



Hoses for Charge – Air Cooler, Turbo Charger

1 Scope

This standard covers the materials performance of elastomeric turbocharger hoses with three (3) layers.

Note: Four (4) layer hoses for higher service temperatures are specified in GMW15408, four (4) layer hoses with moderate temperature requirements are subject of GMW16144.

1.1 Material Description. Materials covered by this specification are divided into four (4) types.

1.1.1 Type A. Acrylonitrile Butadiene Rubber (NBR) respectively Polychloroprene (CR) lining, and Polychloroprene cover for +100 °C permanent and +125 °C peak temperatures.

1.1.2 Type B. Acrylic Ester/Ethylene Copolymer (AEM) in lining and cover for +160 °C permanent, and +175 °C peak temperatures. Can be used for turbo charger systems with Exhaust Gas Recirculation (EGR).

1.1.3 Type C. Polyacrylate Rubber (ACM) in lining and cover for +175 °C permanent, and +185 °C peak temperatures with occasional extreme peaks at +200 °C. Can be used for turbo charger systems with EGR.

1.1.4 Type D. Drawing defined (e.g., using SAE J200 or ASTM D2000 line callout).

1.1.5 Type E. Chlorinated Polyethylene Rubber (CM) in lining and cover for +125 °C permanent, and +135 °C peak temperatures.

1.1.6 Type F. AEM in lining and cover for +175 °C permanent, and +185 °C peak temperatures. Can be used for turbo charger systems with EGR.

All hoses shall have textile reinforcement suitable to fulfill the requirements of the material and durability tests.

1.2 Symbols. Not applicable.

1.3 Applicability. Hoses in turbo charger circuits.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM D2000	ISO 37	ISO 1431-1	ISO 23529
EN 10088-2	ISO 188	ISO 1817	SAE J200
ISO 36	ISO 815	ISO 7619-1	

2.2 GM Standards/Specifications.

GMW3059	GMW16153	GMW16955	GMW17245
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3 Requirements

3.1 Resources.

3.1.1 Test Samples. Unless otherwise specified, the shape, size and number of test pieces shall be in accordance with the relevant test procedures. Unless otherwise specified, samples are finished parts or to be taken from finished parts. If not otherwise stated, mechanical properties in delivery state and after heat or fluid immersion, are to be tested at +23 °C and with the same test methods.

3.1.2 Conditioning. Conditioning shall be as specified in the relevant test procedures.

3.1.3 Equipment. Conforming to the relevant test procedures.

3.1.4 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.5 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this specification shall be determined correctly with respect to its physical definition.

3.1.6 Facilities. Conforming to the relevant test procedures.

3.1.7 Deviations. Deviations from the requirements of this standard shall have been agreed upon. Such deviations shall be specified on component drawings, test certificates, reports, etc.

3.2 Material and Performance Requirements. Material and Performance Requirements are summarized in Table 1, Table 2, and Table 3.

Table 1: Material and Performance Properties, Requirements for the Lining

Property	Test Method	Unit	Value
Hardness			
Type A, Type E	ISO 7619-1	Shore A	75 + 5 -10
Type B	ISO 7619-1	Shore A	65 + 5 -10
Type C,	ISO 7619-1	Shore A	55 ± 5
Type D	As specified on drawing/math data file	Shore A	As specified on drawing
Type F	ISO 7619-1	Shore A	65 ± 5
Elongation at Break			
Type A, Type B, Type C, Type E, Type F	ISO 37, Type 2 dumbbell or Type 4 dumbbell, 200 mm/minute ± 20 mm/minute	%	200 Minimum
Type D	As specified on drawing/math data file	%	As specified on drawing
Tensile Strength			
Type A, Type B, Type F	ISO 37, Type 2 dumbbell or Type 4 dumbbell, 200 mm/minute ± 20 mm/minute	MPa	10 Minimum
Type C	ISO 37, Type 2 dumbbell or Type 4 dumbbell, 200 mm/minute ± 20 mm/minute	MPa	9 Minimum
Type D	As specified on drawing/math data file	MPa	As specified on drawing
Type E	ISO 37, Type 2 dumbbell or Type 4 dumbbell, 200 mm/minute ± 20 mm/minute	MPa	12 Minimum
Age Resistance (Heat Aging)			
Type A	ISO 188 Method B, 504 h -2 h at +100 °C ± 3 °C Change in Hardness Change in Elongation at Break Change in Tensile Strength	Shore A % %	+15 Maximum -40 Maximum -20 Maximum
Type A	ISO 188 Method B, 72 h -2 h at +125 °C ± 3 °C Change in Hardness Change in Elongation at Break Change in Tensile Strength	Shore A % %	+10 Maximum -40 Maximum -20 Maximum
Type B	ISO 188 Method B, 504 h -2 h at +160 °C ± 3 °C Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	% % % MPa	-50 Maximum 130 Minimum -30 Maximum 10 Minimum

Property	Test Method	Unit	Value
Age Resistance (Heat Aging), continued			
Type B	ISO 188 Method B, 168 h -2 h at +175 °C ± 3 °C Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	% % % MPa	-50 Maximum 150 Minimum -30 Maximum 10 Minimum
Type C	ISO 188 Method B, 504 h -2 h at +175 °C ± 3 °C Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	% % % MPa	-50 Maximum 130 Minimum -30 Maximum 7 Minimum
Type C, Type F	ISO 188 Method B, 168 h -2 h at +185 °C ± 3 °C Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	% % % MPa	-50 Maximum 150 Minimum -30 Maximum 7 Minimum
Type C, Type F	ISO 188 Method B, 72 h -2 h at +200 °C ± 3 °C Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	% % % MPa	-50 Maximum 150 Minimum -30 Maximum 7 Minimum
Type D	As specified on drawing/math data file		As specified on drawing
Type E	ISO 188 Method B, 504 h -2 h at +125 °C ± 3 °C Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	% % % MPa	-50 Maximum 130 Minimum -30 Maximum 12 Minimum
Type E	ISO 188 Method B, 168 h -2 h at +135 °C ± 3 °C Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	% % % MPa	-50 Maximum 150 Minimum -30 Maximum 12 Minimum
Type F	ISO 188 Method B, 504 h -2 h at +175 °C ± 3 °C Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	% % % MPa	-60 Maximum 130 Minimum -60 Maximum 7 Minimum
Oil Resistance			
Type A	ISO 1817 to pre-aged engine oil (GMW17245); 168 h -2 h; at +70 °C ± 3 °C Change in Hardness Change in Volume	Shore A %	+15 Maximum ± 15 Maximum
Type B	ISO 1817 to pre-aged engine oil (GMW17245); 168 h -2 h; at +150 °C ± 3 °C Change in Hardness Change in Volume Change in Elongation at Break Change in Tensile Strength	Shore A % % %	± 10 Maximum -5 to +15 Maximum -50 Maximum -30 Maximum
Type C, Type F	ISO 1817 to pre-aged engine oil (GMW17245); 168 h -2 h; at +175 °C ± 3 °C Change in Hardness Change in Volume Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	Shore A % % % % MPa	± 10 Maximum -5 to +15 Maximum -50 Maximum 180 Minimum -30 Maximum 8 Minimum

Property	Test Method	Unit	Value
Oil Resistance, continued			
Type D	As specified on drawing/math data file	%	As specified on drawing
Type E	ISO 1817 to pre-aged engine oil (GMW17245); 168 h -2 h; at +125 °C ± 3 °C Change in Hardness Change in Volume Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	Shore A % % % % MPa	± 10 Maximum -5 to +15 Maximum -50 Maximum 180 Minimum -30 Maximum 12 Minimum
Resistance to Exhaust Gas Recirculation Fluid			
Type B	ISO 1817 to EGR fluid (see Appendix A) 336 h -2 h; at +100 °C ± 3 °C Change in Hardness Change in Volume Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength after additional drying at +80 °C ± 3 °C for 22 h -2 h Change in Hardness Change in Volume Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	Shore A % % % % MPa Shore A % % % % MPa	-10 Maximum -5 to +15 Maximum -35 Maximum 180 Minimum -30 Maximum 12 Minimum +10 Maximum -10 Maximum -35 Maximum 150 Minimum -30 Maximum 10 Minimum
Type B	ISO 1817 to EGR fluid (see Table A1, Appendix A) 1008 h -2 h; at +60 °C ± 3 °C Change in Hardness Change in Volume Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength after additional drying at +80 °C ± 3 °C for 22 h -2 h Change in Hardness Change in Volume Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	Shore A % % % % MPa Shore A % % % % MPa	-10 Maximum -5 to +15 Maximum -35 Maximum 180 Minimum -30 Maximum 10 Minimum +10 Maximum -10 Maximum -35 Maximum 150 Minimum -30 Maximum 10 Minimum
Type C	ISO 1817 to EGR fluid (see Table A1, Appendix A) 336 h -2 h; at +100 °C ± 3 °C Change in Hardness Change in Volume Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength after additional drying at +80 °C ± 3 °C for 22 h -2 h Change in Hardness Change in Volume Change in Elongation at Break Elongation at Break Change in Tensile Strength Tensile Strength	Shore A % % % % MPa Shore A % % % % MPa	-10 Maximum +30 Maximum -35 Maximum 180 Minimum -30 Maximum 9 Minimum +20 maximum -10 maximum -35 maximum 150 minimum -30 maximum 9 minimum