



Technical comparison of Vaisala in-line Process Refractometer offering

General

	PR-23	PR-43	Vaisala POLARIS™ PR53
MEASUREMENT PERFORMANCE			
Refractive index range	1.32 ... 1.53 nD (corresponds to 0 ...100 Brix)	1.32 ... 1.53 nD (corresponds to 0 ...100 Brix)	1.32 ... 1.53 nD (corresponds to 0 ... 100 °Bx)
Accuracy	±0.0002 nD	±0.0002 nD	±0.00014 nD
Repeatability	±0.0001 nD	±0.00004 nD	±0.00002 nD
CORE-optics	No mechanical adjustments	No mechanical adjustments	No mechanical adjustments
Temperature compensation	Automatic, digital compensation	Automatic, digital compensation	Automatic, digital compensation
Calibration	With NIST traceable Cargille standard R.I. liquids over full range	With NIST traceable Cargille standard R.I. liquids over full range	With NIST traceable Cargille standard R.I. liquids over full range, SI traceable temperature calibration one point
REFRACTOMETER SYSTEM			
	PR-23 refractometer and Indicating Transmitter DTR/STR	PR-43 refractometer (stand-alone)	PR53 refractometer (stand-alone) INDIGO520 transmitter (optional)
OPERATING ENVIRONMENT			
UL 50E (NEMA) rating	NEMA 4X	NEMA 4X	NEMA 4X
IP rating	IP67	IP67	IP66, IP67
SUPPLY			
Operating voltage	24 VDC nominal 9 ... 30 V DC (PR-23 Refractometer) 19-32 VDC or 100-240 VAC (DTR Transmitter)	24 V DC nominal 9 ... 30 VDC (PR-43 Refractometer)	24 V DC nominal 9 ... 30 VDC (PR53 Refractometer) 100 – 240 VAC, 15-35 VDC, PoE 26 W (INDIGO520 Transmitter)
Power consumption	Max 30 W (PR-23 System)	2 W (PR-43 Refractometer)	Less than 1 W (PR53 Refractometer) Max 5 W (INDIGO520 Transmitter)
ANALOG OUTPUTS			
mA	Sourcing, isolated, NAMUR NE 43, Conc, T	Sourcing, isolated, NAMUR NE 43, Conc	Sourcing, isolated, NAMUR NE 43, nD, nD raw, Conc, T, QF
mA range	3.8 ... 20.5 mA	3.8 ... 20.5 mA	3.8 ... 20.5 mA
DIGITAL OUTPUTS			
Digital outputs	10/100 Mbit/s Ethernet	10/100 Mbit/s Ethernet	RS-485, non-isolated
Supported protocol	UDP (ASCII) (port 50023) HTTP (port 80) Modbus/TCP, Modbus RTU and Ethernet/IP networks (through fieldbus converter)	UDP (ASCII) (port 50023) HTTP (port 80) Modbus/TCP, Modbus RTU and Ethernet/IP networks (through fieldbus converter)	Modbus RTU
Maximum cable length	30 m	30 m	300 m

CONNECTORS

External connectors	M16x1.5 cable gland	1 x M12 F 8 pins	1 x M12 F 4 pins (service port), 2 x M16x1.5 cable gland / Adapter for conduit entry M16x1.5 / NPT ½"
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INTERFACES

Service interface	DTR display Web UI (through Indicating Transmitter) Field Communicator FC-11	Web UI Field Communicator FC-11	Insight software INDIGO80 handheld HART (modem, handheld) Web UI, HTTPS port 8443 (through INDIGO520) INDIGO520 display
System interface	mA Ethernet	mA Ethernet	Modbus RTU mA HART (Release C) Modbus TCP/IP, port 502 (through INDIGO520)

RECIPE MANAGEMENT

Number of curves	4 chemical curves per DTR	One chemical curve	4 pre-configurable concentration models per refractometer
Recipe change	Recipe change by - Input switch	-	Recipe change by – Modbus RTU – Insight software – HART (Release) – INDIGO520 display – Modbus TCP/IP (through INDIGO520)

Technical comparison of Vaisala in-line Process Refractometer offering Transmitters



DTR / STR



INDIGO520

MECHANICAL SPECIFICATIONS

Display	320 x 240 pixel graphical LCD with LED backlight	Capacitive touchscreen display, strengthened (IK08) glass
Transmitter protection class	IP66, Nema 4X	IP66, Nema 4
Weight	4.5 kg (10 lbs)	1.5 kg (3.3 lbs)

INPUTS AND OUTPUTS

Power supply	AC power 100-240 VAC/50-60 Hz Optional 24 VDC	Protective extra-low voltage, 15...35 V DC, 24 VAC ± 20% AC power 100-240 VAC/50-60 Hz Power over Ethernet (PoE), no analog outputs or relays
Analog outputs	2 x 4...20 mA configurable outputs	4 x 4...20 mA, 0...1/5/10 V, configurable outputs
Analog input	-	1 x 4...20 mA input for third party measurements
Digital output	10/100 Mbit/s, data acquisition over UDP protocol	RS-485 Modbus TCP/IP
Relays	2 x SPDT, 250 VAC, 3 A	2 x SDPT, 30 W, 1 A, 40 VDC, 28 VAC
Input switches	Four switch inputs	-

CONNECTIVITY

	Dual Transmitter DTR: Supports one or two PR-23 refractometers Single Transmitter STR: Supports one PR-23 refractometer (used with the intrinsically safe sensors)	Supports one or two Vaisala Polaris process refractometers (or any other Vaisala Indigo-compatible probe for humidity, temperature, dew point, carbon dioxide, hydrogen peroxide and moisture in oil measurements)
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USER INTERFACES

User interfaces	Web interface for remote use Touchscreen display	Web interface for remote use Touchscreen display
Supported protocols	UDP (port 50023) HTTP (port 80) Modbus/TCP, Modbus RTU, Ethernet/IP networks (through Fieldbus converter)	Modbus TCP/IP (port 502) HTTPS (port 8443)
Prism wash control	Built-in, configurable, timer-based wash control	Built-in, configurable, timer-based wash control
Data logging	-	Measurement, diagnostic data, event log, trend view and report generation, 30 days historical data storing



OPERATING ENVIRONMENT		
Installation	Indoor	Indoor / Outdoor
Altitude	2000 m (6561.68 ft)	3000 m (9843 ft)
Temperature	Operating temperature 0 ... +50 °C (+32 ... +122 °F) Storage temperature -20 ... +60 °C (-4 ... +140 °F).	Operating temperature with display -20 ... +55 °C (-4 ... +131 °F) Storage temperature with display -30 ... +60 °C (-22 ... +158 °F)
Relative humidity	0 ... 100 %	0 ... 100 %

Technical comparison of Vaisala in-line Process Refractometer offering Sanitary Compact Process Refractometers



PR-23-AC



PR-33-AC



PR-43-AC



PR53AC

PROCESS PARAMETERS

Process temperature	–20 °C ... +130 °C (–4 °F ... +266 °F)	–40 °C ... +130 °C (–40 °F ... +266 °F)	–40 °C ... +130 °C (–40 °F ... +266 °F)	–40 °C ... +150 °C (–40 °F ... +302 °F)
Operating temperature	–20 °C ... +45 °C (–4 °F ... +113 °F)	–20 °C ... +45 °C (–4 °F ... +113 °F)	–40 °C ... +45 °C (–40 °F ... +113 °F)	–40 °C ... +60 °C (–40 °F ... +140 °F)
Design pressure	40 bar	40 bar	40 bar	40 bar

INSTALLATION

Process connection	Sanitary 3-A coupling 2.5 in Varinline® type N	Sanitary 3-A coupling 2.5 in Varinline® type N	Sanitary 3-A coupling 2.5 in Varinline® type N	Sanitary 3-A coupling 2.5 in Varinline® type N
Flowcells	AFC Elbow flow cell (1 - 4 in) Miniature flow cell (4-6 mm) Varinline® Type N (40-150mm)	AFC Elbow flow cell (1 – 4 in) Miniature flow cell (4-6 mm) Varinline® Type N (40-150mm)	AFC Elbow flow cell (1 - 4 in) Miniature flow cell (4-6 mm) Varinline® Type N (40-150mm)	SEFC Sanitary elbow flow cell (1 - 2.5 in) SEFC Sanitary elbow flow cell, reduced inlet (1 - 2.5 in) SEFLC Sanitary elbow flow cell for large pipelines (3 - 4 in) SMFC Sanitary miniature flow cell (4-6mm) Varinline® Type N (40-150mm)

MECHANICAL SPECIFICATIONS

Wetted parts	EN 1.4435 (AISI 316L) EN 2.4819 (Alloy C276)	EN 1.4435 (AISI 316L)	EN 1.4435 (AISI 316L)	EN 1.4435 (AISI 316L)
Surface roughness	Ra 0.8 µm Ra 0.38 µm	Ra 0.8 µm Ra 0.38 µm	Ra 0.8 µm Ra 0.38 µm	Ra 0.8 µm Ra 0.38 µm
Sensor housing	EN 1.4435 (AISI 316L) EN AW-6082 T6 Anodized aluminium	EN 1.4301 (AISI 304)	Cover EN 1.4404 (AISI 316L), End plate EN 1.4401 (AISI 316)	EN 1.4404 (AISI 316L)

SANITARY COMPLIANCE

Hygienic design	3-A Sanitary Standard 46-04 EHEDG	3-A Sanitary Standard 46-04 EHEDG	3-A Sanitary Standard 46-04 EHEDG	3-A Sanitary Standard 46-04 EHEDG
Compliance marks	3-A, EHEDG	3-A, EHEDG	3-A, EHEDG	3-A, EHEDG

Technical comparison of Vaisala in-line Process Refractometer offering

Sanitary Probe Process Refractometers



PR-23-AP



PR-43-AP



PR53AP

PROCESS PARAMETERS

Process temperature	–20 °C ... +150 °C (–4 °F ... +302 °F)	–40 °C ... +150 °C (–40 °F ... +302 °F)	–40 °C ... +150 °C (–40 °F ... +302 °F)
Operating temperature	–20 °C ... +45 °C (–4 °F ... +113 °F)	–40 °C ... +45 °C (–40 °F ... +113 °F)	–40 °C ... +60 °C (–40 °F ... +140 °F)
Design pressure	40 bar	40 bar	40 bar

INSTALLATION

Process connection, Insertion length	Sanitary 3-A coupling 2.5 in – 14, 42, or 170 mm MT4 DN25/1T APV tank bottom flange – 170 mm or flush mounted	Sanitary 3-A coupling 2.5 in – 14, 42, 140 or 170 mm Sanitary 3-A coupling 4 in – 66 or 170 mm MT4 DN25/1T APV tank bottom flange – 170 mm or flush mounted Varinline® Type N – 170 mm	Sanitary 3-A coupling 2.5 in – 42 or 170 mm Sanitary 3-A coupling 4 in – 66 or 170 mm Tank bottom flange – 170 mm or flush mounted
Flowcells	SFC Side flow cell (1 – 2.5 in)	SFC Side flow cell (1 – 2.5 in)	SFC Side flow cell (1 – 2.5 in)

MECHANICAL SPECIFICATIONS

Wetted parts	EN 1.4404 (AISI 316L)	EN 1.4404 (AISI 316L)	EN 1.4435 (AISI 316L)
Surface roughness	Ra 0.8 µm	Ra 0.8 µm	Ra 0.8 µm
Sensor housing	1.4404 (AISI 316L) EN AW-6082 T6 Anodized aluminium	Cover EN 1.4404 (AISI 316L), End plate EN 1.4401 (AISI 316)	1.4404 (AISI 316L)

SANITARY COMPLIANCE

Hygienic design	3-A 46-04 EHEDG	3-A 46-04 EHEDG	3-A 46-04 EHEDG
Compliance marks	3-A, EHEDG	3-A, EHEDG	3-A, EHEDG

Technical comparison of Vaisala in-line Process Refractometer offering

Compact Process Refractometers



PR-23-GC



PR-43-GC



PR53GC

PROCESS PARAMETERS

Process temperature	–20 °C ... +130 °C (–4 °F ... +302 °F)	–40 °C ... +150 °C (–40 °F ... +302 °F)	–40 °C ... +150 °C (–40 °F ... +302 °F)
Operating temperature	–40 °C ... +45 °C (–40 °F ... +113 °F)	–40 °C ... +45 °C (–40 °F ... +113 °F)	–40 °C ... +60 °C (–40 °F ... +140 °F)
Design pressure	25 bar	40 bar	40 bar

INSTALLATION

Process connection	Sandvik type L coupling 76.1 mm	Sandvik type L coupling 60.3 mm Sandvik type L coupling 76.1 mm	Sandvik type L coupling 60.3 mm
Flowcells	Wafer flow cell (½, 1, 1.5 in) Pipe flow cell (1 in)	Wafer flow cell (½, 1, 1.5 in) Pipe flow cell (1 in)	Wafer flow cell (½, 1, 1.5 in) (Release B)

MECHANICAL SPECIFICATIONS

Wetted parts	EN 1.4404 (AISI 316L) EN 2.4660 (Alloy 20) EN 2.4819 (Alloy C276)	1.4404 (AISI 316L) EN 2.4819 (Alloy C276)	EN 1.4404 (AISI 316L) EN 2.4660 (Alloy 20) EN 2.4819 (Alloy C276)
Sensor housing	EN 1.4404 (AISI 316L)	Cover EN 1.4404 (AISI 316L), End plate EN 1.4401 (AISI 316)	EN 1.4404 (AISI 316L)

Technical comparison of Vaisala in-line Process Refractometer offering

Probe Process Refractometers



PR-23-GP



PR-43-GP



PR53GP

PROCESS PARAMETERS

Process temperature	–40 °C ... +150 °C (–40 °F ... +302 °F)	–40 °C ... +150 °C (–40 °F ... +302 °F)	–40 °C ... +150 °C (–40 °F ... +302 °F)
Operating temperature	–40 °C ... +45 °C (–40 °F ... +113 °F)	–40 °C ... +45 °C (–40 °F ... +113 °F)	–40 °C ... +60 °C (–40 °F ... +140 °F)
Design pressure	40 bar (subject to process coupling specification)	40 bar (subject to process coupling specification)	40 bar (subject to process coupling specification)

INSTALLATION

Process connection, Insertion length	ANSI flange 3 in – 130 mm DIN flange DN80 – 130 mm JIS flange 80A – 130 mm Sandvik type L coupling 88.9 mm – 130 mm	ANSI flange 2, 3 in – 110 mm (2 in), 130 mm (3 in) DIN flange DN50, DN80 – 110 mm (DN50), 130 mm (DN80) JIS flange 50A, 80A – 110 mm (50A), 130 mm (80A)	ANSI flange 2, 3 in – 110 mm (2 in), 130 mm (3 in) DIN flange DN50, DN80 – 110 mm (DN50), 130 mm (DN80) JIS flange 50A, 80A – 110 mm (50A), 130 mm (80A) Sandvik type L coupling 88.9 mm – 130 mm
Flowcells	PFC-23GP Pipe flow cell (1, 1.5, 2 in)	PFC-23GP Pipe flow cell (1, 1.5, 2 in)	PFC-23GP Pipe flow cell (1, 1.5, 2 in)

MECHANICAL SPECIFICATIONS

Wetted parts	EN 1.4404 (AISI 316L)	EN 1.4404 (AISI 316L)	EN 1.4404 (AISI 316L)
Sensor housing	EN 1.4404 (AISI 316L) EN AW-6082 T6 Anodized aluminium	Cover EN 1.4404 (AISI 316L), End plate EN 1.4401 (AISI 316)	EN 1.4404 (AISI 316L)

Technical comparison of Vaisala in-line Process Refractometer offering

Process Refractometers for Aggressive Mediums



PR-23-M / PR-23-MS

PROCESS PARAMETERS

Process temperature	–20 °C ... +130 °C (–4 °F ... +266 °F)	–10 °C ... +130 °C (+14 °F ... +266 °F)
Operating temperature	–20 °C ... +45 °C (–4 °F ... +113 °F)	–40 °C ... +60 °C (–40 °F ... +140 °F)
Design pressure	10 bar	10 bar

INSTALLATION

Process connection (flowcell integrally mounted to sensor)	G thread ½ in NPT thread ½ in	Tube connection NPT ½ in Flare fitting ½ in Pillar fitting ½ in
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MECHANICAL SPECIFICATIONS

Wetted parts	PTFE (Polytetrafluoroethylene) Kynar (Polyvinylidene fluoride)	PTFE (Polytetrafluoroethylene)
Sensor housing	EN 1.4404 (AISI 316L) Epoxy coated stainless steel EN 1.4404 (AISI 316L)	EN 1.4404 (AISI 316L) Teflon coated stainless steel EN 1.4404 (AISI 316L)



PR53M

Technical comparison of Vaisala in-line Process Refractometer offering

Valve Body Refractometers



PR-23-W



PR53W

PROCESS PARAMETERS

Process temperature	-20 °C ... +130 °C (-4 °F ... +266 °F)	-10 °C ... +160 °C (+14 °F ... +320 °F)
Operating temperature	-20 °C ... +45 °C (-4 °F ... +113 °F)	-40 °C ... +60 °C (-40 °F ... +140 °F)
Design pressure	10 bar	16 bar

INSTALLATION

Process connection	ANSI flange 2, 3, 4 in DIN flange DN50, DN80, DN100	ANSI flange 1, 2 in DIN flange DN25, DN50 JIS flange 25A, 50A
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MECHANICAL SPECIFICATIONS

Wetted parts	Valve body lining: ETFE (Ethylene tetrafluoroethylene) Valve body gasket: PTFE (Polytetrafluoroethylene)	Valve body lining: ETFE (Ethylene tetrafluoroethylene) Valve body gasket: PTFE (Polytetrafluoroethylene)
Sensor housing	EN 1.4404 (AISI 316L)	EN 1.4404 (AISI 316L)
Valve body	Cast iron	Cast iron

Technical comparison of Vaisala in-line Process Refractometer offering

Safe Drive Retractable Process Refractometers



PR-23-SD



PR53SD

PROCESS PARAMETERS

Process temperature	-20 °C ... +180 °C (-4 °F ... +350 °F)	- 40 °C ... +170 °C (-40 °F ... +338 °F)
Operating temperature	-20 °C ... +45 °C (-4 °F ... +113 °F)	-40 °C ... +60 °C (-40 °F ... +140 °F)
Pressure	Maximum operating pressure 20 Maximum retraction pressure 10 bar	Maximum operating pressure 35 bar Maximum retraction pressure 35 bar

INSTALLATION

Process connection	Flange 1.5 in 150 lbs for SAFE-DRIVE® SDI2 isolation valve	Flange 1.5 in 150 lbs for SAFE-DRIVE® SDI5 isolation valve
Isolation valve process connection	By welding to pipe sizes of 2"-24", for both vertical and horizontal pipelines	By welding to pipe sizes of 2"-24", for both vertical and horizontal pipelines (Retrofittable to existing SDI2-23 welding flanges)

MECHANICAL SPECIFICATIONS

Wetted parts	EN 1.4462, SAF 2205 / Duplex steel SS 2377	EN 1.4462, SAF 2205 / Duplex steel SS 2377
Sensor housing	EN 1.4404 (AISI 316L) EN AW-6082 T6 Anodized aluminium	EN 1.4404 (AISI 316L)