

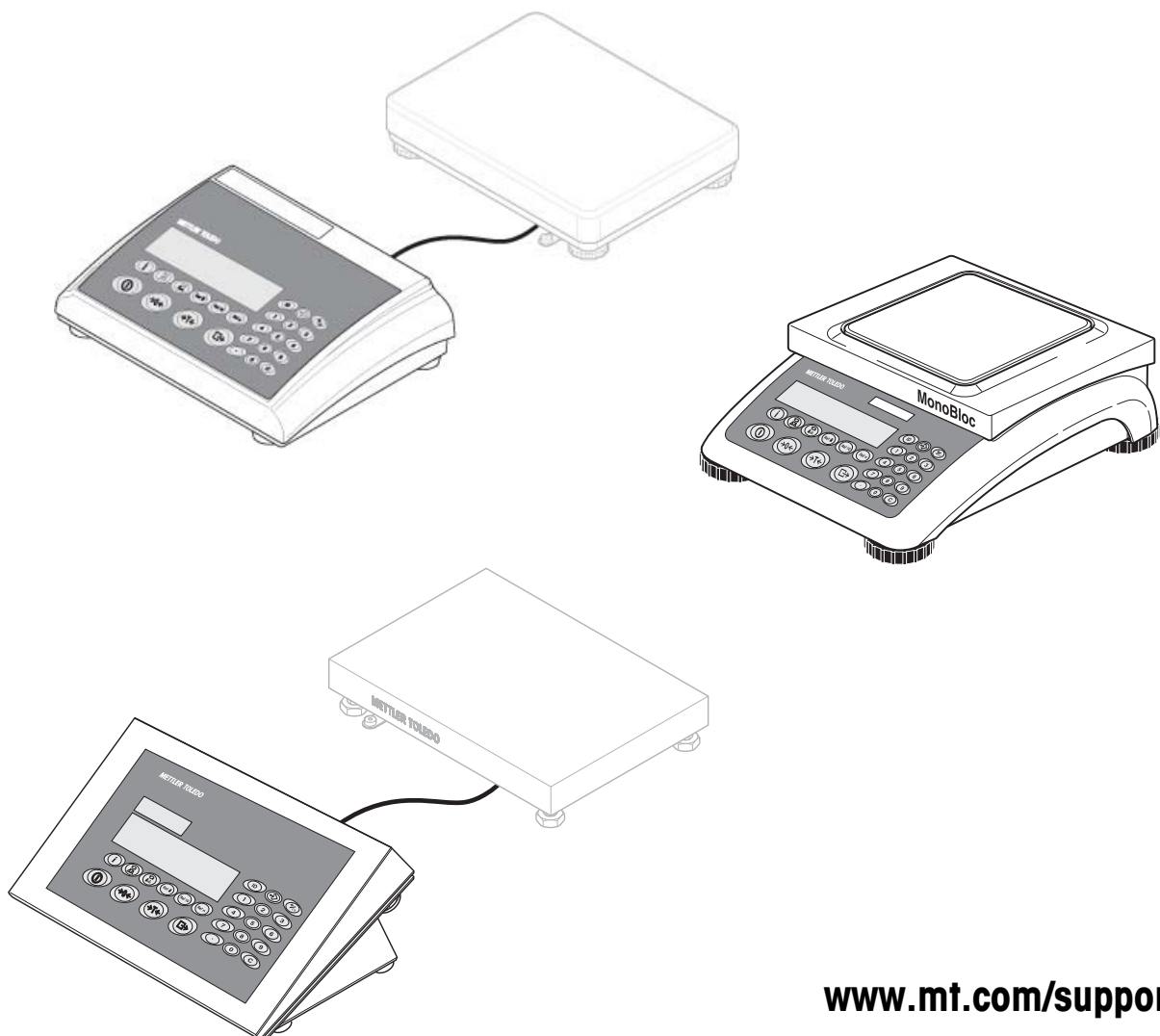
Operating and Installation instructions

Filling with COUNT+

METTLER TOLEDO

Compact scales BBA442 and BBK442

Terminals IND445 and IND449



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1. Important information before you start

This section provides you with basic information for the filling application of your compact scales BBA/BBK442 and terminals IND445/449. Please read through this section carefully even if you already have experience with BBA/BBK442 scales and IND445/449 terminals.

Make sure you comply with the safety instructions!

1.1. Introduction

From SW-Version 1.16 the compact scales BBA/BBK442 and terminals IND445/449 offer a simple application for filling. This application supports the filling of target weights or target pieces.

The filling application is included in the standard software of BBA/BBK442 scales and IND445/449 terminals (with SW version 1.16 and later). These instructions provide you with all necessary details on how to set up the filling system and connect it to the BBA/BBK442 scale and IND445/449 terminals.

The filling installation has to be designed by yourself or purchased from an external manufacturer

For integrating the scale or the terminal into the filling installation an optional digital I/O interface is necessary. This interface offers 4 control inputs and 4 control outputs. An external switch key in the filling installation carries the signal to detect the start on a control input. The activation of the control input starts the filling procedure. Via the control outputs valves and feed chutes in the filling installation will be set. The application can be configured for different procedures.

With the filling application, valves, feed chutes and other conveying equipment for the filling of low or high viscosity, pasty, powdery or granular weighing samples to a target weight or target quantity can be controlled.

The filling process has to be started manually by the operator and will be finished automatically when the range of tolerance is reached or exceeded. The automatic tare monitoring prevents the start of the filling process if a wrong or no tare container is loaded.

The target weight and its tolerances will be entered and saved directly with the keypad. A saved target value can be recalled again if required. All other settings for the filling process can be done in the menu of the compact scale or the terminal. An interface command enables the configuration of the application by a PC.

1.2. What you should know about these instructions

Please note the following information regarding this instruction:

- These instructions are a supplement to the operating instructions you received with your compact scale BBA/BBK442 or your terminal IND445/449. It is assumed that you are familiar with the operation of the scale and the layout and operation of the scale's menu.
- The same conventions apply to these instructions as for the operating instructions of the scale (see section 1 of the operating instructions for the compact scale BBA/BBK442 or the terminal IND445/449).
- It is essential you comply with all safety instructions in the operating instructions of the BBA/BBK442 scale and IND445/449 terminal!
- The application can be activated by an external switch key which is carried on a control input of the optional digital I/O interface.

1.3. Safety instructions

Please comply with the following instructions for a safe and trouble-free operation of your filling installation. These instructions are intended to supplement the safety instructions given in section 1 of the operating instructions of the BBA/BBK442 compact scales or IND445/449 terminals.



Read through these operating instructions carefully even if you already have experience with the BBA/BBK442 scale or the IND445/449 terminal.



Filling installations with compact scales BBA/BBK442 or terminals IND445/449 must not be operated in hazardous areas. For the use in hazardous environment of zone 2/22 an IND449xx terminal has to be used.

For connecting accessories please note the instructions in section 6.2!



Exercise caution when pressing the keys which control the filling system: First ensure that no person is in the vicinity of the filling installation as there is a danger of injury (moving parts, discharge of materials, etc.).



Comply with all local regulations concerning the setup and operation of filling installations.



An emergency stop must be provided for the filling system which interrupts the power supply of the valves directly.

1.4. Explanation of terms used

Automatic tare monitoring

To prevent an accidental start of the filling process without a loaded container a minimum threshold can be specified (see section 3.1 und 3.2). If the loaded container does not lie above this value or if no container has been loaded, the filling process can not be started.

Note: The tare monitoring refers to the gross weight. A tare value does not need to exist.

Filling

Filling of an empty container which is on the scale (weighing in).

Fine feed

Material from a valve, a shaker or another feed device with fine material flow which allows an exact attainment of the target value. (see section 3.2)

Coarse feed

Material from a valve, a shaker or another feed device with a coarse material flow for rapid filling to the vicinity of the target value. (see section 3.2)

Post dispensing

Material that continues flowing after closing of the dispensing device.




2. Configuration of the target values

2.1. General information




To operate the filling application of a BBA/BBK442 compact scale and IND445/449 terminal a target value with corresponding tolerances has to be defined. The target value and tolerances are entered manually through the keypad. After the entry the application is ready for the filling process.

10 memory locations (**81...90**) for target weights with tolerances and 10 memory locations (**91...100**) for target quantities with tolerances are available by standard. This standard allocation can be changed in the menu under **APPLIC** → **MEMOrY** → **CONFIG**


2.2. Manual entry and saving of target weights

1. Enter the memory location number (81...90) and keep  pressed until the confirmation **tARGETt** appears in the display.
If a target had already been saved under the selected memory location, the message **rEPLACE** appears in the display.
2. Enter the target weight and confirm with . The display **tOLEr** appears and + flashes.
3. Enter the upper tolerance in the current weighing unit or percentage and confirm with . The display **tOLEr** appears and – flashes.
4. Enter the lower tolerance accordingly. This value is also the shutoff point for the fine feed.

2.3. Manual entry and saving of target quantities



1. Enter the memory location number (91...100) and keep  pressed until the confirmation **tARGET** appears in the display.
If a target had already been saved under the selected memory location, the message **rEPLACE** appears in the display.
2. Enter the target quantity and confirm with . The display **tOLer** appears and + flashes.
3. Enter the upper tolerance in the pieces or percentage and confirm with . The display **tO-
LEr** appears and – flashes.
4. Enter the lower tolerance accordingly. This value is also the shutoff point for the fine feed..

2.4. Calling up target weights and target quantities

Enter the number of the memory location with the required target weight (81...90) or the required target quantity (91...100) and press briefly .

The selected target weight **t** or the selected target quantity and the associated tolerances are loaded from the memory and appear briefly in the display.

2.5. Clearing of target weights and target quantities

1. Enter the number of the memory location with the target weight (81...90) or the memory location with the target quantity to be cleared (factory setting: 91 ... 100) and press briefly . The saved target value with tolerances is displayed.
2. Press  within 2 seconds. **CLEArED** briefly appears in the display. The saved target value is cleared.

3. Setting of setpoints

3.1. General information

Besides the target value further setpoints for tare monitoring and coarse feed have to be set to operate the filling application with the BBA/BBK442 compact scales or IND445/449 terminals. The fine feed is defined by the lower tolerance of the target value.

3.2. Setting in the menu "application"

The minimal threshold value for the tare monitoring is set by the setpoint **SP.tOL--**. Only after having exceeded this threshold value the filling process can be started. The shutoff point for the coarse feed is set by the setpoint **SP.tOL-**.

The settings of the setpoint is done in percentage in the menu under **APPLIC** → **CHECKW** the percental entry refers to the lower tolerance of the target value

Menu item	Setting	Description
bEEPER	OFF	Signal transmitter switched off
SP.tOL-	000%	Setting of setpoint for coarse feed
SP.tOL--	000%	Setting of setpoint for tare monitoring
SEnD.Mod	CONTINU	Send information to digital I/O continuously
MEMOrY	CONFIG	Configuration of memory locations

The following example shows the interrelationship between target value and setpoints.

Function	Display	Entry	Calculation
Target value	tArGET	1.000 kg	
Fine feed	tOLer-	0.020 kg	1.000 kg – 0.020 kg = 0.980 kg
Coarse feed	SP.tOL-	72 %	0.980 kg x 0.72 = 0.700 kg
Tare monitoring	SP.tOL--	21 %	0.980 kg x 0.21 = 0.200 kg

Note: The setpoints **SP.tOL-** and **SP.tOL--** are entered in % of **tOLer-** and valid for all target values.

The setpoint **SP.tOL--** refers to the gross weight.

The other setpoints refer to the net weight.

3.3. Setting in menu "communication"

For integrating the compact scale or the terminal into the filling installation the digital I/O interface has to be configured. The control inputs **In 0...3** and control outputs **OUT 0...3** are set in the menu under **COMMUNI → OPTION → diGiTAL** and can be taken out of the following overview.

Menu item	Setting	Description
In 0...3	OFF	Input not assigned
	ZerO	Zero scale
	tArE	Tare scale
	Print	Generate print-out / transfer data
	CLEAR	Clear settings
	Unit	Switch units
	rEF 10	Determine average piece weight (10 pieces.)
	rEF n	Determine average piece weight (n pieces.)
	inFO	Display information
	SCALE	Switch scale
	tOtAL+	Totalise
	totAL-	subtract
	StArt	Start filling process
	OUT 0...3	OFF
StAbLE		Stable weight value
bEL.Min		Minimum weight not reached
AbV.Min		Minimum weight reached or exceeded
UndErLd		Insufficient load
OVErLd		Overload
StAr		Changed / calculated and insecure value
bEL.tOL-		Tolerance- not reached (fine feed)
GOOd		within tolerance
AbV.tOL+		Tolerance+ reached or exceeded
SP.tOL-		Setpoint Tolerance- (coarse feed)
SP.tOL--		Setpoint Tolerance- (tare monitoring)
tArGET		Target value reached

Note: The setpoints **bEL.tOL-** and **SP.tOL-** refer to the net weight. The setpoint **SP.tOL--** refers to the gross weight.

After having reached the setpoints **SP.tOL-** and **bEL.tOL-** the states are saved in order to prevent that the outputs are activated automatically by an accidental unloading of the scale.

4. Interface command "PM"

4.1. General information

A target value can also be entered and activated directly by a PC with the interface command "PM". (See Reference Manual: METTLER TOLEDO Standard Interface Command Set, order number: 22011459). For this, the interface of the compact scale or terminal has to be configured according the following overview.

Menu point	setting	description
MOdE	dIALOG	Setting of mode
bAUD	9600	Setting of baud rate
PARitY	8 nonE	Setting of parity check
H.SHAKE	XONXOFF	Setting of handshake

For configuration of your PC please read the corresponding operating and installation instructions of your compact scale or terminal.

4.2. Setting of target values

Command:	PM_x1_x2_x3_x4_x5_x6	
Response:	PM_A	Configuration of target value
	PM_L	Wrong parameters entered
	PM_I	Command not executable at present

4.3. Recalling of target values

Command:	PM	
Response:	PM_A_x1_x2_x3_x4_x5_x6	Configured target value
	PM_L	No target value configured
	PM_I	Command not executable at present
Parameter:	x1 = target value	
	x2 = unit target value	
	x3 = Plus-tolerance (tOLer+)	
	x4 = Unit Plus-tolerance (acc. unit for target value)	
	x5 = Minus-tolerance (tOLer-)	
	x6 = Unit minus-tolerance (acc. unit for target value)	

Example

Command: PM_500_PCS_10_PCS_5_PCS

Response: PM_A

Note: The scale takes the entered values directly and is ready for the filling process. The units for the tolerances, the target weight and target quantity have to be the same. Possible units are: g, kg, t, oz, lb, PCS.

For filling to target quantities the scale has to be in the counting mode. This means, an average piece weight has to be active.

4.4. Setting of setpoints

Command: PM_SP_x1_x2

Response	PM_A	Setpoints activated
	PM_L	Wrong parameters entered
	PM_I	Command not executable at present

4.5. Recalling of setpoints

Command: PM_SP

Response:	PM_A_SP_x1_x2	Entered setpoints
	PM_I	Command not executable at present

Parameter: x1 = Setpoint **SP.tOL-** in range 0...100%

x2 = Setpoint **SP.tOL--** in range 0...100%

Example

Command: PM_SP_90_10

Response: PM_A

Note: The parameter for **SP.tOL-** has to be higher than for **SP.tOL--**.

Target values and setpoints cannot be changed during an active filling process.

5. Filling with BBA/BBK442 and IND445/449

5.1. Start of the filling process

The filling process has to be started manually by the operator via an external switch-key. For this, one of the four control inputs has to be set to **stArt**. The control input activates the coarse and fine feed depending on the configuration, or either the coarse or the fine feed.

The tare monitoring is set in the scale's menu under **APPLIC** → **CHECKW** → **SP.tOL--** and prevents an accidental start without a loaded container.

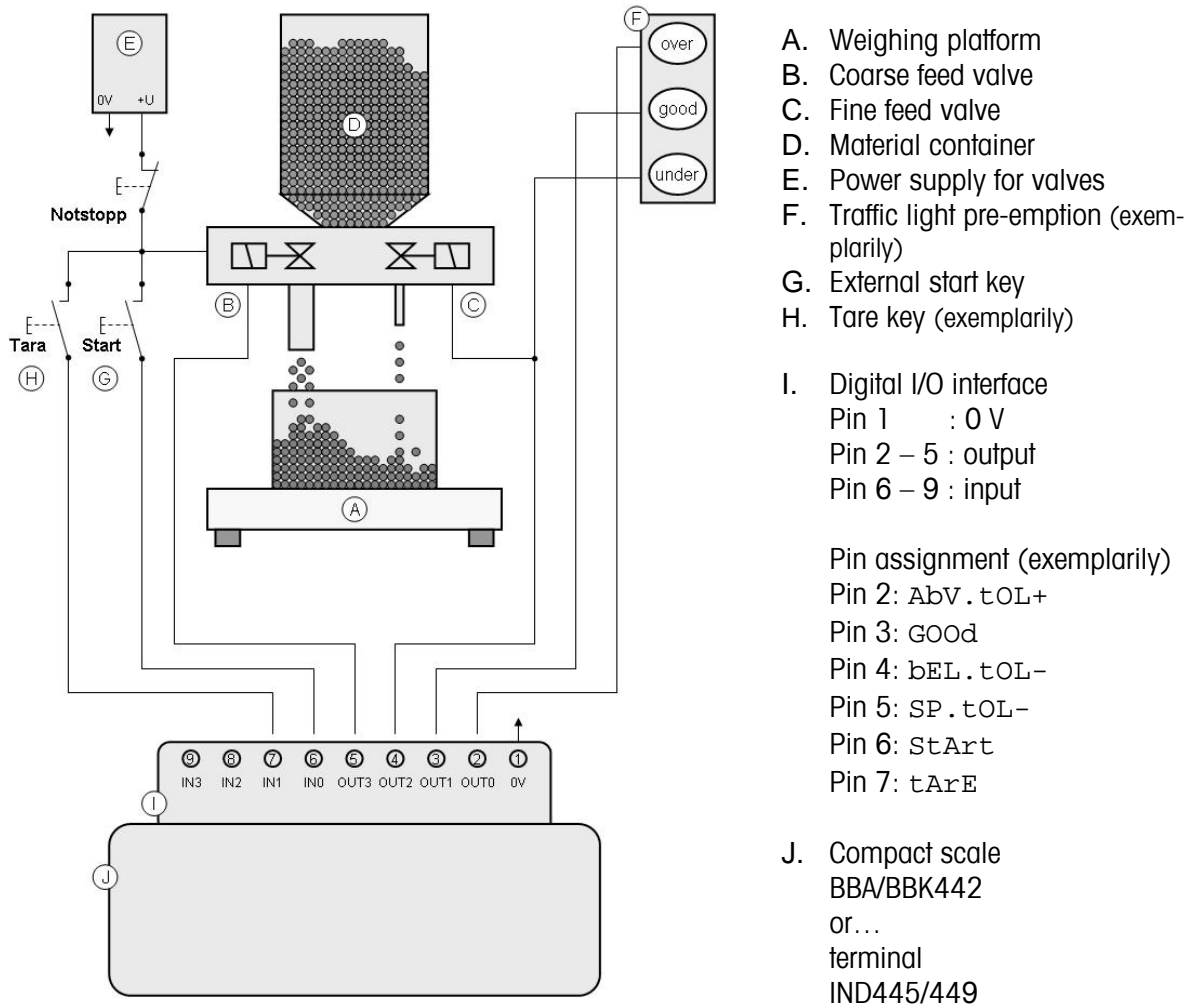
To control valves or feed chutes control outputs can be set according to the following overview.

Tare monitoring	Coarse feed	Fine feed	Description
SP.tOL-- > 0 %	SP.tOL- > 0 %	tOLer- > 0 kg	Tare monitoring activated. Valves for coarse and fine feed are set.
= 0 %	> 0 %	> 0 kg	Tare monitoring deactivated. Valves for coarse and fine feed are set.
> 0 %	= 0 %	> 0 kg	Tare monitoring activated. Valve for fine feed is set
= 0 %	= 0 %	> 0 kg	Tare monitoring deactivated. Valve for fine feed is set

Note: With target weights entries for **tOLer-** are possible in % a.
With target quantities entries for **tOLer-** have to be in PCS.

5.2. Block diagram

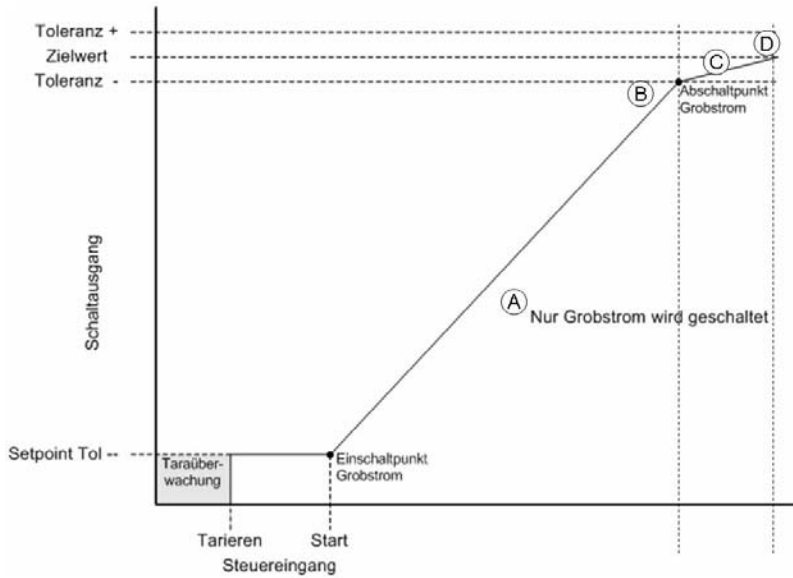
The following block diagram shows exemplarily the schematic structure of a filling device with a compact scale BBA/BBK442 or a terminal IND445/449.



Note: Technical data of the digital I/O interface (see section 5.5) has to be considered.

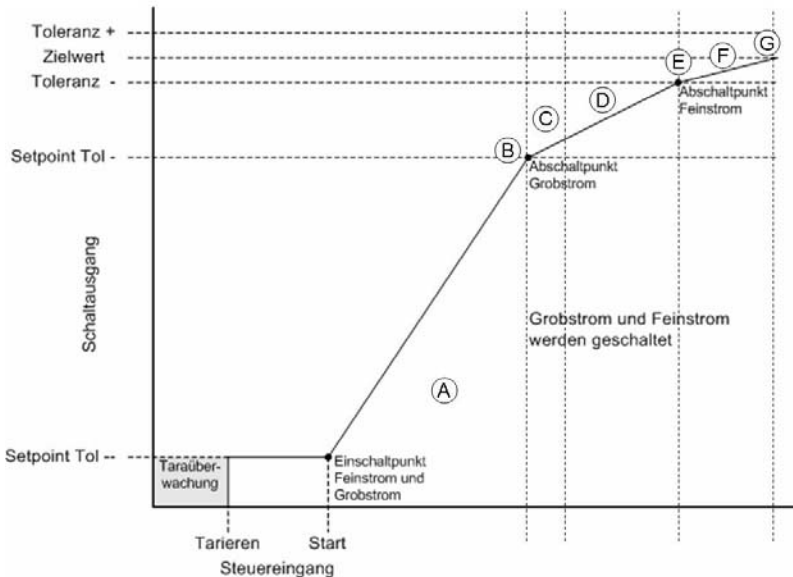
5.3. Course of a filling process

The following illustrations elucidate the terms explained above and show the typical course of a filling process for systems with one or two dispensing devices.



Application with one dispensing device (e.g. valve)

- A: Valve opened
- B: Shutoff point
- C: Post dispensing
- D: Target value reached









Application with two dispensing devices (e.g. valves)

- A: Coarse feed (and fine feed) valve opened
- B: Shutoff point coarse valve
- C: Post dispensing coarse valve
- D: Fine valve (remains) opened
- E: Shutoff point fine valve
- F: Post dispensing fine valve
- G: Target value reached

Note: When starting the filling process the coarse and the fine valve are switched on. After having reached the shutoff points for the coarse and fine valve the states are saved in order to prevent that the valves will not be switched on again if the scale is unloaded accidentally.

5.4. Finalizing the filling process

The filling process will be finished by pressing one the mentioned keys.

-  Clearing current target value
-  Switching off the scale or the terminal
-  Call the scale's menu by longpress
-  Setting a new target value
-  Zero setting after having started the filling process
-  Taring after having started the filling process

Filling process will be stopped by unloading the scale accidentally.

The restart of the filling process is only then possible, if the scale is unloaded and if the minimum threshold value of the tare monitoring is exceeded again.

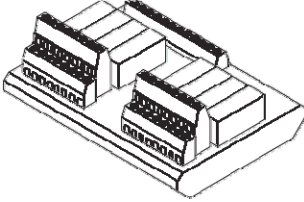
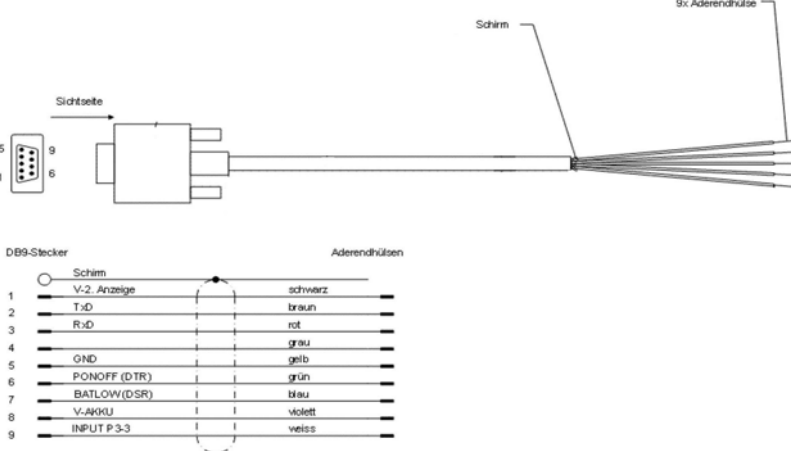
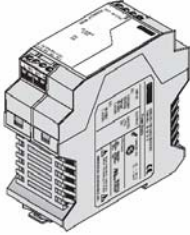
5.5. Specification of digital I/O interface

The following overview shows the characteristics, wiring diagrams and pin assignment for the control inputs and outputs of the digital I/O interface.

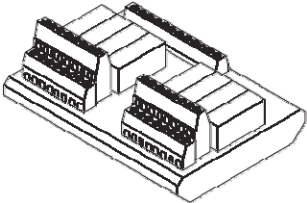
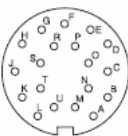
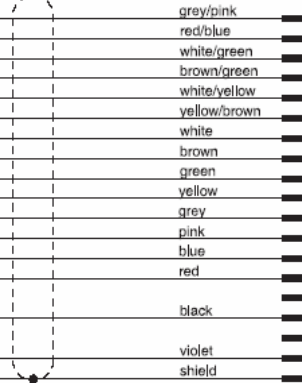
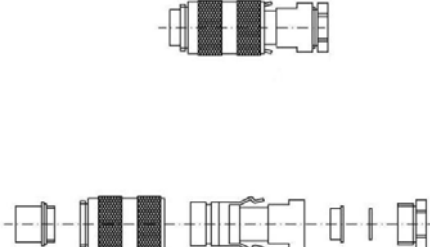

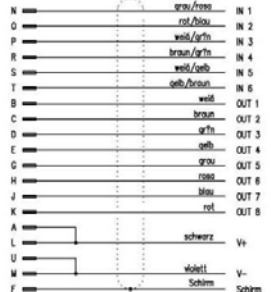
	BBA/BBK442, IND445	IND449																														
Input IN0...IN3	galvanically isolated, optokoppler $I_{min} = 1 \text{ mA}$ at U_{min} (external) $I_{max} = 8 \text{ mA}$ at U_{max} (external)	galvanically isolated, optokoppler $I_{min} = 1 \text{ mA}$ at U_{min} (external) $I_{max} = 8 \text{ mA}$ at U_{max} (external) $I_{min} = 3 \text{ mA}$ at U_{min} (internal)																														
Output OUT0...OUT3	galvanically isolated, open collector $I_{max} = 100 \text{ mA}$ at U_{max} (external)	galvanically isolated, relay contact $I_{max} = 500 \text{ mA}$ at U_{max} (external) $I_{max} = 400 \text{ mA}$ at U_{max} (internal)																														
Excitation	extern $U_{min} = 5 \text{ VDC}$, $U_{max} = 30 \text{ VDC}$ I_{max} for each output	intern $U_{min} = 12 \text{ VDC}$ I_{max} total of all output																														
Pin assignment																																
	<table border="0"> <tr><td>0 V</td><td>1</td></tr> <tr><td>OUT0</td><td>2</td></tr> <tr><td>OUT1</td><td>3</td></tr> <tr><td>OUT2</td><td>4</td></tr> <tr><td>OUT3</td><td>5</td></tr> <tr><td>IN0</td><td>6</td></tr> <tr><td>IN1</td><td>7</td></tr> <tr><td>IN2</td><td>8</td></tr> <tr><td>IN3</td><td>9</td></tr> <tr><td>(internal)</td><td>-</td></tr> </table>	0 V	1	OUT0	2	OUT1	3	OUT2	4	OUT3	5	IN0	6	IN1	7	IN2	8	IN3	9	(internal)	-	<table border="0"> <tr><td>M,U</td></tr> <tr><td>B</td></tr> <tr><td>C</td></tr> <tr><td>D</td></tr> <tr><td>E</td></tr> <tr><td>N</td></tr> <tr><td>O</td></tr> <tr><td>P</td></tr> <tr><td>R</td></tr> <tr><td>A,L</td></tr> </table>	M,U	B	C	D	E	N	O	P	R	A,L
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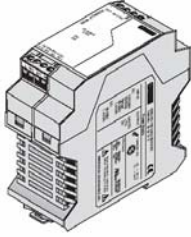
6. Accessories

6.1. Accessories for BBA/BBK442 and IND445

<p>22011967</p>	<p>Relay box 4 Must not be used in hazardous area!</p> 																														
<p>21254225</p>	<p>Cable for relay box 4: D-Sub 9 → open cable ends</p>  <p>Sichtseite</p> <p>Schirm</p> <p>9x Aderendhülse</p> <p>DB9-Stecker</p> <table border="1"> <thead> <tr> <th>DB9-Stecker</th> <th>Schirm</th> <th>Aderendhülzen</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>V-2, Anzeige</td> <td>schwarz</td> </tr> <tr> <td>2</td> <td>TxD</td> <td>braun</td> </tr> <tr> <td>3</td> <td>RxD</td> <td>rot</td> </tr> <tr> <td>4</td> <td></td> <td>grau</td> </tr> <tr> <td>5</td> <td>GND</td> <td>gelb</td> </tr> <tr> <td>6</td> <td>PONOFF (DTR)</td> <td>grün</td> </tr> <tr> <td>7</td> <td>BATLOW (DSR)</td> <td>blau</td> </tr> <tr> <td>8</td> <td>V-APKU</td> <td>violett</td> </tr> <tr> <td>9</td> <td>INPUT P 3-3</td> <td>weiss</td> </tr> </tbody> </table>	DB9-Stecker	Schirm	Aderendhülzen	1	V-2, Anzeige	schwarz	2	TxD	braun	3	RxD	rot	4		grau	5	GND	gelb	6	PONOFF (DTR)	grün	7	BATLOW (DSR)	blau	8	V-APKU	violett	9	INPUT P 3-3	weiss
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<p>00505544</p>	<p>Power supply for relay box 4 (110 - 230 VAC) Must not be used in hazardous area!</p> 																														

6.2. Accessories for IND449

<p>22011967</p>	<p>Relay box 4 Must not be used in hazardous area!</p> 																																																									
<p>00504458</p>	<p>Cable for 4: 19 Pin-round pin plug → open cable ends</p> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <p>19-pin plug</p>  </div> <div style="text-align: center;"> <p>Wire-end ferrule</p>  </div> </div> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr><td>N</td><td>IN 1</td><td>grey/pink</td></tr> <tr><td>O</td><td>IN 2</td><td>red/blue</td></tr> <tr><td>P</td><td>IN 3</td><td>white/green</td></tr> <tr><td>R</td><td>IN 4</td><td>brown/green</td></tr> <tr><td>S</td><td>IN 5</td><td>white/yellow</td></tr> <tr><td>T</td><td>IN 6</td><td>yellow/brown</td></tr> <tr><td>B</td><td>OUT 1</td><td>white</td></tr> <tr><td>C</td><td>OUT 2</td><td>brown</td></tr> <tr><td>D</td><td>OUT 3</td><td>green</td></tr> <tr><td>E</td><td>OUT 4</td><td>yellow</td></tr> <tr><td>G</td><td>OUT 5</td><td>grey</td></tr> <tr><td>H</td><td>OUT 6</td><td>pink</td></tr> <tr><td>J</td><td>OUT 7</td><td>blue</td></tr> <tr><td>K</td><td>OUT 8</td><td>red</td></tr> <tr><td>A</td><td>V+</td><td rowspan="3">black</td></tr> <tr><td>L</td><td>V+</td></tr> <tr><td>U</td><td>V-</td></tr> <tr><td>M</td><td>V-</td><td>violet</td></tr> <tr><td>F</td><td>shield</td><td>shield</td></tr> </table> <p style="text-align: center;">Plug housing + sleeve</p>	N	IN 1	grey/pink	O	IN 2	red/blue	P	IN 3	white/green	R	IN 4	brown/green	S	IN 5	white/yellow	T	IN 6	yellow/brown	B	OUT 1	white	C	OUT 2	brown	D	OUT 3	green	E	OUT 4	yellow	G	OUT 5	grey	H	OUT 6	pink	J	OUT 7	blue	K	OUT 8	red	A	V+	black	L	V+	U	V-	M	V-	violet	F	shield	shield		
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<p>00504461</p>	<p>Digital I/O counter plug, 19 Pin-round pin plug</p>  <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr><td>N</td><td>grey/rose</td><td>IN 1</td></tr> <tr><td>O</td><td>rot/blau</td><td>IN 2</td></tr> <tr><td>P</td><td>weiß/grün</td><td>IN 3</td></tr> <tr><td>R</td><td>brown/grün</td><td>IN 4</td></tr> <tr><td>S</td><td>weiß/gelb</td><td>IN 5</td></tr> <tr><td>T</td><td>gelb/brown</td><td>IN 6</td></tr> <tr><td>B</td><td>weiß</td><td>OUT 1</td></tr> <tr><td>C</td><td>brown</td><td>OUT 2</td></tr> <tr><td>D</td><td>grün</td><td>OUT 3</td></tr> <tr><td>E</td><td>gelb</td><td>OUT 4</td></tr> <tr><td>G</td><td>grau</td><td>OUT 5</td></tr> <tr><td>H</td><td>rosa</td><td>OUT 6</td></tr> <tr><td>J</td><td>blau</td><td>OUT 7</td></tr> <tr><td>K</td><td>rot</td><td>OUT 8</td></tr> <tr><td>A</td><td>schwarz</td><td>V+</td></tr> <tr><td>L</td><td></td><td>V+</td></tr> <tr><td>U</td><td>violett</td><td>V-</td></tr> <tr><td>M</td><td>Schirm</td><td>V-</td></tr> <tr><td>F</td><td></td><td>Schirm</td></tr> </table>	N	grey/rose	IN 1	O	rot/blau	IN 2	P	weiß/grün	IN 3	R	brown/grün	IN 4	S	weiß/gelb	IN 5	T	gelb/brown	IN 6	B	weiß	OUT 1	C	brown	OUT 2	D	grün	OUT 3	E	gelb	OUT 4	G	grau	OUT 5	H	rosa	OUT 6	J	blau	OUT 7	K	rot	OUT 8	A	schwarz	V+	L		V+	U	violett	V-	M	Schirm	V-	F		Schirm
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00505544	<p>Power supply for relay box 4 (110 - 230 V AC) Must not be used in hazardous area!</p> 
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