

# NIBCO CHEMICAL RESISTANCE GUIDE FOR VALVES & FITTINGS

## INTRODUCTION

This chemical resistance guide has been compiled to assist the piping system designer in selecting chemical resistant materials. The information given is intended as a guide only. Many conditions can affect the material choices. Careful consideration must be given to temperature, pressure and chemical concentrations before a final material can be selected.

Thermoplastics and elastomers' physical characteristics are more sensitive to temperature than metals. For this reason, a rating chart has been developed for each.

### MATERIAL RATINGS FOR THERMOPLASTICS & ELASTOMERS

Temp. in °F	= "A" rating, maximum temperature which is recommended, resistant under normal conditions
B to Temp. in °F	= Conditional resistance, consult factory
C	= Not recommended
Blank	= No data available

### MATERIAL RATINGS FOR METALS

A	= Recommended, resistant under normal conditions
B	= Conditional, consult factory
C	= Not recommended
Blank	= No data available

Temperature maximums for thermoplastics, elastomers and metals should always fall within published temperature ratings for individual valves. **THERMOPLASTICS ARE NOT RECOMMENDED FOR COMPRESSED AIR OR GAS SERVICE.**

This guide considers the resistance of the total valve assembly as well as the resistance of individual trim and fitting materials. The rating assigned to the valve body plus trim combinations is always that of the least resistant part. In the cases where the valve body is the least resistant, there may be conditions under which the rate of corrosion is slow enough and the mass of the body large enough to be usable for a period of time. Such use should always be determined by test before installation of the component in a piping system.

In the selection of a butterfly valve for use with a particular chemical, the liner, disc, and stem must be resistant. All three materials should carry a rating of "A." The body of a properly functioning butterfly valve is isolated from the chemicals being handled and need not carry the same rating.

## THERMOPLASTICS & ELASTOMERS

**ABS** — Acrylonitrile Butadiene Styrene Class 4-2-2 conforming to ASTM D1788 is a time-proven material. The smooth inner surface and superior resistance to deposit formation makes ABS drain, waste, and vent material ideal for residential and commercial sanitary systems. The residential DWV system can be exposed in service to a wide temperature span. ABS-DWV has proven satisfactory for use from -40°F to 180°F. These temperature variations can occur due to ambient temperature or the discharge of hot

liquids into the system. ABS-DWV is very resistant to a wide variety of materials, ranging from sewage to commercial household chemical formulations. ABS-DWV is joined by solvent cementing or threading and can easily be connected to steel, copper, or cast iron through the use of transition fittings.

**CPVC** — Chlorinated Polyvinyl Chloride Class 23447-B, formerly designated Type IV, Grade 1 conforming to ASTM D-1784, has physical properties at 73°F similar to those of PVC, and its chemical resistance is similar to or generally better than that of PVC. CPVC, with a design stress of 2000 psi and maximum service temperature of 210°F, has proven to be an excellent material for hot corrosive liquids, hot or cold water distribution, and similar applications above the temperature range of PVC. CPVC is joined by solvent cementing, threading or flanging.

**PP** (Polypropylene) — Type 1 Polypropylene is a polyolefin, which is lightweight and generally high in chemical resistance. Although Type 1 polypropylene conforming to ASTM D-2146 is slightly lower in physical properties compared to PVC, it is chemically resistant to organic solvents as well as acids and alkalis. Generally, polypropylene should not be used in contact with strong oxidizing acids, chlorinated hydrocarbons, and aromatics. With a design stress of 1000 psi at 73°F, polypropylene has gained wide acceptance where its resistance to sulfur-bearing compounds is particularly useful in salt water disposal lines, crude oil piping, and low pressure gas gathering systems. Polypropylene has also proved to be an excellent material for laboratory and industrial drainage where mixtures of acids, bases, and solvents are involved. Polypropylene is joined by the thermo-seal fusion process, threading or flanging. At 180°F, or when threaded, PP should be used for drainage only at a pressure not exceeding 20 psi.

**PVC** — Polyvinyl Chloride Class 12454-B, formerly designated Type 1, Grade 1. PVC is the most frequently specified of all thermoplastic materials. It has been used successfully for over 30 years in such areas as chemical processing, industrial plating, chilled water distribution, deionized water lines, chemical drainage, and irrigation systems. PVC is characterized by high physical properties and resistance to corrosion and chemical attack by acids, alkalis, salt solutions, and many other chemicals. It is attacked, however, by polar solvents such as ketones, some chlorinated hydrocarbons and aromatics. The maximum service temperature of PVC is 140°F. With a design stress of 2000 psi, PVC has the highest long-term hydrostatic strength at 73°F of any of the major thermoplastics being used for piping systems. PVC is joined by solvent cementing, threading, or flanging.

**PVDF** (Polyvinylidene Fluoride) — KEM-TEMP (KYNAR®) is a strong, tough and abrasion-resistant fluorocarbon material. It resists distortion and retains most of its strength to 280°F. It is chemically resistant to most acids, bases, and organic solvents and is ideally suited for handling wet or dry chlorine, bromine and other halogens. No other solid thermoplastic piping components can approach the combination of strength, chemical resistance and working temperatures of PVDF. PVDF is joined by the thermo-seal fusion process, threading or flanging.

**EPDM** — EPDM is a terpolymer elastomer made from ethylene-propylene diene monomer. EPDM has good abrasion and tear resistance and offers excellent chemical resistance to a variety of acids and alkalis. It is susceptible to attack by oils and is not recommended for applications involving petroleum oils, strong

# Nibco Chemical Resistance Guide

**Wenbin Ji**



## **Nibco Chemical Resistance Guide:**

*Corrosion Protection against Carbon Dioxide* Michael Schütze, Bernd Isecke, Roman Bender, 2011-07-18 This handy reference compiles the latest data on the corrosion behavior of materials coming into contact with CO<sub>2</sub> with 95% of the contents previously unpublished It is clearly structured according to material and covers metals non metallic inorganic materials and plastics as well as including information about corrosion protection The result is a must have for all engineers and scientists dealing with corrosion problems in CO<sub>2</sub> containing environments      **Piping Systems Manual** Brian Silowash, 2009-10-05 In depth Details on Piping Systems Filled with examples drawn from years of design and field experience this practical guide offers comprehensive information on piping installation repair and rehabilitation All of the latest codes standards and specifications are included Piping Systems Manual is a hands on design and engineering resource that explains the reasons behind the designs You will get full coverage of materials components calculations specifications safety and much more Hundreds of detailed illustrations make it easy to understand the best practices presented in the book Piping Systems Manual covers ASME B31 piping codes Specifications and standards Materials of construction Fittings Valves and appurtenances Pipe supports Drafting practice Pressure drop calculations Piping project anatomy Field work and start up What goes wrong Special services Infrastructure Strategies for remote locations      *Chemical Engineering Progress*, 1998      Plastic Piping Systems David A. Chasis, 1988 For grades 10 12      **Materials Performance**, 1996

**Consulting-specifying Engineer**, 1995      Machine Design, 1988      **Handbook of Corrosion Engineering 2/E** Pierre R. Roberge, 2012-01-26 THE MOST COMPLETE UP TO DATE CORROSION CONTROL REFERENCE Fully revised throughout Handbook of Corrosion Engineering Second Edition discusses the latest advances in corrosion resistant materials methods and protective coatings This comprehensive resource covers all aspects of corrosion damage including detection monitoring prevention and control Written by a world renowned expert on the subject the book helps you to select materials and resolve design issues where corrosion is considered a factor Understand predict evaluate mitigate and correct corrosion problems with help from this authoritative guide Coverage includes Aqueous corrosion High temperature corrosion Atmospheric water seawater soil concrete and microbial environments Modeling life prediction and computer applications Identifying and inspecting corrosion failures Corrosion maintenance through inspection and monitoring Corrosion testing Selection and design of engineering materials Protective coatings and corrosion inhibitors Cathodic and anodic protection

*Chemical Engineering*, 1987      Centrifugal Pump User's Guidebook Shmariahu Yedidiah, 2012-12-06 Specifically for the pump user this book concentrates on the identification and solution of problems associated with existing centrifugal pumps It gives specific examples on how to modify pump performance for increased efficiency and better quality control which turn into long term cost savings Some basic theory is included to give the reader greater understanding of the problems being encountered and attacked      *Power Plant Engineering*, 1971      **Chemical Engineering Equipment Buyers' Guide**

,1992     **Power Engineering** ,1983     **Thomas Register of American Manufacturers** ,2003 Vols for 1970 71 includes manufacturers catalogs     **Valve Selection and Specification Guide** Ronald C. Merrick,1991-01-10 Today people who specify or select valves spend over two thirds of their time researching literature for information on valve sizing availability materials and standards This is nonproductive time Unfortunately most companies do not have the luxury of a team of experts with the necessary experience and education in all of the different fields that apply to valves The next best alternative is to understand what valves are and all the things they can do By definition valves are devices that stop start mix or change the direction and or magnitude of the fluid flow pressure or its tempera ture As a specifier or selector you will have to determine whether the valve is going to be used for flow control throttling or for on off service Then you will have to determine the cycle life or frequency of their operation You will discover that valves are classified into three categories on off valves control or regulator valves and fixed valves such as orifice plate nozzle duckbill rupture disk blind valve etc These valves represent approximately thirty different design configurations It has been said that if cost and delivery were no problem anyone of the seven basic valve styles could do the job of any other one But cost and delivery are very important factors in the real world So you have to be able to distinguish among these seven styles ball butterfly gate globe pinch diaphragm plug and poppet valves     *PVC* J. Leadbitter,J. A. Day,J. L. Ryan,1994 This report reviews the composition and synthesis of PVC composition and formulation technology compounding and manufacturing technology and the additional range of materials made possible by blending with other polymers It is completed by around 500 abstracts selected from the Rapra Polymer Library database     NFPA Fire Protection Reference Directory and Buyer's Guide ,1984     **Mechanical Engineering** ,1972-07     *Predicasts Technology Update* ,1990     **DE/domestic Engineering** ,1977

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