






Catalog 2009

TUFFALOY

Resistance Welding Products

Leader in the Industry Since 1937

714-252-5340
Simco
www.simcoweld.com

RESISTANCE WELDING PRODUCTS

The little **"TUFFALOY man"** is now seventy 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:
http://www.tuffaloy.com

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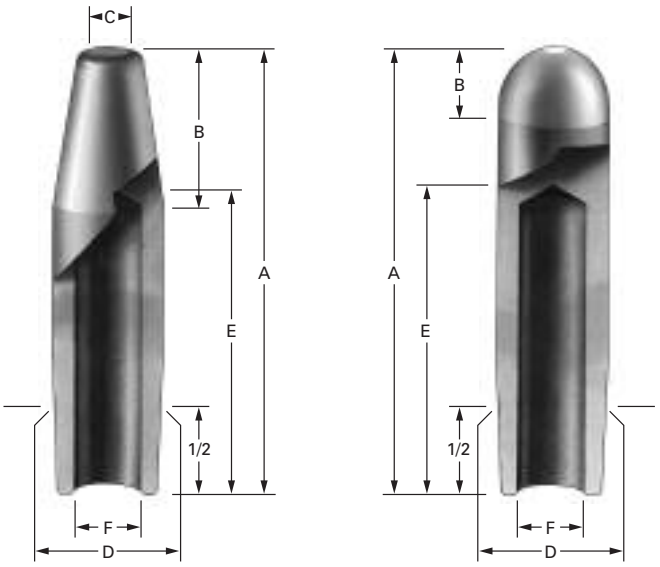
TUFFALOY STANDARD STRAIGHT TIPS

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.

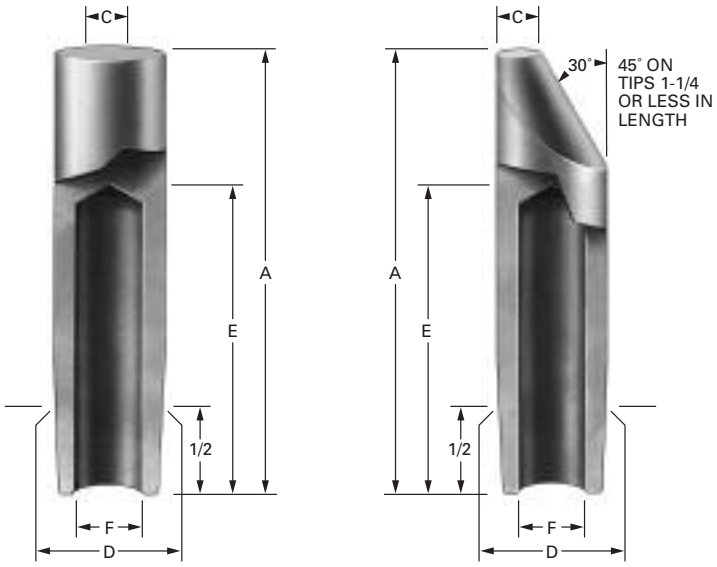


A Overall Length	C Welding Face Dia.	D Gauging Dia.	E Water Hole Depth	F Water Hole Dia.	'A' POINTED NOSE					'B' DOME NOSE				
						RWMA CLASS 1		RWMA CLASS 2			RWMA CLASS 1		RWMA CLASS 2	
					B Nose Length	Description	Part No.	Description	Part No.	B Nose Length	Description	Part No.	Description	Part 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 46.

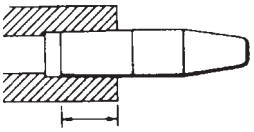
To order Class 3 alloy tips, change description code to indicate it: see "Key to Description", page 4.



				'C' FLAT NOSE					'D' OFFSET NOSE				
					RWMA CLASS 1		RWMA CLASS 2			RWMA CLASS 1		RWMA CLASS 2	
A Overall Length	D Gauging Dia.	E Water Hole Depth	F Water Hole Dia.	C Welding Face Dia.	Description	Part No.	Description	Part No.	C Welding Face Dia.	Description	Part No.	Description	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	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	C-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

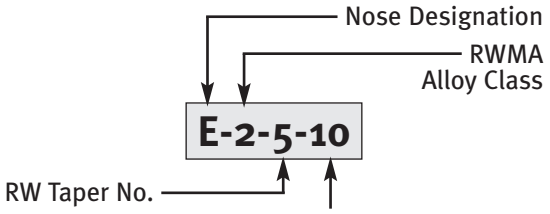
TUFFALOY STANDARD STRAIGHT TIPS

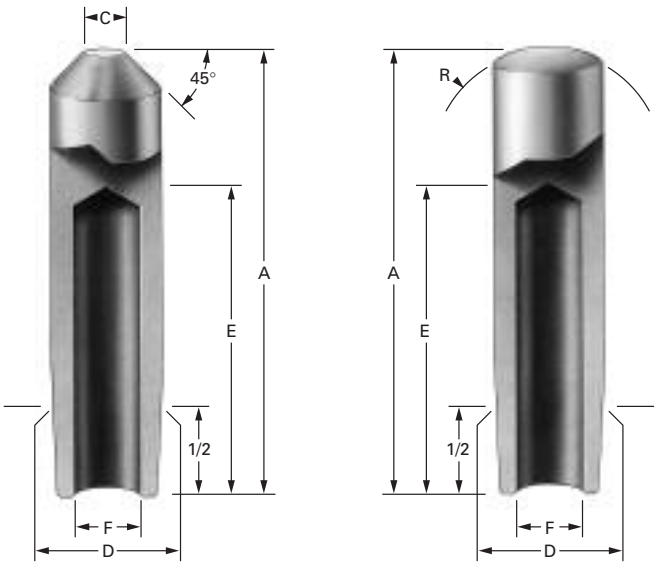
TAPER ENGAGEMENT



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

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.
NO. 4 RW TAPER - 1/2" DIAMETER								
1	.463	1/2	9/32	3/16	E-1404	140-1404	E-2404	140-2404
1-1/4	.463	3/4	9/32	3/16	E-1405	140-1405	E-2405	140-2405
1-1/2	.463	1	9/32	3/16	E-1406	140-1406	E-2406	140-2406
1-3/4	.463	1-1/4	9/32	3/16	E-1407	140-1407	E-2407	140-2407
2	.463	1-1/2	9/32	3/16	E-1408	140-1408	E-2408	140-2408
2-1/4	.463	1-3/4	9/32	3/16	E-1409	140-1409	E-2409	140-2409
2-1/2	.463	2	9/32	3/16	E-1410	140-1410	E-2410	140-2410
2-3/4	.463	2-1/4	9/32	3/16	E-1411	140-1411	E-2411	140-2411
3	.463	2-1/2	9/32	3/16	E-1412	140-1412	E-2412	140-2412
3-1/4	.463	2-3/4	9/32	3/16	E-1413	140-1413	E-2413	140-2413
3-1/2	.463	3	9/32	3/16	E-1414	140-1414	E-2414	140-2414
3-3/4	.463	3-1/4	9/32	3/16	E-1415	140-1415	E-2415	140-2415
4	.463	3-1/2	9/32	3/16	E-1416	140-1416	E-2416	140-2416
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
1-1/2	.613	3/4	3/8	1/4	E-1506	140-1506	E-2506	140-2506
1-3/4	.613	1	3/8	1/4	E-1507	140-1507	E-2507	140-2507
2	.613	1-1/4	3/8	1/4	E-1508	140-1508	E-2508	140-2508
2-1/4	.613	1-1/2	3/8	1/4	E-1509	140-1509	E-2509	140-2509
2-1/2	.613	1-3/4	3/8	1/4	E-1510	140-1510	E-2510	140-2510
2-3/4	.613	2	3/8	1/4	E-1511	140-1511	E-2511	140-2511
3	.613	2-1/4	3/8	1/4	E-1512	140-1512	E-2512	140-2512
3-1/4	.613	2-1/2	3/8	1/4	E-1513	140-1513	E-2513	140-2513
3-1/2	.613	2-3/4	3/8	1/4	E-1514	140-1514	E-2514	140-2514
3-3/4	.613	3	3/8	1/4	E-1515	140-1515	E-2515	140-2515
4	.613	3-1/4	3/8	1/4	E-1516	140-1516	E-2516	140-2516
NO. 6 RW TAPER - 3/4" DIAMETER								
2	.731	1-1/4	7/16	9/32	E-1608	140-1618	E-2608	140-2608
2-1/2	.731	1-3 /4	7/16	9/32	E 1610	140-1610	E-2610	140-2610
3	.731	2-1/4	7/16	9/32	E-1612	140-1612	E-2612	140-2612
3-1/2	.731	2-3/4	7/16	9/32	E-1614	140-1614	E-2614	140-2614
4	.731	3-1/4	7/16	9/32	E-1616	140-1616	E-2616	140-2616
NO. 7 RW TAPER - 7/8" DIAMETER								
2	.844	1-1/4	1/2	5/16	E-1708	140-1708	E-2708	140-2708
2-1/2	.844	1-3/4	1/2	5/16	E-1710	140-1710	E-2710	140-2710
3	.844	2-1/4	1/2	5/16	E-1712	140-1712	E-2712	140-2712
3-1/2	.844	2-3/4	1/2	5/16	E-1714	140-1714	E-2714	140-2714
4	.844	3-1/2	1/2	5/16	E-1716	140-1716	E-2716	140-2716

'F' RADIUS FACED

R Nose Radius	RWMA CLASS 1 Description	RWMA CLASS 1 Part No.	RWMA CLASS 2 Description	RWMA CLASS 2 Part No.
2	F-1404	141-1404	F-2404	141-2404
2	F-1405	141-1405	F-2405	141-2405
2	F-1406	141-1406	F-2406	141-2406
2	F-1407	141-1407	F-2407	141-2407
2	F-1408	141-1408	F-2408	141-2408
2	F-1409	141-1409	F-2409	141-2409
2	F-1410	141-1410	F-2410	141-2410
2	F-1411	141-1411	F-2411	141-2411
2	F-1412	141-1412	F-2412	141-2412
2	F-1413	141-1413	F-2413	141-2413
2	F-1414	141-1414	F-2414	141-2414
2	F-1415	141-1415	F-2415	141-2415
2	F-1416	141-1416	F-2416	141-2416
2	F-1515	141-1505	F-2505	141-2505
2	F-1506	141-1506	F-2506	141-2506
2	F-1507	141-1507	F-2507	141-2507
2	F-1508	141-1508	F-2508	141-2508
2	F-1509	141-1509	F-2509	141-2509
2	F-1510	141-1510	F-2510	141-2510
2	F-1511	141-1511	F-2511	141-2511
2	F-1512	141-1512	F-2512	141-2512
2	F-1513	141-1513	F-2513	141-2513
2	F-1514	141-1514	F-2514	141-2514
2	F-1515	141-1515	F-2515	141-2515
2	F-1516	141-1516	F-2516	141-2516
4	F-1608	141-1608	F-2608	141-2608
4	F-1610	141-1610	F-2610	141-2610
4	F-1612	141-1612	F-2612	141-2612
4	F-1614	141-1614	F-2614	141-2614
4	F-1616	141-1616	F-2616	141-2616
6	F-1708	141-1708	F 2708	141-2708
6	F-1710	141-1710	F-2710	141-2710
6	F-1712	141-1712	F-2712	141-2712
6	F-1714	141-1714	F-2714	141-2714
6	F-1716	141-1716	F-2716	141-2716

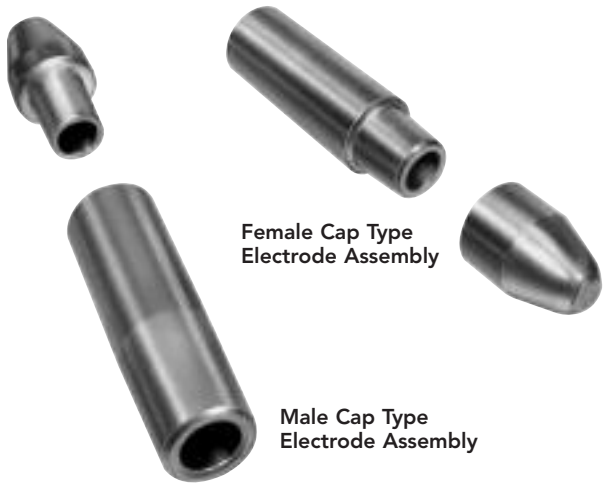
Tuffcap electrodes consist of two pieces: a shank and a replaceable cap. These two-part electrodes can offer major economies, because when the nose geometry is worn out, only the cap needs to be replaced. And it costs far less than a standard one-piece electrode. (A Tuffcap shank will normally outlast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



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 6 & 7.

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.

NEW! SUPER NOSE DESIGN CAPS

To avoid mushrooming and brassing problems associated with standard designs, these caps have a self-dressing weld face ring that acts as a control zone. The Super Nose caps are available in TUFFALOY's new "Z" material, that eliminates electrode sticking problems common when welding galvanized and aluminized materials.

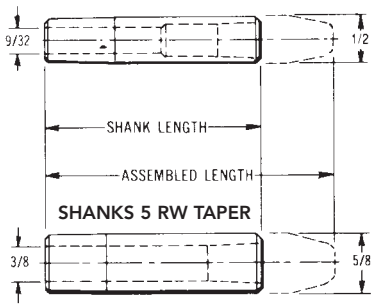
Both male and female designs are offered, designed to fit shanks with 5 RW taper.

U.S. Patent Number 5,155,320
Other patents pending

TUFFALOY CAPS AND SHANKS

STRAIGHT SHANKS FOR MALE CAPS (CLASS 2*)

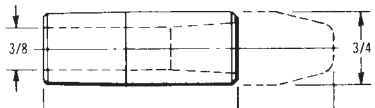
SHANKS 4 RW TAPER



SHANKS 5 RW TAPER

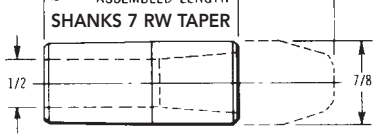
Shank Length	Assembled Length	Descrip-tion	Part No.
1-1/4	2	TG-2405	161-2405
1-1/2	2-1/4	TG-2406	161-2406
1-3/4	2-1/2	TG-2407	161-2407
2	2-3/4	TG-2408	161-2408
2-1/4	3	TG-2409	161-2409
2-1/2	3-1/4	TG-2410	161-2410
2-3/4	3-1/2	TG-2411	161-2411
3	3-3/4	TG-2412	161-2412
3-1/4	4	TG-2413	161-2413
1-1/4	2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



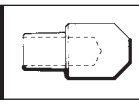
1-1/2	2-1/2	TG-2606	161-2606
2	3	TG-2608	161-2608
2-1/2	3-1/2	TG-2610	161-2610
3	4	TG-2612	161-2612

SHANKS 7 RW TAPER

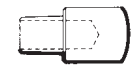


1-1/2	2-1/2	TG-2706	161-2706
2	3	TG-2708	161-2708
2-1/2	3-1/2	TG-2710	161-2710
3	4	TG-2712	161-2712

'E' NOSE 4 AND 5 CAP

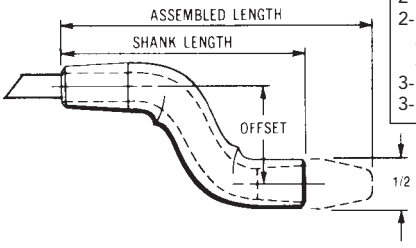


'F' NOSE 4 AND 5 CAP



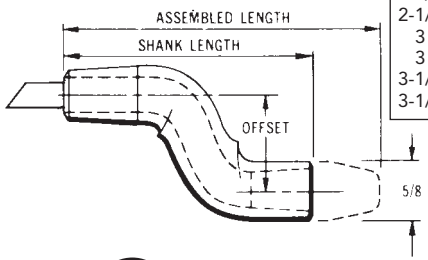
BENT SHANKS FOR MALE CAPS (CLASS 2*)

SHANKS 4 RW TAPER



Shank Length	Off-set	Length	Descrip-tion	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
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

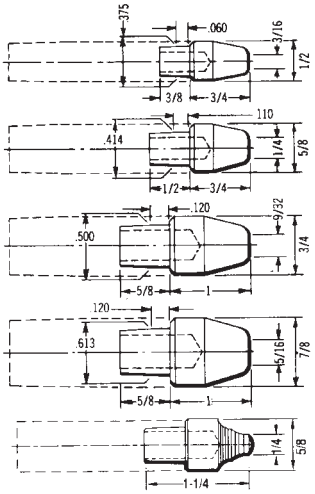
SHANKS 5 RW TAPER



* Class 3 Available

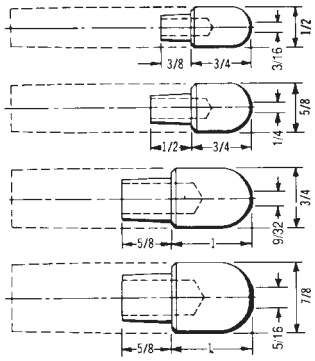
MALE CAPS

POINTED TIPS 'A'



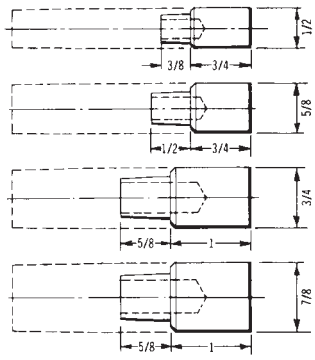
Alloy Class	Taper of Adapter Shank	Descrip-tion	Part No.
1	4RW	TA-14	111-0014
2	4RW	TA-24	112-0024
3	4RW	TA-34	122-1034
1	5RW	TA-15	111-0015
1&2	5RW	TA-25Z	126-0025
2	5RW	TA-25	112-0025
3	5RW	TA-35	122-1035
1	6RW	TA-16	111-0016
2	6RW	TA-26	112-0026
1	7RW	TA-17	111-0017
2	7RW	TA-27	112-0027
Z	4RW	TS-24Z	127-0024
Other sizes available			
Z	5RW	TS-25Z	127-0025

DOME TIPS 'B'



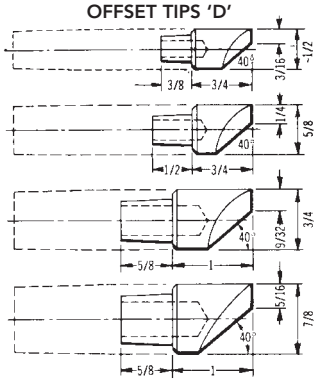
1	4RW	TB-14	113-0014
2	4RW	TB-24	114-0024
1	5RW	TB-15	113-0015
2	5RW	TB-25	114-0025
1	6RW	TB-16	113-0016
2	6RW	TB-26	114-0026
1	7RW	TB-17	113-0017
2	7RW	TB-27	114-0027

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

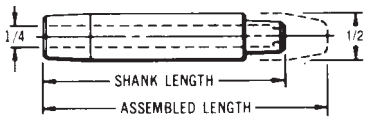
OFFSET TIPS 'D'



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

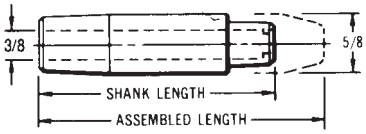
STRAIGHT SHANKS FOR FEMALE CAPS (CLASS 2*)

SHANKS 4 RW TAPER



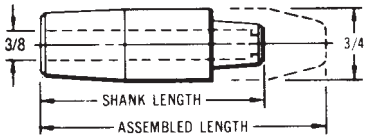
Shank Length	Assembled Length	Description	Part No.
1-1/2	2	TP-2406	163-2406
1-3/4	2-1/4	TP-2407	163-2407
2	2-1/2	TP-2408	163-2408
2-1/4	2-3/4	TP-2409	163-2409
2-1/2	3	TP-2410	163-2410
2-3/4	3-1/4	TP-2411	163-2411
3	3-1/2	TP-2412	163-2412
3-1/4	3-3/4	TP-2413	163-2413
3-1/2	4	TP-2414	163-2414

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

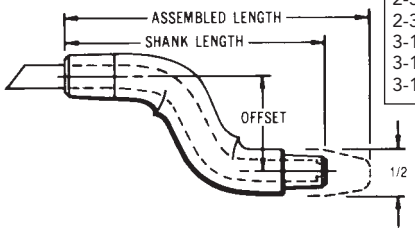
'E' NOSE 4 AND 5 CAP

'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.

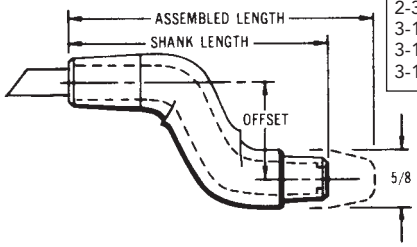
BENT SHANKS FOR FEMALE CAPS (CLASS 2*)

SHANKS 4 RW TAPER



Shank Length	Off-set	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

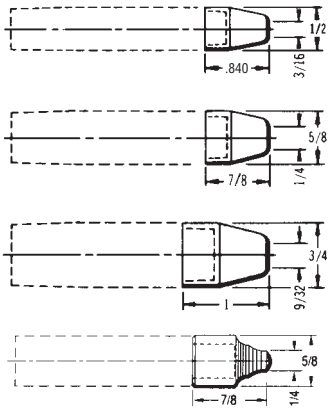
SHANKS 5 RW TAPER



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
3-1/2	1	4	TP-2513-16	164-2570
3-1/4	1-1/4	3-3/4	TP-2513-20	164-2580

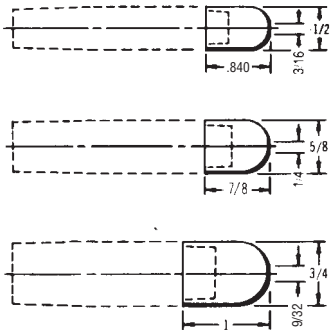
FEMALE CAPS

POINTED TIPS 'A'



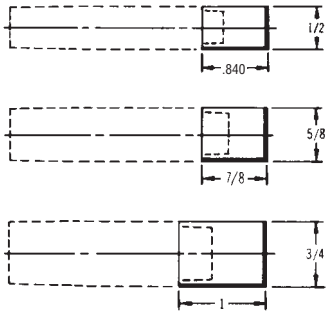
Alloy Class	Taper of Adapter Shank	Description	Part No.
2	4RW	TP-24A	125-0241
2	5RW	TP-25A	125-0251
2	6RW	TP-26A	125-0261
Z	4RW	TP-24SZ	127-0241
Other sizes available			
Z	5RW	TP-25SZ	127-0251

DOME TIPS 'B'



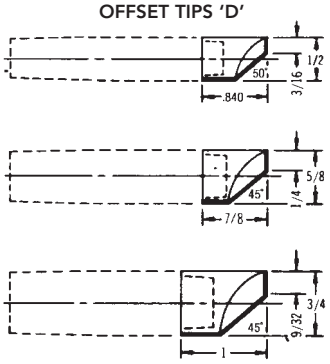
2	4RW	TP-24B	125-0242
2	5RW	TP-25B	125-0252
2	6RW	TP-26B	125-0262

FLAT TIPS 'C'



2	4RW	TP-24C	125-0243
2	5RW	TP-25C	125-0253
2	6RW	TP-26C	125-0263

OFFSET TIPS 'D'



2	4RW	TP-24D	125-0244
2	5RW	TP-25D	125-0254
2	6RW	TP-26D	125-0264

* Class 3 Available

714-252-5340
Simco
www.simcoweld.com

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.

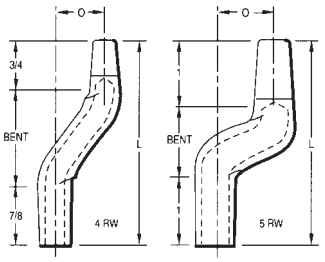
The table shows a wide range of tips generally available from stock. For sizes not shown, refer to the diagrams and description key at the bottom of the page, and order what you need. All measurements will be accurate. However, over-all length, in 1/8-in. multiples, will be held to within 1/16-in.

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

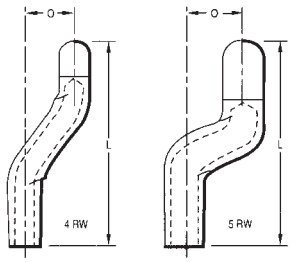
Standard nose designs other than those shown here may be furnished on short order. Follow the "Key to Description", using a 'B' for Dome nose, 'C' for flat nose, 'E' for truncated cone, and 'F' for radius nose.

DOUBLE-BENT, ADDITIONAL NOSE DESIGNS

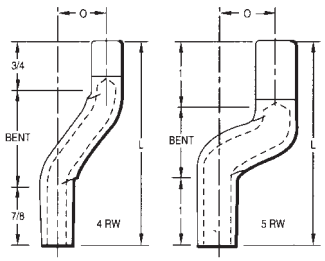
'A' POINTED NOSE



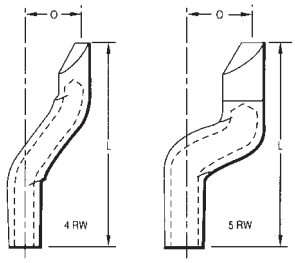
'B' DOME NOSE



'C' FLAT NOSE



'D' OFFSET NOSE



KEY TO DESCRIPTION

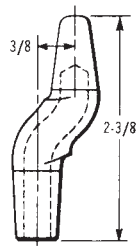
FX-YZLD-O

Example:
FB-1438-16-T

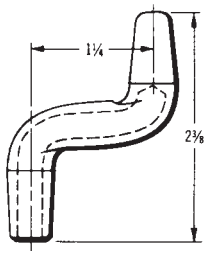
- **F** = Cold-Formed, Double-Bend Tips
- **X** = Nose Type
  - A
  - **B**
  - C
  - D
- **Y** = RWMA Alloy Class
  - **1** = Class 1
  - **2** = Class 2
- **Z** = RW Taper Number
  - **4** =4RW
  - **5** = 5RW
- **L** = Length in inches
  - Refer to table for availability
- **D** = Additional Length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

Taper No.	Length	Offset	CLASS 1				CLASS 2			
			FA Pointed Nose		FD Offset Nose		FA Pointed Nose		FD Offset Nose	
			Description	Item No.	Description	Item No.	Description	Item No.	Description	Item No.
4 RW	1-1/2	7/16					FA-2317-8	167-0060		
	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
	2-7/16	1-5/16								
	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					FA-2530-28	167-1540	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

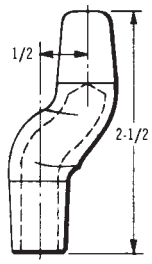
'A' POINTED NOSE



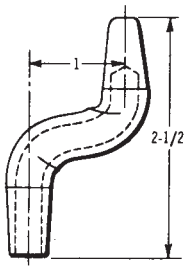
FA-1426-6	FA-2426-6
FA-1526-6	FA-2526-6



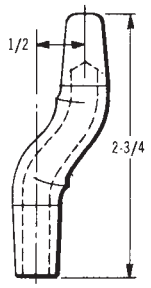
FA-1426-20	FA-2426-20



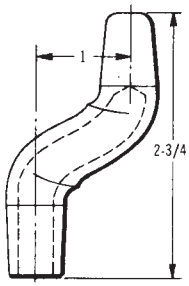
	FA-2428-8
FA-1528-8	FA-2528-8



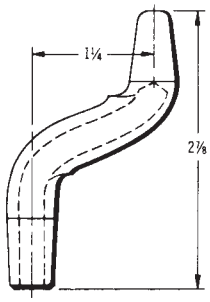
FA-1428-16	FA-2428-16
	FA-2528-16



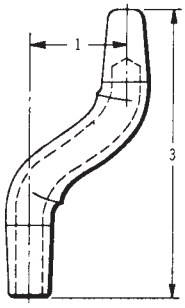
FA-14212-8	FA-24212-8
FA-15212-8	FA-25212-8



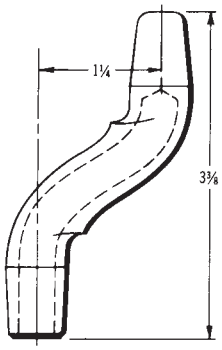
FA-15212-16	FA-25212-16



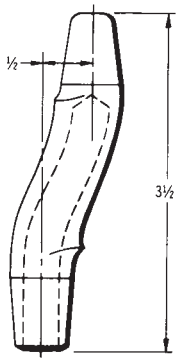
FA-14214-20	FA-24214-20
FA-15214-20	FA-25214-20



FA-1430-16	FA-2430-16

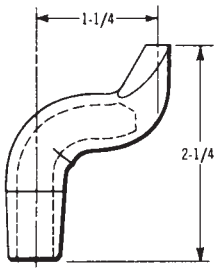


	FA-2436-20
FA-1536-20	FA-2436-20

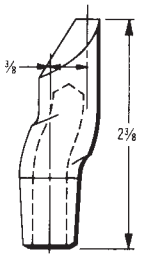


FA-1538-8	FA-2538-8

'D' OFFSET NOSE



FD-1524-20	FD-2524-20



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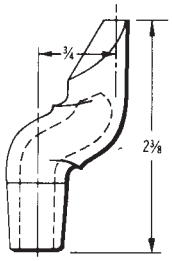

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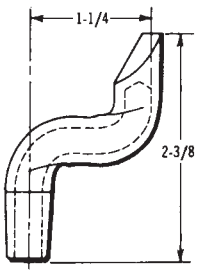
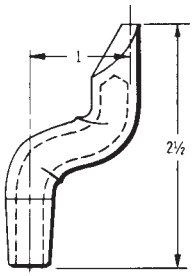
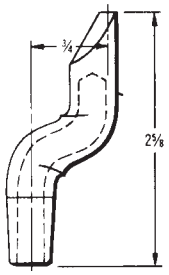


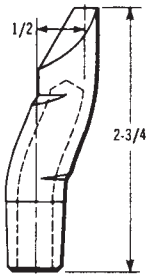
FD-1426-20	FD-2426-20



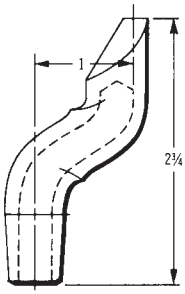
FD-1428-16	FD-2428-16



	FD-24210-12



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



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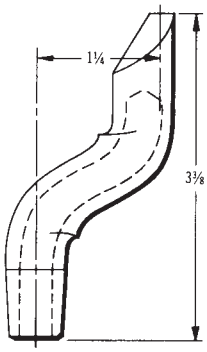

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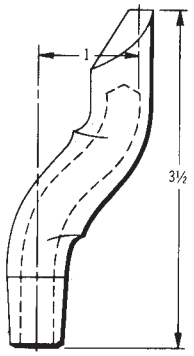

	FD-2538-16

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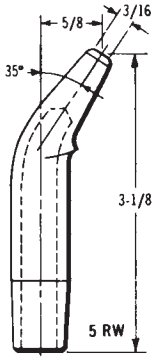
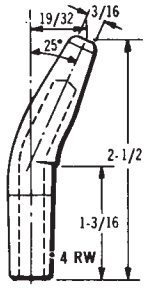
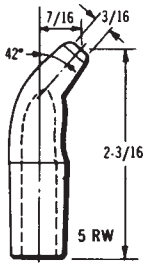
SINGLE-BEND TIPS



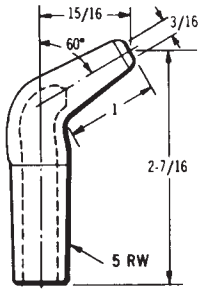
FP-2532-10
Part No.
167-5540



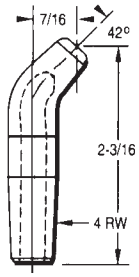
FP-2428-9.5
Part No.
167-4260



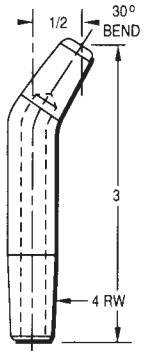
FP-2523-7
Part No.
167-5060



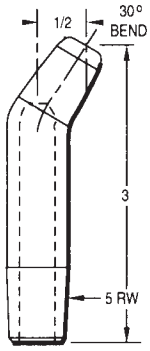
FP-2527-15
Part No.
167-5220



FP-2423-7
Part No.
167-5055

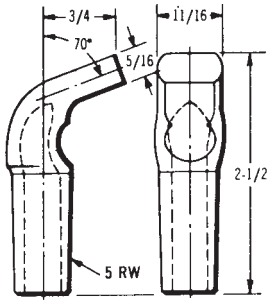


FP-2430-8
Part No.
167-5065

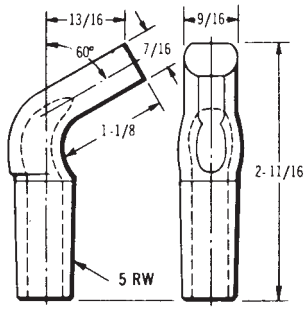


FP-2530-8
Part No.
167-5070

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.



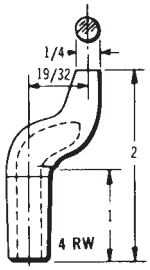
SE-4268
Part No. 170-4268



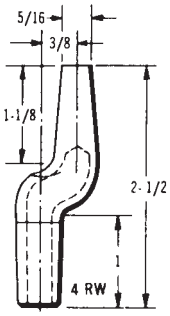
SE-4269
Part No. 170-4269

MISCELLANEOUS TIPS

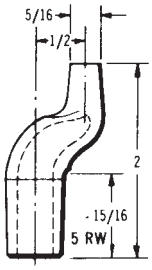
Double bend and flattened tips are made from bar stock. These are some of the standard designs available, but special designs can also be made. These are of Class 2 alloy; Class I alloy can also be ordered.



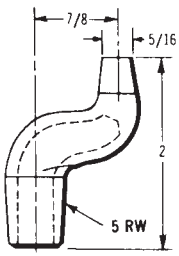
SE-4270
Part No. 170-4270



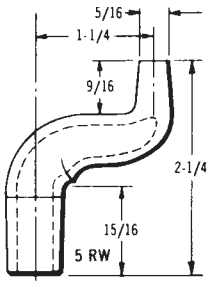
SE-4271
Part No. 170-4271



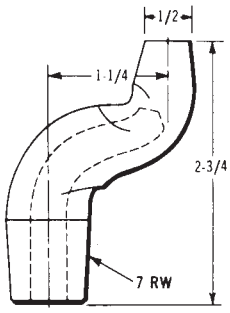
SE-4272
Part No. 170-4272



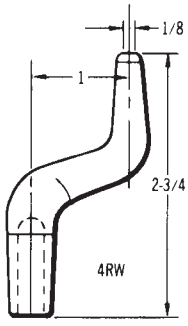
SE-4273
Part No. 170-4273



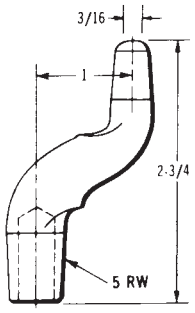
SE-4274
Part No. 170-4274



SE-4275
Part No. 170-4275

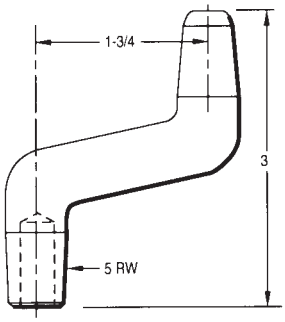


SE-4276-1
Part No. 170-4276-1

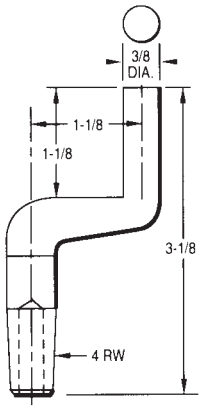


SE-4276
Part No. 170-4276

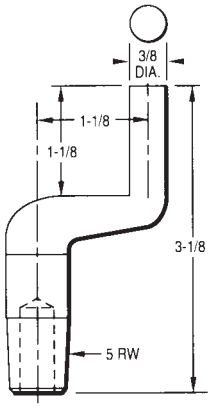
These standard bent tips are in addition to those shown on page 9.
They are of class 2 alloy; Other alloys can also be ordered.



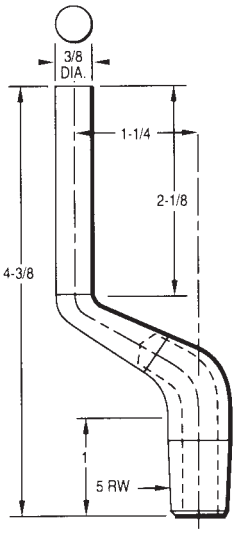
SE-4284 (short water hole)
Part No. 170-4284



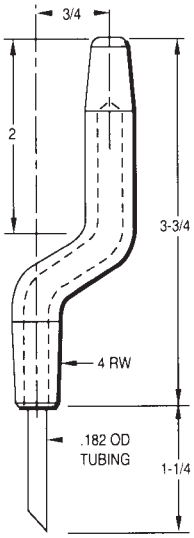
SE-4285
Part No. 170-4285



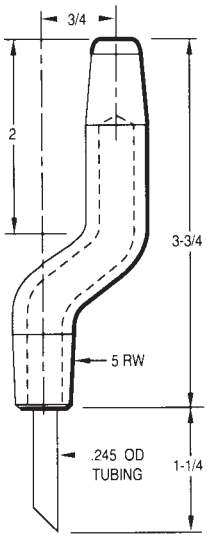
SE-4286
Part No. 170-4286



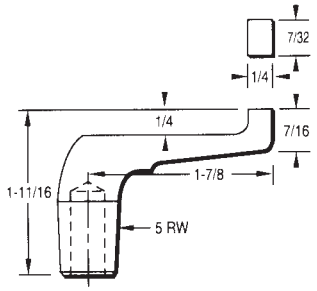
SE-4287
Part No. 170-4287



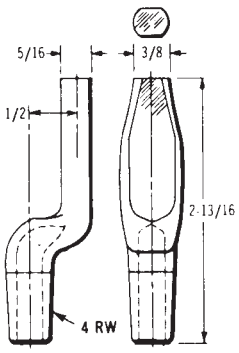
SE-4282
Part No. 170-4282



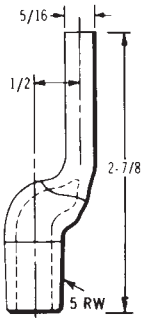
SE-4283
Part No. 170-4283



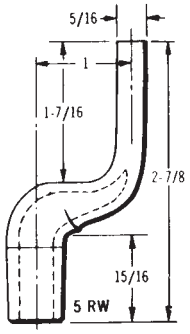
SE-4288
Part No. 170-4288



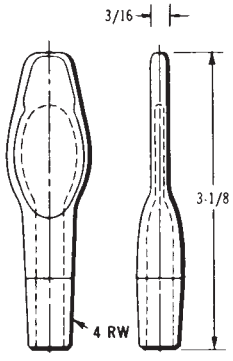
SE-4277
Part No. 170-4277



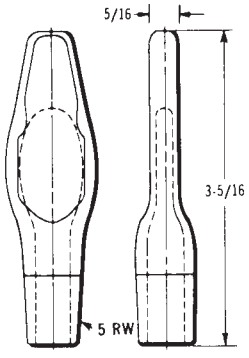
SE-4278
Part No. 170-4278



SE-4279
Part No. 170-4279

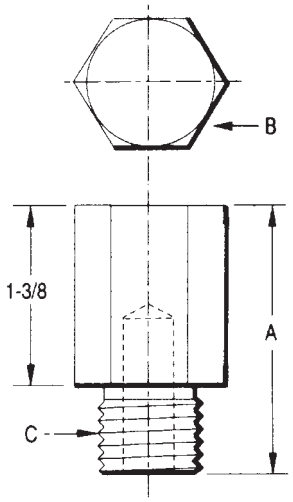


SE-4280
Part No. 170-4280



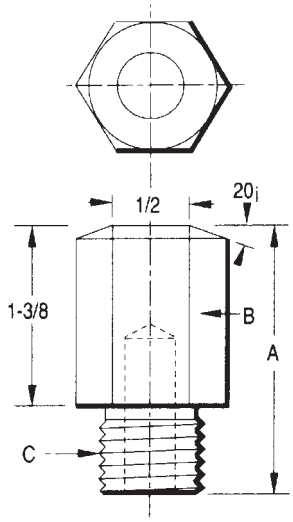
SE-4281
Part No. 170-4281

Tuffaloy threaded electrodes are Class 2 alloy. Other materials are available.



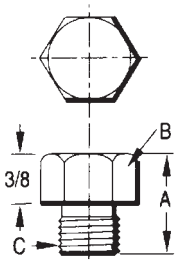
FLAT ELECTRODES

A Overall Length	B Tip Dia. (Hex)	C Male Thread	Description	Part No.
2	1	5/8-11	5100-11-C	187-5100-11
	1	5/8-18	5100-18-C	187-5100-18
	1	3/4-11	5100-10-C	187-5100-10
	1-1/4	3/4-10	5125-10-C	187-5125-10



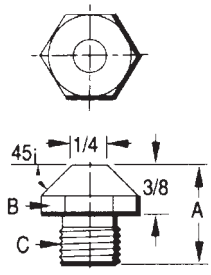
TRUNCATED ELECTRODES

A Overall Length	B Tip Dia. (Hex)	C Male Thread	Description	Part No.
2	1	5/8-11	5100-11-E	188-5100-11
	1	5/8-18	5100-18-E	188-5100-18
	1	3/4-10	5100-10-E	188-5100-10
	1-1/4	3/4-10	5125-10-E	188-5125-10



"C" NOSE ELECTRODES

A Overall Length	B Tip Dia. (Hex)	C Male Thread	Description	Part No.
3/4	5/8	7/16-14	5062-14-C	187-5062-14
3/4	5/8	3/8-16	5062-16-C	187-5062-16



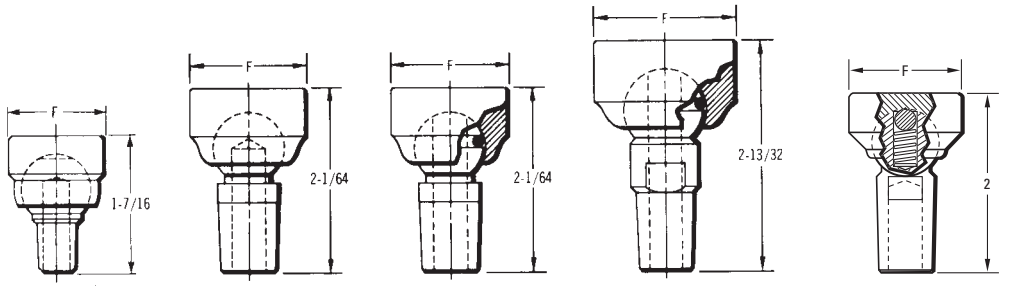
"E" NOSE ELECTRODES

A Overall Length	B Tip Dia. (Hex)	C Male Thread	Description	Part No.
3/4	5/8	7/16-14	5062-14-E	188-5062-14

TUFFALOY SWIVEL TIPS

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

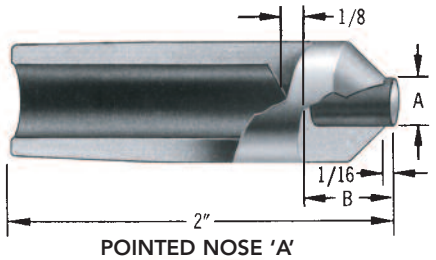
Taper No.	Face Dia. 'F'	S-Series Descrip-tion	S-Series Part No.	OS-Series Descrip. tion	OS-Series Part No.	OSH-Series Descrip-tion	OSH-Series Part No.	SS-Series Descrip-tion	SS-Series Part No.
5-CT*	7/8 1 1-1/4	S-248 S-249 S-250	182-0248 182-0249 182-0250						
4RW	7/8 1 1-1/4	S-348 S-350 S-351	182-0348 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 6.*

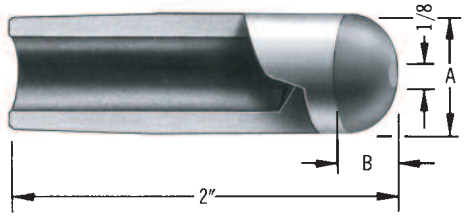
TUFFALOY REFRACTORY METAL-FACED TIPS

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

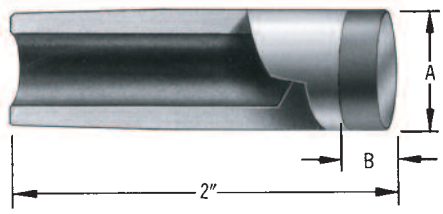
The **TUFFALOY** copper-tungsten, tungsten and molybdenum-faced tips listed here withstand greater heat and pressure, at the expense of some conductivity. Besides being used for spot welding high resistance base metals, they are useful in achieving "heat balance" when welding dissimilar metals. (The 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'

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 16. 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

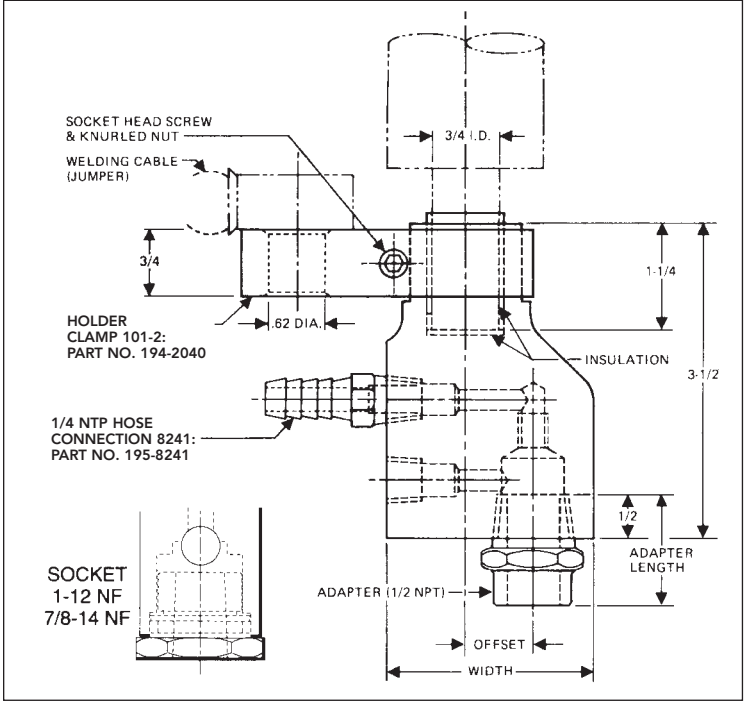
Offset holders are offered in eight offset sizes, from 1/8 to 1 inch. The standard models have a 1/2-NPT adapter socket, to hold adapters for 4 & 5RW tips. Ordering a 3/4-NPT socket will permit adapters for 6 & 7RW tips to be used.

OFFSET HOLDERS

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

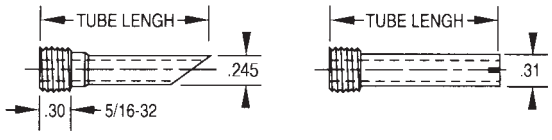
For 7/8 straight-thread adapters use suffix "7/8-14 N.F." Example: 194-1588-7/8-14 NF.

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 & 5 RW TIPS FOR 6 OR 7 RW TIPS

STATIONARY WATER TUBES

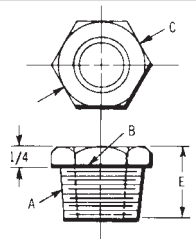
Length	FOR 4RW USE Description	FOR 4RW USE Part No.	FOR 5RW, 6RW OR 7RW USE Description	FOR 5RW, 6RW OR 7RW USE Part No.
3/4	301-.7	194-3107	312-.7	194-3207
1	301-1.0	194-3110	312-1.0	194-3210
1-1/4	301-1.2	194-3112	312-1.2	194-3212
1-1/2	301-1.5	194-3115	312-1.5	194-3215
1-3/4	301-1.7	194-3117	312-1.7	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

TUFFALOY TIP ADAPTERS

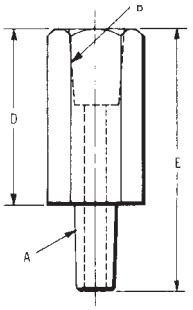
TUFFALOY threaded electrode adapters are used to provide longer electrode holder life, by providing a changable tip socket in holders having threaded openings. Class 2 alloy. Other alloys available.

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-125-15	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	190-1545
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*	

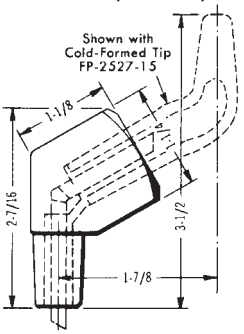
** Not commonly stocked - other adapters available upon request*



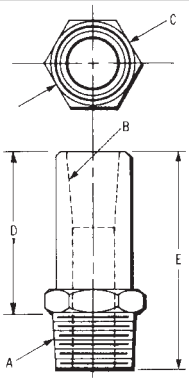
AD-124-.8, AD-125-.8, AD-584-.8, AD-585-.8,



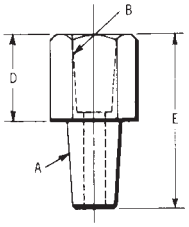
AD-45-2, AD-45-4,



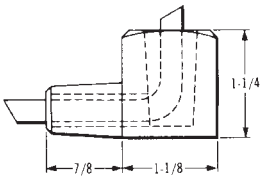
AD-55-30, for 5 RW Tip, Part No. 190-9553



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-54-1, AD-75-2,



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

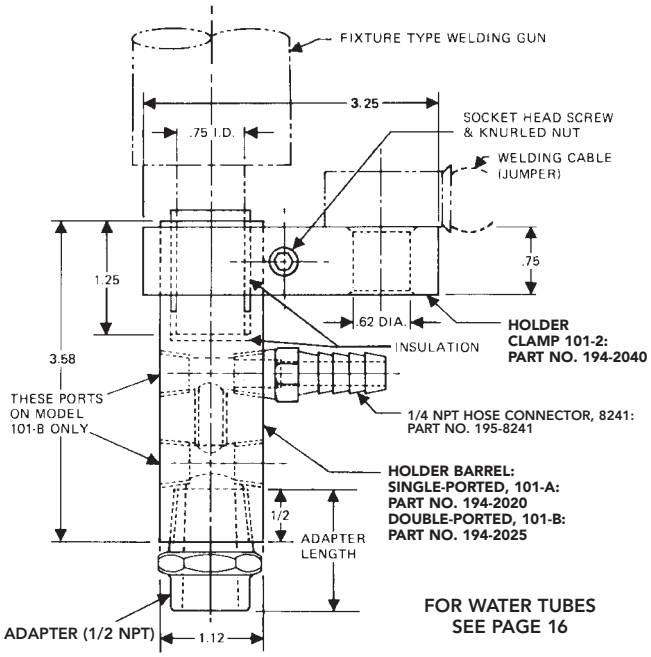
AD-54-90, for 4 RW Tip, Part No. 190-9549

STRAIGHT THREADED ADAPTERS FOR MULTI-SPOT BARREL AND CLAMP

	A	B	Description	Part No.
1.25 Hex	**4 RW TAPER - 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
1.25 Hex	**5 RW TAPER - 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
1.25 Hex	**5 RW TAPER - 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
1.25 Hex	**5 RW TAPER - 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

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

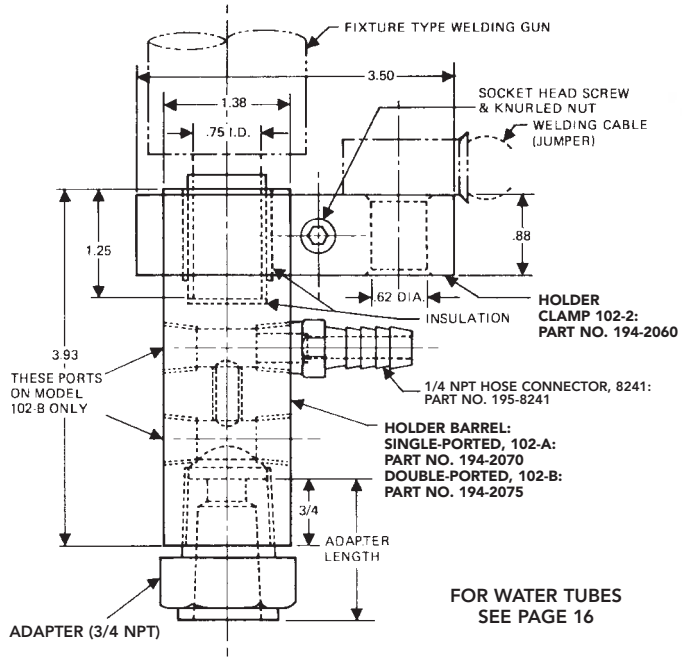
101 SERIES HOLDERS (For 4 & 5 RW Tips)



FOR WATER TUBES SEE PAGE 16

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

102 SERIES HOLDERS (For 6 & 7 RW Tips)



FOR WATER TUBES SEE PAGE 16

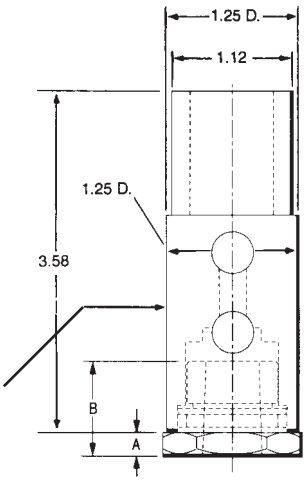
To determine distance adapter sticks out from holder deduct 3/4" from length of adapter selected. Water tubes 3/4" longer than adapter will install approximately flush with adapter face.

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.

Threaded adapters for barrels can be found on page 16.



194-2080 Barrel Only for 7/8 - 14 NF Adapter

194-2081 Barrel Only Dual w/Con. @ 20° Offset for 7/8 - 14 NF Adapter

CLAMP AND BARREL ARE SEPARATE PARTS

Adapters, water connectors and water tubes (see page 15 & 16) are sold separately.

HOLDERS and CLAMPS

Holders For Tip Sizes	Number of Coolant Ports					
	One Set		Two Sets		Clamp	
	Description	Part No.	Description	Part No.	Description	Part No.
4 & 5 RW	101-A	194-2020	101-B	194-2025	101-2	194-2040
6 & 7 RW	102-A	194-2070	102-B	194-2075	102-2	194-2060
4 & 5 RW	103-A	194-2080	103-B	194-2081	101-2	194-2040
5 RW			SH-102-B	194-2085	102-2	194-2060

194-2085 (1-3/8 diameter barrel) only for 1-12 NF adapter

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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.

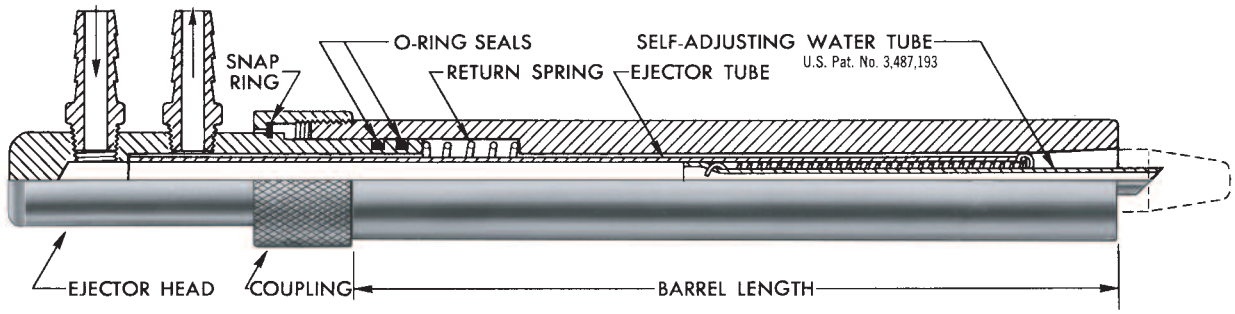
Goldcrown premium holders are made of extra-strength Class 2 alloy and are ground and polished to yield greatest conductivity.

ADAPTER SIZE FOR THREADED BARRELS			
Part No.	Descrip-tion	Taper	THD Size
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

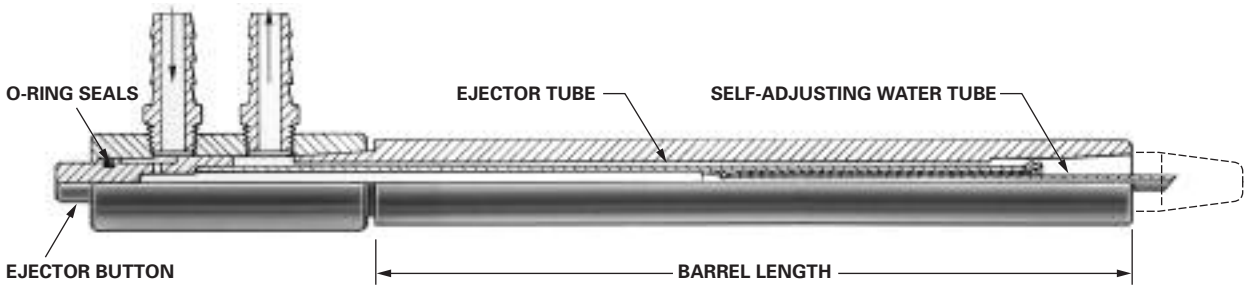
THESE ADAPTERS ARE SUPPLIED *with the holder*

			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.

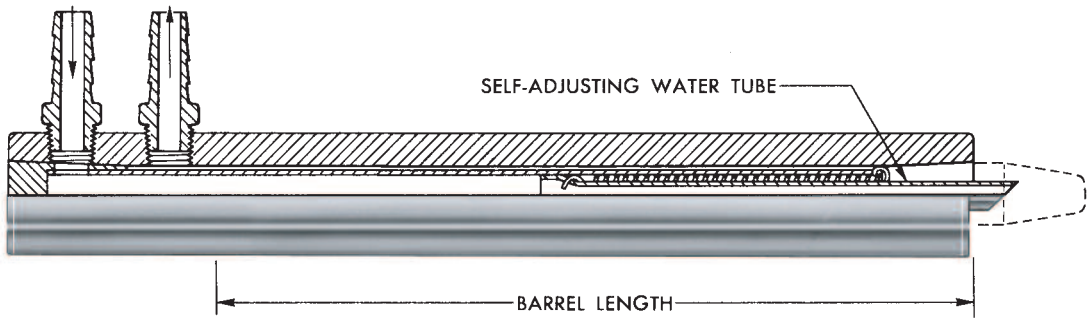
Examples of standard holders in use are shown on page 22.

			GOLDSPOT		STANDARD	
Barrel Dia.	Tip Socket RW	Barrel Length	Descrip-tion	Part No.	Descrip-tion	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*

ADAPTER SIZE FOR THREADED BARRELS			
Part No.	Descrip-tion	Taper	THD Size
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*



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

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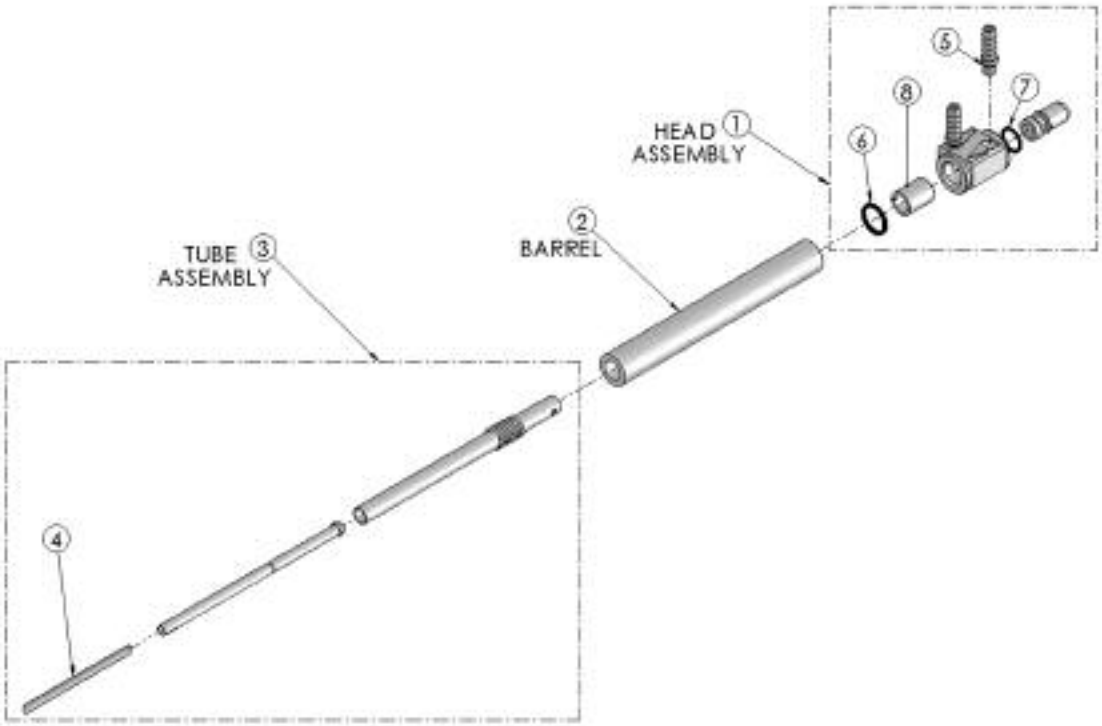
Barrel Diameter	Tip Socket RW	Barrel Length	Descrip-tion	Holder Assy.
1	4	8	NHE-08084	319-0213
1-1/4	4	8	NHE-10084	319-0214
1	5	8	NEH-08085	319-0216
1-1/4	5	8	NEH-10085	319-0217
1	4	12	NEH-08124	319-0233
1-1/4	4	12	NEH-10124	319-0234
1	5	12	NEH-08125	319-0236
1-1/4	5	12	NEH-10125	319-0237

TUFFALOY NICKEL PLATED EJECTOR HOLDERS

with self-adjusting water tubes

TUFFALOY nickel plated ejector holders feature extra strength Class 2 Tuff 77 alloy and are ground, polished and nickel plated for superior conductivity. These holders also feature exclusive spring-loaded self-adjusting water tubes to ensure proper water flow any electrode.



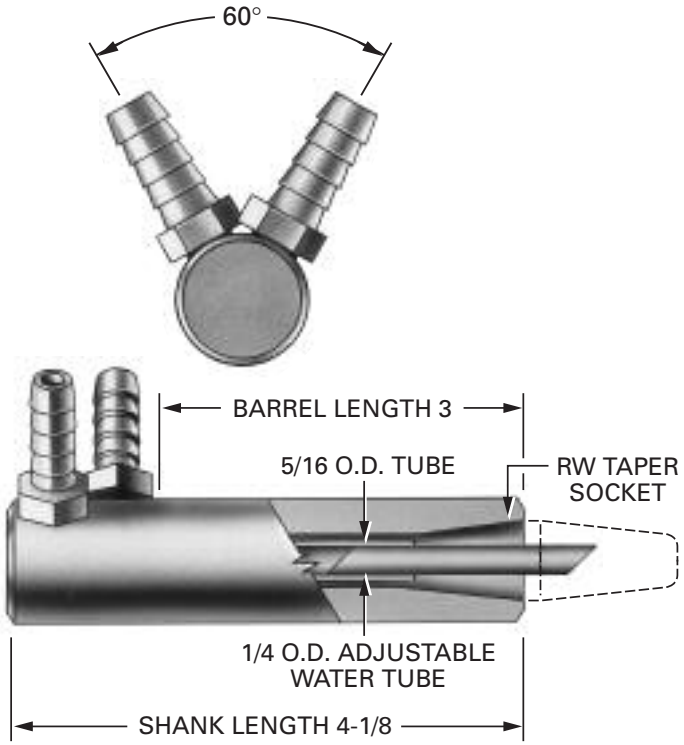
Descrip-tion	Holder Assy.	1 Head Assy.	2 Barrel	3 Tube Assy.	4 Water Tube	5 Hose Conn.	6 Barrel O-Ring	7 Head O-Ring	8 All Thread
NHE-08084	319-0213	195-0101	001-213B	195-0210	195-0017	195-8240	195-8251	037-0096	195-0031
NHE-10084	319-0214	195-0101	001-214B	195-0210	195-0017	195-8240	195-8251	037-0096	195-0031
NEH-08085	319-0216	195-0100	001-216B	195-0208	195-0015	195-8240	037-0099	037-0096	195-0030
NEH-10085	319-0217	195-0100	001-217B	195-0208	195-0015	195-8240	037-0099	037-0096	195-0030
NEH-08124	319-0233	195-0101	001-233B	195-0211	195-0017	195-8240	195-8251	037-0096	195-0031
NEH-10124	319-0234	195-0101	001-234B	195-0211	195-0017	195-8240	195-8251	037-0096	195-0031
NEH-08125	319-0236	195-0100	001-236B	195-0212	195-0015	195-8240	037-0099	037-0096	195-0030
NEH-10125	319-0237	195-0100	001-237B	195-0212	195-0015	195-8240	037-0099	037-0096	195-0030

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*

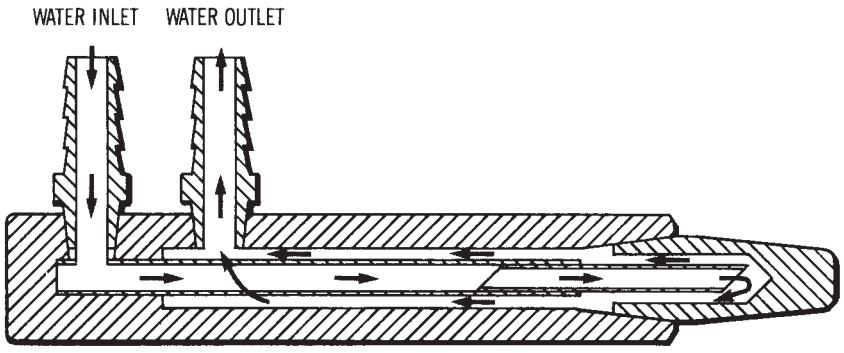


ADJUSTABLE WATER TUBE USE

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.

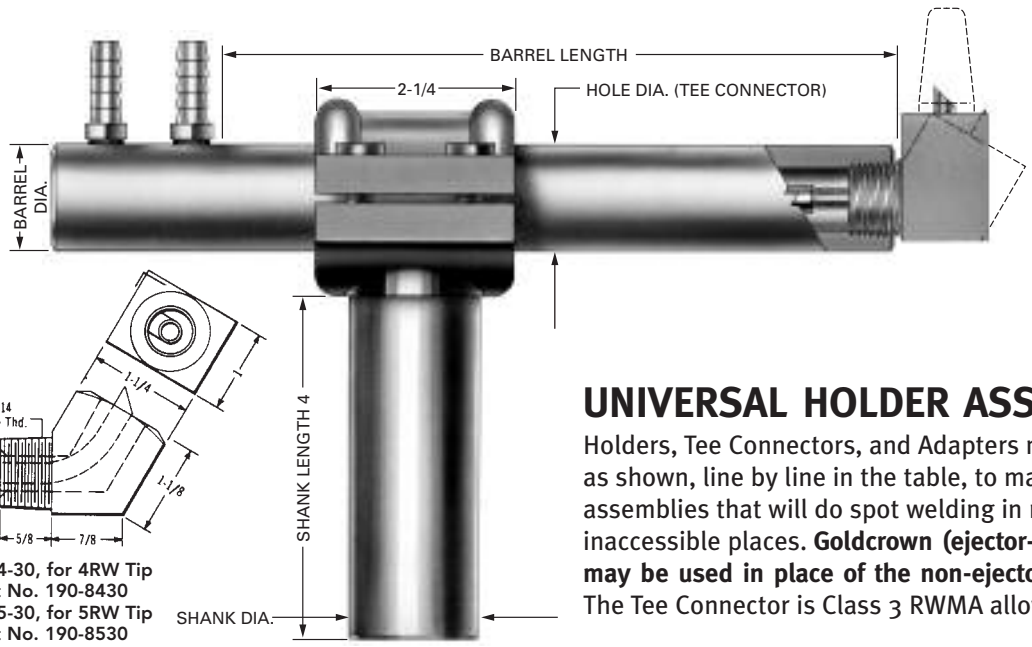
Adjustable water tubes are used to deflect incoming coolant water to the full extent of the water hole in the electrode. Before installing a tip, check that there is an adjustable water tube in place and that it is pulled out far enough so that it will contact the end of the water hole in the tip.

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

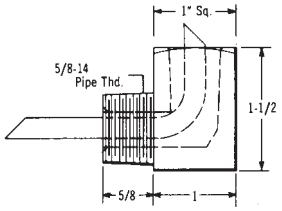


Adjustable water tube correctly positioned in tip. Cold water will strike the hottest part of the tip first.

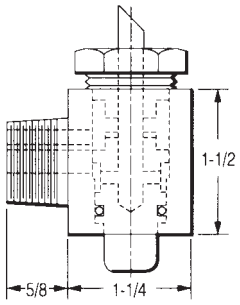
TUFFALOY OFFSET HOLDERS



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



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



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

UNIVERSAL HOLDER ASSEMBLIES

Holders, Tee Connectors, and Adapters may be assembled as shown, line by line in the table, 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.

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.

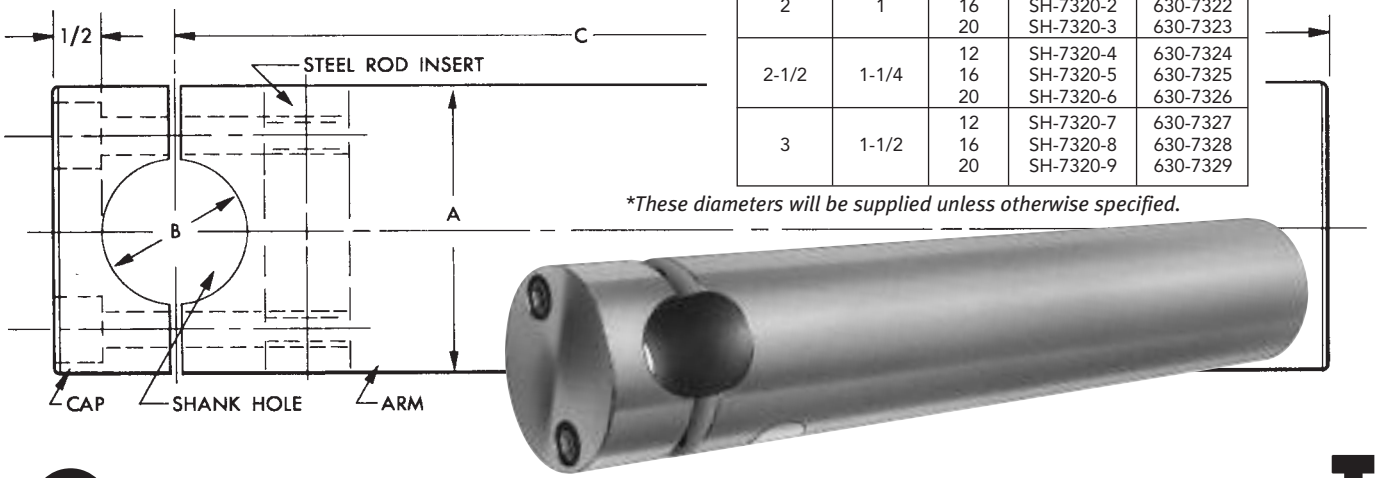
Electrode holder shanks can be attached to these arms from the front, by bolting the cap over them. This means no extra clearance is required between the arms to allow running a shank up (or down) into a hole in the arm. It makes the insertion of Tuffaloy multiple-welding holders much easier.

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.

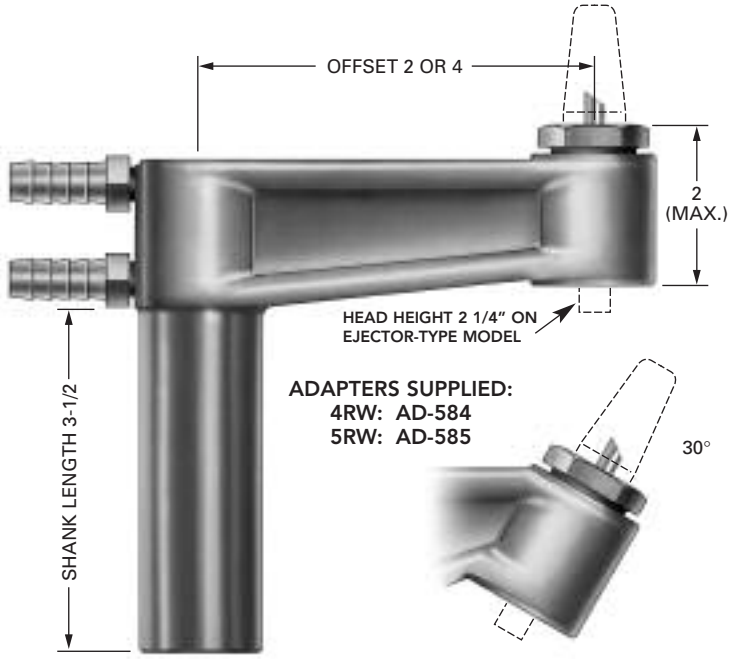


STANDARD OFFSET HOLDERS

TUFFALOY Cast Class 3 Alloy offset holders combine long life with good conductivity. Threaded tip adapters are easily replaced when tip socket is worn beyond use, or when you wish to change to a different taper size.

TUFFALOY offset holders are made in 2- and 4-inch offsets, and in four shank sizes, with 90' and 30* heads. They are supplied with adapters for No. 4 or No. 5 RW taper tips.

Tip Ejector mechanisms are available on all 90* head holders and the 30' head 4-in. offset holders. **When ordering this feature change order number prefix from 'ON' to 'OE'. Example: OE-874-290.**



TWO-INCH OFFSET HOLDERS

Adapter Tip Socket	Socket Angle	3/4" SHANK DIA.		7/8" SHANK DIA.		1" SHANK DIA.		1-1/4" SHANK DIA.		1-1/2" SHANK DIA.	
		Description	Part No.	Description	Part No.	Description	Part No.	Description	Part No.	Description	Part No.
4RW	30°	ON-754-230	335-1300	ON-874-230	335-1400*	ON-14-230	335-1000	ON-1254-230	335-1100	ON-154-230	335-1200*
4RW	90°	ON-754-290	335-1310*	ON-874-290	335-1410*	ON-14-290	335-1010	ON-1254-290	335-1110	ON-154-290	335-1210*
5RW	30°	ON-755-230	335-1350*	ON-875-230	335-1450*	ON-15-230	335-1050	ON-1255-230	335-1150	ON-155-230	335-1250*
5RW	90°	ON-755-290	335-1360*	ON-875-290	335-1460*	ON-15-290	335-1060	ON-1255-290	335-1160	ON-155-290	335-1260

FOUR-INCH OFFSET HOLDERS

4RW	30°	ON-754-430	335-1320*	ON-874-430	335-1420*	ON-14-430	335-1020	ON-1254-430	335-1120	ON-154-430	335-1220*
4RW	90°	ON-754-490	335-1330*	ON-874-490	335-1430*	ON-14-490	335-1030	ON-1254-490	335-1130	ON-154-490	335-1230*
5RW	30°	ON-755-430	335-1370*	ON-875-430	335-1470*	ON-15-430	335-1070	ON-1255-430	335-1170	ON-155-430	335-1270
5RW	90°	ON-755-490	335-1380*	ON-875-490	335-1480*	ON-15-490	335-1080	ON-1255-490	335-1180	ON-155-490	335-1280

**May not be in stock*

USING STANDARD HOLDERS

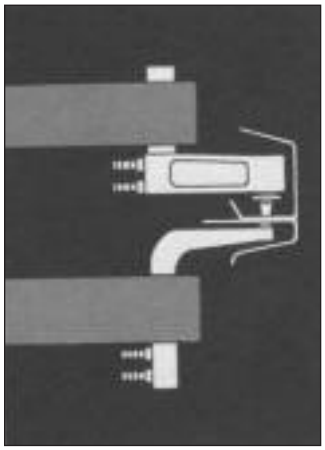


Figure 1: An offset holder over a low-profile paddle-type holder that works in confined spaces.

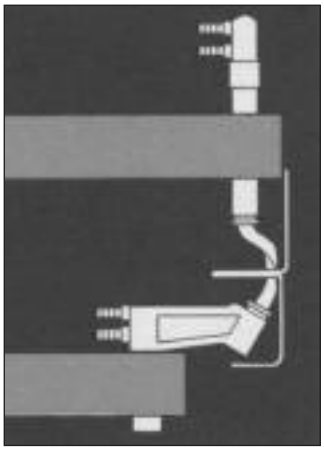


Figure 2: An offset holder with bent tip is used to weld close to the corner of a box section.

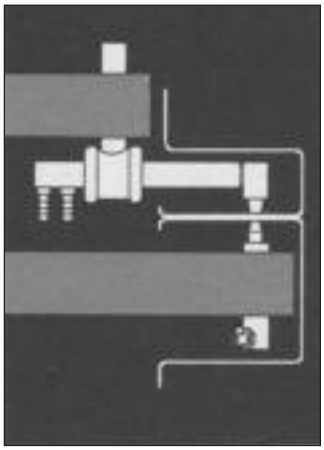


Figure 3: A universal holder (economical because it adjusts to many jobs) over a close-coupled holder.

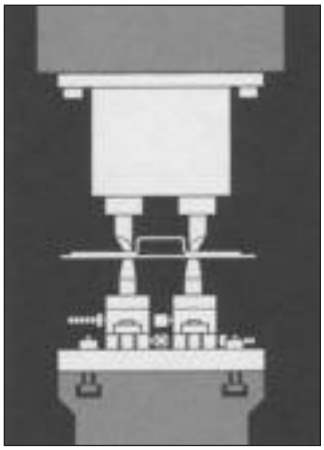


Figure 4: A platen set-up using platen-mounted standard tips under an Equa-Press dual holder.

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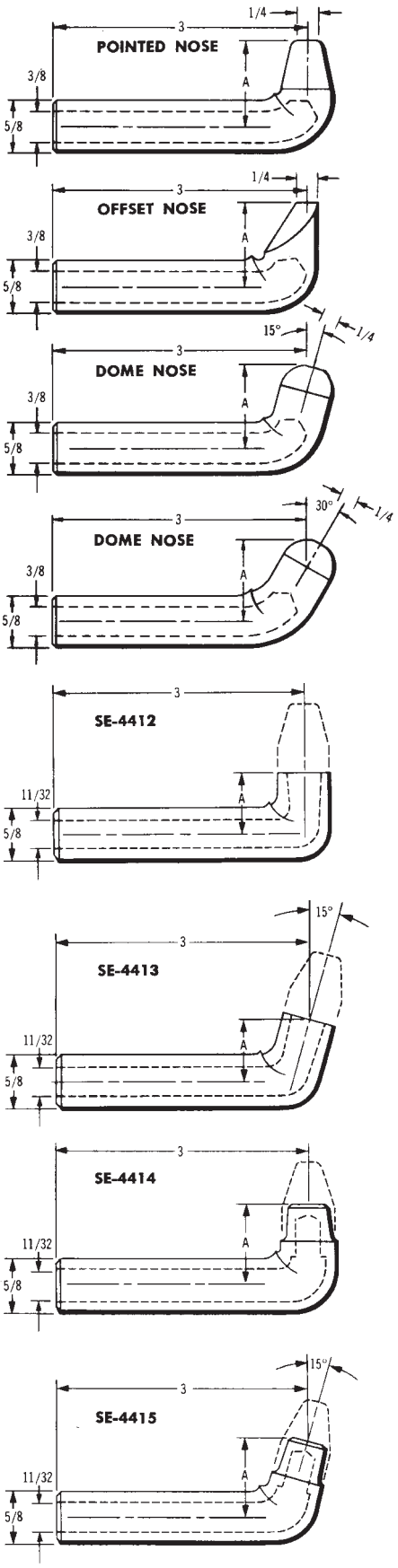
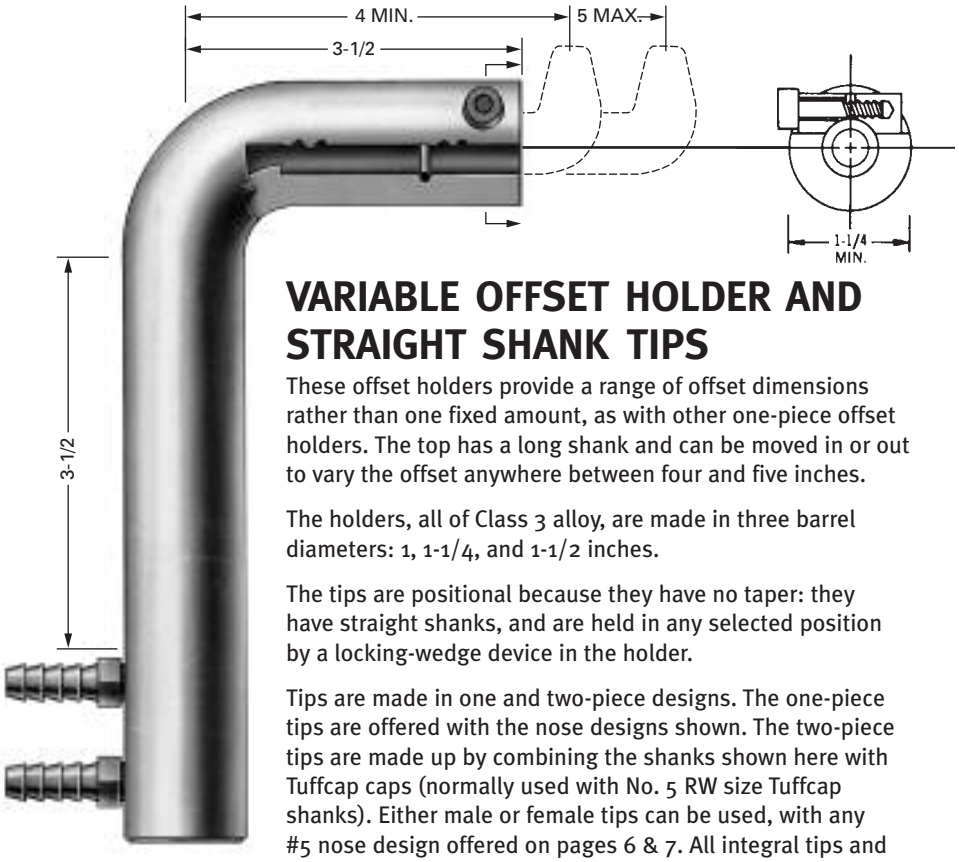


VARIABLE-OFFSET HOLDERS		
Shank Dia.	Descrip-tion	Part No.
1	SH-7223	345-7223
1-1/4	SH-7224	345-7224
1-1/2	SH-7225	345-7225



VARIABLE OFFSET HOLDER AND STRAIGHT SHANK TIPS

These offset holders provide a range of offset dimensions rather than one fixed amount, as with other one-piece offset holders. The top has a long shank and can be moved in or out to vary the offset anywhere between four and five inches.

The holders, all of Class 3 alloy, are made in three barrel diameters: 1, 1-1/4, and 1-1/2 inches.

The tips are positional because they have no taper: they have straight shanks, and are held in any selected position by a locking-wedge device in the holder.

Tips are made in one and two-piece designs. The one-piece tips are offered with the nose designs shown. The two-piece tips are made up by combining the shanks shown here with Tuffcap caps (normally used with No. 5 RW size Tuffcap shanks). Either male or female tips can be used, with any #5 nose design offered on pages 6 & 7. All integral tips and shanks shown here are of Class 2 alloy.

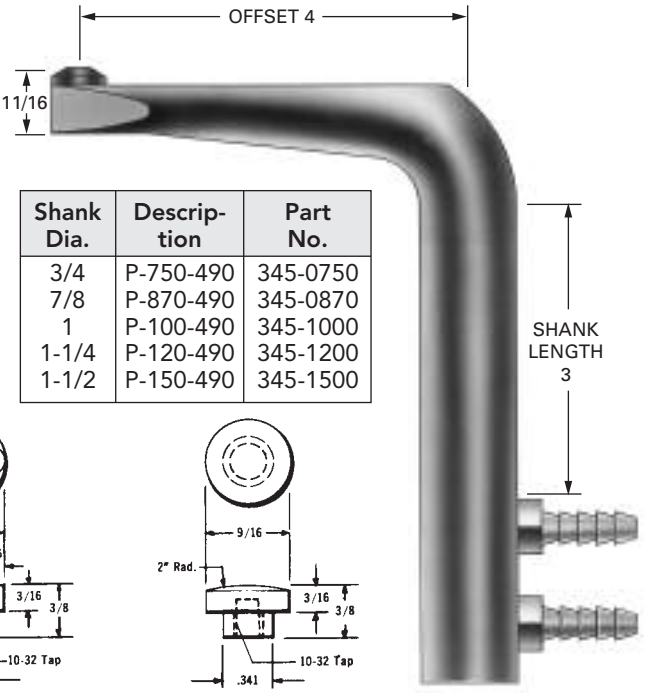
STRAIGHT-SHANK TIPS			
Type of Tip	Nose Length 'A'	Descrip-tion	Part No.
Pointed	1"	SE-4408-1	170-4408
Offset	1"	SE-4409-1	170-4409
15° Dome	1"	SE-4410-1	170-4410
30° Dome	1"	SE-4411-1	170-4411
Pointed	2"	SE-4408-2	170-4418
Offset	2"	SE-4409-2	170-4419
15° Dome	2"	SE-4410-2	170-4420
30° Dome	2"	SE-4411-2	170-4421

STRAIGHT-SHANK TUFFCAP SHANKS				
Tuffcap Cap Type	Nose Length 'A'	Angle	Descrip-tion	Part No.
Male	3/4"	90°	SE-4412	170-4422
Male	3/4"	15°	SE-4413	170-4423
Female	1"	90°	SE-4414	170-4424
Female	1"	15°	SE-4415	170-4425

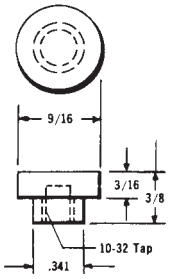
TUFFALOY PADDLE-TYPE HOLDERS AND SOCKET-TYPE TIPS

This holder is for welding in very restricted areas. It provides a very low head height and a four-inch offset. It is made in shank diameters of 3/4, 7/8, 1, and 1-1/4 inches. An adapter bushing is used to add a 1-1/2-in. dia. model to the line. Each holder comes complete with a socket-type tip (SE-3101) and holding screw. The tip may be inserted in either side of the paddle. Holders are of Class 2 alloy. Tips are available in Class 1, Class 2, Class 3 alloy, or Z alloy.

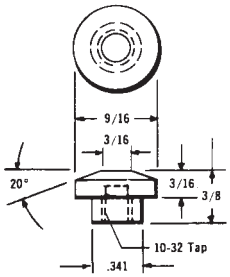
The four socket-type tips shown here can be used in special welding fixtures and dies as well as in the paddle-type holders.



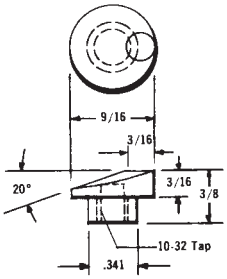
Shank Dia.	Descrip-tion	Part No.
3/4	P-750-490	345-0750
7/8	P-870-490	345-0870
1	P-100-490	345-1000
1-1/4	P-120-490	345-1200
1-1/2	P-150-490	345-1500



FLAT FACED
Class 1 SE-3099-1
Part No. 170-3099-1
Class 2 SE-3099
Part No. 170-3099
Class 3 SE-3111
Part No. 170-3111
ZIRC SE-3099-Z
Part No. 170-3099-Z

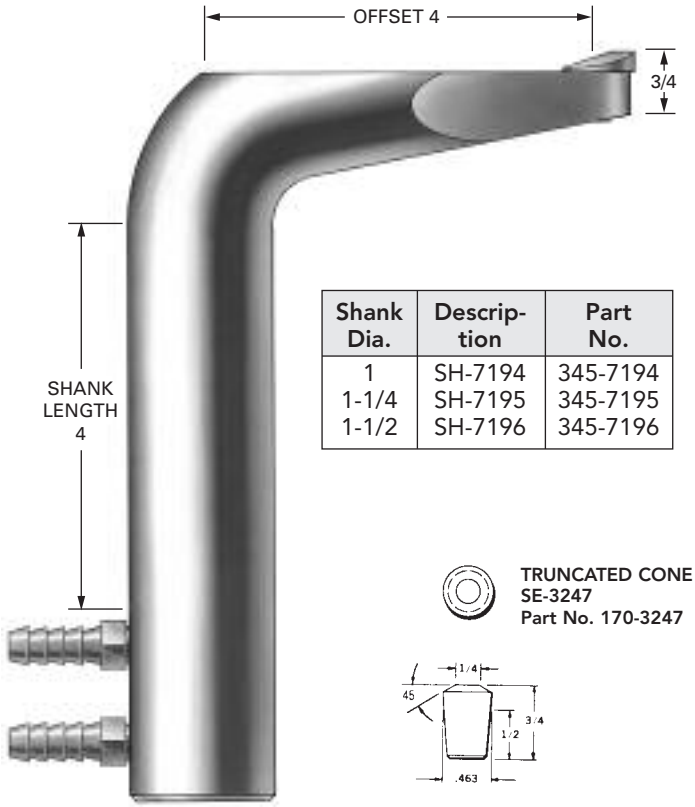


TRUNCATED CONE
Class 1 SE-3101-1
Part No. 170-3101-1
Class 2 SE-3101
Part No. 170-3101
Class 3 SE-3113
Part No. 170-3113
ZIRC SE-3101-Z
Part No. 170-3101-Z



OFFSET
Class 1 SE-3102-1
Part No. 170-3102-1
Class 2 SE-3102
Part No. 170-3102
Class 3 SE-3123
Part No. 170-3123
ZIRC SE-3102-Z
Part No. 170-3102-Z

RADIUS FACED
Class 1 SE-3110-1
Part No. 170-3110-1
Class 2 SE-3110
Part No. 170-3110
Class 3 SE-3133
Part No. 170-3133
ZIRC SE-3110-Z
Part No. 170-3110-Z



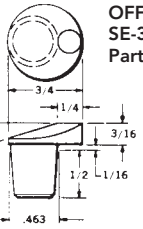
TUFFALOY HEAVY-DUTY PADDLE-TYPE HOLDERS AND TIPS

TUFFALOY heavy-duty paddle-type holders are made of the stronger Class 3 alloy, for greater rigidity and minimum deflection, even under loads of 1000 pounds and more. Class 3 alloy provides 154% more tensile strength. Head height is a low 3/4-in. and the shank length is a usable 4 inches.

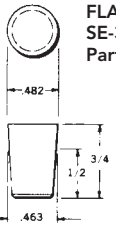
Three low-profile electrodes of Class 2 alloy are offered for use in this heavy-duty holder. If applications permit greater head height, any standard No. 4 RW tip may be used.

Shank Dia.	Descrip-tion	Part No.
1	SH-7194	345-7194
1-1/4	SH-7195	345-7195
1-1/2	SH-7196	345-7196

TRUNCATED CONE
SE-3247
Part No. 170-3247



OFFSET
SE-3248
Part No. 170-3248



FLAT FACED
SE-3249
Part No. 170-3249

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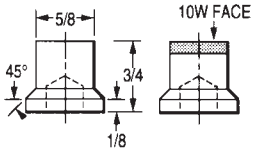
HIGH PRESSURE TIPS

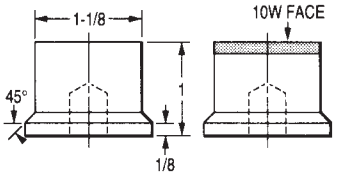
Spot and projection welding operations may utilize pressures over 2000 lbs. TUFFALOY high-pressure tips have flat bottoms which eliminates tip jamming in tapered holders. Assembled tip and holder heights are always the same, as contrasted to tapered tips which can be forced into the sockets varying distances.

TUFFALOY high pressure tips can be used in the two holder styles shown: PM holders for mounting on the platens of press-type welders, and straight holders for spot welder arm mounting. The tips are held to the holders by a threaded coupling. Copper tungsten faced tips are available for high pressure wear and projection welding.

FLAT FACED

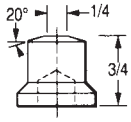


Size 1 PMC-2503
Part No. 180-2203
Part No. 180-2203-10W

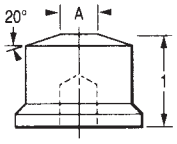


Size 2 PMC-2104
Part No. 180-1040
Part No. 180-2104-10W

TRUNCATED CONE



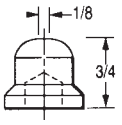
Size 1 PME-2503
Part No. 180-2303



Size 2

'A'	Description	Part No.
1/4	PME-21041	180-1041
5/16	PME-21042	180-1042
3/8	PME-21043	180-1043
7/16	PME-21044	180-1044
1/2	PME-21045	180-1045

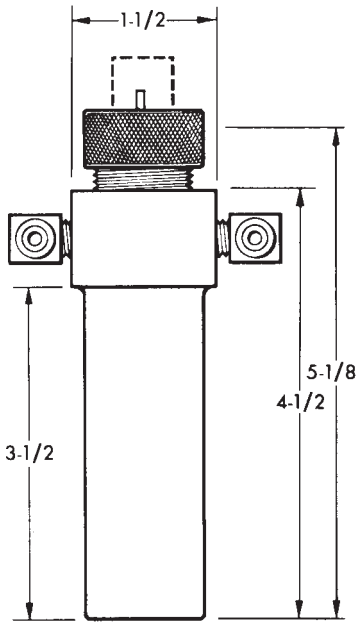
DOME NOSED

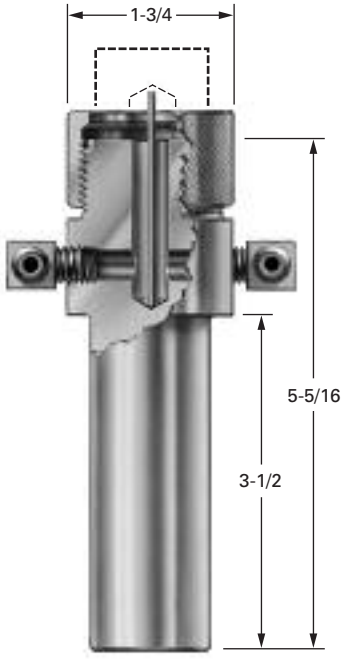


Size 1 PMB-2503
Part No. 180-2103

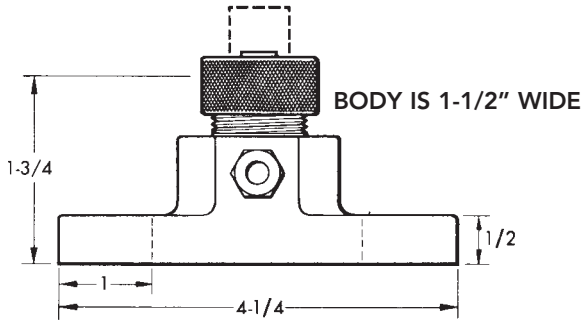
STRAIGHT HOLDERS CLASS 2 ALLOY

Straight holders are made for carrying TUFFALOY high pressure tips in rocker arm welders or press-type welder horn extensions. They are made in two basic sizes, to accommodate the Size 1 and 2 tips. They are of Class 2 alloy and hold the tips in the same manner as do the PM holders.

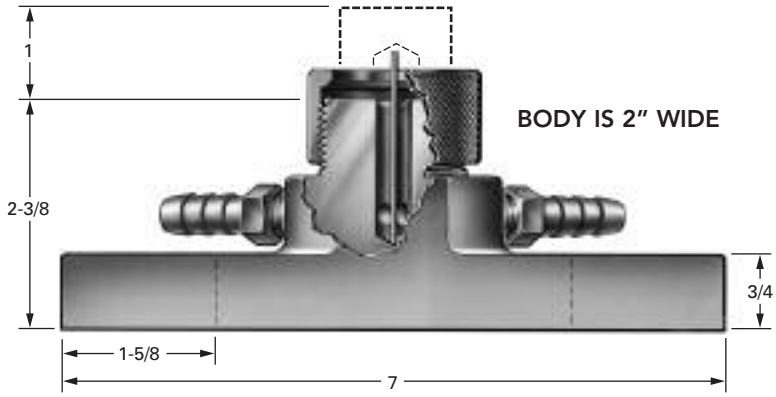




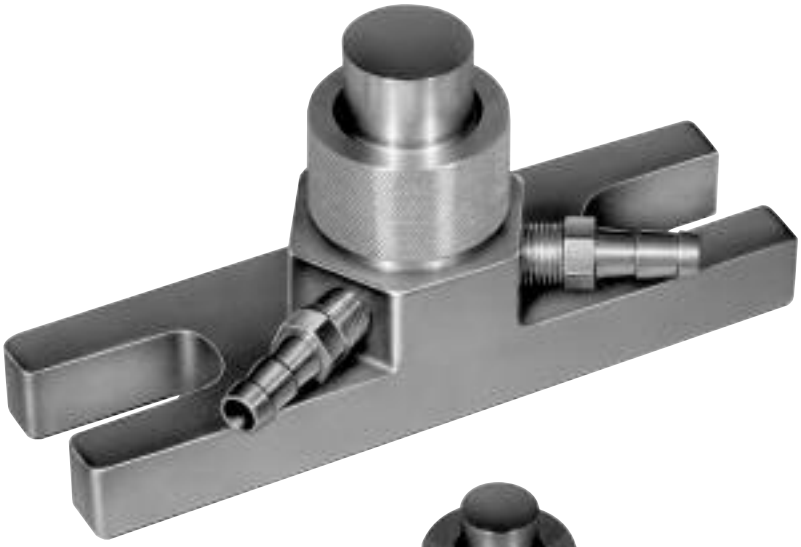
Size	Barrel Dia.	Descrip-tion	Part No.
1	1	4511	350-4511
1	1-1/4	4512	350-4512
1	1-1/2	4513	350-4513
2	1-1/4	4521	350-4521
2	1-1/2	4522	350-4522

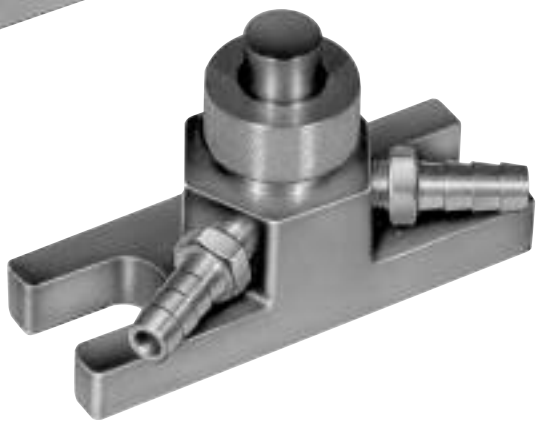


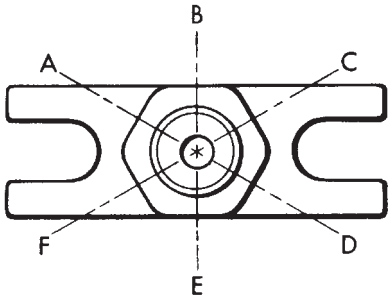
Size 1 PM holder (9/16-in. mounting bolts)
4510 holder, Part No. 350-4510



Size 2 PM holder (3/4-in. mounting bolts)
4520 holder, Part No. 350-4520







PM HOLDERS

TUFFALOY PM holders are mounted directly to press-type welder platens, or are used as components of special weld fixturing.

Platen Mounting: PM holders bolt easily to the platen T-slots at any desired location, in a minimum of time (no intermediary device is required). Big half-inch mounting bolts may be used to assure good conductivity. They are the first such standard, stocked holders to be made available. They come in two sizes, to match standard T-slot spacing, and to hold the 2 sizes of tips shown. The small size 1 PM holder is for use on RWMA Size 1 press-type welders (3-1/2 in. spacing) and the large size, 2 PM holder is for Size 2 and 3 welders (5- and 6-in. spacing). The electrodes used do not require any particular radial positioning to obtain proper coolant flow. These are compact holders that may be used one-to-one or in multiples in close proximity to one another.

Fixture Building: PM holders make special fixture building easy too. They can be bolted to a fixture or backup base as easily as to a platen. They are compact and have self-contained coolant systems that eliminate making a coolant manifold out of the fixture.

Hose Connections: You may specify where you want the hose connectors in the hexagonal base. Select any two of the six possible locations and specify by using the symbols shown on the diagram (connector locations: A-B, or A-D, etc.). Position A-C is standard. (A-F and C-D are not possible.)

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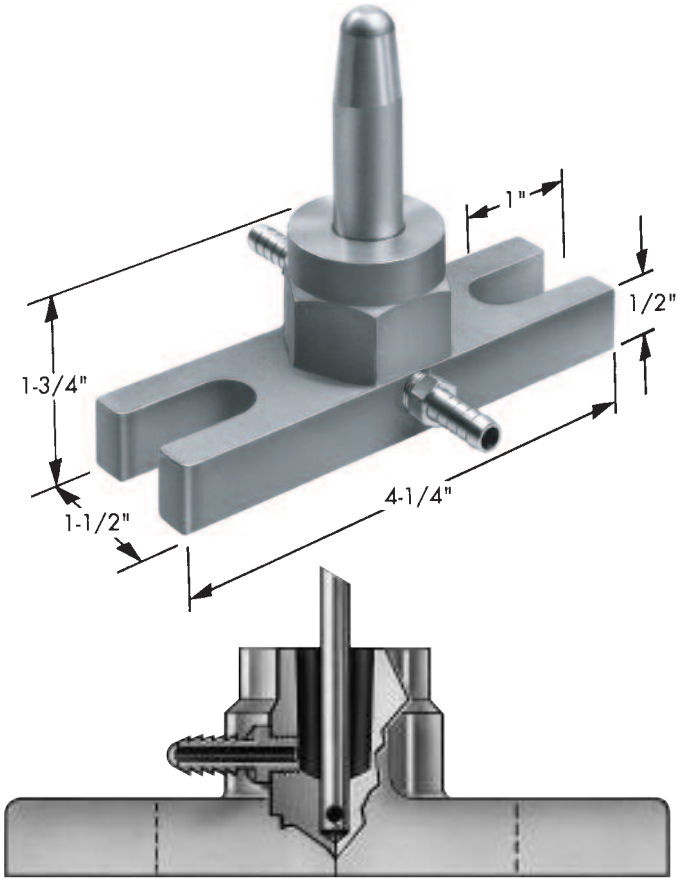
PM HOLDERS

TUFFALOY PM holders may be mounted directly to press-type welder platens, or they can be used as components of special weld fixturing. They come in two sizes, which match standard T-slot spacings (either of which can be furnished to hold any of the four standard tips: 4, 5, 6 or 7 RW). The smaller holder is for use on RWMA Size 1 welders, which have the 3-1/2" spacing. The larger one is for the Size 2 and 3 welders, which have the 5- and 6-inch spacing.

Big, half-inch mounting bolts may be used to assure good conductivity. The holders may be used one-to-one or in multiples closely bunched. PM holders make special fixture building easy. They can be bolted to a fixture or back-up base as easily as to a platen. They are compact and have self-contained coolant systems.



Size 2 PM Holder (3/4-in. mounting bolts)

STANDARD TIP PM HOLDERS

RW Tip Socket	Size 1 (Small)		Size 2 (Large)	
	Description	Part No.	Description	Part No.
4	4560	350-4560	4570	350-4570
5	4561	350-4561	4571	350-4571
6	4562	350-4562	4572	350-4572*
7	4563	350-4563	4573	350-4573

**Item not normally stocked*

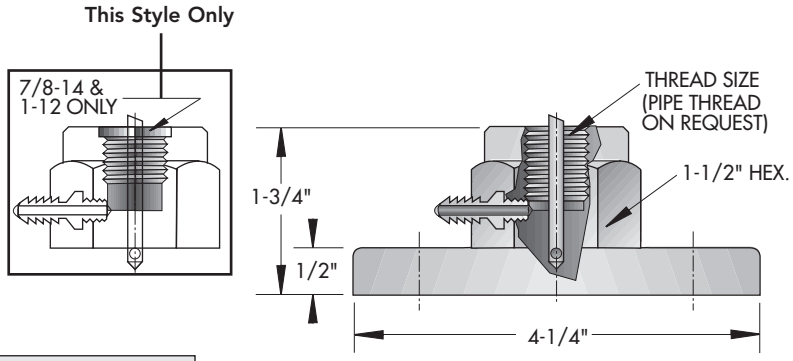
FOR THREADED ELECTRODES

Thread Size	Size 1	Size 2
5/8-11	350-4580	350-4590
3/4-10	350-4581	350-4591

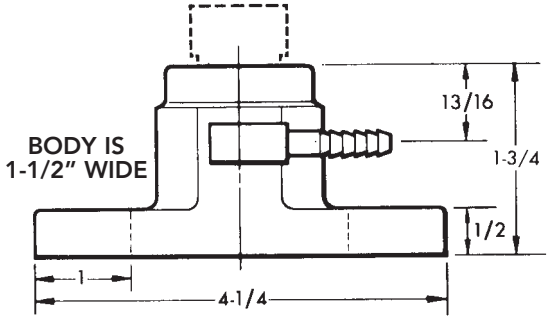
FOR THREADED ADAPTERS

Thread Size	Size 1	Size 2
7/8-14	350-4582	350-4592
1-12	350-4583	350-4593

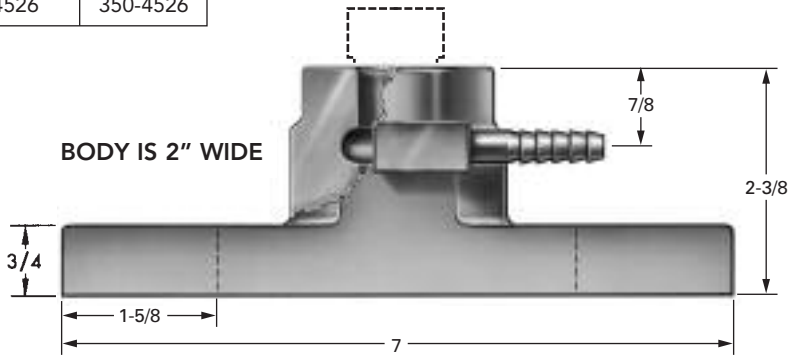
See adapters page 16



PM Holders T-Slot Spacing	Holder Size	For 1" Dia. Electrodes		For 1-1/2" Dia. Electrodes	
		Description	Part No.	Description	Part No.
3-1/2	1PM	4515	350-4515		
5 & 6	2PM	4525	350-4525	4526	350-4526

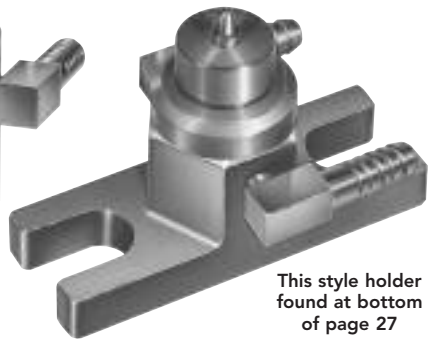


Size 1 PM Holder

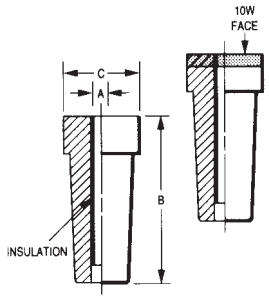


Size 2 PM Holder

This style holder found at top of page 29



This style holder found at bottom of page 27



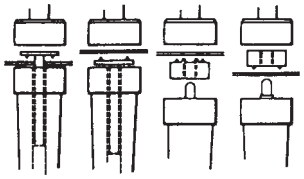
ELECTRODES

Stud Electrodes

Tuffaloy stud electrode tips are for projection-welding screws, bolts or pins, whether they pass through the sheet or are to be attached directly to its face.

Nut Electrodes

Tuffaloy projection weld nut electrodes are designed for either self-piloted or non-piloted nuts. The pilots of the non-piloted-nut electrodes are spring-loaded so they can't interfere with the contacting of nut and sheet under welding pressure.

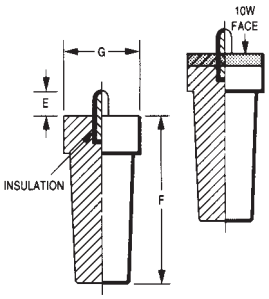


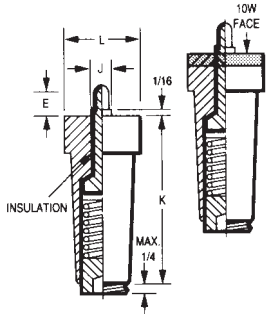
Welding a stud through a hole in sheet metal.

Welding a stud directly to face of sheet metal.

Self-piloted nut aligns itself with the hole in sheet.

Non-piloted-nut is guided by specially designed electrode.





The various types and sizes of TUFFALOY stud-and-nut welding electrodes and holders are described below. For excessive wear applications any of these electrodes may be ordered with refractory metal facings, such as TUFFALOY 10W.

STUD ELECTRODES

A	B	C	Description	Part No.	With 10W Face Refractory - Item Number
.150	2-1/4	1	400	175-4001	175-4001-10W
.164			401	175-4011	175-4011-10W
.190			402	175-4021	175-4021-10W
.216			403	175-4031	175-4031-10W
1/4			404	175-4041	175-4041-10W
5/16 & 8mm			405	175-4051	175-4051-10W
3/8			406	175-4061	175-4061-10W
6mm			506	175-5061	175-5061-10W
7mm			507	175-5071	175-5071-10W
9mm			509	175-5091	175-5091-10W
10mm			510	175-5101	175-5101-10W
3/8	2-3/4	1-1/2	436	175-4361	175-4361-10W
7/16			437	175-4371	175-4371-10W
1/2			438	175-4381	175-4381-10W
9/16			439	175-4391	175-4391-10W
5/8			440	175-4401	175-4401-10W
11/16			441	175-4411	175-4411-10W
3/4			442	175-4421	175-4421-10W
10mm			510-2	175-5102	175-5102-10W
12mm			512-2	175-5122	175-5122-10W

SELF-PILOTED-NUT ELECTRODES

For Nut Size	E Pin Length	F Electrode Length	G Electrode Diameter	Description	Part No.	With 10W Face Refractory - Item Number
.164	3/16	2-1/4	1	411	175-4111	175-4111-10W
.190	3/16			412	175-4121	175-4121-10W
.216	1/4			413	175-4131	175-4131-10W
1/4	5/16			414	175-4141	175-4141-10W
5/16 & 8mm	5/16			415	175-4151	175-4151-10W
3/8	3/8			416	175-4161	175-4161-10W
6mm	1/4			606	175-6061	175-6061-10W
7mm	5/16			607	175-6071	175-6071-10W
9mm	3/8			609	175-6091	175-6091-10W
10mm	3/8			610	175-6101	175-6101-10W
3/8	3/8	2-3/4	1-1/2	456	175-4561	175-4561-10W
7/16	3/8			457	175-4571	175-4571-10W
1/2	7/16			458	175-4581	175-4581-10W
9/16	7/16			459	175-4591	175-4591-10W
5/8	1/2			460	175-4601	175-4601-10W
11/16	1/2			461	175-4611	175-4611-10W
3/4	5/8			462	175-4621	175-4621-10W
10mm	3/8			610-2	175-6102	175-6102-10W
12mm	7/16			612-2	175-6122	175-6122-10W

NON-PILOTED-NUT ELECTRODES

For Nut Size	J Pin Diameter	K Electrode Length	L Electrode Diameter	Description	Part No.	With 10W Face Refractory - Item Number
.164	0.18	2-1/4	1	421	175-4211	175-4211-10W
.190	0.215			422	175-4221	175-4221-10W
.216	0.24			423	175-4231	175-4231-10W
1/4	0.275			424	175-4241	175-4241-10W
5/16 & 8mm	0.345			425	175-4251	175-4251-10W
3/8	0.405			426	175-4261	175-4261-10W
6mm	0.261			706	175-7061	175-7061-10W
7mm	0.3			707	175-7071	175-7071-10W
9mm	0.385			709	175-7091	175-7091-10W
10mm	0.425			710	175-7101	175-7101-l0W
3/8	0.437	2-3/4	1-1/2	476	175-4761	175-4761-10W
7/16	0.562			477	175-4771	175-4771-10W
1/2	0.625			478	175-4781	175-4781-10W
9/16	0.687			479	175-4791	175-4791-l0W
5/8	0.75			480	175-4801	175-4801-10W
10mm	0.453			710-2	175-7102	175-7102-10W
12mm	0.595			712-2	175-7122	175-7122-10W

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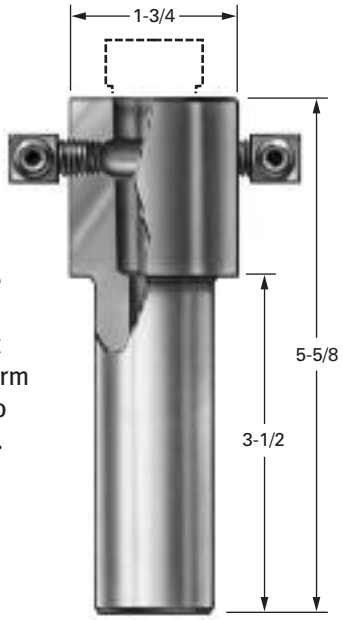
ELECTRODE HOLDERS

U.S. Pat. No. 3,504,159 Canada Pat. No. 858,060

Several standard electrode holders are manufactured by Tuffaloy to accommodate all the Tuffaloy stud-and nut electrode tips.

Straight Holders Barrel Diameter	A Dia.	B Length	For 1" Dia. Electrodes		For 1-1/2" Dia. Electrodes	
			Description	Part No.	Description	Part No.
1	1-3/4	5-5/8	4530	350-4530		
1-1/4	1-3/4	5-5/8	4531	350-4531		
1-1/2	1-3/4	5-5/8	4532	350-4532		
1	2	5-3/4			4535	350-4535
1-1/4	2	5-3/4			4536	350-4536
1-1/2	2	5-3/4			4537	350-4537

Straight Holders - Tuffaloy straight nut-and-stud-electrode holders are of the same high quality as the standard straight holders made for spot welder arm mounting. Coolant is brought to the tip and circulated around it. Holders are available in three barrel diameters.



Straight Holder

ARCTIC HOLDERS

ARCTIC STUD ELECTRODES

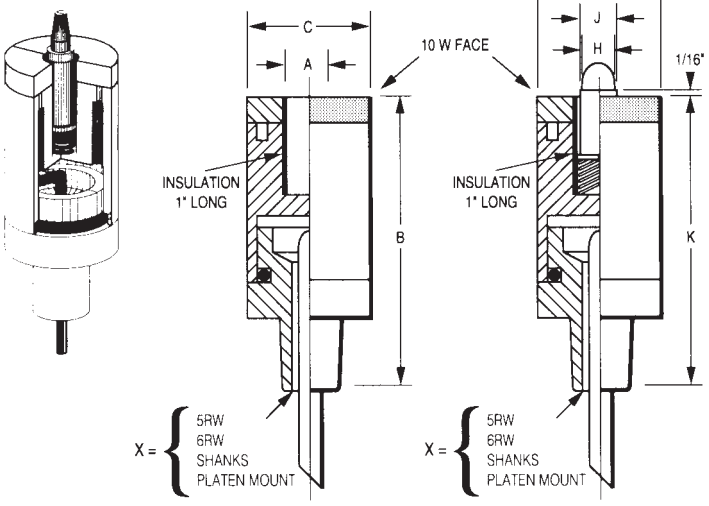
A For Stud Diameter	B Electrode Length	C Electrode Diameter	Description	Part Number Shank Size
0.150	3	1-1/4	115	175-1151-X
0.164			116	175-1161-X
0.190			119	175-1191-X
0.216			122	175-1221-X
1/4			125	175-1252-X
5/16 & 8mm			131	175-1312-X
3/8			138	175-1382-X
7/16			144	175-1442-X
6mm			106	175-1061-X
7mm			107	175-1072-X
9mm			109	175-1092-X
10mm			110	175-1102-X
1/2	3	1-1/2	150	175-1503-X
9/16			156	175-1563-X
5/8			163	175-1633-X
11/16			169	175-1693-X
12mm			112	175-1123-X

ARCTIC NON-PILOTED-NUT ELECTRODES

H For Nut Diameter	J Pilot Diameter	K Electrode Length	L Electrode Diameter	Description	Part Number Shank Size
0.164	0.180	4	1-1/4	216	175-2162-X
0.190	0.215			219	175-2192-X
0.216	0.240			222	175-2222-X
1/4	0.275			225	175-2252-X
5/16 & 8mm	0.345			231	175-2312-X
3/8	0.405			238	175-2382-X
6mm	0.261			206	175-2062-X
7mm	0.300			207	175-2072-X
9mm	0.385			209	175-2092-X
10mm	0.425			210	175-2102-X
7/16	0.562	4	1-1/2	244	175-2443-X
1/2	0.625			250	175-2503-X
9/16	0.687			256	175-2563-X
12mm	0.595			212	175-2123-X

Arctic Electrodes - The Arctic system is a compact stud-and-nut electrode with internal water cooling. Also available with optional air expulsion and platen mounts.

Patent Pending



METRIC NUT ELECTRODES

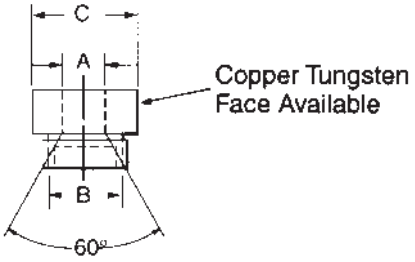
TUFFALOY now stocks the head/pin style welding system components that adds to your selection for stud and nut welding needs. From our standard style to our Arctic, that produces higher quality welds and longer life, you can select the product that best meets your needs.

Heads are made from RWMA class 2 material that are an optimal cost consumable. Class 3 and 10W are available for longer life. With a concave seat the pin locates in the center of assembly when air is applied to the system. This gives you a repeatable location for automated nut feeders to introduce the nut to the environment.

Pins have a nonconductive surface on a steel matrix that gives longer life in a repetitive motion environment. With the threaded head securing the pin in place it makes it easy to replace the pin to meet your requirements. TUFFALOY can design pins for special applications.

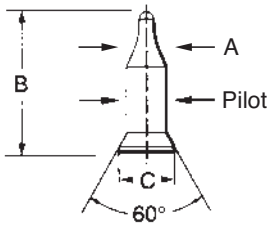
HEADS

Part Number	Hole Dia.	A Pin Size	B Thread	C Dia.	Copper-Tungsten Faced Heads
175-8004	.197	4mm	M18	1.0	175-8004-10W
175-8005	.236	5mm			175-8005-10W
175-8006	.276	6mm			175-8006-10W
175-8007	.315	7mm			175-8007-10W
175-8008	.354	8mm			175-8008-10W
175-8009	.394	9mm			175-8009-10W
175-8010	.432	10mm	M22	1.125″	175-8010-10W
175-8011	.472	11mm			175-8011-10W
175-8012	.512	12mm			175-8012-10W
175-8013	.551	13mm			175-8013-10W
175-8014	.588	14mm	M26	1.250″	175-8014-10W



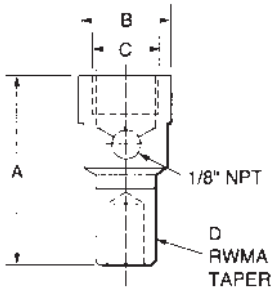
PINS

Part Number	A Nut	B OAL	C Base	Pilot Dia.
195-3004	4mm	1.12″	12mm	.185
195-3005	5mm	1.17″		.224
195-3006	6mm	1.23″		.264
195-3007	7mm	1.24″		.303
195-3008	8mm	1.25″		.340
195-3009	9mm	1.19″		.380
195-3010	10mm	1.37″	16mm	.422
195-3011	11mm	1.38″		.458
195-3012	12mm	1.40″		.500
195-3013	13mm	1.37″		.539
195-3014	14mm	1.50″	.815	.580
195-3015	15mm	1.52″	.815	.620



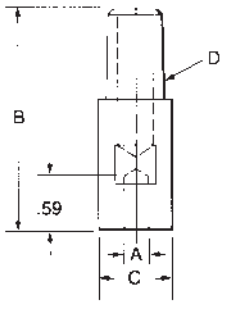
BODIES

Description	Part Number	A OAL	B Dia.	C Thread	D Taper
TDH-25A	301-0004	1.77″	1″	18mm	#4
TDH-25C	301-0005	1.97″	1″	18mm	#5
TDH-30A	301-0015	1.97″	1.125″	22mm	#5
TDH-35A	301-0020	1.97″	1.125″	26mm	#5

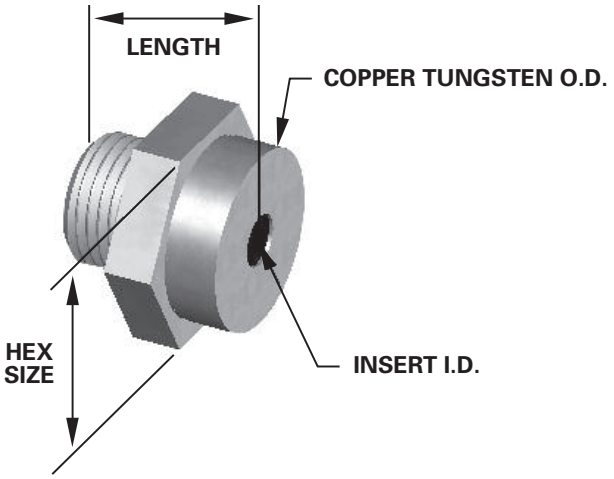


UPPER ELECTRODE

Description	Part Number	A ID	B OAL	C Dia.	D Taper
TNFD 16-M5-16-3	186-0101	5mm	2.36″	.625″	5RW
TNFD 20-M6-16-3	186-0102	6mm		.75″	
TNFD 20-M8-16-3	186-0103	7.5mm		.75″	
TNFD 20-M10-16-3	186-0104	10mm		.75″	
TNFD 20-M12-16-3	186-0105	12mm		.75″	



GH SERIES NUT WELDING HEADS



	175-GH-2 Series	175-GH-3 Series	175-GH-4 Series	Insert I.D.
Length	0.875	1.000	1.125	
Tungsten OD	0.875	1.250	1.500	
Hex Size	1.000	1.375	1.500	
	175-GH-2-188	175-GH-3-188		0.188
	175-GH-2-193	175-GH-3-193		0.193
	175-GH-2-197			0.197
		175-GH-3-200		0.200
	175-GH-2-212			0.212
	175-GH-2-218			0.218
	175-GH-2-239			0.239
	175-GH-2-240			0.240
	175-GH-2-242	175-GH-3-242		(6mm) 0.242
	175-GH-2-245	175-GH-3-245		0.245
		175-GH-3-247		0.247
	175-GH-2-250			0.250
		175-GH-3-251		0.251
	175-GH-2-252			0.252
		175-GH-3-254		0.254
	175-GH-2-258			0.258
		175-GH-3-262		0.262
	175-GH-2-263			0.263
		175-GH-3-264		0.264
	175-GH-2-272	175-GH-3-272		0.272
	175-GH-2-273	175-GH-3-273		0.273
	175-GH-2-275			0.275
	175-GH-2-277			0.277
	175-GH-2-280			0.280
	175-GH-2-282			0.282
	175-GH-2-287			0.287
	175-GH-2-312	175-GH-3-312		0.312
		175-GH-3-317		(8mm) 0.317
	175-GH-2-322	175-GH-3-322		0.322
	175-GH-2-325		175-GH-4-325	0.325
		175-GH-3-326		0.326
		175-GH-3-332		0.332
		175-GH-3-337		0.337
	175-GH-2-342			0.342
	175-GH-2-347	175-GH-3-347		0.347
		175-GH-3-351	175-GH-4-351	0.351
	175-GH-2-352	175-GH-3-352		0.352
	175-GH-2-354			0.354
	175-GH-2-357	175-GH-3-357		0.357
	175-GH-2-359			0.359

175-GH-2 Series	175-GH-3 Series	175-GH-4 Series	Insert I.D.
0.875	1.000	1.125	
0.875	1.250	1.500	
1.000	1.375	1.500	
175-GH-2-368			0.368
175-GH-2-372	175-GH-3-372		0.372
	175-GH-3-392		0.392
	175-GH-3-397		(10mm) 0.397
	175-GH-3-412		0.412
	175-GH-3-417		0.417
	175-GH-3-423		0.423
	175-GH-3-425		0.425
	175-GH-3-427		0.427
	175-GH-3-430		0.430
	175-GH-3-432		0.432
	175-GH-3-437		0.437
	175-GH-3-445		0.445
	175-GH-3-447		0.447
	175-GH-3-452		0.452
	175-GH-3-465		0.465
	175-GH-3-467		0.467
	175-GH-3-470		0.470
	175-GH-3-472		0.472
	175-GH-3-480		(12mm) 0.480
	175-GH-3-504		0.504
	175-GH-3-507		0.507
	175-GH-3-508		0.508
		175-GH-4-509	0.509
	175-GH-3-512		0.512
	175-GH-3-517		0.517
	175-GH-3-522		0.522
	175-GH-3-538		0.538
	175-GH-3-542		0.542
	175-GH-3-547		0.547
	175-GH-3-548		0.548
	175-GH-3-552		0.552
	175-GH-3-557		0.557
	175-GH-3-587		0.587
	175-GH-3-592		0.592
	175-GH-3-632		0.632
	175-GH-3-656		0.656
		175-GH-4-667	0.667
		175-GH-4-677	0.677

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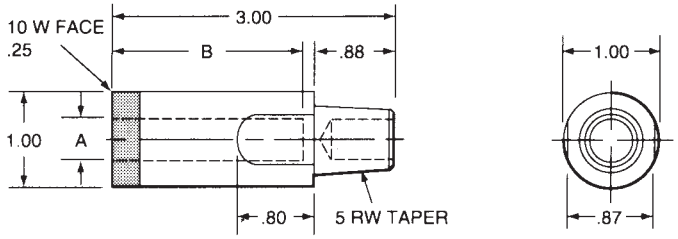
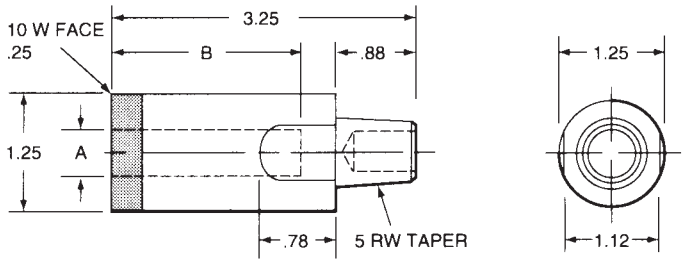
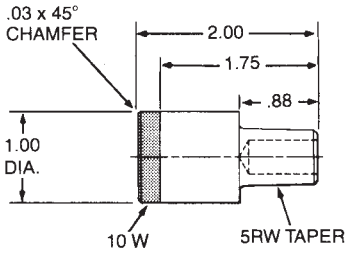
These series of Stud electrodes are made from RWMA Class 2 material with TUFFALOYS' 10W (copper tungsten) on the weld face and wrench flats for easy removal from holders. The Insulator is made to withstand the constant friction that is applied as the stud is inserted and removed.

Screw Thread Size	INSULATOR ID. A	INSULATOR Length B	Part Number
	.218		175-0316-4032-10W
6mm	.243		175-0316-40062-10W
0.250	.256		175-0316-4042-10W
0.312, 8mm	.319	1"	175-0316-4052-10W
0.375	.381		175-0316-4062-10W
10mm	.400		175-0316-40102-10W
	.218		175-0316-4031-10W
6mm	.243		175-0316-4006-10W
0.250	.256		175-0316-4041-10W
0.312, 8mm	.319	2"	175-0316-4051-10W
0.375	.381		175-0316-4061-10W
10mm	.400		175-0316-4010-10W
0.437	.444		175-1313-4372-10W
12mm	.479		175-1313-40122-10W
0.500	.506		175-1313-4382-10W
	.569	1"	175-1313-4392-10W
0.625	.652		175-1313-4402-10W
	.694		175-1313-4412-10W
	.777		175-1313-4422-10W
0.437	.444		175-1313-4371-10W
12mm	.479		175-1313-4012-10W
0.500	.506		175-1313-4381-10W
	.569	2"	175-1313-4391-10W
0.625	.652		175-1313-4401-10W
	.694		175-1313-4411-10W
	.777		175-1313-4421-10W

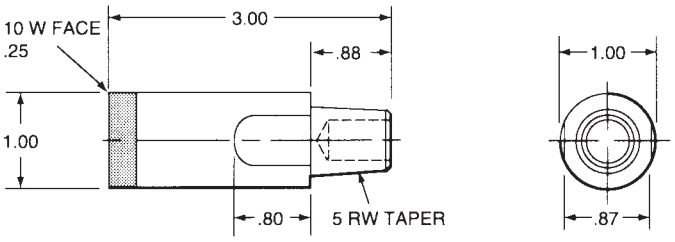




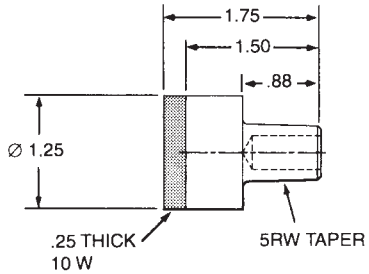
BACKUP ELECTRODES FOR UPPERS



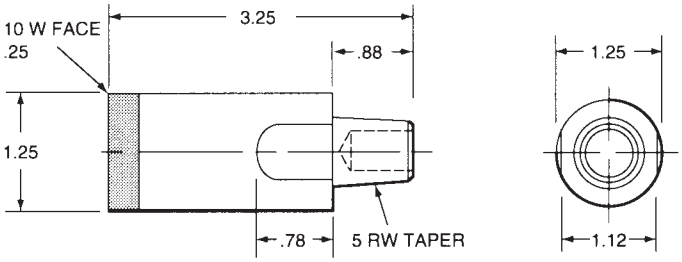
186-0311-10W



186-0316-10W



186-0313-10W



186-1313-10W

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QUICKEST WAY TO CUT WELDING COSTS

Increased productivity without capital investment or increased labor costs just has to spell PROFIT. Hundreds of resistance welding users are profiting from the TUFFALOY methods of multiple welding, to produce almost any assembly requiring closely spaced welds.

The key is to **"think multiple!"** Whenever the welding machine goes through a cycle, have it do more than one weld at a time. It's easy and practical with one of the TUFFALOY multiple welding devices: The Teeter-Tip dual tip adapter, the Equatip dual tip holder, the Equa-Press dual tip holder, or the Tri-Spacer.

They're ready to go to work, cutting costs and increasing production efficiency for you.

Study the multiple welding holders and adapters in this section. Learn their capabilities, **"think multiple,"** and you'll probably see many ways in which TUFFALOY multiple welding can improve your operation. Remember that TUFFALOY is prepared to provide any special fixturing you need. Show our engineers what you require, and they'll design a set-up to do it.

TEETER-TIP DUAL TIP ADAPTERS

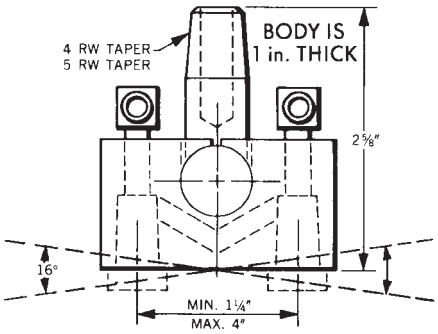
U.S. Pat. 3,356,821

You can spot or projection weld in half the time by doubling the number of welds per machine stroke. Use Teeter-Tip dual tip adapters, which come with water-coolant fittings to beat high heat build-up. These, adapters transmit total pressures of 1000 lbs., and deliver equal current and pressure to each tip. They compensate for normal electrode wear, imperfect tip dressing, and work variations up to .060".

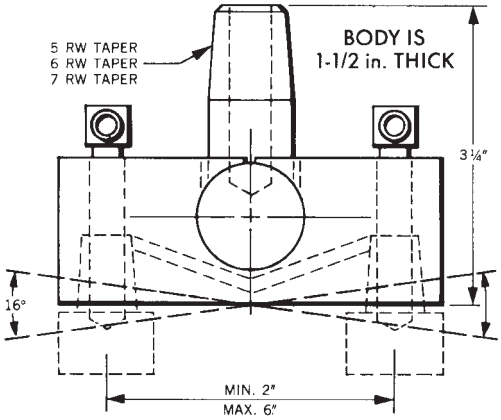
LIGHT-DUTY adapters have no. 4 or 5 RW shanks, tip spacing to 4 inches, tip sockets for 1/2" or 5/8" diameter male Tuffcap caps, or 4 RW tips (5/8" cap sockets are standard).

HEAVY-DUTY adapters have shanks from 5 to 7 RW size, tip spacing to 6 inches, tip sockets for 1/2" or 5/8" diameter male Tuffcap caps, or 4 or 5 RW tips (4 RW sockets are standard). These adapters have a deeper, stronger body.

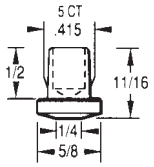
Two low-height 5/8" dia. cap-type tips are shown below. They are recommended for use in these adapters. Other standard caps, both 5/8" & 1/2" dia., are tabled on the next page. You must specify the size tip sockets you want, or the standard socket will be supplied.



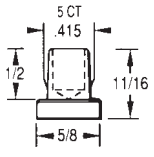
LIGHT DUTY



HEAVY DUTY



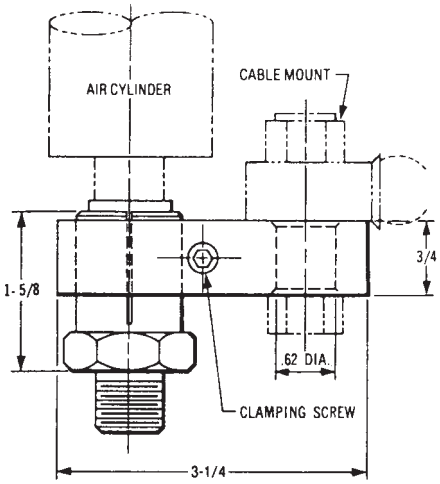
TRUNCATED CONE SE-6332
(Part No. 186-0522)



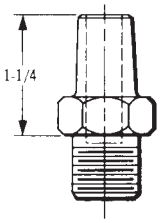
FLAT FACED SE-6296
(Part No. 186-0523)

Style	Shank Taper	Description*	Tip Spacing Range (inches)	Socket Taper
LIGHT Duty	4RW	TT-1408	1-1/4 to 2	4RW 4CT 5CT
	4RW	TT-1416	2 to 4	4RW 4CT 5CT
	5RW	TT-1508	1-1/2 to 2	4RW 4CT 5CT
	5RW	TT-1516	2 to 4	4RW 4CT 5CT
HEAVY Duty	5RW	TT-15516	2 to 4	4RW 5RW 4CT 5CT
	5RW	TT-15524	4 to 6	4RW 5RW 4CT 5CT
	6RW	TT-15616	2 to 4	4RW 5RW 4CT 5CT
	6RW	TT-15624	4 to 6	4RW 5RW 4CT 5CT
	7RW	TT-15716	2 to 4	4RW 5RW 4CT 5CT
	7RW	TT-15724	4 to 6	4RW 5RW 4CT 5CT

**When ordering, also state exact tip spacing and tip socket size, Example: TT - 1508 - 1-1/2 - 5CT. (5CT means 5/8" diameter cap, 4CT means 1/2" diameter cap.)*



Cylinder-mounting adapter shank, Part No. 195-7063; clamp, Part No. 194-2040, not included



5 RW taper adapter shank, Part No. 195-5680

EQUATIP DUAL TIP HOLDERS

U.S. Pat. No. 3,558,847

The Equatip dual tip holder is a smaller version of the Equa-Press holder (on next page). It is more compact, and is more economical for those applications where it will work equally well. An even smaller device, the Equatip adapter (not water-cooled) is shown in box below.

Using the Equatip holder, both tips contact the work squarely, because tip axes remain parallel to direction of force (unlike the Teeter-Tip adapters). An internal roller equalizes current and pressure between the two electrodes, and will compensate for work height variations up to 1/16".

The holders are ordered with either 1" or 1-1/2" spacing between barrels, and with tip sockets to accept either male Tuffcap caps (5/8" dia.) or straight No. 4 RW electrodes. (Bent tips are not recommended.) The distance between welds can be varied by rotating offset-nose tips in the barrels.

Equatip holders can be supplied with straight shanks for arm mounting, a tapered adapter shank for holder mounting, or a cylinder adapter shank to be clamped to a cylinder rod.

Equatip holders can be used with forces up to 1000 lbs.

5/8" DIA. TUFFCAP CAPS (5 CT)

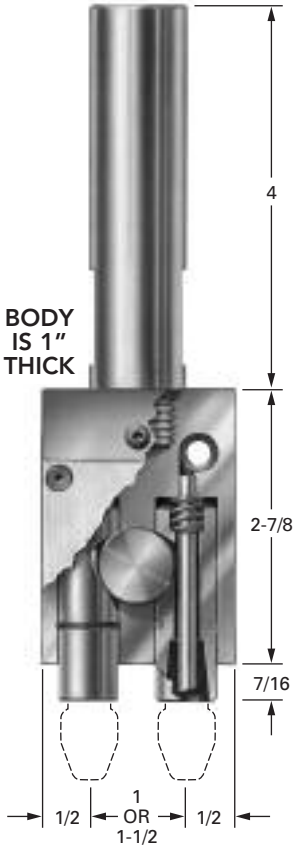
Nose Style	Alloy Class	Descrip-tion	Part No.
Pointed	1	TA-15	111-0015
	2	TA-25	112-0025
Dome	1	TB-15	113-0015
	2	TB-25	114-0025
Flat	1	TC-15	115-0015
	2	TC-25	116-0025
Offset	1	TD-15	117-0015
	2	TD-25	118-0025

Those caps are fully dimensioned on page 6.

EQUATIP HOLDERS

Tip Spacing & Mounting Style	For 5/8" Dia. Tuffcap Caps: Descrip-tion	For 5/8" Dia. Tuffcap Caps: Part No.	For No. 4 RW Tips: Descrip-tion	For No. 4 RW Tips: Part No.
ONE-INCH SPACING:				
1-in. shank	4050	350-4050	4055	350-4055
1-1/4-in. shank	4051	350-4051	4056	350-4056
1-1/2-in. shank	4052	350-4052	4057	350-4057
5RW adapter	4053	350-4053	4058	350-4058
Cylinder adapter*	4054	350-4054	4059	350-4059
1-1/2-INCH SPACING:				
1-in. shank	4150	350-4150	4155	350-4155
1-1/4-in. shank	4151	350-4151	4156	350-4156
1-1/2-in. shank	4152	350-4152	4157	350-4157
5RW adapter	4153	350-4153	4158	350-4158
Cylinder adapter*	4154	350-4154	4159	350-4159

**Without clamp*



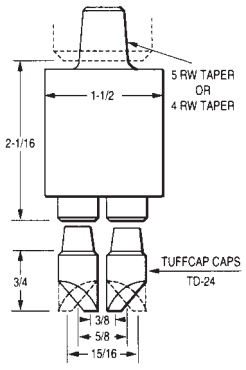
For light-duty welding
EQUATIP ADAPTER

The Equatip dual tip adapter works like the Equatip holder, but it is not water-cooled and is meant for less demanding jobs. It costs less, and is a little smaller, barrels being 5/8" apart. Its straight tips are TUFFCAP caps, 1/2" in diameter.

1/2" DIA. TUFFCAP CAPS (4 CT)

Nose Style	Alloy Class	Descrip-tion	Part No.
Pointed	1	TA-14	111-0014
	2	TA-24	112-0024
Dome	1	TB-14	113-0014
	2	TB-24	114-0024
Flat	1	TC-14	115-0014
	2	TC-24	116-0024
Offset	1	TD-14	117-0014
	2	TD-24	118-0024

Those caps are fully dimensioned on page 6.



4045, Part No. 350-4045-5RW
4046, Part No. 350-4046-4RW

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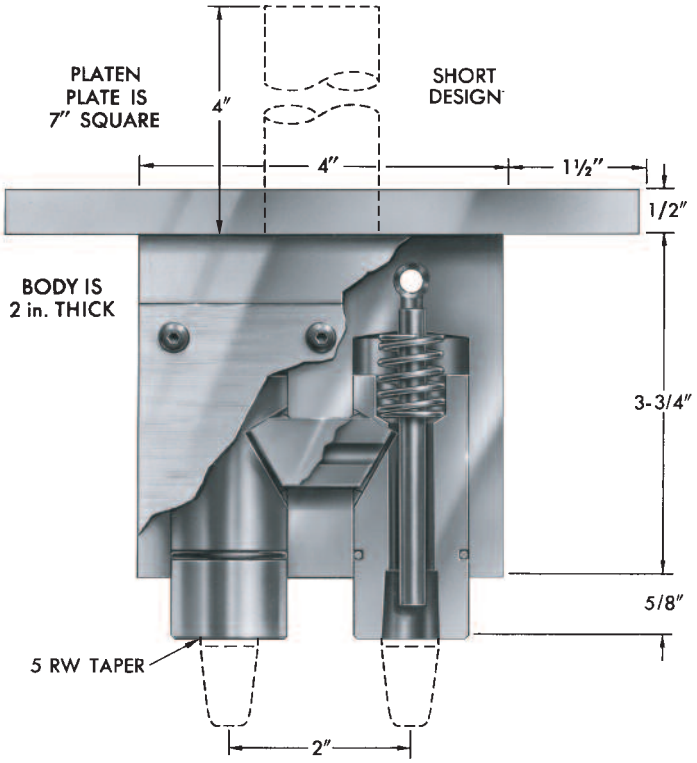
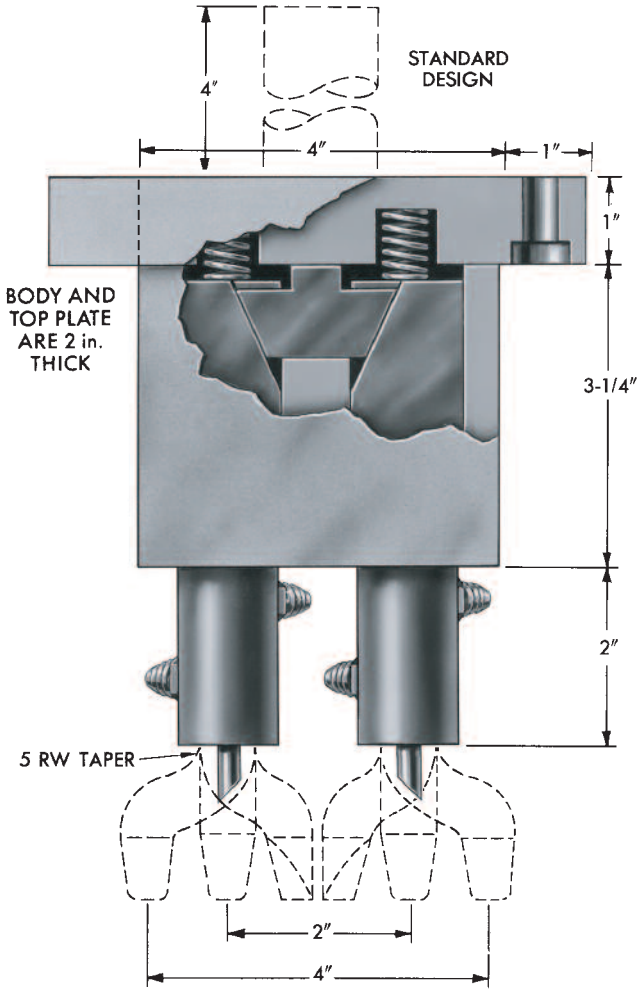
EQUA-PRESS™ DUAL TIP HOLDERS

U.S. Pat. No. 2,979,599
Canada Pat. 637470





The Equa-Press Holder makes two identical welds at once. When it contacts the workpiece, the forging pressure is automatically equalized between the two electrodes, regardless of variations in work thickness, or electrode wear (up to 3/16"). The two tip-holding barrels are sliding pistons, whose movements are controlled by a mechanical equalizing slide in the housing (see cutaway drawings). The spring's only function is to return the barrels to a fully extended position when there is no work contact. Maximum conductivity is maintained through sturdy copperalloy working parts. Spacing can vary up to 4 inches, using TUFFALOY bent offset tips in Equa-Press holders having the standard barrel spacing of two inches (shown).

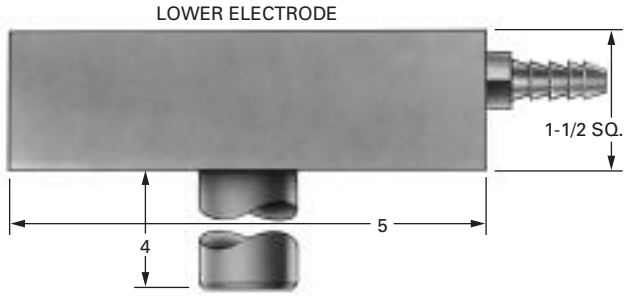
Barrel spacing up to six inches is available as semi-standard (see price list). These are drilled to order from stock components. To order you must give the barrel spacing desired, along with the Item number (from table).

Equa-Press Holders are made in two mounting styles: platen models to mount directly to the platen on press-type welding machines, and shank models for rocker arm machines. All are available in two designs: the standard and the short (close-coupled) type. The short design is internally flood-cooled and takes up less space in the welder.

Equa-Press holders can be used with forces up to 1500 lbs.

Mounting Style	Standard Design		Short Design	
	Descrip-tion	Part No.	Descrip-tion	Part No.
1-in. shank	4010	350-4010	4015	350-4015
1-1 /4-in. shank	4011	350-4011	4016	350-4016
1-1 /2-1n. shank	4012	350-4012	4017	350-4017
Platen	4013	350-4013	4018	350-4018

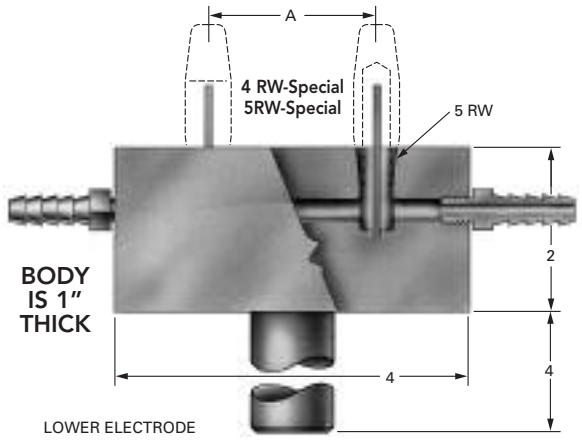
Note: For best results, position the holder so that a line drawn through the electrode centers is at, or nearly at, right angles to the direction of the welder arms. Otherwise, the magnetic field between the arms can cause an excess of current to flow through the inboard electrode.



LOWER ELECTRODES		
Shank Diameter	Description	Part No.
1	4020	350-4020
1-1/4	4021	350-4021
1-1/2	4022	350-4022

LOWER HOLDERS AND ELECTRODES FOR USE WITH EQUA-PRESS HOLDER

A lower, fixed, dual tip holder is offered for use with Equa-Press Holders. Like the Equa-Press, it has a standard two-inch tip spacing and helps make two welds at once, precisely alike. The standard trans-verse bar electrode shown is used when work geometry doesn't require tips on the lower side. They are water-cooled.



STANDARD LOWER HOLDER - 2" SPACING 5 RW		
	Lower Holder	
Shank Diameter	Description	Part No.
1	4030	350-4030
1-1/4	4031	350-4031
1-1/2	4032	350-4032

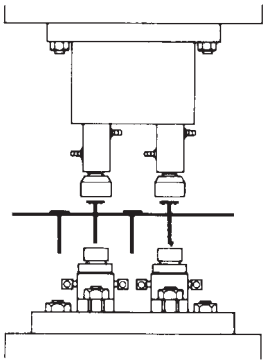
SPECIAL LOWER ELECTRODES			
Style	Shank Diameter (inches)	Description*	A Tip Spacing Range (inches)
4" Body	1	4030	1-1/4 to 2-7/8
	1-1/4	4031	1-1/4 to 2-7/8
	1-1/2	4032	1-1/4 to 2-7/8
8" Body	1	8030	3 to 6
	1-1/4	8031	3 to 6
	1-1/2	8032	3 to 6

** When ordering specify center distance and either 4RW or 5RW sockets*

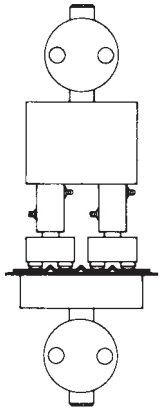
A Case History: Projection welding brackets to automotive frame assemblies is twice as fast with an Equa-Press dual tip holder. Lower welding fixture acts as an inspection device, so warped parts are discovered before welding. Inspection time and scrap loss are both reduced.

A Case History: Joining a piece of metal to itself is always tough. This job was done with an Equa-Press holder - two at a time. Lower clamp faces, carrying current, contact parts near the weld areas to avoid current bypassing weld projections. Two standard swivel tips make four welds, two per part.

A Case History: Dual spot welding of panelled wall sections reduced welding costs enough to justify buying welding machine to do the job in-plant. Equa-Press holder with 5-inch spacing, and special (but simple) tooling to provide two offset tip adapters and matching holders were used. Electrodes are standard TUFFCAP caps.



In this drawing, two studs are projection welded in each welder stroke, using an Equa-Press dual holder over a pair of studwelding electrodes held in PM-style holders.



Here, four spot welds are made simultaneously on a corrugated part. An Equa-Press dual holder is used to hold two Teeter-Tip dual tip adapters.

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TRISPACER HOLDER		
Mounting Style	Descrip-tion	Part No.
1-in. shank	4040	350-4040
1-1/4-in. shank	4041	350-4041
1-1/2-in. shank	4042	350-4042
Platen	4043	350-4043

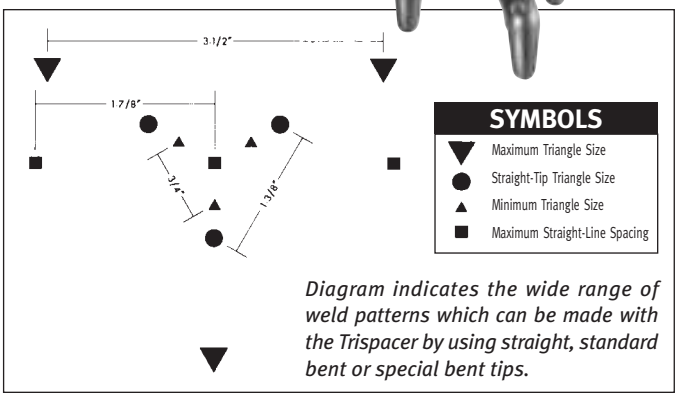


Diagram indicates the wide range of weld patterns which can be made with the Trispacer by using straight, standard bent or special bent tips.

TRISPACER™ TRIPLE TIP HOLDER

U.S. Pat. No. 3,558,848

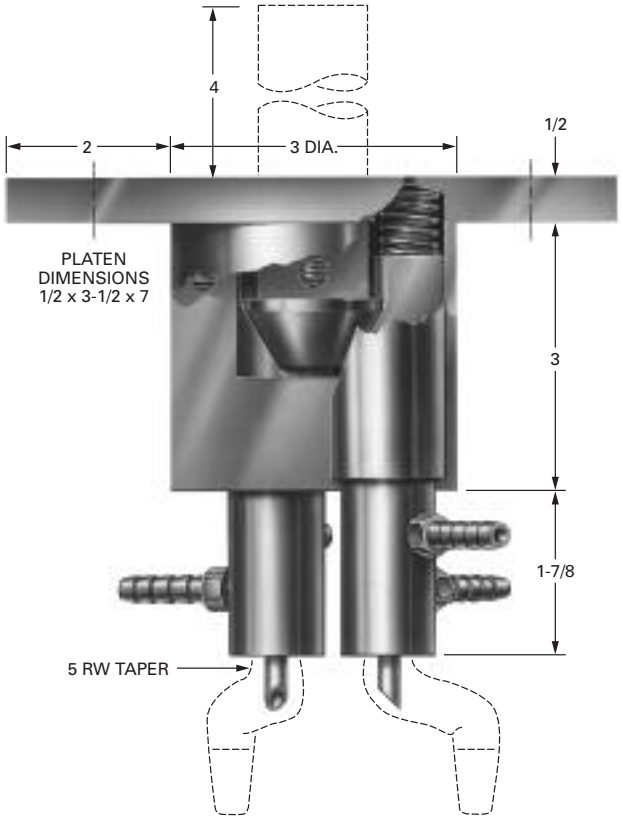
The Trispacer tip holder will make three spot welds at one time, automatically splitting the current and the pressure equally between the three tips. In doing so, it compensates for variations in work thicknesses and electrode wear-up to 3/16-in.

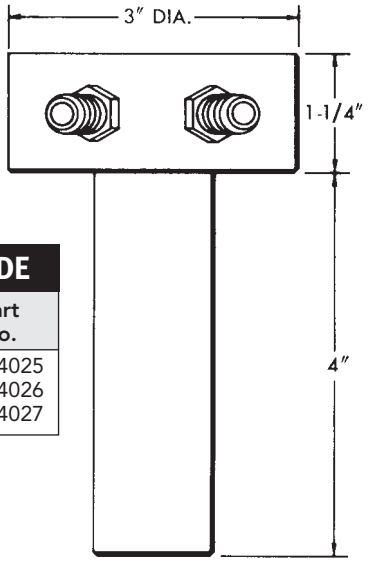
The three tip-holder barrels (#5 RW) are equidistant from one another, all falling on a 1-5/8-in. diameter circle (in the standard model shown). Using straight tips the weld pattern would form an equilateral triangle. However, the weld pattern can be widely varied by using standard or special bent tips. In fact, the three welds can be made in a straight line.

The Trispacer Holder works in the same simple, mechanical way as the Equa-Press Holder: The tip-holding barrels have a limited up-and-down movement, to accommodate work conditions, and are adjusted to deliver equal pressure by the cone-shaped equalizing device in the housing. All current-carrying parts are made of RWMA copper alloys. It is made in two styles: to mount directly to the platen of press-type welders, and with shanks to fit in welder arms.

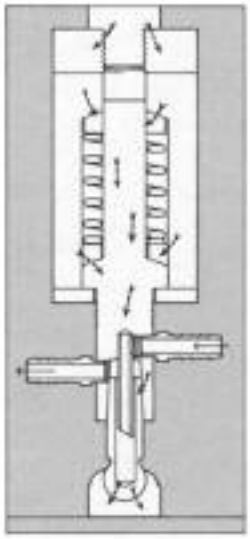
LOWER ELECTRODE

A simple, water-cooled lower electrode is made for use with the Trispacer holder. Its three-inch-diameter face makes it usable with any weld pattern that may be developed for the Trispacer. It comes in three shank diameter models.





LOWER ELECTRODE		
Shank Dia.	Descrip-tion	Part No.
1	4025	350-4025
1-1/4	4026	350-4026
1-1/2	4027	350-4027



Current flow follows dashed arrow through the outer body, two split contact rings, tapered tip socket, and to the electrode.

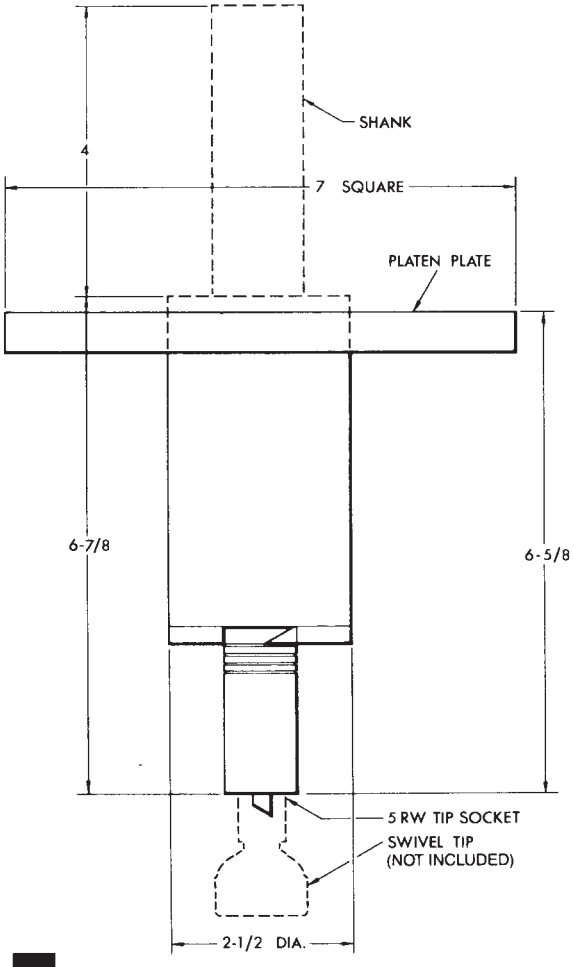
U.S. Pat. No. 3,632,958 Canada Pat. No. 902,189

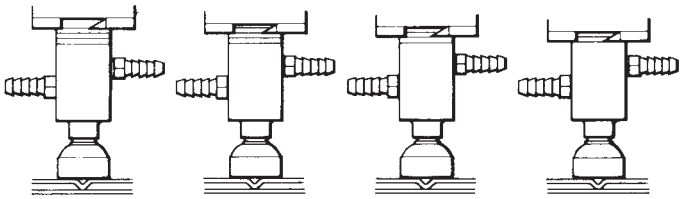
TUFFALOY fast-follow-up (low inertia) holders solve the problem of maintaining adequate weld pressure on rapidly collapsing projection welds-with fewer set-up problems and reduced maintenance.

These holders can be set to deliver fast-follow-up forces of from 140 to 1300 pounds, a range covering 90% of all projection welding operations. They are compact, water cooled, and easy to maintain.

Plus features of the TUFFALOY fast-follow-up holder include: (1) wider range of pressures than any competitive make (2) no flexible shunt-a common cause of holder failure (3) use of standard, unmodified die springs, so if you need a spring of different strength, it's easily available (4) spring forces available are clearly indicated, so it's easy to set up for a specific force (5) three shank sizes, or it can be platen-mounted-the only fast-follow-up holder that can (6) extremely low height permits use where larger units can't be used.

TUFFALOY fast-follow-up holders can be used to limit the weld pressure of any spot welding machine regardless of cylinder size or air pressure. This is better than reducing air pressure, which slows the return stroke and retards production.





A
No external Compression

B
Compression 1 mark

C
Compression 2 marks

D
Compression 3 marks

For every one-eighth of an inch that a fast-follow-up is compressed when setting up, a known amount of force is provided, to quickly follow up any reduction in work thickness. Example: at position B, a type MH spring would delivery 310 lb, at C, 440 lb, etc.

FAST-FOLLOW-UP FORCE CHART (LBS.)

Spring Type	1/8-in. Compression	1/4-in. Compression	3/8-in. Compression	1/2-in. Compression
M (300 lbs. max.)	140	200	250	300
MH (680 lbs. max.)	310	440	560	680
H (1300 lbs. max.)	600	840	1070	1300

Mounting Style	300 LBS MAX. (M SPRING)		680 LBS. MAX. (MH SPRING)		1300 LBS. MAX. (H SPRING)	
	Descrip-tion	Part No.	Descrip-tion	Part No.	Descrip-tion	Part No.
1" Shank	4620	350-4620	4621	350-4621	4622	350-4622
1-1/4" Shank	4623	350-4623	4624	350-4624	4625	350-4625
1-1/2" Shank	4626	350-4626	4627	350-4627	4628	350-4628
Platen-Mtd.	4629	350-4629	4630	350-4630	4631	350-4631

TUFFALOY BAR STOCK

TUFFALOY extruded bar stock is used for fabricating special electrodes, platens, adapters, and other conductive parts. Round bar is available in all three alloy classes (1, 2 & 3). The other shapes are made in Class 2 and 3 alloy. Physical properties are superior to those shown on page 45.

Bar stock is priced per pound in random mill lengths, from 8 to 12 feet. Additional charges are made depending on specific weights and lengths ordered. See the TUFFALOY price list.

	Size In Inches	Weight Pounds Per Foot	Tuffaloy 88 Class 1 Alloy Item No.	Tuffaloy 77 Class 2 Alloy Item No.	Tuffaloy 55 Class 3 Alloy Item No.
ROUND	1/8	.048			431-0125
	3/16	.106		421-0187	431-0187
	1/4	.189		421-0250	431-0250
	5/16	.296		421-0313	431-0313
	3/8	.426		421-0375	431-0375
	1/2	.758		421-0500	431-0500
	9/16	.959		421-0562	431-0562
	5/8	1.184	411-0625	421-0622	431-0625
	21/32	1.82		421-0656	
	3/4	1.704	411-0750	421-0748	431-0750
	7/8	2.32	411-0875	421-0872	431-0875
	1	3.03		421-1000	431-1000
	1-1/8	3.84		421-1125	431-1125
	1-1/4	4.74		421-1250	431-1240
	1-3/8	5.74		421-1375	431-1375
	1-1/2	6.82		421-1500	431-1500
	1-5/8	7.97			431-1625
	1-3/4	9.28		421-1750	431-1750
	2	12.12		421-2000	431-2000
	2-1/8	13.62			431-2125
	2-1/4	15.40		421-2250	431-2250
	2-1/2	18.97		421-2500	431-2500
	2-3/4	23.00		421-2750	
	3	27.15		421-3000	431-3000
	3-1/4	32.05			431-3250
	3-1/2	37.18			431-3500
HEXAGONAL	3/8	.472		422-0375	
	5/8	1.31		422-0625	
	3/4	2.18		422-0750	432-0750
	7/8	2.56		422-0875	432-0875
	1	3.35		422-1000	432-1000
	1-1/8	4.24		422-1125	432-1125
	1-1/4	5.25		422-1250	432-1250
	1-1/2	7.55		422-1500	432-1500
SQUARE	1/4	.24			433-0250
	3/8	.54			433-0375
	1/2	.96		423-0500	433-0500
	5/8	1.56		423-0625	433-0625
	3/4	2.16		423-0750	433-0750
	1	3.84		423-1000	433-1000
	1-1/4	6.00		423-1250	433-1250
	1-1/2	8.64		423-1500	433-1500
	1-3/4	11.83		423-1750	
	2	15.46		423-2000	433-2000

	Size In Inches	Weight Pounds Per Foot	Tuffaloy 77 Class 2 Alloy Item No.	Tuffaloy 55 Class 3 Alloy Item No.
RECTANGULAR	1/4 x 1/2	.484		434-0205
	1/4 x 3/4	.727		434-0207
	1/4 x 1	.96	424-0210	434-0210
	1/4 x 1-1/4	1.20	424-0212	
	1/4 x 1-1/2	1.44	424-0215	434-0215
	1/4 x 2	1.92	424-0220	434-0220
	3/8 x 5/8	.900		434-0306
	3/8 x 314	1.08	424-0307	434-0307
	3/8 x 1	1.44	424-0310	434-0310
	3/8 x 1-1/2	2.16	424-0315	
	3/8 x 2	2.88		434-0320
	1/2 x 3/4	1.44	424-0507	434-0507
	1/2 x 1	1.92	424-0510	434-0510
	1/2 x 1-1/4	2.40		434-0512
	1/2 x 1-1/2	2.138	424-0515	434-0515
	1/2 x 2	3.134	424-0520	434-0520
	1/2 x 2-1/2	4.133	424-0525	434-0525
	1/2 x 3	5.81	424-0530	434-0530
	5/8 x 3/4	1.80	424-0607	434-0607
	5/8 x 1	2.40	424-0610	434-0610
	5/8 x 1-1/2	3.60	424-0615	434-0615
	5/8 x 2	4.85	424-0620	434-0620
	5/8 x 3	7.27	424-0630	
	5/8 x 4	9.60	424-0640	
	3/4 x 1	2.88	424-0710	434-0710
	3/4 x 1-1/4	3.64	424-0712	434-0712
	3/4 x 1-1/2	4.32	424-0715	434-0715
	3/4 x 2	5.72	424-0720	434-0720
	3/4 x 2-1/4	6.48		434-0722
	3/4 x 2-1/2	7.20	424-0725	434-0725
	3/4 x 3	8.64	424-0730	
	1 x 1-1/4	4.85	424-1012	434-1012
	1 x 1-1/2	5.76	424-1015	434-1015
	1 x 2	7.68	424-1020	434-1020
	1 x 2-1/2	9.70	424-1025	434-1025
	1 X 2-3/4	10.56	424-1027	
	1 X 3	11.55	424-1030	434-1030
	1-1/4 x 1-1/2	7.25	424-1215	
	1-1/4 x 1-3/4	8.40	424-1217	
	1-1/4 X 2	9.60	424-1220	
	1-1/4 X 2-1/2	12.06	424-1225	
	1-1/2 x 1-3/4	10.09	424-1517	
	1-1/2 x 2	11.60	424-1520	434-1520
	1-1/2 x 3	17.28	424-1530	434-1530
	2 x 3-1/4	25.15	424-2032	
	2 x 3-3/4	29.05	424-2037	

Stronger, generally harder, and having less conductivity, the refractory metal compositions include copper-tungsten (Classes 10-11), tungsten (Class 13) and molybdenum (Class 14) alloys.

The bars and inserts listed below are made in the following RWMA group B alloys: Class 10 (Tuffaloy 1W), Class 11 (Tuffaloy 10W), and Class 12 (Tuffaloy 20W).

Bars and inserts of Class 13 (Tuffaloy 100W) and Class 14 (Tuffaloy 100M), as well as special sizes and shapes, are priced on request.

COPPER TUNGSTEN ROUND BARS

Eight inches long, available in the following diameters:

From 1/8" to 2".

COPPER TUNGSTEN RECTANGULAR AND SQUARE BARS

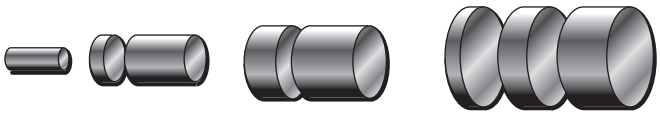
Eight inches long, available in following dimensions:

Widths from 1/8" to 2" and Thicknesses from 1/8" to 1".

COPPER TUNGSTEN ROUND INSERTS

Available in following dimensions:

Diameters from 1/8" to 2" and Thicknesses from 1/4" to 1".

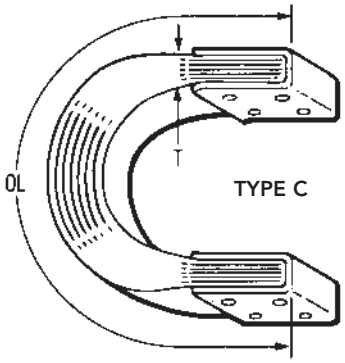


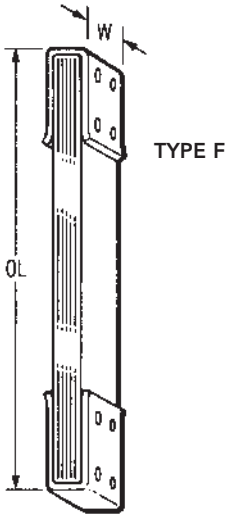
TUFFALOY FORGINGS

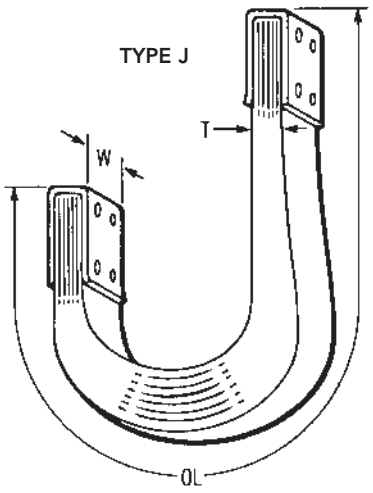
TUFFALOY forgings are used to make seam welder wheels and shafts, butt and flash welder dies, and welder arms and platens. Forgings are superior to castings in physical properties and in absence of porosity. They are available in TUFFALOY 88, 77 and 55 (Class 1, 2 and 3 alloy). All are readily machinable.

When ordering specify whether forging is to be as-forged or finish machined. Regardless of how it is wanted always order by giving finish dimensions.

TUFFALOY SHUNTS AND JUMPERS



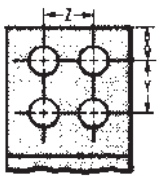




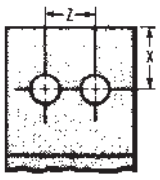
Laminated copper shunts are made to your size and shape specifications. High conductivity electrolytic copper strip is used, and terminal clips are riveted in place.

HOW TO ORDER

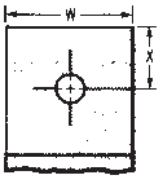
Give the following information:
Type (C, F, or J)
Outside length (OL)
Width (W)
Thickness (less clip) (T)
Hole pattern (specify by letter code)
Hole location (X, Y, Z values)
Hole diameter



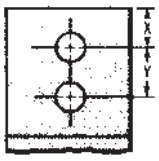
HOLE PATTERN A



HOLE PATTERN B



HOLE PATTERN C



HOLE PATTERN E

Air-cooled jumper cables are flexible, high-conductivity copper conductors with insulative sleeves. They are made in lengths to suit your needs.

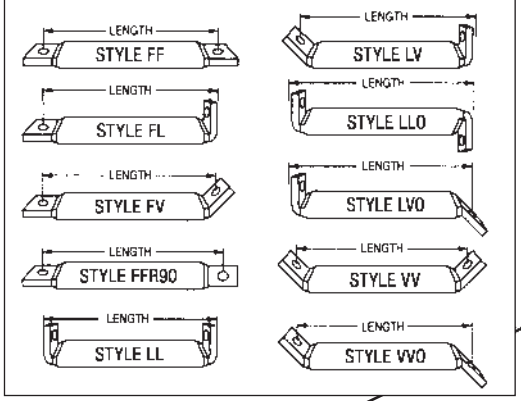
HOW TO ORDER

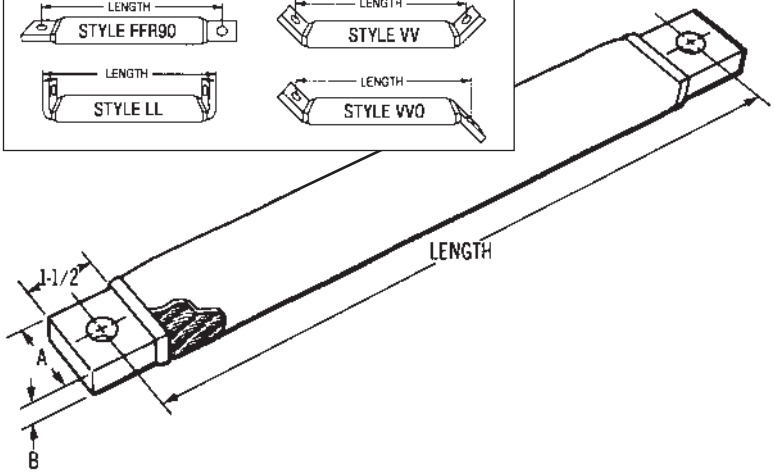
Give the following information:
Conductor rating (MCM)
Length between holes
Terminal orientation style

DIMENSIONS, INCHES			
MCM Rating	O.D. (approx.)	Lug Width A	Lug Thickness B
600	1-5/8	1-3/8	.50
750	1-3/4	1-3/8	.60
1000	2	1-1/2	.70
1200	2-1/8	1-1/2	.82
1500	2-1/4	1-1/2	.99

Holes are 17/32 unless otherwise specified.

TERMINAL ORIENTATION





TIP SOCKET REAMERS

Hole in reamer center permits water tube entry; no need to dismantle holder. 4 RW; Part No. 601-0004; 5 RW, Part No. 601-0005; 6 RW, Part No. 601-0006; 7 RW, Part No. 601-0007.

TIP DRESSING TOOL

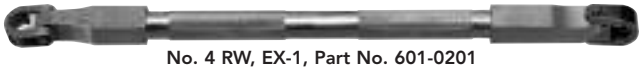
To remove mushroomed nose material on a pair of tips of 4 or 5 RW size, having pointed or dome noses. Other nose design dressers on special order. Dresser, Part No. 601-0102; Dresser cutter, Part No. 601-0103.

Tip File

RADIUS TIP FILE

To restore original contours of welding tips use this two-inch radius file. Part No. 601-0120.

WELDING TIP EXTRACTORS



No. 4 RW, EX-1, Part No. 601-0201
No. 5 RW, EX-2, Part No. 601-0202

No. 4 RW and 5 RW at opposite ends, EX-3, Part No. 601-0203

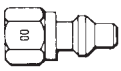
Large: EX-10-A, Part No. 601-0231

TUFFCAP SOCKET REAMERS

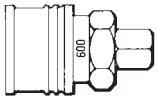
To ream or dress sockets to hold male caps. 4 RW, Part No. 601-0014; 5 RW, Part No. 601-0015; 6 RW, Part No. 6010016.

QUICK-CONNECT COUPLINGS with automatic shut-off

Use these couplings to make up efficient, trouble free coolant systems. Any plug shown will mate with any socket shown. Always put the socket on the upstream side of a connection. Its built-in valve will automatically close upon disconnection.

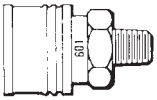


1/8" NPT female plug
Part No. 601-0300

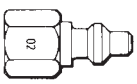


1/8" NPT female socket
Part No. 601-0314

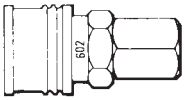
1/8" NPT male plug
Part No. 601-0301



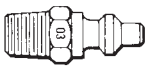
1/8" NPT male socket
Part No. 601-0315



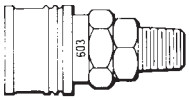
1/4" NPT male plug
Part No. 601-0302



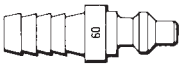
1/4" NPT female socket
Part No. 601-0316



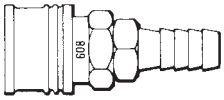
1/4" NPT male plug
Part No. 601-0303



1/4" NPT male socket
Part No. 601-0317



3/8" NPT hose plug
Part No. 601-0309



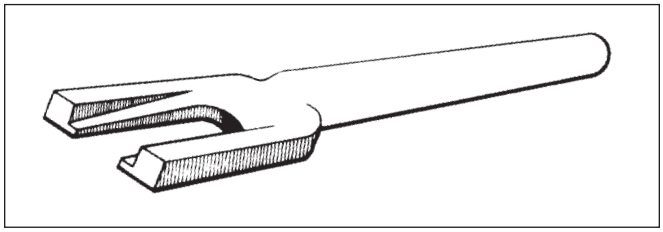
3/8" NPT hose socket
Part No. 601-0320

TUFFCAP EXTRACTORS

Male caps, 4 & 5 RW, EX-45, Part No. 601-0240
Male caps, 5 & 6 RW, EX-56, Part No. 601-0242

Male cap extractor has long lever handles for easier cap removal. In two dual-size models: EX-45 and EX-56.

Female caps, 4 RW, EX-41F, Part No. 601-0220
Female caps, 5 RW, EX-5F, Part No. 601-0221
Female caps, 6 RW, EX-6F, Part No. 601-0222



Female cap extractors are made for three Tuffcap shank sizes: Models EX-4F, EX-5F, and EX-6F.

714-252-5340
Simco
www.simcoweld.com

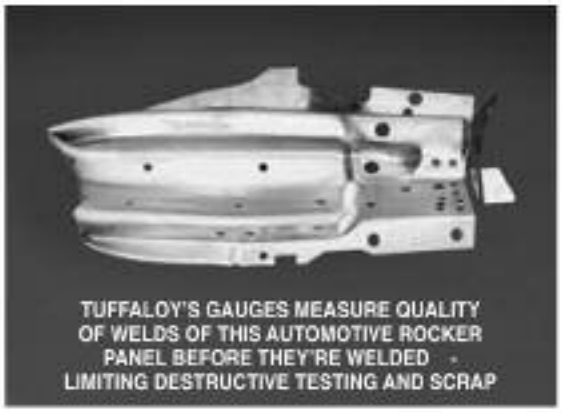
HIGH-ACCURACY WELD FORCE GAUGES AVAILABLE FROM TUFFALOY

Digital-Electronic

Digital-Hydraulic

Standard-Hydraulic

High-Capacity Hydraulic



RWMA MEMBER

WE OFFER ONE OF THE BROADEST PRODUCT LINES AVAILABLE TODAY

Tuffaloy supplies a broad range of weld force gauges, available with accuracies from 0.5% for Digital-Electronic gauges; to 2% accuracy for the Digital-Hydraulic which has a digital output driven by hydraulics; to our Standard Hydraulic models with 2%-3% accuracy. All are available in English and metric readouts.

Our **Digital-Electronic** gauge supplies the highest accuracy (0.5% for 95% of the gauges range). The gauge has large LCD readouts with peak-hold capabilities. All functions are electronic which prevents variations caused by flexing.

The **Digital-Hydraulic** delivers better accuracy than standard hydraulic gauges but at a lower price than all-digital models. The peak-hold feature allows for reading variable forces, which are common in resistance welding machinery. Gauges maintain an accuracy of 1% for 30% to 90% of the gauge's range.

Tuffaloy's **Standard Hydraulic** gauges are the low cost method for obtaining general force measurements. These gauges are available in a standard block style, with extensions. Sizes range from 600 lb. up to 10 tons with accuracy of 2% at the mean and 3% outside of mean for 70% of the gauge's range.

STANDARD GAUGE DATA

Description	Features	Maximum Reading	Increment Every	Opening Required	Extension Length	Item Number
Digital-Electronic Weld Probe 	• *Analog output* • *Auto shut-off* • *No-weld setting-not required* • *Accuracy 0.5% over full range*	0-1000 lbs/ 0-454 Kg	1 lb 1 Kg	1/4″	10″	601-8010MD 601-8045MD-KG
		0-3000 lbs/ 0-1133 Kg	1 lb 1 Kg	1/2″	10″	601-8300MD 601-8136MD-KG
		0-5000 lbs/ 0-2270 Kg	1 lb 1 Kg	1.1″	10″	601-8500MD 601-8227MD-KG
		0-10,000 lbs/ 0-2270 Kg	1 lb 1 Kg	1.1″	10″	601-8100MD 601-9453MD-KG
Digital-Hydraulic* 	• *Accuracy 2%* • *NIST traceable certification*	0-1361 Kg 0-3000 lbs 0-5000 lbs 0-10,000 lbs 0-3000 lbs	1 Kg 1 lb 1 lb 1 lb 1 lb	3/4″ 3/4″ 3/4″ 3/4″ 3/4″	– – – – 12″	601-1361D 601-3000D 601-5000D 601-9999D 601-3000D-12S
Standard-Hydraulic* 	• *Dual reading, lbs and Kg* • *Accuracy 3%*	0-600 lbs 0-1000 lbs 0-2000 lbs 0-2000 lbs 0-3000 lbs 0-3000 lbs 0-5000 lbs 0-6000 lbs 0-6000 lbs 0-10,000 lbs 0-5000 Kg	10 lb 20 lb 50 lb 50 lb 20 lb 20 lb 100 lb 50 lb 50 lb 100 lb 50 Kg	3/4″ 3/4″ 3/4″ 3/4″ 3/4″ 3/4″ 3/4″ 3/4″ 3/4″ 3/4″ 3/4″	– – – 12″ – 12″ – – 18″ – –	601-8006 601-8010 601-8020 601-8020-12 601-8030 601-8030-12 601-5000 601-6000 601-6000-18 601-8100 601-8101
High-Capacity Hydraulic* 	• *Metric equivalent available*	0-20,000 lbs	50 lb	1-3/4″	–	601-20000

** Hydraulic gauges should be selected to be used near mid-range.*

714-252-5340
Simco
www.simcoweld.com

RECOMMENDED USES OF RESISTANCE WELDING MATERIALS

GROUP A COPPER-BASE ALLOYS

RWMA CLASS 1 ALLOY • TUFFALOY 88

ZIRCONIUM-COPPER, suited to welding aluminum and magnesium alloys, coated materials, brass and bronze.

Class 1 alloy is superior to pure copper as an electrode material and is recommended as a general purpose material for resistance welding use. It may be used for spot welding electrodes, seam welding wheels and welding fixture components. It is not heat treatable.

RWMA CLASS 2 ALLOY

TUFFALOY 77 CHROMIUM-COPPER, suited to welding cold- and hot-rolled steels, stainless steel, and low-conductivity brasses and bronzes.

Class 2 alloy is a superior resistance welding electrode material, recommended for high-production operations. It is used for welding electrodes, projection welding electrodes, seam welding shafts and bearings, flash and butt welding electrodes, and current-carrying structural components. Available in forms for use as welding gun arms, welding platens and secondary-circuit structural members. It is heat treatable.

TUFFALOY Z ZIRCONIUM-CHROMIUM-COPPER is suited to welding galvanized steel and other metallic-coated steel.

This is a specially heat-treated alloy which meets the minimum electrical conductivity and hardness specifications of Class 2 alloy.

RWMA CLASS 3 ALLOY • TUFFALOY 55 AND 55A

BERYLLIUM-NICKEL-COPPER (55) are suited to welding steels having high electrical resistance, such as stainless steel.

NICKEL-COPPER (55A) is a beryllium-free alloy with properties similar to TUFFALOY 55.

Class 3 alloy is recommended for projection welding electrodes, and flash and butt welding electrodes. With its higher strength it is also used on highly-stressed current-carrying parts such as electrode shanks and heavy-duty electrode holders. It is heat treatable.

RWMA CLASS 4 ALLOY • TUFFALOY 44

BERYLLIUM-COPPER has extremely high hardness, and is recommended for projection, flash and butt welding electrodes. It has lower conductivity than Class 3 alloy but it is harder and more wear resistant. It should be considered where there is concern with high pressure density and severe wear, but where heating, due to its low conductivity, is not excessive.

It is used frequently in the form of inserts, tooling facings, and seam welder bushings. It is available in the annealed condition which is more readily machined and then subsequently heat treated.

GROUP B REFRACTORY METAL COMPOSITIONS

RWMA CLASS 10 • TUFFALOY 1W

TUNGSTEN 55% – COPPER 45%, suited for facings and inserts for projection welding electrodes and flash and butt welding electrodes. It is recommended where (relatively) high electrical conductivity and some degree of malleability is desired.

RWMA CLASS 11 • TUFFALOY 10W

TUNGSTEN 75% – COPPER 25%, suited to similar applications as Class 10, and for facing on electrode forming electrodes. It is harder than Class 10, and is for general use in projection welding electrodes.

RWMA CLASS 12 • TUFFALOY 20W

TUNGSTEN 80% – COPPER 20%, suited for electro-forming and electro-forging facings, and for electrode facings used to upset studs and rivets. A material for heavy-duty projection welding electrodes.

RWMA CLASS 13 • TUFFALOY 100W (Pure Tungsten)
RWMA CLASS 14 • TUFFALOY 100M (Pure Molybdenum)

Class 13 & 14 materials are used primarily for welding or electro-brazing non-ferrous metals having relatively high electrical conductivity. They are suited to cross-wire welding of copper and brass, and for welding copper wire braid to brass or bronze terminals. Special set-ups and procedures are required.

RWMA RECOMMENDED ELECTRODE MATERIALS FOR SPOT WELDING

Using Conventional Spot Welding Methods

TO WELD SIMILAR METALS

Ferrous	Tin Plate Steel		Terne Plate Steel		Galvanized Iron Zinc Plate		Cadmium Plate Steel		Chrome Plate Steel		Stainless Steel 18-8 Type		Scaly H.R. Steel		C.R. Steel H.R. Steel (Clean)	
Read Block Under Metal To Be Welded	B	I	A	I	A	I (II)	B	I	A	II	A	III (II)	B	I (II)	A	II
	I	3	I	3	I (II)	3	I	3	II	3	III (II)		I (II)	2	II	

Non-Ferrous	Aluminum		Aluminum Alloys Dura-luminum		Cupro Nickel		Nickel Silver		Nickel		Nickel Alloys Monel Nichome (High Res.)		Brass Yellow 25-40% Zinc		Phosphor Bronze Grade A, C & D		Silicon Bronze Everdur Olympic Duronze Herculoy	
	B	I (II)	B	I (II)	A	II	B	II	A	II	A	II	B	II	A[B]	II	A[B]	II
	I (II)	2	I (II)	2	II		II		II		II		II		II		II	

TO WELD DISSIMILAR METALS

Ferrous Alloys	Stainless Steel 18-8 Type		Chrome Plate Steel		Cadmium Plate Steel		Gal-vanized Iron		Terne Plate Steel		Tin Plate Steel	
Cold Rolled Steel Hot Rolled Steel, Clean	A	II (III)	A	II	B	II	B	I	A	I (II)	B	I
	III		II	3	II	3	II	3	II	3	II	3
Tin Plate Steel	B	II (III)	B	II	B	I (II)	B	I	B	I (II)		
	I		I	3	I	3	I	3	I	3		
Terne Plate Steel	B	II	B	II	B	I (II)	B	I				
	I	3	I	3	I	3	I	3				
Galvanized Iron Zinc Plate	B	II	B	II	B	I						
	I	3	I	3	I	3						
Cadmium Plate Steel	B	II	B	II								
	I	3	I	3								
Chrome Plate Steel	A	III (II)										
	II	3										

Non-Ferrous Alloys	Nickel Alloys		Nickel		Phosphor Bronze		Silicon Bronze		Yellow Brass		Nickel Silver	
Cupro Nickel	B	II	B	II	B	II	B	II	B	II	B	II
	II		II		II		II		II		II	
Silicon Bronze EverDur-Olympic Bronze-Herculoy	B	II	B	II	B	II	A	II	B	II		
	II		II		II		II		II			
Nickel Silver	B	II	B	II	B	II	B	II				
	II	1	II		II	1	II					
Nickel Alloys	A	II	B	II								
	II		II									
Stainless Steel 18-8 Type	B	II	B	II								
	III (II)	1	II (III)									

	Alum-inum	
Aluminum Alloys Duraluminum	B	I (II)
	I (II)	2

LEGEND

BLOCK INTERPRETATION

Weld-ability	Electrodes Against ⬆
Electrodes ⬅ Against	Special Information

WELDABILITY
A-Excellent
B-Good

ELECTRODES, RWMA Specifications
I = Group A, Class 1 - TUFFALOY 88
II = Group A, Class 2 - TUFFALOY 77 & TUFFALOY Z
III = Group A, Class 3 - TUFFALOY 55
Materials indicated in circles are second choice, example (II)

SPECIAL INFORMATION
1 - Special conditions required
2 - Good practice recommends cleaning before welding
3 - If plating is heavy, weld strength is questionable.

Data based on Resistance Welding Equipment Standards, Bulletin 16, a publication of the Resistance Welder Manufacturers Association.

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MINIMUM PHYSICAL PROPERTIES FOR RWMA ALLOYS

Published Standards of the Resistance Welder Manufacturer's Association

		Class	TUFFALOY Number	Proportional Limit Tension P. S. I.	Hardness Rockwell	Conductivity Percent I. A. C. S.	Ultimate Tensile Strength P. S. I.	Elongation Percent In 2′ or 4′ Diameter
GROUP A Copper Base Alloys	ROUND RODS Up to 1″ dia.	1 2 3	88 77 55	17,500 35,000 50,000	65-B 75-B 90-B	80 75 45	60,000 65,000 100,000	13 13 9
	1″ to 2″ dia.	1 2 3	88 77 55	15,000 30,000 50,000	60-B 70-B 90-B	80 75 45	55,000 59,000 100,000	14 13 9
	2″ to 3″ dia.	1 2 3	88 77 55	15,000 25,000 50,000	55-B 65-8 90-B	80 75 45	50,000 55,000 95,000	15 13 9
	BARS Square Rectangular Hexagon Up to 1″ thick	1 2 3	88 77 55	20,000 35,000 50,000	55-B 70-B 90-B	80 75 45	60,000 65,000 100,000	13 13 9
	Over 1″ thick	1 2 3	88 77 55	15,000 25,000 50,000	50-B 65-8 90-B	80 75 45	50,000 55,000 100,000	14 13 9
	FORGINGS Up to 1″	1 2 3	88 77 55	20,000 22,000 50,000	55-8 65-B 90-B	80 75 45	45,000 55,000 94,000	12 13 9
	1″ to 2″	1 2 3	88 77 55	15,000 21,000 50,000	50-B 65-B 90-B	80 75 45	40,000 55,000 94,000	13 13 9
	Over 2″	1 2 3	88 77 55	15,000 20,000 50,000	50-B 65-B 90-B	80 75 45	40,000 55,000 94,000	– 12 5
	All sizes	4	44	85,000	33-C	20	140,000	.5
	CASTINGS All sizes	2 3 4 5	77 55 44 66	20,000 45,000 60,000 12 to 16,000	55-8 90-B 33-C 65 to 85-B	70 45 18 10 to 15	45,000 85,000 90,000 65 to 75,000	12 5 .5 2 to 10
GROUP B Refractory Metal Compositions	Rods, Bars & Inserts	10 11 12 13 14	1W 10W 20W 100W 100M		72-B 94-B 98-B 69-A 85-B	35 28 27 30 30	135,000 160,000 170,000 200,000	Ultimate Compression Strength P. S. I.

Thickness "T" of Thinnest Outside Piece	Electrode Diameter	Net Electrode Force	Weld Time (Single Impulse)	Welding Current (Approx.)	Minimum Contacting Overlap	Minimum Weld Spacing	Diameter of Fused Zone	Minimum Shear Strength Lbs.		Thickness "T" of Thinnest Piece
								Tensile Strength Below 70000 PSI	Tensile Strength 70000 PSI And Above	
Inches	Inches	Lbs.	Cycles (60 Per Sec.)	Amps	Inches	Inches	In. Approx.			Inches
0.010	3/8	200	4	4000	3/8	1/4	0.10	130	180	0.010
0.021	3/8	300	6	6500	7/16	3/8	0.13	320	440	0.021
0.031	3/8	400	8	6600	7/16	1/2	0.16	570	800	0.031
0.040	1/2	500	10	9500	1/2	3/4	0.19	920	1200	0.040
0.050	1/2	650	12	10500	9/16	7/8	0.22	1350	–	0.050
0.062	1/2	800	14	12000	5/8	1	0.25	1850	–	0.062
0,078	5/8	1100	17	14000	11/16	1-1/4	0.29	2700	–	0.078
0.094	5/8	1300	20	15500	3/4	1-1/2	0.31	3450	–	0.094
0.109	5/8	1600	25	17500	15/16	1-5/8	0.32	4150	–	0.109
0.125	7/8	1800	26	18000	7/8	1-3/4	0.33	5000	–	0.125

SPOT WELDING LOW CARBON STEEL

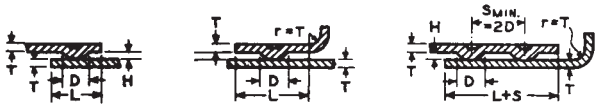
1. Type of steel: SAE 1010
2. Material should be free from scale, oxides, paint, grease and oil.
3. Welding conditions determined by Thickness "T" of thinnest outside piece.
4. Data for total thickness of pile-up not exceeding 4 "T". Recommended maximum ratio between two thicknesses: 3 to 1.
5. Electrode Material: Class 2 (Tuffaloy 77)
6. Minimum weld spacing is that spacing for two pieces for which no special precautions need be taken to compensate for shunted current effect of adjacent welds. For three pieces, increase spacing 30 per cent.

Thickness (of thinnest piece)	Electrode Diameter	Net Electrode Force	Weld Time	Welding Current (Approx.)	Minimum Overlap
Inches	Inches	Pounds	Cycles	Amps.	Inches
0.030	1/2	475	11	10,500	1/2
0.035	1/2	550	12	11,000	9/6
0.040	5/8	625	13	12,500	5/8
0.050	5/8	840	18	14,000	11/16
0.060	5/8	1050	23	15,500	3/4
0.075	3/4	1400	28	19,500	7/8
0.093	3/4	1800	34	24,000	1
0.109	3/4	2200	39	28,500	1-1/4

SPOT WELDING GALVANIZED STEEL

1. Type of galvanized: 1.25 oz/ft² nominal.
2. Material should be free from dirt, paint, grease and oil.
3. Welding conditions determined by thinnest of two pieces only. Schedule is good for thickness ratios up to 2:1.
4. Electrode material: Class 1 or 2 (Tuffaloy 88 or 77).
5. Electrode nose design: Dome or truncated cone.

(from International Lead, Zinc Research Organization, Inc.)



Thickness "T" of Thinnest Outside Piece (Nominal)	Diameter of Projection "D"	Height of Projection "H"	Minimum Shear Strength (Single Projecting Only) Pounds			Diameter of Fused Zone Minimum (At Weld Interface	Minimum Contacting Overlap "L"
			Tensile Strength Below 70000 PSI	Tensile Strength 70000 Up To 150000 PSI	Tensile Strength 150000 PSI And Above		
Inches	Inches	Inches				Inches	Inches
0.010	0.055	0.015	130	180	250	0.112	1/8
0.012	0.055	0.015	170	220	330	0.112	1/8
0.014	0.055	0.015	200	280	380	0.11 2	1/8
0.016	0.067	0,017	240	330	450	0.112	5/32
0.021	0.067	0.017	320	440	600	0.140	5/32
0.025	0.081	0.020	450	600	820	0.140	3/16
0.031	0.094	0.022	635	850	1100	0.169	7/32
0.034	0.094	0.022	790	1000	1300	0.169	7/32
0.044	0.119	0.028	920	1300	2000	0.169	9/32
0.050	0.119	0.028	1350	1700	2400	0.225	9/32
0.062	0.156	0.035	1950	2250	3400	0.225	3/8
0.070	0.156	0.035	2300	2800	4200	0.281	3/8
0.078	0.187	0.041	2700	3200	4800	0.281	7/16
0.094	0.218	0.048	3450	4000	6100	0.281	1/2
0.109	0.250	0,054	4150	5000	7000	0.338	5/8
0.125	0.281	0.060	4800	5700	8000	0.338	11/16
0.140	0.312	0.066	6000	–	–	7/16	3/4
0.156	0.343	0.072	7500	–	–	1/2	13/16
0.171	0.375	0,078	8500	–	–	9/16	7/8
0,187	0.406	0.085	10000	–	–	9/16	15/16
0.203	0.437	0,091	12000	–	–	5/8	1
0.250	0.531	0.110	15000	–	–	11/16	1-1/4

PROJECTION WELDING DATA FOR LOW CARBON AND STAINLESS STEEL

1. TYPES OF STEEL:
   Low-Carbon-SAE 1010
   Stainless-Types 309, 310, 316, 317, 321, 347 and 349.
   (Non-Hardenable: Max. Carbon content 0.15%)
2. Material should be free from scale, oxides, paint, grease and oil.
3. Size of projection normally determined by thickness of thinner piece, and projection should be on thicker piece where possible.
4. Data based on thickness of thinner sheet, and for two thicknesses only.
5. Contacting overlap does not include any radii from forming, etc.
6. Weld should be located in center of overlap.
7. Projection should be made on piece of higher conductivity when dissimilar metals are welded.
8. For diameter of projection "D" a tolerance of 0.003 in. in material up to and including 0.050 in. in thickness and 0.007 in. in material over 0.050 in. in thickness may be allowed.
9. For height of projection "H" a tolerance of 0.002 in. in material up to and including 0.050 in. in thickness and 0.005 in. in material over 0.050 in. in thickness may be allowed.

PROJECTION WELDING SCHEDULE GUIDE

FOR ONE PROJECTION:
CURRENT = 1T + .045 x 100,000 AMPS
TIME = 2T x 100 HERTZ (CYCLES)
= 2T x 6,000 LBS.

FOR MORE THAN ONE PROJECTION:
CURRENT = 1T + .045 x 100,000 + 30% FOR EACH ADDITIONAL PROJECTION
TIME = 2T x 100 HERTZ (CYCLES)
PRESSURE = 2T x 6,000 + 50% FOR EACH ADDITIONAL PROJECTION

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Many factors affecting electrode cost and useful electrode life are briefly outlined below.

PART TO BE WELDED

Lay out the part for resistance welding. Designing engineer, welding engineer and production man in charge of welding should cooperate in securing a better product at lowest cost.

Correct design permits the use of standard straight electrodes: or standard offset or standard angular holders if the straight approach is not possible. Special shaped electrodes cost more, and the difficulty of cooling the electrode is amplified. Single spot, multiple spot, projection, or other method may be accurately chosen to achieve lowest cost. Consult the R.W.M.A Manual.*

MATERIAL TO BE WELDED

The weldability of the materials can be determined by consulting your material supplier, and by reviewing recommendations covered in the R.W.M.A Manual.*

Surface conditions, rust, oil, dirt, and, on many articles, oxide film and even handling marks have a decided effect on weld quality. Cleaning may have to be a part of the welding job in some cases.

WELDING EQUIPMENT AND CONTROL

A welding machine of reputable quality purchased for a particular application will be correctly designed both electrically and mechanically, and will be supplied the correct control equipment and electrodes for the work.

On machine change-overs make sure of adequate electrical and mechanical capacity, and see that the necessary controls are provided. Consult us when redesigning or revising your choice of electrodes.

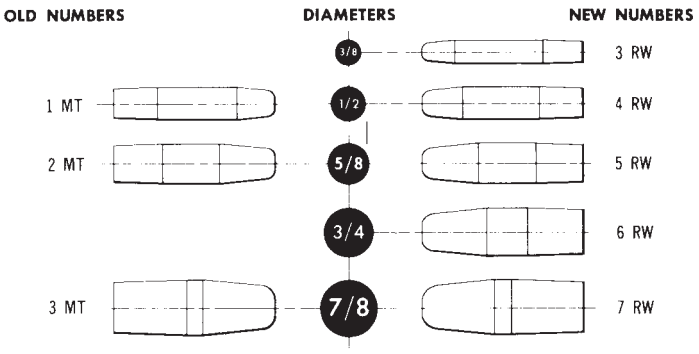
STANDARD GAGE CHART

Thickness in Decimals of an Inch

Gage No.	Manufacturer's Standard	Gage No.	Manufacturer's Standard	Gage No.	Manufacturer's Standard
3	0.2391	12	0.1046	22	0.0299
4	0.2242	13	0.0897	23	0.0269
5	0.2092	14	0.0747	24	0.0239
6	0.1943	15	0.0673	25	0.0209
7	0.1793	16	0.0598	26	0.0179
8	0.1644	17	0,0538	27	0.0164
9	0.1495	18	0.0478	28	0.0149
10	0.1345	19	0.0418	29	0.0135
11	0.1196	20	0.0359	30	0.0120
		21	0.0329		

** Resistance Welding Manual, published by the Resistance Welder Manufacturers Association.*

The RWMA tip numbering system has generally replaced the old Morse taper numbers with new "RW" numbers, and has added two new sizes, as the chart illustrates.



ELECTRODE LIFE SAVERS

1. Use standard Tuffaloy electrodes with Tuffaloy ejector type, self-adjusting tube, water-cooled electrode holders wherever possible. Avoid special or irregular shapes for lowest cost.
2. Use ample cold cooling water as close as practical to the welding contact surface, properly circulated at a minimum of 30-psi pressure, and supplied at a rate of at least 1-1/2 gallons per minute.
3. Be sure to select the proper type and size of electrode, taking into consideration electrode pressure, contact area of electrode, gauge, and nature of material to be welded. Consult the RWMA Manual* or your Tuffaloy field engineer regarding recommended practices. Overloading as well as overheating shortens electrode life.
4. Good welds depend upon properly maintained electrodes which assure an accurate surface contact. Keep tapers clean and dress electrode faces with lathe, emery paddle or fine file. Use castor oil or graphite grease to facilitate tip removal, and avoid application of insulators such as teflon tape and other materials.

RESISTANCE WELDING MACHINE SETUP

TO DETERMINE SPOT WELDING SCHEDULE

CURRENT = 2T x 100,000 = AMPERES

TIME = 2T x 100 = CYCLES

PRESSURE = 2T x 6000 (LB) = FORCE REQUIRED (LB)

T = THICKNESS OF THE THINNEST PIECE

APPROXIMATE PRESSURE EXERTED BY AIR CYLINDER SIZE

DIAMETER		CYLINDER AREA SQ. INCHES				
4"	=	12.5	x		=	
5"	=	19.5	x	WELDER GUAGE PRESSURE	=	ELECTRODE FORCE PRESSURE
6"	=	28.0	x		=	
8"	=	50.0	x		=	

RESISTANCE WELDING

PROBLEM SOLVING

EXPULSION AT WELD INTERFACE
- Short Squeeze Time
- Low Weld Force
- Dirty – Scaly Material
- Poor Fit Up
- Insufficient Edge Distance

SURFACE EXPULSION/ ELECTRODE STICKING
- Short Squeeze Time
- Long Weld Time
- Short Hold Time
- Low Weld Force
- High Weld Current
- Dirty – Scaly Material

ELECTRODE MUSHROOMING
- Insufficient Cooling
- Low weld Force
- High Weld Current
- Small Electrode Face Area
- Long Weld Time
- Welder Head Impacts Work

LOW WELD STRENGTH
- Short Weld Time
- Low Weld Force
- Low Weld Current
- Small Electrode Face Area
- Poor Heat Balance
- Welds Too Close Together

EXCESSIVE WELD INDENTATION
- Long Weld Time
- High Weld Force
- High Weld Current
- Poor Fit Up
- Welder Head Impacts Work

INTERNAL CRACKS IN WELD NUGGET
- Short Hold Time
- Low Weld Force
- Dirty – Scaly Material
- Metallurgy of Material Welded
- Poor Head Follow Up

DISPLACED WELD NUGGET
- Electrode Misalignment
- Poor Heat Balance
- Poor Fit Up

CRACKS IN PARENT MATERIAL
- High Weld Force
- Insufficient Cooling
- Metallurgy of Material Welded

HELPFUL HINTS

- Use standard RWMA design electrodes whenever possible. Use the RWMA recommended electrode material for the part being welded. Keep the electrodes aligned normal to the working face. Only use offset electrodes or weld at an angel when nothing else will work.
- Check the water deflector tubes each time you install electrodes. They should be within one quarter inch of the bottom of the water hole of the electrode.
- Confirm there is water flow from the electrodes, transformer, control and other cooled components before welding.
- Always use the proper size water hose, if removed check for obstructions that might impede flow.
- When a set up will not be used for a period of time remove the electrodes from the holders to avoid freezing into the holder due to corrosion.
- Use fine emery cloth to dress electrode faces. If wear is excessive remove from the machine and dress in lathe or other controlled machine. Dressing electrodes with files is not recommended because alignment and consistency are not possible with this manual method.
- If the use of a hammer is necessary on resistance welding machine or its components, use rubber, plastic, brass, raw-hide or other soft material. Never use a steel hammer.
- If a water leak is found repair as soon as possible, or report it to the appropriate maintenance personnel.
- Check all mechanical connections in the secondary connections. Check all shunts and cables for damage, replace as needed.
- Perform maintenance to Resistance Welding equipment as outlined in RWMA Bulletin 14.
- Keep in mind that sparks/expulsion are an indication that something is not right at the weld. It could be current, force, time, alignment and many other factors. Take time, check your set up for variance from the desired settings. Expulsion can be dangerous and could also result in questionable product.

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RESISTANCE WELDING

DO'S

- Use the RWMA recommended electrode material for the job you are running.
- Use RWMA standard electrodes whenever possible.
- Use the appropriate electrode diameter for the material being welded.
- Use open sight drains or have water flow gauges on out bound side to easily confirm water flow.
- Connect the water inlet hose to the proper holder inlet to insure water flows through the center cooling tube first.
- Recommended water flow for the electrodes is 1.5 gallons per minute of cold water.
- Insure that the water tube extends within 0.25" of the bottom of the electrode water hole.
- Adjust the water tube position when changing to another length electrode.
- Check water tube ends to insure they are not damaged and have an angled cut at the end to prevent water restriction.
- Use ejector type holders to simplify electrode removal.
- Keep the electrode and holder tapers clean to ensure good leak free conduction.
- Dress electrodes frequently to insure good quality welds.
- Use raw-hide or hard rubber hammers for alignment of electrodes.
- Provide cooling water on the exit side top and bottom of seam welding applications.
- Use properly designed knurling wheels to insure continuous dressing of the seam welding wheel.
- Lock out the machine when performing any type of maintenance.

DON'TS

- Never use unidentified electrodes or materials.
- Avoid special, offset, or irregular electrodes when the job can be done with standard electrodes.
- Do not use small electrodes on heavy gauge welding jobs or large electrodes on small gauge materials.
- Do not forget to turn the water on full force before starting to weld.
- Never use water hoses that do not fit the water fitting properly.
- Do not allow water connections to become leaky, clogged or broken.
- Avoid holders with leaking or deformed tapers.
- Never use holders that do not have adjustable water deflector tubes.
- Never use pipe tape or similar product to stop a leak.
- Do not let your electrode mushroom excessively.
- Do not dress electrodes with a file.
- Do not use a steel hammer to adjust any part of a welding machine.
- Do not permit seam welding wheels to run off the edge of the work piece.
- Do not enter a work cell or reach into a welder without using your lockout.

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