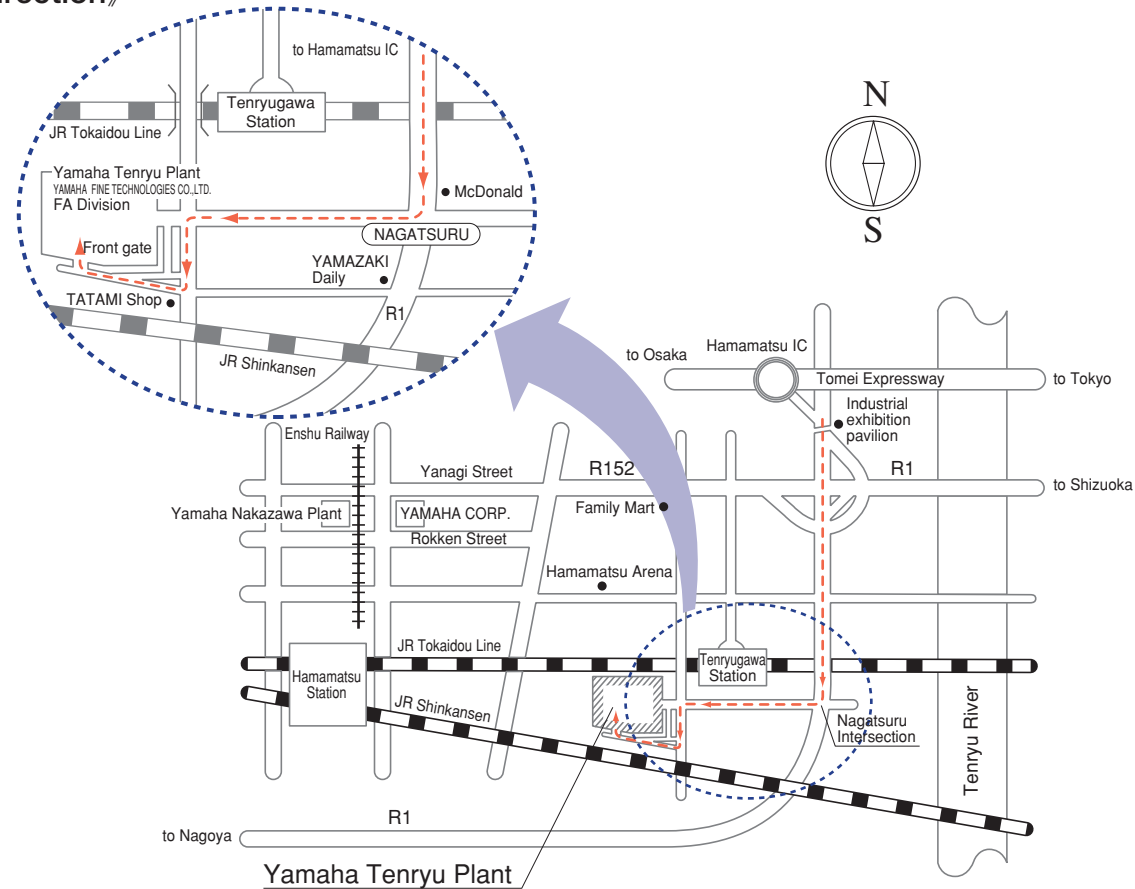


《Direction》



Get off the Shinkansen (bullet train) at Hamamatsu Station and take a taxi.  
Tell driver to take you to “Yamaha Tenryu Plant”. (About a 10 minute ride)

Contact for product inquiries ----- FA Sales Department TEL+81-53-467-3601

Contact for inquiries about maintenance,  
test, or service. ----- User Service Center TEL+81-53-467-3606



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FA Division

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TEL +81-53-467-3601 FAX +81-53-467-3613

URL : <http://www.yamaha.co.jp/finetech/english/index.html>

Please note that we reserve the right to make changes in product specifications without prior notice.



# Helium Leak Tester

He Leak Tester System



The Yamaha Helium Leak Tester is an innovative system for pass-fail testing method that compares leaked gas quantities to a preset figure. In a simple procedure, the workpiece is set into the vacuum chamber, helium gas is injected into it at a specified pressure, then the leak detector measures leaked helium gas in the chamber coming out of the workpiece. The Yamaha system can also detect leaks using the sniffer technique.



## FEATURES

### 1 Precisely detects fine leaks

Unique system configuration developed by Yamaha ensures high reliability detecting fine leak with 100 to 1,000 times more preciseness than conventional water bubble method and pressure decay method.

### 2 Direct connection to production line

Yamaha's advanced technology enables laborsaving and full automation by directly connecting the leak tester to production line.

### 3 Safety design eliminates human errors

Yamaha's design features various unique functions such as automatic GO-NoGo sorting, interlock, etc. that ease operators' burden and prevent human errors.

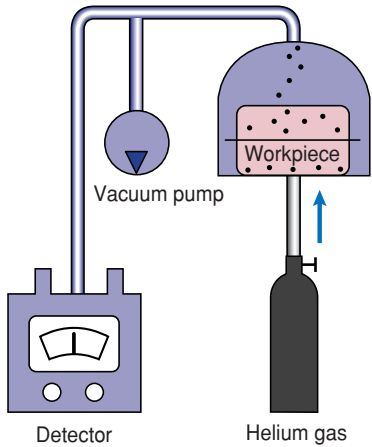
### 4 Easy maintenance and handling

Sophisticated system provides total system control, making handling and maintenance extremely easy. In case of wrong operation or machine trouble, an easy-to-use control panel featuring self-diagnosis function helps an operator bring it back to normal status without affecting production activity.

## TRACER GAS METHOD

### HELIUM LEAK TESTER

#### ■ Vacuum Chamber Method



#### Pros

- Reliably detects overall leakage.
- Fast leak measurements
- No human errors
- Easy to automate.

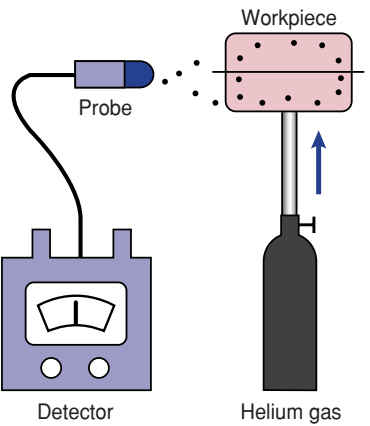
#### Cons

- System structure needs to be rather extensive.
- Pinpointing leak places not possible.

#### Measurement Range

- Down to 10<sup>-8</sup> [Pa · m<sup>3</sup>/sec] (pascal cubic meter per second)

#### ■ Sniffer Method



#### Pros

- Possible to pinpoint leak places.
- Simple setup
- Less expensive

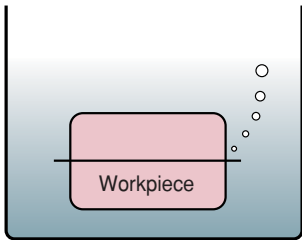
#### Cons

- The probe needs close contact with leak places.
- Certain level of skill needs for probe operation.
- Leakage cannot be measured.

#### Measurement Range

- Down to 10<sup>-6</sup> [Pa · m<sup>3</sup>/sec]

### Water Bubble Leak Method



#### Pros

- Simple equipment, easy to operate.
- Possible to pinpoint leak places.
- Low running cost

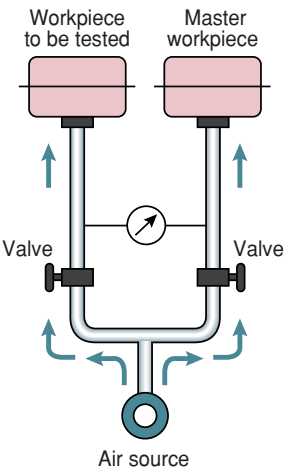
#### Cons

- Requires skillful operators.
- Workpiece requires drying afterward.
- Requires water transparency control.
- Difficult to quantify leakage.
- Poor work environment
- Difficult to automate the process.
- Possible human errors
- The finer leak it gets, the longer it takes.

#### Measurement Range

- Down to 10<sup>-4</sup> [Pa · m<sup>3</sup>/sec]

### Pressure Decay Method



#### Pros

- Simple equipment

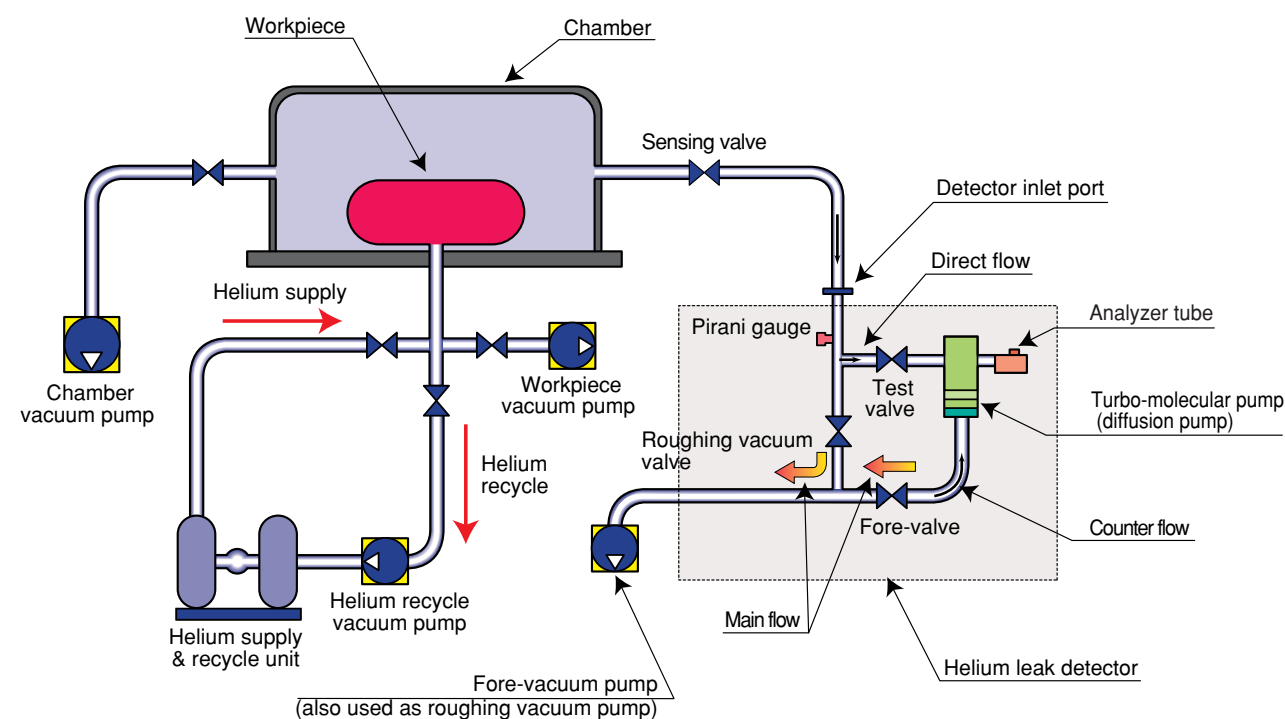
#### Cons

- Vulnerable to both workpiece and ambient temperature fluctuation.
- Poor sensitivity
- Pinpointing leak places not possible.

#### Measurement Range

- Down to 10<sup>-4</sup> [Pa · m<sup>3</sup>/sec]

HELIUM LEAK TESTER (CHAMBER TYPE) SYSTEM DIAGRAM



FEATURES

1. Summary

Yamaha's unique and relentless design work enables stringent leak test criteria featuring an one-of-a-kind leak detector and suitably selected various devices. As a result, entire leak test system provides incredibly reliable test performance and all-in-one support satisfies customers in the best way possible.

2. Technical Advantages

(1) Leak test at lower vacuum of 100-500 Pa range

**Benefit of making leak test at low vacuum**

- ① Stable vacuum time because of less vulnerability against humidity and moisture.
- ② Easy chamber maintenance
- ③ Quick recovery from large leak
- ④ Short takt time because of quick vacuum
- ⑤ Being able to choose durable vacuum pumps.
- ⑥ Being able to minimize cost of vacuum pumps allowing for small installation space.

**Reason that Yamaha's leak tester can perform at low vacuum**

- ① Yamaha's stand-alone technology to reduce residual helium out of the air makes it possible to perform leak test without enhancing degree of vacuum.
- ② Adoption of an uniquely developed leak detector that works at low vacuum.

(2) Ideal equipment selection

**High performance leak detector**

- ① Advanced analysis with 180 degree magnetic deflection mass spectrometer and customized sensor
- ② Use of highly efficient filaments
- ③ Invulnerable design to inlet vacuum break

**Chamber vacuum pump**

- ① Durable against repetitive operation of vacuum and pressure recovery
- ② Air-cooling type
- ③ No mist-separators needed for oil exhaust

(3) Highly reliable master capillary

- ① Certified by reliable third-party and officially approved measuring instrument used.
- ② Durable and long lasting made of stainless steel
- ③ Stably controlled leakage
- ④ Maintains traceability that is eligible for ISO certification

(4) Simple and Easy operation

- ① Sophisticated system facilitates operation and maintenance.
- ② A control panel featuring self-diagnosis function ensures quick restoration in case of operation mistake or machine trouble.
- ③ Easy restart-up after maintenance and simple origin return with a single touch of a button.

WHY HELIUM IS SUITABLE AS TRACER GAS ?

Yamaha uses helium in tracer gas method for various advantageous reasons.

**1**

Harmless to human body and global environment

**2**

Non-combustible and thus safe

**3**

Easily detectable coming out of small holes because of small mass

**4**

Easy to distinguish leak from those in the air because of its micro existence

**5**

Hardly liquefies and thus doesn't clog small holes.

**6**


Chemically inert and thus doesn't oxidize metallic materials being used.

**What is Helium?**

- [Chemical symbol:He] [Atomic weight:4.003] [Category:Noble gas]
- Colorless, odorless, tasteless, non-toxic, inert, monatomic gas
- Exists 0.0005% or 5ppm in the air. (by volume)
- Boiling point (-268.93℃) and melting point (-272.20℃) ...both the lowest among the elements
- The second lightest element and the second most abundant element in the observable universe.
- Chemically stable and does not form compounds with other elements.
- Exists only as gas except in extreme conditions.

Excerpt from Wikipedia

TARGET MARKET AND PRODUCTS

Leak rate	10 <sup>-8</sup>	10 <sup>-7</sup>	10 <sup>-6</sup>	10 <sup>-5</sup>	10 <sup>-4</sup> Pam <sup>3</sup> / sec or over			
Methods of Leak Test								
			CHAMBER METHOD			SNIFFER METHOD		
						WATER BUBBLE LEAK METHOD or PRESSURE DECAY METHOD		
Automotive		Fuel strainers	Car air conditioner pipes Car air conditioner heat exchangers Car compressors Condensers Evaporators Liquid tanks Air tanks	EGR cooler pipes Common rails Delivery pipes Injectors Airbags	Inlet tubes Inlet filler ports Fuel tanks Battery cases Power steering Shock absorbers Lithium ion batteries•Fuel cells	Aluminum wheels Steel wheels Radiators Oil tanks Oil pumps Inlet manifolds Torque converters	Engine assemblies Differential gear cases Chassis pipe connectors Transmission pipe connectors Engine pipe connectors Boat tilt parts	Transmission case peripheral parts Brake tubes Body cylinder cases Brake cylinders Oil pans Mufflers Exhaust manifolds
Home Electronics			Air conditioners Package air conditioners Refrigerators					
Food Industres			Showcase heat exchangers Freezers	Vending machines		Beer casks		
Cooking Equipment-Household Appliances	Fire extinguishers				Door closers			Gas cooking equipment
Medical Products						Chemical closets Catheters Pacemakers Dialysis machines		
Drums & Canisters						Spray cans		Drums 18 liter cans Stove fuel tanks Oil cans

EQUIPMENT USING WATER BUBBLE METHOD or PRES SURE DECAY METHOD

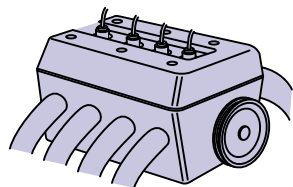
	Agricultural Machinery	Motorcycle Parts	Construction Machinery	Plant Industrial Equipment	Disaster Prevention Equipment	Hydraulic-Pneumatic Parts	Water/Sewer Equipment	Construction Material	Oil Equipment	Gas Equipment	Home Electronics Appliances	Industrial Electrical Equipment
WATER BUBBLE LEAK METHOD or PRESSURE DECAY METHOD	•Fuel tanks •Transmissions •Engines	•Fuel tanks •Transmissions •Carburetors •Engines	•Engine parts •Hydraulic pipes •Rotors	•Pipes •Valves •Joints	•Sprinklers •Fire alarms	•Hydraulic & pneumatic sole-noid valves •Air cylinders •Couplers •Check valves	•Water faucet parts •Water valves	•Madular baths •Wall materials •Sanitary ware •Sinks •Door closers •Floor materials	•Oil heaters •Cartridges •Oil pumps	•Gas meters •Cutoff valves •Gas water heater equipment •Gas cooking appli-ances •Gas hoses •Gas valves	•Various batteries •Waterproof shavers •Waterproof vacuums •Waterproof radios •Laundry machine parts •Irons	•Hermetic seal motors •Speed reducers •Relay switches
	Communication Equipment	Office Supplies	Computers	Healthcare	Electronic Components	Medical Equipment	Precision Equipment	Pharmaceutical Products	Rubber Products	Toiletries	Cosmetic Containers	Food Packaging
WATER BUBBLE LEAK METHOD or PRESSURE DECAY METHOD	•Satellite transceiv-er devices •Water-proof com-munication equip-ment •Communication connectors	•Toner bottles/cans for copiers •Correcting fluid bottles •Printer cartridges	•Hard disks •HDD connectors	•Ionized water puri-fiers •Water cleaners •Electronic ther-mometers •Electric tooth-brushes	•CCD image sensors •LSI •Crystal oscillators (Bombing method)	•Blood pumps •Infusing bags •Syringes	•Waterproof cam-eras •Waches (Bombing method)	•Pillow package •PTP •Powder packages •Ointment tubes	•Nipples •Hoses •Film products	•Wet towels •Packages	•Shampoo pumps •Nozzles	•Processed meats •Freshnoodles •Confectionery



AUTOMOTIVE FIELD

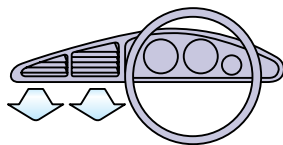
ENGINE

- Radiators
- Water pumps
- Cylinder heads
- Cylinder blocks
- Oil pans
- Engine assemblies
- Delivery pipes
- Injectors
- Common rails
- Oil pumps



AIR CONDITIONERS

- Compressors
- Condensers
- Evaporators
- Liquid tanks
- Air conditioner pipes

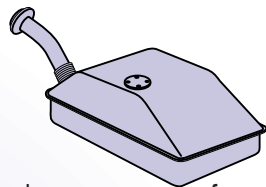


FUEL SYSTEM

- Fuel tank assemblies
- Fuel pumps
- Fuel strainers
- Fuel pipes
- Canisters
- Inlet tubes



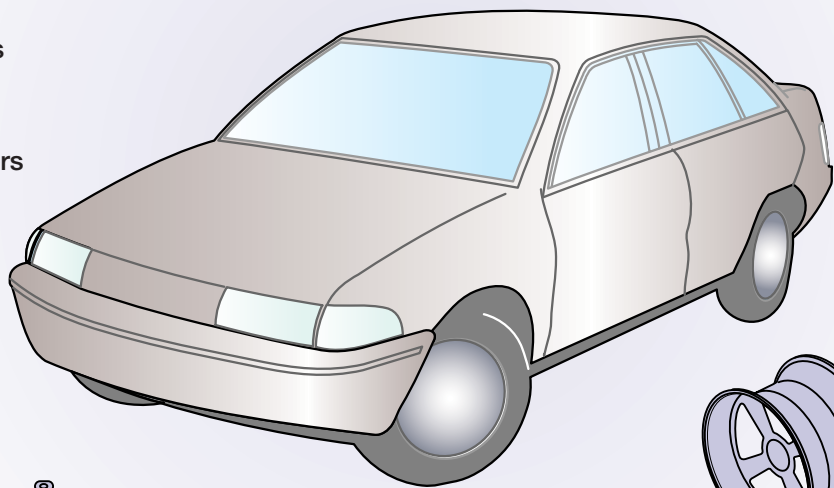
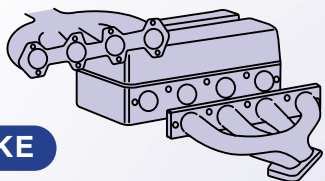
for motorcycles



for cars

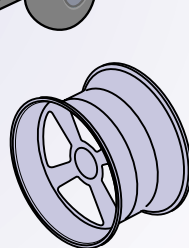
AIR INTAKE

- Intake manifolds
- Exhaust manifolds
- Intercoolers
- Turbochargers
- Catalytic converters
- Mufflers

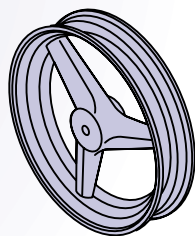


WHEELS

- Aluminum wheels
- Aluminum temporary wheels
- Steel wheels



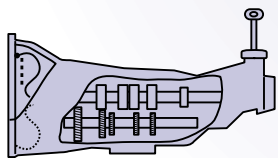
for cars



for motorcycles

TRANSMISSIONS

- Torque converters
- Transmission cases
- Cylinder second brakes
- Oil pump housings

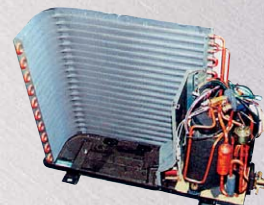


OTHERS

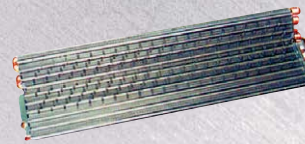
- Power steering
- Steering pumps
- Shock absorbers
- Air suspensions
- Lithium Ion Batteries
- Fuel cells
- Brake master cylinders
- Brake boosters
- Air tanks
- Inflators

AIR CONDITIONING-REFRIGERATION FIELD

- Air conditioner parts
- Evaporators
- Refrigerator coils
- Compressors
- Valve types
- Outdoor air conditioner assemblies



Outdoor air conditioner assemblies



Air conditioner indoor unit heat exchangers



Compressors for home appliances

OTHER FIELD

HOME ELECTRONICS

- Refrigerators
- Batteries of all types
- Waterproof shavers
- Waterproof vacuum cleaners
- Waterproof radios
- Laundry machine parts
- Irons

FOOD INDUSTRIES

- Showcase heat exchangers
- Freezers
- Vending machines
- Beer casks

GAS EQUIPMENT

- Gas meters
- Shutoff valves
- Gas water heaters
- Gas cooking appliances
- Gas hoses
- Gas valves

MEDICAL EQUIPMENT

- Chemical closets
- Catheters
- Pacemakers
- Dialysis machines
- Blood pumps
- Transfusion packs
- Syringes

PRECISION EQUIPMENT

- Waterproof cameras
- Waterproof watches

DRUMS & CANISTERS

- Drum cans
- 18 liter cans
- Stove fuel tanks
- Oil cans
- Spray cans

HYDRAULIC-PNEUMATIC PARTS

- Hydraulic solenoid valves
- Pneumatic solenoid valves
- Air cylinders
- Couplers
- Check valves

WATER-SEWER LINE EQUIPMENT

- Water faucet parts
- Water valves

CONSTRUCTION EQUIPMENT

- Unit baths
- Wall materials
- Sanitary ware
- Sinks
- Door closers
- Floor materials

OIL EQUIPMENT

- Oilstoves
- Cartridges
- Oil pumps

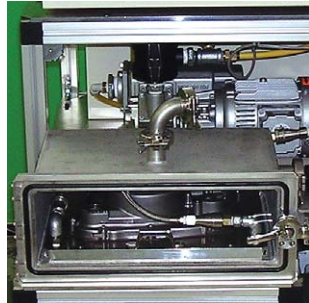
COMMUNICATION EQUIPMENT

- Satellite transceiver devices
- Waterproof communication equipment
- Communication connectors

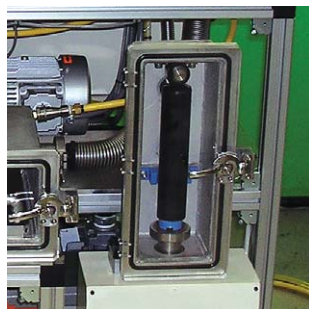


# YAMAHA He LEAK TESTER SYSTEMS

## CUBE SYSTEM



Example 1.  
Chamber for Engine Cover



Example 2.  
Chamber for Shock Absorber Case



System Configuration Example

### ■Reliable and Precise

CUBE system achieves more reliable and precise detection results than conventional bubble-sensing or pressure-decay method.

### ■Environmentally Independent

CUBE system is less influenced by work environment such as workpiece temperature and temperature & humidity at work area. Stable operation can always be expected.

### ■All-in-one and Space-saving

Integration of main functions makes it possible to downsize the system.

### ■Easy and Simple

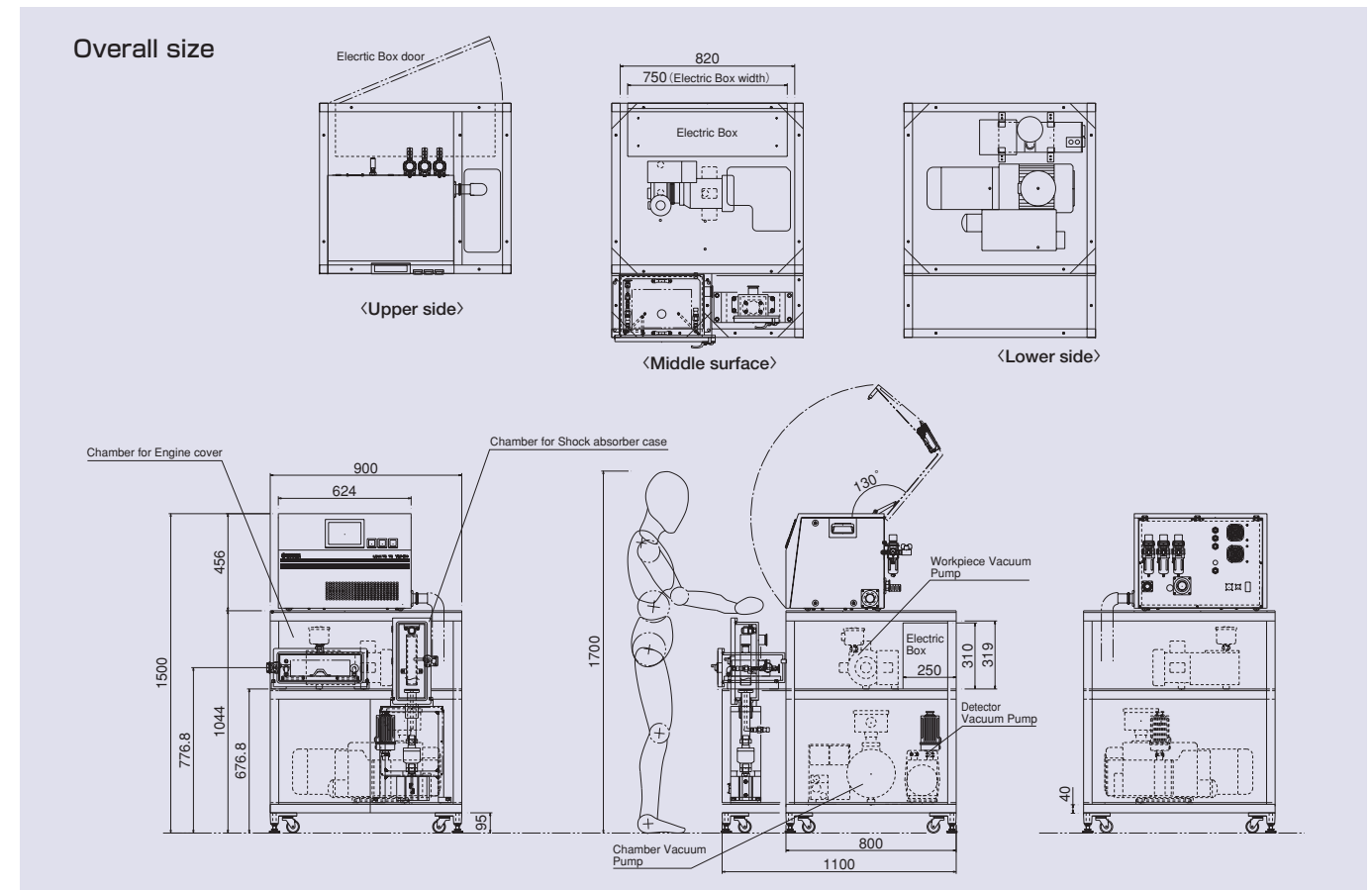
- Easy and simple handling with LCD touch screen
- Easy and simple parameter setup
- Easy and simple data management: Stored data can be transferred to PC.

### ■Quick Workpiece Changeout

- Capable of adapting to different types of workpieces with one system
- Quick changeover by simply rearranging connection fittings

# YAMAHA He LEAK TESTER SYSTEMS

## [CUBE SYSTEM] system example



### ■ [CUBE system] specification example

Item	Specifications	
	Workpiece	Engine cover Shock absorber case
Capability	Analyzer	180 degree magnetic deflection type mass spectrometer
	Detectable rate	$1.0 \times 10^{-9} \sim 9.0 \times 10^{-3} \text{ Pa m}^3 / \text{sec}$
	Cycle time	Depend on chamber size and Leak rate
	Charge pressure [Helium]	Max 0.9 MPa (G)
Equipment	Workpiece volume	400 [cc] 115 [cc]
	Chamber size	(W) 380mm×(D) 285mm×(H) 120mm 13 [L] (W) 120mm×(D) 100mm×(H) 345mm 4.1 [L]
	System size	(W) 900mm×(D) 1100mm×(H) 1500mm
	Chamber vacuum pump	100 [m <sup>3</sup> /h]
	Workpiece vacuum pump	21 [m <sup>3</sup> /h]
	Detector vacuum pump	25 [m <sup>3</sup> /h]
Utilities	Temperature	10~40 °C
	Power supply	3φAC200V±10% 50/60Hz 300VA
	Helium	0.4 [MPa] Rc 3/8 inch
	Air	0.4 [MPa] Rc 3/8 inch
	Nitrogen	0.2 [MPa] Rc 3/8 inch
Operation	Display	5 inch LCD touch panel
	Language	English / Japanese / Chinese / Korean
	Inspection mode	Helium leak test / Calibration
	Calibration	External / Internal
	Setting	Threshold, Calibration range
	Records	Test result / Error records / Maintenance records / Accumulation counter
	I / O	I / O signals are 20 (External start / stop, Mode selection, Error signal etc.)
	Data option	USB port (A type) USB Ver1.1 Save setting, Test records, Error records with external memory

**SNIFFER DETECTOR**  
**YHS-600**



Operation Panel



Sniffer Probe



Item	Specifications
Leak Detector	YHS-600
Detectable Rate	1.0×10 <sup>-8</sup> ~ 1.0×10 <sup>-2</sup> Pa·m <sup>3</sup> / sec
Setup Time	3 minutes
Filament	Double Filaments
Calibration	External
Temperature	10~40°C (50~104°F)
Humidity	90% or less
Power	AC 100V±10% Single phase 50 / 60Hz 10A
Size	546mm (W) ×378mm (D) ×470mm (H)
Weight	46 kg

**LEAK DETECTOR**  
**YLD-220**



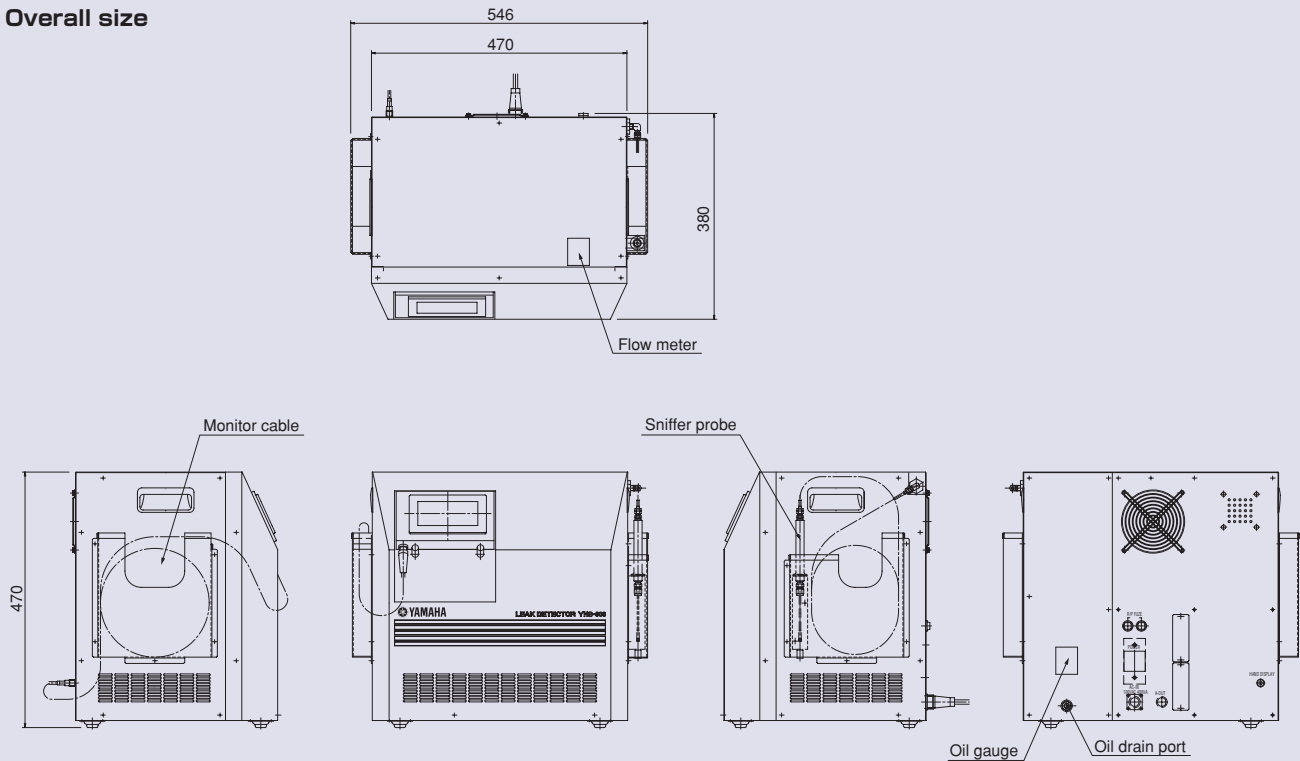
Item	Specifications
Leak Detector	YLD-220
Detectable Rate	1.0×10 <sup>-8</sup> ~ 1.0×10 <sup>-2</sup> Pa·m <sup>3</sup> / sec
Setup Time	3 minutes
Filament	Double Filaments
Calibration	External / Internal
Temperature	10~40°C (50~104°F)
Humidity	90% or less
Power	AC 200~220V±10% Single phase 50 / 60Hz 20A
Size	456mm (W) ×334mm (D) ×414mm (H)
Weight	35 kg

**YLD-500**



Item	Specifications
Leak Detector	YLD-500
Detectable Rate	1.0×10 <sup>-9</sup> ~ 1.0×10 <sup>-2</sup> Pa·m <sup>3</sup> / sec
Setup Time	3 minutes
Filament	Double Filaments
Calibration	External / Internal
Temperature	10~40°C (50~104°F)
Humidity	90% or less
Power	AC 200V±10% Three phases 800VA
Size	456mm (W) ×291mm (D) ×578mm (H)
Weight	35 kg

Overall size





## AW20·30·60

He Leak Tester for Aluminum Wheels



- 1 Accurately detects fine leaks.
- 2 Directly connected to production line and short machine takt time
- 3 Fail-safe system eliminates human errors.
- 4 Low running cost
- 5 Handling and maintenance are extremely simple and easy.

### ■ Dedicated design for aluminum wheels for cars and motorcycles

Pressurized mixed gas of helium and air is injected into the chamber at specified pressure, then the system detects leaks coming out of wheels using mass spectrometry theory. Pass-fail judgment is made in accordance with predetermined threshold.

### ■ Random test without respectively selecting wheel sizes

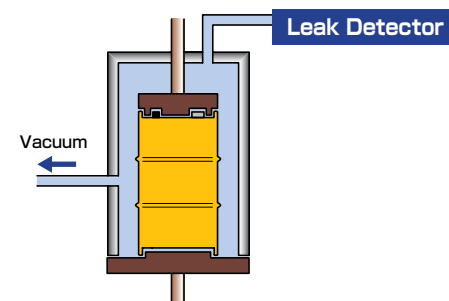
Any size between 12" -20" in diameter can be randomly tested without time-consuming size setting.

### ■ Automatic checkups

Automatic master-capillary-checkup function enables precise leak test all the time.

## DK-1

He Leak Tester for Drums



### ■ Ensuring reliability of crucial testing criteria

Adoption of helium leak testers makes it possible to ensure reliability of leak test of large-sized drums. With this wise choice in place, difficult-to-test portion such as welded or seamed place as well as material defect causing fine leak can be automatically detected with great preciseness. Conventional ways such as pressure drop method and water bubble leak method have been eliminated from a choice by quality-conscious drum manufacturers.

### ■ Anti-deformation mechanism for thin wall

Pressure difference between outside and inside of drums can be appropriately controlled without applying troublesome jigs. This anti-deformation mechanism makes it possible to greatly improve productivity.

### ■ Great manufacturing efficiency as a result of high-speed test and feeding

Machine takt time can always catch up with fast production speed and by incorporating quick conveying unit into a system, great manufacturing efficiency has become a reality.

## FT-1

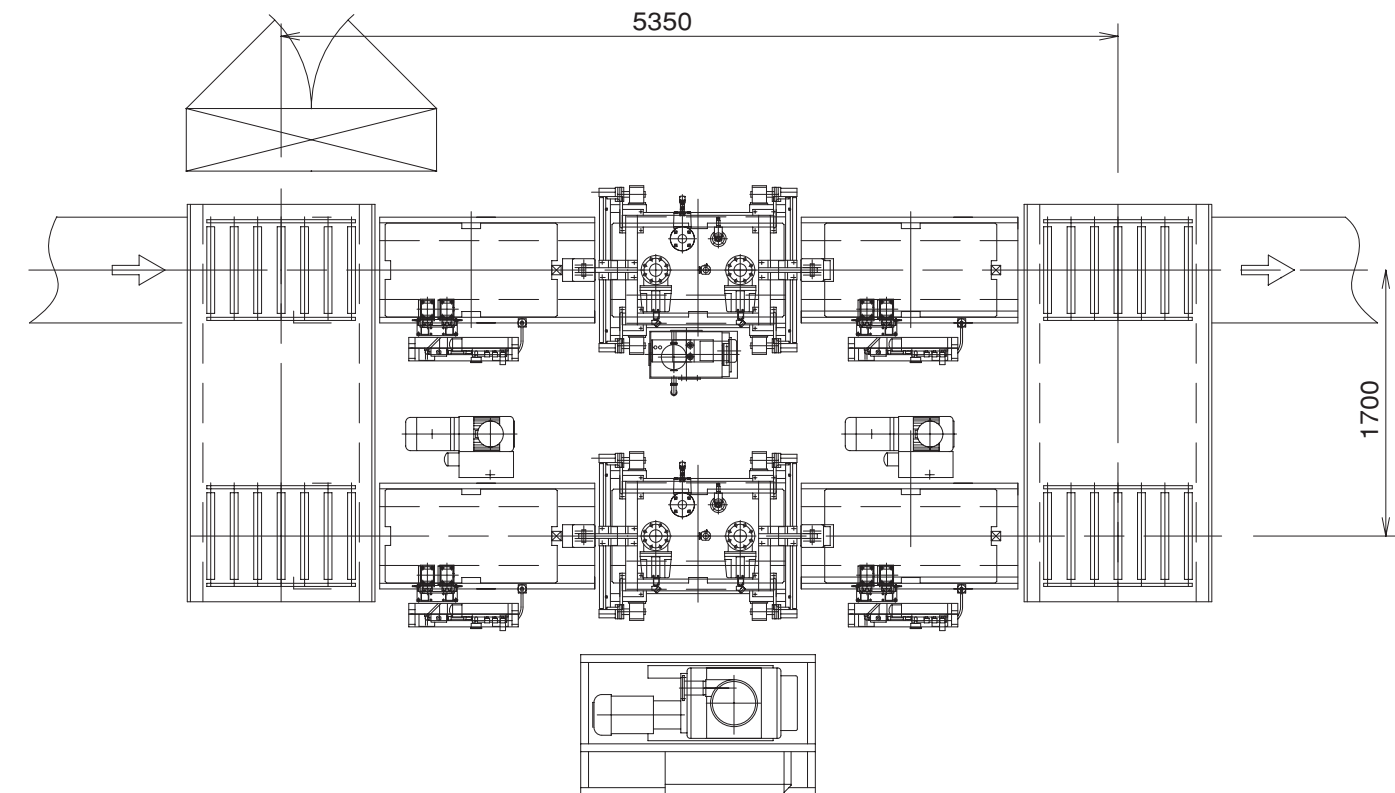
He Leak Tester for Fuel Tanks



- Accurately detects even fine leaks.
- Differential pressure control function prevents work-pieces from deforming inside the vacuum chamber.
- Various fail-safe functions safeguard the detection line when performing large leak test.

## CUSTOM-MADE SYSTEMS

We design and fabricate dedicated systems to match the customer's own unique specifications.



Note: This drawing shows one example of the leak tester system.