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| GM WORLDWIDE ENGINEERING STANDARDS | **Material Specification** | **GMW15348** |

# Power Steering Return and Remote Reservoir Hose

## 1 Scope

This standard covers the material requirements of hose used in hydraulic steering applications as a flexible connection between the power steering gear and the power steering pump or pump reservoir. It also covers hose assemblies with end fittings or user-applied clamps secured to the hose as required by engineering drawings.

**1.1 Material Description.** Materials covered by this standard are divided into several sets of constructions and categories. The “Construction” of hose defines both the material content and construction of the hose. The “Category” of the hose defines the fluid with which it has been qualified for service. The hose is, therefore, defined as “GMW15348 Type “XYZ,” where “X” refers to the construction of the hose, the “Y” refers to the category to which the hose has been qualified for service, and “Z” refers to the pressure rating of the hose. The material “Type” is defined by a combination of its construction, category, and pressure rating. It is possible for a hose to be approved to more than one (1) type.

**1.1.1 Construction.** The “Construction” of hose defines the material content and construction of the hose. All hoses shall have a reinforcement of textile braid. Hoses shall be black. The hoses and/or hose assemblies are capable of giving satisfactory service in an automobile from temperatures of -40 °C to the continuous and excursion temperatures shown in Construction A through Construction C. The descriptions of the constructions of hose used for this application are as in 1.1.1.1 through 1.1.1.3.

**1.1.1.1 Construction A.** This hose consists of a smooth bore tube of chlorinated polyethylene (CM) or chlorosulfonated polyethylene (CSM) compound, resistant to Dexron® VI, reinforced with textile braid, and a cover of CM or CSM compound. The hose and/or hose assembly is capable of giving satisfactory service at temperatures of -40 °C to +125 °C with intermittent operation at temperatures up to +135 °C maximum.

**1.1.1.2 Construction B.** This hose consists of a smooth bore tube of hydrogenated nitrile butadiene rubber (HNBR) compound or ethylene acrylate (AEM) compound, resistant to Dexron® VI, reinforced with textile braid, and a cover capable of meeting the requirements in Table 1 and Table 2. The hose and/or hose assembly is capable of giving satisfactory service temperatures of -40 °C to +150 °C with intermittent operation at temperatures up to +160 °C maximum.

**1.1.1.3 Construction C.** This hose consists of a smooth bore tube of acrylate (ACM) or ethyl acrylate (AEM) compound or equivalent, resistant to Dexron® VI, reinforced with textile braid, and a cover capable of meeting the requirements in Table 1 and Table 2. The hose and/or hose assembly is capable of giving satisfactory service at temperatures of -40 °C to +160 °C with intermittent operation at temperatures up to +175 °C maximum.

**1.1.2 Categories.** The “Category” of hose defines the power steering fluid with which it has been qualified for service. The description of the fluids used with this hose is as in 1.1.2.1 through 1.1.2.3.

**1.1.2.1 Category 1.** This category corresponds to service with hydraulic power steering fluid, GM part number 9985010.

**1.1.2.2 Category 2.** This category corresponds to service with Pentosin power steering fluid, GM part number 9274926 (B 040 2012).

**1.1.2.3 Category 3:** This category corresponds to service with Dexron® VI transmission fluid, GM part number 9986153.

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**1.1.3 Pressure Rating.** The “Pressure Rating” of hose defines the minimum burst pressure of the hose at temperatures from -40 °C to +20 °C per Table 3 of this specification for return hose. The maximum operating pressure at a specific temperature for each “Pressure Rating” for power steering return hose corresponds to 25% of the minimum burst pressure at that temperature. Remote reservoir hose has only one (1) “Pressure Rating” of “D” corresponding to a minimum burst pressure of 1.2 MPa at +20 °C, and a maximum working pressure of 0.05 MPa at +20 °C. For return hose, the +20 °C minimum burst pressures corresponding to the various “Pressure Ratings” are as in 1.1.3.1 and 1.1.3.2.

**1.1.3.1 Pressure Rating A.** This “Pressure Rating” corresponds to a minimum +20 °C burst of 6.7 MPa.

**1.1.3.2 Pressure Rating B.** This “Pressure Rating” corresponds to a minimum +20 °C burst of 13 MPa.

**1.2 Symbols.** Not applicable.

**1.3 Applicability.** Hoses used in hydraulic steering applications.

## 2 References

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

**2.1 External Standards/Specifications.**

| | | | |
|---|---|---|---|
| ASTM D395 | ASTM D471 | ISO 37 | ISO 1431-1 |
| ASTM D412 | ASTM D865 | ISO 188 | ISO 1817 |
| ASTM D413 | ISO 36 | ISO 815 | |

**2.2 GM Standards/Specifications.**

| | | | |
|---|---|---|---|
| 9985010 | B 040 2012 | GMW14264 | GMW15422 |
| 9986153 | GMW3059 | GMW14291 | |

**2.3 Additional References.**

- 9274926 – GM Part Number.
- TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).

## 3 Requirements

### 3.1 Resources

**3.1.1 Test Samples.** Unless otherwise specified, the shape and size of test pieces shall be in accordance with the relevant test procedure. Minimum of six (6) test samples of hoses are required for initial sample testing. Minimum of three (3) test samples of hoses are required for inspection testing.

Samples are finished parts or to be taken from finished parts. Where the dimensions on the finished parts do not allow preparing of test pieces, tests are to be performed on sheet material of same production batch. The same state of cure between slabs or buttons and finished parts must be assured by appropriate tests, which must be described in the test report.). Finished crimp hose assemblies used as test samples must be tested 24 h or longer after the assemblies have been crimped.

If not otherwise stated, mechanical properties in delivery state and after heat or fluid immersion are to be tested at +23 °C ± 5 °C and with the same test methods. Unless otherwise stated, ambient temperature test conditions shall be held to +23 °C ± 5 °C. Unless otherwise stated, all other temperatures except +23 °C ± 5 °C shall be held to ±3 °C.

**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.

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**3.2 Material and Performance Requirements.**

**3.2.1 Design Validation Testing.** Material properties (material/compound approval) are summarized in Table 1. Performance requirements (construction approval), are summarized in Table 2. For full approval of hose, compliance to the requirements of Table 1 and Table 2 is needed.

**3.2.2 Product Validation Testing.** If not defined otherwise, the following testing should be done for production audit testing:

- All tests per Table 1.
- Table 2 tests: Burst Strength, Tensile Test, and Accelerated Pressure Impulse Test.

**3.2.3 Audit/Inspection Testing.** If not defined otherwise, the following testing should be done for production audit testing:

- All tests per Table 1, except Long Term Aging.
- Table 2 tests: Burst Strength, Tensile Test.

**Table 1: Material Properties**

**Properties for the Cover**

| Property | Test Procedure | Unit | Value |
|---|---|---|---|
| **Elongation at Break, As-Received** | | | |
| All Constructions | ASTM D412 or<br>ISO 37, Type 2 or Type 4 dumbbell,<br>200 mm/minute ± 20 mm/minute | % | 100 Minimum |
| **Tensile Strength, As-Received** | | | |
| All Constructions | ASTM D412 or<br>ISO 37, Type 2 or type 4 dumbbell,<br>200 mm/minute ± 20 mm/minute | MPa | 10 Minimum |
| **Age Resistance (Heat Aging)** | | | |
| Construction A | ASTM D865 or ISO 188 Method B,<br>72 +0 h/-2 h at 135 °C ± 3 °C.<br>Change of elongation at break<br>Change of tensile strength | <br><br>%<br>% | <br><br>-40 Maximum<br>-25 Maximum |
| Construction B | ASTM D865 or ISO 188 Method B,<br>72 +0 h/-2 h at 160 °C ± 3 °C.<br>Change of elongation at break<br>Change of tensile strength | <br><br>%<br>% | <br><br>-25 Maximum<br>-20 Maximum |
| Construction C | ASTM D865 or ISO 188 Method B,<br>72 +0 h/-2 h at 175 °C ± 3 °C.<br>Change of elongation at break<br>Change of tensile strength | <br><br>%<br>% | <br><br>-25 Maximum<br>-20 Maximum |
| **Age Resistance (Heat Aging) Long Term** | | | |
| Construction A | ASTM D865 or ISO 188 Method B,<br>1008 +0 h/-2 h at 125 °C ± 3 °C.<br>Elongation at break<br>Change of elongation at break<br>Tensile strength<br>Change of tensile strength | <br><br>%<br>%<br>MPa<br>% | <br><br>100 Minimum<br>-50 Maximum<br>10 Minimum<br>-20 Maximum |
| Construction B | ASTM D865 or ISO 188 Method B,<br>1008 +0 h/-2 h at 150 °C ± 3 °C<br>Elongation at break<br>Change of elongation at break<br>Tensile strength<br>Change of tensile strength | <br><br>%<br>%<br><br>% | <br><br>100 Minimum<br>-40 Maximum<br>10 Minimum<br>-20 Maximum |

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