DRAPER®

EN

Original Instructions
Version 1

VACUUM
TESTING KIT

35891

1. Preface

These are the original product instructions. This document is part of the product; retain it for the life of the product, passing it on to subsequent holders. Read this manual in full before attempting to assemble, operate or maintain this product.

This Draper Tools manual describes the purpose of the product and contains all the necessary information to ensure its correct and safe use. Following all the instructions and guidance in this manual will ensure the safety of both the product and the operator and increase the lifespan of the product.

All photographs and drawings within this manual are supplied by Draper Tools to help illustrate correct operation of the product.

Every effort has been made to ensure the information contained in this manual is accurate. However, Draper Tools reserves the right to amend this document without prior warning. Always use the latest version of the product manual.

1.1 Product Reference

User Manual for: Vacuum Testing Kit

Stock No: 35891

Part No: CTEVG2

1.2 Revisions

Version 1: February 2024
First release

As our manuals are continually updated, always ensure that the latest version is used.

Please visit **drapertools.com/manuals** for the latest version of this manual and the associated parts list, if applicable.

1.3 Understanding the Safety Content of This Manual

WARNING! – Situations or actions that may result in personal injury or death.

CAUTION! – Situations or actions that may result in damage to the product or surroundings.

Important: – Information or instructions of particular importance.

1.4 Copyright © Notice

2. Contents

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3. Product Introduction

3.1 Intended Use

This Vacuum gauge testing kit is designed as a comprehensive accessory kit which can be used for bleeding brakes & clutch units on most vehicles including cars, commercial & motorbikes. Suitable for fault finding common issues on air conditioning, fuel, transmission, turbo waste gates, valve stem oil seals, ignition and emissions.

Read this manual in full before assembling, operating or maintaining this product, and retain it for later use.

3.2 Specification

Stock No.	35891
Part No.	CTEVG2
Piston Stroke:	1"^{3}
Gauge Diameter:	approx. 52mm
Gauge Pressure Range:	0-760mmHg (0-30InHg)
Gauge Pressure Accuracy:	+/- 3%
Short Flexible Hose Length:	75mm
Short Flexible Hose Diameter:	10mm
Long Flexible Hose Length:	525mm
Long Flexible Hose Diameter:	10mm

Important: Read all the Health and Safety instructions before operating, maintaining or repairing this product. Non-compliance with these instructions may result in injury or damage to the user, test kit or vehicle.

4.1 General Health and Safety Precautions

- Keep this product in good working order and condition. **DO NOT** operate if any parts are damaged or missing as this may cause failure and/or personal injury.
- **DO NOT** modify any parts and only use accessories and spare parts supplied by Draper Tools.
- Keep children and unauthorised persons away from the work area.
- Keep the work area clean and tidy and ensure that there is adequate lighting.
- **DO NOT** use the kit to perform a task for which it is not designed.
- **DO NOT** hold the pump inlet against the skin whilst using the pump.
- **DO NOT** allow untrained persons to use the kit.
- **DO NOT** use whilst under the influence of drugs, alcohol or intoxicating medication.
- After use, clean equipment and store in a cool, dry, childproof area.

WARNING! Brake fluid will damage paintwork. Any spillage should be flushed with water immediately.

WARNING! Brake fluid is flammable - keep away from sources of ignition, including hot surfaces e.g. exhaust manifold.

- Dispose of waste liquids in accordance with local authority regulations.

WARNING! DO NOT pollute the environment by allowing uncontrolled discharge of fluids.

- Always read and comply with the warnings on the brake fluid container.
- Wear eye protection and keep skin contact to a minimum. If brake fluid splashes into eyes, rinse with plenty of water and seek medical advice. If swallowed seek medical advice.

4.2 Residual Risk

The safety instructions in this manual cannot account for all possible conditions and situations that may occur. Exercise common sense and caution when using this product and protect against any additional conceivable risks.

4.3 Explanation of symbols


Read the instruction manual

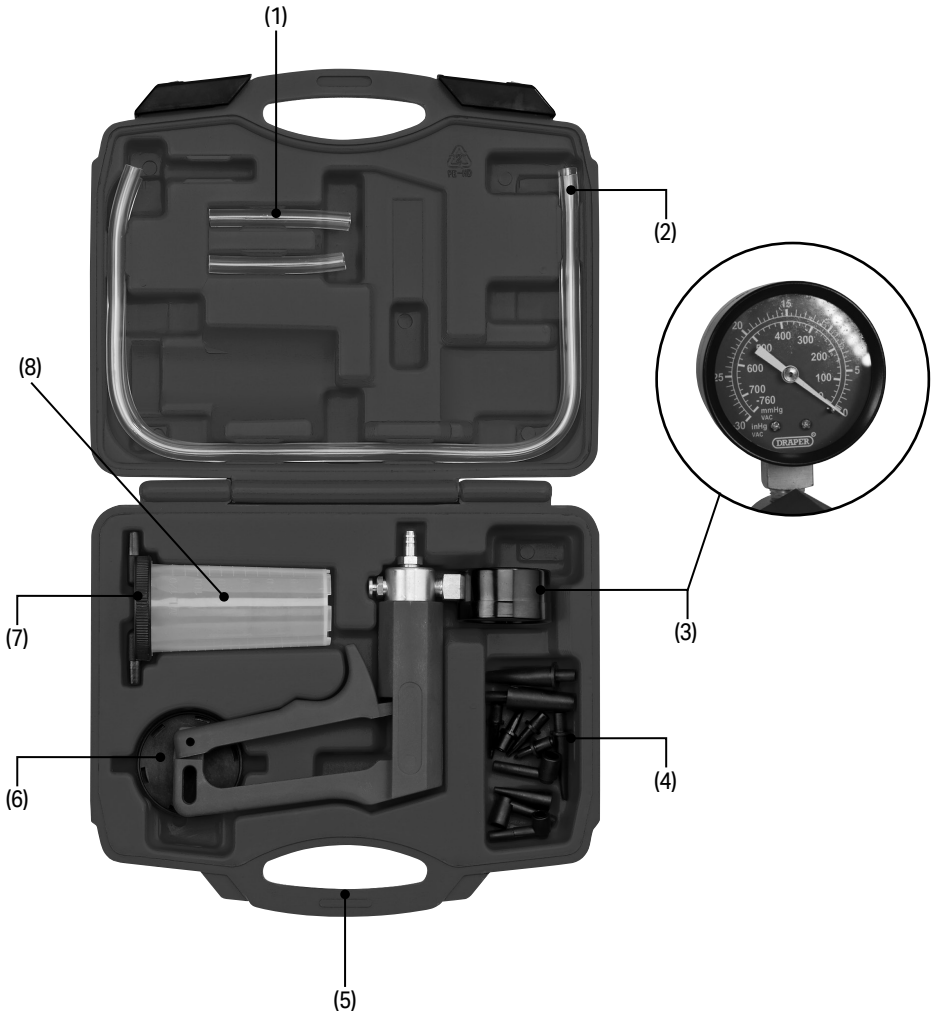

Warning!


Do not abandon in the environment


Wear face mask and safety glasses

5. Identification and Unpacking

5.1 Product Overview



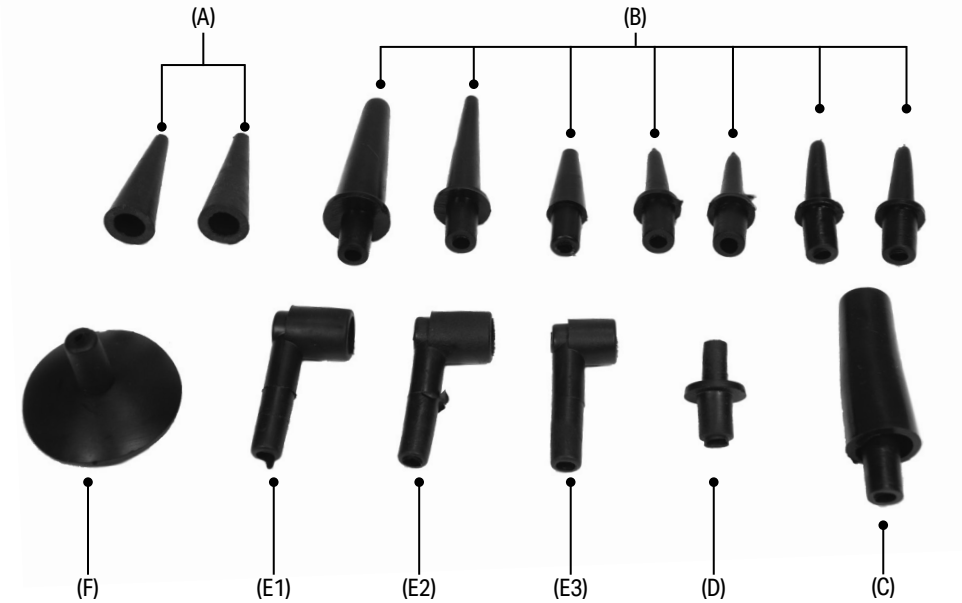
(1) Short Extension Tube X 2
(2) Long Extension Tube X 2
(3) Vacuum Gauge and Pump
(4) Hose and Nipple Adaptors
(5) Storage Case
(6) Transfer Cap
(7) Reservoir Cap
(8) 120ml Reservoir

5. Identification and Unpacking

5.2 What's in the Box?

Carefully remove the product from the packaging and examine it for any signs of damage that may have occurred during shipment.

Before assembling the product, lay the contents out and check them against the parts shown below. If any part is damaged or missing, do not attempt to use the product. Please contact the Draper Helpline; contact details can be found at the back of this manual.



(A) 2 x Hose End Cones
(B) 7 X Tapered Hose Adaptors
(C) 1 X Large Tapered Hose Adaptor
(D) 1 X Stepped Adaptor
(E) 3 X Bleed Nipple Adaptors
E1. 1 X Large
E2. 1 X Medium
E3. 1 X Small
(F) 32mm Suction Cup

5.3 Packaging

Keep the product packaging for the duration of the warranty period for reference should the product need to be returned for repair.

WARNING! Keep packaging materials out of reach of children. Dispose of packaging correctly and responsibly and in accordance with local regulations.

Please visit **drapertools.com** for our full range of accessories and consumables.

Important: Before preparing or adjusting this product, read and understand all the safety instructions listed in this manual.

ALWAYS refer to the manufacturer's service manual to ensure the correct testing procedures and specifications are followed. It is recommended that additional tests such as compression tests, cylinder leakage tests, ignition timing checks are carried out to confirm the vacuum gauge readings.

6.1 Analysing Engine Mechanical Conditions Using Manifold Readings

(Refer to the diagnostic chart for examples of readings that may be observed).

- Important Notes:
  - The action of the needle on the gauge during testing is more important to note rather than the actual reading.
  - Engine types will run with different manifold vacuum pressures, depending on camshaft profile, valve overlap and timing. For reference the needle reading should be steady and between 16 to 21inHg.
  - Manifold vacuum is also affected by altitude and it will drop approximately 1inHg for every 1000feet above sea level so this should also be taking into consideration when assessing the readings.

Fig. 1

6.2 Basic Diagnostic Test

1. Run the engine until the normal operating temperature is reached. Then switch off the engine.
2. Connect the vacuum gauge to a port directly on the manifold or on the carburettor/throttle body below the throttle butterfly.
3. Start the engine and allow to idle, observe the gauge reading as shown in the diagnostic testing.

Diagnostic Testing	
Gauge Reading	**Cause**
16 – 21inHg Needle Steady	Normal
When throttle opened and released, needle drops to below 5inHg and then up to 25inHg. Then settles back to original reading.	Normal
Steady but extremely low.	Leaking intake manifold system. Faulty manifold or carburettor base gasket. Split vacuum hose. EGR valve seized.
Steady but low.	Retarded ignition timing. Confirm using timing light and reset to manufacturer's specification.
Slightly low and slowly fluctuating.	Over lean or rich mixture. Check and reset as per manufacturer's specifications.
Fluctuating between normal and low readings.	Blown head gasket between 2 adjacent cylinders. Carry out cylinder leakage test.
Slightly lower than normal even when throttle is opened and released.	Worn piston rings. Carry out compression test.
Regular drop between normal and low reading.	Burnt Valve.
Normal until drops when revs held at 3000rpm.	Restriction in exhaust system.

6.3 Ignition System Vacuum Advance

On standard points and some electronic ignition systems there are two types of advance methods used, both of which must function correctly to obtain maximum performance and fuel economy.

- **Mechanical/Centrifugal (Weights located in the base of the distributor)** - the weights move outwards advancing the ignition timing as the engine RPM increases. This is tested by disabling the system by removing the vacuum advance line. Then with a timing light connected, raise the engine RPM, checking that the timing advances in accordance with the manufacturer's specification.
- **Vacuum Advance (Engine load sensed via manifold vacuum)** - A vacuum diaphragm is mounted onto the distributor and connected to a rotating internal base plate which advances or retards timing as required to suit varying engine loads.
  a. To test this system for correct operation, connect a timing light, raise the engine RPM and check the timing advance against the manufacturer's specification. If the vacuum advance is not operating, remove the vacuum line from the distributor advance mechanism. Connect the vacuum tester and create a 5-10inHg vacuum, monitoring the timing at the same time. If a timing advance is noted this confirms that the vacuum diaphragm and mechanical links are in order and that the fault is a vacuum supply.
  b. To confirm this, connect the vacuum tester to the vacuum supply line and check the gauge reading. No vacuum should be noted at idle but when the engine RPM is increased a vacuum increase should be observed. If this does not occur, trace the vacuum line back checking for restrictions and breaks.

The vacuum tester can be used to evaluate the condition of a mechanical fuel pump by testing the vacuum that it is able to create.

- Locate and remove the suction line from the pump. Connect the vacuum tester to the suction port of the pump, start and run the engine at idle.
- The vacuum reading observed will vary depending on the make and model being tested but as a general rule approximately 15inHg of vacuum should be created. This should also be held for approximately 1 minute after the engine shuts down. If this vacuum reading is not achieved or the vacuum drops off immediately with the engine shut down, the fuel pump requires either an overhaul or replacement.

7.1 Carburettor Testing

The vacuum test kit allows quick and accurate testing of many different types of vacuum control systems used on carburettors. Examples of tests that can be carried out;

- **Testing a Choke Break Diaphragm**.
  - With the engine off and at normal operating temperature, disconnect the vacuum line to the diaphragm module. Connect the vacuum tester and apply approximately 15inHg of vacuum and wait for 30 seconds.
  - No drop in gauge reading should be observed. With the vacuum still applied ensure that the choke butterfly is pulled to the fully open position.

- **Testing Vacuum Operated Carburettor Secondary Barrel**.
  - With the engine off and at normal operating temperature, remove the vacuum line from the secondary diaphragm module. Connect the vacuum tester, hold the throttle and secondary air valve flaps open.
  - Operate the hand pump whilst observing whether the secondary throttle butterfly opens freely.

7.2 Fuel Injection Pressure Regulator Testing

Multi-point fuel injection rail pressure varies to suit changing engine loads and fuel delivery requirements. This is done using a vacuum operated regulator which is connected to the engine manifold vacuum to sense the varying loads.

a. To test the fuel rail pressure, attach a gauge to the rail, then the engine loads must be created to vary the engine manifold vacuum.

b. Remove and block off the vacuum supply line to the pressure regulator.

c. Then connect and operate the vacuum pump to simulate vacuum pressures in accordance with the manufacturer's specification. Note: any variation in fuel pressure reading.

7.3 Emission Control Exhaust Gas Recirculation Valve (EGR)

- Start the engine and run at idle until normal operating temperature is reached. Remove the vacuum line from the EGR valve and attach the vacuum test kit.
- Operate the hand pump to apply approximately 15inHg of vacuum. If the EGR valve is working correctly the engine idle will become rough. If the idle remains unchanged the valve is possibly seized in the closed position. If the vacuum is not held, the diaphragm in the valve has failed.

7.4 One-Way Valve Testing

Many vacuum operated circuits use in-line one way valves to apply vacuum in one direction only.

- To test the function of the valve remove it from the circuit. Attach the vacuum tester and operate pump to apply vacuum. The valve should only hold vacuum in one direction.

7.5 Electrically Operated Vacuum Solenoid Testing

- Electrically operated vacuum solenoids are commonly used in control circuits for air conditioning/ventilation systems, emission control systems and idle step-up systems.

1. Locate the solenoid to be tested and remove the line that goes to the component.
2. Connect the vacuum tester to the solenoid port and start the engine. With the system turned off the gauge reading should be '0'.
3. Turn the system to the 'on' position and the gauge reading should be equal to the manifold vacuum. If no reading on the gauge, remove the vacuum supply line and test for manifold vacuum at this point. If the vacuum does exist this indicates that the solenoid is faulty, or it is not receiving a 'switch on' voltage (use a multimeter to test this). If no vacuum exists trace the supply line back to the vacuum source checking for kinks and breaks.

7.6 Thermal Vacuum Switch Testing

- There are many vacuum controlled circuits that must only operate when the engine reaches normal operating temperature. This is done using thermal switches that remain in an 'off' position until a given temperature is reached.

1. To test this type of switch, remove the vacuum supply line coming from the manifold to the switch and test the manifold vacuum.
2. If this vacuum is correct refit the supply line to the thermal switch and remove the opposing line from the switch.
3. Attach the vacuum tester to the port and start the engine. With a cold engine no reading should be noted. When the engine reaches normal operating temperature a manifold vacuum reading should be noted.

7.7 Vacuum Operated Heater Tap Testing

Climate control ventilation systems commonly use vacuum operated taps to control the heating modes and to turn the heater tap 'on'.

1. To test, remove the supply line from the tap vacuum module and connect the vacuum tester.
2. With the engine at normal operating temperature locate the heater return hose. With the heater tap in the 'off' position, this hose should be cold.
3. Operate the vacuum pump to open the tap. The gauge reading must hold steady. If the tap is working the return hose will begin to heat. If the hose does not begin to heat, this indicates that the tap is faulty.

7.8 Automatic Transmission Vacuum Operated Modulator Valves Testing

- Automatic transmissions are normally equipped with a vacuum operated modulator valve in order for the automatic transmission to detect engine loads and adjust shift points to suit.
- The vacuum tester can test both whether the modulation valve diaphragm is serviceable and to simulate varying engine loads so modulator pressure readings can be recorded.

1. **To test the modulator valve diaphragm** - remove the vacuum supply line from the valve and attach the vacuum tester. Operate the vacuum pump until approximately 15inHg is achieved and monitor the gauge reading for approximately 30 seconds. No vacuum drop should be noted.
2. **To check modulator pressure readings** - attach a pressure gauge to the appropriate port on the transmission. Remove the vacuum supply line from the modulator and attach the vacuum tester. Start and run the engine and apply vacuum pressures. Monitor readings and confirm that they conform with the manufacturer's specifications.

8.1 Brake Servo Diaphragm Testing

1. Remove the vacuum supply line from the brake servo fitting.
2. Attach the vacuum tester to the vacuum supply port on the servo. Operate the pump to create approximately 15inHg of vacuum and wait for 30 seconds. No drop in the vacuum reading should be observed. If the vacuum drops this indicates that the brake servo diaphragm is faulty. In this case the servo should be removed for overhaul or replaced by an authorised repairer.

8.2 Brake And Clutch Bleeding Procedure

WARNING! Familiarise yourself with the hazards of brake fluid - read and follow the manufacturer's instructions on the container.

- **DO NOT** touch the vehicle's brake pedal whilst bleeding the brakes.
- Ensure that the vacuum pump is connected to the brake bleeder reservoir in accordance with the car manufacturer's recommendations. Failure to do so will result in brake fluid being drawn into the vacuum pump.
- Refer to the specific vehicle manufacturer's instructions for brake bleeding and wheel sequence procedure before proceeding. If no specific instructions from the vehicle manufacturer exist, follow the instructions detailed below:-

1. Remove the cap of the vehicle's master brake fluid reservoir. If the fluid level is not at maximum, top it up.
2. Attach the appropriate size bleeding adaptor (A) to (E) to the bleed nipple on the brake calliper of the first wheel, normally farthest from the master brake fluid reservoir.
3. Operate the vacuum pump until approximately 21inHg vacuum is created.
4. Apply copper grease to the brake bleeding nipples before and after the brake bleeding procedure to reduce the possibility of seized or broken nipples when the brakes are next bled.
5. Open the bleed nipple about a quarter of a turn. Allow brake fluid to be drawn until no air bubbles are visible in the brake fluid in the clear hose.
6. Tighten the bleed nipple and remove the adaptor from the brake nipple.
7. Repeat the process as necessary.

   – **NOTE!** Check the master brake fluid reservoir regularly to ensure that the level does not drop too far, and top up as necessary.
   – Empty bleeder container regularly and do not allow container to overfill as brake fluid will be drawn into vacuum pump.

WARNING! When brake bleeding and/or fluid changing is complete, test the action of the brake pedal to ensure that the brakes are working before attempting to drive the vehicle on the road and test the vehicle for satisfactory performance of the braking system.

9. Maintenance

- After use, clean and store in the storage case in a cool, dry, childproof area.

10. Spares, Returns and Disposal

For spare parts, servicing, and repair and replacement options, please contact the Draper Tools Product Helpline for details of your nearest authorised agent.

Any servicing or repairs carried out by unauthorised personnel or installation of spare parts not supplied by Draper Tools will invalidate your warranty.

At the end of its working life, dispose of the product responsibly and in line with local regulations. Recycle where possible.

- Dispose of waste liquids in accordance with local authority regulations.

11. Warranty

Draper Tools products are guaranteed for 12months to be free from defective materials and workmanship. Full details of the warranty period can be found on the Draper Tools Website.

Should the tool develop a fault within the warranty period, return the complete tool to the place of purchase or contact Draper Tools directly. Proof of purchase must be provided.

This warranty does not apply to any consumable parts or normal wear and tear.

It also does not cover any damage caused by misuse, careless or unsafe handling, modifications, or repairs carried out by any personnel other than an authorised Draper Tools repair agent.

Please note that this guarantee is in addition to and does not affect your statutory rights.

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