

OPERATOR'S MANUAL

PH 7615 - MV 7615  
DIGITAL pH CONTROLLERS  
DIGITAL mV CONTROLLERS

Rev. B – Valid from S/N 50066  
pH Scale: 0.00/14.00 pH  
ORP Scale: 0/1000 mV  
Power Supply: 110/220 Vac

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## 1 GENERAL

This manual applies to the PH 7615 and the MV 7615 digital controllers 1/4 DIN housing. It explains the purpose of the equipment, describes the components of the chain and the procedures for installing the equipment, operating it and calibrating it. Some suggestions are also given for its maintenance.

## 2 FUNCTIONAL DESCRIPTION

This system provides a digital readout of the pH or the ORP of aqueous solutions.

RTD automatic Temperature compensation is employed to provide highly accurate pH measurements over the entire ranges of pH and Temperature.

A basic pH/mV monitoring system consists of two elements: a monitor unit, and a probe or electrode.

The system can be expanded by adding accessories for field applications: recorders, secondary regulators, proportional regulators and Temperature probes.

The controller contains electronic circuits to control the operation of the entire system. It provides a digital readout of pH or ORP on a digital display.

There is included an internal circuit for controlling two alarms, valves, pumps etc.

Set-points are independent and programmed by a front-panel control to trigger at any level within the range of the meter.

Red Led 6's on the panel indicate if the measured value is below the set point A level, or if it is above the set point B level. Red Leds also indicate the switching of corresponding relays.

The controller provides an output of 0/20 mA (on request 4/20 mA, 0/10 V or others) proportional to the meter reading, for driving a recorder, remote readout or regulators having a non-grounded input.

Zero is adjusted by trimmer 3 and slope by trimmer 4 on the front panel.

### 3 PHYSICAL DESCRIPTION

The panel mounting instrument's enclosure is designed according to the DIN 43700 standards and it consists of a plastic case with metallic front panel coated with a polycarbonate membrane.

A transparent splash proof front door SZ 7601 can be added to the housing, in order to protect the unit from excessive moisture or corrosive fumes.

However a mounting in a splash proof board is suggested for field applications.

The connections to the unit are made by means of two extractable terminal blocks on the rear side of the instrument.

The package is supplied complete with fixing clamps for panel mounting.

The figure shows the physical details, dimensions and drill plan of this case.

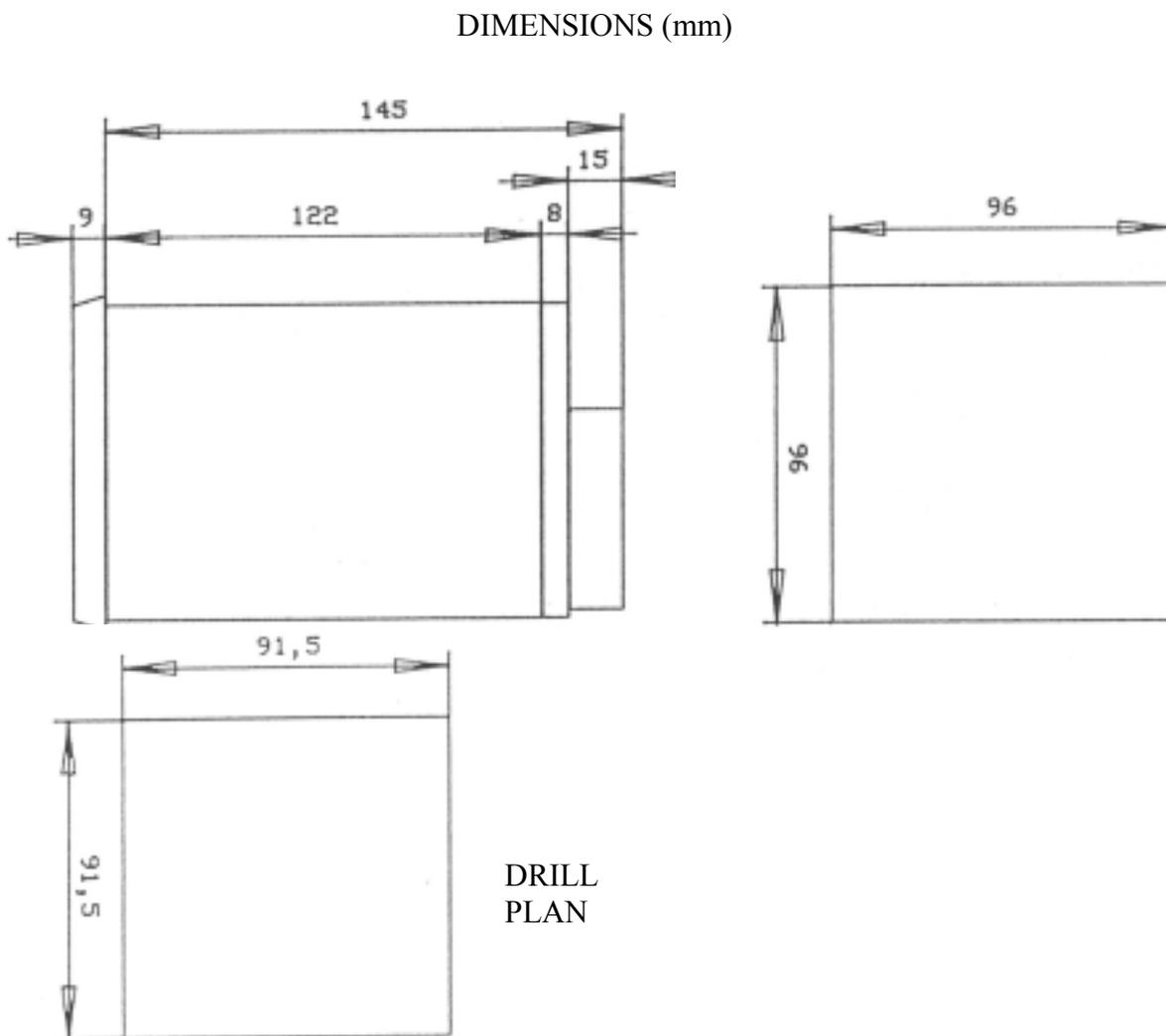


Fig. 1

### 3.1 PH 7615 SPECIFICATIONS

Input:	from pH electrode and RTD Pt100
Output:	0/20 mA dc, non isolated, 300 $\Omega$ max. others on request
Scale:	0.00/14.00 pH
Zero:	adjustment +/- 15%
Slope:	adjustment +/- 20%
Input current:	< 2 pA
R input:	> 10 <sup>12</sup> $\Omega$
Temperature:	0/50 °C
Humidity:	95 % without condensate
Regulators:	+/- 0.25 % hysteresis (others as requested)
Switching time:	< 0.5 s
Relay contacts:	5 A 220 V resistive load
Voltage:	110/220 Vac +/-10 % 50/60 Hz
Power:	3 VA max
Fuse:	80 mA T internal
Weight:	500 g
Size:	96 x 96 x 150 mm (1/4 DIN housing)
Option 091.311:	output 4/20 mA
Option 091.362:	isolated output
Option 091.203:	0/5 s delay and relay switching inversion

### 3.2 MV 7615 SPECIFICATIONS

Input:	from ORP electrode
Output:	0/20 mA dc, non isolated, 300 $\Omega$ max. others on request
Scale:	0/1999 mV
Regulators scale:	0/1000 mV
Zero:	adjustment +/- 15%
Slope:	adjustment +/- 20%
Input Current:	< 2 pA
R input:	> 10 <sup>12</sup> $\Omega$
Regulators:	+/- 0.25 % hysteresis (others as requested)
Switching Time:	< 0.5 s
Relay contacts:	5 A 220 V resistive load
Temperature:	0/50 °C
Humidity:	95 % without condensate
Voltage:	110/220 Vac +/-10 % 50/60 Hz
Power:	3 VA max
Fuse:	80 mA T internal
Weight:	500 g
Size:	96 x 96 x 150 mm (1/4 DIN housing)
Option 091.311:	output 4/20 mA
Option 091.362:	isolated output
Option 091.203:	0/5 s delay and relay switching inversion

## 4 PHYSICAL INSTALLATION

The controller may be installed close to the points being monitored, or it may be located some distance away in a control area.

For a distance between sensor (electrode/probe) and controller greater than electrodes cable an extension cable is suggested by means of a waterproof box.

The enclosure is designed for panel-mounting. It should be mounted on a rigid panel, in a position protected from the possibility of damage or excessive moisture or corrosive fumes.

The B&C Electronics immersion probes have a PVC ring to adjust the depth of the electrode into the liquid to be tested.

Probes may be fastened by hangers with 36 mm. hole.

The coax cable must be protected by a sheath and not installed near power cables. Interrupting cables must be avoided or carried out using high insulation terminals.

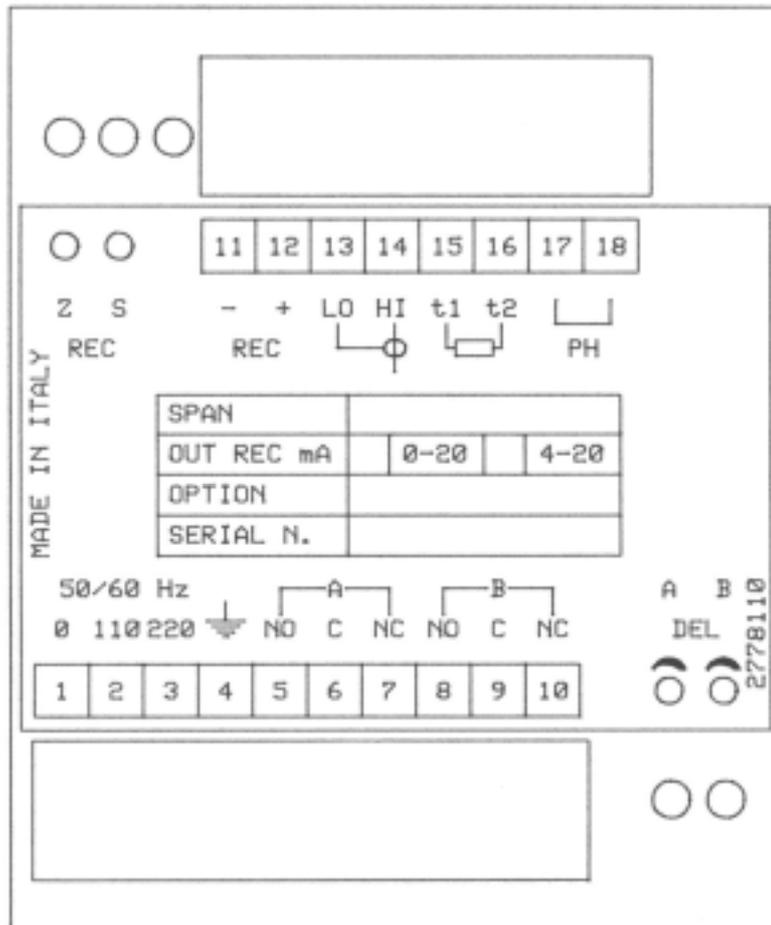
When installing "in line" electrodes it is suggested to follow the specific instructions given by the sensor's manufacturer.

## 5 ELECTRICAL INSTALLATION

The electrical installation consists of:

- connecting the power supply to the meter
- connecting the electrode or the probe to the meter
- connecting alarms, pumps, valves if necessary
- connecting the monitor output to the recorder or similar devices if required
- connecting other optional accessories  
(RTD P.I.D. regulators)

All connections within the controller are made on detachable terminal block located on the rear side.



- 1.2 110 V POWER SUPPLY
- 1.3 220 V POWER SUPPLY
- 4. GROUND (power)
- 5.6 A RELAY N.O. CONTACTS
- 6.7 A RELAY N.C. CONTACTS
- 8.9 B RELAY N.O. CONTACTS
- 9.10 B RELAY N.C. CONTACTS
- DEL A TRIMMER FOR DELAYING A RELAY
- DEL B TRIMMER FOR DELAYING B RELAY
- Z REC OUTPUT ZERO CALIBRATION
- S REC OUTPUT SENS. CALIBRATION
- 11. OUTPUT FOR RECORDER (-)
- 12. OUTPUT FOR RECORDER (+)
- 13. LO INPUT (refer.)
- 14. HI INPUT (glass)
- 15.16 INPUT THERMOCOMPENSATION
- 17.18 OPT

Fig. 2

## 5.1 CONNECTING THE POWER

- connect ground to terminal 4
- connect ac power to 1 and 2 terminals if voltage is 110V
- connect ac power to 1 and 3 terminals if voltage is 220V

## WARNINGS

- power the device by means of an isolation transformer
- avoid mains voltage from an auto-transformer
- avoid mains voltage from a branch point with heavy inductive loads
- separate power supply wires from signal ones
- control the mains voltage value

## 5.2 CONNECTING THE ELECTRODE (PROBE)

Electrode cabling is a critical part of the whole system.

- use a low noise coax cable on overall length between sensor and input terminals of the meter
- low noise cable has, in general, a black conductive sheath interposed between the central and the shield. Be sure this sheath has been removed
- avoid interruption on the cable if a coax connector and a high insulation terminal block are not available
- as a rule the shield of the coax cable is connected to the reference electrode and fastened to the terminal 13 "low".  
The central shielded wire is connected to the glass or metal electrode and fastened to the terminal 14 "high". (see connections diagram).  
In glass/metal electrode applications the glass electrode must be connected to the high impedance terminal 14.
- keep the cable away from power wires on the overall length

## 5.3 CONNECTING ALARMS, PUMPS, VALVES

The output connections are made at terminal block and they consist of two independent relay contacts corresponding to Regulator "A" and Regulator "B".

Regulator "A"

terminal 6 marked C : common contact  
terminal 5 marked NO : normal open contact  
terminal 7 marked NC : normal closed contact

Regulator "B"

terminal 9 marked C : common contact  
terminal 8 marked NO : normal open contact  
terminal 10 marked NC : normal closed contact

To provide an ac-line voltage at the relay commons, connect the ac power phase to the terminal 6 or 9 marked C of the concerned relay.

Connect one side of an external line-operated device to the terminal NO/NC according to the requirements of the device, and connect the other side of the device to the ac power neutral wire.

## **ATTENTION**

Install a fuse in order to protect the relay contacts.

The device must be powered by an external independent line following the above procedure.

## 5.4 CONNECTING A RECORDER

A current output for a remote recorder or P.I.D. regulator is available on terminals 11-12.

Connect the recorder high to terminal "12" and connect the recorder low to terminal "11".

A series connection is required for driving more loads having a total input resistance lower than 300  $\Omega$ . Output drives ground-isolated loads only, unless the isolated output option is installed into the controller.

## 5.5 CONNECTING THE RTD

The model PH 7615 has the automatic temperature compensation carried out by means of an RTD Pt100.

The temperature sensor has to be installed in the same solution being measured, close to the electrode in the pipe-line or in the tank.

## **ATTENTION**

Before connecting RTD Pt100 between the terminals 15-16 as per diagram (to put in the automatic temperature compensation), it's necessary to take away the resistance from the same terminals in order to avoid errors in the measurement.

Reconnect this resistance when a non-compensated operation is necessary.

## 5.6 CHECKING

Before connecting the system to the power supply:

- check that terminal 4 is connected to ground
- check that all connections are right
- check that all cables are properly fastened to prevent strain on the connections
- check that all terminal-strip connections are mechanically and electrically sound
- check that the fuse value is right

## 6 OPERATING THE SYSTEM

### 6.1 PRE-OPERATION CHECK

The system's controls and indicators are all located on the front panel. (See Fig. 3)).

The meter has a digital display 1 that indicates that the unit is on.

Push button 5 and rotate, with a small screwdriver, the corresponding trimmer 7.

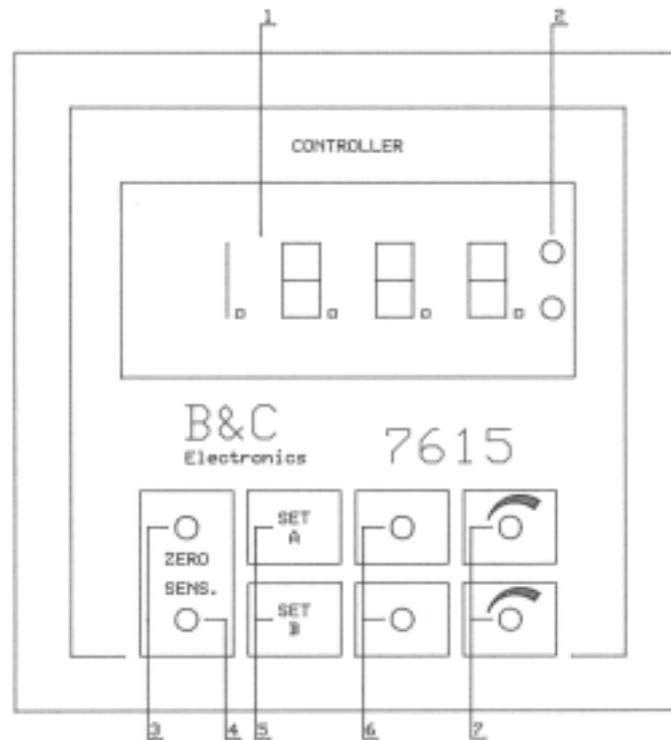
The display will show the set point value.

The regulators have a set-point check by red LED 6's which are part of the circuitry that powers the relay.

When the monitored value is below the set-point value, the LED of Reg A is alight and the corresponding relay is activated.

When the monitored value is above the set-point value, the LED of Reg B is alight and the corresponding relay is activated.

Check the correct switching of the relays by rotating the set point control higher or lower than the value simulated, watching the LED 6's.



1. DISPLAY
2. SCALE SELECTOR INDICATOR
3. ZERO CALIBRATION
4. SLOPE CALIBRATION
5. SET POINT VISUALIZATION
6. SWITCHED RELAY LIGHT
7. SET POINT CONTROL

Fig. 3

The circuit boards of the controllers are adjusted at the factory.

If sensors and probes have been connected correctly, as described in the above sections, the system should function correctly needing only the zero calibration to compensate the reference voltage of the pH electrode.

## **WARNING**

**Faults due to bad connections while connecting are not covered by the guarantee.**

### 6.2 ELECTRIC CALIBRATION

The following procedures can be used to verify that the system is operating satisfactorily, and it can be repeated periodically to check that the meter is remaining in calibration:

- connect a pH/mV simulator to terminals 13-14 of the controller
- simulate pH/mV values over the entire scale of the meter
- adjust "zero" and "slope" by trimmers 3 and 4 on the front panel
- check the input insulation following the right instructions of the simulator. Input current must be lower than 2 pA.

### 6.3 CALIBRATING THE PHMETER

The pHmeters manufactured by B&C Electronics are supplied with a laboratory calibration corresponding to a standard pH electrode having the "zero point" pH = 7, and the slope of 20 degrees Celsius.

Before using the electrode and/or the pH calibration, check that the glass membrane has been stored wet.

If the protective boot is empty and the electrode is dry, immerse the electrode in a buffer solution or tap water (do not use distilled water) for three hours before operating.

See general instructions given by the electrode manufacturer.

Buffer solutions pH = 4-7-9 are available to calibrate the meter.

Immerse the electrode in the buffer solution pH = 7 and adjust the trimmer 3 marked "zero".

Immerse the electrode in the buffer solution pH = 4 or pH = 9 and adjust trimmer 4 marked "sens".

Temperature compensated operations need a special procedure when calibrating the meter:

- the pH value has to be considered at the working temperature of the buffer solution
- before calibrating, immerse the electrode and the RTD Pt100 in the buffer solution and adjust the trimmers after the temperature sensor has reached the thermal equilibrium. Check the calibration periodically.

## 7 OPERATION

To operate the system it's necessary to feed the meter and observe the measured pH or ORP of the solution on it.

Adjust the set-point control A and the set-point control B to the setting required for each particular application.

## 8 PREVENTIVE MAINTENANCE

### 8.1 CONTROLLER

Quality components are used to give the controller a high reliability.

The frequency of such maintenance depends on the nature of each particular application.

As in any electronic equipment, the mechanical components, such as switches, relays, potentiometers and connectors, are the most subject to damage.

- check for damage of the electrolytic capacitors if the meter is exposed to temperatures above 60° C.
- check for damage in all the electronic components if the meter is subjected to excessive voltage
- check for damage of the electronic and mechanical components if the meter is dropped
- repeat the pre-operation check periodically
- check that all the connections are free from moisture and contamination

### **WARNING**

**Disconnect the power supply to the monitor before performing the following procedures:**

- Use moisture free air and blow out the interior of the case and terminal board connections as necessary.
- Inspect the printed circuit boards for dirt and corrosion; clean as necessary and blow dry.
- Tighten all the terminal-board connections and mounting hardware.
- Replace the front panel circuit board or the base circuit board.

### 8.2 SENSOR

The state of the electrode's surface is critical for the normal operation of the system and should be inspected more frequently when using alkaline liquids, oil and grease containing water, and bio-applications.

Suggested methods for cleaning the electrode include chemical cleaning (except hydrofluoric acid) and detergent washing (see the chemical auto clean system B&C Electronics). Either brush or ultrasonic methods may be used.

## 9 TROUBLESHOOTING GUIDE

<b>Symptoms</b>	<b>Probable cause</b>	<b>Remedy</b>
Neither LED lit nor meter reading	line not connected incorrect power wiring fuse interrupted	check power check wiring replace fuse
No meter reading, but LEDS light	I.C. failure inside connector	replace I.C. driver replace circ. board
Meter reading too high/low	electrode failure; meter uncalibrated	clean electrode calibrate with buffers
meter reading does not change	electrode damage; short circuit	electrode replacement check cable
Alarm circuit does not operate, meter reading OK	relay contacts; circuit failure	check wiring/loads replace base c.board return to factory
Slope not sufficient	electrode damage; temp. compensation	electrode replacement check jumper or RTD
Recorder does not operate	recorder not connected output circuits damaged	check wiring replace base c.board

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