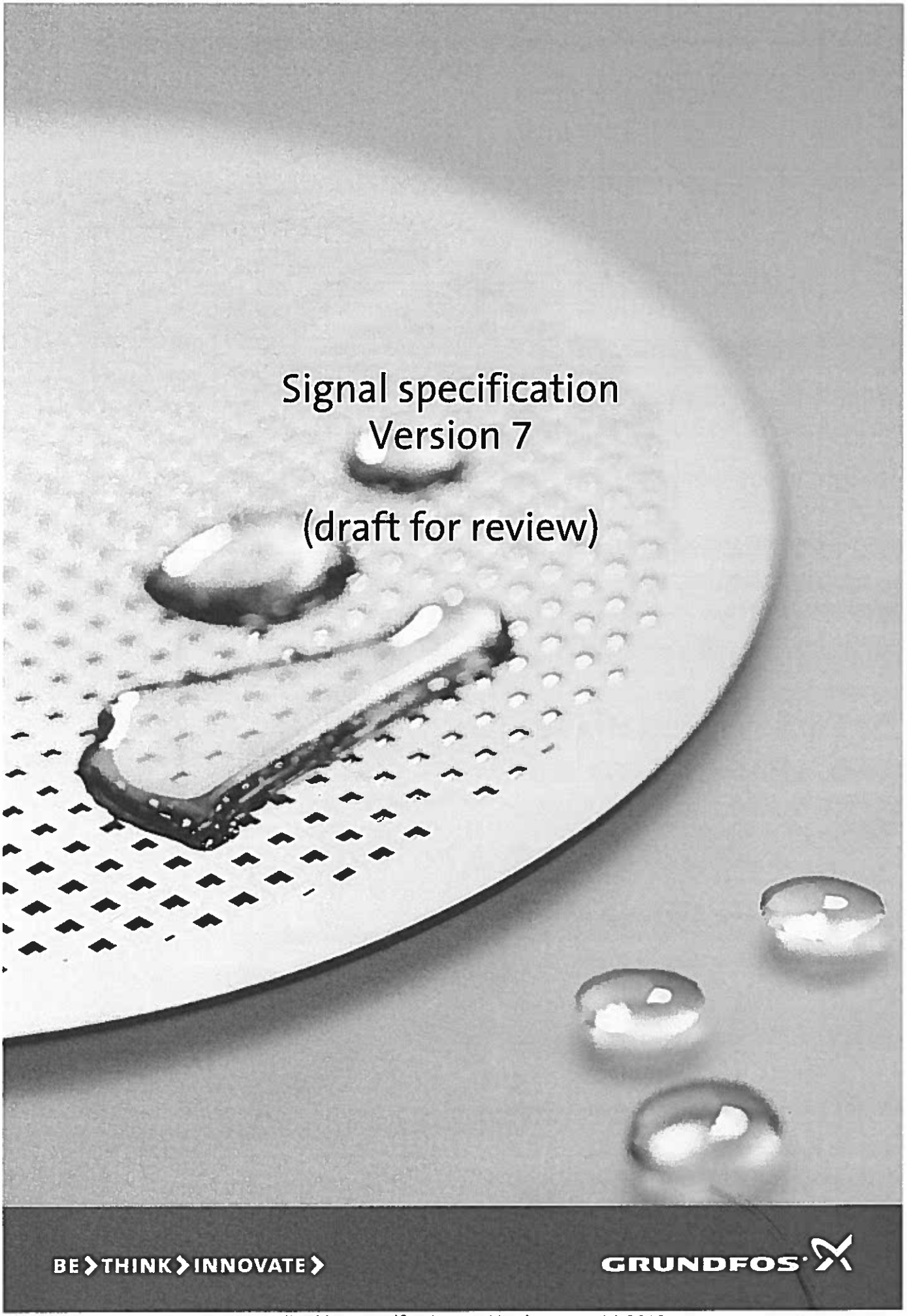
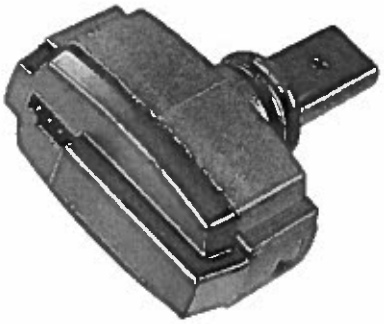


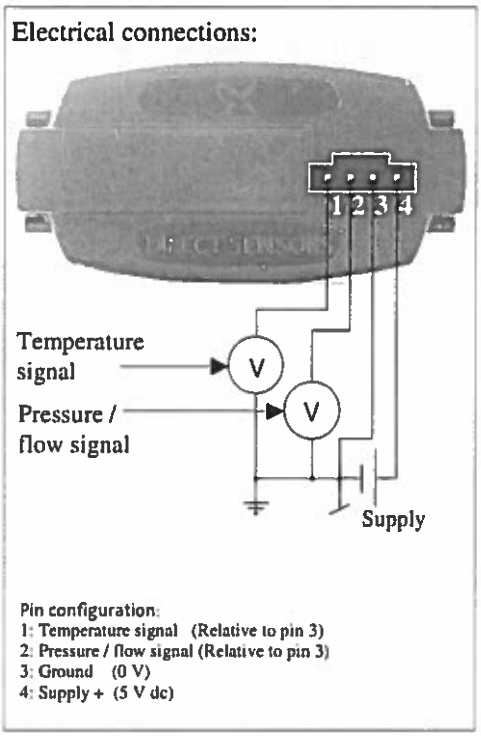

Edited by Grundfos Sensor, Version 7, 31-05-2010

# 1 Version History

| Version: | Date: | Changes: | Initials: |
|---|---|---|---|
| 00.00.03 | 18-10-2007 | First customer edition of this document | PEA |
| 00.00.04 | 01-12-2008 | Added DPS to the document | KMR |
| 00.00.05 | 11-12-2008 | Replacing product number with product name and general version control | KSK |
| 00.00.06 | 26.01.2009 | Adding new product and change the small patches.<br>Signal names OUT1 and OUT2 removed | HBC<br><br>RHA |
| 00.00.07 | 31.05.2010 | Correcting error in *Table 13* line 3 to include VFS sensors with generic dynamic range.<br>Added *Table 14* and *Table 17* containing specification for new DPS series. | RHA |
| | | | |

## 2 Definitions and pin configuration



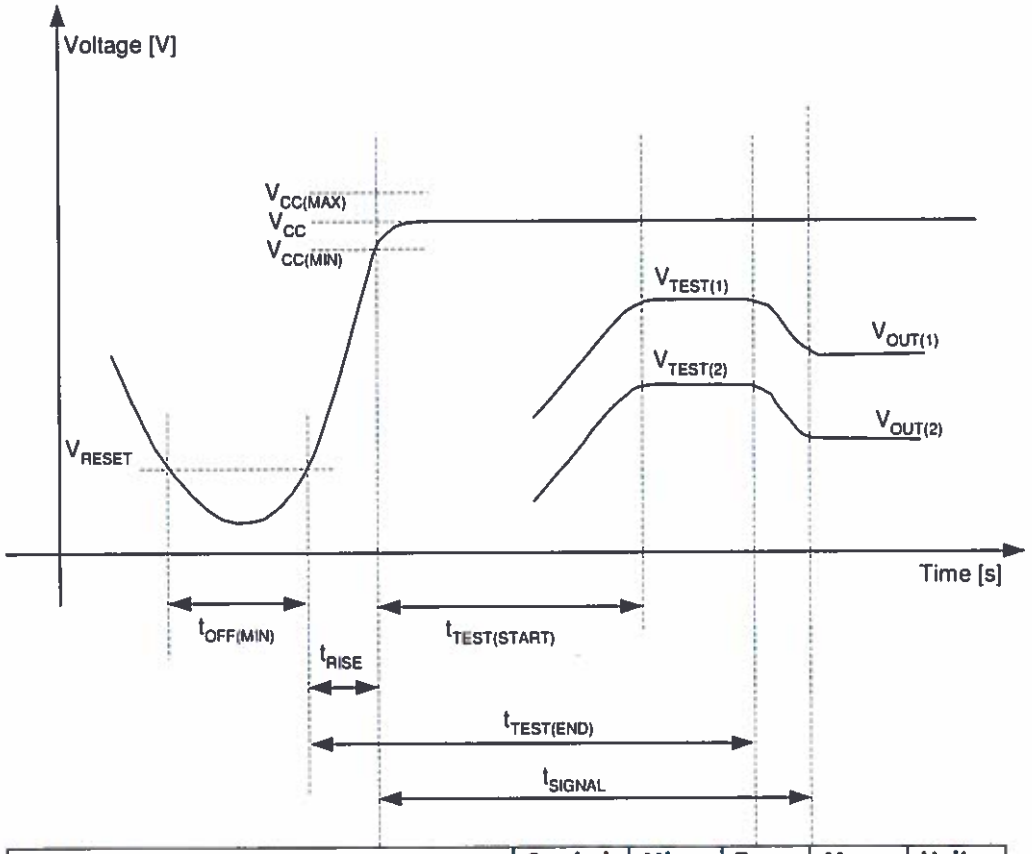



| Symbol | Description | Unit |
|---|---|---|
| RPS | Relative pressure sensor | |
| RPS_HR | Relative pressure sensor with high resolution | |
| VFS | Vortex Flow sensor | |
| DPS | Differential pressure sensor | |
| N | Maximum pressure level | bar |
| $V_{CC}$ | Supply voltage (PIN 4) | V |
| P | Pressure | bar |
| T | Temperature | °C |
| $\dot{Q}$ | Flow | liter/min |
| $V_{pin1}(V)$ | Temperature signal | V |
| $V_{pin2}(V)$ | Pressure or flow signal | V |
| FS | Full scale | |
| $t_{OFF(MIN)}$ | Power-off time required to ensure restart | ms. |
| $t_{RISE}$ | Rise time for supply voltage at power on | ms. |
| $t_{TEST(START)}$ | Time from full supply voltage to valid test pulse | ms. |
| $t_{TEST(END)}$ | Time from rise of supply voltage when test pulse is still valid | ms. |
| $t_{SIGNAL}$ | Time from full supply voltage to valid signal | ms. |
| $V_{RESET}$ | Supply voltage to ensure restart | V |
| $V_{TEST(1)}$ | Test pulse on PIN 1 | V |
| $V_{TEST(2)}$ | Test pulse on PIN 2 | V |

*Table 1 Description of the abbreviations*

## 3 Sensor identification at power-on

When the sensor is powered up, it gives a test pulse on each of the two signal pins for approximately two seconds. Details of the time sequence are specified in *Figure 1* below.




| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Power-off time required to ensure restart | $t_{OFF(MIN)}$ | | | 1 | ms. |
| Rise time for supply voltage at power on | $t_{RISE}$ | TBD[1] | | TBD | ms. |
| Time from full supply to valid test pulse | $t_{TEST(START)}$ | | 200 | 350 | ms. |
| Time from rise of supply voltage when test pulse is still valid | $t_{TEST(END)}$ | 1700 | | | ms. |
| Time from full supply to valid signal | $t_{SIGNAL}$ | | 1750 | 2000 | ms. |
| Supply voltage | $V_{CC}$ | 4.75 | 5.00 | 5.25 | V |
| Supply voltage to ensure restart | $V_{RESET}$ | | | 2.0 | V |
| Test pulse on OUT1 | $V_{TEST(1)}$ | [2] | | [2] | V |
| Test pulse on OUT2 | $V_{TEST(2)}$ | [2] | | [2] | V |

[1] To be determined

[2] For each sensor type specified within ±0.015V somewhere in the range 0.25 V to 3.75 V with $V_{CC}$ on 5.00V

*Figure 1 Shows the behavior of the sensor at start-up.*

The signal $V_{TEST2}$ gives the sensor type, i.e. RPS, DPS, VFS, etc. and the signal $V_{TEST1}$ gives the sensor range.

| Product name | $V_{TEST2}$@ Vcc=5.00V±5% | | | $V_{TEST1}$@ Vcc=5.00V±5% | | | Product characteristics |
|---|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max | |
| RPS 0-0.6 bar | 0,62 | 0,66 | 0,69 | 0,55 | 0,58 | 0,61 | Relative pressure sensor, 0-0.6 bar, 0-100°C |
| RPS 0-1 bar | 0,62 | 0,66 | 0,69 | 0,62 | 0,66 | 0,69 | Relative pressure sensor, 0-1 bar, 0-100°C |
| RPS 0-1,6 bar | 0,62 | 0,66 | 0,69 | 0,70 | 0,73 | 0,77 | Relative pressure sensor, 0-1.6 bar, 0-100°C |
| RPS 0-2,5 bar | 0,62 | 0,66 | 0,69 | 0,77 | 0,81 | 0,86 | Relative pressure sensor, 0-2.5 bar, 0-100°C |
| RPS 0-4 bar | 0,62 | 0,66 | 0,69 | 0,92 | 0,97 | 1,02 | Relative pressure sensor, 0-4 bar, 0-100°C |
| RPS 0-6 bar | 0,62 | 0,66 | 0,69 | 1,07 | 1,13 | 1,19 | Relative pressure sensor, 0-6 bar, 0-100°C |
| RPS 0-10 bar | 0,62 | 0,66 | 0,69 | 1,21 | 1,28 | 1,35 | Relative pressure sensor, 0-10 bar, 0-100°C |
| RPS 0-16 bar | 0,62 | 0,66 | 0,69 | 1,36 | 1,44 | 1,51 | Relative pressure sensor, 0-16 bar, 0-100°C |

*Table 2 Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific RPS sensor.*
*The tolerances are based on non ratiometric measurement, where $V_{cc}$ vary ±5%.*

| Product name | $V_{TEST2}$@ Vcc=5.00V | | | $V_{TEST1}$@ Vcc=5.00V | | | Product characteristics |
|---|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max | |
| RPS 0-0.6 bar | 0,63 | 0,66 | 0,68 | 0,55 | 0,58 | 0,60 | Relative pressure sensor, 0-0.6 bar, 0-100°C |
| RPS 0-1 bar | 0,63 | 0,66 | 0,68 | 0,63 | 0,66 | 0,68 | Relative pressure sensor, 0-1 bar, 0-100°C |
| RPS 0-1,6 bar | 0,63 | 0,66 | 0,68 | 0,71 | 0,73 | 0,76 | Relative pressure sensor, 0-1.6 bar, 0-100°C |
| RPS 0-2,5 bar | 0,63 | 0,66 | 0,68 | 0,79 | 0,81 | 0,84 | Relative pressure sensor, 0-2.5 bar, 0-100°C |
| RPS 0-4 bar | 0,63 | 0,66 | 0,68 | 0,94 | 0,97 | 0,99 | Relative pressure sensor, 0-4 bar, 0-100°C |
| RPS 0-6 bar | 0,63 | 0,66 | 0,68 | 1,10 | 1,13 | 1,15 | Relative pressure sensor, 0-6 bar, 0-100°C |
| RPS 0-10 bar | 0,63 | 0,66 | 0,68 | 1,26 | 1,28 | 1,31 | Relative pressure sensor, 0-10 bar, 0-100°C |
| RPS 0-16 bar | 0,63 | 0,66 | 0,68 | 1,41 | 1,44 | 1,46 | Relative pressure sensor, 0-16 bar, 0-100°C |

Table 3 *Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific RPS sensor.*
*The tolerances are based on ratiometric measurement, where $V_{cc}$ is exactly 5.0V.*

| Product name | $V_{TEST2}$@ Vcc=5.00V±5% | | | $V_{TEST1}$@ Vcc=5.00V±5% | | | Product characteristics |
|---|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max | |
| VFS 1-20 l/min | 0,55 | 0,58 | 0,61 | 0,55 | 0,58 | 0,61 | Vortex Flowsensor, 1-20 l/min, 0-100°C |
| VFS 2-40 l/min | 0,55 | 0,58 | 0,61 | 0,62 | 0,66 | 0,69 | Vortex Flowsensor, 2-40 l/min, 0-100°C |
| VFS 5-100 l/min | 0,55 | 0,58 | 0,61 | 0,69 | 0,73 | 0,78 | Vortex Flowsensor, 5-100 l/min, 0-100°C |
| VFS 10-200 l/min | 0,55 | 0,58 | 0,61 | 0,77 | 0,81 | 0,86 | Vortex Flowsensor, 10-200 l/min, 0-100°C |
| VFS 20-400 l/min | 0,55 | 0,58 | 0,61 | 1,06 | 1,13 | 1,19 | Vortex Flowsensor, 20-400 l/min, 0-100°C |
| VFS 1-12 l/min | 0,55 | 0,58 | 0,61 | 2,62 | 2,77 | 2,91 | Vortex Flowsensor, 1-12 l/min, 0-100°C |

*Table 4 Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific VFS sensor.*
*The tolerances are based on non ratiometric measurement, where $V_{cc}$ vary ±5%.*

| Product name | $V_{TEST2}$@ Vcc=5.00V | | | $V_{TEST1}$@ Vcc=5.00V | | | Product characteristics |
|---|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max | |
| VFS 1-20 l/min | 0,55 | 0,58 | 0,60 | 0,55 | 0,58 | 0,60 | Vortex Flowsensor, 1-20 l/min, 0-100°C |
| VFS 2-40 l/min | 0,55 | 0,58 | 0,60 | 0,63 | 0,66 | 0,68 | Vortex Flowsensor, 2-40 l/min, 0-100°C |
| VFS 5-100 l/min | 0,55 | 0,58 | 0,60 | 0,71 | 0,73 | 0,76 | Vortex Flowsensor, 5-100 l/min, 0-100°C |
| VFS 10-200 l/min | 0,55 | 0,58 | 0,60 | 0,79 | 0,81 | 0,84 | Vortex Flowsensor, 10-200 l/min, 0-100°C |
| VFS 20-400 l/min | 0,55 | 0,58 | 0,60 | 1,10 | 1,13 | 1,15 | Vortex Flowsensor, 20-400 l/min, 0-100°C |

Table 5 *Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific VFS sensor. The tolerances are based on ratiometric measurement, where $V_{cc}$ is exactly 5.0V.*

| Product name | $V_{TEST2}$@ Vcc=5.00V±5% | | | $V_{TEST1}$@ Vcc=5.00V±5% | | | Product characteristics |
|---|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max | |
| DPS 0-0,6 bar | 0,70 | 0,73 | 0,77 | 0,55 | 0,58 | 0,61 | Differential Pressure Sensor, 0-0,6 bar, 0-100°C (Obsolete, see Table 10) |

*Table 6 Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific DPS sensor. The tolerances are based on non ratiometric measurement, where $V_{cc}$ vary ±5%.*

| Product name | $V_{TEST2}$@ Vcc=5.00V | | | $V_{TEST1}$@ Vcc=5.00V | | | Product characteristics |
|---|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max | |
| DPS 0-0,6 bar | 0,71 | 0,73 | 0,76 | 0,55 | 0,58 | 0,60 | Differential Pressure Sensor, 0-0,6 bar, 0-100°C (Obsolete, see Table 11) |

Table 7 *Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific DPS sensor. The tolerances are based on ratiometric measurement, where $V_{cc}$ is exactly 5.0V.*

| Product name | $V_{TEST2}$@ Vcc=5.00V±5% | | | $V_{TEST1}$@ Vcc=5.00V±5% | | | Product characteristics |
|---|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max | |
| RPS_HR 0-4 bar | 0,77 | 0,81 | 0,86 | 0,92 | 0,97 | 1,02 | Relative pressure sensor, 0-4 bar, 0-100°C |
| RPS_HR 0-6 bar | 0,77 | 0,81 | 0,86 | 1,07 | 1,13 | 1,19 | Relative pressure sensor, 0-6 bar, 0-100°C |
| RPS_HR 0-10 bar | 0,77 | 0,81 | 0,86 | 1,21 | 1,28 | 1,35 | Relative pressure sensor, 0-10 bar, 0-100°C |

*Table 8 Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific RPS HR (High Resolution) sensor. The tolerances are based on non ratiometric measurement, where $V_{cc}$ vary ±5%.*

| Product name | $V_{TEST2}$@ Vcc=5.00V | | | $V_{TEST1}$@ Vcc=5.00V | | | Product characteristics |
|---|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max | |
| RPS_HR 0-4 bar | 0,79 | 0,81 | 0,84 | 0,94 | 0,97 | 0,99 | Relative pressure sensor, 0-4 bar, 0-100°C |
| RPS_HR 0-6 bar | 0,79 | 0,81 | 0,84 | 1,10 | 1,13 | 1,15 | Relative pressure sensor, 0-6 bar, 0-100°C |
| RPS_HR 0-10 bar | 0,79 | 0,81 | 0,84 | 1,26 | 1,28 | 1,31 | Relative pressure sensor, 0-10 bar, 0-100°C |

Table 9 *Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific RPS HR (High Resolution) sensor. The tolerances are based on ratiometric measurement, where $V_{cc}$ is exactly 5.0V.*

| Product name | $V_{TEST2}$@ Vcc=5.00V±5% | | | $V_{TEST1}$@ Vcc=5.00V±5% | | | Product characteristics |
|---|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max | |
| DPS 0-0,6 bar | 0,92 | 0,97 | 1,02 | 0,55 | 0,58 | 0,61 | Differential Pressure Sensor, 0-0,6 bar, 0-100°C |
| DPS 0-1 bar | 0,92 | 0,97 | 1,02 | 0,62 | 0,66 | 0,69 | Differential Pressure Sensor, 0-1 bar, 0-100°C |
| DPS 0-1,6 bar | 0,92 | 0,97 | 1,02 | 0,69 | 0,73 | 0,78 | Differential Pressure Sensor, 0-1,6 bar, 0-100°C |
| DPS 0-2,5 bar | 0,92 | 0,97 | 1,02 | 0,77 | 0,81 | 0,86 | Differential Pressure Sensor, 0-2,5 bar, 0-100°C |
| DPS 0-4 bar | 0,92 | 0,97 | 1,02 | 0,92 | 0,97 | 1,02 | Differential Pressure Sensor, 0-4 bar, 0-100°C |
| DPS 0-6 bar | 0,92 | 0,97 | 1,02 | 1,06 | 1,13 | 1,19 | Differential Pressure Sensor, 0-6 bar, 0-100°C |
| DPS 0-10 bar | 0,92 | 0,97 | 1,02 | 1,21 | 1,28 | 1,35 | Differential Pressure Sensor, 0-10 bar, 0-100°C |

*Table 10 Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific DPS sensor. The tolerances are based on non ratiometric measurement, where $V_{cc}$ vary ±5%.*

| Product name | $V_{TEST2}$@ Vcc=5.00V | | | $V_{TEST1}$@ Vcc=5.00V | | | Product characteristics |
|---|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max | |
| DPS 0-0,6 bar | 0,94 | 0,97 | 0,99 | 0,55 | 0,58 | 0,60 | Differential Pressure Sensor, 0-0,6 bar, 0-100°C |
| DPS 0-1 bar | 0,94 | 0,97 | 0,99 | 0,63 | 0,66 | 0,68 | Differential Pressure Sensor, 0-1 bar, 0-100°C |
| DPS 0-1,6 bar | 0,94 | 0,97 | 0,99 | 0,71 | 0,73 | 0,76 | Differential Pressure Sensor, 0-1,6 bar, 0-100°C |
| DPS 0-2,5 bar | 0,94 | 0,97 | 0,99 | 0,79 | 0,81 | 0,84 | Differential Pressure Sensor, 0-2,5 bar, 0-100°C |
| DPS 0-4 bar | 0,94 | 0,97 | 0,99 | 0,94 | 0,97 | 0,99 | Differential Pressure Sensor, 0-4 bar, 0-100°C |
| DPS 0-6 bar | 0,94 | 0,97 | 0,99 | 1,10 | 1,13 | 1,15 | Differential Pressure Sensor, 0-6 bar, 0-100°C |
| DPS 0-10 bar | 0,94 | 0,97 | 0,99 | 1,26 | 1,28 | 1,31 | Differential Pressure Sensor, 0-10 bar, 0-100°C |

Table 11 *Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific DPS sensor. The tolerances are based on ratiometric measurement, where $V_{cc}$ is exactly 5.0V.*

## 4 General specification of output

The output signals have a range from approximately 0V to $V_{cc}$. The range is specified in detail in *Table 12* and *Table 13* covering the series VFS, RPS, RPS_HR and the obsoleted DPS0-0.6. The new DPS series is specified in *Table 14*.

RPS 0-N and RPS_HR 0-N, where N is the upper range, is specified generically in *Table 12*. An example for the RPS 0-4 bar sensor is provided in *Table 15*.
VFS X-Y, where X is the minimum flow and Y is the maximum flow, is specified generically in *Table 13*. An example for a 1-20 liter/minute sensor is provided in *Table 16* and *Figure 2*.
DPS 0-N, where N is the upper range, is specified generically in *Table 14*. An example for the DPS 0-4 bar sensor is provided in *Table 17*. As mentioned previously the sensor outputs are ratiometric, which mean that the output is a function of the supply voltage, $V_{cc}$. The supply voltage $V_{cc}$ is specified to ±5%, which also gives a ±5% variation on the output according to the actual voltage. The tolerances for the sensors output circuit is ±0.3%.

| Pin | Output voltage range (V) | Description |
|---|---|---|
| 1 or 2 | $0.00 - 0.05 \cdot V_{CC}$ | Illegal value. Error in supply, cable, sensor or receiving system |
| 2 | $0.05 \cdot V_{CC} - 0.1 \cdot V_{CC}$ | Pressure < 0 bar (not within FS accuracy) |
| 1 | $0.05 \cdot V_{CC} - 0.1 \cdot V_{CC}$ | Temperature < 0 °C (not within FS accuracy) |
| 2 | $0.1 \cdot V_{CC} - 0.7 \cdot V_{CC}$ | $P = [V_{out}(V) - 0.1 \cdot V_{CC}] \cdot \frac{N}{0.6 \cdot V_{CC}}$ bar , Operating area. |
| 1 | $0.1 \cdot V_{CC} - 0.7 \cdot V_{CC}$ | $T = [V_{out}(V) - 0.1 \cdot V_{CC}] \cdot \frac{100}{0.6 \cdot V_{CC}}$ °C , Operating area. |
| 2 | $0.7 \cdot V_{CC} - 0.75 \cdot V_{CC}$ | Pressure > N bar. (Not within FS accuracy) |
| 1 | $0.7 \cdot V_{CC} - 0.75 \cdot V_{CC}$ | Temperature > 100 °C (not within FS accuracy) |
| 1 or 2 | $0.75 \cdot V_{CC} - V_{CC}$ | Illegal value. Error in supply, cable, sensor or receiving system |

*Table 12 Signal specification for RPS 0-N and RPS_HR 0-N sensors, where N is the upper range. The supply voltage $V_{cc}$ must be within the limitations as shown in Figure 1*

| Pin | Output voltage range (V) | Description |
|---|---|---|
| 1 | $0.00 - 0.05 \cdot V_{CC}$ | Illegal value. Error in supply, cable, sensor or receiving system |
| 2 | $0.00 - V_{Q=0}$ | Illegal value. Error in supply, cable, sensor or receiving system |
| 2 | $V_{Q=0} - 0.1 \cdot V_{CC}$ | Flow < X l./min. (not within FS accuracy) |
| 1 | $0.05 \cdot V_{CC} - 0.1 \cdot V_{CC}$ | Temperature < 0 °C (not within FS accuracy) |
| 2 | $0.1 \cdot V_{CC} - 0.7 \cdot V_{CC}$ | $\dot{Q} = \frac{V_{out}(V) \cdot (Y - X)}{0.6 \cdot V_{CC}} - \frac{Y}{6} + \frac{7 \cdot X}{6} \quad \frac{\text{litre}}{\text{minutes}}$ |
| 1 | $0.1 \cdot V_{CC} - 0.7 \cdot V_{CC}$ | $T = [V_{out}(V) - 0.1 \cdot V_{CC}] \cdot \frac{100}{0.6 \cdot V_{CC}} \quad °C$ |
| 2 | $0.7 \cdot V_{CC} - 0.75 \cdot V_{CC}$ | Flow > Y ltr/min (not within FS accuracy) |
| 1 | $0.7 \cdot V_{CC} - 0.75 \cdot V_{CC}$ | Temperature > 100 °C (not within FS accuracy) |
| 1 or 2 | $0.75 \cdot V_{CC} - V_{CC}$ | Illegal value. Error in supply, cable, sensor or receiving system |

*Table 13 Signal specification for Vortex Flow sensor VFS X-Y, where X is the lower limit, Y is the upper limit and $V_{Q=0}$ is the output voltage representing zero flow. The supply voltage $V_{CC}$ must be within the limitations as shown in Figure 1.*

The output voltage representing no flow detected (zero flow) is defined as follows

$$V_{Q=0} = 0.1 \cdot V_{CC} - \frac{0.7 \cdot V_{CC} - 0.1 \cdot V_{CC}}{Y - X} X \quad , V_{Q=0} \geq 0.05 \cdot V_{CC}$$

Note that given $V_{cc}$=5$V$ the output will clamp at 0.250$V$.

For all flow sensors with a dynamic range of 1:20 this simplifies to

$$V_{Q=0} = 0.0684 \cdot V_{CC}$$

Considering the tolerance of the output circuit the range is

$$V_{Q=0} = 0.0684 \cdot V_{CC} \pm 0.3\% V_{CC} \Rightarrow V_{Q=0} = [0.327; 0.357]\ V$$

For all flow sensors with a dynamic range of 1:12 this simplifies to

$$V_{Q=0} = 0.0455 \cdot V_{CC}$$

which falls for the clamp level. The output will the be in the range

$$V_{Q=0} = 0.05 \cdot V_{CC} \pm 0.3\% V_{CC} \Rightarrow V_{Q=0} = [0.235; 0.265] V$$

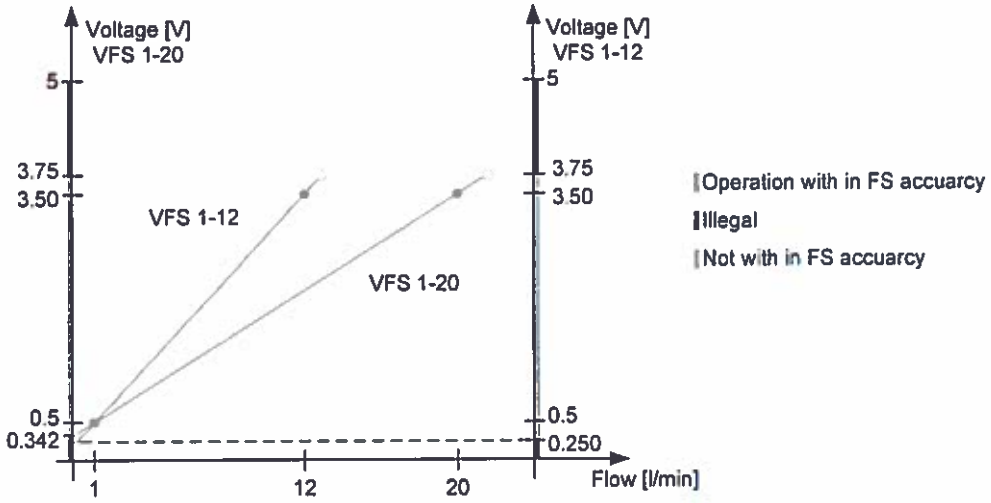



*Figure 2 shows a graphical representation of contents of Table 13 exemplified by a VFS1-12 and a VFS1-20 with $V_{cc}$ = 5V. Note that the levels indicated on the graph are typical values.*

| Pin | Output voltage range (V) | Description |
|---|---|---|
| 1 or 2 | $0.00 - 0.05 \cdot V_{CC}$ | Illegal value. Error in supply, cable, sensor or receiving system |
| 2 | $0.05 \cdot V_{CC} - 0.1 \cdot V_{CC}$ | Pressure < 0 bar (not within FS accuracy) |
| 1 | $0.05 \cdot V_{CC} - 0.1 \cdot V_{CC}$ | Temperature < 0 °C (not within FS accuracy) |
| 2 | $0.1 \cdot V_{CC} - 0.9 \cdot V_{CC}$ | $P = [V_{out}(V) - 0.1 \cdot V_{CC}] \cdot \frac{N}{0.8 \cdot V_{CC}}$ bar , Operating area. |
| 1 | $0.1 \cdot V_{CC} - 0.9 \cdot V_{CC}$ | $T = [V_{out}(V) - 0.1 \cdot V_{CC}] \cdot \frac{100}{0.8 \cdot V_{CC}}$ °C , Operating area. |
| 2 | $0.90 \cdot V_{CC} - 0.95 \cdot V_{CC}$ | Pressure > N bar. (Not within FS accuracy) |
| 1 | $0.90 \cdot V_{CC} - 0.95 \cdot V_{CC}$ | Temperature > 100 °C (not within FS accuracy) |
| 1 or 2 | $0.95 \cdot V_{CC} - V_{CC}$ | Illegal value. Error in supply, cable, sensor or receiving system |

*Table 14 Signal specification for a DPS 0-N sensor, where N is the upper range. The supply voltage $V_{cc}$ must be within the limitations as shown in Figure 1*

## 5 General Sensor identification at power-on

The sensor outputs are ratiometric, which mean that the output voltage on $V_{TEST1}$ and $V_{TEST2}$ will vary according to the tolerances on the supply voltage, the internal 12 bit AD converter and the user application. The sensor is specified to work within ±5% tolerances on the supply voltage. The tolerances for the sensors output circuit is ±0.3%.

$$V_{\text{test1,Nom}} = \frac{A}{4096} \cdot V_{cc,nom} \vee \begin{matrix} V_{\text{test1,min}} = \frac{A}{4096} \cdot V_{cc} \cdot 0.947 \\ V_{\text{test1,max}} = \frac{A}{4096} \cdot V_{cc} \cdot 1.053 \end{matrix}$$

$$V_{\text{test2,Nom}} = \frac{B}{4096} \cdot V_{cc,nom} \vee \begin{matrix} V_{\text{test2,min}} = \frac{B}{4096} \cdot V_{cc} \cdot 0.947 \\ V_{\text{test2,max}} = \frac{B}{4096} \cdot V_{cc} \cdot 1.053 \end{matrix}$$

| Product name | $V_{TEST2}$ | $V_{TEST1}$ | Product characteristics |
|---|---|---|---|
| | A | B | |
| RPS 0-0,6 bar | 538 | 474 | Relative pressure sensor, 0-0.6 bar, 0-100°C |
| RPS 0-1 bar | 538 | 538 | Relative pressure sensor, 0-1 bar, 0-100°C |
| RPS 0-1,6 bar | 538 | 602 | Relative pressure sensor, 0-1.6 bar, 0-100°C |
| RPS 0-2,5 bar | 538 | 666 | Relative pressure sensor, 0-2.5 bar, 0-100°C |
| RPS 0-4 bar | 538 | 794 | Relative pressure sensor, 0-4 bar, 0-100°C |
| RPS 0-6 bar | 538 | 922 | Relative pressure sensor, 0-6 bar, 0-100°C |
| RPS 0-10 bar | 538 | 1050 | Relative pressure sensor, 0-10 bar, 0-100°C |
| RPS 0-16 bar | 538 | 1178 | Relative pressure sensor, 0-16 bar, 0-100°C |

*Table 18 Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific RPS sensor.*

| Product name | $V_{TEST2}$ | $V_{TEST1}$ | Product characteristics |
|---|---|---|---|
| | A | B | |
| VFS 1-20 l/min | 474 | 474 | Vortex Flowsensor, 1-20 l/min, 0-100°C |
| VFS 2-40 l/min | 474 | 538 | Vortex Flowsensor, 2-40 l/min, 0-100°C |
| VFS 5-100 l/min | 474 | 602 | Vortex Flowsensor, 5-100 l/min, 0-100°C |
| VFS 10-200 l/min | 474 | 666 | Vortex Flowsensor, 10-200 l/min, 0-100°C |
| VFS 20-400 l/min | 474 | 922 | Vortex Flowsensor, 20-400 l/min, 0-100°C |
| VFS 1-12 l/min | 474 | 2266 | Vortex Flowsensor, 1-12 l/min, 0-100°C |

*Table 19 Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific VFS sensor.*

| Product name | $V_{TEST2}$ | $V_{TEST1}$ | Product characteristics |
|---|---|---|---|
| | A | B | |
| DPS 0-0,6 bar | 602 | 474 | Differential Pressure Sensor, 0-0.6 bar, 0-100°C (Obsolete, see ***Table 22***) |

*Table 20 Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific DPS sensor.*

| Pin | Output voltage range (V) $V_{CC}$=5.00V | Description |
|---|---|---|
| 1 or 2 | 0.00 – 0.25 | Illegal value. Error in supply, cable, sensor or receiving system |
| 2 | 0.25 – 0.50 | Pressure < 0 bar (not within FS accuracy) |
| 1 | 0.25 – 0.50 | Temperature < 0 °C (not within FS accuracy) |
| 2 | 0.50 – 3.50 | $P = (V_{pin2}(V) - 0.5) \cdot \frac{4}{3}$ $[bar]$, Operating area. |
| 1 | 0.50 – 3.50 | $T = (V_{pin1}(V) - 0.5) \cdot \frac{100}{3}$ $[°C]$, Operating area. |
| 2 | 3.50 – 3.75 | Pressure > 4) bar (not within FS accuracy) |
| 1 | 3.50 – 3.75 | Temperature > 100 °C (not within FS accuracy) |
| 1 or 2 | 3.75 – 5.00 | Illegal value. Error in supply, cable, sensor or receiving system |

*Table 15 Signal specification for an RPS 0-4 sensor with a supply voltage of 5.00V*

| Pin | Output voltage range (V) $V_{CC}$=5.00V | Description |
|---|---|---|
| 1 | 0.00 – 0.25 | Illegal value. Error in supply, cable, sensor or receiving system |
| 2 | 0.00 – 0.342 | Illegal value. Error in supply, cable, sensor or receiving system |
| 2 | 0.342 – 0.50 | Flow < 1 l./min. (not within FS accuracy) |
| 1 | 0.25 – 0.50 | Temperature < 0 °C (not within FS accuracy) |
| 2 | 0.50 – 3.50 | $\dot{Q} = \frac{V_{pin2}(V) \cdot (20-1)}{0.6 \cdot 5} - \frac{20}{6} + \frac{7 \cdot 1}{6}$ $\left[\frac{litre}{minutes}\right]$ |
| 1 | 0.50 – 3.50 | $T = (V_{pin1}(V) - 0.5) \cdot \frac{100}{3}$ $[°C]$ |
| 2 | 3.50 – 3.75 | Flow > 20 l./min (not within FS accuracy) |
| 1 | 3.50 – 3.75 | Temperature > 100 °C (not within FS accuracy) |
| 1 or 2 | 3.75 – 5.00 | Illegal value. Error in supply, cable, sensor or receiving system |

*Table 16 Signal specification for Vortex Flow sensor VFS 1-20 l/min with a supply voltage of 5.00V.*

| Pin | Output voltage range (V) $V_{CC}$=5.00V | Description |
|---|---|---|
| 1 or 2 | 0.00 – 0.25 | Illegal value. Error in supply, cable, sensor or receiving system |
| 2 | 0.25 – 0.50 | Pressure < 0 bar (not within FS accuracy) |
| 1 | 0.25 – 0.50 | Temperature < 0 °C (not within FS accuracy) |
| 2 | 0.50 – 4.50 | $P = (V_{pin2}(V) - 0.5) \cdot \frac{4}{4}$ $[bar]$, Operating area. |
| 1 | 0.50 – 4.50 | $T = (V_{pin1}(V) - 0.5) \cdot \frac{100}{4}$ $[°C]$, Operating area. |
| 2 | 4.50 – 4.65 | Pressure > 4) bar (not within FS accuracy) |
| 1 | 4.50 – 4.65 | Temperature > 100 °C (not within FS accuracy) |
| 1 or 2 | 4.65 – 5.00 | Illegal value. Error in supply, cable, sensor or receiving system |

*Table 17 Signal specification for an DPS 0-4 sensor with a supply voltage of 5.00V*

| Product name | $V_{TEST2}$ | $V_{TEST1}$ | Product characteristics |
|---|---|---|---|
| | A | B | |
| RPS_HR 0-4 bar | 666 | 794 | Relative pressure sensor, 0-6 bar, 0-100°C |
| RPS_HR 0-6 bar | 666 | 922 | Relative pressure sensor, 0-6 bar, 0-100°C |
| RPS_HR 0-10 bar | 666 | 1050 | Relative pressure sensor, 0-6 bar, 0-100°C |

*Table 21 Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific RPS HR (High Resolution) sensor.*

| Product name | $V_{TEST2}$ | $V_{TEST1}$ | Product characteristics |
|---|---|---|---|
| | A | B | |
| DPS 0-0,6 bar | 794 | 474 | Differential Pressure Sensor, 0-0.6 bar, 0-100°C |
| DPS 0-1 bar | 794 | 538 | Differential Pressure Sensor, 0-1 bar, 0-100°C |
| DPS 0-1,6 bar | 794 | 602 | Differential Pressure Sensor, 0-1.6 bar, 0-100°C |
| DPS 0-2,5 bar | 794 | 666 | Differential Pressure Sensor, 0-2.5 bar, 0-100°C |
| DPS 0-4 bar | 794 | 794 | Differential Pressure Sensor, 0-4 bar, 0-100°C |
| DPS 0-6 bar | 794 | 922 | Differential Pressure Sensor, 0-6 bar, 0-100°C |
| DPS 0-10 bar | 794 | 1050 | Differential Pressure Sensor, 0-10 bar, 0-100°C |

*Table 22 Combinations of $V_{TEST1}$ and $V_{TEST2}$ used to identify a specific DPS sensor.*