

N-410-P

**BATCH-CONTROLLER
WITH NUMERICAL KEYPAD**



Signal input flowmeter: Pulse – Coil, NPN, PNP, Reed, Namur, Active

Control input: Five inputs for remote control.

Control output: Three outputs to control valves, pumps and alarms

Communication: Modbus RTU/ASCII



DISCLAIMER

- *The information contained in this document is subject to change without notice. The manufacturer makes no representations or warranties with respect to the contents hereof and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose.*
- *If a company or individual makes changes to the N410-P to the extent that the metrological characteristics are changed, that specific device is no longer traceable to the NTEP Certificate of Conformance.*



SAFETY INSTRUCTIONS

- *Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer must discharge himself by touching a well-grounded object.*
- *This unit must be installed in a (control) cabinet.*
- *This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).*
- *Grounding: a proper grounding to the aluminum casing must be connected as directed.*

FEDERAL COMMUNICATIONS COMMITTEE (FCC)

This device complies with FCC 47 CFR 15. Operation is subject to the following two conditions:

- (1) *This device may not cause harmful interference.*
- (2) *This device must accept any interference received, including interference that may cause undesired operation.*

DISPOSAL - WEEE DIRECTIVE



- *The WEEE Directive requires the recycling of disposed electrical and electronic equipment in the European Union.*
- *Whilst the WEEE Directive may not apply to your region, we support its policy and ask you to be aware on how to dispose of this product.*
- *The crossed out wheelie bin symbol illustrated and found on our products signifies that this product should not be disposed of in general waste or landfill.*
- *Please contact your local dealer, national distributor or the manufacturer's Technical Services for information on product disposal.*

SAFETY RULES AND PRECAUTIONARY MEASURES

- The manufacturer accepts no responsibility whatsoever if the following safety rules, precautions, instructions and the procedures as described in this manual are not followed.
- Modifications of the N410-P 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 N410-P 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 manufacture's plate).
- If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.
- The local labor and safety laws and regulations must be adhered to.

INTENDED USE

The N-SERIES is intended for use in safe areas (ordinary locations). The N-SERIES is designed and constructed for measurement purposes in industrial processes to show the flowrate, the total and the accumulated total of a medium that passes a sensor. For details, refer to the chapter: Technical specifications.

Mechanical work

Only qualified and well-trained persons who are familiar with the mechanical installation and the service procedures and who obey the specific regulations and the requirements set by the authorities, the manufacturer, the employer and the plant owner, are allowed to do the mechanical work.

Electrical work

Only qualified and well-trained persons who are familiar with the electrical installation and the service procedures and who obey the specific regulations and requirements set by the authorities, the manufacturer, the employer and the plant owner, are allowed to do the electrical work.

UNINTENDED USE

A hazardous situation may occur if the N-SERIES is not used for the purpose it was designed for or is used incorrectly. Please obey the information as given in this instruction manual:

- Do not use the N-SERIES in a hazardous area.
- Do not use the N-SERIES in life support applications. A possible malfunction of the N-SERIES can cause (serious) injury or death to persons.

TARGET GROUP

This publication is aimed at the persons who are:

- involved in the preparation of the required work;
- involved in the installation, commissioning work and use of the N-SERIES;
- appointed to supervise the required work;
- appointed for the certification, the occupational, health, safety and the quality tasks.

WARRANTY AND TECHNICAL SUPPORT

For warranty and technical support for your Fluidwell products, visit our internet site www.fluidwell.com or contact us at support@fluidwell.com.

ABOUT THE OPERATION MANUAL

This operation manual is divided into two main sections:

- The daily use of the unit is described in chapter 2 "Operation". These instructions are meant for users.
- The following chapters and appendices are exclusively meant for electricians/technicians. These provide a detailed description of all software settings and hardware installation guidance.

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

A hazardous situation may occur if the N410-P is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this operating manual indicated by the pictograms:



A "**warning**" indicates actions or procedures which, if not performed correctly, may lead to personal injury, a safety hazard or damage of the N410-P or connected instruments.



Caution !

A "**caution**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the N410-P or connected instruments.



Note !

A "**note**" indicates actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

Firmware version: 03.06.xx
Manual: FW-N410-P-M_v0203_01_EN
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1. INTRODUCTION

1.1. SYSTEM DESCRIPTION OF THE N410-P

Functions and features

The batch controller model N410-P is a microprocessor driven instrument designed for batching and filling of small and large batch size quantities.

This product has been designed with a focus on:

- Ease of use with the numerical keypad,
- Ruggedness for its application with a robust enclosure, keypad and mechanical relays,
- Clear operator information: all relevant data can be monitored at a glance,
- User friendly installation with standard high quality plug and play terminals and suitable for both AC and DC applications.
- Wide range of inputs, outputs and functions for any application.

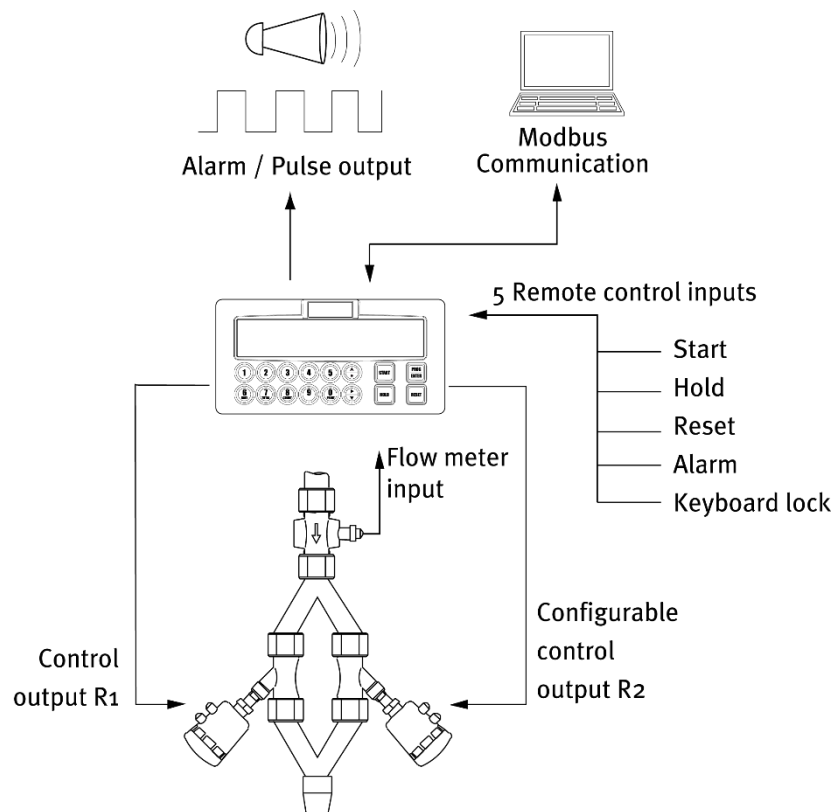


Figure 1: Typical application for the N410-P

Flowmeter input

- One flowmeter: a passive or active pulse, Namur or coil signal output can be connected to the N410-P. The input circuit supports low and high frequency flowmeters. A proper sensor supply is available to power the sensor with 8 / 12 or 24V DC.

Control inputs

- Five control inputs: the functions available are START, HOLD, RESET, keyboard lock and External alarm.

Control outputs

- Two mechanic relay outputs are mainly used for one or two-stage batch control processes. The function of the relay R1 (SPDT) is fixed and is set for batch control (Batch). In most applications, this relay is used as the main batch control relay. The function of the relay R2 (SPDT) is configurable in the setup menu and can be set as batch relay (Batch) or as an output for two-stage control (Preclose), or as an alarm output (Alarm), or as a scaled pulse output (Pulse).
- One transistor output: mainly used for connection to PLC's or other controlling equipment. The function of the transistor configurable in the setup menu and can be set as batch relay (Batch) or as an output for two-stage control (Preclose), or as an alarm output (Alarm), or as a scaled pulse output (Pulse).

Power supply

The N410-P will operate on an AC or a DC power supply:

- 110-230V AC;
- 24V DC.

Configuration of the unit

The N410-P was designed to be implemented in many types of applications. For that reason a SETUP menu is available to configure your N410-P according to your specific requirements. SETUP includes several important features, such as K-factors, measuring units, selection of the control outputs, etc.

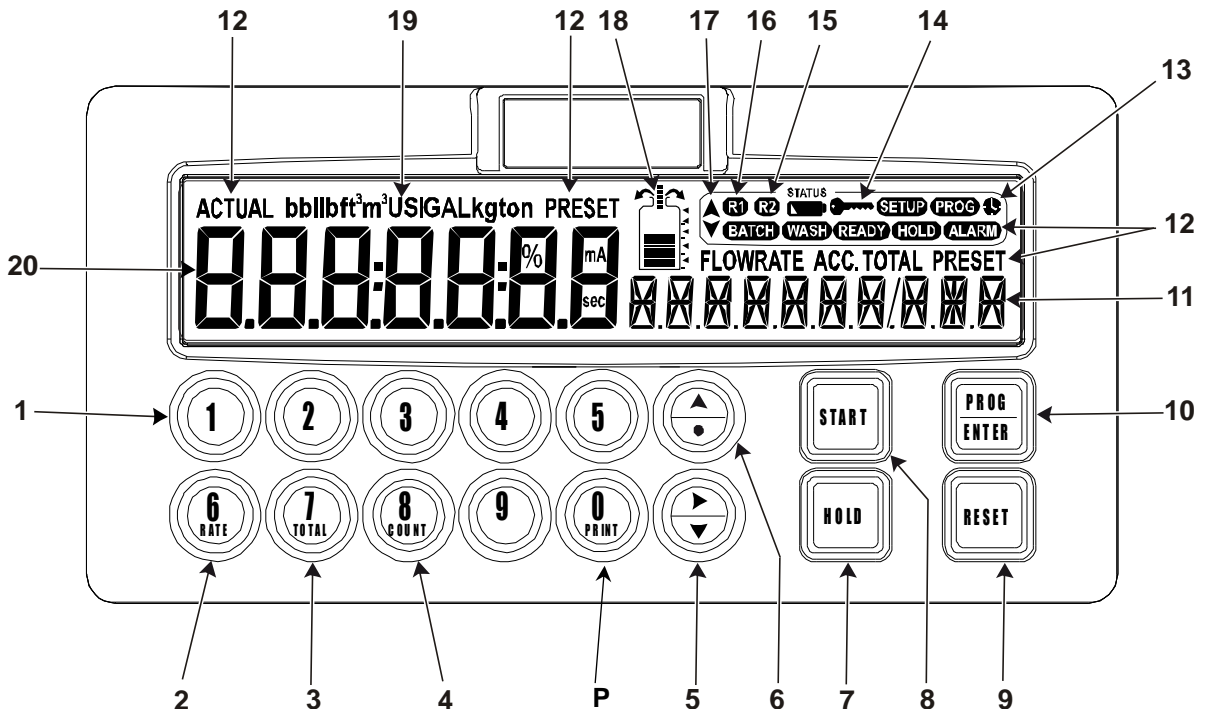
Power failure

Information will not be lost in the event of power failure:

- all settings are stored in EEPROM memory.
- a just-in-time backup is built in to write the latest batch information and (accumulated) total into the memory.

Display information

The unit has a large LCD with a bright LED backlight and displays all kinds of symbols, digits and measuring units, status information and key-word messages.



- | | |
|-------------------------------------|-------------------------------------|
| 1. Numeric keys | 12. Status indicators |
| 2. Rate key | 13. Overrun/Preopen busy indicator* |
| 3. Total key | 14. Key lock indicator |
| 4. Count key | 15. Relay2 indicator |
| 5. Function select/digit delete key | 16. Relay1 indicator |
| 6. Function select/period set key | 17. Increase/decrease indicator |
| 7. Interrupt key | 18. Tank fill/spill indicator |
| 8. Start/Resume key | 19. Unit indicator |
| 9. Reset key | 20. 14mm value display |
| 10. Program/confirm key | |
| 11. 8 mm value display | |

* Preopen busy: **Batch** indicator and clock blinks. Overrun busy: **Ready** indicator and clock blinks

Figure 2: Display and control panel

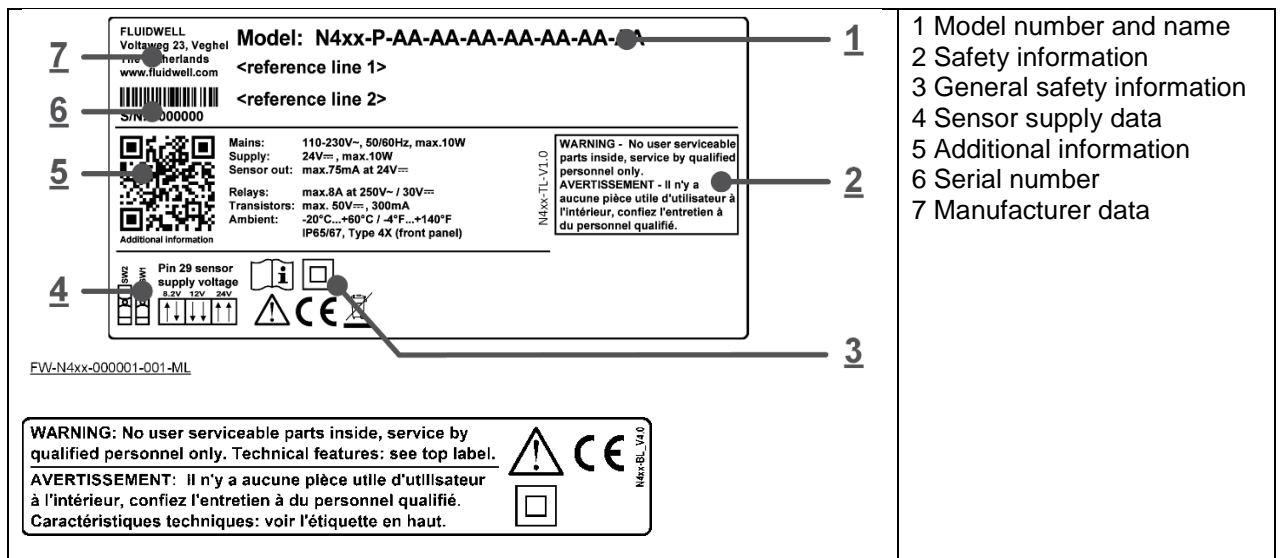


Figure 3: Typical identification label

2. OPERATIONAL

2.1. GENERAL



Caution !

- **The N410-P may only be operated by authorized and trained personnel.**
- **All instructions in this manual are to be observed.**
- **Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.**

This chapter describes the daily use of the N410-P. This instruction is meant for users / operators.

2.2. CONTROL PANEL

The following keys are available:

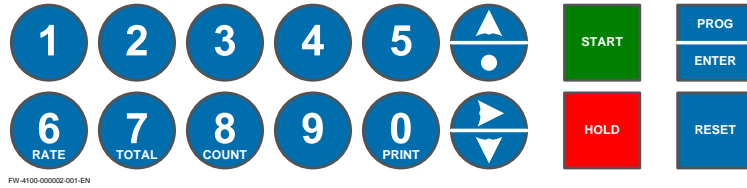


Figure 4: control panel

Functions of the keys

- 1** Once PROG has been pressed, the keys **0** to **9** and **•** are used to enter a PRESET value or configuration value.
- 6 RATE** RATE: to display the actual flowrate during batching.
- 7 TOTAL** TOTAL: to display and reset the actual Total and after pressing twice to display the accumulated total.
- 8 COUNT** COUNT: to display and reset the number of fully executed batches.
- ▲** Once PROG has been pressed: to enter a decimal value. During configuration, this key is used to select a function or value; please read chapter 4.
- ▶** During configuration, this key is used to select a function or value; please read chapter 4.
- START** To START the batch process or to resume after a HOLD command.
- HOLD** To HOLD (interrupt) the batch process.
- PROG**
ENTER To program and save a new PRESET value or other settings. It is also used to gain access to SETUP-level; please read chapter 4.
- RESET** Once HOLD has been pressed, the batch process is terminated after pressing RESET. Reset is also used to accept alarms.

2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the N410-P will always function at Operator level. The information displayed and the functional keys available are dependent upon the SETUP-settings and the active function.



NOTE:

If the key-sign is displayed, the particular key(s) or functions are not accessible!

- **To enter a batch quantity**

To change the PRESET-value, following procedure must be followed:

- 1) Press PROG: the word "PROGRAM" will be flashing,
- 2) Use the numerical keypad 0-9 and decimal position (set with SETUP 1.2 of the configuration menu) to enter the desired value.
- 3) Set the new PRESET-value by pressing ENTER.



Figure 5: Example display information during programming preset value.

When data is altered but ENTER has not been pressed, and then the alteration can still be cancelled by pressing RESET: the former value will be reinstated. The PRESET-value can be used time after time until a new value is programmed.



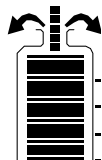
Note !

Please note that alterations will only be set after ENTER has been pressed!

- **Batch maximum / minimum**

When you program a new value which is not valid - the batch size is too large or too small - the increase or decrease-sign(e.g. ▼) will be displayed while you are programming; the new value will not be accepted but the minimum or maximum allowed value will be set.

- **Tank fill symbol**



The batch process can be visualized with the tank fill symbol. This graphical representation can be enabled or disabled.

When the batch overfills the preset quantity by 2.5% the graph will show two overspill arrows indicating this condition.

- **Starting up the batch process**

The batch process can only be started up when "READY" is displayed. The batch process is started 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 N410-P 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 be displayed and R1 / R2 will be flashing.



Figure 6: Example display information during the process.

- **Interrupting and ending the batch process**

1. Press HOLD: Interrupts the batch process temporarily, the pump stays on and the actual data is kept while the display shows HOLD (flashing).
2. Press HOLD, START, The interrupted batch is resumed.

OR:

- Press HOLD, RESET: Stops the batch process at any time, the batch sequence is ended as a completed batch and the remaining quantity of the batch is ignored.
3. When the batch is stopped and the display shows READY, press RESET for 3 seconds. You can start a new batch when the display shows 0.

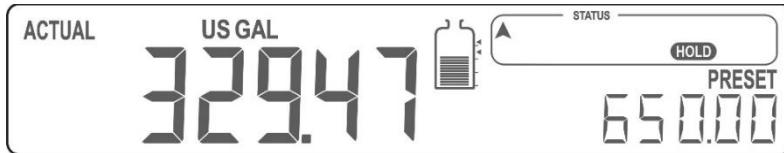


Figure 7: Example display information when interrupted.

- **Power failure during a batch process**

When during a batch a power failure occurs, the latest batch information is saved and made available again at power-up. It is not possible to resume the batch. After the power failure, the display will show "powerfail". Before a new batch is possible, the user must confirm the power failure by pressing the reset-key.

The following information is available on request:

- **Flowrate indication**

During batching, the actual flowrate will be displayed after pressing the RATE-key. To return to the main display: press RATE again or wait for 20 seconds.

- **Display total and accumulated total**

When the TOTAL-key is pressed once, the resettable total will be displayed. After pressing this key again, the accumulated total will be displayed.

The accumulated total cannot be reset. The value will count up to 9,999,999,999. The measurement unit and the 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**



Note !

*Total can only be reset if no batch process is active (status: READY).
This function might not be available due to configuration settings.*

The value for total can be re-initialized. To do so, select Total and press RESET: the flashing text "PUSH RESET" will be displayed.

To avoid a reset at this stage, press another key than RESET or wait for 20 seconds. If RESET is pressed again, TOTAL will be reset to zero. The reset of total DOES NOT influence the accumulated total.

- **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.

2.4 OPERATOR ALARMS

▪ General alarm

When “ALARM” is displayed when no process alarm is present (e.g. no flow, press the “1” key to display the reason of the alarm. Please consult Appendix B: Problem Solving.

▪ No flow alarm

The N410-P offers a no-flow monitoring feature: if the flowmeter fails to generate a signal during a certain period of time, the unit will shut-off the control output(s) and bring the batch controller in HOLD and alarm mode: an alarm message will be displayed, indicating the type of alarm: “NO FLOW”.

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 terminated. (See “Interrupting and ending the batch process”)

▪ External alarm

The N410-P can receive an external alarm during a batch. This can be set with SETUP 7.1 – Alarm. When the alarm is activated a running batch will be interrupted immediately and any other function will be blocked until the alarm status is cleared.

The display will show ‘EXT ALARM’.

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 terminated. (See “Interrupting and ending the batch process”)

3. INSTALLATION



3.1. GENERAL DIRECTIONS

- **Installation, electrical wiring, start-up and maintenance of this instrument may only be carried out by authorized and trained personnel. Personnel must read and understand this Instruction Manual before carrying out any work.**
- **The N410-P 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.**
- **Make sure, 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 authorized personnel.**
- **Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.**
- **Electro static discharge may inflict irreparable damage to electronics! Before installing or opening the unit, the installer must be discharged by touching a well-grounded object.**
- **This unit must be installed in accordance with the related certificates, the plant owner's and the manufacturer's instructions and the prevailing (inter)national Standards and Regulations.**
- **Both internal power supply as well as the relays are double insulated.**
- **To improve ESD sensitivity it is recommended to ground the conductive front panel at one of the chassis ground points.**
- **Grounding: Do ground (PE) the aluminum enclosure part properly as indicated. Two grounding positions are available: one on the top side (photo) and one on the bottom side. Use the supplied M4 x 6mm thread forming screw with a lock washer.**

3.1.1. GENERAL INSTALLATION OVERVIEW

This overview gives an outline of the installation procedure for a general installation (not compliant for custody transfer. For detailed instructions, refer to the next paragraphs.

1. Prepare the installation area for installation of the N410-P.
2. Unpack and prepare the N410-P for installation.
3. Install the N410-P mechanically.
4. Install the N410-P electrically.
5. Program the N410-P as required, refer to chapter 4; Configuration.
6. For future reference, fill in the list of settings (in the back of this manual).
7. Commission the N410-P.
8. When the N410-P is successfully commissioned, put the N410-P into service.

3.2. MECHANICAL INSTALLATION

3.2.1. DIMENSIONS ENCLOSURE

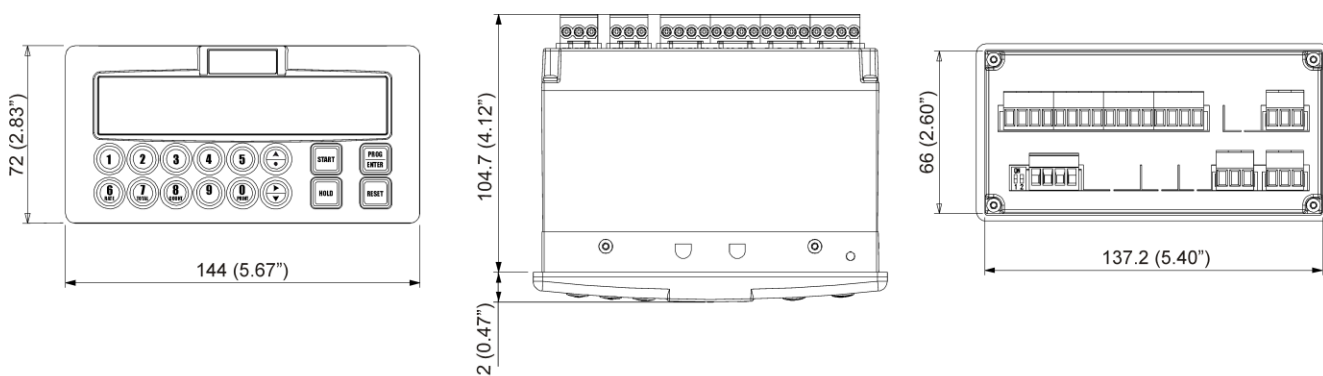
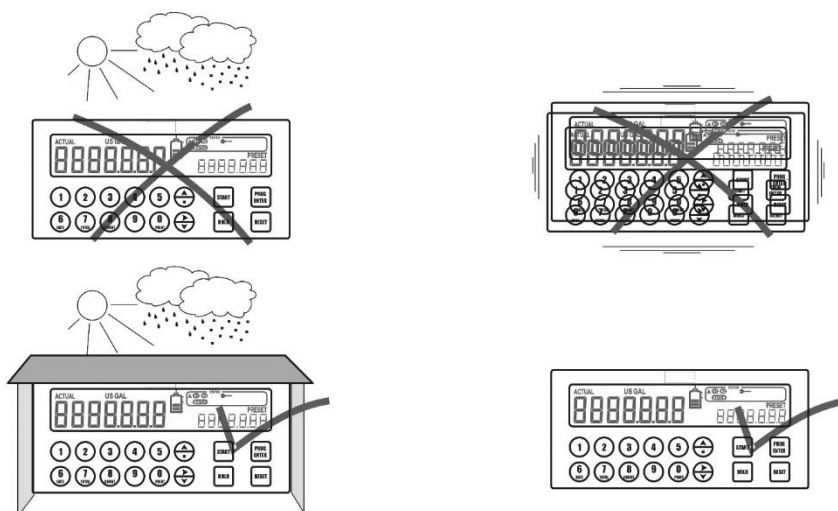


Figure 8: Dimensions enclosure (Connector layout is a typical configuration).

3.2.2. INSTALLATION / SURROUNDING CONDITIONS



Take the relevant IP classification of the enclosure into account (see manufactures plate). Even with an IP67 (Type 4X) enclosure, the unit should not be exposed to harsh unnecessary harsh weather conditions. When used in extreme cold surroundings or varying climatic conditions, take the necessary precautions against moisture by placing a dry sachet of silica gel, for example, inside the control cabinet.

Mount the N410-P on a solid structure to avoid vibrations. The following environmental conditions apply:

Relative humidity:	< 85% RH.
Outdoor use:	not suitable for outdoor use.
IP and NEMA rating:	IP67 and NEMA Type 4X (front only), IP20 rear.
Supply voltage fluctuation:	+/- 10% unless stated otherwise.
Means of protection:	Class II (isolated).
Over-voltage category:	II.
Pollution degree:	2 (internal environment), 3 (external environment).
Ambient:	-20 °C to +60 °C, -4 °F to + 140 °F.
Altitude:	up to 2000 m.

3.2.3. PREPARATION

1. Make sure, the unit and the related installation parts are complete, not damaged or tampered with.
2. Determine the location for the installation of the unit. Mind the physical and ergonomic limitations by the cabinet, the line-of-sight and the installation area.
3. Make the required hole(s) in the panel.
4. Deburr the hole(s) and clean the work area.

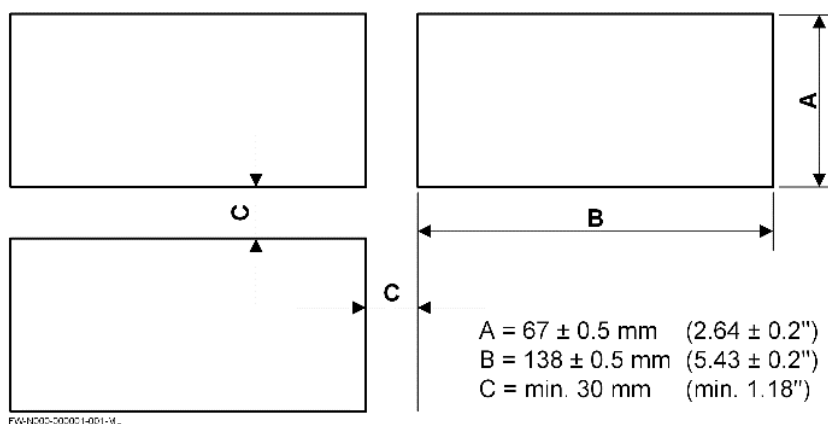
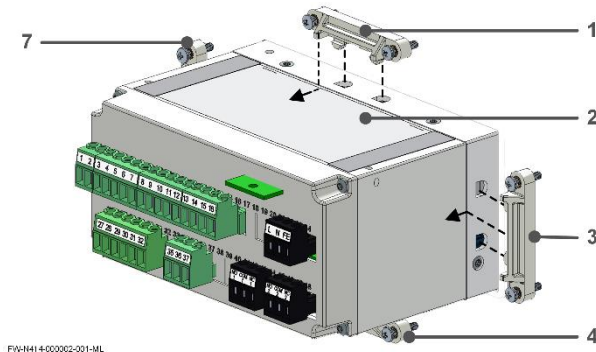


Figure 9: Cut out cabinet.

3.2.4. INSTALL THE UNIT INTO THE CABINET (PANEL)

1. Install the screws in the clamps (1, 3, 4, 7).
2. Install the gasket onto the unit (2).
3. Put the unit (2) in the correct position for installation.
4. Install the top clamp (1) and tighten the screws by hand.
5. Install the other clamps (4, 3, 7) and tighten the screws by hand.
6. Make sure, the unit (2) is installed in the correct position.
7. Torque-tighten, with $0.6 \text{ Nm} \pm 0.1 \text{ Nm}$, the screws top-bottom-left-right.
8. For later installation, keep the security cap for the W&M switch at the unit (2).



For clarity, some parts are not shown or numbered.

3.3 ELECTRICAL INSTALLATION

3.3.1. INTRODUCTION



- **Make sure, the installation is made safe and the activities are approved by the responsible person. Lock-out/Tag-out the related systems as applicable before you start the work.**
- **Electro static discharge may inflict irreparable damage to electronics! Before installing or opening the unit, the installer must be discharged by touching a well-grounded object.**
- **This unit must be installed in accordance with the related certificates, the plant owner's and the manufacturer's instructions and the prevailing (inter)national Standards and Regulations.**
- **Both internal power supply as well as the relays are double insulated.**
- **To improve ESD sensitivity it is recommended to ground the conductive front panel at one of the chassis ground points.**
- **Grounding: Do ground the aluminum enclosure part properly as indicated. Two grounding positions are available: one on the top side (photo) and one on the bottom side. Use the supplied M4 x 6mm thread forming screw with a lock washer.**



On the top of the N410-P



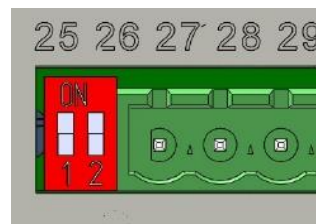
At the bottom of the N410-P

Figure 10: Grounding enclosure (Protective Earth PE).

3.3.2. VOLTAGE SELECTION SENSOR SUPPLY

Sensor supply: 8.2V - 12V or 24 V DC:

A real power supply for the sensor is available. The flowmeter can be powered with 8.2, 12 or 24V DC. Total power consumption: max. 50mA@24V. The voltage is selected with the two switches at the left rear of the enclosure.



Refer to the figure 15 to select the required sensor supply voltage.

Figure 11: Switch setting sensor supply voltage.

Cable and wire selection

The unit complies with the Directives and Standards for Electro Magnetic Interference. For a reliable signal transfer and prevention of external signal interference (crosstalk), for signal wiring, the recommendation is made for a shielded (twisted pair) cable which meets at least the Category 5 cable standard.

3.3.3. TERMINAL CONNECTORS

The following terminal connectors are available:

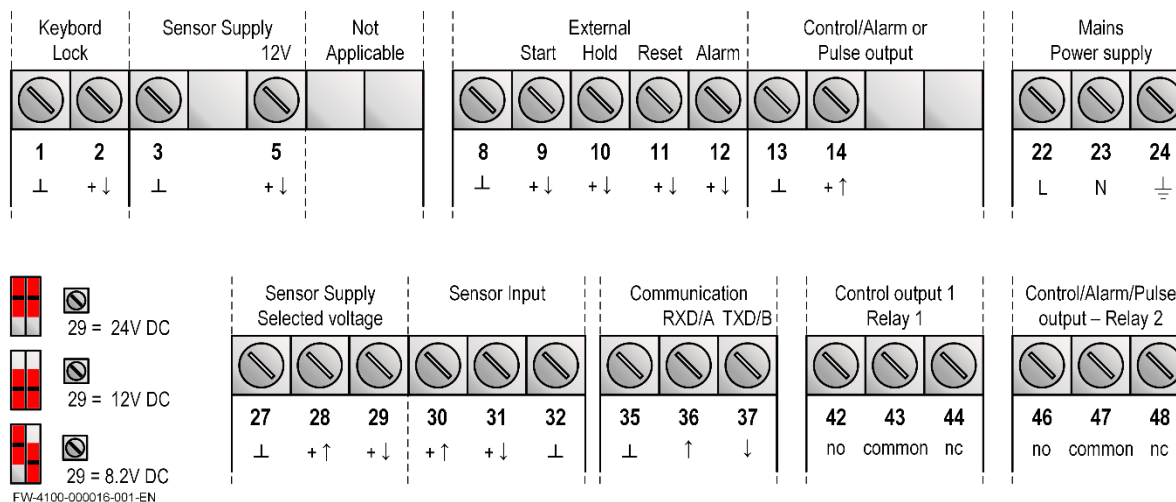


Figure 12: Overview of terminal connectors N410-P.

Terminal 1 - 2; Lock keypad:

This function allows you to connect a lock or jumper in order to completely disable the keypad while the functions from the terminals remain available. Note that certain keys on the keypad can be locked-out with SETUP 9.5 or password protected: read par. 4.2.11.

Read "Terminal 8-11" to lock the batch process.

Terminal 3 to 5, 29 to 32; Flowmeter inputs and supply:

Three basic types of flowmeter signals can be connected to the unit: pulse, active pulse or coil. The screen of the signal wire must be connected to the common ground terminal.

The input signal type has to be selected with the correct SETUP-function (read par. 4.2.8.).

Sine-wave signal (Coil):

The N410-P can be connected to flowmeters that have a coil output signal. With SETUP 6.1 two sensitivity levels can be selected:

- COIL LO: sensitivity from about 120mVp-p.
- COIL HI: sensitivity from about 20mVp-p

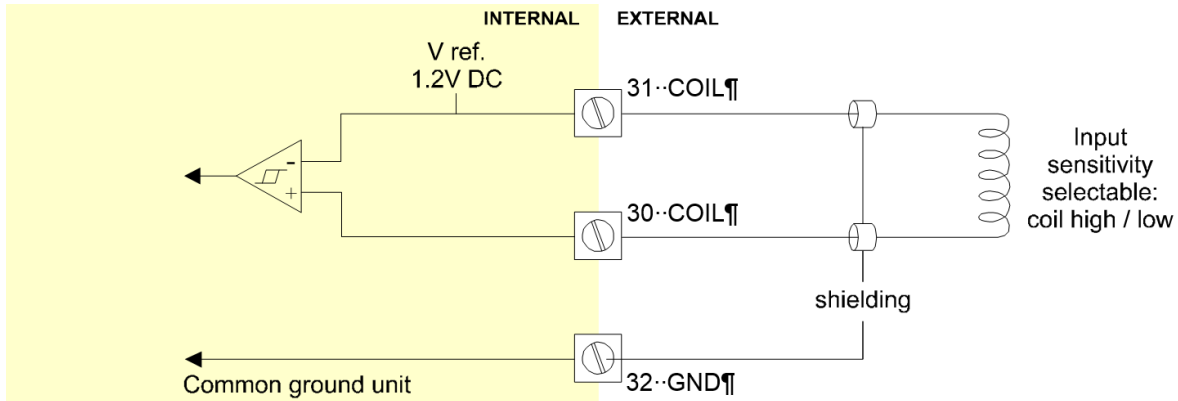


Figure 13: Terminal connections - Coil signal input (typical)

Reed-switch:

The N410-P is suitable for use with flowmeters which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP - low-pass filter (read par. 4.2.8.)

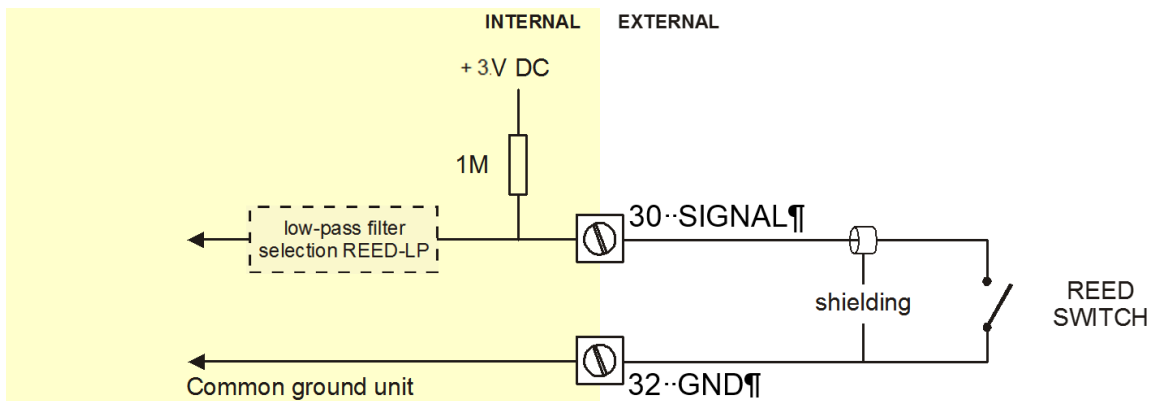


Figure 14: Terminal connections - Reed-switch signal input (typical)

Namur:

The N410-P is suitable for flowmeters with an Namur signal. The N410-P is able to power the Namur sensor, as an external power supply for the sensor is not required.

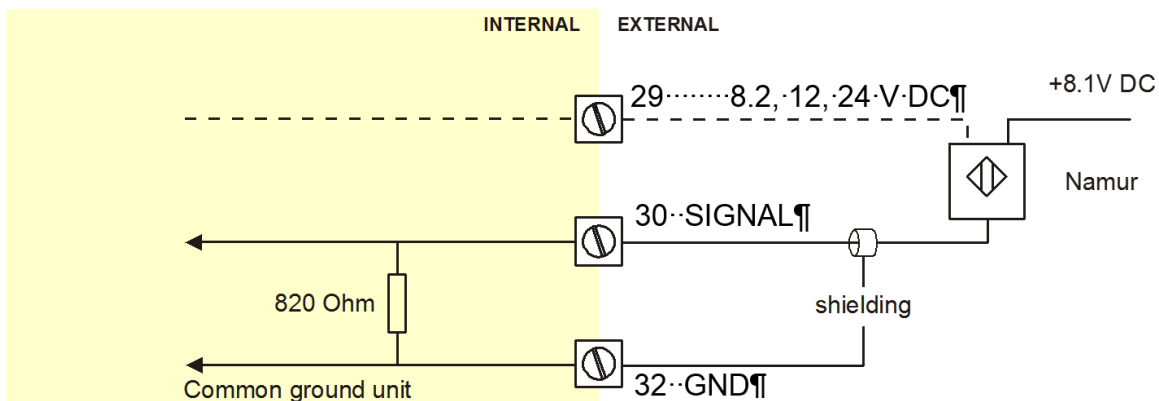


Figure 15: Terminal connections - NAMUR signal input (typical)

Pulse-signal NPN / NPN LP:

The N410-P is suitable for use with sensors which have a NPN output signal. For reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 4.2.8.

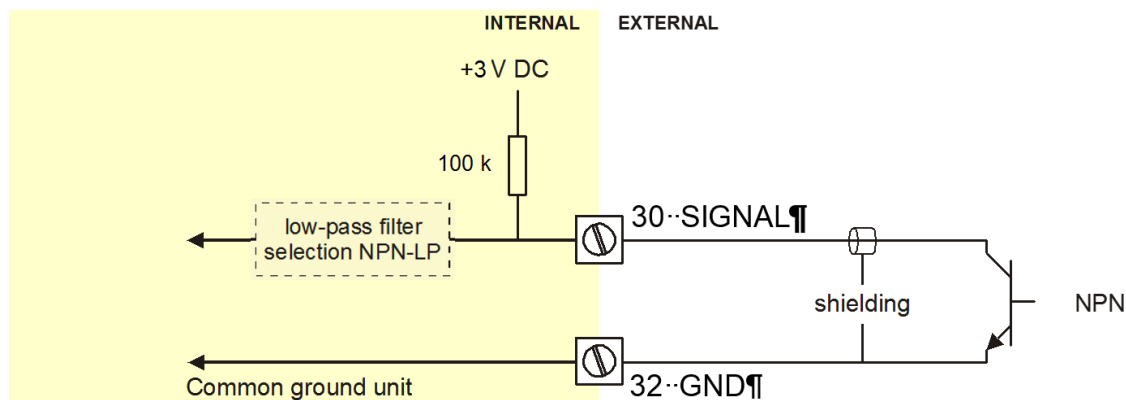


Figure 16: Terminal connections - NPN signal input (typical)

Active signal:

If a sensor gives an active signal (read chapter 3). The detection levels are 50% of the selected supply voltage; approx. 4V (8-1 DC) or 6V (12 DC) or 12V (24 DC).

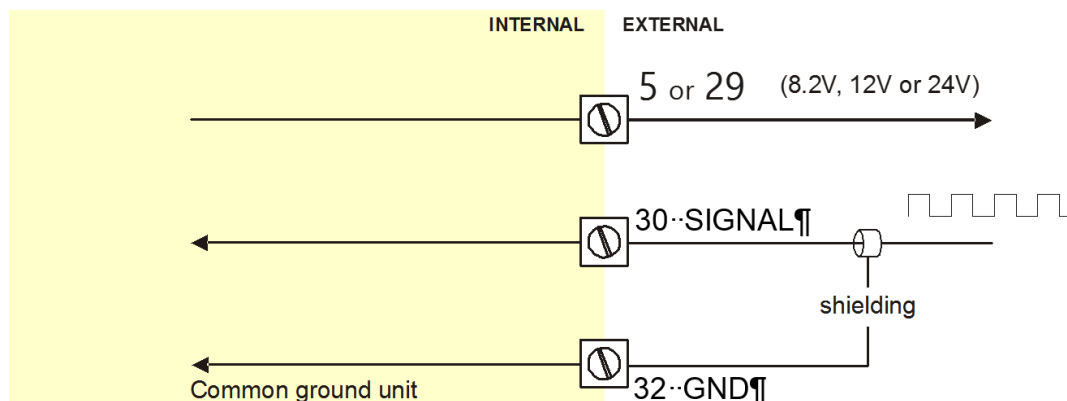


Figure 17: Terminal connections - Active signal input (typical)

Pulse-signal PNP / PNP LP:

The N410-P is suitable for use with sensors which have a PNP output signal. For reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting PNP-LP employs a low-pass signal noise filter, which limits the maximum input frequency - read par. 4.2.8. A sensor supply voltage of 8.2, 12 or 24V DC can be provided by terminal 29.

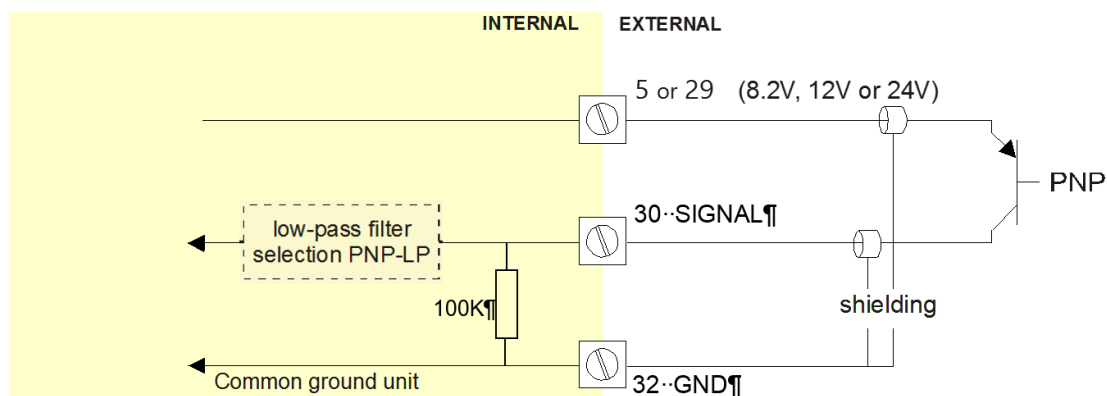


Figure 18: Terminal connections - PNP signal input (typical)

Terminal 8 - 9; External control - Start

With this function, the batch controller can be STARTED remotely. The input must be switched with a potential free contact to the GND-terminal number 8 for at least 100msec.

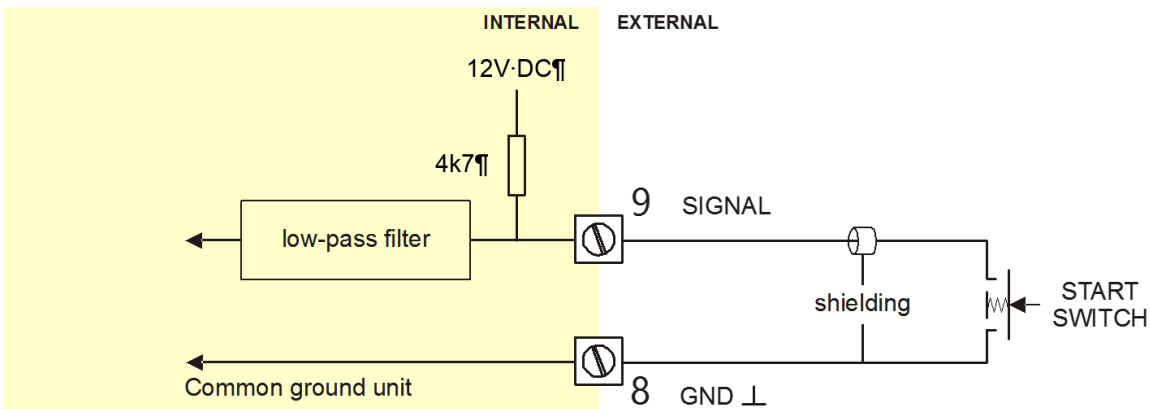


Figure 19: Terminal connections - External start (typical)

Terminal 8-10; External control - Hold

With this function, the batch process can be interrupted and brought to HOLD status. The input must be switched with a potential free contact to the GND-terminal number 8 for at least 100msec.

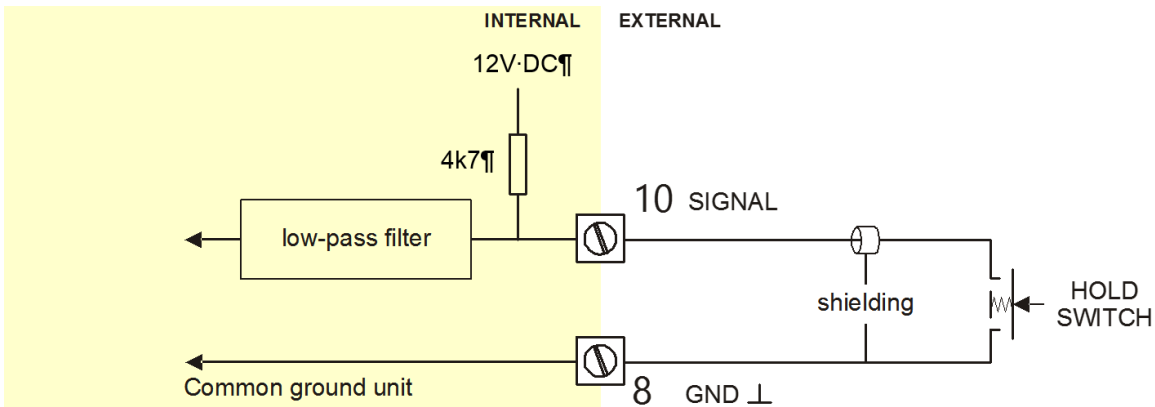


Figure 20: Terminal connections - External hold (typical)

Terminal 8-11; External control - Reset Batch

With this function, the batch process in HOLD status can be cleared remotely with this RESET function. The input must be switched with a potential free contact to the GND-terminal number 8 for at least 100msec.

Terminal 11 can also be used 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).

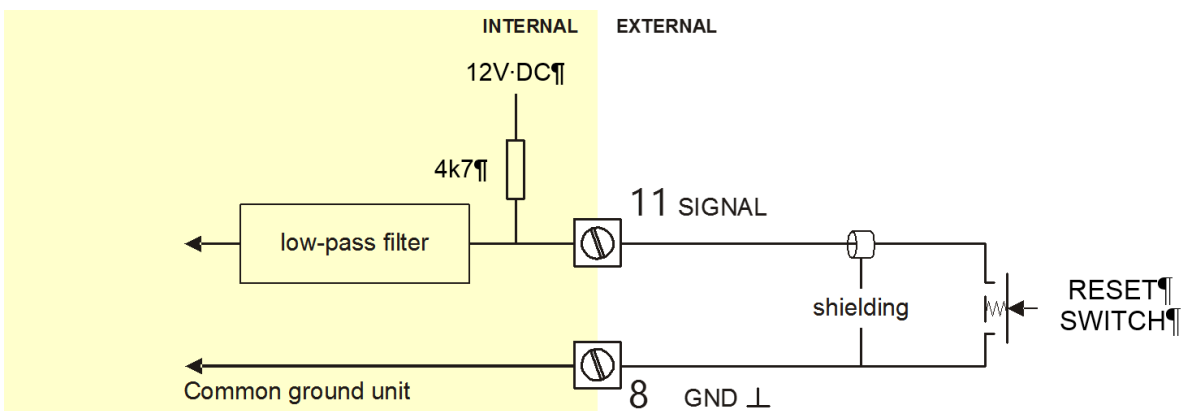


Figure 21: Terminal connections - External reset (typical)

Terminal 8-12; External Alarm:

With this function an external alarm release can be connected to the N410-P. A running batch will be interrupted immediately and will be blocked till the alarm status is initialized. Initialization is only accepted if the input is released.

Initialization can be done by pressing the RESET button or by switching terminal 11 (EXTERNAL RESET) to terminal 8. The input must be switched with a potential free contact to the GND-terminal 8 for at least 100msec.

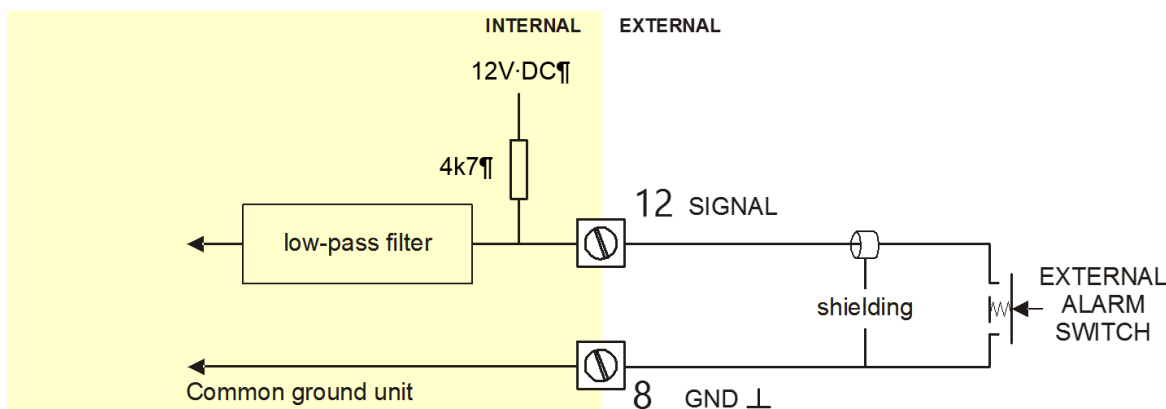


Figure 22: Terminal connections - External alarm (typical)

Terminal 13-14; Transistor 1 output (OT1):

The function of this output is determined by SETUP functions 7.2-7.7.

Max. Driving capacity 300mA@50V DC per transistor.

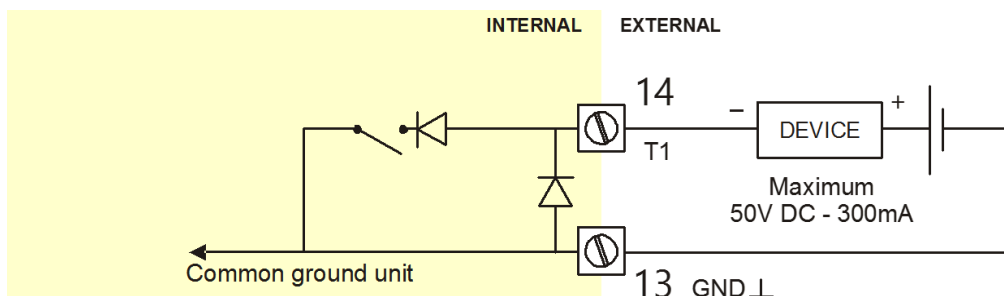


Figure 23: Terminal connections - Passive transistor output (typical)

Terminal 22 to 24; 110-230V AC Power Supply:

Connect AC power only after all other wiring has been completed. The N410-P has an internally mounted line filter and fuse for surge protection. The unit is designed to operate with 110 to 230V AC power or DC voltages (see terminals 27-28). Always make sure to connect Terminal 24 to the electrical system ground.

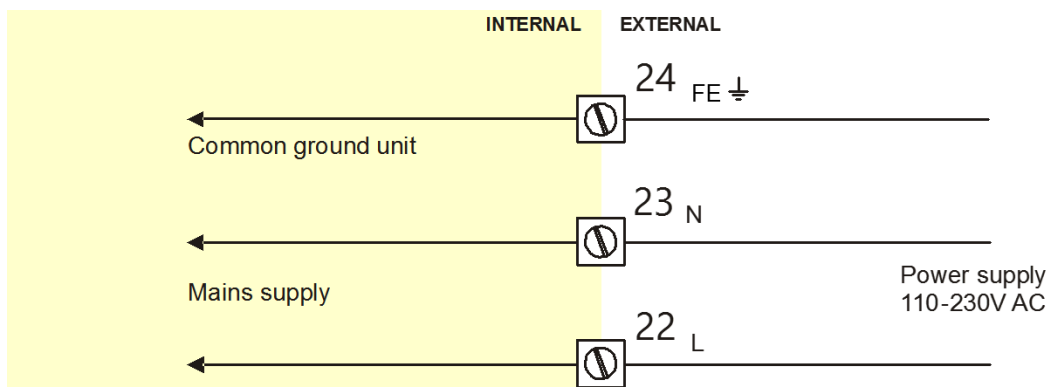


Figure 24: Terminal connections - Power supply mains (typical)

Terminal 27-28; 24V DC Power Supply:

Use these terminals ONLY for DC operated applications. The supply must be a 24V DC $\pm 10\%$. For AC applications, use terminals 22-24.

Terminal 35 to 37: Type CB / CH - RS232/485 (2-wire) communication (optional) :

- Full serial communications and computer control in accordance with RS232 (length of cable max. 15 meters) or RS485 (length of cable max. 1200 meters) is possible.
- Read the Modbus communication protocol and Appendix C.

Terminal 42 to 45; control output R1:

This mechanical relay output is available to control the batch process. Relay 1 is switched-on during the whole batch process. Max. Switching capacity (resistive load): 8A @ 250V AC / 30V DC. Max. Switching power (resistive load): 2000VA 240W.

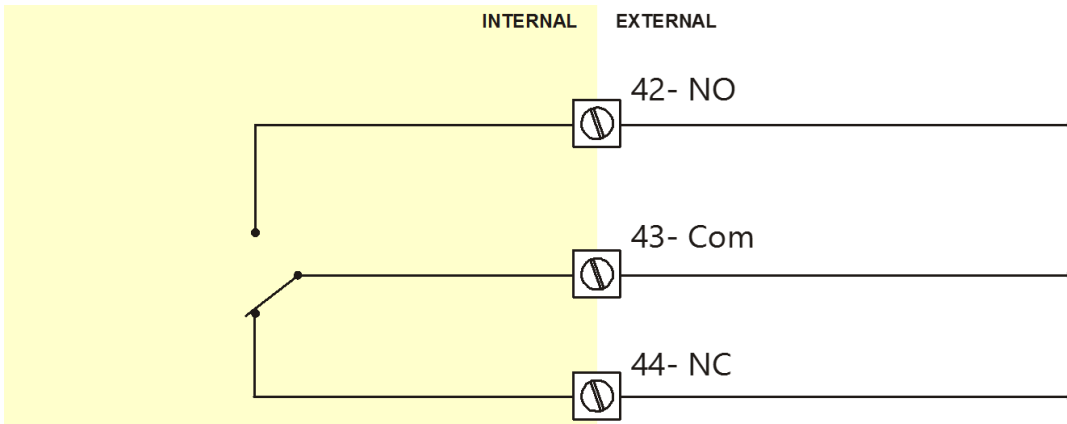
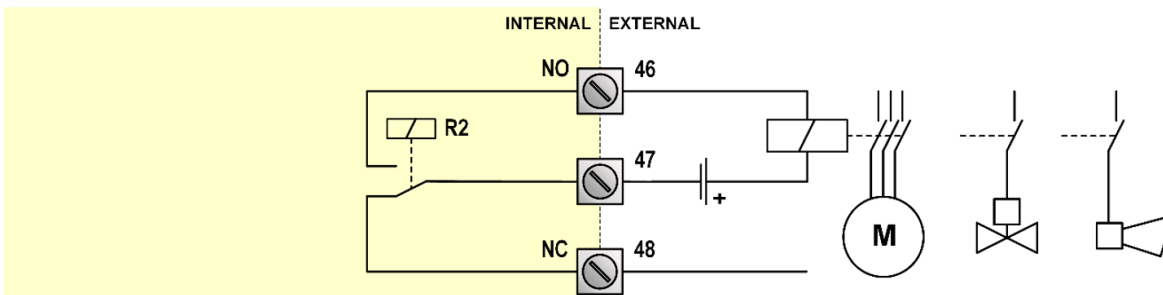


Figure 25: Terminal connections - Mechanical relay output (typical)

Terminal 46 to 48; control output R2:

The function of the mechanical relay 2 is determined by SETUP function 7.1. Max. Switching capacity (resistive load): 8A @ 250V AC / 30V DC. Max. Switching power (resistive load): 2000VA 240W.



Note: The schematic diagram shows some typical applications to control a pump, a valve or an alarm.

Figure 26: Terminal connections - Mechanical controls output (typical)

4. CONFIGURATION

4.1. INTRODUCTION

This and the following chapters are exclusively for electricians and non-operators. In these, an extensive description of all software settings and hardware connections are provided.



Caution !

- **Installation, electrical wiring, start-up and maintenance of the instrument may only be performed by authorized and trained personnel. Personnel must read and understand this Instruction Manual before carrying out its instructions.**
- **Ensure that the measuring system is correctly connected, according to the wiring diagrams. The housing may only be opened by trained personnel.**
- **Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.**

4.2. PROGRAMMING SETUP-LEVEL

4.2.1. GENERAL

Configuration of the N410-P is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows \blacktriangleleft will be displayed. In order to return to the operator level, PROG will need to be pressed for three seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically.

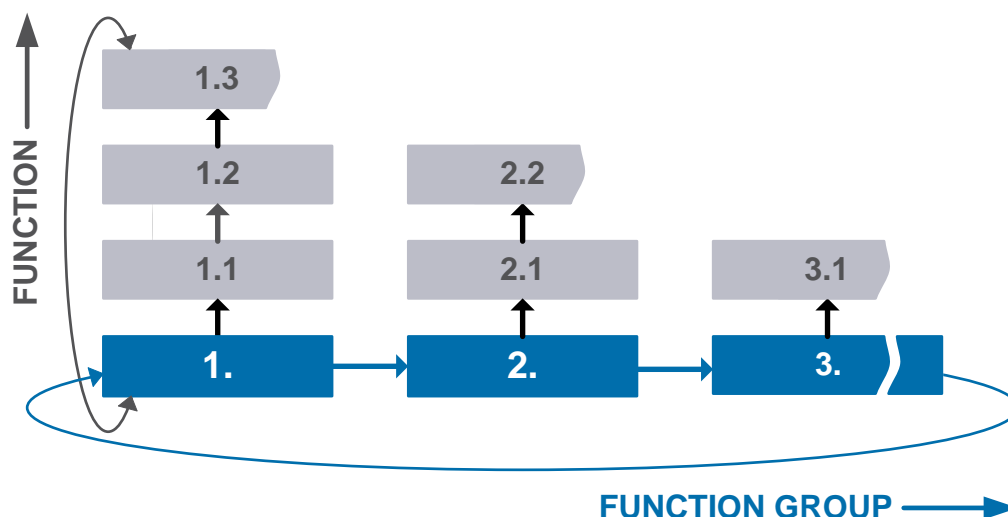


Note !

- *SETUP can only be reached if the N410-P is in "READY" mode. During SETUP, the batch controller can NOT be used for batching!*
- *A password may be required to enter SETUP. Without this password, access to SETUP is denied.*

The N410-P has a so called Weights and Measure switch to lock (by hardware) the setup menu for editing of the parameters. When this switch is set to on the setup menu is locked. A locked setup menu is indicated by the LOCKED indication after you tried to change a setting.

Matrix structure SETUP-level:



FW-4100-000001-001-EN

SCROLLING THROUGH 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 (e.g. 1.▲, 1.1▲, 1.2▲, 1.3▲, 1.4▲, 1.▶, 2.▶, 3.▲, 3.1 etc.).

To change or select a value:

After PROG has been pressed:

- To change a value, use the numerical keypad.
- To select a setting, both ▲ and ▶ can be used.

If the new value is invalid, the increase sign ▲ or decrease-sign ▼ will be displayed while you are programming.

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



Note !

Alterations will only be set after ENTER has been pressed!


To return to OPERATOR-level:

In order to return to the operator level, PROG will have to be pressed for three seconds. Also, when no keys are pressed for 2 minutes, SETUP will be left automatically.


4.2.2. OVERVIEW FUNCTIONS SETUP LEVEL

1. PRESET		
1.1	UNIT	L – m3 – USGAL – IGAL – ft3 – bbl – kg – ton – US ton – lb
1.2	DECIMALS	0000000, 11111.1, 22222.22, 3333.333
1.3	MINIMUM [quantity]	xxxxxxx
1.4	MAXIMUM [quantity]	xxxxxxx
1.5	PRESET [quantity]	xxxxxxx
2. OVERRUN		
2.1	OVERRUN	disable – enable
2.2	TIME	0.1 – 999.9 seconds
3. FLOWRATE		
3.1	UNIT	L – m3 – USGAL – IGAL – ft3 – bbl – kg – ton – US ton – lb
3.2	TIME	/sec – /min – /hour – /day
3.3	DECIMALS	0000000, 11111.1, 22222.22, 3333.333
3.4	CALCULATION	per 1 – 255 pulses
3.5	CUT-OFF	0.1 – 999.9 seconds
4. ALARM		
4.1	NO-FLOW	disable – enable
4.2	FLOWRATE TIME	0.0 – 999.9 seconds
5. DISPLAY		
5.1	Display (direction)	increase – decrease
5.2	TANK	enable – disable
5.3	(BACK)LIGHT	Off – 20% - 40% - 60% - 80% - 100% (brightness)
5.4	DIMMER	Off – 20% - 40% - 60% - 80% - 100%
6. FLOWMETER		
6.1	SIGNAL	Coil-lo, active, npn, npn lp, reed, reed lp, pnp, pnp lp, Namur, Coil hi
6.2	UNIT	L – m3 – USGAL – IGAL – ft3 – bbl – kg – ton – US ton – lb
6.3	K-FACTOR	0.000010 – 9999999
7. CONTROL		
7.1	BATCH RELAY 2	Off, batch, preclose, alarm, pulse
7.2	BATCH TRANS 1	Off, batch, preclose, alarm, pulse
7.3	PRECLOSE [quantity]	xxxxxxx
7.4	WIDTH [sec]	0.001 - 9.999
7.5	AMOUNT [quantity]	xxxxxxx
7.6	PULSE	Acc. Total – batch
8. Communication		
8.1	SPEED	1200; 2400; 4800; 9600; 9600hp; 19200; 38400
8.2	ADDRESS	1-247
8.3	MODE	ASCII; RTU; OFF
8.4	DATABITS	7 Bits; 8 Bits
8.5	PARITY	none; even; odd
9. OTHERS		
9.1	MODEL	N410-P
9.2	SW-VER (software version)	03.06.XX
9.3	SERIAL NO.	XXXXXXXX
9.4	PASSWORD	0000 - 9999
9.5	KEY(BOARD) LOCK	start – hold – preset – control – all – off
9.6	TAG-NR	xxxxxxx



4.2.3. EXPLANATION OF SETUP 1 - PRESET

UNIT 1.1  Note !	This setting is used to select the engineering unit for the indication of the batch total, the accumulated total and the pulse output. Alteration of the measuring unit will have consequences for operator and SETUP menu values. <i>Based on SETUP 6.2, the selection is limited to volumetric or mass flow units of measure only.</i>
DECIMALS 1.2	This setting is used to set the amount of digits behind the decimal point for the (accumulated) total indication.
MINIMUM 1.3	This setting is used to set the lower limit for a batch volume. An operator cannot set a batch volume which is beyond the lower limit.
MAXIMUM 1.4	This setting is used to set the lower limit for a batch volume. An operator cannot set a batch volume which is beyond the lower limit.
PRESET 1.5	A Preset value usually will be entered by the Operator at Operator level. However, this function can be locked out by SETUP 9.5 or externally with the input terminal. With this function, a Preset value can be entered conveniently at configuration level (which can be password protected).

4.2.4. EXPLANATION OF SETUP 2 - OVERRUN

Due to system parameters which are beyond the settings of the batch controller, an overrun can occur at the end of a batch. The batch controller analyzes the overrun volume and automatically corrects the volume each time after each batch (self-learning).	
OVERRUN 2.1	For an accurate overrun correction, it is necessary that the flowmeter meets certain technical demands, such as "high resolution" and shows no "false" overrun due to a slow update time. Do not enable this function if the flow meter is not compatible to this function.
TIME 2.2  Note !	The overrun characteristic of the system will be analyzed during a certain time after the batch relay has been de-energized. In this way, false signal generated through leakage are eliminated. Enter here the expected time needed by the system to stop a batch. It is advisable to provide extra time in order to avoid an incorrect overrun correction or false leakage alarms. The maximum overrun time is 999.9 seconds. <i>The next batch can only be started after the overrun time is completed!</i>

4.2.5. EXPLANATION OF SETUP 3 - FLOWRATE

UNIT 3.1  Note !	This setting is used to select the engineering unit for the indication of the flow rate. Alteration of the measuring unit will have consequences for other SETUP menu values (high and low flowrate alarms). <i>Based on SETUP 6.2, the selection is limited to volumetric or mass flow units of measure.</i>
TIME 3.2	This setting is used to set the time unit for the flow rate calculation. Note that the flow rate is given in engineering unit/time unit, e.g. liters/minute (l/min). Alteration of the measuring unit will have consequences for other SETUP menu values (high and low flowrate alarms).
DECIMALS 3.3	This setting is used to set the amount of digits behind the decimal point for the flow rate indication. Alteration of the measuring unit will have consequences for other SETUP menu values (high and low flowrate alarms).
CALCULATION 3.4  Note !	The flowrate is calculated by measuring the time between a number of pulses, for example 10 pulses. The more pulses the more accurate the flowrate will be. The maximum value is 255 pulses. <ul style="list-style-type: none"> • <i>For low frequency applications (below 10Hz): do not program more than 10 pulses or the update time will be very slow.</i> • <i>For high frequency applications (above 1kHz): do program a value of 50 or more pulses.</i>

CUT-OFF 3.5	With the cut-off time, you determine a minimum flow requirement threshold, if during this time less than XXX-pulses (SETUP 3.4) are generated; the flowrate will be displayed as zero. The cut-off time must be entered in seconds - maximum time is 999.9 seconds (approx. 15 minutes).
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4.2.6. EXPLANATION OF SETUP 4 - ALARM

The N410-P offers a no-flow monitoring feature: When the flowmeter does not generate a signal during a certain (preset) time period, the N410-P will shut-off the control output(s) and bring the batch controller in alarm status.


NO-FLOW 4.1	This setting is used to program the behavior of the no-flow alarm. When the flow rate is zero, it is possible to ignore or disable the no-flow monitoring.
TIME 4.2	This setting is used to set a delay time for the related alarm. When the alarm condition is still valid after the delay time, an alarm is given.

4.2.7. EXPLANATION OF SETUP 5 - DISPLAY

DISPLAY 5.1	This setting is used to set the behavior of the counter during a batch process: count down (quantity to do) or count up (quantity done).
TANK 5.2	The tank indication can be enabled or disabled. During the preopen phase, the indicator is inactive.
(BACK)LIGHT 5.3	The backlight brightness can be adjusted from 0% (off) to 100% (full brightness) in steps of 20%.
DIMMER 5.4	With the DIM function, the backlight will be switched to the entered intensity after five minutes of no activity. This is to extend the lifetime of the backlight and to save energy.

4.2.8. EXPLANATION OF SETUP 6 - FLOWMETER

The N410-P is able to handle high and low frequency pulses. Make sure to use the right terminal connection (see chapter installation).

SIGNAL 6.1				
TYPE OF SIGNAL	EXPLANATION	RESISTANCE	FREQ. / mV	REMARK
NPN	NPN input	100K pull-up	6 kHz.	(open collector)
NPN - LP	NPN input with low pass filter	100K pull-up	2.2 kHz.	(open collector) less sensitive
REED	Reed-switch input	1M pull-up	1.2 kHz.	
REED - LP	Reed-switch input with low pass filter	1M pull-up	120 Hz.	Less sensitive
PNP	PNP input	100K pull-down	6 kHz.	
PNP - LP	PNP input with low pass filter	100K pull-down	700 Hz.	Less sensitive
NAMUR	Namur input	820 Ohm pull-down	4 kHz.	External power required
COIL HI	High sensitive coil input	-	20 mVpp	Sensitive for disturbance!
COIL LO	Low sensitive coil input	-	90 mVpp	Normal sensitivity
ACT	Active pulse input	3K9	10 kHz.	External power required
UNIT 6.2	This setting determines the measurement unit for the flowmeter. With automatic unit conversion, the units for Preset and Flowrate are derived from this setting. The following can be selected: Volumetric: L – m3 – USGAL – IGAL – ft3 – bbl Mass: kg – ton – US ton – lb			
 Note !	<i>Based on the selection for a volumetric or mass unit of measure, consequently those measuring units only are available for setting 11 and 31.</i>			
K-FACTOR 6.3	With the K-factor, the flowmeter pulse signals are converted to a quantity or mass. The K-factor is based on the number of pulses generated by the flowmeter per selected measuring unit (SETUP 6.2), for example per			


	<p>cubic feet. The more accurate the K-factor, the more accurate the functioning of the system will be.</p> <p>Example 1: Calculating the K-factor. The flowmeter generates 2.4813 pulses per liter and the selected unit is m³. A cubic meter consists of 1000 liter which gives 2.4813 pulses*1000 liter=2481.3 pulses per m³. So, the K-Factor is 2481.3. Enter for the Flowmeter K-Factor: 24813 and for the flowmeter K-Factor decimals: 1.</p> <p>Example 2: Calculating the K-factor. The flowmeter generates 6.5231 pulses per gallon and the selected engineering unit is gallons. So, the K-Factor is 6.5231. Enter for the Flowmeter K-Factor: 65231 and for the Flowmeter K-Factor decimals: 4.</p> <p>The N410-P calculates automatically the internal K-Factors for selected measuring units for PRESET (SETUP 1.1) and Flowrate (SETUP 3.1).</p>
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4.2.9. EXPLANATION OF SETUP 7 - CONTROL

Two mechanical control outputs are available to control relays or valves. **RELAY 1** is always used as the main batch control relay, its function is fixed and cannot be changed.

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

- Batch: the function is equal to relay 1.
- Preclose: used for two-stage control.
- Alarm: in case of a no flow alarm
- Pulse: for use as a scaled pulse output.

BATCH RELAY 2 7.1	Function according to: Off, batch, preclose, alarm, pulse
BATCH TRANS 1 7.2	Function according to: Off, batch, preclose, alarm, pulse
PRECLOSE QUANTITY 7.3	According to the setting "Preclose", the switch-off moment of the output is based on the remaining quantity before the end of batch. With value zero (0), this function is disabled.
WIDTH (PULSE) 7.4	<p>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.</p> $\text{Maximum frequency} = \frac{1}{2 * \text{pulse length (in seconds)}}$ <p>The pulse width is set in milliseconds in the range 0.001 - 9.999 sec. Value "zero" disables the pulse output.</p> <p> Note ! <i>If the frequency should go out of range - when the flowrate increases for example - an internal buffer will be used to "store the missed pulses": As soon as the flowrate 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!</i></p>
AMOUNT 7.5	A pulse will be generated every time a certain quantity is added to the total (preset). Enter this quantity here while taking the displayed decimal position and measuring unit into account (according to PRESET).
PULSE 7.6	With this function, it is determined if a pulse will be generated according to 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 and does not reflect the complete totalized volume.

4.2.10. EXPLANATION OF SETUP 8 - COMMUNICATION


The functions described below relates to communication with an external device.

For communication variables: read Appendix C – communication.

SPEED 8.1	For external control, the following communication speeds can be selected: 1200 – 2400 – 4800 – 9600 – 9600HP – 19200 – 38400
ADDRESS 8.2	For communication purposes, a unique identity can be attributed to every N410-P. This address can vary from 001-247.
MODE 8.3	The communication protocol is Modbus ASCII or RTU mode. Select OFF, to disable this communication function.
DATABITS 8.4	This setting determines for communication the number of data bits. Select 8 bit for bus-rtu and 7 bits for bus-asc.
PARITY 8.5	As demanded by the connected equipment, select a parity bit (odd, even or none).

4.2.11. EXPLANATION OF SETUP 9 - OTHERS

For support and maintenance it is important to have information about the characteristics of the N410-P. Your supplier will ask for this information when support is required.

MODEL 9.1	This setting shows the model name.
SW-VERS 9.2	This setting shows the version number of the firmware (software).
SERIAL NO 9.3	This setting shows the serial number.
PASSWORD 9.4	This setting is used to set a password (pin code) to limit the access for the setup menu. Only persons who know the pin code can access the setup menu. The pin code 0000 disables the pin code to allow for access by any person.
KEY(BOARD) LOCK 9.5  Note !	This function inhibits certain functions of the keyboard: Start: to lock the START key; a batch cannot be executed. Hold: to lock the HOLD key; interruption of the batch is not possible. Control: START and HOLD are both locked out. Preset: to lock the ability to change the batch value. All: the complete keyboard is locked, except SETUP functionality. Off: this lock function is disabled. <i>The functions available from the cable terminals remain in use!</i>
TAG-NR 9.6	This setting is used to set a tag number for the N410-P.

5. MAINTENANCE

5.1. GENERAL DIRECTIONS



- **Installation, electrical wiring, start-up and maintenance of the instrument may only be performed by authorized and trained personnel. Personnel must read and understand this Operating Manual before carrying out its instructions.**
- **All instructions in this manual are to be observed.**
- **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.**
- **Take careful notice of the “Safety rules, instructions and precautionary measures” in the front of this manual.**

The N410-P 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 N410-P in such a way that no condensation will occur, e.g. to put a dose of desiccant (drying agent) inside the enclosure just before closing it. Furthermore, it is required to replace the desiccant periodically as advised by its 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, re-calibration of the flowmeter might be necessary. Do not forget to 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.

5.2. REPAIR

Note: following repair actions do require the breaking of the W&M seal:

- a. The two field replaceable, heavy duty, mechanical relays (make-and-break / NO-NC), configurable for i.e. batching with one-stage or two-stage control, can be repaired by an authorized person and shall be replaced with equivalent certified parts. These relays are of make/type: Panasonic DK1A1B24V and have Farnell order number: 1423190.
- b. The fuse, located on the PCB above the supply connectors, shall be replaced with an equivalent certified part. The fuse is of make/type: fuse slow 250vac 1.25a radial by Littelfuse 37211250411 and has Digikey order number: WK4250BK-ND
- c. The, primary, real-time clock (RTC) battery, located on the interface board and used as a back-up battery for the internal clock (date/time stamp). The RTC battery shall be replaced with an equivalent certified part. The RTC battery is of make/type: Energizer BR1225 (ANSI/NEDA 5020LC/AWCI L09), Lithium-Carbon/Fluoride, 3V/48mAh, Low-drain.

5.3. REPAIR POLICY

If you have any problem with your Fluidwell product and you wish Fluidwell to repair it, please follow the procedure below:

- a. Obtain a Return Material Authorization (RMA) from your supplier or distributor Together with the RMA, you need to complete a repair form to submit detailed information about the problem.
- b. Send the product, within 30 days, to the address provided with the RMA. The physical return of your repair can only take place after the authorization of your repair application, as confirmed by the RMA number.

If the product is within the warranty period, it will be repaired or exchanged and returned within three weeks. If the product is no longer under warranty, you will receive a repair estimate.

APPENDIX A: TECHNICAL SPECIFICATION

General	
Display	
Type	High intensity numeric and alphanumeric LCD, UV-resistant. White LED backlight. Intensity adjustable form 0 – 100% in steps of 20%. Good readings in full sunlight and darkness.
Dimensions	22 x 116mm (0.87 x 4.57”).
Digits	Seven 14mm (0.56”) and ten 8mm (0.3”). Various symbols and measuring units.
Refresh rate	8 times/sec.
Enclosure	
General	Die-cast aluminum front panel, GRP back enclosure. Polycarbonate window, silicone gasket; UV stabilized and flame retardant material.
Key pad	Sixteen industrial micro-switch keys; UV-resistant silicone keypad; replaceable front.
Painting	UV-resistant 2-component industrial painting.
Dimension	Dimensions: 144 x 72 x 110mm (5.67” x 2.83” x 4.33”) – W x H x D.
Classification	IP67 / (Type 4X) at the front side. IP20 at the back side.
Panel cut-out	138 x 67mm (5.43” x 2.64”) W x H.
Weight	650 gram / 1.7 lbs.
Panel thickness	Max. 6mm (1/4”)
Environment	
Operational	-20°C to +60°C (-4°F to +140°F)
Storage	-40°C to +80°C (-40°F to +176°F)
Humidity	85% non-condensing, relative
Power	
Type PG	110-230V AC. Power consumption max. 10 Watt. 24V DC + 10%. Power consumption max. 10 Watt.
Sensor excitation	Terminal 5 : 12V DC. I _{out} max. 30mA Terminal 29 : 8.2 / 12 or 24V DC Terminal 31 : 1.2 or 3V DC (for sensor with low power consumption (Coil/Reed-switch 8.2V DC, I _{out} max. 20mA; 12V DC, I _{out} max. 30mA; 24V DC, I _{out} max. 75mA
Terminal connections	
Type	Removable plug-in terminal strip. Wire max. 2.5mm ²
Data protection	
Type	EEPROM backup of all setting. Backup of running totals every minute and at power-down Data retention at least 10 years.
Password	Configuration settings and control keys can be password protected.
Lock function	Complete keypad can be locked with external input (e.g. key lock or PLC).
Directives and Standards	
EMC	2014/30/EU; FCC 47 CFR part 15
LVD	2014/35/EU
RoHS	2011/65/EU
IP & NEMA	EN 60529; NEMA 250

Inputs	
Flowmeter	
Type P	Namur, Coil / sine wave (HI: 20mVpp or LO: 80mVpp,sensitivity selectable), NPN/PNP, open collector, reed-switch, active pulse signals 8 - 12 and 24V DC.
Frequency	Minimum 0 Hz – maximum 5kHz for total and flowrate. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120Hz.
K-Factor	0.000010 – 9,999,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.

Control inputs	
Function	Five remote inputs: START, HOLD, RESET, keypad lock and external alarm.
Type	Current sinking
Logic	Level sensitive
Low Level	0V DC min. to 3V DC max.
High Level	8V DC min. to 24V DC max.
Impedance	4.7 K Ohm pull up to +12V DC
Current	2.5 mA steady state
Response	100ms make and break time

Outputs	
Control outputs	
Function	One batch output (always a mechanical relay). Two configurable outputs (one mechanical relay and one transistors: batch / two-stage control / any alarm / scaled pulse outputs.
Scaled pulse output	Max. Frequency 500Hz. Pulse width is user definable between 1msec up to 10 seconds.
Mechanical relays	2 isolated, field replaceable, electro-mechanical relays (NO-NC). Max. switching capacity (resistive load): 8A @ 250V AC / 30V DC Max. switching power (resistive load): 2000VA 240W
Transistor	One passive transistor output – not isolated. Load max. 50V DC – 300mA.

Communication	
Communication option	
Function	Reading display information, reading / writing all configuration settings.
Type CB	Modbus ASCII – RS232
Type CH	Modbus ASCII – RS485 2-wire
Type CX	No communication
Speed	1200 – 2400 – 4800 – 9600 – 9600HP – 19200 – 38400 baud
Addressing	Maximum 255 Addresses

Operational	
Operator functions	
Functions	<ul style="list-style-type: none"> • Enter a preset value, • Start / hold and stop the batch process, • Total can be reset to zero, • Batch counter can be reset to zero.
Displayed information	<ul style="list-style-type: none"> • Preset value • Running batch total or remaining quantity, • Total and accumulated total. • Flowrate • Batch counter • Graphical indication progress of the actual batch – percentage wise.
Additional functions	<ul style="list-style-type: none"> • Active overrun correction • Minimum / maximum preset value • No-flow monitoring
Preset / Total	
Digits	7 digits.
Units	L – m3 – USGAL – IGAL – ft3 – bbl – kg –Ton – US Ton – lb
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.
Note:	cannot be reset to zero
Batch counter	
Digits	10 digits
Note	Counter can be reset to zero.
Flowrate	
Digits	7 digits
Units	L – m3 – USGAL – IGAL – ft3 – bbl – kg –Ton – US Ton – lb
Time unit	/sec - /min - / hour - /day
Decimals	0 – 1 – 2 or 3

APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the N410-P is going to be installed or while it is in operation.

N410-P will not switch on, seems to have no power:

Fuse blown

- Replace fuse. Read chapter 5.

Flowmeter does not generate pulses:

Check:

- Flowmeter, wiring and connection of terminal connectors.
- Power supply of flowmeter.

Flowmeter generates “too many pulses”:

Check:

- Signal wiring: use correctly finished, shielded twisted-pair cable.
- Proper grounding of the N410-P and the flowmeter.

The password is unknown:

If the password is not 1234, there is only one possibility left: call your supplier.

ALARM

When the alarm flag starts to blink an alarm condition has occurred. Press the “1 button” several times to display the error code. When multiple errors arise at the same time, their error codes are added and their sum is displayed. The codes are:

Not recoverable by the end user:

[d] 1: display-data error
[d] 2: data-storage error
[d] 4: initialization error
[d] 8: interface error 1
[d] 16: interface error 2

For a not recoverable error, keep the error code at hand and contact your supplier.

Recoverable by the end user:

[d] 32: Configuration error

APPENDIX C: COMMUNICATION MODBUS VARIABLES

General

The N410-P is fitted with the Modbus communication protocol and can be equipped with various physical interfaces like RS485 and RS232 (please see device datasheet for available options). The tables below show the various variables that can be accessed through the communication.

Currently, the function codes supported are:

- function code 3 “Read Holding Registers” (4x references);
- function code 16 “Preset Multiple Registers” (4x references).

The table below shows Modbus PDU addresses in the decimal representation, followed by its hexadecimal representation (0x0000). When the PLC address range is required (4x references typically used by PLCs), please add a value of 40001 to the Modbus PDU address. E.g. reading the serial number with PLC-based addressing means reading 165 + 40001 = register 40166.

Variables spanning multiple registers use ‘big-endian’ data representation. This means that the lowest register holds the least significant word of the variable. Although most Modbus Masters will support variables that span 2 registers, variables spanning more registers sometimes require you to manually calculate the resulting value.

Variables spanning multiple registers have always to be read / written in 1 single action!

Following example shows how data is represented and how this calculation can be accomplished:

For a total-value of 158928, the following register data has been received by the Modbus master:

PDU Address 566 = 0x0000 = 0
 PDU Address 567 = 0x0002 = 2
 PDU Address 568 = 0x6CD0 = 27856

If we interpret this as a 48 bit unsigned integer value, it's value would be:

0x0000.0002.6CD0 = 158928.

If this value needs to be calculated: $0*65536*65536 + 2*65536 + 27856 = 158928$.

For additional information regarding using your Fluidwell Modbus device, please read the ‘Fluidwell General Modbus Communication Protocol’ and ‘Modbus troubleshooting guide’ that are available through our website or your distributor.

Runtime variables of the N410-P

PDU ADDRESS	REGISTER	VARIABLE	REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 572 h: 0x23C	40573	flow rate	2	R	Uint32	0...9999999, Representation: unit, time, decimals depending on variables d: 109, d: 49, d: 50
d: 566 h: 0x236	40567	total	3	R	uint48	0...9999999999, Representation: unit, decimals depending on variables d: 108, d: 33
d: 560 h: 0x230	40561	accumulated total	3	R	uint48	0...99999999999999, Representation: unit, decimals depending on variables d: 108, d: 33
d: 208 h: 0x0D0	40026	error status	1	R	uint16	Bit field: 0x0001=Display error 0x0002=EEPROM error 0x0004=EEPROM initialization error

Reading flowrate, total or accumulated total: The returned values are given including the decimals and represent the actual value. The given value may differ from the value that is displayed on the display – this is due to the fact that the display is limited in the number of digits and may have a slower update rate set.

For example when two decimals are selected for total and total has a value of 123456,78 the display will show 23456,78 while communication will read a “total” of 12345678 (note that the decimals should be adapted according the setting in “total decimals” which is in this case 2).

For example read var. 566 for total:

Read var. 33 (total decimals) and calculate real value of total by multiplying total with $10^{-(total\ decimals)}$

Clearing total: It is possible to clear the total counter by means of writing a value of 0 to all the 3 registers (total, accumulated total, total decimals) in a single write action. Writing any other value will result in the reply of an error message. It is not possible to write (clear) the accumulated total.

Type

uint16 = 16 bits unsigned integer

uint24 = 24 bits unsigned integer (stored in unit32 with MSB always 0)

uint32 = 32 bits unsigned integer

uint48 = 48 bits unsigned integer

char = 8 bits ASCII character

PDU address

d: nnn = decimal numbering

h: 0xnnn = hexa-decimal numbering

Preset variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 108 h: 0x06C	40033	unit	1	R/W	uint16	0=L 3= l GAL 6=kg 9=lb 1= m ³ 4=FT3 7= ton 2=US GAL 5= BBL 8=US ton
d: 33 h: 0x021	40034	decimals	1	R/W	uint16	0...3
d: 214 h: 0x0D6	40215	Batch minimum	2	R/W	uint24	1...9999999 Representation: 0.000010...9999999
d: 218 h: 0x0DA	40219	Batch maximum	2	R/W	uint24	1...9999999 Representation: 0.000010...9999999
d: 200 h: 0x0C8	40201	Preset value	2	R/W	uint24	1...9999999 Representation: 0.000010...9999999

Overrun variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 194 h: 0x0C2	40195	Overrun enable	1	R/W	uint16	0=disable 1=enable
d: 192 h: 0x0C0	40193	Overrun time	1	R/W	uint16	1...9999 Representation: 0.0001 – 9.999 sec

Flowrate variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 109 h: 0x06D	40033	unit	1	R/W	uint16	0=L 3= l GAL 6=kg 9=lb 1= m ³ 4=FT3 7= ton 2=US GAL 5= BBL 8=US ton
d: 49 h: 0x031	40050	time unit	1	R/W	uint16	0=/sec 1=/min 2=/hr 3=/day
d: 50 h: 0x032	40051	decimals	1	R/W	uint16	0...3
d: 55 h: 0x037	40056	nr. of pulses	1	R/W	uint16	1...255
d: 56 h: 0x038	40057	cut-off	1	R/W	uint16	1...9999 Representation: 0.1 - 999.9 seconds

Alarm variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 68 h: 0x044	40195	no-flow alarm	1	R/W	uint16	0=disable 1=enable
d: 46 h: 0x02E	40193	no-flow time	1	R/W	uint16	1...9999 Representation: 0.0001 – 9.999 sec

Display variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 195 h: 0x0C3	40196	direction	1	R/W	uint16	0=decreasing 1=increasing
d: 58 h: 0x03A	40059	tank	1	R/W	uint16	0=disable 1=enable
d: 67 h: 0x043	40068	backlight	1	R/W	uint16	0=0% 2=40% 4=80% 1=20% 3=60% 5=100%
d: 110 h: 0x06E	40111	backlight dimmed	1	R/W	uint16	0=0% 2=40% 4=80% 1=20% 3=60% 5=100%

Flowmeter variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 96 h: 0x060	40097	flowmeter signal	1	R/W	uint16	0=NPN 3=Reed LP 6=NAMUR 9=active 1=NPN LP 4=PNP 7=coil hi 2=Reed 5=PNP LP 8= coil lo
d: 224 h: 0x0E0	40225	unit	1	R/W	uint16	0=L 3= l GAL 6=kg 9=lb 1= m ³ 4=FT3 7= ton 2=US GAL 5= BBL 8=US ton
d: 227 h: 0x0E3	40228	k-factor	1	R/W	uint16	1...9999999 Representation: 0.000010...9999999

Control variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 85 h: 0x055	40086	Relay 2	1	R/W	uint16	0=disabled 2=preclose 4= impulse 1=batch 3= alarm
d: 86 h: 0x056	40087	Transistor1	1	R/W	uint16	0=disabled 2=preclose 4= impulse 1=batch 3= alarm
d: 197 h: 0x0C5	40198	preclose	2	R/W	uint16	1...9999999 Representation: 0.000010...9999999
d: 128 h: 0x080	40129	width	1	R/W	uint16	0...9999 Representation: 0.001 – 9.999 sec
d: 133 h: 0x085	40134	decimals	1	R/W	uint16	0...3
d: 130 h: 0x082	40131	quantity decimals	2	R/W	uint24	1...9999999 Representation: 0.000010...9999999
d: 134 h: 0x086	40135	source	2	R/W	uint24	0=acc. total 1=batch total

Communication variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 144 h: 0x090	40145	speed (Baudrate)	1	R/W	uint16	0=1200 2=4800 4=9600HP 6=38400 1=2400 3=9600 5=19200
d: 145 h: 0x091	40146	Modbus address	1	R/W	uint16	1...247
d: 146 h: 0x092	40147	Modbus mode	1	R/W	uint16	0=off 1=RTU 2=ASCII
d: 1271 h: 0x4F7	41272	Data bits	1	R/W	uint16	0=7 bits 1=8 bit
d: 1272 h: 0x4F8	41273	Parity	1	R/W	uint16	0=none 1=even 2=odd

Others variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 160 h: 0x0A0	40161	model number	1	R	uint16	0...9999
d: 173 h: 0x0AD	40174	model suffix	1	R	char	Representation: ASCII character
d: 162 h: 0x0A2	40163	firmware version	2	R	uint32	0...999999 Representation: xx.xx.xx
d: 165 h: 0x0A5	40166	serial no	2	R	uint32	0...9999999 Representation: xxxxxxx
d: 168 h: 0x0A8	40169	Password	1	R	uint16	0...9999
d: 139 h: 0x08B	40140	keyboard lock	1	R/W	uint16	0=off 2=hold 4=control 1=start 3=preset 5=all
d: 170 h: 0x0AA	40171	tag no	2	R/W	uint32	0...9999999 Representation: xxxxxxx

Other communication variables

PDU ADDRESS	REGISTER	VARIABLE COMMUNICATION - BATCH	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
d: 221d h: 0x0DD	40224	batch mode	1	r	uint16	1=batch running 3=batch finished 2=batch pause 8= batch in overrun time
d: 154 h: 9A	40155	Batch key-lock	2	r/w	Uin32	Range (hex): 0000..FFFF steps of 0.1 second
d: 156 h: 9C	40155	Batch key-lock	1	r/w	Uin16	Bit filed (hex): Key 1: 0x01 Key 2: 0x02 Key 3: 0x04
d: 157d h: 0x09D	40158	batch command				1= start 3=stop 2 = pause 4=release A start command is only accepted after a release command.

APPENDIX D: DECLARATION OF CONFORMITY



Count on us.

EU Declaration of Conformity

Fluidwell N-series indicators

Veghel, June 2017

We, Fluidwell BV, declare under our sole responsibility that the N-series indicators are designed and will operate conform the following applicable European Directives and Harmonised Standards, when installed and operated according to the related manual:

EMC Directive	2014/30/EU	EN61000-6-2:2005; EN61000-6-3:2007; EN61326-1:2013
RoHS Directive	2011/65/EU	EN 50581:2012
Low Voltage Directive	2014/35/EU	EN61010-1:2010

Last two digits of the year in which the CE marking was affixed: 14.

Fluidwell BV

I. Meij, Manager Technology

Fluidwell BV are ISO9001 certified by DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, The Netherlands.

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LIST OF CONFIGURATION SETTINGS			
SETTING	DEFAULT	DATE :	DATE :
1. – PRESET	Enter your settings here		
1.1 unit	L		
1.2 decimals	0000000		
1.3 minimum batch	0 L		
1.4 maximum batch	0 L		
1.5 preset	0 L		
2. – OVERRUN			
2.1 overrun	disabled		
2.2 time	1.0 sec		
3. – FLOWRATE			
3.1 unit	L		
3.2 time	/min		
3.3 decimals	0000000		
3.4 calculation	10 pulses		
3.5 cut-off	30.0 sec		
4. – ALARM			
4.1 no-flow	disabled		
4.2 flowrate time	10.0 sec		
5. – DISPLAY			
5.1 display	increase		
5.2 tank	enabled		
5.3 light	100%		
5.4 dimmer	100%		
6. – FLOWMETER			
6.1 signal	Coil lo		
6.2 unit	L		
6.3 K-factor	0000001		
7. – CONTROL			
7.1 batch relay 2	Batch		
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8.2 address	1		
8.3 mode	Bus-RTU		
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9.1 model	N410-P	N410-P	N410-P
9.2 sw-vers	03.06.nn		
9.3 serial no.	-----	-----	-----
9.4 password	0000		
9.5 keylock	Off		
9.6 tag-nr	0000000		

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