

Compact Ultrasonic Flowmeter



measuring
•
monitoring
•
analyzing

DUK



DUK with U-PACE electronics



Display rotatable in 90° Increments



KofiCom Interface Set

 **IO-Link**



- Measuring Ranges:
0.16...240 GPH to 0.6...160 GPM
- Accuracy: $\pm 0.7\%$ of Reading + $\pm 0.7\%$ of F.S.
- Turndown Ratio: starting at 250:1
- $P_{\max}$: 230 PSI; $T_{\max}$: 194° F
- Connections: 1/2"...3" NPT or G Thread
- Material: Brass or 316 Stainless Steel
- Outputs: Analog, Frequency, Switching, Compact Electronics (C3T0) with Configurable Outputs and Digital Display
- Additionally for the C3T0: IO-Link, Temperature Measurement, Bi-Directional Flow Measurement, and media viscosity up to 68 cSt.



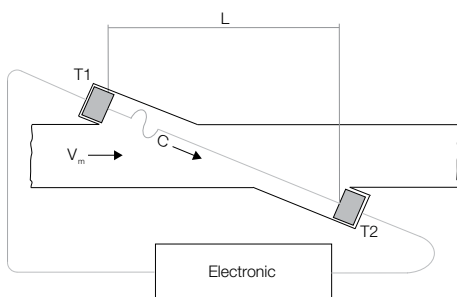
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KOBOLD Instruments, Inc.
1801 Parkway View Drive
Pittsburgh, PA 15205
Main Office:
1.800.998.1020
1.412.788.4890
info@koboldusa.com
www.koboldusa.com

Description

The KOBOLD model DUK flow meters are used for measuring, monitoring, metering, and batching of various liquids. They are highly repeatable, feature a small pressure loss, and offer measurement independent of density and temperature changes. The devices work on the principle of run time difference. Ultrasonic waves in the media are influenced by the rate of flow. Two sensors mounted opposite one another in the pipeline function simultaneously as transmitter and receiver of the ultrasonic signals. If there is no flow, the run times of both signals are identical. If the media is flowing, then the run time of the signal against the flow is longer than the signal with the flow. The run time difference, which is determined by a microprocessor, is proportional to the rate of flow.



The devices can be equipped with a switching output, a frequency output, or an analog output. In addition, the U-PACE electronic (Universal Precision and Control Electronics, order code C3T0) is available and features two outputs that can be configured arbitrarily by the user. The compact electronic offer various diagnostic functions and a wide array of other exceptional features:

Features

- Flow and Temperature Measurement
- Switching, Transmitting, and Batching Functions
- Batching Function with External Control Input
- Colored, Multi-Parameter Configurable TFT-display, rotatable in 90° steps
- Bi-Directional Flow Measurement
- Intuitive Setup Menu via 4 Optical Touch Keys
- 2 Configurable Outputs (Pulse/Frequency/Alarm/Analog Output)
- Grand and Resettable Totalizer
- IO Link Function

Advantages

- High Turndown Ratio starting at 250:1
- Small Pressure Loss
- High Repeatability of $\pm 0.1\%$ of Full Scale
- Independent from Density and Temperature

Areas of Application

- Machine Building
- Automotive
- Robotics
- Cooling
- Hot Water

Technical Details

Measuring Principle:	Ultrasonic
Range:	See Table
Media:	Water, Various Media
Viscosity:	Max. 3 cSt (Max. 68 cSt C3T0)
Accuracy¹⁾:	$\pm 0.7\%$ of Reading + $\pm 0.7\%$ of F.S. (Water/Water-Glycol < 10 cSt) $\pm 1.5\%$ of Reading + $\pm 0.7\%$ of F.S. (>10 cSt)
Repeatability:	$\pm 0.1\%$ of F.S.
Mounting Position:	Universal: Flow in Direction of the Arrow (Horizontal: Electronic on Top or Below)
Straight Piping:	10x Pipe Diameter In/Out
Media Temperature:	-4...194 °F
Ambient Temperature:	-4...158 °F
Response Time t_{90}:	Approx. 0.5...1s at flow change >10% of F.S. (Depending on Electronic Version)
Max Pressure:	230 PSI
Pressure Loss:	Max. 2.2 PSI at F.S.
Protection:	IP65
Wetted Parts	
Sensor Housing:	Brass or 316 Stainless Steel
Sensors:	PEEK
Seal:	NBR, FKM, EPDM
Temperature Measurement (C3T0)	
Sensor:	PT1000
Accuracy:	< ± 1.8 °F (Depending on Ambient Temperature)
Response Time Temp. t_{90} (Signal Output):	Max. 30 s (Flow > 1 m/s)

¹⁾ Reference Cond.: Media: 59...86°F, 14.5 PSI, Pipe Connection Internal Diameter $\geq$ Meter Connection Size, Flow in the Direction of the Arrow Marking

Measuring Ranges and Weights

Model	Measuring Range "G" (GPM)	Measuring Range "H" (LPM)	Size (NPT/G)	DUK-...S30x DUK-...F3x0 DUK-...Lx43	DUK-...C3T0
DUK-xxx3x	0.16...240 GPH	0.01...15	½	1.87 LB	2.31 LB
DUK-xxx4x	0.02...5	0.08...20	½	1.87 LB	2.31 LB
DUK-xxx5x	0.04...10	0.16...40	¾	2.31 LB	2.76 LB
DUK-xxx6x	0.06...16	0.25...63	1	3.20 LB	3.64 LB
DUK-xxx8x	0.16...40	0.6...150	1½	5.18 LB	5.62 LB
DUK-xxx9x	0.25...65	1...250	2	8.38 LB	8.81 LB
DUK-xxxBx	0.6...160	2.5...630	3	15.65 LB	16.09 LB

Electrical Specifications

DUK-...S300, DUK-...S30D (Switching Output)

Display: Bi-color LED for Switch Status
Switching Output (..S300): SPDT Relay, max. 1 A/30 V_{DC}
Switching Output (..S30D): Active 24 V_{DC}, N/C and N/O
Switch Point: 10...90% of f.s. in 10% Steps, Configurable by the Customer Using a Rotary Switch
Power Supply: 24 V_{DC} ± 20 %
Power Consumption: 30 mA
Electrical Connection: Plug M 12x1, 5-Pin
Max Range Overflow: Flashing Bi-color LED from 105% of full scale

DUK-...F300, DUK-...F390 (Frequency Output)

Pulse Output: PNP, Open Collector, max. 200 mA
Frequency at F.S.: 500 Hz (..F300)
 50 to 1000 Hz (..F390)
 User Specified
Power Supply: 24 V_{DC} ± 20 %
Power Consumption: 25 mA
Electrical Connection: Plug M 12x1, 4-Pin
Max. Range Overflow: Frequency output approx. 2 kHz from 105% of full scale

DUK-...L343 (Analog Output)

Analog Output: 4-20 mA, 3-wire
Load: Max. 500 Ω
Power Supply: 24 V_{DC} ± 20 %
Power Consumption: Max. 45 mA
Electrical Connection: Plug M 12x1, 4-Pin
Max. Range Overflow: I_{out} approx. 20.5 mA from 103% of full scale

DUK-...L443 (Analog Output; 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
Max. Range Overflow: I_{out} approx. 20.5 mA from 103% of full scale



Electrical Specifications (continued)

DUK...C3T0 (U-PACE Electronic)

Supply Voltage:	19-30 V _{DC} ; Internal Power Consumption max. 200 mA
Display:	TFT Display, 128x128 Pixels, 1.4" Display, Orientation Adjustable in 90° Increments
Display Repetition Rate:	0.5... 10 s, Adjustable
Pulse Output:	Push-Pull, Freely Scalable, Configurable for Partial and Accumulated Totalizer
Frequency Output:	Push-Pull, Fully Scalable, 2 kHz at Overflow 50... 1000 Hz at Full Scale, User Programmable
Alarm Output:	NPN, PNP, Push-Pull. Configurable Max 30 V _{DC} , Max. 200 mA Short-Circuit Proof
Analog Output:	Active, 3-wire, 4-20 mA, Max. Load 500 Ω or 0-10 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 < V _S
Batching Function:	Batching Output OUT2: Push-Pull, High Active Control Input OUT1: START/STOP 0.5s < t _{high} < 4s, RESET t _{high} > 5s
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

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 Parameterization:	Yes
Operational Readiness:	10 s
Max. Cable Length:	20 m

Configuration of Outputs (C3T0)

Output 1 (OUT1, PIN 4)	Output 2 (OUT2, PIN 2)
Analog Output 0-10 V _{DC}	Analog Output 0-10 V _{DC}
Analog Output 4-20 mA	Analog Output 4-20 mA
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

Order Details (Example: **DUK-11 N4 G S300 L**)

Note: Flow range determined by fitting size and can be referenced on the measuring range and weight table located on page 2

Housing/Sealing Material	Connection/GPM ¹⁾	Output / Electronic	Flow Direction	Options
DUK-11.. = Brass Housing, NBR Seals DUK-12.. = SS Housing, NBR Seals DUK-31.. = Brass Housing, FKM Seals DUK-32.. = SS Housing, FKM Seals DUK-51.. = Brass Housing, EPDM Seals DUK-52.. = SS Housing, EPDM Seals	..N3G⁴⁾.. = ½" NPT ..N4G.. = ½" NPT ..N5G⁴⁾.. = ¾" NPT ..N6G.. = 1" NPT ..N8G.. = 1½" NPT ..N9G.. = 2" NPT ..NBG.. = 3" NPT ..G3G⁴⁾.. = G ½ ..G4G.. = G ½ ..G5G.. = G ¾ ..G6G.. = G 1 ..G8G.. = G 1½ ..G9G.. = G 2 ..GBG.. = G 3	Switching Output ..S300.. = Relay, M12-Plug ..S30D.. = Active 24 V _{DC} , M12-Plug Frequency Output ..F300.. = M12-Plug, 500 Hz ..F390.. = M12-Plug, 50 to 1000 Hz (User Specified) Analog Output ..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 Electronic ..C3T0.. = Compact TFT Display, 2x Configurable Outputs (Current/Voltage/Pulse/Frequency/Alarm, IO-Link configurable), M12x1 Electrical Connection		..0 = without ..A²⁾ = Include Medium Configuration ..K³⁾ = Including Calibration Report
Accessories: P/N 807.037 = 4-Pin Micro-DC Connector with 6-foot Cable for Output Types F300, F390, L343, S30D, & C3T0 P/N 807.007 = 5-Pin Micro-DC Connector with 6-foot Cable for Output Types S300				

¹⁾ Standard as GPM package (GPH or GPM, °F, PSI), optional L/min package (L/min, °C, bar) (code DUK-...xxH... instead of DUK-...xxG...)

²⁾ Medium Configuration based on Media Database (see following page). **Ordering Code ABG-DUK**

Note: The standard factory configuration for the DUK is always water

³⁾ Number of measuring points (standard): 5, **Ordering Code DOK-F3-05**

⁴⁾ Brass housing not available.

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: 3 ft) for connection PC <-> KofiCom Interface • M12 cable with plug + socket (length: 3 ft 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)	-



Compact Ultrasonic Flowmeter Model DUK

DUK Media Tables Overview¹⁾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.para	001 DUK WATER	Water 100 %
002	DUK_Water-Glycol-20.para	002 DUK H2OGLY20	Water Glycol mixture 20 %
003	DUK_Water-Glycol-34.para	003 DUK H2OGLY34	Water Glycol mixture 34 %
004	DUK_Water-Glycol-39.para	004 DUK H2OGLY39	Water Glycol mixture 39 %
005	DUK_Water-Glycol-52.para	005 DUK H2OGLY52	Water Glycol mixture 52 %
006	DUK_Alkan_Solvent.para	006 DUK ALKAN	Solvent/Alkan comparable to Exxsol D120, 4 cSt at 77 °F
007	DUK_Oil ISO VG 10-4.para	007 DUK OIL VG10	Mineral transmission oil Shell ISO VG 10, 10 cSt at 104 °F, for DUK connection code ...4... only
008	DUK_Oil ISO VG10-5+.para	008 DUK OILVG10+	Mineral transmission oil Shell ISO VG 10, 10 cSt at 104 °F, for DUK connection code ...3...; for DUK connection code ...5... or greater
009	DUK_Oil ISO VG 22-4.para	009 DUK OIL VG22	Mineral machine oil Shell ISO VG 22, 22 cSt at 104 °F, for DUK connection code ...4... only
010	DUK_Oil ISO VG 22-5+.para	010 DUK OILVG22+	Mineral machine oil Shell ISO VG 22, 22 cSt at 104 °F, or DUK connection code ...3...; for DUK connection code ...5... or greater
011	DUK_Oil ISO VG 32-4.para	011 DUK OIL VG32	Mineral machine oil Shell ISO VG 32, 32 cSt at 104 °F, for DUK connection code ...4... only
012	DUK_Oil ISO VG 32-5+.para	012 DUK OILVG32+	Mineral machine oil Shell ISO VG 32, 32 cSt at 104 °F, or DUK connection code ...3...; for DUK connection code ...5... or greater
013	DUK_Oil ISO VG 46-4.para	013 DUK OIL VG46	Mineral machine oil Shell ISO VG 46, 46 cSt at 104 °F, for DUK connection code ...4... only
014	DUK_Oil ISO VG 46-5+.para	014 DUK MOR46 5+	Mineral machine oil Shell ISO VG 46, 46 cSt at 104 °F, or DUK connection code ...3...; for DUK connection code ...5... or greater
015	DUK_Oil ISO VG 68-4.para	015 DUK MOR68 4	Mineral machine oil Shell ISO VG 68, 68 cSt at 104 °F, for DUK connection code ...4... only
016	DUK_Oil ISO VG 68-5+.para	016 DUK MOR68 5+	Mineral machine oil Shell ISO VG 68, 68 cSt at 104 °F, or DUK connection code ...3...; for DUK connection code ...5... or greater
017/1	DUK_Ethanol 4.para	017 DUK Ethanol	Ethanol, for DUK connection code ...4... only
17/2	DUK_Ethanol 5+.para	017 DUK Ethanol+	Ethanol, for DUK connection code ...3...; for DUK connection code ...5... or greater
018	DUK_Fuel 100LL.para	018 DUK FUEL100L	Fuel (airplanes) 100LL
019	DUK_Chloroform.para	019 DUK CHLOFORM	Chloroform
020	DUK_Aceton.para	020 DUK ACETON	Acetone
021	DUK_Anilin.para	021 DUK ANILIN	Anilin
023	DUK_Cyclohexane.para	023 DUK CYCLOHEX	Cyclohexane
024	DUK_Diesel EN590.para	024 DUK DIESEL	Diesel EN590
025	DUK_Acetic_Acid 5%.para	025 DUK ACACID 5	Acetic Acid 5 %
026	DUK_Acetic Acid 10%.para	026 DUK ACACID10	Acetic Acid 10 %
027	DUK_Acetic Acid 20%.para	027 DUK ACACID20	Acetic Acid 20 %
028	DUK_Ethylene Glycol.para	028 DUK ETHGLYC	Ethylene Glycol 100 %
029	DUK_Glyzerine-4.para	029 DUK GLYCERIN	Glycerine, for DUK connection code ...4... only
030	DUK_Glyzerine-5+.para	030 DUK GLYCERIN	Glycerine, for DUK connection code ...3...; for DUK connection code ...5... or greater
031	DUK_Methylacetate.para	031 DUK METHACET	Methylacetate
032	DUK_Hexane.para	032 DUK HEXANE	Hexane
033	DUK_n-Pentane.para	033 DUK PENTANE	n-Pentane
034	DUK_n-Octane.para	034 DUK OCTANE	n-Octane
035	DUK_O-Xylene.para	035 DUK OXYLENE	O-Xylene; O-Xylol; 1,2 Dimethylbenzol
036	DUK_Petroleum.para	036 DUK PETROLEU	Petroleum
037	DUK_Seawater.para	037 DUK SEAWAT	Seawater
038	DUK_Triglycerid.para	038 DUK TRIGLYC	Triglyceride
039	DUK_Corn Oil 4.para	039 DUK CORNOIL	Cornoil, for DUK connection code ...4... only
040	DUK_Corn Oil 5+.para	040 DUK CORNOIL	Cornoil, for DUK connection code ...3...; for DUK connection code ...5... or greater
041	DUK_Palm Oil 4.para	041 DUK PALMOIL	Palmoil, for DUK connection code ...4... only
042	DUK_Palm Oil 5+.para	042 DUK PALMOIL	Palmoil, for DUK connection code ...3...; for DUK connection code ...5... or greater
043	DUK_Rapeseed Oil.para	043 DUK RAPEOIL	Rapeseedoil
044	DUK_Olive Oil 4.para	044 DUK OLIVEOIL	Oliveoil, for DUK connection code ...4... only
045	DUK_Olive Oil 5+.para	045 DUK OLIVEOIL	Oliveoil, for DUK connection code ...3...; for DUK connection code ...5... or greater
046	DUK_Carbondetrachloride	046 DUK CARCHL	Carbondetrachloride
047	DUK_Benzene	047 DUK BENZENE	Benzene
048	DUK_Gasoline ROZ 95	048 DUK GAS 95	Gasoline ROZ 95
049	DUK_Gasoline ROZ 98	048 DUK GAS 98	Gasoline ROZ 98
050	DUK_Biodiesel EN14214	049 DUK BIODIE	Biodisel SN EN 14214
051	DUK_Fuel Oil EL	051 DUK FUELOIL	Fuel Oil Extra Light
052	DUK_Fuel Oil L	052 DUK FUELOIL	Fuel Oil Light
...	...	...	... more media in "MEDIATOR Tool"

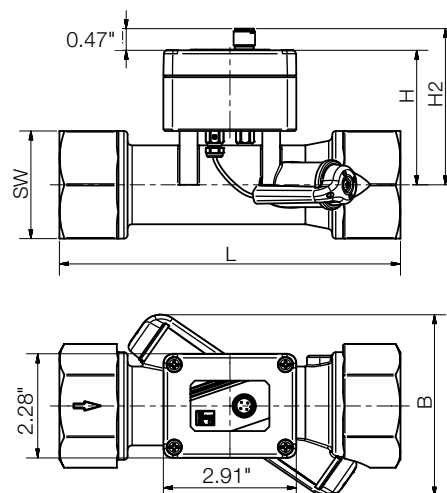
¹⁾ Operate with newtonian media below the boiling point only

²⁾ Devcie has no ATEX approval

³⁾ Material resistance to be checked by the user

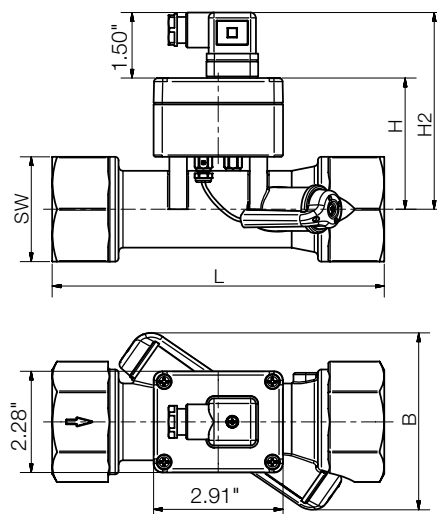
Dimensions: DUK-...S30x, DUK-...F3x0, DUK-...L343

Model	NPT/G	SW	H	H2	L	B
DUK-xxx3x	½	1.18"	2.48"	2.95"	5.12"	3.94"
DUK-xxx4x	½	1.18"	2.48"	2.95"	4.49"	3.35"
DUK-xxx5x	¾	1.42"	2.56"	3.03"	4.98"	3.50"
DUK-xxx6x	1	1.81"	2.72"	3.19"	5.75"	3.66"
DUK-xxx8x	1½	2.36"	2.95"	3.43"	7.48"	4.06"
DUK-xxx9x	2	2.99"	3.15"	3.62"	9.37"	4.49"
DUK-xxxBx	3	4.13"	3.54"	4.02"	12.05"	5.31"



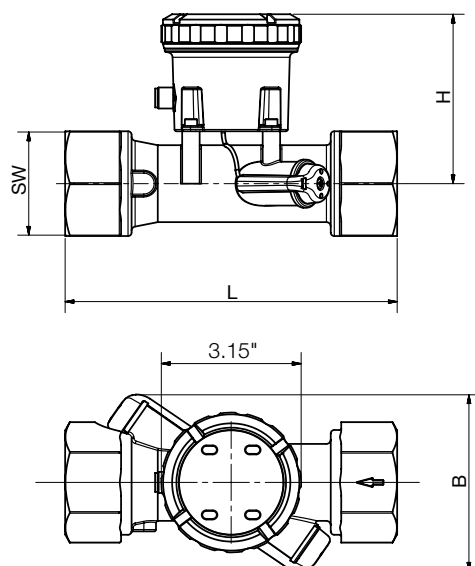
Dimensions: DUK-...L443

Model	NPT/G	SW	H	H2	L	B
DUK-xxx3x	½	1.18"	2.48"	3.98"	5.12"	3.94"
DUK-xxx4x	½	1.18"	2.48"	3.98"	4.49"	3.35"
DUK-xxx5x	¾	1.42"	2.56"	4.06"	4.98"	3.50"
DUK-xxx6x	1	1.81"	2.72"	4.21"	5.75"	3.66"
DUK-xxx8x	1½	2.36"	2.95"	4.45"	7.48"	4.06"
DUK-xxx9x	2	2.99"	3.15"	4.65"	9.37"	4.49"
DUK-xxxBx	3	4.13"	3.54"	5.04"	12.05"	5.31"



Dimensions: DUK-...C3T0

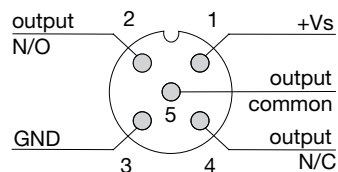
Model	NPT/G	SW	H	L	B
DUK-xxx3x	½	1.18"	3.35"	5.12"	3.94"
DUK-xxx4x	½"	1.18"	3.35"	4.49"	3.35"
DUK-xxx5x	¾"	1.42"	3.43"	4.98"	3.50"
DUK-xxx6x	1"	1.81"	3.58"	5.75"	3.66"
DUK-xxx8x	1½"	2.36"	3.82"	7.48"	4.06"
DUK-xxx9x	2"	2.99"	4.02"	9.37"	4.49"
DUK-xxxBx	3"	4.13"	4.41"	12.05"	5.31"



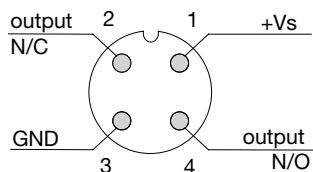


Electrical Connection

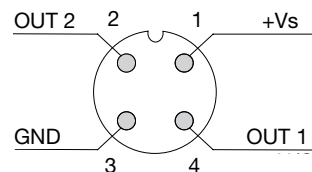
DUK-..S300



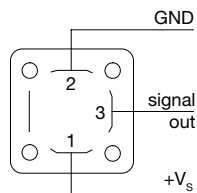
DUK-..S30D



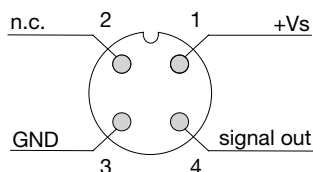
DUK-..C3T0



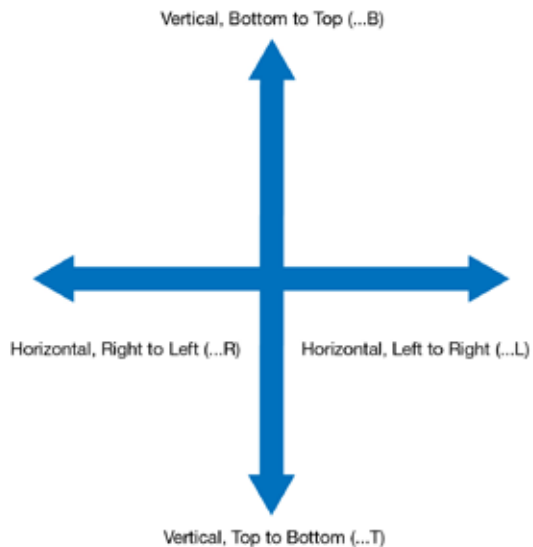
DUK-..L443



DUK-..F3x0, DUK-..L343



Flow Direction Diagram



Flow is in the direction of the arrow. Orientation is indicated as directly facing the flowmeter with flow direction aligned with the diagram. For horizontal flows, the display is specified on the top of the meter.

Example: Horizontal flow, left to right (...R)