

FPS5851HPC4



- **Real-time urea quality sensing:**
Urea concentration
Urea temperature
Detection of unauthorized fluids
Identification of Diesel fuel
- **Fully integrated sensor and processing electronics provide a solid state sensor for in line urea quality monitoring**
- **Factory calibrated in compliance with DIN70070 / ISO 22241 standards.**
- **Digital output as per J1939, CAN2.0B standard or CAN2.0A featuring high-resolution parameter readings**

DESCRIPTION

The FPS5851HPC4 sensor directly and simultaneously measures all the critical parameters of aqueous urea solution. Relying on patented tuning fork technology, the measurements of both urea concentration and in line temperature enable users to determine if the quality of the employed reducing fluid will enable Selective Catalytic Reduction systems to achieve optimal performance. Real-time multi-parametric urea analysis allows high performance algorithms to provide direct feedback to urea feed control systems or ECMs to optimize emission control for NOx reduction. The FPS5851HPC4 is an important tool for meeting regulated OBD compliance to confirm urea presence and concentration, using Failure Mode Indicators. A universal digital CAN J1939 compliant protocol provides easy to connect interface to main control systems (i.e., ECM, SCR feed control, OBD bus). A standard 4 pin connector allows cost effective mounting options. The multiparametric sensor relies on simultaneous measurement of a fluid viscosity, density and dielectric constant to detect unauthorized fluids and allows the identification of both proper fluid and Diesel fuel.

FEATURES

- Proprietary corrosion and contaminant resistant wetted parts
- High reliability and long term stability
- Optimized for OEM specifications
- Rugged SST based construction for demanding environment (vibration, side-load)

APPLICATIONS

- Diesel Engines SCR systems
- Passenger Vehicles
- Buses & Trucks
- Off Highway Vehicles

FPS5851HPC4

PERFORMANCE SPECIFICATIONS

MAXIMUM RATINGS

Ratings	Symbol	Value	Unit
Supply Voltage (Peak)	V_{cc}	36	V _{dc}
Ambient Operating Temperature (electronics)*	T_e	-40 to +125	°C
Ambient Operating Pressure (fluid)	P_f	Max 16	bar
Storage Temperature	T_{stg}	-50 to +150	°C
Input Current @12 Vdc (in rush)	I_{pk}	< 200	mA
Vibration (Peak)		20	Grms

Peak conditions: less than 10% of the operating time.

* Ambient Operating Temperature: Service temperature range at which the sensor and its electronics can operate securely.

METROLOGICAL CHARACTERISTICS

Measurement Ranges	Symbol	Min	Typ	Max	Unit
Urea concentration	%urea	5	32.5	62.5	% mass
Urea concentration accuracy *		-1		+1	% mass
DEF Fluid Temperature **	T	-8		60	°C
Temperature Accuracy	T		+/-1		°C
Response time	t		< 2		min
Pressure range	P_f	5		16	bar

* Adblue / DEF fluids classically freeze at temperature inferior to -11°C and quickly degrade at temperatures superior to 40°C. To protect sensing element, Urea quality sensor will not make any concentration measurement below -8°C. For temperature above 60°C urea concentration is still operating with +/-2% accuracy.

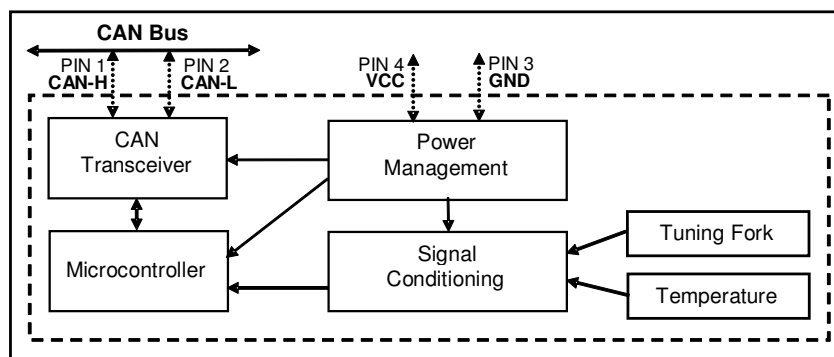
** Temperature sensor is capable within the -40 to 125°C range with 1°C accuracy.

ELECTRICAL CHARACTERISTICS

(@V_{cc}=12 V_{dc}, ambient temperature)

Electrical Characteristics	Symbol	Min	Typ	Max	Unit
Supply Voltage	V _{Batt}	9	12 (24)	36	Vdc
Supply Current (steady state)	I_{avg}		40(30)	100	mA

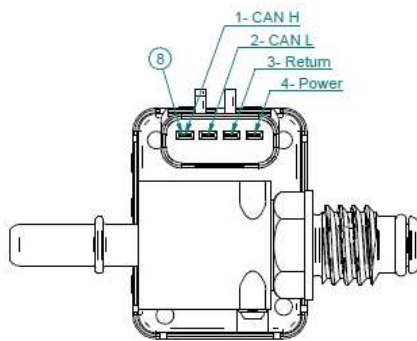
BLOCK DIAGRAM



FPS5851HPC4

CONNECTION & MECHANICAL PACKAGING

PINOUT assignment

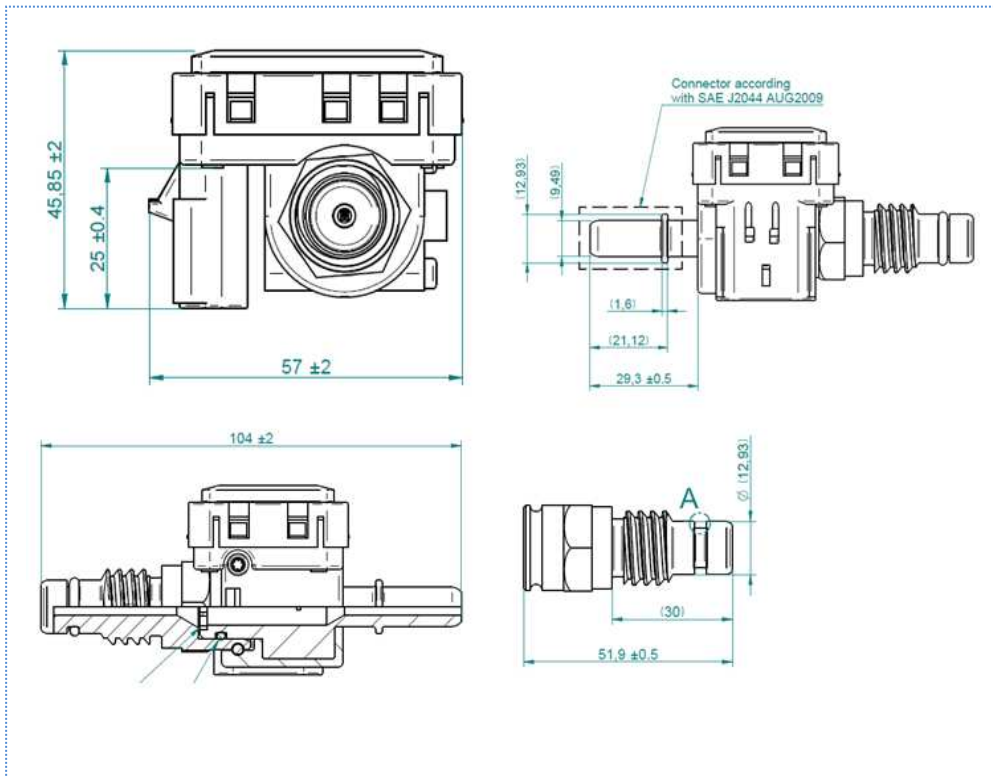


N ₀	Function
4	VCC – Voltage Supply
3	GND – Ground
2	CAN_L
1	CAN_H

Mating connector type is FCI female receptacle ref. 54200409 (black-sealed).

MECHANICAL CHARACTERISTICS: FPS5851HPC4 PACKAGE

All dimensions are in millimeters (mm).



FPP805A501

FPS5851HPC4

TRANSMISSION DATA

FPS5851HPC4 Urea Quality SENSOR J1939 Standard SPN and Standard PGN

PGN 64923 is related to catalyst reagent properties
CAN Frame description

Baud rate = 250 Kbit/s

Catalyst Reagent Temperature: SPN 3515	Min	Typ	Max
Limits (°C)	-40		150
Limits (DATA)	0x00		0xBE
Resolution (°C per bit)		1	
Byte position		1	
Update rate (s)		1	
Catalyst Reagent Concentration : SPN3516	Min	Typ	Max
Limits (%)	5		62.5
Limits (DATA)	0x14		0xFA
Resolution (% per bit)		0.25	
Byte position		2	
Update rate (s)		1	
Catalyst Reagent Type : SPN3521	This parameter indicates what reagent is in the SCR system		
0010	Diesel fuel		
0011	Proper fluid		
1101	Not able to determine catalyst reagent type		
1110	Error detected with urea reagent type detection		
1111	Not available		

SPN 3519	Catalyst reagent temperature Preliminary FMI
Used to identify the applicable J1939-73 FMI that applies to the most significant failure of the catalyst temperature sensor	

Proper fluid detection message is when good quality DEF/AdBlue is detected. MEAS defined a proper fluid of DEF/AdBlue in the concentration range of 29-36% (32.5% $\pm$ 3.5% urea).

Failure status and diagnostic of the sensor are defined by SPN 3519 and 3520.

SPN 3519 - CATALYST REAGENT TEMPERATURE 2 PRELIMINARY FMI			
	FMI	FMI Description	MEAS DESCRIPTION
Note 1	FMI=2	Data erratic, intermittent or incorrect	Electronics in safety mode; over temperature conditions detected
	FMI=3	Voltage Above Normal, Or Shorted To High Source	Temperature Sensing Element - open circuit (internal issue)
	FMI=4	Voltage Below Normal, Or Shorted To Low Source	Temperature Sensing Element - short circuit (internal issue)
	FMI=12	Bad Device or Component	No communication between sensing elements and electronics (internal issue)
	FMI=15	Data Valid But Above Normal Operating Range - Moderately Severe Level	Temperature Sensing Element > 150 °C (external issue)
	FMI=17	Data Valid But Below Normal Operating Range - Moderately Severe Level	Temperature Sensing Element < -40 °C (external issue)
	FMI=31	Condition Exists	No error detected

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SPN 3520

Catalyst reagent properties Preliminary FMI

Used to identify the applicable J1939-73 FMI that applies to the most significant failure of the catalyst reagent properties sensor. This is used for indicating failures of the catalyst reagent concentration or catalyst reagent type.

SPN 3520 - CATALYST REAGENT PROPERTIES PRELIMINARY FMI			
	FMI	FMI Description	MEAS DESCRIPTION
Note 1	FMI=2	Data erratic, intermittent or incorrect	Electronics in safety mode; over temperature conditions detected (electronics > 125 °C) (external issue)
Note 2	FMI = 3	Voltage Above Normal, Or Shorted To High Source	Quality Sensing Element - open circuit (internal issue)
Note 2	FMI = 4	Voltage Below Normal, Or Shorted To Low Source	Quality Sensing Element - short circuit (internal issue)
	FMI=11	Root Cause Not Known	Root Cause Not Known (internal issue)
Note 3	FMI=12	Bad Device or Component	No communication between sensing elements and electronics
Note 4	FMI=15	Data Valid But Above Normal Operating Range - Least Severe Level	Urea Sensing Element - Urea concentration ≥ 62.5% (external issue)
		Data Valid But Below Normal Operating Range - Least Severe Level	Urea Sensing Element - Urea concentration ≤ 5% (external issue)
Note 5	FMI=17	Condition Exists	No error detected

Note FMI 2 code is transmitted if electronic temperature is > 125 °C; "error" code (0xFE) is simultaneously transmitted on SPN3516 and SPN 3515

Note :FMI 3 or 4 code is transmitted on SPN 3520 if Urea sensing element is out of standard range (broken sensing element, open or short circuit). Only DEF sensing element is impacted.

Consecutive troubleshooting can be: (1) visual inspection of the sensor / (2) cleaning / (3) replacement

Note :FMI 12 code is transmitted on both SPN 3520 and SPN 3519 if there is improper internal communication (between electronic components). Both sensing elements are potentially impacted

Note :FMI 15 code is transmitted if urea concentration is ≥ 62.5%; 0xFA (62.5%) code is simultaneously transmitted on SPN3516

Note :FMI 17 code is transmitted if urea concentration is ≤ 5%; 0x14 (5%) code is simultaneously transmitted on SPN3516

Note :NOT ABLE TO DETERMINE CATALYST REAGENT TYPE code is transmitted if detected fluid is not CATALYST REAGENT IS PROPER and not DIESEL

RESISTANCE TO PHYSICAL AND CHEMICAL STRESSES

FPS5851HPC4 contains circuits to protect its inputs and outputs against Electrostatic discharges (ESD) up to ±15kV (air discharge)

FPS5851HPC4 is protected against EMC interferences (SAE J1114)

FPS5851HPC4 is protected against reverse polarity

FPS5851HPC4 is cross wire protected

FPS5851HPC4 sensor is qualified for operation in harsh operating conditions and protected from corrosion and contamination by urea, fuel, water, soaps and acids.

NOTE: This FPS5851HPC4 – Urea Quality Sensor and its use may be covered by one or more patents, including US Patents 6,957,565; 6,873,916; 6,494,079; 6,336,353; 7,043,969 and other pending US and worldwide patents.

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