

FPA2400BST – Fluid Property Analyzer



- **Instrument for measuring Real-Time Fluid Properties**
 - Viscosity
 - Density
 - Dielectric Constant
 - Temperature
- **Data Logging**
 - Programmable Sample Rates
 - 30+ Days
- **Host Interface**
 - RS-232 or CAN standards
 - Modbus32 Protocol
- **Robust-Ruggedized Construction**
 - IP-68 compatible
- **Operating Power Supply**
 - 12V nominal

DESCRIPTION

The FPA is a fluid property analytical tool that will directly and simultaneously measure and data log the viscosity, density, dielectric constant and temperature of fluids. Relying on patented tuning fork technology, the instrument 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 FPA provides in-line monitoring of fluids for a wide range of OEM and End-User installations including fluid reservoirs, IC engines, turbines, process lines and pressurized high flow conduits (e.g., chemical feed, process loops) for applications that include on and off highway vehicles, refrigeration circuits (HVAC&R), compressors, oil & gas refining, commodity and fine chemical processes (e.g., distillates), industrial equipment and turbines.

The FPA is suitable for laboratory or remote field installations. Its flexible configuration, offering different thread types, cables lengths and communication protocols makes the FPA adaptable to a diversity of applications. The FPA supports the dominant communication interface (e.g. digital CAN J1939 compliant, Modbus32 over RS-232/485 protocols) to simplify and enable “plug and play” connectivity with host computers, remote wireless communication nodes, DCS and SCADA systems. Data logging capabilities enable the FPA to be the ideal measurement device for experimental studies where data recording is critical, even in case of PC shutdown. The FPA may also be directly interfaced to a PC and operated with the custom FPA Studio Software.

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FEATURES

- Simultaneous sampling for Temperature, Viscosity, Density & Dielectric Constant
- Data Logging, up to 30 days at 1-sample/ 2 min.
- Programmable sample rates, at x-min./sample
- Over Temperature Protection: (+125°C) Auto Shutdown
- Real-Time Clock with Battery Backup
- Modbus32 Interface over RS-232
- Threaded Fluidic Interface for pressurized and flow applications
- Extended cable length for remote installation of sensor
- Host PC Application Software “FPA Studio”

APPLICATIONS

- Dynamic and complex fluid states (e.g., process fluids, engine oils, fuel quality)
- Wind Turbines
- Industrial and Manufacturing
- Gearboxes & Transmissions
- Marine, Railroad or Aircraft
- Electric Transformers
- Compressors, Oil & Refrigerants
- Hydraulic Systems
- Oils, Fuels

PERFORMANCE SPECS

MAXIMUM RATINGS

Probe Ratings	Symbol	Value	Unit
Storage Temperature*	T _s	-50 to +150	°C
Shock (Peak)	S _{peak}	20	G
Vibration Operating Limit	V _{vol}	50	Grms
Fluid Pressure Compatibility	P	Vacuum to 50	bars
Burst Pressure	P	450	bars

SCU Ratings	Symbol	Value	Unit
Maximum Supply Voltage	V _{cc}	+32	V _{dc}
Input Current @ 24 Vdc (In rush)	I _{in rush}	< 400	mA
Input current @5-32 Vdc	I _{max}	170	mA
Storage Temperature*	T _s	-50 to +105	°C
Vibration Operating Limit	V _{vol}	45	Grms
Shock (Peak)	S _{peak}	10	G

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

TYPICAL RATINGS

Probe Ratings	Symbol	Min	Typ	Max	Unit
Ambient Operating Temperature**	T _a	-40		+125	°C
Operating Pressure	P	0		25	Bar
Fluid Temperature	T _f	-40		+150	°C

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SCU Ratings	Symbol	Min	Typ	Max	Unit
Ambient Operating Temperature**	T _a	-40		+85	°C
Supply Voltage	V _{supply}	5	+12/24	+32	V _{dc}
Input Current @ 5-32 Vdc	I _{avg}		100		mA

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

METROLOGICAL CHARACTERISTICS

Multi-Parametric Measurement Ranges	Symbol	Min	Typ	Max	Unit
Viscosity (dynamic)	μ	0.5	15.0	75*	mPa-s (cP)
Viscosity (dynamic) Accuracy for viscosity 10 <μ< 50 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
Temperature	T	-40		150	°C
Temperature Accuracy	T		0.1		°C
Acquisition Characteristics	Symbol	Min	Typ	Max	Unit
Output Refresh Rate	t		30		Second

*Although not warranted, viscosities up to 75 cP may be measured depending on the application of the FPA

TRANSMISSION SIGNALS

SIGNAL OUTPUT

Standard: RS-232 and CAN.

RS-485 is available as an option.

USB is also possible using a converter interface. Converters interfaces are available as options.

HOST PC APPLICATION OUTPUT

FPA may operate in stand-alone configuration that does not require a PC or DCS. Under these circumstances the FPA data logging mode offers data acquisition and storage over extended periods of time.

PC or Host interface is required only for data log retrieval. PC Application Software allows users to download data logging record in a text file or directly record data in a text file if the datalog is in disabled mode.

Otherwise recorded data are only retrievable using Modbus 32 protocol with RS-232 or RS-485 outputs. Bus Transceiver Signal & Data Communication Specifications are described in the “Modbus Register Map and Commands FPA” document.

The datalog works even when the PC is shutdown and therefore insures secure data recording.

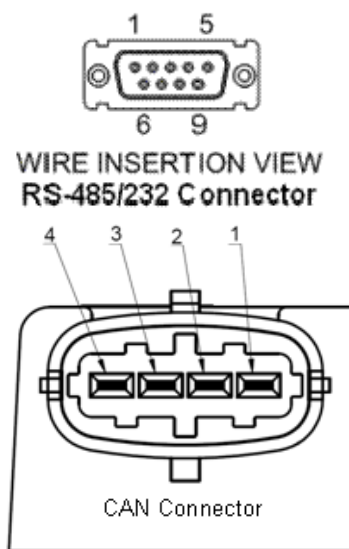
DATA PROCESSING AUTODIAGNOSTIC

The FPA Sensor Control Unit (SCU) is equipped with 4 green LEDs indicating measurement process status. This enables visual control of correct data processing.

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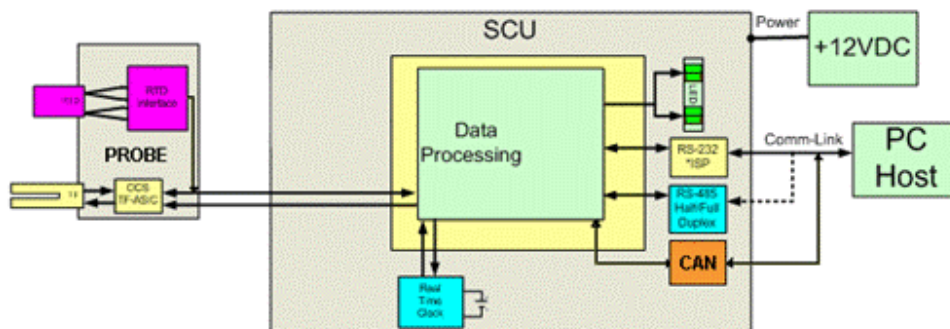
PIN OUT ASSIGNMENT (subject to further confirmation)



Pin	RS-232 Description	RS-485 Description
1	n/c	Tx-
2	TxD	Tx+
3	RxD	Rx+
4	n/c	Rx-
5	GND	GND
6	n/c	n/c
7	n/c	n/c
8	n/c	n/c
9	n/c	n/c

Pin	CAN Description
1	CAN_L
2	CAN_H
3	GND
4	Vcc

BLOCK DIAGRAM



FPA block diagram

MECHANICAL CHARACTERISTICS & CONNECTING

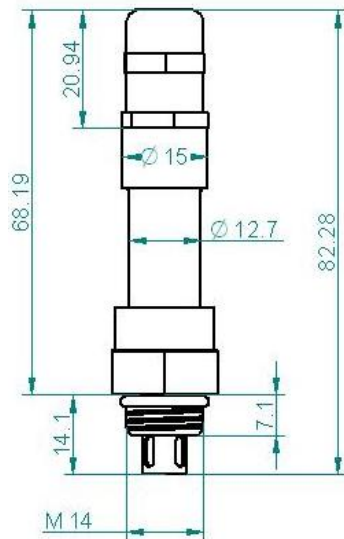
The FPA comprises a sensing probe, a Sensor Control Unit (SCU) and 4 connecting cables. The standard configuration comes with 2m cables for easy installation. Optional cable length of 8m is available for RS-232, RS-485, RS-232/USB and RS-485/USB.

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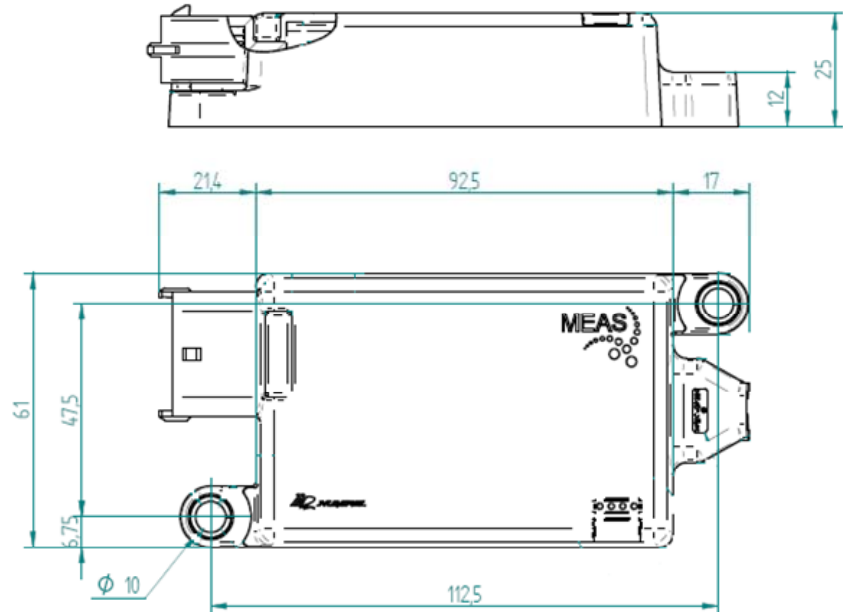
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FPA DIMENSIONS (All dimensions are in millimeters)

Probe (with M14x1.5 screw)



Sensor Control Unit



MECHANICAL INTERFACE/ MOUNTING LOCATION

Standard sensor thread type is M14x1.5. Optional thread type is 3/8" NPT.

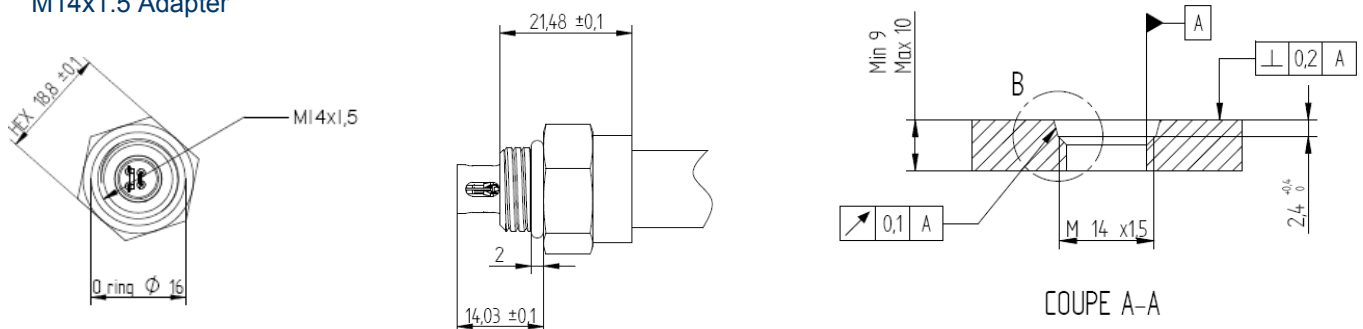
O-ring is provided.

The instrument is also provided with an elastomeric protective cap that protects the sensing elements from any damages during transportation and handling. The cap must be removed prior to installation of the sensor into the fluid media. The cap should be replaced over the sensor once removed from the fluid media to protect the sensing elements.

Sensor is designed for installation and operation in ambient to high pressure mounting locations including low to high flow fluid streams. Sensor may be mounted and operated in any orientation. Refer to the FPA Installation Guide for more details.

The threaded adapters comply with the following drawings. Please contact the factory for more details.

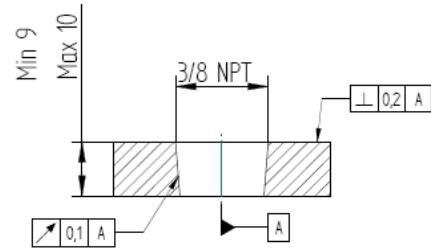
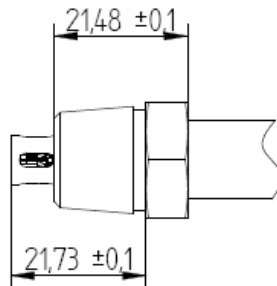
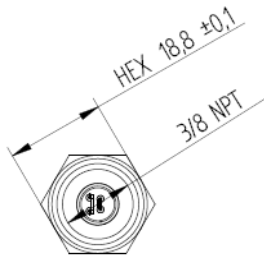
M14x1.5 Adapter



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3/8" NPT Adapter



COUPE B-B

STANDARD CONFIGURATION & OPTIONS

Components	Standard Configuration Pack	Options Please Contact MEAS for Prices Associated to Options
PROBE		
Probe Cable length (Probe to SCU)	2m	N/A
Thread Type	M14 x 1.5 or 3/8"NPT	N/A
SENSOR CONTROL UNIT		
RS-232 Cable length (SCU to Computer)	2m	8m additional
CAN Cable length (SCU to CAN node)	2m	N/A
Power supply cable length (SCU to Power)	2m	N/A
Communication Protocols	CAN & RS-232	RS232 & CAN + RS232-USB adapter
	CAN & RS-485	RS485 & CAN + RS485 -USB adapter
Power supply	12 Vdc	110Vac/12Vdc Transformer (US)
		220Vac/12Vdc Transformer (EU)
FPA DOCUMENTS & SOFTWARE*		
Documents included in pack	FPA Data Sheet	N/A
	FPA Installation Guide	N/A
	FPA Presentation	N/A
	Application Note Hydraulic Fluid	N/A
	FPA White Paper	N/A
	MEAS Corporate Brochure	N/A
	Communication Guidelines	N/A
FPA Modbus Protocol		
FPA Studio Software & Manual	Compatible with Windows 2000, XP, Vista **	N/A
SERVICES		
Warranty	1 year	2 years extended warranty (to be ordered on purchase)
Standard Calibration	Medium Viscosity (18 cP @100°C)	N/A
Specific Calibration	N/A	On customer request
Periodic Check	N/A	On customer request

* documents are electronically provided on a delivered USB key

** following configurations are compatible : XP(SP1/2/3), Vista (no SP / SP1/2), not compatible with any 64bits versions

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RESISTANCE TO PHYSICAL AND CHEMICAL STRESSES

- The FPA2400BST contains circuits to protect its inputs and outputs against Electrostatic discharges (ESD) up to $\pm 15\text{kV}$, air discharge
- The FPA2400BST is protected against reverse polarity
- The FPA2400BST is cross wire protected
- The FPA2400BST's wetted sensing parts are protected with a proprietary coating that is resistant to harsh chemical conditions demonstrate good probe operation in presence of 5% nitric acid, soot, fuel, water, oxidized oil, a non-exhaustive list

NOTE: This FPA 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.

ORDERING INFORMATION

Please refer to the following code to order the FPA2400BST with the desired configuration:

	Thread Type	Communication Protocols	Cable Length	Power Supply	Warranty	Calibration
Standard configuration FPP801F100	S = M14 x 1.5 or O = 3/8"NPT	2 = RS232 & CAN	2 = 2m	O = 12V	1 = 1 year	M = Medium Viscosity std
		3 = RS232/USB & CAN 4 = RS485 & CAN 5 = RS485/USB & CAN	8 = 8m	U = 110/12 V transformer E = 220/12V transformer	2 = 2 years	S = specific calibration

Example:

Standard configuration : FPP801F100 S/022O1M

Optional configuration : FPP801F100 S32E1S

Reference to this ordering code, the following elements will be provided with the ordered FPA sensor:

Option type	Option name	Option description	Option part number
Communication protocols	3 = RS232/USB & CAN	DONGLE RS232 USB	FPPRS232USB
	4 = RS485 & CAN	No added elements to be delivered (internal option)	
	5 = RS485/USB & CAN	DONGLE RS485 USB	FPPRS485USB
Cable length	8 = 8m	CABLE W2A PROLONGATEUR RS 8M	HPP130W2A1
Power Supply	U = 110/12 V transformer	FPA POWER SUPPLY US	FPPPOWERUS
	E = 220/12V transformer	FPA POWER SUPPLY EU	FPPPOWEREU
Warranty	2 = 2 years	WARRANTY 2 YEARS	FPPWARR2Y
Calibration	S = specific calibration	No added elements to be delivered (internal option)	

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