

Instruction Manual

HI 300N - HI 310N

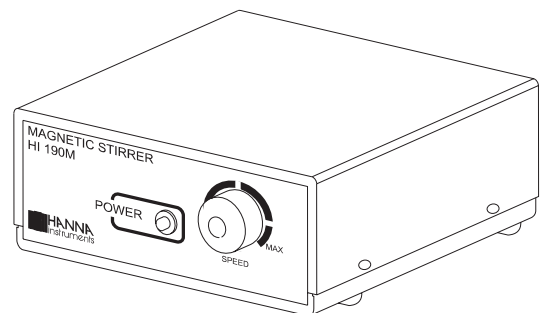
HI 301N - HI 311N

HI 302N - HI 312N

HI 303N - HI 304N

HI 322N - HI 324N

Magnetic Stirrers



HANNA[®]
instruments
www.hannainst.com

Dear Customer,
 Thank you for choosing a Hanna product.
 Please read this instruction manual carefully before using the meter. If you need additional technical information, do not hesitate to e-mail us at **tech@hannainst.com**.
 These meters are in compliance with **CE** directives.

WARRANTY

All Hanna Instruments **products are warranted for two years** against defects in workmanship and materials when used for their intended purpose and maintained according to the instructions. Damages due to accidents, misuse, tampering or lack of prescribed maintenance are not covered. This warranty is limited to repair or replacement free of charge. If service is required, contact the dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charge for repair or replacement. If the instrument is to be returned to Hanna Instruments, obtain a Return Goods Authorization from the Customer Service Department first and then send it with shipment cost prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

TABLE OF CONTENTS

Preliminary Examination	3
General Description	3
Application Guide	5
Electrical Connections	6
Accessories	6
Functional Description & Specifications	7
HI 300N & HI 310N	8
HI 301N & HI 311N	10
HI 302N & HI312N	12
HI 303N	14
HI 304N	16
HI 322N & HI 324N	18
Operational Guide for	
HI 300N & HI 310N	20
HI 301N, HI 303N & HI 311N	22
HI 302N, HI 304N & HI 312N	24
HI 322N & HI 324N	26

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it to make sure that no damage has occurred during shipping. If there is any damage, notify your Dealer.

Each stirrer is supplied complete with a magnetic stir bar.

Note: Save all packing material until you are sure that the instrument functions correctly. All defective items must be returned in the original packing with the supplied accessories.

GENERAL DESCRIPTION

The Hanna series of magnetic stirrers are designed with simplicity of use for stirring and mixing solutions in a wide range of laboratory applications. Several models are available in an extensive range covering:

- general purpose stirrers
- dual-speed range
- auto-reverse cycle stirring
- rpm indication
- timer control

All models employ a motorized magnet to rotate a stirring bar to create a forced vortex rotational flow in the solution with a constant angular speed which is adjustable with an external speed knob.

Unlike conventional stirrers, all Hanna stirrers use the concept of pulse-driven drive to give the full power required to effectively stir the fluid regardless of the speed.

This eliminates the need to start the motor at high speed and the user is now able to control the speed precisely.

Each stirrer is equipped with an opto-sensor for speed monitoring, and a speed limiter circuit that prevents hazardous operation when the load is suddenly removed.

The power required to effectively stir a fluid is affected by the torque load on the stirrer which is dependent on the capacity, type and viscosity of the fluid. The speed of the stirrer decreases as the torque load increases and vice versa, unless the power delivered changes accordingly.

For Newtonian fluids like water, the viscosity remains constant during stirring. General purpose, normal stirrers are ideal for this kind of fluids.

For some fluids like oil and clay, the viscosity changes during the stirring process, making it necessary to adjust the power to maintain a constant speed during the stirring.

Hanna Auto-Speed stirrers (HI 31X series) are designed with automatic feedback control to maintain constant speed when the torque load changes and are therefore ideal for stirring non-Newtonian fluids where the viscosity changes during stirring.

They are also ideal for mixing applications where one solution is added to another which changes the capacity and thereby the torque load on the stirrer.

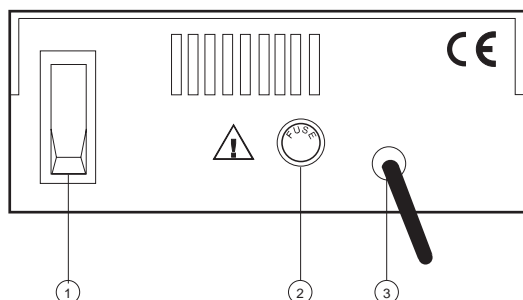
The Auto-Speed stirrers maintain a constant stirring speed during the mixing up to the full capacity of 5 liters. They can also be used with Newtonian fluids up to a capacity of 5 liters.

Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.

APPLICATION GUIDE

APPLICATION	MODEL
Newtonian fluids up to 2.5 liters	HI 300N HI 301N HI 302N HI 304N
Non-Newtonian fluids up to 5 liters whose viscosity changes during stirring or Newtonian fluids up to 5 liters or mixing operation where load changes during stirring	HI 310N HI 311N HI 312N
Repetitive stirring in Newtonian fluids up to 2.5 liters	HI 303N
Repetitive stirring in multiple samples with the same stirring speed	HI 304N
Routine stirring application with a predetermined stirring time	HI 322N
Repetitive stirring in multiple samples with the same stirring speed and predetermined stirring time	HI 324N

ELECTRICAL CONNECTIONS



1. ON/OFF switch for power supply
2. Fuse holder for 400 mA/250 V fuse
3. AC power cord.

Unplug the stirrers from the power supply before replacing the fuse.

ACCESSORIES

HI 731320 Magnetic stir bar (10 pcs)

FUNCTIONAL DESCRIPTION AND SPECIFICATIONS

See the following pages for specifications of each model.

The capacity is referred to stirring water with a viscosity of 0.001 N·s/m² at 25°C.

Specifications for all models

Speed Control	ON/OFF and continuously variable with potentiometer knob
Drive	Direct drive D.C. Motor with magnet
Power Consumption	4 W
Torque Delivered	85 g·cm
Power Supply	115 or 230 Vac, 50/60 Hz depending on models
Fuse	400 mA/250 V; 20x5 mm
Stirring Bar	Teflon [®] coated, L 50 x dia 7 mm

Recommendations for Users

Before using these products, make sure that they are entirely suitable for the environment in which they are used.

Operation of these instruments in residential area could cause unacceptable interferences to radio and TV equipments, requiring the operator to take all necessary steps to correct interferences.

Any variation introduced by the user to the supplied equipment may degrade the instruments' EMC performance.

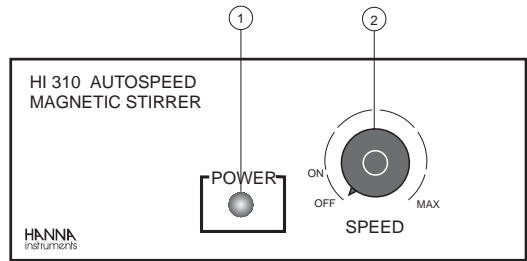
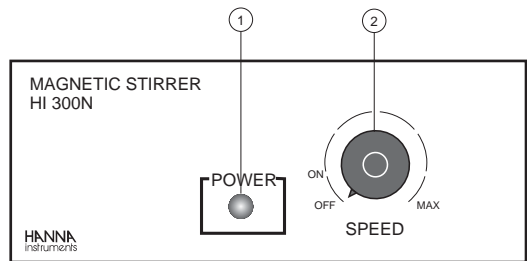
Unplug the stirrers from the power supply before replacing the fuse.

To avoid damages or burns, do not place these stirrers in microwave ovens.

HI 300N & HI 310N
GENERAL PURPOSE STIRRERS

These general purpose stirrers are suitable for daily stirring applications in the laboratory.

HI 300N normal stirrer and **HI 310N** autospeed stirrer are covered with a corrosion resistant stainless steel top.

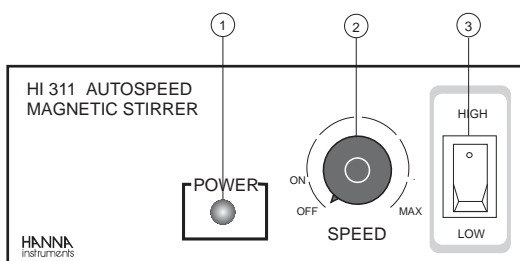
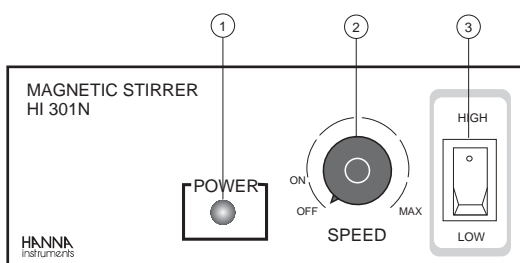


1. **Power indicator** (LED lights up when the stirrer is powered)
2. **ON/OFF/SPEED knob**, to turn the stirrer ON and OFF, and set the stirring speed (continuously variable up to the maximum)

	HI300N	HI 310N
Maximum Stirring Capacity	2.5 Liters (0.66 gallons)	5 Liters (1.3 gallons)
Speed Range Min Max	100 rpm 800 to 1000 rpm	
Auto-Speed	not applicable	standard
Power Supply HI 300N-1 HI 300N-2 HI 310N-1 HI 310N-2	110/115 Vac, 50/60 Hz 220/240 Vac, 50/60 Hz 110/115 Vac, 50/60 Hz 220/240 Vac, 50/60 Hz	
Installation Category	II	
Cover Material	AISI 316 stainless steel	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions	180 x 180 x 70 mm (7.1 x 7.1 x 2.8")	
Weight	1.4 kg (3.1 lb.)	

HI 301N & HI 311N **TWO-SPEED STIRRERS**

HI 301N normal stirrer and **HI 311N** autospeed stirrer, are ideal for long duration stirring which require slow speed and accurate speed control (for example in electrolysis applications). The selectable HIGH/LOW range allows to set the speed precisely.

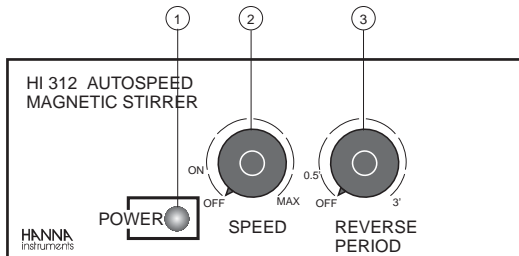
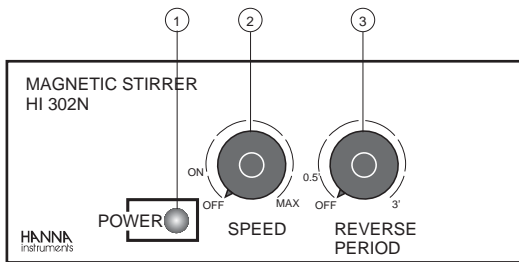


1. **Power indicator** (LED lights up when the stirrer is powered)
2. **ON/OFF/SPEED knob**, to turn the stirrer ON and OFF, and set the stirring speed (continuously variable up to the maximum)
3. **HIGH/LOW switch** (for selecting low or high speed range)

	HI301N	HI311N
Maximum Stirring Capacity	2.5 Liters (0.66 gallons)	5 Liters (1.3 gallons)
Speed Range Low High	100 to 500 rpm 100 to 800/1000 rpm	
Auto-Speed	not applicable	standard
Power Supply HI 301N-1 HI 301N-2 HI 311N-1 HI 311N-2	110/115 Vac, 50/60 Hz 220/240 Vac, 50/60 Hz 110/115 Vac, 50/60 Hz 220/240 Vac, 50/60 Hz	
Installation Category	II	
Cover Material	AISI 316 stainless steel	
Environment	0 to 50°C (32 to 122°F); RH max 95% RH	
Dimensions	180 x 180 x 70 mm (7.1 x 7.1 x 2.8")	
Weight	1.4 kg (3.1 lb.)	

HI 302N & HI 312N **AUTO-REVERSE STIRRERS**

HI 302N normal stirrer and **HI 312N** autospeed stirrer allow to stir the fluid in both directions and are ideal for powder mixing applications to ensure a homogeneous final product and complete dissolution of hard-to-wet powders. The reverse stirring period is adjustable from 30 seconds to 3 minutes. When set to 1 minute, the fluid will rotate in one direction for minute and then reverse its rotation for another minute at the desired speed in a repeated cycle until the stirrer is switched off.



1. **Power indicator** (LED lights up when the stirrer is powered)
2. **ON/OFF/SPEED knob**, to turn the stirrer ON and OFF, and set the stirring speed (continuously variable up to the maximum)
3. **REVERSE PERIOD knob** with the ON/OFF and continuously variable selection of inversion cycle time in minutes, from 0.5 to 3 minutes

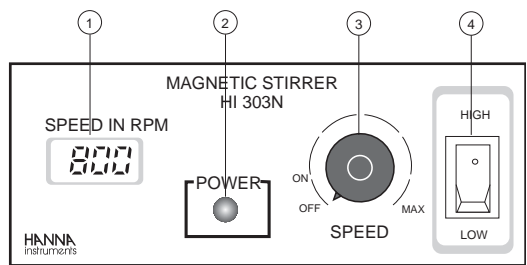
12

	HI 302N	HI 312N
Maximum Stirring Capacity	2.5 Liters (0.66 gallons)	5 Liters (1.3 gallons)
Speed Range Min. Max.	100 rpm 800 to 1000 rpm	
Reverse Interval	from 30 seconds to 3 minutes	
Auto-Speed	not applicable	standard
Power Supply HI 302N-1 HI 302N-2 HI 312N-1 HI 312N-2	110/115 Vac, 50/60 Hz 220/240 Vac, 50/60 Hz 110/115 Vac, 50/60 Hz 220/240 Vac, 50/60 Hz	
Installation Category	II	
Cover Material	AISI 316 stainless steel	
Environment	0 to 50°C (32 to 122°F) 95% RH max.	
Dimensions	180 x 180 x 70 mm (7.1 x 7.1 x 2.8")	
Weight	1.4 kg (3.1 lb.)	

13

HI 303N
TWO-SPEED STIRRER WITH TACHOMETER

HI 303N stirrer incorporates an LCD tachometer.
This model allows precise stirring repeatability by using two separate ranges. In each range, the speed can be fine tuned for exacting accuracy.

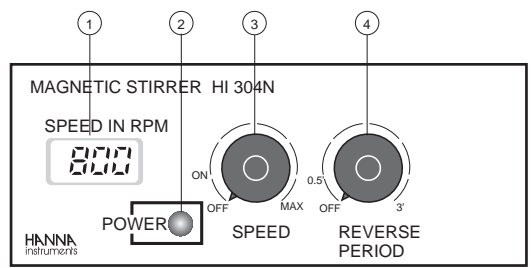


1. **rpm LCD** displays the rpm speed
2. **Power indicator** (LED lights up when the stirrer is powered)
3. **ON/OFF/SPEED knob**, to turn the stirrer ON and OFF, and set the stirring speed (continuously variable up to the maximum)
4. **HIGH/LOW switch** (for selecting low speed range or high speed range)

	HI 303N
Maximum Stirring Capacity	2.5 Liters (0.66 gallons)
Speed Range Low High	100 to 500 rpm 100 to 1000 rpm
Tachometer	4-digit LCD
Power Supply HI 303N-1 HI 303N-2	110/115 Vac, 50/60 Hz 220/240 Vac, 50/60 Hz
Installation Category	II
Cover Material	AISI 316 Stainless Steel
Environment	0 to 50°C (32 to 122°F); RH max 95%
Dimensions	180 x 180 x 70 mm (7.1 x 7.1 x 2.8")
Weight	1.4 kg (3.1 lb.)

HI 304N
AUTO-REVERSE STIRRER WITH TACHO-
METER

HI 304N is a heavy-duty stirrer with a built-in tachometer. An advanced circuit allows to reverse the direction of the stir at an interval that can be adjusted from 30 seconds up to 3 minutes.

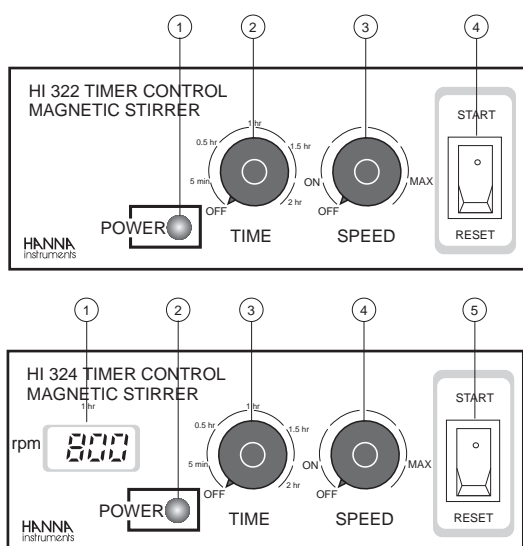


1. **rpm LCD** displays the rpm speed
2. **Power indicator** (LED lights up when the stirrer is powered)
3. **ON/OFF/SPEED knob**, to turn the stirrer ON and OFF, and set the stirring speed (continuously variable up to the maximum)
4. **REVERSE PERIOD knob** with the ON/OFF and continuously variable selection of inversion cycle time in minutes, from 0.5 to 3 minutes

	HI 304N
Maximum Stirring Capacity	2.5 Liters (0.66 gallons)
Speed Range Min. Max.	100 rpm 800 to 1000 rpm
Tachometer	4-digit LCD
Power Supply HI 304N-1 HI 304N-2	110/115 Vac, 50/60 Hz 220/240 Vac, 50/60 Hz
Installation category	II
Cover Material	AISI 316 stainless steel
Environment	0 to 50°C (32 to 122°F); RH max 95% RH
Dimensions	180 x 180 x 70 mm (7.1 x 7.1 x 2.8")
Weight	1.4 kg (3.1 lb.)

HI 322N & HI 324N **TIMER-CONTROLLED STIRRERS**

HI 322N and **HI 324N** are autospeed stirrers equipped with timer control to start and automatically stop the stirring process after a user-selectable period (from 5 minutes to 2 hours). They are the ideal stirrers for routine applications where the required stirring time is known, and for non-Newtonian fluids whose viscosities change during stirring or Newtonian fluids up to 5 liters capacity.

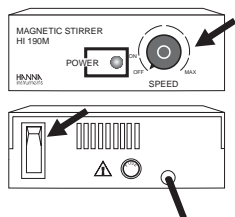


1. **rpm LCD** displays the rpm speed
2. **Power indicator** (LED lights up when the stirrer is powered)
3. **TIME knob** for setting the stirring time from 5 minutes to 2 hours
4. **SPEED knob**, to turn the stirrer ON and OFF, and set the stirring speed (continuously variable up to the maximum)
5. **START/RESET switch** for starting and re-setting the time control

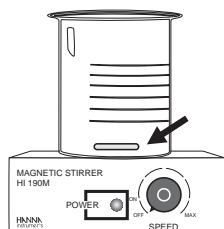
	HI 322N	HI 324N
Maximum Stirring Capacity	5 Liters (1.3 gallons)	5 Liters (1.3 gallons)
Speed Range Min. Max.	100 rpm 800 to 1000 rpm	
Timer Range	user selectable from 5 minutes to 2 hours	
Tachometer	not applicable	4-digit LCD
Auto-Speed	standard	standard
Power supply HI 322N-1 HI 322N-2 HI 324N-1 HI 324N-2	110/115 Vac, 50/60 Hz 220/240 Vac, 50/60 Hz 110/115 Vac, 50/60 Hz 220/240 Vac, 50/60 Hz	
Installation Category	II	
Cover Material	AISI 316 stainless steel	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions	180 x 180 x 70 mm (7.1 x 7.1 x 2.8")	
Weight	1.4 kg (3.1 lb.)	

OPERATIONAL GUIDE FOR HI 300N and HI 310N

- Make sure that the **SPEED** knob (on the front panel) and the **ON/OFF** switch (on the rear panel) are in **OFF** position.

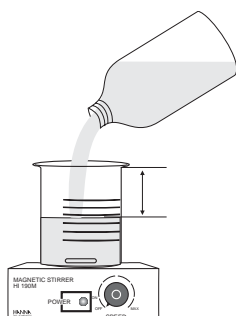


- Place a beaker or glass container at the center of the top of the stirrer, and place the stirring bar in the beaker.

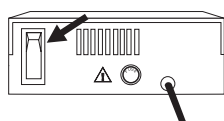


- Pour the liquids to be mixed into the beaker.

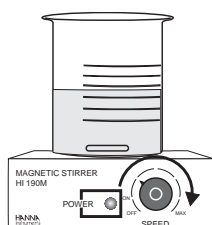
Do not fill up to the brim and leave sufficient space to prevent spillage during stirring.



- Connect the power cord to the mains and turn the stirrer on.

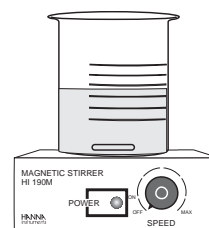


- Adjust the **SPEED** knob slowly until the required stirring speed is achieved.



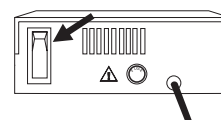
20

- Allow sufficient time for the mixing operation to attain uniform rotational flow.



- When stirring is complete, turn the **SPEED** knob to the **OFF** position.

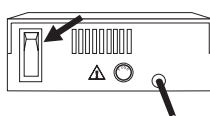
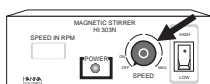
- If no further stirring is required, turn the stirrer off.



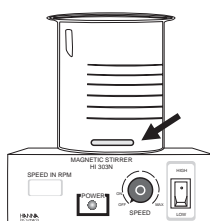
21

OPERATIONAL GUIDE FOR HI 301N, HI 303N and HI 311N

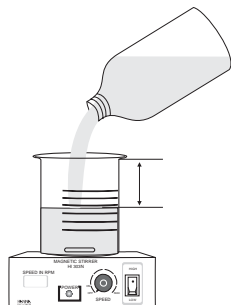
- Make sure that the SPEED knob and the ON/OFF switch are in the OFF position.



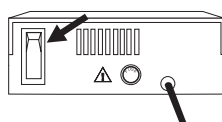
- Place a beaker or glass container at the center of the top of the stirrer and place the stirring bar in the beaker.



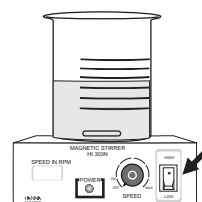
- Pour the liquids to be mixed into the beaker. Do not fill up to the brim and leave sufficient space to prevent spillage during stirring.



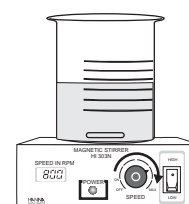
- Connect the power cord to the mains and turn the stirrer on with the ON/OFF switch.



- Select the low or high range with the HIGH/LOW switch as required.

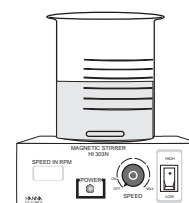


- Adjust the SPEED knob slowly until the required stirring speed is achieved.
- Allow sufficient time for the mixing operation to attain uniform rotational flow.

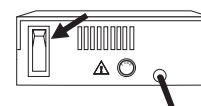


The stirring speed is indicated in the rpm LCD (**HI 303N** only).

- When stirring is complete, turn the SPEED knob to the OFF position.

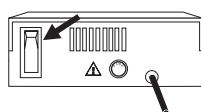
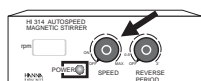


- If no further stirring is required, turn the stirrer off.

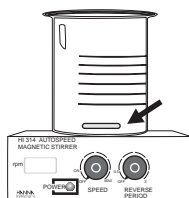


OPERATIONAL GUIDE FOR HI 302N, H I304N and HI 312N

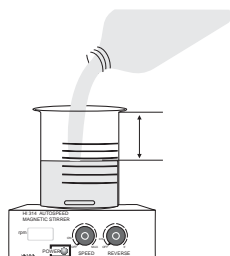
- Make sure that the **SPEED** knob and the **ON/OFF** switch are in the **OFF** position.



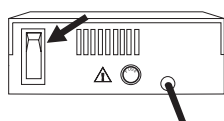
- Place a beaker or glass container at the center of the top of the stirrer and place the stirring bar in the beaker.



- Pour the liquids to be mixed into the beaker. Do not fill up to the brim and leave sufficient space to prevent spillage during stirring.

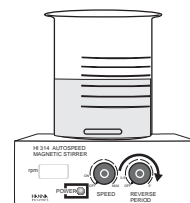


- Connect the power cord to the mains and turn the stirrer on with the **ON/OFF** switch.

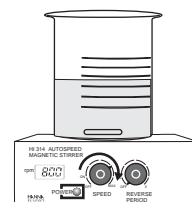


- Set the **REVERSE PERIOD** knob to the desired reverse stirring period from 30 seconds to 3 minutes.

E.g. if set to one minute, the fluid will rotate in one direction for one minute and then reverse its rotation for another minute in a repeated cycle until the stirrer is turned off.

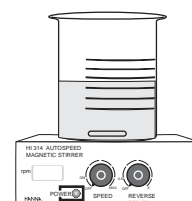


- Adjust the **SPEED** knob slowly until the required stirring speed is achieved.

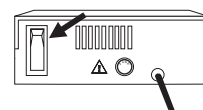


- Allow sufficient time for the mixing operation to attain uniform rotational flow. The stirring speed is indicated in the rpm LCD for **HI 304N**.

- When stirring is complete, turn the **SPEED** knob to the **OFF** position.

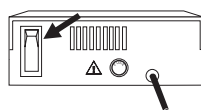
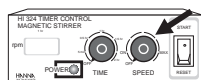


- If no further stirring is required, turn the stirrer off.

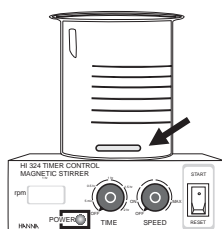


OPERATIONAL GUIDE FOR HI 322N and HI 324N

- Make sure that the **SPEED** knob and the **ON/OFF** switch are in the **OFF** position and the **START/RESET** switch is in **RESET** position.



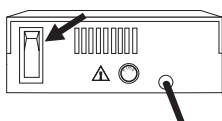
- Place a beaker or glass container at the center of the top of the stirrer and place the stirring bar in the beaker.



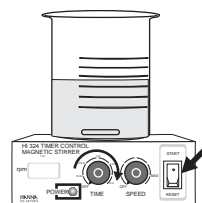
- Pour the liquids to be mixed into the beaker. Do not fill up to the brim and leave sufficient space to prevent spillage during stirring.



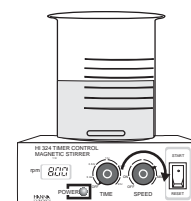
- Connect the power cord to the mains and turn the stirrer on with the **ON/OFF** switch.



- Set the **TIME** knob to the desired stirring time from 5 minutes to 2 hours. Then set the **START/RESET** switch to **START**. The stirrer will only start stirring when the **START** switch is in the **START** position and will end when the selected stirring time has passed.

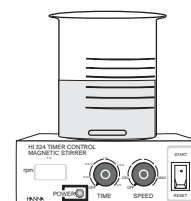


- Adjust the **SPEED** knob slowly until the required stirring speed is achieved.

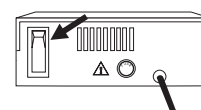


- Allow sufficient time for the mixing operation to attain uniform rotational flow. The stirring speed is indicated in the rpm LCD for **HI 324N**.

- When stirring is complete, turn the **SPEED** knob to the **OFF** position.



- If no further stirring is required, turn the stirrer off.



SALES AND TECHNICAL SERVICE CONTACTS

Australia:

Tel. (03) 9769.0666 • Fax (03) 9769.0699

China:

Tel. (10) 88570068 • Fax (10) 88570060

Egypt:

Tel. & Fax (02) 2758.683

Germany:

Tel. (07851) 9129-0 • Fax (07851) 9129-99

Greece:

Tel. (210) 823.5192 • Fax (210) 884.0210

Indonesia:

Tel. (21) 4584.2941 • Fax (21) 4584.2942

Japan:

Tel. (03) 3258.9565 • Fax (03) 3258.9567

Korea:

Tel. (02) 2278.5147 • Fax (02) 2264.1729

Malaysia:

Tel. (603) 5638.9940 • Fax (603) 5638.9829

Singapore:

Tel. 6296.7118 • Fax 6291.6906

South Africa:

Tel. (011) 615.6076 • Fax (011) 615.8582

Taiwan:

Tel. 886.2.2739.3014 • Fax 886.2.2739.2983

Thailand:

Tel. 66.2619.0708 • Fax 66.2619.0061

United Kingdom:

Tel. (01525) 850.855 • Fax (01525) 853.668

USA:

Tel. (401) 765.7500 • Fax (401) 765.7575

MAN300 06/05

*For e-mail contacts and complete list of Sales and Technical offices, please see **www.hannainst.com***