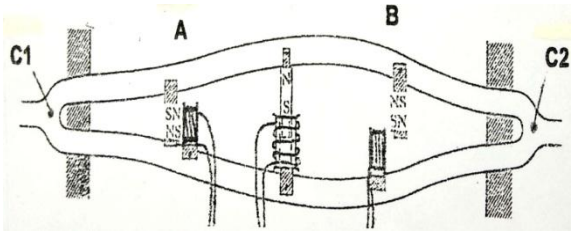
tekCor TKC Multivariable Coriolis Flow Sensors

The **tekCor** **TKC** Series principle was initiated by **tekflo sensors** engineers, who pioneered vibrating tube density meters in early 1970s. This evolved into what are now commonly known as Coriolis mass flow sensors. The result of this experience makes the **tekCor** **TKC** range one of the most exciting advances in liquid mass flow and density sensing in terms of uniquely wide mass flow rate ranges, small size capability, the ultimate in accuracy, vibration insensitivity, and all at a refreshingly low cost. It is also a truly a multi-variable sensor, providing outputs of mass flow, density, temperature, and concentration of 2 component liquids.

CE

tekCor size 5mm - 250mm flanged

The **tekCor** has a twin U-tube flow tube configuration, shown in plan view below. The diagram shows the principle of operation of **tekCor**. It is actually based on Newton's Second Law of Motion, which states the change of momentum (acceleration) of a fluid is proportional to the applied force (mass). Coriolis used this principle in the Coriolis flow sensor. The flow tubes are caused to vibrate at their longitudinal centre point at their resonant frequency. Mass flow of the media causes a change in the phase shift of frequency sensors at A and B. This phase shift is caused by the Coriolis force and is proportional to the mass of the liquid media, as well as its mean velocity. Hence it is proportional directly to true mass flow.



When there is zero flow there is no frequency phase change at sensors A and B and there is no Coriolis force. However, when a liquid flows through the twin tubes of **tekCor**, the mass particles of the fluid are subjected to a superimposed lateral acceleration, since they must increase their velocity travelling around a longer distance of a bend. This lateral acceleration is accompanied by the so-called Coriolis force. The mass particles drift away in one rotational direction from the inlet single tube centre point C1, and return in an opposite rotational direction to the centre point of the outlet single tube C2. In other words, the measuring tube twists.

tekCor has a resonant frequency far above that of the natural frequencies of typically 50 – 150 Hz in industrial piping systems. Furthermore, the natural resonant frequencies of the twin tubes of **tekCor** are extremely accurately matched, so external vibrations have the same effect on each of the twin tubes. The result is high insensitivity to plant vibration, allowing **tekCor** diameters down to 3mm (0.1")

tekCor Processor Multivariable Measurement

When the liquid density changes, the combined mass of the measuring tube and fluid also changes. The exciter frequency is then automatically adjusted accordingly. Thus, the new resonant frequency is a function of density or media concentration, which is digitally linearised and provided as additional output signals. A separate temperature sensor with output allows derivative density sensing (º Brix, ºBaume etc.). A **tekCor** microprocessor provides the necessary outputs for mass flow, volumetric flow, temperature, density and its derivatives, including % concentration of a 2-component liquid.
tekCor has optional steam or electrical heat tracing to maintain specified operational temperatures for optimum accuracy.

tekCor Multivariable Advantages

+ **O**ffers direct mass flow measurement - no need for temperature and pressure compensation
+ Signal and display independent of viscosity and density
+ Microprocessor with multivariable terminal outputs for mass or volume flow, density, temperature, % concentration
+ RS485 with MODBUS communication standard
+ Optional HART communication
+ Multivariable features allow derivative density measurement (eg ºBrix, ºBaume, etc.)
+ Flow accuracy to < ± 0.15% of reading over 15 : 1 flow range
+ Density accuracy to ± 0.002 g/cm3 over 0.2 - 3 g/cm3 or ± 2.0 kg/cm3 over 200 – 3000 kg/cm3
+ Accuracy traceable to USA NIST and other internationally recognised standards
+ Unaffected by velocity profile. No straight pipe diameters required
+ Designed to USA 3A and EHEDG sanitary guidelines, with approved sanitary connections
+ Liquid measurement virtually unaffected by small gaseous bubbles
+ Brings a new dimension in low cost metering with highest accuracy
+ Unobtrusive sensing tubes with low pressure loss U-tube construction
+ Highest temperatures to 350º C (660º F), highest pressures to 100 bar g (1450 psig)
+ Programmable batch control via n/o or n/c relay 24Vdc, 0.1 A
+ Available with steam or electrical heat tracing
+ Quality Assurance with tekflo sensors certified ISO 9001 Partnership
+ Custom calibration guarantees operation to specification straight out of the packing crate
+ Meets European EMC Conformity Standards EN 61326 – 1 for use in industrial locations
+ Meets European Pressure Equipment Directive – Sound Engineering Practice
+ Certified Flameproof and Intrinsically Safe options
+ LED display of multivariable parameters and service diagnostics

tekCor TKC Series Specification

Nominal Diameters:	5mm – 250 mm (0.2” – 10”)
Connection options:	1/2” – 10” ANSI 150 – 600rf flanged 10 – 200 mm JIS K10 – 100 flanged 15 – 200 mm PN 10 – 100 flanged 1/2” – 6” Tri-Clamp or screwed BSP or NPT connectors 15 – 150mm DIN sanitary to DIN 11851
Power supplies:	85 – 245 Vac or 18 – 36 Vdc, 8W
Mass flow ranges:	0 –500 kg /h to 0 – 2700000 kg/h (0 - 1100 lb/h to 0 – 6000000 lb/h, size dependent
Volume flow ranges:	0 – 500 lph to 0 – 270000 lph (0 – 2.0 gpm to 0 - 12000 gpm), size dependent
Density range:	0 – 3.0 kg/m³ (0 – 0.2 lb/ft³) liquids only
Analog output:	Mutivariable 4 – 20 mA into max. 750 Ohms programmable for mass flow, volumetric flow, density, % solution of 2-component liquids and temperature.
Frequency output:	Programmable 0 up to 10,000 Hz or in pulses per unit mass or volume from internal 12V, k Ohm load
Alarm control:	Allows upper and lower limits of mass flow, volumetric flow, density, 2-component liquids, temperature or batch control. Rating 24 V dc, 0.1 A
Communication:	RS 485 with programmable active or passive HART protocol (optional extra) RS485 with programmable active or passive MODBUS protocol standard Protection: IP65 and NEMA 4X
Wetted parts:	AISI 316L, 304 stainless steel or Hastelloy C. Flow tubes not in 304 stainless steel.
Non wetted parts:	AISI 304 stainless steel, carbon steel process connections, epoxy coated die cast aluminium junction box (remote versions only) and microprocessor (integral and remote versions)

Mass flow accuracy: < ± 0.15% of reading . See Accuracy Graph for further details

Flow repeatability: < ± 0.075%

Density accuracy: < ± 0.002 g/cm3 over 0.2 - 3 g/cm3 or ± 2.0 kg/cm3 over 200 – 3000 kg/cm3

Density repeatability: < ± 0.001 g/cm3

Media temperature : - 40º C to + 125º C (- 40º F to + 257º F) integral or remote microprocessor
range options - 40º C to + 350º C (- 40º F to + 660º F) remote microprocessor only
Ambient temperature: - 40º C to + 70º C (+158º F) storage or + 55º C (+ 130º F) in operation

Temperature error: ± 1º C (1.8º F)

Pressure rating options: 40 bar g (580 psig) standard
Optional 100 bar g (1450 psig)
These pressures are limited by connection type

Intrinsically Safe Option: Ex d IIC T3 – T6 for sizes 10 – 80mm (1/2" – 3")
Ex d ib IIC T3 – T6 for sizes 100 – 250mm (4" – 10")
All 'T' Groups are based on a max ambient of 55º C (131º F)
Max process temperature 350º C (662º F) for Groups T1 – T3

Note !
The intrinsically versions apply to both integral or remote processors.

Multivariable Microprocessor : Remote or integrally mounted, size and operational temperature dependent. Remote transmitter max 25m (80 feet) cable

Batch control relay: 24 Vdc, 0.1 A normally open or normally closed (see order code)

Microprocessor display: In English Language.

Electrical connections: Junction box M20, multivariable terminal, or flying cable 10m (30 feet) standard max length

European EMC: Meets EN 61326 – 1 for use in industrial locations

Pressure Directive: Meets European Equipment Directive 97/23/EC – Sound Engineering Practice dependent on media type and process pressure.

Typical Applications

The **tekCor** is the most cost effective choice today for applications such as mixing and batching liquids, high accuracy control of processes, measuring fluids of quick changing density, product quality assurance, control of % alcohol, or % concentration for 2-component liquids.

The **tekCor** microprocessor provides outputs for mass or volume flow, density, temperature, or % concentration of 2-component liquids.

The wide range of media includes liquid food and beverages (eg ketchup, mayonnaise, vinegar, fruit juice), or detergents, solvents, vegetable oils, palm oil, honey, heating oil, fuels, animal fats, latex, oils, toluene, alcohol, liquefied gases (eg. butane, natural gas, propane), latex, methane, toothpaste and liquid chocolate.

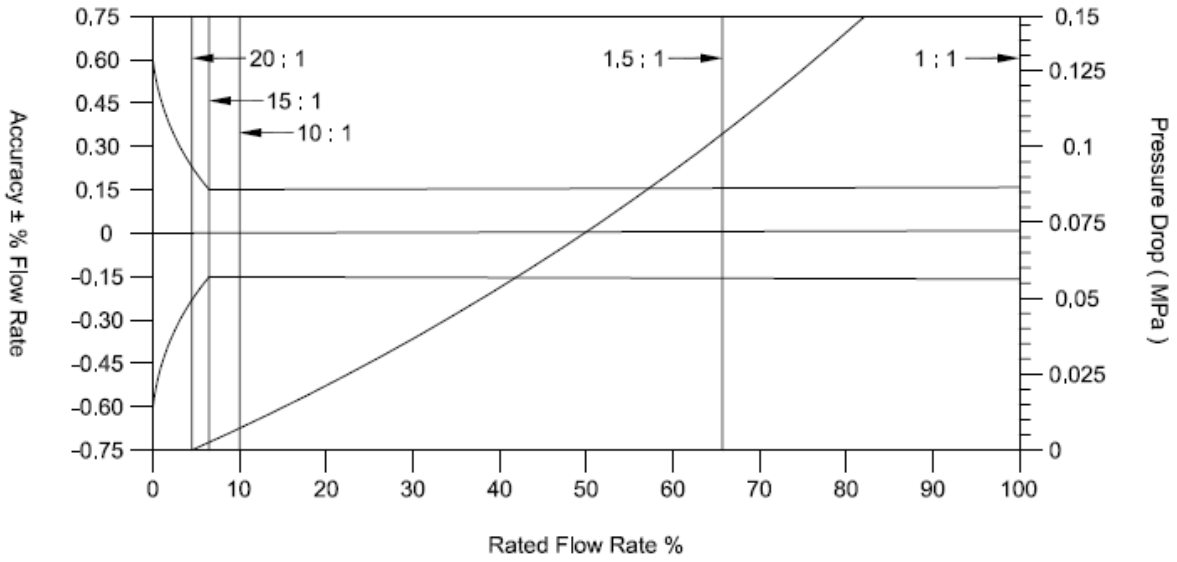
tekCor TKC Flow Ranges

Nom Diameter mm	Nom Diameter Inches	Mass Flow Ranges kg/h	Mass Flow Ranges lb/h	Flange, Sanitary or Scewed Connection Sizes
5	0.25”	0 - 500	0 - 1100	1/2" or DN10
10	0.40”	0 - 1500	0 - 3300	“ “ “
15	0.60”	0 - 4500	0 - 9900	“ “ “
20	0.80”	0 - 9450	0 - 20800	3/4” or DN20
25	1.00”	0 - 25500	0 - 56100	1” or DN25
50	2.00”	0 - 94500	0 - 208000	2” or DN50
80	3.00”	0 - 240000	0 - 528000	3” or DN80
100	4.00”	0 - 540000	0 - 1200000	4” or DN100
150	6.00”	0 - 825000	0 - 1820000	6” or DN150
200	8.00”	0 - 1650000	0 - 3630000	8” or DN200
250	10.0”	0 - 2700000	0 - 5940000	10” or DN250

Note !

1) kg/h ranges are the same value as water in litres/hour at 20º C (68º F)
2) Sanitary fittings maximum is 6” Tri-Clamp ot 150mm DIN 11851
3) See connection options in Specification above
4) 65 mm (2.5”) nominal size available, with same flow ranges as 50mm 92”)

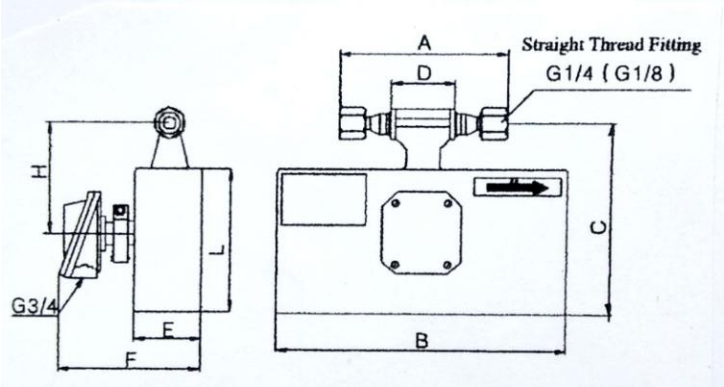
tekCor Accuracy and Pressure Drop Graph



Note !

1) For pressure drops of liquids other than water please consult Tekflo or your nearest Authorised Distributor. For liquid viscosities < 15 cP the approximate pressure drop is proportional to the liquid density.
2) At 1/2 maximum flow rate pressure loss is 1/4 of maximum stated, at 1/4 maximum flow rate the pressure loss is 1/16 max stated, and so on.
3) Pressure drop in MPa x 10 = bar g = x 14.5 psid

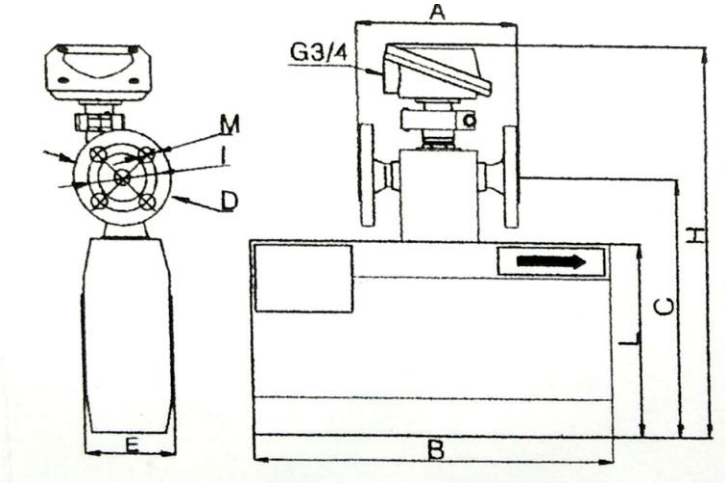
tekCor TKC Drawings, Dimensional Data and Weights



5 mm (0.25") Nominal Diameter tekCor
Maximum Pressure 10 bar g (145 psig) Screw Ends Process C0nnections 1/8" or 1/4" BSPP/NPT
REMOTE Microprocessor

Nom Diameter		A		B		C		D		E		F		H		L	
mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins
5	0.25	135	5.32	215	8.47	185	7.28	85	3.35	40	1.58	128	5.04	130	5.12	140	5.51

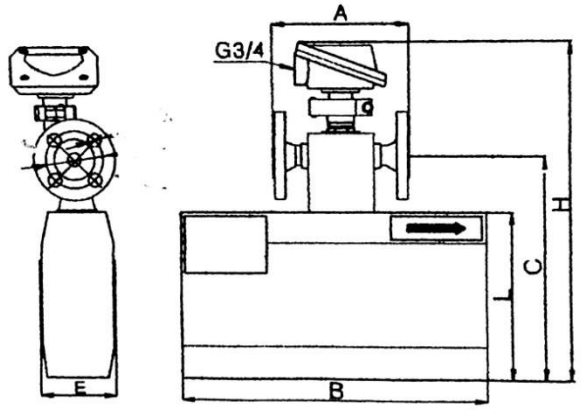
Note: 1) A Dimension = 145mm (5.71") for 1/4" BSPP/NPT connections
2) Approx Weight: 7 kg (16 lbs) for both size connections
3) Add 4 kg (9 lb) for REMOTE microprocessor



10 – 50mm (0.5" – 2") Nominal Diameter tekCor
Maximum Pressure 40 bar g (580 psig), Process Connection Dependent.
REMOTE Microprocessors

Nom Diameter		A		B		L		C		H		E		F		Approx Weights	
mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	kg	lbs
10	0.5"	162	6.38	320	12.6	170	6.69	223	8.78	357	14.1	76	2.99	-	-	10	22
15	0.6"	162	6.38	370	14.6	190	7.48	250	9.84	379	14.9	94	3.70	-	-	11	24
20	0.75"	202	7.95	480	18.9	265	10.4	337	13.3	460	18.1	114	4.49	-	-	12	26
25	1"	274	10.8	615	24.2	295	11.6	383	15.1	513	20.2	146	5.75	-	-	15	33
50	2"	562	22.1	460	18.1	595	23.4	702	27.6	847	33.4	201	7.91	-	-	40	88

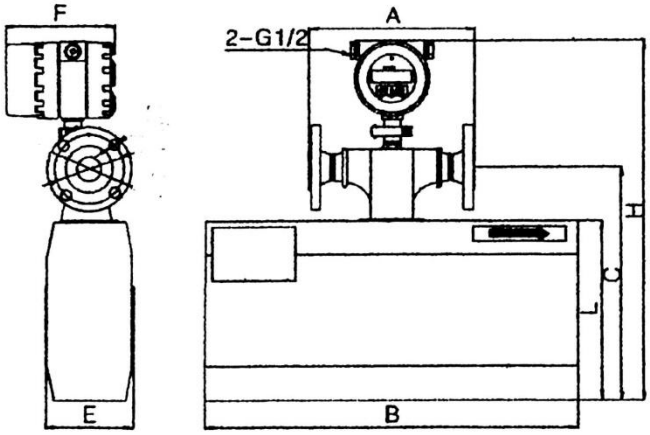
Note: Add 4 kg (9 lb) for REMOTE microprocessor



10 – 50mm (0.5" – 2" Nominal Diameter tekCor
Maximum Pressure 100 bar g (1450 psig), Process Connector Dependent
REMOTE Microprocessors

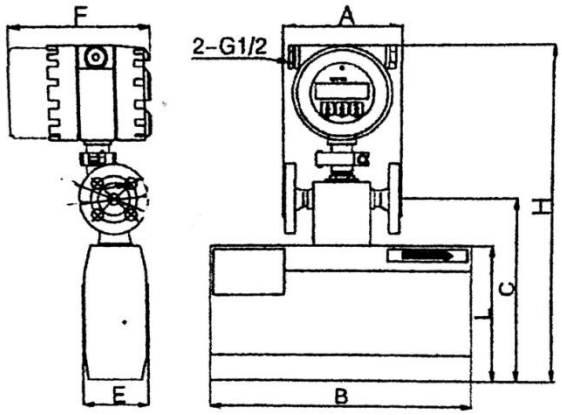
Nom Diameter mm	ins	A mm	ins	B mm	ins	L mm	ins	C mm	ins	H mm	ins	E mm	ins	F mm	ins	Approx Weights kg	lbs
10	0.5"	190	7.48	320	12.6	170	6.69	223	8.79	357	14.1	76	2.99	-	-	13	29
15	0.6"	190	7.48	370	14.6	190	7.48	250	9.84	379	14.9	94	3.70	-	-	14	31
20	0.75"	246	9.69	480	18.9	265	10.4	337	13.3	460	18.1	114	4.49	-	-	16	35
25	1"	320	12.6	615	24.2	295	11.6	383	15.1	513	20.2	146	5.75	-	-	20	44
50	2"	620	24.4	460	18.1	595	23.4	702	27.6	847	33.3	201	7.91	-	-	52	114

Note: **Add 4 kg (9 lb) for REMOTE microprocessor**



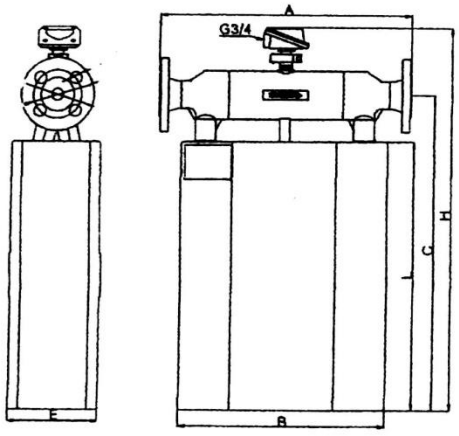
10 – 50mm (0.5" – 2") Nominal Diameter tekCor
Maximum Pressure 40 bar g (580 psig), Process Connection Dependent.
INTEGRAL Microprocessors

Nom Diameter mm	ins	A mm	ins	B mm	ins	L mm	ins	C mm	ins	H mm	ins	E mm	ins	F mm	ins	Approx Weights kg	lbs
10	0.5"	162	6.38	320	12.6	170	6.69	223	8.78	436	17.2	76	2.99	180	7.09	14	31
15	0.6"	162	6.38	370	14.6	190	7.48	250	9.84	458	18.0	94	3.70	180	7.09	15	33
20	0.75"	202	7.95	480	18.9	265	10.4	337	13.3	540	21.3	114	4.49	180	7.09	17	37
25	1"	274	10.8	615	24.2	295	11.6	383	15.1	563	22.2	146	5.75	180	7.09	19	42
50	2"	562	22.1	460	18.1	595	23.4	702	27.6	930	36.6	201	7.91	180	7.09	44	97

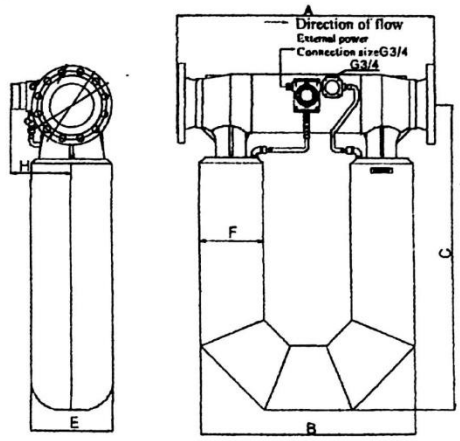


10 – 50mm (0.5" – 2" Nominal Diameter tekCor
Maximum Pressure 100 bar g (1450 psig), Process Connector Dependent
INTEGRAL Microprocessors

Nom Diameter mm	ins	A mm	ins	B mm	ins	L mm	ins	C mm	ins	H mm	ins	E mm	ins	F mm	ins	Approx Weights kg	lbs
10	0.5"	190	7.48	320	12.6	170	6.69	223	8.79	438	17.2	76	2.99	180	7.09	17	37
15	0.6"	190	7.48	370	14.6	190	7.48	250	9.84	458	18.0	94	3.70	180	7.09	18	40
20	0.75"	246	9.69	480	18.9	265	10.4	337	13.3	540	21.3	114	4.49	180	7.09	20	44
25	1"	320	12.6	615	24.2	295	11.6	383	15.1	563	22.2	146	5.75	180	7.09	24	53
50	2"	620	24.4	460	18.1	595	23.4	702	27.6	847	33.3	201	7.91	180	7.09	56	123



tekCor Without Heat Tracing



tekCor With Electrical Heat Tracing

80 – 250mm (3" – 10") Nominal Diameter tekCor
Maximum Pressure 40 bar g (580 psig), Process Connection Dependent.
REMOTE Microprocessors

Nom Diameter mm	ins	A mm	ins	B mm	ins	C mm	ins	E mm	ins	F mm	ins	H mm	ins	Approx Weights kg	lbs
80	3	850	33.5	774	30.5	937	36.9	214	8.43	277	10.9	310	12.2	62	136
100	4	890	35.0	824	32.4	1135	44.7	264	10.4	-	-	285	11.2	155	341
150	6	1090	42.9	950	37.4	1050	41.3	290	11.4	-	-	285	11.2	350	770
200	8	1211	47.7	1005	39.6	1415	55.7	380	15.0	290	11.4	285	11.2	500	1100
250	10	1370	53.9	1120	44.1	1690	66.5	450	17.7	320	12.6	328	12.9	620	1364

Note: Add 4 kg (9 lb) for REMOTE microprocessor

80 – 250mm (3" – 10") Nominal Diameter tekCor
Maximum Pressure 100 bar g (1450 psig), Process Connection Dependent.
REMOTE Microprocessors

Nom Diameter		A		B		C		E		F		H		Approx Weights	
mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	kg	lbs
80	3	892	35.1	774	30.5	937	36.9	214	8.43	277	10.9	310	12.2	62	136
100	4	932	36.7	824	32.4	1135	44.7	264	10.4	-	-	285	11.2	155	341
150	6	1136	44.7	950	37.4	1050	41.3	290	11.4	-	-	285	11.2	350	770
200	8	1257	49.5	1005	39.6	1415	55.7	380	15.0	290	11.4	285	11.2	500	1100
250	10	1394	54.9	1120	44.1	1690	66.5	450	17.7	320	12.6	328	12.9	620	1364

Note: **Add 4 kg (9 lb) for REMOTE microprocessor**

tekCor size 15mm - 40mm flanged

tekCor TKC Series Coriolis Ordering Code

Example :	tekCor TKC	080	1300kg/h	M3.0	20	1	110C	H	1	3"	X	A	1	C	2	A
tekCor Nominal Diameter mm	5mm (0.25")	005														
	80mm (3.00")	080														
	250mm (10.00")	250														
	other pipe sizes	xxx														
Flow Range with Outputs	Metric max mass range		15000kg/h													
	Metrix volumetric range		15000 lph													
	USA mass range		40000lb/h													
	USA volumetric range		40000gph													
Liquid Density with Output	No density output			NDO												
	Density range metric in kg/m3			M3.0												
	Density range in USA lb/ft3			U0.2												
2 Components % Solution with Output	No % Solution				NS											
	% Solution, example 0 - 20%				20											
Temperature Range	minus 40°C to +125°C (minus 40°F to +257°F) integral or remote microprocessor					1										
	minus 40°C to +350°C (minus 40°F to +660°F) remote microprocessor					2										
Temperature with Output	No temperature output						0000									
	Temperature output, state max °C or °F = C or F						xxxx									
Communication Protocol	RS485 with MODBUS standard supply							M								
	RS485 with HART Optional extra							H								
Remote or Integral Microprocessor	Integral microprocessor								1							
	Remote microprocessor								2							
Process Connections, State size and Code Letter	½" - 8" ANSI 150 = **A** ½" - 8" ANSI 300 = **B** ½" - 8" ANSI 600 = **C**									x						
	DN15-200mm PN10 = **D** DN15-200mm PN16 = **E** DN15 - 200mm PN40 = **F**									x						
	DN15 - 200mm PN64 = **G** DN15 - 200mm PN100 = **H**									x						
	½" - 6" Tri-Clamp USA 3A = **I** 15 - 200mm DIN sanitary to DIN 11851 = **J**									x						
	½" BSPP male for sizes 5 or 10mm (1") = **K** ¾"BSPP male for sizes 20mm = **L**									x						
	¾"BSPP male for sizes 20mm = **L** 1"BSPP male for sizes 25mm = **M**									x						
	½" NPT male for sizes 5 or 10mm = **N** ¾"NPT male for sizes 20mm = **O**									x						
	1" NPT male for sizes 25mm (1") & less = **P** Other - Specify after code = **Q**									x						
Pressure Rating (Conn dependent)	Sanitary or screwed connections 10 barg 9145 psig) = 1										1					
	40 barg (580 psig) = 2 100 barg (1450 psig) = 3										x					
Wetted Flow Tube & Process Conn Mat'l	AISI 316L											A				
	Hastelloy C											B				
Programmable Batch Control	No Batch Control = 1 Batch normally open relay = 2 Batch normally close relay = 3												x			
Remote Micrprocessor Installation	Wall mounting with brackets													A		
	Pipe mounting bracket													B		
	Integral microprocessor (No mounting bracket)													C		
Power Supply	85 -265 V, 50 -60Hz = 1 24 V dc = 2														x	
Explosive Atmospheres	No explosive atmospheres															A
	Flameproof Option : Ex d IIC T3 - T6 for sizes 5 - 80mm (¼" - 3")															B
	Flameproof Option : Ex d ib IIC T3 - T6 for sizes 100 - 250mm (4" - 10")															C
	Intrinsically safe version is the same as flameproof option, except with IS Barriers / IS Barriers not included															x

tekCor TKC Coriolis Flow Sensor Enquiry Form

Customer's Name, Project Name, & Location:						
Detail	**Sensor 1**	**Sensor 2**	**Sensor 3**	**Sensor 4**	**Sensor 5**	**Sensor 6**
Quantity						
Media Type ADD any special notes, such as Dirty (D), Clean (C), air bubbles (AB), is % concentration required… max 2 components?						
Max. Mass or Volumetric Flow Rate with Units						
Remote or Integral Microprocessor . See Specification						
Note: Cable Length for remote transmitters Max. 10m (30 feet) included						
Bi-directional (B)/ Uni-directional (U)						
Pressure Range and Units						
Temperature Range and Units With/Without Output ?						
Liquid Viscosity and Units						
Explosive Atmosphere and Type Required						
Density or SG Range With Output (W) / Without Output (N) ?						
Pipe Schedule or ID / Wall Thickness Specify mm or inches						
Process connections required						
Pipe Material						
Is the flow sensor to be used in an area of high magnetic fields? Yes / No						
Batch Control Required? Yes / No Normally 0pen/Normally Closed ?						
Media component % solution required? Yes/No Note: max 2 components						
Communication required ? Yes/No MODBUS standard, HART optional						

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Specifications are subject to change without notice