

Pearson BTEC Levels 4 Higher Nationals in Engineering (RQF)

## Unit 31: Electrical Systems and Fault Finding

# Unit Workbook 4

in a series of 4 for this unit

Learning Outcome 4

## Electrical Safety Components

## INTRODUCTION

### **LO4 Explain the operating characteristics of electrical safety components**

*Electrical safety standards:*

Approved codes of practice

*Component types available and applications:*

Construction, application, characteristics and testing of: distribution boards, circuit breakers, residual current devices (RCDs), fuses, thermal devices, relays, contactors, switch gear, emergency stop buttons, interlocks, disconnectors, earth connections, Insulation Protection (IP) rating

Sample

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## Electrical safety standards:

### Approved codes of practice

#### Electrical and Power

Standard	Year	Description
BS EN 61439 (many parts)	2009 - 2012	Low-voltage switchgear and control gear assemblies
BS 5266 Parts 1 to 10 also BS EN 50172	1999 - 2008	Code of practice for emergency lighting
BS 5424 Parts 2 and 3, also IEC 60158 part 3	1985 - 1988	Specification for low voltage control gear
BS EN 60422	2008	Monitoring and maintenance guide for mineral insulating oils in electrical equipment
BS 5839 Parts 1 - 11, also PD6531:2010	1988 - 2010	Fire detection & alarm systems for buildings
BS EN 60079-30-2	2007	Electric surface heating
BS 6423	1983	Code of practice for maintenance of electrical switchgear and control gear for voltages up to and including 1 kV
BS 6626	2010	Code of practice for maintenance of electrical switchgear and control gear for voltages above 1 kV and up to and including 36 kV
BS EN 62305, 4 parts	2006-2011	Code of practice for protection of structures against lightning
BS 7375	2010	Code of practice for distribution of electricity on construction and building sites
BS 7430	1998	Code of practice for earthing
BS 7671	2008 - 2011	Requirements for electrical installations. IEE Wiring Regulations. Seventeenth edition
BS 7909	2008 - 2011	Code of practice for temporary electrical systems for entertainment and related purposes.
BS EN 50110 Parts 1 and 2	2004 - 2010	Operation of electrical installations

IEC 60479 Parts 1-4, also PD6519	1994-2005	Guide to effects of current on human beings and livestock.
BS EN 60529	1992	Specification for degrees of protection provided by enclosures (IP code)
BS EN 60947 Parts 1-8	2001 - 2011	Specification for low voltage switch gear and control gear

### Electrical Appliances

Standard	Year	Description
BS 1362	1973	Specification for general purpose fuse links for domestic and similar purposes (primarily for use in plugs)
BS 1363 Parts 1 -5	1995 - 2008	13 A plugs, socket-outlets and adaptors.
BS EN (IEC) 60309, Parts 1,2, 4	1999 - 2007	Plugs, socket-outlets and couplers for industrial purposes.
BS EN 60320, Parts 1, 2	1999 - 2009	Appliance couplers for household and similar general purposes.
BS EN 60335, Many parts		Specification for safety of household and similar electrical appliances

### Electromagnetic Compatibility

Standard	Year	Description
BS EN 61000-6-3,4	2007 - 2011	Electromagnetic compatibility. Generic emission standard.
BS EN 61000-6-1,2	2005 - 2007	Electromagnetic compatibility. Generic immunity standard.
BS EN (IEC) 60801, Part 2	1993	Electromagnetic compatibility for industrial-process measurement and control equipment. Electrostatic discharge requirements

### Flammable Atmospheres

Standard	Year	Description
EEMUA 181	1995	Guide to risk-based assessments of in-situ large Ex e & Ex n machines
EEMUA 186	1997	A Practitioners handbook – electrical installation & maintenance in potentially explosive atmospheres

BS EN 1127, Parts 1,2	2007 - 2008	Explosive atmospheres. Explosion prevention and protection. Basic concepts and methodology for mining
PD CLC/TR 50404:	2003	Code of practice for avoidance of hazards due to static electricity.
BS EN 61241	2004, 2005	Electrical apparatus with protection by enclosure for use in the presence of combustible dusts.
PD CLC/TR 50427	2004	Assessment of inadvertent ignition of flammable atmospheres by radio-frequency radiation. Guide
BS EN ISO 10497	2004	Testing of valves. Specification for fire type-testing requirements
BS 7535	1992	Guide to the use of electrical apparatus complying with BS 5501 or BS 6941 in the presence of combustible dusts
BS EN 60079, many parts	2004	Electrical apparatus for potentially explosive atmospheres. Replaced by BS EN 60079, but remains current.
BS EN 60079-6	2007	Explosive atmospheres. Equipment protected by oil immersion "o"
BS EN 60079-2	2007	Explosive atmospheres. Equipment protected by pressurized enclosures "p"
BS EN 60079-5	2007	Explosive atmospheres. Equipment protected by powder filling "q"
BS EN 60079-1	2007	Explosive atmospheres. Equipment protected by flameproof enclosures 'd'
BS EN 60079-7	2007	Explosive atmospheres. Equipment protected by increased safety 'e'
BS EN 60079-11	2007	Explosive atmospheres. Equipment protected by intrinsic safety 'i'
BS EN 60079-22-2	2007	Explosive atmospheres. Gas detection. Selection, installation, use and maintenance of detectors for flammable gases or oxygen
Energy Institute Model Code of Safe Practice, Part 1 (IP1)	2010	Electrical Safety Code
Energy Institute Model Code of Safe Practice, Part 15 (IP15)	2005	Area classification code for installations handling flammable fluids
Energy Institute Model Code of Safe Practice, Part 21 (IP21)	2002	Guidelines for the control of hazards arising from static electricity

### Machinery

Standard	Year	Description
BS EN ISO 13850	2008	Safety of machinery. Emergency stop. Principles for design.

BS EN 953	1997 - 2009	Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards
BS EN 13849	2008	Safety of machinery. Safety related parts of control systems. General principles for design
BS EN 982	1996 - 2008	Safety of machinery. Safety requirements for fluid power systems and their components. Hydraulics
BS EN 983	1996 - 2008	Safety of machinery. Safety requirements for fluid power systems and their components. Pneumatics
BS EN 1037	1996 - 2008	Safety of machinery. Prevention of unexpected start-up
BS EN ISO 12100	2010	Safety of machinery. General principles for design. Risk assessment and risk reduction.
BS EN 1088	2008	Safety of machinery. Interlocking devices associated with guards. Principles for design and selection.
PD 5304	2005	Safe use of machinery
BS EN 60204 many parts		Safety of machinery. Electrical equipment of machines.
BS EN 61069, Parts 1-8	1991-1999	Industrial-process measurement and control. Evaluation of system properties for the purpose of system assessment.
BS EN 61310, Parts 1,2,3	2008	Safety of machinery. Indication, marking and actuation.
BS EN 61496, 3 parts	2004 - 2008	Safety of machinery. Electro-sensitive protective equipment.
PIAC	1988	Printing industry advisory committee - safety at power operated paper cutting guillotines