Badger Meter

Industrial Process Controller

Model PC200

User Manual

CONTENTS

SCOPE OF THIS MANUAL

This manual is divided into two main sections:

- The daily use of the unit is described in *"Operation" on page 17*. These instructions are meant for users.

- The remaining chapters provide a detailed description of all software settings and hardware installation guidance. These instructions and are meant exclusively for electricians/technicians.

This manual describes the standard unit as well as most of the options available. For additional information, please contact your supplier.

IMPORTANT

Read this manual carefully before attempting any installation or operation.
Keep the manual in an accessible location for future reference.

UNPACKING THE PC200

NOTE: If damage to the shipping container is obvious, request that the carrier be present when the product is unpacked. All claims for equipment damage during transit are the sole responsibility of the recipient.

After carefully unpacking the unit, check for any visible sign of damage. If found, notify the carrier for insurance purposes and call the factory for possible replacement. Keep all packing material in the event that the unit must be returned to the factory.

NOTE: Operating temperature is 32…130° F (0…55° C) with a maximum humidity of 85% non-condensing. Always select a mounting location with proper ventilation and environmental protection.

SAFETY CONSIDERATIONS

Safety Terminology and Symbols

⚠ DANGER   Indicates a hazardous situation, which, if not avoided, will result in death or serious personal injury.

⚠ WARNING   Indicates a hazardous situation, which, if not avoided, could result in death or serious personal injury.

⚠CAUTION   Indicates a hazardous situation, which, if not avoided, could result in minor or moderate personal injury or damage to property.

Safety Instructions

⚠ WARNING

- *LIFE SUPPORT APPLICATIONS: THE PC200 IS NOT DESIGNED FOR USE IN LIFE SUPPORT APPLIANCES, DEVICES, OR SYSTEMS WHERE MALFUNCTION OF THE PRODUCT CAN REASONABLY BE EXPECTED TO RESULT IN A PERSONAL INJURY. CUSTOMERS USING OR SELLING THESE PRODUCTS FOR USE IN SUCH APPLICATIONS DO SO AT THEIR OWN RISK AND AGREE TO FULLY INDEMNIFY THE MANUFACTURER AND SUPPLIER FOR ANY DAMAGES RESULTING FROM SUCH IMPROPER USE OR SALE.*

- *ELECTROSTATIC DISCHARGE INFLICTS IRREPARABLE DAMAGE TO ELECTRONICS! BEFORE INSTALLING OR OPENING THE UNIT, INSTALLERS MUST DISCHARGE THEMSELVES BY TOUCHING A WELL-GROUNDED OBJECT.*

- *THIS UNIT MUST BE INSTALLED IN ACCORDANCE WITH THE EMC (ELECTROMAGNETIC COMPATIBILITY) GUIDELINES.*

- *CONNECT A PROPER GROUNDING TO THE ALUMINUM CASING AS INDICATED.*

Disposal

Dispose of this product according to local regulations regarding waste electronic equipment. The separate collection and recycling of your waste equipment will help to conserve natural resources and ensure that it is recycled in a manner that protects the environment.

Safety Rules and Precautionary Measures

The manufacturer accepts no responsibility whatsoever if the following safety rules and precaution instructions and the procedures as described in this manual are not followed.

- Modifications of the PC200 implemented without preceding written consent from the manufacturer will result in the immediate termination of product liability and warranty period.

- Installation, use, maintenance, and servicing of this equipment must be carried out by authorized technicians.

- Check the mains voltage and information on the manufacturer's plate before installing the unit.

- Check all connections, settings and technical specifications of the various peripheral devices with the PC200 supplied.

- Open the casing only if all leads are free of potential.

- Never touch the electronic components (ESD sensitivity).

- Never expose the system to heavier conditions than allowed according to the casing classification (see manufacturer's plate and *"Installation Conditions" on page 9*).

- If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.

- Adhere to the local labor and safety laws and regulations.

PC200 BATCH CONTROLLER DESCRIPTION

Functions and Features

The batch controller model PC200 is a microprocessor-driven instrument designed for batching and filling both small and large quantities, as well as displaying total, accumulated total and flow rate.

This product is designed with a focus on:

- Ease-of-use with the numerical keyboard.
- Ruggedness for its application with a robust enclosure, keyboard and proper mechanical relays.
- Clear operator information: all relevant data can be monitored in one glance.
- User-friendly installation with quality plug-and-play terminals; suitable for both AC and DC applications (standard).
- A wide range of inputs, outputs and functions for a broad fulfillment in many applications.

Flow Meter Input

One flow meter: a passive or active pulse signal output can be connected to the PC200. The input circuit supports low and high frequency flow meters. A power supply is available to power the sensor with 8 / 12 or 24V DC.

Control Inputs

The PC200 has six control inputs:

- Start
- Hold
- Resume
- Reset totalizer
- Reset cycle counter
- Lockout the entire keyboard

Control Outputs

The PC200 has five control outputs—two mechanical relay outputs and three transistor outputs. The two mechanical relay outputs (make and break) are used for batching with two-stage control or one-stage control. Three transistor outputs are for connection to PLCs or other controlling equipment. The function of relay R2 and the transistor outputs can be configured to:

- Batching
- Two-stage control
- High flow rate alarm
- Low flow rate alarm
- No-flow alarm
- Any alarm
- Scaled pulse output
- Pre-warn or end of batch signal

Power Supply

AC power supply: as standard, the PC200 will operate on 110…230V AC.

DC power supply: as standard, the PC200 can also operate on 24V DC.

Configuration of the Unit

The PC200 is designed for many types of applications. Use the SETUP level to configure your PC200 to your specific requirements. For details, see *"Configuration" on page 21* and *"Record of Configuration Settings" on page 33.*

The SETUP level includes several important features, such as K-factors, measurement units and selection of the control outputs. All settings are stored in EEPROM memory and will not be lost in the event of power failure.

Display Information

The PC200 has a large transflective LCD with a bright LED backlight and displays symbols and digits for measuring units, status information and keyword messages.

All *total*, *accumulated total* and *batch counter* information is stored in EEPROM memory and will not be lost in the event of power failure.

INSTALLATION

⚠CAUTION

- *MOUNTING, ELECTRICAL INSTALLATION, STARTUP AND MAINTENANCE OF THIS INSTRUMENT MAY ONLY BE CARRIED OUT BY TRAINED PERSONNEL AUTHORIZED BY THE OPERATOR OF THE FACILITY. PERSONNEL MUST READ AND UNDERSTAND THIS OPERATING MANUAL BEFORE CARRYING OUT ITS INSTRUCTIONS.*

- *THE PC200 MAY ONLY BE OPERATED BY PERSONNEL WHO ARE AUTHORIZED AND TRAINED BY THE OPERATOR OF THE FACILITY. OBSERVE ALL INSTRUCTIONS IN THIS MANUAL.*

- *ENSURE THAT THE MEASURING SYSTEM IS CORRECTLY WIRED ACCORDING TO THE WIRING DIAGRAMS. PROTECTION AGAINST ACCIDENTAL CONTACT IS NO LONGER ASSURED WHEN THE HOUSING COVER IS REMOVED OR THE PANEL CABINET HAS BEEN OPENED (DANGER FROM ELECTRICAL SHOCK). THE HOUSING MAY ONLY BE OPENED BY TRAINED PERSONNEL.*

- *OBEY ALL SAFETY PRECAUTIONS MENTIONED IN "Safety Considerations" on page 5.*

Installation Conditions
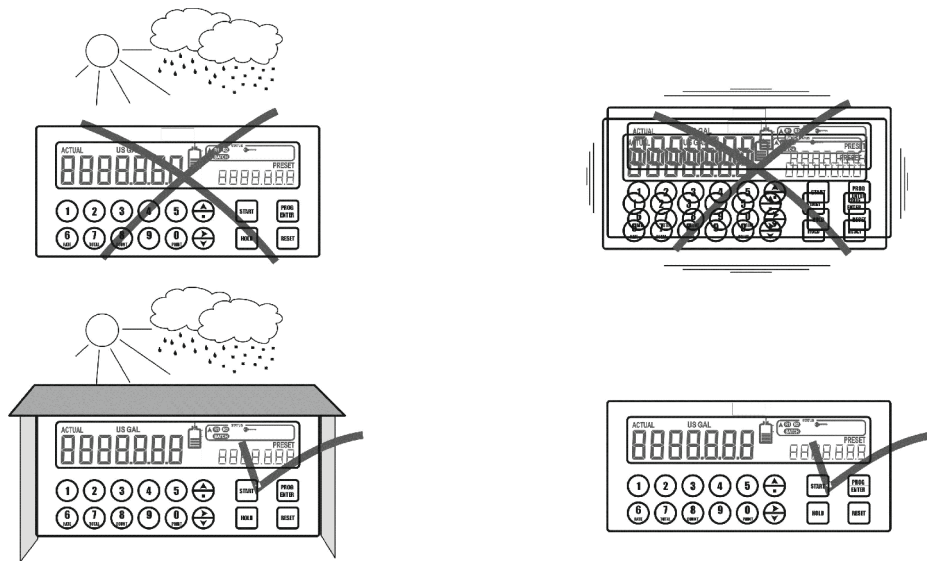
Figure 1: Acceptable installation conditions

Consider the IP classification of the casing (see the manufacturer's plate) when selecting a location for the PC200. An IP65 (NEMA 4X) casing should NEVER be exposed to weather conditions.

When used in very cold surroundings or varying climatic conditions, take the necessary precautions against moisture by placing a dry sachet of silica gel, or similar material, inside the instrument case.

Mounting the PC200

Mount the PC200 on a solid structure to avoid vibrations. The basic unit is equipped for panel mount. To install:

1. Measure and cut the mounting hole to the dimensions shown in *Figure 2 on page 10*.
2. Install the gasket around the mounting bezel.
3. Insert the unit through the front panel cutout.
4. Secure the unit to the panel with the mounting clips.

Figure 2: Enclosure dimensions
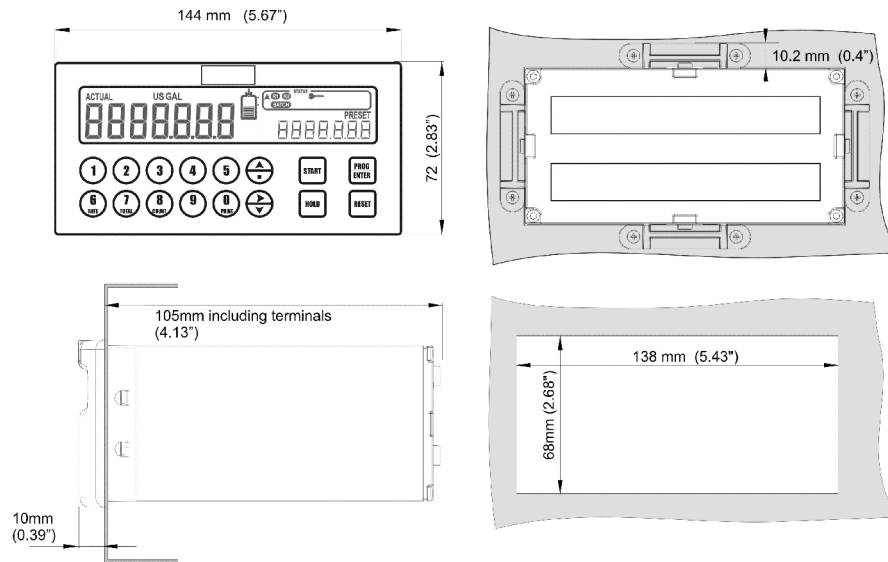

Figure 3: Grounding location, top view

IMPORTANT

Installations must have a reliable ground connection for the sensor and the metal casing.
Installations must have an effective screened cable for the input signal and grounding of its screen to the ground terminal or at the sensor itself, whichever is appropriate to the application.

Figure 4: Grounding location, bottom view

WIRING THE PC200

At installation, be sure to comply with the following requirements:

- Disconnect power to the unit before attempting any connection or service to the unit.
- Avoid using machine power service for AC power. When possible, use a dedicated or lighting circuit.
- Do not bundle or route signal lines with power lines.
- Keep all lines as short as possible.
- Use shielded wire for all input wiring.
- Observe all local electrical codes.

⚠CAUTION

TO PREVENT ACCIDENTS, POWER SHOULD NOT BE APPLIED UNTIL ALL OTHER CONNECTIONS HAVE BEEN COMPLETED.

Voltage Selection Sensor Supply

Sensor supply
8.2…12 or 24V DC

A power supply for the sensor is available. The flow meter can be powered with 8.2, 12 or 24V DC.

Total power consumption
Max. 50 mA @ 24V

The voltage is selected with the two switches at the rear of the enclosure.
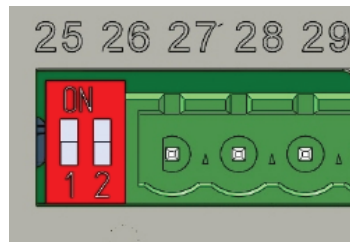
Figure 5: Switch setting sensor supply voltage

Switch positions

Voltage Selection		
Switch 1	**Switch 2**	**Voltage**
on	on	24V DC
on	off	8.2V DC
off	off	12V DC

Table 1: Switch positions

Terminal Connectors
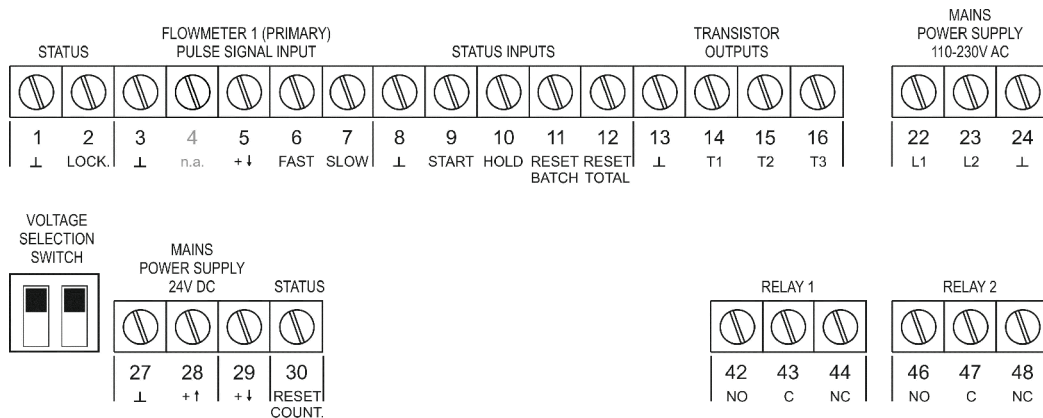
Figure 6: Overview of terminal connectors

Terminal #01-02; lock keyboard:

Use the LOCK KEYBOARD function to connect a lock or jumper in order to disable the complete keyboard while the functions from the terminals remain available. Certain keys on the keyboard can be locked-out with SETUP 85 or passcode-protected with SETUP 84. Terminal #11 can block the batch process.

Terminal #03-07; flow meter input:

- A high or low frequency NPN signal can be connected to the PC200. For low frequency sensors like a reed switch, a low pass filter on terminal #07 eliminates contact bounce. For higher frequencies, use terminal #06.

- Use terminal #05 for a 12V DC sensor supply. Use terminal #29 for 8.1, 12 or 24V DC.

- The screen of the signal wire must be connected to the common ground terminal #03 (unless earthed at the sensor itself). Terminal #04 is not used.

- Active signals switching between 0…8V DC, 0…12V DC or 0…24V DC can be connected as well.
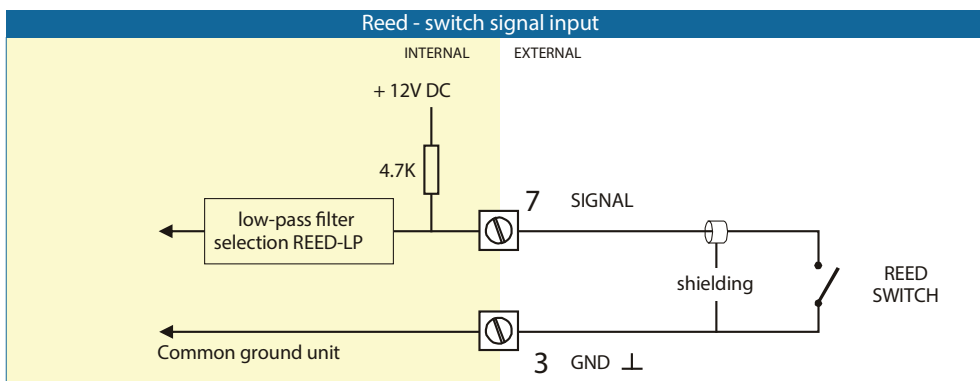
Figure 7: Reed switch signal input
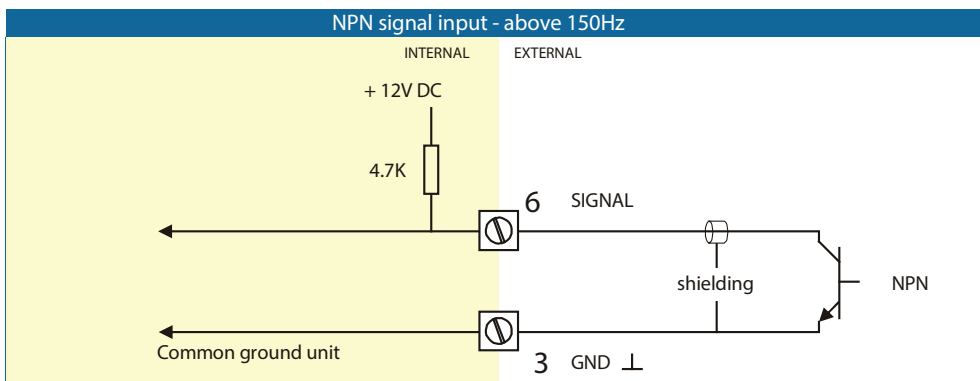
Figure 8: NPN signal input
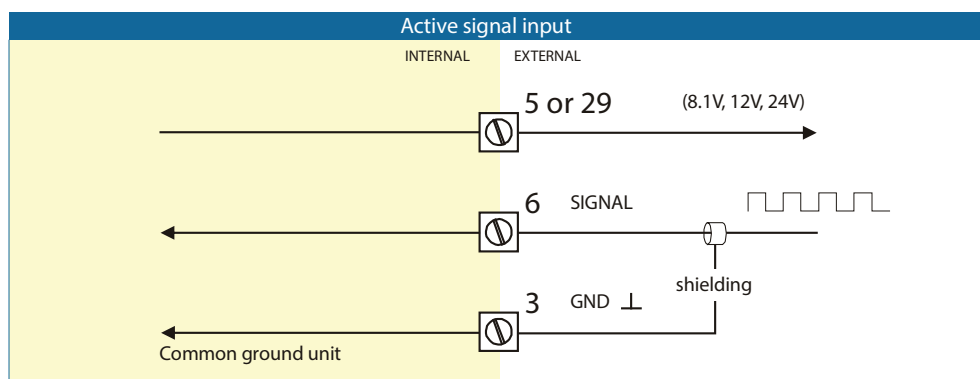
Figure 9: Active signal input

Terminal #08-09; External control start:

Use the EXTERNAL CONTROL START function to remotely start the batch controller. The input must be switched with a potential-free contact to the GND terminal number #08 for at least 100 msec.
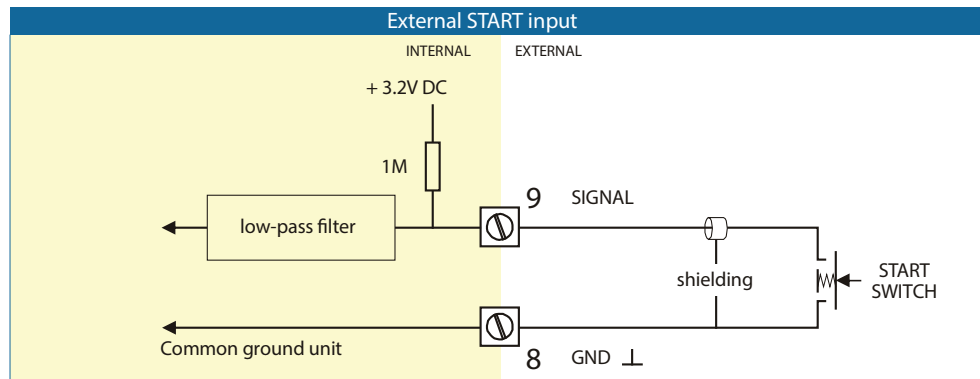
Figure 10: External start input

Terminal #08-10; External control hold:

Use the EXTERNAL CONTROL HOLD function to interrupt the batch process and bring it to HOLD status. The input must be switched with a potential-free contact to the GND terminal #08 for at least 100 msec.
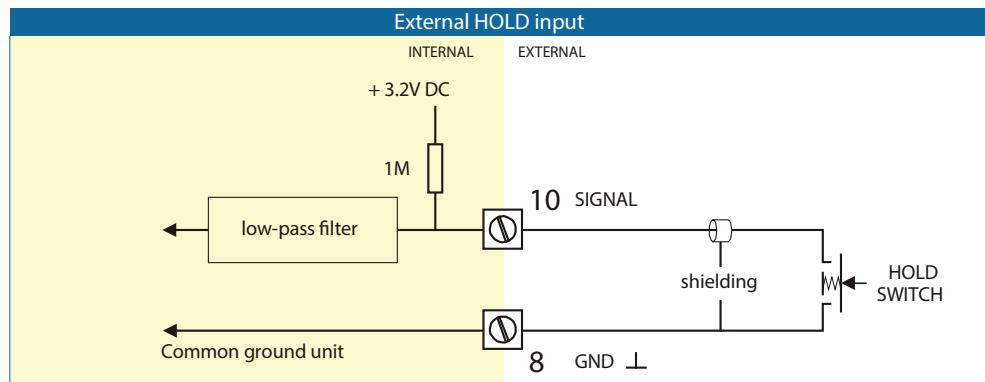
Figure 11: External hold input

Terminal #08-11; External control reset batch:

Use the EXTERNAL CONTROL RESET BATCH function to remotely clear the batch process in HOLD status. The input must be switched with a potential-free contact to the GND terminal #08 for at least 100 msec.

You can also use terminal #11 to block the batch process: as long as this input is switched to terminal 8, it is not possible to start a batch (the START button on the keyboard is blocked as well).
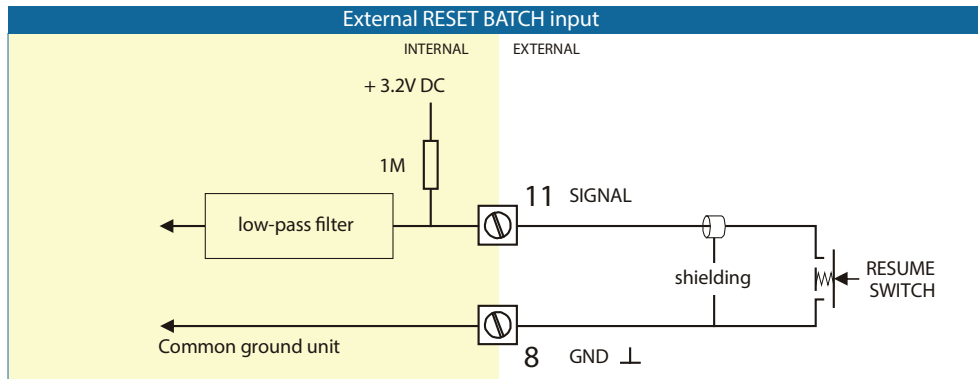
Figure 12: External reset batch input

Terminal #08-12; Reset totalizer:

Use the RESET TOTALIZER function for end-of-shift coordination and control. You can reset the inventory totalizer to zero. The input must be switched with a potential-free contact to the GND terminal #08 for at least 100 msec.

You can also use terminal #12 to block the RESET function from the keyboard: as long as this input is switched to terminal #08, it is not possible to clear the actual totalizer. You must release the input to clear the total.
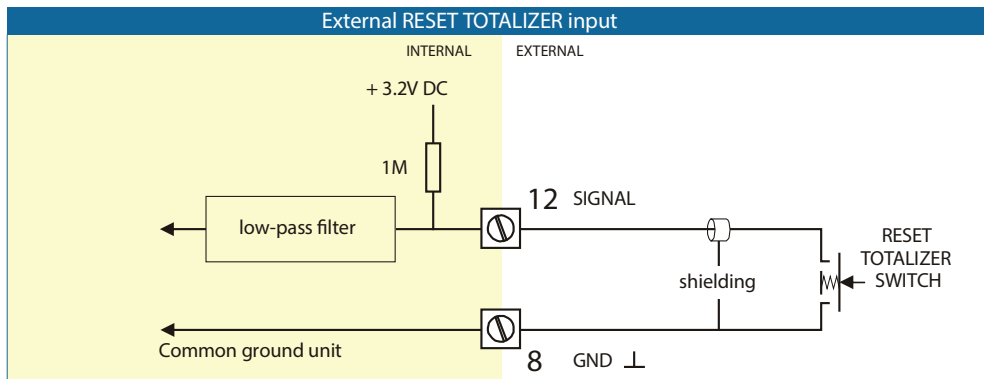
Figure 13: External reset totalizer input

Terminal #13-16; Transistor outputs T1, T2 and T3:

The function of these TRANSISTOR OUTPUTS is determined by SETUP functions 72-79.

The maximum driving capacity is 300 mA @ 50V DC per transistor.
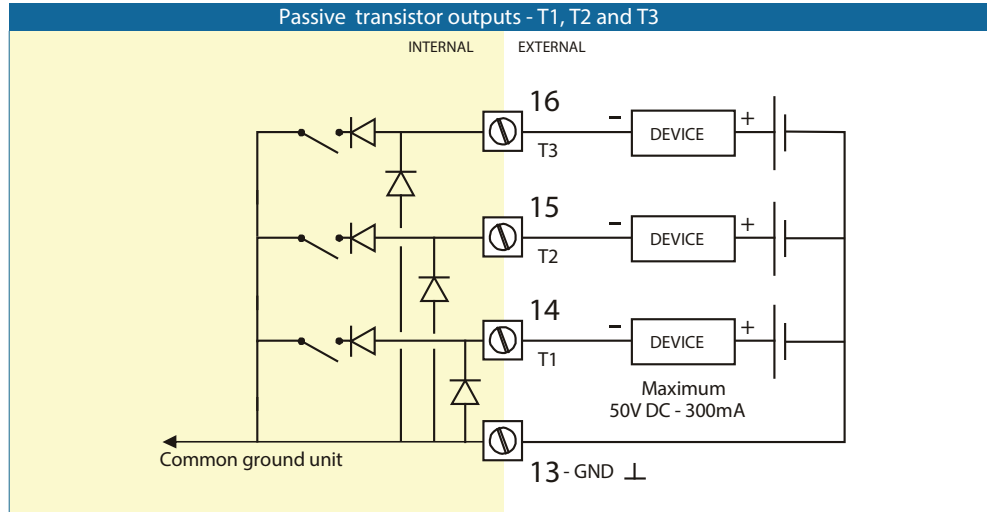
Figure 14: Passive transistor outputs T1, T2 and T3

Terminal #22-24; 80…230V AC power supply:

Connect AC power only after all other wiring has been completed.

The PC200 has an internally mounted line filter and fuse for surge protection. The unit is designed to operate with 85…265V AC power or DC voltages (see terminal #27-28).

Always make sure to connect terminal #24 to the electrical system ground.

Terminal #27-28; 24V DC power supply:

Use these terminals ONLY for DC-operated applications. The supply must be a 24V DC +10%.

For AC applications, use terminals 22-24.

Terminal #30; Reset cycle counter:

Use the RESET CYCLE COUNTER function for end-of-shift coordination and control. The inventory cycle counter can be reset to zero. The input must be switched with a potential-free contact to the GND terminal #01 or #08 for at least 100 msec.

You can also use terminal #30 to block the RESET function from the keyboard: as long as this input is switched to terminal #1 or #08, it is not possible to clear the actual counter. You must first release the input to clear the COUNT value.
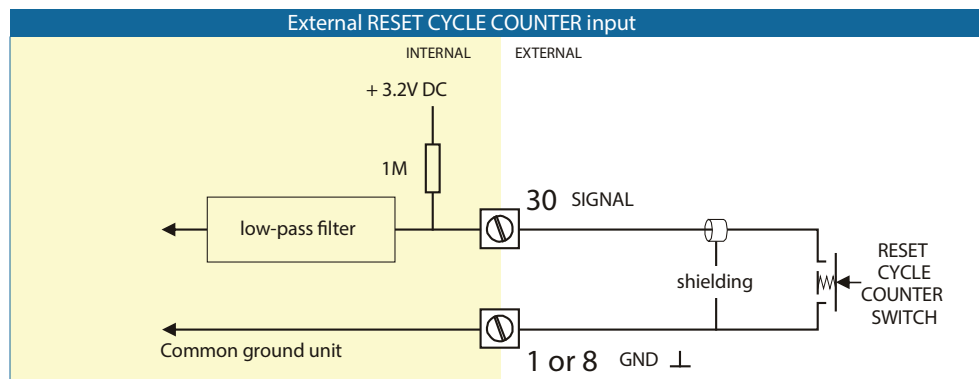
Figure 15: External reset cycle counter input

Terminal #42-44; control output R1:

Use the mechanical relay CONTROL OUTPUT R1 to control the batch process. Relay 1 is switched ON during the whole batch process. The maximum switch power is 240V-3A per output.
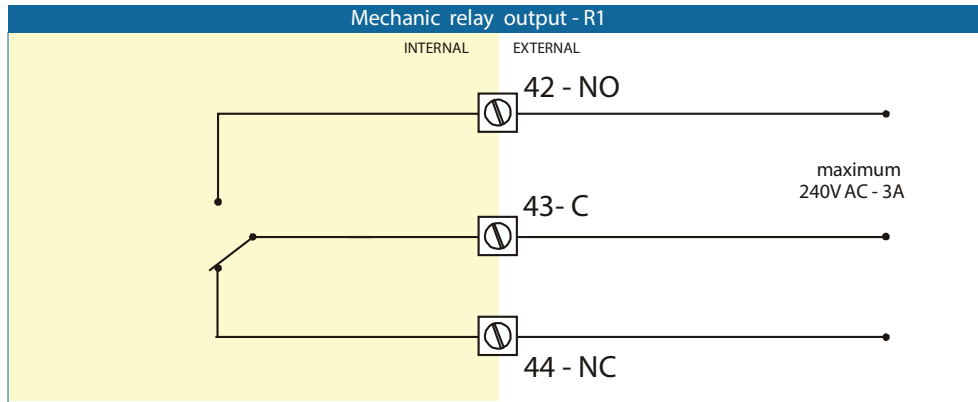
Figure 16: Mechanical relay output R1

Terminal #46-48; control output R2:

The function of the mechanical relay 2 is determined by SETUP function 71.

The maximum switch power is 240V-3A per output.
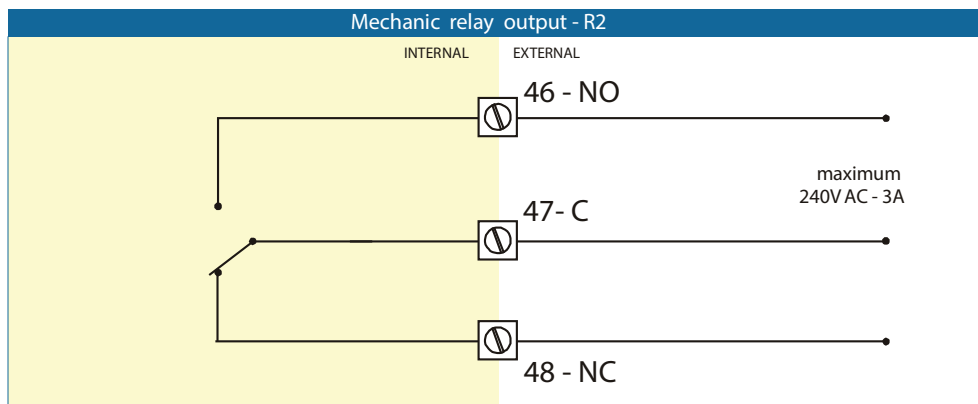
Figure 17: Mechanical relay output R2

OPERATION

⚠️CAUTION

THE PC200 MAY BE OPERATED ONLY BY PERSONNEL WHO ARE AUTHORIZED AND TRAINED BY THE OPERATOR OF THE FACILITY. OBSERVE ALL INSTRUCTIONS IN THIS MANUAL. OBEY ALL SAFETY PRECAUTIONS MENTIONED IN "SAFETY CONSIDERATIONS" ON PAGE 5.

Control Panel
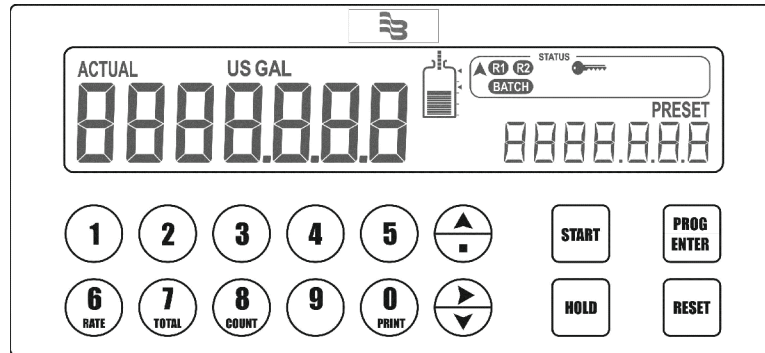
Figure 18: PC200 control panel

Function Keys

1	Press **PROG** then use keys 0 to 9 and ■ to enter a PRESET value or configuration value.
6 RATE	Press **RATE** to display the actual flow rate during batching.
7 TOTAL	Press **TOTAL** once to display and reset the actual total. Press **TOTAL** twice to display the accumulated total.
8 COUNT	Press **COUNT** to display and reset the number of executed batches.
0 PRINT	Press **PRINT** to print the currently displayed information.
START	Press **START** to begin the batch process or to resume after a HOLD situation.
HOLD	Press **HOLD** to interrupt the batch process.
RESET	Press **RESET** after pressing **HOLD** to completely cancel a batch process. At the SETUP level, press **RESET** to reset the totalizers and other values.
PROG ENTER	Press **PROG/ENTER** to enter the programming function, to save new PRESET values or other settings and to gain access to the SETUP level. See *"Configuration" on page 21*.
▲ ■	Press ■ after pressing **PROG** to enter a decimal value. During configuration, press ▲ to select a function or value. See *"Configuration" on page 21*.
► ▼	During configuration, press this arrow key to select a function or value. See *"Configuration" on page 21*.

Operator Information and Functions

In general, the PC200 functions at the Operator level. The information displayed and the functional keys available depend on the SETUP settings and the active function.

A key symbol 🔑 indicates a particular key or function is locked and not available.

Enter a Batch Quantity

To change the PRESET value:

1. Press **PROG**. The word "PROGRAM" flashes on the display.
2. Use the numerical keyboard 0-9 and the decimal position to enter the new value.
3. Press **ENTER** to save the new value or press **RESET** to cancel the change and keep the PRESET value.

Figure 19: Example display information during programming preset value

Batch Maximum / Minimum

If you try to program a value that is not valid (the batch size is too large or too small), the increase (▲) or decrease (▼) sign displays. The new value is ignored and the minimum or maximum allowed value is set.

Starting the Batch Process

The batch process can only be started up when "READY" is displayed. The batch process is started up by pressing the START key. Depending on the SETUP settings, one or two relays will be switched. The arrows at the display indicate if the ACTUAL value will be counting up or down.

Once the PRESET quantity is reached, the batch outputs will be switched off and the batch process is ended. A next batch can be started with the same PRESET quantity or a new value can be entered.

The PC200 is equipped with a smart (self learning) overrun correction: at the end of the process, the outputs will be switched OFF earlier as the PRESET value, taking the overrun quantity of previous batches into account. The result is an accurate batch, even in slowly varying circumstances. During overrun, a clock will display and "R1 / R2" will be flashing.

Figure 20: Example display information during the process

Interrupting and Ending the Batch Process

When you press **HOLD**, the batch process is temporarily interrupted; the actual values are not lost. The word "HOLD" flashes on the display. From this point, you can press **START** to resume the batch process.

You can end the batch process entirely at any time by pressing **RESET**.

NOTE: The actual values are lost and the system returns to steady state. The batch cannot be resumed.
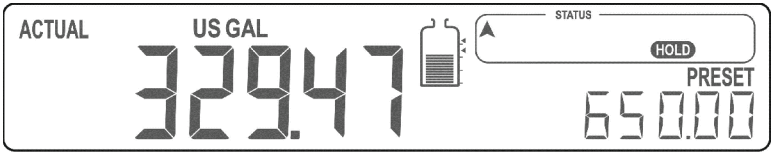
Figure 21: Example display information when interrupted

Additional key functions:

6 RATE	Flow rate indication	During batching, the actual flow rate will display after pressing the **RATE** key. To return to the main display: press **RATE** again or wait for 20 seconds.
7 TOTAL	Display total and accumulated total	When the **TOTAL** key is pressed once, the resettable total will display. After pressing this key again, accumulated total will display.
		The accumulated total cannot be reinitialized. The value will count up to 9,999,999,999. The unit and number of decimals are displayed according to the configuration settings for preset. To return to the main display: press **TOTAL** again or wait for 20 seconds.
	Clear total	The value for total can be reinitialized. To do so, select **TOTAL** and press **RESET**: the flashing text "PUSH RESET" will display.
		To avoid reinitialization at this stage, press a key other than RESET or wait for 20 seconds. If **RESET** is pressed again, TOTAL will be reset to zero.
		Reinitialization of total DOES NOT influence the accumulated total.
		NOTE: Total can only be reset if no batch process is active (status: READY).
		NOTE: This function might not be available due to configuration settings.
8 COUNT	Display batch counter	The number of completed batches is displayed after pressing **COUNT**. To return to the main display: press **COUNT** again or wait for 20 seconds.
	Clear batch counter	The value batch counter can be reinitialized. To do so, select **COUNT** and press **RESET**: the flashing text "PUSH RESET" will display.
		To avoid reinitialization at this stage, press a key other than RESET or wait for 20 seconds. If **RESET** is pressed again, COUNT will be reset to zero.
		NOTE: COUNT can only be reset if no batch process is active (status: READY).
		NOTE: This function might not be available due to configuration settings.

Operator Alarms

No Flow Alarm

The PC200 offers a no-flow monitoring feature: if the flow meter fails to generate a signal during a certain period of time, the unit will shut off the control outputs and bring the batch controller in HOLD and alarm mode. A "NO FLOW" alarm message will display.

To clear the alarm, press **RESET** once while the batch controller remains in HOLD mode. When in HOLD mode, the batch can be continued or interrupted. See *"Interrupting and Ending the Batch Process" on page 19*.

Flow Rate Alarm

If during a batch process the actual flow rate is outside the allowed range, a "LO RATE", or "HI RATE" alarm message will display, indicating the type of alarm: "LO RATE", "HI RATE".

Based on the configuration setting 4.5 Reset Flow Rate Alarm, the following will happen:

- Auto mode: The process is not interrupted, the alarm cannot be cleared and will disappear once the flow rate is within its limits again.

- Manual mode: Press **FLOW RATE** followed by **RESET** to acknowledge the alarm; the alarm will disappear. The alarm will be cleared automatically in case the batch process is ended.

- Hold mode: The batch process will go on HOLD automatically as soon as the flow rate is outside the allowed range. To clear the alarm, press **RESET** once, while the batch controller remains in HOLD mode. When in HOLD mode, the batch can be continued or cancelled completely. See *"Interrupting and Ending the Batch Process" on page 19*.

Alarm 01-03

If "ALARM" is displayed when no process alarm is present (no flow or flow rate alarm), press the "1" key to display the reason for the alarm.

See *"Troubleshooting" on page 32*.

CONFIGURATION

This section, which describes software settings and hardware connections, is exclusively meant for electricians and non-operators.

⚠CAUTION

- *MOUNTING, ELECTRICAL INSTALLATION, STARTUP AND MAINTENANCE OF THE INSTRUMENT MAY ONLY BE PROVIDED BY TRAINED PERSONNEL AUTHORIZED BY THE OPERATOR OF THE FACILITY. PERSONNEL MUST READ AND UNDERSTAND THIS MANUAL BEFORE CARRYING OUT ITS INSTRUCTIONS.*

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Programming the Setup Level
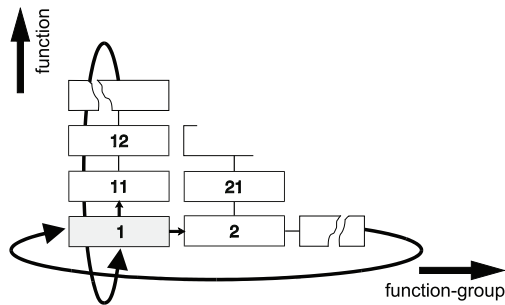
Figure 22: Matrix structure setup level

Configuration of the PC200 is done at the SETUP level.

To access the SETUP level, press **PROG/ENTER** for 7 seconds.

Both arrows will display.

To return to the operator level, press and hold **PROG** for three seconds. If no key is pressed for 2 minutes, the unit will automatically exit SETUP.

NOTE: SETUP can only be reached if the PC200 is in "READY" mode. During SETUP, the batch controller cannot be used for batching!

NOTE: A passcode may be required to enter SETUP. Without this passcode, access to SETUP is denied.

Scrolling Through the Setup Level

Selection of function-group and function:
SETUP is divided into several function groups and functions. Each function has a unique number. The number is a combination of two figures. The first figure indicates the function-group and the second figure the sub-function. Additionally, each function is expressed with a keyword.

The functions can be selected with these arrow keys. After selecting a sub-function, the next main function is selected by scrolling through all sub-functions (for example, 1▲, 11▲, 12▲, 13▲, 14▲, 1▶, 2▶, 3▶, 31▲).

To change or select a value:
After **PROG** has been pressed:

- To change a value, use the numerical keyboard.

- To select a setting, use ▲ and ▶.

If you try to program a value that is not valid (the batch size is too large or too small), the increase (▲) or decrease (▼) sign displays. The new value is ignored and the minimum or maximum allowed value is set.

When data is altered but ENTER is not pressed, the alteration can be cancelled by waiting for 20 seconds or by pressing **ENTER** for three seconds: the PROG-procedure will be left automatically and the former value reinstated.

NOTE: Alterations will only be set after you press **ENTER**.

To return to OPERATOR-level:
To return to the operator level, press **PROG** for 3 seconds. If no key is pressed for 2 minutes, SETUP will be automatically left.

Overview of the Setup Functions

SETUP FUNCTIONS AND VARIABLES			
1. PRESET			**Default**
11	UNIT	L, m³, USGAL, IGAL, ft³, bbl, kg, ton, US ton, lb	USGAL
12	DECIMALS	0, 1, 2, 3 (Ref: displayed value)	0
13	BATCH MINIMUM	X,XXX,XXX quantity	0 USGAL
14	BATCH MAXIMUM	X,XXX,XXX quantity	0 USGAL
15	PRESET VALUE	X,XXX,XXX quantity	0 USGAL
2. OVERRUN			**Default**
21	OVERRUN	disable, enable	disable
22	TIME	0.1…999.9 seconds	1.0 sec
3. Flow rate			**Default**
31	UNIT	L, m³, USGAL, IGAL, ft³, bbl, kg, ton, US ton, lb	USGAL
32	TIME UNIT	sec, min, hour, day	minute
33	DECIMALS	0, 1, 2, 3 (Ref: displayed value)	0
34	CALCULATION	per 1…255 pulses	10
35	Cutoff	0.1…999.9 seconds	30.0 sec
4. ALARM			**Default**
41	NO-FLOW alarm	0.0…999.9 seconds	0.0 sec
42	LOW flow rate alarm	0000.000…9,999,999	0 USGAL
43	HIGH flow rate alarm	0000.000…9,999,999	0 USGAL
44	DELAY flow rate alarm	0.0…999.9 seconds	0.0 sec
45	RESET flow rate alarm	automatic, manual, stop batch	auto
5. DISPLAY			**Default**
51	DISPLAY	Increase, decrease	increase
52	BACKLIGHT brightness	Off, 20%, 40%, 60%, 80%, 100%	100%
53	DIM BACKLIGHT	Off, 20%, 40%, 60%, 80%, 100%	100%
6. FLOW METER			**Default**
61	UNIT K-FACTOR	L, m³, USGAL, IGAL, ft³, bbl, kg, ton, US ton, lb	USGAL
62	K-FACTOR	0.000010…9,999,999	1
7. CONTROL			**Default**
71	RELAY 2	batch, preclose, HI flow, LO flow, no-flow, any flow, pulse, pre-warn, end of batch, off	Batch
72	TRANSISTOR 1	batch, preclose, HI flow, LO flow, no-flow, any flow, pulse, pre-warn, end of batch, off	Batch
73	TRANSISTOR 2	batch, preclose, HI flow, LO flow, no-flow, any flow, pulse, pre-warn, end of batch, off	Pulse
74	TRANSISTOR 3	batch, preclose, HI flow, LO flow, no-flow, any flow, pulse, pre-warn, end of batch, off	Any flow
75	PRECLOSE volume	X,XXX,XXX quantity	0 USGAL
76	PREWARN time	0.1, 999.9 sec	0.0 sec
77	PULSE WIDTH	0.001, 9.999 sec	0.000 sec
78	PULSE PER	X,XXX,XXX quantity	1000 USGAL
79	PULSE ACCORDING	Acc. Total, batch	Acc.Total
8. OTHERS			**Default**
81	MODEL	PC200	PC200
82	SOFTWARE VERSION	03.____.____	—
83	SERIAL NO.	--.--.---	—
84	PASSWORD	0000, 9999	0000
85	KEYBOARD LOCK	Start, hold, preset, control, all, off	off
86	TAGNUMBER	0000000, 9999999	0

Table 2: Setup functions overview

Details of the Setup Functions

1 – PRESET	
UNIT **11**	SETUP – 11 determines the measurement unit for preset, total, accumulated total and pulse output. The following units can be selected: L, m³, USGAL, IGAL, ft³, bbl, kg, ton, US ton, lb Alteration of the measurement unit will have consequences for operator and SETUP level values. **NOTE:** Based on setting 61, the selection is limited to volumetric or mass flow units of measure only.
DECIMALS **12**	The decimal point determines the number of digits following the decimal point for preset, total, accumulated total and pulse output. The following can be selected: 0000000, 111111.1, 22222.22, 3333.333
BATCH MINIMUM **13**	This function prevents the operator from entering a new PRESET value that is less than the entered batch minimum. Value zero (0) disables this function.
BATCH MAXIMUM **14**	This function prevents the operator to enter a new PRESET value which is more than the entered batch maximum. Value zero (0) disables this function.
PRESET VALUE **15**	A Preset value usually will be entered by the Operator at Operator level. However, that function can be locked out by SETUP 84 or from the terminal input. With this function, a Preset value can be entered conveniently at configuration level (which can be password-protected).

Table 3: Preset functions

2 – OVERRUN	
Overrun can occur at the end of the batch process, as a result of slowness of a valve or pump. Consequently, the accuracy is less. With this function, the PC200 analyzes the actual overrun characteristic of every batch again. This information is used to correct the overrun automatically.	
OVERRUN **21**	For an accurate overrun correction, the flow meter must: • Be high resolution. • Show no false overrun due to a slow update time. • Not spin once the valve is closed. Do not enable this function if the flow meter does not meet these technical demands.
TIME (OVERRUN) **22**	The overrun characteristic of the system will be analyzed during a certain time after switching-off the valves. This eliminates false signals generated through leakage. Enter the time you expect the system needs to stop a batch. Provide some extra time to avoid an incorrect overrun correction. **NOTE:** The next batch can only be started after the overrun time elapses. The minimum overrun time is 0.1 second. The maximum overrun time is 999.9 seconds.

Table 4: Overrun functions

3 – FLOW RATE	
MEASUREMENT UNIT **31**	SETUP – 21 determines the measurement unit for flow rate. The following units can be selected: L, m³, USGAL, IGAL, ft³, bbl, kg, ton, US ton, lb Alteration of the measurement unit will have consequences for other SETUP level values (high and low flow rate alarms). **NOTE:** Based on setting 61, the selection is limited to volumetric or mass flow units of measure only.
TIME UNIT **32**	The flow rate can be calculated per second (SEC), minute (MIN), hour (HR) or day (DAY). Alteration of the time unit will have consequences for other SETUP level values (high and low flow rate alarms).
DECIMALS **33**	This setting determines for flow rate the number of digits following the decimal point. The following can be selected: 00000, 1111.1, 2222.22, 3333.333 Alteration of the decimals will have consequences for other SETUP level values (high and low flow rate alarms).
CALCULATION **34**	The flow rate is calculated by measuring the time between a number of pulses, for example 10 pulses. The more pulses the more accurate the flow rate will be. The maximum value is 255 pulses. **NOTE:** For low frequency applications (below 10 Hz): do not program more than 10 pulses or the update time will be very slow. **NOTE:** For high frequency application (above 1 kHz) program a value of 50 or more pulses.
Cutoff TIME **35**	With this setting, you determine a minimum flow requirement threshold. If during this time less than XXX-pulses (SETUP 34) are generated, the flow rate will display as zero. Enter the cutoff time in seconds. The maximum time is 999.9 seconds (about 15 minutes).

Table 5: Flow rate functions

4 – ALARM	
NO-FLOW ALARM **41**	The PC200 offers a no-flow monitoring feature: if the flow meter fails to generate a signal during a certain period of time, the unit will shut off the control outputs and bring the batch controller in HOLD and alarm status. After clearing the alarm, the batch can be continued or denied. The maximum time to generate a signal is 999.9 seconds (about 15 minutes). With value zero (0) this function is disabled.
LOW-Flow rate ALARM (MINIMUM) **42**	The minimum required flow rate is set with this setting. Once the flow rate is lower as this value and the delay time has passed (setting 44), a low flow rate alarm will be generated. With value zero (0) this function is disabled.
HIGH-Flow rate ALARM (MAXIMUM) **43**	The maximum allowed flow rate is set with this setting. Once the flow rate is above this value and the delay time has passed (setting 44), a high flow rate alarm will be generated. With value zero (0) this function is disabled.
DELAY TIME FLOW RATE ALARM **44**	An alarm generated by SETUP 42 or 43 can be ignored during X-time. If the actual flow rate is still incorrect after this delay time an alarm will be generated.
RESET Flow rate ALARM **45**	Once a flow rate alarm has been generated, select a way to proceed: • Automatic: the batch process will not get on hold, the alarm situation will display on the LCD and if applicable, on the control outputs. If the flow rate comes within the allowed range, the alarm will be reset automatically. • Manual: as automatic, but the alarm has to be RESET by the operator. • Stop batch: as automatic but the process will be on HOLD: the Operator can resume or reset the batch.

Table 6: Alarm functions

5 – DISPLAY	
DISPLAY **52**	The actual batched value can be set to display the batched quantity (increase), or to display the remaining quantity to be batched (decrease).
BRIGHTNESS **52**	The density of the backlight can be set in steps of 20% in the range: 0…100%

Table 7: Display

6 – FLOW METER	
The PC200 is able to handle high and low frequency pulses. Do use the right terminal connection. See *"Installation" on page 9*. The PC200 calculates automatically the internal K-Factors for selected measuring units for PRESET (SETUP 11) and Flow rate (SETUP 31).	
UNIT K-FACTOR **61**	SETUP – 61 determines the measurement unit for the K-Factor entry (setting 62). According to the calibration sheet of your flow meter, a certain number of pulses are generated versus a certain volume and measuring unit. Enter the measuring unit. The following units can be selected: L, m^3, USGAL, IGAL, ft^3, bbl, kg, ton, US ton, lb Alteration of the measurement unit will have consequences for operator and SETUP level values.
K-FACTOR **62**	With the K-factor, the flow meter pulse signals are converted to a quantity. The K-factor is based on the number of pulses generated by the flow meter per selected measurement unit (SETUP 61), for example per cubic feet. The more accurate the K-factor, the more accurate the functioning of the system will be. Example 1: Calculating the K-factor. Let us assume that the flow meter generates 248.13 pulses per liter. So, the K-factor is 248.13. Enter for SETUP – 61: "Liter". Enter for SETUP – 62: "248.13". Example 2: Calculating the K-factor. Let us assume that the flow meter generates 6.5231 pulses per gallon. So, the K-Factor is 6.5231. Enter for SETUP – 61: "USGAL". Enter for SETUP – 62: "6.5231".

Table 8: Flow meter functions

7 – RELAY OUTPUT	
Two mechanical control outputs are available to control relays or valves. Relay 1 is always used as the main batch control relay, its function cannot be determined.	

The second relay as well as the three transistor outputs can be used for the desired function:

- Batch: the function is equal to relay 1.
- Preclose: used for two-stage control. See SETUP 75.
- LO flow alarm: switched once a low flow rate alarm has been triggered. See SETUP 42.
- HI flow alarm: switched once a high flow rate alarm has been triggered. See SETUP 43.
- No-flow alarm: switched in case a no-flow is triggered. See SETUP 41.
- Any flow alarm: switched in case a flow rate or no-flow alarm will be triggered.
- Pre-warn: to generate a switch signal at X-volume before end-of batch. See SETUP 75 and 76.
- Pulse: for use as a scaled pulse output. See SETUP 77 and 78.
- End of batch: will switch on at the end of a batch till a next batch is started (so reverse to the batch process).

RELAY 2 71	Function according to: batch / preclose / HI flow rate alarm / LO flow rate alarm / no-flow alarm / any flow alarm / pulse / pre-warn / end of batch / off
TRANSISTOR 1 72	Function according to: batch / preclose / HI flow rate alarm / LO flow rate alarm / no-flow alarm / any flow alarm / pulse / pre-warn / end of batch / off
TRANSISTOR 2 73	Function according to: batch / preclose / HI flow rate alarm / LO flow rate alarm / no-flow alarm / any flow alarm / pulse / pre-warn / end of batch / off
TRANSISTOR 3 74	Function according to: batch / preclose / HI flow rate alarm / LO flow rate alarm / no-flow alarm / any flow alarm / pulse / pre-warn / end of batch / off
PRECLOSE QUANTITY 75	According to the setting Preclose, the switch moment of the output is based on the remaining quantity before the end of batch. With value zero (0) this function is disabled.
PREWARNING 76	According to the setting Pre-warn, the output will be switch at the moment of Preclose during X- seconds. This time can be set in the range: 0.1…999.9 seconds.
PULSE WIDTH 77	The pulse width determines the time that the output will be switched; in other words the pulse length. This pulse length determines also the maximum frequency based on a 50/50 duty cycle. Maximum frequency = 1 / 2*pulse length (in seconds) The pulse width is set in milliseconds in the range 0.001…9.999 seconds. Value "zero" disable the pulse output. **NOTE:** If the frequency should go out of range—when the flow rate increases, for example—an internal buffer will be used to store the missed pulses: As soon as the flow rate slows down, the buffer will be emptied. It might be that pulses will be missed due to a buffer-overflow, so it is advised to program this setting within its range!
IMPULSE PER 78	A pulse will be generated every X-quantity. Enter this quantity while taking the displayed decimal position and measuring unit into account (according to PRESET).
PULSE ACCORDING ACC. TOTAL / BATCH 79	This function determines if a pulse will be generated according the quantity batched or according to accumulated total. With setting BATCH, the pulse generator will be set to zero when a new batch is started up (and does not reflect the complete totalized volume).

Table 9: Relay output

8 – OTHERS	
MODEL **81**	For support and maintenance: provide this information to your supplier.
SOFTWARE VERSION **82**	For support and maintenance: provide this information to your supplier.
SERIAL NUMBER **83**	For support and maintenance: provide this information to your supplier.
KEYBOARD LOCK **85**	The LOCK function inhibits certain functions of the keyboard: • Start: to lock the START key; a batch cannot be executed. • Hold: to lock the HOLD key; a batch cannot be interrupted. • Preset: to lock the ability to change the batch value. • Control: START and HOLD are both locked out. • All: the complete keyboard is locked, except SETUP functionality. • Off: this lock function is disabled. **NOTE:** The Lock function on terminal 2 will lock the complete keyboard and can be used in combination with this Inhibit function. **NOTE:** The functions available from the cable terminals remain in use!
TAGNUMBER **86**	For identification of the unit and communication purposes, a unique tag number of maximum seven digits can be entered.

Table 10: Other functions

Transmitter Connections

Device	Wire Color	PC200 Connection
PM5	RED	7
MS-ESXP	BLACK	3
MS-EA	GREEN	GROUND
MS-ER1		

Device	Wire Color	PC200 Connection
PFT3	WHITE	7
FT1	WHITE	3
FT-2XP		
PFT-2		
Meter Mounted PC200		

Device	Wire Color	PC200 Connection
FT-1E	RED	5, 29
PFT-2E	BLACK	3, 27
PFT-3E	GREEN	6

NOTE: See *"Voltage Selection Sensor Supply" on page 11*.

Device	Wire Color	PC200 Connection
EPT-1XP	RED	6
PEPT-1	BLACK	3, 27
	GREEN	GROUND

Table 11: Transmitter connections

Transmitter Pulses Per Unit

Use with the following transmitters: FT1, FT2XP, PFT2, PFT3, RST, RST-6P

Size	Meter Model	US Gallons	Liters	Ft³
1/2"	OP	222.960	58.899	1687.857
1/2"	OP (FT1 only)	111.500	29.455	834.078
1"	OP	76.640	20.246	573.307
2"	OP	20.600	5.442	154.099
2"	Industrial Turbo	17.360	4.586	129.862
3"	Industrial Turbo	12.400	3.276	92.758
4"	Industrial Turbo	2.560	0.676	19.150
6"	Industrial Turbo	1.080	0.285	8.079
5/8"	LP RCDL	229.554	60.641	1717.186
5/8"	25 RCDL	198.340	52.396	1484.689
3/4"	35 RCDL	126.671	33.463	947.566
1"	40 RCDL	89.781	23.717	671.610
1"	55 RCDL	58.064	15.339	434.351
1"	70 RCDL	46.752	12.350	349.726
1-1/2"	120 RCDL	23.867	6.305	178.539
2"	170 RCDL	14.565	3.848	108.955
1-1/2"	160 Turbo Series	1.537	0.406	11.495
2"	200 Turbo Series	1.537	0.406	11.495
3"	450 Turbo Series	1.598	0.422	11.955
4"	1000 Turbo Series	1.665	0.440	12.455
6"	2000 Turbo Series	0.150	0.040	1.122
8"	3500 Turbo Series	0.151	0.040	1.133
10"	5500 Turbo Series	0.198	0.052	1.481
12"	6200 Turbo Series	0.129	0.034	0.963
16"	6600 Turbo Series	0.016	0.004	0.116
20"	10000 Turbo Series	0.009	0.002	0.067
1/2"	Industrial OG	378.5 *	100 *	2831 *
3/4"	Industrial OG	249.8 *	66 *	1868 *
1"	Industrial OG	249.8 *	66 *	1868 *
1" HF	Industrial OG	162.8 *	43 *	1217 *
1-1/2"	Industrial OG	64.4 *	17 *	481 *
2"	Industrial OG	34.1 *	9 *	255 *
3"	Industrial OG	11.4 *	3 *	85 *

Table 12: Transmitter pulses per unit

* Approximate values. Exact pulses/liter for water is listed on each meter.

MAINTENANCE

⚠️**CAUTION**

- ***MOUNTING, ELECTRICAL INSTALLATION, STARTUP AND MAINTENANCE OF THIS INSTRUMENT MAY ONLY BE CARRIED OUT BY TRAINED PERSONNEL AUTHORIZED BY THE OPERATOR OF THE FACILITY. PERSONNEL MUST READ AND UNDERSTAND THIS OPERATING MANUAL BEFORE CARRYING OUT ITS INSTRUCTIONS.***

- ***THE PC200 MAY ONLY BE OPERATED BY PERSONNEL WHO ARE AUTHORIZED AND TRAINED BY THE OPERATOR OF THE FACILITY. ALL INSTRUCTIONS IN THIS MANUAL ARE TO BE OBSERVED.***

- ***ENSURE THAT THE MEASURING SYSTEM IS CORRECTLY WIRED UP ACCORDING TO THE WIRING DIAGRAMS. PROTECTION AGAINST ACCIDENTAL CONTACT IS NO LONGER ASSURED WHEN THE HOUSING COVER IS REMOVED OR THE PANEL CABINET HAS BEEN OPENED (DANGER FROM ELECTRICAL SHOCK). THE HOUSING MAY ONLY BE OPENED BY TRAINED PERSONNEL.***

- ***OBEY ALL SAFETY PRECAUTIONS MENTIONED IN** "Safety Considerations" on page 5**.***

The PC200 does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is the users responsibility to take all precautions to dehumidify the internal atmosphere of the PC200 in such a way that no condensation will occur, for example by placing dry silica-gel sachet in the casing just before closing it. Furthermore, it is required to replace or dry the silica gel periodically as advised by the silica gel supplier.

Check periodically:

- The condition of the casing, cable glands and front panel gasket and buttons.

- The input/output wiring for reliability and aging symptoms.

- The process accuracy. As a result of wear and tear, recalibration of the flow meter might be necessary. Re-enter any subsequent K-factor alterations.

- Clean the casing with soapy-water. Do not use any aggressive solvents as these might damage the coating.

Repair

This product cannot be repaired by the user and must be replaced with an equivalent certified product. Repairs should only be carried out by the manufacturer or his authorized agent.

TECHNICAL SPECIFICATIONS

General		
Display	Type	High intensity transflective numeric and alphanumeric LCD, UV-resistant. White LED backlight. Intensity adjustable from 0…100% in steps of 20%. Good readings in full sunlight and darkness.
	Digits	Seven 14 mm (0.56") and ten 8 mm (0.3"). Various symbols and measuring units.
	Refresh rate	User definable: 8 times/sec.
Enclosure		Die-cast aluminum front panel, GRP back enclosure. Polycarbonate window, silicone gasket; UV stabilized and flame retardant material.
	Keypad	Sixteen industrial micro-switch keys; UV-resistant silicone keypad.
	Painting	UV-resistant 2-component industrial painting.
	Dimension	144 × 72 × 110 mm (5.67" × 2.83" × 4.33"), W x H x D.
	Classification	IP65 / NEMA4X at the front side.
	Panel cutout	138 × 68 mm (5.43" × 2.68") W x H.
	Weight	650 gram / 1.7 lb
	Panel thickness	Max. 6 mm (0.25").
Environment	Operation	$-20…60°$ C $(-4…140°$ F)
	Storage	$-40…80°$ C $(-40…176°$ F)
	Humidity	85% non-condensing, relative
Power	Type PG	85…265V AC. Power consumption max. 15 Watt. 24V DC + 10%. Power consumption max. 15 Watt.
	Sensor excitation	8.2 / 12 or 24V DC selectable. Max. 50 mA
Terminal Connections	Type	Removable plug-in terminal strip. Wire max. 2.5 mm^2.
Data Protection	Type	EEPROM backup of all setting. Backup of running totals. Data retention at least 10 years.
	Passcode	Configuration settings and control keys can be passcode protected.
	Lock function	Complete keyboard can be locked with external input (e.g. key lock or PLC).
Environment	EMC	Compliant ref: EN 61326 (1997), EN 61010-1 (1993). CE and FPP certified.
Flow Meter Inputs		NPN, open collector, reed-switch, active pulse signals 8, 12 and 24V.
	Frequency	Minimum 0 Hz, maximum 7 kHz for total and flow rate. Maximum frequency depends on signal type and internal low-pass filter. Example: Reed switch with low-pass filter: max. frequency 120 Hz.
	K-Factor	0.000010…9,999,999 with variable decimal position.
	Low-pass filter	Available for all pulse signals.
	Low Level	0…2V DC max.
	High Level	8…20V DC max.
	Impedance	4.7 kOhm pull-up to 12V DC
	VDC Current	2.5 mA steady state

Control Inputs	Function	Six remote inputs: START, HOLD, RESET, total reset, counter reset, lock keyboard
	Frequency	DC to 20 Hz typical
	Type	Current sinking
	Logic	Level sensitive
	Low Level	0… 2V DC max
	High Level	8…20V DC max
	Impedance	4.7 kOhm pull-up to 12V DC
	Current	2.5 mA steady state
	Response	100 ms make and break time
Control Outputs	Function	One batch output (always a mechanical relay)
		Four user-defined outputs (one mechanical relay and three transistor):
		batch, two-stage control, high flow rate alarm, low flow rate alarm, no-flow alarm, any alarm, scaled pulse, pre-warn, end of batch signal
	Scaled pulse output	Max. frequency 500 Hz. Pulse length user-definable 0.001…2 seconds
	Mechanical relays	Two mechanical relay outputs; max. switch power 230V AC…3A.
	Transistors	Three passive transistor outputs, not isolated. Load max. 50V DC…300 mA.
Operator Functions	• Enter a preset value • Start / interrupt and stop the batch process • Total can be reset to zero • Batch counter can be reset to zero	
	Displayed information	• Preset value • Running batch total or remaining quantity • Total and accumulated total • Flow rate • Batch counter
	Additional functions	• Active overrun correction • Minimum / maximum preset value
Preset / Total	Digits	7 digits
	Units	L, m^3, USGAL, IGAL, ft^3, bbl
	Decimals	0, 1, 2 or 3
	Note	Total can be reset to zero.
Accumulated Total	Digits	10 digits
	Units/decimals	According to selection for preset.
Flow Rate	Digits	7 digits
	Units	L, m^3, USGAL, IGAL, ft^3, bbl
	Time unit	sec, min, hour, day
	Decimals	0, 1, 2 or 3

Table 13: Technical specifications

TROUBLESHOOTING

This section explains some problems that may occur when the PC200 is going to be installed, or while it is in operation.

Issue	Action
Flow meter does not generate pulses	Check: • Signal selection: if the sensor generates above 150 Hz it should be connected to high frequency input. • Flow meter, wiring and connection of terminal connectors. See *"Terminal Connectors" on page 11*. • Power supply of flow meter. See *"Voltage Selection Sensor Supply" on page 11*.
Flow meter generates too many pulses	Check: • Signal selection: if the sensor is a reed switch, make sure it is connected to the low frequency input. • Proper grounding of the PC200 and flow meter. See *"Wiring the PC200" on page 11*.
The passcode is unknown	If the passcode is not 1234, call your supplier.
ALARM	When the alarm flag starts to blink an internal alarm condition has occurred. Press **SELECT** several times to display the 5-digit error code. The codes are: • 0001: Irrecoverable display-data error: data on the display might be corrupted. • 0002: Irrecoverable data-storage error: the programming cycle might have gone wrong: check programmed values. • 0003: Error 1 and error 2 occurred simultaneously. If the alarm occurs more often or stays active for a longer time, please contact your supplier.

Table 14: Troubleshooting

RECORD OF CONFIGURATION SETTINGS

Setting		Default	Date	Date
			Enter your settings in these two columns.	
1 – PRESET	11 unit	USGAL		
	12 decimals	0000000		
	13 minimum batch size	0 USGAL		
	14 maximum batch size	0 USGAL		
	15 preset value	0		
2 – OVERRUN	21 overrun	disabled		
	22 overrun time	1.0 sec		
3 – FLOW RATE	31 unit	USGAL		
	32 time unit	minute		
	33 decimals	0000000		
	34 calculation	10 pulses		
	35 cutoff	30.0 sec		
4 – ALARM	41 no-flow alarm	0.0 sec (disabled)		
	42 low flow rate alarm (minimum)	0 USGAL (disabled)		
	43 high flow rate alarm (maximum)	0 USGAL (disabled)		
	44 delay flow rate alarm	0.0 sec		
	45 reset flow rate alarm	auto		
5 – DISPLAY	51 display	increase		
	52 backlight	100%		
	53 dimmer	100%		
6 – FLOW METER	61 unit K-factor	USGAL		
	62 K-factor	0000001		
7 – CONTROL	71 relay 2	Batch		
	72 transistor 1	Batch		
	73 transistor 2	Scaled pulse		
	74 transistor 3	Any flow		
	75 preclose volume	0 USGAL		
	76 pre-warn time	0.0 sec (disabled)		
	77 pulse width	0.000 sec (disabled		
	78 pulse per	1000 USGAL		
	79 pulse according	Acc. Total		
8 – OTHERS	81 model	PC200		
	82 software version	03.____.____		
	83 serial number	_ _ _ _ _ _		
	84 passcode	0000		
	85 keyboard lock	Off		
	86 tag number	0000000		

Table 15: Record of configuration

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