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REPORT

on

Intrinsically Safe Equipment and Systems for Use in Hazardous Locations

Under the

CLASSIFICATION PROGRAM

Bristol Babcock Inc
Watertown, CT 06795 USA

DESCRIPTION

PRODUCT COVERED:

USC – Process flow meter, Controlwave Express, Models CWM-GFC-1 followed by –000 through –999, followed by -1 through -5, followed by –2 through -6, followed by –0 or -1, followed by –1 **or -2**, followed by 0 through 3, followed by –1, -4, or -5, followed by –0 through -3, followed by –0 through -3, followed by –0 through -2, followed by –0 or -1, followed by –0 or –1 **or -2**, followed by –0, -1, or -2, followed by –0 through -3, followed by 0 through 9 intrinsically safe for use in Class I, Division 1, Group C and D hazardous locations when installed per Control Drawing No. 400135-00-0.

GENERAL:

The Controlwave Express is a permanently installed process flow meter powered by the following devices as described in the nomenclature: Battery, Solar Panel, Bristol Babcock ISTRAN. This device is intended for use in Class I, Division 1, Groups C and D hazardous locations and has been evaluated for a T4 temperature code in a maximum ambient temperature of +70°C. Additionally, the Controlwave Express also contains a single backup coin-cell battery. The Controlwave Express provides intrinsically safe connections through the field I/O board, and is able to communicate information through the ISTRAN.

The device is to be used only with the following batteries:

Main battery (Optional) – Part Number 396924-01-8 manufactured by Bristol Babcock.

Backup Battery – Model BR2330 manufactured by Panasonic.

TECHNICAL CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):

USC indicates investigation to United States Standard UL 913, Fifth Edition.

The device is Classified only as to intrinsic safety, and is intended for use in an ambient temperature range of –40°C ≤ Tamb ≤ +70°C.

NOMENCLATURE:

For model nomenclature please see ILL. 47.

INSTALLATION INSTRUCTIONS:

Each device is provided with a copy of Control Drawing No. 400135-00-0, as shown in ILL.**2**.

MARKING:

The device is provided with the markings described in ILL. 1 on a metal label.

CONSTRUCTION DETAILS:

General – The device is constructed in accordance with the following figures, illustrations and descriptive pages. Dimensions are approximate unless specifically indicated otherwise.

Spacings – Where affecting intrinsic safety, spacings have been evaluated and found to be in accordance with Table 8.1 in UL 913, Fifth Edition.

Circuit Boards – Unless otherwise indicated, circuit boards are R/C (ZPMV2) Printed Wiring Material manufactured by one of the manufacturers listed in the R/C Directory. Soldering times and temperatures must not exceed those specified.

Conformal Coating - Where indicated, circuit boards are provided with R/C (QMJU2) coating applied per the manufacturer’s instructions, having a minimum CTI value of 90.

Internal Wiring - Unless otherwise indicated, all internal wiring is R/C (AVLV2) with minimum insulation thickness of 0.5mm.

DOCUMENTATION:

The device is constructed in accordance with the following drawings:

Fig. No.	ILL. No.	Drawing No.	Rev.	Date	Title
1		-	-		Controlwave Express with enclosure open and no partition installed.
2		-	-		RTD Probe, 6ft cable
3		-	-		Battery pack
	1	396831-07-9	E	-	Dataplate, UL Listed, I.S.
	2	400135-00-0	**K**	**2009-08-20**	CW Express IS Remote Term Panel Entity Parameters
		Pressure			
	3	396531-02-4	C	2005-09-13	Bill of Materials for Transducer Assy, with A/D Module 150"/2000 PSI, Cres Non-Vented
	3A	396531-01-6	D	2005-09-13	Bill of Materials for Transducer Assy, with A/D Module 150"/150 PSA, Cres/Non-Vented
	4	396531-03-2	C	2005-09-13	Bill of Materials for Transducer Assy, with A/D Module 150"/150 PSA, Cres/Non-Vented
	5	396531-04-0	C	2005-09-13	Bill of Materials for Transducer Assy, with A/D Module 100"2000 PSA, Cres/Non-Vented
	6	396531-05-9	D	2005-09-13	Bill of Materials Pressure Transducer Assy, with A/D Module 300"/1000 PSI, Cres/Non-Vented
	7	396531-06-7	D	2005-09-13	Bill of Materials Pressure Transducer Assy, with A/D Module 300"/2000 PSI, Cres/Non-Vented
	8	396531-07-5	C	2005-09-13	Pressure Transducer Assy, with A/D Module 25 PSI/2000 PSI, Cres/Non-
	9	396531-09-1	C	2004-12-08	Pressure Transducer Assy, with A/D Module 25 PSI/4000 PSI, Cres/Non-
	10	621549-03-7	B	2006-04-26	Sensor Mounting & Cable ControlWave-Micro flow GFC-2 GFCP
	11	396664-01-6	E	2006-02-06	Plate, Radio Mounting/Modem Mounting
	12	621571-14-8	C	2009-03-26	Basic Parts, 2 buttom option, CWM-GFC-T4
	13	621571-16-4	C	2009-03-26	Basic Parts, 2 button option, CWM-GFC-TC Corrector

14	621571-15-6	C	2009-03-26	Basic parts, 25 button option, CWM-GFC-T4
15	621571-17-2	C	2009-03-26	Basic parts, 25 button option, CWM-GFC-TC Corrector
16	396865-02-0	A	2006-11-28	Bill of Materials Pressure Transducer Assy, with A/D Module Female NPT 300" WC, Cres/DC200
17	396865-04-6	A	2006-11-28	Bill of Materials Pressure Transducer Assy, with A/D Module Female NPT 25 PSIG, Cres/DC200
18	396865-06-2	A	2006-11-28	Bill of Materals Pressure Transducer Assy, with A/D Module Femaile NPT 100 PSIG, Cres/DC200
19	396865-07-0	A	2006-11-28	Bill of Materials Pressure Transducer Assy, with A/D Module Female NPT 300 PSIG, Cres/DC200
20	396865-09-7	A	2006-11-28	Bill of Materials Pressure Transducer Assy, with A/D Module Female NPT 1000 PSIS, Cres/DC200
21	396865-12-7	A	2006-11-28	Bill of Materials Pressure Transducer Assy, with A/D Module Female NPT 2000 PSIS, Cres/DC200
22	621549-07-0	B	2007-05-14	Bill of Materials Sensor Mounting & Cable ControWave-Micro GFC-TC Female PT mounting parts
	Display			
23	400143-75-5	A	2008-04-16	PCB Assembly, Display
24	400143-01-1	A	2008-03-14	Bill of Materials, Display
24A	**400143-01-1**	**B**	**2009-08-18**	**Bill of Materials, Display (Alternate)**
25	400143-00-3	A	2008-03-14	CWM Display Board, IS Version
	Termination Panel			
26	400135-75-2	B	2008-05-13	CW Express GFC IS Termination Panel
26A	**400135-01-9**	**D**	**2009-08-18**	**Bill of Materials, CW Express GFC IS Termination Panel**
27	400135-50-7	3	2008-04-28	CW Express IS Remote Termination Panel, Artwork
28	400135-50-7	3	-	CW Express GFC IS Remote Term Panel, Fab
	RTD			
29	392610-00-0	G	2008-06-05	RTD Sensor, Bendable
	Battery			
30	400144-75-1	A	2003-06-17	PCB Assembly, Analog I/O
31	400144-01-8	B	2009-03-11	Bill of Material CW IS Battery Protection

32	621581-02-0	B	2008-04-16	Bill of Material, Battery Kit
33	396924-01	A	2008-04-17	Bill of Materials, Battery Assembly
34	400144-50-6	0	2008-03-18	CW Express Battery IS Protection, Artwork
35	400144-50-6	0	2008-03-18	CW Express Battery IS Protection, Fab
36	400144-00-0	B	2009-03-27	CW Express Battery IS Protection, Schematic
	Process I/O Board			
37	400093-75-8	D	-	CW Express Process I/O, PCB Assembly
38	400093-04-9	E	2008-08-18	Bill of Material CW Express Process I/O Digital Input Output
38A	400093073C	A	-	Bill of Material CW Express Process I/O Digital Analog Input
38B	**400093-04-9**	**F**	**2009-08-18**	**Bill of Material CW Express Process I/O Digital Input Output (Alternate)**
38C	**400093073C**	**B**	**2008-04-07**	**Bill of Material CW Express Process I/O Digital Analog Input (Alternate)**
39	400093-50-2	2	-	CW Express Process I/O, PCB Artwork
40	400093-50-2	2	2007-10-24	CW Express Process I/O, PCB Fab.
41	400093-00-6	A	2008-04-07	CW Express Process I/L, Schematic
	Processor Selection (CPU Board)			
42	400159015C	C	2009-03-10	Bill of Material, GFC CPU, CW Micro Express 6V IS
42A	**400159015C**	**G**	**2009-08-18**	**Bill of Material, GFC CPU, CW Micro Express 6V IS**
42B	**400159023C**	**B**	**2009-08-18**	**Bill of Material, GFC CPU, CW Micro Express, 6V IS, W/RS-485, W/10KHZ PULSE IN**
43	400159-50-3	1	-	CPU Board Artwork
44	400159-00-7	**C**	**2009-07-09**	CW Micro GFC, Schematic
	Telecounter			
45	400001-75-6	B	2002-02-02	PCB Assembly, Teleflow Corrector Pulser
46	396829-00-7	**P**	**2009-08-20**	Model Nomenclature
47	396986-02-1	2	2009-03-09	Non-Metallic Partition

Overall Assembly Controlwave Express
Figure 1

General – Shown is the Controlwave Express with optional batteries, but does not show the plastic partition. This represents all models of the Controlwave Express. The Controlwave Express contains three printed wiring boards and may contain a battery. All internal wiring is secured as shown.

Enclosure – Plastic, with overall dimensions of 11 in. by 8 in. by 7 in. The enclosure is hinged and secures with two clips on the side of the case.

Plastic Partitions – One provided, which isolates the CPU and I/O boards from the wiring connected to the Field Wiring Board. This partition has a thickness of 1.2mm and is made of Kapton. See ILL. 47 for a drawing of the partition.

Field Wiring Board – One provided, with approximate overall dimensions of 178mm by 122mm by 1.5mm. See ILLS. **26, 26A, 27 and** 28 for complete details.

CPU Circuit Board - One provided, with approximate overall dimensions of 101mm by 241mm by 1.6mm thick. See ILLS. 42 through 44 for schematic, bill of materials, and PCB Layout. **For alternate construction, refer to bill of materials, ILL. 42A.** Board is provided with conformal coating as described under “Construction Details.”

Backup Battery Cell (XS1) – R/C (BBCV2) 1 provided, Poly-carbonmonoflouride Lithium type, Model BR 2330 manufactured by Panasonic or Model BR2335 manufactured by Rayovac.

Fuse (F1) – R/C (JDXY2) Model OMT 125, rated 1.5A nominal with a breaking capacity of 100A at 125Vac/dc.

Fuse (F2) – R/C (JDXY2) Model MSF 250, rated 0.125A nominal with a breaking capacity of 35A at 250Vac/dc.

Protective Resistors - The following are protective current-limiting resistors. All are film or wire-wound type with designations and ratings as shown:

R108 – 1Kohms, 1%, 1/8W, 1206 package size
R114, 281 – 2Kohms, 1%, 1/8W, 1206 package size
R117 – 2ohms, 1%, 3W, Wirewound
R123, R131 – 15Kohms, 5%, 1/8W, 1206 package size
R126, R134 – 75Kohms, 5%, 1/8W, 1206 package size
R130 – 270ohms, 5%, 3/4W, 2010 package size
R264 – 680ohms, 5%, 1/4W, 1206 package size
R286 through R293 – 220ohms, 1%, 3/4W, 2010 package size

Zener Diodes - The following are protective zener diodes, rated and designated as follows:

U18 – 3.3V zener array, Model SMF3.3
U31, U32, U45 – 5V zener array, Model SMF05
* CR2 through CR7 – 6.2V, 1% **or 5%,** 3W
* CR18, 19, 44, 45, 48, 49, 52, 53, 60, 61, 62 – 8.2V, 1% **or 5%,** 3W

Blocking Diodes – The following are protective blocking diodes, rated and designated as follows:

CR21 through 29 – Model BAS70 manufactured by Vishay Semiconductors, rated 200mA and 70V.

I/O Circuit Board - One provided, with approximate overall dimensions of 114mm by 241mm by 1.6mm thick, see ILLS. 37 through 41 for schematic, bill of materials, and PCB Layout. **For alternate construction, refer to bill of materials, ILLS. 38B and 38C.** Board is provided with conformal coating as described under “Construction Details.”

Protective Resistors - The following are protective current-limiting resistors. All are film or wire-wound type with designations and ratings as shown:

R7, R8, R9, R10 – 1Kohm, 1%, 1/8W, 1206 package size
R11, R18, R25, R32, R204, R205, R214 – 47.5Kohms, 1%, 1/8W, 1206 package size
R14, R21, R28, R35, R42 – 150Kohms, 1%, 1/8W, 1206 package size
R68, R69, R120 – 100ohms, 5%, 1/2W, 2010 package size
R53 through R56, R58, R59, R125 through R128 – 1.5Kohms, 1%, 1/8W, 1206 package size
R39, R46, R70, R150, R153, R156 – 15Kohms, 5%, 1/8W, 1206 package size
R139, R149, R152, R155 – 75Kohms, 1%, 1/8W, 1206 package size

* Zener Diodes (CR88, CR89) – Rated 6.2V, 1% **or 5%,** 3W.

Diodes (CR5, CR6, CR7, CR18, CR43 through CR47, CR67, CR83) – Model BAS70, may be followed by additional letters, rated 70V standoff voltage, 200mA forward current.

Display Circuit Board - One provided, with approximate overall dimensions of 77mm by 100mm by 1.6mm thick. See ILLS. 23 through 25 for schematic, bill of materials, and PCB Layout. **For alternate construction, refer to bill of materials, ILL. 24A.** Board is provided with conformal coating as described under “Construction Details.”

Zener Diodes - The following are protective zener diodes, rated and designated as follows:

U11 – 3.3V Zener Array, Model SMF3.3
CR2 – 7.5V, 5%, rated 550mW
* CR4, CR5 – 8.2V, 1% **or 5%, 3W**

RTD Sensor Probe

Figure 2

General – Shown is the RTD Sensor Probe. The RTD Sensor probe is a resistive temperature sensor provided with three wires inside a flexible metal jacket. The RTD Sensor probe is a resistive device. See ILL. 29 for complete details.

Cable – The RTD Probe may be provided with a cable length of 6ft, 15ft, and 25ft. The cable is provided within a bendable metal shield that is bonded to the Controlwave chassis.

Battery Pack, Part No. 396924-01-8
Figure 3

General – Shown is an overall view of the optional battery pack. This battery pack contains several protective components and one circuit board. The battery is a Lead-Acid battery type.

Battery – R/C (BAZR2) One provided, Model PS-670 manufactured by Power Sonic.

* Fuse (F1) – R/C (JDYX2) Model OMT 125 **1.0A** manufactured by Schurter, rated **1.0A** nominal with a breaking capacity of 100A at 125Vac/dc.

Protective Resistors (R1, R2) – Two provided, rated 500mohm, 5%, 3W, Model RW3R0DBR500JE manufactured by Ohmite.

The RS-485 interface to the GFC is connected to RAS 3808 transmitter. (The UL file for this product is E192567 Vol.1 Sec. 4). See ILL. 2,42B and 44 for details.