

**Annexe to: I ECEX SIR 09.0020X Issue 8**

**Applicant: ADS Environmental Services**

**Apparatus: Flowshark Triton (Model Number 8000-FST)  
or Flowhawk (Model Number 8000-FHK)**



The **8000-FHK/ FST Monitor System**, also known as the ADS Flowshark Triton (Model Number 8000-FST) or Flowhawk (Model Number 8000-FHK), is a self-contained device that measures/logs depth and velocity in sewer pipes and open channels. The 8000-FHK/FST Monitor System comprises various, intrinsically safe devices that are individually marked as detailed below:

Device	Reference	Assembly No.	Coding
Monitor Assembly	8000-FHK/FST	8000-0009-CERT	Ex ia IIB T4 Ga
Combo Sensors	Combo sensor 1 (plastic ABS enclosure)	8000-0001-CERT	Ex ia IIB T4 Ga
	Combo sensor 2 (plastic ABS enclosure)		
	Combo sensor 3 (aluminium enclosure)	8000-0003-CERT	Ex ia IIB T4 Ga
	Combo sensor 4 (plastic ABS enclosure)	8000-0004-CERT	Ex ia IIB T4 Ga
		8000-0226-CERT	Ex ia IIB T4 Ga
	Combo sensor 5 (plastic ABS enclosure)	8000-0195-CERT	Ex ia IIB T4 Ga
Modems & Interfaces	PSTN Modem assembly	8000-0053-CERT	Ex ia IIB T4 Ga
	Modem DAA	8000-0158-CERT	[Ex ia] IIB (Ga)
	Direct Connect Interface	8000-0054-CERT	[Ex ia] IIB (Ga)

The Monitor Assembly uses an enclosure that provides a degree of protection not less than IP20 and is made from a plastic cylinder, 28% Polypropylene GP220FA, 12% Fiberglass and 60% Polypropylene J440, with a metallic end cap, 6061-T6 aluminium, all thread forms are compatible with the alloy used. There are three sockets for connection to sensors and a communication module, these sockets are arranged with either a different number of pins or are keyed so as to avoid the possibility of making a wrong interconnection. The enclosure contains no terminals or compartments and is isolated from the internal circuits so that no connection facilities for earthing or bonding conductors are supplied.

The Combo Sensors are externally connected to the Monitor Assembly and the sensor cable can be extended up to 300 ft (91 m). The sensors comprise a processor/signal conditioning board and piezoelectric transducers and are fully potted. In this application, the construction of "CS1" and "CS2" are identical except for the frequency of operation of the crystals - one operates at 1 MHz and the other at 250 kHz.

The Direct Connect Interface is used to transfer data from the 8000-FHK/FST Monitor System located in the hazardous area to a Personal Computer in the non-hazardous area. It comprises a single PCB fully encapsulated inside a rectangular, plastic box with Emerson-Cummings type 2651MM epoxy resin. The PSTN Modem is intended to communicate with a landline "Public Switched Telephone Network (PSTN)" and is used with the DAA Modem.

One of the following devices can be connected the Monitor Assembly using the Communications Connector "COMM":

- a Direct Connect Interface
- a PSTN Modem together with a DAA Modem
- a GSM Modem Assembly, this is a separately certified device, see details below:

Assembly No	Coding	Certificate No.
8000-0052-CERT	Ex ia IIB T4 Ga	Sira 09ATEX2053X

- an External Modem Unit, this is a separately certified device, see details below; since this Unit provides external power, the internal battery pack is not fitted:

Assembly No	Coding	Certificate No.
106124-CERT	[Ex ia] IIB	Sira 03ATEX2482

### Channel 1 and Channel 2 Connector

Up to 300 ft (90 m) of cable that is an integral part of the sensors can be connected to these connectors.

### Communications Connector

COMM Connector, Pins A to C, E, G to J Wrt K (Output Signals)
$U_o = 7.14 \text{ V}$ $I_o = 3.082 \text{ A}$ $P_o = 1.26 \text{ W}$ $C_i = 156.5 \mu\text{F}$ $L_i = 13.08 \mu\text{H}$ $C_o = 1 \mu\text{F}$ The $L_o$ and $L_o/R_o$ is not specified, however the external cable shall comply with the following: A minimum resistance of $0.0238 \Omega/\text{ft}$ ( $0.0072 \Omega/\text{m}$ ) A maximum inductance of $0.5 \mu\text{H}/\text{ft}$ ( $0.15 \mu\text{H}/\text{m}$ ) A maximum length of 300 ft (90 m)
COMM Connector, Pins D, K (Output Supply), With Internal Battery Used
$U_o = 13.2\text{V}$ $I_o = 3.333 \text{ A}$ $P_o = 7.34\text{W}$ $C_i = 0$ $L_i = 0$
COMM Connector, Pins D, K (Input Supply), With External Power Used
$U_i = 10.5 \text{ V}$ $I_i = 3.28 \text{ A}$ $P_i = 5.36 \text{ W}$ $C_i = 0$ $L_i = 0$
COMM Connector Pin F Wrt, K (Gnd)
$U_m = 250 \text{ V}$
Terminal Block P2 (Input Supply)
$U_m = 250 \text{ V}$

**Date: 12 December 2012**

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## Sira Certification Service

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**Annexe to: I ECEX SIR 09.0020X Issue 8**

**Applicant: ADS Environmental Services**

**Apparatus: Flowshark Triton (Model Number 8000-FST)  
or Flowhawk (Model Number 8000-FHK)**



The **8000-FHK/ FST-60C Monitor System**, also known as the ADS Flowshark Triton (Model Number 8000-FST-60C) or Flowhawk (Model Number 8000-FHK-60C), is a self-contained device that measures/logs depth and velocity in sewer pipes and open channels. The 8000-FHK/FST-60C Monitor System comprises various, intrinsically safe devices that are individually marked as detailed below:

Device	Reference	Assembly No.	Coding
Monitor Assembly	8000-FHK/FST-60C	8000-0009-CERT	Ex ia IIB T3 (152°C) Ga
Combo Sensors	Combo sensor 1 (plastic ABS enclosure)	8000-0001-CERT	Ex ia IIB T3 (152°C) Ga
	Combo sensor 2 (plastic ABS enclosure)		
	Combo sensor 3 (aluminium enclosure)	8000-0003-CERT	Ex ia IIB T3 (152°C) Ga
	Combo sensor 4 (plastic ABS enclosure)	8000-0004-CERT	Ex ia IIB T3 (152°C) Ga
		8000-0226-CERT	Ex ia IIB T3 (152°C) Ga
	Combo sensor 5 (plastic ABS enclosure)	8000-0195-CERT	Ex ia IIB T3 (152°C) Ga
Modems & interfaces	Direct Connect Interface	8000-0054-CERT	[Ex ia] IIB (Ga)

The Monitor Assembly uses an enclosure that provides a degree of protection not less than IP20 and is made from a plastic cylinder, 28% Polypropylene GP220FA, 12% Fiberglass and 60% Polypropylene J440, with a metallic end cap, 6061-T6 aluminium, all thread forms are compatible with the alloy used. There are three sockets for connection to sensors and a communication module, these sockets are arranged with either a different number of pins or are keyed so as to avoid the possibility of making a wrong interconnection. The enclosure contains no terminals or compartments and is isolated from the internal circuits so that no connection facilities for earthing or bonding conductors are supplied.

The Combo Sensors are externally connected to the Monitor Assembly and the sensor cable can be extended up to 300 ft (91 m). The sensors comprise a processor/signal conditioning board and piezoelectric transducers and are fully potted. In this application, the construction of "CS1" and "CS2" are identical except for the frequency of operation of the crystals - one operates at 1 MHz and the other at 250 kHz.

The Direct Connect Interface is used to transfer data from the 8000-FHK/FST-60C Monitor System located in the hazardous area to a Personal Computer in the non-hazardous area. It comprises a single PCB fully encapsulated inside a rectangular, plastic box with Emerson-Cummings type 2651MM epoxy resin.

One of the following devices can be connected the Monitor Assembly using the Communications Connector "COMM":

- a Direct Connect Interface
- a GSM Modem Assembly, this is a separately certified device, see details below:

Assembly No	Coding	Certificate No.
8000-0052-CERT	Ex ia IIB T3 (152°C) Ga	Sira 09ATEX2053X

- an External Modem Unit; this is a separately certified device and is not part of this certificate, see details below. Since this Unit provides external power, the internal battery pack is not fitted:

Assembly No	Coding	Certificate No.
106124-CERT	[Ex ia] IIB	Sira 03ATEX2482

#### Channel 1 and Channel 2 Connector

Up to 300 ft (90 m) of cable that is an integral part of the sensors can be connected to these connectors.

#### Communications Connector

COMM Connector, Pins A to C, E, G to J Wrt K (Output Signals)					
$U_o = 6.30\text{ V}$	$I_o = 3.049\text{ A}$	$P_o = 1.19\text{ W}$	$C_i = 156.5\text{ }\mu\text{F}$	$L_i = 13.08\text{ }\mu\text{H}$	$C_o = 1\text{ }\mu\text{F}$
The $L_o$ and $L_o/R_o$ is not specified, however the external cable shall comply with the following: A minimum resistance of $0.0238\text{ }\Omega/\text{ft}$ ( $0.0072\text{ }\Omega/\text{m}$ ) A maximum inductance of $0.5\text{ }\mu\text{H}/\text{ft}$ ( $0.15\text{ }\mu\text{H}/\text{m}$ ) A maximum length of 300 ft (90 m)					
COMM Connector, Pins D, K (Output Supply), With Internal Battery Used					
$U_o = 13.2\text{ V}$	$I_o = 3.333\text{ A}$	$P_o = 7.34\text{ W}$	$C_i = 0$	$L_i = 0$	
COMM Connector, Pins D, K (Input Supply), With External Power Used					
$U_i = 10.5\text{ V}$	$I_i = 3.28\text{ A}$	$P_i = 5.36\text{ W}$	$C_i = 0$	$L_i = 0$	
COMM Connector Pin F Wrt, K (Gnd)					
$U_m = 250\text{ V}$					
Terminal Block P2 (Input Supply)					
$U_m = 250\text{ V}$					

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**Condition of Manufacture**

1. The insulation of the IS Modem DAA shall be routinely tested as follows and in accordance with clauses 6.3.12 and 10.3 of IEC 60079-11:2006. There shall be no breakdown or flashover:
  - Subject the insulation between the frame and the output circuits to either 500 V rms or 700 V dc for 1 minute or either value increased by a factor of 1.2 for 1 second.
  - Subject the insulation between the input circuit and the output circuit to either 1500 V rms or 2100 V dc for 1min or either value increased by a factor of 1.2 for 1 second.

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**DETAILS OF CERTIFICATE CHANGES (for issues 1 and above):**

<b>Issue 1 – this Issue introduced the following change:</b>	
1.	The following Boards were modified as detailed below, consequently the Bill of Materials and artwork was changed: <b>Processor Board:</b> Addition of U27, U31, R116, R117, R118, R119, R125, R126 and Q2 Addition of safety components R120, R122, R123, R124 Addition of H1, H2, headers and J3 to J7 connectors for the purposes of servicing R16 changed from 499 k $\Omega$ to 47.5 k $\Omega$ , R114 and R115 changed from 4.99 k $\Omega$ to 4.7 k $\Omega$ <b>Regulator Board:</b> Addition of R4, R21, R27, R28, C25 and C26 Change resistors R22 and R23 from 10 $\Omega$ to 1 $\Omega$ Change R19 from 100 k $\Omega$ to 210 k $\Omega$ Change capacitors C6 and C17 from 4.7 $\mu$ F to 47 $\mu$ F Change capacitors C10 and C22 from 6.8 nF to 22 nF Change capacitors C8 and C21 from 2.2 nF to 0.1 $\mu$ F Change fuse F2 from 100 mA to 125 mA (The change of fuse has increased the value of Po at the Communications Connector from 0.889 W to 1.187 W, the description being modified accordingly). <b>CS1/ CS2 Sensor Board:</b> Addition of resistors R11 and R12 Change the tolerance of resistors R7 to R10 and R17 to R19 from 1% to 0.1% <b>CS3 Sensor Board:</b> Addition of resistors R11 and R12 Change the tolerance of resistors R7 to R10 and R17 to R19 from 1% to 0.1% Addition of capacitor C34
<b>Issue 2 – this Issue introduced the following changes:</b>	
1.	The value of fuse F2 was changed from 125 mA to 140 mA (The change of fuse has increased the value of Po at the Communications Connector from 1.187 W to 1.26 W, the description being modified accordingly).
2.	The part numbers and values of zener diodes D4 and D8 were changed from 1N5338B, 5.1 V 5% to 1N5338C, 5.1 V 1% or 1N5338B or 1N5338D measured at 1%.
3.	The addition of previously omitted capacitor voltage ratings and tolerances.
<b>Issue 3 - this Issue introduced the following changes:</b>	
1.	Introduction of a new 12 V IS battery pack.
2.	Introduction of a external power option (106124 Communication Interface).
3.	Piezo crystal types to be specified on certification drawings instead of by manufactures name and type number.
4.	Deletion of part number 507784 (1MHz crystal) from drawings 8000-0001 rev A1 and 8000-0003 rev A1.
5.	Changing CS1 and CS3 sensor boards, R7 from 316 $\Omega$ 0.1 W to 340 $\Omega$ 62.5 mW. Addition of C35,C36,C37, C38, 0.22 $\mu$ F 10% to the CS3 sensor board.
6.	Changing Regulator board zener diodes D29, D30 from 5.1 V, 5% to 6.8 V, 5%.
7.	Coating of an area around Processor board, J1 pin 8 and J2 pin D.
8.	Addition of R127 to the Processor board and changing R110 1.54 k $\Omega$ to 2.2 k $\Omega$ .
9.	Changing the certification label to list the new battery pack.
10.	Modification of the description to reflect the changes to the communications connector "COMM".
<b>Issue 4 – this Issue introduced the following changes:</b>	
1.	To recognise the introduction of a new battery pack assembly type 8000CA0043-CERT.
2.	To allow the introduction of a new piezo crystal type for the CS1/CS2 sensor.
3.	The conditions of Manufacture are amended as a result of this variation.
<b>Issue 5 – this Issue introduced the following changes:</b>	
1.	To recognise a new combo sensor model series CS4.
2.	To allow the introduction of a new modem model type IS PSTN, for communication with a landline "Public Switched Telephone Network (PSTN).
3.	The addition of an IS Modem DAA for connection of the IS PSTN modem to the telephone network.
4.	The authorisation of corrections to the COMM Connector output signal pin designations in the input/output parameters.
5.	To endorse minor changes to the circuit, production procedures & assembly construction.
6.	Report GB/SIR/ExTR09.0204/00 was replaced by GB/SIR/ExTR09.0204/01.
7.	Report GB/SIR/ExTR10.0054/00 was replaced by GB/SIR/ExTR10.0054/01.
<b>Issue 6 – this Issue introduced the following changes:</b>	
1.	The use of component approved fuses in the regulator board was endorsed, these fuses, which have been moved outside of the encapsulation and are mounted in pluggable fuse holders, are IS Fusion types, ISF021/T/315, ISF021U/T/140 and ISF021/T/100, certified IECEx SIR 07.0050U.
2.	The regulator board was allowed to be produced in two builds, one is a new design and one retrofits the existing PCB design.
3.	The manufacturer's name and address was changed, From: ADS Environmental Services, 4940 Research Drive, Huntsville, Alabama 35805, USA To: ADS LLC, 1300 Meridian Street, Suite 3000, Huntsville, Alabama 35801, USA

Date: 12 December 2012

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Issue 7 – this Issue introduced the following changes:	
1.	The introduction of Assembly No. 8000-0226-CERT, this is a re-designed 8K-CS4 Combo sensor, the enclosure and electrical circuits being modified to support a pressure sensor element.
2.	The introduction of a new 8K-CS5 Combo sensor; this is a slim version of the 8K-CS3 sensor with a modified electrical circuit.
3.	The label drawing for the battery introduced at Issue 4 was recognised.
4.	The description was modified to clarify the products covered including the new models.
Issue 8 – this Issue introduced the following changes:	
1.	The recognition of drawing number 8000-0050-CERT rev A1.
2.	The introduction of a new model identified as 8000-FHK/FST-60C (fully described in the Description above); the introduction of the 8000-FHK/FST-60C requires the following changes <ul style="list-style-type: none"><li>* The maximum ambient temperature the Monitor, Combo sensors and Direct Connect Interface was raised to +60°C.</li><li>* A new temperature class, T3 (152°C), is applicable for the Monitor and Combo sensors.</li><li>* Several drawings have been modified, including “Bill of Materials”, schematic and the general assembly. The Bill of Materials and labels have been issued as new drawings to reflect a different model number.</li><li>* The entity parameters were revised.</li><li>* The Public Switched Telephone Network (PSTN) and DAA Modem are not listed as modems and interfaces that are suitable for use with the 8000-FHK/FST-60C.</li><li>* The voltage of zener diodes was reduced as detailed below:<ul style="list-style-type: none"><li>* D13 and D16 from 6.8 V to 6.0 V.</li><li>* D29 and D30 from 6.8 V to 6.0 V.</li><li>* D9 and D10 from 5.1 V to 4.7 V.</li></ul></li></ul>