UNICONT

P☐F-601-☐ — loop indicator and converter to HART

Installation and programming manual

2nd editon

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1. INTRODUCTION

The Unicont PDF-601-A Ex devices are 2-wire on-site indicators that can be inserted into a 4 … 20 mA current loop without the need for additional power supply. Since the displayed value is proportional to the input, the units are suitable for indication of temperature, pressure, level, etc. values, so the information carried by the loop current. The customer can program the engineering units and the indication range.

The HART capable Unicont P☐F -601-B Ex 3-wire process indicators and transmitters display the loop current, furthermore these units are able to transmit the 4 … 20 mA output current or convert input current to HART signals, so these units enable transmitters, that have only analogue outputs, to be integrated into HART multidrop systems. The ratio between the input and output current can be programmed. The devices require additional power supply. The intelligent electronics and HART communication enables versatile signal processing and remote programming. The software uses the Universal HART commands No. 1-3, 6, 7, 11-18 and device specific commands No128-132, 135 and 139 of the HART Revision 5.

2. ORDER CODES

UNICONT   P ☐ F – 6 0 1 – ☐ Ex

FUNCTION	CODE		INSTALLATION	CODE		HOUSING	CODE		OUTPUT / EX	CODE
With display	D		Wall, mounting plate	F		Stainless steel	6		------ / Ex d	A *
Without display	T								4 ... 20 mA+HART / Ex d	B
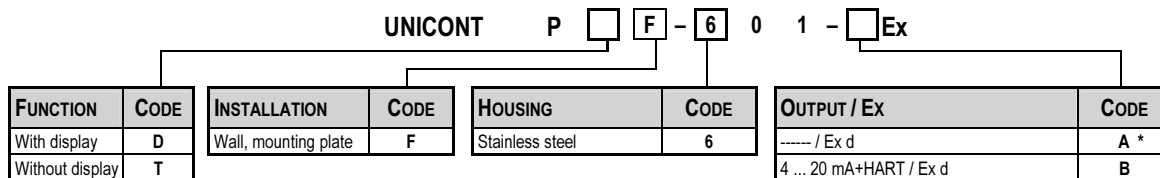
* Type „A" is available only with display.

3. TECHNICAL DATA

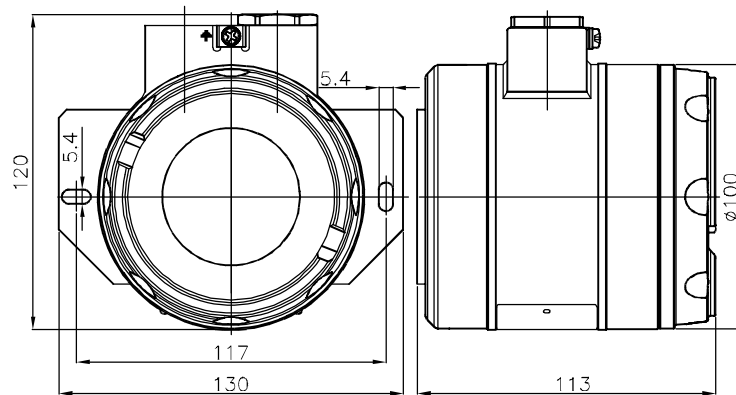| Type	PDF-601-A Ex	PロF-601-B Ex
Powering	2-wire	3-wire
Input	Current loop	
Range	3,6 … 22 mA	0 … 22 mA
Display/Indication	6-digit LCD, engineering unit and bargraph	
Range of displayed value	-9999 … 29999	
Displayed process value (programmable)	mA, ºC, ºF, **%**, m, cm, in ,**ft**, l, m^3 , gal, ft^3 **DIST** (distance), **LEV** (level), **VOL** (volume/content)	
Ambient temperature	-40ºC…+70ºC, with display: - 20ºC…+70ºC	
Accuracy	± 0,1 % for displayed values over 10000	
Temperature coefficient	± 0,05 % / 10°K	
Output	----	4…20 mA and/or HART for 4…20mA the current limit values: 3,9…20,5 mA minimal value of terminal resistance for HART: R_{tmin} = 250 Ω
Error indication of the current output	----	Output = 3,8 or 22 mA
Supply voltage	----	10 V…36 V
Load resistance	----	$R_t \leq$ (Us-10V) / 0,022A, at Us supply voltage
Input voltage drop	< 1,6 V	< 1 V
Input overvoltage capability	50 mA	50 mA
Damping	3 s, 5 s, 10 s or 20 s	
Electric protection	Class III	
Ingress protection	IP67	
Ex protection	Flame-proof housing	
Ex marking	⟨Ex⟩ II 2 G Ex d IIB T6	
Electric connection	wire cross section 0,25 … 1,5 mm^2 shielded, twisted wire cable suggested	
Housing	Stainless steel	
Weight	appr. 2,4 kg	

3.1 DIMENSIONS

Table 1.

3.2 ACCESSORIES

– Installation and programming manual
– Warranty Card
– Declaration of Conformity
– Sticker set of engineering units
– For HART capable units EView Light software on CD-ROM (in addition)

4. INSTALLATION AND ELECTRIC CONNECTION

The devices are suitable for working in closed areas or they can be used in open-air applications, too. Installation location should be selected so that proper space is available for handling, programming and checking the display.
The device shall be protected against direct sunlight in order to protect it from exceeded temperature.

⚠	The device must not be set up and installed, until the „Ex d" protective qualified cable gland is not fixed to the place of the red plastic closing cap with proper sealing. The metal plug may only be removed if 2 cable glands are used.
⚠	Do not forget to unscrew the socket set screw with sized 2 allen key before opening the cover of the device! The sealing ring must be replaced if damaged, otherwise the IP class of the device can be jeopardized.

4.1 WIRING

- 2-wire indicators are used in 4… 20 mA current loops. They do not require separate power supply.
- 3-wire devices are powered with 10…36 VDC through the output.
- Current values on the terminals should not exceed overload capability limits specified under „Technical data".

> ⚠ The unit may be damaged by electrostatic discharge (EDS) at its terminal, thus the precautions commonly used to avoid electrostatic discharge e.g. by touching a properly grounded point before removing the cover of the enclosure should be applied.

- After removal of the cover of the housing and the display module the screw terminals can be accessed. The metal housing of the device must be connected to the equipotential system!
- Wiring should be made with shielded cable, specified under 'Technical Data'.
- The cover must be tightened and the fixing set screw must be screwed in after wiring and programming.

> ⚠ The cover must be tightened and the fixing set screw must be screwed in after wiring and programming!
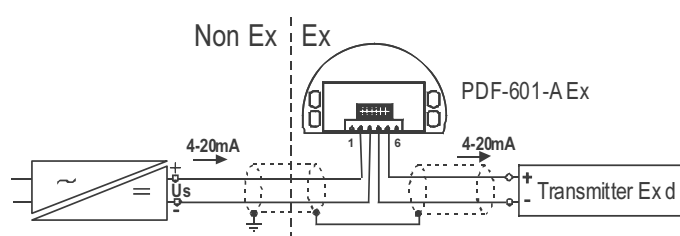
Figure 2. Wiring of 2-wire
Unicont device to the current loop of a 2-wire transmitter
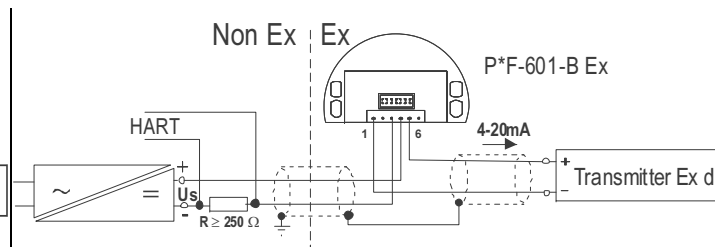
Figure 3. Wiring of HART capable (3-wire)
Unicont device to the current loop of a 2-wire transmitter

Shielding should be grounded at one point.
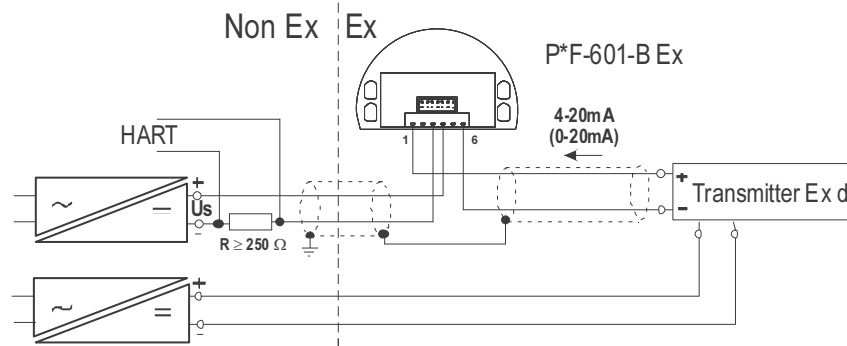
Figure 4. Wiring of HART capable (3-wire) Unicont device to the current loop of a 4-wire transmitter
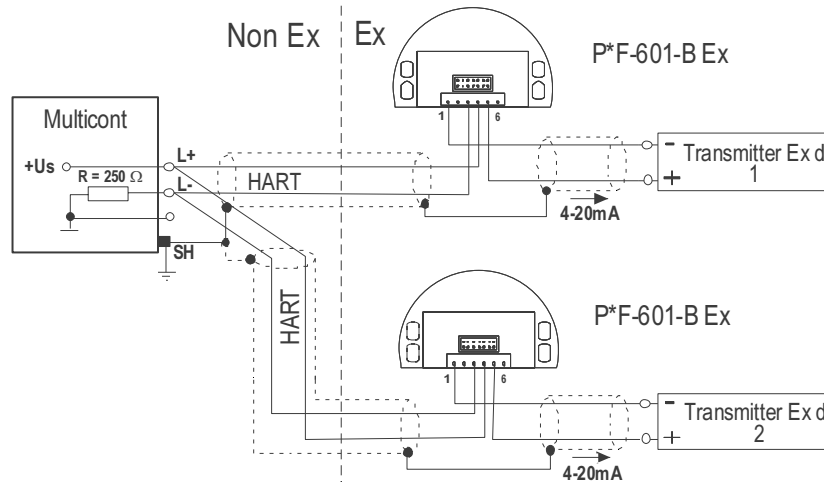
Figure 5. Wiring of 3-wire **Unicont** units with a **Multicont** controller and 2-wire transmitters
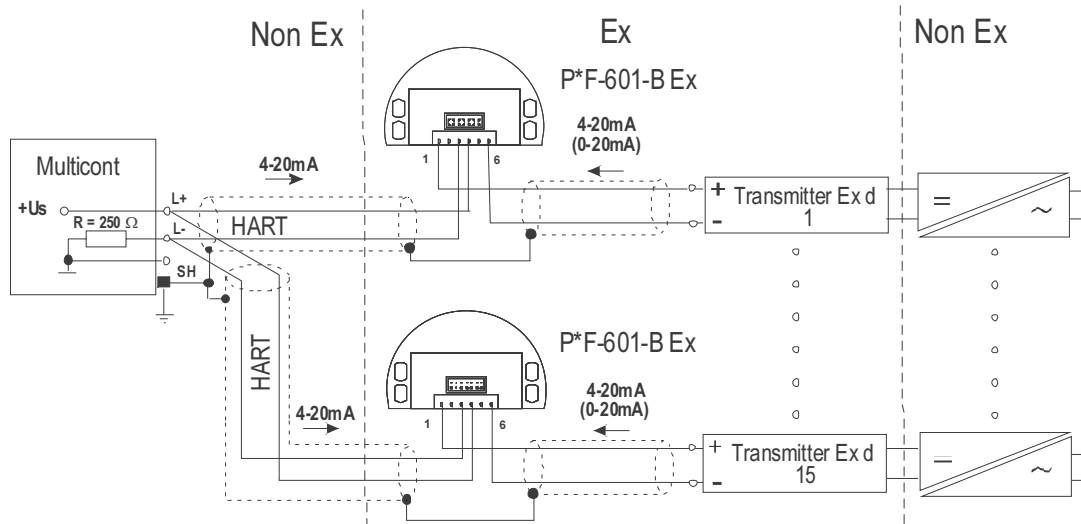
Figure 6. Wiring of 3-wire **Unicont** units with **Multicont** controller and 4-wire transmitters

Simplified circuit schematic
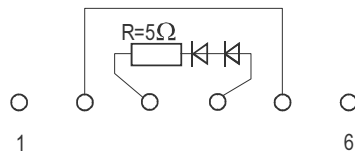
Figure 7. 2-wire Unicont
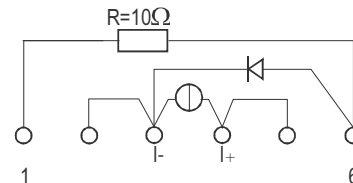
Figure 8. 3-wire Unicont

4.2 SAFETY REGULATIONS FOR THE EX CERTIFIED UNITS

⎯ WARNING – DO NOT OPEN WHEN ENERGIZED

⎯ The housing of the device must be connected to the equipotential network.

⎯ Device must be operated only with using properly sealed „Ex d" protective qualified cable gland.

5. INSTALLATION, PROGRAMMING

Lighting of the VALID LED indicates that the Unicont, installed and wired correctly, will operate according to the Manufacturer's settings. The device operates in MEASUREMENT mode. It is indicated by the format of the displayed value and that the PROG display does not lit.
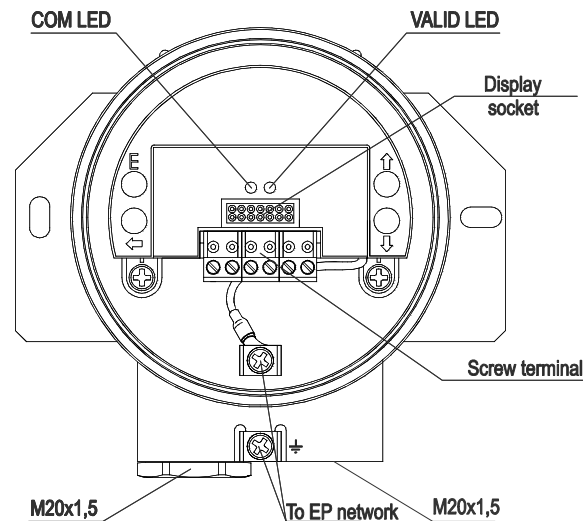
5.1 DEFAULT

Manufacturer's settings are the following:

The percental (%) value shown on the display is proportional to the input (4 mA→0%, 20 mA →100.0%).

Damping: 3 s

Noise suppression frequency: 50 Hz

Bargraph indication is proportional to the input (0/4 mA→ 0%, 20 mA →100.0%).

The output of the 3-wire models can be 4…20 mA current and / or HART signal.

During operation:

COM LED flashes during HART communication

While pressing the ⊙ key the input current appears on the display of the 2-wire models.

While pressing the ⊙ key the output current appears on the display of the 3-wire models.

Programming keys

Programming keys
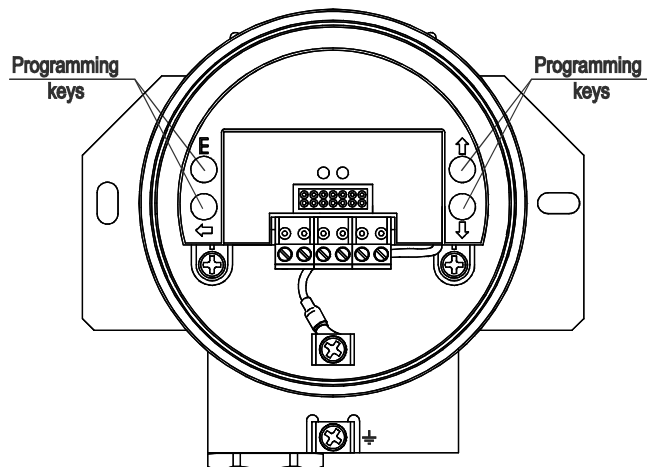
5.2 DISPLAY OF THE SAP-202 AND KEYS OF THE UNIT

Symbols on the screen

- **DIST** – distance displayed (when ON)
- **LEV** – level displayed (when ON)
- **VOL** – volume / content displayed (when ON)
- **%** – percent displayed (when ON)
- **mA** and **°C** current and temperature displayed (when ON)
- ▼ – arrow (points to the relevant engineering unit)
- **PROG** – programming is in progress (when flashing)

Symbols and sign on the frame

- **M** – metric system
- **US** – imperial engineering unit system
  ºF, m, cm, in ,ft, l, m^3 , gal, ft^3

LED

VALID lights up during operation

COM flashes during HART communication

5.3 PROGRAMMING

Uniconts can be programmed by programming keys and the procedure can be followed on the display. HART capable models can also be programmed remotely via the MultiCONT controller or with the aid of a HART modem and EView software installed on a PC. During on site programming remote programming is not possible and vice versa.

If the unit has already been programmed it is going to work according to the last setting and the information shown on the display.corresponts to the setting.

Adjustment of the Unicont to the conditions of the actual application can be carried out by programming the parameters.

The unit will work during programming in accordance with the parameters set previously.
The new, modified parameters will only be effective after returning to Measurement Mode.

If the transmitter is left in Programming Mode by mistake, it automatically returns to Measurement Mode after 3 minutes and is going to operate with the parameters entered during the last completed programming cycle.

5.3.1. STEPS OF PROGRAMMING

'Double key pressing' (pressing two keys simultaneously) has to be used to get into and out of PROGRAMMING mode. It is also used in programming mode.

This is represented in the manual with the symbols of the two keys and the '+' sign in between them. That is: Ⓔ + ⬅ (getting into PROGRAMMING mode).

This procedure is should be carried out as follows: press the first key (E) and keep it pressed while pressing the key shown after the '+' sign. The two keys should be kept pressed simultaneously for about 3s (until the display changes).

After double key pressing of Ⓔ + ⬅ the device gets into PROGRAMMING mode and 'PROG' symbol is blinking. One of the following two images appears and parameters can be changed.
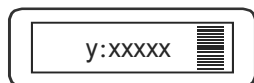
y:xxxxx	y	one digit parameter address (**0, 1**, … **9**)	
	xxxxx	five characters after the colon "**:**"	
	▤	Bargraph	

	X	X	X	X	X
possible	–	0	0	0	0
indicators in	1	:		:	:
place of X	2	:		:	:
(– dark)	–	9	9	9	9
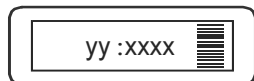
yy :xxxx	yy	two digit parameter address (**10, 11**, … **19**)
	dcba	four characters after the colon "**:**" (during programming parameter value "**a**" blinks first!)
	▤	Bargraph

When 'PROG' is blinking programming can be performed. Since modification of P10 makes the unit restart and reset DEFAULT values it is suggested to begin programming with checking and / or changing this parameter.

When 'PROG' is lit, parameters are being protected by secret code and can only be read out. Applying this code (See P19) provides protection against unauthorised or unintended parameter modifications.

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OPERATION OF THE PROGRAMMING KEYS

PRESSING KEY(S)	OPERATION		
(E) + (◄) (press for min 3 sec) *	Getting in and out of PROGRAMMING and MEASUREMENT mode (both directions). (Returning to Measurement mode means saving of the modifications)		
(▲)	Value of input current appears onthe display In MEASUREMENTmode.		
	While **parameter address blinking**		While **parameter value blinking**
(E)	To go to parameter value		To return to parameter address.
(◄) + (▲)	Cancel all modifications of the actual programming procedure. **CANCEL** will be displayed for warning.		Neglect value modification of the relevant parameter (if any) and return to the parameter address. **CANCEL** will be displayed
(◄) + (▼)	Reset all parameter values to default. **LOAD** is be displayed for warning.		Reset default value of the relevant parameter. **LOAD** will be displayed for warning.
(▲) + (▼)			GET VALUE – function for automatic setting of P0 and P1. Actual/measured value will be offered as the value to be programmed. After pressing (E) for saving the value, '**SET**' message confirms the modification.
(◄)	To have the next character to the left blinking (to be able to change that character)		
(▲) / (▼)	Modify the blinking digit (increase, decrease, minus sign) or scroll up / down … 8, 9, " –" ,0, 1, 2, …		

Remarks:

Double key pressing is indicated by '+'

* Make sure that (E) is pressed first!

If, after pressing (E) , blinking does not jump over from the parameter address to the parameter value, then this means that
> *• the parameter is either read-out type, or*
> *• the secret code prevents the modification (see P19)*

If the modification of the parameter value is not accepted i.e. the parameter value keeps blinking after pressing (E):
• the modified value is either out of range, or
• the entered code is not valid

5.3.2. PARAMETERS –DESCRIPTION AND PROGRAMMING

Attention! Before programming it is suggested to read the description of parameter **P10** carefully!

P0:	**- - - a**	**Setting input current (Ia) that is to be assigned to displayed value (Da) See Figure 9, 10 and 11**	**FACTORY DEFAULT: 4 mA**

P1:	**- - - a**	**Setting input current (Ib) to be assigned to displayed value (Db)**	**FACTORY DEFAULT: 20 mA**

The current value can be entered in P0 and P1 manually
For instance, entering 5.6 mA in P0 should be performed as shown below:
1. Press Ⓔ + ◉ to get into PROGRAMMING mode
2. Press ⊙ ⊙ to go to P0
3. Press Ⓔ to go to the parameter value
4. Press ⊙ /⊙ / ◉ to adjust the display to 5.6
5. Press Ⓔ + ◉ to return to MEASUREMENT mode

If the actual current value is to be entered in P0 or P1 it can automatically be set by the GET VALUE function. To do so the above described procedure should be performed, but pressing ⊙ + ⊙ (instead of ⊙ /⊙ / ◉) (step 4.). Successful setting is indicated by the message '**SET**' displayed.

Remarks:
If the input current range is set for 4 … 20 mA, than the value of P11 cannot be set below 4 mA in P0 and the value of P1 cannot exceed 20 mA. An input current value outside of this range would make VALID LED and current value display blinking.

P2:	**Setting displayed value (Da) to be assigned to input current Ia See Figure 9, 10 and 11**	**FACTORY DEFAULT: 0.0**

P3:	**Setting displayed value (Db) to be assigned to input current Ib**	**FACTORY DEFAULT: 100.0**

P4:	**Setting output current pertaining to the input current Ia (for 3-wire models only)**	**FACTORY DEFAULT: 4 mA**

P5:	**Setting output current pertaining to the input current Ib (for 3-wire models only)**	**FACTORY DEFAULT: 20 mA**
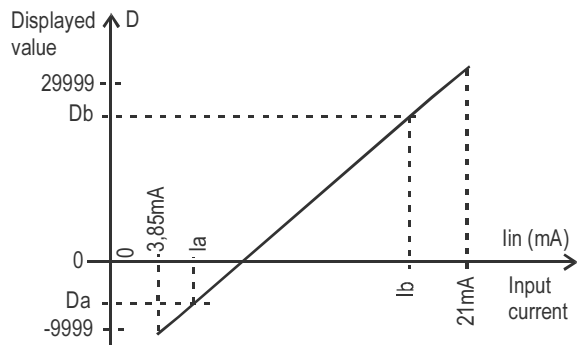
Figure 9. Display curve of 2-wire models
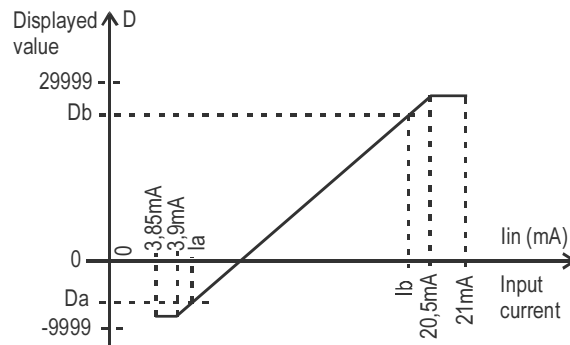
Figure10. Display curve of 3-wire models with input range set for 4…20 mA
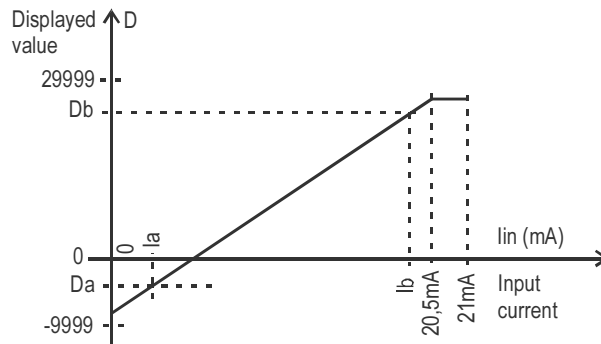
Figure 11. Display curve of 3-wire models with input range set for 0…20 mA

P9:   - - - a   Current generator test   **(for 3-wire models only)**

In this parameter the actual current output is displayed. Going to the parameter value the output current of 3.6…22 mA can be set by the keys ⊙ and ⊕. The current value entered this way should conform with the output current measured with an ammeter.

P10:   - - - a   Setting the decimal point   **FACTORY DEFAULT: 0002**

Important remark: modification of P10 represents resetting parameter values to the FACTORY DEFAULT. Thus, it is suggested that programming starts with knowing the range of values to be displayed and programming P10 first.

a	Position of decimal point
0	xx.xxx
1	xxx.xx
2	xxxx.x
3	xxxxx

P11: dcba Setting range,* damping, noise suppression, error indication on the output current *   **FACTORY DEFAULT: 0000**

a **Range** can be selected with the 3-wire models for 4…20 mA or 0…20 mA. Setting is important in respect to the output current error indication.

b **Damping** can be used to reduce unwanted fluctuation of the displayed value

c **Noise suppression** is for eliminating possible disturbance coming from the mains

d **Error indication on the current output** of the 3-wire models is used to indicate error signals arriving as input current and the error of the Unicont itself according the chart below. Simultaneous occurrence of both errors is going to result output current to be the error indication of the Unicont.

* For 3-wire models only

Attention: character „**a**" is at the right end (this is the first to blink)

a	Range selection
0	4…20mA
1	0…20mA

b	Damping
0	3 s
1	5 s
2	10 s
3	20 s

c	Noise suppression
0	50 Hz
1	60 Hz

d	Error indication on the current output		
	Unicont error	Error indication on the input current*	
		Current > 20 mA	Current < 4 mA
0	3.8 mA	3.8 mA	3.8 mA
1			22 mA
2		22 mA	3.8 mA
3			22 mA
4	22 mA	3.8 mA	3.8 mA
5			22 mA
6		22 mA	3.8 mA
7			22 mA

*- If an error indication of 22 mA arrives (from a transmitter) to the input of the Unicont, with settings 5 (under **d)** than it means that the current output of the Unicont is 3.8 mA (and with setting 6 it is 22 mA)

- If an error indication of 3.8 mA arrives (from a transmitter) to the input of the Unicont, with settings 1 (under **d)** than it means that the current output of the Unicont is 22 mA (and with setting 6 it is 3.8 mA mA)

P12: dcba   **Displayed process values and their units**   **FACTORY DEFAULT: 0100**

The columns of the chart below can be programmed separately and it is supposed to be done reasonably (i.e. to have symbol LEV lit: **2** should be set under **b,** to have relevant unit lit (m/ft or cm/in) **2 or 3** should be set under **a** and setting 1 under **d** should be chosen if the required unit is meter or centimetre. This also means that there is no engineering unit to set for FLOW (it can be displayed in %)

Settings in column '**a**' make engineering units lit on the frame (**c** should be set to 0)

Settings in column '**b**' make the symbols (**DIST**, **LEV**, **VOL**, **FLOW**) lit on the frame

Settings in column '**c**' make **%, mA or °C** lit on the frame (**a** should be set 0)

	a	b	c	d
1	m^3/ft^3	DIST	%	M
2	m/ft	LEV	mA	US
3	cm/in	VOL	°C	-
4	l/gal	FLOW	-	-
5	t	-	-	-
6	°F	-	-	-

P13: 00ba   **HART short address (for 3-wire models only)**   **FACTORY DEFAULT: 00**

The short address of the unit for the multidrop system (HART network) is to be given here.

Please note that in accordance with the HART standards the address of a single device should be 00. In this case current output will change according to the settings in the range of 3.8 ... 22 mA and HART communication is also available.

For systems with more than one device 01 …15 addresses should be given. In these cases the output current will be fixed to 4 mA. Thus, information is transferred by the HART communication only (i.e. current output does not carry any information and error indication on the current output is not possible). (See also 'Description of Eview' supplied with HART capable devices.)

P14: dcba   **Product version**

Hardware and software versions of the model can be found in this parameter.

d = 0 not HART capable   d = 1 HART capable   c = hardware version,   ba = software version

Engineering units transferred by HART communication can be set in this parameter.

CODE	DIMENSION	CODE	DIMENSION	CODE	DIMENSION	CODE	DIMENSION	CODE	DIMENSION	CODE	DIMENSION	CODE	DIMENSION
0	-	26	ft³/s	52	h	78	MetTon/h	114	in/s	143	deg
1	inH20@68°F	27	ft³/d	53	d	79	MetTon/d	115	in/min	144	rad
2	inHg@0°C	28	m³/s	54		80	lb/s	116	ft/min	145	inH20@60°F
3	ftH20@68°F	29	m³/d	55		81	lb/min	117	deg/s	146	
4	mmH20@68°F	30	Impgal/h	56	uS	82	lb/d	118	rev/s	147	
5	mmHg@0°C	31	Impgal/d	57	%	83	lb/d	119	rev/m	148	
6	psi	32	°C	58	V	84	STon/min	120	m/h	149	Vol
7	bar	33	°F	59	pH	85	STon/h	124	bbl liq	150	
8	mbar	34	°R	60	g	86	STon/d	125	ounce	151	
9	g/cm²	35	Kelvin	61	kg	87	LTon/h	126		152	ft³/lb
10	kg/cm²	36	mV	62	MetTon	88	LTon/d	127	kW	153	pF
11	Pa	37	ohm	63	lb	89		128	kWh	154	mL/L
12	kPa	38	Hz	64	STon	90		129	hp	155	uL/L
13	torr	39	mA	65	LTon	91	g/cm³	130	ft³/h	163	kohm
14	atm	40	gal	66	mS/cm	92	kg/cm³	131	m³/min	164	MJ
15	Ft³	41	L	67	uS/cm	93	lb/gal	132	bbl/s	235	gal/d
16	min	42	Impgal	68	N	94	lb/ft³	133	bbl/min	237	Mpa
17	L/min	43	m³	69		95	g/mL	134	bbl/h	238	inH20@4°C
18	Impgal/min	44	ft	70	g/s	96	kg/L	135	bbl/d	239	mmH20@4°C
19	M³/h	45	m	71	g/min	97	g/L	136	gal/h	**240**	**L/d**
20	ft/s	46	bbl	72	g/h	98	lb/in³	137	Impgal/s	**241**	**kg/dm³**
21	m/s	47	in	73	kg/s	99	STon/yd³	138	L/h	**242**	**ms**
22	gal/s	48	cm	74	kg/min	100	yd³	139	ppm	**243**	**ft/h**
23	Mgal/d	49	mm	75	kg/h	111	ft³	140		**244**	**dB**
24	L/s	50	min	76	kg/d	112	in³	141	HJ/h	**245**	**m/s²**
25	ML/d	51	s	77	MetTon/min	113	in/s	142		**246**	**ft/s²**

Codes over 240 are engineering units defined by NIVELCO They might be different at other manufacturers.

P19: **Secret code** **FACTORY DEFAULT: 0000**

Settings can be protected by a 4 digit number (secret code) (other than 0000) entered in this parameter. If the secret code is active the PROG symbol is lit and the value of the parameters can only be viewed. To be able to do any programming or to modify the secret code or to remove protection (modify the secret code to 0000) the secret code, already entered, needs to be known. The procedure is the following: Go to P19 press Ⓔ to select parameter address. Then go to parameter value, enter the secret code. Press Ⓔ to go to the address and Ⓔ again to return to value. Enter the new secret code or 0000. If there is no secret code or it is not active the PROG symbol is blinking.

5.4 ERROR INDICATIONS

5.4.1. VALID LED IS BLINKING AND A MESSAGE OF ERRX APPEARS ON THE DISPLAY:

ERRX	Error description	Solution
1	Memory error	Contact local agent
2	Programming error: same value in P0 and P1, or P2 and P3, or P4 and P5 with the 3-wire models	Modify programming
3	Display overflow	– " –

5.4.2. VALID LED AND THE DISPLAYED VALUE IS BLINKING:

For the 4…20 mA range: if Iin < 3.85 mA or Iin > 21 mA
For the 0…20 mA range: if Iin > 21 mA

5.4.3. ERROR INDICATION ON THE OUTPUT CURRENT (FOR 3-WIRE MODELS ONLY)

Output current is 3.8 mA or 22 mA, depending on setting of character **d** in **P11** parameter.

5.5 HART COMMUNICATION

The HART capable UNICONT units communicate with the HART master unit according to the HART standard. (MultiCONT, communicator, PC, etc.).

6. MAINTENANCE AND REPAIR

The unit does not require regular maintenance. All repairs will be carried out only on the premises of the Manufacturer.

7. STORAGE

Ambient temperature: -25 °C ...+60 °C
Relative humidity: max. 98 %