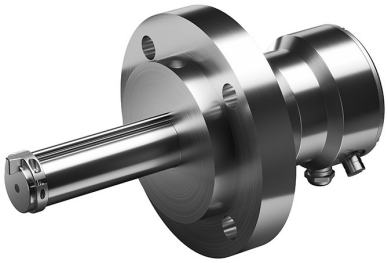
Polaris™ PR53GP Probe Process Refractometer



The Vaisala Polaris PR53GP general-purpose probe process refractometer is designed for measuring concentrations of sugars/Brix, acids, alkaline solutions, hydrocarbons, solvents, and various other solutions. It can be installed directly in a pipeline or tank and is suitable for production and quality-control applications in the sugar, chemical, petrochemical, and other industries.

Features

- Reliable optical concentration measurements with refractive index
- Sulfuric acid, sodium hydroxide, and more than 500 concentration curves
- Special alloy materials available for demanding environments
- Clamp and flange connections available
- Measurement not affected by bubbles, particles, suspended solids, or color
- Indigo520-compatible
- Built-in 4 ... 20 mA 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. Because bubbles, particles, or crystals in the process do not affect measurement, the RI allows accurate measurement for different chemicals. Typical applications include crystallizers, wet scrubbers, reactors, transport pipelines, blending, and distillation operations.

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 PR53GP 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 the 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.

Easy mounting

The PR53GP can be installed in standard flanges, making it easy to mount to process line. With the optional cooling cover accessory, the instrument tolerates high process pressures and temperatures. The optional flange-mounted pipe flow cell installation accessory allows flange-mounted installation in a wide variety of pipe sizes. Selected alloy materials provide durability under challenging process conditions. Other special materials and engineered solutions are available upon request.

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

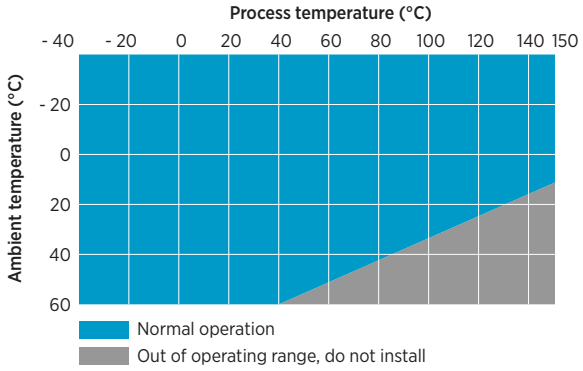
The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter is required when the application or the installation position 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 Ta = +20 °C, with standard low-pass filtering.*
3) *At standard low-pass filtering.*

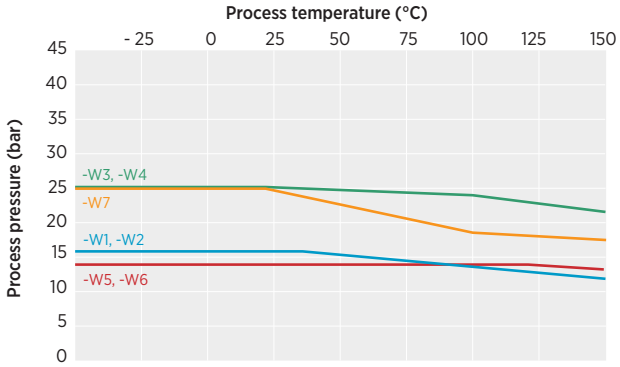


PR53GP process temperature (indicative)

Operating environment

Process parameters	
Process temperature	−40 ... +150 °C (−40 ... +302 °F)
Design temperature	+180 °C (+356 °F) [1]
Design pressure	40 bar [2]
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 50/UL 50E (NEMA) rating	Type 4X
IP rating	IP66 IP67

1) *Maximun momentary temperature peak.*
2) *Maximum at +20 °C, operating pressure to the clamp rating pressure.*



PR53GP 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 × 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"

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	
Sensor head	EN 1.4404 (AISI 316L)[1)]
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al_2O_3 [2)]
Prism gasket	Modified PTFE [2)]
L coupling gasket	PTFE [2)]
L coupling welding ferrule (-W7)	EN 1.4404 (AISI 316L)[1)]
Wash nozzle parts	EN 1.4404 (AISI 316L)
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
Flange	EN 1.4404 (AISI 316L) Dimensioning and tolerances as per ASME B16.5, DIN 2543, JIS B2220
L coupling clamp, 88.9 mm (-W7)	EN 1.4301 (AISI 304)
Cable	4×22 AWG PUR, black 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	-W1 7.2 kg (15.87 lb); -W2 11.3 kg (24.91 lb); -W3 7.7 kg (16.98 lb); -W4 11.7 kg (25.79 lb); -W5 7.2 kg (15.87 lb); -W6 10.5 kg (23.15 lb); -W7 5.1 kg (11.24 lb)

1) Material certificate included.
2) Manufacturer's declaration included.

Mounting accessories

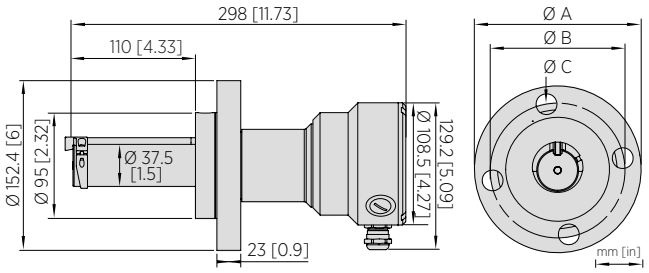
Item
L coupling clamp D 88.9 mm
L coupling ferrule 88.9 / 3.6 mm PN25
L coupling blind flange 88.9 mm
L coupling gasket 88.9 / 84 mm

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

Calibration accessories

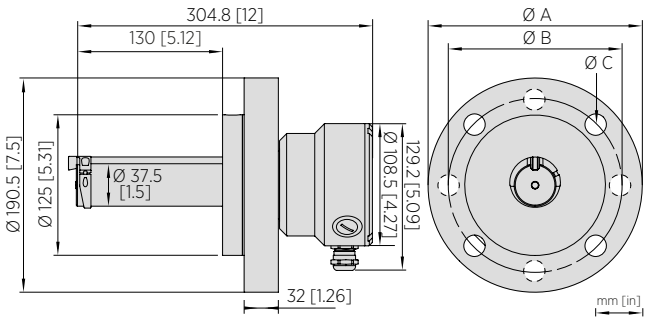
Item
RI liquid kit for RI field calibration, standard 1.33, 1.37, 1.42, 1.47, 1.52
RI liquid kit for RI field calibration, large 1.32, 1.33, 1.35, 1.38, 1.41, 1.44, 1.47, 1.50, 1.52, 1.53
Sample holder and cover



Dimensions PR53GP-W2 2 inch flange

Dimensions of 2″ flange, insertion length 110 mm

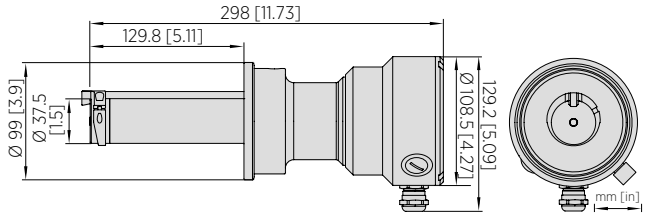
Dimension	-W1	-W3	-W5
ØA	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØB	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



Dimensions PR53GP-W2 3 inch flange

Dimensions of 3″ flange, insertion length 130 mm

Dimension	-W2	-W4	-W6
ØA	190.5 mm (7.5 in)	200 mm (7.87 in)	185 mm (7.28 in)
ØB	152.4 mm (6 in)	160 mm (6.3 in)	150 mm (5.9 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



Dimensions PR53GP-W7 L coupling 88.9 mm (3.5 in)

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