

EXNER PROCESS EQUIPMENT



EXCELL 231/ 241

NIR Sensor
Technical Information

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1 Product Description

1.1 NIR sensor EXcell

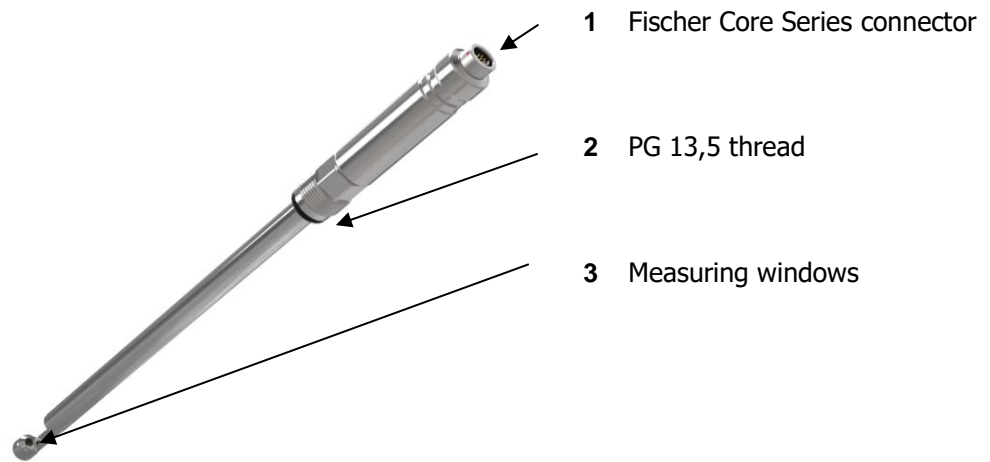


Fig. 1: NIR Sensor EXcell 231

EXcell 231 EXcell 231 is a high precision digital NIR-absorbance sensor in 12mm-hygienic design monitoring biomass measurement in biotech, food and pharma applications for both laboratories and industrial production processes. It's design made of stainless steel, it's wearless sapphire windows, it's LED technology and the integrated digital amplifier makes them a reliable, robust, cost efficient and unique measuring device.

Different measuring units for absorbance, turbidity and mass like AU / OD / FAU / EBC or mg/l can be displayed or even a customer defined measuring unit can be chosen.

The parametrizing software EXpert 2.x allows a comfortable and easy sensor parametrization. Also measuring values can be displayed graphically and can be stored and exported. There are different communication interfaces for USB, RS485 Modbus or for 0...20 mA current output available.

The sensor can be mounted like a standard pH-sensor by it's PG13,5 thread connection. It allows to operate particularly on industrial production applications in combination with Extract retractable holders and EXmatic cleaning system.

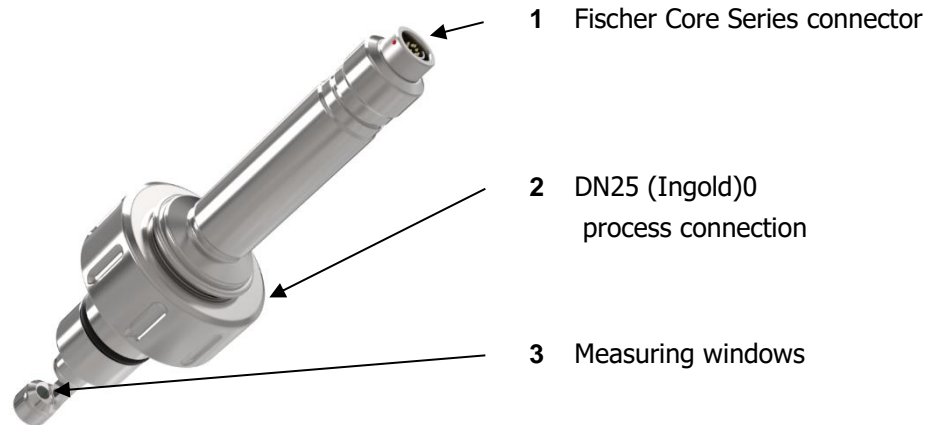


Fig. 2: Sensor EXcell 241

EXcell 241 EXcell 241 is a high precision digital NIR-absorbance sensor for DN25-weld in sockets monitoring biomass measurement in biotech, food and pharma applications for both laboratories and industrial production processes. It's design made of stainless steel, it's wearless sapphire windows, it's LED technology and the integrated digital amplifier makes them a reliable, robust, cost efficient and unique measuring device.

Different measuring units for absorbance, turbidity and mass like AU / OD / FAU / EBC or mg/l can be displayed or even a customer defined measuring unit can be chosen.

The parametrizing software EXpert 2.x allows a comfortable and easy sensor parametrization. Also measuring values can be displayed graphically and can be stored and exported. There are different communication interfaces for USB, RS485 Modbus or for 0...20mA current output available.

The sensor can be mounted into a DN25 welding socket which is available on many industrial fermenters. For best hygienic installation the appropriate O-ring-position can be chosen.

In case of strong vibrations in the system, the additional use of the safety bracket is recommended (see accessories).

1.2 NIR sensor EXcell

Reference filters (EXcap 110) with various absorption values are available for inspecting and calibrating the sensors EXcell 231 and EXcell 241. These can be attached to the sensor as and when required. To guarantee the inspection/calibration is carried out without any errors, you should make sure that the reference filter is touching right up against the sensor, and that the filter plate is on the same side of the sensor as the detector.



Fig. 3: Reference filter

In order to be able to carry out an inspection or calibration of the sensor by means of the reference filter, the unit "AU" must first be selected for the sensor.

2 Parameterization and Installation

2.1 Parameterize sensor with EXpert software

The EXcell sensor is parameterized via the EXpert 2.x software. To do this, you must install the Expert 2.x software first on a Microsoft Windows PC with Windows 7 or higher and after that connect the sensor with the ECI 01 communication interface to the USB interface of the PC.



Always install the EXpert software first before connecting the sensor to the PC via the USB interface



Make sure, that you ...

- First installed the EXpert 2.x software on the PC and only after successful installation connect the sensor to the computer via the USB interface.
- Are using the latest Software EXpert 2.x and the corresponding firmware has been installed on the sensor
- Follow the operating instructions of the EXpert 2.x software

2.2 Electrical connection ECI-01



At first, please ensure the following:

- For electrical connection, the original cables with the correct connectors must be used.

The ECI-01 Exner Communication Interface transfers the measured values of the optical EXcell sensors to a standardised USB 2.0 interface and supplies the required voltage to the sensor.



ECI-01 and the EXpert software are required to parameterise the sensor.

Housing:	Stainless steel
Voltage supply:	5 V DC via USB interface
Connection:	Fischer Core Series / USB connector

2.3 Mechanical connection

DANGER!



Injury hazard due to leaking/escaping process liquid!

Burning or cauterization - depending on the properties of the process liquid.

Check that the container or the pipe to which the sensor is connected is pressure-free, empty and clean.



Please ensure the following:

- There must be sufficient working space available for operation of the sensor.
- The process must be switched off.
- Containers and/or pipes must be pressure-free, empty and clean.
- The connection gland from the system and the process connection of the sensor must match.
- Insert the sensor into the matching process nozzle.
- Tighten the pressure screw (1) applying max. 10-20 Nm.

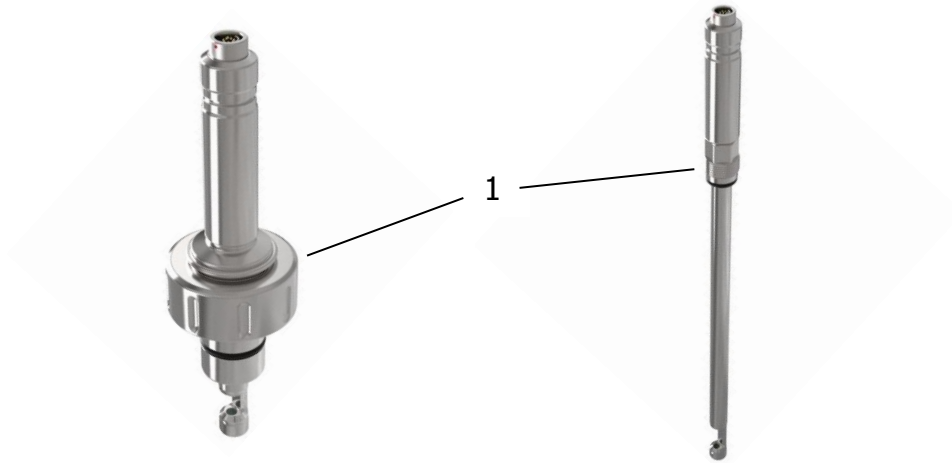


Fig. 4: Union nut / pressure screw at the sensor

2.4 Electrical connection ECI-02

The ECI-02 Exner Communication Interface transfers the measured values of the optical EXcell sensors to a standardised RS485 Modbus interface and supplies the required voltage to the sensor.

Housing: 23 mm mounting rail housing

Voltage

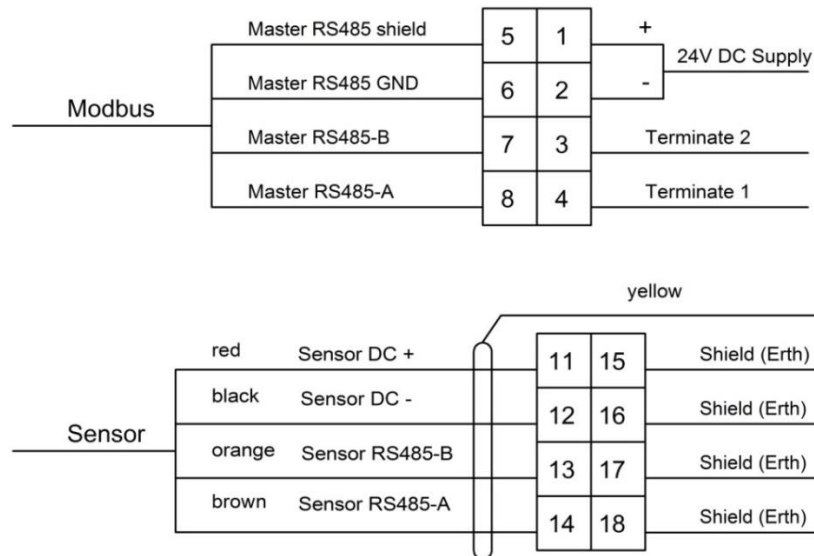
supply: 24 V DC, 12...36 V

Output: Modbus RS485

Input: EXcell sensor



ECI-02 terminal diagram



To terminate RS485 lines, place jumper between "Terminate 1" and "Terminate 2".

2.5 Electrical connection ECI-03

The ECI-03 Exner Communication Interface transfers the measured values of the optical EXcell sensors to a standardised 0/4...20 mA interface and supplies the required voltage to the sensor.



In addition, a limit value contact and an alarm contact can be used. The graphical colour display with touch function displays current measured values and parameterizations.

Housing: Panel mounting 48x96 mm

Voltage supply: 24 V DC 12...36 V

Output: 0/4...20 mA max. 24 mA

Limit contact 24V, 100 mA PNP

Alarm contact 24V, 100 mA PNP

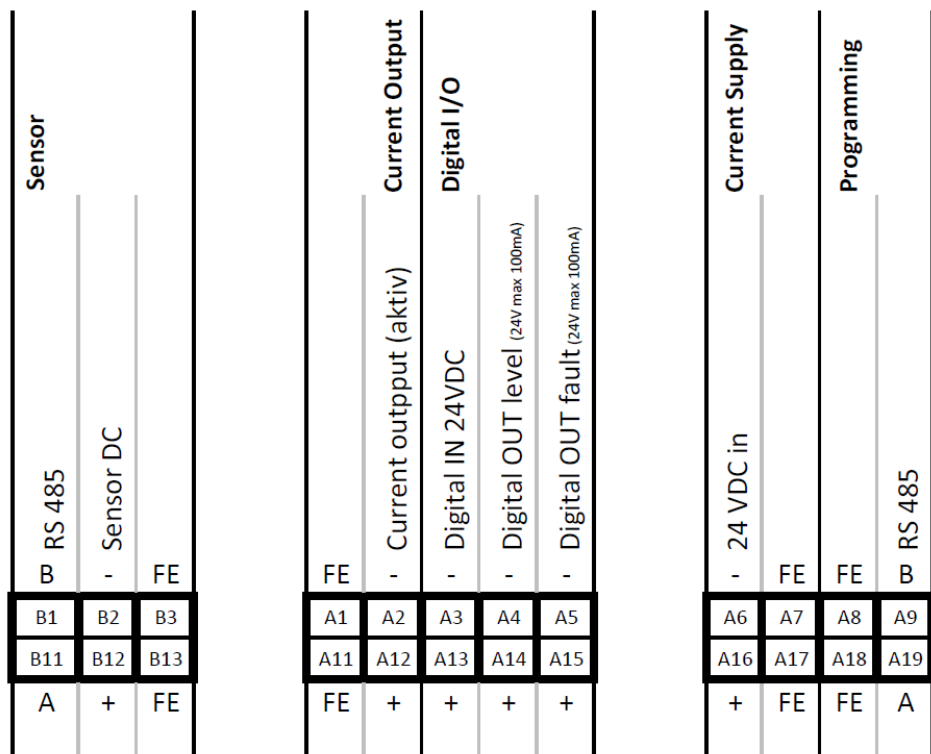
Input: EXcell sensor terminals

Display: Graphics 25x29 mm

touch function

colour

ECI-03 terminal diagram



Parameterization

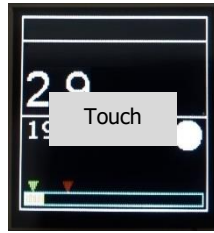
ATTENTION!



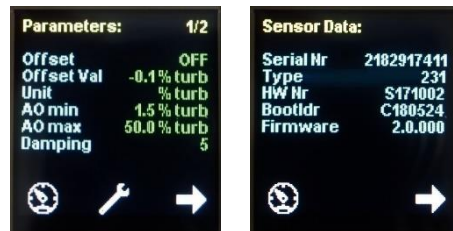
Incorrectly set parameters can lead to incorrect measuring values and switching points. This can affect the process.



Make sure that parameters are only changed by authorised and qualified personnel.



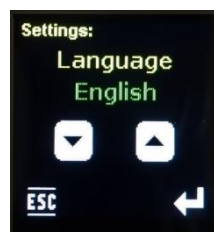
Touch the display to open the menu.



Touch the arrow symbol to access individual parameters or sensor and display data. To configure a parameter, touch the tool symbol.



Afterwards, select the respective setting with the arrows and confirm the selection with the Enter symbol.



The desired value is also selected with the arrows. To set a numeric value, it can be increased/decreased by single digits by briefly pressing the respective arrow. Keep an arrow pressed, to change the numeric value in steps of 10.

Press enter to confirm the entered value and leave the setting mode. Press ESC if no value is to be changed and to leave the setting mode.



To return to the display, press the dial symbol or wait for 30 seconds without making any input or touching the display.

User menu

Standard user parameters are indicated in **bold** and underlined.

Parameter	Designation	Value range	Description
Offset	Enabling offset	<u>OFF</u> , ON	Enables/disables the offset setting
Offset Val	Offset	-6.0 ... <u>0.0</u> (for unit AU)	Sets the offset value. A reliable offset value can only be set if the current measured value does not change or only minimally changes over a period of approx. 5 seconds.
Unit	Display toggling	<u>AU</u> , EBC, FAU, mg/l, CDU	Sets the measuring value to be displayed: CDU : Customer-defined unit The CDU value is to be defined via the EXpert software.
AO min	Minimum output limit (Analog Output min)	<u>0.0</u> ... 6.0 (for unit AU)	Sets the turbidity value for minimum output.
AO max	Maximum output limit (Analog Output max)	<u>0.0</u> ... 6.0 (for unit AU)	Sets the turbidity value for maximum output.

Parameter	Designation	Value range	Description
Damping	Damping	0 ... 100	Applies damping to the turbidity measuring value by returning a moving average over the set number of measuring values.
DO On	Switch-on point (Digital Output on)	0.0 ... 6.0 (for unit AU)	Sets the switch-on point.
DO off	Switch-off point (Digital Output off)	0.0 ... 6.0 (for unit AU)	Sets the switch-off point.
DO funct	Switching function Digital Output typ	NO , NC	NO = Normally open contact NC = Normally closed contact
DO Delay	Switching delay Digital Output delay	0 ... 200 s	Delays the switching point by up to 200 seconds
Language	Language settings	Deutsch , English, Français, Nederlands	Sets the display language.

2.6 Electrical connection Lucullus

For the NIR absorption sensors EXcell 231 and EXcell 241 a suitable adapter cable is available especially for connection to a Lucullus system. This optionally can be ordered as an accessory.



Fig. 5: Connection cable EXcell 231/241 for Lucullus system

3 Technical Specifications

3.1 Standards

EN 61326-1: 2013-7
EN 61326-2-3: 2013-7
DIN/EN 27027 (ISO 7027)

3.2 Specification

Sensor specifications	
Measuring range	0...6 AU; 0...6600 EBC; 0...12 OD
Resolution	0,01 AU
Accuracy	± 1 %
Reproducibility	≤ 1 % from final value
Wave length	850 nm
Light source	LED
Optical path length	5, 10 oder 20 mm
Material	Stainless steel 1.4435 (316L)
Surface finish	Electropolished < Ra 0,37 µm
Measuring window	Sapphire
Process connection	Thread PG 13,5 ; DN25 connection (G 1 ¼")
Process temperature	0...90 °C, autoklavable
Process pressure	Max. 10 bar (150 psi)
Electrical connection	Fischer Core Series
Cable length	2 m / 5 m
Interfaces	USB, RS485 Modbus, 0...20 mA with switching output (ECI-03)

Max. measuring range:

Unit	Optical path length		
	5 mm	10 mm	20 mm
AU	0...6	0...6	0...6
OD	0...12	0...6	0...3
EBC	0...6600	0...3300	0...1650

3.3 Dimensions

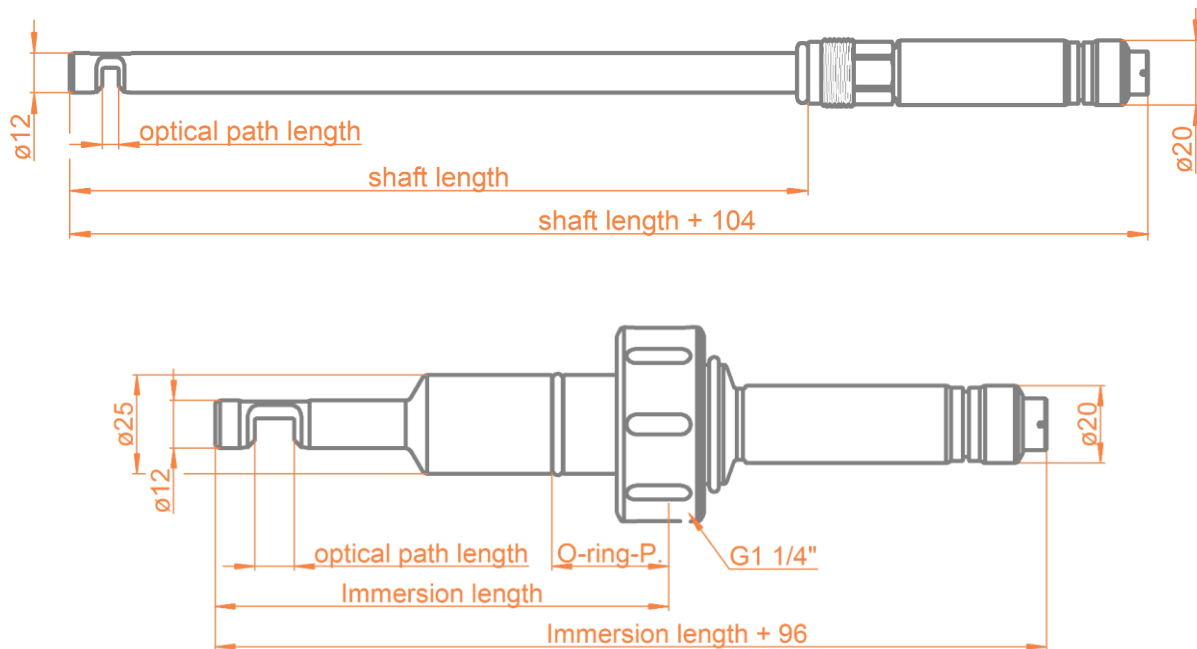


Abb. 6: Dimensions EXcell 231/241

3.4 Ambient conditions

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

3.5 Process conditions EXcell

Max. permissible pressure PS: 10 bar

Max. permissible temperature TS: 90 °C

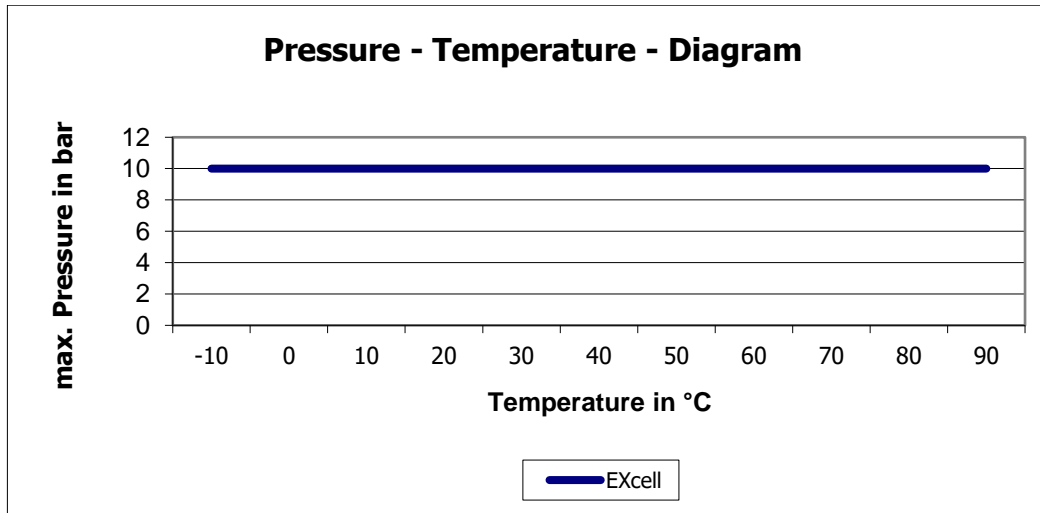


Abb. 7: Pressure - temperature diagram EXcell

3.6 Order structure EXcell 231

Sensor EXcell 231													
Code	Measuring range												
C	0...6 AU / 0...6600 EBC / 0...12 OD												
X	Special design												
	<table border="1"> <thead> <tr> <th>Code</th> <th>Shaft length</th> </tr> </thead> <tbody> <tr> <td>120</td> <td>120 mm</td> </tr> <tr> <td>225</td> <td>225 mm</td> </tr> <tr> <td>325</td> <td>325 mm</td> </tr> <tr> <td>425</td> <td>425 mm</td> </tr> <tr> <td>XXX</td> <td>Special design</td> </tr> </tbody> </table>	Code	Shaft length	120	120 mm	225	225 mm	325	325 mm	425	425 mm	XXX	Special design
Code	Shaft length												
120	120 mm												
225	225 mm												
325	325 mm												
425	425 mm												
XXX	Special design												
	<table border="1"> <thead> <tr> <th>Code</th> <th>Optical path length</th> </tr> </thead> <tbody> <tr> <td>05</td> <td>5 mm</td> </tr> <tr> <td>10</td> <td>10 mm</td> </tr> <tr> <td>20</td> <td>20 mm</td> </tr> <tr> <td>XX</td> <td>Special design</td> </tr> </tbody> </table>	Code	Optical path length	05	5 mm	10	10 mm	20	20 mm	XX	Special design		
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Code	Process connection												
PG1	Thread PG 13,5												
XXX	Special design												
EXcell 231	Order code												

3.7 Bestellstruktur EXcell 241

Sensor EXcell 241	
Code	Measuring range
C	0...6 AU / 0...6600 EBC / 0...12 OD
X	Special design
Code	Immersion length
070	65 mm + optical path length
110	105 mm + optical path length
XXX	Special design
Code	Optical path length
05	5 mm
10	10 mm
20	20 mm
XX	Special design
Code	O-ring position
25	25 mm
28	28 mm
29	29 mm
30	30 mm (for standard weld-in socket)
35	35 mm
50	50 mm
55	55 mm
XX	Special design
Code	Dichtungswerkstoff
EPD	EPDM / FDA / USP VI
XXX	Special design
EXcell 241	Order code

4 Spare parts and Accessories

Spare parts EXcell 231 / 241	
Description	Order code
PC-Software EXpert 2.x on USB-stick (for Windows)	2-120-69-003
Communication interface ECI-01 for USB-connection	2-120-69-004
Communication interface ECI-02 Modbus RS485	2-120-58-003
Communication interface ECI-03 0...20mA with display	2-120-69-005
Connection cable EXcell 231/241 2m (for ECI-02/03)	2-120-69-001
Connection cable EXcell 231/241 5m (for ECI-02/03)	2-120-69-002
Connection cable EXcell 231/241 2m (for Lucullus)	2-120-69-006
Connection cable EXcell231/241 5m (for Lucullus)	2-120-69-007

Spare parts for EXcell 231	
Description	Order code
Covering cap for calibration filter > 4 AU	2-120-58-008

Spare parts for EXcell 241	
Description	Order code
Safety weld-in socket DN25 straight, 40mm, 1.4404 / 316L	2-087-33-001
Safety weld-in socket DN25 inclined, 40mm, 1.4404 / 316L	2-087-33-002
Safety bracket SK25 for welding socket DN25 (Ingold)	2-140-33-002

Certificates EXcell 231 / 241	
Description	Order code
Certificate EN10204-2.2 for surface-finishing (Ra<0,38 µm)	2-121-01-001
Certificate EN10204-3.1 for material	2-121-01-002
Certificate for elastomer-compound EPDM-FDA / USP VI DIN EN 10204-2.2	2-121-01-003

Factory inspection	
Description	Order code
Factory recalibration for NIR-sensors incl. certificate	2-999-00-013

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