EXNER PROCESS EQUIPMENT

EXSPECT

NIR Sensor
Technical Information

All brand and product names are registered trademarks of
Exner Process Equipment GmbH.

Imprint

Editor:

EXNER PROCESS EQUIPMENT GMBH
Industriestr. 6A
D-76275 Ettlingen

Date of issue: 2015-11-05

© 2010, Dipl.-Ing. Detlef Exner

Status 2015-11-05

Table of Contents

1 Product Description

1.1 EXSPECT NIR sensor

Components

1 Casing cover
2 Display
3 M12 male connector

4 Process connection
5 Pressure screw
6 Measuring window
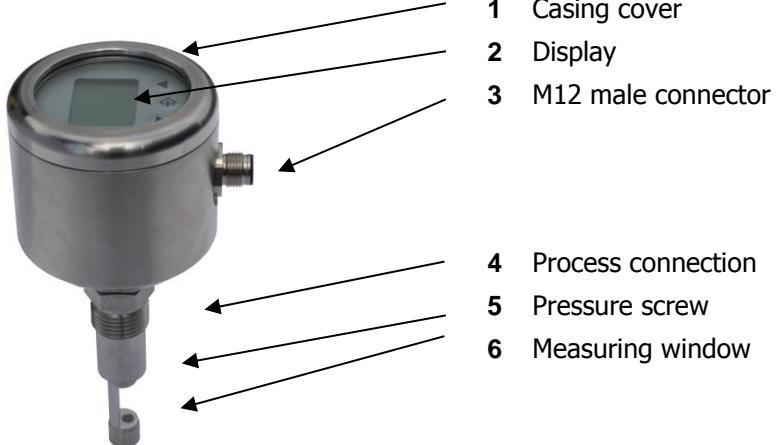
NIR Sensor

Variants The EXspect NIR sensor is available in three different optical path lengths (OPL). High-degree absorptions (very cloudy media) are measured with short OPLs. For lower-degree absorptions longer OPLs should be selected to ensure detection of even the smallest changes.

EXspect 230 The NIR sensor EXspect 230 is a sensor for examination of the optical density of liquids for continuous monitoring of process results and precise indication of any changes. Particularly suitable for phase separation, filter monitoring and measurement of concentrations.

- Precise phase separation
- Fast product change
- Reduced waste water costs
- Filter monitoring
- Color-independent measurement of concentrations
- Compact design with integrated amplifier and display
- The durable sapphire windows are suitable for CIP/SIP.
- Hygienic design, no seals, no gaps.
- LED illumination guarantees stable and persistent signal.
- Integrated contact and analog output.
- Easy parameterization

EXspect 240
Similar to the EXspect 230, the NIR sensor EXspect 240 is a sensor for examination of the optical density of liquids, however, it is designed for application in manual or automatic retractable holders of the Extract family. Due to the use of retractable holders, the sensor can be flushed or removed during a running process. This effectively prevents distortion of the results due to deposits at the measuring windows and allows for long-term monitoring of processes.

- Automatic cleaning
- 100% automated
- Precise phase separation
- Fast product change
- Reduced waste water costs
- Filter monitoring
- Color-independent measurement of concentrations
- Compact design with integrated amplifier and display
- The durable sapphire windows are suitable for CIP/SIP.
- Hygienic design, no seals, no gaps.
- LED illumination guarantees stable and persistent signal.
- Integrated contact and analog output.
- Easy parameterization

Display
The display shows the currently measured value. The function buttons are provided for configuration of the sensor. The display can be removed which effectively prevents unauthorized or accidental change of settings.

Adjustment input
By short-term application of a 24V DC signal at the adjustment input the current measured values is reset to 0%. By this means the transmitter can be adjusted (reset to zero) to specified measuring media. The same can be achieved via the menu function "reset to zero".

1.2 Functions

Reset to zero
Resets the current measured value to 0%.

It has the same function as the adjustment input via the external contact.

Display switch-over
Determines which measured value is to be displayed:
- Turbidity
- Temperature
- Alternating between turbidity and temperature

Independent of display switch-over the analog output always provides a signal on the basis of turbidity.

Beginning of measuring range	Determines the 4mA point for the output current. The range can be freely selected between -100% … 0 …100%.
End of measuring range	Determines the 20mA point for the output current. The range can be freely selected between -100% … 0 …100%.
Damping	Dampens the measured turbidity value in a range from 0 to 200 seconds both for the output current and for display indication.
Range of zero	Determines a range of display digits around the zero point in which the measured value is reset to 0%.
Switch-off point	Determines the switch-off point of the contact switch. The range can be freely selected between -100% … 0 …100%.
Switch-on point	Determines the switch-on point of the contact switch. The range can be freely selected between -100% … 0 …100%.
Switching function	Determines the switching function of the contact switch. The operator can select between normally-closed and normally-open switch.
Switching delay	Determines the switching delay of the contact switch. The range can be freely selected between 0 and 200 seconds.
Analog output lower limit	Determines the minimum output current. The range can be freely selected between 3.5mA and 22.5mA.
Analog output upper limit	Determines the maximum output current. The range can be freely selected between 3.5mA and 22.5mA.
Malfunction current	If the transmitter detects an internal malfunction an error code is shown in the display and the malfunction current determined here is output. The malfunction current can be freely selected between 3.5mA and 22.5mA.
Automatic keylock	After a specific operating time the keys are automatically locked in order to prevent unauthorized operation. The time-out for the keylock can be freely selected between 0 and 100 minutes. If 0 is set, the keylock function is disabled.
Reset	With the reset function set to 1 all parameters will be reset to factory settings.

1.3 Process integration

Sensor

By means of its ½" process connection the EXSPECT 230 sensor is directly installed in pipes or containers or plugged into present process connections using the corresponding adapters. The EXspect 240 rod sensor is installed into a retractable holder which is connected to process lines or containers.

Transmitter

The transmitter is supplied with 24V DC, it has a freely parameterizable switching contact and a 4 to 20mA output for measured value output. Via a 24V input the measured value can be reset to 0%.

Process integration

Pressure
Temperature

The EXspect sensor may be applied in processes with a pressure of up to 10bar and a maximum process temperature of 140°C.

!!! Please not the pressure and temperature diagrams in chapter 8!

Installation position

In general, the sensors can be operated in any position. However, readability of the display and easy access an operation of the unit should be considered.

2 Parameterization

2.1 User menu

ATTENTION! ⚠️	Wrong setting of parameters may result in output of incorrect measuring values and switching points. This may lead to unwanted process influence.

☑	Please ensure that only authorized and trained personnel carry out changes of parameters.

The sensor is parameterized via the function buttons at the display.

By pressing the Enter button the user enters the menu. By pressing the arrow buttons the user calls up the individual parameters.

If a parameter is to be configured, the Enter button is pressed again and the desired setting is then selected by means of the arrow buttons. Confirmation of the correct setting is made by pressing the Enter button again.

At the end of the parameters the user can change to the main display by confirming ESC (escape) by pressing the Enter button.

User menu

The **bold** and **underlined** values are the **standard user parameters**. With the "RST" function all user parameters are reset to standard.

Para-meter	Designation	Value range	Description
ESc	Menu beginning/end	n/a	Entry to and exit from the menu
-o-	Adjustment/ reset to zero	n/a	Resets the measured value to zero. Same function as the adjustment input.
dsp	Display switch-over	turB, temp, ALT	Determines which measured value is to be displayed: turB: Turbidity temp: Temperature

Para-meter	Designation	Value range	Description
			Alt: Alternating between turbidity and temperature Independent of display switch-over the analog output always provides a signal on the basis of turbidity.
MRB	Measuring beginning	-100.0 … **0** … 100.0	Determines the 4mA point.
MRE	Measuring end	-100.0 … 0 … **100.0**	Determines the 20mA point.
dAM	Damping	**0.0** … 200.0	Damping of the measured turbidity value
r-o-	Range of zero	**0** … 100	Determines a range of display digits around the zero point in which the measured value is reset to zero.
Don	Digital output on	-100.0 … **0.0** …100.0	Determines the swtich-on point.
doff	Digital output off	-100.0… 0.0 …**100.0**	Determines the swtich-off point.
dtyp	Digital output type	**0**, 1	0 = NO contact 1 = NC contact
ddly	Digital output delay	**0.0** … 200.0s	Delays the switching point by up to 200sec.
Aoll	Analog output lower limit	**3.5** … 22.5mA	Determines the minimum output current.
Aoul	Analog output upper limit	3.5 … **22.5**mA	Determines the maximum output current.
Mout	Malfunction output	3.5 … **22.5**mA	If the transmitter detects an internal malfunction an error code is shown in the display and the malfunction current determined here is output.
Aulo	Automatic keylock	**0** … 100min.	After a specific operating time the keys are automatically locked in order to prevent unauthorized operation. Setting the Aulo to 0 disables the keylock function.
rst	Reset	0, 1	Reset to standard parameters
esc	Menu beginning/end	n/a	Entry to and exit from the menu

2.2 Adjusting the sensor to medium (reset to zero)

For detection of repeating product conditions, the sensor may be adjusted for such product conditions.

Submerge the tip of the sensor into the reference liquid and select menu function "-0-" to set the measuring value to 0%. Alternatively you can apply a 24V DC switching signal to the adjustment input. The transmitter will reset the current measured value to zero.

In clear water the absorption value can be set to zero by means of the adjustment function.

2.3 Output current

The EXspect sensor is equipped with a 4 - 20mA output for signaling the measured absorption values. The output current is configured by means of the following parameters:

MRB determines the beginning of the measuring range and consequently the 4mA point.

MRE determines the end of the measuring range and consequently the 20mA point.

dAM determines the damping factor that has an effect on the display and the output current.

$Aoll$ determines the minimum output current.

$Aoul$ determines the maximum output current.

$Mout$ determines the malfunction current that is applied to the output current in case of an internal malfunction.

2.4 Switching points

**The EXspect sensor is equipped with a PNP switching output that can be configured by means of four parameters.**

D*on* determines the switch-on point and *doff* the switch-off point.

Together, the two parameters determine the function of the switching output:

If *don* is lower than *doff*, the output is switched on when the measured value is in the range between the switching points (window function).
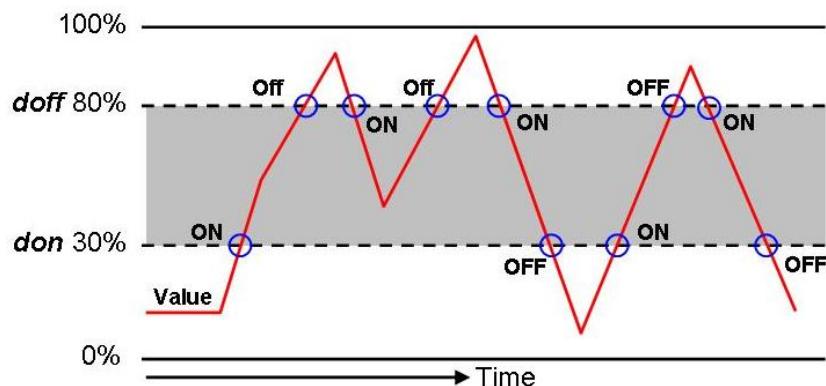
If *don* is higher than *doff*, the output is switched on when the measured value exceeds *don*. And it only switches off again when the measured value undershoots *doff* (hysteresis function).
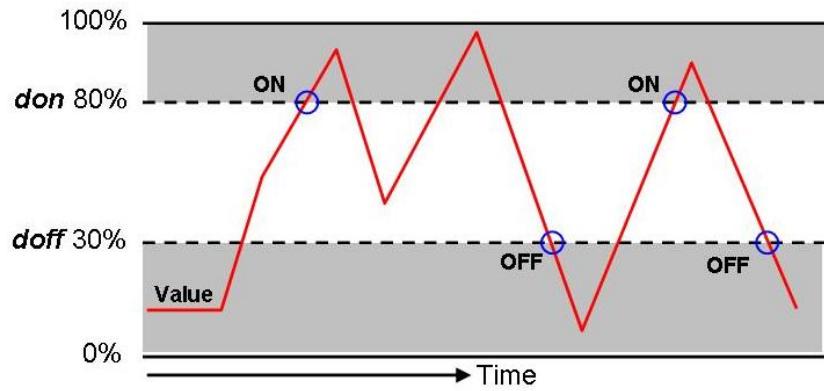
If don and $doff$ are equal, the output is switched on when the measured value exceeds the switching value $don + doff$ and it is switched off when the measured value undershoots the switching value $don + doff$.
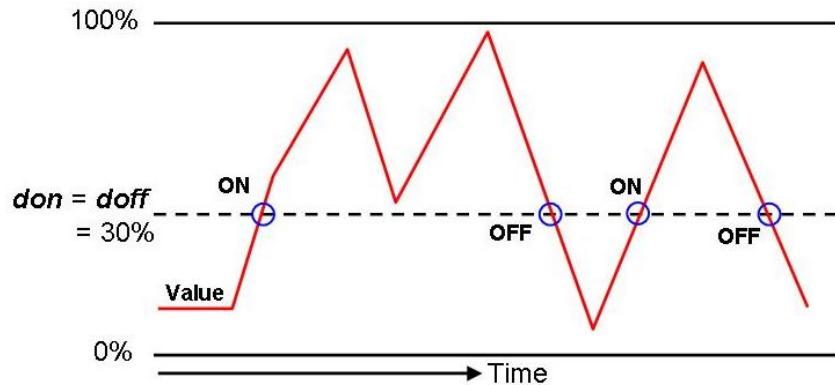
Both parameters can be set in a range from -100.0 to + 100.0% independently of each other.

$dtyp$ inverts the function of the switching output.
If the value is 0, the switching output operates as normally-open (NO) contact, if the value is 1 the switching output operates as normally-closed (NC) contact.

$ddly$ delays the switching output by up to 200sec. This value is equal for both switch-on and switch-off.

2.5 Display

The EXspect sensor is equipped with a removable display. The sensor can only be parameterized via the display.

However, it can operate without the display connected, if and as previously parameterized.

Dsp determines the display value. In the display the values for either turbidity in % or temperature in °C or both values alternatingly can be displayed.

2.6 Automatic keylock

The user has the possibility to lock the keypad against unauthorized access.

$Aulo$ activates the keylock. Please note, the set value must be higher than zero. The value set corresponds to the time-out in minutes after which the keypad is locked after the keypad was last actuated. Pressing any button has the time-out counter start again. If the set value is zero, automatic keylock is disabled.

The locked keypad can be unlocked by de-energizing it for a short time. For that, disconnect the plug and put it back on.

2.7 Reset

It is possible for the user to reset all user parameters to factory settings.

rst resets all parameters to factory settings by changing the set value to 1 and confirming this by pressing the Enter button.

3 Technical Specifications

3.1 Standards

EN 61326-1: 10-2006
EN 61326-2-3: 5-2007
DIN/EN 27027 (ISO 7027)

3.2 Specification

Sensor specifications	
Measuring range	0…100%
Wave length	880 nm
Light source	LED
Optical path length	5, 10 or 20mm
Material	Stainless steel 1.4435 (316L)
Surface finish	Electropolished < Ra 0.37µm
Measuring window	Sapphire
Supply voltage	24VDC
Output current	4…20mA
Switching output	NO or NC configuration, 150mA max.
Input contact	+24V DC for adjustment (reset to zero)
Cable connection	M12 plug 5-pole
Cable length	Either 3m or 5m
Process connection	G ½" for weld-in nozzle with 15° cone

3.3 Dimensions

OPL 5   **OPL 10**   **OPL 20**

ø68

142

59

45

22

OPL5

ø12

ø18

147

64

50

27

OPL 10

157

74

60

37

OPL 20

258 / 363 / 463 depending on sensor length

ø68

ø12

optical path length

sensor length

Thread PG13,5
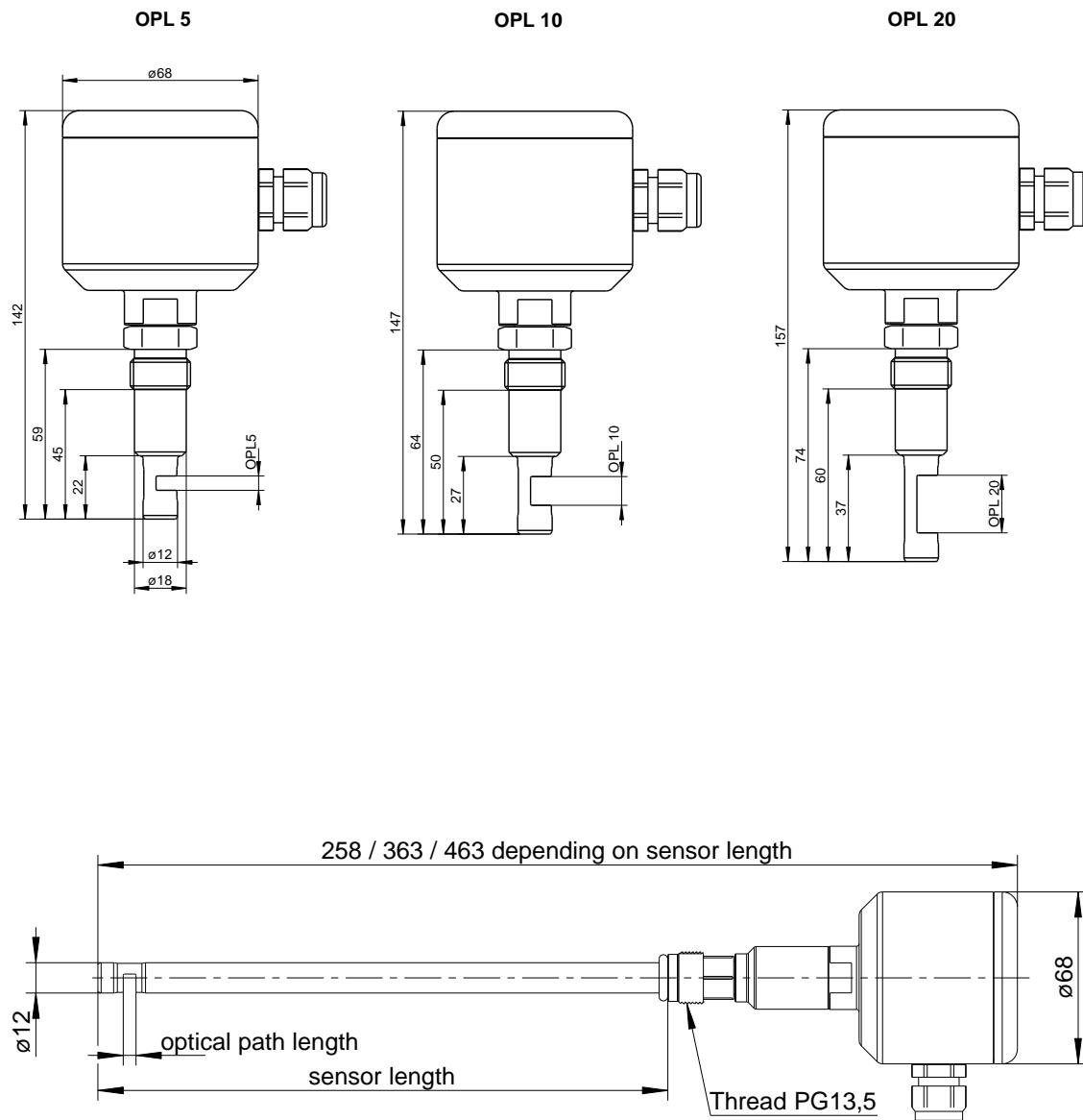
Sensor length 120mm, 225mm or 325mm

3.4 Ambient conditions

Ambient temperature	**- 10 - 70 °C**
Transport and storage temperature	**- 20 - 80 °C**

3.5 Process conditions EXSPECT

Max. permissible pressure PS: 10 bar

Max. permissible temperature TS: 90 °C

Max. permissible sterilization temp.   141°C   max. 2 hrs

Pressure - Temperature - Diagram
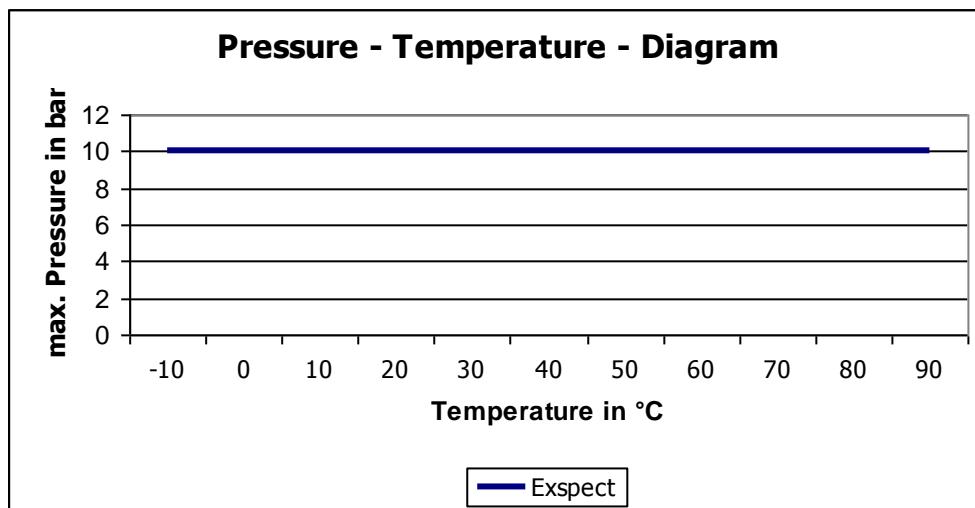
Pressure - temperature diagram EXSPECT

3.6 Orderstructure for EXSPECT 230

Sensor EXSPECT 230

Des.	Material
4435	Stainless steel 1.4435 / 316L
XXXX	Special design

Des.	Optical path length
05	5 mm
10	10 mm
20	20 mm
XXX	Special design

Des.	Process connection
G12	Thread G ½" for weld-in nozzle
XXX	Special design

Des.	Electrical connection
M12	M12 plug 5-pole
XXX	Special design

Des.	Display
1	With integrated display
0	Without display
X	Special design

EXSPECT 230	-	-	-	-	-	Order number

3.7 Orderstructure for EXSPECT 240

Sensor EXspect 240

Des.	Material
4435	Stainless steel 1.4435 / 316L
XXXX	Special design

Des.	Sensor length
120	120 mm
225	225 mm
325	325 mm
XXX	Special design

Des.	Optical path length
05	5 mm
10	10 mm
20	20 mm
XX	Special design

Des.	Process connection
PG1	Thread PG 13.5
XXX	Special design

Des.	Electrical connection
M12	M12 plug 5-pole
XXX	Special design

Des.	Display
1	With integrated display
0	Without display
X	Special design

EXSPECT 240	-	-	-	-	-	Order number

4 Spare parts and Accessories

Accessories for EXspect 230 / 240	
Description	Order number
Connection cable 2m	2-125-00-001
Connection cable 5m	2-125-00-002
Connection cable 10m	2-125-00-003
Operating display	2-116-00-003

Accessories for rod sensor EXspect 240	
Description	Order number
Manual retractable holder EXtract8XX-M	Upon request
Pneumatic retractable holder EXtract8XX	Upon request
Cleaning control EXmatic460	Upon request

Certificates for EXspect 230 / 240	
Description	Order number
Certificate EN10204-2.2 for surface finish (Ra<0.38µm)	2-121-01-001
Certificate EN10204-3.1 for material	2-121-01-002

Installation adapter EXspect 230		
Description	**Drawing**	**Order number**
Cylindrical weld-in nozzle G ½"	ø30 G1/2" 34	2-087-33-003
Round weld-in nozzle G ½"	ø30 G1/2" 34 ø35	2-083-33-004
Process adapter Varivent F DN25-40	G1/2" 34 66	2-083-33-001
Brass weld-in aid G1/2"	SW15 47 G1/2"	2-086-11-001
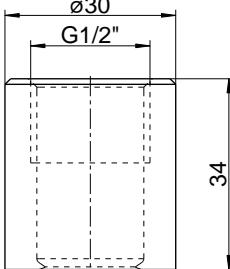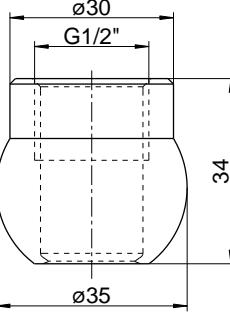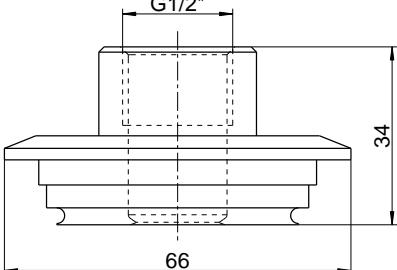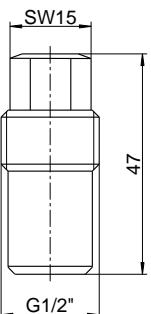
Exner Process Equipment GmbH
Industriestraße 6a
D-76275 Ettlingen

Fon.: +49 (0)7243 9454290
Fax.: +49 (0)7243 94542999
www.e-p-e.com