

BCF19-700-8

19.2 kW Liquid Cooled On-Board Battery Charger



The Bel Power Solutions BCF19-700-8 is a 19.2 kW liquid-cooled on-board battery charger for hybrid (HEV) or full electric (EV) vehicles.

The BCF19-700-8, can be powered by standard EVSE charging stations directly from public grid in custom systems (Single Phase or Split-Phase 100 – 277 VAC) to charge the HV batteries. Any alternative power sources, such as generators, must be tested and qualified by a system integrator before use in the final application.

The output voltage covers a wide variety of HV batteries in the range from 450 VDC to 900 VDC with constant output current of 30 A.



FEATURES

- Typical full load efficiency 94 %
- AC input voltage range 90 – 305 VAC
- HV output voltage range 450 – 900 VDC
- Output power up to 18 kW
- Liquid cooled
- CAN bus serial interface
- Over temperature, output over voltage and over current protection
- SAE J1939 compliant CAN control and monitoring
- SAE J1455 compliant environmental standards
- IEC 61851-21-1 compliant immunity requirements
- IP rating IP67 & IP6K9K, Type 6
- Safety-approved to UL 2202 (Second Edition)

APPLICATIONS

- Hybrid and Electric Vehicles
- Medium through heavy duty, on & off highway vehicles

1. MODEL SELECTION

MODEL	DESCRIPTION
BCF19-700-8	Liquid cooled on-board battery charger
BCF19-CON-KIT	Connector Kit (AC, HV DC and signal connector with terminals; no cables)

2. AC INPUT

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Input Voltage	Nominal operating range	100	240	277	VAC
	Absolute operating range	90		305	
Input Current	Charge mode			80	Arms
Input Frequency		47	50/60	63	Hz
Input Power				19.2	kW
Leakage Current	at 305 VAC, 60 Hz		2.7	3.5	mA
Power Factor	$V_{AC_IN} = 120 V_{rms}$, PHV = 600 VDC * 14 ADC	0.95	0.99	1	
	$V_{AC_IN} = 240 V_{rms}$, PHV = 600 VDC * 30 ADC				
Inrush Current	NTC pre-charge $I_{INRUSH} \leq I_{ACNOM}$				
Efficiency	$V_{AC_IN} = 120 V_{rms}$, PHV = 600 VDC * 14 ADC	90	91.5		%
	$V_{AC_IN} = 240 V_{rms}$, PHV = 600 VDC * 30 ADC	93.5	94.5		

3. DC OUTPUT

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Output Power	$T_{coolant} \leq 60^{\circ}C$			18.0	kW
	$T_{coolant} = 75^{\circ}C$			12.6	
Output Type	DC current source with 100/120 Hz sine wave ripple component				
Output Voltage	Not regulated; depends on battery voltage	450		900	VDC
Output Current	Average output charging current adjustable via CAN Including AC ripple component (AC + DC)	0		30	ADC
		0		37	Arms
Ripple	100/120 Hz	0		22	Arms
Output Capacitance			40		μF
Inrush Current	Use external pre-charge resistor $\geq 25 \text{ Ohm}$				

4. PROTECTIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
AC Over Voltage Protection	$V_{HV_UVP} < 495 \text{ V}$, Hysteresis 5 Vrms			272	Vrms
	$V_{HV_UVP} \geq 495 \text{ V}$			315	
AC Under Voltage Protection	Turn On		88	90	Vrms
	Turn Off		83	85	
HV Over Current Protection	CAN adjustable	0		30	A
HV Over Voltage Protection	Latch type, CAN adjustable, max. OVP duration 1 ms	500	915	915	VDC
HV Under Voltage Protection	UVP duration 1 s, hysteresis 20 VDC	435	450	850	VDC
Input & Output Fuse Protection	AC input fuse: EVSE circuit breaker - Type D		100		Arms
	HV output fuse (900 VDC minimum)		50		Arms
	VAUX input shall be fused by external automotive fuse		7.5		A
Over Temperature Protection	Converter shutdown at $T_{coolant}$ higher than	75			$^{\circ}C$

5. MONITORING AND CONTROL SIGNALS

PARAMETER	DESCRIPTION / CONDITIONS
Wake Up	CAN communication enable Level High = Enable
Control Pilot	Function and levels according to SAE J1772 and IEC 61851
Proximity Detection	Function and levels according to SAE J1772 and IEC 61851
VAUX	12V/24V battery voltage input (typ. input current 12V/1 A, 24V/0.5 A; min 3 A power supply) Used to supply internal aux converter. Input protected against reverse connected battery by serial diode
Wake Out	High side switch to wake VCU (Vehicle Control Unit) and other vehicle control modules. Powered from VAUX
CAN BUS	CAN BUS SAE J1939 interface, 500 kbit/s
HVIL IN, HVIL OUT	Signals of high-voltage interlock loop
LED 1, LED 2	Constant current LED driver output, controlled over CAN bus
BUTTON A, BUTTON B	Inputs for external push-buttons, state is reported over CAN bus, can be used to control charger without CAN bus
LOCK, LOCK FEED	Control and monitoring signals of vehicle charge inlet type 2 locking actuator

6. ENVIRONMENTAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Operating Temperature	T_coolant at full load T_coolant at power derating	-40 -40		+60 +75	°C
Storage Temperature		-40		+80	°C
Altitude	SAE J1455, Operating Non-Operating: 18.6 kPa absolute pressure			4000 12200	m
Humidity	SAE J1455			95	%
Thermal Shock	SAE J1455, T_amb = -40°C to +85°C (no coolant cycling)				
Vibration	ISO 16750-3-2012 (Commercial vehicle, sprung masses)				
IP Rating	IP67 and IP6K9K per ISO 20653:2013 (IP2XB without mating connectors installed.) TYPE 6 according to UL50E, and CSA C22.2 Note: All mating connectors shall be installed, and all unused pins shall be sealed.				

7. COOLING SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS
Cooling Type	Liquid cooled
Inlet Coolant Temperature	-40°C / +75°C (70% derating above +60°C)
Coolant Medium / Mixture	50/50 ethylene glycol/distilled water with proper corrosion inhibitor
Coolant Volume In Cooling System	0.7 L
Minimum / Maximum Coolant Flow	7 – 12 LPM; max 15 LPM at 20% duty cycle for short-term operation
Maximum Coolant Pressure	29 psig (2 bar)
Typical Pressure Drop	3.0 psig (0.2 bar) at coolant temperature +20°C and 15 LPM
Inlet/Outlet Cooling System Connection	SCHAEFER 40061033X (assembled); Recommended mating fitting NORMAQUICK PS3 NW12 (not included)
Material Of Cooling System	Fittings: Aluminum alloy EN AW-6082-T6 Chassis: Aluminum alloy AlSi7Mg0,3 Bottom cover: Aluminium alloy 5052-H32

8. SAFETY, REGULATORY AND EMI SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	CLASS / LEVEL / CRITERION
Safety Standards	UL 2202 2nd Edition	
Radiated Emission	IEC 61851-21-1:2017	Table 8
Conducted Emission	IEC 61851-21-1:2017	Table 4
Emission of voltage changes, voltage fluctuations & flicker on AC power lines	IEC 61851-21-1:2017 (IEC 61000-3-11:2000 and IEC 61000-3-3:2013)	According to standard
Harmonic Input Current	IEC 61000-3-2:2014 and IEC 61000-3-12:2011	According to standard
Radiated Electromagnetic Field	IEC 61851-21-1:2017 ISO 11452-2:2004	Performance Criterion B
Electrical Fast Transient (EFT) /Burst	IEC 61000-4-4; Level 2 (± 5 kHz)	Performance Criterion B
Surge Immunity	IEC 61000-4-5; Level 3 surge (± 1 kV DM and ± 2 kV CM)	Performance Criterion C
RF Conducted Immunity	IEC 61000-4-6; Level 3 (10 V, 0.15...80 MHz, AM 80%, 1 kHz)	Performance Criterion A
Bulk Current Injection (BCI)	ISO 11452-4-5; 20 - 200 MHz, 60 mA, 80% AM	Performance Criterion B
Capacitive Coupling Clamp (CCC)	ISO 7637-3; Level 3	Performance Criterion A
Electrical Transient Conduction Along Supply Lines	ISO 7637-2:2011; Pulse number 1	C
	Pulse number 2a	B
	Pulse number 2b	C
	Pulse number 3a	A
	Pulse number 3b	A
Starting Profile	ISO 16750-2	C
Load Dump	ISO 16750-2	C
Isolation (factory tested)	AC Input to HV output:	4242 VDC
	AC Input to chassis:	4242 VDC
	HV Output to chassis:	3220 VDC
	Signals & VAUX have negative terminal connected to chassis PE	

9. CONNECTORS

PARAMETER	DESCRIPTION / CONDITIONS	MANUFACTURER	MPN
AC Side Connector *	Charger side	Amphenol	HVSL600 02 3A 1 H6
	Mating connector		HVSL600 06 3A 1 25
HV Power Connector *	Charger side	Amphenol	HVSL600 02 2A 1 H6
	Mating connector		HVSL600 06 2A 1 25
Signal Connector	Charger side	TE Connectivity	776163-5
	Mating connector		776164-5
	Crimp contact		770520-1 or 770854-1

* Connector with HVIL signals.

7.1 AC INPUT CONNECTOR

PIN	FUNCTION	
1	L1	Phase L1
2		Protective Earth
3	L2/N	Phase L2 or Neutral N

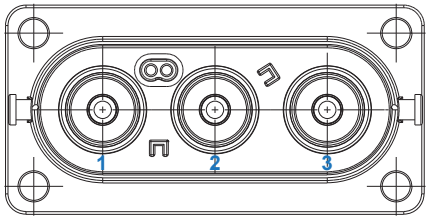


Figure 1. AC input connector, Charger side



Figure 2. AC input connector, Cable side

7.2 DC OUTPUT CONNECTOR

PIN	FUNCTION	
1	HVDC -	High voltage negative
2	HVDC +	High voltage positive

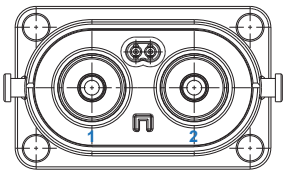


Figure 3. HV output connector, Charger side



Figure 4. HV output connector, Cable side

7.3 SIGNAL CONNECTOR

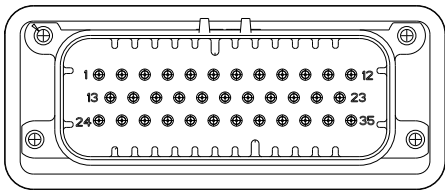


Figure 5. Signal connector, Charger side

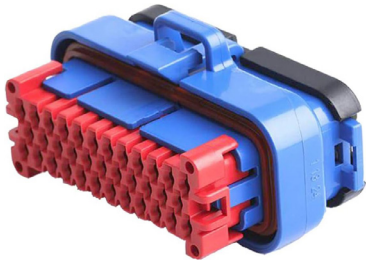


Figure 6. Signal connector, Cable side

PIN	NAME	DESCRIPTION / FUNCTION
1	GND	Signal Ground
2	BUTTON A	BUTTON A input
3	GND	Signal Ground
4	BUTTON B	BUTTON B input
5	GND	Signal Ground
6	LED 1	LED 1 current output
7	CAN INT L	Diagnostic CAN L
8	GND	Signal Ground
9	VAUX	12V/24V supply input
10	HVIL OUT	HVIL loop output
11	CAN L	CAN Bus L
12	CAN H	CAN Bus H
13	TEMP 1 N	Input for external temperature sensor
14	TEMP 1 P	Input for external temperature sensor
15	TEMP 2 N	Input for external temperature sensor
16	TEMP 2 P	Input for external temperature sensor
17	GND	Signal Ground
18	LED 2	LED 2 current output
19	CAN INT H	Diagnostic CAN H
20	WAKE OUT	High side switch output
21	GND	Signal Ground
22	WAKE_UP	Wake-up input
23	WAKE_UP	Wake-up input
24	LOCK P	H-bridge output for locking actuator
25	LOCK N	H-bridge output for locking actuator
26	LOCK FEED P	Feedback from locking actuator
27	LOCK FEED N	Feedback from locking actuator
28	PROXIMITY	EVSE Proximity
29	GND	Signal Ground
30	CONTROL PILOT	EVSE Control Pilot
31	GND	Signal Ground
32	VAUX	12V/24V supply input
33	HVIL IN	HVIL input
34	CAN L	CAN Bus L
35	CAN H	CAN Bus H

10. MECHANICAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	NOM	UNIT
Dimensions	W x H x D	594.2 x 372 x 91.5 23.4 x 14.6 x 3.6	mm in
Weight		20	kg
Enclosure	Aluminum alloy		

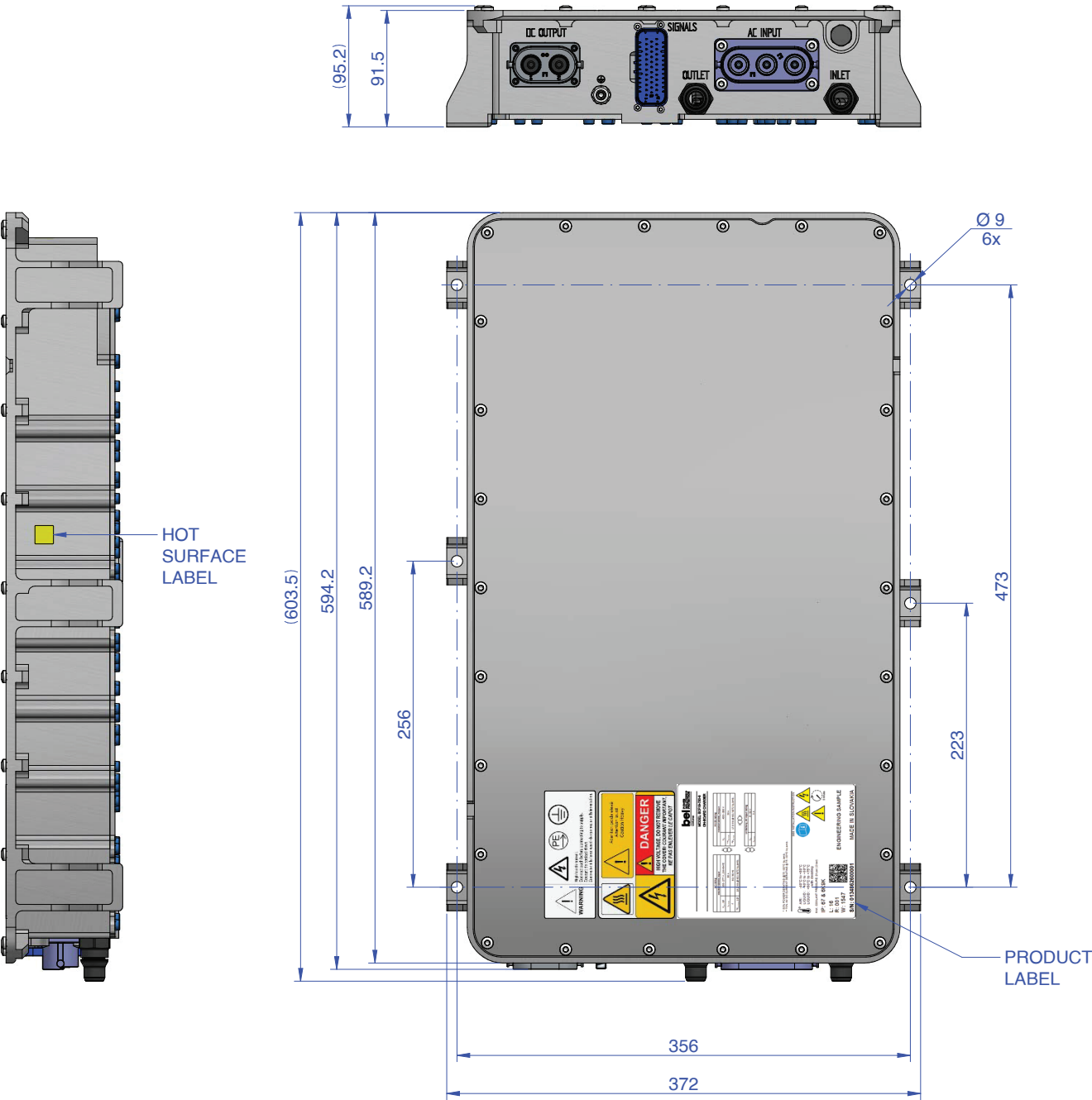


Figure 7. Mechanical Drawing

11. POWER WIRING DIAGRAM

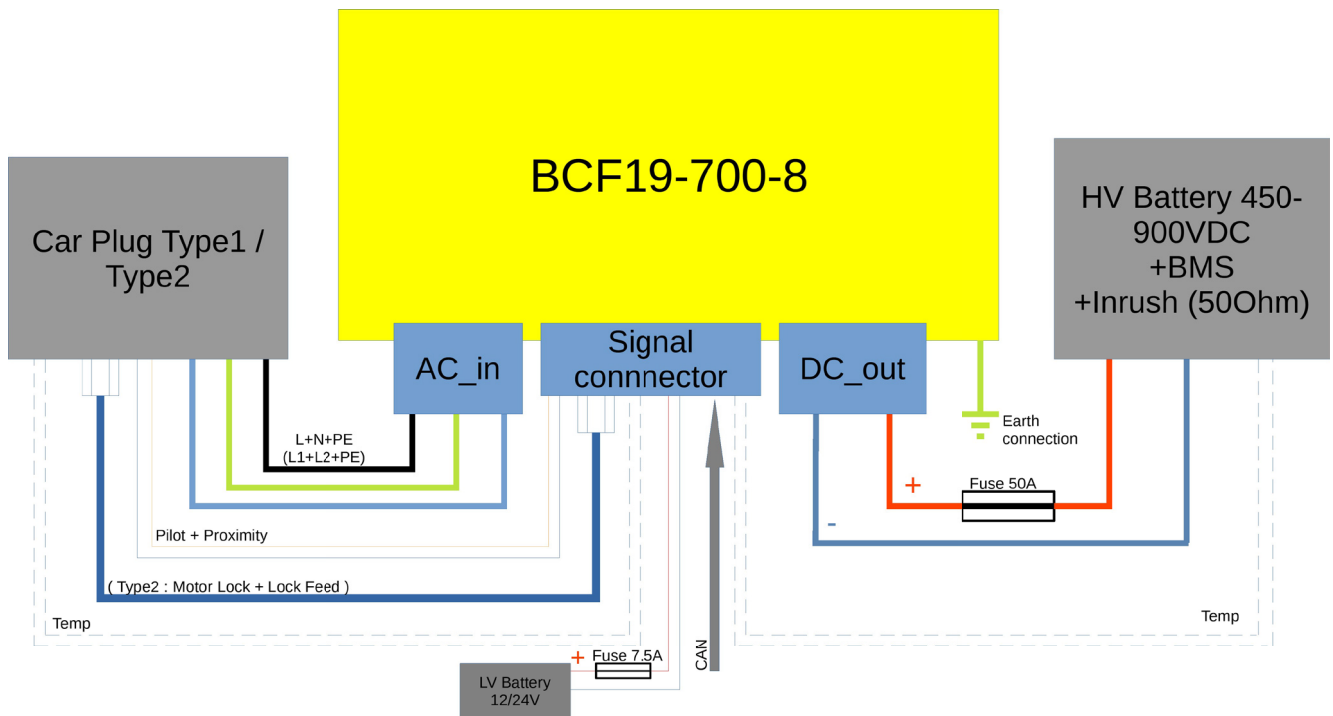


Figure 8. Power Connection Schematic diagram

Notes: 1. External HV pre-charge circuit is required when it is not part of the Battery Management System (BMS)
2. Please note, the BCF19-700-8 cannot provide output power without connected HV Battery.

12. SIGNAL CONNECTOR CONNECTION

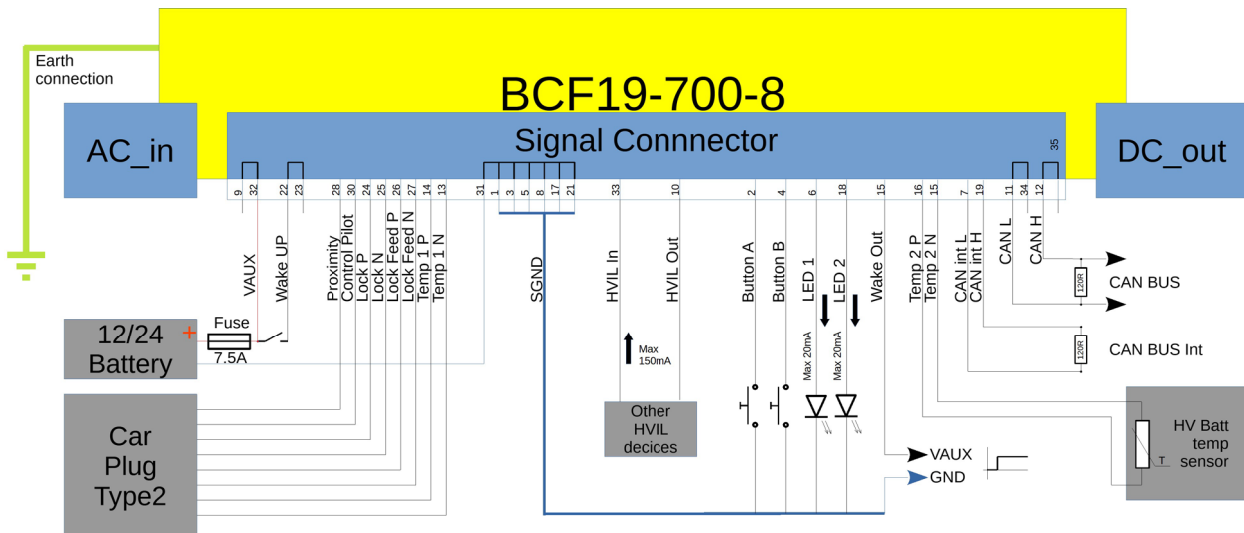


Figure 9. Signal Connector Schematic diagram

13. ACCESSORIES

ACCESSORY	DESCRIPTION
BCF19-CON-KIT	Connector Kit (AC, HV DC and signal connector with terminals; no cables)



Figure 10. Connector Kit BCF19-CON-KIT

For more information on these products consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.

TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.