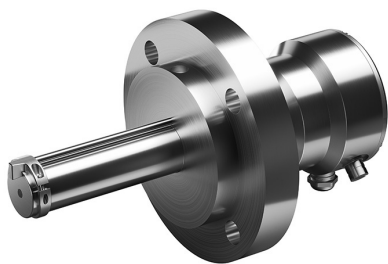


Polaris™ PR53GPEX Probe Process Refractometer



Vaisala Polaris PR53GPEX general-purpose probe process refractometer for potentially explosive environments 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
- Compliant with ATEX and IECEx
- Options for Ex Zone 0 or Zone 2
- Sulfuric acid, sodium hydroxide, and more than 500 concentration curves
- Special alloy materials available for demanding environments
- Refinery probe head option available
- Clamp and flange connections available
- Measurement not affected by bubbles, particles, suspended solids, or color
- Vaisala Indigo520 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 in potentially explosive environments directly in the process stream. Inline process refractometers are easy to install and have no moving parts that require regular maintenance.

Safe in potentially explosive environments

The PR53EX series refractometers can be installed directly into hazardous areas. They are safe to use and can withstand continuous exposure to potentially explosive environments that contain flammable gas, vapor, or mist. Operation in these environments requires no additional protective enclosures. A robust design, combined with trouble-free operation, ensures a long-term solution for concentration measurement in potentially explosive environments. The PR53EX series refractometers have two Ex certified options for Zone 2 and Zone 0. For Zone 0 environments, a galvanic isolator is installed between the potentially explosive area and the refractometer to ensure safe operation.

Refinery probe head option

The PR53GPEX can be ordered with a refinery probe head option that is designed to support the unique requirements of the refining and petroleum industries. Typical applications are, for example, acid in alkylation, glycol or amines in gas processing, and multi-product (crude oil, fuel oil, diesel) interfaces in transfer operations. The refinery probe head is machined from a single piece of metal allowing weld-free pressure bearing components.

Plug and play to Indigo

The refractometer can be interfaced directly, or it can be connected to a Vaisala Indigo520 transmitter. The transmitter provides access to features such as data storage, graphical interface, and analog and digital interface. 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

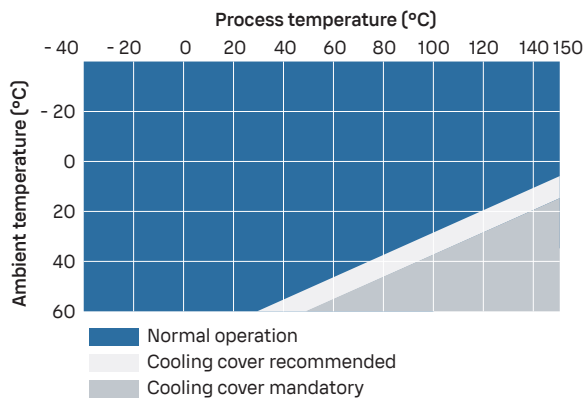
Measurement range	1.32–1.53 nD (Corresponds to 0–100 °Bx)
Accuracy	±0.00014 nD (0.1 °Bx) ^{1) 2)}
Repeatability	±0.000017 nD ³⁾
Resolution	±0.000001 nD

Response time T_{63} with default damping	10 s ⁴⁾
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) VD algorithm accuracy is 0.00030.
- 3) Repeatability, confidence level $k=2$, including random noise, at $T_a = +20$ °C, with standard low-pass filtering.
- 4) With standard low-pass filtering.



PR53GPEX process temperature

Operating environment

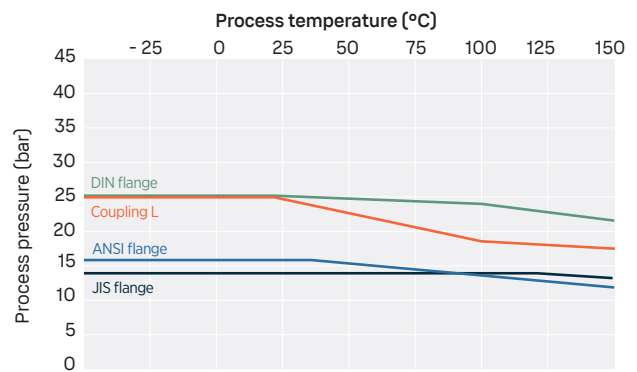
Process parameters

Process temperature	-40 ... +150 °C (-40 ... +302 °F)
Design temperature	+180 °C (+356 °F) ^{1) 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 rating	Type 4X
IP rating	IP66

- 1) Maximum momentary temperature peak.
- 2) The use of cooling cover is mandatory in certain conditions. See PR53EX Safety Guide in docs.vaisala.com.
- 3) Maximum at +20 °C, operating pressure to the process connection rating pressure.



PR53GPEX process pressure

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
Vibration and shock	Tested according to IEC 60068-2

Inputs and outputs

Protection class	3, PELV
Supply (Zone 2 only)	
Operating voltage	24 V DC nominal (9–30 V DC)
Power consumption	Less than 1 W

Outputs

Output parameters	RI, temperature, concentration, quality factor
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Analog outputs

mA	'ia' variant: Sinking, isolated, NAMUR NE 43, configurable 'ec' variant: Sourcing, isolated, NAMUR NE 43, configurable
mA range	3.8–20.5 mA
Maximum load	'ia' variant: Max. 800 Ω 'ec' variant: Max. 600 Ω

Accuracy of analog outputs at +20 °C	±0.1 % of full scale (±0.0002 RI)
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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 × M12-4M, A-coded ¹⁾ 2 × M16×1.5 cable gland, Cable D 5–10 mm / Adapter for conduit entry M16×1.5 / NPT 1/2"
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- 1) For USB2 adapter and Insight software, see [vaisala.com/insight](https://docs.vaisala.com/insight).

Intrinsically safe parameters for the 'ia' variant

Parameter	Value
Terminals VIN+ and VIN-	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	Negligible
Ci	1.1 nF
Terminals RS-485+ and RS-485-	
Ui	28 V
Pi	700 mW
Li	Negligible
Ci	1.1 nF
Uo	5 V
Io	39 mA
Po	49 mW
Terminals Analog out + and Analog out -	
Ui	28 V
Ii	100 mA
Pi	700 mW
Li	16 nH
Ci	11.6 nF
Service Port connector	
Um	250 V

Ex classification for Europe and international

Certification	Classification
Europe (ATEX, Zone 0)	EESF 25 ATEX 025X I MI Ex ia I Ma (pending) II 1G Ex ia IIC T4...150 °C (T3) Ga IP66
Europe (ATEX, Zone 2)	EESF 25 ATEX 013X II 3G Ex ec IIC T4...150 °C (T3) Gc IP66
International (IECEX, Zone 0)	IECEX EESF 25.0019X Ex ia I Ma (pending) Ex ia IIC T4...150 °C (T3) Ga IP66
International (IECEX, Zone 2)	Ex ec IIC T4...150 °C (T3) Gc IP66

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

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

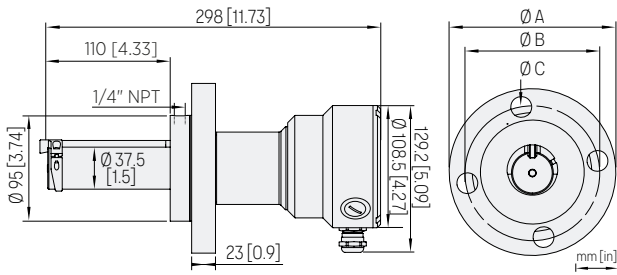
Item	Item code
USB adapter for service port, for Insight service software (see vaisala.com/insight)	USB2
Instrument cable, 2×2×0.5 mm ² (AWG 21), PUR jacket, gray, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-10M
Instrument cable, 2×2×0.5 mm ² (AWG 21), PUR jacket, gray, open ends, 30 m (98 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-30M
Instrument cable, 2×2×0.5 mm ² (AWG 21), PUR jacket, gray, open ends, 50 m (164 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, VW1	CBL211266-50M
Instrument cable, 2×2×0.5 mm ² (AWG 21), PUR jacket, light blue, open ends, 10 m (33 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, FT2	CBL211606-10M
Instrument cable, 2×2×0.5 mm ² (AWG 21), PUR jacket, light blue, open ends, 100 m (330 ft) Flame-retardant acc. to IEC 60332-1-2, FT1, FT2	CBL211606-100M
Cooling cover	ASM215772SP

Mechanical specifications

Wetted parts	
Sensor head	EN 1.4404 (AISI 316L) ¹⁾
Surface roughness	Ra 0.8 µm
Prism	Sapphire monocrystalline, 99.996 % Al ₂ O ₃ ²⁾
Prism gasket	Modified PTFE ²⁾
L coupling gasket	PTFE ²⁾
L coupling welding ferrule	EN 1.4404 (AISI 316L) ¹⁾
Wash nozzle parts	EN 1.4404 (AISI 316L) ¹⁾
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)
Blanking plug	EN 1.4305 (AISI 303)
Thread adapter	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 mm ² , TPE, 0.5 m 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	EN 1.4301 (AISI 304)
Cable (Zone 0)	2×2×0.5 mm ² (AWG 21), PUR jacket, light blue 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, FT2
Cable (Zone 2)	2×2×0.5 mm ² (21 AWG) PUR jacket, gray 10 m multistrand, with ferrules Flame-retardant acc. to IEC 60332-1-2, FT1, VW1
Weight	PR53GP 2" flange 7.2 kg (15.87 lb) - 7.7 kg (16.98 lb) PR53GP 3" flange 10.5 kg (23.15 lb) - 11.7 kg (25.79 lb) PR53 L coupling 5.1 kg (11.24 lb)

¹⁾ Material certificate included.

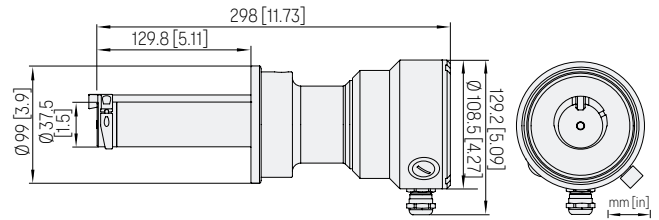
²⁾ Manufacturer's declaration included.



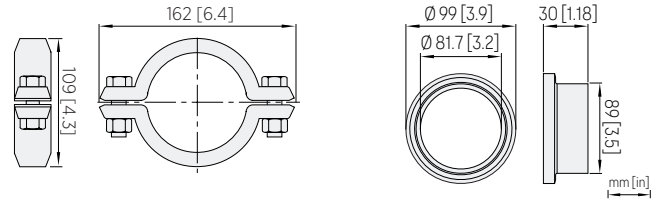
Dimensions of PR53GPEX 2" flange

Dimensions of 2" flange, depth 110 mm

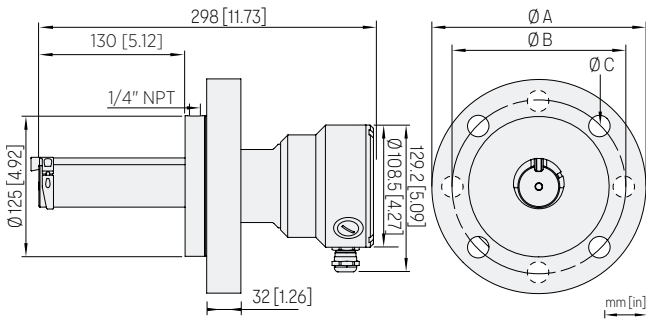
Dimension	ANSI 2"	DIN DN50	JIS 50A
ØA	152.4 mm (6 in)	165 mm (6.5 in)	155 mm (6.1 in)
ØB	120.7 mm (4.75 in)	125 mm (4.92 in)	120 mm (4.72 in)
ØC	19.1 mm (0.75 in)	18 mm (0.71 in)	19 mm (0.75 in)



Dimensions of PR53GPEX L coupling 88.9 mm (3.5 in)



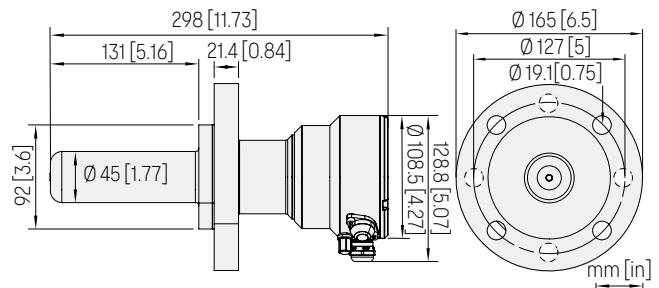
Dimensions of PR53GPEX L coupling clamp



Dimensions of PR53GPEX 3" flange

Dimensions of 3" flange, depth 130 mm

Dimension	ANSI 3"	DIN DN80	JIS 80A
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 of PR53GPEX refinery probe head