

MIL-U-20625A**28 MARCH 1957****SUPERSEDING****MIL-J-20625****26 FEBRUARY 1952****MILITARY SPECIFICATION****UNIVERSAL JOINTS, BLOCK TYPE,
MECHANICAL REMOTE CONTROL SYSTEM**

This specification has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy, and the Air Force.

1. SCOPE

1.1 Scope. This specification covers universal joints of the block type for use in rotary type hand-operated or intermittent power operated valve remote control systems of the mechanical type.

1.2 Classification. Universal joints shall be of the following classes, as specified (see 6.1) :

Class a — Steel.

Class b — Bronze.

Class c — Steel, Corrosion-Resistant.

2. APPLICABLE DOCUMENTS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS**FEDERAL**

QQ-N-281 "Nickel-Copper-Alloy (Monel and R-Monel) Bars, Plates, Rods, Sheets, Strips, Wire, Forgings, and Structural and Special Shaped Sections.

QQ-S-624 —Steel, Alloy; Bars (General Purpose).
LLL-B-631 — Boxes, Fiber, Corrugated (for Domestic shipment).
LLL-B-636 — Boxes, Fiber, Solid (for Domestic Shipment).
PPP-B-585 — Boxes; Wood, Wire-bound.
PPP-B-601 — Boxes, Wood, Cleated-Plywood.
PPP-B-621 — Boxes, Wood, Nailed and Lock-Corner.

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JAN-P-108 — Packaging and Packing for Overseas Shipment — Boxes, Fiberboard (V-Board and W-Board), Exterior and Interior.
MIL-P-116 — Preservation, Methods of.
MIL-N-994 — Naval Brass Bars, Plates, Rods, Sheets, Strips, Wire, Forging, and Structural and Special Shaped Sections.

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MIL-L-10547 — Liners, Case, Water-proof.

MIL-B-16444 —Bronze Hydraulic
(Ounce Metal) Cast
ings.

STANDARDS**FEDERAL**

FED. STD. — Steel: Chemical Com-
No. 66 position and Hard-
enability.

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MIL-STD-105 — Sampling Procedures
and Tables for In-
spection by Attri-
butes.

MIL-STD-129 — Marking for Shipment
and Storage.

MIL4TD-130 — Identification marking
of U. S. Military
Property.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

2.2 Other publication The following docu-
ment forms a part of this specification,
Unless otherwise indicated, the issue in ef-
fect on date of invitation for bids shall apply.

CONSOLIDATED CLASSIFICATION COMMITTEE
Consolidated Freight Classification
Rules,

(Application for copies should be addressed to the
Consolidated Classification Committee, 202 Chicago
Union Station, Chicago 6, Ill.)

3. REQUIREMENTS

3.1 Material. The materials of parts shall
be in accordance with table I, as applicable.
Materials for parts not covered by table I
shall be of high grade commercial standard
material which, when installed in a mechanical
valve remote control system and operated
intermittently, will transmit the required
torques specified in table IL

TABLE I. Materials.

	Hubs	Block	Pins
Class a	QQ-S-624 FS 4140	QQ-S-624 FS 4140 or FS 3120	QQ-S-624 FS 3120 or FS 4140
Class b	MIL-B-16444	MIL-N-994	QQ-N-281
Class c	Fed. Std. No. 66, Steel No. 303, annealed condition	Composition A bar Fed. Std. No. 66, Steel No. 303, annealed condition	Class A rods Fed. Std. No. 66, Steel No. 303, annealed condition

TABLE II. Transmitted torques (pound-foot).

Joint size	180 degrees	150 degrees
$\frac{3}{8}$	20	16
1	40	32
1$\frac{1}{4}$	70	56
1$\frac{3}{4}$	125	80
2	180	130
2$\frac{1}{2}$	250	200
3	375	300
4	500	400

3.2 General design, Universal joints shall
consist of two hubs with extended jaws,
herein called the "yoke", block and bearing
pins, assembled so that a torque applied to
one hub will be transmitted to the other.
The dimensions shall conform to table III
and joints assembled as shown on figure 1.

TABLE III. General dimensions.

A Shaft size (max.)	B Overall length		C Hole length		D Hub diameter		E Hub length class b	F Offset diameter class b
	Classes a and c	Class b	Classes a and c	Class b	Classes a and c	Class b		
<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
$\frac{1}{2}$	3	$4\frac{3}{4}$	$1\frac{1}{32}$	$1\frac{1}{2}$	$\frac{7}{8}$	$1\frac{1}{4}$	$1\frac{1}{8}$	$1\frac{5}{8}$
$\frac{5}{8}$	$3\frac{3}{4}$	$4\frac{3}{4}$	$1\frac{1}{8}$	$1\frac{1}{2}$	1	$1\frac{1}{4}$	$1\frac{1}{8}$	$1\frac{5}{8}$
$\frac{3}{4}$	$3\frac{3}{4}$	$4\frac{3}{4}$	$1\frac{9}{16}$	$1\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{8}$	$1\frac{5}{8}$
1	5	$6\frac{3}{4}$	$1\frac{1}{16}$	$2\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{1}{8}$	2
$1\frac{1}{4}$	$5\frac{7}{16}$	8	$1\frac{1}{8}$	$2\frac{1}{2}$	2	$2\frac{1}{4}$	$1\frac{1}{8}$	$2\frac{1}{4}$
$1\frac{1}{2}$	7	8	$2\frac{5}{32}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{1}{8}$	$2\frac{1}{4}$
$1\frac{3}{4}$	9	9	$2\frac{11}{16}$	$2\frac{3}{4}$	3	$2\frac{3}{4}$	$2\frac{1}{8}$	$3\frac{1}{8}$
2	$10\frac{3}{8}$	$3\frac{1}{8}$	4

3.2.1 *Sizes.* Universal joints shall be designated by the outside diameter of the hub (see D of table III). For a given shaft size the joint shall be equal to or larger than that specified in table III.

3.2.2 *Hubs.* Unless otherwise specified in the contract or order, the joints shall be furnished with the hubs machined with centers but not drilled for shafting. When so specified, the diameter and length of the hubs shall conform to table III for the shaft size indicated.

3.2.3 *Bearing pins.* The bearing pins, when assembled with the hubs and block shall not project outward beyond the yoke and shall be positively secured in operating position so that operation will not cause the pins to become loose or drop out.

3.2.4 *Dimensional tolerances.* Clearance permitted between pins and holes shall be 0.001 inch maximum. Clearance between block and yoke shall be 0.004 inch maximum. Pins may be off-center 0.005 inch maximum. All other dimensions shall be plus or minus 0.020 inch.

3.2.5 *Lubrication.* An oil passage shall be provided in one of the pins through which a lubricant may be applied to the working surfaces,

3.2.6 *Fastenings.* Set screws shall not be used in universal joints.

3.3 **Performance.** The universal joint shall be capable of transmitting the static torques shown in table II at the indicated angle without rupture, permanent set, or other evidence of failure.

3.3.1 *Backlash.* The universal joint shall exhibit no more than the maximum backlash set forth in table IV.

TABLE IV. Maximum backlash.

Hub outside diameter	Backlash (degree)
$\frac{7}{8}$ }	0.6
1 }	
$1\frac{1}{4}$ }	.5
$1\frac{1}{2}$ }	
2 }	.3
$2\frac{1}{2}$ }	
3 }	
4 }	

3.3.2 *Efficiency.* The universal joint shall transmit the torques shown in table II with an efficiency of not less than 98 percent with the axes of the hubs at 180 degrees, and 80

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percent with the joint at an angle of 150 degrees between the axes of the hubs.

3.4 Identification marking. Each joint shall be permanently and legibly marked with the manufacturer's name, trademark or symbol in accordance with Standard MIL-STD-130.

3.5 Surface roughness. All nonworking machined surfaces shall have 125 microinch finish or better, bearing surfaces shall have 32 microinch finish or better (see 3.2.4).

3.6 Workmanship. Workmanship shall be in accordance with high grade commercial practice governing this type of material. Each universal joint shall be uniform in quality and temper and shall be free from burrs, slivers, gouges, porosity, cracks, objectionable scale, or any other defects which may adversely affect serviceability.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling.

4.1.1 Lot. All joints of the same class and size presented at one time shall be considered a lot for purposes of acceptance inspection and tests.

4.1.2 Sampling for visual and dimensional examination. A random sample of joints shall be selected from each inspection lot of material offered for Government inspection in accordance with Standard MIL-STD-105 at inspection level III for lots of 110 and under and inspection level II for lots over 110. The acceptable quality level shall be equal to 1.5 percent defective.

4.1.3 Sampling for lot acceptance tests. A random sample of joints shall be selected from each lot offered for Government tests in accordance with Standard MIL-STD-106 at inspection level I. The acceptable quality level shall be 1.0 percent defective. However, the sample size shall be the number associated with the letter specified for level I, and the

acceptance number shall be zero until the acceptable quality level allows one or greater.

4.2 Lot acceptance inspection and tests.

4.2.1 Visual and dimensional examination. Each of the sample units selected in accordance with 4.1.2 shall be visually and dimensionally examined to verify compliance with this specification. Any unit in the sample containing one or more visual or dimensional defects shall be rejected, and if the number of defective units in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

4.2.2 Tests. Each of the sample joints selected as specified in 4.1.3 shall be subjected to the tests specified in 4.3 to determine compliance with this specification. Any unit in the sample containing one or more defects shall be rejected, and if the number of defective units in any sample exceeds the acceptance number for the sample, the lot represented by the sample shall be rejected.

4.2.3 Inspection of marking, packaging, and packing. Sample packages shall be selected in accordance with the sampling plan of 4.1.3 for inspection to verify conformance to the applicable requirements of Section 5 and the markings required in the contract or order.

4.2.4 Resubmission. Rejected lots may be resubmitted for inspection tests after being reworked to correct the defects. Before resubmitting, full particulars concerning previous rejections and the action taken to correct the defects found in the original lot shall be furnished the Government inspector. Joints rejected after retest shall not be resubmitted without specific approval of the bureau or agency concerned.

4.3 Test procedures.

4.3.1 Backlash. The backlash of the joints shall not exceed the amount specified in ta-

ble IV when the joint is mounted in a test apparatus with the hubs at 180 degrees,

4.3.2 *Torque*. The joint shall be subjected to the torques specified in table II at four or more radial positions of the hub and at the angles specified. The load shall be sustained at each position for 3 minutes.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging.

5.1.1 *Level A*. Unless otherwise specified in the contract or order, class a universal joints shall be cleaned by process C-1 of Specification MIL-P-116 and individually preserved and packaged in accordance with method I using preservative type P-2. Class b universal joints shall be packaged in accordance with method 111 of Specification MIL-P-116.

5.1.2 *Level C*. The universal joints shall be cleaned, preserved and packaged in accordance with commercial practice.

5.2 Packing,

5.2.1 *Level A*. Unless otherwise specified in the contract or order, the universal joints shall be packed in overseas type, cleated plywood, nailed wood, wirebound or fiberboard boxes conforming to Specifications PPP-B-601, PPP-B-621, PPP-B-585 and JAN-P-108, respectively. The containers, except Specification JAN-P-108 boxes, shall be lined with a sealed case liner conforming to Specification MIL-L-10547. The gross weight of wood or wood cleated boxes shall not exceed approximately 200 pounds, fiberboard boxes, 70 pounds.

5.2.2 *Level B*. Unless otherwise specified in the contract or order, universal joints shall be packed in domestic type cleated plywood, nailed wood, wirebound, corrugated or solid

fiberboard boxes conforming to Specification PPP-B-601, PPP-B-621, PPP-B-585 or the special requirements of Specifications LLL-B-631 and LLL-B-636, respectively. The gross weight of wood or wood cleated boxes shall not exceed approximately 200 pounds.

5.2.3 *Level C*. Universal joints shall be packed to insure carrier acceptance and safe delivery to destination at the lowest applicable rate, Containers shall comply with the Consolidated Freight Classification Rules or other carrier regulations applicable to the mode of transportation.

5.3 *Marking*. In addition to any special markings required in the contract or order, marking of the packages and shipping containers shall be in accordance with Standard MIL-STD-129.

6. NOTES

6.1 **Intended use**. Class a universal joints are intended for general purpose use in mechanical remote control systems, Class b joints are intended for use where corrosive conditions are abnormal or nonmagnetic materials are required. Class c joints are intended for use where corrosive conditions are abnormal or high torque requirements are desired.

6.2 **Ordering data**. Procurement documents should specify the following:

- (a) Title, number, and date of this specification,
- (b) Class required (see 1.2).
- (c) Number of each size required; designated by hub outside diameter (see 3.2.1).
- (d) Whether joints shall be preserved and packaged in accordance with level A or C; packed in accordance with level A, B, or C (see 5.1 and 5.2).

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Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

Custodians:

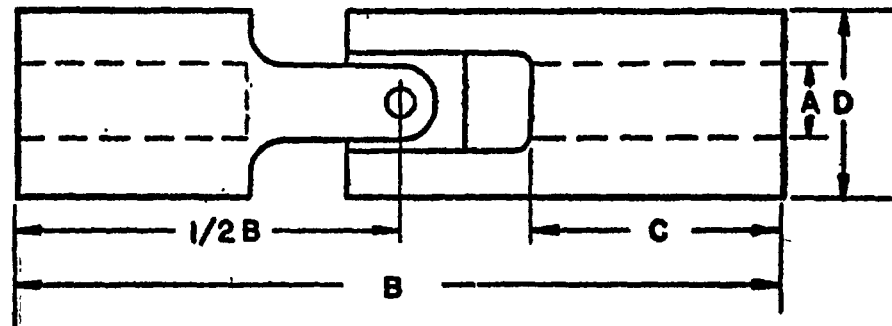
Army-Ordnance Corps
Navy-Bureau of Ships
Air Force

Other interest:

Army-EQT
Navy-Or

Preparing activity:

Navy-Bureau of Ships



Classes A and C

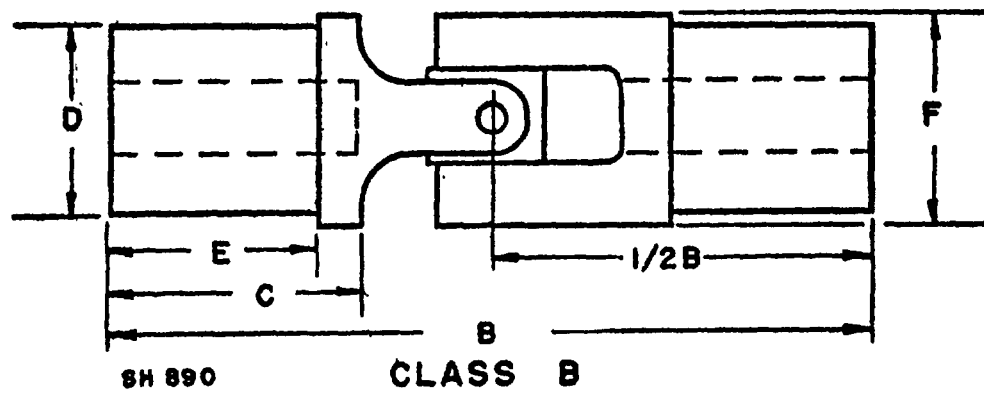


Figure 1 - Universal joints.

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 149-R004
<p style="text-align: center;">INSTRUCTIONS</p> <p>This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).</p>		
SPECIFICATION		
ORGANIZATION (of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?		
A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE?		
<input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE

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