

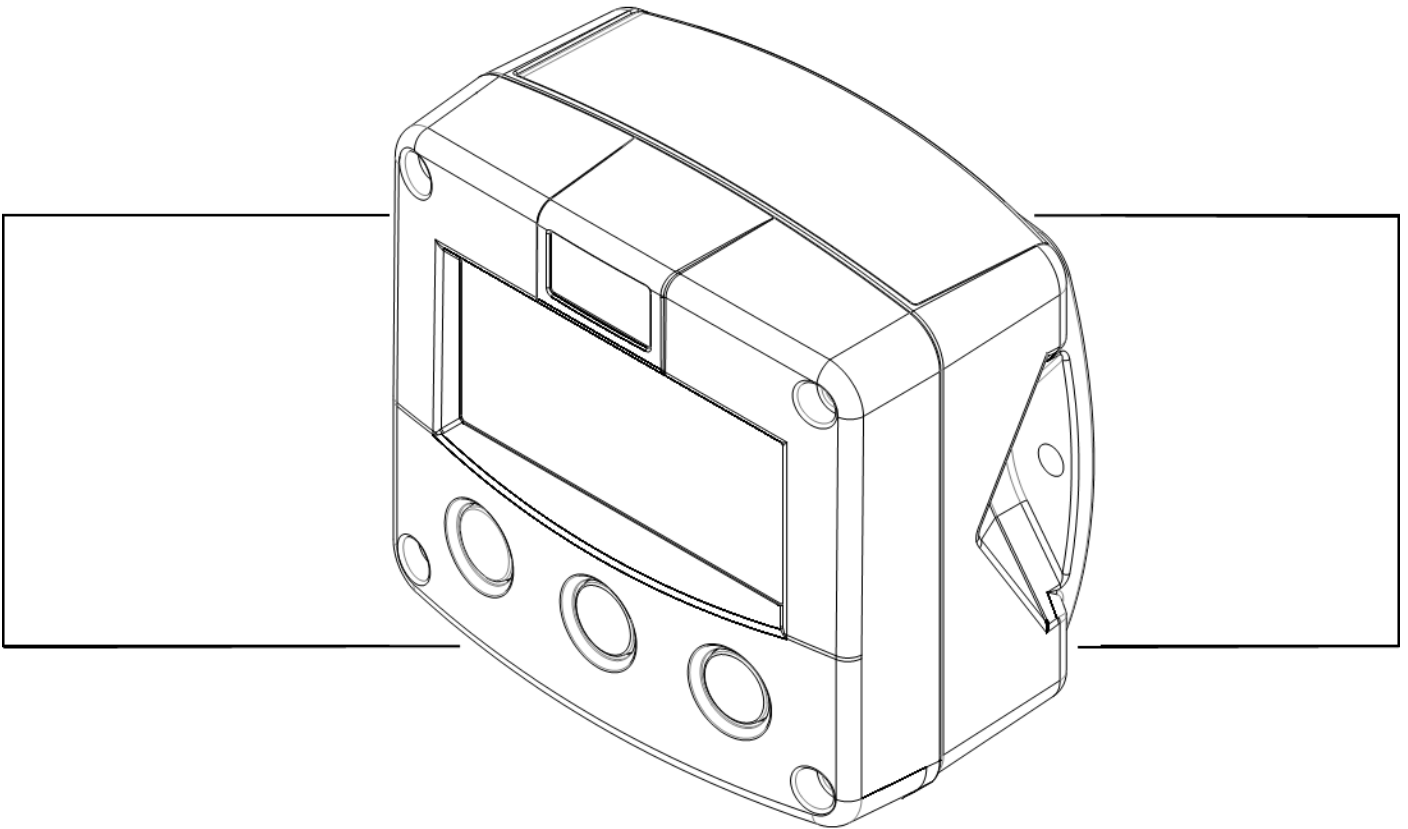
Manual

Your success counts

**RED SEAL
MEASUREMENT**

Neptune E6000

***DISPENSER WITH TICKET PRINTER DRIVER,
linearization, temperature compensation,
control inputs and digital outputs***



Signal input flowmeter: pulse and coil

Signal input temperature: PT100 2- or 3-wire or static value

Signal inputs remote control: Start, stop, print and line selection

Signal outputs: Pump and valve control outputs, pulse retransmission and scaled pulse reflecting total.

Hazardous area: Class I, Division 2, Groups A, B, C, D T5

Custody transfer: NTEP Approval to NIST Handbook 44, NCWM Publication 14



SAFETY INSTRUCTIONS



- Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.
- **LIFE SUPPORT APPLICATIONS:** The Neptune E6000 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.
- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.
- This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).
- Connect a proper grounding to the metal enclosure as indicated in the manual.
The Protective Earth (PE) wire may never be disconnected or removed.

DISPOSAL OF ELECTRONIC WASTE



- The WEEE Directive requires the recycling of disposed electrical and electronic equipment in the European Union. When the WEEE Directive does 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 wheeled bin symbol as illustrated and found on our products tells that this product shall not be disposed of into the general waste system or into a landfill.
- At the end of its life, equipment shall be disposed of according to the local regulations regarding waste of the electrical and the electronic equipment.
- Please contact your local dealer, national distributor or the manufacturer's Technical helpdesk for information on the product disposal.

SAFETY RULES AND PRECAUTIONARY MEASURES

- The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions, instructions and procedures as described in this manual are not followed.
- Modifications of the Neptune E6000 implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- 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 Neptune E6000 supplied.
- Open the enclosure 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 the classification of the enclosure (see manufacture's plate and chapter 4).
- If the operator detects errors or dangers, or disagrees with the safety precautions taken, he must inform the owner or principal responsible.
- The local labor and safety laws and regulations must be adhered to.

ABOUT THE OPERATION MANUAL

This operation manual is divided into two main sections:

- The daily use of the Neptune E6000 is described in chapter 2 "Operational". 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 Neptune E6000 as well as most of the options available. For additional information, please contact your supplier.

A hazardous situation may occur if the Neptune E6000 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 Neptune E6000 or connected instruments.



A "**caution !**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the Neptune E6000 or connected instruments



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.

WARRANTY AND TECHNICAL SUPPORT

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

MODEL REFERENCE

Throughout this manual, several options and types are indicated by configuration codes such as **PX** and **HU**. The **Red Seal Measurement** model **Neptune E6000** is based on the Fluidwell F1-Series product range and is currently available in the following configuration:

Model	Default configuration
Neptune E6000	F100-P-CB-HAU-IR-OT-PB-PX-TP-XN-ZB

Please use the configuration code to review the CSA certificate and select the appropriate control drawing.

Hardware version : 03.02.05 / 03.52.xx
 Software version : 03.09.01
 Manual : RS_RSM1331-XN-M_v2005_01_EN.docx
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1 INTRODUCTION

1.1 SYSTEM DESCRIPTION OF THE NEPTUNE E6000

Functions and features

The flow rate / totalizer, model Neptune E6000 is a microprocessor driven instrument designed to measure and control a fuel delivery. For this purpose, the Neptune E6000 is capable of printing a delivery ticket, storing a number of past deliveries and controlling pump and valve outputs. Furthermore, the product features several control inputs, linearization of the flowmeters flow curve and registration of total and accumulated total.

This product has been designed with a focus on:

- Suitable for legally relevant transactions:
NTEP certified according NIST Handbook 44 and NCWM Publication 14.
- Suitable for use in hazardous area (type XN):
Non-Incendive for use in Class I, Division 2, Groups A, B, C, D T5 for use in Canada and the US.
- Provide the operator (the customer) with a simple to use instrument.
- Several mounting possibilities with aluminum, stainless steel or plastic enclosures for harsh industrial surroundings.
- Ability to process various types of flowmeter signals.
- Transmitting possibilities with pulse and printer or Modbus outputs.

Flowmeter input

This manual describes the Neptune E6000 with a pulse type input from the flowmeter.

One flowmeter with a passive or active pulse or coil signal output can be connected to the Neptune E6000.

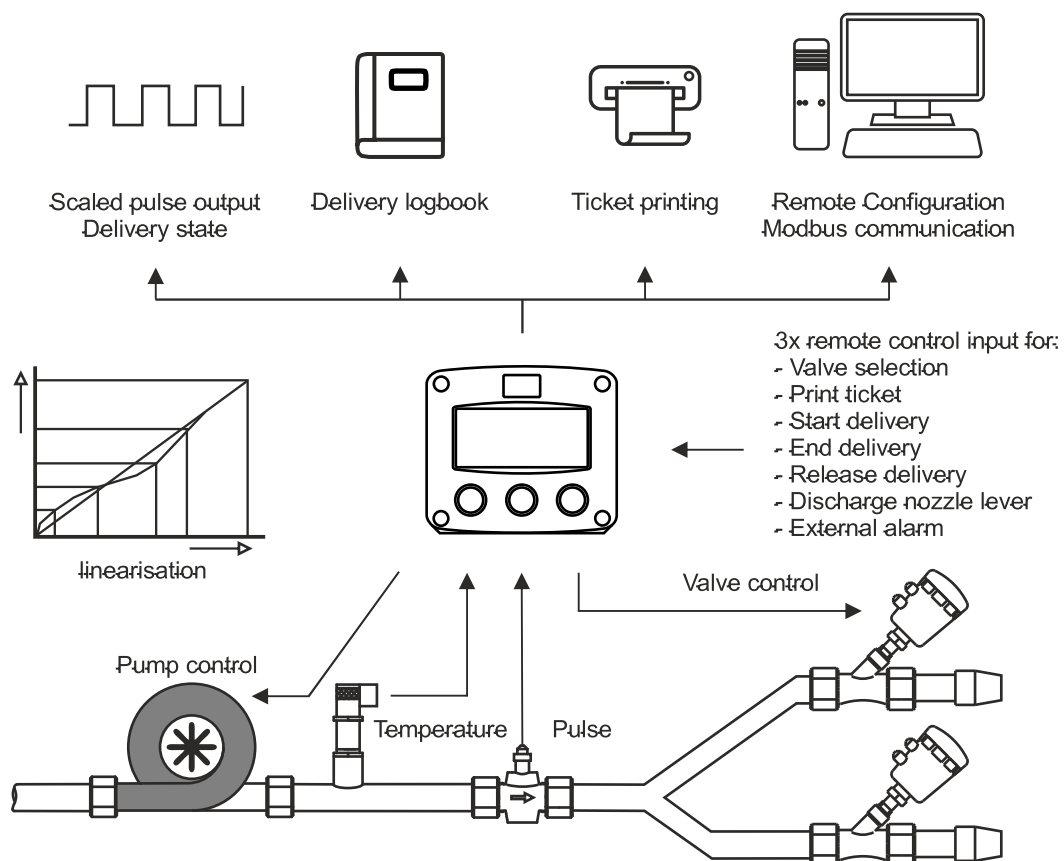


Fig. 1: Typical application for the Neptune E6000

Standard inputs and outputs

- Temperature sensor input for connecting a 2- or 3-wire PT100 element (RTD).
- Three configurable control inputs to either:
 - Print a delivery ticket
 - Start a delivery
 - Stop a delivery
 - Release delivery
 - Valve-selection for automatic delivery line selection
 - Discharge nozzle lever detection
 - External alarm
- Three configurable digital outputs for:
 - Pump and valve control
 - Delivery state (delivery busy, waiting for release)
 - Configurable pulse output to transmit pulses representing a certain linearized total quantity.
 - Unscaled frequency output for retransmission of the incoming pulses as square wave forms.
- Communications port to either support ticket printing or Modbus interface.
Additionally, the port can also be used to configure the unit.

Configuration

The Neptune E6000 has been designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure your Neptune E6000 according to your specific requirements. It includes several important features, such as K-Factor, measurement units, signal selection etc. All settings are stored in an EEPROM memory and will not be lost in the event of a power failure. To lock the configuration, a Weights and Measures (W&M) switch is available inside the enclosure. When disabled, the display indicates 'CONFIG MODE' to point out to the operator that the system is not ready to perform valid deliveries.

Backup battery

To guarantee that all delivery data is stored correctly in the event of a power failure, an optional backup battery can be installed (recommended). In the event of a power failure, the display automatically switches to running on the backup battery, and ends the running delivery. The display then enters a low power state where no deliveries are possible anymore, all inputs are ignored and outputs aren't activated. See paragraph 2.6 for more information.

When a backup battery is not available, a small coin cell battery is present to maintain the real time clock.

Display information

The Neptune E6000 has a large LCD with various symbols and digits to display measurement units, status information and key-word messages. All delivery information is stored in a logbook record when it becomes available. A number of deliveries can be reviewed on the display and tickets can be reprinted. A backup of all totals and grand total in EEPROM memory is made every minute.

Backlight

A backlight is available as an option (Type -ZB). The intensity can be set as desired. Furthermore, for situations where the system runs on an external battery (e.g. a truck) the backlight can be configured to switch off automatically to preserve power.



Note !

*To use the backlight, the unit must be powered externally.
When running on backup battery power, the backlight will not work.*

Options

Various other options are available. Please contact your supplier for more details.

1.2 MAKING DELIVERIES

Deliveries can be made using the START and STOP buttons on the control panel when the display is in idle mode. Alternatively, a START command can be given using one of the control inputs or the Modbus interface. When a delivery is started, the unit first performs a display test and activates the control outputs to start a pump and open valves. During the delivery all pulses coming from the flowmeter are registered and the display shows the total quantity that has been dispensed so far. When the delivery is finished, a delivery ticket can be printed and a delivery record is stored in the delivery logbook.

Please consult paragraph 2.3 for a more detailed description of the delivery process and operator interaction.

1.3 TICKET PRINTING

The Neptune E6000 is equipped with a ticket printing feature. After each delivery a ticket can be printed, either automatically or on demand using the control panel or control inputs. Alternatively, tickets can also be

(re)printed from the logbook. The delivery ticket shows delivery data such as a header, quantity, starting time of the delivery and other delivery details. The first time the ticket of is printed, the original delivery ticket is printed. The second and following times, the same ticket is printed with the indication **** DUPLICATE **** on it.



*To print tickets, the communications mode must be configured as Printer.
When the mode is set for Modbus communication, printing is not available.*

The delivery ticket uses lines with a width of 20 characters and has the following layout. Please see SETUP-menu 11 for various settings to configure the content of the ticket.

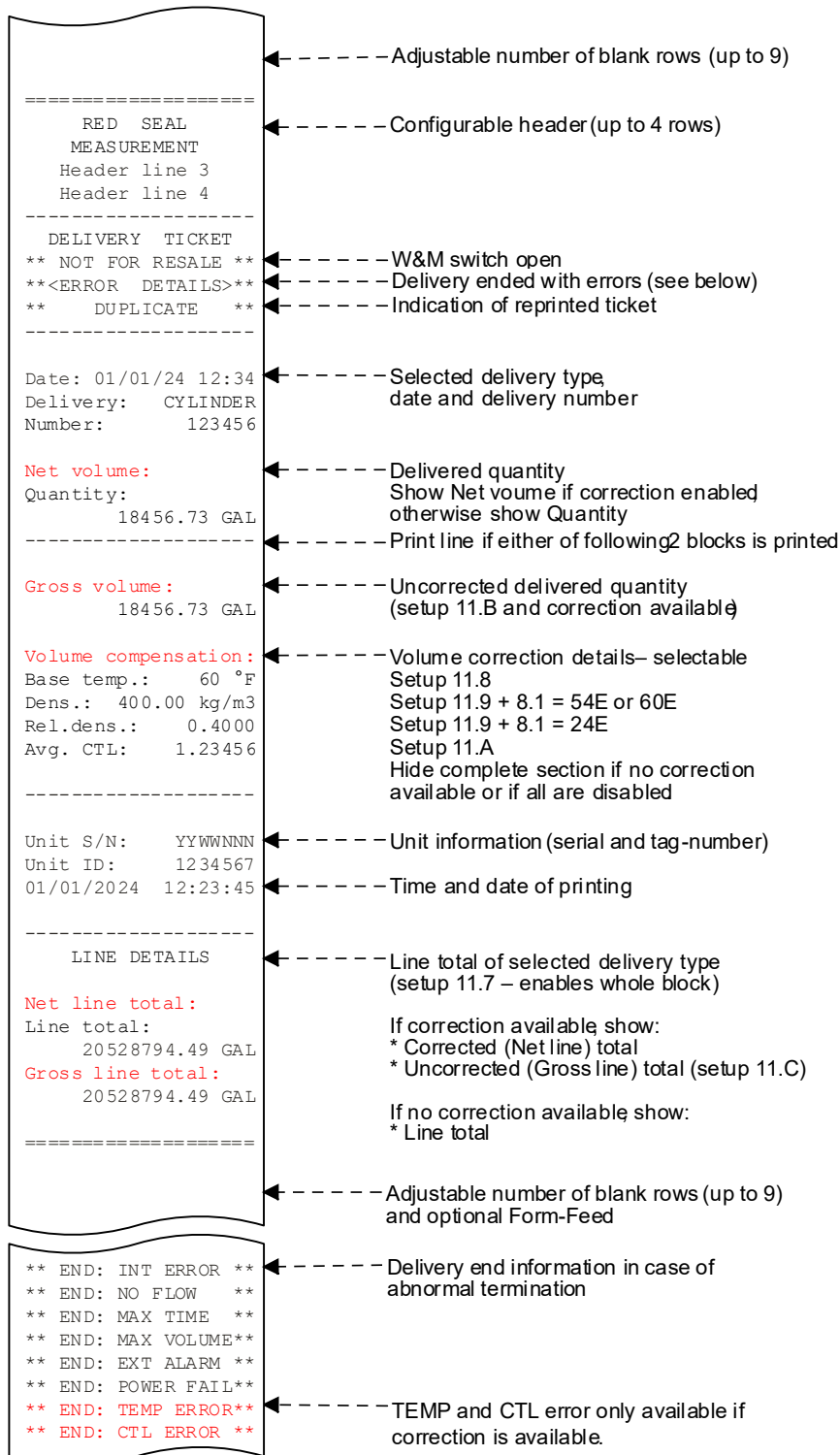


Fig. 2: Delivery ticket example



*The same delivery ticket can be printed again as long as no other delivery is started.
After a ticket is printed for the first time, a reprint of the ticket will indicate 'DUPLICATE'.*

2 OPERATIONAL

2.1 GENERAL INFORMATION

This chapter describes the daily use of the Neptune E6000. This instruction is meant for users / operators.

By default, the Neptune E6000 will act at Operator level. Signals generated by the connected flowmeter are measured by the Neptune E6000 in the background and the measured volume (if any) is added to the grand total. If a delivery is active, the measured volume is also added to the quantity of the current delivery and added to the (selected) delivery line total.



Caution !

- The Neptune E6000 may only be operated by (or under supervision of) personnel who are authorized and trained by the operator of the facility. 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.

2.2 CONTROL PANEL

The control panel has three keys. The following keys are available:

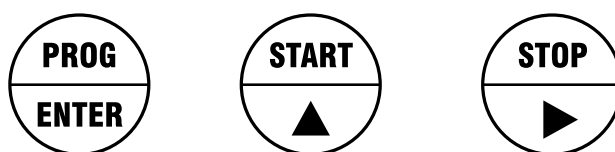


Fig. 3: Control panel

Functions of the keys



PROG-key

This key is used to print a ticket for the current delivery or a delivery record in the submenu. The PROG-key is also used to gain access to SETUP-level; please read chapter 3.



START-key

This key is used to START a delivery; also used to navigate the submenu.



STOP-key

This key is used to PAUSE and STOP a delivery; also used to enter and navigate the submenu.

2.3 DELIVERIES

During normal operation, the Neptune E6000 remains in idle state, waiting for a command to start a delivery. When performing a delivery, the current delivery status is indicated with (flashing) flags, as shown in the table below. Each delivery state is explained in more detail in the following paragraphs with an emphasis on operating the device using the control panel.

READY	State 1:	Waiting for a new delivery. Details from the last delivery are shown.
—	State 2:	Waiting for the Operator to select the delivery line.
RUN HOLD READY	State 3:	Delivery is being started and a display test is performed.
RUN	State 4:	Delivery is being started, waiting for pump to start.
RUN	State 5:	Delivery has started and product is being delivered.
HOLD	State 6:	Delivery is being paused and waiting for valve to close.
HOLD	State 6:	Delivery is paused.
HOLD	State 7:	Delivery is being ended and waiting for valve to close.
READY	State 8:	Delivery is finished and details are shown.
—	State 9:	Waiting for the Operator to start (re)printing the delivery ticket.
—	State 10:	Delivery ticket is being printed.

Note: A flashing flag indicates the display is waiting for an activity to end and no user interaction is possible.



Note !

When using the Modbus interface, the following commands are available to control deliveries:

Start, Start line 1, Start line 2, Stop, Release.

In general, these start and stop commands are functional if the command could also be given from the control panel. The release command is used to release the device for the following delivery.



Note !

This product is fitted with a 'Weights and Measures' switch (see paragraph 4.3.4) to put the display in configuration mode. When the configuration mode is enabled and the display operates at operator level, this is indicated on the screen by the text 'CONFIG MODE'.

2.3.1 STATE 1: IDLE

When no delivery is active, the display shows the delivery idle screen:

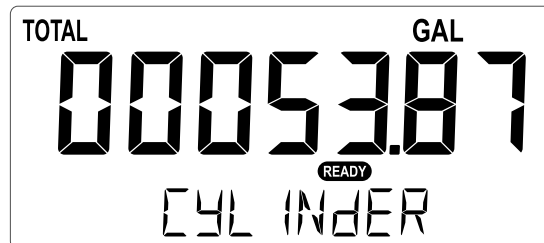


Fig. 4: Example of delivery idle screen

The top line shows the **TOTAL** flag, last delivered quantity (fixed) and measurement unit (**53.87 GAL**).

The bottom line shows the delivered product or selected delivery line (**CYLINDER**) and the finished state of the delivery (**READY**). The following functions are available from the control panel:



Print a ticket for the last delivery.

The print prompt screen will be shown (state 9).



Start a new delivery.

The delivery is started (state 3) or the delivery line select screen is shown (state 2).



No function.

(See paragraph 2.4 for instructions on how to enter the submenu with this key.)



Note !

A new delivery can only be started when:

- No errors are present.
- External power is supplied.
- All remote control inputs configured with the STOP function are inactive.
- No external alarm is given via the remote control inputs.
- If the release feature is enabled (see state 11): a release command has been given first.

2.3.2 STATE 2: LINE SELECTION

When the unit is configured to support two delivery lines (see SETUP 2.2), the operator needs to select the line using the control panel or a remote switch (see SETUP 6.1). To select the delivery line via the control panel, the following screen is shown:



Fig. 5: Example of delivery line select screen

The configurable short texts above the START and STOP buttons indicate selections for delivered product or delivery line (see SETUP 2.3 and 2.4). The following functions are available from the control panel:



Cancel the operation and return to delivery idle status (state 1).



Select delivery line 1 (**CYL**) and start the delivery (state 3).



Select delivery line 2 (**AUTO**) and start the delivery (state 3).

2.3.3 STATE 3: DISPLAY TEST

When the delivery is started, the control output for the pump is activated (see SETUP 9.1-3) and a short display test is performed to show the operator the display is working correctly:

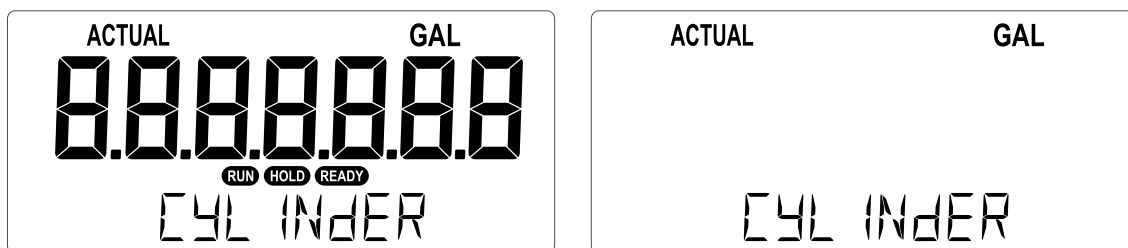


Fig. 6: Example of display test screens

During the display test, the (selected) product or delivery line is indicated on the bottom line and interaction using the control panel is not possible. After the display test the delivery start screen is shown (state 4).

2.3.4 STATE 4: DELIVERY START

After the display test, the delivery starts with a quantity of zero before the valve is opened. This is shown on the delivery start screen:

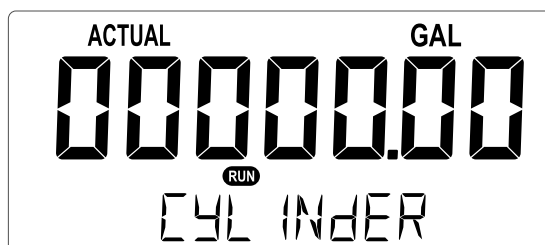


Fig. 7: Example of delivery start screen

On the delivery start screen, the (selected) product or delivery line is indicated on the bottom line and a cleared totalizer with **ACTUAL** flag and measuring unit is shown. The **RUN** flag indicates the delivery has started. If an additional pump start delay time is configured (see SETUP 2.8), the delivery start screen will be shown for the duration of the delay time with a blinking **RUN** flag.

As long as the delivery start screen is showing, the valves remain closed and no interaction using the control panel is possible. After this period the display continues in state 5.

2.3.5 STATE 5: DELIVERY ACTIVE

When the display test and optional pump start delay are finished, the control output for the (selected delivery line) valve is activated (see SETUP 9.1-3), the display shows the delivery active screen and delivery of the product begins:

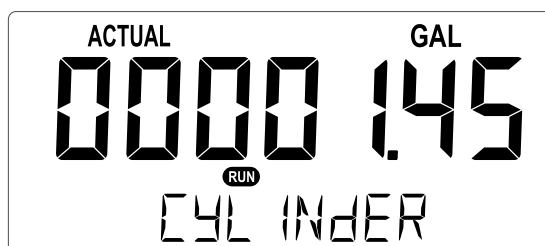


Fig. 8: Example of delivery active screen

The top line shows the **ACTUAL** flag, delivered quantity (running) and measurement unit (**1.45 GAL**). The bottom line shows the delivered product or (selected) delivery line (**CYLINDER**) and the active state of the delivery (**RUN**). The following functions are available from the control panel:



No function.



No function.



Interrupt the delivery.

If the pause-state is enabled (SETUP 2.7), the delivery is paused (state 6). Otherwise, the delivery is closed (state 7).

2.3.6 STATE 6: DELIVERY PAUSED

When a delivery is paused (see SETUP 2.7), the pump remains on but the valve is closed and the delivery paused screen is shown:

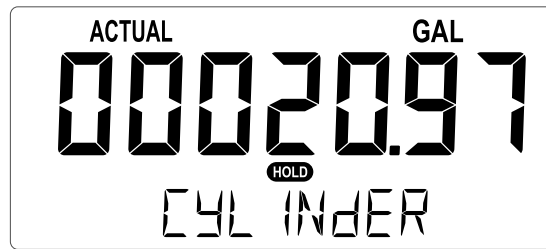


Fig. 9: Example of delivery paused screen

The top line shows the **ACTUAL** flag, delivered quantity (running) and measurement unit (**20.97 GAL**). The bottom line shows the delivered product or (selected) delivery line (**CYLINDER**). The paused state of the delivery is indicated by the **HOLD** flag. If the **HOLD** flag is blinking, it means the valve is still in the process of closing. During the valve delay time (see SETUP 2.9) the delivered quantity is still expected to increase until the valve is completely closed. The following functions are available from the control panel:



No function.



Resume the delivery.
The display returns to the delivery active screen (state 5) and the valve is re-opened.



End the delivery.
The display continues with the delivery closing screen (state 7).

2.3.7 STATE 7: DELIVERY CLOSING

Before a delivery can be ended, the valve has to be closed completely. If the valve has not yet been closed completely (by pausing the delivery, state 6), the display shows the delivery closing screen which is identical to delivery paused screen:

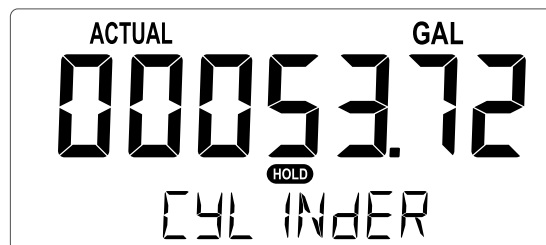


Fig. 10: Example of delivery closing screen

The top line shows the **ACTUAL** flag, delivered quantity (running) and measurement unit (**53.72 GAL**). The bottom line shows the delivered product or (selected) delivery line (**CYLINDER**) and the closing state of the delivery (flashing **HOLD** flag). The closing state continues for the duration of the valve delay time (see SETUP 2.9) and the delivered quantity is still expected to increase until the valve is completely closed. After this, the screen automatically changes to the delivery ended screen. When the delivery closing screen is showing, no interaction using the control panel is possible.

2.3.8 STATE 8: DELIVERY ENDED

When a delivery is ended, it means the valve has been closed, the pump has been turned off and the delivered quantity cannot be changed anymore. The display shows the final delivery result for the duration of the delivery ended time (see SETUP 2.A), before continuing with printing a ticket (see SETUP 11.5) or returning the installation to the delivery idle state, ready to perform a new delivery.

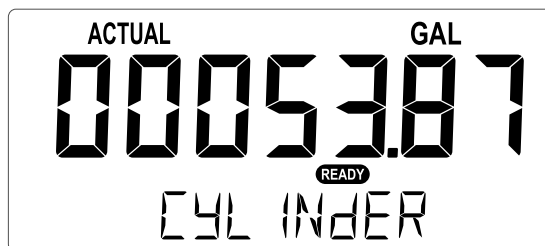


Fig. 11: Example of delivery ended screen

The top line shows the **ACTUAL** flag, delivered quantity (fixed) and measurement unit (**53.87 GAL**). The bottom line shows the delivered product or (selected) delivery line (**CYLINDER**) and the ended state of the delivery is indicated by the flashing **READY** flag.

When the delivery ended screen is showing, no interaction using the control panel is possible.

2.3.9 STATE 9: PRINT PROMPT AND REPRINT PROMPT

When a ticket is about to be printed for the first time, the operator can be asked to confirm the print job by showing the print prompt screen. When the initial ticket was already printed for this delivery, the reprint prompt screen appears.

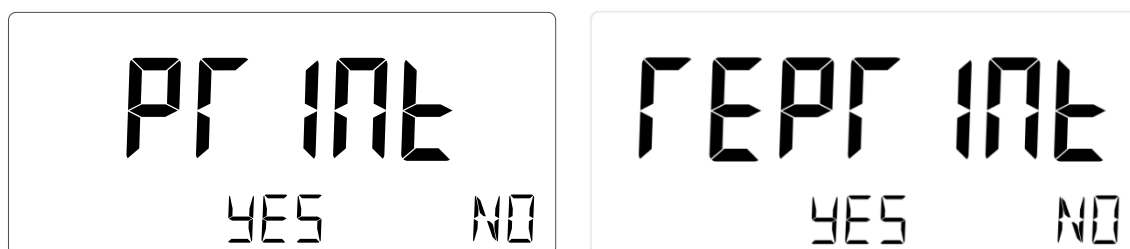


Fig. 12: Example of print (l) and reprint (r) prompt screen

The following functions are available from the control panel:



No function.



Selects YES and starts printing the delivery ticket.
During printing, the display shows the print active screen.



Selects NO and cancels printing the delivery ticket.
The installation is returned to the delivery idle state, ready to perform a new delivery.

Printing a delivery ticket automatically after a delivery

When a delivery is ended, a delivery ticket can be printed (see SETUP 11.5) automatically (printing starts immediately) or after confirmation by the operator. In the latter case, the display shows the print prompt screen until the operator makes a selection.

Printing a duplicate delivery ticket

When the automatic print job after a delivery (see SETUP 11.5) is finished and the reprint function is enabled (see SETUP 11.6), the display returns to the print prompt screen to ask the operator if he wants to print a duplicate of the same ticket. The reprint prompt screen will only be shown for the configured amount of time; after that, the installation is returned to the delivery idle state, ready to perform a new delivery.

Printing a delivery ticket manually

If a printing action was started manually from the delivery idle screen, the print or reprint prompt screen is shown. After confirmation, the ticket for the last made delivery will be (re)printed. The installation will always return to the delivery idle state when printing is finished or cancelled.

2.3.10 STATE 10: PRINTING ACTIVE

When the actual printing is being executed, the printing screen is shown:



Fig. 13: Example of print active screen

Depending on how the print job was started (SETUP 11.5 and 11.6), when it finishes the display will either show the print prompt screen to print again or return to the delivery idle state, ready to perform a new delivery. When the printing active screen is showing, no interaction using the control panel is possible.

2.3.11 STATE 11: RELEASE

If the release feature is enabled (see SETUP 2.F), a new delivery cannot be started until a release command is given using a control input or the Modbus interface. The release feature can be used to prevent unauthorized deliveries from the system or to guarantee that the last delivery is completely finished (for example by reading out all data or receiving payment).

After startup, power failure or removal of an external alarm, a release command must always be given (if the release feature is enabled) before new deliveries can be made.

The release state can be made visible by assigning the function to one of the relay outputs, and by reading the device state with the Modbus interface.

2.4 SUBMENU

To provide the operator with additional information, a submenu, which can be password protected (see SETUP 3.1), is available at operator level. The submenu can be reached when the delivery idle screen is shown by pressing the STOP button for more than 3 seconds.

The submenu contains 2 groups with following selections (quite similar to the SETUP menu):

GROUP: TOTAL		DESCRIPTION
1	Line 1 Total	The accumulated quantity of all deliveries performed on delivery line 1. This total cannot be reset to zero.
2	Line 2 Total	The accumulated quantity of all deliveries performed on delivery line 2. This total cannot be reset to zero.
3	Grand Total	The accumulated total quantity that was registered from the flowmeter, independent of any delivery. This total cannot be reset to zero.
4	Base Temperature	Used base temperature based on the selected formula. Only available when enabled in SETUP 3.2.
5	Actual Temperature	Currently measured temperature or set static temperature. Only available when enabled in SETUP 3.3
6	Actual CTL	Currently calculated temperature correction factor. Only available when enabled in SETUP 3.4
7	Uncorrected Line 1 Total	The uncorrected accumulated quantity of all deliveries performed on delivery line 1. This total cannot be reset to zero. Only available when enabled in SETUP 3.5
8	Uncorrected Line 2 Total	The uncorrected accumulated quantity of all deliveries performed on delivery line 2. This total cannot be reset to zero. Only available when enabled in SETUP 3.5
9	Uncorrected Grand Total	The uncorrected accumulated quantity that was registered from the flowmeter, independent of any delivery. This total cannot be reset to zero. Only available when enabled in SETUP 3.5
10	Time + Date	The actual time and date used for deliveries and printing. The time is shown in 24 hour format, the date is displayed using setting SETUP 10.A.
11	Error screen	Displays the current error status of the device. See paragraph 2.5. Only available when an error is present.

GROUP: DELIVERY		DESCRIPTION
LOG 1.A	Delivery number + quantity	Details of the most recently made delivery. When a new delivery is made, this record moves to position 2.
LOG 1.B	Delivery line + time/date	
LOG 1.C	Delivery status	
LOG 1.D	Base temperature + density	
LOG 1.E	Average CTL of delivery + uncorrected quantity	
↑	↑	↑
LOG 63.A...E Delivery information screen		Details of the oldest available delivery. When a new delivery is made, this record will be lost.

Navigating the submenu groups

The following functions are available from the control panel:



Press for 3 seconds to leave the submenu and return to the delivery idle screen.



Press to enter the selected group.



Press to toggle between the groups.

Navigating inside submenu Total



No function.



Selects the next screen in the submenu.



No function.

Navigating inside submenu Delivery



Starts a print job to print a (duplicate) delivery tickets for the selected delivery.



Selects the next (older) delivery record.
Press and hold to scroll forwards through the records.



Selects the next delivery information screen.
Press and hold to scroll backwards through the records.



Note !

*Navigating the submenu works similar to navigating the SETUP menu (see paragraph 3.2.2).
To return to the idle delivery screen, press the PROG button anywhere in the submenu for 3 seconds.*

2.4.1 SUBMENU DELIVERY AND DELIVERY RECORDS

The submenu Delivery is used to look up past deliveries and optionally print a (duplicate) delivery ticket. Every delivery is stored in a logbook, which can hold records for the last 199 deliveries. When new deliveries are performed, the oldest record is automatically deleted. Each delivery record contains the following details:

Record field	Description	More info
Delivery number	Every delivery is given a unique delivery number (increasing order).	SETUP 2.1
Date / Time stamp	Registration of the date and time the delivery was started.	
Selected delivery line	The delivery line that was used to perform the delivery with.	SETUP 2.2
Delivered quantity (corrected)	The total quantity of product that was dispensed during the delivery. The unit and number of decimals are according the settings for Total.	SETUP 1.1 SETUP 1.2
Delivered quantity (uncorrected)	The uncorrected total quantity of product that was dispensed during the delivery. The unit and number of decimals are according the settings for Total.	SETUP 1.1 SETUP 1.2
Base temperature	The temperature to which the quantity is corrected based on the selected formula.	SETUP 8.1 SETUP 8.3
Density, or Relative density	The (relative) density used to calculate the temperature correction factor CTL	SETUP 8.1 SETUP 8.2

Average CTL	The average temperature correction factor CTL for the delivery. This is calculated by dividing the corrected delivered quantity by the uncorrected delivered quantity.	
Delivery status	The state of a delivery is determined at its end. The delivery status can have following values: 0: Successful 1: Maximum delivery time reached 2: Maximum quantity reached 3: No flow detected 4: Power failure 5: External alarm 6: Temperature input error 7: CTL calculation error 8: Internal error occurred 128: Successful [Configuration mode] 129: Maximum delivery time reached [Configuration mode] 130: Maximum quantity reached [Configuration mode] 131: No flow detected [Configuration mode] 132: Power failure [Configuration mode] 133: External alarm [Configuration mode] 134: Temperature input error [Configuration mode] 135: CTL calculation error [Configuration mode] 136: Internal error occurred [Configuration mode]	Par. 2.3 SETUP 2.D SETUP 2.E SETUP 2.B Par. 2.6 SETUP 6 SETUP 7 SETUP 8 App. B Par. 4.3.4
Delivery line total (corrected)	The accumulation of all deliveries performed on this delivery line. Unit and number of decimals are according the settings for Total.	SETUP 1.1 SETUP 1.2
Delivery line total (uncorrected)	The uncorrected accumulation of all deliveries performed on this delivery line. Unit and number of decimals are according the settings for Total.	SETUP 1.1 SETUP 1.2



Note !

- When the logbook is read from the display using the remote configuration tool, the same fields and statuses as shown above are available.
- The delivery logbook can be cleared using the remote configuration tool.

Display of delivery records from logbook

Each of the delivery information screens show the actual record number (1...199) on the bottom of the display (**LOG 199** in below examples). To avoid confusion, only the delivered quantities are shown. To review logged delivery line totals and additional delivery information, please use the remote configuration tool to read all record data.

The first delivery information screen shows the corrected delivered quantity (indicated by the **standard** flag) and the unique delivery number:



Fig. 14: Delivery record – corrected delivered quantity and delivery number

The second delivery information screen shows the used delivery line (1 or 2) at the top left of the display, together with the date and time the delivery was started:



Fig. 15: Delivery record – selected delivery line and time / date of delivery

The third delivery information screen shows the end state of the delivery:

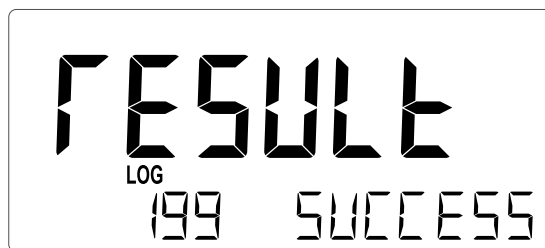


Fig. 16: Delivery record – delivery status successful

Besides successful deliveries, three other kinds of delivery statuses can occur:

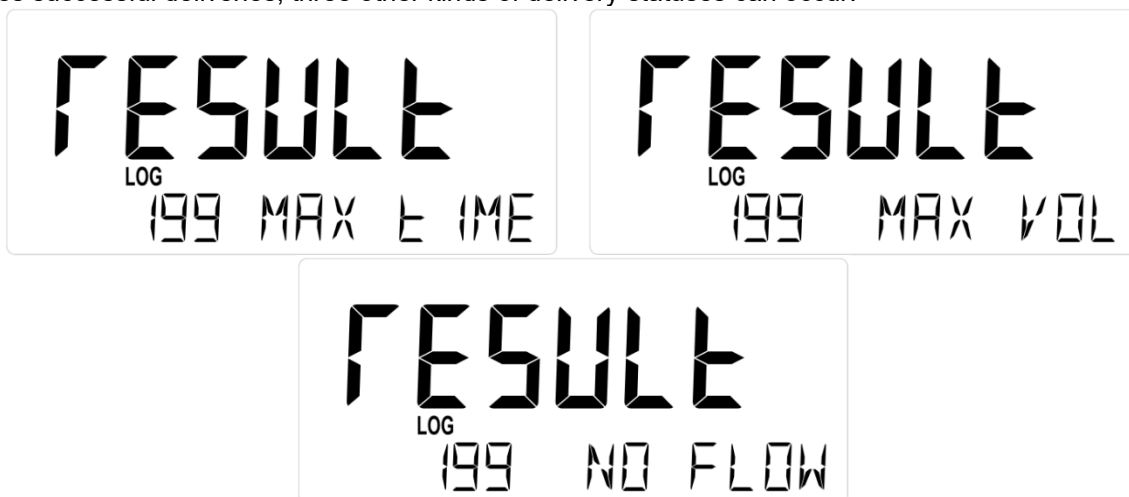


Fig. 17: Delivery record – delivery status without normal ending



Fig. 18: Delivery record – delivery status erroneous

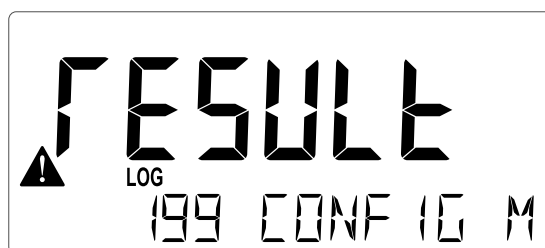


Fig. 19: Delivery record – delivery status invalid due to configuration mode

The fourth delivery information screen shows the base temperature and set (relative) density:

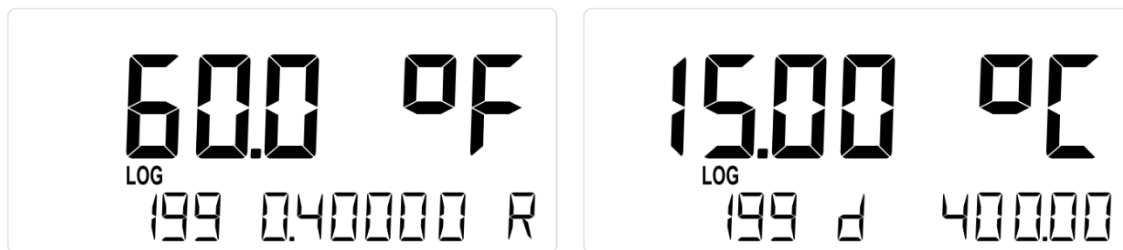


Fig. 20: Delivery record – base temperature and relative density (l) / density (r)

The fifth delivery information screen shows the uncorrected delivered quantity (indicated by the absence of the **standard** flag) and average temperature correction factor CTL:



Fig. 21: Delivery record – uncorrected delivered quantity and average CTL

2.5 OPERATOR ALARMS

Low-battery alarm (Type PB)

When the unit is supplied by battery, the battery voltage drops during operation. When it becomes too low, the battery indicator comes on to indicate that the battery needs to be replaced. Please install a fresh and new battery (as soon as possible) to keep a reliable operation and indication.

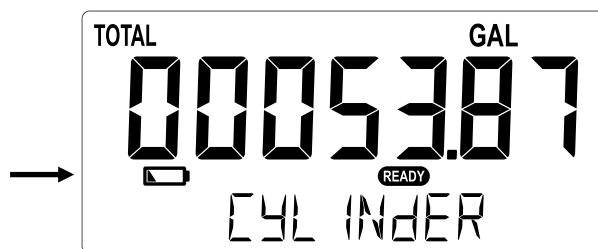


Fig. 22: Example of low-battery alarm

Alarm conditions

When an alarm condition occurs, the alarm-flag is shown on the delivery idle screen and any of the other delivery state screens.

The alarm condition can be raised for several reasons:

- The last delivery has ended with an error. This can be reviewed in the delivery record.
- An external alarm was given on the control inputs.

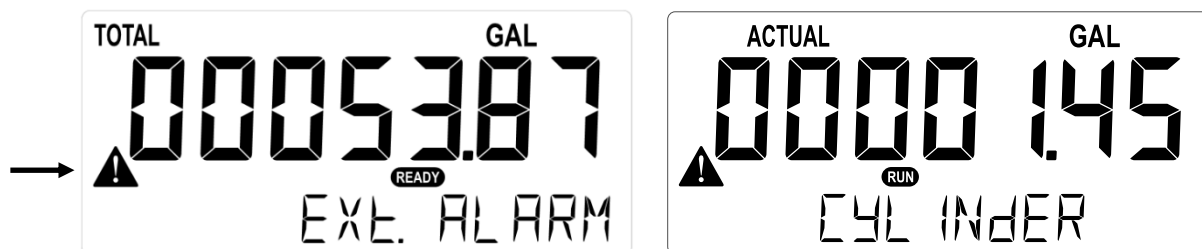


Fig. 23: Example of an alarm condition during idle state (l) and delivery (r)

- The configuration mode is still enabled by the Weights and Measures switch (see paragraph 4.3.4). This is also indicated on the display with the text 'CONFIG MODE':

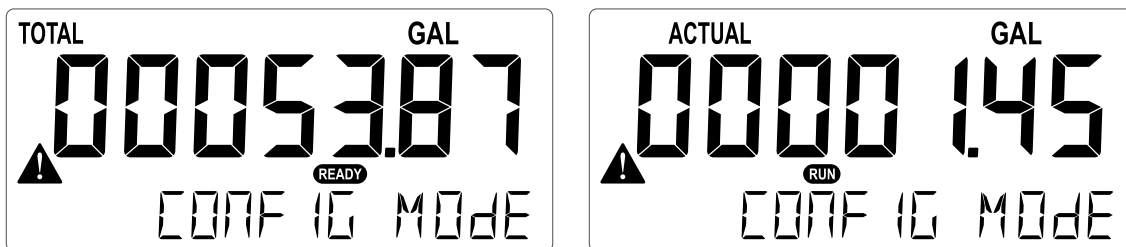


Fig. 24: Example of configuration mode during idle state (l) and during delivery (r)

- An internal error was raised and the alarm code should be reviewed. To review the alarm code, gain access to the submenu, enter the group Total and scroll to the error screen using the START button. If this screen is not available or shows 'NO ERROR', no internal error is present and the error is shown for a different reason.

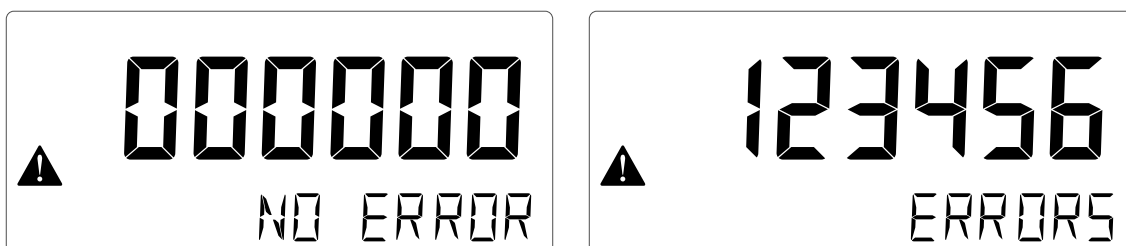


Fig. 25: Example of error screen without errors (l) and with errors present (r)

Please see Appendix B: Problem solving for an explanation of the available internal alarm codes.



- A delivery cannot be started when an internal error or external alarm is present. Also, a delivery is ended immediately if either of the two occurs and the delivery is flagged as erroneous.*
- If a delivery is started with the W&M switch left open or its state was changed during the delivery, the delivery is also flagged as erroneous.*
- If a delivery is started with the W&M switch left open and an internal error occurs, the delivery is not ended immediately to allow the installer to inspect the installation.*
- The state of a delivery can be looked up in the delivery record using the submenu (see paragraph 2.4).*

2.6 BACKUP BATTERY

To guarantee that all delivery data is stored correctly in the event of a power failure, an optional backup battery can be installed (recommended).

In the event of a power failure, the display automatically switches to running on the backup battery and closes and stores the running delivery. The display then enters a low power state where no deliveries are possible anymore, all inputs are ignored and outputs aren't activated.

Furthermore, the display refresh rate (SETUP-menu 3.6) is lowered to preserve battery power. By default, the display refresh rate is set to 'OFF', so the display turns off 30 seconds after the main power was disconnected. At a key press, the display will turn on again and delivery data and totalizer values can be reviewed. Depending on the installation, printing a ticket might also be possible. After 30 seconds of inactivity, the display will turn off again automatically.

When the main power is restored, the display automatically turns back on and normal operation can be resumed. If a delivery ticket still needs to be printed for a closed delivery, this should be done manually first before starting a new delivery. Alternatively, a duplicate delivery ticket can be printed from the delivery record using the submenu (see paragraph 2.4).



- Besides the optional backup battery, a small coin cell is present to preserve time and date in case all power to the unit is removed (e.g. when replacing the backup battery).*
- When a different refresh rate is selected in the configuration, the display does not turn off and the last delivery data remains visible, but the battery will be drained faster.*
- The (optional) backlight will not work when operating on backup battery.*

3 CONFIGURATION

3.1 INTRODUCTION

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

All settings of the Neptune E6000 can be set via the control panel. As an alternative, you can also use the Remote Configuration Software which you can find on our website or through your supplier. Depending on the type of communication interface your device has, you might need a specific communication cable, which is available through your supplier.

3.2 CONFIGURING USING SETUP MODE



Changing the settings of the Neptune E6000 may have an influence on the current operation of the device, even when SETUP-level is still active.

Make sure that the unit is not being used for any application when altering the settings.



Note !

This product is fitted with a 'Weights and Measures' switch (see paragraph 4.3.4) to put the display in configuration mode. When the configuration mode not enabled, attempting to change a protected setting results in the text '- LOCKED -' to be displayed.

Protected settings are indicated with a + in the WM column in below table.

3.2.1 ENTERING SETUP-LEVEL

Configuration of the Neptune E6000 is done at SETUP-level, which can be reached at all times while the Neptune E6000 remains fully operational. At SETUP-level the display will deactivate the **RUN** indicator and activate the **SETUP** indicator.

Use the control panel to access SETUP-level



PROG-key

To enter SETUP-level, press the PROG-key for 7 seconds at OPERATOR-level. During this time, the symbols ▲ ▼ will be displayed.

When SETUP-level is entered, a password might be required to continue. You can enter the password by following the procedure for programming values as shown in following paragraphs.



Note !

A password may be required to enter SETUP.

Without this password access to SETUP is denied.

3.2.2 NAVIGATING THROUGH SETUP-LEVEL

Each function has a unique menu-number, which is displayed below the **SETUP** indicator at the bottom of the display. The menu-number is a combination of two figures, e.g. 1.2. The first number indicates the function-group and the second number indicates the function. Additionally, each function and function-group is expressed with a keyword.

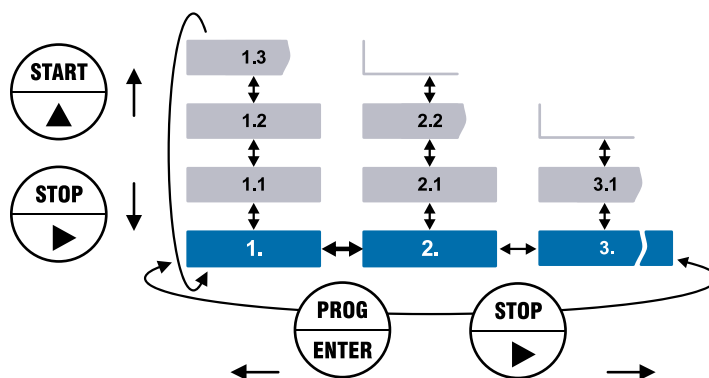


Fig. 26: SETUP matrix structure

Use the control panel to navigate through SETUP-level



PROG-key

When a function is selected, this key is used to start the programming sequence.
When only a function group is selected (and no function), this key is used to scroll back a function group (e.g. 3 → 2 → 1 → 3).



START-key

This key is used to select the next function in the list (e.g. 1 → 1.1 → 1.2 → 1). When the top of the list is reached, it will wrap around and return to the function group selection.



STOP-key

This key is used to select the previous function in the list (e.g. 1.2 → 1.1 → 1 → 2).
When the bottom of the list is reached, it will return to the function group selection.
When only a function group is selected (and no function), this key is used to scroll to the next function group. (e.g. 1 → 2 → 3 → 1).

3.2.3 PROGRAMMING SEQUENCE

After selecting a function at SETUP-level, a new value can be programmed using the control panel. A function either contains a value (a number with optionally a decimal point, e.g. 123.45), a list with items (e.g. Disable – Enable) or a line of text (e.g. ABCDEFGH).

For each function that needs to change, navigate to that function and follow the steps indicated below.
During the programming sequence, the display will deactivate the **SETUP** indicator and activate the **PROGRAM** indicator.



Note !

When programming new values, alterations will only be set after the PROG-key has been pressed to confirm the new value! (STEP 3)

Step 1: Starting the programming sequence



PROG-key

When a function is selected at SETUP-level, this key is used to start the programming sequence.

Step 2a: Changing a value



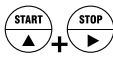
START-key

This key is used to increment the selected digit or to select the next position of the decimal point. When the entered value is out of range, the increase sign ▲ or decrease-sign ▼ will be displayed while you are programming. If this value is confirmed by pressing the PROG-key, the value will be brought within a valid range automatically.



STOP-key

This key is used to select the next digit. If a decimal point can be set, this will be included in the sequence as well (e.g. [decimal point] → digit 1 → digit 2 → digit 3 → [decimal point]).
Note that the selected decimal point is flashing when it can be changed. When no decimal point is selected, all available decimals will be flashing on the display to indicate this when the sequence reaches the decimal point.



START-key + STOP-key

The combination of the START-key and STOP-key is used to select a negative value. When a value can also be entered as a negative number, pressing the START-key and STOP-key simultaneously will toggle the '-' (minus) sign on and off.

Step 2b: Changing the selected item in a list



START-key

This key is used to select the next item in the list (e.g. Disable → Enable).
At the end of the list, the selection will wrap around to the first selection.



STOP-key

This key is used to select the previous item in the list (e.g. Enable → Disable).
At the bottom of the list, the selection will wrap around to the last selection.

Step 2c: Changing a line of text**START-key**

This key is used to scroll through the list of available characters. The following character set is available through the control panel: ", *, –, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z

When a line of text is programmed via the Remote Configuration Software, a larger character set with ASCII codes 32 through 127 is available. When an character is programmed that cannot be shown on the display, that character is indicated by turning all segments on. When the character is changed by pressing the SELECT-key, it will return to the character set indicated above and the original character is lost.

**STOP-key**

This key is used to select the next character. When the end of the line is reached, the selection will wrap around to the first character (e.g. character 1 → character 2 → character 3 → character 4 → character 1).

The currently selected character will be flashing; when the selected character represents a space, it will alternate with an _ (underscore).



Note !

- Since the LCD is not suitable to display all characters, a character that cannot be shown is indicated on the LCD with all segments turned on (resembling the number 0 and * (asterisk) combined). This can occur when text is programmed from a PC.
- A blinking underscore _ represents a space, not an underscore!
- When the signs < or > are shown on the display, this indicates that more characters are available to the left and / or to the right of the currently shown text.
- Press the STOP-key for 3 seconds to clear the entire line of text.
- Press the PROG-key for 3 seconds to cancel any changes.

Step 3: Finishing the programming sequence**PROG-key**

During the programming sequence, this key is used to confirm the new value and return to SETUP-level. To cancel the operation, either press the PROG-key for 3 seconds or wait for 20 seconds: the programming sequence is cancelled and the former value is reinstated.

3.2.4 RETURNING TO OPERATOR-LEVEL

When all settings are configured correctly, the unit can be returned to OPERATE-level.

Please keep a record of all settings for later reference.

Use the control panel to return to OPERATE-level**PROG-key**

In order to return to the operator level, press the PROG-key for three seconds.

When no keys are pressed for 2 minutes, SETUP-level will be left automatically.

3.3 SETUP MENU OVERVIEW

1	TOTAL		DEFAULT	WM
1.1	UNIT	L – m3 – US GAL – I GAL – cf – oil bbl – kg – ton – US ton – lb – nL – nm3 – (none)	US GAL	+
1.2	DECIMALS	0 – 0.1 – 0.02 – 0.003	0.02	+
1.3	K-FACTOR	auto, 0.000010 – 9999999	auto	+
1.4	LINE 1 TOTAL	0.000 – 9,999,999 (with standard flag lit) (read-only)	–	–
1.5	LINE 1 TOTAL (uncorrected)	0.000 – 9,999,999 (read-only)	–	–
1.6	LINE 2 TOTAL	0.000 – 9,999,999 (with standard flag lit) (read-only)	–	–
1.7	LINE 2 TOTAL (uncorrected)	0.000 – 9,999,999 (read-only)	–	–
1.8	ACC. TOTAL (grand total)	0.000 – 99,999,999,999 (with standard flag lit) (read-only)	–	–
1.9	ACC. TOTAL (uncorrected)	0.000 – 99,999,999,999 (read-only)	–	–
2	DELIVERY		DEFAULT	WM
2.1	DELIVERY NUMBER	1 – 999999	1	+
2.2	LINE SELECTION	line 1 – line 2 – select	line 1	+
2.3	SHORT 1 TEXT	4 character description for delivery line 1	CYL	–
2.4	SHORT 2 TEXT	4 character description for delivery line 2	AUTO	–
2.5	LONG 1 TEXT	8 character description for delivery line 1	CYLINDER	–

2.6	LONG 2 TEXT	8 character description for delivery line 2	AUTOGAS	–
2.7	PAUSE	disable – enable	disable	–
2.8	PUMP DELAY	0 ... 99 sec	0 sec	+
2.9	VALVE DELAY	1 ... 99 sec	1 sec	+
2.A	END DELAY	0 ... 9 sec	3 sec	+
2.B	NO FLOW TIMEOUT	0 ... 999 sec	180 sec	+
2.C	PAUSE TIMEOUT	0 ... 999 sec	300 sec	+
2.D	DELIVERY TIMEOUT	0 ... 9999 sec	3600 sec	+
2.E	DELIVERY MAXIMUM	0.001 – 9000000	9000000	+
2.F	RELEASE	disable – enable	disable	+
3	DISPLAY		DEFAULT	WM
3.1	OPER PWD	000 ... 999 (submenu, 000 = disabled)	000	–
3.2	T-BASE	hide – disp (submenu)	hide	–
3.3	T-ACTUAL	hide – disp (submenu)	hide	–
3.4	ACT CTL	hide – disp (submenu)	hide	–
3.5	UN. TOTAL	hide – disp (submenu)	hide	–
3.6	LCD NEW	fast – 1 sec – 3 sec – 15 sec – 30 sec – off	off	–
3.7	BACKLIGHT (brightness)	0% – 20% – 40% – 60% – 80% – 100%	100%	–
3.8	BACKLIGHT OFF	disable – 30 sec – 1 min – 2 min – 3 min – 5 min – 10 min – 15 min	disable	–
4	FLOWMETER		DEFAULT	WM
4.1	SIGNAL	NPN – NPN_LP – REED – REED_LP – PNP – PNP_LP – NAMUR – coil_hi – coil_lo	coil_lo	+
4.2	UNITS	hand – auto_vol – auto_mas	auto_vol	+
4.3	UNIT	Auto-vol: L – m3 – US GAL – IGAL – cf – oil bbl Auto mas: kg – ton – US ton – lb	US GAL	+
4.4	K-FACTOR	0.000010 – 9999999	1	+
5	LINEARIZE		DEFAULT	WM
5.1	FREQ. / M-FACTOR 1	0000.1 – 9999.9 Hz / 0.000001 – 9.999999	0.0 / 1.000000	+
↑	↑	↑		+
5.F	FREQ. / M-FACTOR 15	0000.1 – 9999.9 Hz / 0.000001 – 9.999999	0.0 / 1.000000	+
5.G	LINEARIZATION	enable – disable	disable	+
5.H	DECIMALS FREQUENCY	0 – 0.1 – 0.02 – 0.003	0.1	+
6	CONTROL		DEFAULT	WM
6.1	FUNC C1	disable – select – start – stop – print – release – alarm	disable	+
6.2	FUNC C2	disable – start – stop – print – release – alarm	disable	+
6.3	FUNC C3	disable – start – stop – print – release – alarm	disable	+
6.4	IDLE C1	open – closed	open	+
6.5	IDLE C2	open – closed	open	+
6.6	IDLE C3	open – closed	open	+
7	TEMPERATURE		DEFAULT	WM
7.1	FUNCTION	disable – PT100 – static	disable	+
7.2	SENSOR	PT100-2 – PT100-3	PT100-2	+
7.3	UNIT	°C – °F	°F	+
7.4	T-STATIC	-999.99 – 999.99	60.0 °F	+
7.5	FILTER	01 – 99 (01 = off)	01	+
7.6	ACTUAL	xx.xx °X	–	–

8	FORMULA		DEFAULT	WM
8.1	EQUATION	disable – API 24E – API 54E – API60E	disable	+
8.2	REL. DENS (API 24E) DENSITY (API 54E) DENSITY (API 60E)	24E: 0.35000 – 0.68800 54E: 351.70 – 687.80 60E: 331.70 – 683.60	0.40000 400.00 400.00	+ + +
8.3	T-BASE	none – 24E: 60.0 °F – 54E: 15.00 °C – 60E: 20.00 °C (read-only, based on 8.1)	none	–
8.4	ACT CTL	0.43777 – 1.45557 (read-only, based on 7.1, 7.4, 7.6, 8.1, 8.2)	1.00000	–
9	RELAYS		DEFAULT	WM
9.1	RELAY 1	disable – busy – release – valve 1 – valve 2 – pump – pulse – retrans	valve 1	–
9.2	RELAY 2	disable – busy – release – valve 1 – valve 2 – pump – pulse	valve 2	–
9.3	RELAY 3	disable – busy – release – valve 1 – valve 2 – pump – pulse	pump	–
9.4	WIDTH	0.000 – 9.999 sec	0.000	–
9.5	AMOUNT	0000.000 – 9999999	1000	–
10	COMMUNIC		DEFAULT	WM
10.1	MODE	off – bus rtu – bus asc – printer	printer	–
10.2	SPEED	1200 – 2400 – 4800 – 9600 – 9600HP – 19200 – 38400 - 57600	9600	–
10.3	DATABITS	8 bits – 7 bits	8 bits	–
10.4	PARITY	none – even – odd	none	–
10.5	ADDRESS	001 – 247	1	–
10.6	TRANSMIT DELAY	0 – 255 msec	15	–
10.7	LINE DELAY	0.000 – 0.125 – 0.250 – 0.375 – 0.500 – 0.750 – 1.000 sec	0.000 sec	–
10.8	LINE TERMINATION	CR/LF – CR – LF	CR/LF	–
10.9	START ROW	0 – 9	2	–
10.A	END ROW	0 – 9	4	–
10.B	FORM FEED	disable - enable	disable	–
10.C	DATE FORMAT	YY/MM/DD – DD/MM/YY – MM/DD/YY	MM/DD/YY	+
11	TICKET		DEFAULT	WM
11.1	HEADER 1	16 ASCII characters (use remote configuration tool for all options)	RED SEAL	+
11.2	HEADER 2	16 ASCII characters (use remote configuration tool for all options)	MEASUREMENT	+
11.3	HEADER 3	16 ASCII characters (use remote configuration tool for all options)	<empty>	+
11.4	HEADER 4	16 ASCII characters (use remote configuration tool for all options)	<empty>	+
11.5	AUTO PRINT	disable – prompt – auto	Auto	+
11.6	REPRINT TIME	0 – 999 sec	10 sec	–
11.7	LINE TOT	no print – print	no print	–
11.8	T-BASE	no print – print	no print	–
11.9	DENSITY	no print – print	no print	–
11.A	AVG CTL	no print – print	no print	–
11.B	UN. DELIV	no print – print	no print	–
11.C	UN. LINE	no print – print	no print	–
12	OTHERS		DEFAULT	WM
12.1	MODEL	E6000	–	–
12.2	SOFTWARE VERSION	xx.xx.xx	–	–
12.3	SERIAL NO	xxxxxxx	–	–
12.4	TIME	HH:MM:SS (24 hour format)	00:00:00	–
12.5	DATE	YY.MM.DD	00.01.01	–
12.6	PASSWORD	0000 – 9999	0000	–
12.7	TAG NO	0000000 – 9999999	0000000	–
12.8	BATTERY MODE	operate - shelf	operate	–

3.4 SETUP MENU EXPLANATIONS

3.4.1 MENU 1 – TOTAL



Caution !

- First setup the flowmeter at SETUP MENU 4 - Flowmeter. It has a direct influence on the settings for Total.
- Change of the type of flowmeter unit (SETUP 4.2 and SETUP 4.3) will cause the unit for Total to jump to the default setting of the new flowmeter unit type.
- When a different unit is selected, the actual total values are NOT recalculated!

1	TOTAL	
1.1	UNIT	This setting determines the measurement unit for (accumulated) total and the scaled pulse output. The measurement units which are available, are controlled from the UNITS which are selected in the flowmeter menu. AUTO-VOL: L – m3 – US gal – l gal – cf – Oil bbl – nL – nm3 AUTO-MAS: kg – ton – US ton – lb HAND: l – m3 – US gal – l gal – cf – Oil bbl – kg – ton – US ton – lb – nL – nm3 – ---- (no unit)
1.2	DECIMALS	The decimal point determines for Total and accumulated Total the number of digits following the decimal point. The following can be selected: 0 – 0.1 – 0.02 – 0.003
		 Caution ! The next menu item can be modified only if the automatic unit conversion in SETUP 4.2, Flowmeter-units, is set to Hand. Else, the display will show “AUTO”.
1.3	K-FACTOR	With the Total K-Factor, the flowmeter pulse signals are converted to a total unit. The Total K-Factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 1.1). The more accurate the Total K-Factor, the more accurate the functioning of the system will be. <i>After pressing PROG, the decimal point will flash and the decimal position can be changed by pressing the SELECT-key.</i> <i>Continue by pressing the CLEAR-key to set the digits.</i>
1.4	LINE 1 TOTAL	SETUP 1.4 through 1.9 are used to indicate the corrected and uncorrected totalizer values of line 1, line 2 and grand total. Corrected values are indicated by the flag standard being lit. Grand total is indicated by the flag ACC. TOTAL (accumulated total) due to limitations of the display. Note that Grand total counts all pulsed from the flowmeter, where Line 1 and Line 2 totals only count the pulses that have passed during deliveries.
1.5	LINE 1 TOT. (uncorrected)	
1.6	LINE 2 TOTAL	
1.7	LINE 2 TOT. (uncorrected)	
1.8	ACC. TOTAL (grand total)	
1.9	ACC. TOTAL (uncorrected)	



Note !

3.4.2 MENU 2 – DELIVERY

2	DELIVERY	
2.1	DELIVERY NUMBER	This setting indicates the number of the <u>next</u> delivery to be performed. When a new delivery is started, this number will be appointed to it and the number for the next delivery is incremented by 1. When the number passes 999999 it will wrap around to number 1.
2.2	LINE SELECTION	The delivery line to be used can be a fixed selection or selected by the operator. This is done with following selections: • Line 1 – Delivery line 1 is selected permanently and the entered text from SETUP 2.5 is used on the display and delivery ticket. Valve 1 is used as the controlling valve for the delivery. • Line 2 – Delivery line 2 is selected permanently and the entered text from SETUP 2.6 is used on the display and delivery ticket. Valve 2 is used as the controlling valve for the delivery. • Select – The delivery line is selected by the operator at the beginning of each delivery. The texts from SETUP 2.3 and 2.4 are used for the selection of line 1 and line 2, respectively. Based on the selection, the text from SETUP 2.5 or SETUP 2.6 is used on the display and delivery ticket. Also, valve 1 or valve 2 is used as the controlling valve for the delivery. <i>When select is chosen as line selection, remote control input 1 (SETUP 6.1) can be configured to select the delivery line automatically using an external.</i>



Note !

2.3	SHORT 1	 <i>Note !</i>	A 4 character description shown on the display for the selection of delivery line 1 and 2. <i>Note: Please make sure to only use characters that can be shown correctly at the used location on display.</i>
2.4	SHORT 2		
2.5	LONG 1	 <i>Note !</i>	An 8 character description shown on the display and printed on the delivery ticket to indicate delivery line 1 and 2. <i>Note: Please make sure to only use characters that can be shown correctly at the used location on the display.</i>
2.6	LONG 2		
2.7	PAUSE	 <i>Note !</i>	Indicates whether the pause state is available during a delivery. If disabled, a delivery will be ended immediately after the STOP button is pressed. If enabled, a delivery goes into pause state after a STOP button is pressed and can be resumed with the START button. Pressing the STOP button again will end the delivery completely. <i>If a delivery is stopped using a remote control input (SETUP 6.1-3), the pause state is omitted and the delivery is ended immediately.</i>
2.8	PUMP DELAY		Indicates the amount of time the pump needs to be started, before a delivery can be started (and the valves opened). Possible values: 0 – 99 seconds
2.9	VALVE DELAY		Indicates the amount of time it takes a valve to close completely at the end of a delivery or when going to pause state. Any pulses received from the flowmeter during this time will be regarded as belonging to the delivery. Possible values: 1 – 99 seconds
2.A	END DELAY		Indicates the time the display waits after a delivery is finished, showing the delivery results on screen, before continuing with printing or returning to idle mode. Possible values: 0 – 9 seconds
2.B	NO FLOW TIMEOUT		The no flow timeout detects when no flow is present. If this lasts longer than the specified time, the delivery is paused or ended. When the parameter is set to 0, the detection is disabled. Possible values: 0 – 999 seconds (approximately 16 minutes max)
2.C	PAUSE TIMEOUT		Indicates the maximum time the pause state may be maintained. After the time has lapsed, the delivery will be ended automatically. Possible values: 0 – 999 seconds (approximately 16 minutes max)
2.D	DELIVERY TIMEOUT		Indicates the maximum time for the duration of a delivery. After the time has lapsed, the delivery will be ended automatically. Possible values: 0 – 9999 seconds (approximately 2,5 hours max)
2.E	DELIVERY MAXIMUM		Indicates the maximum delivery amount of a delivery. When the amount reaches the maximum, the delivery will be ended automatically. Possible values, depending on SETUP 1.1 and 1.2: 0.001 – 9000000
2.F	RELEASE		To prevent unauthorized deliveries, the system can be configured to require a release command to be given before a new delivery can be started. This setting is used to turn this function on and off. If enabled, a release command must be given before each delivery using a control input or the Modbus interface. After a restart, power failure, internal error or external alarm the release command must also be given (again).

3.4.3 MENU 3 – DISPLAY

3	DISPLAY	
3.1	OPER PWD	To prevent unauthorized access to the submenu, a password can be entered in the range 000...999. When set to 000, the password protection is turned off.
3.2	T-BASE	Selects if the base temperature is shown in the submenu. Possible selections: Hide – Display
3.3	T-ACTUAL	Selects if the actual line temperature is shown in the submenu. Possible selections: Hide – Display

3.4	ACT CTL	Selects if the actual temperature correction factor is shown in the submenu. Possible selections: Hide – Display
3.5	UN. TOTAL	Selects if the uncorrected delivery line total is shown in the submenu. Possible selections: Hide – Display
3.6	LCD NEW	When the unit is externally powered, the display is completely functional and display refresh rate is set to FAST. To preserve power when the unit is running on battery power, the display refresh rate can be lowered or completely turned off. The refresh rate will be lowered after 30 seconds of inactivity at operator level when the idle screen is shown. By pressing a key on the unit, the display comes back on. The following can be selected: FAST – 1 sec – 3 sec – 15 sec – 30 sec – OFF
3.7	BACKLIGHT	The unit can be provided with a backlight (Type -ZB). The backlight brightness can be adjusted from 0% (off) to 100% in steps of 20%. The following can be selected: 0% - 20% - 40% - 60% - 80% - 100%  <i>To use the backlight, the unit must be powered externally. With only battery power the backlight will not work.</i>
3.8	BACKLIGHT OFF	To reduce power usage, e.g. when supplied from a vehicle battery, the backlight can be switched off after an set amount of time of inactivity. During a delivery, the backlight is always switched on.

3.4.4 MENU 4 – FLOWMETER

To simplify the configuration of the flowmeter and total settings, the Neptune E6000 is equipped with an automatic unit conversion feature. This avoids difficult K-Factor calculations and all configuration it done inside the Flowmeter menu. To use the automatic unit conversion, you only need to enter the (average) K-Factor and the related measurement unit. These can be found on the test/calibration certificate that came with your flowmeter.

For a detailed description and tutorials on the automatic unit conversion function, please refer to our website or your supplier.

To setup the automatic unit conversion, follow this procedure:

1. SETUP 4.1: Select the correct type of flow meter signal
2. SETUP 4.2: Select the type of measurement unit used on the certificate: volume or mass
3. SETUP 4.3: Select the measuring unit according to the certificate
4. SETUP 4.4: Enter the (average) K-factor shown on the certificate.
5. SETUP 1.1: Select the desired measuring units for (accumulated) Total.

The automatic unit conversion can handle either volume or mass units. For measurement units which are not supported, for example 'revolutions' or the use of volume and mass units simultaneously, the automatic unit conversion can be set to 'Hand', allowing total to be configured independently.

Example: Calculating the K-factor.

To manually calculate the K-factor to enter for total, follow this example:

Assume that the flowmeter generates 65.231 pulses per US gallon and the required measurement unit is cubic foot / ft³. A cubic foot consists of 7.48052 gallon which implies 487.9618 pulses per cubic feet. So, the K-Factor to enter is 487.9618.

4 FLOWMETER				
4.1	SIGNAL	The Neptune E6000 is able to handle several types of input signal. The type of flowmeter pickup / signal is selected with this setting. The selections with LP are used to apply a build-in low-pass filter. See also paragraph 4.6.4.		
	TYPE OF SIGNAL	EXPLANATION	RESISTANCE	FREQ. / mVpp
	NPN	NPN input	100 k Ω pull-up	max. 6 kHz.
	NPN - LP	NPN input with low pass filter	100 k Ω pull-up	max. 2.2 kHz.
	REED	Reed-switch input	1 M Ω pull-up	max. 1.2k Hz.
	REED - LP	Reed-switch input with low pass filter	1 M Ω pull-up	max. 120 Hz.
	PNP	PNP input	51 k Ω pull-down	max. 6 kHz.
	PNP - LP	PNP input with low pass filter	51 k Ω pull-down	max. 700 Hz.
	NAMUR	NAMUR input	820 Ω pull-down	max. 4 kHz.
	COIL HI	Coil input High sensitivity	-	min. 20 mVpp.
	COIL LO	Coil input Low sensitivity	-	min. 90 mVpp
4.2	UNITS	With this setting the automatic unit conversion is enabled for volumetric flows or mass flows. When Hand is selected, the automatic unit conversion is disabled. The following can be selected: AUTO-VOL, AUTO-MASS, HAND		
		To make use of the automatic unit conversion, Total must have a convertible unit. If this is not possible, HAND should be chosen. This will cause SETUP 4.3 and SETUP 4.4 to disappear and the unit, K-factor and K-factor decimals must be specifically set at SETUP-menu 1 – Total.		
4.3	K-FACTOR UNIT	This setting determines the measurement unit for the flowmeter. With automatic unit conversion, the units for Total and Flowrate are derived from this setting. The following can be selected: AUTO-VOL: L – m³ – US gal – l gal – cf – Oil bbl AUTO-MAS: kg – ton – US ton – lb  Note ! - Changing the type of flowmeter unit (volumetric or mass) causes the setting of Total (SETUP 1.1) to automatically change to the default unit of that type. - Change of the flowmeter unit will not change the amount displayed for Line 1 Total, Line 2 Total and Grand Total.		
4.4	K-FACTOR	With the K-factor, the flowmeter pulse signals are converted to a quantity. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 4.3), for example per cubic meter. The more accurate the K-factor, the more accurate the functioning of the system will be.  Note ! After pressing PROG, the decimal point will flash and the decimal position can be changed by pressing the SELECT-key. Continue by pressing the CLEAR-key to set the digits.		

3.4.5 MENU 5 – LINEARIZE

Linearization principle

In normal situations, the calculation of flow is based on flowmeters that follow an 'ideal line' and give a fixed number of pulses over the entire frequency range to represent a certain amount. The calculation uses an average K-factor (the so-called $KF0$), which is entered at SETUP-menu 4 (when automatic unit conversion is disabled, SETUP-menu 1).

Since many flowmeters do not follow this 'ideal line', the linearization function can be used to reflect the actual flow curve better. This allows for more accurate flowrate and totalization values, as well as improved analog and pulse output values over the frequency range of the flowmeter.

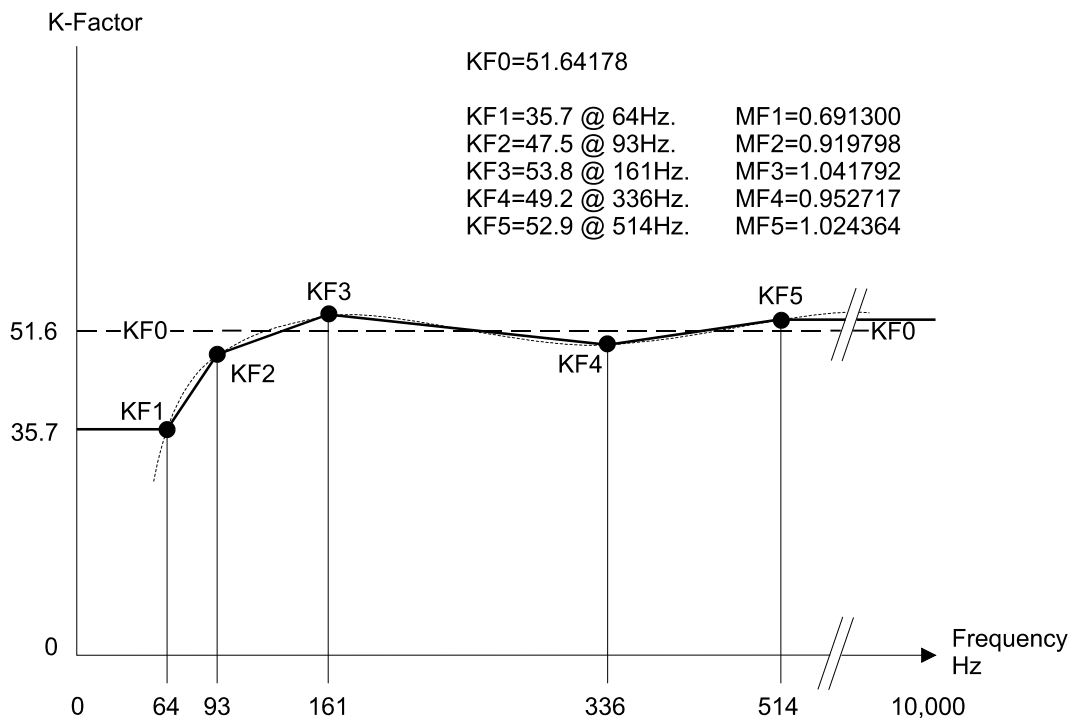


Fig. 27: Example of K-Factors and linearization points

The linearization function uses linearization points to calculate new K-factors based on the measured flowmeter frequency. As shown in the chart above, each point consists of a frequency and a Meter Factor (MF_x , indicating the deviation of the K-factor KF_x from the average K-factor $KF0$).

When a new frequency is measured, the corresponding Meter Factor is calculated by interpolating between the linearization points. The new Meter Factor is then used to calculate the actual K-factor for total using this formula:

$$K\text{-factor} = MF * KF0$$

When the measured frequency is below the lowest or above the highest frequency given in the linearization points, the Meter Factor belonging to that frequency is used.

Entering linearization points

A table of 15 linearization points can be entered into the unit. It is advised to enter the linearization points in increasing order of frequency; however, this is not mandatory. The linearization points are usually located at frequencies where the linear behavior of the flowmeter changes. Linearization points that are not used can be disabled by entering a frequency of 0 Hz.

The following formula can be used to calculate the Meter Factors for the linearization points:

$$\text{Meter Factor } MF_x = \frac{KF_x @ \text{flow } x}{KF0}$$

In this formula, the value of $KF0$ represents the average K-factor of the flowmeter and $KF_x @ \text{flow } x$ represents the actual K-factor (derived from the actual flow) at the selected frequency (note that the K-factors must be in the same engineering units (e.g. pulses / GAL) to perform the calculation).



The K-factor entered at SETUP-menu 4 or SETUP-menu 1 must be identical to the $KF0$ used in the calculations.

5 LINEARIZATION		
5.1 ↑ 5.F	FREQ. / M-FACTOR 1 ↑ FREQ. / M-FACTOR 15	The M Factor is displayed on the top line of the display. A value between 0.000001 and 9.999999 can be entered. Most M-factors will be around 1.000000, for example 0.945354 or 1.132573. The frequency is displayed on the bottom line of the display. The maximum frequency is 9999.9 Hz. When value 0.0Hz is entered, the M-Factor is disabled. (Read also SETUP 5.H – decimals frequency.)
5.G	LINEARIZATION	This setting is used to enable or disable the linearization function. • Disabled: the K-factor set at SETUP 4.4 will be used for the calculation of total without linearization. • Enabled: the K-factor set at SETUP 4.4 will be used as <i>KF0</i> in the linearized calculations for total. <i>When automatic unit conversion is disabled in SETUP 4.2 the K-factor entered at SETUP 1.3 is used.</i>
5.H	DECIMALS FREQUENCY	This setting determines the number of decimals for the frequency entered. The following can be selected: 0 – 0.1 – 0.02 – 0.003



Note !

3.4.6 MENU 6 – REMOTE CONTROL INPUTS

6 CONTROL		
6.1	FUNC C1	Three remote control inputs with selectable functionality are available to control various processes. Following functions can be selected: • Disable: the control input is not used. • Select: When delivery line selection is enabled (SETUP 2.2), control input 1 can be used to select the delivery line externally. If selected, the display will not ask the operator to select the line, but uses the state of control input 1 (see also SETUP 6.4): ○ <i>Not-active:</i> delivery line 1 is selected ○ <i>Active:</i> delivery line 2 is selected • Start: Starts a delivery when the display is in idle mode. • Stop: Stops a running delivery. Note that the delivery is always stopped completely, even when the pause function is enabled (SETUP 2.7). A new delivery cannot be started as long as the control input is kept closed. This can be useful to prevent any unauthorized deliveries. • Print: Starts printing a delivery ticket when the display is in idle mode. Can also be used to acknowledge the auto print or reprint prompt (SETUP 11.5 and 11.6) after a delivery. • Release: Activating the input releases the device for the next delivery as required when the release function is enabled at SETUP 2.F. • Alarm: An activated input indicates that an external alarm situation is present. When an external alarm is raised, any active delivery is stopped immediately (with the delivery status indicating <i>external alarm</i>), valves are closed and pumps disabled. During an alarm situation new deliveries are forbidden and the display shows a warning message. When the input is deactivated, the alarm situation is lifted and the device returns to normal service.
6.2	FUNC C2	
6.3	FUNC C3	
6.4	IDLE C1	Depending on the type of switch or lever used, a selection must be made to indicate when a control input is considered active or not-active (idle). Following options are available: • Open: The control input is active if the input signal is connected to common. Otherwise, it is not-active. • Close: The control input is active if the input signal is not connected to common. Otherwise, it is not-active.
6.5	IDLE C2	
6.6	IDLE C3	

3.4.7 MENU 7 – TEMPERATURE

7	TEMPERATURE			
7.1	FUNCTION	Selects how the actual temperature of the medium is obtained with following selections: • Disable: there is no actual temperature available to the system. • PT100: a PT100 RTD element is connected to the unit and measured to determine the actual line temperature. Valid measurement range is -100°C to +200°C (-148°F to 392°F). The temperature calculation uses the International Temperature Scale of 1990 Temperature vs Resistance table (ITS-90). • Static: when no temperature measurement is possible or available, a static temperature can be used. This would normally be set to the average line temperature during delivery and is installation specific. The entered static temperature is indicated on the unit as the actual temperature.		
7.2	SENSOR	Selects how the PT100 RTD element is connected. Following functions can be selected: • PT100-2: 2-wire connection • PT100-3: 3-wire connection Please see paragraph 4.6.6 for connection details.		
7.3	UNIT	Selects in which unit the actual temperature is indicated on the unit: • °C • °F This setting is usually set to the same temperature unit as the base temperature that is specified by the selected formula of SETUP 8.1.		
7.4	T-STATIC	When SETUP 7.1 is set to static, the static temperature to be used must be entered here in the unit of SETUP 7.3. To toggle the minus-sign '-' simultaneously press the START and STOP button.		
7.5	FILTER	Stabilizes the temperature reading. This digital filter setting produces a more stable but less actual reading. The filter principal is based on three input values: the filter level (01-99), the last measured input value, and the last average value. The higher the filter level, the longer the response time of a changed value. Use trial and error to find the best setting for your application.		
		RESPONSE TIME ON STEP CHANGE OF INPUT VALUE (% OF END VALUE)		
	FILTER VALUE	50%	75%	90%
	01	filter disabled	filter disabled	filter disabled
	10	7 sec	14 sec	22 sec
	20	14 sec	28 sec	45 sec
	30	21 sec	41 sec	68 sec
	50	35 sec	69 sec	114 sec
	75	52 sec	104 sec	172 sec
	99	69 sec	137 sec	227 sec
7.6	ACTUAL	Shows the actual measured or set static temperature.		

3.4.8 MENU 8 – FORMULA

8	FORMULA			
8.1	EQUATION	Selects how the temperature correction factor CTL is calculated. This factor is used to correct the measured quantity so it represents the quantity it would have at base temperature conditions. The following equations can be selected: • Disable: No correction is applied. • API 24E: Table 24E for NGL and LPG using a 60 °F Base temp. • API 54E: Table 54E for NGL and LPG using a 15 °C Base temp. • API 60E: Table 60E for NGL and LPG using a 20 °C Base temp. Tables are implemented according standard API MPMS 11.2.4-2019.		

8.2	REL DENS (24E) DENSITY (54E, 60E)	Enter here the relative density for equation API 24E or the density for equation API 54E and 60E. The entered value should represent the density as observed when the medium is at base temperature. • API 24E relative density at 60°F, range: 0.35000 – 0.68800 [] • API 54E density at 15°C, range: 351.70 – 687.80 [kg/m³] • API 60E density at 20°C, range: 331.70 – 683.60 [kg/m³]
8.3	T-BASE	Shows the base temperature and unit specified by the selected equation of SETUP 8.1.
8.4	ACT CTL	Shows the actual calculated temperature correction factor CTL.

3.4.9 MENU 9 – RELAYS



Note !

- The digital transistor outputs D1, D2 and D3 have a maximum scaled output frequency of 500Hz.
- In retransmit mode (D1 only), the maximum input frequency is 10 kHz and the output requires a minimum on and off-time of 50 µs.
- The settings for Relay 1, Relay 2 and Relay 3 correspond with digital transistor outputs D1, D2 and D3, respectively.

9	RELAYS																																		
9.1	RELAY 1	The following modes of operation are available for the digital outputs: • Disable: the output is switched off. • Busy: the output is activated when a delivery is running. • Release: the output is activated when waiting for a release command (see setup 2.F). • Valve 1: when delivery line 1 is selected for the delivery, the output is activated after the display test has finished and any set pump delay (SETUP 2.8) has passed. • Valve 2: when delivery line 2 is selected for the delivery, the output is activated after the display test has finished and any set pump delay (SETUP 2.8) has passed. • Pump: activated when a delivery is started to engage the pump. • Pulse: a scaled pulse is given each time the grand total has increased with the amount set at SETUP 9.5. The duration of the pulse is determine by the pulse width set at SETUP 9.4. • Retransmit: the unscaled incoming pulse from the flowmeter is retransmitted on the output.  Note ! <i>The Retransmit mode is often used when sinus / non-square wave input signals are present (for example, coil signals) that need to be transmitted as robust square wave forms.</i>																																	
9.2	RELAY 2																																		
9.3	RELAY 3																																		
9.4	WIDTH	 Note ! <i>The scaled pulse signal always has a 50% duty cycle. This means the minimum time between the pulses is equal to the pulse width setting. If the frequency should go out of range (for example when the flowrate increases), an internal buffer stores the missed pulses. As soon as the flowrate slows down, the buffer will be emptied.</i> <i>Pulses can be missed due to a buffer-overflow, therefore it is advisable to program this setting within its range.</i> <table><tr><th colspan="4">MAXIMUM FREQUENCY-TO-WIDTH SETTINGS FOR SCALED PULSE OUTPUT</th></tr><tr><th>Frequency (Hz)</th><th>Width (sec)</th><th>Frequency (Hz)</th><th>Width (sec)</th></tr><tr><td>disable</td><td>0.000 s</td><td>62.5 Hz</td><td>0.008 s</td></tr><tr><td>0.1 Hz</td><td>5.000 s</td><td>100 Hz</td><td>0.005 s</td></tr><tr><td>0.5 Hz</td><td>1.000 s</td><td>125 Hz</td><td>0.004 s</td></tr><tr><td>1.0 Hz</td><td>0.500 s</td><td>166 Hz</td><td>0.003 s</td></tr><tr><td>10.0 Hz</td><td>0.050 s</td><td>250 Hz</td><td>0.002 s</td></tr><tr><td>50.0 Hz</td><td>0.010 s</td><td>500 Hz</td><td>0.001 s</td></tr></table>		MAXIMUM FREQUENCY-TO-WIDTH SETTINGS FOR SCALED PULSE OUTPUT				Frequency (Hz)	Width (sec)	Frequency (Hz)	Width (sec)	disable	0.000 s	62.5 Hz	0.008 s	0.1 Hz	5.000 s	100 Hz	0.005 s	0.5 Hz	1.000 s	125 Hz	0.004 s	1.0 Hz	0.500 s	166 Hz	0.003 s	10.0 Hz	0.050 s	250 Hz	0.002 s	50.0 Hz	0.010 s	500 Hz	0.001 s
MAXIMUM FREQUENCY-TO-WIDTH SETTINGS FOR SCALED PULSE OUTPUT																																			
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50.0 Hz	0.010 s	500 Hz	0.001 s																																

9.5	AMOUNT	A pulse will be generated every time a certain quantity is added to the total. Enter this quantity here while taking the maximum frequency into account. For example, if 100 pulses per gallon are required, enter 0.01 GAL (0.01 GAL x 100 pulses = 1 gallon)  Note ! After pressing PROG, the decimal point will flash and the decimal position can be changed by pressing the SELECT-key. Continue by pressing the CLEAR-key to set the digits.
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3.4.10 MENU 10 – COMMUNICATION

The Neptune E6000 is equipped with a communication interface (Type CX/CB/CH) to connect a printer for ticket printing or to connect to a Modbus network (see Appendix C: Modbus interface for more information). The communications port is also used to configure the Neptune E6000 using the Remote Configuration Tool. The tool and optional interface cable to connect your type of interface to the PC are available through your supplier or our website.

10	COMMUNIC	
10.1	MODE	This setting is used to configure the communication mode of your device on the communications bus for Modbus or printer output. The following modes can be selected: OFF – BUS RTU – BUS ASCII – PRINTER
10.2	SPEED	This setting is used to set the baud rate and should match the speed used on the communications bus. The following communication speeds can be selected: 1200 – 2400 – 4800 – 9600 – 9600HP – 19200 – 38400  Note ! Communication speeds from 9600HP and upwards are more power consuming. When used with battery power, it is advised to set the speed at 9600 or lower.
10.3	DATABITS	This setting is used to configure the number of data bits and should match the number used on the communications bus. Select 8 bit for Modbus RTU and 7 or 8 bits for Modbus ASCII.
10.4	PARITY	This setting is used to configure the parity mode and should match the parity mode used on the communications bus. Available settings are ODD – EVEN – NONE
10.5	ADDRESS	This setting is used to configure the bus address of your device on the Modbus communications bus. This address can vary from 001-247.
10.6	TRANSMIT DELAY	This setting is used to configure and additional delay between receiving a Modbus message and transmitting the reply. The transmit delay is useful on communications busses to allow drivers to switch between transmitting and receiving, such as RS485. The delay can vary from 0-255 msec and is set to 15ms by default.
10.5	LINE DELAY	For printers that requires less data to be sent at once, a line delay can be entered. Following values are available: 0.000 – 0.125 – 0.250 – 0.375 – 0.500 – 0.750 – 1.000 sec
10.6	LINE TERMINATION	This setting is used to define how the printer terminates a printed line. The following terminations can be selected: • CR sends a carriage return, but no line feed. • LF sends a line feed, but no carriage return. Choose • CR/LF sends a carriage return and line feed (default).
10.7	START ROW	Use this setting to print up to 9 empty lines before printing the ticket.
10.8	END ROW	Use this setting to print up to 9 empty lines after printing the ticket
10.9	FORM FEED	Use this setting to send a form feed command after printing the ticket.
10.A	DATA FORMAT	This setting is used to select how the date is printed on the tickets. The following formats can be selected (e.g. October 31th 2020): • Y.M.D prints the date as 20/10/31. • D.M.Y prints the date as 31/10/20. • M.D.Y prints the date as 10/31/20.

3.4.11 MENU 11 – TICKET

11	TICKET	
11.1	HEADER 1	Up to 4 lines of freely configurable header lines can be printed at the top of a ticket. Each line can hold up to 16 printable ASCII characters (character codes 32 to 127). Please see Step 2c: Changing a line of text in paragraph 3.2.3 for instruction on changing the header lines via the control panel. However, for full functionality, it is recommended to program the header lines using the Remote Configuration Tool. • <i>Empty header lines before the first filled header line will be printed as empty lines. Empty headers lines after the last filled header line will be skipped!</i> • <i>Since the LCD is not suitable to display all characters, a character that cannot be shown is indicated on the LCD with all segments turned on (resembling the number 0 and * (asterisk) combined).</i>
11.2	HEADER 2	
11.3	HEADER 3	
11.4	HEADER 4	
	 Note !	
11.5	AUTP PRN	When a delivery is finished, a ticket can be printed. This settings selects what action should be taken with following options: • Disable – when the delivery is finished, the display returns to idle mode and no ticket is printed. If required, the operator can print a ticket manually. • Prompt – a ticket is printed automatically after the delivery is finished, but only after the operator presses a button on the display. This gives him the chance to prepare the printer first. • Auto – a ticket is printed automatically, immediately after a delivery is finished.
11.6	REPRINT (time)	If a ticket is printed automatically after a delivery (see SETUP 11.5), the operator can be asked if he wants to print the ticket again. This question is shown for the entered amount of time, after which the display returns to idle mode. With value 0 no question is asked. Possible values: 0 – 999 sec
11.7	LINE TOT	Selects if the corrected delivery line total (Net line total) is printed on the ticket. If not print is selected, the uncorrected delivery line total (Gross line total) is also not printed (SETUP 11.C is ignored). Possible selections: No print – Print
11.8	T-BASE	Selects if the base temperature is printed on the ticket. Possible selections: No print – Print
11.9	DENSITY	Selects if the set (relative) density is printed on the ticket. Possible selections: No print – Print
11.A	AVG CTL	Selects if the average temperature correction factor is printed on the ticket. The average CTL is calculated by dividing the corrected delivered quantity (Net volume) by the uncorrected delivered quantity (Gross volume). Possible selections: No print – Print
11.B	UN. DELIV	Select if the uncorrected delivered quantity (Gross volume) is printed on the ticket. Possible selections: No print – Print
11.C	UN. LINE	Select if the uncorrected delivery line total (Gross line total) is printed on the ticket. Possible selections: No print – Print

3.4.12 MENU 12 – OTHERS

12	OTHERS	
12.1	MODEL	For support and maintenance it is important to have information about the characteristics of the Neptune E6000. Your supplier will ask for this information in case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
12.2	SOFTWARE VERSION	
12.3	SERIAL NO.	
12.4	TIME	This setting can show and set the system time, which is used for printing timestamps on tickets. The format is HH.MM.SS in 24 hour notation.
12.5	DATE	This setting can show and set the system date, which is used for printing timestamps on tickets. The format is YY.MM.DD.
12.6	PASSWORD	All SETUP values can be password protected. This protection is disabled with value 0000 (zero). A 4 digit password can be programmed, for example 1234.
12.7	TAG-NO	For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered. A value other than 0 will also be printed on the delivery ticket.
12.8	BATTERY MODE	The Neptune E6000 has two modes: operational or shelf. When "shelf" is selected, the Neptune E6000 shuts down and can be stored for several years: it will not process the sensor signal and the display is switched off but all settings and totals are stored. In this mode, power consumption is extremely low. To wake up the Neptune E6000 again, press the SELECT-key two times.

4 INSTALLATION

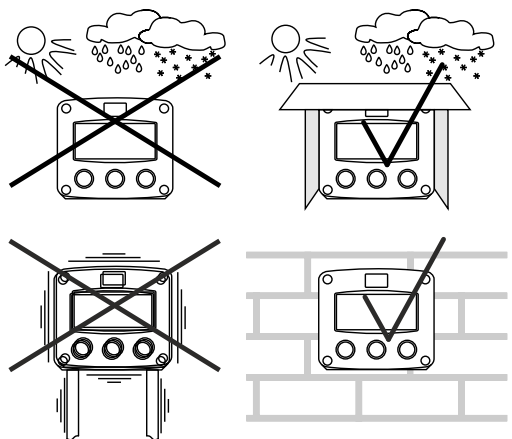
4.1 GENERAL DIRECTIONS



Caution !

- Mounting, electrical installation, start-up 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 Neptune E6000 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.
- Take careful notice of the "Safety rules, instructions and precautionary measures" at the front of this manual.

4.2 INSTALLATION / SURROUNDING CONDITIONS



Take the relevant IP classification of the enclosure into account (see identification plate). Even an enclosure rated for IP67 / TYPE 4X should NEVER be exposed to strongly varying (weather) conditions.

When used in very cold surroundings or varying climatic conditions, inside the instrument case, take the necessary precautions against moisture.

Mount the Neptune E6000 onto a solid structure to avoid vibrations.

For use in Safe Areas, also known as Ordinary Locations, and Hazardous Locations, the following conditions apply:

Ambient temperature range:	-40°C to +70°C / -40°F to +158°F
Relative humidity:	Up to 80% for temperatures up to 31°C, decreasing linearly to 50% at 40°C.
Indoor / Outdoor use:	Suitable for indoor and outdoor use
IP and TYPE rating:	Type 4X
Supply voltage fluctuation:	As indicated by the supply range (e.g. 10V to 30V)
Means of protection:	Division 2: energy limited Ordinary locations: Class I (PE connected metal enclosure) Class II (non-metallic enclosure)
Installation category:	I
Pollution degree:	2
Altitude:	up to 2000 m

4.3 HANDLING THE NEPTUNE E6000 ENCLOSURE



REPLACING BATTERIES, DISCONNECTING LIVE CIRCUITS OR OPENING INSTALLED ENCLOSURES MAY ONLY BE DONE WHEN THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.

4.3.1 IDENTIFICATION

To identify your device, on the top-side of the unit, a label is applied. The label shows the precise ordering code and specific certification data. The production date is either indicated by the 'MFG.DATE' (YYYY-WW) or the first 4 digits of the serial number representing year and week number (YYWW).

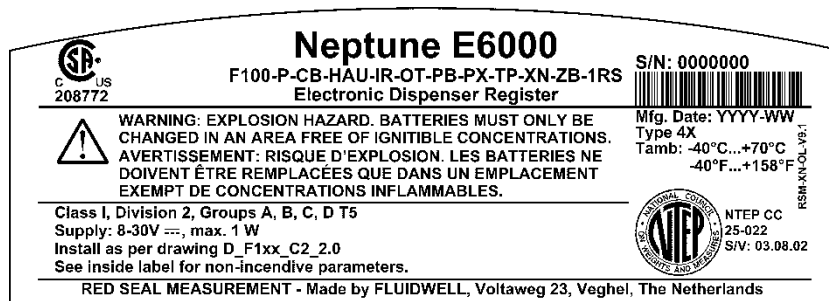


Fig. 28: Identification – Example of Neptune E6000 identification label (with type XN)

Additional information regarding the configuration of the unit, is shown on the label on the inside:

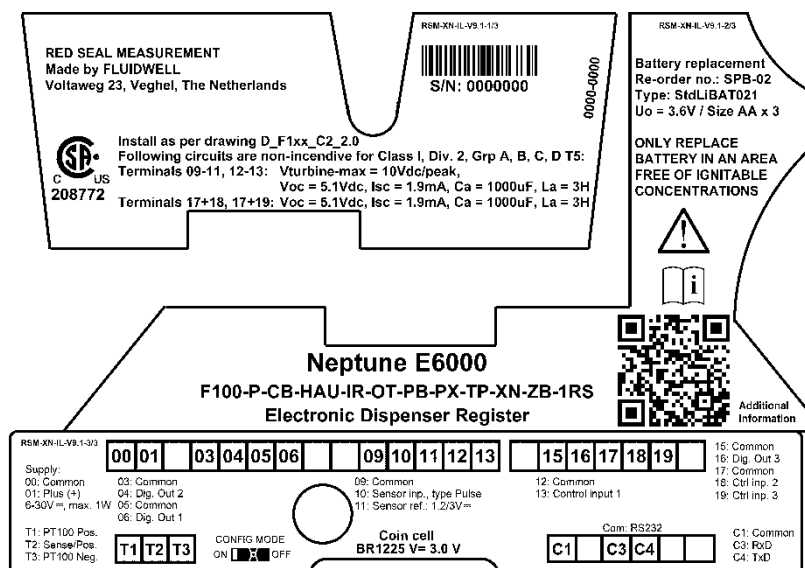
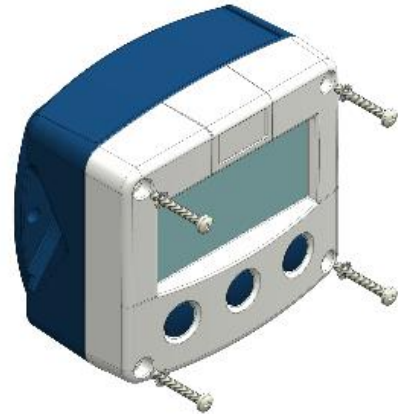


Fig. 29: Identification – Example of Neptune E6000 configuration label (with type XN)

4.3.2 OPENING / REMOVING THE COVER

To open the Neptune E6000, the front cover needs to be removed. Please follow this procedure:

1. If necessary, clean the enclosure with an anti-static cloth made damp with a mild soap solution. Wait for the enclosure to dry before opening.
2. While loosening the screws, hold on to the front cover to prevent it from falling down.
3. Unscrew all 4 screws from the front of the enclosure and (if present) mind that the serrated washers are kept with the screws.
4. Carefully take the front cover away from the rear cover, minding that the wiring stays intact.
5. Depending on the work to be done, all terminal connectors can be removed from their mating parts and the front cover is now completely separate.



4.3.3 CLOSING / REPLACING THE COVER

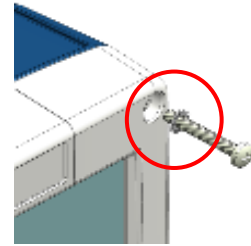
To replace the cover on the Neptune E6000 enclosure, follow this procedure:

1. Re-insert all terminals to their original position.
2. Carefully position the front cover onto the back cover, making sure that the gasket falls nicely into the gutter of the back cover.
3. Replace all 4 screws into the front cover and mind that the serrated washers are replaced (metal enclosure only).
4. Fasten all 4 screws in an alternating way so that the front cover is placed evenly across the edge of the back cover.

Tighten the 4 screws with the torque value for the type of enclosure as specified in following table:

Plastic enclosure:	1 Nm per screw
Aluminum enclosure:	1 Nm per screw
Aluminum w. extended back enclosure:	1 Nm per screw
Stainless steel enclosure:	2 Nm per screw

5. The Neptune E6000 is now ready to be returned to service.



4.3.4 WEIGHTS AND MEASURES (W&M) SWITCH

To secure all settings that influence the accuracy and quality of a delivery, the system needs to be put into configuration mode before any of those settings can be changed and valid deliveries can be made. This is done with the Weights and Measures switch (W&M switch) which is located on the inside of the enclosure where it is accessible through a small hole in the plastic cover, as shown in following image:

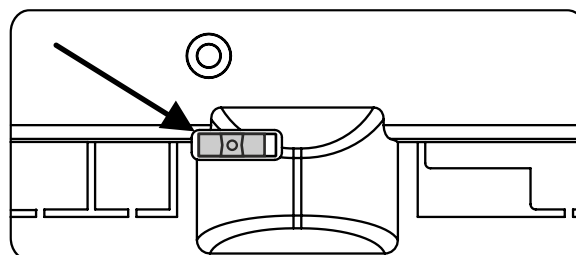


Fig. 30: Location of W&M switch

To change the switch, open and close the cover as described in the previous paragraphs. The slider on the switch can be moved by using a small flathead screwdriver. The label indicates which direction to move the slider to turn the configuration mode on and off.

When the configuration mode is on, the display indicates this by showing the text 'CONFIG MODE'. Any deliveries made (for testing purposes) in this state will be marked as erroneous.

4.4 MECHANICAL INSTALLATION

4.4.1 DIMENSIONS – ALUMINUM ENCLOSURE – TYPE HAA ... HAZ

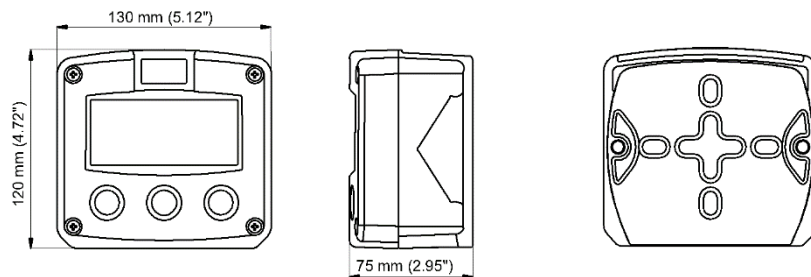


Fig. 31: Dimensions – Aluminum enclosures

4.4.2 DIMENSIONS – ALUMINUM W. EXTENDED BACK ENCLOSURE – TYPE HBA ... HBZ

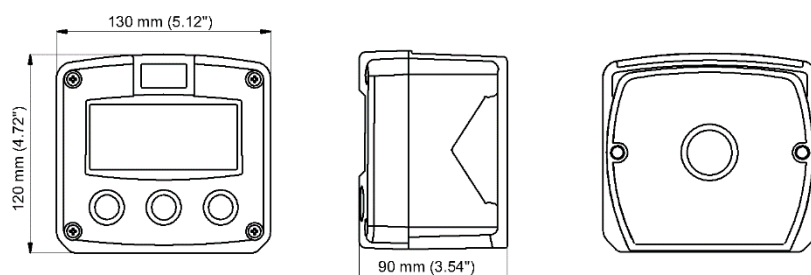


Fig. 32: Dimensions – Aluminum with extended back enclosures

4.4.3 DIMENSIONS – STAINLESS STEEL ENCLOSURE – TYPE HSA ... HSZ

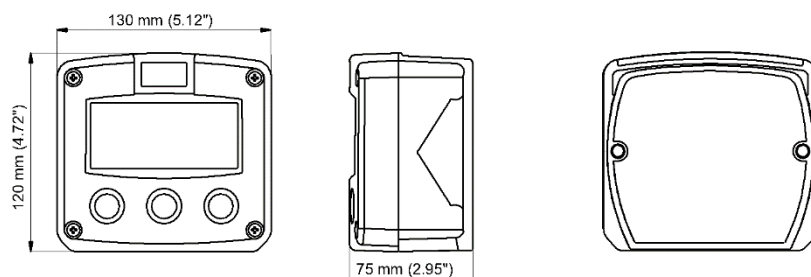


Fig. 33: Dimensions – Stainless Steel enclosures

4.4.4 DIMENSIONS – PLASTIC ENCLOSURE – TYPE HGA ... HGZ

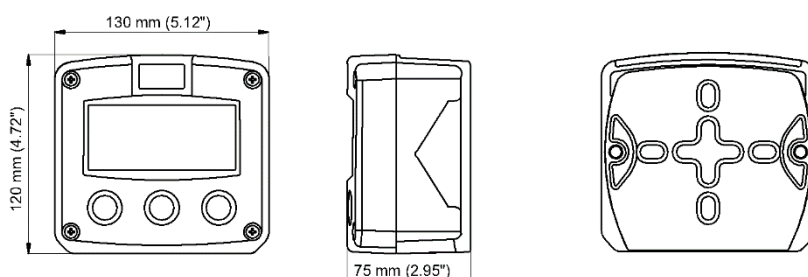


Fig. 34: Dimensions – Plastic enclosures

4.4.5 USING CONDUITS AND CONDUIT HUBS WITH A PLASTIC ENCLOSURE

It is possible to use the plastic enclosure in combination with 1 or 2 conduit hubs of 1/2". For this purpose, two ordering types have been added:

- Type HGL:** 2x 1/2" conduit hub entries – fitted with internal earthing plate
Type HGT: 1x 1/2" conduit hub entry – fitted with internal earthing plate



Fig. 35: Dimensions – Plastic enclosures for conduit hubs

The 1/2" conduit hubs are not delivered together with the unit and must be purchased separately. Please make sure to select conduit hubs that are suitable for the application and suitable for the hazardous area they are being installed into. The entry holes available for the conduit hubs are 7/8" / 22mm and must be able to accommodate a panel thickness of 5 mm. Furthermore, it is advised to limit the height the conduit hub intrudes into the enclosure to about 10mm.



MAKE SURE THAT THE CONDUITS, CONDUIT HUBS AND PROTECTIVE EARTH CONDUCTOR ARE INSTALLED CORRECTLY TO ENSURE PROPER PROTECTION OF THE INSTALLATION.

Because of the isolating nature of the plastic enclosure, an internal earthing plate is supplied where the conduit hub body is inserted into and screwed tight with the nut. This automatically connects the conduits to the earthing plate. On top of the earthing plate, provisions have been made to connect the external Protective Earth (PE) conductor.

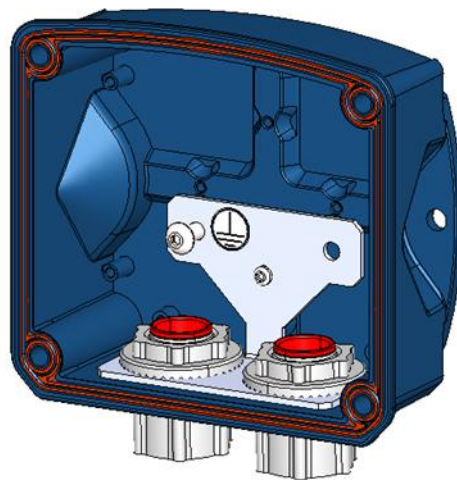


Fig. 36: Plastic enclosure with conduit hubs and internal earthing plate

Please see paragraph 4.5.2 for more information on the electrical installation of the Protective Earth.

4.4.6 MOUNTING

The enclosure can be installed by itself or with the aid of a mounting plate in the configurations shown below. When the unit is installed on a wall or onto a meter, please use components and installation techniques that are suitable for the used materials.

When using the mounting plate, please follow the instructions that came with the accessories.

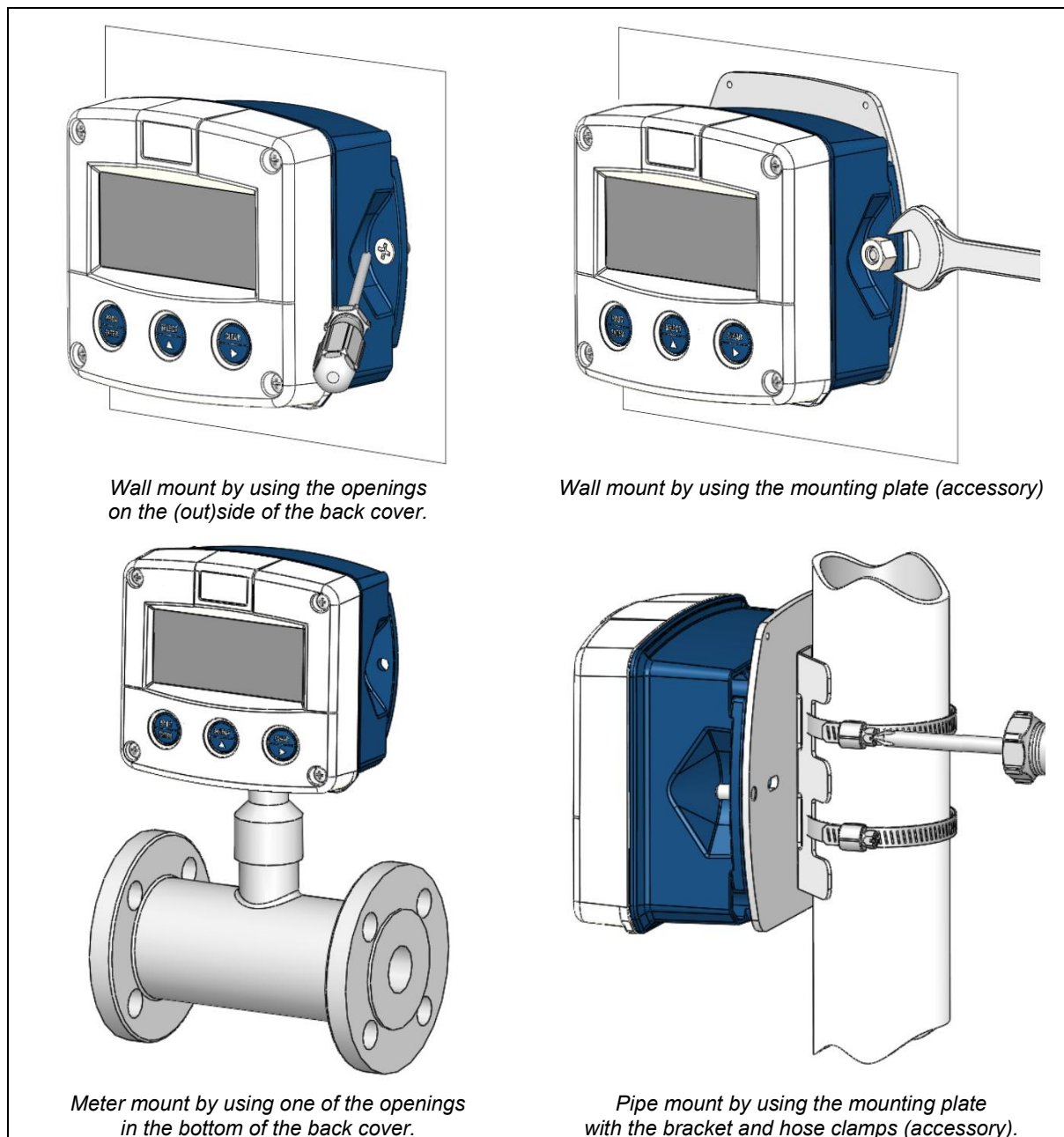


Fig. 37: Installation – Mounting configurations

4.5 ELECTRICAL INSTALLATION



REPLACING BATTERIES, DISCONNECTING LIVE CIRCUITS OR OPENING INSTALLED ENCLOSURES MAY ONLY BE DONE WHEN THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.



- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the Neptune E6000, the installer has to discharge himself by touching a well-grounded object.
- The Neptune E6000 must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).



- Do ground the aluminum / stainless steel enclosure properly with a PE wire as indicated to the Protective Earth terminal. It is the responsibility of the installer to install, connect and test the Protective Earth connections in accordance with the local and (inter)national Rules and Regulations.
- The installation must comply with (inter)national requirements and local ordinances.
Within the United States all field wiring (for Class I, Div. 2) must conform to Article 501.10(B) of the National Electric Code, NFPA 70.
Within Canada all field wiring must conform to Section J18-064 (for non-incendive field wiring) or J18-152 (for Class I, Div. 2 wiring), of the Canadian Electrical Code.

4.5.1 ELECTRICAL SAFETY

Please consult the table with environmental conditions and safety parameters shown at the beginning of this chapter.

General directions:

- Use (separate) cable glands with effective IP67 / TYPE 4(X) seals for all wires.
- For unused cable entries, fit blind plugs with effective IP67 / TYPE 4(X) seals.
- Make a reliable ground connection to the metal enclosure.
- Use effective screened cable for the input/output signals and provide grounding of its screen to the “⊥” terminal (for isolated signals the corresponding – terminal) or at the external device itself, whichever is appropriate to the application. Be careful not to create ground loops!
- All wiring must be in accordance with local codes and regulations.
- In case this instrument is connected to a supply by means of a permanent connection a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.
Furthermore, a protective over-current device with a maximum rating of 0.5A (e.g. fuse or circuit breaker) must be inserted in the positive supply line in safe area.
- Always use the mating connectors supplied with the device. In case of loss or damage, see Appendix A: General regarding replacements.
- The external power supply must be an approved ELV source (type LEC (Limited Energy circuit) or Class 2 power source), insulated from AC mains by double / reinforced insulation per CSA C22.2 No. 61010-1 / UL61010-1.
All other inputs and outputs shall at least be reinforced insulated from mains.
- The installation must comply with (inter)national requirements and local ordinances.
Within the United States all field wiring (for Class I, Div. 2) must conform to Article 501.10(B) of the National Electric Code, NFPA 70.
Within Canada all field wiring must conform to Section J18-064 (for non-incendive field wiring) or J18-152 (for Class I, Div. 2 wiring), of the Canadian Electrical Code.

4.5.2 PROTECTIVE EARTH CONNECTIONS

Inside the Neptune E6000, different types of bonding and earthing are used. The common ground is mostly used for termination of the wire shields and the Protective Earth (PE) is used for electrical safety. For DC-powered installations, route the Protective Earth (PE) grounding conductor into the enclosure together with the incoming power conductors.



Risk of damage to equipment!

Be very careful when connecting terminal 00 / GND to Protective Earth (PE).

This terminal is internally connected to the common ground of the system and (especially when multiple power supplies are connected) the PE connection can cause ground loop currents that could damage the equipment.

Metal enclosure

When the Neptune E6000 is supplied with a metal enclosure (aluminum or stainless steel), the enclosure must be grounded in accordance with national and local electrical codes.

To ground the Neptune E6000, the PE conductor must be connected to the PE stud which is located in the metal back panel, as indicated in the image below. To connect the conductor, a screw (M4 x 6mm) with a serrated washer, a terminal and a washer is used (torque: 2 Nm). The metal front panel is connected to the Protective Earth by the mounting screws with serrated washers.

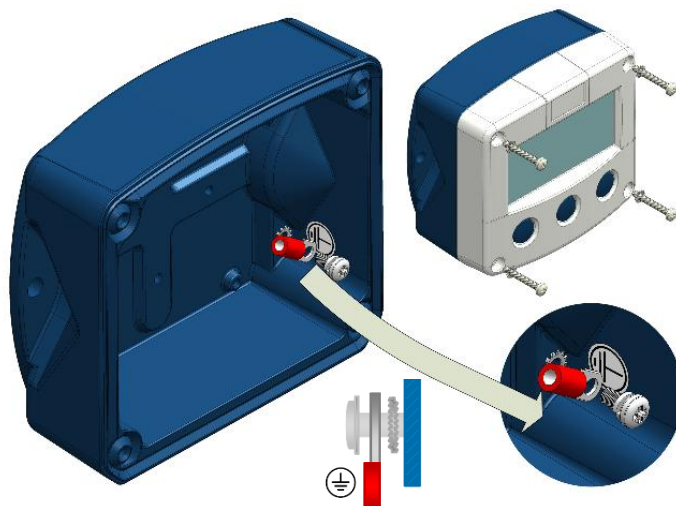


Fig. 38: Protective Earth (PE) connection on metal enclosure

Metal enclosure with conduit hubs

When the Neptune E6000 is supplied with a metal enclosure (aluminum or stainless steel) and installed with conduit hubs, the conduit hubs are automatically grounded by the threaded connection with the metal enclosure. Make sure to order the Neptune E6000 with the correct drilling pattern and thread sizes.

Plastic enclosure

When the Neptune E6000 is supplied with a non-metal enclosure (e.g. plastic), the enclosure meets the requirements of class 2 (double insulated). Therefore any incoming PE conductor can be terminated with an insulating end cap.

Plastic enclosure with conduit hubs

When the Neptune E6000 is supplied with a non-metal enclosure (e.g. plastic) and installed with conduit hubs, the conduit hubs need to be grounded in accordance with national and local electrical codes. For this purpose, a metal grounding plate is inserted in the back panel into which the hubs are secured and the PE conductor must be connected, as indicated in the image below. To connect the conductor, a screw (M5 x 8mm) with a serrated washer, a terminal and a washer is used (torque: 2 Nm).

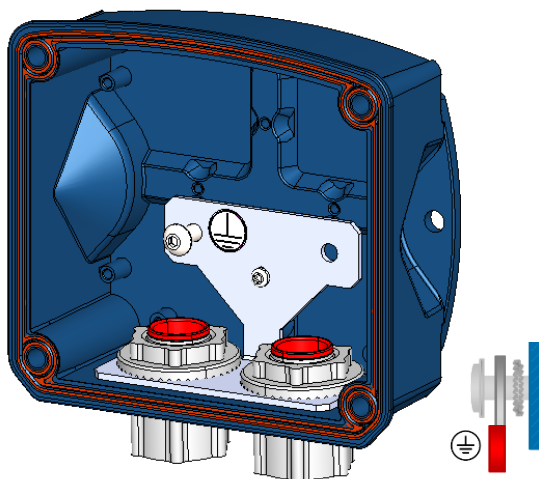


Fig. 39: Protective Earth (PE) connection on conduit hub grounding plate

4.5.3 FIELD WIRING CONNECTIONS



When installing the Neptune E6000 in a hazardous area, do NOT install any wiring unless the area has been declassified or is known to be non-hazardous.



- Do ground the aluminum / stainless steel enclosure properly with a PE wire as indicated to the Protective Earth terminal. It is the responsibility of the installer to install, connect and test the Protective Earth connections in accordance with the local and (inter)national Rules and Regulations.
- When a power supply is connected to the field wiring connections, please also consider the demands for power supply wiring shown in paragraph 4.5.4.
- Always use the mating connectors supplied with the device. In case of loss or damage, see Appendix A: General regarding replacements.
- The installation must comply with (inter)national requirements and local ordinances. Within the United States all field wiring (for Class I, Div. 2) must conform to Article 501.10(B) of the National Electric Code, NFPA 70. Within Canada all field wiring must conform to Section J18-064 (for non-incendive field wiring) or J18-152 (for Class I, Div. 2 wiring), of the Canadian Electrical Code.

All field wiring enters the Neptune E6000 through the bottom of the enclosure and connects to the circuit assembly inside the enclosure door. Wiring is routed through cable glands or up to two conduit hubs. Please make sure to order the Neptune E6000 with the correct drilling pattern and thread (metal) or hole (plastic) sizes.

The wire screens (shield) are meant to prevent electromagnetic interference and shall be terminated at one side to prevent ground loops. Connection of the screen can either be made to the common ground terminal or at the sensor itself, whichever is appropriate to the application.

Inside of the Fluidwell unit, the various common ground terminals are connected to each other. It is advised to terminate the wire screens in the vicinity of the sensor and to insulate the wire screen with a shrink tube at the Neptune E6000 side.

4.5.4 POWER SUPPLY WIRING



- In case this instrument is connected to a supply by means of a permanent connection a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment. Furthermore, a protective over-current device with a maximum rating of 0.5A (e.g. fuse or circuit breaker) must be inserted in the positive supply line in safe area.
- The external power supply must be an approved ELV source (type LEC (Limited Energy circuit) or Class 2 power source), insulated from AC mains by double / reinforced insulation per CSA C22.2 No. 61010-1 / UL61010-1.
- Always use the mating connectors supplied with the device. In case of loss or damage, see Appendix A: General regarding replacements.

The Neptune E6000 should be powered from an external power supply. An internal power supply is also available in the form of a lithium battery but only acts as a backup device. When both external and internal power supplies are available, the internal power supply is automatically interrupted. Note that the optional backlight only works with the external power supply option PX.

4.5.5 SENSOR SUPPLY

For type PB / PX

With these types of power supply, there is no real sensor supply out available but only a limited power supply. This power supply **SHOULD NOT** be used to supply the flowmeters electronics, converters etc. as it will not provide adequate sustained power! All energy used by the flowmeters pick-up will directly influence the battery life-time. It is strongly advised to use a "zero power" pickup such as a coil or reed-switch when operating without external power. It is possible to use some low power NPN or PNP output signals, but the battery life time will be significantly reduced (consult your distributor). The sensor supply is fixed to 1.2V DC for coil type inputs and 3V DC for all other types of flowmeter inputs (set by firmware).

4.6 TERMINAL CONNECTORS



Take careful notice of all safety and precautionary measures indicated in paragraph 4.4: Electrical Installation and review paragraph 4.4.3 and 4.4.4 before applying any field or power supply wiring.



To prevent the disconnection of live circuits in hazardous area, always use the supplied cable connectors with at least 5 poles (where possible) to ensure proper strain relief.

4.6.1 OVERVIEW



Note !

The hazardous area certification allows several configurations to be used.

For the Neptune E6000, only **Configuration 2** is applicable.

Please observe the correct configuration when reviewing control drawings and certificate.

Configuration 2

This configuration does not contain isolated digital inputs or isolated digital outputs. It can be identified by the absence of both Type IG and Type OG in the model code.

For installation of Configuration 2 apparatus, please review control drawing D_F1xx_C2_2.0 in Appendix D.

The following terminal connectors are available on the Neptune E6000 – Configuration 2:

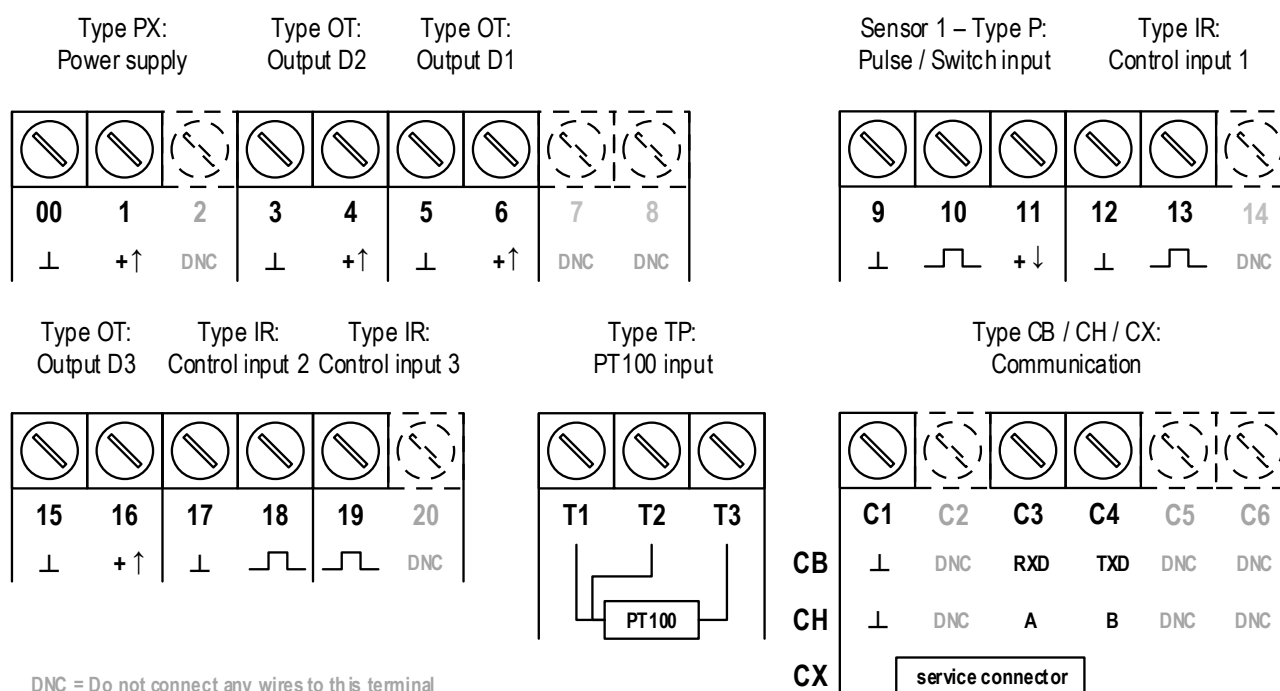


Fig. 40: Overview of terminal connectors – Configuration 2 (standard)

4.6.2 TERMINAL 00-01: POWER SUPPLY – TYPE PX

Connect an external power supply of 6-30VDC (type PX) or 8-30VDC (type PX-ZB) to these terminals. The connected supply is used to power the unit and backlight. When power is applied to these terminals, discharge of the (optional) internal battery will be disabled.

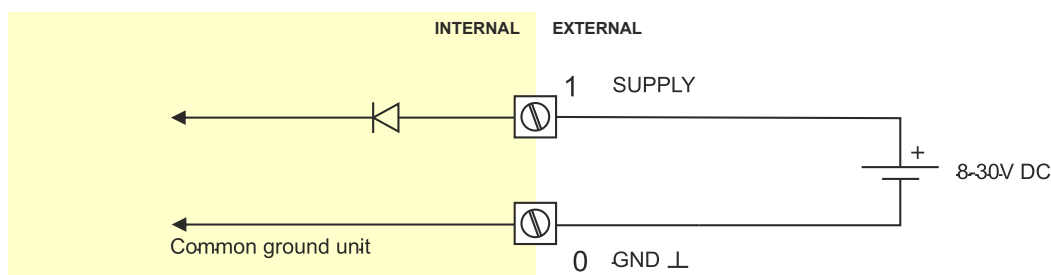


Fig. 41: Terminal connections – Power supply connection

Please read paragraph 4.5.4: Power supply wiring for wiring requirements.

4.6.3 TERMINAL 03-04, 05-06 AND 15-16: DIGITAL OUTPUTS D1, D2 AND D3 – TYPE OT

The functionality of the digital outputs is programmed through the RELAYS menu (SETUP-menu 11). See paragraph 3.3.8 for more details.



Note !

- The digital transistor outputs D1, D2 and D3 have a maximum scaled output frequency of 500Hz.
- In retransmit mode (digital output D1 only), the maximum input frequency is 10 kHz and the output requires a minimum on and off-time of 50 μ s.
- The settings for Relay 1, Relay 2 and Relay 3 correspond with outputs D1, D2 and D3, respectively.

Type OT

Three passive transistor outputs are available with this option, maximum driving capacity 300mA / 30V DC.

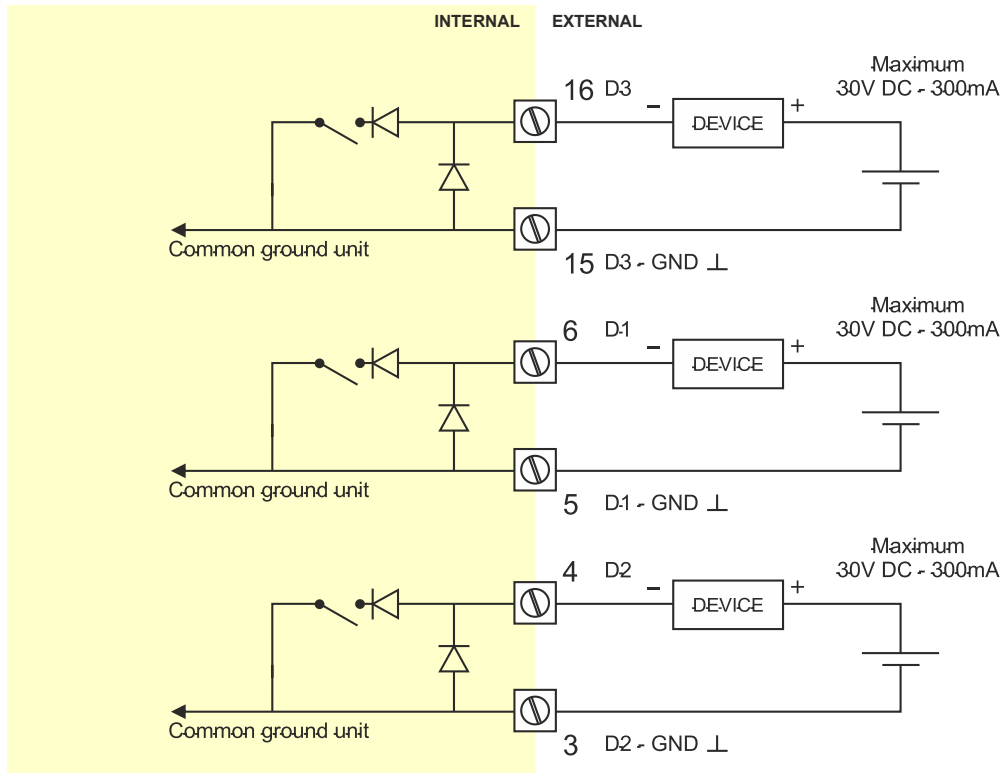


Fig. 42: Terminal connections –Transistor outputs D1, D2, D3

4.6.4 TERMINAL 09-11: FLOWMETER INPUT

Three basic types of flowmeter signals can be connected to the unit: pulse, active pulse or sine-wave (coil). The screen of the signal wire must be connected to the common ground terminal 09 (unless earthed at the sensor itself).

The maximum input frequency is approximately 10 kHz (depending on the type of signal). The input signal type has to be selected in SETUP-menu 4: Flowmeter (read chapter 3).

The following safety parameters are applicable to terminals 9, 10 and 11:

V_{in-max}	=	10 Vdc or peak
V_{oc}	=	5.1 Vdc
I_{sc}	=	1.9 mA
P_o	=	2.4 mW
C_a	=	1000 μ F
L_a	=	3 H

Sine-wave signal (Coil)

The Neptune E6000 is suitable for use with flowmeters which have a coil output signal. Two sensitivity levels can be selected in SETUP-menu 4: Flowmeter (read chapter 3):

- COIL-LO: sensitivity from about 80mV_{pp}
- COIL-HI: sensitivity from about 20mV_{pp}

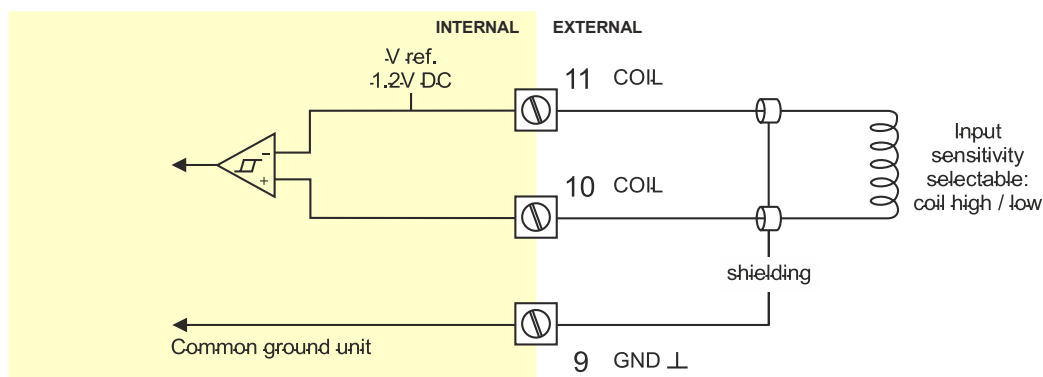


Fig. 43: Terminal connections – Coil signal input

Pulse-signal NPN / NPN-LP

The Neptune E6000 is suitable for use with flowmeters which have a NPN output signal. For reliable pulse detection, the pulse amplitude has to go below 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency (read chapter 3).

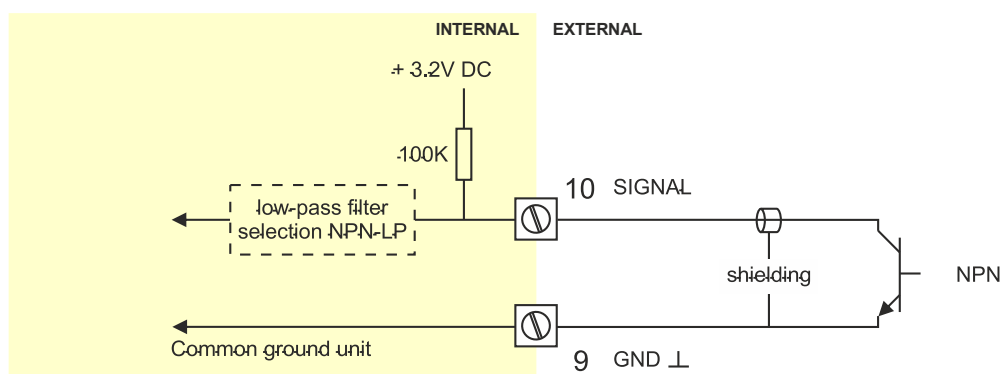


Fig. 44: Terminal connections – NPN signal input

Pulse-signal PNP / PNP-LP

The Neptune E6000 is suitable for use with flowmeters which have a PNP output signal. 3V is offered on terminal 11 which has to be switched by the sensor to terminal 10 (SIGNAL). For a 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 chapter 3).

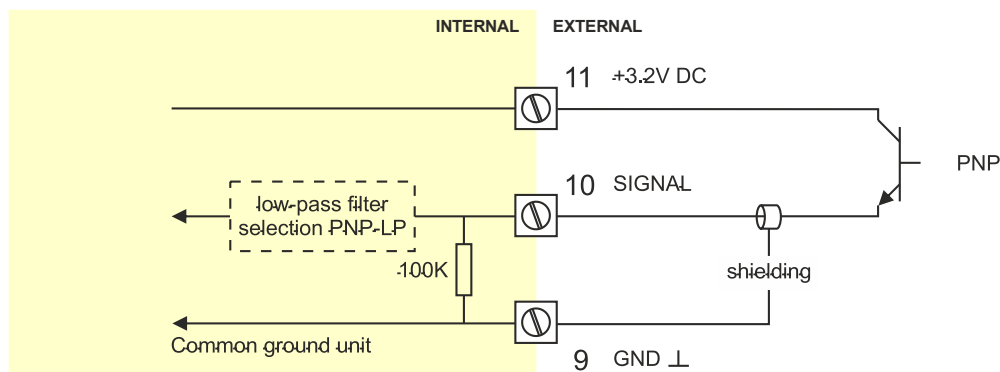


Fig. 45: Terminal connections – PNP signal input

When an external voltage needs to be used (e.g. if a higher voltage is required by the flowmeter), this voltage must be limited to the V_{in-max} of 10V dc.

Reed-switch

The Neptune E6000 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 chapter 3).

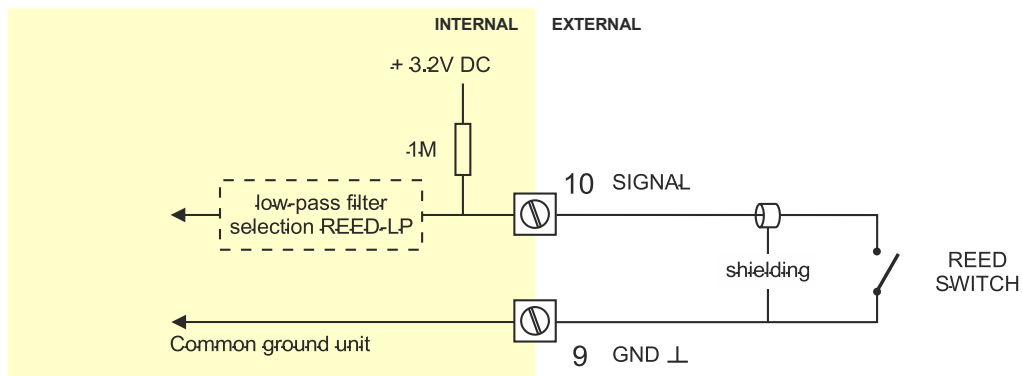


Fig. 46: Terminal connections – Reed-switch signal input

NAMUR-signal

The Neptune E6000 is suitable for flowmeters with an Namur signal. The unit is not able to power the Namur sensor, so an external power supply for the sensor is required. This voltage is normally 8.2V dc, but must be limited to the V_{in-max} of 10V dc at all times.

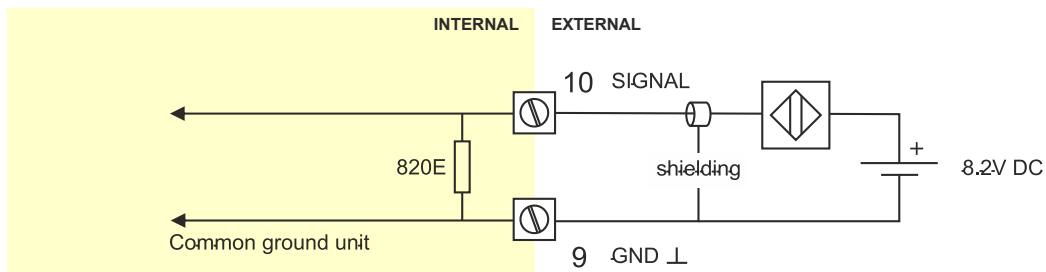


Fig. 47: Terminal connections – NAMUR signal input (typical)

4.6.5 TERMINAL 12-13 AND 17-18-19: REMOTE CONTROL INPUTS 1, 2 AND 3 – TYPE IR

These three remote control inputs can be used to perform several functions which are configured in SETUP-menu 6. The selected action is performed the moment the switch is **closed**. When an input that is assigned the STOP command is kept closed, a new delivery cannot be started until the input is opened. The input must be switched with a potential free contact to its ground terminal for at least 200ms.

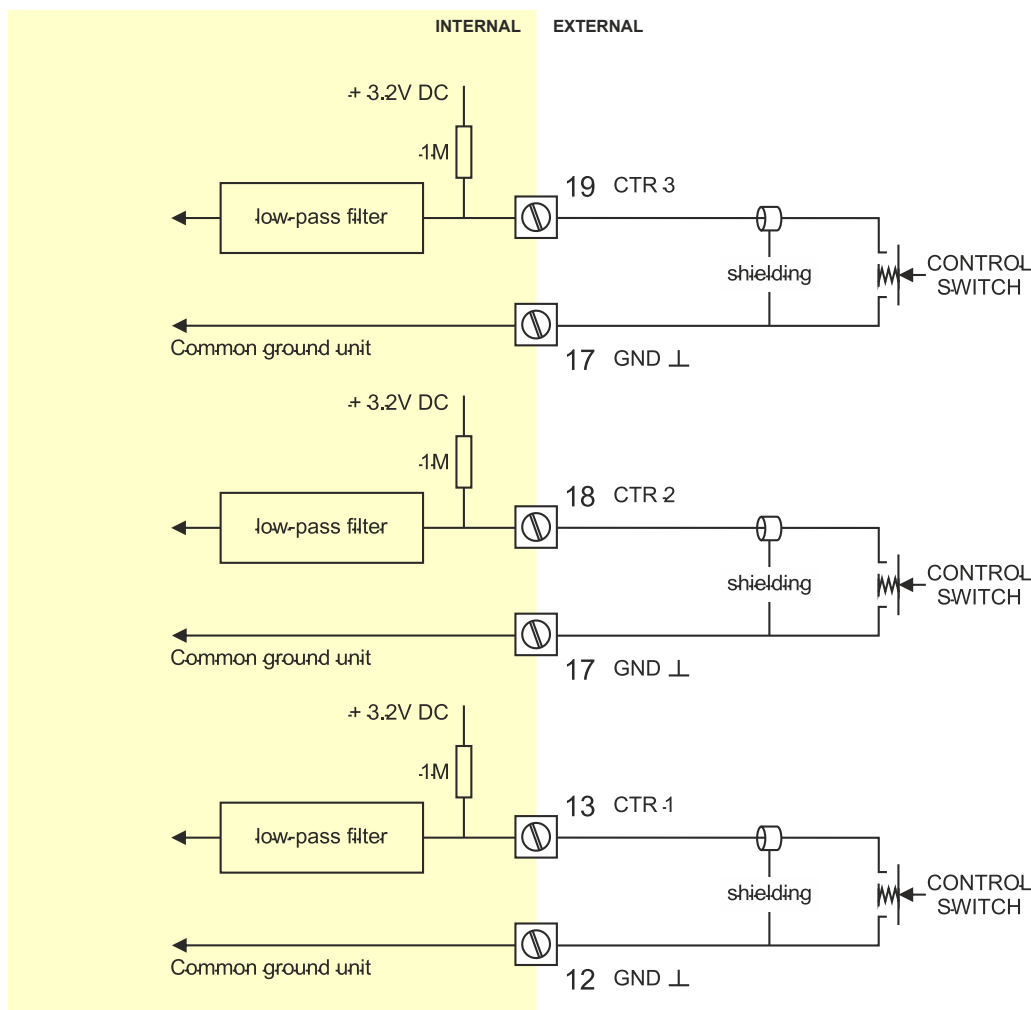


Fig. 48: Terminal connections – External control inputs

4.6.6 TERMINAL T1-T3: PT100 INPUT

The PT100 input is used to measure the actual line temperature. A PT100 element (RTD) can be connected in 2-wire or 3-wire configuration, as shown in below figure. The measured resistance is converted to temperature by using the standard PT100 table from IEC 60751:2008 (ITS90). This assumes an overall temperature coefficient of 0.00385 ohms/ohms/°C and an R_0 of 100 ohms at 0.0°C.

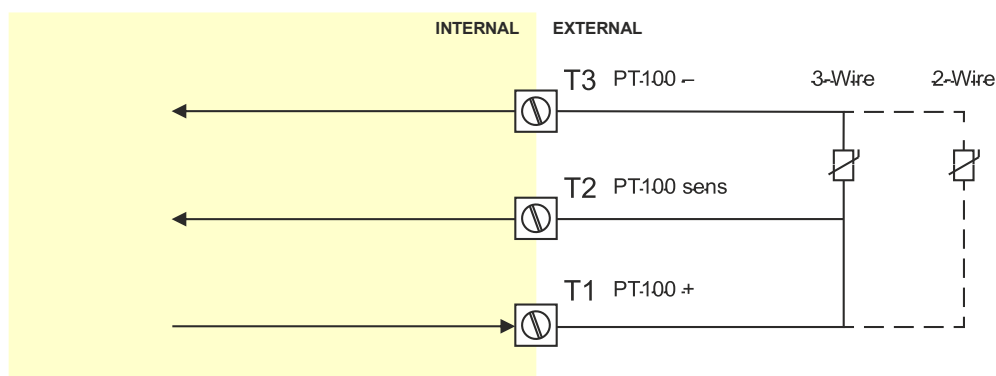


Fig. 49: Terminal connections – PT100 input



Make sure to only connect 2 wires for the 2-wire input and 3 wires for the 3-wire input. Don't connect the unused wires as this has a negative influence on the measurement.

4.6.7 TERMINAL C1-C6: COMMUNICATION INTERFACE

The Neptune E6000 is equipped with a communication interface (Type CX/CB/CH) to print a ticket and to configure the unit. Special configuration software is available to completely configure the Neptune E6000 and read-out logged data.



Note !

- When the communication interface is configured as an RS232 port (type CB) or RS485 port (type CH), it is suitable for use in hazardous area with a permanent connection.
- The service port (type CX) is not intended to be connected with a permanent connection.
- Terminals C5 and C6 are not used and should not be connected.

Type CB: RS232

With type CB, an RS232 communications port is available. The RS232 port is supplied by the unit, even when battery powered. A connection to terminal C2 is not required.

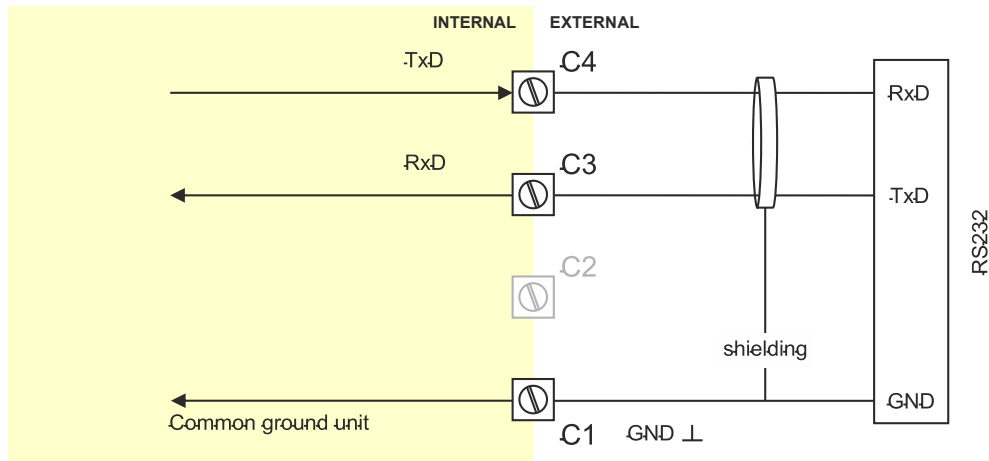


Fig. 50: Terminal connectors – Communication type CB: RS232 port

Type CH: RS485 (2 wire)

With type CH, an RS485 (length of cable max. 1200 meters) communications port is available. All connected devices on the bus, either in hazardous or safe area, must limit the voltages on terminals C3 and C4 between -7V and +12VDC with respect to terminal C1 / GND. The RS485 interface is designed to work without terminations on the bus, due to power limitations.

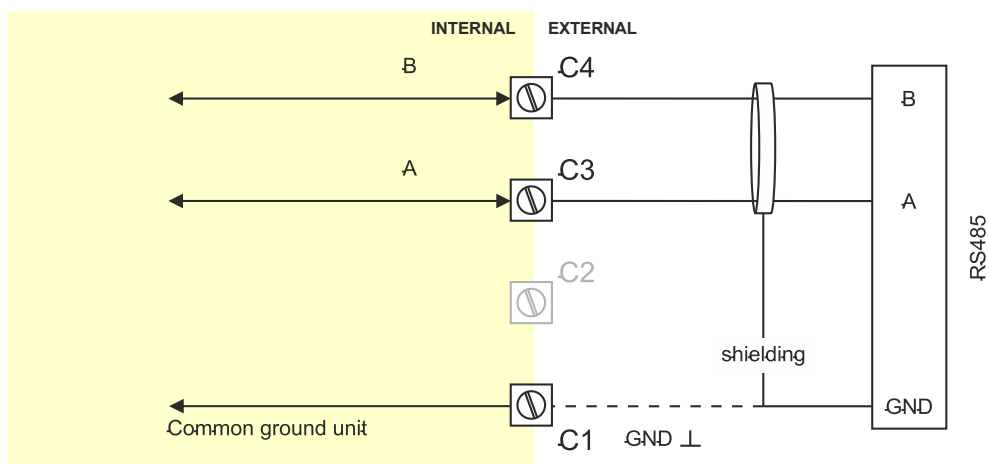


Fig. 51: Terminal connectors – Communication type CH: RS485 (2 wire)

Type CX: service port

With type CX, a service port is available to configure the Neptune E6000 and read-out logged data via an external device, e.g. a laptop. The connection is not made with the standard type connectors, but the connections to terminals C1 through C4 are made via a special service port connector.

To connect a laptop to the service port connector, a special cable is required which is available through your supplier.



When the communication interface is configured as a *service port* (type CX), it may only be used when the area is known to be non-hazardous.

The service port is not intended to be connected with a permanent connection.

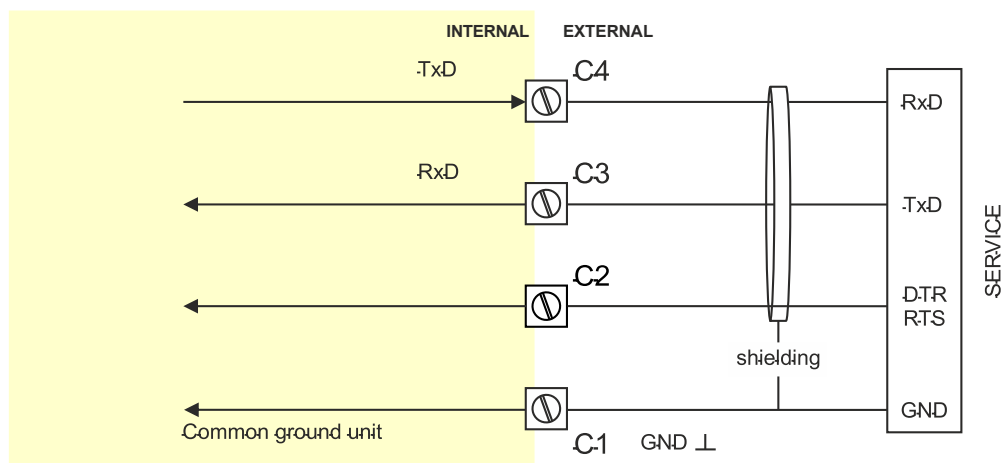


Fig. 52: Terminal connectors – Communication type CX: service port

5 MAINTENANCE

5.1 GENERAL DIRECTIONS



Caution !

- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- This device may only be operated by persons 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 trained persons authorized by the operator of the facility.
- Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.

The Neptune E6000 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 Neptune E6000 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.

Battery life-time

The battery life-time is influenced by several issues :

- Type of sensor (read chapter 3): NPN and PNP inputs consume more energy than coil inputs;
- Input frequency: the higher the frequency, the shorter the battery life-time;
- Display update: fast display update uses significantly more power;
- Pulse output and communications;
- Low temperatures; the available power will be less due to battery chemistry.



Note !

It is strongly advised to disable the unused functions.

Check periodically

- The condition of the enclosure, cable glands, hubs and front panel.
- 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.
- The indication for low-battery.
- Clean window and enclosure only with a lint-free cleaning cloth made damp with a mild soap solution. Do not use any aggressive solvents as these might damage the coating.

5.2 INSTRUCTIONS FOR REPAIR

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

Repair policy

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

- 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.
- 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 and the reported problem falls under the warranty conditions, the product will be repaired or exchanged and returned within three weeks. Otherwise, you will receive a repair estimate.

5.3 BATTERY REPLACEMENT



REPLACING BATTERIES, DISCONNECTING LIVE CIRCUITS OR OPENING INSTALLED ENCLOSURES MAY ONLY BE DONE WHEN THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.



THE USE OF UNAPPROVED BATTERIES CAN INVALIDATE EXPLOSION SAFETY.

Only use batteries that are approved by the manufacturer.

Approved batteries can be ordered from your supplier.

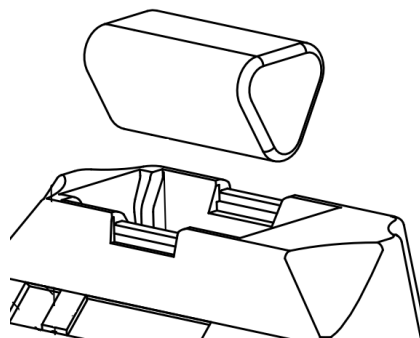


- Handle the battery with the utmost care to prevent a short circuit and damage. A mistreated battery can become unsafe. Unsafe batteries can cause (serious) injury to persons. Do not recharge, crush, disassemble, incinerate, heat above its rated temperature or expose the contents to water.
- Only use batteries which are certified for use in hazardous areas. The use of standard batteries in hazardous area's is not safe and prohibited. Batteries that are regarded as unsafe can cause (serious) injury to persons and damage to the property.
For use in hazardous areas we advise to apply the following batteries only:
 - Main battery: StdLiBAT021 - re-ordering number: SPB02.
 - Clock backup battery: Panasonic BR1225 A
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.

5.3.1 REPLACE THE MAIN BATTERY – TYPE PB

To remove the main battery, follow these instructions:

1. Open the enclosure as indicated in section 4.3.
2. Locate the battery, open the Velcro fastener and remove the battery from its compartment.
3. Find the battery connector in the battery compartment and carefully disconnect the battery from the unit.
4. Store the old battery in a small plastic bag (e.g. the bag the new battery came in) or install an insulation tape over the battery connector to prevent a short circuit.



To install the new main battery, follow these instructions:

1. Make sure the new battery is undamaged, in good condition and suitable for use in the unit.
(Type: StdLiBAT021 - re-ordering nr. SPB02)
2. Find the battery connector and carefully connect the battery to the unit.
3. Install the battery into its compartment and close the Velcro fastener around the battery.
4. Check that the battery is installed properly by checking that the screen has come on.
5. Close the enclosure as indicated in section 4.3.
6. If required, initialize the date and time on the unit.

Uo = 3.6V / Size AA x 3 Fluidwell BV www.fluidwell.com <DATE YYYY-MM> Re-order no. : SPB02	 	WARNINGS: Consult the manual for replacement instructions. Fire, explosion or severe burns may result if mistreated. Do not recharge, crush, disassemble, incinerate, heat above 100°C (212°F) or expose contents to water. AVERTISSEMENTS : Consulter le manuel pour connaître les consignes de remplacement. Une mauvaise utilisation peut entraîner un incendie, une explosion ou de graves blessures. Ne pas recharger, écraser, démonter, incinérer, chauffer à plus de 100°C (212°F) ou exposer à l'eau.
Primary Lithium Battery - Only replace with Fluidwell recommended battery pack. Pile primaire au lithium - Remplacer uniquement par une pile recommandée par Fluidwell		

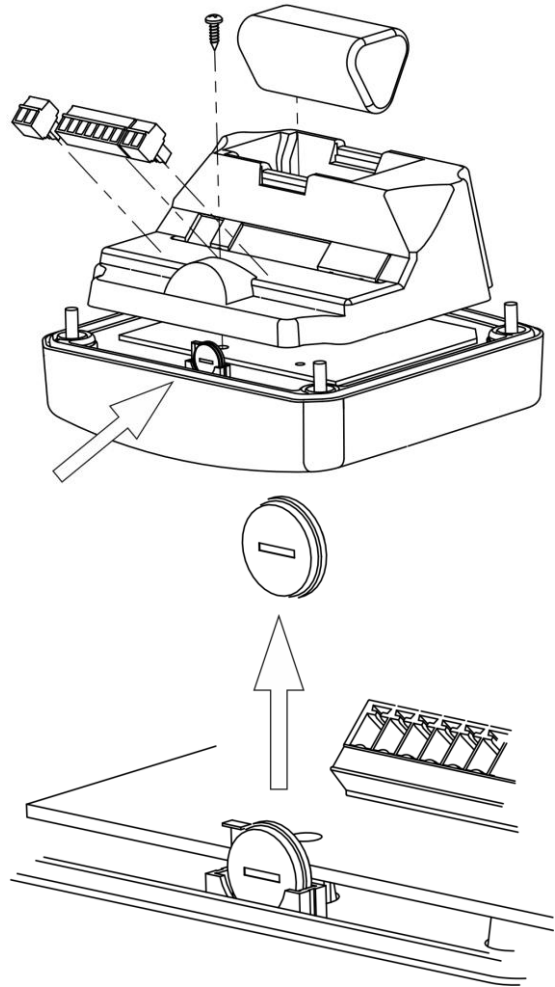
5.3.2 REPLACE THE CLOCK BACKUP BATTERY

To remove the clock backup battery, follow these instructions:

1. Open the enclosure and remove the main battery as indicated in the previous section.
2. Remove all connectors.
3. Remove the two screws that fasten the plastic cover and then carefully remove the plastic cover.
4. Locate the backup battery and remove it from its socket by pushing the locking clip to the side.
5. Store the old battery in a small plastic bag (e.g. the bag the new battery came in) or install an insulation tape over the battery to prevent a short circuit.

To install the new clock backup battery, follow these instructions:

1. Make sure the new battery is undamaged, in good condition and suitable for use in the unit.
(Type: Panasonic BR1225A or equivalent)
2. Locate the backup battery socket, push the locking clip to the side and insert the new battery into the socket while minding the correct orientation (as indicated by the image to the right).
3. Carefully replace the plastic cover and secure it with the two screws.
4. Replace all connectors to their original position.
5. Install the main battery and close the enclosure as indicated in the previous section.
6. Initialize the date and time on the unit.



5.3.3 DISPOSAL OF BATTERIES

Dispose of batteries in accordance with the (inter)national, the manufacturer's and the plant owner's standards and regulations.



- Batteries pose an environmental hazard.
- Do not dispose of as general waste or incinerate.
- Return used batteries to a recycling point.

APPENDIX A. TECHNICAL SPECIFICATION

General

Display	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Digits	Seven 17mm (0.67") and eleven 8mm (0.31"). Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec - 30 secs.
Type ZB	LCD with LED backlight. Improved readability in full sunlight and darkness.
Enclosures	
General	Die-cast aluminum, Stainless Steel or GRP (Glassfibre Reinforced Polyamide) enclosure with Polycarbonate window, silicone and EPDM gaskets. UV stabilized and flame retardant material. Three industrial micro-switch keys. UV-stabilized silicone keypad.
Control Keys Painting	Aluminum enclosure only: UV-resistant 2-component industrial painting.
Field/wall-mount enclosures Material and drillings	Dimensions: 130 x 120 x 75mm (5.10" x 4.72" x 2.95") – LxHxD.
Aluminum	Type HA, HL ... HZ and HAA ... HAZ
Aluminum extended back	Type HBA ... HBZ
Stainless Steel	SS 316 L, Type HAS ... HSZ
Plastic	HGA ... HGZ
with conduit hub entries	HGL: 2x 1/2" conduit hub entries – fitted with internal earthing plate HGT: 1x 1/2" conduit hub entry – fitted with internal earthing plate
Equipment ratings	
Ambient temperature range	-40°C to +70°C, -40°F to +158°F
Relative humidity	Up to 80% for temperatures up to 31°C, decreasing linearly to 50% at 40°C.
Indoor / Outdoor use	Suitable for indoor and outdoor use
Enclosure rating	Type 4X
Means of protection	Division 2: Energy limited Ordinary locations: Class I (PE connected metal enclosure) Class II (non-metallic enclosure)
Installation category	I
Pollution degree	2
Altitude	Up to 2000 m
Power supply	
Type PB	Lithium battery - life-time depends upon settings - up to 5 years.
Type PX	6-30V DC; Power consumption max. 0.4 Watt.
Type PX-ZB	8-30V DC; Power consumption max. 1.0 Watt.
Sensor excitation	
Type PB / PX	3V DC for low power pulse signals and 1.2V DC for coil pick-up.
Data protection	
Type	EEPROM backup of all setting. Backup of running totals every minute. Data retention at least 10 years.
Password	Configuration settings can be password protected.
Hazardous area	
Class I, Division 2	Certificate: CSA 80038272 Groups A, B, C, D T5 CSA C22.2 No. 213-17 ANSI/UL 121201-2019
Directives and Standards	
EMC	EN 61326-1; FCC 47 CFR part 15
LVD	CAN/CSA C22.2 No. 61010-1-12, UPD1:2015, UPD2:2016, AMD1:2018 UL 61010-1-12, AMD1:2018
RoHS	EN 50581
IP & TYPE	CSA C22.2 No. 94.2-15 UL 50E-2015
Weights & Measure	
NTEP approval	Certificate: 25-022 NTEP location: 9011 South 83 rd Street, Lincoln, Nebraska 68516 Handbook 44 Specifications, Tolerances and Other Technical Requirements for Weighing and Measuring Devices, 2025 Edition NCWM Publication 14: Measuring Devices, 2025 Edition.

Terminals	
Type	Removable plug-in terminal strip.
Brand	PTR: AKZ1550/___-3.81-GREEN PHOENIX CONTACT: MC 1.5/___-ST-3.81
Torque	0.25 Nm
Minimum number of poles	To prevent the disconnection of live circuits in hazardous area, adhere to the following: PHOENIX: Only connectors (cable part) with a minimum of 3 poles are allowed. PTR: Only connectors (cable part) with a minimum of 5 poles are allowed.
Wire sizes	Solid: 0.14...1.5 mm ² / Stranded: 0.14...1.5 mm ² / Stranded with Ferrule: 0.25...1.0 mm ²
Replacements	Always use the mating connectors supplied with your device. Only replace with same brand and type. For suitable replacement connectors (cable part), please contact your supplier or the manufacturer directly.

Inputs

Flowmeter	
Type P	Coil / sine wave (sensitivity selectable), NPN, PNP, reed switch, NAMUR
Frequency	Minimum 0 Hz - maximum 7 kHz for total and flow rate. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120 Hz.
K-Factor	0.000010 - 9999999 with variable decimal position.
Low-pass filter	nnp-lp; reed-lp; pnp-lp
Linearization	15 positions with interpolation function; Meter-Factor 0.000001 - 9.999999 versus Frequency 0.001 Hz - 9,999 Hz.

Remote control inputs	
Type IR	3 control inputs with selectable function: delivery line selection, start, stop, print
Input	Make-and-break contact – When stop function is selected, additional functionality to block out any START command (as long as this contact is being made). Duration minimum 200 msec. to activate the input.

Temperature input	
Type TP	PT100 RTD - Range -100°C ... +200°C / -148°F ... 392°F
Conversion	PT100 table from IEC 60751:2008 (ITS90). Overall temperature coefficient: 0.00385 ohms/ohms/°C, Ro = 100 ohms at 0.0°C.
Wires	2- or 3-Wire configuration
Update time	Once per second
Accuracy	0.05°C / 0.1°F

Outputs

Digital output(s)	
General	- Valve or pump control - Transmitting grand total (scaled pulse) or input pulse retransmission
Frequency	Retransmission: Minimum pulse duration: 50µs, square wave output based on frequency of (sine wave or coil) input signal Scaled: max. 500Hz. Pulse length user definable between 1msec up to 10 seconds.
Type OT	Three passive transistor outputs. Load max. 30V DC – 300mA.

Communication option	
Protocol	Printer (ASCII) or Modbus protocol (RTU and ASCII)
Speed	1200; 2400; 4800; 9600; 19200; 38400; 57600
Type CB	RS232
Type CH	RS485 2-wire
Type CX	Service connector – temporary use in non-hazardous area only. A special communication cable might be required, available through your supplier.

Operational

Volume correction	
Formula	Temperature correction for volumes of NGL and LPG. Tables according to API Manual of Petroleum Measurement Standards (MPMS) 11.2.4:2019 / GPA 8217
Tables	None (disabled); API 24E (60°F); API 54E (15°C); API 60E (20°C)
Update time	Once per second during deliveries
Operator functions	
Displayed information	At operator level: • Corrected delivery quantity (of currently active or last performed delivery) • Delivery line selection (if required) • Configuration mode indication • (Duplicate) Delivery ticket printing of last delivery Inside the submenu: • Corrected and uncorrected: Delivery line 1 total, Delivery line 2 total and Grand total • Base temperature based on selected formula • Actual measured temperature • Actual calculated CTL (temperature correction factor) • Reviewing and duplicate printing of delivery records <i>The uncorrected delivery quantity is only available by reviewing the related delivery record. This is to avoid any confusion regarding the actual delivered quantity.</i>  Note !
Totals	
Digits	7 digits.
Correction	Available in both corrected and uncorrected value
Unit	L, m3, US gal, igal, cf, Oil bbl, kg, ton, US ton, lb or none.
Decimals	0 - 1 - 2 or 3.
	 Note ! <i>Delivery line totals and Grand totals (both corrected and uncorrected) cannot be reset to zero.</i>
Deliveries	
Quantity	7 digits.
Correction	Available in both corrected and uncorrected value
Unit and decimals	According settings for Total
Number of records	199 – oldest record is overwritten automatically when a new delivery is started.
Record content	• Delivery number and delivery status • Selected delivery line • Delivery quantity (corrected and uncorrected) • Delivery line total at end of delivery (corrected and uncorrected) • (Relative) Density, Base temperature and average CTL • Time and Date of delivery <i>Recorded corrected and uncorrected delivery line totals are only available by extracting the delivery record information to the PC or by printing (a duplicate of) the delivery ticket.</i>  Note !

APPENDIX B. PROBLEM SOLVING

In this appendix, several problems are treated that can occur when the Neptune E6000 is going to be installed or while it is in operation.

Delivery cannot be started:

Following items can prevent a delivery from starting:

- Is an external alarm or an (internal) error present?
- Is the external power supply interrupted?
- Is the device waiting for a release command? (see SETUP 2.F)
- Is a delivery already running?
- When the W&M switch is unlocked, deliveries can be started but are all marked as invalid. Check if the display shows 'CONFIG MODE'.

Flowmeter does not generate pulses:

Check:

- Signal selection;
- Pulse amplitude;
- Flowmeter, wiring and connection of terminal connectors;
- Power supply of flowmeter.

Flowmeter generates "too many pulses":

Check:

- Settings for total and flow rate;
- Type of signal selected with actual signal generated;
- Sensitivity of coil input;
- Proper grounding of the Neptune E6000;
- Use screened wire for flowmeter signals and connect screen to terminal 9. (unless connected at sensor).

PT100 temperature measurement is incorrect / faulty:

Check:

- Setting for number of wires used for measurement;
- Two wire measurement: do not connect the third and fourth wire (if present);
- Three wire measurement: do not connect the fourth wire (if present) and make sure to connect the PT100 sense + wire correctly with respect to the PT100 + wire.

Pulse output does not function:

Check:

- Amount: pulse per "x" quantity; is the value programmed reasonable and will the maximum output be under 500Hz for output D2 and under 50 Hz for output D3?
- Solid state output: Is output D3 enabled in the configuration settings?
- Width: is the external device able to recognize the selected pulse width and frequency?

Linearization does not work:

Check:

- Is the function enabled?
- Are all M-Factors and frequencies entered correctly?

Printer does not work:

Check:

- Is the communication port set to printer?
- Is the printers TxD line connected to the units RxD line, and vice-versa for the other RxD and TxD line?
- Are the communication settings on the unit identical to the settings on the printer?

The password is unknown:

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

Display shows 'LOCKED' when trying to alter configuration settings:

Altering configuration settings can only be done in configuration mode. Move the W&M switch to enable the configuration mode as described in paragraph 4.3.4. Move the switch back when the changes are done.

ALARM

When the alarm flag starts to blink an internal alarm condition has occurred. Press the "select 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 shown. The digital [d] codes are:

Not recoverable by the end user:

[d] 0 = no error	[d] 64 = logdata-storage error
[d] 1 = display error	[d] 128 = k-factor conversion error
[d] 2 = data-storage error	[d] 256 = PT100 analog input error
[d] 4 = initialization error	[d] 512 = Temperature range error
[d] 8 = analog input error	[d] 1024 = Density calculation error
[d] 16 = linearization error (M-Factor out of range)	[d] 2048 = CTL calculation error
[d] 32 = I/O configuration error	[d] 4096 = Configuration error (formula enabled, temperature disabled)

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

APPENDIX C. MODBUS COMMUNICATION

General

This product 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 interface.

Currently, the following function codes are supported:

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

The tables on the next pages show the Modbus PDU addresses in a decimal format, followed by its hexadecimal representation (0x0000). When the PLC address range is required (4x references are typically used by PLCs), please use the holding registers addresses.

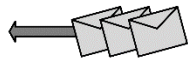
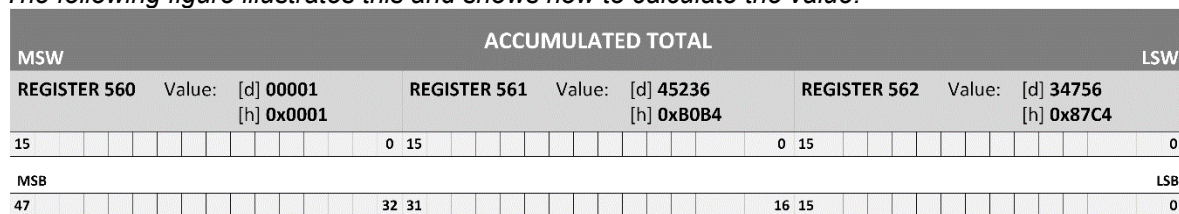
Variables consisting of multiple registers

Several variables in the system are too big to fit in a single register and are spanned over multiple registers. Most Modbus masters support variables that span 2 or 4 registers in integer and floating point format. If your Modbus master does not support any of the formats we supply, select an integer based variable, and you can calculate the corresponding value manually, as shown in this example:

Let's assume that variable accumulated total spans 3 registers with address 560, 561 and 562.

When a transmission is done, register 560 (which represents the MSW - most significant word) arrives first, followed by register 561 in the middle and register 562 at the end (the LSB - least significant word).

The following figure illustrates this and shows how to calculate the value.



F1W-F000-000032-003-MIL

ACCUMULATED TOTAL: $[\text{register } 560 * 2^{32}] + [\text{register } 561 * 2^{16}] + [\text{register } 562 * 1]$
 Calculation [d]: $[00001 * 4294967296] + [45236 * 65536] + [34756 * 1] = 7259588548$
 Calculation [h]: $0x[0001][B0B4][87C4] = 0x0001B0B487C4$

Datatypes

The following datatypes are used for Modbus communication with the F119-P:

DATA TYPE	NUMBER OF BYTES	NUMBER OF REGISTERS (16 BIT)	DESCRIPTION
char	1	1	8 bits ASCII character
string[x]	1	x / 2 (rounded up)	Array of x ASCII characters, unused positions return zero (0x00)
uint16	2	1	16 bits unsigned integer
uint32	4	2	32 bits unsigned integer
int32	4	2	32 bits signed integer
uint48	6	3	48 bits unsigned integer
uint64	8	4	64 bits unsigned integer
float32	4	2	32 bits floating point
float64	8	4	64 bits floating point

Note: When reading and writing integer-type variables, values are transmitted without the decimal point.

For the correct representation, please see the remarks-field in the tables below.

Note: Variables spanning multiple registers use 'big-endian' data representation.

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

Sending delivery commands

A delivery commands is given by sending a specific value to the delivery command register per this table:

Delivery commands of the Neptune E6000						
PDU ADDRESS	HOLDING REGISTER	VARIABLE	# REG'S	R/W	TYPE	VALUE / REMARKS
[d] 263 [h] 0x010D	40264	Delivery command	1	R/W	uint8	0 = start – send a start command without line selection 1 = start 1 – send a start command for Line 1 2 = start 2 – send a start command for Line 2 3 = stop – send a stop command to stop the delivery 4 = release – send a release command

Delivery information

For efficient readout of all relevant data relating to the current of last delivery, the following table with registers is available. The entire table, or part of it, can be read with a single read command after which it can be processed by the host as required. The table consists of 3 parts:

1. General device information and status
2. Actual / last delivery information
3. Addition delivery information

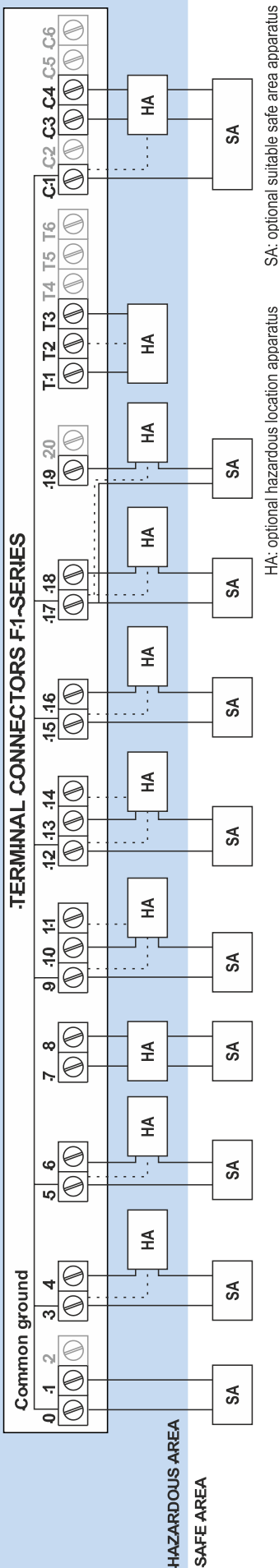
Use the device state register (6469) to determine if a delivery is being performed or has finished. This register also indicates whether a release needs to be given or if an error / alarm situation is present.

Note: At present, it is not possible to read logged deliveries directly using Modbus, only the actual (running) or last (finished) delivery information is available. To read out logged deliveries, please use the configuration tool.

Delivery information of the Neptune E6000 – Contiguous read						
PDU ADDRESS	HOLDING REGISTER	VARIABLE	# REG'S OFFSET	R/W	TYPE	VALUE / REMARKS
1. Actual device information						
[d] 6416 [h] 0x1910	46417	Device model	16 0	R	string[32]	Neptune E6000
[d] 6432 [h] 0x1910	46433	Device version number	2 16	R	uint32	0...999999 Representation: xx.xx.xx
[d] 6434 [h] 0x1910	46435	Device tag number	2 18	R	uint32	0...9999999 Representation: xxxxxxxx
[d] 6436 [h] 0x1910	46437	Device serial number	2 20	R	uint32	0...9999999 Representation: xxxxxxxx
[d] 6438 [h] 0x1910	46439	Actual uncorrected grand total	4 22	R	uint64	Actual grand totals: 0.000...99999999999 Actual line totals: 0.000...9999999 Representation: unit → reg 6515, decimals → reg 6514
[d] 6442 [h] 0x1910	46443	Actual uncorrected delivery line 2 total	4 26	R	uint64	
[d] 6446 [h] 0x1910	46447	Actual uncorrected delivery line 1 total	4 30	R	uint64	
[d] 6450 [h] 0x1910	46451	Actual corrected grand total	4 34	R	uint64	
[d] 6454 [h] 0x1910	46455	Actual corrected delivery line 2 total	4 38	R	uint64	
[d] 6458 [h] 0x1910	46459	Actual corrected delivery line 1 total	4 42	R	uint64	
[d] 6462 [h] 0x1910	46463	Actual device date	2 46	R	uint32	00-01-01 – 99-12-31 Representation: yy-mm-dd Stored decimal: 25:12:31 = [d] 251231 = [h] 0x0003.D55F
[d] 6464 [h] 0x1910	46465	Actual device time	2 48	R	uint32	00:00:00 – 23:59:59 Representation: hh:mm:ss Stored decimal: 23:59:59 = [d] 235959 = [h] 0x0003.99B7
[d] 6466 [h] 0x1910	46467	Actual temperature	2 50	R	float32	-999...999 Representation: unit → reg 6517, accuracy → 0.1°F / 0.05°C
[d] 6468 [h] 0x1910	46469	Device error register	1 52	R	uint16 (bitfield)	[d] 0 [h] 0x0000 = no error [d] 1 [h] 0x0001 = display error [d] 2 [h] 0x0002 = data-storage error [d] 4 [h] 0x0004 = initialization error [d] 8 [h] 0x0008 = data-storage error [d] 16 [h] 0x0010 = Linearization error (M-factor fault) [d] 32 [h] 0x0020 = IO expander error [d] 64 [h] 0x0040 = data-storage error data logging [d] 128 [h] 0x0080 = Automatic K-factor conversion error [d] 256 [h] 0x0100 = PT100 ADC error [d] 512 [h] 0x0200 = Temperature range error [d] 1024 [h] 0x0400 = Density calculation error [d] 2048 [h] 0x0800 = CTL calculation error [d] 4096 [h] 0x1000 = Configuration error
[d] 6469 [h] 0x1910	46470	Device state	1 53	R	uint8	0 = idle – the device is ready to start a delivery. 1 = delivery busy – a delivery is currently running. 2 = release – the device is waiting for a release command. 3 = external alarm – an external alarm is present 4 = (internal) error – an (internal) error is present 5 = no ext. power – no external power is available <i>Note: A delivery can only be started with device state = 0.</i>

Delivery information of the Neptune E6000 – Contiguous read						
PDU ADDRESS	HOLDING REGISTER	VARIABLE	# REG'S OFFSET	R/W	TYPE	VALUE / REMARKS
2. Actual (running) / last (finished) delivery information						
[d] 6470 [h] 0x1910	46471	Record number	1 54	R	uint8	Fixed to value 1, indicating current/last delivery.
[d] 6471 [h] 0x1910	46472	Delivery status	1 55	R	uint8	0: Successful 1: Maximum delivery time reached 2: Maximum quantity reached 3: No flow detected 4: Power failure 5: External alarm 6: Temperature input error 7: CTL calculation error 8: Internal error occurred 128: Successful [Configuration mode] 129: Maximum delivery time reached [Configuration mode] 130: Maximum quantity reached [Configuration mode] 131: No flow detected [Configuration mode] 132: Power failure [Configuration mode] 133: External alarm [Configuration mode] 134: Temperature input error [Configuration mode] 135: CTL calculation error [Configuration mode] 136: Internal error occurred [Configuration mode]
[d] 6472 [h] 0x1910	46473	Delivery number	2 56	R	uint32	0...9999999
[d] 6474 [h] 0x1910	46475	Delivery date	2 58	R	uint32	00-01-01 – 99-12-31 Representation: yy-mm-dd Stored decimal: 25:12:31 = [d] 251231 = [h] 0x0003.D55F
[d] 6476 [h] 0x1910	46477	Delivery time	2 60	R	uint32	00:00:00 – 23:59:59 Representation: hh:mm:ss Stored decimal: 23:59:59 = [d] 235959 = [h] 0x0003.99B7
[d] 6478 [h] 0x1910	46479	Selected delivery line	1 62	R	unit16	0 = Line 1 1 = Line 2
[d] 6479 [h] 0x1910	46480	Corrected delivered quantity	4 63	R	uint64	Delivered quantity: 0.000...9999999 Representation: unit → reg 6515, decimals → reg 6514
[d] 6483 [h] 0x1910	46484	Uncorrected delivered quantity	4 67	R	uint64	
[d] 6487 [h] 0x1910	46488	Base temperature	3 71	R	string[5]	Character representation based on selected API table: API Table 24E: 60 °F API Table 54E: 15 °C API Table 60E: 20 °C
[d] 6490 [h] 0x1910	46491	Density / relative density	2 74	R	float32	API Table 24E: 0.35000 – 0.68800 relative density API Table 54E: 351.70 – 687.80 [kg/m³] API Table 60E: 331.70 – 683.60 [kg/m³]
[d] 6492 [h] 0x1910	46493	Average / actual CTL	2 76	R	float32	During delivery: actual calculated correction factor Outside deliveries: average correction factor last delivery.
[d] 6494 [h] 0x1910	46495	Corrected delivery line total	4 78	R	uint64	Line totals: 0.000...9999999 Representation: unit → reg 6515, decimals → reg 6514
[d] 6498 [h] 0x1910	46499	Uncorrected delivery line total	4 82	R	uint64	
[d] 6502 [h] 0x1910	46503	Description selected delivery line	4 86	R	string[8]	Character representation of selected delivery line.
[d] 6506 [h] 0x1910	46507	Description delivery end information	8 90	R	string[16]	Character representation of delivery ending state.
3. Addition delivery information						
[d] 6514 [h] 0x1910	46515	Number of decimals total	1 98	R	uint8	Number of decimals applicable to delivery and line total values in this delivery.
[d] 6515 [h] 0x1910	46516	Unit Total	2 99	R	string[3]	Character representation of delivery and line total values in this delivery.
[d] 6517 [h] 0x1910	46518	Unit Temperature	1 101	R	string[2]	Character representation of temperature unit. Degrees symbol is represented by [d] 248 / [h] 0xF8
[d] 6518 [h] 0x1910	46519	Unit density / relative density	3 102	R	string[5]	Character representation of density / relative density (kg/m3 / [])
[d] 6520 [h] 0x1910	46521	Last register	104			Total 105 registers.
Note: The list of variables shown above can be read as one contiguous list of registers. Unused registers return 0 (0x0000).						

TERMINAL CONNECTORS F.1-SERIES



Terminals		0, 1 Power Supply	3, 4 Digital Output 2	5, 6 Digital Output 1	7, 8 Analog Output	9, 10, 11 Sensor 1	12, 13, 14 Sensor 2	15, 16 Digital Output 3	17, 18 Sensor 3	17, 19 Sensor 4	T1, T2, T3 Sensor 5	C1, C2, C3, C4 Communication
Function	Isolated	-	-	-	Yes	-	-	-	-	-	-	-
	-Type PX:	-Type OT:	-Type OT:	-Type OT:	-Type AH:	10V dc or peak	10V dc or peak	-Type OF:	-Type IA / TA:	-Type IR:	-Type TP:	-Type CB: -12V dc -Type CH: -7V dc to 12V dc -Type CX: service connector
Input:	V _{in-max} I _{in-max}	30V dc 0.5A (fused)	30V dc 300mA	30V dc 300mA	30V dc	10V dc or peak	10V dc or peak	30V dc 300mA	30V dc 50mA	5.1V dc 1.9mA 2.4mW 1000µF	(no parameters)	
Output:	V _{oc} I _{sc} P _o C _a L _a					5.1V dc 1.9mA 2.4mW 1000µF 3H	5.1V dc 1.9mA 2.4mW 1000µF 3H		-Type IR (w/o IA / TA): 5.1V dc 1.9mA 2.4mW 1000µF 3H	5.1V dc 1.9mA 2.4mW 1000µF 3H		
Note 1: Configuration 2 is applicable for all F1xx-XN models without Type IG and Type OG.												
Note 2: Greyed-out terminal mean 'no connection' and should not be connected to any circuit.												
Note 3: Isolated means isolated from internal circuitry and circuits connected to GND.												
Note 4: All circuits can have optional hazardous location apparatus installed. Verify suitability with above I/O parameters and I/O parameters of the circuits and optional apparatuses.												
Note 5: In case this instrument is connected to a supply by means of a permanent connection a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment. Furthermore, a protective over-current device with a maximum rating of 0.5A (e.g. fuse or circuit breaker) must be inserted in the positive supply line in safe area.												
Note 6: The external power supply must be an approved ELV source, insulated from AC mains by double / reinforced insulation per CSA C22.2 No. 61010-1 / UL61010-1. The installation must comply with (inter)national requirements and local ordinances. Within the United States all field wiring (for Class I, Div. 2) must conform to Article 501.10(B) of the National Electric Code NFPA 70. Within Canada all field wiring must conform to Section J18-064 (for non-incendive field wiring) or J18-152 (for Class I, Div. 2 wiring), of the Canadian Electrical Code for installations within Canada.												
Control drawing: D_E4xx		Variant: Configuration 2		Revision: 2.0		Drawing number: D_E4xx_C2_2.0		Date: September 08th, 2024				

Your success counts



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