

FPS2800B12C4 – Fluid Property Sensor Module



- Fully integrated, stand-alone module combines sensor and processing electronics
- Accurate, repeatable temperature, viscosity, density and dielectric constant
- Factory calibrated with NIST traceable fluids
- Digital output as per J1939, CAN2.0B standard or CAN2.0A featuring high-resolution parameter readings



DESCRIPTION

The FPS2800B12C4 is a novel fluid property sensor that will directly and simultaneously measure the viscosity, density, dielectric constant and temperature of fluids. Relying on patented tuning fork technology, the sensor monitors the direct and dynamic relationship between multiple physical properties to determine the quality, condition and contaminant loading of fluids such as engine oil, fuel, transmission and brake fluid, hydraulic and gear oils, refrigerants and solvents. The multi-parametric analysis capability improves fluid characterization algorithms. The FPS provides in-line monitoring of fluids for a wide range of OEM and aftermarket installations including fluid reservoirs, process lines and pressurized high flow conduits (e.g., engine oil gallery) for applications that include on and off highway vehicles, HVAC&R, compressors, industrial equipment and turbines. A universal digital CAN J1939 compliant protocol provides easy to connect interface to main Host controller. A simple 4 pin connector allows for cost effective mounting options.

FEATURES

- Rugged construction for high pressure and high flow environments
- Proprietary corrosion and contaminant resistant coating for wetted parts
- On-board microprocessor for real-time data analysis with 12 - 24 volts supply
- Highly reliable and long term stability

APPLICATIONS

- On and Off Highway Vehicles
- HVAC&R
- Compressors
- Industrial Equipments
- Turbines

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PERFORMANCE SPECS

MAXIMUM RATINGS

Ratings	Symbol	Value	Unit
Supply Voltage (Peak)	V_{cc}	60	V_{dc}
Ambient Operating Temperature (electronics)*	T_e	-40 to +125	°C
Ambient Operating Temperature (fluid)*	T_f	-40 to +150	°C
Storage Temperature**	T_{sta}	-50 to +150	°C
Input Current @12Vdc (In rush)	I_{max}	< 200	mA
Operating Pressure	P	25 (Note 1)	Bars
Vibration (Peak)		20	Grms

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

NOTE: 1 Elevated pressure ratings are available, contact MEAS France for specs.

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

** Storage Temperature: Temperature range at which the sensor can be stored with no risk of damage.

METROLOGICAL CHARACTERISTICS

(@ $V_{cc}=12V_{dc}$, $T=100^{\circ}C$, unless otherwise noted)

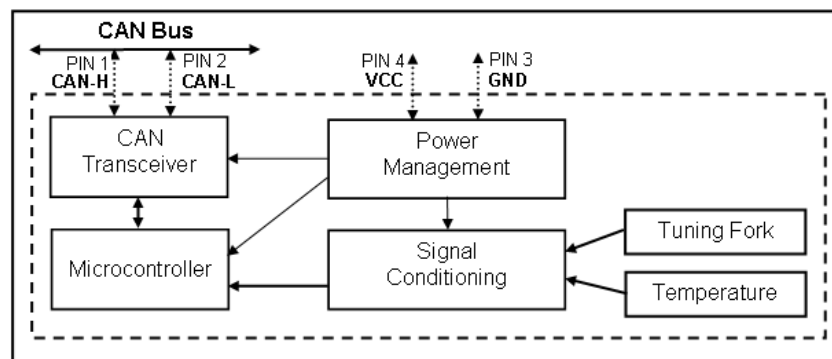
Multi-Parametric Measurement Ranges	Symbol	Min	Typ	Max	Unit
Viscosity (dynamic)	μ	0.5	15	50	mPa-s (cP)
Viscosity (dynamic) Accuracy for viscosity > 10 mPa-s (cP)		-5	+/-2	+5	% Value
Viscosity (dynamic) Accuracy for viscosity < 10 mPa-s (cP)			+/- 0.2		mPa-s (cP)
Density	ρ	0.65	0.85	1.50	gm/cc
Density Accuracy		-3	+/-1	+3	% Value
Dielectric Constant	ϵ	1.0	2.0	6.0	-
Dielectric Constant Accuracy		-3	+/- 1	+3	% Value
Fluid Temperature	T	-40		150	°C
Temperature Accuracy	T		0.1		°C

ELECTRICAL CHARACTERISTICS

(@ $V_{cc}=12V_{dc}$, $T=100^{\circ}C$, unless otherwise noted)

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

BLOCK DIAGRAM



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TRANSMISSION DATA

Viscosity	Min	Typ	Max
Data Range (mPa-s)	0.0		1003.9
Limits (DATA)	0x0000		0xFAF9
Resolution (mPa-s per bit)		0.015625	
Update period (s)		30	
Density	Min	Typ	Max
Data Range (gm/cc)	0.000		1.9608
Limits (DATA)	0x0000		0xFAF6
Resolution (gm/cc per bit)		0.00003052	
Update period (s)		30	
Dielectric Constant	Min	Typ	Max
Data Range (-)	0.00		7.842
Limits (DATA)	0x0000		0xFAF1
Resolution (- per bit)		0.00012207	
Update period (s)		30	
Temperature	Min	Typ	Max
Data Range (°C)	-273.0		+1735
Limits (DATA)	0x0000		0xFB00
Resolution (°C per bit)		0.03125	
Update period (s)		30	

SELF DIAGNOSTIC

Status message code	Bit position
Tuning Fork – impedance below normal or shorted to ground	1
Tuning Fork – impedance above normal or sensor damaged	2
Tuning Fork – ASIC over temperature conditions	3
Fit – simplex algorithm failed to converge	4
RTD – resistance below normal or shorted to ground	5
RTD – resistance above normal or sensor damaged	6
RTD – sensor temperature over temperature conditions	7
Internal – system error	8

Diagnostic bit is set to '1' when error is detected

FPS2800 STANDARD SPN AND STANDARD PGN

Parameter	SPN	PGN	Byte Position	Length (byte)
Dynamic Viscosity	5055	64776	1	2
Density	5056	64776	3	2
Dielectric Constant	5468	64776	7	2
Oil Temperature Sensor	175	65262	3	2
Status code message	N/A	65329	1	1

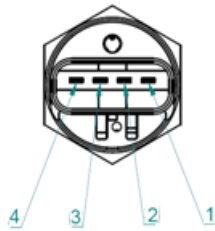
No delay is required between command write and data read.
CAN transmission Baudrate = 250kbps

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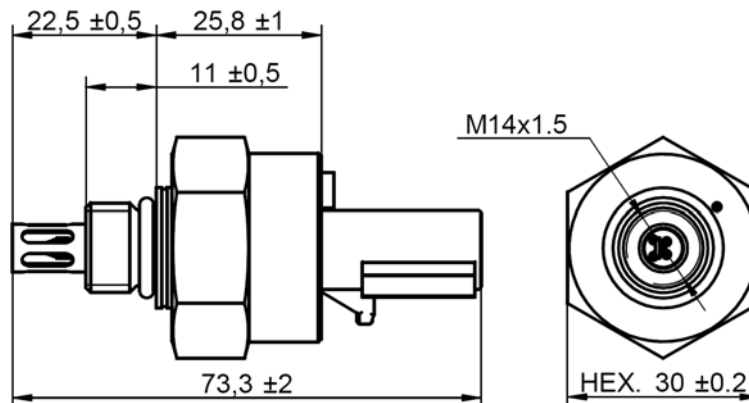
CONNECTING & MECHANICAL PACKAGING

PINOUT ASSIGNMENT (SUBJECT TO FURTHER CONFIRMATION)



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

MECHANICAL CHARACTERISTICS: FPS2800B12C4 PACKAGE OUTLINE



All dimensions are millimeters (mm). Mating connector type is FCI female receptacle ref. 54200409 (black-sealed). Sensor body is stainless steel.

M14 Viton O'ring provided for hermetical mounting.

NOTE: For installation details, please refer to the MEAS France FPS Installation Guide – FPC013.

FPS OPTIONAL PARTS

The FPS can be provided with

- A CAN Viewer Software which allows to visualize the measured values with a PC
- A CAN-USB interface, which enables communication between PC and FPS
- An FCI Mating connector with pigtail wires

These parts should be ordered on purchase.

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RESISTANCE TO PHYSICAL AND CHEMICAL STRESSES

- FPS2800B12C4 contains circuits to protect its inputs and outputs against Electrostatic discharges (ESD) up to $\pm 25\text{kV}$ (air discharge)
- FPS2800B12C4 is protected against EMC interferences (SAE J1114)
- FPS2800B12C4 is protected against reverse polarity
- FPS2800B12C4 is cross wire protected
- Additional tests under harsh chemical conditions demonstrate good operation in presence of 5% nitric acid, soot, fuel, water, oxidized oil, a non-exhaustive list

NOTE: This FPS 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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