

Aflas™

TFE Elastomer

FA 150L

Features

- Composition: di-polymer of tetrafluoroethylene and propylene
- Viscosity modifier
- Process target: transfer and injection molding, extrusion and calendaring
- Peroxide cure technology
- Low viscosity grade di-polymer

Typical Properties of Gumstock (Data not for specification purposes)

Fluorine Content [3M 36.4]	57.0%
Specific Gravity [ASTM D297]	1.55
Color	Dark Brown
Solubility	Freon™ TF or Tetrahydrofuran
Mooney Viscosity ML 1 + 10 @ 100°C (212°F) [3M 2.14.3]	Approx. 35

Recommended Processing Procedure

Aflas FA 150L can be compounded using standard water cooled internal mixers or two-roll mills with standard fillers and ingredients utilized in typical TFE elastomer formulations. The “dry” ingredients should be blended before adding to the masticated gum. For best results, FA 150L should be banded on the mill several minutes prior to adding the blended dry ingredients. For internally mixed compounds, a two-pass procedure is recommended, with the peroxide being added in the second pass. Once mixed, the compounded stocks have good scorch resistance and storage stability.

Product Form

Aflas FA 150L is packaged in slab form. Nominal size is 22” x 12” x 3” and is available in 55 lb. (24.9 kg) boxes.

Safety/Toxicology

Follow recommended handling precautions for use of Aflas TFE elastomers. General handling precautions include: (1) Store and use all Aflas TFE elastomers only in well ventilated areas. (2) Do not smoke in areas contaminated with dust from Aflas TFE elastomers. (3) Avoid eye contact. (4) After handling Aflas TFE elastomers wash any contacted skin with soap and water.

Potential hazards, including evolution of toxic vapors, do exist during compounding or processing under high temperature conditions. Before processing Aflas TFE elastomers, consult the product MSDS (Material Safety Data Sheet) and follow all label directions and handling precautions. You should also read and follow all directions from other compound ingredient suppliers. Material Safety Data Sheets on Dyneon products are available from your Dyneon Sales Representative or by dialing 651-733-5353.

FA 150L

ISO 9002

Aflas™ TFE elastomers are manufactured at ISO 9002 registered facilities.

Typical Properties of Vulcanizate (Data not for specification purposes)

Compound	phr
FA 150L	100
MT Black (N990)	25
Triallyl Isocyanurate (TAIC)	5
Percadox™ 14	1
Sodium Stearate	1

Typical Rheological Properties Oscillating Disk Rheometer (ODR 2000) 100 cpm, 3.0° arc, microdie, 12 minutes

Temperature °C (°F)	177°	(350°)
ML, Minimum Torque, inch-lb (dN m)	2.9	(3.3)
ts2, Time to 2 inch-lb rise from minimum - minutes	1.9	
t'50, Time to 50% cure - minutes	3.9	
t'90, Time to 90% cure - minutes	8.7	
MH, Maximum Torque, inch-lb (dN m)	38.6	(43.6)

Typical Physical Properties [3M 125.3 and 125.17] Press Cure 10 minutes @ 177°C (350°F) Post Cure 16 hours @ 200°C (392°F)

Tensile, psi (Mpa)	1610	(11.1)
100% Modulus, psi (Mpa)	425	(2.9)
Elongation at break, %	350	
Hardness, Shore A (ASTM D 2240)	70	

Compression Set, %, [ASTM D 395 Method B (O-rings)]

Aged 70 hours @ 200°C (392°F)	40
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TR10 [ASTM D 1329] °C (°F) 2 (35.6)

Technical Information and Test Data

Technical information, test data, and advice provided by Dyneon personnel are based on information and tests we believe are reliable and are intended for persons with knowledge and technical skills sufficient to analyze test types and conditions, and to handle and use raw polymers and related compounding ingredients. No license under any Dyneon or third party intellectual rights is granted or implied by virtue of this information.

Important Notice:

Because conditions of product use are outside Dyneon's control and vary widely, user must evaluate and determine whether a Dyneon product will be suitable for user's intended application before using it.

The following is made in lieu of all express and implied warranties (including warranties of merchantability and fitness for a particular purpose): If a Dyneon product is proved to be defective, Dyneon's only obligation, and user's only remedy, will be, at Dyneon's option, to replace the quantity of product shown to be defective when user received it or to refund user's purchase price. In no event will Dyneon be liable for any direct, indirect, special, incidental, or consequential loss or damage, regardless of legal theory, such as breach of warranty or contract, negligence, or strict liability.

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Aflas is a trademark of Asahi Glass

AFLAS™ SP Applications

- Automotive
- Chemical Plant
- Oilfield
- Aerospace
- General Industrial Fields

AFLAS™ TFE Elastomer Grades

Grade	ML+10 at 100°C Mooney Viscosity	Application
150L	35	Tank lining or as a viscosity modifier in blends with other AFLAS™ grades. Generally not used for molding.
150E	60	Used primarily for high speed extrusion, such as wire and cable jacketing. Also used for calendering.
150P	95	A general purpose grade, for a wide variety of molding, calendering, and extrusion.
150C	95 ^{1?}	Used primarily for extrusion as wire and cable jacketing.
100S	160 ^{1?}	Used primarily for compression molded goods. Provides the best overall physical properties.
100H	110 ^{1?}	Used for compression molded goods used under severe environments.
SP	75	Used primarily for compression molded goods. Provides improved processability of 100 series.
MZ201	50	A general purpose grade, for a wide variety of molding, calendering, and extrusion. Low hardness is possible.

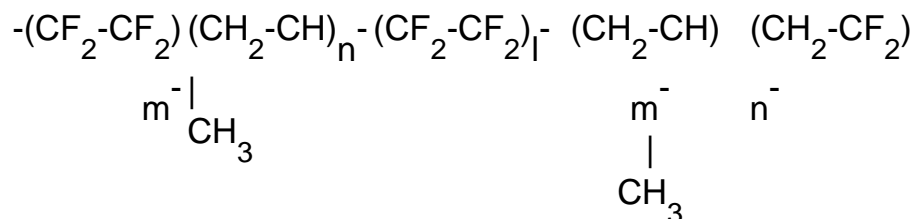
1) False Mooney value due to rotor slippage.

AFLAS™ TFE Elastomer: Structure and Properties

Structure

AFLAS™ 100/150

AFLAS™ SP, MZ201



Properties

Item		AFLAS™ 100/150	AFLAS™ SP	AFLAS™ MZ201
Raw Gum	Specific Gravity	1.55	1.50	1.58
	Fluorine Content (%)	56	55	59
	Glass Transition Temperature (°C)	-3	-3	-13
Vulcanization1/	Volume Resistivity (V-cm)/A	3×10^{16}	3×10^{14}	4×10^{13}
	Dielectric Constant at 1 kHz	3.0	4.0	5.9

1) Non-filler Formulation

Compounding Formulation and Mechanical Properties

Grade		100S	150P	150E	SP ^{2?}	200S ^{1?}	MZ201 ^{3?}
Mooney Viscosity ML_{M10} at 100°C		160	95	60	75	60	50
Formulation (Rate)	Polymer	100	100	100	100	100	100
	Peroxide^{1?}	1	1	1	1	1	--
	Triallyl Isocyanurate	5	5	5	3	3	--
	Sodium Stearate	1	1	1	--	--	--
	Calcium Hydroxide	--	--	--	6	--	3
	Magnesium Oxide	--	--	--	3	--	3
	MT Carbon Black	30	30	30	30	25	30
Vulcanization	Press Cure: ° C/min	170/20	170/20	170/20	170/20	170/20	170/20
	Post Cure: ° C/h	200/4	200/4	200/4	200/4	200/4	230/24
	Tensile Strength : MPa	21.0	18.1	14.6	18.2	19.9	13.7

Mechanical Properties	Elongation: %	320	260	300	220	190	210
	Modulus at 100% Elongation: MPa	4.5	4.4	4.0	7.9	25.9	6.1
	Hardness (Shore A)	72	72	71	76	68	74
	Compression Set %, 70h at 200°C	26	29	32	30	25	30

1) 1,3-bis-(t-butylperoxy) diisopropyl benzene

2) & 3) Specific vulcanization promoter incorporated

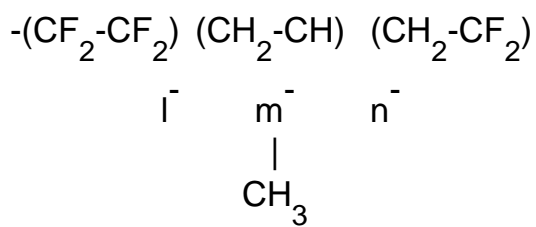
AFLAS™ SP

A Newly Developed Fluoroelastomer with:

- Improved curability
- Easy mold release
- Strong adhesion to metal (with AGC's primer) and distinguished chemical resistance inherited from the AFLAS™ original polymer

Structure & Properties of AFLAS™ SP

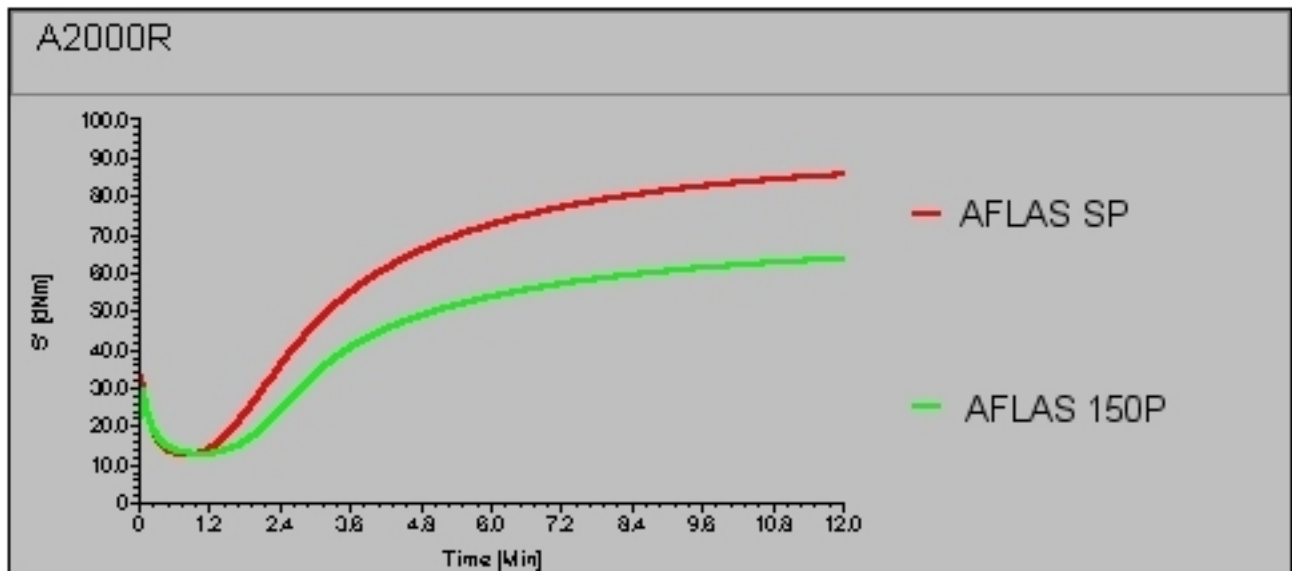
Polymer Structure



Properties

Specific Gravity	1.50
Fluorine Content (%)	55
Mooney Viscosity (ML 1+10 at 100°C)	75
Cure System	Peroxide

Typical ODR curves of AFLAS™ SP and 150P vulcanized by peroxide. Measured at 177°C, with a microdie, non-preheated, with oscillator frequency of 1.66Hz and 3°(as arc).



Oil Resistance of AFLAS™ SP

Polymer	SP	150P	FKM ^{1?}
Initial Properties			
Hardness: JIS-A	76	70	70
100% Modulus: MPa	7.9	6.2	2.9
Tensile: MPa	18.1	20.9	23.7
Elongation: %	220	260	350
SJ-Engine Oil, 175°Cx1000h			
Hardness: JIS-A (Points Changed)	71(-5)	65(-5)	73(3)
100% Modulus: MPa (% Retained)	7.5(-3)	3.8(-37)	3.5(20)
Tensile: MPa (% Retained)	16.5(-8)	17.9(-12)	5.1(-79)
Elongation: % (% Retained)	180(-16)	255(-1)	145(-59)
Volume Change (%)	7.5	7.3	1.2
Gear Lube, 175°Cx1000h			
Hardness, JIS-A (Points Changed)	65(-11)	64(-6)	8(8)
100% Modulus, MPa (% Retained)	7.7(-1)	3.8(-37)	-
Tensile, MPa (% Retained)	14.4(19)	15.9(-22)	3.3(-86)
Elongation, % (% Retained)	200(-9)	260(1)	80(-78)
Volume Change (%)	8.2	5.0	1.0

1) VdF/HFP/TFE - peroxide cure

Retention of the tensile strength and elongation of AFLAS™ and FKM terpolymer (fluorine content 69 %, peroxide vulcanizable) when immersed in SJ-class engine oil at 175 °C.

