

# Differential Pressure Transducers

**Model 8310**  
**Models 8313, 8314**  
**Model 8315**

Code:	8310 EN
Delivery:	10 - 12 weeks
Warranty:	24 months



Model 8310  
for lower pressure ranges



Models 8313, 8314  
for medium pressure ranges



Model 8315  
for high pressure ranges

- Measuring ranges from 0 ...  $\pm 35$  mbar to 0 ...  $\pm 500$  bar
- Accuracy < 0.25% or < 0.5%
- Available for line pressures up to 345 bar
- Optional output available as  $\pm 5$  V or 4 ... 20 mA
- Suitable for liquid or gaseous media
- Made of stainless steel, reliable, robust

## Application

Sensors in the 831x series measure differences in pressure between the two ports of the measuring element. Pressure differences can be measured with respect to a reference pressure, such as atmospheric, or to the command variable of a regulation system. Equally, however, it is possible to measure pressure differences within systems that have a high static pressure.

The differential pressure transducers sense in both directions and can handle liquid or gaseous media applied to either port. Vents make installation easier. The robust design and the use of stainless steel make it possible to use the differential pressure transducer under tough operating conditions.

Example applications:

- ▶ Measuring flow rates
- ▶ Clean room technology
- ▶ Monitoring and control of heating/ventilation/air-conditioning systems

## Description

On both pressure ports, the differential pressure transducers include a closed chamber, each with a membrane. Both membranes, like all the parts that come into contact with the medium, are made of stainless steel and are welded to create a hermetic seal against the inner space of the measuring element. Transducers with this structure are also referred to as wet/wet; it allows differential pressure of gaseous and liquid media to be measured directly. The differential pressure sensors work in both directions, i.e. either port can be the higher pressure connection. Integrated measurement amplifiers for  $\pm 5$  V or 4 ... 20 mA are offered as an option; this increases the height by 29 mm.

## Technical Data - Model 8310

Model	Order Code	Measurement Range [bar]	Typical Measurement Error* [% v.E.]	Characteristic Nominal [mV/V]
8310	8310-4035	0 ... ± 0.035	< ± 0.25	1
	8310-4100	0 ... ± 0.1	< ± 0.25	1.5
	8310-4200	0 ... ± 0.2	< ± 0.25	2
	8310-4500	0 ... ± 0.5	< ± 0.25	2
	8310-5001	0 ... ± 1	< ± 0.25	2
	8310-5002	0 ... ± 2	< ± 0.25	2

\* Total error consisting of non-linearity, hysteresis and variation.

### Electrical values

Bridge resistance: foil strain gauge 350 Ω, nominal  
Calibration shunt resistor: 59 kΩ ± 0.1 %  
The bridge output voltage, caused by a shunt resistor of this value is given in the calibration protocol.  
Excitation voltage: 10 V DC or AC  
Sensitivity: refer to table  
Insulation resistance: 5 GΩ at 50 V DC

### Environmental conditions

Operating temperature: 0 °C ...90 °C  
Nominal temperature range: 0 °C ...55 °C  
Influence of temperature to zero signal: < ± 0.009 % F.S./K  
Influence of temperature to characteristic: < ± 0.009 % F.S./K

### Mechanical values

Kind of measurement: measurement of differential pressure  
Dead volume: every side approx. 6.6 cm³  
Variation of volume: for range 0 ... ± 200 mbar approx. 0.17 cm³  
Pressure of system<sup>1)</sup>: max. 100 bar  
Influence of system pressure to zero signal: < ± 0.5 % F.S./70 bar  
Overload<sup>2)</sup>: one side max. 100 bar  
Resonance frequency:  
for range 0 ... ± 200 mbar liquid media 5 Hz  
gaseous media 10 Hz  
Dynamic load:  
recommended 70 % of nominal pressure  
possible 100 % of nominal pressure

#### Design:

Both pressure chambers are sealed hermetically, the membranes are welded. The outer caps of the pressure chamber are bolt. They are sealed by O-rings, made of VITON®.

All differential pressure transducers used for low pressure ranges contain silicone oil between their membranes. Due to this their maximum operation and storage temperature is 90 °C

#### Mounting:

Mounting hole with internal thread 1/4-28 UNF, 8 mm deep, central on both sides of the differential pressure transducer.

Material: stainless steel 316SS (like 1.4571)

Pressure connection: internal thread 1/8 - 27 NPT

Bleeder holes:  
closed at delivery internal thread 1/8 - 27 NPT

Electrical connection:  
6 pin bajonett lock, Amphenol 62GB-16F-10-6S

Mating connector: model 9945  
Amphenol 62GB-16F10-6S or Souriau 851-06EC-10-6S  
in scope of delivery

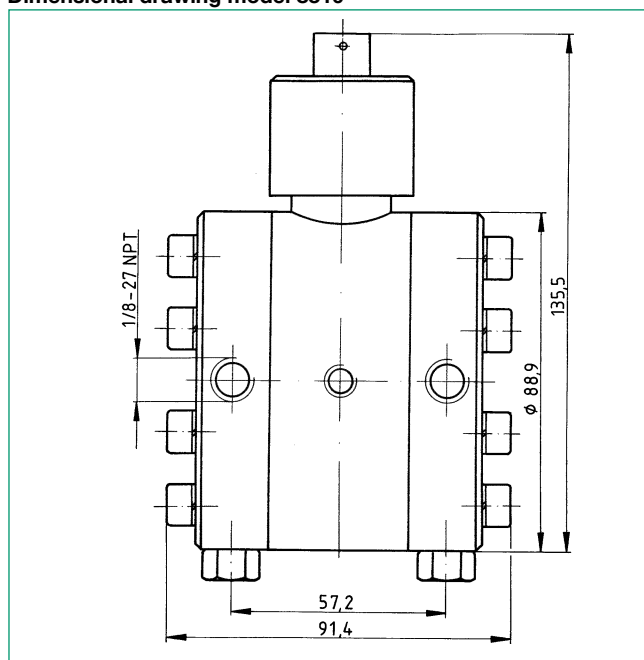
Dimensions: refer to dimensional drawing

#### Mounting:

Mounting hole with internal thread 1/4-28 UNF, 8 mm deep on both sides of the differential pressure transducer.

Weight: approx. 3.8 kg

## Dimensional drawing model 8310



<sup>1)</sup> The differential pressure transducers for low pressure ranges may be used to take measurements on systems with line pressures up to 100 bar (or, with the option, up to 345 bar). The line pressure is the maximum static pressure that is permitted simultaneously on both ports of a differential pressure transducer. The result of adding the static pressure to the pressure to be measured must also not exceed the maximum line pressure. For instance, a transducer with a measuring range of 0 ... ± 100 mbar may be exposed to 100 bar at one pressure port and 99.9 bar at the other, or may have 0 bar at one port and 0.1 bar at the other. It should be noted that when the line pressure changes, the zero point moves. The shift in the zero point is reproducible. It is normal and is compensated for a line pressure of 100 bar.

<sup>2)</sup> All the differential pressure transducers have mechanical protection against overload. If the measuring range is exceeded by more than 50%, the membrane presses against a stop. Because this stop places a heavy mechanical stress on the membrane, overload should be avoided entirely if at all possible. If, however, overloading does occur, the zero point will move; a change in precision or damage is prevented. Damage will only be caused by frequent or sudden overload.

## Test and Calibration Certificate

Included in delivery, et al. with specification of zero output, sensitivity and shunt calibration factor.

### Options

Internal amplifier with voltage output - 5 V...+ 5 V = ---V2xxxxxx  
Internal amplifier with current output 4...20 mA;  
Δp Δ 0 bar = 4 mA, Δp = full scale positive Δ 20 mA ---V4xxxxxx  
Extension of max. pressure of system on request

## Factory Calibration Certificate (WKS)

Calibration of a pressure transducer separately as well as connected to an indicator. Standard is a certificate with 11 points, starting at zero, running up and down in 20% increments and covering the complete measuring range. Special calibrations on request. Calculation of costs by base price plus additional costs per point.

Order Code 83WKS-83XX

## Technical Data - Models 8313, 8314

Model	Order Code	Measurement Range [bar]	Typical Measurement Error* [% F.S.]
8313	8313-5	0 ... ± 5	< ± 0.25
	8313-10	0 ... ± 10	< ± 0.25
	8313-20	0 ... ± 20	< ± 0.25
	8313-50	0 ... ± 50	< ± 0.25
8314	8314-5	0 ... ± 5	< ± 0.50
	8314-10	0 ... ± 10	< ± 0.50
	8314-20	0 ... ± 20	< ± 0.50
	8314-50	0 ... ± 50	< ± 0.50

\* Total error consisting of non-linearity, hysteresis and variation.

### Electrical values

Bridge resistance:	foil strain gauge	350 Ω, nominal
Calibration shunt resistor:		59 kΩ ± 0.1 %
The bridge output voltage, caused by a shunt resistor of this value, is given in the calibration protocol.		
Excitation voltage:	recommended possible	10 V DC or AC 15 V DC or AC
Characteristic:		2 mV/V, nominal

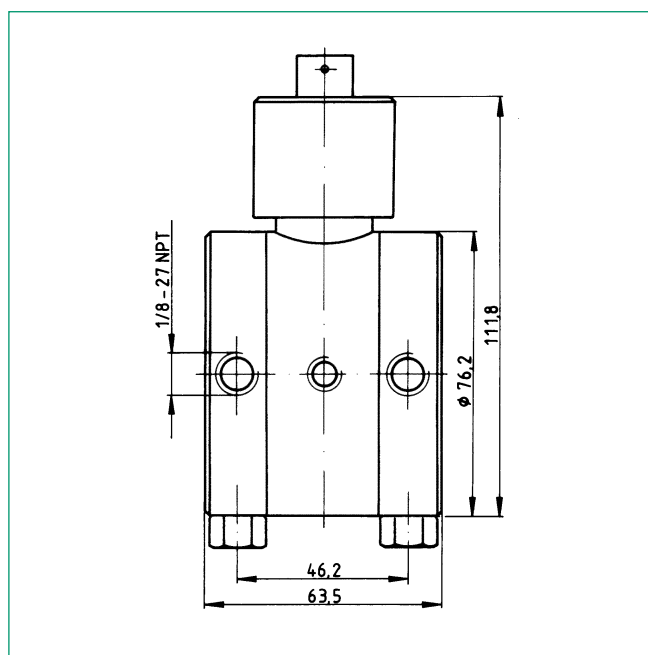
### Environmental conditions

Range of operation temperature:	- 50 °C ... 120 °C
Range of nominal temperature:	15 °C ... 70 °C
Influence of temperature to zero signal:	
model 8313	< ± 0.009 % F.S./K
model 8314	< ± 0.014 % F.S./K
Influence of temperature to characteristic:	
model 8313	< ± 0.009 % F.S./K
model 8314	< ± 0.018 % F.S./K

### Mechanical values

Kind of measurement:	measurement of differential pressure		
Individual error:			
model 8313	non-linearity	< ± 0.15 % F.S.	
	hysteresis	< ± 0.10 % F.S.	
	variation	< ± 0.05 % F.S.	
model 8314	non-linearity	< ± 0.25 % F.S.	
	hysteresis	< ± 0.13 % F.S.	
	variation	< ± 0.07 % F.S.	
Dead volume:	every side approx.	4.1 cm <sup>3</sup>	
Variation of volume:	for range 0 ... ± 20 bar	approx.	0.1 cm <sup>3</sup>
Pressure of system:	maximum	100 bar	
Maximum overload for one side:		100 bar	
Natural frequency:			
for range	0 ... ± 20 bar	liquid media	10 Hz
		gaseous media	20 Hz
Dynamic load:			
recommended		70 % of nominal pressure	
possible		100 % of nominal pressure	
Design:	Both pressure chambers are sealed hermetically, the membranes are welded. The outer caps of the pressure chamber are bolt. They are sealed by O-rings, made of viton.		
Mounting:	Mounting hole with internal thread 1/4-28 UNF, 8 mm deep, central on both sides of the differential pressure transducer.		
Material:	stainless steel 17 - 4 PH, like 1.4542		
Pressure connection:	internal thread 1/8 - 27 NPT		
Bleeder holes:	closed at delivery	internal thread 1/8 - 27 NPT	
Electrical connection:	6-pin bajonett lock	Souriau 851-07A-10-5P	
Mating connector:		model 9945	
	Amphenol 62GB-16F10-6S or	Souriau 851-06EC-10-6S	in scope of delivery
Dimensions:	refer to dimensional drawing		
Weight:	approx. 2.3 kg		

## Dimensional drawing models 8313 and 8314



The differential pressure transducer for medium pressure ranges can be used to take measurements on systems up to a line pressure of 100 bar. The line pressure is the maximum static pressure that is permitted simultaneously on both ports of a differential pressure sensor. The result of adding the static pressure to the pressure to be measured must also not exceed the maximum line pressure. For instance, a transducer with a measuring range of ± 10 bar may be exposed to 100 bar at one pressure port and 90 bar at the other, or may have 0 bar at one port and 10 bar at the other. It should be noted that when the line pressure changes, the zero point moves. The shift in the zero point is reproducible. It is normal and is compensated for a line pressure of 100 bar.

### Test and Calibration Certificate

Included in delivery, et al. with specification of zero output, sensitivity and shunt calibration factor.

### Options

Internal amplifier with voltage output - 5 V...+ 5 V =	...-V2xxxxxx
Internal amplifier with current output 4...20 mA;	
Δp Δ 0 bar = 4 mA, Δp = full scale positive Δ 20 mA	...-V4xxxxxx
Extension of max. pressure of system	on request

### Factory Calibration Certificate (WKS)

Calibration of a pressure transducer separately as well as connected to an indicator. Standard is a certificate with 11 points, starting at zero, running up and down in 20% increments and covering the complete measuring range. Special calibrations on request. Calculation of costs by base price plus additional costs per point.

### Order Code 83WKS-83XX



## Technical Data - Model 8315

Order Code	Measure-ment Range [bar]	Measure-ment Error* [% v.E.]	Max. System Pressure [bar]	Max. Overload to One Side [bar]
8315-100	0 ... ± 100	< ± 0,25	240	200
8315-200	0 ... ± 200	< ± 0,25	340	400
8315-500	0 ... ± 500	< ± 0,25	640	750

\* Total error consisting of non-linearity, hysteresis and variation.

### Electrical values

Bridge resistance: foil strain gauge 350 Ω, nominal  
 Calibration shunt resistor: 59 Ω ± 0.1 %  
 The bridge output voltage, caused by a shunt resistor of this value is given in the calibration protocol.  
 Excitation voltage: 10 V DC or AC  
 Sensitivity: 2 mV/V, nominal

### Environmental conditions

Operating temperature: - 50 °C ... 120 °C  
 Nominal temperature range: 15 °C ... 70 °C  
 Influence of temperature to zero signal: ≤ ± 0.009 % F.S./K  
 Influence of temperature to characteristic: ≤ ± 0.009 % F.S./K

### Mechanical values

Kind of measurement: measurement of differential pressure  
 Individual error: non-linearity < ± 0.15 % F.S.  
 hysteresis < ± 0.10 % F.S.  
 variation < ± 0.05 % F.S.  
 Dynamic load: recommended 70 % of nominal load  
 possible 100 % of nominal load

### Design:

Both pressure chambers are sealed hermetically, the membranes are welded. The outer caps of the pressure chamber are bolt. They are sealed by O-rings, made of metal.

### Mounting:

One side of the differential pressure transducer, opposite to the connector, has a mounting hole. Internal thread 10 - 32 UNF, 9.5 mm deep.

Material: stainless steel 17-4 PH (similar to 1.4542)

Pressure connector: internal thread 1/4 - 18 NPT

Electrical connector: 6 pin bajonett lock Souriau 851-07A-10-6P

Mating connector: model 9945  
 Amphenol 62GB-16F10-6S or Souriau 851-06EC-10-6S in scope of delivery

Dimensions: refer to dimensional drawing

Weight: approx. 1.8 kg

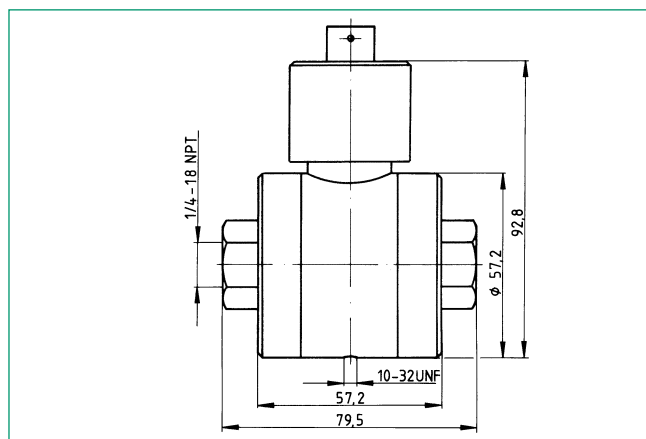
### Technical data with integrated amplifier, all 831x

	Voltage output ± 5 V	Current output 4...20 mA
Excitation voltage	26 ... 32 V or ± 15 V	22 ... 32 V
Current consumption	max. 45 mA	max. 65 mA
Circuit technology	4 wire	3 wire
Burden	-	500 Ω
Measuring rate	2 kHz	2.5 kHz
Operating temperature	- 20 °C ... 85 °C	

### Pin assignment, all 831x

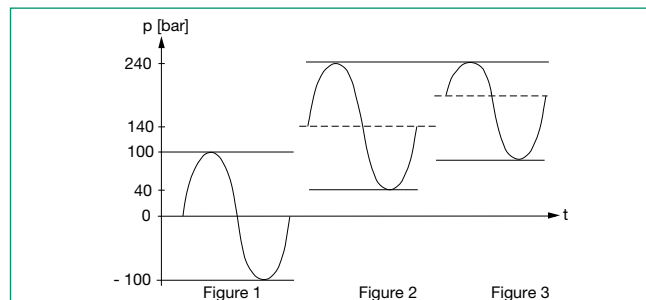
Pin	without Amplifier	Voltage output	Current output
A	Excitation +	Excitation +	Excitation +
B		Signal -	Signal - and Excitation -
C	Excitation -	Excitation -	
D		Signal +	Signal +
E	Signal -	Calibration shunt resistor	Calibration shunt resistor
F	Signal +	Calibration shunt resistor	Calibration shunt resistor

## Dimensional drawing model 8315



The differential pressure transducers are designed for a line pressure up to 140 bar and are designed for large pressure differences such as occur on double-acting hydraulic cylinders in construction machinery or material test devices. If the measuring range in the positive direction is restricted, the transducers can be used at a higher line pressure - up to the maximum value given in the table.

Thus the sensor that has a measuring range of ± 100 bar, when connected to 0 bar line pressure, operates over the range - 100 ... + 100 bar (figure 1), while when connected to 140 bar line pressure it operates from 40 ... 240 bar (figure 2). If the same sensor is connected to a 240 bar line pressure, only the range from 140 bar ... 240 bar is available for measurements (figure 3).



For any applications of the differential pressure sensors, care must be taken to ensure that the value for „overload, one side“ is not exceeded. If the line pressure changes, the sensor's zero point moves. The shift in the zero point is reproducible and is in most cases less than 2% of full-scale. It is normal and is compensated for a static pressure 140 bar on both sides.

## Accessories, all 831x

Connecting cable for sensors with bridge output, complete with coupling plug and socket, 6 core, screened, bending radius > 5 mm, PVC insulation, standard length 3 m

for any type of burster analysis electronics in desktop housing with 12 pin connection

**Model 9911**

with open, color-coded and tinned cable ends

**Model 9986**

7281 with burster TEDS

**Model 99229-545D-0160030**

## Test and Calibration Certificate

Included in delivery, et al. with specification of zero output, sensitivity and shunt calibration factor.

## Options

Internal amplifier with voltage output - 5 V...+ 5V DC ...-V2xxxxxx

Internal amplifier with current output 4...20 mA;  
 $\Delta p \triangleq 0 \text{ bar} = 4 \text{ mA}$ ,  $\Delta p = \text{full scale positive} \triangleq 20 \text{ mA}$  ...-V4xxxxxx

Extension of max. pressure of system on request

## Factory Calibration Certificate (WKS)

Calibration of a pressure transducer separately as well as connected to an indicator. Standard is a certificate with 11 points, starting at zero, running up and down in 20% increments and covering the complete measuring range. Special calibrations on request. Calculation of costs by base price plus additional costs per point.

**Order Code 83WKS-83XX**