

3701/55 ADAPT (ESD) Emergency Shutdown Device

Datasheet

Cordant™

100M8833 Rev. L



Description

The 3701/55 Emergency Shutdown Device, (ADAPT ESD) is a safety PLC with a graphical logic programming interface and integrated overspeed detection. ADAPT ESD is designed for emergency shutdown of rotating machinery such as steam, gas, and hydro turbines, expanders, and other process equipment.

ADAPT ESD is a compact, standalone, triple-redundant, safety shutdown device that is designed to meet a broad range of user scenarios and applications. The design offers an electrical and mechanical package with attention to reliability and availability as well as extensive self-diagnostics and compliance to industry standards.

Inputs

Inputs to the system are processed using three CPU modules to provide triple modular redundancy (TMR). Each CPU processing module processes two unique speed input channels, for a total of six speed channels for the system. The processing modules also monitor an array of 32 discrete (DI) and process variable (PV) signal inputs. Twelve channels of this input signal array may be configured either as discrete inputs or 4-20 mA analog inputs. Remaining channels in the array are reserved for discrete input signals only.

Outputs

Machinery shutdown functionality of the 3701/55 ADAPT ESD system is actuated by TMR relay output modules. Each relay output module has five relays with a level of configurability that accommodates a variety of applications and requirements. Four of the five relays in each module are used to annunciate system logic. The remaining relay reflects the



OK/NOTOK status of the associated protection path. The Bently Nevada Monitor Configuration software provides a graphical interface to configure relay logic. The state of each relay is determined by the system inputs and configured system logic in conjunction with the control state of the relay. Relay control states depend on the application, and may be set as normally energized/de-energized and independent one-out-of-one, (1oo1), voting or TMR two-out-of-three, (2oo3), voting. Each CPU module in the system has two, internally powered, 4-20 mA recorder outputs controlled by the full-scale speed set by the user through the Monitor Configuration software.

Compliance

The 3701/55 ESD complies with most applicable technical regulations and standards.

- North American general safety, CSA certified
- CE, Low Voltage and Electro-Magnetic Compatibility
- Functional Safety certification (SIL)
- CE, Machinery Directive
- North American, Hazardous Area certification, CSA certified
- European ATEX and IECEx Hazardous Area certification pending

3701 ADAPT ESD Overview

Typical (and recommended) applications of the ADAPT ESD will use a triple modular redundant architecture. In this configuration, each processor module physically connects to an array of 32 input channels, 12 of which are configurable as discrete inputs or 4-20 mA analog inputs, as well as two speed inputs. The Bently Nevada Monitor Configuration software allows you to configure large combinations of logic blocks in order to manage the system trip logic. This logic dictates how the trip mechanisms for the system are driven. The ADAPT ESD system can drive 12 independent trip relays. Of the 12 relays, six of these signals can optionally be configured for two-out-of-three,

(2oo3), voting. In the 2oo3 arrangement, the system activates a relay only when any two of the three CPU modules drive to trip. In independent mode, or one-out-of-one voting, any single CPU that drives to trip will cause an assigned relay to activate on the corresponding output card. For the highest safety, the system should be configured in “de-energize to trip”, or “normally energized” mode so that loss of power will not result in a machine running unmonitored.

ADAPT ESD Processing Module (CPU)

The ADAPT ESD system has three CPU modules. The CPU (part number 323174-01) is a state-of-the-art, high-performance CPU module. All three CPU modules process all 32 discrete inputs and 12 analog inputs. Each individual CPU module processes two speed inputs, for a total of six speed inputs. The CPU module features redundant Ethernet connections. The CPU receives trip logic configuration from the Bently Nevada Monitor Configuration software. The trip logic can have up to 500 logic steps. The input-to-output decision time is optimized to provide 2ms nominal logic processing time and 8ms relay toggle time in order to minimize the overall duration between detection of an emergency condition and successful shutdown. All embedded code on the CPU is capable of being upgraded without disassembly of the system.

ADAPT ESD Relay Module

There are three relay modules in each ESD system. Each Relay Module (part number 323073-01) has five relay contacts. Two of the relays are independent relays, driven by a corresponding CPU module. The remaining two relays are configurable as either independent or 2oo3 voted. When using a 2oo3 mechanical trip assembly, a typical installation would involve a series connection of one independent relay from each of the three relay modules. Each of the three CPUs would independently drive relays on each of the three relay cards. When two of the three CPUs drive for trip, the trip assembly would have the inputs it needs to

actuate the safety mechanism. Alternately, 2oo3 relays can be implemented directly on the ESD system. The remaining fifth relay is a protection fault relay used to convey the overall health/status of the system. The ADAPT ESD system drives the protection fault relay to broadcast a condition has compromised the integrity of the system.

Ordering Information



For the detailed listing of country and product-specific approvals, refer to the [Approvals Quick Reference Guide \(108M1756\)](#).

For additional technical documentation, please log in to bntechsupport.com and access the Bently Nevada Media Library.

324343	ADAPT ESD Weatherproof Enclosure
103M1345-01	3701/55 ADAPT ESD Configuration Software DVD Please download this software at bnTechSupport.com
Bently_Manus	Customer Documentation DVD

3701/55 ADAPT ESD Monitor

A: Agency Approval

00	None
01	CSA/NRTL/C CLASS 1, DIV 2, ZONE 2
02	ATEX/IECEX

B: Relay Option

01	Standard Relay Module
02 *	Gold-plated Relay Module



* This relay option **does not** have Hazardous Area Certifications

Accessories

289761-01	ADAPT ESD Terminal Base Assembly
323174-01	ADAPT ESD CPU Module
323073-01	ADAPT ESD 4 Ch. Relay Output Module
323073-02	ADAPT ESD 4 Ch. Gold-plated Relay Output Module
289036-01	Spare ADAPT ESD Terminal Block