

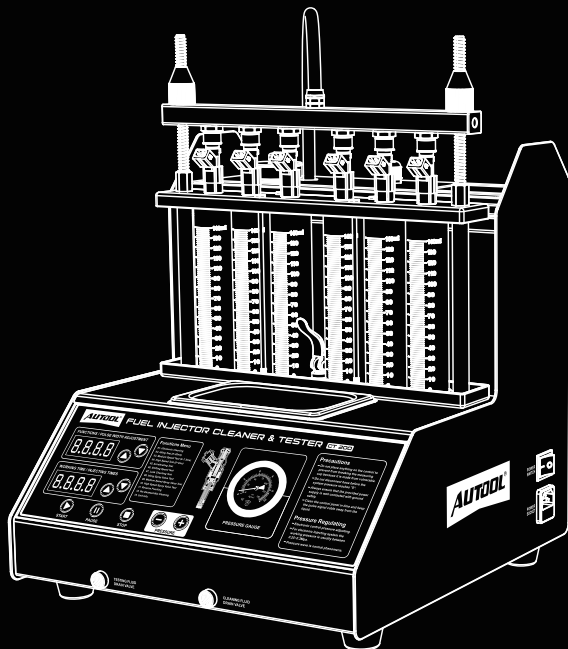
AUTOOL[®]

AUTOOL CT200

Auto Fuel Injector Cleaner & Tester

User Manual

用户手册





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CAUTIONS

Warning



Before using the instrument, please read this manual carefully for proper operation.

- ▶ Since the test device is part of quartz glass, it is easy to break, so do not place other objects around the equipment to avoid bumping and breaking.
- ▶ If there is no digital display after power on, please check whether the power supply is powered; if so, check whether the plug is connected firmly, or whether the fuse is blown. If it is not broken, and the switch is still invalid after pressing the switch several times intermittently, please contact the manufacturer and must not disassemble it by yourself, otherwise our company will not provide warranty.
- ▶ When no cleaning agent is added to the ultrasonic tank, it is strictly prohibited to open the ultrasonic cleaning item to avoid damage to the ultrasonic system.
- ▶ Every time the test solution is changed, it must be cleaned up, and then 1L of new test solution should be added.
- ▶ The use of unqualified testing agent will cause corrosion of the oil pump, oil supply pipeline and failure of the pressure gauge.
- ▶ Using other cleaning agent and testing agent will cause the equipment surface coating to peel off.
- ▶ It is strictly forbidden to use kerosene, gasoline or other testing agent and cleaning agents as testing agent and cleaning agents for this machine. Otherwise, the “O” ring and pipeline rubber parts in the equipment will be damaged, causing leakage.
- ▶ The cleaning agent and testing agent should not be mixed up.

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PRODUCT INTRODUCTION

Overview

Fuel injector diagnostic and cleaning equipment is a mechatronics product that combines ultrasonic cleaning technology and micro-computer oil pressure closedloop control cleaning and detection technology. This product simulates various operating conditions of the engine, and cleans and inspects the fuel injectors of various automobiles and motorcycles. This equipment is the necessary and preferred equipment for the automobile and motorcycle repair and maintenance industry, research and teaching and training departments.

Main functions

- **Ultrasonic cleaning:**
Ultrasonic cleaning can be performed on single or multiple injectors at the same time, which can remove the attachments and internal blockages on the injectors.
 - **Uniformity detection:**
To detect the uniformity of the injection volume of each injector.
 - **Atomization observation:**
Using the background light, you can observe the spray atomization situation of the nozzle in a comprehensive and careful manner.
 - **Tightness test:**
It can detect the tightness and dripping of the fuel injector under high pressure.
 - **Fuel injection volume detection:**
It can detect the fuel injection volume of the fuel injection nozzle under specific working conditions (Such as the same time and the same number of times).
-

Main features

- Using ultrasonic powerful cleaning technology, strong cleaning ability.
- Using electronic pressure regulating control technology, stable oil pressure and wide adjustable range.
- Use high-quality oil pump to ensure long-term stable use.

- The use of high-definition digital tube display makes the operation clear and easy to learn.
- The oil tank liquid level is displayed visually, and the detection liquid can be recycled.
- Bright background light, you can clearly see the various situations of the fuel injector when it is working.
- It has replaceable composite joints suitable for a variety of vehicle types.
- The testing time and pulse width of the fuel injector can be adjusted as desired within the allowed adjustment range.

Working environment

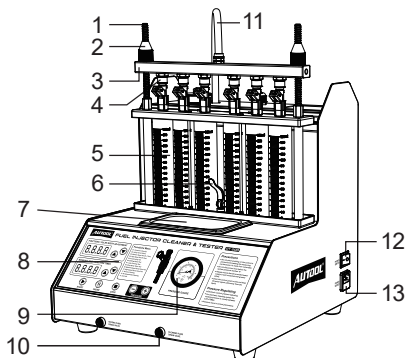
Power Supply	AC 110/220V ±10%
Frequency	50HZ ±0.5
Relative Humidity	<85%
Environment Temperature	0°C~+40°C
External Magnetic Field Strength	<400A/m
No open flames are allowed around	

Technical parameters

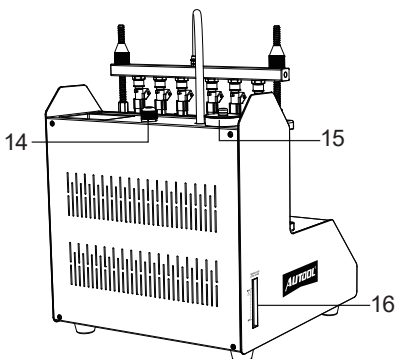
Fuel Tank Capacity	3500ml
Ultrasonic Cleaning Frequency	28KHZ ±0.5KHZ
RPM Range	0~7500RPM
PWM Pulse Width	0~20ms
Time Settings	0~10min
Cleaning Frequency	40kHz
Cylinder Volume	140ml
Injection Times	0~9900times, step 100ms
System Pressure	0~0.6Mpa
Product Size	405*380*430mm
Package Size	485*465*490mm

PRODUCT STRUCTURE

Structure diagram

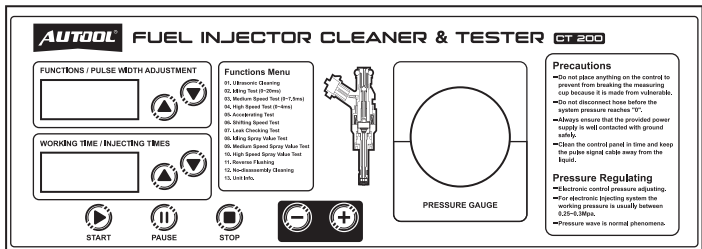


1	Lock pole	2	Lock nut
3	Oil rail	4	Top oil inlet connector
5	Glass measuring cylinder	6	Oil drain handle
7	Ultrasonic cleaning tank	8	Operation panel
9	Pressure gauge	10	Cleaning agent drain valve
11	Oil outlet pipe	12	Power switch
13	Power socket		



14	Signal wire	15	Oil fill-in port
16	Testing agent liquid level		

Operation panel diagram



- Pulse width /Function window:**
Display the selected function item when the function is selected, and display the pulse width of the injector when working.
- Time window:**
Display the working time of the fuel injector and the number of fuel injection.
- Pulse width adjustment button:**
Adjust the pulse width of the injector when working.

 - Press up to increase the working pulse width of the injector when cleaning the injector.
 - Press down to clean the injector to reduce the working pulse width of the injector.
- Time /Time adjustment button:**
Adjust the working time of the injector and the number of injections.

 - Press up to increase the working time of the injector / the number of injections.
 - Press down to reduce the working time of the injector / the number of injections.
- Start button:**
Press to execute the selected work item.
- Pause button:**
Temporarily stop the selected work item after pressing.

- **Stop button:**
Stop the selected work item and return to the selected work item.
- **Function selection button:**
Select work item.
 - Press up to select work item.
 - Press the down to select the work item.
- **Pressure adjusting knob:**
Adjust pressure change.
 - Turn clockwise to increase the pressure value.
 - Turn counterclockwise to decrease the pressure.

OPERATION PROCESS

Ultrasonic cleaning

Ultrasonic cleaning is to use the penetrating and cavitation shock waves generated when ultrasonic waves propagate in the medium, and powerfully clean objects with complex shapes, cavities and pores to completely remove stubborn carbon deposits on the fuel injector.

Preparation

- Remove the fuel injector from the vehicle and check whether its rubber seal is damaged. If it is damaged, it should be replaced in time before the cleaning test to avoid leakage during the test. Then put the fuel injection nozzle into the cleaning agent, carefully remove the external grease and wipe it with a soft cloth.
- Turn on the power and turn on the power switch on the side of the main unit.
- Put the cleaning bracket in the accessories into the ultrasonic cleaning tank, and place the wiped fuel injector in the cleaning bracket positioning hole of the ultrasonic tank.

Methods And Steps

- Add an appropriate amount of cleaning agent to the ultrasonic tank and spread the cleaning agent over the bottom of the cleaning stand.
- Insert the plugs of the drive wires into the injector sockets in turn. (Special fuel injectors need to be connected with an adapter cable)
- Press the item selection up and down keys to select the "01 Ultrasonic Cleaning" item, and then press the working time up and down keys to set the time. (The system defaults to 10 minutes, if you need to modify the time, you can use the up and down keys to change)
- Press the start button and turn on the ultrasonic cleaning switch on the side of the device to start cleaning. When working, you can press the pause button to suspend work or press the stop button to exit.
- During the cleaning process, the heating switch on the side of

the equipment can be turned on to improve the cleaning effect.

- The working time gradually decreases. When it is 0, the system automatically stops.
- Take out the fuel injection nozzle from the ultrasonic tank, wipe the cleaning liquid on it with a soft cloth, and prepare for the next job.

⚠ NOTE

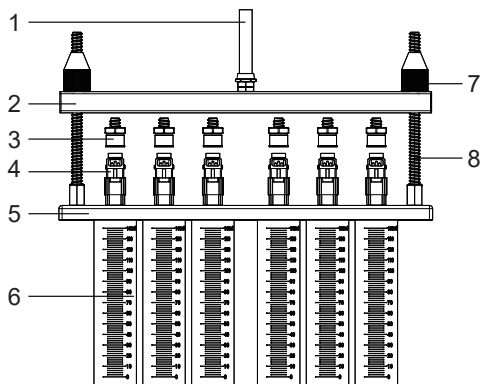
- ▶ During the cleaning process, you can hear the intermittent (approximately 5 seconds) vibrating sound when you take the fuel injector out and put it to your ear, so you can judge whether the fuel injector is working normally.
- ▶ Ultrasonic cleaning is strictly prohibited when there is no cleaning agent in the ultrasonic tank to avoid equipment damage.
- ▶ Only the ultrasonic cleaning agent dedicated to cleaning the fuel injection nozzle can be added to the ultrasonic tank, and other reagents cannot be used instead, otherwise any malfunctions and damages caused will not be covered by the warranty.

Injector diagnostic

This function is to detect the atomization, dripping, blockage, fuel injection angle status of the fuel injectors and the size and balance of the fuel injection of each fuel injector at different speeds.

Preparation

- Confirm that the oil drain handle is open, use the funnel in the accessories to add the test liquid to the equipment through the glass window, and pay attention to control the flow rate during the addition to avoid overflow.
- Add 1 bottle (about 1000ml) of testing agent each time.
- Install the fuel injector.



Top-in fuel injector installation diagram

1	Oil outlet pipe	2	Oil rail
3	Top oil inlet connector	4	Injectors
5	Upper plate seat	6	Glass measuring cylinder
7	Lock nut	8	Lock pole

- Select the top oil inlet connector from the accessories and install it into the oil separator.
- Install the fuel injector in the forward direction (apply a little grease on the “O” ring of the fuel injector)
- Put the horizontal end of the oil separator and the fuel injector on the upper plate seat, and tighten the two ends with the locking rod. Ready to test.

Methods And Steps

02 Idle Speed Test

- Confirm that the injector to be tested has been installed properly and the signal wire has been plugged in.
- Select “02 Idle Speed Test”.
- Press the working time up and down keys to set the time. (Generally set to 2 minutes)
- Press the start button to start work.

- Turn the pressure adjustment knob to adjust the pressure to 0.25~0.3MPa. (In the electronic injection system, the general oil pressure works at 0.25~0.3MPa)
 - Press the up and down keys to select the appropriate pulse width. (The system default is 3ms)
 - The working time gradually decreases. When it is 0, the system automatically stops.
-

03 Medium Speed Test

- Select “03 Medium Speed Test”.
 - Press the start button.
 - The rest of the operation steps are consistent with item 02.
-

04 High Speed Test

- Select “04 High Speed Test”.
 - Press the start button.
 - The rest of the operation steps are consistent with item 02.
-

05 Accelerating Test

- Select “05 Accelerating Test”.
- Press the start button.

NOTE

- ▶ The fuel pressure, working time and pulse width are automatically set by the system. The time system defaults to 10s as a cycle period, and the user does not need to set it separately.
 - ▶ The system will automatically and continuously cycle three times to simulate the working condition and fuel injection volume of the fuel injector when the engine is accelerating uniformly.
-

06 Variable Speed Test

- Select “06 Variable Speed Test”.
- Press the start button.

⚠ NOTE

- ▶ The fuel pressure, working time and pulse width are automatically set by the system. The time system defaults to a cycle of 10s, and the user does not need to set it separately.
 - ▶ The system will automatically and continuously cycle three times to simulate the working condition and fuel injection volume of the fuel injector when the engine is idling, medium speed, and high speed.
-

07 Leakage Test

- Select “07 Leak Test”.
- Press the working time up and down buttons to set the time. (Generally set to 1 minute)
- The rest of the operation steps are consistent with item 02.

⚠ NOTE

- ▶ The pulse width system defaults to 3ms, no need to set it again.
 - ▶ Whether the fuel injection nozzle is dripping and leaking when the simulated oil pressure is 0.3Mpa.
-

08 Idle Speed Spray Volume Test

- Press the item selection up and down keys to select the “08 Idle fuel injecting amount test” item.
- The remaining operation steps are consistent with item 02.

⚠ DESCRIPTION

- ▶ Simulate the working conditions and fuel injection volume of the engine when the fuel injection nozzle works for a certain number of times when the engine is idling.
-

09 Medium Speed Spray Volume Test

- Select “09 Medium Spray Volume”.
 - The rest of the operation steps are consistent with item 08.
-

10 High Speed Spray Volume Test

- Select “10 High Spray Volume”.
- The rest of the operation steps are consistent with item 08.

NOTE

▶ Flow Balance Test

The flow balance test shall be carried out at different speeds. When the liquid level in the measuring cylinder is 2/3 of the measuring cylinder, pause or stop work to observe the balance of the fuel injection volume. The deviation of the fuel injection volume of all fuel injection nozzles on a vehicle should not exceed 2%. Or refer to the relevant technical manual of the fuel injector to judge the flow balance of the fuel injector.

▶ Observation of Fuel Injection Shape

Observe whether the fuel injection shapes and angles of all fuel injection nozzles on the same car are uniform at various speeds. At the same time, you can adjust the opening pulse width of the fuel injection nozzle to check whether the minimum opening pulse width of the fuel injection nozzle is consistent.

▶ Leak Detection Test

The leak detection test is to detect the tightness of the injector needle valve under the high pressure of the system. (Observe the tightness of the fuel injector, generally there should be no leakage within one minute)

11 Reverse Flush Test

- Press the item selection up and down keys to select “11 Reverse Flush”, and install the injectors in the opposite direction for cleaning.

12 No-disassembly Cleaning

- Please connect to various special parts that can clean the combustion chamber or throttle.

13 Unit Info

- Display the product number and date of manufacture of the device.

STORAGE AND MAINTENANCE

Storage

- Turn off the power and unplug the power plug.
 - Put all connectors back into the accessory box for storage.
 - Drain the ultrasonic cleaning agent. Wipe the equipment clean with a dry soft cloth.
 - If the machine needs to be stored for a long time, discharge the testing agent into a bottle and seal it.
-

- **Replacement of Test Agent**

When the test agent is used for a period of time, a lot of impurities will accumulate, and the agent containing dirt cannot be used, otherwise it will easily block the fuel injector. When replacing the agent, first open the testing agent drain valve to empty the tank, and then inject a little testing agent to clean the interior of the tank. After cleaning, drain the fuel tank again and then pour 1L of new testing agent into the tank.

- **Fuse Replacement**

There is a square box marked with a fuse on the power socket on the left side of the device, and the fuse can be seen by opening the box. If it is blown, replace it with a new one.

MAINTENANCE SERVICE

Our products are made of long-lasting and durable materials, and we insist on perfect production process. Each product leaves the factory after 35 procedures and 12 times of testing and inspection work, which ensures that each product has excellent quality and performance.

Maintenance To maintain the performance and appearance of the product, it is recommended that the following product care guidelines be read carefully:

- Be careful not to rub the product against rough surfaces or wear the product, especially the sheet metal housing.
- Please regularly check the product parts that need to be tightened and connected. If found loose, please tighten it in time to ensure the safe operation of the equipment. The external and internal parts of the equipment in contact with various chemical media should be frequently treated with anti-corrosion treatment such as rust removal and painting to improve the corrosion resistance of the equipment and extend its service life.
- Comply with the safe operating procedures and do not overload the equipment. The safety guards of the products are complete and reliable.
- Unsafe factors are to be eliminated in time. The circuit part should be checked thoroughly and the aging wires should be replaced in time.
- Adjust the clearance of various parts and replace worn (broken) parts. Avoid contact with corrosive liquids.
- When not in use, please store the product in a dry place. Do not store the product in hot, humid, or non-ventilated places.

WARRANTY

From the date of receipt, we provide a three-year warranty for the main unit and all the accessories included are covered by a one-year warranty.

Warranty access

- The repair or replacement of products is determined by the actual breakdown situation of product.
- It is guaranteed that AUTOOL will use brand new component, accessory or device in terms of repair or replacement.
- If the product fails within 90 days after the customer receives it, the buyer should provide both video and picture, and we will bear the shipping cost and provide the accessories for the customer to replace it free of charge. While the product is received for more than 90 days, the customer will bear the appropriate cost and we will provide the parts to the customer for replacement free of charge.

These conditions below shall not be in warranty range

- The product is not purchased through official or authorized channels.
- The product breakdown because the user does not follow product instructions to use or maintain the product.

We AUTOOL pride ourselves on superb design and excellent service. It would be our pleasure to provide you with any further support or services.

Disclaimer

All information, illustrations, and specifications contained in this manual, AUTOOL resumes the right of modify this manual and the machine itself with no prior notice. The physical appearance and color may differ from what is shown in the manual, please refer to the actual product. Every effort has been made to make all descriptions in the book accurate, but inevitably there are still inaccuracies, if in doubt, please contact your dealer or AUTOOL after-service centre, we are not responsible for any consequences arising from misunderstandings.

RETURN & EXCHANGE SERVICE

Return & Exchange

- If you are an AUTOOL user and are not satisfied with the AUTOOL products purchased from the online authorized shopping platform and offline authorized dealers, you can return the products within seven days from the date of receipt; or you may exchange it for another product of the same value within 30 days from the date of delivery.
- Returned and exchanged products must be in fully saleable condition with documentation of the relevant bill of sale, all relevant accessories and original packaging.
- AUTOOL will inspect the returned items to ensure that they are in good condition and eligible. Any item that does not pass inspection will be returned to you and you will not receive a refund for the item.
- You can exchange the product through the customer service center or AUTOOL authorized distributors; the policy of return and exchange is to return the product from where it was purchased. If there are difficulties or problems with your return or exchange, please contact AUTOOL Customer Service.

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注意事项

警告

重要的安全说明:

- ▶ 在使用仪器之前，请仔细阅读本说明书，以便正确操作。
- ▶ 触摸设备或发动机发热部位时要小心。
- ▶ 如电源线有破损请不要开机使用，设备摔落或受损时请在专业人员检查后才可使用。
- ▶ 不要让电源线悬挂在桌边、椅边、柜台边，也不要接触热的部分或正在转动的风扇页。
- ▶ 如需扩充的电源线，电源线的等级要大于等于原设备电源线。比设备原电源线等级差的电源线会过热。
- ▶ 不使用设备时不要连接电源线插头。不要通过拉电源线来拔插头，应用手将插头取下。
- ▶ 存放设备前应让设备完全冷却，并且将线松软的绕好。
- ▶ 本仪器所选用的清洗液系易燃、弱挥发性液体，在清洗过程中严禁烟火。
- ▶ 仪器应放在无阳光直射且通风良好的房间内，并张贴“严禁烟火”和“易燃品危险警告”标志。
- ▶ 操作者的头发、衣服、手指或身体其他部位应远离设备运转部位。
- ▶ 为了防止受电击，不要在潮湿的部位接触工作中的设备或在雨中操作设备。
- ▶ 请按手册中的方法操作设备。使用生产商推荐的附件。
- ▶ 在超声波清洗池未加超声波清洗液的情况下，严禁打开超声波系统，否则容易损坏超声波设备。
- ▶ 设备机壳必须可靠接地。
- ▶ 汽车尾气中含有多种有毒有害气体（如一氧化碳、碳化氢、氮氧化物等），测试时要将其引到室外并保持室内良好通风。
- ▶ 汽车发动机排气管和水箱等部件温度较高，勿碰，以防灼伤。

- ▶ 免拆清洗时，被清洗车辆要拉好手制动，并将变速器置于空档，同时挡好前轮。
- ▶ 操作时要戴安全防护眼镜。日常用的眼镜不是安全的眼镜。
- ▶ 断开有压力的燃油管接头时要用毛巾捂住接头，以防燃油窜出伤人及引起火灾。
- ▶ 本设备主机使用检测液，免拆清洗使用清洗液。超声波清洗使用专用的超声波清洗液，若没有，可以用本设备配备的清洗液代替。
- ▶ 由于测试装置部分为石英玻璃，易破碎，因此不要在设备周围放置其它物品，以免磕碰造成破碎。
- ▶ 通电后若无数字显示（可能存在数秒延迟），请检查电源是否有电；如有，请检查插头是否接牢，或者检查保险管是否熔断。如没断，且断续按动开关几次仍无效，请与当地经销商联系，切不可自行拆开，否则我公司将不予保修。
- ▶ 在超声槽内没有添加清洗液时，严禁打开超声波清洗项目，以免空打造成超声系统损坏。
- ▶ 测试液每次更换时，必须全部排空，然后再添加1000ml测试液。
- ▶ 使用不合格的测试液将造成泵浦、供油管路腐蚀和压力表失灵。
- ▶ 使用其它清洗液与测试液将造成设备表面涂层剥落。
- ▶ 严禁使用煤油、汽油、天那水和其它测试液与清洗液等作为本机的测试液和清洗液使用。否则将会使设备内的“O”型圈。管路橡胶件等损坏，造成泄漏。
- ▶ 清洗液与测试液不可混着使用。
- ▶ 请将本机置于平面上使用，由四个底脚支撑机身重量，否则造成超声波清洗槽的损坏，不属保修范围。

产品简介

产品介绍

喷油嘴清洗检测仪是采用超声波清洗技术与微电脑油压闭环控制清洗检测技术相结合的一种机电一体化产品。该产品可以模拟发动机的各种工况，对各种汽车的喷油嘴进行清洗、检测，同时还可以对汽车喷油嘴及供油系统进行免拆清洗。该设备是汽车修理行业、养护、研究及教学培训部门的必备和首选设备。

主要功能

- **超声波清洗:** 可同时对单个或多个喷油嘴进行超声波清洗，能彻底清除喷油嘴的积碳。
 - **均匀性检测:** 检测各个喷油嘴喷油量的均匀性。
 - **雾化性观测:** 利用背景灯，可全面仔细地观察喷油嘴的喷射雾化情况。
 - **密封性测试:** 可检测喷油嘴在高压下的密封性和滴漏情况。
 - **喷油量检测:** 可以检测喷油嘴在特定的工况参数下（如相同时间、相同次数）的喷油量。
-

主要特点

- 采用超声波强力清洗技术，清洗能力强。
 - 采用电子调压控制技术，油压稳定，可调范围宽。
 - 采用高清晰数码管显示，操作直观，简便易学。
 - 油箱液位直观显示，测试液可循环使用。
 - LED明亮背景光，可清晰观看喷油嘴工作时的各种情况。
 - 拥有专利并适用于多种车型的可更换复合式适配接头。
 - 在允许调节范围内可任意调整喷油嘴的测试时间、脉冲宽度。
-

工作环境

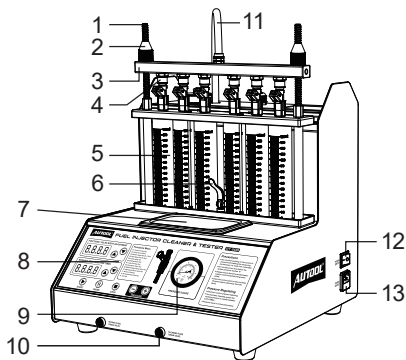
环境温度	+10°C~+40°C
相对湿度	<85%
外磁场强度	<400A/m
周围 2m 以内严禁明火	

技术指标

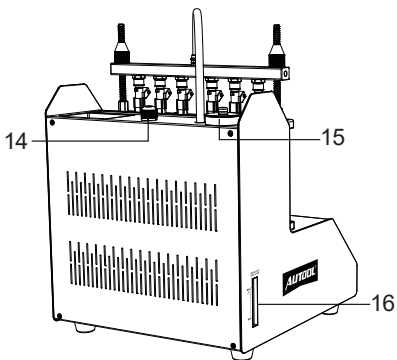
电源	AC 110V/220V±10% 50Hz/60Hz
超声波清洗功率	28KHZ ±0.5KHZ
模拟检测转速范围	0~7500RPM
时间设置	0~10min
脉宽范围	0~20ms
油箱容积	3500ml
测试管容积	140ml
产品尺寸	405x380x430mm
包装尺寸	485x465x490mm
产品重量	15.92kg
包装重量	17.89kg

产品结构

整机结构

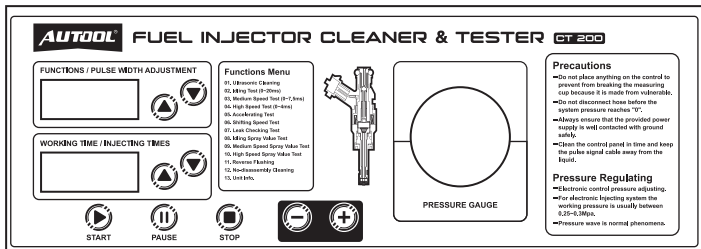


1	螺纹杆	2	滚花螺杆
3	直排油分油器	4	直排油接头
5	玻璃测试量筒	6	排油阀
7	超声波清洗槽	8	控制面板
9	压力表	10	清洗液排油阀
11	供油管	12	电源开关
13	电源插座		



14	脉冲信号线	15	检测液加注口
16	检测液视窗		

控制面板说明



- 控制面板共分四个区，从左至右分别为项目选择区、参数设定区、系统控制区和系统压力控制区，各区域的功能如下：

1、项目选择区	通过按[项目选择]键选择某项功能，选中后，其相应指示灯会变亮。
2、参数设定区	在选定功能和参数后，可通过▲或▼键设置参数大小。数码管显示相应的参数值，按方向键▲，所设参数值增加；按左方向键▼，所设参数值减少。
3、系统控制区	分别对设备的开始、暂停和停止操作过程进行控制。
4、系统压力控制区	通过[-]、[+]键可以调节系统压力。

安装与连接

简单安装

安装过程如下:

- 拆箱后将机器搬至台面上，将紧固出油管的扎带松开。
- 从配件箱中取出脉冲信号线装在机器顶部右侧的底座上。
- 从配件箱中取出两个调节螺杆并装在玻璃管上部的上压板上。
- 从配件箱中取出两个滚花螺母装在调节螺杆上。
- 从配件箱中取出分油器组件，装在滚花螺母上并用压紧螺杆压紧。

喷油嘴离车检测一般操作程序

准备工作

- 将喷油嘴从车上拆下，并且仔细查看喷油嘴的橡胶密封圈是否损坏，如有损坏，应在清洗测试前及时更换同型号密封圈，以免测试时发生泄漏。再将喷油嘴放入汽油或清洗剂中，仔细清除外部油污后用软布擦拭干净。
- 检查并添加检测液。向油箱内加注，观察侧面的液位管，一般以加注油箱容量的 1/2 即可。
- 在超声波清洗槽内加入适量的清洗液，要浸过喷油嘴针阀。
- 按下主机右侧的电源开关。
- 选出相应的喷油嘴连接偶件。

注意

- ▶ 在均匀性检测/雾化性观测、密封性测试、喷油量检测和自动清洗检测时，主机使用检测液。免拆清洗时，主机使用汽油加清洗液。超声波清洗机使用专用的超声波清洗液。
-

清洗与测试 顺序

一般完整的清洗测试程序建议按以下项目顺序进行。

- 超声波清洗。
- 均匀性/雾化性检测。
- 密封性测试。
- 喷油量检测。
- 自动清洗检测。

根据不同的测试项目，在参数选择栏选择对应的参数并对其进行设置。具体操作详见“操作过程说明”。

操作后的整理

清洗检测工作结束后，应做好清理工作，包括：

- 打开放油阀，使检测液流回油箱。
- 将超声波清洗池中的清洗液回收到原瓶中，并用干软布擦拭干净超声波清洗机。
- 用干软布把机器台面擦净。
- 为避免挥发，将油箱内的检测液全部放出，如能继续使用，存放在安全的地方，如已经脏污不能继续使用，按有关规定处理掉。

操作过程说明

超声波清洗

超声波清洗是利用超声波在介质中传播时产生的穿透性和空化冲击波，对喷油嘴内部积碳产生强烈抖动，已达到彻底清除喷油嘴上的顽固积碳的效果。

准备工作

- 从车上拆下喷油嘴，检查其橡胶密封圈是否损坏，如有损坏，应在清洗测试前及时更换，以免测试时发生泄露。再将喷油嘴放入汽油或清洗液中，仔细清除外部油污后用软布擦拭干净。
- 接通电源。

⚠ 注意

- ▶ 本设备长时间断电后重启，会有数秒钟的延迟。
- 从配件箱中取出清洗支架，放入超声槽内，并将擦拭干净的喷油嘴放在超声槽的清洗支架定位孔中。

方法与步骤：

01项 超声波清洗

- 在超声槽内加入适量的清洗液，一般清洗液以漫过清洗支架即可。
- 打开位于主机右面的超声波开关，开始超声波清洗。
- 超声波清洗过程中，可以给喷油嘴输入脉冲信号。方法是：
 1. 将驱动线任意插头依次插入喷油嘴插孔。（特殊喷油嘴需要配用转接线连接）。
 2. 按项目选择上下键选定“01 超声波清洗”项，然后按工作时间上下键设定时间。（系统预设10分钟，如需修改时间可通过上下键改变）
 3. 按工作键，系统开始输入脉冲信号。

清洗结束后，从超声槽中拿出喷油嘴，用软布擦净上面的清洗剂，准备下一项工作。

⚠ 注意

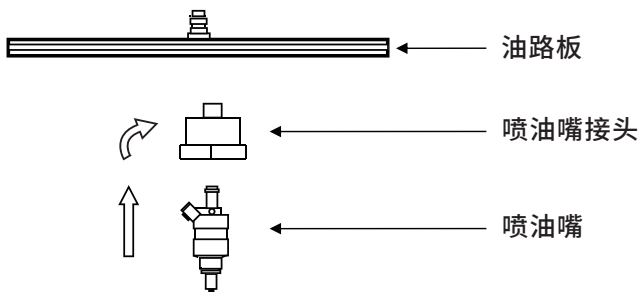
- ▶ 在清洗的过程中，将喷油嘴拿出放在耳边可以听到间歇性的震动声，从而可以判断喷油嘴是否有脉冲信号。
- ▶ 超声槽内无清洗液时严禁进行超声波清洗以免造成设备损坏。
- ▶ 超声槽内只能加入与本机配套的超声波清洗液，不能使用其它试剂代替，否则将会造成设备表面涂层、面膜剥落，将不在保修范围之内。

测试功能

此功能是检测喷油嘴的雾化、滴漏、阻塞、喷油角度状况及每个喷油嘴在不同转速下喷油量大小和均衡性。

准备工作

- **添加测试液**
将测试液从加液口倒入。
- **喷油嘴的安装**
喷油嘴安装



喷油嘴安装示意图

1. 将喷油嘴接头、油路板堵头装入油路板。
2. 正向安装喷油嘴。(把喷油嘴的“O”形圈上涂少许润滑脂)
3. 将油路板和喷油嘴安装在上板座上，用固定镙杆和固定镙套旋紧固定。准备测试。

方法与步骤:

02项 怠速测试

- 将机器上黑色出油管的快速接头与油路上的公端接头连接好，插好喷油嘴驱动线。
- 按项目选择上下键选定“02 怠速测试”项。
- 按工作时间上下键设定时间。（一般设定为10分钟）
- 按工作键开始工作。
- 旋转压力调节旋钮，使压力调至2-5公斤。（在电子喷射系统中，一般油压工作在2-5公斤）
- 按上下键选择合适的脉宽。（系统预设为3ms，一般调整为3ms）。
- 工作时间逐渐减少，当为0时，系统自动停止。

03项 中速测试

- 按项目选择上下键选定“03 中速测试”项。
- 按工作键即可。
- 其余操作步骤与02项一致。

04项 高速测试

- 按项目选择上下键选定“04 高速测试”项。
- 按工作键即可。
- 其余操作步骤与02项一致。

05项 加速测试

- 按项目选择上下键选定“05 加速测试”项。
- 按工作键即可。

⚠ 注意

- ▶ 燃油压力、工作时间和脉宽系统自动设置，时间系统预设10s为一个循环周期，用户可设置。
- ▶ 系统将自动连续循环三次模拟发动机在匀加速时喷油嘴的工作状况和喷油量。

06项 变速测试

- 按上下键选定“06 变速测试”项。
- 按工作键即可。

⚠ 注意

- ▶ 燃油压力、工作时间和脉宽系统自动设置，时间系统预设为10s一个循环周期，用户不必另外设置。
- ▶ 系统将自动连续循环三次模拟发动机在怠速、中速、高速时的喷油嘴工作状况和喷油量。

07项 检漏测试

- 按项目选择上下键选定“07 检漏测试”项。
- 按工作时间上下键设定时间。（一般设定为1分钟）
- 其余操作步骤与02项一致。

⚠ 注意

- ▶ 脉宽系统预设为3ms，无需再设定。
- ▶ 模拟车辆油路压力在0.3Mpa时喷油嘴是否有滴漏现象。

08项 怠速喷油量测试

- 按项目选择上下键选定“08 怠速喷油量测试”项。
- 其余操作步骤与02项一致。

⚠ 注意

- ▶ 模拟发动机在怠速时，喷油嘴工作一定次数时的工作状况和喷油量。

09项 中速喷油量测试

- 按项目选择上下键选定“09 中速喷油量测试”项。
- 其余操作步骤与08项一致。

10项 高速喷油量测试

- 按项目选择上下键选定“10 高速喷油量测试”项。
- 其余操作步骤与08项一致。

⚠ 注意

▶ 流量均衡性

在不同转速下进行流量均衡性测试，当量筒内检测液液面处于量筒2/3时，暂停或停止工作，观测喷油量的均衡性。对于一辆车上的所有喷油嘴的喷油量偏差不应超过2%。或参照喷油嘴的相关技术手册，来判断喷油嘴的流量均衡性。

▶ 喷油形状观察

在各种转速下观察同一车上所有喷油嘴的喷油形状、角度是否均匀一致。同时可以调整喷油嘴开启脉宽，检查喷油嘴的最小开启脉宽是否一致。

▶ 检漏测试

检漏测试是检测喷油嘴在系统高压下喷油嘴针阀的密封性。
(观测喷油嘴密封性，一般一分钟内不应有泄漏)

11项 反向测试

- 按项目选择上下键选定“11 反向清洗”，将喷油嘴反方向安装进行清洗。

12项 免拆清洗

- 连接好各种专用部件可以清洗燃烧室或节气门。

13项 设备信息

- 用于存放设备的产品编号及出厂日期，如型号、功能有所变动时以操作面板说明为主。

整理与维护

整理

- 关闭电源，拔下电源插头。
 - 将所有接头放回配件盒内，以便保存。
 - 把超声波清洗液放回原瓶中密封，并用干软布把设备擦拭干净。
 - 如长期不用，打开测试液阀将油箱中的测试液放回原瓶中密封保存。
-

维护

测试液更换

- 当测试液使用一段时间后，会积累很多杂质，含有污物的测试液不能使用，否则容易堵塞喷油嘴。更换测试液时，先将测试液阀打开放出测试液，放净后，再注入少许干净测试液对内部进行清洗。清洗结束后，重新关闭测试液阀，倒入新的测试液。

保险管更换

- 在设备左面电源插座处有一标有保险管的方盒，拉开方盒即可看到保险管。如熔断，更换新的即可（5A）。

维修保养服务

您所拥有的AUTOOL产品选用持久耐用的材料，AUTOOL坚持精益求精的生产工艺，每一件产品出厂都经过35道工序及12次质检工作，从而确保每一件产品都拥有卓越的品质及性能。所以您的AUTOOL产品值得您定期维护保养，使其产品将能够长期稳定地工作。

维修保养

维护保养是为了保持产品性能和外观，我们建议您仔细阅读以下产品保养指南：

- 注意不要将产品与粗糙表面摩擦或揉搓产品，特别是钣金外壳。
- 对产品中需要紧固和连接的部位经常进行检查，如发现松动应及时紧固，以保证产品的安全运行。对与各种化学介质接触的产品外部和内部零件要经常进行除锈、喷漆等防腐处理，以提高产品的抗腐蚀能力，延长产品的使用寿命。
- 遵守安全操作规程，不超负荷使用产品。产品的安全防护装置齐全可靠，及时消除不安全因素。电路部分彻底检查，老化电线要及时更换。
- 定期清洗和更换易耗部件；调整各部位配合间隙和更换磨损（已坏）部件清洁时，避免产品接触带腐蚀性的液态物品。
- 不使用时，请将产品存放于干燥的位置。不要将产品存放在高温、潮湿或不通风的地方。

保修服务

AUTOOL主机自客户签收日起享有3年保修期。其所含附件自客户签收日起享有1年保修期。

保修方式

- 根据具体的故障情况对产品进行免费修理或更换；
- 我方保证所有更换的部件、附件或产品都是全新；
- 在客户收到产品90天内出现故障同时提供视频和图片，我方承担运费并免费提供相应配件给客户更换。收到产品超过90天，客户承担相应的费用，我方免费提供配件给客户更换；

以下情况不在免费保修范围：

- 非正规渠道购买AUTOOL的产品；
- 未按产品说明书要求使用和维护造成的损坏；

在AUTOOL，我们为精湛的设计和卓越的服务感到自豪。我们很乐意为您提供更多的支持或服务。

声明

偶然公司保留更改产品设计与规格的权利，届时恕不另行通知。实物外观与颜色可能与说明书中显示的有差别，请以实物为准。我们已尽最大努力力求使书中所有描述准确，但仍难免有不妥之处。如有疑问，请联系经销商或偶然售后服务中心。本公司对产品拥有最终解释权，不承担任何因误解而产生的后果。

退换货服务

退换货

- 如果您对从线上授权购物平台和线下授权经销商所购买的 AUTOOL 产品不满意, 根据《AUTOOL 全球销售条款》, 您可以自收到产品之日起七日内退货; 或者在产品交付之日起的30日内调换等值的其他产品。
- 退回及调换的产品必须处于完全可销售状态, 并附上相关销售单单据, 所有相关配件、纸质发票 (如有)。
- AUTOOL 将会对寄回退货的商品进行检查, 以确保其处于完好无损的状态并且符合条件, 相关条件详情请参阅《AUTOOL 全球销售条款》。任何未通过检查的商品将退还给您, 您将不会获得商品退款。
- 您可以通过客户服务中心或AUTOOL授权经销商调换产品; 退换货原则为从哪里购买, 就从哪里退换货。如果您退换货遇见困难或者阻碍, 请联系AUTOOL客户服务中心。通过客户服务中心退换货时, 我们建议您通过下面的方式进行:

中国区域致电	400-032-0988 / 18929303778
售后微信号	18929303778
海外区域致电	+86 0755 23304822
E-mail	aftersale@autooltech.com
Facebook	https://www.facebook.com/autool.vip
YouTube	https://www.youtube.com/c/autooltech

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