

GP 16-12-01	Switchgear, Control Centers, and Bus Duct	April 2005
-------------	---	------------

Switchgear, Control Centers, and Bus Duct

GP 16-12-01

Scope

- 1) [I] This Global Practice (GP) covers low and medium voltage switchgear, control centers and bus duct, including relaying for motor branch circuits.
 - 2) [I] An asterisk (*) indicates that a decision by Purchaser is required or that additional information is furnished by Purchaser.
 - 3) * [I] The following are not established in this Practice and must always be specified separately:
 - a) Type of switching device for medium voltage control center.
 - b) Type of circuit breaker for medium voltage switchgear.
 - c) Relaying for other than motor branch circuits.
-

Downstream, Chemical	For ExxonMobil Use Only	Version 2.0.0
Page 1 of 23	©ExxonMobil Development Company	



Documents

Document Sharing Hub

Table of Contents

1. Required References	4
1.1. Global Practices–ExxonMobil Engineering Practices	4
1.2. ExxonMobil Data Sheets	4
1.3. IEC–International Electrotechnical Commission	5
1.4. IEEE–Institute of Electrical and Electronics Engineers	5
1.5. NEMA–National Electrical Manufacturers Association	5
1.6. UL–Underwriters Laboratories, Inc.	6
2. Definitions	6
3. Documentation	7
4. Switchgear and Control Center Construction Practices	7
5. Switchgear	8
5.1. Low Voltage Switchgear	11
5.2. Medium Voltage Switchgear	11
5.3. Switchgear Control Power (LV and MV)	12
6. Control Centers	13
6.1. Low Voltage Control Centers	14
6.2. Medium Voltage Control Centers	16
7. Control and Protective Relaying of Motor Circuits	17
7.1. Control Switches for Motor Controllers	17
7.2. Reacceleration Control	17
7.3. Protective Relaying	19
7.4. Protective Relaying for MV Motors	20
7.5. Protective Relaying for LV Breaker-Controlled Motors	20
7.6. Remote Metering	21
7.7. Motor Space Heater Control	21
7.8. Motor Off Alarms	21
8. Space Heaters	22
9. Bus Duct	22
10. Inspection and Testing	23



GP 16-12-01	Switchgear, Control Centers, and Bus Duct	April 2005
-------------	---	------------

10.1. Inspection	23
10.2. Testing	23
Record of Change	25
Attachment: Purpose Codes Definitions	26

DNST, CHEM	For ExxonMobil Use Only	Version 2.0.0
Page 3 of 23	©ExxonMobil Development Company	

GP 16-12-01	Switchgear, Control Centers, and Bus Duct	April 2005
-------------	---	------------

1. Required References

This Section lists Specifications and Standards that are generically referenced and assumed to be a part of this document. Unless otherwise specified herein, use the latest edition.

[I] Purchase and use of equipment covered by this Practice shall conform to nationally recognized codes and standards which are approved by Owner's Engineer and which are acceptable within the country where the equipment will be used. Sections 1.4 through 1.6 lists specifications and standards which shall be applied for equipment purchased to U.S. standards. Section 1.3 lists specifications and standards for IEC purchased equipment.

1.1. Global Practices–ExxonMobil Engineering Practices

GP 16-04-01	Grounding and Overvoltage Protection
-----------------------------	--------------------------------------

1.2. ExxonMobil Data Sheets

ExxonMobil Data Sheets	ExxonMobil Data Sheet Home Page
D161201C01	Documentation Requirements Sheet - Switchgear, Control Centers, and Bus Duct - Switchgear, Control Centers, and Bus Duct
I161201C01	Inspection and Testing Requirements - Switchgear, Control Centers, and Bus Duct - Switchgear, Control Centers, and Bus Duct
T161201C01	Technical Data Sheet - Switchgear, Control Centers, and Bus Duct - Low Voltage Switchgear - Customary Units
T161201C02	Technical Data Sheet - Switchgear, Control Centers, and Bus Duct - Metal Enclosed Bus - Customary Units
T161201C03	Technical Data Sheet - Switchgear, Control Centers, and Bus Duct - Medium Voltage Switchgear - Customary Units
T161201C04	Technical Data Sheet - Switchgear, Control Centers, and Bus Duct - Low Voltage Motor Control Centers - Customary Units
T161201C05	Technical Data Sheet - Switchgear, Control Centers, and Bus Duct - Medium Voltage Motor Control Centers - Customary Units
T161201M01	Technical Data Sheet - Switchgear, Control Centers, and Bus Duct - Low Voltage Switchgear - Metric Units
T161201M02	Technical Data Sheet - Switchgear, Control Centers, and Bus Duct - Metal Enclosed Bus - Metric Units
T161201M03	Technical Data Sheet - Switchgear, Control Centers, and Bus Duct - Medium Voltage Switchgear - Metric Units

DNST, CHEM	For ExxonMobil Use Only	Version 2.0.0
Page 4 of 23	©ExxonMobil Development Company	



Documents

Document Sharing Hub

GP 16-12-01	Switchgear, Control Centers, and Bus Duct	April 2005
-------------	---	------------

T161201M04	Technical Data Sheet - Switchgear, Control Centers, and Bus Duct - Low Voltage Motor Control Centers - Metric Units
T161201M05	Technical Data Sheet - Switchgear, Control Centers, and Bus Duct - Medium Voltage Motor Control Centers - Metric Units

1.3. IEC—International Electrotechnical Commission

IEC 60439-1	Low-Voltage Switchgear and Controlgear Assemblies Part 1: Type-Tested and Partially Type-Tested Assemblies
IEC 62271-200	High-voltage switchgear and controlgear Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
IEC TR 61641	Enclosed Low Voltage Switchgear and Controlgear Assemblies - Guide for Testing under Conditions of Arcing Due to Internal Fault

1.4. IEEE—Institute of Electrical and Electronics Engineers

IEEE C37.13	Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures (ANSI/IEEE)
IEEE C37.20.1	Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear (ANSI/IEEE)
IEEE C37.20.2	Standard for Metal-Clad Switchgear (ANSI/IEEE)
IEEE C37.23	Guide for Metal-Enclosed Bus and Calculating Losses in Isolated-Phase Bus (ANSI/IEEE)
IEEE C57.13	Standard Requirements for Instrument Transformers (ANSI/IEEE)

1.5. NEMA—National Electrical Manufacturers Association

NEMA ICS 1	Industrial Control and Systems General Requirements
NEMA ICS 2	Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts
NEMA ICS 3	Industrial Control and Systems Factory Built Assemblies
NEMA ICS 4	Industrial Automation Control Products and Systems Section Terminal Blocks
NEMA ICS 6	Industrial Control and Systems Enclosures
NEMA SG 4	Alternating-Current High-Voltage Circuit Breakers

DNST, CHEM	For ExxonMobil Use Only	Version 2.0.0
Page 5 of 23	©ExxonMobil Development Company	



Documents

Document Sharing Hub

GP 16-12-01	Switchgear, Control Centers, and Bus Duct	April 2005
-------------	---	------------

1.6. UL–Underwriters Laboratories, Inc.

UL 347	UL Standard for Safety High Voltage Industrial Control Equipment
UL 489	UL Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 1558	UL Standard for Safety Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear

2. Definitions

Term	[I] Description
Drawout	To be removable and arranged with a mechanism for moving the switching and interrupting device physically between connected and disconnected positions and equipped with self-aligning and self-coupling power and control disconnecting devices. Removal of the device may be accomplished without the necessity of unbolting connections or mounting supports.
Fully insulated bus bars	Bars fully coated or covered with solid insulating material, or individual bars fully surrounded by solid insulating material, so as to safely isolate personnel from live bars, and to prevent the propagation of arcs between phases or between phase and ground. The use of solid insulation coatings, coverings, or barriers shall not result in reducing the air-insulation clearances between the bars, or between the bars and ground.
"Healthy trip" pilot light	A pilot light that supervises the condition of a circuit, which trips a circuit breaker or other switching device either directly or through an auxiliary relay. When energized, the light shows that the circuit, including series connected trip coils of the switching device or auxiliary relay, is continuous and ready to function if its associated protective device operates.
Low voltage (LV) switchgear or control center	0 to 1000 volts
Medium voltage (MV) switchgear:	1001 to 34500 volts
MV control center:	1001 to 7200 volts
Plug-in	To be arranged for moving the switching and interrupting device physically between connected and disconnected positions and equipped with self-aligning and self-coupling power supply side disconnecting devices. Removal of the device may be accomplished without the necessity of unbolting power supply connections or mounting supports.

DNST, CHEM	For ExxonMobil Use Only	Version 2.0.0
Page 6 of 23	©ExxonMobil Development Company	



Term	[I] Description
Switching device	The device in a motor controller (or starter) that makes and breaks motor current such as a magnetic contactor or vacuum switch. Such device may also break fault current when so rated and applied for this purpose.
Undervoltage protection	As applied to motor control, causes the motor controller to trip either instantaneously or after a predetermined time interval upon a dip or loss of motor supply voltage. Upon restoration of normal supply voltage, the controller does not reclose or only recloses if supply voltage is restored within a predetermined time interval.

3. Documentation

- 1) [M] Manufacturer's equipment diagrams shall be furnished. The diagrams shall include:
 - a) Plan and section drawings
 - b) Front and rear elevation drawings
 - c) Device internals and switch development drawings
 - d) Wiring diagrams, showing physical location of all equipment, terminal blocks in cubicles, and all remote wiring
 - e) Schematic diagrams (covering both a-c and d-c control and metering circuits) showing individual wire numbers, terminal blocks and all device terminal numbers
 - f) Three-line diagrams, showing all current transformers, potential transformers, metering and protective relaying connections, main bus and breaker configurations
 - g) Instruction books, including assembly instruction and details, parts lists, and all individual components
- 2) [M] Vendor shall provide documentation showing equipment meets the approval requirements of the local authority. Approval requirements may include labeling, listing, or other certification by a nationally recognized testing organization acceptable to the local authority.

4. Switchgear and Control Center Construction Practices

- 1) [O], [R] Switchgear construction shall be used for LV drawout air circuit breakers and for MV drawout circuit breakers (all types). Units of the same size and ratings shall be field interchangeable. The scope of supply shall include all the necessary special tools to facilitate equipment maintenance and operation.

Cautionary Note: LV circuit breakers may come with protective relays fitted on the circuit breaker. LV circuit breakers shall be checked for protective devices before they are interchanged.

- 2) [O], [R] LV control center construction shall be used for the following plug-in equipment:
 - a) Fused contactors

DNST, CHEM	For ExxonMobil Use Only	Version 2.0.0
Page 7 of 23	©ExxonMobil Development Company	



Documents

Document Sharing Hub