Ultrasonic Flow Meter/ Monitor/Counter/Dosing Unit

measuring • monitoring • analysing

DUK



DUK with U-PACE electronics



Display rotatable in 90° steps



KofiCom Interface set

- Measuring range: 0.01 - 15 … 2.5 - 630 l/min
- Accuracy: 0.7 % of reading + 0.7 % of full scale
- Range span: at least 250
- p_{max}: 16 bar; t_{max}: 90 °C
- Connection: G ½ … G 3, ½" … 3" NPT female
- Material: brass or stainless steel 1.4408
- Analogue, frequency and switching outputs, compact electronic with digital display
- Additionally for option C3T0: Temperature measuring, bi-directional measurement, measuring of viscous media up to 68 mm²/s, IO-Link



Model: POD (optional electronics)



S5

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KOBOLD Messring GmbH
Nordring 22-24
D-65719 Hofheim/Ts.
Head Office:
+49(0)6192 299-0
+49(0)6192 23398
info.de@kobold.com
www.kobold.com

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Description

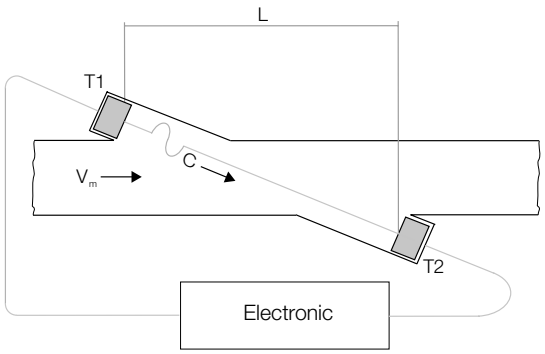
The new KOBOLD type DUK flow meters are used for the measurement, monitoring, metering and dosing of low viscosity fluids.

The devices work on the principle of the difference in running times. This is based on the fact that ultrasonic waves in a medium are influenced by the speed of flow.

Two sensors mounted opposite one another in the pipeline function simultaneously as transmitter and receiver of ultrasound signals.

If there is no flow, then the running times of both signals are identical. If the medium is flowing, then the running time of the signal against the flow is longer than that with the flow.

The running time difference, which is determined by a microprocessor, is proportional to the speed of flow.



The devices can be equipped with a switching output, a frequency output or an analogue output. In addition, a universal U-PACE electronics (Universal Precision and Control Electronics, order code C3T0) is available and features two outputs arbitrarily configurable by the customer.

The compact electronics offers various diagnostic functions and the following features:

- Flow- and temperature measurement
- Monitoring, dosing and transmitter function
- Dosing function with external control input
- Coloured, multi-parameter configurable TFT-display, rotatable in 90° steps
- Bidirectional measuring
- Intuitive setup menu via 4 optical touch keys
- 2 configurable outputs (pulse-/frequency-/alarm- and analogue output)
- Grand and resettable totaliser
- IO link function

Advantages

- High range span of at least 1:250
- Small pressure loss
- High repeat accuracy ± 0.1 % of full scale
- Independent from density and temperature

Areas of Application

- Machine building
- Automotive
- Robotic
- Cooling
- Hot water

Technical Details

Sensor

Measuring principle:	ultrasonic
Range:	see table
Medium:	water, various media
Viscosity:	All Media in „DUK Media Tables Overview“ within media temperature range (Additional media on request)
Sensor for temperature measurement:	PT1000 (only for option C3T0)
Accuracy flow*:	0.7 % of reading + 0.7 % of full scale (water/water-glycol ≤ 10 mm²/s) 1.5 % of reading + 0.7 % of full scale (> 10 mm²/s)
Accuracy temperature:	+/- 1°K (depending on ambient temperature)
Repeat accuracy:	±0.1 % of full scale
Mounting position:	in all directions, flow in direction of the arrow (horizontal: electronic on top or below)
In-/Outlet:	10 x DN
Media temperature:	-20 ... +90 °C
Ambient temperature:	-20 ... +70 °C

* Under reference conditions in standard flow direction

Reference conditions:
Medium: water;
Medium's and ambient temperature: 15 °C ... 30 °C, 1 bar,
connection pipe inside diameter ≥ 13 mm (for ½ "), ≥ 19 mm (for ¾ "),
≥ 26 mm (for 1 "), ≥ 39 mm (for 1½ "), ≥ 52 mm (for 2 "),
≥ 78 mm (for 3 ")
Flow in direction of the arrow marking

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Technical Details (continued)

Response time t90:	approx. 0.5...1 s at flow change >10 % FS (depending on electronic version)
Response time t90 temperature:	max. 30 s (flow > 1 m/s)
Pressure:	0 …16 bar
Pressure loss:	max. 150 mbar at full scale
Protection:	IP 65

Wetted Parts

Sensor housing:	brass or stainless steel 1.4408
Sensors:	PEEK
Seal:	NBR, FKM (EPDM on request)

Measuring Ranges and Weights

Model	Measuring range [l/min]	Size [G/NPT]	DUK-...S30x DUK-…F3xo DUK-...Lxx3	DUK-...C3T0
DUK-1xx3	0.01 - 15	½"	approx. 850 g	approx. 1050 g
DUK-1xx4	0.08 - 20	½"	approx. 850 g	approx. 1050 g
DUK-1xx5	0.16 - 40	¾"	approx. 1050 g	approx. 1250 g
DUK-1xx6	0.25 - 63	1"	approx. 1450 g	approx. 1650 g
DUK-1xx8	0.6 - 150	1½"	approx. 2350 g	approx. 2550 g
DUK-1xx9	1 - 250	2"	approx. 3800 g	approx. 4000 g
DUK-1xxB	2.5 - 630	3"	approx. 7100 g	approx. 7300 g

Electrical Details

DUK-...S300, DUK-...S30D

Display:	Duo-LED for switch status
Switching output (..S300):	relay SPDT max. 1 A/30 V_{DC}
Switching output (..S30D):	active 24 V_{DC}, N/C and N/O
Switch point:	10…90 % FS in 10 % - steps that can be configured by the customer using a rotary switch
Power supply:	24 V_{DC} ±20 %
Power consumption:	30 mA
Electrical connection:	plug M12, 5-pin
Meas. range overflow:	flash of the DUO-LED (red/green) from 105 % of full scale

DUK-...F300, DUK-…F390

Impulse output:	PNP, open collector, max. 200 mA
Frequency at F.S.:	500 Hz (…F300) 50…1000 Hz (…F390) proportional to flow rate
Power supply:	24 V_{DC} ±20 %
Power consumption:	25 mA
Electrical connection:	plug M12, 4-pin
Meas. range overflow:	F_{out} approx. 2 kHz from 105 % of full scale

DUK-...L303; DUK-...L343

Output:	0(4)-20 mA, 3-wire
Load:	max. 500 Ω
Power supply:	24 V_{DC} ±20 %
Power consumption:	max. 45 mA
Electrical connection:	plug M12x1
Meas. range overflow:	I_{out} approx. 20.5 mA from 103 % of full scale

DUK-...L443 (usage with AUF-3000)

Output:	4 - 20 mA, 3-wire
Load:	max. 500 Ω
Power supply:	24 V_{DC} ±20 %
Power consumption:	max. 45 mA
Electrical connection:	plug DIN 43650
Meas. range overflow:	I_{out} approx. 20.5 mA from 103 % of full scale

DUK-...C3T0 (U-PACE electronics)

Supply voltage:	19 - 30 V_{DC}, internal power consumption max. 200 mA
Display:	TFT display, 128 x 128 pixels, 1.4" display orientation in 90° steps adjustable
Display repetition rate:	0.5 ... 10 s, adjustable
Pulse output	Push-Pull, freely scalable, configurable for partial and accumulated totaliser
Frequency output	Push-Pull, freely scalable, 2 kHz @ overflow f_{min} @ FS = 50 Hz f_{max} @ FS = 1000 Hz

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Electrical Details (continued)

Alarm output:	NPN, PNP, Push-Pull, configurable max. 30 V_{DC}, max. 200 mA short-circuit proof
Analogue output:	active, 3 wire, 0(4)-20 mA, max. load 500 Ω or 0(2)-10 V_{DC}, (R_i = 500 Ω) (factory calibrated with R_L = 1 MΩ)
Control input:	active signal U_{high} max. 30 V_{DC} 0 <Low <10 V_{DC} 15 V_{DC} <High <Vs
Dosing function:	Dosing output OUT2: Push-Pull, High active Control input OUT1: START/STOP 0.5 s <t_{high} <4 s RESET t_{high} >5 s
Electrical connection:	plug M12x1, 4-pin

Shock resistance
DIN EN 60068-2-27:2010: 20 g (11 ms)
Vibration resistance
DIN EN 60068-2-6:2008: 5 g (10 … 2000 Hz)
Environmental testing
DIN EN 60068-2-30:2006: severity level b

Configuration of outputs

Output 1 (OUT1, PIN 4)	Output 2 (OUT2, PIN 2)
Analogue output 4-20 mA	Analogue output 4-20 mA
Analogue output 0-20 mA	Analogue output 0-20 mA
Analogue output 2-10 V	Analogue output 2-10 V
Analogue output 0-10 V	Analogue output 0-10 V
Switching output NPN/PNP/PP	Switching output NPN/PNP/PP
Pulse output PP	Pulse output PP
Frequency output PP	Frequency output PP
Communication mode KofiCom	
Communication mode IO-Link	
Control input	
Control input dosing function	Dosing output

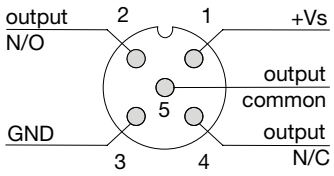
IO-Link specification

Manufacturer ID:	1105 (decimal), 0 x 0451 (hex)
Manufacturer name:	Kobold Messring GmbH
IO-Link specification:	V1.1
Bitrate:	COM3
Minimal cycle time:	1,1 ms
SIO-Mode:	yes (OUT1 in configuration IO-Link)
Block parameterisation:	yes
Operational readiness:	10 s
Max. cable length:	20 m

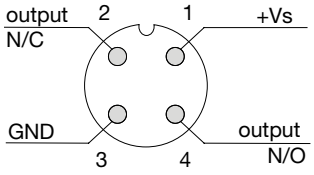
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Electrical Connection

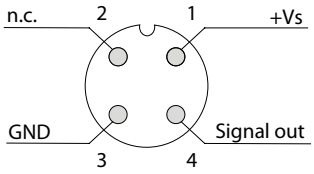
DUK-...S300



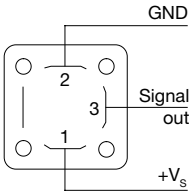
DUK-...S30D



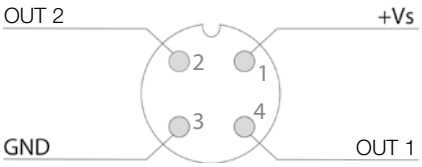
DUK-…F3x0, DUK-...L3x3



DUK-...L443



DUK-...C3T0



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Order Details (Example: **DUK-11 G4H S300 L**)

Housing material/ Sealing	Connection / Measuring range	Electronic	Flow direction	Options
DUK-11 [4] = brass/ NBR **DUK-32** [5] = stainless steel 1.4408/ FKM	**G3H** = G ½ female (meas. range 0.01 - 15 l/min) **G4H** = G ½ female (meas. range 0.08 - 20 l/min) **G5H** = G ¾ female (meas. range 0.16 - 40 l/min) **G6H** = G 1 female (meas. range 0.25 - 63 l/min) **G8H** = G 1½ female (meas. range 0.6 - 150 l/min) **G9H** = G 2 female (meas. range 1 - 250 l/min) **GBH** = G 3 female (meas. range 2.5 - 630 l/min) **N3G** = ½" NPT female (meas. range 0.16 - 240 GPH) **N4G** = ½" NPT female (meas. range 0.02 - 5 GPM) **N5G** = ¾" NPT female (meas. range 0.04 - 10 GPM) **N6G** = 1" NPT female (meas. range 0.06 - 16 GPM) **N8G** = 1½" NPT female (meas. range 0.16 - 40 GPM) **N9G** = 2" NPT female (meas. range 0.25 - 65 GPM) **NBG** = 3" NPT female (meas. range +-0.6 - 160 GPM)	**Switching output** **S300** = relay, M12-plug **S30D** = aktiv 24 V_{DC}, M12-plug **Frequency output** **F300** = M12-plug, 500 Hz **F390** = M12-plug, 50…1000 Hz **Analogue output** **L303** = M12-plug, 0-20 mA **L343** = M12-plug, 4-20 mA **L443** = DIN-plug, 4-20 mA	**L** = from left to right **R** = from right to left **T** = from top to bottom **B** = from bottom to top	without = without **Y** = special option (specify in clear text)
		U-PACE electronics **C3T0** [7] = compact, TFT display, 2 outputs (current/voltage/pulse/ frequency/alarm output/IO link configurable), M12x1 plug		**0** = without **A** [3] = incl. medium configuration **K** [6] = including calibration report

[2] While ordering please specify cable length in metres
[3] Medium configuration based on Media Data Base (see following page). **Ordering code ABG-DUK.**
NOTE: The standard factory configuration for DUK is always with "water".
[4] For FKM sealing, use model code **DUK-31.** For EPDM sealing, use model code **DUK-51.** Brass housing not available with connection code "3"
[5] For NBR-sealing, use model code **DUK-12.** For EPDM sealing, use model code **DUK-52.**
[6] Number of measuring points (standard): 5
[7] l/min-package (nameplate (l/min, °C, bar)), calibrated range and temperature °C
GPM-package (nameplate (GPM or GPH, °F, PSI)), calibrated range and temperature °F

Order Details for C3T0 Electronic Accessories

Model	Description	Image
KOFICOM-IFMU	PC-Interface Set (necessary for the use of „Software Mediator Tools") comprising: • KofiCom Interface • USB cable (length: 1 m) for connection PC <-> KofiCom Interface • M12 cable with plug + socket (length: 1 m each) for connecting of device	
Software MEDIATOR Tool	Windows software for exchanging of media tables when using viscous media except water (free download under https://www.kobold.com/qr/DUK)	–

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DUK Media Tables Overview [1) 2) 3)]

(excerpt only. Detailed media table is available in "MEDIATOR Tool" at https://www.kobold.com/qr/DUK)

Nr.	Filename	Infotext Display	Description
001	DUK_Water	001 DUK WATER	Water 100%
002	DUK_Water Glycol 20	002 DUK H2OGLY20	Water Glycol Mixture 20%
003	DUK_Water Glycol 34	003 DUK H2OGLY34	Water Glycol Mixture 34%
004	DUK_Water Glycol 39	004 DUK H2OGLY39	Water Glycol Mixture 39%
005	DUK_Water Glycol 52	005 DUK H20GLY52	Water Glycol Mixture 52%
006	DUK_Alkan Solvent	006 DUK ALKAN	Solvent/Alkan comparable to Exxsol D120, 4mm²/s@25°C"
007	DUK_Oil ISO VG 10 4	007 DUK OIL VG10	Mineral transmission Oil Shell ISO VG 10, 10mm²/s@40°C, for DUK Size "4" only
008	DUK_Oil ISO VG 10 5+	008 DUK OILVG10+	Mineral transmission Oil Shell ISO VG 10, 10mm²/s@40°C, for DUK Size "3"; "5" and greater only
009	DUK_Oil ISO VG 22 4	009 DUK OIL VG22	Mineral machine Oil Shell ISO VG 22, 22mm²/s@40°C, for DUK Size "4" only
010	DUK_Oil ISO VG 22 5+	010 DUK OILVG22+	Mineral machine Oil Shell ISO VG 22, 22mm²/s@40°C, for DUK Size "3"; "5" and greater only
011	DUK_Oil ISO VG 32 4	011 DUK OIL VG32	Mineral machine Oil Shell ISO VG 32, 32mm²/s@40°C, for DUK Size "4" only
012	DUK_Oil ISO VG 32 5+	012 DUK OILVG32+	Mineral machine Oil Shell ISO VG 32, 32mm²/s@40°C, for DUK Size "3"; "5" and greater only
013	DUK_Oil ISO VG 46 4	013 DUK OIL VG46	Mineral machine Oil Shell ISO VG 46, 46mm²/s@40°C, for DUK Size "4" only
014	DUK_Oil ISO VG 46 5+	014 DUK OILVG46+	Mineral machine Oil Shell ISO VG 46, 46mm²/s@40°C, for DUK Size "3"; "5" and greater only
015	DUK_Oil ISO VG 68 4	015 DUK OIL VG68	Mineral machine Oil Shell ISO VG 68, 68mm²/s@40°C, for DUK Size "4" only
016	DUK_Oil ISO VG 68 5+	016 DUK OILVG68+	Mineral machine Oil Shell ISO VG 68, 68mm²/s@40°C, for DUK Size "3"; "5" and greater only
017/1	DUK_Ethanol 4	017 DUK Ethanol	Ethanol, for DUK Size "4" only
017/2	DUK_Ethanol 5+	017 DUK Ethanol+	Ethanol, for DUK Size "3"; "5" and greater only
018	DUK_Fuel 100LL	018 DUK FUEL100L	Fuel (Airplanes) 100LL
019	DUK_Chloroform	019 DUK CHLOFORM	Chloroform
020	DUK_Aceton	020 DUK ACETON	Aceton
021	DUK_Anilin	021 DUK ANILIN	Anilin
022	not available		
023	DUK_Cyclohexane	023 DUK CYCLOHEX	Cyclohexane
024	DUK_Diesel EN590	024 DUK DIESEL	Diesel EN590
025	DUK_Acetic Acid 5%	025 DUK ACACID 5	Acetic Acid 5%
026	DUK_Acetic Acid 10%	026 DUK ACACID10	Acetic Acid 10%
027	DUK_Acetic Acid 20%	027 DUK ACACID20	Acetic Acid 20%
028	DUK_Ethylene Glycol	028 DUK ETHGLYC	Ethylene Glycol 100%
029	DUK_Glyzerine 4	029 DUK GLYCERIN	Glycerine, for DUK Size "4" only
030	DUK_Glyzerine 5+	030 DUK GLYCERIN	Glycerine, for DUK Size "3"; "5" and greater only
031	DUK_Methylacetate	031 DUK METHACET	Methylacetate
032	DUK_Hexane	032 DUK HEXANE	Hexane
033	DUK_n-Pentane	033 DUK PENTANE	n-Pentane
034	DUK_n-Octane	034 DUK OCTANE	n-Octane
035	DUK_Xylene	035 DUK XYLENE	O-Xyelne; O-Xylol; 1,2 Dimethylbenzol
036	DUK_Petroleum	036 DUK PETROLEU	Petroleum

(continued on next page)

DUK Media Tables Overview [1) 2) 3)] (continued)
(excerpt only. Detailed media table is available in "MEDIATOR Tool" at https://www.kobold.com/qr/DUK)

Nr.	Filename	Infotext Display	Description
037	DUK_Seawater	037 DUK SEAWAT	Seawater
038	DUK_Triglycerid	038 DUK TRIGLYC	Triglycerid
039	DUK_Corn Oil 4	039 DUK CORNOIL	Cornoil, for DUK Size "4" only
040	DUK_Corn Oil 5+	040 DUK CORNOIL	Cornoil, for DUK Size "3"; "5" and greater only
041	DUK_Palm Oil 4	041 DUK PALMOIL	Palmoil, for DUK Size "4" only
042	DUK_Palm Oil 5+	042 DUK PALMOIL	Palmoil, for DUK Size "3"; "5" and greater only
043	DUK_Rapeseed Oil	043 DUK RAPEOIL	Rapeseedoil
044	DUK_Olive Oil 4	044 DUK OLIVEOIL	Oliveoil, for DUK Size "4" only
045	DUK_Olive Oil 5+	045 DUK OLIVEOIL	Oliveoil, for DUK Size "3"; "5" and greater only
046	DUK_Carbontetrachloride	046 DUK CARCHL	Carbonetetrachloride
047	DUK_Benzene	047 DUK BENZENE	Benzene
048	DUK_Gasoline ROZ 95	048 DUK GAS 95	Gasoline ROZ 95
049	DUK_Gasoline ROZ 98	049 DUK GAS 98	Gasoline ROZ 98
050	DUK_Biodiesel EN14214	050 DUK BIODIE	Biodiesel SN EN 14214
051	DUK_Fuel Oil EL	051 DUK FUELOIL	Fuel Oil ExtraLight
052	DUK_Fuel Oil L	052 DUK FUELOIL	Fuel Oil Light
053	DUK_Methanol	053 DUK METHANOL	Methanol
054	DUK_Oil BOT291S 4	054 DUK BOT291S	Castrol BOT 291 S, for DUK Size "4" only
055	DUK_Oil BOT291S 5+	055 DUK BOT291S	Castrol BOT 291 S, for DUK Size "3"; "5" and greater only
056	DUK_Silicon Oil	056 DUK SilOil 1	Silicon Oil M80.055.03 range -20°C up to 50°C
057	DUK_Ethylen Glykol Kryo 30	057 DUK Kryo 30	Ethylene Glycol 75% Lauda Kryo 30
058	DUK_BOT2350	058 DUK BOT2350	Castrol BOT 2350
059	DUK_Afton ETF-000973-B-02 4	059 DUK ETF973B2	Afton ETF-000973-B-02, for DUK Size "4" only
060	DUK_Afton ETF-000973-B-02 5+	060 DUK ETF973B2	Afton ETF-000973-B-02, for DUK Size "3"; "5" and greater only
061	061 DUK_Shell GRP III 4	061 DUK GRP III	Shell GRP III, for DUK Size "4" only
062	062 DUK_Shell GRP III 5+	062 DUK GRP III	Shell GRP III, for DUK Size "3"; "5" and greater only
...	...	...	***... more media in "MEDIATOR Tool"***

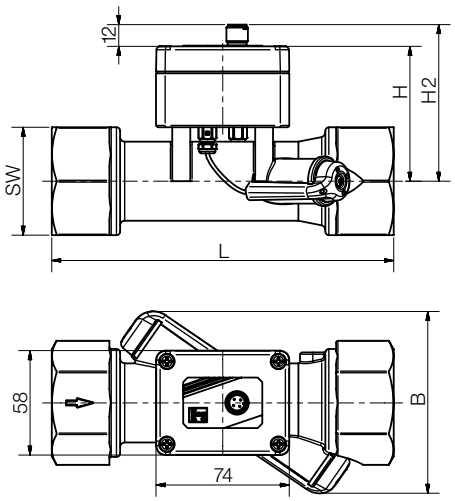
[1)] Operate the device with newtonian media below the boiling point only
[2)] Device has no ATEX approval
[3)] Material resistance has to be checked by customer

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Dimensions

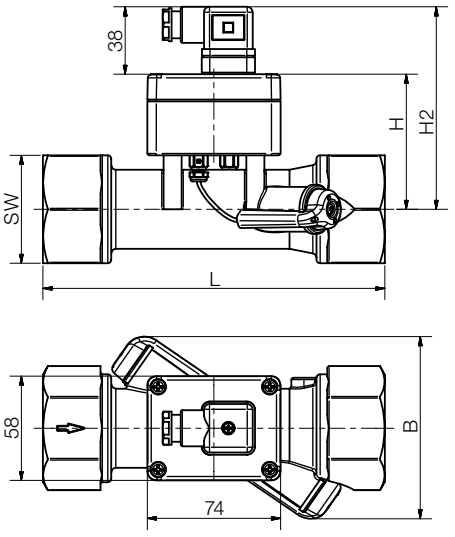
DUK-…S30x, DUK-…F3x0, DUK-…L3x3

Model	G/ NPT	SW [mm]	H [mm]	H2	L [mm]	B [mm]
DUK-xxx3	½"	30	63	101	130	100
DUK-xxx4	½"	30	63	75	114	85
DUK-xxx5	¾"	36	65	77	126,5	89
DUK-xxx6	1"	46	69	81	146	93
DUK-xxx8	1½"	60	75	87	190	103
DUK-xxx9	2"	76	80	92	238	114
DUK-xxxB	3"	105	90	102	306	135



DUK-…L443

Model	G/ NPT	SW [mm]	H [mm]	H2	L [mm]	B [mm]
DUK-xxx3	½"	30	63	101	130	100
DUK-xxx4	½"	30	63	101	114	85
DUK-xxx5	¾"	36	65	103	126.5	89
DUK-xxx6	1"	46	69	107	146	93
DUK-xxx8	1½"	60	75	113	190	103
DUK-xxx9	2"	76	80	118	238	114
DUK-xxxB	3"	105	90	128	306	135

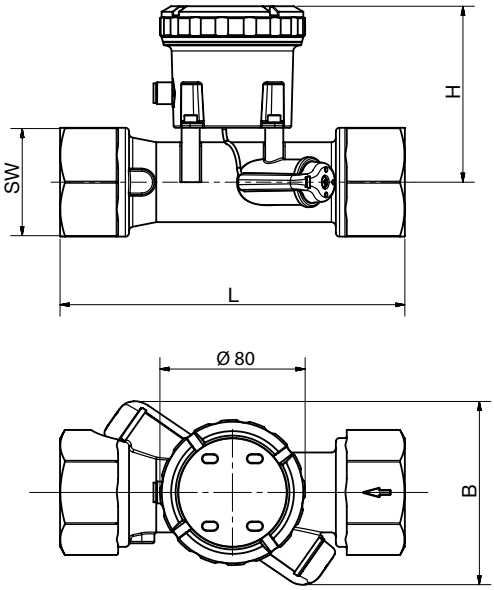


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Dimensions (continued)

DUK-…C3T0

Model	G/NPT	SW [mm]	H [mm]	L [mm]	B [mm]
DUK-xxx3	½"	30	85	130	100
DUK-xxx4	½"	30	85	114	85
DUK-xxx5	¾"	36	87	126.5	89
DUK-xxx6	1"	46	91	146	93
DUK-xxx8	1½"	60	97	190	103
DUK-xxx9	2"	76	102	238	114
DUK-xxxB	3"	105	112	306	135



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