MultiCONT

P-200

User's and Programming manual
software version: v.02._ _

TABLE OF CONTENTS

Thank you for choosing a NIVELCO instrument.
We are sure that you will be satisfied throughout its use!

1. INTRODUCTION

The **MultiCONT** unit is a universal interface between NIVELCO's HART-capable intelligent level transmitters and the other elements of the process control system like the PC-s , PLC-s, displays and the actuators. Besides its role as an interface, the MultiCONT ensures the powering of the 2-wire transmitters while being capable of complex control tasks. The **MultiCONT** unit supports communication with a maximum of 15 standard or 4 Ex certified NIVELCO's HART-capable 2- and / or 4-wire transmitters. If MultiCONT is used with NIVELCO's MicroTREK microwave level transmitters the maximum number of transmitters in a loop should not exceed 8 pcs. for normal transmitters and 2 pcs. for Ex version transmitters. In case of PiloTREK devices the maximum number of transmitters in a loop should not exceed 6pcs. for normal transmitters and 2 pcs. for Ex version transmitters. If a system contain more transmitters than one MultiCONT can handle, further MultiCONT units can be wired in series via an RS485 line. Remote programming of the transmitters and downloading of the parameters and measured data is possible using the **MultiCONT**. The various outputs such as 4 … 20 mA, relays and digital outputs can be controlled using measured values and new values calculated from the measured values. Measured values (Primary Value and three additional values) are able to be logged.

Large DOT matrix LCD panel facilitate a wide variety of display functions including tank content visualisation. The type and number of outputs of the basic unit can be expanded with external (relay and/or current output) PJK-100 type Universal Interface Modules. The total number of relays included in the MultiCONT and in the modules must not be more than 64, while that of the analog outputs (4…20 mA outputs) can be maximum 16. A further restriction is that there can be a maximum of 32 Universal Interface Modules.
Explosion proof certified versions of the **MultiCONT** should be installed outside the hazardous area.

1.1. THE HART SYSTEM

The **HART** (**H**ighway **A**ddressable **R**emote **T**ransducer – bus addressable field devices) is a digital communication protocol developed by ROSEMOUNT for industrial measurement applications. A digital signal of small amplitude is placed on the widely used standard 4…20mA output current, and due to its symmetric sinusoidal nature and its small amplitude, it does not affect the accuracy of the output current. Since no extra cable is needed for signal transfer, the already existing cable can be used to realize the transfer. The identification, programming and querying of the transmitters can be done using this communication.
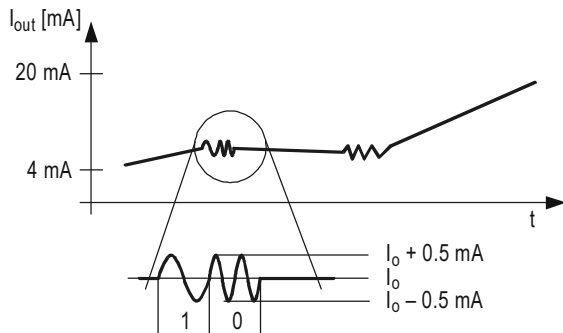
This diagram shows the output signal of a 4…20mA transmitter (device) and the superimposed HART signal, which is essentially a ± 0.5 mA modulation of the output current..

The enlarged picture shows that HART communication uses frequency modulation, and logical "1" is assigned to 1200 Hz, while "0" is assigned to 2200 Hz. This is called FSK (Frequency-Shift Keying) modulation. The communication is realized with systematic series of impulses above described.

1.1.1. The Communication

The HART communication is basically a master-slave type, which means that the transmitter – slave – only sends a response when the master (of which there can be only one in the system) sends a query. The master can be a Hand-held Communicator, a PC with a HART modem or a universal interface, in this case, a MultiCONT (naturally, only one can be active). The communication uses standard commands (see chapter 1.1.3)

1.1.2. The structure of the system

The system must contain a 230..1000 Ω resistor to guarantee that the HART signal of small amplitude will not load the power supply of unknown output impedance.

1.1.2.1 Point-to-point connection

When a master (communicator or HART modem with PC or MultiCONT) and a slave are alone in a system, we talk of a point-to-point connection
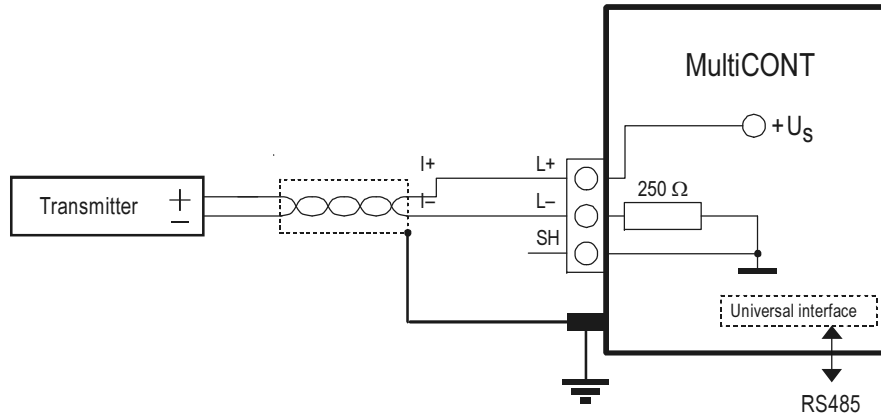
In this case the flowing current is the output current of the transmitters, so if permitted by the loop voltage, even a local indicator can be included into the loop. Essentially, the minimal voltage specified in the manual must be kept on the terminals of the transmitters.

Since the speed of transfer is 1200 bit/sec, communication is slow, because the master queries and the slave responds. This can be speeded up if the querying is left out, and the slave responds continuously every given period of time until the master stops the transfer in the break between 2 data transmissions. This is called "burst mode".

1.1.2.2 Multipoint connection (Multidrop). Multiple slaves connected in parallel.

HART's addressing system can handle 15 devices whereby they are wired in parallel. In this case, the current is the sum of the currents of all the devices in the loop, which has not informative value. So in this case, the output current of the transmitters should be set to multidrop mode, which means a constant current of 4mA. This automatically happens when the polling address is set between 1..15. (if the polling address is 0, then we should have only one transmitter with 4…20mA output, if the polling address is 1…15, then we will have a constant 4 mA). There is a deviation possibility for transmitters whose output current can be programmed to an arbitrary fixed value, however in this case, the minimal voltage drop on the terminal of the transmitters must be the minimum specified voltage, otherwise the transmitter(s) will not be able to work (measure or respond)
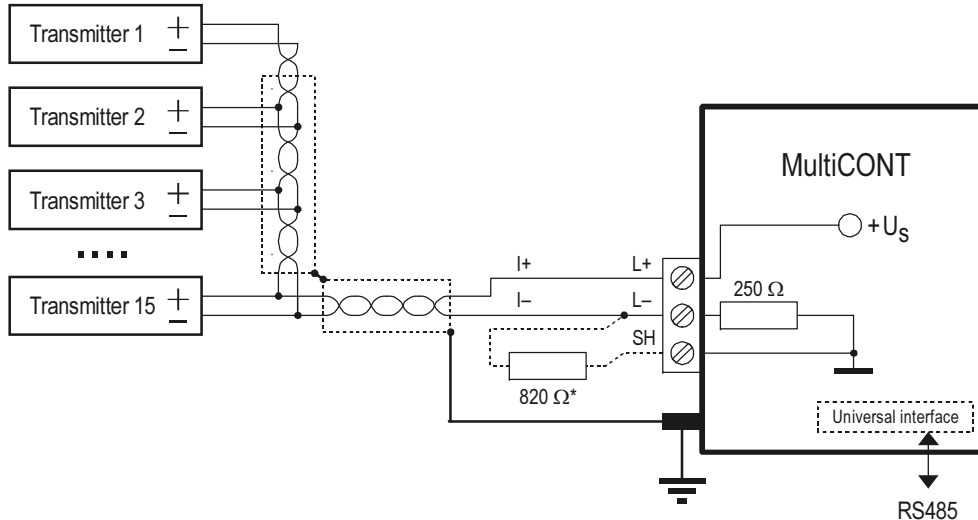
In a Multidrop system, the „burst mode" does not work

* An 820 Ω resistor should be connected between the L- and SH terminals of the Ex version MultiCONT when it is used with the 3 (max. allowed) Ex version MicroTREK microwave level transmitter.

1.1.3. Properties of HART-capable devices

These are programmed into the unit during manufacturing, some can be configured using a HART MASTER, others cannot (they can be reconfigured only by the manufacturer)

Short TAG	8 character device ID. Can be reconfigured.
Short address	Used to differentiate the 0…15 devices. There cannot be 2 identical „short addresses" in one system. Can be reconfigured
Message	A max 32-character arbitrary comment that can be assigned to the device and is generally operation-related. Can be reconfigured
Descriptor	A max 16-character arbitrary comment that can be assigned to the device and is generally material-related. Can be reconfigured
Date	Date. Can be assigned to the device. Can be reconfigured
Factory ID	Factory ID. For NIVELCO devices: 151, cannot be reconfigured
Device type ID	Device type ID, cannot be reconfigured
Device ID	The manufacturer's electronic production number, cannot be reconfigured. The Factory ID, the Device Type ID and the Device ID together form the "Long Address".
SW version (Software version):	Software version of the device (see device manual)
HW version (Hardware version):	Hardware version of the device (see device manual)

Apart from this, they provide the specification of the HART version according to which the device's commands work

1.1.4. HART Command set

We have seen how to build up a HART system. Using the HART commands, we can decide what the devices should do. Naturally, an ultrasonic transmitter needs commands different from those of a temperature transmitter or maybe a valve, so quite a large number of commands would be needed. Every command has a one-byte identifier. The 31st command enables expansion, and in this case the next 2 bytes form the code of a command (0…65535). HART commands can be divided in to 3 classes:

- universal commands 0..30
- general commands 32..121
- device-specific commands 128..253

In all cases, the commands contain an address (this can be short, long address, TAG), which determines the corresponding device.
Two devices with the same address cannot be connected together!!

1.1.4.1 Universal commands

These are commands understood by all devices, and to which all devices give the same reply.

0. Read unique identifier
    the addressed device provides the following in it's reply:
    - Manufacturer's code (provided by the HART foundation, see appendix)
    - Product code (provided by manufacturer, see chapter 5.2.1.1)
    - Universal command table code (HART 5)
    - Device ID
    - Software version
    - Hardware version
    - Device status

1. Read primary variable
    This reads the digital value (Primary Value) that the transmitter sends to the 4…20 mA output.
    The unit also belongs to the numeric value.

2. Read output current in mA and in percent of range

3. Read output current and four dynamic variables
    The primary, secondary, tertiary and quaternary variables are transmitted.
    The secondary, tertiary and quaternary variables are specified in the manual of the given device.

6. Modify (short) polling address (Write polling address)
    If there is more than one device in the loop (multidrop), each device must have a different address.
    In this case, the address should be configured before connecting the device to avoid errors caused by devices with the same addresses replying at the same time.

11. Read unique device identifier associated with tag
    Devices are queried based on their short TAG and not based on their addresses.
    As a result, there must not be more than one device with exactly the same short TAG.

12. Read device message
    This reads the 32 character message stored in the non-volatile memory of the device (e.g. T18 35% HCL TANK)

13. Read the 8 character "short TAG", 16 character descriptor and date

14. Read PV sensor information

15. Read output information

16. Read final assembly number

17. Write 32 character message

18. Write the 8 character "short TAG", 16 character descriptor and date

19. Write final assembly number

1.1.4.2 General commands

These commands do not need to be understood by all devices. If not understood, nothing happens, however, if understood, then it must be interpreted according to the standard. Many such commands exist, the most important ones are the following:

- 34: damping (writing settling time)
- 35: measurement range (writing of upper and lower limits, and/or dimension)
- 36: Upper limit now! (sets the upper limit – 20 mA)
- 37: Lower limit now! (sets the lower limit – 4 mA)
- 40: setting constant current output (can be very useful during testing)
- 41: Device self-test, sends back the result.
- 42: Master reset (setting factory default)
- 50: Reading assignment status of the primary variable (PV), the secondary variable (SV), the tertiary variable (TV) and the quaternary variable (QV). This can not always be read unambiguously, in most cases it can be found in the manual of the device.
- 109: Switching „Burst" mode on and off.

1.1.4.3 Device –specific commands

These commands are specified by the manufacturer. A description of the commands can be found in the device manual.

2. TECHNICAL DATA

TYPE		P☐☐ - 2☐☐-☐
Outputs	Transmitter Power Supply	30 V DC / 60 mA (For Ex Version: 25 V DC / 22 mA)
	Display	128 x 64 dot-matrix
	Analogue	Max. 2 galvanically isolated 4 … 20 mA outputs, max load of 500 Ω, with over-voltage protection
	Relay	Max. 5 SPDT, 250 V AC, AC1. 5 A
	RS 485 interface	Galvanically isolated, HART / MODBUS protocol
	HART	Output signal level: 0.5 ±0.1 V_{pp} trapezoid 1200 / 2200 Hz Minimum level of Input signal: 50 mV_{pp} Inbuilt sensor resistance: 250 Ω.
	Logger	Capacity: FLASH = 65000 entry; SD card (max 2 GB) = depends on the card!

TYPE		P☐☐ - 2☐☐-☐
Connecting cables	Power Supply, Relays, analogue 4 … 20 mA	0.5 … 2.5 mm^2 wire cross-section
	RS 485 interface	Shielded, twisted cable pair with a cross section of 0.5 … 2.5 mm^2
	HART line	Below1500 m shielded, twisted cable pair with a min.cross section of ⌀0.5mm Above 1500 m shielded, twisted cable pair, with a min. cross section of ⌀0.8mm max. resistance : 75 Ω, max.capacitance : 200 nF
Number of powered transmitters		Max. 15 non-Ex (max. 4 Ex) transmitters
Power supply / Power consumption / max. power supply		85 … 255 V AC 50 … 60 Hz / 12 VA / 255 V_{eff} 11.4 … 28 V AC 50 … 60 Hz / 12 VA / 28 V_{eff} 11.4 … 40 V DC / 11 W / 40 V DC
Fuse		85 … 255 V AC 50 … 60 Hz T400 mA 11.4 … 28 V AC 50 … 60 Hz and 11.4 … 40 V DC T1A
Housing material		Polycarbonate (PC)
Mounting		Wall mounted
Ambient Temperature		-20 °C … +50 °C
Ingress protection		IP 65
Ex marking		⟨Ex⟩ II (1) G [Ex ia Ga] IIB, ⟨Ex⟩ II (1) D [Ex ia Da] IIIC
Intrinsically safe output limitation data		U_o = 30 V I_o = 140 mA P_o = 1 W L_o = 4 mH C_o = 200 nF U_m = 253 V
Electrical protection		Class I / III
Mass		0.9 kg

2.1. ACCESSORIES

- Warranty Card
- User's and Programming manual
- Declaration of Conformity
- 2 universal cable gland sealings

3. ORDER CODE

MultiCONT P ☐ ☐ – 2 ☐ ☐ – ☐

Expansion	Code
Expandable *	R
Standard	E

Enclosure	Code
IP 65 wall enclosure	W
IP 65 wall enclosure + transparent cover	C
IP 65 wall enclosure + transparent cover + logger	D

Input	Code
1 HART unit	1
2 HART units	2
4 HART units	4
8 HART units	8
15 HART units	M

Output	Code
Display only	0
1 relay	1
2 relays	2
3 relays	3
4 relays	4
5 relays	D
1x 4-20mA Analogue output	F
1 relay + 1 x 4-20 mA Analogue output	5
2 relays + 1 x 4-20 mA Analogue output	6
3 relays + 1 x 4-20 mA Analogue output	7
4 relays + 1 x 4-20 mA Analogue output	8
5 relays + 1 x 4-20 mA Analogue output	Q
2x 4-20mA Analogue output	G
1 relay + 2 x 4-20 mA Analogue output	H
2 relays + 2 x 4-20 mA Analogue output	J
3 relays + 2 x 4-20 mA Analogue output	K
4 relays + 2 x 4-20 mA Analogue output	9
RS 485 interface	A
1 relay + RS 485 interface	L
2 relays + RS 485 interface	M
3 relays + RS 485 interface	N
4 relays + RS 485 interface	P
5 relays + RS 485 interface	E
1x 4-20mA Analogue output + RS 485 interface	B
1 relay + 1 x 4-20 mA output+ RS 485 interface	R
2 relays + 1 x 4-20 mA output+ RS 485 interface	C
3 relays + 1 x 4-20 mA output+ RS 485 interface	S
4 relays + 1 x 4-20 mA output+ RS 485 interface	T
5 relays + 1 x 4-20 mA output+ RS 485 interface	Z
2x 4-20mA + RS 485 interface	U
1 relay + 2 x 4-20 mA output+ RS 485 interface	V
2 relays + 2 x 4-20 mA output+ RS 485 interface	W
3 relays + 2 x 4-20 mA output+ RS 485 interface	X
4 relays + 2 x 4-20 mA output+ RS 485 interface	Y

Power Supply	Code
85 ... 255 V AC	1
24 V AC / DC	2
85 ... 255 V AC Ex	5
24 V AC / DC Ex	6

Ex: Ex ia

The order code of an Ex version should end in „Ex".

* The system can be expanded using Relay, Analogue and Universal Interface Modules

3.1. DIMENSIONS
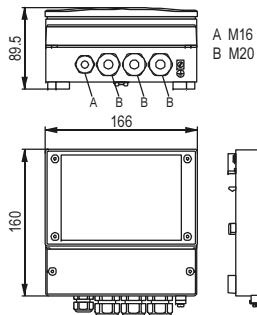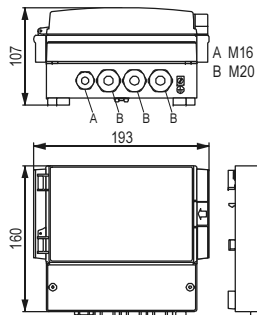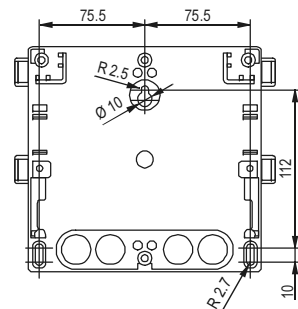
| P□W | P□C, P□D | ARRANGEMENT OF MOUNTING HOLES |

| P□W | P□C | P□D |
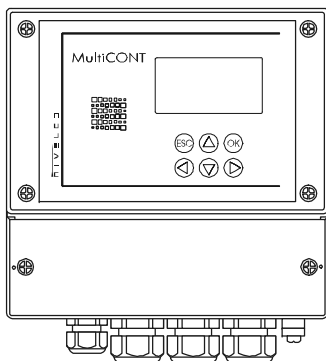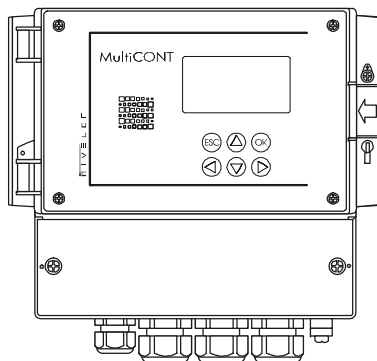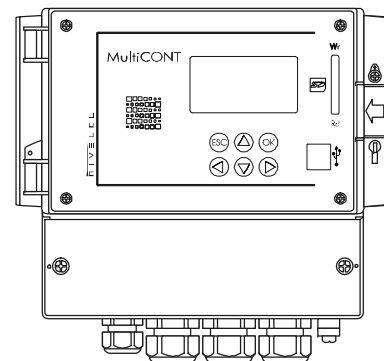
3.2. CONDITIONS OF USE OF THE EX UNITS

- The units should be mounted outside the hazardous zone!
- Device should be protected against direct sunshine!
- The power supply and ambient temperature values must not exceed the specifications in the Technical data!
- Transmitters installed in hazardous areas must only be connected to the L+ and L- terminals!
- The housing of the transmitter must be grounded!
- The transmitters must be connected using shielded, twisted cable pairs!

4. ELECTRICAL CONNECTION

4.1. ARRANGEMENT OF THE CABLE TERMINALS

4.1.1. Four relays version
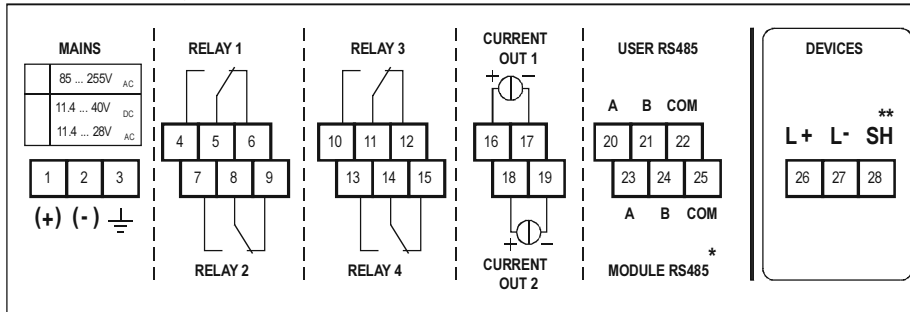
After loosening and removing screws fastening the cover the cables can be connected. The same cable should not be used for AC and DC as well as for SELV and mains voltage.

For wiring of the transmitters shielded, twisted cable pair (STP) should be used with the length depending on the number of connected units and the electrical properties of cable.

RS485 interface: **A:** TRD+
B: TRD−
COM: shielding

* Only PR types
** Non-Ex versions only

4.1.2. Five relays version
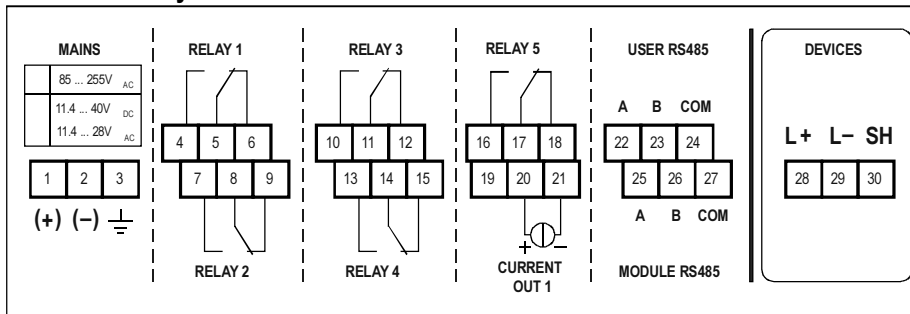
Number of	Cable Capacitance (pF / m)			
Transmitters	65	95	160	225
1	2800	2000	1300	1000
5	2500	1800	1100	900
10	2200	1600	1000	800
15	1850	1400	900	700

Shielding of the connecting cable between the transmitter and the controller should be grounded at one end, connected either to the internal or external part of the earthing screw.

Intrinsically safe (Ex) transmitters should be connected through the terminals L+, L– to the controller. These points are galvanically isolated from the other parts of the electronics. Power supply for the Ex transmitter is current-, voltage- and power-limited.

4.2. WIRING

4.2.1. Wiring

Before wiring, please check: if the units (order codes) are HART-capable, the value of the loop current and also if there are two or more units with the same "Short address". (See 5.2. Steps of commissioning)

4.2.1.1 Wiring of 2-wire units (transmitters)
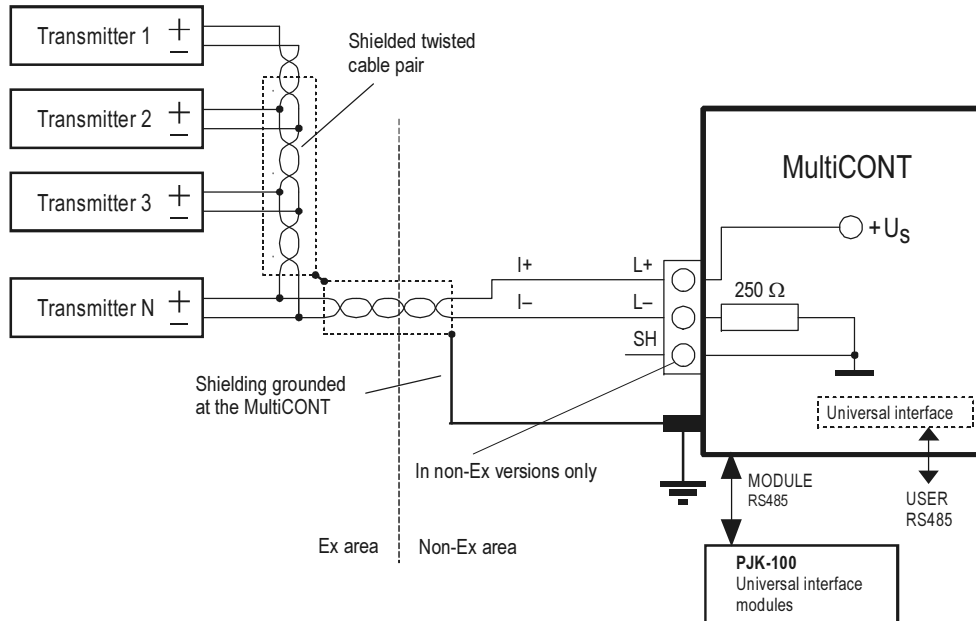
4.2.1.2 Wiring of 4-wire units (transmitters with separate power supply)

Transmitter 1

Transmitter 2

Transmitter 3

Transmitter 15

Shielded twisted cable pair

85...255 VAC
11.4...28 VAC
11.4...40 VDC

Shielding grounded at the MultiCONT

MultiCONT

250 Ω

I+   L−
I−   SH

Universal interface

MODULE
RS485

USER
RS485

PJK-100
Universal Interface
Modules
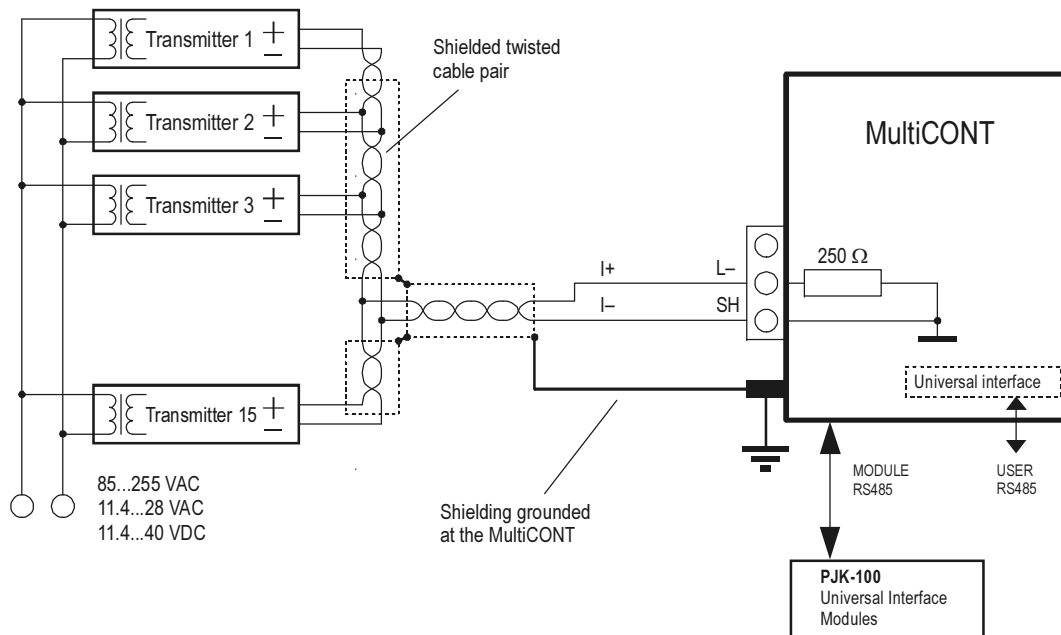
4.2.1.3 Wiring of Combined Systems (containing both 2- and 4-wire transmitters)
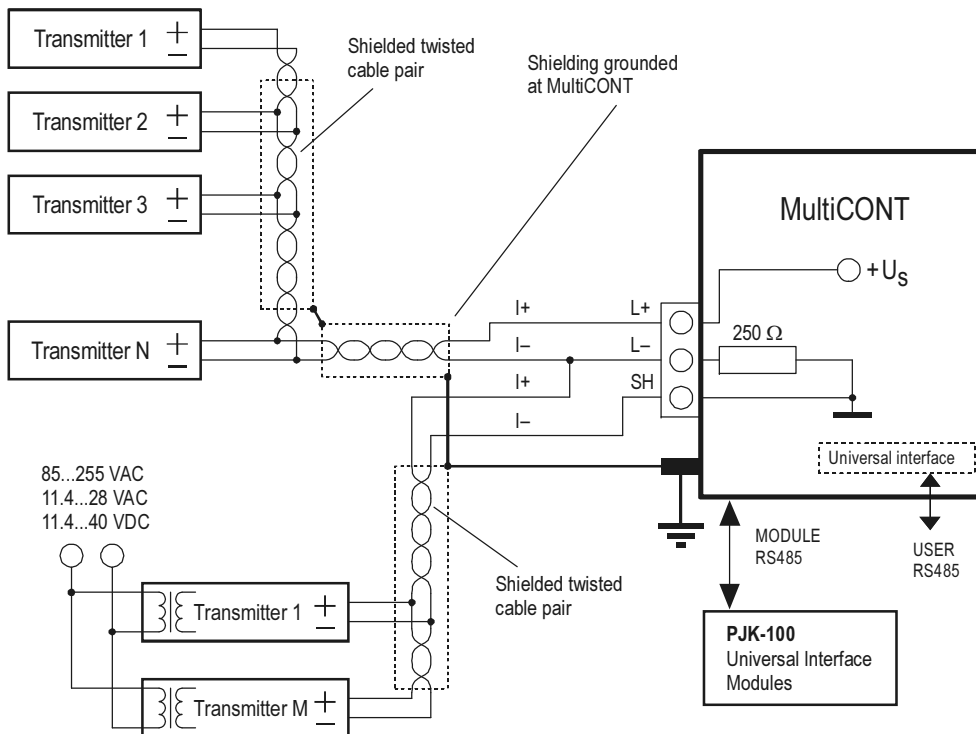
4.2.2. Wiring of Universal Interface Modules (PJK-100)

Connection with shielded twisted pair cable, shielding is grounded at one point, at the MultiCONT.

The terminal resistor is connected to the two farthest points of the cable. (TB and B terminals are connected in PJK 100; and on the MultiCONT the K2 terminal resistor, located next to the terminals, is switched on.)
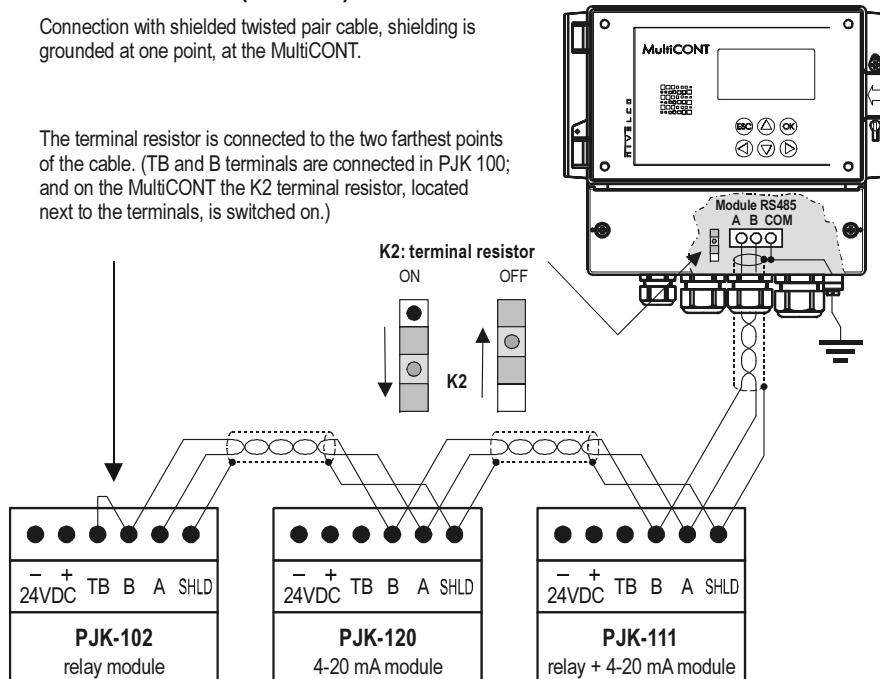
The most important rule is that the data transfer line has to be closed at both ends with a resistor, at points farthest from each other. The value of the terminal resistor depends on the wave impedance of the connecting cable. The interface contains a 120 Ω terminal resistor, so please use a cable with appropriate impedance. A configuration, whereby there aren't 2 terminal resistors, or where the 2 terminal resistors are not at the farthest points from each other is a bad configuration. In such cases, especially if the data transfer cable is too long, data transfer errors are likely to occur.

The Universal Interface Modules should be connected one after another on one cable pair. Star-shaped topology is forbidden. The maximum length of the cable is 1000m, but in this case a cable with shielded, twisted pair of wires (**STP**, **S**hielded **T**wisted **P**air) must be used. The capacitance of the cable should be less than 100 pF/m. The Universal Interface Modules connected to a system must each be given different addresses (0…31), see 5.2.1.2.

5. PROGRAMMING OF MultiCONT

During programming the following can be performed:

- Automatic detection of devices (transmitters) connected to the MultiCONT, and putting them into the list of devices. Devices not on the list are part of the system but are unable to communicate with the MultiCONT (see 5.2.3 Main menu / MultiCONT config / DEV detect).
- Activation, inactivation of devices (transmitters) (See 5.2.3 Main menu / Devices).Theoretically all devices in the system should be working. (whether in the list or not). Devices in the list automatically become active. Inactivation can be used to temporarily disable devices from the system.
- Activation, inactivation of relays and current outputs (see Attachment 3 and 4)
- Relays and current outputs of the MultiCONT should also be activated (see Attachment 3 and 4)
  Assignment of the MultiCONT outputs (relays, current outputs) to devices (transmitters)
- Formation of functional values (difference of 2 measured values, sum or average of 2 or more measured values)
- Remote programming of devices, although it is practical to program the devices in the laboratory before installation and wiring.
  (parameters of the transmitters e.g. P01, P02, etc. will be used in this Manual in the same way as described in the Installation and User's Manual)
- Programming of MultiCONT outputs (Relay and current output parameters of the MultiCONT will be identified as RP1, RP2, RP3 and CR1, CR2, CR3 respectively).

The programming of systems involving the MultiCONT universal interface assumes a sound knowledge of both the HART standard and the programming of the connected devices.
During programming full scale of operation such as measurement, polling of devices, functioning of the relays and current outputs will be maintained.

Modifications will be automatically saved upon returning back to measurement mode.

If the MultiCONT is left in Programming mode, it will automatically return to Measurement mode 5 minutes after the last key was pressed (modifications will be saved!).

In case of one or multiple devices when the relay settings are modified use the 'Load default settings' if necessary!

5.1. STEPS OF PROGRAMMING

Programming can be done using the 6 buttons with the help of the 128x64 point graphic screen. There are three different kinds of images.

- **Measurement / operation images**
  (marked with capital letters in the upper right corner (Appendix 5):
  Measurement, see 5.10 Measurement mode
  Bargraph image (output range)
  User image, see 5.4 MultiCONT configuration
  Relay assignment table
  Current output assignment table
  Error list, see 6. Error codes

- **Programming / configuration images:**

  Name of the menu | Number of menu table

  Main menu   ▼ 05
  Devices
  → Relays
  Current generators

  Selected menu point

  No further menu points
  ▼ Further menu points down the line
  ⬍ Further menu points up and down the line
  ▲ Further menu points up the line
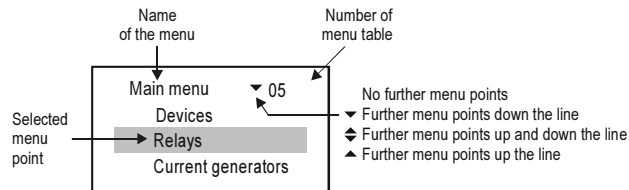
- **Box messages / warnings** indicate steps taken by the unit or those to be performed

  Scanning HART line
  Device: 3

  HART logical error
  Click OK

See a summary of the programming below. A complete menu system is in **Appendix 2**. The relevant menu item and the value or character to be edited appears in a highlighted form.

(ESC) (⬆) (OK)
(⬅) (⬇) (➡)

(⬇) and (⬆) are used to select options within the menu. The buttons are repetitive i.e. steadily pressing the button results in continuous stepping (the menu repeats at the end).

Programming mode can be entered and a menu item can be selected by pressing (OK) and exited by pressing (ESC).

The (⬅) and (➡) buttons are used for editing parameters with numbers or text, selection of local values or for character positioning and for selection in some sub-menus (e.g. Relay functions). Repeating function keys (⬇) and (⬆) are used for scrolling numbers and characters when editing parameters with numbers or text. (These two buttons are dual-functional - steady pressing results in continuous stepping up-down and in jumping to the beginning at the end). Use (ESC) to acknowledge (quit) error messages (deletion of the error list).

5.1.1. Scrolling and selecting menu items

The various display modes (M, B, U, R, C, E) can be selected using ⬅ and ➡ buttons.

With (OK) button can enter into the Programming Mode or the selected menu point and can return with (ESC) button.

The desired menu item can be selected using ⬇ and ⬆ (repetitive functioning i.e. steady pressing results continuous stepping and jumping to the beginning at the end).
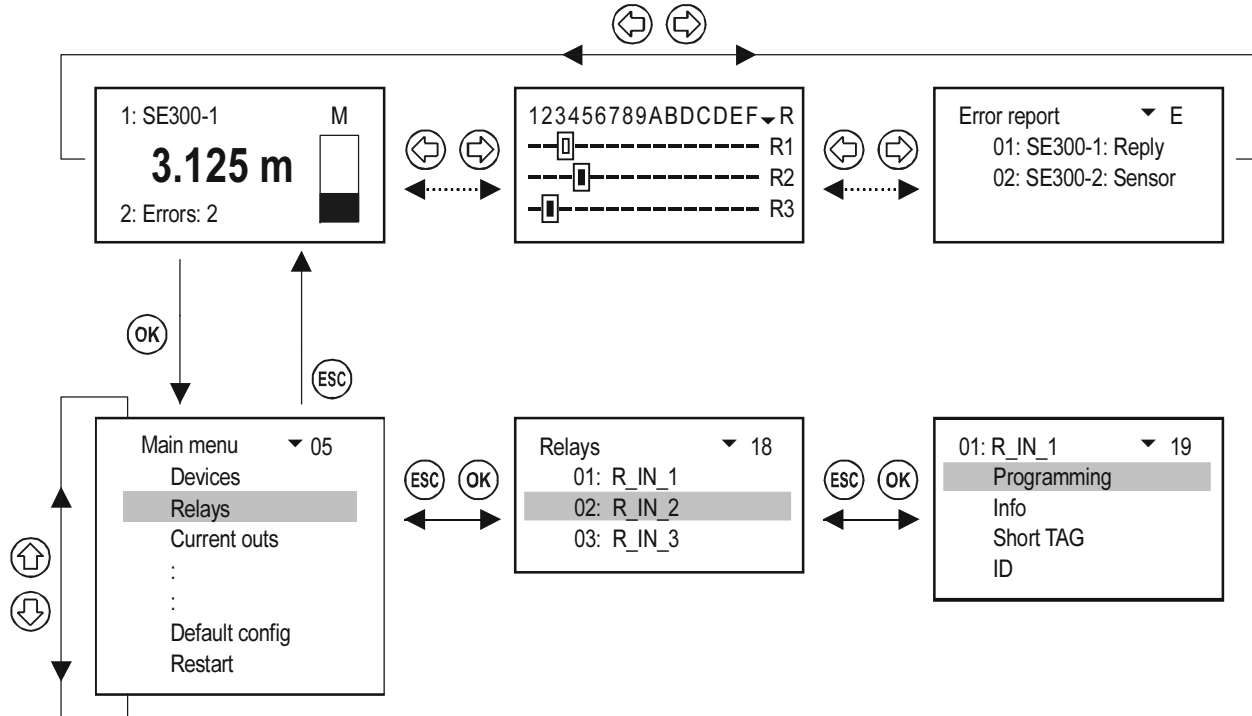
5.1.2. Activation (of devices, relays and current outputs) selection (of language, operation mode, etc.)

Devices on the list may be active (▣) or inactive (☐). Only active devices will be queried. Active relays and current outputs operate according to their configuration, inactive relays are de-energized while inactive current outputs remain 0 mA.

No active relay.

R_IN_1 is active
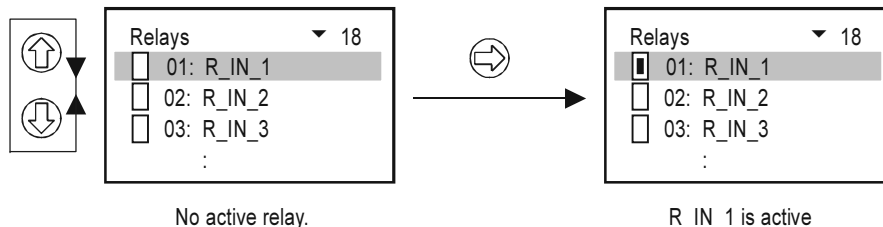
Use ⇨ to switch between active and inactive relay states.

Selection of the various modes (Relay mode, current output mode, language, etc.) is done similarly.
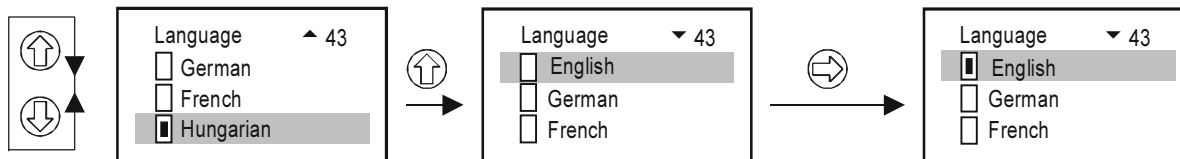
After selection, the chosen language is immediately activated.

5.1.3. Assignment of outputs (relay and current) to the device

During configuration, the relays and current outputs should be assigned to the field devices and to their variables (PV, SV, TV, QV):

- ⊞ Value has a positive sign (for summation)
- ⊟ Value has a negative sign (for differential measurement)
- Ⅰ Values from devices marked this way will be averaged

The above settings can be changed using ⟳

Assignment of device **SE380-1** to the relay **R_IN_1** in the MultiCONT should be performed as below:

01: R_IN_1 ▼ 19
Program
Info
Short TAG
ID

→ (OK) →

Programming ▼ 20
Source
Function
Parameter
:

→ (OK) →

Source ⇕ 21
☐ 1: SE380-1
☐ 2: SE380-2
☐ 3: SE360-1
:

→ (⟳) →

Source ⇕ 21
⊞ 1: SE380-1
☐ 2: SE380-2
☐ 3: SE360-1
:

→ (⟳) →

1: SE380-1 ▼ 57
Ⅰ PV
☐ SV
☐ TV
☐ QV

Source ⇕ 21
⊞ 1: SE380-1
⊟ 2: SE380-2
☐ 3: SE360-1
:
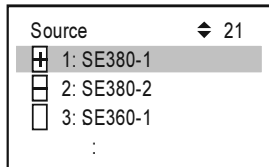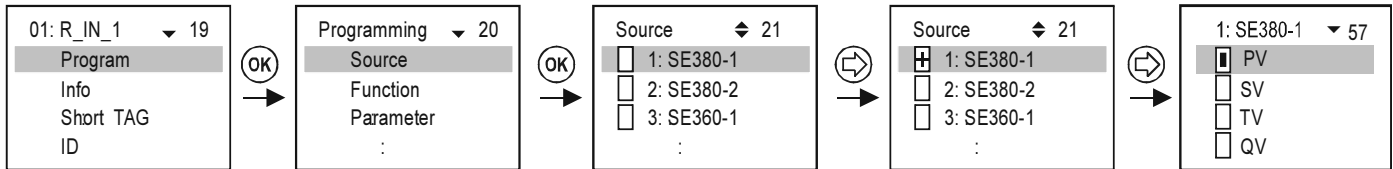
Relay R_IN_1 is controlled by the **difference** of the measured values of SE380-1 and SE380-2

Source ⇕ 21
Ⅰ 1: SE380-1
Ⅰ 2: SE380-2
Ⅰ 3: SE360-1
:
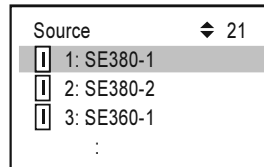
Relay R_IN_1 is controlled by the **average** of the measured values of SE380-1, SE380-2 and SE360-1

Important: If there are more than one devices (sources) assigned to a relay (difference or average) then those devices should be programmed to measure the same parameter (DIST, LEV, ...) in the same unit (m, ft, inch, ...)
Otherwise error message (Program) will appear. See 5.7, 5.8 and 6.

5.1.4. Entering parameter values

Parameters have signs and absolute values. Positioning the cursor to the sign and digits can be done using ⟨⇦⟩ ⟨⇨⟩ .

⟨⇧⟩ and ⟨⇩⟩ are for modifying the value of either the sign or the digit.

Switching between the (+) and (-) signs

```
Parameter          23          ⇧              Parameter          23
RP1  =  ▶ + 0000.000 ◀    ⟷              RP1  =  ▶ − 0000.000 ◀
RP2  =     0.000                ⇩              RP2  =     0.000
RP3  =     0                                   RP3  =     0
```
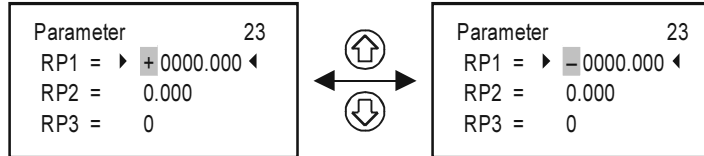
Changing cursor position

```
Parameter          23          ⇨              Parameter          23
RP1  =  ▶ + 0000.000 ◀   ⟶              RP1  =  ▶ + 0000.000 ◀
RP2  =     0.000           ⟵              RP2  =     0.000
RP3  =     0                    ⇦              RP3  =     0
```
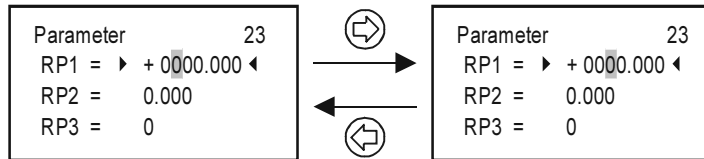
Modifying the value of the digit (no carry-over)

```
Parameter          23          ⇧              Parameter          23
RP1  =  ▶ + 0000.000 ◀   ⟶              RP1  =  ▶ + 0010.000 ◀
RP2  =     0.000           ⟵              RP2  =     0.000
RP3  =     0                    ⇩              RP3  =     0
```
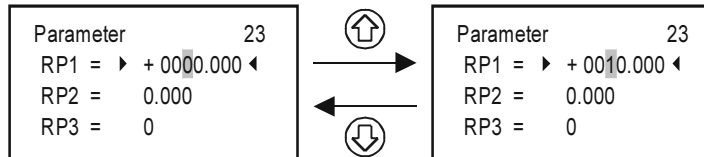
(ESC) can be used to quit without saving.

To save the parameters, press (OK) after RP3.

5.1.5. Editing character variables (e.g. Short TAG)

Scrolling order of the characters:

ABCDEFGHIJKLMNOPQRSTUVWXYZ [\ ] ^ _   ! ” # $ %   & ’ ( ) * + , - . / 0123456789 : ; < = > ? @

The character being edited is displayed in INVERTED mode.

```
┌─────────────────────────┐            ┌─────────────────────────┐
│ Short TAG         09     │    ⇧       │ Short TAG         09     │
│                          │  ──────▶   │                          │
│     ▸ S T 3 0 0 - 1 2 ◂  │  ◀──────   │     ▸ S T 3 0 1 - 1 2 ◂  │
│                          │    ⇩       │                          │
└─────────────────────────┘            └─────────────────────────┘
```
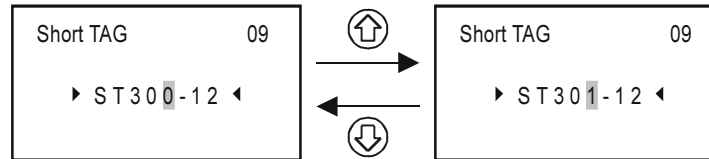
5.2. STEPS OF PUTTING INTO OPERATION A MultiCONT NETWORK

Steps of putting into operation:

- **Preparing transmitters and Universal Interface Modules.** (see chapter 5.2.1) Transmitters should be given a unique „Short address". If there are multiple transmitters, then the address should not be zero!
- **Adding the devices in the loop into the device list.** see chapter 5.2.3
- **Configuration of the state of the transmitters.** Devices (transmitters) placed in the device list during the detection process automatically become active i.e. the MultiCONT queries them constantly. This can be avoided by setting their state to be inactive (see chapter 5.2.3)
- **Detecting Universal Interface Modules**: The detected modules (relays, current outputs) become inactive, meaning that MultiCONT does not control them.
- **Relay configuration:** The relay should be assigned to one or more transmitters (sources), the mode of operation (function) should be specified, the switching points should be configured (parameters RP1…RP3), and then it should finally be activated. See chapter 5.7.
- **Current output configuration:** Similar to the relay configuration, see chapter 5.8.

5.2.1. Preparation of the Transmitters and the Universal Interface Modules.

5.2.1.1 Preparation of the Transmitters

During this procedure, programming of the **current outputs** and "**Short address**" (see Manual of the transmitters) of the transmitters should be checked in laboratory circumstances. The loop current of the normal (non-Ex) MultiCONT is max. 60 mA, and it is max. 22 mA for the Ex certified version. If the loop current exceeds this value the voltage at the terminals of the transmitters will be decreased to be too low for the transmitters to start to operate. (There may happen that the transmitters could operate, but HART signals will be distorted because the decreased terminal voltage and communication may be failed or not be able to work.) In networks with only one transmitter the short address of the unit can be 0, so the output of the transmitter operates in 4-20mA range. In case of multiple transmitters the short addresses should be set between 1…15 and then the current output of the transmitters will be automatically limited to 4mA. The value of this can be overridden by the fixed output current parameter (see Manual of the transmitter). It is really important that loop current must not exceed the given limit value. In addition to this, two or more instruments must not have the same "**Sort address**" or "**Long address**" in order to provide error-free operation.

Modification of the "**Short address**" can be performed with Eview2 configuration software, or with the MultiCONT. In this case transmitters should be connected and detected one by another and set the appropriate "**Short address**". The "**Long address**" of the device is given by the manufacturer, which cannot be modified by the user.

Data for NIVELCO made devices				
DEVICE TYPE	**„SHORT ADDRESS" PARAMETER**	**CONSTANT CURRENT PARAMETER**	**DEVICE TYPE ID**	**DEFAULT „SHORT TAG"**
EchoTREK 4 wire	P19	P08	1	**XXXXXX** where xxxxxx is the order or type code of the transmitter e.g.: STA380
EchoTREK 2 wire			3, 4	
EasyTREK			2	
NIVOCAP			5	
NIVOTRACK			6	
NIVOPRESS	P13	////////	21	DB500
UNICONT		////////	22, 23	PDF400
THERMOCONT		////////	20	TB500

5.2.1.2   Preparing of the Universal Interface Modules

The MultiCONT can be expanded by a maximum of 32 Universal Interface Modules. They can be differentiated from each other using their „Short Addresses". Two or more modules with the same address must not be in one system. Configuration is possible using the row of DIP switches that can be found on the top of the modules (0…31).
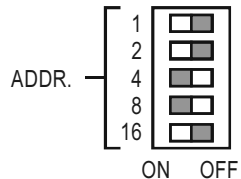
Example for setting the address:
4+8=12, this is the „Short Address" of the module.

5.2.2. Wiring

Wiring has to be done according to the previous instructions (See chapters 2.: Technical Data and 4.1: Arrangement of cable terminals)

5.2.3. Putting the MultiCONT into operation

Switching on initiates a 40 sec **test process**, during which MultiCONT tests the integrity of the memory where its settings are stored (See 5.9 The Boot Process). If everything goes perfectly, then the following

```
┌─────────────────────────┐
│                         │
│     No HART device      │
│                         │
└─────────────────────────┘
```
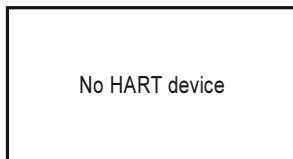
message appears on the screen, implying that the device table - the object of the query - is empty yet.

To **choose a programming Language** (English, German, French, Hungarian) select the Language menu item under **"Main menu"/"MultiCONT config"/"Language"** using the ↑ and ↓ buttons and confirm it using the → button.

From here on, the device will function using the selected language.

To detect devices in the loop select the **"Main menu"/"MultiCONT config"/" DEV detect"** program.

It is essential not to confuse the *Short address* with the *List-tag* of the units. In order to make possible to search and identify HART-capable devices, it is necessary to assign *Short addresses* ranging from 1 …. 15 to the devices during their (laboratory) programming. MultiCONT however registers the devices on the basis of the *List-tags* ranging from 1, … 8, 9, A, B, … F.

At this stage configure the settings specific to the functioning of the system (display, backlight, etc.) under **"Main menu" / "MultiCONT config"**. See chapter 5.4. Relays (see chapter 5.7) and current outputs (see chapter 5.8) should be programmed in accordance with the requirements of the application.

Settings can be protected via **"Main menu"/"MultiCONT config"/"Password"** with a secret code (software protection) and by using the program protection switch K1 (hardware protection) on the back of the front panel (see chapter 7).

5.3. MAIN MENU

The **Main menu** can always be accessed from measurement mode by pressing **OK**.

```
Main menu      ▼ 01
   Devices              ──────▶  Setting features of devices (see chapter 5.5)
   Relays               ──────▶  Programming relay mode of operation and parameters (see chapter 5.7)
   Current outs         ──────▶  Programming current generator mode of operation and parameters (see chapter 5.8)
   Inputs
   UIM-s                ──────▶  Information about UIM-s, TAG modification
   MultiCONT conf.      ──────▶  Programming of parameters affecting operation (see chapter 5.4)
   Save config.         ──────▶  Saves the actual configuration (see chapter 5.11)
   Load config.         ──────▶  Loads the saved configuration
   Default config       ──────▶  Reset to default. Clears device list, relay and current output parameters,
                                 assignments and resets the parameters of "MultiCONT conf."
                                 Does not clear the switching number and work time.
                                 The steps in 5.2.3 have to be repeated (Putting the MultiCONT into operation).

   Restart              ──────▶  Simulate repowering ( RESET )
   Quick Set            ──────▶  Quick Setup, sets the MultiCONT to default, makes device detection,
                                 activates the detected devices and activates the logging
                                 (if the MultiCONT has logging feature)
```

5.4. MULTICONT CONFIGURATION

The selected menu item appears in inverted mode on the display, and is marked in grey in this manual.

```
Main menu        ⬍ 01          MultiCONT conf.  ▼ 35
    Devices                        DEV detect
    Relays                         EXT detect
    Current outs                   Sorting
    Inputs                         Main display
    UIM-s          (OK)            List display
    MultiCONT config    ➡          User display
    Save config.                   Trend
    Load config.                   HART
    Default config.                USER RS485
    Restart                        LOG
    Quick Set                      Password
                                   Language
                                   Backlight
                                   Display contrast
                                   Clock
                                   Report
                                   Prog CS
```

Select menu items
using ⬆ and ⬇ buttons
Enter by pressing (OK)

5.4.1. DEV detect:

Queries the transmitters via HART line from 0 to 15, and lists them with 1…9, A, B, C, D, E, F tag.

M
No HART device

"OK"

Main menu ▼01
Inputs
UIM-s
MultiCONT config

"OK"

MultiCONT conf. ▼35
DEV detect
EXT detdct

"OK"

Scanning HART line
Device: N

Message appears
and detection starts
N=0…15

MultiCONT found devices with the
same long address. This is an error state
and detection stops.
Return to **MultiCONT config**
by clicking OK
(*see next page*)

"OK"

Same address

M
No HART device

No device found
(device list
will remain empty,
see next page)

Deetect DEV   37
- - - > SAVE < - - - -
1: SPA-440 (01)
2: SEA-360 (07)

List of detected devices (Short TAG)
Short address in brackets

MultiCONT detects devices in accordance to the **Short address** (that is why two or more devices must not have the same Short address) After detection however, query will be performed using the **Long address** that consists of the following three parts:

- **Manufacturer's ID:** (See APPENDIX 1. At the end of the Manual (for NIVELCO products it is:151)
- **Device type ID:** identification number of the device type (see chapter 5.2.1.1)
- **Device ID:** number generated during production (0…16777215)

When detection stops with the „**Same Long address"** error message there are two ways to identify the devices with the same Long address

- Devices should be removed one by one until **DEV detect** program can run to completion.
  Obviously the address of one of those devices remained in the loop is the same as the address of the unit last removed.
  Then reconnecting the devices one by one again, after detection, the Factory ID, Device Type ID, and Device ID can be read in from the "Main menu"/"Devices" menu item (see chapter 5.5 programming devices)
- The Long addresses of the transmitters can be read using the Eview2 configuration software (preset to work with Short Addresses) provided with HART capable devices

Since the **Long address** can not be modified please send such a unit back to the manufacturer, or call our Export Sales Department for help.

Question: what happens if the MultiCONT does not find all the devices?

1. One of the transmitters is not HART-capable. Check the transmitter type on the name plate.
2. Faulty device. Dismount the unit and check it in laboratory circumstances.
3. Faulty wiring connection.
4. The terminal voltage of the unit is small, check the configuration of the current outputs of the transmitters (See chapter 5.2.1.1 preparation of transmitters)
5. None of the devices are responding, please check:
    - Is there any voltage between terminals L+ and SH? If no, then the output is faulty, or there is a short-circuit on the line.
    - If there is voltage between terminals L+ and SH, then check if the terminals L+ and L- are short-circuited or if there is an open-circuit.

Then, the next steps will be **adding the device to the list, and setting the device.**

Searching result may be the following:

```
┌─────────────────────┐
│                     │
│   No HART device    │
│     Press OK        │
│                     │
└─────────────────────┘
```
No device was found in the loop
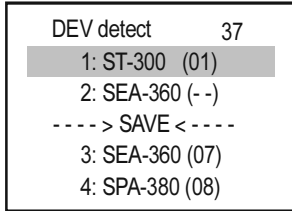
```
┌─────────────────────┐
│ DEV detect      37  │
│ ▓1: ST-300   (01)▓  │
│  2: SEA-360  (- -)  │
│ - - - - > SAVE < - - - - │
│  3: SEA-360  (07)   │
│  4: SPA-380  (08)   │
└─────────────────────┘
```
Device is found in the loop:
The devices above the ---→SAVE←--- line are the ones already included in the list. This list is empty if the unit is either newly manufactured or if reset („**Main menu"/"Default"**). The units under this line are not in the list, but have responded to a query. The „Short Address" (Polling Address) appears in brackets. Whereby a unit in the list responds, the „Short Address" will appear in brackets, otherwise a (--) will appear instead.

Upon selecting any unit that has responded (either above or below the line) an pressing „OK", the „Short Tag" can be changed.
MultiCONT only handles units above the line.

Note:
If the number of the devices in the loop is known and MultiCONT detected them already, detection process can be interrupted by pressing the ← button (the ← button should be pressed until „DEV detection end" message appears).

Reorganising the list can be done in the following manner:

- Select the unit using ⬆ and ⬇ buttons
- Press the ⮕ button to move the unit to the end of the list at the other side of the line
- Selecting the SAVE line saves the list above the SAVE line.
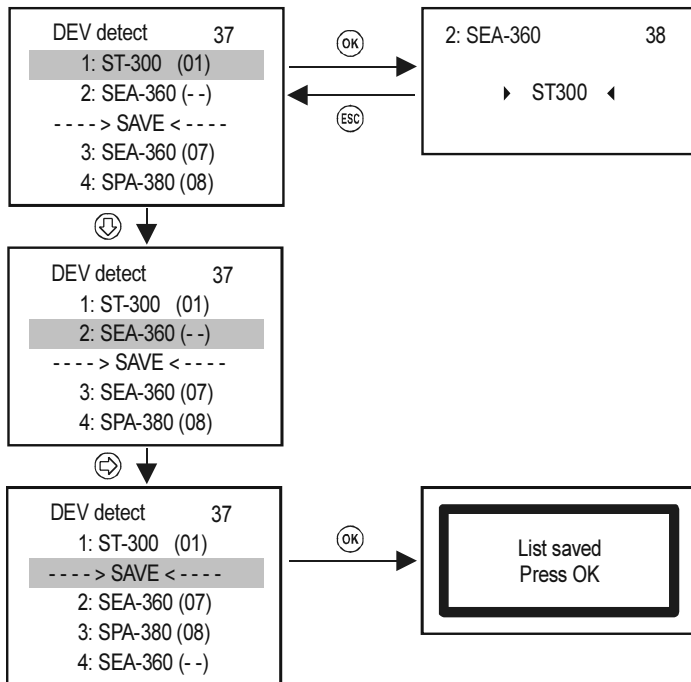
```
┌─────────────────────────┐              ┌─────────────────────────┐
│ DEV detect      37      │     (OK)     │ 2: SEA-360        38    │
│   1: ST-300  (01)       │    ──────▶   │                         │     „Short TAG" can be modified
│   2: SEA-360 (- -)      │    ◀──────   │       ▸ ST300 ◂         │
│ - - - > SAVE < - - - -  │     (ESC)    │                         │
│   3: SEA-360 (07)       │              └─────────────────────────┘
│   4: SPA-380 (08)       │
└─────────────────────────┘
         (⬇)
┌─────────────────────────┐                                             **Note:**
│ DEV detect      37      │                                             When pressing → button does not move the selected device above
│   1: ST-300  (01)       │                                             the --- SAVE --- line it means that the list above the --- SAVE --- line is full
│   2: SEA-360 (- -)      │                                             and you cannot add more devices. The length of the list depends on the
│ - - - > SAVE < - - - -  │                                             type of the MultiCONT (1, 2, 4, 8, 15, see order code)
│   3: SEA-360 (07)       │
│   4: SPA-380 (08)       │
└─────────────────────────┘
         (⮕)
┌─────────────────────────┐              ┌─────────────────────────┐
│ DEV detect      37      │     (OK)     │                         │
│   1: ST-300  (01)       │    ──────▶   │      List saved         │     Saving the list above the ----> SAVE <---- line
│ - - - > SAVE < - - - -  │              │      Press OK           │
│   2: SEA-360 (07)       │              │                         │
│   3: SPA-380 (08)       │              └─────────────────────────┘
│   4: SEA-360 (- -)      │
└─────────────────────────┘
```

The units in the saved list automatically become active!!
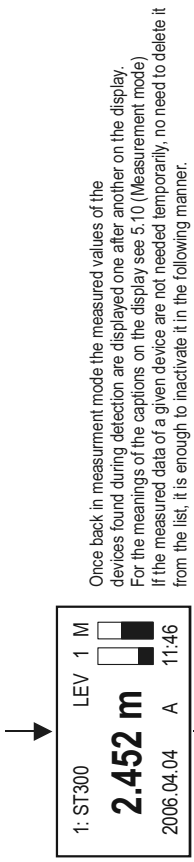
Once back in measurment mode the measured values of the devices found during detection are displayed one after another on the display.
For the meanings of the captions on the display see 5.10 (Measurement mode)
If the measured data of a given device are not needed temporarily, no need to delete it from the list, it is enough to inactivate it in the following manner.

"OK"

```
1: ST300        LEV  1  M  ▮▯
     2.452 m
2006.04.04   A       11:46
```

"OK"

```
Main menu              ▶ 01
    Devices
    Relays
    Current outs
```
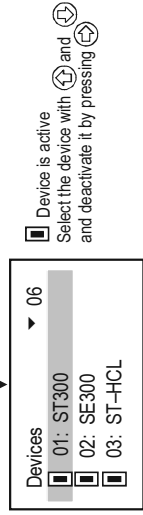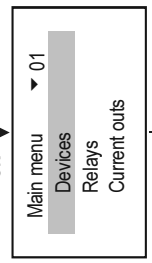
■ Device is active
Select the device with ⬆ and ⬇
and deactivate it by pressing ⬆

```
Devices                ▶ 06
 01: ST300
 02: SE300
 03: ST–HCL
 ■ ■ ■
```

⬆
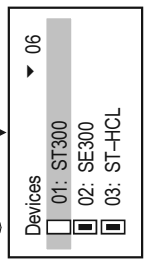
□ Inactive device
■ Active device

```
Devices                ▶ 06
 01: ST300
 02: SE300
 03: ST–HCL
 □ ■ ■
```

"ESC"

```
Main menu              ▶ 05
    Devices
    Relays
    Current outs
```

"ESC"

```
2: SE300        VOL  2  M  ▮▯
     41.18 m³
2006.04.04   A       11:46
```
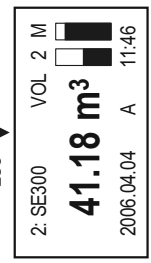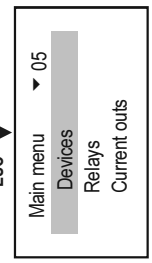
Upon re-entering measuring mode the measured values of the inactive device are not shown on the display and states of assigned relays and current outputs do not change.

5.4.2. EXT detect:

For detection of, external expansion (Relays, Current Output, or Combined) modules if available.

The query process is similar to that of the DEV detect mode, the only difference being that the modules that get into the list remain in an inactive state. (See 5.2.3 Putting the MultiCONT into operation)

The detected relays or current outputs (4-20 mA) will placed at end of the Detected EXT list.

5.4.3. Main Display:

The main display consists of 3 parts: „Main display", „List display" and „Status field" See 5.10 .

Among these, the „Main display" and „List display" can be freely selected for each device.

The quantity to be displayed and the rounding of the decimal part can be set in the „Main display".

This is where to configure the stepping of the results of the transmitters on the display.
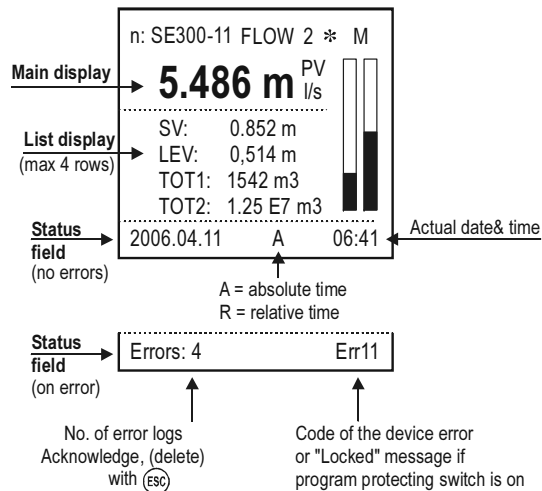
5.4.3.1 Source

The quantity to be displayed in the "Main display" can be selected independently for each transmitter. Cross-check your selection in "Main menu"/"MultiCONT config."/"HART"/"CommandSet", to confirm the selection of the appropriate command containing the desired quantity.

Main display	▼ 55
Source	
Rounding	
Step	

(OK)

Source	▼ 56
1: SE380	
2: SE360	
3: SP380	
:	
x: ST340	

(OK)

2: SE360	▼ 42	
☐ PV	←	Primary Value
▣ SV	←	Secondary Value
☐ TV	←	Tertiary Value
☐ QV	←	Quaternary Value
☐ Current	←	Current out of the transmitter*
☐ Percent	←	PV in %
☐ Level	←	Level
☐ Level%	←	Level in %
☐ TOT1	←	TOT1 and TOT2 Totalizer Values
☐ TOT2	←	during flow measurement
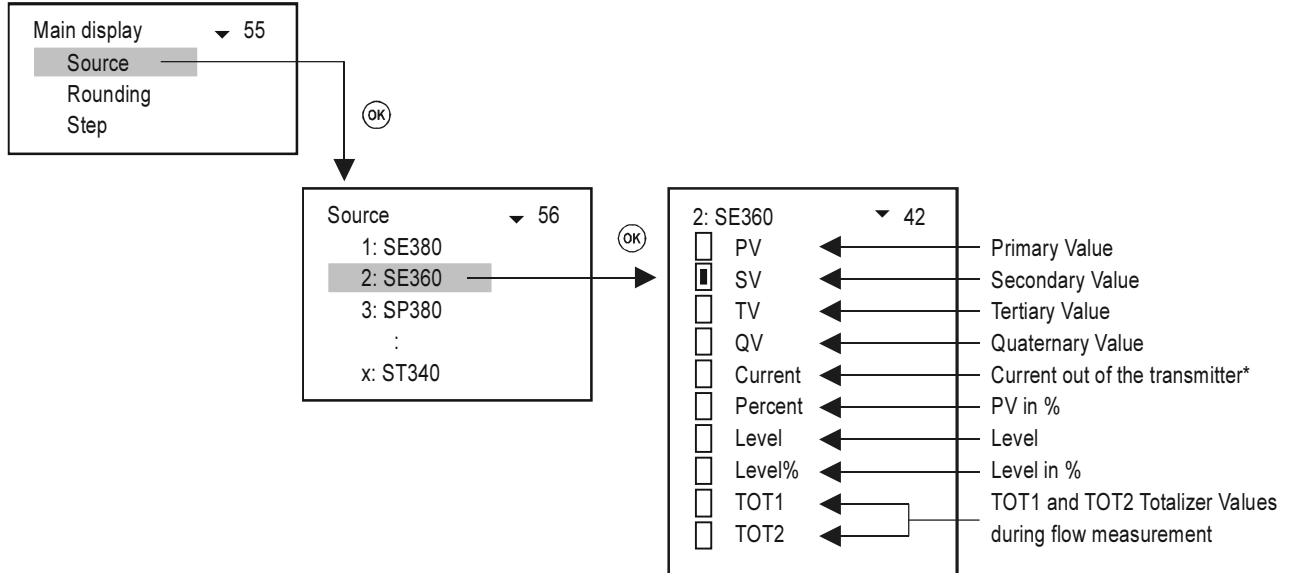
* Output current, as a displayed quantity is recommended to use only if there is only one device in the system, and if the „Short Address" is zero, i.e. the current output is not constant.

5.4.3.2 Rounding

The MultiCONT by default rounds to 4 decimal digits i.e., the quantity is displayed with precision of 4 decimals.
The rounding is for the main image quantity only.

```
Main display          55
      Source
      Rounding  ─────
      Step
```
(OK) →
```
Rounding      ▼ 70
      1: SE380
      2: SE360
      3: SP380
          :
      x: ST340
```
(OK) →
```
SE360                 59
      □  No
      ▣  x.xxx
      □  x.xx
      □  x.x
```
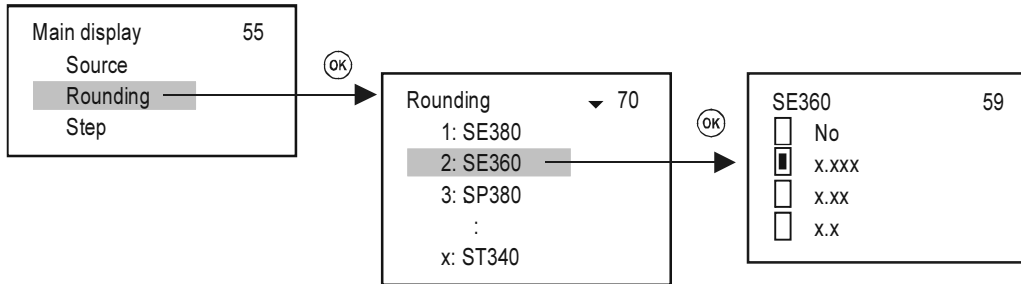
5.4.3.3 Stepping

Stepping is related to the display only. The query of the transmitters and the control of the relays and current outputs operates constantly, depending on the cycle time set in the background („Main menu"/"MultiCONT config."/"HART"/"Cycle time").

```
Main display          55
      Source
      Rounding
      Step  ─────
```
(OK) →
```
Step                  48
      ▣  Manual       ◄─── manual stepping of the devices on the display using (↓) and (↑)
      □  Auto step 5s ◄───
      □  Auto step 10s◄─── automatic stepping at 2 different speeds
      □  Polled       ◄─── refreshes the display after quering the device
```
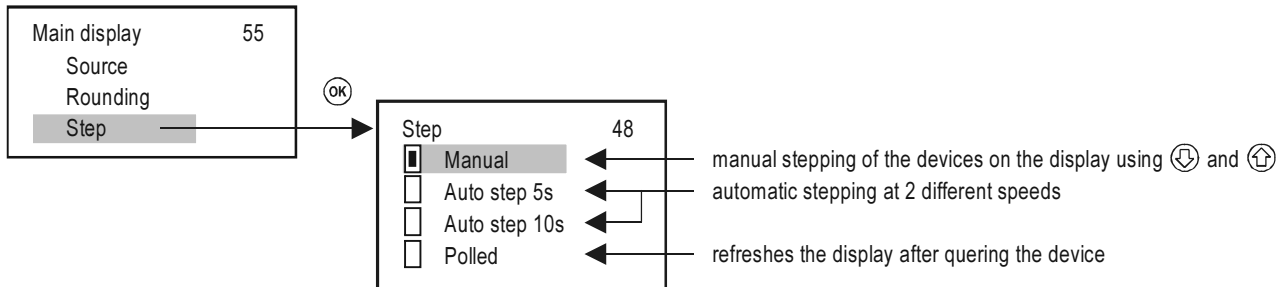
5.4.4. List display

Max. 4 quantities can be selected.


```
List display        ▼ 60
     Source ────────┐
```

(OK)

```
Source              ▼ 61
     1: SE380
     2: SE360 ───────┐
     3: SP380
        :
     x: ST340
```

(OK)

2: SE360 ▼ 62		
☐ PV	◄────	Primary Value
▣ SV	◄────	Secondary Value
☐ TV	◄────	Tertiary Value
▣ QV	◄────	Quaternary Value
☐ Current	◄────	Current out of the transmitter*
☐ Percent	◄────	PV in %
☐ Level	◄────	Level
▣ Level%	◄────	Level in %
☐ TOT1	◄────	TOT1 and TOT2 Totalizer Values
☐ TOT2	◄────	during flow measurement
☐ Status	◄────	Status of the instrument
☐ PV rate of change	◄────	Change speed rate of Primary Value
☐ Working	◄────	Working hours of the instrument
☐ Head of fl.	◄────	Level (h) for calculate instantaneous flow in case of flowmetering
☐ Relays	◄────	Status of the internal relays

* The output current, as a display quantity is recommended to use only, if there is only one device in the system, and if the „Short Address" is zero, i.e., if the current output is not constant.

** The MultiCONT calculates the value of PV rate of change in every 5 sec. If there are more transmitters in the loop and this cycle time is more than 5 sec, calculation of PV_Rate (t1 - t2 ≥ 5 sec) is performed per cycles.

Change speed rate of PV [PV/min]=(PV $_{t1}$-PV $_{t2}$)×60/(t1-t2)

5.4.5. User Display:

In measuring mode (See chapter 5.10) the user can select a display format besides the display showing the measured data and this can be seen in the user display. We will receive an error message in the use's image if:

- Only one device is selected to display double, difference or average.
- In the case of difference or average display for given transmitters, the values or dimensions are different.

5.4.5.1 Editing the user display

User display	63
Type	
:	

Type	6 51
▣ Multiple	
☐ Difference	
☐ Average	

Multiple	▾ 52
▣ 1: SPA-380	
☐ 2: SEA-380	
▣ 3: SPA-360	

SPA-380	65
▣ PV	
☐ SV	
☐ TV	
☐ QV	

Difference	▾ 52
⊟ 1: SPA-380	
☐ 2: SEA-380	
⊞ 3: SPA-360	

SPA-380	65
☐ PV	
▣ SV	
☐ TV	
☐ QV	

Average	▾ 52
▣ 1: SPA-380	
▣ 2: SEA-380	
☐ 3: SPA-360	
▣ 4: SPA-380	

SPA-380	65
▣ PV	
☐ SV	
☐ TV	
☐ QV	
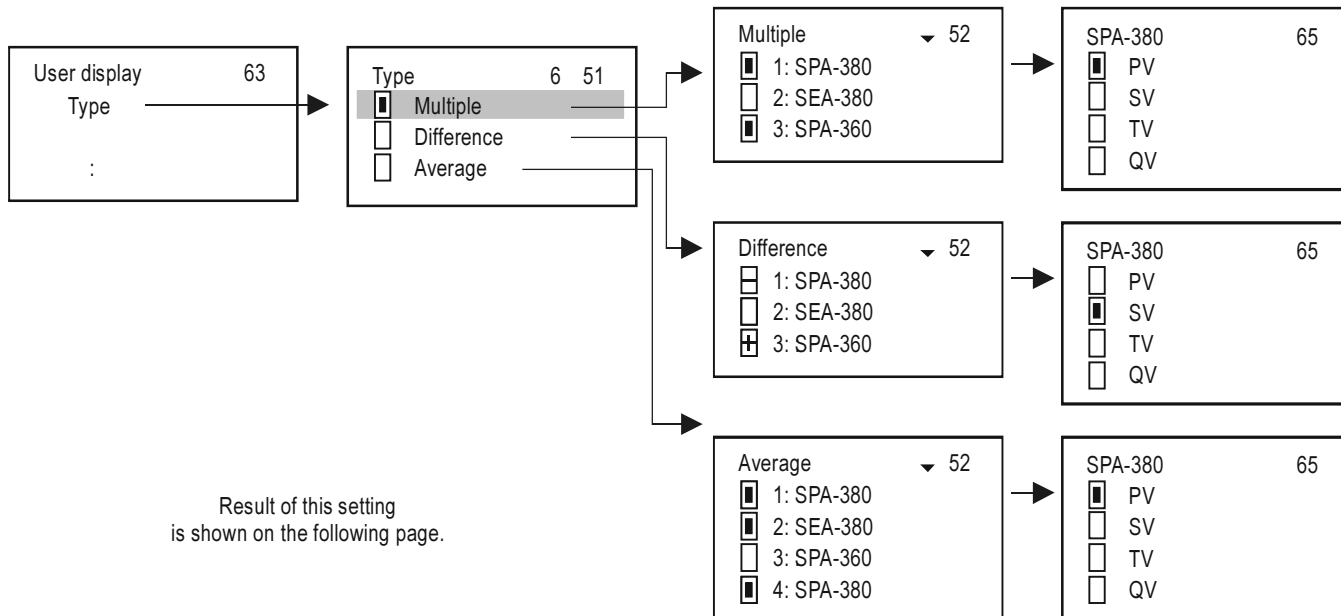
Result of this setting
is shown on the following page.

5.4.5.2 The resulted user displays

- **Multiple**

```
1: SPA-380   LEV   ☐ U
   SV=12.45 m      ■
3: SPA-360   VOL
   SV=125.3 m3     ☐
                   ■
```
→ Bargraph / Output range

- **Difference**

```
1: SPA-360   LEV   ☐ U
   +PV=12.45 m     ■
3: SPA-380   LEV
   -PV=15.32 m     ☐
                   ■
      –2.87 m
```
→ difference of SPA-360 and SPA-380
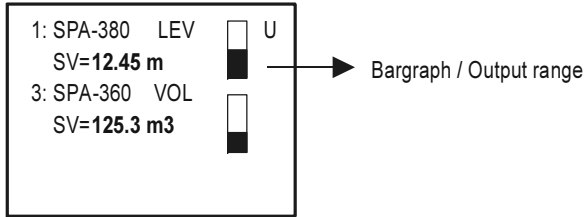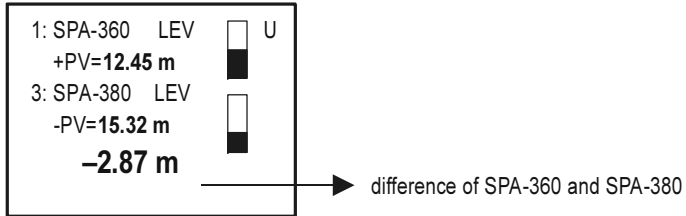
- **Average**

List number of devices whose average value is
calculated by MultiCONT

```
A: 134             U

3: SPA-380   LEV   ☐
   PV=15.32 m      ■
      3.19 m
```
→ The average value calculated from the measurement
result of the selected devices can be stepped using
⬆ and ⬇

→ the calculated average
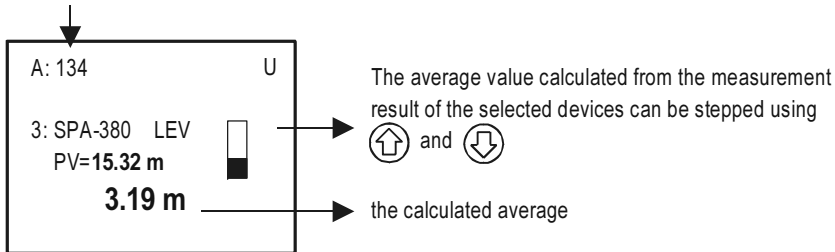
5.4.6. HART

In this menu, it is possible to configure MultiCONT properties, the settings related to the transmitter query and also to choose the HART commands which the MultiCONT uses to communicate with the devices

```
HART                68
    Short TAG        ◄
    Polling address  ◄
    Message          ◄──── MultiCONT properties
    Description       ◄
    Date             ◄
    Command set
```
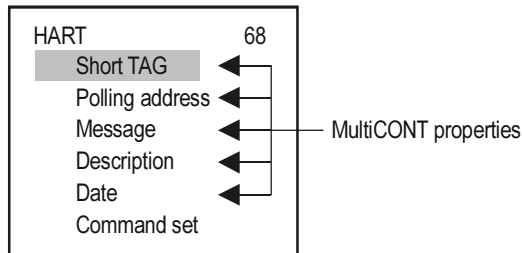
5.4.6.1 MultiCONT Short TAG

Arbitrary 8-character identifier

```
Short TAG           54

        ▶ P-200 ◄
```
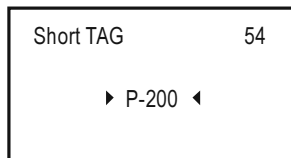
5.4.6.2 Polling Address

If multiple MultiCONT-s are to be connected to a single system via RS485, then this address distinguish them.

```
Polling address     54

        ▶ 00 ◄
```
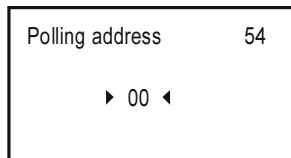
5.4.6.3 Message

An arbitrary message (usually related to the operation, and max 32 characters) can be assigned to a device.
To change rows use „OK" and „ESC".

```
Message             54

▶ MULTICONT PROCESS ◄
   CONTROLLER
```
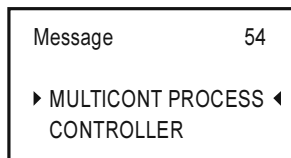
5.4.6.4 Description

An arbitrary text that can be assigned to a device (max 16 characters)

```
Description              54

  ▸ MULTICONT P-200 ◂
```

5.4.6.5 Date

The date assigned to the MultiCONT

```
Date                     54

    ▸ 1900.00.00. ◂
```

5.4.6.6 Command Set

The communication between the MultiCONT and the devices is via different commands. The MultiCONT sends a command containing the address of the device, which responds in accordance with the standards. Some of the commands are universal, while others are device-specific. The appropriate commands are selected automatically based on the data required to control the display, relays, and current outputs. This can be checked or modified in this menu point. If a command became unselected which is needed for appropriate operation, „Program failure" message will be generated in the relays and current outputs. The display flashes, showing that the result will not be refreshed, because the needed HART command for this operation is inactivated. **So the modification of this option is not recommended or it needs great care!** If multiple commands are selected, then the refresh time increases (display, relay, and output current modification).

```
Command set        ▾ 66
   1: SE360
   2: ST380
   3: SE380
```

(OK)

```
3: SE380             67
  ☐ COM1
  ◼ COM2
  ☐ COM3
  ◼ NIV128
  ☐ NIV129
```

MultiCONT uses the following commands to communicate with the devices.

- COM1: query of primary quantities/values
- COM2: the output current in mA and in % (output range)
- COM3: the primary, secondary, tertiary and quaternary values

These commands can be interpreted by any device belonging to any manufacturer.
The commands below can only be interpreted by NIVELCO products:

- NIV128: device specific command optimized for DIST, LEV, VOL measurements
- NIV129: device specific command optimized for DIST, LEV, FLOW, TOT1, TOT2 measurements

The table below shows the contents of the responses of NIVELCO-manufactured devices to given commands:

COM3: 03 Universal HART command

P01	EchoTREK 4-wire. EasyTREK				EchoTREK 2-wire. EasyTREK				NIVOTRACK				NIVOCAP			
	PV	SV	TV	QV	PV	SV	TV	QV	PV	SV	TV	QV	PV	SV	TV	QV
0	**DIST**	LEV	DIST	Temp	**DIST**	Temp	-	-	**DIST**	Temp	-	-	**%**	-	-	-
1	**LEV**	LEV	DIST	Temp	**LEV**	DIST	Temp	-	**LEV**	DIST	Temp	-	**LEV**	%	-	-
2	**LE%**	LEV	DIST	Temp	**LE%**	LEV	DIST	Temp	**LE%**	LEV	DIST	Temp	**LE%**	LEV	%	-
3	**VOL**	LEV	DIST	Temp	**VOL**	LEV	DIST	Temp	**VOL**	LEV	DIST	Temp	**VOL**	LEV	%	-
4	**VO%**	LEV	DIST	Temp	**VO%**	LEV	DIST	Temp	**VO%**	LEV	DIST	Temp	**VO%**	LEV	%	-
5	**FLO**	LEV	DIST	Temp	**FLO**	LEV	DIST	Temp	-	-	-	-	-	-	-	-

P10	NIVOPRESS				UNICONT				THERMOCONT			
	PV	SV	TV	QV	PV	SV	TV	QV	PV	SV	TV	QV
0	P*	-	-	-	Prog**	I_{in}	-	-	Temp	-	-	-
1	P*	-	-	-	Prog**	I_{in}	-	-	Temp	-	-	-
2	LEV	P*	-	-	Prog**	I_{in}	-	-	-	-	-	-
3	LEV	P*	-	-	Prog**	I_{in}	-	-	-	-	-	-

* P: pressure
** Prog: the value calculated by the device from the input current (I_{in}).
   During configuration, it is necessary to set the value (e.g. 4 mA = 0 m^3, 20mA = 125 m^3) corresponding to the incoming 4…20mA (I_{in})

See the relevant data in the User's & Programming manual of the transmitter.

NIV128: NIVELCO device specific commands optimized for VOL measurement

	EchoTREK 4-wire. EasyTREK				EchoTREK 2-wire. EasyTREK				NIVOTRACK				NIVOCAP			
P01	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos.
0	**DIST**	LEV	SR*	Curr.	**DIST**	LEV	SR	Curr.	**DIST**	LEV	SR	Curr.	**%**	LEV	0	Curr.
1	**LEV**	LEV	SR	Curr.	**LEV**	LEV	SR	Curr.	**LEV**	LEV	SR	Curr.	**LEV**	LEV	0	Curr.
2	**LE%**	LEV	SR	Curr.	**LE%**	LEV	SR	Curr.	**LE%**	LEV	SR	Curr.	**LE%**	LEV	0	Curr.
3	**VOL**	LEV	SR	Curr.	**VOL**	LEV	SR	Curr.	**VOL**	LEV	SR	Curr.	**VOL**	LEV	0	Curr.
4	**VO%**	LEV	SR	Curr.	**VO%**	LEV	SR	Curr.	**VO%**	LEV	SR	Curr.	**VO%**	LEV	0	Curr.
5	**FLO**	LEV	SR	Curr.	**FLO**	LEV	SR	Curr.	**-**	-	-	-	-	-	-	-

* SR (sensor range): Value of the difference in level between the „Maximum range" (H=P04) and the „Minimum range" (dead zone - near blocking) in % (empty tank: DIST=H $\Rightarrow$ 0%, full tank: DIST="Minimum range" $\Rightarrow$ 100%). Necessary for displaying the bargraph.

NIV129: NIVELCO device specific commands optimized for FLOW measurement
 (TOT1 and TOT2 in float format)

	EchoTREK 4-wire EasyTREK				EchoTREK 2-wire EasyTREK				NIVOTRACK				NIVOCAP			
P01	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos
0	**DIST**	LEV	TOT1	TOT2	**DIST**	LEV	TOT1	TOT2	**DIST**	LEV	0	0	**%**	*LEV*	0	0
1	**LEV**	LEV	TOT1	TOT2	**LEV**	LEV	TOT1	TOT2	**LEV**	LEV	0	0	**LEV**	LEV	0	0
2	**LE%**	LEV	TOT1	TOT2	**LE%**	LEV	TOT1	TOT2	**LE%**	LEV	0	0	**LE%**	LEV	0	0
3	**VOL**	LEV	TOT1	TOT2	**VOL**	LEV	TOT1	TOT2	**VOL**	LEV	0	0	**VOL**	LEV	0	0
4	**VO%**	LEV	TOT1	TOT2	**VO%**	LEV	TOT1	TOT2	**VO%**	LEV	0	0	**VO%**	LEV	0	0
5	**FLO**	LEV	TOT1	TOT2	**FLO**	LEV	TOT1	TOT2	**-**	-	-	-	-	-	-	-

5.4.7. USER RS485

The **MultiCONT User RS485 interface** provides serial data transfer to the central process controller computer or to a PLC. The following can be queried from MultiCONT through the communication line:

- system properties (MultiCONT configuration, relays, current outputs, transmitters, errors, number of Universal Interface Modules, etc)
- error list
- device assignment to relays or current outputs
- configuration of relays and current outputs
- output values of the devices

The MultiCONT units have separate addresses so they can be connected into a system. (max. 30 MultiCONT-s).

2 communication protocols are available:

- HART 5 (default)
- MODBUS RTU

```
USER RS485        80
   Protocol
   Parity
   STOP bit
```

```
Protocol          82
 ▣ HART prot.
 ☐ MODBUS prot.
```

```
Parity            83
 ☐ No parity
 ▣ ODD parity
 ☐ EVEN parity
```

```
STOP bit          84
 ▣ 1 STOP bit
 ☐ 2 STOP bit
```
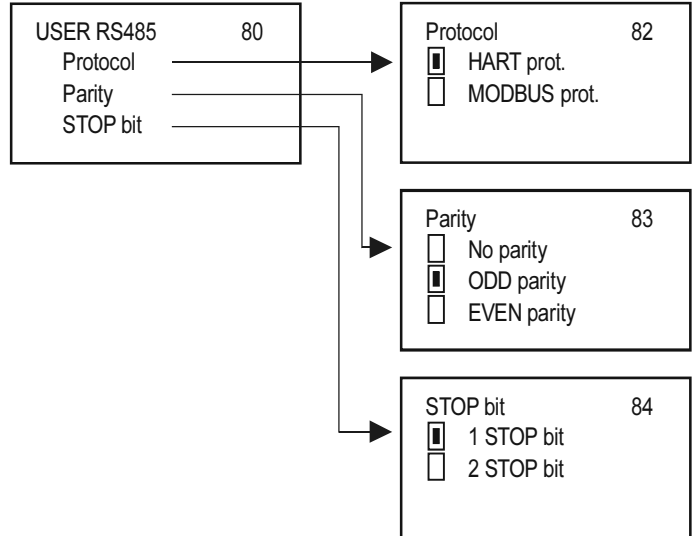
5.4.8. Data Logger

Logger capability of the MultiCONT has two main parts with the following functions:

- Trend logger: in a separate board in PED- and PRD- types. Storing can be done to the FLASH or the memory card. In case of trend logging the ID of the transmitter, the primary value and three additional selectable values will be stored.
  - Time-controlled logging whereby an item is stored after a programmed time elapse or
  - Event-controlled logging whereby an item is stored a pre-set condition is fulfilled.

- Two types of time-window logging can be used for flow-metering. Storing is done to the FLASH memory.
  - In case of "Time-window TOT" TOT is calculated in a selected time interval, monitoring the average, minimum and maximum value of the flow.
  - In case of "Time-window FM" the 8 highest values of flow are stored with time in a selected time interval.

The time-windows are independent from the trend logger and even all four saving modes can operate at the same time (time/event-controlled, time-windows). Time-window logger function can be used only for NIVELCO manufactured transmitters used in flow-metering mode.

```
┌─────────────────────────┐        ┌─────────────────────────┐        ┌─────────────────────────┐        ┌─────────────────────────┐
│ LOG                 140 │        │ Setting             141 │        │ Source              143 │        │ 5:SPA-360           144 │
│   Setting               │        │   Source                │        │   ■ SEA-380             │        │   ☐ SV                  │
│   Show time window TOT  │        │   Function              │        │   ■ LEP-100             │        │   ☐ TV                  │
│   Show time window FM   │        │   Parameters            │        │   ☐ SEA-340             │        │   ☐ QV                  │
│   Clear log             │        └─────────────────────────┘        │   :                     │        │   ☐ Current             │
│   Clear time window TOT │                                           │   ■ SPA-360             │        │   ☐ Percent             │
│   Clear time window FM  │                                           └─────────────────────────┘        │   ☐ Level               │
│   Info                  │                                                                               │   ☐ Level %             │
└─────────────────────────┘                                                                               │   ▣ TOT1                │
                                    ┌─────────────────────────┐                                           │   ▣ TOT2                │
                                    │ Function            145 │                                           │   ☐ PV rate of change   │
                                    │   ▣ Time controlled     │                                           │   ☐ Working             │
                                    │   ▣ Event controlled    │                                           │   ■ Head of flow        │
                                    │   ☐ Time window TOT     │                                           └─────────────────────────┘
                                    │   ☐ Time window FM      │
                                    └─────────────────────────┘        ┌─────────────────────────┐        ┌─────────────────────────┐
                                                                       │ Parameter           149 │        │ Event controlled    146 │
                                                                       │   LP1  1234             │        │   ▣ PV abs. change      │
                                    ┌─────────────────────────┐        │   LP2  5678             │        │   ☐ PV limit mon.       │
                                    │ Source              143 │        │   LP3  0030             │        │   ☐ PV zone mon.        │
                                    │   1: SEA-380            │        └─────────────────────────┘        └─────────────────────────┘
                                    │   2: LEP-100            │
                                    │   3: SEA-340            │        ┌─────────────────────────┐        ┌─────────────────────────┐
                                    │   :                     │        │ 1:SEA-380           151 │        │ Time window TOT 147     │
                                    │   N: SPA-360            │        │ T001: 2009.05.12 12:00  │        │   ☐ 1  hr               │
                                    └─────────────────────────┘        │ TOT: 12568m3            │        │   ☐ 2  hrs              │
                                                                       │ Qave: 35.6 l/s          │        │   ☐ 4  hrs              │
                                                                       │ Qmax: 58.6 l/s          │        │   ☐ 8  hrs              │
                                    ┌─────────────────────────┐        │   2009.05.12  18:23     │        │   ☐ 12 hrs              │
                                    │ Source              143 │        │ Qmin: 0 l/s             │        │   ☐ 24 hrs              │
                                    │   1: SEA-380            │        │   2009.05.13  08:02     │        │   ☐ 1 week              │
                                    │   2: LEP-100            │        └─────────────────────────┘        │   ▣ 1 month             │
                                    │   3: SEA-340            │                                           └─────────────────────────┘
                                    │   :                     │        ┌─────────────────────────┐
                                    │   N: SPA-360            │        │ 3:SEA-340           142 │        ┌─────────────────────────┐
                                    └─────────────────────────┘        │                         │        │ Time window FM  148     │
                                                                       │ Q1: 1256 l/s            │        │   ☐ 1 month             │
                                    ┌─────────────────────────┐        │   2009.10.11-10:10      │        │   ☐ 6 months            │
                                    │ Info                150 │        │ Q2: 1059 l/s            │        │   ▣ 12 months           │
                                    │   Entry number:         │        │   2009.05.10-09:45      │        └─────────────────────────┘
                                    │   Overflow:             │        │ Q3: 0959 l/s            │
                                    │   Status                │        │   2009.07.10-08:35      │
                                    └─────────────────────────┘        └─────────────────────────┘
```

5.4.8.1 Trend logger

Trend logger function is only available on PRD- and PED- instruments. Trend logging can be time-controlled (store an entry after a programmed time elapse) or event-controlled (logging upon measurement changes). These two modes can be working simultaneously and conditions of the logging can be set from the menu (programmed trend logging). Logged entry contains the necessary data to identify a transmitter, the time of the entry, the primary value of the transmitter, and three additional menu-selectable values.

In case of THERMOPOINT temperature transmitters in addition to the PV and 3 freely chosen values, it is also possible to log all the measured temperature points by selecting the **Main menu -> MultiCONT conf. -> LOG -> Settings -> Source -> All values** menu.

The result of the logged data is displyed as shown in the LOG data file (LT record).
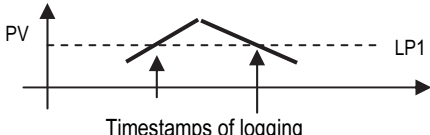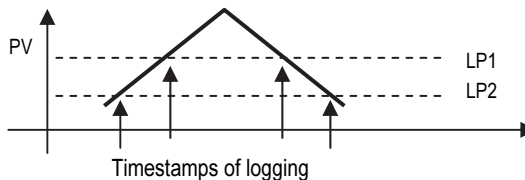
NIVELCO DataLogger Ver.:1.0.3.5 Multicont Ver.:01.02.26

Date:2015.06.29 13:14

Hea	Date	Time	Type	Dev	Addr	Tag	Err.	Status	Curr0	Value0	Unit0	Curr1	Value1	Unit1	Curr2	Value2	Unit2	Curr3	Value3	Unit3					
LT	2015.06.29	13:11:00	2	1	151.18.15978248	TMH-500	0	320	15	degC	26.4	26.2	25.8	26.2	26.1	26	25.7	26.1	26.1	25.9	25.7	25.6	25.6	25.7	25.6
LG	2015.06.29	13:11:02	2	1	151.18.15978248	TMH-500	0	320	TEMP	26.399999	degC	?	NaN	(null)	?	NaN	(null)	?	NaN	(null)					
LT	2015.06.29	13:11:02	2	1	151.18.15978248	TMH-500	0	320	15	degC	26.4	26.2	25.8	26.2	26.1	26	25.7	26.1	26.1	25.9	25.7	25.6	25.6	25.7	25.6
LG	2015.06.29	13:11:04	2	1	151.18.15978248	TMH-500	0	320	TEMP	26.399999	degC	?	NaN	(null)	?	NaN	(null)	?	NaN	(null)					

Data are stored into the FLASH memory in the first step. Capacity of the FLASH memory is 65000 entries. Then if data are stored into an SD (Secure Digital) card, the capacity is depended on the SD card. The readout of the on-board memory can be performed via the USB port with an ordinary commercial USB cable (USB A-B cable). Usage of the SD card is detailed in the chapter 5.4.8.4.

List of transmitters
to be logged.
Select with ⟶ button

Selecting the additional three
quantities besides the primary value

```
┌────────────────────┐   ┌────────────────────┐   ┌────────────────────┐   ┌────────────────────────┐
│ LOG           140  │   │ Setting       141  │   │ Source    143      │   │ 5:SPA-360        144   │
│   Setting          │───│   Source           │───│ ▣ SEA-380          │   │   ☐ SV                 │
│   Show time window TOT │   Function         │   │ ▣ LEP-100          │   │   ☐ TV                 │
│   Show time window FM  │   Parameters       │   │ ☐ SEA-340          │   │   ☐ QV                 │
│   Clear log        │   │   SD saving mode   │   │   :                │   │   ☐ Current            │
│   Clear time window TOT│                    │   │ ▣ SPA-360          │   │   ☐ Percent            │
│   Clear time window FM │                    │   └────────────────────┘   │   ☐ Level              │
│   Info             │   │                    │                            │   ☐ Level %            │
└────────────────────┘   └────────────────────┘                            │   ▣ TOT1               │
                                                 ┌────────────────────┐   │   ▣ TOT2               │
                                                 │ Function      145  │   │   ☐ PV rate of change  │
                                                 │ ▣ Time controlled  │   │   ☐ Working            │
                                                 │ ▣ Event controlled │   │   ▣ Head of flow       │
                                                 │ ☐ Time window TOT  │   └────────────────────────┘
                                                 │ ☐ Time window FM   │
                                                 └────────────────────┘
                                                 ┌────────────────────┐   ┌────────────────────────┐
                                                 │ Parameter     149  │   │ Event controlled   146 │
                                                 │   LP1  1234        │   │ ▣ PV abs. change       │
                                                 │   LP2  5678        │   │ ☐ PV limit mon.        │
                                                 │   LP3  0030        │   │ ☐ PV zone mon.         │
                                                 └────────────────────┘   └────────────────────────┘
```

For using the trend logging function, the following data should be set:

- In the "Source" menu point the transmitter can be selected which measured value will be logged and the additional three values can be selected to be logged besides the primary value.
- In the "Mode" menu point the logging mode (time-controlled, event-controlled or both) can be selected.
- In case of time-controlled logging mode in the "Parameters" menu point the logging interval should be entered into LP3 in minutes.
- In case of event-controlled logging mode in the "Parameters" menu point LP1 and LP2 parameters should be set, according to the table below:

Event-controlled trend logging		
Mode	**Operation**	**Parameters**
PV absolute change	Logging when (absolute) change of Primary value (PV) reaches the value in LP1	**LP1**
PV limit value monitoring	The logging monitors and stores the timestamps when Primary value (PV) exceeds or falls under the value in LP1. PV ⋯⋯⋯ LP1 Timestamps of logging	**LP1**
PV zone monitoring	The logging monitors and stores the timestamps when Primary value (PV) quits from the zone defined by LP1-LP2, or when it returns into the zone. PV ⋯⋯⋯ LP1 ⋯⋯⋯ LP2 Timestamps of logging	**LP1** **LP2**

In case of time-controlled trend logging the average of the selected values will be stored within the time interval which is set in LP3 parameter.
Mode and parameters of the logging are the same for all transmitters. Logging function commences when exiting the "LOG"/"Settings" menu point.

Besides the measurement values of the transmitters there are many events (which affect the operation of the whole system) stored in the trend logger regardless the programming (see chapter 5.4.8.5).

5.4.8.2 Time-window TOT (Total flow logging)

This function is only available for NIVELCO manufactured transmitters operating in flow measurement mode (for this option NIV129 should be selected in "Main menu"/"MultiCONT conf."/"HART"/"Command set"). Within the selected time interval MultiCONT counts the total flow (TOT), the average flow (Qave) and monitors the maximal and the minimal flow. The length of this time interval can be selected from the menu. Up to 256 time-windows can be stored.

```
Time window TOT   147
 □  1  hr
 □  2  hrs
 □  4  hrs
 □  8  hrs
 □  12 hrs
 □  24 hrs
 □  1 week
 ■  1 month
```

Read logging data: "Main menu"/"MultiCONT conf."/"LOG"/"Show time window TOT"

↑, ↓, OK and → buttons are used for stepping in the list (OK moves down 10 lines, → moves up 10 lines in the list)
T000 is the unfinished "Time-window 1". T001 is the last finished time-window. Increasing nnn, the time can be incremented. nnn=0…255

```
2: SE300              151   ——— Identifier of the transmitter
  Tnnn:   2010.01.12-09:13   ——— Number of "Time-window TOT" and time of start
  TOT:    15689 l            ——— Total flow
  Quave: 12.56 l/s           ——— Average flow
  Qmax:  54.23 l/s           ——— Maximum flow with time
          2010.01.12-11:23
  Qmin:   4.53 l/s           ——— Minimum flow with time
          2010.01.12-13:56
```

5.4.8.3 Time-window FM (Flow Maximum logging)

This function is only available for NIVELCO manufactured transmitters operating in flow measurement mode (for this option NIV129 should be selected in "Main menu"/"MultiCONT conf."/"HART"/"Command set"). The 8 highest flow values are stored with time within the time interval selected in the menu.

```
Time window FM        148
 ■  1 month
 □  6 months
 □  12 months
```

Read logging data: "Main menu"/"MultiCONT conf."/"LOG"/"Show time window FM"

↑ and ↓ buttons are used for stepping in the list.

```
2: SE300              142   ——— Identifier of the transmitter

  Q1:    458.56 l/s          ——— Highest flow with time
          2010.01.13-15:25
  Q2:    418.13 l/s          ——— 2nd highest flow with time
          2010.01.14-07:47
  Q3:    356.98 l/s          ——— 3rd highest flow with time
          2010.01.22-23:01
```

5.4.8.4 Using a memory card for logging

Trend logging function is facilitated by a LOGGER unit connected to the front panel. It contains a FLASH memory chip and an SD (Secure Digital) card slot. Communication between the central unit of the MultiCONT and the LOGGER unit is indicated by two LED-s on the front panel. The green LED (read) flashes when a new logging entry is created, the red LED (wire) indicates when data are stored to the SD card. For storing data an SD (Secure Digital) memory card with maximum 2 GB capacity is recommended.
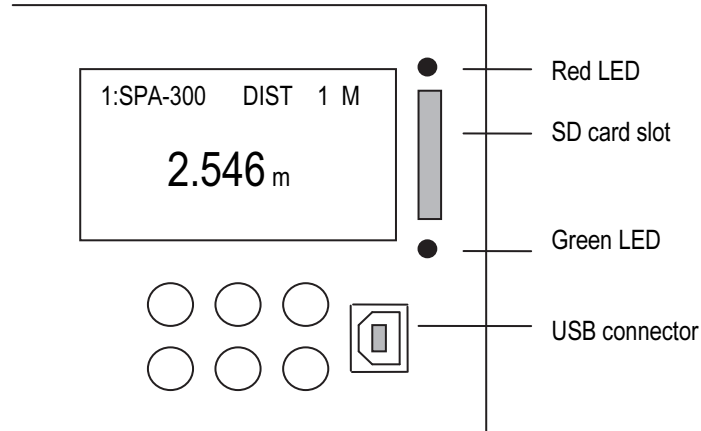
In case of PED- and PRD- type devices (which are able to trend logging) checking of the LOGGER unit is done when turning it on. Then the following box messages will be shown on the display in accordance to the result of the logging procedure:

```
┌─────────────────────────────┐
│   ┌─────────────────────┐   │
│   │                     │   │
│   │   LOGGER PRESENT    │   │
│   │                     │   │
│   └─────────────────────┘   │
│                             │
└─────────────────────────────┘
```
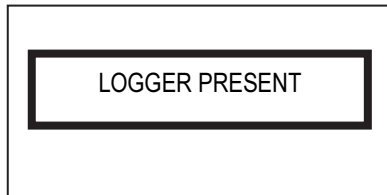
Everything is OK
Red and green LED-s are flashing until this caption appears

```
┌─────────────────────────────┐
│   ┌─────────────────────┐   │
│   │                     │   │
│   │  LOGGER NOT PRESENT │   │
│   │                     │   │
│   └─────────────────────┘   │
│                             │
└─────────────────────────────┘
```
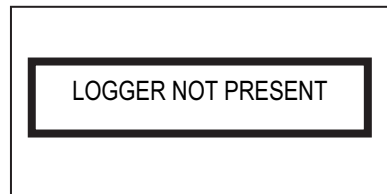
LOGGER card is not working properly
In this case **P-200 :LOG IP** entry will be created in the error-list

This procedure is repeated in every turning ON/OFF and restart.

Then the measurement data are sent continuously to the LOGGER unit (flashing green LED indicates) and in case of fulfilment of the selected conditions (see chapter 5.4.8.1) they are logged, which is indicated by the flashing red LED.

Capacity of the on-board FLASH memory is 65000 entries. When this memory is became full and there is no SD card in the card-reader, the old entries will be overwritten so the logging will be performed by a "rotation". Number of overflows can be read out in the "LOG"/"Info" menu point. When there is an SD card in the slot the read and write process is done with the frequency selected in "LOG"/"Settings"/SD saving mode" menu point.

The LOGGER unit of the MultiCONT senses automatically the inserted SD card. Then saving the FLASH memory into the memory card commences automatically. State of this process can be followed in the trend bargraph. Before remove the memory card, the end of the write process (when the red LED does not flash) has to be waited. In order to avoid removing the card during the write process, push the ESC and the ↑ buttons at the same time. Then the following box message will be shown on the display:

```
┌─────────────────────────────┐
│   ┌─────────────────────┐   │
│   │                     │   │
│   │      SD card        │   │
│   │   can be removed    │   │
│   │                     │   │
│   └─────────────────────┘   │
│                             │
└─────────────────────────────┘
```
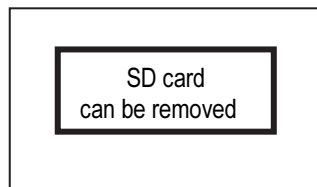
From this moment the MultiCONT does not send any data for 10 seconds to the LOGGER unit (write is unavailable) and the SD card can be safely removed.

5.4.8.5 File system of the SD card and file content of a logging entry

When inserting an SD card into the MultiCONT, content of the on-board FLASH memory is loaded automatically into the memory card (this is indicated by continuous flashing of the red LED during write process). The LOGGER unit finds the last dated directory and examines if the files are more than 200 in this subdirectory. If not, MultiCONT continues the write process. If there are more than 200 files, a new directory is created. One logging file can contain max. 1000 entries, but new logging files are created when turning ON/OFF, restart of the MultiCONT and exiting from the LOG menu.

After finishing the saving process to the SD card, data are able to open in any PC with appropriate SD card-reader. The logging file is a special TAB articulated text file, which can be read with any spreadsheet application if necessary.

Name of the sub-directories on the card: **PR**ddd   where ddd=001…999
Name of files in the sub-directories: **PR**ffffff**.TXT**   where ffffff=000001…999999

The created file-system looks like in the following:

```
PR001                          1st directory
   PR000001.TXT
   PR000002.TXT
   PR000003.TXT
        .
   PR000200.TXT
PR002                          2nd directory
   PR000201.TXT
   PR000202.TXT
        .
   PR000252.TXT
PR003                          3rd directory
   PR000253.TXT
   PR000254.TXT
        .
```

The PRffffff.TXT named logging files in the directories consist of two main parts: header and data field. The header contains the following information:

```
NIVELCO DataLogger Ver.:1.08 MultiCONT Ver.:01.02.02     << DataLogger and MultiCONT version
Date:2001.01.01 01:02                                    << Date of file creation
```

Data field contains the following data rows:

Title	Description	Example
Head	Logging entry code	(LG = logger, ST = status, SD = mem.card operation, ER = error message, VO = time of switching OFF)
Date	Logging entry date	2010.05.07
Time	Logging entry time	13:01:40
Type	Logging entry type (see Type codes)	2
Dev	List-tag of the source device	3
Addr	HART Long address of the transmitter	151.30.2555904
Tag	Short tag	SAP-300
Err.	Error	0
Status	Status	0
Curr1		FLOW
Value1	Primary Value	125.67
Unit1		m3/h
Curr2		LEV
Value2	Selected additional 2nd quantity	0.567
Unit2		m
Curr3		TOT2
Value3	Selected additional 3rd quantity	12345678
Unit3		m3
Curr4		Work
Value4	Selected additional 4th quantity	1548
Unit4		h

Comments:

- If logging entry type is not 2, then MultiCONT is the source (DEV=255, TAG=P-200, Error=0, Status=0), instead of the PV and the three additional selected values use NAN (no data) caption can be read.
- Insertion of SD card: `SD    2010.05.07    13:01:40      SD pushed`
- Removal of SD card: `SD    2010.05.07    13:01:40      SD pulled`
- In case of ST entries, the selected values in LP1, LP2 and LP3 parameters can be read out from Value1, Value2 and Value3.
- In case of ST entries the following codes are in the Type and Dev columns:

Type:

B7	B6	B5	B4	B3	B2	B1	B0
				00=absolute value change 01=limit value monitoring 10=zone monitoring		1=event-controlled ON	1=time-controlled ON

Dev:

B7	B6	B5	B4	B3	B2	B1	B0
	SD saving mode 000= 1 row 001= 8 rows 010= 16 rows 011= 32 rows 100= 64 rows 101= 128 rows			Number of transmitters to be logged (LOG/Settings/Source)			

- The following codes can be in the type code column:

Type code	Description	Comments
0	Hardware reset	Turning ON
1	Software reset	Device restart from menu
2	Entry of measured value	Programmed TREND logging entry
3	MultiCONT CRC altered	Settings of MultiCONT have changed. CRC calculated when entering Main menu differs from the CRC calculated when quitting the Main menu.
4	TOT1 clear	Clearing TOT1 from a NIVELCO instrument used for flow-metering.
5	TOT2 clear	Clearing TOT2 from a NIVELCO instrument used for flow-metering.
6	MultiCONT clock set	
7	Transmitter (DEVICE) default load	Loading default settings of the transmitter from menu
8	MultiCONT default load	
9	Logger delete from menu	
10	MultiCONT error-list clear	
11	Transmitter program CRC altered	MultiCONT checks CRC when entering and quitting remote programming mode. Logging entries are created when the two CRC differs.
12	New list saved after (DEVICE) detection	
253	Instrument respond error	Transmitter does not respond to the entered commands, it will be stored also in the error-list
254	Instrument inactive	The instrument selected for logging is in inactive state

5.4.9. Secret code

The viewing and modification of MultiCONT settings can be protected with a secret code differing from 00000000.
If there is a password, the following symbol ⚷ appears left of the menu identifier, and flashes after being unlocked.
The password remains temporarily unlocked until returning to the measuring process.

Password protected MultiCONT

```
┌─────────────────────────┐
│ Password          ⚷ 44  │
│    Unlock               │
│    Modify               │
│    Scope                │
└─────────────────────────┘
```

┌─────────────────────────┐
│   │
│   No Code   │
│   Press OK   │
│   │
└─────────────────────────┘

"Password" is 00000000,
no restriction

┌─────────────────────────┐
│ Unlock   ⚷   │
│   │
│   ▸ 00000000 ◂   │
│   │
└─────────────────────────┘

The "Password" is not 00000000,
To enter and modify a password is needed

┌─────────────────────────┐
│   │
│   Unlock please   │
│   Press OK   │
│   │
└─────────────────────────┘

Password modification permission is denied
thus unable to modify "password"
Go back to Unlock menu

┌─────────────────────────┐
│ Modify   ⚷   │
│   │
│   ▸ 00000000 ◂   │
│   │
└─────────────────────────┘

If "Password" is unlocked the key flashes,
if there was no password, there is no key
"Password" can be deleted by typing 00000000

┌─────────────────────────┐
│ Scope   46   │
│   ▣ All   │
│   ☐ Modify   │
│   │
└─────────────────────────┘

No access
Access to view parameters but not to modify

5.4.10. Language

This is where to select the language used during measurement and programming.
The selected language will be switched to immediately.

```
Language          43
  ▐  English
  ☐  German
  ☐  French
  ☐  Hungarian
  ☐  Czech
```

→ Default: english

select using ⟳
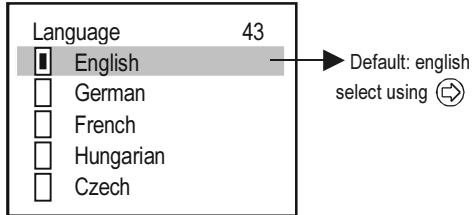
5.4.11. Background lighting

The background lighting of the display can be modified here.

```
Backlight         36
  ▐  High
  ☐  Low
  ☐  Auto
```

In auto mode, pressing any button sets the backlight to "high".
10 s after the last button was pressed, the backlight turns off
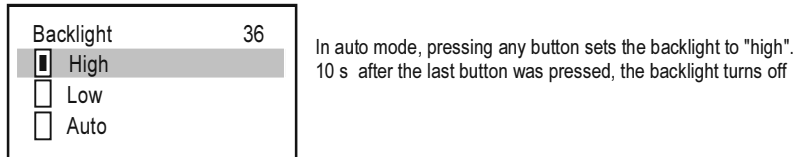
5.4.12. Report:

This provides information about the system structure. This displays the number of devices (transmitters), relays, current outputs, and modules in the system, and also the number that can be handled. Binding is when a relay or current output is assigned to a device.

Report	▼ 53	
Devices:	002/015	→ 2 devices (transmitters) in the loop, max. 15
UIM-s	000/032	→ No. of Universal Interface Modules (PJK-100)
Relays:	004/064	→ No. of relays (64 = sum of maximal internal and external relays)
Current outs:	002/016	→ No. of current outputs
Inputs:	000/000	→ Other inputs
U485:	NO	→ RS485 user interface
M485:	YES	→ RS485 module interface (needed for UIM functioning)
Bindings:	005/100	→ No. of bindings
Type:	PEC2M9	→ Type of MultiCONT
SW type:	01	→ Software type of MultiCONT
SW version:	01.00	→ Software version of MultiCONT
Serial:	B9718160	→ Serial no. of MultiCONT processor
Date:	2005/11/15	→ Date of MultiCONT software update
Working:	6/18/59	→ MultiCONT work time (days/hrs/mins)
Power cnt:	224	→ No. of MultiCONT "power-on"s
Temp min.:	18°C	→ MultiCONT min. temperature
Temperature:	22°C	→ MultiCONT actual temperature
Temp max.:	35°C	→ MultiCONT max. temperature

5.4.13. Prog CS

When exiting the menu the device generates a Frame Check Sequence from the settings (EXCLUSIVE-OR operation of bytes)

Prog CS	81
	129

5.5. PROGRAMMING DEVICES

Device selection with the ⬆ and ⬇ buttons, then press ⊙ to query and modify parameters.

▣ Device is active

☐ Device is not active, but can be programmed as if it were active

---

Main menu ▶ 01
- Devices
- Relays
- Current outs

"OK"

Devices ▶ 06
- ☐ 01: ST300
- ☐ 02: SE300
- ▣ 03: SG300

"OK"

Device: SG300 ▶ 07

Menu item	Description
Remote programming	Programming the device and querying parameters see: chapter 5.6.*
Short TAG	To query and modify the Short TAG use ⊙ ⬆ ⬇ and after press ⊙
Short address	Short address** (1…15), used during detection will search for the device with this address. Secret code* not needed for modification. Modification should be done with care
Message	Arbitrary text assigned to the device (usually related to operation, max 32 char)
Description	Arbitrary text assigned to the device (usually related to the material, max 16 char)
Date:	Date assigned to the device
Final ass. number	Factory setting = 0
Factory ID	Factory ID, for NIVELCO devices = 151
Device type ID	Device type ID
SW version	Software version of the transmitter (see manual)
HW version	Hardware version of the transmitter (see annual)
Device ID	Manufacturer's electronic serial number
Major revision	HART revision
Device revision	0

* In case of the NIVELCO non-compatible transmitters, only the assigned 4-20 mA values and damping time can be programmed. Detected "Short address" will shown when pressing OK button. Detected "Short address" programmed".

** In this menu point the short address of the device will shown when pressing OK button. Detected "Short address" is stored in the operative memory, turning off the device the memory content is erased. In case of this "??" will appear. It has no effect on the operation, because communication is performed via "Long address" (cannot modified) after the detection. The transmitter will have the modified address at the next detection!

5.6. REMOTE PROGRAMMING

Select the device to be programmed as described above.

The diagram flow:

Devices
- 01: ST300
- 02: SE300
- 03: SG300
▸ 06

"OK"

Device: SG300 ▸ 07
Remote programming
Short TAG
Short address

"OK"

The device is in PROG mode, remote programming is not allowed. Quit programming mode or wait for automatic exiting of PROG mode (max. 30 min)

HART protection
Press OK

"OK"

"OK"

Remote programming ☖ 08
- Secret unlock
- Secret mod.
- App. parameters
- Parameters
- Linear table
- Echo
- Clear TOT1
- Factory defaults
- Service

☖ "Key" shows that the device configuration is protected by a **"Password"** (see programming manual of the device)

Unlocking the **"Password"**

Entering or changing the **"Password"**. To change an existing code the old one should be unlocked!! *

Parameter for NIVELCO instruments for selecting the unit to be used (Metric: m, cm, US: ft, inch)

Querying and modifying the parameters of the device. **

If the device is password protected parameters are only readable. *

Editing the linearisation table (see chapter 5.6.1.)

Draws the Echo-map for ultrasonic transmitters*** . (returns with "unknown DEV/comm" error for devices where this is not defined)

Clears TOT1 for with flow measurement function devices

Return to default settings.

Clear TOT2, temperature calibration, DIST calibration, write Device ID (service code is needed for access)

*, **, *** See next page for explanation
Note: Content of this menu is depended on the type of the transmitter!
For example: MicroTREK see: appendix 6.
LEP-100 see: appendix 7.

* If the access is denied the following message appears.

```
Unlock please
Press OK
```
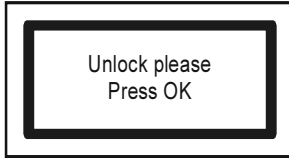
After entering a valid code press **OK**.

** Parameters entered during remote programming via MultiCONT will be sent without being checked to the device where the data is checked. In the event of bad parameter value, or if the given parameter is not defined in the given device, then the following message appears:

```
HART logical error
Press OK
```
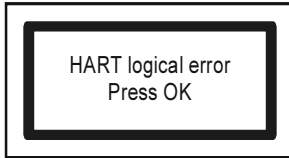
To correct the problem see the User's Manual of the respective device (transmitter)

*** Explanation of the Echo Map of ultrasonic transmitters

On enter:

No. of echoes

No. of selected echo (on enter 1), select with (⇦) or (⇨)

Measured echo is blinking

```
Echo      5   1      13
1.40 m           -3.2 dB
```

Amplitude and distance of the measured (blinking) echo

The echo-map

Selected echo marking

```
0.70 m           -17.5 dB
```

amplitude and distance

after pressing (⇨) button:

```
Echo      5   2      13
1.40 m           -3.2 dB


1.40 m           -3.2 dB
```
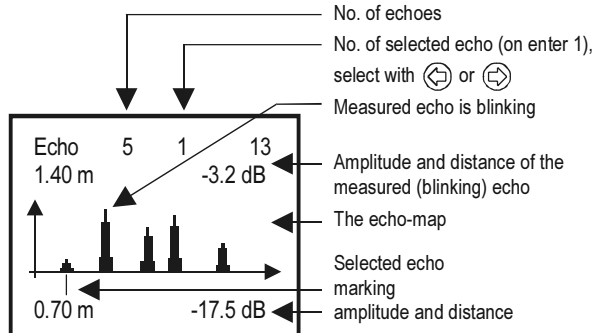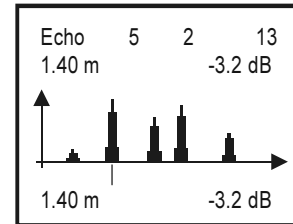
Note!! The displayed data corresponds to the moment of entering into the menu.
The flashing echo is the one used by the transmitter to measure distance. To refresh the display press **ESC** then **OK**.

5.6.1. Editing the linearisation table

Remote program ▶ 08
App. parameters ◀
Parameteres
Linear table
Echo

"OK"

Table with two rows
Data pair to be edited

Linear table ▶ 12
01: 0.000 0.000
02: 1.520 125.540
(Lin. 03:)

"OK"

Edit using ⟳ ⇧ ⇩ and ⊕ buttons
Editing left sided element of the data pair
Right sided element of the data pair

Lin. 03
▶ +0001.980▼ m
0.000 m³/s

"OK"

Lin. 03
1.980 m
▶ +0259.300◀ m³/s

"OK"

Edit of 3rd row has finished

Linear table ▶ 12
01: 0.000 0.000
02: 1.520 125.540
03: 1.980 259.300
(Lin. 04)

Warning! For the transmitter to compute the measurement results using the linearisation table, linearisation has to be enabled in parameter P47 (See the Installation and Programming Manual of the given transmitter)

5.7. RELAY CONFIGURATION

First of all it is recommended to decide which relay is to be assigned to which device(s), and to which measured value (PV=primary value, SV=secondary value, ...) in Main menu/Relays/ Program/Source. Relays can be assigned to one or more sources (difference, average). Secondly the relay function should be selected in Main menu/Relays/ Program/Function. Finally the parameters have to be specified in Main menu/Relays/Program/Parameter such that the dimensions of RP1 and RP2 are determined by the devices assigned to them. Thus if the chosen value is LEVEL [m] then the RPx parameters also have to be entered in LEVEL [m].

5.7.1. Relay Selection

It is impossible to enter the relay menu if the system does not contain a single relay. The number of relays in the system can be viewed under Main menu/MultiCONT config/ Report. (See chapter 5.4.12.)
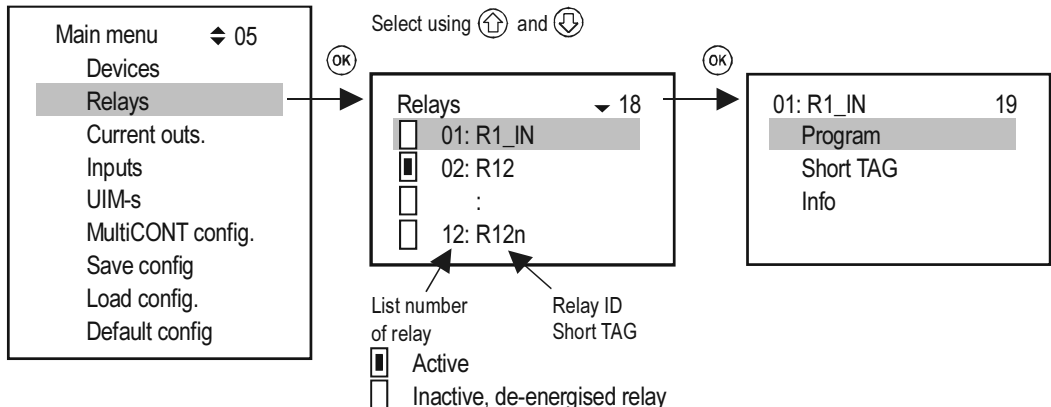
5.7.2. Properties of the selected relay

The refreshing of "Cycle", "Working", "Input" and "Output" takes place continuously in the case of the internal relays.

```
┌────────────────────────────┐        ┌────────────────────────────┐
│ 01: R1_IN            19     │        │ Short TAG            25     │
│     Program                │        │                            │
│     Short TAG ─────────────┼───────▶│      ▸  R_IN_1  ◂          │
│     Info ───────────┐      │        │                            │
└─────────────────────┼──────┘        └────────────────────────────┘
                      │
                      │               ┌────────────────────────────┐
                      │               │ Info                 74     │
                      └──────────────▶│    Cycle:          1789  ───┼──▶ Number of state changes of the relay
                                      │                             │    The energisation and release are each considered a different state
                                      │    Working:          67  ───┼──▶ Relay energisation time [ h ]
                                      │    Input:         0.589  ───┼──▶ The value that the relay state was calculated from
                                      │                             │    (if RP1...RP3 are known)
                                      │    Output:           BE  ───┼──▶ Actual state of the relay
                                      │    ID:        9729718161 ───┼──▶ Relay ID number
                                      │    Parent:    9728718160 ───┼──▶ In case of an internal relay, the MultiCONT's ID,
                                      │                             │    if not then the module's ID
                                      │    Location:    Internal ───┼──▶ Location of the relay (Internal=in MultiCONT,
                                      │                             │    External=in an external module)
                                      └────────────────────────────┘
```

5.7.3. Relay programming

5.7.3.1 Source selection

One or more devices can be assigned to one relay.

```
┌─────────────────────────┐      ┌─────────────────────────┐      ┌─────────────────────────┐      ┌─────────────────────────┐
│ Relay: R1_IN        19  │      │ Program            20   │      │ Source        ▼    21   │      │ 1: SE300           57   │
│   Program          ──── │ ───▶ │   Source                │ ───▶ │ ⊞ 1: SE300       ────   │ ───▶ │   ☐ PV                  │
│   Short TAG             │      │   Function              │      │ ☐ 2: SC380              │      │   ◪ SV                  │
│   Info                  │      │   Parameter             │      │ ⊟ 3: SP380              │      │   ☐ TV                  │
│                         │      │   Invert                │      │         :               │      │   ☐ QV                  │
└─────────────────────────┘      │   Clear TOT             │      │ ☐ n: ST-300-1           │      │                         │
                                 │   Update TOT            │      └─────────────────────────┘      └─────────────────────────┘
                                 │   Test                  │
                                 └─────────────────────────┘      ☐  Not assigned                 ⊟  Assigned with a "–" sign
                                                                  ⊞  Assigned with a "+" sign      ▯  Assigned by averaging
                                                                                                   Modify using ⟳
```
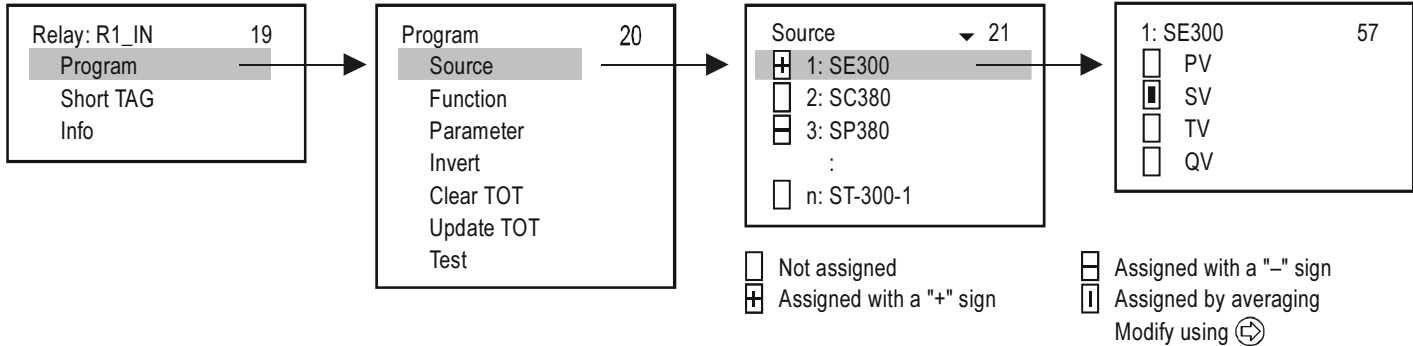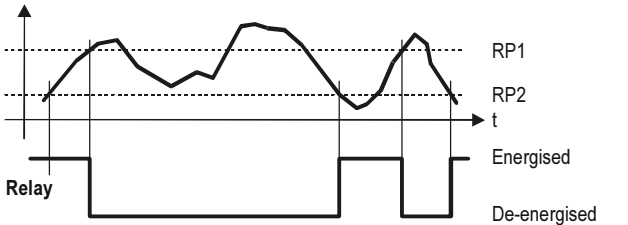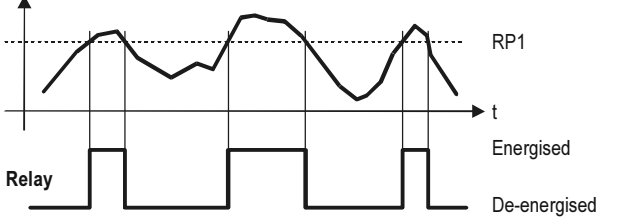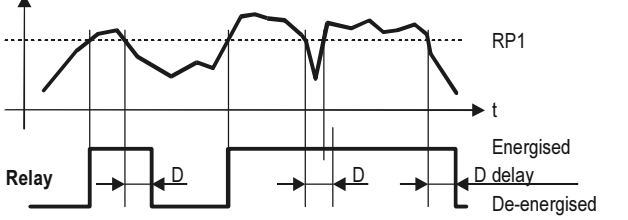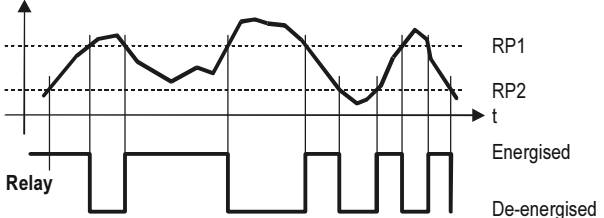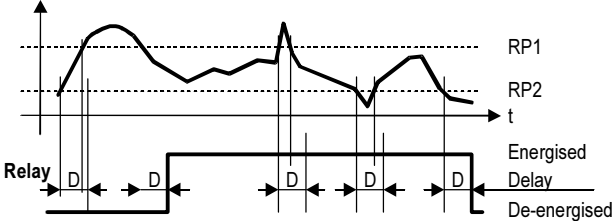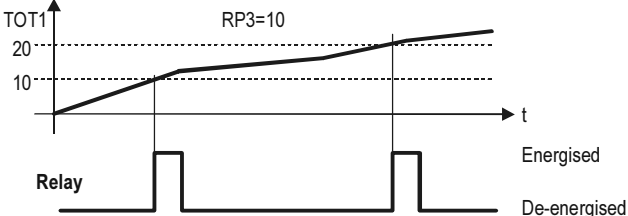
In the above example, Relay R1_IN is controlled by the difference of the secondary values of SE300 and SP380. In case of a single unit, the sign is indifferent, in fact, average might as well be selected. In case of the selection of multiple devices, control depends on the result of the mathematical sum. If in the case of selected multiple devices the dimensions of the quantities are different, the unit will display an error message. Upon selecting the quantity, confirm that the appropriate HART command has been selected for the device (See Main menu/MultiCONT config/HART / command set, see chapter 5.4.5.5)

5.7.3.2 Function

```
┌─────────────────────────┐         ┌─────────────────────────┐         ┌─────────────────────────┐
│ Relay: R1_IN       19   │         │ Program          ▾ 20   │         │ Function         ▾ 22   │
│  Program                │────▶    │  Source                 │────▶    │  ☐  Hyst.               │
│  Short TAG              │         │  Function               │         │  ▣  Alarm               │
│  Info                   │         │  Parameter              │         │  ☐  Alarm, D            │
└─────────────────────────┘         │  Invert                 │         │  ☐  Alarm, G            │
                                    │  Clear TOT              │         │  ☐  Window              │
                                    │  Update TOT             │         │  ☐  Window, D           │
                                    │  Test                   │         │  ☐  Error               │
                                    └─────────────────────────┘         │  ☐  Impulse, F          │
                                                                        │  ☐  TOT 1               │
                                                                        │  ☐  Alt., S             │
                                                                        │  ☐  Sequential          │
                                                                        │  ☐  PV rate of change   │
                                                                        └─────────────────────────┘
```

☐ Not selected
▣ Selected
Select using ⟳
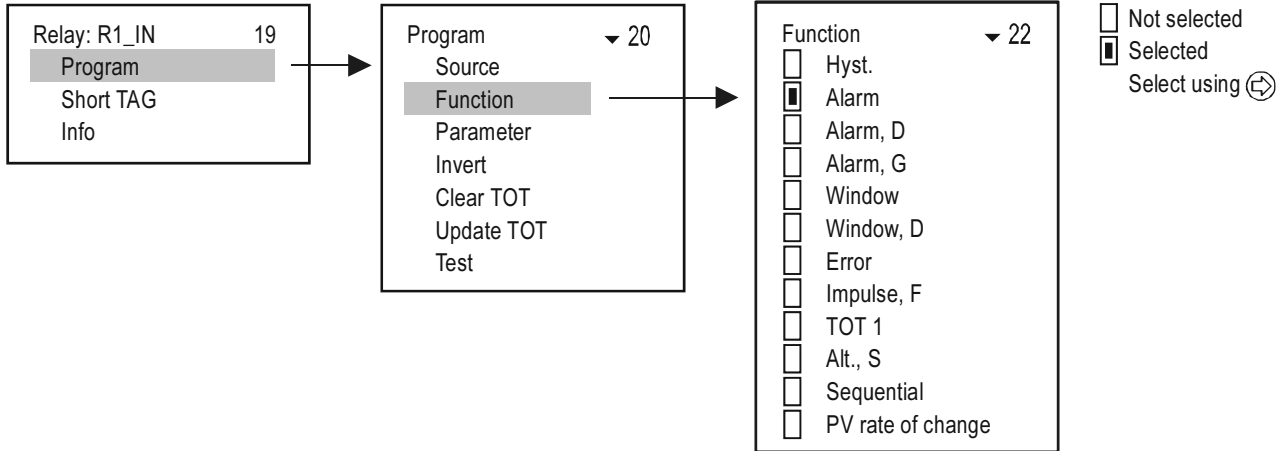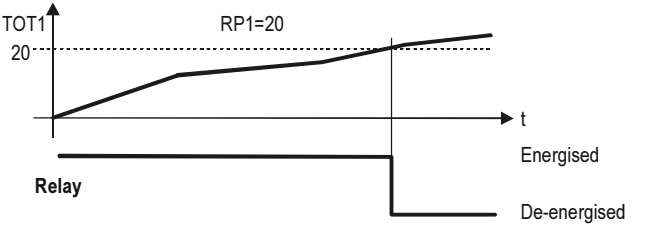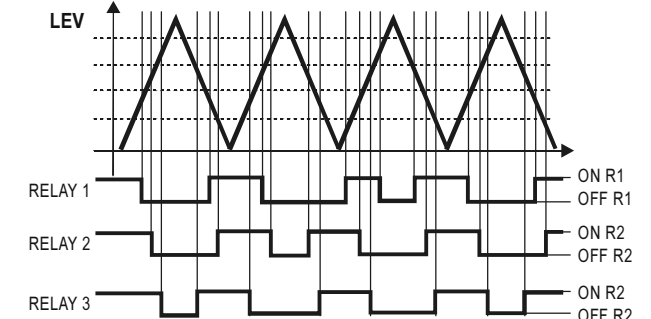
OPERATING MODE	FUNCTION	PROG. PAR

Hysterisis. (2-point control)
   Default: filling with energized relay:
   Invert = OFF,
   above RP1 the relay will be de-energized below RP2 it will be energized
   Inverted operation: by interchanging RP1 and RP2
   or by selecting Invert = ON
Main menu/Relays/Program/Invert
If RP1 = RP2 then the upper alarm function is enabled
		RP1, RP2

Alarm
   Default: Invert = OFF
   Below RP1 relay will be de-energized
   Inverted operation (relay will be energized below RP1) or by selecting Invert = ON
   Hysterisis = 2.5% of RP1
If RP1 = 0 the relay will be constantly energized
		RP1

Alarm D (with delayed switching)
   Default: Invert = OFF
   below RP1 relay will be de-energized using delay in RP3 (Factory default t= 0 sec)
   Delay can be set under RP3 in sec
		RP1, RP3

Alarm G (group ALARM) Default: „Invert =Off"	Relay get de-energized if the condition (measured value is less than RP1) is fulfilled in case of any transmitters assigned to the relay. Hysteresis: 2.5% of RP1 Operation can be inverted with Invert =On switch (Relay get de-energized if the measured value is more than RP1)	**RP1**

Window (window comparator) Default: Invert= OFF Between RP1 and RP2 relay will be energized Inverted operation (Between RP1 and RP2 relay will be de-energized) or by selecting Invert = ON		**RP1, RP2**
Window D (comparator with switching differential) Default: Invert = OFF Between RP1and RP2 relay will be energized using delay in RP3 (Factory default t= 0 sec) Inverted operation (Between RP1and RP2 relay will be de-energized) or by selecting Invert = ON		**RP1, RP2, RP3**
Error Default: Invert = OFF In case of error relay will be de-energized. RP3=0 for any error; RP3=n for error of code **n** Inverted operation (in case of error relay will be energized) or by selecting Invert =ON		**RP3**
Impulse F Default: Invert = OFF relay will be energized for appr. 200ms for each unit volume set in RP3 Operation can be inverted by selecting Invert = ON Programming error will be displayed if: • more than one device (transmitter) is marked as source • RP3 = 0		**RP3**

TOT1
    Default: Invert = OFF
    relay will be de-energized when TOT1 reaches value in RP1
    Operation can be inverted by selecting Invert = ON (relay will be energized)
		RP1

Alt (optimized pump control) Default: Invert = OFF More relays (max 8) can be assigned to one source (transmitter) and they are controlled such that the switching number will be the same for all of them. In this case the connected relays will be energized and de-energized one after the other irrespective of which relay's conditions are fulfilled. The programmed relay operation is shown in the following diagram.		**RP1, RP2**

PV rate of change
    Default: "Invert = OFF"
 	
The MultiCONT counts PV rate of change in every 5 seconds. When there are more transmitters in the loop and cycle time is more than 5 seconds, PV_Rate is calculated per cycles.
 	
(t1-t2 ≥ 5sec)
 	
PV rate of change speed is [PV/min] =(PV_{t1}-PV_{t2})*60/(t1-t2)
 	
There are two operation modes, depending on the value of the parameters:
1.   **RP1 > RP2 ≥ 0**
     For example: Relay becomes energized when level is increasing in the tank too fast.
2.   **RP1 < RP2 ≤ 0**
     For example: Relay becomes energized when level is decreasing in the tank too fast.
 	
Inversion of the operation can be performed with selecting „Invert = ON"
	
	PV rate of change **RP1 > RP2 ≥ 0** RP1 RP2 t Energized De-Energized
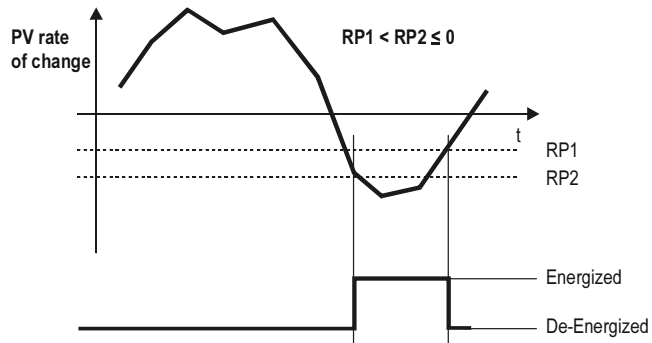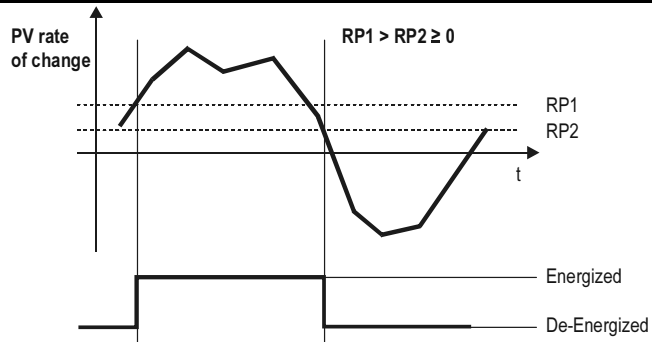	
	PV rate of change **RP1 < RP2 ≤ 0** t RP1 RP2 Energized De-Energized
		RP1
		RP2

Sequential

Default: „Invert = OFF"

More operation modes are possible to use depending on the values of the parameters.

There is only one relay in energized state. When all relays are in de-energized state, then new cycle is started and relays will be reversed.

In the followings, there is an example for the operation in case of two relays (max. 8 relays can be operating in a group)

Sequential
 	
1. **Different switching points for the relays for turning ON and OFF**
 	
   Rx-RP1 > Rx-RP2
 	
   Emptying with energized relay
		RP1
		RP2
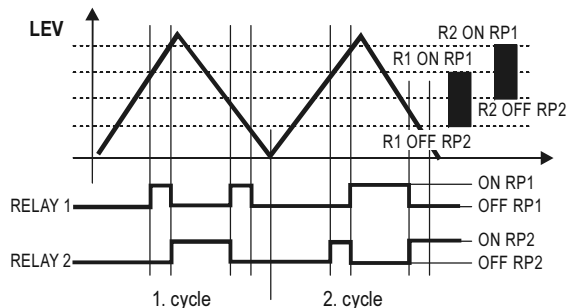
Sequential
 	
2. **Different switching points for turning ON and same switching points for turning OFF for the relays.**
 	
   Rx-RP1 > Rx-RP2
 	
   Emptying with energized relay
		RP1
		RP2
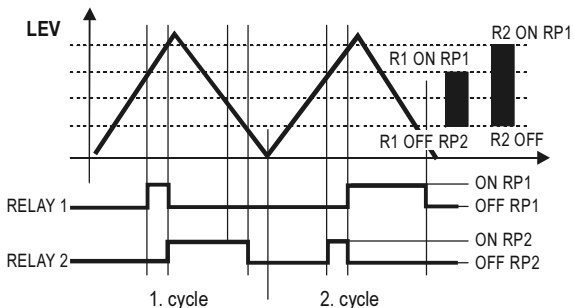
Sequential
 	
3. **Same switching points for the relays for turning ON and OFF**
 	
   Rx-RP1 > Rx-RP2
 	
   Emptying with energized relay
   In case of x (x=2..8) relays, relays are operating alternately
		RP1
		RP2

Sequential
 	
4. **Different switching points for the relays for turning ON and OFF**
   Rx-RP1 < RX-RP2
 	
   Filling with energized relay
		RP1
		RP2

Sequential 5. **Different switching points for turning ON and same switching points for turning OFF for the relays** **Rx-RP1 < RX-RP2** Filling with energized relay	LEV R1 OFF RP2 R2 OFF RP2 R1 ON RP1 R2 ON RP1 RELAY 1 — ON RP1 / OFF RP2 RELAY 2 — ON RP1 / OFF RP2 1. cycle 2. cycle	
Sequential 6. **Different switching points for turning ON and same switching points for turning OFF for the relays** **Rx-RP1 < RX-RP2** Filling with energized relay In case of x (x=2..8) relays, relays are operating alternately	LEV R1 OFF RP2 R2 OFF RP2 R1 ON RP1 R2 ON RP1 RELAY 1 — ON RP1 / OFF RP2 RELAY 2 — ON RP1 / OFF RP2 1. cycle 2. cycle	**RP1** **RP2**
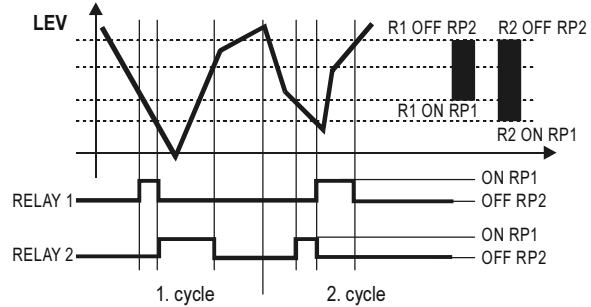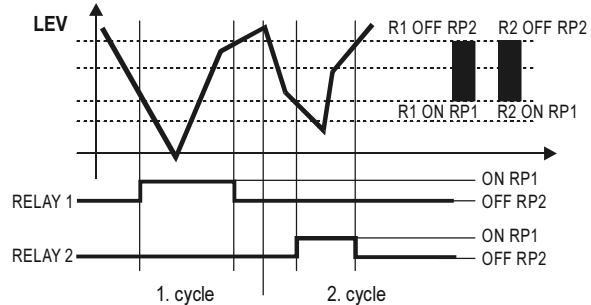
5.7.3.3 Configure parameters

```
Program          ▼ 20
    Source
    Function
    Parameter
    Invert
    Clear TOT
    Update TOT
    Test
```

```
Parameter          23
RP1 =  ▸ + 0003.45  ◂
RP2 =    12.45
RP3 =    0
```
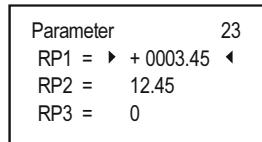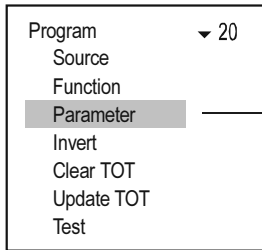
▸ ◂ Parameter to be edited

⟲⟳ Selection of digit position

⬆⬇ Modifying sign and number

(ESC) For RP1 steps back to "Programming" sub-menu,
        for RP2 and RP3 steps back to the previous parameter

(OK)   Accepts parameter change and steps to the next,
        pressing for RP3, values of RP1...RP3 are loaded to the
        memory and steps back to "Programming" sub-menu

5.7.3.4 Invert

The operation of the relay can be inverted by switching on the inverter.

Default: Off

Invert	26
☐ On	
▣ Off	
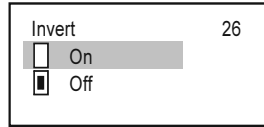
☐ Not selected
▣ Selected
Select using ⮐
Selected choice gets applied immediately

5.7.3.5 Deleting TOT

Quantity (**TOT1 and TOT2**) summation is done in the flow-measuring transmitters. In the MultiCONT it is possible to transmit the **TOT2** in preset units in the form of relay impulses. In order to do this, the relay has to be switched to **'Impulse F'** mode. In the **'RP3'** parameter (belonging to the relay), specify the volume that will trigger 1 impulse (the length of 1 impulse is about 200 ms). There is a **'PULSE'** and a **'TOTAL'** variable for each relay programmed to work in 'Impulse F' mode. The **'TOTAL'** variable of the relay goes after the **'TOT2'** variable of the transmitter. The volume difference between the 2 variables, given in **'RP3'** is put into the **'PULSE'** variable. The value in the **'PULSE'** variable is transmitted to the output of the relay. The **'TOTAL'** and **'PULSE'** relay variables get into the "non-volatile" memory even in the event of a power failure, as a result of the (automatic) **saving** done every 6 minutes. The relay impulses that occur in the time elapse between the last save and the return of power get counted again after the power supply is turned on. In order to avoid repeated counting, use a UPS.

Example: Let the TOT2 value of the transmitter be 1000 m^3. Let the TOTAL value of the relay also be 1000 m^3. Let the PULSE value of the relay be 0. At the same time, assume the RP3 parameter of the relay to be 10 m^3. In this case, no impulses appear at the relay output, because the TOT2 value of the transmitter is the same as the TOTAL value of the relay. Based on the measurement of the transmitter the TOT2 value changes from 1000 m^3 to 1050 m^3, the change being 50 m^3. Also, based on the RP3 parameter of the relay (10 m^3 unit volume), 5 is added to the value of the PULSE variable, with the change being 5*10=50 m^3. The relay then counts 5 impulses. After this, the value of the relay's PULSE becomes 0, while that of TOTAL becomes 1050 m^3

Once in this menu, pressing 'OK' will delete the values of the relay's **'TOTAL'** and **'PULSE'** variables. This results in the total volume in the transmitter's **'TOT2'** variable to be counted to the output of the relay based on the unit set in the **'RP3'**.

The delete operation is followed by the window below.

Clearing TOT
Press OK
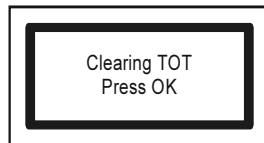
5.7.3.6 Refreshing TOT

Once in the menu, pressing 'OK' will copy the transmitter's 'TOT2' value into the relay's 'TOTAL' variable, and then delete the contents of the relay's 'PULSE'. The transmitter and the MultiCONT become synchronised.

The update operation is followed by the window below.

```
┌─────────────────────────┐
│ ┌─────────────────────┐ │
│ │                     │ │
│ │    Updating TOT     │ │
│ │     Press OK        │ │
│ │                     │ │
│ └─────────────────────┘ │
└─────────────────────────┘
```

5.7.3.7 Testing

Relay operation can be tested as seen below.

```
┌──────────────────────────┐
│ Test              24     │
│  ☐   On                  │
│  ▣   Off                 │
│  ☐   Toggle              │
└──────────────────────────┘
```
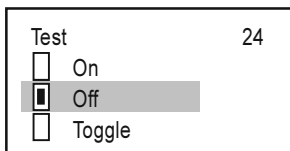
☐ Not selected
▣ Selected
Select using ⟳
Changing the selection will change
the state of relay immediately

In "toggle" mode, pressing ⟳ causes the state of the relay to switch.

Note:

1.

```
Parameter          23
RP1 =  ▸ 0001.25 ◂
RP2 =    12.45
RP3 =    0
```

To program the parameter select the relevant parameter in Main menu/Relays/Relay/Program/**Parameter** using the ⬆ ⬇ buttons, enter the value in between the pointers and press (OK). Programming can only be completed by pressing (OK) after setting RP3 (even if it is zero or not applicable in the given function!)

2. Inactive relays are de-energized (See: Main menu/**Relays**).
3. More than one device can be assigned to any of the relays (Main menu/Relays/Program/**Source**)
4. The result will be the mathematical combination of the sources.
   If the measurement mode or dimensions of devices are different MultiCONT will send error message (See 6. Errors, Error messages)
5. The result of the transmitters marked with ⊞ are added.
6. The result of the transmitters marked with ⊟ is subtracted from the sum of the result of the transmitters marked with ⊞
7. Computes the average of the results of the transmitters marked with ⏐

8. If the **Error** function is selected no (source) assignment is required since errors of all active devices will be monitored.

9. Relay state will not be changed (HOLD) if its assigned source does not reply!

10. The device will indicate program error if:
    - There are multiple sources with different dimensions
    - „Impulse F" function is selected, and there are multiple sources or RP3=0
    - „Alt S" or Sequential function is selected, and more than 8 relays are assigned to one device or the sources are different (e.g.: PV for 1 relay, and SV for another)
    - The sources are SV, TV, and QV but the COM3 command is not selected
    - ALARM, G function is selected and dimensions of the transmitters' measurement values are different

For a detailed overview of the Programming see Appendix 3.

5.8. OPERATION AND PARAMETERS OF CURRENT OUTPUTS

First of all a **device should be assigned to the current output** (Main menu / Current outputs / Program / **Source**).

- The result of the transmitters marked with ⊞ are added.
- The result of the transmitters marked with ⊟ is subtracted from the sum of the result of the transmitters marked with ⊞ . (**difference measurement**)
- Computes the average of the results of the transmitters marked with ⏐⏐

Secondly the relevant **function should be selected and configured** in (Main menu/ Current outputs /Program/**Function)**. Finally the parameters have to be programmed such that the values of the dimensions of CP1 and CP2 be determined by the transmitter(s). Thus if the measurement mode is LEVEL [m] (e.g. for SE-300 P01=x1 P00=00x), then the programming has to be in LEVEL [m] too (Main menu/ Current outputs /Program/**Parameter**).
For a detailed overview of the programming steps see **Appendix 4**.

5.8.1. Selection of Current outputs

It is impossible to enter the current output menu if the system does not contain a single current output. The number of relays in the system can be viewed under Main menu/MultiCONT config/ Report. (See chapter 5.4.12)
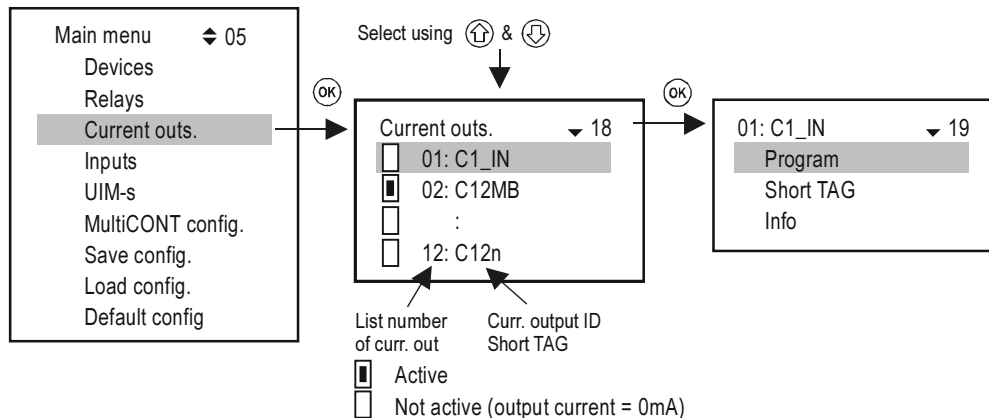
5.8.2. Properties of the selected Current Output

```
┌─────────────────────────┐          ┌─────────────────────────┐
│ 01: C1_IN          19   │          │ Short TAG          34   │
│    Program              │          │                         │
│    Short TAG  ──────────┼────────► │    ▸  C1_IN  ◂          │
│    Info  ────────────┐  │          │                         │
└──────────────────────┼──┘          └─────────────────────────┘
                       │
                       │             ┌─────────────────────────┐
                       │             │ Info               34   │
                       └──────────►  │   Input:        0.589  ──►  The value that the output current was calculated from
                                     │                              (if CP1...CP3 are known)
                                     │   Output:    12.45 mA  ──►  Actual value of the output current
                                     │   ID:      9729718161  ──►  ID of the current output
                                     │   Parent:  9728718160  ──►  For an internal curr.out., this is the MultiCONT's ID,
                                     │                              for an external one, this is the module's ID
                                     │   Location:    Internal ──► Location of the curr. out. (Internal=in MultiCONT,
                                     │                              external=in module)
                                     └─────────────────────────┘
```

5.8.3. Current Output programming

5.8.3.1 Source selection

One or more devices can be assigned to a single current output

```
┌──────────────────┐   ┌──────────────────┐   ┌──────────────────┐   ┌──────────────────┐
│ 01: C1_IN    19  │   │ Program      29  │   │ Source     ▾ 30  │   │ 01: SE300        │
│   Program  ──────┼──►│   Source  ───────┼──►│ ⊞ 1: SE300 ──────┼──►│  □ PV            │
│   Short TAG      │   │   Function       │   │ □ 2: SC380       │   │  ▣ SV            │
│   Info           │   │   Parameter      │   │ ⊟ 3: SP380       │   │  □ TV            │
│                  │   │   Test           │   │      :           │   │  □ QV            │
└──────────────────┘   └──────────────────┘   │ □ n: ST-300-1    │   └──────────────────┘
                                              └──────────────────┘
```

□ Not assigned   ⊟ Assigned with a "–" sign
⊞ Assigned with a "+" sign ▣ Assigned by averaging
                            Modify using ⊜
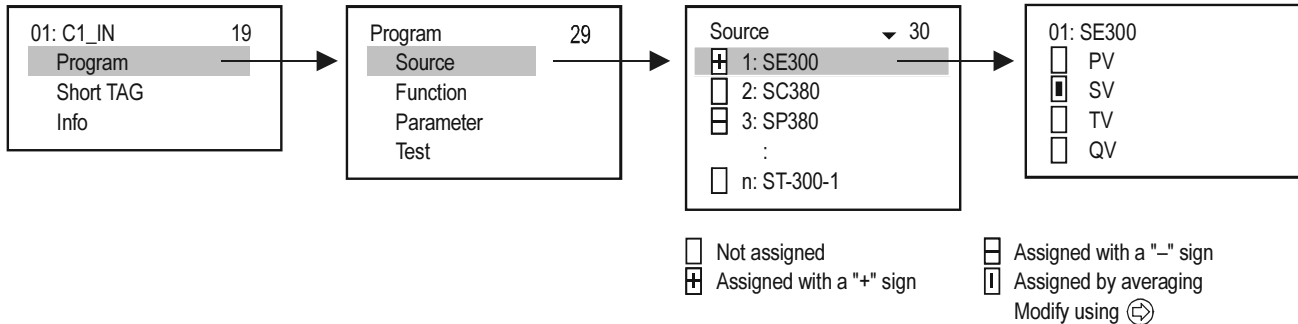
In the above example, current output C1_IN is controlled by the difference between the secondary values of SE300 and SP380. In the case of a single unit, the sign is indifferent; in fact, average might as well be selected. In the case of the selection of multiple devices, functioning depends on the result of the mathematical sum. If in the case of selected multiple devices the dimensions or the values are different, the unit will display an error message. Upon selecting the value, confirm that the appropriate HART command has been selected for the device (See Main menu/MultiCONT config/HART / command set, see chapter 5.4.5.5)

5.8.3.2 Function

```
Curr. out.: C1_IN    28        Program           29        Function              31
   Program                        Source                    □   Variable
   Short TAG                      Function                   ▣   Error 3.6 mA
   Info                           Parameter                  □   Error 22 mA
                                  Test                       □   Variable H = 3.6mA
                                                             □   Variable H = 22mA
```

□ Not selected
▣ Selected
Select using ⟳
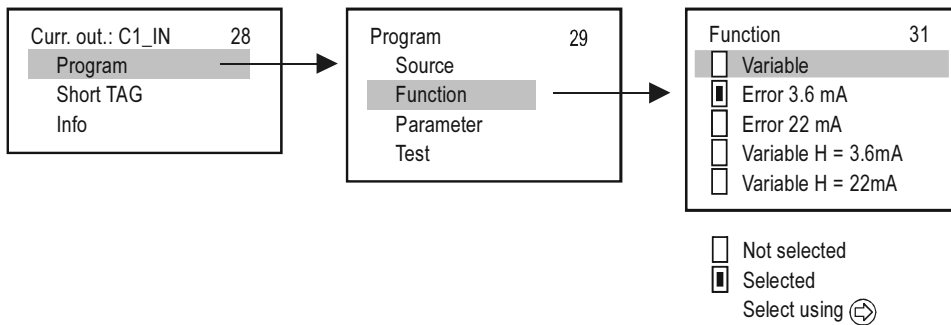
FUNCTION	DESCRIPTION OF OPERATION	PROG.PAR.
Variable	Operates in accordance to the selected (PV, SV, TV, QV) value in the "Source" menu point. The value in CP1 parameter is assigned to 4mA, the value in CP2 parameter is assigned to 20mA.	CP1 CP2
Error 3.6mA Error 22mA	CP3=0 in every cases it is the error current CP3=n in case of "n" coded error it is the error current Error codes (see chapter 6) If there is no error, value of the current output is 4mA	CP3
Variable H = 3.6mA Variable H = 22mA	The previous two functions in one: Until there is no error, it works according to the selected (PV, SV, TV, QV) value in the "Source" menu point. The value in CP1 parameter is assigned to 4mA, the value in CP2 parameter is assigned to 20mA. In case of any error, selected error current will be applied.	CP1 CP2 CP3

Note:

1. The device will display an error if the selected mode is "Variable" and CP1=CP2
2. Value of the output current will not change (HOLD), if the assigned device does not respond or responds with an "Err xx" error!
3. If the current output is not active the output will be 0 mA.
4. If the **Error** function is selected, then no **Source** assignment is required since errors of all active devices will be monitored.
5. The modified parameters can only be saved when the cursor is on CP3 by pressing (OK).

5.8.3.3 Parameter configuration
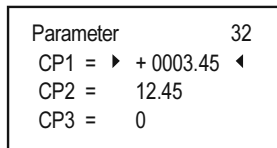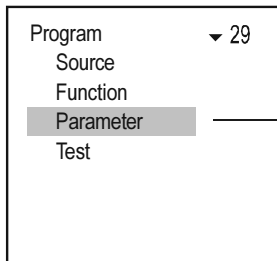
```
Program          ▼ 29
    Source
    Function
    Parameter
    Test
```

```
Parameter          32
CP1 = ▶ + 0003.45 ◀
CP2 =     12.45
CP3 =     0
```

▶ ◀ Parameter to be edited
⟲⟳ Selection of digit position
⟰⟱ Sign and number modification
(ESC) from CP1: steps back to "Programming" sub-menu,
    from CP2: and CP3 steps back to the previous parameter
(OK) Accepts parameter change and steps to the next row.
    Pressing when CP3 is highlighted, loads the values of CP1...CP3 into
    the memory and steps back to "Programming" sub-menu

5.8.3.4 Testing

The current output can be tested in steps of 1µA. Upon changing the numbers, the output changes immediately, and it is not necessary to press OK.

```
Test              33

    ▶  12.125  ◀
```
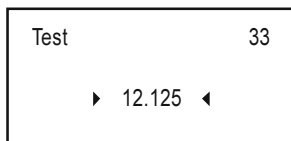
⟲⟳ Selecting the digit position
⟰⟱ Sign and number modification

5.9. THE BOOT PROCESS

At every powering on, a test program runs testing the MultiCONT hardware. The whole process can be followed on the display in English. The procedure takes about 40s.

```
                        ┌──────────────────────┐
                        ↓                      ↓
        ┌──────────────────────┐   ┌──────────────────────┐
        │  LOGGER NOT PRESENT  │   │   LOGGER PRESENT      │
        └──────────────────────┘   └──────────────────────┘
                        ↓                      │
                        ↓←─────────────────────┘
```

Hardware check is successful.
MultiCONT is in measurement mode
and queries the active transmitter

```
┌─────────────────────────┐
│ 1: SE300        1     M  │
│                         │        Still no valid data
│        - - -            │
│                         │
│ 2010.01.21 A     09.32  │
└─────────────────────────┘
```
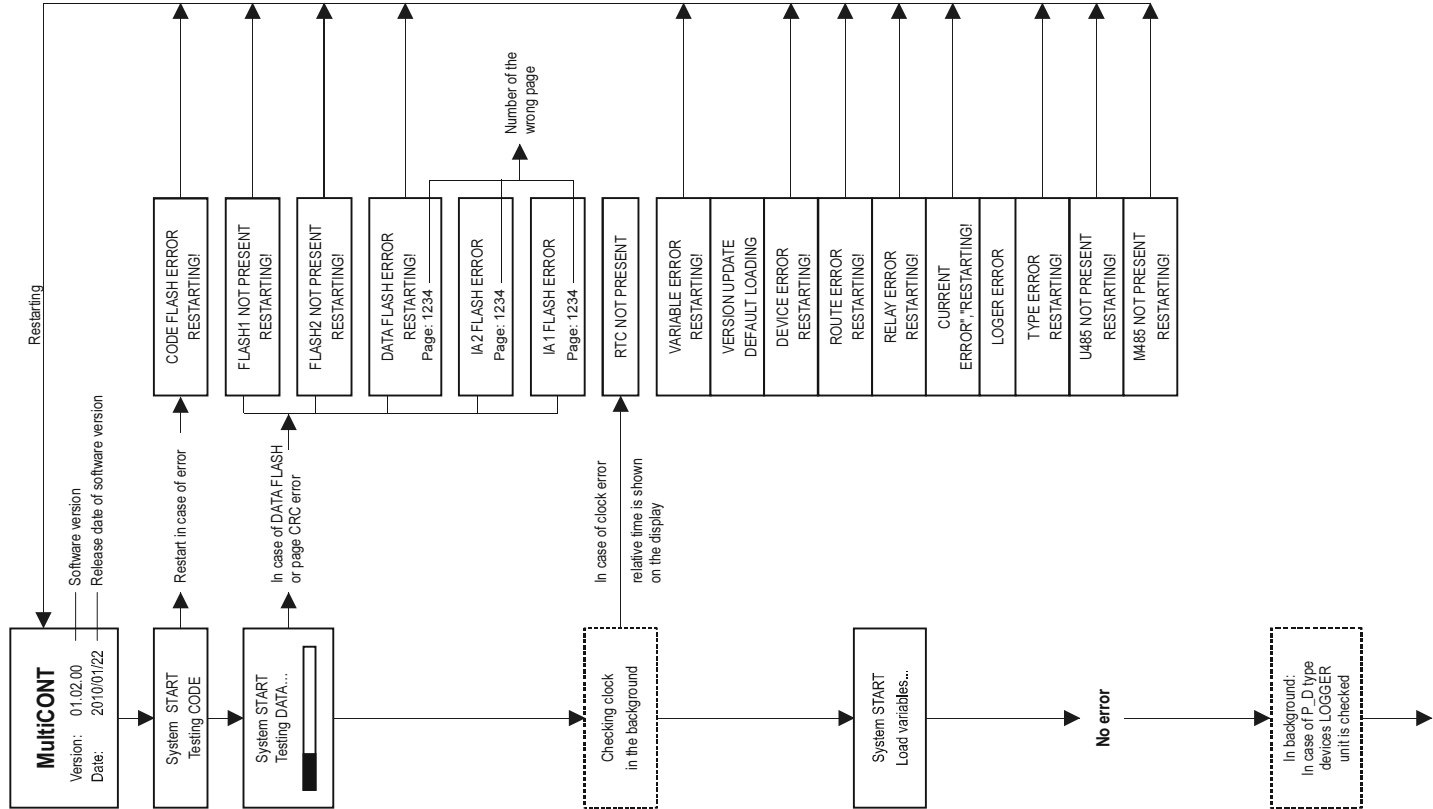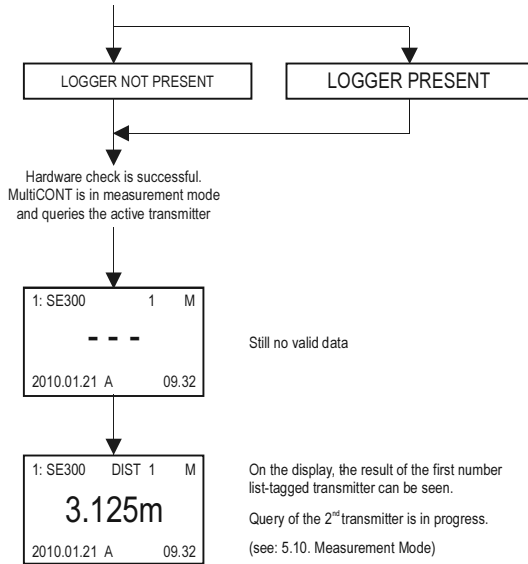
```
┌─────────────────────────┐
│ 1: SE300   DIST  1    M  │        On the display, the result of the first number
│                         │        list-tagged transmitter can be seen.
│      3.125m             │
│                         │        Query of the 2$^{nd}$ transmitter is in progress.
│ 2010.01.21 A     09.32  │
└─────────────────────────┘        (see: 5.10. Measurement Mode)
```

5.10. MEASUREMENT MODES

After the boot test the MultiCONT will automatically enter the **Measurement Mode / standard display image**. Measurement values will be queried and displayed in accordance with the contents of the device list read from the memory and the settings in **Main menu / MultiCONT config. / Main display / Step.** Maximum 5 data per device can be displayed simultaneously on the display (1 main display – see 5.4.3 - and 4 on the list display – see 5.4.4) together with dimensions and abbreviations (DIST, LEV, VOL, FLOW, PV, SV, TV, QV, TOT1, TOT2, E). In the upper row the device identifier (Short TAG), List Tag (1,…9,A.,...F) can be seen and the device communicating actually with the MultiCONT.

When the device communicates via RS485, the "*" flashes. There are two bargraphs on the display. One is the "sensor range" (only for NIVELCO transmitters), this indicates the transmitter's measurement range (the tank level between the maximum and minimum measuring distance). The other is the "output range" that indicates the 4-20mA range of the transmitter.
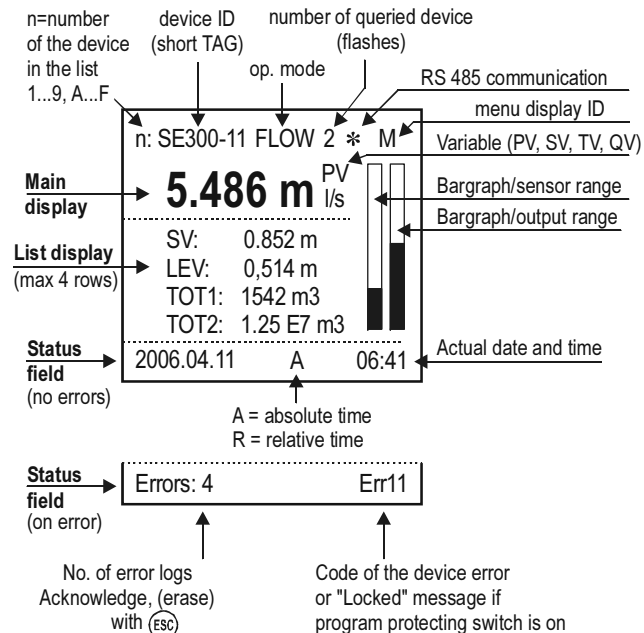
In this mode, it is possible to view the **"Bargraph display",** the **"User display"** (**Range**, **Double**, **Difference**, **Average** see **Main menu / MultiCONT config / User display** - chapter 5.4) selected by the user, the relay-device and current output-device assignments, and also the error list, using (◁) and (▷) for selection. **See Appendix 5**

After the termination of a possible error, the display keeps on displaying the error until the error is acknowledged by pressing the **ESC** button. The query of the devices, the control of the relays and the current outputs and the servicing of the RS485 all happen continuously during programming. The MultiCONT automatically returns to measurement mode 5 minutes after the last button was pressed. It also records and saves the number of switchings and worktime of the relays every 6 minutes. The 6 minutes commence after the automatic exit.

5.11. SAVING, LOADING THE CONFIGURATION OF THE MultiCONT

Settings of the MultiCONT are stored in a non-volatile FLASH memory (**FMA**). The content of this FLASH memory is replaced into the operative memory (**OM**) (which is a volatile memory) when MultiCONT is turned ON or restarted. Settings are saved automatically when exiting from the Menu.

In addition to this, working hours and the switching number of the relays are saved in every 6 minutes into the FLASH memory. In the "Main menu"/"Save config." menu point a safety copy (**FMS**) can be made from the automatically saved settings.

Load of the safety copy can be performed in the "Main menu"/"Load config." menu point. When turning ON or restarting, memory content is replaced into the operative memory from the FLASH memory, if it is faultless (calculated and stored CRC are the same). If there is a safety copy from the settings, the content of this (**FMS**) is copied to the operative memory (**OM**) and the automatic saving storage (**FMA**) FLASH memory, when ESC and ← buttons are pressed simultaneously.

FLASH
Non-volatile memory

FMA
Automatic save

FMS
Safety copy from the settings

Load: turning ON / restart, if there is no error

Automatic save, when exiting from the menu

When turning ON / restart pressing ESC and ← simultaneously

Save settings from menu

Load settings from menu

RAM (OM)
Operative memory

Memory content is erased when turning OFF
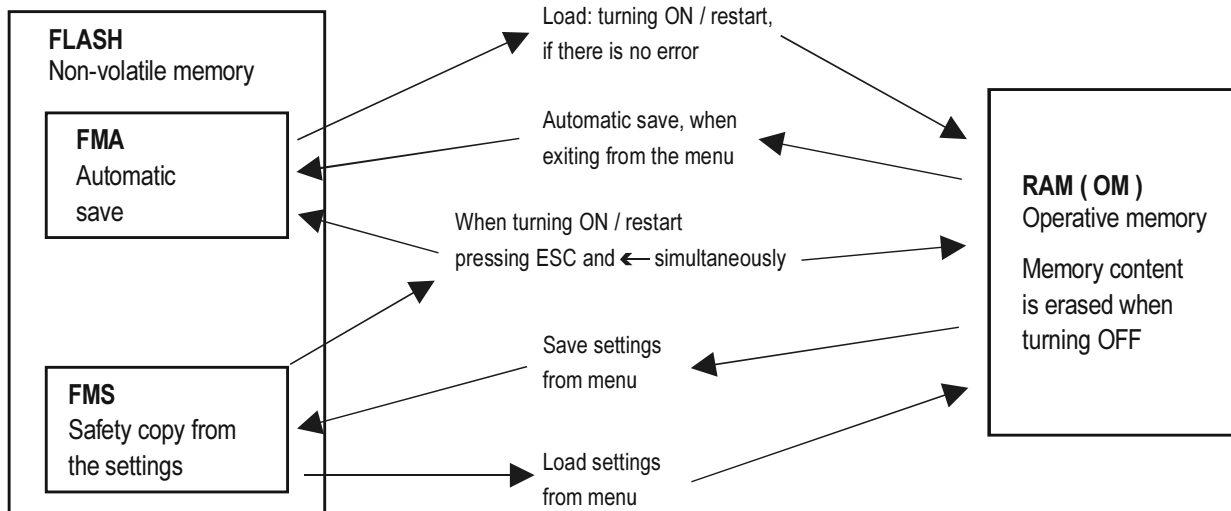
6. ERROR CODES

In the event of an error, the message "errors" (see Measurement mode, appendix 5) immediately appears regardless of which device the error is connected to.

Errors occurring during operation will be collected in the E (Error) table where the error identifier message can be viewed.

```
Errors                      E
  01: SE300-11 : Response
  02: ST300-11 : Program
  03: SP300-11 : Device
```

"Sensor" and **"Reply"** error message will automatically be erased from the list upon termination of the error.

Other errors entries will remain in the table until acknowledgement by pressing ESC. Thus for instance if a relay or current output set for function "Error", it will indicate the error even after termination of the error until the error is acknowledged as above.

ERROR CODE	MESSAGE	ERROR DESCRIPTION	CORRECTION
1	Init	Device does not reply after switching-on*	Check wiring of device
2	Reply	Device with normal operation does not respond **	Check wiring of device
3	Sensor	Sensor failure on the device ***	Check device (transmitter)
4	Device	Other device Error (See chart next page)	Check programming of device (See relevant Install and Prog. Manual), and measurement conditions
5	Program	Error occurred during programming of relay or current output ****	Check programming
6	Save	Error occurred in the course of saving to memory	If this happens repeatedly, send device to the manufacturer.
7	Log	Logging does not answer or a failure may happened during the saving process	Please check the memory card, if necessary try with another SD card.

* An active device on the list does not reply after switching-on. Possible reasons:
- the system was modified before turning on (device was disconnected, the wiring was changed, etc.)
- device failed to reach operation conditions during the boot process (and is not yet able to measure) thus this error message appears (e.g. in solid applications, STD-300 transmitters may not respond until the amplification reaches operation conditions).

** A device that had been working perfectly suddenly stops responding. Possible reasons:
- the device has gone wrong
- broken cable
- noisy HART line (See Main menu/MultiCONT config/HART test)

*** A special error message belongs to sensor failures. This error can appear in the case of ultrasonic transmitters due to the breakdown of the transducer or during a dusty filling process, when if there is a display, a **NoEcho** message is displayed. In case of magnetostrictive transmitters, this error can be due to the cracking of the magnet disc, or a break in the magnetostrictive wire.

```
1: SE300-12   DIST    M
       SENSERR
2 Errors: 1     Err00
```
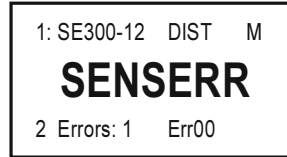
Device responds but there is no valid result because of sensor error.

**** Programming error will be caused if:

- assignment of more than one source with different dimensions to a relay or current output
- an appropriate value (PV, SV, etc) is assigned to a current output and CP1=CP2 (see 5.8 Operation and parameters of current outputs)
- assignment of flow value (Impulse F) to a relay and there is more than one source (see 5.7 Relay configuration)
- assignment of flow value (Impulse F) to a relay and RP3=0 (see 5.7 Relay configuration)
- more than 8 relays with „Alt S" or Sequential function are assigned to a transmitter
- different variables are selected in the case of a relay with „Alt R" function
- the source is SV, TV or QV, but the COM3 HART command is not selected
- ALARM, G function is selected, but the dimensions of the measured values are not the same

7. HARDWARE PROTECTION OF THE SETTINGS
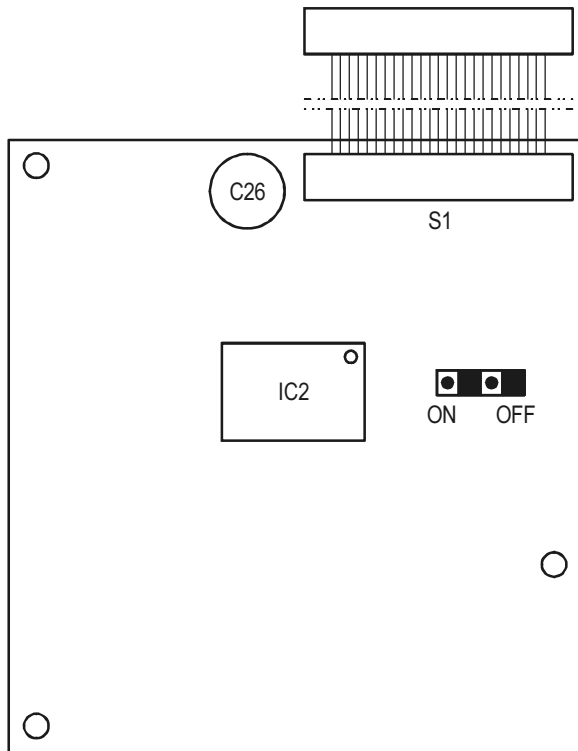
For access, loosen the nuts fastening the front panel.

The program protection switch in **ON** position will prevent modification of parameters affecting operation such as:

- relay parameters
- current output parameters
- activation of devices
- remote programming
- denying access to the **Service** menu
- denying permission to run **DEV detect**, **EXT detect** under MultiCONT config

The switch does not prevent modifications that do not influence the operation of the MultiCONT (such as language, backlight, user image, sorting, restart, etc)

8. FUSE REPLACEMENT
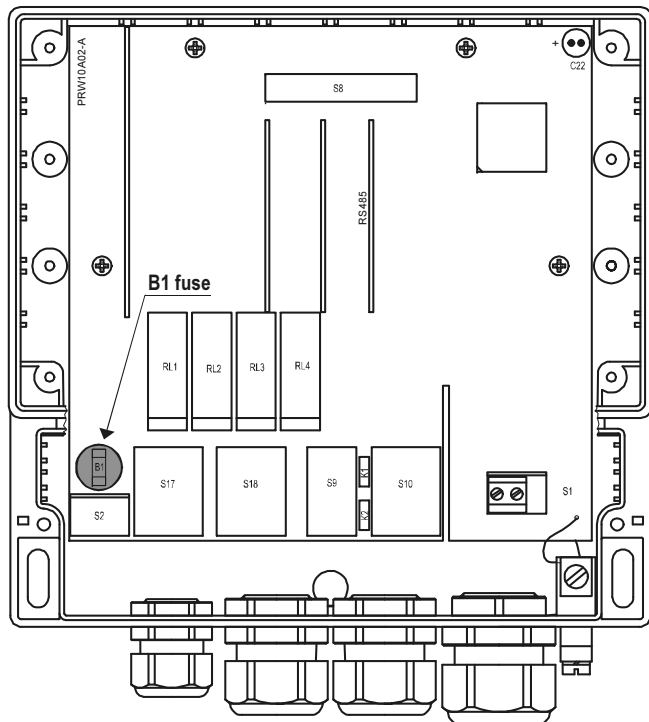
In order to change the fuse loosen four nuts fastening the front panel, carefully tilt the front panel forward, such that the cable band is not under tension and replace the fuse.

Warning! Only use fuses specified in the table below:

POWER SUPPLY	FUSE B1
85…255 V AC 50…60Hz	T400mA
11.4…28 V AC 50…60Hz 11.4…40 V DC	T1A

The device contains 1 network fuse. Its value depends on the power supply.

9. SERVICING

9.1. BOX MESSAGES:

No.	Box Message	Explanation
1	No CODE!	Secret code is not set
2	In manual prg!	The transmitter is under manual programming
4	Already unlocked!	No code in the transmitter (i.e. 00000000)
5	Unlock, please!	Secret code needed for modification (see."Main menu/"MultiCONT config."/"password")
6	HART error!	Communication error
7	TOT1 cleared!	Value of TOT1 deleted
8	TOT2 cleared!	Value of TOT2 deleted
9	HART no reply	During programming the device does not respond, or bad data
10*	HART comm. error	Error in HART message (parity, framing, overflow, …)
11*	HART logical error	Other logical error in HART message
12*	HART write protect	The parameter cannot be written
13	Unknown dev/comm	The address (Long address) in the HART message is not found in the list
14	Parameter saved	Successful save of the parameter
15	Save error	Error in writing to FLASH memory
16	Device added	The selected device in the „Device detect" menu has been included into the list.
18	Unknown param.	Unknown parameter during device detection
19	Default loaded	Loading of Factory default (depending on type) was successful.
20	PSW cleared	Secret code is deleted
23	FLASH error	FLASH error at boot
24	Same address!	Multiple same Long address found during DEV detect
25	No HART device	In the „Device detect" menu, searched for devices with „Short addr." between 0..15 but did not find any
26	Load error	Error when reading from FLASH memory
28	No comp. Device	Device is not NIVELCO compatible
30	HART:Parse error	The received data are not applicable
31	HART:Invalid sel.	The received HART command is unknown to the MultiCONT

No.	Box Message	Explanation
32	HART:Too large	The received HART command is longer than standard
33	HART:Too small	The received HART command is shorter than standard
34	HART:Few data	
35	HART:Device spec.	Bad parameter sent during remote programming
36	HART:Access restr.	
37	HART:Busy	
38	HART:Comm. not. imp.	The received HART command is unknown to the MultiCONT
39	Please wait!	DEV detect cannot run due to periodic disturbance on the HART line, which causes continuous error!
40	TOT cleared	TOT deleted during relay programming (Impulse F)
41	TOT updated	TOT updated during relay programming (Impulse F)
42	No in RP mode	Device could not enter „Remote programming" (RP) mode during programming
43	Stick in RP mode	Unsuccessful exit after remote programming of device

9.2. OTHER MESSAGES:

No.	Message	Explanation
1	Scanning HART line	Displayed during device detection
2	Logical error	- Displayed instead of user's image, if **difference** or **average** is selected, but there is only one active device - Displayed if the dimensions of the results of the selected devices are different
3	No user screen	In „Main menu"/"MultiCONT config."/"User display" „None" is selected
4	No active device	Displayed during measurement or instead of user's image, when there is no active device
5	No HART device	The unit's device list is empty (run „DEV detect"
6	Locked	The hardware switch is on (the program cannot be modified)
7	No current output	Displayed in the position of the „current output assignment" image, if there is no current output in the system
8	No relay output	Displayed in the position of the „Relay assignment" image, if there is no relay in the system

9.3. TROUBLESHOOTING

9.3.1. It is impossible to enter the „Main menu"/"Relays" or „Main menu"/„Current outputs" menu:

There is no relay or current output in the unit. Check the number of relays and/or current outputs in „Main menu"/"MultiCONT config."/"report" menu.

9.3.2. It is impossible to enter the „Main menu"/"Devices" menu:

The device list is empty. (there are neither inactive, nor active devices in the system, in measurement mode a „No HART Device" message appears on the display.)

9.3.3. A „Please wait" message appears upon selecting „DEV detect"

The HART line is so noisy, that there is no communication, and every command is bad. The only way to exit this state is by switching the unit off and on again. Check the shielding of the cable and the cable route.

9.3.4. The result of „DEV detect" is the „No device" message

The MultiCONT did not detect any device that responded.

DEVICES
L+ L- SH

● ● ●

- Check for short-circuits or open-circuits.
  There is a short-circuit if there is voltage between L+ and SH, but between L+ and L- the voltage is 0V.
- The line is open-circuited (cut) if there is no voltage between L- and SH, because there is no voltage drop on the sensing resistor (R_{fi}=255Ω) connected between these 2 points, whereas the loop current should never be 0mA.
- Check the terminal voltage at the devices (transmitters). If the terminal voltage is small, it might be due to bad wiring (big intermediate resistance) or big loop current, resulting on a big voltage drop on the sensing resistor. Connect the devices in to the loop one by one, checking the „Short address" and the constant current parameter (see: chapter on preparation of transmitters)
- Confirm that the device is HART capable (Type, nameplate)
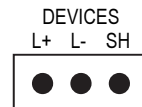
9.3.5. The unit does not start up when switched on

It restarts repeatedly (see: chapter 5.9.)

- This can be due to faulty FLASH (the non-volatile memory in the unit)
- Or a bad RS485 card (types P__-1_A and P__-1_B), because this is tested at boot, and does not continue in case of an error. Request help from our Export Sales department.

9.3.6. The „Response" error entry is too frequent

The line is noisy, check the grounding of the cable shielding. If the cable is not shielded, replace it with a shielded cable.

9.4. ADDITIONAL INFORMATION

9.4.1. Problems that may occur during remote programming:

In the case of integer type parameters, MultiCONT displays all the four digits even if the case of a given transmitter only one digit is meaningful. For example:

PRW:

P12 Error state	14
▸ 0002 ◂	

SE-300:

P12:	2

SE-300 only tests the value of digit „a" value(see Manual), and does not display an error if 1002 is written. It even stores this value. It does not indicate any operational error, but upon reading this parameter from SE-300 1002 is received which does not have any meaning according to the manual!!!!

9.4.2. MultiCONT transmits the parameters without examining them, and the testing is done by the device.

In the event of an error, if the device does not accept it, then a "HART logical error" box message appears on the display.

9.4.3. Use of Second HART Master (Hand-Held or HART modem + Eview2 configuration software)

Normally, there can only be one master in HART systems. Since the MultiCONT is a master, other masters can only be used if if the status of every device is set to inactive, i.e. the MultiCONT is in listen mode. (see „Main menu"/"Devices") After this, the other master can be connected to the L- and SH terminals (with a 255 Ω sensing resistor inside)

9.4.4. Upon exiting remote programming, the unit tests to see if the transmitter really exited the remote programming mode

(During remote programming „RP" appears on the display of the transmitter). If this is not successful, then the „Stuck in RP mode" box message keeps us informed. In this case, it is not possible to manually enter programming mode!!

9.4.5. When a transmitter does not respond, then „Response" error is entered into the table, but upon termination of the error (the device responds), this entry is automatically cleared from the table (and does not need to be acknowledged)

This is also true for „Sensor" error (noEcho, etc). The states of the relays and current outputs are not refreshed during this process!!!

9.4.6. Upon exiting the menu, MultiCONT immediately saves the modifications

However, there are events that need to be saved, and this happens every 6 minutes. These include:

- Work time and number of state changes of relays
- The number of times the MultiCONT was turned on (see: „Main menu"/"MultiCONT config."/"Report"/"Power count")
- The relevant internal variables, if the function of any relay is „Impulse F", i.e. RP3 sends a unit pulse to the output, (TOTAL and PULSE, see: „Main menu"/"Relays"/"Programming"/"deleting TOT")

9.4.7. The error list is cleared when the device is put off

APPENDIX 1. MANUFACTURER IDENTIFICATION CODES OF HART-CAPABLE DEVICES:

1	"Acromag",	38	"Rosemount",	75	"Termiflex Corporation",	112	"US ELECTRIC MOTORS",	139	"Thermo Electric Co.",

1 "Acromag",
2 "Allen Bradley",
3 "Ametek",
4 "Analog Devices",
5 "Elsag Bailey",
6 "Beckman",
7 "Bell Microsensor",
8 "Bourns",
9 "Bristol Babcock",
10 "Brooks Instrument",
11 "Chessel",
12 "Combustion Engineering",
13 "Daniel Industries",
14 "Delta",
15 "Dieterich Standard",
16 "Dohrmann",
17 "Endress & Hauser",
18 "Elsag Bailey",
19 "Fisher Controls",
20 "Foxboro",
21 "Fuji",
22 "ABB Automation",
23 "Honeywell",
24 "ITT Barton",
25 "Kay Ray/Sensall",
26 "ABB Automation",
27 "Leeds & Northrup",
28 "Leslie",
29 "M-System Co.",
30 "Measurex",
31 "Micro Motion",
32 "Moore Industries",
33 "Moore Products",
34 "Ohkura Electric",
35 "Paine",
36 "Rochester Instrument Systems",
37 "Ronan",

38 "Rosemount",
39 "Peek Measurement",
40 "Schlumberger",
41 "Sensall",
42 "Siemens",
43 "Weed",
44 "Toshiba",
45 "Transmation",
46 "Rosemount Analytic",
47 "Metso Automation",
48 "Flowserve",
49 "Varec",
50 "Viatran",
51 "Delta/Weed",
52 "Westinghouse",
53 "Xomox",
54 "Yamatake",
55 "Yokogawa",
56 "Nuovo Pignone"
57 "Promac",
58 "Exac Corporation",
59 "Meggitt Mobrey",
60 "Arcom Control System",
61 "Princo",
62 "Smar",
63 "Foxboro Eckardt",
64 "Measurement Technology",
65 "Applied System Technologies",
66 "Samson",
67 "Sparling Instrumnets",
68 "Fireye",
69 "Krohne",
70 "Betz",
71 "Druck",
72 "SOR",
73 "Elcon Instruments",
74 "EMCO",

75 "Termiflex Corporation",
76 "VAF Instruments",
77 "Westlock Controls",
78 "Dexelbrook",
79 "Saab Tank Control",
80 "K-TEK",
81 "Flowdata",
82 "Draeger",
83 "Raytek",
84 "Siemens Milltronics PI",
85 "BTG",
86 "Magnetrol",
87 "Metso Automation",
88 "Milltronics",
89 "HELIOS",
90 "Anderson Instrument Company",
91 "INOR",
92 "ROBERTSHAW",
93 "PEPPERL+FUCHS",
94 "ACCUTECH",
95 "Flow Measurement",
96 "KAMSTRUP",
97 "Knick",
98 "VEGA",
99 "MTS Systems Corp.",
100 "Oval",
101 "Masoneilan-Dresser",
102 "BESTA",
103 "Ohmart",
104 "Harold Beck and Sons",
105 "Rittmeyer Instrumentation",
106 "Rossel Messtechnik",
107 "WIKA",
108 "Bopp & Reuther Heinrichs",
109 "PR Electronics",
110 "Jordan Controls",
111 "Valcom s.r.l.",

112 "US ELECTRIC MOTORS",
113 "Apparatebau Hundsbach",
114 "Dynisco",
115 "Spriano",
116 "Direct Measurement",
117 "Klay Instruments",
118 "Action Instruments",
119 "MMG Automatiky DTR",
120 "Buerkert Fluid Control Systems",
121 "AALIANT Process Mgt",
122 "POUNDS INSTRUMENT",
123 "ZAP S.A. Ostrow Wielkopolski",
124 "GLI",
125 "Fisher-Rosemount Performance Technologies",
126 "Paper Machine Components",
127 "LABOM",
128 "Danfoss",
129 "Turbo",
130 "TOKYO KEISO",
131 "SMC",
132 "Status Instruments",
133 "Huakong",
134 "Duon Systems",
135 "Vortek Instruments, LLC",
136 "AG Crosby",
137 "Action Instruments",
138 "Keystone Controls",

139 "Thermo Electric Co.",
140 "ISE-Magtech",
141 "Rueger",
142 "Mettler Toledo",
143 "Det-Tronics",
144 "TN Technologies",
145 "DeZURIK",
146 "Phase Dynamics",
147 "WELLTECH SHANGHAI",
148 "ENRAF",
149 "4tech ASA",
150 "Brand Instruments",
151 "NIVELCO",
152 "Camille Bauer",
153 "Metran",
154 "Milton Roy Co.",
155 "PMV",
156 "Turck",
157 "Panametrics",
158 "Stahl",
159 "Analytical Technology Inc.",
160 "Fieldbus International",
161 "BERTHOLD",
162 "InterCorr",
163 "China BRICONTE Co Ltd",
164 "Electron Machine",
165 "Sierra Instruments",
166 "Fluid Components Intl",

Main display

1: SE300 LEV 2 **M**
1.234 m
SV= 12.45m
LEV= 25.12m
2006.04.04 A 10:44

n: SE300 FLOW **M**
1.234 l/s
TOT1=124567
TOT2=985762
Hibák: 3

Bargraph display

1 2 3 4 5 **B**

User display

1:SE-300 LEV ☐ U
1.234m
2:SPA-300 LEV
12.45m

Relay assignment

1234567 R
R01
R02
R03

4-20mA assignment

1234567 C
C01
C02

Error report

Error report E
01: SE300 : Reply
02: SP300 : Program

Measuring mode

Enter Menu: (OK) button
Exit Menu: (ESC) button

Returns to measuring mode if no key is pressed within 5s

Depending on the selected unit!

Remote programming of the parameters of the device

♀ shows that programming of the device is locked by a password

1: SE300 ▼ 07
Remote program
Short TAG
Polling address
Message
Descriptor
Date
Final ass. number
Factory ID
Device type ID
SW version
HW version
Device ID
Major version
Device version

Remote program ▼ 08
Secret unlock
Secret mod.
App. parameters
Parameters
Linear. table
Echo
Clear TOT1
Default
Service

Parameter ▼ 11
P01 Meas. mode
P02 Unit
P03 Round
⋮
P19 Polling addr.
P20 Damping
⋮

Main menu ♀ ▼ 01
Devices
Relays
Current outs
Inputs
UIM-s
MultiCONT conf.
Save config.
Load config.
Default config
Restart
QuickSet

Devices ▼ 06
☐ 1: SE300
☐ 2: ST300
⋮
☐ 15: SC300

Relays ▼ 18
☐ 01: R_IN_1
☐ 02: Rxxx
⋮
☐ nn: Rxxx

01:R_IN_3 ▼ 19
Program
Short TAG
Info

Program ▼ 20
Source
Function
Parameter
Invert
Clear TOT
Update TOT
Test

Source 21
☐ 1: SE380
☐ 2: ST360
☐ n: ST330

1: SE380 57
☐ PV
☐ SV
☐ TV
☐ QV

Function ▼ 22
Hyst.
Alarm
Alarm, K
Alarm, CS
Window
Window, D
Error
Impulse, F
TOT1
Alt..S
Sequential
PV rate of change

Short TAG 25
▸ R_IN_3 ◂

Info 74
Cycle: 1785
Working: 586
Input: 0.39
Output: ON
ID: 9729718161
ID: 9728718160
Location: Belső

Parameter 23
RP1 = ▸ 0001.25 ◂
RP2 = 12.45
RP3 = 0

Current outs 27
☐ 01: C_IN_1
☐ 02: Cyy
⋮
☐ nn: Cyy

01:C_IN_1 28
Program
Short TAG
Info

Program ▼ 29
Source
Function
Parameter
Test

Source 30
☐ 1: SE380
☐ 2: ST360
☐ n: ST330

1: SE380 58
☐ PV
☐ SV
☐ TV
☐ QV

Short TAG 34
▸ C_IN_1 ◂

Function 31
Variable
Error 3.6 mA
Error 22 mA
Variable H=3.6mA
Variable H=22mA

UIM-s 75
01: EXT_I/O
02: EXT_I/O

Info 64
Input: 1.42
Output: 12.458mA
ID: 9729718161
Parent: 9728718160
Location: Internal

Parameter 32
CP1 = ▸ 0001.25 ◂
CP2 = 12.45
CP3 = 0

01:EXT_I/O 76
List
Short TAG
Info

List 79
01: REL_O_S1 (01)
02: REL_O_S2 (02)

Buttons:
Step between menus: (ESC) (OK)
Step inside menus: ⬇ ⬆
Activate: ⇨

Legend:
☐ Not active
☐ Active, during assignment, relay is energised
☐ Source assigned with positive sign
☐ Source assigned with negative sign
☐ Source assigned to be averaged

Detected DEV 37
1: SE300 (01)
2: SP360 (- -)
-----> SAVE <-----
3: SCA380 (08)
4: STD330 (12)

2: SP360 38

▶ SP360 ◀

1: SE380 42
■ PV
☐ SV
☐ TV
☐ QV
☐ Current
☐ Percent
☐ Level
☐ Level %
☐ TOT1
☐ TOT2

Detected EXT 39
1: REL_O_S1 (01)
2: CUR_O_S2 (- -)
-----> SAVE <-----
3: REL_O_S1 (08)

1: REL_O_S1 40

▶ REL_O_S1 ◀

Source 56
1: SE380
2: ST360
3: ST330

Sorting 41
Devices
Relays
Current outs
Inputs
UIM-s

Main display 55
Source
Round
Step

Round 70
1: SE380
2: ST360
3: ST330

1: SE380 ▼ 59
☐ No
☐ x.xxx
☐ x.xx
☐ x.x

MultiCONT conf. 35
DEV detect
EXT detect
Sorting
Main display
List display
User display
Trend display
HART
USER RS485
LOG
Password
Language
Backlight
Display contrast
Clock
Report
Prog CS

Step ▼ 48
■ Manual
☐ Auto step 5s
☐ Auto step 10s
☐ Poledt

1: SE380 62
■ PV
☐ SV
☐ TV
☐ QV
☐ Current
☐ Percent
■ Level
■ Level %
☐ TOT1
☐ TOT2
☐ Status
☐ PV rate of change
☐ Working
☐ Head of flow
☐ Relays

List display 60
Source

Source 61
1: SE380
2: ST360
3: ST330

USER RS485 80
Protocol
Parity
STOP bit

User display 63
Type

Password 44
Unlock
Modify
Scope

Type 51
■ Multiple
☐ Difference
☐ Average

Multiple 52
☐ 1:SE380
■ 2:ST360
■ 3:ST330
☐ 4:SE380

1: SE380 57
■ PV
☐ SV
☐ TV
☐ QV

Language 43
☐ English
☐ German
☐ French
■ Hungarian
☐ Czech

Difference 52
⊞ 1:SE380
☐ 2:ST360
☐ 3:ST330
⊟ 4:SE380

1: SE380 57
■ PV
☐ SV
☐ TV
☐ QV

Backlight 36
■ High
☐ Low
☐ Auto

HART 68
ShortTAG
Polling address
Message
Descriptor
Date
Command set

Short TAG 54
P-200

Average 52
■ 1:SE380
☐ 2:ST360
☐ 3:ST330
■ 4:SE380

1: SE380 57
■ PV
☐ SV
☐ TV
☐ QV

Clock 72
Date
Time

Command set 66
1: SE380
2: ST360
3: ST330

Report 53
Devices: 002/015
Exts: 000/032
Relays: 004/064
Currents: 002/016
Inputs: 000/000
U485: YES
M485: NO
Bindings: 012/100
Type: PRC2M9
SW type: 01
SW version: 01.00
Serial No.: 123456
Date: 2005/01/13
Working: 6/8/29
Power cnt.: 125
Temp. min: 13°C
Temperature: 25°C
Temp. max: 38°C

USER RS485 82
■ HART Prot
☐ MODBUS prot.

SE380 67
☐ COM 1
■ COM 2
☐ COM 3
■ NIV 128
☐ NIV 129

05 — Main menu
- Devices
- Relays
- Current outs.
- Inputs
- UIM-s
- MultiCONT config.
- Save config.
- Load config.
- Default config.
- Restart
- Quick Set

18 — Relays
- 01: R1_IN [ ]
- 02: R12 [■]
- :
- 12: R12n [ ]

List number of relay | Relay ID Short TAG
[■] Active
[ ] Not active (relay de-energised)

19 — 02: R12
- Program
- Short TAG
- Info

Change using (↑)(↓) buttons
(ESC) Cancel
(OK) OK

20 — Program
- Source
- Function
- Parameter
- Invert
- Clear TOT
- Update TOT
- Test

25 — Short TAG
▲ R132-HCL ▼

74 — Info
- Cycle: 2307
- Working: 47
- Input: 0.245
- Output: OFF
- ID: 9729718162
- Parent: 9729718172
- Location: Internal

21 — Source
- 1: SE300 [+][ ]
- 2: SC380
- :
- n: ST300-1 [ ]

SE300
- PV [ ]
- SV [■]
- TV [ ]
- QV [ ]

[ ] No sign assigned
[+] Assigned with a "+" sign
[ ] Assigned with a "−" sign
[−] Assigned to be averaged
Modify using (↑) button

22 — Function
- Hyst
- Alarm
- Alarm, D [■]
- Window
- Window, D
- Error
- Pulse, F
- TOT
- Alt.S
- Sequential
- PV rate of change

[ ] Not selected
[■] Selected
Select using (↑) button

23 — Parameter
- RP1 = ▶ 0003.45 ▼
- RP2 = 12.45
- RP3 = 0

▶ Parameter to be changed
(↑)(↑) Selection of digit position
Sign and number modification
(ESC) From RP1: exits to "Programming" menu, from RP2 and RP3: steps back to the previous parameter
(OK) Accepts parameter change and moves on. Pressing when RP3 is highlighted: loads RP1..RP3 to the memory, and steps back to "Programming" menu.

▲ ▼ (↑)(↑)(ESC)(OK)

26 — Invert
- On [ ]
- Off [■]

[ ] Not selected
[■] Selected
Select using (↑) button
Selected choice applies immediately

24 — Test
- On [ ]
- Off [■]
- Toggle [ ]

[ ] Not selected
[■] Selected
Select using (↑) button
State of relay changes immediately after selection

(OK) (←) (→) (ESC)

Note:
Relay cycle and worktime are saved every 6 mins.

58

1: SE300

☐ PV ■ SV ☐ TV ☐ QV

PV = primary value
SV = secondary value
TV = tertiary value
QV = quaternary value
See: 5.4.6.6 Command set

Source ◆ 30

+ 1: SE300
− 2: SC380
:
☐ n: ST300-1

☐ No sign assigned
+ Assigned with a "+" sign
− Assigned with a "–" sign
Assigned to be averaged
Modify using ⬆ button

Function ◆ 31

Variable
Error 3.6 mA
Error 22 mA
Variable H = 3.6 mA
Variable H = 22 mA

Parameter ◆ 32

CP1:= ► 0003.45 ▼
CP2 = 12.45
CP3 = 0

▲▼ Parameter to be changed
⬆⬇ Selection of digit position
⬅➡ Modify sign and number
ESC From CP1: exits to "**Programming**" menu, from CP2 and CP3: steps back to the previous parameter
OK Accepts parameter change and moves on, pressing when CP3 is highlighted: loads CP1..CP3 to the memory and steps back to "**Programming**" menu.

Test 33

18.565 ▼ ▲

Type using ⬇ ⬆ buttons
While typing the output changes

Program ◆ 29

Source
Function
Parameter
Test

☐ Not selected
■ Selected
Select using ⬆ button

Short TAG 34

► R132-HCL ▼ ▲

Modify with ⬇ ➡ ⬆ buttons
ESC Cancel
OK OK

Info 64

Input:
Output: 0.458
14.56mA
ID: 972A718162
Parent: 972A718160
Location: Internal

02: C_IN_2 ◆ 28

Program
Short TAG
Info

Current outs. ◆ 27

☐ 01: C1_IN
■ 02: C2_IN
:
☐ 12: C2n

List number | Curr. out ID
of curr. out | Short TAG

■ Active
☐ Not active
(output current = 0 mA)

Main menu ◆ 05

Devices
Relays
Current outs.
Inputs
UIM-s
MultiCONT config.
Save config.
Load config.
Default config.
Restart
Quick Set

OK ⬅ ➡ ESC

Standard display image

1: SE300-11   VOL   * ▲ M

31.25 m3

DIS: 8.25 m
LEV: 7.36 m
Temp: 25.4 °C

2006.04.25   A   09:48

Bargraph display

1 2 3 4   B
                    100%

                    0%

User display

1: SPA-340 LEV
    PV=2.456m
2: SEA-380 VOL
    PV=23.45m3

Double
Difference
Average

Relay assignment

123456789ABCDEF▾R
                    ─── R01
                    ─── R02
                    ─── R03
                    ─── R04

List No. of relay

─ Not assigned
□ Assigned (de-energised)
■ Assigned (energised)
Scroll using ⬆ and ⬇ buttons

4-20 mA assignment

123456789ABDCDEF▾C
                    ─── C01
                    ─── C02

List No. of curr. out.

─ Not assigned
□ Assigned

list number
of the device

Error list

Error list   ▾ E
01: SE300-11:   Set   Program
02: ST300   :   Reply
03: ST380   :   Device   Program
04: SE360   :   Save
05: SC360   :   Device
06: STD330   :   SCD330 :
07: SCD330   :   Device

Error type
Device ID
List no. of error

Delete errors by pressing (Esc)
Scroll using ⬆ ⬇
errors: see chapter 6.

Main menu   ▾ 05
   Devices
   Relays
   Current outs.
   Inputs
   UIM-s
   MultiCONT config.
   Default config.
   Restart
   Quick Set

Enter "**Main menu**" by pressing (OK)
Exit "**Main menu**" by pressing (Esc)

RS 485 communication
menu ID

bargraph

device ID
(Short TAG)
max. 8 char.

mode

n: SE300-11   FLOW * ▲ M

5.486 m

LEV: 0.514 m
TOT1: 1542.5 m3
TOT2: 1.25 E7 m3

Errors: 2   Err11

Error code of the device
(see chapter 6. Error codes)
"Locked" message, if
program protection switch is ON (see chapter 7.)

No. of error
logs.
Delete by
pressing (Esc)

List display

Line no.
of the device
in the list

LOG — 140
- Setting
- Show time window TOT
- Show time window FM
- Clear LOG
- Clear time window TOT
- Clear time window FM
- Info

Setting — 141
- Source
- Function
- Parameters
- SD saving mode

Source — 143
- ☑ SEA-380
- ☑ LEP-100
- ☑ SEA-340
- :
- ☑ TMH-500

5: SPA-360 — 144
- ☐ SV
- ☐ TV
- ☐ QV
- ☐ Current
- ☐ Percent
- ☐ Level
- ☐ Level %
- ☑ TOT1
- ☑ TOT2
- ☐ PV rate of change
- ☐ Working
- ☑ Head of flow
- ☐ All values

If the "Source" is a TMH-500 unit "All values" can be selected. This case all measured temperature values are stored into an additional row ("LT row") along with the standard logging entry ("LG row")

	Date	Time	Func	Value	Unit	...	...	...	Source	Func	Val	...	TEMP	Value	Unit
LG	1909.12.03	02:58:39	SV	24.7999999		2	1	151.18.11534336	TMH-500	QV	0	64	TEMP	24.480000	degC
				24.4	degC	TV	15.000000		TMH-500		1.000000	64	15	24.7	24.4
LT	1909.12.03	02:58:39		24.5	degC	2	1	151.18.11534336	TMH-500	24.4	0	24.4	24.6	**degC**	24.5
	SV			24.4		24.4		23.9	24.6		24.7				

Temperature value — Number of temperature sensors — Unit