



VELOCITY15R Pro

Benchtop Centrifuge

Instruction manual



Model VELOCITY15R Pro Benchtop Centrifuge

V1.0

VELOCITY15R Pro BENCHTOP CENTRIFUGE


Thank you very much for choosing Dynamica Velocity15R Pro centrifuge. Please carefully read through this instruction manual before using this centrifuge.




Appearance or specification is subject to change without notice.

Dynamica

Safety Reminder

Symbol  is the general international safety sign, please read carefully the following safety precautions. Follow the instructions and procedures described in this manual to operate this centrifuge safely.

- Read all safety Warnings and Cautions in this manual carefully.
- Safety messages are labeled as follows. The safety symbol  is in combination with words of “WARNING” and “CAUTION” to notify users the potential danger; Please read those instruction carefully before using the centrifuge for the first time.

WARNING: Personal danger

Warning notes indicate any condition or practice, which if not strictly observed, could result in personal injury or possible death.

CAUTION: Instrument damage

Caution notes indicate any condition or practice, which if not strictly observed or remedied, could result in damage or destruction of the equipment.

NOTE: Need to be noted generally.

- Do not operate the centrifuge in a way which is not described in this manual. Please contact our service personnel if you have any question.

WARNING:

- This centrifuge is not explosion-proof. Never use explosive or flammable samples.
- Do not install the centrifuge in or near places where inflammable gases are generated or chemicals are stored.
- Make sure to prepare necessary safety measures before using samples that are toxic, radioactive or contaminated with pathogenic micro-organisms.
- If the instrument, the rotor and or accessories that has been contaminated by solutions with toxic, radioactive or pathogenic materials, clean it according to the decontamination procedure that you specified.
- If the contaminated equipment requires service of Dynamica or authorized agency of Dynamica, either at the customer's site, Dynamica or at the agent facilities, sterilize and decontaminate it in advance. Make sure to notify the service representatives of the use of such materials.
- Do not touch the power cord or switch with wet hands to avoid electrical shocks.
- Users or any hazardous materials are recommended to keep 30cm away from the

centrifuge when it is operating.


- Never forcedly release the door lock while the rotor is rotating.

Unauthorized repairs, disassembly, and other services applied to the centrifuge are strictly prohibited.

 **CAUTION:**

- The centrifuge must be located on the firm and level table.
- Be careful not to get your fingers or hands caught between the door hook and the table when closing the door.
- When opening the door, make sure the angle between door and the shell is more than 70 degree.
- Do not move or relocate this centrifuge while the rotor is rotating.
- If there is liquid in the chamber, dry it immediately to avoid contaminating the sample.
- Keep the chamber clean and remove any objects before running the instrument.
- Cautions on rotors:
 - 1) Always check for corrosion and damages on the rotor surface before using it. Do not use the rotor or bucket if such abnormality is found.
 - 2) Do not run this centrifuge over the allowable maximum speed of the rotor, buckets, and adapters. If their maximum speeds vary, run it at the lowest maximum speed among them.
 - 3) Do not exceed the allowable imbalance.
 - 4) Make sure the tubes and bottles within their actual capacities.
 - 5) Make sure all the buckets are the same type at all times.
 - 6) If the rotor is provided with a cover, make sure it is tightly rotated on the rotor before the operation.
 - 7) Use recommended rotors only.
- If any abnormal condition occurs during operation, stop it immediately and contact our service representative. Notify the service representative the error code.
- Earthquakes may cause damage to the centrifuge. Contact our service representative if abnormality observed.

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1 Specification

Maximum speed	15,000rpm
Maximum RCF	22,302×g (FA15M)
Maximum capacity	10×5ml (FA15N)
Timer	1minute~99minute/HOLD mode
Temperature Range	-20℃~45℃
Driving system	AC Motor
Safety features	Cover door with dual-locks, over-speed protection, overheat protection and imbalance protection, situation diagnosis system
Power requirements	230V: Single phase, ~220-240V±10%, 50/60Hz±1Hz, 500VA
Dimensions (mm)	270mm×290mm×590 mm(H*W*D)
Weight	About 36kg
Additional features	Rotor auto identification, Instant running function, Processing display

2 Operational Condition

2.1 Basic operational conditions

- 1) Power: (230V) single phase, $\sim 220-240V \pm 10\%$, $50/60\text{Hz} \pm 1\text{Hz}$, 10A, standard sine wave;
- 2) Install an emergency switch that turns off the main power supply in the event of malfunction. It is ideal to install the emergency switch outside of the room or near the exit;
- 3) Environment temperature: $5^{\circ}\text{C} \sim 40^{\circ}\text{C}$;
- 4) Relative humidity: $\leq 80\%$;
- 5) No vibration and airflow around;
- 6) No electric dust, explosive and corrosive gases around;

2.2 Transport and storage condition

- 1) Storage temperature: $-40^{\circ}\text{C} \sim +55^{\circ}\text{C}$;
- 2) Relative humidity: $\leq 80\%$.

3 Installation


This section describes the instructions that you should abide by when installing the centrifuge to ensure your safety and the optimum performance.

WARNING:

- This centrifuge may be damaged if it is connected to an improper power source.
- Check if the power source meets the requirements.
- Must take out rotor before moving the centrifuge.
- When transporting the machine, need to use trolley or need 2 persons to move the machine together.

3.1 Location

- 1) Locate this centrifuge on a firm and level table, ensure the four feet of this centrifuge stand on the table firmly. Avoid installing on the slippery table that conveys vibration.
- 2) Ideal environment temperature is $20^{\circ}\text{C}\pm 5^{\circ}\text{C}$. Temperature should not be over 30°C . Avoid direct sunlight to the instrument.
- 3) Keep clearances of 10cm on both sides of the centrifuge and 30cm behind it to ensure its cooling efficiency.
- 4) Do not install near by a heat-generating device or waterworks from where may drip or splash. Such location may cause sample temperature fluctuation or malfunction of the centrifuge.

 **WARNING:** Users or any hazardous are recommend keeping 30cm away from the centrifuge when it is running.

3.2 Connection of the power cord and grounding

WARNING:

- Do not touch the power cord with wet hands to avoid electrical shocks.
- This centrifuge must be properly earthed.

- 1) This centrifuge is equipped with a 3P flat plug. Grounding can be done by plugging the 3P plug into the outlet.
- 2) Rating current of the outlet should be more than 10A, and its earth terminal is installed properly.

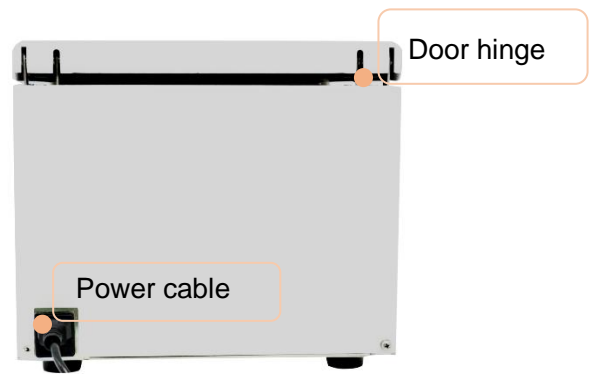
4 Structure

This instrument consists of door, centrifuge chamber, driving part, shell, equipment driving part, sensor, rotor and other accessories. See as the following.

Front



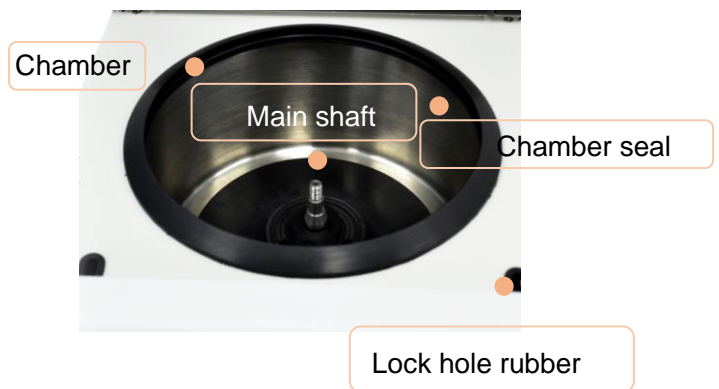
Rear



Inner



Chamber



5 Operation panel

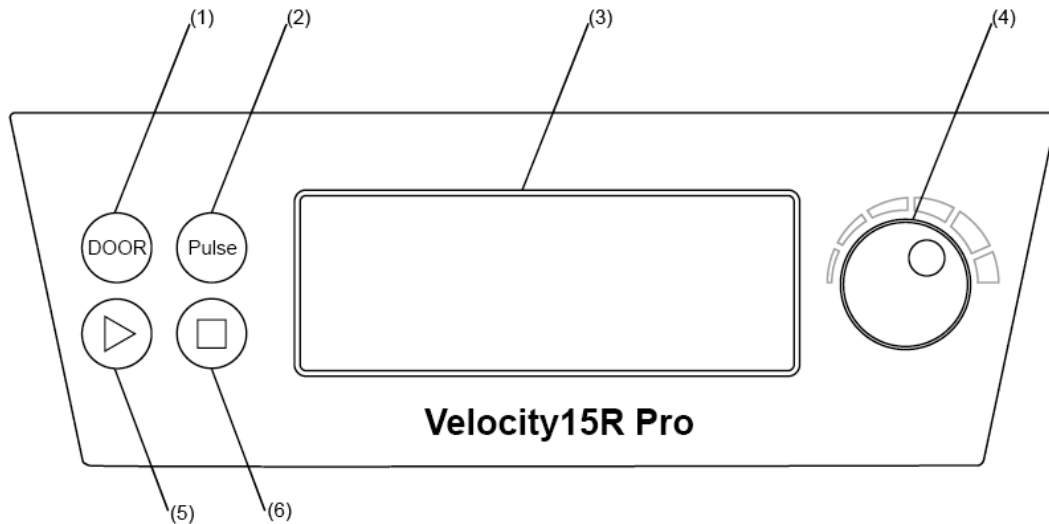


Figure 5-1 Operation Panel

NO.	Symbol	Name	Function
(1)		Door button	Press this button to open the door while stopped.
(2)		Pulse button	Accelerate the rotor while this button is pressed. The rotor slow down and stop while this button is released.
(3)		LCD Screen	Displays running parameters and status.
(4)		Adjusting Knob	Adjusting the value of the parameters' setting & changing (speed and time); short pressing aim to choosing and confirming; long pressing aim to in or out the setting status.
(5)		Start button	Make the rotor start rotating.
(6)		Stop button	Make the Rotor stop rotating.

LCD screen displays the main interface as figure 5-2. It shows parameters of the speed, the temperature and the time.

The interface displays the operation parameters when the rotor is running, the lower

place in the display showing the value of the parameters setting. The detail operation information, please refer Section 7 for detail.

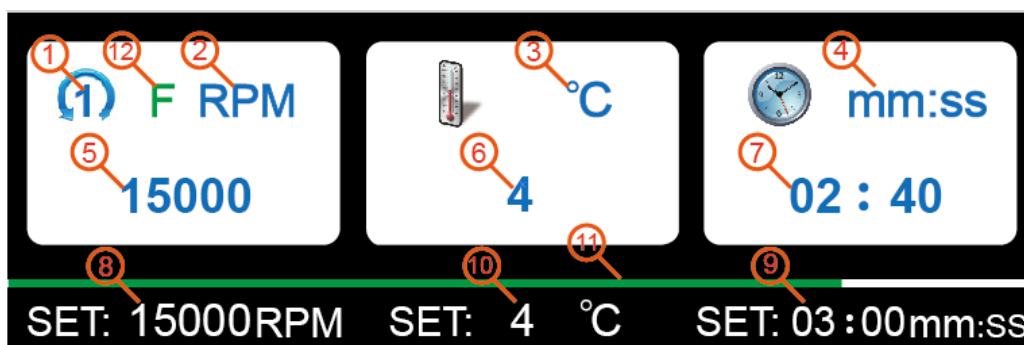


Figure 5-2 The LCD main interface

No.	Description
1	The identification number of the rotor
2	Rotating speed unit (RPM/×g)
3	Temperature Unit (°C)
4	Time unit (mm:ss)
5	Actual rotating speed
6	The chamber temperature
7	The real rotating time after approaching the setting speed
8	The setting value of the speed
9	The setting value of the time
10	The setting value of the temperature
11	The centrifuged progress (in green)
12	The rate of the acceleration and the deceleration (F-fast; S-slow)


6 Preparation of Rotor

WARNING:

- This centrifuge is not explosion-proof. Never use explosive or flammable samples.
- There are restriction on the usage of biological samples and radioactive substances that require biological isolation such as pathogens and recombinant DNA for safety purposes. User must prepare necessary safety measures before treating with samples containing such substances.


1) Prepare the sample

2) Put the sample into tubes or bottles

 **CAUTION:** Sample may leak from the gap between the bottle and its cap if the bottle is fully filled up.

- Do not exceed the capacity specified in the instruction manual.

3) Balance the centrifuge tubes or bottles

 **CAUTION:** There are some cases where samples of different composition due in different precipitation levels by centrifugation even if they are equal in volume, and such operation may increase the level of imbalance. Properly arrange the tubes or bottles so that the same sample is placed symmetrically.

- See Table 6.1 for imbalance tolerance of each rotor.
- Recommend that you use this centrifuge in a well-balanced condition to prolong its life expectancy.
- Never intentionally run the centrifuge under unbalanced condition even though the allowable imbalance tolerance is not exceeded.


4) Inspect the rotor

CAUTION:

- If any abnormality such as corrosion or scratches is found, stop using the rotor and contact our service representative.
- Only use the rotors we recommended.

- Check whether the rotor have corrosion or scratch before using.

5) Set balanced tubes or bottles symmetrically on the rotor

 **CAUTION:** Make sure that the cover is put on the rotor and fixed securely. Otherwise, the rotor or its cover may be dropped off while the instrument is running. That might damage the centrifuge or the rotor.

6) Confirm the ID code of the rotor

- This instrument can identify rotors automatically. There is magnetic steel embedded at the bottom of rotor.
- Each rotor is assigned with an ID code. the function of over-speed protection and the speed/RCF display can be realized.
- The list of available rotor's ID code, see Table 6.1.

Table 6.1 List of rotors

Rotor type	ID code	Max. speed (rpm)	Max. RCF (×g)	Tube/bottle	Imbalance tolerance(*)
					Mass Imbalance(g/tube)
FA15M	1	15,000	22,302	2 ml tube	0.2
FA15N	2	15,000	20,550	5 ml tube	0.2
FA15Q	3	15,000	19,328	0.2ml tube	0.1
FA15R	4	15,000	21,028	2ml cryogenic vial	0.2

* : The imbalance tolerance given in the table indicate the mass imbalance when the centrifuge tubes are place symmetrically. The mass imbalance value offered is just for the reference.

7 Operation

⚠ WARNING:

- Do not push or lean the machine when it is running.
- Do not run the centrifuge with fragments of tubes or dew drops left in the rotor chamber. Those matters may get mixed with sample or may cause the rise of the rotor retention temperature. Always keep the rotor chamber clean.
- If the centrifuge makes abnormal noise during its operation, stop it immediately and contact our service representative. Notify the error code if displayed.

7.1 Normal Operation

1) Turn on the power switch.

■ The LCD screen displays a welcome interface, in the meantime, this centrifuge starts a self-checking process for preparation. (Figure 7-1).

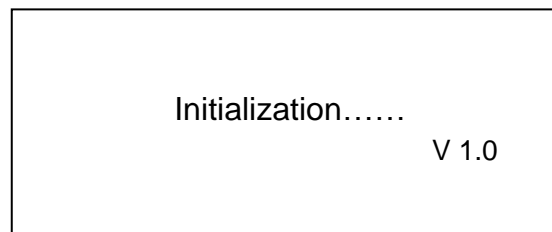


Figure 7-1 Initialization interface

NOTE: When the power is turned on, this centrifuge will take 3 seconds to self-check. During this time, the centrifuge will have no response to the buttons.

The centrifuge will move to a preparing status after passing the self-checking step, and display the running parameters of the last time. For example, the Figure 7-2 shows that the speed was set to be 15000rpm, the temperature was 4°C, the running time was 3 minutes.

Figure 7-2 is only an example. User's setting parameters and running parameters may be different from that in the figure.

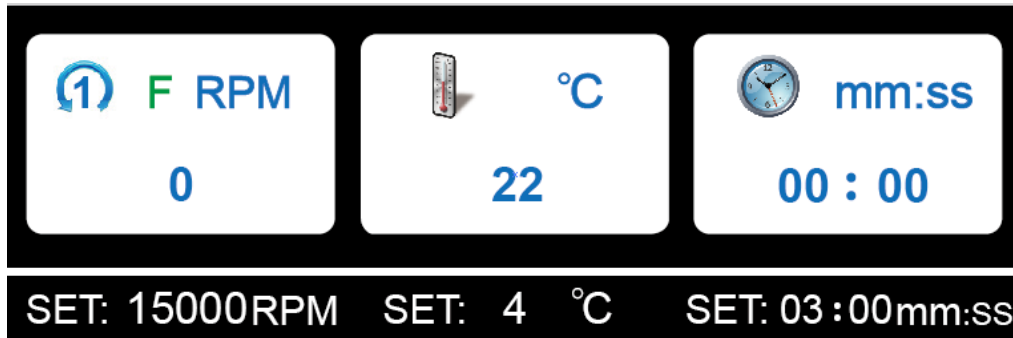


Figure 7-2 Preparation mode interface

- The door is locked automatically.

After self-checking has passed, user can open the door by pressing “DOOR” button.

- 2) Carefully move the filled with sample tube into the rotor, tighten the rotor lid by hand.
- 3) Gently open the door and move the rotor into the drive shaft. Fix the rotor into the drive shaft with the hex screw drive which offered in the main unit tool package. (tighten the hex screw in the clockwise)

- Installing the rotor into the drive shaft should be carefully, make sure there is no incline.

- 4) Close the door and start running.

⚠ CAUTION:

- Make sure that the angle between the door and the table is more than 70 degree, otherwise the door may fall and hurt your hands.
- Do not get your hands caught between the door hook and table when closing the door.

- 5) Set the parameters.

⚠ CAUTION: Some buckets and adapters, and tubes, bottle and micro-plates that are sold on the market have lower allowable speeds (allowable RCF) than the rotor. Use them at the lowest allowable speed or less.

Press the knob, changing the speed mode between the RPM and RCF.

Please change the mode to “RPM” as speed setting; please change the mode to “×g” as the RCF setting.

Long press the knob (3 seconds) to move into the parameters setting status.

- a. Rate setting

Press the knob, changing the mode between the “F” (fast) and the “S” (slow). Then press the knob to ensure the rate.

- b. Speed setting

- ① Rotate the knob go to the speed setting. The number in the speed showing area turn

blue marked by gray. Press the knob, go to the speed setting, rotate the knob to increase the speed setting value (increment is 100rpm or $100\times g$)

② Reach the target speed, press the knob to ensure the parameter value. The screen lower part will show the target speed.

c. Temperature setting

① Rotate the knob go to the temperature setting. The number in the showing area turn blue marked by gray. Press the knob, go to the temperature setting, rotate the knob to increase the temperature setting value (increment is 1°C)

② Reach the target temperature, press the knob to ensure the value. The screen lower part will show the target temperature.

d. Centrifuged time setting

① Rotate the knob go to the time setting, after the temperature setting completed. The number in the time showing area turn blue marked by gray.


Press the knob, go to the time setting, rotate the knob to increase the time setting value (increment is 1min)

② Reach the target time, press the knob to ensure the parameter value. The screen lower part will show the target time.


All parameters completed, please long press the knob (3 seconds) to exit the setting mode.

NOTE: The centrifuge may shake slightly when it is operated under 3000 rpm, this does not indicate any problem.

e. Continuous centrifuge

The unit could keep working till the  button pressing, while make the time setting as "HOLD". Rotate the knob during the time setting, the "HOLD" could be found.

6) Start running.

Press  button, to start the running.


■ The rotor identification number will be showing in the upper left side of the screen as the speed up to 60rpm.

■ The timer will start to count the time while the target speed approaching.


■ Able to press the knob to exchange the unit between the "RPM" and the " $\times g$ " during the rotating progress.

- The progress bar will be green and grow longer during the centrifuged working time.
- All the parameters could able to change the value setting during the rotating. The rotor will be in the new set speed value for the next rotating. The progress bar will be changed after the time value reset.


7) Ending the running

The centrifuge will stop when it reaches the end of the setting time or “” button is pressed.

Open the door, loosen the rotor by the hex screw driver in counter-clockwise, straight upside to move the rotor from the rotor shaft.

 **WARNING:** Do not open the door before the rotor stops.

After ending the operation, the centrifuge will save the operating parameters and recall them when power switch is turning on again.


 **CAUTION:** Please take out the rotor when you are not using the centrifuge. It can avoid rotor corrosion and damaging the drive shaft.

- Please open the chamber door and turn off the power to dry the rotor chamber at the end of daily operation or while the centrifuge will not be used for a long time. Close it when it is completely dry.

If there is anything wrong with the centrifuge, it will brake automatically and display the error number on the right bottom of the Screen. The error warning will be display in the lower place of the screen. User could find the error in the Table 9-1 and make corrective actions accordingly.

7.2 Pulse Operation

NOTE:

- Under this mode, if user keeps pressing the button, the speed will rise until it reaches the setting speed. If releases “” button, it starts to decelerate until it stops.
- Only when rotor is not rotating and the door is closed, the press is effective.

1) Turn on the power switch and set the rotor onto the drive shaft.

2) Check the set speed and change it when necessary.

3) Press “” button.

- The rotor continues to accelerate while pressing this button, and when the centrifuge reaches the set speed, it will continue to operate at the set speed.

4) Release “” button.

- The rotor starts the decelerating process, until it stops.

8 Maintenance

8.1 The daily maintenance

⚠ CAUTION: Using cleaning or sterilization methods other than recommended in this instruction manual may cause corrosion or deterioration to this centrifuge.

Please switch off the centrifuge before cleaning.

1) Centrifuge

- If the centrifuge is exposed to ultraviolet rays for a long time, the color of the covers may be changed and the label may be peeled off. Please cover the centrifuge with cloth after use to avoid direct exposure.
- If the centrifuge is stained, clean it with a cloth or sponge moistened with a neutral detergent solution.
- Sterilize the centrifuge by wiping with a cloth moistened with 70% ethanol solution.

2) Rotor chamber

⚠ CAUTION: Do not pour water, neutral detergent or disinfectant solution directly into the rotor chamber. Otherwise it may leak into the drive unit and cause corrosion or damage to the drive shaft.

- Wipe frost or moisture in the rotor chamber with a soft cloth. If the rotor chamber is dirty, clean with cloth or moistened sponge with a neutral detergent solution. Sterilize the centrifuge by wiping with a cloth moistened with 70% ethanol solution.
- If dewdrops are staying in the rotor chamber, dry the chamber with a soft cloth.

3) Drive shaft

- Wipe the drive shaft with soft cloth, and then coat some silicone grease on it.

4) The door

- Clean and sterilize the door using the same method specified in the step 1).

5) Rotor

- To prevent corrosion, please remove the rotor from the rotor chamber after use. If a rotor is equipped with a cover, detach the cover and invert the rotor to dry the tube holes.
- If a sample is leaked in the rotor, first rinse the rotor with water, and then apply a thin coat of silicon grease to it when it is completely dried.
- Purchase the silicon grease separately. For details, please refer to rotor instruction manual.

8.2 Periodic inspection and replace consumable parts

The table below lists the consumable parts of this centrifuge. It is recommended to replace those parts within its lifespan. The timing of replacement varies depending on operation environment and condition.

No.	Description	Guideline for replacement condition
1	Supporting pole	Door can not be supported normally.
2	Centrifugal chamber seal	There are cracks on the surface.
3	Door seal	
4	Lock hole rubber	

9 Troubleshooting

9.1 Common error list

This centrifuge is designed with self-diagnosing function. For example, an error code of the fault found will be displayed at the right bottom corner of the screen.


 **WARNING:** Do not open the door when the rotor is rotating.

Table 9-1 Error code

Symptom	Causes	Solution	
Nothing appears on the screen when the power is turned on.	<ul style="list-style-type: none"> ·Power socket or the power cable broken; ·The fuse broken; ·Circuit board broken. 	<ul style="list-style-type: none"> ·Remove the cause of trouble and turn on the power ·Replace the fuse. ·Replace the board 	
Error code E-xx appeared on the left corner of Screen.	E-02 Motor Over Temp	<ul style="list-style-type: none"> ·Ambient temperature is over high; ·Fan broken; ·Motor temp protect switch broken; ·Circuit board broken. 	<ul style="list-style-type: none"> ·Down the Ambient Temp; ·Replace the fan; ·Replace the motor; ·Replace the board.
	E-07 Lid Error	<ul style="list-style-type: none"> ·Door lock broken; ·Force to open the door during the motor working; ·Door unclosed. 	<ul style="list-style-type: none"> ·Replace the lock; ·Replace the door.
	E-08 Chamber Over Temp	<ul style="list-style-type: none"> ·Ambient temperature is too high; ·Air vent is braked; ·Temperature sensor failed; ·Circuit board broken. 	<ul style="list-style-type: none"> ·Decrease ambient temperature; ·Clear the air vent; ·Replace temperature sensor part; ·Replace the board.
	E-09 No Rotor	<ul style="list-style-type: none"> ·No rotor is loaded; ·Speed sensor broken; ·Circuit board broken. 	<ul style="list-style-type: none"> ·Load the rotor; ·Replace the speed sensor; ·Replace the board.
	E-10 Rotor Error	<ul style="list-style-type: none"> ·The rotor not fit the centrifuge; ·Circuit board broken. 	<ul style="list-style-type: none"> ·Replace the rotor; ·Replace the board.
	E-11 Parameter Setting Error	<ul style="list-style-type: none"> ·The setting is over the allowable range; ·Circuit board broken. 	<ul style="list-style-type: none"> ·Check the settings and let it within the allowable range; ·Replace the board.
	E-13 Rotor Imbalance	<ul style="list-style-type: none"> ·The tube located place imbalance; ·The sample filled over the imbalance range; ·Circuit board broken. 	<ul style="list-style-type: none"> ·Balance the tube and the sample; ·Replace the board.

	Symptom	Causes	Solution
	E-01/03/04/05 /06/12/14	Read Maintenance manual.	Contact our sales or service representative. Inform them the alarm code.

10 Frequent problems and solutions

WARNING:

- Never open the door while the instrument is running.
- If the door is opened while the rotor is still rotating, close it immediately.

10.1 How to open the door

1) The condition with the power on

Note: You can open the door only when the instrument is powered and the rotor is not rotating.

(1) Turns on the power switch, press “DOOR” button to open the door.

(2) When the rotor is stopped, press “DOOR” button to open the door.

2) The condition with the power off

If the door cannot be opened due to the power outage, try to use the following steps:

(1) Make sure that the rotor is not rotating.

- Listen carefully to make sure that no sound can be heard.
- Confirm that the rotor is not rotating through observation window.
- It will take more than 20 minutes for a large-size rotor to stop completely. Please allow of a sufficient time before taking any further actions.

(2) Insert a hex screwdriver into the small hole to open the door.

- The small hole is located on the left side of the centrifuge.
- Insert a hex screwdriver into this hole, and then push the lock to open the door.

(3) While the screwdriver pushing the lock, you can open the door with your hand.

11 Applicable rotors and tubes

CAUTION:

- To use the rotor properly please read the instruction manual carefully.
- Do not run the centrifuge exceeding the allowable maximum speeds of the rotor, buckets, and adapters. Some adapters, tubes and bottles have a lower speed than the rotor.

11.1 Table of applicable rotors

Rotor type	Maximum speed	Actual capacity (ml×No. of tubes)	Tube/bottle	
	Maximum RCF		Part name	Size(Φ×L)mm
FA15M	15,000rpm 22,302×g	2×24	2ml round bottom tube	10.8×42
FA15N	15,000rpm 20,550×g	5×10	5ml culture tube	16.7×60
FA15Q	15,000rpm 19,328×g	0.2×32	0.2ml PCR tube	6×21.5
FA15R	15,000rpm 21,028×g	2×18	2ml cryogenic vial (Thermo/Corning)	12.4×48.5

11.2 Cleaning and sterilizing tubes and bottles

1) To choose optional conditions for cleaning and sterilizing the tubes and bottles, please refer to the following table.

Cleaning and sterilizing conditions for tubes and bottles

O: Applicable X: Inapplicable

Condition		Material	PA	PC	PP
Cleaning	Running water cleaning	Acidic detergent(pH5 or lower)	X	X	X
		Acidic detergent (higher than pH5)	O	O	O
		Alkaline detergent(higher than pH9)	O	X	O
		Alkaline detergent(pH9 or lower)	O	O	O
		Neutral detergent(pH7)	O	O	O
		Warm water (up to 70°C)	O	O	O
	Ultrasonic cleaning	Neutral detergent (pH7)	O	O	O
Sterilization	Autoclaving	115°C (0.7kg/cm ²) 30minutes	O	O	O
		121°C (1.0kg/cm ²) 20 minutes	X	O	O
		126°C (1.4kg/cm ²) 15 minutes	X	X	X
	Boiling	15 to 30 minutes	O	O	O
	Ultraviolet sterilization	200-300nm	X	X	X
	Gas sterilization	Ethylene oxide	O	X	O
		Formaldehyde	O	O	O

PA: Polyallomer; PC: Polycarbonate; PP: Polypropylene

2) Cleaning PC tubes and bottles

PC materials have low chemical stability against alkaline solutions, so avoid using detergents with pH higher than 9. Note that some neutral detergents' pH is still higher than 9 even if diluted according to the instruction. Use detergent with its pH between 7.0 and 9.0.

3) Sterilize PA, PC and PP tubes and bottles by autoclave

PA begins softening at about 120°C, and PC and PP at about 130°C. So disinfect PA tubes/bottles at 115°C (0.7kg/cm²) for 30 minutes and PC and PP tubes/bottles at 121°C (0.1kg/cm²) for 20 minutes when using the autoclaving. If the temperature is exceeded, the tubes/bottles may deform.

Please take the following instructions when using a sterilizing vessel:

- (1) Place bottles in vertical position with mouths upward. If bottles are inclined, they may deform due to gravity action.
- (2) Remove caps and inner covers to avoid deformation or rupture.
- (3) Take the bottles out till the sterilizing chamber cools down to the room temperature.
- 4) The lifetime of tubes and bottles

The lifetime of plastic tubes and bottles depends on the characteristics of samples, speed of the rotor, temperature and so on.


When the plastic tubes/bottles are used for ordinary centrifugation (pH between 5.0 and 9.0), their life expectancies are defined as follows:

When operated at the maximum speed:

High quality tubes and bottles (PA, PC, PP): 30~50 times

Ordinary tubes and bottles (PA, PC, PP): about 10 times

The lifetime of the plastic tubes/bottles also depend on the treatment conditions such as cleaning and sterilization.

 **WARNING:** Waste liquid and residues should be poured into the specified containers in order to efficient treatment and recycling every time when the operation is done.

Don't use tubes or bottles with crack.

12 Rotating radius of applicable rotors

Table 12.1 List of the maximum radius of rotors

Name	Rotor ID	Maximum radius(cm)	Name	Rotor ID	Maximum radius(cm)	Name	Rotor ID	Maximum radius(cm)
FA15M	1	8.4	FA15N	2	7.74	FA15Q	3	7.28
FA15R	4	7.92						

13 Calculating relative centrifuge force (RCF)

An RCF can be determined by the following calculation formula:

$$RCF=1.118 \times r \times n^2 \times 10^{-5}$$


r-rotating radius, unit: cm, n-rotating speed, unit: r / min

14 Circuit connecting graph

The electric system consists of control board, display board, sensors, motor and fans etc. All three fuses are placed on the control board, with signs of F100, F300, F301 respectively, their specifications are:

F100: 10A, $\Phi 5 \times 20$, delay type, used for the main control board; F300: 1A, $\Phi 5 \times 20$, delay type, used for the fans; F301: 8A, $\Phi 5 \times 20$, delay type, used for the compressor.

F1 (2 EA): 10A, $\Phi 5 \times 20$, ordinary type, used for DC POWER protection.

 Unauthorized repairs, disassembly, and other services to the centrifuge are strictly prohibited.

15 Guarantee

■ Guarantee of the centrifuge

This centrifuge is guaranteed for one year from the date of delivery and it has been operated and maintained properly.

■ Guarantee of the rotor

The rotor is guaranteed for 7 years from the date of delivery. When the rotor has been damaged by corrosion or material fatigue, please pay special attention on it and do not use the rotor any more.

We do not guarantee the centrifuge and the rotor under the following conditions even before the guarantee period expires:

- (1) Failures caused by incorrect installation
- (2) Failures caused by rough and/or improper operation
- (3) Failures caused by transportation or displacement after installation
- (4) Failures caused by unauthorized disassembly or modification
- (5) Failures caused by using of non-Dynamica components such as rotors, buckets and adapters
- (6) Failures caused by natural disasters including fire, earthquakes and so on
- (7) Consumable parts and parts with a limited guarantee period

After-sales Service

Periodic maintenance is recommended to assure safe and efficient operation. If the centrifuge has something wrong, do not attempt to repair it by yourself. Contact our sales or service representative.



The Velocity Range

Bench Top Centrifuges

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