Sheet Metal Thickness / Double Sheet Detection
Series Universal Double Sheet Metal Monitor
Ref. no. 20.05-80, ...-81, ...-82, ...-93, 20.21-01

Robust unit for reliable double sheet detection in de-
stacking and loading facilities for sheet metal process-
ing works (especially presses and press lines)

- Single surface contact measurement with DSP
  thickness sensor
  up to 5.5 mm for Fe

- Single surface contact measurement with BDWF
  thickness sensor
  up to 5.5 mm for non-ferrous (NE)

- Single surface contact measurement with DSPW
  combination thickness sensor
  up to 3.5 mm for Fe
  up to 4.0 mm for non-ferrous (NE)

- Single surface non-contact measurement with DSD
  thickness sensor on reference basis
  up to 12 mm for Fe

- Double surface non-contact measurement with
  thickness sensors BDWD/S and BDWD/E
  up to 3.0 mm for Fe
  up to 6 mm for non-ferrous (NE)

- Operation of 2 sensors on one device, several sensors
  can be operated via T-coupler or sensor switch

- 256 program memories for different materials and
  thicknesses with the associated sheet metal thickne
  ss sensors in the standard operation mode

- Indication of sheet thickness and program parameter

- Standard version with electrically isolated parallel inter-
  face to system controller

- Field bus version with interface to different standard
  field buses

- Serial interface for the down- and uploading of the pro-
  gram parameters

Application

Double Sheet Metal Monitors check the automatic destack-
ing and separation of ferrous (Fe) and non-ferrous (NE) work-
pieces at sheet metal processing works (e.g. presses) with
automatic feeding systems such as destackers, robots, feed-
ers, etc. They reliably detect the situations when two or more
sheets stick together, and allow thus to stop the process be-
fore resulting in damage to machinery or tooling.

The BDK Double Sheet Metal Monitor is suitable for opera-
tion with various sheet metal thickness sensors for monitoring
ferrous and non-ferrous sheet metals. Depending on the sen-
stor and/or measuring method, a thickness up to max. 12 mm
can be detected.

Configuration

A lockable cover protects the evaluation device against unau-
thorised access. Sensor and evaluation device are character-
ised by a sturdy construction and a high protection class. The
ready-made connecting leads, with plugs and sockets on
both sensor and device ends, permit quick and easy mount-
ing and commissioning of these devices.

Four operator keys and a four-line illuminated text display
permit the convenient entry of device and measuring parame-
ters. There are 256 program memory locations, which permit
the storage of the measuring programs. They allow quick
changes of material or tool during operation, and the pro-
grams remain stored even when the device is switched off.

A laptop and the PROPAR/BDK-1 software allow the down-
and uploading of all program parameters using the RS232
interface on the front panel of the device.
Mode of Operation

There are various measurement methods for double sheet monitoring and measuring the sheet metal thickness with the BDK 1.3 evaluation device. Measuring methods can be subdivided into two groups: contact and non-contact.

The selection between ferrous sheet measurement using the magnetic flux method and the non-ferrous sheet measurement based on the eddy current principle takes place automatically when selecting the sensor type. This procedure requires that the sensor rests on the sheet metal during the measurement.

With the double surface non-contact measurement method of ferrous (Fe) and non-ferrous (NE) sheets, the generated alternating magnetic field is attenuated by the sheet metal placed between the two sensors, transmitter and receiver (transmission measurement).

A single surface non-contact measurement detects the distance between sensor and sheet metal. Based on this distance, the evaluation device evaluates the thickness of the sheet metal (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.

On the LC display, sensor type, upper and lower threshold value, sensor connection right/left, measurement internal/external, and the calibration selection are presented in dependence of the selected program number. After each measurement the reading is updated and displayed.

The display is equipped with signal lamps, which optically indicate the active status of a measurement, of the proximity switch (initiator) and the 0-, 1- and 2-sheet detection. In connection with these messages the press controller allows an individual evaluation via three potential-free relay outputs K0 ... K2. The outputs of BDK-1.3 are equipped with electromechanical relays, those of BDK/OB-1.3 with contactless semiconductor relays. K1 and K2 are equipped with one reversing switch each. K0 is equipped with one NO and one NC.

Parameters and similar information are entered using the four keys and their possible combinations.

Devices which have a field bus interface, for example Profinet, transmit via this interface instead of the relay outputs the measured value, the 0-, 1- and 2-sheet metal messages, the memory location number of the current program and the current threshold value.

The selection of the measuring program and initiation of the measurement can take place via either a parallel interface to the PLC or the field bus interface.

When being operated without PLC (stand-alone-operation), the measurement program can be selected on the device itself and the measuring operation can be initiated by the integral proximity switch (initiator) of the sensor.

Technical Data

Evaluation Devices

**Inputs:**
- External start (STA) 1 ... 8 VDC
- Hi-level 12 ... 30 VDC
- Lead break detection 0 ... 1 VDC
- Input current approx. 10 mA
- Electrical isolation yes (to power supply)

**Outputs:**
- Relay output K0 1 NC, 1 NO
- Relay outputs K1, K2 1 rev. switch each 6 A, 250 VAC
- Relay output K0 1 NC, 1 NO
- Relay outputs K1, K2 1 rev. switch each 0.5 A, 30 V

**Measurement accuracy:**
- At calibration point ± 0.1 or 0.2 mm
- Across measurement range ± 5% of sensor value
- Permissible air gap see sensor data

**Power supply:**
- DC 24 VDC
- Tolerance ± 15%
- Residual ripple max. 10%

**Power consumption:**
- Measurement process active max. 100 W
- Idle state approx. 12 W

**Overload protection:**
- Melt fuse T3.15 A

**Housing:**
- Version metal, with window IP65
- Protection rating screw mounting (4 x M6)
- Mounting approx. 3.5 kg
- Weight approx. 55 °C

**Order Data:**
- BDK-1.3, relay outputs Ref. no 20.05-80
- Universal Double Sheet Metal Monitor
- BDK/OB-1.3, Semi-conductor relay outputs Ref. no 20.21-01

**Devices with field bus connection:**
- BDK/FS-1.3 (InterBus S) Ref. no 20.05-81
- BDK/FP-1.3 (PROFIBUS DP) Ref. no 20.05-82
- BDK/PN-1.3 (PROFINET IO) Ref. no 20.05-93

*) When connecting inductive loads to the semi-conductor relays, an appropriate cut-off protection has to be used.
DSP thickness sensor for Fe sheets
(single surface contact measurement)

- Field coil
  - Nominal voltage: approx. 38 VDC
  - Power consumption: max. 2.2 A
- Integral proximity switch
  - Switching distance: approx. 1.2 mm
- Housing material: nickel-plated steel
- Protection rating: IP 65
- Ambient temperature: 0 ... 60 °C

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. no.</th>
<th>Measuring range mm</th>
<th>Sheets up to mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSP-36sg-1s</td>
<td>13.05-86</td>
<td>0.2 ... 2.0</td>
<td>1.5</td>
</tr>
<tr>
<td>DSP-42sg-1s</td>
<td>13.05-87</td>
<td>0.2 ... 3.0</td>
<td>2.5</td>
</tr>
<tr>
<td>DSP-54sg-1s</td>
<td>13.05-89</td>
<td>0.2 ... 4.0</td>
<td>3.5</td>
</tr>
<tr>
<td>DSP-75sg-1s</td>
<td>13.05-90</td>
<td>0.2 ... 6.0</td>
<td>5.5</td>
</tr>
</tbody>
</table>

BDWF thickness sensor for NE sheets
(single surface contact measurement)

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

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<tr>
<td>BDWF-m54rg-2s</td>
<td>13.05-73</td>
<td>0.2 ... 6.0</td>
<td>5.5</td>
</tr>
</tbody>
</table>

BDWD/S and BDWD/E thickness sensors for Fe and NE sheets
(double surface non-contact measurement)

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

<table>
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<th>Type</th>
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<th>Meas. range mm</th>
<th>Sheets in mm</th>
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<tbody>
<tr>
<td>BDWD/S-m36rg-1s (transmitter)</td>
<td>13.05-74</td>
<td>Fe 0.2 ... 3.5</td>
<td>3.0</td>
</tr>
<tr>
<td>BDWD/E-m36rg-1s (receiver)</td>
<td>13.05-75</td>
<td>NE 0.2 ... 20.0</td>
<td>6.0</td>
</tr>
<tr>
<td>BDWD/S-60aq30-1Y1 (transmitter)</td>
<td>13.05-76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BDWD/E-60aq30-1Y1 (receiver)</td>
<td>13.05-77</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DSD thickness sensor for Fe sheets
(single surface non-contact measurement)

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

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<th>Sheets up to mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSD-18mg 61n0,5/3-1Sd1</td>
<td>13.05-91</td>
<td>0.5 ... 6.0</td>
<td>3.0</td>
</tr>
<tr>
<td>DSD-60mg 90n3/12-1Y1</td>
<td>13.05-83</td>
<td>3 ... 20.0</td>
<td>12.0</td>
</tr>
</tbody>
</table>

*Possibility to extend the measurement and sheet thickness range with software version E119 or higher (from July 2014).

DSPW thickness sensor for Fe and NE sheets
(single surface contact measurement)

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

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</tr>
</thead>
<tbody>
<tr>
<td>DSPW-42sg-1s **)</td>
<td>13.05-66</td>
<td>Fe 0.2 ... 3.5</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NE 0.2 ... 2.5</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NE 0.2 ... 4.0</td>
<td>*) 3.0</td>
</tr>
<tr>
<td>DSPW-54sg-1s</td>
<td>13.05-67</td>
<td>Fe 0.2 ... 4.0</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NE 0.2 ... 3.0</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NE 0.2 ... 5.0</td>
<td>*) 4.0</td>
</tr>
</tbody>
</table>

*) The measuring range for non-ferrous (NE) sheets can be extended to 4 mm or 5 mm by use of a special adapter for the sensor installation, which can be supplied separately on demand.

**) For using the DSPW-42sg-1s sensor, the evaluation device has to be equipped with software version E118 or higher.

Standards Applied

- Measuring relays and protection equipment: EN 60255-1
- EMC emission: EN 61000-6-4
- EMC immunity: EN 61000-6-2