Data-Driven Decisions Through In-Process Test

Automatic Transmission Manufacturing: Final Assembly Testing

Harness the combined power of in-process testing and data analytics on your production line with Sciemetric.

Visit **www.sciemetric.com** or email **inquiries@sciemetric.com.**

LEGEND

- Key test application
- Sub assembly line
- Main assembly line
- End of line tests
- Sample Qualityworx™ station(s)

SUB ASSEMBLY LINE

Check of Gear Set Assembly Check Backlash (10a)

Test Description: Rotational gear set TIT, gage and vibration check.

Signatures/Measurements: Torque vs. angle, laser vs. angle, accelerometer vs. angle.

Defects: Binding, nicks, improper gear sets.

Check Backlash (10b)

Test Description: Rotational gear set TIT, gage and vibration check.

Signatures/Measurements: Torque vs. angle, laser vs. angle, accelerometer vs. angle.

Defects: Binding, nicks, improper gear sets.

MAIN ASSEMBLY LINE

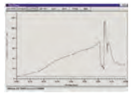
Force-Distance Checks (10)

Test Description: Verify proper insertion of dowel pins, cup plugs or seals.

Signatures/Measurements: Force vs. time, distance vs. time and force vs. distance.

Defects: Missing dowel pins, seal or plugs, incorrect size, misalignment, insertion to proper depth.

Snap Ring Verification (20)



Test Description: Gage seated snap ring with sensor to determine proper insertion.

Signatures/Measurements: Based on probe used, profile, and machine vision images and data.

Defects: Missing snap ring, incorrect size or not seated.

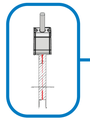
Seal Integrity Check (30)

Test Description: Verify sealing integrity of rear transmission seal using a standard pressure or flow test.

Signatures/Measurements: Pressure decay vs. time or mass flow vs. time.

Defects: Missing seal, incorrect seal, rolled seal, defective seal, cocked seal.

Gage Stack-Up (40)



Test Description: Multiple or single probe gaging for stack up (laser or LVDT).

Signatures/Measurements: Profile vs. time or Profile vs. encoder.

Defects: Defective stack up from mis-assembled or mis-aligned components. Improperly sized components.

Shim Size Verification for Bearing Pre-Load (50)

Test Description: Gage shim height with advancing probe for correct shim size.

Signatures/Measurements: Distance measurement.

Defects: Determine proper sizing for shims.

Oil Fill/Volume Test (60)

Test Description: Oil fill and volume test.

Signatures/Measurements: Pressure test vs. time or mass flow vs. time.

Defects: No fluid, improper fluid levels.

Clutch Apply/ Release Torque Check (70)

Test Description: Torque to turn of clutch.

Signatures/Measurements: Torque vs. angle (run and apply).

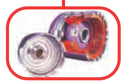
Defects: Verify proper clutch installation and clutch operation.

Case Ground/Rotational Clutch Flow (80)

Test Description: Torque to turn of rotational clutch and flow test.

Signatures/Measurements: Torque vs. angle, Flow vs. time.

Defects: Verify proper clutch installation.



End Play Check Input Shaft (90)

Test Description: End play check of main input shaft.

Signatures/Measurements: Load vs. distance.

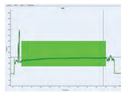
Defects: Verify proper input shaft installation.

Liquid Gasket Verification (100)

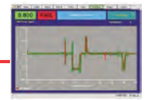
Test Description: Check liguid sealing, gathering machine vision images and data.

Signatures/Measurements: Flow vs. pressure and pressure vs. pump.

Defects: Air bubbles, blocked nozzles, incorrect nozzle, too little or too much sealant, etc.



Dynamic Radial Shaft Seal Leak Test/Final Dry Torque (110)

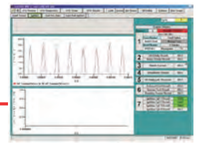


Test Description: Dynamic Radial shaft seal leak test and final dry torque.

Signatures/Measurements: Torque vs. angle, Pressure decay vs. time or mass, flow vs. time.

Defects: Improper drag torque, improper seal installation.

TRS Check/Electrical Continuity Test (120)



Test Description: TRS Check Electrical Continuity Check.

Signatures/Measurements: Current vs. time, electric continuity vs. time.

Defects: Defective sensors, electrical shorts.

Final Leak Test (130)

Test Description: Final Leak Test.

Signatures/Measurements: Pressure decay vs. time or mass flow vs. time.

Defects: Missing seal, incorrect seal, rolled seal, defective seal, cocked seal.

Oil Fill/Volume Test (140)

Test Description: Oil fill and volume test.

Signatures/Measurements: Pressure test vs. time or mass flow vs. time.

Defects: No fluid, improper fluid levels.

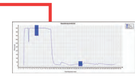
Final Wet Torque/Run Out Check (150)

Test Description: Final Wet Torque and Run out Check.

Signatures/Measurements: Pressure test vs. time or mass flow vs. time.

Defects: Improper drag torque, TIR profile on input shaft. Run out signature.

Oil Fill Check (170)



Test Description: Oil fill Check.

Signatures/Measurements: Pressure test vs. time or mass flow.

Defects: No fluid, improper fluid levels. Verification of fluid.

END OF LINE TESTS

End of Line Tests (160)

Test Description: Final Test Stands Check.

Signatures/Measurements: Accelerometers vs. angle FFT vs. angle.

Defects: Disassembly, gear mesh, bent parts. Nicks, burrs, sub-micron machining errors.

REPAIR BAY MANAGER (Q10)

Using QualityWorX, collects information about the parts under repair. Associates test and operation step failures to defects and repairs. Provides statistical data to enable defect avoidance.

DATA COLLECTION, MANAGEMENT AND ANALYSIS (Q20)

Collect and store data for each test. Generate reports on production quality or specific parts. Analyze information to identify the root causes of issues affecting yield, to optimize manufacturing test cycles, management limits and more.

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