

HALLGREEN Esters are additives that meet customers' needs for environmentally friendly esters. These innovative new compounds are plant-derived, biodegradable, and perform as well as traditional esters derived from petroleum-based products.

Plasticizer	HallGreen R-4010	Citroflex 4	Citroflex A- 4	Plasthall DOP
<u>Original Physical Properties</u>				
Stress @ 100% Elong. MPa	7.1	4.9	6.4	6.0
psi	1030	715	935	870
Stress @ 200% Elong. MPa	11.1	7.9	10.4	9.4
Stress @ 300% Elong. MPa	13.9	10.8	13.5	12.1
Tensile Strength, MPa	16.5	14.2	16.6	15.4
psi	2390	2065	2410	2235
Elongation @ Break, %	397	409	400	420
Hardness Duro A, pts.	69	64	69	63
Specific Gravity	1.219	1.237	1.241	1.203
<u>Air Oven Aging, 3 days @ 136°C</u>				
Stress @ 100% Elong. MPa	12.2	*	*	*
psi	1775	*	*	*
Stress Change, %	72	*	*	*
Tensile Ultimate @ Break, MPa	17.9	*	*	*
psi	2600	*	*	*
Tensile Change, %	9	*	*	*
Elongation @ Break, %	325	*	*	*
Elongation Change, %	-18	*	*	*
Hardness Duro A, pts	78	>90	>90	>90
Hardness Change, pts.	9	>26	>21	>27
Weight Change, %	-10.2	-35.3	-32.7	-31.6
High Humidity, 24hrs @ 90°C	1.6	0	0.2	0
Dry Out 1hr @ 90°C	-0.7	-0.6	-0.4	-0.2
High Humidity, 9d @ 90°C, DO	-1.1	1.4	0.8	0.3
Dry Out 1hr @ 90°C	-10.4	-1.2	-0.9	-0.4

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<u>Immersion/Extraction, Percent Weight Change After:</u>				
Hexane, 24hrs @23°C	-16.2	-20.0	-18.1	-32.5
Dry Out, 4hrs @ 70°C	-23.5	-26.7	-26.0	-33.9
Cottonseed Oil, 24hrs @ 60°C	-14.6	-17.2	-14.6	-14.8
Distilled Water, 24hrs @ 90°C	9.5	2.4	3.6	2.0
Dry Out, 24hrs @ 60°C	-2.2	-2.6	-1.2	-0.5
1 Soapy Water, 24hrs @ 90°C	7.1	-21.0	-2.2	0.7
Dry Out, 24hrs @ 60°C	-5.7	-26.6	-8.7	-2.7
1% Soapy Water, 7d @90°C	10.4	-30.1	-19.5	1.3
Dry Out, 24hrs @ 60°C	-15.2	-34.1	-27.0	-3.9

Compatibility and Permanence

ABS Migration	-0.5	-3.1	-3.6	-0.4
Visual	Min	Med	Med	Slt
Polystyrene Migration	-3.8	-3.2	-7.1	-3.2
Visual	Severe	Severe	Severe	Severe

PVC Formulation:

PVC Resin K-70 - 100.0

Ba/Zn Stabilizer - 2.0

Paraplex G-62 - 5.0

Plasticizer Variable - 67.0

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