3 Available

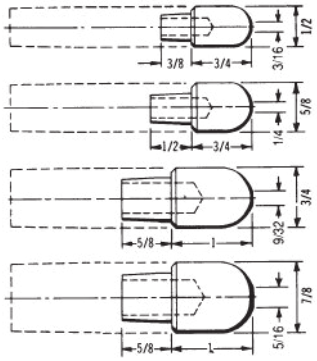
MALE CAPS

POINTED TIPS 'A'



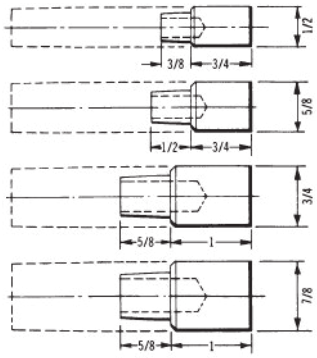
Alloy Class	Taper of Adapter Shank	Description	Part No.
1	4RW	TA-14	111-0014
2	4RW	TA-24	112-0024
3	4RW	TA-34	122-1034
1	5RW	TA-15	111-0015
1&2	5RW	TA-25Z	126-0025
2	5RW	TA-25	112-0025
3	5RW	TA-35	122-1035
1	6RW	TA-16	111-0016
2	6RW	TA-26	112-0026
1	7RW	TA-17	111-0017
2	7RW	TA-27	112-0027

DOME TIPS 'B'



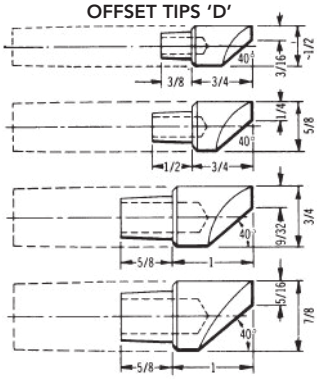
1	4RW	TB-14	113-0014
2	4RW	TB-24	114-0024
1	5RW	TB-15	113-0015
2	5RW	TB-25	114-0025
1	6RW	TB-16	113-0016
2	6RW	TB-26	114-0026
1	7RW	TB-17	113-0017
2	7RW	TB-27	114-0027

FLAT TIPS 'C'



1	4RW	TC-14	115-0014
2	4RW	TC-24	116-0024
3	4RW	TC-34	122-3034
1	5RW	TC-15	115-0015
2	5RW	TC-25	116-0025
3	5RW	TC-35	122-3035
1	6RW	TC-16	115-0016
2	6RW	TC-26	116-0026
1	7RW	TC-17	115-0017
2	7RW	TC-27	116-0027

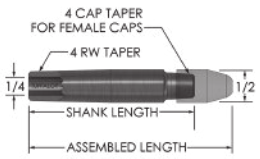
OFFSET TIPS 'D'



1	4RW	TD-14	117-0014
2	4RW	TD-24	118-0024
3	4RW	TD-34	122-4034
1	5RW	TD-15	117-0015
2	5RW	TD-25	118-0025
3	5RW	TD-35	122-4035
1	6RW	TD-16	117-0016
2	6RW	TD-26	118-0026
1	7RW	TD-17	117-0017
2	7RW	TD-27	118-0027

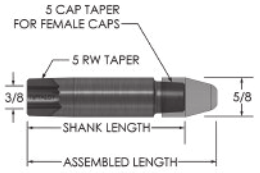
STRAIGHT SHANKS FOR FEMALE CAPS (CLASS 2*)

SHANKS 4 RW TAPER



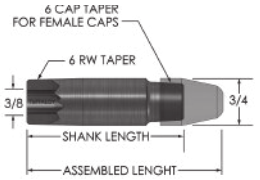
Shank Length	Assembled Length	Description	Part No.
1-1/2	2	TP-2406	163-2406
1-3/4	2-1/4	TP-2407	163-2407
2	2-1/2	TP-2408	163-2408
2-1/4	2-3/4	TP-2409	163-2409
2-1/2	3	TP-2410	163-2410
2-3/4	3-1/4	TP-2411	163-2411
3	3-1/2	TP-2412	163-2412
3-1/4	3-3/4	TP-2413	163-2413
3-1/2	4	TP-2414	163-2414

SHANKS 5 RW TAPER



1-1/2	2	TP-2506	163-2506
1-3/4	2-1/4	TP-2507	163-2507
2	2-1/2	TP-2508	163-2508
2-1/4	2-3/4	TP-2509	163-2509
2-1/2	3	TP-2510	163-2510
2-3/4	3-1/4	TP-2511	163-2511
3	3-1/2	TP-2512	163-2512
3-1/4	3-3/4	TP-2513	163-2513
3-1/2	4	TP-2514	163-2514

SHANKS 6 RW TAPER



1-1/2	2	TP-2606	163-2606
2	2-1/2	TP-2608	163-2608
2-1/2	3	TP-2610	163-2610
3	3-1/2	TP-2612	163-2612

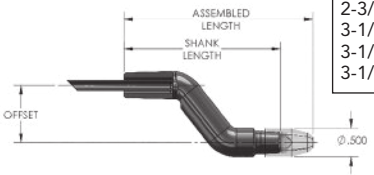
'E' NOSE 4 AND 5 CAP

'F' NOSE 4 AND 5 CAP

For improved cooling, female shanks are drilled through (to put water in contact with cap). Shanks may be ordered with a blind water hole, upon request.

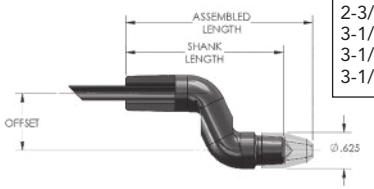
BENT SHANKS FOR FEMALE CAPS (CLASS 2*)

SHANKS 4 RW TAPER



Shank Length	Offset	Length	Description	Item No.
2-3/4	1/2	3-1/4	TP-2411-08	164-2442
2-3/4	3/4	3-1/4	TP-2411-12	164-2445
2-3/4	1	3-1/4	TP-2411-16	164-2447
3-1/4	1/2	3-3/4	TP-2413-08	164-2465
3-1/4	1-1/4	3-3/4	TP-2413-20	164-2480
3-1/2	1	4	TP-2414-16	164-2490

SHANKS 5 RW TAPER

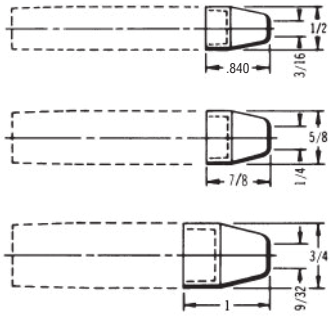


2-3/4	1/2	3-1/4	TP-2511-08	164-2542
2-3/4	3/4	3-1/4	TP-2511-12	164-2545
2-3/4	1	3-1/4	TP-2511-16	164-2547
3-1/4	1/2	3-3/4	TP-2513-08	164-2565
3-1/4	1	3-3/4	TP-2513-16	164-2570
3-1/4	1-1/4	3-3/4	TP-2513-20	164-2580

* Class 3 Available

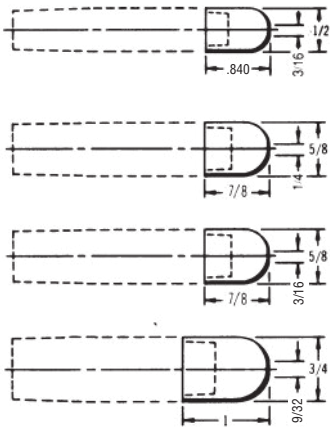
FEMALE CAPS

POINTED TIPS 'A'



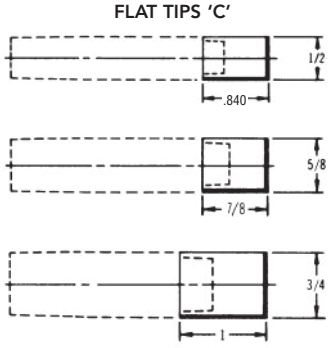
Alloy Class	Taper of Adapter Shank	Description	Part No.
2	4RW	TP-24A	125-0241
2 (Cu Cr Zr)	4RW	TP-24AZ	126-0241
2	5RW	TP-25A	125-0251
2 (Cu Cr Zr)	5RW	TP-25AZ	126-0251
2	6RW	TP-26A	125-0261
2 (Cu Cr Zr)	6RW	TP-26AZ	126-0261

DOME TIPS 'B'



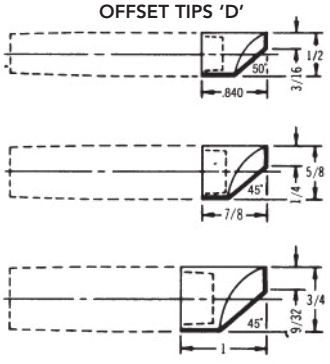
2	4RW	TP-24B	125-0242
2	5RW	TP-25B	125-0252
2 (Cu Cr Zr)	5RW	TP-25BZ	126-0252
2	5RW	TP-25B-.20	125-0252.20
2 (Cu Cr Zr)	5RW	TP-25BZ-.20	126-0252.20
2	6RW	TP-26B	125-0262
2 (Cu Cr Zr)	6RW	TP-26BZ	126-0262

FLAT TIPS 'C'



2	4RW	TP-24C	125-0243
2	5RW	TP-25C	125-0253
2 (Cu Cr Zr)	5RW	TP-25CZ	126-0253
2	6RW	TP-26C	125-0263

OFFSET TIPS 'D'



2	4RW	TP-24D	125-0244
2	5RW	TP-25D	125-0254
2 (Cu Cr Zr)	5RW	TP-25DZ	126-0254
2	6RW	TP-26D	125-0264

DOUBLE-BEND, WITH STANDARD NOSE DESIGNS

These standard cold-formed tips are bent from straight tips (some after added machining) and have the same hardness and conductivity. They outlast, many times over, the old cast and forged tips of similar geometry, which are impossible to cool adequately.

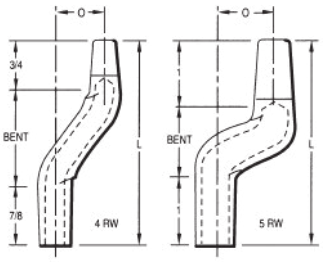
The table shows a wide range of tips generally available from stock. For sizes not shown, refer to the diagrams and description key at the bottom of the page, and order what you need. All measurements will be accurate. However, over-all length, in 1/8-in. multiples, will be held to within 1/16-in.

Tapers, water holes, and nose designs are the same as the standard straight tips in this catalog.
Water tubes can be furnished.

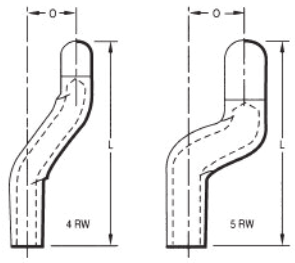
Standard nose designs other than those shown here may be furnished on short order. Follow the "Key to Description", using a 'B' for Dome nose, 'C' for flat nose, 'E' for truncated cone, and 'F' for radius nose.

DOUBLE-BENT, ADDITIONAL NOSE DESIGNS

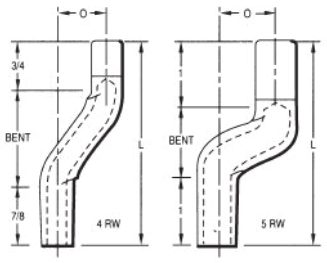
'A' POINTED NOSE



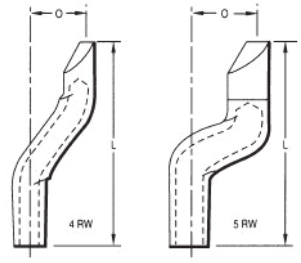
'B' DOME NOSE



'C' FLAT NOSE



'D' OFFSET NOSE



KEY TO DESCRIPTION

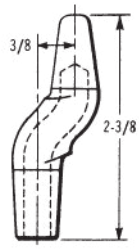
FX-YZLD-O

Example:
FB-1438-16-T

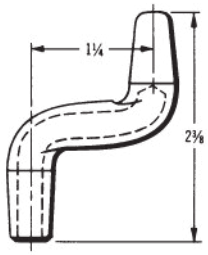
- **F** = Cold-Formed, Double-Bend Tips
- **X** = Nose Type
  - A
  - **B**
  - C
  - D
- **Y** = RWMA Alloy Class
  - **1** = Class 1
  - 2 = Class 2
- **Z** = RW Taper Number
  - **4** =4RW
  - 5 = 5RW
- **L** = Length in inches
  Refer to table for availability
- **D** = Additional Length in 16ths
- **O** = Offset in 16ths
  Refer to table for availability
- **T** = With water tubes

			CLASS 1				CLASS 2			
			FA Pointed Nose		FD Offset Nose		FA Pointed Nose		FD Offset Nose	
Taper No.	Length	Offset	Description	Item No.	Description	Item No.	Description	Item No.	Description	Item No.
3 RW	1-1/2	7/16					FA-2317-8	167-0060		
4 RW	2-3/16	1							FD-2423-16	167-2080
	2-1/4	1/2	FA-1424-8	165-0100			FA-2424-8	167-0100		
	2-1/4	3/4					FA-2424-12	167-0120		
	2-3/8	3/8	FA-1426-6	165-0160			FA-2426-6	167-0160		
	2-3/8	3/4					FA-2426-12	167-0180		
	2-3/8	1-1/4	FA-1426-20	165-0200	FD-1426-20	165-2200	FA-2426-20	167-0200	FD-2426-20	167-2200
	2-1/2	1/2					FA-2428-8	167-0240		
	2-1/2	1	FA-1428-16	165-0280	FD-1428-16	165-2280	FA-2428-16	167-0280	FD-2428-16	167-2280
	2-5/8	3/4	FA-14210-12	165-0320			FA-24210-12	167-0320	FD-24210-12	167-2320
	2-3/4	1/2	FA-14212-8	165-0360			FA-24212-8	167-0360	FD-24212-8	167-2360
	2-3/4	1					FA-24212-16	167-0400		
	2-3/4	1-1/4					FA-24212-20	167-0420		
	2-7/8	3/4					FA-24214-12	167-0430		
	2-7/8	1-1/4	FA-14214-20	165-0460			FA-24214-20	167-0460		
	3	1	FA-1430-16	165-0520			FA-2430-16	167-0520		
	3-3/8	1-1/4					FA-2436-20	167-0580		
	3-1/2	1					FA-2438-16	167-0620		
5 RW	2-1/4	1/2							FD-2524-8	167-3100
	2-1/4	1-1/4			FD-1524-20	165-3140			FD-2524-20	167-3140
	2-3/8	3/8	FA-1526-6	165-1160			FA-2526-6	167-1160	FD-2526-6	167-3160
	2-3/8	3/4			FD-1526-12	165-3180	FA-2526-12	167-1180	FD-2526-12	167-3180
	2-1/2	1/2	FA-1528-8	165-1240			FA-2528-8	167-1240		
	2-1/2	1					FA-2528-16	167-1280		
	2-3/4	1/2	FA-15212-8	165-1360	FD-15212-8	165-3360	FA-25212-8	167-1360	FD-25212-8	167-3360
	2-3/4	3/4					FA-25212-12	167-1380		
	2-3/4	1	FA-15212-16	165-1400	FD-15212-16	165-3400	FA-25212-16	167-1400	FD-25212-16	167-3400
	2-7/8	1					FA-25214-16	167-1440		
	2-7/8	1-1/4	FA-15214-20	165-1460			FA-25214-20	167-1460		
	3	1/2	FA-1530-8	165-1480			FA-2530-8	167-1480	FD-2530-8	167-3480
	3	3/4					FA-2530-12	167-1500		
	3	1-3/4					FA-2530-28	167-1540		
	3	1							FD-2530-16	167-3520
	3-1/4	1	FA-1534-16	165-1560			FA-2534-16	167-1560		
	3-3/8	3/8			FD-1536-6	165-3570				
	3-3/8	1-1/4	FA-1536-20	165-1580	FD-1536-20	165-3580	FA-2536-20	167-1580	FD-2536-20	167-3580
	3-1/2	1/2	FA-1538-8	165-1600			FA-2538-8	167-1600		
	3-1/2	1					FA-2538-16	167-1620	FD-2538-16	167-3620

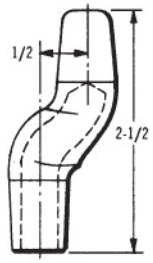
'A' POINTED NOSE



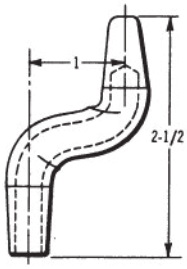
FA-1426-6	FA-2426-6
FA-1526-6	FA-2526-6



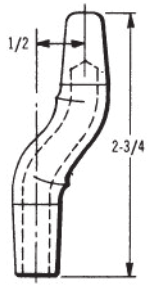
FA-1426-20	FA-2426-20



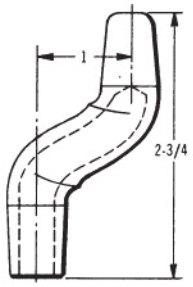
	FA-2428-8
FA-1528-8	FA-2528-8



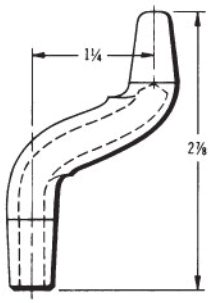
FA-1428-16	FA-2428-16
	FA-2528-16



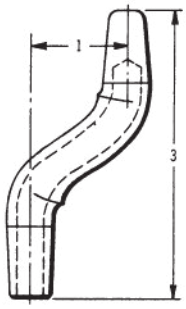
FA-14212-8	FA-24212-8
FA-15212-8	FA-25212-8



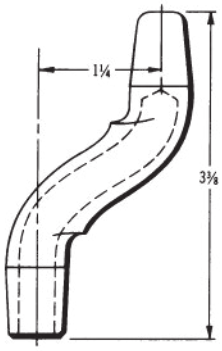
FA-15212-16	FA-25212-16



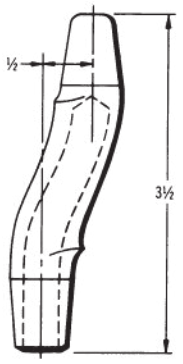
FA-14214-20	FA-24214-20
FA-15214-20	FA-25214-20



FA-1430-16	FA-2430-16

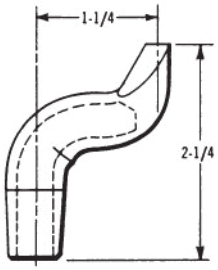


	FA-2436-20
FA-1536-20	FA-2436-20

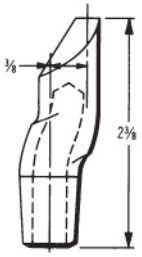


FA-1538-8	FA-2538-8

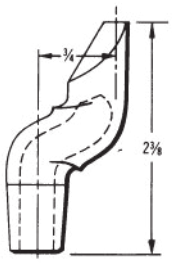
'D' OFFSET NOSE



FD-1524-20	FD-2524-20



	FD-2526-6



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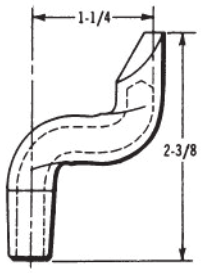
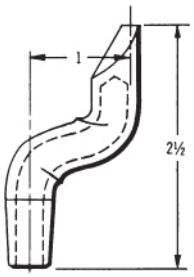
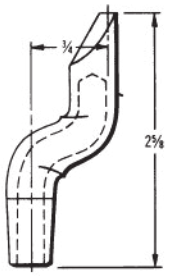


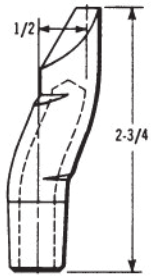
FD-1426-20	FD-2426-20



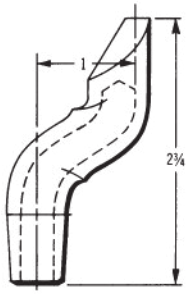
FD-1428-16	FD-2428-16



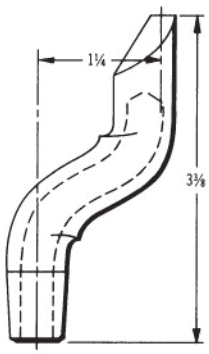
	FD-24210-12



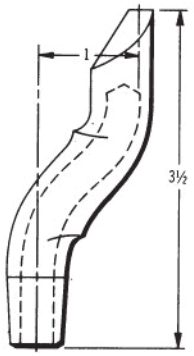
	FD-24212-8
FD-15212-8	FD-25212-8



FD-15212-16	FD-25212-16



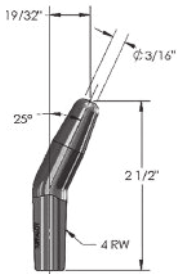
FD-1536-20	FD-2536-20



	FD-2538-16

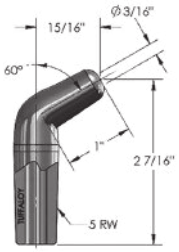
SINGLE-BEND TIPS

FP-2532-10
Part No.
167-5540

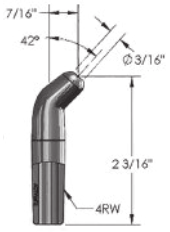


FP-2428-9.5
Part No.
167-4260

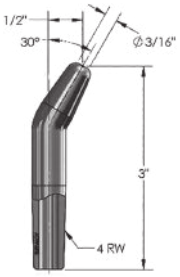
FP-2523-7
Part No.
167-5060



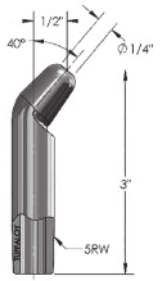
FP-2527-15
Part No.
167-5220



FP-2423-7
Part No.
167-5055

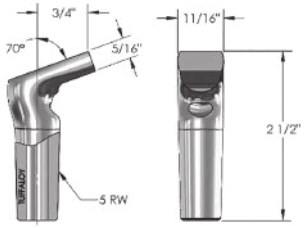


FP-2430-8
Part No.
167-5065

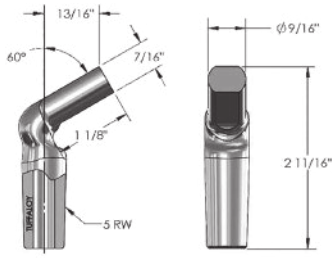


FP-2530-8
Part No.
167-5070

Cold-formed tips with a single bend have standard pointed-nose design. Other single-bend tips with flat noses (below) or other special designed noses and configurations are available on special order. These are of Class 2 alloy; Class I alloy can also be ordered.



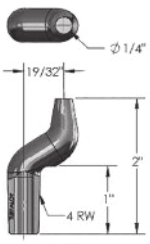
SE-4268
Part No. 170-4268



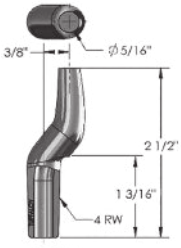
SE-4269
Part No. 170-4269

MISCELLANEOUS TIPS

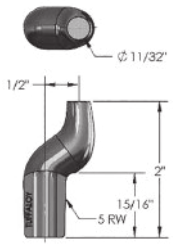
Double bend and flattened tips are made from bar stock. These are some of the standard designs available, but special designs can also be made. These are of Class 2 alloy; Class I alloy can also be ordered.



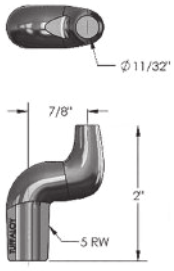
SE-4270
Part No. 170-4270



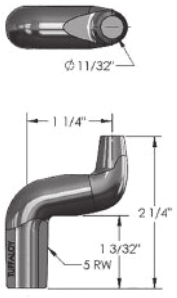
SE-4271
Part No. 170-4271



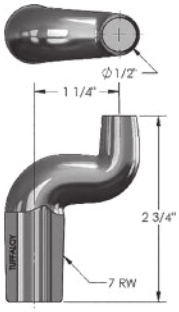
SE-4272
Part No. 170-4272



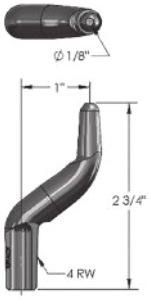
SE-4273
Part No. 170-4273



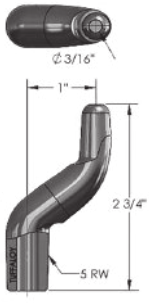
SE-4274
Part No. 170-4274



SE-4275
Part No. 170-4275

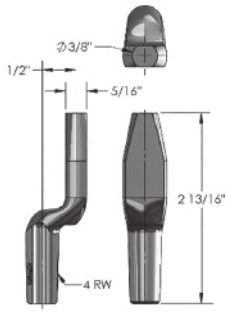


SE-4276-1
Part No. 170-4276-1

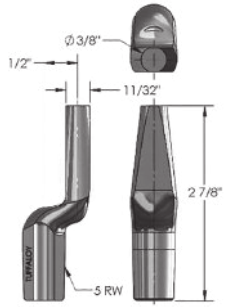


SE-4276
Part No. 170-4276

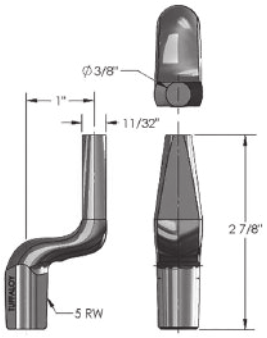
These standard bent tips are in addition to those shown on page 11.
They are of class 2 alloy; Other alloys can also be ordered.



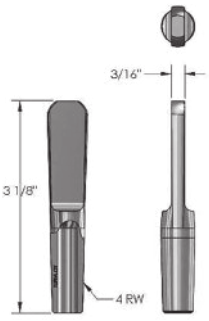
SE-4277
Part No. 170-4277



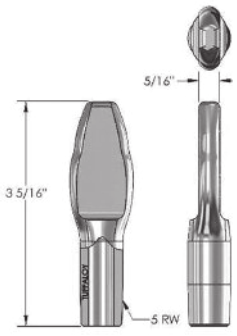
SE-4278
Part No. 170-4278



SE-4279
Part No. 170-4279



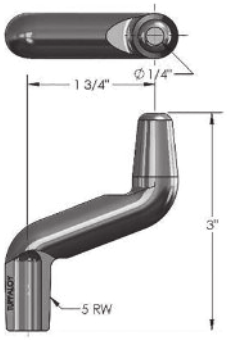
SE-4280
Part No. 170-4280



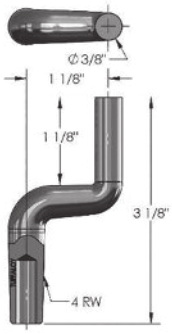
SE-4281
Part No. 170-4281

SE-4282
Part No. 170-4282

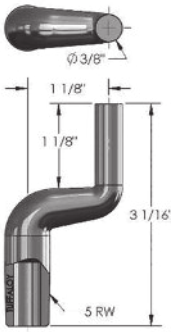
SE-4283
Part No. 170-4283



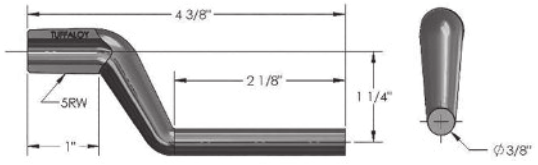
SE-4284 (short water hole)
Part No. 170-4284



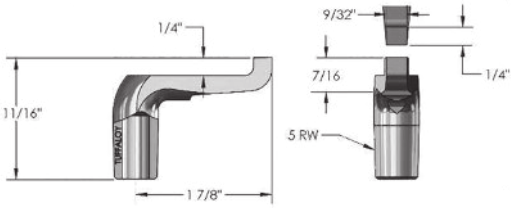
SE-4285
Part No. 170-4285



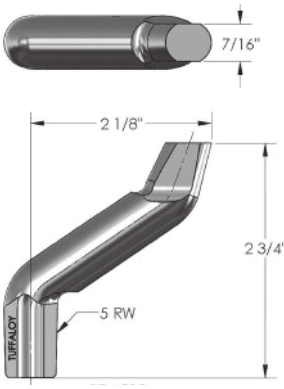
SE-4286
Part No. 170-4286



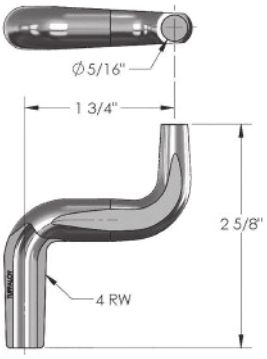
SE-4287
Part No. 170-4287



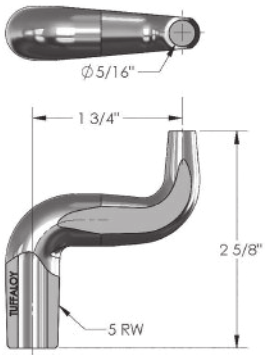
SE-4288
Part No. 170-4288



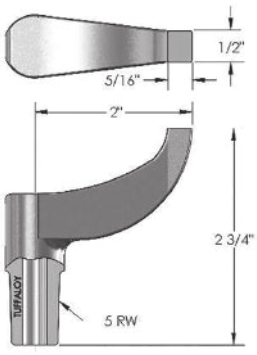
SE-4535
Part No. 186-0520



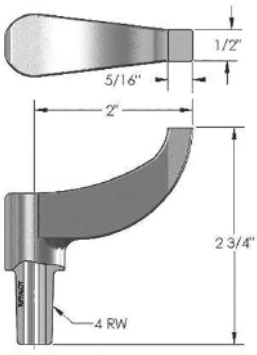
SE-4089-4
Part No. 170-4090



SE-4089-5
Part No. 170-4089



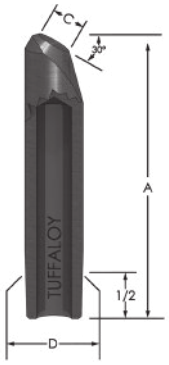
5RW: C-507-5
Part No. 186-0507



4RW: C-507-4
Part No. 186-0508

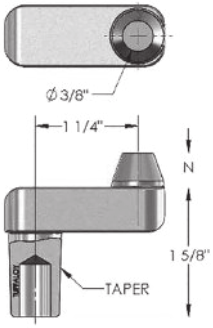
These straight tips have welding faces angled 30'.

Alloy Class	Taper No.	Face 'C'	Length 'D'	Descrip-tion	Part No.
2	4RW	1/4	2	H-2408-30	145-2408
2	4RW	1/4	3	H-2412-30	145-2412
2	4RW	1/4	4	H-2416-30	145-2416
2	5RW	3/8	2	H-2508-30	145-2508
2	5RW	3/8	3	H-2512-30	145-2512
2	5RW	3/8	4	H-2516-30	145-2516

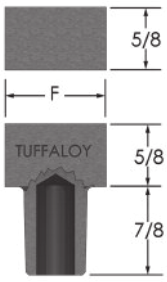


N-15 thru N-28

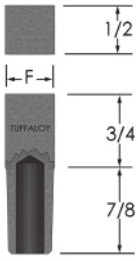
Alloy Class	Taper No.	Length 'N'	Descrip-tion	Part No.
2	4RW	3/8	N-15	186-0015
2	4RW	3/4	N-16	186-0016
2	5RW	3/8	N-27	186-0027
2	5RW	3/4	N-28	186-0028



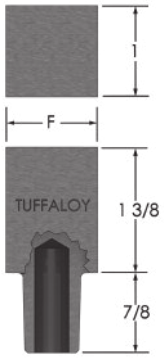
BACK UP ELECTRODES



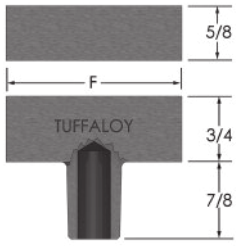
220



221 thru 224

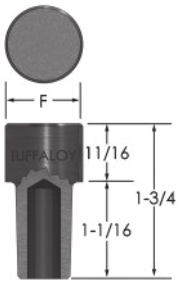


225

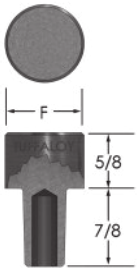


226 thru 229

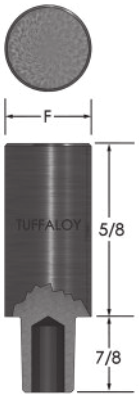
These tips are all machined from bar stock. Special designs can be made to order.



301 thru 304



305 thru 315



316

RECTANGULAR FACE

Alloy Class	Taper No.	Face 'F'	Descrip-tion	Part No.
2	5RW	1	220	186-0220
2	4RW	1/2	221	186-0221
2	4RW	1	223	186-0223
2	5RW	1	224	186-0224
2	5RW	1	225	186-0225
2	5RW	2	226	186-0226
2	4RW	2	227	186-0227
2	5RW	1-1/2	228	186-0228
2	4RW	1-1/2	229	186-0229

ROUND FACE

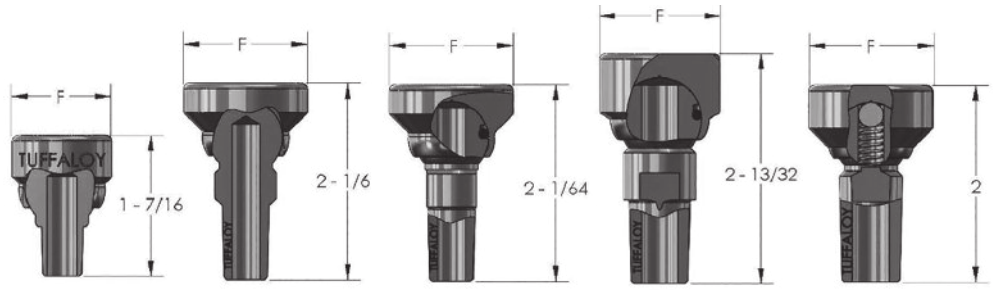
Alloy Class	Taper No.	Face 'F'	Descrip-tion	Part No.
2	4RW	7/8	301	186-0301
1	4RW	7/8	302	186-0302
2	5RW	7/8	303	186-0303
1	5RW	7/8	304	186-0304
2	4RW	7/8	305	186-0305
1	4RW	7/8	306	186-0306
2	5RW	7/8	307	186-0307
1	5RW	7/8	308	186-0308
2	4RW	1	309	186-0309
1	4RW	1	310	186-0310
2	5RW	1	311*	186-0311
1	5RW	1	312	186-0312
2	5RW	1-1/4	313*	186-0313
2	5RW	1-1/2	315	186-0315
2	5RW	1	316*	186-0316

*311, 313 and 316 available with Copper Tungsten face. See pg. 35

Additional Back Up Electrodes with Copper Tungsten Facings – See Page 35

Swivel tips have ball-jointed swivel heads to compensate for minor misalignment, and to eliminate marking of the work surface. They are all machined from Class 2 alloy bar stock. The S-and SS-Series tip water hole does not reach the head. In the OS and OSH models, the water does contact the head, and O-rings are used to seal it. In the SS Series a spring is used to keep pressure on head for better positioning. **Class 1 and class 3 heads are also available.**

Note: Standard swivel tilt is approximately 18', a 25' swivel is available on request. Add suffix "HS" to above part number.



S-Series* (Tuffcap Design) | S-Series | OS-Series | OSH-Series | SS-Series

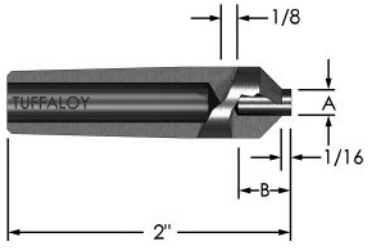
Taper No.	Face Dia. 'F'	S-Series Descrip-tion	S-Series Part No.	OS-Series Descrip. tion	OS-Series Part No.	OSH-Series Descrip-tion	OSH-Series Part No.	SS-Series Descrip-tion	SS-Series Part No.
5-CT*	7/8 1 1-1/4	S-248 S-249 S-250	182-0248 182-0249 182-0250						
4RW	7/8 1 1-1/4	S-348 S-350 S-351	182-0348 182-0350 182-0351	OS-348 OS-350 OS-351	182-1348 182-1350 182-1351				
5RW	7/8 1 1-1/4 1-1/2 2	S-349 S-353 S-354	182-0349 182-0353 182-0354	OS-349 OS-353 OS-354	182-1349 182-1353 182-1354	OSH-353 OSH-354 OSH-356 OSH-358	182-2353 182-2354 182-2356 182-2358	SS-353 SS-354	182-3353 182-3354
7RW	2-1/2					3360	182-3360		

**Will fit Tuffcap adapter shanks having No. 5 RW tapers, as shown on page 8.*

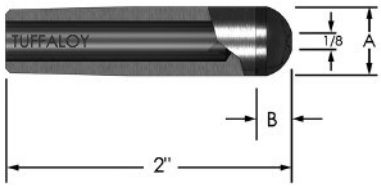
TUFFALOY REFRACTORY METAL-FACED TIPS

Nose Type	Taper No.	Facing Alloy Class	Dimensions A	Dimensions B	Descrip-tion	Part No.
Pointed	4RW	14	3/16	3/8	A-2408-100M	185-0120
	4RW	13	3/16	3/8	A-2408-100W	185-0130
	5RW	11	1/4	3/8	A-2508-10W	185-0150
	5RW	14	1/4	3/8	A-2508-100M	185-0160
	5RW	13	1/4	3/8	A-2508-100W	185-0170
Dome	4RW	11	1/2	1/4	B-2408-10W	185-1110
	5RW	11	5/8	1/4	B-2508-10W	185-1120
	5RW	13	5/8	1/4	B-2508-100W	185-1170
Flat	4RW	11	1/2	1/4	C-2408-10W	185-1210
	4RW	14	1/2	1/4	C-2408-100M	185-1220
	4RW	13	1/2	1/4	C-2408-100W	185-1230
	5RW	11	5/8	1/4	C-2508-10W	185-1250
	5RW	14	5/8	1/4	C-2508-100M	185-1260
	5RW	13	5/8	1/4	C-2508-100W	185-1270

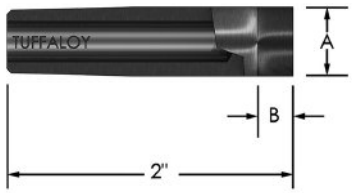
The **TUFFALOY** copper-tungsten, tungsten and molybdenum-faced tips listed here withstand greater heat and pressure, at the expense of some conductivity. Besides being used for spot welding high resistance base metals, they are useful in achieving "heat balance" when welding dissimilar metals. (The higher resistance electrode is used against the lower resistance, or thinner, member, to help contain the heat generated.) They have the same diameters and tapers as the standard straight tips in this catalog. Bodies are of Class 2 alloy. Lengths other than those shown can be ordered.



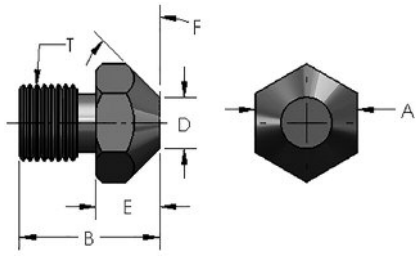
POINTED NOSE 'A'



DOME NOSE 'B'

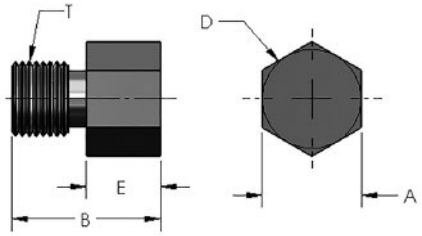


FLAT NOSE 'C'



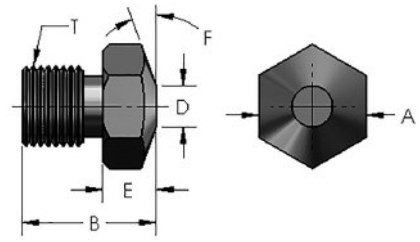
"A" POINTED NOSE THREADED ELECTRODE

RWMA Alloy Class No.	Part Number	Part Description	T Thread Size	A Hex Size (in)	B Overall Length	D Weld Face Diameter	E Hex Body Length (in)	F Angle
2 (CuCr)	188-2431-16-A	TH-2431-16-A	3/8-16	1/2	11/16	1/4	5/16	45°
2 (CuCrZr)	188-2431-16-AZ	TH-2431-16-AZ	3/8-16	1/2	11/16	1/4	5/16	45°
2 (CuCrZr)	188-2437-16-AZ	TH-2437-16-AZ	3/8-16	1/2	3/4	1/4	3/8	45°
2 (CuCrZr)	188-2450-16-AZ	TH-2450-16-AZ	3/8-16	1/2	7/8	1/4	1/2	45°
3	188-3450-16-A	TH-3450-16-A	3/8-16	1/2	7/8	1/4	1/2	45°



"C" FLAT NOSE THREADED ELECTRODE

RWMA Alloy Class No.	Part Number	Part Description	T Thread Size	A Hex Size (in)	B Overall Length	D Weld Face Diameter	E Hex Body Length (in)
3	188-3437-16-C	TH-3437-16-C	3/8-16	1/2	3/4	1/2	3/8
2 (CuCr)	188-2450-16-C	TH-2450-16-C	3/8-16	1/2	7/8	1/2	1/2
3	188-3450-16-C	TH-3450-16-C	3/8-16	1/2	7/8	1/2	1/2
2 (CuCr)	187-5062-14	5062-14-C	7/16-14	5/8	3/4	5/8	3/8
2 (CuCr)	187-5062-16	5062-16-C	3/8-16	5/8	3/4	5/8	3/8
2 (CuCr)	187-5100-10	5100-10-C	3/4-10	1	2	1	1-3/8
2 (CuCr)	187-5125-10	5125-10-C	3/4-10	1-1/4	2	1-1/4	1-3/8
2 (CuCr)	187-5100-11	5100-11-C	5/8-11	1	2	1	1-3/8
2 (CuCr)	187-5100-18	5100-18-C	5/8-18	1	2	1	1-3/8



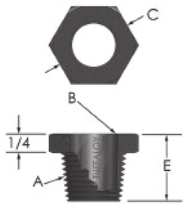
"E" TRUNCATED NOSE THREADED ELECTRODE

RWMA Alloy Class No.	Part Number	Part Description	T Thread Size	A Hex Size (in)	B Overall Length	D Weld Face Diameter	E Hex Body Length (in)	F Angle
2 (CuCr)	188-2425-16-E	TH-2425-16-E	3/8-16	1/2	5/8	3/16	1/4	20°
3	188-3425-16-E	TH-3425-16-E	3/8-16	1/2	5/8	3/16	1/4	20°
3	188-3437-16-E	TH-3437-16-E	3/8-16	1/2	3/4	3/16	3/8	20°
2 (CuCr)	188-2450-16-E	TH-2450-16-E	3/8-16	1/2	7/8	3/16	1/2	20°
3	188-3450-16-E	TH-3450-16-E	3/8-16	1/2	7/8	3/16	1/2	20°
2 (CuCr)	188-5062-14	5062-14-E	7/16-14	5/8	3/4	1/4	3/8	45°
2 (CuCr)	188-5100-11	5100-11-E	5/8-11	1	2	1/2	1-3/8	20°
2 (CuCr)	188-5100-18	5100-18-E	5/8-18	1	2	1/2	1-3/8	20°
2 (CuCr)	188-5100-10	5100-10-E	3/4-10	1	2	1/2	1-3/8	20°
2 (CuCr)	188-5125-10	5125-10-E	3/4-10	1	2	1/2	1-3/8	20°

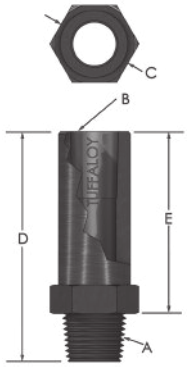
TUFFALOY threaded electrode adapters are used to provide longer electrode holder life, by providing a changable tip socket in holders having threaded openings. Class 2 alloy. Other alloys available.

A Pipe Thread or Taper	B Taper Socket	C Body Size	D Body Length	E Over-All Length	Description	Part Number
1/2-14 NPT	4RW	1" Hex	1/4	7/8	AD-124-.8	190-1408
			3/8	1	AD-124-1.0	190-1410
			5/8	1-1/4	AD-124-1.2	190-1412
			7/8	1-1/2	AD-124-1.5	190-1415
			1-1/8	1-3/4	AD-124-1.7	190-1417
			1-3/8	2	AD-124-2.0	190-1420
			1-5/8	2-1/4	AD-124-2.2*	
			1-7/8	2-1/2	AD-124-2.5	190-1425
			2-1/8	2-3/4	AD-124-2.7*	
			2-3/8	3	AD-124-3.0	190-1430
			2-5/8	3-1/4	AD-124-3.2*	
			2-7/8	3-1/2	AD-124-3.5	190-1435
			3-1/8	3-3/4	AD-124-3.7*	
			3-3/8	4	AD-124-4.0	190-1440
			4-3/8	5	AD-124-5.0*	
1/2-14 NPT	5RW	1" Hex	1/4	7/8	AD-125-.8	190-1508
			3/8	1	AD-125-1.0	190-1510
			5/8	1-1/4	AD-125-1.2	190-1512
			7/8	1-1/2	AD-125-1.5	190-1515
			1	1-5/8	AD-125-1.6*	
			1-1/8	1-3/4	AD-125-1.7	190-1517
			1-3/8	2	AD-125-2.0	190-1520
			1-5/8	2-1/4	AD-125-2.2*	
			1-7/8	2-1 /2	AD-125-2.5	190-1525
			2-1/8	2-3/4	AD-125-2.7*	
			2-3/8	3	AD-125-3.0	190-1530
			2-5/8	3-1/4	AD-125-3.2*	
			2-7/8	3-1/2	AD-125-3.5	190-1535
			3-1/8	3-3/4	AD-125-3.7*	
			3-3/8	4	AD-125-4.0	190-1540
			3-7/8	4-1/2	AD-125-4.5*	
5/8-14 NPT	4RW	1" Hex	1/4	7/8	AD-584-.8	190-2408
			3/8	1	AD-584-1.0	
			7/8	1-1/2	AD-584-1.5*	
			1-3/8	2	AD-584-2.0*	
5/8-14 NPT	5RW	1" Hex	1/4	7/8	AD-585-.8	190-2508
			3/8	1	AD-585-1.0*	190-2510
			5/8	1-1/4	AD-585-1.2	190-2512
			7/8	1-1/2	AD-585-1.5	190-2515
			1-1/8	1-3/4	AD-585-1.7	190-2517
			1-3/8	2	AD-585-2.0*	
			1-7/8	2-1/2	AD-585-2.5*	
			2-3/8	3	AD-585-3.0*	
			3-3/8	4	AD-585-4.0*	
3/4-14 NPT	5RW	1.25 Hex	3/16	1-1/8	AD-345-1.1*	
			7/16	1-3/8	AD-345-1.3*	
			9/16	1-1/2	AD-345-1.5	190-3515
			13/16	1-3/4	AD-345-1.7	190-3517
			1-1/16	2	AD-345-2.0	190-3520
			1-9/16	2-1/2	AD-345-2.5	190-3525
			2-1/16	3	AD-345-3.0	190-3530
			2-9/16	3-1/2	AD-345-3.5	190-3535
			3-1/16	4	AD-345-4.0	190-3540
			4-1/16	5	AD-345-5.0	190-3550
3/4-14 NPT	6RW	1.25 Hex	5/16	1-1/4	AD-346-1.2*	
			7/16	1-3/8	AD-346-1.3	190-3613
			9/16	1-1/2	AD-346-1.5	190-3615
			1-1/16	2	AD-346-2.0	190-3620
			1-9/16	2-1/2	AD-346-2.5	190-3625
			1-13/16	2-3/4	AD-346-2.7*	
			2-1/16	3	AD-346-3.0	190-3630
			2-9/16	3-1/2	AD-346-3.5	190-3635
			3-1/16	4	AD-346-4.0	190-3640
			3-9/16	4-1/2	AD-346-4.5	190-3645
			4-1/16	5	AD-346-5.0	190-3650
3/4-14 NPT	7RW	1.25 Hex	9/16	1-1/2	AD-347-1.5	190-3715
			1-1/16	2	AD-347-2.0	190-3720
			1-9/16	2-1/2	AD-347-2.5	190-3725
			2-1/16	3	AD-347-3.0	190-3730
			2-9/16	3-1/2	AD-347-3.5	190-3735
			3-1/16	4	AD-347-4.0	190-3740
			3-9/16	4-1/2	AD-347-4.5	190-3745
			4-1/16	5	AD-347-5.0	190-3750
4RW	5RW	1" Hex	1	2	AD-45-2	190-4520
			2	3	AD-45-3	190-4530
			3	4	AD-45-4	190-4540
5RW	4RW	7/8 Hex	1/4	1-1/8	AD-54-1	190-5410
			1	2	AD-54-2	190-5420
			1-1/2	2-1/2	AD-54-2.5*	
			2	3	AD-54-3	190-5430
			3	4	AD-54-4	190-5440
5RW	5RW	7/8 Hex	1	2	AD-55-2	190-5520
			1-1/2	2-1/2	AD-55-2.5	190-5525
			2	3	AD-55-3*	
			3	4	AD-55-4	190-5540
			4	5	AD-55-5	190-5550
5RW	6RW	1" Hex	1-1/8	2	AD-56-2	190-5620
6RW	4RW	1" Hex	1/4	1-1/4	AD-64-1	190-6410
6RW	5RW	1" Hex	1/4	1-1/4	AD-65-1	190-6510
7RW	4RW	1" Hex	1/4	1-1/2	AD-74-1	190-7410
7RW	5RW	1" Hex	1/4	1	AD-75-1	190-7510
			3/4	2	AD-75-2	190-7520
			2-1/4	3-1/2	AD-75-3.5*	
			2-3/4	4	AD-75-4*	

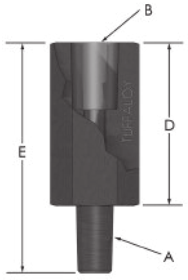
Not commonly stocked - other adapters available upon request



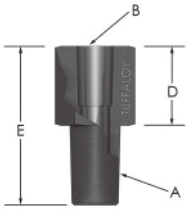
AD-124-.8, AD-125-.8, AD-584-.8, AD-585-.8,



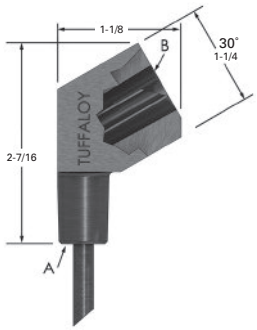
AD-124-1.0, AD-124-4.0, AD-125-1.0, AD-125-4.0, AD-345-1.0, AD-347-4.0,



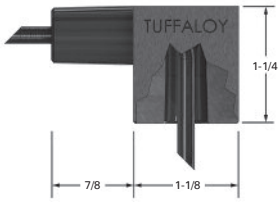
AD-45-2, AD-45-4,



AD-54-1, AD-75-2,



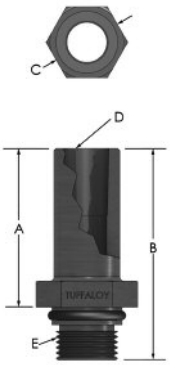
AD-55-30, for 5 RW Tip, Part No. 190-9553



AD-55-90, for 5 RW Tip, Part No. 190-9559

AD-54-90, for 4 RW Tip, Part No. 190-9549

STRAIGHT THREADED ADAPTERS FOR MULTI-SPOT BARREL AND CLAMP



194-2085 1-3/8 D. Barrel Required for 1-12 NF Adapter

A	B	Description	Part No.
D = 4 RW TAPER - E = 7/8-14 NF			
3/8	1-1/8	AD-134-1.1	190-3211
1/2	1-1/4	AD-134-1.2	190-3212
5/8	1-3/8	AD-134-1.3	190-3213
3/4	1-1/2	AD-134-1.5	190-3215
1	1-3/4	AD-134-1.7	190-3217
1-1/4	2	AD-134-2.0	190-3220
1-1/2	2-1/4	AD-134-2.2	190-3222
1-3/4	2-1/2	AD-134-2.5	190-3225
2-1/4	3	AD-134-3.0	190-3230
2-3/4	3-1/2	AD-134-3.5	190-3250
D = 5 RW TAPER - E = 7/8-14 NF			
3/8	1-1/8	AD-135-1.1	190-3311
1 /2	1-1/4	AD-135-1.2	190-3312
5/8	1-3/8	AD-135-1.3	190-3313
3/4	1-1/2	AD-135-1.5	190-3315
1	1-3/4	AD-135-1.7	190-3317
1-1/4	2	AD-135-2.0	190-3320
1-1/2	2-1/4	AD-135-2.2	190-3322
1-3/4	2-1/2	AD-135-2.5	190-3325
2-1/4	3	AD-135-3.0	190-3330
2-3/4	3-1/2	AD-135-3.5	190-3335
D = 5 RW TAPER - E = 1-12 NF			
3/8	1-1/8	AD-105-1.1	190-4311
1/2	1-1/4	AD-105-1.2	190-4312
5/8	1-3/8	AD-105-1.3	190-4313
3/4	1-1/2	AD-105-1.5	190-4315
1	1-3/4	AD-105-1.7	190-4317
1-1/4	2	AD-105-2.0	190-4320
D = 5 RW TAPER - E = 1-12 NF			
1-1/2	2-1/4	AD-105-2.2	190-4322
1-3/4	2-1/2	AD-105-2.5	190-4325
2	2-3/4	AD-105-2.7	190-4327
2-1/4	3	AD-105-3.0	190-4330
2-3/4	3-1/2	AD-105-3.5	190-4335

1.25 Hex (4 RW TAPER)

1.25 Hex (5 RW TAPER - 1-12 NF)

1.25 Hex (5 RW TAPER - 1-12 NF)

These standard-tip holders are mounted directly to air or hydraulic cylinder pistons. They are ideal for assembling special multi-head resistance welding equipment. Current and coolant water are brought to each of the holders separately.

Electrode adapters for the tip diameter being used and in lengths to suit your set-up are ordered separately: see page 17. Water tubes, for carrying water into the tip, should also be ordered separately.

TUFFALOY offers both straight and offset holders for cylinder mounting. Clamps, hose connections, water tubes and adaptors are not included. Order separately.

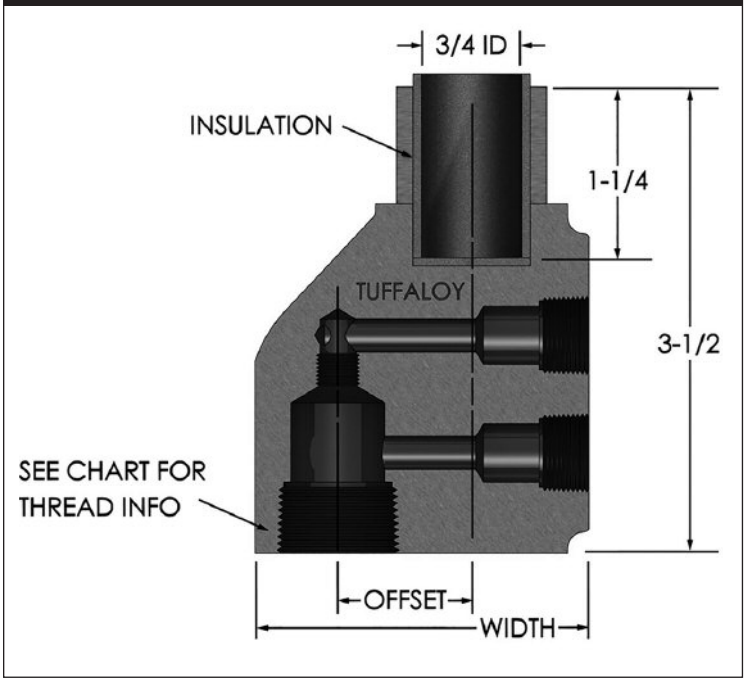
OFFSET HOLDERS

Offset holders are offered in eight offset sizes, from 1/8 to 1 inch. The standard models have a 1/2-NPT adapter socket, to hold adapters for 4 & 5RW tips. Ordering a 3/4-NPT socket will permit adapters for 6 & 7RW tips to be used.

OFFSET HOLDERS

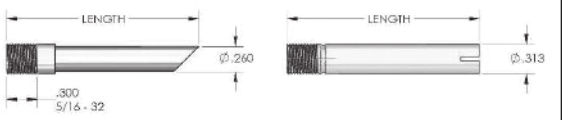
Offset (inches)	Width (inches)	4 & 5 RW Part No. 7/8-14 Threads	4 & 5 RW Part No. 1/2" Pipe	6 & 7 RW Part No. 3/4" Pipe
1.0	2.5	194-1578	194-1588	194-1598
0.88	2.5	194-1577	194-1587	
0.75	2.31	194-1576	194-1586	194-1596
0.62	2.18	194-1575	194-1585	
0.50	2.06	194-1574	194-1584	194-1594
0.38	1.94	194-1573	194-1583	
0.25	1.81	194-1572	194-1582	
0.12	1.68	194-1571	194-1581	

ORDER CLAMP SEPARATELY



To determine distance adapter sticks out from holder, deduct 1/2-in from length of adapter selected. Water tubes 1/2-in. longer than adapter will install approximately flush with adapter face.

STATIONARY WATER TUBES



FOR 4 RW TIPS FOR 5, 6 OR 7 RW TIPS

STATIONARY WATER TUBES

Length	FOR 4RW USE Description	FOR 4RW USE Part No.	FOR 5RW, 6RW OR 7RW USE Description	FOR 5RW, 6RW OR 7RW USE Part No.
3/4	301-.7	194-3107	312-.7	194-3207
1	301-1.0	194-3110	312-1.0	194-3210
1-1/4	301-1.2	194-3112	312-1.2	194-3212
1-1/2	301-1.5	194-3115	312-1.5	194-3215
1-3/4	301-1.7	194-3117	312-1.7	194-3217
2	301-2.0	194-3120	312.2.0	194-3220
2-1/2	301-2.5	194-3125	312-2.5	194-3225
3	301-3.0	194-3130	312-3.0	194-3230
3-1/2	301-3.5	194-3135	312-3.5	194-3235
4	301-4.0	194-3140	312-4.0	194-3240
4-1/2	301-4.5	194-3145	312-4.5	194-3245

STRAIGHT HOLDERS

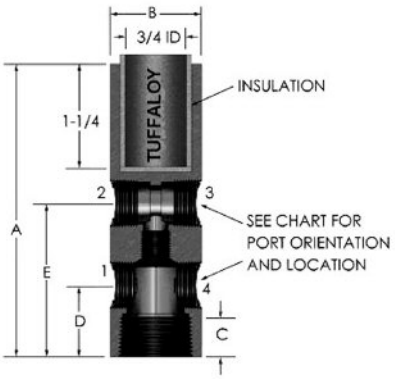
Straight holders for multi-spot welding are available in two sizes, to carry tips having four different diameters. Series 101 holders are for 4 & 5RW tips, and Series 102 holders are for 6 & 7RW tips. They may be ordered with one or two sets of coolant ports.

Mating electrical contact surfaces of both the barrels and the clamp are silver plated. Item Numbers for replacement barrels and clamp parts are called out on the drawings.

ADAPTERS FOR MULTI-SPOT BARREL AND CLAMP

TUFFALOY threaded electrode adapters are used to provide longer electrode holder life, by providing a changeable electrode socket in holders having threaded openings. Standard electrode adapters are made of class 2 alloy. Other alloys available.

STRAIGHT HOLDERS

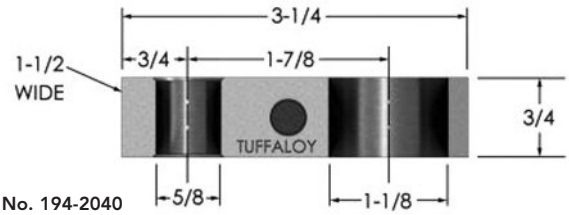


IN LINE PORTS OFFSET 20° PORTS

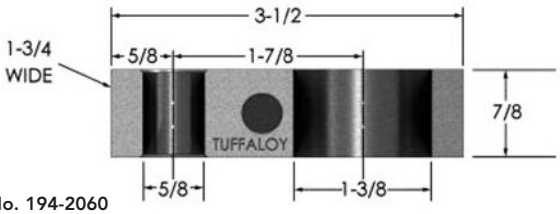
CYLINDER MOUNTED STRAIGHT BARREL HOLDERS

Part Number	Description	Overall Length "A" (inches)	Clamping Diameter "B" (inches)	Thread Type	Water In "E"	Water Out "D"	Water Fitting Thread	Water Port Orientation
194-2020	101-A	3.58	1-1/8	1/2-14 NPT	1-7/8	7/8	1/4-18 NPT	In Line 1 & 2
194-2025	101-B	3.58	1-1/8	1/2-14 NPT	1-7/8	7/8	1/4-18 NPT	In Line 1, 2, 3 & 4
194-2026	SH-101-1	3.25	1-1/8	1/2-14 NPT	1-5/8	7/8	1/8-27 NPT	In Line 1, 2, 3 & 4
194-2070	102-A	3.93	1-3/8	3/4-14 NPT	2-3/16	1-3/16	1/4-18 NPT	In Line 1 & 2
194-2075	102-B	3.93	1-3/8	3/4-14 NPT	2-3/16	1-3/16	1/4-18 NPT	In Line 1, 2, 3 & 4
194-2080	103-A	3.58	1-1/8	7/8-14	1-7/8	1-1/16	1/4-18 NPT	In Line 1 & 2
194-2081	SH-101-876	3.58	1-1/8	7/8-14	1-7/8	1-1/16	1/4-18 NPT	In Line 1, 2, 3 & 4 Offset 20°
194-2082	653-1036	3.58	1-1/8	7/8-14	1-7/8	1-1/16	1/4-18 NPT	In Line 1 & 2 Offset 20°
194-2085	SH-102-B	3.93	1-3/8	1-12	2-3/16	1-3/16	1/4-18 NPT	In Line 1, 2, 3 & 4

CLAMPS FOR CYLINDER MOUNTED HOLDERS



Part No. 194-2040



Part No. 194-2060

CLAMPS FOR CYLINDER MOUNTED HOLDERS

Part Number	Description	Length (inches)	Width (inches)	Height (inches)	Diameter of Holder Socket (inches)	Diameter of Welding Cable Socket (inches)	Location of Welding Cable Socket (inches)	Location of Holder Stocket (inches)
194-2040	101-2	3-1/4	1-1/2	3/4	1-1/8	5/8	3/4	2-5/8
194-2060	102-2	3-1/2	1-3/4	7/8	1-3/8	5/8	5/8	2-1/2

GOLDCROWN® AND STANDARD EJECTOR HOLDERS

with self-adjusting water tubes

TUFFALOY straight tip-ejecting holders deliver dependable, first class performance. They are designed with maximum simplicity to require minimum maintenance.
All TUFFALOY straight holders now feature exclusive spring-loaded self-adjusting water tubes to ensure the proper flow of coolant through resistance welding electrodes.
The larger ejector holders incorporate bigger fittings for higher coolant flow rates.

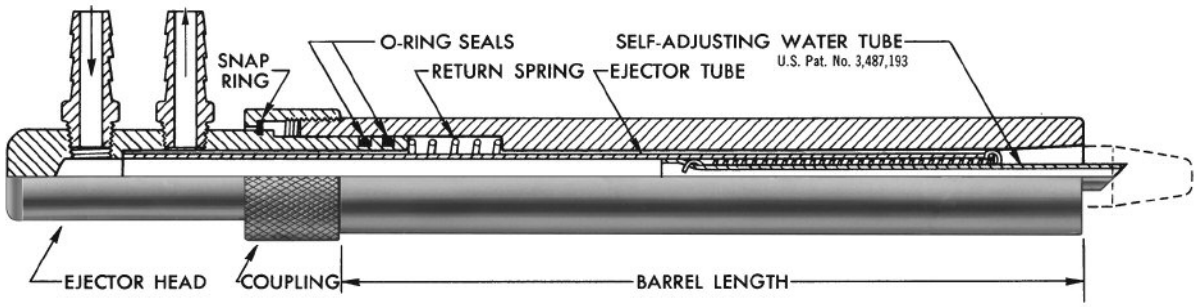
Goldcrown premium holders are made of extra-strength Class 2 alloy and are ground and polished to yield greatest conductivity.

ADAPTER FOR THREADED BARRELS			
Part No.	Descrip-tion	Taper	THD
195-8550	8550	4RW	5/8-14 NPT
195-8551	8551	5RW	5/8-14 NPT
190-3615	AD-346-1.5	6RW	3/4-14 NPT

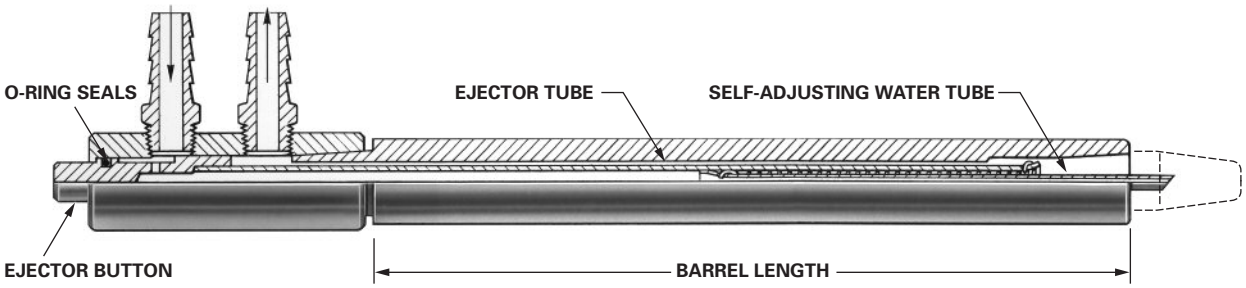
THESE ADAPTERS ARE SUPPLIED
with the holder

			GOLDCROWN		STANDARD	
Barrel Dia.	Tip Socket RW	Barrel Length	Descrip-tion	Part No.	Descrip-tion	Part No.
5/8	4	8	E-05084	320-0100		
5/8	4	12	E-05124	320-0120		
3/4	4	8	E-06084	320-0140		
3/4	5	8	E-06085	320-0150		
3/4	4	12	E-06124	320-0160		
3/4	5	12	E-06125	320-0170*		
7/8	4	8	E-07084	320-0180		
7/8	5	8	E-07085	320-0190		
7/8	4	12	E-07124	320-0200		
7/8	5	12	E-07125	320-0210		
1	4	8	E-08084	320-0220	SHE-08084	321-0220
1	5	8	E-08085	320-0230	SHE-08085	321-0230
1	6	8	E-08086	320-0240*	SHE-08086	321-0240*
1	4	12	E-08124	320-0250	SHE-08124	321-0250
1	5	12	E-08125	320-0260	SHE-08125	321-0260
1	6	12	E-08126	320-0270*	SHE-08126	321-0270*
1-1/4	4	8	E-10084	320-0280	SHE-10084	321-0280
1-1/4	5	8	E-10085	320-0290	SHE-10085	321-0290
1-1/4	6	8	E-10086	320-0300*	SHE-10086	321-0300*
1-1/4	7	8	E-10087	320-0310	SHE-10087	321-0310
1-1/4	4	12	E-10124	320-0320	SHE-10124	321-0320
1-1/4	5	12	E-10125	320-0330	SHE-10125	321-0330
1-1/4	6	12	E-10126	320-0340*	SHE-10126	321-0340*
1-1/4	7	12	E-10127	320-0350	SHE-10127	321-0350
1-1/2	4	8	E-12084	320-0360*	SHE-12084	321-0360
1-1/2	5	8	E-12085	320-0370	SHE-12085	321-0370
1-1/2	5	8	E-12085-A	320-0375*	SHE-12085-A	321-0375*
1-1/2	6	8	E-12086	320-0380	SHE-12086	321-0380
1-1/2	6	8	E-12086-A	320-0385	SHE-12086-A	321-0385
1-1/2	7	8	E-12087	320-0390	SHE-12087	321-0390
1-1/2	4	12	E-12124	320-0410	SHE-12124	321-0410
1-1/2	4	12	E-12124-A	320-0415*	SHE-12124-A	321-0415*
1-1/2	5	12	E-12125	320-0420	SHE-12125	321-0420
1-1/2	5	12	E-12125-A	320-0425*	SHE-12125-A	321-0425*
1-1/2	6	12	E-12126	320-0440*	SHE-12126	321-0440*
1-1/2	7	12	E-12127	320-0450	SHE-12127	321-0450

Suffix 'A' in holder description denotes a threaded tip adapter is supplied
**Item not normally stocked*



Cross-section of holders with barrels 1 inch or more in diameter.



Cross-section of holders with barrels 7/8 inch or less in diameter.

GOLDSPOT® AND STANDARD NON-EJECTOR HOLDERS

with self-adjusting water tubes

TUFFALOY straight non-ejector holders are now equipped with the same springloaded self-adjusting water tubes as the Goldcrown ejector unit, so electrode cooling is facilitated and improved. They are low in initial cost and inexpensive to maintain. Simple design and few parts contribute to low maintenance cost and excellent performance. Holders are heavy-duty and built to withstand very high welding rates.

Goldspot premium holders have barrels of Class 2 alloy, ground and polished for best conductivity.

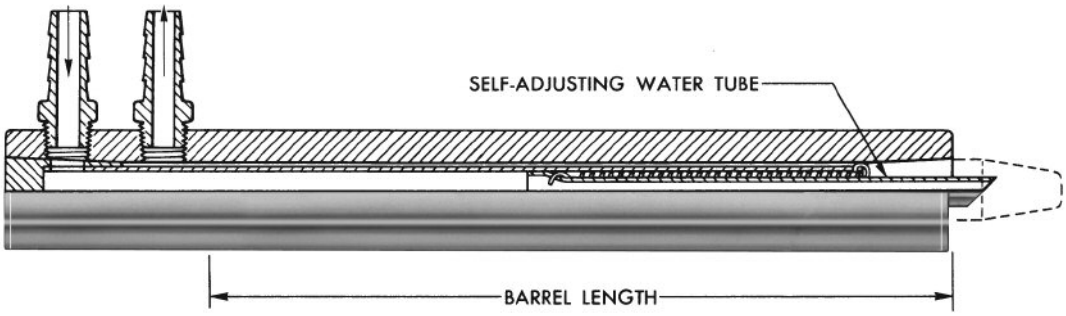
Cross-section view of holders with barrels less than 1 inch diameter.

ADAPTER FOR THREADED BARRELS			
Part No.	Description	Taper	THD
195-8550	8550	4RW	5/8-14 NPT
195-8551	8551	5RW	5/8-14 NPT
190-3615	AD-346-1.5	6RW	3/4-14 NPT
190-3715	AD-347-1.5	7RW	3/4-14 NPT

THESE ADAPTERS ARE SUPPLIED *with the holder*

			GOLDSPOT		STANDARD	
Barrel Dia.	Tip Socket RW	Barrel Length	Description	Part No.	Description	Part No.
5/8	4	8	N-05084	325-0100		
5/8	4	12	N-05124	325-0120*		
3/4	4	8	N-06084	325-0140		
3/4	5	8	N-06085	325-0150*		
3/4	4	12	N-06124	325-0160*		
3/4	5	12	N-06125	325-0170*		
7/8	4	8	N-07084	325-0180		
7/8	5	8	N-07085	325-0190*		
7/8	4	12	N-07124	325-0200		
7/8	5	12	N-07125	325-0210*		
1	4	8	N-08084	325-0220	SHN-08084	326-0220
1	4	8	N-08084-A	325-0225	SHN-08084-A	326-0225
1	5	8	N-08085	325-0230	SHN-08085	326-0230
1	5	8	N-08085-A	325-0235*	SHN-08085-A	326-0235*
1	6	8	N-08086	325-0240*	SHN-08086	326-0240*
1	4	12	N-08124	325-0250	SHN-08124	326-0250
1	4	12	N-08124-A	325-0255	SHN-08124-A	326-0255
1	5	12	N-08125	325-0260	SHN-08125	326-0260
1	5	12	N-08125-A	325-0265	SHN-08125-A	326-0265
1	6	12	N-08126	325-0270*	SHN-08126	326-0270*
1-1/4	4	8	N-10084	325-0280*	SHN-10084	326-0280*
1-1/4	4	8	N-10084-A	325-0285	SHN-10084-A	326-0285
1-1/4	5	8	N-10085	325-0290	SHN-10085	326-0290
1-1/4	5	8	N-10085-A	325-0295	SHN-10085-A	326-0295
1-1/4	6	8	N-10086	325-0300*	SHN-10086	326-0300*
1-1/4	7	8	N-10087	325-0310*	SHN-10087	326-0310*
1-1/4	4	12	N-10124	325-0320	SHN-10124	326-0320
1-1/4	4	12	N-10124-A	325-0325*	SHN-10124-A	326-0325*
1-1/4	5	12	N-10125	325-0330	SHN-10125	326-0330
1-1/4	5	12	N-10125-A	325-0335	SHN-10125-A	326-0335
1-1/4	6	12	N-10126	325-0340*	SHN-10126	326-0340*
1-1/4	7	12	N-10127	325-0350*	SHN-10127	326-0350*
1-1/2	4	8	N-12084	325-0360*	SHN-12084	326-0360*
1-1/2	4	8	N-12084-A	325-0365*	SHN-12084-A	326-0365*
1-1/2	5	8	N-12085	325-0370	SHN-12085	326-0370
1-1/2	5	8	N-12085-A	325-0375	SHN-12085-A	326-0375
1-1/2	6	8	N-12086	325-0380*	SHN-12086	326-0380*
1-1/2	7	8	N-12087	325-0390	SHN-12087	326-0390
1-1/2	4	12	N-12124	325-0410*	SHN-12124	326-0410*
1-1/2	5	12	N-12125	325-0420	SHN-12125	326-0420
1-1/2	5	12	N-12125-A	325-0425*	SHN-12125-A	326-0425*
1-1/2	6	12	N-12126	325-0440*	SHN-12126	326-0440*
1-1/2	7	12	N-12127	325-0450*	SHN-12127	326-0450*

Suffix "A" in holder description denotes a threaded tip adapter is supplied
**Item not normally stocked*

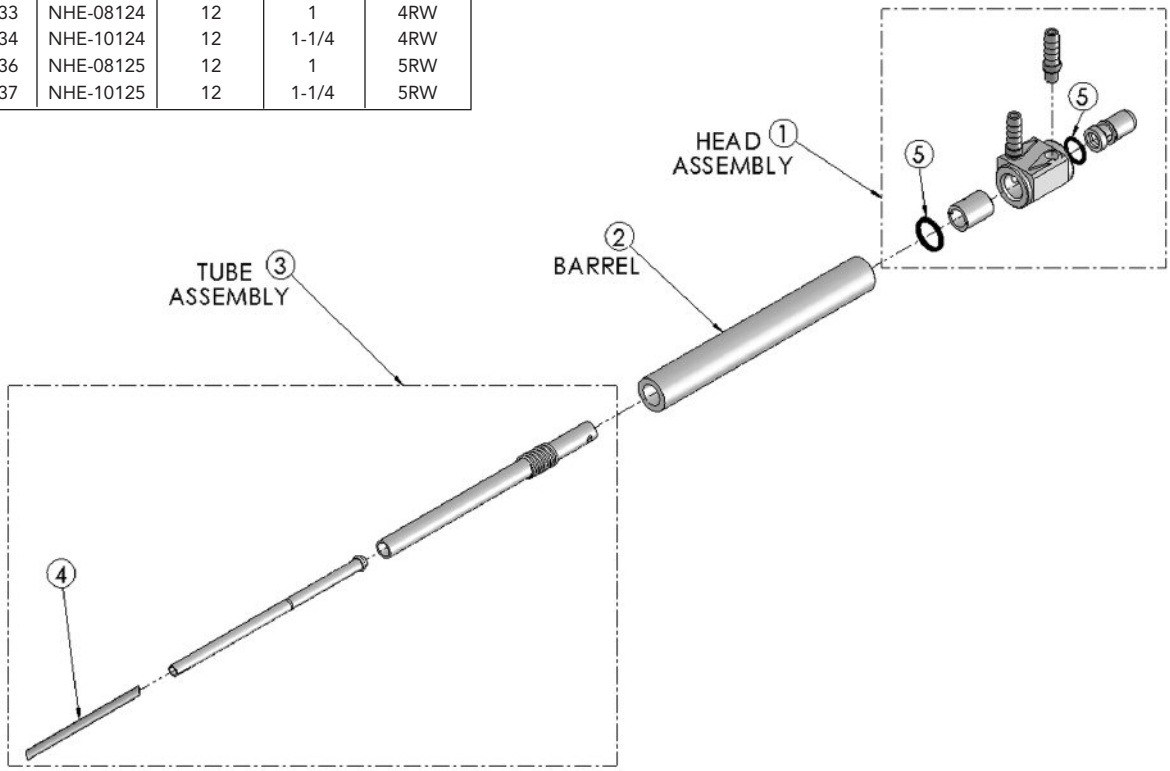


Cross-section view of holders with barrels 1 inch or more in diameter.

Part Number	Descrip-tion	Barrel Length (in)	Barrel Dia. (in)	Tip Socket Taper
319-0206	NHE-08035	3	1	5RW
319-0207	NHE-10035	3	1-1/4	5RW
319-2011	NHE-06084	8	3/4	4RW
319-0212	NHE-07084	8	7/8	4RW
319-0213	NHE-08084	8	1	4RW
319-0214	NHE-10084	8	1-1/4	4RW
319-0216	NHE-08085	8	1	5RW
319-0217	NHE-10085	8	1-1/4	5RW
319-0231	NHE-06124	12	3/4	4RW
319-0232	NHE-07124	12	7/8	4RW
319-0233	NHE-08124	12	1	4RW
319-0234	NHE-10124	12	1-1/4	4RW
319-0236	NHE-08125	12	1	5RW
319-0237	NHE-10125	12	1-1/4	5RW

TUFFALOY NICKEL PLATED EJECTOR HOLDERS

TUFFALOY nickel plated ejector holders feature high conductivity copper with nickel plated surfaces for corrosion resistance and super conductivity. These holders also feature adjustable water tubes to insure proper water flow for all electrodes.



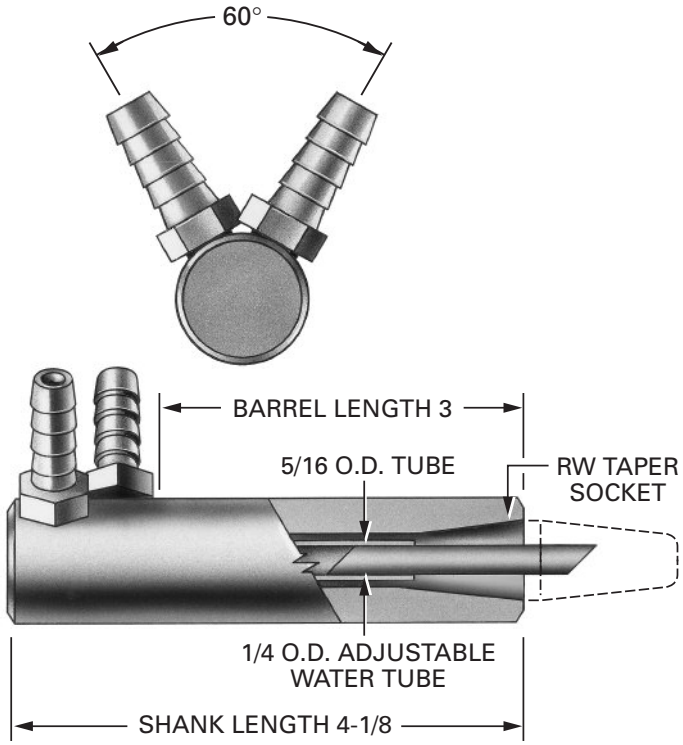
Descrip-tion	Holder Assy.	1 Head Assy.	2 Barrel	3 Tube Assy.	4 Water Tube	5 Hose O-Ring Kit
NHE-08084	319-0213	195-0101	001-213B	195-0210	195-0017	037-0105
NHE-10084	319-0214	195-0101	001-214B	195-0210	195-0017	037-0105
NHE-08085	319-0216	195-0100	001-216B	195-0208	195-0015	037-0106
NHE-10085	319-0217	195-0100	001-217B	195-0208	195-0015	037-0106
NHE-08124	319-0233	195-0101	001-233B	195-0211	195-0017	037-0105
NHE-10124	319-0234	195-0101	001-234B	195-0211	195-0017	037-0105
NHE-08125	319-0236	195-0100	001-236B	195-0212	195-0015	037-0106
NHE-10125	319-0237	195-0100	001-237B	195-0212	195-0015	037-0106

CLOSED-COUPLED HOLDERS

For use where welding space is limited. Standard body length is 3 inches. Other lengths are made on request; minimum length 2 inches.

Body Dia.	Tip Socket	Descrip-tion	Part No.
3/4	4RW	N-06034	330-0140
7/8	4RW	N-07034	330-0180
7/8	5RW	N-07035	330-0190
1	4RW	N-08034	330-0220
1	5RW	N-08035	330-0230
1-1/4	4RW	N-10034	330-0280
1-1/4	5RW	N-10035	330-0290
1-1/2	4RW	N-12034	330-0360*
1-1/2	5RW	N-12035	330-0370*

**Item not normally stocked*

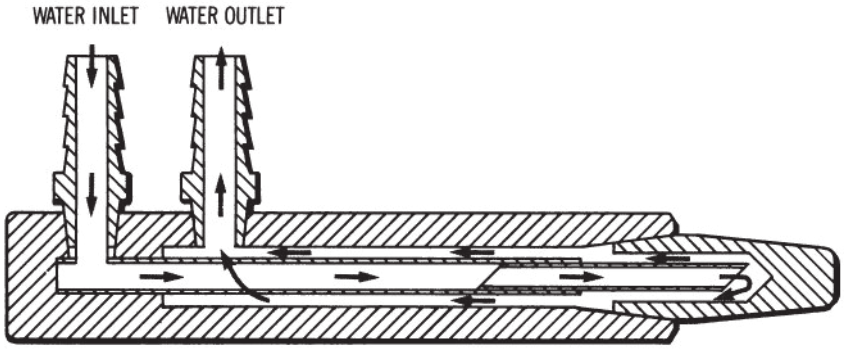


ADJUSTABLE WATER TUBE USE

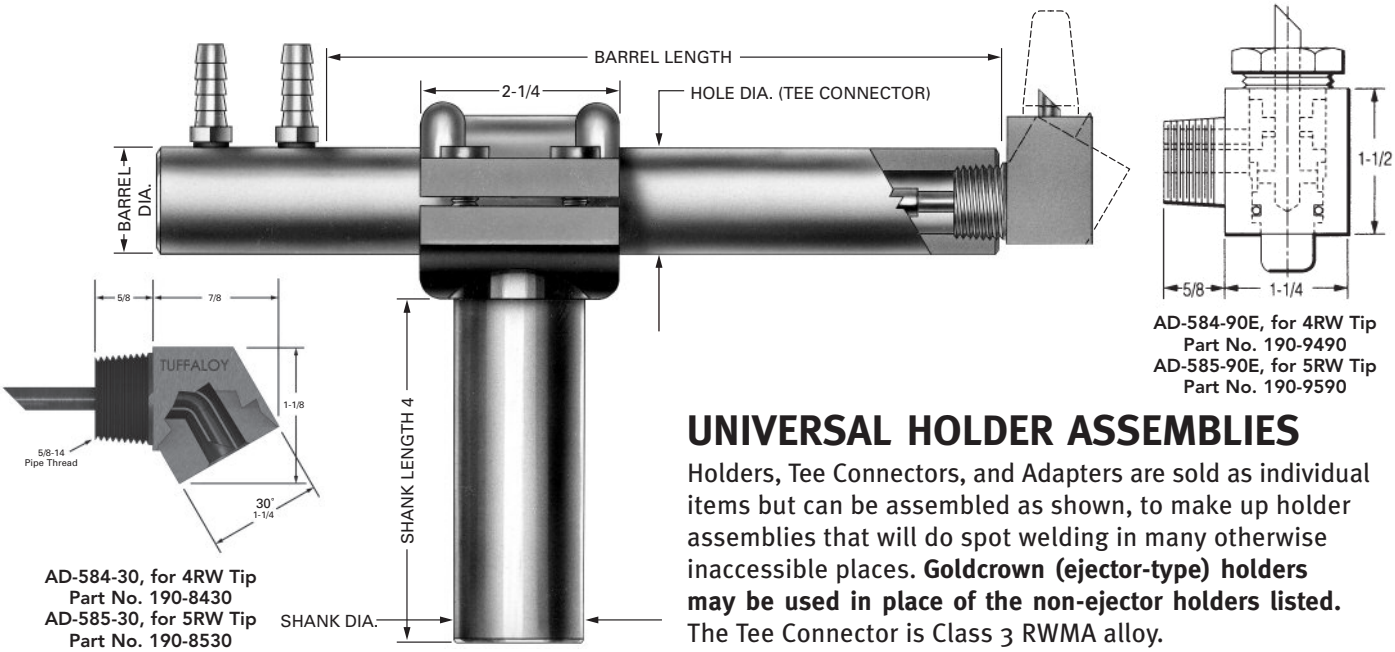
It is very important that resistance welding electrodes be kept as cool as possible; excessive heat softens them, allowing the nose to mushroom and weld quality to drop.

Adjustable water tubes are used to deflect incoming coolant water to the full extent of the water hole in the electrode. Before installing a tip, check that there is an adjustable water tube in place and that it is pulled out far enough so that it will contact the end of the water hole in the tip.

The drawing shows a typical straight holder, but the principle is the same for all types of holders.



Adjustable water tube correctly positioned in tip. Cold water will strike the hottest part of the tip first.

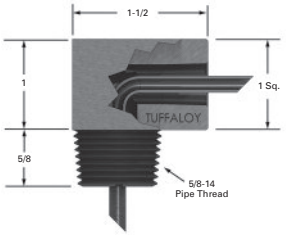


AD-584-90E, for 4RW Tip
Part No. 190-9490
AD-585-90E, for 5RW Tip
Part No. 190-9590

AD-584-30, for 4RW Tip
Part No. 190-8430
AD-585-30, for 5RW Tip
Part No. 190-8530

UNIVERSAL HOLDER ASSEMBLIES

Holders, Tee Connectors, and Adapters are sold as individual items but can be assembled as shown, to make up holder assemblies that will do spot welding in many otherwise inaccessible places. **Goldcrown (ejector-type) holders may be used in place of the non-ejector holders listed.** The Tee Connector is Class 3 RWMA alloy.



AD-584-90, for 4RW Tip
Part No. 190-8490
AD-585-90, for 5RW Tip
Part No. 190-8590

HOLDERS				TEE CONNECTORS			
Barrel Dia.	Barrel Length	Descrip-tion.	Part No.	Hole Dia.	Shank Dia.	Descrip-tion	Part No.
1	8	N-08085-A	325-0235	1	1	T-1-1	192-1100
1-1/4	8	N-10085-A	325-0295	1-1/4	1	T-1	192-1000
1-1/4	8	N-10085-A	325-0295	1-1/4	1	T-1	192-1000
1-1/4	8	N-10085-A	325-0295	1-1/4	1-1/4	T-125	192-1250
1-1/4	8	N-10085-A	325-0295	1-1/4	1-1/4	T-125	192-1250
1-1/4	8	N-10085-A	325-0295	1-1/4	1-1/4	T-125	192-1250
1-1/2	8	N-12085-A	325-0375	1-1/2	1-1/2	T-15	192-1500
1-1/2	8	N-12085-A	325-0375	1-1/2	1-1/2	T-15	192-1500
1-1/2	8	N-12085-A	325-0375	1-1/2	1-1/2	T-15	192-1500

ADAPTERS TO CHOOSE FROM			
Tip Socket	Angle Degrees	Descrip-tion	Part No.
4RW	90	AD-584-90	190-8490
4RW	30	AD-584-30	190-8430
5RW	90	AD-585-90	190-8590
5RW	30	AD-585-30	190-8530
6RW	90	AD-586-90	190-8690

WELDER ARMS TUFFALOY

Class 2 spot welding machine arms made by Tuffaloy reduce set up time and give longer life.

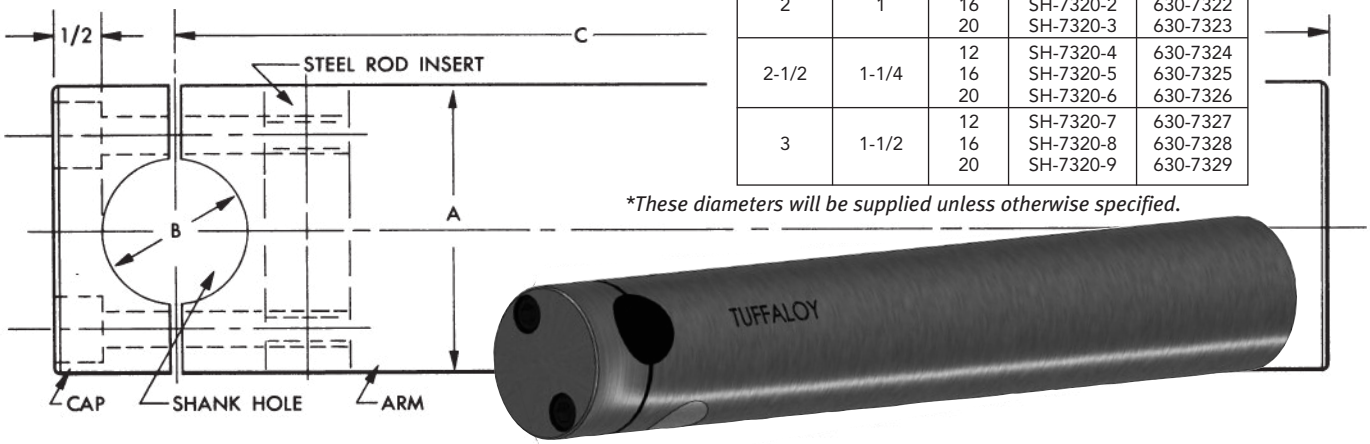
Electrode holder shanks can be attached to these arms from the front, by bolting the cap over them. This means no extra clearance is required between the arms to allow running a shank up (or down) into a hole in the arm. It makes the insertion of Tuffaloy multiple-welding holders much easier.

One of the most common failures of welder arms is the destruction of the bolt hole threads, due to the relatively soft copper involved. Tuffaloy arms have a transverse steel bar insert in which the bolt hole threads are cut. This provides greatly increased thread life.

Standard arm configurations are shown in the table. Special arms are also available.

A Arm Diameter	B Hole Diameter*	C Arm Length	Descrip-tion	Part No.
2	1	12	SH-7320-1	630-7321
		16	SH-7320-2	630-7322
		20	SH-7320-3	630-7323
2-1/2	1-1/4	12	SH-7320-4	630-7324
		16	SH-7320-5	630-7325
		20	SH-7320-6	630-7326
3	1-1/2	12	SH-7320-7	630-7327
		16	SH-7320-8	630-7328
		20	SH-7320-9	630-7329

**These diameters will be supplied unless otherwise specified.*



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. / &) 3 D;;H I =DA9: GH6G B 69: >C 6C9 >C8= D;;H IH 6C9 >C ;DJG H=6C@ H>O H L >I= P 6C9 P=: 69H . =: N6G: HJEEA>: 9 L >I= 696EI: GH ;DG(D DG(D , 1 I6E: GI>EH

. >E ?: 8IDGB : 8=6C>HB H6G 6K6>A67A DC 6AA P =: 69 =DA9: GH6C9 I=: P=: 69 >C D;;H I =DA9: GH , 74= >@34@=6 B78A 540BC@ 270=64 >@34@=C< 14@ ?@45F 5@< N$ # OB> N$ O F0< ?;4 $

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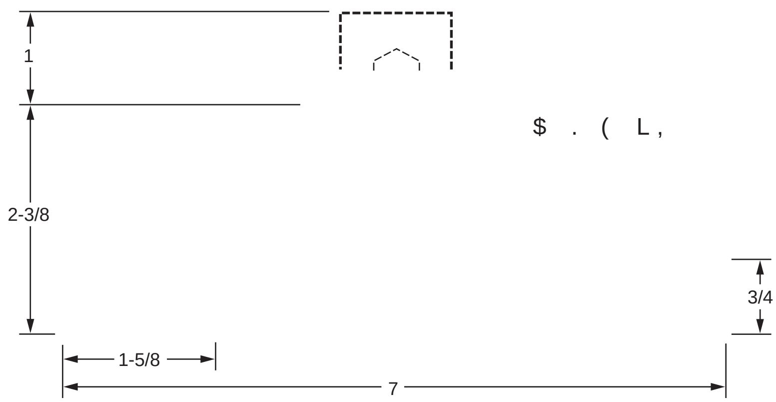

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* A6I: C' DJCI>C< * ' =DA9: GH7DA : 6H>ANIDI=: EA6I: C. HADIH6I 6CN9: H>G 9 AD86I>DC >C 6 B>C>B JB D; I>B : CD>CI: GB : 9>6GN9: K>8: >HG FJ>G 9 >< =6A; >C8= B DJCI>C< 7DAHB 6N7: JH 9 ID 6HHJG <DD9 8DC9J8I>K>IN . =: N6G I=: ;>GH HJ8= H6C96G9 HD8@9 =DA9: GHID 7: B 69: 6K6>A67A . =: N8DB : >CIL D H>O: H IDB 6I8= H6C96G9 . HADI HE68>C< 6C9 ID =DA9 I=: H>O: HD; I>EHH=DL C . =: HB 6AAH>O: * ' =DA9: G>H;DG JH DC , 1 ' - >O: EGHHINE: L : A9: GH >C HE68>C< 6C9 I=: A6G<: H>O: * ' =DA9: G>H;DG- >O: 6C9 L : A9: GH 6C9 >C HE68>C< . =: : A 8IGD9: H JH 9 9D CDI G FJ>G 6CN E6G>8JA6GG69>6AEDH>I>DC>C< IDD7I6>C EGDE: G8DDA6CI ;ADL . =: H 6G 8DB E68I =DA9: GHI=6I B 6N7: JH 9 DC: ID DC: DG>C B JA>EA: H >C 8ADH EGDM>B >IN ID DC: 6CDI=: G

>MIJG J>A9>C< * ' =DA9: GHB 6@ HE: 8>6A;>MIJG 7J>A9>C< : 6HNIDD . =: N86C 7: 7DA: 9 ID 6 ;>MIJG DG768@JE 76H 6H: 6H>AN6HID 6 EA6I: C . =: N6G 8DB E68I 6C9 =6K: H A; 8DCI6>C: 9 8DDA6CI HNH: B H I=6I : A>B >C6I: B 6@>C< 6 8DDA6CI B 6C>;DA9 DJI D; I=: ;>MIJG

" DH DCC: 8I>DCH 3DJ B 6NHE: 8>;NL =: G NDJ L 6CI I=: =DH 8DCC: 8IDGH>C I=: =: M6<DC6A76H - : A8I 6CNIL DD; I=: H>MEDHH>7A AD86I>DCH6C9 HE: 8>;N7NJH>C< I=: HNB 7DAHH=DL C DC I=: 9>6<G6B 8DCC: 8IDGAD86I>DCH DG : I8 * DH>I>DC >HH6C96G9 6C9 6G CDI EDHH>7A

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D; HE: 8>6AL : A9 ;>MJG<C< . =: N8DB : >C IL D H>O H L =>8=
B 6I8= H6C96C9 . HADI HE68>C<H : >I=: GD; L =>8= 86C 7:
;JGC>H=: 9 ID =DA9 6CND; I=: ;DJGH6C96C9 I>EH
DG , 1 . =: HB 6AA G=DA9: G>H;DGJH DC, 1 ' ->O
L : A9: GH L =>8= =6K I=: XHE68>C< . =: A6G<: GDC:
>H;DGI=: ->O 6C9 L : A9: GH L =>8= =6K I=: 6C9
>C8= HE68>C<

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<DD9 8DC9J8I>K>HN . =: =DA9: G>HB 6N7: JH 9 DC: ID
DC: DG>C B JA>EA: H8ADH AN7JC8=: 9 *' =DA9: G>HB 6@
HE: 8>6A;>MJG 7J>A9>C< : 6HN . =: N86C 7: 7DA: 9 ID 6
;>MJG DG768@JE 76H 6H: 6H>AN6HID 6 EA6I: C . =: N
6G 8DB E68I 6C9 =6K H A; 8DCI 6>C: 9 8DDA6CI HNH: B H

() # ') %%' $! ' (				
',) 8> (=294B	(8H4 4A2@> BB=<	(; 0:: %0@B # =	(8H4 4A2@> BB=<	!0@4 %0@B # =

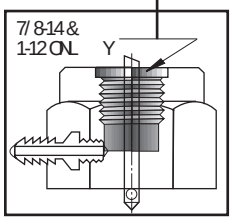
=: 6 78=78;6 *5BB<=8, 4. -

(8H4 %' =:34@ 8< ; =C<BB<6 1=:BA

$') ' !)' $ (		
) 7@03 (8H4	(8H4	(8H4

$') ' %) ' (		
) 7@03 (8H4	(8H4	(8H4

) 78A (BG4 $ <:G



%. *-*9=;<9*0.

%' =:34@A) (:=B(>028<6	=:34@ (8H4	=@ K 80 :42B@34A 4A2@>BB=<	%0@B # =	=@ L 80 :42B@34A 4A2@>BB=<	%0@B # =
	# #				

(8H4 %' =:34@

(8H4 %' =:34@

. =: K6GEDJHINE: H6C9 H+O HD; . / &) 3 HJ9 6C9 CJI L : A9>C<
: A:8IGD9: H6C9 =DA9: GH6G 9: H8G97: 9 7: ADL DG: M8: H+H<K L : 6G
6EEA86I>DCH6CND; I=: H : A:8IGD9: HB6N7: DG9: G9 L >I= G; G68IDCN
B : I6A;68>C<H HJ8= 6H. / &) 3

) 78A ABG4 7=:34@
5=C<3 0B1=BB=;
=5>064

()* !)'$ (

			4A2@B BB=<	%0@B # =	, 8B7 , 024 '45@2B=@G B4; #C; 14@
; ;					* * * * * * * * * * * *
; ;					* * * * * * * * * * * *

) 78A ABG4 7=:34@5=C<3
0BB=> =5>064

!)'$ (

(BC3 ;42B@34A
. J;;6ADNHJ9 : A:8IGD9: I>EH
6G ;DGEGD? 8I>DC L : A9>C<
H8G L H 7DAHDGE>CH L =: I=: G
I=: NE6H+HI=GDJ<= I=: H+: : I
DG6G ID7: 6II68=: 9
9>G8IANID>H;68:

#CB ;42B@34A
. J;;6ADNEGD? 8I>DC L : A9 CJI
: A:8IGD9: H6G 9: H+<C 9 ;DG
: >I=: GH A, E>ADI: 9 DGCDC
E>ADI: 9 CJIH . =: E>ADIHD; I=:
CDC E>ADI: 9 CJI : A:8IGD9: H
6G H+EG<C< AD69: 9 HDI=: N
86CZI >CI: G; G L >I= I=:
8DCI68I>C< D; CJI 6C9 H+: : I
JC9: GL : A9>C< EGH+HJG

(! %!$) #*) !)'$ (

=@# CB (8+4	%8< !4<6B7	:42B@34 !4<6B7	:42B@34 80; 4B4@	4A2@B BB=<	%0@B # =	, 8B7 , 024 '45@2B=@G B4; #C; 14@
; ;						* * * * * * * * * * * *
; ;						* * * * * * * * * * * *

#$# %!$) #*) !)'$ (

=@# CB (8+4	%8< 80; 4B4@	:42B@34 !4<6B7	! :42B@34 80; 4B4@	4A2@B BB=<	%0@B # =	, 8B7 , 024 '45@2B=@G B4; #C; 14@
; ;						* * * * * * * * * * * *
; ;						* * * * * * * * * * * *

(.5 270 * <=>- =1;8>01 *
185 27 <1. . =6 . =*5
(.5 270 * <=>- - 2. , =BB=8
/*, . 8/ <1. . =6 . =*5
%5 925B=; - 7>=*5207<2=<. 57
@2=1 =1. 185 27 <1. . =
! 87 925B=; - 7>=2<0>2 . - +B
<9. , 2*55B - . <207. - . 5 , ;8 - .

!)'$ $! '(

A

' %#*=!8 DD*7*-* #*=!8

-:K: G6AH6C96C9 :A8IGD9: =DA9:GH6G B6CJ;68IJG:9 7N.J;;6ADNID 688DBBD96I: 6AA=: .J;;6ADNHJ9 6C9 CJI :A8IGD9: I>EH

(B@867B =:34@A 0@@: 80; 4B4@	80	!4<6B7	=@K 80 :42B@34A 4A2@> B8=<		=@ L 80 :42B@34A 4A2@> B8=<	
			4A2@> B8=<	%0@B #=	4A2@> B8=<	%0@B #=

(B@867B >;34@A .J;;6ADNHG6><=I CJI 6C9 HJ9 :A8IGD9: =DA9:GH6G D;I=: H6B: =><= FJ6A>IN6HI=: H6C96C9 HG6><=I =DA9:GHB69: ;DGHEDI L:A9:G6GB BDJCI>C< DDA6CI >H 7GDJ<=I IDI=: I>E 6C9 8>G8JA6I:9 6GDJC9 >I " DA9:GH6G 6K6>A67A >C I=G: 76G:A9>6B:I:GH

B

(B@867B =:34@

$ ( ) #*) # ()* , ! # $! '(				
(70<9 $	=@ L 80 :42B@34A		=@ L 80 :42B@34A	
	4A2@> B8=<	%0@B #=	4A2@> B8=<	%0@B #=

$ 55A4B# CB0<3
(BC3 , 4:38<6 =:34@

') $! '(

') ()* !)'$ (				
=@(BC3 80; 4B4@	:42B@34 !4<6B7	:42B@34 80; 4B4@	4A2@> B8=<	%0@B# C; 14@ (70<9 (8H4
; ; ; ; ; ; ; ; ; ; ; ;				+ + + + + + + + + + + +
; ;				+ + + + +

@2B2 ;42B@34A .=: G8I>8 HNH:B >H6 8DBE68I HJ9 6C9 CJI :A8IGD9: L>I=>CI:G8<6AL 6I:G8DDA>C< A>D 6K6>A67A L>I= DEI>DC6A6><G: MEJA>HDC 6C9 EA6I:CBDJCIH

#*=.7=#.7-270

') #$# %!$) #*) !)'$ (					
=@# CB 80; 4B4@	%8=B 80; 4B4@	:42B@34 !4<6B7	! :42B@34 80; 4B4@	4A2@> B8=<	%0@B# C; 14@ (70<9 (8H4
; ; ; ; ; ; ; ; ; ; ; ;					+ + + + + + + + + +
; ;					+ + + +

C
A
10 W FACE
INSULATION
1º LONG
B

L
J
H
.063
10 W FACE
K

X = { 5 and 6 RW SHANKS / PLATEN MOUNT
(BC3 , 4:38<6

X = { 5 and 6 RW SHANKS / PLATEN MOUNT
# CB, 4:38<6

")' #*) !)'$ (

./ &) 3 CDL HD8@HI=: =: 69 E>CHNA L : A9>C< HNH: B 8DB EDC: CIHI=6I 699HIDNDJGH A8I>DC;DGHJ9 6C9 CJI L : A9>C< C. : 9H GDB DJGH6C96G9 HNA IDDJG GBI>8 I=6I EGD9J8: H=><=: GFJ6A9NL : A9H6C9 ADC<: GA9: NDJ 86CH A8I I=: EGD9J8I I=6I 7: H B : : IHNDJGC. : 9H

403A6G B69: ;GDB , 1 ' 8A6HH B6I: G6AI=6I 6G 6CDEI>B6A8DH 8DCHJB67A A6HH 6C9 1 6G 6K6>A67A ;DG ADC<: GA9: 1 >I= 6 8DC86K H 6I I=: E>CAD86I: H>CI=: 8: CI: GD, 6HH B7ANL =: C6>G>H6EEA9 IDI=: HNH: B . =>H<>K H NDJ 6 GE: 6I67A AD86I>DC;DG6JIDB 6I: 9 CJI ;: : 9: GHID>CIG69J8: I=: CJI IDI=: : CK<GDCB : CI

%8=A=6K 6 CDC8DC9J8I>K HJG68: DC 6 H: : AB 6IG9MI=6I <>K HADC<: GA9: >C6 G E: I>I>K BDI>DC : CK<GDCB : CI 1 >I= I=: I=G 69: 9 =: 69 H 8JG9C< I=: E>C>CEA68: >I B 6@H>I : 6HNIDGEA68: I=: E>CIDB : : I NDJGGFJ>G B : CIH ./ &) 3 86C 9: H><CE>CH;DGHE: 8>6A6EEA86I>DCH

(					
%0@B # C; 14@	=:4 8D	%8< (8H4	) 7@403	8D	=>>4@)C<6AB4< 0243 403A
		; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;			* * * * * *
		; ; ; ; ; ; ; ; ; ;		I	* * * * *
		; ;		I	*

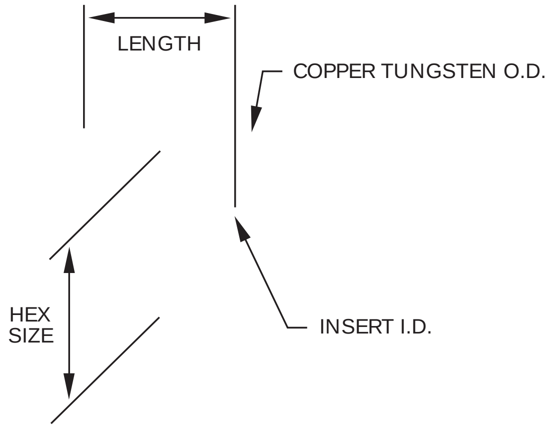
%#(				
%0@B # C; 14@	# CB	$!	0A4	%8=B 8D
	; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	I I I I I I I I	; ;	
	; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	I I I I I I I I	; ;	
	; ; ; ; ; ; ; ;	I I I I		

$ (					
4A2@>BB=<	%0@B # C; 14@	$!	8D	) 7@403	)0>4@)7@403
' ' ' ' ' '		I I I I I I	I I I I I I	; ; ; ; ; ; ; ; ; ; ; ;	

*%8%' !)'$						
4A2@>BB=<	%0@B # C; 14@		$!	8D	)0>4@	,
'! '! '! '! '!		; ; ; ; ; ; ; ; ; ;	I	I I I I I	%8	* * * * *

21, * 1& +21 #"" ! "/ 0501" * , * - , +" +10

(' (#*) , ! # (



	(4@4A	(4@4A	(4@4A	<A4@B	(4@4A	(4@4A	(4@4A	<A4@B
! 4<6B7								
) C<6AB4< $								
4F (8H4								
) 7@403 (8H4								
								; ;
				; ;				
								; ;
				; ;				

. =: H H G> HD; - IJ9 : A 8IGD9: H6G B 69: ;GDB , 1 ' A6HH B 6I: G>6AL >I= . / &) 3- Z 8DEE: GIJC<H: C DCI=: L: A9 ;68: 6C9 L GC8= ;A6IH;DG 6HNG B DK6A;GDB =DA9: GH . =: #CHJA6IDG>HB 69: IDL >I=H6C9 I=: 8DCH6CI ;G8I>DCI=6I >H6EEA>: 9 6HI=: HJ9 >H>CH G: 9 6C9 G B DK: 9

(2@E) 7@03 (8H4	# (* !) $ ' ! 4<6B7	%0@B # C; 14@
; ; ; ; ; ;	I	* * * * * *
; ; ; ; ; ;	I	* * * * * *
; ;	I	* * * * * * *
; ;	I	* * * * * * *

* % !) ' $ ($ ' * %% ' (

, , , ,

&* ( ) , .)$ *) , ! # $()(

#C8G6H 9 EGD9J8I>K>INL>I=DJI 86E>I6A>OK HB:CI DG>C8G6H 9 A67DG8DHH?JH =6HIDHE:AA*,) # " JC9G9HD; G:H>H6C8: L:A9>C< JH GH6G EGD;>I>C< ;GDB I=: . / &) 3 B:I=D9HD; BJA>EA: L:A9>C< IDEGD9J8: 6AB DH 6CN6HH B7AN GFJ>G:C< 8ADH ANHE68:9 L:A9H

.=: @N>HIDLB78=: < C;BB?;4 M1 =:C:K GI=: L:A9>C< B68=>C: <D:HI=GDJ<= 6 8N8A =6K: >I9DBDG I=6CDC: L:A9 6I 6 I>B: #IZH: 6HN6C9 EG68I>86AL>I= DC: D;I=: . / &) 3 BJA>EA: L:A9>C< 9:K>8:H .=: .::I:G.>E 9J6AI>E 696EI:GI=: FJ6I>E 9J6AI>E =DA9:GI=: FJ6 * GHH9J6AI>E =DA9:GDGI=: .G>-E68:G

.=: NZG G69NID<DIDL DG@8JII>C< 8DHH6C9 >C8G6H>C< EGD9J8I>DC:;;>8>:C8N;DGNDJ

-IJ9NI=: BJA>EA: L:A9>C< =DA9:GH6C9 696EI:GH>CI=>HH 8I>DC & 6GCI=:>G86E67>A>:H LB78=: < C;BB?;4 M6C9 NDJZA EGD767ANH: B6CNL6NH>CL=>8=./ &) 3 BJA>EA: L:A9>C< 86C>BEGDK NDJGDE:G6I>DC ,:B:B7:GI=6I ./ &) 3 >HEG E6G9 IDEGDK<9: 6CNHE:8>6A;>MIJG>C< NDJ C.:9 -=DL DJG:C<>C.:GHL=6I NDJ GFJ>G 6C9 I=:NZA9:H><C 6 H I JE ID9D>I

)) ') % * !) % %) ' (

' %#*=

3DJ 86CHEDI DGEGD?:8I>DCL:A9 >C=6A I=: I>B: 7N9DJ7A>C< I=: CJB7:GD; L:A9H E:GB68=>C: HGD@ / H .::I:G.>E 9J6AI>E 696EI:GH L=>8= 8DB: L>I= L6I:G 8DDA6CI;>I>C<HID7:6I =><==:6I 7J>A9 JE .=:H 696EI:GHIG6CHB>I IDI6AEGHJGH D; A7H 6C9 9:A>K G:FJ6A8JG>CI 6C9 EGHJG ID:68= I>E .=:N8DB E:CH6I: ;DGCDGB6A A8IGD9: L:G>B E:G;8II>E 9GHH>C< 6C9 LDG@K6G6I>DCHJE ID X

!) *). 696EI:GH=6K CD DG ,1 H=6C@HI>E HE68>C< ID >C8=:H I>E HD8@IH;DG XDG X9>6B:I:GB6A .J;;86E 86EH DG ,1 I>EH X86E HD8@IH6G H6C96G9

+. *). 696EI:GH=6K H=6C@H;GDB ID ,1 H>O I>E HE68>C< ID >C8=:H I>E HD8@IH;DG XDG X9>6B:I:GB6A .J;;86E 86EH DG DG ,1 I>EH ,1 HD8@IH6G H6C96G9 .=:H 696EI:GH=6K 69::E:GHGDC<:G7D9N

.LDADL =:><=I X9>6 86E INE: I>EH6G H=DL C7:ADL .=:N6G G8DBB:C9:9 ;DGJH >CI=:H 696EI:GH) I=:GH6C96G9 86EH 7DI= X X9>6 6G I67A9 DCI=: C.MI E6<: 3DJ BJH HE:8>;NI=: H>O I>E HD8@IHNDJ L6CI DGI=: H6C96G9 HD8@I L>AA7: HJEEA>:9

(BG4	((70<9)0>4@	4A2@> B8=<	!)8> (>028<6 ' 0<64 8<274A	) (=294B)0>4@
!) CBG	%" %" %" %"	'' '' '' ''	A= A= A= A=	%" ' ' %" ' ' %" ' ' %" ' '
+. CBG	%" %" %" %" %" %"	'' '' '' '' '' ''	A= A= A= A= A= A=	%" %" ' ' %" %" ' ' %" %" ' ' %" %" ' ' %" %" ' ' %" %" ' '

(1.7 8;-.;270 *5<8 <=*=. A*,==29 <9*,270 *7- =29 <8,4.=<2C A*6 95 && & &6.*7< F-2*6.=;;,*9 &6.*7< F-2*6.=;;,*9

)'*#) $# (%0@B#=

!) (%0@B#=

16" 2-5/8" 1" THICK !) *). T L S 3-1/4" .1/2" THICK +. *). T L S

&*) % * !) % $! ' (

' %#*=!8

.=: FJ6I>E9J6A>E=DA9:G>H6HB6AAGK:GHDCD;I=: FJ6*GHH=DA9:GDCC:MIE6<: #>HBDG:8DCDB>86A;DGI=DH 6EEA86I>DCHL=:G>LAA LDG@FJ6ANL:AA C:K:CHB6AAG9:K8: I=: FJ6I>E 696EI:GCDIL6I:G8DDA9 >HH=DL C>C7DM7:ADL

/ H<C<I=: FJ6I>E=DA9:G7DI=I>EH8DCI68I=: LDG@ HFJ6G:AN7:86JH I>E6MHGB6><CE6G6AAAID9>G8I>DC D;;DG8: JCA<@I=: .:::I:G.>E696EI:GH C>CI:GG6A GDAAG:FJ6A<OH8JGG:CI6C9EGHHJG7:IL::CI=: ILD :A8IGD9:H6C9L>AA8DBE:CH6I:;DGLDG@=:><I K6G6I>DCHJEID X

.=: =DA9:GH6G:DG9:G9L>I=:>I=:GXDG X HE68><C<7:IL::C76GGAH6C9L>I=I>EHD8@IHID688:EI :>I=:GB6A.J;;86E86EH X9>6 DGHG6><=I(D ,1 :A8IGD9:H :CI>EH6G:CDIG8DBB:C9:9 .=: 9>H6C8: 7:IL::CL:A9H86C7:K6G>97NGDI6I>C<D;;HICDH I>EH>C I=: 76GGAH

FJ6I>E=DA9:GH86C7: HJEEA>9L>I=HG6><=IH=6C@H ;DG6GB BDJCI>C< 6I6E:G9696EI:GH=6C@DG=DA9:G BDJCI>C< DG68NA<C9:G696EI:GH=6C@ID7: 8A6BE:9 ID68NA<C9:GGD9

FJ6I>E=DA9:GH86C7: JH9L>I=;DG8:HJEID A7H

&*) % $! ' (

) 8> (>028<6 " =C<BB<6 (BG4	=@ L 8D) C5520> 0>A 4A2@B BB=<	=@ L 8D) C5520> 0>A %\D@B #=	=@#= ',) 8>A 4A2@B BB=<	=@#= ',) 8>A %\D@B #=
$# # (% # 7< @6/<9 7< @6/<9 7< @6/<9 %\ /2/>A8? F:7<23?/2/>A8?				
# (% # 7< @6/<9 7< @6/<9 7< @6/<9 %\ /2/>A8? F:7<23?/2/>A8?				

(2=18>=,5?69

M)* % %( )			
#=A4 (BG4	::=G :0AA	4A2@B BB=<	%\D@B #=
#=7<A32		'	
=;3		'	
:/A		'	
"44@BA		'	

&18<.,*9<*;./>5B-26.7<287.-879*0.

$.
(L
)

>@;867B3CBG E4;38=6

&*) % %\) '

.=: FJ6I>E9J6A>E696EI:G LDG@HA<@I=: FJ6I>E=DA9:G 7JI>I>HCDIL6I:G8DDA96C9 >HB:6CI;DGAHH9:B6C9>C< 2D7H#8DHHAHH6C9>H6 AHIA:HB6AAG76GGAH7:>C< X6E6GH#HHG6><=I>EH 6G./ * 86EH X>C9>6B:IG

M)* % %( )			
#=A4 (BG4	::=G :0AA	4A2@B BB=<	%\D@B #=
#=7<A32		'	
=;3		'	
:/A		'	
"44@BA		'	

&18<.,*9<*;./>5B-26.7<287.-879*0.

%\D@B#= ',
%\D@B#= ',

PLATTEN PLATE IS 7º SQUARE

SHORT DESIGN

4

1-1/2

1/2

BODY IS 2º THICK

3-3/4

&* % (( )"
* !) %
$! ' (
' % #* = ! 8
* 7* - * #* =

5/8

2

STANDARD DESIGN

4

1

1/2

. =: FJ6 * G HH" DA9: GB 6@ HIL D>9: CI>86AL: A9H6I DC8:
1 =: C>I 8DCI68I HI=: L DG@E>8: I=: ;DG<C< EG HHJG >H
6JIDB 6I>86AAN: FJ6AC 9 7: IL: : CI=: IL D: A 8IGD9: H
G<6G9A HHD; K6G6I>DCH>C L DG@I=>8@C HH DG A 8IGD9:
L: 6G JE ID X . =: IL D I>E =DA9>C< 76GG AH6G HA9>C<
E>HDCH L=DH B DK B: CIH6G 8DCIGDAA 9 7N6 B: 8=6C>86A
: FJ6AC<< HA9: >C I=: =DJH>C< H: 8JI6L 6N9G6L >C<H
. =: HEG>C<ZHDCAN;JC8I>DC>HID GIJGCI=: 76GG AHID 6 ;JAAN
: MI: C9: 9 EDH>I>DC L=: C I=: G >HCD L DG@8DCI68I ' 6MB JB
8DC9J8I>K>IN>HB 6>CI6>C: 9 I=GDJ<= HJG9N8DEE: G6AADN
L DG@C< E6GH - E68>C< 86CK6GNJE ID >C8=: H JH>C<
. / &) 3 7: CI D;;H I I>EH>C FJ6 * G HH=DA9: GH=6K>C<
I=: H6C96G9 76GG AHE68>C< D; IL D >C8=: H H=DL C

6GG AHE68>C< JE ID H>M>C8=: H>H6K6>A67A 6HH B>
H6C96G9 H: EG8: AH . =: H 6G 9G>AA 9 IDDG9: G;GDB
HD8@8DB EDC: CIH . DDG9: GNDJ B JH <>K: I=: 76GG A
HE68>C< 9: H>G9 6ADC< L>I= I=: #I: B CJB 7: G ;GDB I67A

FJ6 * G HH" DA9: GH6G B 69: >CIL D B DJCI>C< HNA H
EA6I: CB D9: AHID B DJCI 9>G 8IANID I=: EA6I: CDC EG HH
INE: L: A9>C< B 68=>C: H 6C9 H=6C@B D9: AH;DGGD8@G
6GB B 68=>C: H AA6G 6K6>A67A >CIL D 9: H><CH I=:
H6C96G9 6C9 I=: H=DG 8ADH 8DJEA 9 INE: . =: H=DG
9: H><C>H>CI: GG6AAN;ADD9 8DDA 9 6C9 I6@HJE A HH
HE68: >CI=: L: A9: G

FJ6 * G HH=DA9: GH86C 7: JH 9 L>I= ;DG8: HJE ID A7H

BODY AND
TOP PLATE
ARE 2º
THICK

3-1/4

2

" =C<BB<6 (BG4	(B0<3 0@ 4A6<		(7=@B 4A6<	
	4A 2@> BB<=	% 0@B # =	4A 2@> BB<=	% 0@B # =
7< @6/ <9 7< @6/ <9 7< @6/ <9 #:/ A3<				

! 8= 8; +. <=;. <>5< 98<2287 =1. 185 . ; <8 =1* =* 57. - ;*@7 =1;8>01 =1.
. 5 , =;8- . , . 7=;< 2< *= 8; 7. *;5B *= ;201=*705 < =8 =1. - 2. , =287 8/ =1.
@ 5 . ; *;6 < " =1. ;@2< =1. 6 *07. =2 /2 5 +. =@ . 7 =1. *;6 < , *7 , *>< *7
. A , . << 8/ , >;;. 7==8 /5 8@=1;8>01 =1. 27+8*;- . 5 , =;8- .

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(70<9 8 0; 4B4@	4A2@>BB=<	%0@B# =

!$, ' $! '(# !)'$ ($' *(,) &* % (($! '

A0L : G;>M9 9J6A>E=DA9: G>HD;:: G9 ;DGJH L>I= FJ6 * GHH " DA9: GH &>@ I=: FJ6 * GHH >I =6H6 H6C96C9 IL D>C8= I>E HE68>C< 6C9 =: AEHB 6@ IL DL : A9H6I DC8: EG8>H AN6A>@ . =: H6C96C9 IG6CHK GH 76G: A:8IG69: H=DL C>HJH 9 L =: CL DG@<: DB : IGN 9D: HCZI GFJ>G I>EHDC I=: A0L : GH>9: . =: N6G: L 6I: G8DDA 9

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() # ' !$, ' $! ' M(% # ',		
	!= E4@ =:34@	
(70<9 8 0; 4B4@	4A2@>BB=<	%0@B# =

(% ! !$, ' !)'$ (			
, (BG4	(70<9 8 0; 4B4@ 8<274A	4A2@>BB=<	) 8> (>028<6 ' 0<64 8<274A
I =2F			A= A= A=
I =2F			A= A= A=

(1. 7 8;- . ;270 <9. , 2B, . 7=; - 2<=* 7, . *7- . 2=1. ; $(8; $(<8, 4. =<

< 2<=8;B #;83 , =287 @ 5 270 +;, 4. =< =8 *>=86 8=2?. /;*6 . *<< 6 +52 < 2< =@2, . *</*<= @2=1 *7 : >* #;. << - >* 5=29 185 . ; 8@ ; @ 5 270 /2A>;. *, =< *< * 7 27 <9. , =287 - . ?2, . <8 @*;9. - 9*; =< *;. - 2<; 8?. ;. - +. /8;. @ 5 270 7<9. , =287 =26 . *7- <, ;*9 5B << *;. +8=1 ;. - >, . -

*< 2<=8;B 8272 70 * 92 , . 8/ 6 . =* 5=8 2=< . 5 2< *5@* B< =8>01 &12< 38+ @* < - 87. @2=1 * 7 : >* #;. << 185 . ; =@8 * =* =26 . 8@ ; , 5 6 9 /*, . < , *;; B270 , >;;. 7= , 87=*, =9*; =< 7. *; =1. @ 5 *;. * < =8 * ?82 , >;;. 7=+B9* << 270 @ 5 9;83 , =287 < &@8 <=* 7- *;- <@2?. 5=29 < 6 * 4. /8>; @ 5 < =@8 9. ; 9*; =

*< 2<=8;B >*5 <98= @ 5 270 8/ 9* 7. 55 - @* 55 < , =287 < ;. - >, . - @ 5 270 , 8<=< . 78>01 =8 3><=2B +>B270 @ 5 270 6 *, 127. =8 - 8 =1. 3B+ 27 95* 7= : >* #;. << 185 . ; @2=1 27, 1 <9*, 270 *7- <9. , 2*5 +>=<26 95 =8852 70 =8 9;8?2 . =@8 8//< = =29 *- *9=; < *7- 6 *=, 1270 185 . ;< @ ;. >< - 5 , =;8- . < *;. <=* 7- *;- & #, *9<

7 =12< - ;* @270 =@8 <>- < *;. 9;83 , =287 @ 5 . - 27 . *, 1 @ 5 . ; <=; 84. >< 270 *7 : >* #;. << - >* 5185 . ; 8?. ; * 9*2, 8/ <>- @ 5 270 . 5 , =;8- . < 1. 5 27 # <=B5 185 . ;<

. ;. /8>; <98= @ 5 < *;. 6 *- . <26 >5* 7. 8><B 87 * , 8;; >0* = - 9*; = 7 : >* #;. << - >* 5185 . ; 2< >< - =8 185 =@8 & . =; &29 - >* 5 =29 *- *9=; ;<

)' (% ' $! '		
" =C<BB<6 (BG4	4A2@8> BB=<	%0@B # =
7< @6/ <9 7< @6/ <9 7< @6/ <9 #:/ A3<		

(." $!(

2*0;*6 27-2,*=,<=1. @2. ;*70. 8/ @5 9*==;7<@12,1 ,*7+. 6*-. @2=1 =1. &2-9*,.; +B><270 <=;*201=<=*7-*;- +.7=8; <9.,2*5+.7==29<

3 DIA

2

1/2

PLATEN
DIMENSIONS
1/2 X 3-1/2 X 7

3

1-7/8

5 RW TAPER

)' (% ')")' %0)% $! '

' %#*=!8

.=: .G>E68: GI>E =DA9: GL>AAB 6@ I=G: HEDI L: A9H6I DC. I>B: 6JIDB 6I>86AANHEA>I>C< I=: 8JGG:CI 6C9 I=: EG:HHJG: FJ6AAN7:IL::C I=: I=G: I>EH #C 9D>C< HD >I 8DBE: CH6I: H;DG K6G>6I>DCH >C LDG@I=>8@C: HH H6C9 :A 8IGD9: L: 6GJE ID >C

.=: I=G: I>E =DA9: G 76GG:AH ,1 6G: FJ>9>H6CI ;GDB DC: 6CDI=: G 6AA;6AA>C< DC 6 >C 9>6B: I: G 8>G8A >C I=: H6C96G9 BD9: AH=DLC / H>C< HG6><=I I>EHI=: L: A9 E6II: GC LDJA9 ;DGB 6C: FJ>A6I: G6AIG>6C<A " DL: K: GI=: L: A9 E6II: GC 86C 7: L>9: ANK6G>9 7NJH>C< H6C96G9 DG HE: 8>6A 7: CI I>EH #C ;68I I=: I=G: : L: A9H 86C 7: B 69: >C 6 HG6><=I A>C:

.=: .G>E68: G' DA9: G L DG@H >C I=: H6B: H>B EA B: 8=6C>86AL 6N 6HI=: FJ6 * G:HH" DA9: G. .=: I>E =DA9>C< 76GG: AH=6K: 6 AB >I: 9 JE 6C9 9DL CB DK B: CI ID 688DB B D96I: L DG@8DC9>I>DCH 6C9 6G: 69?JH: 9 ID 9: AK G: FJ6AEG: HHJG: 7NI=: 8DC: H=6E: 9 : FJ6A>O>C< 9: K>8: >C I=: =DJH>C< A#8JGG: CI 86GGN>C< E6GH6G B 69: D; ,1 ' 8DEE: G 6AADNH #I >HB 69: >CIL DHNA H IDB DJCI 9>G:8IANIDI=: EA6I: CD; EG: HHINE: L: A9: GH 6C9 L >I= H=6C@HID;>I >CL: A9: G 6GB H

.G>E68: G' DA9: GH 86C 7: JH 9 L >I= ;DG8: HJE ID A7H

!$, ' !)'$

H>B EA L 6I: G 8DDA 9 ADL: G: A 8IGD9: >HB 69: ;DG JH L >I= I=: .G>E68: G=DA9: G#I HI=G: >C8= 9>6B: I: G ;68: B 6@H >I JH 67A L >I= 6CNL: A9 E6II: GC I=6I B 6N 7: 9: K: ADE: 9 ;DG I=: .G>E68: G#I 8DB : H >C I=G: : H=6C@ 9>6B: I: GB D9: AH

3 DIA

1-1/4

!$, ' !)'$		
(70<9 80	4A2@8> BB=<	%0@B # =

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' % #*= ! 8 DD*7*-* #*= ! 8

./ &) 3 ;6H ;DAADL JE ADL >C: G>6 =DA9: GHIHDAK: I=: EGD7A B D; B 6>CI6>C>C< 69: FJ6I: L: A9 EG HHJG DC G6E>9AN 8DAA6EH>C< EGD? 8I>DC L: A9HL >I= ;: L: GH I JE EGD7A B H6C9 G: 9J8: 9 B 6>CI: C6C8:

.=: H =DA9: GH 86C 7: H I ID 9: AK: G ;6H ;DAADL JE ;DG8: H D; ;GDB ID EDJC9H 6 G6C<: 8DK: G>C< D; 6AA EGD? 8I>DC L: A9>C< DE: G6I>DCH .=: N 6G: 8DB E68I L 6I: G 8DDA: 9 6C9 : 6HNID B 6>CI6>C

*AJH;: 6IJG: HD; I=: ./ &) 3 ;6H ;DAADL JE =DA9: G>C8AJ9: L>9: G G6C<: D; EG HHJG HI=6C 6CN 8DB E: I>I>K: B 6@ CD ;A: M7A: H=JCI 6 8DB B DC 86JH D; =DA9: G ;6>AJG JH D; H6C96G9 JC B D9>;>: 9 9>: HEG>C< H HD >; NDJ C: : 9 6 HEG>C< D; 9>;;: G CI HG C<I= >I Z H: 6H>AN 6K6>A67A HEG>C< ;DG8: H 6K6>A67A 6G: 8A 6GAN >C9>86I: 9 HD >I Z H: 6HN ID H I JE ;DG 6 HE: 8>;>8 ;DG8: I=G: : H=6C@ H>O H DG> 86C 7: EA6I: C B DJCI: 9 I=: DCAN ;6H ;DAADL JE =DA9: G I=6I 86C : MIG B : AN ADL =: >< =I E: GB >HHJH L=: G: A6G<: GJC>H 86C Z I 7: JH 9

./ &) 3 ;6H ;DAADL JE =DA9: GH 86C 7: JH 9 ID A B >I I=: L: A9 EG HHJG D; 6CN HEDI L: A9>C< B 68=>C: G <6G9A HH D; 8N A>C9: G H>O DG 6>G EG HHJG .=>H >H 7: II: G I=6C G 9J8>C< 6>G EG HHJG L=>8= HADL H I=: GIJG C HIGD@ 6C9 G I6G9H EGD9J8I>DC

>;;. 7=/58@/858@<-*<1.- *;;8@ =1;8>01 =1. 8>=; +8-B =@8 <952= ,87=*,=;27< =*9.;.- =29 <8,4.= *7- =8 =1. .5,=;8-.

7º SQUARE

# = 4FB4@0: =; >@AA8=<	=; >@AA8=< ; 0@9	=; >@AA8=< ; 0@9A	=; >@AA8=< ; 0@9A

8;.?.;B87. .201=1 8/*7 27,1 =1*=* /*<=/858@>9 2<,86 9;.<<.- @1.7 <.=270 >9 * 478@7 *6 8>7=8/ /8;,. 2<9;8?2.- =8 : >2,45B/858@>9 *7B;.->,=28 7 27 @8;4=12,47.<< A*6 95 *=98<2287 * =B9. <9;270 @8>5 -.52?.;B 5+ *= 5+ .=;

() $!!$, *% $'		') ! (		
(>@8<6) G>4	8< =; >@AA8=<	8< =; >@AA8=<	8< =; >@AA8=<	8< =; >@AA8=<
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6-5/8

" =C<B8<6 (BG4	! (" - " (% #		! (" - " (% #		! (" - (% #	
	4A2@8> B8=<	%0@B # =	4A2@8> B8=<	%0@B # =	4A2@8> B8=<	%0@B # =
I &6/ <9 I &6/ <9 I &6/ <9 #:/ A8< A2						

5 RW TIP SOCKET

SWIVEL TIP
(NOT INCLUDED)

2-1/2 DIA

./ &) 3 : MIGJ9: 9 76GHID8@>HJH 9 ;DG;67G86I>C< HE: 8>6A: A:8IGD9: H EA6I: CH 696EI: GH 6C9 DI=: G8DC9J8I>K: E6GH , DJC9 76G>H6K6>A67A >C6AAI=G: 6AADN8A6HH H . =: DI=: GH=6E: H6G: B 69: >C A6HH 6C9 6AADN*=N>86A EGDE: G>: H6G: HJE: G8DGIDI=DH H=DL CDCE6<:

6GHID8@>HEG8: 9 E: GEDJC9 >C G6C9DB B >AA:C<I=H ;GDB ID ;: : I 99>I>DC6A8=6G<: H6G: B 69: 9: E: C9>C< DC HE: 8>;>8 L: ><=IH6C9 A:C<I=HDC9: G9 - : : I=: ./ &) 3 EG8: A>H

	(8>H4 < <274A	, 4867B %=C<3A %41@ ==B	)C50:=G :0AA ::=G B4; #=	)C50:=G :0AA ::=G B4; #=	)C50:=G :0AA ::=G B4; #=
- * # $					
- # $					
- (& *					

	(8>H4 < <274A	, 4867B %=C<3A %41@ ==B	)C50:=G :0AA ::=G B4; #=	)C50:=G :0AA ::=G B4; #=
-) # * ! -	E E E E E E			
	E E E E E E			
	E E E E E E			
	E E E E E E			
	E E E E E E			
	E E E + + E E + + E E E			
	E E			

-IGDC<:G<:C:G5AN=6C9:G6C9=6K>C<A:HH8DC9J8I>K>HN
I=:G;G58IDCNB:I6A8DBEDH+>DCH>C8AN9:8DEE:GIJC<H:C
A5HHH IJC<H:C A5HH 6C9BDAN79:CJB
A5HH 6ADNH

.=:76GH6C9>CH GHA+H:97:ADL6G:B69:>CI=:
;DADL>C<,1' <GDJE 6ADNH A5HH .J;;6ADN 1
A5HH .J;;6ADN 1 6C9 A5HH .J;;6ADN 1

6GH6C9>CH GHD; A5HH .J;;6ADN 1 6C9 A5HH
.J;;6ADN ' 6HL:A6HHE:8>6A+HO H6C9H=6E:H6G
EG58:9DCGFJ:H

$%8%')*# () #'$*# '(

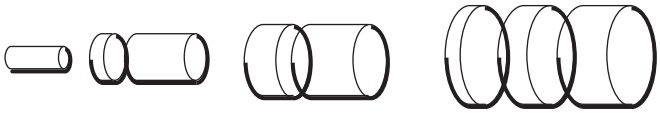
><=I>C8=:HADC< 6K6>A67A>CI=:;DADL>C<9>B:I:GH

GDB XID X

$%8%')*# () #' $*# #(')(

K6>A67A>C;DADL>C<9>B:CHDCH

>6B:I:GH;GDB XID X6C9.=>8@C:HHH
;GDB XID X



#,/$&+$0

./ &)3;DG><C<H6G JH9IDB6@H6BL:A9:GL=::A+H6C9H=6;IH7JII6C9;A5H=L:A9:G9>:H6C9L:A9:G6GBH6C9
EA5I:CH DG><C<H6G HJE:GDGID86H>C<H>CE=N+86AEGDE:G>:H6C9>C67HC8:D;EDGDH+N.=:N6G6K6>A67A>C
./ &)3 6C9 A5HH 6C9 6ADN A+6G G69>ANB68=>C67A

1=:CDG9:G><HE:8>;NL=:I=:G;DG><C<>HID7:6H;DG<:9DG;>CH=B68=>C:9 ,:<6G9A:HHD;=DL>:>HL6CI:96A6NHDG9:G
7N<K><;>CH=9>B:CHDCH

). %

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&6B >C6I: 9 8DEE: GH=JCIH6G B 69:
IDNDJGH=O 6C9 H=6E: HE: 8>;>86I>DCH
" ><= 8DC9J8I>K>HN: A 8IGDAN>8 8DEE: G
HGE>HJH 9 6C9 I: GB >C6A8AEH6G
G=K I: 9 >C EA68:

$,)$ $' '

! >K I=: ;DA6DL >C< >C;DGB 6I>DC
. NE: DG$
) JIH9: A:C<I=) &
1 >9I= 1
. =>8@C: HH A:H=H8AE .
" DA E6II: G6C HE: 8>;N7NA:II: G8D9:
" DA AD86I>DC 2 3 4 K6A9: H
" DA 9>6B : I: G

$! %)) '# $! %)) '# $! %)) '# $! %)) '#

>G8DDA:9 ?JBE: G867A:H6G ;A:M7A
=><= 8DC9J8I>K>HN8DEE: G8DC9J8IDGH
L >I= >CHJA6I>K: HA: K: H . =: N6G B 69:
>C A:C<I=HIDHJ>I NDJGC: : 9H

$,)$ $' '

! >K I=: ;DA6DL >C< >C;DGB 6I>DC
DC9J8IDGG6I>C< ' '
&: C<I= 7: IL : : C=DA:H
. : GB >C6ADG> CI6I>DC HNA:

) ' " # ! $' #)) $#

" #($#(# (			
" " ' 0BB<6	$ 0>>@F	!C6 , 83B7	!C6) 7829<4AA

85 <*;. >75 << 8=1. ;@2<. <9. ,22 -

!)'$) %' ' " '( ) %)* % !)'$ ' " '(

"DA >CG6B:G8:CI:GE:GB>HL6I:GIJ7::CIGN ODC::9ID 9>HB6CIA=DA9:G ,1 *6G(D ,1 *6G(D ,1 *6G(D ,1 *6G(D (*..6E *6G(D

) % ' ((#)$$!

.DGBDK: BJH=GDDB:9 ODH B6I:G6ADC6E6>GD;I>EHD; DG ,1 H>O =6K>C< ED>CI:9 DG9DB: ODH H) I=:GODH 9:H>C9GHH GHDCHE:8>6ADG9:G GHH G*6G(D GHH G8JII:G*6G(D

' *( ) % !

)8> 84

.DGHDG DG><>C6A8DCIDJGHD;L:A9>C< I>EHJH I=>HIL D>C8= G69>JH;>A >A *6G(D "6C9A *6G(D " >A "6C9A *6G(D

, ! #) % -)')$'(

#= ', 0<3 ', 0B=>>=A8B4 4<3A
- %0@B#=

#= ', - %0@B#=
#= ', - %0@B#=

(B0<30@ CBG - %0@B#=
40DG CBG (, %0@B#= (,

.DG6B DG9GHHI6E:GHID=DA9 B6A 86EH ,1 *6G(D ,1 *6G(D ,1 *6G(D

&* $##) $*%1 # (
E8B7 0CB>< 0BB2 A7CB>55

/H I=:H 8DJEA>C<HIDB6@ JE:;;>8>:CI IGDJ7A ;G: 8DDA6CI HNH:BH CNEA3< H=DL C L>AAB6I: L>I= 6CNHD8@I H=DL C AL6NHEJII=: HD8@IDCI=: JEHG6B H>9: D;6 8DCC:8I>DC #IH7J>A >CK6AK: L>AA6JIDB6I>86AAN8ADH JEDC9>H8DCC:8I>DC

L#%) 54; 0:4 >:C6 %0@B#=
L#%) 54; 0:4 A=294B %0@B#=

L#%) ; 0:4 >:C6 %0@B#=
L#%) ; 0:4 A=294B %0@B#=

L#%) ; 0:4 >:C6 %0@B#=
L#%) 54; 0:4 A=294B %0@B#=

L#%) ; 0:4 >:C6 %0@B#=
L#%) ; 0:4 A=294B %0@B#=

L#%) 7=A4 >:C6 %0@B#=
L#%) 7=A4 A=294B %0@B#=

$# *) + ,) ' $(!* $(! " %

*6G(D *6G(D *6G(D
A7 8DCI6>C:G #

)* % -)')$'(

" 0:4 0>A ', - %0@B#=
" 0:4 0>A ', - %0@B#=

4; 0:4 0>A ', - %0@B#= " 0:4 0> ',
4; 0:4 0>A ', - %0@B#= " 0:4 0> ',
4; 0:4 0>A ', - %0@B#= " 0:4 0> ',

*5 ,*9.A=;*,=8;1*<5B70 5?.;1*7-5</8;.*<2;,*9 ;.68?*5 7=@8->*5<2C 68-.5<) *7-)

.6*5 ,*9.A=;*,=8;<*;.6*-. /8;=1;..&>//,*9<1*74<2C< 8-.5<)) *7-)

Q JGG:CI B:I:G

Q 6HNIDJH

Q 6H>ANA<>7A >C 6AA><=I>C< 8DC9>I>DCH

Q* DH>I>K: @NE69 68I>DC

Q- J>I67A ;DGK6G9DJH6EEA>86I>DCH

Q, :69HL6K: ;DGB H;GDB " OJEL 6G9H

Q. G68:67A 688JG68N

Q 6I6 6G8=>K>C<

Q- B6AA6C9 A><=IL:><=I 6AADL>C< ;DG: 6HN EDG67>A>IN

Q 6A>7G6I>DCH GK>8: H6K6>A67A

Q) C: N 6GL 6GG6CIN

)*' (

Q#CIJ>I>K: ;A:M>7A >CI:G;68:

Q& M E>M.A>H -.(L>I= N AADL <G:C768@A><=I

Q B7DH>H 9 9>H>8I68I>A @NE69 L>I= 6CI><A6G 9>HEA6NL>C9DL

Q JIDEDL:GD;;

Q&6G<: 8=D8: D; 8D>A>H

Q DG DE:G6I>DC

Q 6A>7G6I>DC 8:G>;>86I>DC

Q/- 8DCC:8I>DC

Q#C8AJ9:H >C8= ;A:M>7A 8D>A 76II:G> H6C9 86GGN>C< 86H

Q#CI:<G6IDGDJIEJI ;DGDH8>AADH8DE: 8DCC:8I>DC

Q1 .:GB>C6AHD;IL6G

$%) $#(

Q A:M>7A 8D>AV >C8= *6G (D DG >C8= *6G (D 9>6B:I:GL>I= ;::I A:69

Q II:CJ6IDGVG6C<: BJA>EA>:G;DGJE ID @ *6G (D

Q MI:CH>DC 867A V B:I:GH *6G (D

. =: 1 : A9   C6ANO GD;;: GHI=: : C<>C: : G>C< EGD;: HH>DC6AI=:
;68>A>I>: HID 6C6ANO ;6JA ;>C9 6C9 >B EGDK: EGD8: HHFJ6A>IN
DC ID96NZHHDE=>H>I86I: 9 L : A9>C< 8DCIGDA HNH: B H JAA
IG68: 67>A>IN<K: HNDJ I=: 8DC;>9: C8: >C NDJG EGD8: HH H
I=6I NDJG8JHIDB: GH9: B 6C9

%$,   ' ($*'   , : 8=6G<: 67A (> "

(%   .   M   E>M.AH - . (IG6CH;A 8I>K: L>I= N AADL <G: C768@A<=I

*' ' #) ' #   ID   @

*' ' #)   *') $#   8N8A H   H 8DC9H

" $#) $'   %' "   ) ' (

C@@=B   ) 8< 4   >=3C2BB>= =6;4   %>A8BB>=

*: 6@; ' -   . DI6AL: A9 I>B: K: G6<: 8DC9J8I>DC 6C<A   * DH>I>DC D; B DC>IDG 9 E6G6B: I: G>C L: A9 EJA H IG6>C

K: G6<: , ' -   CNEJA H I>B: DC9J8I>DC 6C<A D; : K: GNH6B EA

&DL: H , ' -   (JB 7: G D; EJA H H

88JG68N   D; ;JAA H86A   88JG68N   D   88JG68NS T

' : 6HJG: H 6C9 9>HEA6N HK6A: H ;DG: 68= 6C9   8N8A

% $ ' " "   ! %' "   ) ' (

G FJ: C8N   JGG: CI I=G H=DA9

A6C@>C<   A6C@>C<

1 : A9 86EIJG   1 : A9 86EIJG

* (' + ' (L L L ;I9>8=>E 8DB   G>K: GH 0 * =IB

" #($#(   ) L M   ) 9 M   ) =   A7 >C8AJ9>C< 76II: G>H

(%   .   - " % (

8A?;0G

0B0

4B08;

(4BC?

' . , ! $' * (+ ! ! '$") !$.

8688D: :42B@<82 | ! 0C64 | 8688D: G3@0C:82 | (B0<30@3 G3@0C:82

, $ ' $# $) '$ ()%$ *)!#(+ ! !)$.

.J;;6ADNHJEEA>H6 7GD69 G6C<: D; L:A9 ;DG8: <6J<:H 6K6>A67A: L>I= 688JG68>H;G6B ;DG ><>I6A A:8I G6C>8 <6J<:H ID 688JG68N;DGI=: ><>I6A" N9G6JA>8 L=>8= =6H6 9><>I6AD JIEJI 9G>K: C7N=N9G6JA>8H ID DJG-I6C96G9 " N9G6JA>8 BD9: A>H L>I= 688JG68N AA6G 6K6>A67A: >C C<A>H= 6C9 B:IG>8 G69DJIH

) JG 8688D; ;42B@=82 <6J<: HJEEA>:HI=: =><=:H 688JG68N ;DG D; I=: <6J<:H G6C<: . =: <6J<: =6HA6G<: & G:69DJIHL>I= E:6@=DA9 86E67>A>I>:H AA;JC8I>DCH6G :A:8IG6C>8 L=>8= EGK: CIH K6G>6I>DCH86JH 9 7N;A:M8C<

. =: 8688D; G3@0C;82 9:A>K: GH7: II: G688JG68N I=6C H6C96G9 =N9G6JA>8 <6J<:H7JI 6I 6 AD L:G EG>8: I=6C 6AA9><>I6AB D9:A>H . =: JC>I D; B:6HJG>H;>A9 H A:8I67A: 7:IL:: C EDJC9H @AD<G6B H C:L IDCH6C9 @ADC: L IDCH . =: E:6@=DA9 ;:6IJG: 6AADL H;DGG 69><C< K6G>67A: ;DG8:H L=>8= 6G 8DB B DC>C G H>H6C8: L:A9><C< B 68=>C: GN! 6J<:HB 6>CI6>C 6C 688JG68ND; ;DG ID D; I=: <6J<: ZHG6C<:

.J;;6ADNZH(B0=30@3 G3@0C;82 <6J<:H 6G I=: ADL 8DH B:I=D9 ;DGD7I6><C< <:C:G6A;DG8: B:6HJG B:CIH . =: H <6J<:H6G 6K6>A67A: >C 6 H6C96G9 7AD8@HNA: L>I=:M: CH>DCH - >O H G6C<: ;GDB A7 JE ID IDCH L>I= 688JG68N D; 6I I=: B:6C 6C9 DJIH>9: D; B:6C ;DG D; I=: <6J<: ZHG6C<:

()# ' *)

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4A2@>B8=<	40BC@A	" 0F8; C; ' 4038<6	<2@4; 4<B D4@G	$ >4<8<6 ' 4?C8@403	FB4<A8=< ! 4<6B7	B4; # C; 14@
! !(" " (&%$! " &%	7 * (+$ +10, 10 7 10+ / %10 +## 7 + 3 " (! / " 00*$ * +0 . " - 1&" ! 7 1. 5 +2" . #1((. * $"	:0@ 5	:0 5	I	I	
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B- ;* >52, 0* >0. < <18>5 +. <. 5 , =. - =8 +. >< - 7. * ; 6 2- ;* 70.

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' , " ! ((!!$. H)* !$.

4#;)(#')** , HJ>:9IDL:A9>C<6AJB>CJB6C9B6<C.H>JB6AADNH8D6I:9B6I:G6AH7G6HH6C97GDCO

A6HH 6AADN>HHJE:GDGIDEJG8DEE:G6H6C:A8IG9:B6I:G6A6C9>HG8DBB:C9:96H6<:C.G6AEJGEDH B6I:G6A;DGG>H>H6C8: L:A9>C<JH #B6N7:JH9;DGHEDIL:A9>C<:A8IG9:HH6BL:A9>C<L=::AH6C9L:A9>C<;>MJG8DBEDC.CIH#>HCDI=:6IIG6I67A

' , " ! ((!!$. H)* !$. # /

./ &)3 ",)'#')** , HJ>:9IDL:A9>C<8DA96C9=DIGDAA9H::AHH6>CAHHH::A6C9ADL8DC9J8I>K>IN7G6HHH 6C97GDCOH

A6HH 6AADN>H6HJE:GDGG>H>H6C8: L:A9>C<:A8IG9:B6I:G6AG8DBB:C9:9;DG=><=EG9J8I>DCDE:G6I>DCH#>HJH9;DGL:A9>C< :A8IG9:HEG?8I>DCL:A9>C<:A8IG9:HH6BL:A9>C<H=6;IH6C97:6G>C<H;A6H=6C97JIIL:A9>C<:A8IG9:H6C98JGG>CI86GGN>C< HGJ8IJG6A8DBEDC.CIH K6>A67A>C;DGB H;DGJH6HL:A9>C<<JC6GBHL:A9>C<EA6I:CH6C9H8DC96GN8>8J>HGJ8IJG6AB:B7:GH #>H=:6IIG6I67A

./ &)3 4 4#;)(#' ",)'#')** , >HHJ>:9IDL:A9>C<<6AK6C>O9H::A6C9DI=:GB:I6AA88D6I:9H::A

.=>H>H6HE:8>6AN=:6IIG6I:96AADNL=>8=B::IHI=:B>C>BJB:A8IG86A8DC9J8I>K>IN6C9=6G9C.HHHE:8>86I>DCHD; A6HH 6AADN

' , " ! ((!!$. H)* !$.

,3&&#' (#%&)** , 6GHJ>:9IDL:A9>C<H::AH=6K>C<=><=:A8IG86AG>H>H6C8: HJ8=6HH6>CAHHH::A

(#%&)** , >H67:GNAAJB;G:6AADNL>=EGDE:G>HH>B>A6GID./ &)3

A6HH 6AADN>HG8DBB:C9:9;DGEG?8I>DCL:A9>C<:A8IG9:H6C9;A6H=6C97JIIL:A9>C<:A8IG9:H1>=>H=><=:GHGC<I=>>H 6AHDJH9DC=><=ANHGHH98JGG>CI86GGN>C<EG6HHHJ8=6H:A8IG9: H=6C@H6C9=:6KN9JIN:A8IG9: =DA9:GH#>H=:6IIG6I67A

' , " ! ((!!$. H)* !$.

,3&&#')** , =6H:MIG:B:AN=><==6G9C.HH6C9>HG8DBB:C9:9;DGEG?8I>DC;A6H=6C97JIIL:A9>C<:A8IG9:H#=6HADL:G 8DC9J8I>K>INI=6C A6HH 6AADN7JI>I>H=6G9:G6C9BDGL:6GG>H>H6CI #H=DJA97: 8DCH9:G9L=:GI=:G>H8DC8:GCL>==><= EGHHJG9:C>H>N6C9HK GL:6G7JIL=:G=:6I>C< 9J:IDI>HADL8DC9J8I>K>IN>HCDI:M8:HH>K

#>HJH9;GFJ:CIAN>CI=: ;DGB D;>CH GHIDDA>C<;68>C<H6C9H6BL:A9:G7JH=>C<H#>H6K6>A67A>CI=: 6CC.6A98DC9>>DCL=>8=>H BDGG69>ANB68=>C.96C9I=:CHJ7HFJ:CIAN=:6IIG6I:9

' $*% ' ')$'.") ! $" %$( ) $#(

' , " ! ((H)* !$. ,

./(!-.(V)** , HJ>:9;DG;68>C<H6C9>CH GH;DGEG?8I>DCL:A9>C<:A8IG9:H6C9;A6H=6C97JIIL:A9>C<:A8IG9:H #>HG8DBB:C9:9L=:G GA6I>K AN=><=:A8IG86A8DC9J8I>K>IN6C9HDB:9:<G: D;B6AA67>A>N>H9:H>G9

' , " ! ((H)* !$. ,

./(!-.(V)** , HJ>:9IDH>B>A6G6EEA>86I>DCH6H A6HH 6C9;DG;68>C<DC:A8IG9: ;DGB>C<:A8IG9:H#>H=6C9:G I=6C A6HH 6C9>H;DG<:C.G6AJH>CEG?8I>DCL:A9>C<:A8IG9:H

' , " ! ((H)* !$. ,

./(!-.(V)** , HJ>:9;DG:A8IG9;DGB>C<6C9:A8IG9;DG>C<;68>C<H6C9;DG:A8IG9: ;68>C<HJH9IDJEH IHJ9H 6C9GK IH B6I:G6A;DG=:6KN9JINEG?8I>DCL:A9>C<:A8IG9:H

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A6HH B6I:G6AH6GJH9EGB6GAN;DGL:A9>C<DG:A8IG97G6O>C<ODC;:GGDJHB:I6AH=6K>C<GA6I>K AN=><=:A8IG86A 8DC9J8I>K>IN.=:N6GHJ>:9ID8GDHHL>GL:A9>C<D;8DEE:G6C97G6HH6C9;DGL:A9>C<8DEE:GL>G7G6>9ID7G6HHDG7GDCO I:GB>C6AH -E:86AH IJEH6C9EG8:9JGH6GFJ>G9

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%6C1;8A743 (B0=30@8A>5B74 '4A8AB0=24, 4;34@' 0=C502BC@4@A AA>28B>=

		:0AA	)* !$. #C; 14@	%@=>=@B<0: !8; 8B)4<A8=< %(	0@8<4AA ' =29E4::	=<3C2BD8BG %4@24<B (	*:B8; 0B4)4<A84 (B@4<6B7 %(	:=<60B8=< %4@24<B < J=@J 80; 4B4@
=>>4@ 0A4 ::=GA	'$*# '$ (*>B= L380							
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	'((?C0@4 '42B0<6C:0@ 4F06=< *>B= KB7829							
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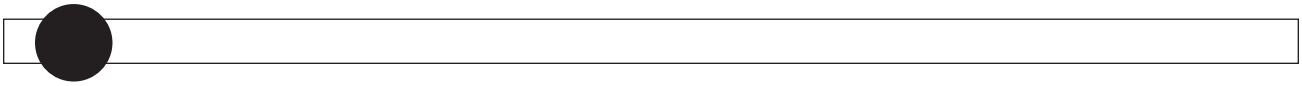

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' 6CN;68IDGH6;;: 8I>C< : A8IGD9: 8DH 6C9 JH ;JA: A8IGD9: A>;: 6G 7G>;ANDJIAC. 9 7: ADL

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&6NDJI I=: E6GI ;DGG H>H6C8: L: A9>C< : H>C>C< : C<>C. : G L: A9>C< : C<>C. : G6C9 EGD9J8I>DC B6C>C 8=6G<: D; L: A9>C< H=DJA9 8DDE: G6I: >C H 8JG>C< 6 7: II: GEGD9J8I 6I ADL: H 8DH

DGG: 8I 9: H>C E: GB>HHI=: JH D; H6C96G9 HG6><=I : A8IGD9: H DGH 6C96G9 D; ;H I DGH 6C96G9 6C<JA6G=DA9: GH>; I=: HG6><=I 6EEGD68=>HCDI EDHH>7A - E: 8>6AH=6E: 9 : A8IGD9: H 8DH B DG 6C9 I=: 9>;;:8JAIND; 8DDA>C< I=: : A8IGD9: >H6B EA>;>9 - >C<A HEDI B JA>EA HEDI EGD?:8I>DC DGDI=: GB : I=D9 B 6N 7: 688JG6I: AN 8=DH C ID 68=>: K: ADL: H 8DH DCHJAI I=: , 1 ' ' 6CJ6A *(, 1 ')) %

") ' !)$, !

. =: L: A967>AIND; I=: B 6I: G6AH 86C 7: 9: I: GB>C: 9 7N 8DCHJA>C< NDJGB 6I: G6AHJEEA>: G 6C9 7NG K>: L>C< G 8DB B : C96I>DCH 8DK: G 9 >C I=: , 1 ' ' 6CJ6A

- JG;68: 8DC9>I>DCH GH D>A 9>G 6C9 DCB 6CN 6G>8A H DM9: ;>AB 6C9 : K C=6C9A>C< B 6G@H=6K 6 9: 8>9: 9 : ;;: 8I DC L: A9 FJ6AIN A6C>C< B 6N=6K ID7: 6 E6G D; I=: L: A9>C< ?D7 >C HDB : 86H H

, ! # &* %' #) # $#)' $!

L: A9>C< B 68=>C: D; G EJI67A FJ6AINEJG8=6H 9 ;DG6 E6G>8JA6G6EEA>86I>DC L>AA7: 8DG:8IAN9: H>C. 9 7DI=: A8IG>86AN 6C9 B : 8=6C>86AN 6C9 L>AA7: HJEEA>: 9 I=: 8DG:8I 8DCIGDA : FJ>EB : CI 6C9 : A8IGD9: H;DGI=: LDG@

) CB 68=>C: 8=6C<: DK GHB 6@ HJG D; 69: FJ6I: : A8IG>86A 6C9 B : 8=6C>86A86E68>IN 6C9 H : I=6I I=: C. 8: HH6GN 8DCIGDAH 6G EGDK>9: 9 DCHJAI JHL=: C G9: H>C>C< DGG K>H>C< NDJG 8=D>8: D; : A8IGD9: H

( ) # ' ')					
) 782: =4AA 8= 428< 0;A >50= =27					
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/ H H6C96G9 . J;;6ADN: A8IGD9: HL>I= . J;;6ADN :?: 8IDGINE: H A; 69?JH>C< IJ7: L6I: G8DDA 9 : A8IGD9: =DA9: GHL=: G K: GEDHH>7A KD>9 HE: 8>6ADG>G<JA6GH=6E: H;DGADL: H 8DH

/ H 6B EA 8DA9 8DDA>C< L6I: G6H8ADH 6HEG68I>86A IDI=: L: A9>C< 8DCI68I HJG;68: EGDE: GAN 8>8JA6I: 9 6I 6 B>C>B JB D; EH>EG HJG 6C9 HJEEA>: 9 6I 6 G6I: D; 6I A 6H <6AADCHE: GB >CJI:

: HJG IDH A8I I=: EGDE: GINE: 6C9 H>O D; : A8IGD9: I6@>C< >CID 8DCH>9: G6I>DC : A8IGD9: EG HJG 8DCI68I 6G 6 D; : A8IGD9: <6J<: 6C9 CJG D; B 6I: G6AID7: L: A9: 9 DCHJAI I=: , 1 ' ' 6CJ6A DGNDJG . J;;6ADN;>A9 : C<>C. : GG<6G9>C< G 8DB B : C9: 9 EG68I>8: H) K: GAD69>C< 6HL: AA6H DK G=: 6I>C< H=DG: CH: A8IGD9: A>;:

! DD9 L: A9H9: E: C9 JEDC EGDE: GAN B 6>CI6>C: 9 : A8IGD9: HL=>8= 6HHJG 6C 688JG6I: HJG;68: 8DCI68I % : E I6E: GH8A 6C 6C9 9G HH: A8IGD9: ;68: HL>I= A6I=: : B : GNE699A DG;>C. ;>A / H 86HDGD>ADG<G6E=>I: <G 6H ID;68>AI6I: I>E G B DK6A 6C9 6KD>9 6EEA>86I>DC D; >CHJA6IDGH HJ8= 6HI: ;ADC I6E: 6C9 DI=: GB 6I: G6AH

' (( ) # , ! # " # ( ) * %

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Q/ H , 1 ' H6C96G9 : A8IGD9: HL =: C: K: GEDH+H7A:

Q/ H I=: 6EEGDEG6I: : A8IGD9: 9>6B: I: G;DGI=: B6I: G6A 7: >C< L : A9: 9

Q/ H DE: CH><=I 9G6>CHDG=6K: L6I: G;ADL <6J<: HDCDJI 7DJC9 H+9: ID: 6H+AN8DC;>B L6I: G;ADL

Q DCC: 8I I=: L6I: G>CA:I =DH IDI=: EGDE: G=DA9: G>CA:I ID >CHJG: L6I: G;ADL HI=GDJ<= I=: 8: CI: G8DDA<C< IJ7: ;>GH

Q, : 8DBB: C9: 9 L6I: G;ADL ;DGI=: : A8IGD9: H>H <6ADCH E: GB >CJI: D; 8DA9 L6I: G

Q#CHJG: I=6I I=: L6I: GIJ7: : MI: C9HL>I=>C XD; I=: 7DIIDB: D; I=: : A8IGD9: L6I: G=DA:

Q 9?JH I=: L6I: GIJ7: EDH+H>DC L =: C8=6C><C< ID6CDI=: G AC<I= : A8IGD9:

Q =: 8@L 6I: GIJ7: : C9HID>CHJG I=: N6G: CDI 96B6<: 9 6C9 =6K: 6C6C<A9 8JI 6I I=: : C9 IDEG:K: CI L6I: GG:HG8I>DC

Q/ H :?8IDGNE: =DA9: GHIDH+B EA;N: A8IGD9: GB DK6A

Q%: EI=: : A8IGD9: 6C9 =DA9: GI6E: GH8A6CID: CHJG: <DD9 A6@G: 8DC9J8I>DC

Q G:H+H: A8IGD9: H;G:FJ: CIANID>CHJG: <DD9 FJ6A+NL : A9H

Q G:H+H: A8IGD9: H>C6 A6I=: IDI=: >GDG<<C6A8DCIDJG L=: C: K: GEDH+H7A:

Q/ H G6L =>9: DG=6C9 GJ77: G=6B B : GH;DG6A<CB : CI D; : A8IGD9: H

Q*GEK<9: 8DDA<C< L6I: GDCI=: : M+H+9: IDE:6C9 7DIIDB D; H 6B L : A9>C< 6EEA86I>DCH

Q/ H EGDE: GAN9: H><C: 9 @CJGA<C< L =: : A+HID>CHJG 8DCI>CJDJH9G:H+H<C< D; I=: H 6B L : A9>C< L =: : A

Q&D8@DJI I=: B68=>C: L =: C:E: G;DGB>C< 6CNINE: D; B6>CI: C6C8:

$#Q)(

Q(: K: GJH JC>9: CI>;>9 : A8IGD9: HDGB6I: G6A+H

Q KD>9 HE: 8>6AD;:H I DG>GG<JA6G: A8IGD9: HL =: CI=: 2D7 86C7: 9DC: L >I= H6C96G9 : A8IGD9: H

Q DCDI JH HB6A+A: A8IGD9: HDC =: 6KN<6J<: L : A9>C< 2D7HDGA6G<: : A8IGD9: HDCHB6A+A<6J<: B6I: G6A+H

Q DCDI ;DG<: I IDIJGCI=: L6I: GDC;JA+;DG8: 7: ;DG: H6G>C< IDL : A9

Q(: K: GJH L6I: G=DH HI=6I 9DCDI ;>I=: L6I: G;>I>C< EGDE: GAN

Q DCDI 6A+DL L6I: G8DCC: 8I>DCHID7: 8DB : A6@N 8AD<<: 9 DG7GD@C

Q KD>9 =DA9: GHL>I=: A6@C< DG9: ;DGB: 9 I6E: GH

Q(: K: GJH =DA9: GHI=6I 9DCDI =6K: 69?JH67A L6I: G 9: ;A8IDGJ7: H

Q(: K: GJH E>E: I6E: DGH+B>A6GEGD9J8I IDHDE:6 A6@

Q DCDI AI NDJG: A8IGD9: BJH=GDDB : M8: H+H<: AN

Q DCDI 9GHH: A8IGD9: HL >I= 6 ;>A:

Q DCDI JH 6 H: : A=6B B : GID69?JH 6CNE6G: D; 6 L : A9>C< B68=>C:

Q KD>9 I=: JH D; H 6B L : A9: GL =: : A+HIDDI=>CIDH6C9 I=: =: 6I DGEGH+HJG: D; NDJG?D7

Q DCDI E: GB>I H 6B L : A9>C< L =: : A+HIDGJCD;: I=: : 9<: D; I=: L DG@E>8:

Q DCDI : CI: G6 L DG@8: A+DGG68= >CID6 L : A9: GL >I=DJI JH+C< NDJGAD8@DJI

QUOTE REQUEST SPECIALS AND CUSTOMS

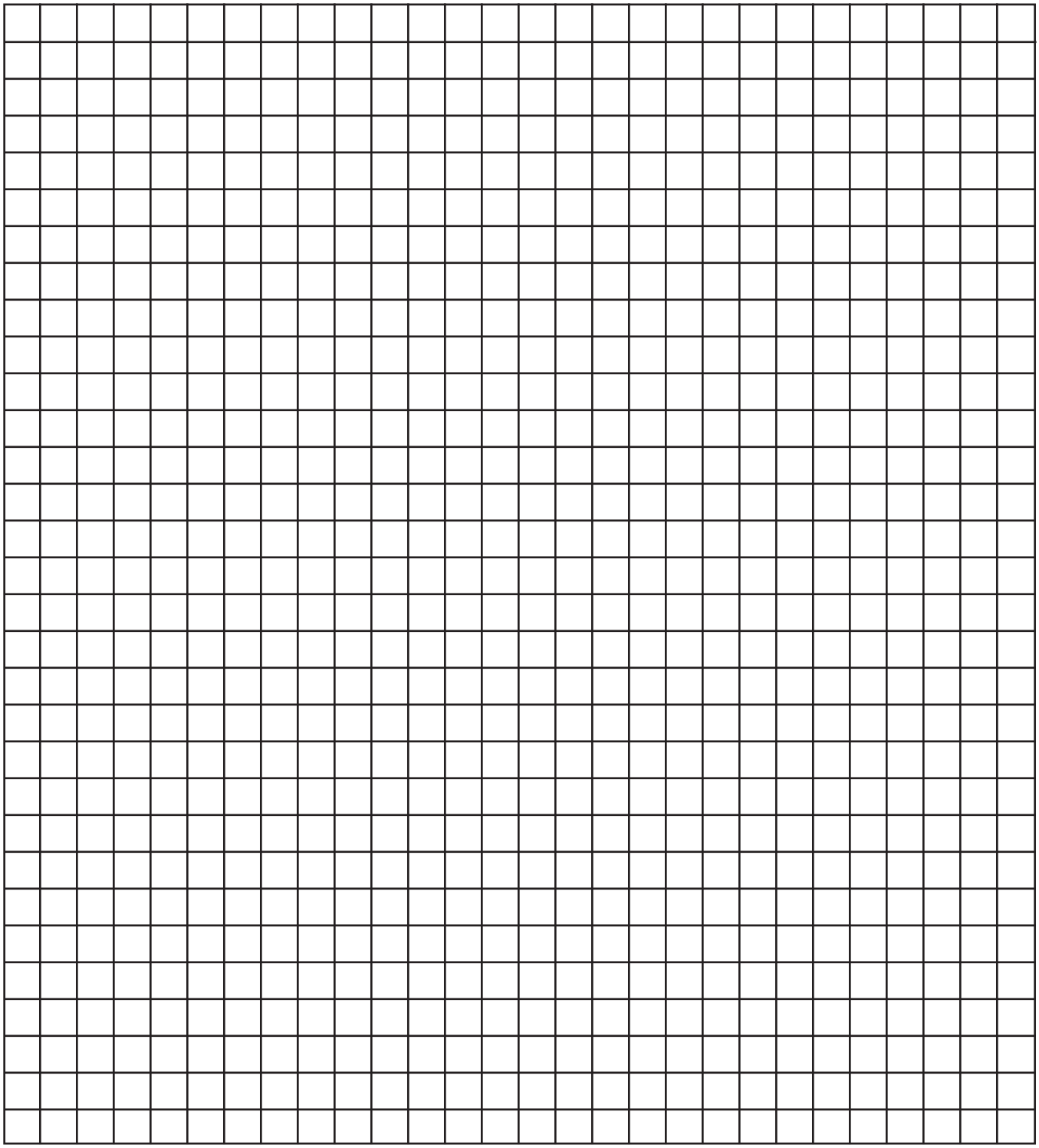
Contact Name: _____ Company: _____

Address: _____

Phone: _____ Fax: _____ Email: _____

Part Information: _____ Material/Alloy: _____

Part Number or Description: _____



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