Настольная низкоскоростная охлаждаемая центрифуга

TDL-5M

руководство по эксплуатации

Thanks for using SHUKE centrifuge.
Please read this manual carefully before installing, using or mending this instrument for the best performance and security.

V 2.0

CONTENTS

P.S.: Packing list, Certificate of Compliance and Product warranty card

1. Safety Caution

Safety Cautions are the requirements for safe operation of the centrifuge described in this manual. Please read carefully before installing, operating, maintaining and repairing this centrifuge. Understanding safety cautions and correct operation can avoid injury to operator and damage to the performance of the centrifuge.

1.1 Install and Maintain Notice

1.1.1 The rotor accessory package may be placed in the chamber of the centrifuge. When installing, be sure to open the door to check and remove.

1.1.2 During the maintenance of the centrifuge, any parts that need to be removed may cause electric shock and personal injury. When maintaining the machine, make sure the centrifuge is power off, and the plug of the power cord has been unplugged from the socket; the maintenance work should be carried out by professional technician.

1.1.3 The replacement parts should be confirmed to meet the requirements of this centrifuge.

1.2 Electric Notice

1.2.1 To reduce the risk of electric shock, the centrifuge uses a three-pin plug, which must be connected to a three-pin socket with a ground wire.

1.2.2 Make sure the socket on the wall connects well with the ground wire. Make sure the power voltage must conform to the operating voltage of the centrifuge.

1.2.3 Do not use two holes extended power adapter converted from three holes.

1.2.4 Do not use a two-wire extension socket. Do not use a multipurpose power adapter without a ground wire.

1.2.5 Do not place containers with liquids on or near the centrifuge. If the container is accidentally tipped over, liquid may seep into centrifuge and damage electrical or mechanical components.

1.3 Fire Prevention Notice

This centrifuge is not designed for separating flammable and explosive materials. It can’t centrifuge these materials. Do not put containers with these materials into the centrifuge or near the centrifuge within 30 cm.

1.4 Safe Operation Notice

1.4.1 Please use the rotors and accessories designed by our company for this centrifuge.

1.4.2 Before starting this centrifuge, please make sure the centrifugal chamber is clear and no sundries.

1.4.3 Before starting the centrifuge, please make sure the locking screw on the rotor in the centrifuge chamber is tight.

1.4.4 When the centrifuge is working, please make sure the speed does not exceed rotor's max speed.

1.4.5 Please do not use hand to force the rotor to decelerate or stop.

1.4.6 Do not lift or move the centrifuge before the centrifuge rotor has stopped spinning.

1.4.7 Do not open the door while the centrifuge is running.

1.4.8 When the centrifuge is running, it must be kept 30cm distance from other objects. Please do not be in this range when the centrifuge is working except when debugging the centrifuge. Do not put any objects into the centrifuge while the centrifuge is running.

1.5 Chemistry & Biology Safety Notice

1.5.1 Routine operation may include all kinds of solution and test samples, which may be pathogenic, toxic or radioactive material. All the materials mustn't be operated by this centrifuge, unless protective measures have been taken.

1.5.2 Pay attention to the instructions on the original solution container regarding the solution in the container before operation.

1.5.3 Must be careful when handling these solutions as they can be contagious.

1.5.4 The operation must strictly follow the operating procedures and methods specified by the laboratory.

1.5.5 The destruction of all waste solutions must be carried out in accordance with the requirements of environmental safety and protection.

1.6 Use Environment Notice

In order to ensure that the centrifuge works stably and reliably and it functions normally, it should be ensured that it meets the following conditions:

1.6.1 Ambient temperature: 5℃～40℃

1.6.2 Relative humidity: ≤80%

1.6.3 Atmospheric pressure: 860hPa～1060hPa;

1.6.4 Power supply: AC 220V±22V, 50Hz±1Hz

1.6.5 Good ventilation, no dust, floc, metal chips and other sundries intrude into the centrifuge.

1.6.6 Avoid corrosive gas and strong electromagnetic interference.

1.6.7 When in use, place it on a stable horizontal working platform, and all machine feet are firmly under force.

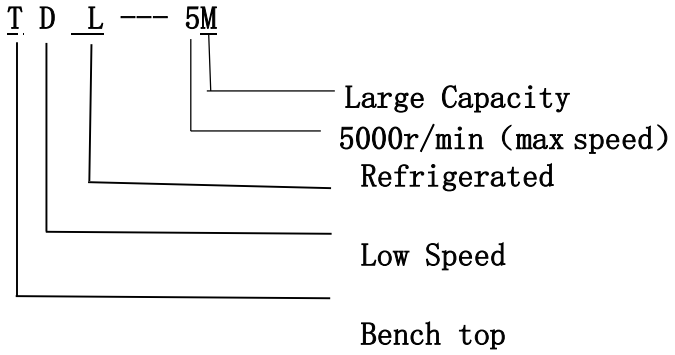
When you ask for after-sale service, please make sure you have cleaned up the centrifuge, which is your responsibility!

2. Symbols & Model & Classification

2.1 Symbols

Sequence number	Symbols	GB NO.	Meanings
1	～	4706.1	Alternating current
2	|	5465.2	Connect with (power)
3	○	5465.2	Cut off (power)
4	⏚	4728.2	Ground fault protection (earth)
5	⚠	4793	Caution!

2.2 Model Description



2.3 Classification Description

TDL-5M Bench-top low speed refrigerated centrifuge, the max speed is 5000r/min.

2.3.1 According to the management category of "Medical Device Classification Catalog", it belongs to Class 1 of medical laboratory equipment.

2.3.2 According to the electric shock protection, it belongs to Class 1 ordinary equipment with protective grounding measures.

2.3.3 According to the structure, it belongs to bench-top centrifuge.

2.3.4 According to rotating speed, it belongs to low speed centrifuge.

3. Technical Parameters

3.1 Centrifuge Parameters

Max Speed	5000r/min
Max RCF	5200Xg
Max Capacity	4x750ml（4000r/min)
Timer Range	1s-99H59min59s
Noise	≤56dB(A)
Power supply	AC 220V±22V 50HZ±1HZ
Power	1.5KW
Weight	108KG
Dimension (LxWxH)	600x680x420mm

3.2 Rotor Parameters

Rotor		**Capacity**	**Max speed**	**Max RCF**
No.1 Swing out rotor		4X100ml	5000rpm	4650Xg
		4X50ml		
No.2 Swing out rotor		32X15ml	4000rpm	2980Xg
		8X50ml		
		8X100ml		
	48X2~7ml Vacuum blood collection tube		4000rpm	3100Xg
	64X2~7ml Vacuum blood collection tube			
No.3 Swing out rotor	4X250ml		5000rpm	5201Xg
	adaptor	8X50ml		
		4X100ml		
		36X10ml		
		20X15ml		
		40X7ml Vacuum blood		

		collection tube		
No.4 Microplate rotor		2X3X96holeX0.2ml	4000rpm	1971Xg
No.5 Swing out rotor	4X500ml		4200rpm	3551Xg
	adaptor	16X50ml		
		36X15ml		
		76X2~7ml Vacuum blood collection tube		
	Swing bucket rotor			
	adaptor	20X50ml		
		40X15ml		
		80X10ml Vacuum blood collection tube		
		112X2~7ml Vacuum blood collection tube		
		100X1.5ml		
	Hang cup	148X5ml RIA tube		
		96X2~7ml Vacuum blood collection tube		
	Microplate rotor	4X2X96holeX0.2ml		
	4X250ml Conical Bottom		4000rpm	3400Xg
No.6 Swing out rotor		4X750ml	4000rpm	3500Xg
adaptor		12X100ml		
		20X50ml		
		28X50ml		
		56X15ml		
		96X2~7ml Vacuum blood collection tube		
No.7 Swing out rotor		6X250ml	4000rpm	3581Xg

4.Working Principle

when operating the centrifuge,putting equal quantity solution (such as centrifuge bottles and centrifuge tubes) in the places of the rotor symmetrically,high speed revolution of the motor make solution to separate,the relative centrifuge force depends on turning radius “r “(RCF) and speed “n”,computational formula as following :

$$RCF=1.118\times10^{-5}\times n^2\times r\ (\times g)$$

Formula:

n——speed（r/min）

r——turning radius（cm）

g——gravitational acceleration（9.8 newton/kg）

computational formula of particle separation in mixture liquid time needed T:

$$T=\frac{27.4\times(1nR_{max}-1nR_{min})\mu}{n^2\ r^2(\sigma-\rho)}\quad（min）$$

Formula：

ρ——mixed liquid density（g/cm³）

μ——mixed liquid viscosity（P）

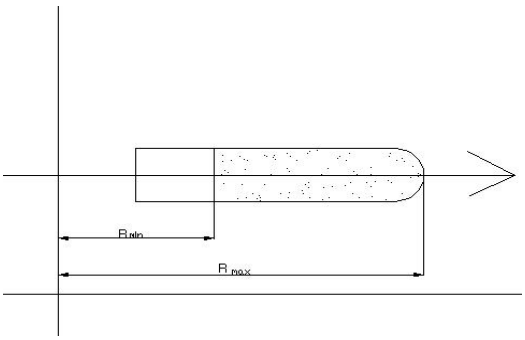
n ——speed（r/min）

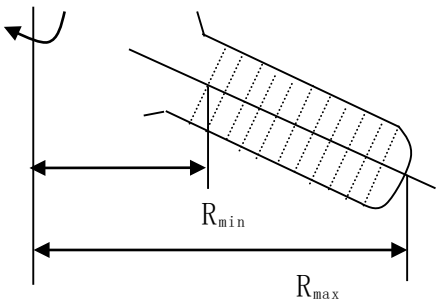
r ——rotor radius（cm）

σ ——particle density（g/cm³）

R_{max}—the horizontal distance from subface of centrifuge solution to axis（cm）

R_{min}——the horizontal distance from solution surface to axis（cm）

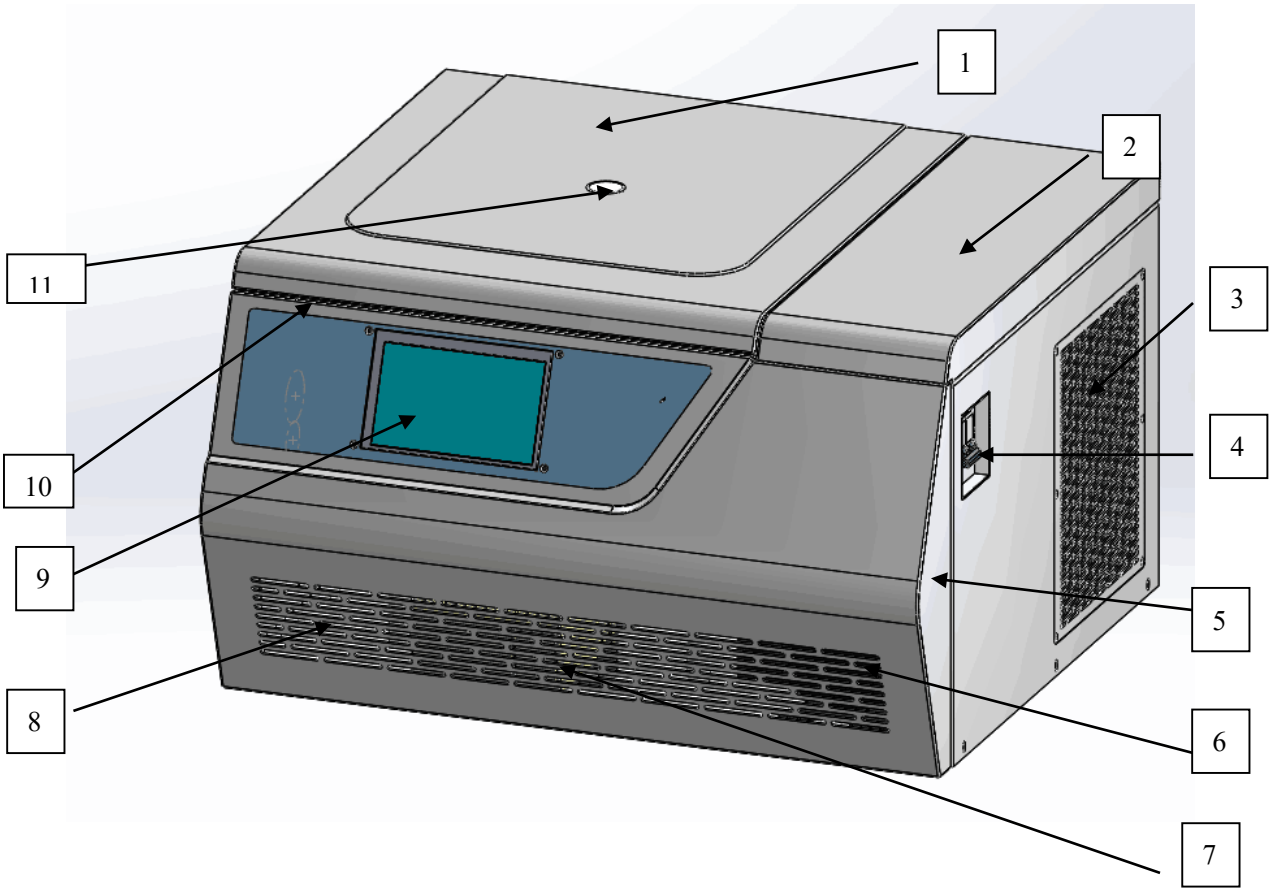




5. Schematic Diagram and System Block Diagram

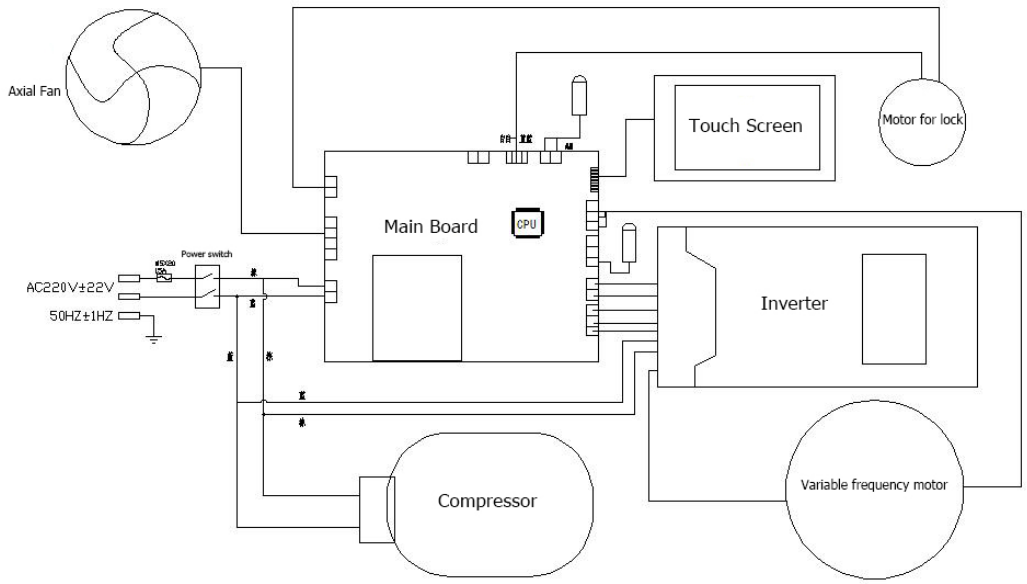
5.1 Schematic Diagram

The centrifuge is mainly composed of body part, rotating part, shock absorption system, control system, refrigerating system etc. Its structure diagram is as follows:



1.Lid 2. Heat dissipating cavity 3. Condenser 4.Power switch
5. Front panel 6. Compressor 7.Inverter 8. Vent 9.Touch screen
10. Electronic lid lock 11. Perspective window

5.2 Electrical System Diagram



6. Install & Use

6.1 Installation Requirements (by users)

6.1.1 Installation environment demand

The installing place of this centrifuge is indoors, the ground should be flat and rigid. No conductive dust, corrosive or damaging insulation air, and no powerful vibration source nearby.

6.1.2 Installation space demand

After installation, there must be a safe space of 30cm around it. No other materials should be placed in this space when the centrifuge is in use.

6.1.3 Installation power supply demand

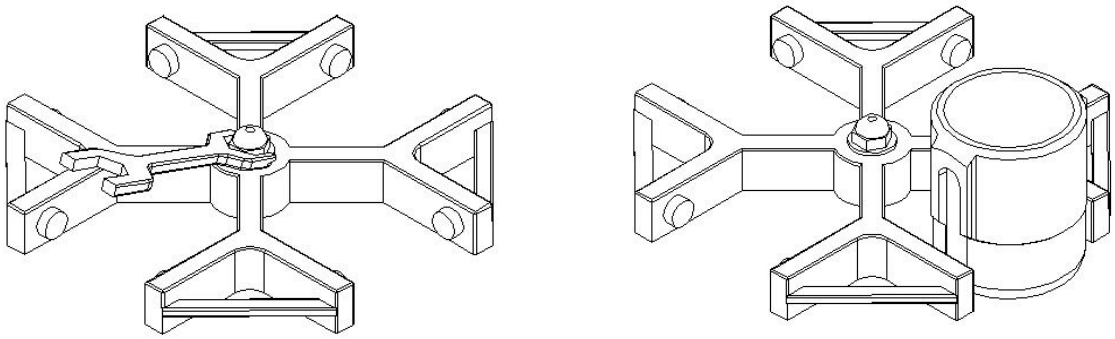
The power supply is single-phase AC power supply, AC 220V, 15A. The power supply must have an independent ground wire, and it is strictly forbidden to use the neutral wire instead of the ground wire.

6.1.4 Centrifuge installation demand

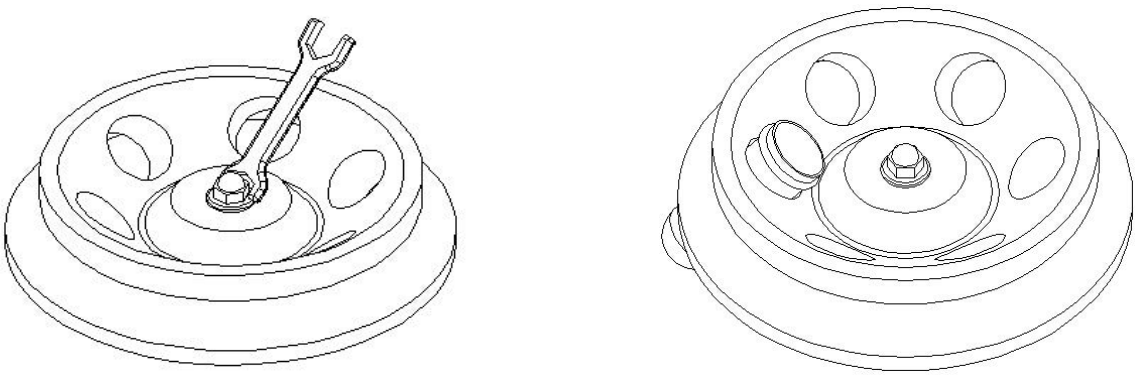
After the centrifuge is taken out of the package, properly handle the package and fillings to avoid environmental pollution. Place it on a reserved horizontal workbench or ground. Use the emergency door opening device to open the door and remove all accessories or packaging (if any) from the centrifuge chamber. Connect the power and turn on the power switch. After the installation, the four rubber feet of the bottom plate of the machine should be evenly stressed, otherwise the spacer should be added (solved by the user) and readjusted to the requirements.

6.1.5 Rotor installation demand

When the machine is stopped, open the door first, select the rotor to be used, align the center hole of the rotor with the main shaft of the motor, and install it vertically on the motor shaft (note that the taper of the center hole of the rotor is downward, and the screw mandrel will be exposed above the rotor after the installation), install the spacer and nut provided, and use the supplied wrench to tighten the nut. Corresponding pendants should be attached to the swing out rotor, test tube sleeves should be attached to the fixed angle rotor, and the pendants/tube sleeves should be installed in place.



Swing out rotor



Fixed angle rotor

6.1.6 Emergency switch installation

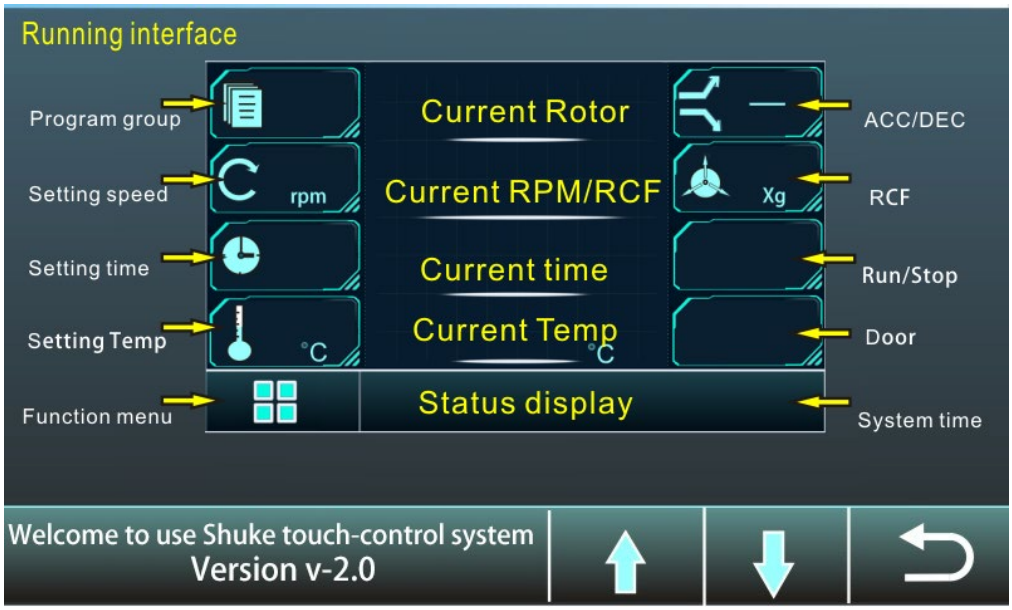
To prevent the power supply from being cut off when the centrifuge runs out of control. Please install the emergency switch at the indoor door or outdoors far away from the machine

⚠ Cation: Do not turn on the machine until the centrifuge chamber is cleaned, otherwise the machine may be damaged.

- Operate according to the operation steps specified in Article 6.1, first run at low speed, and gradually increase to the highest speed . If there is no abnormality, the debugging is successful.

6.2 Control System Operation Instructions

The main interface is shown below：



6.3 Parameter Setting

For the convenience of users, this machine can store 999 preset program groups and a temporary program group. The preset program group number is 001-999 and the temporary program group number is 000.

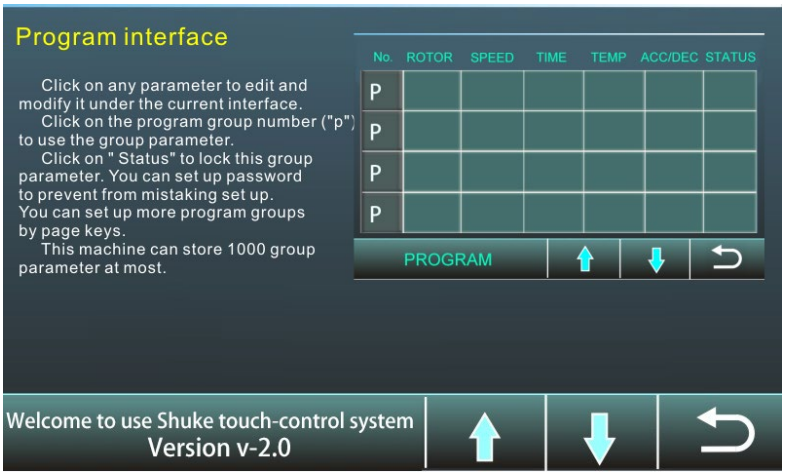
Preset program groups

1) Click the icon 

,the page will automatically jump to the program group interface. In the program group interface, you can select the program group and edit the program group parameters, and click the program group number to directly call the group parameters to the main interface. Click any parameter in the program group to enter the editing interface of the parameter for modification.

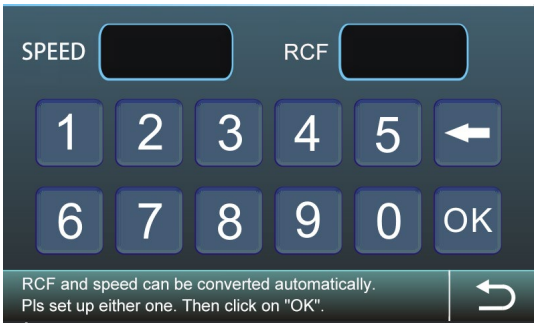
2) After modifying the called program group on the main interface, the modified parameters are automatically saved to the temporary program group No. 000, and the parameters in the program group with the original number will not be changed. If you want to change the parameters in the program group, please go to the program group interface to modify.

3) The program group also has a locking function to prevent other users from modifying the parameters that have been set. You can click the small lock icon behind the program group to lock, and click again to unlock (after setting the user password, you need to enter the user password for both locking and unlocking).



Set speed

Click the icon 20000 rpm and the page will automatically jump to the input interface of SPEED/RCF, directly enter the value you want to set and OK to confirm the completion. According to the current rotor, the set SPEED will be automatically converted into RCF and displayed (when set RCF, it will also be automatically converted into SPEED). During operation, if the set SPEED or RCF is greater than the upper limit of the rotor currently installed, the centrifuge will give an alarm.



Set time

Clicking the icon 20:00 m:s , page will automatically jump to the time input interface, directly enter the value you want to set and OK to confirm the completion.When setting the time, if the set time is greater than or equal to 1 hour, the time sheet on the main interface will automatically display: hours: minutes, If the set time is less than 1 hour, the time sheet on the main interface will automatically display: minutes: seconds

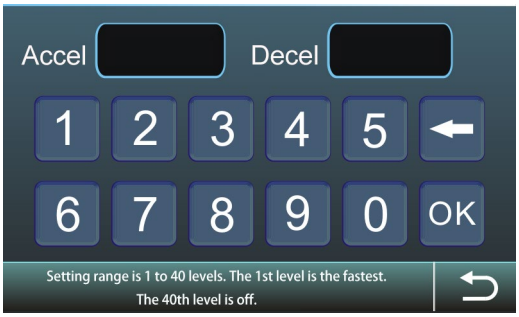
Set temperature

Click the 4 °C icon, and the page will automatically jump to the temperature input interface, directly enter the value you want to set and OK to confirm the completion, the temperature setting range is -20°C to 40°C, and the setting beyond the range will automatically default to the maximum or minimum value.

! ! ! Depending on the use environment and parameters, the cooling speed will be different, and the machine will automatically pre-cool when it is powered on. The factory debugging is that when the ambient temperature is less than or equal to 35°C, the rotor can reach below 4°C within 20 minutes at the maximum speed.

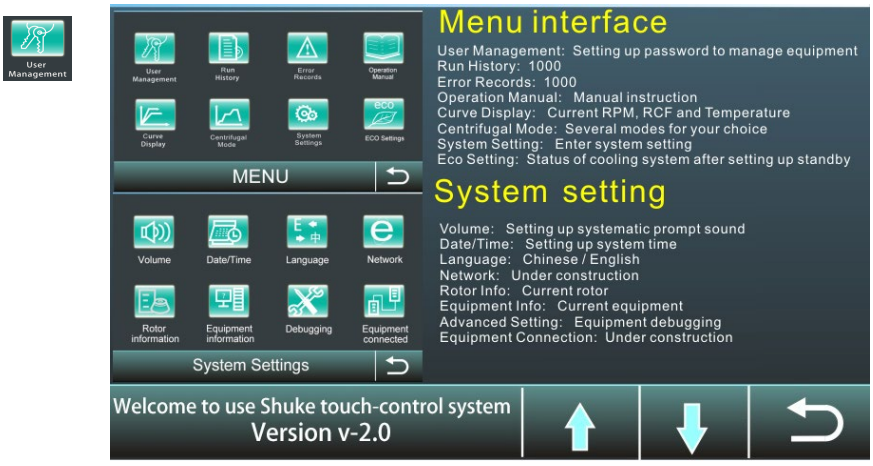
Set acceleration/deceleration rate

Click the icon 01/01 and the page will automatically jump to the acceleration/deceleration input interface, directly enter the value you want to set and OK to confirm the completion. The acceleration range is 1-40 levels, the 1st level is the fastest, and the 40th level is free stop. The time varies according to the specifications of the rotor. The larger the capacity of the rotor, the longer the time is correspondingly, and the smaller the rotor capacity, the faster the up and down.



Menu Functions Introduction

Click the icon and the page will automatically jump to the menu interface



1) User Management:Set password to lock centrifuge or programs.

2) Run History:Can see 1000 run histories.

3) 

Error Records:Store at most 1000 error records.

4) 

Operation Manual:The operation manual of this centrifuge.

5) 

Curve Display:The coordinate system is used to display the relationship between Speed,time,RCF and Temperature.

6) 

Centrifugal Mode:Can choose multi-stage mode and general mode.

7) 

System Settings:Enter the third-level menu to set and view other functions

8) 

Eco Settings:Enter the intelligent temperature control or turn off the cooling function. (This function is optional, if this function is not installed, it is invalid)

9) 

Sound Settings： Turn on/off the system prompt sound and key prompt sound.

10) 

Date/Time:System time calibration, reset the system time in the format of year, month, day, hour, minute and second.

11) 

Language:Choose system language(Support Chinese and English)

12) 

Rotor Information:Check the information of rotor being used.

13) 

Equipment Information:Check the information of the centrifuge.

14) 

Advanced Setting:Used for engineering debugging at the factory.

Stop

During the operation of the machine, when the centrifugation time decreases to zero, the machine will decelerate according to the deceleration parameter, and the information prompt bar will show that it is stopping. When the rotor has stopped running completely, the door cover can be opened only after hearing the indicating voice. If the machine needs to be stopped during operation, press the stop key and the machine will stop according to the above procedure.

Open the door

Click the key 

, and push the door upwards after hearing the door opening sound.

6.4 Emergency Door Opening

There is a small hole (with an indicator label) on the left side of the machine for emergency opening. Use a 6mm Allen wrench to insert and rotate to open the door. It is used for emergency door opening in

case of power failure or door lock failure! It is not used to open the door in daily use!

6.5 Cautions for use

WARNING:Do not use the rotor at excessive speed. Losses caused by overspeed use are the responsibility of the user.

The fixed angle rotor test tube is filled with liquid about 75% of the nominal capacity of the test tube and must be placed symmetrically and balanced. When the rotor needs to be replaced, the rotor in use must be removed, the lock nut must be loosened with a special wrench, and the rotor can be taken out.

⚠ Do not lift or move the centrifuge while it is running.

⚠ Do not open the door cover while the rotor is spinning.

⚠ After the power is turned off, it should be turned on again at an interval of more than 5 minutes to avoid the compressor being blocked.

⚠ After use, use a soft rag to dry the water in the chamber, open the door cover, and dry the difficult-to-clean water.

⚠ Parts such as rotors and buckets need to be kept clean to prevent corrosion or accelerated aging.

7. Common Faults Analysis

When common faults occur, the display screen will prompt the fault and solution.

Other Faults:

	Fault	Cause	Solution	Note
Power Supply	The switch indicator does not light up after turning on the power switch	blown fuse	Replace fuse	Specification: BGXP ¢5×20 、250V 15A。
		The power cord is in poor contact/damaged power cord	Reconnect the power cord/replace the power cord	
		No electricity from electrical socket	Use another electrical socket	220V±22V 50HZ±1HZ

	The switch power light is on, but the LCD screen has no display	Internal circuit failure		Contact manufacturer
Door Lock	Cannot open door	Door lock motor is broken	Emergency switch can open the door	Contact manufacturer
	Cannot lock door	Door lock motor does not return	Press several times to open the door, then lock again	
		The lock is not aligned	Adjust the lock position and length	
Can't boot into the main interface	Alarm sound-Fast	Damaged circuit board memory		Contact manufacturer
	Alarm sound-Slow	LCD communication failure		Contact manufacturer
Imbalance	Machine vibrates when powered on		Power off and then power on again	
	Unbalance sensor damaged			Contact manufacturer
Temperature	cool down very slowly	refrigerant leak		Contact manufacturer
		Refrigeration system clogged		Contact manufacturer
	Cannot cool	Refrigeration system failure		Contact manufacturer
Cannot run	Speed setting		Set correct speed	
	Time set is 0		Set time	
	Door isn’t closed		Close the door	

8. Repair and Maintenance

8.1 The normal service life of this machine is 6 years. Please dispose of it properly after reaching the limit to avoid harm to the environment. See label for delivery time.

8.2 The normal service life of the rotor is 6 years, and the cumulative number of uses is 30,000 times. If any of the two items are met, the period of use has been reached. Prohibit the use of rotors beyond their useful life.

8.3 Do not hit the rotor with sharp and hard objects. Prevent bumping during handling and disassembly, and prevent the rotor from cracking during use due to scratches or trauma.

8.4 The rotor should be checked regularly for corrosion spots, grooves, small cracks, etc. If any of the above conditions are found, please stop using the rotor immediately and contact the manufacturer.

8.5 If the centrifuged sample is found to be splashed during use, soaked or dripped on the rotor, it should be immediately blotted dry and cleaned locally.

8.6 When cleaning the rotor, in order to prevent the damage of the surface oxide layer, please dampen a sponge or cotton cloth with detergent to clean it, then wash off the detergent with distilled water or scrub with 70% alcohol, and allow it to be dried upside down after cleaning.

8.7 The power supply should be cut off when the centrifuge is not in use.

9. Transportation and Storage

9.1 Transportation

For long-distance transportation, it is necessary to use a wooden or paper packing box, cover the centrifuge with the dust cover and put it in the box, and fill the the box with foam shock-absorbing materials. During transportation ,it is strictly forbidden to collide,invert, tumble and drench.

Short-distance indoor transportation can be carried out directly, but large vibrations, collisions and inversions should also be avoided.

9.2 Storage

If the centrifuge is not used for a long time, the door should be opened, and it should be stored in a ventilated, dry and clean room. The storage site is free of corrosive substances and flammable and explosive substances.

Due to the continuous updating of technology, if there is any discrepancy with this description, please consult our company.

10. Warranty Regulations

All products of our company are guaranteed for 12 months from the date of purchase. Outside the warranty period, only the cost of maintenance will be charged.

In the following cases, it is not within the scope of free maintenance

•Failures caused by incorrect installation, use, and maintenance.

•Failures caused by attempting to disassemble and re-change the parameters of the relevant components.

•Malfunctions caused by the use of rotors and accessories not designed for this machine.

•Malfunctions caused by force majeure factors such as wars, natural disasters, etc.

In order to facilitate the understanding of the quality of the company's products and provide better services to users, please note: properly keep the warranty card and maintenance records.

Bench-top Low Speed Refrigerated Centrifuge

TDL-5M

Certificate of compliance

Product Name: Bench-top low speed refrigerated centrifuge

Factory Number: **24061406**

This product is permitted to leave the factory after inspection.

Inspector:_____

Date:_____

Product warranty card

(maintained by this card within the warranty period.)

Product Name	Bench-top low speed refrigerated centrifuge		
Model	TDL-5M	Product number	**24061406**
Date of production	June,2024	Purchase date	
Name of user and Department(stamped)			
Address:		Contact：	
Tel:	Fax:	E-mail:	
Comments and Suggestions to our products:			

Packing List

Serial number	Name		Quantity	Unit	Remarks
1	Bench-top low speed refrigerated centrifuge TDL-5M		1	set	
2	optional rotors	4*750ml swing rotor	1	set	
3		28*50ml adapter	1	set	
4		56*15ml adapter	1	set	
5					
6	attachment tools	special spanner	1	set	
7		17-19 spanner	1	set	
8		power wire	1	set	
9					
10					
11	attachment documents	packing list	1	piece	
12		Operation manual	1	set	
13		Warranty card	1	set	
14					
15					

Packing person:

Date:

Контакты сервисных центров

Сервисный центр Диаэм в Москве:
Адрес: 129345, г. Москва, ул. Магаданская, д.7, корп.3
Тел.: 8 (800) 234-05-08, +7 (495) 745-05-08
service@dia-m.ru, www.dia-m.ru

Сервисный центр Диаэм в Новосибирске:
Адрес: 630090, Новосибирск, Академгородок, пр. Ак. Лаврентьева, 6/1, офис 100А
Тел.: 8 (800) 234-05-08, +7 (495) 745-05-08
service@dia-m.ru, www.dia-m.ru

Сервисный центр Диаэм в Казани:
Адрес: 420111, Казань, ул. Профсоюзная, д.40-42, пом. № 8
Тел.: 8 (800) 234-05-08, +7 (495) 745-05-08
service@dia-m.ru, www.dia-m.ru

Сервисный центр Диаэм в Санкт-Петербурге:
Адрес: 197022, Санкт-Петербург, ул. Профессора Попова, д. 23, лит. Д, офис 614 (БЦ «Гайот»)
Тел.: 8 (800) 234-05-08, +7 (495) 745-05-08
service@dia-m.ru, www.dia-m.ru