

# Kabels van Koper naar Glas

**Industrial Ethernet**

## Onderwerpen:

- Uw toepassing is bepalend
- Kunststoffen en eigenschappen
- Specials, “alles” is mogelijk
- Ethernet kabels bewerkelijk?
- Optische kabels

**Industrial Ethernet**

**Uw toepassing is bepalend**

**Industrial Ethernet**

# Toepassing: belasting door beweging

Vaste verlegging



Flexibele verlegging



Hoogflexibele verlegging



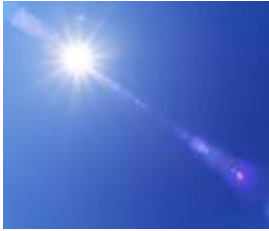
Hoogflexibele verlegging met torsie



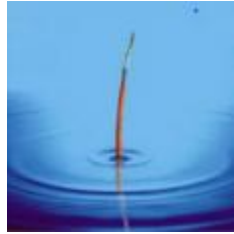
**Industrial Ethernet**

# Toepassing: belasting door omgeving

UV straling



Water



Temperaturen



Vuur



Knaagdieren



Olie & Chemicaliën



Ruwe Olie



**Industrial Ethernet**

# Toepassing: Veiligheid

Schepen



Platforms



Treinen



Tunnels



Vlamvertragings

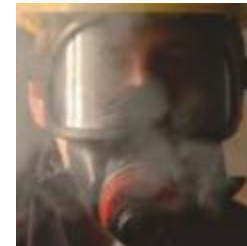
IEC-60332-3

Isolatiebehoud

IEC-60331-23(FE90/FE180)



Rookontwikkeling








Giftigheid rook

# Kunststoffen en eigenschappen

**Industrial Ethernet**

The footer features a dark red and blue gradient background. On the left, there are several overlapping arrows pointing to the right, in shades of red and blue. On the right side, there are abstract, glowing blue and white lines that resemble a network or data flow.

## Kunststoffen enkele voorbeelden

	<u>Isolatie materiaal</u>	<u>Voordeel</u>	<u>Nadeel</u>
	PVC	Prijs	Halogeen houdend
	FRNC	Halogeenvrij / rookarm	Flexibiliteit
	PUR	Flexibel / Robuust	Ontmantelen
	PE	Lage water opname	Stug
	FEP	Hoge temperaturen	Prijs

**Industrial Ethernet**



# Kunststoffen en eigenschappen

Material	Chemical Description	LHTS Classification	VDE Classification	Thermal Properties					Resistance					Physical Properties				Electric Properties			Flammability			Density					
				Continuous Operating Temperature for 20000 h	Continuous Operating Temperature for 2000 h	Normal Operating Capacity	Max/Min Temperature	Cold Winding Test	Oil	Acid/Alk	Chemical	Ozone	UV	Water Absorption	Shrink / Swell	Elongation at Break	Dielectric Resistance	Specific Volume Resistance	Dielectric Strength	Relative Humidity	UL	Flame Retardant	Low Smoke Density		Crosslink Status	Religion Free			
				from °C	to °C	°C	20h	°C	°C	°C	%	AV	IMV	%	Ω·cm	kV/mm	%	UL	UL	UL	UL	UL	UL	g/cm <sup>3</sup>					
<b>Thermoplastics</b>																													
PEH	Polymethacrylates		3F	-100	240	300	210	237	-80	++	++	++	++	++	0.01	0.01-0.02	>30	>300	++	>10 <sup>12</sup>	>20	2.0	35	++	yes	---	no	2.18-2.28	
PEK	Sulfonated Polyethylene Glycol		3TF	-100	210	250	200	180-210	-50	++	++	++	++	++	0.01	0.01-0.02	>10	>300	+	>10 <sup>12</sup>	>20	2.1	35	++	yes	---	no	2.12-2.17	
PEK	Sulfonated Polyethylene Glycol		6.4	-100	230	210	210	200-240	-80	++	++	++	++	++	0.01	0.01-0.02	>30	>300	+	>10 <sup>12</sup>	>20	2.1	35	++	yes	---	no	2.12-2.17	
PEP	Sulfonated Polyethylene Glycol	7g	6F	-100	205	230	200	205-215	-80	++	++	++	++	++	0.01	0.01-0.02	>20	>300	+	>10 <sup>12</sup>	>20	2.1	35	++	yes	---	no	2.08-2.09	
ETP	Ethylene-Tetrafluoroethylene		7F	-100	150	300	300	220-270	-40	++	++	++	++	++	0.02	0.01-0.01	>20	>100	++	>10 <sup>12</sup>	>30	2.6	>30	++	yes	---	no	1.68-1.88	
ETP	Ethylene-Tetrafluoroethylene		7TF	-100	125	150	300	200-280	-40	++	++	++	++	++	0.10	0.01-0.01	>20	>100	++	>10 <sup>12</sup>	>30	3.3	>30	++	yes	---	no	1.67-1.80	
PEV	Polyethylene Glycol		30F	-100	125	125-145	300	140-180	-40	++	++	++	++	++	0.02	0.01-0.02	>30	>300	++	>10 <sup>12</sup>	>20	>8.0	>30	++	yes	---	no	1.26-1.60	
<b>Silicone</b>																													
SR	Silicone Rubber	5	3G	-40	180	230	>300	cross-linked	-80	-/+	-/+	+	+	++	1.00	4.00-6.00	4-15	>200	+	>10 <sup>12</sup>	10-30	>27	25-35	++	yes	++	yes	1.28-1.38	
<b>Thermoplastics</b>																													
LDPE	Low Density Polyethylene		2F	-100	70	90	300	115-125	-50	-/+	++	+	+	---	<0.01	0.01	10-20	>400	+	>10 <sup>12</sup>	>70	2.3	>17	---	yes	++	yes	0.93-0.94	
HDPE	High Density Polyethylene		2F	-100	80	110	310	115-125	-50	-/+	++	+	+	---	<0.01	0.01	15-30	>400	-/+	>10 <sup>12</sup>	>80	2.4	>17	---	yes	++	yes	0.94-0.96	
PE	Polyethylene		6F	-100	100	120	150	220-260	-30	++	-/+	+	+	-/+	1.00-1.20	0.01-0.02	30-60	>30	++	>10 <sup>12</sup>	>30	1.3-1.4	20	+	yes	++	yes	1.14	
PP	Polypropylene		6F	-40	80	110	140	120-140	-40	+	+	+	+	-/+	0.10	0.01-0.01	>30	>400	+	>10 <sup>12</sup>	>60	2.2	18	---	yes	++	yes	0.91	
PVC	Polyvinyl Chloride		7	-40	80	120	140	140-140	-40	-/+	+	-/+	++	-/+	0.40	0.10-0.10	>30	>300	+	>10 <sup>12</sup>	>20	4.0-5.0	>20	++	no	---	no	1.26-1.48	
<b>Thermoplastic Elastomers</b>																													
TPU-1	Thermoplastic Polyetheretherketone Elastomer		11F	-40	80	120	150	180-205	-50	++	++	+	+	+	0.00-1.00	0.01-0.01	>30	>400	++	>10 <sup>12</sup>	>30	1.2-1.4	>30	-/+	N.A.	++	yes	1.12-1.21	
TPU-2	Thermoplastic Polyester Elastomer	7h	12F to 12T	-70	115	150	300	180-200	-50	++	---	++	+	++	0.00-1.20	0.01-0.01	>30	>300	++	>10 <sup>12</sup>	>30	1.5-1.8	>20	-/+	yes	++	yes	1.08-1.20	
TPU-3	Thermoplastic Polybutadiene Elastomer		17F	-75	115	125	140-150	>100	-40	+	+	+	+	+	1.00-2.00	0.10-0.10	>10	>300	+	>10 <sup>12</sup>	>10	1.0-1.3	33-37	-/+	yes	+	yes	1.19-1.30	
TPU-4	Thermoplastic Polybutadiene Elastomer		18F	-40	90	120	130-150	>100	-40	---	++	+	+	+	1.50	0.10-0.10	>30	>300	+	>10 <sup>12</sup>	>20	1.0	33-37	-/+	yes	+	yes	1.20-1.40	
<b>Elastomers</b>																													
EPDM	Ethylene Propylene Diene		3G	-40	90	100	300	cross-linked	-40	---	++	+	+	++	0.02	0.01-0.01	7-15	>200	+	>10 <sup>12</sup>	30	1.0-1.3	30	-/+	yes	+	yes	1.18-1.40	
EPDM	Ethylene Propylene Rubber		3G	-40	90	100	300	cross-linked	-40	---	++	+	++	+	0.20	0.01-0.01	7-10	>200	+	10 <sup>11-12</sup>	30	1.0-1.3	>20	-/+	yes	+	yes	1.20-1.40	
VM	Ethylene Vinyl Alcohol Rubber	8	4G	-40	130	130	300	cross-linked	-50	+	+	+	+	+	0.10	>0.01	>30	>200	+	10 <sup>11-12</sup>	>20	4.0-7.0	>20	-/+	yes	+	yes	1.50-1.90	
CR	Chloroprene Rubber		3G	-40	90	120	300	cross-linked	-40	+	+	+	+	+	1.00	0.50-0.70	>30	>200	+	10 <sup>11-12</sup>	20	0.5-1.0	35-34	++	no	---	no	1.40-1.65	
FKM/FFKM	Fluorocarbon		6.4	-30	180	200	300	cross-linked	-20	++	++	++	++	++	>0.20	0.01-0.01	5-10	300	+	10 <sup>11-12</sup>	>15	4.0-4.8	40	++	yes	---	no	1.60-2.25	
<b>Special Thermoplastics</b>																													
PI	Polyimide		6F	-100	220	260	400	no	-70	-/+	---	+	++	++	>0.20	0.01-0.01	>30	>30	++	>10 <sup>12</sup>	30	3.5	40-50	++	yes	+	yes	1.45	
PEEK	Polyetheretherketone	3a	20F	-40	220	260	300	240	-50	++	++	++	++	++	0.50	>0.00	>30	>400	++	>10 <sup>12</sup>	>100	3.3	35	++	yes	+	yes	1.32	
PIE	Polyetherimide		6.4	-40	150	170	300	>220	-25	+	-/+	+	+	+	>0.20	0.01-0.01	>30	>400	+	>10 <sup>12</sup>	>100	3.2-3.5	>40	+	yes	+	yes	1.27	
PIE	Silicone Polyetheretherketone Copolymer		21F	-40	120	150	300	>170	-40	+	+	+	+	+	0.10	0.01-0.01	>30	>300	+	>10 <sup>12</sup>	>15	2.8	40	+	yes	+	yes	1.38	
<b>Others</b>																													
PA6	Free Amino Film		6.4	-100	200	300	300	no	-40	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	>200	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	>40	+	yes	+	yes	1.40
IG1	Mica tape	8	6.4	-50	>900	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	>80	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	>10	+	N.A.	N.A.	yes	>2.70
IG	Glass fiber	8	6.4	N.A.	>500	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	>80	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	>10	+	N.A.	N.A.	yes	N.A.

# Industrial Ethernet

**Specials “alles” is mogelijk**

**Industrial Ethernet**

A decorative banner at the bottom of the slide. It features a dark blue background with a red arrow pointing right on the left side. The text 'Industrial Ethernet' is written in white, bold, sans-serif font. The right side of the banner has a blue and white abstract pattern resembling a network or data flow.

## Specials, “alles” is mogelijk, enkele voorbeelden:



### **Profinet Cat5e flexible en robuust.**

Hoog flexibel, torsie bestendig,  
Trekkracht to 5000N



### **Profinet Cat5e Vuurbestendig.**

Halogeenvrij en rookarm  
Isolatiebehoud 90 minuten FE90.



### **Ethernet Hybrid**

Ethernet gecombineerd met  
voeding.



### **Ethernet hoge temperaturen**

Ethernet met 6 paren  
Temperatuur -50° C - +180° C

# Industrial Ethernet

# Ethernet kabels, bewerkelijk?

**Industrial Ethernet**

A decorative banner at the bottom of the slide. It features a dark red and blue background with stylized arrows pointing right. The text 'Industrial Ethernet' is written in white, bold, sans-serif font across the center of the banner. The background also includes faint, abstract patterns resembling network connections or data flow.

# Ethernet Cat6 - Cat7 Confectie



**Industrial Ethernet**

# Ethernet Cat6A Fast Connect



**Industrial Ethernet**

# Optische kabels

**Industrial Ethernet**

A decorative banner at the bottom of the slide. It features a dark red and blue background with white and blue arrows pointing right. The text 'Industrial Ethernet' is written in white, bold, sans-serif font across the center of the banner. The background also includes faint, stylized network or data motifs.

# Toepassing koper kabel = Toepassing optische kabel



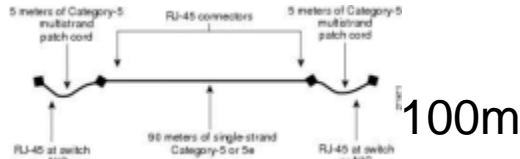
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**Industrial Ethernet**



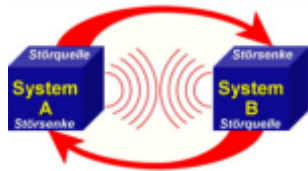
# Toepassing koper kabel $\neq$ Toepassing optische kabel



**$\neq$**



50m - >10km



EMC "gevoelig"



EMC ongevoelig

# Industrial Ethernet

# Fiber Optic cables

Glass Singlemode



GLASS 9/125/250 $\mu$ m

14.000m

Crimp/Glue/Polish

Glass Multimode



GLASS 62,5/125/250 $\mu$ m

2.000m

Crimp/Glue/Polish

Polymer Cladded Fiber



PCF 200/230/500 $\mu$ m

100m

Crimp or Clamp/Cleave

Polymer Optical Fiber

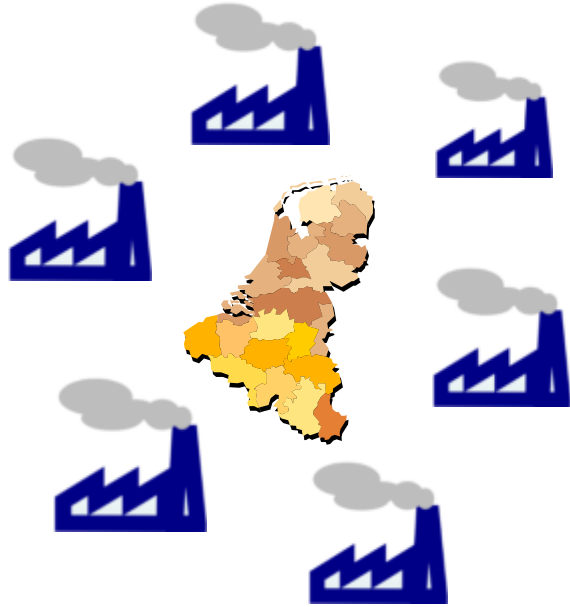


POF 980/1000 $\mu$ m

50m

Crimp or Clamp/Polish

**Industrial Ethernet**



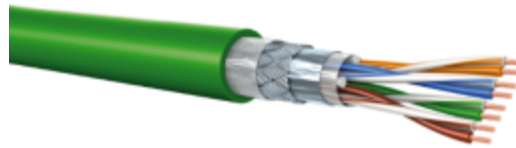
Industrial  
Solutions



Marine  
Technologies



Rolling  
Stock



**Industrial Ethernet**

**Vragen?**

**Industrial Ethernet**