

***The following procedures cover MERCON®***

## **Miscibility**

### **Specifications**

This procedure covers MERCON®.

### **Objective**

The objective is to determine whether a fluid is miscible with automatic transmission fluids.

### **Field service simulated**

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### **Procedure fixture**

Performance of this procedure requires sample jars, ASTM cloud and pour point thermometers, refrigeration apparatus, metal sample jar holder, and hot oil bath.

### **Procedure parameters**

Two jars are partially filled with procedure fluid and mixed with reference fluids while one jar is filled with procedure fluid only. A series of cooling and heating is performed with observations at certain temperatures to determine pour point, separation, and color changes.

### **Procedure parts evaluated**

The procedure fluid is evaluated.

### **Pass/fail criteria**

Pass/fail criteria require that there be no separation or color change at the end of procedure.

## **Viscosity**

### **Specifications**

This procedure covers MERCON®.

### **Objective**

The objective is to determine viscosity of procedure fluid at 100°C, -18°C and -40°C for new fluids and viscosity at 100°C and -18°C for used fluids.

### **Field service simulated**

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### **Procedure fixture**

Performance of this procedure requires glass capillary-type viscometers, glass tube holders, viscometer thermostat and bath, temperature measuring and timing devices, Brookfield viscometer and stand for low-temperature viscosity measurement.

### **Procedure parameters**

New fluid is tested at 100°C, -18, and -40°C. At 100°C, the fluid is put into a glass capillary viscometer and placed in a bath at 100°C until the temperature stabilizes. The time is measured for the fluid to flow from one calibration mark to another. This time, along with the viscometer tube factor, is used to determine the kinematic viscosity tube factor. For the measurements at -18°C and -40°C, the procedure fluid is cooled to the appropriate temperature and then placed in the Brookfield viscometer following ASTM designation D 2983.

### **Procedure parts evaluated**

The procedure fluid is evaluated.

### **Pass/fail criteria**

The pass/fail criteria are as follows:

100°C (ASTM D 445)	6.8 mm 2/5 min
-18°C (ASTM D 2983)	1,700 mPa-s max
-40°C (ASTM D 2983)	20,000 mPa-s max

## Noack Volatility Procedure

### Specifications

This procedure covers MERCON®.

### Objective

The objective is to determine evaporation of a procedure fluid at high temperature and -40°C Brookfield viscosity of used fluid.

### Field service simulated

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### Procedure fixture

The Noack volatility procedure machine is evaluated.

### Procedure parameters

The fluid is weighed initially, and then heated with slight vacuum to 150°C for one hour. After cooling, the fluid is reweighed.

### Procedure parts evaluated

The procedure fluid is evaluated.

### Pass/fail criteria

There is no pass/fail requirement at this time.

## Flash Point

### Specifications

This procedure covers MERCON®.

### Objective

The objective is to determine flash point by ASTM designation D 92.

### Field service simulated

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### Procedure fixture

Performance of this procedure requires a procedure cup, heating plate, procedure flame applicator, heater, shield, and thermocouple.

### Procedure parameters

Fill the cup with the proper amount of fluid. Heat fluid and, when approaching anticipated flash point, pass procedure flame over cup. Flash point is that temperature when the procedure fluid first flashed.

### Procedure parts evaluated

The procedure fluid is evaluated.

### Pass/fail criteria

The pass/fail criterion is 177°C minimum.

## **Copper Strip Procedure**

### **Specifications**

This procedure covers MERCON®.

### **Objective**

The objective is to determine copper strip corrosion by ASTM designation D 130.

### **Field service simulated**

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### **Procedure fixture**

Performance of this procedure requires 125 ml bottle, heating oven or bath, and metal specimen conforming to ASTM D 130.

### **Procedure parameters**

Place the copper strip in bottle and cover with procedure fluid. Heat at 150°C for 3 hours.

### **Procedure parts evaluated**

The copper strip is evaluated.

### **Pass/fail criteria**

The pass/fail criterion is 1b maximum.

## **Noncorrosion and Nonrusting**

### **Specifications**

This procedure covers MERCON®.

### **Objective**

The objective is to determine corrosion and rusting by ASTM designation D 665.

### **Field service simulated**

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### **Procedure fixture**

Performance of this procedure requires an oil bath, 400 ml beaker, beaker cover, stirrer, grinding and polishing equipment.

### **Procedure parameters**

Polish the specimens as per procedure. Fill beaker with 300 ml of procedure fluid and 20 ml of distilled water. Insert the procedure specimen and spin at 1000 rpm for 24 hours. Remove and rate the specimens.

### **Procedure parts evaluated**

The procedure specimens (pins) are evaluated.

### **Pass/fail criteria**

There must be no rust on procedure pins.

## Vane Pump Wear Procedure

### Specifications

This specification covers MERCON®.

### Objective

The objective is to determine the fluid anti-wear characteristics by ASTM designation D 2882.

### Field service simulated

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### Procedure fixture

Performance of this procedure requires the procedure fixture be an electric motor-driven Vickers 104-C pump mounted on a stand capable of controlling speed, temperatures, and pressures.

### Procedure parameters

The fluid is tested for 100 hours at 1000 psi and 175°F.

### Procedure parts evaluated

The weight loss to ring and vanes, any unusual wear, scuffing, deposits, and deterioration to seals are evaluated.

### Pass/fail criteria

The total weight loss must not be more than 10 mg maximum.

## Color

### Specifications

This procedure covers MERCON®.

### Objective

The objective is to determine the color of the procedure fluid.

### Field service simulated

This procedure simulates uniform identification by sight.

### Procedure fixture

Performance of this procedure requires a sample container and a colorimeter consisting of light source, glass color standards, and sample container housing with cover and viewing piece.

### Procedure parameters

Using a standard light source, the liquid procedure fluid is placed in the procedure container and compared with colored glass disks ranging in value from 0.5 to 8.0.

### Procedure parts evaluated

The procedure fluid is evaluated.

### Pass/fail criteria

The color of the procedure fluid must fall between 6.0 and 8.0.

## Friction Durability

### Specifications

This procedure covers MERCON®.

### Objective

The objective is to determine the friction characteristics and friction durability of the procedure fluid.

### Field service simulated

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### Procedure fixture

Performance of this procedure requires the SAE No. 2 friction procedure machine.

### Procedure parameters

Fifteen thousand (20,000) cycles of 20 seconds duration are required. Clutches are engaged once each cycle absorbs  $20,740 \pm 100$  joules of total energy. Fluid temperature is maintained at 115°C.

### Procedure parts evaluated

The steel and composition plates are evaluated.

### Pass/fail criteria

The pass/fail criteria are as follows:

- Between 25 and 15,000 cycles of operation, the midpoint dynamic torque should be between 127 and 156 Nm at an apply pressure of 275 kPa.
- At cycles 25, 200, 1000, 3000 . . . 15,000, the low speed dynamic torque should be between 117 and 156 Nm at an apply pressure of 275 kPa.
- At cycles 200, 1000, 3000 . . . 15,000, the low speed dynamic/midpoint dynamic ratio should fall between 0.9 and 1.0.
- At cycles 25, 200, 1000, 3000 . . . 15,000, the engagement time must be between 0.75 and 1.0 seconds.
- From cycles 100 – 15,000, all 0.25 second static torques should be between 97 and 146 Nm at 275 kPa apply pressure.

## Anti-Foaming Properties

### Specifications

This procedure covers MERCON®.

### Objective

The objective is to determine foaming characteristics of procedure fluid by ASTM designation D 892.

### Field service simulated

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### Procedure fixture

Performance of this procedure requires an ASTM foaming procedure apparatus.

### Procedure parameters

The sample, maintained at a temperature of 24°C, is blown with air at a constant rate for 5 minutes, then allowed to settle for 10 minutes. The volume of foam is measured at the end of both periods. The procedure is repeated on a second sample at 93.5°C, and then, after collapsing the foam at 24°C, a third sample is run at 150°C with 200 ml/min of air.

### Procedure parts evaluated

The procedure fluid is evaluated.

### Pass/fail criteria

The pass/fail criteria are as follows:

- The maximum allowable foam volume at end of 5-minute blowing period is 100 ml for all four sequences outlined in ASTM designation D 892.
- Maximum allowable foam at end of 1-minute settling period is 0 ml.

## Elastomer Compatibility

### Specifications

This procedure covers MERCON®.

### Objective

The objective is to determine elastomer compatibility of the procedure fluid.

### Field service simulated

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### Procedure fixture

Performance of this procedure requires ASTM D 471 equipment.

### Procedure parameters

Strips of each reference elastomer, ATRR-100, ATRR-200, ATRR-300, ATRR-400, and ATRR-500 are cut per ASTM D 471 and are immersed in three tubes, two containing reference fluid and the other containing the candidate fluid. ATRR-100 is immersed at 150°C for 168 hours. ATRR-200 is immersed at 163°C for 70 hours, and ATRR-300 is immersed at 163°C for 240 hours. ATRR-400 and ATRR-500 are immersed at 163°C for 168 hours.

### Procedure parts evaluated

The elastomer reference materials are evaluated.

### Pass/fail criteria

The pass/fail criteria are as follows:

	<u>Volume Change</u>	<u>Hardness Change</u>
ATRR-100	+1% to +6%	±5 Pts.
ATRR-200	+3 to +8%	±5 Pts.
ATRR-300	Rate and Report	Rate and Report
ATRR-400	+1% to +5%	-2 to +5 Pts.
ATRR-500	+9% to +20%	-10 to +1 Pts.

## Aluminum Beaker Oxidation Procedure

### Specifications

This procedure covers MERCON®.

### Objective

The objective is to determine the oxidation stability of the procedure fluid.

### Field service simulated

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### Procedure fixture

Performance of this procedure requires an aluminum beaker and associated components, bushings for gear pump, gear pump, air flow control system, temperature control systems, aluminum and copper metal strips.

### Procedure parameters

The beaker is filled with procedure fluid, the circulation pump and heating element are turned on and the temperature is rapidly brought up to 155°C. At this point the procedure starts and airflow is introduced into the gear pump at 5 ml/min. Hot samples are removed periodically and the copper strip is inspected once after 50 hours and reinserted. After 300 hours at procedure temperature, the procedure is completed. The beaker and fluid are weighed before and after the procedure.

### Procedure parts evaluated

The aluminum and copper metal strips, top of pump housing, the beaker, and the procedure fluid are evaluated.

### Pass/fail criteria

The pass/fail criteria are as follows:

	<u>Hrs.</u>	<u>Limits</u>
Pentane Insolubles	250	less than 1%
TAN Change	250	4.0 max
Diff. IR, Absorbance per cm path length	250	40 max
% Viscosity Inc., 40°C	250	40% max
Copper Strip Rating	50	3b max
Copper Strip Rating	300	3b max
Aluminum Strip Rating	300	no varnish
Sludge	300	no sludge
Viscosity, -40°C	300	rate and report

## Cycling Procedure

### Specifications

This procedure covers MERCON®.

### Objective

The objective is to determine friction retention, oxidation stability, and corrosion protection characteristics of a procedure fluid (DEXRON® III Cycling Procedure).

### Field service simulated

This procedure simulates satisfactory performance in a normally functioning transmission under service conditions.

### Procedure fixture

Performance of this procedure requires a Hydra-matic automatic transmission driven by a GM 5.7L L-98 engine. The engine and transmission are mounted on a procedure stand capable of cyclic operation with control of speed, load, temperatures, and pressures.

### Procedure parameters

Thirty-two thousand (32,000) accelerations through the 1–2, 2–3, and 3–4 shifts are performed. Transmission sump temperature is maintained at 135°C. Engine speed, transmission output speed, output shaft torque, and acceleration times are all controlled during the cycle.

### Procedure parts evaluated

All of the internal transmission parts are rated for sludge, varnish, deterioration, wear, and abnormal conditions.

### Used lubricant analysis

The used lubricant analysis consists of viscosity, TAN, carbonyl group absorbance increase, and effluent gas O<sub>2</sub> content.

### Pass/fail criteria

The pass/fail criteria are as follows:

- 1–2 shift time must be 0.30 to 0.75 seconds and 2–3 shift time must be 0.30 to 0.75 seconds for 20,000 cycles.
- Viscosity at 100°C must be greater than 5.0 cSt.
- TAN increase must be less than 2.5.
- IR absorbance increase must be less than 0.35.
- Brookfield viscosity of used fluid must be less than 3,000 cP.
- Transmission part condition shall be equal to or better than that obtained with reference fluids.