

Dryflex[®] TPV

Thermoplastic Vulcanisate Compounds

TPV

CONTENTS

[INTRODUCTION →](#)

[What are TPVs? →](#)

[TPV or TPS? →](#)

[KEY PROPERTIES & CUSTOMISATION →](#)

[Colour →](#)

[Hybrids and Semi-TPVs →](#)

[Haptics & Aesthetics →](#)

[TYPICAL APPLICATIONS →](#)

[SERIES OVERVIEW →](#)

[GRADE TABLES →](#)

[Dryflex VE series →](#)

[Dryflex V series →](#)

[Dryflex XL 100 series →](#)

[Dryflex XL 200 series →](#)

[Dryflex XL 900 series →](#)

[PRODUCT TESTING & PERFORMANCE →](#)

[Compression Set Behaviour →](#)

[Influence of Oil →](#)

[Dryflex VE series Heat Ageing & Oil Resistance →](#)

[Dryflex V series Heat Ageing & Oil Resistance →](#)

[PROCESSING →](#)

[Injection Moulding →](#)

[Extrusion →](#)



INTRODUCTION

Dryflex TPV Thermoplastic Vulcanisate compounds are high performance materials designed for demanding applications where improved durability, heat or fluid resistance are required.

Our aim is to supply a material that precisely matches application requirements. We are constantly testing new polymers, additives, stabilisers and other ingredients to create unique material combinations. We have engineered several **Dryflex TPV** series to suit different applications, with properties including flow characteristics, hardness, specific gravity, strength resistance and colour.

In this guide we show some typical grades, these tables are not exhaustive and do not list all available properties and materials. Please use this guide as an introduction to our **Dryflex TPV** grades and contact us at TPV@hexpolTPE.com to discuss your specific requirements.

WHAT ARE TPVs?

TPVs are compounds of PP and EPDM rubber which have been dynamically vulcanised during the compounding process. The vulcanisation process changes the structure of the rubber phase making it more durable, improving its recovery to deformation and reducing the ingress of aggressive fluids such as oils and solvents.

This process modifies the rubber phase by the creation of chemical cross-links or bridges between the individual rubber chains forming a network structure. Without this, the rubber chains move independently of each other allowing more permanent deformation to occur. This network structure also makes it more difficult for fluids to penetrate into and through the rubber chains.

They have seen strong growth in automotive seals, pipe seals, and other applications where a heat resistance of up to 135°C is required. Hardness values range typically from 45 Shore A to 50 Shore D. TPVs also lend themselves to under-bonnet automotive applications where improved temperature and oil resistance is required.

TPV or TPS?

Thermoplastic Vulcanisates (TPV) share many of the same characteristics as TPE compounds based on Styrenic Block Copolymers (TPS), such as soft-touch appeal, flexibility, recyclability etc.

In certain applications, the higher thermal stability and chemical resistance of a TPV is not required and TPS based compounds will perform very well in these circumstances. Likewise, there are times when a TPS compound doesn't have the strength and durability for a demanding environment.

As HEXPOL TPE manufacture both TPS and TPV compounds, we can offer the best solution for each application, we won't over-specify when it is not needed.



Further information about our TPS based Dryflex compounds is available from our website, for example the Dryflex SE range is optimised for injection moulding

DRYFLEX TPV

KEY PROPERTIES

- A wide range of hardness'
- Service temperatures of -60°C to 135°C
- Improved resistance to aggressive fluids such as oils, acids, bases and aqueous solutions
- Low compression set
- Low flex fatigue
- Dryflex XL grades are easier to colour
- Lightweight parts
- Design flexibility
- Recyclability
- Grades for injection moulding, extrusion and blow moulding
- Excellent weathering and environmental resistance
- Adhesion to PP and PE in multi-component applications

COLOUR

Due to the cured elastomer phase, TPV compounds can be notoriously difficult to colour. The addition of separate colour masterbatch can also have an unexpected effect on the physical properties and functionality of the compound. The **Dryflex XL** series of TPV compounds have a 'clean' appearance, which makes them easier to colour. The **Dryflex V** series of TPV compounds are available in several pre-determined colours as well as black or natural. They are fully colour compounded, meaning fewer production steps for the processor and a consistent colour without any loss to properties or performance.

HYBRIDS AND SEMI-TPVs

It is also possible to produce hybrid materials based on TPVs that are combined with other TPE materials such as SEBS and/or only partially cross-link the rubber phase (sometimes referred to as a Semi-TPV). The main benefits of these are to expand the possibilities of material properties and therefore also its potential applications, alter the processing characteristics (viscosity) of the material, change the surface appearance and aesthetics of the final product and in some cases to improve economics.

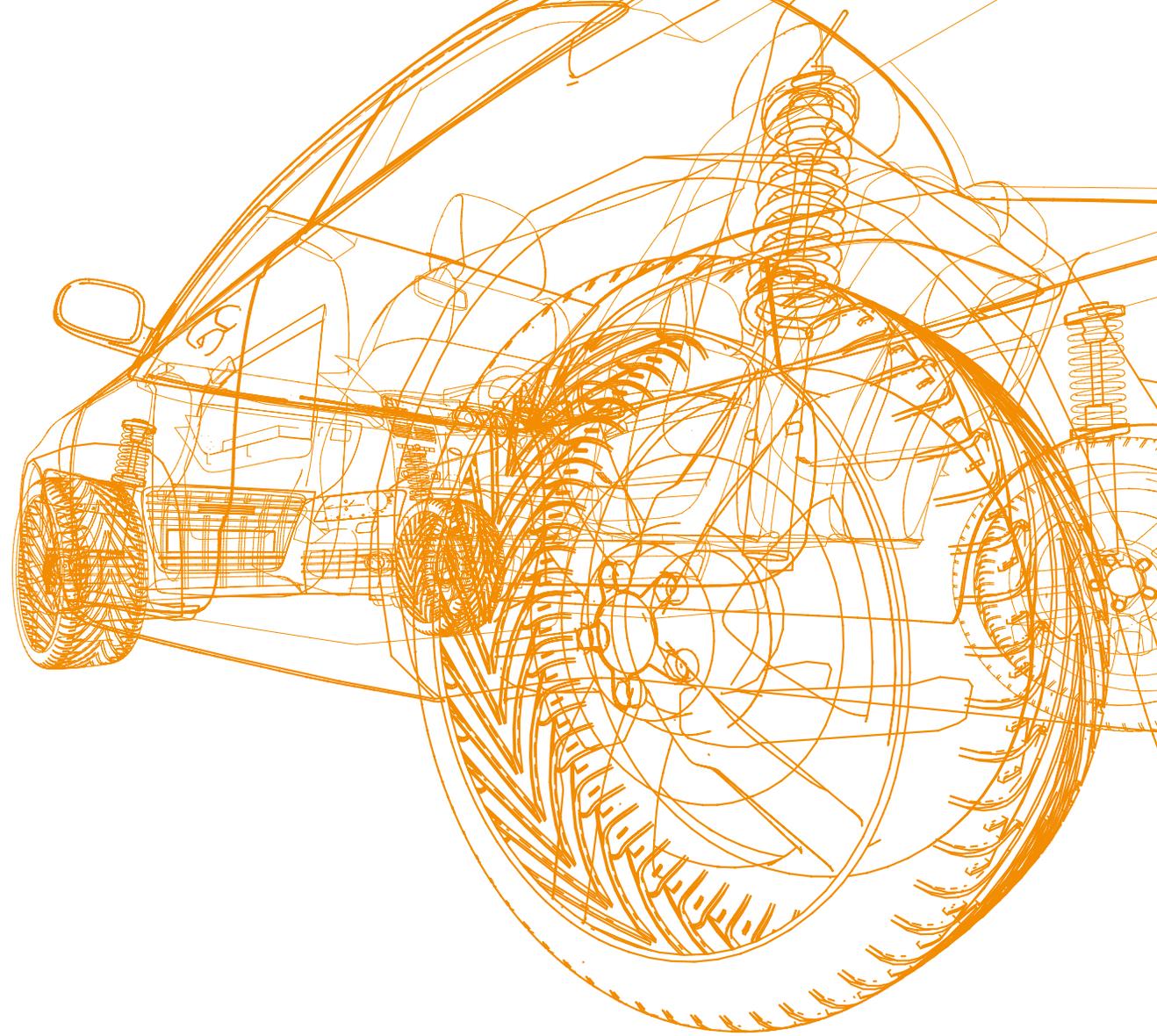
HAPTICS & AESTHETICS

Dryflex TPV compounds are shear thinning and have excellent flow characteristics, helping to eliminate flow lines in complex or thin-walled parts. Dryflex TPV compounds are suitable for multi-component processing, with adhesion to olefinic polymers such as PP and PE, allowing for soft-touch areas and tactile surface finishes.

TYPICAL APPLICATIONS

TPV compounds are used extensively in a wide variety of market segments, including:

- Automotive interior, exterior and under-bonnet
- Electronics and appliances
- White goods
- Consumer goods
- Building and construction



SERIES OVERVIEW

SERIES	EASY TO COLOUR	OIL RESISTANCE	HEAT AGEING	REQUIRES PREDRYING	INJECTION MOULDING	EXTRUSION	LINK TO GRADE TABLE
DRYFLEX VE	✓	✓ ✓	✓ ✓	YES	✓	✓	→
DRYFLEX V	✓ ✓	✓	✓	YES	✓	✓	→
DRYFLEX XL 100	✓ ✓ ✓	✓	✓	NO	✓		→
DRYFLEX XL 200	✓ ✓ ✓	✓	✓	NO	✓		→
DRYFLEX XL 900	✓ ✓ ✓	✓	✓	NO	✓		→

DRYFLEX VE SERIES

Designed for extrusion applications, for example automotive weatherseals and dynamic gaskets. The Dryflex VE series has improved oil resistance and heat ageing properties compared to the Dryflex XL grades. The grade references below are for black compounds, natural and coloured versions are also available.

Grade	Hardness ¹ ISO 868 Shore A	Density ISO 2781 g/cm ³	Tensile Strength ² ISO 37 Type 1 MPa	Stress at 100% Strain ² ISO 37 Type 1 MPa	Elongation at Break ² ISO 37 Type 1 %	Tear Strength ² ISO 34-1 Method C N/mm	CS 23°C / 24h ISO 815-1 Type B %	CS 70°C / 24h ISO 815-1 Type B %	CS 100°C / 24h ISO 815-1 Type B %
Dryflex VE 55A101	55	0.97	5.0	2.0	>400	19.5	18.0	27.5	34.0
Dryflex VE 60A101	60	0.97	5.5	2.0	>400	20.0	17.0	28.0	34.0
Dryflex VE 65A101	65	0.97	6.5	2.5	>450	24.0	19.5	29.0	35.5
Dryflex VE 70A101	70	0.97	7.0	3.0	>450	26.0	20.0	30.0	36.0
Dryflex VE 75A101	75	0.97	7.5	3.0	>500	30.5	21.0	35.0	41.0
Dryflex VE 80A101	80	0.97	10.0	3.5	>650	32.0	26.0	38.0	45.5

¹ After 15 seconds

² Across the flow direction

DRYFLEX V SERIES

General purpose TPV for extrusion, injection moulding and blow moulding. The Dryflex V series has improved oil resistance and heat ageing properties compared to the Dryflex XL grades. The grade references below are for black compounds, natural and coloured versions are also available.

Grade	Hardness ¹ ISO 868 Shore A or D	Density ISO 2781 g/cm ³	Tensile Strength ² ISO 37 Type 1 MPa	Stress at 100% Strain ² ISO 37 Type 1 MPa	Elongation at Break ² ISO 37 Type 1 %	Tear Strength ² ISO 34-1 Method C N/mm	CS 23°C / 24h ISO 815-1 Type B %	CS 70°C / 24h ISO 815-1 Type B %	CS 100°C / 24h ISO 815-1 Type B %
Dryflex V 45A101	45 A	0.94	4.0	1.0	>550	13.0	18.0	29.0	34.0
Dryflex V 55A101	55 A	0.94	4.5	1.5	>450	15.0	18.0	27.0	31.5
Dryflex V 60A101	60 A	0.93	5.5	2.0	>500	19.0	20.0	30.0	37.0
Dryflex V 65A101	65 A	0.93	6.0	2.0	>500	20.0	19.5	32.0	37.5
Dryflex V 70A101	70 A	0.95	7.0	2.5	>550	22.0	22.5	37.0	44.5
Dryflex V 75A101	75 A	0.96	7.0	3.0	>450	26.0	27.0	39.0	47.5
Dryflex V 80A101	80 A	0.97	8.0	3.5	>600	32.0	31.0	41.0	48.0
Dryflex V 85A101	85 A	0.94	9.0	3.5	>450	30.0	34.0	40.0	49.0
Dryflex V 90A101	90 A	0.94	10.0	4.5	>550	44.0	38.0	48.0	52.0
Dryflex V 40D101	40 D	0.96	21.0	8.5	>550	80.0	46.0	52.0	57.0
Dryflex V 45D101	45 D	0.94	21.0	10.0	>650	87.0	51.0	54.0	62.0
Dryflex V 50D101	50 D	0.97	21.0	11.0	>750	105.0	55.0	58.0	65.0

¹ After 15 seconds

² Across the flow direction



DRYFLEX XL 100 SERIES : HIGH FLOW

The Dryflex XL 100 series is designed for long or complex flow paths, which require a material with excellent flow properties. They can also be used for general moulding and are available as non-filled grades where easy colourability is required. The Dryflex XL 100 series also displays excellent bonding to polypropylene, EPDM and other olefinic polymers.

Grade	Hardness ¹ ISO 868 Shore A	Density ISO 2781 g/cm ³	Tensile Strength ² ISO 37 Type 1 MPa	Stress at 100% Strain ² ISO 37 Type 1 MPa	Elongation at Break ² ISO 37 Type 1 %	Tear Strength ² ISO 34-1 Method C N/mm	CS 23°C / 24h ISO 815-1 Type B %	CS 100°C / 24h ISO 815-1 Type B %
Dryflex XL 40100	40	0.91	2.0	1.0	>350	12	17	40
Dryflex XL 50100	50	0.92	2.5	1.5	>350	13	19	42
Dryflex XL 60100	60	0.92	4.0	2.0	>350	19	23	43
Dryflex XL 70100	70	0.93	5.8	2.5	>450	25	29	46
Dryflex XL 80100	80	0.93	6.9	3.4	>500	32	32	50
Dryflex XL 90100	90	0.93	7.6	4.8	>350	45	37	60

¹ After 15 seconds

² Average

DRYFLEX XL 200 SERIES :

GENERAL PURPOSE

The Dryflex XL 200 series has been designed as a lower cost alternative to the Dryflex XL 100 series for injection moulding articles. these grades are very clean, easy to colour and also display very good bonding to polypropylene and olefinic polymers.

Grade	Hardness ¹ ISO 868 Shore A	Density ISO 2781 g/cm ³	Tensile Strength ² ISO 37 Type 1 MPa	Stress at 100% Strain ² ISO 37 Type 1 MPa	Elongation at Break ² ISO 37 Type 1 %	Tear Strength ² ISO 34-1 Method C N/mm	CS 23°C / 24h ISO 815-1 Type B %	CS 100°C / 24h ISO 815-1 Type B %
Dryflex XL 50200	50	0.88	2.6	1.7	>150	11	20	37
Dryflex XL 60200	60	0.88	3.5	2.3	>200	19	24	39
Dryflex XL 70200	70	0.89	5.0	3.8	>150	26	26	40
Dryflex XL 80200	80	0.89	6.6	4.8	>200	35	34	46
Dryflex XL 90200	90	0.89	10.0	7.8	>250	64	38	60

¹ After 15 seconds

² Average



DRYFLEX XL 900 SERIES : SUPERIOR STRENGTH

The Dryflex XL 900 series is our original range of TPVs. They have good all round properties giving a balance of compression set values against strength properties.

Grade	Hardness ¹ ISO 868 Shore A	Density ISO 2781 g/cm ³	Tensile Strength ² ISO 37 Type 1 MPa	Stress at 100% Strain ² ISO 37 Type 1 MPa	Elongation at Break ² ISO 37 Type 1 %	Tear Strength ² ISO 34-1 Method C N/mm	CS 23°C / 24h ISO 815-1 Type B %	CS 100°C / 24h ISO 815-1 Type B %
Dryflex XL 45900	45	0.95	3.1	1.4	>300	12	15	39
Dryflex XL 55900	55	0.96	4.2	2.0	>350	18	18	38
Dryflex XL 63900	63	0.96	5.3	2.5	>400	22	20	40
Dryflex XL 68900	68	0.96	6.5	2.8	>450	26	20	45
Dryflex XL 73901	73	0.97	7.6	3.2	>450	32	23	45
Dryflex XL 80900	80	0.95	8.5	3.7	>500	36	30	48
Dryflex XL 87900	87	0.96	8.7	5.0	>450	44	35	55

¹ After 15 seconds

² Average

PRODUCT TESTING & PERFORMANCE

We understand the importance of durability, particularly when parts need to perform in demanding and high-stress environments. We have engineered Dryflex TPV compounds to give long term ageing resistance; including UV, ozone and weathering.

We accurately fingerprint and analyse our compounds to ensure consistency of our products and develop materials with superior performance. Testing can include Xenon-Arc accelerated weathering, this simulates the damaging effects of long term outdoor exposure by exposing test samples to varying conditions of the most aggressive components of weathering-light, moisture and heat.

FIGURE 1 : COMPRESSION SET BEHAVIOUR OF TPE & ELASTOMERS

Dryflex TPV compounds offer long-term low compression set.

Shape retention is very good up to around 135°C.

Recovery to deformation at elevated temperatures is also good due to the 'spring back' properties of the vulcanised elastomer.

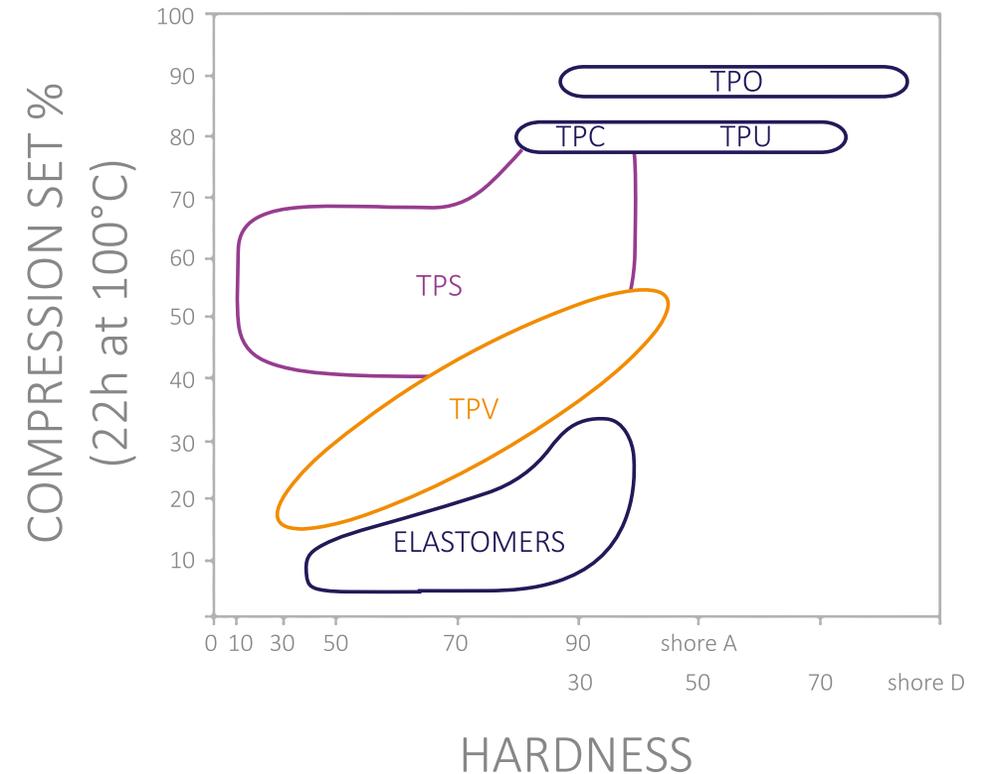
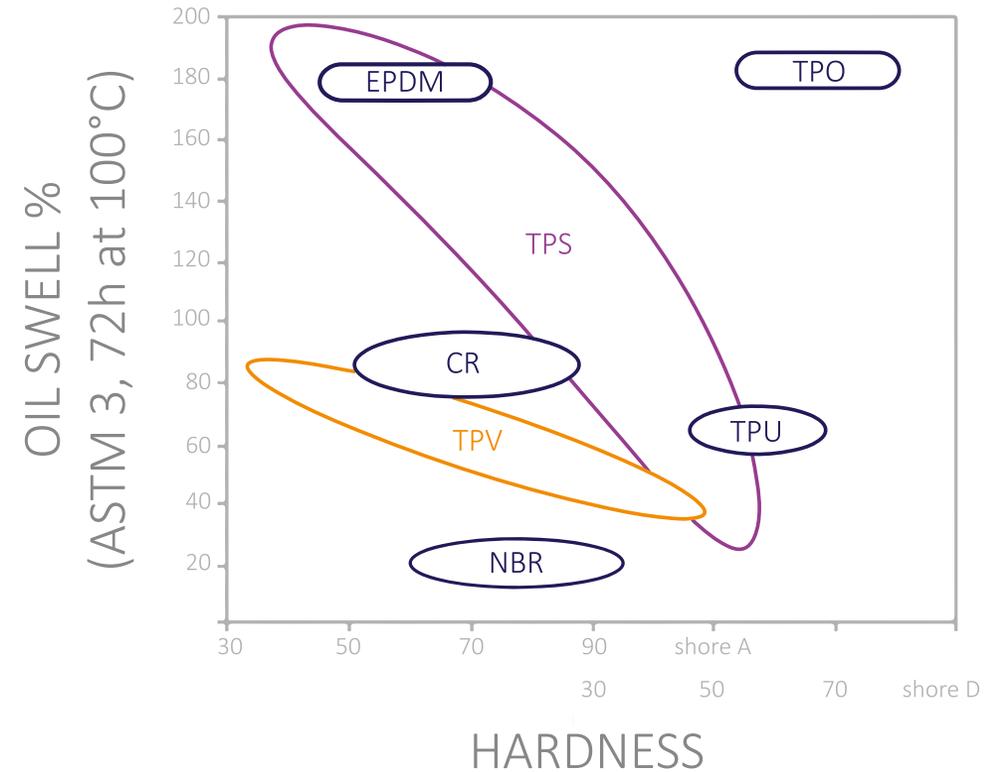


FIGURE 2 : INFLUENCE OF OIL ON TPE & ELASTOMERS

In terms of hydrocarbons and various oils, Dryflex TPVs display good resistance at ambient and elevated temperatures.

The chemically crosslinked network structure slows down and sometimes prevents penetration into the EPDM domains.



DRYFLEX VE SERIES

HEAT AGEING & OIL RESISTANCE PERFORMANCE

Grade	Hardness ¹ Shore A ISO 868	HEAT AGED 150°C / 168h			IRM 901 125°C / 168h				IRM 903 125°C / 168h			
		Hardness Shore A Change ISO 868	Tensile Strength % Change ² ISO 37	Elongation at Break % Change ² ISO 37	Hardness Shore A Change ISO 868	Tensile Strength % Change ² ISO 37	Elongation at Break % Change ² ISO 37	Volume Swell ASTM D 471	Hardness Shore A Change ISO 868	Tensile Strength % Change ² ISO 37	Elongation at Break % Change ² ISO 37	Volume Swell ASTM D 471
Dryflex VE 55A101	55	-4	-10	-2	-21	-30	-53	54	-29	-49	-68	-109
Dryflex VE 60A101	60	2	5	4	-11	-28	-52	35	-27	-48	-68	84
Dryflex VE 65A101	65	3	6	4	-13	-26	-50	40	-28	-48	-65	90
Dryflex VE 70A101	70	5	9	-11	-16	-22	-49	44	-29	-48	-63	99
Dryflex VE 75A101	75	3	-3	-12	-13	-29	-46	44	-28	-47	-64	99
Dryflex VE 80A101	80	3	6	3	-15	-23	-44	42	-27	-48	-62	95

¹ After 15 seconds

² Across the flow direction



DRYFLEX V SERIES

HEAT AGEING & OIL RESISTANCE PERFORMANCE

Grade	Hardness ¹ Shore A ISO 868	HEAT AGED 150°C / 168h			IRM 901 125°C / 168h				IRM 903 125°C / 168h			
		Hardness Shore A Change ISO 868	Tensile Strength % Change ² ISO 37	Elongation at Break % Change ² ISO 37	Hardness Shore A Change ISO 868	Tensile Strength % Change ² ISO 37	Elongation at Break % Change ² ISO 37	Volume Swell ASTM D 471	Hardness Shore A Change ISO 868	Tensile Strength % Change ² ISO 37	Elongation at Break % Change ² ISO 37	Volume Swell ASTM D 471
Dryflex V 55A101	55 A	4	4	-9	-19	-37	-54	50	-29	-49	-63	99
Dryflex V 60A101	60 A	4	3	-9	-14	-30	-55	40	-29	-49	-67	96
Dryflex V 65A101	65 A	5	1	-4	-20	-32	-55	48	-29	-49	-55	104
Dryflex V 70A101	70 A	2	6	-9	-18	-36	-50	51	-29	-48	-65	104
Dryflex V 75A101	75 A	1	1	7	-19	-34	-44	48	-28	-47	-54	103
Dryflex V 80A101	80 A	2	3	5	-22	-38	-63	77	-38	-56	-79	150

¹ After 15 seconds

² Across the flow direction



PROCESSING

Dryflex TPVs are easily processed on standard thermoplastics equipment. They require no vulcanisation and are 100% recyclable during production. We have grades for extrusion, injection moulding, blow moulding or thermoforming. The [Dryflex XL](#) grades are not hydroscopic, so in general no predrying is required, however, after periods of prolonged storage predrying may be necessary. The [Dryflex V](#) and [Dryflex VE](#) grades are slightly hydroscopic, we recommend predrying for 3 hours at 80°C.

Cycle times will be governed by temperature and section thickness. Care must be taken to allow sufficient cooling of the section prior to demoulding in order to prevent permanent distortion of the article. Always ensure adequate extraction is available to remove any fumes which may be generated during processing.

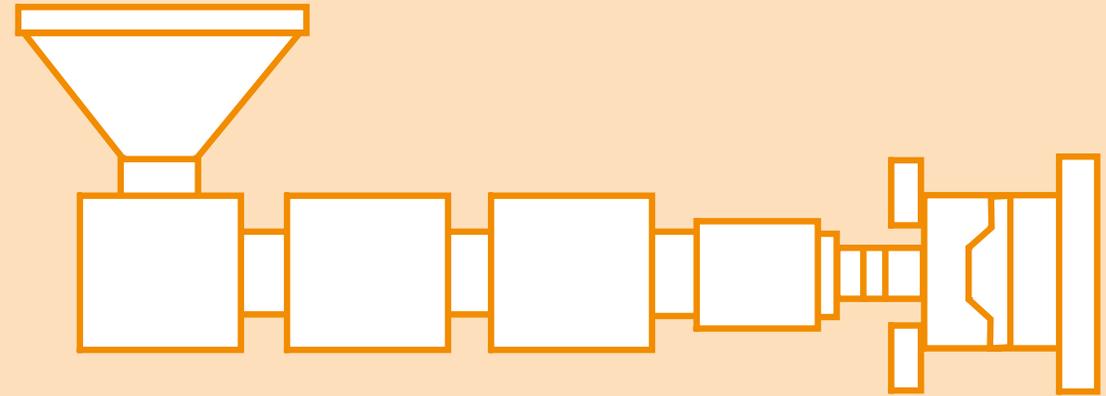
This processing information is intended only as a guide.
The actual parameters will depend on the machine used and the moulding being produced.



Further TPE processing & problem solving information is available to download from our website

INJECTION MOULDING

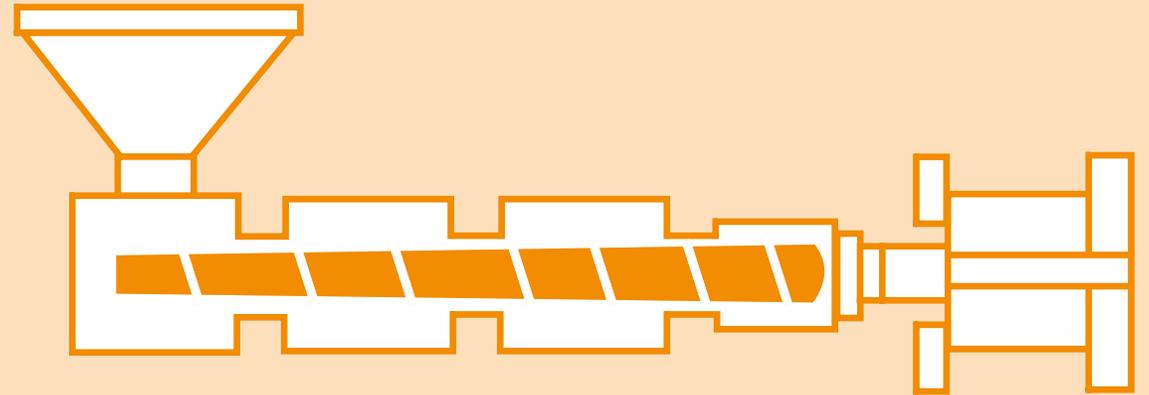
Gates & Runners:	Fully rounded allowing easy flow
Venting:	0.02 - 0.05 mm deep at final fill point
Injection Speed:	Medium - Fast
Injection Pressure:	Medium
Back Pressure:	Low - Medium
Holding Pressure:	Sufficient to pack the mould
Cooling:	Can be demoulded when parts have cooled sufficiently



Recommended start-up temperatures °C	Dryflex V and VE series	160 - 190	170 - 200	180 - 210	190 - 220	15 - 50
	Dryflex XL 100 series	160 - 180	170 - 190	180 - 200	180 - 210	20 - 60
	Dryflex XL 200 series	160 - 190	170 - 200	180 - 210	200 - 220	20 - 60
	Dryflex XL 900 series	160 - 190	170 - 200	180 - 210	200 - 220	20 - 60

EXTRUSION

L/D Ratio: 20:1 - 25:1
Compression Ratio: 2.5 - 3.5
Breaker Plate/Screen: Both should be used
Draw Down: 5 - 10%
Cooling: Cold water bath



Recommended start-up temperatures °C

Dryflex V and VE series 150 - 160 160 - 170 170 - 180 180 - 190 180 - 200

WANT TO LEARN MORE?

Email the TPV team at

TPV@hexpolTPE.com

or visit

www.hexpoltpc.com/en/dryflex-tpv.htm

ALSO SEE →

[Dryflex TPV : chemical resistance guide](#)

[Dryflex SE : TPEs for injection moulding](#)

[Dryflex FLAM : HFFR TPEs](#)

[Dryflex AM : TPEs for automotive mats](#)

[Dryflex 2K : TPEs for multi-component applications](#)

ABOUT HEXPOL TPE



HEXPOL TPE is a global compounding group specialising in Thermoplastic Elastomers (TPE) for key industries such as consumer, medical, packaging, automotive and construction. We have a core belief in being the easiest company to do business with. That's why we invest in our operations, teams and technologies to offer our customers the most reliable, relevant and cost-effective TPE compounds, backed by highly responsive support, technical knowhow and application expertise. Our teams work together, across boundaries, applying the knowledge, experience and talents we have all around the world to meet the needs of our customers

All the information about chemical and physical properties consists of values measured in tests on injection moulded test specimens. We provide written and illustrated advice in good faith. This should only be regarded as being advisory and does not absolve the customers from doing their own full-scale tests to determine the suitability of the material for the intended applications. You assume all risk and liability arising from your use of the information and/or use or handling of any product. Figures are indicative and can vary depending on the specific grade selected and the production site. HEXPOL TPE makes no representations, guarantees, or warranties of any kind with respect to the information contained in this document about its accuracy, suitability for particular applications, or the results obtained or obtainable using the information. Some of the information arises from laboratory work with small-scale equipment which may not provide a reliable indication of performance or properties obtained or obtainable on larger-scale equipment. We retain the right to make changes without prior notice. HEXPOL TPE makes no warranties or guarantees, express or implied, respecting suitability of either HEXPOL TPE's products or the information for your process or end-use application. Dryflex® is a registered trademarks, property of the HEXPOL TPE group of companies.