



# VENA® PEM FUEL

## Anode and Cathode

Vena® PEM FUEL is specially designed to fulfill the main requirements to use in the cathode and anode of PEM (polymer electrolyte membrane) Fuel Cell and electrolyzer systems.

Specially designed for the passage of gases as hydrogen and oxygen.

## **PROPERTIES**

- Low degree of permeability to gases. FKM material has lower permeability values to hydrogen gas compared to silicones and some other elastomers.
- Excellent resistance to thermal aging and oxidizing agents (oxygen, ozone, UV).
- Good mechanical properties.
- Low conductivity.
- Excellent purity – extremely low extractables and volatile compounds content.
- Cleaning protocol is applied to reduce the amount of environmental and production contaminants. Pharma-grade treatment.
- Excellent chemical resistance.
- Hoses are capped so that they can be delivered with the lower possible level of contaminants.
- Operational temperature range from -30°C (-22 F) to +180°C (356 F), it may reach up to 200°C (392 F) during short periods of time.

## **CONSTRUCTION**

- Usually, external green color used for cathode and external red color for anode, but color could be customized under request
- This reference is manufactured with polyester fabric reinforcement, internal black and smooth FKM layer and external silicone.
- Can be produced with customized lateral outlets and metal screwed connections for adapting any sensor
- Can be equipped with stainless steel or aluminum connections

### **Alternatives:**

- PEM FUEL PLUS: One more layer of polyester fabric reinforcement to greater pressure resistance.
- PEM FUEL HT: Aramid layers instead polyester to reach up to +200°C (392 F) for operational temperature and 220°C (428 F) during short periods of time.
- PEM FUEL WIRED: Encapsulated coopered steel spring wire for vacuum resistance and bend availability.
- PEM FUEL-X: Conductive FKM inner layer with a volume resistivity less than  $10^6 \Omega\cdot\text{cm}$  according to the ASTM D257.

**REGULATIONS**

This reference can be classified as V0 or V1 by the flammability specification UL-94 (flame retardant and selfextinguishing) under request.

This reference is in accordance with the RoHS Directive 2002/95/EC and its subsequent amendments including the RoHS2 Directive 2011/65/EU and RoHS3 Directive 2015/863.

This construction can be certified by TAP00002FX (DNV-CP-0183) "Flexible hoses for Fuel Cells in Maritime Industry" under request. It can be certified to use it in Hydrogen and Oxygen circuits

**TECHNICAL SPECIFICATIONS**

Inner Diameter		Wall Thickness		Working pressure		Bursting pressure	
				ISO 1402		ISO 1402	
mm	inch	+1.0/-0.5 mm	+0.04/-0.02 inch	Bar at room temperature	Psi at room temperature	Bar at room temperature	Psi at room temperature
6	1/4	4.30	0.17	16.2	234.4	48.5	703.3
13	1/2	4.30	0.17	9.7	140.6	29.1	421.7
19	3/4	4.30	0.17	7.3	105.4	21.8	316.1
25	1	4.30	0.17	5.9	85.6	17.7	256.7
32	1 1/4	4.30	0.17	4.9	70.8	14.7	212.5
38	1 1/2	4.30	0.17	4.3	62.2	12.9	186.5
45	1 3/4	4.30	0.17	3.8	54.7	11.3	164.0
51	2	4.30	0.17	3.4	49.7	10.3	149.1
57	2 1/4	4.30	0.17	3.2	45.7	9.5	137.0
63	2 1/2	4.30	0.17	2.9	42.3	8.8	127.0
70	2 3/4	4.30	0.17	2.7	39.1	8.1	117.2
76	3	4.30	0.17	2.5	36.5	7.6	109.5
80	3 1/8	4.30	0.17	2.3	33.6	7.0	100.8
90	3 1/2	4.30	0.17	1.9	27.8	5.7	83.2
100	4	4.30	0.17	1.7	23.9	5.0	71.8

## PROPERTIES

### FKM properties

The inner layer is from FKM, a fluoropolymer elastomer. The typical properties of this elastomer are listed below:

Property	Method	Unit	Value
Hardness	ISO 868	Shore-A	70±5
Specific gravity	ISO 2781	g/cm <sup>3</sup>	1,91±0.03
Tensile strength	ISO 37	MpA	>7
Elongation at break	ISO 37	%	>200
Tear Strength	ISO 34	kN/m	>19

### Fabric properties

The typical properties of the polyester mesh fabric are:

Property	Method	Unit	Value
Weight	ISO 3801	g/m <sup>2</sup>	145±5%
Thickness	-	mm	0.45±0.05
Break strength (length)	ISO 13934-2	N	>500
Break strength (width)	ISO 13934-2	N	>450
Break elongation (length)	ISO 13934-2	%	>60
Break elongation (width)	ISO 13934-2	%	>60

**Silicone properties**

The outer VMQ silicone rubber compound is an organopolysiloxane mixture. The typical properties of this silicone are listed below:

<b>Property</b>	<b>Method</b>	<b>Unit</b>	<b>Value</b>
Hardness	ISO 868	Shore-A	70±5
Specific gravity	ISO 2781	g/cm <sup>3</sup>	1,24±0.02
Tensile strength	ISO 37	MpA	>7
Elongation at break	ISO 37	%	>200
Tear Strength	ISO 34	kN/m	>19

**LIMITATIONS**

Respect the work pressure established values. High temperatures may affect the bursting and working pressure values.

This type of tube is not recommended for applications with negative pressure (vacuum), except Vena® PEM FUEL WIRED alternative.

# CONTACT

