

CALL US & MEET US, IF YOU ARE IN CNG AUTOMOTIVE INDUSTRY RANGE OF PRODUCTS FOR YOU FROM EXPERTS

CNG VIGILANT - Leak Tester for Automotive CNG Circuit & Components in convincing PASKALS quality

Leak Testing Technologies

- **Pressure Decay + Differential Pressure** with Innovative TTLIV
- Temperature Compensation Circuitry & inbuilt Temperature Compensation Software
- Helium Mass Spectrometry (OPTIONAL)



YOU ALSO NEED IT



Attractive features

- ◆ User Friendly: Fully Automatic with Remote Control BOX
- ◆ Safe: Step Pressurization & Flow Control
- ◆ Economy: Gas Recycling/ Reuse (Low running cost)
- ◆ Redundancy: High Pressure Storage
- ◆ Rugged Performance proven over several installations
- ◆ Independent Software Programs for up to 5 Circuit Types.

In technical collaboration with



Company Profile



PASKALS is an advanced fluid systems company offering wide range of Products & custom built advanced fluid systems. We also provide engineering consultancy in High Pressure Fluid Systems DOMAIN for product development, testing & validation. We can test & validate your products/ systems in our High Pressure Fluid Systems LAB.

PASKALS has collaboration with HASKEL INC. USA (www.haskel.com), WORLD LEADER in high pressure Products. Haskel has a history of 60 YEARS in High Pressure engineering.

PASKALS offers complete range of advanced fluid systems. **You think of a fluid system and we can deliver it.** Our expertise spans all fluids (including specialty gases) and all applications. From Ultimate Vacuum Systems to systems with pressures up to 7000 Bars. We build systems for high technology industries like Aviation, Defense, R&D, Chemical, oil & Gas, Automotive, Shipping etc.

PASKALS has cumulative experience of more than 100 engineering years in this domain and an established niche Customer base in INDIA.

We have supplied several systems with various types of gases including Oxygen/Helium/Nitrogen/Refrigerants and developed advanced Fluid Systems on them.

PASKALS customers are high end Application Users like Automotive, Chemical Industries, Oil & Gas, High Pressure Gases, Nuclear, Defense, and Space & R&D

PASKALS specialize in CNG Vigilant, CNG Circuit Leak Tester, CNG Circuit Component Tester, CNG Service Masters, CNG Dispensing Unit, PressurePAC, TestPAC, Gas Distribution Systems, Gas Generator & Plants, Special Gas Systems, Pilot Plant & Hydraulic Power Packs.

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PASKALS - Industry & Applications

Automotive Industry	High Pressure Industry	Nuclear, Defense, Space & R&D	Pharma Industry	Semiconductor Industry	Oil & Gas Industry	Chemical Industry
<ul style="list-style-type: none"> ▪ CNG Systems ▪ PressurePAC ▪ TestPAC ▪ Test Stands (Hydrostatic Testing) ▪ Refrigerant Charging & Recovery system ▪ Hydraulic Power Pack 	<ul style="list-style-type: none"> ▪ Gas Booster Station ▪ Gas Distribution Systems ▪ Gas Cabinets ▪ Priority Panels ▪ Gas Control Panels ▪ Gas Filtration & conditioning Stations ▪ Nitrogen Generator & Plants ▪ Oxygen Generator & Plants ▪ Gas Skids & Trolleys 	<ul style="list-style-type: none"> ▪ PressurePAC ▪ TestPAC ▪ Custom Engineered Test Equipment ▪ Gas Cabinets ▪ Priority Panels ▪ Gas Control Panels ▪ Gas Distribution Systems ▪ Special Gas Systems ▪ Engineering Projects 	<ul style="list-style-type: none"> ▪ Pilot Plants ▪ Herbal Extraction Systems ▪ PressurePAC ▪ TestPAC 	<ul style="list-style-type: none"> ▪ Gas Cabinets ▪ Priority Panels ▪ Gas Control Panels ▪ Gas Distribution Systems ▪ Special Gas Systems 	<ul style="list-style-type: none"> ▪ Valve Actuation System ▪ PressurePAC ▪ TestPAC 	<ul style="list-style-type: none"> ▪ Metering Skids ▪ Flushing Skids ▪ Injection Skid ▪ PressurePAC ▪ TestPAC

PASKALS PRODUCTS

CNG Vigilant <ul style="list-style-type: none"> • CNG Circuit Leak Tester 	CNG Circuit Component Testers <ul style="list-style-type: none"> ✓ CNG Regulator Tester ✓ Cylinder Valve Leak Tester 	CNG Service Master <ul style="list-style-type: none"> ✓ CNG Service Masters 	CNG Stations <ul style="list-style-type: none"> ✓ CNG Booster Stations ✓ Custom CNG Systems 	PressurePAC <ul style="list-style-type: none"> ✓ PressurePAC-Industrial ✓ PressurePAC-Lab and R & D 	TestPAC <ul style="list-style-type: none"> ✓ Hydrostatic Pressure Testing ✓ Pressure Generators (Up to 4000 Bar)
Gas Distribution Systems <ul style="list-style-type: none"> ✓ Gas Booster Stations ✓ Gas Cabinets ✓ Priority Panels ✓ Gas Control Panels ✓ Gas Filtration & Conditioning Skids 	Gas Generator & Plants <ul style="list-style-type: none"> ✓ Nitrogen Generator & Plants ✓ Oxygen Generator & Plants ✓ Gas Booster Stations ✓ Gas Filtration & Conditioning ✓ Gas Skids 	Special Gas Systems <ul style="list-style-type: none"> ✓ Refrigerant Recovery & Charging Systems ✓ Pure Oxygen Systems ✓ Helium Systems ✓ Argon Gas Systems ✓ Gas Booster Stations 	Pilot Plants & Skids <ul style="list-style-type: none"> ✓ Customized Pilot Plants ✓ Metering Skids ✓ Flushing Skids ✓ Chemical Injection Skids 	Test Stands <ul style="list-style-type: none"> ✓ Hose Leak Test Stands ✓ Valve Test Stands ✓ Servo Hydraulic Test Stands ✓ Customized Test Stands 	Hydraulic Power Packs <ul style="list-style-type: none"> ✓ Hydraulic Power Packs

PASKALS IN CNG AUTOMOTIVE INDUSTRY

ONE STOP SHOP FOR ALL YOUR HIGH PRESSURE NEEDS

Paskals & Haskel together have delivered innovative products for CNG Automotive Industry, worldwide.

Our Innovative **CNG Vigilant** is a must for every CNG vehicle manufacturer for end of line testing. It is a complete solution for your entire Leak testing needs and features like Temperature Compensation & Nitrogen Recycling makes it Best Leak Testers available in market.

Paskals & Haskel together have products for all your needs. Be it component testing, R&D and Product development, testing at your service stations, we have proven products for all your needs.

Our **PressurePAC** is developed to take care of the pressing requirement in various departments for testing/maintenance / repair/R&D & Product development purpose. It is compact and portable enough to carry it anywhere. We have electric driven as well as Air Driven versions of the product.

Every company in the CNG Automotive Industry should have several of these units in their R&D Lab, Product Development department, Maintenance Department & Production Department. These are work horses designed for rugged life.

We have developed Testers for all components in your CNG circuit. Some of these are:

- CNG Circuit Pressure Regulators Test Equipment
- CNG Circuit Gauges Test Equipments
- CNG Circuit Valve Test Equipment
- CNG Nozzle Test Equipments
- CNG Cylinder Test Equipments
- CNG Cylinder Valve Test Equipment

Paskals have also developed **CNG Service Master** for CNG Vehicle service centers & remote locations. These are low cost and rugged systems. These are very popular with Service Stations & CNG Kit manufacturers.

Our other products like TestPAC, Gas Boosters, Pumps shall be of great use at your end. We build custom engineered equipments and have supplied more than 200 of these in INDIA itself.

We are one stop company for all your high pressure needs and have the innovation of 60 years of Haskel & our 55 Engineers behind these products.

CNG Vigilant - Leak Testing Technology

LEAK DETECTION at High Pressure is extremely challenging & involved affair. It is primarily due to severe temperature effects (errors). Using Gas equation, it can be easily seen that one degree temperature change in the test medium will cause a pressure change of ~1 Bar (in case of 100 cc test Volume being tested at 300 Bar of N2 temperature at 45 Degree C).

Let us say that due to Nitrogen filling there is an increase in pressure of value ΔP_t

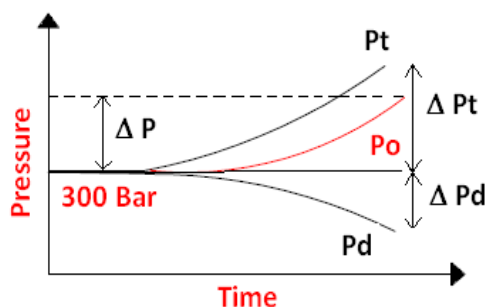
Using formula

$$P_1 V / T_1 = P_2 V / T_2$$

$$\Delta P_t = 0.9433 \text{ BAR}$$

If there is a leak in the circuit and due to this leak let us say there is a pressure drop of ΔP_d in the system (which is < 0.5 Bar) then final change in pressure will be $\Delta P_t - \Delta P_d > 0$

An error of approximately 1 Bar is generated automatically in the system due to temperature. With such pronounced errors due to temperature effects, PASKALS has developed temperature compensation technologies. These are implemented in following ways:



ΔP_t = Pressure increase due to Temp rise

ΔP_d = Pressure Decay due to leak

ΔP = Final pressure Difference

- Innovative TTLIV technology
- Automatic/ Preprogrammed & calibrated rate of filling the Test volume – Independent programs for various Test Volumes (up to 5 types)
- Software programmed to handle temperature effects

Other Features

- **Fully Automatic with Remote control Box**

Leak Testing was never more simplified than VIGILANT-Ver 0.3. Two simple steps make it possible to conduct the Leak Test. Connect the unit and press a button. Predefined Testing Procedure and Parameters makes the process standard.

With **Remote Control** feature it is now possible to control the machine from a distance of up to **10 meters**. It allows the user to **control and monitor** the system when working at a distance (like from below the vehicle).

- **Safety: Step Pressurization and Flow Control**

In any domain Human error is inevitable. In many cases some fitting is left loose or open. In such a condition if the circuit is charged to high pressure without controlling the flow accident might happen.

CNG Vigilant has fool proof features to avoid such a case. Filled volume is internally measured to insure that filled gas is not getting leaked into cylinder or in to the atmosphere. Pressurization is done in multiple stages for more controlled and safe operation. Flow rate is controlled such that if pressure does not reach the first stage in a specified time alarm will go off.

System is monitored at each stage for prescribed time duration and in case of leak notification is generated with audio and visual alarm. Testing Parameters like Test Pressure and Test Time can be configured by user according to his requirement.

- **Independent Software Program for up to 5 Circuit types**

Internal Volume of the circuit is very important parameter in temperature compensation. With Vigilant Ver0.3, the user circuit is calibrated in the software for filling rate control as well as temperature compensation. Preprogrammed logic decides the flow rate of filling such that higher level of accuracy is achieved without increasing the operational time.

Keeping in mind the variation in circuits of different models, Vigilant is designed to function specifically to the circuit properties. Independent Programs are configured to fulfill unique system needs.

Up to five circuits may be calibrated & programmed.

- **Nitrogen Auto changeover & recycling /Reuse**

As production line is moving more and more towards making itself efficient, Machine downtime is one area that is non productive and needs to be minimized. With its Auto changeover feature VIGILANT-Ver0.3 has no downtime.

VIGILANT-Ver 0.3 can be connected to nitrogen Bank with 4 cylinder capacity(Offered OPTIONALLY) and it automatically switches over to next cylinder when one cylinder empties. It is no more required to change the single cylinder again and again.

Running cost of equipment is minimized by Reusing the Nitrogen. The Nitrogen vented from the system after test cycle is redirected to the booster and filled into the reservoir. This makes nitrogen bank last long hence reducing the running cost of machine.

- **High Accuracy Leak Detection Methods**

A choice of Leak Detection method is offered with VIGILANT-Ver 0.3 based on the level of accuracy required. Methods offered are:-

- **Pressure Decay + Differential Pressure** STANDARD Vigilant Ver 0.3 works on combined Pressure Decay + Differential Pressure technology. The LEAK is monitored and alarm is generated in case LEAK is detected. This method of leak detection is accurate, efficient & cost effective. Per vehicle Test Costs are also LOW.
- **Mass Spectrometer** is a very high accurate method of leak detection. It can achieve up to 1×10^{-10} atm cc/sec accuracy level. This may be used with SNIFFER PROBE for CNG Circuits. For CNG circuit components, option of vacuum chamber is available. With vacuum chambers, unit is placed in a vacuumized leak proof chamber and then it is filled with pressurized Nitrogen-Helium mixture. Mass Spectrometer determines the Leak Rate. This option has higher per test cost and is highly accurate.

- **Recoding, Analysis, Report Generation and Printing**

Documentation is an important part of Production which is why automatic report is generated at end of each test. All TEST DATA, vehicle wise is displayed, recorded and stored for future analysis & reporting. The data may also be taken to a computer for further analysis. User comments can also be added for further detailing of the test. This report can be printed and saved for future reference.

PRODUCT SPECIFICATIONS

Model →	VIGILANT VER.<0.30>	VIGILANT VER.<0.34>
Features ↓		
Detection Method	Pressure Decay + DP Sensing with Temperature compensation	Helium Mass Spectrometry
Medium	Nitrogen	Nitrogen-Helium Mixture
Minimum Detectable Leak Rate	Configurable	up to 1×10^{-9} atm cc/sec
Pressure range	up to 350 Bar	
Report generation	Yes	
Temperature Compensation	Yes	
Input Nitrogen Capacity	up to 4 x 40 Liter (Optional)	
Operating Voltage	230 VAC, 50 Hz	
Air Pressure Requirement	3-6 Bar	
Purity of Dry Inlet Air	5 micron	
Air flow Required	40 SCFM	
DPT of Air	-40°C	
Nitrogen Pressure Requirement	40-140 Bar	
Purity of Nitrogen	99.99%	
DPT of Nitrogen	-40°C	
Internal Reservoir Volume	40 liter	
Operation	Continuous	
Test Procedure	Step Pressurization	
Printer	Optional	
Nitrogen Cylinder Trolley	Optional	

PressurePAC™

YOU NEED IT IN ALL YOUR ENGINEERING DEPARTMENTS MUST FOR R&D, Maintenance, Production Floor

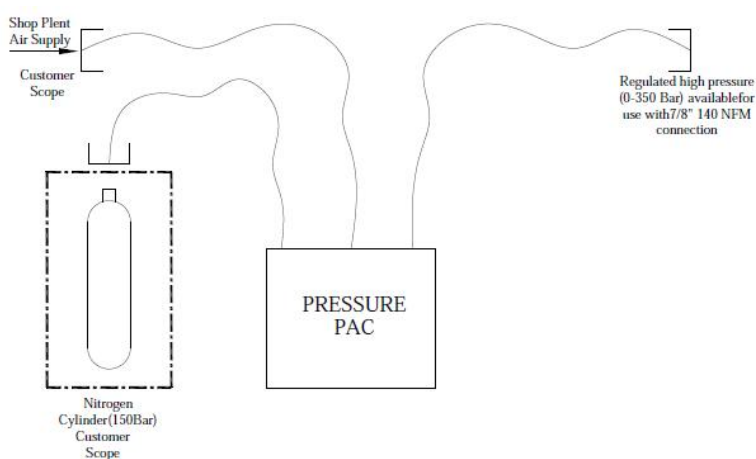
“State of the art technology (Fully Pneumatic or fully electrical) has allowed the engineers at Paskals to design and develop a range of Compact & Safe Systems for the compression of Non-reactive gases such as Nitrogen, Argon, and Helium”.



- ✓ easy to operate just **Plug & Play** type, suits to your need of Regulated High Pressure Gas @300 bar”
- ✓ Add Value to your Product Quality /Safety System by selecting Paskals PressurePAC.
- ✓ PressurePAC are safe, mobile, no moving parts and come with accessories Operating manuals.
- ✓ Paskals Product support, Training,spares just a phone call away

“OUR PRESSUREPAC ARE USED IN VARIOUS APPLICATIONS”

- CNG R&D Set ups in AUTOMOTIVE OEMs & LABS
- CNG Circuit Leakage test *
- CNG Circuit component prototype testing.
- As intensifier to High Pressure gases.
- R&D labs immediate High Pressure Requirements.

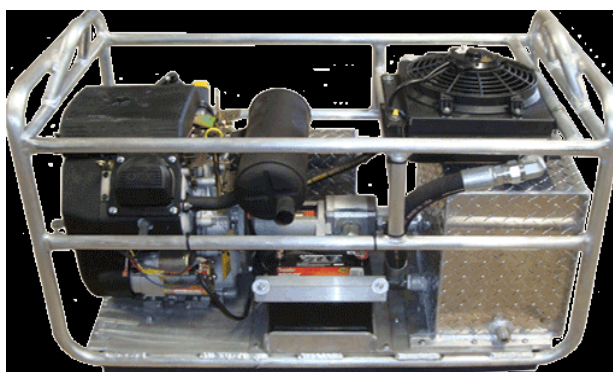


Drive	Drive Pressure (Bar)	Inlet Gas Pressure (Bar)	Outlet Gas Pressure (Bar)	Regulated Gas Pressure (Bar)	Reject Gas Pressure (Bar)
Air	4	40-150	350	0-350	10

Our Featured Product



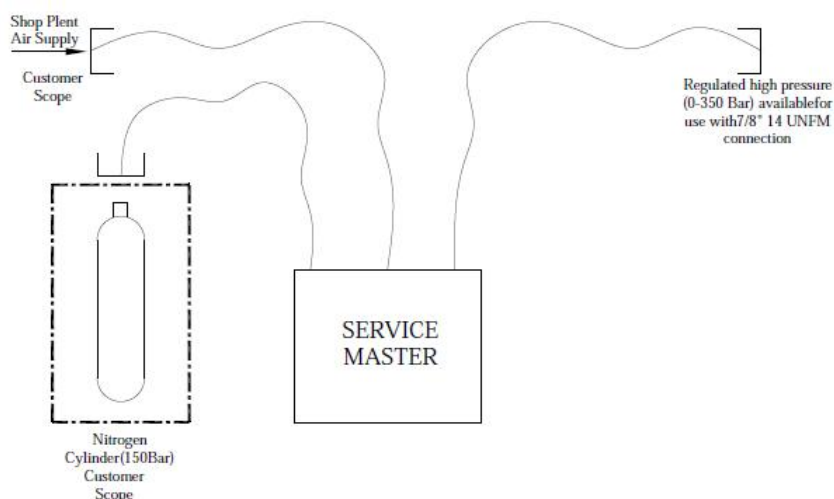
“State of the art technology (Hydraulic Driven) has allowed the engineers at Paskals to design and develop a range of Compact & Safe Systems for the compression of Non-reactive gases such as Nitrogen, Argon, and Helium”.



- ✓ Easy to operate just **Plug & Play** type, suits to your need of Regulated High Pressure Gas @300 bar
- ✓ Add Value to your CNG Vehicle Circuit servicing/maintenance needs by selecting Paskals CNG Service Master.
- ✓ Paskals Product support, Training, spares just a phone call away.

“OUR PRESSUREPAC ARE USED IN VARIOUS APPLICATIONS”

- CNG R&D Set ups in AUTOMOTIVE OEMs & LABS
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ive	Drive Voltage (Volts)*	Inlet Gas Pressure (Bar)	Outlet Gas Pressure (Bar)	Regulated Gas Pressure (Bar)	Reject Gas Pressure (Bar)
Electric	220V	150	350	0-300	10

*Other Options in 24 V DC/12 VDC are also available .Please consult Factory.

Our Featured Product

TestPACTM

Paskals TestPAC is designed to provide on-site High Pressure testing. These units are self-contained and powered by compressed Air.

These units can generate Liquid Pressure up to 4000 bar * and for gases we have PressurePAC which can generate gas pressure up to 2000 bar*.



Ability to stall at any predetermined pressure and hold this fixed pressure without consuming power or generating heat

- ✓ No heat, flame or risk of spark
- ✓ Infinity Variable cycling speed (flow rate)
- ✓ No limit or adverse effect to continuous stop / start application
- ✓ Pump seals are self-lubricated requiring no external airline Lubricator
- ✓ Reliable, Easy to maintain, compact and robust.
- ✓ Stainless steel frame standard
- ✓ Portable Configuration

“OUR TESTPAC ARE USED IN VARIOUS INDUSTRIES& APPLICATIONS”

- Hydrostatic Pressure Testing
- Isostatic pressing
- Crimping and small power tools
- Hydraulic Presses
- Water Injection blast cleaning
- Valve Actuation
- Roller Tensioning
- Liquid Chromatography
- Filter Presses
- Chemical Injection & Metering
- Foam Manufacturer
- Hydraulic Tube Pulling / Swaging
- Armament Manufacturers (Isostatic & Hydrostatic Testing)
- Air-conditioning / Refrigeration
- Die Casting
- Fire Industry (Washing, Cutting , Curving & Purging of ICs & PCBs)
- Railways
- Tunnel / Mining / Quarrying
- Lubrication
- Automotive Industry
- Universities (Laboratory Applications)
- Diving / Sub aqua
- Clamping
- CNG Market- Transportation
- Diesel Engines
- Military Aircraft
- Plastic Injection Moulding & Die casting
- Jacking / Lifting

CNG PRODUCTS

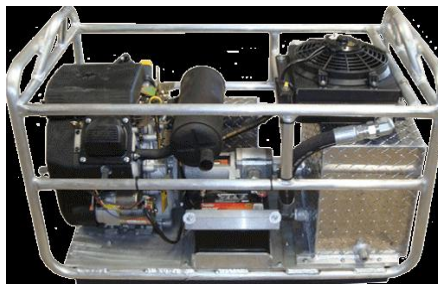
TestPAC™



Attractive Features*

- ✓ Fully Automatic
- ✓ Pneumatic Operated
- ✓ Up to 4000 Bar Pressure
- ✓ Intermeshed safety interlocks
- ✓ Step Pressurization
- ✓ Non electric pneumatic controlled model available
- ✓ Fully Mobile/Portable and easy handling
- ✓ Compact
- ✓ Rugged Performance
- ✓ User Friendly easy operation
- ✓ Low cost/Economic Model
- ✓ Multiple Applications in various industries

CNG Service Master™



Attractive Features*

- ✓ Hydraulic operated
- ✓ Snoop/Soap solution for joints leak Check.
- ✓ Low voltage electric power required
- ✓ High Pressure storage
- ✓ Step Pressurization (3 stages) to 300 bar
- ✓ Manual Operation
- ✓ Mobile/Portable and easy handling
- ✓ Low cost /Economic Model
- ✓ Highly recommended for CNG Vehicle service stations/retrofitment centers/maintenance depots.

PressurePAC™



Attractive Features*

- ✓ Fully Automatic Pneumatic Operated
- ✓ No Electrical Power Required
- ✓ Pneumatic logic controlled operation
- ✓ Safety interlocking
- ✓ Step Pressurization to 300 bar
- ✓ Fully Mobile
- ✓ Ergonomic Panel
- ✓ Nitrogen Recycling
- ✓ Compact
- ✓ Trusted Performance
- ✓ Recommended for CNG vehicle OEMs,
- ✓ OEMs CNG R&D centers/Labs
- ✓ CNG components i.e. Valves,regulator Manufactures for their immediate pressure testing requirement

OUR PRODUCTS



IN TECHNICAL COLLABORATION WITH



For further assistance, please consult factory.