Polaris™ PR53GC Compact Process Refractometer

The Vaisala Polaris PR53GC general-purpose compact process refractometer is designed for measuring concentrations of acids, alkaline solutions, alcohols, hydrocarbons, solvents, and various other solutions. It can be installed directly in a pipeline and is suitable for production, transport, and quality-control applications in the chemical and other industries. Compact in size with over 500 different concentration curves, the PR53GC is suitable for a wide range of industrial applications.

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
- Type L coupling
- 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

Benefits

The optical measurement is based on the refractive index (RI). The RI can be measured from practically any liquid or slurry, 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 concentration measurement directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

The PR53GC 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 in 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

Type L clamp connections allow easy installation directly into the process line. The unit can also be installed into a flange-mounted flow cell, which enables the use of an additional wash system for applications where prism wash is required.

Selected alloy materials provide durability under challenging process conditions. Other special materials and engineered solutions are available upon request.

Plug and play to Indigo

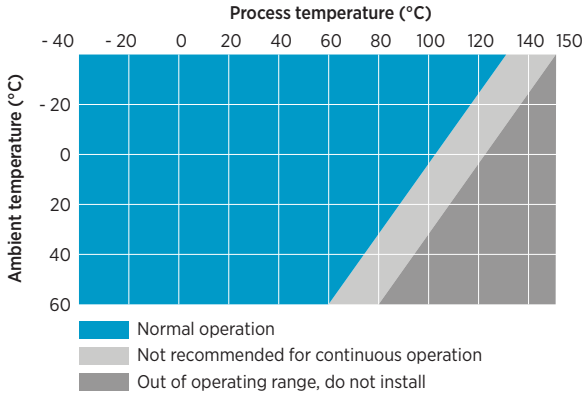
The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. It provides access to features such as data storage, graphical interface, and analog and digital interface. The Indigo520 transmitter is required when the application or the installation position 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.*

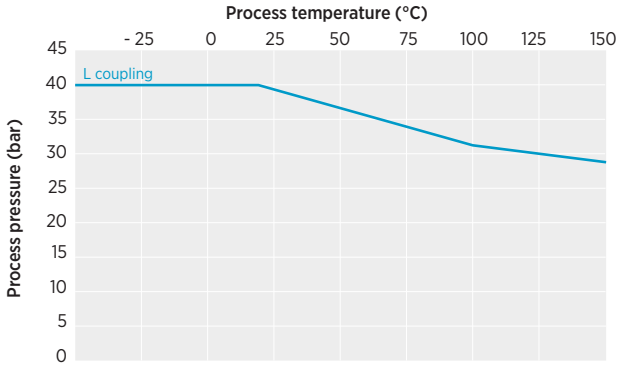


PR53GC process temperature (indicative)

Operating environment

Process parameters	
Process temperature	−40 ... +150 °C (−40 ... +302 °F)
Design temperature	+180 °C (356 °F) [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 momentary temperature peak.*



PR53GC 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) (-W1) EN 2.4660 (Alloy 20) (-W2) EN 2.4819 (Alloy C276) (-W3) 1)
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al_2O_3 2)
Prism gasket	Modified PTFE 2)
L coupling gasket	PTFE2)
Welding ferrule	EN 1.4404 (AISI 316L) (-W1) EN 2.4660 (Alloy 20) (-W2) EN 2.4819 (Alloy C276) (-W3) 1)
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)
L coupling clamp (60,3 mm)	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	2.7 kg (5.95 lb)

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

Mounting accessories

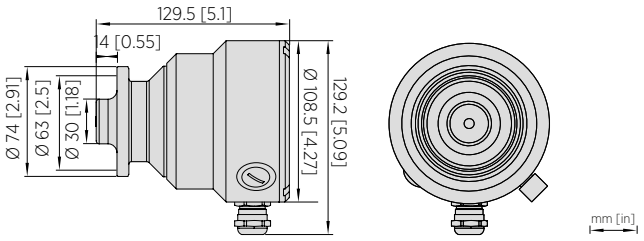
Item
L coupling clamp D 60.3 mm
L coupling ferrule 60.3 mm
L coupling blind flange 60.3 mm
L coupling gasket 60.3 mm

Accessories

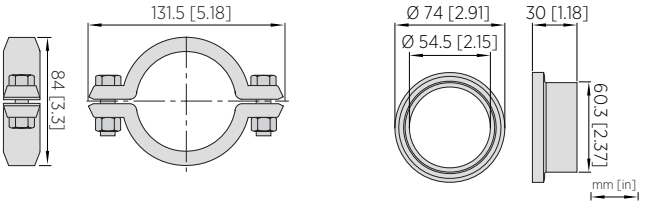
Item
USB adapter for service port, for Insight service software (see www.vaisala.com/insight)
Fiberglass brush for prism cleaning
Instrument cable, 4×22 AWG, PUR jacket, black, open ends, 10 m Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Instrument cable, 4×22 AWG, PUR jacket, black, open ends, 30 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

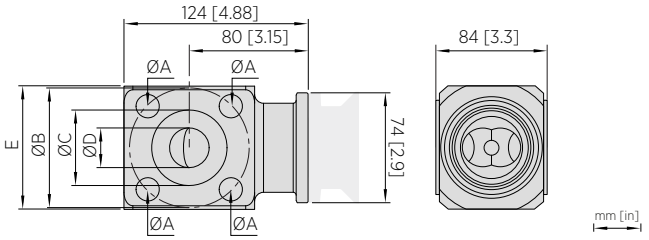


Dimensions PR53GC



Dimensions PR53GC L coupling clamp

Flow cells for PR53GC



WFC Flange Wafer Flow Cell

Dimensions WFC Flange Wafer Flow Cell

Dimension	ANSI	DIN	JIS
ØA	15.7 mm (0.62 in)	14 mm (0.55 in)	19 mm (0.75 in)
ØB	79.2 mm (3.12 in)	85 mm (3.35 in)	90 mm (3.54 in)
ØC	50.8 mm (2 in)	68 mm (2.68 in)	68 mm (2.68 in)
ØD	26.7 mm (1.05 in)	28.5 mm (1.12 in)	28.5 mm (1.12 in)
E	83 mm (3.27 in)	83 mm (3.27 in)	89 mm (3.50 in)

WFC Flange Wafer Flow Cell

Item	Code
DIN flange DN25	-W1
ANSI flange 1"	-W2
JIS flange DN25	-W3
Length 84 mm	-L1
No wash nozzle, plugged	-N0
Steam wash nozzle	-N1
Water wash nozzle	-N2
Pressurized water wash nozzle	-N3
Material EN 1024 3.1 certificate included	-D1
Material: EN 1.4404 Other variants, surface treatments and special materials available on request	

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