



VAISALA

Polaris™ PR53AC Sanitary Compact Process Refractometer



Features

- Reliable optical concentration measurements with refractive index
- 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
- Indigo520-compatible
- Built-in 4 ... 20 mA and Modbus RTU outputs

The Vaisala Polaris PR53AC sanitary compact process refractometer is designed to measure liquid concentrations, such as Brix, inline. Applications include 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 for concentration of sugar (Brix) and various other chemical concentrations directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance. The PR53AC continues the success of the Vaisala K-PATENTS® process refractometer series. Based on 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

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.

Brix and beyond

Brix is a common measurement unit in the food, dairy, and beverage processing industries. Measurements can also be shown in total solids, Oechsle, Baume, or Plato. Other measurement units include concentration of sucrose, gelatin, lactulose, and hydrogen peroxide. The refractometer comes pre-configured with the selected concentration curve.

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 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. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter 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 the Indigo520, or through a USB cable using Vaisala software.

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 ± 0.00002 nD ²⁾

Resolution ± 0.000015 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⁾

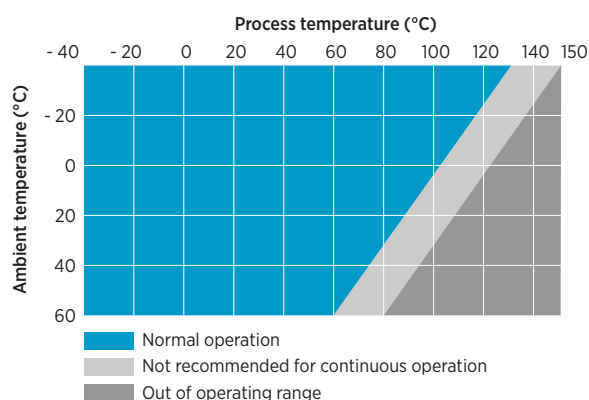
Sensor class F0.15 IEC 60751

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.



PR53AC process temperature, options Sanitary 2.5" and Type N (indicative)

Operating environment

Process parameters

Process temperature -40 ... +150 °C (-40 ... +302 °F) ¹⁾

Design temperature +180 °C (356 °F) ²⁾

Design pressure 40 bar ³⁾

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 (NEMA) rating Type 4X

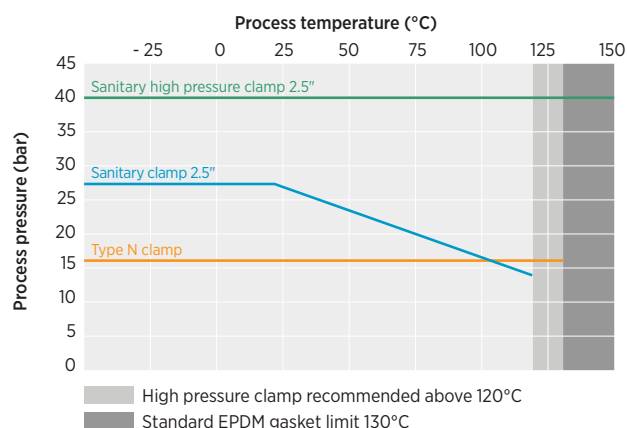
IP rating IP66

IP67

1) -40 ... +130 °C (-40 ... 266 °F) EPDM gasket, -40... +150 °C (-40 ... +302 °F) PTFE gasket.

2) Maximum momentary temperature peak.

3) Maximum at +20 °C, operating pressure to the clamp rating pressure.



PR53AC process pressure

Inputs and outputs

Supply

Operating voltage 24 V DC nominal (9 ... 30 V DC)

Power consumption Less than 1 W

Protection class 3, PELV

Outputs

Output parameters RI, temperature, concentration, quality factor

Analog outputs

mA Sourcing, isolated, NAMUR NE 43, configurable

mA range 3.8 ... 20.5 mA

Loop impedance Max. 600 Ω

Accuracy of analog outputs at +20 °C ± 0.1 % of full scale (± 0.00002 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 \times M12 F 4 pins, A-coded ¹⁾
2 \times M16 \times 1.5 cable gland, Cable D
5 ... 10 mm / Adapter for conduit entry
M16 \times 1.5 / NPT 1/2"

1) For USB2 adapter and Insight software. See www.vaisala.com/insight.

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, UKCA

Sanitary compliance

Hygienic design	3-A 46-04 EHEDG
Compliance marks	3-A, EHEDG ¹⁾
Biocompatibility	USP Class VI <88>, 70 °C
ADI free (Animal Derived Ingredients)	Yes

¹⁾ For EHEDG compliant installation, use 2.5" / 4" sanitary gasket.

Mechanical specifications

Wetted parts

Sensor head	EN 1.4435 BN2 (AISI 316L) ¹⁾
Surface roughness	Ra 0.8 µm
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, dummy plug	EN 1.4305 (AISI 303)
Conduit hub	EN 1.4404 (AISI 316L)
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Carrier, PA 6.6
Sanitary 2.5" clamp	EN 1.4301 (AISI 304) ²⁾
Type N Clamp	EN 1.4301 (AISI 304) ²⁾
Cable	4×22 AWG PUR, 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.

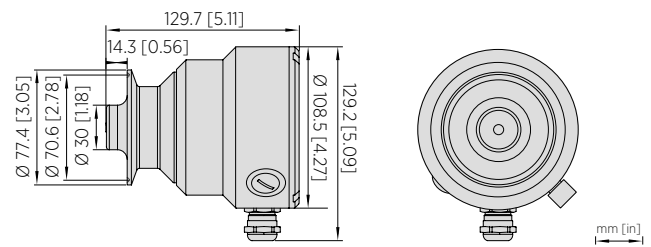
⁴⁾ 3-A certificate, EHEDG certificate.

Calibration accessories

Item
RI liquid kit for RI field calibration, standard 1.33, 1.37, 1.42, 1.47, 1.52
RI liquid kit for RI field calibration, large 1.32, 1.33, 1.35, 1.38, 1.41, 1.44, 1.47, 1.50, 1.52, 1.53
Sample holder and cover

Accessories

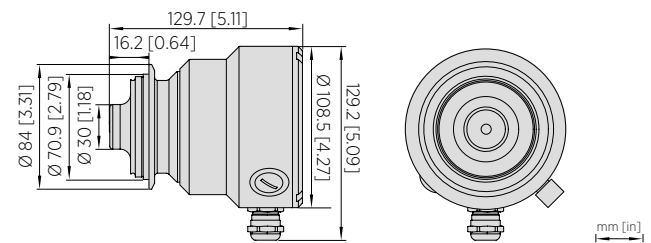
Item	Code
USB adapter for service port, for Insight service software (see www.vaisala.com/insight)	USB2
Fiberglass brush for prism cleaning	
Instrument cable, 4×22 AWG, PUR jacket, black, open ends, 10 m Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	
Instrument cable, 4×22 AWG, PUR jacket, black, open ends, 30 m Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	
Instrument cable, 4×22 AWG, PUR jacket, black, open ends, 50 m Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	
Cooling cover	



Dimensions for PR53AC Sanitary 2.5"

Mounting accessories for PR53AC Sanitary 2.5"

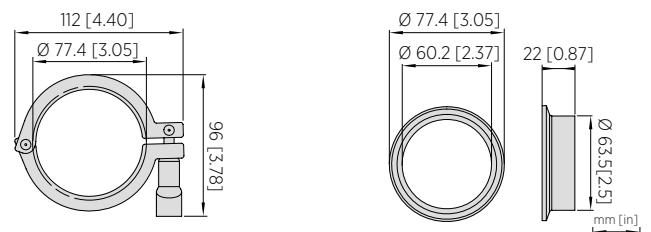
Item
Welding ferrule, 2.5"
Sanitary clamp 2.5"
High-pressure clamp 2.5"
Blind flange 2.5"
Sanitary gasket, 2.5", EPDM
Sanitary gasket, 2.5", EHEDG certified, PTFE/steel, Combifit VOE-2034 (optional)



Dimensions for PR53AC Type N

Mounting accessories for PR53AC Type N

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



Mounting kit for PR53AC Sanitary 2.5"

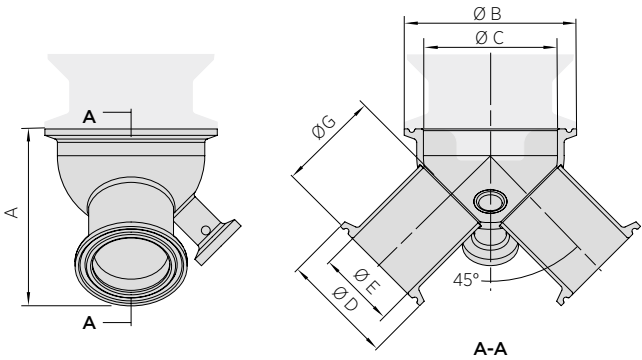
Flow cells for PR53AC

SEFC Sanitary Elbow Flow Cell

Item	Configuration code
SEFC Sanitary Elbow Flow Cell, DIN 32676-C sanitary coupling	
Wetted parts	
Sanitary coupling 1", reduced inlet for < 1.5 m/s flow rate	
Sanitary coupling 1.5", reduced inlet for < 1.5 m/s flow rate	
Sanitary coupling 2.5", reduced inlet for < 1.5 m/s flow rate	
Sanitary coupling 1"	
Sanitary coupling 1.5"	
Sanitary coupling 2.5"	
Wash nozzle	
No wash nozzle option	
Steam wash nozzle	
Water wash nozzle	
Pressurized water wash nozzle	
Documentation	
EN 1024 3.1 material certificate included	
Material: EN 1.4435	
Other variants, surface treatments and special materials available on request	
Operating pressure: 15 bar at +20 °C (+68 °F), 9 bar at +120 °C (+248 °F)	

SEFC Sanitary Elbow Flow Cell, dimensions

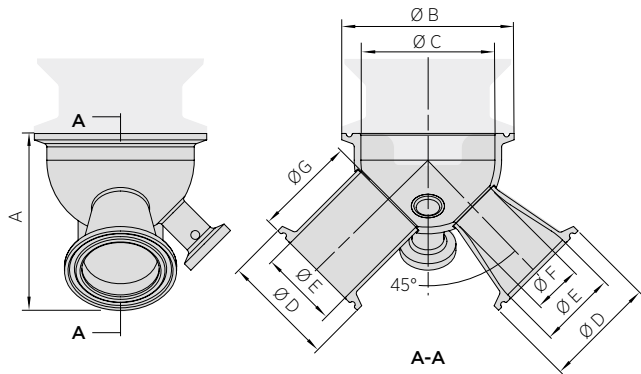
Dimension	1"	1½"	2"	2½"
A	65.7 mm (2.59 in)	79.6 mm (3.13 in)	97.5 mm (3.84 in)	115.7 mm (4.56 in)
ØB	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	50.4 mm (1.98 in)	50.4 mm (1.98 in)	63.9 mm (2.52 in)	77.4 mm (3.05 in)
ØE	22.1 mm (0.87 in)	34.8 mm (1.37 in)	47.5 mm (1.87 in)	60.2 mm (2.37 in)
ØG	21.7 mm (0.85 in)	44.9 mm (1.77 in)	41.9 mm (1.65 in)	64.8 mm (2.55 in)



SEFC Sanitary Elbow Flow Cell

SEFC Sanitary Elbow Flow Cell reduced inlet, dimensions

Dimension	1"	1½"	2"
A	65.7 mm (2.59 in)	79.6 mm (3.13 in)	97.5 mm (3.84 in)
ØB	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	50.4 mm (1.98 in)	50.4 mm (1.98 in)	63.9 mm (2.52 in)
ØE	22.1 mm (0.87 in)	34.8 mm (1.37 in)	47.5 mm (1.87 in)
ØF	16 mm (0.63 in)	22.1 mm (0.87 in)	34.8 mm (1.37 in)
ØG	21.7 mm (0.85 in)	44.9 mm (1.77 in)	41.9 mm (1.65 in)



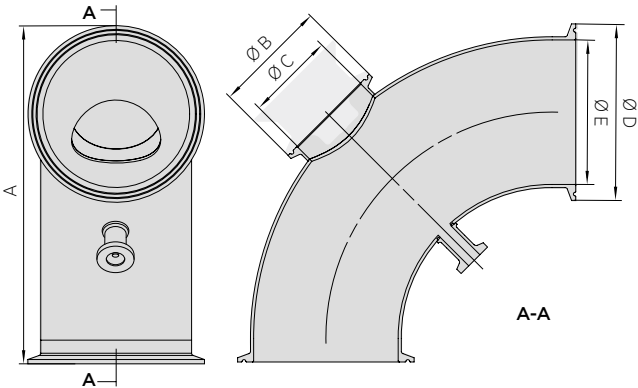
SEFC Sanitary Elbow Flow Cell, reduced inlet

SEFCL Sanitary Elbow Flow Cell, for Large Pipelines

Item	Configuration code
SEFCL Sanitary Elbow Flow Cell, for Large Pipelines	
Wetted parts	
Sanitary coupling 3"	
Sanitary coupling 4"	
Wash nozzle	
No wash nozzle option	
Steam wash nozzle	
Water wash nozzle	
Pressurized water wash nozzle	
Documentation	
Material certificate included	
Material: AISI 316L	
Other variants, surface treatments and special materials available on request	
Operating pressure: 15 bar at +20 °C (+68 °F), 9 bar at +120 °C (+248 °F)	

SEFCL Sanitary Elbow Flow Cell, for Large Pipelines, dimensions

Dimension	3"	4"
A	172.5 mm (6.79 in)	227.8 mm (8.97 in)
ØB	77.9 mm (3.07 in)	77.9 mm (3.07 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	90.9 mm (3.58 in)	118.9 mm (4.68 in)
ØE	72.9 mm (2.87 in)	97.4 mm (3.83 in)



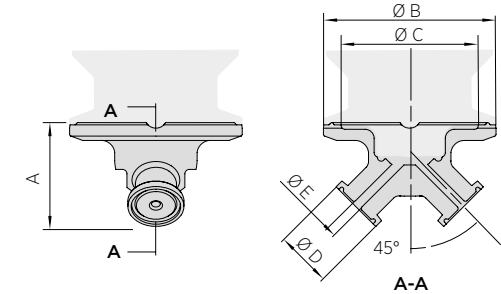
SEFCL Sanitary Elbow Flow cell, Large (3 in)

SMFC Sanitary Miniature Flow Cell

Item	Configuration code
SMFC Sanitary Miniature Flow Cell	
Material: EN 1.4435, EN 1024 3.1 material certificate included	
Wetted surface Ra: Electropolished 0.4 um, batch traceable, certificate included	
Other variants, surface treatments and special materials available on request	
Operating pressure: 15 bar at +20 °C (+68 °F), 9 bar at +120 °C (+248 °F)	

SMFC Sanitary Miniature Flow Cell, dimensions

Dimension	4 mm	5 mm	6 mm
A	46.6 mm (1.83 in)	46.6 mm (1.83 in)	46.6 mm (1.83 in)
ØB	77.5 mm (3.05 in)	77.5 mm (3.05 in)	77.5 mm (3.05 in)
ØC	61.6 mm (2.43 in)	61.6 mm (2.43 in)	61.6 mm (2.43 in)
ØD	25 mm (0.98 in)	25 mm (0.98 in)	25 mm (0.98 in)
ØE	4 mm (0.16 in)	5 mm (0.2 in)	6 mm (0.24 in)



SMFC Sanitary Miniature Flow Cell

Flow cell accessories for SMFC

Item
Gasket 22.2×3.0 mm EPDM
Sanitary clamp 0.5"