SVMtec	Manual	Version	1.0
		Date	11.06.2024
		Agent	D. Bergmann

PSC8-TAS – True Airspeed measurement

1. GENERAL DESCRIPTION

The PSC8-TAS is suitable for determining the flow velocities of air flows in conjunction with a pressure probe (e.g. Prandtl probes) or a restriction flow meter. The following quantities can be measured:

- Differential pressure = Pitot or differential pressure of the probe
- Differential pressure of the static pressure of the probe versus ambient pressure
- Ambient pressure (barometric air pressure)
- Temperature
- Relative humidity

The device automatically calculates these values:

- Flow velocity
- Air density

For the determination of the dynamic pressure, which is necessary for the determination of the flow velocity, a suitable pressure probe is additionally required, e.g. Prandtl probe, Pitot probe or nozzle pressure. In order to be able to cover a large velocity range, two pressure sensors with different ranges are installed, which are internally connected in parallel.

The second variable necessary for determining the flow velocity is the density. This is determined via the measured variables air pressure, temperature and humidity. In order to also be able to measure in flows with negative or positive pressure to the environment, another differential pressure sensor is installed, which determines the difference between the environment and the static pressure connection of the probe.

The data transmission uses ASCII text in the respective SI units. Via a simple protocol, the transmission rate can be set in the range between 1 and 100 Hz. For the differential pressure sensors an offset deduction (TARA) can be done via the software.

Power is supplied via the USB interface. An additional power supply is not necessary in this case. Optionally, the CAN bus can be used. In this case, an external supply in the range of 7 to 24VDC is necessary, which is supplied via the interface connector with M8 plug.

The configuration is done via the USB connection. When connected via USB, the scanner logs on to the system as a virtual COM port. This allows any software that supports a serial protocol to be used.

A sample program for use with LabVIEW is included, and a DBC file is also supplied for use with CAN.

2. TECHNICAL DESCRIPTION

2.1. PRESSURE RANGES

The standard pressure ranges are listed in the following table. Other ranges are available upon request.

[1]	p-Min[2]	p-Max[3]	Δp[4]		Proof[5]	Burst[6]	
Uni-directional							
D	0	250	0,02	[Pa]	25	75	[kPa]
D	0	500	0,04	[Pa]	25	75	[kPa]
D	0	1,25	0,0001	[kPa]	50	75	[kPa]
D	0	2,5	0,0002	[kPa]	50	75	[kPa]
D	0	5,0	0,0004	[kPa]	50	125	[kPa]
D	0	7,5	0,0005	[kPa]	50	125	[kPa]
D	0	15	0,001	[kPa]	50	200	[kPa]
D	0	25	0,002	[kPa]	100	100	[kPa]
D	0	50	0,004	[kPa]	100	100	[kPa]
D	0	100	0,008	[kPa]	300	1000	[kPa]
D	0	250	0,02	[kPa]	720	1700	[kPa]
D	0	500	0,04	[kPa]	1200	1700	[kPa]
D	0	1000	0,08	[kPa]	1700	1700	[kPa]

Notes:

1. Nominal smallest measurable value
2. Nominal largest measurable value
3. Digital resolution (rounded)
4. Maximum pressure that does not damage the sensor
5. Maximum differential pressure against the environment that the internal sensor housing can withstand. Exceeding this pressure may cause the housing to burst, although sensor damage occurs at the proof pressure.

2.2. PRESSURE PORTS

The PSC pressure scanners can be supplied with the pneumatic connections illustrated below.

T16	T20 (standard)

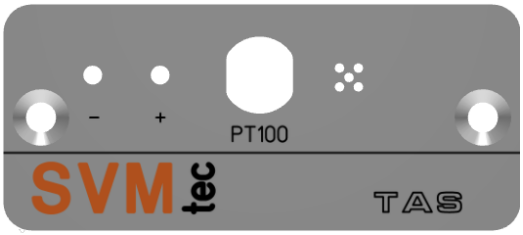
Name	DI [mm]	Hose material (recommended)	Max. pressure	Suitable for
T16	1,3 … 1,6	Silicon, PE, PVC	0,1MPa	All versions
T20	1,5 … 2,0	Silicon	15kPa	All versions

2.3. HOUSING

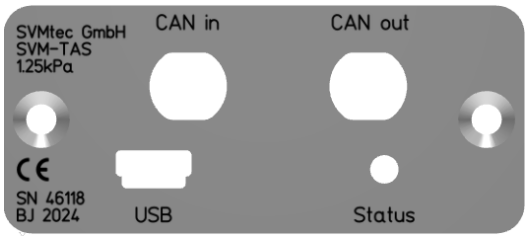
Front and Rear Panels

The connectors for the pressure probe and the temperature sensor are placed on the front panel.

The rear panel features a status LED, USB and the CAN interface.



TAS front



TAS rear

2.4. INTERFACES

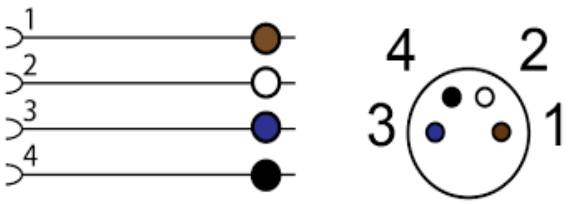
All devices come standard with USB-mini and CAN interfaces. The CAN bus and USB interface cannot operate simultaneously. When connected to a computer via USB, the CAN interface is deactivated. For CAN bus operation, an external power supply is required. Up to ten devices can be daisy-chained without additional power supply.

2.5. ELECTRICAL CONNECTIONS AND INTERFACES

CAN

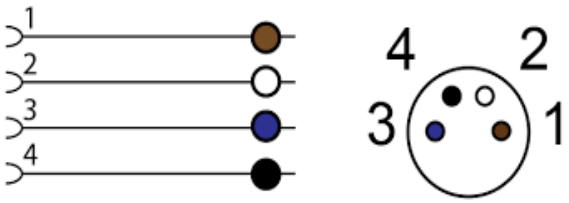
M8 - CAN Pinout

Pin	Function	Cable color
1	+ Supply	brown
2	CAN low	white
3	- Supply (GND)	blue
4	CAN high	black



M8 – PT100 Pinout

Pin	Function	Cable color
1	F+	brown
2	T+	white
3	T-	blue
4	F-	black



2.6. TECHNICAL DATA

CAN Bus Communication

Rate	125, 250, 500, 1000kBaud
Protocol	CAN2.0A, CAN2.0B

Power Supply

Supply Voltage PSC4 / PSC5	Via CAN connector, 7-24V, ca. 70mA

Genauigkeit und Abtastraten

Range (depends on selected sensors)	+/-0,025…50kPa
Accuracy	Min. +/- 0,1% FSS
Sample rate per channel	1-100 Hz

Dimensions

Housing	60 x 30 x 120 mm (W x H x D)
Pressure ports	D = 1,6mm / D = 2mm
Recommended hoses	Soft-PE- und Silicon hoses 3 x 1mm (D=1.6mm) / 3,5 x 1,5mm (D=2mm)

Environmental Conditions

Temperature	5 … 50 °C
Humidity	0 … 95 %, non-condensing
Medium	Air and other noncorrosive gases

3. SOFTWARE

The devices come with the free xSC-Logger program for Windows. This program allows configuration of all devices via the USB interface. Data logging and storage can also be performed via USB.

A driver package is available for the LabVIEW graphical programming language from National Instruments. The devices can also be operated under Linux.

3.1. CONFIGURING INTERFACES

When connected to a computer via USB, the device registers as a virtual COM port, allowing it to be used with any software supporting the RS-232 protocol. If unknown, the corresponding COM port can be identified via the Windows Device Manager.

3.2. SERIAL PROTOCOL

The virtual COM port can operate at any baud rate, though 19200, 8 data bits, no parity, and 1 stop bit are recommended. DTR (Data Terminal Ready) must be set.

When retrieving data through the USB interface, the output is in CSV format with a “tab” as separation character.

The output is printed in the following order:

P1: low range differential pressure sensor

P2: high range differential pressure sensor

T: PT100 temperature sensor

Patmos: atmospheric pressure

H: Humidity

Rho: calculated density

V: calculated flow velocity

Psel: optimal pressure derived from P1 and P2

The following commands are available for configuring the pressure scanner:

Command	Function	Reply
EE_LOAD	Load calibration data from EEPROM	#EEPROM:loaded
EE_SAVE	Save calibration data to EEPROM	#EEPROM:saved
**IDN?*	Read device id	TYPE FW-VERSION SERIENNUMMER zB: *PSC8-USB 1.8 #SN3xxxx*
RATE x	Define sample rate Range x = 10...5000 [ms] Default: *500[ms] = 2[Hz]*	#Rate=x ms #Error: Rate-Range
RATE 0	Activate Request-Mode Current values are read only after manual command „?“ is sent	#Request-Mode active
TX x	Enable/disable serial output x = 0: deactivate output x = 1: enable output	#TX OFF / #TX ON
?	Query data from all channels (Pascal)	0.00<tab>0.00<tab>…<CR><LF>
*RST	Restore default values	#RESET
SCAN_A x	Define a scanlist (channel list) binary value, each bit corresponds to a channel, see next page	-
TARA	Perform zero compensation measurement	#TARA
FILTER x	Exponential filter setting x = 0: automatic through „RATE” setting x > 0: IIR filter in [ms]	#FILTER
CAN_ID x	Set CAN-ID	#OK
CAN_IT x	Set the frame format x = 0: Normal (11bit, CAN 2.0A) x = 1: Extended (23bit, CAN 2.0B)	#OK
CAN_SPEED x	x=0: 125 kBaud x=1: 250 kBaud x=2: 500 kBaud x=3: 1 MBaud	#OK
CAN?	Query CAN configuration	#ID:0x[...]_Speed:[baud]_IT:[0,1]

A command must always be terminated with a line break (CR or LF or CR+LF).

The sensor numbering starts with the number "1".

Calibration and scanlist settings can be changed during operation. These parameters remain valid as long as the scanner is connected to a power supply or USB.

Only after the EE_SAVE command has been sent, the parameters are stored permanently and are available even after the power supply has been switched off.

Channels that are not used can be defined and deactivated via a scan list (`SCAN_A`).

For this purpose, the binary listing of the individual channels is converted into a decimal number ("x") and transmitted to the device with the `SCAN_A x` command.

The reset command `*RST` automatically reactivates all channels.

As an example, configuration options of the scan list are shown in the following table:

Channel (Scan_A)	**1**	2	3	**4**	**5**	**x**
Ex. a)	**1 (ON)**	0 (OFF)	0 (OFF)	0 (OFF)	0 (OFF)	**1**
Ex. b)	**1 (ON)**	**1 (ON)**	**1 (ON)**	0 (OFF)	0 (OFF)	**7**
Ex. c)	0 (OFF)	0 (OFF)	0 (OFF)	**1 (ON)**	**1 (ON)**	**24**
Ex. d)	**1 (ON)**	**1 (ON)**	**1 (ON)**	**1 (ON)**	**1 (ON)**	**31**

Caution: *By default, all channels are activated and transmitted in ascending order. When using the scanlist, deactivated channels are skipped to reduce overall data volume.*

If, for example, channels 1, 3, and 5 are in use, they will be sorted in ascending order and transmitted at places 1, 2 and 3.

3.3. DBC FILE

A DBC file defines values and channel attributes transported with the CAN protocol. An example of a valid DBC file is given here:

```
VERSION ""

NS_ :
        NS_DESC_
        CM_
        BA_DEF_
        BA_
        VAL_
        CAT_DEF_
        CAT_
        FILTER
        BA_DEF_DEF_
        EV_DATA_
        ENVVAR_DATA_
        SGTYPE_
        SGTYPE_VAL_
        BA_DEF_SGTYPE_
        BA_SGTYPE_
        SIG_TYPE_REF_
        VAL_TABLE_
        SIG_GROUP_
        SIG_VALTYPE_
        SIGTYPE_VALTYPE_
        BO_TX_BU_
        BA_DEF_REL_
        BA_REL_
        BA_DEF_DEF_REL_
        BU_SG_REL_
        BU_EV_REL_
        BU_BO_REL_
        SG_MUL_VAL_

BS_:

BU_: TAS SVM_GmbH

BO_ 256 MSG0    : 8 TAS
 SG_ TAS_P1     : 0|16@1-  (0.1,0) [-100|50000]   "Pa" SVM_GmbH
 SG_ TAS_P2     : 16|16@1- (1,0)   [-100|50000]   "Pa" SVM_GmbH
 SG_ TAS_T      : 32|16@1- (0.1,0) [-100|1000]    "°C" SVM_GmbH
 SG_ TAS_Patmos : 48|16@1- (2,0)   [60000|120000] "Pa" SVM_GmbH

BO_ 257 MSG02: 8 TAS
 SG_ TAS_H      : 0|16@1-  (0.1,0)  [0|100]       "%" SVM_GmbH
 SG_ TAS_Rho    : 16|16@1- (0.01,0) [0|2]         "kg/m3" SVM_GmbH
 SG_ TAS_V      : 32|16@1- (0.1,0)  [0|500]       "m/s" SVM_GmbH
 SG_ TAS_Psel   : 48|16@1- (1,0)    [-100|50000]  "Pa" SVM_GmbH


BA_DEF_  "BusType" STRING ;
BA_DEF_DEF_  "BusType" "CAN";
```

EG Konformitätserklärung

EU Declaration of Conformity

Name des Herstellers:	SVMtec GmbH
Name of Manufacturer:	Ingenieurbüro für Strömungsmechanik, Versuchs- und Messtechnik
Anschrift des Herstellers:	Bergnelkenstr. 7
Adress of Manufacturer:	70563 Stuttgart (Germany)

Für das folgende Produkt wird hiermit bestätigt, dass es den Schutzanforderungen entspricht, die in den Richtlinien des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten bezüglich elektromagnetischer Verträglichkeit (2004/108/EG) festgelegt sind:

It is hereby confirmed in respect of the following designated product that it comply with protection requirements specified in the Directive of the Council for Harmonization of the Statutory Provisions of the Member States for Electromagnetic Compatibility (2004/108/EG):

Bezeichnung / name:	SVM / Mehrkanaldruckscanner der PSC-Serie
	SN 46000 - 46999

Zur Beurteilung des Produkts wurden folgende harmonisierte Normen herangezogen:

Reference was made to the following harmonised standards:

EN 61326-1:2006	Elektrische Mess-, Steuer-, Regel- und Laborgeräte EMV-Anforderungen - Teil 1: Allgemeine Anforderungen

Stuttgart, den 04.08.2022

Dr.-Ing. Detlef Bergmann (Geschäftsführer)