

smartDIE-PRO 6



6-channel die protection device with teach-in function and graphical event indication

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Subject to changes

Subject to changes in the interests of technical advancement.

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Font types

Italic or **bold** font refers to the title of a document or is used to highlight text.

`Courier` font refers to text which is shown on the display and/or screen as well as to menu options of software.

" < > " refers to keys of the keyboard of your computer (such as <RETURN>).

Table of contents

Table of contents	3
1 Change index.....	5
2 General.....	6
2.1 Scope of application	6
3 Additional safety notes	7
3.1 Definition of icons and notes.....	7
3.2 Supplement notes to the intended use	7
3.3 Organizational measures	7
4 Technical data	8
4.1 Functional scope.....	8
4.2 Scope of delivery	9
4.3 Electrical specifications.....	9
4.3.1 smartDIE-PRO 6	9
4.3.2 Beckhoff socket (EP2338-0001).....	10
4.4 Dimensions and accessories	10
4.4.1 smartDIE-PRO 6	10
4.4.2 Wall mount	11
4.4.3 Beckhoff socket (EP2338-0001).....	11
5 Wiring diagram	12
5.1 General drawing	12
5.2 smartDIE-PRO 6	13
5.3 Beckhoff socket (EP2338-0001).....	14
5.4 Connection cable	15
6 Basic screen.....	18
6.1 Graphical event indication.....	19
6.2 Status, error and bridging indication.....	20
7 Authorize.....	21
7.1 Standard passwords & user level	21
8 Programming function	22
9.1 Programming and/or parameterizing of a die protection input	22
9.2 Programming the monitoring function in the "dynamic" monitoring type	23
9.3 Error messages during operation	23
9.3.1 Possible error messages during static monitoring:	23
9.3.2 Possible error messages during dynamic monitoring:	24
9.3.3 Error messages of the cam monitoring function.....	24
10 Commissioning function	25
11 Counter	26

12 Die administration	27
12.1 Basic screen of the die administration	27
12.2 Select die	28
12.3 Create new die.....	29
12.4 Activate/select existing die.....	31
12.5 Delete available die	32
13 EC Declaration of Conformity	33

1 Change index

Change	Date	Index
First edition	7 Oct. 2014	00

2 General

This user manual contains the following subjects:

- Electrical specifications
- Installation
- Commissioning
- Configuration/parameterization

Since the documentation has a modular structure, this user manual is deemed a supplement to other sources of documentation such as product data sheets, dimensional drawings, brochures and assembly instructions.

The user manual may form part of the scope of delivery depending on customer specifications or it may be requested separately.



*These operating instructions are kept up-to-date. However, since **TRsystems GmbH/UNIDOR** products are subject to continuous further development, it is possible that short-term deviations between the device version and the operating instructions might occur due to technical changes. Please note that we do not assume liability for damage which might arise as a result.*

2.1 Scope of application

This user manual solely applies to the following product:

smartDIE-PRO 6

Order number: 192101000000

The products are marked by attached nameplates and form part of a system.

Therefore, the following documentation applies:

- The system-specific operating instructions of the operator
- This user manual
- Further documents supplied together with system

3 Additional safety notes

3.1 Definition of icons and notes



means that minor physical injury or property damage may occur if appropriate precautions are not taken.



refers to important information and/or characteristics of and application advice for the product used.

3.2 Supplement notes to the intended use

The system is designed to be used in **Ethernet** networks with a maximum speed of 100 Mbps for full-duplex operation specified in IEC 61158 as CPF2/2 (Communication Profile)

The technical directives on establishing the Ethernet network must be complied with in order to ensure safe operation.



The intended use also includes:

*observing all notes contained in this user manual,
observing the assembly instructions, in particular the chapter "**Fundamental safety notes**" must be read and understood before beginning to work*

3.3 Organizational measures

This user manual must always be available at the place of use of the system.

Before beginning work, the personnel assigned to perform activities on the system must have read and understood

- the assembly instructions, in particular the chapter "Fundamental safety notes",
- and this user manual, in particular the chapter "Additional safety notes"

This particularly applies to temporary personnel.

4 Technical data

Regarding the power supply for all hardware components with one power supply unit only, a power supply unit with the following specifications is required:

- Output voltage: 24 V DC (-15%/+20%)
- Output current: min 2 A/max 4 A

Regarding a separate power supply for the smartDIE-PRO 6 and the Beckhoff modules, power supply units with the following specifications are required:

Power supply unit for the smartDIE-PRO 6:

- Output voltage: 24 V DC ($\pm 20\%$)
- Output current: min 1.5 A

Power supply unit for the Beckhoff modules:

- Output voltage: 24 V DC (-15%/+20%)
- Output current: max 4 A



If a power supply unit with an output current exceeding 4 A is used, the power supply for the Beckhoff modules (EP2338-0001) must be secured with a 4 A fuse as they could otherwise be damaged. (refer to chapter 4.3.2)



If all hardware components are supplied via one power supply unit only, the smartDIE-PRO 6 might also be switched off in the case of a short-circuit on one of the digital outputs/inputs.

4.1 Functional scope

6-channel die protection device with learning function and graphical event indication

Monitoring types:

- Off (no monitoring)
- Static 0
- Static 1
- Dynamic

Bridging function (internal + external)

6 cam inputs

2 piece counters (overall number of pieces + lot size)

Input for "counter stop"

Indication of the current stroke rate

2 separate stop outputs

- Immediate stop
- OT stop

4.2 Scope of delivery

The following components are included in the standard scope of delivery:

Quantity:	Designation:	Order no.:
Hardware components:		
1	smartDIE-PRO 6	192101000000
1	smartDIE-PRO 6 wall mount, adjustable	49970480
1	USB data backup memory stick, 8 GB	63095320
2	EP2338-0001 EtherCAT box, 8 dig. inp. or 8 dig. outp.	781-20065
Power cable (M8 female/M8 male):		
1	Power cable, ZK 2020-3132-0005 (0.5 m)	64060143
1	Power cable, ZK 2020-3132-0050 (5.0 m)	64060135
Power cable (M8 female/open end):		
1	Power cable, M8-4/0-10 (10.0 m)	64060152
EtherCAT cable (M8 male/M8 male):		
1	EtherCAT cable, ZK1090-3131-0005 (0.5 m)	64060142
1	EtherCAT cable, ZK1090-3131-3050 (5.0 m)	64060136
Miscellaneous:		
1	DIG I/O cable PSA 4eC M8-3/0-10 (10 m)	64060141
8	M8/3-pin connec. plug *99-3379-100-03*	620001569
8	Protective cap M8	49250021
2	WZS M8-3/07-01 adapter cable WZS (0.20 m)	507050200002

4.3 Electrical specifications

4.3.1 smartDIE-PRO 6

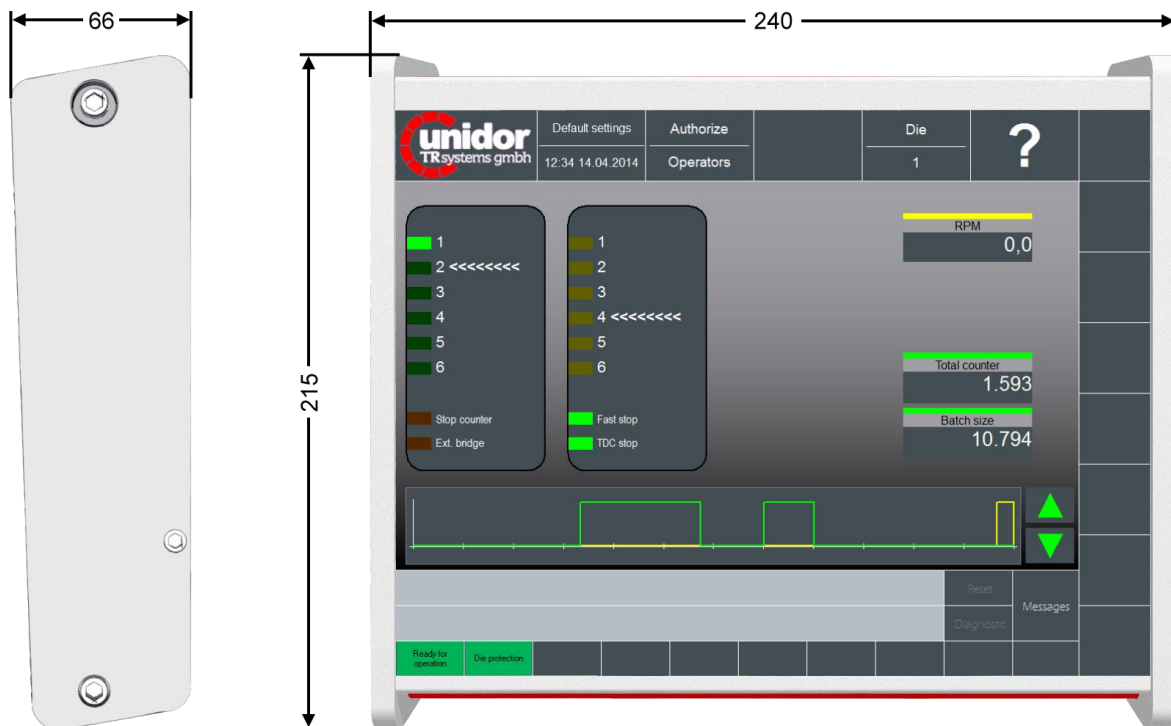
Supply voltage:	24 V DC (±20%)
Power input:	max 1.5 A
CPU:	Intel Atom D510 1.66 GHz
RAM:	2 GB
Flash memory:	4 GB (without mechanical drive)
Operating system:	Windows Embedded XP
Display:	10.4" resistive LCD touch screen, 1024x768 pixels
Bus interface:	1x RJ45 Ethernet (100BASE-TX) 1x M8 female EtherCAT (100BASE-TX)
USB:	2x USB 2.0
Dimensions:	240 x 66 x 215 mm (W x H x D)
Weight:	2200 g
Installation:	Table or wall mount
Operating/storage temperature:	0..+45°C/-25..+70°C (non-condensing)

4.3.2 Beckhoff socket (EP2338-0001)

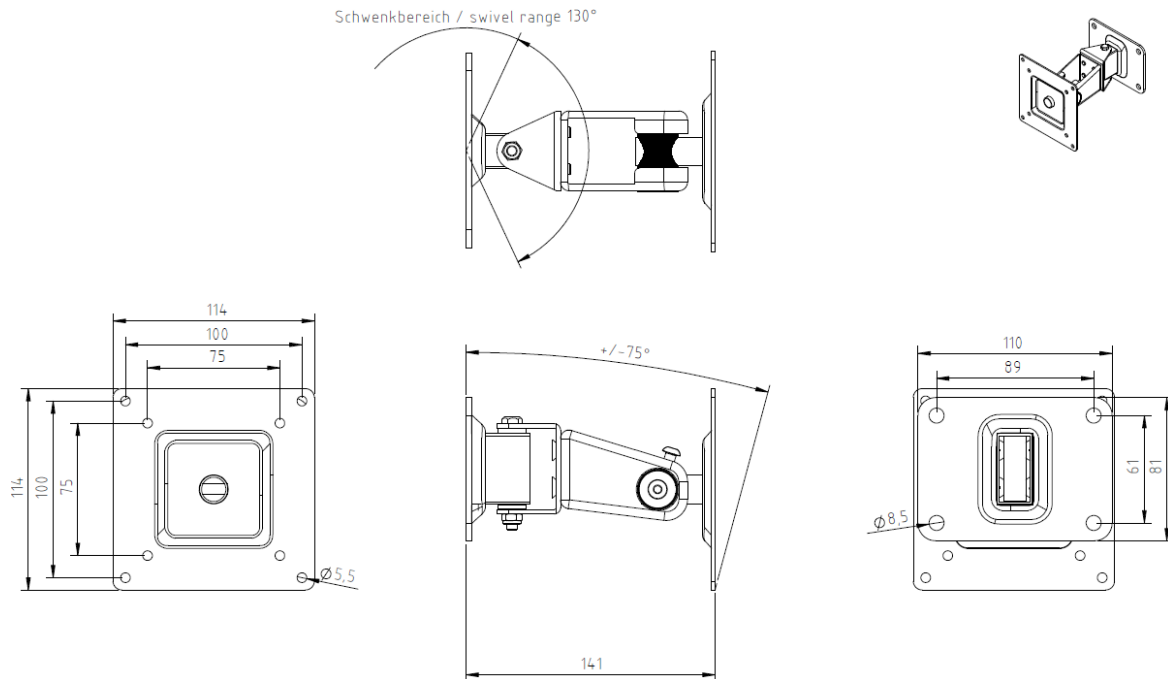
- Supply voltage: 24 V DC (-15%/+20%)
- Power supply/transfer: max 4 A
- Power input: Us 120 mA
 - Up typ. 20 mA + load (max 0.5 A/output)
- Bus interface: 2x M8 female (EtherCAT)
- Channels: 8 freely selectable digital inputs or outputs (M8 female)
- Input filter: 10 μ s
- "Log 0": -3..+5 V
- "Log 1": 11..30 V (6 mA input current)
- Output current: max 0.5 A
- Short-circuit current: typ. 1.5 A
- Dimensions: 30 x 126 x 26.5 mm (W x H x D)
- Weight: 165 g
- Installation: 2x mounting holes \varnothing 3 mm for M3
- Operating/storage temperature: . 0..+55°C/-25..+85°C

4.4 Dimensions and accessories

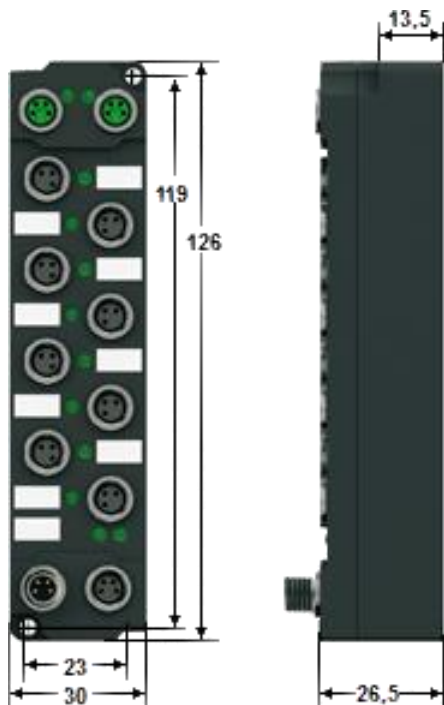
4.4.1 smartDIE-PRO 6



4.4.2 Wall mount



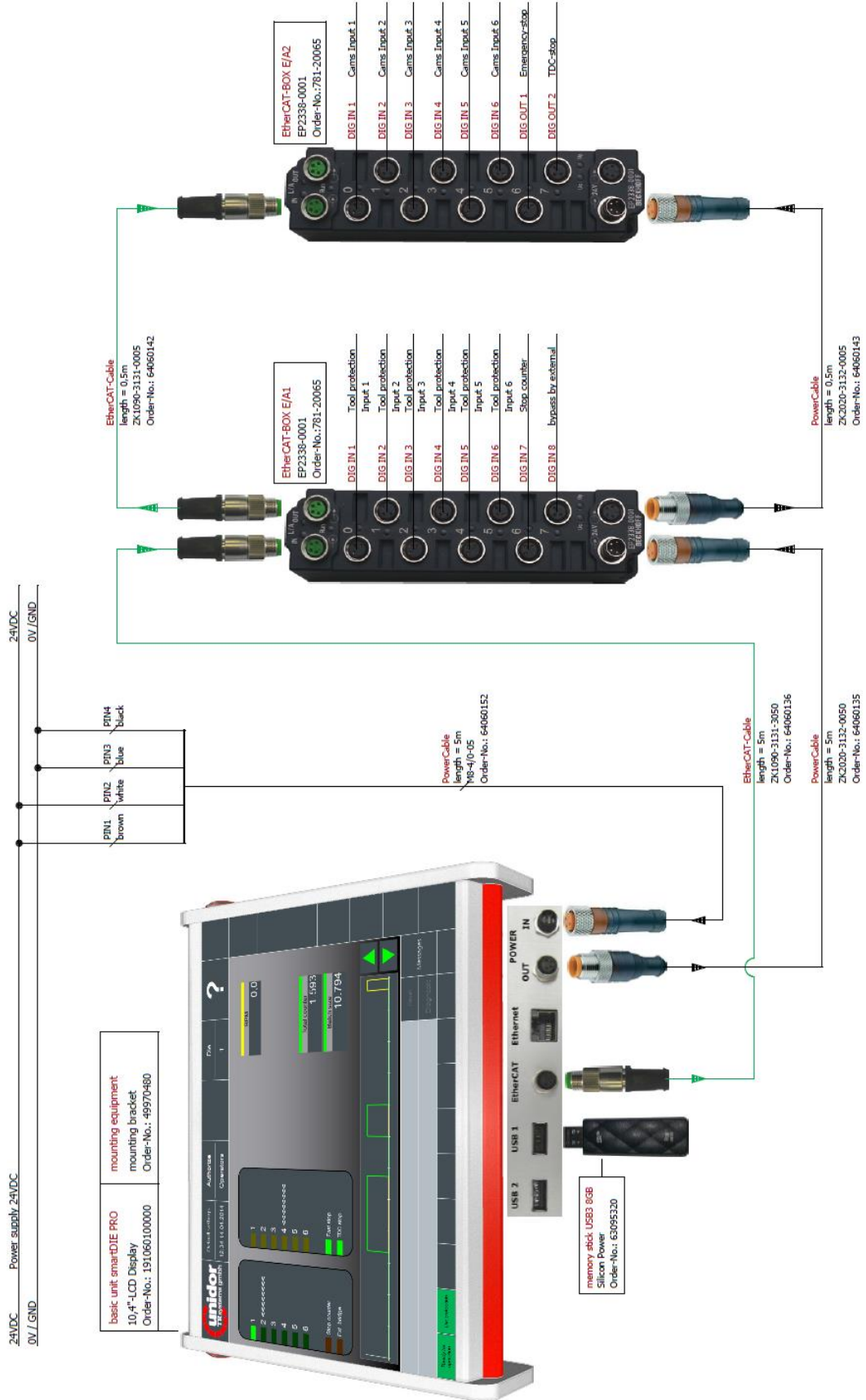
4.4.3 Beckhoff socket (EP2338-0001)



User manual

5 Wiring diagram

5.1 General drawing



5.2 smartDIE-PRO 6



5.3 Beckhoff socket (EP2338-0001)

Equipment:
8x Plug M8/3-pol.
Order-No.: 620001569



PIN1 = +24VDC
PIN3 = 0V/GND
PIN4 = IN/OUT Signal



EP2338 0001					
D: 27140208					
S-Nr:					
ETHERCAT					
IN	<table border="1"> <tr><td>4</td><td>2</td></tr> <tr><td>3</td><td>1</td></tr> </table>	4	2	3	1
4	2				
3	1				
OUT	<table border="1"> <tr><td>4</td><td>2</td></tr> <tr><td>3</td><td>1</td></tr> </table>	4	2	3	1
4	2				
3	1				
1	Tx+				
2	Rx+				
3	Rx-				
4	Tx-				
DIGITAL					
I/O x 8	<table border="1"> <tr><td>3</td><td>4</td></tr> <tr><td> </td><td>1</td></tr> </table>	3	4		1
3	4				
	1				
1	+24 V Up				
3	GND				
4	Input/Output				
10 µs filter time / I _{MAX} = 0.5 A					
POWER SUPPLY					
IN	<table border="1"> <tr><td>2</td><td>4</td></tr> <tr><td>1</td><td>3</td></tr> </table>	2	4	1	3
2	4				
1	3				
OUT	<table border="1"> <tr><td>4</td><td>2</td></tr> <tr><td>3</td><td>1</td></tr> </table>	4	2	3	1
4	2				
3	1				
1	+24 V Us				
2	+24 V Up				
3/4	GND				



Equipment:
8x lens cap M8
Order-No.: 49250021

5.4 Connection cable



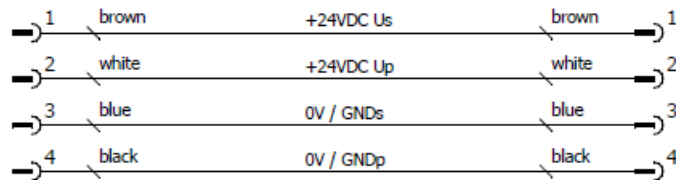
1x PowerCable
 ZK2020-3132-0050 (4x0,34mm²)
 length = 5m
 Order-No.: 64060135

1x PowerCable
 ZK2020-3132-0005 (4x0,34mm²)
 length = 0,5m
 Order-No.: 64060143

Connection smartDIE PRO POWER OUT
 Connection EP2338-0001 POWER IN

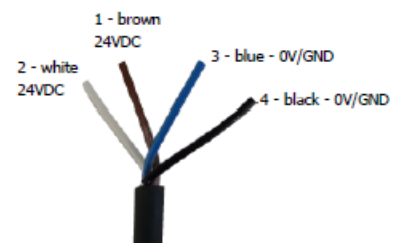


Connection smartDIE PRO POWER IN
 Connection EP2338-0001 POWER OUT



1x PowerCable smartLINE
 M8-4/0-10 (4x0,34mm²)
 length = 10m
 Order-No.: 64060152

Connection smartDIE PRO PC POWER IN

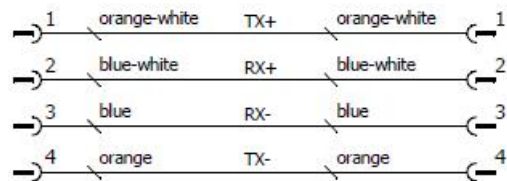
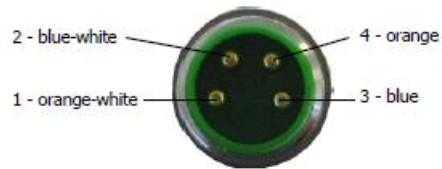




1x EtherCAT-Cable
 ZK1090-3131-3050 (4x0,34mm²)
 length = 5m
 Order-No.: 64060136

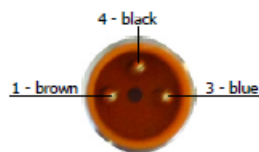
1x EtherCAT-Cable
 ZK1090-3131-0005 (4x0,34mm²)
 length = 0,5m
 Order-No.: 64060142

Connection smartDIE PRO EtherCAT
 Connection EP2338-0001 EtherCAT IN/OUT

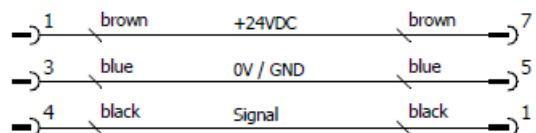
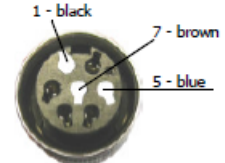


1x Cable for Tool protection
 WZS M8-3/07-01 (3x0,34mm²)
 length = 0,20m
 Order-No.: 507050200002

Connection EP2338-0001



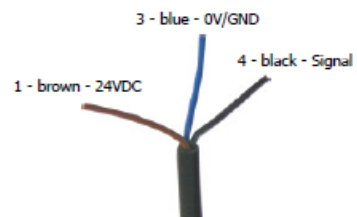
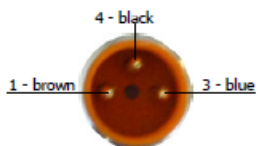
Connection Tool protection





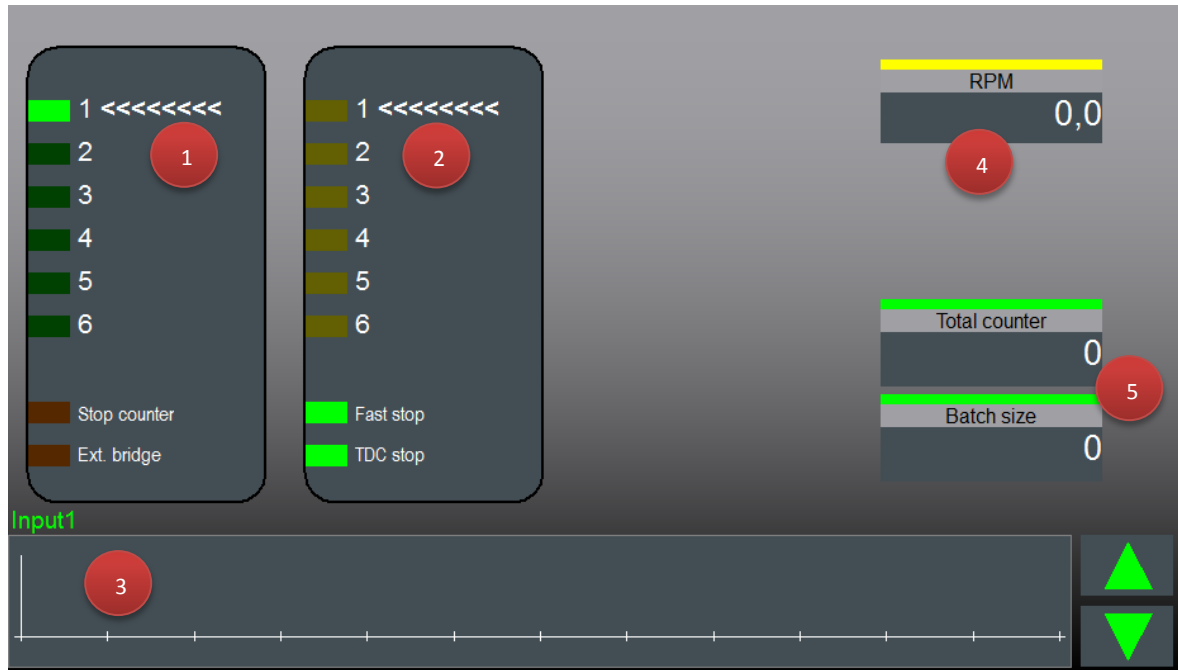
1x DIG I/O Cable PSA 4eC
M8-3/0-10 (3x0,34mm²)
length = 10m
Order-No.: 64060141

Connection EP2338-0001



6 Basic screen

The basic screen is used to graphically display events as well as to display current actual values of the die monitoring system. This page is also used to access the corresponding programming or parameterization screens of the system.

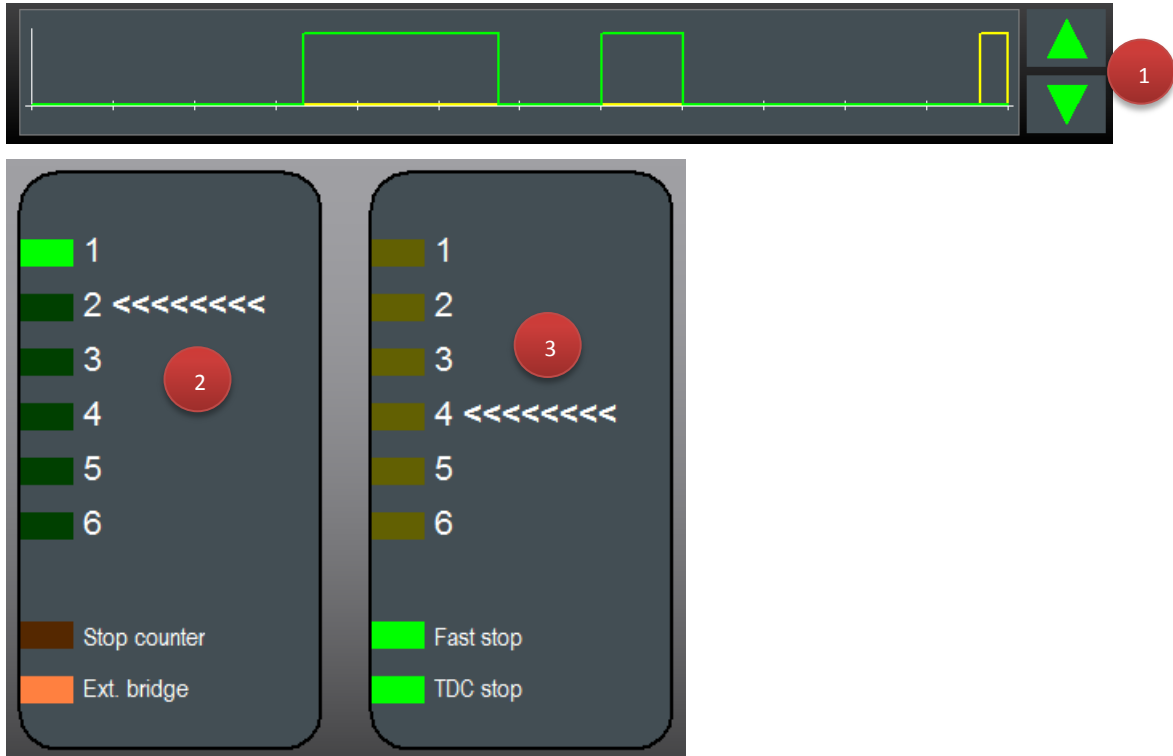


- 1 Indication of the current status of the die protection inputs as well as the additional inputs for Stop counter and Ext. bridge.
This field may also be used to change to the "programming" screen (by simply touching the framed field on the touch screen).
- 2 Indication of the current status of the cam inputs as well as the inputs for Fast stop and TDC stop.
This field may also be used to change to the "programming" screen (by simply touching the framed field on the touch screen).
- 3 Graphical event indication of the selected die protection input as well as the status of the assigned cam.
- 4 Indication of the current stroke rate (RPM).
- 5 Indication of the current counter reading of the lot and overall batch size.
The "parameterization screen" of the batch size is opened by touching one of these fields.

6.1 Graphical event indication

The graphical event indication displays the status of the signal transducer input (green curve) as well as the cam (yellow curve).

The currently selected input (1..6) may be selected using the arrow keys (1) right next to the display. The currently selected die protection input (2) as well as the corresponding cam (3) are displayed in the signal status indications with "#####".



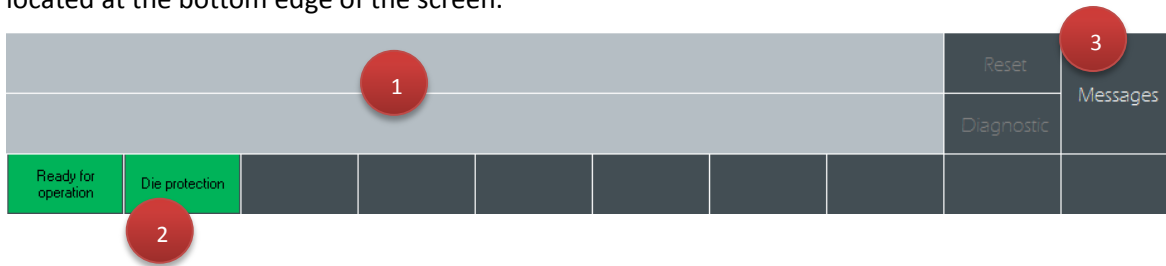
As shown in the example above, the "die protection input number 2" as well as the correspondingly programmed "cam input number 4" are currently displayed.



The last cycle (or stroke) of the cam is always displayed. It is displayed in such a way that the end of the cam is shown at the end (right side) of the graphical display.

6.2 Status, error and bridging indication

The message line(s) as well as the status and bridging indication of the die protection device are located at the bottom edge of the screen.



- 1 Message line 1 + 2
- 2 Status indication of the "die protection" (WZS) function. This indication/key allows the "die protection" function to be bridged when touched.

Possible indication(s):

 - Green = Everything is okay, die protection device active and error-free
 - Red = There is at least one error
 - Yellow = Bridged internally
 - Orange = Bridged externally
 - Flashing yellow = Die protection device in learning mode
 - Blue = (Programming) value modified but not saved yet
- 3 Key for message window as well as acknowledgement key



Caution: There is no automatic arming when bridged externally!

Example(s):



Die protection device bridged externally.



Die protection device has (at least) one error.

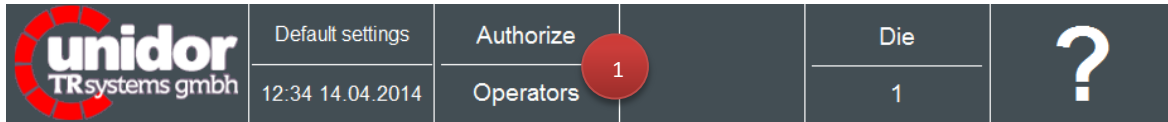


Die protection device bridged internally.

7 Authorize

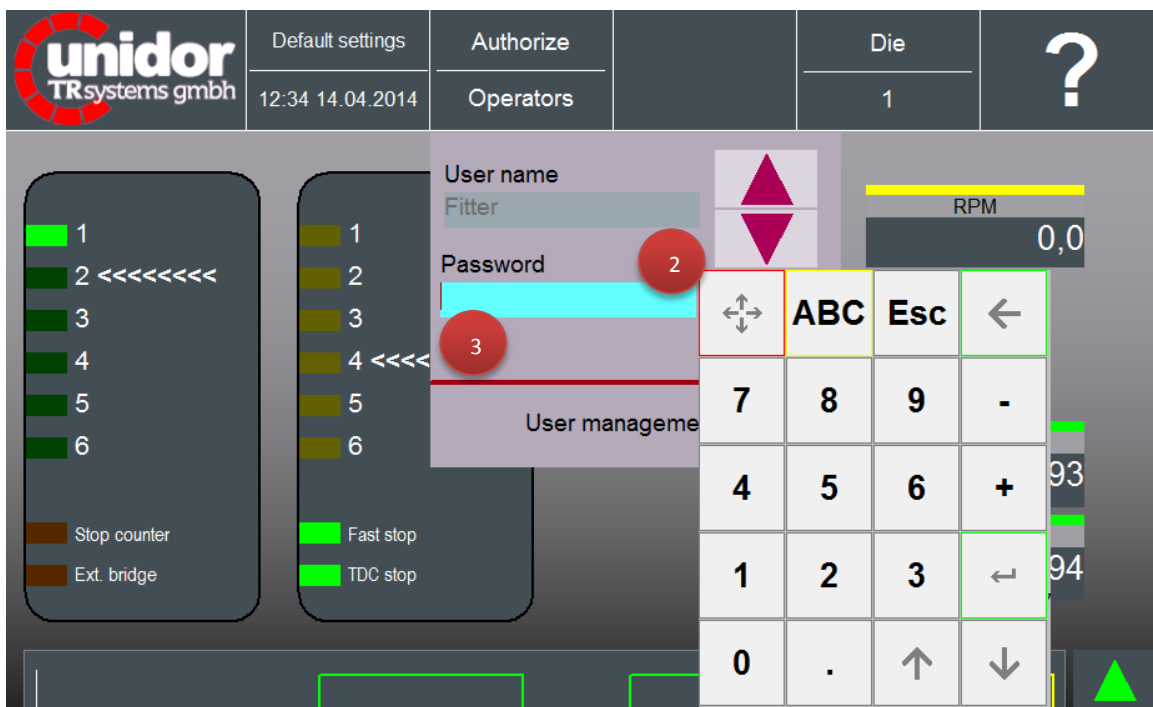
In order to protect the device against unauthorized or wrong entries, the system has a 5-level user administration. When activated, the device is automatically logged into with the lowest authorization level (operator).

In order to change the user level, the user must be authorized via the device. This is done via the top menu bar of the system by pressing the "Authorize" button.



Once the "Authorize" field (1) has been touched, a dialogue field is opened (2). In this dialogue, the desired user may be selected using the arrow keys and the corresponding password (3) may be entered if required.

When the password is entered, the display changes to the selected user.



7.1 Standard passwords & user level

User name:	User level:	Password:
Operator	Operator	None required
Fitter	Fitter	111110
Maintenance	Maintenance	487000
Administrator	Administrator	*
Supervisor	Supervisor	**

*) Passwords are reserved to OEM customers only (you will receive this password upon request if required)

***) Passwords are only known to TRsystems and will not be disclosed.

8 Programming function

The programming function is opened by touching the input or cam display (refer to chapter 6). Via this screen, the monitoring type as well as the corresponding settings for each input may be adjusted separately. These (adjustment) values are stored in the current tool depending on the respective die.



- 1 "Commissioning" key: Access to this screen is only granted from user level "Maintenance". (for a description refer to chapter 7)
- 2 "Teach-in" key: When this key is pressed, the teach-in procedure is started (if dynamic inputs are parameterized).
- 3 "Back" key: Changes to the previous page or to the basic screen
- 4 9 Freely selectable name of the die protection input and key for selecting the monitoring type.

9.1 Programming and/or parameterizing of a die protection input

By repeatedly touching the (1) key, the different monitoring types may be changed in the following order:

"Off"->"Static 0"->"Static 1"->"Dynamic"->"Off"



For the monitoring types "Off", "Static 0" and "Static 1", no additional settings must be made.

9.2 Programming the monitoring function in the "dynamic" monitoring type

Regarding the dynamic monitoring, it is necessary to allocate a cam to the monitoring as well as specify the signal status.

Furthermore, the signal flanks must be specified before making a request. In order to allow for a so called "count over" in the case of a fluctuating flank number, the minimum and the maximum flank number must be entered. If precise counting and/or monitoring are to take place, the minimum and maximum flanks must be programmed to the same value.



These parameters may only be programmed and/or changed if the user is a "fitter" or a higher ranking user. (refer to chapter 7)

Programming						
Input1	interrogation	OV	Cams	Edges min.	Edges max.	Edges act
dynamic		0V	1	0	0	0
Input2						

- 1 Selection key for the signal status at the time of the request. Selection options "0V" – "24V" – "0..24V"
- 2 Selection of the cam input for requesting purposes (input from 1..6 possible)
- 3 Minimum number of signal edges at the time of the request
- 4 Maximum number of signal edges at the time of the request
- 5 Indication of the actual edges of the last stroke and/or at the time of the request

9.3 Error messages during operation

Error messages may occur during operation which are described in the following.

9.3.1 Possible error messages during static monitoring:

Static input {designator} wrong signal state
Target: {value} actual: {value}

Example:

Static input Input1 wrong signal state	Reset	Messages
Set: 1 Act: 0	Diagnostic	

9.3.2 Possible error messages during dynamic monitoring:

Dynamic input {designator} not enough changes!
Target: {value} actual: {value}

Example:

Dynamic input Input1 not enough changes!	Reset	Messages
Set: 4 Act: 2	Diagnostic	

Dynamic input {designator} too many changes!
Target: {value} actual: {value}

Example:

Dynamic input Input1 too many changes!	Reset	Messages
Set: 2 Act: 3	Diagnostic	

{designator} wrong signal state at time of scan!
Target: {value} actual: {value}

Example:

Input1 wrong signal state at time of scan!	Reset	Messages
Set: 1 Act: 0	Diagnostic	

{designator} signal change in scanning cams!
Target: {value} actual: {value}

Example:

Input1 signal change in scanning cams!	Reset	Messages
Set: 1 Act: 0	Diagnostic	

9.3.3 Error messages of the cam monitoring function

The system monitors the signal changes of the cams used. If more than one cam is used, they are monitored.

{designator} cam monitoring
Cam {cam number} too few changes!

Example:

Input6 cam monitoring	Reset	Messages
Cams 5 too few changes!	Diagnostic	

10 Commissioning function

From the "Maintenance" level, the "commissioning" screen allows for the adjustment of some of the parameters uniform for all dies.



- 1 Input field to determine the cam for piece counter as well as stroke rate indication. Admissible input range = 1..6
- 2 Input field to determine the maximum number of bridged strokes (internal bridging only). Upon completion of these strokes, the die protection device is automatically activated and/or armed.
- 3 Number of teach-in strokes for dynamic inputs.
- 4 The "Back" key is used to open the previous page.

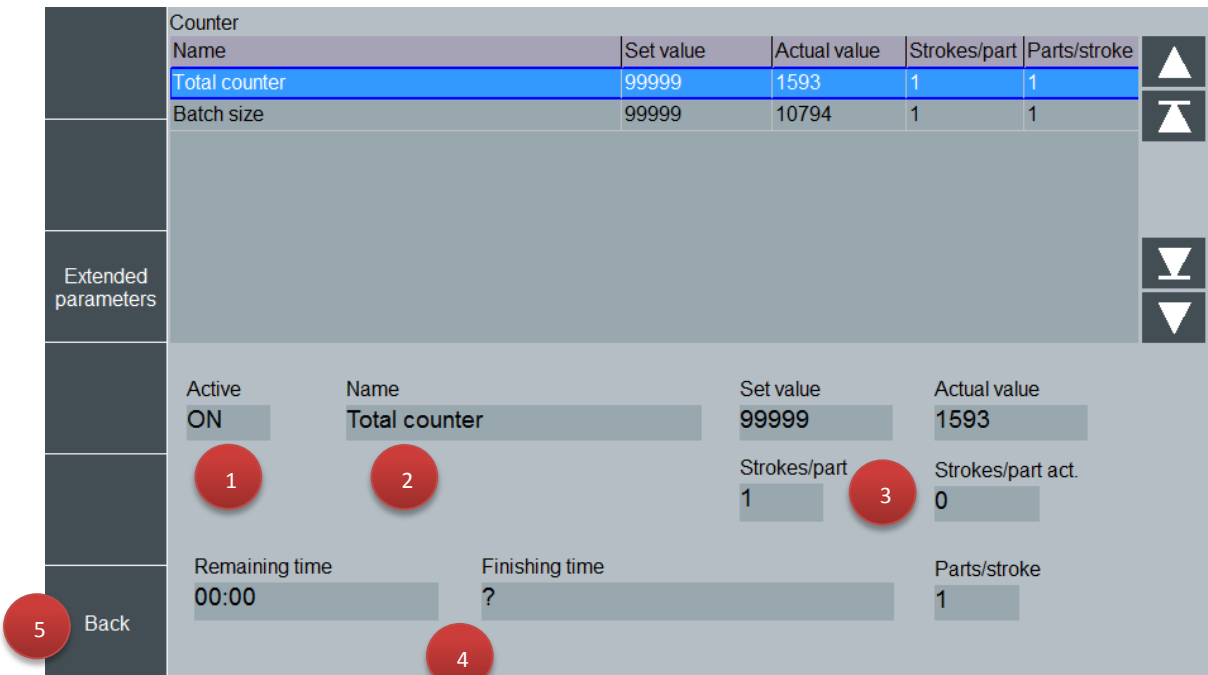
11 Counter

The system has 2 piece counters (overall number of pieces + lot size)

The counters may be parameterized via the counter screen. If connected externally, the piece counters may be blocked externally (24 V signal). This may be useful for retrofitting or setting up of the machine since the produced pieces are not counted in this case.

"Strokes per part" and "Parts per stroke" may be programmed.

Once the counter has achieved its target value, the OT stop output is activated (0).



The screenshot shows a counter configuration interface. At the top, there is a table with columns: Counter, Name, Set value, Actual value, Strokes/part, and Parts/stroke. The 'Total counter' is selected. Below the table is an 'Extended parameters' section. At the bottom, there are fields for 'Active' (ON), 'Name' (Total counter), 'Set value' (99999), 'Actual value' (1593), 'Strokes/part' (1), 'Strokes/part act.' (0), 'Remaining time' (00:00), 'Finishing time' (?), and 'Parts/stroke' (1). A 'Back' button is at the bottom left. Red circles with numbers 1-5 point to specific elements: 1 to the 'Active' toggle, 2 to the 'Name' field, 3 to the 'Strokes/part' field, 4 to the 'Remaining time' and 'Finishing time' fields, and 5 to the 'Back' button.

Counter	Name	Set value	Actual value	Strokes/part	Parts/stroke
Total counter		99999	1593	1	1
Batch size		99999	10794	1	1

Extended parameters

Active: ON
Name: Total counter
Set value: 99999
Actual value: 1593
Strokes/part: 1
Strokes/part act.: 0
Remaining time: 00:00
Finishing time: ?
Parts/stroke: 1
Back

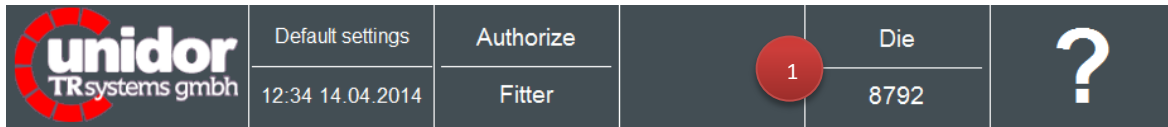
- 1 Activate/deactivate counter
- 2 Free text designator of the counter
- 3 "Set value"/"Actual value" as well as "Strokes/part" and "Parts/stroke"
- 4 Indication of "remaining time" & "finishing time" (only when engaged). The remaining time is calculated which is required for the current stroke rate until the target value of the counter is achieved.
- 5 The "Back" key is used to change to the previous page or to the basic screen.

12 Die administration

The die administration is used to permanently save the settings and programming. An arbitrary* number of dies may be created in the system.

In order to create or activate a die, a user level of "fitter" or higher is required.





The die administration is opened via the "Die" field (1) in the top edge of the screen.



12.1 Basic screen of the die administration

The basic screen of the die administration shows the currently selected die as well as its free text designator (die name).

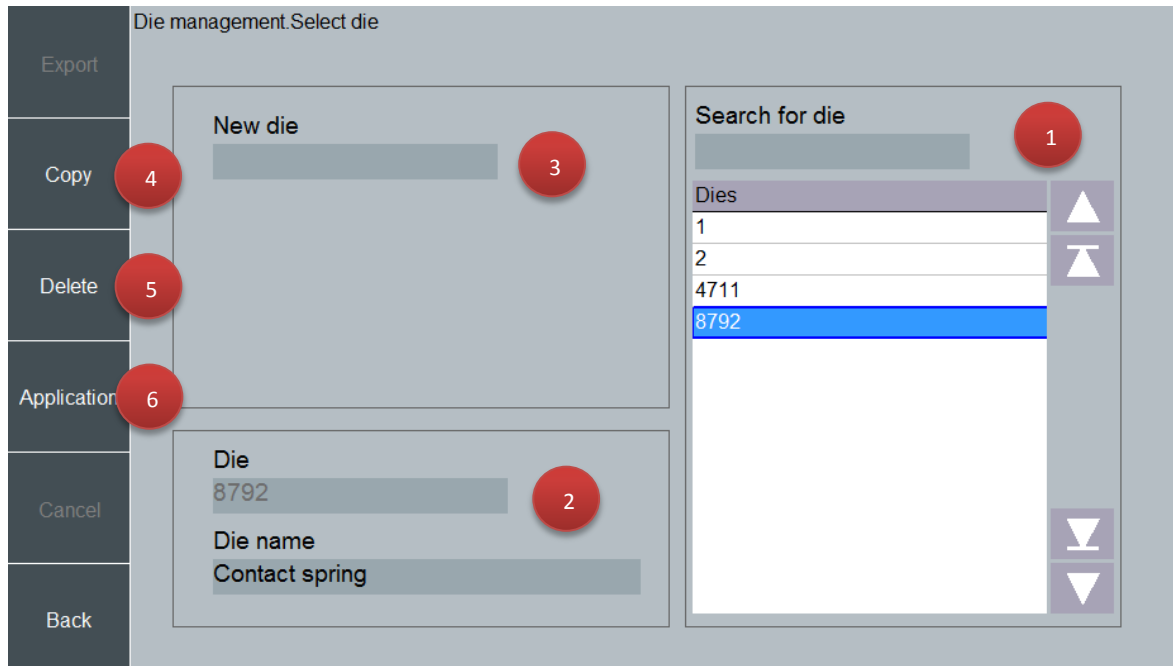


-  Current (active) die
-  With the "Select die" key, an already available die is selected or dies are created or deleted.
-  With the "Configure die" key, a specified die, for example, is saved.
-  Data backup options (with available USB memory stick)

*) Depends on free memory

12.2 Select die

Once the "Select die" key is pressed, the following screen is displayed.

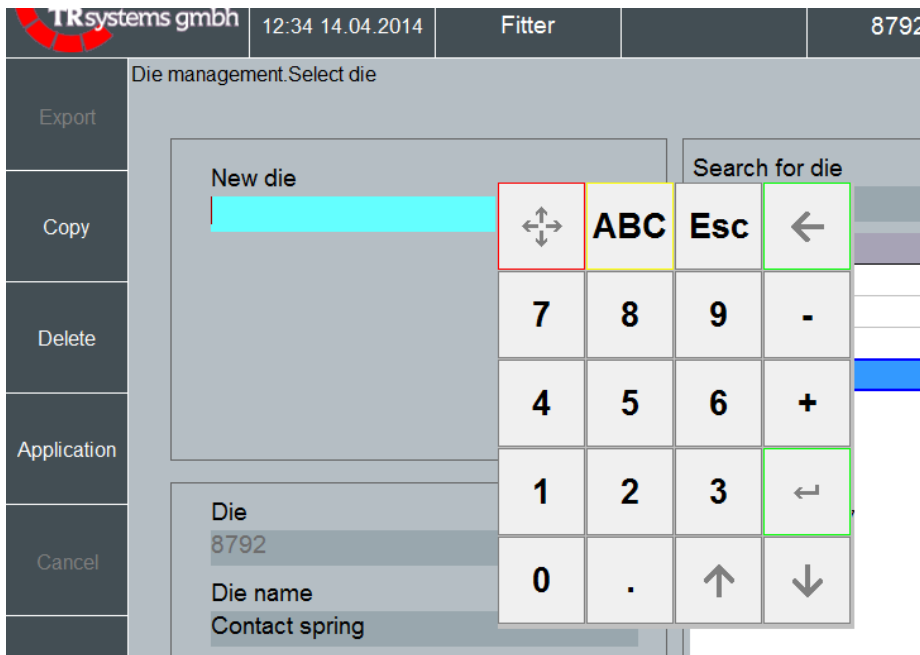



The screen is divided into different areas. Each area is responsible for a specific function.

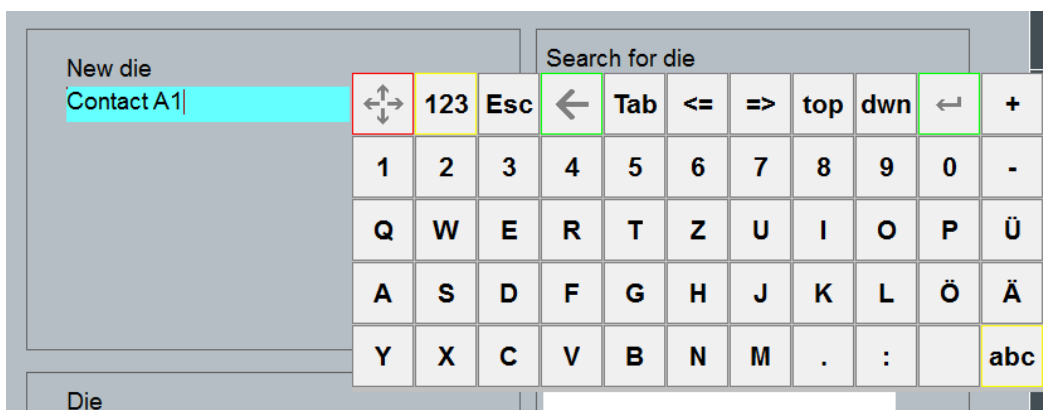
- 1 In the case of a large number of dies within the die list, the list of all dies already created may be browsed by entering the die name in the field "Search for die". When opening the screen, the currently active die is selected.
- 2 Die information on the die currently selected in the list.
- 3 Input field for the new creation of a die.
- 4 Copy die selected in the list
- 5 Delete die selected in the list
- 6 Apply (activate) die selected in the list.

12.3 Create new die

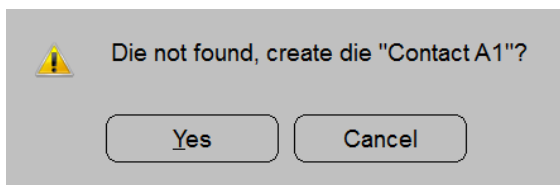
In order to create a new die, the input field "New die" (3) must be touched. An on-screen keyboard is then displayed which prompts you to enter the die name.



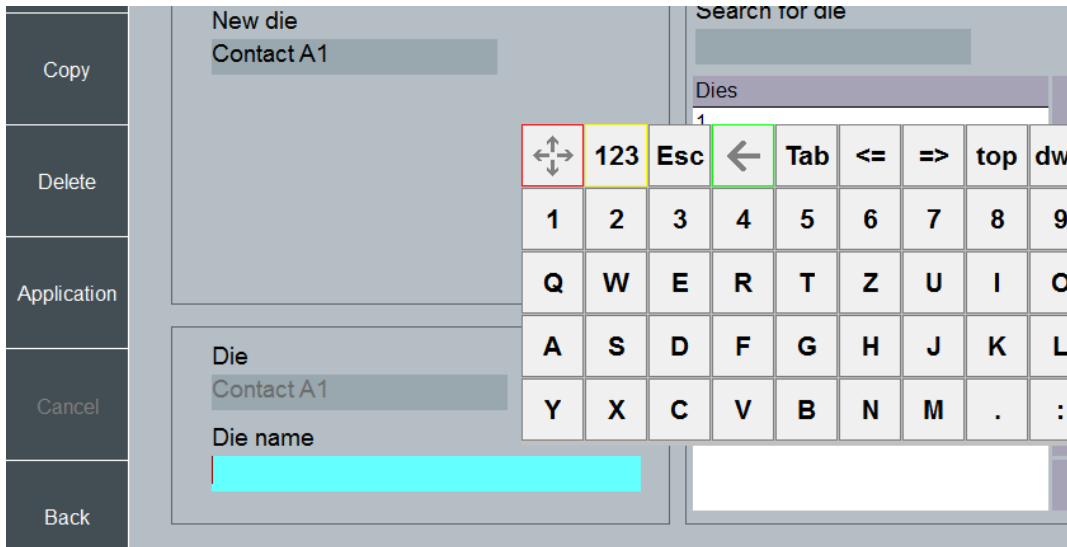
When a valid die name is entered, the entry must be confirmed with the "Enter key" .



When the "Enter key" is pressed, a dialogue box appears asking if you want to create the new die. Confirm this window by pressing "Yes".

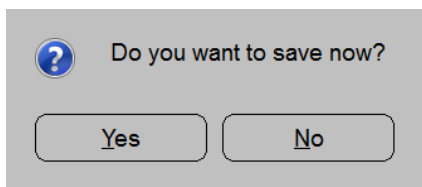


Once confirmed, a clear text designator may be entered.

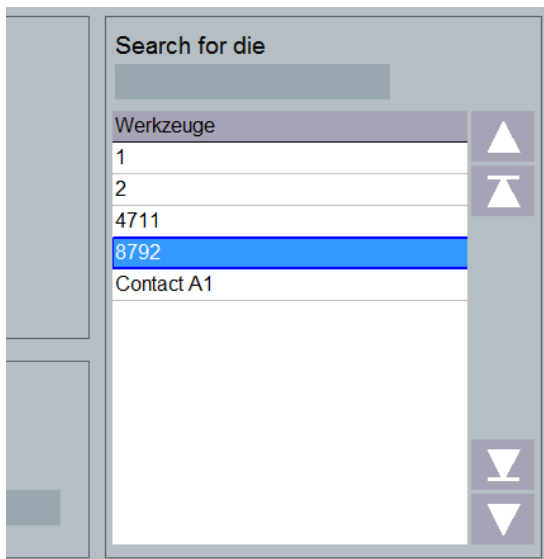


Input of the clear text designator "Die name".

Once confirmed with the "Enter" key, another dialogue field is shown asking if you want to save the die.



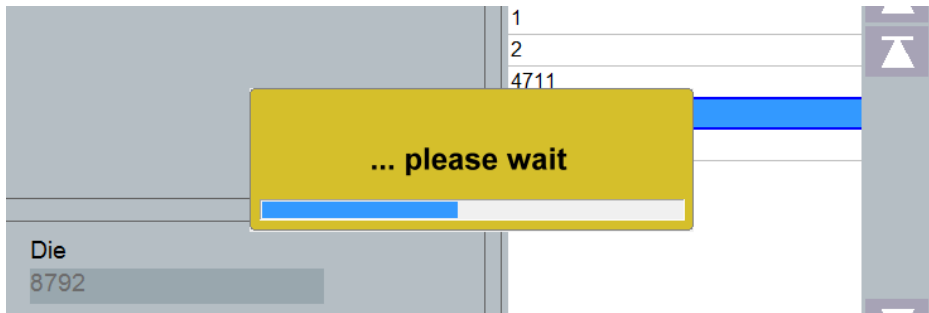
When the "Yes" button is pressed, the die is added to the list.



In order to edit the newly created die, it must be activated as the current die. Proceed as described in the following chapter.

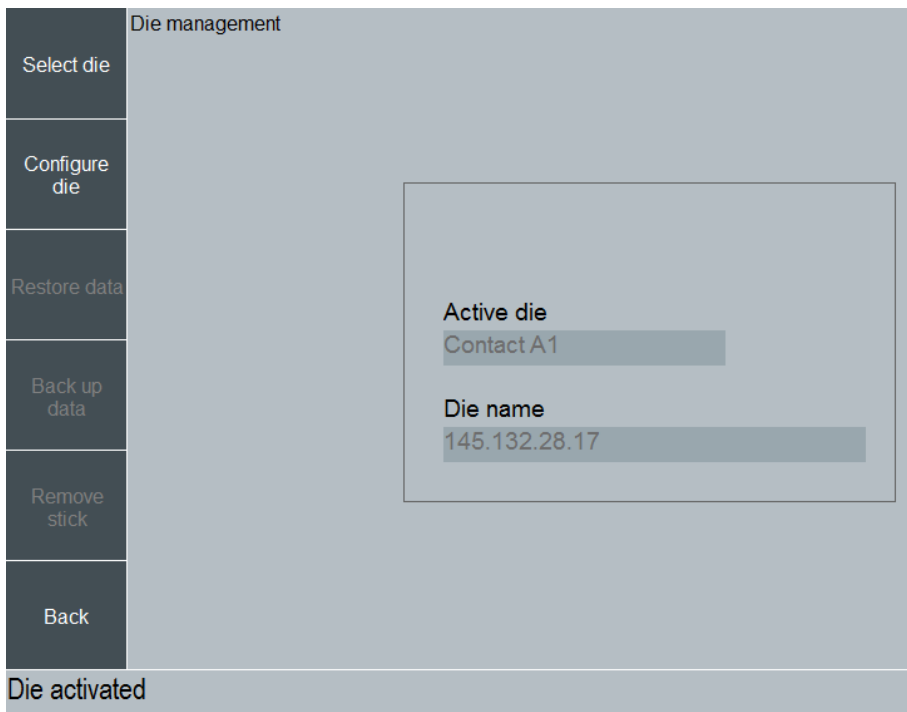
12.4 Activate/select existing die

In order to activate an already existing die, the desired die must first be selected from the die list. The selected die may be activated by pressing "Accept".



During activating, a window with a progress bar is shown.

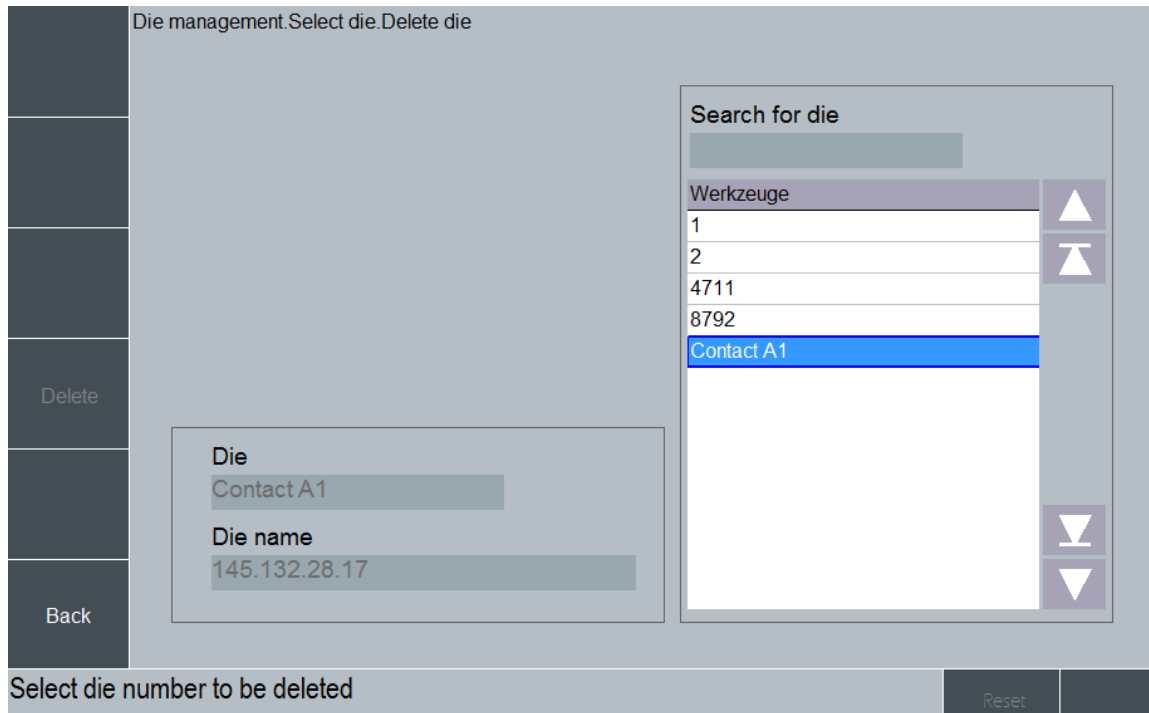
Upon completion of the activating procedure, the display changes to the currently active die.



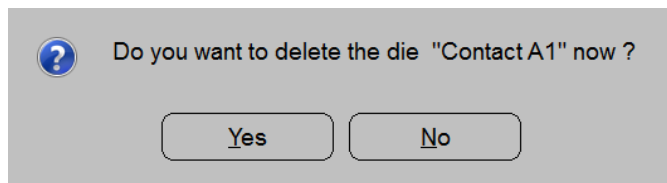
Additionally, a note is displayed in the message line.

12.5 Delete available die

To delete the available die, the "Delete die" key is pressed. The display is changed to the deletion view.



In order to delete a die, the die is selected from the list and then deleted by pressing the "Delete" button. A confirmation window is displayed in order to ensure that the correct die is deleted.



If "Yes" is pressed, all die data relating to this die will be deleted.

If "No" is pressed, deletion is cancelled.



Dies may only be deleted if they are not active!

13 EC Declaration of Conformity

Manufacturer: TRsystems GmbH, System department Unidor
Factory: Unidor, Freiburger Straße 3, D-75179 Pforzheim

hereby confirm for the

Product: smartDIE-PRO 6
Device type: smartLINE
Model name: smartDIE-PRO 6

compliance with the EC Directive 89/392/EEC and the following standards:

- ✓ EN 60204.1, Electrical Equipment for Industrial Machines
- ✓ Electromagnetic Compatibility 89/336/EEC IEC 801 Parts 1, 2, 4
- ✓ EN 55011 Radio Interference Voltage
- ✓ EN 55022 Noise Radiation
- ✓ VDE 0100, VDE 0113, EN 60204

Issued by: TRsystems GmbH, System department Unidor
Date: 6 Oct. 2014
Place: Pforzheim, Germany

