

MARKEZ® Z1416 is our most popular FDA compliant FFKM compound due to its relative low cost and broad range of chemical and temperature resistance. Used as a cost effective alternative to 6375, 4079 and 7075 in countless applications across various industries like Petro-Chem, Paint and Ink applications where resistance to harsh solvents is required.

ABOUT MARKEZ® #Z1416

MARKEZ® Z1416 is a top of the line material designed for a wide variety of applications.

- FDA Compliant CFR 177.2600
- Cost effective
- Nearly universal chemical compatibility
- Low compression set
- 72% fluorine content
- Good dynamic properties - Long service life

Commonly used in high temperature food applications, chemical sprayers, injectors and reactors, lab Instrumentation, and semiconductor applications.

APPLICATION EXAMPLES

MARKEZ® Z1416 has almost universal chemical compatibility.

- Inorganic & Organic Acids & Alkine
- Ketones, Esters, Ethers, Aldehydes
- Chemicals relavent to Petro-Chem equipment, Sour gas
- Solvents
 - Acetone, Heptane
 - Glycol ethers, Naphtha
 - Toluene, Turpentine
 - White spirit, Xylene
 - Methyl ethyl ketone (MEK)
 - Dimethylformamide (DMF)

APPLICATION EXAMPLES

- Chem sprayers, injectors and reactors
- High temp food & steam applications
- Aerospace Fuels, Skydrol & Oils
- Semiconductor Applications
 - Dry etch, Strip, LPCVD, Litho/Track, ECP, Exhaust valves

ADDITIONAL INFORMATION

- Service Temperature of 5° to 608°F
- Compatible with steam < 580°F
- Compatible with amines < 100°F
- Spec: ASTM

This information is accurate and reliable to the best of our knowledge. However, Marco Rubber makes no warranty, expressed or implied, that parts manufactured from this material will perform satisfactorily in the customer's application. It is the customer's responsibility to evaluate parts prior to use.

PHYSICAL PROPERTIES

ORIGINAL PROPERTIES	ASTM Method	Typical Test Results
Color		Black
Material Type	FFKM	FFKM
Hardness: (°IRHD)	D1415	77
Tensile Strength MPa (psi)	D412	14.7 (2,120)
Elongation at Break	D412	1.65
Linear Coefficient °F Thermal Expansion (1/°C)		3.5 x 10 ⁻⁴
Min Operating Temp (lower spikes)		-15°C (5°F)
Max Operating Temp (higher spikes)		320°C (608°F)
COMPRESSION SET	ASTM D2000 Requirements	Typical Test Results
70 hrs. @ 200°C, %	40	20
70 hrs. @ 230°C, %	40	24
336 hrs. @ 230°C, %	55	41

ELECTRICAL PROPERTIES - Dielectric constant and loss factor at 50 Hz frequency. Volume and surface resistivity measured applying 100 V direct tension	Units	Typical Test Results
Dielectrical Constant	ε'	3.5
Loss Factor	tan (δ)	0.03
Surface resistivity	Rs (Ω)	5 x 10 ¹⁶
Volume resistivity	Rv (Ω cm)	6.1 x 10 ¹⁶
GAS PERMEATION RATE	Gas	Typical Test Results
Permeation rate at 30°C (cm ³ (STP)-mm/m ² -atm-d)	Nitrogen	250
Permeation rate at 30°C (cm ³ (STP)-mm/m ² -atm-d)	Oxygen	450
Permeation rate at 30°C (cm ³ (STP)-mm/m ² -atm-d)	Helium	5400
HEAT RESISTANCE (70 hrs. @ 290°C)	Requirements	Typical Test Results
Hardness Change, points	-5 to +5	+5
Tensile Strength Change, % max	-20	+2
Ultimate Elongation Change, % max	-5	+18
Weight Loss, % max	5	2

GENERAL CHEMICAL COMPATIBILITY TESTING	COMPATIBILITY RATING	Typical Test Results (% Volume Swell)
Inorganic acid	A	<10%
Organic acid	A	<10%
Alkalis	A	<10%
Water / Steam	A	<10%
Ketons	A	<10%
Esters	A	<10%
Ethers	A	<10%
Adelhydes	A	<10%
Alcohols	A	<10%
HydroCarbons	A	<10%
Sour gas	A	<10%
Lubricants	A	<10%
Fluorinated fluids	C	30-50%
Amines (Room Temperature)	A	<10%
Hot amines (>70°C) *Markez Z1028 provides excellent chemical compatibility with most chemicals, including Amines below 70°C. For hot amines over 70°C, use Markez Z1352 compound.	C*	30-50%

CHEMICAL TESTING - WATER	Test	Typical Test Results
220°C for 168 hrs.	Tensile strength change, %	-12
220°C for 168 hrs.	Elongation change, %	1
220°C for 168 hrs.	Hardness, Shore A	-1
220°C for 168 hrs.	Volume change, %	2
CHEMICAL TESTING - STEAM	Test	Typical Test Results
300°C for 168 hrs.	Tensile strength change, %	11
300°C for 168 hrs.	Elongation change, %	-17
300°C for 168 hrs.	Hardness, Shore A	0
300°C for 168 hrs.	Volume change, %	-0.8

CHEMICAL TESTING - ACIDS - HCL 37%	Test	Typical Test Results
80°C for 70 hrs.	Tensile strength change, %	-4
80°C for 70 hrs.	Elongation change, %	-15
80°C for 70 hrs.	Hardness, Shore A	-1
80°C for 70 hrs.	Volume change, %	1.6

CHEMICAL TESTING - ACIDS - HF 49%	Test	Typical Test Results
80°C for 70 hrs.	Tensile strength change, %	5
80°C for 70 hrs.	Elongation change, %	-23
80°C for 70 hrs.	Hardness, Shore A	0
80°C for 70 hrs.	Volume change, %	0.3
CHEMICAL TESTING - ACIDS - Nitric acid 65%	Test	Typical Test Results
80°C for 70 hrs.	Tensile strength change, %	-30
80°C for 70 hrs.	Elongation change, %	5
80°C for 70 hrs.	Hardness, Shore A	-10
80°C for 70 hrs.	Volume change, %	10
CHEMICAL TESTING - ACIDS - Glacial acetic acid	Test	Typical Test Results
80°C for 70 hrs.	Tensile strength change, %	-35
80°C for 70 hrs.	Elongation change, %	-3
80°C for 70 hrs.	Hardness, Shore A	-10
80°C for 70 hrs.	Volume change, %	7

CHEMICAL TESTING - ALKALINE & AMINES - KOH, 50%	Test	Typical Test Results
125°C for 168 hrs.	Tensile strength change, %	-10
125°C for 168 hrs.	Elongation change, %	-15
125°C for 168 hrs.	Hardness, Shore A	-2
125°C for 168 hrs.	Volume change, %	0.4
CHEMICAL TESTING - ALKALINE & AMINES - N-methyl-diethanolamine (MDEA)	Test	Typical Test Results
100°C for 168 hrs.	Tensile strength change, %	2
100°C for 168 hrs.	Elongation change, %	0
100°C for 168 hrs.	Hardness, Shore A	-2
100°C for 168 hrs.	Volume change, %	4.6
CHEMICAL TESTING - ALKALINE & AMINES - NH ₃ , 28%	Test	Typical Test Results
100°C for 336 hrs.	Tensile strength change, %	-15
100°C for 336 hrs.	Elongation change, %	-18
100°C for 336 hrs.	Hardness, Shore A	-7
100°C for 336 hrs.	Volume change, %	15
CHEMICAL TESTING - ALKALINE & AMINES - Ethylene diamine	Test	Typical Test Results
60°C for 336 hrs.	Tensile strength change, %	-10
60°C for 336 hrs.	Elongation change, %	-13
60°C for 336 hrs.	Hardness, Shore A	-8
60°C for 336 hrs.	Volume change, %	20
23°C for 504 hrs.	Volume change, %	1.8

CHEMICAL TESTING - AEROSPACE FLUIDS - Fuel B	Test	Typical Test Results
23°C for 70 hrs.	Tensile strength change, %	4
23°C for 70 hrs.	Elongation change, %	-2
23°C for 70 hrs.	Hardness, Shore A	1
23°C for 70 hrs.	Volume change, %	0.2
CHEMICAL TESTING - AEROSPACE FLUIDS - Skydrol LD4	Test	Typical Test Results
125°C for 70 hrs.	Tensile strength change, %	-19
125°C for 70 hrs.	Elongation change, %	14
125°C for 70 hrs.	Hardness, Shore A	-4
125°C for 70 hrs.	Volume change, %	4.6
CHEMICAL TESTING - AEROSPACE FLUIDS - Reference Oil 300	Test	Typical Test Results
175°C for 720 hrs.	Tensile strength change, %	-9
175°C for 720 hrs.	Elongation change, %	6
175°C for 720 hrs.	Hardness, Shore A	-2
175°C for 720 hrs.	Volume change, %	0.6