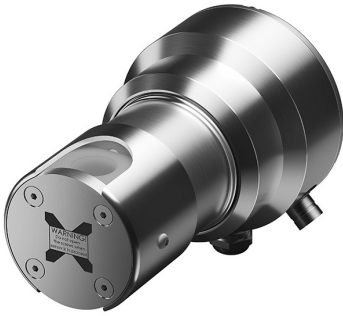




Polaris™ PR53M PTFE-Body Process Refractometer



Features

- Non-metallic wetted parts, integrated ultra-pure PTFE and sapphire flow cell for demanding environments
- Reliable optical concentration measurements with refractive index
- Potassium hydroxide, sodium hydroxide, hydrochloric acid, hydrofluoric acid, and more than 500 concentration curves
- Measurement not affected by bubbles, particles, suspended solids, or color
- Various fittings and connections available for ½ inch tubing
- Indigo520-compatible
- Built-in 4 ... 20 mA and Modbus RTU outputs

The Vaisala Polaris PR53M PTFE-body process refractometer is designed to measure concentrations of aggressive chemicals, such as hydrochloric acid (HCl), sodium hydroxide (NaOH), sodium chloride (NaCl), sulfuric acid (H₂SO₄), and hydrofluoric acid (HF) in the chemical and semiconductor industries. The integrated ultra-pure PTFE flow cell has no metallic wetted parts, minimizing contamination risk and making it suitable for contact with aggressive chemicals. The PR53M can be mounted to ½ inch process lines with a standard NTP-threaded connection.

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. Because bubbles, particles, or crystals in the process do not affect measurement, the 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, Vaisala offers the possibility 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 PR53M 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 ... 1.54 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.

Operating environment

Process parameters

Process temperature	-10 ... +130 °C (+14 ... +266 °F)
Pressure	10 bar ¹⁾

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) Maximum at +20 °C.

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
Compliance marks	CE, China RoHS, RCM, UKCA

Mechanical specifications

Wetted parts

Prism and sapphire plate	Sapphire monocrystalline, 99.996 % Al ₂ O ₃ ¹⁾
Flow cell	Ultra pure PTFE
Prism gasket	Modified PTFE
Process gasket	Kalrez 6375 UP ¹⁾

Non-wetted parts

Housing	Optional coating
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.

Mounting accessories

Item

Support
Flare fitting
Pillar-type fitting

Calibration accessories

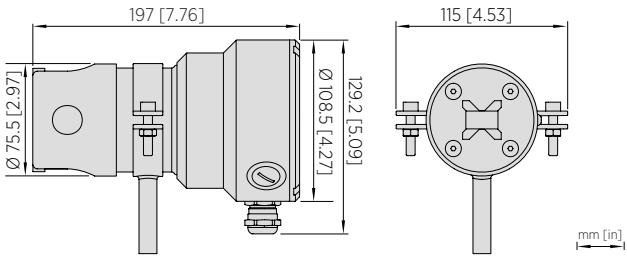
Item

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

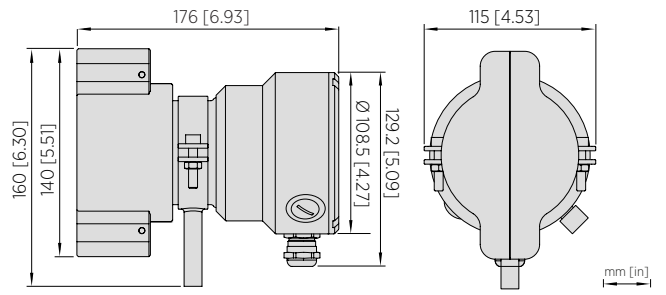
Accessories

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 PR53M-W1



Dimensions PR53M-W2