EN

AW02

Analog Evaluation Unit

Operating Instructions

Translation of the Original Operating Instruction
Subject to change without notice
Available as PDF version only
Status: 12.02.2018
www.wenglor.com

Table of Contents

1. Proper Use

This device is used to evaluate voltage values from 0…10 V of two analog Sensors.

2. Safety Precautions

- This operating instruction is part of the product and must be kept during its entire service life.
- Read this operating instruction carefully before using the product.
- This product is not suitable for safety applications.
- Installation, start-up and maintenance of this product has only to be carried out by trained personnel.
- Tampering with or modifying the product is not permissible.
- Protect the product against contamination during start-up.
- Not a safety component in accordance with the EU Machinery Directive.

3. General Information Regarding the Device

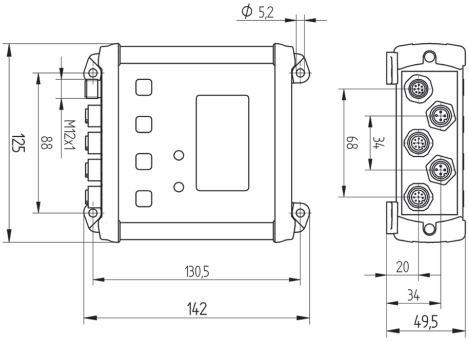
The AW02 evaluation unit with DSP technology is capable of processing voltage values (0 to 10 V) from two analog Sensors of the same type. The signals are processed by the evaluation unit such that measurement results can be read out from two outputs either as a switching signal or as an analog value. The individual functions can be configured, and Sensor and application related settings can be selected with the help of the four control keys and the LCD panel. Measurement results appear at the display. Displayed units of measure can be freely selected (volts, meters, bar, °C etc).

Evaluation functions:

- Thickness measurement
- Height measurement
- Differential measurement
- Imbalance measurement
- Volumetric flow measurement

4. Device Features

4.1 Housing Dimensions



4.2 EU Declaration of Conformity

The EU declaration of conformity can be found on our website at www.wenglor.com in the product's download area.

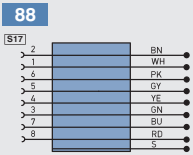
Environmental Type 1

4.3 Technical Data

Electrical Data	
Supply Voltage	18…30 V DC
Current Consumption (Ub = 24 V)	100 mA
Measuring rate	5000/s
Temperature Range	–10…50 °C
Switching Outputs	2
PNP Switching Output/Switching Current	400 mA
PNP Error Output/Switching Current	400 mA
Analog Output	0…10 V
Short Circuit Protection	yes
Reverse Polarity Protection	yes
Interface	RS-232
Baud Rate	38,4 kBd
Resolution	< 5 mV
Analog Inputs	2
Analog Input	0…10 V
Protection Class	III
Mechanical Data	
Housing	Aluminum
Degree of Protection	IP65
Connection	M12×1, 8-pin
Error Output	yes
PNP NO/NC switchable	yes
Analog Output	yes

4.4 Complementary Products

wenglor offers Connection Technology for field wiring.

Suitable Connection Technology No.	
Interface Cable S232W3	

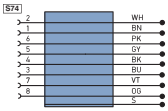
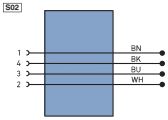
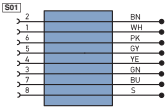
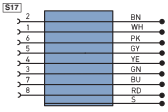
4.5 The Control Panel

ESC → Switch to main menu: The current operation is aborted without saving data.
Enter → Select a menu item or acknowledge a selected value.
Up → Navigation within the menu, adjust values (press and hold the respective key until the desired value is reached.)
Down → Navigation within the menu, adjust values (press and hold the respective key until the desired value is reached.)

4.6 Pin Assignments

4.6.1 Input Pin Assignments

Selecting the right Connection Diagram for the Sensor is described in the section entitled **Initial Start-Up.** The wire colors listed in the table are only valid if the appropriate wenglor connector cables are used.

Connection Diagram No.	Input Pin Assignments
531	
501, 510, 755, 782	
503, 506, 514, 529, 504, 508	
516	
182, 183, 184, 188	

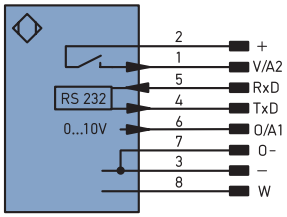
Connecting plug devices:
4-pin plug devices: BG2SG2V1-xxx connector cable
BW2SG2V1-xxx connector cable
8-pin plug devices: BG88SG88V2-xxx connector cable

Connecting cable devices:
Sensors with 4 conductor connector cable: 4-pin M12×1 plug; S03G
Sensors with 8 conductor connector cable: 8-pin M12×1 plug; SG80-ME or SW80-ME

4.6.2 Output Pin Assignments

Output “Out”

515



Legend

+	Supply Voltage +
–	Supply Voltage 0 V
~	Supply Voltage (AC Voltage)
A	Switching Output (NO)
Ā	Switching Output (NC)
V	Contamination/Error Output (NO)
V̄	Contamination/Error Output (NC)
E	Input (analog or digital)
T	Teach Input
Z	Time Delay (activation)
S	Shielding
RxD	Interface Receive Path
TxD	Interface Send Path
RDY	Ready
GND	Ground
CL	Clock
E/A	Output/Input programmable
	IO-Link
PoE	Power over Ethernet
IN	Safety Input
OSSD	Safety Output
Signal	Signal Output
Bl_D+/-	Ethernet Gigabit bidirect. data line (A-D)
EN0 RS422	Encoder 0-pulse 0-0̄ (TTL)
PT	Platinum measuring resistor
nc	not connected
U	Test Input
Ū	Test Input inverted
W	Trigger Input
O	Analog Output
O–	Ground for the Analog Output
BZ	Block Discharge
AMV	Valve Output
a	Valve Control Output +
b	Valve Control Output 0 V
SY	Synchronization
E+	Receiver-Line
S+	Emitter-Line
⏚	Grounding
SnR	Switching Distance Reduction
Rx+/–	Ethernet Receive Path
Tx+/–	Ethernet Send Path
Bus	Interfaces-Bus A(+)/B(–)
La	Emitted Light disengageable
Mag	Magnet activation
RES	Input confirmation
EDM	Contactor Monitoring
ENA RS422	Encoder A/Ā (TTL)
ENB RS422	Encoder B/B̄ (TTL)
ENA	Encoder A
ENB	Encoder B
AMIN	Digital output MIN
AMAX	Digital output MAX
AOK	Digital output OK
SY In	Synchronization In
SY OUT	Synchronization OUT
OLT	Brightness output
M	Maintenance

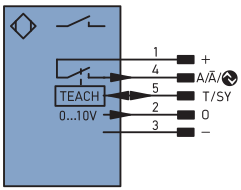
Wire Colors according to DIN IEC 757

BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue
VT	Violet
GY	Grey
WH	White
PK	Pink
GNYE	Green/Yellow

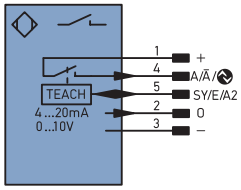
4.7 Connectable Sensors

The evaluation units is suitable for Sensors with 4 and 8-pin plugs which correspond to the following Connection Diagrams: 182, 183, 184, 188, 501, 503, 506, 507, 510, 514, 516, 529, 531, 755 or 782.

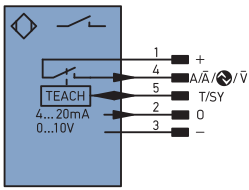
182



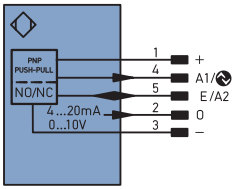
183



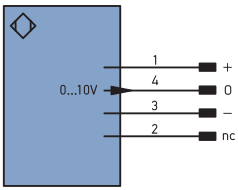
184



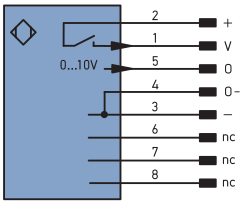
188



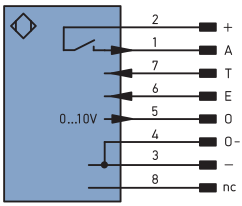
501



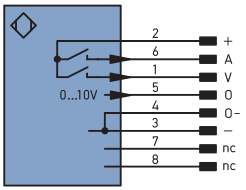
503



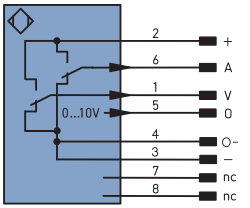
504



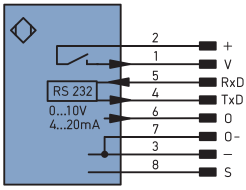
506



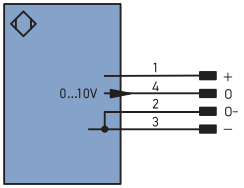
507



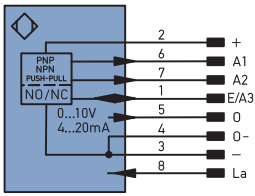
508



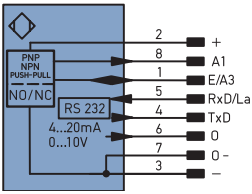
510



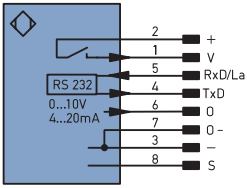
514 *



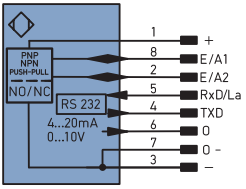
516



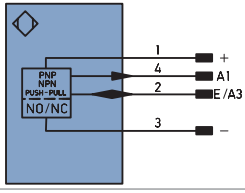
529



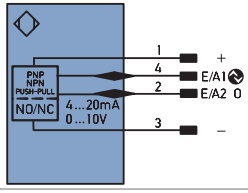
531



755



782



* Note: Pin 7 may not be connected, or output 2 of the connected sensor must be switched off.

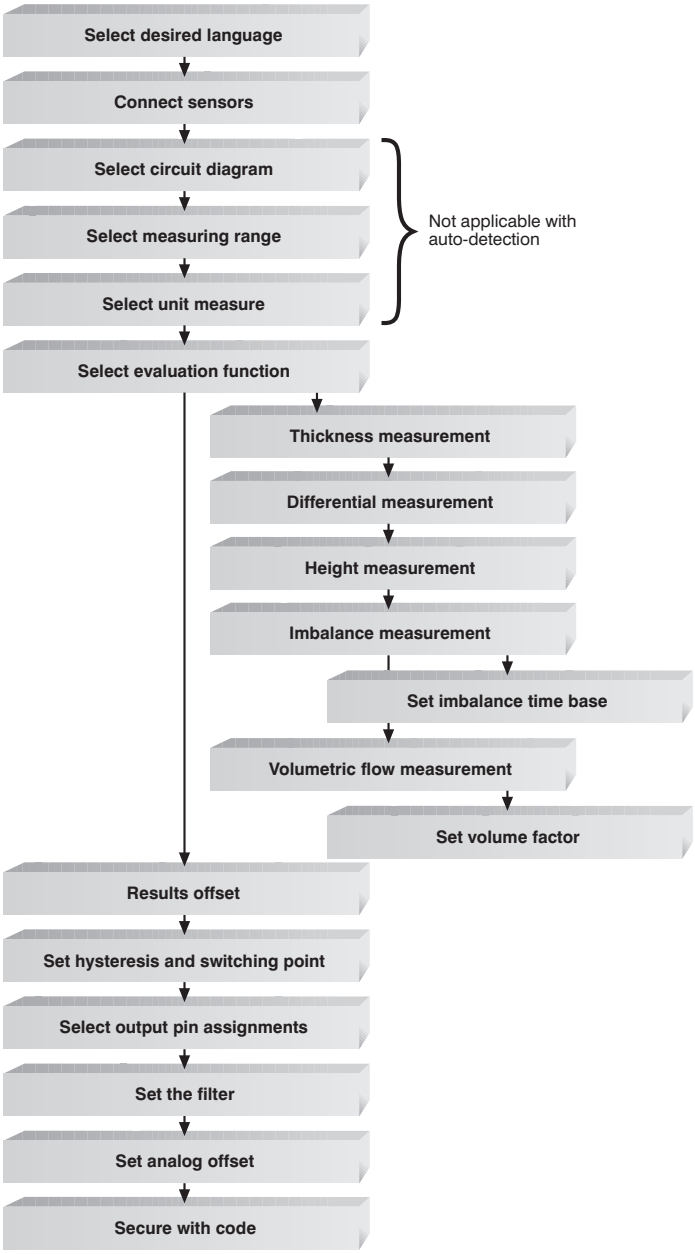
Legend

+	Supply Voltage +
–	Supply Voltage 0 V
~	Supply Voltage (AC Voltage)
A	Switching Output (NO)
Ā	Switching Output (NC)
V	Contamination/Error Output (NO)
V̄	Contamination/Error Output (NC)
E	Input (analog or digital)
T	Teach Input
Z	Time Delay (activation)
S	Shielding
RxD	Interface Receive Path
TxD	Interface Send Path
RDY	Ready
GND	Ground
CL	Clock
E/A	Output/Input programmable
	IO-Link
PoE	Power over Ethernet
IN	Safety Input
OSSD	Safety Output
Signal	Signal Output
Bl_D+/–	Ethernet Gigabit bidirect. data line (A-D)
EN RS422	Encoder 0-pulse 0-0̄ (TTL)
PT	Platinum measuring resistor
nc	not connected
U	Test Input
Ū	Test Input inverted
W	Trigger Input
O	Analog Output
O–	Ground for the Analog Output
BZ	Block Discharge
AMV	Valve Output
a	Valve Control Output +
b	Valve Control Output 0 V
SY	Synchronization
E+	Receiver-Line
S+	Emitter-Line
⏚	Grounding
SnR	Switching Distance Reduction
Rx+/–	Ethernet Receive Path
Tx+/–	Ethernet Send Path
Bus	Interfaces-Bus A(+)/B(–)
La	Emitted Light disengageable
Mag	Magnet activation
RES	Input confirmation
EDM	Contactor Monitoring
ENA RS422	Encoder A/Ā (TTL)
ENB RS422	Encoder B/B̄ (TTL)
ENA	Encoder A
ENB	Encoder B
AMIN	Digital output MIN
AMAX	Digital output MAX
AOK	Digital output OK
SY In	Synchronization In
SY OUT	Synchronization OUT
OLT	Brightness output
M	Maintenance

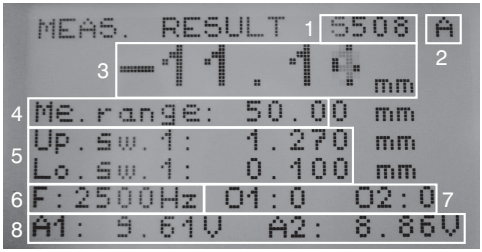
Wire Colors according to DIN IEC 757

BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue
VT	Violet
GY	Grey
WH	White
PK	Pink
GNYE	Green/Yellow

5. Functions


Select desired language
Connect sensors
Select circuit diagram
Select measuring range
Select unit measure
Not applicable with auto-detection
Select evaluation function
Thickness measurement
Differential measurement
Height measurement
Imbalance measurement
Set imbalance time base
Volumetric flow measurement
Set volume factor
Results offset
Set hysteresis and switching point
Select output pin assignments
Set the filter
Set analog offset
Secure with code

6. Display



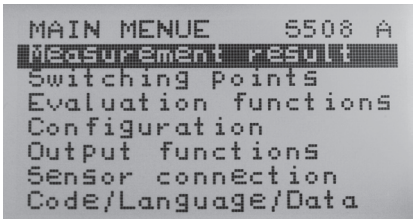
1. Utilized Connection Diagram
2. Utilized data record
3. Current measuring results
4. Active evaluation function/selected measuring range (displayed alternately)
5. Upper and lower switching point 1/ Upper and lower switching point 2 (displayed alternately)
6. Cut-off frequency resulting from filter setting
7. Status of outputs
   S1: switching output 1
   S2: switching output 2
   F: error output
   Status 0: not switched
   Status 1: switched
8. Output values from connected Sensors

7. Initial Start-Up

Connect one or two analog Sensors to the AW02. If only one Sensor is connected, always use S1 (4-pin or 8-pin connector socket).

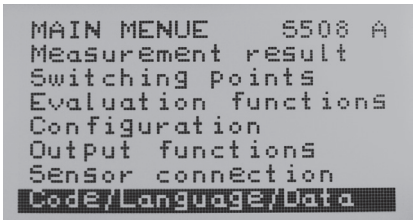
NOTE!
Only one socket each may be used at S1 and S2.
Connect the AW02 to supply power (18 to 30 V DC).
The AW02 is started up (boot time: approximately 5 sec.).

Change to the main menu by pressing the **ESC** key.

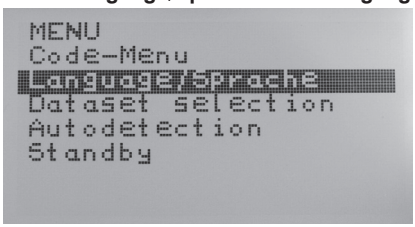


7.1 Selecting the Desired Language

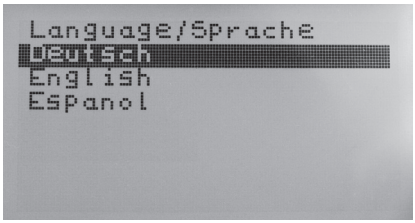
Select **Language**/**Data**/**Code** in the main menu and acknowledge by pressing the **ENTER** key.



Select **Language**/**Sprache** in the **Language**/**Data**/**Code** menu and acknowledge by pressing the **ENTER** key.

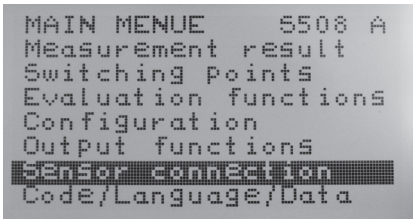


Select the desired language in the **Language**/**Sprache** menu and acknowledge by pressing the **ENTER** key.



7.2 Connecting the Sensors

Select **Sensor Connection** in the main menu and acknowledge by pressing the **ENTER** key.



Select the desired Connection Diagram in the **Sensor Connection** menu and acknowledge by pressing the **ENTER** key.

NOTE!
Sensors with circuit diagrams 508, 529, 516 and 531 are automatically detected by the AW02. In this case, “Auto-Detection” appears in the **Code**/**Language**/**Data** menu.

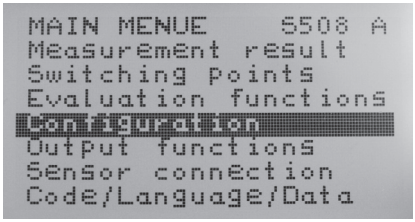
The following settings are selected automatically in this case:

- Default measuring range for connected Sensors
- Appropriate unit of measure
- Appropriate wiring diagram

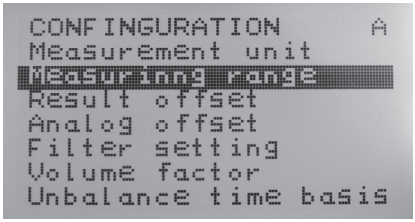
7.3 Selecting a Measuring Range

(already selected in the case of auto-detection)

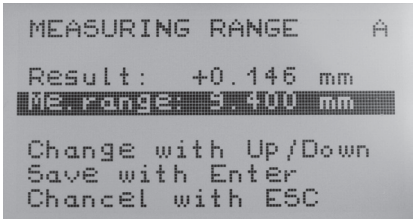
Select **Configuration** in the **main menu.**



Select **Measuring Range** in the **Configuration** menu.



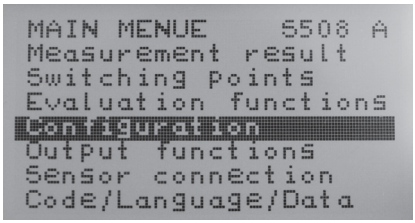
Adjust the Sensors’ measuring range in the **Measuring Range** menu with the **UP** and **DOWN** keys and acknowledge by pressing the **ENTER** key.



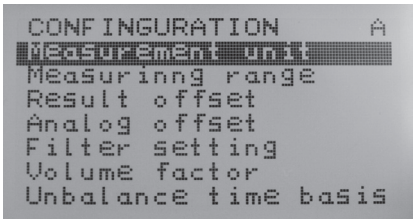
NOTE!
If Sensors with correction factor are utilized, adjust the
measuring range to match the correction factor.
Example:
- Sensor correction factor: 1.2
- Sensor measuring range: 1.5 to 4.5 mm
- Select following measuring range at the Sensor: 1.25 to 3.75 mm

7.4 Selecting a Unit of Measure

Select **Configuration** in the **main menu.**



Select **Unit of Measure** in the **Configuration** menu.



Select the desired unit of measure from several options in the **Unit of Measure** menu, and acknowledge by pressing the **ENTER** key (the next menu page can be displayed by selecting the last line and pressing the enter key).

NOTE!
The selected unit of measure is only a text element. The correct unit of measure must be selected for the utilized measuring range. The selected unit of measure has no influence on the accuracy of the evaluation unit.

7.5 Selecting an Evaluation Function

The following evaluation functions are available: thickness measurement, differential measurement, height measurement, imbalance measurement and volumetric flow measurement.
The utilized type of evaluation function depends upon the application, as well as how the analog Sensors are arranged.

Select **Evaluation Functions** in the **main menu.**

7.5.1 Thickness Measurement

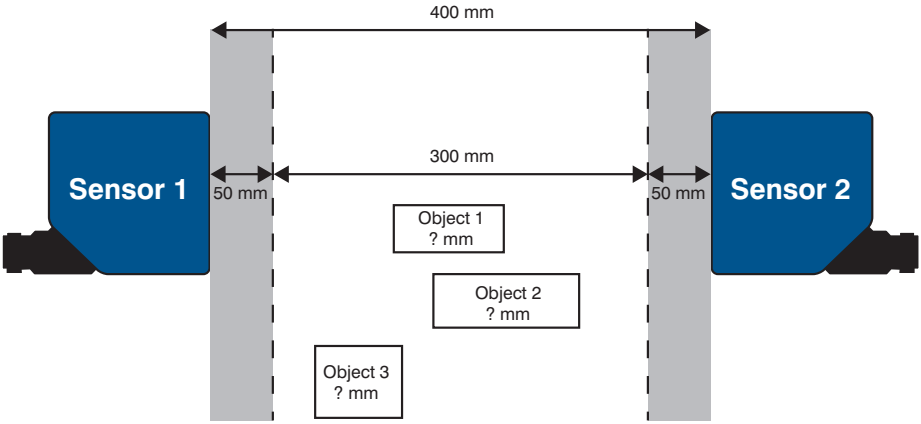
Thickness measurement is used to determine the thickness of objects such as tree trunks. The two Sensors of the same type are set up opposite one another for thickness measurement. The thicker the object is, the less the distance is to the respective Sensors. Object thickness is calculated on the basis of the measured distances.

NOTE!

- The sensors must be aligned to each other.
- Utilized measuring range S1 + utilized measuring range S2 < selected measuring range (see chapter “7.3 Selecting a Measuring Range” on page 13)
- Maximum distance between the sensors is the sum of the lower and upper range limits, and must be complied with.

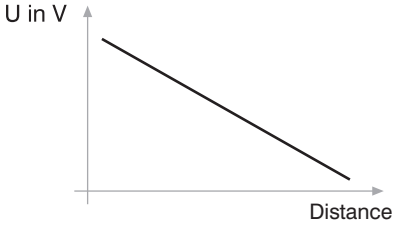
e.g. CP35MHT80

Working range:	50…350 mm
Max. distance:	50 mm (blind spot) + 350 mm (max. working range) = 400 mm



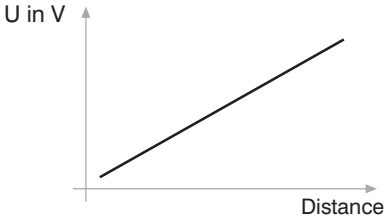
Select **Thickness** in the **Evaluation Functions** menu and acknowledge the respective type of characteristic curves of the sensors used for thickness measurement by pressing the **ENTER** key:

– Thickness S1, S2 ◣ → Used for Sensors with falling characteristic curve.



Voltage decreases as distance increases.

– Thickness S1, S2 ◢ → Used for Sensors with rising characteristic curve.



Voltage increases as distance increases.

– Trigger thickness S1, S2 ◣ → Same as **thickness S1, S2 ◣** but in combination with an external trigger Sensor. Results are acquired after each trigger pulse.

– Trigger thickness S1, S2 ◢ → Same as **thickness S1, S2 ◢** but in combination with an external trigger Sensor. Results are acquired after each trigger pulse.

Continue with **Results Offset** (chapter “7.7 Results Offset”) and subsequent chapters.

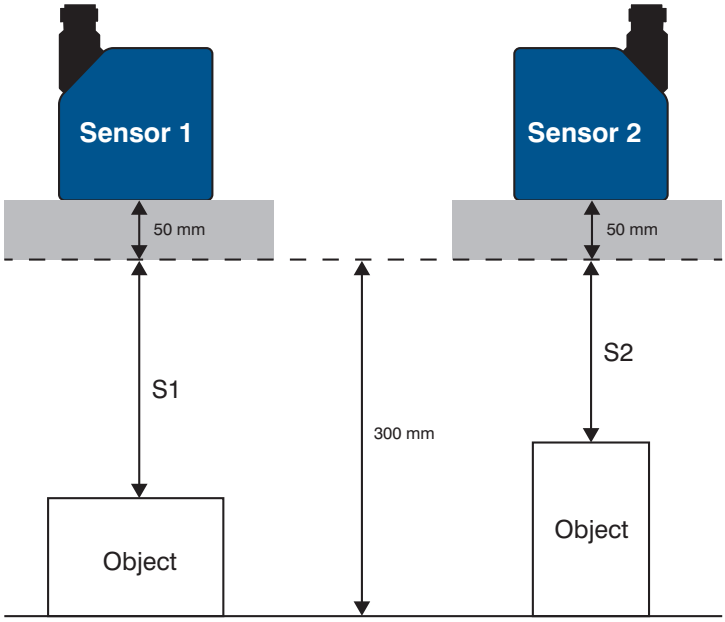
NOTE!

- The type of thickness measurement is determined by the characteristic curves of the utilized sensors. Depending on whether the sensor has, or is set to, a rising or falling characteristic curve, the type must be correspondingly selected in order to obtain a correct measurement. Notes concerning the selected characteristic curves can be found in the operating instructions for the analog sensors.
- In order to assure that correct measurement results are displayed at the analysis module, **results offset** (chapter “7.7 Results Offset” on page 24) must be set during the next step.
- Further descriptions concerning trigger mode operation are included in chapter “7.6 Trigger Mode Operation” on page 24.

7.5.2 Differential Measurement

Two Sensors are used for differential measurement. The AW02 determines the difference between the two input voltages and evaluates the resulting value. Differential measurement is useful when the height reference point fluctuates during height measurements.

e.g. CP35MHT80
Working range: 50…350 mm



Select **Differential Measurement** in the **Evaluation Functions** menu.

Select the desired type of differential measurement:
– **Diff. S1-S2** → where voltage at S1 > voltage at S2
– **Diff. S2-S1** → where voltage at S1 < voltage at S2
– **Trigg. Diff. S1-S2** → Same as **Diff. S1-S2,** but in combination with an external trigger Sensor. Results are acquired after each trigger pulse.
– **Trigg. Diff. S2-S1** → Same as **Diff. S2-S1,** but in combination with an external trigger Sensor. Results are acquired after each trigger pulse.

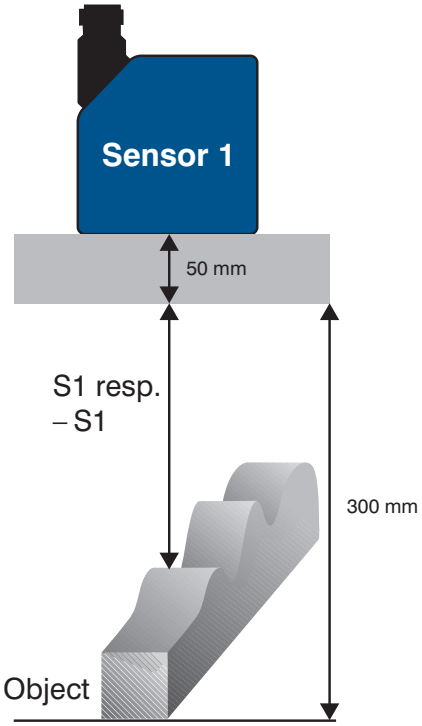
Continue with **Results Offset** (chapter “7.7 Results Offset”) and subsequent chapters.

NOTE!
- In order to assure that correct measurement results are displayed at the analysis module, **results offset** (chapter “7.7 Results Offset”) must be set during the next step.
- Further descriptions concerning trigger mode operation are included in chapter “7.6 Trigger Mode Operation”.

7.5.3 Height Measurement

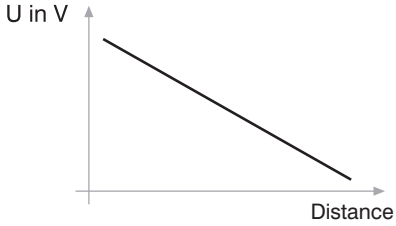
Only one analog Sensor is used for height measurement. The respective height of the object is measured.

e.g. CP35MHT80
Working range: 50…350 mm



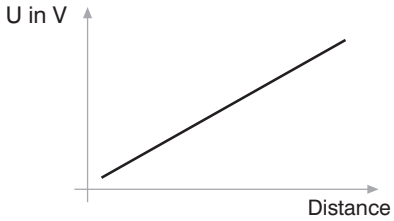
Select **Height Measurement** in the **Evaluation Functions** menu, and acknowledge height measurement by pressing the **ENTER** key:

– **Height S1** → Used for Sensors with falling characteristic curve.



Voltage decreases as distance increases.

– **Height -S1** → Used for Sensors with rising characteristic curve.



Voltage increases as distance increases.

– **Trig. Height S1** → Same as **Height S1,** but in combination with an external trigger Sensor. Results are acquired after each trigger pulse.
– **Trig. Height -S1** → Same as **Height -S1,** but in combination with an external trigger Sensor. Results are acquired after each trigger pulse.

Continue with **Results Offset** (chapter “7.7 Results Offset”) and subsequent chapters.

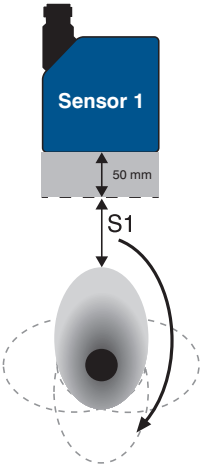
NOTE!

- The type of height measurement is determined by the characteristic curve of the utilized sensor. Depending on whether the sensor has, or is set to, a rising or falling characteristic curve, the type must be correspondingly selected in order to obtain a correct measurement. Notes concerning the selected characteristic curves can be found in the operating instructions for the analog sensors.
- In order to assure that correct measurement results are displayed at the analysis module, **results offset** (page 24) must be set during the next step.
- Further descriptions concerning trigger mode operation are included in chapter “7.6 Trigger Mode Operation” on page 24.

7.5.4 Imbalance Measurement

We speak of imbalance when different points on the surface of a rotating shaft have different distances to its axis of rotation. Imbalance measurement involves the ascertainment of the minimum and maximum distances from the Sensor to the rotating shaft during an adjustable time interval (imbalance time base). The difference between the minimum and the maximum distances represents the measure of imbalance.

e.g. CP35MHT80
Working range: 50…350 mm



Select **Imbalance** in the **Evaluation Functions** menu.

Select the desired type of **imbalance** measurement:

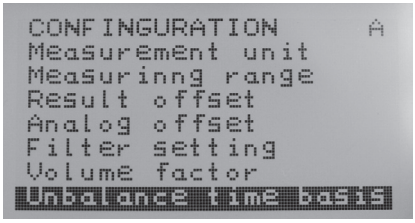
– Imbalance S1 → Used for Sensors with rising or falling characteristic curve.

Acknowledge your selection by pressing the **ENTER** key.

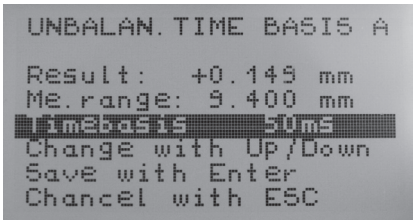
Setting the Imbalance Time Base
The duration of a single rotation of the turning shaft (periodic time) is taken into consideration by the imbalance time base. The imbalance time base value must be greater than periodic time. A value of 1.5 to 10 times periodic time is recommended for the imbalance time base. The imbalance time base can be set to a value of between 50 and 5000 ms.

Select **Configuration** in the **main menu.**

Select **Imbalance Time Base** in the **Configuration** menu.



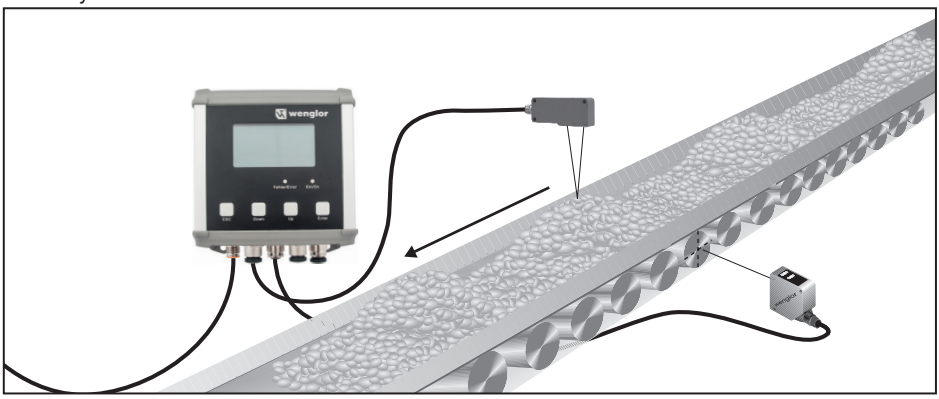
Select the desired value for the imbalance time base with the **UP** and **DOWN** keys, and acknowledge your setting with the **ENTER** key.



Continue with **Results Offset** (chapter “7.7 Results Offset”) and subsequent chapters.

7.5.5 Volumetric Flow Measurement

Volume per second of a conveyed object is determined by means of volumetric flow measurement. The length of the conveyance path and the height of the conveyed object are taken into consideration. An adjustable factor takes the shape of the conveyed object into consideration. Volumetric flow measurement is used primarily where there is only minimal fluctuation of the shape of the conveyed objects. Changes in shape influence the accuracy of this measurement.



NOTE!
Important: If the height of the goods to be conveyed fluctuates, this type of measurement is not advisable (i.e. is subject to error).

Volumetric flow = volume factor X object height

Object height determined
by the analog Sensor

Select **Volume** in the **Evaluation Functions** menu.

Select the desired type of **volumetric flow** measurement:

Volumetric flow S1 → Used for Sensors with rising characteristic curve.
Volumetric flow -S1 → Used for Sensors with falling characteristic curve.

Acknowledge your selection by pressing the **ENTER** key.

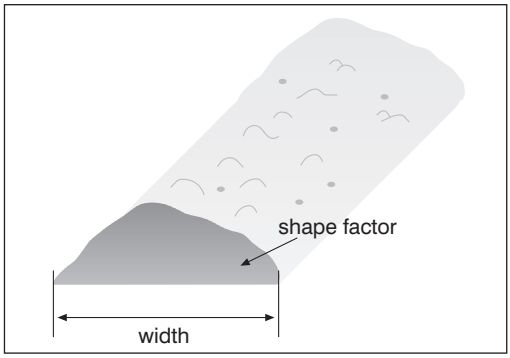
Setting the Volume Factor

Width, length and height of the object to be measured are taken into consideration by the volume factor. The volume factor can be set between 0 and 1.

Volume factor = width × measuring distance × shape factor

- width: Object width
- measuring distance: Distance between two pulses
- shape factor: Factor which describes the shape

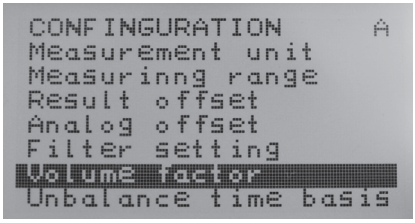
Example:



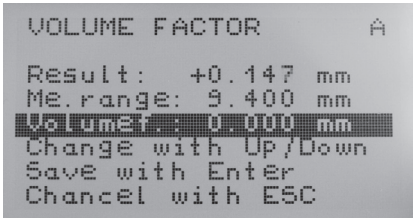
Shape factor for a rectangle: 1
Shape factor for a semicircle: $\pi/4$
Sample calculation:
Object width: 0.8 m
Measuring distance: 0.05 m
Shape factor (nearly semicircular bulk goods): 0.8
Resulting volume factor: 0.8 × 0.05 × 0.8 = 0.032

Select **Configuration** in the **main menu.**

Select **Volume Factor** in the **Configuration** menu.



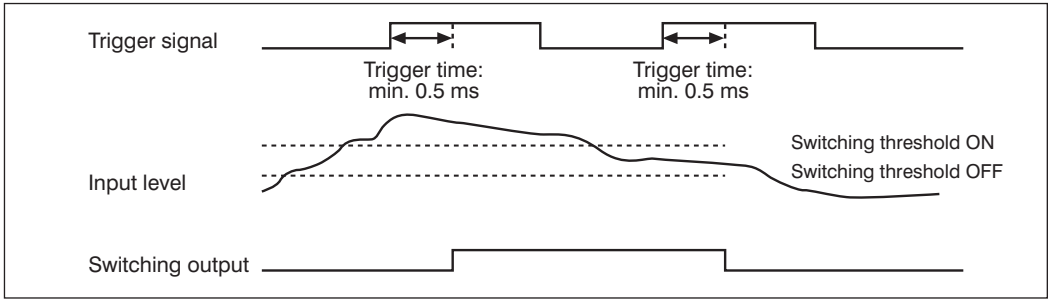
Select the desired value for the volume factor with the **UP** and **DOWN** keys, and acknowledge your setting with the **ENTER** key.



7.6 Trigger Mode Operation

The trigger input is at pin 8 (see “4.6.2 Output Pin Assignments” on page 7).
The permissible voltage range for the trigger pulse is 18 to 30 V.

The minimum duration of the trigger pulse is 0.5 ms. The maximum duration is unlimited. Measurement occurs during the rising edge of the trigger pulse. Measurement results are saved until the next trigger pulse occurs, and the corresponding signal is read out to the output according to the respective output configuration.

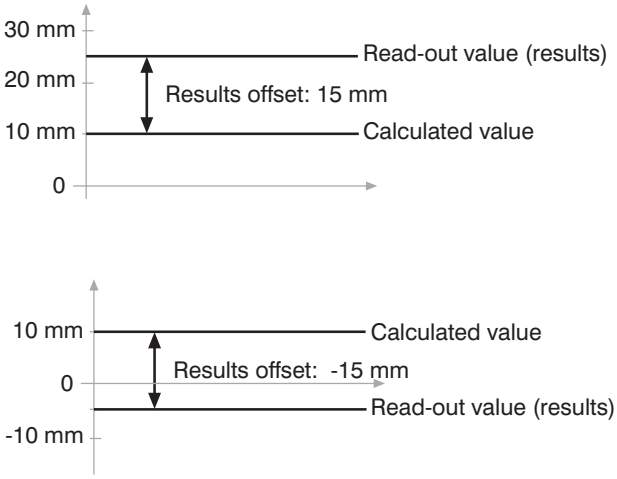


7.7 Results Offset

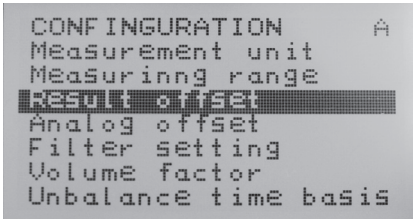
Results offset is used to adapt the measurement results read out by the evaluation unit to the application. Measuring offset may amount to any value within a range of “– measuring range… + measuring range”. The value selected for results offset is added to the calculated value. The value read out by the evaluation unit is the sum of the calculated value and the value selected for the results offset. The switching point is based upon the value which is read out by the evaluation unit (results).

Example:
Calculated value: 10 mm

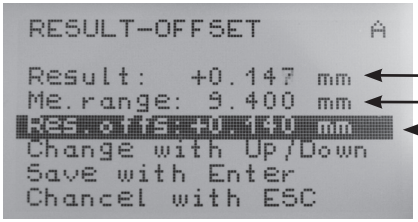
Results offset: 0 mm → read-out value: 10 mm
Results offset: 15 mm → read-out value: 25 mm
Results offset: –15 mm → read-out value: –5 mm



Results offset is set under **Configuration** in the **main menu**.



The analog sensors must be aligned to an object with a known thickness in order to correctly set results offset. The analysis module must then be adjusted using the up or down scroll key until the known object thickness is read out as the measurement result. The results offset value is acknowledged by pressing the enter key.



7.8 Selecting Hysteresis and the Switching Points

Select **Switching Points** in the **main menu.**

Upper switching point 1
Lower switching point 1
} Switching points for output 1

Upper switching point 2
Lower switching point 2
} Switching points for output 2

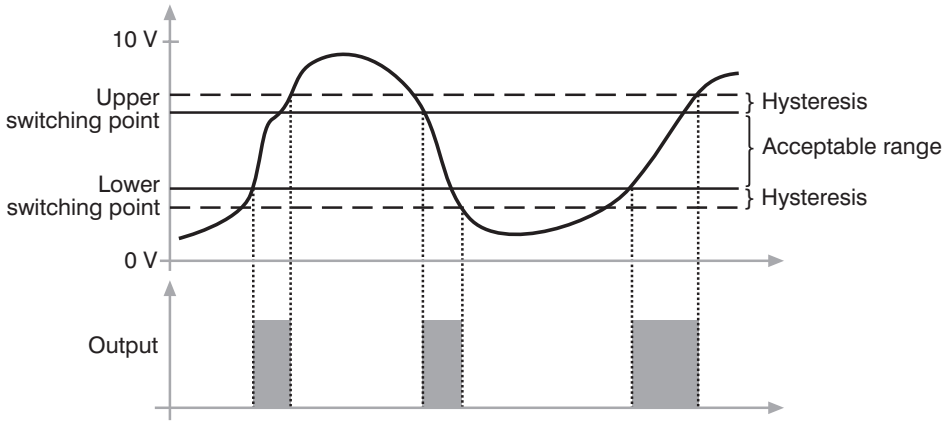
Hysteresis Valid for outputs 1 and 2

7.8.1 Selecting Hysteresis

The adjustable hysteresis value can be set within a range of 0.5 % to 25 % of the measuring range. The hysteresis value must be positive.

Select **Hysteresis** in the **Switching Points** menu.

Setting hysteresis: Select the desired value for output hysteresis with the **UP** and **DOWN** keys, and acknowledge your setting with the **ENTER** key.



On-state with value between upper and lower switching threshold (the output is set up for NO operation in the example).

7.8.2 Selecting the Switching Points

Only positive switching points can be selected. In the case of negative measurement results, the measurement results must be shifted into the positive range by means of results offset (see page 24).

Select the desired menu item in the **Switching Points** menu.

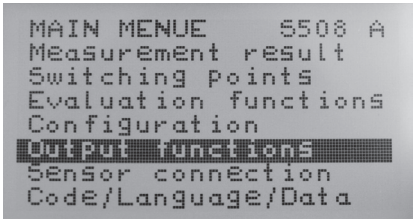
Select the desired value for each respective switching point with the **UP** and **DOWN** keys, and acknowledge your setting with the **ENTER** key.

NOTE!
The current measured value can be entered as a switching point by simultaneously pressing the Up and Down keys (Teach-In function).

Change to the main menu by pressing the **ESC** key.

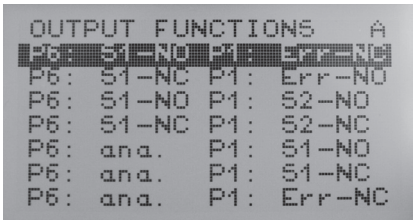
7.9 Selecting Output Pin Assignments

Various output configurations can be selected in the **Output Pin Assignments** menu.



NOTE!
If the outputs are set up as switching outputs it must be assured that the device connected to the respective output is suitable for voltages of the same level as supply voltage (max. 30 V DC).

Select **Output Pin Assignments** in the **main menu.**



- Pin 6 can be used as a switching output, or as an analog output:

P6: S1-NO	Pin 6 = switching output 1 as NO contact
P6: S1-NC	Pin 6 = switching output 1 as NC contact
P6: ana	Pin 6 = analog output

- Pin 1 can be used as a switching output, or as an error output:

P1: Err-NC	Pin 1 = error output as NC contact
P1: Err-NO	Pin 1 = error output as NO contact
P1: S2-NO	Pin 1 = switching output 2 as NO contact
P1: S2-NC	Pin 1 = switching output 2 as NC contact
P1: S1-NO	Pin 1 = switching output 1 as NO contact
P1: S1-NC	Pin 1 = switching output 1 as NC contact

Select the desired output configuration in the **Output Pin Assignments** menu and acknowledge by pressing the **ENTER** key.

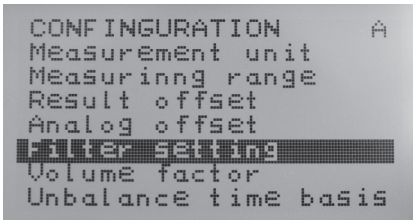
8. Additional Settings

8.1 Filter

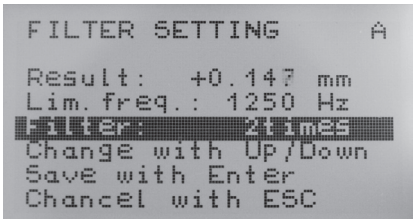
(except for **imbalance measurement)**
Filters are used to average the values read out by the Sensors. Short interference signals can thus be suppressed. The filter value specifies the number of values which will be used to generate a mean value. The higher the filter value, the greater the filtering effect. The maximum filter value is 313. The most commonly used filter values lie within a range of 2 to 20. Higher filter values have only been used in special cases. The Measuring rate is cut in half as of a filter value of 32 (from 5000 to 2500 measurements per second).

Select **Configuration** in the **main menu.**

Select **Filter Setting** in the **Configuration** menu.



Select the desired filter value with the **UP** and **DOWN** keys and acknowledge by pressing the **ENTER** key.

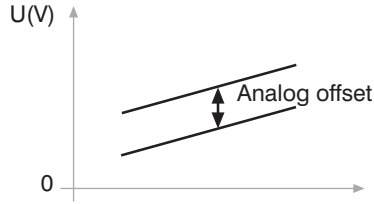


8.2 Analog Offset

The value entered as an analog offset is added to the determined output voltage. However, the value for the measurement results remains constant. A value within a range of –10 to +10 V can be selected as an analog offset. The read-out voltage can have a value within a range of 0 to 10 V. If values of less than O V or greater than 10 V result due to analog offset, the respective value is read out as 0 V or 10 V.

Voltage at the analog output: determined output voltage + analog offset

Example:
5 V output voltage + 3 V analog offset = 8 V read-out voltage



Select **Configuration** in the **main menu.**

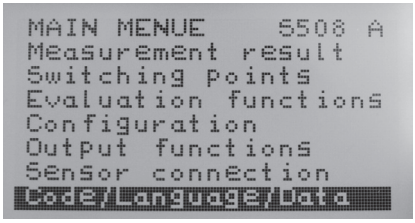
Select **Analog Offset** in the **Configuration menu.**

Select the desired value for analog offset with the **UP** and **DOWN** keys, and acknowledge your setting with the **ENTER** key.

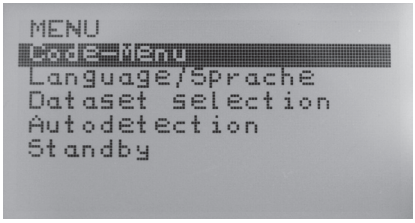
8.3 Code

The menu can be disabled in order to prevent unauthorized alteration of the selected settings, so that only the **Measurement Results** and the **Cancel Disabling** functions can be selected.

Select **Language**/**Data**/**Code** in the **main menu.**



Select the desired function from the **Code Menu** and acknowledge by pressing the **ENTER** key.



8.3.1 Entering a New Code

A new code can be entered with the help of this menu function. A five digit code is used, which is entered with the following keys.

Down	→	**D**
Up	→	**U**
Enter	→	**E**

A new code cannot be entered as long as the menu is disabled. The standard code must be entered first in order to change the code. The standard code is as follows:

U	**D**	**E**	**D**	**E**
(**U**p)	(**D**own)	(**E**nter)	(**D**own)	(**E**nter)

Then enter the new 5 digit code, make a note of it, enter it once more for verification and acknowledge by pressing the **ENTER** key.

The new code has now been saved to memory.

NOTE!
Make a note of the new code before saving it to memory! If the code is forgotten, it can only be overwritten with a master code. The master code can be requested from the wenglor Support department by e-mail.

8.3.2 Disabling the Menu

The main menu can be disabled with this function, so that only **Measurement Results** and **Cancel Disabling** can be selected.

Enter the code which has been selected as described above, and acknowledge by pressing the **ENTER** key.

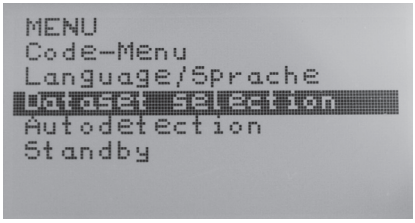
In order to cancel menu disabling select **Cancel Disabling,** enter the valid code and acknowledge by pressing the **ENTER** key.

8.4 Data Record A/B

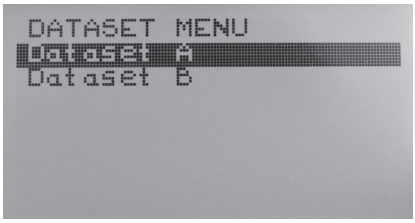
Upon shipment from the factory, all settings are saved to data record A. Entirely independent of these values, all of the settings can be entered a second time to data record B using different values. In this way, either data record A or data record B can be selected, depending upon the respective application.

Select **Language**/**Data**/**Code** in the **main menu.**

Select **Data** in the **Language**/**Data**/**Code** menu.



Select the desired data record from the **Data menu** and acknowledge by pressing the **ENTER** key.



The selected **data set** is indicated on the upper right corner in the **main menu.**

8.5 Auto-Detection

As described under **Connecting the Sensors,** 8-pin wenglor Sensors with RS 232 interface are recognized automatically by the AW02. If Sensors are exchanged during operation, auto-detection can be manually activated.

Select **Language**/**Data**/**Code** in the **main menu.**

Select **Auto-Detection** in the **Language**/**Data**/**Code** menu.

Auto-Detection appears in the main menu. The matching Connection Diagram for the connected Sensor, the corresponding **measuring range** and the **unit of measure** are automatically selected.

8.6 Standby

The AW02 can be set to the standby mode. The outputs are deactivated in the this operating mode.

Select **Language**/**Data**/**Code** in the **main menu.**

Select **Standby** in the **Language**/**Data**/**Code** menu.

The AW02 is now in the standby mode and the outputs are deactivated. The standby mode is exited by pressing the **ESC** key, or by interrupting supply power.

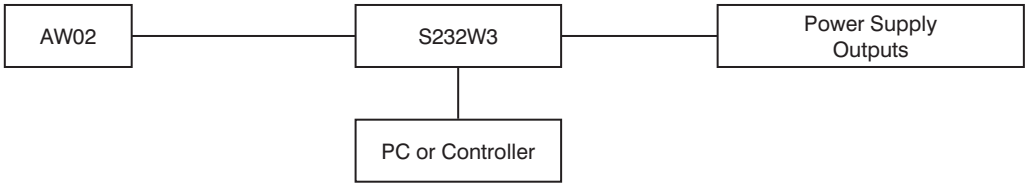
9. Settings and Queries via the RS-232 Interface

The interface makes use of a software handshake procedure. All AW02 settings can be configured at a PC and uploaded to the device. RS-232 interface connections RxD (pin 5, gray) and TxD (pin 4, yellow) are linked to minus (pin 3, green), and can be connected to the corresponding terminals at the communication partner.

Interface Configuration
38,400 baud, 8 data bits, no parity, 1 stop bit

Plug connectors included with the wenglor S232W3 plug adapter:
- 8-pin M12 plug connector for connecting the power supply and the outputs
- 8-pin M12 socket connector for direct Sensor connection
- 9-pin M12 subminiature socket connector for direct connection to the RS-232 interface at the PC, or the utilized controller

Connect the AW02 to the PC, the controller etc. via the wenglor S232W3 plug adapter.
Install the plug adapter as follows:
- Disconnect the 8-conductor connector cable (S80-xx) from Plug connector **OUT** at the AW02.
- Connect the S232W3 plug adapter directly to the AW02.
- Connect the 8-conductor connector cable (S80-xx) to the plug adapter.
- Connect the 9-pin subminiature socket connector at the PC to the serial interface
- Switch the power supply on.



9.1 Protocol for Communications via the RS-232 Interface

Frame Layout for Data Transmission

Calculating the Checksum BBC (Block Check Character): The Checksum is generated from an EXOR-frame operation.

Transmitting Partner	Characters (ASCII)		Receiving Partner	Frame Segment
Start character	/ (ASCII 47)	=>	Connect	Frame header
Length information	2 Byte	=>	Connect	Frame header
Command bytes	2 Byte	=>		Frame header
1. data byte	2 Byte	=>	Data information	User data
2. data byte	2 Byte	=>		User data
..	..	=>	Data information	User data
n. Data byte	..	=>	Data information	User data
Checksum (BCC)	2 Byte	=>		Frame end
Stop bit	. (ASCII 46)	=>	Disconnected	Frame end

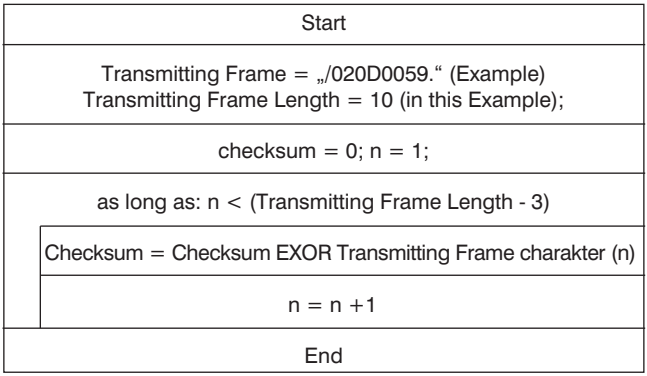
Start Character	Length	Command	Data	Checksum	Stop Cha racter
/	02	0D	00	59	.
2FH	30H 32H	30H 44H	30H 30H	35H 39H	2EH
Data used to calculate the checksum					

Calculating Example:

/	2FH	=	0010	1111
0	30H	=	0011	0000
	XOR	=	0001	1111
2	32H	=	0011	0010
	XOR	=	0010	1101
0	30H	=	0011	0000
	XOR	=	0001	1101
D	44H	=	0100	0100
	XOR	=	0101	1001
0	30H	=	0011	0000
	XOR	=	0111	1001
0	30H	=	0011	0000
	XOR	=	0101	1001

=> Checksum = 59H

Program Example:



9.2 RS 232 Interface Commands for the AW02

Command	Response	Function	Possible Values
/020WAo64.	/080WAo±xxxxxqq.	Display analog offset	
/070SAo±xxxxqq.	/070SAo±xxxxqq.	Set analog offset (±xxxx)	±0…9999
/020WOu70.	/050WOuxyzqq.	Poll outputs (switch1=x, switch2=y, error=z)	
/050SAFxxxqq.	/050SAFxxxqq.	Set output function (xxx)	See table “Output Function”
/020WAF4D.	/050WAFxxxqq.	Display output function	
/030SDbA28.	/030SDbAqq.	Select data record A	
/020WDb6C.	/030WDbxqq.	Display data record	
/030SDbB2B.	/030SDbBqq.	Select data record B	
/020WEo60.	/080WEo±xxxxxqq.	Display results offset	
/070SEo±xxxxqq.	/070SEo±xxxxqq.	Set results offset (±xxxx)	±0…9999
/010Er29.	/080Er±xxxxxqq.	Read out results value with plus/minus sign and without unit of measure	
/020WFl60.	/050WFlqq.	Display filter	
/050SFlxxxqq.	/050SFlxxxqq.	Set filter (xxx)	
/020WFW5B.	/050WFWqq.	Display operating mode	
/050SFWxxxqq.	/050SFWxxxqq.	Set operating mode (xxx)	See table “Operating Mode”
/020WHy7B.	/060WHyxxxxqq.	Display hysteresis	
/070SHy+xxxxqq.	/070SHy+xxxxqq.	Set hysteresis (xxxx)	0005…2500
/020WME42.	/060WMExxxxqq.	Display unit of measure	
/060SMExxxxqq.	/060SMExxxxqq.	Set unit of measure (xxxx)	See table “unit of measure”
/020WMB45.	/080WMBxxxxxxqq.	Display measuring range	
/080SMB0xxxx0qq.	/080SMB0xxxx0qq.	Set measuring range (xxxx)	0001…9999
/020WO134.	/070WO1xxxxxqq.	Display upper switching point 1	
/070SO1+xxxxqq.	/070SO1+xxxxqq.	Set upper switching point 1 (xxxx)	0005…9999
/020WO237.	/070WO2xxxxxqq.	Display upper switching point 2	
/070SO2+xxxxqq.	/070SO2+xxxxqq.	Set upper switching point 2 (xxxx)	0005…9999
/020WSA58.	/050WSAxxxqq.	Display Connection Diagram	
/050SSAxxxqq.	/060SSAxxxqq.	Set Connection Diagram (xxx)	Connection Diagram No.
/020WU12E.	/070WU1xxxxxqq.	Display lower switching point 1	
/070SU1+xxxxqq.	/070SU1+xxxxqq.	Set lower switching point 1 (xxxx)	0010…9999
/020WU22D.	/070WU2xxxxxqq.	Display lower switching point 2	
/070SU2+xxxxqq.	/070SU2+xxxxqq.	Set lower switching point 2 (xxxx)	0010…9999
/000V49.	/070V81x1201qq.	Query version	
/020WVF5A.	/070WVFxxxxxqq.	Display volume factor	
/060SVFxxxxqq.	/060SVFxxxxqq.	Set volume factor (xxxx)	0001…9999
/020WZUq45.	/050WZUxxxqq.	Display imbalance time base	
/050SZUxxxqq.	/050SZUxxxqq.	Set imbalance time base (xxxx)	0001…200 = time base/25 in ms

Sign entry at commands: If a command contains the sign “±”, either “+” or “–” is used depending upon the desired value:

Tables for RS-232 Interface commands

Table “Unit of Measure”	
	xxx
bar	825
celsius	827
fahrenheit	828
gram	818
hektopascal	826
kilogram	819
cubic meter/second	815
liter/second	816
meter	812
millibar	824
millimeter	811
millinewton	822
millinewtonmeter	820
millivolt	813
newton	823
newtonmeter	821
without device	829
volt	814

Table “Operating Mode”	
	xxx
Thickness S1 + S2	411
Thickness -S1 + -S2	412
Differential S1 - S2	421
Differential S2 - S1	422
Height S1	431
Height -S1	432
Trigger thickness S1 + S2	413
Trigger thickness -S1 + -S2	414
Trigger Differential S1 - S2	423
Trigger Differential S2 - S1	424
Trigger height S1	433
Trigger height -S1	434
Imbalance S1	441
Volumetric flow S1	451
Volumetric flow -S1	453

Table “Output Function”	
	xxx
Switching Output 1 NC, Error Output NO	301
Switching Output 1 NO, Error Output NO	302
Switching Output 1 NC, Switching Output 2 NC	303
Switching Output 1 NO, Switching Output 2 NO	304
Analog Output, Switching Output1 NC	305
Analog Output, Switching Output1 NO	306
Analog Output, Error Output NC	307

10. Maintenance Instructions

- The wenglor analog evaluation unit is maintenance-free.
- It is advisable to clean the display and check the plug connections at regular intervals.
- Do not use solvents or cleansers for cleaning which could damage the device.

11. Proper Disposal

wenglor sensoric GmbH does not accept the return of unusable or irreparable products. Respectively valid national waste disposal regulations apply to product disposal.