

## RAF-FP Valve Data

RAPHAEL model RAF-FP Industrial & POG Fire Protection Valves are elastomeric diaphragm type open fail safe streamlined globe & angle pattern valves, featuring direct resilient diaphragm seal, with no wet spring or metallic wet moving parts inside the valve body. RAPHAEL RAF-FP valves are used for fixed deluge fire suppression systems, water, foam & seawater based flow control in manual or remote on-off & pressure control applications.

RAF-FP hydrodynamic pattern design ensures high flowrates with minimum head loss.

As an open fail safe valve maintained in stand-by closed position, the valve trips open automatically upon water pressure being released from its control chamber by the fire system actuation device or, manual emergency actuation.

RAF-FP resets to stand-by close position again by pressurizing its control chamber with system water without opening the valve.

RAF-FP as Fire Protection control valves are manufactured from different materials as Ductile Iron A-536, Cast Steel WCB A-216, St.St ASTM A-304 and ASTM A-316, Nickel Aluminum Bronze B148 C95800 & other special alloys.

RAPHAEL state of the art corrosion protection technologies allow a wide choice of coatings as RILSAN polyamide (NYLON#11), High Built Epoxy (FBE), Polyester, and vitreous Enamel glazing to DIN 3475.

Other coating options are available on request .

RAF-FP valves operate with a patented reinforced diaphragm, which eliminates the need for a compensating metal spring The special elastic design enables gradual and precise opening or drip tight smooth closing of the valve without vibration preventing water hammering.

RAF-FP automatic control valves are designed for installation in horizontal or vertical direction indifferently. RAF-FP available sizing starts from DN 25 to DN 350 (1" - 14"). See size and body pattern table and consult availability in different available material options



### Design:

- Only three parts: body, diaphragm & cover plate, no wet metal spring inside the control chamber. Full bore unobstructed.
- 250 psi (17 BAR) seal test 25.5 BAR to DIN3230 ANSI FCI 70-2 CLASS VI Bubble-Tight
- Simple automatic or manual reset of RAF-FP valve to standby position without draining or opening the valve itself, neither closing OS&Y or other valves in the system
- Low maintenance cost, the valve is serviced in-line, only one replaceable part, the long-life elastomeric diaphragm.
- Conforms with Fire testing to ISO-6182:5 Rev. 2011
- Conforms with Inspection, Testing, and Maintenance Std. of water-based Fire Protection Systems, NFPA 25<sup>(1)</sup>
- Consult for other Fire Protection Approvals

### Valve ends:

- Flanged: FLxFL - ISO - ANSI - ABNT<sup>(2)</sup>
- Threaded: THxTH - BSP - NPT
- Grooved: GRxGR
- Flanged: - Grooved FLxGR (FDV valves)

1. assembled with control trims  
2. consult flange facing Std



RAPHAEL standard corrosion protection coating RILSAN (Nylon #11) is suitable for corrosive industrial environments and fresh or brackish, desalinated water, AFFF foam. Consult with Raphael about materials and coating options for seawater service valves.

RAPHAEL standard internal coating specification for Pressure Relief valves is Enamel to DIN3475 setting a unique industry standard

**Upstream - Downstream endConnections**

Alloy	Connections	Std - Face - Class
D.I A-536	Threaded	BSP or NPT
	Grooved	ANSI C606
	Flanged ISO 7005-2	PN16
	Flanged ANSI B16.42	# 150RF; #150FF
	Flanged ANSI B16.42	MSS SP6
	Flanged ABNT	NBR 7675:2005
C.S WCB A-216	Flanged ISO 7005-2	PN16
	Flanged ANSI B16.50	# 150RF; #150FF
	Flanged ANSI B16.50	MSS SP6
ST.ST A-304/316	Flanged ISO 7005-2	PN16
	Flanged ANSI B16.50	# 150RF; #150FF
	Flanged ANSI B16.50	MSS SP6
NiAlBr B-148 C95800	Flanged ISO 7005-2	PN16
	Flanged ANSI B16.24	# 150RF; #150FF
	Flanged ANSI B16.24	MSS SP6

## Specifications

### Cast valve body & cover plate

- Ductile Iron ASTM A-536
- Cast Steel ASTM A-216 WCB
- Stainless Steel ASTM A-351 CF8 (304)
- Stainless Steel ASTM A-351 CF8M (316)
- Nickel Aluminium Bronze B-148 C95800

### Std bolts

- Stainless Steel A-304 #A2

### Optional bolts

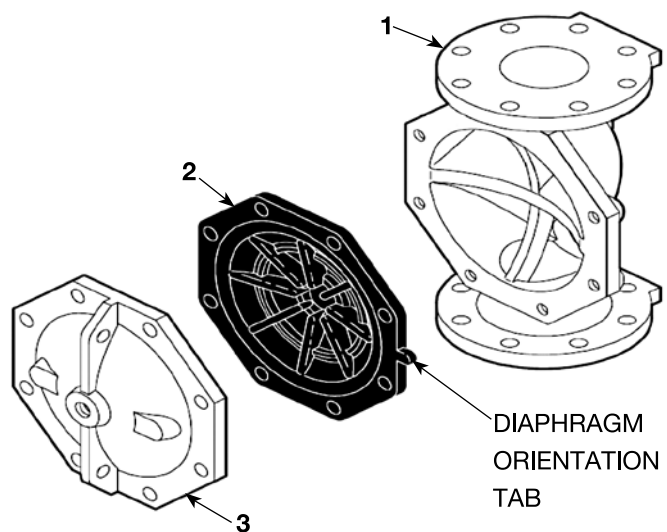
- Stainless Steel A-316 #A4
- Nickel alloy for seawater service valves

### Elastomeric diaphragm

- NBR, three layer reinforced natural rubber
- EPDM, three layer reinforced ethylene propylene (seawater & corrosive media)

### Coating (Color: RED F.P)

- Rilsan polyamide based (NYLON # 11)
- Polyester based EPC
- High Built Epoxy FBE
- Vitreous Enamel to DIN 3475



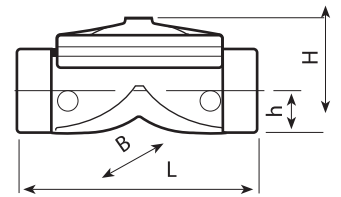
1. Valve Body  
2. Elastomeric diaphragm  
3. Valve Cover Plate

## Engineering Data:

### Dimensions & weight globe pattern valves:

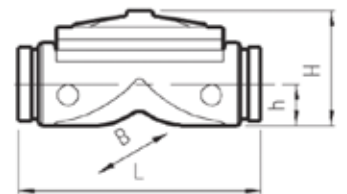
#### Threaded Inline

Nominal Diameter		L	H	B	h	Weight
[inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[Kg]
1	25	156	70	94	21	1.5
1.5	40	159	80	96	29	2
2	50	190	100	125	38	3.5
2.5	65	216	110	125	46	5
3-2-3	80-50-80	230	125	125	50	5
3	80	290	138	200	50	11
4	100	346	220	230	60	16.5



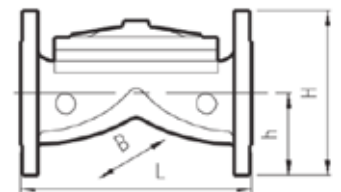
#### Grooved Inline

Nominal Diameter		L	H	B	h	Weight
[inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[Kg]
1	25	156	70	94	21	1.4
1.5	40	159	80	96	29	1.5
2	50	190	100	15	38	3
2.5	65	216	110	125	46	4.7
3-2-3	80-50-80	230	125	125	50	4.8
3	80	290	138	200	50	10.8
4	100	346	220	230	60	18
6	150	412	241	300	88	33
8	200	470	350	354	125	51



#### Flanged Inline

Nominal Diameter		L	H	B	h	Weight
[inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[Kg]
2	50	190	159	165	76	7.9
2.5	65	216	173	185	80	9.3
3-2-3	80-50-80	230	175	200	100	11
3	80	283	200	200	100	17.5
4	100	305	220	230	99	26
6	150	406	295	300	142	46
8	200	470	383	354	160	67.5
10	250	635	430	464	197	111
12	300	749	474	480	234	151
14	350	900	520	520	260	177





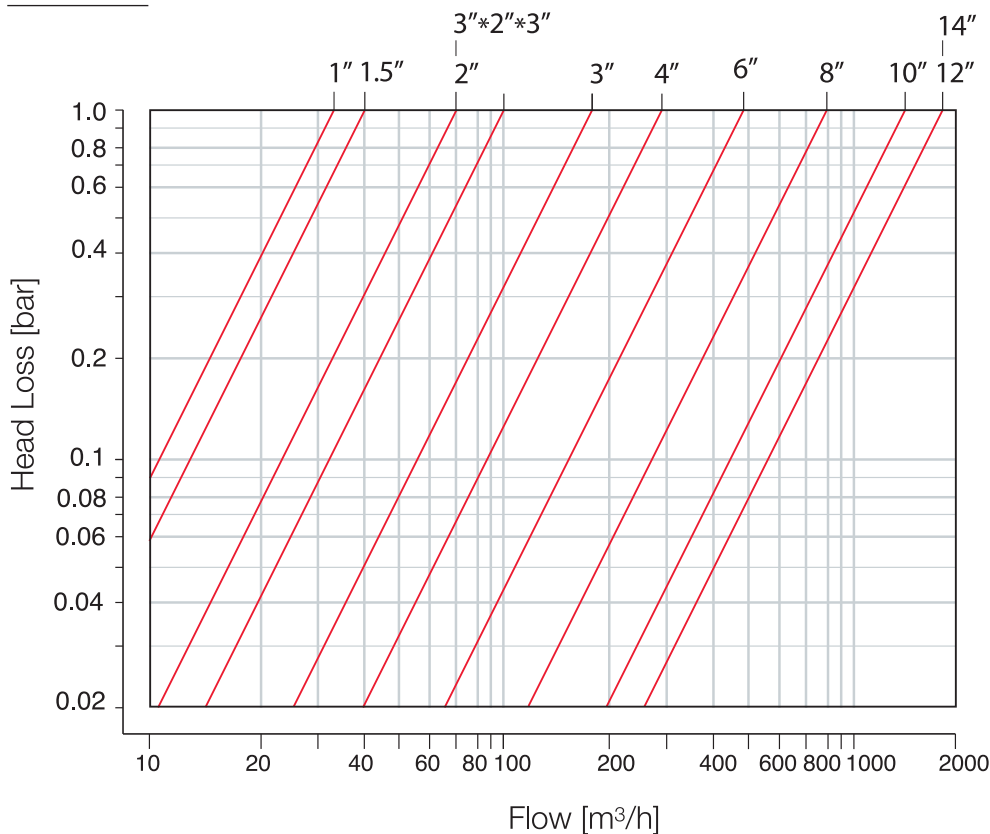
Kv - Coefficient

Nominal Diameter		Kv
[inch]	[mm]	
1	25	32
1.5	40	40
2.0	50	70
2.5	65	100
3-2-3	80-50-80	72
3	80	170
4	100	290
6	150	490
8	200	790
10	250	1400
12	300	1800
14	350	1800

Control Chamber Displacement Volume

Nominal Diameter		Control Chamber Volume
[inch]	[mm]	[liter]
1	25	0.065
1.5	40	0.065
2	50	0.08
2.5	65	0.16
3-2-3	80-50-80	0.08
3	80	0.3
4	100	0.78
6	150	1.56
8	200	3.5
10	250	7.6
12	300	7.6
14	350	7.6

Flow Chart



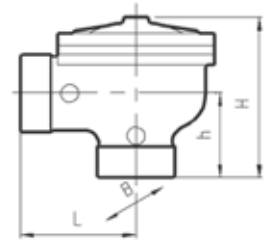
Kv = Valve flow coefficient [m³/h]; [bar]  
 Cv = Valve flow coefficient [gpm]; [psi]  
 [Q = Flow rate [m³/h]; [gpm]  
 Δ [P = Head loss across the valve [bar]; [psi]  
 Cv = 1.16 Kv

$$Q = Kv \sqrt{\Delta P}$$

## Dimensions & weight angle pattern valves:

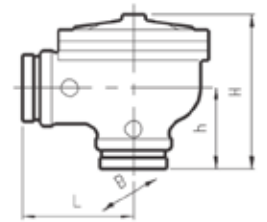
### Threaded

Nominal Diameter		L	H	B	h	Weight
[inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[Kg]
2	50	90	150	125	81	4.2
2.5	65	117	160	125	83	7
3-2-3	80-50-80	110	146	125	72	4.9
3	80	148	205	200	107	12
4	100	150	227	230	118	15.9



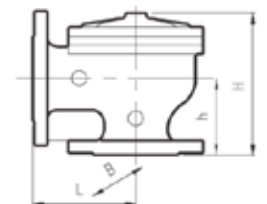
### Grooved

Nominal Diameter		L	H	B	h	Weight
[inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[Kg]
2	50	90	150	125	81	4
2.5	65	117	160	125	83	5
3-2-3	80-50-80	110	146	125	72	4.7
3	80	148	205	200	107	11
4	100	150	227	230	118	15.6
6	150	206	317	300	150	32
8	200	225	400	354	170	45.5



### Flanged

Nominal Diameter		L	H	B	h	Weight
[inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[Kg]
2	50	112	159	165	77	8.1
2.5	65	122	160	185	83	11
3-2-3	80-50-80	140	200	200	100	12
3	80	154	210	200	115	19
4	100	177	230	230	113	26.5
6	150	218	315	300	148	48.7
8	200	225	400	354	170	62.5





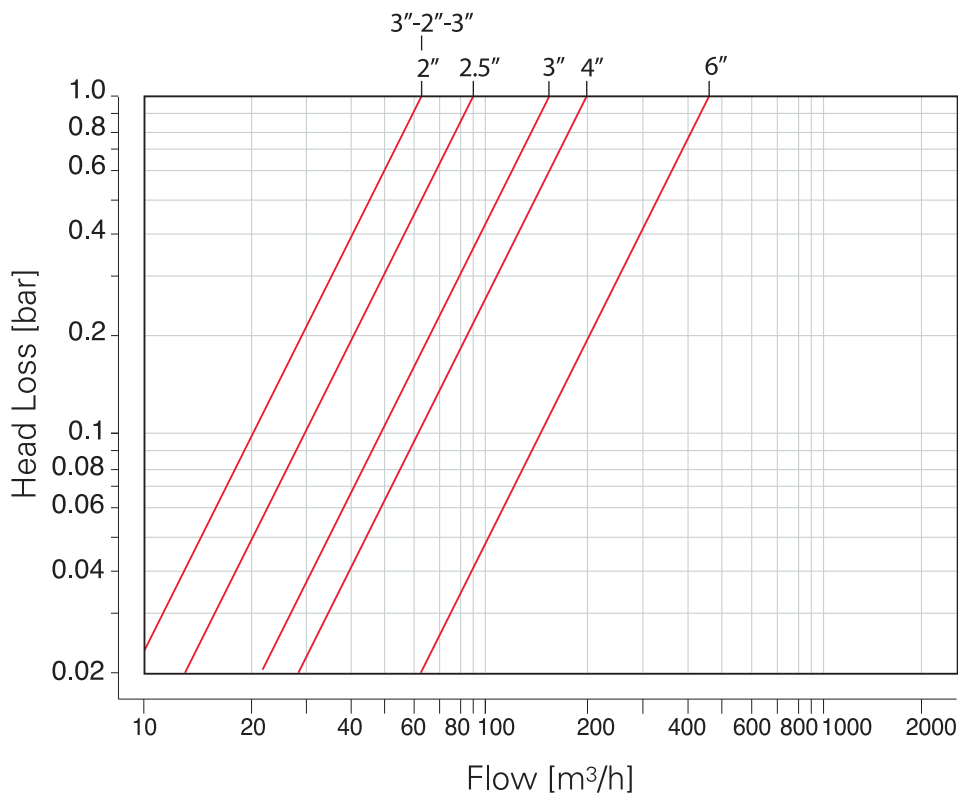
## Kv - Coefficient

Nominal Diameter		Kv
[inch]	[mm]	
2	50	62
2.5	65	90
3-2-3	80-50-80	62
3	80	155
4	100	200
6	150	470

## Control Chamber Displacement Volume

Nominal Diameter		Control Chamber Volume
[inch]	[mm]	
2	50	0.08
2.5	65	0.16
3-2-3	80-50-80	0.08
3	80	0.3
4	100	0.78
6	150	1.56

## Flow Chart



Kv = Valve flow coefficient [m³/h]; [bar]  
 Cv = Valve flow coefficient [gpm]; [psi]  
 [Q = Flow rate [m³/h]; [gpm]  
 $\Delta P$  = Head loss across the valve [bar]; [psi]  
 Cv = 1.16 Kv

$$Q = Kv \sqrt{\Delta P}$$

## RAF-FP Valve Features

- The elastomeric diaphragm direct seal actuator being the only moving wet part in the control chamber above the RAF-FP body, open and close the valve, ensuring dependable long term service and minimizing maintenance
- RAF-FP designed as fire control valve typically held in stand-by closed position for long periods of time, does not stick due to typical internal corrosion of wet metallic mechanisms in other type valves
- Soft gradual yet fast opening prevents water hammering. Opening speed of RAF-FP valves can be controlled.
- Soft closing upon pressurizing RAF-FP control chamber by line pressure or other independent water source<sup>1)</sup>, prevents surges. Closing speed of RAF-FP valves can be controlled.
- RAF-FP performance is not affected by installation direction, horizontal or vertical for globe pattern or angle pattern RAF-FP valves
- RAF-FP do not false trip open due to system water surges or mechanical vibration & shock, preventing false open tripping typical of differential type dry pipe valves
- RAF-FP features superb modulating performance in a wide range of pressure and flow conditions

### Installation:

- Identify RAF-FP model & control trim PI&D and assembly drawings
- Do not store and/or install in areas exposed to freezing conditions
- Flush the system before valves are installed
- Follow installation and commissioning guidelines for each RAF-FP valve application. Pressure to the valve control trim in case it is not directly connected to the valve inlet side (or same pipeline upstream of an OS&Y manual valve) should be equal or higher than line pressure upstream of RAF-FP valves. Consult with Raphael Tech. Support when needed.

- Set the RAF-FP valve and test it following relevant directives.

### Operation:

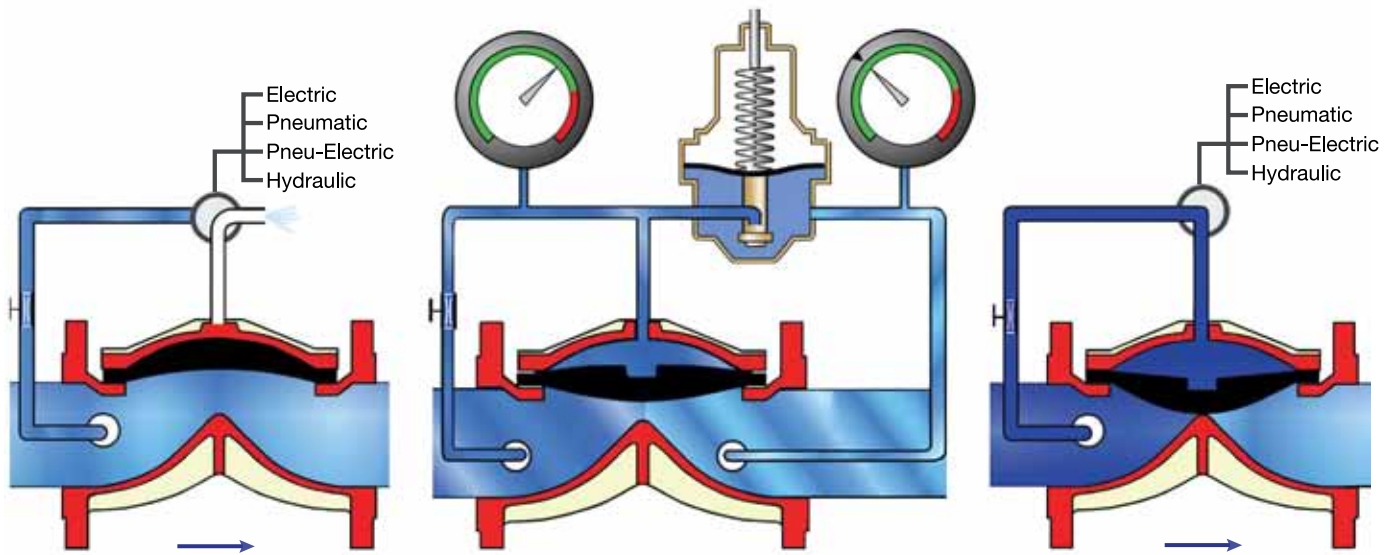
- RAF-FP are fail safe open type valves, ensuring safe opening if correctly installed, maintained, and tested periodically following relevant directives.
- RAF-FP valves are maintained tightly closed when the control chamber is pressurized. By reducing the control chamber pressure venting it manually or automatically by an electric, pneumatic, hydraulic or pneu-electric control trim, RAF-FP valves trip open and water flows downstream
- By adding a 2 or 3 way Raphael control pilot RAF-FP modulates pressure and / or flow to preset levels downstream or upstream.



RAF-FP manual hydraulic actuation: Pressurize or vent control chamber to close or open RAF-FP Valve

1. Equivalent or higher pressure. Consult Raphael for lower pressure independent control lines

## Operation mode:



### Full Open valve mode

Control chamber pressure is vented, the diaphragm moves up, the RAF-FP valve opens full bore and water flows downstream

### Modulating valve mode

Control chamber pressure is partially vented monitored by a pilot valve, the diaphragm moves up or down, RAF-FP valve accurately modulates flowrate and pressure to pre-set levels

### Stand-by close valve mode

When control chamber pressure equals to line pressure (or control chamber is pressurized by an independent control line at equivalent pressure), RAF-FP close tightly to stan-by mode, there is no flow of water downstream

## Inspection, Testing & Maintenance

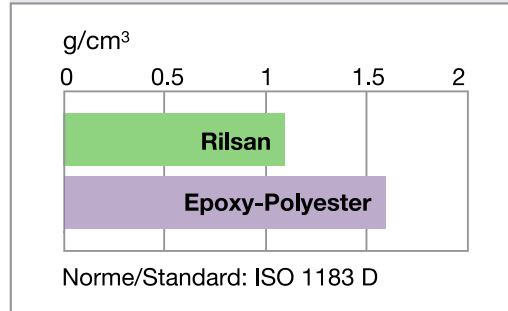
- Inspection, & Testing as well as routine maintenance should be performed periodically following NFPA 25 directives for water-based Fire Protection Systems
- Refer to specific RAF-FP application bulletins for Raphael recommended Inspection Testing and Maintenance of valves, control trims and additional accessories
- Close all line isolating valves as well as independent control lines connected to RAF-FP, ensure to vent pressure in the valve control chamber, valve body & control trim before any maintenance works are performed.
- Proper wet operation testing of RAF-FP valves should be performed at least once a year following specific instructions in RAF-FP application bulletins. All other isolating or other type valves in the water based Fire Protection System should be inspected and tested as well
- Under routine Inspection Testing & Maintenance, control trim filter should be cleaned, trim check valves should operate unobstructed

## Ordering Information:

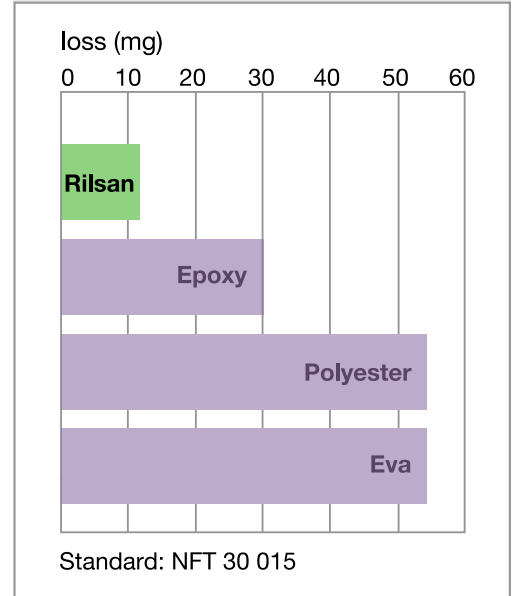
- Refer to Raphael Valve Application List for standard or special control trims. Please contact your local Raphael Distributor regarding available valves and control trim configurations, EEx trim components and custom specifications

**RAPHAEL Engineered Coatings: RILSAN (Nylon # 11) comparative performance:**

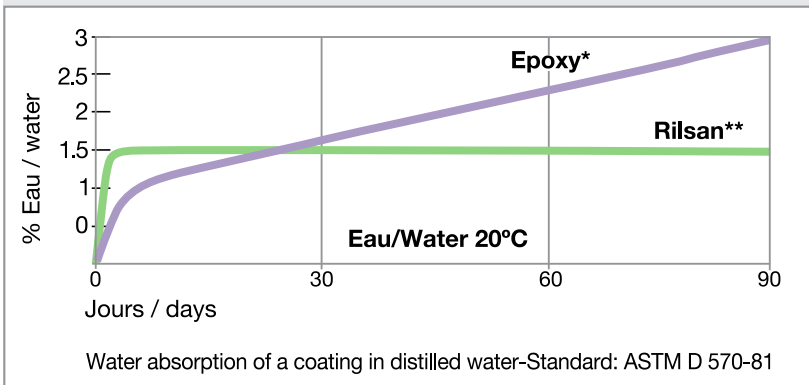
**Low Specific Gravity**



**Excellent Wear Resistance**

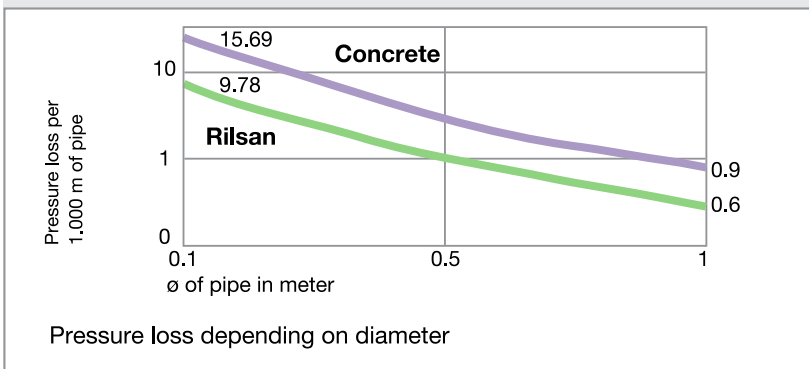


**Low Moisture Absorption**

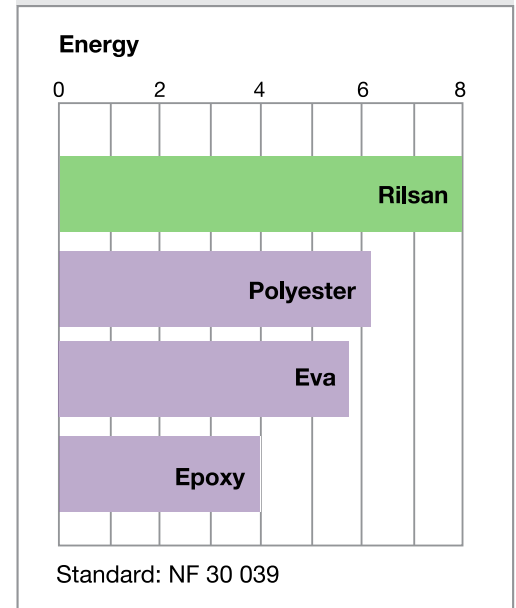


\*F.B.E. \*\*Rilsan T Black CMAC

**Pressure Loss**



**Impact Resistance**



RILSAN is an ARKEMA Trademark

## Chemical Resistance of Rilsan

### Resistance of Rilsan to various chemicals, as a function of temperature

Condition after 18 months contact:						
G = good L = limited P = poor		Resistance				
		Concentration	20°C	40°C	60°C	90°C
<b>Alcohols</b>						
benzyl alcohol		L	P	P	P	
butanol		G**	L	P		
ethanol	pure	G**	G	L		
glycerine	pure	G	G	L	P	
glycol		G	G	G	P	
methanol	pure	G**	L	P		
<b>Aldehydes and ketones</b>						
acetaldehyde		G	L	P		
acetone	pure	G	G**	L	P	
benzaldehyde		G	L	P		
cyclohexanone		G	L	P		
formaldehyde	technical	G	L	P		
methyl ethyl ketone		G	G	L	P	
methyl isobutyl ketone		G	G	L	P	
<b>Chlorinated solvents</b>						
carbon tetrachloride		P				
methyl bromide		G	P			
methyl chloride		G	P			
perchloroethylene		G	G	L		
trichloroethane		L	P			
trichloroethylene		G	L			
<b>Hydrocarbons</b>						
acetylene		G	G	G		
benzene		G	G**	L		
butane		F	G	G		
cyclohexane		G	G	L		
decalin		G	G	G	L	
HCFC (FORANE®)		G				
HFC (FORANE®)		G				
hexane		G	G	G		
methane		G	G	G		
naphthalene		G	G	G	L	
propane		G	G	G		
styrene		G	G**			
toluene		G	G**	L	L	
xylene		G	G**	L	L	
<b>Inorganic acids</b>						
chromic acid	10%	P	P	P	P	
hydrochloric acid	1%	G	L	P	P	
hydrochloric acid	10%	G	L	P	P	
nitric acid	all concentrations	P	P	P	P	
phosphoric acid	50%	G	L	P	P	
sulphuric acid	1%	G	L	L	P	
sulphuric acid	10%	G	L	P	P	
sulphur trioxide		L	P	P	P	
<b>Inorganic bases</b>						
ammonia	liquid or gas	G	G			
ammonium hydroxide	concentrated	G	G	G	G	
limenash		G	G	G		
potassium hydroxide	50%	G	L	P	P	

		Resistance				
		Concentration	20°C	40°C	60°C	90°C
sodium hydroxide	5%	G	G	L		
sodium hydroxide	10%	G	L	L		
sodium hydroxide	50%	G	L	P	P	
<b>Inorganic salts</b>						
alum	conc. solutions or slurries	G	G	G		
aluminium sulphate	"	G	G	G	G	
ammonium nitrate	"	G	G	G		
ammonium sulphate	"	G	G	L		
barium chloride	"	G	G	G	G	
calcium arsenate	"	G	G	G		
calcium chloride	"	G	G	G	G	
calcium sulphate	"	G	G	L		
copper sulphate	"	G	G	G	G	
diammonium phosphate	"	G	G	L		
magnesium chloride	50%	G	G	G	G	
potassium ferrocyanide	"	G	G	G		
potassium nitrate	"	G*	L*	P	P	
potassium sulphate	"	G	G	G	G	
sodium carbonate	"	G	G	L	P	
sodium chloride	saturated	G	G	G	G	
sodium silicate	"	G	G	G	G	
sodium sulphide	"	G	G	L		
trisodium phosphate	"	G	G	G	G	
<b>Organic acids and anhydrides</b>						
acetic acid		L	P	P	P	
acetic anhydride		L	P	P	P	
citric acid		G	G	L	P	
formic acid		P	P	P	P	
lactic acid		G	G	G	L	
oleic acid		G	G	G	L	
oxalic acid		G	G	L	L	
picric acid		L	P	P	P	
stralic acid		G	G	G	L	
tartaric acid	saturated sol.	G	G	G	L	
uric acid		G	G	G	L	
<b>Organic bases</b>						
aniline	pure	L	P	P	P	
diethanolamine	20%	G	G**	G**	L	
pyridine	pure	L	P	P	P	
urea		G	G	L	L	
<b>Other inorganic products</b>						
agricultural sprays		G	G			
bleach solution		L	P	P	P	
bromine		P	P			
chlorine	10ppm, 240 days	G	G			
fluorine		P	P	P	P	
hydrogen		G	G	G	G	
hydrogen peroxide	20 vol.	G	L			
mercury		G	G	G	G	
oxygen		G	G	L	P	
ozone	2ppm, 10 days	G	G			
potassium permanganate	5%, 6 months	L	P			

		Resistance				
		Concentration	20°C	40°C	60°C	90°C
sea water		G	G	G	G	
soda water		G	G	G	G	
sulphur		G	G			
water		G	G	G	G	
<b>Phenols</b>						
		P	P	P	P	
<b>Salts, esters, ethers</b>						
amyl acetate		G	G	G	L	
butyl acetate		G	G	G	L	
diethyl enter		G				
dioctylphosphate		G	G	G	L	
diocetylphthalate		G	G	G		
ethyl acetate		G	G	G		
fatty acid esters		G	G	G	G	
methyl acetate		G	G	G		
methyl sulphate		G	L			
tributylphosphate		G	G	G	G	
tricresylphosphate		G	G	G	G	
<b>Various Organic compounds</b>						
anethole		G				
carbon disulphide		G**	L*	P		
diacetone alcohol		G	G**	L	P	
dimethyl formamide		G	G	L		
ethylene chlorhydrin		G	P			
ethylene oxide		G	G	L	P	
furfural		G	G**	L	P	
glucose		G	G	G	G	
tetraethyl lead		G				
tetrahydrofurane		G	G	L		
<b>Various products</b>						
beer		G				
cider		G				
crude petroleum		G	G	G**		
diesel fuel		G	G	G**		
fruit juices		G	G			
fuel oil		G	G	G	G	
greases		G	G	G	G	
ground-nut oil		G	G			
high octane petrol		G	G	G**		
kerosene (paraffin)		G	G	G**		
linseed cake		G	G	G	G	
milk		G	G	G	G	
mustard		G				
normal petrol		G	G	G**		
oils		G	G	G	G	
soap solution		G				
solutions or emulsions of 2,4-D - D.D.T. or lindane	agricultural sprays	G				
hydroxy-quinoline		G				
solvent naphtha		G	G**	G		
stearin		G	G	G		
town gas		G		G		
turpentine		G	G**	G		
vinegar		G				
wine		G				

\*slight yellowing \*\*Action gonflante / Swelling action

The values given in this technical data sheet are the results of tests carried out in accordance with standard test procedures.

They are given as an indication to enable customers to make the best use of our products but must be considered as average values without implying undertaking on our part.