



Polaris™ PR53W Valve-Body Process Refractometer



Features

- ETFE-lined valve-body flow cell with non-metallic wetted parts, for aggressive chemicals in pressurized pipelines
- Reliable optical concentration measurements with refractive index
- Hydrochloric acid, sulfuric acid, amino acid, potassium hydroxide, and more than 500 concentration curves
- Measurement not affected by bubbles, particles, suspended solids, or color
- ANSI and DIN flanges for 1 and 2 inch process lines
- Indigo520-compatible
- Built-in 4 ... 20 mA and Modbus RTU outputs

The Vaisala Polaris PR53W valve-body process refractometer is designed to measure concentrations of aggressive chemicals, such as sulfuric acid, hydrochloric acid (HCl), and sodium hydroxide (NaOH) in production pipelines such as in the chemical, biochemical, and pharmaceutical industries. The PR53W is mounted in a membrane-lined valve body that has no metallic wetted parts. This allows convenient flange mounting to 1 and 2 inch ANSI and DN50 and DN25 flanges.

Benefits

The optical measurement is based on the refractive index (RI). RI can be measured from practically any liquid and it responds to dissolved material. Because bubbles, particles, or crystals in the process do not affect measurement, RI allows accurate measurement for different chemicals, also slurries. Typical applications include different chemical-mixing and monitoring installations in the fine chemical and semiconductor industries. In addition to a wide selection of product options, it is possible to customize the product for specific needs. The outstanding long-term stability provides years of accurate, continuous, fast, and stable concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53W continues the success of the Vaisala K-PATENTS® process refractometer series. Based on the 40 years of experience and continuous development, the PR53 family is the latest generation of digital process refractometers.

Accurate and reliable

The optical measurement principle offers accurate and drift-free measurement. Because temperature measurement is incorporated inside the process refractometer, the changing process temperature does not affect the concentration measurement.

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. 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) ¹⁾
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.

Operating environment

Process parameters

Process temperature	-10 ... +160 °C (+14 ... +320 °F)
Operating pressure	16 bar

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

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

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
Compliance marks	CE, China RoHS, RCM, UKCA

Mechanical specifications

Wetted parts

Prism and sapphire plate	Sapphire monocrystalline, 99.996 % Al ₂ O ₃ ¹⁾
Valve body lining	ETFE
Prism gasket	Modified PTFE ¹⁾
Valve body gasket	PTFE ¹⁾

Non-wetted parts

Valve body	Cast iron
Housing	EN 1.4404 (AISI 316L)
Screws TX20, torque 2.0 Nm	EN 1.4404 (AISI 316L)
Cable	4×22 AWG PUR, black 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1

1) Manufacturer's declaration included

Calibration accessories

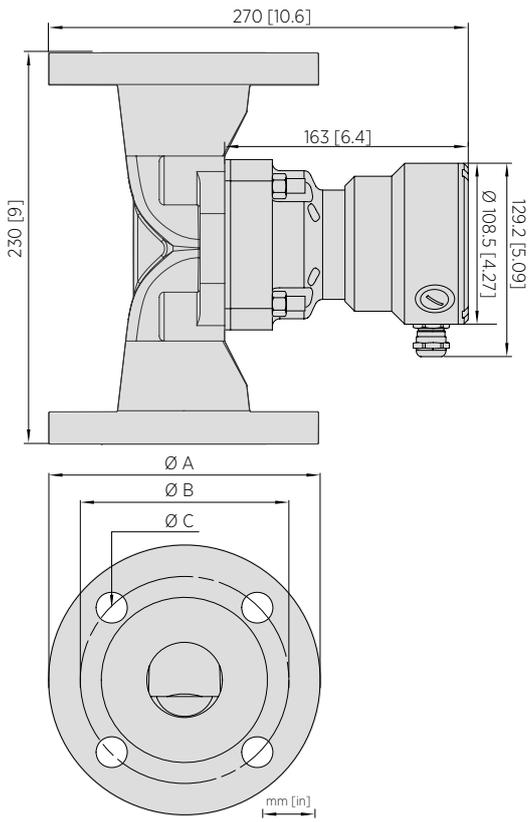
Item

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

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 PR53W valve body

PR53W valve body flange dimensions

Dimension	ANSI 2"	DIN DN50	JIS 50A
ØA	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØB	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)