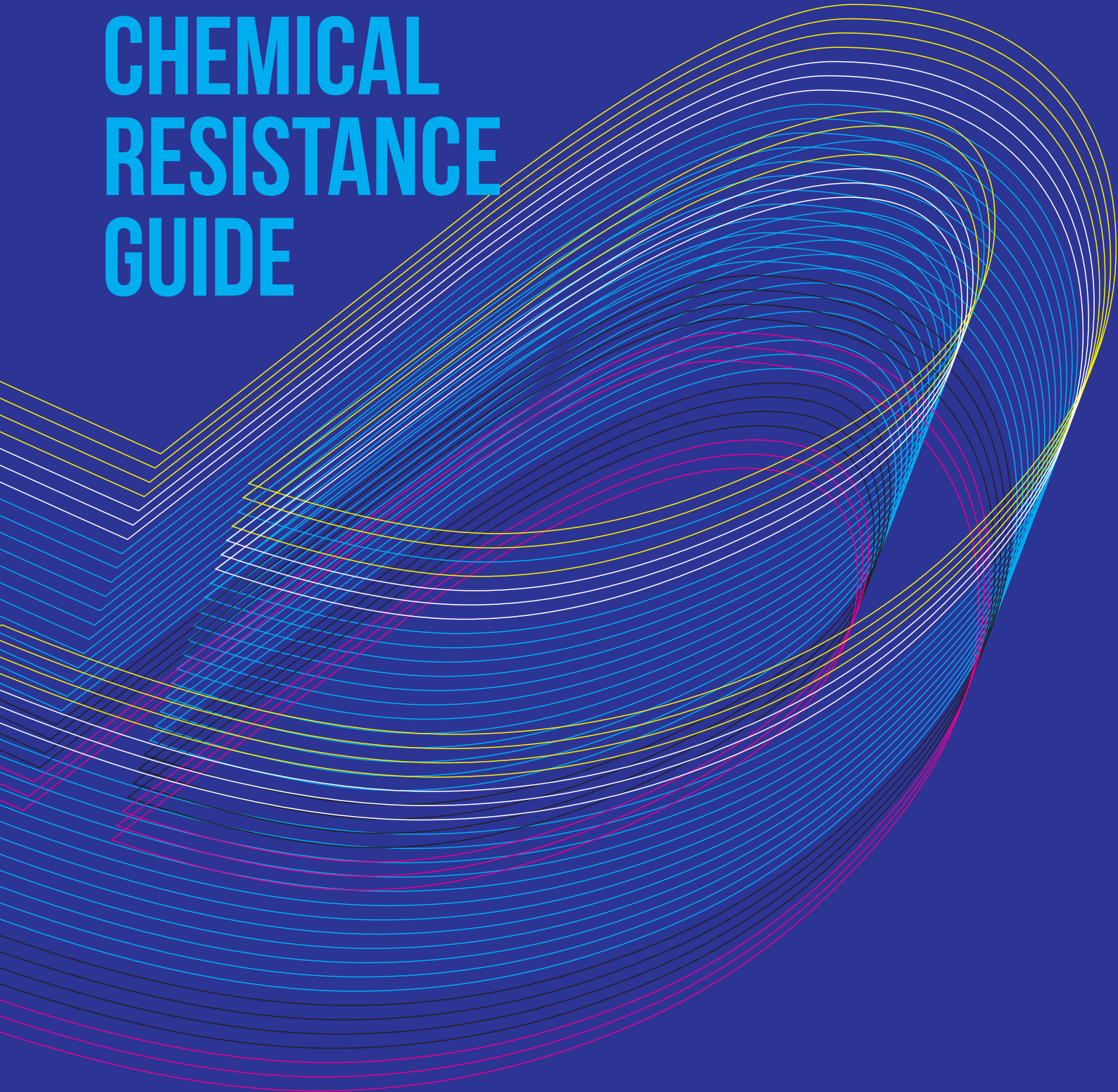


# ELASTRON V201 GRADES CHEMICAL RESISTANCE GUIDE



T H E R M O P L A S T I C E L A S T O M E R S

*el*astron

# PHYSICAL AND CHEMICAL EFFECTS OF FLUIDS ON ELASTOMERS

Elastomers that are in contact with fluids are subject to chemical and physical effects.

## CHEMICAL EFFECTS

Some base fluids and additives react chemically with elastomers, particularly at elevated temperatures, resulting in additional crosslinking or scission of the polymer chains. In addition, the action of a liquid on elastomers can be markedly affected by the presence of atmospheric oxygen. For some elastomers the effect of aeration is considerable and for others, insignificant.

A chemical reaction between fluid and elastomer can lead to serious changes in the physical properties of the elastomer. When the attack is severe, the elastomer loses its elasticity and becomes hard and brittle or soft and tacky.

## PHYSICAL EFFECTS

Changes in the physical properties of elastomers that are in contact with fluids may result from two simultaneous actions:

- (a) Absorption of the liquid by the elastomer and
- (b) Extraction of soluble constituents such as plasticizers and antioxidants from the elastomer

The result is a change in volume (i.e. swelling if a is greater than b or shrinkage if b is greater than a).

Swell increases from time of immersion up to a point where no more fluid will be absorbed and the volumetric expansion remains constant. The time taken to reach this state of equilibrium is largely dependent on the temperature, shape and thickness of the part.

The change in volume can alter such physical properties of the elastomer as hardness, modulus, tensile strength and elongation. A swell has the same effect as adding plasticizer to the elastomer by making it more flexible with decrease in hardness, modulus and tensile strength. Such changes are more or less proportional to the percentage of volume increase.

A shrinkage normally causes a reduction in flexibility and increase in hardness, modulus and tensile strength.

If the test fluid is nonvolatile, the swell will remain permanent. If the fluid is volatile, shrinkage can occur if the elastomer is allowed to dry out. Drying out does not occur as long as the elastomeric part is continuously in contact with the fluid or its vapor [1].

## INTRODUCTION

This bulletin summarizes the change of the physical properties of the Elastron V201 grades (low, medium and high hardness) after exposure to a variety of chemicals. Aging times were one week (according to ASTM method D-471) at temperatures ranging from room temperature to 125°C, depending upon the chemical.

Results of these chemical aging tests demonstrate that Elastron V201 grades are quite resistant to a wide variety of oils, solvents and chemicals because of their natures. V201 is not readily soluble in any common solvent, but will swell in aromatic solvents, halogenated organic solvents and hot petroleum oils.

The data here are based on laboratory work done under controlled conditions. We recommend the tests to be performed under actual service conditions, as the resistance and absorption are highly dependent on the service temperature and other conditions of the end application.

[1] 'Rubber as an engineering material: guideline for uses', Khairi Nagdi, Hanser Publishers, 1993

## TEST METHODS

Injection molded test plaques were prepared. The dimension of the plaques is 125 x 65 x 2mm. Test specimens were cut from these plaques to measure the effect of fluid immersion upon tensile properties, hardness and weight change, using ASTM procedures.

Property	ASTM Procedure	Abb.
Elongation at break	D412; die c	E
Tensile Strength	D412; die c	TS
Hardness	D2240 (3 sec. delay)	H
Weight change	D471	W
Volume change	D471	V

## RATING OF TESTS RESULTS

All test results of properties are classified by using the table indicating in below:

Rating	Percent Change	Meaning	Description
A	<20	Good	Very good suitability Elastomer shows little or no effect from exposure. Little effect on performance and physical properties. Very good resistance
B	20- 39	Fair	Good suitability Some effects from exposure with some loss of physical properties Some chemical swelling
C	40- 59	Not recom.	Limited suitability Significantly swell and loss of physical properties after exposure
D	60- 79	Not recom.	The elastomer is unsuitable for application in this media
E	80- 100	Not recom.	The elastomer is unsuitable for application in this media
F	>100	Not recom.	The elastomer is unsuitable for application in this media

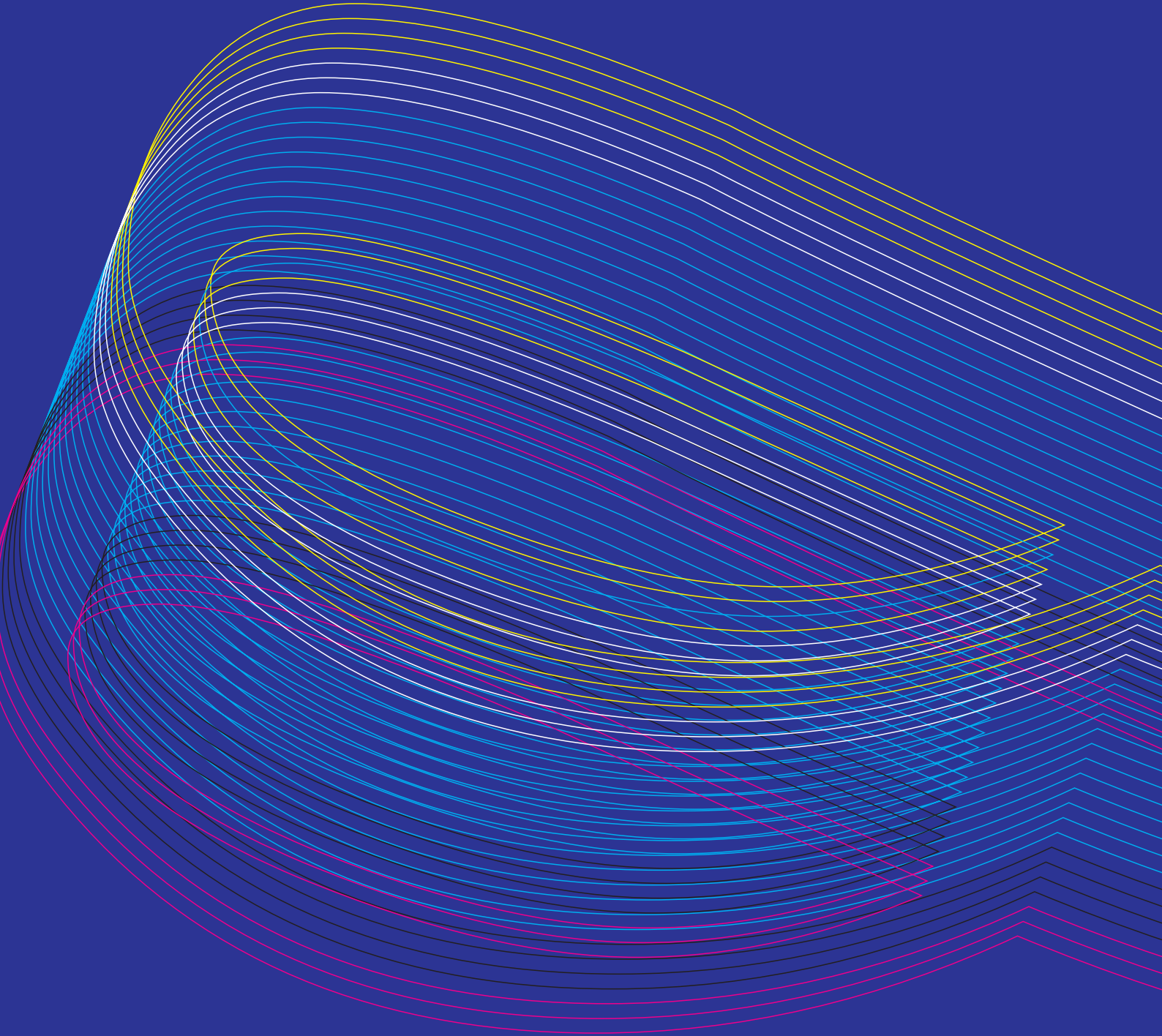
## OVERVIEW OF THE CHEMICAL RESISTANCE

Chemical	Resistance
Acid	Good
Bases	Good
Salts	Good
Aqueous Solutions	Good
Organic Solvents	Variable
Oils	Swells
Automotive Oils	Swells
Other Automotive Fluids	Good

	Temp, °C	45 shA					75 shA					40 shD				
		TS	E	H	W	V	TS	E	H	W	V	TS	E	H	W	V
98% Sulphuric Acid	23	A	B	A	A	A	B	C	A	A	A	A	A	A	A	A
10% Hydrochloric Acid	23	B	C	A	A	A	A	A	A	A	A	A	A	A	A	A
50% Sodium Hydroxide	23	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
10% Potassium Hydroxide	23	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Water	80	B	C	A	A	A	B	B	A	A	A	A	A	A	A	A
10% Zinc Chloride	23	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A
15% Sodium Chloride	23	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A
18% Calcium Chloride	23	A	A	A	A	A	A	B	A	A	A	A	A	A	A	A
%2.5 Detergent*	23	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A
	80	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
%2.5 Rinse Aid	80	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Special detergent test**	80	A	C	A	A	A	A	A	A	A	A	A	A	A	A	A
Dimethylformamide	23	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Aniline	23	B	B	A	A	A	A	B	A	A	A	A	A	A	A	A
Acetic acid	23	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A
Ethanol	23	C	B	A	A	A	A	A	A	A	A	A	A	A	A	A
Glycerol	23	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cyclohexane	23	F	D	A	B	B	D	B	A	B	B	B	A	A	A	A
Diethyl Ether	23	F	D	A	C	B	C	A	A	B	B	C	A	A	A	A
Methylethylketone	23	F	F	A	B	B	D	B	A	A	B	B	A	A	A	A
Bromobenzene	23	F	E	A	B	B	E	B	A	B	B	B	A	A	A	A
n-butyl acetate	23	F	E	A	C	C	F	C	A	B	B	B	A	A	A	A
n-hexane	23	F	F	A	B	B	E	B	A	B	B	C	A	A	A	A
Xylene	23	F	E	A	B	B	F	C	A	B	B	B	A	A	A	A
Diocetyl phthalate	23	F	E	A	A	A	A	B	A	A	A	A	A	A	A	A
1,4-dioxane	23	F	E	A	B	B	B	A	A	B	B	A	A	A	A	A
IRM 901	100	A	A	A	C	B	B	A	A	B	B	A	B	A	A	A
	125	B	A	A	C	C	C	C	A	B	B	B	B	A	B	B
IRM 902	100	A	A	A	C	C	C	A	A	B	B	B	B	A	A	A
	125	A	B	A	D	C	B	B	A	C	B	B	C	A	B	B
IRM 903	100	A	A	A	D	D	B	A	B	B	B	C	C	A	B	B
	125	B	A	A	E	D	C	B	B	D	C	C	C	A	C	B
Automatic transmission fluid	125	A	A	A	D	C	C	B	B	C	C	C	C	A	B	B
Hydolic Brake Fluid	23	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
	100	A	A	A	A	A	B	A	A	A	A	B	B	A	A	A
Grease	23	B	C	A	B	B	B	B	A	B	A	A	A	A	A	A
	100	A	A	A	A	A	B	A	A	A	A	B	B	A	A	A
Power Steering Fluid	125	B	A	A	C	B	C	C	B	C	B	B	C	A	B	B
Antifreeze	125	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A

## APPENDIX

Chemical Name	Brand	Code
1- Sulphuric Acid	Merck	1.00713.2500
2- Hydrochloric Acid	Merck	1.00317.2500
3- Sodium Hydroxide	Merck	1.06498.1000
4- Potassium Hydroxide	Merck	1.05012.1000
5- Zinc Chloride	Merck	1.08816.1000
6- Sodium Chloride	Merck	1.06404.1000
7- Calcium Chlorid	Merck	1.02378.0500
8- Detergent	Finish	
9- Rinse Aid	Finish	
10-Acetic acid	Merck	1.00056.2500
11-Aniline	Merck	1.01261.1000
12-Bromobenzene	Merck	8.01786.1000
13-n-butyl acetate	Merck	1.09652.2500
14-Cyclohexane	Merck	1.09666.2500
15-Diethyl Ether	Merck	1.00921.5000
16-Dimethylformamide	Merck	1.03034.2500
17-Dioctyl phthalate	Sigma Aldrich	D201154-2L
18-1,4-dioxane	Merck	1.09671.2500
19-Ethanol	Sigma Aldrich	32221-2.5 L
20-Glycerol	Merck	1.04092.2500
21-n-hexane	Sigma Aldrich	208752-2.5 L
22-Methylethylketone	Merck	1.06014.1000
23-Xylene	Merck	1.08661.2500
24-IRM 901	Petroyağ Octopus	P1923 2154/ 414-066356
25-IRM 902	Petroyağ Octopus	N2226 2178/ 515-075581
26-IRM 903	Petroyağ Octopus	N418 3114040004/ 116-087969
27-Automatic transmission fluid	Castrol ATF DEX II	TR01646621 A00712
28-Hydolic Brake Fluid	Castrol Brake Fluid Dot 4	TR01640979 A00031
29-Lithium Grease	Petrol Ofisi SuperGres	EP2 3112/ 00567
30-Power Steering Fluid	Castrol Transmax CVT	1408156S1082769L
31-Antifreeze	Shell Antifreeze Concentrate	131028122



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