

Instrumentation Northwest, Inc. (INW)

APPLICATION NOTE

SELECTING APPROPRIATE CABLE FOR INW SENSOR APPLICATIONS

June 2007

Introduction

INW sells sensor cable in four different materials—polyurethane, polyethylene, FEP Teflon[®], and Tefzel[®]. The purpose of this application note is to acquaint the user with the various cable types and assist the user in making cable selections. The information in this application note is intended as a general guide only. Users are responsible to verify the suitability of any particular material for their own applications through testing or other means.

Cable Properties and Recommended Use

INW recommends either polyurethane, polyethylene, or FEP Teflon[®] for most applications. For high temperature and/or high contamination applications, INW recommends the Tefzel[®] cable.

Polyurethane:

Polyurethane (PU) cable can handle temperatures up to 80° Celsius and is a good general-purpose cable.

Advantages: Flexible in cold weather and resistant to abrasion

Disadvantages: Not recommended for high temperature and/or high contamination applications

Recommended use: Most applications, unless high temperature or high contamination is involved.

Note: Polyurethane comes in two variations—polyester-based and polyether-based. Polyester-based material is subject to early hydrolysis and degradation in many environments that polyether-based material is not. Heat, oxidation, and certain chemicals will accelerate this degradation. **All polyurethane cable sold by INW is polyether-based.**

Polyethylene:

Polyethylene (PE or HDPE) can handle temperatures up to 80° Celsius and is often used in direct burial and long term submerged applications for industrial and telephone applications.

Advantages: Very low water absorption and good resistance to a wide range of chemicals

Disadvantages: Very stiff in cold weather and not as resistant to abrasion as polyurethane

Recommended use: Permanent installations, unless high temperature or high contamination is involved.

FEP Teflon[®] Cable:

FEP Teflon[®] cable has an outer jacket of Teflon[®] and an inner core of polyurethane for strength and flexibility. This cable can handle temperatures up to 80° Celsius.

Advantages: Highest resistance to water absorption and chemical attack, good flexibility, cheaper than pure Teflon[®] cable.

Disadvantages: More expensive than polyurethane or polyethylene cable

Recommended use: Portable and permanent applications with moderate chemical contamination and temperatures below 80° Celsius.

Inside PU, PE, and FEP Teflon[®] Cables:

All INW polyurethane, polyethylene, and FEP Teflon[®] cables contain stranded conductors and are insulated with polyethylene. This combination makes for good insulation and good flexibility. All cables also contain a strong nylon vent tube that will not collapse under compression. The cables also include braided shielding of tin-plated copper that stands up well in our applications if properly grounded at the instrument ends.

Tefzel[®] Cable:

Tefzel[®] cable has an outer jacket of Tefzel[®] and has a much higher temperature rating (up to 150° Celsius) than polyurethane, polyethylene, or FEP Teflon[®] cabling. The interior insulation and vent tubing are Teflon[®]. As in INW's other cables, the Tefzel[®] cable contains stranded conductors and a braided shield of tin-plated copper.

Advantages: Temperature rating of 150° Celsius, good for high-temp and/or highly contaminated applications

Disadvantages: Most expensive

Recommended use: Any applications where temperatures may exceed 80° Celsius and in highly contaminated environments.

Chemical Effect Ratings on Various Cable Materials

	Polyurethane	Polyethylene	FEP Teflon®	Tefzel®
ACIDS				
Acetic Acid, Glacial	3	1	1	1
Chromic Acid 5%	4	3	1	1
Hydrochloric Acid 20%	—	1	1	1
Sulfuric Acid <10%	—	1	1	1
BASES				
Propyl Amine	—	3	1	—
Ammonia 10%	2	3	1	1
Sodium Hydroxide 205	—	1	1	1
HALOGENS				
Bromine	3	4	1	1
OXIDANTS				
Hydrogen Peroxide 10%	2	1	1	1
ALIPHATIC HYDROCARBONS				
Alcoholols: Butyl	2	1	1	1
Ethyl	3	2	1	1
Propyl	2	1	1	1
Gasoline, High-Aromatic	2	3	1	1
Kerosene	2	3	1	1
Propylene Glycol	2	2	1	1
AROMATIC HYDROCARBONS				
Benzene	4	3	1	1
Toluene (Toluol)	4	3	1	1
HALOGENATED HYDROCARBONS				
Carbon Tetrachloride	3	2	1	1
Trichloroethylene	4	3	1	1
HYDROCARBONS				
Ketones	4	3	1	1
Methylene Chloride	4	3	1	1
OXYGENATED SOLVENTS AND ESTERS				
Acetone	4	2	1	2
Ethylene Glycol	2	1	1	1
SALTS				
Copper Cyanide	—	2	1	1
Silver Nitrate	2	2	1	1
Sodium Bicarbonate	2	1	1	1
Zinc Chloride	2	1	1	1
WATERS				
Water, Fresh	2	1	1	1
Water, Sea	3	1	1	1
COMMON CHEMICALS				
Diesel Fuel	2	3	1	1
Jet Fuel (JP3, -4, -5)	2	2	1	1
Chemical Effect Ratings: 1 = Excellent 4 = Not Recommended 2 = Good — = No Information 3 = Fair				

The information in this table is intended as a general guide only. Users are responsible to verify the suitability of any particular material for their own applications through testing or other means.

Teflon and Tefzel are registered trademarks of Dupont, Inc.

Instrumentation Northwest appreciates any comments you may have regarding this application note. Please contact:

Instrumentation Northwest, Inc.

ATTN: Engineering – Cable

8902 122nd Avenue NE

Kirkland, WA 98033

www.inwusa.com

(800) 776-9355 (425) 822-4434 FAX (425) 822-8384