

WARNING: Compatibility of hose and fittings with conveyed fluid is an essential factor in avoiding chemical reactions that may result in release of fluids or failure of the hose or connection. This chemical compatibility guide must not be used in conjunction with any other compatibility guides from previous or future catalogue editions, bulletins or publications. Incorrect use of these charts could result in death, personal injury or property damage.



INTRODUCTION

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HOSE SELECTION BY MEDIUM AND HOSE TYPE

This hose compatibility chart is a reference of Manuli Hydraulics hose compatibility with various fluid media. It is intended as a guide to chemical compatibility with inner tube materials and assembly lubricants applied internally to the hose. The Fluid Compatibility Chart lists the relative resistance of hose tube and fitting materials to more common:

- ✓ hydraulic oils
- ✓ other diversified oils families (for hydrokinetic and lubrication applications)
- ✓ chemicals

in three relative separated charts.

The ratings shown do not cover all possible variations of all factors, such as temperature, concentration, degradation or fluid contamination, etc. Testing under actual conditions is the best way to assure chemical compatibility for critical applications.

PART 1: HYDROSTATIC OILS COMPATIBILITY CHART (actual hydraulic systems and applications)

The specific recommendations regarding hydraulic fluids are based upon specific laboratory bench tests with fluids, performed according to ISO 1817 and internal methodology, integrated with field experiences and the advices of various polymers or fluid suppliers. **It must be stressed, however, that this information is offered only as a guide and is not a guarantee.** Final hose selection depends also upon pressure, fluid and ambient temperatures, concentration, duration of exposure and special requirements or variations, which may not be known by Manuli Hydraulics. Legal and other regulations must be followed with particular attention.

All the combined factors in working operations may impact on the service life of the hose assembly and must be carefully considered before release a hose for a specific application: the chemical compatibility with the service fluid is only one of the factors to be considered.

It is always recommended to test the specific fluid brand name with the requested hose, in order to verify chemical compatibility. Manuli Hydraulics constantly performs compatibility tests as service to market, progressively updating the compatibility chart.

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PART 2: HYDROKINETIC APPLICATIONS AND LUBRICANT OILS COMPATIBILITY CHART (automated transmissions and various lubrication systems)

This second part of the compatibility chart list a particular family of oils, not designed for standard hydraulics (hydrostatic applications), rather studied for many diversified applications such as lubrication for gear, compressors, turbines, diathermic oils for cooling or heat transmission, and ATF (Automatic Transmission Fluids) oils for the hydrokinetic (hydrodynamic) applications. These fluids are often very aggressive on traditional tube rubbers, more than hydraulic oils, due to the nature of the fluids and additives, aimed to give properties of long life duration and high temperature resistance; that's why their chemical compatibility with tube rubbers must be carefully checked before eventual use.

It is to be underlined that Manuli hoses are designed in principle for use with hydraulic oils only, and that diversified applications such as the ones with these categories of other oils, must be verified case by case with lab and/or field tests by users under their sole and exclusive responsibility and no liability whatsoever can be attributed to Manuli Hydraulics in that regard.

For more detailed information contact Manuli Hydraulics or visit www.manuli-hydraulics.com.

PART 3: BEHAVIOUR TO CHEMICALS (GUIDELINES FROM LITERATURE) FOR NON HYDRAULIC APPLICATIONS

WARNING: Manuli hoses are designed for hydraulics use and applications, they are not intended for industrial diversified applications with various chemicals.

The recommendations regarding **generic chemicals** are mainly based on literature data in conjunction with polymers used for the tube compound. The field results of the fluid conveyed in the hose should be carefully tested and field validated by users.

No test on finished hose assemblies in combination with the mentioned chemicals has been normally performed.

The possible good rating and on field performance of the hose with a chemical mentioned in the list does not mean in any case the release by Manuli Hydraulics of the product for that application or any guarantee. The possible validation for use is under the sole and exclusive responsibility of the end user and no liability whatsoever can be attributed to Manuli Hydraulics in that regard. In fact Manuli Hydraulics hoses are designed for hydraulics use and applications, they are not intended for industrial diversified applications with various chemicals.

The outer cover of the hose is intended to protect the reinforcement layer(s) from mechanical influences (abrasion, weathering etc.); cover compounds are not designed to exhibit the same chemical resistance as the tube compounds. Manuli Hydraulics should be consulted about the compatibility of the cover, should the application involve the extended exposure or immersion in a liquid: **anyway the hydraulic hoses of the Manuli Hydraulics product range are not designed in general for immersion in the service fluid.** This type of special applications should be avoided or carefully studied with additional external protections for the hoses, selection of special hose types, e.g. with thermoplastic cover and validation on

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the specific application. The turbulence of the fluid, the high temperature and nature of the fluid as well as other elements may impact the properties or integrity of the hose cover material (the cover compound of the hose is designed to resist to oil drops and external agents, not immersion in the service fluid).

For more detailed information contact Manuli Hydraulics or visit www.manuli-hydraulics.com.

HOW TO USE THE CHART

- Hydraulic fluids are listed in alphabetic order with the manufacturer brand name and ISO identification symbol (DIN when available), chemicals are listed alphabetically;
- Find the hose type and read the compatibility rating (see rating scale);
- Define the proper hose selection for the application by choosing the best rating.

LEGENDA OF RATINGS

E = Excellent - Small or negligible changes of compound properties: no problem for use. Service life can exceed the expectations.

G = Good - There are only minor changes of some compound properties. Service life is normally in line with state of the art (standard) expectations.

C = Conditional - significant changes on some compound properties. Service life can be reduced; higher durability can be achieved with reduced severity of working conditions (temperature in particular) or with an upgraded hose selection. Whenever possible, a field validation under actual working conditions is recommended.

X = Not recommended - Unsuitable, severe effects on physical properties.

REMARKS:

- O-Rings used with couplings also must be considered for chemical compatibility with the fluid to be conveyed. This includes fittings containing internal O-Rings; for example Metric Female 24° Cone seat fittings, etc. Standard O-Ring of Manuli Hydraulics fittings are made of Nitrile rubber (NBR), highly chemically compatible with all hydraulic fluids. If you use special fluids or very high temperatures, different O-Ring materials should be used, contact Manuli Hydraulics for specific information. See Technical Manual for dimensions of O-Rings.
- Compatibility of hose fittings with conveyed fluids is an essential factor in avoiding chemical reactions that may result in release of fluids and failure of the connection with the potential of causing severe personal injury or property damage. Standard Manuli Hydraulics fittings are made of carbon steel with Hexavalent chromium free plating.

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OILS CLASSIFICATION - ACCORDING TO ISO 6743-4

ISO 6743-4 is an important norm regarding “Lubricants, industrial oils and related products (class L)”. The norm defines a very wide family of oils, used in many different sectors and applications.

The oils must be carefully understood and properly managed to avoid problems and possible mistakes. The Part 4 of the norm in particular regards the **Hydraulic Oils (Family H)**, for hydrostatic and hydrokinematic applications, the other parts of the norm regard other fluids, of different nature or aimed to different applications than hydraulics.

Manuli Hydraulics hoses are designed and qualified for use with Hydraulic Oils (Family H of the ISO 6743-4), and the behavior of the particular oil formulation has to be verified case by case.

The applications with oils of the families different than H must be checked carefully but in principle Manuli Hydraulics hoses are not designed for use with them.

Here below the classification of oils by ISO 6743 spec.

Part 1: Family A (Total Loss systems)

Part 2: Family F (Spindle bearings, bearings and associated clutches)

Part 3A: Family D (Compressors)

Part 3B: Family D (Gas and refrigeration compressors)

Part 4: Family H (Hydraulic Systems)

Part 5: Family T (Turbines)

Part 6: Family C (Gears)

Part 7: Family M (Metalworking)

Part 8: Family R (Temporary protection against corrosion)

Part 9: Family X (Greases)

Part 10: Family Y (Miscellaneous)

Part 11: Family P (Pneumatic tools)

Part 12: Family Q (Heat Transfer Fluids)

Part 13: Family G (Slideways)

Part 14: Family U (Heat treatment)

Part 15: Family E (Internal combustion engines)

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The Family H in particular, object of use with Manuli Hydraulics hoses is composed by the following families of oils, identified by ISO dedicated symbols, used also in the compatibility chart.

ISO 6743-4 CLASSIFICATION OF HYDRAULIC FLUIDS

General application	Particular application	More specific applications	Composition and properties	Symbol ISO-L	
HYDRAULIC SYSTEMS	HYDROSTATIC APPLICATIONS	(std hydraulic applications)	Non-inhibited refined mineral oils	HH	
			Refined mineral oils with improved anti-rust and anti-oxidation properties	HL	
			Oils of HL type with improved anti-wear properties	HM	
			Oils of HL type with improved viscosity/temperature properties	HR	
			Oils of HM type with improved viscosity/temperature properties	HV	
			Synthetic fluids with no specific fire resistant properties	HS	
		Applications where environmentally acceptable fluids are requested	Triglycerides	HETG	
			Polyglycols	HEPG	
			Synthetic esters	HEES	
			Polyalphaolefin and related hydrocarbon products	HEPR	
		Hydraulic slide-way systems	Oils of HM type with anti-stick/slip properties	HG	
		Applications where fire resistant fluids are required	Oils in water emulsion	HFAE	
			Chemical solution in water	HFAS	
			Water in oil emulsion	HFB	
			Water polymer solutions	HFC	
			Synthetic fluids containing no water and consisting of phosphate esters	HFDR	
			Synthetic fluids containing no water and of other composition	HFDU	
		HYDROKINETIC APPLICATIONS	Automatic transmissions	(ATF oils)	HA
			Couplers and converters		HN

XXXX	Generally good compatibility with hoses, anyway the behaviour of the particular oil formulation to be verified case by case
HA & HN	ATF oils, chemical compatibility with hoses to be carefully verified case by case upon request and application
HFAS & HFDR	No compatibility with Manuli Hydraulics hoses. Dedicated hoses are requested.