SDF Sensors

Pitot tube sensors for • gas • steam • liquids

SDF sensors from S.K.I.

Dear readers,

We should like to thank you for your interest in learning more about SDF flow sensors. Manufacturers are defined by what they make. This proven axiom applies to our SDF flow sensors as it does to all our other products.

SDF sensors are a product of S.K.I. (Schlegel & Kremer Industrieautomation GmbH).
Ever since the company's foundation in 1992 the name "S.K.I." has stood for:

- innovative engineering know-how and continuous further development
- flexibility and an open ear for what customers need
- reliability and integrity in the planning and handling of customer orders
- absolute credibility in complying with agreed characteristics and a sense of responsibility for ensuring that our products function as efficiently as possible.

This brochure is intended to give you a general idea of our company philosophy and of what exactly we offer when it comes to solving your flow measuring tasks. At S.K.I. we are sure of one thing:
what benefits you benefits us. This is why we are committed to ensuring a real and quantifiable advantage for our customers.

Using SDF flow sensors is a matter of principle – but also much more besides. It is a contribution to saving the planet's energy resources and to conserving our environment. We have of course always keenly and positively participated in discussions about measuring accuracy and service-friendliness; however, this conservational aspect, we feel, attains a significance extending beyond everyday business matters.

With this in mind we look forward very much to working together with you.

SDF sensors – an overview

SDF flow sensors are universal measuring instruments for use in pipework with a diameter greater than 25 mm (1 inch); practical constraints are very few. These sensors can be used anywhere where you need to measure the flow of gases, saturated wet steam, super-heated dry steam, or liquids. These sensors are not only ideally suitable for a very wide range of applications; they also bring substantial cost / benefit advantages compared with other measuring methods.

- Your benefit – simplicity:
  SDF sensors can be assembled and fitted quickly and easily.

- Your benefit – long-term reliability:
  SDF sensors need no sharp edges and are thus virtually free from wear and tear. This gives you precision that lasts.

- Your benefit – guaranteed precision:
  SDF sensors can be manufactured from virtually any material. We guarantee that even special designs will provide the specified precision.

- Your advantage – efficiency:
  SDF sensors cause only minimal narrowing of the free cross-section of the pipework. Keeping constriction to a minimum means low losses in usable energy. This is good news for your financial controller and for the environment.

- Your benefit – trouble-free operation:
  SDF sensors are generally almost maintenance-free. Only the elements following downstream in the measuring chain need occasional low-level routine maintenance.

- Your benefit – a reliable background:
  SDF sensors are a product of S.K.I. GmbH. This means reliable and qualified specialist support both before and after purchasing.

The class of an SDF sensor is the sum of its individual characteristics. Each of these characteristics offers you as customer an immediately recognizable benefit. All these characteristics taken together make SDF sensors second to none.

SDF sensors – sleep soundly and save money

Easy to install

To install an SDF sensor in the pipework you must:

- mark out and drill the necessary holes in the pipe wall
- prepare the welding points
- weld the installation muff and if necessary a counter support in position
- fasten the sensor in the installation muff.
- The rest of the work (e.g. connecting the electrical measuring transducer) is performed in the same way as with other differential pressure sensors.

This means:

- no need to cut the pipework
- usually no need for lifting tool

The installation components needed to fit the sensor in the pipework are all included in delivery with each SDF sensor.

Pressure loss kept to a minimum

SDF sensors cause only minimal narrowing of the free cross-section of the pipework. The constriction caused by an SDF sensor is only 2 to 15 percent of that experienced with orifice measurement. The drop in pressure at a measuring point fitted with an SDF sensor is thus extremely small.
This is one of the major advantages of an SDF pitot tube sensor over other measuring methods. Reducing pressure losses also curbs financial waste. And “waste” is indeed the right word if your energy consumption is higher than is absolutely necessary.

A simple example:

A steam measurement as per DN150,
pressure 6 bar, temperature 170 °C,
flow rate 6000 kg/h

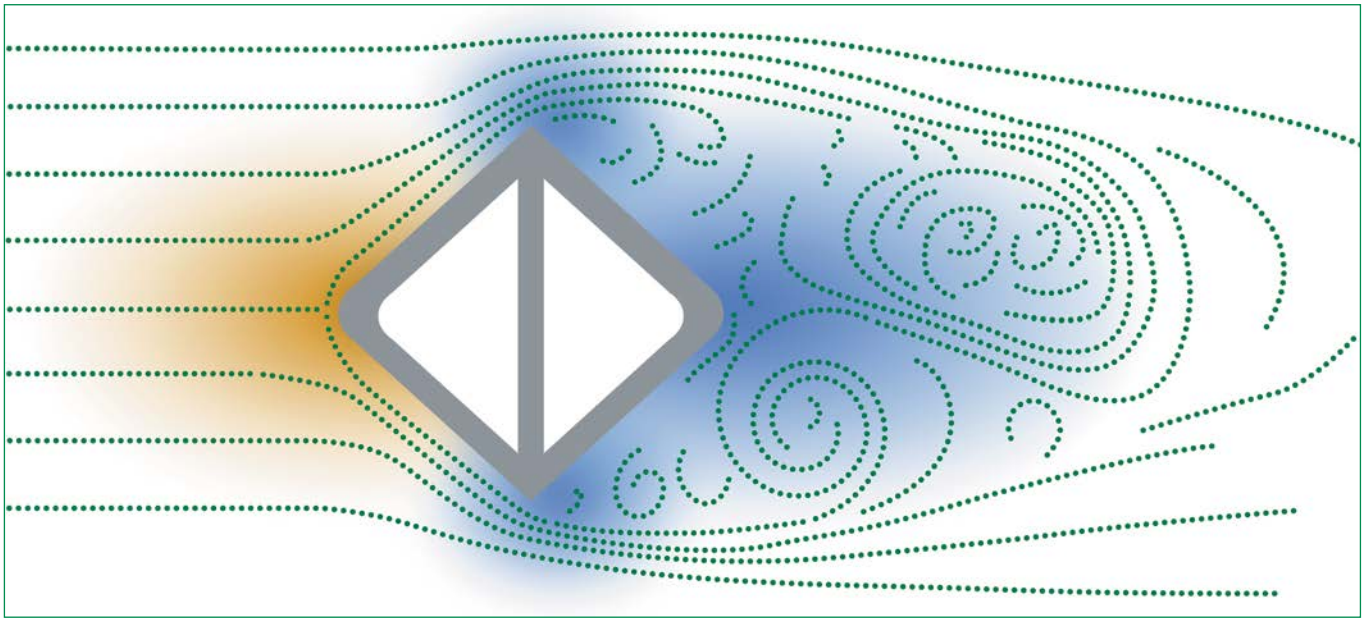
The loss of usable energy per hour amounts to:

Orifice method	SDF sensor
8,24 kWh	0,24 kWh

These figures speak for themselves.

Operating costs with orifice measurement are over 30 times higher than with sensor measurement.





A high level of precision in practical applications

SDF sensors stand out in comparison with other measuring methods by virtue of the characteristic way in which they determine measured values at the measuring point. Only pitot tube sensors manufactured according to the SDF design are able to perform correct averaging even when the inlet section and outlet section are not of the length usually required. Smoothing sections of sufficient length upstream and downstream from the measuring point are in industrial practice more often the exception than the rule.
In these circumstances there is really only one answer:

the SDF pitot tube sensor.

We have in our practical experience frequently installed SDF sensors in pipe sections appreciably shorter than the prescribed length (5 x inside diameter) and these extremely precise measuring instruments have functioned perfectly.

Measured results with long-term stability

The functioning and accuracy of an SDF sensor is – thanks to its shape and design – not generally affected by wear and tear of the exterior sensor profile.
In practical applications SDF sensors have proven to be extremely resistant to contaminants.
The size of the sensor inlet and the inner volume of an SDF sensor are precisely harmonized to produce a “dirt-repellent” effect.

The consequences:

In most cases SDF sensors can be used in media with dust concentrations of up to 200 mg/m³ without the need for extra regular cleaning.

Conclusion:

Always reliable, stable and accurate – even in the roughest conditions – that is how our customers experience SDF sensors in practical applications.

SDF sensors – tried and tested competence

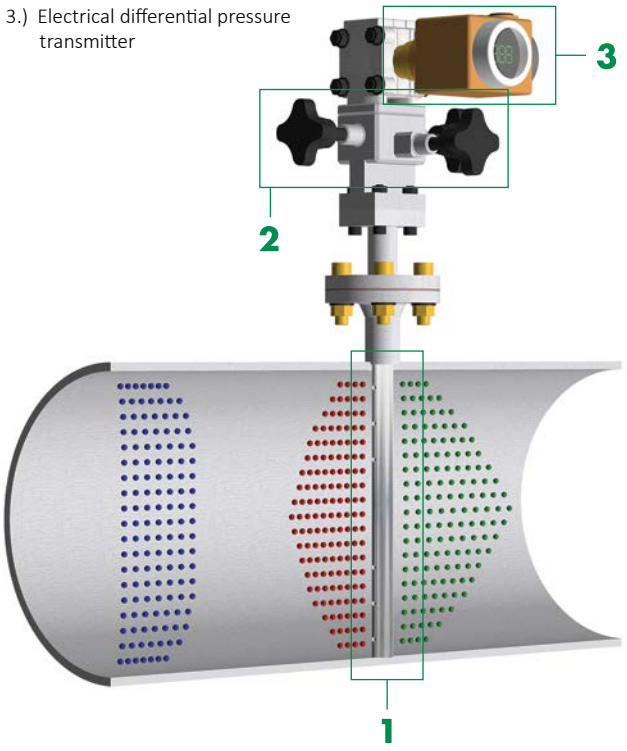
Functional principle

An SDF sensor consists of two interior chambers tightly separated from each other. The sensor is inserted from outside through the pipe wall into the pipe. In the exposed upstream chamber the impact of flowing medium causes the pressure to rise.

1.) SDF sensor

2.) 3-way-manifold or similar

3.) Electrical differential pressure transmitter



In the downstream chamber in the shadow of the sensor and thus partially shielded from the impact of flowing medium, negative pressure forms.
The pressure difference between these two chambers is acquired in the sensor and forwarded to a differential pressure measuring transducer.

The transducer converts this data into an electric signal.

Of course the pressure difference thus measured depends not only on the speed of the medium but also on its density. This is taken into account when it comes to calculating the flow velocity.

Specifications

Applications	
Gases:	Temperatures up to 1200 °C, Pressures up to 320 bar (even higher pressures available on request)
Steam:	Standard: 300 °C Maximum: 590 °C; 180 bar
Liquids:	Pressure up to PN 320
Pipework	
SDF-10:	32 … 100 mm
SDF-22:	80 … 1500 mm
SDF-F-32:	300 … 2500 mm (Sensor type suitable for special mechanical or chemical loads)
SDF-F-50:	from 300 mm and under extreme mechanical loads
Accuracy	
Linearity	Max. Deviation 1 % in the range between 5×10^4 and 5×10^6 Re
Materials	
Standard:	316L
Others:	A335 P1 (=similar to 1.5415), A335 P12 (=1.7335), A335 P22 (=1.7380), A335 P91 (1.4903), 1.4922, Hastelloy B and C, Inconel, Monel, plastics (PVC, PP, PVDF)
Certificates	
Delft hydraulics:	Series tests on several sensors and sensor types to determine the absolute deviation of sensors from ongoing production process; (for results see “Accuracy” in this table)
TÜV Rheinland Sicherheit und Umweltschutz GmbH:	Report no. 936/802015 dated 1993: Suitability for continuously operating apparatus used to measure exhaust fl ow rates as per requirements specifi ed in the circular issued by the Bundesumweltministerium (German environment ministry) dated 01/Mar/1990



Commissioning and maintenance

SDF sensors are straightforward and undemanding as regards routine maintenance and care of the measuring point. Their robustness and their functional principle make these sensors virtually maintenance-free. Routine maintenance work on SDF sensors is limited to removing sticky deposits left by the medium and cleaning. SDF sensors are also resistant to contaminants. They can cope with dust concentrations up to 200 mg/m³ without needing regular cleaning.
SDF sensors are extremely precise measuring instruments and yet they do not need to have sharp edges. This makes them in practical terms virtually wear-free. That is a claim that not every differential pressure sensor can make.
In everyday use attention usually focusses on the differential pressure transducer. Nowadays the necessary adjustments need only about a minute per device.

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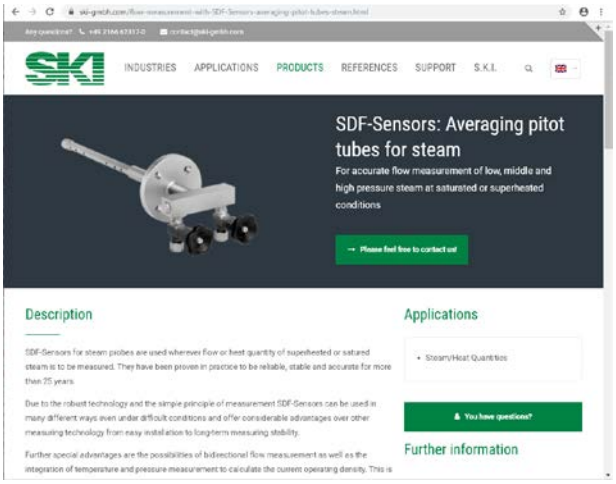
Continuously improving quality

When it comes to the accuracy and functional reliability of measuring instruments one thing is sure, namely that devices and solutions are only as good as the manufacturer that makes them. Schlegel & Kremer Industrieautomation GmbH bases its operations on a quality management system as per ISO 9001. The ISO 9001/2015 system involves monitoring the level of customer satisfaction. Customer satisfaction is thus the decisive measure of our activity and success. This philosophy is reflected in the quality of the advice provided by our specialists, in the reliability and precision of our products, and in punctuality and integrity of our deliveries. Striving for customer satisfaction is thus the hallmark of S.K.I. GmbH and its products.

www.ski-gmbh.com

SDF sensors have been featured in the Internet for many years. We have always considered the Internet not only as a platform for advertising, presentation, and e-commerce but also – and above all – as a network for supporting our customers, for supplying them with all the working instruments they need, and for selecting and designing the appropriate measuring points.



S.K.I. is the first – and still today the only – company in this field to offer its customers a complete set of support tools free-of-charge. You as customer, or as someone interested in SDF sensors, are thus always at the cutting edge of technology and profit in this way from the on-going development of our calculation tools.

Visitors to our web site can calculate on-line which SDF sensors are best suited to their needs; in so doing they can draw on the comprehensive on-line support available. The basic data of all the usual media is provided automatically.

Our site also provides automatic access to a continuously growing database of pipework data according to the various applicable standards.

Visitors to our site are offered comprehensive on-line assistance in defining their measuring tasks.

It is perhaps almost superfluous to mention that of course all the written documentation referring to our SDF sensors can be read, saved, and printed out at any time in electronic form and in any of several available languages.

SDF sensors: the universal instrument for flow measurement

Compressed air

Supply gases, in particular compressed air pipes, are a typical standard application for SDF sensors.

The measuring setup is compact, simple, and extremely quick and easy to install and put into service; it is also – by its very nature – also suitable for existing pipe networks.

The sensor is installed either via a flange or via a welded-on pressure-resistant threaded fitting and a cutting ring.

The function of SDF sensors in compressed air applications is safe from any adverse effects caused by oil or condensation.

Fluctuations in the density of the medium caused by changing pressures and temperatures can be corrected by means of integrated or external sensors.

Biogas

Biogas, landfill gas, or other natural gases which are conveyed through pipework with relatively low pressure differences are a special challenge.

To measure gases in these circumstances one needs sensors which keep pressure losses constantly low and which are resistant both to condensation and to aggressive constituents in the gas.

This is an application area in which SDF sensors – by their very nature – are the first and often the only viable choice.

SDF sensors meet all these requirements; when it comes to stationary operation over prolonged periods they are therefore ideally suitable and superior to all other methods – irrespective of whether these use moving or heated elements.



Flue gas

The “SDF sensor” concept has always, right from the outset, been linked with the task of measuring gases that are contaminated, corrosive, or charged with water or dust.

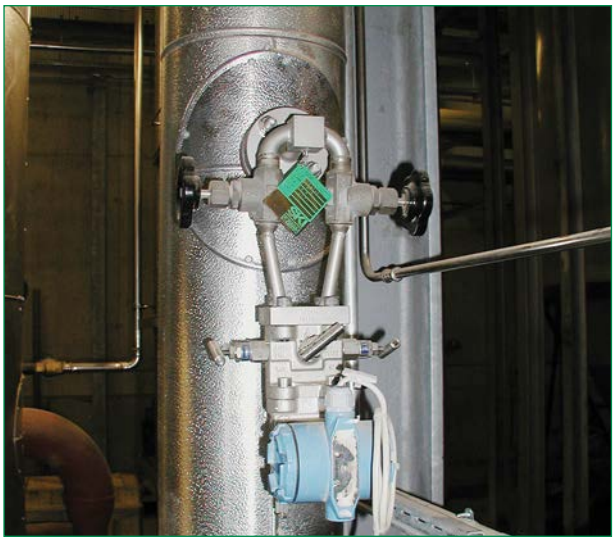
SDF sensors have always, based on an expert assessment issued by the TÜV Rheinland, been approved for use in systems requiring official certification.

They are thus ideally suitable for continuous use under difficult conditions. This fact is confirmed time and time again by our customers, most of whom, for precisely this reason, have remained loyal over many years.

Our customers in this sector – system builders, operators, market leaders and specialists in emissions measurement – know and value our sensors as the premium products they are.

Our customers have several good reasons for using SDF flue gas sensors from S.K.I., namely the quality and reliability of our products, the qualified competence of our advisory and service staff, and the hands-on practical suitability of the solutions we propose.

Water/condensate



There are many procedures available for measuring the flow of water. Yet even with this medium there are certain application areas in which SDF sensors are the only reasonable choice.
One example is taking measurements in feed water systems in which the medium lacks conductivity.

SDF sensors, thanks to their special design options, are almost predestined for use in the high pressures and high temperatures that usually prevail in feed water pipes.

Another example is taking measurements in large pipe systems; persuasive arguments here in favor of SDF sensors are the cost factor and the relative ease with which an SDF sensor can be retrofitted.

*Some of our model diagrams show pipes; these are not included in standard delivery.

SDF sensors for steam and special applications

High pressures – high temperatures

One innovation with an assured future is the range of SDF high-pressure steam sensors.

Compared with other measuring instruments that might at first glance seem suitable SDF high-pressure steam sensors help you make substantial savings not only in energy costs, as might be expected with steam sensors anyway, but also in the actual procurement.

High linearity across a broad velocity range, typical for SDF sensors, is the really decisive factor affecting the quality of measured results in this field. SDF sensors owe their high linearity to their intelligent shape which dispenses with the usual sharp edges subject to wear and tear. This ensures constant accuracy over an unusually long useful life.

Measuring steam – saving energy

When it comes to steam pipes SDF sensors are on home territory.

Alone the high energy saving potential achieved by keeping pressure losses constantly low justifies the installation of SDF sensors; it even justifies replacing already installed measuring equipment.

Amortization periods of only eight months and less are far from exceptional. In economic terms an investment of this nature is virtually a “must”.

Over and beyond the economic advantages, however, SDF steam sensors incorporate a number of characteristic features which make them particularly practical.
The special form of their condensate containers, for example, ensures a stable zero-point for measuring operations under all conceivable circumstances.

Orifice out – sensor in – it's as simple as that

Have we convinced you of the advantages of an SDF flow sensor – but you have an orifice measuring system already installed? For precisely this eventuality we have developed the SDF sensor adjusting ring; this makes for the simplest installation imaginable.

This is the principle in just a few words:

- Remove the orifice
- Fit our adjusting ring
- Connect the measuring transducer
- Finished!

There is no need for any extra welding work on the pipework because your new measuring system simply takes over the existing setup.

The above diagram shows the special construction of an adjusting ring for extremely short inlet sections. The standard adjusting rings contain only one SDF sensor.

FASTLOK sensors

The vast majority of industrial procedures simply do not tolerate interruption. This is the typical situation where a FASTLOK sensor comes into its own.

FASTLOK sensors can be inserted and removed all in the course of normal operation. These sensors can, depending on type, be used at rated pressures of up to 100 bar.

All other features are the same as with the other SDF sensors. The only difference is that outside the pipe there is a special apparatus into which the flow sensor fits before being withdrawn – thus sealing it off against its immediate surroundings.

Air purging units LSE-HD

The dust concentration is over 200 mg/m³?
Before they become congested with dust, SDF sensors are cleaned with air purging units. This procedure is safe and reliable. The cleaning principle is very simple – and does not need solenoid valves.

AccuMind®

AccuMind® flow computers are the suitable partners for our SDF sensors. They provide everything that is needed to convert a differential pressure signal into a flow rate signal.

Sensors and measuring transducers

We at S.K.I. do not only plan and equip complete measuring points. We also offer all the other instruments needed to organize and operate an efficient measuring system. And we provide service before and after purchase.

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