process measurement solutions

KB Series

self averaging pitot flowmeter for gas, liquids and steam flows

Data sheet
IP371

Advantages of the KB series

- Patented square sensor design - reliable accuracy
- Multiple sensing ports on both up and down stream sides
- Symmetrical sensor for Bi-directional flows
- Safelock mounting for safety and reliability
- Integral 3 valve manifold
- Long term accuracy
- Simple low cost installation
- Energy savings due to low permanent pressure loss

Description

The KB series is a patented self averaging pitot tube flow sensor designed specifically to measure flow accurately in a wide variety of applications covering gas, liquid & steam.

The KB series with its unique design has a number of significant benefits over other averaging pitot tubes and flow meters which make it the right choice for many applications in the following industries :-

- Power generation and nuclear power stations
- Building services & HVAC (heating ventilating and air conditioning)
- Chemical & petrochemical processing
- Gas processing and transmission
- Water & Waste
- Food & Beverage

Typical KB Series system with remote manifold and 4301 DP transmitter

KB Series system with integral 3-valve manifold and direct mounted 4301 DP transmitter

How it works

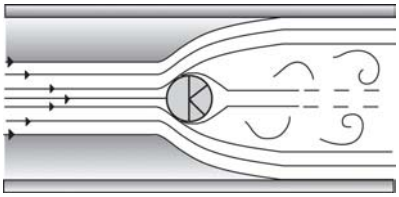
The KB series flow sensor is a primary element device which produces a differential pressure (DP) when inserted into a flow stream in a similar way to Orifice plates and Venturis.

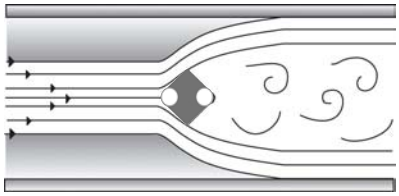
The KB series is typically connected to a Differential Pressure transmitter, which converts the DP signal produced by the KB series into a 4-20 mA/Hart signal which is proportional to flow rate.

Unlike the classic Pitot sensor, which is a single point device typically moved manually around the pipe to build up detail of the flow profile, the KB series is a self averaging pitot tube with multiple ports or sensing holes on both the up and down stream sides of the sensor. These ports constantly average the flow profile to generate an accurate DP signal in on site flow conditions.

Advantages of the KB series

Patented square sensor design





The square sensor profile with its well defined 'edges' and external plenum tubes produces a fixed fluid separation point for all liquids and gases ensuring optimum accuracy independent of Reynolds Number and flow rate.

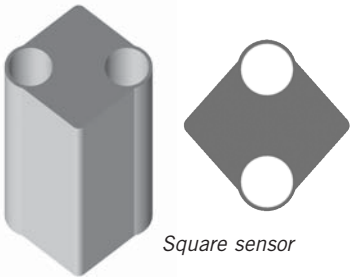
The square shape of the KB series is key to its performance, unlike the simple round sensors which have a fluid separation point that varies with Reynolds number (flow rate) leading to unpredictable accuracy.

The unique solid construction and manufacturing process ensure precise dimensional control and reproducability of the sensor profile - which is key to the accuracy of predicted calibrations.

The KB's unique construction also eliminates any potential for leakage between the high and low pressure plenums which can arise due to manufacturing tolerances, temperature variations and plant vibration with other sensor designs. This leakage will then be a source of unknown errors.

Symetrical sensor for Bi-directional flows

The unique design with averaging on both the up and down stream sides leads to a totally symmetrical sensor, this gives the ability for bi-directional flow measurement with the same accuracy and 'K' factor in both directions.

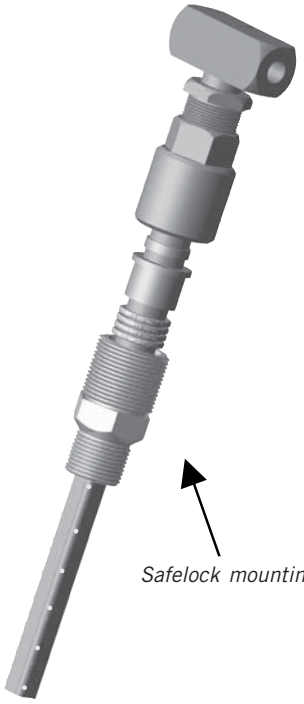


Square sensor

Integral 3 valve manifold - for ease of installation

The KB series is available with an optional integral 3 valve manifold allowing direct mount of the 4301 Differential pressure transmitter.

- Eliminates impulse lines
- Reduced cost of installation
- Reduced potential for leakage



Safelock mounting

Advantages of the KB series

Safelock mounting - Safety & reliability

The Patented Safelock mounting mechanism has a number of benefits over the traditional compression fitting.
The Safelock mechanism physically pushes or pins the end of the KB sensor against the opposite wall of the pipe in a controlled manner.
This increases the strength and structural limit of the sensor and often eliminates the need for an opposite end support compared to a non-pinned cantilevered sensor.

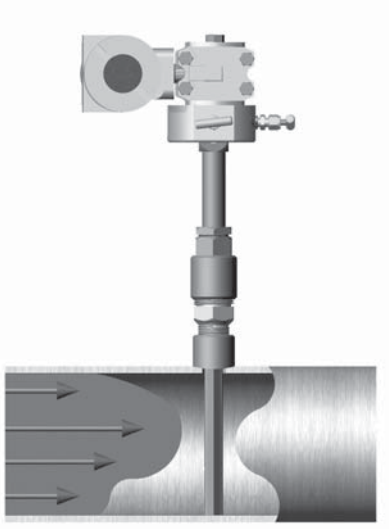
The safelock mechanism incorporates a safe ring that positively prevents the sensor from being ejected from the pipe even under high pressures, giving total peace of mind.

Gland packing seal - eliminates problems associated with ferrule crimping particularly if the sensor is removed for inspection or cleaning.

Multiple sensing ports on both up and down stream sides - for accuracy in real applications

Multiport averaging across the full pipe diameter on both the up and down stream sides of the KB sensor leads to averaging of the flow profile on both the impact (high) pressure and suction (low) pressure. This is critical to achieving accurate flow measurement in real industrial applications where bends and valves produce disturbed non-ideal flow profiles, particularly as most of the DP is generated from the down stream suction side.

This is unlike many other averaging pitot tubes which deviate from the ideal design for flow measurement by using a single sensing port in order to simplify manufacture.

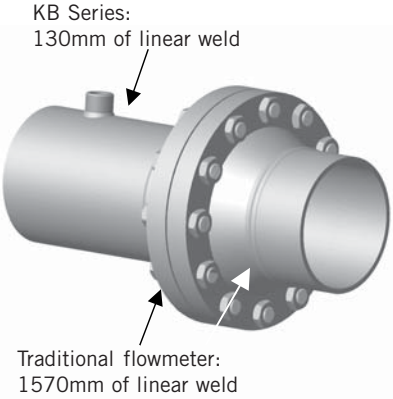


Multiple sensing points

Long term accuracy

The performance of the KB series is unaffected by wear, grease or deposits on the sensor giving long trouble free and accurate flow measurements.

Advantages of averaging pitot tubes



Typical for 250mm pipe

Simple low cost installation

The sensor is easily installed by typically drilling a single 22mm hole and welding on a single boss (nipple) with only 130mm of linear weld (typical of size 30 sensor covering pipe sizes up to DN1065mm).
No pipe cutting or flange welding is required.
Combined with the integral manifold this makes the KB series one of the simplest and lowest cost flow meters to install.

Energy savings due to low permanent pressure loss vs orifice

The KB series has a very low permanent pressure loss due to the low blockage area in the pipe.
When compared to an orifice plate on an application the energy savings can be significant.
The KB series installation can pay for itself within months when used in place of orifice plates.

KB Series specifications

Functional specification - standard products

Service	Liquid, gas and steam applications
Pipe sizes	12 – 2000 mm / ½" – 80"
Flow sensor sizes	
Size 10:	Line size 12 to 40mm / ½ to 1½"
Size 20:	Line size 50 to 150mm / 2 to 6"
Size 30:	Line size 100 to 1065mm/ 4 to 42"
Size 40:	Line size 300 to 2000mm / 12 to 80"
	Note: Sizes 20, 30 & 40 are insertion sensors and size 10 units are supplied as pipe sections
Pressure limits	
Size 10 & 20:	0 to 83 Barg / 1200psig *
Size 30 & 40:	flanged 0 to 207 Barg / 3000psig *
Size 30 & 40:	safelock 0 to 83 Barg / 1200 psig
	Note units with integral manifold are limited to : 83 Barg / 1200 psig
	* Subject to flange rating

Process temperature limits	
Integral manifold pressure transmitter:	-40 to 100°C typical (subject to pressure transmitter limits)
Remote mounted pressure transmitter:	
Size 10:	-40 to 400°C *
Size 20:	-40 to 260°C *
Size 30:	Safelock gland -40 to 260°C *
Size 40:	Safelock gland -40 to 260°C *
Size 30:	Fixed flange -40 to 400°C *
Size 40:	Fixed flange -40 to 400°C *
	* Higher on application

Physical specification

Sensor & mounting	316L stainless steel – including integral welded flange where fitted.
Safe lock Gland assembly	316 stainless steel with Fluograf packing
Sensor head DP output conns.	
Standard:	
Size 10	6.35mm OD tube/ ¼" NPT male
Size 20	¼" NPT female
Size 30 & 40	½" NPT female
Optional:	Integral 3 valve manifold:- Stainless steel. 3 Valve manifold as part of sensor head, to allow direct mounting of the 4301 and other DP transmitters. Available on sensor sizes 20, 30 & 40 *Note, size 20 sensor must be installed with independent support of the integral transmitter.*

Mounting hardware	Threaded weldolet or flanged weld neck. 316 stainless steel or carbon steel as appropriate to pipeline material.
Isolating valves	¼" or ½" NPT female threaded – complete with inlet adapters/ connectors appropriate to sensor size and orientation. Type and material according to duty – the following are standard supply:
Air or water:	Low pressure/ temp Brass ball: Max 40 bar @ 180°C
High pressure gases or liquids:	Stainless steel needle max 205 bar @ 175°C
Steam:	Brass steel needle max 175 bar @ 175°C (will require fill connections)

Performance specification

Accuracy	+/- 1% of reading
Repeatability	+/- 0.1% of reading

Verified by independent test laboratories.

Pressure equipment directive (97/23/EC) compliance information

Sizes ≤25mm of the KB10 and all units in the KB20, 30 and 40 ranges fall within the scope of Article 3.3 of the directive and are designed and manufactured in accordance with Sound Engineering Practice. These units do NOT carry a CE mark and neither do they have a declaration of Conformity relating to the Pressure Equipment Directive even though complying with it.

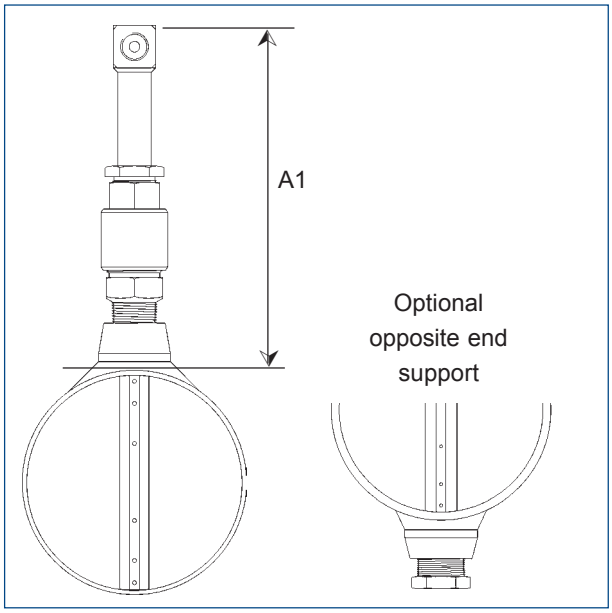
Some KB 10 series meters of sizes >25mm nominal bore, depending on fluid pressure and the Group applicable to the fluid, as detailed in the Directive, may be classified in Category I or II. Units that are classified as such will carry the CE mark and have a Declaration of Conformity in relation to the Pressure Equipment Directive.

Some KB 10 series meters of sizes >25mm (nominal) may also fall with the scope of Article 3.3 of the directive and will NOT be CE marked as detailed above.

The range of aluminium duct bars are rated up to a maximum of 0.5 bar working pressure and are NOT CE marked as the directive does not apply to these units.

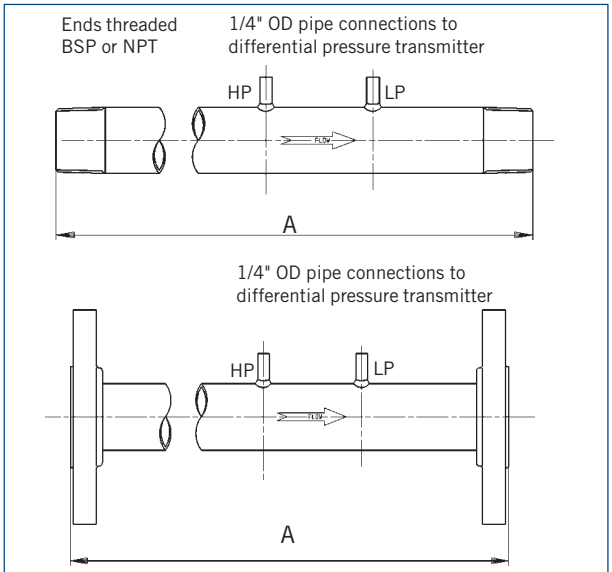
NOTE: THIS EQUIPMENT IS NOT APPROVED FOR USE WITH UNSTABLE GASES

Model 20, 30 & 40 – safelock mounting with threaded weldolet



Sensor Size	A1 mm	Sensor & Weldolet Thread	Process Connection
20	177	¾" NPT	¼" NPT
30	264	1" NPT	½" NPT
40	316	1½" NPT	½" NPT

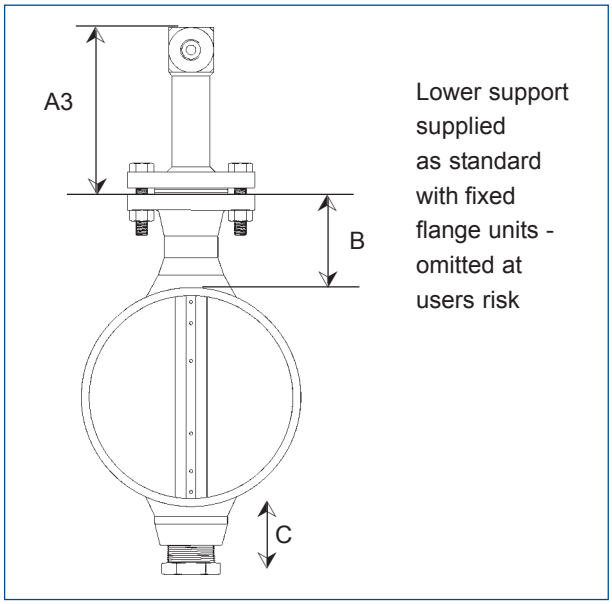
Model 10 – In-line threaded and flanged versions



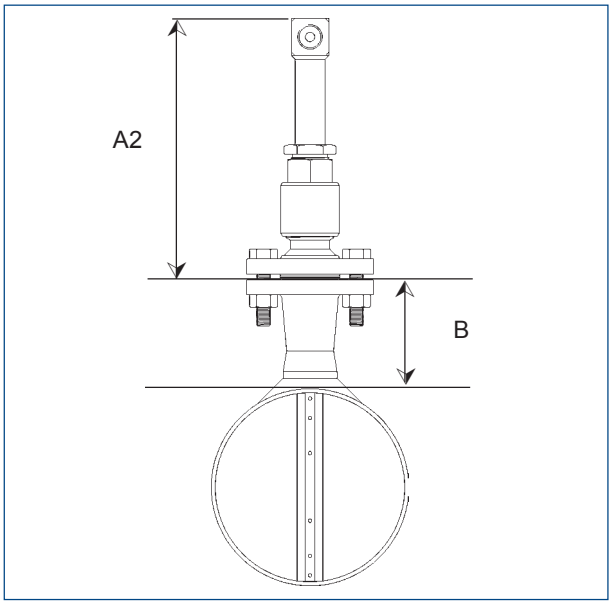
Maximum flange rating at ambient temperatures is ANSI 600

Meter Size	A mm
12	250
20	300
25	350
32	450
40	500

Model 20, 30 & 40 – fixed flange mounting with opposite end support



Model 20, 30 & 40 - flanged mounting with safelock gland



Sensor size	A2 mm	A3 mm	B ANSI 150/ PN16	B ANSI 300/ PN25/40	B ANSI 600	C mm	Flange NB	Process connection
20	157	101	75	80	85	43	20mm ¾"	¼" NPT
30	227	151	85	90	95	55	25mm 1"	½" NPT
40	292	217	95	100	110	64	40mm 1½"	½" NPT

A2 and A3 dimensions apply to ANSI 150 lb flanges.

To achieve the full structural capability when fitting a fixed flanged sensor (without safelock), the use of an opposite end support is recommended. Omission of this feature will reduce the structural capability of the sensor.

Note [1] - For flanged sensor models if an existing flanged branch is being re-used then the B dimension, together with the pipe internal diameter and outside diameter/wall thickness must be stated when ordering, should the dimension exceed the ANSI 600 dimension by greater than 30mm please consult factory.

Ordering information - KB Series insertion sensors

Code	KB Series sensor - Model size
KB20	Size 20 50 to 150mm / 2" to 6"
KB30	Size 30 100 to 1065mm / 4" to 42"
KB40	Size 40 300 to 2000mm / 12" to 80"

Code	Duty
L	Liquid
G	Gas
S	Steam

Code	Pipeline size
XXXX	Internal pipeline diameter in mm EXACT diameter ID & wall thickness or pipe size & schedule required on order

Code	Sensor mounting
B	Safelock
C	Fixed flange
D	Flange + safelock

Code	Pipe orientation & head
1	Horizontal - standard head
2	Vertical - standard head
3	Horizontal - integral 3 valve manifold (see note 1)
4	Vertical - integral 3 valve manifold (see note 1)

Code	Sensor flange rating (note 3)	Code	
A	Not required - safelock (code B above)	F	PN 25, 40 (see note 2)
B	ANSI 150 RF	G	ANSI 900 RF
C	ANSI 300 RF	H	ANSI 1500RF
D	ANSI 600 RF	Z	Special on application
E	PN 16 (see note 2)		

Code	Opposite end support
0	Not required
1	Carbon Steel
2	Stainless Steel

KB30	L	0343	B	1	A	0	Typical ordering information

Notes: 1. Size 20 units fitted with integral manifolds must be installed with additional support bracket on pressure transmitter. Maximum pressure for integral manifold is 83 bar/1200 psi.
2. BS4504 - RF unless otherwise stated
3. Standard flange sizes (bores) are shown on previous page, for other sizes please consult factory.

Ordering information - KB10 - in line sensors

KB	KB Series sensor - inline version for pipe diameters 12 to 40mm (½" to 1½")

Code	Type / size
10	Inline version

Code	Duty
L	Liquid
G	Gas
S	Steam

Code	Pipeline size	
12	12mm (½")	schedule 40
20	20mm (¾")	schedule 40
25	25mm (1")	schedule 40
32	32mm (1¼")	schedule 40
40	40mm (1½")	schedule 40

Code	Sensor mounting	
E	BSPT screwed	(size as above pipeline)
F	NPT screwed	(size as above pipeline)
G	ANSI 150 RF flanges	(size as above pipeline)
H	DN PN10/40 flanges (BS4504 RF unless otherwise stated)	
Z	Special to order	

Code	Instrument valves / connections	
00	6.35mm / ¼" OD stainless steel tube	400°C / 752°F
01	¼" Brass valves and nipples	150°C / 302°F
03	¼" Stainless steel valves and nipples	275°C / 527°F

Code	Other
AO	Standard
ZZ	Special to order

KB	10	L	20	E	01	AO	Typical ordering information

Ordering information - KB Series accessories

KBA	KB accessories			
Code	**Isolating valves - pair**			
00	None			
01	Brass ball std + nipple	size 20	40bar / 580psi	180°C / 356°F
02	Stainless needle + nipple	size 20	345bar / 5000psi	230°C / 446°F
03	Brass needle, elbow steam	size 20	207bar / 3000psi	200°C / 392°F
04	Brass ball std - elbow	size 20	40bar / 580psi	180°C / 356°F
05	Stainless needle, elbow	size 20	345bar / 5000psi	230°C / 446°F
06	Brass needle, steam	size 30 & 40	207bar / 3000psi	200°C / 392°F
07	Brass ball std + nipple	size 30 & 40	40bar / 580psi	180°C / 356°F
08	Stainless needle + nipple	size 30 & 40	345bar / 5000psi	230°C / 446°F
09	Brass ball std - elbow	size 30 & 40	40bar / 580psi	180°C / 356°F
10	Stainless needle, elbow	size 30 & 40	345bar / 5000psi	230°C / 446°F

Code	**Indicator / DP transmitter**
A	Not required
B	Indicator - low pressure gas 1Barg (14.5 psig) maximum line pressure
C	Indicator - medium pressure gas 5.5 Barg (80 psig) maximum line pressure
D	Transmitter - typical code 4301-D1-1-I-B-U/D-00A100 See data sheet 0075
E	Indicator - high pressure liquid and gas 34 Barg (490 psig) maximum line pressure

Code		**Mounting hardware, flanged stand-off nozzle for fixed flange or flange with safelock**			
CS	**SS**	**Flange type**	**CS**	**SS**	**Flange type**
00	**00**	Not required	**12**	**27**	DN40 PN16 * - type 40
01	**16**	¾" ANSI 150 RF - type 20	**13**	**28**	DN20 PN25/40 * - type 20
02	**17**	1" ANSI 150 RF - type 30	**14**	**29**	DN25 PN25/40 * - type 30
03	**18**	1½" ANSI 150 RF - type 40	**15**	**30**	DN40 PN25/40 * - type 40
04	**19**	¾" ANSI 300 RF - type 20	**31**	**39**	1" ANSI 900 RF - type 30
05	**20**	1" ANSI 300 RF - type 30	**32**	**40**	1½" ANSI 900 RF - type 40
06	**21**	1½" ANSI 300 RF - type 40	**33**	**41**	1" ANSI 1500 RF - type 30
07	**22**	¾" ANSI 600 RF - type 20	**34**	**42**	1½" ANSI 1500 RF - type 40
08	**23**	1" ANSI 600 RF - type 30			
09	**24**	1½" ANSI 600 RF - type 40			*Note 2 : BS4504 RF - unless otherwise stated
10	**25**	DN20 PN16 * - type 20			
11	**26**	DN25 PN16 * - type 30			

Code		**Safelock mounting hardware - threaded weldolet**
CS	**SS**	**Size**
A	**A**	Not required
B	**E**	Size 20
C	**F**	Size 30
D	**G**	Size 40

Code	**Remote manifold**
0	Not required
1	3 valve stainless steel
2	5 valve stainless steel

KBA	06	A	00	C	0	Typical ordering information

Ordering information - Duct bar

KBD	KB Duct bar sensor - for low pressure air flows, 60°C maximum

Code	**Bar material and duct shape**
40	316L stainless steel - Round duct (6 Barg / 87 psig maximum)
50	316L stainless steel - Rectangular or square duct (6 Barg / 87 psig maximum)
51	Aluminium - Rectangular or square duct (500 mbarg / 7 psig maximum)

Code	**Duty**
G	Gas - Air only

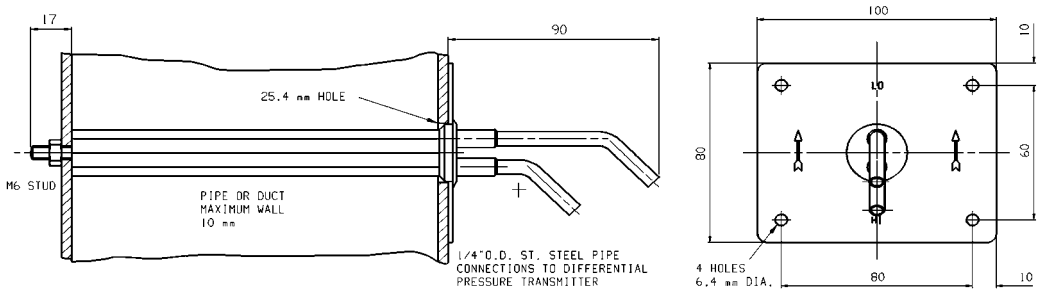
Code	**Duct size - enter exact internal diameter or internal dimension of rectangular duct that bar will span**
xxxx	Internal duct size in mm - maximum 2000mm / 80" *(assumes a wall thickness of between 1 & 3mm consult factory if outside these limits)*

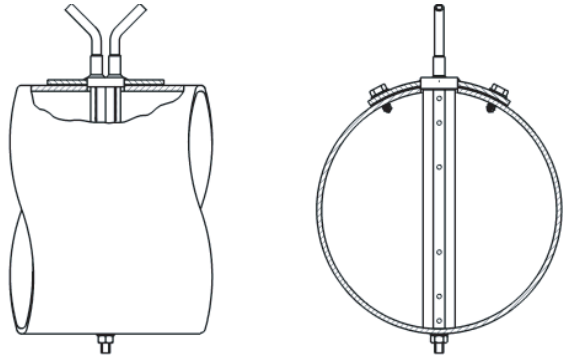
Code	**Flow direction / duct orientation**
B	Horizontal or flow vertically up
C	Flow vertically down

Code	**Instrument connections**
00	6.35mm / ¼" OD stainless steel tube
01	¼" Brass valves and nipples
02	¼" Stainless steel valves and nipples

KBD	50	G	264	B	01	Typical ordering information

Duct bar - for HVAC air flow applications





Mounting detail
for 316L st.st. versions

Duct Bar specification

Duct sizes	100 to 2000mm / 4" - 80" [1]
Sensor material	316L stainless steel or aluminium
Maximum temperature	60°C / 140°F
Maximum pressure	
316L st st.	6 barg / 87psig
Aluminium	500 mbarg / 7psig
Accuracy	+/- 1.0 % of reading
Repeatability	+/- 0.1 % of reading
DP connections	6.35mm/¼" OD tube or ¼" NPT valves
Fluid media	Air: For low pressure & temperatures only
Simple threaded opposite end support	supplied as standard

Note [1] higher on application

The Duct bar units are specifically designed for low temperature and pressure air flow applications as typically found in HVAC (heating, ventilating and air conditioning) applications.

The Duct bar utilises the same unique sensor shape with multiple port flow averaging - giving the same performance, low pressure drop and other features as the standard industrial KB series sensors.

The method of mounting is simple and very effective for rectangular and round ducts, using the 'flange' plate with self tapping screws or bolts.

KDG Instruments
Crompton Way Crawley West Sussex UK RH10 9QR
Tel: 01293 866000 Fax: 01293 530849
e-mail: sales@solartron.com www.solartronmobrey.com

Solartron Mobrey GmbH	Deutschland	tel: 0211/99 808-0
Solartron Mobrey Ltd	China	tel: 021 6353 5652
Solartron Mobrey sp z o o	Polska	tel: 022 871 7865
Solartron Mobrey AB	Sverige	tel: 08-725 01 00
Mobrey SA	France	tel: 01.30.17.40.80
Solartron Mobrey SA-NV	Belgium	tel: 02/465 3879
Solartron Mobrey	USA	tel: (281) 398 7890

solartron mobrey
a Roxboro Group Company

IP371
Dec 2002