



FLUID, ULTRA LOW VISCOSITY (ULV) AUTOMATIC TRANSMISSION

WSS-M2C949-A

1. SCOPE

The material defined by this specification is for factory fill automatic transmission fluid (ATF) composed of base oil and additives.

2. APPLICATION

This specification was released originally for factory fill applications (including top offs) of new automatic transmissions for improved fuel economy. This fluid was originally released for use in 9- and 10 speed automatic transmissions developed jointly by Ford and General Motors.

3. REQUIREMENTS

Material specification requirements are to be used for initial qualification of materials.

3.1 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements for Production Materials (WSS-M99P1111-A).

3.2 COLOR

(ASTM D1500)

Red, 6.0 – 8.0

3.3 VISCOSITY

3.3.1 New/Fresh fluid

At 150 °C

(ASTM D445)

Report

At 100 °C

(ASTM D445)

4.6 to 4.4 mm²/sec

At 40 °C

(ASTM D445)

22 mm²/sec, min

At -10 °C

(ASTM D2983)

Report

At -40 °C

(ASTM D2983)

10000 mPa.s max

3.3.2 Base Oil Viscosity

At 100 °C

(ASTM D445)

3.6 mm²/sec, min

3.3.3 Viscosity Index

(ASTM D2270)

135 min.

3.3.4 Shear Stability (CEC L-45-T93)

After 20 h KRL, KV at 100 °C

4.2 mm²/s, min

After 40 h KRL, KV at 100 °C

4.0 mm²/s, min

3.3.5 High Temperature

(ASTM D4683)

High Shear (at 150 °C)

2.00 mPa.s, min.

3.3.6 Evaporation loss, 150 °C, 2 h.

(Modified NOACK Test)

10% max

3.3.7 After NOACK Test, Viscosity at -40 °C

2000 mPa.s max change

Date	Action	Revisions	Rev. 0
2014 01 02	Released		



Documents

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- 3.3.8 Cold Crank Simulation
CCS -30 °C (ASTM D5293) 2000 mPa.s max.
CCS -35 °C (ASTM D5293) 3000 mPa.s max.
- 3.4 **FLUID FILM THICKNESS (EHD)**
(at 60, 80, 100 and 120 °C). Report
- 3.5 **TEMPERATURE IN DEEP-GROOVE THRUST BALL BEARING**
(PV 1454-ARKL, modified Shell four-ball per DIN 51 350 Part 1) Report
- 3.6 **FLASH POINT**
(ASTM D92) 180 °C min
- 3.7 **FIRE POINT**
(ASTM D92) 200 °C min
- 3.8 **POUR POINT**
(ASTM D97) -50 °C max
- 3.9 **DENSITY** (at 15 °C)
(ASTM D4052) 0.841 gm/cc +/- 0.005
- 3.10 **ANTI FOAMING PROPERTIES**
(ASTM D892 for Seq I, II and III. ASTM D6082 for Sequence IV)
Volume below is in mls and are maximum allowed volumes.
- | | New | Post KRL
(20 h) | Thermal Aging
130 °C for 90 h | Post Cycling Test |
|--------------|--------|--------------------|----------------------------------|-------------------|
| Sequence I | 50 / 0 | 50 / 0 | 50 / 0 | 50 / 0 |
| Sequence II | 50 / 0 | 50 / 0 | 50 / 0 | 50 / 0 |
| Sequence III | 50 / 0 | 50 / 0 | 50 / 0 | 50 / 0 |
| Sequence IV | 50 / 0 | 100 / 0 | 150 / 0 | 150 / 0 |
- 3.11 **AERATION TEST**
(GM Method, Contact SWRI or Intertek)
- Aeration % at 60 °C < 2% compared to reference
Aeration % at 90 °C < 2% compared to reference
Aeration % at 120 °C < 2% compared to reference
De-aeration Time at 60 °C < 5 sec compared to reference
De-aeration Time at 90 °C < 5 sec compared to reference
De-aeration Time at 120 °C < 5 sec compared to reference
- 3.12 **COPPER STRIP** 1b max
(ISO 2160/ASTM D130, 3 h at 150 °C, no water added)
- Extended durability test (6 weeks ageing test, 150 °C)
Copper content, ppm Rate & Report
- 3.13 **NONCORROSION AND NONRUSTING PROPERTIES** No visible rust
(ASTM D665, Procedure A, 24 h)

**3.14 ELASTOMER COMPATIBILITY**

3.14.1 ATRR-101 Nitrile after aging 168 h at 150 +/- 3 °C per ASTM D471, para 6.1, with aluminum block, must be within the limits below:

- Volume change from original -3 to 4%
- Hardness, Durometer A change from original 0 to 10

3.14.2 ATRR-201 Polyacrylic, after aging 70 h at 163 +/- 3 °C in per ASTM D471, para 6.1, with aluminum block, must be within the limits below:

- Volume change from original 0 to 6%
- Hardness, Durometer A change from original +/- 5

3.14.3 ATRR-206 Polyacrylic after aging 70 h in candidate fluid at 150 +/-1 °C per ASTM D471

- Volume change from original Rate & Report
- Hardness, Durometer A change from original Rate & Report

3.14.4 ATRR-207 Polyacrylic after aging 70 h in candidate fluid at 150 +/-1 °C per ASTM D471

- Volume change from original Rate & Report
- Hardness, Durometer A change from original Rate & Report

3.14.5 ATRR-400 Fluoroelastomer after aging 240 h at 163 +/- 3 °C per ASTM D471, para 6.1, with aluminum block, must be within the limits below:

- Volume change from original 0 to 4%
- Hardness, Durometer A change from original +/- 8

3.14.6 ATRR-406 Fluorelastomer after aging 70 h in candidate fluid at 150 +/-1 °C per ASTM D471

- Volume change from original Rate & Report
- Hardness, Durometer A change from original Rate & Report

3.14.7 ATRR-407 Fluorelastomer after aging 70 h in candidate fluid at 150 +/-1 °C per ASTM D471

- Volume change from original Rate & Report
- Hardness, Durometer A change from original Rate & Report

3.14.8 ATRR-408 Fluorelastomer after aging 70 h in candidate fluid at 150 +/-1 °C per ASTM D471

- Volume change from original Rate & Report
- Hardness, Durometer A change from original Rate & Report

3.14.9 ATRR-500 Ethylene-Acrylic after aging 240 h at 163 +/- 3 °C per ASTM D471, para 6.1, with aluminum block, must be within the limits below:

- Volume change from original 5 to 15%
- Hardness, Durometer A change from original +/- 5



- 3.14.10 ATRR-506 Ethylene-Acrylic after aging 70 h in candidate fluid at 150 +/- 1 °C per ASTM D471
- Volume Change from original Rate & Report
 - Hardness, Durometer A change from original Rate & Report
- 3.14.11 ATRR-507 Ethylene-Acrylic after aging 70 h in candidate fluid at 150 +/- 1 °C per ASTM D471
- Volume Change from original Rate & Report
 - Hardness, Durometer A change from original Rate & Report
- 3.14.12 ATRR-600 Hypalon after aging 240 h in candidate fluid at 163 +/- 1 °C per ASTM D471, para 6.1, with aluminum block or fluid bath, must be within the limits below:
- Volume change from original 5 to 35%
 - Hardness, Durometer A change from original -30 to 0
- 3.14.13 ATRR-700 Hydrogenated Nitrile after aging 240 h in candidate fluid at 163 +/- 1 °C per ASTM D471, para 6.1, with aluminum block, must be within the limits below:
- Volume change from original -2 to 4%
 - Hardness, Durometer A change from original 0 to 5
- 3.14.14 ATRR-706 Hydrogenated Nitrile after aging 70 h in candidate fluid at 150 +/- 1 °C per ASTM D471
- Volume change from original Rate & Report
 - Hardness, Durometer A change from original Rate & Report

3.15 ODOR

The fluid manufactured to this specification shall meet the Transmission and Driveline Engineering (TDE) Odor Test procedure. The fluids shall be found to be acceptable when it receives an acceptability rating of 2 or less.

3.16 TOXICITY

The fluid manufactured and formulated to this specification must not contain skin sensitization components. The entire formulation must be reviewed and approved for use by Ford Toxicology Department. MSDS must accompany all containers other than tank cars quantities and Ford Toxicology Identification Number must be prominently displayed.

3.17 WEAR

- 3.17.1 Vane Pump Wear Test, wt. loss
(ASTM D7043 at 80 +/- 3 °C, 6.9 mPa) 10 mg max
- 3.17.2 Four-Ball Wear Test, 40 Kg load, 2 h
(ASTM D4172)
- Average Wear Scar Diameter
600 RPM, 100 °C (Average of 2 tests) 0.6 mm max
600 RPM, 150 °C (Average of 2 tests) 0.6 mm max