

PERFORMANCE CHARACTERISTICS

($V_S = 5.0 V_{DC}$, $T_A = 25^\circ C$, analog output signal is **ratiometric** to V_S , digital output signal is **not ratiometric** to V_S)

Characteristics	Min.	Typ.	Max.	Units
Total accuracy (-20...85 °C) ⁴			±1.5	%FSS
Response delay ^{5, 6}		2		ms
A/D resolution ⁶		13		bit
D/A resolution			11	
Current consumption ⁷		5		mA
ANALOGUE PERFORMANCE CHARACTERISTIC				
Output at min. specified pressure	0.44	0.50	0.56	V
Full scale span (FSS) ³		4.00		
Full scale output	4.44	4.50	4.56	
DIGITAL PERFORMANCE CHARACTERISTIC				
Output at min. specified pressure	2883	3277	3670	counts
Full scale span (FSS) ³		26214		
Full scale output	29097	29490	29883	

Specification notes:

1. Proof pressure is the maximum pressure which may be applied without causing durable shifts of the electrical parameters of the sensing element.
2. Burst pressure is the maximum pressure which may be applied without causing damage to the sensing element or leaks to the housing.
3. Full Scale Span (FSS) is the algebraic difference between the output signal for the highest and lowest specified pressure.
4. Total accuracy is the combined error from offset and span calibration, linearity, pressure hysteresis, and temperature effects. Linearity is the measured deviation based on a straight line. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure. Calibration errors include the deviation of offset and full scale from nominal values.
5. Max. delay time between pressure change at the pressure die and signal change at the output.
6. The response time depends on the adjusted internal A/D resolution of the sensor. For 13 bit it is typ. 2 ms. Other A/D resolutions and response time are available on request. Please contact First Sensor for further information.
7. Sensors with lower current consumption are available on request. Please contact First Sensor for further information.

I²C BUS

Introduction

The sensor is capable to generate a digital output signal. The device runs a cyclic program, which will store a corrected pressure value with 13 bit resolution about every 500 μs within the output registers of the internal ASIC. In order to use the sensor for digital signal readout, it should be connected to a bidirectional I²C-bus.

According to the I²C-bus specification, the bus is controlled by a master device, which generates the clock signal, controls the bus access and generates START and STOP conditions. The sensor is designed to work as a slave, hence it will only respond to requests from a master device.

Digital I²C interface

The sensor complies with the following protocol (Fig. 1):

Bus not busy: During idle periods both data line (SDA) and clock line (SCL) remain HIGH.

START condition (S): HIGH to LOW transition of SDA line while clock (SCL) is HIGH is interpreted as START condition. START conditions are always generated by the master. Each initial request for a pressure value has to begin with a START condition.

STOP condition (P): LOW to HIGH transition of SDA line while clock (SCL) is HIGH determines STOP condition. STOP conditions are always generated by the master. More than one request for the current pressure value can be transmitted without generation of intermediate STOP condition.

DATA valid (D): State of data line represents valid data when, after START condition, data line is stable for duration of HIGH period of clock signal. Data on line must be changed during LOW period of clock signal. There is one clock pulse per bit of data.

Acknowledge (A): Data is transferred in pieces of 8 bits (1 byte) on serial bus, MSB first. After each byte receiving device – whether master or slave – is obliged to pull data line LOW as acknowledge for reception of data. Master must generate an extra clock pulse for this purpose. When acknowledge is missed, slave transmitter becomes inactive. It is on master either to send last command again or to generate STOP condition in that case.

Slave address: The I²C-bus master-slave concept requires a unique address for each device. The sensor has a preconfigured slave address (1111000xb). By factory programming it is possible to define a secondary slave address additional to the general one. According to I²C specification 127 different addresses are available. The sensor will then listen to both slave addresses. After generating a START condition the master sends the address byte containing a 7 bit address followed by a data direction bit (R/W). A "0" indicates a transmission from master to slave (WRITE), a "1" indicates a data request (READ).

DATA operation: The sensor starts to send 2 data bytes containing the current pressure value as a 15 bit information placed in the output registers.

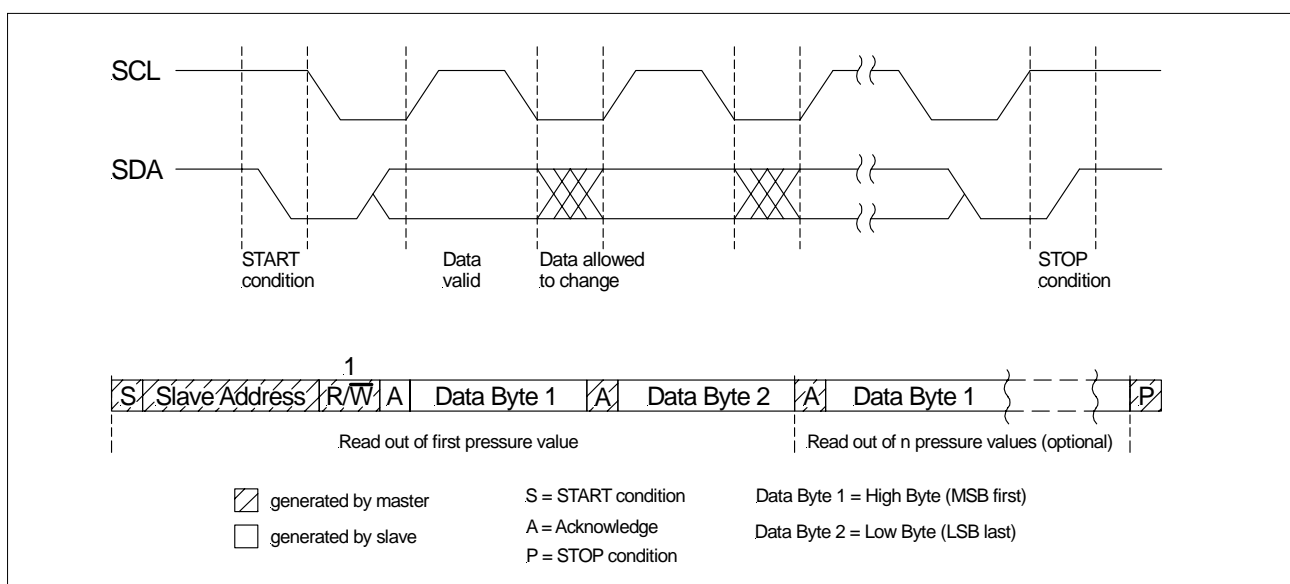


Fig. 1: I²C bus protocol

I²C Interface Parameters

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input high level		90		100	% of V _s
Input low level		0		10	
Output low level				10	
Pull-up resistor		500			Ω
Load capacitance @ SDA	C _{SDA}			400	pF
Input capacitance @ SDA/SCL	C _{I2C_IN}			10	
SCL clock frequency	F _{SCL}	100*		400	kHz
Bus free time between STOP and START condition	t _{BUF}	1.3			μs
Hold time (repeated) START condition, to first clock pulse	t _{HD,STA}	0.8			
LOW period of SCL	t _{LOW}	1.3			
HIGH period of SCL	t _{HIGH}	0.6			
Setup time repeated START condition	t _{SU,STA}	1			
Data hold time	t _{HD,DAT}	0			
Data setup time	t _{SU,DAT}	0.2			
Rise time of both SDA and SCL	t _R			0.3	
Fall time of both SDA and SCL	t _F			0.3	
Setup time for STOP condition	t _{SU,STO}	0.6			

* recommended

Note: First Sensor recommends communication speeds of at least 100 kHz (max. 400 kHz). Please contact First Sensor for further information.

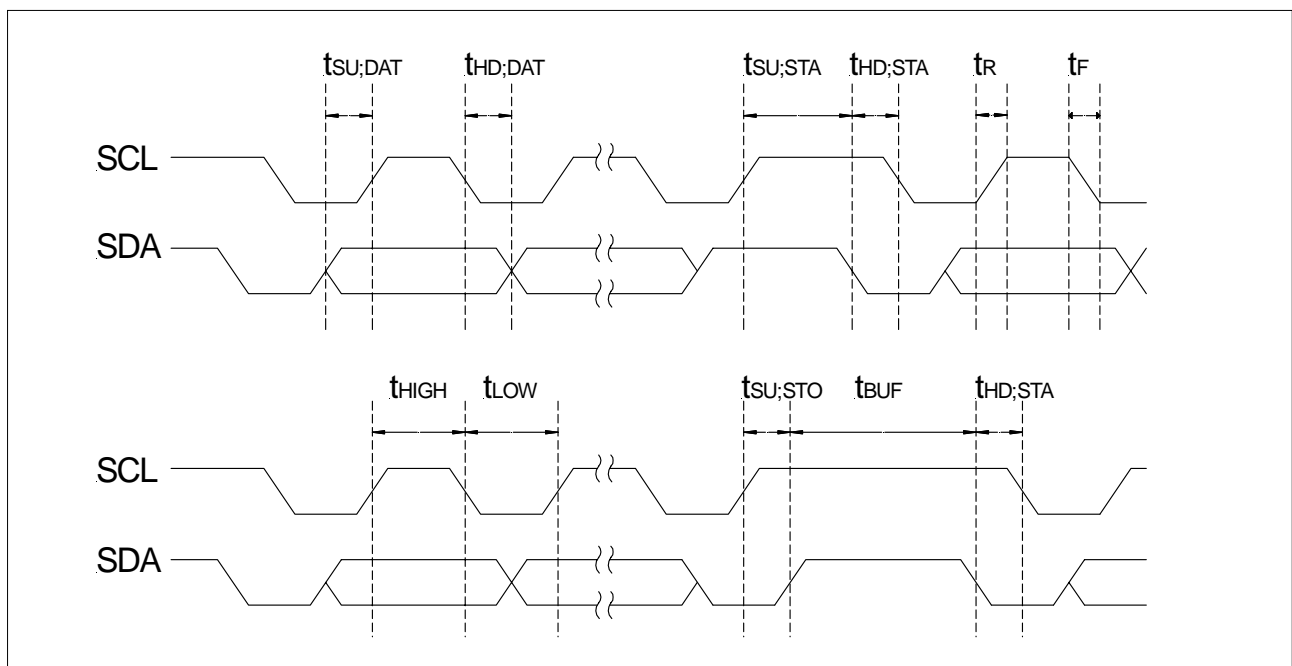
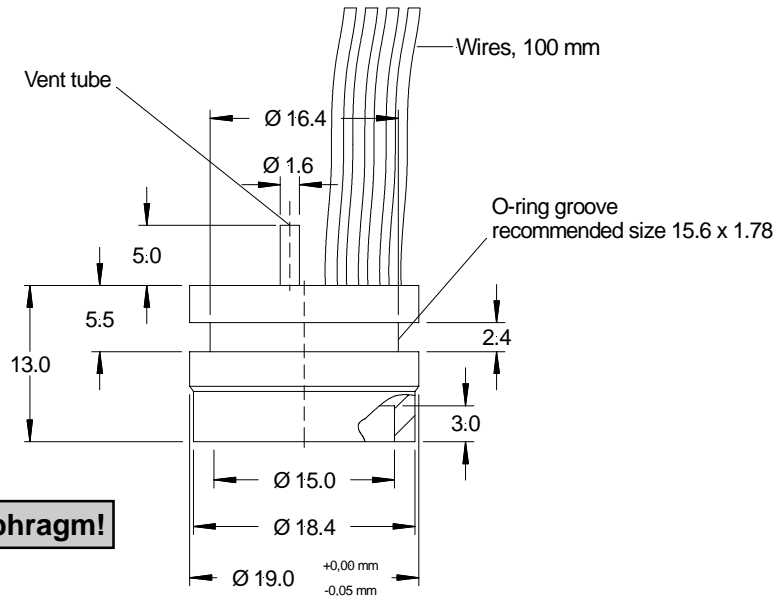


Fig. 2: Timing characteristics

PHYSICAL DIMENSIONS

SSI...1 (weld ring)



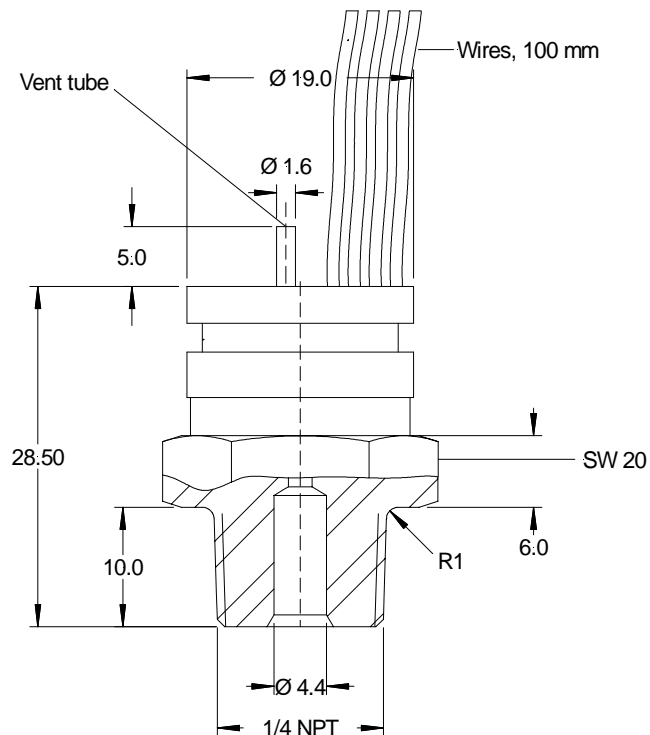
Do not touch diaphragm!

mass: approx. 17 g

dimensions in mm

A clearance fit 19H8 with 20 ° phase is recommended for mounting.

SSI...5 (1/4 " NPT)

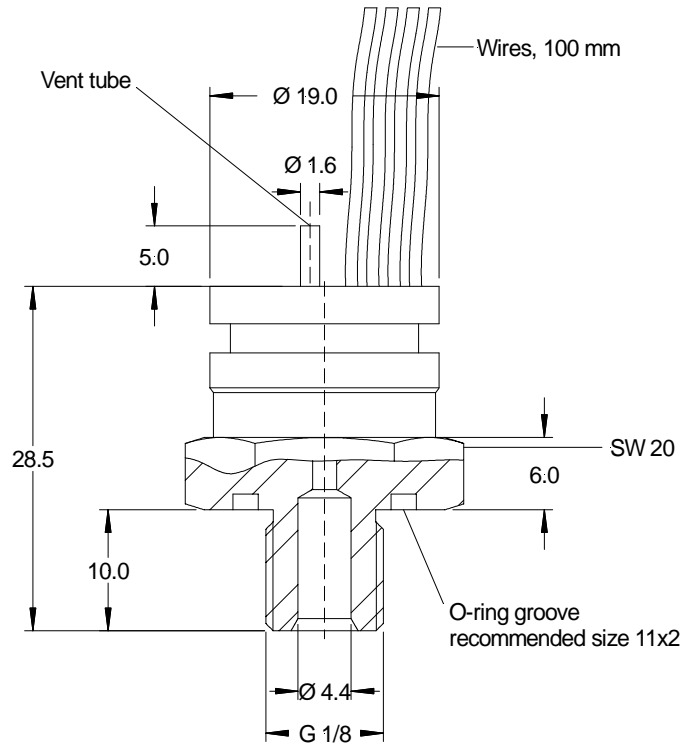


mass: approx. 50 g

dimensions in mm

PHYSICAL DIMENSIONS

SSI...9 (G 1/8 " HEX)

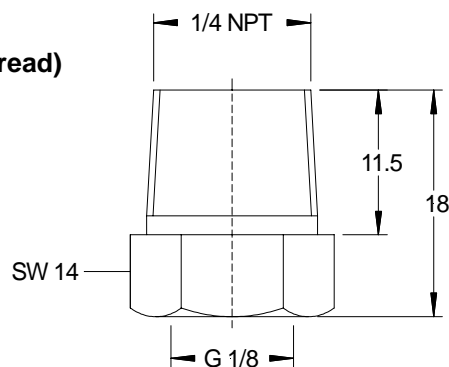


mass: approx. 35 g

dimensions in mm

OPTIONAL PRESSURE FITTING

SSI...N
(1/4 " NPT fitting for G 1/8 " thread)



Other fittings are available on request. Please contact First Sensor.