



Typical physical properties of ARPRO Black

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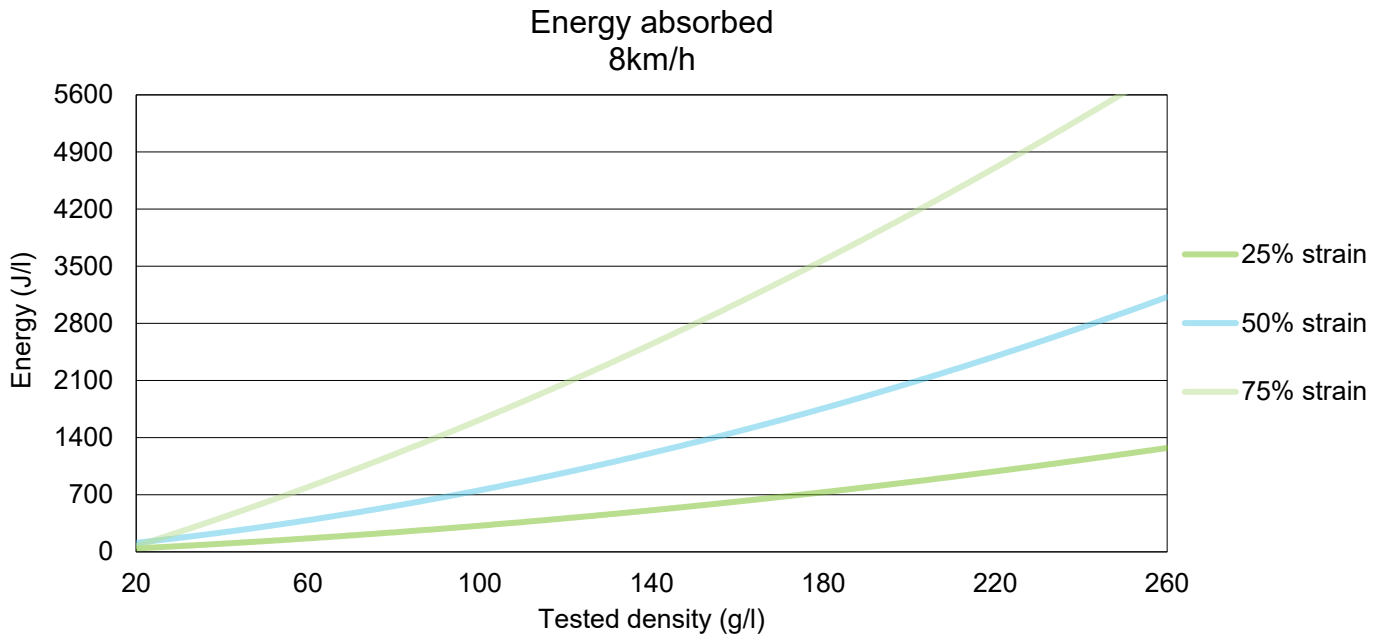
Property	Test	Unit	Density (g/l)											
			20	30	40	50	60	80	100	120	140	160	180	200
Energy absorption in dynamic impact	Vertical impact drop tower	J/l												
25% strain	Flat impactor		40	70	100	115	160	240	330	460	530	610	710	800
50% strain	8km/h		100	160	230	280	370	630	770	1000	1300	1500	1700	1900
75% strain	23°C		200	290	410	500	670	1200	1500	2000	2800	3200	3550	4000
Equivalent modulus	ISO 844	MPa												
at 3% compression			1.4	2.5	3.7	5.1	6.7	10.3	14.3	18.5	23.1	28.2	33.9	40.6
Compressive strength	ISO 844	kPa												
25% strain			80	150	210	275	340	500	700	900	1150	1400	1700	2000
50% strain			150	220	300	370	475	700	960	1300	1600	2000	2500	3000
75% strain			370	460	600	800	1000	1600	2300	3200	4500	6000	7800	9600
Compression set**	ISO 1856 C	%												
25% strain – 22 hours – 23°C	Stabilising 24 hours		12.5	12	11.5	11.5	11.5	11	11	10.5	10.5	10.5	10.5	10.5
Tensile strength	ISO 1798	kPa												
			350	480	620	780	920	950	1130	1300	1700	1900	2100	2280
Tensile elongation	ISO 1798	%												
			29	29	28	27	26	15	13	12	11	9	8.5	7.5
Resilience after dynamic impact at 75% strain	5min after impact	%												
			99	97	96	94	93	90	88	85	82	80	**	**

* For ARPRO Colours, White and Grey please refer to the datasheet "Typical physical properties of ARPRO additional grades" or to the grade specific datasheet.

** Dynamic compression up to 75% is not recommended for ARPRO ≥ 180g/l

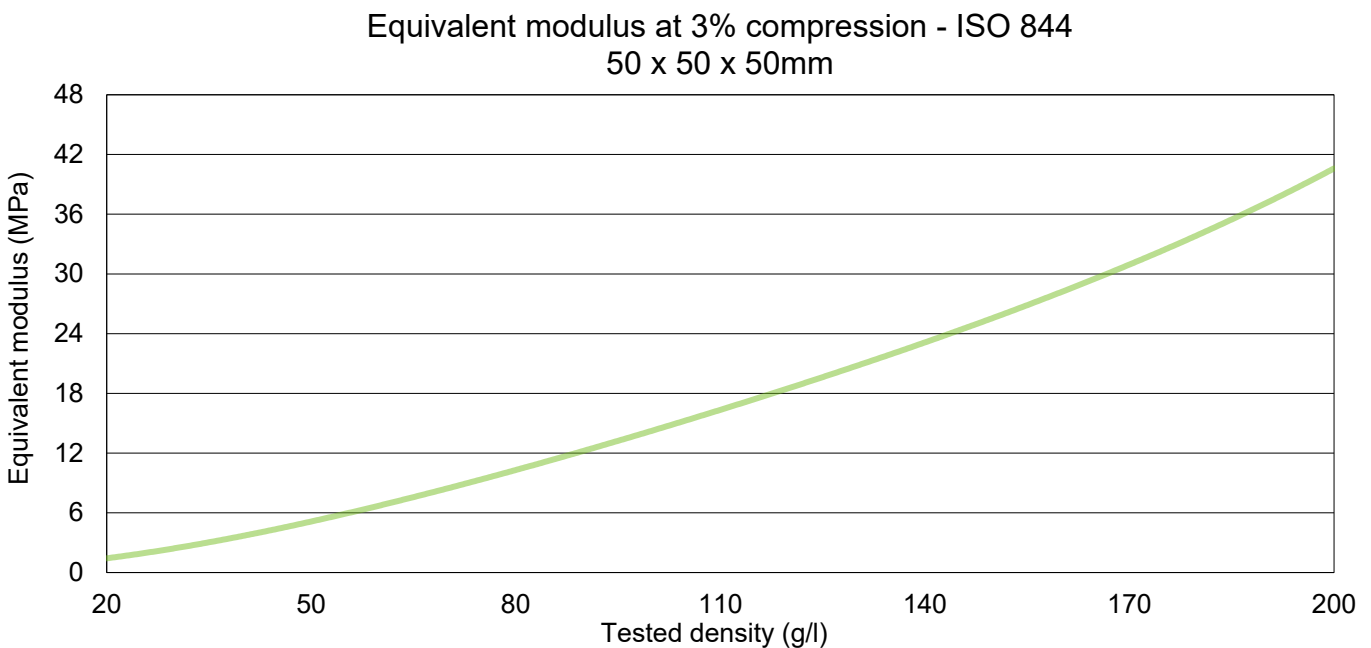
Energy absorption: The value measures the capability of ARPRO to dissipate impact energy.

Test method: A mass is dropped on a cubic test piece of 100 or 50mm at 8km/h. The impact weight and sample size are selected to ensure a minimum of 85% strain on the sample and therefore completely describe its performance characteristic. The deceleration of the impactor is recorded over the time and converted into the energy absorbed at different strain levels.



Equivalent Modulus: Characterisation of the slope at the beginning of the compressive curve when ARPRO is deformed in its elastic region.

Test method: ISO 844. The compressive stress at 3% deformation is recorded when a 50 x 50 x 50mm cube is uniaxially compressed at a rate of 5mm/min. The ratio of this stress over 3% of strain represents the equivalent modulus at 3% compression.



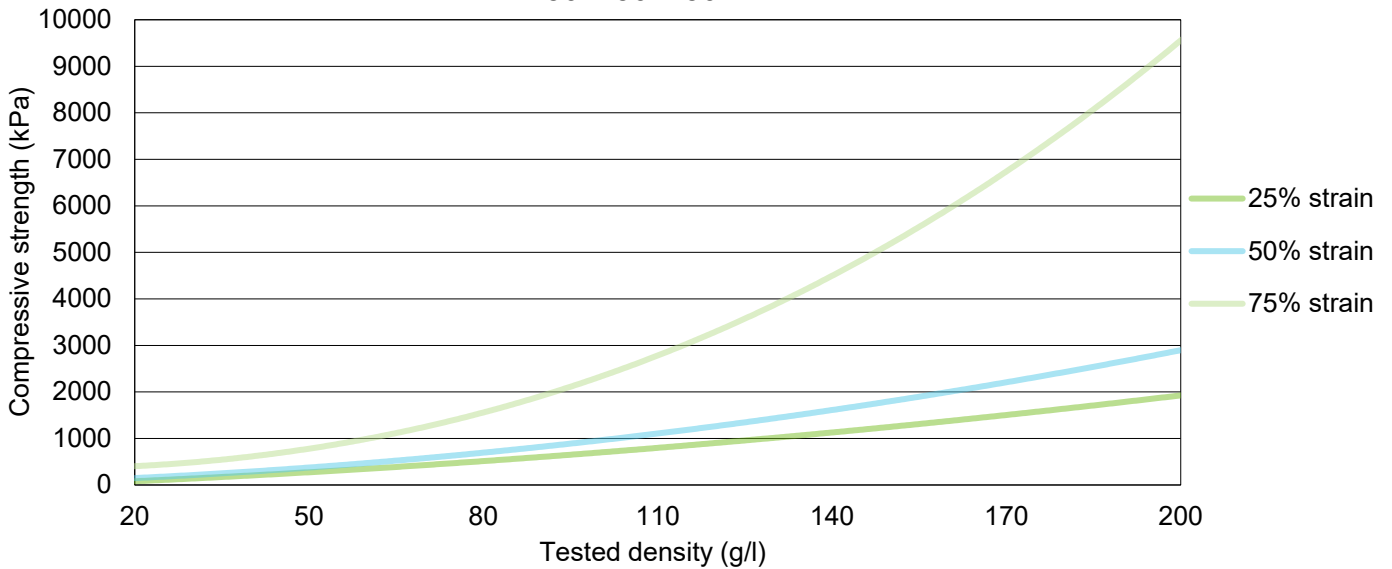
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Compressive strength: The ability of a material to resist forces that attempt to compress it.

Test method: ISO 844. Five 50*50*50mm cubes are compressed in an axial direction to the faces at a rate of 5mm/min, to a maximum of 85% compression. The compressive stress and corresponding relative deformation are recorded.

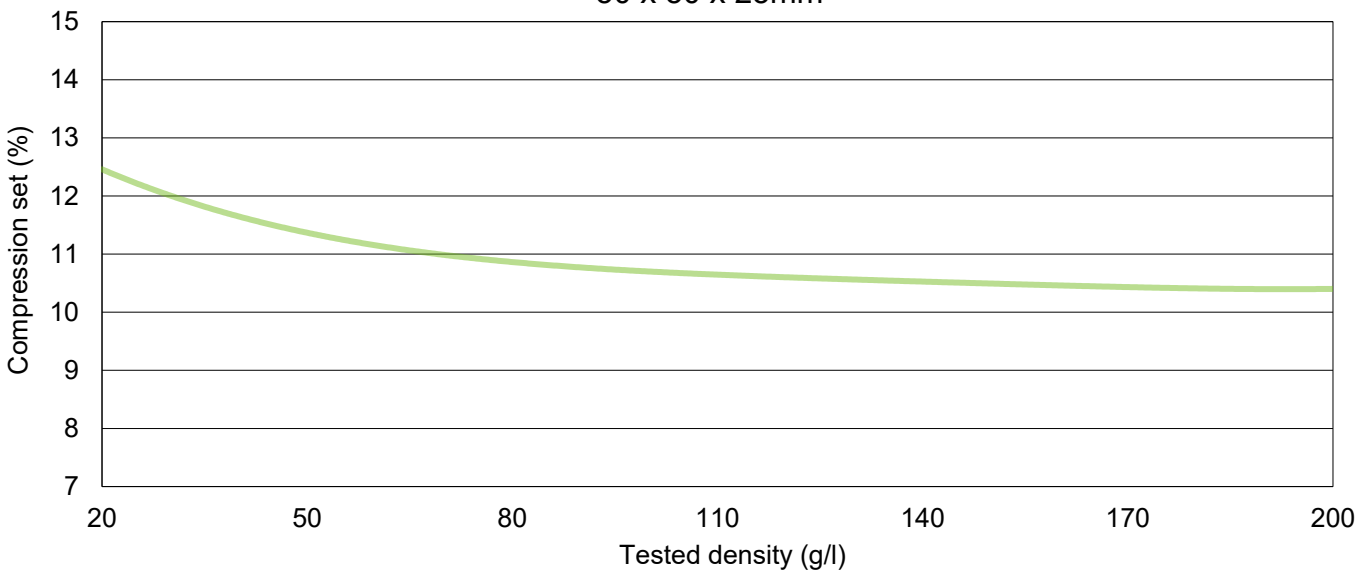
Compressive strength - ISO 844
50 x 50 x 50mm



Compression set: The ability to go back to original thickness after static deformation.

Test method: ISO 1856 C. Five 50*50*25mm samples are maintained for 22 hours at 23°C under 25% strain. The effect on the thickness 24 hours after the release is recorded.

Compression set - ISO 1856 C
50 x 50 x 25mm



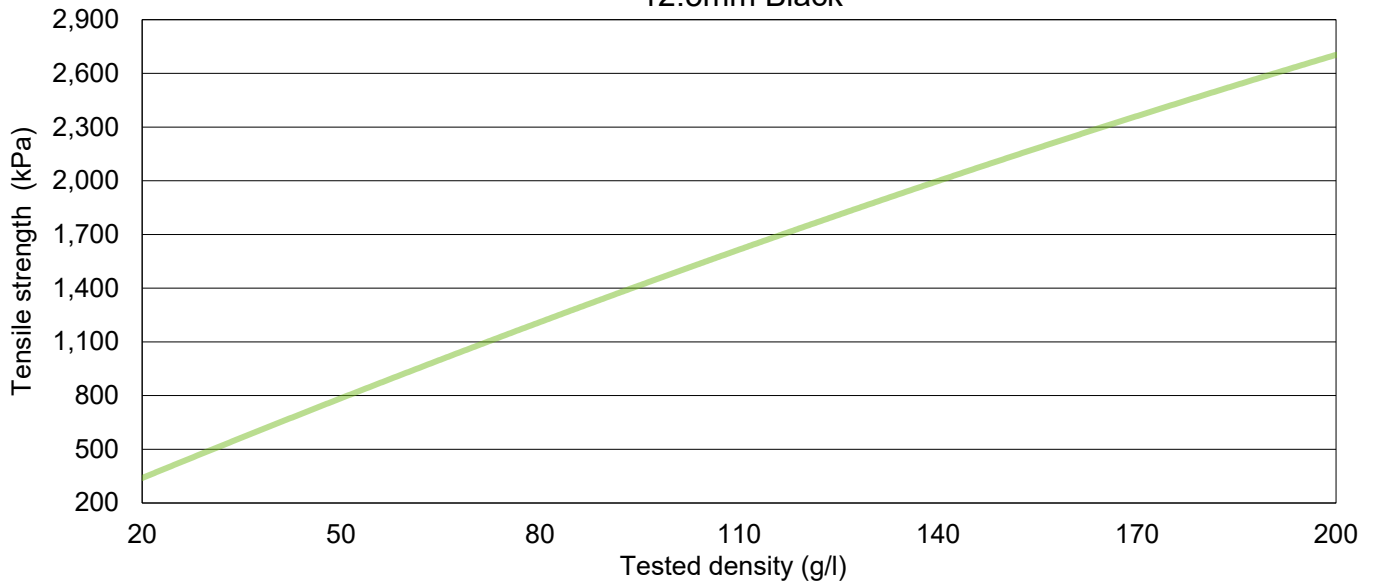


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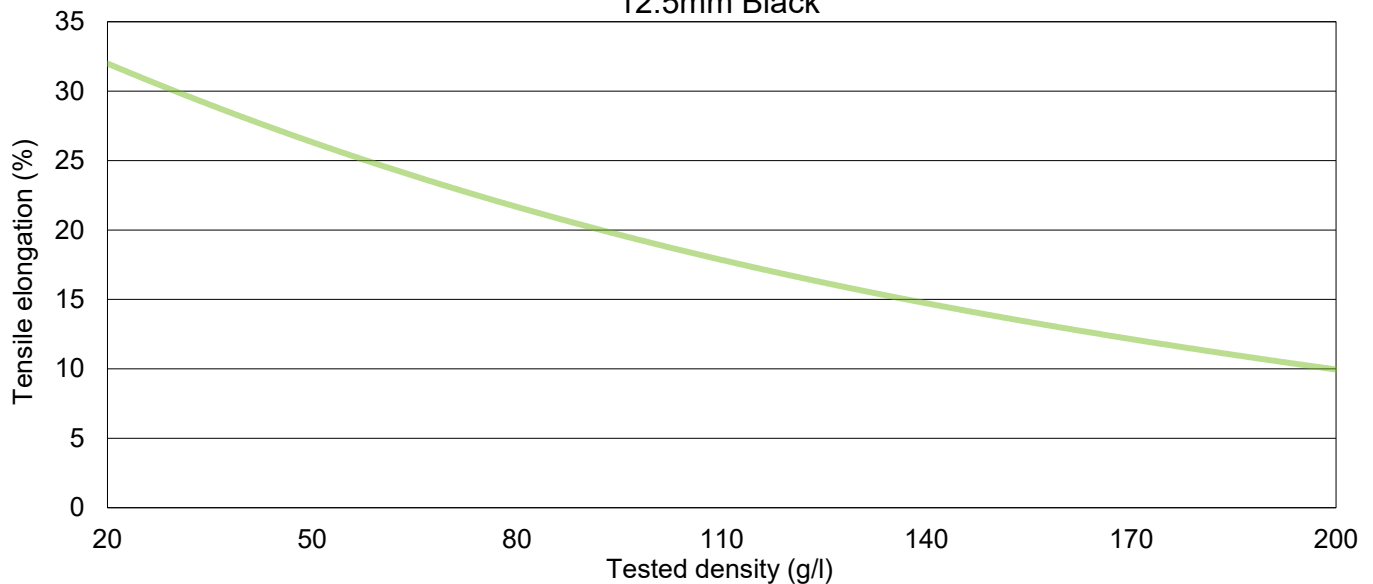
Tensile strength & elongation: The maximum strength and elongation that a material can withstand while being stretched or pulled before failing.

Test method: ISO 1798. Five 12.5mm thick test pieces (dumbbell shape) are extended at a constant rate of 500mm/min until they break. The strength & deformation at the break point are recorded.

Tensile strength - ISO 1798
12.5mm Black



Tensile elongation - ISO 1798
12.5mm Black



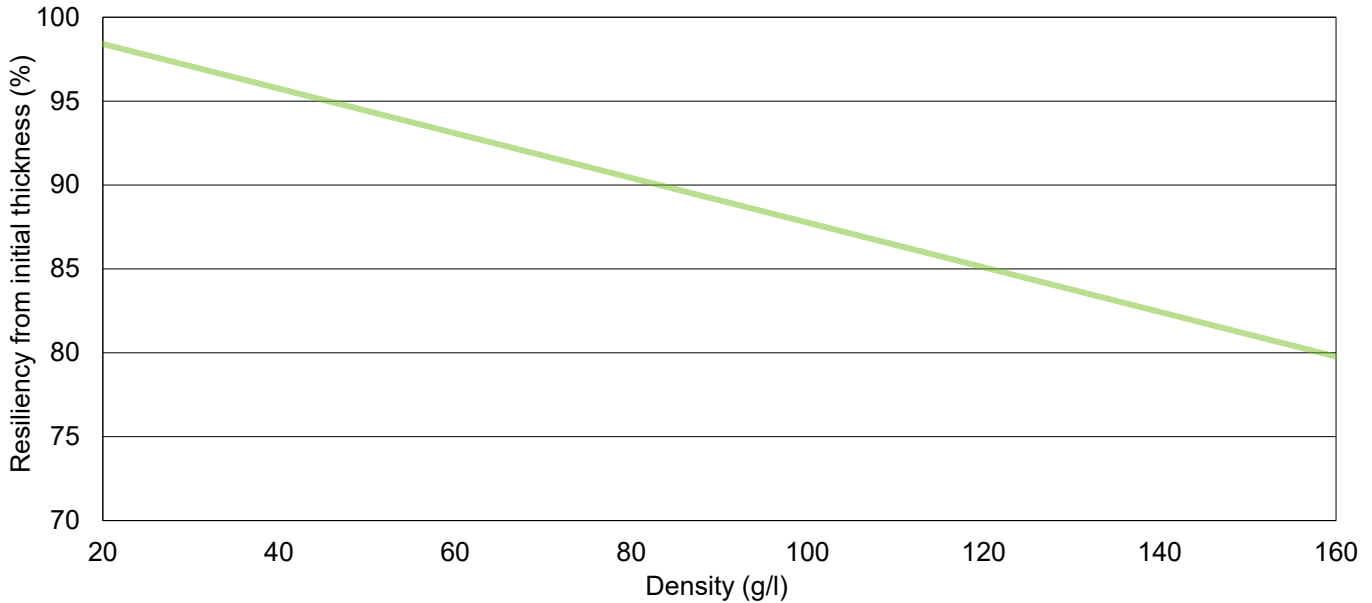
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Resilience after dynamic impact: The capability of ARPRO to recover after a dynamic compression.

Test method: A 50 or 100mm cube is impacted at 2.2m/s, with an impact weight selected to obtain 75% strain. The sample thickness is measured 5 minutes after the impact and then compared to the sample thickness before impact.

Resiliency after dynamic impact at 75%



Summary

The fusion level of parts is characterised by tensile strength and tensile elongation. The test shows that ARPRO has a good level of tensile strength and elongation, which means ARPRO is strong enough to handle further handling and mounting. This value also depends on the moulding parameters.

ARPRO is capable of handling significant loads with little loss of form or shape: the combination of compressive strength, compression set and multiple stress-strain tests illustrates this feature. The higher the density, the stiffer the material.

ARPRO is an excellent energy absorbing material compared to other lightweight materials.

Automotive parts should be designed with a minimum nominal density of 30g/l, allowing part weight tolerances.

ARPRO is 100% recyclable and we also provide recycled ARPRO.