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Subject to technical change.  
 All dimensions in mm (inch).

We assume no liability for typing errors.  
 Different variations than specified are possible.  
 Please contact our technical consultants.

## Introduction

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### Use of this Manual

This Manual describes the operation of the series:

RFnivo RF 8000 and  
Capanivo CN 8000

with the Digital electronic module.

For installation, wiring, safety notes etc. refer to document "Technical information / instruction manual" of either series RF 8000 or CN 8000.

## **Local Operation (Standalone)**

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### **Part 1:**

### **Digital Electronic module: Local Operation (Standalone)**



## Local Operation (Standalone)

- Local operation gives you access to all the functions listed in the table on page 8, see Quick Reference: operating functions using input keypad.
- An extended range of functions is available only via remote operation using PROFIBUS PA: see PROFIBUS PA Parameters on page 30.

## Local User Interface (LUI)

You can program the transmitter using the input keypad, and view measuring results, error messages and modes of operation on the digital display.

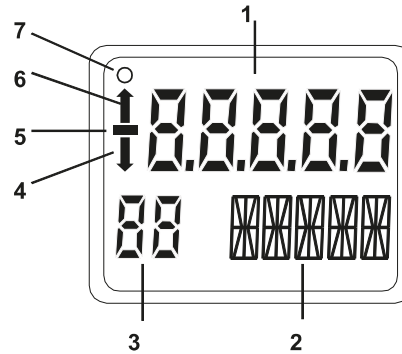
## Input keypad

Three keys M,  and , are located below the display (see Programming via the Local User Interface (LUI) on page 7). The keys are accessible when you open the lid. The lid must be closed again after programming.

## LCD display (local operation)

The local digital display shows one of the following:

- the measured value and associated units
- the logical level (sensor covered/ uncovered)
- the numerical value and mode number
- an error message and status information.
- software revision number <sup>1</sup>



- 1 – Primary Reading (displays measured value, or logical level, or an error message)
- 2 – Auxiliary Reading (displays Units, or the Bar Graph, or Status [error code])<sup>1</sup>
- 3 – Indicator for Write Protection / Mode number/ Simulation
- 4 – Down arrow indicates alarm output switch open
- 5 – Negative sign
- 6 – Up arrow indicates alarm output switch closed
- 7 – Communication Indicator - visible only when communications are in progress

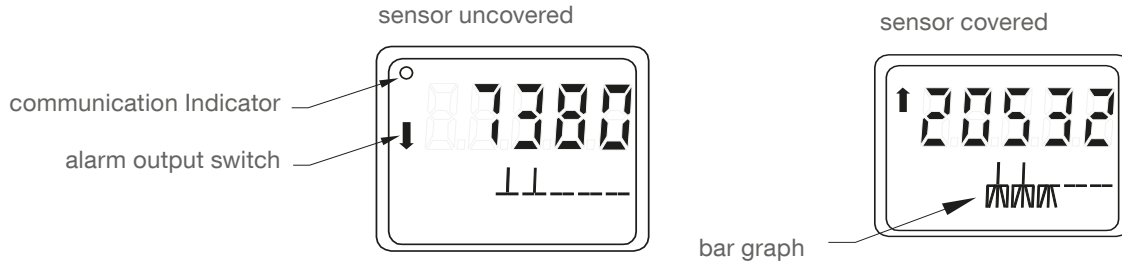
<sup>1</sup> The current software revision is displayed for 1 to 2 seconds at startup on two successive screens which are immediately followed by RUN mode display.

## Local Operation (Standalone)

### RUN mode display

#### Measured value display

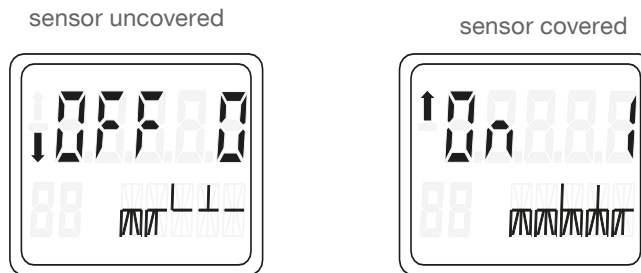
The default startup display is the measured value display. It shows the value (in counts <sup>1</sup>) when Sensor (Sens) has been selected in Mode 13.



<sup>1</sup>. See Counts on page 39 for more details.

#### Logical level display (output status)

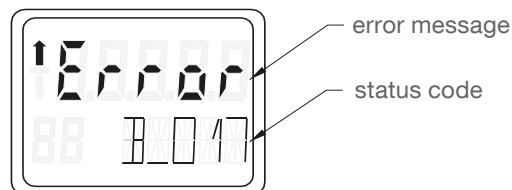
The logical level display shows the value when the OUT parameter of the Discrete Input Function Block is selected in Mode 13.



#### Error message display

If hardware or software errors occur in the transmitter, the error message appears in the primary reading field.

A status code is displayed in the auxiliary display which indicates the type of error (see Status on page 24). This information is also available via the PROFIBUS interface.



#### Units

The corresponding unit is displayed in the auxiliary reading field when Electronics Temperature is selected in Mode 13.



## Local Operation (Standalone)

### Bar graph

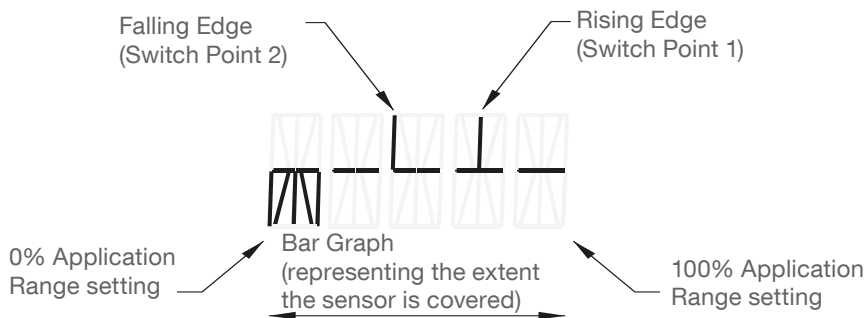
The Bar Graph represents the extent to which the sensor is covered during normal operation. It is displayed when one of the three following mode options is selected:

- OUT (output of the Discrete Input Function Block)
- PRIM (the Primary Value of the Transducer Block)
- SENS (the discrete Sensor Value of the Transducer Block)

The 0% and 100% Application Range settings terminate the Bar Graph at each end and are represented on the lower part of the graph. The two Switch Points (Falling Edge and Rising Edge) are indicated as black vertical lines on the upper part of the graph; Rising Edge is the point where the output state is switched on and Falling Edge is the point where it is switched off.

Example:

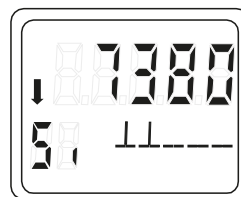
Assume that a vessel is being filled and the sensor is slowly being covered. Because the level is rising, switch point 2 (falling edge) will be passed without any change in the output occurring. If the level continues to rise, eventually switch point 1 (rising edge) will be reached, resulting in a state changeover. This new state will remain unchanged until the vessel is being emptied and the probe uncovered. If the level falls so that switch point 2 (falling edge) is passed again, the output state will change once more.



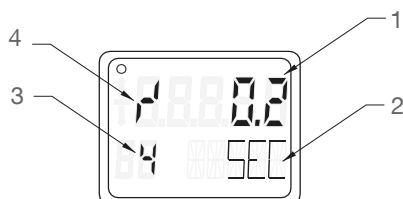
### Lock/Simulation Indicator

(In PROGRAM mode, this field displays the Mode number.)

- When a lock is enabled, either Li, Lc, LA, LL, is displayed (see Lock, page 37).
- When simulation (via PROFIBUS PA) is active, Si is displayed (see Simulation, on page 36).





### PROGRAM mode display (local operation)



- 1 – numerical value
- 2 – physical unit
- 3 – Mode indicator
- 4 – Rising (or Falling) indicator

## Local Operation (Standalone)

### Programming via the Local User Interface (LUI)

The keypad consists of three input keys below the display: M, , and . A flashing digit indicates the position of the cursor.

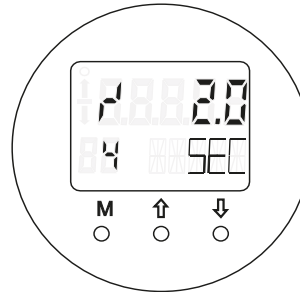
M – Mode key



– increment key






– cursor movement/accept value



### Mode selection and adjustment






**Note:** Master Reset function and Condensed Status Setup are available only via SIMATIC PDM software package.

#### Editing non-numerical values:

- To select a mode, press M (mode key).
- To select an option in a mode, press  or  to scroll forwards or backwards through the options. Press M to select option.
- To switch to the next mode, press M again. To cycle forwards through the menu, press M repeatedly. To move backwards through the menu, hold M and tap .

#### Editing numerical values:

Numerical values are always edited from the most significant digit first, and the cursor position is indicated by a flashing digit.

- To enable Edit function and to activate the cursor press  or .
- To increment the value of the flashing digit, press .
- To move the cursor to the right press .
- After editing the least significant digit, press  once again to store the edited value.
- To switch to the next mode, press M.

## Local Operation (Standalone)

### Quick Reference: operating functions using input keypad

Function	Mode		Key function			Display, or explanation
	#	M <sup>a</sup>				
Measured value display <sup>b</sup>						Measured value (selected in Mode 13)
Error display						Hardware or software error.
Sensor test	2		Either key activates test			Displays GOOD or FAILd.
Rise Time	4		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Time in seconds. Range: 0.0 to 100.0 s
Fall Time	5		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Time in seconds. Range: 0.0 to 100.0 s
HW Write Protection	10		Either key activates keylock.			Hold for 5 seconds to release <sup>c</sup>
Display Source	13	*	Scroll up or down to select an option.			Source of measured value: 0 = OUT (output); 1 = PRIM (primary value); 2 = SENS (sensor); 3 = TMP E (electronics temperature)
Unit	14	*	Scroll up or down to select an option.			Select K, °C, °F, °R (if electronics temperature selected in Mode 13).
Node address (PROFIBUS only)	15		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Assign slave address on the PROFIBUS network (0 to 126). Recommended setting range 1 to 125.
PROFIBUS Ident Number	16		Scroll up or down to select an option.			Select device mode: 1 = according to profile; or, 2 = according to profile with full device specific support.
Application Range, Lower Limit / 0%	19		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Adjust lower limit of application range.
Application Range, Upper Limit / 100%	20		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Adjust upper limit of application range.
Alarm output trigger	23	*	Scroll up or down to select an option.			Select the source event to switch the alarm output. See Mode 23: Alarm output trigger (default: dIAG), page 16.
Contact type	24	*	Scroll up or down to select an option.			Set contact functionality in case of event: (logical inversion of alarm output switch) Make contact (CLOSE)/ Break contact (OPEN)
Switch Point 1 (Rising Edge) OFF to ON	25		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Set % of range at which switch will change from OFF to ON.
Switch Point 2 (Falling Edge) ON to OFF	26		Enable Edit function, or increment digit.	Move cursor to the right, or store edited value.		Set % of range at which switch will change from ON to OFF.
Local Status Text	27	*	Scroll up or down to select an option.			Select presentation of status text. See Mode 27: Local Status Text (default: U_075), page 18.

a. In Modes indicated by an asterisk (\*), press M to store a selection. In other Modes, press to store numerical values.

b. If L appears in the Mode indicator field of the display, the HW Write Protection is activated.

c. If LA, LL, Lc or Li appears in the Mode indicator field of the display after releasing the HW Write Protection, there is an additional block on local operation via the bus. Lock, on page 37 explains how to release this using SIMATIC PDM.

In measuring mode, if neither L, LA, LL, Lc or Li, appears in the Mode indicator display field, local operation is possible.



## Local Operation (Standalone)

### Status codes

Every measured value which can be displayed is given a status to identify its quality. If it is classified as Bad or Uncertain the text Error alternates with the measured value in the display and the status code alternates with the unit or Bar Graph.

If the status is **Bad** or **Uncertain**, either a status code or a status message is displayed in the auxiliary display. If the selection for Local Status text is numeric a numeric code will be displayed. If a language is selected, a text message will be displayed. (For details see Mode 27: Local Status Text (default: U\_075) on page 18).

The status display has priority, and neither the physical unit nor the Bar Graph is visible if the status is Bad or Uncertain.

Examples:

LUI Status Code	Quality	Error
Bar graph displayed	Good	
G_164	Good	Maintenance required
U_075	Uncertain	Substitute value - Constant output
B_016	Bad	Sensor failure

The status codes can be found in Status on page 24.

### Error messages

In the case of exceptional events, error messages can appear during local operation and are displayed for around 10 seconds after the occurrence of the error.:

Error messages available		
Error code	Meaning	Corrective Action
F_001	Local operation disabled	Release HW Write Protection
F_002	Change of bus address not possible as the device is exchanging data with master class 1	End communication with master class 1
F_003	Change of PROFIBUS Ident Number not possible as the device is exchanging data with master class 1	End communication with master class 1
F_004	Value too large to fit in LCD display (>99999 or <-99999)	Change display value units
F_008	Local adjustment of parameters blocked by SIMATIC PDM	Enable "Local operation" with SIMATIC PDM

## Local Operation (Standalone)

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### Mode 2: Sensor test (default: OFF)



**Note:** Sensor Test should only be initiated when the process value is stable. A dramatic change of level in the vessel could cause a sensor failure message.

The Sensor Test checks the circuitry including the sensor, the signal path from the sensor to the transmitter, and the transmitter itself. While the sensor test is active, the sensor value increases by a specific offset. This is verified by the electronics.

There are three methods of activating a sensor test:

- locally, using the keypad
- locally, using a magnet
- remotely, via PROFIBUS PA

#### Keypad activated sensor test

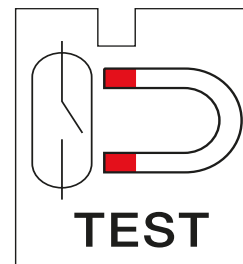
- Select Mode 2.
- Press  or  to start the test.
- After a few seconds, the display shows GOOD or FAILd.
- Press M to exit.

#### Magnet-activated sensor test <sup>1</sup>

To carry out a test without opening the lid or entering Mode 2, use a magnet.

- Bring the magnet close to the test area indicated on the housing.
- The sensor test starts, and finishes automatically after 10 seconds.
- The auxiliary reading displays either SENSOR TEST SUCCESSFUL, or SENSOR TEST FAILED, as rolling text.

<sup>1</sup>. Test magnet is supplied with the instrument.



#### Sensor test using PROFIBUS PA


- Please see Sensor Test on page 37 for details.

**Note:** Output state does not change when sensor test is initiated.





## Local Operation (Standalone)

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### Mode 4: Rise Time (default: 0.0 s)

Rise Time is a delay setting which adjusts the response time of the signal1 to the sensor becoming covered (Rising Edge). It affects the Primary Value of the Transducer Block. Possible values range from 0.0 to 100.0 s, in 0.1 s intervals. This symbol  to the left of the numerical value on the display indicates a Rise Time setting.





#### To set Rise Time:

- Select Mode 4.
- Press  or  to open Edit Mode.
- Press  to adjust the value digit by digit.
- Press  to save the value.
- Press M to exit.

### Mode 5: Fall Time (default: 0.0 s)

Fall Time is a delay setting which adjusts the response time of the signal1 to the sensor becoming uncovered (Falling Edge). It affects the Primary Value of the Transducer Block. Possible values range from 0.0 to 100.0 s, in 0.1 s intervals. This symbol  to the left of the numerical value on the display indicates a Fall Time setting.

#### To set Fall Time:



- Select Mode 5.
- Press  or  to open Edit Mode.
- Press  to adjust the value digit by digit.
- Press  to save the value.
- Press M to exit.

### Mode 10: HW Write Protection (default: OFF, display --)



**Note:** When HW Write Protection is enabled, L appears in the Mode display field, in normal measuring mode.

Protects parameters from unintentional modification. This prevents parameter changes both locally via the keypad and remotely via SIMATIC PDM. The parameters are still readable.

#### To enable HW Write Protection

- Select Mode 10.
- Press  or  to activate keylock and to disable operation: L appears in the numerical value field.
- Press M to exit.

#### To disable HW Write Protection



- Select Mode 10.
- Hold  and  simultaneously for more than 5 seconds: L disappears from the numerical value field
- Press M to exit.

## Local Operation (Standalone)

### Mode 13: Display Source (default: 0)

Determines which value will be displayed.

To select the display source from the options shown in the table below:

- Select Mode 13.
- Press  or  to select the value for the desired source.
- Press M to save the selection and exit

You can assign the physical unit in Mode 14, if Electronics Temperature is selected as the display source.

Display Source	Value	Auxiliary Reading	Units	Displayed Value
From Discrete Input Function Block: OUT	0	OUT	none	Bar graph and ON or OFF
From Transducer Block: Primary Value	1	PRIM	none	Bar graph and ON or OFF
From Transducer Block: Sensor Value	2	SENS	none	Bar graph and counts value
From Transducer Block: electronics temperature: Electronics temperature	3	TMP E	K, °C, °F, or °R	Temperature in units



### Mode 14: Unit (default: °C)

**Note:** Mode 14 becomes available only after Electronics Temperature is selected in Mode 13.

If Electronics Temperature is selected as the display source in Mode 13, you can change the corresponding physical unit by selecting one of the following options:

Physical Unit	Display
K	K
°C	°C
°F	°F
°R	°R

To set the physical unit:






- Select Mode 14: the primary reading field displays Unit, and the physical unit appears in the auxiliary reading field..
- Press  or  to select the desired physical unit
- Press M to save the selection and exit

## Local Operation (Standalone)

### Mode 15: Node address <sup>1</sup> (default: 126)

Sets the node address of the device on PROFIBUS. The permitted range is from 0 to 126. We recommend setting the range between 1 and 125.

To set the PROFIBUS node address:

- Select Mode 15: The current node address is shown in the primary reading field.
- Press  or  to open Edit mode
- Enter the node address in the permitted range: press  to change the value of each digit, and press  to move the cursor to the next digit.
- Press  after editing the least significant digit, to terminate the procedure and to save the value.
- Press M to exit.

**Note:**



- While the device is in cyclic data exchange with a class 1 Master, it is not possible to change the address. Abort the cyclic communication to change the address.
- Ensure that you set a unique node address to the device. Otherwise, the devices with the same addresses will cause confusion on the bus.

### Mode 16: PROFIBUS Ident Number <sup>1</sup> (default: 1)

Determines which of two device operating modes to select. It recognizes two operating modes in relation to the DP Master:

Mode	Description	
0	Conforms to profile version 3.0 Class B device with no extensions.	Generic: can substitute transmitters conforming to PROFIBUS PA profile 3.0, one Discrete Input Function Block.
1	Conforms to profile version 3.0 Class B device with extensions.	Device-Specific: full functional range with Discrete Input Function Block.

To set the device operating mode:

- Select Mode 16: The current device operating Mode (0 or 1) appears in the primary reading field.
- Press  or  to select the desired operating mode.
- Press M to save the selection and exit

<sup>1</sup>: Applies to PROFIBUS PA applications only. If in standalone application (no network), leave the node address at the default value.

### Mode 19: 0% Application Range setting

This point corresponds to the left limit of the bar graph in the digital display.  
 To adjust the 0% Application Range setting: see page 19 (for CN 8000) or 21 (for RF 8000)

### Mode 20: 1000% Application Range setting

This point corresponds to the right limit of the bar graph in the digital display.  
 To adjust the 0% Application Range setting: see page 19 (for CN 8000) or 21 (for RF 8000)



## Local Operation (Standalone)

### Mode 23: Alarm output trigger (default: dIAG)

The alarm output (solid-state switch) can be forced to switch for one of several reasons. The table below lists the possible triggers:

Selection message	Trigger description	Cause	Remark
OFF	Deactivated		
dIAG	Diagnosis (diagnostic interrupt)	Sensor Value above sensor range	
		Sensor Value below sensor range	
		Electronics temperature above nominal range	
		Electronics temperature below nominal range	
		Memory check of RAM, ROM, EEPROM not passed (test running in background)	
OUT_d	Output Value (process interrupt)	Logical Level (OUT parameter)	Affected by Application Range, upper and lower limits; Rise Time; Fall Time; and Inversion
ALERT	Diagnostic Alarm Limit exceeded	Sensor Value higher than Diagnostic Alarm upper limit	Diagnostic Alarm Limits are set with SIMATIC PDM

To select the trigger which will force the alarm output to switch:



- Select Mode 23. The current selection (OFF, dIAG, Out\_d, or ALERT) appears in the primary reading field.
- Press  or  until the desired selection message appears.
- Press M to save and exit.

### Mode 24: Contact type (default: CLOSE)

The solid state switch alarm output can function in one of two ways:

- Make contact (close)
- Break contact (open)

To select the contact type.

- Select Mode 24. The current contact type (OPEN or CLOSE) appears in the primary reading field.
- Press  or  to select the desired contact type.
- Press M to save and exit.



**WARNING:** If you change this parameter, the position of the switch changes immediately. Adapted applications or devices can react unintentionally.

**Note:** This adjustment is independent of the Inversion Output parameter of the Discrete Input Function Block, which can only be set remotely.


## Local Operation (Standalone)

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### Mode 25: Switch Point Off to On / Switch Point 1 / Rising Edge (default: 55%)

**Note:** Initial setup can be carried out prior to mounting into the process, but it is extremely important to calibrate the unit and adjust the sensitivity on the product itself.

Allows you to adjust the switch behavior by setting the percentage of the Application Range (defined in Mode 19 and Mode 20) at which point the logical switch will change from OFF to ON.

This symbol  appears to the left of the numerical value to indicate a Rising Edge value.








Switch Point 1 must have a value greater than or equal to the value for Switch Point 2.  
If you enter a lower value, Switch Point 2 will be adjusted to the same value.

The permitted range is limited by the distance of the Switch Point to the next Measuring Limit.

To view the current setting for Switch Point 1:

- Select Mode 25.
- The current setting appears in the primary reading field as a percent of the Application range (0 to 100%).
- Press M to exit, or:

To adjust the setting:

- Press  or .
- The display switches to the current measured Sensor Value as a percent of the Application Range (0 to 100%).
- Press  or  to open Edit mode: the Sensor value is frozen.
- Press  to edit the value of each digit, and press  to move the cursor to the next digit.
- After editing or leaving the least significant digit unchanged, press  to terminate procedure and save the new value.
- You see the new setting for Switch Point 1.
- Repeat the process, or press M to exit.

## Local Operation (Standalone)

### Mode 26: Switch Point On to Off / Falling Edge (default: 45%)

**Note:** Initial setup can be carried out prior to mounting into the process, but it is extremely important to calibrate the unit and adjust the sensitivity on the product itself.

Allows you to adjust the switch behavior by setting the percentage of the Application Range (defined in Mode 19 and Mode 20) at which point the logical switch will change from ON to OFF.








This symbol  appears to the left of the numerical value to indicate a Falling Edge value.

Switch Point 2 must have a value less than or equal to the value for Switch Point 1. If you enter a higher value, Switch Point 1 will be adjusted to the same value.

To view the current setting for Switch Point 2:

- Select Mode 26.
- The current setting appears in the primary reading field as a percent of the Application Range (0 to 100%).
- Press M to exit, or:

To adjust the setting:

- Press  or 
- The display switches to the current measured Sensor Value as a percent of the Application Range (0 to 100%).
- Press  or  to open Edit mode: the Sensor value is frozen.
- Press  to edit the value of each digit, and press  to move the cursor to the next digit.
- After editing or leaving the least significant digit unchanged, press  to terminate procedure and save the new value.
- You see the new setting for Switch Point 2.
- Repeat the process, or press M to exit.



### Mode 27: Local Status Text (default: U\_075)

Sets the format for representing Sensor Status. The default setting is a numeric format: one letter followed by an underscore and a decimal figure representing the status code (e.g. U\_075).

You can select between the numeric format described above, or text as English, German, French, Spanish, or Italian strings. The strings are represented as rolling text.

Language format	Display message
numeric	U_075
Italian	ItALI
Spanish	ESPAñ
French	FrAnC
German	dEUtS
English	EnGLI

To select the status format:

- Select Mode 27.
- The current setting is shown in the primary reading field.
- Press  or  to select a new format.
- Press M to save and exit



## Local Operation (Standalone)








### CN 8000 Switching Point Setup

Use the following procedure to set up the switch point for the CN 8000 model.

#### 1. Set the 0% Application Range Setting (Mode 19):

- Install the device in the process.
- Use the M button to navigate to Mode 19.
- Set up the process to provide the recommended condition for your process from the table below:








Application	Material	Setup conditions
General	<ul style="list-style-type: none"> <li>dry solids</li> <li>low viscosity liquids</li> </ul>	sensor uncovered; min. 100 mm (4") free space all around
Demanding	<ul style="list-style-type: none"> <li>hygroscopic / wet solids</li> <li>high viscosity and high conductivity liquids</li> </ul>	sensor immersed then uncovered; but retaining max. possible material buildup
Interface detection	<ul style="list-style-type: none"> <li>liquid A / liquid B</li> <li>foam / liquid</li> </ul>	sensor immersed in the material with the lowest dielectric constant

- Press  or . The display switches to the current measured sensor value in counts.
- Press  or  to enter Edit Mode; the sensor value is frozen and ready for editing.
- Set the sensor value to approximately 300 counts below the value of the current reading. Press  to edit the value of each digit, and press  to move the cursor to the next digit.
- After editing the least significant digit (or leaving it unchanged), press  to terminate the procedure and save the new value. The display now shows the new value for the 0% Application Range setting.
- Press M to exit.

#### 2. Set the 100% Application Range setting (Mode 20):

- Install the device in the process.
- Use the M button to navigate to Mode 20.
- Set up the process to provide the recommended condition for your process from the table below:

Application	Material	Setup conditions
General	<ul style="list-style-type: none"> <li>dry solids</li> <li>low viscosity liquids</li> </ul>	sensor fully covered
Demanding	<ul style="list-style-type: none"> <li>hygroscopic / wet solids</li> <li>high viscosity and high conductivity liquids</li> </ul>	sensor fully covered
Interface detection	<ul style="list-style-type: none"> <li>liquid A / liquid B</li> <li>foam / liquid</li> </ul>	sensor immersed in the material with the lowest dielectric constant

- Press  or . The display switches to the current measured sensor value in counts.
- Press  or  to enter Edit mode; the sensor value is frozen and ready for editing.
- Set the sensor value to to approximately 1000 counts above the value of the current reading..Press  to edit the value of each digit, and press  to move the cursor to the next digit.
- After editing the least significant digit (or leaving it unchanged), press  to terminate the procedure and save the new value. The display now shows the new value for the 100% Application Range setting.
- Press M to exit.

#### 3. Adjust the Off to On switch point (Mode 25):

- Use the M button to navigate to Mode 25.
- Set the value to 55% as a starting point.

## Local Operation (Standalone)

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### 4. Adjust the On to Off switch point (Mode 26):

- a. Use the M button to navigate to Mode 26.
- b. Set the value to 45% as a starting point.

**Note:**

A minimum hysteresis (difference between the Off to On switch point and the On to Off switch point) of 10% must be maintained for reliable operation. In some situations it may be desirable to increase the hysteresis between the two switch points to prevent false tripping (e.g. turbulence in the process).

### 5. Adjust the other parameters of the device as desired.

## Local Operation (Standalone)








### RF 8000 Switching Point Setup

Use the following procedure to set up the switch point for the RF 8000 model.

#### 1. Set the 0% Application Range Setting (Mode 19):

- a. Install the device in the process.
- b. Use the M button to navigate to Mode 19.
- c. Set up the process to provide the recommended condition for your process from the table below:








Application	Material	Setup conditions
General	<ul style="list-style-type: none"> <li>• dry solids</li> <li>• low viscosity liquids</li> </ul>	Material in tank should be at the lowest point it could reach during the normal process.
Demanding	<ul style="list-style-type: none"> <li>• hygroscopic / wet solids</li> <li>• high viscosity and high conductivity liquids</li> </ul>	Material in tank should be at the lowest point it could reach during the normal process. The sensor should have the minimum possible material build up
Interface detection	<ul style="list-style-type: none"> <li>• liquid A / liquid B</li> <li>• foam / liquid</li> </ul>	Material in tank should be at the lowest point it could reach during the normal process.

- d. Press  or . The display switches to the current measured sensor value in counts. Record the count value
- e. Press  or  to enter Edit mode; the sensor value is frozen and ready for editing.
- f. Set the sensor value to 95% of the value obtained in step 1d (0.95 x counts). Press  to edit the value of each digit, and press  to move the cursor to the next digit.
- g. After editing the least significant digit (or leaving it unchanged), press  to terminate the procedure and save the new value. The display now shows the new value for the 0% Application Range setting.
- h. Press M to exit.

#### 2. Set the 100% Application Range setting (Mode 20):

- a. Install the device in the process.
- b. Use the M button to navigate to Mode 20.
- c. Set up the process to provide the recommended condition for your process from the table below:

Application	Material	Setup conditions
General	<ul style="list-style-type: none"> <li>• dry solids</li> <li>• low viscosity liquids</li> </ul>	Material in tank should be at the highest point it could reach during the normal process.
Demanding	<ul style="list-style-type: none"> <li>• hygroscopic / wet solids</li> <li>• high viscosity and high conductivity liquids</li> </ul>	Material in tank should be at the highest point it could reach during the normal process.
Interface detection	<ul style="list-style-type: none"> <li>• liquid A / liquid B</li> <li>• foam / liquid</li> </ul>	Sensor immersed in the material with the highest dielectric constant

- d. Press  or . The display switches to the current measured sensor value in counts. Record the count value
- e. Press  or  to enter Edit mode; the sensor value is frozen and ready for editing.
- f. Set the sensor value to 105% of the value obtained in step 2d (1.05 x counts). Press  to edit the value of each digit, and press  to move the cursor to the next digit.
- g. After editing the least significant digit (or leaving it unchanged), press  to terminate the procedure and save the new value. The display now shows the new value for the 100% Application Range setting.
- h. Press M to exit.

## Local Operation (Standalone)

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### 3. Determine the switch point:

- Bring the process material to the desired switching level in the process.
- Record the count value displayed on the device.
- Calculate the trip point as a percent of process range:

$$\text{trip point (\%)} = \frac{(\text{counts recorded in step 3b} - M19)}{(M20 - M19)} \times 100$$

### 4. Adjust the Off to On switch point (Mode 25):

- Use the M button to navigate to Mode 25.
- Set the value to 5% above the trip point percentage calculated in step 3c as a starting point.

### 5. Adjust the On to Off switch point (Mode 26):

- Use the M button to navigate to Mode 26.
- Set the value to 5% below the trip point percentage calculated in step 3c as a starting point.

#### Notes:

- A hysteresis (difference between the Off to On switch point and the On to Off switch point) of 10% is used as an example of a typical setup. In some situations it may be desirable to increase the hysteresis between the two switch points to prevent false tripping (e.g. turbulence in the process).
- All parameters should be set up to account for a possible deviation of  $\pm 1\%$  of the actual measurement under reference conditions.

### 6. Adjust the other parameters of the device as desired.

## Remote Operation via PROFIBUS PA

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### Part 2:

### Digital Electronic module: Remote Operation via PROFIBUS PA

## Remote Operation via PROFIBUS PA

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**Note:** The following instructions assume that the user is familiar with PROFIBUS PA.

PROFIBUS PA is an open industrial protocol. Full details about PROFIBUS PA can be obtained from PROFIBUS International at [www.profibus.com](http://www.profibus.com)

RF 8000 / CN 8000 with Electronic module Digital is a Class B, Profile Version 3.01, PA device. It supports Class 1 Master for cyclic and acyclic data exchange, and Class 2 for acyclic services: (see Cyclic versus Acyclic Data on page 23 for details).

You will need a software package to configure RF 8000 / CN 8000. We recommend SIMATIC Process Device Manager (PDM) by Siemens. (You can find more information at [www.siemens.com/processinstrumentation](http://www.siemens.com/processinstrumentation). Select SIMATIC PDM from the Quick links to products drop-down list on the right hand side.)

### SIMATIC PDM

SIMATIC PDM is a software package used to commission and maintain RF 8000 / CN 8000 and other process devices.

SIMATIC PDM monitors the process values, alarms and status signals of the device and allows you to display, compare, adjust, verify, and simulate process device data.

### Electronic Device Description (EDD)

In order to use SIMATIC PDM with PROFIBUS PA, you will need the Device Description for Pointek CLS200/300 which will be included with new versions of PDM.

You can locate the Device Description in Device Catalog, under Sensors/Level/Capacitive/Siemens Milltronics. If you do not see Pointek CLS200/300 under Siemens Milltronics, you can download it from the Pointek CLS200/300 product page of our web site.

Go to: <http://pia.khe.siemens.com/index.asp?Nr=4924> and click on Downloads.

After downloading the DD file, you need to open PDM and click Options/Manage Device Catalog.

### Configuration

To configure a PROFIBUS Class 1 Master (for example, a PLC), you will need a GSD file.

#### The GSD file

The GSD file can be downloaded from either the Pointek CLS200/300 product pages on the web site: [www.siemens.com/level](http://www.siemens.com/level), under Downloads.

### Setting the PROFIBUS address

When your instrument is shipped, the PROFIBUS PA address is set to 126. You can set it locally (see Mode 15: Node address (default: 126), on page 13) or remotely via the bus, using a parameterization tool such as SIMATIC PDM or HW-Config. When cyclic data transfer with a Class 1 Master is in process, the address can only be changed via the bus.

#### Bus address (Device Address)

Values	Range: 0 to 126 (recommended setting between 1 and 125)
	Pre-set: 126

## Remote Operation via PROFIBUS PA

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### Bus Termination

**Note:** PROFIBUS PA MUST be terminated at both extreme ends of the cable for it to work properly. Please refer to the PROFIBUS PA User and Installation Guidelines (order number 2.092), available from [www.profibus.com](http://www.profibus.com)

### Power Demands

To determine how many devices can be connected to a bus line, calculate the combined maximum current consumption of all the connected devices (12.5 mA for RF 8000 / CN 8000). Allow a current reserve for safety.

### Cyclic versus Acyclic Data

When data is requested from a device via PROFIBUS PA, there are two data transfer methods. Cyclic data is requested and provided at every bus scan: acyclic data is requested and provided as needed.

- Input and output information is always requested at every bus scan and is set up as cyclic data.
- Configuration and maintenance information is needed infrequently, and is set up as acyclic data.

### Acyclic Data Transmission

RF 8000/ CN 8000 supports up to four simultaneous connections by a Class 2 Master (C2 connection). It supports one connection by a Class 1 Master (C1 connection).

### Cyclic Data Transmission

Cyclic data transmission transfers the user data relevant for process automation between the Class 1 Master (control or automation system) and the transmitter.

When you configure RF 8000/ CN 8000 on the PROFIBUS PA bus, there is one slot available for modules, and the Level Status module is automatically inserted.

## Transmission of user data via PROFIBUS PA

The user data is continuously updated by the cyclic service of PROFIBUS PA. The user data is the OUT parameter of the Discrete Input Function Block and is composed of the Logical Level and Status bytes.

The 2 bytes must be read consistently <sup>1</sup>, in a contiguous chunk: they must not be read byte by byte, and must not suffer an interrupt. If you are using an S7-300 / 400, you will need to use SFC14 DPRD\_DAT: Read Consistent Data of a Standard PD Slave.

Byte	Out
Byte 1	Logical Level
Byte 2	Status <sup>a</sup>

<sup>1</sup> Consistent in this context means all-at-one-time.

<sup>a</sup> If Condensed status is turned on (default), then the condensed status appears here.

### Logical Level

The Logical Level indicates the level of the material.

Inversion	Sensor Status	Logical Level
OFF	uncovered	= 0 (zero)
OFF	covered	= 1

## Remote Operation via PROFIBUS PA

### Status

Status provides information via the status byte, on the usability of the measured value in the PLC/DCS <sup>1</sup>, the device status, and additional process information (for example, process alarms).

<sup>1</sup> Programmable Logic Controller/Distributed Control System.

### Status Byte

The status byte is a standardized code returned by a PROFIBUS slave on every bus scan, along with the main process variable (output of the Analog Input Function Block).

- The status code indicates whether the process variable is valid or not.
- It also indicates other process-related information.

### Status Codes

The codes for the Status bytes are listed in the following tables. Possible causes for an error are shown, along with measures to correct it.

If the language selected for the display is numeric, a status code will be displayed. If any other language has been selected, a status description will be displayed.

**Note:** For more detail, please consult the PROFIBUS PA User and Installation Guideline (order number 2.092), available for download from [www.profibus.com](http://www.profibus.com).

Status Codes for Good Quality				
Hex	Digital display	PDM display	Possible Cause	Corrective Measure
80	---	Good	Normal operation	---
84	G_132	Good; Active block alarm	A parameter relevant for the behavior of the device has been changed. The display is extinguished after 10 seconds.	Note to the control system
8D	G_141	Good; Active critical alarm; Limit underflow	The Sensor Value exceeds the Lower Diagnostic Alarm Limit <sup>a</sup>	Check installation and sensor adjustment.
8E	G_142	Good; Active critical alarm; Limit overflow	The Sensor Value exceeds the Upper Diagnostic Alarm Limit <sup>a</sup>	Check installation and sensor adjustment.
A4	G_164	Good; Maintenance required	Maintenance interval has expired	Maintenance work, electronics servicing, or sensor servicing, is required.

<sup>a</sup> Set via PROFIBUS PA, in counts (see Counts on page 39 for details).



## Remote Operation via PROFIBUS PA

Status Codes for Bad Quality				
Hex	Digital display	PDM display	Possible Cause	Corrective Measure
00	---	Bad	Is used if no other information is available	---
0F	B_015	Bad; Device failure; Value constant	Device has an irreparable Error.	Replace the electronics.
10	B_016	Bad; Sensor failure	Sensor test failed	Check sensor
11	B_017	Bad; Sensor failure; Limit underflow	Sensor shows an error. Measured level too small	Check sensor
12	B_018	Bad; Sensor failure; Limit overflow	Sensor shows an error. Measured level too high	Check sensor
1F	B_031	Bad; Out of service; Value constant	The function block is put out of order with a target mode command. A parameterized safety value is supplied.	For normal operation, reset the target mode to "AUTO".

Status Codes for Uncertain Quality				
Hex	Digital display	PDM display	Possible Cause	Corrective Measure
40	U_064	Uncertain	Sensor test in progress; no error detected.	To return to normal operation, deactivate sensor test.
47	U_071	Uncertain, Last usable value, Value constant	"Fail Safe" input condition is met; the parameterized safety setting is set to "keep last valid value".	Consult the log of measured data.
4B	U_075	Uncertain, Substitute value, Value constant	Value is not an automatic measured value. This identifies a parameterized, static substitute value or a preset value.	Consult the log of measured data.
4F	U_079	Uncertain, initial value, Value constant	After run-up, an initial value is entered in the device memory.	Reject the value in the user program.
50	U_080	Uncertain, Value inaccurate	Unreliable operating parameters or maintenance alarm	Check the operating parameters, e.g. the permitted ambient temperature. Immediate maintenance work required.

## Remote Operation via PROFIBUS PA

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### Diagnostics

In addition to information on the usability of the measured value, RF 8000 / CN 8000 can actively report information on its own status. Diagnostics are important information, which an automation system can use to introduce remedial measures.

Standard PROFIBUS DP mechanisms are used to transport diagnostic information and actively report it to the Class 1 Master. For this, PROFIBUS DP provides a protocol to transmit information ranked higher than user data to the Class 1 Master.

The content of the "Device status" parameter from the physical block is reported and, in addition, information on whether a change of status has occurred (event arrived/ event gone). The diagnostic object consists of 10 bytes (4 bytes standard diagnostics and 6 bytes Extended diagnostics).

## Remote Operation via PROFIBUS PA

### Standard diagnostics

Diagnostic Messages				
Byte	Bit	Meaning when value = 1	Possible Cause	Corrective Measure
Byte 0	0	---		
	1	---		
	2	---		
	3	Electronics temperature is too high	The temperature of the measuring transducer electronics (which is monitored by the measuring transducer) exceeds 85°C.	Reduce the ambient temperature to within the permissible range
	4	Memory error	An error has been found. (During operation, the memories are constantly checked for check sum errors and read/ write errors.)	Replace the electronics.
	5	Measurement failure	Either the sensor has failed, or the sensor limits are being exceeded.	Have the sensor checked by the service department.
	6	---		
	7	---		
Byte 1	0	---		
	1	---		
	2	---		
	3	Restart (goes to 0 after 10 s)	The supply current has been fed to the device; or a warm start <sup>a</sup> has been triggered using SIMATIC PDM; or the internal watchdog has expired.	Check the cabling and the power unit
	4	Coldstart <sup>b</sup> (goes to 0 after 10 s)	The device has been reset to its factory settings.	
	5	Maintenance required	A service interval has expired	Service the device, and reset the messages using SIMATIC PDM.
	6	---		
	7	Ident Number violation	You have changed the parameter PROFIBUS Ident Number during cyclic operation. The device is reporting the violation of the Ident number and showing you a preliminary failure warning. In the case of a warm restart, the device will no longer participate in cyclical communication of reference data without a change in the system configuration.	Adjust the configuration data (change of GSD), so that it is consistent with the Ident number set in the device.
Byte 2	0	Maintenance alarm	Device requires maintenance	Maintenance action required
	1	Maintenance demanded	Device requires immediate maintenance or a failure will occur.	
	2	Function check		
	3	Invalid process conditions		
Byte 3	7	Extended diagnostics available		

<sup>a</sup> With a warm start, the volatile data is preserved.

<sup>b</sup> With a cold start, all volatile data is lost.

## Remote Operation via PROFIBUS PA

### Extended diagnostics

Extended Diagnostic Messages			
Byte	Bit	Meaning	Corrective Action
0	0	Electronic temperature exceeds permissible range	Bring temperature of electronics module to within allowed range
	2	Sensor value exceeds diagnostic alarm limits	Either adjust diagnostic alarm limits or remove cause of out of range sensor value
	3	Calibration timer, unacknowledged alarm	Perform calibration and timer will automatically be reset
	4	Calibration timer, unacknowledged warning	
	5	Service timer, unacknowledged alarm	Perform service and reset timer using SIMATIC PDM
	6	Service timer, unacknowledged warning	
2	6	Sensor value exceeds sensor limits	Perform service on sensor or replace unit
	7	Sensor Test Running	Wait for sensor test to finish, then remove test magnet from device housing
3	1	Memory checksum error	Device is defective; replace unit
	2	Sensor test failed	Sensor is defective; replace sensor
	3	Sensor value simulation	To return to normal operation, disable the simulation with SIMATIC PDM
	4	Simulation: Electronic temperature	To return to normal operation, disable the simulation with SIMATIC PDM
	5	Simulation: Digital input in simulation	To return to normal operation, disable the simulation with SIMATIC PDM
	6	Digital Input in Manual mode	To return to normal operation, disable the simulation with SIMATIC PDM; reset the block mode of the Digital Input Function Block
	7	Simulation: Diagnosis	To return to normal operation, disable the simulation with SIMATIC PDM

Note: The instrument status can be simulated using SIMATIC PDM. This allows you to test the reaction of the automation system to errors.

## Remote Operation via PROFIBUS PA

### Self tests

RF 8000/ CN 8000 carries out the following self tests:

Self Tests				
Self test function	Algorithm	Frequency	Diagnostic error message	Corrective measure
Measure the electronics temperature	If electronics temperature exceeds 85 °C	Every measurement cycle/ 60 ms	Electronics temperature too high	Reduce ambient temperature to within permissible range
RAM test	Writing and verifying every cell with a byte (walking one and walking zero <sup>a</sup> ) to detect defect cells and crosstalk	45 s	Memory error	Replace the electronics.
Code test	Summarizing the bytes and comparison with a checksum	45 s	Memory error	Replace electronics and, if necessary, measuring cell.
Sensor test	If measurement returns a value outside the sensor range determined by Measuring Limits	every measurement cycle/ 60 ms	Measurement failure	Have sensor checked by service department
Check service timers	If a service timer reaches the parameterized warning or alarm limit	60 ms	Maintenance required	Carry out servicing and reset messages using SIMATIC PDM.
Watchdog trigger	The program must pass specific checkpoints. If all checkpoints are not passed within a specific time, the watchdog timer expires and a restart will be carried out	2 s	Restart	Check cabling and power unit to ensure the power supply to RF 8000 / CN 8000

<sup>a</sup> A walking one and zero is a method of checking each bit in each location of volatile memory.

Values of the DIAGNOSIS bit:

0 = not set

1 = set

## Configuration Example

To configure and use PROFIBUS PA with an S7-300/ 400 PLC

1. If Pointek CLS200/300 is not listed in the STEP 7 device catalog, you can download the DeviceInstall file from the Siemens Milltronics Web site and run it from your computer.  
Go to <http://pia.khe.siemens.com/index.asp?Nr=4924> and click Downloads.
2. Add the Pointek CLS200/300 "rack": click and drag the Pointek CLS200/300 folder from the hardware catalog.
3. Fill the rack with desired modules, by dragging and dropping them from the hardware catalog.
4. After configuring PROFIBUS PA in steps 2 and 3, download it to the PLC.

Add code to the PLC program to read data consistently using the SFC14.

## Remote Operation via PROFIBUS PA

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### PROFIBUS PA Parameters

**! WARNING:** It is essential to check settings during the process itself, and confirm that they are correct, before regular operation commences.

The full range of RF 8000 / CN 8000 functions is available only via remote operation using PROFIBUS PA. To use PROFIBUS PA, you will need a PC configuration tool: we recommend SIMATIC PDM. For more information see SIMATIC PDM on page 22.

### Measured Values

In measuring operations, measured values such as the logical level are provided via PROFIBUS PA. They can be viewed via PROFIBUS PA, and on the LCD display. To view values via PROFIBUS PA open the menu View – Display, and select one of the following tabs:

Measured value source	Description
Output	Output value On (covered) or Off (uncovered)
TB <sup>2</sup> Discrete Input Part 2	Discrete Sensor Value On (covered) or Off (uncovered) as well as Primary Value (On or Off)
TB <sup>2</sup> Discrete Input Part 1	Sensor value represented in counts <sup>1</sup> as well as a dynamic representation of level as a percentage of the application range.
Electronics Temperature	Internal temperature of the electronics.

For instructions on selecting the display source for the LCD, see Display Source for local operation on page 38.

<sup>1</sup> For more detail see Counts on page 39.

<sup>2</sup> TB - Transducer Block

### Functions

The device menu gives you access to the following functions:

- Upload from/Download to the device
- Set Address
- Master Reset
- Write Locking
- Sensor Test
- Simulation
- Condensed Status Setup

## Remote Operation via PROFIBUS PA

### Changing parameter settings

**Note:** Initial setup can be carried out prior to mounting into the process, but it is extremely important to calibrate the unit and adjust the sensitivity on the product itself.

- First launch SIMATIC PDM, connect to Pointek CLS200/300, and upload data from the device (the status fields change to Loaded).
- Adjust parameter values in the parameter value field.
- After adjusting the value, press Enter (the status fields read Changed).
- When you have completed the adjustments, open the menu Device – Download data to Device then go to File – Save to save parameter settings offline (the status fields are cleared).

Parameter	Value	Unit	Status
<b>Pointek CLS200</b>			
DD Version	1.01.08-000		Initial val
» Identification			
» » Operation Unit			
TAG	Pointek CLS200		
Descriptor	.		Initial val
Message	.		Initial val
» » Device			
Manufacturer	Siemens Milltronics		Initial val
Product designation	Pointek CLS200		Initial val
Device Serial Num	0		Initial val
Software Revision	0300.01.01		Initial val
Hardware Revision	01		Initial val
Profile Revision	3.0		Initial val
PROFIBUS Ident Number	Manufacturer specific		Initial val
Installation Date	xx.xx.xxxx		Initial val
Ordernumber	7ML560...		Initial val
» » Parametrization			
Date			Initial val
Executor			Initial val
» Input			
» » Transducer Block: Discrete Input			
» » » Measuring Limits			
Lower Value	5714	digits	Initial val
Upper Value	53333	digits	Initial val
» » » Range of Application			
0%	5714	digits	Initial val
100%	53333	digits	Initial val
» » » Switch Behaviour			
Switch Point 1 (Off->On)	75	%	Initial val
Switch Point 2 (On->Off)	25	%	Initial val
» » » Delay			
Rise Time (Off->On)	0	s	Initial val
Fall Time (On->Off)	0	s	Initial val
» » » Diagnostic Alarm Limits			
Lower Limit	5714	digits	Initial val
Upper Limit	53333	digits	Initial val
» » » Transducer Block: Electronics Temperature			
» » » » Measuring Limits			
Temperature Unit	°C		Initial val
Lower Value Min	-40.0	°C	Initial val
Upper Value Max	85.0	°C	Initial val
» Output			
» » Function Block: Discrete Input			
» » » Inversion			
Inversion Output	Off		Initial val
» » » Fail Safe Mode			
Fail Safe Mode	Storing last valid Output Value.		Initial val

Press F1 for help. Specialist No connection NUM

## Remote Operation via PROFIBUS PA

### Filling level status

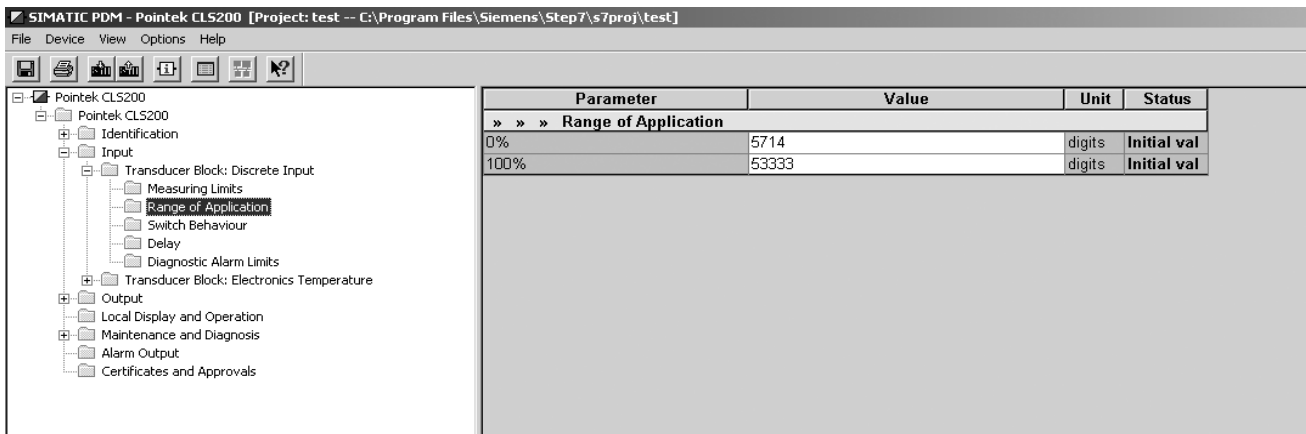
#### Adjust 0 % application range setting

The lower limit of the application range (0%) corresponds to the left limit of the bar graph in the digital display.

For reliable and accurate detection of the process material, select the example in the table below that most closely resembles your application, and follow the setup procedure.

Application	Material	Setup procedure
General applications	dry solids low viscosity liquids	Sensor uncovered and a minimum of 100 mm (4") free space all around
Demanding applications	hygroscopic / wet solids high viscosity and high conductivity liquids	Sensor immersed and then uncovered, but retaining as much build up of material as possible on the sensor.
Interface detection	liquid A / liquid B foam / liquid	Immerse the sensor in the material that has the lowest relative dielectric constant.

1. Follow the setup procedure that most closely resembles your application.
2. Open the menu View – Display and select the tab Transducer Block: Discrete Input (Part 1). Make a note of the Sensor\_Value (digits)
3. Close Display window, and enter the sensor value (recorded in the previous step) to the Value field:  
 > Input > Transducer Block: Discrete Input > Range of Application > 0%.  
 Press Enter: the status field reads Changed.



The screenshot shows the SIMATIC PDM software interface for a Pointek CL5200 device. The left pane displays a tree view of the configuration structure, with 'Range of Application' selected under 'Transducer Block: Discrete Input'. The right pane shows a table of parameters:

Parameter	Value	Unit	Status
» » » Range of Application			
0%	5714	digits	Initial val
100%	53333	digits	Initial val

4. If no more settings need adjusting, download the data to the device and save the parameter settings offline (the status fields go blank). Otherwise, continue to adjust other parameters as required.



## Remote Operation via PROFIBUS PA

### Adjust 100 % application range setting

Adjusts the upper limit of the application range (100%). This point corresponds to the right limit of the bar graph in the digital display.

For reliable and accurate detection of the process material, select the example in the table on page 33 that most closely resembles your application, and follow the setup procedure.

Application	Material	Setup procedure
General applications	dry solids low viscosity liquids	Sensor fully covered
Demanding applications	hygroscopic / wet solids high viscosity and high conductivity liquids	Sensor fully covered
Interface detection	liquid A / liquid B foam / liquid	Immerse the sensor in the material that has the highest relative dielectric constant

1. Follow the setup procedure that most closely resembles your application.
2. Open the menu View – Display and select the tab Transducer Block: Discrete Input (Part 1). Make a note of the Sensor\_Value (digits)
3. Close Display window, and copy the sensor value to the parameter view field:  
 > Input > Transducer Block: Discrete Input > Range of Application > 100%.  
 Press Enter: the status field reads Changed.
4. If no more settings need adjusting, download the data to the device and save the parameter settings offline (the status field goes blank). Otherwise, continue to adjust other parameters as required.

### Inversion

When Inversion Output = On, the level status undergoes a logical inversion. If you want to invert the logic of the level status:

- Go to Output > Function Block: Discrete Input > Inversion Output > Off or On
- Press Enter: the status field reads Changed

### Delay

You can adjust the timing behavior of the transmitter using two independent delay times.

- Rise Time (Off to On) determines the delay of the signal flow from the moment the sensor becomes covered until the Primary Value is set.
- Fall Time (On to Off) determines the delay of the signal flow from the moment the sensor becomes uncovered until the Primary Value is reset.

The delay timers have a range of values from 0.0 to 100.0 seconds.

- Go to Input > Transducer Block: Discrete Input > Delay > Rise Time (Off to On) and set the value from 0 to 100 seconds.
- Go to Fall Time (On to Off), and set the value from 0 to 100 seconds
- Press Enter: the status field reads Changed..

#### Note:

If the sensor status changes before the delay interval is complete, the timer is reset to its initial value and restarted.

## Remote Operation via PROFIBUS PA

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### Failsafe Mode

If the Transducer Block delivers a measured value accompanied by a status message classifying the quality as bad (for example Bad, sensor failure), the Discrete Input Function Block can react with one of three possible preset options.

Failsafe Mode	Description
The default value is used as the output value.	The predefined preset safety value is output (status code U_075).
Store the last valid output value.	The last valid output value is output (status code U_071).
The calculated output value is incorrect.	The bad output value is accompanied by the status which the Transducer Block assigns to it (B_0xx).

Set the fault behavior in the Discrete Input Function Block:

- Go to Output > Function Block: Discrete Input > Fail Safe Mode > Fail Safe Mode and select one of the 3 options.
- Press Enter: the status field reads Changed

You can use SIMATIC PDM to determine the fault location by looking at the Input and Sensor Values of the Transducer Block.

### Simulation

Simulation functions are helpful when you are installing the transmitter.

- You can create process values without recording actual values.
- You can use the full range of values of the simulated process values.
- You can simulate errors.

The LCD displays Si in the Mode display when Simulation is activated.

### Output simulation

Output simulation allows you to provide process values for the cyclic class 1 Master, to test how the automation program processes those values.

Carry out the following settings:

1. Open the Device Menu Simulation.
2. Select the register Output.
3. Set the target mode to MAN (manual).
4. Enter the desired output value, the quality and the status.
5. Transfer the settings to the device.
6. You can view the output behavior, for example with SIMATIC PDM (open the View Menu Display).
7. To return to normal operation, reset the target mode to AUTO and press Transfer.

### Input (Primary Value) simulation

Input Value simulation allows you to test the effects on the Primary Variable of your preset inversion and failsafe settings, and see how the output value is affected.

Carry out the following settings:

1. Open the Device Menu Simulation
2. Select the register Input.
3. Set the simulation mode to Enabled.
4. Enter the desired input value, the quality and the status.
5. Transfer the settings to the device.
6. You can view the output behavior, for example with SIMATIC PDM (open the View Menu Display).
7. To return to normal operation, reset the simulation mode to Disabled and press Transfer.

## Remote Operation via PROFIBUS PA

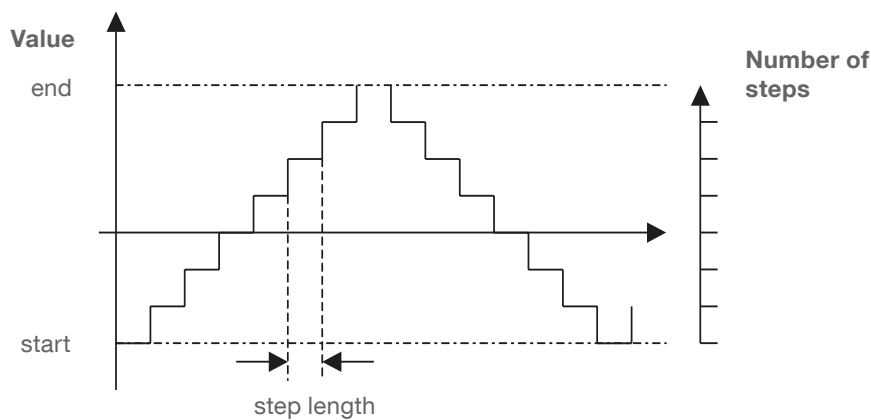
### Sensor Value Simulation

By simulating the Sensor Value as a fixed value or as a parameterizable slope, you can test:

- the reaction to the Measuring Limits being exceeded
- the logic switch behavior
- the behavior of the delay timers

With a parameterizable slope you can make the simulation value dynamic. It runs from a starting value to an end value in a step function, dwelling on each step for the preset period of time. At the end value the direction is reversed.

#### Parameterizable slope



Carry out the following settings:

1. Open the Device Menu Simulation.
2. Select the register Sensor Value.
3. Set Simulation Sensor Value, then set the parameters:
  - for simulation mode fixed, enter a Sensor Value
  - for simulation mode ramp, adjust the ramp parameters
4. Transfer the settings to the device.
5. You can view the behavior of the Sensor Value Discrete, the Input (Primary) Value, and the Output, in SIMATIC PDM (open the View Menu Display, and select the register Transducer Block: Discrete Input Part I).
6. To return to normal operation, turn off Simulation Sensor Value and press Transfer.

### Electronics temperature Simulation

By simulating the electronics temperature, you can test the effect of excessive temperatures on the measuring results:

1. Open the Device Menu Simulation
2. Select the register Electronics Temperature.
3. Set Simulation Electronic Temperature, then set the parameters:
  - either enter a fixed value for Electronics Temperature fixed
  - or adjust the ramp parameters for Electronic Temperature ramp
4. Transfer the settings to the device.
5. You can view the reaction in the status of the measured values (input and secondary variables), and the output, using SIMATIC PDM (open the View Menu Display and select the appropriate register).
6. To return to normal operation, turn off Simulation Electronic Temperature and press Transfer.

## Remote Operation via PROFIBUS PA

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### Drag indicators (Peak indicators)

Two pairs of drag indicators allow you to monitor the negative and positive peak values for the measured values Sensor Value and Electronics Temperature.

- Open the View Menu Drag Indicators.
- To reset the peaks to the actual measured value, click the appropriate Reset button.
- Press Enter: the status field reads Changed

### Operating hours

An operating hours meter for the electronics is activated when the transmitter is first started.

- Open the View Menu Operating hours.

### Switch Point adjustment

There are two switch points:

- Switch point 1 (Off to On)
- Switch point 2 (On to Off)

To adjust the switch behavior, set the percentage of the application range <sup>1</sup> at which point the logic switch will change from OFF to ON, or from ON to OFF.

- The application range must be defined first (see Adjust 0 % application range setting: and Adjust 100 % application range setting on page 31. Ensure your setup procedure follows the guidelines for the application which most resembles your operation).
- Open the menu View–Display, and select the register Transducer Block: Discrete Input, to view the actual Sensor Value, the Sensor Value Discrete, the actual valid Switch Point and Hysteresis
- Go to Input > Transducer Block: Discrete Input > Switch behavior.
- Edit the value of Switch Point 1 in the “Switch Point” field.
- Edit the value of Switch Point 2 to adjust the Hysteresis
- Click on Transmit.
- Track the effect of the adjustment by looking at the Sensor Value Discrete.

<sup>1</sup> The application range is defined by the 0% and 100% settings (see page 32).

### Device Reset

To reset the device, open the Device Menu Master Reset. The three reset options are:

- Factory reset (Restart/cold startup)
- Warm start (new start-up)
- Resetting the PROFIBUS address to 126

#### Factory Reset (Restart/cold startup)

If RF 8000 / CN 8000 has been adjusted to such an extent that it can no longer fulfil its measuring tasks, you can use Factory Reset to recreate the delivery status. It resets most parameters to the factory setting.

During a Factory Reset, a check mark appears against the diagnostic message Restart (cold startup) carried out for about ten seconds, and the LCD displays UPDATE ALERT, as rolling text in the auxiliary reading field.

## Remote Operation via PROFIBUS PA

### Warm start (new start-up)

A Warm start (new start-up) disconnects RF 8000 / CN 8000, and restarts it. Communication is interrupted and re-established.

You will need this function if, for example, during communication with a cyclic Master, the PROFIBUS address has been changed.

During a Warm start, a check mark appears against the diagnostic message New startup (warm startup) carried out for a few seconds. As long as there is no measured value result, the automation or control system records the status Uncertain, initial value, Value constant.

### Resetting the PROFIBUS address to 126

If no other device in your system has the preset address 126, you can extend the PROFIBUS PA line during operation of the automation or control system, with an additional RF 8000 / CN 8000 with the address 126. The only requirement is to change the address of the new integrated device to another value lower than 126.

If you remove a RF 8000 / CN 8000 from the PROFIBUS channel, you should use this function to reset its address to 126 so that, if required, it can be reintegrated into this or another system.

### Lock

Secures RF 8000 / CN 8000 from changes.

Lock Options			
Parameter name	Effect	Turn on/off	Digital display
HW Write Protection	Parameter changes using SIMATIC PDM, and settings via local operation, are both disabled. Independent of the other lock functions.	Keypad Mode 10	L
Write locking	Prevents parameter changes via the bus. Local operation is possible.	SIMATIC PDM Online dialog: Write locking	Lc
Local Operation	If local operation is disabled, no access is possible using the keypad. Independently of this parameter, local operation is automatically enabled 30 s after a communication failure. Once communication has been reestablished, the parameter Local Operation in the device is reset to the original setting.	SIMATIC PDM Local Operation	LA

You can also combine the locking functions

HW Write Protection	Write locking	Local Operation	Digital display
Off	Off	enabled	
On	On or Off	enabled or disabled	L
Off	Off	disabled	LA
Off	On	disabled	LL
Off	On	enabled	Lc

### Sensor Test

Open the Device Menu to find and activate the Sensor Test via PDM, and to see the results (test successful, or test failed).

## Remote Operation via PROFIBUS PA

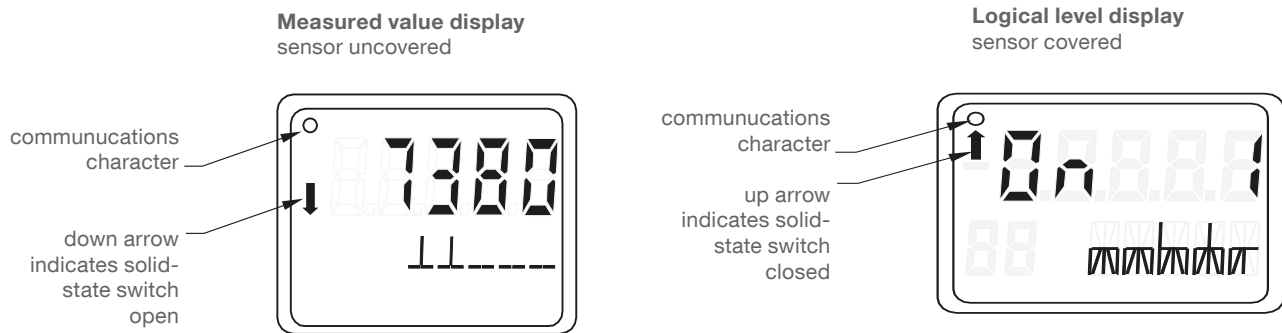
### Display Source for local operation

You can select one of four options for the value to be displayed on the LCD:

- Output value
- Primary Value
- Sensor Value
- Electronics Temperature.

Go to Local Display and Operation > Display Source and select from the pull-down tab.

The measured value display shows the value (in counts) when Sensor value is selected. The logical level display shows the value On or Off when Output value is selected. When communication with a master is in progress, this is indicated by the communication character o on the digital display. (For more details see RUN mode display on page 5)



## Technical Reference

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### High Frequency Oscillator

The RF 8000 / CN 8000 is equipped with a high frequency oscillator which responds to the capacitance. The inverse of frequency is proportional to the capacitance.

A small change in capacitance results in a large change in frequency which is easy to detect, resulting in high resolution and accuracy.

### Counts

Frequency is always represented in 'counts', a dimensionless, uncalibrated value generated from the inverse of frequency. The measured value is displayed in counts. (If you are using PROFIBUS PA, you can set the measuring limits, in counts.)