



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

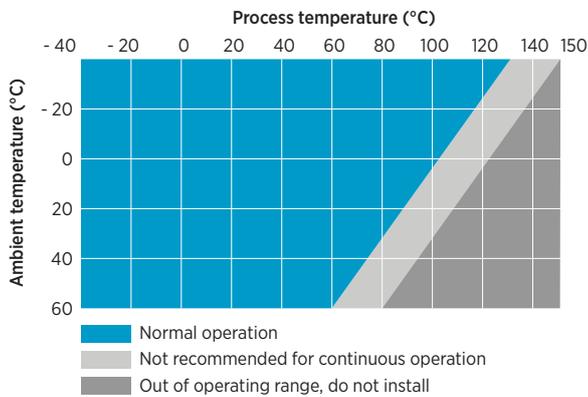
Refractive index

Measurement range	1.32 ... 1.54 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) At standard low-pass filtering.



PR53AC process temperature, options -W1 and -W3 (indicative)

Operating environment

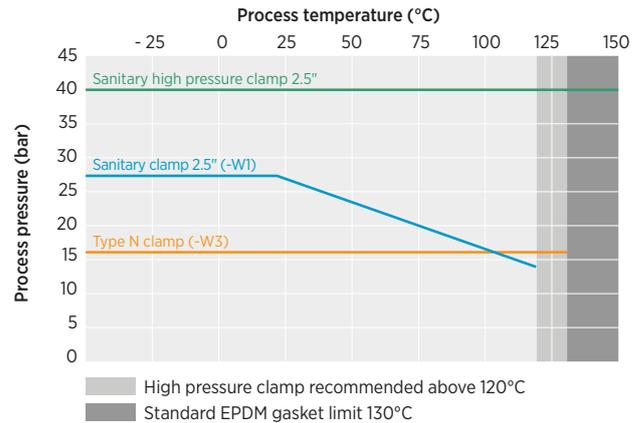
Process parameters

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
NEMA rating	NEMA 4X
IP rating	IP66 IP67

- 1) -40 ... +130 °C (-40 ... 266 °F) EPDM gasket, -40... +150 °C (-40 ... +302 °F) EHEDG 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
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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 × M12 F 4 pins, A-coded ¹⁾ 2 × M16×1.5 cable gland, Cable D 5 ... 10 mm / Adapter for conduit entry M16×1.5 / NPT ½"
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- 1) For USB2 adapter and Insight software. See www.vaisala.com/insight.

Compliance

EMC compatibility	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, EC 1935/2004 EC 1935/2004
Compliance marks	CE, China RoHS, RCM, UKCA

Sanitary compliance

Hygienic design	3-A 46-04 EHEDG
Compliance marks	3-A, EHEDG ¹⁾
ADI free (Animal Derived Ingredients)	USP Class VI

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

Mechanical specifications

Wetted parts

Sensor head	EN BN2 1.4435 (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 (-W1)	EPDM ^{2) 4)}
Type N gasket (-W3)	EPDM ²⁾
Welding ferrule (-W1)	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 (-W1)	EN 1.4301 (AISI 304)
Type N Clamp (-W3)	EN 1.4301 (AISI 304)
Cable (-C1)	4×22 AWG PUR, black 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.

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

USB adapter for service port, for Insight service software (see www.vaisala.com/insight)

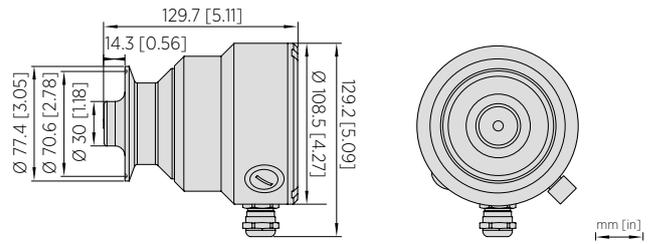
Fiberglass brush for prism cleaning

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 option -W1 and -W2

Mounting accessories for options -W1 and -W2

Item

Welding ferrule, 2.5"

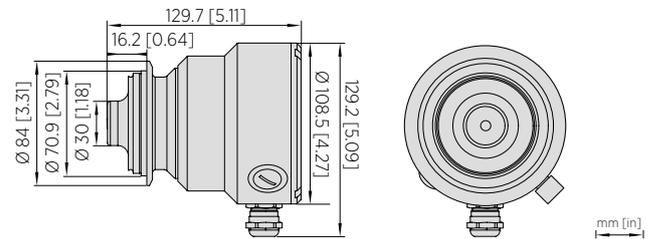
Sanitary clamp 2.5"

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 option -W3 and -W4

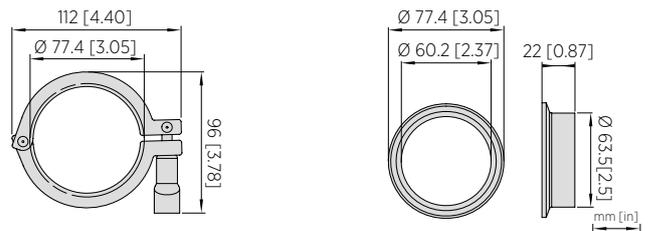
Mounting accessories for options -W3 and -W4

Item

Type N clamp 2.5", DN 50/40

Type N blind flange

Gasket 59.5×3 mm, EPDM



Sanitary clamp installation kit for options -W1 and -W3

Flow cells for PR53AC

SEFC Sanitary Elbow Flow Cell

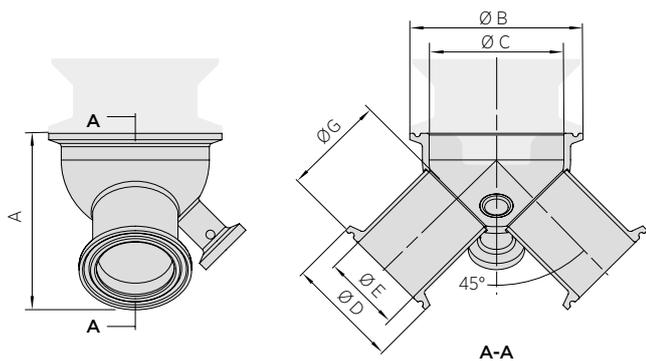
Item	Configuration code
Sanitary Elbow Flow Cell, DIN 32676-C sanitary coupling	SEFC
Sanitary coupling 1", reduced inlet for < 1.5 m/s flow rate	-W1
Sanitary coupling 1.5", reduced inlet for < 1.5 m/s flow rate	-W2
Sanitary coupling 2.5", reduced inlet for < 1.5 m/s flow rate	-W3
Sanitary coupling 1"	-W4
Sanitary coupling 1.5"	-W5
Sanitary coupling 2.5"	-W6
No wash nozzle option	-N0
Steam wash nozzle	-N1
Water wash nozzle	-N2
Pressurized water wash nozzle	-N3
EN 1024 3.1 material certificate included	-D1

Material: EN 1.4435

Other variants, surface treatments and special materials available on request

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)			
ØC	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 (-W4, -W5, -W6)

Flow cell accessories for options -W1, -W2, -W4, -W5

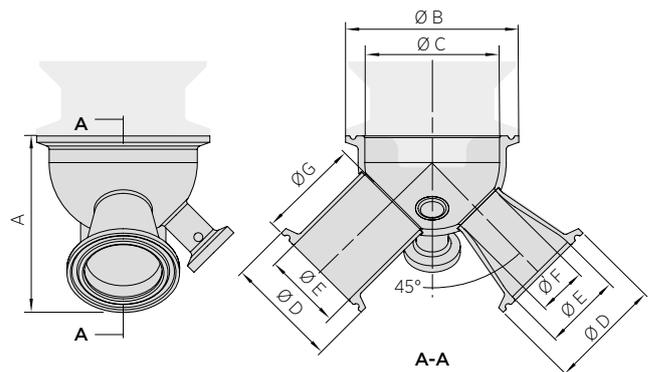
Item
Steam wash nozzle for SEFC-W1
Water wash nozzle for SEFC-W1
Pressure water wash nozzle for SEFC-W1
Water wash nozzle blind plug for SEFC and SEFCL

Flow cell accessories for options -W3, -W6, -W7

Item
Steam wash nozzle for SEFC-W1
Water wash nozzle for SEFC-W1
Pressure water wash nozzle for SEFC-W1
Water wash nozzle blind plug for SEFC and SEFCL

SEFC Sanitary Elbow Flow Cell reduced inlet, dimensions

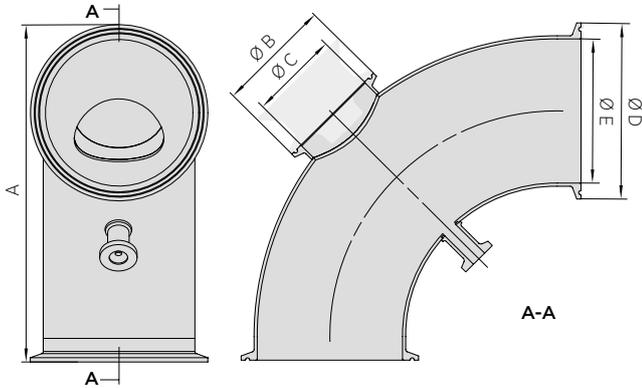
Dimension	1"	1½"	2"
A	65.7 mm (2.59 in)	79.6 mm (3.13 in)	97.5 mm (3.84 in)
ØB	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	50.4 mm (1.98 in)	50.4 mm (1.98 in)	63.9 mm (2.52 in)
ØE	22.1 mm (0.87 in)	34.8 mm (1.37 in)	47.5 mm (1.87 in)
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 (-W1, -W2, -W3)

SEFCL Sanitary Elbow Flow Cell, for Large Pipelines, dimensions

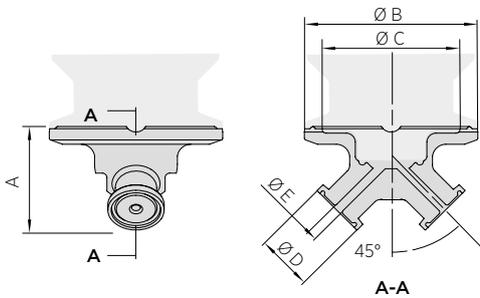
Dimension	3"	4"
A	172.5 mm (6.79 in)	227.8 mm (8.97 in)
ØB	77.9 mm (3.07 in)	77.9 mm (3.07 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	90.9 mm (3.58 in)	118.9 mm (4.68 in)
ØE	72.9 mm (2.87 in)	97.4 mm (3.83 in)



SEFCL Sanitary Elbow Flow cell, Large (3 in)

SMFC Sanitary Miniature Flow Cell, 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

SEFCL Sanitary Elbow Flow Cell, for Large Pipelines

Item	Configuration code
Sanitary Elbow Flow Cell, for Large Pipelines	SEFCL
Sanitary coupling 3"	-W1
Sanitary coupling 4"	-W2
No wash nozzle option	-N0
Steam wash nozzle	-N1
Water wash nozzle	-N2
Pressurized water wash nozzle	-N3
Material certificate included	-D1
Material: AISI 316L	
Other variants, surface treatments and special materials available on request	

SMFC Sanitary Miniature Flow Cell

Item	Configuration code
Miniature Flow Cell	SMFC
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	

Flow cell accessories for SMFC

Item
Gasket 22.2×3.0 mm EPDM
Sanitary clamp 0.5"

1) USP Class VI, manufacturer's declaration included.