

Flexim FLUXUS F631 Ultrasonic Flowmeter



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Transmitter

Technical data

FLUXUS F631	
	
design	portable
measurement	
measurement principle	transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content
flow direction	bidirectional
synchronised channel averaging	x
flow velocity	m/s 0.01...25
repeatability	0.15 % MV ± 0.005 m/s
fluid	all acoustically conductive liquids with < 10 % gaseous or solid content in volume (transit time difference principle)
temperature compensation	corresponding to the recommendations in ANSI/ASME MFC-5.1-2011
measurement uncertainty (volumetric flow rate)	
measurement uncertainty of the measuring system ¹	± 0.3 % MV ± 0.005 m/s
measurement uncertainty at the measuring point ²	± 1 % MV ± 0.005 m/s
transmitter	
power supply	100...240 V/50...60 Hz (power supply unit (IP40, 0...40 °C)) 10.5...13.5 V DC (socket at transmitter) - integrated battery - USB C
integrated battery	Li-Ion, 7.2 V/10 Ah, max. 72 Wh
• operating time	h without outputs, inputs and backlight, 1 measuring channel, ambient temperature > 10 °C - continuous measurement: > 25 h - low-power mode: max. 80 d
power consumption	W < 8 (with outputs, inputs and backlight), charging: 24
number of measuring channels	2
damping	s 0...100 (adjustable)
measuring cycle	Hz 100...1000 (1 channel)
response time	s 1 (1 channel), option: 0.02
housing material	glass-fiber reinforced polyamide
degree of protection	IP65/IP67
dimensions	mm see dimensional drawing
weight	kg 2.25
ambient temperature	°C -20...+60
place of installation	indoor, outdoor, wet environments
relative humidity of air	max. 95 %
height above sea level	m max. 2000
degree of pollution	3
display	240 x 128 pixels, backlight
menu language	English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian, Chinese
measuring functions	
physical quantities	volumetric flow rate, mass flow rate, flow velocity, thermal energy rate (if temperature inputs are installed)
totaliser	volume, mass, optional: thermal energy
calculation functions	average, difference, sum
diagnostic functions	sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times
communication interfaces	
service interfaces	measured value transmission, parametrisation of the transmitter: USB C (PC), USB A (USB stick)
process interfaces	Modbus RTU (optional)

¹ with aperture calibration of the transducers

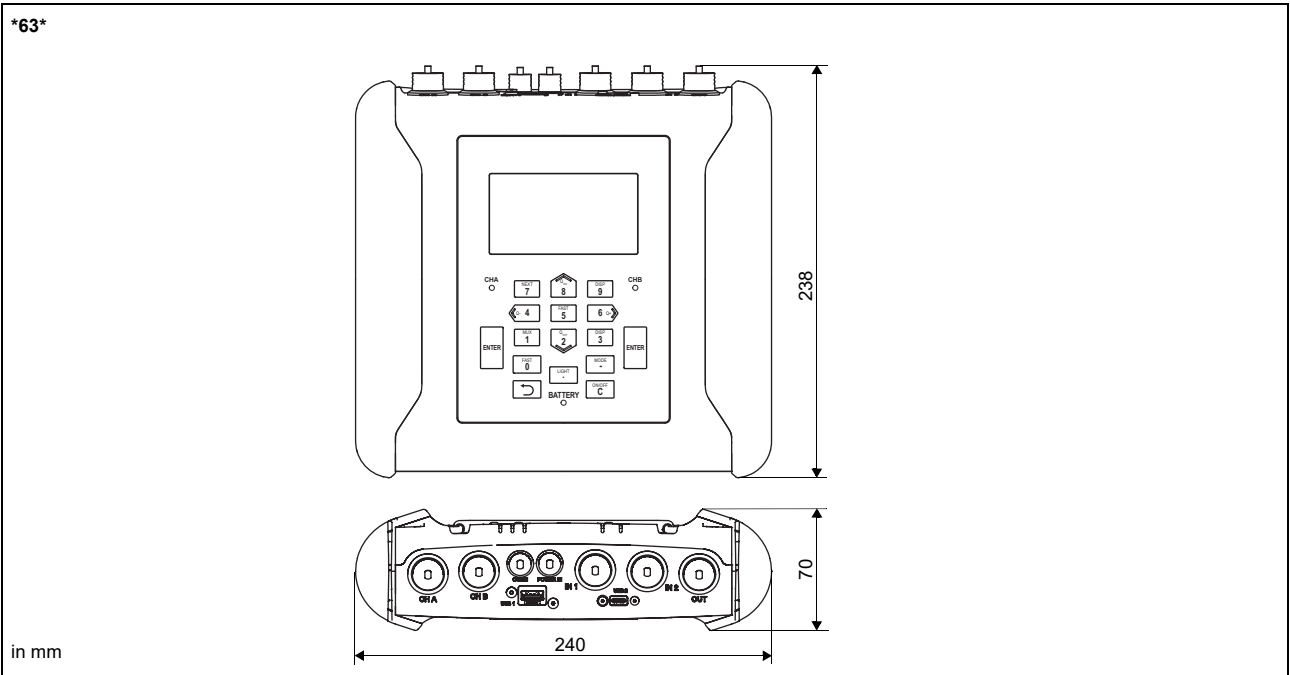
² for transit time difference principle and reference conditions

³ operating time extension using the power pack PP0026NN (optional, item number: 612060-6CE)

FLUXUS F631	
accessories	
data transmission kit	USB cable (USB C - USB A)
software	- FluxDiag Reader: reading of measured values and parameters, graphical representation - FluxDiag (optional): reading of measurement data, graphical representation, report generation, parametrisation of the transmitter
adapter	optional - output adapter AO61, AO62 - Modbus adapter AO63 - input adapter AI61, AI62
transport case	optional - without wheels dimensions: 538 x 406 x 211 mm - with wheels dimensions: 538 x 406 x 269 mm
data logger	
loggable values	all physical quantities, totalised physical quantities and diagnostic values
capacity	max. 800 000 measured values
outputs	
	The outputs are galvanically isolated from the transmitter.
	The max. voltage, both between the outputs and against the internal power supply of the transmitter, is 60 V DC (permanent).
• switchable current output	
number	2
	configurable according to NAMUR NE 43
	All switchable current outputs are jointly switched to active or passive.
range	mA 4...20 (alarm current: 3.2...3.99, 20.01...24, hardware fault current: 3.2)
uncertainty	0.04 % of output value $\pm 3 \mu\text{A}$
active output	$R_{\text{ext}} < 530 \Omega$, $U_{\text{opencircuit}} < 28 \text{ V DC}$
passive output	$U_{\text{ext}} = 9...30 \text{ V DC}$, depending on R_{ext} ($R_{\text{ext}} < 458 \Omega$ at 20 V)
• digital output	
number	2
functions	- frequency output - binary output - pulse output
type	open collector (passive)
operating parameters	OC30V/100mA 5...30 V, $I_{\text{max}} = 100 \text{ mA}$, $R_{\text{int}} = 20 \Omega$ Low: $U < 2 \text{ V}$ at $I_{\text{loop}} = 2 \text{ mA}$ ($R_{\text{ext}} = 12 \text{ k}\Omega$ at $U_{\text{ext}} = 24 \text{ V}$) High: $U > 15 \text{ V}$ ($R_{\text{ext}} = 12 \text{ k}\Omega$ at $U_{\text{ext}} = 24 \text{ V}$)
frequency output	
• range	kHz 0.002...10
• damping	s 0...999.9 (adjustable)
• pulse-to-pause ratio	1:1
binary output	
• binary output as alarm output	limit, change of flow direction or error
pulse output	
• pulse value	units 0.01...1000
• pulse width	ms 0.05...1000
• pulse rate	max. 10 000 pulses
inputs	
	The inputs are galvanically isolated from the transmitter.
number	- max. 4 temperature inputs or 2 temperature inputs and 2 current inputs (see also standard scope of supply)
• temperature input	
type	Pt100/Pt1000
connection	4-wire
range	$^{\circ}\text{C}$ -150...+560
resolution	K 0.01
accuracy	$\pm 0.01 \text{ \% MV} \pm 0.03 \text{ K}$ at 18...28 $^{\circ}\text{C}$ $\pm 0.01 \text{ \% MV} \pm 0.03 \text{ K} \pm 0.0005 \text{ \% / K}$ at $< 18 \text{ }^{\circ}\text{C} / > 28 \text{ }^{\circ}\text{C}$
cable resistance	Ω max. 1000
• switchable current input	
	All switchable current inputs are jointly switched to active or passive.
accuracy	$\pm 0.1 \text{ \% MV} \pm 0.01 \text{ mA}$ at 18...28 $^{\circ}\text{C}$ $\pm 0.1 \text{ \% MV} \pm 0.01 \text{ mA} \pm 0.005 \text{ \% / K}$ at $< 18 \text{ }^{\circ}\text{C} / > 28 \text{ }^{\circ}\text{C}$
resolution	μA 0.1
active input	$R_{\text{int}} = 75 \Omega$, $I_{\text{max}} \leq 30 \text{ mA}$ $U_{\text{opencircuit}} = 28 \text{ V}$ (open circuit) $U_{\text{min}} = 21.4 \text{ V}$ at 20 mA
• range	mA 0...20
passive input	$U_{\text{ext}} = 24 \text{ V}$, $R_{\text{int}} = 35 \Omega$, $I_{\text{max}} \leq 24 \text{ mA}$
• range	mA 0...20

¹ with aperture calibration of the transducers² for transit time difference principle and reference conditions³ operating time extension using the power pack PP0026NN (optional, item number: 612060-6CE)

Dimensions



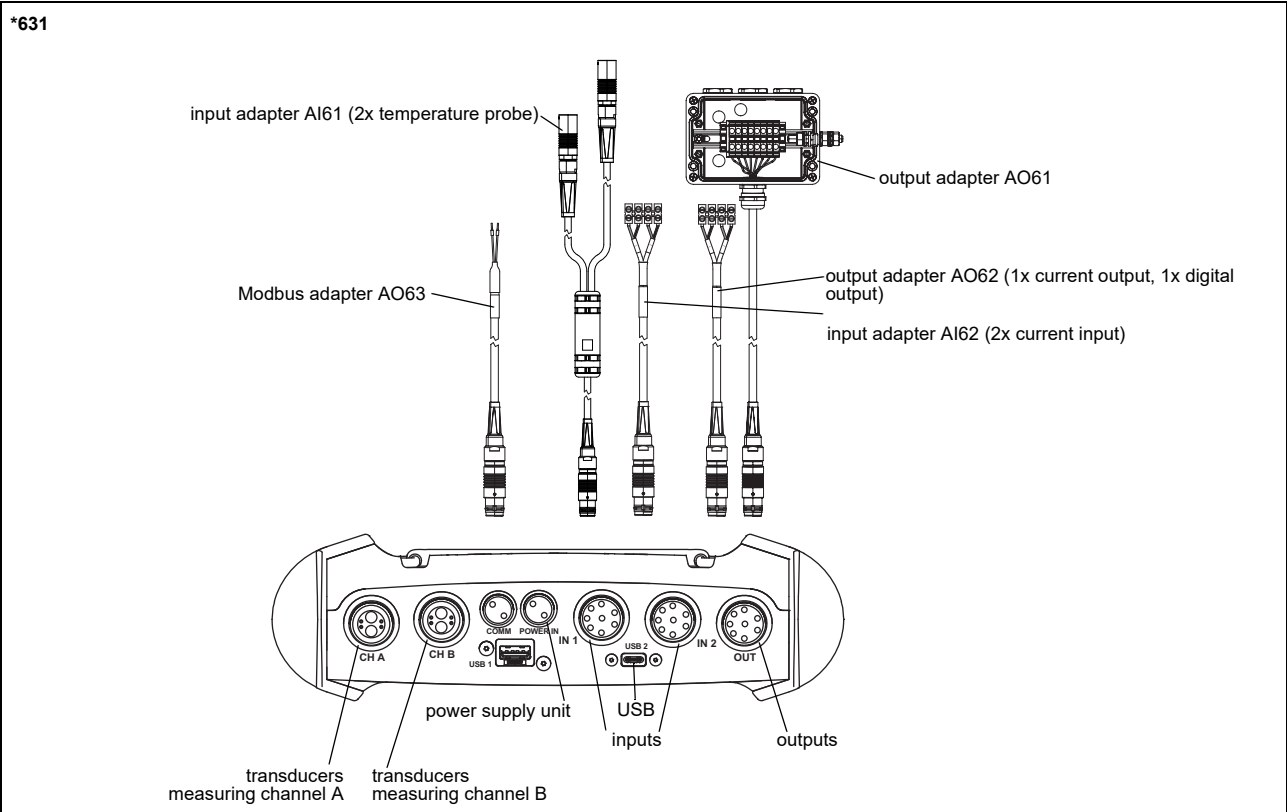
Storage

- do not store outdoors
- store within the original package
- store in a dry and dust-free place
- protect against sunlight
- keep all openings closed
- storing temperature: 0...40 °C

Standard scope of supply

	F631BA Basic	F631EE Energy
mode		
measurement of liquids	x	x
thermal energy rate measurement	-	x
outputs		
switchable current output	2	2
digital output	2	2
Modbus	optional	optional
inputs		
temperature input	-	4
accessories		
transport case	x	x
adapter	output adapter AO61	output adapter AO61 2x input adapter AI61

Adapters

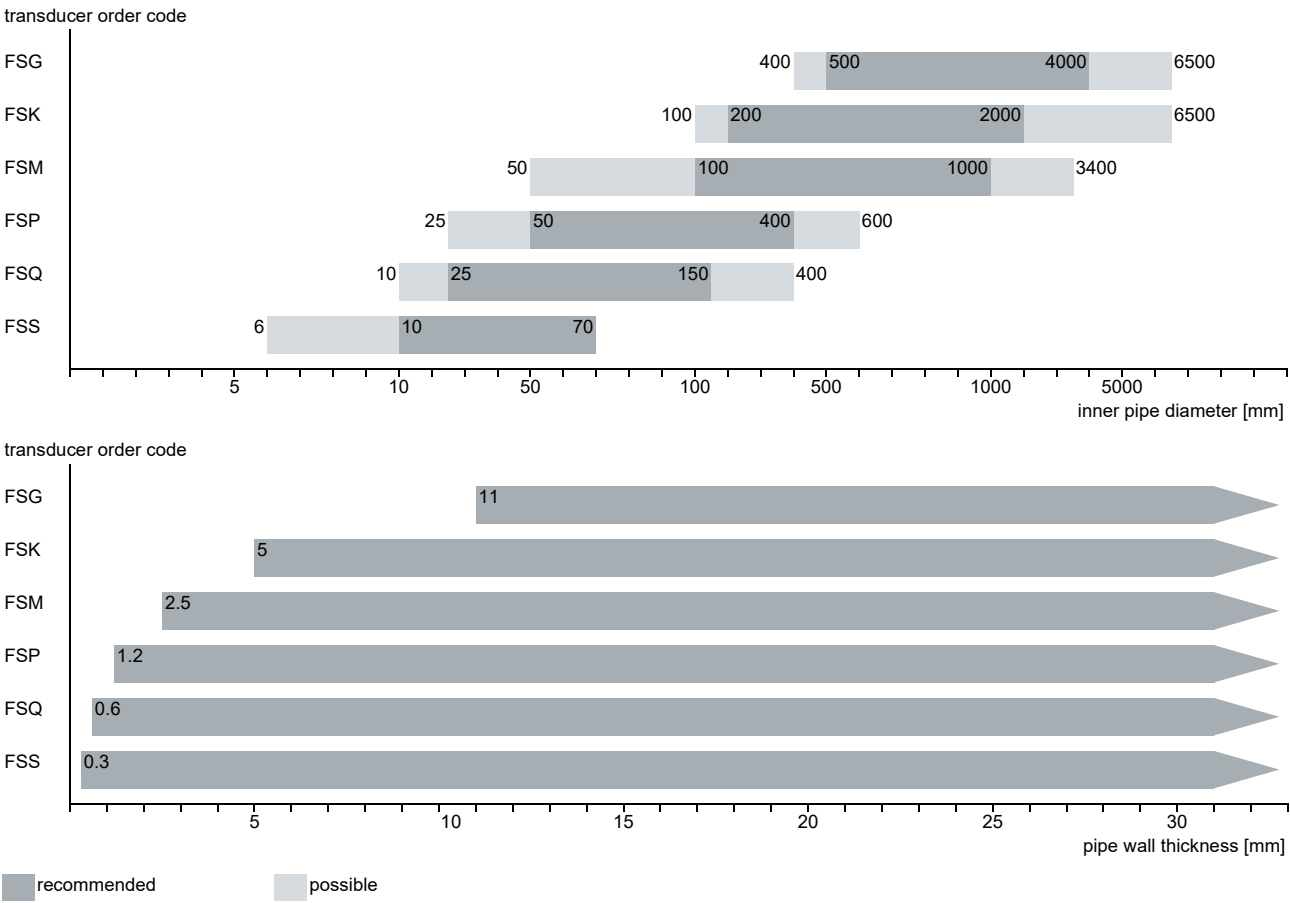


Technical data

	output adapter	output adapter	Modbus adapter	input adapter	input adapter
technical type	AO61	AO62	AO63	AI61	AI62
item number	63101-1	63101-2	63102-1	63103-1	63103-2
weight	kg	0.565	0.15	0.09	0.27
weight				0.15	
material					
housing	polyester				
gasket	silicone				
degree of protection	IP65			IP65/IP67	
ambient temperature	°C	-20...+60			
place of installation	indoor, outdoor, wet environments				
relative humidity of air	max. 80 % (31 °C), decreasing linearly to 50 % (40 °C), no condensation				
height above sea level	m	max. 2000			
degree of pollution	3	3	3	3	3

Transducers

Transducer selection

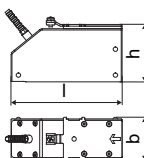
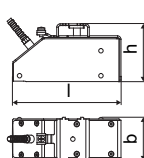
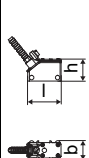
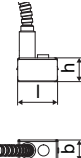


Transducer order code

1, 2	3	4	5...7	8, 9	10, 11	12...14	no. of character			
transducer	transducer frequency	-	ambient temperature	explosion protection	-	certification	connection system	-	cable length	description
FS										set of ultrasonic flow transducers for Measurement of Liquids, shear wave
	G									0.2 MHz
	K									0.5 MHz
	M									1 MHz
	P									2 MHz
	Q									4 MHz
	S									8 MHz
		N								normal temperature range
		E								extended temperature range
			NNN							not explosion-proof
				**						
					NY					with connector
						***			in m	

Technical data

Shear wave transducers (nonEx, NY)

order code		FSG-NNNN-**NY	FSK-NNNN-**NY	FSM-NNNN- **NY	FSP-NNNN-**NY	FSQ-NNNN-**NY	FSS-NNNN-**NY
technical type		C(DL)G1NZ4	C(DL)K1NZ4	CDM2NZ4	CDP2NZ4	CDQ2NZ4	CDS1NZ4
transducer frequency	MHz	0.2	0.5	1	2	4	8
inner pipe diameter d							
min. extended	mm	400	100	50	25	10	6
min. recommended	mm	500	200	100	50	25	10
max. recommended	mm	4000	2000	1000	400	150	70
max. extended	mm	6500	6500	3400	600	400	70
pipe wall thickness							
min.	mm	11	5	2.5	1.2	0.6	0.3
material							
housing		PEEK with stainless steel cover 304 (1.4301)					stainless steel 304 (1.4301)
contact surface		PEEK					PEI
degree of protection		IP66 (transducer) IP65/IP67 (on the transmitter side)		IP66 (transducer) IP65/IP67 (on the transmitter side)		IP66 (transducer) IP65/IP67 (on the transmitter side)	
transducer cable							
type		1699					
length	m	5		4		3	2
dimensions							
length l	mm	129.5	126.5	64		40	25
width b	mm	51	51	32		22	13
height h	mm	67	67.5	40.5		25.5	17
dimensional drawing							
weight (without cable)	kg	0.47	0.36	0.066		0.016	0.004
pipe surface temperature	°C	-40...+130					-30...+130
ambient temperature	°C	-40...+130 connector: -20...+60					-30...+130
temperature compensation		x					

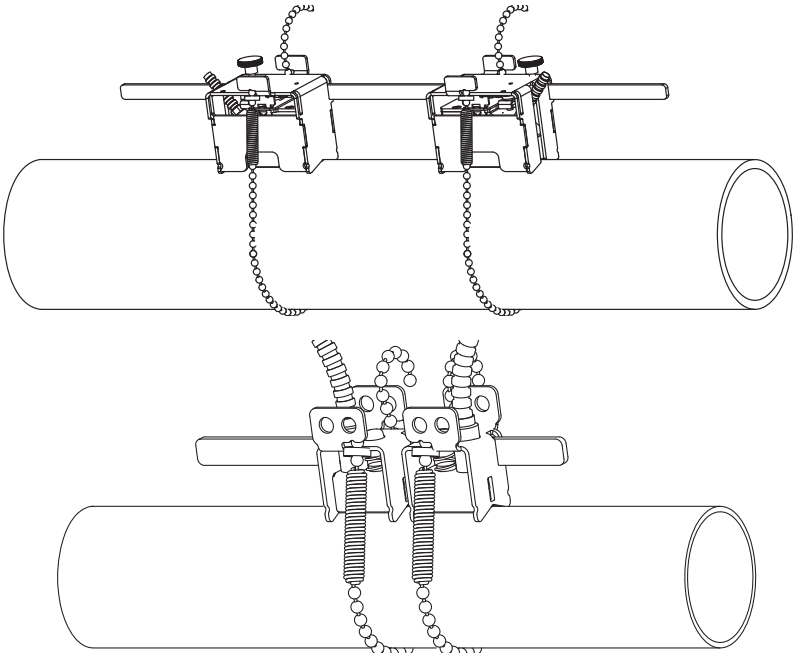
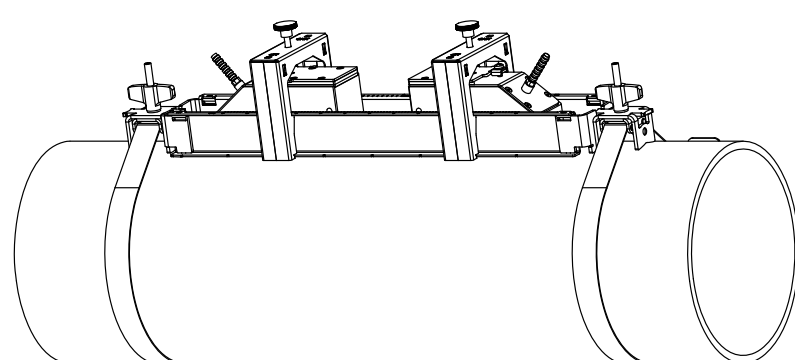
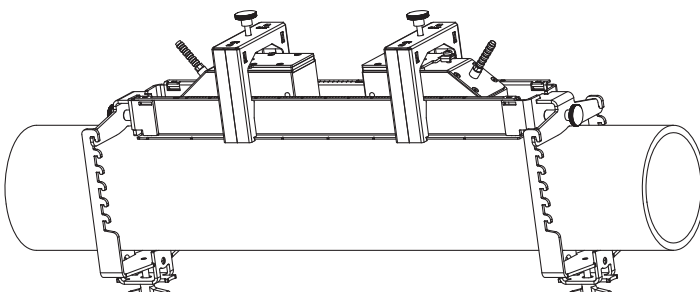
Shear wave transducers (nonEx, NY, extended temperature range)

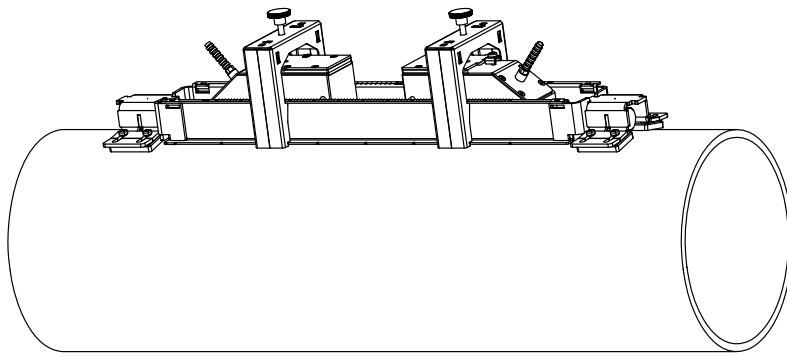
order code		FSM-ENNN-**-NY	FSP-ENNN-**-NY	FSQ-ENNN-**-NY
technical type		CDM2EZ4	CDP2EZ4	CDQ2EZ4
transducer frequency	MHz	1	2	4
inner pipe diameter d				
min. extended	mm	50	25	10
min. recommended	mm	100	50	25
max. recommended	mm	1000	400	150
max. extended	mm	3400	600	400
pipe wall thickness				
min.	mm	2.5	1.2	0.6
material				
housing		PI with stainless steel cover 316L (1.4301)		
contact surface		PI		
degree of protection		IP66 (transducer) IP65/IP67 (on the transmitter side)		
transducer cable				
type		6111		
length	m	4		3
dimensions				
length l	mm	64		40
width b	mm	32		22
height h	mm	40.5		25.5
dimensional drawing				
weight (without cable)	kg	0.066		0.017
pipe surface temperature	°C	-30...+200		
ambient temperature	°C	-30...+200 connector: -20...+60		
temperature compensation		x		

Transducer mounting fixture

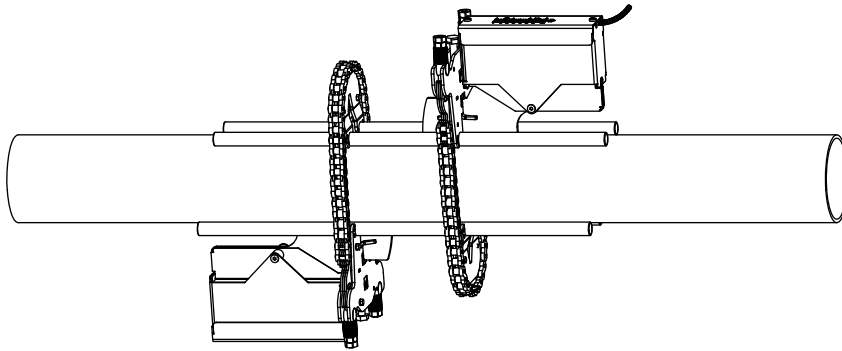
Order code

1, 2	3	4	5	6	7...10	no. of character
transducer mounting fixture	transducer	measurement arrangement	size	fixation	outer pipe diameter	description
TS						fastening shoes
VM						portable Variofix
WN						WaveInjector WI-550
WH						WaveInjector WI-630
	A					all transducers
	N					transducers with transducer frequency M, P, Q
	W					transducers with transducer frequency G, K, M, P
	G					transducers with transducer frequency G
	K					transducers with transducer frequency K
	M					transducers with transducer frequency M
	P					transducers with transducer frequency P
	Q					transducers with transducer frequency Q
	S					transducers with transducer frequency S
		D				diagonal arrangement
		R				reflection arrangement
			S			small
			M			medium
				C		chains
				T		threaded rods
				G		tension belts
				H		high-temperature tension belts
					0020	10...20 mm
					0040	20...40 mm
					0130	10...130 mm
					0360	130...360 mm
					0920	360...920 mm
					2000	920...2000 mm
					0070	33...70 mm
					0120	70...120 mm
					0170	70...125 mm
					0220	70...220 mm
					0370	70...370 mm
					0520	70...520 mm
					0560	350...560 mm
					0850	560...850 mm
					1000	600...1000 mm
					R04	retention hooks (outer pipe diameter 40 mm)
					R10	retention hooks (outer pipe diameter 100 mm)
					M00	magnet

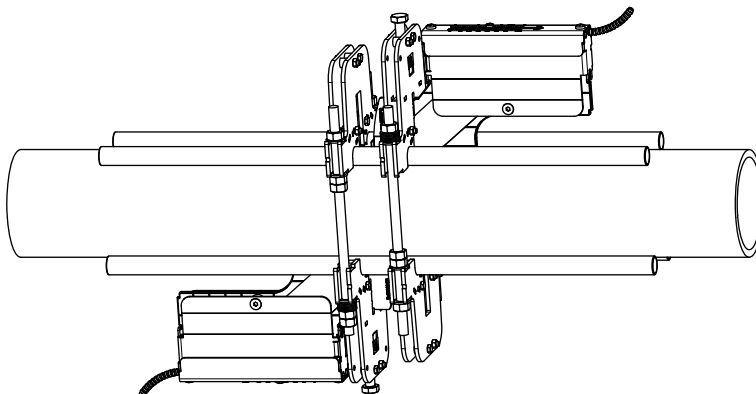
fastening shoes FS and chains 	transducer frequency: M, P, Q material: stainless steel 304 (1.4301), 430 (1.4016) dimensions: M, P: 420 x 55 x 68 mm Q: 420 x 52 x 58 mm chain length: 0.5 m, 1 m, 2 m outer pipe diameter: max. 150 mm, 310 mm, 600 mm transducer frequency: S material: stainless steel 304 (1.4301), 301 (1.4310), 303 (1.4305) dimensions: 210 x 32 x 44 mm chain length: 0.5 m outer pipe diameter: max. 150 mm
portable Variofix VM and tension belts or high-temperature tension belts 	material: stainless steel 316Ti (1.4571) dimensions: G, H, K: 542 x 94 x 115 mm M, P, Q: 534 x 74 x 86 mm tension belts material: steel, powder coated, textile tension belt length: 5 m, 7 m ambient temperature: max. 60 °C outer pipe diameter: max. 1500 mm, 2100 mm high-temperature tension belts material: clasp: stainless steel 304 (1.4301) tension belt: Aramid length: 2 m, 5 m ambient temperature: max. 260 °C outer pipe diameter: max. 600 mm, 1500 mm
portable Variofix VM and retention hooks 	material: stainless steel 316Ti (1.4571), 304 (1.4301) dimensions: G, H, K: 542 x 94 x max. 292 mm M, P, Q: 534 x 74 x max. 292 mm outer pipe diameter: max. 40 mm, max. 100 mm

portable Variofix VM and magnet


material: stainless steel 316Ti
(1.4571), 304 (1.4301)
dimensions:
G, H, K: 542 x 94 x 115 mm
M, P, Q: 534 x 74 x 86 mm

WaveInjector with chains


see Technical specification
TSWaveInjectorVx-x

WaveInjector with threaded rods


outer pipe diameter:
35...380 mm
see Technical specification
TSWaveInjectorVx-x

Coupling materials for transducers

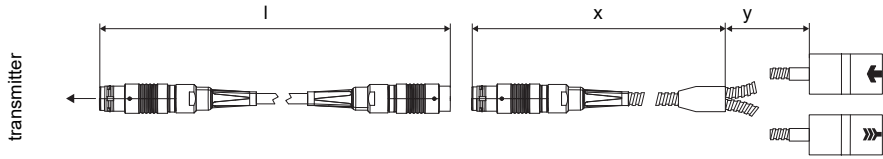
normal temperature range (4th character of transducer order code = N) extended temperature range (4th character of transducer order code = E)	WaveInjector	
	< 280 °C	280...630 °C
coupling compound type E	coupling foil type A and coupling foil type VT	coupling foil type B and coupling foil type VT

Technical data

type	ambient temperature °C	remark
coupling compound type E (Elbesil BL)	-30...+200	
coupling foil type A	max. 280	
coupling foil type B	280...630	
coupling foil type VT	-10...+200	fluid temperature 200 °C: min. 2 years

coupling foil not to be used for transducer mounting fixture with magnets

Connection systems

connection system NY	
direct connection/connection with extension cable	transducers technical type
	*****Z4

Cable

transducer cable		
type		1699
weight	kg/m	0.094
ambient temperature	°C	-55...+200
cable jacket		
material		PTFE
outer diameter	mm	2.9
thickness	mm	0.3
colour		brown
shield		x
sheath		
material		stainless steel 316Ti (1.4571)
outer diameter	mm	8

extension cable			
type		1750	2551
standard length	m	5 10	-
max. length	m	10	see table below
weight	kg/m	0.12	0.083
ambient temperature	°C	< 80	-25...+80
cable jacket			
material		PE	TPE-O
outer diameter	mm	6	8
thickness	mm	0.5	
colour		black	black
shield		x	x
sheath			
material		stainless steel 304 (1.4301)	-
outer diameter	mm	9	-
remark		optional	

Cable length

transducer frequency		F, G, H, K			M, P			Q			S		
transducers technical type		x	y	l	x	y	l	x	y	l	x	y	l
*D***Z4 ¹	m	2	3	≤ 25	2	2	≤ 25	2	1	≤ 25	1	1	≤ 20
*L***Z4 ¹	m	2	7	≤ 25	-	-	-	-	-	-	-	-	-

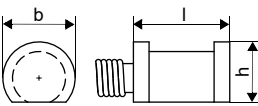
¹ l > 25...100 m on request

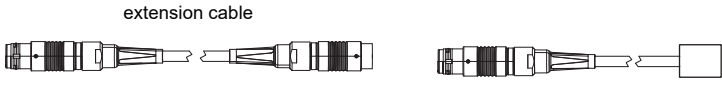
x, y - transducer cable length

l - max. length of extension cable

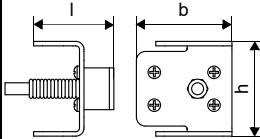
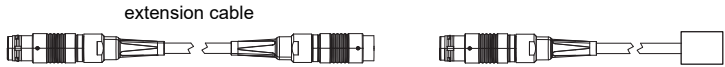
Clamp-on temperature probe (optional)

Technical data

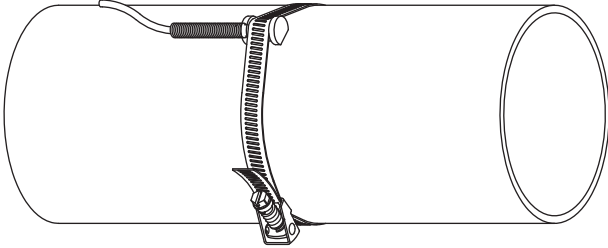
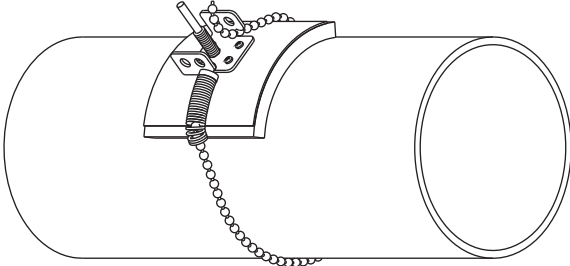
PT12NY, PT13NY		
item number		PTN12NY: • 630415-1 • 630414-1 (matched) PTN13NY: • 630413-1 • 630412-1 (matched)
design		clamp-on with connector
type		PTN12NY: Pt100 PTN13NY: Pt1000
connection		4-wire
measuring range	°C	-30...+250
accuracy T		±(0.15 °C + 2 · 10 ⁻³ · T [°C]) class A
accuracy ΔT (2x Pt matched according to EN 1434-1)		≤ 0.1 K (3 K < ΔT < 6 K), more corresponding to EN 1434-1
response time	s	50 (t50, T1 = 25 °C, T2 = 60 °C)
housing material		aluminum
degree of protection		IP54
dimensions		
length l	mm	20
width b	mm	15
height h	mm	13
dimensional drawing		
weight	kg	0.25 (without connector)
accessories		
thermal conductivity paste 200 °C		x
thermal conductivity foil 250 °C		x

Connection system		
direct connection/connection with extension cable		
		
extension cable		

Cable			
		temperature probe	extension cable
type		4 x 0.22 mm ²	LIYCY 8 x 0.14 mm ²
standard length	m	3	5/10/25
max. length	m	-	200
ambient temperature	°C	-30...+250	-25...+80
min. bend radius	mm	27	68
cable jacket			
material		PFA	PVC
outer diameter	mm	3.8 ±0.15	4.8 ±0.2
colour		black	grey

PT12FY			
item number		• 630415-2 • 630414-2 (matched)	
design		clamp-on short response time, with connector	
type		Pt100	
connection		4-wire	
measuring range	°C	-50...+250	
accuracy T		±(0.15 °C + 2 · 10 ⁻³ · T [°C]) class A	
accuracy ΔT (2x Pt matched according to EN 1434-1)		≤ 0.1 K (3 K < ΔT < 6 K), more corresponding to EN 1434-1	
response time	s	8 (t ₅₀ , T ₁ = 25 °C, T ₂ = 60 °C)	
housing material		PEEK, stainless steel 304 (1.4301), copper	
degree of protection		IP54	
dimensions			
length l	mm	14	
width b	mm	30	
height h	mm	27	
dimensional drawing			
weight	kg	0.32 (without connector)	
accessories			
thermal conductivity paste 200 °C		x	
thermal conductivity foil 250 °C		x	
plastic protection plate, insulation foam		x	
Connection system			
direct connection/connection with extension cable			
			
Cable			
		temperature probe	extension cable
type		4 x 0.22 mm ²	LIYCY 8 x 0.14 mm ²
standard length	m	3	5/10/25
max. length	m	-	200
ambient temperature	°C	-50...+250	-25...+80
min. bend radius	mm	27	68
cable jacket			
material		PFA	PVC
outer diameter	mm	3.8 ±0.15	4.8 ±0.2
colour		black	grey

Fixation

tension strap PT12N 	material: stainless steel 301 (1.4310), 410 (1.4006) thermal insulation necessary
ball chain PT12F 	material: stainless steel 316L (1.4404) length: 1 m

Wall thickness measurement (optional)

The pipe wall thickness is an important pipe parameter which has to be determined exactly for a good measurement. However, the pipe wall thickness often is unknown.

The wall thickness probe can be connected to the transmitter instead of the flow transducers and the wall thickness measurement mode is activated automatically.

Acoustic coupling compound is applied to the wall thickness probe which then is placed firmly on the pipe. The wall thickness is displayed and can be stored directly in the transmitter.

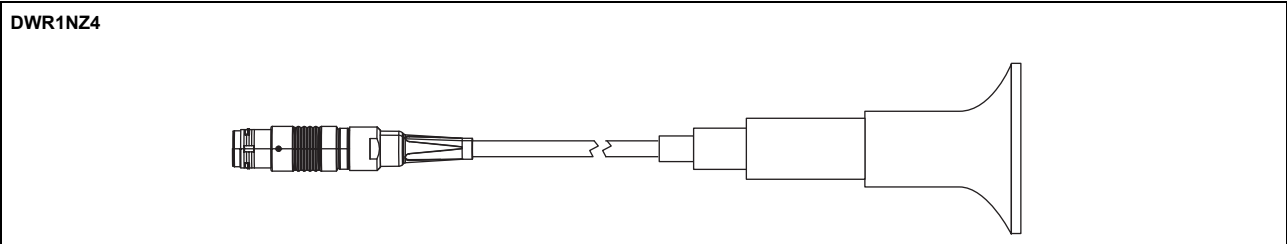
Technical data

DWR1NZ4		
item number		630522-0
measuring range ¹	mm	1...250
resolution	mm	0.01
accuracy		1 % ±0.1 mm
fluid temperature	°C	-20...+200, short-time peak max. 500
cable		
type		2616
length	m	1.5
Connector		
length	°C	-20...+60

¹ The measuring range depends on the attenuation of the ultrasonic signal in the pipe. For strongly attenuating plastics (e.g. PFA, PTFE, PP) the measuring range is smaller.

Cable

2616		
ambient temperature	°C	<200
cable jacket		
material		FEP
outer diameter	mm	5.1
colour		black
shield		x



Annex

Reference conditions

as available at e.g. the test facilities of Physikalisch-Technische Bundesanstalt

measurement principle		transit time difference correlation principle
all uncertainties	%	95
fluid temperature		25 °C ±5 K
ambient temperature		25 °C ±5 K
warm-up time	min	10
flow profile at the measuring point		fully developed, rotationally symmetric
installation		installation according to specifications using the recommended transducers
Reynolds number		> 10 000
pipe diameter uncertainty	%	0.2
pipe wall thickness uncertainty	%	1
circularity tolerance		0.08 % of inner pipe diameter
SCNR	dB	> 48
SNR	dB	> 12

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