



**STARTER 2100  
Bench pH Meter  
Instruction Manual**



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# 1 INTRODUCTION

😊 Thank you for choosing OHAUS.

Please read the manual completely before using the STARTER 2100 bench pH meter to ensure proper setup, operation and maintenance.

STARTER 2100 has an excellent performance/price ratio and is designed with many useful features. Other accessories and various electrodes are available for different applications. Contact your preferred Authorized OHAUS Distributor for details and pricing.

Starter 2100 offers many practical features such as:

- Large liquid crystal screen with well-organized display
- Electrode condition icon on the display to show the pH electrode performance
- Recall of last calibration data
- Quick Guide attached under the meter to assist with operation

## 1.1 Definition of Signal Warnings and Symbols

Safety notes are marked with signal words and warning symbols. These show safety issues and warnings. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions and false results.

### Signal Words

<b>WARNING</b>	For a hazardous situation with medium risk, possibly resulting in injuries or death if not avoided.
<b>CAUTION</b>	For a hazardous situation with low risk, resulting in damage to the device or the property or in loss of data, or injuries if not avoided.
<b>Attention</b>	For important information about the product.
<b>Note</b>	For useful information about the product

### Warning Symbols



General hazard



Explosion hazard



Corrosive hazard



Alternating current



Direct current

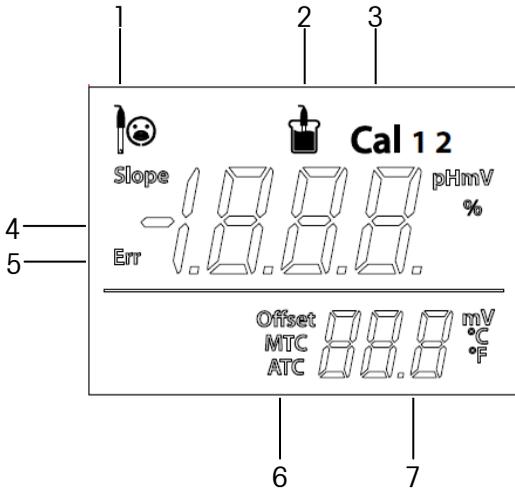
## 1.2 Safety Precautions

**CAUTION:** Read all safety warnings before installing, making connections, or servicing this equipment. Failure to comply with these warnings could result in personal injury and/or property damage. Retain all instructions for future reference.

- Verify that the input voltage range printed on the data label and the plug type matches the local AC power to be used.
- Make sure that the power cord does not pose a potential obstacle or tripping hazard.
- Use the equipment only in dry locations.
- Dry off any liquid spills immediately. The instrument is not watertight.
- When using chemicals and solvents, comply with the instructions of the chemical producer and the general lab safety rules.
- Use only approved accessories and peripherals.
- Operate the equipment only under ambient conditions specified in these instructions.
- Disconnect the equipment from the power supply when cleaning.
- Do not operate the equipment in hazardous or unstable environments.
- Service should only be performed by authorized personnel.

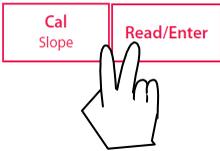
1.3 Display and controls

Displays



1	Electrode condition		
	Slope: more than 95% and offset: $\pm$ (0-15) mV Electrode condition is good	Slope: 90-95% or offset: $\pm$ (15-35) mV Electrode condition is acceptable	Slope: less than 90% or offset: $\pm$ (35-60) mV Electrode condition is not good or needs cleaning
2	Measurement icon -  , measurement or calibration is running; disappear means the reading is locked, no matter measurement		
3	Calibration icon - <b>Cal</b> , <b>1</b> point or <b>2</b> point calibration in progress		
4	<b>pH/mV</b> reading or slope (%) in calibration		
5	Error message - <b>Err</b>		
6	Auto temperature compensation - <b>ATC</b> ; Manual temperature compensation - <b>MTC</b>		
7	Temperature during measurement or <b>Offset</b> (mV) in calibration		

Controls

<p>Button</p>	<p>Press &amp; release </p>	<p>Press &amp; hold for 3 seconds </p>
<p></p>	<ul style="list-style-type: none"> <li>- Start measurement or lock current reading</li> <li>- Confirm temp setting</li> </ul>	
<p></p>	<ul style="list-style-type: none"> <li>- Start calibration</li> </ul>	<ul style="list-style-type: none"> <li>- Review the latest calibration data (slope, offset)</li> </ul>
<p></p>	<ul style="list-style-type: none"> <li>- Meter turn on</li> <li>- Exit, return to measurement screen</li> </ul>	<ul style="list-style-type: none"> <li>- Meter turn off</li> </ul>
<p></p>	<ul style="list-style-type: none"> <li>- Entered temperature setup mode</li> <li>- Increase temp. value when in temp. setup mode</li> </ul>	
<p></p>	<ul style="list-style-type: none"> <li>- Switch between pH and mV measuring modes</li> <li>- Decrease temp. value when in temp. setup mode</li> </ul>	
<p></p>	<ul style="list-style-type: none"> <li>- Start self-diagnosis</li> </ul>	

## 2 INSTALLATION

Carefully unpack the box.

### 2.1 Package contents

The model ST2100-B (basic model) has the following items:

ST2100-B	Units
STARTER 2100	1
Built-in electrode arm	1
12V Power supply	1 set

In addition to ST2100-B content, the model ST2100-E package also includes the following:

ST210 2-in-1 pH electrode	1
pH Buffer Powder Set (4.01, 7.00, 10.01)	1 set

In addition to ST2100-E content, the model ST2100-F package also includes the following:

STTEMP30 temperature electrode	1
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Additional Ohaus pH electrodes for different applications are available

Each pH buffer powder should be dissolved in 250ml pure or deionized water in a volumetric flask.

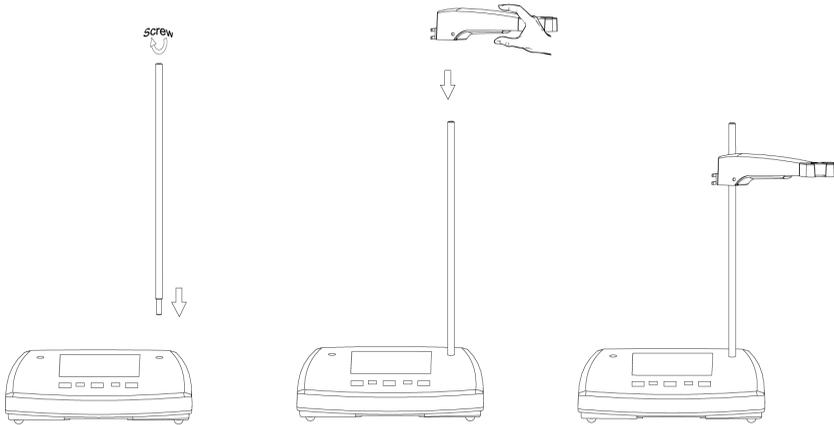
Accessories:

Model	Description	Item NO
ST310	3-in-1 plastic refillable pH Electrode	83033965
ST210	2-in-1 plastic refillable pH Electrode	83033966
ST320	3-in-1 plastic gel pH Electrode(no need to refill)	83033967
ST230	2-in 1 glass muddy sample pH Electrode	83033968
STTEMP30	Temperature Electrode	83033970
STORP1	Gel plastic ORP electrode	30038555
STORP2	Refillable glass ORP electrode	30038553

Buffer powder set (4.01; 7.00; 10.00)	83033971
Buffer pH1.68 250ml	30100424
Buffer pH4.01 250ml	30100425
Buffer pH7.00 250ml	30100427
Buffer pH10.01 250ml	30100429
Electrode arm built-in (2100)	30058732
pH electrode Reference Electrolyte	30059255
pH electrode storage(protection) solution	30059256

## 2.2 Installing the built-in electrode arm

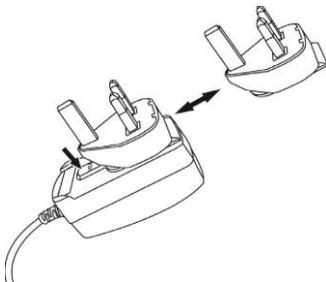
Install the built-in electrode arm on the left or right side of the STARTER 2100 meter.



- Remove the rubber hole cover from the meter
- Insert the metal stick into the hole and screw to fasten it.
- Install the upper electrode arm upon the metal stick from above; adjust it to a desired height.

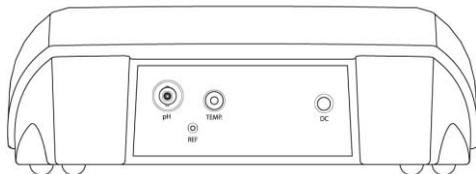
## 2.3 Installing power adapter

Choose the proper adapter clip, insert into the power adapter slot.

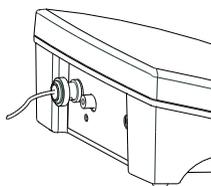
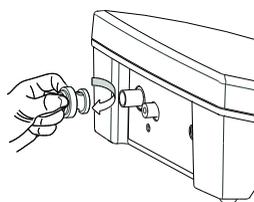


## 2.4 Installing the electrodes

Connect the pH electrode to the meter. There are 3 Socket for pH electrode. The BNC (pH), Cinch (Temp.) and banana (REF) socket.



For ST210, you only need to connect the pH electrode with the pH socket (BNC);



For temperature electrode STTEMP30, connect with Temp. Socket (Cinch).

For pH electrode ST310, connect both the BNC and Cinch socket.

The banana (REF) socket is only for separate Reference Electrode. (e.g. STREF1)

## 2.5 Attached quick guide

Another unique design of the STARTER 2100 is the attached quick guide, the quick guide is attached into the bottom housing of the meter.

### 3 SETUP

#### 3.1 Set MTC temperature

Please note:

If a temperature electrode is used, Automatic Temperature Compensation (**ATC**) and the sample temperature are displayed on the screen. You may then choose to skip MTC setup (below).

If the meter does not detect a temperature electrode or one is not used, the meter automatically switches to Manual Temperature Compensation (**MTC**) mode and **MTC** appears on the screen. MTC can be set as follows:

- Press button-  and the MTC temperature value appears on the display.
- Next use button-  or button-  to increase or decrease the value to the temperature of your sample.
- Press button-  to confirm the setting then return to the measurement screen; or press button-  to reject the setting and return to the measurement screen.

The default MTC temperature value setting is 25 °C (77° F).

**Note:** °C = 5/9 (°F -32)

## 4 STARTER 2100 OPERATION

Standard procedure of pH measurement is as follows:

- Connect pH (and Temperature if necessary) electrode to the meter and rinse
- Prepare buffer
- Calibrate pH electrode
- Prepare sample & measure
- Record measurement results
- Rinse and properly store pH and other electrodes



pH electrode preparation: pH electrode should be rinsed with pure water before and after using.

**CAUTION** Check if the electrode is physically damaged. (Be careful with the glass bulb)

The pH electrode should be stored in the storage bottle.

After the pH electrode is put into the sample or buffer solution, the user should stir several seconds then wait **30 to 60 seconds** for the signal to stabilize, and then press the proper button to operate (calibration or measurement).



**WARNING** Do not operate the equipment in hazardous environments. The equipment is not explosion protected.



**WARNING** When using chemicals and solvents, comply with the instructions of the chemical producer and the general lab safety rules.

### 4.1 Calibration

#### 4.1.1 Buffer group

STARTER 2100 can perform **1** or **2-point** calibrations. **OHAUS recommends conducting a 2 point calibration.**

There is 1 buffer group (the US group) stored in the meter. The US buffer group is (at 25°C):

1.68	4.01	7.00	10.01
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STARTER 2100 automatically corrects for the temperature dependence of the buffer pH values given in the following table.

5 °C	1.67	4.01	7.09	10.25
10 °C	1.67	4.00	7.06	10.18
15 °C	1.67	4.00	7.04	10.12
20 °C	1.68	4.00	7.02	10.06
<b>25 °C</b>	<b>1.68</b>	<b>4.01</b>	<b>7.00</b>	<b>10.01</b>
30 °C	1.68	4.01	6.99	9.97
35 °C	1.69	4.02	6.98	9.93
40 °C	1.69	4.03	6.97	9.89
45 °C	1.70	4.05	6.97	9.86
50 °C	1.71	4.06	6.96	9.83

#### 4.1.2 Performing 1-point calibration

**Calibration:** pH electrodes need to be calibrated with pH standard buffer solutions before a proper pH measurement can be made. **Calibration** is to display the correct **pH** value when the meter receives the **mV** value signal from the pH electrode.

**Slope:** the linear coefficient between mV and pH according to theoretical value (e.g. - 59.16mV/pH @ 25 °C which means 100% slope);

**Offset:** the mV value when pH value is 7.00. (Theoretical value is 0 mV);

- Begin by ensuring the meter is plugged in, the electrode is properly attached and the meter is powered on by pressing .
- Place the pH electrode in the prepared buffer solution, stir for approximately 5 seconds and wait for an additional 30-60 seconds.
- Press button- , “**Cal 1**” displays on the top right of the screen and is blinking. The measurement icon  appears on the top of the screen,  is blinking during calibration.
- When the reading is stable (normally the reading does not change in 5s), press button-  to lock the reading and finish 1 point calibration. The buffer value (e.g. pH 7.00) with the temperature is displayed on the screen; the meter can recognize the buffer automatically (auto buffer recognition).

The 1-point calibration is finished; now we have 3 options:

- ❖ Press button-  to store the 1-point calibration data and exit, the **offset** and the **slope** are shown on the display for 3 seconds then returns to the measurement screen.

- ❖ Press button-  to reject the calibration and return to the measurement screen.
- ❖ Press button-  to do the 2-point calibration.

**Note:** With the 1-point calibration only the **offset** is adjusted. If the pH electrode was previously calibrated with 2-point calibration the previously stored **slope** will remain. Otherwise theoretical **100% slope** (-59.16 mV / pH @25 °C) will be used.

#### 4.1.3 Performing 2-point calibration

- Perform 1-point calibration as described above.
- Rinse the pH electrode with pure water and wipe off water with a tissue.
- Place the electrode in the next calibration buffer stir and wait, then press button- , "Cal 2" displays on the top right of the screen and is blinking.  appears and is blinking during calibration.
- When reading is stable (normally the reading does not change in 5s), press button-  to lock the reading and finish 2-point calibration,  disappears. The buffer pH value (e.g. **4.01 pH**) with the temperature display on the screen.

The 2-point calibration is finished, now we have 2 options:

- ❖ Press button-  to store the 2-point calibration, the **offset** and **slope** are shown on the display for 3 seconds then returns to the measurement screen.
- ❖ Press button-  to reject the calibration and return to the measurement screen.

**Note:** The use of a temperature electrode (e.g. STTEMP30) or a pH electrode with a built-in temperature sensor (3-in-1 pH electrode) is recommended. If you use the **MTC** mode, you should enter the correct temperature value and keep all buffer and sample solutions at the set temperature. (See 3.1)

## 4.2 Sample measurement

### 4.2.1 pH measurement

- Place the electrode in the sample, stir 5 seconds then wait 30-60 seconds.
- Press button-  to start the pH measurement,  appears on the display.  is blinking during measurement.
- When the reading is stable, press button-  to lock the reading,  disappears, the pH value with the temperature is displayed on the screen, you can record the measurement result. If you want to do another measurement, press button- .

### 4.2.2 mV measurement

- Press button-  to switch between **pH measurement mode** and **mV measurement mode**.
- Follow the same procedure as for pH measurement to perform a mV measurement.

## 4.3 Temperature measurement

For better accuracy, we recommend using a temperature electrode or pH electrode with a temperature sensor built in.

- ❖ If a temperature electrode is used, **ATC (Auto Temperature Compensation)** and the sample temperature are displayed.
- ❖ If the meter does not detect a temperature electrode, it automatically switches to the **Manual Temperature Compensation mode** and **MTC** appears. MTC temperature should be set (3.1).

**Note:** STARTER 2100 accepts **NTC 30 k $\Omega$**  temperature sensor.

## 5 MAINTENANCE

### 5.1 Error message

If the measurement out of range, pH: < 0.00 or > 14.00; mV: < -1999 or > 1999; the buffer temperature T[°C] < 5 or > 40, then the meter will display “- - -”.

If meter display “Err”, it means

<b>Err</b>	Self-diagnosis failure	Repeat the self-diagnosis. (See 5.4)
	<b>Or</b> Calibration failure	Calibration failure (slope < 85%, offset > 60mV); you need to use fresh buffer to do calibration again properly; if still not good, need to replace the pH electrode.

For further technical support please contact Ohaus. (US & Canada please call 1-800-672-7722)

### 5.2 Meter maintenance

**Attention:** Never unscrew the two halves of the housing!

The STARTER 2100 series instruments do not require any routine maintenance.

To clean, use a damp cloth.

The housing is made of acrylonitrile butadiene styrene (ABS). This material is susceptible to damage by some organic solvents, such as toluene, xylene and methyl ethyl ketone (MEK). Any spillage should be immediately wiped off.

### 5.3 Electrode maintenance

**Attention:** Make sure the electrode is filled with electrolyte solution. Always store the electrode according to the electrode instruction manuals and do not allow it to dry out.

If the electrode response becomes sluggish or the slope is not good enough, try:

- Soak the electrode in 0.1M HCl for more than 8 hours.
- For fat or oil contaminant, degrease the membrane with cotton wool soaked in either acetone or a soap solution.

After electrode treatment, a new calibration should be performed. If the electrode slope is still not good, the electrode might need to be replaced.

## 5.4 Self-diagnosis

- Press and hold button- and button- simultaneously until the meter display the full screen. Each icon blinks one after the other.

This way you may check whether all icons are correctly shown. The next step is to check that the keys are functioning correctly. This requires user interaction.

When **b** blinks, five icons are displayed.

- Press the five keys in any order. Each time you press a key an icon disappears from the screen, continue to press the other keys until all the icons have disappeared.

When the self-diagnosis has been completed successfully, *PAS* appears, means “pass”. If self-diagnosis fails, error message **Err** appears.

**Note:** You have to finish pressing all five keys within **2 minutes**, otherwise **Err** appears and you will have to repeat the procedure.

## 5.5 Recover factory settings

- When the meter is off, press and hold button- & button- & button- together for 3 seconds, the screen displays *RSF* and blinks, means “Reset”. Then we have 2 choice:
  - ❖ Press button- to reset factory settings (MTC, slope and offset, etc.), display *YES* then restart the meter.
  - ❖ Or press button- to quit the setting, display *NO* then turn off the meter.

## 6 TECHNICAL DATA

### 6.1 Specifications

#### Ambient conditions

- Indoor use only
- Altitude: Up to 2000 m
- Specified Temperature range: 5 °C to 40 °C
- Humidity: maximum relative humidity 80 % for temperatures up to 30 °C decreasing linearly to 50% relative humidity at 40 °C
- Mains supply voltage fluctuations: up to  $\pm 10\%$  of the nominal voltage
- Installation category II
- Pollution degree: 2
- Operability is assured at ambient temperatures between 5 °C to 40 °C

Model	ST2100
Measuring range	0.00...14.00 pH -1999...1999 mV 0 °C...100 °C
Resolution	0.01 pH 1 mV 0.1 °C
Error limits	$\pm 0.01$ pH $\pm 1$ mV $\pm 0.5$ °C
Calibration	1 or 2 points 1 predefined buffer group (4.01, 7.00, 10.01)
Memory	Recall last calibration data
Power supply	AC Adapter Input: 100-240V ~ X.XA 50/60 Hz AC Adapter Output: 12V --- X.XA
Size/weight	220 W x 175 D x 78 H mm / 0.75 kg
Display	Liquid crystal
Input	BNC, impedance > 10e+12 $\Omega$ Cinch, NTC 30 k $\Omega$
Reference input	2mm banana socket
Temperature-compensation	ATC & MTC
Housing	ABS

## 6.2 Compliance



This product conforms to the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EC. The Declaration of Conformity is available online at [europe.ohaus.com/europe/en/home/support/compliance.aspx](http://europe.ohaus.com/europe/en/home/support/compliance.aspx).



In conformance with the European Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements. Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment. If you have any questions, please contact the responsible authority or the distributor from which you purchased this device. Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related. Disposal instructions in Europe are available online at [europe.ohaus.com/europe/en/home/support/weee.aspx](http://europe.ohaus.com/europe/en/home/support/weee.aspx). Thank you for your contribution to environmental protection.

**FCC Note:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### ISO 9001 Registration

In 1994, OHAUS Corporation, USA, was awarded a certificate of registration to ISO 9001 by Bureau Veritas Quality International (BVQI), confirming that the OHAUS quality management system is compliant with the ISO 9001 standards requirements. On June 21, 2012, OHAUS Corporation, USA, was re-registered to the ISO 9001:2008 standard.

## 7 BUFFER GROUPS

You can find **US standard** in 4.1.1, other standards for your reference.

### Buffer group **Europe standard**

Temp °C	pH2.00	pH4.01	pH7.00	pH9.21	pH11.00
5	2.02	4.01	7.09	9.45	11.72
10	2.01	4.00	7.06	9.38	11.54
15	2.00	4.00	7.04	9.32	11.36
20	2.00	4.00	7.02	9.26	11.18
<b>25</b>	<b>2.00</b>	<b>4.01</b>	<b>7.00</b>	<b>9.21</b>	<b>11.00</b>
30	1.99	4.01	6.99	9.16	10.82
35	1.99	4.02	6.98	9.11	10.64
40	1.98	4.03	6.97	9.06	10.46
45	1.98	4.04	6.97	9.03	10.28
50	1.98	4.06	6.97	8.99	10.10

### Buffer group **JJG119**

Temp °C	pH1.68	pH4.00	pH6.86	pH9.18	pH12.46
5	1.67	4.00	6.95	9.39	13.21
10	1.67	4.00	6.92	9.33	13.01
15	1.67	4.00	6.90	9.28	12.82
20	1.68	4.00	6.88	9.23	12.64
<b>25</b>	<b>1.68</b>	<b>4.00</b>	<b>6.86</b>	<b>9.18</b>	<b>12.46</b>
30	1.68	4.01	6.85	9.14	12.29
35	1.69	4.02	6.84	9.11	12.13
40	1.69	4.03	6.84	9.07	11.98
45	1.70	4.04	6.83	9.04	11.83
50	1.71	4.06	6.83	9.02	11.70

### Buffer group **JIS Z 8802**

Temp °C	pH1.68	pH4.01	pH6.86	pH9.18
5	1.67	4.00	6.95	9.40
10	1.67	4.00	6.92	9.33
15	1.67	4.00	6.90	9.28
20	1.68	4.00	6.88	9.23
<b>25</b>	<b>1.68</b>	<b>4.01</b>	<b>6.86</b>	<b>9.18</b>
30	1.68	4.02	6.85	9.14
35	1.69	4.02	6.84	9.10
40	1.69	4.04	6.84	9.07
45	1.70	4.05	6.83	9.04
50	1.70	4.06	6.83	9.01

**LIMITED WARRANTY**

Ohaus products are warranted against defects in materials and workmanship from the date of delivery through the duration of the warranty period. During the warranty period Ohaus will repair, or, at its option, replace any component(s) that proves to be defective at no charge, provided that the product is returned, freight prepaid, to Ohaus.

This warranty does not apply if the product has been damaged by accident or misuse, exposed to radioactive or corrosive materials, has foreign material penetrating to the inside of the product, or as a result of service or modification by other than Ohaus. In lieu of a properly returned warranty registration card, the warranty period shall begin on the date of shipment to the authorized dealer. No other express or implied warranty is given by Ohaus Corporation. Ohaus Corporation shall not be liable for any consequential damages.

As warranty legislation differs from state to state and country to country, please contact Ohaus or your local Ohaus dealer for further details.





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