

RPS/DPS 8100

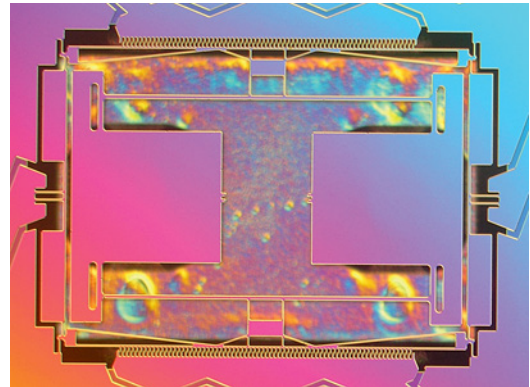
High Accuracy Resonant Pressure Sensor

Since 1972, Druck has manufactured precision pressure sensors with a capability to meet critical applications in industrial, aerospace, oil and gas, and research environments. Today, Druck is part of Baker Hughes Oil & Gas and has continually worked to develop and improve on the performance of our pressure sensors to meet our customers' requirements.

The RPS/DPS 8100 incorporates the exciting new TERPS technology. TERPS is a resonant silicon pressure sensor technology platform that provides an order of magnitude greater accuracy and stability than current pressure measurement technologies.

In addition to providing the performance and packaging improvements available with TERPS, the RPS/DPS 8100 product line takes advantage of best practices to offer a wide range of pressure and electrical connections to enable a level of customization for your specific requirements never before available in the performance class of this sensor.

The combination of the power of the TERPS technology and the quality, reliability and flexibility of the RPS/DPS 8100 Series offers a truly unique solution for high accuracy and high stability pressure measurement requirements.



Features:

- High Precision, $\pm 0.01\%$ FS over compensated temperature range
- High Stability, ± 50 ppm FS/year (typical)
- Wide temperature range, up to -55 to $+125^{\circ}\text{C}$ (-67 to 257°F)
- Multiple Output configurations, RS232, RS485, USB 2.0, CAN Bus, Frequency & Diode (TTL)
- Wide selection of pressure & electrical connections to suit specific requirements
- Low acceleration effects

Specifications

Measurement

Base Pressure Ranges

- 0 to 2 bar (0 to 30 psi) absolute
- 0 to 3.5 bar (0 to 50 psi) absolute

Calibrated Ranges

- Barometric: Up to 1.3 bar (18 psi) with minimum span of 350 mbar (5 psi)
- Low pressure: Up to 2 bar (30 psi) with minimum span of 0.5 bar (7 psi)
- High pressure: Up to 3.5 bar (50 psi) with minimum span of 1 bar (14 psi)

Note: Values in psi are approximate.

Alternative barometric ranges are available on request. Higher pressure ranges are available in the RPS/DPS 8000 series.

Overpressure

2X FS

Pressure Containment

7 bar (100 psi)

Supply and Output

Electronics Option	Supply Voltage (Vdc)	Output	Current Consumption ¹ (mA)
1	5 to 32	Frequency ² & Diode ³ (TTL)	<3.5
A	9 to 28	RS485	16.5 quiescent, 32 max
B	9 to 28	RS232	16.5 quiescent, 32 max
C	7.5 to 30	CAN Bus	25 quiescent, 32 max
U	4.8 to 5.2	USB 2.0	40 quiescent, 100 max

1. Full temperature range
2. Square wave pressure signal, 25 kHz nominal, 3–9 kHz span
3. Voltage 0.4 to 0.8 V @ 25°C (77°F), typically –2 mV/°C

Response Time

- **TTL Output:**
<25 ms for pressure change from 10% to 90% FS
- **RS232/485/USB Output:**
Dependent on the output update rate which is set by the user with a minimum of 500 ms (see manual K0473 for details)
- **CAN Bus:**
Dependent on the output update rate which is set by the user with a minimum of 10 ms while maintaining specification (see manual K0533 for details)

Supply Response

- **TTL :** Accurate to specification within 500 ms of supply switch on, overall operating temperatures
- **CAN Bus/RS232/485/USB:** Accurate to specification within 10 minutes of turning supply switch on

Electrical Protection

RS232/485/CAN Bus/TTL: Connecting Vsupply and GND between any combinations of pins on the connector will not damage the unit

USB: Complies with USB 2.0 peripheral specification.

Insulation

RS232/485/CAN Bus/TTL:

>100 Mohm @ 500 Vdc between all pins and case.

Performance

There are two levels of performance specification:

- Standard
- Improved

Specifications include combined effects of non-linearity, hysteresis, repeatability and temperature errors over the compensated temperature range and calibrated pressure range.

Accuracy Code	Precision
A1- Standard	0.02% FS
A2- Improved	0.01% FS

- For barometric ranges with improved accuracy, precision is ±0.1 hPa max.
- For Frequency & Diode output the above accuracies are achievable by using a polynomial curve fit algorithm and coefficient data supplied with sensor.
- Sensors are calibrated against standards traceable to UKAS operating to better than 100 ppm.

Compensated Temperature Ranges:

There are four compensated temperature ranges available:

- –10 to +50°C
- –40 to +85°C
- –40 to +125°C (TTL and CAN bus only)
- –55 to +125°C (TTL and CAN bus only)

Temperature Effects

All temperature effects are included in the accuracy statement.

Physical Specifications

Long Term Stability

Standard: $\pm 0.02\%$ FS/annum max.

Improved: $\pm 0.01\%$ FS/annum max. ($\pm 0.005\%$ FS typical)

Note: Unless otherwise specified, specifications are at the reference conditions of 25°C (77°F) $\pm 5^\circ\text{C}$ ($\pm 9^\circ\text{F}$)

Orientation (g) Sensitivity

Less than 0.05 mbar/g

Storage Temperature Range

As compensated temperature range

Operating Temperature Range

As compensated temperature range

(Restricted by some electrical connector options)

Pressure Media

Non-condensing dry gases compatible with 316L Stainless Steel, silicon, silicon dioxide, Fluorosilicon RV adhesive and glass

Ingress Protection

See *Electrical Connector* section

Vibration

- BS EN 60068-2-6 (2008) Sine sweeps 5 Hz to 2 kHz, levels to 20g_n
- BS EN 60068-2-64 random 10 Hz to 2kHz to 4g_n RMS for 1 hour each axis
- Less than 0.02% FS effect at any time

Shock

- DO-160E 9 (Figure 7.2) 20 g_n 11 ms terminal saw-tooth profile
- Negligible calibration change

Pressure Connector

Pressure connector should be one of:

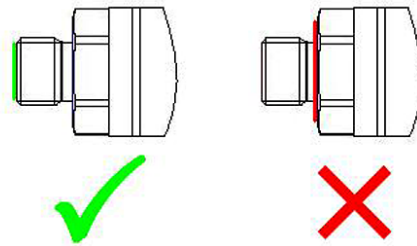
- G1/4 Female
- G1/4 Male Flat
- G1/4 Male 60° Internal Cone
- G1/8 Male 60° Internal Cone
- 1/4 NPT Female
- 1/4 NPT Male
- 1/8 NPT Male
- M20 x 1.5 Male (3mm bore)
- M14 x 1.5 60° Internal Cone
- M12 x 1 Internal Cone
- 7/16-20 UNJF Male 74° External Cone
- G1/2 Male
- G1/4 Quick Connect
- 1/2 NPT Male
- G1/4 Male Flat Long
- 7/16-20 UNF Female
- Depth Cone (G1/4 Female)
- 7/16-20 UNF Male Short Flat
- 3/8-24 UNJF

- 1/4 VCR Female
- 1/4 VCR Male

Other pressure connectors may be available. Contact Baker Hughes to discuss your requirement.

Please ensure that only the intended sealing face is used when mounting the sensor. Failure to comply with this requirement may affect performance or calibration accuracy.

Male threaded pressure connectors must not be sealed or constrained against the face at the base of the thread. The forward cone or flat face should always be used, as indicated below.



Electrical Connector

Code No.	Description	Max Operating Temp. Range		IP Rating
		°C	°F	
0	No Connector	-55 to +125	-67 to +257	-
1	Polyurethane Cable	-40 to +85	-40 to +176	65
2	Raychem Cable	-55 to +125	-67 to +257	65
3	Polyurethane Depth	-40 to +85	-40 to +176	68
4	Hyrel Depth	-40 to +85	-40 to +176	68
6	MIL-C-26482	-55 to +125	-67 to +257	*
C	1/2 NPT Conduit	-40 to +85	-40 to +176	67
G	M12 X 1, 5-pin	-55 to +125	-67 to +267	*
H	PTFE Cable (Orange)	-55 to +125	-67 to +267	54
M	Micro-USB Socket	-40 to +85	-40 to +176	-

* Hermetically sealed connectors with a maximum leak rate of 1×10^{-6} cc/s at 1 atmosphere. High IP rated mating connectors are available.

Certifications

- CE Marked
- RoHS
- EMC Standards:
 - BS EN 61000-6-1: 2007, Susceptibility - Light Industrial
 - BS EN 61000-6-2: 2005, Susceptibility - Heavy Industrial
 - BS EN 61000-6-3: 2007+A1:2011, Emissions - Light Industrial
 - BS EN 61000-6-4: 2007+A1:2011, Emissions - Heavy Industrial
- BS EN 61326-1: 2013, Electrical Equipment for - Measurement, Control and Laboratory Use - EMC requirements
- BS EN 61326-2-3:2013 Requirements for pressure transducers

Connection Details

Option	Code	Connection	Function			
			Frequency & Diode	Digital- RS485	Digital - RS232	Digital - CAN Bus
Flying Leads	0	RED	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE
		YELLOW	FREQ	RS485 B	Rx	CAN Hi
		GREEN	+VE TEMP	RS485 A	Tx	CAN Lo
		BLUE	GROUND	GROUND	GROUND	SUPPLY -VE
		BLACK	-VE TEMP	-	-	CAN 0V
		ORANGE	EEPROM	-	-	-

Option	Code	Connection	Function			
			Frequency & Diode	Digital- RS485	Digital - RS232	Digital - CAN Bus
M12	G	1	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE	N/C
		2	FREQ	RS485 B	Rx	SUPPLY +VE
		3	GROUND	GROUND	GROUND	SUPPLY -VE /CAN 0V
		4	+VE TEMP	RS485 A	Tx	CAN HI
		5	EEPROM	-	-	CAN LO

Option	Code	Connection	Function			
			Frequency & Diode	Digital- RS485	Digital - RS232	Digital - CAN Bus
CABLE	1, 3, 4, C	RED	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE
		YELLOW	FREQ	RS485 B	Rx	CAN Hi
		BLUE	+VE TEMP	RS485 A	Tx	CAN Lo
		WHITE	GROUND	GROUND	GROUND	SUPPLY -VE
		BLACK	-VE TEMP	-	-	CAN 0V
		ORANGE	EEPROM	-	-	-
		SCREEN	-	-	-	-

Option	Code	Connection	Function			
			Frequency & Diode	Digital- RS485	Digital - RS232	Digital - CAN Bus
PTFE	H	RED	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE
		YELLOW	FREQ	RS485 B	Rx	CAN Hi
		GREEN	+VE TEMP	RS485 A	Tx	CAN Lo
		BLUE	GROUND	GROUND	GROUND	SUPPLY -VE
		BLACK	EEPROM	-	-	-
		WHITE	-VE TEMP	-	-	CAN 0V
		SCREEN	CASE	CASE	CASE	CASE

Option	Code	Connection	Function			
			Frequency & Diode	Digital- RS485	Digital - RS232	Digital - CAN Bus
RAYCHEM	2	RED	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE
		WHITE	FREQ	RS485 B	Rx	CAN Hi
		GREEN	+VE TEMP	RS485 A	Tx	CAN Lo
		BLUE	GROUND	GROUND	GROUND	SUPPLY -VE /CAN 0V
		BLACK	EEPROM	-	-	-
		SCREEN	-	-	-	-

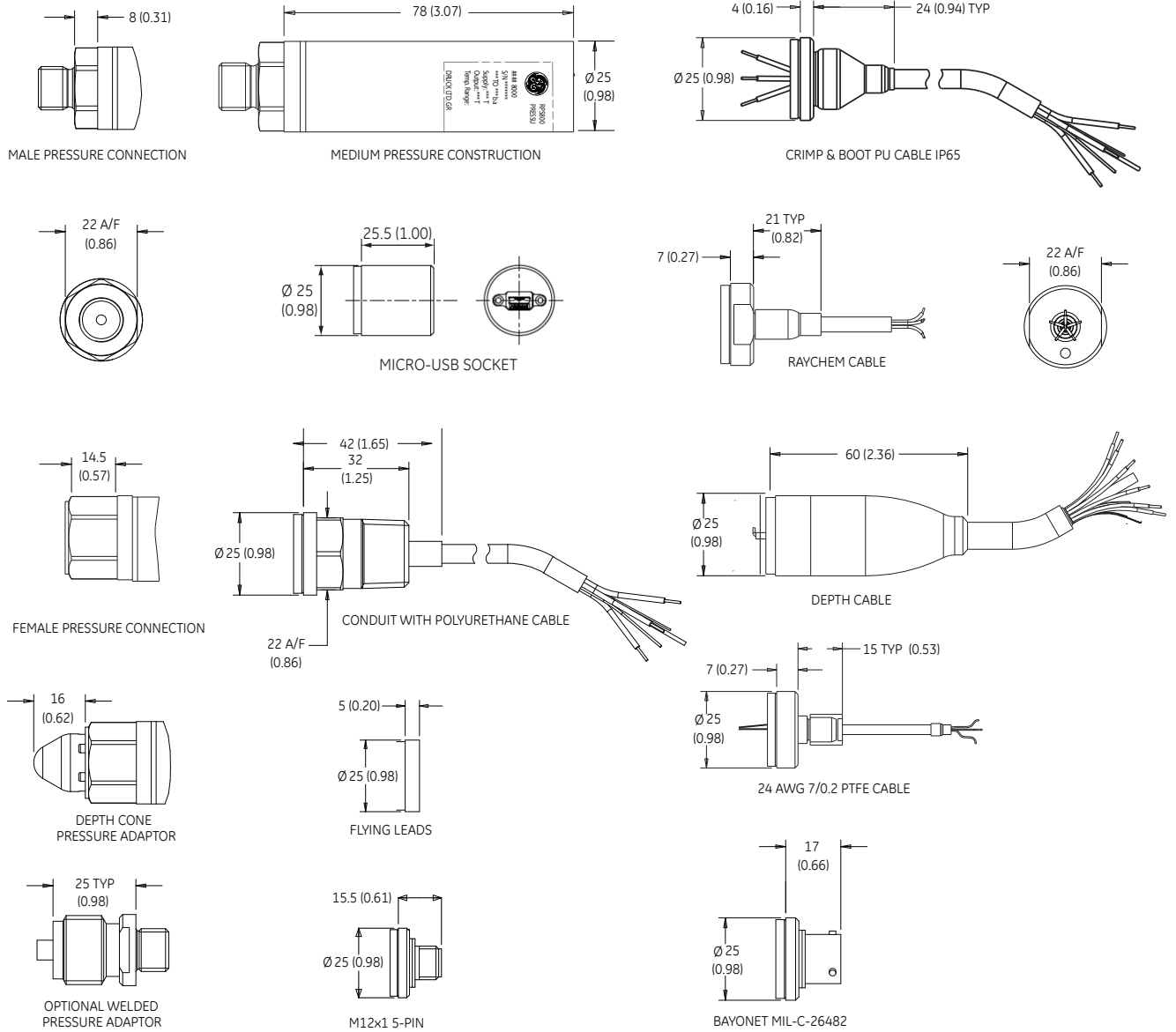
Option	Code	Connection	Function			
			Frequency & Diode	Digital- RS485	Digital - RS232	Digital - CAN Bus
Micro-USB	M	1	-	-	+5 V	-
		2	-	-	D-VE	-
		3	-	-	D+VE	-
		4	-	-	ID	-
		5	-	-	GROUND	-

Option	Code	Connection	Function			
			Frequency & Diode	Digital- RS485	Digital - RS232	Digital - CAN Bus
MIL-C	6	A	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE	SUPPLY +VE
		B	FREQ	RS485 B	Rx	CAN Hi
		C	+VE TEMP	RS485 A	Tx	CAN Lo
		D	GROUND	GROUND	GROUND	SUPPLY -VE
		E	EEPROM	-	-	-
		F	-VE TEMP	-	-	CAN 0V

	Frequency & Diode	Digital- RS232	Digital - RS485	CAN Bus	USB*1
Maximum Cable length (m)	10	10	1000	1000	2

Note*1: Cable not provided with USB option.

Dimensional Drawings



Notes:

1. All dimensions are nominal lengths and are subject to change.
2. All dimensions are in millimeters (inches).
3. Other pressure and electrical connectors may be available. Please contact Baker Hughes.

Ordering Information

(1) Select model code

Main Product Variant

RPS Resonant Pressure Sensor – Frequency & Diode Output (**Note 1**)

DPS Digital Pressure Sensor – Digital Output (**Note 1**)

Product Series

8 RPS/DPS 8100 Series

Diameter, Material and Isolation

1 25mm Stainless Steel Silicon Exposed

Electrical Connector

0 No Electrical Connector (Flying leads)

1 Polyurethane Cable

2 Raychem Cable

3 Polyurethane Cable (Depth)

4 Hytrel Cable (Depth)

6 MIL-C-26482 (6-pin Shell Size 10)

C 1/2" NPT Conduit with Polyurethane Cable

G M12x1, 5-Pin

H PTFE Cable

M Micro-USB Socket (**Note 3**)

Output Option (**Note 5**)

1 Frequency & Diode

A RS485

B RS232

C CAN Bus

U USB 2.0 (**Note 4**)

Compensated Temperature Range

TA -10 to +50°C

TB -40 to +85°C

TC -40 to +125°C (**Note 2**)

TD -55 to +125°C (**Note 2**)

Accuracy

A1 Standard: 0.02%

A2 Improved: 0.01%

Calibration

CC Full Thermal Calibration

Hazardous Area Approval

H0 None

Pressure Connector

PA: G1/4 Female

PB: G1/4 Male Flat

PC: G1/4 Male 60 degree internal Cone

PD: G1/8 Male 60 degree internal Cone

PE: 1/4 NPT Female

PF: 1/4 NPT Male

PG: 1/8 NPT Male

PH: M20x1.5 Male (3mm bore)

PJ: M14x1.5 60° Internal Cone

PK: M12x1 Internal Cone

PL: 7/16-20 UNJF Male 74 degree external cone

PN: G1/2 Male

PQ: G1/4 Quick Connect

PR: 1/2 NPT Male

PT: G1/4 Male Flat Long

PV: 7/16-20 UNF Female

PW: Depth Cone (G1/4 Female)

PX: 7/16-20 UNF Male Short Flat

PY: PY: 3/8-24 UNJF

RA: 1/4 VCR Female

RF: 1/4 VCR Male

RPS 8 1 4 1 - TA - A2 - CC - H0 - PA [Typical Model Code]

Note 1: RPS variants require Output Option Code '1'. DPS variants require Output Option Code 'A', 'B', 'C' or 'U'.

Note 2: Not available for RS232/485/USB outputs or micro USB socket connector.

Note 3: Only available with USB output option.

Note 4: Only available with micro USB socket connector.

Ordering Information (cont.)

2) State pressure range and units (e.g., 0 to 1.6 bar, 0 to 20 psi):

Unit options are:

Symbol	Description
bar	bar
mbar	millibar
psi	pounds/sq. inch
Pa	Pascal
hPa	hectoPascal
kPa	kiloPascal
MPa	megaPascal
mmH ₂ O	mm water
cmH ₂ O	cm water
mH ₂ O	metres water
inH ₂ O	inches water
ftH ₂ O	feet water
mmHg	mm mercury
inHg	inches mercury
kgf/cm ²	kg force/sq. cm
atm	atmosphere
Torr	torr

3) State cable lengths and units (e.g., 1 m cable, 3 ft cable) (only required on certain electrical connectors):

NOTE 5: Maximum Cable length: (1) Frequency & Diode - 10 m, (A) RS485 - 1000 m, (B) RS232 - 10 m, (C) CAN Bus - 1000 m. Integer values only, e.g. 1m (3 ft) cable. Minimum cable length is 1m (3 ft) if cable is supplied.

Typical order examples:

RPS 8111-TA-A1-CC-H0-PA, 3.5 bara, 5 m cable

DPS 816A-TB-A2-CC-H0-PL, 750-1,150 mbara

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