



Polaris™ PR53ACEX Sanitary Compact Process Refractometer



Features

- Reliable optical concentration measurements with refractive index
- Options for Ex Zone 0 or Zone 2
- Compliant with ATEX and IECEx
- Brix, Total Solids, Oechsle, Baume, Plato, and more than 500 concentration curves
- 3-A and EHEDG certified
- 3-A and Type N sanitary couplings
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various flow cells available
- Vaisala Indigo520 compatible
- Built-in 4–20 mA, HART, and Modbus® RTU outputs

Vaisala Polaris PR53ACEX sanitary compact process refractometer for potentially explosive environments is designed for measuring liquid concentrations, such as Brix, inline. Applications include life science, food, beverage, dairy and brewery industry customers, and OEMs. 3-A and EHEDG certifications ensure that all hygienic demands and safety requirements are met. Easy to install directly in pipelines with a sanitary clamp and optional flow cells.

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid and it responds to dissolved material. Bubbles, particles, or fibers in the process do not affect measurement. The outstanding long-term stability provides years of accurate, continuous, fast, and stable measurement in potentially explosive environments directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

Safe for sanitary applications

The product is compatible with both clean-in-place (CIP) and sterilization-in-place (SIP) systems. The material offering, including stainless-steel wetted parts, PTFE, and sapphire, are all suitable for direct contact with the process with convenient installations directly to process lines with standard sanitary and Type N couplings, or with a sanitary flow cell. Stainless steel is easy to maintain and keep clean, and traceability ensures safety.

Safe in potentially explosive environments

The PR53EX series refractometers can be installed directly into hazardous areas. They are safe to use and can withstand continuous exposure to potentially explosive environments that contain flammable gas, vapor, or mist. Operation in these environments requires no additional protective enclosures. A

robust design, combined with trouble-free operation, ensures a long-term solution for concentration measurement in potentially explosive environments. The PR53EX series refractometers have two Ex certified options for Zone 2 and Zone 0. For Zone 0 environments, a galvanic isolator is installed between the potentially explosive area and the refractometer to ensure safe operation.

Wash system

Most applications do not need wash systems due to the self-cleaning effect: the shear force of the process flow keeps the measurement point clean. For the most demanding applications, the powerful refractometer wash system ensures correct measurement when process conditions are sticky.

Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. The transmitter provides access to features such as data storage, graphical interface, and analog and digital interface. Indigo520 is required when the application or the installation position requires washing to control the process. Changing settings, measurement parameters, or other servicing updates can be done directly from Indigo520, or through a USB cable using Vaisala software.

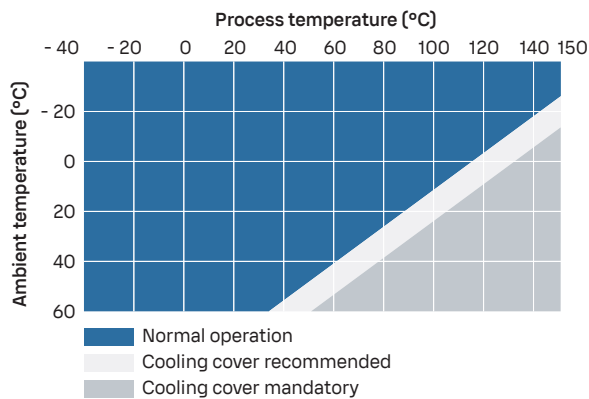
The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

Technical data

Measurement performance

Refractive index	
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) ¹⁾
Repeatability	±0.000017 nD ²⁾
Resolution	±0.000001 nD
Response time T ₆₃ with default damping	10 s ³⁾
Measurement cycle	1 / s
Long-term stability	Max. 0.1 % full scale / a
Temperature	
Accuracy at 20 °C (68 °F)	±0.3 °C (0.54 °F) ¹⁾
Sensor class	F0.15 IEC 60751
Temperature coefficient	±0.002 °C / °C

- 1) Accuracy specified with respect to calibration reference, including non-linearity, hysteresis at +20 °C.
- 2) Repeatability, confidence level k=2, including random noise, at T_a = +20 °C, with standard low-pass filtering.
- 3) With standard low-pass filtering.

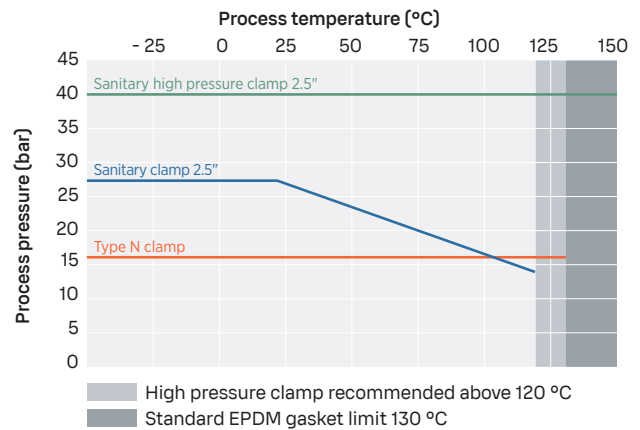


PR53ACEX process temperature

Operating environment

Process parameters	
Process temperature	-40 ... +150 °C (-40 ... +302 °F) ^{1) 2)}
Design temperature	+180 °C (356 °F) ³⁾
Design pressure	40 bar ⁴⁾
Operating environment	
Storage temperature	-40 ... +65 °C (-40 ... +149 °F)
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Maximum operating altitude	2000 m (approx. 6500 ft)
Operating humidity	0–100 %RH
Storage humidity	0–100 %RH, non-condensing
UL 50E rating	Type 4X
IP rating	IP66

- 1) -40 ... +130 °C (-40 ... 266 °F) EPDM gasket, -40 ... +150 °C (-40 ... +302 °F) PTFE gasket.
- 2) The use of cooling cover is mandatory in certain conditions. See PR53EX Safety Guide in docs.vaisala.com.
- 3) Maximum momentary temperature peak.
- 4) Maximum at +20 °C (68 °F), operating pressure to the clamp rating pressure.



PR53ACEX process pressure

Ex classification for Europe and international

Certification	Classification
Europe (ATEX, Zone 0)	EESF 25 ATEX 025X I M1 Ex ia I Ma (pending) II 1G Ex ia IIC T4...150 °C (T3) Ga IP66
Europe (ATEX, Zone 2)	EESF 25 ATEX 013X II 3G Ex ec IIC T4...150 °C (T3) Gc IP66
International (IECEx, Zone 0)	IECEx EESF 25.0019X Ex ia I Ma (pending) Ex ia IIC T4...150 °C (T3) Ga IP66
International (IECEx, Zone 2)	Ex ec IIC T4...150 °C (T3) Gc IP66

Inputs and outputs

Protection class	3, PELV
Supply (Zone 2 only)	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W
Outputs	
Output parameters	RI, temperature, concentration, quality factor
Analog outputs	
mA	'ia' variant: Sinking, isolated, NAMUR NE 43, configurable 'ec' variant: Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	'ia' variant: Max. 800 Ω 'ec' variant: Max. 600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.0002 RI)
Digital outputs	
Digital output	RS-485, non-isolated
Maximum cable run	300 m (approx. 1000 ft) (digital)
Supported protocol	Modbus RTU
Connectors	
External connectors	1 × M12-4M, A-coded ¹⁾ 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT 1/2"

1) For USB2 adapter and Insight software, see [vaisala.com/insight](https://www.vaisala.com/insight).

Intrinsically safe parameters for the 'ia' variant

Parameter	Value
Terminals VIN+ and VIN-	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	Negligible
Ci	1.1 nF
Terminals RS-485+ and RS-485-	
Ui	28 V
Pi	700 mW
Li	Negligible
Ci	1.1 nF
Uo	5 V
Io	39 mA
Po	49 mW
Terminals Analog out + and Analog out -	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	16 nH
Ci	11.6 nF
Service Port connector	
Um	250 V

Compliance

Electromagnetic compatibility (EMC)	EN 61326-1, industrial environment
Safety	IEC/EN/UL 61010-1
Pressure	CRN all territories, ASME BPVC Sec VIII Div. 1 Ed. 2021
Material compliance	FDA 21 CFR 177.150, 177.2600, 177.1550 EC 1935/2004 EC 2023/2006, GMP EU 10/2011
Compliance marks	CE, China RoHS, RCM
Vibration and shock	Tested according to IEC 60068-2

Sanitary compliance

Hygienic design	3-A 46-04 EHEDG
Compliance marks	3-A, EHEDG (for EHEDG compliant installation, use 2.5" / 4" sanitary gasket)
Biocompatibility	USP Class VI <88>, 70 °C
ADI free (Animal Derived Ingredients)	Yes

Calibration accessories

Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

Accessories

Item	Item code
USB adapter for service port, for Insight service software (see vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm ² (AWG 21), PUR jacket, gray, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm ² (AWG 21), PUR jacket, gray, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm ² (AWG 21), PUR jacket, gray, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Instrument cable, 2×2×0.5 mm ² (AWG 21), PUR jacket, light blue, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, FT2	CBL211606-10M
Instrument cable, 2×2×0.5 mm ² (AWG 21), PUR jacket, light blue, open ends, 100 m (330 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, FT2	CBL211606-100M
Cooling cover	ASM215772SP

Mechanical specifications

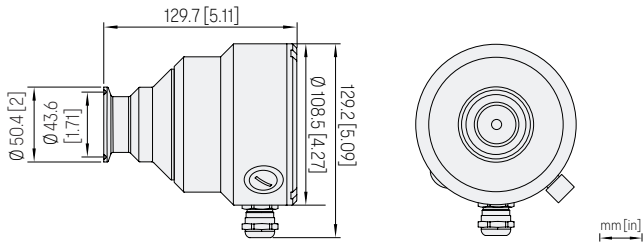
Wetted parts	
Sensor head	EN 1.4435 BN2 (AISI 316L) ¹⁾
Surface roughness	Ra 0.8 µm Ra 0.38 µm electropolished ¹⁾
Prism	Sapphire monocrystalline, 99.996 % Al ₂ O ₃ ²⁾
Prism gasket	Modified PTFE ³⁾
Sanitary 2.5" gasket	EPDM ²⁾
Type N gasket	EPDM ²⁾
Welding ferrule	EN 1.4435 (AISI 316L) ^{1) 4)} ASME BPE-2019 (DIN 32676-C)
Non-wetted parts	
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable gland	EN 1.4305 (AISI 303)
Blanking plug	EN 1.4305 (AISI 303)
Thread adapter	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT 1/2"
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12-4M, A, 4×0.34 mm ² , TPE, 0.5 m (16.4') Carrier, PA 6.6
Sanitary 2.5" clamp	EN 1.4301 (AISI 304) ²⁾
Type N Clamp	EN 1.4301 (AISI 304) ²⁾
Cable (Zone 0)	2×2×0.5 mm ² (AWG 21), PUR jacket, light blue 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, FT2
Cable (Zone 2)	2×2×0.5 mm ² (AWG 21), PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	2.7 kg (5.95 lb)

1) EN 10204 / 3.1 certificate included.

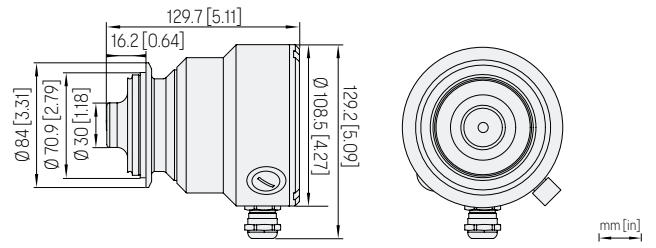
2) Manufacturer's declaration included.

3) ADI free, FDA 21 C.F.R 177.1550, 3A Sanitary Standard, USP Class VI <88>, 70 °C.

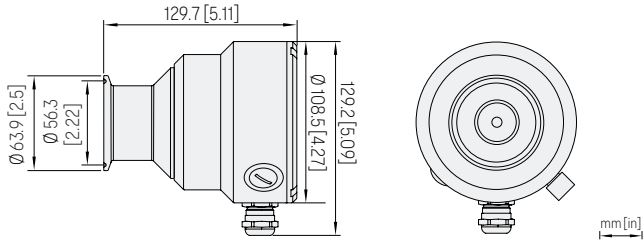
4) 3-A certificate, EHEDG certificate.



Dimensions for PR53ACEX Sanitary 1.5"



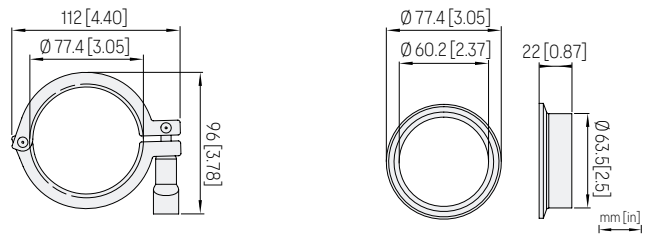
Dimensions for PR53ACEX Type N



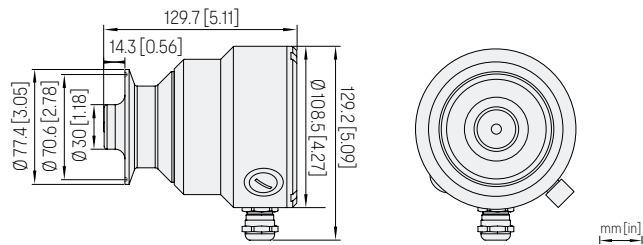
Dimensions for PR53ACEX Sanitary 2"

Type N mounting accessories

Item
Type N clamp 2.5", DN 50/40
Type N blind flange
Gasket 59.5×3 mm, EPDM



Mounting kit for PR53ACEX Sanitary 2.5"



Dimensions for PR53ACEX Sanitary 2.5"

Sanitary 2.5" mounting accessories

Item
Welding ferrule, 2.5"
Sanitary clamp 2.5"
High-pressure clamp 2.5"
Blind flange 2.5"
Sanitary gasket, 2.5", EPDM
Sanitary gasket, 2.5", EHEDG compliant, PTFE/steel, Combifit VOE-2034 (optional)