

Leak Testing and Special Application for assembly lines

A modern manufacturing line is designed to deliver a final product with high reliability and always increasing performances. The leak testing is now implemented as one of the methods for process monitoring and quality control: an accurate leak test can surely grant the product quality in terms of reliability, performances and safety.

Leak testing is used in-line in the machining process and/or at assembly stage.

MG after having acquired the company TRACE (market leader with over 350 systems installed in France and specialized in helium applications), becomes the right partner able to provide leak test stations to be used in the machining process and/or at assembly stage.

MG and TRACE are actually able to supply leak testing stations tailored to the Customer's needs:

- **Automatic machines with roller/pallet conveyors as well as gantry loader**
(suitable for in-line applications)
- **Automatic machines with robot automation**
(suitable for assembly line integration)
- **Machines with rotary table**
(suitable to speed-up the loading/unloading operations)
- **Machines with automatic sealing tools exchange**
(flexible for different part families)
- **Machines with "sealing tools carriage"**
(easily and quickly re-toolable for different part families)
- **Manual stations for final inspection or as back-up station for repair loops**
- **Integrated applications (multi stations) for assembly lines**
(assembly + leak test + dimensional inspection)
- **Tracer gas vacuum chambers**
(high performances for very little leaks)
- **Tracer gas sniffing stations**
(suitable for leaks localization)

Few reasons to perform the leak testing

- Ensure integrity of checked parts
- Ensure good functionality
- Avoid contamination problems
- Reduce reworking
- Reduce production costs
- Total quality assurance of the parts

Where and how leaks occur:

after casting

- Porosity
- Flaws/cracks

after machining

- Machining errors
- Part defects

after assembling

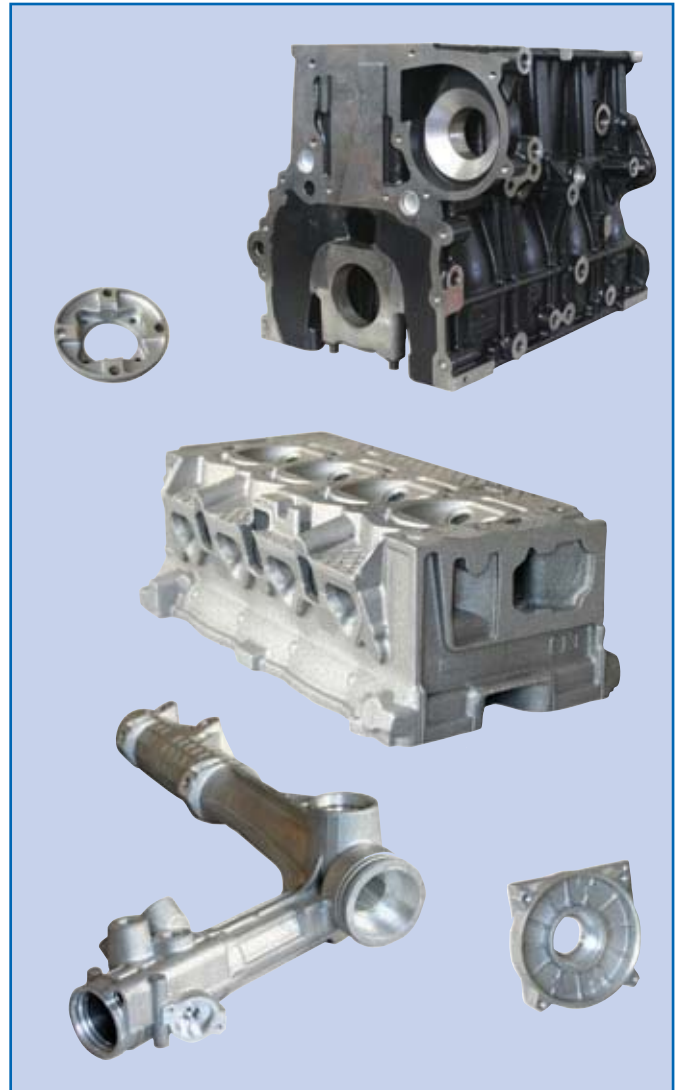
- Missing seals
- Defective seals
- Wrong positioning
- Wrong assembling

Leak testing techniques

- Part pressurization and/or water dunk
- Pressure decay measurement:
 - by relative transducer
 - by differential transducer
- Flow measurement
- Mass Spectrometer for helium

Typical checks

- Oil circuit leakage
- Water circuit leakage
- Fuel circuit leakage
- Gasket leakage
- Fluid circuit integrity



Typical part for which the leak test is required

- Engine block
- Cylinder head
- Gear case
- Differential case
- Crankshaft & camshaft
- Oil, water and fuel pumps
- Manifolds
- Valves
- Brake components
- Gas components
- Others

Examples of installed applications

Leak test machine for engine block water, low pressure and high pressure oil circuit

- Gantry loader solution
- Two different part types (4 cylinders)
- Automatic retooling of sealing assemblies
- Test pressure 1,5/0,6 bar
- Twin station machine for cycle time constraint



In-line automatic machine for engine block water jacket

- Roller conveyor solution
- Three different part types (6 cylinders)
- Automatic retooling of sealing assemblies
- Test pressure 1,5 bar



In-line automatic machine for engine head water circuit, fuel circuit and oil circuit

- Roller conveyor solution
- Three different part types (6 cylinders)
- Automatic retooling of sealing assemblies
- Test pressure 1,5 bar



Oil, water, injection circuit leak test station for assembled engine and filling oil station

- Pallet conveyor solution
- Two engine models
- Two stations
- Flow measures and decay measure



In-line automatic machine for engine heads front seal

- Roller conveyor solution
- Relative vacuum test
- Camshaft turning torque checking
- Part repair bays



In-line automatic machine for auxiliary gears assembly oil circuit

- Roller conveyor solution
- Working island with pallet line
- Different part typologies
- Oil circuit leak test and shaft turning torque checking



Engine block front seal leak test station

- Pallet conveyor solution
- In-line vacuum test with part conveyed on pallet
- Measure result recorded on radio frequency identification (RFID) system



8-16V cylinder valve leak test station

- Roller conveyor solution
- Heads assembly line
- Two stations for the two different heads
- Flow measure



Examples of installed applications

Assembly and leak test machine for 4 and 5 cylinder engine heads

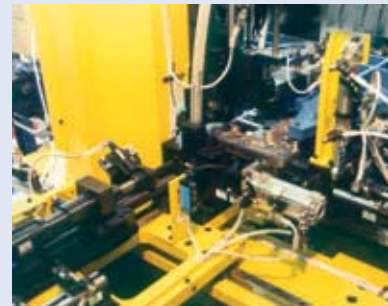
1[^] station

- Oil circuit leak test
- Oil circuit continuity test



2[^] station

- Oil plug screw-driving
- Oil praying plug screw-driving



3[^] station

- Water circuit leak test
- Oil plug leak test



Automatic machine for four cylinder engine block circuit

- Oil circuit leak test
- Two stations, each dedicated to a part typology
- Loading and unloading by gantry
- Part translation by lift and carry beam
- Hydraulically powered



Four cylinder engine block water jacket and oil plug leak test station (integrated into the final measuring machine)

- Pallet conveyor solution
- Water jacket leak test
- Two stations, each dedicated to a part typology



Oil pump body leak test

- Robot handled solution
- Oil pump body leak test



Revolving table machine, manual load/unload, for leak test of engine heads after cubing

- 1[^] station
- Part station
 - Deck face water circuit holes presence check
- 2[^] station
- Water circuit leak test
 - Good part marking



Valve leak test

- Valve run-in and test for 16 valve engine heads



Examples of installed applications

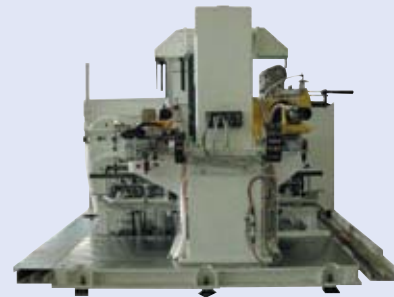
Engine block front seal and oil plugs leak test station

- Long block
- Vacuum test



Engine block rear seal leak test station

- Engine block rear seal leak test station
- Thread hub screwing



Engine block leak test

- Water jacket leak test
- Dunk tank for locating leak by rolling part



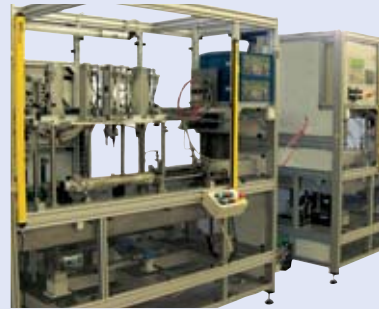
Leak test with air and part dunk

- Leak test with air
- Part dunk and repairing station for truck and tractor engine blocks



Power steering gear body leak test

- Manual load/unload
- Leak test
- Dunk tank lifting for locating leak
- Part marking



V6 engine block front oil seal leak test

- Vacuum test
- Fixture is hung above the line



Cam carrier oil circuit leak test

- 4 cylinder cam carrier
- Manual load/unload



Assembly station and leak test machine for 4 and 5 cylinder heads

- Repair station



Examples of installed applications

Leak test machine for engine block water, oil low pressure and high pressure circuits

- Robot handled solution
- Machines with revolving table (high speed)
- Two part families
- 1500 pcs/day
- About 30 machines of this model installed



Leak test machine for cylinder head water and high pressure oil circuits

- Robot handled solution
- Different part families
- Re-toolable solution
- 1200 pcs/day
- About 15 machines of this model installed



Leak test machine for cylinder head cover high pressure oil circuit

- Robot handled solution
- Two part families
- Manual loading at front side



Leak test machine for cylinder head and camshaft cover water, low and high pressure oil circuits

- Robot handled solution
- 1250 pcs/day
- 7 machines on this model installed



Leak test machine for assembled engine water and oil circuits

- Pallet conveyor solution
- Two part families
- 2000 pcs/day



Leak test machine for engine block

- Pallet conveyor solution



Machines with robot automation (assembly line integration)

- Area with one robot and 2 test machines for 2500 pcs/day



Machines with robot automation (assembly line integration)

- Robotized area with 2 leak test machines and sorted accumulation for 2500 pcs/day



Leak test cylinder head direct injection fuel circuit

- Robot handled solution
- Vacuum chamber solution with tracer gas
- High performance (high resolution)
- Twin station machine for cycle time constraint



Helium leak test back-up station (sniffing method)



Leak test for cylinder head direct injection fuel circuit

- Pallet conveyor solution
- Sniffing cycle with tracer gas for leak localization
- Robot handled sniffing cycle
- High performance (high resolution)
- Twin station machine for cycle time constraint



Leak test for cylinder head direct injection fuel circuit

- Robot handled solution
- Vacuum chamber solution
- High performance (high resolution)



Machine for oil filling (N° 4 machines already installed)

- Automatic gear assembly line
- Cycle time: 94 sec



Oil suction automatic station after hot test machine

- Automatic engine assembly line
- Cycle time: 54 sec



Cylinder head cam shaft front ring seal assembly station

- Automatic engine assembly line
- Cycle time: 40 sec



Assembly station for caps press fitting and screw-driving with caps feeding units



Special Application for assembly lines

Automatic assembly area for cylinder block cap press fitting (2 stations) and leak test station (water, low pressure and high pressure oil circuit)



Crankshaft oil gallery flow inspection machine

- Cycle time: 18 sec



Automatic dimensional inspection station in automatic gear box assembly line

- Cycle time: 22 sec



Automatic dimensional inspection station in automatic gear box assembly line

- Cycle time: 22 sec



Multi station machine for freeze caps press fitting, oil plug screw driving and oil and water circuits leak test for 4 cylinder engine head

1[^] station

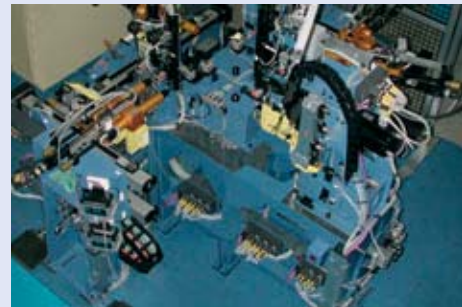
- Main oil channel oil plugs screw driving
- Loctite spraying on freeze cap seat
- Freeze cap press fitting
- Screw-driving assembly moved by CNC slides
- Thread oil plugs and freeze caps fed by pneumatic shot units

2[^] station

- Oil plugs screw-driving for tightening oil circuit
- Loctite spraying on freeze cap seat
- Freeze cap press fitting
- Screw-driving assembly moved by CNC slides
- Thread oil plugs and freeze caps fed by pneumatic shot units

3[^] station

- Water circuit leak test
- Low pressure oil circuit leak test



16V camcarrier screw driving and front seal leak test station

- 16V head assembly line
- Fly-roller conveyor
- Relative vacuum test



LTE - Delta S

It's a reliable and easy to use instrument for leak detection.
It's based on the pressure decay technology.

Up to 16 resident measuring programs.
Standard pressure ranges = +1 Bar + 6 Bar relative (special on request).
RS 232 serial interface for data collection.
Calibration report.

Delta 1S absolute measure. Available version with automatic or manual pressure regulator.



Delta 3S differential measure related to a reference volume. With relative pressure transducer for test pressure and a differential transducer for leak testing.

Dimension Top Bench version: mm 320(w)x175(h)x440(d)
Weight: 12 Kg

E9066 - WINATE

It's a reliable instrument for leak detection by pressure decay.
It's based on the MG industrial E9066.
The instrument is equipped with a full size keyboard and optionally with a bar code reader .
Software function for set of all the test parameters.
Statistical analysis.
Data Backup and restore.
Data transfer to LAN (optional).



Dimension Top Bench version: mm 540(w)x500(h)x400(d)
Weight: 40 Kg

TRACE 5

It's a reliable and high performing instrument for leak detection.
It's based on the pressure decay technology
Measure display in cc/mm or mbar.
Resolution 0,07 Pa.
Cycle time reduction
Improve measure accuracy and repeatability
Slightly affected by temperature change
Up to 127 resident measuring programs.
RS 232 serial interface for data collection.



Dimension Top Bench version mm 600(w)x250(h)x170(d)
Weight: 20 Kg