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Polaris™ PR53AC Sanitary Compact Process Refractometer

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.

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 and Indigo80 compatible
- Built-in 4–20 mA, HART, and Modbus RTU outputs

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 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.

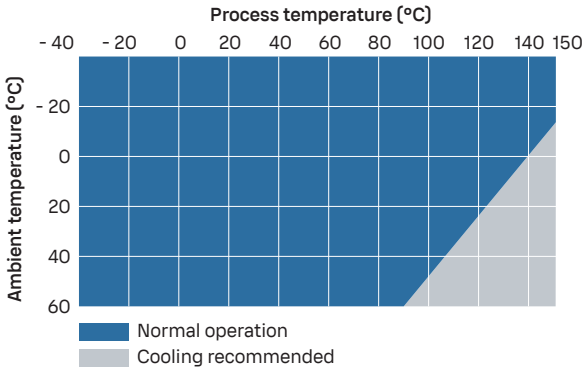
The refractometer can also be connected to the portable diagnostics tool Indigo80 handheld indicator.

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	±0.00002 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 Ta = +20 °C, with standard low-pass filtering.
3) With standard low-pass filtering.

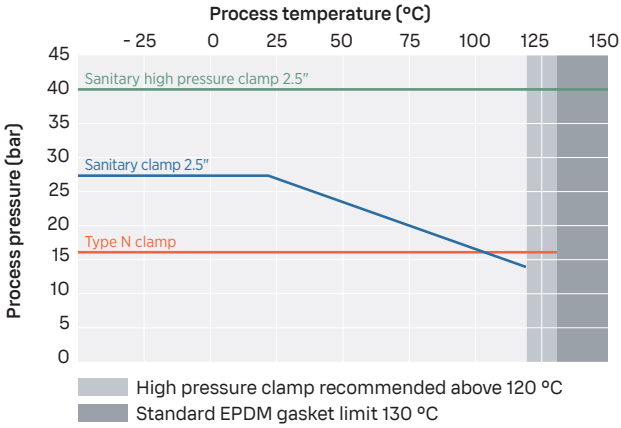


PR53AC process temperature (indicative)

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 (68 °F), 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
Maximum load	600 Ω
Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.00002 RI)
Supported protocol	HART 7
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 M 4 pins, A-coded [1] 1 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT ½″

1) For USB2 adapter and Insight software, see 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
Vibration and shock	Tested according to IEC 60068-2
Listing marks	MET listed (US and Canada)

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

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_2O_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) HUMMEL 1.693.1600.50
Dummy plug	EN 1.4305 (AISI 303) AGRO 8717.96.08.70
Thread adpter	EN 1.4404 (AISI 316L) Vaisala, DRW257718, M16×1.5 / NPT ½ in
M12 connector	Gland, EN 1.4305 (AISI 303) Contacts, CuZn with Ni/Au plating Phoenix Contact, 1405233, M12/4(M), A, 4×0.34 mm², TPE, 0.5 m Carrier, PA 6.6
Sanitary 2.5″ clamp	EN 1.4301 (AISI 304) [2]
Type N Clamp	EN 1.4301 (AISI 304) [2]
Cable	2×2×0.5 mm² (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)

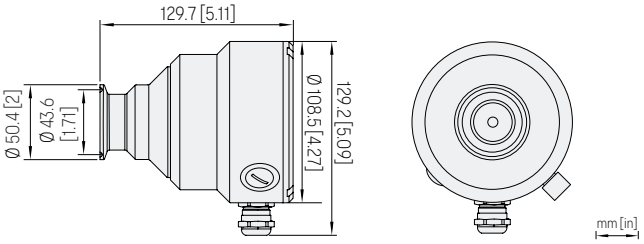
1) *EN 10204 / 3.1 certificate included.*
2) *Manufacturer's declaration included.*
3) *ADI free, FDA 21 C.F.R 177.1550, 3A Sanitary Standard, USP Class VI <88>, 70 °C.*
4) *3-A certificate, EHEDG certificate.*

Calibration accessories

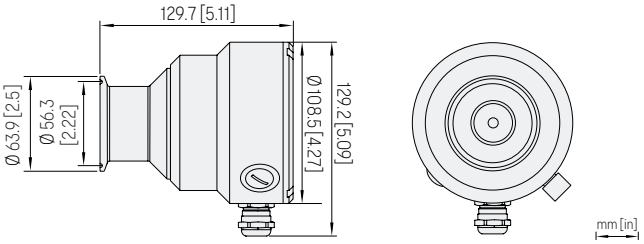
Item	Item code
Verification kit 1.33, 1.37, 1.42, 1.47, 1.52	280380SP
Calibration kit 1.32, 1.33, 1.35, 1.36, 1.37, 1.38, 1.40, 1.42, 1.45, 1.47, 1.50, 1.52, 1.53, 1.57	278292SP
High-range special kit 1.42, 1.47, 1.53, 1.57, 1.60, 1.62, 1.67, 1.72	278293SP
Sample holder and cover	278295SP

Accessories

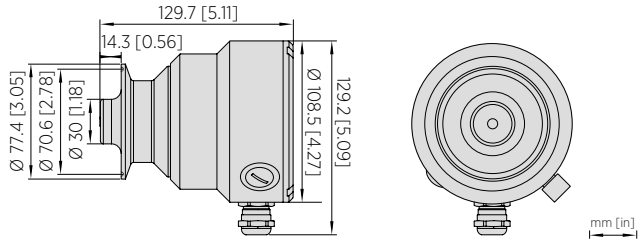
Item	Item code
USB adapter for service port, for Insight service software (see www.vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm² (AWG 21), PUR jacket, grey, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Cooling cover	ASM214675SP



Dimensions for PR53AC Sanitary 1.5"



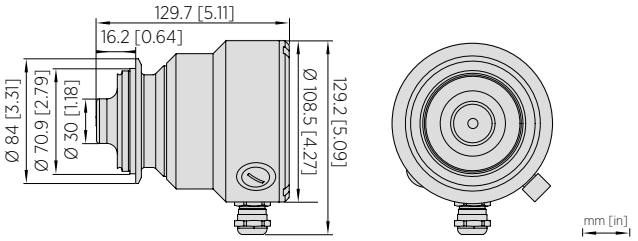
Dimensions for PR53AC Sanitary 2"



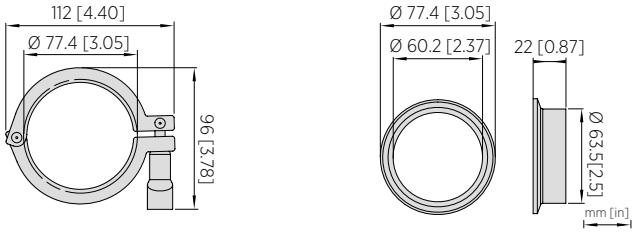
Dimensions for PR53AC Sanitary 2.5"

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)



Dimensions for PR53AC Type N



Mounting kit for PR53AC Sanitary 2.5"

Type N mounting accessories

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

Flow cells for PR53AC

Flow cells are only compatible with the PR53AC that has 2,5″ sanitary process connection.

Operating pressure

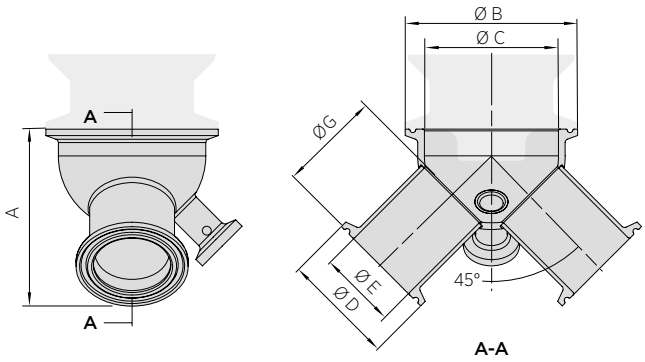
Flow cell model	Max. pressure
SEFC for 1″ pipelines	27 bar at 20 °C 13.8 bar at 120 °C
SEFC for 1,5″ pipelines	25 bar
SEFC for 2″ pipelines	20 bar
SEFC for 2.5″ pipelines	15 bar
SEFCL for 3″ pipelines	12.5 bar
SEFCL for 4″ pipelines	10 bar
MFC	27 bar at 20 °C 13.8 bar at 120 °C

SEFC Sanitary Elbow Flow Cell

Item
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
Flow cell: EN 1024 3.1 material certificate included Sanitary gasket: Manufacturer’s declaration included
Material: EN 1.4435 Other variants, surface treatments and special materials available on request

SEFC Sanitary Elbow Flow Cell, dimensions

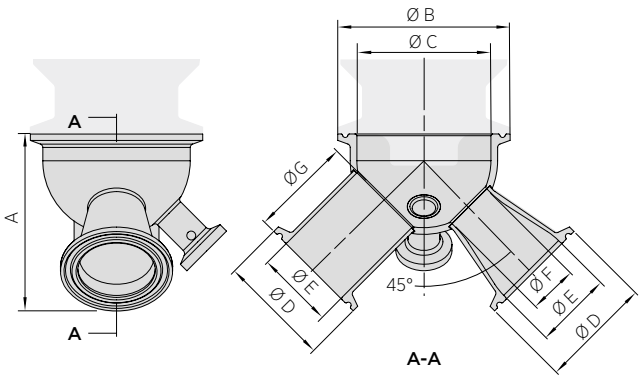
Dimension	1″	1½″	2″	2½″
A	65.7 mm (2.59 in)	79.6 mm (3.13 in)	97.5 mm (3.84 in)	115.7 mm (4.56 in)
ØB	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)	77.4 mm (3.05 in)
ØC	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)	60.2 mm (2.37 in)
ØD	50.4 mm (1.98 in)	50.4 mm (1.98 in)	63.9 mm (2.52 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)



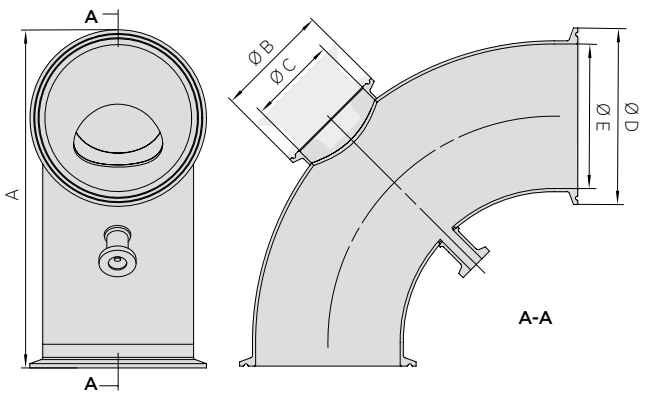
SEFC Sanitary Elbow Flow Cell, reduced inlet

SEFCL Sanitary Elbow Flow Cell, for Large Pipelines

Item
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
Flow cell: Material certificate included Sanitary gasket: Manufacturer’s declaration included
Material: AISI 316L Other variants, surface treatments and special materials available on request

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)

MFC Miniature Flow Cell

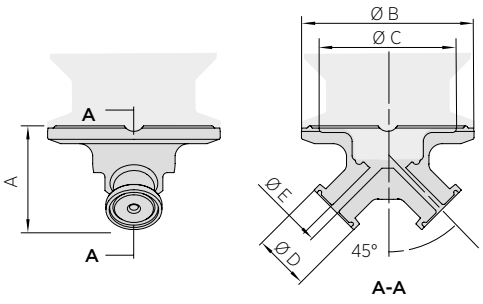
Item
MFC Miniature Flow Cell
Material: EN 1.4435, EN 1024 3.1 material certificate included Wetted surface Ra: Electropolished 0.4 um, batch traceable, certificate included Other variants, surface treatments and special materials available on request

MFC 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)

Flow cell accessories for MFC

Item
Gasket 22.2×3.0 mm EPDM
Sanitary clamp 0.5”



MFC Miniature Flow Cell

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