

Double Sheet Metal Monitor BDK-A

New Universal System for contact and non-contact double sheet detection
Easy and convenient operator guidance with TFT-Display
2048 program memories allow fast job change
Contact and non-contact measurement
Sensors for all sheet metal chart
Flexible extension and retrofitting
Compatible with Systems BDK-1.3 and BDK-ET

Device Description GB 20.21-10, -11, -12
Edition 04.26

Contents

1. Application	1
2. Configuration	1
3. Mode of Operation	1
4. Measuring methods	2
5. Operation	3
6. Timing Diagram for Interrogation of Measured Value	12
7. Interconnection with Press Controller	14
8. Wiring	15
9. Wiring Diagrams	17
10. Sheet Metal Thickness Sensors	18
11. Connecting Leads VLG	25
12. T-Coupler ADD	26
13. Sensor Switch BDIW	27
14. Bracket for mounting Sheet Thickness Sensor	28
15. Technical Data	29
16. Order Data	29



1. Application

The use of Double Sheet Metal Monitors ensures proper insertion of the workpieces, by preventing insertion of double sheets. Damage to the tool or the press maybe prevented.

BDK-A double sheet metal detector is suitable in conjunction with various sheet thickness sensors for monitoring ferrous and non-ferrous sheets, depending on sensor or measuring method, up to a maximum sheet thickness of 5.5 or 6.5 mm.

2. Configuration

Sensor and evaluation device are characterised by a sturdy construction and a high protection class. The ready-made connecting leads with plugs and sockets on both sensor and device sides permit quick and easy mounting and commissioning of these devices.

The 5" colour touch display (TFT) offers fast, convenient operator guidance and visualisation of all program steps, processes and measurement results.

There are 2048 program memory locations, which allow the storage of the measuring programs. They allow quick changes of material or tool during operation, and the programs remain stored even when the device is switched off.

The measurement result is shown on the TFT display and via indicator lights and is carried out via the interface for further processing in the system control unit.

3. Mode of Operation

Various measuring methods are available with the BDK-A for monitoring double sheets and measuring the sheet thickness. The measuring methods can be divided into contact and non-contact.

For single-surface contact measurement of ferrous sheets (using magnetic flux measurement) or nonferrous sheets (using the eddy current method), the selection is made automatically by selecting the sensor type.

The sensor must rest on the sheet metal during the measurement.

With double-surface non-contact measurement for ferrous and non-ferrous sheets, the generated alternating magnetic field is attenuated by inserting a sheet between the two sensors (transmission measurement).

The sensors are designed as transmitters and receivers.

With single-sided non-contact measurement, the distance between the sensor and the sheet is detected. The sheet thickness can then be calculated from the known distance between the sensor and the sheet surface (distance measurement).

With all methods, after making the measurement, the microprocessor-controlled monitoring device uses the sensor signal to determine the thickness of the sheet metal and compares the result to the current threshold values.

The measured value is updated and displayed after each measurement

The TFT display shows the data for the respective menu: Measurement, program number, sensor type, sensor connection right / left, start external / internal and the repeat time.

Additional indicator shows the active status of a measurement, the proximity switch and 0, 1 and 2-sheet detection.

The press control unit can use these signals to carry out a corresponding evaluation via three potential-free relay outputs K0 ... K2 or a bus interface.

The colour touch display is used to enter parameters and the like (see 5. Operation).

For devices with a fieldbus interface, e.g. PROFIBUS or PROFINET, the measured value, the 0...2 sheet metal message, the set programme memory number and the current limit value are output via the bus interface.

Selection of the measurement programme and the triggering of the measurement may happen via a parallel PLC interface or the bus interface.

When operating without a PLC (stand-alone operation), the measuring program can be set on the device and the measurement can be started using the proximity function integrated in the sensor.

4. Measuring methods

4.1 Single surface contact measurement:

Ferrous sheets (Fe) from 0.2 up to 5.5 mm.
Detection with Sensors DSP.

Non-ferrous sheets (NE) from 0.2 up to 5.5 mm.
Detection with Sensor BDWF.

Ferrous sheets (Fe) from 0.2 up to 3.5 mm and also Non-ferrous sheets (NE) from 0.2 up to 4 mm.
Detection with Sensor DSPW.

The DSP Sheet Metal Thickness Sensors for ferrous workpieces have an exciter coil which generates a strong magnetic field. The workpiece is temporarily pulled onto the sensor head and brought to magnetic saturation by the high flux density. A sensor coil measures the saturation flux density, which is approximately proportional to the thickness.

In the BDWF Sheet Metal Thickness Sensor for non-ferrous workpieces, an exciter coil induces an eddy current in the non-ferrous workpiece to be measured. The sensor coil measures the field caused by the eddy current, which is approximately proportional to the thickness. Since the workpiece is not pulled onto the sensor head, no essential air gap between workpiece and sensor head is permissible during measurement. In both types of measurement, the accuracy is about 0.1 mm at the calibration point or about 5 % of the end-of-scale value across the measurement range.

The DSPW Sensor combines the two measuring methods of DSP and BDWF.



Note:

On the display, the indication of the sensor type (DSPW/FE for ferrous, DSPW/NE for non-ferrous sheets) allows to select the material being used.

A general statement about the permissible air gap for single surface contact measurement is not possible because it is influenced by the thickness, the type of sheet metal, and the sensor being used. Basically, there should be no air gap, neither between the sensor and the workpiece nor between the workpieces in the case of a double sheet. See diagrams in the chapter "Sheet Metal Thickness Sensors".

4.2 Double surface non-contact measurement

The double surface non-contact measurement is realised by the Sheet Metal Thickness Sensors BDWD/S (transmitter) and BDWD/E (receiver) for ferrous magnetic sheets with thicknesses ranging from 0.2 to 3 mm and for non-ferrous magnetic sheets with thicknesses ranging from 0.2 to 6 mm.



Note:

On the display, the indication of the sensor type (BDWD/FE for ferrous, BDWD/NE for non-ferrous sheets) allows to select the material being used. Via the parameterisation of the sensor connection in the menu Parameter, the transmitter BDWD/S and receiver BDWD/E can be assigned to the according connection (XS1 or XS2).

A transmitter coil in the (BDWD/S) transmitter generates an alternating magnetic field. A receiver coil in the (BDWD/E) receiver measures the field, which is attenuated approximately proportionally to the thickness of the workpiece.

The accuracy is about 0.2 mm at the calibration point or about 5 % of the end-of-scale sensor value across the measurement range. This measurement procedure is insensitive to the relative position workpiece – sensor heads and to air gaps between workpieces, which may move during measurement. Between sensor and sheet metal, however, a minimum distance of 10 mm must be kept.

Strong sources of magnetic interference can influence the measurement results.

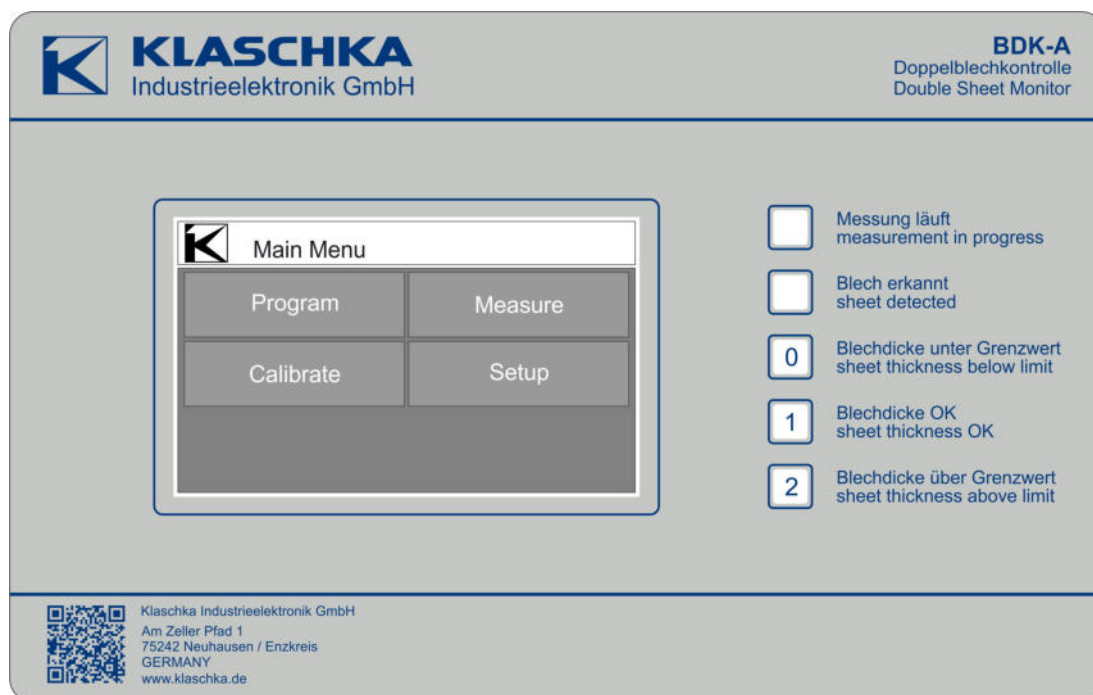
4.3 Single surface non-contact measurement

The DSD Sheet Metal Sensor is suitable for monitoring pieces of ferromagnetic sheet metal (other materials on request) with a thickness range from 0.5 to 6.5 mm. The workpieces, however, must be placed on a solid reference plate, for example, a conveyor belt. (For further notes about non-magnetic sheets we can provide you on request).

The distance between the sensor and workpiece is detected by the DSD sensor. Since the distance between the sensor and the supporting plate is fixed, the thickness of the workpiece can be calculated as the difference between the two distances. The measured thickness can be compared with the nominal value in order to detect a double sheet.

The accuracy at the calibration point is 0.2 mm with DSD-18 and 0.3 mm with DSD-30 or 5 % of the end-of-scale sensor value across the entire measurement range.

Measurement can be taken as the metal sheet moves along the sensor. With the single surface non-contact measurement, an air gap between the workpieces and between the workpiece and the supporting plate can directly influence the measured thickness (The measured thickness will appear to be greater than the actual thickness).



5. Operation

Easy and convenient operation with 5" colour touch display.



Note:

Please do not use any hard or sharp objects to operate the appliance. Damage caused by improper operation is excluded from the warranty.

5.1. Indicators

Operator guidance is provided by displaying the necessary operating steps. This makes it possible to check the current operating status at any time. Measurement results are also displayed with 5 indicator lights.

The illuminated fields have the following meaning:

measurement in progress:	lights up during measurement process.
sheet detected:	lights up when sensor detects a sheet
sheet thickness below limit:	Lights up if there is no sheet between or in front of the sensor, or if there is a sheet under below limit.
sheet thickness OK:	Lights up when 1-sheet message.
sheet thickness above limit:	Lights up when the 2-sheet message and for general errors.

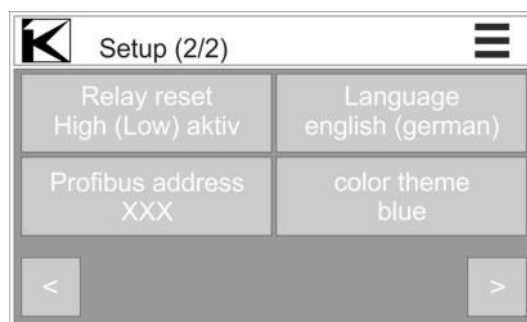
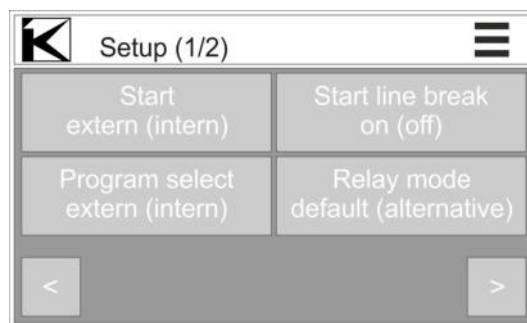
5.2. Operating modes in Main Menu

Selection of 4 different operating modes.

5.2.1. Basic settings in Menu "Setup"

When the device is used for the first time, the first step is to enter the basic settings (see picture in chapter 5.4) Button "Setup".

Following settings can be made:



Use "Hamburger Button" to finish "Setup".



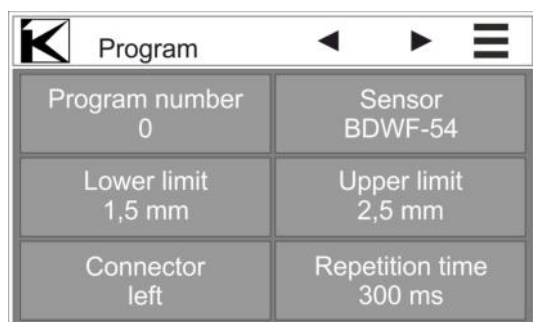
Note:

When entering parameters in the "Program"- and "Calibrate" operating modes, as well as in the "Setup" Menu, the relays output will signal a double sheet message.

5.2.2. Operating mode "Program"

In order to monitor the sheet metal thickness, measurement result is compared with an upper threshold to check for a double sheet and a lower threshold to check for nominal thickness and presence of a sheet. The device is provided with 2048 program memory locations for storing the type of sensor with its calibration, and the threshold values. In the "Measure" mode, the appropriate set of parameters can thus be called up from the memory (see picture in chapter 5.5).

Programming



Number of program memories:

- 0...1023 (BDK-A): Relay outputs with PLC interface
- 0...2047 (BDK-A/FP, BDK-A/PN): Fieldbus interface

- Press "Program number" button and enter the program memory location (0 ... 1023 / 2047).
- Select the sensor type used from the list.
- Select the upper limit value. If this is exceeded, a double sheet message should be issued.
- (Note: It makes sense to select the upper limit value between the single sheet thickness and the double sheet thickness. The closer the limit value is to the single sheet thickness, the more certain it is that a double sheet message will be issued. However, if this value is too close to the single sheet thickness, a double sheet message may also be issued for single sheets as a result of measured value fluctuations).
- Select lower limit value. If the value falls below this, an undersize message should be issued
- Select the sensor connection (left or right).
- Enter the repetition time (setting the time interval of 100 ms ... 10 s after which the next measurement is started if the start signal is continuously present).
- Note: At 0 seconds, the device only carries out one measurement per start signal

- Only for double-surface non-contact measurement with BDWD/S and BDWD/E sheet thickness sensors:

In the "Connection" submenu, you can select whether a sensor pair with T-coupler is fixed either on the left (XS1) or right (XS2). Without a T-coupler, the BDWD/S and BDWD/E sensors can be connected variably between left -> right and right -> left.

In the "Measuring time" submenu, measuring duration can be selected between 50 ms and 300 ms.

Note: Longer measuring time is advisable for thick sheets in order to obtain a more constant measured value.



Use "Hamburger Button"  to finish "Program".

Program memory selection

In the menu "Setup", you can select the program memory to be used in measuring mode (internal or external).

Internal selection

In the "Programming" menu, "Program number" submenu, enter the number of the program memory to be used.

External selection

The program memory selection externally happens either via the PLC or via the fieldbus interface (for selection via fieldbus interface, see chapter 6.2)

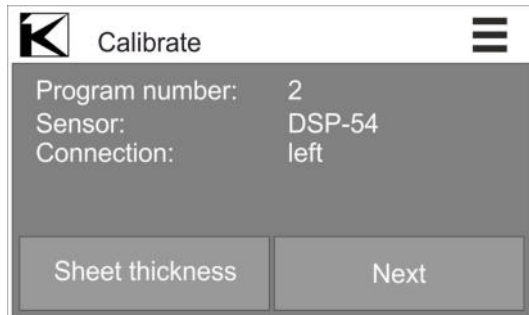
Memory selection must be set to external in the setup menu. The desired program memory is set by applying the corresponding binary code to A1 ... A10.

5.2.3. Operating mode "Calibration"

- In order to obtain an optimum measurement result, the sensor should be recalibrated if one of the following factors changes (see picture 5.6):
- Sheet metal type and its magnetic or electrical properties.
- Sensor, type of Sensor and Sensor environment..
- Cable length and cable cross-section (for DSP, DSPW).
- Air gap between sensor and sheet metal (only for one-sided measurement).

Calibration of a sample sheet (calibration plate)

Press the "Calibration" button and enter the program memory location to be calibrated. 0 ...1023 / 2047.



- Press "Sheet thickness" button., Enter the thickness of the calibration sheet used. Confirm and finish with "Return" and "Next" buttons.
- Monitor then prompts to place or insert the calibration plate and waits for the operator to start the calibration measurement by pressing "Next" button.
- Once the calibration measurement has been completed, either a double sheet measurement or a zero sheet measurement is performed. Monitor prompts for the respective action and waits for pressing the enter button.
- After successful calibration, the new calibration values can be saved in the non-volatile memory by pressing the "Save" button.

Only double-surface non-contact measurement (BDWD): The optimum spacing of the sensor pair can be set using the indication on the display, see section 10.2.1

Exit of the "Calibration" operating mode at any time by using "Hamburger Button" . Existing calibration values are retained and new values will be ignored.

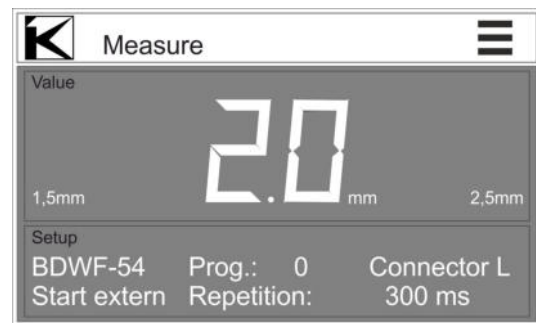
5.2.4. Operating mode "Measure"

A measurement is initiated depending on the start type, set in menu "Setup" (see picture in chapter 5.4).

Either via the proximity switch integrated in the sensor or via an external start signal "STA" at the parallel PLC interface. (for control via fieldbus interface, see chapter 6.2).

If the start signal is permanently present, the measurement is repeated periodically. The repeat time can be set between 0.1 and 10 seconds in menu "Program".

In addition, a measurement can be triggered at any time by touching the touch display.



The measurement is evaluated using the calibration curve, stored in the current program memory and the limit values, set there. (programming, selection of program memory and "Limit value" operating mode, see chapter 5.5 "Programming").

When the measurement is initiated, the sheet metal must completely cover the sensor head. (For double surface measurement with BDWD, the sheet must extend over sensors head by at least 90 mm. If the sheet has not yet reached this position during the measurement process or has already left it again, a lower value will be measured and a single sheet message may be issued despite existing double sheet.

With "external" start mode, the measurement can be started at a defined time (STA) via the PLC or an additional proximity switch.

The sensor lines and the external start signal are monitored for line breakage, so that in case of error, measuring mode is switched off and a fault signal is issued when relays K0, K1 and K2 drop out, causing an error message.

5.3. Acknowledge Error Message

If the cause of a general error message has been rectified, the device must always be reset to operating condition. This is done via the touch display.

After the error has been acknowledged, relay K0 pulls in again. Relay K2 remains dropped out until the next measurement.



Important note:

An incorrectly performed calibration will result in incorrect calculation of the thickness and, thus, to incorrect "1 sheet" and "2 sheet" messages. Therefore only authorised operating staff is allowed to perform the calibration and the setting of the thresholds.

Before calibrating BDWD Sensor, make sure that the sensor spacing and orientation are correctly adjusted. These settings are performed during calibration (see chapter 10.2).



Important note:

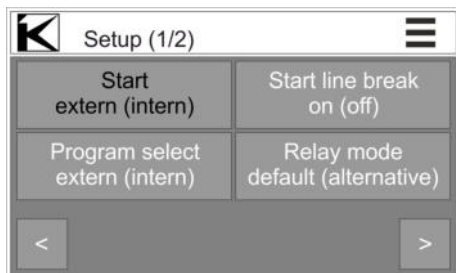
After a measuring program is programmed or the sensor or the metal type is calibrated, insert first one and then two metal sheets to check the proper functioning of the device.

5.4. Menu: Setup

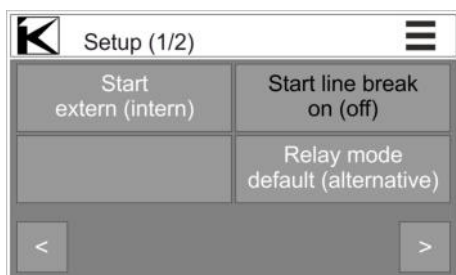
Various parameters can be set in the "Setup" menu, which then apply to all programs.

Start Measurement:

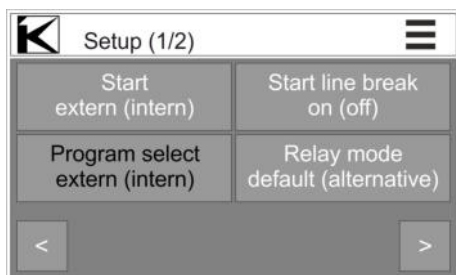
The start of the measurement can be set "internal" via the built-in proximity function, or "external" via start contact "STA" or via the fieldbus interface.

**STA lead breakage recognition:**

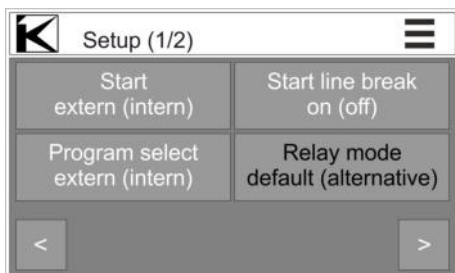
The supply line of the start contact, with parallel PLC interface, "STA" can be selected for line breakage. To do this, the detection must be switched on.

**Select memory:**

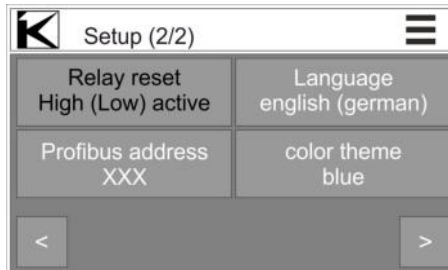
Memory selection "manual" via setting of the program memory number in the menu "Setup" or "external" via the PLC or bus interface.

**Relay mode:**

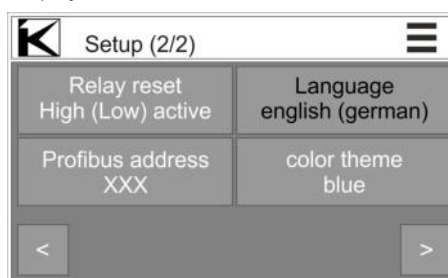
Switching between two different relay modes, "standard" and "alternative".

**Relay reset:**

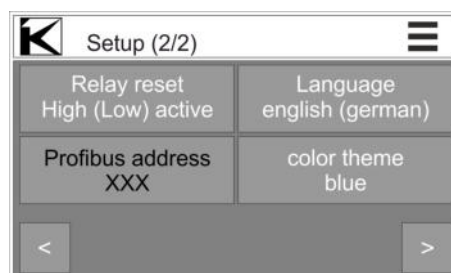
Definition of whether the relays are to drop out at 24 V level ("24 V active") or at 0 V level ("0V active").

**Language of display text:**

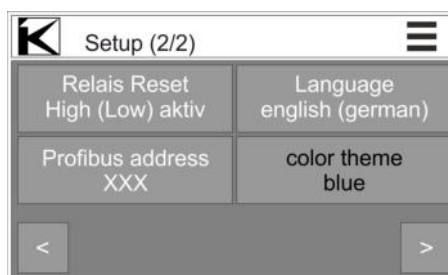
The display text can be shown either in German or English.

**Profibus Address:**

Profibus address can be set between 1 and 125.

**Set display colour:**

One of four different designs can be selected for the display



5.5. Menu: Program

Up to 1024 or 2048 parameter sets with sensor type, limit values, repetition time and connection position can be programmed in the menu "Program".

Start Programming:

In the main menu, press the button "Program" to switch to the submenu.

Main Menu	
Program	Measure
Calibrate	Setup

Manage Program number:

Press Button "Program number".

Program	
Program number 10	Sensor -----

Enter Program number:

Use keypad to enter a program number between 0 and 1023 (BDK-A / Relay outputs), or 0 and 2047 (BDK-A/FP, BDK-A/PN / Fieldbus)

Enter program number				
Program number 0 ... 2047	7	8	9	X
10	4	5	6	
Overview	1	2	3	X
		0	.	↵

Select Sensor-type :

Press Button "Sensor".

Program	
Program number 10	Sensor -----

Select Sensor category:

Depending on the type of material or the measuring principle of the sheet to be checked, select sensor type.

Select sensor category	
DSP	BDWF
DSPW	DSD
BDWD	

Select Sensor:

Select the connected sensor.

Select sensor	
DSP-36	DSP-42
DSP-54	DSP-75

Enter limit value:

Enter the lower and upper limit value, press "Lower limit" or "Upper limit".

Program	
Program number 10	Fuehler DSP-36
Lower limit -----	Upper limit -----
Connector -----	Repetition time -----

Enter limit value:

Depending on the thickness of the nominal sheet, enter the lower and upper limit value.

Enter lower limit				
Lower limit min. 0.0 mm max. 1.9 mm	7	8	9	X
0.5	4	5	6	
	1	2	3	X
		0	.	↵

Select sensor connection: Press "Connector".

Program	
Program number 10	Sensor DSP-36
Lower limit 0.5 mm	Upper limit 1.5 mm
Connector -----	Repetition time -----

Select connection: left XS1 / right XS2.

Select connection	
left	right

Enter Repetition time: Press "Repetition time".

Program	
Program number 10	Sensor DSP-36
Lower limit 0.5 mm	Upper limit 1.5 mm
Connector left	Repetition time -----

Enter Repetition time:

Repetition time: Time between start of two measurements. Input between 150 ms and 10 s.

Enter repetition time				
Repetition time	7	8	9	X
min. 150 ms	4	5	6	
max. 10000 ms	1	2	3	X
300	0	.	↵	

Check programming:

Check parameter set with "Hamburger Button" to exit.

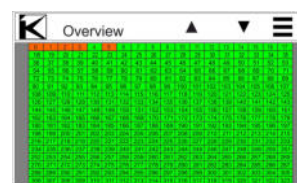
Program	
Program number 0	sensor BDWF-54
Lower limit 2,5 mm	Upper limit 1,5 mm
Connector left	Repetition time 300

Save Program: At the end of parameterisation.

Accept	
Program number 10 All parameters have been entered.	
Cancel	Save

Program overview: Free program memory locations or created programmes are displayed in the overview. Press "Overview" in submenu "Program number". Two different views are displayed.

Prog	Sensor	Threshold	Repetition time	Connector
0	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
1	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
2	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
3	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
4	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
5	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
6	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
7	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
8	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
9	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
10	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
11	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
12	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
13	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
14	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
15	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
16	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
17	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
18	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
19	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms
20	DSPW 64 (M2)	1.5 mm	2.5 mm	300 ms

**Delete Program:** To delete all parameters, press button "Program number" for approx. 5 seconds, until the submenu "Delete program" is opened.

Program	
Program number 0	Sensor BDWF-54
Lower limit 2,5 mm	Upper limit 1,5 mm
Connector left	Repetition time 300

Press Button "Delete" to delete.

Delete program	
Program number 0 All parameter will be deleted.	
Delete	Cancel

A new parameter set can then be created.

Program	
Program number 0	Sensor -----

5.6 Menu: Calibration

The actual value of the nominal plate is measured and saved in the Calibrate menu.

Start Calibration:
Press Button "Calibrate".

Main Menu

Program	Measure
Calibrate	Setup

Enter Program-Number:
Number of the program to be calibrated, enter.

Calibrate

Enter program number

7	8	9	X
4	5	6	
1	2	3	←
	0	.	↵

Check Program:
Check the parameters of the program.

Calibrate

Program number: 2
Sensor: DSP-54
Connector: left

Sheet thickness

Enter calibrate sheet thickness:
Enter the nominal thickness of the sheet to be checked.

Calibrate

Sheet thickness
min. 0.1 mm
max. 6.0 mm

7	8	9	X
4	5	6	
1	2	3	←
	0	.	↵

Calibration step 1:
with nominal plate.

Calibrate

Calibration 2.0 mm sheet.
Place the sensor on the sheet metal

Next

Calibration step 1 in progress:
Wait until measurement is complete.

Calibrate

Calibration 2.0 mm sheet metal.
in progress...

Next

Finish Calibration step 1:
Remove the nominal plate from the sensor.

Calibrate

Remove the sensor from the sheet metal.

Next

Start Calibration step 2 (without sheet):
Wait until measurement is complete.

Calibrate

Calibration 0.0 mm sheet metal.

Next

Finish Calibration:
Finish calibration with Save.

Calibrate

Save calibration?

Canel Save

Interfaces

The double sheet metal monitors devices are available with two different interface versions.

- A: Devices with parallel PLC interface for connection to the I/O level of the controller.
B: The version with the fieldbus interface is available with various standards (PROFIBUS DP, PROFINET IO).

5.6. Parallel Interface

5.6.1. Outputs

The sheet metal thickness monitors without the bus interface are equipped with three electrically isolated relay outputs. K1 and K2 are equipped with one reversing switch each. K0 is equipped with one NO and one NC. Depending on the relay mode, the following signals can be generated.

Standard Mode

K0: Result of the last sheet thickness measurement (result output after completion of the measurement).

Pulled in: A thickness greater than the current lower threshold has been measured (1 or 2 sheets).

Dropped out: A thickness less than the current lower threshold has been measured.

K1: 0 sheet message (negated)

Thickness measurement initiated by the integrated proximity switch (drops out immediately on detection of a workpiece).

Pulled in: No workpiece has been detected.

Dropped out: Workpiece has been detected.

K2: Result of most recent measurement (output of result after completion of measurement).

Pulled in: A thickness less than the current upper threshold has been measured (0 or 1 sheet).

Dropped out: A thickness greater than the current upper threshold has been measured (2 sheets) or general error message.

In the case of a general error message, the cause of the error will be specified more precisely on the display.

Standard Mode			
Sheets	K0	K1	K2
0	0	1	1
Undersize	0	0	1
1	1	0	1
2	1	0	0
Error	0	0	0

Alternative Mode

At the beginning of the measurement, all the relays pull in. At completion of measurement, following message is generated:

K0: 0 sheet message (negated)

Pulled in: A thickness greater than the current lower threshold has been measured (1 or 2 sheets).

Dropped out: Thickness less than the current lower threshold has been measured (0 sheet or too thin).

K1: 1 sheet message (negated)

Pulled in: A thickness less than the current lower or greater than the current upper threshold has been measured (0 or 2 sheets).

Dropped out: A thickness less than the current upper and greater than the current lower threshold has been measured (1 sheet).

K2: 2 sheet message (negated)

Pulled in: A thickness less than the upper threshold has been measured (0 or 1 sheet).

Dropped out: A thickness greater than the current upper threshold has been measured (2 sheets).

In the case of a general error message, the cause of the error will be more precisely specified on the display.

Alternative Mode			
Sheets	K0	K1	K2
0	0	1	1
Undersize	0	1	1
1	1	0	1
2	1	1	0
Error	0	0	0

5.6.2. Inputs

STA Input

The measurement can be initiated by an external signal on the "STA" input. This can be an external mechanical switch, a proximity switch, or a PLC.

For the line break monitoring a resistor must be connected in parallel with the switch.

Relay Reset

In order to ensure reliable operation, the relay outputs must be reset before or after each measurement and dynamically queried via the press controller.

While the relays are reset, K0, K1, and K2 are in the dropped out condition. After relays reset, depending on the selected relays mode, the relays take on the following condition:

Standard Mode:

After the test, K1 pulls in if no workpiece is present. The relays K0 and K2 do not pull in until completion of a measurement. After an error and following error clearance including acknowledgement, 2 sheet message will be signaled (K2 is in dropped out condition).

Alternative Mode:

The relays K0, K1, and K2 do not pull in until the beginning of the next measurement. After the measurement, K0, K1, or K2 drop out again, corresponding to the result. These are also the results after an error acknowledgement.

Control Inputs

The programme memory locations, 0 ... 1023, are selected via 10 electrically isolated inputs, A0 ... A9.

5.7. Interfaces PROFIBUS DP, PROFINET IO

Machine control systems often communicate with their decentralised field devices via fieldbusses. The standard versions of the BDK-A Double Sheet Detectors are available with fieldbus interface, PROFIBUS DP, or PROFINET IO. All important measurement and control data can be transmitted from and to the controller via these interfaces. Other fieldbus interfaces are available on request.

For devices with PROFIBUS DP and PROFINET interface the relevant GSDML or GSD file is enclosed in delivery.

5.7.1. Outputs (Inputs)

Byte 0

- Bit 0 on : Measurement in progress.
- Bit 1: Workpiece recognition via integrated proximity switch (asynchronous to measuring clock pulse)
off: Workpiece recognised
on: No workpiece recognised
- Bit 2: Result of most recent measurement (synchronous to measuring clock pulse, updated when measurement is completed)
on: Measured thickness between current lower and upper threshold (1 sheet)
off: Status after resetting measurement result, or measured thickness less than current lower or greater than current upper threshold
- Bit 3 on: Measured thickness greater than current upper threshold (2 sheets).
off: Status after resetting measurement result, or measured thickness less than current upper threshold
- Bit 4 on: Measurement result available
off: Status after resetting measurement result
- Bit 5 on : Not used
- Bit 6 on : Sensor error
- Bit 7 on : System error

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
System error	Sensor error		Measurement result available	2 sheets	1 sheet	Sheet detected	Measurement in progress

Byte 1:

- Bit 0 ... 7: The internally or externally selected memory location number is returned (asynchronous to clock pulse) Bit 0 ... 7

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Program Bit [7] reflected	Program Bit [6] reflected	Program Bit [5] reflected	Program Bit [4] reflected	Program Bit [3] reflected	Program Bit [2] reflected	Program Bit [1] reflected	Program Bit [0] reflected

Byte 2:

- Bit 0 ... 7: Output of most recent measurement result in mm/10 (synchronous with clock pulse)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Measured value Bit [7]	Measured value Bit [6]	Measured value Bit [5]	Measured value Bit [4]	Measured value Bit [3]	Measured value Bit [2]	Measured value Bit [1]	Measured value Bit [0]

Byte 3:

- Bit 0 ... 2: Current upper threshold value in recently selected memory location number is output in mm/10 (asynchronous to clock pulse)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Upper limit Bit [7]	Upper limit Bit [6]	Upper limit Bit [5]	Upper limit Bit [4]	Upper limit Bit [3]	Upper limit Bit [2]	Upper limit Bit [1]	Upper limit Bit [0]

Byte 4:

- Bit 0 ... 2: The current program memory number set internally or externally is fed back (asynchronous to the measuring cycle) Bit 8 ... 10

- Bit 7 Measuring mode is activated

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Measuring mode activated					Program Bit [10] reflected	Program Bit [9] reflected	Program Bit [8] reflected

5.7.2. Inputs (Outputs)

Byte 0:

- Bit 0 on : Start of measurement
- Bit 1 ... 3: Not used
- Bit 4 on : Reset 0, 1, or 2 sheet message and thickness measurement
- Bit 5: Not used
- Bit 6 on: Reset Sensor error
- Bit 7 on: Reset System error

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reset System error	Reset Sensor error		Reset Sheet message				Start measurement

Byte 1:

- Bit 0 ... 7: Selected memory location number 0 ... 255 (binary coded)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Program memory Bit [7]	Program memory Bit [6]	Program memory Bit [5]	Program memory Bit [4]	Program memory Bit [3]	Program memory Bit [2]	Program memory Bit [1]	Program memory Bit [0]

Byte 2:

- Bit 0 ... 2: Selected memory location number 256 ... 2047 (binary coded)

- Bit 3 ... 6: Not used

- Bit 7  Measurement activated

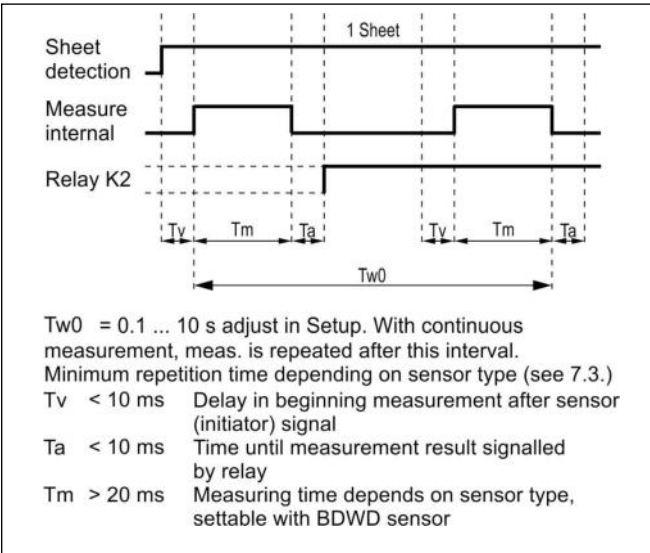
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Measurement Mode activated					Program memory Bit [10]	Program memory Bit [9]	Program memory Bit [8]

6. Pulse Diagram for query of measured value

6.1. BDK-A mit PLC-Interface

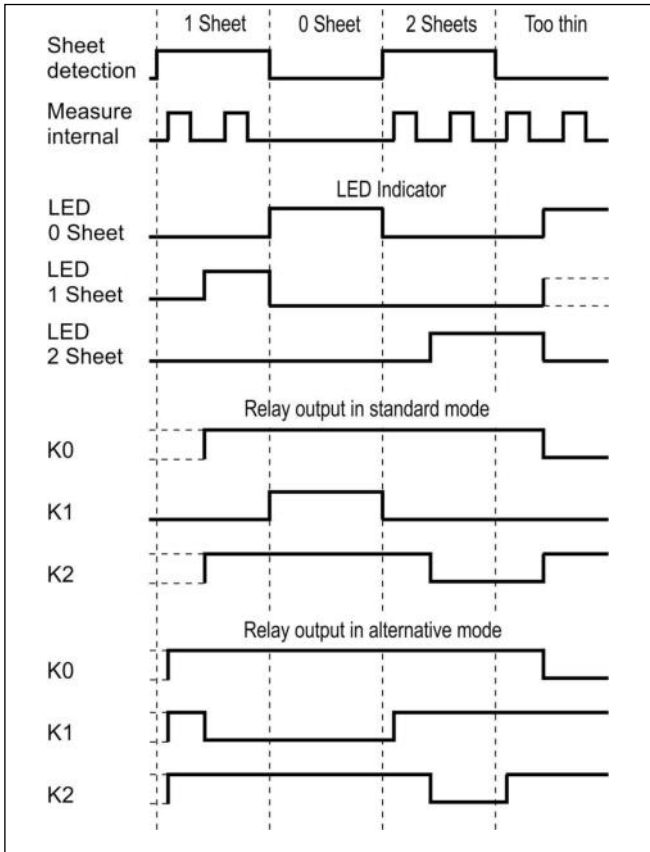
6.1.1. Internal start of measurement

Timing Diagram of measurement

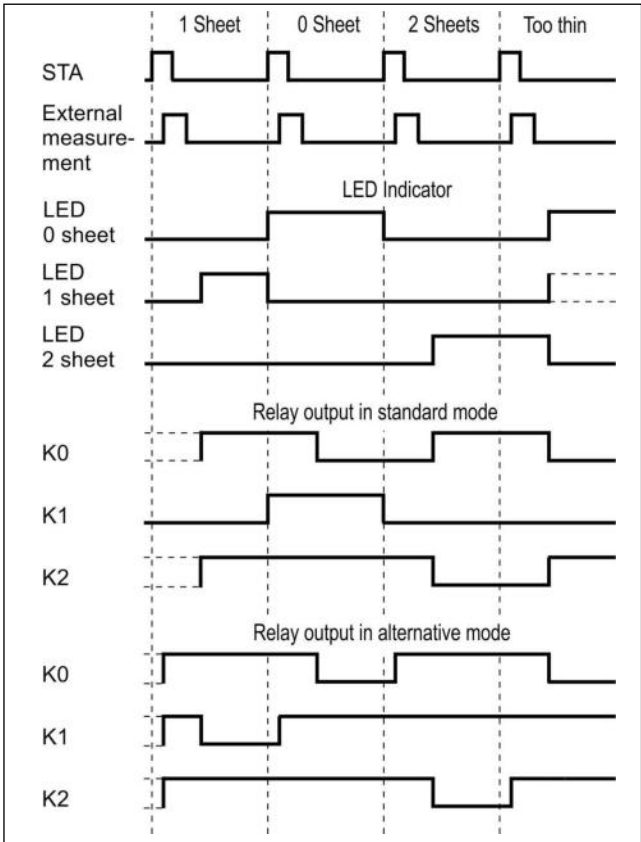


6.1.2. Internal start of measurement

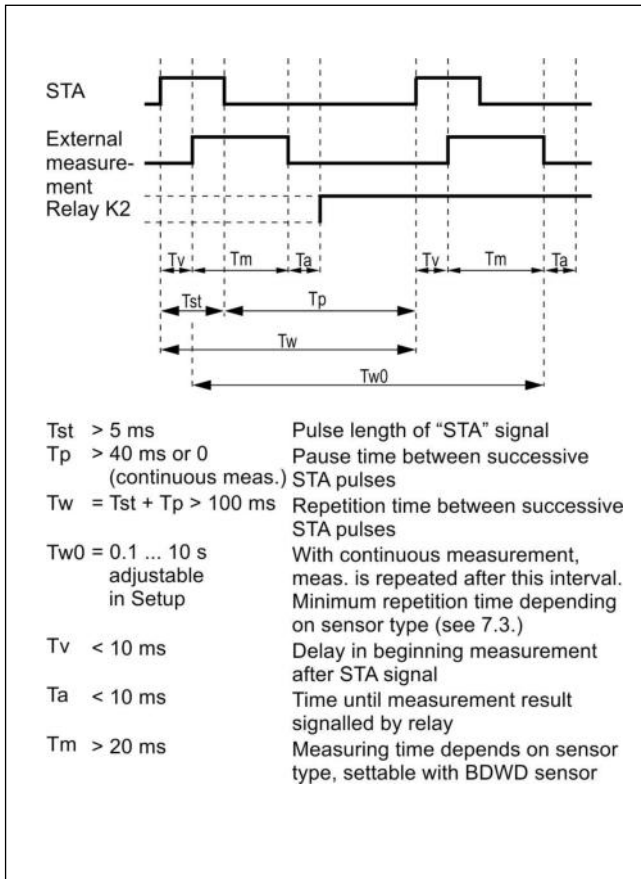
Overview of measurement sequences



6.1.3. External start of measurement Overview of measurement sequences



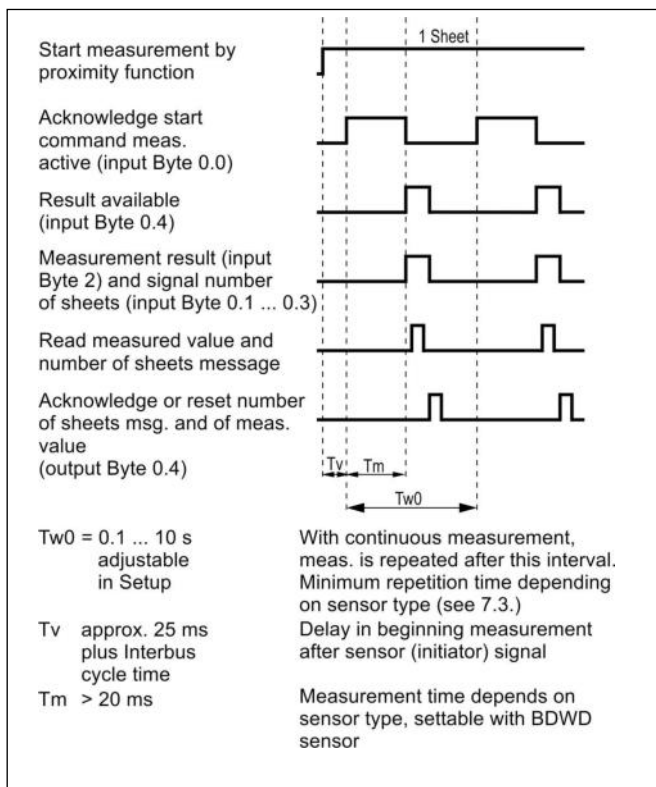
Timing Diagram of measurement



6.2. With Fieldbus Interface

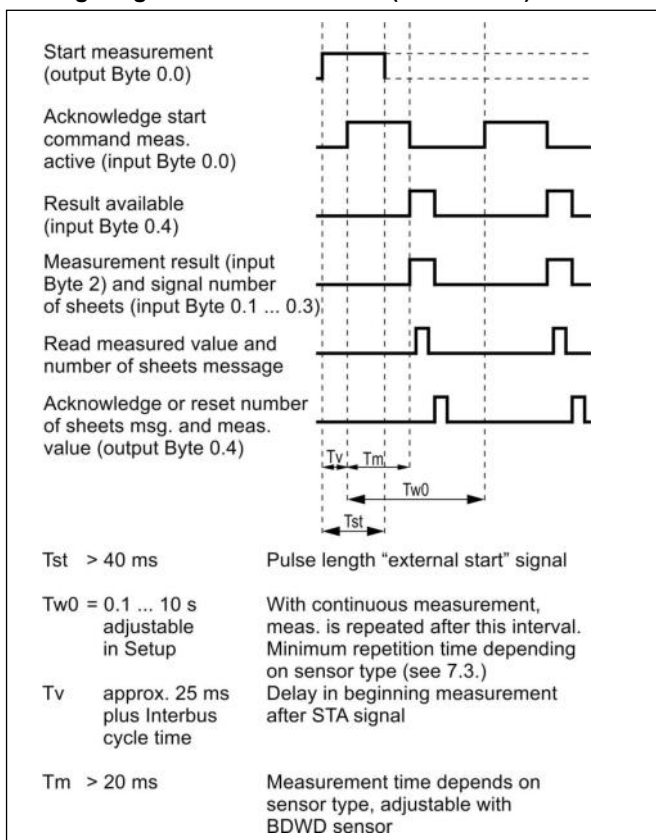
6.2.1. Internal start of measurement

Timing Diagram of measurement (handshake)



6.2.2. External start of measurement

Timing Diagram of measurement (handshake)



6.3. Repetition Time

The setting of the smallest repetition time interval (T_{w0}) - time distance between measurement beginnings with a permanent active start signal - has to be individually fitted to the different sensors and measuring principles.

This setting is made in the menu "Program", submenu "Repetition time".

Type	Ref.no.	Repetition Time
DSP-36sg-1s	13.05-86	150 ms ... 10 s
DSP-42sg-1s	13.05-87	150 ms ... 10 s
DSP-54sg-1s	13.05-89	150 ms ... 10 s
DSP-75sg-1s	13.05-90	300 ms ... 10 s
DSPW-42-sg-1s Eisen	13.05-66	150 ms ... 10 s
DSPW-42-sg-1s Nichteisen		100 ms ... 10 s
DSPW-54sg-1s Eisen	13.05-67	150 ms ... 10 s
DSPW-54sg-1s Nichteisen		100 ms ... 10 s
BDWF-m54rg-2s	13.05-73	100 ms ... 10 s
BDWD/S-m36rg-1s	13.05-74	100 ms ... 10 s
BDWD/E-m36rg-1s	13.05-75	100 ms ... 10 s
BDWD/S-60aq30-1Y1	13.05-76	100 ms ... 10 s
BDWD/E-60aq30-1Y1	13.05-77	100 ms ... 10 s
DSD-18mg61n0,5/3-1Sd1	13.05-91	100 ms ... 10 s
DSD-30mg74n3/6,5-1Sd1	13.05-94	100 ms ... 10 s



Important Note:

To prevent the DSP and DSPW sensors (measuring mode for ferrous workpieces) from heating up, they may operate at the smallest possible repetition time only with a maximum start-up time of 50%.

This leads to a higher degree of measuring inaccuracy and to the destruction of the sensor during long periods of operation

That means: At the smallest possible repetition time, e.g. with a whole measuring time of 1 s a break of min. 1 s has to take place.

7. Interconnection with Press Controller

Appropriate interconnection of this device with the press controller appreciably improves the safety of the machinery.

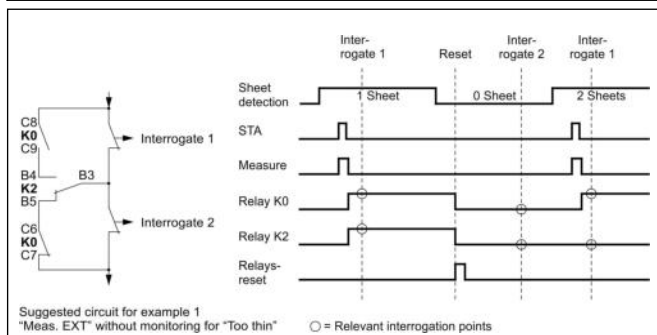
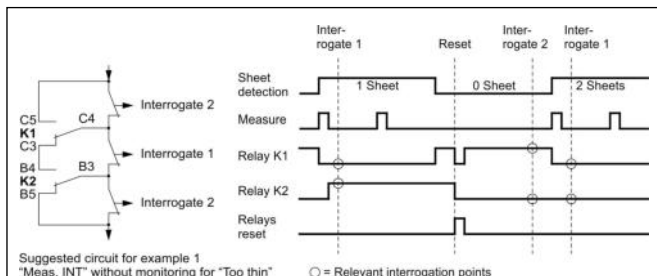
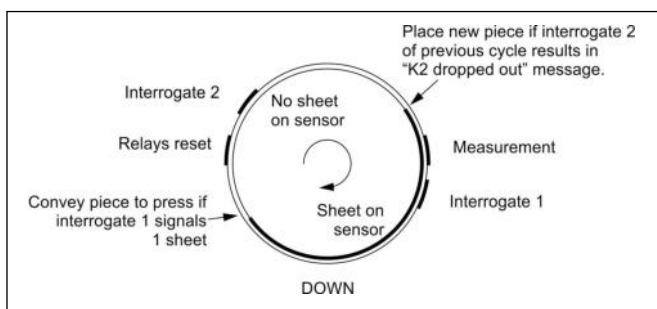
In order to ensure the best reliability of the machinery, the relay-outputs should be interrogated at various instants during the operating cycle of the press.

Query should take place in such a manner that the relays have to change the status every cycle.

Example 1:

Operation with relay reset, measuring on an intermediate depositing station or with workpiece being transported (standard mode).

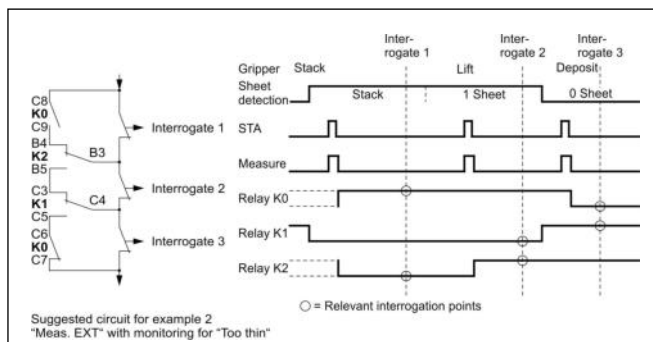
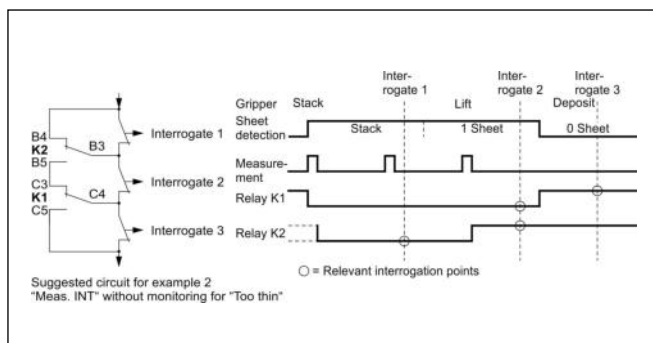
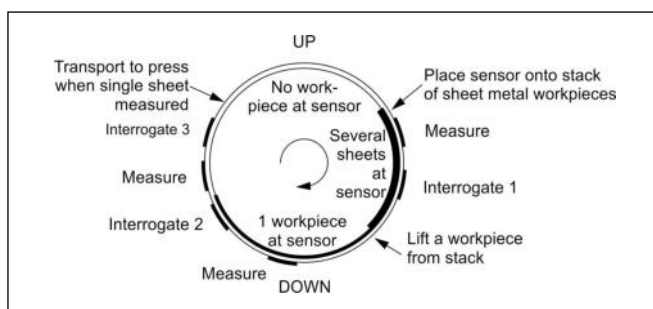
1. Start measurement with proximity switch or external start after sensor has been placed onto workpiece.
2. Query 2, if relay K1 is pulled in or K0 and K2 have dropped out.



Example 2:

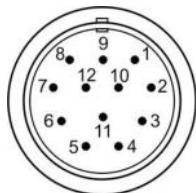
Operation without relays reset, workpiece being lifted from stack (standard mode).

1. Measurement start with proximity switch or external start when sensor has been placed on stack.
2. Query 1, if multiple sheets have been measured (K0 pulled in, K1 and K2 dropped out).
3. Further measurements after metal sheet has been lifted from stack.
4. Query 2, if single sheet has been measured (K1 dropped out, K0 and K2 pulled in).
5. Workpiece deposit.
6. Measurement after workpiece has been deposited.
7. Query 3, if workpiece has been deposited (K0 dropped out, K1 and K2 pulled in).



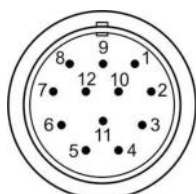
8. Wiring

8.1. Contact Assignment PLC Interface XS3.1 und XS3.2



XS3.1

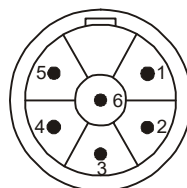
PIN	Signal
1	Memory selection BIT 0
2	Memory selection BIT 1
3	Memory selection BIT 2
4	Memory selection BIT 3
5	Memory selection BIT 4
6	Memory selection BIT 5
7	Memory selection BIT 6
8	Memory selection BIT 7
9	Memory selection BIT 8
10	Memory selection BIT 9
11	P external
12	M external



XS3.2

PIN	Signal
1	STA
2	Relay reset
3	Relay 0a (NC)
4	Relais 0a (NC)
5	Relais 0b (NO)
6	Relais 0b (NO)
7	Relais 1 (NC)
8	Relais 1 (center contact)
9	Relais 1 (NO)
10	Relais 2 (NC)
11	Relais 2 (center contact)
12	Relais 2 (NO)

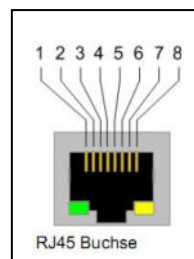
8.2. Power supply connection PLC Interface XS4



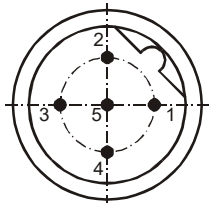
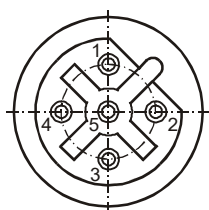
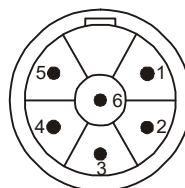
XS4

PIN	Signal
1	+24 VDC
2	not used
3	0 VDC
4	not used
5	PE
6	not used

8.3. PROFINET IO connection XS5.1 und XS5.2

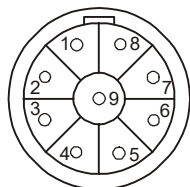


PIN	Signal	Meaning
1	Tx +	Transmission data +
2	Tx -	Transmission data -
3	Rx +	Receive data +
4	-	-
5	-	-
6	Rx -	Receive data -
7	-	-
8	-	-

8.4. PROFIBUS DP ConnectionM12 bus connector:**Input XS6****Output XS7****8.5. Power supply connection XS8 with Fieldbus Interface**

PIN	Signal
1	+24 VDC
2	not used
3	0 VDC
4	not used
5	PE
7	not used

Pin	Signal	Meaning
1	VP	Versorgungsspannungs- Plus, (P5V)
2	RxD/TxD-N	Transmission-/ Receive data - N, A-line
3	DGND	Potential of data transmission (reference potential to VP)
4	RxD/TxD-P	Transmission-/ Receive data - P, B-line
5	shield	Shield or protective ground
Thread		Shield or protective ground

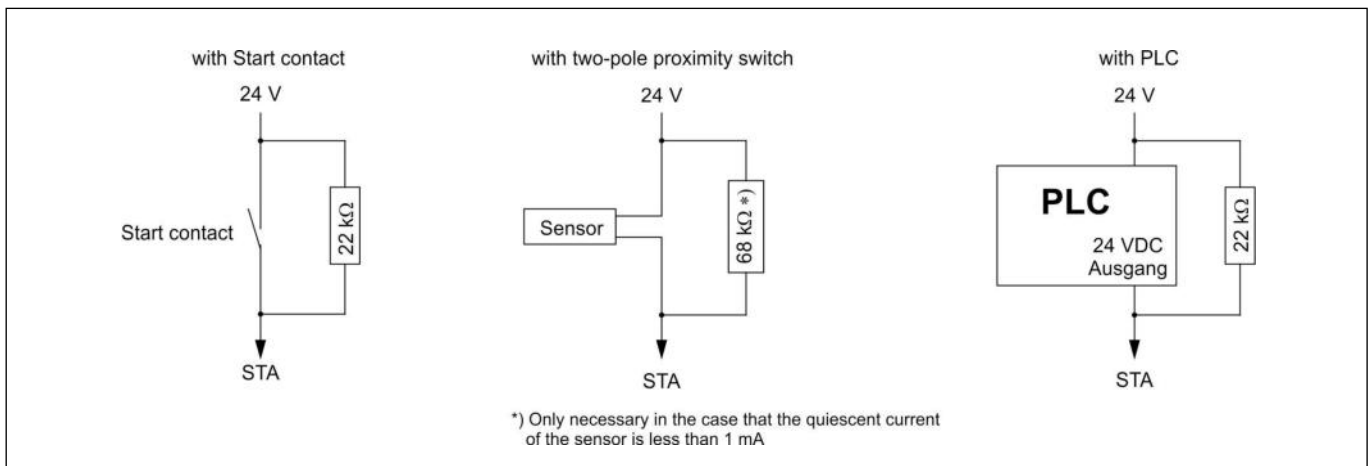
8.6. Connection XS1 and XS2 for Sensors BDWF, BDWD, DSD, DSP and DSPW as well as T-Coupler ADD and Sensor Switch BDIW

	BDWF / BDWD	DSD	DSP	DSPW	
1	+24 VDC	+24 VDC	+24 VDC	+24 VDC	(red)
2	OUT	not used	not used	OUT	(black)
3	M	M	M	M	(violet / brown/grey)
4	IN	not used	not used	IN1	(pink)
5	not used	IN	Proximity switch	not used	(green)
6	not used	not used	IN	IN2	(blue)
7	not used	not used	S-OUT1	S-OUT1	(brown) *
8	not used	not used	S-OUT2	S-OUT2	(white) *
9	not used	not used	not used	not used	-
Housing	Shielding	Shielding	Shielding	Shielding	Shielding

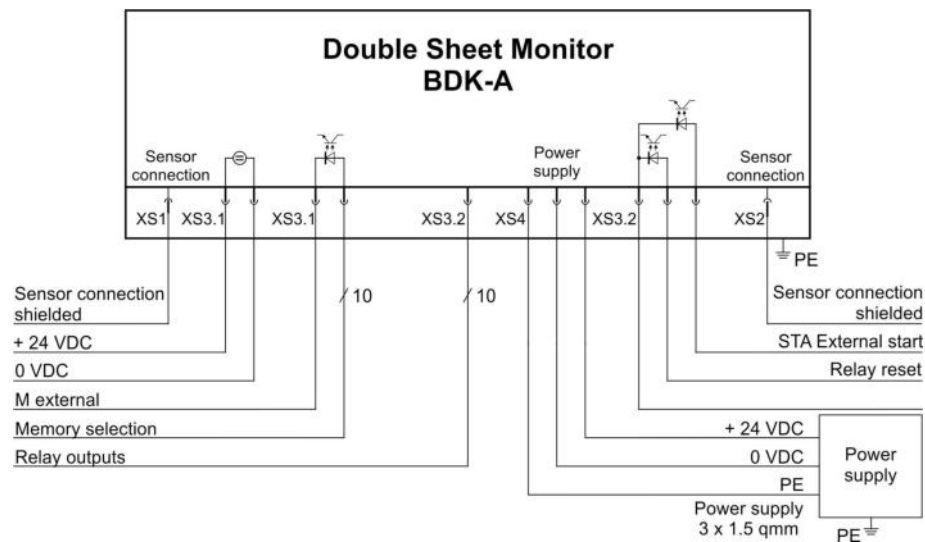
* 1,00mm

9. Wiring Diagrams

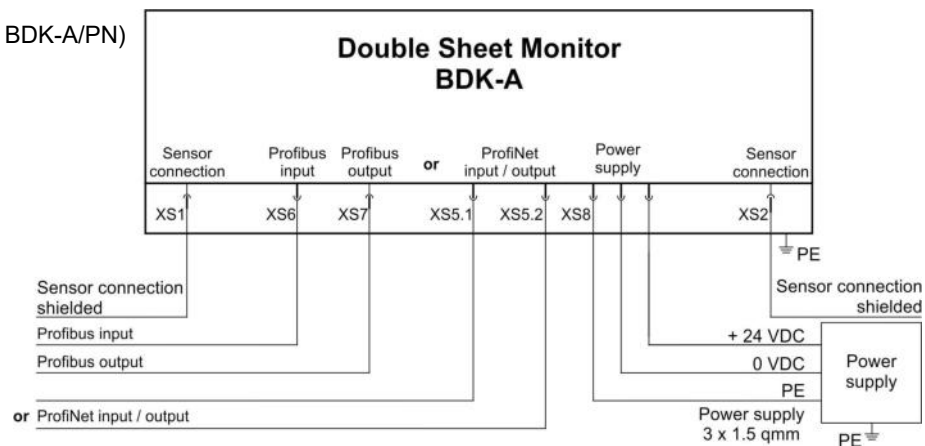
Wiring STA-Line with Lead breakage monitor

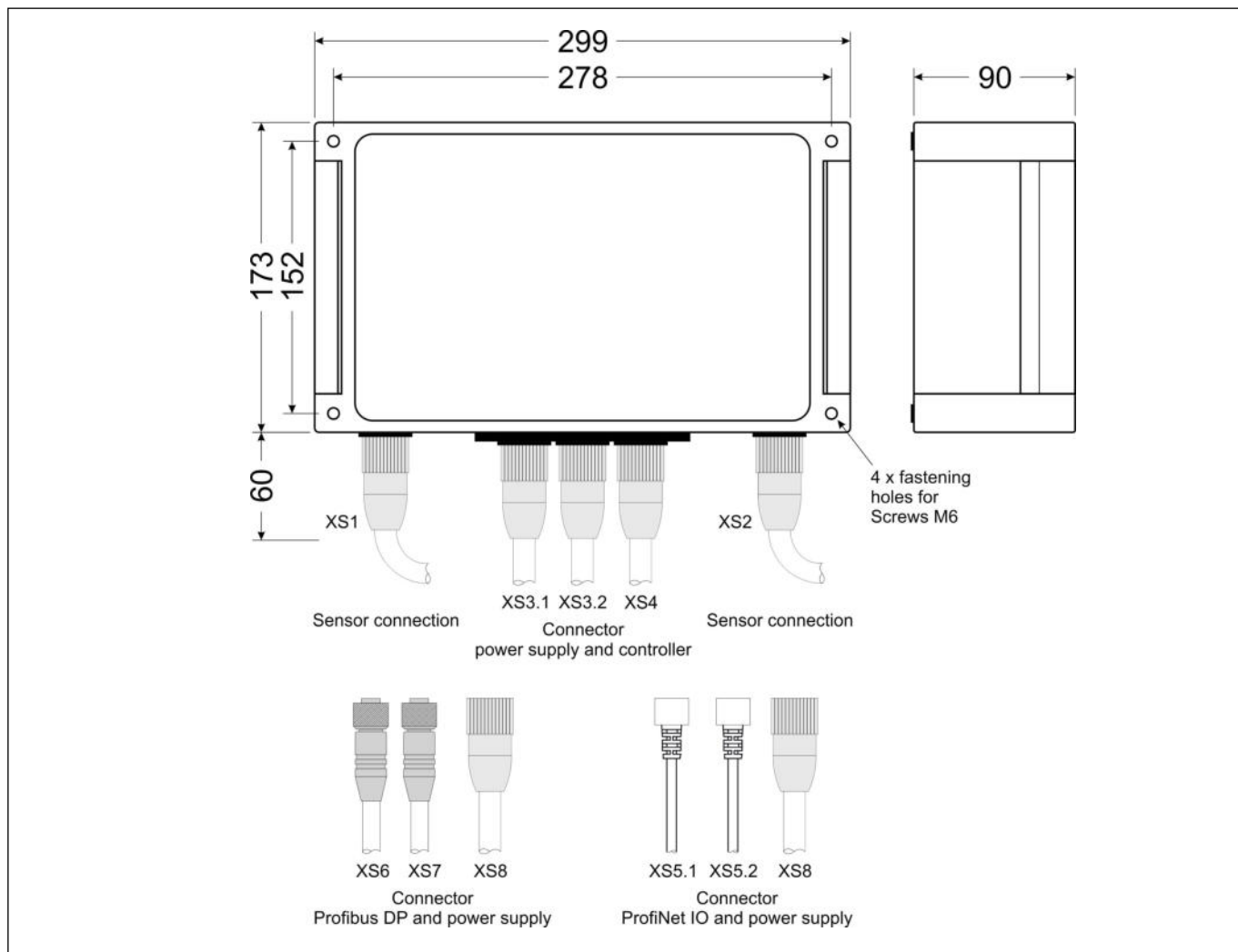


PLC Interface
(BDK-A/PR)



Fieldbus Interface
(BDK-A/PB and BDK-A/PN)





10. Sheet Metal Thickness Sensors

10.1. DSP, DSPW und BDWF for single surface contact measurement

10.1.1. Mounting

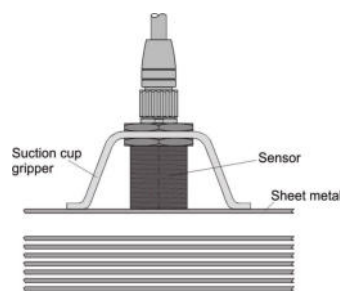
Preferably, the sensor should be built into an appropriately designed suction cup on the gripper.

The suction cup lifts the workpiece from the stack, bringing it near the proximity switch in the sensor. Just before the sensor touches the workpiece, the proximity switch recognises the sheet metal and initiates the measurement.

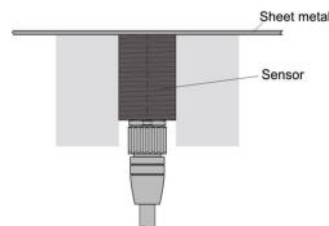
In the case of ferrous metals, the workpiece is held onto the sensor during the brief measuring time (≤ 110 ms). Instead of having a sensor in the suction cup gripper, it can be mounted also single-sided in a measuring station. In such case, however, the workpieces must remain motionless relative to the sensor during measurement. Mounting the sensor directly under and flush with the surface supporting the workpiece avoids accumulation of dirt and filings around the sensor (avoid air gap between sensor and workpiece).

A spring-mounted sensor is a suitable expedient if workpieces which are not flat and/or are very stiff (more than 1.5 mm thick) are to be processed. The workpieces must be large enough to completely cover the sensing face of the sensor during measurement.

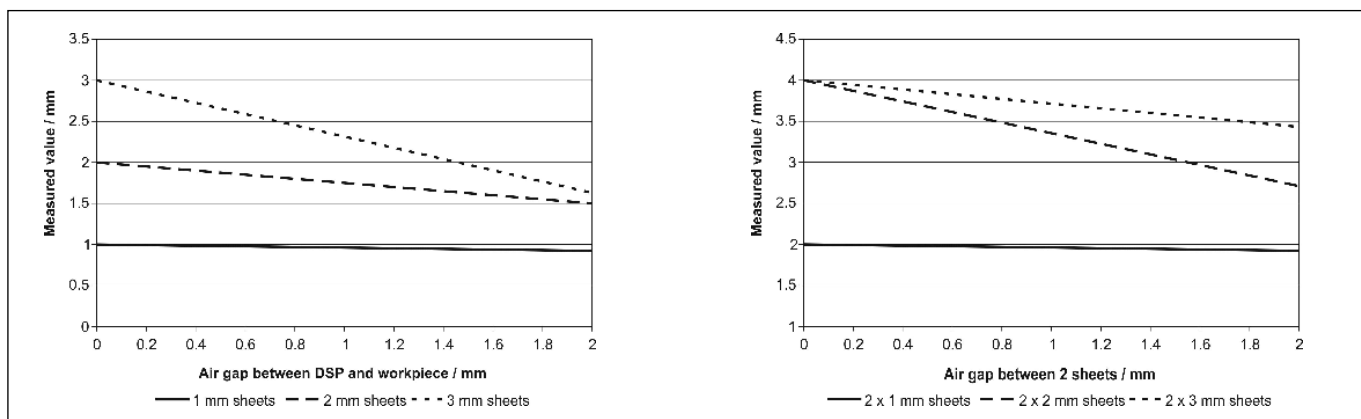
Mounting in the Suction Cup Gripper



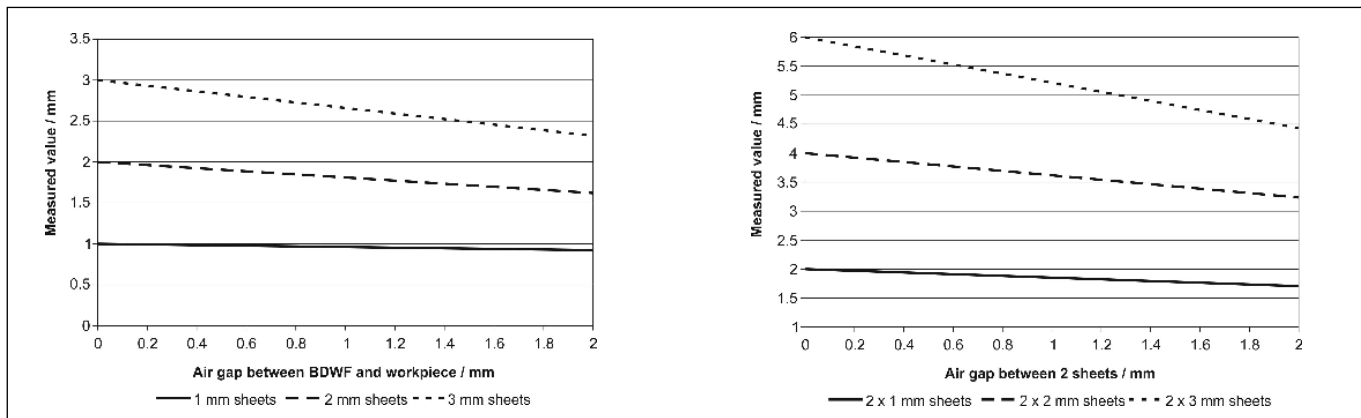
Flush Mounting



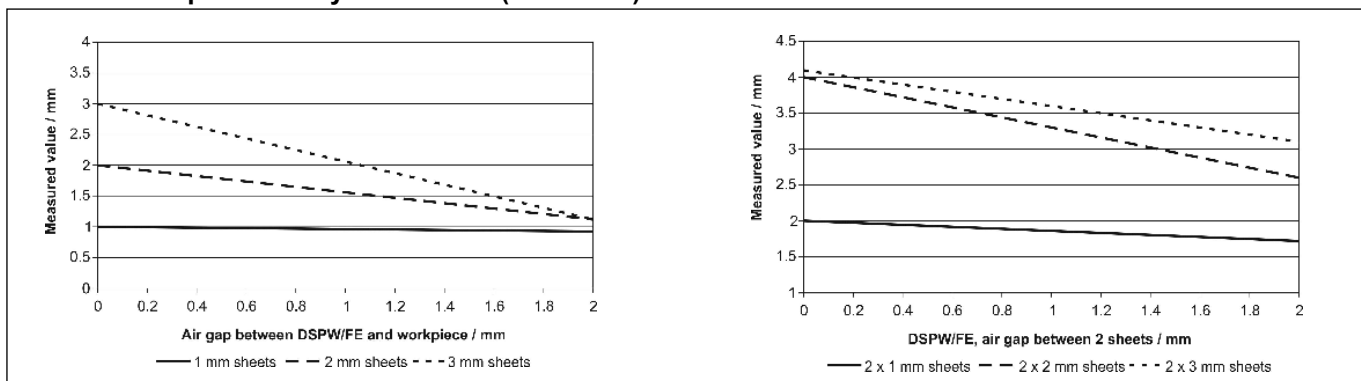
10.1.2. Air Gap Sensitivity with DSP-54sg-1s (Fe sheets)



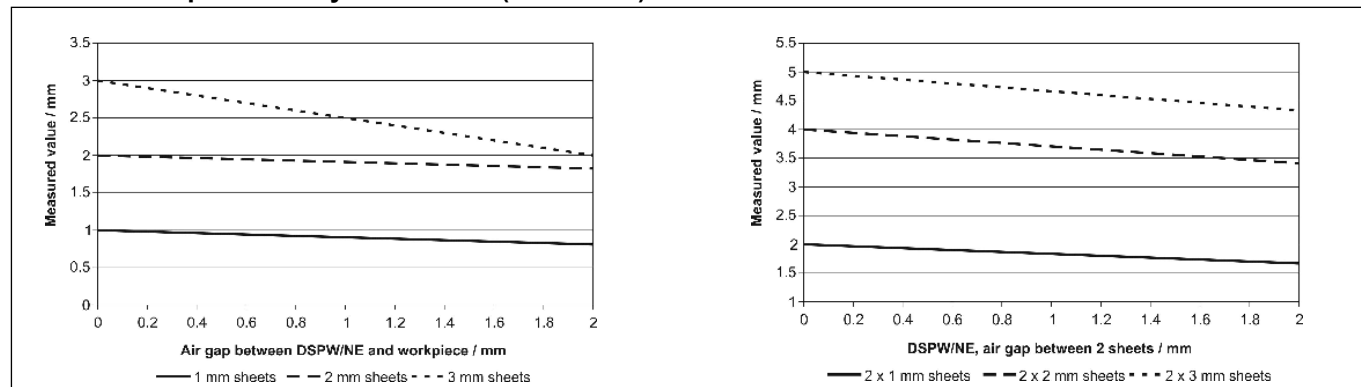
10.1.3. Air Gap Sensitivity with BDWF-m54rg-2s (NE sheets)

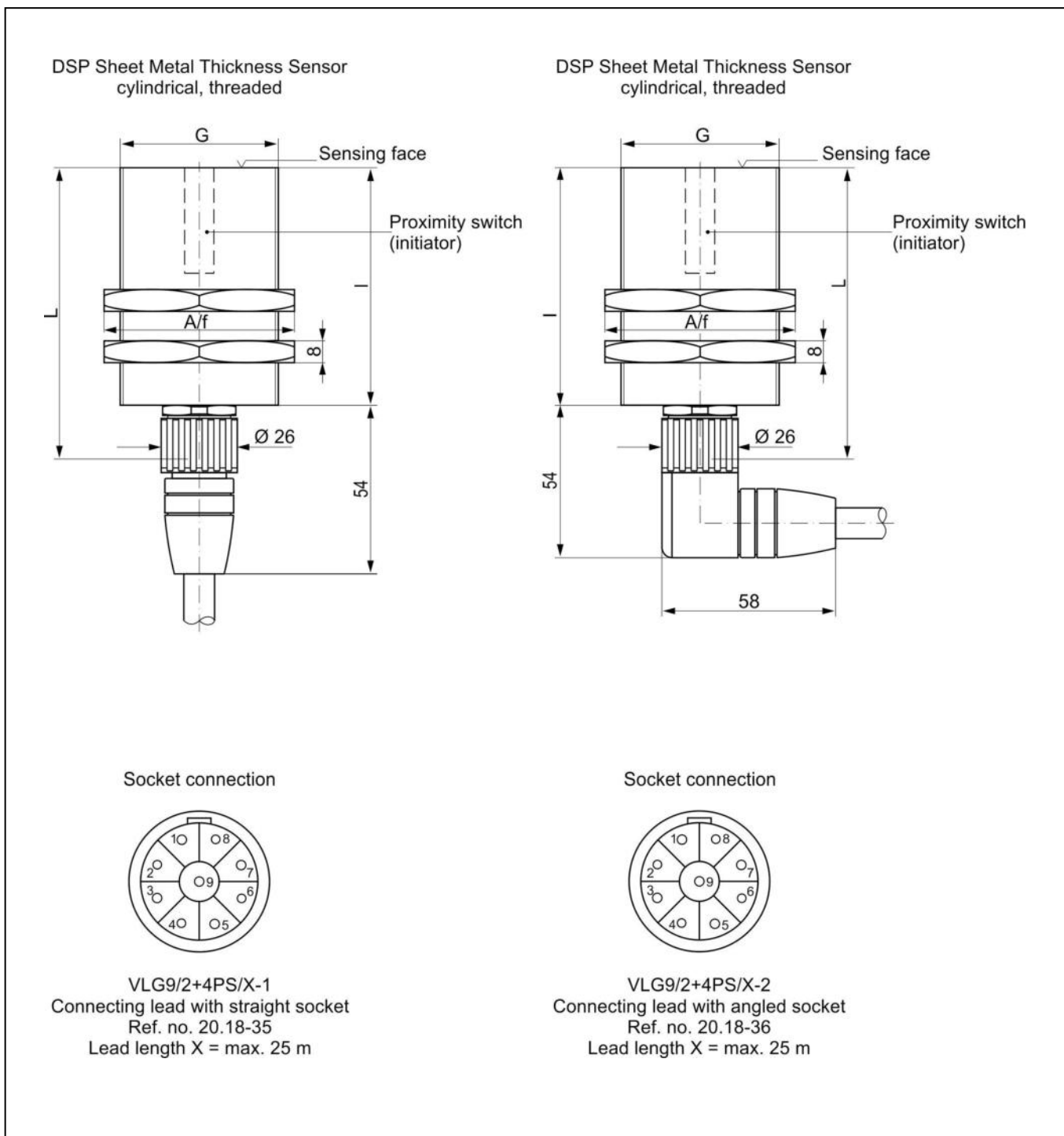


10.1.4. Air Gap Sensitivity with DSPW (Fe sheets)



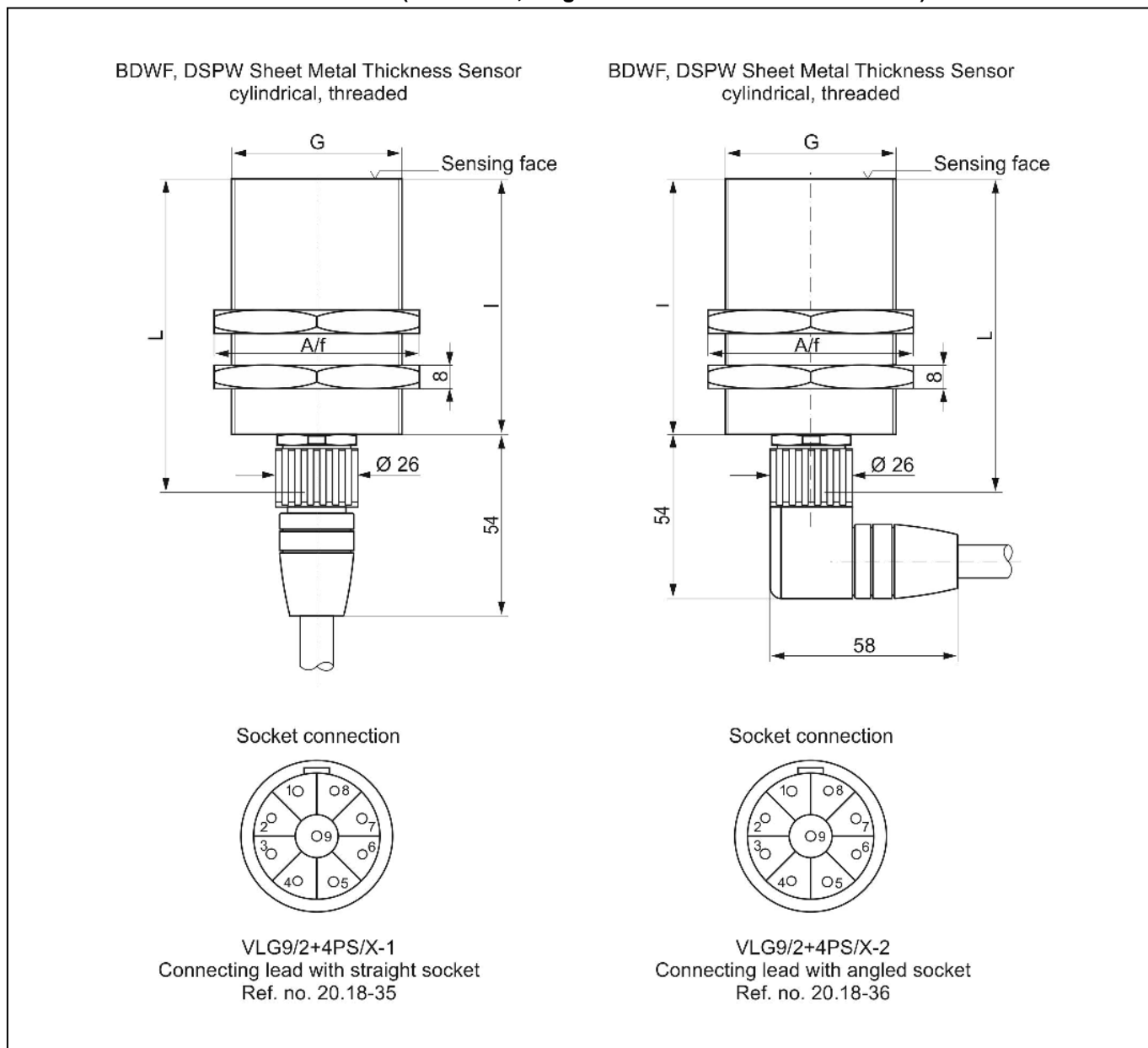
10.1.5. Air Gap Sensitivity with DSPW (NE sheets)



10.1.6. Housing Dimensions DSP (Fe sheets, single surface contact measurement)

Typ	Ref.no.	Measuring Range mm	Fe sheets up to mm	Measur. Time ms	L mm	I mm	G Thread	SW	D mm	Weight g
DSP-36sg-1s	13.05-86	0.2 ... 2	1.5	< 20	90	65	M36 x 1,5	55		380
DSP-42sg-1s	13.05-87	0.2 ... 3	2.5	< 30	100	75	M42 x 1,5	65		650
DSP-54sg-1s	13.05-89	0.2 ... 4	3.5	< 50	107	81	M54 x 0.75	65		1200
DSP-75sg-1s	13.05-90	0.2 ... 6	5.5	< 110	126	100	M75 x 1.5	90		3010

**10.1.7. Housing Dimensions DSPW (Fe and NE sheets, single surface contact measurement)
BDWF (NE sheets, single surface contact measurement)**



Type	Ref.no.	Measuring Range mm	Sheets up to mm	Meas Time ms	L mm	I mm	G Thread	SW	D mm	Weight g	Lead-length up to m
BDWF-m54rg-2s	13.05-73	0.2 ... 6	5.5	< 100	101	81	M54 x 0.75	65	54	650	50
DSPW-42sg-1s	13.05-66	FE: 0.2 ... 4 NE: 0.2 ... 2.5 NE: 0.2 ... 4.0*)	3.0 2.0 3.0	< 70	117	96	M42 x 1.5	55	42	900	25
DSPW-54sg-1s	13.05-67	FE: 0.2 ... 4 NE: 0.2 ... 3 NE: 0.2 ... 5.0*)	3.5 2.5 4.0	< 70	117	96	M54 x 0.75	65	54	1200	25

*) The measuring range for non-ferrous (NE) sheets can be extended to **4 mm** or **5 mm** by use of a special adapter.
When using an unsuitable adapter, the accuracy and linearity of the sensor may deteriorate.

10.2. BDWD/S and BDWD/E for double surface non-contact measurement

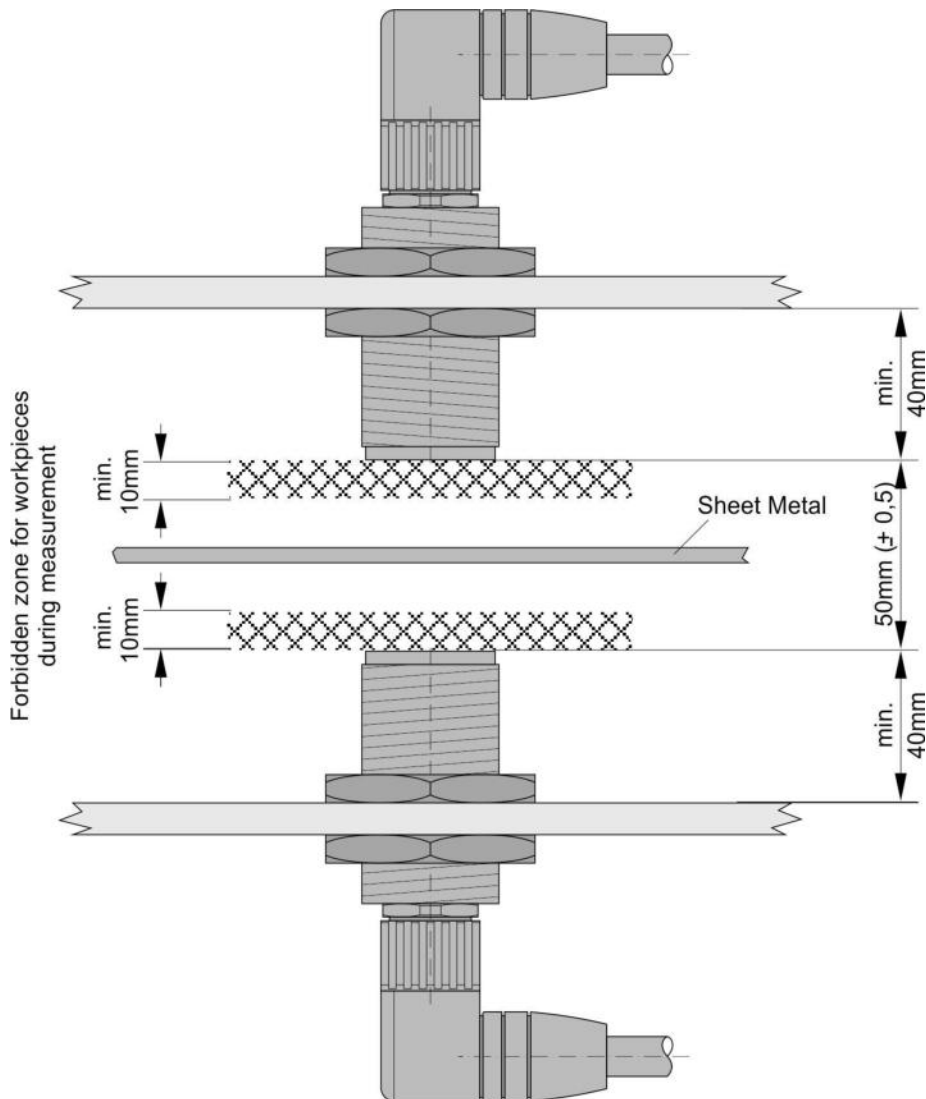
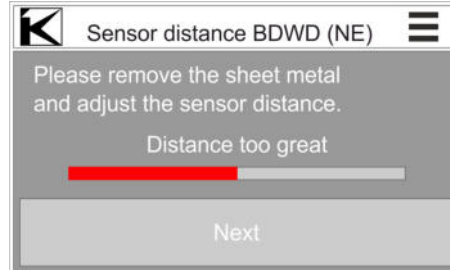
10.2.1. Mounting

The BDWE/S and BDWD/E sensor pair is to be mounted with a distance of 50 mm between their sensing faces. In order to provide maximum measurement accuracy, mounting must be accomplished in such manner that the workpieces will be transported precisely between the transmitter and receiver.

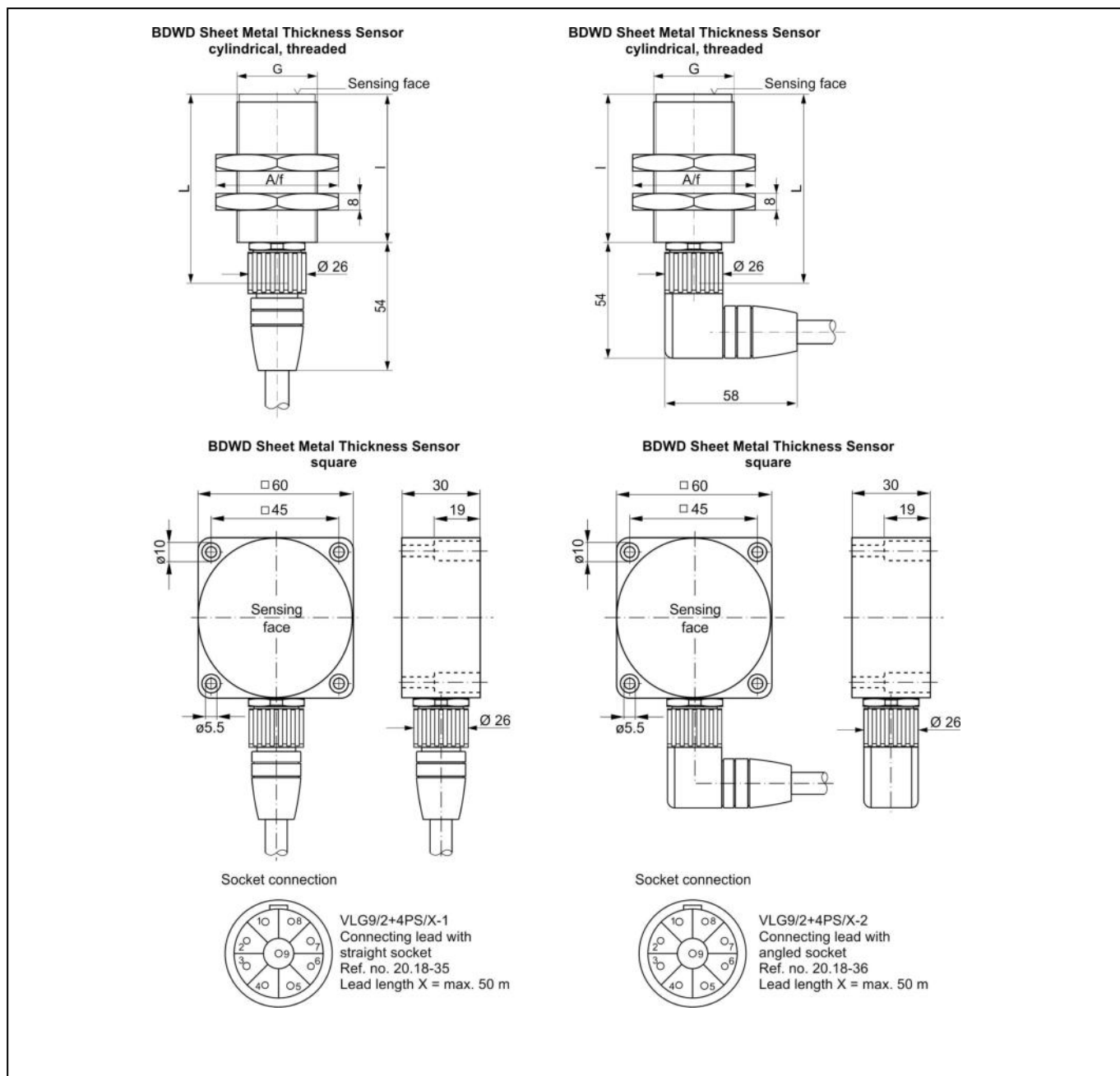
Visual support for the precise mounting procedure is provided in the menu "Calibration", Sensor distance submenu. The LC- display shows the distance between the transmitter and receiver.

Mounting must be accomplished so that the workpieces maintain a distance of at least 10 mm from the sensing faces during measurement.

The workpieces must be large enough to exceed at least 90 mm over the edges of the sensing faces during the entire measuring interval. Otherwise, especially the measurement of thick ferrous workpieces can lead to wrong results or to a reduced measuring range.



10.2.2. Housing Dimensions BDWD (Fe and NE sheets, double surface non-contact measurement)



Type	Ref. no.	Meas. Range mm		Sheets up to mm		Measur. Time ms	L mm	I mm	G Thread	SW	Weight g
		Ferrous	Non-ferrous	Ferrous	Non-ferrous						
Transmitter BDWD/S-m36rg-1s	13.05-74	0.2 ... 3.5	0.2 ... 20	3.0	6.0	25 ... 200	85	65	M36 x 1.5	55	250
Receiver BDWD/E-m36rg-1s	13.05-75	0.2 ... 3.5	0.2 ... 20	3.0	6.0	25 ... 200	85	65	M36 x 1.5	55	250
Transmitter BDWD/S-60aq30-1Y1	13.05-76	0.2 ... 3.5	0.2 ... 20	3.0	6.0	25 ... 200	-	-	-	-	500
Receiver BDWD/E-60aq30-1Y1	13.05-77	0.2 ... 3.5	0.2 ... 20	3.0	6.0	25 ... 200	-	-	-	-	500

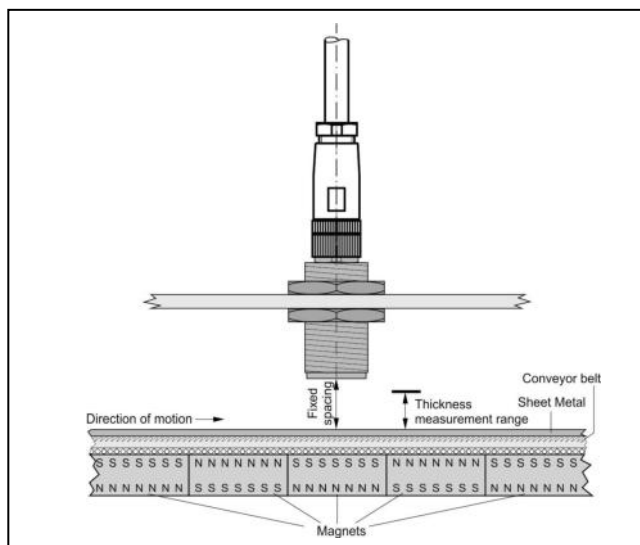
10.3. DSD Sensor for single surface non-contact measurement

10.3.1. Mounting

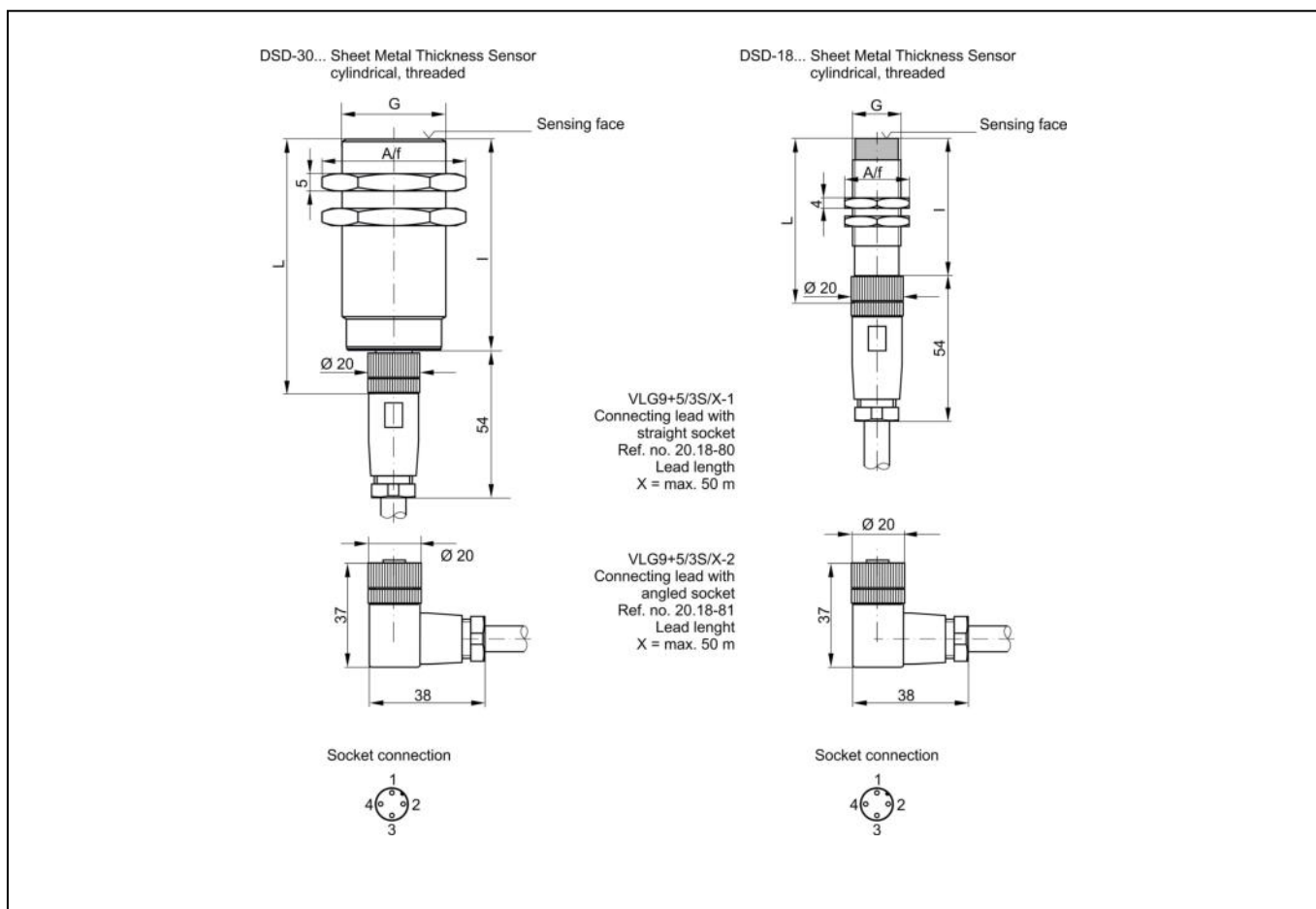
The distance between the sensing face and the surface supporting the workpiece (conveyor belt) must correspond to the distance specified for the sensor to be used. The workpieces must lie on the supporting surface without any air gap.

Strong magnetic fields, resulting from magnets which are used on conveyor belts, may influence the measurements when the workpiece moves along the sensor. This influence can be minimised by mounting the sensor symmetrically to the magnetic poles, and hence to the respective magnetic field.

The workpieces must be large enough to completely cover the sensing face during the entire measuring operation.



10.3.2. Housing Dimensions DSD (Fe sheets, single surface non-contact measurement)



Type	Ref.no.	Di- stance mm	Ferrous materials		Meas. Time ms	L mm	I mm	G Thread	SW	Wei- ght g
			Measuring range mm	Sheets up to mm						
DSD-18mg 61n0,5/3-1Sd1	13.05-91	8	0.5 ... 7.0	0.5 ... 3.5	10	61	51	M18x1	24	50
DSD-30mg 74n3/6,5-1Sd1	13.05-94	16	3.0 ... 13.0	3.0 ... 6.5	10	74	61	M30 x 1.5	36	112

11. Connecting Leads VLG

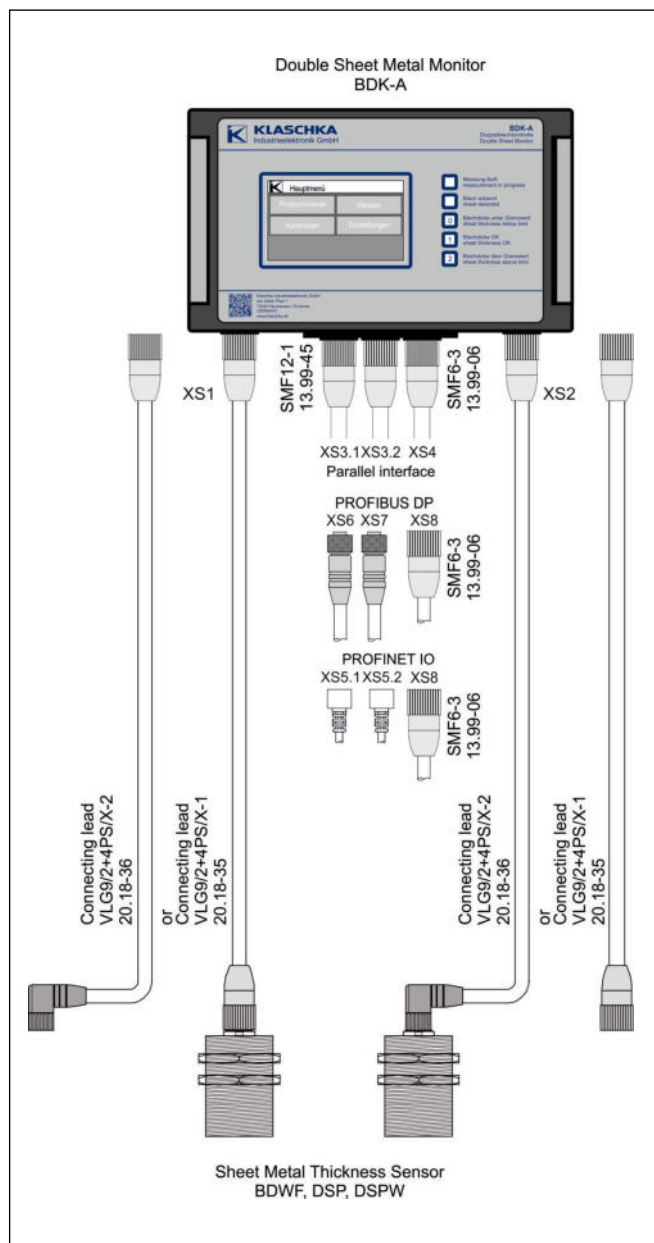
All connecting leads for the connection of the sensors to the evaluation unit are oil-resistant and suitable for drag chains.

The maximum lead length depends on the sensor type.

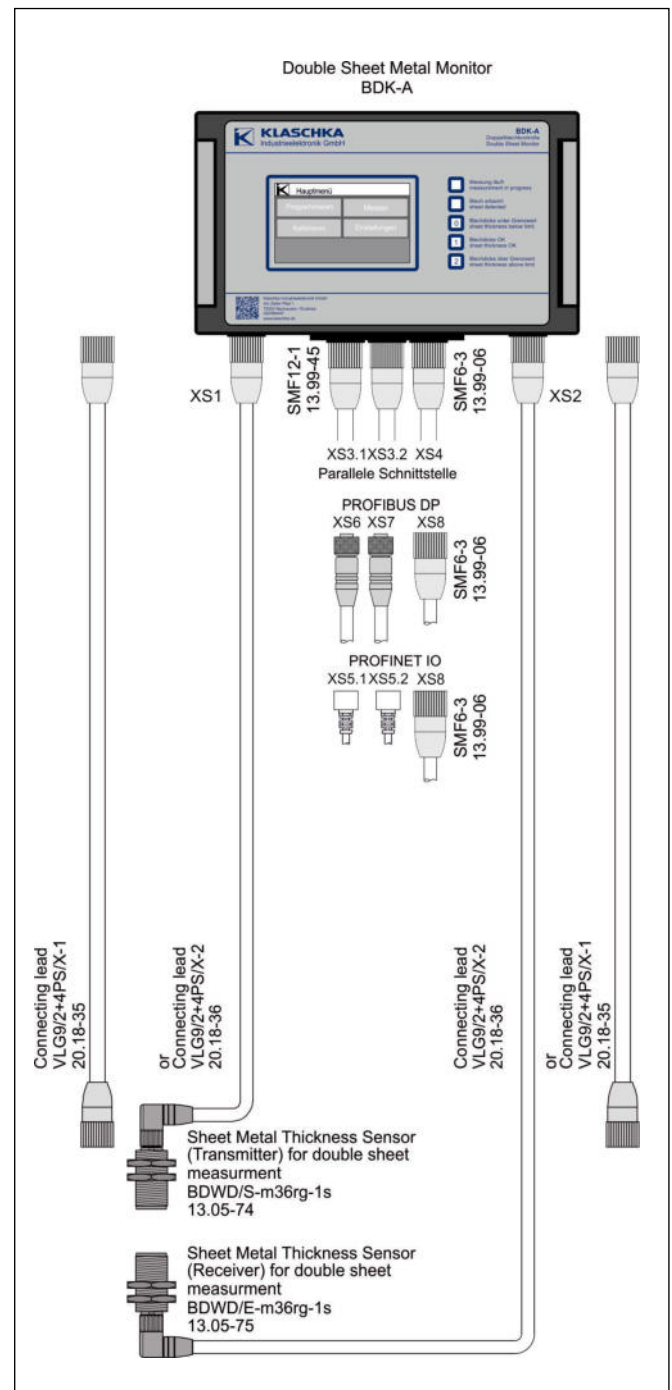
The connectors are device-sided (BDK-A) straight.

Depending on the installation situations, the lead with the straight connector VLG9/2+4PS/X-1 (Ref. no. 20.18-35) can be used instead of the lead with the angled connector VLG9/2+4PS/X-2 (Ref. no. 20.18-36).

11.1. Configuration Example for Sensors, single surface contact measurement



11.2. Configuration Example for Sensors, double surface non-contact measurement



12. T-Coupler ADD

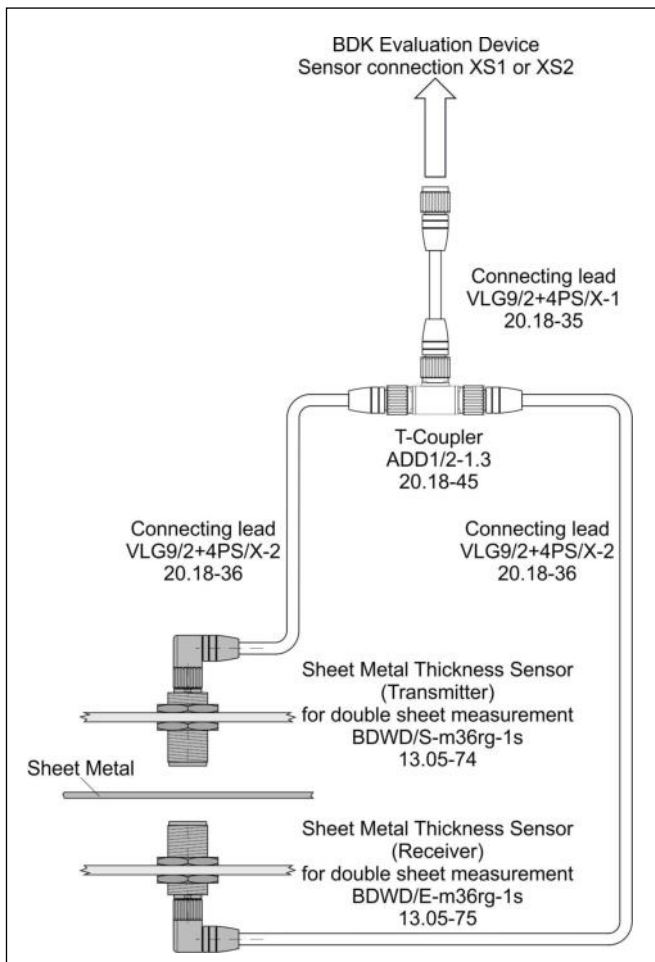
When using the ADD T-coupler, two different sensor types can be employed on each sensor connection (XS1 and XS2) of the BDK-A.

Depending on the installation situations the lead with the straight connector VLG9/2+4PS/X-1 (Ref. no. 20.18-35) can be used instead of the lead with the angled connector VLG9/2+4PS/X-2 (Ref. no. 20.18-36).

The selection of the desired sensor or sensor pair on the corresponding connection takes place via default of the of the accordingly specified program number.

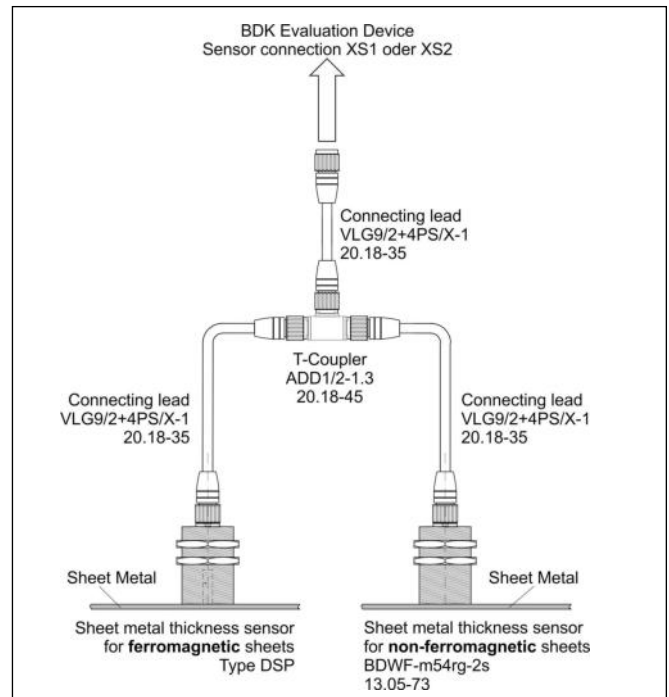
12.1. Double surface non-contact measurement via one Sensor Connection

The ADD T-coupler enables the connection of the BDWD/S and BDWD/E sensor pair to the sensor connection (XS1 or XS2) of the BDK-A.



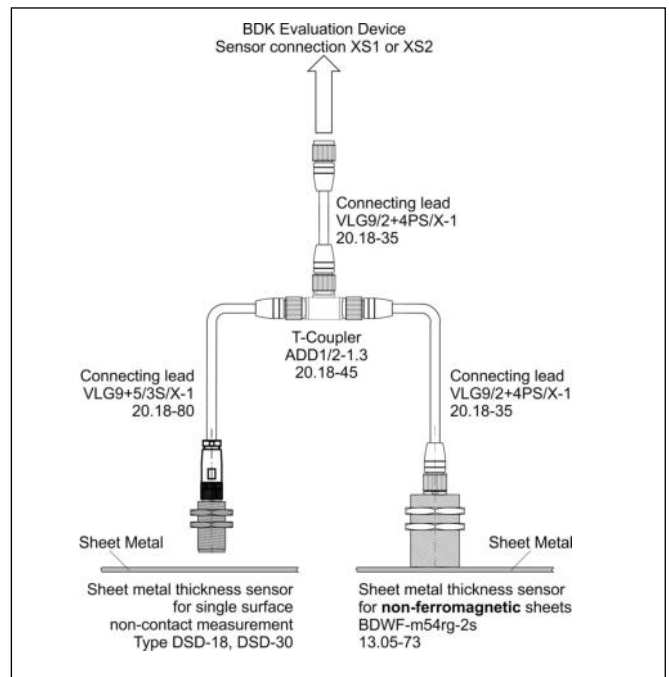
12.2. Single surface contact monitoring of ferrous (FE) and non-ferrous (NE) sheet metals via one Sensor Connection

The application of the ADD T-coupler enables the operation of one sheet metal thickness sensor of the type series DSP (for ferrous magnetic sheets) and of one BDWF sheet metal thickness sensor (for non-ferrous magnetic sheets) on one sensor connection (XS1 or XS2).



12.3. Single surface non-contact monitoring of Ferrous Sheets (Fe) and contact measuring of Fe/NE sheets via on Sensor Connection

The application of the ADD T-Coupler enables the operation of one sensor of the type series DSD (non-contact measurement of ferrous magnetic sheets) and one BDWF sensor (contact measurement of non-ferrous magnetic sheets) on one sensor connection (XS1 or XS2).



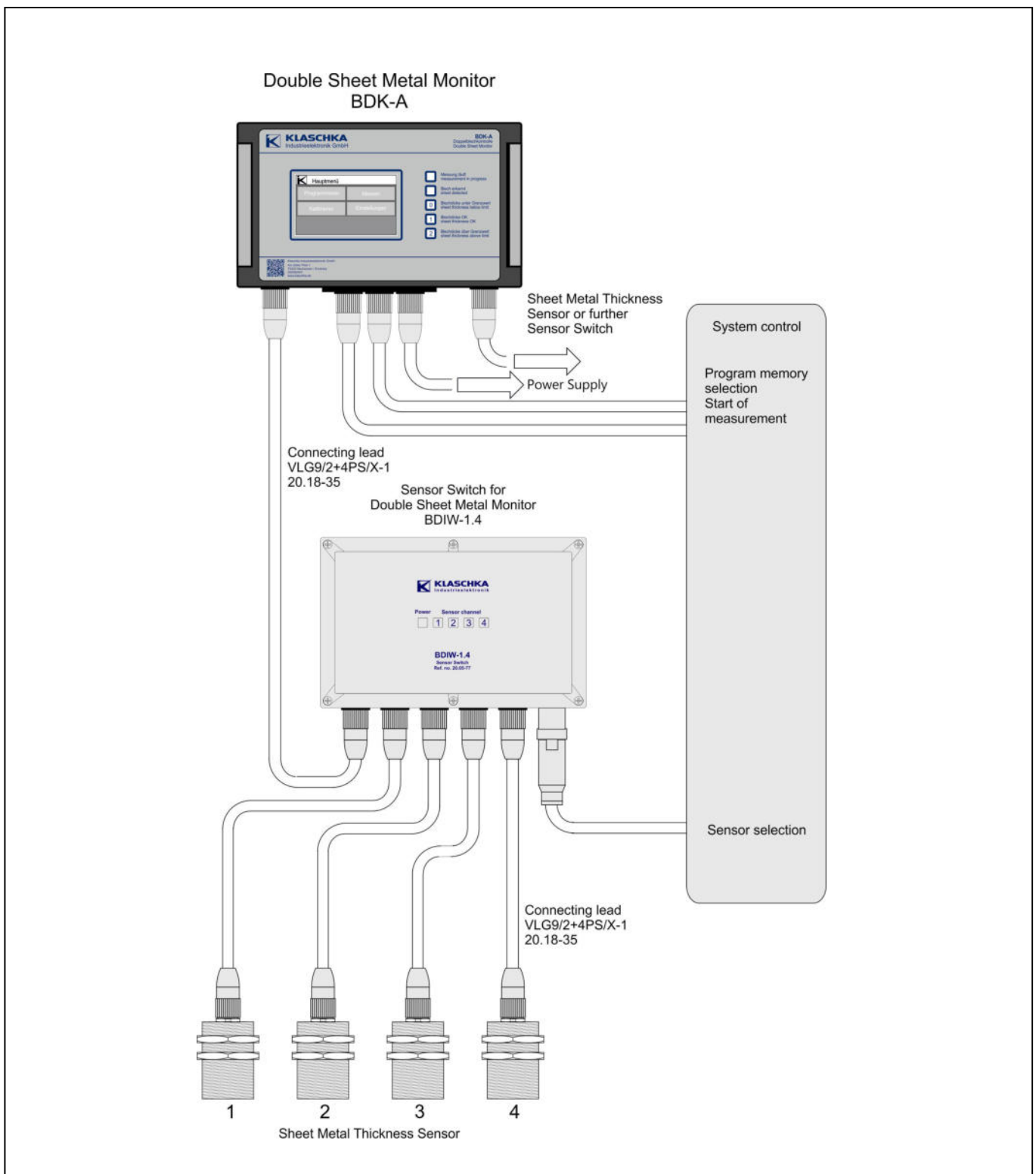
(regarding 12.2 and 12.3) Instead of the BDWF sensor, either a DSPW sensor can be connected.
Contact measuring of ferrous (Fe) and non-ferrous (NE) sheets.

13. Sensor Switch BDIW

With the operation of BDK-A Sheet Metal Monitors it often occurs that one monitor has to be connected to different sheet metal thickness sensors. This is, for example, the case when working with very different sheet thicknesses and materials at one press or when measuring at different points of material supply.

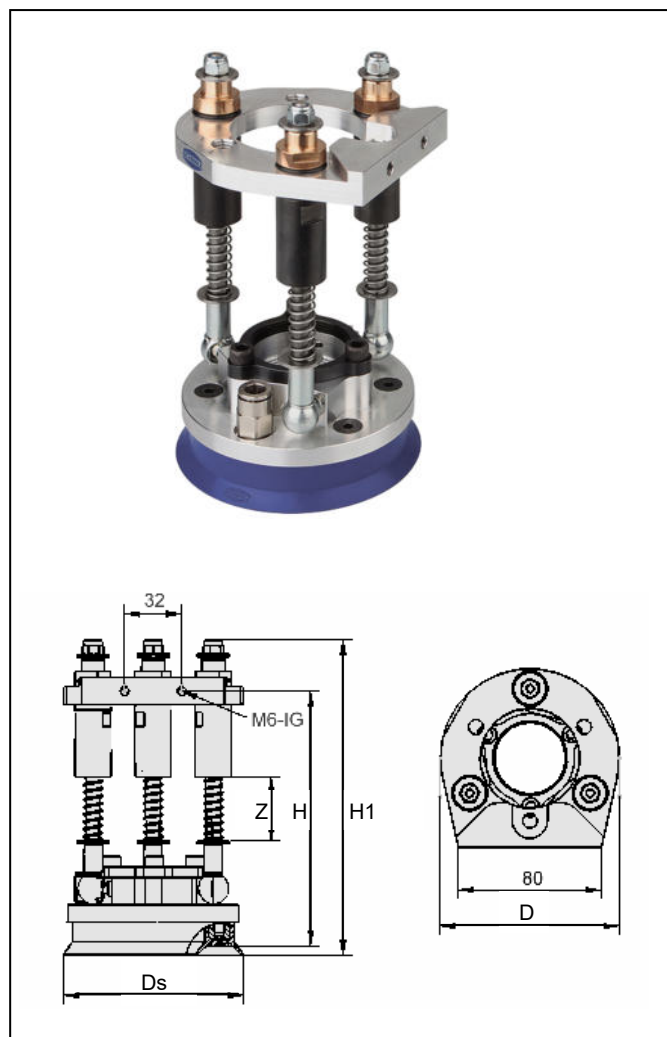
With the two equivalent sensor connections XS1 and XS2 as well as the use of the ADD T-coupler, the monitoring device disposes of a lot of possibilities for the connection of further sensors. The BDIW sensor switch allows to operate up to 4 additional sensors (similar or different types) via each of the XS1 or XS2 sensor connections of the BDK-A.

Please find more details in description KB 20.05-77.



14. Bracket with suction cup for Sensors (DSP, DSPW, BDWF)

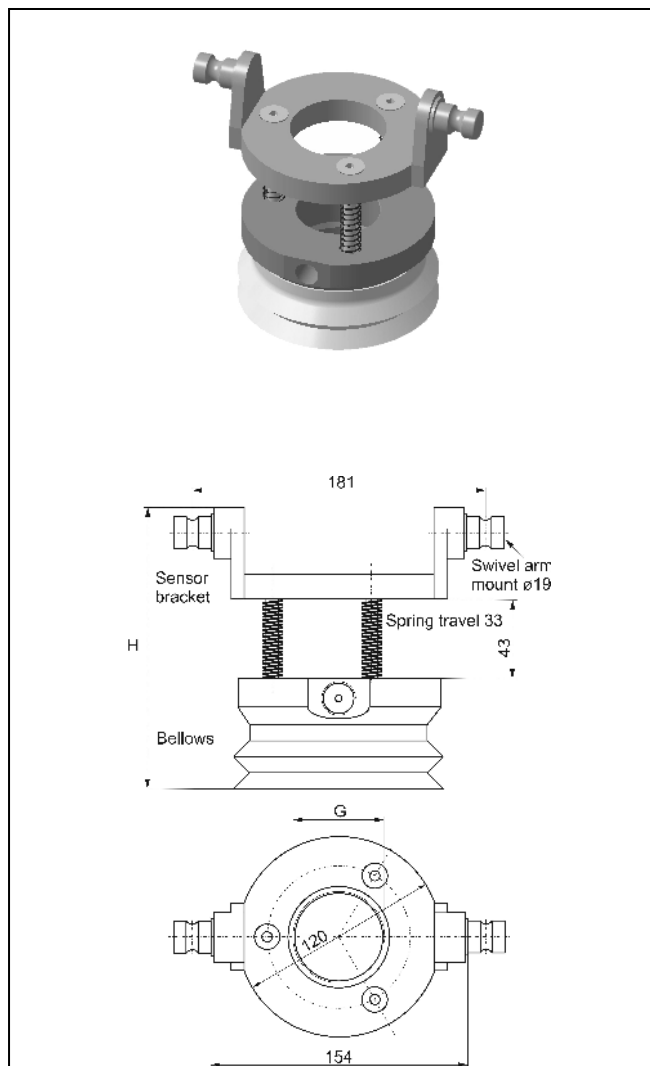
For single surface contact monitoring (e.g. for destacking equipment), sheet thickness sensors are often built into the suction cup of the gripper. For the DSP, DSPW, and BDWF thickness sensors (with M42, M54 design), there are different versions of sensor brackets available.

14.1. For Sensors with thread M42 x 1.5 and M54 x 0.75 spring-mounted, with suction ring, with flexible spherical bearing

Type Ref.no.	D	Ds	H	H1	Z	Weight (g)
ZBF/BBF42-1 13.99-77	100	100	143	178	36	1070
ZBF/BBF54-2 13.99-87	130	128.8	187	221	80	1300

Spare Parts for Sensor Brackets

Type	Ref.no.	
ZBF/BB42-1	13.99-78	Suction cup for sensor bracket M42
ZBF/BB54-2	13.99-88	Suction cup for sensor bracket M54

14.2. For Sensors with thread M42 x 1.5 and M54 x 0.75 spring-mounted, with bellows

Type Sach-Nr.	H	G	Weight (g)
ZBF/BBF42-2 13.99-84	165.2	M42 x 1.5	1300
ZBF/BBF54-1 13.99-69	162.0	M54 x 0.75	1500

Spare Parts for Sensor Brackets

Typ	Ref.no.	
ZBF/BB42-2	13.99-85	Bellows for sensor bracket M42
ZBF/BB54-1	13.99-68	Bellows for sensor bracket M54

15. Technical Data

15.1. Evaluation Devices

Measurement accuracy

- At calibration point ± 0.1 or 0.2 mm
- Across measurement range ± 5 % end of scale value
- Permissible air gap see page 19

PowerSupply

- DC voltage 24 VDC
- Tolerance ± 15 %
- Residual ripple max. 10 %

Power consumption

- During measurement max. 100 VA
(with Sensors DSP and DSPW, otherwise 20 VA)
- Idle state ca. 12 VA

Overload protection

- At 24 VDC via fuses
T 3.15 A

Housing

- Protection rating sturdy metal housing,
IP 65
- Mounting screw mounting
(4 x M6)

Weight

approx. 3.3 kg

Ambient temperature

0 ... 55 °C

Inputs (for BDK-A/PR, 20.21-10)

Start external (STA)

- lo-level 1 ... 8 VDC
- hi-level 12 ... 30 VDC
- Lead break detection 0 ... 1 VDC
(external resistor
necessary,
see page 17)
- Input current ca. 10 mA
- Electrical isolation yes (to power supply)

Threshold select external

- (A1 ... A10 and Relay reset)
- lo-level 0 ... 4 VDC
- hi-level 12 ... 30 VDC
- Input current approx. 10 mA
- Electrical isolation yes (to power supply)

Outputs (for BDK-A/PR, 20.21-10)

Elektromechanical relays

- Relay output K0 1 NC, 1 NO
- Relay outputs K1, K2 1 change over switch
each
1 A, 30 VDC

15.2. Sensors DSP

Workpiece

ferromagnetic

Field coil

- Nominal voltage approx. 36 VDC
- Coil current max. 2.2 A

Proximity switch

- Type IAD-m8rg-2k
- Switching distance approx. 1.2 mm
- Housing material nickel-plated steel
- Protection rating IP 65
- Ambient temperature 0 ... 60 °C

15.3. Sensor BDWF

Workpiece

non-ferrous

- Power supply 24 VDC
- Input current 10 Vpp
- Sheet detection
- Switching distance 1 ... 5 mm (dep. on sheet)
- Housing material nickel-plated steel
- Protection rating IP 65
- Ambient temperature 0 ... 60 °C

15.4. Sensors BDWD/S, BDWD/E

Workpiece

ferrous, non-ferrous

- Power supply 24 VDC
- Input current 10 Vpp
- Housing material nickel-plated steel
- Protection rating IP 65
- Ambient temperature 0 ... 60 °C

15.5. Sensors DSD

Workpiece

ferromagnetic

- Power supply 24 VDC
- Housing material nickel-plated brass
- Protection rating IP 65
- Ambient temperature 0 ... 60 °C

15.6. Sensor DSPW

Workpiece

ferrous, non-ferrous,
24 VDC

Sheet detection

- Switching distance 1 ... 5 mm
- Housing material nickel-plated steel
- Protection rating IP 65
- Ambient temperature 0 ... 60 °C

15.7. Standards Applied

- structure and el. protection EN 60255-6
(VDE 0435 part 6)
- EMC emission EN 61000-6-4
- EMC immunity EN 61000-6-2

16. Order Data**16.1. Evaluation Devices BDK-A****Characteristics and benefits**

sturdy Metal Housing for harsh environment
 5" colour touch display (TFT)
 convenient operator guidance
 up to 2048 program memories
 usable for complete range of measurement methods:
 - contact and non contact
 - single surface and double-surface
 - ferrous and non-ferrous metal sheets
 - installation and extension with up to 8 Sensors
 - comfortable retrofitting with all measuring methods

(Ref. no.)

BDK-A/PR-4.3 (Relay outputs)	20.21-10
BDK-A/PB-4.3 (PROFIBUS DP)	20.21-11
BDK-A/PN-4.3 (PROFINET IO)	20.21-12

Additional Note:

New designed Double Sheet Detection Monitor BDK/A is also suitable as a compatible successor and replacement for our long time and numerous approved systems BDK-1.3 and BDK-ET.

The identical range of Sensors, Connecting Leads and Accessories are applicable to the previous system configurations BDK-1.3 and BDK-ET.

Exception for BDK-A/PR (20.21-10) with relay-output:
 New Lead sockets (SMF) for connection:
 1x SMF6-3 (13.99-06) for power supply lead
 2x SMF12-1 (13.99-45) for controller leads

(BDK-1.3 (20.05-80) and BDK-ET (20.05-96) needs SMF25-1, 13.99-04)

16.2. Sheet Metal Thickness Sensors**16.2.1. Single surface contact, Ferrous (Fe) sheets**

DSP-36sg-1s Sensor for Fe sheets up to 1.5 mm thread M36 x 1,5.	13.05-86
DSP-42sg-1s Sensor for Fe sheets up to 2.5 mm, thread M42 x 1.5	13.05-87
DSP-54sg-1s Sensor for Fe sheets up to 3.5 mm, thread M54 x 0.75	13.05-89
DSP-75sg-1s for Fe sheets up to 5.5 mm, thread M75 x 1.5	13.05-90

16.2.2. Single surface contact, non-ferrous (NE) sheets

BDWF-m54rg-2s Sensor for NE sheets up to 5.5 mm, thread M54 x 0.75	13.05-73
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16.2.3. Single-surface contact, Ferrous (Fe) and non-ferrous (NE) sheets

DSPW-42sg-1s Sensor for Fe sheets up to 3.0 mm, and NE sheets up to 2.0 mm, thread M42 x 1.5	13.05-66
--	-----------------

DSPW-54sg-1s Sensor for Fe sheets up to 3.5 mm, and NE sheets up to 2.5 mm, thread M54 x 0.75	13.05-67
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16.2.4. Double surface non-contact, Ferrous (Fe) and non-ferrous (NE) sheets

BDWD/S-m36rg-1s (Transmitter) Sensor for Fe sheets up to 3.0 mm, and NE sheets up to 6.0 mm, thread M36 x 1.5	13.05-74
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BDWD/E-m36rg-1s (Receiver) Sensor for Fe sheets up to 3.0, and NE sheets up to 6.0 mm, thread M36 x 1.5	13.05-75
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BDWD/S-60aq30-1Y1 (Transmitter) Sensor for Fe sheets up to 3.0 mm, and NE sheets up to 6.0 mm, rectangular housing 60x60 mm	13.05-76
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BDWD/E-60aq30-1Y1 (Receiver) Sensor for Fe sheets up to 3.0 mm, and NE sheets up to 6.0 mm, rectangular housing 60x60 mm	13.05-77
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16.2.5. Single-surface non-contact, ferrous (Fe) sheets, non-ferrous (NE) sheets with reduced range

DSD-18mg61n0,5/3-1Sd1 Sensor for Fe sheets up to 3.5 mm Measuring range for NE sheets depends on type, (further details on request) thread M18 x 1.	13.05-91
--	-----------------

DSD-30mg74n3/6,5-1Sd1 Sensor for Fe sheets up to 6.5 mm Measuring range for NE sheets depends on type, (further details on request) thread M30 x 1.5	13.05-94
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16.3. Connecting Leads and Accessories

16.3.1. Lead Sockets

SMF6-3 13.99-06
Lead socket for connection of power supply leads for BDK-A /PR (Relay outputs), BDK-A/PB (PROFIBUS) and BDK-A/PN (PROFINET).

SMF12-1 13.99-45
Lead socket, 12-pole, for connection of controller leads for BDK-A/PR (Relay Outputs) (2x each device).

16.3.2. Connecting Leads

All connecting leads are oil-resistant and suitable for drag chains.
Please indicate the lead length X when ordering.
(standard length X = 5 m).

The connectors are device-sided (BDK-A) straight and sensor-sided optionally straight or angled.

Extension leads (BDK-A, leading to multiple coupling or multiple coupling, leading to Sensor) are also available with open ends to multiple coupling.

VLG9/2+4PS/X-1 20.18-35
Connecting lead BDK <---> sensor, lead socket sensor-sided straight

VLG9/2+4PS/X-2 20.18-36
Connecting lead BDK <---> sensor, lead socket sensor-sided angled

VLG9/2+4PS/X-3 20.18-37
Extension lead BDK-lead (VLG) <---> sensor, lead socket sensor-sided straight

VLG9/2+4PS/X-4 20.18-38
Extension lead BDK-lead (VLG) <---> sensor, lead socket sensor-sided angled

VLG9E/2+4PS/X-1 20.18-39
Connecting lead BDK and multiple coupling (open ends)

VLG9E/2+4PS/X-2 20.18-40
Connecting lead multiple coupling (open ends) and sensor, lead socket straight

VLG9E/2+4PS/X-3 20.18-41
Connecting lead multiple coupling (open ends) and sensor, lead socket angled

VLG9+5/3S/X-1 20.18-80
Connecting lead BDK <---> DSD-18/DSD-30, lead socket sensor-sided straight

VLG9+5/3S/X-2 20.18-81
Connecting lead BDK <---> DSD-18/DSD-30, lead socket sensor-sided angled

16.3.3. T-Coupler for connecting additional Sensors

ADD1/2-1.3 20.18-45
for additional 2 Sensors
1 x pin, 2 x socket

16.3.4. Sensor Switch for connecting additional Sensors

BDIW-1.4 20.05-77
Sensor switch for selecting one out of four sensors (DSP, DSPW, BDWF, BDWD, or DSD).
Power supply 24 VDC.

SPF8-1 13.99-05
Lead socket for connecting supply and control leads

16.3.5. Connecting Leads for BDIW-1.4

VLG9/2+4PS/X-1 20.18-35
Connecting lead BDK <---> BDIW and BDIW <---> Sensor connection DSP, DSPW, BDWF, BDWD plug sensor-sided straight

VLG9/2+4PS/X-2 20.18-36
BDIW <---> Sensor connection DSP, DSPW, BDWF, BDWD plug sensor-sided angled

VLG9+5/3S/X-1 20.18-80
Connecting lead BDIW <---> DSD-18/DSD-30, lead socket sensor-sided straight

VLG9+5/3S/X-2 20.18-81
Connecting lead BDIW <---> DSD-18/DSD-30, lead socket sensor-sided angled

16.3.6. Sensor Bracket for installing Thickness Sensor

Sensor bracket M42 x 1.5, spring-mounted, with suction ring, **flexible spherical bearing** ZBF/FBF42-1 13.99-77

Sensor bracket M54 x 0.75, spring-mounted, with suction ring, **flexible spherical bearing** ZBF/FBF54-2 13.99-87

Sensor bracket M42 x 1.5, spring-mounted, **with bellows** ZBF/FBF42-2 13.99-84

Sensor bracket M54 x 0.75, spring-mounted, **with bellows** ZBF/FBF54-1 13.99-69

16.3.7 Spare Parts for Sensor Brackets

Suction cup for brackets M42 (139977) ZBF/FB42-1 13.99-78

Suction cup for bracket M54 (139987) ZBF/FB54-2 13.99-88

Bellows for brackets M42 (139984) ZBF/FB42-2 13.99-85

Bellows for brackets M54 (139969) ZBF/FB54-1 13.99-68

We are certified according to DIN EN ISO 9001.
Subject to changes!