

LDC

**TOMBO BRAND
Rockwool
M.G. Products**



PT. NICHIAS ROCKWOOL INDONESIA

INTRODUCTION

Nichias Rockwool Products, sold under the name of "M.G. Products" and is part of Nichias Corporation. M.G. Products are made by technically advanced, from several types of minerals which are fused together at high temperature and dispersed into inorganic fiber by centrifugal force spin process.

M.G. Products have an extremely fine fiber diameter which is processed by pendulum system, best thermal insulation, accoustical properties, excellent fire resistance, and no cause nor promote corrosion.

M.G. Products are light weight and easy to handle. It is also easily cut to shape or size with sharp knife and at job site installation is very simple.

M.G. Products are service in industrial and commercial application, where their outstanding properties are highly evaluated.

CHARACTERISTICS

Physical Structure

M.G. Products have fine fiber diameter of approximately 5 microns. The fiber are cemented by a binder of phenolic resin, that allows the material to retain its shape and keeps it from shrinking during storage.

Thermal Conductivity

M.G. Products have primary product property, that exhibit extremely thermal conductivity even at lower densites because of extremely fine fiber diameter and homogeneous structure.

Accoustical Properties.

M.G. Products that are highly efficient sound absorber material. Test have shown an excellent degree of sound reduction.

Chemical Neutrality

M.G. Products are made of chemically inert raw materials, it does not react with the materials with which it comes in contact. M.G. Products will neither cause nor promote corrosion.



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TOMBO BRAND

General Properties

PRODUCT PROPERTIES

■ **Chemical Composition**

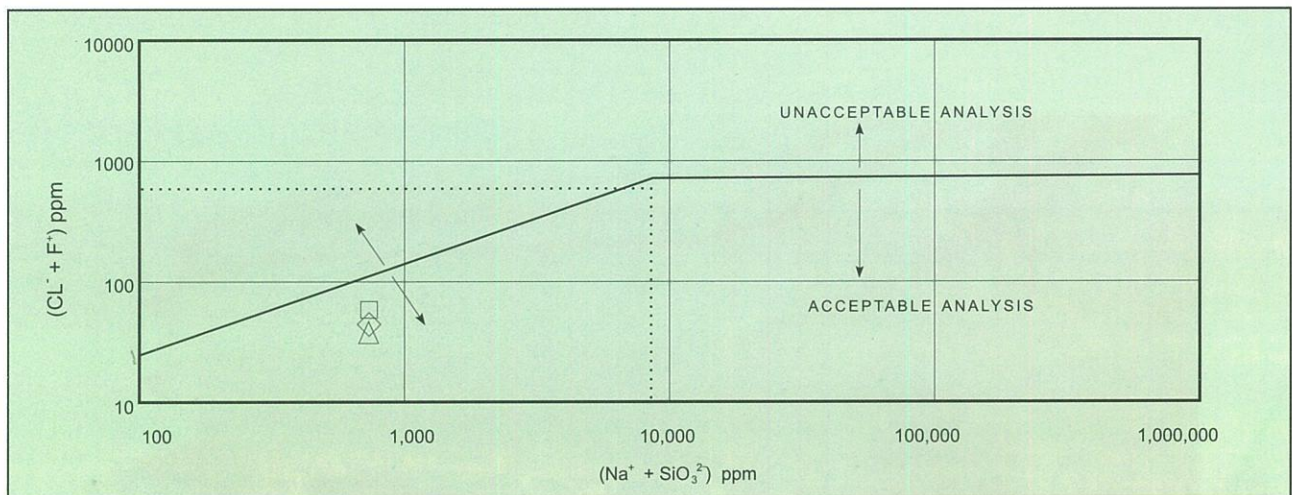
CHEMICAL	CONTENT (%)
SiO ₂	35 ~ 45
Al ₂ O ₃	10 ~ 20
CaO	30 ~ 35
MgO	5 ~ 10
Fe ₂ O ₃	0 ~ 7
Others	0 ~ 3

- pH : Neutral, 7.0 ~ 8.0
- Chloride Content : < 10 ppm
- Early Fire Hazard : None
- Moisture Absorption : < 0.2 %
- Shot Content : 0.8 % weight (JIS : less than 4 % weight remained in 500 μm of test sieve)
- Fiver Diameter : 4.5 ~ 5.0 μm (JIS : less than 7 μm)
- Ignition Loss :

M.G. Products	Felt	Wired Blanket	Mighty Roll	Mighty Cover	Elbow Cover
Ign. Loss (% weght)	2 ± 0.5	1 ± 0.5	1 ± 0.5	3 ± 1.5	3 ± 1.5

● Standard reference : Refers to ASTM C 612 - C 592 & JIS A 9504

■ **Non Promote Corrosion**



● Refers to ASTM C 795

● Remarks :

1. Δ point M.G. Felt less than 120 kg / m³
- point M.G. Mighty Cover
- ◇ point M.G. Felt over than 120 kg / m³

2. Quantitative analysis data of graphic as follows :

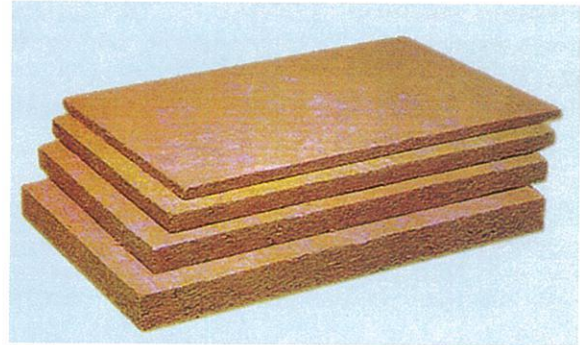
No.	M.G. Products	Chemical Analysis	Result (ppm)	
			Sample 1	Sample 2
1	Felt (< 120 kg / m ³)	Chloride (Cl)	5.0	5.0
		Fluoride (F ⁺)	27.0	27.3
		Silicic acid (SiO ₃ ²⁻)	470.7	481.2
		Sodium (Na ⁺)	8.7	9.3
2	Mighty Cover	Chloride (Cl)	10.0	10.0
		Fluoride (F ⁺)	25.0	25.4
		Silicic acid (SiO ₃ ²⁻)	434.2	448.6
		Sodium (Na ⁺)	12.9	12.9
3	Felt (> 120 kg / m ³)	Chloride (Cl)	7.5	7.5
		Fluoride (F ⁺)	27.7	27.4
		Silicic acid (SiO ₃ ²⁻)	453.6	463.8
		Sodium (Na ⁺)	8.0	8.5

● Refers to ASTM C 795

TOMBO BRAND

M.G. Felt

Slab shaped insulation made from rockwool bonded with phenolic resin for use in heated equipments, vessels, tanks, etc.



PHYSICAL PROPERTIES

Density (kg/m ³)	40	60	80	100	120	150	200	250
Thickness (mm)	25, 40, 50, 75, 100					25, 40, 50, 75	25, 40, 50	25
Width x Length (mm)	600 x 1,200							
Service Temperature (°C)	Up to 450°C	Up to 650°C				Up to 700°C		
Thermal Conductivity : W/m. K(kcal/m.h.°C)								
100 oC	0.048 (0.042)	0.043 (0.037)	0.042 (0.036)	0.041 (0.035)	0.041 (0.035)	0.040 (0.034)	0.043 (0.037)	0.043 (0.037)
200 oC	-	0.061 (0.052)	0.057 (0.049)	0.057 (0.049)	0.055 (0.047)	0.053 (0.046)	0.052 (0.045)	0.054 (0.046)
300 oC	-	0.087 (0.075)	0.077 (0.066)	0.073 (0.063)	0.071 (0.061)	0.069 (0.059)	0.064 (0.055)	0.067 (0.058)
400 oC	-	0.123 (0.106)	0.099 (0.085)	0.095 (0.082)	0.092 (0.079)	0.088 (0.076)	0.078 (0.067)	0.080 (0.069)
Sound Absorption Coefficient (thickness = 50 mm)								
125 Hz	-	0.28	0.26	0.37	0.35	0.39		
250 Hz	-	0.55	0.73	0.62	0.67	0.61		
500 Hz	-	0.95	0.90	0.91	0.89	0.81		
1000 Hz	-	0.99	0.99	0.98	0.97	0.95		
2000 Hz	-	0.97	0.95	0.95	0.96	0.95		
4000 Hz	-	0.98	0.97	0.97	0.95	0.91		

- Other densities and sizes also are available on request.
- Equivalent to ASTM C 612 Type IV, JIS A 9504

TOMBO BRAND

M.G. Lath Board

Metal-mesh covered board insulation, consisting of M.G. Felt and expanded metal lath with diamond-shaped openings, one side or both sides. Use for insulating vessels, tanks, equipments, etc.



PHYSICAL PROPERTIES

Density (kg/m ³)	60	80	100	120
Thickness (mm)	25, 40, 50, 75, 100			
Width x Length (mm)	600 x 1,200			
Service Temperature (°C)	Up to 700 °C			
Thermal Conductivity : W/m. (kcal/m.h.°C)				
100 °C	0.043 (0.037)	0.042 (0.036)	0.041 (0.035)	0.041 (0.035)
200 °C	0.061 (0.052)	0.057 (0.049)	0.057 (0.049)	0.055 (0.047)
300 °C	0.087 (0.075)	0.077 (0.066)	0.073 (0.063)	0.071 (0.061)
400 °C	0.123 (0.106)	0.099 (0.085)	0.095 (0.082)	0.092 (0.079)

- Other densities and sizes also are available on request.
- Equivalent to ASTM C 612, JIS A 9504

TOMBO BRAND

M.G. Mighty Roll

Flexible rockwool blanket for insulation of instrument piping, elbows, ducts, and roofing, etc.



PHYSICAL PROPERTIES

Density (kg/m ³)	24	32	40	60	80	100
Thickness (mm) x Width (mm) x Length (mm)	25 x 600 x 5,000 40, 50 x 600 x 4,000 75, 100 x 600 x 3,000					
Service Temperature (°C)	Up to 450 °C			Up to 650 °C		
Thermal Conductivity . W/m. K(kcal/m.h.°C)						
10 °C	0.036 (0.031)	-	0.033 (0.029)	0.032 (0.029)	0.032 (0.029)	0.032 (0.029)
20 °C	0.038 (0.033)	-	0.035 (0.030)	0.033 (0.029)	0.033 (0.029)	0.033 (0.029)
30 °C	0.040 (0.035)	-	0.037 (0.032)	0.034 (0.030)	0.034 (0.030)	0.034 (0.030)
40 °C	0.042 (0.037)	-	0.038 (0.033)	0.035 (0.030)	0.035 (0.030)	0.035 (0.030)
50 °C	0.044 (0.038)	-	0.040 (0.035)	0.037 (0.032)	0.037 (0.032)	0.036 (0.031)
60 °C	0.048 (0.041)	-	0.041 (0.036)	0.039 (0.034)	0.039 (0.034)	0.038 (0.033)
100 °C	0.057 (0.050)	-	0.048 (0.042)	0.043 (0.037)	0.042 (0.036)	0.041 (0.035)
200 °C	-	-	-	0.061 (0.052)	0.057 (0.049)	0.057 (0.049)
300 °C	-	-	-	0.087 (0.075)	0.077 (0.066)	0.073 (0.063)
400 °C	-	-	-	0.123 (0.106)	0.099 (0.085)	0.095 (0.082)

- Other densities and sizes also are available on request.
- Equivalent to ASTM C 553 Type VII, JIS A 9504

TOMBO BRAND

M.G. Wired Blanket

Flexible rockwool blanket insulation has one side stitched with 0.5 mm diameter galvanized wire and mesh of hexagonal pattern. Used for fittings, valves, large pipes, cylindrical and spherical surface of boilers, tanks vessels, etc. Other types of metal surfacing are available on request.



PHYSICAL PROPERTIES

Density (kg/m ³)	60	80	100	120
Thickness (mm) x Width (mm) x Length (mm)	25 x 900 x 5,000 40, 50 x 900 x 4,000 75, 100 x 900 x 3,000			
Service Temperature (°C)	Up to 750 °C			
Thermal Conductivity : W/m. K(kcal/m.h.°C)				
100 °C	0.043 (0.037)	0.042 (0.036)	0.041 (0.035)	0.041 (0.035)
200 °C	0.061 (0.052)	0.057 (0.049)	0.057 (0.049)	0.055 (0.047)
300 °C	0.087 (0.075)	0.077 (0.066)	0.073 (0.063)	0.071 (0.061)
400 °C	0.123 (0.106)	0.099 (0.085)	0.095 (0.082)	0.092 (0.079)

- Other densities and sizes also are available on request.
- Equivalent to ASTM C 592 Type II, JIS A 9504

TOMBO BRAND

M.G. Mighty Cover

Pre-molded pipe covering made from rockwool bonded with phenolic resin. ALK type (with facing of aluminium foil reinforced with kraft paper) is available on request. Used for all types of heated and/or cooled piping in process industries and buildings.

PHYSICAL PROPERTIES

Density (kg/m ³)	90			
Service Temperature (°C)	Up to 650 °C			
Thickness (mm)	20, 25, 30, 40, 50, 65, 75, 100			
Length (mm)	1,000			
Nominal Pipe Size	NPS (inch)	ID (mm)	NPS (inch)	ID (mm)
	1/2	22	14	356
	3/4	27	16	406
	1	34	18	457
	1-1/4	43	20	508
	1-1/2	49	22	559
	2	61	24	610
	2-1/2	76	26	660
	3	89	28	711
	3-1/2	102	30	762
	4	114	32	813
	5	140	34	864
	6	165	36	914
8	216			
10	267			
12	319			
Thermal Conductivity : W/m.K (kcal/m.h. °C)				
100 °C	0.038 (0.033)			
200 °C	0.052 (0.044)			
300 °C	0.070 (0.060)			
400 °C	0.092 (0.079)			

- Other densities and sizes (in ANSI) also are available on request.
- Available thickness are not for all sizes, please consult before order.
- Equivalent to ASTM C 547, JIS A 9504



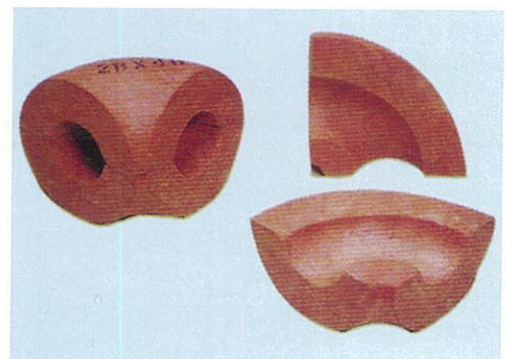
TOMBO BRAND

M.G. Elbow Cover

Molded and prefabricated cover for elbow. Ready for us at job site. Superior thermal properties, easier application, less installation time and man power cost compared with conventional job site fabricated elbow cover.

PHYSICAL PROPERTIES

Density (kg/m ³)	150	
Service Temperature (°C)	Up to 700 °C	
Thickness (mm)	25, 30, 40, 50, 65, 75, 100	
Nominal Pipe Size	NPS (inch)	ID (mm)
	2	61
	2-1/2	76
	3	89
	3-1/2	102
	4	114
	5	141
	6	165
	8	216
	10	267
	12	319
	14	356
	16	406
18	457	
20	508	



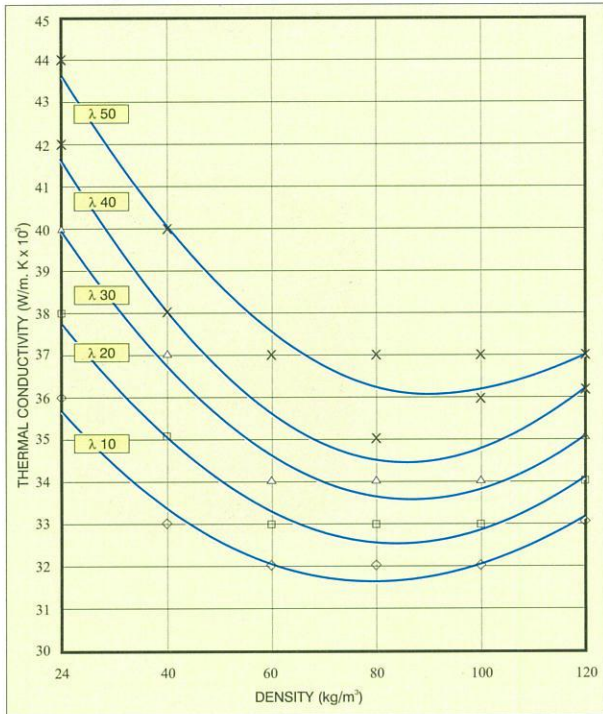
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THERMAL CONDUCTIVITY

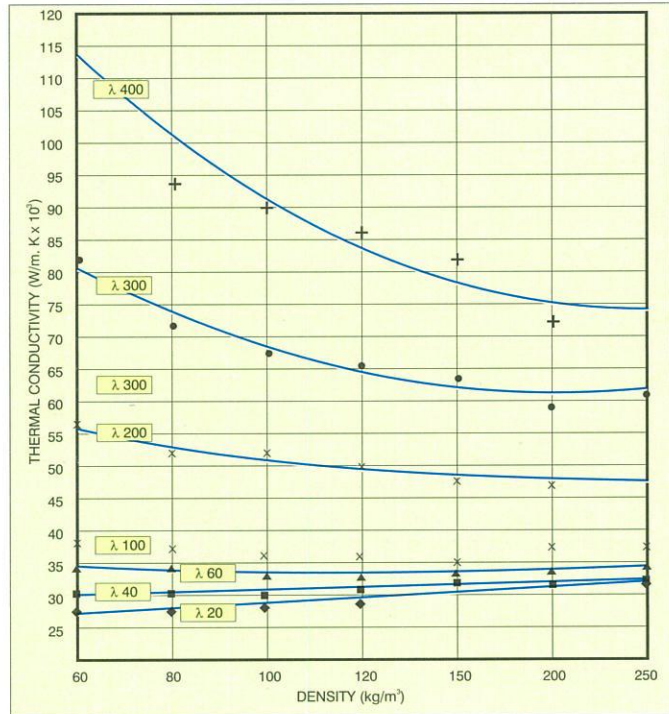
The thermal conductivity is the most important property of an insulation material, because it is a measure of the heat transfer. M.G. Products have an extremely high thermal performance due to the our technology in production process, which gives them already a low thermal conductivity at low densities.

THERMAL CONDUCTIVITY OF MATERIALS AS THE FUNCTION OF DENSITY

THERMAL CONDUCTIVITY OF MATERIALS AS THE FUNCTION OF DENSITY



THERMAL CONDUCTIVITY OF MATERIALS AS THE FUNCTION OF DENSITY



TYPICAL FIGURES THERMAL CONDUCTIVITY OF M.G. PRODUCTS

DENSITY (kg/m ³)	THERMAL CONDUCTIVITY									
	10°C	20°C	30°C	40°C	50°C	60°C	100°C	200°C	300°C	400°C
24	0.036 (0.031)	0.038 (0.033)	0.040 (0.035)	0.042 (0.037)	0.044 (0.038)	0.048 (0.041)	0.057 (0.050)			
40	0.033 (0.029)	0.035 (0.030)	0.037 (0.032)	0.038 (0.033)	0.040 (0.035)	0.041 (0.036)	0.048 (0.042)			
60	0.032 (0.029)	0.033 (0.029)	0.034 (0.030)	0.035 (0.030)	0.037 (0.032)	0.039 (0.034)	0.043 (0.037)	0.061 (0.052)	0.087 (0.075)	0.123 (0.106)
80	0.032 (0.029)	0.033 (0.029)	0.034 (0.030)	0.035 (0.030)	0.037 (0.032)	0.039 (0.034)	0.042 (0.036)	0.057 (0.049)	0.077 (0.066)	0.099 (0.085)
100	0.032 (0.029)	0.033 (0.029)	0.034 (0.030)	0.035 (0.030)	0.036 (0.031)	0.038 (0.033)	0.041 (0.035)	0.057 (0.049)	0.073 (0.063)	0.095 (0.082)
120	0.033 (0.029)	0.034 (0.030)	0.035 (0.030)	0.036 (0.031)	0.037 (0.032)	0.038 (0.033)	0.041 (0.035)	0.055 (0.047)	0.071 (0.061)	0.092 (0.079)
150	0.036 (0.031)	0.037 (0.032)	0.037 (0.032)	0.037 (0.032)	0.038 (0.033)	0.039 (0.034)	0.040 (0.034)	0.053 (0.046)	0.069 (0.059)	0.088 (0.076)
200	0.036 (0.031)	0.037 (0.032)	0.037 (0.032)	0.037 (0.032)	0.038 (0.033)	0.039 (0.034)	0.043 (0.037)	0.052 (0.045)	0.064 (0.055)	0.078 (0.067)
250	0.036 (0.031)	0.037 (0.032)	0.038 (0.0333)	0.038 (0.033)	0.039 (0.034)	0.040 (0.034)	0.043 (0.037)	0.054 (0.046)	0.067 (0.058)	0.080 (0.069)

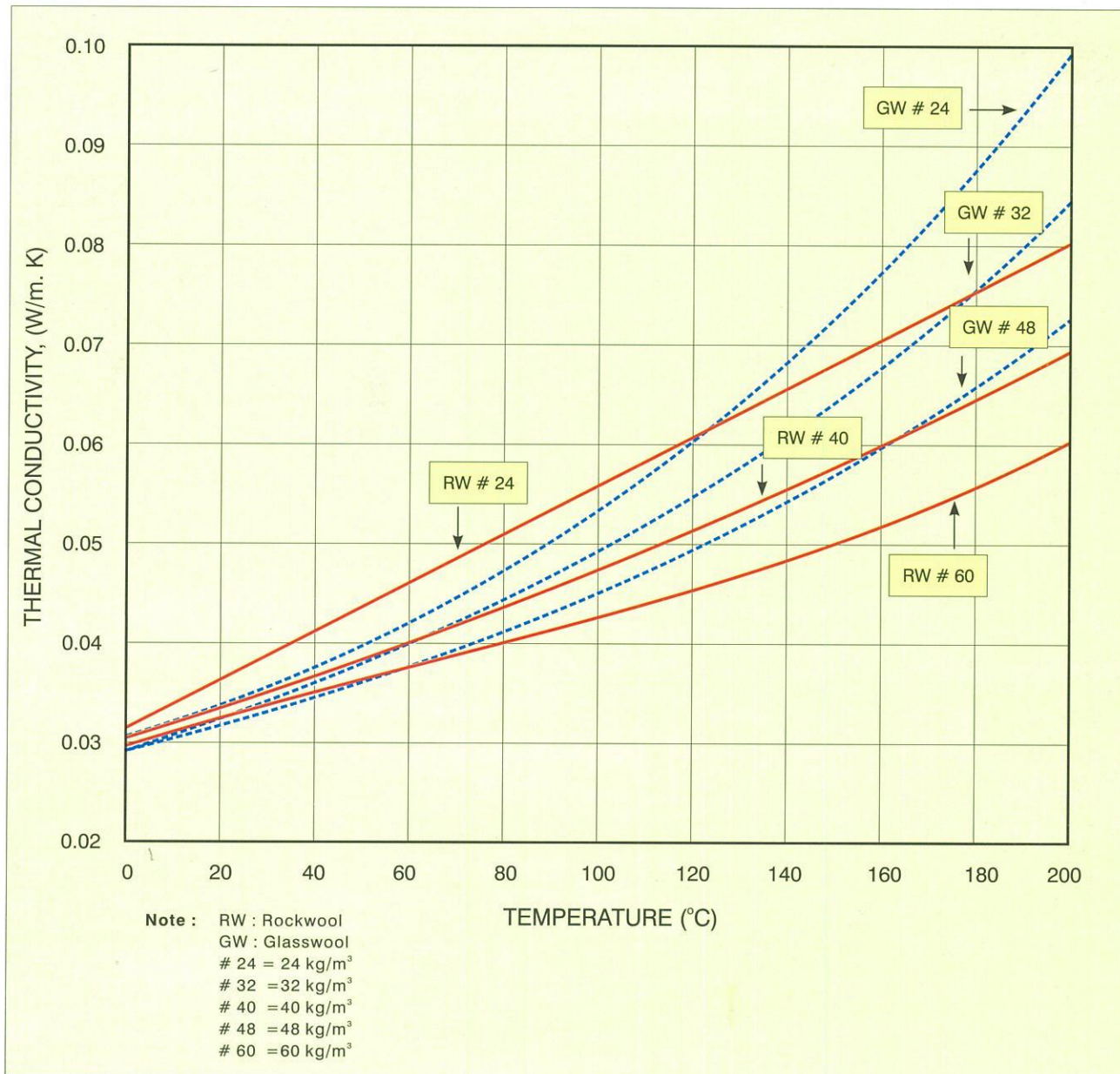
Unit : W/m. K (kcal/m.h. °C)

TOMBO BRAND

PRODUCTS COMPARISON

COMPARISON OF THERMAL CONDUCTIVITY BETWEEN ROCKWOOL AND GLASSWOOL

Comparative curve of thermal conductivity performance between. M.G. Products (low density) and glasswool (else manufacturer) are shown as follows :



Specification		Rockwool	Glasswool
Service temperature		up to 650°C	-20 to +250
pH		7.0 to 8.0	9.0
Thermal conductivity at 20°C (W/m. K)	24 kg/m ³	0.038	0.035
	32 kg/m ³	-	0.034
	40 kg/m ³	0.035	-
	48 kg/m ³	-	0.033
	60 kg/m ³	0.033	-

TOMBO BRAND

SURFACE TEMPERATURE

SURFACE TEMPERATURE TABLE

INSULATING MATERIAL		M.G. Felt								
DENSITY		< 100 kg / m ³								
AMBIENT TEMPERATURE		30 °C								
OPERATING TEMPERATURE (°C)	THICKNESS (mm)									
	25	40	50	65	75	100	125	150	175	200
100	37.3	34.7	33.8	33.0	32.6	32.0	31.6	31.3	31.1	31.0
125	45.2	39.9	38.0	40.1	35.5	34.1	33.3	32.8	32.4	32.1
200	45.7	46.1	43.0	44.8	38.8	36.7	35.4	34.5	33.9	33.4
250	66.0	53.4	49.0	50.4	42.9	39.8	37.8	36.6	35.6	34.9
300	79.5	62.2	56.1	57.0	47.7	43.4	40.8	39.0	37.8	36.8
350	95.7	72.7	64.6	57.0	53.3	47.8	44.3	42.0	40.3	39.0
400	114.7	85.1	74.7	64.8	60.4	53.0	48.5	45.5	43.3	41.7
450	137.2	99.7	86.6	74.1	68.4	59.1	53.4	49.6	46.8	44.7
500	163.3	116.8	100.4	84.4	77.8	66.2	59.1	54.4	50.9	48.4
550	193.4	136.5	116.4	97.3	88.7	74.4	65.7	59.9	55.7	52.5
600	228.0	159.0	134.7	111.6	101.1	83.8	73.3	66.2	61.1	57.3

SURFACE TEMPERATURE TABLE

INSULATING MATERIAL		M.G. Felt								
DENSITY		> 100 kg / m ³								
AMBIENT TEMPERATURE		30 °C								
OPERATING TEMPERATURE (°C)	THICKNESS (mm)									
	25	40	50	65	75	100	125	150	175	200
100	37.2	34.7	33.8	33.0	32.6	32.0	31.6	31.3	31.1	31.0
125	44.6	39.5	37.7	36.0	35.2	33.9	33.2	32.7	32.3	32.0
200	52.9	44.9	42.1	39.4	38.2	36.2	35.0	34.2	33.6	33.1
250	62.3	51.0	47.0	43.3	41.6	38.8	37.0	35.9	35.1	34.4
300	73.2	58.1	52.8	47.8	45.5	41.7	39.4	37.9	36.8	35.9
350	85.8	66.3	59.4	52.9	50.0	45.1	42.2	40.2	38.7	37.7
400	100.3	75.7	67.1	58.9	55.2	49.1	45.3	42.8	41.0	39.7
450	117.0	86.6	75.9	65.8	61.2	53.6	49.0	45.9	43.6	42.0
500	136.1	99.0	86.0	73.6	68.0	58.8	53.2	49.4	46.6	44.6
550	157.9	113.2	97.5	82.6	75.8	64.7	57.9	53.4	50.1	47.6
600	182.6	129.3	110.5	92.8	84.7	71.4	63.3	57.9	53.9	51.0

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SURFACE TEMPERATURE

SURFACE TEMPERATURE TABLE

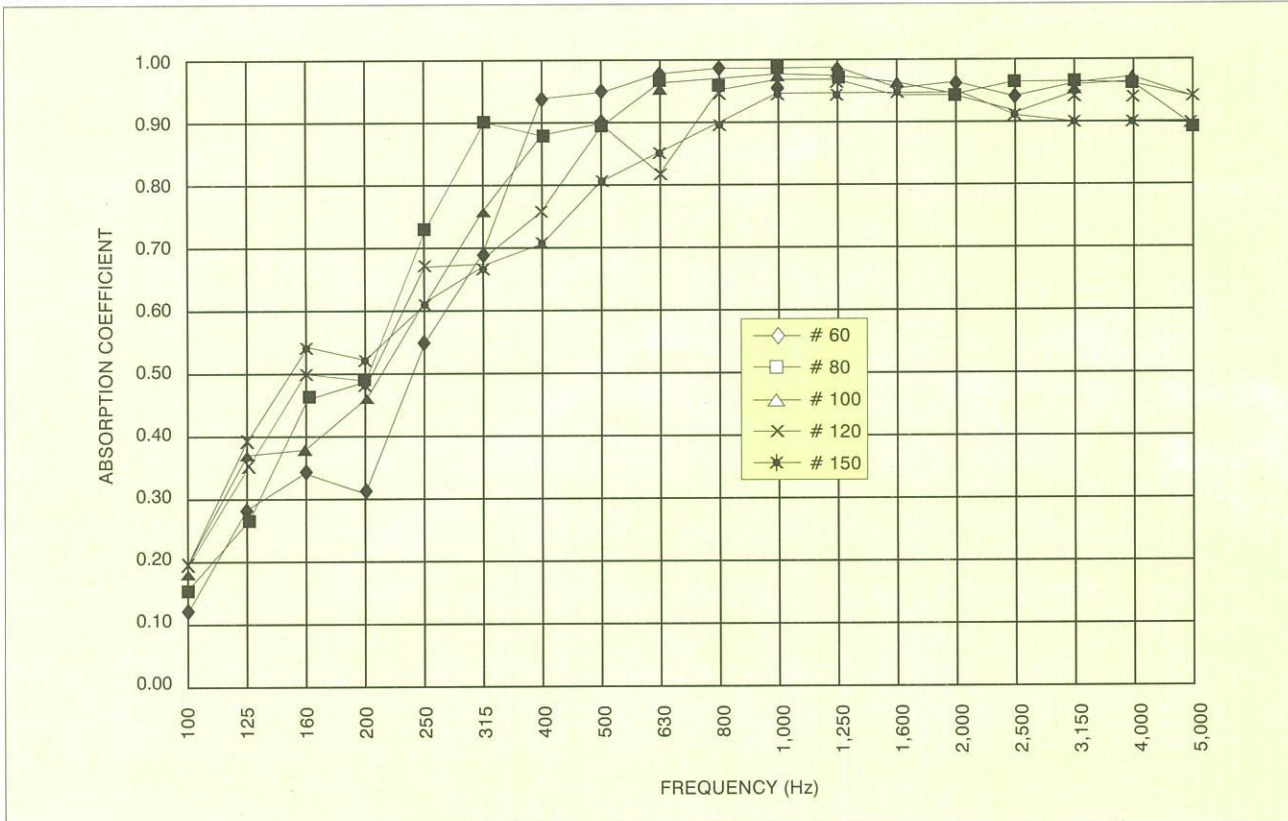
INSULATING MATERIAL		M.G. MIGHTY COVER					
AMBIENT TEMPERATURE		30 °C					
OPERATING TEMPERATURE (°C)	NPS	THICKNESS (mm)					
		25	40	50	65	75	100
100	15 A	34.4	32.5	31.8	31.3	31.1	30.8
	80 A	35.8	33.5	32.7	32.0	31.7	31.2
	300 A	36.8	34.2	33.3	32.5	32.1	31.5
150	15 A	38.1	34.8	33.4	32.5	32.1	31.4
	80 A	41.0	36.6	35.0	33.7	33.1	32.1
	300 A	42.5	37.8	38.2	34.7	34.0	32.9
200	15 A	42.5	37.0	35.3	33.8	33.2	32.2
	80 A	46.9	40.0	37.7	35.6	34.7	33.3
	300 A	48.3	42.0	38.6	37.2	38.1	34.4
250	15 A	47.8	38.8	37.4	35.3	34.4	33.1
	80 A	53.8	44.1	40.8	37.9	36.6	34.6
	300 A	57.1	46.9	43.4	40.1	38.8	36.2
300	15 A	63.5	43.2	40.0	37.1	35.8	34.1
	80 A	81.5	48.8	44.5	40.8	38.8	36.2
	300 A	88.2	52.8	47.8	43.5	41.5	38.3
350	15 A	80.4	74.0	42.9	39.2	37.7	35.3
	80 A	71.0	54.3	48.7	43.7	41.5	38.0
	300 A	78.7	58.2	53.1	47.4	44.9	40.7
400	15 A	88.2	51.5	48.2	41.8	39.7	38.7
	80 A	81.8	80.8	53.8	47.2	44.4	40.1
	300 A	88.7	88.8	58.1	51.8	48.7	43.5
450	15 A	77.2	58.5	50.0	44.3	41.8	38.3
	80 A	93.7	67.8	58.2	51.3	47.8	42.5
	300 A	102.4	75.4	88.0	57.1	53.1	46.7
500	15 A	87.4	82.2	54.3	47.4	44.5	40.1
	80 A	107.3	78.0	85.5	55.8	51.7	45.2
	300 A	117.9	85.2	73.7	83.0	58.1	50.3
550	15 A	98.8	88.7	58.2	50.9	47.5	42.1
	80 A	122.7	85.2	72.8	61.1	56.1	48.2
	300 A	135.3	86.2	82.6	89.6	83.8	54.4
600	15 A	111.7	78.0	64.7	54.8	50.7	44.4
	80 A	138.8	95.8	80.8	88.8	61.0	51.8
	300 A	154.7	108.8	92.3	77.0	70.1	59.0

TOMBO BRAND

ACCOUSTICAL PROPERTIES

M. G. Products are highly efficient sound absorber materials.

SOUND ABSORPTION COEFFICIENT OF MATERIAL AS THE FUNCTION OF DENSITY



● Thickness = 50 mm

SOUND ABSORPTION COEFFICIENT DATA

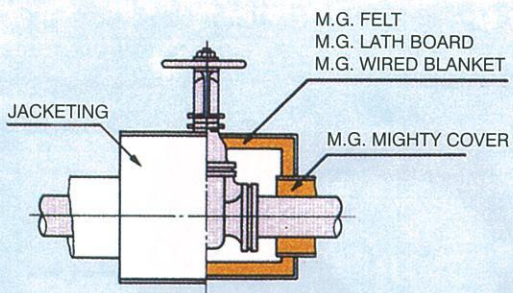
FREQUENCY (Hz)	DENSITY (kg/m ³)				
	# 60	# 80	# 100	# 120	# 150
100	0.12	0.15	0.18	0.18	0.19
125	0.28	0.26	0.37	0.35	0.39
160	0.34	0.46	0.38	0.50	0.54
200	0.31	0.49	0.46	0.48	0.52
250	0.55	0.73	0.62	0.67	0.61
315	0.69	0.90	0.76	0.68	0.67
400	0.94	0.88	0.88	0.76	0.71
500	0.95	0.90	0.91	0.89	0.81
630	0.98	0.97	0.96	0.82	0.85
800	0.99	0.96	0.97	0.95	0.90
1,000	0.99	0.99	0.98	0.97	0.95
1,250	0.99	0.98	0.98	0.97	0.95
1,600	0.96	0.96	0.97	0.95	0.95
2,000	0.97	0.95	0.95	0.96	0.95
2,500	0.95	0.97	0.97	0.92	0.92
3,150	0.97	0.97	0.96	0.95	0.91
4,000	0.98	0.97	0.97	0.95	0.91
5,000	0.95	0.90	0.95	0.95	0.91

● Test Method : ASTM C 423

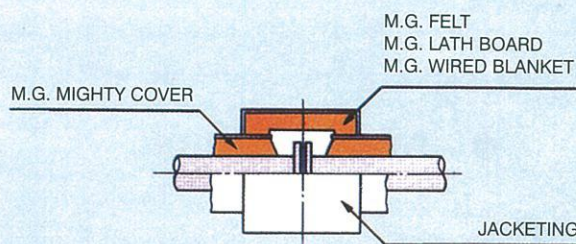
TOMBO BRAND

APPLICATION

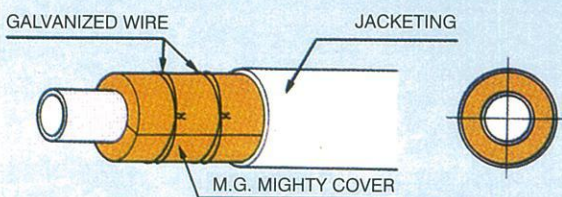
● **VALVE INSULATION**



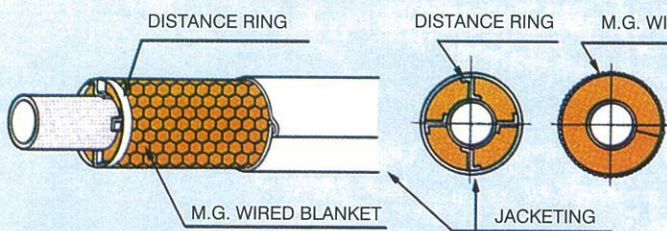
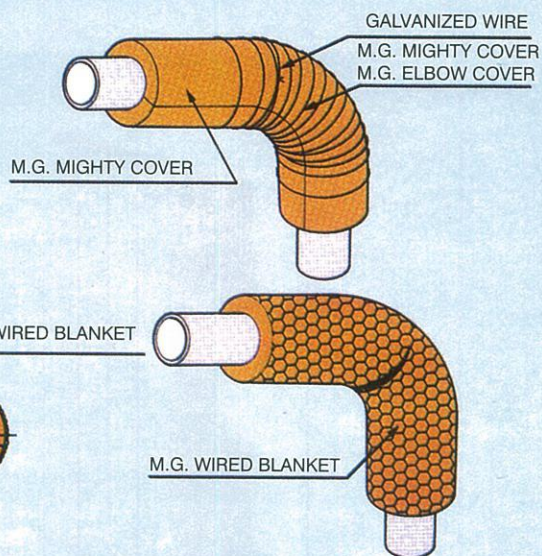
● **FLANGE INSULATION**



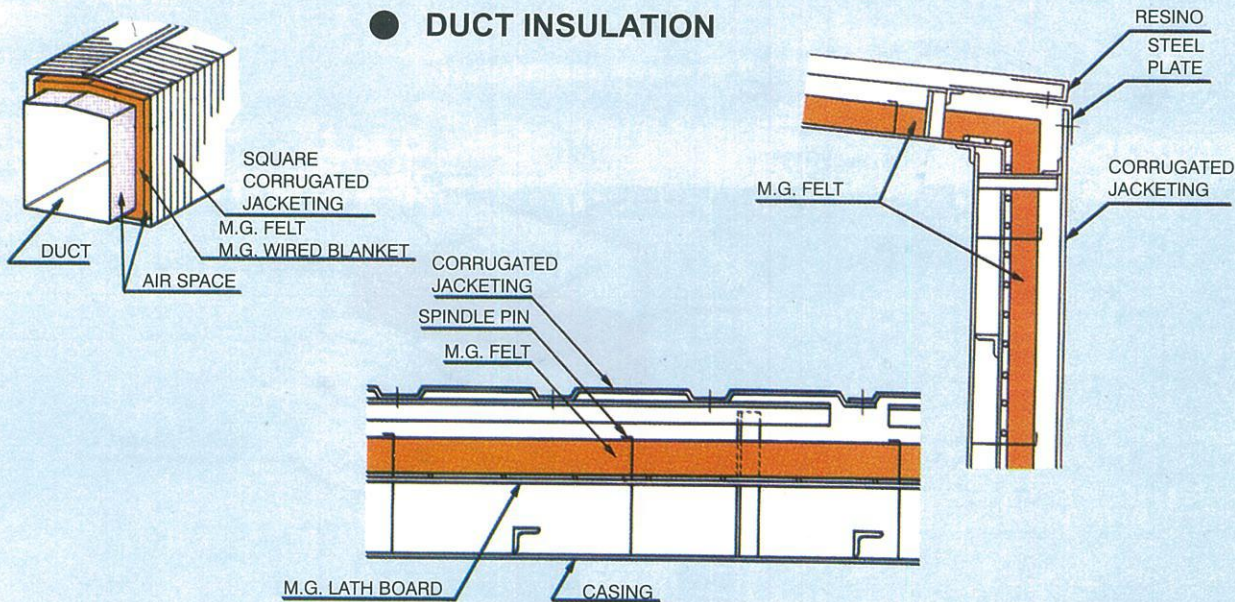
● **PIPE INSULATION**



● **ELBOW INSULATION**



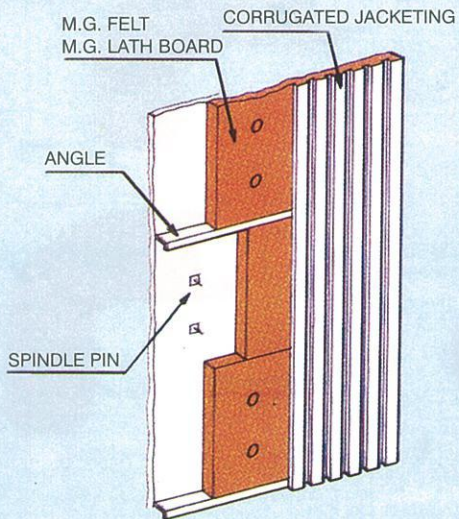
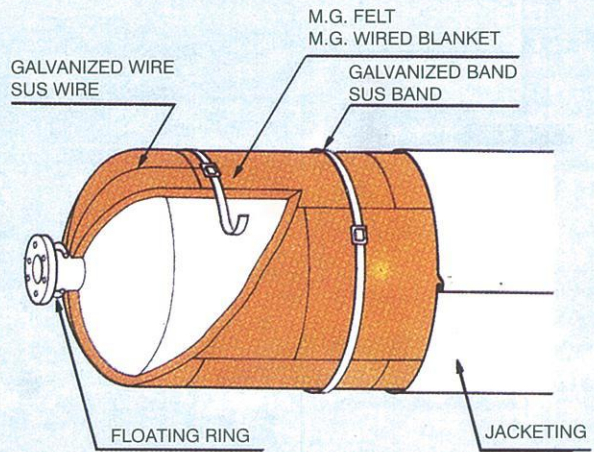
● **DUCT INSULATION**



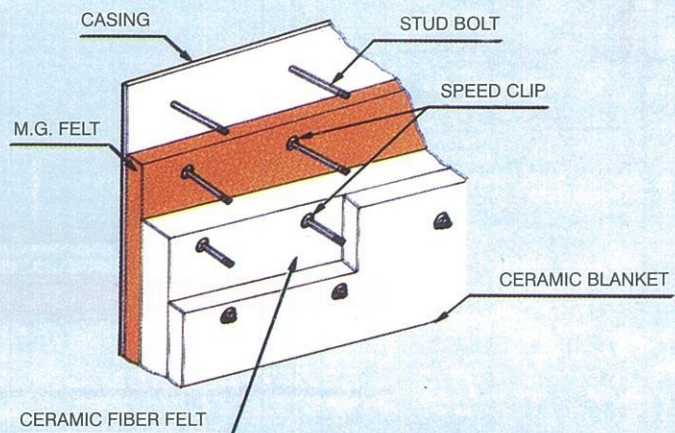
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● **TANK INSULATION**



● **FURNACE INSULATION**



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