

HOW TO SELECT TRIM MATERIAL FOR
NORRIS
BUTTERFLY VALVES



Selection Guide for R, M & D
Series 175, 200 & 285 PSI
Butterfly Valves

HOW TO SELECT TRIM MATERIAL FOR NORRIS BUTTERFLY VALVES

The following data is intended as a guide to selecting metals and elastomers for internal wetted parts of Norris Butterfly Valves in specific applications.

Because of Norris' dry back construction, body materials are not affected by the flow stream. Pressure, temperature and external environment are the critical considerations for selection of body materials.

Norris elastomer seats are harder, less porous and less subject to swell and deterioration than those used in vertical disc butterfly valves. The specially compounded elastomers are of greater density and higher durometer. Use of these harder elastomers is possible because Norris' precision-machined angle disc does not have to penetrate as deep into the seat to give positive bubble-tight shutoff.

When premium elastomers are required for an application, selection of Norris M-Series valves with replaceable metal seats may be more economical because of the limited amount of elastomer used for sealing. Please see complete list of metal seat materials on page 8.

HOW TO USE THE GUIDE

This guide has been prepared from published data, vendor ratings, laboratory and field experience. Recommendations are based on 75° F. Because of varying temperature, aeration, inhibiting and accelerating contaminants often encountered, Norris does not guarantee corrosion resistance of any material. When chemicals are mixed, it cannot be assumed a metal or elastomer will provide the same corrosion resistance as described for the pure chemical.

The ratings reported in this brochure should be considered as a guide and not as an unqualified recommendation. It is necessary that the user approve each material for a specific application. Where valve performance is critical, we suggest actual product testing be done to assure material compatibility with the flow stream.

For applications which require clarification or for additional information, contact Alberta Oil Tool, Edmonton, Alberta. (780) 434-8566

EXPLANATION OF RATINGS

- 1 - Fully resistant
- 2 - Satisfactorily resistant (slightly attacked)
- 3 - Test for application
- X - Not recommended
- - Insufficient data

DESIGN FEATURES

A. The drive shaft is double O-ring sealed to prevent leakage into the shaft bearing areas and protect from outside contamination.

B. The handle shaft is retained by a sealed retention screw. On 14" and larger valves, shafts are crosspinned to the disc.

C. Body O-ring flange seals eliminate need for flange gaskets. Flange seals can be replaced without dismantling the valve and replacing the seat. Many times a damaged O-ring flange seal can be repaired simply by turning it over and then reinserting it in the body face groove.

D. Disc/shaft connection assures positive disc action. Precision fit prevents disc "flutter".

E. Angle disc construction gives 360° uninterrupted contact of disc with seat. The disc does not seat in the shaft holes, assuring a bubble-tight shutoff time after time with no scrubbing or compression set of the elastomer in the shaft hole area.

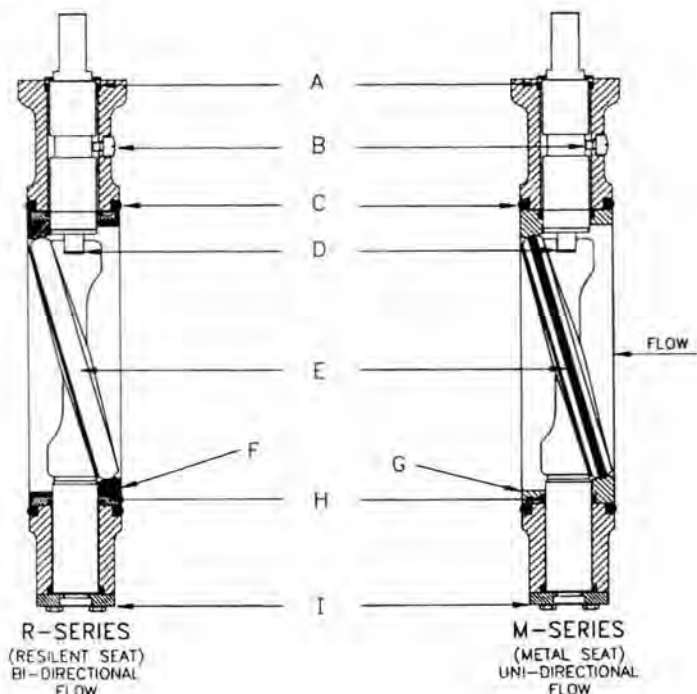
F. Field removable and interchangeable resilient seat is bonded to a rigid backing ring to prevent the seat from distorting or collapsing due to high velocity flow or in vacuum service. The rigid backing of seat also prevents seat collapse during installation of the valve between flanges. The rubber liner isolates the valve body from contact with flow media.

G. The metal seat is field replaceable and interchangeable. The metal liner isolates the valve body from contact with flow media.

H. A stationary bottom shaft is double O-ring sealed to prevent steam leakage.

I. The bottom shaft is retained by a thrust plate.

D-Series metal-lined damper type throttling valves with less than 0.5% C_v leakage are also available.



Environment	Chemical Formula	ELASTOMERS - 75° F					METALS - 75° F									
		Buna N	EPDM	HSN	Fluorocarbon	Atlas	Ducile & Cast Iron	Aluminum Bronze	416 SS	316 SS	17-4PH SS	Monel & K-Monel	lilum PD & Nitronic 50	Alloy 20	Hastelloy B	Hastelloy C
Acetic Acid, 20%	CH ₃ COOH	1	1	2	1	X	X	X	2	1	2	2	1	1	1	1
Acetic Acid, 50%	CH ₃ COOH	1	1	-	1	X	X	X	2	1	2	1	1	1	1	1
Acetone	CH ₃ COOH	X	1	X	X	X	1	2	1	1	2	1	1	1	1	1
Air	-	1	1	-	1	1	2	1	2	1	1	1	1	1	1	1
Aluminum Chloride	AlCl ₃	1	1	1	1	1	X	X	X	X	X	X	3	1	1	1
Aluminum Fluoride	AlF ₃ H ₂ O	1	1	1	1	1	X	2	X	2	X	2	3	1	1	2
Aluminum Sulfate	Al ₂ (SO ₄) ₃	1	1	-	1	1	X	X	X	1	2	1	-	1	1	1
Ammonia	NH ₃	1	1	1	X	1	2	2	-	-	X	1	1	1	1	1
Ammonia-Anhydrous	NH ₃	2	1	2	X	1	2	X	2	1	1	X	1	1	2	2
Ammonium Chloride	NH ₄ Cl	2	1	1	1	1	X	X	2	X	X	1	-	1	1	1
Ammonium Hydroxide, 10%	NH ₄ OH	1	1	-	1	1	1	X	2	1	1	X	-	1	2	1
Ammonium Hydroxide, 18%	NH ₄ OH	1	1	-	1	1	1	X	1	1	1	X	-	1	1	1
Ammonium Nitrate	NH ₄ NO ₃	1	1	1	X	1	X	X	1	1	2	X	-	1	2	2
Ammonium Phosphate	(NH ₄) ₂ HPO ₄	1	1	1	1	1	X	2	1	1	-	2	-	1	1	1
Ammonium Sulfate	(NH ₄) ₂ SO ₄	1	1	-	1	1	X	2	X	2	-	2	-	1	1	2
Amyl Acetate	CH ₃ COOC ₅ H ₁₁	X	1	X	X	X	2	2	2	1	2	1	-	1	1	1
Amyl Alcohol	C ₅ H ₂ O	1	1	2	1	1	2	2	2	1	2	1	1	1	1	2
Aniline	C ₆ H ₅ NH ₂	X	1	X	1	1	1	2	2	1	2	2	3	1	2	2
Arsenic Acid	H ₃ AsO ₄ ½ H ₂ O	1	1	-	1	1	X	X	2	2	2	X	-	1	2	2
Asphalt, Emulsion	-	1	3	-	1	1	2	2	1	1	1	1	-	1	1	1
Asphalt, Liquid	-	3	X	-	1	1	2	2	1	1	1	1	-	1	1	1
ASTM #1 Oil	-	1	X	1	1	1	3	1	2	1	1	1	-	1	1	1
ASTM #3 Oil	-	1	X	1	1	1	3	1	2	1	1	1	-	1	1	1
ASTM Fuel A	-	1	X	1	1	2	3	1	2	1	1	1	-	1	1	1
ASTM Fuel B	-	2	X	1	1	X	3	1	2	1	1	1	-	1	1	1
ASTM Fuel C	-	X	X	2	1	X	3	1	2	1	1	1	-	1	1	1
Barium Carbonate	BaCO ₃	1	1	-	1	1	X	1	2	2	1	2	-	1	2	2
Barium Chloride	BaCl ₂ 2H ₂ O	1	1	-	1	1	X	2	2	2	2	2	-	1	1	1
Barium Hydroxide	BaOH	1	1	-	1	1	X	X	2	2	2	2	-	1	2	2
Barium Sulfate	BaSO ₄	1	1	-	1	1	X	2	2	2	2	2	-	1	2	2
Barium Sulfide	BaS	1	1	-	1	1	3	X	2	2	2	2	-	1	-	2
Beer (Alcohol Industry)	-	1	1	-	1	1	X	2	1	1	2	1	1	1	1	1
Beer (Beverage Industry)	-	2	1	-	1	1	X	2	X	1	1	1	1	1	1	1
Beet Sugar Liquors	-	1	1	-	1	1	X	2	2	1	2	1	1	1	1	1
Benzaldehyde	C ₆ H ₅ CHO	X	1	X	X	2	X	2	2	2	2	2	3	1	2	2
Benzene	C ₆ H ₆	X	X	X	1	3	2	2	2	2	2	2	3	1	2	2
Benzoic Acid	C ₆ H ₅ CO ₂ H	X	X	-	1	1	X	2	2	2	2	2	-	1	2	1
Black Sulfate Liquor (Also see Sulfate)	-	1	1	-	1	-	3	X	2	2	1	2	1	1	X	X
Borax Liquors	-	2	1	1	1	1	X	2	2	1	1	1	-	1	1	1
Boric Acid	H ₃ BO ₃	1	1	1	1	1	X	2	2	2	2	2	-	1	1	1
Brine (Also see Water, Sea)	-	1	1	1	1	X	X	2	X	2	2	2	1	1	2	1
Brine (Aerated)	-	1	1	1	1	-	X	2	X	2	2	2	1	1	2	1
Bromine (Dry Gas)	-	X	X	-	1	-	X	X	X	X	X	1	3	X	1	1
Bromine (Wet)	-	X	X	-	1	-	X	X	X	X	X	X	X	X	1	1
Bunker Oils (Fuel Oils)	-	1	X	1	1	1	2	2	1	1	1	1	-	1	1	1
Butadiene	H ₂ C=C ₂ H ₂ =CH ₂	1	X	-	1	-	X	2	1	2	2	1	-	1	2	2
Butane	C ₄ H ₁₀	1	X	1	1	2	2	2	2	2	2	1	-	1	2	2
Butyl Acetate	C ₅ H ₁₂ O ₂	X	X	-	X	X	2	X	2	2	2	2	-	1	2	2
Butylene	-	1	X	-	1	1	2	2	2	2	2	1	-	1	3	2
Butyraldehyde	C ₄ H ₈ O ₂	X	2	-	X	X	X	2	3	2	2	1	3	-	-	-
Butyric Acid	CH ₃ CH ₂ CH ₂ COOH	X	1	-	2	-	X	2	2	2	2	2	-	1	2	1
Calcium Bisulfite	Ca(HSO ₃) ₂	1	X	-	1	1	X	X	X	2	2	X	1	2	-	2
Calcium Carbonate	CaCO ₃	1	1	1	1	-	X	X	1	2	2	2	1	1	2	2
Calcium Chloride	CaCl ₂	1	1	1	1	1	3	X	X	2	2	2	-	2	2	1
Calcium Hypochlorite	Ca(ClO) ₂	X	1	2	1	1	X	X	X	2	X	X	3	2	X	1
Calcium Hydroxide, 20%	Ca(OH) ₂	1	1	X	1	1	2	1	X	2	2	2	-	1	2	1
Calcium Sulfate	CaSO ₄	1	1	-	1	1	X	X	2	2	2	2	-	1	2	2
Carbolic Acid	C ₆ H ₅ OH	X	2	X	1	1	X	3	2	1	1	1	-	1	1	1
Carbon Bisulfide	CS ₂	X	X	-	1	1	X	2	2	2	1	X	-	1	2	2
Carbon Dioxide	CO ₂	1	1	-	2	1	2	2	1	2	2	2	-	1	1	2
Carbon Dioxide (Dry Gas)	CO ₂	1	1	-	2	-	2	2	1	2	2	1	-	1	1	2
Carbon Tetrachloride (Dry)	CCl ₄	X	X	-	1	3	X	2	1	1	2	1	-	1	1	1
Carbon Tetrachloride (Wet)	CCl ₄	X	X	2	1	3	X	2	1	1	2	1	-	2	1	1
Carbonated Water	-	1	1	1	1	-	X	1	1	1	1	1	-	1	1	1
Carbonic Acid	H ₂ CO ₃	1	1	1	1	1	X	X	2	2	2	X	-	1	1	1
Castor Oil	-	1	1	1	1	1	2	2	2	2	1	1	1	X	1	1
China Wood Oil (Tung)	-	1	X	1	1	1	X	X	3	1	2	2	1	1	1	1
Chlorine (Dry)	Cl ₂	X	X	3	1	-	X	1	X	2	X	1	3	2	2	1
Chlorine (Wet)	Cl ₂	X	X	3	1	1	X	X	X	X	X	X	X	X	1	1
Chlorinated Solvents (Dry)	-	X	1	X	1	-	X	X	X	X	X	X	-	1	3	1
Chloroacetic Acid	CH ₂ ClCO ₂ H	X	1	X	X	-	X	2	X	X	X	X	X	X	1	1
Chlorobenzene (Dry)	C ₆ H ₅ Cl	X	X	-	1	X	2	2	1	2	2	2	3	2	2	1
Chloroform	CHCl ₃	X	X	X	1	X	X	2	2	1	2	1	-	1	2	2
Chloroform (Dry)	CHCl ₃	X	X	X	1	X	X	2	2	1	2	1	-	1	2	2
Chlorosulfonic Acid (Dry)	ClSO ₂ OH	X	X	-	X	2	X	X	X	X	X	2	X	X	1	1
Chlorosulfonic Acid (Wet)	ClSO ₂ OH	X	X	-	X	2	X	X	X	X	X	2	X	X	1	1

Environment	Chemical Formula	ELASTOMERS - 75°F					METALS - 75°F									
		Buna N	EPDM	HSN	Fluorocarbon	Aflas	Ducile & Cast Iron	Aluminum Bronze ²	416 SS	316 SS	17-4PH SS	Monel & K-Monel	Inconel PD & Nitronic 50	Alloy 20	Hastelloy B	Hastelloy C
Chlorotoluene	CH ₃ C ₆ H ₄ Cl	X	X	-	1	X	2	1	2	2	1	1	1	1	1	1
Chrome Alum	CrK(SO ₄) ₂ 12H ₂ O	1	1	X	1	-	2	2	3	2	2	2	2	1	X	2
Chromic Acid, 10%	CrO ₃	1	2	-	1	1	X	X	X	1	X	2	-	1	1	1
Citric Acid	C ₆ H ₈ O ₇	1	1	1	1	1	X	X	2	2	2	1	1	1	1	1
Citrus Juices	-	1	1	1	1	1	X	2	2	1	1	1	1	1	1	1
Coke Oven Gas	-	X	1	-	1	1	2	2	2	2	2	2	-	1	1	1
Cooking Oil	-	2	1	1	1	-	2	2	2	1	1	1	-	1	1	1
Copper Acetate	-	1	1	-	X	X	X	X	2	2	2	X	-	1	2	2
Copper Chloride	CuCl ₂	1	1	-	1	1	X	X	X	X	3	X	-	X	2	2
Copper Nitrate	-	1	1	-	1	-	X	X	2	1	2	X	-	1	X	2
Copper Sulfate	CuSO ₄	1	1	-	1	1	X	X	2	2	2	X	3	1	2	1
Corn Oil	-	1	X	1	1	1	2	1	2	2	2	2	1	1	1	1
Cottonseed Oil	-	1	X	-	1	1	2	1	2	2	2	1	1	1	1	1
Creosote Oil	-	1	X	-	1	1	X	X	2	2	2	2	-	1	X	2
Cresylic Acid	-	X	1	1	1	1	X	X	2	2	2	X	-	1	1	1
Crude Oil (Sweet)	-	1	X	1	1	1	2	2	2	1	2	1	-	1	1	1
Crude Oil (Sour)	-	2	X	1	1	1	X	3	2	1	2	1	-	1	1	1
Cutting Oils	-	1	X	-	1	-	2	1	1	1	1	1	-	-	1	1
Water Emulsions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyclohexane	C ₆ H ₁₂	1	X	1	1	2	X	-	2	2	2	1	-	1	2	2
Diacetone Alcohol	-	X	1	X	X	3	X	2	2	2	2	1	-	1	1	1
Diesel Fuels	-	1	X	1	1	1	2	2	2	1	2	1	1	1	2	2
Diethylamine	(C ₂ H ₅) ₂ NH	2	2	-	2	2	X	X	2	2	2	1	-	1	-	2
Dowtherms	-	X	X	X	2	-	X	1	1	1	1	-	-	1	-	1
Drilling Mud	-	1	X	-	-	-	2	1	1	1	1	1	1	1	1	1
Dnp Cocks, Gas	-	3	X	-	1	-	2	2	1	1	1	1	-	1	1	1
Dry Cleaning Fluids	-	3	X	-	2	3	X	3	2	1	1	1	-	1	1	1
Drying Oil	-	1	X	-	1	-	3	X	2	1	2	2	-	1	1	1
Ethane	C ₂ H ₆	1	X	-	1	1	X	2	2	1	1	1	-	1	1	1
Ethanolamine, Mono	C ₂ H ₇ ON	1	1	-	X	1	2	X	1	1	2	2	-	-	2	2
Ethanolamine, Tri	C ₆ H ₁₅ O ₃ N	3	1	-	X	1	2	X	2	2	2	2	-	-	2	2
Ethyl Acetate	C ₄ H ₈ O ₂	X	1	X	X	X	2	2	2	2	2	2	-	1	2	2
Ethyl Acrylate	CH ₂ =CHCO ₂ C ₂ H ₅	X	2	-	X	X	X	2	2	2	2	2	-	-	-	1
Ethyl Alcohol	C ₂ H ₆ O	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1
Ethyl Chloride (Dry)	C ₂ H ₅ Cl	1	1	1	1	3	2	2	1	1	2	2	-	1	2	2
Ethyl Chloride (Wet)	C ₂ H ₅ Cl	3	X	1	1	2	X	3	2	1	2	3	-	1	2	2
Ethylene Chloride (Dry)	CH ₂ ClCH ₂ Cl	X	2	-	1	-	3	1	1	2	2	2	-	1	1	3
Ethylene Chloride (Wet)	CH ₂ ClCH ₂ Cl	X	X	-	2	-	X	2	X	X	X	2	X	-	X	X
Ethylene Diamine	C ₂ N ₄ H ₈	1	1	1	1	1	3	X	2	2	2	3	3	-	2	X
Ethylene Dichloride (Dry)	CH ₂ ClCH ₂ Cl	X	X	-	1	3	X	2	1	2	2	1	3	-	1	2
Ethylene Dichloride (Wet)	CH ₂ ClCH ₂ Cl	X	X	-	1	1	X	2	1	2	2	1	3	-	1	2
Ethylene Glycol	C ₂ H ₆ O ₂	1	1	1	1	1	2	2	2	2	2	2	-	1	1	1
Ethylene Oxide	CH ₂ CH ₂ O	X	X	-	X	X	2	2	2	1	2	2	-	1	1	1
Fatty Acids	-	1	X	-	1	1	X	2	2	1	2	2	1	1	1	1
Ferric Chloride	FeCl ₃	1	1	-	1	1	X	X	X	X	X	X	X	X	2	2
Ferric Nitrate	Fe(NO ₃) ₃	1	1	-	1	1	X	X	X	2	2	X	-	1	X	2
Ferric Sulfate	Fe(SO ₄) ₃	1	1	-	1	1	X	X	X	1	2	2	-	1	X	1
Ferrous Chloride	Fe ₂ Cl ₂	1	1	-	1	-	X	X	X	X	X	X	X	1	2	2
Ferrous Nitrate	Fe(NO ₃) ₂	1	1	-	1	-	X	X	2	2	2	X	-	1	-	1
Ferrous Sulfate	FeSO ₄	1	1	-	1	-	X	X	2	2	2	2	-	1	2	2
Ferrous Sulfate (Saturated)	FeSO ₄	1	1	-	1	-	X	X	2	2	2	2	-	1	2	2
Fertilizer Solutions	-	2	3	-	1	-	X	X	2	1	1	1	1	1	1	1
Fluorosilicic Acid	H ₂ SiF ₆	1	1	-	2	-	X	2	3	2	2	1	-	1	2	2
Food Fluids & Pastes	-	2	3	-	1	-	X	2	2	1	1	1	1	1	1	1
Formaldehyde	HCHO	X	1	-	1	1	X	2	2	2	2	2	3	1	2	2
Formic Acid	HCOOH	X	1	-	2	-	X	1	2	2	1	2	3	1	2	1
Fruit Juices	-	1	1	-	1	1	X	2	1	2	2	1	1	1	1	1
Fuel Oil	-	1	X	1	1	1	2	1	1	2	1	2	-	1	2	2
Furfural	C ₄ H ₃ OCHO	X	2	X	X	1	X	2	2	2	2	2	-	1	2	2
Gallic Acid	-	2	2	X	1	1	X	X	2	2	2	2	-	1	2	2
Gas, Manufactured	-	1	X	-	1	-	3	1	2	2	1	1	-	1	1	1
Gas, Natural	-	1	X	-	1	1	2	1	1	1	1	1	-	1	1	1
Gasoline (Aviation)	-	3	X	-	1	-	2	1	1	1	1	1	-	1	1	1
Gasoline (Leaded)	-	1	X	-	1	-	3	2	1	2	2	2	-	1	1	1
Gasoline (Motor)	-	3	X	-	1	2	2	2	1	1	1	1	-	1	1	1
Gasoline (Sour)	-	1	X	1	1	2	X	2	2	2	2	X	-	1	2	2
Gasoline (Unleaded)	-	1	X	-	1	1	X	2	1	2	2	2	-	1	1	1
Gelatin	-	1	1	-	1	1	X	1	1	2	2	2	-	1	2	X
Glacial Acetic Acid	CH ₃ COOH	X	2	1	X	X	X	2	X	2	2	2	-	-	-	-
Glucose	-	1	1	1	1	1	2	2	1	2	2	2	-	1	1	1
Glycerine (Glycerol)	-	1	1	-	1	1	1	2	1	1	2	1	1	1	1	1
Grease	-	1	X	1	1	1	2	1	1	1	1	1	-	1	1	1
Heptane	CH ₃ (CH ₂) ₅ CH ₃	1	X	1	1	2	X	2	2	2	2	2	-	1	1	1
Hexane	C ₆ H ₁₄	1	X	-	1	1	2	2	2	1	2	2	-	1	1	1
Hydraulic Oil (Petroleum Base)	-	1	X	1	1	1	2	1	1	1	1	1	-	1	1	1

Environment	Chemical Formula	ELASTOMERS - 75° F					METALS - 75° F									
		Buna N	EPDM	HSN	Fluorocarbon	Aflas	Ductile & Cast Iron	Aluminum Bronze	416 SS	316 SS	17-4PH SS	Monel & K-Monel	Illum PD & Nitronic 60	Alloy 20	Hastelloy B	Hastelloy C
Hydrobromic Acid	HBr	X	1	-	1	1	X	X	X	X	X	X	X	2	2	
Hydrochloric Acid, 10%	HCl	1	1	-	1	1	X	X	X	X	X	X	X	2	1	
Hydrochloric Acid, 20%	HCl	1	1	-	1	1	X	X	X	X	X	X	X	2	1	
Hydrochloric Acid, 37%	HCl	X	1	-	1	1	X	X	X	X	X	X	X	2	1	
Hydrocyanic Acid	HCN	1	1	2	1	1	X	X	2	2	2	2	1	2	2	
Hydrofluoric Acid, 48%	HF	X	X	-	1	1	X	X	X	X	3	2	1	2	2	
Hydrofluorosilicic Acid	H ₂ SIF ₆	1	1	-	1	1	X	2	2	X	2	3	3	2	2	
Hydrogen Gas	H ₂	1	1	-	1	1	1	2	1	1	2	1	1	1	1	
Hydrogen Peroxide (Concent.)	H ₂ O ₂	X	1	X	1	1	X	X	2	1	2	1	2	1	1	
Hydrogen Peroxide (Dilute)	H ₂ O ₂	1	1	X	1	1	X	X	X	2	2	2	1	1	1	
Hydrogen Sulfide (Dry)	H ₂ S	1	1	-	X	-	2	1	2	1	2	-	1	2	2	
Hydrogen Sulfide (Wet)	H ₂ S	X	1	1	1	1	X	X	X	2	X	3	1	2	2	
Hypo (Sodium Thiosulfate)	-	1	2	-	1	1	X	3	2	1	2	1	1	3	2	
Iodine (Wet)	-	1	2	1	1	X	X	X	X	X	X	X	X	2	2	
Iodoform	CHI ₃	X	1	-	1	-	X	X	2	1	1	X	1	X	X	
Iso-octane	C ₈ H ₁₈	1	X	1	1	2	3	2	2	2	2	-	1	2	2	
Isopropyl Alcohol	C ₃ H ₈ O	1	1	2	1	1	2	2	2	2	2	-	1	2	2	
Isoropyl Ether	(CH ₃) ₂ CHOCH(CH ₃)	2	X	2	X	X	3	2	2	2	2	-	1	1	2	
JP-4 Fuel	-	1	X	1	1	-	2	2	2	2	2	-	1	1	1	
JP-5 Fuel	-	1	X	1	-	-	1	2	2	2	2	-	1	2	2	
JP-6 Fuel	-	1	X	1	1	-	1	2	2	2	2	-	1	2	2	
Kerosene	-	1	X	1	1	1	2	2	1	2	2	-	1	2	2	
Ketones	-	X	X	-	X	-	2	2	2	2	2	-	1	1	1	
Lactic Acid (Dilute, Cold)	-	1	1	-	1	1	X	2	2	1	1	X	1	2	2	
Lactic Acid (Concent., Cold)	-	X	X	-	1	1	X	1	2	2	2	X	-	2	2	
Lead Acetate	-	1	1	-	1	X	X	2	2	2	2	-	1	2	2	
Linoleic Acid	-	1	X	2	1	1	2	X	1	2	2	-	1	2	2	
Linolenic Acid	C ₁₈ H ₃₂ O ₂	2	X	2	3	-	X	2	3	1	2	1	-	-	-	
Linseed Oil	-	1	X	1	1	1	2	2	1	2	2	2	1	1	2	
LPG	-	1	X	1	1	3	2	1	1	1	1	1	1	1	1	
Lubricating Oil	-	1	X	-	1	1	1	2	1	2	2	2	1	1	1	
Magnesium Chloride	MgCl ₂	1	1	-	1	1	X	2	2	2	X	2	-	1	1	
Magnesium Hydroxide	Mg(OH) ₂	1	1	-	1	1	X	2	2	1	2	2	-	1	1	
Magnesium Nitrate	Mg(NO ₃) ₂	1	1	-	1	-	3	2	1	2	2	-	1	2	1	
Magnesium Sulfate	MgSO ₄	1	1	-	1	1	X	2	2	2	2	1	-	1	2	
Maleic Acid	C ₄ H ₄ O ₄	X	1	-	1	1	X	2	1	2	2	2	-	2	2	
Malic Acid	-	1	X	-	1	1	X	2	2	1	2	2	-	1	2	
Mercuro Chloride	HgCl ₂	1	1	1	1	1	X	X	X	2	X	X	X	X	2	
Mercuro Cyanide	Hg(CN) ₂	1	1	-	1	-	X	X	X	2	3	2	-	1	2	
Mercury	-	1	1	1	1	1	1	X	1	1	2	2	-	1	2	
Methane	CH ₄	1	1	1	1	2	2	2	1	1	2	1	-	1	1	
Methyl Acetate	CH ₃ CO ₂ CH ₃	X	X	X	X	X	X	2	3	2	2	1	-	2	1	
Methyl Acetone	-	X	1	-	X	-	3	2	2	2	2	-	1	1	1	
Methyl Alcohol	CH ₃ OH	1	1	-	X	1	2	2	2	2	2	1	-	1	1	
Methyl "Cellosolve"	-	X	1	2	X	-	X	1	2	2	2	-	1	1	1	
Methyl Chloride (Dry)	CH ₃ Cl	X	X	X	1	-	2	X	2	1	2	2	-	1	2	
Methyl Ethyl Ketone	C ₅ H ₁₀ O	X	1	X	X	X	2	2	2	2	2	-	1	2	2	
Methyl Formate	HCOOCH ₃	X	1	-	X	-	X	2	2	2	2	-	-	-	2	
Methyl Isobutryl Ketone	C ₆ H ₁₂ O	X	1	X	X	X	2	2	2	2	2	-	-	2	2	
*Methyl Tertiary Butyl Ether	(MTBE)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Methylamine	CH ₃ NH ₂	3	2	-	3	-	2	2	2	1	1	2	-	-	-	
Methylene Chloride	CH ₂ Cl ₂	X	X	-	2	-	2	1	2	2	2	-	2	1	1	
Mine Waters (Acid)	-	1	1	-	1	-	X	X	X	2	3	X	3	2	1	
Mineral Oil	-	1	X	1	1	1	2	2	1	1	1	-	1	1	1	
Mineral Spirits	-	1	X	-	1	-	2	2	1	2	2	-	2	1	2	
Molasses, Edible	-	1	1	-	1	-	X	X	X	1	1	2	-	1	1	
Molasses, Crude	-	1	1	-	1	-	1	2	1	1	2	2	-	1	1	
Muratic Acid (Hydrochloric)	HCl	X	2	-	1	-	X	X	X	X	X	X	X	1	1	
Naphtha	-	1	X	2	1	2	X	X	2	1	2	2	-	1	2	
Naphthalene	C ₁₀ H ₈	X	X	X	1	X	3	1	1	1	2	2	-	1	2	
Nickel Ammonium Sulfate	-	1	2	-	1	-	X	X	3	1	2	2	-	-	-	
Nickel Chloride	NiCl ₂	1	1	-	1	1	X	X	X	2	3	3	1	1	1	
Nickel Nitrate	Ni(NO ₃) ₂ · 6H ₂ O	1	1	-	1	-	2	2	1	2	2	-	1	2	2	
Nickel Sulfate	NiSO ₄	1	1	-	1	1	X	X	2	2	1	2	-	1	X	
Nitric Acid, 10%	HNO ₂	X	1	-	1	1	X	X	2	1	2	X	1	1	2	
Nitric Acid, 30%	HNO ₃	X	1	X	1	-	X	X	2	1	2	X	1	1	X	
Nitric Acid, 80%	HNO ₃	X	X	X	1	-	X	X	2	1	X	X	2	2	X	
Nitric Acid, 100%	HNO ₃	X	X	X	1	-	X	X	X	1	2	X	2	X	2	
Nitrobenzene	C ₆ H ₅ NO ₂	X	X	X	2	1	X	2	2	2	2	2	-	1	X	
Nitrogen (Gas)	N ₂	1	1	-	1	-	2	2	1	1	2	1	-	1	1	
Nitrous Oxide	N ₂ O	X	2	-	1	-	X	1	3	2	-	X	-	1	X	
Oils, Animal	-	1	2	1	2	1	1	1	1	1	1	-	1	1	1	
Oils, Fuel	-	1	X	1	1	1	2	1	1	1	1	-	1	1	1	
Oils, Lubricating	-	1	X	-	1	1	1	1	1	1	1	-	1	1	1	
Oils, Mineral	-	1	X	1	1	1	2	1	1	1	1	-	1	1	1	
Oil, Petroleum (Refined)	-	1	X	-	1	1	1	1	1	1	1	-	1	1	1	

*Note: For MTBE Service: Available Elastomers-Teflon Encapsulated Compounds, Kalrez. Available Metals - See Gasoline.

Environment	Chemical Formula	ELASTOMERS - 75° F					METALS - 75° F									
		Buna N	EPDM	HSN	Fluorocarbon	Aflas	Ductile & Cast Iron	Aluminum Bronze	416 SS	316 SS	17-4PH SS	Monel & K-Monel	Inconel PD & Nitronic 50	Alloy 20	Hastelloy B	Hastelloy C
Oil, Petroleum (Sour)	-	2	X	1	1	1	X	X	3	2	2	2	2	1	1	1
Oil, Water Mixtures	-	1	X	1	1	1	2	1	1	1	1	1	1	1	1	1
Oleic Acid	C ₁₈ H ₃₄ O ₂	1	X	1	1	1	X	2	2	1	2	1	1	1	2	2
Ortho Dichlorobenzene	C ₆ H ₄ Cl ₂	X	X	-	2	-	3	2	2	2	2	1	-	-	-	-
Oxalic Acid, 25%	C ₂ H ₂ O ₄ · 2H ₂ O	X	1	2	1	1	X	X	2	2	2	2	2	2	2	2
Oxygen	-	1	1	X	1	1	2	2	1	2	2	2	2	1	1	1
Ozone (Wet)	-	X	1	2	1	1	X	2	2	2	2	2	2	1	1	1
Ozone (Dry)	-	X	1	2	1	1	2	1	2	2	2	2	-	1	1	1
Plamitic Acid	C ₁₈ H ₃₂ O ₂	1	1	-	1	1	3	2	2	2	2	2	2	1	2	2
Paraformaldehyde	(HCHO) ₆	2	2	-	2	-	2	2	2	2	2	-	-	-	-	-
Pentane	CH ₃ (CH ₂) ₃ HC ₃	1	X	-	1	-	2	2	2	2	2	-	1	2	1	1
Perchloroethylene (Dry)	Cl ₂ C:CCl ₂	X	X	-	1	-	X	2	2	1	2	1	-	1	2	2
Petrolatum	-	1	X	-	1	-	X	2	3	2	3	2	3	-	-	-
Phenol	C ₆ H ₅ OH	X	1	X	1	1	X	X	2	1	2	1	-	1	1	1
Phosphoric Acid, 10%	H ₃ PO ₄	X	1	-	1	1	X	X	1	1	2	X	1	1	1	1
Phosphoric Acid, 50%	H ₃ PO ₄	X	1	-	1	1	X	X	2	2	2	X	2	1	1	1
Phosphoric Acid, 85%	H ₃ PO ₄	X	1	-	1	-	X	X	X	2	X	X	2	1	1	1
Phthalic Acid	C ₈ H ₆ O ₂	X	X	-	1	-	X	2	2	1	2	2	-	1	2	2
Phthalic Anhydride	C ₈ H ₄ (CO) ₂ O	X	1	-	1	-	X	2	1	1	2	1	-	1	1	1
Picric Acid	C ₆ H ₂ (NO ₂) ₃ OH	1	1	-	1	X	X	X	2	2	2	X	3	1	2	2
Potassium Bisulfite	KHSO ₃	1	1	-	1	-	X	X	3	2	2	X	-	1	-	-
Potassium Bromide	KBr	1	1	-	1	-	X	2	2	2	1	2	-	1	2	1
Potassium Carbonate	K ₂ CO ₃	1	1	-	1	-	2	2	2	1	2	2	-	1	2	2
Potassium Chlorate	KClO ₃	1	1	-	1	-	2	2	2	1	2	2	-	1	X	2
Potassium Chloride	KCl	1	1	-	1	1	X	2	2	1	2	1	-	1	2	2
Potassium Cyanide	KCN	1	1	-	1	1	X	X	2	2	2	2	-	1	2	2
Potassium Dichromate	K ₂ Cr ₂ O ₇	1	1	-	1	1	2	X	2	2	2	2	-	1	2	2
Potassium Diphosphate	KH ₂ PO ₄	1	1	-	1	1	2	2	2	1	1	1	-	-	-	-
Potassium Ferricyanide	K ₃ Fe(CN) ₆	1	1	-	1	-	X	2	2	2	2	2	-	1	2	2
Potassium Ferrocyanide	-	1	1	-	1	-	X	X	X	2	3	2	-	1	2	2
Potassium Hydroxide (Dil.)	KOH	1	1	-	1	1	3	2	2	2	2	1	-	2	2	2
Potassium Hydroxide (to 70%)	KOH	1	1	-	X	-	3	2	2	2	2	2	-	2	2	2
Potassium Iodide	KI	1	1	-	1	-	2	2	2	2	2	2	-	1	2	2
Potassium Nitrate	KNO ₃	1	1	1	1	1	X	2	2	2	2	2	-	1	X	2
Potassium Permanganate	KMnO ₄	X	1	-	1	-	2	2	2	2	2	2	-	1	X	1
Potassium Sulfate	K ₂ SO ₄	1	1	1	1	1	X	2	2	2	2	2	-	1	2	2
Potassium Sulfide	K ₂ S	1	3	-	X	-	X	X	2	2	2	X	-	1	2	2
Potassium Sulfite	K ₂ SO ₃ · 2H ₂ O	1	1	-	1	-	X	2	3	2	2	2	1	-	-	1
Propane	C ₃ H ₆	1	X	1	1	1	X	2	1	2	2	1	-	1	2	2
Propyl Alcohol	-	1	1	1	1	1	2	2	1	1	2	2	-	1	1	1
Propylene Glycol	-	1	2	-	1	1	2	2	2	2	2	2	-	-	2	2
Pyrogallic Acid	C ₆ H ₃ (OH) ₃	1	3	-	1	-	X	2	2	2	2	2	-	1	2	2
Quench Oil	-	1	X	-	1	-	2	1	1	1	1	1	-	-	-	-
Resins & Rosins	-	X	X	-	1	-	X	1	2	1	1	1	-	1	1	1
Salicylic Acid	C ₆ H ₄ (OH)(COOH)	1	1	-	1	1	X	2	2	2	2	2	-	2	X	1
Sea Water	-	1	1	1	1	1	X	2	X	2	2	2	1	1	2	1
Silver Nitrate	AgNO ₃	1	1	2	1	1	X	X	2	1	2	X	-	1	1	1
Sodium Acetate	NaC ₂ H ₃ O ₂	2	1	-	X	X	X	2	2	2	2	2	-	1	2	2
Sodium Aluminate	NaAlO ₂	1	1	-	1	-	X	2	2	2	2	2	-	1	X	2
Sodium Bicarbonate	NaHCO ₃	1	1	1	1	1	X	2	2	1	2	1	-	1	1	1
Sodium Bisulfate, 10%	NaHSO ₄	1	1	-	1	-	X	X	1	1	2	2	-	2	2	2
Sodium Bisulfite, 10%	NaHSO ₃	1	1	-	1	1	X	2	3	2	3	2	-	1	2	2
Sodium Borate	-	1	1	-	1	1	2	1	1	2	1	2	-	1	2	2
Sodium Bromide, 10%	NaBr	1	1	-	1	-	2	1	X	2	1	2	-	1	2	2
Sodium Carbonate	Na ₂ CO ₃	1	1	1	1	1	2	1	2	2	2	1	-	1	2	2
Sodium Chlorate	NaClO ₃	1	1	-	1	-	3	2	2	2	2	1	-	1	X	1
Sodium Chloride	NaCl	1	1	1	1	1	2	2	X	2	2	1	2	2	2	2
Sodium Chromate	-	1	1	-	3	-	3	1	3	1	3	1	-	-	1	2
Sodium Cyanide	NaCN	1	1	-	1	1	X	X	1	1	2	X	-	1	2	2
Sodium Fluoride	NMaF	1	1	-	1	-	X	X	3	2	2	1	-	-	2	2
Sodium Hydroxide, 20%	NaOH	1	1	-	X	1	2	2	2	1	2	1	-	1	1	2
Sodium Hydroxide, 50%	NaOH	1	1	-	X	-	2	X	2	1	X	1	-	1	1	1
Sodium Hydroxide, 70%	NaOH	1	1	-	X	-	2	X	2	2	2	1	-	2	1	1
Sodium Metaphosphate	NaPO ₃	1	1	-	1	1	3	X	2	2	3	2	-	1	-	-
Sodium Metasilicate	Na ₂ SiO ₃	1	2	-	1	-	X	2	2	2	2	1	-	-	1	1
Sodium Nitrate	NaNO ₃	1	1	-	X	1	X	2	1	1	2	2	-	1	X	2
Sodium Perborate	-	1	1	-	1	1	X	2	2	2	2	2	-	1	2	2
Sodium Peroxide	Na ₂ O ₂	1	1	-	1	1	X	X	1	2	2	2	-	1	2	2
Sodium Phosphate (Dibasic)	Na ₂ HPO ₄	1	2	-	1	1	X	2	2	1	1	1	-	2	1	1
Sodium Phosphate (Tribasic)	-	2	2	-	1	1	X	3	X	1	1	1	-	2	1	-
Sodium Silicate	-	1	1	-	1	1	X	1	1	2	2	2	-	1	2	2
Sodium Sulfate	Na ₂ SO ₄	1	1	-	1	1	2	1	2	1	2	2	-	1	2	2
Sodium Sulfide	Na ₂ S	1	1	-	1	-	X	X	X	2	1	2	-	2	2	2
Sodium Sulfite	Na ₂ SO ₃	1	1	-	1	-	X	X	2	1	2	2	-	1	X	2
Sodium Thioisulfate	-	1	1	-	1	1	X	X	1	2	2	2	-	1	2	2
Soybean Oil	-	1	X	1	1	1	2	1	2	2	2	2	-	1	1	1

POSITIVE SHUTOFF – 200 psi W.P.
MATERIAL SPECIFICATIONS & MODEL NUMBERING SYSTEM

EXAMPLE ORDER NUMBER: 4 R 30 11 2 2 B B 1J

VALVE SIZE	2, 2 1/2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 36,		
SEAT TYPE	R – Resilient Elastomer Liner – Positive Shutoff M – Replaceable Metal Liner – Positive Shutoff D – Replaceable Metal Liner – Damper Type Throttling T – Replaceable Teflon Liner – Positive Shutoff		
BODY TYPE	10 – Wafer Span 20 – Span Double Rib 30 – Full Lug		
BODY MATERIAL	10 – Cast Iron, ASTM A126 Class B * (All 14" and larger valves have Teflon bushings) 11 – Ductile Iron, ASTM A395 60-40-18 20 – Cast Steel, ASTM A216 Gr. WCB w/Teflon Bushing to prevent shaft seizing 21 – Stainless Steel, ASTM A743 Gr. CF-8M * 30 – Valve Bronze, ASTM B61 * 31 – Nickel – Aluminum Bronze ASTM B148 Alloy 958 * 40 – Aluminum Alloy 356T6 ASTM B26 Alloy SG70A *		
DISC MATERIAL	1 – Ductile Iron ASTM A395 60-40-18 2 – Stainless Steel, 316 ASTM A743 Gr. CF-8M 2 – 25-5 SMO SS (Teflon Valves Only) 3 – Stainless Steel Alloy #20, ASTM A743 Gr. Cr-7M * 4 – Aluminum Bronze, ASTM B148 Alloy 955 5 – Aluminum Alloy 356T6 ASTM B26 Alloy SG70A * 6 – Nickel – Copper Alloy (Monel) QQ-N-288 *	B – Hastelloy B ASTM A494 N-12MV * C – Hastelloy C ASTM A494 CW12-MV * T2 – Teflon Coated Disc & Shaft	
SHAFT MATERIAL	1 – Stainless Steel 20cb3 * 2 – Stainless Steel AISI 316 2 – 25-5 SMO SS (Teflon Valves Only) 3 – Stainless Steel AISI 415 4 – Nickel – Copper Alloy (Monel) ASTM B164 Class A * 6 – Nickel – Copper – Aluminum Alloy (K-Monel) QQ-N-286A *	7 – Stainless Steel 17-4PH B – Hastelloy B * C – Hastelloy C * For Teflon Coated Disc LEAVE BLANK	
SEAT MATERIAL	<u>R/T-SERIES (ELASTOMERS)</u> A – Buna N (Hycar) B – Fluorocarbon / Viton A E – Neoprene (Black) * G – Neoprene (White) * H – HSN J – Abrasion Resistant Buna * K – Hypalon L – ECO N – Natural Rubber * S – EPDM (Nordel) H – Highly Saturated Nitrile TA – Teflon/Buna TB – Teflon/Viton TS – Teflon/EPDM	<u>M & D SERIES (METAL)</u> 1 – Cast Iron, ASTM A126 Class B 2 – Stainless Steel, 316 ASTM A743 Gr. CF-8M 3 – Aluminum Bronze ASTM B148 Alloy 953 4 – Aluminum Alloy 356T6 ASTM B26 Alloy SG70A * 5 – Nickel – Copper Alloy (Monel) QQ-N-288 Comp A or E *	B – Hastelloy B ASTM A494 N-12MV * C – Hastelloy B ASTM A494 * CW12-MW *
O-RING SEAL MATERIAL	A – Buna N (Hycar) B – Fluorocarbon / Viton B D – Slippery Viton * E – Neoprene (Black) * F – Aflas H – Highly Saturated Nitrile	G – Neoprene (White) * K – Hypalon L – ECO M – Buna N	S – EPDM (Nordel) T – Teflon Disc O-Ring only. Add "T" to M-Series model number. X – Teflon Encapsulated Silicone Y – Teflon Encapsulated Viton TEFLON VALVE LEAVE BLANK
OPERATORS	Manual Handles 1J – Standard On/Off uninitiated topworks 1S – 10° detente topworks. Locates position of valve disc every 10 degrees. 1A – Standard On/Off Handle with 1S detente topworks. 1P – On/Off detente topworks with padlocking device only. 1Q – Standard On/Off topworks with handle and padlocking device. 1F – Squeeze trigger 10 position throttling handle. 1FM – Squeeze trigger 10 position throttling handle with marine trim. 1W – 10 position Squeeze trigger handle. Teflon Valves Only	Gear Operators 2P/2T – Weatherproof worm and gear operator with cast iron case and cover. For valves 14" and larger. 2X – Weatherproof worm and gear operator with cast iron case and cover. For valves 2"-12". Replaces models 2R and 2K. 2TM – Weatherproof worm and gear operator with epoxy coated case and cover, monel shaft for marine applications. 2W – Weatherproof gear operator. Teflon Valve Only.	

FOR FURTHER INFORMATION PLEASE CONTACT:



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