

RESISTANCE WELDING PRODUCT GUIDE

Version 7.0



T. J. SNOW CO., INC.

1-800-NOW-SNOW

<http://www.tjsnow.com>

— centerline —

(WINDSOR) LIMITED

centerline

(WINDSOR) LIMITED

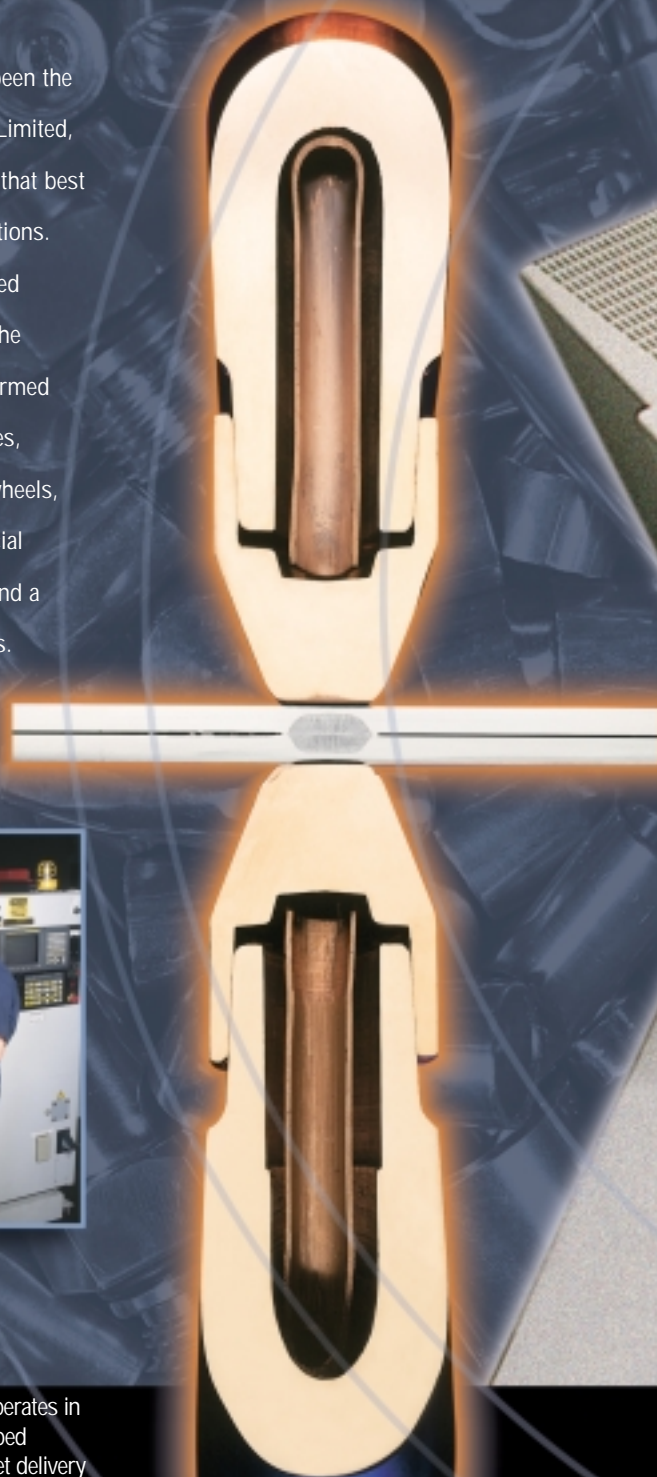
For over 40 years innovation has been the hallmark of CenterLine (Windsor) Limited, resulting in products and services that best meet customer needs and expectations.

The CenterLine Electrodes and Allied Products Division is dedicated to the manufacture and supply of cold-formed electrodes, welding tips and fixtures, adapters, holders, seam welding wheels, patented weld nut electrodes, special welding dies, shunts and cables, and a host of other consumable products.



PRODUCTION CAPACITY

The CenterLine Electrodes Division operates in a modern, highly efficient, well-equipped facility, managed and operated to meet delivery and quality expectations on a daily basis.



DESIGN ASSISTANCE

CenterLine prides itself on its ability to quickly react to special electrode and fixture needs. With its wealth of application experience, CenterLine can design and manufacture components that are specifically suited to unique applications.



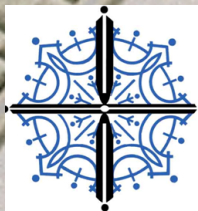
MANUFACTURING EXCELLENCE

In order to maintain its reputation as a quality supplier, CenterLine continues to invest in machinery, tooling, and people. This has enabled the company to effectively respond to ever changing industry challenges.



INVENTORY SUPPORT

CenterLine maintains an extensive inventory to guarantee part supply and to satisfy emergency needs. CenterLine is a true partner with its customers, constantly assisting them in fulfilling their commitments.

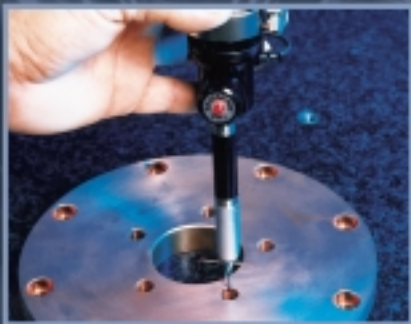


T. J. SNOW CO., INC.
Resistance Welding Equipment & Supplies
Service • Sales • Consulting • Seminars

The Complete Joining Company

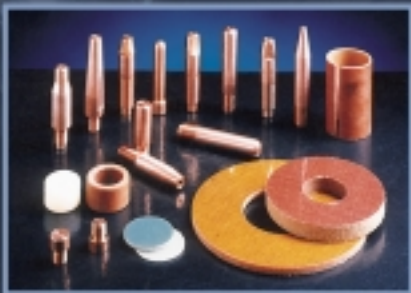
centerline

(WINDSOR) LIMITED



QUALITY COMMITMENT

Because customers depend on CenterLine for quality components, strict adherence to material and part specification is of primary importance. CenterLine can be relied upon to consistently supply electrode needs with the quality customers demand and expect.



PRODUCT DIVERSIFICATION

In addition to offering an abundance of resistance welding consumable products, the CenterLine Electrodes Division is also a manufacturer and supplier of wire welding contact tips, insulating materials and bushings, weld gun replacement parts, castings, forgings, shunts, cables, spot welding machine arms and caps, seam welding wheels and many other production related items. This diversification truly makes CenterLine a full service supplier.



SPECIAL MATERIALS

The variety of materials and coatings used in today's manufactured components can create demanding weld conditions. CenterLine can assist in choosing the right electrode material to maximize tip life and effectively weld these components. Available material options such as tungsten faced tips and assorted classes of copper can resolve many welding problems.



EXCLUSIVE DEVELOPMENTS

CenterLine continuously introduces new products to satisfy challenges presented by our customers' requirements.

Now, CenterLine has combined its proven nut electrode technology with proven sensing technology to create the patented **Smart Electrode** nut detection system. The Smart Electrode System can help you determine if a weld nut is present and in the correct orientation. This diagnostic device provides a reliable method for enhancing the quality of the projection welding process.

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The Complete Joining Company

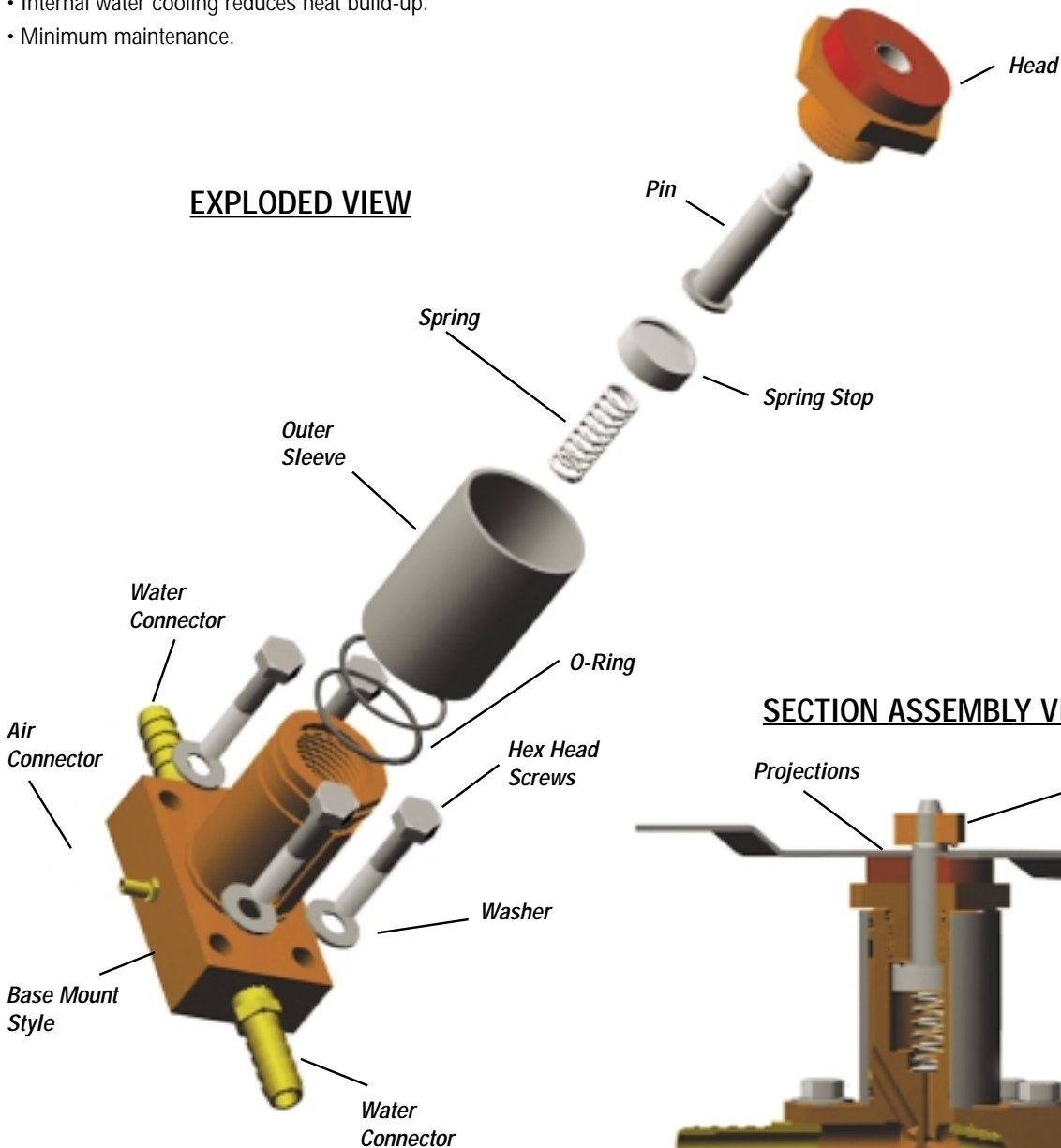
STUD & WELD NUT ELECTRODES

CenterLine manufactures a wide variety of stud & nut welding electrodes.

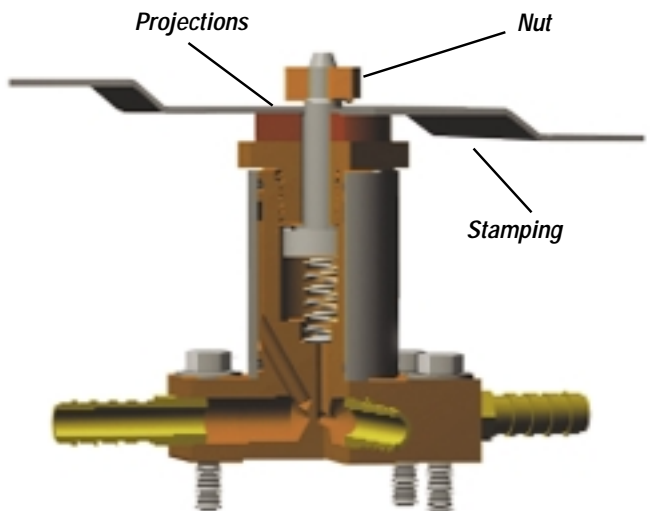
The high quality design and assembly provides a number of features and benefits including:

- Accurate on center positioning of pilotless nuts provided automatically.
- Insulated pin and sleeve prevents pin arcing in the threads.
- Unit converts from welding nuts to studs in seconds by removal of pilot pin and/or welding head.
- Used by automotive, mass transit, farm implement, stamping and appliance manufacturers.
- Internal water cooling reduces heat build-up.
- Minimum maintenance.

EXPLODED VIEW



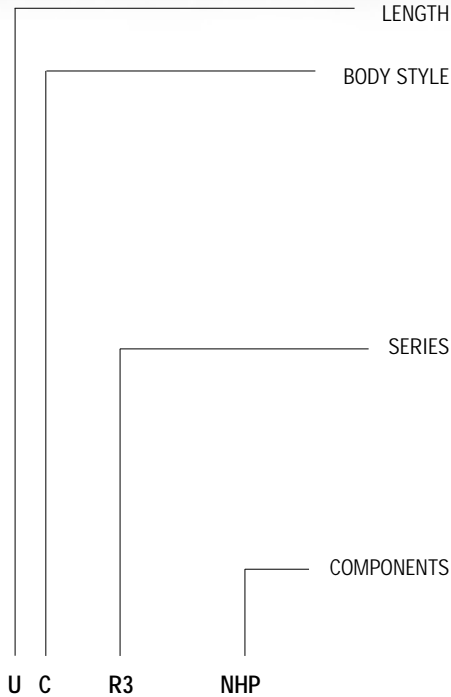
SECTION ASSEMBLY VIEW



STUD & WELD NUT ELECTRODES

Stud & Weld Nut Model Number Breakdown

CODING EXAMPLE



USE U FOR STANDARD LENGTH (SHOWN BELOW)
USE X FOR EXTENDED LENGTH (.50 (12.70) LONGER THAN STANDARD LENGTH)

USE A FOR BASE MOUNT
USE B FOR 4 RW TAPER
USE C FOR 5 RW TAPER
USE D FOR 6 RW TAPER
USE E FOR 7 RW TAPER
USE F FOR 7/8-14 THREAD
USE G FOR 1-12 THREAD
USE H FOR BASE MOUNT WITH CABLE LUG (17/32" clearance hole for 1/2 screw)
USE J FOR BASE MOUNT WITH CABLE LUG (Tapped hole for 1/2-13 screw)
USE K FOR BASE MOUNT WITH CONTACT (CL-200-37)

USE 2 FOR SERIES 2 (.88" WELD FACE)
USE 3 FOR SERIES 3 (1.25" WELD FACE)
USE 4 FOR SERIES 4 (1.50" WELD FACE)
USE R2 FOR RETRACTABLE PIN SERIES 2 (.88" WELD FACE)
USE R3 FOR RETRACTABLE PIN SERIES 3 (1.25" WELD FACE)
USE R4 FOR RETRACTABLE PIN SERIES 4 (1.50" WELD FACE)

Note: Leave blank if generating a complete nut or stud welding unit because information is contained in the pin or head number.

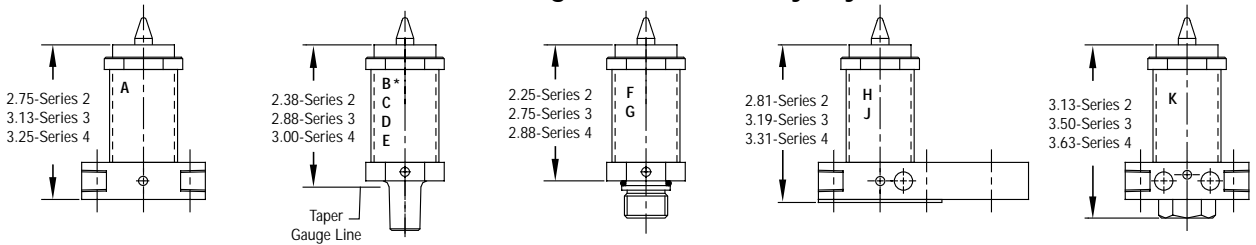
USE NHP FOR UNIT WITH NO HEAD OR PIN
USE GENERATED PIN # FOR COMPLETE NUT WELDING UNIT
USE GENERATED HEAD # FOR COMPLETE STUD WELDING UNIT

X A GH3050T125417
U G GP2A3482700525

Standard Length with 5 RW Body Style Retractable Series 3 with no Head or Pin.

Extended Length, Base Mount Style, head #. This describes a complete stud welding unit.
Standard Length, 1-12 Threaded Body Style, pin #. This describes a complete nut welding unit.

Standard Length of Series Body Styles



***Note:** On Body Style 'B' add .25 to length shown.

Spare Parts List (Not including Pin or Head)



Spring Stop

| | |
|----|---------------|
| U2 | SPRINGSTOP-U2 |
| X2 | SPRINGSTOP-X2 |
| U3 | SPRINGSTOP-U3 |
| X3 | SPRINGSTOP-X3 |
| U4 | SPRINGSTOP-U4 |
| X4 | SPRINGSTOP-X4 |



Spring

| | |
|---------|-----------------|
| U2 | SPRING037013050 |
| U3 & U4 | SPRING037025075 |
| X2 | SPRING037032100 |
| X3 & X4 | SPRING037034125 |



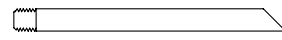
Screw Insulator
230-012



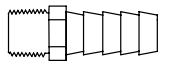
O-Ring Set
CL-206, CL-306, CL-406



Screw Insulator Washer
W-203NP



Water Tube
CLT-308-32



Water Connector
RW-1015



Air Connector
BF1

STUD & WELD NUT ELECTRODES

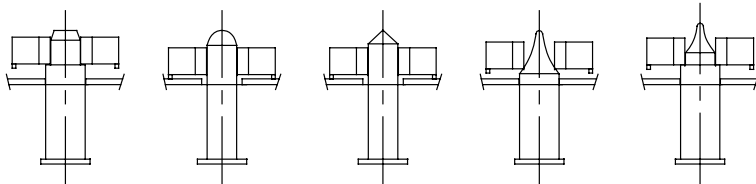
Manual Load Weld Nut Pins

| PinType | Description |
|---------|---|
| GP | Stainless Steel Pin, Supported by spring and/or air |
| CP | Coated, D2 Steel Pin, Supported by spring and/or air |
| RP | Retractable, Stainless Steel Pin, Movement controlled by Air Pressure only, Special Application please contact CenterLine |
| KP | Coated Retractable, D2 Steel Pin, Movement controlled by Air Pressure only, Special Application please contact CenterLine |

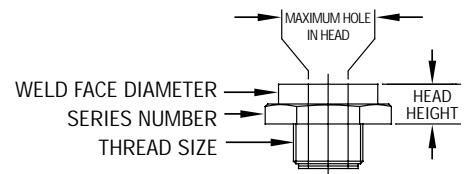
| Series | Thread Size | Weld Face Diameter | Maximum Hole in Head* | Head Height |
|--------|-------------|--------------------|-----------------------|-------------|
| 2 | 5/8-18 | 7/8 Standard | 0.427 (10.85) ID | 0.500 |
| 3 | 7/8-14 | 1-1/4 Standard | 0.642 (16.31) ID | 0.500 |
| 4 | 1-1/8-12 | 1-1/2 Standard | 0.852 (21.64) ID | 0.625 |

**Special weld nut electrodes are available for larger IDs and areas with clearance restrictions.*

| Nose Type | Description |
|-----------|---|
| A | Preferred when locating nut and stamping, no stamping contact during weld, no hole in upper electrode |
| B | Preferred when locating nut only, no stamping contact, no hole in upper electrode |
| C | Preferred when locating nut only, no stamping contact, no hole in upper electrode |
| D | Locates nut at a point on the pin nose. upper electrode requires clearance hole for pin tip |
| E | Preferred when locating nut and stamping, no hole in upper, good for hard to load applications |



NOSE TYPE A NOSE TYPE B NOSE TYPE C NOSE TYPE D NOSE TYPE E



APPLICATION SIZES

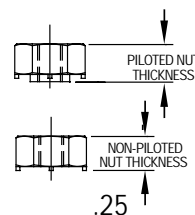


EXAMPLE

HOLE IN STAMPING
.353

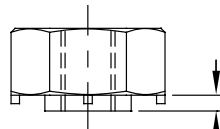
HOLE IN NUT
.275

.05



.25

CAUTION



DO NOT select B & C nose types when pilot thickness exceeds stamping thickness.

Generate Your Own Number (Total 14 Characters)

| Example | GP | 2 | A | 348 | 270 | 05 | 25 |
|---|----------|---------------|-----------|---|--|-----------------------------|------------------------|
| Breakdown | Pin Type | Series Number | Nose Type | Hole in Stamping -.005" (3 Dec.) - see note below | Hole in Nut -.005" (3 Dec.) - see note below | Stamping Thickness (2 Dec.) | Nut Thickness (2 Dec.) |
| NOTE: For B & C style pins, the "Hole in Stamping" value is the "Hole in Nut" value (i.e. GP2B2702700525) | | | | | | | |
| Part Number | | | | | | | |

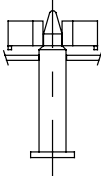
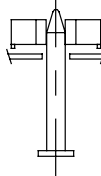


STUD & WELD NUT ELECTRODES

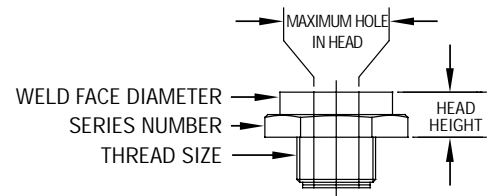
Auto Load Weld Nut Pins

| PinType | Description |
|---------|---|
| GA | Stainless Steel Pin, Supported by spring and/or air |
| CA | Coated, D2 Steel Pin, Supported by spring and/or air |
| RA | Retractable, Stainless Steel Pin, Movement controlled by Air Pressure only, Special Application please contact CenterLine |
| KA | Coated Retractable, D2 Steel Pin, Movement controlled by Air Pressure only, Special Application please contact CenterLine |

| Series | Thread Size | Weld Face Diameter | Maximum Hole in Head* | Head Height |
|--------|-------------|--------------------|-----------------------|-------------|
| 2 | 5/8-18 | 7/8 Standard | 0.427 (10.85) ID | 0.500 |
| 3 | 7/8-14 | 1-1/4 Standard | 0.642 (16.31) ID | 0.500 |
| 4 | 1-1/8-12 | 1-1/2 Standard | 0.852 (21.64) ID | 0.625 |

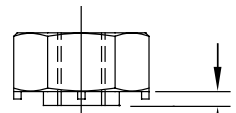
**Special weld nut electrodes are available for larger IDs and areas with clearance restrictions.*

| Nose Type | |
|---|---|
| N | P |
|  |  |
| NOSE TYPE N | NOSE TYPE P |
|  |  |
| STRAIGHT | STRAIGHT |
| For auto loading nuts where the stamping is being located. | For auto loading nuts where the stamping is not being located. Refer to caution note. |



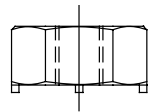
CAUTION P Nose Types Only

PILOTED NUT

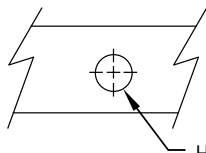


Caution: If pilot thickness exceeds stamping thickness, please see special application sheet

NON-PILOTED NUT



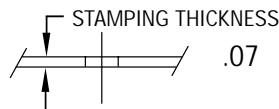
APPLICATION SIZES



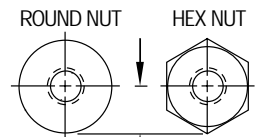
HOLE IN STAMPING
ONLY FOR N NOSE TYPES
.502



HOLE IN NUT
.362



.07



MEASUREMENT FROM CENTER
TO OUTERMOST EDGE
.47

EXAMPLE

Generate Your Own Number (Total 14 Characters)

| Example | GA | 3 | N | 497 | 357 | 07 | 47 |
|--|----------|---------------|-----------|---|--|-----------------------------|--|
| Breakdown | Pin Type | Series Number | Nose Type | Hole in Stamping -.005" (3 Dec.) - see note below | Hole in Nut -.005" (3 Dec.) - see note below | Stamping Thickness (2 Dec.) | Measurement from Center to Outermost Edge (2 Dec.) |
| NOTE: For P style pins, the "Hole in Stamping" value is the "Hole in Nut" value (i.e. GA3PB3573570747) | | | | | | | |
| Part Number | | | | | | | |

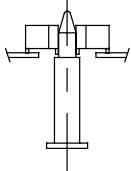

STUD & WELD NUT ELECTRODES

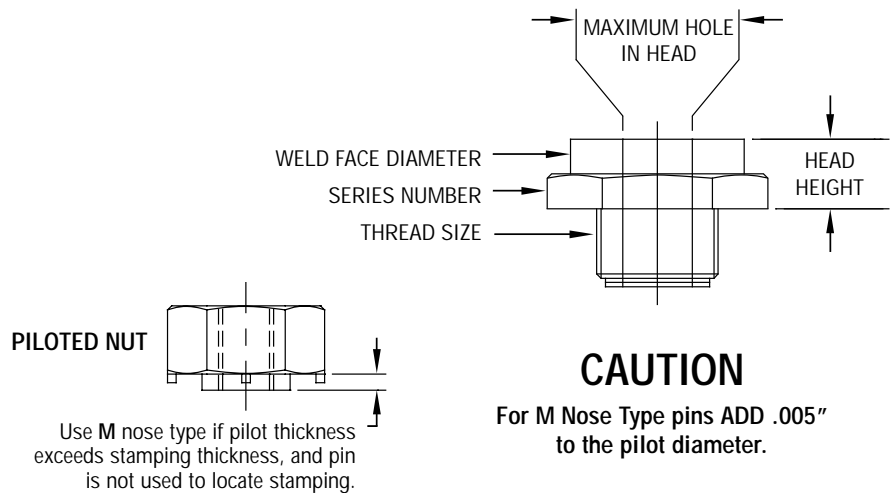
Special Application Auto Load Weld Nut Pins

| PinType | Description |
|---------|---|
| GA | Stainless Steel Pin, Supported by spring and/or air |
| CA | Coated, D2 Steel Pin, Supported by spring and/or air |
| RA | Retractable, Stainless Steel Pin, Movement controlled by Air Pressure only, Special Application please contact CenterLine |
| KA | Coated Retractable, D2 Steel Pin, Movement controlled by Air Pressure only, Special Application please contact CenterLine |

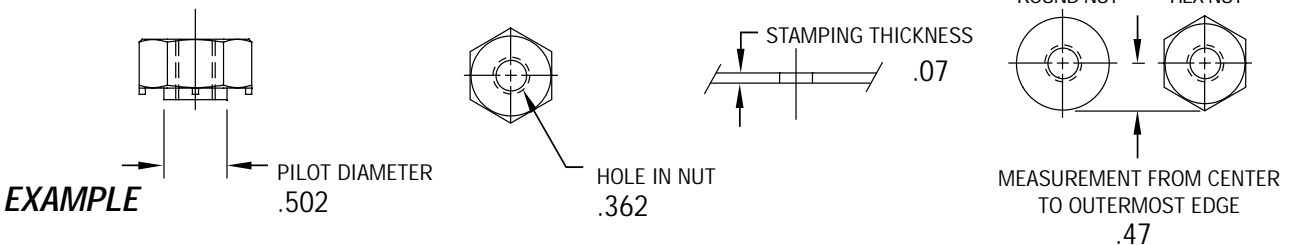
| Series | Thread Size | Weld Face Diameter | Maximum Hole in Head* | Head Height |
|--------|-------------|--------------------|-----------------------|-------------|
| 2 | 5/8-18 | 7/8 Standard | 0.427 (10.85) ID | 0.500 |
| 3 | 7/8-14 | 1-1/4 Standard | 0.642 (16.31) ID | 0.500 |
| 4 | 1-1/8-12 | 1-1/2 Standard | 0.852 (21.64) ID | 0.625 |

**Special weld nut electrodes are available for larger IDs and areas with clearance restrictions.*

| Nose Type |
|--|
| <p>M</p>  <p>NOSE TYPE M</p> |
|  <p>STRAIGHT</p> <p>For auto loading nuts where the stamping is not being located and pilot thickness is greater than material thickness.</p> |



APPLICATION SIZES

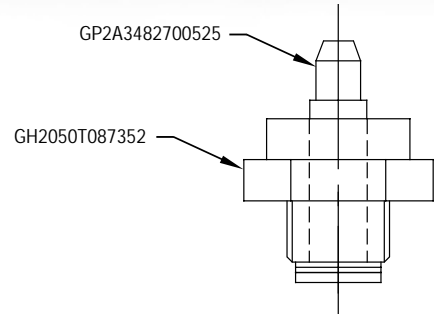
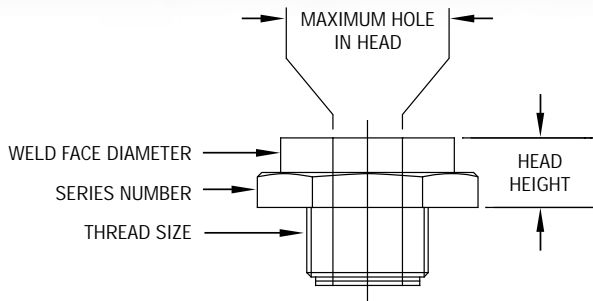


Generate Your Own Number (Total 14 Characters)

| Example | GA | 3 | M | 507 | 357 | 07 | 47 |
|-------------|----------|---------------|-----------|---------------------------------|-----------------------------|-----------------------------|--|
| Breakdown | Pin Type | Series Number | Nose Type | Pilot Diameter + .005" (3 Dec.) | Hole in Nut -.005" (3 Dec.) | Stamping Thickness (2 Dec.) | Measurement from Center to Outermost Edge (2 Dec.) |
| Part Number | | | | | | | |

STUD & WELD NUT ELECTRODES

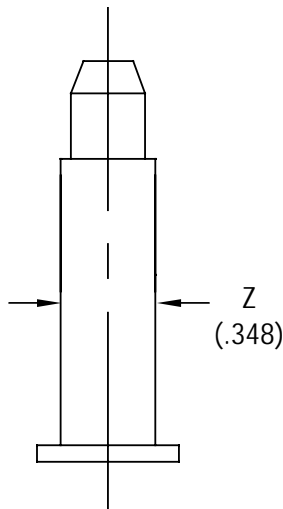
Nut Welding Heads



| Series | Thread Size | Weld Face Diameter | Maximum Hole in Head* | Head Height |
|--------|-------------|--------------------|-----------------------|-------------|
| 2 | 5/8-18 | 7/8 Standard | 0.427 (10.85) ID | 0.500 |
| 3 | 7/8-14 | 1-1/4 Standard | 0.642 (16.31) ID | 0.500 |
| 4 | 1-1/8-12 | 1-1/2 Standard | 0.852 (21.64) ID | 0.625 |

**Special weld nut electrodes are available for larger IDs and areas with clearance restrictions.*

EXAMPLE



Pin # GP2A3482700525

Series Number — Major Diameter of Pin (Z dimension)

PART NUMBER INSTRUCTIONS

Example: Z Dimension = .348

Step 1 Establish the major diameter of pin (Z dimension).

Step 2 The final 3 digits in the nut welding head # are represented by the following formula.
 $Z (.348) + .002 = .350$

Step 3 Lastly, insert the result from Step 2 to the end of the series part number prefix below.

Final Nut Welding Head Number

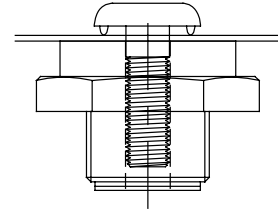
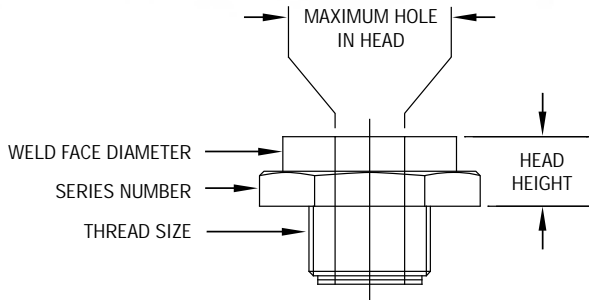
Example Series 2 - GH2050T087350

Generate Your Own Number (Total 13 Characters)

| Series | Part Number Prefix | Z + .002" Specify to 3 decimal places. |
|--------|--------------------|--|
| 2 | GH2050T087 | |
| 3 | GH3050T125 | |
| 4 | GH4062T150 | |

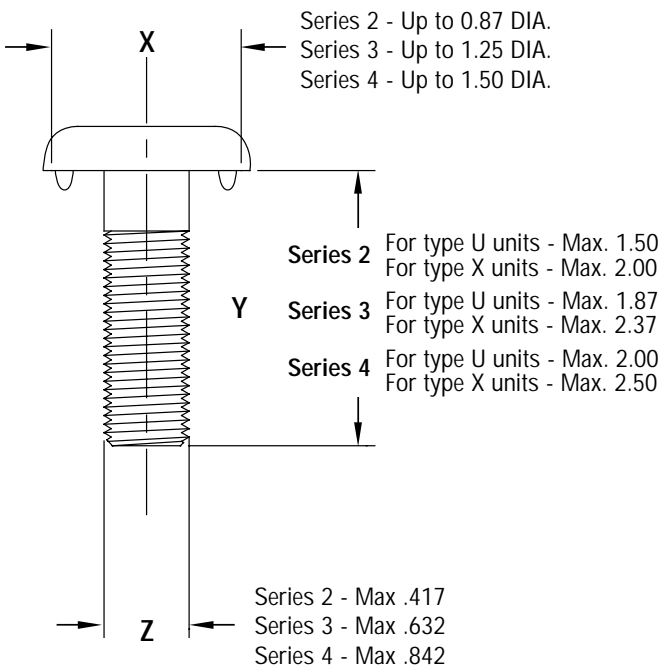
STUD & WELD NUT ELECTRODES

Stud Welding Heads



| Series | Thread Size | Weld Face Diameter | Maximum Hole in Head* | Head Height |
|--------|-------------|--------------------|-----------------------|-------------|
| 2 | 5/8-18 | 7/8 Standard | 0.427 (10.85) ID | 0.500 |
| 3 | 7/8-14 | 1-1/4 Standard | 0.642 (16.31) ID | 0.500 |
| 4 | 1-1/8-12 | 1-1/2 Standard | 0.852 (21.64) ID | 0.625 |

**Special weld nut electrodes are available for larger studs and areas with clearance restrictions.*



PART NUMBER INSTRUCTIONS

Example: X Dimension - .75
Y Dimension - 1.25
Z Dimension - .430

Step 1 In this case, X & Y indicates Series 2 however, Z dimension dictates Series 3 or larger.

Step 2 The final 3 digits in the stud welding head # is represented by the following formula.
 $Z (.430) + .010 = .440$

Step 3 Lastly, insert the result from **Step 2** to the end of the **series part number**.

Final Stud Welding Head Number
Example Series 3 - GH3050T125440

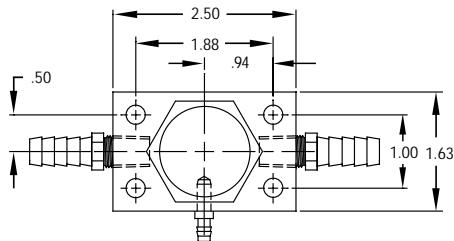
Generate Your Own Number (Total 13 Characters)

| Series | Part Number Prefix | Z + .010" Specify to 3 decimal places. |
|--------|--------------------|--|
| 2 | GH2050T087 | |
| 3 | GH3050T125 | |
| 4 | GH4062T150 | |

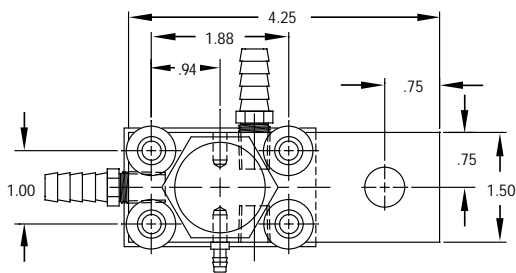
STUD & WELD NUT ELECTRODES

Mounting Dimensions For Base Mount Body Styles

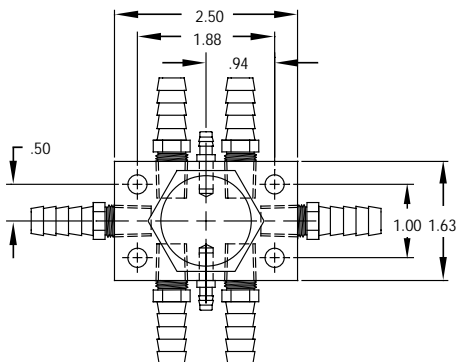
Body Style A



Body Style H&J



Body Style K



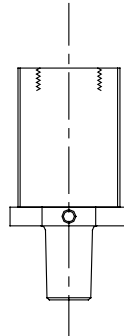
NOTE: Base units come with 1/4-20 screws for mounting.

PART NUMBER EXAMPLE

COMPLETE BODY REPLACEMENT UNIT

UCR3NHP

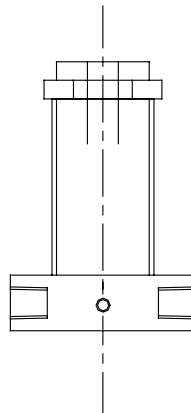
- NHP - No Head or Pin
- R3 - Retractable Pin series 3
- C - 5 RW Taper
- U - Standard Length



COMPLETE STUD WELDING UNIT

XAGH3050T125440

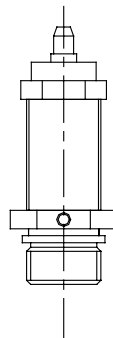
- GH3050T125440
Head # created from Stud
welding head sheet.
- A - Base Mount
- X - Extended Length



COMPLETE NUT WELDING UNIT

UGGP2A3482700525

- GP2A3482700525
Pin # created from manual load
weld nut pins sheet.
- G - 1" - 12 Thread
- U - Standard Length



SMART ELECTRODES

CenterLine has combined its proven nut electrode technology with proven sensing technology to create the patented Smart Electrode nut detection system. The Smart Electrode System can help you determine if a weld nut is present and in the correct orientation. This diagnostic device provides a reliable method for enhancing the quality of the projection welding process.

System Features

- Available for CenterLine's 2, 3 and 4 series nut weld units.
- Fiber optics communicate data directly from electrode to the monitoring system.
- No PLC or PC is required and there is no software to purchase.
- Able to sense the presence of a single nut at the point-of-weld.
- Capable of sensing piloted and non-piloted nuts.
- Bypass switches to deactivate "gun open" and "single nut" sensors.
- Able to detect when the weldgun has returned to the open position.
- Available for "special electrodes" at a modest additional cost.
- Standard components for quick turnaround time.

The CenterLine Smart Electrode System can be integrated into simple, stand-alone applications or fully integrated monitoring systems. It is compact and easy to install with the aid of the detailed installation manual included with every unit and the tooling change required to incorporate the Smart Electrode is minimal. Set-up and calibration are maintained electronically – no mechanical adjustments are necessary.

EXAMPLE EXPLANATION CODING

| | |
|-----------------------------|--|
| PRODUCT TYPE | USE SE FOR SMART ELECTRODE |
| MODEL | USE 01 FOR UNIT WITH INTEGRATED AMPLIFIER USE 02 FOR UNIT WITH REMOTE AMPLIFIER USE 03 FOR REMOTE AMPLIFIER ONLY (USE WITH MODEL SE-02) |
| AIR OPTION | USE N FOR WITHOUT AIR OPTION USE A FOR WITH AIR OPTION |
| BODY LENGTH | USE U FOR STANDARD LENGTH BODY USE X FOR EXTENDED LENGTH BODY (0.5 (12.70) LONGER THAN STANDARD LENGTH) |
| BODY STYLE (See pg. 1-2) | USE A FOR BASE MOUNT USE B, C, D OR E FOR TAPER MOUNT USE F OR G FOR THREAD MOUNT USE H OR J FOR BASE MOUNT WITH CABLE LUG USE K FOR WELD-THRU BASE MOUNT WITH CONTACT |
| SERIES | USE 2 FOR 200 SERIES .88 DIA. WELD FACE USE 3 FOR 300 SERIES 1.25 DIA. WELD FACE USE 4 FOR 400 SERIES 1.50 DIA. WELD FACE |

SE - 01 - N - U A 2



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SMART ELECTRODES

| COMPONENTS | SE-01 | SE-02 |
|---|-------|-------|
| Fiber optic sensor up to 5' (1.5m) | • | • |
| Fiber optic integrated control interface (24 volt DC versions available) | • | |
| Fiber optic non-integrated control interface (24 volt DC versions available) | | • |
| Smart Electrode Remote Amplifier (additional Remote Amplifiers available – Model SE-03) | | • |
| Optional filter regulator (order separately) | • | • |
| M-12 five pin shielded cord 16.4' (5m) | | • |
| CenterLine nut weld unit (2, 3 and 4 series available) | • | • |
| Custom CenterLine nut weld bodies and/or copper details are available to suit if required | • | • |

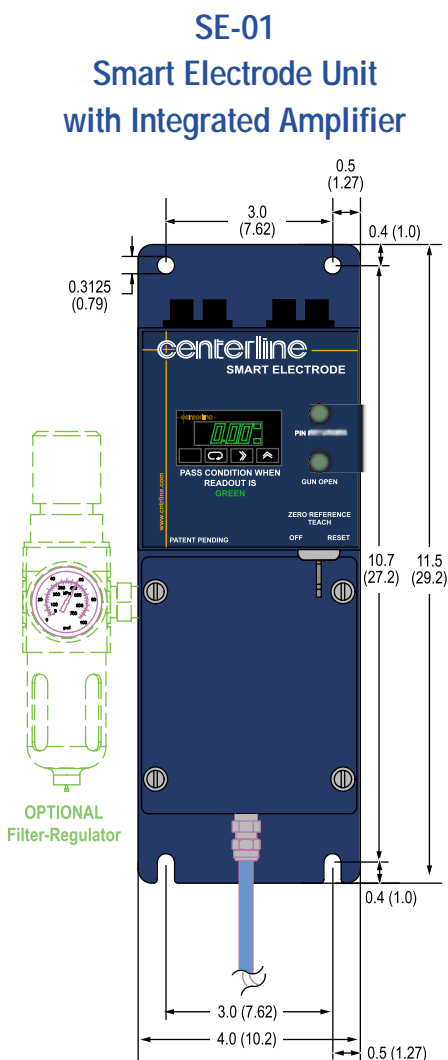


FIGURE 2-1

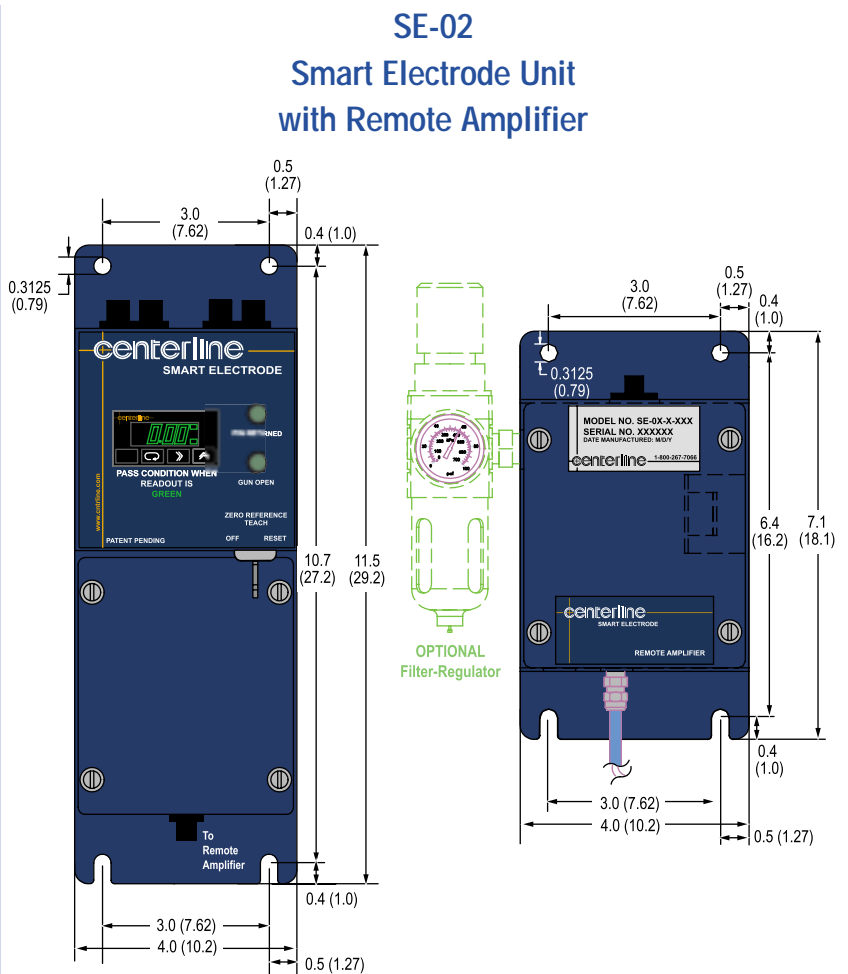


FIGURE 2-2

ELECTRODE CAPS

Replaceable Female Spot Welding Caps

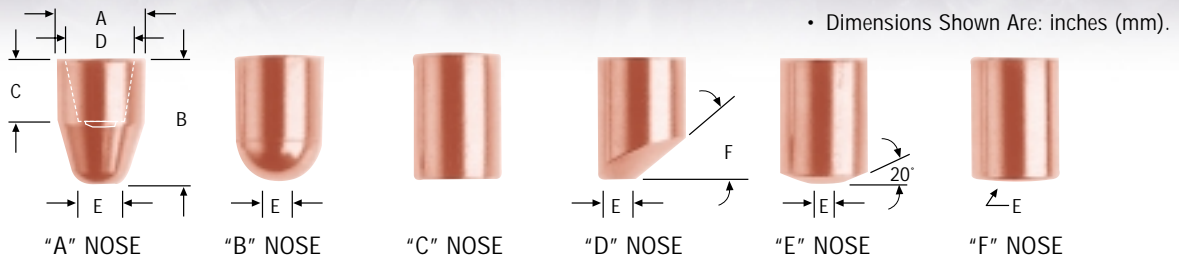


FIGURE 3-1 (Material RWMA Class 2, 3, Zirconium & Dispersion Strengthened Copper)

| ITEM NO. | | DIMENSIONS | | | | | | | |
|----------|------------|----------------|----------------|-------------|-------------|--------------|----------------|---------------------------|---------------------------|
| CLASS 2 | | A | B | | C | D | E | | F |
| Standard | Short Caps | Major Diameter | Overall Length | Standard | Short Caps | Taper Length | Taper Diameter | Welding Face Diameter | Offset Angle |
| | | | | | | | | | |
| CLFA-24 | CLFA-24S | | | | | | | .19 (4.76) | .25(6.35) |
| CLFB-24 | CLFB-24S | | | | | | | .12(3.17) | .12(3.17) |
| CLFC-24 | CLFC-24S | .500 (12.70) | .84 (21.34) | .59 (14.99) | .32 (8.13) | .394 (10.01) | ----- | ----- | |
| CLFD-24 | CLFD-24S | | | | | | | .19 (4.76) | .19 (4.76) 40° |
| CLFE-24 | CLFE-24S | | | | | | | .19 (4.76) | .19 (4.76) |
| CLFF-24 | CLFF-24S | | | | | | | 2.00 (50.80) sphere. rad. | 2.00 (50.80) sphere. rad. |
| CLFA-25 | CLFA-25S | | | | | | | .25 (6.35) | .25 (6.35) |
| CLFB-25 | CLFB-25S | | | | | | | .19 (4.76) | .19 (4.76) |
| CLFC-25 | CLFC-25S | .625 (15.88) | .88 (22.23) | .63 (16.00) | .38 (9.53) | .495 (12.57) | ----- | ----- | |
| CLFD-25 | CLFD-25S | | | | | | | .25 (6.35) | .25 (6.35) 40° |
| CLFE-25 | CLFE-25S | | | | | | | .25 (6.35) | .25 (6.35) |
| CLFF-25 | CLFF-25S | | | | | | | 2.00 (50.80) sphere. rad. | 2.00 (50.80) sphere. rad. |
| CLFA-26 | CLFA-26S | | | | | | | .31 (7.94) | .31 (7.94) |
| CLFB-26 | CLFB-26S | | | | | | | .19 (4.76) | .19 (4.76) |
| CLFC-26 | CLFC-26S | .750 (19.05) | 1 (25.40) | .75 (19.05) | .47 (11.94) | .625 (15.88) | ----- | ----- | |
| CLFD-26 | CLFD-26S | | | | | | | .31 (7.94) | .31 (7.94) 45° |
| CLFE-26 | CLFE-26S | | | | | | | .31 (7.94) | .31 (7.94) |
| CLFF-26 | CLFF-26S | | | | | | | 2.00 (50.80) sphere. rad. | 2.00 (50.80) sphere. rad. |

• ADDITIONAL LENGTHS ARE AVAILABLE UPON REQUEST.

EXAMPLE:

FEMALE CAP, A NOSE, ZIRCONIUM, A = .750 (19.05) DIAMETER

FOR ALL OTHER ITEMS:

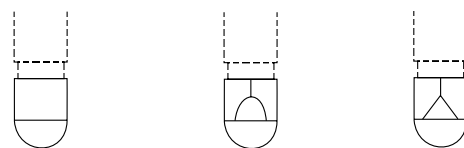
- Check Key To Item Numbers For Availability
- Use Example For Ordering Available Items

KEY TO ITEM NUMBERS

| | |
|---------------|--|
| CLF - | Cap Designation |
| A,B,C,D,E,F - | Nose Designation |
| 2,3 - | RWMA Alloy Class |
| Z - | Zirconium |
| G - | Dispersion Strengthened Copper |
| 4 THRU 6 - | Major Diameter In .125 (3.18) Increments |
| S - | Short overall length |

•CLFA - Z6

Female Cap Designation
Nose Designation
Major Diameter
Zirconium



Class 2 (CuCrZr) Copper-Zirconium Glidcop®

Glidcop® is a registered trademark of SCM Metal Products Inc.

ELECTRODE CAPS

Replaceable Male Spot Welding Caps

• Dimensions Shown Are: inches (mm).

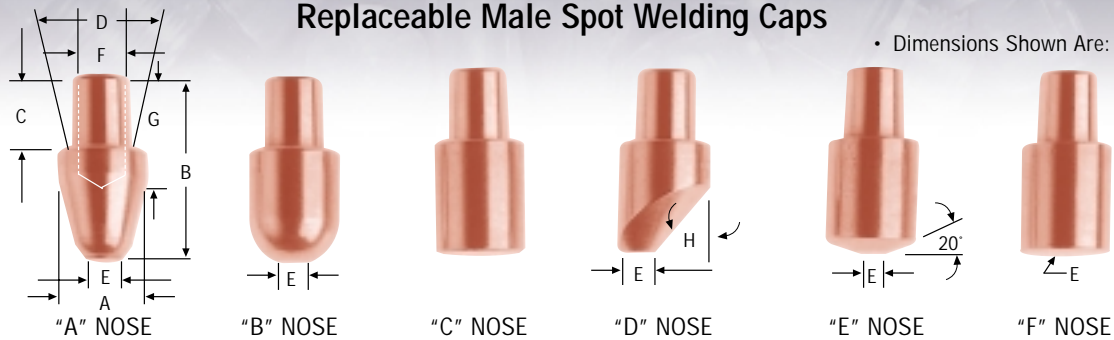


FIGURE 3-2 (Material RWMA Class 2, 3, Zirconium & Dispersion Strengthened Copper)

| ITEM NO. | DIMENSIONS | | | | | | | |
|------------------|---------------------|---------------------|-------------------|---------------------|----------------------------|--------------------------|-----------------------|-------------------|
| CLASS 2 Standard | A Major Diameter | B Overall Length | C Taper Length | D Taper Diameter | E Welding Face Diameter | F Water Hole Diameter | G Water Hole Depth | H Offset Angle |
| WA-24 | | | | | .19 (4.76) | | | |
| WB-24 | | | | | .19 (4.76) | | | |
| WC-24 | .482 (12.24) | 1.12 (28.45) | .38 (9.53) | .375 (9.53) | — | .28 (7.14) | .62 (15.88) | |
| WD-24 | | | | | .19 (4.76) | | | 40° |
| WE-24 | | | | | .19 (4.76) | | | |
| WF-24-2 | | | | | 2.00 (50.80) sphere. rad. | | | |
| WA-25 | | | | | .25 (6.35) | | | |
| WB-25 | | | | | .19 (4.76) | | | |
| WC-25 | .625 (15.88) | 1.25 (41.15) | .50 (12.70) | .415 (10.54) | — | .31 (7.94) | .875 (22.23) | |
| WD-25 | | | | | .25 (6.35) | | | 40° |
| WE-25 | | | | | .25 (6.35) | | | |
| WF-25-2 | | | | | 2.00 (50.80) sphere. rad. | | | |
| WA-26 | | | | | .31 (7.94) | | | |
| WB-26 | | | | | .19 (4.76) | | | |
| WC-26 | .750 (19.05) | 1.62 (41.15) | .63 (15.88) | .500 (12.70) | — | .38 (9.53) | 1 (25.40) | |
| WD-26 | | | | | .31 (7.94) | | | 45° |
| WE-26 | | | | | .31 (7.94) | | | |
| WF-26-4 | | | | | 4.00 (101.60) sphere. rad. | | | |
| WA-27 | | | | | .31 (7.94) | | | |
| WB-27 | | | | | .25 (6.35) | | | |
| WC-27 | .875 (22.23) | 1.62 (41.15) | .63 (15.88) | .613 (15.57) | — | .50 (12.70) | 1 (25.40) | |
| WD-27 | | | | | .31 (7.94) | | | 45° |
| WE-27 | | | | | .31 (7.94) | | | |
| WF-27-6 | | | | | 6.00 (152.40) sphere. rad. | | | |

• ADDITIONAL LENGTHS ARE AVAILABLE UPON REQUEST.

FOR ALL OTHER ITEMS:

- Check Key To Item Numbers For Availability
- Use Example For Ordering Available Items

KEY TO ITEM NUMBERS

- W - Cap Designation
- A,B,C,D,E,F - Nose Designation
- 2,3 - RWMA Alloy Class
- Z - Zirconium
- G - Dispersion Strengthened Copper
- 4 THRU 7 - Major Diameter In .125 (3.18) Increments

EXAMPLE:
MALE CAP,

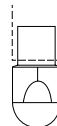
A NOSE,

CLASS 3,

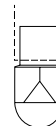
A = .875 (22.23) DIAMETER



Class 2 (CuCrZr)



Copper-Zirconium



Glidcop®

• WA - 37
Male Cap Designation
Nose Designation
Major Diameter
RWMA Alloy

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ELECTRODE CAPS

Replaceable Button Caps

For Paddle Holder Type 1 - See Page 6-4

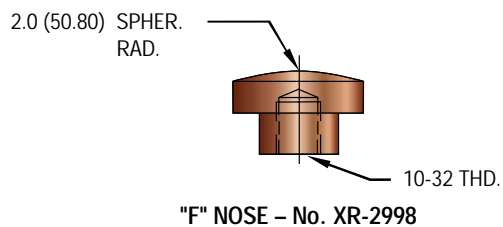
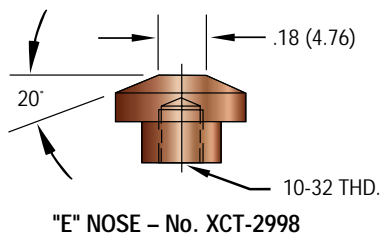
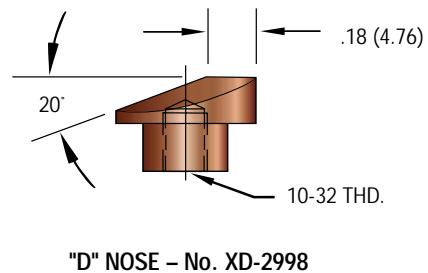
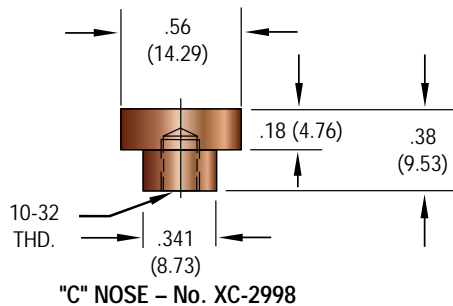


FIGURE 3-3 (Material RWMA Class 2)

For Paddle Holder Type 3 - See Page 6-4

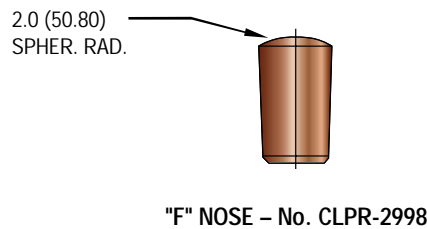
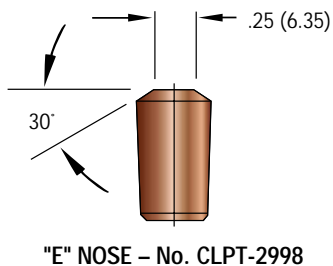
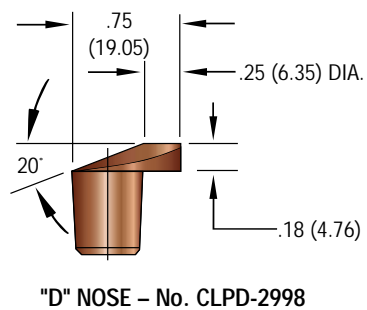
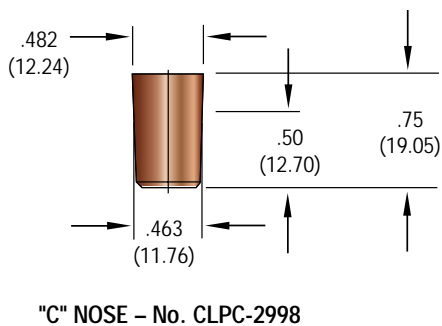


FIGURE 3-4 (Material RWMA Class 2)

• Dimensions Shown Are: inches (mm).

ELECTRODE CAPS

Button Caps

For Paddle Holder Type 2 – See Page 6-4

EXAMPLE – CLR2-78-AY

CLR2-78 = RWMA Class 2
CLR3-78 = RWMA Class 3
CLRZ-78 = Zirconium

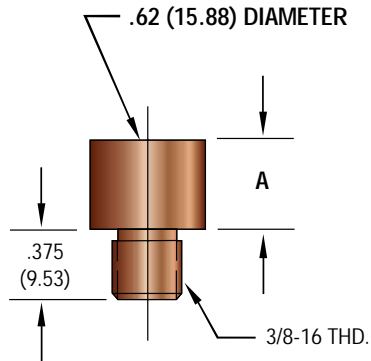


FIGURE 3-5 (Material RWMA Class 2, 3 & Zirconium)

| ITEM NO. | "A" = HEIGHT |
|-------------|--------------|
| CLR2-78-31C | .312 (7.92) |
| CLR2-78-37C | .375 (9.53) |
| CLR2-78-43C | .437 (11.10) |
| CLR2-78-50C | .500 (12.70) |
| CLR2-78-62C | .625 (15.88) |
| CLR2-78-75C | .750 (19.05) |
| ETC. | See Example |

EXAMPLE – CLH3-78-AY

CLH2-78 = RWMA Class 2
CLH3-78 = RWMA Class 3

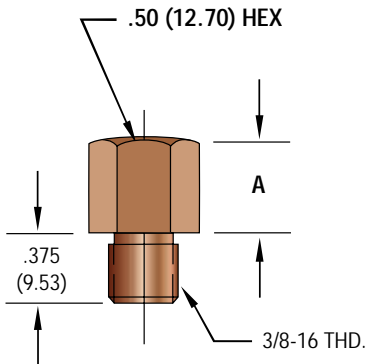


FIGURE 3-6 (Material RWMA Class 2 & 3)

"Y" = NOSE DESIGNATION

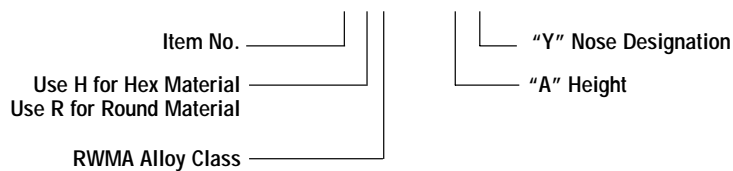
- * A = Pointed
- * B = Dome
- C = Flat (Shown)
- * E = Truncated (20°)
- F = .62 (15.88) Radius

* 0.25(6.35) Weld Face Diameter

• Dimensions Shown Are: inches (mm).

EXAMPLE: .50 (12.70) HEX, CLASS 3, "A" = .50 (12.70) HEIGHT, C = FLAT NOSE.

• CLH3-78-50C



NOTE: Other thread sizes and shapes are available.

STANDARD ADAPTERS

Straight Male Adapter Shanks For Female Caps

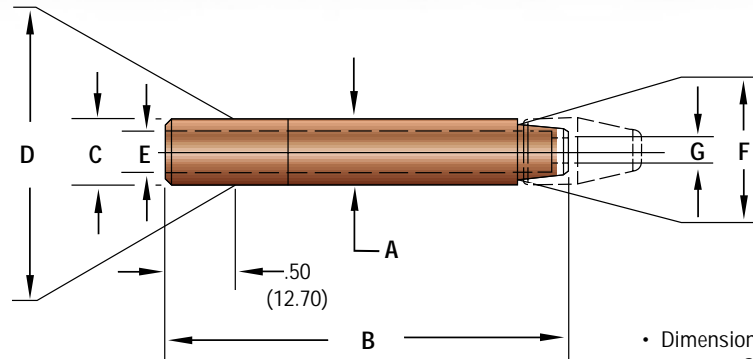
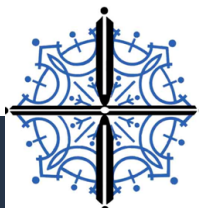


FIGURE 4-1 (Material RWMA Class 2 & 3)

| ITEM NO. | DIMENSIONS | | | | | | |
|-----------|------------------------|------------------------------|------------------------------|--------------------------------|-----------------------------|--------------------------------|-----------------------------------|
| CLASS 2 | A Major Diameter | B Shank Overall Length | C Minor Taper Diameter | D Gauging Taper Diameter | E Water Hole Diameter | F Cap End Taper Diameter | G Taper Water Hole Diameter |
| CLF-2405T | | 1.25 (31.75) | | | | | |
| CLF-2406T | | 1.50 (38.10) | | | | | |
| CLF-2407T | | 1.75 (44.45) | | | | | |
| CLF-2408T | | 2.00 (50.80) | | | | | |
| CLF-2409T | | 2.25 (57.15) | | | | | |
| CLF-2410T | | 2.50 (63.50) | | | | | |
| CLF-2411T | .482 (12.24) | 2.75 (69.85) | .438 (11.13) | .463 (11.76) | .28 (7.14) | .402 (10.21) | .25 (6.35) |
| CLF-2412T | | 3.00 (76.20) | | | | | |
| CLF-2413T | | 3.25 (82.55) | | | | | |
| CLF-2414T | | 3.50 (88.90) | | | | | |
| CLF-2415T | | 3.75 (95.25) | | | | | |
| CLF-2416T | | 4.00 (101.60) | | | | | |
| CLF-2506T | | 1.43 (36.32) | | | | | |
| CLF-2507T | | 1.68 (42.67) | | | | | |
| CLF-2508T | | 1.93 (49.02) | | | | | |
| CLF-2509T | | 2.18 (55.37) | | | | | |
| CLF-2510T | | 2.43 (61.72) | | | | | |
| CLF-2511T | .625 (15.88) | 2.68 (68.02) | .588 (14.94) | .613 (15.57) | .34 (8.73) | .502 (12.75) | .265 (6.73) |
| CLF-2512T | | 2.93 (74.42) | | | | | |
| CLF-2513T | | 3.18 (80.77) | | | | | |
| CLF-2514T | | 3.43 (87.12) | | | | | |
| CLF-2515T | | 3.68 (93.47) | | | | | |
| CLF-2516T | | 3.93 (99.82) | | | | | |

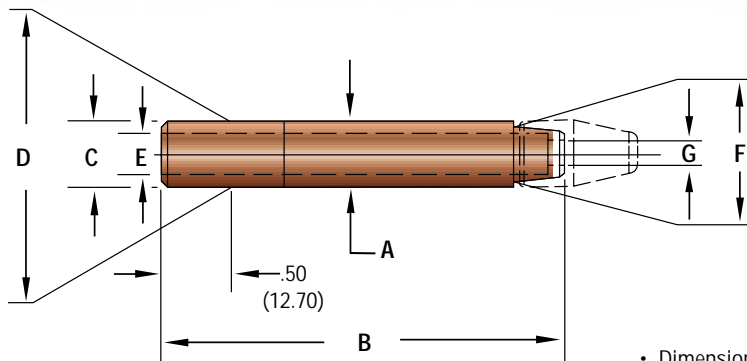


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STANDARD ADAPTERS

Straight Male Adapter Shanks For Female Caps



- Dimensions Shown Are: inches (mm).
- See pg. 3-1 For Caps.

FIGURE 4-2 (Material RWMA Class 2 & 3)

| ITEM NO. | DIMENSIONS | | | | | | |
|-----------|------------------------|------------------------------|------------------------------|--------------------------------|-----------------------------|-------------------------------------|-----------------------------------|
| CLASS 2 | A Major Diameter | B Shank Overall Length | C Minor Taper Diameter | D Gauging Taper Diameter | E Water Hole Diameter | F Major Female Taper Diameter | G Taper Water Hole Diameter |
| CLF-2608T | | 2.00 (50.80) | | | | | |
| CLF-2610T | | 2.50 (63.50) | | | | | |
| CLF-2612T | .750 (19.05) | 3.00 (76.20) | .706 (17.93) | .731 (18.57) | .38 (9.53) | .633 (16.08) | .343 (8.71) |
| CLF-2614T | | 3.50 (88.90) | | | | | |
| CLF-2616T | | 4.00 (101.60) | | | | | |
| CLF-2708T | | 2.00 (50.80) | | | | | |
| CLF-2710T | | 2.50 (63.50) | | | | | |
| CLF-2712T | .875 (22.23) | 3.00 (76.20) | .819 (20.80) | .844 (21.44) | .38 (9.53) | .633 (16.08) | .343 (8.71) |
| CLF-2714T | | 3.50 (88.90) | | | | | |
| CLF-2716T | | 4.00 (101.60) | | | | | |

FOR ALL OTHER ITEMS:

- Check Key To Item Numbers For Availability
- Use Example For Ordering Available Items

- ADDITIONAL LENGTHS ARE AVAILABLE UPON REQUEST.

KEY TO ITEM NUMBERS

- CLF - Adapter Designation
 2 or 3 - RWMA Alloy Class
 4 Thru 7 - RW Taper Number
 05 Thru 16 - Overall Length in .25 (6.35) Increments
 T - Thru Water Hole
 Delete "T" If Blind Hole Is Required

EXAMPLE:

MALE ADAPTER, CLASS 2, RW 6 TAPER, 2.50 (63.50) O.A.L., THRU WATER HOLE

• CLF - 2610T

- Adapter Designation _____
 RWMA Alloy Class _____
 RW Taper No. _____
 Overall Length _____
 Thru Water _____

STANDARD ADAPTERS

Straight Female Adapter Shanks For Male Caps

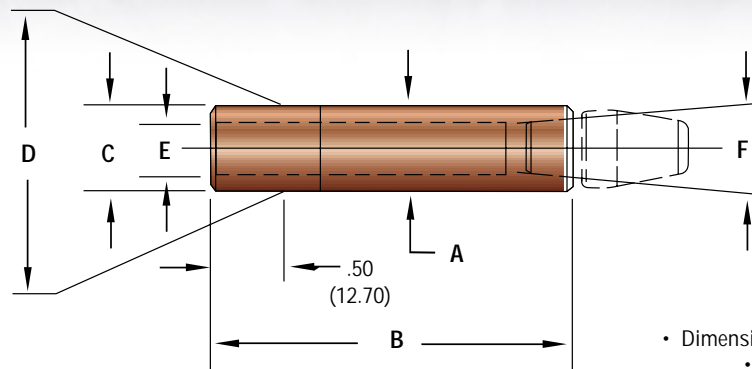
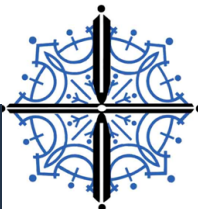


FIGURE 4-3 (Material RWMA Class 2 & 3)

| ITEM NO. | DIMENSIONS | | | | | |
|----------|------------------------|------------------------------|------------------------------|--------------------------------|-----------------------------|-------------------------------------|
| CLASS 2 | A Major Diameter | B Shank Overall Length | C Minor Taper Diameter | D Gauging Taper Diameter | E Water Hole Diameter | F Major Female Taper Diameter |
| WG-2405 | | 1.25 (31.75) | | | | |
| WG-2406 | | 1.50 (38.10) | | | | |
| WG-2407 | | 1.75 (44.45) | | | | |
| WG-2408 | | 2.00 (50.80) | | | | |
| WG-2409 | | 2.25 (57.15) | | | | |
| WG-2410 | | 2.50 (63.50) | | | | |
| WG-2411 | .482 (12.24) | 2.75 (69.85) | .438 (11.13) | .463 (11.76) | .28 (7.14) | .375 (9.53) |
| WG-2412 | | 3.00 (76.20) | | | | |
| WG-2413 | | 3.25 (82.55) | | | | |
| WG-2414 | | 3.50 (88.90) | | | | |
| WG-2415 | | 3.75 (95.25) | | | | |
| WG-2416 | | 4.00 (101.60) | | | | |
| WG-2505 | | 1.25 (31.75) | | | | |
| WG-2506 | | 1.50 (38.10) | | | | |
| WG-2507 | | 1.75 (44.45) | | | | |
| WG-2508 | | 2.00 (50.80) | | | | |
| WG-2509 | | 2.25 (57.15) | | | | |
| WG-2510 | | 2.50 (63.50) | | | | |
| WG-2511 | .625 (15.88) | 2.75 (69.85) | .588 (14.94) | .613 (15.57) | .38 (9.53) | .415 (10.54) |
| WG-2512 | | 3.00 (76.20) | | | | |
| WG-2513 | | 3.25 (82.55) | | | | |
| WG-2514 | | 3.50 (88.90) | | | | |
| WG-2515 | | 3.75 (95.25) | | | | |
| WG-2516 | | 4.00 (101.60) | | | | |

• ADDITIONAL LENGTHS ARE AVAILABLE UPON REQUEST.



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STANDARD ADAPTERS

Straight Female Adapter Shanks For Male Caps

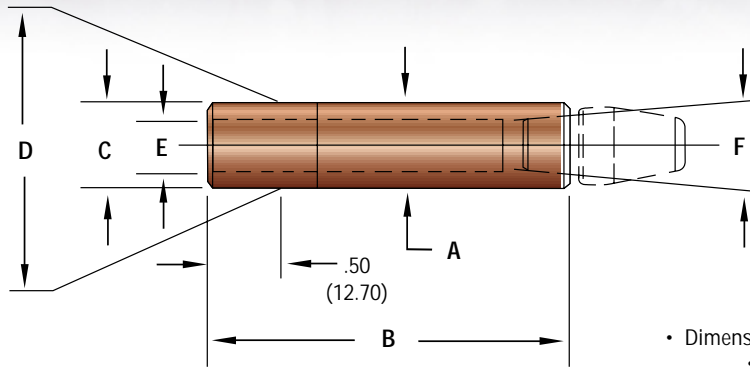


FIGURE 4-4 (Material RWMA Class 2 & 3)

| ITEM NO. | DIMENSIONS | | | | | |
|----------|------------------------|------------------------------|------------------------------|--------------------------------|-----------------------------|-------------------------------------|
| CLASS 2 | A Major Diameter | B Shank Overall Length | C Minor Taper Diameter | D Gauging Taper Diameter | E Water Hole Diameter | F Major Female Taper Diameter |
| WG-2608 | | 2.00 (50.80) | | | | |
| WG-2610 | | 2.50 (63.50) | | | | |
| WG-2612 | .750 (19.05) | 3.00 (76.20) | .706 (17.93) | .731 (18.57) | .44 (11.11) | .501 (12.73) |
| WG-2614 | | 3.50 (88.90) | | | | |
| WG-2616 | | 4.00 (101.60) | | | | |
| WG-2708 | | 2.00 (50.80) | | | | |
| WG-2710 | | 2.50 (63.50) | | | | |
| WG-2712 | .875 (22.23) | 3.00 (76.20) | .819 (20.80) | .844 (21.44) | .50 (12.70) | .613 (15.57) |
| WG-2714 | | 3.50 (88.90) | | | | |
| WG-2716 | | 4.00 (101.60) | | | | |

• ADDITIONAL LENGTHS ARE AVAILABLE UPON REQUEST.

FOR ALL OTHER ITEMS:

- Check Key To Item Numbers For Availability
- Use Example For Ordering Available Items

KEY TO ITEM NUMBERS

WG - Adapter Designation
2 or 3 - RWMA Alloy Class
4 Thru 7 - RW Taper Number
05 Thru 16 - Overall Length in .25 (6.35) Increments

EXAMPLE:

FEMALE ADAPTER, CLASS 3, RW 4 TAPER, 1.25 (31.75) O.A.L.

• WG - 3405

Adapter Designation _____
RWMA Alloy Class _____
Overall Length _____
RW Taper No. _____

STANDARD ADAPTERS

Offset Male Adapter Shanks For Female Caps

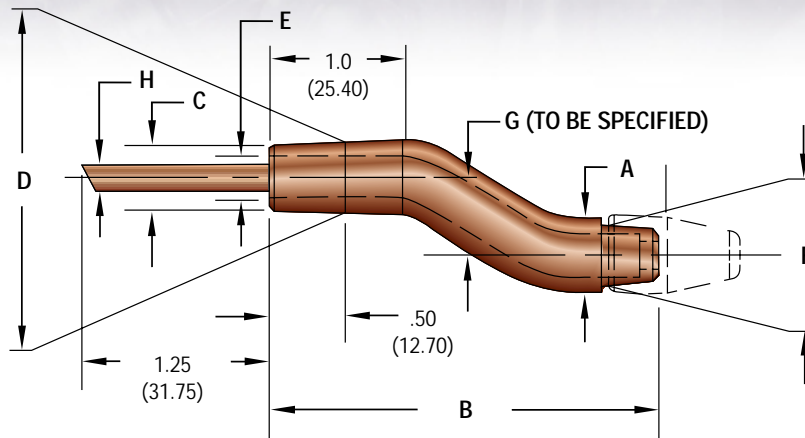


FIGURE 4-5 (Material RWMA Class 2 & 3)

- Dimensions Shown Are: inches (mm).
- See pg. 3-1 For Caps.

| ITEM NO. | DIMENSIONS | | | | | | | |
|--------------|------------------------|------------------------------|------------------------------|--------------------------------|-----------------------------|--------------------------------|-------------|-----------------------------|
| CLASS 2 | A Major Diameter | B Shank Overall Length | C Minor Taper Diameter | D Gauging Taper Diameter | E Water Hole Diameter | F Cap End Taper Diameter | G Offset | H Water Tube Diameter |
| CLF-2410-04T | | 2.50 (63.50) | | | | | .25 (6.35) | |
| CLF-2411-04T | | 2.75 (69.85) | | | | | .25 (6.35) | |
| CLF-2412-04T | | 3.00 (76.20) | | | | | .25 (6.35) | |
| CLF-2413-04T | | 3.25 (82.55) | | | | | .25 (6.35) | |
| CLF-2410-08T | .482 (12.24) | 2.50 (63.50) | .438 (11.13) | .463 (11.76) | .28 (7.14) | .402 (10.21) | .50 (12.70) | .19 (4.76) |
| CLF-2411-08T | | 2.75 (69.85) | | | | | .50 (12.70) | |
| CLF-2412-08T | | 3.00 (76.20) | | | | | .50 (12.70) | |
| CLF-2413-08T | | 3.25 (82.55) | | | | | .50 (12.70) | |
| CLF-2510-04T | | 2.50 (63.50) | | | | | .25 (6.35) | |
| CLF-2511-04T | | 2.75 (69.85) | | | | | .25 (6.35) | |
| CLF-2512-04T | | 3.00 (76.20) | | | | | .25 (6.35) | |
| CLF-2513-04T | | 3.25 (82.55) | | | | | .25 (6.35) | |
| CLF-2510-08T | .625 (15.88) | 2.50 (63.50) | .588 (14.94) | .613 (15.57) | .34 (8.73) | .502 (12.75) | .50 (12.70) | .25 (6.35) |
| CLF-2511-08T | | 2.75 (69.85) | | | | | .50 (12.70) | |
| CLF-2512-08T | | 3.00 (76.20) | | | | | .50 (12.70) | |
| CLF-2513-08T | | 3.25 (82.55) | | | | | .50 (12.70) | |

FOR ALL OTHER ITEMS:

- Check Key To Item Numbers For Availability
- Use Example For Ordering Available Items

• ADDITIONAL LENGTHS ARE AVAILABLE UPON REQUEST.

EXAMPLE:

MALE ADAPTER, CLASS 3,
RW 4 TAPER, 2.50 (63.50) O.A.L., .25 (6.35) OFFSET, THRU WATER HOLE

KEY TO ITEM NUMBERS

- CLF - Adapter Designation
 2 or 3 - RWMA Alloy Class
 4 Thru 6 - RW Taper Number
 10 Thru 20 - Overall Length in .25 (6.35) Increments
 04 Thru 16 - Offset in .06 (1.59) Increments
 T - Thru Water Hole
 Delete "T" If Blind Hole Is Required

• CLF - 3410 - 04T

- Adapter Designation
 RWMA Alloy Class
 RW Taper No.
 Thru Water
 Offset (G)
 Overall Length

STANDARD ADAPTERS

Offset Female Adapter Shanks for Male Caps

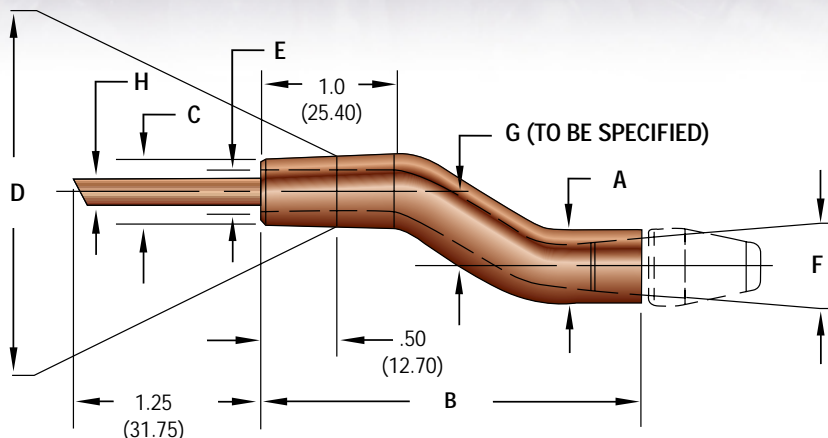


FIGURE 4-6 (Material RWMA Class 2 & 3)

- Dimensions Shown Are: inches (mm).
- See pg. 3-2 For Caps.

| ITEM NO. | DIMENSIONS | | | | | | | |
|------------|------------------------|------------------------------|------------------------------|--------------------------------|-----------------------------|--------------------------------|-------------|-----------------------------|
| CLASS 2 | A Major Diameter | B Shank Overall Length | C Minor Taper Diameter | D Gauging Taper Diameter | E Water Hole Diameter | F Cap End Taper Diameter | G Offset | H Water Tube Diameter |
| WG-2410-04 | | 2.50 (63.50) | | | | | .25 (6.35) | |
| WG-2411-04 | | 2.75 (69.85) | | | | | .25 (6.35) | |
| WG-2412-04 | | 3.00 (76.20) | | | | | .25 (6.35) | |
| WG-2413-04 | | 3.25 (82.55) | | | | | .25 (6.35) | |
| WG-2410-08 | .482 (12.24) | 2.50 (63.50) | .438 (11.13) | .463 (11.76) | .28 (7.14) | .375 (9.53) | .50 (12.70) | .19 (4.76) |
| WG-2411-08 | | 2.75 (69.85) | | | | | .50 (12.70) | |
| WG-2412-08 | | 3.00 (76.20) | | | | | .50 (12.70) | |
| WG-2413-08 | | 3.25 (82.55) | | | | | .50 (12.70) | |
| WG-2510-04 | | 2.50 (63.50) | | | | | .25 (6.35) | |
| WG-2511-04 | | 2.75 (69.85) | | | | | .25 (6.35) | |
| WG-2512-04 | | 3.00 (76.20) | | | | | .25 (6.35) | |
| WG-2513-04 | | 3.25 (82.55) | | | | | .25 (6.35) | |
| WG-2510-08 | .625 (15.88) | 2.50 (63.50) | .588 (14.94) | .613 (15.57) | .38 (9.65) | .415 (10.54) | .50 (12.70) | .25 (6.35) |
| WG-2511-08 | | 2.75 (69.85) | | | | | .50 (12.70) | |
| WG-2512-08 | | 3.00 (76.20) | | | | | .50 (12.70) | |
| WG-2513-08 | | 3.25 (82.55) | | | | | .50 (12.70) | |

FOR ALL OTHER ITEMS:

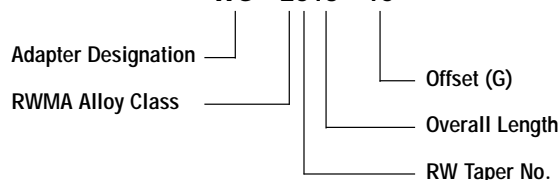
- Check Key To Item Numbers For Availability
- Use Example For Ordering Available Items

- ADDITIONAL LENGTHS ARE AVAILABLE UPON REQUEST.

EXAMPLE:

FEMALE ADAPTER, CLASS 2,
RW 5 TAPER, 3.25 (82.55) O.A.L., 1.0 (25.40) OFFSET.

• WG - 2513 - 16



KEY TO ITEM NUMBERS

- WG - Adapter Designation
- 2 or 3 - RWMA Alloy Class
- 4 Thru 6 - RW Taper Number
- 10 Thru 20 - Overall Length
in .25 (6.35) Increments
- 04 Thru 16 - Offset in .06 (1.59) Increments

STANDARD ADAPTERS

Single Bend Male Adapter Shanks For Female Caps

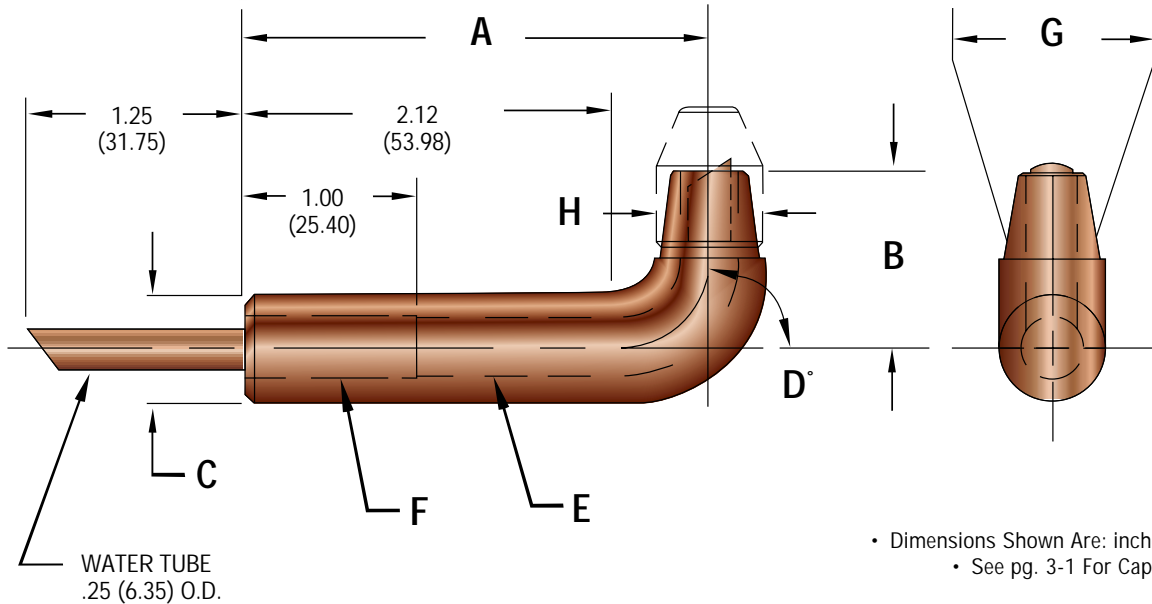


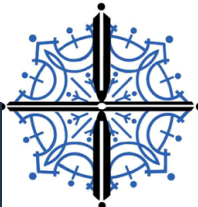
FIGURE 4-7 (Material RWMA Class 3)

DIMENSION CHARTS

| | | | |
|--------------------|--------------|--------------|-------------|
| C – DIAMETER | .625 (15.88) | .750 (19.05) | .88 (22.35) |
| DIAMETER CODE | 5 | 6 | 7 |
| A – OVERALL LENGTH | AS CODED | | |
| B – OFFSET | AS CODED | | |
| D – ANGLE | AS CODED | | |

| | | | |
|--------------------|--------------|--------------|--------------|
| H – CAP SIZE | .500 (12.70) | .625 (15.88) | .750 (19.05) |
| E – HOLE DIAMETER | .28 (7.11) | .31 (7.87) | .34 (8.64) |
| F – HOLE DIAMETER | .38 (9.65) | .38 (9.65) | .38 (9.65) |
| G – TAPER DIAMETER | .402 (10.21) | .502 (12.75) | .633 (16.08) |

• TO ORDER YOUR SPECIALS USE CODING CHART - SEE PG. 4-8



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STANDARD ADAPTERS

Single Bend Male Adapter Shanks For Female Caps

EXAMPLE EXPLANATION CODING

| | |
|---|--|
| CENTERLINE SPECIALS | USE CF FOR SINGLE BEND MALE ADAPTERS FOR FEMALE CAPS |
| CAP SIZE | USE 0 FOR .50 (12.70) NOMINAL DIAMETER USE 1 FOR .62 (15.88) NOMINAL DIAMETER USE 2 FOR .75 (19.05) NOMINAL DIAMETER |
| MATERIAL | USE 3 FOR CLASS 3 RWMA |
| C = ADAPTER DIAMETER (IN .125 (3.18) INCREMENTS) | USE 5 FOR .62 (15.88) NOMINAL DIAMETER STRAIGHT SHANK USE 6 FOR .75 (19.05) NOMINAL DIAMETER STRAIGHT SHANK USE 7 FOR .88 (22.35) NOMINAL DIAMETER STRAIGHT SHANK USE 5E FOR .62 (15.88) NOMINAL DIAMETER ELECTRODE TAPER SHANK USE 6E FOR .75 (19.05) NOMINAL DIAMETER ELECTRODE TAPER SHANK USE 7E FOR .88 (22.35) NOMINAL DIAMETER ELECTRODE TAPER SHANK |
| A = OVERALL LENGTH (IN .25 (6.35) INCREMENTS) | USE 10 FOR 2.50 (63.50) MINIMUM LENGTH |
| B = OFFSET LENGTH (IN .125 (3.18) INCREMENTS) | USE 8 FOR 1.0 (25.40) MINIMUM OFFSET |
| D = OFFSET ANGLE (AS CODED) | USE 45 FOR 45° OFFSET USE 60 FOR 60° OFFSET USE 75 FOR 75° OFFSET USE 90 FOR 90° OFFSET |
| WATER HOLE THRU | USE T FOR WATER HOLE THRU OMIT T FOR BLIND HOLE CAP TAPER END ONLY |
| CF 1 - 3 5 10 8 90 T | |

SAMPLE TYPICAL CAP ADAPTER CODING

CAP ADAPTER WATER HOLE WILL BE DRILLED THRU
CAP ADAPTER OFFSET ANGLE WILL BE 90°
CAP ADAPTER OFFSET WILL BE 1.0 (25.40) LONG
CAP ADAPTER WILL BE 2.50 (63.50) LONG
CAP ADAPTER WILL HAVE .62 (15.88) DIAMETER
CAP ADAPTER WILL BE MADE OF CLASS 3 RWMA MATERIAL
CAP ADAPTER WILL HAVE A STRAIGHT SHANK
CAP ADAPTER WILL BE SINGLE BEND MALE FOR FEMALE CAPS

EXAMPLE:

• CF1-3510890T

• Dimensions Shown Are: inches (mm)

STANDARD ADAPTERS

Single Bend Female Adapter Shanks For Male Caps

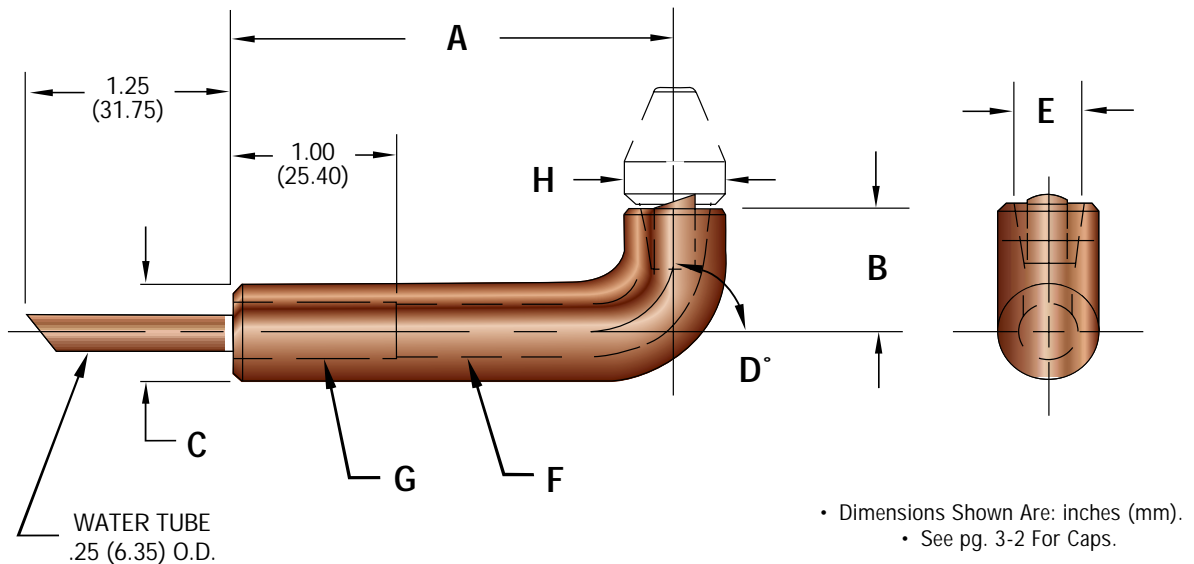


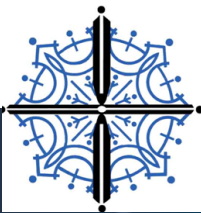
FIGURE 4-8 (Material RWMA Class 3)

DIMENSION CHARTS

| | | | | |
|--------------------|--------------|--------------|--------------|--------------|
| C – DIAMETER | .625 (15.88) | .750 (19.05) | .875 (22.23) | 1.00 (25.40) |
| DIAMETER CODE | 5 | 6 | 7 | 8 |
| A – OVERALL LENGTH | AS CODED | | | |
| B – OFFSET | AS CODED | | | |
| D – DIAMETER | AS CODED | | | |

| | | | | |
|--------------------|--------------|--------------|--------------|--------------|
| H – CAP SIZE | .500 (12.70) | .625 (15.88) | .750 (19.05) | .875 (22.23) |
| E – TAPER DIAMETER | .374 (9.50) | .414 (10.52) | .500 (12.70) | .613 (15.57) |
| F – HOLE DIAMETER | .28 (7.11) | .34 (8.64) | .44 (11.18) | .50 (12.70) |
| G – HOLE DIAMETER | .38 (9.65) | .38 (9.65) | .44 (11.18) | .50 (12.70) |

• TO ORDER YOUR SPECIALS USE CODING CHART - SEE PG. 4-10



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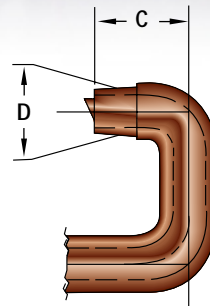
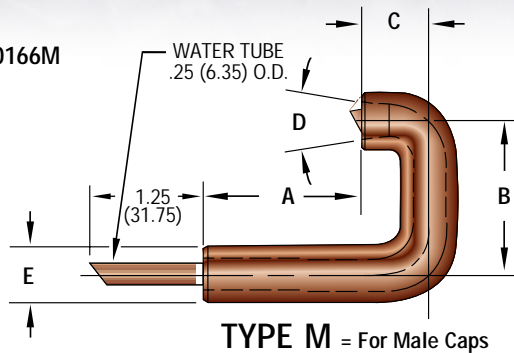
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STANDARD ADAPTERS

J Shape Cap Adapters

EXAMPLE:

- CL JA5-35-10166M



Minimum "C" Dim.

Type M = .75 (19.05)
Type F = 1.00 (25.40)

FIGURE 4-9 (Material RWMA Class 3)

- Dimensions Shown Are: inches (mm).
- See pg. 3-1 & 3-2 For Caps

EXAMPLE EXPLANATION CODING

| | |
|---|---|
| CENTERLINE SPECIALS | USE CL |
| GROUP | USE JA FOR J SHAPE CAP ADAPTER |
| D = TAPER DIA. | USE 5 FOR .625 (15.88) DIAMETER CAP USE 6 FOR .750 (19.05) DIAMETER CAP |
| MATERIAL | USE 3 FOR CLASS 3 RWMA |
| E = ADAPTER DIAMETER (IN .125 (3.18) INCREMENTS) | USE 5 FOR .62 (15.88) NOMINAL DIAMETER USE 6 FOR .75 (19.05) NOMINAL DIAMETER |
| A = OVERALL LENGTH (IN .25 (6.35) INCREMENTS) | USE 10 FOR 2.50 (63.50) MINIMUM LENGTH |
| B = OFFSET LENGTH (IN .125 (3.18) INCREMENTS) | USE 16 FOR 2.00 (50.80) MINIMUM OFFSET |
| C = NOSE HEIGHT (IN .125 (3.18) INCREMENTS) | USE 6 FOR .75 (19.05) MINIMUM HEIGHT FOR MALE USE 8 FOR 1.00 (25.40) MINIMUM HEIGHT FOR FEMALE |
| TYPE | M FOR MALE CAP F FOR FEMALE CAP |

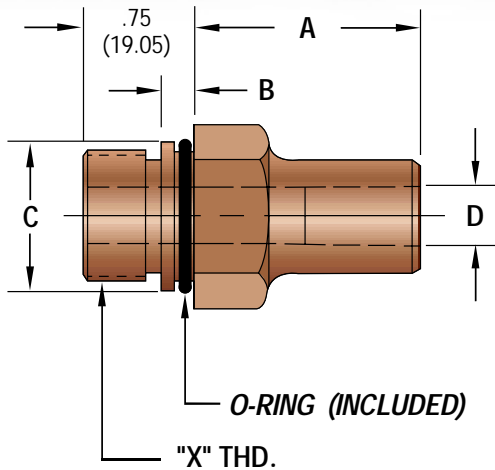
CL JA 5 - 3 5 10 16 6 M

SAMPLE TYPICAL J SHAPE CAP ADAPTER CODING

CAP ADAPTER TYPE WILL BE FOR MALE CAPS
CAP ADAPTER NOSE WILL BE .75 (19.05) HIGH
CAP ADAPTER OFFSET WILL BE 2.00 (50.80) LONG
CAP ADAPTER WILL BE 2.50 (63.50) LONG
CAP ADAPTER WILL HAVE .62 (15.88) DIAMETER
CAP ADAPTER WILL BE MADE OF CLASS 3 RWMA MATERIAL
CAP ADAPTER NOSE WILL BE .625 (15.88) DIAMETER CAP TAPER
J SHAPE CAP ADAPTER

STANDARD ADAPTERS

CenterLine Hex Adapters Straight Thread



| TAPER NO. | D | Minimum A | | |
|-----------|---------------|-----------|------|----------|
| | | 7/8-14 | 1-12 | 1-1/4-12 |
| #4RW | 0.463 (11.76) | 0.25 | 0.25 | 0.25 |
| #5RW | 0.625 (15.88) | 0.25 | 0.25 | 0.25 |
| #6RW | 0.750 (19.05) | 1.13 | 0.25 | 0.25 |
| #7RW | 0.875 (22.35) | 1.38 | 1.25 | 0.25 |

| THREAD | "X" | B | C | HEX | O-RING |
|----------|-----|-------------|--------------|-------|-----------|
| 7/8-14 | 87 | 0.25 (6.35) | 1 (25.40) | 1-1/4 | SLORD-117 |
| 1-12 | 10 | 0.25 (6.35) | 1.13 (28.58) | 1-1/4 | SLORD-119 |
| 1-1/4-12 | 12 | 0.25 (6.35) | 1.38 (34.93) | 1-1/2 | SLORD-123 |

FIGURE 4-10

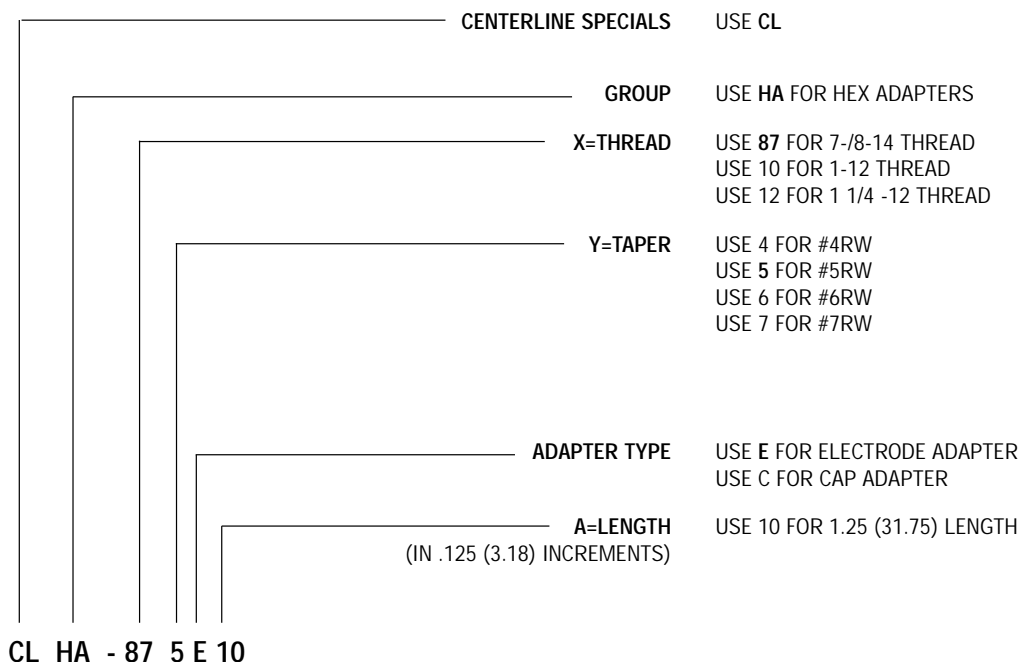
• Dimensions Shown Are: inches (mm).

EXAMPLE:

• CLHA - 875E10

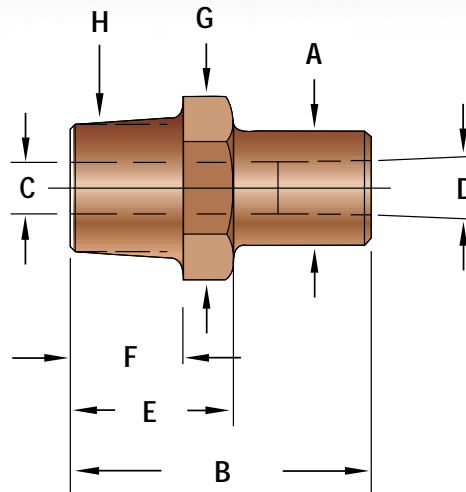
HEX ADAPTER, 7/8-14 THD., #5 RW TAPER, ELECTRODE ADAPTER, LENGTH = 1.25 (31.75).

EXAMPLE EXPLANATION CODING



STANDARD ADAPTERS

Cap and Electrode Hex Adapters Pipe Thread



- Dimensions Shown Are: inches (mm).
- See Pg. 3-2 For Caps.

FIGURE 4-11 (Material RWMA Class 2 & 3)

ELECTRODE ADAPTER CHART

| ELECTRODE CODE | 4 | 5 | 4 | 5 | 5 | 6 | 7 |
|--------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| A- DIAMETER | 0.88 (22.35) | 0.94 (23.88) | 0.88 (22.35) | 0.94 (23.88) | 0.94 (23.88) | 1.09 (27.69) | 1.24 (31.50) |
| B- LENGTH | AS CODED | | | | | | |
| LENGTH (Minimum) | 0.88 (22.35) | 0.88 (22.35) | 1.00 (25.40) | 1.00 (25.40) | 1.12 (28.45) | 1.12 (28.45) | 1.38 (35.05) |
| C- HOLE DIAMETER | 0.42 (10.67) | 0.44 (11.18) | 0.42 (10.67) | 0.44 (11.18) | 0.44 (11.18) | 0.50 (12.70) | 0.56 (14.22) |
| D- TAPER DIAMETER | 0.463 (11.76) | 0.625 (15.88) | 0.463 (15.88) | 0.625 (15.88) | 0.625 (15.88) | 0.750 (19.05) | 0.875 (22.22) |
| E- HEX LENGTH | 0.88 (22.35) | 0.88 (22.35) | 1.00 (25.40) | 1.00 (25.40) | 1.38 (35.05) | 1.38 (35.05) | 1.38 (35.05) |
| F- THREAD LENGTH | 0.62 (15.75) | 0.62 (15.75) | 0.75 (19.05) | 0.75 (19.05) | 0.88 (22.35) | 0.88 (22.35) | 0.88 (22.35) |
| G- HEX | 1.00 (25.40) | 1.00 (25.40) | 1.00 (25.40) | 1.00 (25.40) | 1.25 (31.75) | 1.25 (31.75) | 1.25 (31.75) |
| H- THREAD (N.P.T.) | 1/2 | 1/2 | 5/8 | 5/8 | 3/4 | 3/4 | 3/4 |

CAP ADAPTER CHART

| ELECTRODE CODE | 4 | 5 | 4 | 5 | 5 | 6 | 6-1 | 7 |
|--------------------|--------------|---------------|--------------|---------------|---------------|---------------|---------------|---------------|
| A- DIAMETER | 0.50 (12.70) | 0.62 (15.75) | 0.50 (12.70) | 0.62 (15.75) | 0.62 (15.75) | 0.75 (19.05) | 0.75 (19.05) | 0.88 (22.35) |
| B- LENGTH | AS CODED | | | | | | | |
| LENGTH (Minimum) | 0.88 (22.35) | 0.88 (22.35) | 1.00 (25.40) | 1.00 (25.40) | 1.12 (28.45) | 1.12 (28.45) | 1.12 (28.45) | 1.12 (28.45) |
| C- HOLE DIAMETER | 0.28 (7.11) | 0.38 (9.65) | 0.28 (7.11) | 0.38 (9.65) | 0.38 (9.65) | 0.44 (11.18) | 0.44 (11.18) | 0.56 (14.22) |
| D- TAPER DIAMETER | 0.313 (7.95) | 0.414 (10.52) | 0.313 (7.95) | 0.414 (10.52) | 0.414 (10.52) | 0.500 (12.70) | 0.562 (14.27) | 0.700 (17.78) |
| E- HEX LENGTH | 0.88 (22.35) | 0.88 (22.35) | 1.00 (25.40) | 1.00 (25.40) | 1.38 (35.05) | 1.38 (35.05) | 1.38 (35.05) | 1.38 (35.05) |
| F- THREAD LENGTH | 0.62 (15.75) | 0.62 (15.75) | 0.75 (19.05) | 0.75 (19.05) | 0.88 (22.35) | 0.88 (22.35) | 0.88 (22.35) | 0.88 (22.35) |
| G- HEX | 1.00 (25.40) | 1.00 (25.40) | 1.00 (25.40) | 1.00 (25.40) | 1.25 (31.75) | 1.25 (31.75) | 1.25 (31.75) | 1.25 (31.75) |
| H- THREAD (N.P.T.) | 1/2 | 1/2 | 5/8 | 5/8 | 3/4 | 3/4 | 3/4 | 3/4 |

• TO ORDER YOUR SPECIALS USE CODING CHART - SEE PG. 4-14

STANDARD ADAPTERS

Cap and Electrode Hex Adapters Pipe Thread

EXAMPLE EXPLANATION CODING

| | |
|--|---|
| CENTERLINE SPECIALS | USE WB |
| GROUP | USE 4 FOR PIPE THREAD |
| TYPE | USE C FOR CAP ADAPTER USE E FOR ELECTRODE ADAPTER |
| MATERIAL | USE 2 FOR CLASS 2 RWMA USE 3 FOR CLASS 3 RWMA |
| CAP OR ELECTRODE DIAMETER (IN .125 (3.18) INCREMENTS) | USE 4 FOR .50 (12.70) NOMINAL DIAMETER USE 5 FOR .62 (15.88) NOMINAL DIAMETER USE 6 FOR .75 (19.05) NOMINAL DIAMETER USE 6-1 FOR .75 (19.05) NOMINAL DIAMETER (INCREASED WATER FLOW) USE 7 FOR .88 (22.23) NOMINAL DIAMETER |
| THREAD SIZE - N.P.T. | USE A FOR 1/2 N.P.T. USE B FOR 3/4 N.P.T. USE C FOR 5/8 N.P.T. |
| OVERALL LENGTH (IN .125 (3.18) INCREMENTS) | SEE PG. 4-13 FOR MINIMUM LENGTHS |

WB 4 C - 3 5 A 10

SAMPLE TYPICAL THREADED ADAPTER CODING

| |
|--|
| ADAPTER WILL BE 1.25 (31.75) LONG |
| ADAPTER WILL HAVE 1/2 N.P.T. (THREAD SIZE) |
| ADAPTER WILL BE USED WITH .62 (15.88) DIAMETER CAP |
| ADAPTER WILL BE MADE OF CLASS 3 RWMA |
| ADAPTER WILL BE MADE FOR CAP TYPE ELECTRODE |
| ADAPTER WILL HAVE PIPE THREAD |

EXAMPLE:

• WB4C-35A10

• Dimensions Shown Are: inches (mm)



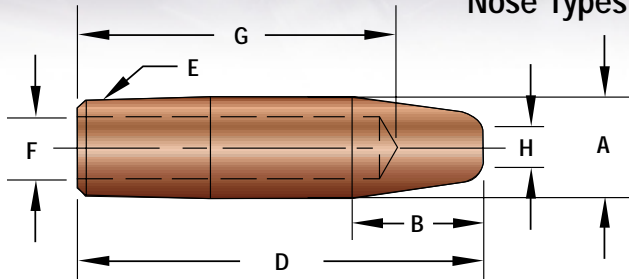
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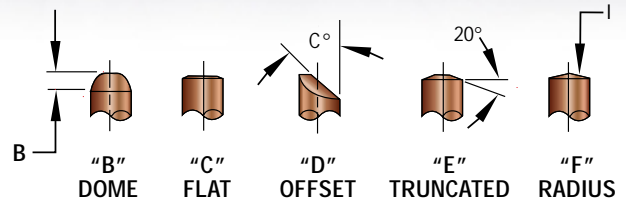
RESISTANCE WELDING ELECTRODES

Tips With Tapered Shanks Nose Types A, B, C, D, E & F



"A" POINTED

FIGURE 5-1 (Material RWMA Class 2 & 3)



• Dimensions Shown Are: inches (mm).

EXAMPLE EXPLANATION CODING

| | |
|--|--|
| CENTERLINE SPECIALS | USE W FOR TIPS WITH TAPERED SHANKS |
| NOSE TYPE | USE A FOR POINTED NOSE USE B FOR DOME NOSE USE C FOR FLAT NOSE USE D FOR OFFSET NOSE USE E FOR TRUNCATED NOSE USE F FOR RADIUS NOSE |
| MATERIAL | USE 2 FOR CLASS 2 RWMA ALLOY USE 3 FOR CLASS 3 RWMA ALLOY USE Z FOR ZIRCONIUM |
| RW TAPER | USE 4 FOR 4 RW TAPER USE 5 FOR 5 RW TAPER USE 6 FOR 6 RW TAPER USE 7 FOR 7 RW TAPER |
| OVERALL LENGTH (IN .25 (6.35) INCREMENTS) | USE 05 FOR 1.25 (31.75) MINIMUM LENGTH USE 06 FOR 1.50 (38.10) LENGTH USE 07 FOR 1.75 (44.45) LENGTH USE 08 FOR 2.00 (50.80) LENGTH USE 09 FOR 2.25 (57.15) LENGTH ETC. |

W A - 2 4 05

SAMPLE TYPICAL TIP WITH TAPERED SHANK CODING

TIP OVERALL LENGTH WILL BE 1.25 (31.75)
TIP WILL HAVE #4 RWMA TAPER
TIP WILL BE MADE OF CLASS 2 RWMA
TIP WILL HAVE TYPE A NOSE

EXAMPLE:

• WA-2405

• Dimensions Shown Are: inches (mm).

RESISTANCE WELDING ELECTRODES

Tips With Tapered Shanks Nose Types A, B, C, D, E & F

KEY TO ITEM NUMBERS

| | |
|--------------|---|
| W - | Standard Prefix |
| ★ - | Nose Designation (see pg. 5-1 for nose types) |
| 2, 3 or Z - | RWMA Alloy Class |
| 4 thru 7 - | RW Taper |
| 05 thru 16 - | Overall Length – in .25 (6.35) Increments |

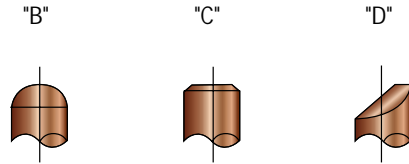
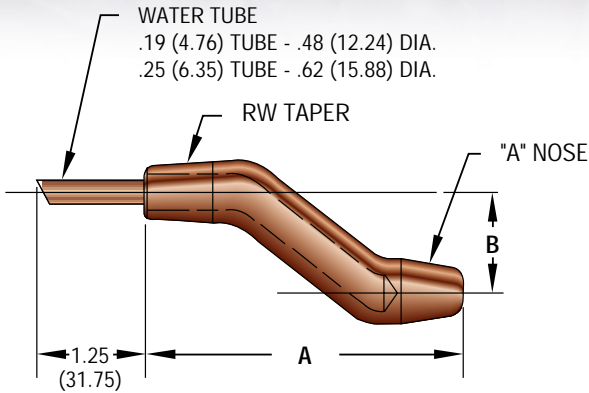
• Dimensions Shown Are: inches (mm).

| ITEM NO. | DIMENSIONS | | | | | | | | |
|-----------|------------------------|---------------------|----------------------|------------------------|------------------|-----------------------------|--------------------------|----------------------------|----------------------------|
| CLASS 2 | A Major Diameter | B Nose Length | C Angle Offset | D Overall Length | E RW Taper | F Water Hole Diameter | G Water Hole Depth | H Weld Face Diameter | I Nose Sphere Radius |
| W ★ -2405 | | .38 (9.53) | | 1.25 (31.75) | | | .75 (19.05) | | |
| W ★ -2406 | | .63 (15.88) | | 1.50 (38.10) | | | 1.00 (25.40) | | |
| W ★ -2407 | | .75 (19.05) | | 1.75 (44.45) | | | 1.25 (31.75) | | |
| W ★ -2408 | | .75 (19.05) | | 2.00 (50.80) | | | 1.50 (38.10) | | |
| W ★ -2409 | | .75 (19.05) | | 2.25 (57.15) | | | 1.75 (44.45) | | |
| W ★ -2410 | .482 (12.24) | .75 (19.05) | 30° | 2.50 (63.50) | 4 | .28 (7.14) | 2.00 (50.80) | .19 (4.76) | 2 |
| W ★ -2411 | | .75 (19.05) | | 2.75 (69.85) | | | 2.25 (57.15) | | |
| W ★ -2412 | | .75 (19.05) | | 3.00 (76.20) | | | 2.50 (63.50) | | |
| W ★ -2413 | | .75 (19.05) | | 3.25 (82.55) | | | 2.75 (69.85) | | |
| W ★ -2414 | | .75 (19.05) | | 3.50 (88.90) | | | 3.00 (76.20) | | |
| W ★ -2415 | | .75 (19.05) | | 3.75 (92.25) | | | 3.25 (82.55) | | |
| W ★ -2416 | | .75 (19.05) | | 4.00 (101.60) | | | 3.50 (88.90) | | |
| W ★ -2505 | | .75 (19.05) | 40° | 1.25 (31.75) | | | .50 (12.70) | | |
| W ★ -2506 | | .75 (19.05) | 40° | 1.50 (38.10) | | | .75 (19.05) | | |
| W ★ -2507 | | .75 (19.05) | 30° | 1.75 (44.45) | | | 1.00 (25.40) | | |
| W ★ -2508 | | 1.13 (28.58) | 30° | 2.00 (50.80) | | | 1.25 (31.75) | | |
| W ★ -2509 | | 1.13 (28.58) | 30° | 2.25 (57.15) | | | 1.50 (38.10) | | |
| W ★ -2510 | .625 (15.88) | 1.13 (28.58) | 30° | 2.50 (63.50) | 5 | .38 (9.53) | 1.75 (44.45) | .25 (6.35) | 2 |
| W ★ -2511 | | 1.13 (28.58) | 30° | 2.75 (69.85) | | | 2.00 (50.80) | | |
| W ★ -2512 | | 1.13 (28.58) | 30° | 3.00 (76.20) | | | 2.25 (57.15) | | |
| W ★ -2513 | | 1.13 (28.58) | 30° | 3.25 (82.55) | | | 2.50 (63.50) | | |
| W ★ -2514 | | 1.13 (28.58) | 30° | 3.50 (88.90) | | | 2.75 (69.85) | | |
| W ★ -2515 | | 1.13 (28.58) | 30° | 3.75 (95.25) | | | 3.00 (76.20) | | |
| W ★ -2516 | | 1.13 (28.58) | 30° | 4.00 (101.60) | | | 3.25 (82.55) | | |
| W ★ -2608 | | 1.00 (25.40) | | 2.00 (50.80) | | | 1.25 (31.75) | | |
| W ★ -2610 | | 1.00 (25.40) | | 2.50 (63.50) | | | 1.75 (44.45) | | |
| W ★ -2612 | .750 (19.05) | 1.00 (25.40) | 30° | 3.00 (76.20) | 6 | .44 (11.11) | 2.25 (57.15) | .28 (7.14) | 4 |
| W ★ -2614 | | 1.00 (25.40) | | 3.50 (88.90) | | | 2.75 (69.85) | | |
| W ★ -2616 | | 1.00 (25.40) | | 4.00 (101.60) | | | 3.25 (82.55) | | |
| W ★ -2708 | | .75 (19.05) | 40° | 2.00 (50.80) | | | 1.25 (31.75) | | |
| W ★ -2710 | | 1.13 (28.58) | 30° | 2.50 (63.50) | | | 1.75 (44.45) | | |
| W ★ -2712 | .875 (22.23) | 1.13 (28.58) | 30° | 3.00 (76.20) | 7 | .50 (12.70) | 2.25 (57.15) | .31 (7.94) | 6 |
| W ★ -2714 | | 1.13 (28.58) | 30° | 3.50 (88.90) | | | 2.75 (69.85) | | |
| W ★ -2716 | | 1.13 (28.58) | 30° | 4.00 (101.60) | | | 3.25 (82.55) | | |

Replace ★ with nose type A, B, C, D, E, or F.

RESISTANCE WELDING ELECTRODES

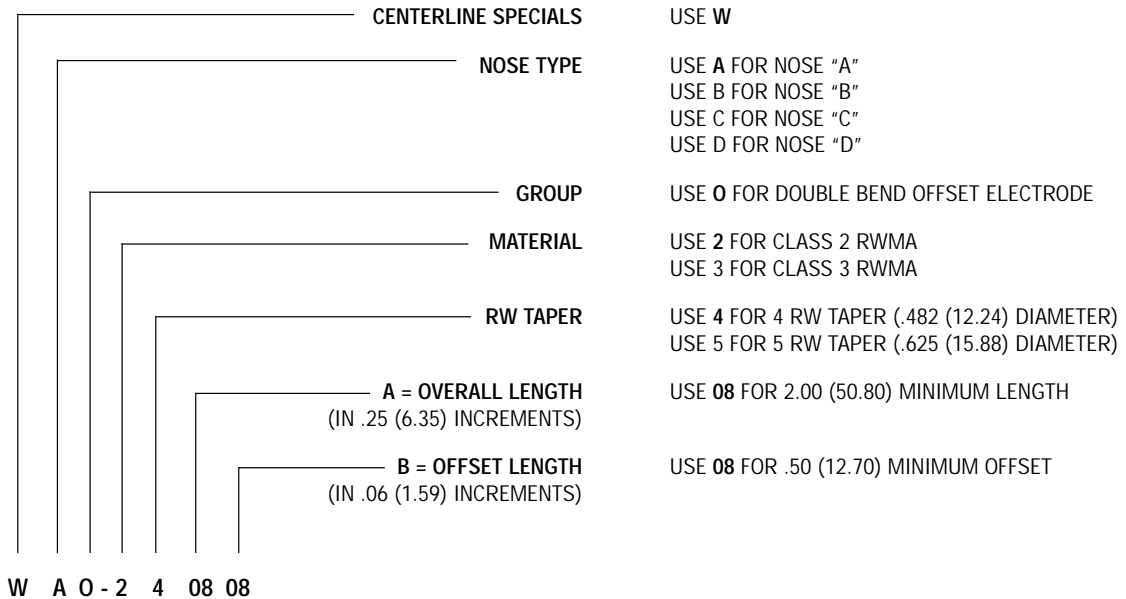
Double Bend Offset Electrodes



Example: • WAO-2408-08

FIGURE 5-2 (Material RWMA Class 2 & 3)

EXAMPLE EXPLANATION CODING



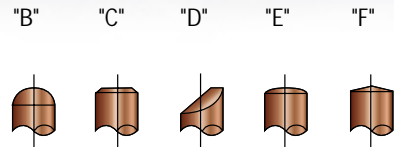
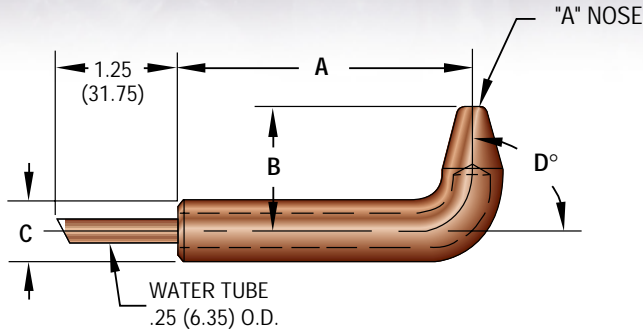
SAMPLE TYPICAL DOUBLE BEND OFFSET CODING

ELECTRODE OFFSET WILL BE .50 (12.70)
ELECTRODE WILL BE 2.00 (50.80) LONG
ELECTRODE WILL HAVE 4 RW TAPER
ELECTRODE WILL BE MADE OF CLASS 2 RWMA MATERIAL
DOUBLE BEND OFFSET ELECTRODE
ELECTRODE NOSE TYPE WILL BE "A" NOSE

• Dimensions Shown Are: inches (mm).

RESISTANCE WELDING ELECTRODES

Single Bend Electrodes



Example: • CLLA-25-10690

FIGURE 5-3 (Material RWMA Class 2, 3 & Zirconium)

EXAMPLE EXPLANATION CODING

| | |
|---|--|
| CENTERLINE SPECIALS | USE CL |
| GROUP | USE L FOR SINGLE BEND ELECTRODE |
| NOSE TYPE | USE A FOR NOSE "A" USE B FOR NOSE "B" USE C FOR NOSE "C" USE D FOR NOSE "D" USE E FOR NOSE "E" USE F FOR NOSE "F" |
| MATERIAL | USE 2 FOR CLASS 2 RWMA USE 3 FOR CLASS 3 RWMA USE Z FOR ZIRCONIUM |
| C = ADAPTER DIAMETER (IN .125 (3.18) INCREMENTS) | USE 5 FOR .62 (15.88) NOMINAL DIAMETER STRAIGHT SHANK USE 6 FOR .75 (19.05) NOMINAL DIAMETER STRAIGHT SHANK USE 7 FOR .88 (22.35) NOMINAL DIAMETER STRAIGHT SHANK USE 5E FOR .62 (15.88) NOMINAL DIAMETER ELECTRODE TAPER SHANK USE 6E FOR .75 (19.05) NOMINAL DIAMETER ELECTRODE TAPER SHANK USE 7E FOR .88 (22.35) NOMINAL DIAMETER ELECTRODE TAPER SHANK |
| A = OVERALL LENGTH (IN .25 (6.35) INCREMENTS) | USE 10 FOR 2.5 (63.50) MINIMUM LENGTH |
| B = OFFSET LENGTH (IN .125 (3.18) INCREMENTS) | USE 6 FOR .75 (19.05) MINIMUM OFFSET |
| D = OFFSET ANGLE | USE 30 FOR 30° OFFSET USE 45 FOR 45° OFFSET USE 60 FOR 60° OFFSET USE 75 FOR 75° OFFSET USE 90 FOR 90° OFFSET |

CL L A - 2 5 10 6 90

SAMPLE TYPICAL ELECTRODE CODING

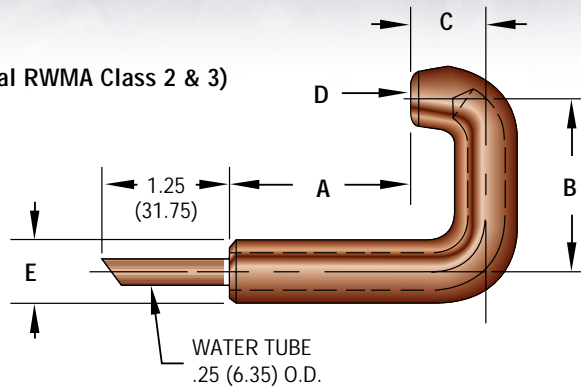
| |
|---|
| ELECTRODE OFFSET ANGLE WILL BE 90° |
| ELECTRODE OFFSET WILL BE .75 (19.05) LONG |
| ELECTRODE WILL BE 2.50 (63.50) LONG |
| ELECTRODE WILL HAVE .62 (15.88) DIAMETER |
| ELECTRODE WILL BE MADE OF CLASS 2 RWMA MATERIAL |
| ELECTRODE NOSE TYPE WILL BE TYPE "A" |
| SINGLE BEND ELECTRODE |

• Dimensions Shown Are: inches (mm).

RESISTANCE WELDING ELECTRODES

J Shape Electrodes

FIGURE 5-4 (Material RWMA Class 2 & 3)



Example: • CLJE1-25-10166

EXAMPLE EXPLANATION CODING

| | |
|---|--|
| CENTERLINE SPECIALS | USE CL |
| GROUP | USE JE FOR "J" SHAPE ELECTRODE |
| D = NOSE TYPE | USE 1 FOR NOSE - .62 (15.88) DIAMETER "A" NOSE USE 2 FOR NOSE - .75 (19.05) DIAMETER "A" NOSE USE 3 FOR NOSE - .88 (22.23) DIAMETER "A" NOSE |
| MATERIAL | USE 2 FOR CLASS 2 RWMA USE 3 FOR CLASS 3 RWMA |
| E = ADAPTER DIAMETER (IN .125 (3.18) INCREMENTS) | USE 5 FOR .62 (15.88) NOMINAL DIAMETER USE 6 FOR .75 (19.05) NOMINAL DIAMETER USE 7 FOR .88 (22.23) NOMINAL DIAMETER |
| A = OVERALL LENGTH (IN .25 (6.35) INCREMENTS) | USE 10 FOR 2.50 (63.50) MINIMUM LENGTH |
| B = OFFSET LENGTH (IN .125 (3.18) INCREMENTS) | USE 16 FOR 2.00 (50.80) MINIMUM OFFSET |
| C = NOSE HEIGHT (IN .125 (3.18) INCREMENTS) | USE 6 FOR .75 (19.05) MINIMUM HEIGHT |

CL JE 1 - 2 5 - 10 16 6

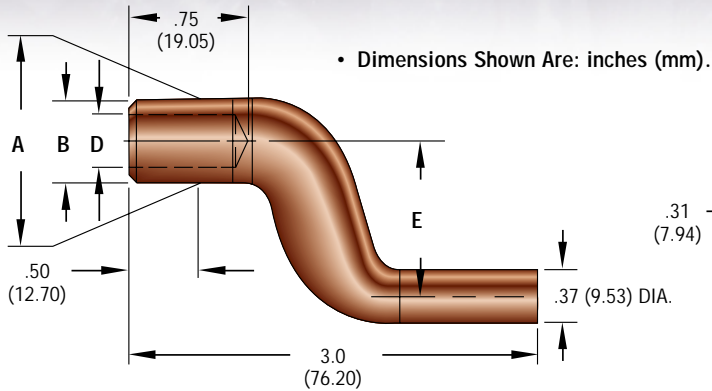
SAMPLE TYPICAL J SHAPE ELECTRODE CODING

ELECTRODE NOSE WILL BE .75 (19.05) HIGH
ELECTRODE OFFSET WILL BE 2.00 (50.80) LONG
ELECTRODE WILL BE 2.50 (63.50) LONG
ELECTRODE WILL HAVE .62 (15.88) DIAMETER
ELECTRODE WILL BE MADE OF CLASS 2 RWMA MATERIAL
ELECTRODE NOSE TYPE WILL BE .62 (15.88) DIAMETER
J SHAPE ELECTRODE

• Dimensions Shown Are: inches (mm).

RESISTANCE WELDING ELECTRODES

Irregular-Offset Electrodes With Taper Shanks



• WEF-SERIES FIGURE 5-5 (Material RWMA Class 2)

| ITEM NO. | DIMENSIONS | | | | |
|----------|------------------------|------------------------|------------|-----------------------|-------------------|
| CLASS 2 | A Major Taper Diameter | B Minor Taper Diameter | C RW Taper | D Water Hole Diameter | E Offset Distance |
| WEF-2412 | .463 (11.76) | .438 (11.13) | 4 | .281 (7.14) | 1.125 (28.58) |
| WEF-2512 | .613 (15.57) | .588 (14.94) | 5 | .375 (9.53) | 1.125 (28.58) |

Spade Electrodes

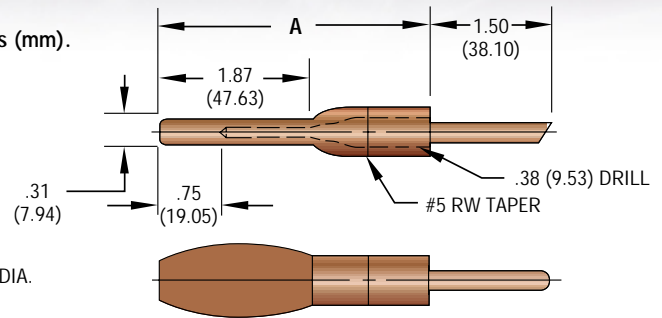


FIGURE 5-6 (Material RWMA Class 2)

| ITEM NO. | "A" O.A.L. |
|----------|---------------|
| WEM100-1 | 3.31 (84.14) |
| WEM100-2 | 3.56 (90.49) |
| WEM100-3 | 3.81 (96.84) |
| WEM100-4 | 4.06 (103.19) |

• Dimensions Shown Are: inches (mm).

1.25 (31.75) Irregular-Offset Electrodes With Taper Shanks

• WFA-SERIES

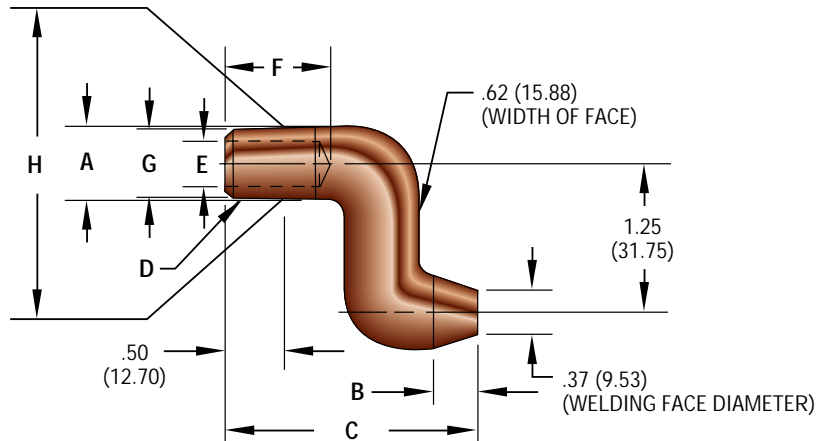
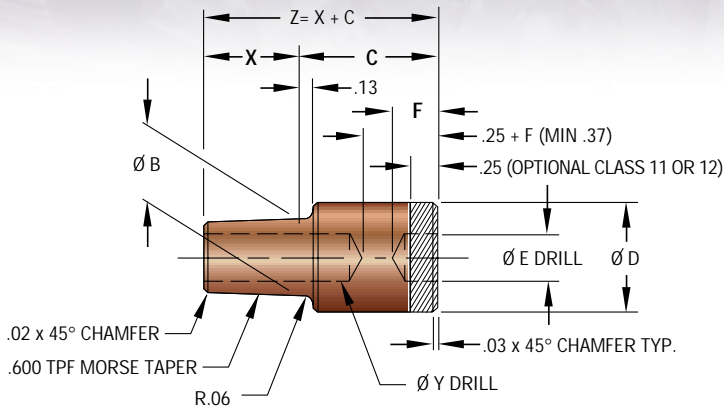


FIGURE 5-7 (Material RWMA Class 2)

| ITEM NO. | DIMENSIONS | | | | | | | |
|----------|------------------------|---------------|------------------|------------|-----------------------|--------------------|------------------------|------------------|
| CLASS 2 | A Major Taper Diameter | B Nose Length | C Overall Length | D RW Taper | E Water Hole Diameter | F Water Hole Depth | G Minor Taper Diameter | H Taper Diameter |
| WFA-2408 | .50 (12.70) | .38 (9.53) | 2.00 (50.80) | 4 | .281 (7.14) | .88 (22.23) | .438 (11.13) | .463 (11.76) |
| WFA-2409 | .50 (12.70) | .75 (19.05) | 2.38 (60.33) | 4 | .281 (7.14) | .88 (22.23) | .438 (11.13) | .463 (11.76) |
| WFA-2508 | .62 (15.88) | .38 (9.53) | 2.12 (53.98) | 5 | .375 (9.53) | .75 (19.05) | .588 (14.94) | .613 (15.58) |
| WFA-2509 | .62 (15.88) | .75 (19.05) | 2.50 (63.50) | 5 | .375 (9.53) | .75 (19.05) | .588 (14.94) | .613 (15.58) |

RESISTANCE WELDING ELECTRODES

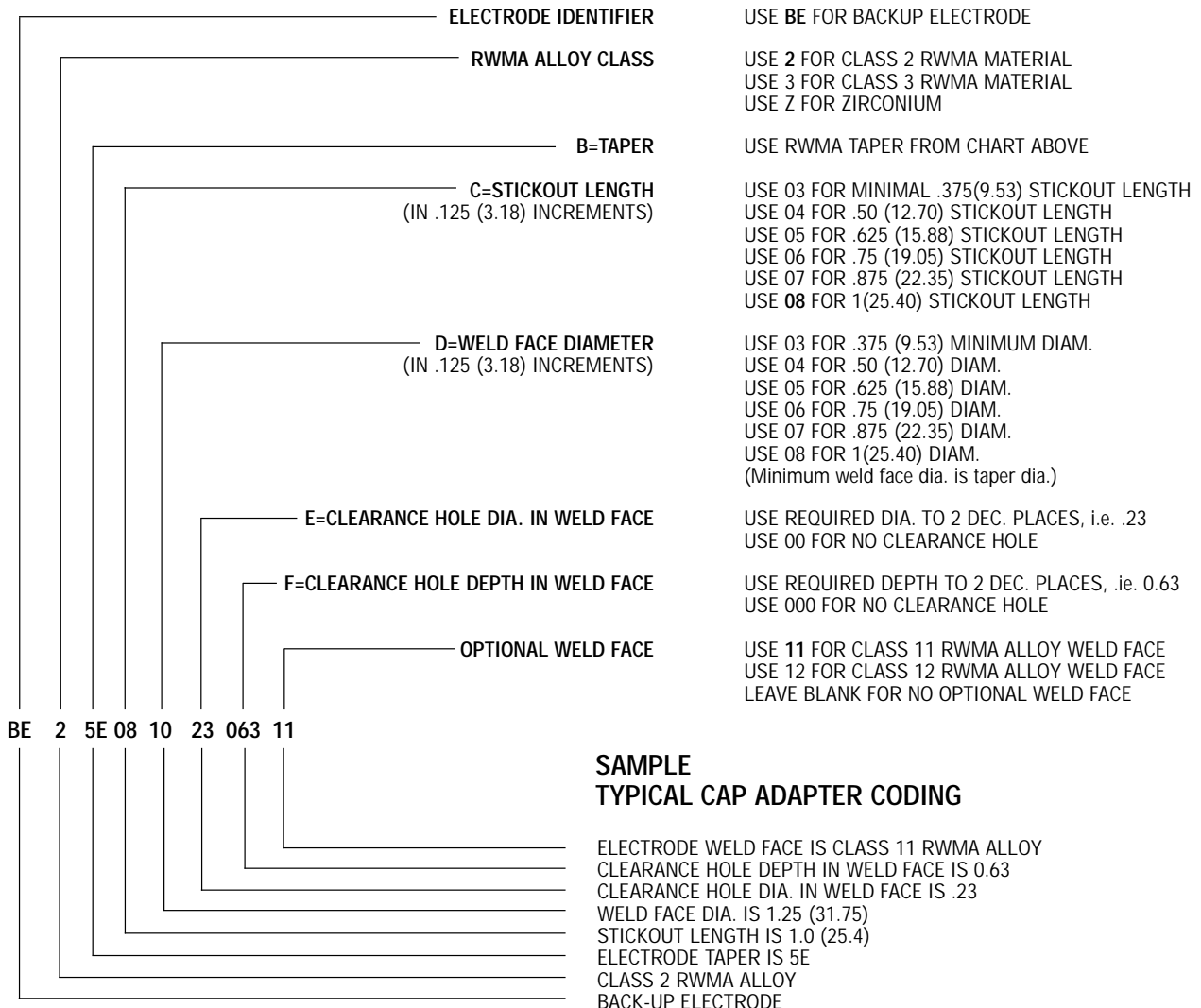
Backup Electrodes



| RWMA TAPER | B | X | Y |
|------------|--------------|---------------|------|
| 3E | .375 (9.52) | .500 (12.70) | 9/32 |
| 4E | .463 (11.76) | .500 (12.70) | 9/32 |
| 5E | .625 (15.88) | .750 (19.05) | 3/8 |
| 6E | .750 (19.05) | .875 (22.23) | 7/16 |
| 7E | .875 (22.23) | 1.125 (28.57) | 1/2 |
| 4C | .375 (9.52) | .285 (2.86) | 9/32 |
| 5C | .415 (10.52) | .390 (9.52) | 5/16 |
| 6C | .501 (12.70) | .500 (12.70) | 3/8 |
| 7C | .613 (15.57) | .500 (12.70) | 1/2 |

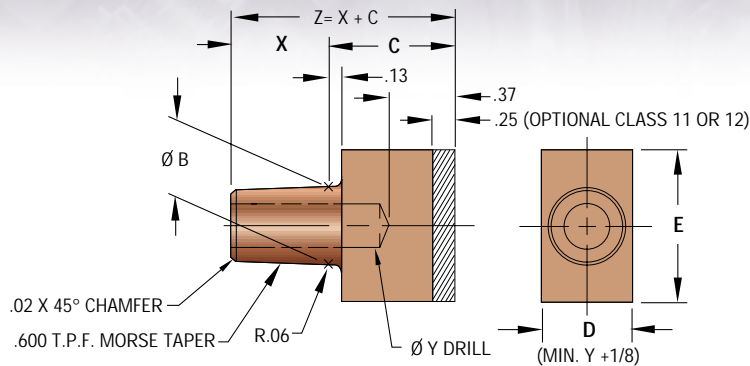
FIGURE 5-8 (Material RWMA Class 2&3)

EXAMPLE EXPLANATION CODING



RESISTANCE WELDING ELECTRODES

Block Type Electrodes



| RWMA TAPER | B | X | Y |
|------------|--------------|---------------|------|
| 3E | .375 (9.52) | .500 (12.70) | 9/32 |
| 4E | .463 (11.76) | .500 (12.70) | 9/32 |
| 5E | .625 (15.88) | .750 (19.05) | 3/8 |
| 6E | .750 (19.05) | .875 (22.23) | 7/16 |
| 7E | .875 (22.23) | 1.125 (28.57) | 1/2 |
| 4C | .375 (9.52) | .285 (2.86) | 9/32 |
| 5C | .415 (10.52) | .390 (9.52) | 5/16 |
| 6C | .501 (12.70) | .500 (12.70) | 3/8 |
| 7C | .613 (15.57) | .500 (12.70) | 1/2 |

FIGURE 5-9 (Material RWMA Class 2&3)

EXAMPLE EXPLANATION CODING

| | |
|--|---|
| ELECTRODE IDENTIFIER | USE RBE FOR RECTANGLE BACKUP ELECTRODE |
| RWMA ALLOY CLASS | USE 2 FOR CLASS 2 RWMA ALLOY USE 3 FOR CLASS 3 RWMA ALLOY USE Z FOR ZIRCONIUM |
| B=TAPER | USE RWMA TAPER FROM CHART ABOVE |
| C = STICKOUT LENGTH (IN .125 (3.18) INCREMENTS) | USE 03 FOR MINIMAL .375(9.53) STICKOUT LENGTH USE 04 FOR .50 (12.35) STICKOUT LENGTH USE 05 FOR .625 (15.88) STICKOUT LENGTH USE 06 FOR .75 (19.05) STICKOUT LENGTH USE 07 FOR .875 (22.35) STICKOUT LENGTH USE 08 FOR 1 (25.40) STICKOUT LENGTH |
| D=WELD FACE WIDTH (IN .125 (3.18) INCREMENTS) | USE 03 FOR MINIMUM .375 (9.53) WIDTH USE 04 FOR .50 (12.35) WIDTH USE 05 FOR .625 (15.88) WIDTH USE 06 FOR .75 (19.05) WIDTH USE 07 FOR .875 (22.35) WIDTH USE 08 FOR 1 (25.40) WIDTH |
| E=WELD FACE LENGTH (IN .125 (3.18) INCREMENTS) | USE 03 FOR MINIMUM .375 (9.53) LENGTH USE 04 FOR .50 (12.35) LENGTH USE 05 FOR .625 (15.88) LENGTH USE 06 FOR .75 (19.05) LENGTH USE 07 FOR .875 (22.35) LENGTH USE 08 FOR 1 (25.40) LENGTH |
| OPTIONAL WELD FACE | USE 11 FOR CLASS 11 RWMA ALLOY WELD FACE USE 12 FOR CLASS 12 RWMA ALLOY WELD FACE LEAVE BLANK FOR NO OPTIONAL WELD FACE |

RBE 2 5E 08 05 08 11

SAMPLE TYPICAL CAP ADAPTER CODING

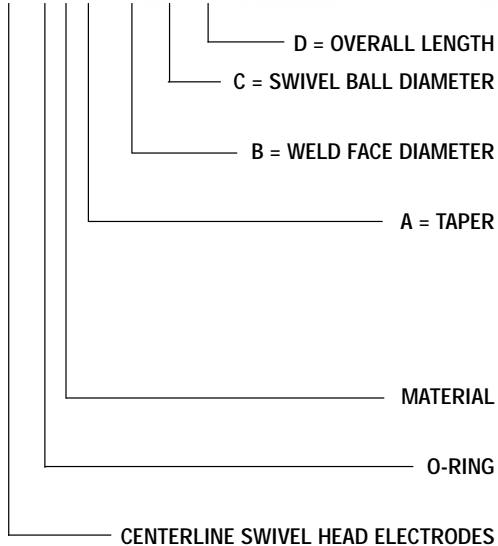
ELECTRODE WELD FACE IS CLASS 11 RWMA ALLOY
WELD FACE LENGTH IS 1.0 (25.4)
WELD FACE LENGTH IS 1.0 (25.4)
STICKOUT LENGTH IS 1.0 (25.4)
ELECTRODE TAPER IS 5E
CLASS 2 RWMA ALLOY
RECTANGLE BACK-UP ELECTRODE

RESISTANCE WELDING ELECTRODES

Swivel Head Electrodes with Water-Cooled Shanks

CODING EXAMPLE

SHEA O 2 5E XXX 75 YYY



SPECIFY REQUIRED LENGTH, EX. FOR 2.00 (50.80) USE 200

USE 50 FOR .50 (12.70) DIAMETER

USE 75 FOR .75 (19.05) DIAMETER

SPECIFY REQUIRED DIAMETER, EX. FOR 1.00 (25.40) DIAMETER
USE 100

USE 5C FOR #5 CAP TAPER

USE 6C FOR #6 CAP TAPER

USE 4E FOR 4RW TAPER

USE 5E FOR 5RW TAPER

USE 6E FOR 6RW TAPER

USE 7E FOR 7RW TAPER

USE 2 FOR CLASS 2

USE 3 FOR CLASS 3

USE O IF O-RING REQUIRED ON FORMED ASSEMBLY
OMIT O IF O-RING NOT REQUIRED

USE SHEA FOR FORMED ASSEMBLY

Blind Hole

EXAMPLE:

• SHEA25E10075200

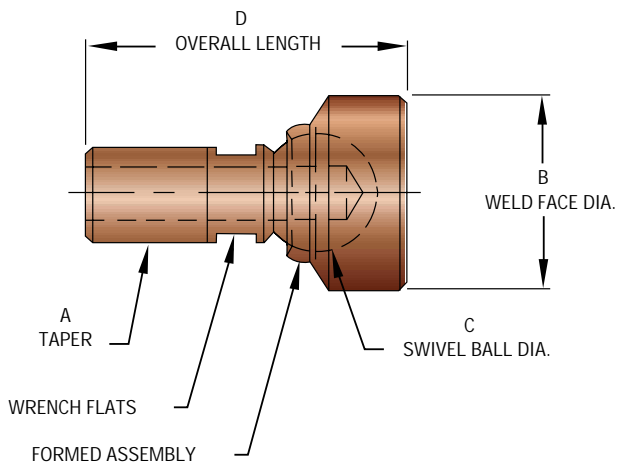


FIGURE 5-10 (Material RWMA Class 2&3)

Thru Hole with O-Ring

EXAMPLE:

• SHEAO25E10075200

O-RING

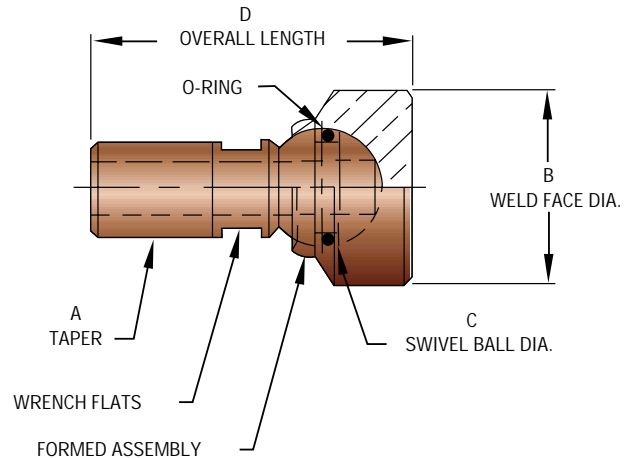


FIGURE 5-11 (Material RWMA Class 2&3)

• Dimensions Shown Are: inches (mm).

HOLDERS

Straight Heavy-Duty Ejector Holders - Swivel head

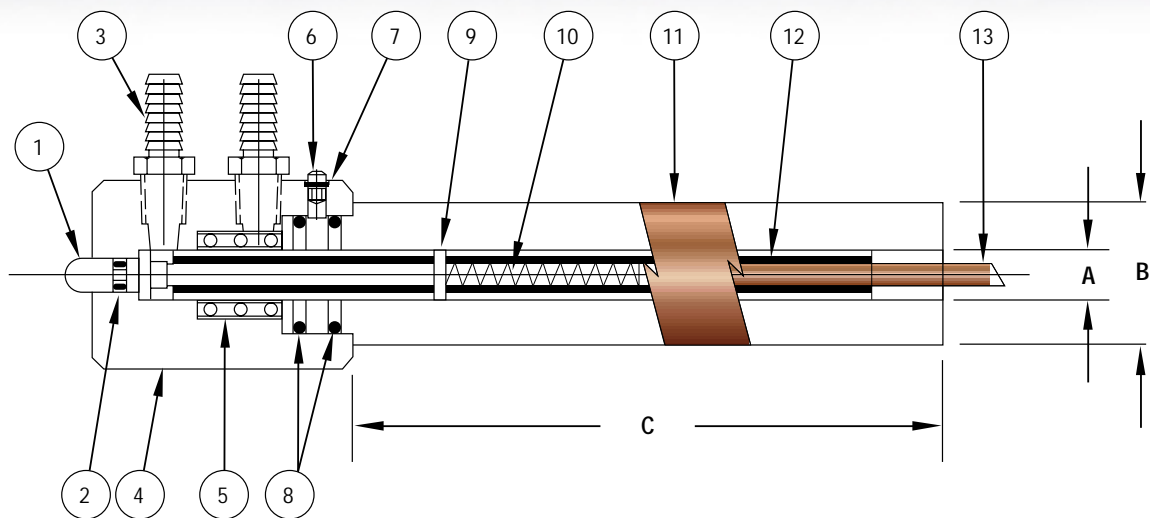


FIGURE 6-1 (Material RWMA Class 2)

THE CENTERLINE HEAVY DUTY EJECTOR HOLDER HAS BEEN DESIGNED TO PROVIDE LONGER SERVICE LIFE WITH:

- tough RWMA Class 2 alloy barrel
– resists deformation of the tapered end

- spring-loaded water tube –
properly positioned in electrode
automatically

- leak-proof water seals

- impact-resistant stainless steel
ejector in a rugged, high-strength
Bronze Head – for positive ejection

- tested water flow rate of better
than 2.0 gpm at 30 psi. – assures
adequate cooling of electrode and holder

All CenterLine Holders are constructed
entirely of non-magnetic, corrosion-
resistant components.

- stainless steel ejector tube

| HEAVY DUTY HOLDER | | | | | REPLACEMENT PARTS | | | |
|-------------------|----------|------------------|-------------------|-----------------|-------------------|-----------------|---------------|---------|
| Complete Holder # | RW Taper | A Taper Diameter | B Barrel Diameter | C Barrel Length | 11 Barrel | 12 Ejector Tube | 13 Water Tube | 4 Head |
| EAK-40608 | 4 | .463 (11.76) | .75 (19.05) | 8 | RW-2201-4 | RW-2301 | RW-2401 | RW-2101 |
| EAK-40708 | 4 | .463 (11.76) | .88 (22.35) | 8 | RW-2202-4 | RW-2301 | RW-2401 | RW-2101 |
| EAK-40808 | 4 | .463 (11.76) | 1.00 (25.40) | 8 | RW-2203-4 | RW-2301 | RW-2401 | RW-2101 |
| EAK-40812 | 4 | .463 (11.76) | 1.00 (25.40) | 12 | RW-2213-4 | RW-2311 | RW-2401 | RW-2101 |
| EAK-41008 | 4 | .463 (11.76) | 1.25 (31.75) | 8 | RW-2204-4 | RW-2301 | RW-2401 | RW-2102 |
| EAK-41012 | 4 | .463 (11.76) | 1.25 (31.75) | 12 | RW-2214-4 | RW-2311 | RW-2401 | RW-2102 |
| EAK-50808 | 5 | .625 (15.88) | 1.00 (25.40) | 8 | RW-2203-5 | RW-2302 | RW-2402 | RW-2101 |
| EAK-50812 | 5 | .625 (15.88) | 1.00 (25.40) | 12 | RW-2213-5 | RW-2312 | RW-2402 | RW-2101 |
| EAK-51008 | 5 | .625 (15.88) | 1.25 (31.75) | 8 | RW-2204-5 | RW-2302 | RW-2402 | RW-2102 |
| EAK-51012 | 5 | .625 (15.88) | 1.25 (31.75) | 12 | RW-2214-5 | RW-2312 | RW-2402 | RW-2102 |
| EAK-51208 | 5 | .625 (15.88) | 1.50 (38.10) | 8 | RW-2205-5 | RW-2302 | RW-2402 | RW-2102 |
| EAK-51212 | 5 | .625 (15.88) | 1.50 (38.10) | 12 | RW-2215-5 | RW-2312 | RW-2402 | RW-2102 |
| EAK-71208 | 7 | .875 (22.23) | 1.50 (38.10) | 8 | RW-2205-7 | RW-2303 | RW-2402 | RW-2102 |
| EAK-71212 | 7 | .875 (22.23) | 1.50 (38.10) | 12 | RW-2215-7 | RW-2313 | RW-2402 | RW-2102 |

| STANDARD REPLACEMENT PARTS | | |
|----------------------------|----------|--------------------------------|
| Detail No. | Part No. | Part Name |
| 1 | RW-2501 | Ejector Pin |
| 2 | RW-2850 | O-Ring – Ejector Pin |
| 3 | RW-1015 | Hose fitting |
| 5 | RW-2820 | Ejector Return Spring |
| 6 | RW-2601 | Retaining Screw |
| 7 | RW-2810 | Retaining Screw Washer |
| 8 | RW-2860* | O-Ring – Barrel (2) Req'd |
| 9 | RW-2840 | Retaining Pin – Ejector Spring |
| 10 | RW-2830 | Water Tube Spring |

*SPECIFY O-RING RW-2861 FOR BARREL
DIAMETERS OF 1.25 (31.75) AND
1.50 (38.10)–(2 REQ'D)

- Dimensions Shown Are: inches (mm).

HOLDERS

Standard Non-Ejector Holders

- RW-1015 Brass Connection Fits 3/8 Hose

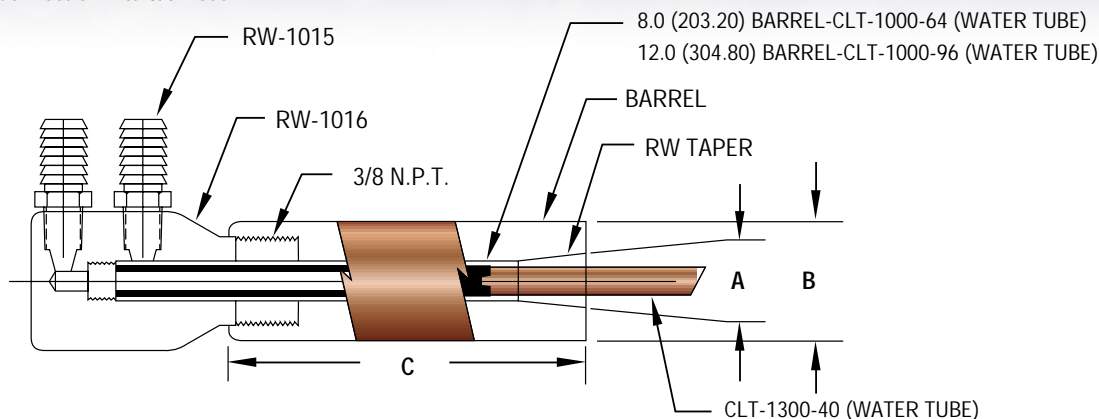


FIGURE 6-2 (Material RWMA Class 2)

| HOLDER # | A10804 | A20804 | A30804 | A30805 | A40805 | A50805 | A31204 | A31205 | A41205 |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|
| RW Taper | 4 | 4 | 4 | 5 | 5 | 5 | 4 | 5 | 5 |
| A – Diameter | .463 (11.76) | .463 (11.76) | .463 (11.76) | .625 (15.88) | .625 (15.88) | .625 (15.88) | .463 (11.76) | .625 (15.88) | .625 (15.88) |
| B – Diameter | .75 (19.05) | .88 (22.23) | 1.00 (25.40) | 1.00 (25.40) | 1.25 (31.75) | 1.50 (38.10) | 1.00 (25.40) | 1.00 (25.40) | 1.25 (31.75) |
| C – Length | 8.0 (203.20) | 8.0 (203.20) | 8.0 (203.20) | 8.0 (203.20) | 8.0 (203.20) | 8.0 (203.20) | 12.0 (304.80) | 12.0 (304.80) | 12.0 (304.80) |
| BARREL | RW-1121-2 | RW-1121-3 | RW-1121-4 | RW-1121-6 | RW-1121-7 | RW-1121-8 | RW-1121-9 | RW-1121-10 | RW-1121-11 |

Close-Coupled Holders

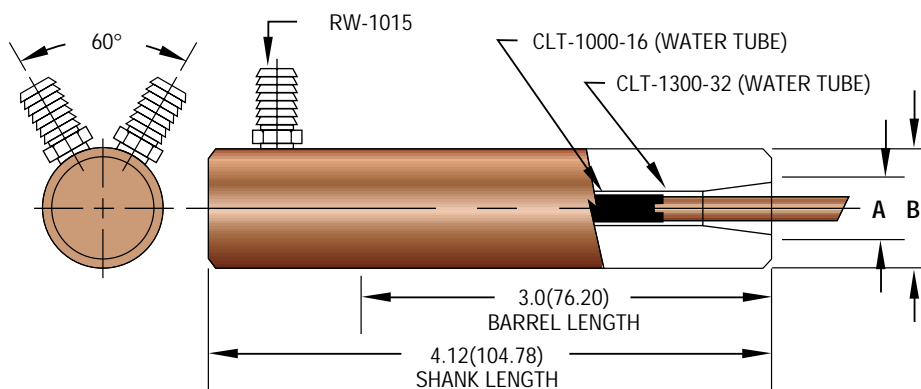


FIGURE 6-3 (Material RWMA Class 2)

| HOLDER # | 1-20304 | 1-30304 | 1-40304 | 1-20305 | 1-30305 | 1-40305 |
|--------------|-------------|--------------|--------------|-------------|--------------|--------------|
| A – RW Taper | 4 | 4 | 4 | 5 | 5 | 5 |
| B – Diameter | .88 (22.23) | 1.00 (25.40) | 1.25 (31.75) | .88 (22.23) | 1.00 (25.40) | 1.25 (31.75) |

- FOR USE WHERE WELDING SPACE IS LIMITED. STANDARD BODY LENGTH IS 3.0 (76.20).

- Dimensions Shown Are: inches (mm).

HOLDERS

Offset Non-Ejector Electrode Holders

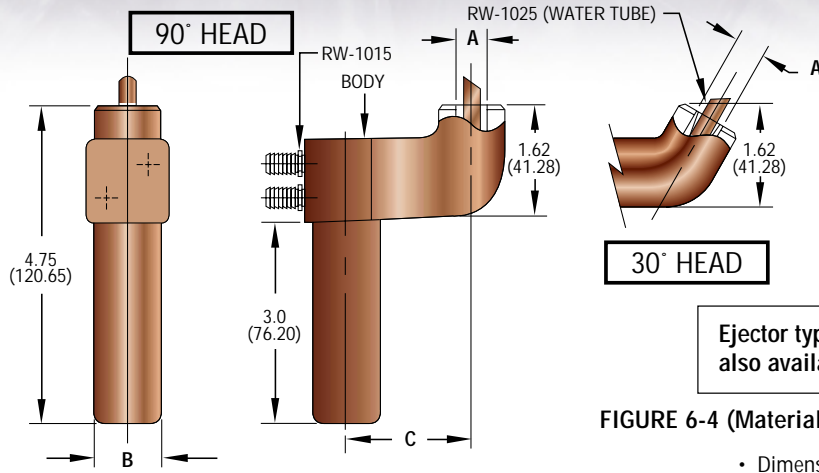


FIGURE 6-4 (Material RWMA Class 3)

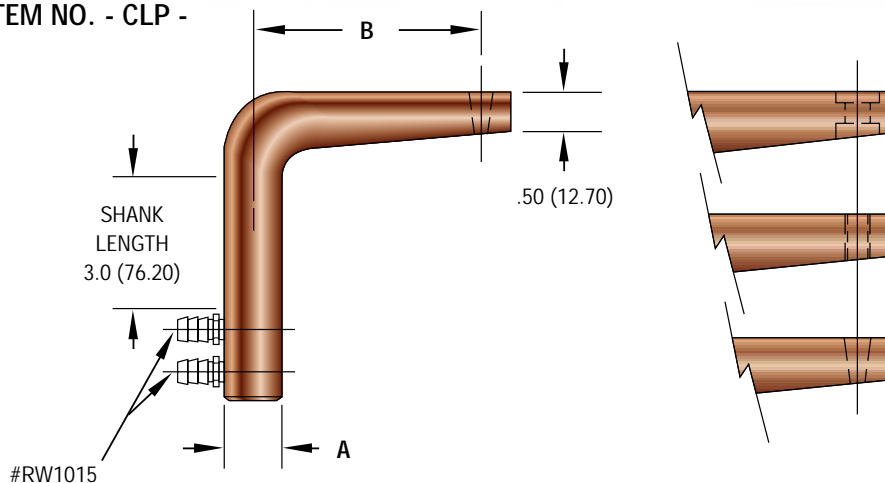
• Dimensions Shown Are: inches (mm).

| OFFSET HOLDERS – Ordering Chart | | | | |
|---------------------------------|---------------|---------------|---------------|---------------|
| 90° COMPLETE HOLDER NO. | B30304 | B40304 | B30305 | B40305 |
| RW Electrode Taper | 4 | 4 | 5 | 5 |
| A – Diameter | .463 (11.76) | .463 (11.76) | .619 (15.72) | .619 (15.72) |
| B – Diameter | 1.00 (25.40) | 1.25 (31.75) | 1.00 (25.40) | 1.25 (31.75) |
| C – Offset | 2.00 (50.80) | 2.00 (50.80) | 2.00 (50.80) | 2.00 (50.80) |
| Body | RW-1122-2 | RW-1122-3 | RW-1122-5 | RW-1122-6 |
| 90° COMPLETE HOLDER NO. | G30304 | G40304 | G30305 | G40305 |
| RW Electrode Taper | 4 | 4 | 5 | 5 |
| A – Diameter | .463 (11.76) | .463 (11.76) | .619 (15.72) | .619 (15.72) |
| B – Diameter | 1.00 (25.40) | 1.25 (31.75) | 1.00 (25.40) | 1.25 (31.75) |
| C – Offset | 3.00 (76.20) | 3.00 (76.20) | 3.00 (76.20) | 3.00 (76.20) |
| Body | RW-1126-2 | RW-1126-3 | RW-1126-5 | RW-1126-6 |
| 90° COMPLETE HOLDER NO. | C30304 | C40304 | C30305 | C40305 |
| RW Electrode Taper | 4 | 4 | 5 | 5 |
| A – Diameter | .463 (11.76) | .463 (11.76) | .619 (15.72) | .619 (15.72) |
| B – Diameter | 1.00 (25.40) | 1.25 (31.75) | 1.00 (25.40) | 1.25 (31.75) |
| C – Offset | 4.00 (101.60) | 4.00 (101.60) | 4.00 (101.60) | 4.00 (101.60) |
| Body | RW-1123-2 | RW-1123-3 | RW-1123-5 | RW-1123-6 |
| 30° COMPLETE HOLDER NO. | D30304 | D40304 | D30305 | D40305 |
| RW Electrode Taper | 4 | 4 | 5 | 5 |
| A – Diameter | .463 (11.76) | .463 (11.76) | .619 (15.72) | .619 (15.72) |
| B – Diameter | 1.00 (25.40) | 1.25 (31.75) | 1.00 (25.40) | 1.25 (31.75) |
| C – Offset | 2.00 (50.80) | 2.00 (50.80) | 2.00 (50.80) | 2.00 (50.80) |
| Body | RW-1124-2 | RW-1124-3 | RW-1124-5 | RW-1124-6 |
| 30° COMPLETE HOLDER NO. | E30304 | E40304 | E30305 | E40305 |
| RW Electrode Taper | 4 | 4 | 5 | 5 |
| A – Diameter | .463 (11.76) | .463 (11.76) | .619 (15.72) | .619 (15.72) |
| B – Diameter | 1.00 (25.40) | 1.25 (31.75) | 1.00 (25.40) | 1.25 (31.75) |
| C – Offset | 3.00 (76.20) | 3.00 (76.20) | 3.00 (76.20) | 3.00 (76.20) |
| Body | RW-1127-2 | RW-1127-3 | RW-1127-5 | RW-1127-6 |
| 30° COMPLETE HOLDER NO. | F30304 | F40304 | F30305 | F40305 |
| RW Electrode Taper | 4 | 4 | 5 | 5 |
| A – Diameter | .463 (11.76) | .463 (11.76) | .619 (15.72) | .619 (15.72) |
| B – Diameter | 1.00 (25.40) | 1.25 (31.75) | 1.00 (25.40) | 1.25 (31.75) |
| C – Offset | 4.00 (101.60) | 4.00 (101.60) | 4.00 (101.60) | 4.00 (101.60) |
| Body | RW-1125-2 | RW-1125-3 | RW-1125-5 | RW-1125-6 |

HOLDERS

Paddle Type Holders - Type 1, 2 & 3

ITEM NO. - CLP -



SAMPLE TIPS:

TYPE-1 – XC-2998
• See Pg. 3-3 For Caps.

TYPE-2 – CL-78-50C
• See Pg. 3-4 For Caps.

TYPE-3 – CLPC-2998
• See Pg. 3-3 For Caps.

FIGURE 6-5 (Material RWMA Class 2 & 3)

• FINAL FIGURE USED IN ORDERING –

- Indicate Desired Shank Diameter "A" - In .125 (3.18) Increments
- Indicate Desired Offset Dimension "B" - In .250 (6.35) Increments
- For Holders & Tips Specify RWMA Class 2 Or 3 Requirements

EXAMPLE:

HOLDER, RWMA CLASS 2, TYPE - 3, "A" = 1.00 (25.40) DIAMETER, "B" = 4.00 (101.60) OFFSET.

CLP- 2 3- 8 16
Item No. "B" Dimension
RWMA "A" Diameter
Alloy Class Type

Platen Mount - Holders

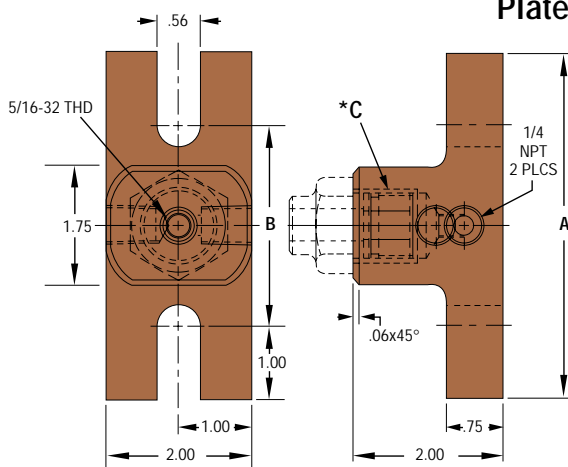


FIGURE 6-6 (Material RWMA Class 2)

| DIM. | CL-1-PM-"X" | CL-2-PM- "X" |
|------|---------------|---------------|
| A | 4.75 (120.65) | 7.00 (177.80) |
| B | 2.75 (69.85) | 4.31 (109.47) |

| C* | X |
|--|------------------|
| For these thread/taper types | Replace "X" with |
| 1/2 Pipe Thread | 50P |
| 5/8 Pipe Thread | 62P |
| 3/4 Pipe Thread | 75P |
| 7/8-14 Straight Thread | 87S |
| 1-12 Straight Thread | 10S |
| 4RW Taper | 4E |
| 5RW Taper | 5E |
| 6RW Taper | 6E |
| 7RW Taper | 7E |
| *Other threads/tapers available upon request | |

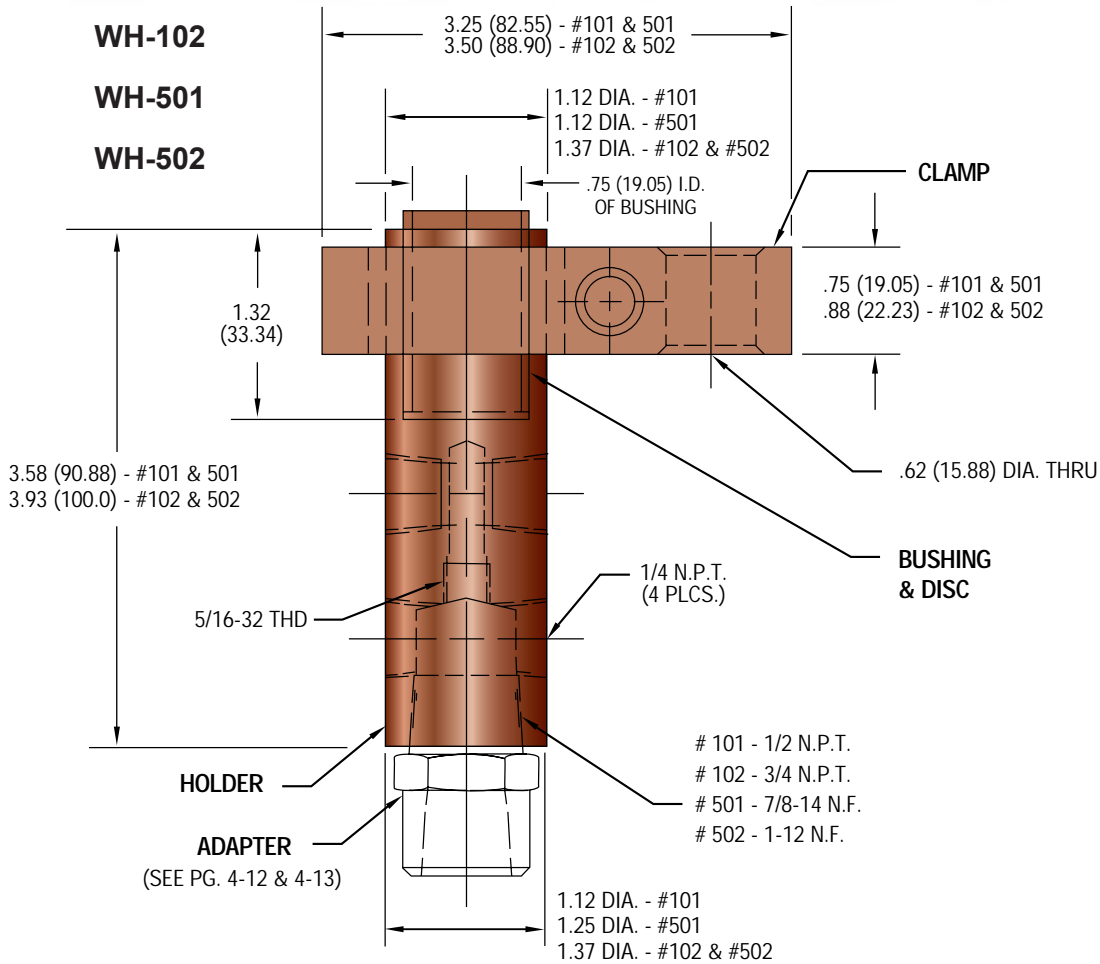
See pages 4-12 & 4-13
for Adapters.

See pages 9-1 & 9-2
for Water Tubes.

HOLDERS

Cylinder Mounted Holders

ITEM NO. WH-101



• Dimensions Shown Are: inches (mm).

FIGURE 6-7 (Material - Copper)

101, 102, 501 & 502 SERIES HOLDERS

| DETAILS | 1/2 N.P.T. | 3/4 N.P.T. | 7/8-14 N.F. | 1-12 N.F. |
|---------------|------------|------------|-------------|-----------|
| ASSEMBLY NO.* | WH-1010C | WH-1020C | WH-5010C | WH-5020C |
| BARREL | WH-101-1 | WH-102-1 | WH-501-1 | WH-502-1 |
| CLAMP NO. | WH-101-2 | WH-102-2 | WH-101-2 | WH-102-2 |
| BUSHING NO. | WH-101-3 | WH-101-3 | WH-101-3 | WH-101-3 |
| DISC NO. | WH-101-4 | WH-101-4 | WH-101-4 | WH-101-4 |

*A complete assembly consists of a barrel, clamp, bushing and disc.

HOLDERS

Cylinder Mounted Holders

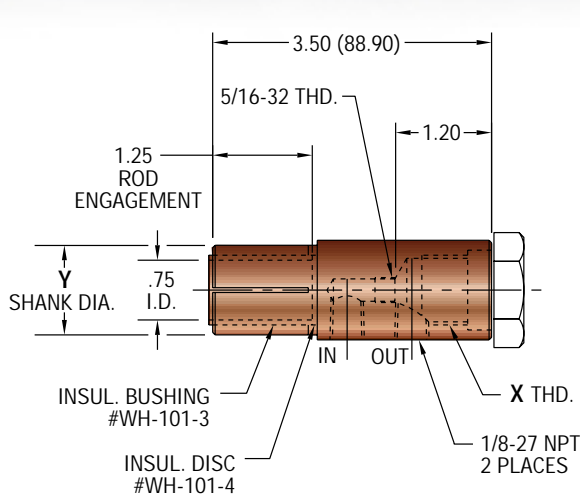


FIGURE 6-8 (Material RWMA Class 2)
Straight Barrel (WHCL Series)

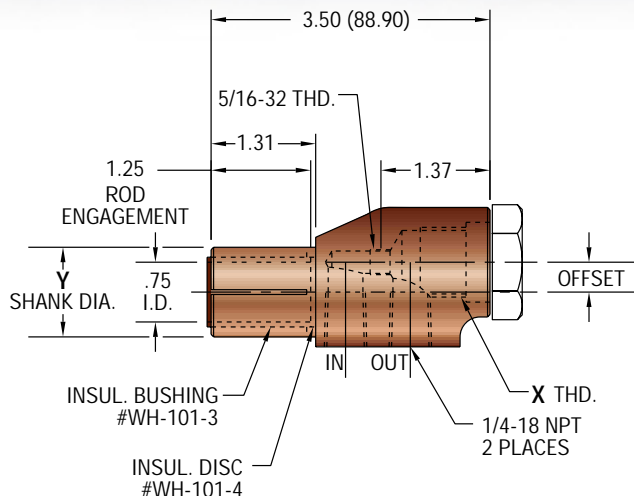


FIGURE 6-9 (Material RWMA Class 3)
Offset Barrel (WHCLO Series)

EXAMPLE EXPLANATION CODING

| | |
|---------------------------------------|---|
| CENTERLINE BARRELS | USE WHCL |
| OFFSET | USE 0 FOR OFFSET BARRELS OMIT FOR STRAIGHT BARRELS |
| X =THREAD | USE 50P FOR .500 PIPE THREAD USE 62P FOR .625 PIPE THREAD USE 75P FOR .750 PIPE THREAD USE 87S FOR .875 STRAIGHT THREAD USE 10S FOR 1.00 STRAIGHT THREAD |
| Y=SHANK | USE 112 FOR 1-1/8 DIAMETER USE 125 FOR 1-1/4 DIAMETER USE 137 FOR 1-3/8 DIAMETER |
| OFFSET (IN .125 (3.18) INCREMENTS) | USE 1 FOR 1/8 OFFSET (MINIMUM) USE 2 FOR 1/4 OFFSET USE 3 FOR 3/8 OFFSET USE 4 FOR 1/2 OFFSET USE 5 FOR 5/8 OFFSET USE 6 FOR 3/4 OFFSET USE 7 FOR 7/8 OFFSET USE 8 FOR 1" OFFSET (MAXIMUM) |

WHCL 0 87S 112 8



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HOLDERS

Heavy Duty Cylinder Mounted Holders

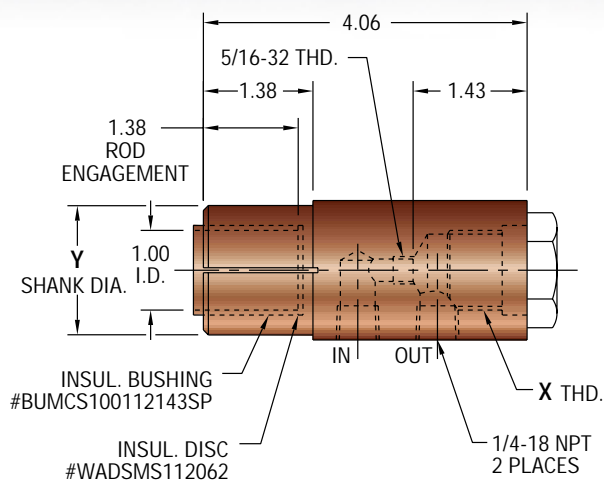


FIGURE 6-10 (Material RWMA Class 2)
HEAVY DUTY STRAIGHT BARREL
(WHCLH Series)

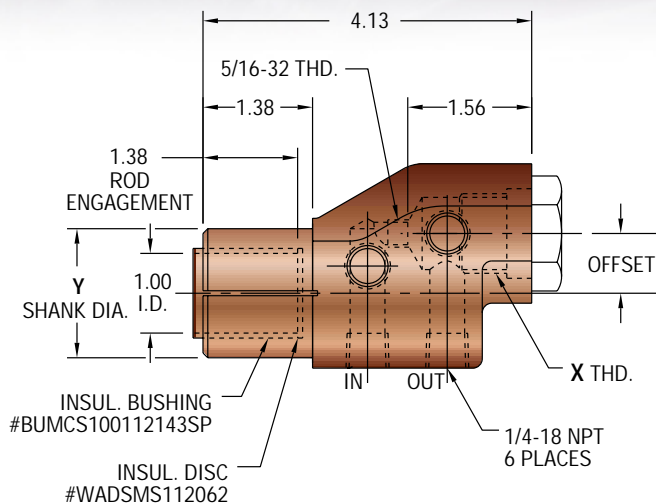
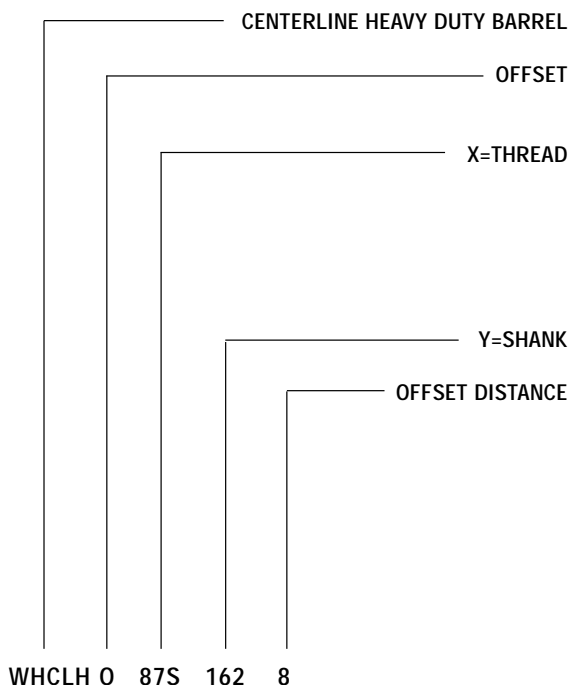


FIGURE 6-11 (Material RWMA Class 3)
HEAVY DUTY OFFSET BARREL
(WHCLHO Series)

EXAMPLE EXPLANATION CODING



USE WHCLH

USE 0 FOR OFFSET BARRELS
OMIT FOR STRAIGHT BARRELS

USE 50P FOR .500 PIPE THREAD
USE 62P FOR .625 PIPE THREAD
USE 75P FOR .750 PIPE THREAD
USE 87S FOR .875 STRAIGHT THREAD
USE 10S FOR 1.00 STRAIGHT THREAD
USE 12S FOR 1.25 STRAIGHT THREAD

USE 162 FOR 1-5/8 DIAMETER

USE 1 FOR 1/8 OFFSET (MINIMUM)
USE 2 FOR 1/4 OFFSET
USE 3 FOR 3/8 OFFSET
USE 4 FOR 1/2 OFFSET
USE 5 FOR 5/8 OFFSET
USE 6 FOR 3/4 OFFSET
USE 7 FOR 7/8 OFFSET
USE 8 FOR 1" OFFSET (MAXIMUM)

HOLDERS

Light Duty Cylinder Mounted Holders

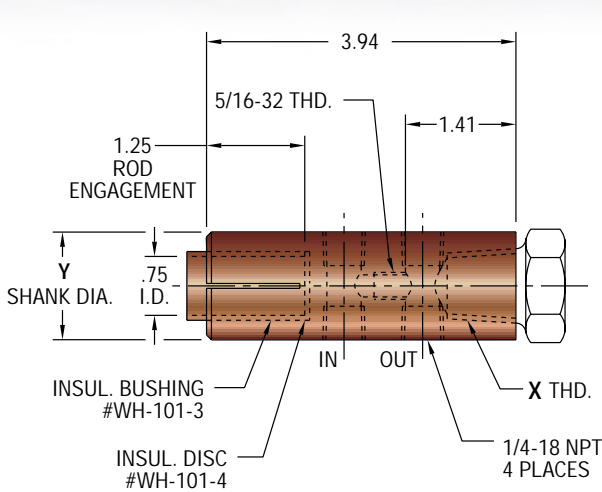


FIGURE 6-12 (Material RWMA Class 2)
LIGHT DUTY STRAIGHT BARREL
(WHCLL Series)

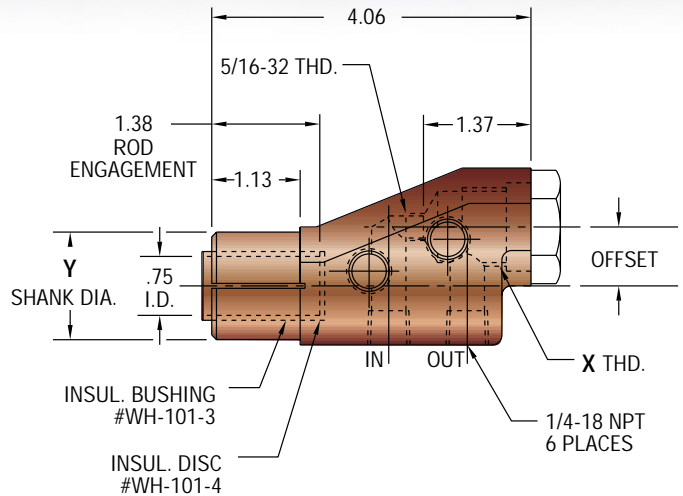
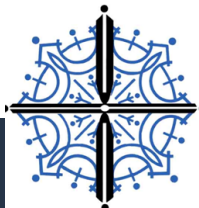


FIGURE 6-13 (Material RWMA Class 3)
LIGHT DUTY OFFSET BARREL
(WHCLLO Series)

EXAMPLE EXPLANATION CODING

| | |
|------------------------------|---|
| CENTERLINE LIGHT DUTY BARREL | USE WHCLL |
| OFFSET | USE 0 FOR OFFSET BARRELS OMIT FOR STRAIGHT BARRELS |
| X=THREAD | USE 50P FOR .500 PIPE THREAD USE 62P FOR .625 PIPE THREAD USE 75P FOR .750 PIPE THREAD USE 87S FOR .875 STRAIGHT THREAD USE 10S FOR 1.00 STRAIGHT THREAD |
| Y=SHANK | USE 137 FOR 1-3/8 DIAMETER |
| OFFSET DISTANCE | USE 1 FOR 1/8 OFFSET (MINIMUM) USE 2 FOR 1/4 OFFSET USE 3 FOR 3/8 OFFSET USE 4 FOR 1/2 OFFSET USE 5 FOR 5/8 OFFSET USE 6 FOR 3/4 OFFSET USE 7 FOR 7/8 OFFSET USE 8 FOR 1" OFFSET (MAXIMUM) |

WHCLL 0 87S 112 8



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HOLDERS

Light Duty Shunt/Cable Clamps

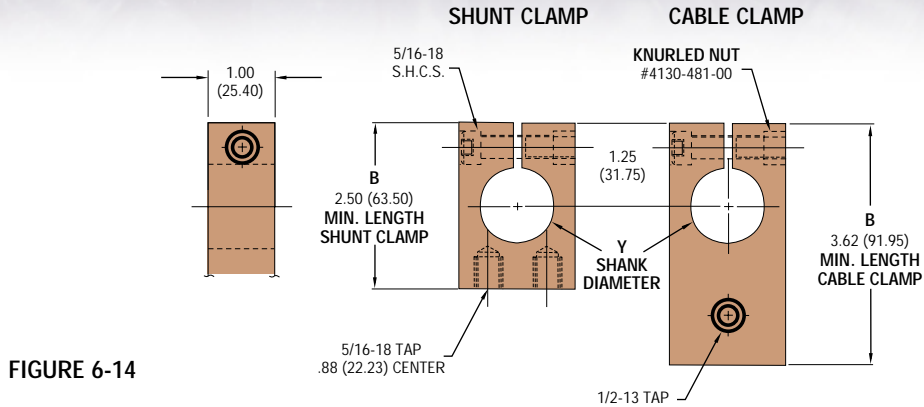


FIGURE 6-14

EXAMPLE EXPLANATION CODING

| | |
|-------------------------------|--|
| CENTERLINE CABLE/SHUNT CLAMPS | USE WHCLSA FOR SHUNT CLAMPS USE WHCLCA FOR CABLE CLAMPS |
| Y = SHANK DIAMETER | USE 112 FOR 1.125 DIAMETER USE 125 FOR 1.250 DIAMETER USE 137 FOR 1.375 DIAMETER |
| B = LENGTH | USE 0250 FOR 2.50 LENGTH (MIN. FOR WHCLSA) USE 0362 FOR 3.62 LENGTH (MIN. FOR WHCLCA) etc. |

WHCLSA 112 0250

Heavy Duty Shunt/Cable Clamps

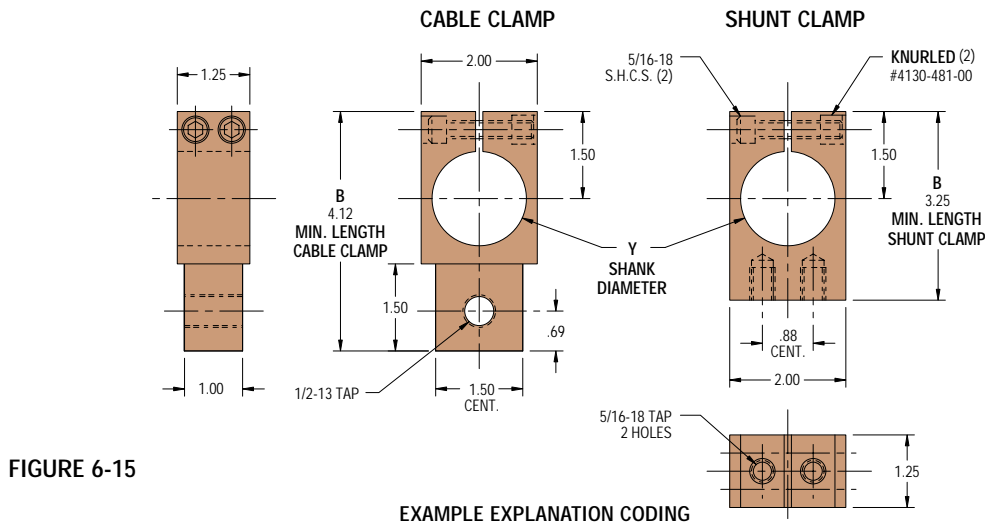


FIGURE 6-15

EXAMPLE EXPLANATION CODING

| | |
|--|--|
| CENTERLINE HEAVY DUTY CABLE/SHUNT CLAMPS | USE WHCLHSA FOR SHUNT CLAMPS USE WHCLHCA FOR CABLE CLAMPS |
| Y = SHANK DIAMETER | USE 162 FOR 1.625 DIAMETER |
| B = LENGTH | USE 0325 FOR 3.25 LENGTH (MIN. FOR WHCLHSA) USE 0412 FOR 4.12 LENGTH (MIN. FOR WHCLHCA) etc. |

WHCLHCA 162 0412

HOLDERS

Gun Type Holders (Forging) (Barrel Lock Style)

ITEM NO. – CLHA20-

TYPE "A"

1.38 (34.93) Diameter Forging
Use with Barrel Lock
No. PB-1089-01
(Order Separately)

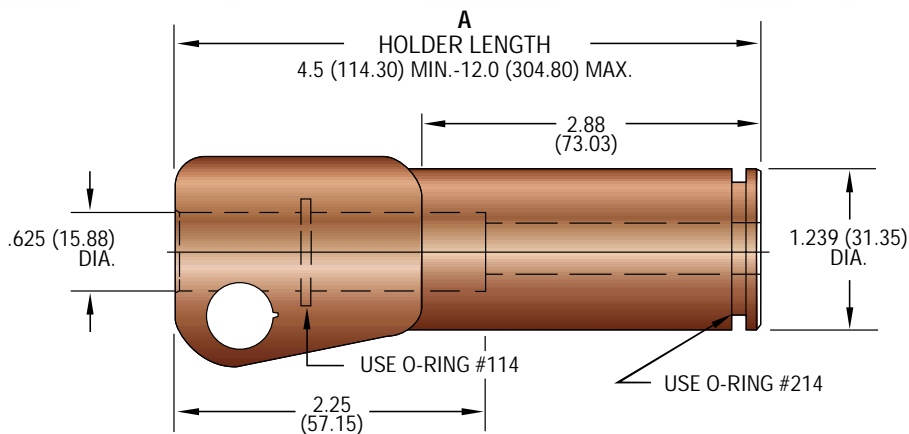


FIGURE 6-16 (Material RWMA Class 3)

ITEM NO. – CLHB25-

TYPE "B"

1.38 (34.93) Diameter Forging
Use with Barrel Lock
No. PB-1089-02
(Order Separately)

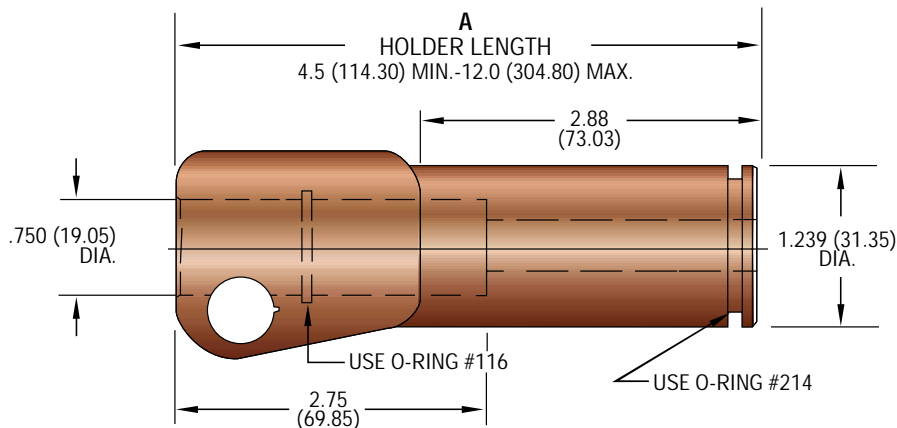


FIGURE 6-17 (Material RWMA Class 3)

• FINAL FIGURE USED IN ORDERING –

- Indicate Desired "A" Length - In .50 (12.70) Increments

EXAMPLE: TYPE "A" WITH 7.50 (190.50) LENGTH

CLHA20 - 15
Item No. _____ "A" Length

- Dimensions Shown Are: inches (mm).

HOLDERS

Gun Type Holders (Forging) (Barrel Lock Style)

ITEM NO. – CLHC30-

TYPE "C"

1.63 (41.28) Diameter Forging
Use with Barrel Lock
No. PB-1089-04
(Order Separately)

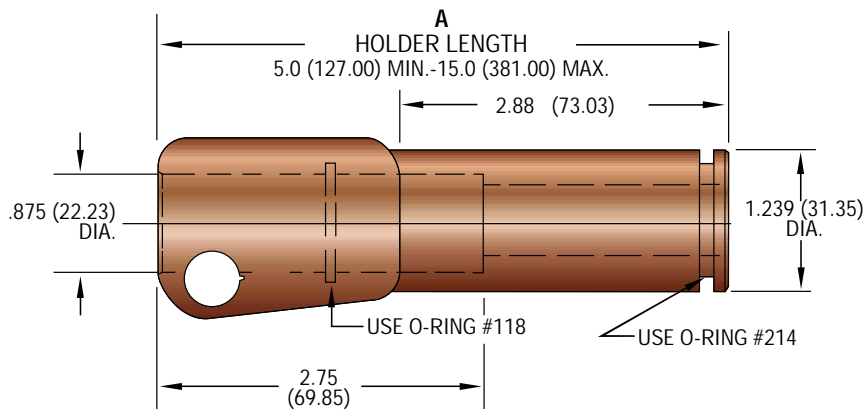


FIGURE 6-18 (Material RWMA Class 3)

ITEM NO. – CLHD35-

TYPE "D"

1.63 (41.28) Diameter Forging
Use with Barrel Lock
No. PB-1089-04
(Order Separately)

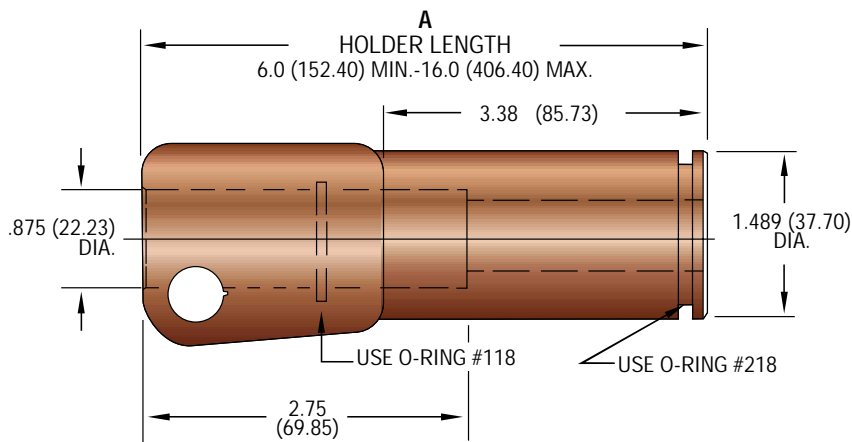


FIGURE 6-19 (Material RWMA Class 3)

• FINAL FIGURE USED IN ORDERING –

- Indicate Desired Holder Length "A" - In .50 (12.70) Increments

EXAMPLE: TYPE "C" WITH 14.00 (355.60) LENGTH

CLHC30 - 28
Item No. _____ "A"
Length

- Dimensions Shown Are: inches (mm).

HOLDERS

Gun Type Holders (Forging) (Barrel Lock Style)

ITEM NO. – CLHE40-

TYPE "E"

Use with Barrel Lock Ass'y
No. PB-1089-02
(Order Separately)

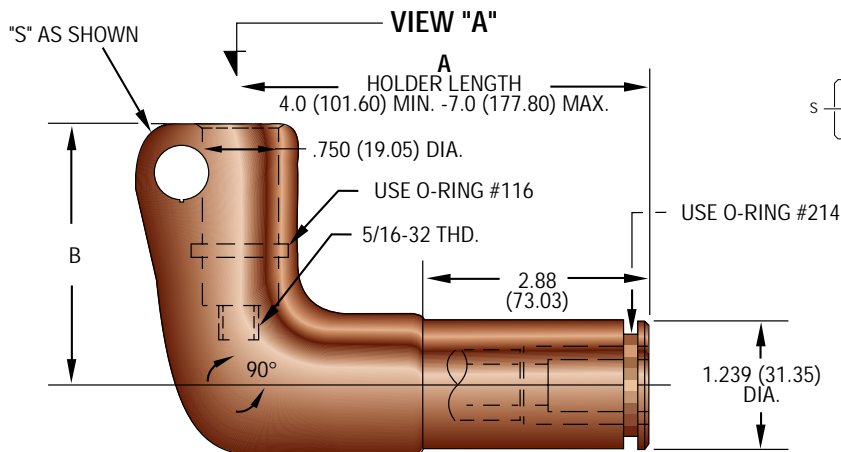


FIGURE 6-20 (Material RWMA Class 3)

ITEM NO. – CLHF45-

TYPE "F"

Use with Barrel Lock Ass'y
No. PB-1089-04
(Order Separately)

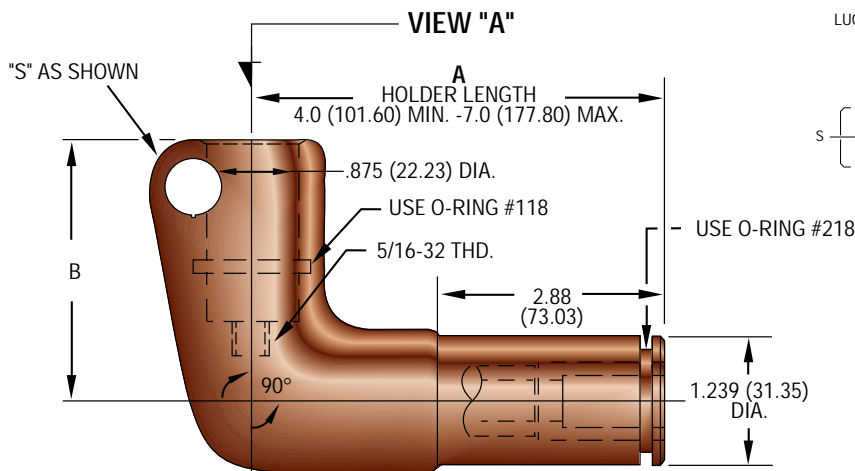


FIGURE 6-21 (Material RWMA Class 3)

• FINAL FIGURE USED IN ORDERING –

- Indicate Desired Holder Length "A" - In .50 (12.70) Increments
- Indicate Desired Offset Dimension "B" - In .25 (6.35) Increments

EXAMPLE: TYPE "E", "A" = 6.00 (152.40) LENGTH, "B" = 2.50 (63.50), "S" LUG POSITION.

CLHE40 - 12 - 10 - S
Item No. _____ Lug
"A" _____ "B"

• Dimensions Shown Are: inches (mm).

HOLDERS

Gun Type Holders (Forging) (Barrel Lock Style)

ITEM NO. – CLHG50-

TYPE "G"

1.38 (34.93) Diameter Forging
Use with Barrel Lock
No. PB-1089-01
(Order Separately)

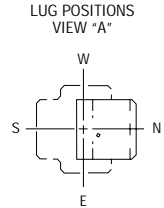
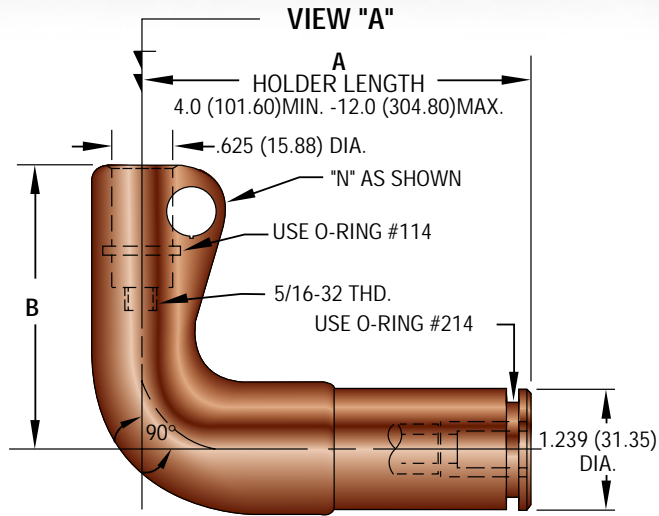


FIGURE 6-22 (Material RWMA Class 3)

ITEM NO. – CLHH55-

TYPE "H"

1.38 (34.93) Diameter Forging
Use with Barrel Lock
No. PB-1089-02
(Order Separately)

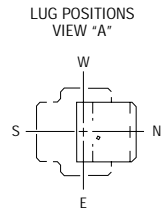
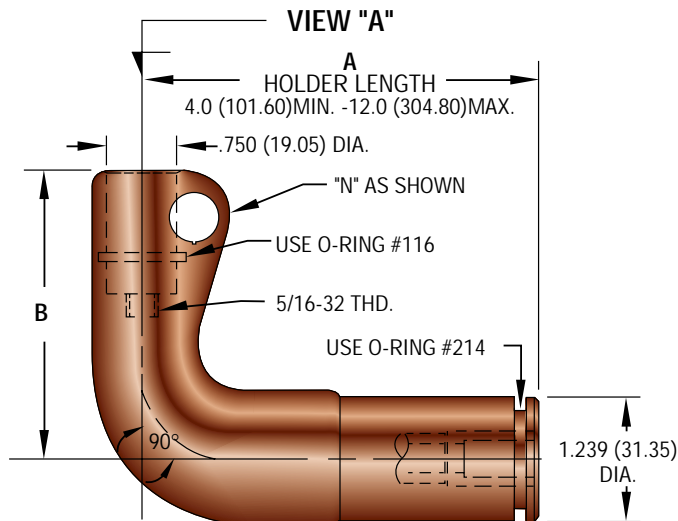


FIGURE 6-23 (Material RWMA Class 3)

• FINAL FIGURE USED IN ORDERING –

- Indicate Desired Holder Length "A" - In .50 (12.70) Increments
- Indicate Desired Offset Dimension "B" - In .25 (6.35) Increments

EXAMPLE: TYPE "G", "A" = 11.00 (279.40) LENGTH, "B" = 5.00 (127.00), "N" LUG POSITION.

CLHG50 - 22 - 20 - N

Item No. _____ Lug _____

"A" _____ "B" _____

• Dimensions Shown Are: inches (mm).

HOLDERS

Gun Type Holders Pipe Thread Style

ITEM NO. – CLHJ602-

TYPE "J"
PIPE THD. = 1/2 N.P.T.

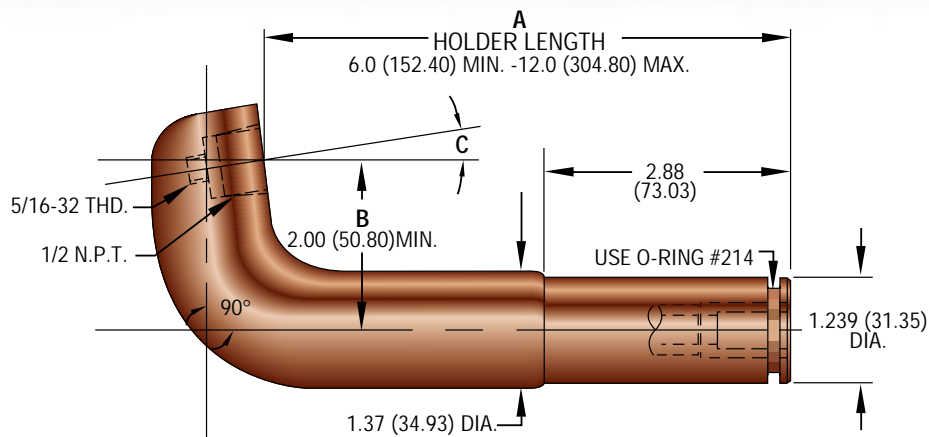


FIGURE 6-24 (Material RWMA Class 2&3)

ITEM NO. – CLHK652-

TYPE "K"
PIPE THD. = 5/8 N.P.T.

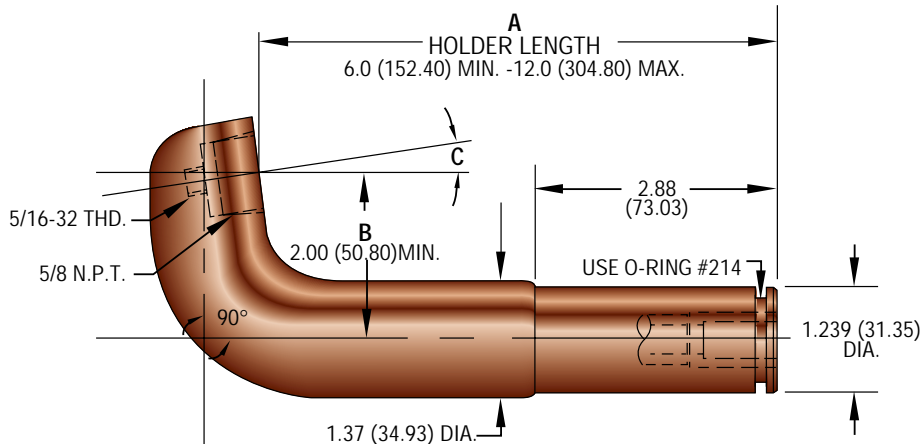


FIGURE 6-25 (Material RWMA Class 2&3)

• FINAL FIGURE USED IN ORDERING –

- Indicate Desired Holder Length "A" - In .50 (12.70) Increments
- Indicate Desired Offset Dimension "B" - In .25 (6.35) Increments
- Specify – "C" – 0-90°

EXAMPLE: TYPE "J", CLASS 3, "A" = 12.00 (304.80) LENGTH, "B" = 8.00 (203.20), "C" = 10°.

CLHJ603 - 24 - 32 - 10
Item No. _____
Class No. _____
"A" _____
"B" _____
"C" _____

• Dimensions Shown Are: inches (mm).

HOLDERS

Gun Type Holders Pipe Thread Style

ITEM NO. – CLHL702-

TYPE "L"
PIPE THD. = 3/4 N.P.T.

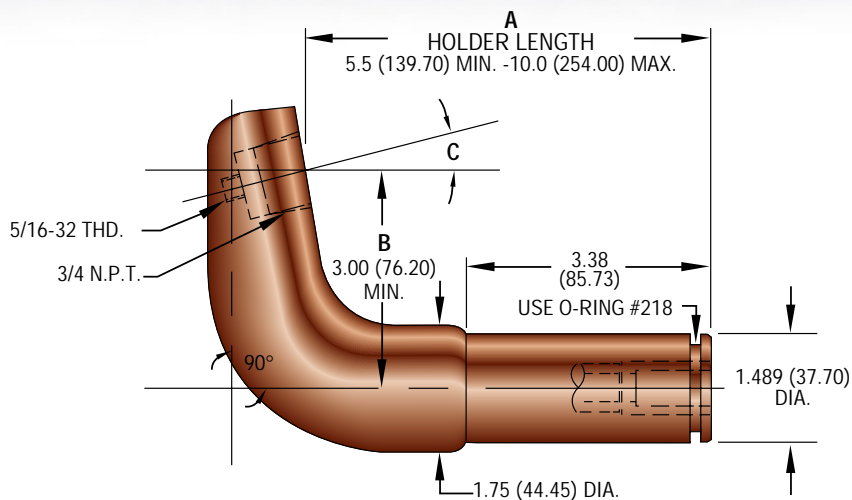


FIGURE 6-26 (Material RWMA Class 2&3)

ITEM NO. – CLHM752-

TYPE "M"
PIPE THD. = 1 N.P.T.

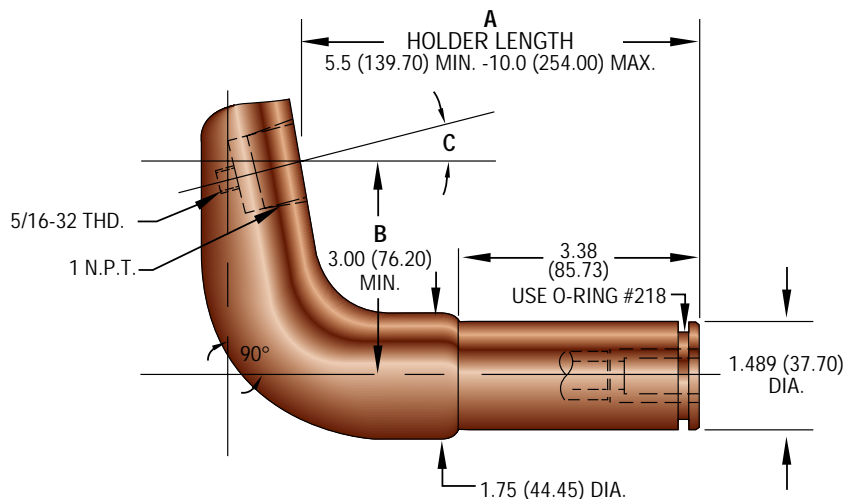


FIGURE 6-27 (Material RWMA Class 2&3)

• FINAL FIGURE USED IN ORDERING –

- Indicate Desired Holder Length "A" - In .50 (12.70) Increments
- Indicate Desired Offset Dimension "B" - In .25 (6.35) Increments
- Specify – "C" – 0-90°

EXAMPLE: TYPE "L", CLASS 2, "A" = 5.50 (139.70) LENGTH, "B" = 7.00 (177.80), "C" = 10°.

CLHL702 - 11 - 28 - 10
 Item No. _____
 Class No. _____
 "A" _____ "C" _____
 "B" _____

• Dimensions Shown Are: inches (mm).

HOLDERS

Gun Type Holders Pipe Thread Style

TYPE "N"
(With 1/2 N.P.T.)

ITEM NO. – CLHN802-

TYPE "O"
(With 5/8 N.P.T.)

ITEM NO. – CLH0852-

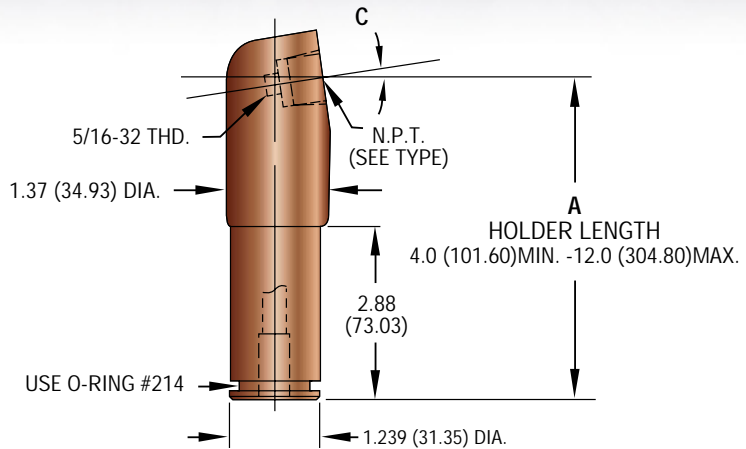


FIGURE 6-28 (Material RWMA Class 2&3)

TYPE "P"
(With 3/4 N.P.T.)

ITEM NO. – CLHP902-

TYPE "R"
(With 1 N.P.T.)

ITEM NO. – CLHR952-

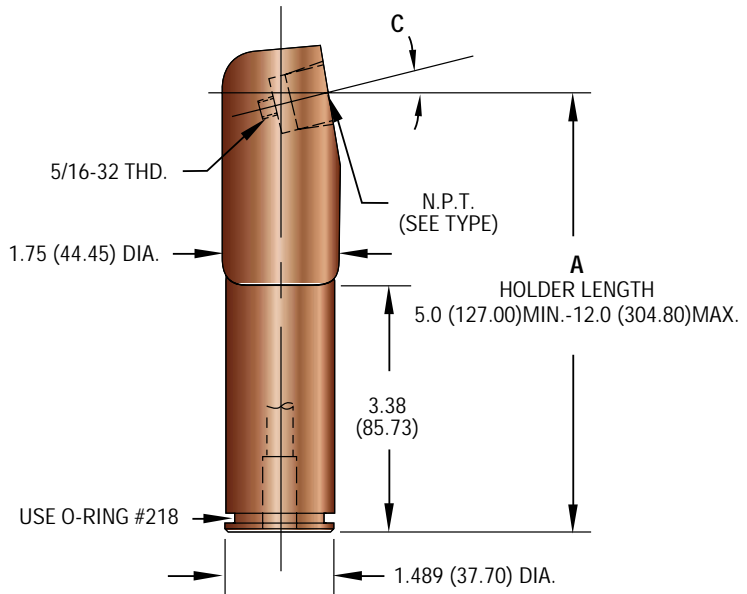


FIGURE 6-29 (Material RWMA Class 2&3)

• FINAL FIGURE USED IN ORDERING –

- Indicate Desired Holder Length "A" - In .50 (12.70) Increments
- Specify – "C" – 0-90°

EXAMPLE: TYPE "N", 1/2-14 N.P.T., CLASS 3, "A" = 9.00 (228.60) LENGTH, "C" = 10°.

CLHN803 - 18 - 10
 Item No. _____
 Class No. _____
 "A" _____
 "C" _____

• Dimensions Shown Are: inches (mm).

SPOT WELDING MACHINE ARMS & CAPS

CenterLine Spot Welding Machine Arms are engineered and manufactured to accommodate any of the standard line CenterLine Electrode Holders as well as most other special shank type holders which might be required for specific special applications.

Among the benefits to be obtained from use of our Spot Welding Arms are:

- **reduction in required set-up time** resulting from easier front attachment feature.
- **extended arm life** which occurs as a consequence of reduced bolt hole thread wear. Hole and threads are cut through steel insert which is less malleable than copper used for basic arm.

NOTE: CenterLine can engineer and/or manufacture special spot welding machine arms for particular applications based on customer specifications.

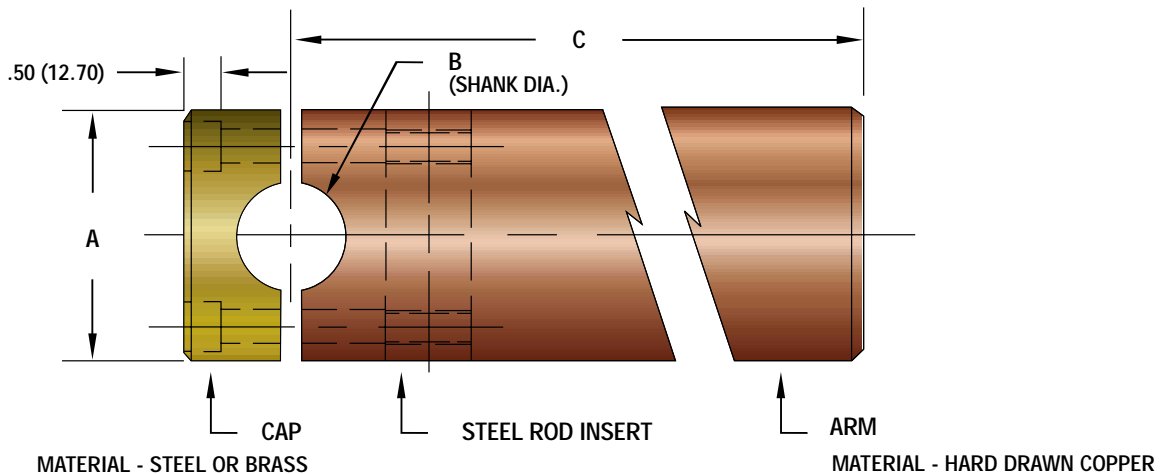


FIGURE 7-1

| ORDERING CHART | |
|----------------|---|
| CLRA | STANDARD PREFIX - ARM (ONLY) |
| CLRC | STANDARD PREFIX - CAP (ONLY) |
| CLRAC | STANDARD PREFIX - ARM & CAP ASSEMBLY |
| 04 THRU 16 | "A" DIAMETER - .25 (6.35) INCREMENTS |
| 06 THRU 16 | "B" DIAMETER - .12 (3.18) INCREMENTS |
| 8 THRU 50 | "C" DIMENSION - 1.00 (25.40) INCREMENTS |
| "B" OR "S" | BRASS OR STEEL - (CAP ONLY) |

EXAMPLE: Arm & Cap Assembly, "A" Dia. = 3.00 (76.20), "B" Dia. = 1.25 (31.75), "C" = 36.00 (914.40).

CLRAC - 1210 - 36
 Item No. _____
 "A" _____
 "B" _____ "C" _____

• Dimensions Shown Are: inches (mm).

SHUNTS & CABLES

Air-Cooled Jumper Cables

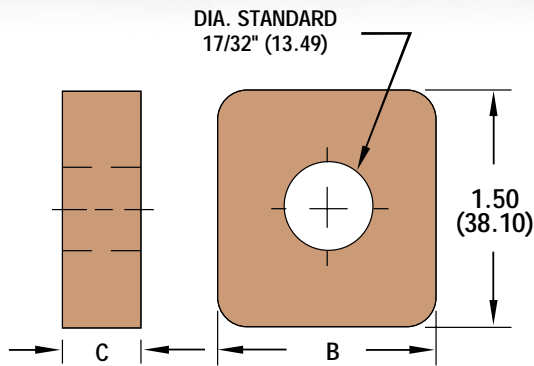


FIGURE 8-1

| TERMINAL DIMENSIONS | | | |
|---------------------|--------------|--------------|--------------|
| MCM | Jacket O.D. | B | C |
| 600 | 1.63 (41.28) | 1.38 (34.93) | .500 (12.70) |
| 750 | 1.75 (44.45) | 1.38 (34.93) | .600 (15.24) |
| 1000 | 2.00 (50.80) | 1.50 (38.10) | .700 (17.78) |
| 1200 | 2.12 (53.98) | 1.50 (38.10) | .820 (20.83) |
| 1500 | 2.25 (57.15) | 1.50 (38.10) | .990 (25.15) |

HOW TO ORDER CENTERLINE AIR-COOLED CABLES

Please Supply the Following Information:

| TYPE | TERMINALS | | M.C.M. | LENGTH |
|------|-----------|---------|--------|------------|
| | 1ST END | 2ND END | | |
| CLAC | F | F | 600 | 20 (508.0) |

EXAMPLE:

CLAC - FF - 600 - 20

END STYLES

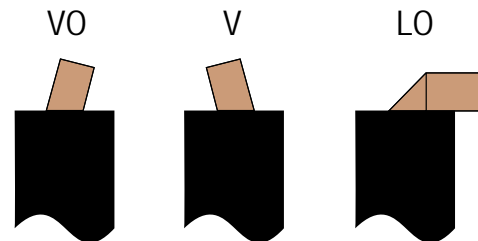
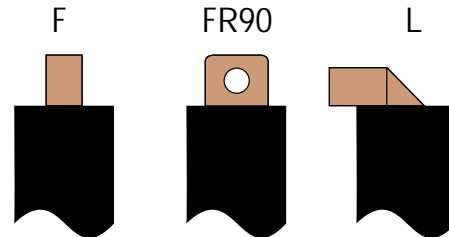


FIGURE 8-2

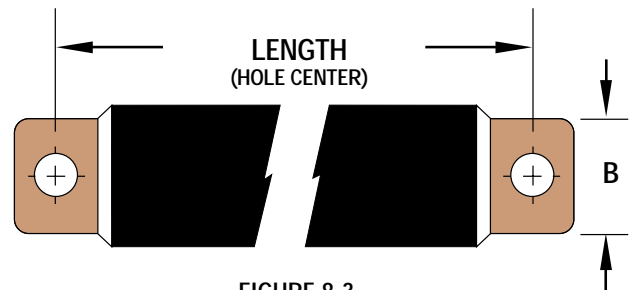
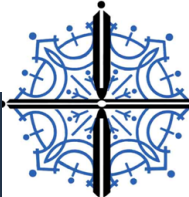


FIGURE 8-3

• WATER-COOLED JUMPER CABLES ALSO AVAILABLE UPON REQUEST

• Dimensions Shown Are: inches (mm).



T. J. SNOW CO., INC.

Resistance Welding Equipment & Supplies
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SHUNTS & CABLES

Laminated Shunts

FURNISH THE FOLLOWING INFORMATION WHEN ORDERING:

| DIMENSIONS | |
|----------------------------|--------------------|
| OUTSIDE LENGTH | O.L. |
| WIDTH | W |
| THICKNESS (LESS CLIP) | T |
| HOLE DIAMETER | |
| TYPE | C,F,J |
| HOLE PATTERN | A,B,C,D |
| END STYLE | CLIP, SOLDER, ETC. |
| DIMENSIONS (IF APPLICABLE) | A,B,X,Y,Z |

Our shunts are custom designed to customer requirements and specifications – and are readily available in any hole pattern, or size. The secondary conductor strips are of high conductivity copper – shunts are normally supplied with their ends secured by riveted copper clips.

CenterLine laminated shunts are now available with a protective covering. Please inquire when placing your order.

- TO ORDER YOUR SPECIALS USE THE CODING CHART ABOVE

TYPE "J"

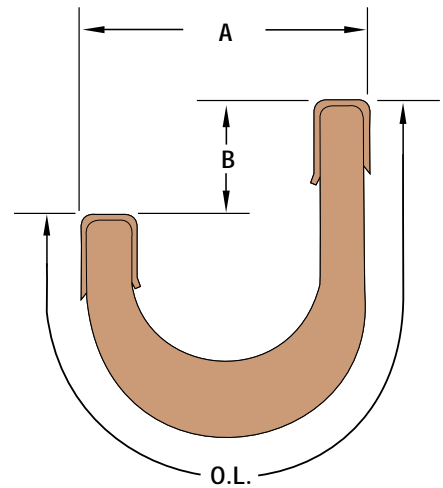


FIGURE 8-4

TYPE "C"

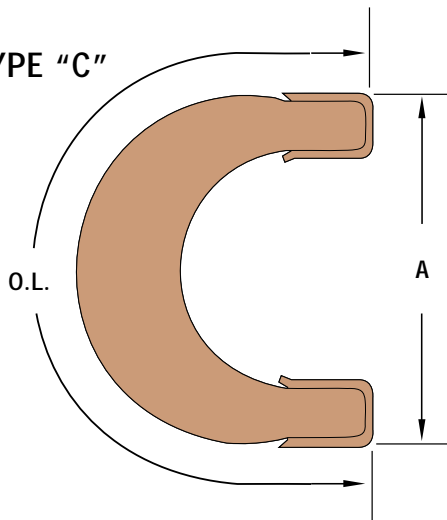


FIGURE 8-5

SAME AS WIDTH OF SHUNT
UNLESS OTHERWISE SPECIFIED

TYPE "F"

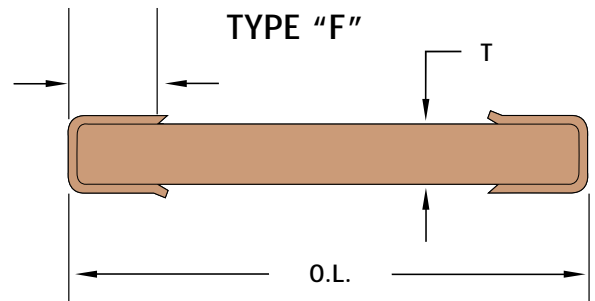


FIGURE 8-6

HOLE PATTERN

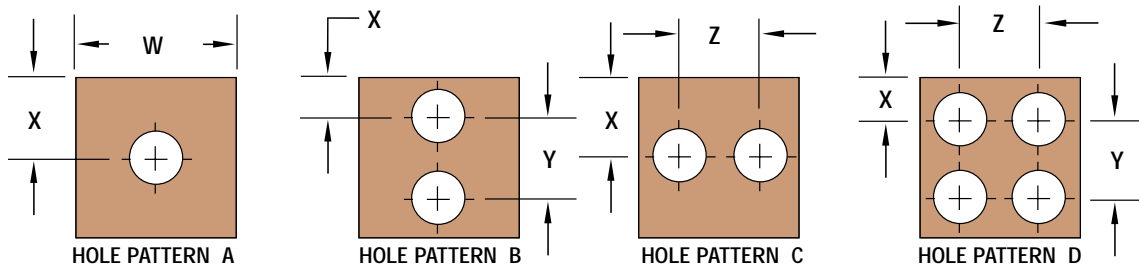


FIGURE 8-7

WATER TUBES

ITEM NO. – CLT-1000-

TYPE "A"

(Use with Telescoping Tubes
Type "B" & "C")

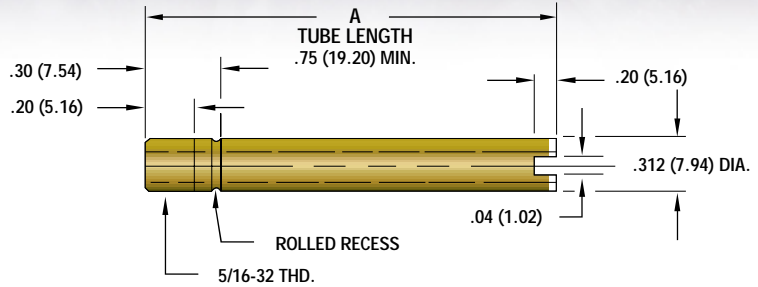


FIGURE 9-1 (Material - 1/4 ID BRASS TUBE)

ITEM NO. – CLT-1200-

TYPE "B"

(Use with 4 RW Electrodes)

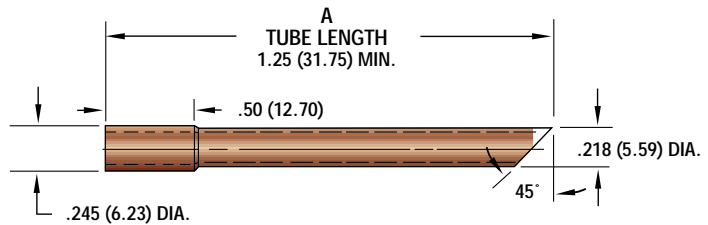


FIGURE 9-2 (Material - Copper)

ITEM NO. – CLT-1300-

TYPE "C"

(Use with 5, 6 & 7 RW Electrodes)

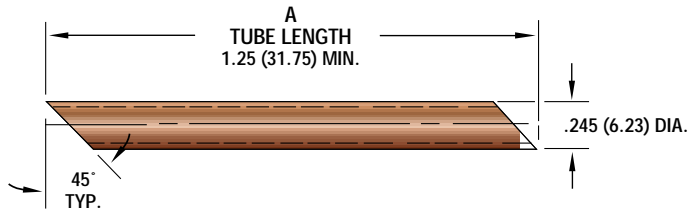


FIGURE 9-3 (Material - Copper)

ITEM NO. – CLT-1400-

TYPE "D"

(Use with 5, 6 & 7 RW Electrodes)

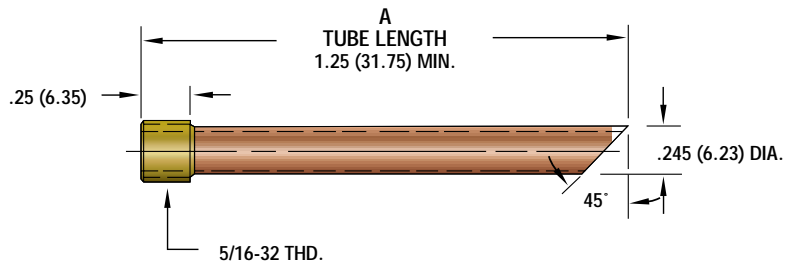


FIGURE 9-4 (Material - Copper & Brass)

ITEM NO. – CLT-1500-

TYPE "E"

(Use with 4 RW Electrodes)

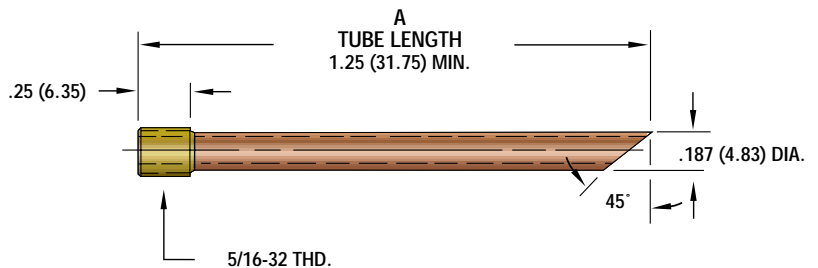


FIGURE 9-5 (Material - Copper & Brass)

WATER TUBES

ITEM NO. – CLT-1600-

TYPE "F"

B = .210 (5.31) DIA.

ITEM NO. – CLT-1700-

TYPE "G"

B = .250 (6.35) DIA.

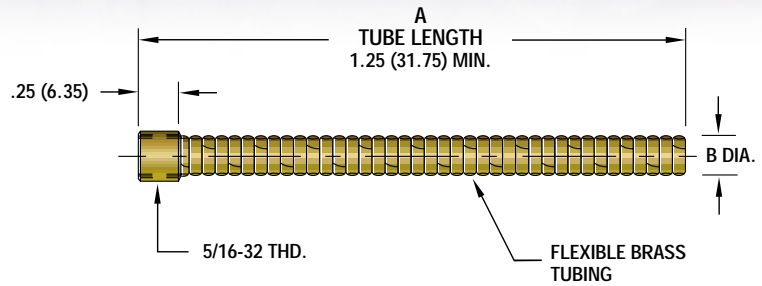


FIGURE 9-6 (Material - Interlocked Flexible Brass)

ITEM NO. – CLT-1800-

TYPE "H"

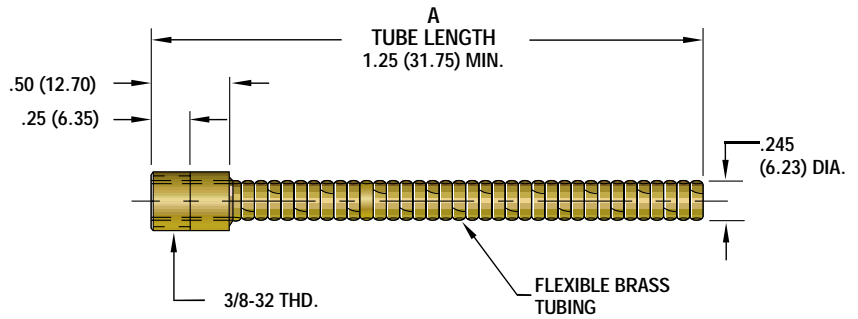
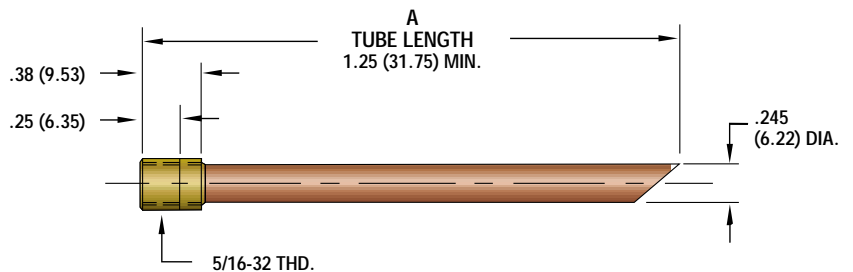


FIGURE 9-7 (Material - Interlocked Flexible Brass)

ITEM NO. – CLT-1900-

TYPE "I"



(Use with 5, 6 & 7 RW Electrodes)

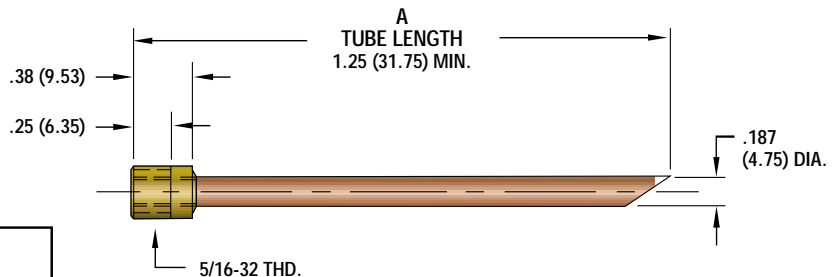
FIGURE 9-8 (Material - Copper & Brass)

ITEM NO. – CLT-2000-

TYPE "J"

(Use with 5, 6 & 7 RW Electrodes)

FIGURE 9-9 (Material - Copper & Brass)



PART NUMBER CODING

- Indicate Desired Tube Length "A" - In .12 (3.18) Increments

EXAMPLE: TYPE "G" WITH 1.50 (38.10) LENGTH

CLT - 1700 -12

Item No. _____

"A"
Length

• Dimensions Shown Are: inches (mm).

SEAM WELDING WHEELS

CenterLine Forged Seam Welding Wheels

are manufactured from a selection of alloys for a wide variety of manufacturing conditions and materials applications.

CenterLine (RWMA Class 1)

For seam welding of aluminum, terne plate and situations where extensive heat is developed.

CenterLine (RWMA Class 2)

Ideal for cold rolled and similar clean uncoated material seam welding applications.

CenterLine (RWMA Class 3)

Usually recommended for seam welding of stainless steels and for use where unusually high pressures prevail.

CenterLine (Zirconium & Dispersion Strengthened Copper)

Suggested for seam welding of galvanized materials and conditions where temperatures are relatively high.

NOTE:

CenterLine Seam Welding Wheels are made available either as A) machined Blanks or B) finished seam welding wheels manufactured to customer specifications.

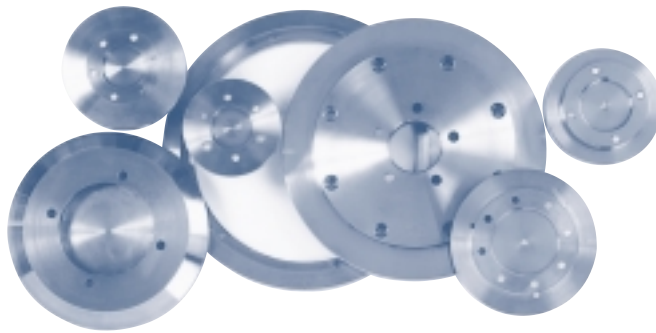


FIGURE 10-1 (Material RWMA Class 1, 2, 3, Zirconium & Dispersion Strengthened Copper)

Raw Materials And Accessories



ALLOY ROD and BAR STOCK

- Forged and Machine Plate
- Hexagon Bar
- Rectangular
- Solid Round Rod

COPPER TUNGSTEN and REFRACTORY METALS



SEAM WELDER SHAFTS and BUSHINGS

- (See above - "Seam Welding Wheels")

STOCK/CUSTOM FORGINGS and CASTINGS

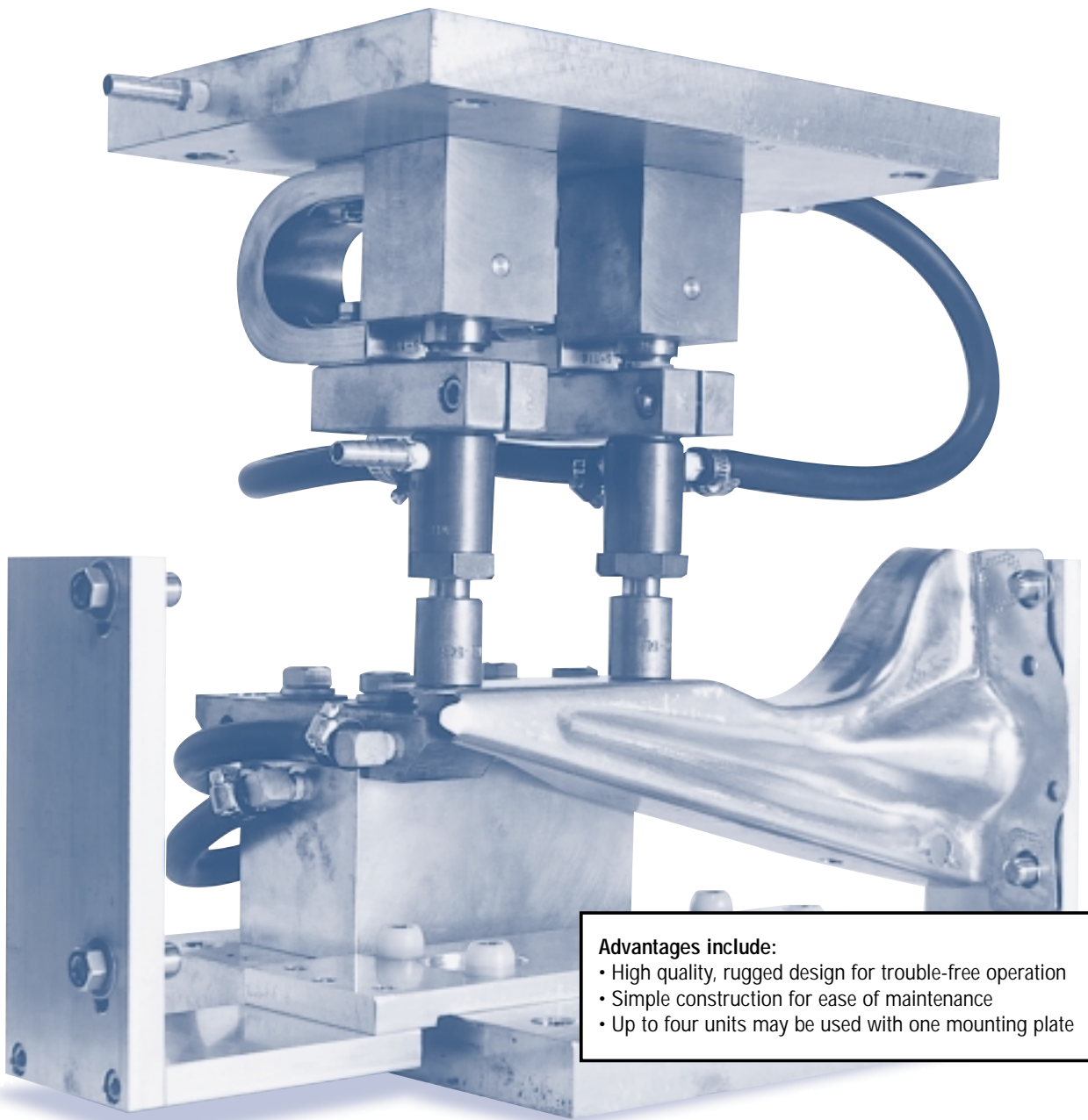
WELDING DIES, HOLDERS and FIXTURES

- Flash, Butt and Projection

GREASE EQUALIZERS

CenterLine **grease equalizers** are available in a variety of styles and configurations to satisfy nearly all multi-spot welding applications. Unlike spring style units, the CenterLine grease equalizers ensure that equal pressure is distributed to all spot locations.

CenterLine can also design and manufacture custom weld fixtures.



Advantages include:

- High quality, rugged design for trouble-free operation
- Simple construction for ease of maintenance
- Up to four units may be used with one mounting plate

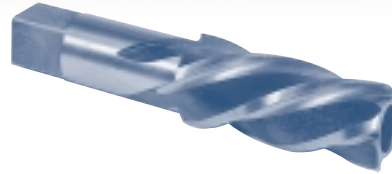
Contact CenterLine for specific information concerning styles and availability.

ACCESSORIES

Reamer

Worn tapers in electrode holders can be reworked with this high speed steel reamer.

| PART NO. | DESCRIPTION |
|----------------|-----------------------|
| R-4E | 4RW TAPER |
| R-5E | 5RW TAPER |
| R-6E | 6RW TAPER |
| R-7E | 7RW TAPER |
| R-4C | .50 (12.70) CAP TAPER |
| R-5C | .62 (15.88) CAP TAPER |
| R-6C | .75 (19.05) CAP TAPER |
| R-7C | .87 (22.10) CAP TAPER |



Gauges

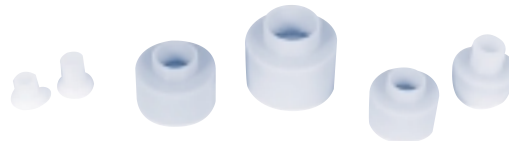
CenterLine Force Gauges use standard non-calibrated pressure gauges. These gauges should be utilized as indicators of tip force fluctuations and not as precise measuring tools (Accuracy +/- 10%) Modifications quoted upon request. Gauge may not be exactly as shown.



Nylon Socket Head Insulators

These nylon socket head screw insulators are used on fixtures/machines when the copper needs to be insulated from the rest of the machine.

| PART NO. | DESCRIPTION |
|---------------------|-------------|
| 230-008 | #10 SCREW |
| 230-009 | #10 SCREW |
| HE-705-57 | 1/4 SCREW |
| FSD-15135 | 5/16 SCREW |
| FSD-15057 | 3/8 SCREW |
| FSD-15058 | 1/2 SCREW |



Male Cap Extractor

To separate CenterLine tips from their adapter shanks the easy way, use the **CenterLine Male Cap Extractor**. Its beveled edges are radiused to match the shank diameter, increasing wedging action (and eliminating jaw adjustments). Jaw openings contact most of the shank circumference (instead of only two points), resulting in much less damage to the shank and tip.

- CLEX-45, for 4 and 5 RW taper shanks
- CLEX-56, for 5 and 6 RW taper shanks

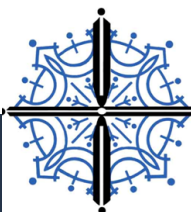


Electrode Extractor

Use the Special **CenterLine Electrode Extractor** for removing "caps" from shanks and die bodies.

CLCX-250 Speed Wrench

- Dimensions Shown Are: inches (mm).

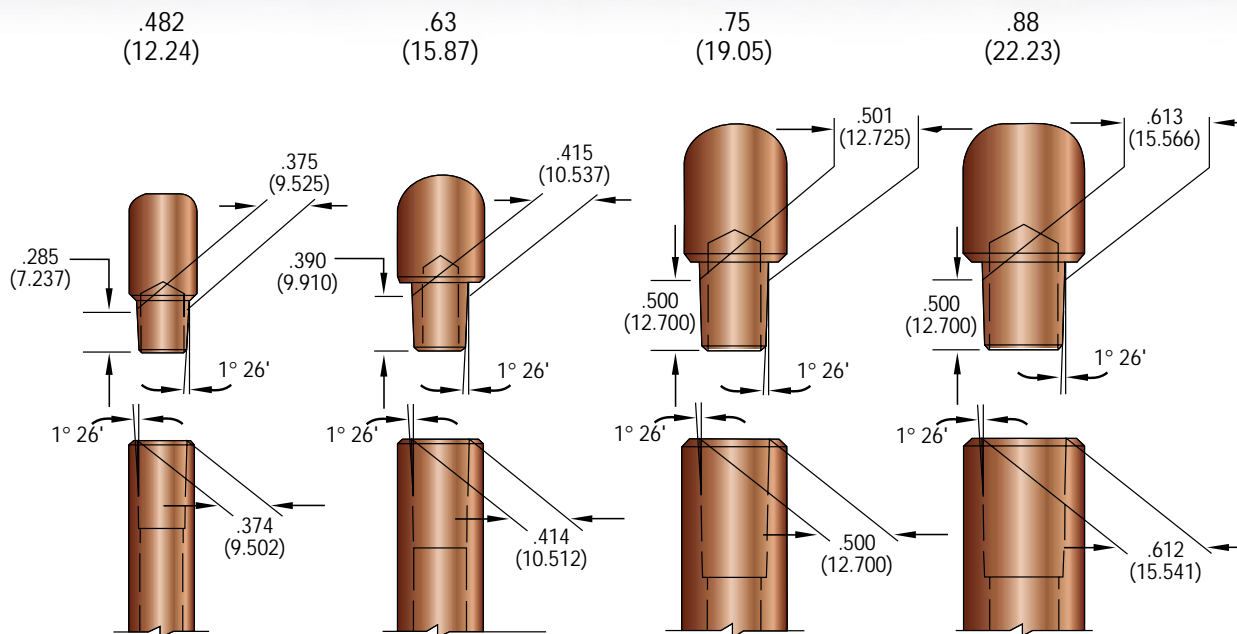


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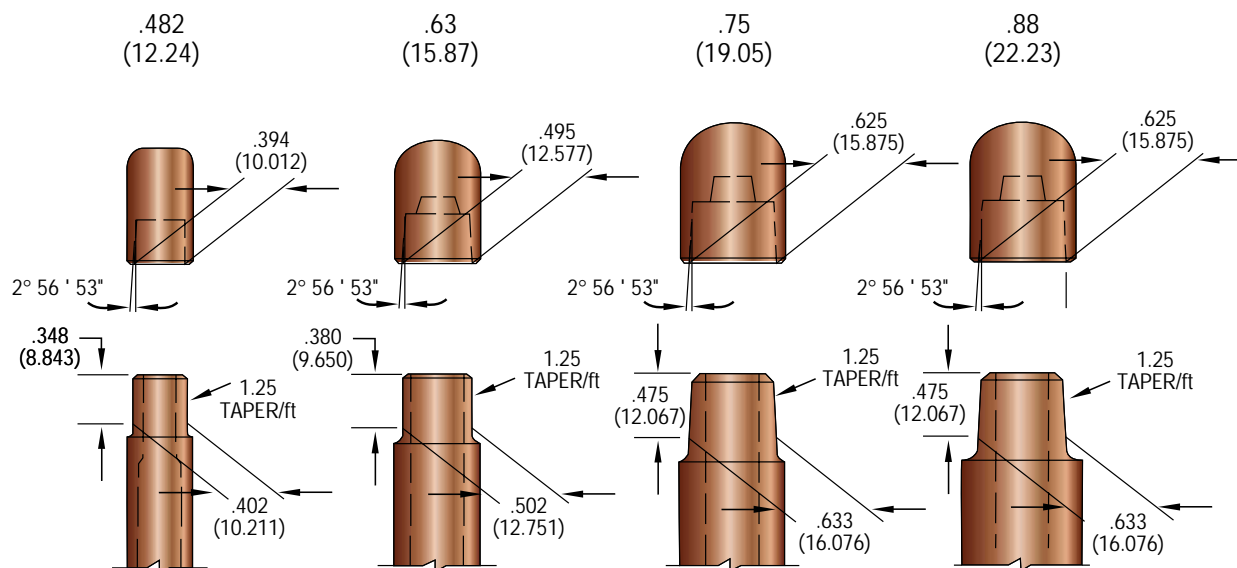
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REFERENCE DATA

MALE CAP DATA



FEMALE CAP DATA

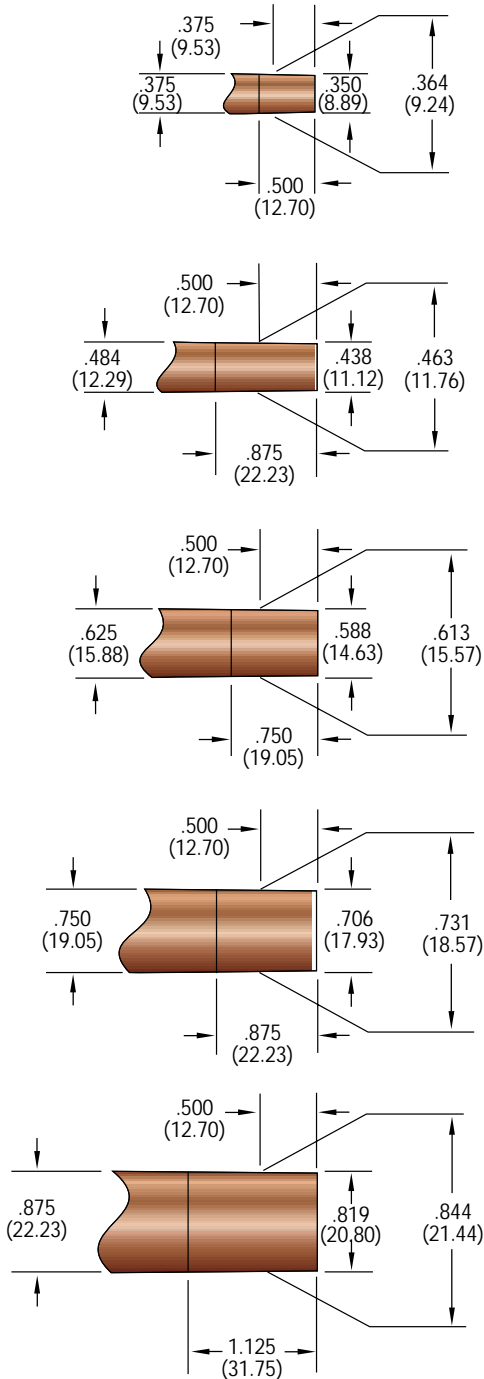


• Dimensions Shown Are: inches (mm).

REFERENCE DATA

ELECTRODE AND ADAPTER TAPERS

(Refer to pages 4-12 to 4-14)



#0 MT - #3 RW

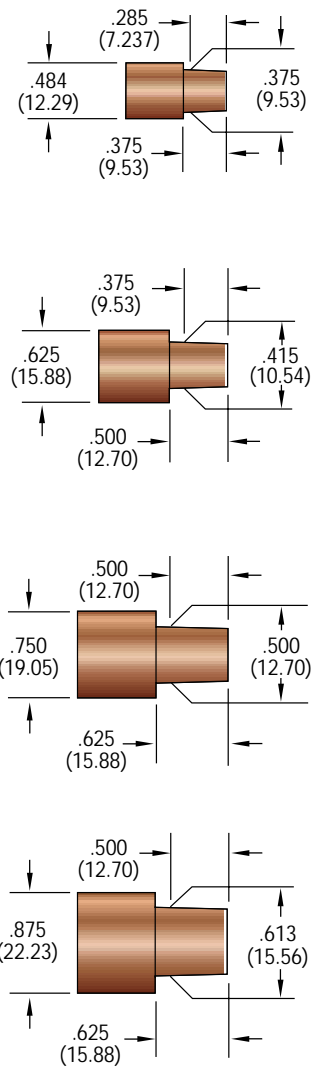
#1 MT - #4 RW

#2 MT - #5 RW

#6 RW

#3 MT - #7 RW

CAP TAPERS



• Dimensions Shown Are: inches (mm).

REFERENCE DATA

RWMA Recommended Electrode Materials For Spot Welding

SIMILAR FERROUS METALS

| ALLOY 1 ** | Stainless Steel | | Galvanized Steel | | Tin Plate | | Terne Plate | | Cadmium Plate | | Chrome Plate | | Cold-Rolled Steel | |
|------------|-----------------|------|------------------|--------|-----------|--------|-------------|--------|---------------|--------|--------------|---|-------------------|---|
| ALLOY 1 ** | A | 2,3* | A | 1,2,20 | B | 1,2,20 | A | 1,2,20 | A | 1,2,20 | A | 2 | A | 2 |
| | 2,3* | | | 1,2,20 | | 1,2,20 | | 1,2,20 | | 1,2,20 | | 2 | | 2 |

DISSIMILAR NONFERROUS METALS

| ALLOY 1 ** | Aluminum & Aluminum Alloys | | Copper | | Nickel-Silver | | Nickel & Nickel Alloys | | Phosphor Bronze | | Yellow Brass | | Red Brass | |
|------------|----------------------------|-----|---------|-------|---------------|---|------------------------|---|-----------------|---|--------------|---|-----------|---|
| ALLOY 1 ** | A | 1 | C | 13,14 | A | 2 | A | 2 | A | 2 | A | 2 | A | 2 |
| | 1 | | 13,14 | | 2 | | 2 | | 2 | | 2 | | 2 | |
| ALLOY 1 ** | Titanium | | Silicon | | Bronze | | Cupro | | Nickel | | Magnesium | | | |
| | A | 2,3 | A | 2 | B | 2 | A | 2 | B | 2 | B | 1 | | |
| | 2,3 | | 2 | | 2 | | 2 | | 2 | | 1 | | | |

REFRACTORY METALS

| ALLOY 1 → ALLOY 2 ↓ | Tungsten Molybdenum | | Chrome Plate | | Stainless Steel | | Nickel & Nickel Alloys | |
|------------------------|---------------------|---|--------------|---|-----------------|------|------------------------|---|
| Tungsten Molybdenum | B | 2 | B | 2 | B | 2,3* | B | 2 |
| | 2 | | 2 | | 2 | | 2 | |

DISSIMILAR FERROUS METALS

| ALLOY 1 → ALLOY 2 ↓ | Nickel & Nickel Alloy | | Cold-Rolled Steel | | Tin Plate | | Terne Plate | | Galvanized Steel | | Cadmium Plate | | Chrome Plate | |
|------------------------|--------------------------|---|----------------------|---|--------------|--------|----------------|--------|---------------------|--------|------------------|--------|-----------------|---|
| Stainless Steel | B | 2 | A | 2 | B | 1,2,20 | B | 1,2,20 | B | 1,2,20 | B | 1,2,20 | B | 2 |
| | 2,3* | | 2,3* | | 2,3* | | 2,3* | | 2,3* | | 2,3* | | 2,3* | |
| Chrome Plate | B | 2 | B | 2 | B | 1,2,20 | B | 1,2,20 | B | 1,2,20 | B | 1,2,20 | | |
| | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | | | |
| Cadmium Plate | B | 2 | B | 2 | C | 1,2,20 | B | 1,2,20 | B | 1,2,20 | | | | |
| | 1,2,20 | | 2 | | 1,2,20 | | 1,2,20 | | 1,2,20 | | | | | |
| Galvanized Steel | C | 2 | B | 2 | B | 1,2,20 | C | 1,2,20 | | | | | | |
| | 1,2,20 | | 1,2,20 | | 1,2,20 | | 1,2,20 | | | | | | | |
| Terne Plate | C | 2 | B | 2 | C | 1,2,20 | | | | | | | | |
| | 1,2,20 | | 1,2,20 | | 1,2,20 | | | | | | | | | |
| Tin Plate | C | 2 | B | 2 | | | | | | | | | | |
| | 1,2,20 | | 1,2,20 | | | | | | | | | | | |
| Cold-Rolled Plate | C | 2 | | | | | | | | | | | | |
| | 2 | | | | | | | | | | | | | |

DISSIMILAR NONFERROUS METALS

| ALLOY 1 → ALLOY 2 ↓ | Nickel & Nickel Alloy | | Phosphor Bronze | | Silicon Bronze | | Nickel- Silver | | Cupro Nickel | | Yellow Brass | | Red Brass | |
|------------------------|--------------------------|-------|--------------------|---|-------------------|--------|-------------------|--------|-----------------|--------|-----------------|--------|--------------|---|
| Copper | | | C | 2 | C | 1,2,20 | C | 1,2,20 | C | 1,2,20 | C | 1,2,20 | C | 2 |
| | | | 14 | | 14 | | 14 | | 14 | | 14 | | 14 | |
| Red Brass | C | 2 | C | 2 | C | 2 | C | 2 | C | 2 | C | 2 | | |
| | 14 | | 14 | | 14 | | 14 | | 14 | | 2 | | | |
| Yellow Brass | C | 2,10* | B | 2 | B | 2 | B | 2 | B | 2 | | | | |
| | 2 | | 11 | | 11 | | 11 | | 11 | | | | | |
| Cupro Nickel | B | 2 | B | 2 | B | 2 | B | 2 | | | | | | |
| | 2 | | 2 | | 2 | | 2 | | | | | | | |
| Nickel-Silver | B | 2,10* | B | 2 | B | 2 | | | | | | | | |
| | 1,2,20 | | 1,2,20 | | 1,2,20 | | | | | | | | | |
| Silicon Bronze | C | 2,10* | B | 2 | | | | | | | | | | |
| | 2 | | 2 | | | | | | | | | | | |
| Phosphor Bronze | C | 2 | | | | | | | | | | | | |
| | 2 | | | | | | | | | | | | | |

| BLOCK INTERPRETATION | |
|--|---------------------------------|
| WELDABILITY A=Excellent, B=Good, C=Fair | ELECTRODE CONTACTING ALLOY 1 |
| ELECTRODE CONTACTING ALLOY 2 | |

BLOCK INTERPRETATION

WELDABILITY
A=Excellent, B=Good, C=Fair

ELECTRODE
CONTACTING ALLOY 1

ELECTRODE
CONTACTING ALLOY 2

* Electrode materials are second choices

** Alloy 1=Alloy 2 (refer to block interpretation)

ALLOYS

1=Class 1

2=Class 2

3=Class 3

10=Class 10

11=Class 11

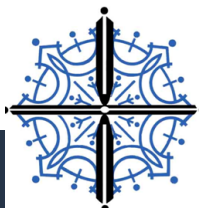
13=Class 13

14=Class 14

20=Class 20

REFERENCE DATA

| GROUP "A" – COPPER BASE ALLOYS – | | | | | | | | | | |
|---|----------|--|--|--------------|---|---|---|---|---|---|
| CLASS | RWMA NO. | GENERAL USE | DESCRIPTION | AVAILABILITY | | | | | | |
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | |
| RWMA CLASS 1 <i>ZIRCONIUM</i> | 1.15000 | Electrodes for welding aluminum alloys, magnesium alloys, coated materials, brass and bronzes. Can be used for both spot and seam welding. | A specially heat treated zirconium copper alloy that meets the minimum electrical conductivity and hardness specification of Class 1 Alloy. | | | X | X | | | |
| <i>CADMIUM</i> | 1.16200 | | A high conductivity cadmium copper alloy , not heat treatable, but can be work hardened. | | | X | X | | | |
| RWMA CLASS 2 <i>CHROMIUM-ZIRCONIUM</i> | 2.18150 | These materials are stronger than Class 1 materials but have slightly lower conductivity. They are used for the spot and seam welding of cold and hot rolled steel, stainless steel and low conductivity brass & bronze. They are also used as flash welding dies, and as electrodes for the welding of steel & other coated materials. | A specially heat treated chromium zirconium copper alloy that meets the minimum electrical and hardness specification of Class 2 Alloys. | | | X | X | X | | |
| <i>CHROMIUM</i> | 2.18200 | | A high conductivity chromium copper alloy , that obtains its optimum properties from a combination of both heat treatment and cold work. | | | X | X | X | X | |
| RWMA CLASS 3 <i>COBALT-BERYLLIUM COPPER</i> | 3.17500 | Their high hardness makes them ideal for electrodes for the spot and seam welding of high resistance materials such as stainless steel, nichrome and monel metal. As a casting, they are used for flash, butt and projection welding electrodes & fixtures. They can also be used for seam welder bearing and other current carrying structural parts. | Heat treatable copper alloys with a combination of high tensile strength and good electrical and thermal conductivity. | | | X | X | X | X | |
| <i>NICKEL-BERYLLIUM COPPER</i> | 3.17510 | | | | | X | X | X | X | X |
| <i>BERYLLIUM-FREE COPPER</i> | 3.18000 | | | | | X | X | X | X | |
| RWMA CLASS 4 <i>BERYLLIUM</i> | 4.17200 | Electrode material for special flash, flash butt and projection welding applications where pressures are extremely high and wear is severe but where heat is not excessive. Used in the form of inserts & facings. | A heat treatable copper alloy having the unusual combination of very high strength and lower electrical conductivity than Class 3. Can be annealed, machined & reheat treated to regain its properties. | | | X | X | X | X | |
| RWMA CLASS 5 <i>ALUMINUM</i> | 5.95300 | Typical uses are flash welding electrodes, secondary circuit welder arms, knees, platens and other current carrying fixtures where high strength, wear resistance and non-magnetic properties are required. | Copper base alloy usually furnished in the form of castings. It is not heat treatable. | | | X | | | | |



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REFERENCE DATA

| GROUP "B" – REFRACTORY METAL COMPOSITION – | | | | | | | | | |
|---|----------|---|--|--------------|---|---|---|---|---|
| CLASS | RWMA NO. | GENERAL USE | DESCRIPTION | AVAILABILITY | | | | | |
| | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| RWMA CLASS 10 <i>COPPER-TUNGSTEN</i> | 10.74450 | Flash and butt welding electrodes where higher electrical and thermal conductivity is necessary and where a degree of malleability is desired. They can also be used for spot welding low conductivity steels -- stainless. | A powder metallurgical combination of 45% copper & 55% of the refractory metal tungsten. Not a true alloy. This combination produces dense, hard metals of superior wear resistance and strength at elevated temperatures. | | | X | | | X |
| RWMA CLASS 11 <i>COPPER-TUNGSTEN</i> | 11.74400 | Projection welding electrodes, flash & butt welding electrodes, light upsetting electroforging & seam welder bushings. Harder than Class 10 & used where moderate pressure required. | A powder metallurgical combination of 25% copper and 75% of the refractory metal tungsten. Not a true alloy. This combination produces dense, hard metals with good thermal & electrical conductivity. | | | | X | | X |
| RWMA CLASS 12 <i>COPPER-TUNGSTEN</i> | 12.74350 | Heavy duty projection welding electrodes, electro-forming & electroforging electrodes, electrode facing for upsetting of studs and rivets, cross wire welding of large diameter wire and rod. | A powder metallurgical combination of 20% copper and 80% of the refractory metal tungsten. Not a true alloy. This combination produces dense, hard metals of superior wear resistance and strength at elevated temperatures. | | | X | | | X |
| RWMA CLASS 13 <i>TUNGSTEN</i> | 13.74300 | Cross wire welding of copper & brass electro brazing and some electro upsetting. Welding of braided copper wire to other materials. | Tungsten is extremely hard and has low ductility. It cannot be machined but can be ground to required contours. It does not alloy with non-ferrous materials. | | | X | X | | X |
| RWMA CLASS 14 <i>MOLYBDENUM</i> | 14.42300 | Cross wire welding of copper & brass electro brazing and some electro upsetting. Welding of braided copper wire to other materials. | Molybdenum is not as hard as Class 13 and can be drilled and machined to special contours. | | | X | X | X | X |
| GROUP "C" – SPECIALTY MATERIAL – | | | | | | | | | |
| RWMA CLASS 20 <i>DISPERSION STRENGTHENED COPPER</i> | 20.15760 | Welding of metallic coated metal such as galvanized steel, tern plate, etc. | A powder metallurgy material consisting of copper and aluminum oxide with high temperature hardness and physical properties different than the copper alloys. | | | X | X | | |
| AVAILABILITY CODING EXPLANATION | | | | | | | | | |
| • 1 = CASTING • 2 = FORGING • 3 = ROD & BAR • 4 = PLATE • 5 = TUBE • 6 = INSERTS | | | | | | | | | |
| • GENERAL SUGGESTED APPLICATIONS, NOT TO BE INTERPRETED AS THE OPTIMUM FOR ANY SPECIFIC APPLICATION | | | | | | | | | |

REFERENCE DATA

OVEREXPOSURE EFFECTS

| TYPE/LOCATION OF OVEREXPOSURE | RWMA CLASS 1 | RWMA CLASS 2 | RWMA CLASS 3 | ZIRCONIUM COPPER | TUNGSTEN | GLIDCOP |
|--|-----------------|-----------------|-----------------|---------------------|----------|---------|
| Skin: Irritation with possible discoloration of skin or hair. | X | X | | X | X | N/A |
| Skin: Irritation with possible discoloration of skin (Copper). On broken skin, can cause granulomatous lesions (hard lesions with a central non-healing core) (Beryllium). Cobalt can cause an allergic sensitivity even with very low exposures. Often expressed as eruptions in creases of elbow, knee, ankles and neck. | | | X | | | |
| Inhalation: Upper respiratory tract irritation, metallic taste in mouth, nausea, metal fume fever (sensation of chills and stuffiness of the head and weakness). Possible lesions on nasal passages. | X | X | | X | X | N/A |
| Inhalation: Upper respiratory tract irritation, metallic taste in mouth, nausea, metal fume fever. Possible lesions on nasal passages (Copper). Cough, substernal pain, moderate shortness of breath, some weight loss (Beryllium). Chronic Beryllium disease can exhibit these symptoms plus weakness and fatigue. Severity can be from non-disabling to severely disabling. High Cobalt inhalation levels can cause asthma-like symptoms to interstitial pneumonia with fibrosis in severe cases. | | | X | | | |
| Eyes: Metal particles penetrating the eyes may cause irritation discoloration and damage. | X | X | | X | X | X |
| Eyes: Copper particles penetrating the eye may cause irritation discoloration and damage. Beryllium dust and fumes may cause irritation and conjunctivitis. | | | X | | | |
| Cadmium – reported to increase incidence of prostate cancer. | | X | | | | |
| Beryllium & Nickel – classed as suspect of carcinogenic potential for man. | | | X | | | |
| Chromium – dust and fumes can cause skin and pulmonary sensitization and is corrosive. Overexposure is unlikely to occur. | | X | | | | |

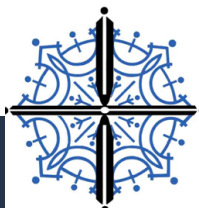
REACTIVITY

| | | | | | | |
|---|---|---|---|---|---|---|
| Hazardous Polymerization: Will not occur. Stability: Stable Incompatibility: Dust or fume contact / acetylene gas may cause formation of copper acetylides which are sensitive to shock. | X | X | X | X | | X |
| Hazardous Decomposition Products: Melting may generate harmful fumes. | | | | | X | |

EMERGENCY & FIRST AID PROCEDURES

Skin: Wash contaminated skin using soap or mild detergent and water. If irritation persists after washing, get medical attention. **Eyes:** Wash eyes immediately with large amounts of water, lifting lower and upper lids occasionally.

Get medical attention immediately.



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OTHER PRODUCTS

CenterLine manufactures a variety of products to satisfy resistance welding and metal working needs. Contact CenterLine for additional information on other products.

RESISTANCE WELDING EXPERTISE

CenterLine has a broad range of proven resistance welding gun solutions.

The CenterLine product range includes:

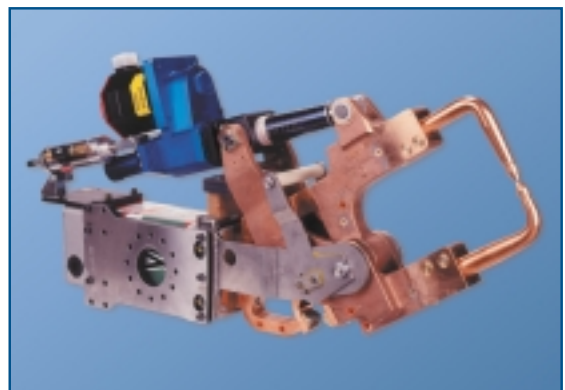
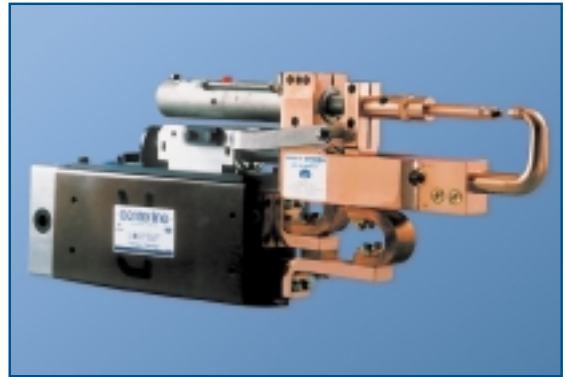
- basic solutions to satisfy your general needs
- custom solutions to address your unique requirements
- innovative solutions to meet your future needs.

Our knowledge and experience are reflected in a family of resistance welding gun solutions that are well suited for tough industrial environments. A culture of continuous improvement has helped us improve our product line by simplifying installation, improving durability, and requiring minimal maintenance.

We have diverse engineering and manufacturing capabilities to turn your unique requirements or ideas into a solution that will give you a competitive advantage.

Standard CenterLine™ solutions all offer low-impact operation. Our Staac™ air cylinder, OHMA® air/oil cylinder, or servo-electric actuator, will help ensure you can:

- maximize up-time by decreasing wear
- reduce operating cost by maximizing consumable life
- minimize noise
- decrease shock and vibration
- minimize electrode skidding
- control dimensional variation
- improve weld appearance



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OTHER PRODUCTS

OHMA® Welding Cylinders

The OHMA intensifier cylinder produces consistent welding forces with low impact. It is ideal for high force applications and space restrictive locations. This cylinder operates with a low impact advance stroke resulting in prolonged electrode life, reduced part deformation and decreased overall shock to the equipment.



AMSI Welding Cylinders

American Machining Specialties Incorporated (AMSI) coupled with CenterLine, offers a comprehensive line of new air cylinders:

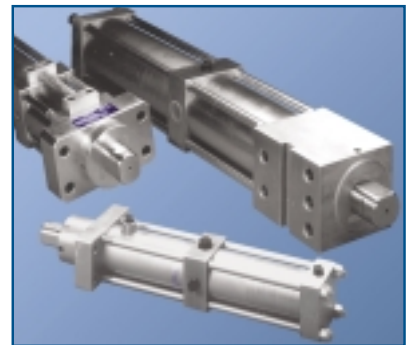
- Dual Piston Cylinders
- Triple Piston Cylinders
- Pre-Lube Cylinders
- Retract Cylinders
- Proximity Switch Cylinders
- Hydraulic Cylinders

The line of standard cylinders provide direct replacements for a large variety of weld cylinder applications. In addition to the standard line we also offer in house design to fit our customer's specific requirements as well as replacement seal kits and parts for competitive brands.



OHMA® Piercing Cylinders

The OHMA piercing cylinder offers a robust design and remains one of the most practical and trouble-free systems available today. By using shop air pressure and hydraulic fluid, the OHMA cylinder produces work forces ranging from one ton to hundreds of tons. Rod, stroke and mounting style options make the OHMA cylinder suitable for virtually all metalworking applications.



OHMA® Press Packages

The OHMA press family is a collection of presses ranging from 4 to 70 tons. The presses are designed to satisfy production needs, prototype work or serves as an all purpose press. The design offers total flexibility with a soft touch, non-shock approach to the part and a 1/2" high force work stroke. These presses are ideal for piercing, pierce nut installation, crimping, coining, marking, forming, stamping, etc.



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