

OPTISWITCH 4000/5000

Technical Datasheet

Vibration level switches for liquids

- Operates up to 250°C / 480°F and 64 bar / 925 psi
- Pump dry-run detection
- High reliability due to permanent fault monitoring function

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Universal liquid level switches

OPTISWITCH 4000/5000 series is a level sensor that uses a vibrating fork for detecting level. It is designed for use in all liquids. It is not affected by foam and external vibration. It is also unaffected by variations of product properties such as ε_r, viscosity etc.



1 OPTISWITCH 4000
2 OPTISWITCH 5100
3 OPTISWITCH 5200

Highlights

- Output options: relay, transistor, NAMUR, contactless electronic switch and 2-wire
- 5000 series: Plastic, aluminium or stainless steel housings
- LED signal lamp for indicating the switching condition (with plastic housing only)
- 5000 series: Large choice of materials for wetted parts. This includes 316L, Hastelloy C4, enamel, ECTFE and PFA.
- 5000 series. Probe length: 53...6000 mm / 2...236"
- Repeatability: +/-2 mm
- Thread connections G/NPT ¾; flange sizes from DN25 PN40; Triclamp 1" or 2" and other hygienic fittings

Industries

- Chemicals
- Food & Beverage
- Water & Wastewater
- Oil & Gas

Applications

- Reactors
- Hygienic and sanitary applications
- Process and storage tanks for liquids
- Dry-run and overfill protection

Features and Options



OPTISWITCH 4000 - The economical version

- Simple and robust measuring system, virtually unaffected by the chemical and physical properties of liquids
- Easily mountable in pipelines from DN 25, vessels and tanks
- Outputs: contactless electronic switch or transistor



OPTISWITCH 5100, 5150 - The compact version

- Standard or HT version, large array of process fittings, housings and electronics
- Outputs: relay, transistor, 2wire, NAMUR or contactless electronic switch
- Process connection option for high temperature up to 250°C / 482°F
- With all relevant approvals (ATEX etc.)
- Version OPTISWITCH 5150 with polished tuning fork e.g. for food processing



OPTISWITCH 5200, 5250 - The special version with probe extension

- Standard or HT version, large array of process fittings, housings and electronics
- Probe length up to 6000 mm / 236"
- Outputs: relay, transistor, 2wire, NAMUR or contactless electronic switch
- Process connection option for high temperature up to 250°C / 482°F
- With all relevant approvals (ATEX etc.)
- Version OPTISWITCH 5150 with polished tuning fork e.g. for food processing

Technical data

OPTISWITCH 4000 C

Function

Measurement parameter	Level detection of liquids

Measurement accuracy

Hysteresis	Approx. 2 mm / 0.08" with vertical installation
Integration time	Approx. 500 ms
Frequency	Approx. 1200 Hz

Operating conditions

Temperature	
Ambient temperature on housing	-40…+70°C / -40…+158°F
Storage and transport temperature	-40…+80°C / -40…+176°F
Process temperature	
Standard	-40…+100°C / -40…+212°F
High temperature version (optional)	-40…+150°C / -40…+302°F
Temperature shock	No limitation
Process pressure	-1…64 bar / -14.5…928 psi
Viscosity (dynamic)	0.1...10.000 mPa s (requirement: with SG=1)
Density	>0.7 g/cm^2 / >0.025 lbs/in^2

Materials

Wetted parts	
Process fitting – thread	316L
Gaskets	Klingersil C-4400
Vibrating element	316L
Non-wetted parts	
Housing	316L and plastic PEI
Surface quality	
Standard	Ra = approx. 3.2 µm / 1.26^{-4}"
Hygienic version	Ra < 0.8 µm / 3.15^{-5}"

Process connection

Thread	G¾ A; ¾ NPT; G1 A; 1 NPT
Hygienic fittings	Bolting DN 25 PN 40; bolting DN 40 PN 40; Tri-Clamp 1"; Tri-Clamp 1½"; SMS

Power Supply

Transistor output	
Supply voltage	10…55 VDC
Power consumption	Max. 0.5 W
Contactless electronic switch	
Supply voltage	20…253 VAC, 50/60 Hz, 20…253 VDC
Power consumption	Approx. 3 mA (via load circuit)
Operating elements	
Control lamp	Illuminated lens for indication of the switching condition.
Mode adjustment	Min./max. adjustment through electrical connection
Electromechanical data	
Plug connection	1x plug M12x1 or 1x plug DIN 43650
Screwed terminals	For wire cross-section up to 1.5 mm²

Output

Transistor output	Floating transistor output, overload and permanently shortcircuit-proof
Load current	Max. 250 mA
Voltage loss	Max. 1 V
Turn-on voltage	Max. 55 VDC
Blocking current	<10 µA
Modes (adjustable)	Min. / max.
Delay time	When immersed: approx. 0.5 s; when uncovered: approx. 1 s
Contactless electronic switch	Contactless electronic switch
Modes (adjustable)	Min. / max.
Delay time	When immersed: approx. 0.5 s; when uncovered: approx. 1 s

Approvals

Protection category	
Valve plug	IP 65
Valve plug with IDC method of termination	IP 67
M12x1 plug connection (only with transistor output)	IP 66/IP 67
Overvoltage category	III
Protection class	
Transistor output	II
Contactless electronic switch	I
CE conformity	
EMC (89/336/EEC)	Emission EN 61326: 1997 (class B), immunity EN 61326: 1997/A1: 1998
LVD (73/23/EEC)	EN 61010-1: 2001
SIL conformity	OPTISWITCH fulfills the requirements of functional safety according to IEC 61508.

OPTISWITCH 5000 C series

Function

Measurement parameter	Level detection of liquids

Design

Sensor length	
OPTISWITCH 5100 C, 5150 C	See chapter "Dimensions".
OPTISWITCH 5200 C, 5250 C	
316L, 2.4610 (Hastelloy C4)	80...6000 mm / 3...236"
2.4610 (Hastelloy C4) enamelled	80...1500 mm / 3...59"
1.4435 (316L) ECTFE coated	80...3000 mm / 3...118"
1.4435 (316L) PFA coated	80...3000 mm / 3...118"

Measurement accuracy

Hysteresis	Approx. 2 mm / 0.08" with vertical installation
Integration time	Approx. 500 ms
Frequency	Approx. 1200 Hz

Operating conditions

Temperature	
Ambient temperature on housing	-40…+70°C / -40…+158°F
Storage and transport temperature	-40…+80°C / -40…+176°F
Process temperature	
316L / Hastelloy C4 (2.4610)	-50…+150°C / -58…+302°F
Process temperature with temperature adapter	Option
316L / Hastelloy C4 (2.4610)	-50…+250°C / -58…+482°F
enamelled	-50…+200°C / -58…+392°F
with ECTFE coating	-50…+150°C / -58…+302°F
with PFA coating	-50…+150°C / -58…+302°F
Temperature shock	No limitation
Process pressure	-1…64 bar / -14.5…928 psi
Viscosity (dynamic)	0.1...10.000 mPa s (requirement: with SG=1)
Density	0.7...2.5 g/cm^2 / 0.025...0.09 lbs/in^2; 0.5...2.5 g/cm^2 / 0.018...0.09 lbs/in^2 by switching over

Materials

Wetted parts	
Process fitting – thread	316L; 2.4602 (Hastelloy C4)
Process fitting – flange	316L; 316L with Hastelloy C4 coating; steel enamelled; 316L with ECTFE coating; 316L with PFA coating
Gaskets	Klingersil C-4400
Tuning fork	316L / 2.4610 (Hastelloy C4)
Extension tube ø21.3 mm / ø0.84"	316L; 2.4610 (Hastelloy C4); 2.4610 (Hastelloy C4) enamelled; 316L with ECTFE coating; 316L with PFA coating
Non-wetted parts	
Housing	Plastic PBT (Polyester), Alu-die casting powder-coated, 316L
Gasket ring between housing and housing cover	NBR (stainless steel housing), silicone (Alu / plastic housing)
Peephole in housing cover	PMMA (Makrolon)
Ground terminal	316L
Temperature adapter (Option)	316L
Gastight leadthrough (Option)	316L / glass
Surface quality	
Standard (OPTISWITCH 5100 C, 5200 C)	Ra = approx. 3.2 µm / 1.26-4"
Hygienic version (OPTISWITCH 5150 C, 5250 C)	Ra < 0.8 µm / 3.15-5"
Coatings	
ECTFE	Approx. 0.5…0.8 mm / 0.02…0.03"
PFA	Approx. 0.3…0.5 mm / 0.01…0.02"
Enamel	Approx. 0.8 mm / 0.03"

Process connection

Thread	G¾ A; ¾ NPT; G1 A; 1 NPT
Flanges	DIN: ≥DN25; ANSI: ≥1"
Hygienic fittings (OPTISWITCH 5150 C, 5250 C)	Bolting DN 40 PN 40; Tri-Clamp 1"; Tri-Clamp 1½" PN 10; cone DN 25 PN 40; Tuchenhagen Varivent DN 50 PN 10

Power Supply

Relay output	
Supply voltage	20…253 VAC, 50/60 Hz, 20…72 VDC (at U >60 VDC, the ambient temperature can be max. 50°C / 122°F)
Power consumption	1…8 VA (AC); ca. 1.3 W (DC)
Transistor output	
Supply voltage	10…55 VDC
Power consumption	Max. 0.5 W
Contactless electronic switch	
Supply voltage	20…253 VAC, 50/60 Hz, 20…253 VDC
Power consumption	Approx. 3 mA (via load circuit)

Two-wire output	
Supply voltage	10…36 VDC (via the signal conditioning instrument)
NAMUR output	
Supply voltage (standard characteristics)	For connection to amplifier according to NAMUR IEC 60947-5-6, approx. 8.2 V
Open-circuit voltage	U_0 approx. 8.2 V
Shortcircuit current	I_U approx. 8.2 mA
Operating elements	
Control lamp	Control lamp (LED) for indication of the switching condition.
Density switch (electronics versions: relay, transistor, contactless electronic switch, two-wire, NAMUR outputs)	
0.5	0.5...2.5 g/cm^2 / 0.018...0.9 oz/in^2
0.7	0.7...2.5 g/cm^2 / 0.025...0.9 oz/in^2
Mode switch (electronics versions: relay output, transistor output, contactless electronic switch)	
A	Max. detection or overfill protection
B	Min. detection or dry run protection
Characteristics reversal (electronics version: NAMUR output)	
Max.	Falling characteristics (Low current when immersed)
Min.	Rising characteristics (High current when immersed)
Electromechanical data	
Cable entry/plug (dependent on the version) - Single chamber housing	1x cable entry M20x1.5 (cable ø5…9 mm), 1x blind stopper M20x1.5; attached 1x cable entry M20x1.5 or 1x cable entry ½ NPT, 1x blind stopper ½ NPT, 1x cable entry ½ NPT
Screwed terminals	For wire cross-section up to 1.5 mm²

Output

Relay output	Relay output (DPDT), 2 floating spdts
Turn-on voltage	Min.: 10 mV; max.: 253 VAC/DC
Switching current	Min.: 10 µA; max.: 5 A AC, 1 A DC
Breaking capacity	Max.: 1250 VA, 50 W
Contact material (relay contacts)	AgCdO and Au plated
Modes (adjustable)	Min. / max.
Delay time	When immersed: approx. 0.5 s; when uncovered: approx. 1 s
Transistor output	Floating transistor output, overload and permanently shortcircuit proof
Load current	Max. 400 mA
Voltage loss	Max. 1 V
Turn-on voltage	Max. 55 VDC
Blocking current	<10 µA
Modes (adjustable)	Min. / max.
Delay time	When immersed: approx. 0.5 s; when uncovered: approx. 1 s
Contactless electronic switch	Contactless electronic switch
Modes (adjustable)	Min. / max.
Delay time	When immersed: approx. 0.5 s; when uncovered: approx. 1 s

Two-wire output	
Suitable signal conditioning instruments	SU 501
Output signal	
Min. mode	Vibrating element uncovered: 16 mA ±1 mA; vibrating element covered: 8 mA ±1 mA
Max. mode	Vibrating element uncovered: 8 mA ±1 mA; vibrating element covered: 16 mA ±1 mA
Fault signal	<2 mA
Modes (adjustable)	Min. / max. (changeover with the signal conditioning instrument)
Delay time	When immersed: approx. 0.5 s; when uncovered: approx. 1 s
NAMUR output	Two-wire NAMUR output
Current consumption	
Falling characteristics	≥2.2 mA uncovered / ≤1 mA covered
Rising characteristics	≤1 mA uncovered / ≥2.2 mA covered
Fault signal	≤1 mA
Necessary processing system	NAMUR processing system according to IEC 60947-5-6 (EN 50227/DIN 19234)
Modes (NAMUR output adjustable to falling or rising characteristics)	Min.: rising characteristics (High current when immersed); max.: falling characteristics (Low current when immersed)

Approvals

ATEX	ATEX II 1G, 1/2G, 2G EEx ia IIC T6 ❶
	ATEX II 1/2G, 2G EEx d IIC T6 ❷
	ATEX II 1/2D IP6X T
Ship approval	GL & LR
WHG	German Federal Water Act ❸
Protection category	IP 66/IP 67
Overvoltage category	III
Protection class	
Transistor output, two-wire output, NAMUR output	II
Relay output, contactless electronic switch	I
CE conformity	
EMC (89/336/EEC)	Emission EN 61326/A1: 1998 (class B), susceptibility EN 61326: 1997/A1: 1998
LVD (73/23/EEC)	EN 61010-1: 1993
SIL conformity	OPTISWITCH fulfills the requirements of functional safety according to IEC 61508.

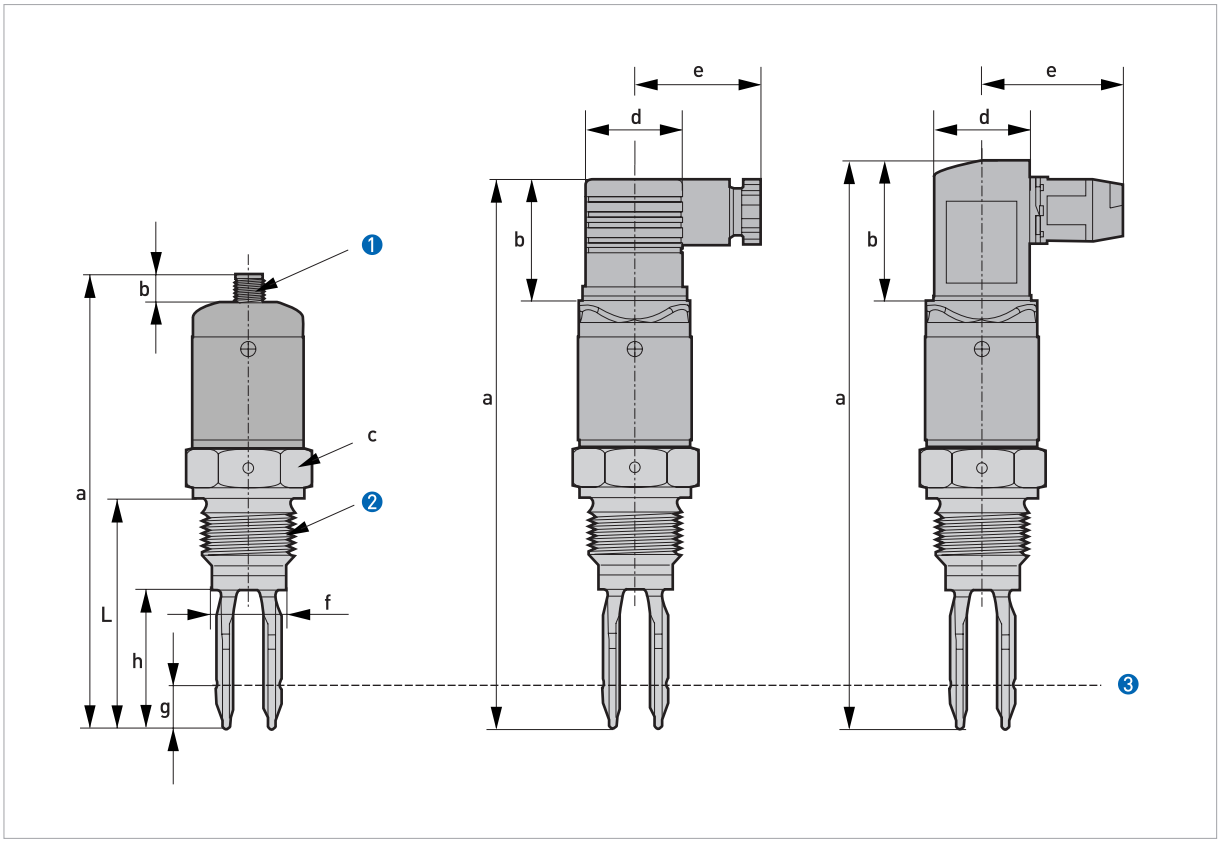
❶ this approval is for 2-wire and NAMUR electronics. It can be combined with either WHG or with ship approval.

❷ only for the plastic-coated aluminium housing with a ½ NPT cable gland. An optional temperature adapter can be used without a gas-tight bushing.

❸ only for contactless electronic switch, relay and transistor electronics.

Dimensions and Weights

OPTISWITCH 4000 - Standard version:
From left to right: thread (M12x1, valve plug DIN 43650 and valve plug DIN 43650 with IDC method of termination)



1 M12x1
2 Thread G¾ A, G1 A, ¾ NPT, 1 NPT
3 Switching point

Dimensions in mm

	a	b	c	d	e	f	g	h	L
	[mm]								
Thread G¾ A, G1 A, ¾ NPT or 1 NPT (M12x1)	132.5	10.0	WS 32	-	-	21.3	13.0	40.0	L ❶
Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650)	158.0	35.0	-	27.0	36.0	-	-	-	-
Thread G¾ A,G1 A, ¾ NPT or 1 NPT(valve plug DIN 43650 with IDC method of termination)	165.0	42.0	-	28.0	42.0	-	-	-	-

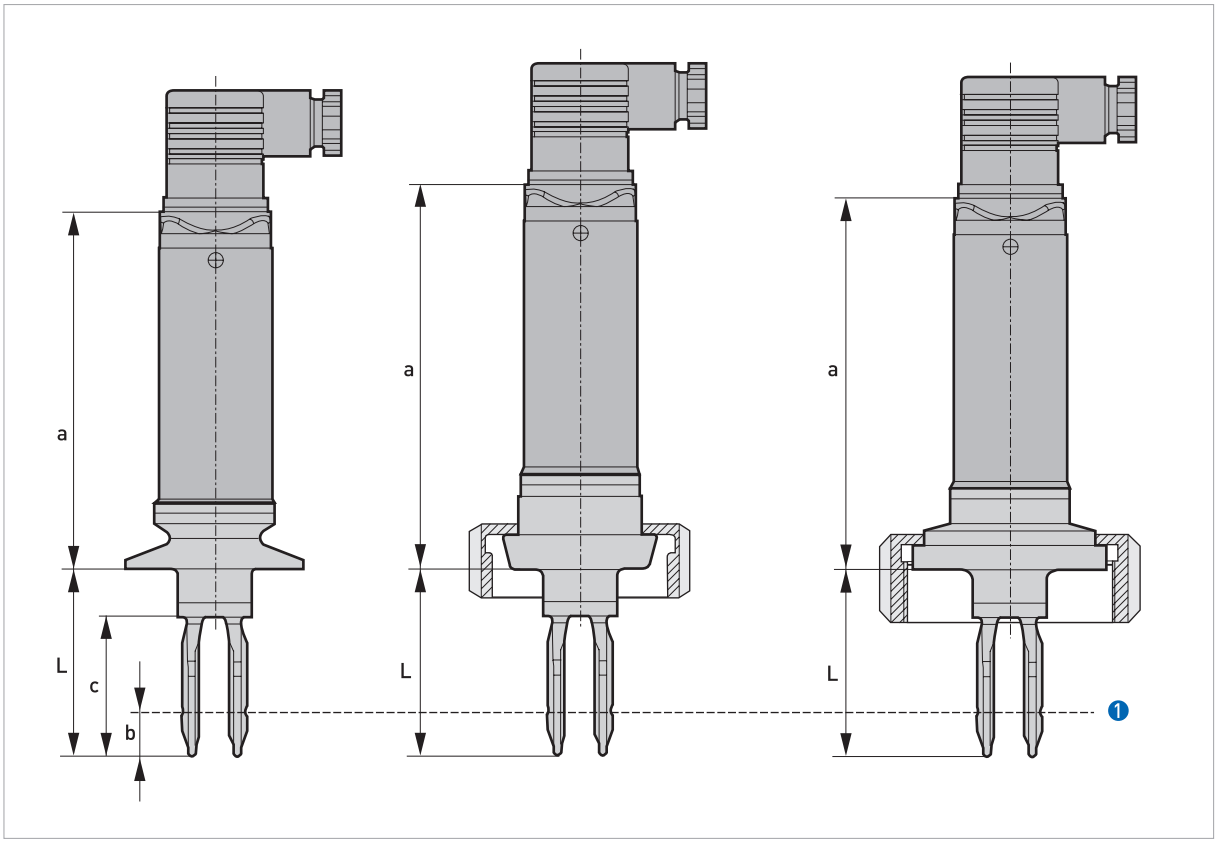
❶ with G¾ A, ¾ NPT: 66 mm; with G1 A, 1 NPT: 69 mm

Dimensions in inches

	a	b	c	d	e	f	g	h	L
	[inches]								
Thread G¾ A, G1 A, ¾ NPT or 1 NPT (M12x1)	5.22	0.39	WS 32	-	-	0.84	0.51	1.57	L ❶
Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650)	6.22	1.38	-	1.06	1.42	-	-	-	-
Thread G¾ A, G1 A, ¾ NPT or 1 NPT(valve plug DIN 43650 with IDC method of termination)	6.50	1.65	-	1.10	1.65	-	-	-	-

❶ with G¾ A, ¾ NPT: 2.6"; with G1 A, 1 NPT: 2.7"

OPTISWITCH 4000 - Hygienic version:
From left to right: Tri-Clamp (valve plug DIN 43650); Bolting (valve plug DIN 43650); SMS 1145 (valve plug DIN 43650)



1 Switching point

DImensions in mm

	a	b	c	L
	[mm]			
Tri-Clamp (valve plug DIN 43650)	101.0	13.0	40.0	L ❶
Bolting (valve plug DIN 43650)	115.0	-	-	L ❶
SMS 1145 (valve plug DIN 43650)	105.0	-	-	L ❶

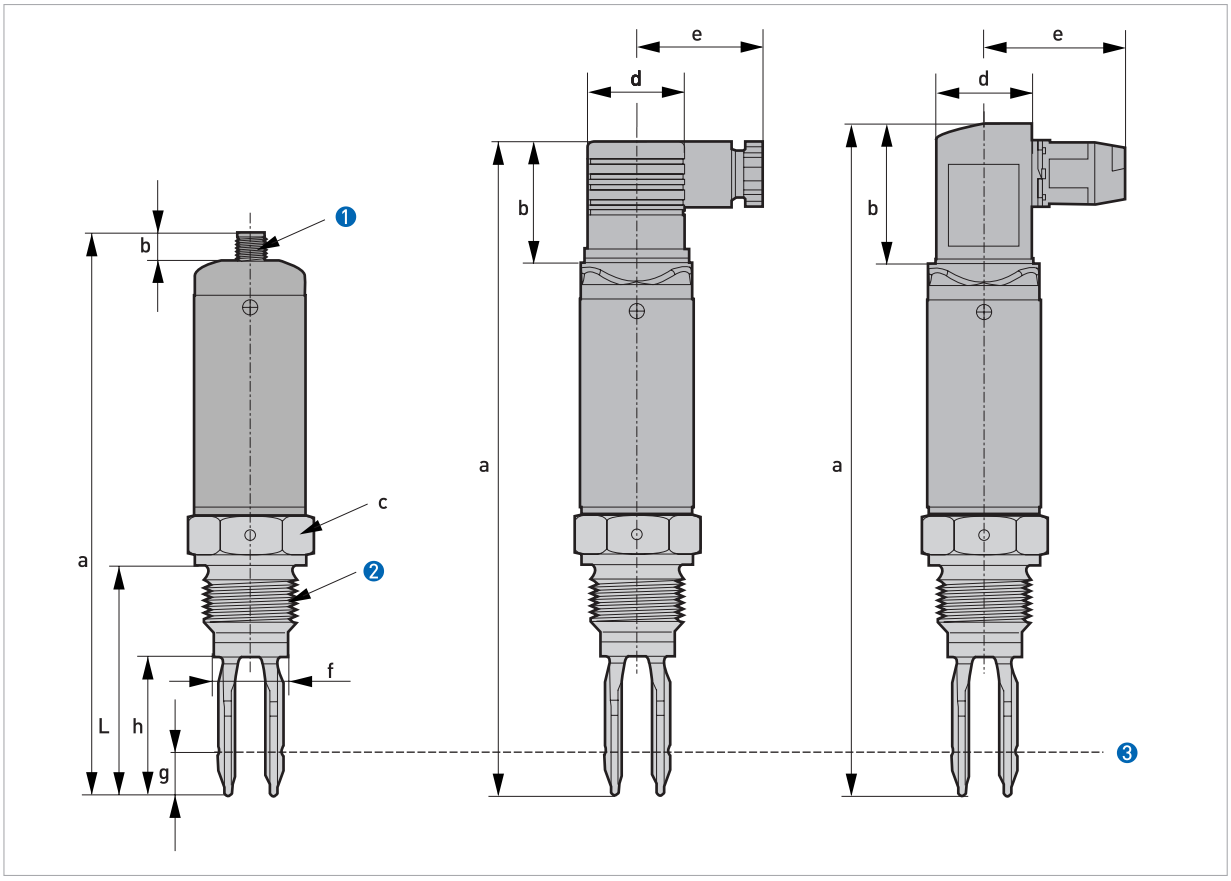
❶ 53 mm

Dimensions in inches

	a	b	c	L
	[inches]			
Tri-Clamp (valve plug DIN 43650)	3.98	0.51	1.57	L ❶
Bolting (valve plug DIN 43650)	3.53	-	-	L ❶
SMS 1145 (valve plug DIN 43650)	4.13	-	-	L ❶

❶ 2.1"

OPTISWITCH 4000 - High temperature version:
From left to right: thread (M12x1, valve plug DIN 43650 and valve plug DIN 43650 with IDC method of termination)



1. M12x1
2. Thread G¾ A, G1 A, ¾ NPT, 1 NPT
3. Switching point

Dimensions in mm

	a	b	c	d	e	f	g	h	L
	[mm]								
Thread G¾ A, G1 A, ¾ NPT or 1 NPT (M12x1)	162.5	10.0	WS 32	-	-	21.3	13.0	40.0	L ❶
Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650)	188.0	35.0	-	27.0	36.0	-	-	-	-
Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650 with IDC method of termination)	182.0	42.0	-	28.0	42.0	-	-	-	-

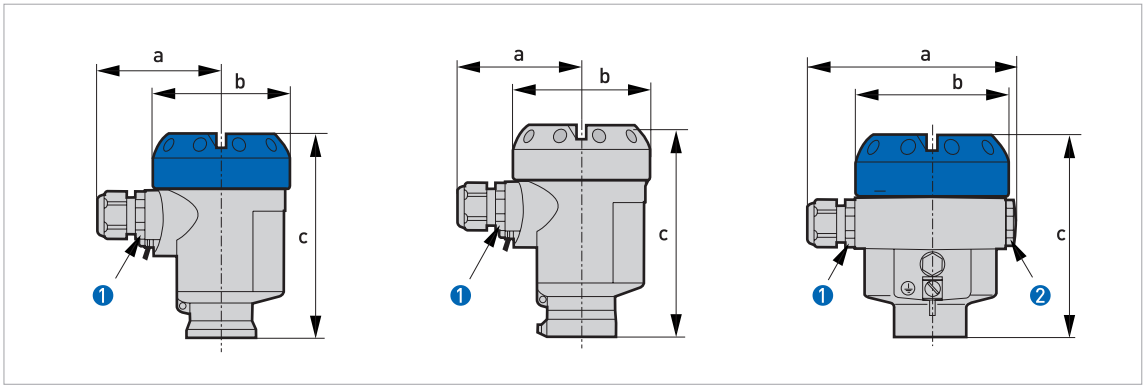
❶ with G¾ A, ¾ NPT: 66 mm; with G1 A, 1 NPT: 69 mm

Dimensions in inches

	a	b	c	d	e	f	g	h	L
	[inches]								
Thread G¾ A, G1 A, ¾ NPT or 1 NPT (M12x1)	6.40	0.39	WS 32	-	-	0.84	0.51	1.57	L ❶
Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650)	7.40	1.38	-	1.06	1.42	-	-	-	-
Thread G¾ A, G1 A, ¾ NPT or 1 NPT (valve plug DIN 43650 with IDC method of termination)	7.15	1.65	-	1.10	1.65	-	-	-	-

❶ with G¾ A, ¾ NPT: 2.6"; with G1 A, 1 NPT: 2.7"

OPTISWITCH 5000 series - Housing
From left to right: Plastic, Stainless steel and Aluminium housing

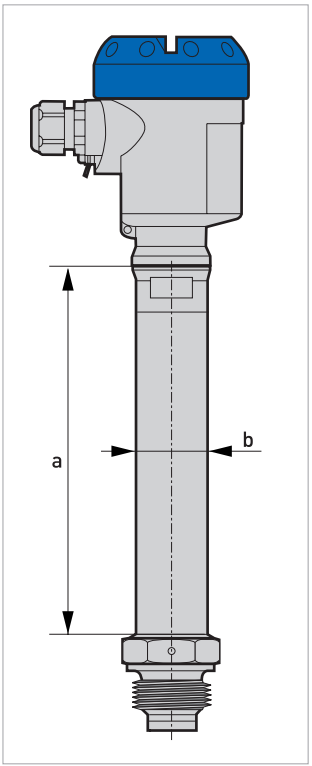


1 M20x1,5 / ½ NPT
2 M20x1,5

Dimensions and Weights

	Dimensions [mm]			Weight [kg]	Dimensions [inches]			Weight [lbs]
	a	b	c		a	b	c	
Plastic Housing	69	Ø77	112	0.76	2.72	Ø3.0	4.41	1.68
Stainless steel housing	69	Ø77	117	1.53	2.72	Ø3.0	4.61	3.37
Aluminium housing	116	84	114	1.17	4.57	3.31	4.49	2.58

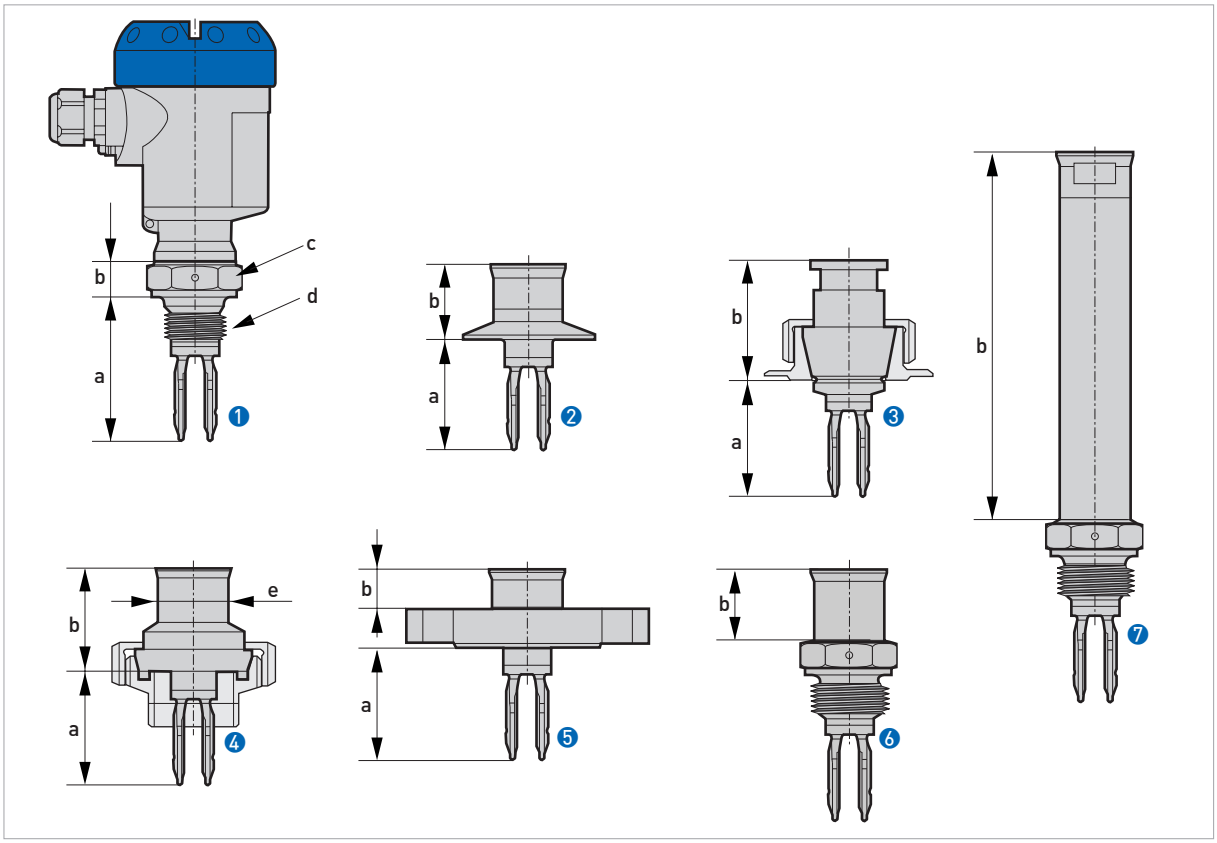
OPTISWITCH 5100 C, 5150 C, 5200 C, 5250 C - Temperature adapter



Dimensions in mm and inches

	a	b	a	b
	[mm]		[inches]	
Temperature adapter	178	Ø34	7	Ø1.34

OPTISWITCH 5100 C, 5150 C



1. Thread
2. Tri-Clamp (OPTISWITCH 5150)
3. Cone DN 25 (OPTISWITCH 5150)
4. Bolting DN 40 (OPTISWITCH 5150)
5. Flange
6. Gas-tight leadthrough
7. Temperature adapter

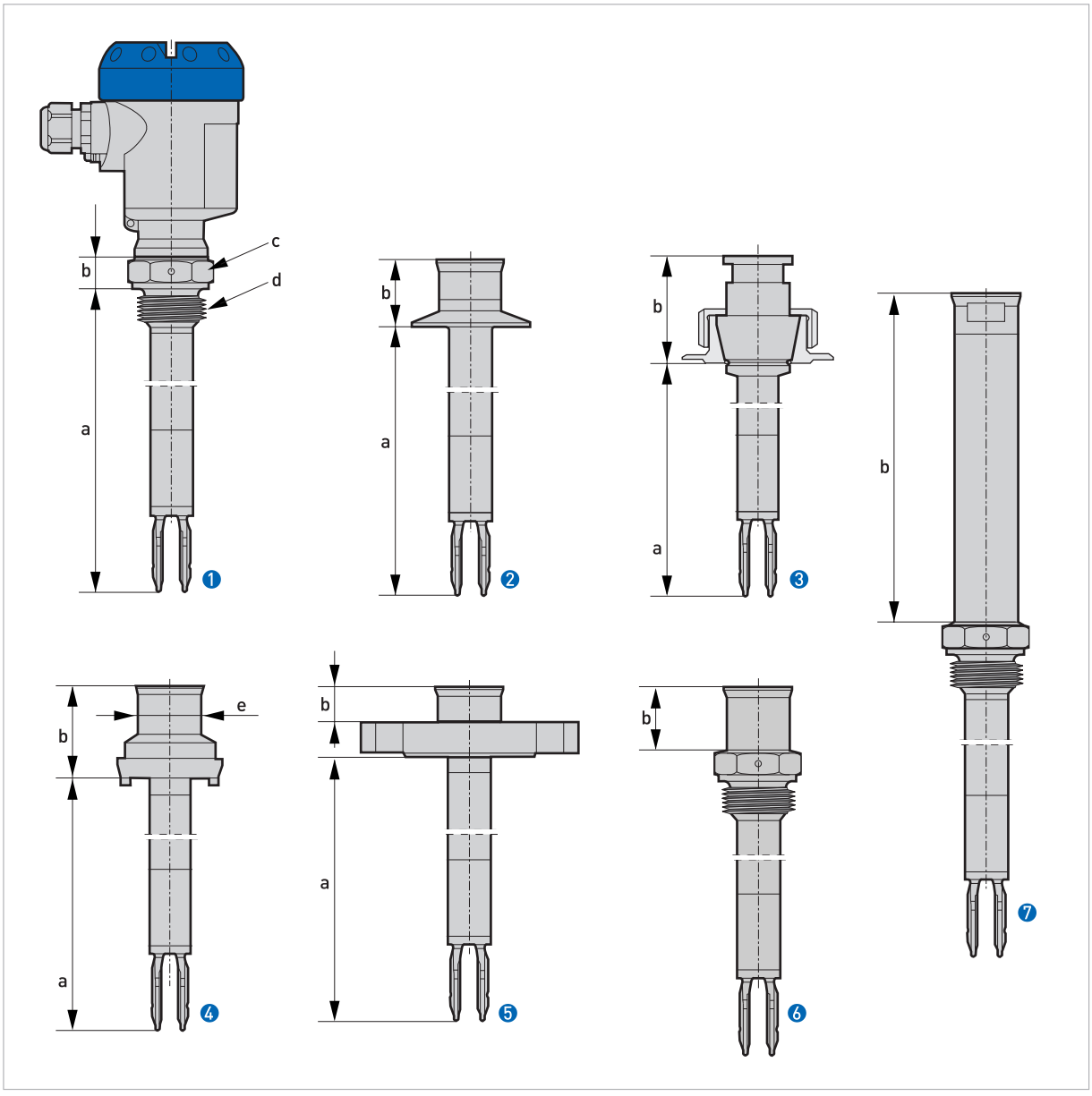
Dimensions in mm

	a	b	c	d
	[mm]			
Thread	66	18.5	WS 32 (G¾A; ¾ NPT); WS 41 (G1A; 1 NPT)	G¾A, ¾ NPT; G1A, 1 NPT
Tri-Clamp (OPTISWITCH 5150)	53	36	-	-
Cone DN 25 (OPTISWITCH 5150)	55	57	-	-
Bolting DN 40 (OPTISWITCH 5150)	53	50	Ø33.7	-
Flange	53	19	-	-
Gas-tight leadthrough	-	34	-	-
Temperature adapter	-	178	-	-

Dimensions in inches

	a	b	c	d
	[inches]			
Thread	2.6	0.72	WS 32 (G¾A; ¾ NPT); WS 41 (G1A; 1 NPT)	G¾A, ¾ NPT; G1A, 1 NPT
Tri-Clamp (OPTISWITCH 5150)	2.09	1.41	-	-
Cone DN 25 (OPTISWITCH 5150)	2.17	2.24	-	-
Bolting DN 40 (OPTISWITCH 5150)	2.09	1.97	Ø1.33	-
Flange	2.09	0.75	-	-
Gas-tight leadthrough	-	1.34	-	-
Temperature adapter	-	7.0	-	-

OPTISWITCH 5200 C, 5250 C



1. Thread
2. Tri-Clamp (OPTISWITCH 5250)
3. Cone DN 25 (OPTISWITCH 5250)
4. Bolting DN 40 (OPTISWITCH 5250)
5. Flange
6. Gas-tight leadthrough
7. Temperature adapter

Dimensions in mm

	a	b	c	d
	[mm]			
Thread	L ❶	18.5	WS 32 (G¾A; ¾ NPT); WS 41 (G1A; 1 NPT)	G3/4A, ¾ NPT; G1A, 1 NPT
Tri-Clamp (OPTISWITCH 5250)	L ❶	36	-	-
Cone DN 25 (OPTISWITCH 5250)	L ❶	57	-	-
Bolting DN 40 (OPTISWITCH 5250)	L ❶	50	Ø33.7	-
Flange	L ❶	19	-	-
Gas-tight leadthrough	-	34	-	-
Temperature adapter	-	178	-	-

❶ Ordered sensor length

Dimensions in inches

	a	b	c	d
	[inches]			
Thread	L ❶	0.72	WS 32 (G¾A; ¾ NPT); WS 41 (G1A; 1 NPT)	G¾A, ¾ NPT; G1A, 1 NPT
Tri-Clamp (OPTISWITCH 5250)	L ❶	1.41	-	-
Cone DN 25 (OPTISWITCH 5250)	L ❶	2.24	-	-
Bolting DN 40 (OPTISWITCH 5250)	L ❶	1.97	Ø1.33	-
Flange	L ❶	0.75	-	-
Gas-tight leadthrough	-	1.34	-	-
Temperature adapter	-	7.0	-	-

❶ Ordered sensor length

Notes

Notes

KROHNE Product Overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Mass flowmeters
- Ultrasonic flowmeters
- Vortex flowmeters
- Flow controllers
- Level measuring instruments
- Pressure gauges
- Temperature measuring instruments
- Water solutions & analysis
- Oil and gas turnkey solutions

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Instrumentation and control equipment catalog

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