

RAMAN

Gasket Manufacturer



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Non-Metallic Sheets & Gaskets

Compressed non-asbestos sheets & gaskets

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sheets & gaskets

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Metal Gaskets

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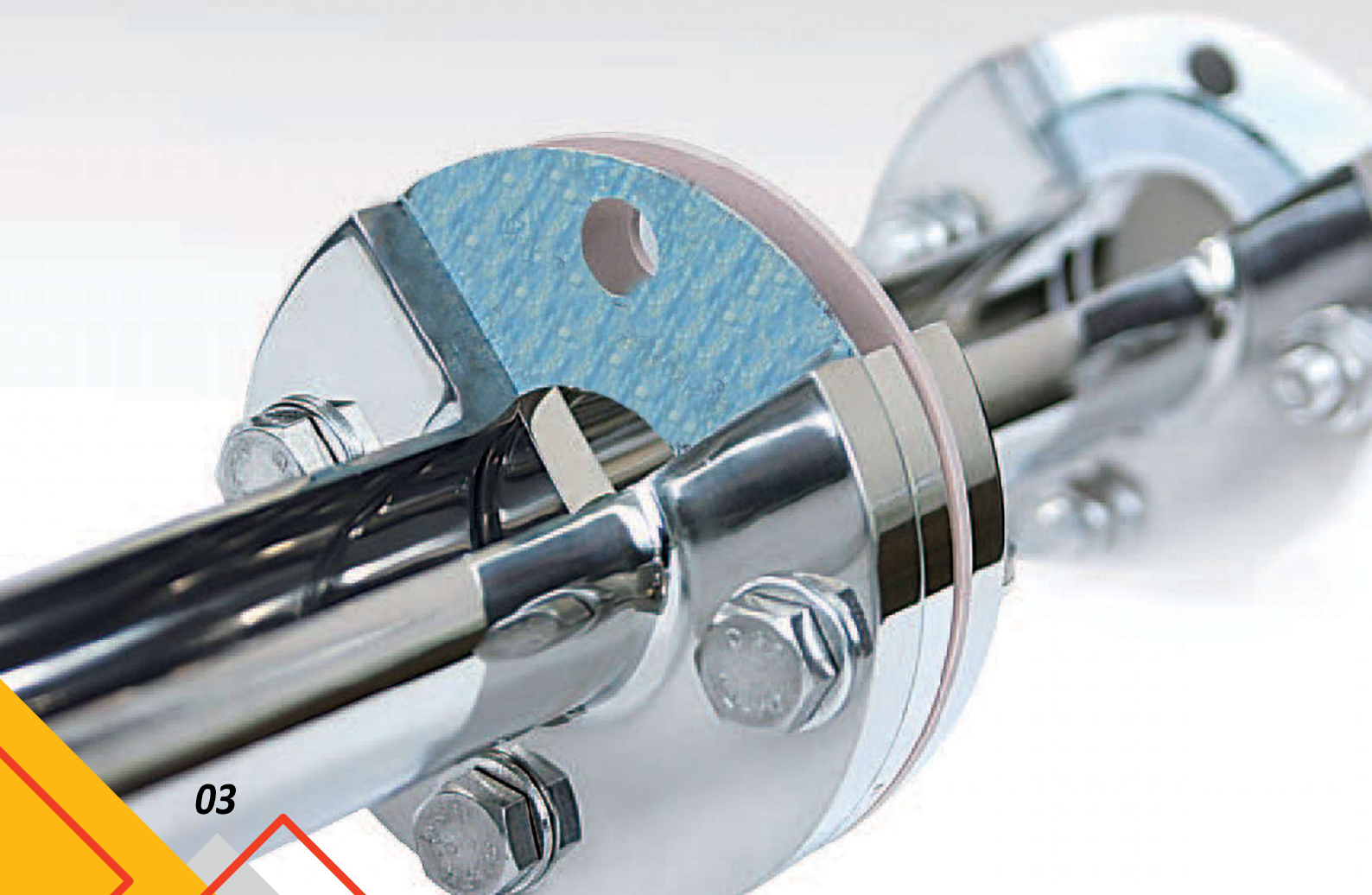
Gasket		
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Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets
Sheets & Gaskets



Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets

Aramid Fiber + NBR

RAMAN 6000

Industrial Applications

[Characteristic]

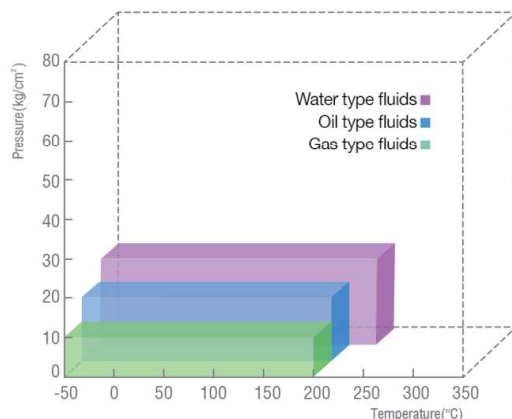
RAMAN-6000 is manufactured by the hot calender process using high quality Non-Asbestos fiber (Aramid Fiber) and oil resistant synthetic rubber (NBR). Specially, this sheet has superior sealing performance with excellent oil resistance.

[Application]

Short-term peak Temp.	350°C [662°F]
Maximum continuous Temp.	220°C [428°F]
Short-term peak Pressure	80kgf/cm ² [7.85 MPa]

Applied Fluids : Water, Alkali, Salt Solution, Hot Oil, Oil Gas, Freon Gas below, Organic Solvent

[Service Range]



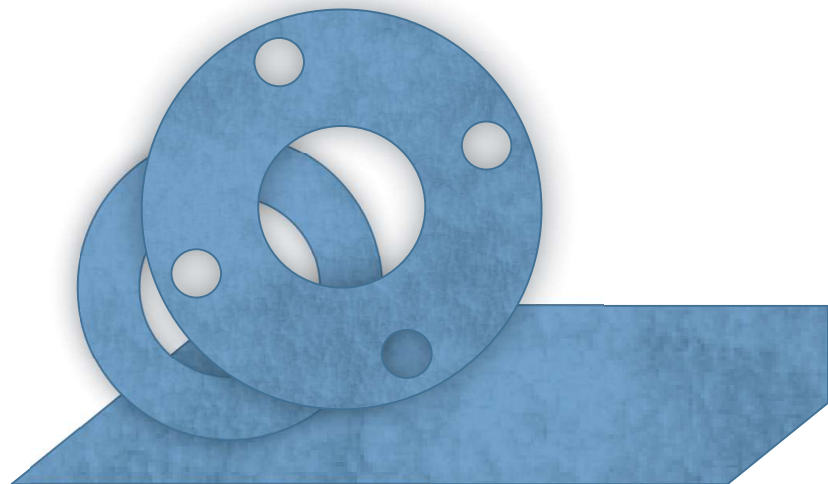
*Maximum Temp. & Pressure combinations can not be used at the same time.

[Size]

Thickness(mm)	0.5 ~ 3.2
Sheet(mm)	1270×1270 / 1270×2540 1270×3810 / 1520×1520 2540×3810 / 1520×3040

*Other Sizes can be available, if required.

*One or both sides Graphite & PTFE coating available, if required.



[Typical Physical Properties]

Test Method	Description	RAMAN 6000
	Density [g/cm ³]	1.7
ASTM F152	Tensile strength Across grain.MPa (kgf/mm ²)	13.7 (1.4)
ASTM F36R	Compressibility [%]	9
	Recovery [%]	55
ASTM F146	Fluid Resistance after 5hrs immersions	
	ASTM #3 oil (150°C) Thickness Increase [%]	5
	Tensile Loss [%]	23
ASTM F147	ASTM Fuel B (20~30°C) Thickness Increase [%]	5
	Weight Increase [%]	9
	Flexibility	No Crack
ASTM F495	Ignition Loss [%] 850°C(1123°F) x 30min	29

*All data are typical values

[Design Data]

Thickness(mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
3.2	2.00	112 (1600)
1.6	2.75	260 (3700)
0.8	3.50	457 (6500)

Note

Water type fluids : For steam line, spiral wound gasket or graphite sheet gasket is recommended.

Oil type fluids : For organic solvents, use below 150°C

Gas type fluids : Do not use for toxic & explosive gas line

*If properties out of guideline needed, Please contact our Technical Team.

Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets

Non-Metallic Sheets & Gaskets



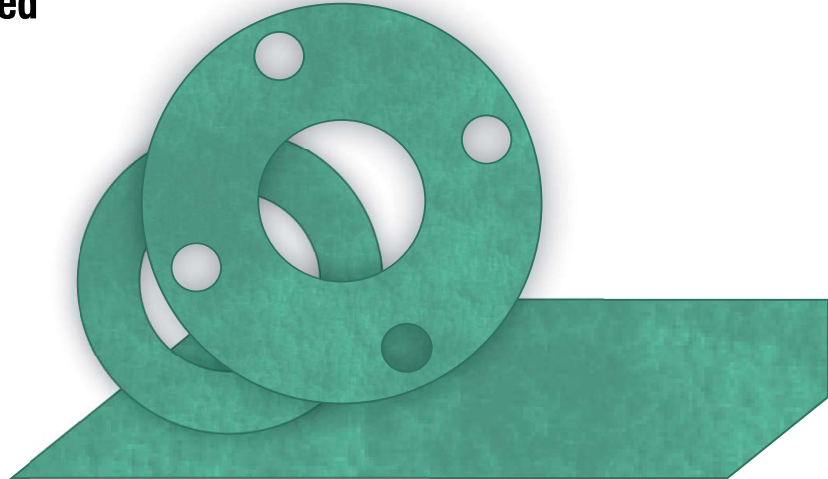
Aramid Fiber + NBR + Wire Reinforced

RAMAN 6000W

Industrial Applications

[Characteristic]

This 6000W is an excellent quality Non-Asbestos gasket material (same compounds of RAMAN-6000) with stainless steel wire-mesh inserted to be suitable for exhaust Line under high temperature and high pressure (Aramid Fiber + NBR Binder).

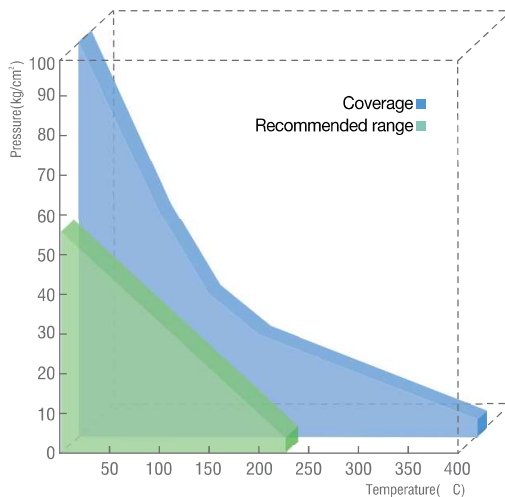


[Application]

Short-term peak Temp.	400°C [752°F]
Short-term peak Pressure	100kgf/cm ² [9.8 MPa]

Applied Fluids : Suitable for Water, Hot Oil, Oil Gas Alkali, Salt Solutions, Solvents, Etc. Not be Used in Steam, Strong Acid and Alkali, Soluble Chemicals.

[Service Range]



*Maximum Temp. & Pressure combinations can not be used at the same time.

[Size]

Thickness(mm)	1.0 ~ 3.2
Sheet(mm)	1524x3100

*Other Sizes can be available, if required.

*One or both sides Graphite & PTFE coating available, if required.

[Typical Physical Properties]

Test Method	Description	RAMAN 6000
	Density [g/cm ³]	1.7
ASTM F152	Tensile strength Across grain.MPa (kgf/mm ²)	17.7 (1.8)
ASTM F36R	Compressibility [%]	9
	Recovery [%]	53
ASTM F146	Fluid Resistance after 5hrs immersions	
	ASTM #3 oil (150°C) Thickness Increase [%]	5
	Tensile Loss [%]	21
ASTM F147	ASTM Fuel B (20~30°C) Thickness Increase [%]	3
	Weight Increase [%]	11
	Flexibility	No Crack
ASTM F495	Ignition Loss [%]	25
	850°C(1123°F) x 30min	

*All data are typical values

[Design Data]

Thickness(mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
3.2	2.00	112 (1600)
1.6	2.75	260 (3700)
0.8	3.50	457 (6500)

note

Water type fluids : For steam line, spiral wound gasket or graphite sheet gasket is recommended.

Oil type fluids : For organic solvents, use below 150°C

Gas type fluids : Do not use for toxic & explosive gas line

*If properties out of guideline needed, Please contact our Technical Team.

Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets

Aramid Fiber + NBR

RAMAN 6010

Industrial Applications

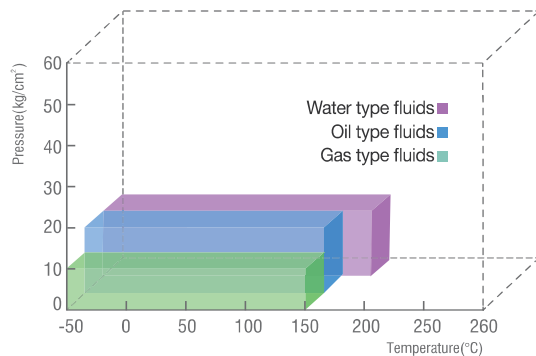
[Characteristic]

High quality heat resistant fiber (Aramid Fiber) and excellent oil resistant synthetic rubber (NBR) are compounded and calendared into a gasket sheet for oil resistance required applications.

[Application]

Short-term peak Temp.	260°C [500°F]
Maximum continuous Temp.	180°C [356°F]
Short-term peak Pressure	60kgf/cm ² [5.88 MPa]
Applied Fluids : Water, Hot Water, Oils, Mild acids and alkalis.	

[Service Range]



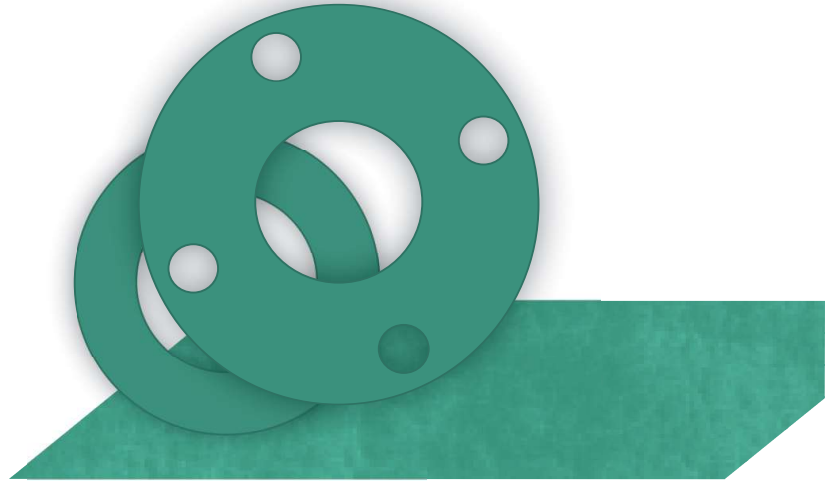
*Maximum Temp. & Pressure combinations can not be used at the same time.

[Size]

Thickness(mm)	0.5 ~ 3.2
Sheet(mm)	1270×1270 / 1270×2540
	1270×3810 / 1520×1520
	2540×3810 / 1520×3040

*Other Sizes can be available, if required.

*One or both sides Graphite & PTFE coating available, if required.



[Typical Physical Properties]

Test Method	Description	RAMAN 6010
	Density [g/cm ³]	1.6
ASTM F152	Tensile strength Across grain.MPa (kgf/mm ²)	10.8 (1.1)
ASTM F36R	Compressibility [%]	11
	Recovery [%]	53
ASTM F146	Fluid Resistance after 5hrs immersions	
	ASTM #3 oil (150°C) Thickness Increase [%]	6
	Tensile Loss [%]	26
ASTM F147	ASTM Fuel B (20~30°C) Thickness Increase [%]	5
	Weight Increase [%]	13
	Flexibility	No Crack
ASTM F495	Ignition Loss [%]	31
	850°C(1123°F) x 30min	

*All data are typical values

[Design Data]

Thickness(mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
3.2	2.00	112 (1600)
1.6	2.75	260 (3700)
0.8	3.50	457 (6500)

Note

Water type fluids : For steam line, spiral wound gasket or graphite sheet gasket is recommended.

Oil type fluids : For organic solvents, use below 150°C

Gas type fluids : Do not use for toxic & explosive gas line

*If properties out of guideline needed, Please contact our Technical Team.

Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets

Non-Metallic Sheets & Gaskets 

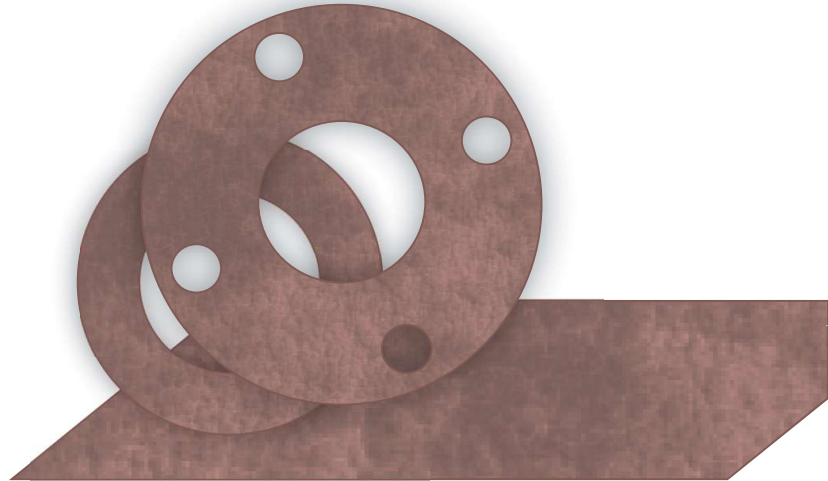
Organic Fiber + NBR

RAMAN 6030

Industrial Applications

[Characteristic]

This is an economical Non-Asbestos sheet that is compounded with high quality Non-Asbestos fiber and filler & synthetic rubber materials. Especially, it shows a decent quality in processing & sealing performance under water, hot water, mild acids and alkalis and building-fire-fighting pipe.

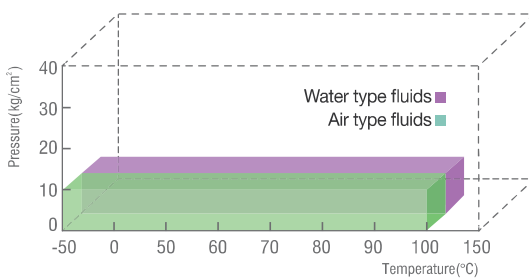


[Application]

Short-term peak Temp.	150°C [423°F]
Maximum continuous Temp.	100°C [212°F]
Short-term peak Pressure	40kgf/cm ² [3.92 MPa]

Applied Fluids : Air, Water, Hot Water, Salt Solution, Mild Acids and Alkalies.

[Service Range]



* Maximum Temp. & Pressure combinations can not be used at the same time.

[Size]

Thickness(mm)	0.5 ~ 3.2
Sheet(mm)	1270×1270 / 1270×2540
	1270×3810 / 1520×1520
	2540×3810 / 1520×3040

* Other Sizes can be available, if required.

* One or both sides Graphite & PTFE coating available, if required.

[Typical Physical Properties]

Test Method	Description	RAMAN 6030
	Density [g/cm ³]	1.6
ASTM F152	Tensile strength Across grain.MPa (kgf/mm ²)	7.8 (0.8)
ASTM F36R	Compressibility [%]	13
	Recovery [%]	55
ASTM F146	Fluid Resistance after 5hrs immersions	
	ASTM #3 oil (150°C) Thickness Increase [%]	11
	Tensile Loss [%]	40
ASTM Fuel B (20~30°C)	Thickness Increase [%]	10
	Weight Increase [%]	15
	Flexibility	No Crack
ASTM F495	Ignition Loss [%]	34
	850°C(1123°F) x 30min	

* All data are typical values

[Design Data]

Thickness(mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
3.2	2.00	112 (1600)
1.6	2.75	260 (3700)
0.8	3.50	457 (6500)

Note

Water type fluids : For steam line, spiral wound gasket or graphite sheet gasket is recommended.

Oil type fluids : For organic solvents, use below 150°C

Gas type fluids : Do not use for toxic & explosive gas line

*If properties out of guideline needed, Please contact our Technical Team.

Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets

Aramid Fiber + SBR

RAMAN 6100

Industrial Applications

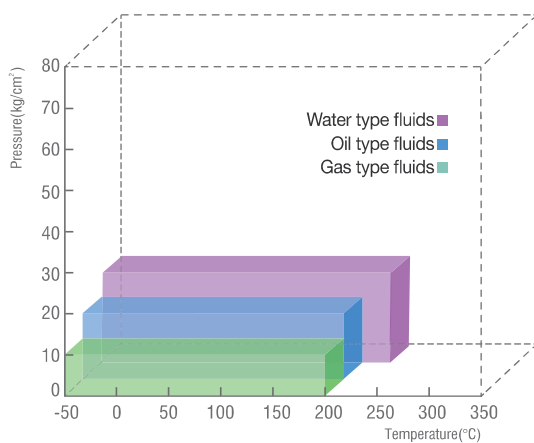
[Characteristic]

RAMAN-6100 is designed specifically to perform and seal more effectively than other Non-Asbestos sheet materials. This sheet provides superior heat resistance and excellent recovery because of unique blends of special Non-Asbestos fiber (Aramid Fiber) & fillers and SBR binder

[Application]

Short-term peak Temp.	350°C [662°F]
Maximum continuous Temp.	220°C [428°F]
Short-term peak Pressure	80kgf/cm ² [7.85 MPa]
Applied Fluids : Air, Water, Oils, Mild Acids and Alkali, Inert Gases, Fuels, Salt Solution, Lubricant.	

[Service Range]



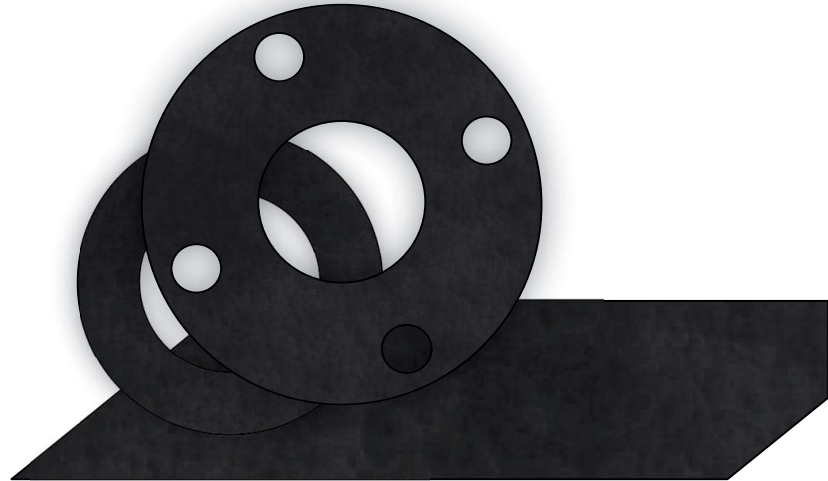
*Maximum Temp. & Pressure combinations can not be used at the same time.

[Size]

Thickness(mm)	0.5 ~ 3.2
Sheet(mm)	1270×1270 / 1270×2540
	1270×3810 / 1520×1520
	2540×3810 / 1520×3040

*Other Sizes can be available, if required.

*One or both sides Graphite & PTFE coating available, if required.



[Typical Physical Properties]

Test Method	Description	RAMAN 6100
	Density [g/cm ³]	1.7
ASTM F152	Tensile strength Across grain.MPa (kgf/mm ²)	13.7 (1.4)
ASTM F36R	Compressibility [%]	10
	Recovery [%]	55
ASTM F146	Fluid Resistance after 5hrs immersions	
	ASTM #3 oil (150°C) Thickness Increase [%]	15
	Tensile Loss [%]	30
ASTM F147	Flexibility	No Crack
ASTM F495	Ignition Loss [%]	30
	850°C(1123°F) x 30min	

*All data are typical values

[Design Data]

Thickness(mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
3.2	2.00	112 (1600)
1.6	2.75	260 (3700)
0.8	3.50	457 (6500)

Note

Water type fluids : For steam line, spiral wound gasket or graphite sheet gasket is recommended.

Oil type fluids : For organic solvents, use below 150°C

Gas type fluids : Do not use for toxic & explosive gas line

*If properties out of guideline needed, Please contact our Technical Team.

Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets

Non-Metallic Sheets & Gaskets



Aramid Fiber + NBR

RAMAN 6200

Industrial Applications

[Characteristic]

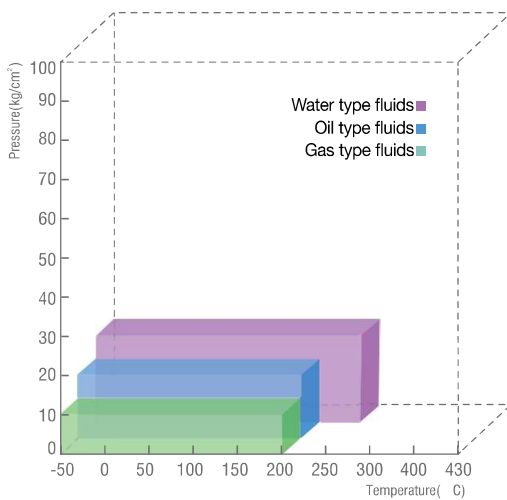
High quality Non-Asbestos fiber (Aramid Fiber) and excellent heat & oil resistant rubber are compounded and calendered into a gasket sheet with superior chemical resistance. Especially it shows a good sealing performance under hot oil, oil gas, etc.

[Application]

Short-term peak Temp.	430°C [806°F]
Maximum continuous Temp.	250°C [482°F]
Short-term peak Pressure	100kgf/cm ² [9.8 MPa]

Applied Fluids : Water, Alkali, Salt Solution, Hot Oil, Oil Gas, Fuels below, Organic Solvents

[Service Range]



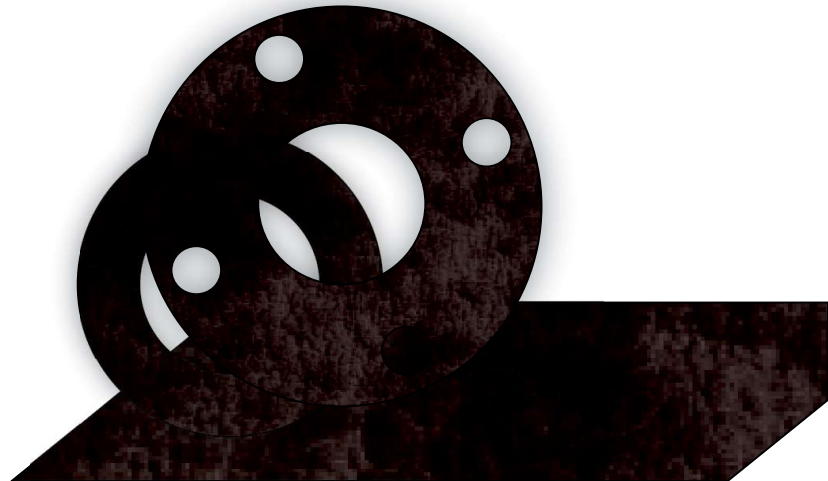
*Maximum Temp. & Pressure combinations can not be used at the same time.

[Size]

Thickness(mm)	0.5 ~ 3.2
Sheet(mm)	1270x1270 / 1270x2540
	1270x3810 / 1520x1520
	2540x3810 / 1520x3040

*Other Sizes can be available, if required.

*One or both sides Graphite & PTFE coating available, if required.



[Typical Physical Properties]

Test Method	Description RAMAN 6200	RAMAN 6200
	Density [g/cm ³]	1.7
ASTM F152	Tensile strength Across grain.MPa (kgf/mm ²)	11.8 (1.2)
ASTM F36R	Compressibility [%]	10
	Recovery [%]	53
ASTM F146	Fluid Resistance after 5hrs immersions	
	ASTM #3 oil (150°C) Thickness Increase [%]	4
	Tensile Loss [%]	17
ASTM F147	ASTM Fuel B (20~30°C) Thickness Increase [%]	5
	Weight Increase [%]	8
	Flexibility	No Crack
ASTM F495	Ignition Loss [%] 850°C(1123°F) x 30min	28

*All data are typical values

[Design Data]

Thickness(mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
3.2	2.00	112 (1600)
1.6	2.75	260 (3700)
0.8	3.50	457 (6500)

note

Water type fluids : For steam line, spiral wound gasket or graphite sheet gasket is recommended.

Oil type fluids : For organic solvents, use below 150°C

Gas type fluids : Do not use for toxic & explosive gas line

*If properties out of guideline needed, Please contact our Technical Team.

Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets

Carbon Fiber + NBR

RAMAN 6400

Industrial Applications

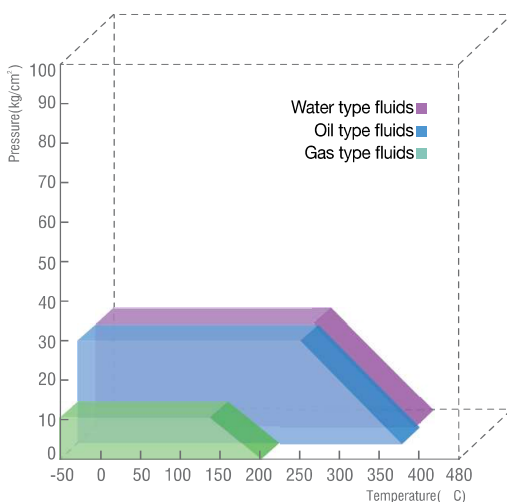
[Characteristic]

This Non-Asbestos sheet, RAMAN-6400 provides superior chemical resistance and excellent heat resistance to use in steam and other high-temperature required lines. Suitable for a wide range of fluids like as fuel, lubricating, animal & vegetable oil, organic solvents, etc.

[Application]

Short-term peak Temp.	480°C [896°F]
Maximum continuous Temp.	320°C [608°F]
Short-term peak Pressure	100kgf/cm ² [9.8 MPa.]
Applied Fluids : Lubricating Oil, Fuel, Animal Oil, Organic Solvents, etc / Water, Hot Water, Steam, Hot Oil, Oil Gas, Salt Solution.	

[Service Range]



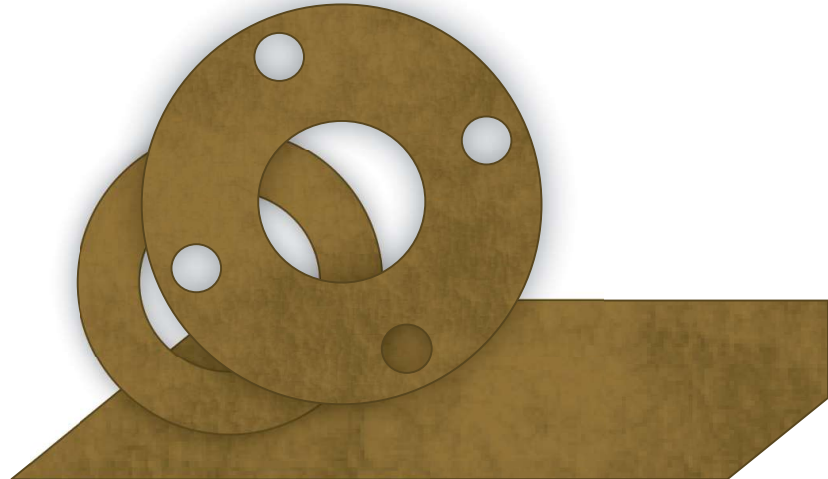
*Maximum Temp. & Pressure combinations can not be used at the same time.

[Size]

Thickness(mm)	0.5 ~ 3.2
Sheet(mm)	1270×1270 / 1270×2540
	1270×3810 / 1520×1520
	2540×3810 / 1520×3040

*Other Sizes can be available, if required.

*One or both sides Graphite & PTFE coating available, if required.



[Typical Physical Properties]

Test Method	Description	RAMAN 6400
	Density [g/cm ³]	1.8
ASTM F152	Tensile strength Across grain.MPa (kgf/mm ²)	13.7 (1.4)
ASTM F36R	Compressibility [%]	9
	Recovery [%]	58
ASTM F146	Fluid Resistance after 5hrs immersions	
	ASTM #3 oil (150°C) Thickness Increase [%]	5
	Tensile Loss [%]	23
ASTM F147	ASTM Fuel B (20~30°C) Thickness Increase [%]	4
	Weight Increase [%]	9
	Flexibility	No Crack
ASTM F495	Ignition Loss [%]	26
	850°C(1123°F) x 30min	

*All data are typical values

[Design Data]

Thickness(mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
3.2	2.00	112 (1600)
1.6	2.75	260 (3700)
0.8	3.50	457 (6500)

note

Water type fluids : For steam line, please consult to our Technical Team in advance

Oil type fluids : For organic solvents, use below 150°C

Gas type fluids : Do not use for toxic & explosive gas line

*If properties out of guideline needed, Please contact our Technical Team.

Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets

Non-Metallic Sheets & Gaskets 

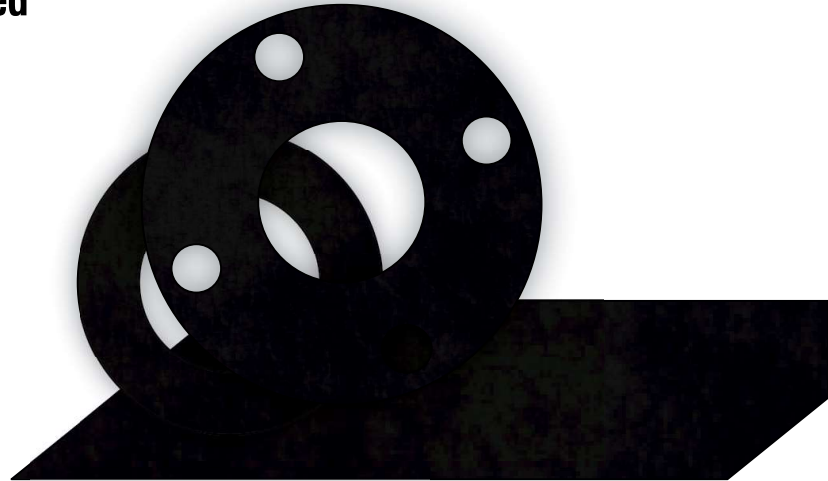
Carbon Fiber + NBR+Wire Reinforced

RAMAN 6400W

Industrial Applications

[Characteristic]

This 6400W is excellent quality Non-Asbestos carbon fiber gasket material with stainless steel wire-mesh inserted to be suitable for exhaust line under high temperature and high pressure.

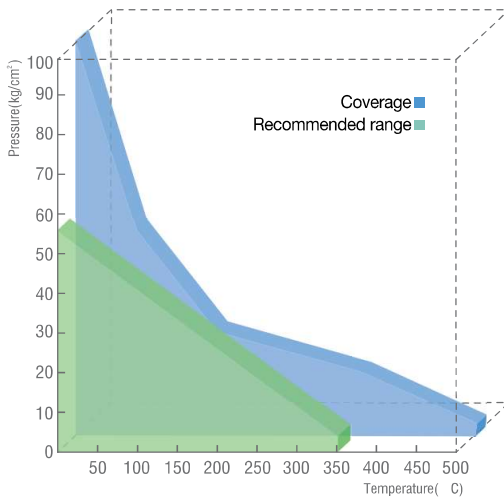


[Application]

Short-term peak Temp.	500°C [932°F]
Maximum continuous Temp.	350°C [662°F]
Short-term peak Pressure	100kgf/cm ² [9.8 MPa]

Applied Fluids : Suitable for Water, Hot Oil, Oil Gas Alkali, Salt Solutions, Solvents, Etc. , Strong Acid and Alkali, Soluble Chemicals.

[Service Range]



*Maximum Temp. & Pressure combinations can not be used at the same time.

[Size]

Thickness(mm)	1.0 ~ 3.2
Sheet(mm)	1524x3100

*Other Sizes can be available, if required.
*One or both sides Graphite & PTFE coating available, if required.

[Typical Physical Properties]

Test Method	Description	RAMAN 6400W
	Density [g/cm ³]	1.8
ASTM F152	Tensile strength Across grain.MPa (kgf/mm ²)	17.7 (1.8)
ASTM F36R	Compressibility [%]	10
	Recovery [%]	57
ASTM F146	Fluid Resistance after 5hrs immersions	
	ASTM #3 oil (150°C) Thickness Increase [%]	4
	Tensile Loss [%]	16
ASTM Fuel B (20~30°C)	Thickness Increase [%]	3
	Weight Increase [%]	6
ASTM F147	Flexibility	No Crack
ASTM F495	Ignition Loss [%]	24
	850°C(1123°F) x 30min	

*All data are typical values

[Design Data]

Thickness(mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
3.2	2.00	112 (1600)
1.6	2.75	260 (3700)
0.8	3.50	457 (6500)

note

Water type fluids : For steam line, spiral wound gasket or graphite sheet gasket is recommended.

Oil type fluids : For organic solvents, use below 150°C

Gas type fluids : Do not use for toxic & explosive gas line

*If properties out of guideline needed, Please contact our Technical Team.

Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets

Aramid Fiber + Synthetic Rubber

RAMAN 6210

Automotive Applications



[Characteristic]

RAMAN 6210 is designed for Automotive purposes. It shows excellent oil-resistance and recovery with the use of high quality fibers (Aramid Fiber) and NBR rubber binder.

[Application]

Applied Fluids : Water, Hot Water, Oils, Mild Acids and Alkalis

Aramid Fiber + NBR

RAMAN 6215

Automotive Applications



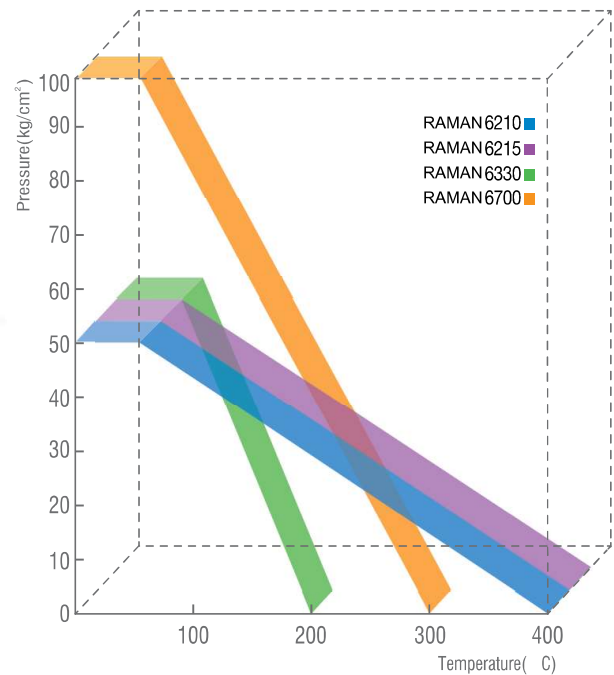
[Characteristic]

Same as RAMAN 6210, but this RAMAN 6215 is also suitable for fuel-resistant application.

[Application]

Applied Fluids : Water, Air, Mild Acids and Alkalis, Salt Solution, Lubricant

[Service Range]



*Maximum Temp. & Pressure combinations can not be used at the same time.



Non-Metallic Sheets & Gaskets

Compressed Non-Asbestos Sheets & Gaskets

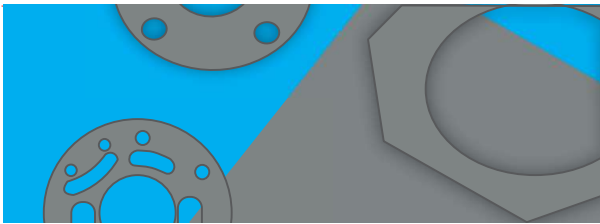
Non-Metallic Sheets & Gaskets



Aramid Fiber + Synthetic Rubber

RAMAN 6330

Automotive Applications



[Characteristic]

This sheet has a self-swelling property to perform high pressure sealing performance in spite of low bolt force, which is compounded with excellent quality Aramid Fiber and SBR rubber binder.

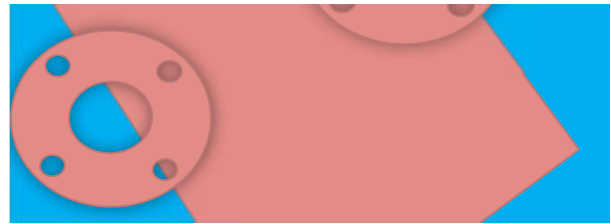
[Application]

Applied Fluids : Water, Oil, Fuels, Salt Solution, Mild Acids and Alkalis

Aramid Fiber + NBR

RAMAN 6700

Automotive Applications



[Characteristic]

Special high quality fibers and oil resistant rubber are compounded and calendered into an Non-Asbestos gasket sheets. It shows very excellent properties in stress relaxation and tensile strength, etc.

[Application]

Applied Fluids : Water, Alkali, Salt Solution, Hot oil, oil Gas, Freon Gas
Gas type Fluids

[Typical Physical Properties]

Test Method	Description	RAMAN 6210	RAMAN 6215	RAMAN 6330	RAMAN 6700
	Short-term peak Temp.(°C)	400°C (752°F)	400°C (752°F)	200°C (392°F)	300°C (572°F)
	Pressure MPa. (kgf/cm ²)	4.9 (50)	4.9 (50)	4.9 (50)	9.8 (100)
	Density (g/cm ³)	1.7	1.7	1.7	1.7
ASTM F152	Tensile strength Across grain.MPa (kgf/mm ²)	1.0 (9.8)	1.4 (13.7)	1.0 (9.8)	1.6 (15.7)
ASTM F38	Creep Relaxation (%)	25	21	24	18
ASTM F36R	Compressibility (%)	12	8	13	9
	Recovery (%)	58	60	56	55
ASTM F146	Fluid Resistance after 5hrs immersions				
	ASTM No.3 5h / 150°C Thickness Increase (%)	7	2	17	5
	Tensile Strength Loss (%)	-	-	-	17
	Weight Increase	13	6	24	-
ASTM Fuel B 5h / 20-30°C	Thickness Increase (%)	6	5	10	3
	Weight Increase (%)	10	5	16	5
	Ignition Loss (%) 850°C(1123°F)x30min	28	28	29	35

*The Thickness of material tested 0.5mm for JIC 6210, 6215, 6330 and 6700
*All data are typical values

Non-Metallic Sheets & Gaskets

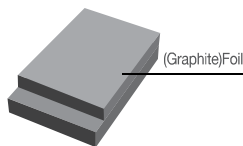
Sheets & Gaskets

(Flexible Graphite) Sheets & Gaskets

RAMAN 4201 Series

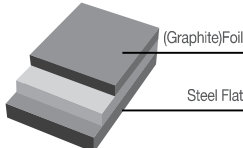
RAMAN 4201

Pure Graphite Sheet



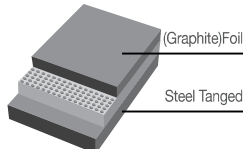
RAMAN 4201-P

Stainless Steel Flat
Reinforced Graphite Sheet



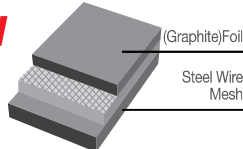
RAMAN 4201-B

Stainless Steel Tanged
Reinforced Graphite Sheet



RAMAN 4201-W

Stainless Steel Wire-Mesh
Reinforced Graphite Sheet



[Characteristic]

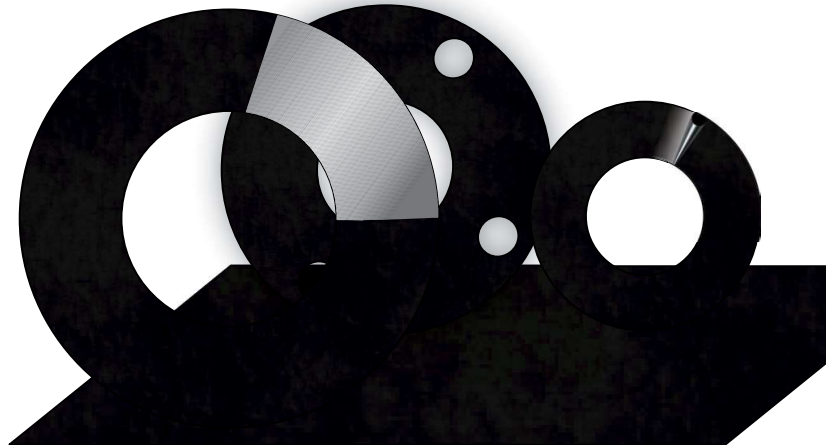
Expanded gasket shows a good adherence to flange and performs sealing performance even under low seating stress. There is no property change under temperature variation from cryogenic to High Temperature range. It shows good corrosive and chemical resistance. Various kinds of graphite gaskets such as stainless steel(wire-mesh, foil and tang) inserted types can be available in accordance with some special conditions.

[Application]

Temp.	-200°C ~ 450°C (Non-Oxidizing Atmosphere Grade)
	-200°C ~ 525°C (Oxidation Resistant Grade)
	650°C (in steam service)
pH range	0~14
Applied Fluids	High temperature & high pressure steam, hot water, gas, organic solvents, acid, alkali, LPG, LNG, Liquid N2. etc.

[Size]

Thickness(mm)	0.8 ~ 3.2
Sheet(mm)	1000×1000 / 1500×1500



[Typical Physical Properties]

Test Method	Description	RAMAN 4201	RAMAN 4201 - P,B,W
	Carbon Content		Min. 98%
	Ash Content		Max. 2%
	Leachable Chloride Content		Max. 50 ppm
	Sulfur Content		Max. 550 ppm
ASTM F36A	Compressibility[%]	40	35
	Recovery[%]	15	20
ASTM F38	Creep Relaxation[%]	< 5	< 5

[Design Data]

RAMAN No.	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
RAMAN 4201 RAMAN 4201-P RAMAN 4201-W	2	63 (900)
RAMAN 4201-B	2	176 (2500)



Non-Metallic Sheets & Gaskets

Sheets & Gaskets

Non-Metallic Sheets & Gaskets 

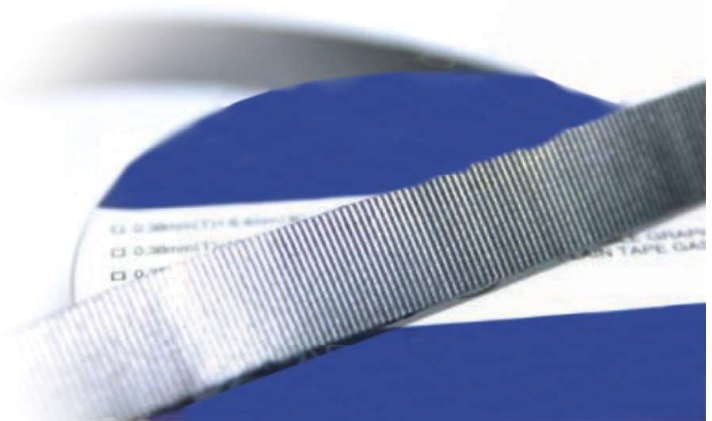
(Flexible Graphite) Plain Tape

RAMAN 4204 (Flexible Graphite) crinkled Tape

RAMAN 4205

[Characteristic]

One side of (Expanded Graphite) sheet is treated with adhesive and cut into tapes. Plain and Crinkled types can be provided. RAMAN-4204 is plain tape and RAMAN-4205 is crinkled tape.



[Application]

Mainly used for the cover to the surface of metal gaskets or flanges. Service temperature and pH range same as those of JIC 4201.

Temp.	-200°C ~ 450°C (Non-Oxidizing Atmosphere) 650°C (in steam service)
pH range	0~14

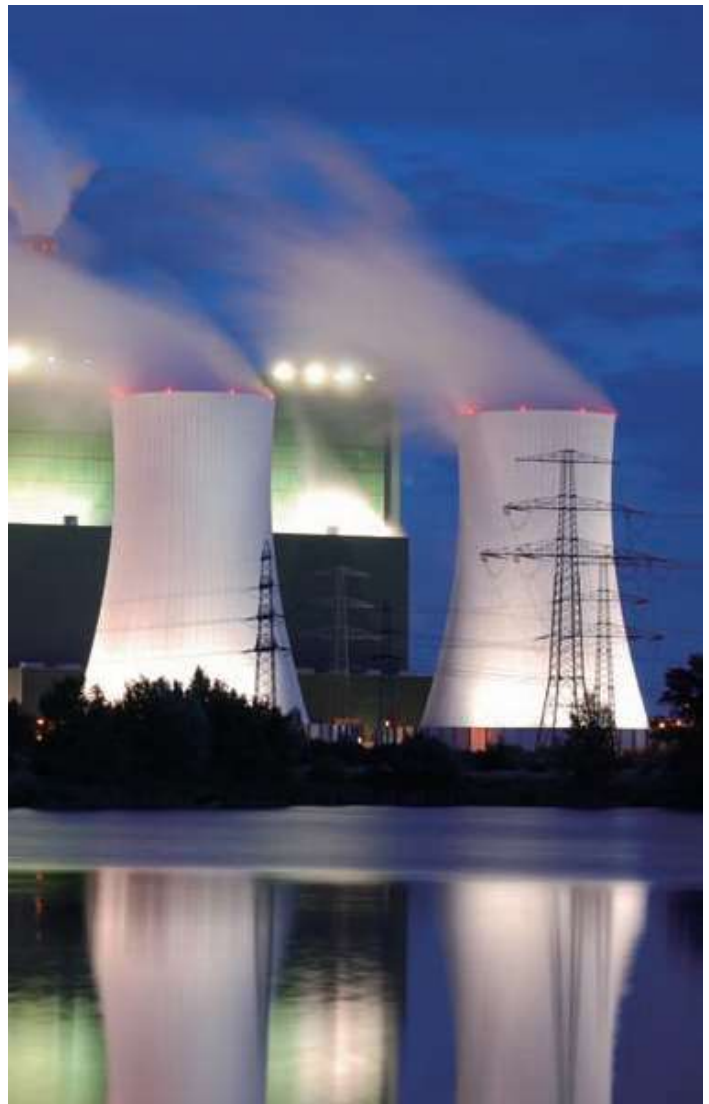
[Size]

Thickness(mm)	Width(mm)	Length(M)
0.4 (0.38)	6.4	15
0.4 (0.38)	12.7	15
0.4 (0.38)	19.1	15
0.4 (0.38)	25.4	15

*Other Sizes can be available, if required.

note

Keep gaskets from damage/breakdown with care when transporting and using gaskets.
Do not recommend the use of gaskets under Strong Acid Fluids.
Do not recommend the use of gasket under high-temperature Oxygen Lines.



Non-Metallic Sheets & Gaskets

Sheets & Gaskets

(PTFE) Solid Gasket

RAMAN 8305

[Characteristic]

Solid Gasket, RAMAN 8305 is made into cut gaskets. It shows very excellent in chemical resistance. Carbon, Glass or other filler materials can be used for wide service applications.

[Application]

Maximum Service Temp.	100°C
Maximum Service Pressure	10kgf/cm ²

Applied Fluids : Alkaline metallic organic chemical compounds, chemicals or solvents except fluorine under high temperature and high pressure, oil gas, foods and medicines to avoid fluid contamination.

[Size]

Thickness(mm)	1.0 ~ 3.0
Sheet(mm)	1000×1000 / 1500×1500

*Other Sizes can be available, if required.

[Typical Physical Properties]

Test Method	Description	Value
RAMAN K 7137	Density [g/cm ³]	2.15
	Tensile strength.MPa (kgf/mm ²)	23.2 (2.37)
	Elongation [%]	310
RAMAN R 3453	Compressibility [%]	16
	Recovery [%]	45
ASTM F38	Creep relaxation [%]	79

*All data are typical values

[Design Data]

Material	Thickness (mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)	Flange Surface
PTFE	1.5	3.2	230 (3271)	12.5 ~ 25S
	3.0	2.5	200 (2845)	

*Pure PTFE Gasket can be applied to L,M&F flange, L,T&G flange

(PTFE) Reinforced Gasket

RAMAN 8305G

[Characteristic]

This RAMAN 8305G is very special Gasket that is reinforced with some filler materials such as Carbon or Glass, etc. to improve Cold-Flow Phenomenon as the weak point of Starflon Gasket.

[Application]

Maximum Service Temp.	200°C
Maximum Service Pressure	40kgf/cm ²

Applied Fluids : Alkaline metallic organic chemical compounds, chemicals or solvents except fluorine under high temperature and high pressure, oil gas, foods and medicines to avoid fluid contamination.

[Size]

Thickness(mm)	1.0 ~ 3.0
Sheet(mm)	1000×1000 / 1270×1270

*Other Sizes can be available, if required.

[Typical Physical Properties]

Test Method	Description	Value
RAMAN K 7137	Density [g/cm ³]	2.28
	Tensile strength.MPa (kgf/mm ²)	14.7 (1.5)
	Elongation [%]	330
RAMAN R 3453	Compressibility [%]	5
	Recovery [%]	60
ASTM F38	Creep relaxation [%]	51

*All data are typical values

[Design Data]

Material	Thickness (mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
PTFE	1.0	3.5	250 (3556)
	1.5	3.2	230 (3271)
	2.0	3.0	200 (2845)
	3.0	2.5	



Non-Metallic Sheets & Gaskets

Sheets & Gaskets

Non-Metallic Sheets & Gaskets



(PTFE) Enveloped Gasket

RAMAN 8310



[Characteristic]

Elastic cushion materials (Compressed Non-Asbestos sheet, Rubber sheet) is enveloped with PTFE sheet into a gasket. Excellent in chemical resistance.

[Application]

Maximum Service Temp.	150°C
Maximum Service Pressure	20kgf/cm ²

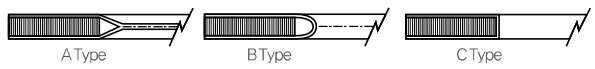
Applied Fluids : Elastic enough to perform a sealability by low face pressure. Suitable for strong acid, strong alkali, low temperature fluid, oxygen, Cl² gas, organic solvents, corrosive fluid, etc.

[Design Data]

Gasket Type	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
A	3.5	150 (2134)
B	4.0	200 (2845)
C	3.5	150 (2134)

[Standard Size]

KS 5K, 10K FLANGE / ANSI 150LB FLANGE



(PTFE) Jacketed Gasket

RAMAN 8313



[Characteristic]

Elastic cushion materials (Compressed Non-Asbestos sheet or Rubber sheet) is completely shielded into a gasket. This prevents the contamination of cushion materials from the fluid flow

[Application]

Maximum Service Temp.	150°C
Maximum Service Pressure	20kgf/cm ²

Applied Fluids : Strong acid, strong alkali, low temperature fluid, oxygen, Cl² gas, oil solvents, corrosive fluids.

[Design Data]

Gasket Type	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
A	3.5	150 (2134)
B	4.0	200 (2845)
C	3.5	150 (2134)

[Standard Size]

KS 5K, 10K FLANGE / ANSI 150LB FLANGE



Non-Metallic Sheets & Gaskets

Sheets & Gaskets

(PTFE) Expanded Sheet gasket

RAMAN 8312

[Characteristic]

This Sheet Gasket is made from 100% expanded PTFE with multidirectional strength. Developed to come up with the problems of creep and cold flow. Excellent in chemical resistance and in the use and cut gasketing process.

[Application]

Maximum Service Temp.	260°C
Maximum Service Pressure	20kgf/cm ²

Applied Fluids : Alkaline metallic organic chemical compounds, chemicals or solvents except fluorine under high temperature and high pressure, oil gas, foods and medicines to avoid fluid contamination.

[Size]

Thickness(mm)	1.0 ~ 3.0
Sheet(mm)	1000×1000 / 1500×1500



[Typical Physical Properties]

Test Method	Description	Value
ASTM D792	Density (g/cm ³)	0.60
ASTM F152	Tensile Strength .MPa (kgf/mm ²)	47.56 (4.85)
ASTM F36	Compressibility(%)	66
	Recovery(%)	16
ASTM F37B	Sealability Nitrogen Gasket Stress = 60 psi Internal Pressure = 4 bar (mL/min)	0.16
	ASTM F38	Creep relaxation(%)

*All data are typical values

[Design Data]

Thickness(mm)	Gasket Factor(m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
1.0	3.5	250 (3556)
1.5	3.2	230 (3271)
2.0	3.0	200 (2845)
3.0	2.5	



Non-Metallic Sheets & Gaskets

Sheets & Gaskets

Non-Metallic Sheets & Gaskets



(PTFE) Expanded Joint Sealant Gasket

RAMAN 6066

[Characteristic]

This is an expanded, pure PTFE sealing material. From very conformable, flexible strip forms, using in applications involving non-standard flanges and harsh surface and places where the enough force cannot be given.

This has outstanding chemical resistance and is inherently clean, making the product particularly suitable for sealing against aggressive media or in situations where feedstock contamination may be of concern.



[Application]

Maximum Service Temp.	260°C
Maximum Service Pressure	20kgf/cm ²

Applied Fluids : Chemical pipe, steam & heat exchanger, flange with rough surface & places where the strong bolting force is not available.



[Size]

Width(mm)	Thickness(mm)	Length(M)
7.0	2.5	15
10.0	3.0	8
12.0	4.0	4.5
16.0	6.0	4.5
20.0	7.0	4.5
25.0	5.0	4.5
25.0	7.0	4.5

Installation Instructions

- 1) Clean flange surface completely to ensure optimal adhesion.
- 2) Measure all sizes correctly.
- 3) Remove the adhesive backing tape.
- 4) Position sealant on the surface.
- 5) Finish install with overlapping each ends as picture.



Size Selection Criteria

Flange Diameter	0 - 500 Ø	500 - 1000 Ø	1000 - 1500 Ø	Over 1500 Ø
Joint Sealant Size(mm)	3 - 9	6 - 12	9 - 16	12 - 19

*Other sizes can be available as customer's requirements.

Non-Metallic Sheets & Gaskets

Sheets & Gaskets

Stainless Steel Reinforced Sheet

RAMAN 4201-HT

[Characteristic]

RAMAN-4201 HT is designed mineral material with stainless steel tanged reinforced to versatile demanding sealing application for chemical and temperature resistance. Especially, excellent in oxidation and chemical compatibility exceeds that of graphite and will successfully seal up to 980°C (1800°F)

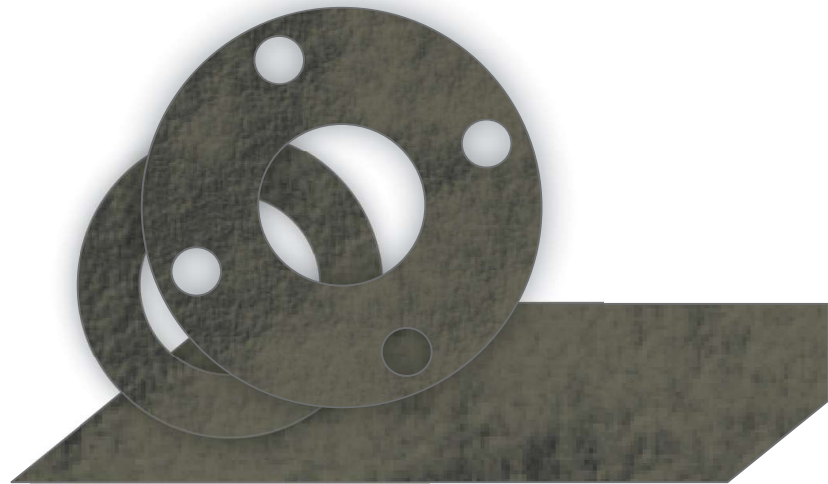
[Application]

Maximum Service Temp.	982°C (1800°F)
Maximum Tested Pressure	203kgf/cm ² (2900psi)
Applied Fluids : combustion engine exhaust, nitrogen fertilizer manufacturing, steam and other applications.	

[Size]

Thickness range(inch)	1/32", 1/16", 1/8"
Sheet(mm)	1000x1000 / 1500x1500

*Other sizes can be available as customer's requirements.



[Typical Physical Properties]

Test Method	Description	1/32"	1/16"	1/8"
ASTM F36	Facing Density(g/cm ³)	1.2	1.2	1.2
	Compressibility(%)	33	44	44
	Recovery(%)	13	9	9
ASTM F38	Creep Relaxation(%)	23.5%		

[Design Data]

Thickness (inch)	Gasket Factor (m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
1/32"	2.0	176 (2500)
1/16"		
1/8"		

*Other sizes can be available as customer's requirements.



Non-Metallic Sheets & Gaskets

Non-Metallic Sheets & Gaskets Description

Non-Metallic Sheets & Gaskets

[Properties for Compressed Non-Asbestos Sheet Materials]

Test Method	Description	6000	6100	6200	6400	8000W	6400W	6010	6030	6700	6210	6215	6330
	Density (g/cm ³)	1.7	1.7	1.7	1.8	1.7	1.8	1.6	1.6	1.7	1.7	1.7	1.7
ASTM F152	Tensile Strength.MPa (kgf/mm ²) Across grain.	13.7 [1.4]	13.7 [1.4]	11.8 [1.2]	13.7 [1.4]	17.7 [1.8]	17.7 [1.8]	10.8 [1.1]	7.8 [0.8]	15.7 [1.6]	9.8 [1.0]	13.7 [1.4]	9.8 [1.0]
ASTM F36R	Compressibility [%]	9	10	10	9	9	10	11	13	9	12	8	13
	Recovery [%]	55	55	53	58	53	57	53	55	55	58	60	56
ASTM F146	Fluid Resistance after 5hrs immersions												
	Oil Resistance ASTM # 3 oil (150°C)												
	Thickness Increase [%]	5	15	4	5	5	4	6	11	5	7	2	17
	Tensile Strength Loss [%]	23	30	17	23	21	16	26	40	17			
	Weight Increase [%]								17		13	6	24
	Fuel Resistance ASTM Fuel B(20~30°C)												
ASTM F147	Flexibility(F≤12)	No Break	No Break	No Break	No Break	No Break	No Break	No Break	No Break	No Break	No Break	No Break	No Break
	ASTM F495	Ignition Loss [%] 850°C (1123°F) x 30min	29	30	28	26	25	24	31	34	35	28	28
Standard Size	Thickness [mm]	0.5~3.2			1.0~3.2			0.5~3.2			0.35~2.0		
	Sheet Size [mm]	1270×1270, 1270×3810, 2540×3810,		1270×2540, 1520×1520, 1520×3040		1524×3100			1270×1270, 1270×2540, 1270×3810, 1520×1520, 2540×3810, 1520×3040		1220×1240, 1220×3730, 1270×2540,		1220×1870, 1270×1270
	Application	KS L 5406 , RAMAN R 3453, ASTM F 104											

- Thickness of material tested 1.5mm (except, JIC 6000W, 6400W : 3.0mm).
- Thickness of material tested 0.5mm for JIC 6210, 6215, 6330 & 6700
- Other thickness can be available as customer's requirements.
- All data are typical values.

[Gasket Design Data]

Thickness (mm)	Gasket Factor (m)	Min. Design Seating Stress (y) kgf/cm ² (psi)
3.0(1/8")	2.00	112 (1600)
1.5(1/16")	2.75	260 (3700)
1.0(1/32")	3.50	457 (6500)

note

Maximum Temp. & Pressure combinations can not be used simultaneously.
If properties our of guideline needed, contact our Technical Team.
Do not recommend the use of gaskets under noxious & explosive Gas lines applications.
When the use of Steam Line, make sure to refer to Notice or contact our Technical Team.



Semi-Metallic Gaskets

Spiral Wound Gaskets

High Temperature Spiral Wound Gaskets

Metal Jacketed Gaskets

Kammprofile Gaskets



Semi-Metallic Gaskets

Spiral Wound Gaskets

(Flexible Graphite) Filled Type

- RAMAN380 -SF Basic Type
- RAMAN380 -R-SF Inner Ring Type
- RAMAN383 -SF Outer Ring Type
- RAMAN383 -R-SF Inner-Outer Ring Type

[Characteristic]

This spiral wound gasket is manufactured by spirally winding a preformed V-shaped metal strip and flexible (graphite) filler on the outer periphery under tension properly. Varying metallic inner & outer rings can be attached as required by operating conditions and applications with a variety of winding metal materials. Widely used in the chemical, petrochemical, oil refining, gas, power plant, various pipe flanges, heat-exchangers and shipbuilding

[Application]

Maximum Service Temp.	450°C
Maximum Pressure Range	Class 150 to 2500
Applied Size	ASME B16.20 / RAMAN B2404 KS B1518 / JPI 7S-41

* Maximum Temperature & pressure combinations can not be used at the same time.

note

- Do not recommend the use of gaskets under strong acid and oil gas (under high temperature) applications.
- Inner rings are mandatory for the use at raised face, full face, male & female flanges to prevent damages to the gasket bore and inner windings.

Non-Asbestos Filled Type

- RAMAN380 -NA Basic Type
- RAMAN380 -R-NA Inner Ring Type
- RAMAN383 -NA Outer Ring Type
- RAMAN383 -R-NA Inner-Outer Ring Type

[Characteristic]

This spiral wound gasket is manufactured by spirally winding a preformed V-shaped metal strip and non-asbestos filler on the outer periphery under tension properly. Varying metallic inner & outer rings can be attached as required by operating conditions and applications with a variety of winding metal materials. Suitable for use in the chemical & petrochemical industries and various pipe flanges, etc.

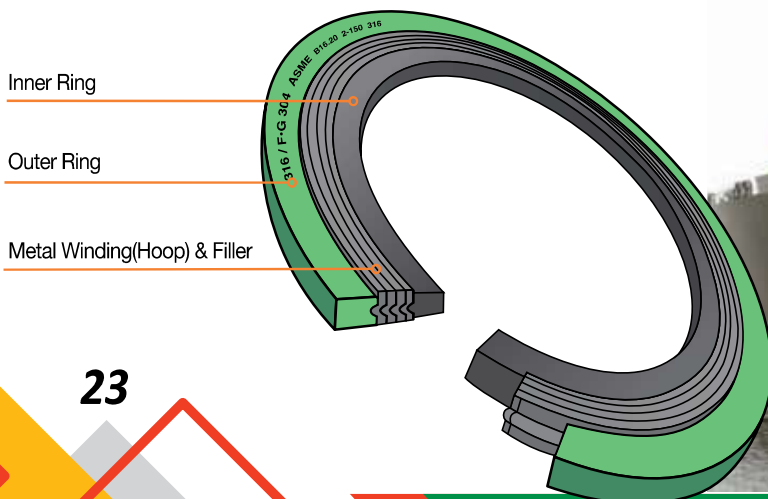
[Application]

Maximum Service Temp.	400°C
Maximum Pressure Range	Class 150 to 2500
Applied Size	ASME B16.20 / RAMAN B2404 KS B1518 / JPI 7S-41

* Maximum Temperature & pressure combinations can not be used at the same time.

note

- Inner rings are mandatory for the use at raised face, full face, male & female flanges to prevent damages to the gasket bore and inner windings.



Semi-Metallic Gaskets

Spiral Wound Gaskets

(PTFE) Filled Type

- RAMAN380  -TF Basic Type
- RAMAN380  -R-TF Inner Ring Type
- RAMAN380  -TF Outer Ring Type
- RAMAN380  -R-TF Inner-Outer Ring Type

[Characteristic]

This spiral wound gasket is manufactured by spirally winding a preformed V-shaped metal strip and (PTFE) filler on the outer periphery under tension properly. Varying metallic inner & outer rings can be attached as required by operating conditions and applications with a variety of winding metal materials. Superior in chemical resistance.

Suitable for use in the chemical plants, oxygen pipe lines, LPG lines and other pipe flanges for che esistance.

[Application]

Maximum Service Temp.	260°C
Maximum Pressure Range	Class 150 to 2500
Applied Size	ASME B16.20 / RAMAN B2404 KS B1518 / JPI 7S-41

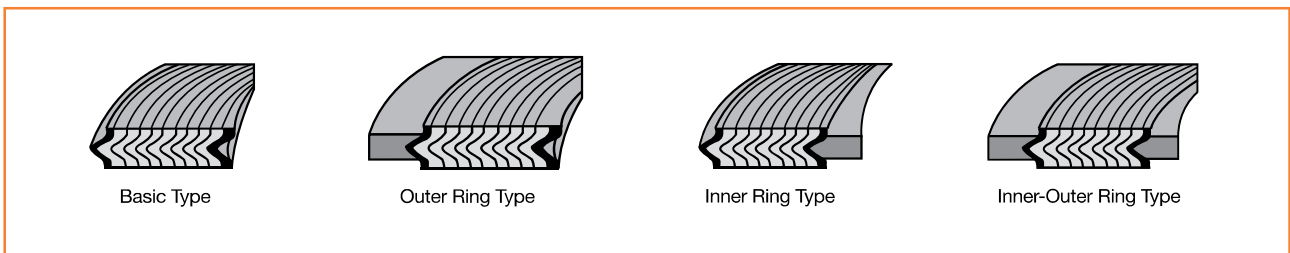
* Maximum Temperature & pressure combinations can not be used at the same time.

note

- Inner rings are mandatory for the use at raised face, full face, male & female flanges to prevent damages to the gasket bore and inner windings.



[Spiral Wound Gaskets Types]



Semi-Metallic Gaskets

High Temperature Spiral Wound Gaskets

Multi-Filler Filled Type

- RAMAN380  -Multi- filler Basic Type
- RAMAN380  -R-Multi-filler Inner Ring Type
- RAMAN380  -Multi- filler Outer Ring Type
- RAMAN380  -R-Multi- filler Inner-Outer Ring Type

This is a spiral wound gasket utilizing a combination of fillers (non-asbestos & (flexible graphite)) to give excellent sealing performance at critical high temperature applications. Flexible is susceptible to degradation due to oxidation when exposed under air or other oxidizing media. This multi-filler spiral wound gasket protects the and shields it from contact of oxidizers without any loss in .

[Characteristic]

Very Special structure in multi-fillers as Non-asbestos (NA) / Ceramic (CE)+Non-asbestos(NA) / Ceramic(CE) to protect from oxidation and degradation

Each 3 times NA/CE windings around inside & outside of filler SUS 316, hoop material is mandatory at oVC conditions. But, maximum temperature & pressure combinations cannot be used at the same time.

[Application]

Maximum Service Temp.	600°C
Maximum Pressure Range	Class 150 to 2500
Applied Size	ASME B16.20 /RAMAN B2404 KS B1518 / JPI 7S-41

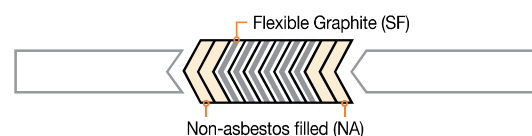
Suitable for the use at high temperature(over450°C)/pressure application to protect the from oxidation in air or using fluids.

* Maximum Temperature & pressure combinations can not be used at the same time.

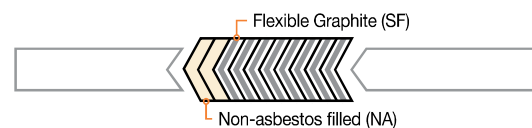


[Structure]

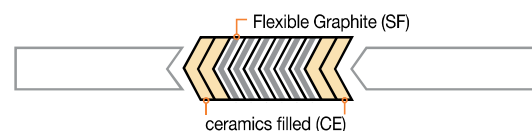
•Non-asbestos filled+Non-asbestos filled(NA+SF+NA)



•Non-asbestos filled(NA+SF)



•Ceramics filled +Ceramics filled(CE+SF+CE)



note

- Inner rings are mandatory for the use at raised face, full face, male & female flanges to prevent damages to the gasket bore and inner windings.
- Do not recommend the use of outer ring to keep gasket body from distorting when it bolted.

Semi-Metallic Gaskets

High Temperature Spiral Wound Gaskets

Filled Type

- RAMAN 380 -HT Basic Type
- RAMAN380 -R-HT Inner Ring Type
- RAMAN380 -HT Outer Ring Type
- RAMAN380 -R-HT Inner-Outer Ring Type

[Characteristic]

This spiral wound gasket is designed to use at extremely high temperature applications and has been replacing asbestos filled spiral wound gaskets which are being phased out. This can be used in up to 1000 C with very excellent sealing performance and chemical compatibility in totally free oxidation.

[Application]

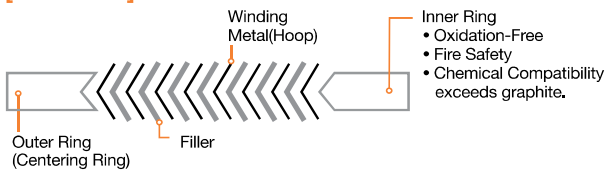
Maximum Service Temp.	1000°C
Maximum Pressure Range	Class 150 to 2500
Applied Size	ASME B16.20 / RAMAN B2404 KS B1518 / JPI 7S-41

* Maximum Temperature & pressure combinations can not be used at the same time.

note

- Inner rings are mandatory for the use at raised face, full face, male & female flanges to prevent damages to the gasket bore and inner windings.
- Wide range of metals available.
- At max. 1000°C : Inconel materials recommended.
- At max. 870°C : Stainless steel 321 or 347 shall be available.

[Structure]



Multi-Filler Filled Type (HTG)

- RAMAN380 -HTG Basic Type
- RAMAN380 -R-HTG Inner Ring Type
- RAMAN380 -HTG Outer Ring Type
- RAMAN380 -R-HTG Inner-Outer Ring Type

[Characteristic]

This is spiral wound gasket winding filler in the middle of filler of RAMAN 3808-HT Series gaskets to improve the sealing performance.

[Application]

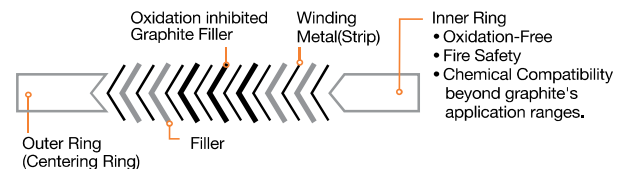
Maximum Service Temp.	800°C
Maximum Pressure Range	Class 150 to 2500
Applied Size	ASME B16.20 / JIS B2404 KS B1518 / JPI 7S-41

* Maximum Temperature & pressure combinations can not be used at the same time.

note

RAMAN 3808-HTG is better in sealing performance than RAMAN 3808-HT but, low operating temperature required due to oxidation.

[Structure]



Semi-Metallic Gaskets

Metal Jacketed Gaskets

Non-Asbestos Filled (NA) Filler

RAMAN 3840-NA	Double Jacketed Type
RAMAN 3841-NA	Double Shell Type
RAMAN 3860-NA	Double Jacketed Corrugated type

[Characteristic]

This Metal Jacketed Gaskets consist of a metallic outer shell with non-asbestos filler inside. The metal jacket protects the filler and resists pressures, temperature and the filler material gives the gasket resilience. A wide range of materials are available in accordance with the relevant temperature and corrosive conditions. They are used for heat exchanger applications with pass partition bars.

[Application]

Maximum Service Temp.	530°C
Maximum Service Pressure	60kgf/cm ²
Heat exchanger, High-pressure vessels, Boiler, Pumps, Valve bonnet, etc.	
Applied Fluids: Steam, Lubricants, Hydrocarbon, Water, Hot water, Organic solvents, Cryogenic line, Oxygen gas, Low temperature gases, LPG, etc.	

Ceramic (CE) Filler

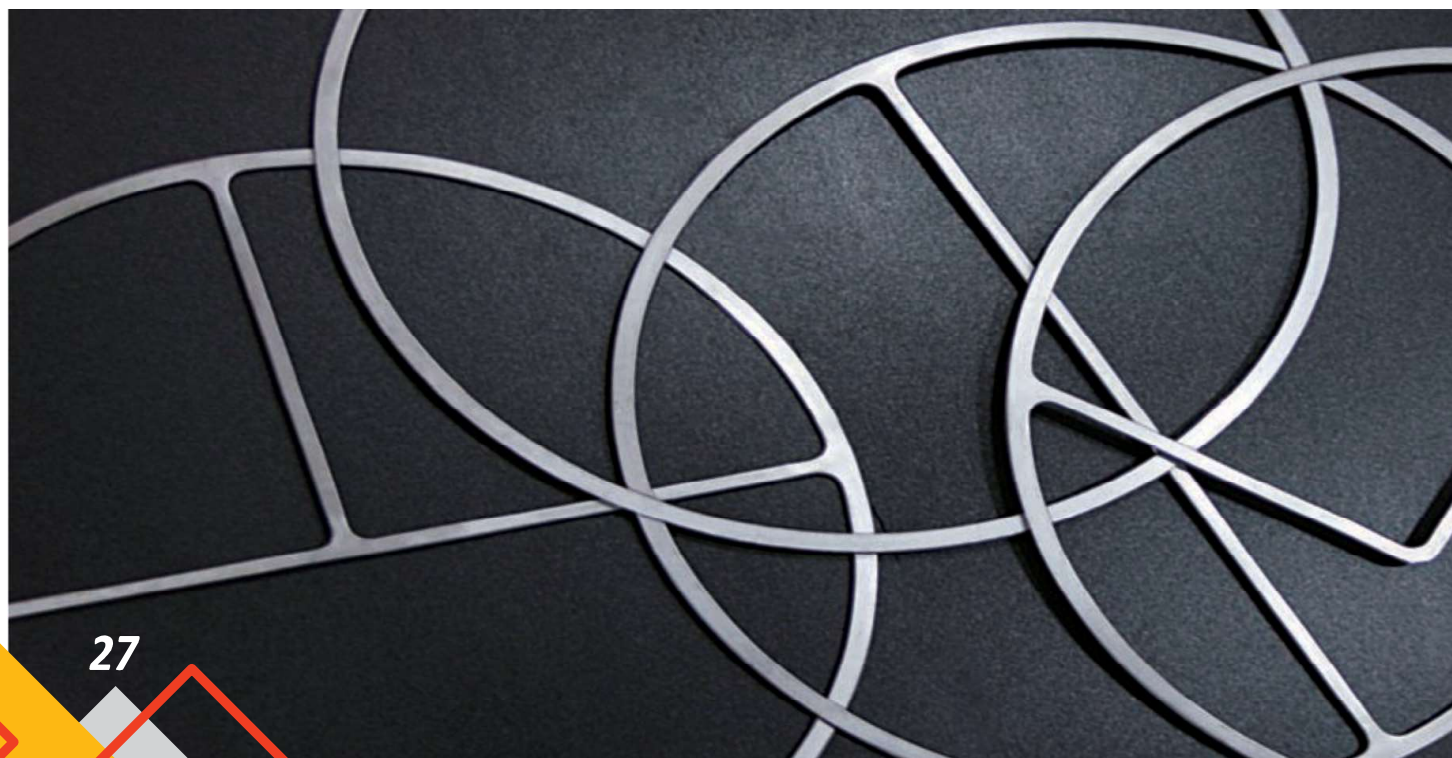
RAMAN 3840-CE	Double Jacketed Type
RAMAN 3841-CE	Double Shell Type
RAMAN 3860-CE	Double Jacketed Corrugated type

[Characteristic]

This Gaskets using Ceramic filler with metallic outer shell. "CE" means a ceramic board which resists temperature up to 1300°C. JIC no. 3840-CE is ceramic board completely covered with stainless steel such stainless steel 304 or 316, etc in a flat shape. JIC 3860-CE is corrugated jacket type, specially designed for goose neck spherical joints which may be considered as most difficult to seal.

[Application]

Maximum Service Temp.	1300°C
Short-term peak Pressure	60kgf/cm ²
Goose neck of blast furnace, Heat exchanger, Naphtha cracking furnace, Valve bonnet, etc.	



Semi-Metallic Gaskets

Metal Jacketed Gaskets

(SF) Filler

RAMAN 3840-SF	Double Jacketed Type
RAMAN 3841-SF	Double Shell Type
RAMAN 3860-SF	Double Jacketed Corrugated type

[Characteristic]

Same as RAMAN 3840-NA Series, but its filler material is A wide range of materials are available in accordance with the relevant temperature and corrosive conditions.

They are used for heat exchanger applications with pass partition bars.

[Application]

Maximum Service Temp.	530°C
Short-term peak Pressure	60kgf/cm ²

Heat exchanger, High-pressure vessels, Boiler, Pumps, Valve bonnet, etc.

Applied Fluids: Steam, Lubricants, Hydrocarbon, Water, Hot water, Organic solvents, Cryogenic line, Oxygen gas, Low temperature gases, LPG, etc.

Tape Attached

RAMAN 3840-□-(SF)	Double Jacketed Type
RAMAN 3841-□-(SF)	Double Shell Type
RAMAN 3860-□-(SF)	Double Jacketed Corrugated type

*□:NA, SF&CE available

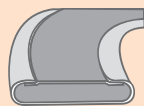
[Characteristic]

Metal jacketed gasket with tape 0.5mm thick on the sealing face. Excellent sealing performance with low bolt stress. Recommended for sealing gases.

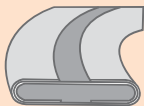
[Application]

Maximum Service Temp.	530°C (Neutral or reducing atmosphere) 400°C (Oxidizing atmosphere)
Short-term peak Pressure	100kgf/cm ²

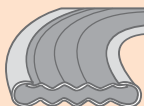
Heat exchanger, High-pressure vessels, Boiler, Pumps, Valve bonnet, etc.



Double Jacketed Type



Double Shell Type



Double Jacketed Corrugated type



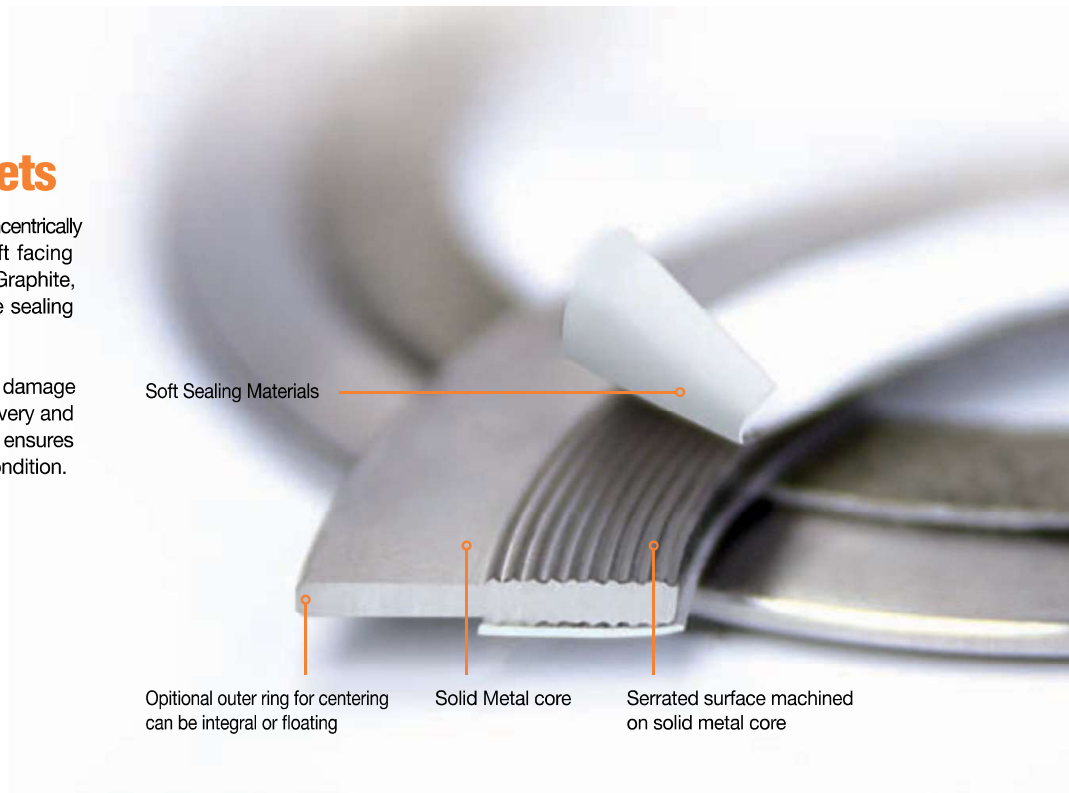
Semi-Metallic Gaskets

Kammprofile Gaskets

Kammprofile Gaskets

Kammprofile Gasket is comprised of a concentrically serrated solid metal ring and various soft facing materials of soft facing such as flexible Graphite, PTFE, and Non-asbestos providing stable sealing performance.

The sealing layers protect flange surface damage from high bolt stress and excellent in recovery and compressibility. Especially, the metal core ensures the blowout resistance under operating condition.



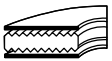
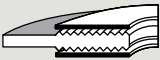




Solid metal core

Availability on low bolting stress in small contract area. Strong resistance in cold flow, over compression and breakage, High Stability of large size installation and handling

Soft sealing material

Supplement of uneven surface imperfections metal to metal during installation. Ideal for low stress and weak flange. Resistance in extreme temperature and pressure changes

[Kammprofile Gaskets Type]

Name	Cross Section	Construction		Centering Ring		Flange			
		Parallel Root	Convex Root	Integral	Floating	Male / Female	Tongue / Groove	Flat Face	Raised Face
Parallel Type - Without Collar		●				●	●		
Parallel Type - With outer Collar		●		●				●	●
Parallel Type - With outer Ring		●			●			●	●
Convex Type - With outer Ring			●			●	●		
Convex Type - Without Collar			●	●				●	●
Convex Type - With outer Collar			●		●			●	●



Raman



Raman

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