

Low Voltage Rear Connected Switchboard

Selection and Application Guide



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Type RCS Rear Connected Switchboards

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General Information

Type RCS Rear Connected Switchboards

Siemens Type RCS rear connected switchboards are designed, constructed and tested to provide superior protection, power monitoring and control. At the heart of the Type RCS switchboard is the World Class Siemens WL Breaker.

Type RCS switchboards can be utilized for the following applications:

- **Institutional**
 - Water treatment
 - Airports
 - Universities
 - Medical facilities
 - Correctional facilities
- **Critical Power**
 - Data Processing
 - Hospitals
- **Commercial**
 - Large office buildings
 - Distribution centers
 - Large warehouses

Product Scope:

- **Equipment ratings**
 - 600VAC Maximum
 - 3 Phase 3 Wire,
 - 3 Phase 4 Wire
 - 50/60 Hz
 - 6000 amp maximum horizontal bus
 - 5000 amp maximum vertical bus
- **Enclosure options**
 - NEMA 1 Indoor
 - NEMA 3R Outdoor Walk-In
 - NEMA 3R Outdoor Non Walk-in

Siemens WL breakers can be manually or electrically operated and are available in two versions:

- UL489 (Insulated case circuit breakers)
- UL1066 (Low voltage power breakers)

Refer to pages 13 through 23 for interrupt, withstand and operating ratings related to each breaker version.

Industry Standards

Type RCS switchboards are designed, tested and constructed in accordance with:

- UL 891 Switchboards
- NEMA PB2 – Deadfront Distribution Switchboards
- Applicable requirements of the National Electric Code (NEC)



Type RCS Rear Connected Switchboard

Insulated Case Circuit Breakers

WL insulated case breakers are designed for continuous operation at 100% of their current rating without the need for external heat sinks and are in accordance with:

- UL 489 — Molded-case Circuit Breakers, Molded-case Switches and Circuit Breaker Enclosures
- NEMA AB1 — Molded-case Circuit Breakers, Molded-case Switches and Circuit Breaker Enclosures

Low Voltage Power Breakers

WL low voltage power circuit breakers are designed for continuous operation at 100% of their current rating without the need for external heat sinks, and in accordance with:

- UL 1066 — Low Voltage AC and DC Power Circuit Breakers Used in Enclosures
- ANSI C37.13 — Low Voltage AC Power Circuit Breakers Used in Enclosures
- ANSI C37.16 — Preferred Ratings, Related Requirements, and Application for Low Voltage Power Circuit Breakers and AC Power Circuit Protectors

- ANSI C37.17 — Trip Devices for AC and General Purpose DC Low-Voltage Power Circuit Breakers
- NEMA SG3 - Low Voltage Power Circuit Breakers

Features and modifications required by NEC are incorporated when the assembly is designated as "Service Equipment."

UL Listing

Underwriters' Laboratories listing mark (UL) is supplied for each vertical section provided all devices within a vertical section are UL Listed or UL Recognized and suitable for the intended use. All circuit breaker drawout elements are UL Listed.

Optional CSA compliance and cUL labeling is available.

Seismic Qualification

Seismic qualification to all major seismic construction standards (IBC, UBC, CBC, SBC, BOCA and IEE 693) is available.

Construction Details

Type RCS Rear Connected Switchboards

General

The Siemens Type RCS switchboard assembly consists of one or more metal-enclosed vertical sections. The end sections are designed to allow installation of future sections.

Each vertical section consists of up to six individually enclosed breaker or auxiliary compartments which are sized to provide uniform height.

Included in each assembly are various components such as circuit breakers, instrumentation and control equipment, transformers, relays, three-phase bus work, and all internal wiring, connectors, and other supporting equipment.

Finish

During construction, the structural steel parts, panels, and compartments are all prepared for painting by a five-stage wash system.

Standard finish color is light gray ANSI 61. The standard painting process is a UL approved electrostatic powder coat paint system utilizing a polyester powder coat paint. The completed finish has a nominal 2 mils dry film thickness.

Assembly Construction

Siemens Type RCS rear connected switchboards are constructed of a rigid internal frame structure that minimizes the possibility of damage during shipment and supports multiple installation methods — rolling or lifting. Lifting eyes are integrated into the internal frame design and ensure the structural integrity of the lifting assembly is always adequate for the weight of the total structure.

If requested in advance, the switchboard structure can be shipped so that the unit can be tilted onto its back during installation. This is an option that must be specified at order entry.

Each complete vertical section contains three compartments.

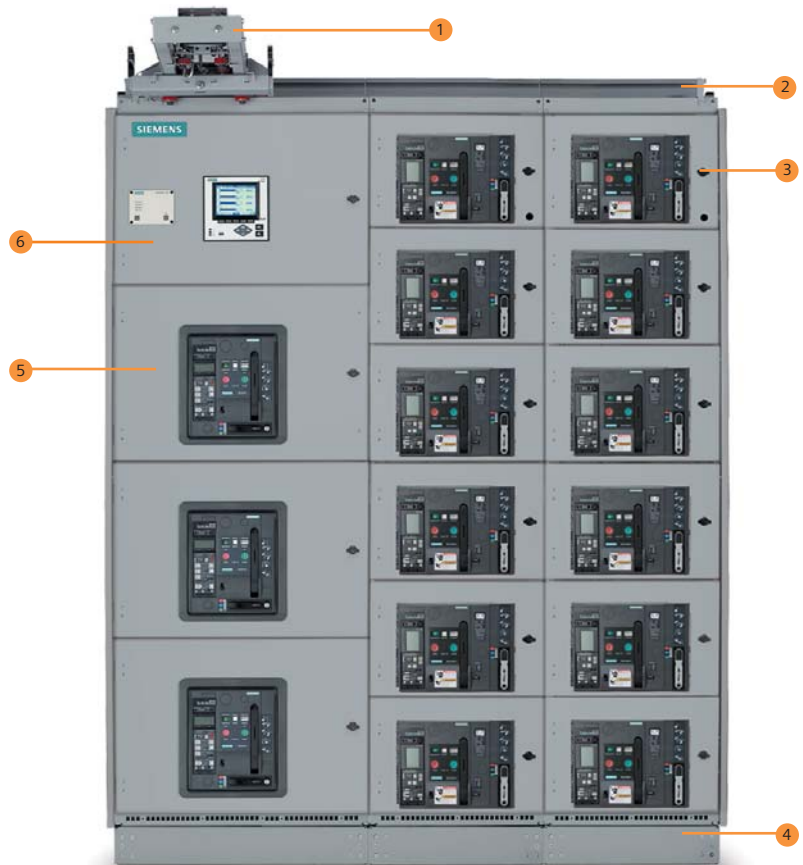
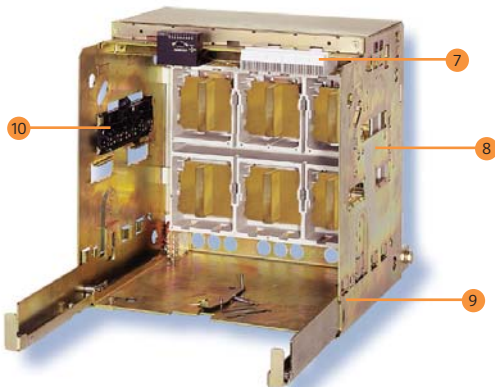
- (1) Front compartment containing breakers and/or auxiliary equipment

- (2) Bus compartment containing horizontal and vertical bus
- (3) Rear cable compartment containing the load side runbacks connecting the load side of the breaker to the load cable terminals

Within the front compartment, each breaker is barriered and compartmented from all other breakers in the front compartment. This design also isolates the breakers in the front compartment from the bus compartment.

Optional barriers can be supplied to isolate the bus compartment from the rear cable compartment. Other optional barriers include: (1) Full depth section barriers to isolate one section from the adjacent section(s). (2) Barriers to isolate the incoming line side connections to the main breaker(s) from the load side bus and connections in the switchboard section.

- 1 Breaker Hoist and Track
- 2 Ventilation and Lifting Structure
- 3 Quarter Turn Door Latch
- 4 Channel Sill Base (Optional)
- 5 Breaker Compartment
- 6 Auxiliary Instrument Compartment
- 7 Secondary Disconnect
- 8 Breaker Cradle (Guide Frame)
- 9 Breaker Drawout Rail
- 10 TOC Switch Operator



Construction Details

Type RCS Rear Connected Switchboards

Main and Ground Bus

The standard main bus is silver-plated copper. Tin-plated copper bus is optionally available. Vertical and horizontal bus bar utilize a channel shape design to maximize short circuit withstand capability and minimize heat rise. All bus joints include Grade 5 bolts and conical spring washers. Provisions for future extension of the main bus include plated joints and high tensile strength steel hardware.

The main three-phase horizontal bus is arranged vertically one phase above the other with edge-to-edge alignment to provide high, short circuit strength. Insulated main bus with isolated vertical bus is optional.

Vertical bus ratings available are 800, 1200, 1600, 2000, 2500, 3000, 3200, 4000, and 5000 amperes continuous current. Horizontal bus ratings available are 800, 1200, 1600, 2000, 2500, 3000, 3200, 4000, 5000, and 6000 amperes. A neutral bus is furnished when specified, and can be rated 2500, 3000, 4000, 5000, 6,000 or 8,000 amperes continuous current.

A ¼" X 3" standard copper ground bus extends through all sections. Cable lugs are mounted to the ground bus in each section.

Standard short circuit withstand (3 cycle) bus bracing is 100,000 amperes. Optional 3 cycle short circuit withstand ratings of 150,000 and 200,000 are available. Optional 4 cycle short circuit withstand ratings of 100,000, 150,000 and 200,000 are available. Optional 60 cycle short time withstand bus bracing rating of 100,000 is also available.

Load side runbacks for feeder circuits are copper construction, insulated with sleeve tubing in the main bus area, and supported by high-strength bus bracing.

Control and Communication Wiring

Standard control and communication wiring is extra-flexible, stranded copper type MTW. Type SIS control and communication wiring is available as an option. Control and communication wiring is installed and accessed from the front of the switchboard structure. Each breaker compartment has a dedicated horizontal and vertical wireway.

For devices not having screw-type terminals, pressure terminals are used.

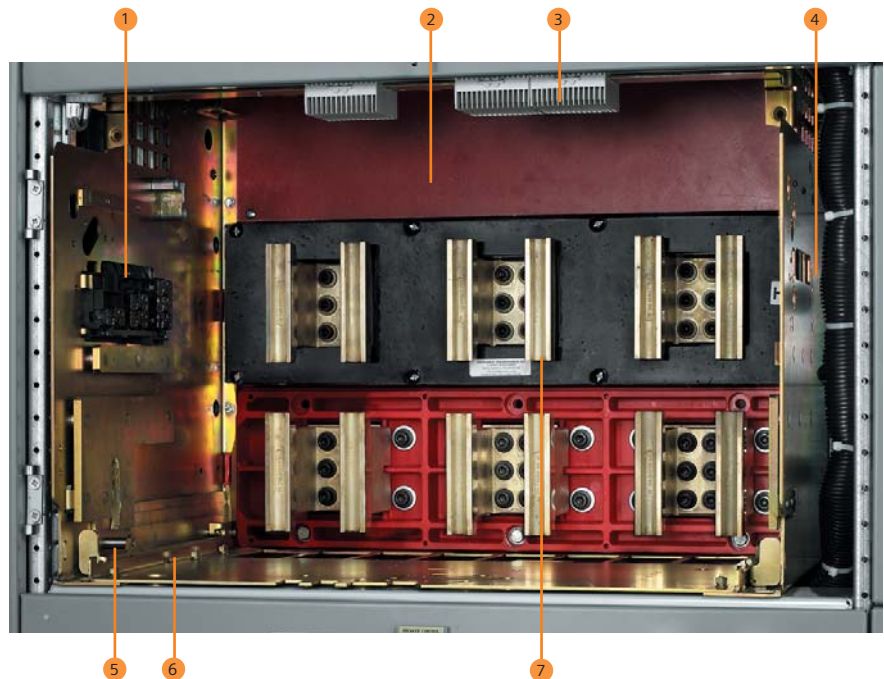
Insulation

The insulation used is a UL recognized thermoset or thermoplastic material that has excellent heat resistance, flame retardance, dimensional stability and low moisture absorption.

Circuit Breaker Compartments

Typical circuit breaker compartments include primary disconnects, drawout rails, secondary disconnects, vertical wireway, horizontal wireway and, if applicable, TOC switch operator, MOC switch operator and associated interlocks. Draw-out rails allow the breaker to be withdrawn from the compartment without additional extensions or adapters. Up to six (2 sets of three) current transformers for metering or relaying can be mounted in each compartment.

A variety of auxiliary devices such as breaker control switches, indicating lights and pushbuttons can be mounted on the breaker compartment door.



- | | |
|------------------------------------|--------------------------|
| 1 TOC Switch Operator | 5 Interference Interlock |
| 2 Breaker Compartment Rear Barrier | 6 Drawout Rails |
| 3 Secondary Disconnect | 7 Primary Disconnect |
| 4 Vertical Wireway | |

Circuit Breaker Cell Interior

Construction Details

Type RCS Rear Connected Switchboards

Options

Switchboard Mounted Hoist

The integrally mounted hoist, standard on walk-in outdoor and optional on indoor switchboard enclosures, travels along rails on top of the switchboard to assist in breaker handling.

TOC and MOC Switches

The Truck Operated Cell (TOC) Switch provides interlocking control or remote indication of the breaker racking position. The cubicle mounted auxiliary switch or Mechanism Operated Cell (MOC) switch provides interlocking control or remote indication based on the main contact position (open or closed).

Shutters

These provide protection against accidental contact with primary disconnects in a compartment when the breaker is removed. Shutters automatically close when the breaker is moved to the test position, disconnect position or is withdrawn and are padlockable and field installable.

Key Interlock

This provides a mechanical means for operating circuit breakers and other devices only when prescribed conditions are met.

Test Set

A portable breaker test set is available as an option and supports testing the full range of functions and protective settings supplied with the breaker trip unit.

Metering and Auxiliary Compartments

Compartments are available to house devices such as voltage transformers, metering, control power transformers, and supervisory devices.

Instrument and Control Transformers

Voltage transformers and control power transformers are mounted in auxiliary compartments. These transformers are protected by primary pull-out type current-limiting fuses and secondary fuses. Current transformers are normally mounted

on the compartment primary disconnect studs where they are readily accessible. See tables on page 37 for available ratings.

Miscellaneous

Each switchboard lineup includes a breaker lifting device that is adjustable for use with Size 1, Size 2 and Size 3 breakers.

An optional portable breaker hoist is available if the integrated breaker hoist and track is not specified.

A test cabinet is also available as an option. The test cabinet is wall mounted necessary equipment for testing electrically-operated breakers that have been removed from the breaker compartment.

4" high formed steel channel sills are available for indoor switchboard enclosures.

Outdoor Switchboard

Type RCS switchboard is available in two outdoor (NEMA 3R) enclosures. Walk-in and non walk-in versions are available to meet your particular application.

For protection from snow, rain and other foreign matter, both outdoor enclosures rest on a six-inch high, formed steel base which provides rigid support and a tight bottom seal. A heavy duty protective under-coating is applied to the underside of all outdoor enclosures to protect against moisture and corrosion. Shielded ventilation housings permit proper air circulation while excluding dirt and foreign matter.

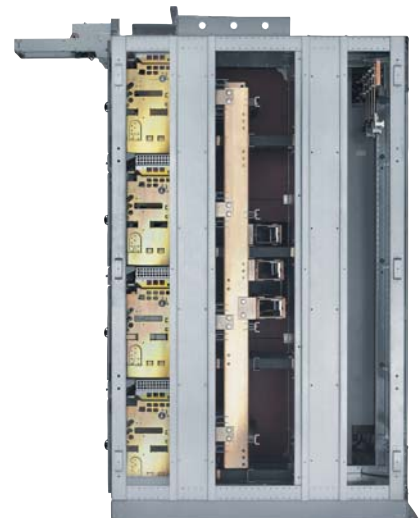
In the walk-in outdoor enclosure a lighted, unobstructed service aisle is provided at the front of the switchboard allowing inspection and maintenance without exposure to the elements. An access door equipped with an emergency bar release is located at each end of the aisle.

The following features are standard with walk-in outdoor enclosures.

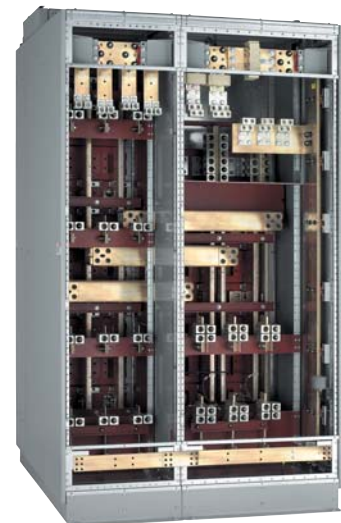
- (1) Space heaters in breaker compartment and bus compartment

- (2) Screens and filters for exterior door ventilation louvers
- (3) Incandescent lighting receptacle with three-way switch at each aisle access door
- (4) Duplex receptacle with ground fault protection at each aisle access door.
- (5) Load center for power distribution to lights, receptacles, switches and heaters.

For non walk-in outdoor enclosures, space heaters and screens/filters for ventilation louvers are standard with lighting, receptacles, switches and load centers offered as options.



Side View

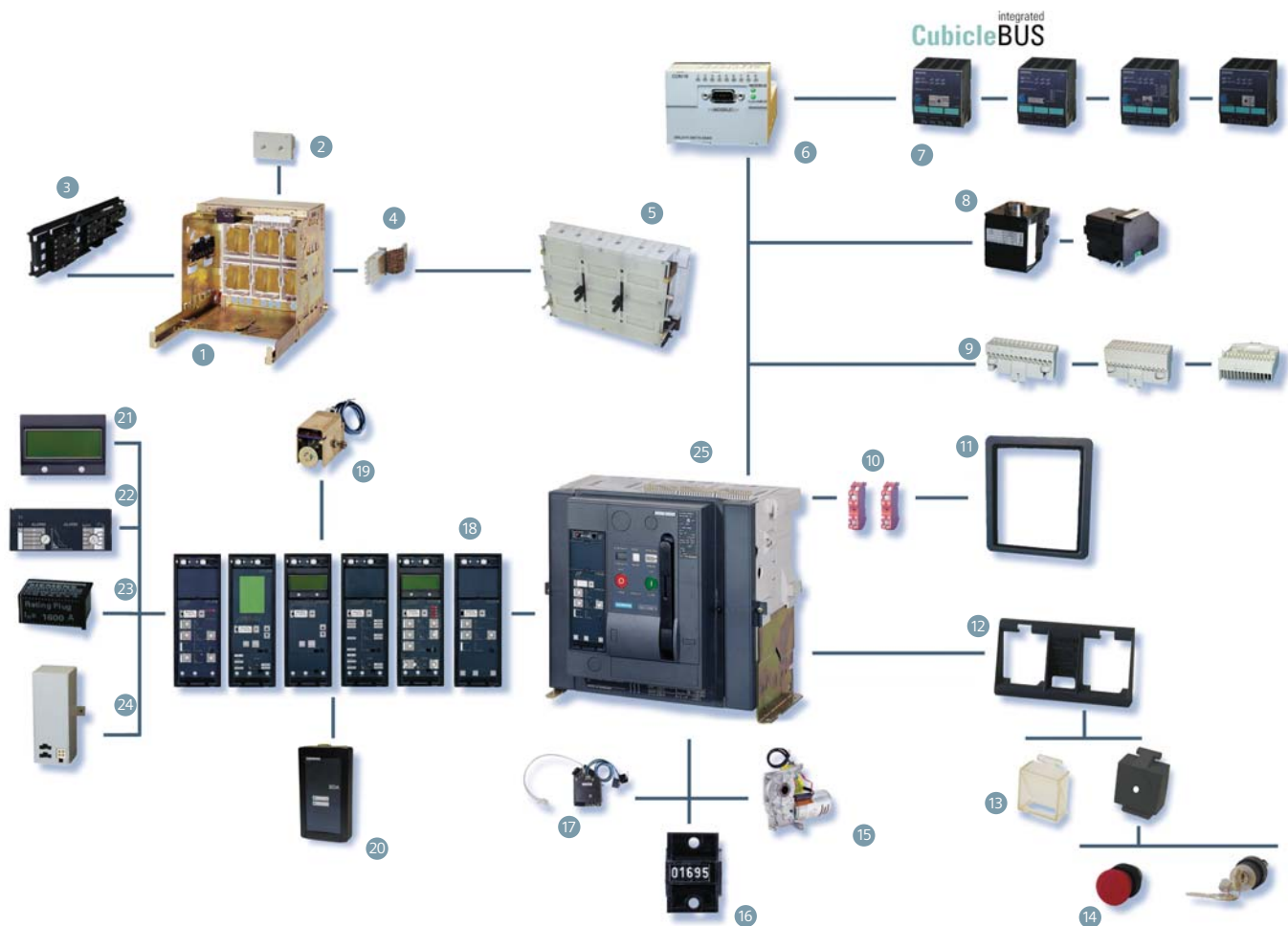


Rear View

WL Circuit Breaker

Type RCS Rear Connected Switchboards

WL Circuit Breaker:
Superior individual products for low-voltage power distribution systems



- | | | |
|---|--|---|
| 1 Guide Frame | 9 Multiple Secondary Connections | 17 Breaker Status Sensor (BSS) |
| 2 Vertical to Horizontal BUS Connector | 10 Auxiliary Switch Block | 18 Complete Trip Unit Family |
| 3 Position Signaling Switch (TOC) | 11 Door Sealing Frame | 19 Remote Reset |
| 4 Breaker / Guide Frame Grounding Contact | 12 Interlocking Set Base Plate | 20 Breaker Data Adapter (BDA) for Internet Connection |
| 5 Shutter (locking) | 13 Protective Cover for OPEN/CLOSE Buttons | 21 Multi Angle LCD Module |
| 6 MODBUS or PROFIBUS Communications | 14 Multiple Key Locking Accessories | 22 Ground Fault Protection Module |
| 7 External CubicleBUS I/O Module | 15 Single Bolt Motor Operator Installation | 23 Rating Plug |
| 8 Plug-In Open and Closed Solenoids | 16 Operations Counter | 24 Metering Function (+ wave forms and harmonics) |
| | | 25 Circuit Breaker |

Electronic Trip Unit

Type RCS Rear Connected Switchboards

Electronic Trip Unit

During development of our electronic trip units we have consistently striven to ensure modularity. The following are just some of the modules that are simple to retrofit at any time:

- Ground fault protection
- Communication
- Metering function
- Displays
- Rating plugs

This enables fast local adaptation to new system conditions. At the same time, the ETUs are provided with new, innovative functions, and all trip units are completely interchangeable independent of breaker ratings.

Rating Plug

The Rating Plug is a replaceable module that enables users to reduce the rated device current for optimum adaptation to the system; e.g. during startup of a plant section. The Rating Plug should be selected so that it corresponds to the rated current of the system.

Switch-selectable I2t or I4t Characteristic Curve Improved Overload Protection

The best possible protection is assured when all protective devices in the system are optimally coordinated. To achieve optimum selectivity and coordination, the long-time characteristic can be switched between I2t and I4t.

Switchable Parameter Sets

To allow the protection to adapt to changes in system needs such as switching between utility and generator feeds, WL Circuit Breakers support ETUs with two independent parameter sets. Switching between the parameter sets occurs in less than 100 ms and can be done remotely or via a contact input to an optional CubicleBUS module.

Extended Instantaneous Protection

The electronic trip units designed for use with the WL circuit breaker provide a feature we call "Extended Instantaneous Protection" (Patent Pending).

It allows the WL breaker, as a family, across the entire range of ampacities to be applied at the withstand rating of the breaker with minus 0% tolerance; that means no instantaneous override. EIP further enables the circuit breaker to be applied up to the full interrupting rating of the breaker on systems where the available fault current exceeds the withstand rating, even with LS-only trip units. Why is this feature important? The answer is reliable power.

The coordination of the main breaker and the first level of feeder breakers is especially important because of the wide spread outage that will occur if one of these breakers trips unnecessarily.

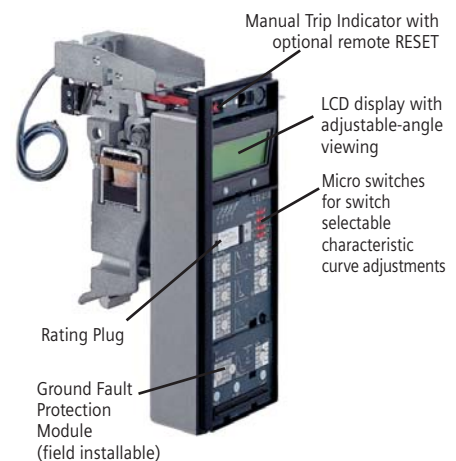
Conventional practice is to specify electronic trip breakers with "LS" type trip units in critical power systems. These 'Long-Time' and 'Short-Time' only trip units forgo the fast tripping times given by an 'Instantaneous' function. The justification for this delay is the benefit of allowing a downstream breaker to open first to clear a high magnitude fault. The main or feeder stays closed to keep the remainder of the loads operating.

However, a circuit breaker with an LS-only trip unit may never be applied on a system capable of delivering fault current higher than the breaker's withstand rating, commonly 85kA or less. Where the available fault current is above this level, a breaker with an additional function must be used — an instantaneous override. This instantaneous override function trips the breaker instantly when the fault current reaches a pre-determined level below the withstand rating, usually around 20% lower. The benefit of this override is to allow application of the breaker up to the interrupting rating, which may be as high as 150kA. The disadvantage is that it compromises the coordination benefit because the main will probably trip at the same time as a downstream branch breaker in that 20% lower override window.

This is where the Extended Instantaneous Protection feature of the WL can offer the next level of coordination and protection functionality. Unlike an instantaneous override, Extended Instantaneous Protection (EIP) allows the full withstand rating — in fact up to the tolerance of plus 20% higher. Of course, EIP still provides the ability of the breaker to be applied at the interrupting level, as high as 150kA in a Frame Size III, non-fused breaker. This unique combination enables the system designer to achieve the highest possible level of coordination in the industry and also allows application of the WL on modern power systems with extremely high levels of available fault current.

A further benefit offered by EIP, over a standard LS trip unit equipped breaker, is that it provides an extra measure of protection in the event that the available fault current increases at some time during the life of the system beyond the withstand level. This would typically be due to a utility transformer change but could also be due to the addition of generators or large motors that contribute fault current. EIP provides the breaker the ability to react in an instantaneous fashion to a high level fault instead of having to rely on the slower reaction time of the short-time function.

Sample Configuration of an ETU745



Electronic Trip Unit

Type RCS Rear Connected Switchboards

Selection Criteria for WL Circuit Breakers

The basic criteria for selecting circuit breakers is:

Maximum Available Short Circuit at the installation point. This value determines the short circuit current interrupting rating or short circuit current withstand rating of the circuit breaker.

Rated Current I_n which is to flow through the respective circuit breaker continuously. This value may not be greater than the maximum rated current of the circuit breaker. The rated current for the WL is determined by the rating plug, up to the maximum frame rating.

Ambient Temperature of the circuit breaker.

Design of the circuit breaker.

Protective Functions of the circuit breaker. These are determined by the selection of the appropriate trip unit.

Dynamic Arc-Flash Sentry (Patent Pending) A unique feature of the WL trip unit allows the system designer to achieve lower levels of arc flash energy and delayed tripping for selective trip coordination purposes.

Dynamic Arc-Flash Sentry (DAS) employs the unique dual protective setting capability of the 755 and 776 trip units, coupled with the ability to easily toggle to a lower arc flash parameter set. A normal operation parameter set can be optimized for selective trip coordination, while the second set is optimized for lower arc flash energy levels. The dynamic action comes from the ability to switch from the normal operation set to the arc flash limiting set based on the presence of personnel as they approach the flash protection boundary. A wide variety of switching methods may be used based on the needs of a particular facility. The capabilities range from fully automatic switching using appropriate occupancy sensors to manual switching via a key operation.

Trip Unit Functions



Basic Protective Functions		ETU725	ETU727
Long-time overcurrent protection	L	●	●
Short-time delayed overcurrent protection	S	●	●
Instantaneous overcurrent protection	I	●	●
Neutral protection	N	–	●
Ground fault protection	G	–	●
Additional Functions			
Selectable neutral protection		–	●
Defeatable short-time delay		–	–
Defeatable instantaneous protection		–	–
Selectable thermal memory		–	–
Zone selective interlocking		–	–
Selectable I^2t or fixed short-time delay		–	–
Adjustable instantaneous pick-up		1	–
Selectable I^2t or I^4t long-time delay		–	–
Adjustable short-time delay and pick-up		●	●
Selectable and adjustable neutral protection		–	–
Dual protective setting capability		–	–
Dynamic arc-flash sentry		–	–
Extended instantaneous protection		●	●
Parameterization and Displays			
Parameterization by rotary switches (10 steps)		●	●
Parameterization by communication (absolute values)		–	–
Parameterization by menu/keypad (absolute values)		–	–
Remote parameterization of the basic functions		–	–
Remote parameterization of the additional functions		–	–
Alphanumeric LCD		–	–
Graphical LCD		–	–
Metering Function			
Metering function <i>Plus</i>		–	–
Communication			
CubicleBUS		–	–
Communication via PROFIBUS-DP		–	–
Communication via the MODBUS		–	–
Communication via the Ethernet (BDA)		–	–

● standard – not available ○ optional

¹ Fixed short-time delay only

Electronic Trip Unit

Type RCS Rear Connected Switchboards



Basic Protective Functions		ETU745	ETU748	ETU755	ETU776
Long-time overcurrent protection	L	●		●	●
Short-time delayed overcurrent protection	S	●	●	●	●
Instantaneous overcurrent protection	I	●	-	●	●
Neutral protection	N	●	●	●	●
Ground fault protection	G	○	○	○	○
Additional Functions					
Selectable neutral protection		●	●	●	●
Defeatable short-time protection		●	-	●	●
Defeatable instantaneous protection		●	-	●	●
Selectable thermal memory		●	●	●	●
Zone selective interlocking		○	○	○	○
Selectable I ² t or fixed short-time delay		●	●	●	●
Adjustable instantaneous pick-up		●		●	●
Selectable I ² t or I ⁴ t long-time delay		●	●	●	●
Adjustable short-time delay and pick-up		●	●	●	●
Selectable and adjustable neutral protection		●	●	●	●
Dual protective setting capability		-	-	●	●
Dynamic arc-flash sentry		-	-	●	●
Extended instantaneous protection		●	●	●	●
Parameterization and Displays					
Parameterization by rotary switches (10 steps)		●	●	-	-
Parameterization by communication (absolute values)		-	●	●	●
Parameterization by menu/keypad (absolute values)		-	-	-	●
Remote parameterization of the basic functions		-		●	●
Remote parameterization of the additional functions		-		●	●
Alphanumeric LCD		○	○	-	-
Graphical LCD		-	-	-	●
Metering Function					
Metering function <i>Plus</i>		○	○	○	○
Communication					
CubicleBUS		●	●	●	●
Communication via PROFIBUS-DP		○	○	○	○
Communication via the MODBUS		○	○	○	○
Communication via the Ethernet (BDA)		○	○	○	○

● standard - not available ○ optional

Time/Current Characteristic Curves

Type RCS Rear Connected Switchboards

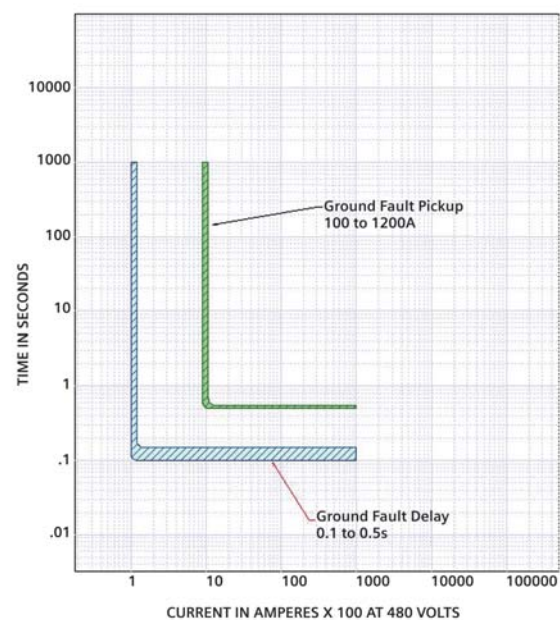
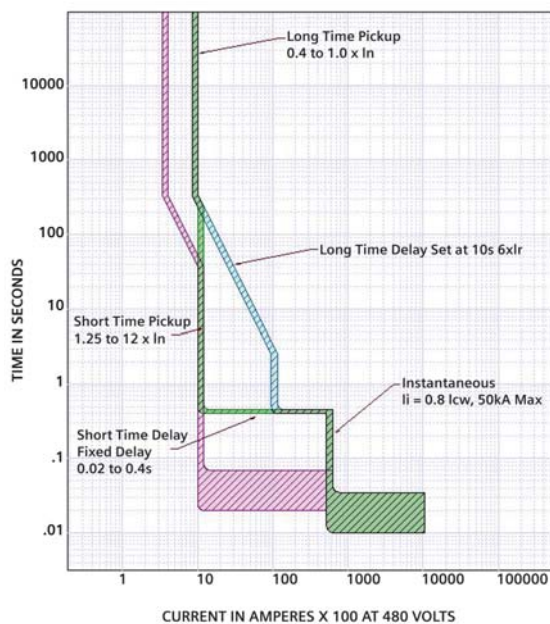
Tripping Characteristics

Every trip unit and every trip function has its own characteristic. You will find just a small section of these illustrated below. The characteristics show the respective greatest and smallest setting range of WL Circuit Breakers.

To obtain a complete release characteristic, the appropriate characteristic functions must be determined.

The characteristics show the behavior of the overcurrent release when it is activated by a current already flowing before tripping. If the overcurrent trip takes place immediately after closing and the overcurrent release is therefore not yet activated, the opening time is prolonged by about 3 to 10 ms, depending on the value of the overcurrent.

ETU725 and ETU727

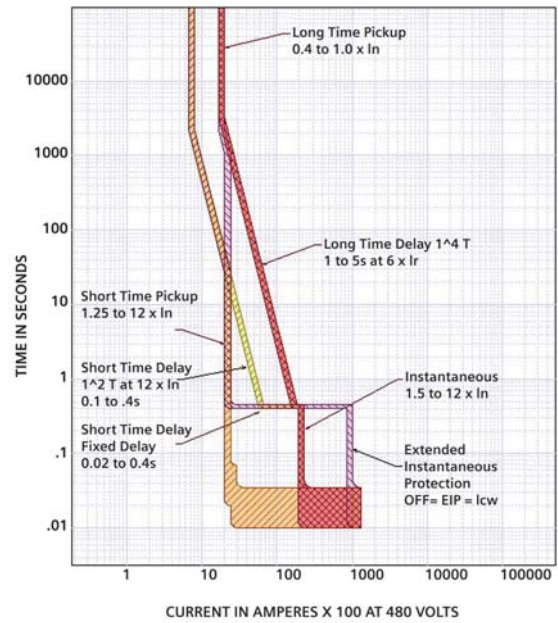
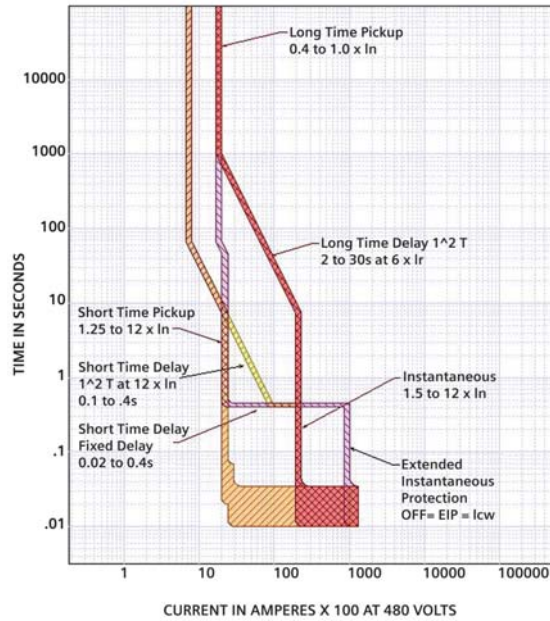


Time/Current Characteristic Curves

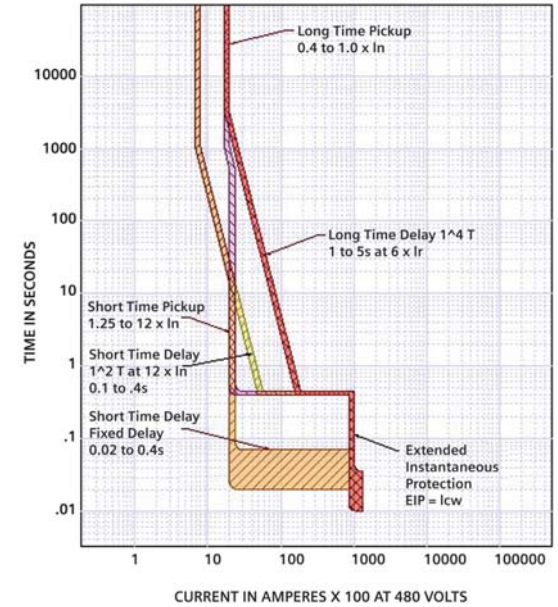
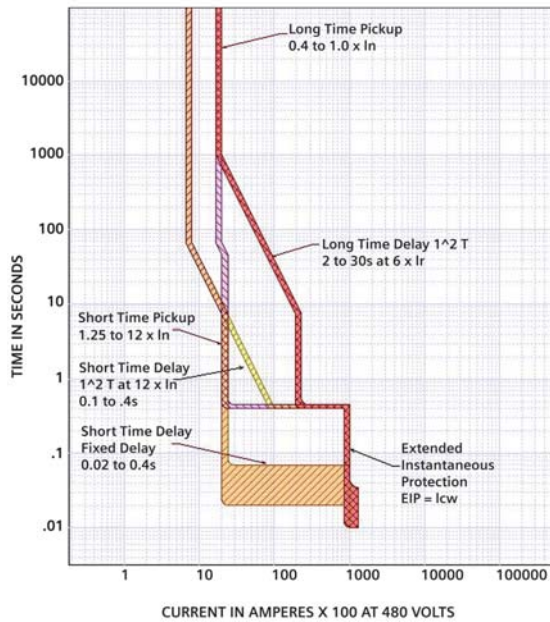
Type RCS Rear Connected Switchboards

Tripping Characteristics

ETU745



ETU748

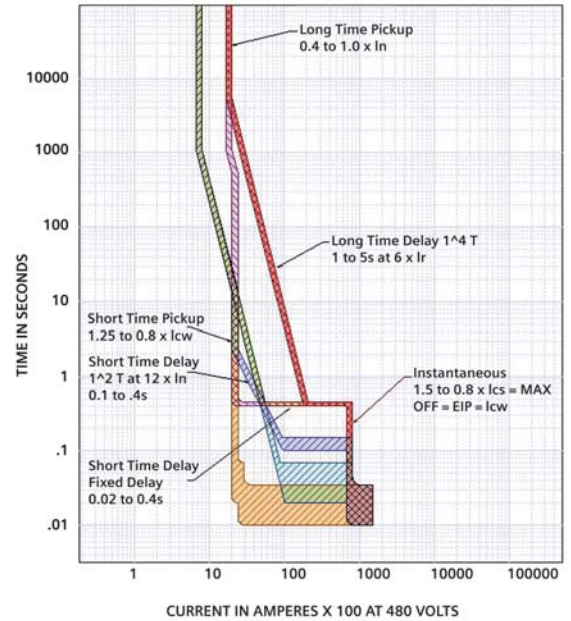
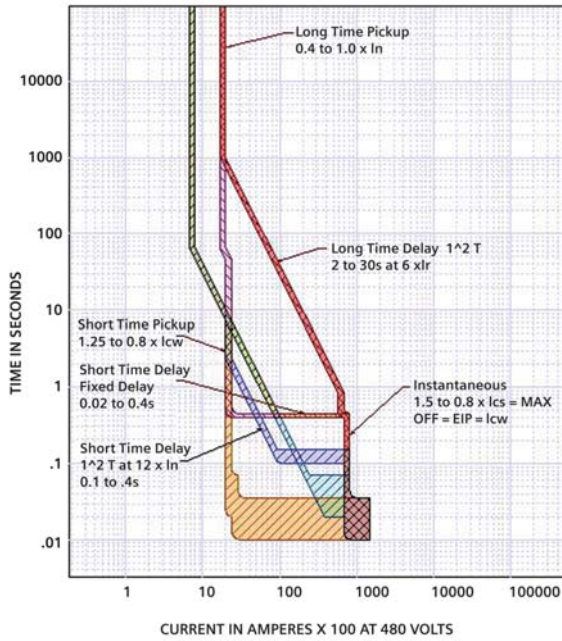


Time/Current Characteristic Curves

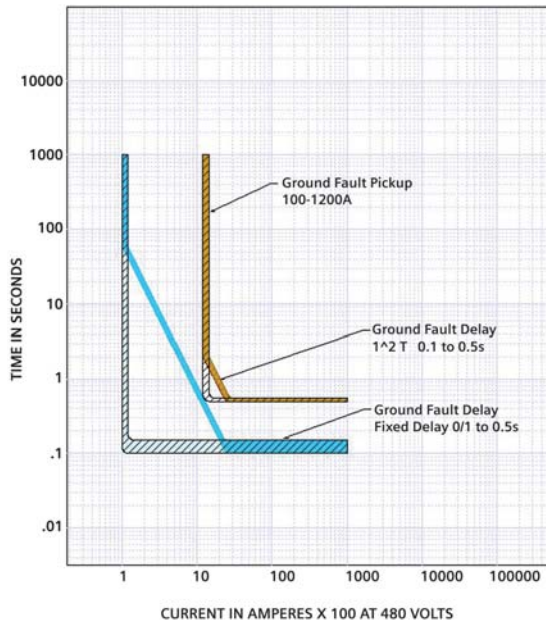
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Tripping Characteristics

ETU776



Ground Fault Curve for ETU745, 748, 755 and 776



Breaker Technical Data

Type RCS Rear Connected Switchboards

WL UL 489 Insulated Case Circuit Breakers

Breaker Ratings

Frame Rating Rating Class		Frame Size 1					
		800			1200		
		S	H	L	S	H	L
Interrupting Current I_{cs} (kAIR RMS) 50/60 Hz	240V	65	85	100	65	85	100
	480V	65	85	100	65	85	100
	600V	65	65	65	65	65	65
Short-time Withstand Current I_{cw} (kA RMS) 50/60 Hz	0.5 s	65	65	65	65	65	65
Extended Instantaneous Protection (kA RMS)	240-480V	65	85	100	65	85	100
	600V	65	65	65	65	65	65
Close and Latch Ratings (kA RMS) 50/60 Hz		65	65	65	65	65	65
Rating Plug Range		200A to 800A			200A to 1200A		
Minimum switchboard cubicle dimensions (fixed or draw-out version)	width (in.)	22.0			22.0		
	height (in.)	15.0			15.0		
	depth (in.)	19.5			19.5		

Frame Rating Rating Class		Frame Size 2															
		800			1200			1600			2000			2500		3000	
		S	L	C	S	L	C	S	L	C	S	L	C	L	C	L	C
Interrupting Current I _{CS} (kAIR RMS) 50/60 Hz	240V	65	100	150	65	100	150	65	100	150	65	100	150	100	150	100	150
	480V	65	100	150	65	100	150	65	100	150	65	100	150	100	150	100	150
	600V	65	85	100	65	85	100	65	85	100	65	85	100	85	100	85	100
Short-time Withstand Current I _{CW} (kA RMS) 50/60 Hz																	
	0.5 s	65	85	100	65	85	100	65	85	100	65	85	100	85	100	85	100
Extended Instantaneous Protection (kA RMS)	240-480V	65	100	150	65	100	150	65	100	150	65	100	150	100	150	100	150
	600V	65	85	100	65	85	50	65	85	100	65	85	100	85	100	85	100
Close and Latch Ratings (kA RMS) 50/60 Hz		65	85	100	65	85	100	65	85	100	65	85	100	85	100	85	100
Rating Plug Range		200 – 800A			200 – 1200A			200 – 1600A			200 – 2000A			200 – 2500A		200 – 3000A	
Minimum switchboard cubicle dimensions (fixed or draw-out version)	width (in.)	22.0			22.0			22.0			22.0			22.0		22.0	
	height (in.)	22.5			22.5			22.5			22.5			22.5		22.5	
	depth (in.)	19.5			19.5			19.5			19.5			19.5		19.5	

Frame Rating Rating Class		Frame Size 3			
		4000		5000	
		L	C	L	C
Interrupting Current I_{cs} (kAIR RMS) 50/60 Hz	240V	100	150	100	150
	480V	100	150	100	150
	600V	85	100	85	100
Short-time Withstand Current I_{cw} (kA RMS) 50/60 Hz	0.5 s	85	100	85	100
Extended Instantaneous Protection (kA RMS)	240-480V	100	150	100	150
	600V	85	100	85	100
Close and Latch Ratings (kA RMS) 50/60 Hz		85	100	85	100
Rating Plug Range		800A to 4000A		800A to 5000A	
Minimum switchboard cubicle dimensions (fixed or draw-out version)	width (in.)	32.0		32.0	
	height (in.)	22.5		22.5	
	depth (in.)	19.5		19.5	

Breaker Technical Data

Type RCS Rear Connected Switchboards

WL Non-Automatic Switches UL 489

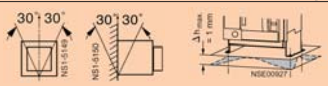
Ratings

Rating Nominal Current Rating Class		Frame Size 1		Frame Size 2				Frame Size 3	
		800	1200	1600	2000	2500	3000	4000	5000
		H	H	L	L	L	L	L	L
Short-time Withstand Current (kA RMS) 50/60 Hz	0.5 s	65	65	85	85	85	85	85	85
Breaking Capacity with External Relay (kA RMS)	240V	85	85	100	100	100	100	100	100
50/60 Hz, instantaneous trip	480V	85	85	100	100	100	100	100	100
	600V	65	65	85	85	85	85	85	85

Breaker Technical Data

Type RCS Rear Connected Switchboards

WL UL 489 Insulated Case Circuit Breakers


Frame Rating			Frame Size 1	
Rated Current at 50/60 Hz			800	1200
Rated voltage	V AC	A	600	600
Permissible ambient temperature	Operation (for operation with LCD max 55°C)	C	-25 / +70	25 / +70
	Storage (observe special conditions for LCD)	C	-40 / +70	40 / +70
Power loss at rated current I_n (with 3-phase symmetrical load)	Drawout version	W	80	180
	Fixed mount version	W	60	120
Operating times	Make-time	ms	35	35
	Break-time	ms	34	34
	Make-time, electrical (via closing solenoid)	ms	50	50
	Break-time, electrical (via shunt trip)	ms	40	40
	Break-time, electrical (via instantaneous UVR)	ms	73	73
Endurance	Mechanical (without maintenance)	operating cycles	7,500	7,500
	Electrical (without maintenance)	operating cycles	7,500	7,500
Switching frequency		operations/hour	60	60
Minimum interval between breaker trip and next closing of the circuit breaker (when used with the automatic mechanical reset of the reclosing lockout)		ms	80	80
Mounting position				
Dimensions	Fixed-mounted Circuit Breaker	width	18.1	
		height	14.6	
		depth	9.5	
	Guide Frame (for draw-out version)	width	18.1	
		height	15.0	
Weight	Fixed-mounted Circuit Breaker (w/o main busbar connectors)	lb/kg	86 / 39	86 / 39
	Drawout Circuit Breaker	lb/kg	137 / 62	137 / 62
	Guide Frame	lb/kg	108 / 49	108 / 49
Auxiliary secondary wire size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal (standard)		1 x 14 or 2 x AWG 16	
	Tension spring terminal		2 x AWG 14	
	Ring tongue terminal		2 x AWG 14 1 x AWG 10 ¹ 2 x AWG 16	
	Pigtail leads (fixed mount breaker only)		1 x AWG 14, 40" long	
TOC wire connection size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal		1 x AWG 14	
MOC wire connection size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal		1 x AWG 14	

¹ For use only with Siemens supplied ring terminals (WL10RL)

Breaker Technical Data

Type RCS Rear Connected Switchboards

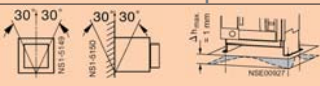
WL UL 489 Insulated Case Circuit Breakers

Frame Rating			Frame Size 2		
Rated Current at 50/60 Hz		A	800	1200	1600
Rated voltage		V AC	600	600	600
Permissible ambient temperature	Operation (for operation with LCD max 55°C)	C	-25 / +70	-25 / +70	-25 / +70
	Storage (observe special conditions for LCD)	C	-40 / +70	-40 / +70	-40 / +70
Power loss at rated current I_n (with 3-phase symmetrical load)	Drawout version	W	85	150	320
	Fixed mount version	W	40	80	120
Operating times	Make-time	ms	35	35	35
	Break-time	ms	34	34	34
	Make-time, electrical (via closing solenoid)	ms	50	50	50
	Break-time, electrical (via shunt trip)	ms	40	40	40
	Break-time, electrical (via instantaneous UVR)	ms	73	73	73
Endurance	Mechanical (without maintenance)	operating cycles	10,000 5,000 (C-Class)	10,000 5,000 (C-Class)	10,000 5,000 (C-Class)
	Electrical (without maintenance)	operating cycles	7,500 5,000 (C-Class)	7,500 5,000 (C-Class)	7,500 5,000 (C-Class)
Switching frequency		operations/hour	60	60	60
Minimum interval between breaker trip and next closing of the circuit breaker (when used with the automatic mechanical reset of the reclosing lockout)		ms	80	80	80
Mounting position					
Dimensions	Fixed-mounted Circuit Breaker	width	18.1		
		height	18.7		
		depth	9.5		
	Guide Frame (for draw-out version)	width	18.1		
		height	20.3		
		depth	18.6		
Weight	Fixed-mounted Circuit Breaker (w/o main busbar connectors)	lb/kg	124 / 56 148 / 67 (C-Class)	124 / 56 148 / 67 (C-Class)	124 / 56 148 / 67 (C-Class)
	Drawout Circuit Breaker	lb/kg	159 / 72 220 / 100 (C-Class)	159 / 72 220 / 100 (C-Class)	159 / 72 220 / 100 (C-Class)
	Guide Frame	lb/kg	112 / 51 163 / 74 (C-Class)	112 / 51 163 / 74 (C-Class)	112 / 51 163 / 74 (C-Class)
Auxiliary secondary wire size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal (standard)		1 x AWG 14 or 2 x AWG 16		
	Tension spring terminal		2 x AWG 14		
	Ring tongue terminal		2 x AWG 14 1 x AWG 10 ¹ 2 x AWG 16		
	Pigtail leads (fixed mount breaker only)		1 x AWG 14, 40" long		
TOC wire connection size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal		1 x AWG 14		
MOC wire connection size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal		1 x AWG 14		

¹ For use only with Siemens supplied ring terminals (WL10RL)

Breaker Technical Data

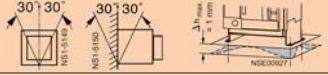
Type RCS Rear Connected Switchboards

Frame Rating Rated Current at 50/60 Hz			Frame Size 2		
A			2000	2500	3000
Rated voltage	V AC		600	600	600
Permissible ambient temperature	Operation (for operation with LCD max 55°C)	C	-25 / +70	-25 / +70	-25 / +70
	Storage (observe special conditions for LCD)	C	-40 / +70	-40 / +70	-40 / +70
Power loss at rated current I_n (with 3-phase symmetrical load)	Drawout version	W	500	680	1000
	Fixed mount version	W	230	320	450
Operating times	Make-time	ms	35	35	35
	Break-time	ms	34	34	34
	Make-time, electrical (via closing solenoid)	ms	50	50	50
	Break-time, electrical (via shunt trip)	ms	40	40	40
	Break-time, electrical (via instantaneous UVR)	ms	73	73	73
Endurance	Mechanical (without maintenance)	operating cycles	10,000 5,000 (C-Class)	10,000 5,000 (C-Class)	10,000 5,000 (C-Class)
	Electrical (without maintenance)	operating cycles	4,000	4,000	4,000
Switching frequency		operations/hour	60	60	60
Minimum interval between breaker trip and next closing of the circuit breaker (when used with the automatic mechanical reset of the reclosing lockout)		ms	80	80	80
Mounting position					
Dimensions	Fixed-mounted Circuit Breaker	width	18.1		
		height	18.7		
		depth	9.5		
	Guide Frame (for draw-out version)	width	18.1		
		height	20.3		
		depth	18.6		
Weight	Fixed-mounted Circuit Breaker (w/o main busbar connectors)	lb/kg	130 / 59 148 / 67 (C-Class)	141 / 64 148 / 67 (C-Class)	141 / 64 148 / 67 (C-Class)
	Drawout Circuit Breaker	lb/kg	177 / 80 220 / 100 (C-Class)	209 / 95 220 / 100 (C-Class)	209 / 95 220 / 100 (C-Class)
	Guide Frame	lb/kg	128 / 58 163 / 74 (C-Class)	152 / 69 163 / 74 (C-Class)	152 / 69 163 / 74 (C-Class)
Auxiliary secondary wire size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal (standard)		1 x AWG 14 or 2 x AWG 16		
	Tension spring terminal		2 x AWG 14		
	Ring tongue terminal		2 x AWG 14 1 x AWG 10 ¹ 2 x AWG 16		
	Pigtail leads (fixed mount breaker only)		1 x AWG 14, 40" long		
TOC wire connection size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal		1 x AWG 14		
MOC wire connection size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal		1 x AWG 14		

¹ For use only with Siemens supplied ring terminals (WL10RL)

Breaker Technical Data

Type RCS Rear Connected Switchboards

Frame Rating			Frame Size 3	
Rated Current at 50/60 Hz			4000	5000
Rated voltage		V AC	600	600
Permissible ambient temperature	Operation (for operation with LCD max 55°C)	C	-25 / +70	-25 / +70
	Storage (observe special conditions for LCD)	C	-40 / +70	-40 / +70
Power loss at rated current I_n (with 3-phase symmetrical load)	Drawout version	W	1100	1650
	Fixed mount version	W	580	950
Operating times	Make-time	ms	35	35
	Break-time	ms	34	34
	Make-time, electrical (via closing solenoid)	ms	50	50
	Break-time, electrical (via shunt trip)	ms	40	40
	Break-time, electrical (via instantaneous UVR)	ms	73	73
Endurance	Mechanical (without maintenance)	operating cycles	5,000	5,000
	Electrical (without maintenance)	operating cycles	2,000	2,000
Switching frequency		operations/hour	60	60
Minimum interval between breaker trip and next closing of the circuit breaker (when used with the automatic mechanical reset of the reclosing lockout)		ms	80	80
Mounting Position				
Dimensions	Fixed-mounted Circuit Breaker	width	26.8	
		height	20.7	
		depth	9.5	
	Guide Frame (for draw-out version)	width	27.7	
		height	20.3	
		depth	18.6	
Weight	Fixed-mounted Circuit Breaker (w/o main busbar connectors)		181 / 82 200 / 90 (C-Class)	181 / 82 200 / 90 (C-Class)
	Drawout Circuit Breaker		278 / 126	278 / 126
	Guide Frame		306 / 139	306 / 139
Auxiliary secondary wire size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal (standard)		1 x AWG 14 or 2 x AWG 16	
	Tension spring terminal		2 x AWG 14	
	Ring tongue terminal		2 x AWG 14 1 x AWG 10 ¹ 2 x AWG 16	
	Pigtail leads (fixed mount breaker only)		1 x AWG 14, 40" long	
TOC wire connection size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal		1 x AWG 14	
MOC wire connection size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal		1 x AWG 14	

¹ For use only with Siemens supplied ring terminals (WL10RL)

Breaker Technical Data

Type RCS Rear Connected Switchboards

WL Circuit Breakers ANSI / UL 1066

Breaker Ratings

Frame Rating		Frame Size 2																
		800					1600					2000				3200		
		N	S	H	L	F	N	S	H	L	F	S	H	L	F	S	H	L
Interrupting Current I _{cs}																		
(kAIR RMS) 50/60 Hz	254V AC	50	65	85	100	200	50	65	85	100	200	65	85	100	200	65	85	100
	508V AC	50	65	85	100	200	50	65	85	100	200	65	85	100	200	65	85	100
	635V AC	50	65	65	85	200	50	65	65	85	200	65	65	85	200	65	65	85
Short-time Withstand Current I _{cw} (kA RMS)																		
50/60 Hz	0.5 s	50	65	65	85	—	50	65	65	85	—	65	65	85	—	65	65	85
Extended Instantaneous Protection	285																	
(kA RMS)	508V AC	50	65	95	100	—	50	65	85	100	—	65	85	100	—	65	85	100
	635V AC	50	65	65	85	—	50	65	65	85	—	65	65	85	—	65	65	85
Close and Latch Ratings																		
(kA RMS) 50/60 Hz		50	65	65	85	65	50	65	65	85	65	65	65	85	65	65	65	85
Rating Plug Range		200 – 800A					200 – 1600A					200 – 2000A				200 – 3200A		
Endurance Rating																		
(switching operations with maintenance) ¹	Mechanical	15,000					15,000					15,000				15,000		
	Electrical	15,000					15,000					15,000				15,000		

Frame Rating Rating Class		Frame Size 3									
		3200		4000				5000			
		M	F	H	L	M	F	H	L	M	F
Interrupting Current I_{cs} (kAIR RMS) 50/60 Hz	254V AC	150	200	85	100	150	200	85	100	150	200
	508V AC	150	200	85	100	150	200	85	100	150	200
	635V AC	85	200	85	85	85	200	85	85	85	200
Short-time Withstand Current I_{cw} (kA RMS) 50/60 Hz	0.5 s	100 ²	—	85	100 ²	100 ²	—	85	100 ²	100 ²	—
Extended Instantaneous Protection (kA RMS)	254V AC	—	—	—	—	—	—	—	—	—	—
	508V AC	150	—	85	100	150	—	85	100	150	—
	635V AC	85	—	85	85	85	—	85	85	85	—
Close and Latch Ratings (kA RMS) 50/60 Hz		100	85	85	100	100	85	85	100	100	85
Rating Plug Range		800 – 3200A		800 – 4000A				800 – 5000A			
Endurance Rating (switching operations with maintenance) ¹	Mechanical	10,000		10,000				10,000			
	Electrical	10,000		10,000				10,000			

¹ Maintenance means: replacing main contacts and arc chutes (see operating instructions).

² Do not apply breaker at 635V AC on a system with available fault current > 85kA RMS.

Breaker Technical Data

Type RCS Rear Connected Switchboards

WL Non-Automatic Switches ANSI / UL 1066

Ratings

Frame Rating Rating Class		Frame Size 2								Frame Size III			
		800		1600		2000		3200		3200	4000		5000
		L	F	L	F	L	F	L	F	L	F	L	F
Short-time Withstand Current (kA RMS) 50/60 Hz	0.5 s	85	20	85	20	85	20	85	40	100 ¹	40	100 ¹	40
Breaking Capacity with External Relay (kA RMS) 50/60 Hz, Instantaneous trip	254V AC	100	20	100	20	100	20	100	40	100	40	100	40
	506V AC	100	20	100	20	100	20	100	40	100	40	100	40
	635V AC	85	20	85	20	85	20	85	40	85	40	85	40

WL Circuit Breakers

Frame Rating		Frame Size 2				Frame Size 3		
		800	1600	2000	3200	3200	4000	5000
Rated current I_n at 40°C, at 50/60Hz	A	800	1600	2000	3200	3200	4000	5000
Rated operational voltage	VAC	600	600	600	600	600	600	600
IEC Rated Insulation voltage U_i	VAC	690	690	690	690	690	690	690
IEC 60-947-1 Rated impulse withstand voltage U_{imp} Main conducting paths auxiliary circuits	kV	8	8	8	8	8	8	8
	kV	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Permissible ambient temperature operation (for operation with LCD max. 55°C)	°C	-25 / +70	-25 / +70	-25 / +70	-25 / +70	-25 / +70	-25 / +70	-25 / +70
Storage (observe special conditions for LCD)	°C	-40 / +70	-40 / +70	-40 / +70	-40 / +70	-40 / +70	-40 / +70	-40 / +70
Power loss at I_n with 3-phase ¹ symmetrical load	W	85 130 (fused)	320 520 (fused)	500 850 (fused)	1150	700 ²	1100 ²	1650 ²
Operating times Make-time Break-time Make-time, electrical (via closing solenoid) Break-time, electrical (via shunt trip) Break-time, electrical (via instantaneous)	ms	35	35	35	35	35	35	35
	ms	34	34	34	34	34	34	34
	ms	50	50	50	50	50	50	50
	ms	40	40	40	40	40	40	40
	ms	73	73	73	73	73	73	73

¹ Do not apply switch at 635V AC on a system with available fault current > 85kA RMS.

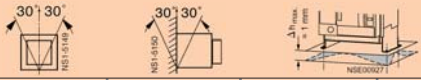
² Consult factory for fuse carriage power loss.

Breaker Technical Data

Type RCS Rear Connected Switchboards

WL Circuit Breakers ANSI/UL 1066

Ratings

Frame Rating		Frame Size 2				Frame Size 3		
		800	1600	2000	3200	3200	4000	5000
Endurance								
Mechanical (without maintenance)	operating cycles	12,500	12,500	10,000	10,000	5,000	5,000	5,000
Mechanical (with maintenance) ¹	operating cycles	15,000	15,000	15,000	15,000	10,000	10,000	10,000
Electrical (without maintenance)	operating cycles	7,500	7,500	4,000	4,000	2,000	2,000	2,000
Electrical (with maintenance) ¹	operating cycles	15,000	15,000	15,000	15,000	10,000	10,000	10,000
Switching frequency	1/h	60	60	60	60	60	60	60
Minimum interval between breaker trip and next closing of the circuit breaker (when used with the automatic mechanical reset of the bell alarm)	ms	80	80	80	80	80	80	80
Mounting Position								
Auxiliary secondary wire size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal	1 x AWG 14 or 2 x AWG 16	1 x AWG 14 or 2 x AWG 16	1 x AWG 14 or 2 x AWG 16	1 x AWG 14 or 2 x AWG 16	1 x AWG 14 or 2 x AWG 16	1 x AWG 14 or 2 x AWG 16	1 x AWG 14 or 2 x AWG 16
	Tension spring terminal	2 x AWG 14	2 x AWG 14	2 x AWG 14	2 x AWG 14	2 x AWG 14	2 x AWG 14	2 x AWG 14
	Ring tongue terminal (standard)	2 x AWG 14 1 x AWG 10 ² 2 x AWG 16	2 x AWG 14 1 x AWG 10 ² 2 x AWG 16	2 x AWG 14 1 x AWG 10 ² 2 x AWG 16	2 x AWG 14 1 x AWG 10 ² 2 x AWG 16	2 x AWG 14 1 x AWG 10 ² 2 x AWG 16	2 x AWG 14 1 x AWG 10 ² 2 x AWG 16	2 x AWG 14 1 x AWG 10 ² 2 x AWG 16
TOC wire connection size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal	1 x AWG 14	1 x AWG 14	1 x AWG 14	1 x AWG 14	1 x AWG 14	1 x AWG 14	1 x AWG 14
Weight								
Circuit Breaker	kg/lb	72/159	72/159	75/165	95/209	118/260	118/260	118/260
Guide Frame	kg/lb	51/112	51/112	60/132	69/152	139/306	139/306	139/306
MOC wire connection size (Cu) max # of aux. connecting leads x cross section (solid or stranded)	Bare wire pressure terminal	1 x AWG 14	1 x AWG 14	1 x AWG 14	1 x AWG 14	1 x AWG 14	1 x AWG 14	1 x AWG 14

¹ Maintenance consists of replacing main contacts and arc chutes (see operating instructions.)

² For use only with Siemens supplied ring terminals (WL10RL).

Breaker Technical Data

Type RCS Rear Connected Switchboards

WL Circuit Breaker Accessory Ratings

Manual Operating Mechanism with Mechanical Closing			
Closing/charging stored energy mechanism			
	Maximum actuating force required on hand lever	52 lbs	
	Number of hand lever strokes required	9	
Manual Operating Mechanism with Mechanical and Electrical Closing			
Charging stored-energy mechanism			
Closing solenoid and Shunt Trip	Coil voltage tolerance	24V DC	14 – 28V DC
		48V DC	28 – 56V DC
		120V AC / 125V DC	70 – 140V DC
			104 – 127V AC
		240V AC / 250V DC	140 – 280V DC
			208 – 254V AC
			180Y / 104V AC
			220Y / 127V AC
	Power consumption (5% duty cycle)		120 W for 50 ms
	Minimum closing solenoid actuation signal required		50 ms
Motor Operating Mechanism with Mechanical and Electrical Closing			
Spring charging motor			
	Motor voltage tolerance at 120V AC, 240V AC		85 – 110%
	Extended tolerance for battery operation at 24V DC, 48V DC, 125V DC, 250V DC		70 – 126%
	Power consumption of the motor		110 W
	Time required for charging the stored-energy mechanism		≤ 10 s
For motor and closing solenoid short-circuit protection			
	Short-circuit protection		
	Standard slow-blow cartridge fuse	24 – 60 V	6A
		110 – 250 V	3A
Auxiliary Release			
Undervoltage release (UVR)	Operating values		≥ 85% (circuit breaker can be closed)
			35 – 70% (circuit breaker opens)
	AC Coil voltage tolerance at 120V AC, 240V AC		85 – 110%
	DC Extended tolerance for battery operation at 24V DC, 48V DC, 125V DC, 250V DC		85 – 126%
Rated control supply voltage	AC 50/60Hz	V	120, 240
	DC	V	24, 48, 125, 250
Power consumption (inrush / continuous)	AC	VA	200 / 5
	DC	W	200 / 5
Opening time of the circuit breaker for AC / DC		ms	200
UVR (no time delay), 2 settings			
	Setting 1	ms	80
	Setting 2	ms	200
UVR (with time delay)			
	Adjustable delay	s	0.2 to 3.2
	Reset by additional NC direct opening	ms	≤ 100
Interlock Shunt Trip (100% continuous duty)			
	Operating range		85 – 110%
	Extended tolerance for battery operation at 24V DC, 48V DC, 125V DC, 250V DC		70 – 126%
Rated voltage	AC 50/60Hz	V	110, 230
	DC	V	24, 30, 48, 60, 110, 220
Power consumption	AC / DC	VA / W	15 / 15
Minimum shunt trip actuation signal at rated voltage		ms	60
Opening time of the circuit breaker at rated voltage		ms	80
Short circuit protection			1A
Smallest permissible fuse			

Breaker Technical Data

Type RCS Rear Connected Switchboards

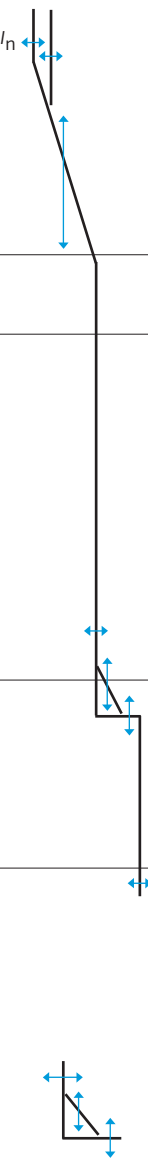
WL Circuit Breaker Accessory Ratings

Auxiliary Contacts and Mechanism Operated Contacts (MOC)					
Contact rating	Alternating current	50/60 Hz	Rated operational voltage	240V	
			Rated operational current, continuous	10A	
			Rated operational current, making	30A	
			Rated operational current, breaking	3A	
	Direct current	Rated operational voltage	24V, 125V, 250V		
		Rated operational current, continuous	5A		
		Rated operational current, making	1.1A at 24V, 1.1A at 125V, 0.55A at 250V		
		Rated operational current, breaking	1.1A at 24V, 1.1A at 125V, 0.55A at 250V		
Bell Alarm Switch and Ready-to-Close Signal Contact					
Contact rating	Alternating current	50/60 Hz	Rated operational voltage	240V	
			Rated operational current, continuous	5A	
			Rated operational current, making	8A	
			Rated operational current, breaking	5A	
	Direct current	Rated operational voltage	24V, 48V, 125V	250V DC ①	
		Rated operational current, continuous	0.4A	0.2A	
		Rated operational current, making	0.4A	0.2A	
		Rated operational current, breaking	0.4A	0.2A	
Shunt Trip, UVR and Blown Fuse Signaling Contacts					
Contact rating	Alternating current	50/60 Hz	Rated operational voltage	127V, 240V	
			Rated operational current, continuous	3A	
			Rated operational current, making	5A	
			Rated operational current, breaking	6A	
	Direct current	Rated operational voltage	24V, 48V, 125V	125V DC (IEC Rating Only)	
		Rated operational current, making	1.0A	0.5A	
		Rated operational current, breaking	1.0A	0.5A	
	Position Signal Contact on the Guide Frame (TOC)				
Breaker position:	Connected position		3 form C	1 form C	6 form C
	Test position		2 form C	or 1 form C	or 0 form C
	Disconnected position		1 form C	1 form C	0 form C
Contact rating	Alternating current	50/60 Hz	Rated operational voltage	120V	240V
			Rated operational current, continuous	10A	10A
			Rated operational current, making	6A	3A
			Rated operational current, breaking	6A	3A
	Direct current	Rated operational voltage	24V	48V, 125V	250V
		Rated operational current, continuous	6A	1A	1A
		Rated operational current, making	6A	0.22A	0.11A
		Rated operational current, breaking	6A	0.22A	0.11A

Breaker Technical Data

Type RCS Rear Connected Switchboards

Function Overview of the Electronic Trip Units

Basic Functions		ETU725	ETU727	ETU745
	L	Long-time overcurrent protection Function can be switched ON/OFF Setting range $I_R = I_n \times \dots$	✓	✓
		–	–	–
		0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.8, 0.9, 1	0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.8, 0.9, 1	0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.8, 0.9, 1
		–	–	✓
		10s, set at $6 \times I_R$	10s, set at $6 \times I_R$	2, 3.5, 5.5, 8, 10, 14, 17, 21, 25, 30
		–	–	1, 2, 3, 4, 5
		–	–	✓ (via slide switch)
		at $t_{sd}=20$ ms (M)	at $t_{sd}=20$ ms (M)	at $t_{sd}=20$ ms (M)
	N	Neutral protection Function can be switched ON/OFF N-conductor setting range $I_N = I_n \times \dots$	–	✓
		–	✓ (via slide switch)	✓ (via slide switch)
	S	Short-time delayed overcurrent protection Function can be switched ON/OFF Setting range $I_{sd} = I_n \times \dots$	–	✓
		–	–	✓ (via rotary switch)
		1.25, 1.5, 2, 2.5, 3, 4, 6, 8, 10, 12	1.25, 1.5, 2, 2.5, 3, 4, 6, 8, 10, 12	1.25, 1.5, 2, 2.5, 3, 4, 6, 8, 10, 12
		Setting range of time delay t_{sd} , fixed (seconds)	–	–
		0, 0.02 (M), 0.1, 0.2, 0.3, 0.4	0, 0.02 (M), 0.1, 0.2, 0.3, 0.4	0.02 (M), 0.1, 0.2, 0.3, 0.4, OFF
		– fixed only	– fixed only	✓ (via rotary switch)
		–	–	0.1, 0.2, 0.3, 0.4
		–	–	per CubicleBUS module
	I	Instantaneous overcurrent protection Function can be switched ON/OFF, Extended Instantaneous Protection is enabled when OFF Setting range $I_i = I_n \times \dots$	✓	✓
		–	–	✓ (via rotary switch)
	G	Ground fault protection ² Trip and alarm function Detection of the ground fault current by residual summing method Detection of the ground fault current by direct summing method Setting range of the I_g for trip Setting range of the I_g for alarm Setting range of the time delay t_g (seconds) Switch-selectable ground fault protection (I^2t / fixed) Setting range time delay t_g at I^2t ZSI ground function	–	✓ (standard)
		–	–	✓
		–	✓	✓
		–	–	✓
		–	A, B, C, D, E	A, B, C, D, E
		–	–	A, B, C, D, E
		–	0.1, 0.2, 0.3, 0.4, 0.5	0.1, 0.2, 0.3, 0.4, 0.5
		–	–	✓
		–	–	0.4, 0., 0.3, 0.4, 0.5
		–	–	per CubicleBUS module

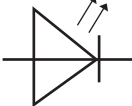
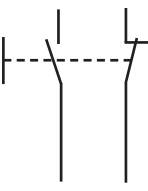
¹ Extended Instantaneous Protection (EIP) allows the WL breaker to be applied at the withstand rating of the breaker with minus 0% tolerance; that means no instantaneous override whatsoever. EIP further enables the circuit breaker to be applied up to the full instantaneous rating of the breaker on systems where the available fault current exceeds the withstand rating.

² Ground Fault Module cannot be removed after installation.

✓ available
– not available
○ optional

Breaker Technical Data

Type RCS Rear Connected Switchboards

Basic Functions		ETU725	ETU727	ETU745
Parameter sets				
	Selectable between parameter set A and B	–	–	–
LCD				
	LCD, alphanumeric (4-line)	–	–	○
	LCD, graphic	–	–	–
Communication				
	CubicleBUS integrated	–	–	✓
	Communication capability via PROFIBUS/MODBUS	–	–	✓
Metering function				
	Metering function capability with Metering Function or Metering Function PLUS	–	–	✓
Display by LED				
	Trip unit active	✓	✓	✓
	Alarm	✓	✓	✓
	ETU error	✓	✓	✓
	L trip	✓	✓	✓
	S trip	✓	✓	✓
	I trip	✓	✓	✓
	N trip	–	✓	✓
	G trip	–	✓	✓ (only with ground fault module)
	G alarm	–	–	✓ (only with ground fault module)
	Tripped by extended protection or protective relay function	–	–	✓
	Communication	–	–	✓
Signal contacts with external CubicleBUS modules (Opto or relay)				
	Overcurrent warning	–	–	✓
	Load shedding ON/OFF	–	–	✓
	Early signal of long-time trip (200 ms)	–	–	✓
	Temperature alarm	–	–	✓
	Phase unbalance	–	–	✓
	Instantaneous trip	–	–	✓
	Short-time trip	–	–	✓
	Long-time trip	–	–	✓
	Neutral conductor trip	–	–	✓
	Ground fault protection trip	–	–	✓ (only with ground fault module)
	Ground fault alarm	–	–	✓ (only with ground fault module)
	Auxiliary relay	–	–	✓
	ETU error	–	–	✓

Step for Settings via Communications or ETU Key Pad

from ... to	step
0 ... 1	0.1
1 ... 100	1
100 ... 500	5
500 ... 1000	10
1000 ... 1600	50
1600 ... 10000	100
10000 ... max	1000

Setting range of the I_g

	Frame Size II	Frame Size III
A	100 A	400 A
B	300 A	600 A
C	600 A	800 A
D	900 A	1000 A
E	1200 A	1200 A

- ✓ available
- not available
- optional

Breaker Technical Data

Type RCS Rear Connected Switchboards

Basic Functions		ETU748	ETU755	ETU776
	L	Long-time overcurrent protection Function can be switched ON/OFF Setting range $I_R = I_n \times \dots$	✓	✓
		–	–	–
		0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.8, 0.9, 1	0.4 ... 1 (step: 1A)	0.4 ... 1 (step: 1A)
		✓	✓ (via communications)	✓
		2, 3.5, 5.5, 8, 10, 14, 17, 21, 25, 30	2 ... 30 (step: 0.1s)	2 ... 30 (step: 0.1s)
		1, 2, 3, 4, 5	1 ... 5 (step: 0.1s)	1 ... 5 (step: 0.1s)
N	Neutral protection Function can be switched ON/OFF N-conductor setting range $I_N = I_n \times \dots$	–	✓	✓
		✓ (via rotary)	✓ (via slide switch)	✓ (via keypad or communications)
		–	1	0.5 ... 1
	S	Short-time delayed overcurrent protection Function can be switched ON/OFF Setting range $I_{sd} = I_n \times \dots$	✓	✓
		✓ (via rotary switch)	✓ (via communications)	✓ (via key pad or communications)
		1.25, 1.5, 2, 2.5, 3, 4, 6, 8, 10, 12	1.25 ... 0.8 x $I_{CW} = \max$ (step: 10A)	1.25 ... 0.8 x $I_{CW} = \max$ (step: 10A)
I	Instantaneous overcurrent protection Function can be switched ON/OFF, Extended Instantaneous Protection is enabled when OFF Setting range $I_i = I_n \times \dots$	✓	✓	✓
		–	✓ (via communications)	✓ (via key pad or communications)
		– $I_i = I_{CW} = EIP^1$	$1.5 \times I_n \dots 0.8 \times I_{CS} = \max$, OFF = $I_{CW} = EIP^1$	$1.5 \times I_n \dots 0.8 \times I_{CS} = \max$, OFF = $I_{CW} = EIP$
	G	Ground fault protection² Trip and alarm function Detection of the ground fault current by residual summing method Detection of the ground fault current by direct sensing method Setting range of the I_g for trip Setting range of the I_g for alarm Setting range of the time delay t_g (seconds) Switch-selectable ground fault protection (I^2t fixed) Setting range time delay t_g at I^2t ZSI ground function	○ (field install. module)	○ (field install. module)
		✓	✓ (via communications)	✓ (via key pad or communications)
		✓	✓	✓
		✓	✓	✓
		A, B, C, D, E	A ... E (step: 1A)	A ... E (step: 1A)
		A, B, C, D, E	A ... E (step: 1A)-	A ... E (step: 1A)
		0.1, 0.2, 0.3, 0.4, 0.5	0.1 ... 0.5 (step: 0.001s)	0.1 ... 0.5 (step: 0.001s)
		✓	✓	✓
		0.1, 0.2, 0.3, 0.4, 0.5 per CubicleBUS module	0.1 ... 0.5 (step: 0.001s) per CubicleBUS module	0.1 ... 0.5 (step: 0.001s) per CubicleBUS module

¹ Extended Instantaneous Protection (EIP) allows the WL breaker to be applied at the withstand rating of the breaker with minus 0% tolerance; that means no instantaneous override whatsoever. EIP further enables the circuit breaker to be applied up to the full instantaneous rating of the breaker on systems where the available fault current exceeds the withstand rating.

² Ground Fault Module cannot be removed after installation.

Notes: M = Motor protection setting (20 ms)

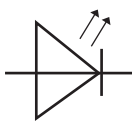
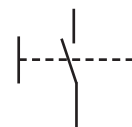
Communications = Setting the parameters of the trip unit via the Breaker Data Adapter, PROFIBUS/MODBUS

Key pad = Direct input at the trip unit

✓ available
– not available
○ optional

Breaker Technical Data

Type RCS Rear Connected Switchboards

Basic Functions		ETU748	ETU755	ETU776
Parameter sets				
	Selectable between parameter set A and B	–	✓	✓
LCD	LCD, alphanumeric (4-line)	○	–	–
	LCD, graphic	–	–	✓
Communication				
	CubicleBUS integrated	✓	✓	✓
	Communication capability via PROFIBUS/MODBUS	✓	✓	✓
Metering function				
	Metering function capability with Metering Function PLUS	✓	✓	✓
Display by LED				
	Trip unit active	✓	✓	✓
	Alarm	✓	✓	✓
	ETU error	✓	✓	✓
	L trip	✓	✓	✓
	S trip	✓	✓	✓
	I trip	–	✓	✓
	N trip	✓	✓	✓
	G trip	✓ (only with ground fault module)	✓ (only with ground fault module)	✓ (only with ground fault module)
	G alarm	✓ (only with ground fault module)	✓ (only with ground fault module)	✓ (only with ground fault module)
	Tripped by extended protection or protective relay function	✓	✓	✓
	Communication	✓	✓	✓
Signal contacts with external CubicleBUS modules (Opto or relay)				
	Overcurrent warning	✓	✓	✓
	Load shedding ON/OFF	✓	✓	✓
	Early signal of long-time trip (200 ms)	✓	✓	✓
	Temperature alarm	✓	✓	✓
	Phase unbalance	✓	✓	✓
	Instantaneous trip	✓	✓	✓
	Short-time trip	✓	✓	✓
	Long-time trip	✓	✓	✓
	Neutral conductor trip	✓	✓	✓
	Ground fault protection trip	✓ (only with ground fault module)	✓ (only with ground fault module)	✓ (only with ground fault module)
	Ground fault alarm	✓ (only with ground fault module)	✓ (only with ground fault module)	✓ (only with ground fault module)
	Auxiliary relay	✓	✓	✓
	ETU error	✓	✓	✓

Metering and Protective Relaying Accuracies

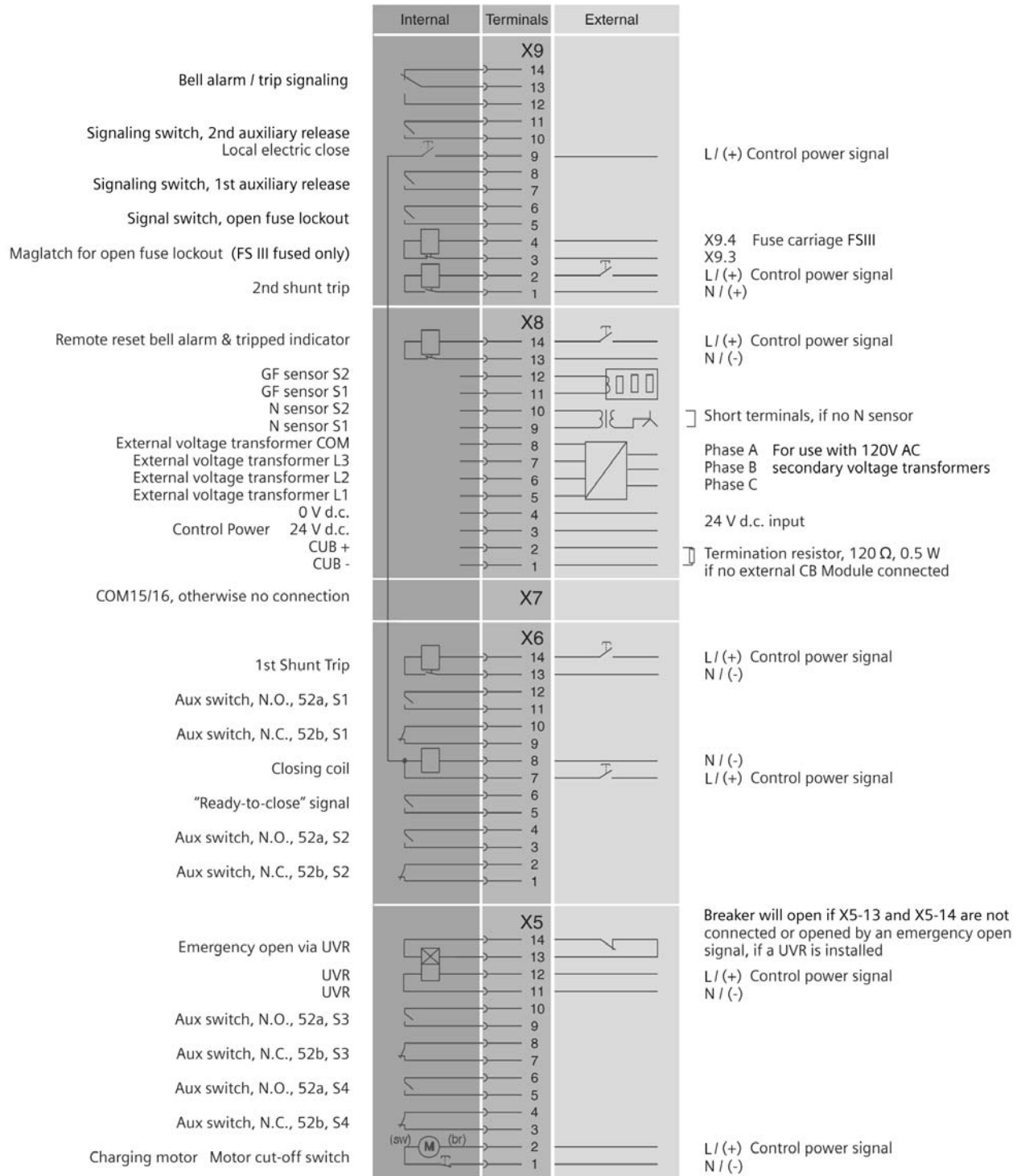
Protective Relaying	Pick-up Accuracy	Metering Values	Accuracy
Phase Unbalance (I)	2% (5...50% I_N)	(I) at $1 \times I_N$	+/- 1%
Phase Unbalance (V)	2% (5...50% V_N)	(V) at $1 \times V_N$	+/- 0.5%
THD (I) (up to 29th)	+/- 3% (80...120% V_N)	(P) at $1 \times I_N$	+/- 3%
THD (V) (up to 29th)	+/- 3% (80...120% V_N)	(S) at $1 \times I_N$	+/- 2%
Overvoltage	+/- 2% (80...120% V_N)	(Q) at $1 \times I_N$	+/- 3%
Undervoltage	+/- 2% (80...120% V_N)		
Under/Over Frequency	+/- 0.1 Hz		

- ✓ available
- not available
- optional

WL Secondary Terminal Assignments

Type RCS Rear Connected Switchboards

WL Breaker Secondary Terminal Assignments

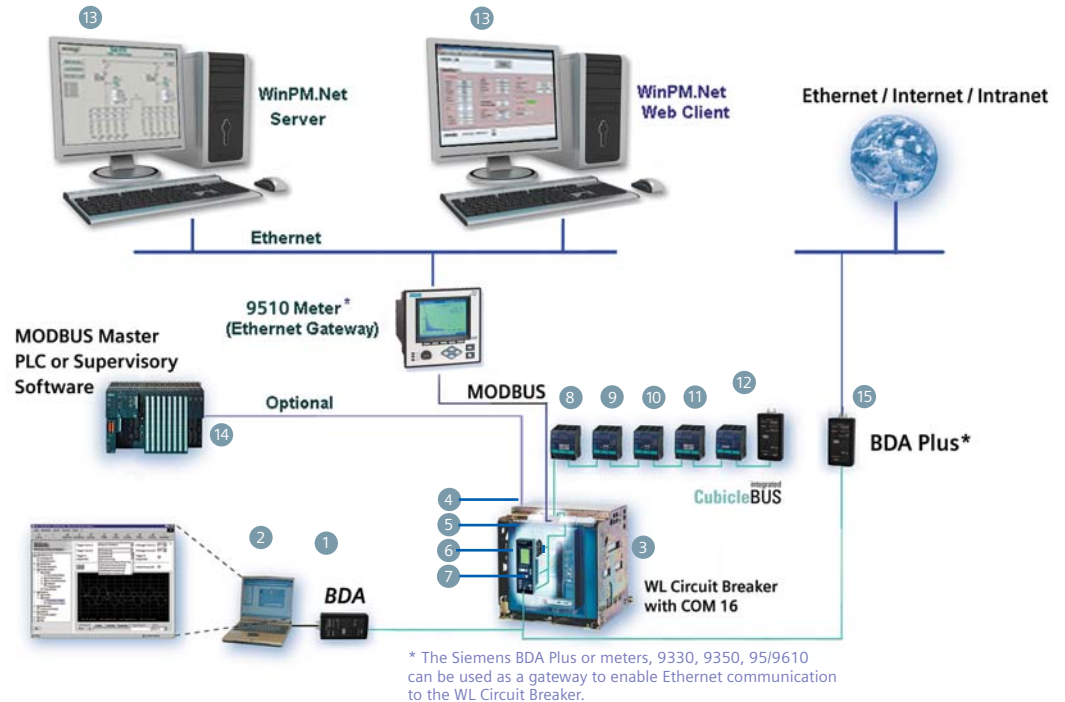


WL Communications Overview

Type RCS Rear Connected Switchboards

Connection Diagram

- 1 Breaker Data Adapter (BDA)
- 2 Browser-capable input and output device (e.g. notebook)
- 3 WL Circuit Breaker
- 4 COM16 MODBUS module or COM 15 PROFIBUS module
- 5 Breaker Status Sensor (BSS)
- 6 Electronic Trip Unit
- 7 Metering function PLUS
- 8 Zone Selective Interlocking (ZSI) module
- 9 Digital output module with relay or optocoupler outputs
- 10 Digital output module with relay or optocoupler outputs, remotely configurable
- 11 Analog output module
- 12 Digital input module
- 13 WinPM.Net on PC
- 14 PLC (e.g. SIMATIC S7)
- 15 BDA Plus



Features

- Industry standard MODBUS or PROFIBUS communication available on all WL breakers from 200A to 5000A.
- The high modularity of the WL Circuit Breakers and accessories allows simple retrofitting of all communication components.
- The ability to connect additional -input and output modules to the breaker-internal CubicleBUS of the WL opens up a range of opportunities to reduce secondary device count and wiring and to increase functionality implemented in switchboard.
- Innovative software products for local configuration, operation, monitoring and diagnostics of WL Circuit Breakers using MODBUS, PROFIBUS or via Ethernet/Intranet/Internet.
- Complete integration of WL Circuit Breakers in all Totally Integrated Power and Totally Integrated Automation Solutions.

Section Configurations

Type RCS Rear Connected Switchboards

General Notes:

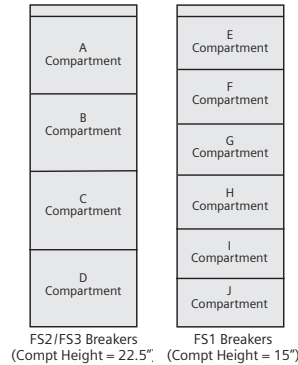
- A blank/instrument compartment can always be substituted for a breaker compartment
- Any 22" wide section can be 32" wide if more conduit working room is needed
- For bus duct connections – if incoming is top, Compartment A must be blank/instrument, if incoming is bottom, Compartment D must be blank/instrument
- Bussed transition section is 22" wide
- For close coupled dry type transformer connections, Compartment A must be blank/instrument
- Utility metering is always in a separate section. Section width is dependent on utility

Switchboard Depth Dimensional Information

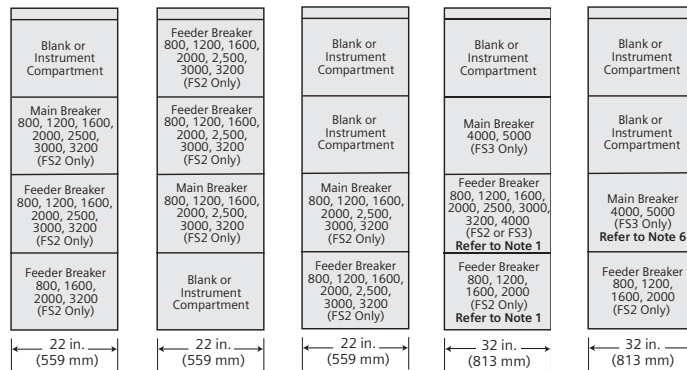
(Dimensions below are for internal frames – not total structure depth)

- Non-fused indoor - 60" standard, 70" and 80" optional.
- Fused indoor - 65" standard, 75" and 80" optional.
- Non-fused non-walk-in outdoor - 60" standard and 75" optional.
- Fused non-walk-in outdoor - 65" standard and 75" optional.
- Non-fused walk-in outdoor - 60" standard and 75" optional.
- Fused walk-in outdoor - 65" standard and 75" optional.
- Walk-in aisle is 42" deep
- Sections with cable-connected main, tie and/or feeder breakers that are 3200 amp or greater must be minimum depth of 70" for unfused breakers and 75" for fused breakers

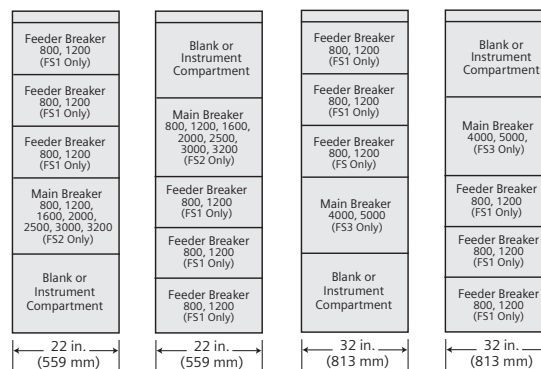
Section Compartment Arrangement



Main Sections (Non-fused Breakers)



Main Sections (Non-fused Breakers)



Note 1 – If a 4000 amp feeder breaker is installed in Compartment C, Compartment D must be a Blank or Instrument Compartment.

Note 2 – If a 4000 amp breaker is installed in Compartment B, Compartment A must be a Blank or Instrument Compartment.

Note 3 – Only one 800, 1600, 2000 amp feeder breaker per section is allowed and must be located at the same location (top or bottom) as the horizontal main bus.

Note 4 – If a 3200 amp breaker is installed in Compartment B, the middle level through bus is not available.

Note 5 – If a 3200 amp breaker is installed in Compartment D, the lower level through bus is not available.

Note 6 – If incoming is bottom, feeder breakers can mount in compartments A and/or B.

Section Configurations

Type RCS Rear Connected Switchboards

Main Sections (Fused Breakers)

Blank or Instrument Compartment	Blank or Instrument Compartment	Blank or Instrument Compartment	Blank or Instrument Compartment
Main Breaker 800, 1600, 2000	Blank or Instrument Compartment	Main Breaker 3200, 4000	Main Breaker 5000
Feeder Breaker 800, 1600, 2000	Main Breaker 800, 1600, 2000		
Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000	Blank or Instrument Compartment
22 in. (559 mm)	22 in. (559 mm)	32 in. (813 mm)	32 in. (813 mm)

Tie Sections (Non-fused Breakers)

Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only) Refer to Note 2	Feeder Breaker 800, 1200 (FS1 Only)	Blank or Instrument Compartment	Feeder Breaker 800, 1200 (FS1 Only)
Tie Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Tie Breaker 4000 (FS3 Only)	Feeder Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200, 4000 (FS2 or FS3) Refer to Note 1	Feeder Breaker 800, 1200 (FS1 Only)	Tie Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Feeder Breaker 800, 1200 (FS1 Only)
Feeder Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Tie Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200, 4000 (FS2 or FS3) Refer to Note 1	Tie Breaker 4000, 5000 (FS3 Only)	Tie Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Feeder Breaker 800, 1200 (FS1 Only)	Tie Breaker 4000, 5000 (FS3 Only)
Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only) Refer to Note 1	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Blank or Instrument Compartment	Feeder Breaker 800, 1200 (FS1 Only)	Blank or Instrument Compartment
22 in. (559 mm)	22 in. (559 mm)	32 in. (813 mm)	32 in. (813 mm)	22 in. (559 mm)	22 in. (559 mm)	32 in. (813 mm)

Tie Sections (Fused Breakers)

Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000	Blank or Instrument Compartment
Tie Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000	Tie Breaker 3200, 4000	Tie Breaker 5000
Feeder Breaker 800, 1600, 2000	Tie Breaker 800, 1600, 2000		
Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000	Blank or Instrument Compartment
22 in. (559 mm)	22 in. (559 mm)	32 in. (813 mm)	32 in. (813 mm)

Section Configurations

Type RCS Rear Connected Switchboards

Main and Tie Sections (Non-fused Breakers)

Blank or Instrument Compartment	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Blank or Instrument Compartment	Blank or Instrument Compartment	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)
Main Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Tie Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Main Breaker 800, 1200, 1600, 2000 (FS2 Only)	Main Breaker 4000 (FS3 Only)	Tie Breaker 4000 (FS3 Only)
Tie Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Main Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Tie Breaker 800, 1200, 1600, 2000 (FS2 Only)	Tie Breaker 4000 (FS3 Only)	Main Breaker 4000 (FS3 Only)
Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Main Breaker 800, 1600, 2000 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)
22 in. (559 mm)	22 in. (559 mm)	22 in. (559 mm)	32 in. (813 mm)	32 in. (813 mm)

Main and Tie Sections (Fused Breakers)

Blank or Instrument Compartment	Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000
Main Breaker 800, 1600, 2000	Main Breaker 800, 1600, 2000	Tie Breaker 800, 1600, 2000
Tie Breaker 800, 1600, 2000	Tie Breaker 800, 1600, 2000	Main Breaker 800, 1600, 2000
Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000
22 in. (559 mm)	22 in. (559 mm)	22 in. (559 mm)

Feeder Sections (Non-fused Breakers)

Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Blank or Instrument Compartment	Feeder Breaker 800, 1200 (FS1 Only)	Feeder Breaker 800, 1200 (FS1 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)
Feeder Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Feeder Breaker 800, 1200, 1600, 2000 (FS2 Only)	Feeder Breaker 4000, 5000 (FS3 Only)	Feeder Breaker 800, 1200 (FS1 Only)	Feeder Breaker 800, 1200 (FS1 Only)	Feeder Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)
Feeder Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only) Refer to Note 4	Feeder Breaker 4000, 5000 (FS3 Only)	Feeder Breaker 4000, 5000 (FS3 Only)	Feeder Breaker 800, 1200 (FS1 Only)	Feeder Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Feeder Breaker 800, 1200 (FS1 Only)
Feeder Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only) Refer to Note 5	Blank or Instrument Compartment	Blank or Instrument Compartment	Feeder Breaker 800, 1200 (FS1 Only)	Feeder Breaker 800, 1200, 1600, 2000, 2500, 3000, 3200 (FS2 Only)	Feeder Breaker 800, 1200 (FS1 Only)
22 in. (559 mm)	32 in. (813 mm)	32 in. (813 mm)	22 in. (559 mm)	22 in. (559 mm)	22 in. (559 mm)

Feeder Sections (Fused Breakers)

Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000 Refer to Note 3	Blank or Instrument Compartment
Feeder Breaker 800, 1600, 2000	Feeder Breaker 3200, 4000	Feeder Breaker 5000
Feeder Breaker 800, 1600, 2000		
Feeder Breaker 800, 1600, 2000	Feeder Breaker 800, 1600, 2000 Refer to Note 3	Blank or Instrument Compartment
22 in. (559 mm)	32 in. (813 mm)	32 in. (813 mm)

Note 1 – If a 4000 amp feeder breaker is installed in Compartment C, Compartment D must be a Blank or Instrument Compartment.

Note 2 – If a 4000 amp breaker is installed in Compartment B, Compartment A must be a Blank or Instrument Compartment.

Note 3 – Only one 800, 1600, 2000 amp feeder breaker per section is allowed and must be located at the same location (top or bottom) as the horizontal main bus.

Note 4 – If a 3200 amp breaker is installed in Compartment B, the middle level through bus is not available.

Note 5 – If a 3200 amp breaker is installed in Compartment D, the lower level through bus is not available.

Note 6 – If incoming is bottom, feeder breakers can mount in compartments A and/or B.

Shipping Weight/Dimensional Information

Type RCS Rear Connected Switchboards

Siemens Type RCS Switchboard can be configured in many ways by combining different section types. Up to five vertical sections plus a transition section can be shipped together as a unit.

Maximum shipping split length is 110 in. (2794 mm). If all vertical sections are not to be shipped as a unit, specifications need to be provided that describe the limiting factors (e.g., low door or narrow hallway).

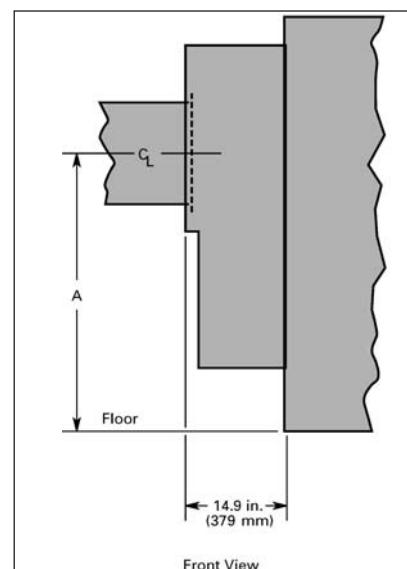
Normal indoor vertical sections are 96 in. (2438 mm) high and a minimum 60 in. (1524 mm) deep. A top-mounted hoist, which is shipped as an accessory in a separate container, adds 6.2 in. (157 mm) for a total installed height of 102.2 in. (2596 mm).

The outdoor switchboard assembly contains the indoor assembly in an outdoor housing. The overall height is 112.8 in. (2865 mm) for non walk-in designs and 114 in. (2896 mm) for walk-in designs. The depth of a

non walk-in outdoor assembly with a 60 in. (1524 mm) internal structure is 82.3 in. (2090 mm) and the depth of a walk-in outdoor assembly with a 60 in. (1524 mm) internal structure is 110.7 in. (2812 mm). Maximum shipping split length for outdoor structures is 66 in. (1676 mm).

The major assembly sections include:

- Transition Sections — used as transition to liquid filled transformer or to outdoor dry type transformers.
- Auxiliary Sections — used as incoming bus duct or cable entrance when a main breaker is not used.
- Main Sections — used to contain main breaker and may house metering and feeder breakers.
- Feeder Sections — used to feeder contain breakers and other equipment such as instrumentation.
- Tie Sections — used to contain tie breaker and other equipment such as feeder breakers.



Transition Section For Liquid Filled and Outdoor Dry Type Transformers

	Dimension A in inches (mm)	Weight in lbs. (kg)
Indoor	55 (1397)	500 (227)
Outdoor	61 (1549)	550 (250)

Approximate Weight – Lbs.

Section Type	22" Indoor	22" Outdoor	32" Indoor	32" Outdoor	38" Indoor	38" Outdoor	48" Indoor	48" Outdoor
Auxiliary	1000 (450)	2000 (900)	1300 (585)	2500 (1125)	1800 (810)	3200 (1440)	N/A	N/A
Utility Metering	N/A	N/A	N/A	N/A	2100 (945)	3500 (1575)	2600 (1170)	4500 (2025)
Breaker	1400 (630)	2400 (1080)	2000 (900)	3300 (1485)	N/A	N/A	N/A	N/A

Weights shown in pounds and () kilograms.

Weights shown do not include weight of circuit breaker removable element (but does include cradle).

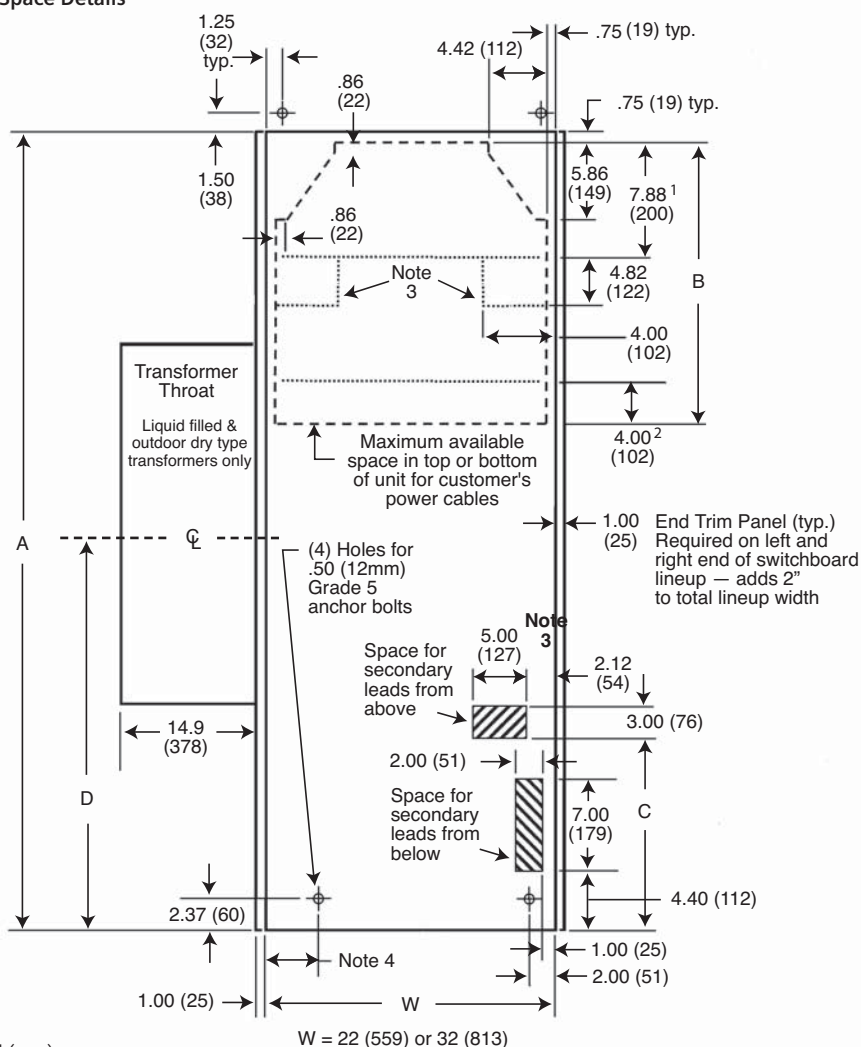
Add 400 lbs for hoist and track.

On outdoor switchboard, add 500 lbs for end walls (weight is for both ends). Refer to shipping documents for actual weights.

Shipping Weight/Dimensional Information

Type RCS Rear Connected Switchboards

Indoor Floor Plan and Cable Space Details



Dimensions shown in inches and (mm).

A Equipment Depth	Direction of Cables	B	C	D
60" deep with N, S, H, L, M or C Rating Class Breakers	Below	21.50 (546) ^{1 2}	13.88 (353)	Consult Factory
	Above	21.25 (540) ¹	18.88 (480)	Consult Factory
70" deep with N, S, H, L, M or C Rating Class Breakers	Below	31.50 (800) ^{1 2}	13.88 (353)	Consult Factory
	Above	31.25 (794) ¹	18.88 (480)	Consult Factory
80" deep with N, S, H, L, M or C Rating Class Breakers	Below	41.50 (1054) ^{1 2}	13.88 (353)	Consult Factory
	Above	41.25 (1048) ¹		

¹ Reduce by 7.88" if upper neutral is present with cables above or if a lower neutral is present with cables below.

² Reduce by 4.00" if an 800-3200A breaker is located in the bottom compartment.

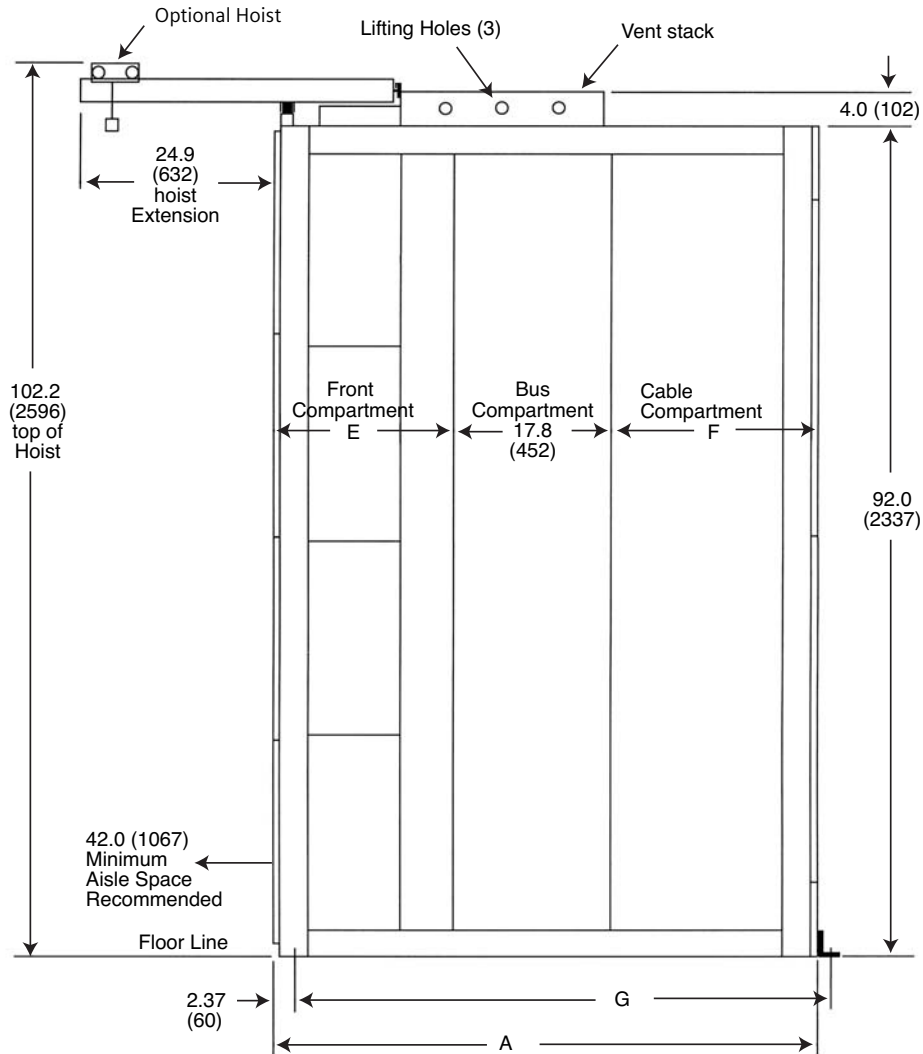
³ Reduce cable space by 4.00" x 4.82" if neutral riser present (consult factory).

⁴ 4.10" (104) if W=22", 4.60" (117) if W=32".

Shipping Weight/Dimensional Information

Type RCS Rear Connected Switchboards

Indoor Side View



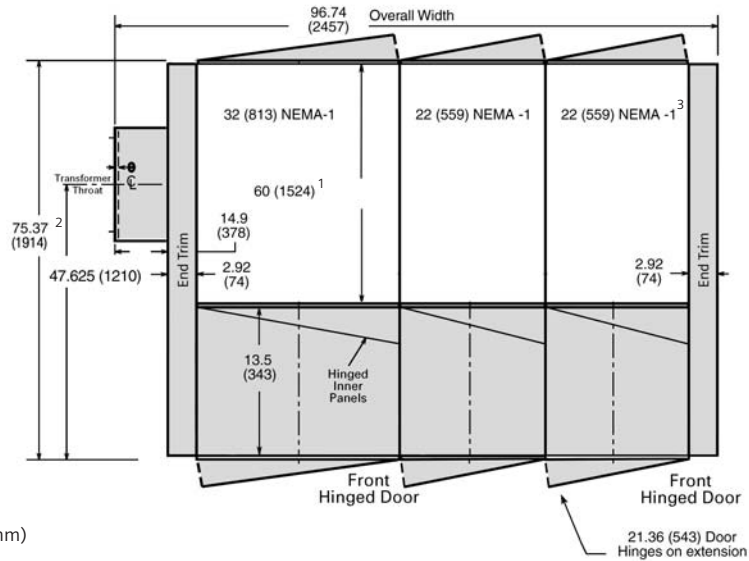
Dimensions shown in inches and (mm).

A Equipment Depth	E Breaker Compartment Depth	F Rear Compartment Depth	G Anchor Bolt Spacing
60 (1524) Non-fused breakers	19.8 (503)	22.4 (569)	59.13 (1502)
70 (1778) Non-fused breakers	19.8 (503)	32.4 (823)	69.13 (1756)
80 (2032) Non-fused breakers	19.8 (503)	42.4 (1077)	79.13 (2010)
65 (1651) Fused breakers	24.8 (630)	22.4 (569)	64.13 (1629)
75 (1905) Fused breakers	24.8 (630)	32.4 (823)	74.13 (1883)
80 (2032) Fused breaker	24.8 (630)	37.4 (950)	79.13 (2010)

Shipping Weight/Dimensional Information

Type RCS Rear Connected Switchboards

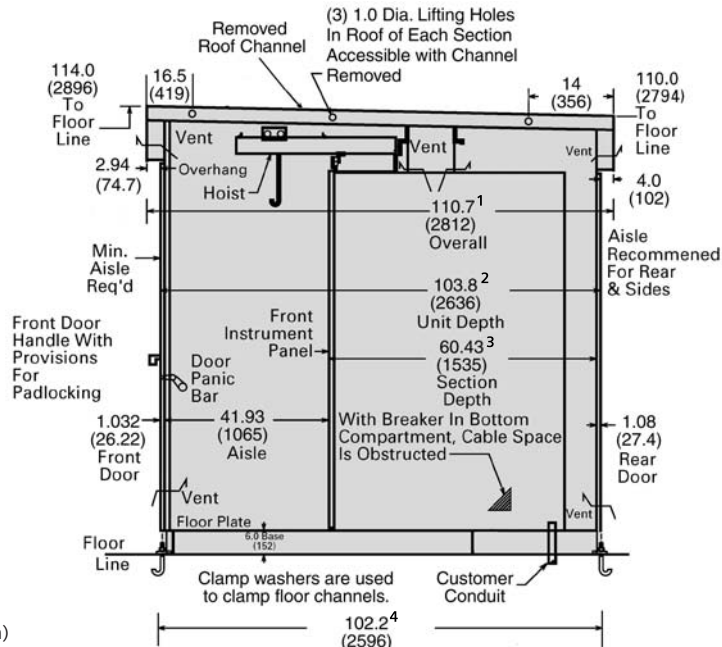
Outdoor Non-Walk-in Floor Plan



Dimensions shown in inches (mm)

- ¹ 60" is representative for a 60" deep switchboard internal structure. For other internal structure depths (65 or 75), add extra depth to 60" that is shown.
² 75.37" is representative for a 60" deep internal structure. For other internal structure depths (65 or 75), add extra depth to 75.37" that is shown.
³ Refer to appropriate indoor plan view for available customer conduit information.

Outdoor Non Walk-in Side View



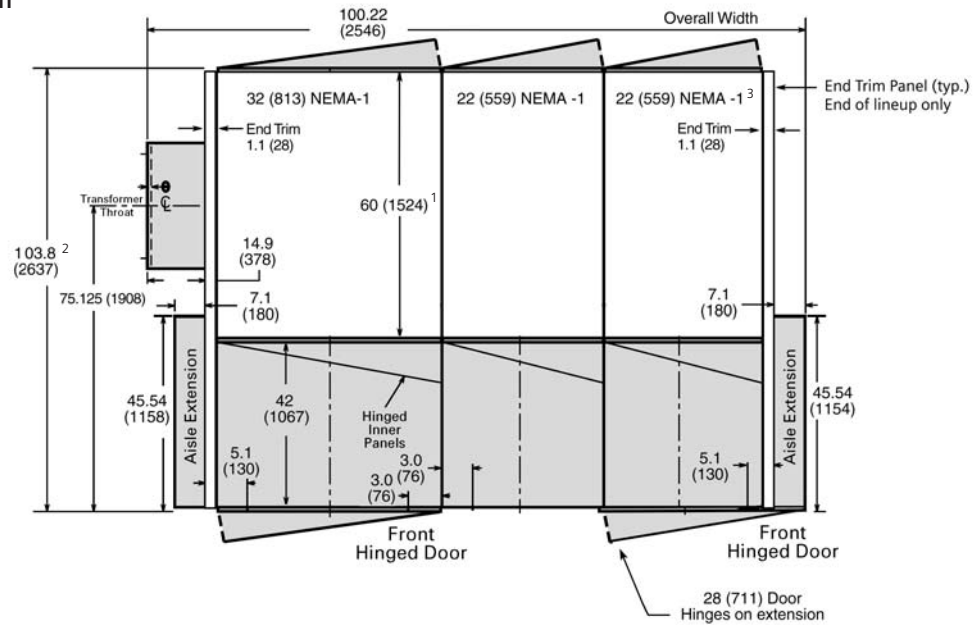
Dimensions shown in inches (mm)

- ¹ 82.27 dimension is based on 60" internal frame structure and if a deeper internal frame structure is used (65 or 75) the extra depth should be added to the 82.27 dimension.
² 75.37 dimension is based on 60" internal frame structure and if a deeper internal frame structure is used (65 or 75) the extra depth should be added to the 75.37 dimension.
³ 60.43 dimension is based on 60" internal frame structure and if a deeper internal frame structure is used (65 or 75) the extra depth should be added to the 60.43 dimension.
⁴ 73.77 dimension is based on 60" internal frame structure and if a deeper internal frame structure is used (65 or 75) the extra depth should be added to the 73.77 dimension.

Shipping Weight/Dimensional Information

Type RCS Rear Connected Switchboards

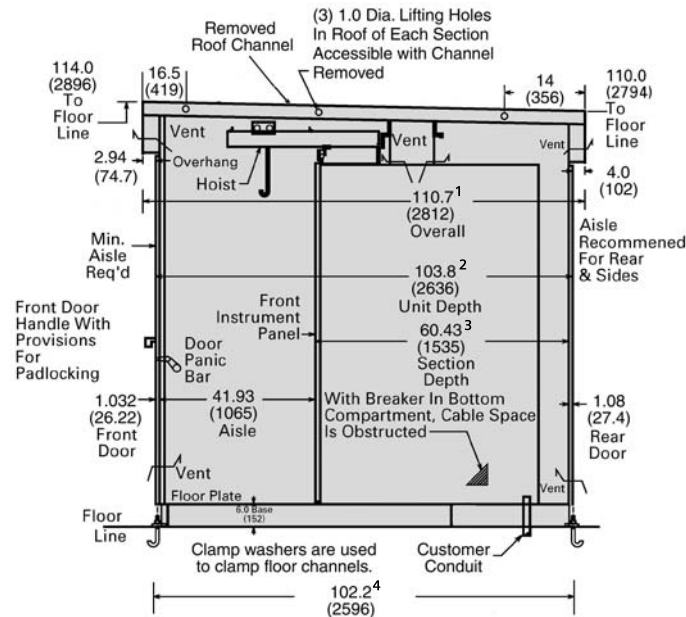
Outdoor Walk-in Floor Plan



- ¹ 60" is representative for a 60" deep switchboard internal structure. For other internal structure depths (65 or 75), add extra depth to 60" that is shown.
- ² 103.8" is representative for a 60" deep internal structure. For other internal structure depths (65 or 75), add extra depth to 103.7" that is shown.

- ³ Refer to appropriate indoor plan view for available customer conduit information.

Outdoor Walk-in Side View



Dimensions shown in inches (mm)

- ¹ 110.7 dimension is based on 60" internal frame structure and if a deeper internal frame structure is used (65 or 75) the extra depth should be added to the 110.7 dimension.
- ² 103.8 dimension is based on 60" internal frame structure and if a deeper internal frame structure is used (65 or 75) the extra depth should be added to the 103.8 dimension.

- ³ 60.43 dimension is based on 60" internal frame structure and if a deeper internal frame structure is used (65 or 75) the extra depth should be added to the 60.43 dimension.
- ⁴ 102.2 dimension is based on 60" internal frame structure and if a deeper internal frame structure is used (65 or 75) the extra depth should be added to the 102.2 dimension.

VT, CPT, CT Data

Type RCS Rear Connected Switchboards

Voltage Transformers – External Metering and Relaying

Ratio	Accuracy Class at 60 Hz			Volt-Amp Rating	Thermal Rating VA	Hertz
	Burden					
	W	X	Y			
600:120	0.6	1.2	1.2	100	150	50/60
480:120	0.6	1.2	1.2	100	150	50/60
288:120	0.6	1.2	1.2	100	150	50/60

Control Power Transformers – 115°C Rise

kVA	Primary Phase	Secondary Voltage	Voltage
3 5 10 ¹ 15 ¹	Single	240/480	120/240

Current Transformers for FSI and FSII WL Breaker Applications – External Metering and Relaying ²

Ratio	Accuracy at 60 Hz Metering Burden (ohms)					Class
	B-0.1	B-0.2	B-0.5	B-0.9	B-1.8	
100.5	1.2	—	—	—	—	C5
150.5	1.2	—	—	—	—	C7
200.5	1.2	—	—	—	—	C9
250.5	1.2	—	—	—	—	C12
300.5	0.6	0.6	—	—	—	C15
400.5	0.6	0.6	1.2	—	—	C20
500.5	0.6	0.6	1.2	—	—	C25
600.5	0.3	0.3	0.6	1.2	—	C21
800.5	0.3	0.3	0.6	0.6	—	C29
1000.5	0.3	0.3	0.6	0.6	1.2	C35
1200.5	0.3	0.3	0.3	0.6	1.2	C20
1500.5	0.3	0.3	0.3	0.3	0.6	C25
1600.5	0.3	0.3	0.3	0.3	0.6	C27
2000.5	0.3	0.3	0.3	0.3	0.6	C34
2500.5	0.3	0.3	0.3	0.3	0.3	C20
3000.5	0.3	0.3	0.3	0.3	0.3	C21
3200.5	0.3	0.3	0.3	0.3	0.3	C24

Current Transformers for FSIII WL Breaker Applications – External Metering and Relaying ²

Ratio	Accuracy at 60 Hz Metering Burden (ohms)					Class
	B-0.1	B-0.2	B-0.5	B-1.0	B-2.0	
2000.5	0.3	0.3	0.3	0.3	0.3	C20
2500.5	0.3	0.3	0.3	0.3	0.3	C20
3000.5	0.3	0.3	0.3	0.3	0.3	C20
3200.5	0.3	0.3	0.3	0.3	0.3	C20
4000.5	0.3	0.3	0.3	0.3	0.3	C20
5000.5	0.3	0.3	0.3	0.3	0.3	C20

¹ Requires complete compartment.

² Breaker compartment will accept 1 set of CT's each on top and bottom primary disconnects.

Guide Form Specifications

Type RCS Rear Connected Switchboards

SECTION SWITCHBOARDS

PART 1 – GENERAL

1.1 SCOPE

- A. This section defines switchboard assemblies with drawout circuit breaker elements for use in ac systems, rated 600 V or less.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections (where applicable) include the following:
1. Section 16345 - Medium Voltage Load Break Switches
 2. Section 16470 - Dry Type Substation Transformers
 3. Section 16490 - Liquid Type Substation Transformers

1.3 SUBMITTALS

- A. Submit shop drawings and product data for approval and final documentation in the quantities listed according to the Conditions of the Contract. Customer name, customer location, and customer order number shall identify all transmittals.
- B. Documents for Approval: General arrangement drawing showing dimensioned elevation, floor plan, side view and foundation details, one-line diagram showing major features, nameplate legends, schematic diagrams and bill of material.
- C. Final Documents: Record documentation to include those in 1.3.B and wiring diagrams, list of recommended spare parts, instruction and installation manuals [and certified test reports]
- D. Product Data: Include features, characteristics, and ratings of individual circuit breakers and other components. Also, time-current characteristic curves for over current protective devices, including circuit-breaker trip devices and fusible devices.

- E. [Manufacturer Seismic Qualification]: Switchboard, and associated breakers, shall meet and be certified to seismic requirements specified in the [IBC International Building Code] [UBC Uniform Building Code Zone 2] [UBC Uniform Building Code Zone 4] [CBC California Building Code Zone 4] [SBC Standard Building Code] [BOCA Building Code] [IEEE 693]. Mounting and anchorage requirements shall be supplied by the switchboard manufacturer.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of this equipment shall have a minimum of 5 years experience producing similar electrical equipment. The manufacturer of the switchboard assembly shall be the same manufacturer as the breakers. The manufacturer shall be ISO 9001 or 9002 certified.
- B. Comply with requirements of latest revisions of applicable industry standards, specifically including the following:
1. UL 891 Switchboards
 2. NEMA PB2 – Deadfront distribution switchboards.
 3. UL 489 – Molded-case circuit breakers, molded-case switches and circuit breaker enclosures.
 4. UL 1066 – Low Voltage AC and DC power circuit breakers used in enclosures.
 5. ANSI C37.13 – Low Voltage AC power circuit breakers used in enclosures.
 6. ANSI C37.16 – Preferred ratings, related requirements and application for low voltage power circuit breakers and AC power circuit protectors.
 7. ANSI C37.17 – Trip devices for AC and general purpose DC low voltage power circuit breakers.
 8. NEMA SG3 – Low voltage power circuit breakers

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in factory labeled packages. Shipping groups shall not exceed 15 ft. in length.
- B. Circuit breakers shall be shipped inside their respective cells in which they were factory acceptance tested.
- C. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from potential damage from weather and construction operations. Store so condensation will not form on or in switchboard and if necessary, apply temporary heat where required to obtain suitable service conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The switchboard assembly shall be manufactured by Siemens Energy & Automation, or approved equal.

2.2 RATINGS

- A. System Configuration: switchboard suitable for application in [three-phase] [60 Hz] [50 Hz], [3 wire] [4 wire] [grounded-neutral] [3 wire ungrounded] [3 wire high-impedance grounded] system.
- B. Electrical Ratings:
1. Nominal System Voltage: [600 V] [480 V] [240 V] [208 V] [OTHER].
 2. Maximum Design Voltage: [600 volts]
 3. Short-Circuit Current: [100kA] [150kA] [200kA]
 4. Main-Bus Continuous Current: [1600] [2000] [2500] [3000] [4000] [5000] [6000] A.
 5. [Neutral Bus Continuous Current:] [50] [100] [200] percent of main phase bus, up to 8000A maximum.

2.3 SWITCHBOARD GENERAL CONSTRUCTION

- A. The switchboard shall be factory assembled and tested, and comply with applicable industry standards. It shall be a coordinated design so that shipping groups are easily connected together at the site into a continuous line-up. Necessary connecting materials shall be furnished. All low voltage circuit breakers and assemblies shall be produced by a single manufacturer.

Guide Form Specifications

Type RCS Rear Connected Switchboards

- B. The switchboard assembly shall consist of one or more metal-enclosed sections in an [indoor NEMA 1 enclosure] [out-door NEMA 3R non walk-in enclosure] [outdoor NEMA 3R walk-in enclosure].
1. End sections shall include provisions for main bus extension and installation of future vertical sections.
 2. The design shall incorporate preformed steel channels, angles, and structural components bolted together and reinforced to form a rigid, self-supporting assembly.
 3. Fabricate enclosure with removable, [rear cover panels, secured by captive screws], [hinged rear doors with captive screws] [hinged rear doors with three-point latch and padlockable handle] to allow access to rear interior of switchboard.
- C. Front breaker doors must be free of any ventilation openings.
- D. Horizontal barriers are to be provided to form individual circuit breaker or metering compartments. Circuit breaker compartments are to be barriered from the bus compartment through a primary disconnect assembly. Each circuit breaker or metering compartment shall be provided with a hinged front door secured with hand-operated [pad-lockable] [key-lockable] rotary latches.
- E. Circuit breaker compartments shall include stationary primary contact disconnects that shall be silver-plated copper at the connection points and of one-piece construction.
1. The upper set of disconnects shall bolt directly to the main bus and, for feeder circuit breakers, the lower set shall extend to the rear cable area and shall be insulated where they pass through the main bus compartment.
 2. Primary disconnects shall be sized for the maximum continuous current for the frame size of the circuit breaker which is located in the compartment.
 3. Interlocks shall be provided to prevent a circuit breaker element of the incorrect frame size or interrupting rating from being inserted into the compartment.
4. Secondary control and communication connections, when required, shall be accessible from the front of the switchboard without exposing any power cables or bussing. The secondary control contacts shall be of the sliding contact design, silver-plated and engage the drawout circuit breaker element in the "connected" and "test" positions.
- F. All control wiring within the assembly shall be continuous and shall terminate on each end at a suitable terminal block. Control wiring shall be 18-gauge minimum, stranded type [MTW] [SIS] and shall be labeled at each end with sleeve-type wire markers.
1. Wire markers shall be machine imprinted with the wire name as indicated on the wiring diagrams.
 2. Terminals shall be pressure wire connectors except where connecting to components that do not accept these terminations. Control wiring for external connections shall be terminated in a separate front accessible compartment for ease of access.
- G. Finish: Painted steel parts shall be prepared for painting by a five-stage wash system consisting of an alkaline cleaner, fresh water rise, iron phosphate treatment, fresh water rise and non-chromate sealer. After cleaning and stabilization, the steel parts shall be coated with a thermosetting polyester powder applied with electrostatic equipment at a nominal 2 mils dry film thickness and then cured properly. The paint finish shall have a salt spray rating as defined in ASTM B-117. Paint color shall be ANSI 61 light gray.
- H. Bus isolation barriers shall be arranged to isolate the buses on either side of each main and tie circuit breaker from each other.
- I. [Incoming line isolation barriers shall be arranged to isolate the incoming line connections from the main horizontal and vertical bus].
- J. Main bus shall connect vertical sections and shall be uniform capacity the entire length of assembly. Vertical and horizontal bus bar shall utilize a channel shape design to maximize short circuit withstand capability and minimize heat rise. The main horizontal bus shall be run in a vertical, edge-to-edge arrangement for high short circuit strength. Access to the rear cable termination area shall be possible without reaching over the main and vertical bus.
1. Bus shall be [98 % minimum conductivity copper silver-plated over entire length of the bus bar] [98% conductivity copper tin-plated over entire length of the bus bar].
 2. Feeder Circuit-Breaker Load Terminals: Plated copper bus extensions equipped with pressure connectors for outgoing circuit conductors.
 3. Ground Bus shall be copper of 98% minimum conductivity, minimum size 1/4 by 3 inches.
 4. Bus bracing shall be equal to the short circuit interrupting rating of the lowest rated circuit breaker applied in the assembly or 100kA minimum.
 5. Provide for future extensions from either end of main phase, neutral, and ground bus by means of pre-drilled bolt holes and connecting links.
- K. [Bus/Cable compartment barriers: Barriers shall be supplied to isolate the rear cable area from the main bus area.]
- L. [Insulated bus bar shall consist of bus bars enclosed in factory-applied, flame-retardant UL recognized insulation system. Bolted bus joints shall be insulated with secure joint covers that can easily be removed and reinstalled.]
- M. [Low Voltage High-Resistance Grounding System] [Installed in the switchboard assembly] [Contained in separate NEMA 1 enclosure] for use on [480 V] [600 V] [wye] [delta] source, including the following components:
1. Meter relay (MR)
 2. 3 Indicating lights: white for "Normal," red for "Ground Fault" green for "Pulsing"
 3. "Reset" push button
 4. "Test" push button
 5. On – Off switches for system and pulse

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Type RCS Rear Connected Switchboards

6. Repeat cycle timer, set to produce approx. 30 current pulses per minute
 7. Neutral grounding resistor assembly
 8. Pulse resistor assembly
 9. Test resistor assembly
 10. Relay for repeat cycle timer
 11. Alarm relay, with extra interlocks for remote alarm (59X)
 12. Control power transformer
 13. Neutral ammeter and current transformer
 14. Optional Portable clamp on ammeter
 15. [3 Grounding transformers for generating a neutral CPT] (For Delta System without a system neutral)
- N. [Outdoor NEMA 3R Non Walk-In enclosure shall consist of indoor switchboard assemblies in weather-resistant steel housing. Enclosure shall be painted steel, integral structural-steel base frame with factory-applied asphalt undercoating. Each section shall be equipped with the following features:]
1. Structural design and anchorage adequate to resist loads imposed by 125-mph wind.
 2. Space heater operating at [full] [one-half of] rated voltage, sized to prevent condensation.
 3. Louvers equipped with insect/rodent screen and filter and arranged to permit air circulation while excluding exterior dust and rodents.
 4. Internal aisle of sufficient width to permit protective-device withdrawal.
 5. [Load center for distribution of power to lights, receptacles and heaters.]
 6. [Incandescent lighting receptacles with three-way switch.]
 7. [Duplex receptacle with ground fault protection.]
- O. [Outdoor NEMA 3R Walk-In enclosure shall consist of indoor switchboard assemblies in weather-resistant steel housing having an operating aisle space of approximately 42 inches. Enclosure shall be painted steel, integral structural-steel base frame with factory-applied asphalt undercoating. Each section shall be equipped with the following features:]

1. Structural design and anchorage adequate to resist loads imposed by 125-mph wind.
2. Space heater operating at [full] [one-half of] rated voltage, sized to prevent condensation.
3. Louvers equipped with insect/rodent screen and filter and arranged to permit air circulation while excluding exterior dust and rodents.
4. Internal aisle of sufficient width to permit protective-device withdrawal, disassembly, and servicing in aisle.
5. Aisle access doors with outside padlocking provisions and interior panic latches.
6. Adequate incandescent lighting receptacles with three-way switch at each access door.
7. A duplex receptacle with ground fault protection, at aisle access door.
8. A load center shall be supplied for distribution of power to lights, receptacles and heaters.
9. Aisle ventilation louvers equipped with insect/rodent screen and filter and arranged to permit air circulation while excluding exterior dust and rodents.

2.4 COMPONENTS

- A. Instrument Transformers: Comply with IEEE C57.13.
1. Potential Transformers: Secondary-voltage rating of 120 V and NEMA accuracy class of 0.6 with burdens of W, X, and Y.
 2. Current Transformers: Ratios as indicated; burden and accuracy class suitable for connected relays, meters, and instruments.
- B. Multifunction Digital-Metering Monitors shall be UL-listed or recognized, microprocessor-based unit suitable for three or four wire systems. Units shall be mounted in the instrument compartment door and as follows:
1. Incoming monitoring or main breakers: Included in the circuit breaker trip unit device or Siemens Model [PAC 3200] [9200] [9300] [9330] [9340] [9350] [9360] [9510] [9610] digital meters.

2. Feeder breakers: Included in the circuit breaker trip device or Siemens Model [9200] [9300] [9330] digital meters.
- C. Provision for Future Devices: Equip future circuit breaker compartments with rails, mounting brackets, supports, necessary appurtenances, and bus connections.
- D. Control Power Supply: Control power transformer supplying 120-V control circuits through secondary disconnect devices are to be dry-type transformers with primary and secondary fuses.
1. Transformers shall be mounted in auxiliary compartments.
 2. [Multiple source with control power transfer.] Two control power transformers located in separate compartments with necessary interlocking relays shall be provided.
 - a. Each transformer shall be connected to line side of associated main circuit breaker.
 - b. [Secondary windings connected through a relay or relays to control bus to effect an automatic control power transfer scheme.]
 3. [(24) (48) (125) volt DC battery system]
- E. [Mimic Bus]: Continuous mimic bus applied to front of switchboard, arranged in single-line diagram format, shall indicate the arrangement of the circuit breakers in the power circuit.

2.5 CIRCUIT BREAKERS

- A. All insulated case circuit breakers can comply with the requirements of UL489 and all low voltage power circuit breakers can comply with UL1066. All breakers shall be three-pole, 100% rated type WL low voltage circuit breaker manufactured by Siemens Energy & Automation, or approved equal.
- B.
1. Circuit breaker element shall have connected, test, and disconnected position indicators, spring charged/discharged indicators, and circuit breaker open or closed and ready to close indicators all of which shall be visible to the operator with the compartment door closed. It shall be possible

Guide Form Specifications

Type RCS Rear Connected Switchboards

- to rack the circuit breaker element from the connected to the disconnected position with the compartment door closed {otherwise known as through the door drawout}.
2. Provide interlocks to prevent racking the circuit breaker unless the breaker is open
- C. Ratings: Interrupting up to 150 kA at 480V without fuses and up to 200 kA at 600V with fuses. Short time current ratings for each circuit breaker shall be as indicated on the drawings or data tables. Circuit breakers shall be 600-volt class.
- D. Operating Mechanism: Mechanically and electrically trip-free, stored-energy operating mechanism with the following features:
1. Normal Closing Speed: independent of both control and operator
 2. [Electrical operator, field installable with manual charging]
 3. [Operation counter]
- E. Each low voltage circuit breaker shall be equipped with self-powered, microprocessor-based trip-device to sense overload and short circuit conditions. The device shall measure true RMS current. The tripping system shall consist of Rogowski coils {sensors} on each phase, a release mechanism, and the following features:
1. Field Installable and Interchangeable so that any trip unit can be used with any frame size circuit breaker. And can be upgraded for future expansion in functionality, such as communication.
 2. Functions: Long time, short time and extended instantaneous protection function shall be provided {EIP} to allow the breaker to be applied at the withstand rating of the breaker with minus 0% tolerance so that there is no instantaneous override whatsoever. This feature shall further more allow the circuit breaker to be applied up to the full instantaneous rating of the breaker on systems where the available fault current exceeds the breakers withstand rating. Each shall have an adjustable pick-up setting. In addition, long time and short time bands shall each have adjustable time delay. Short time function shall include a switchable I²t ramp and optionally I⁴t to improve coordination with fuses or inverse relays.
3. A software program shall be made available free of charge to support system co-ordination studies. The software will allow time current curves to be generated for the chosen settings.
 4. Individual LED's shall indicate an overcurrent, short circuit or ground fault trip condition. The data shall be maintained for a minimum of 48 hours without the need for a separate battery.
 5. Time-current characteristics shall be field adjustable locally or optionally remotely via a bus system [ModBus] [Profibus] [Ethernet].
 6. Current Adjustability: [Dial settings], [keypad] and rating plugs on trip units.
 7. Pickup Points: 10 Long Time Settings.
 8. Field Installable Ground-fault protection with at least three time-delay bands; adjustable current pickup and an I²t ramp. Arrange to provide protection for [three-wire] [four-wire] service.
 9. [Field installable zone selective interlocking: Connections will be made between main, tie and feeder circuit breakers to ensure that the circuit breaker closest to the fault trips for short time and ground fault conditions.]
 10. [Field Installable Communications and metering functions shall be provided per schedule]
 11. [A LCD display shall be available to simplify settings and viewing data locally.]
 12. The option to remotely switch protection settings shall be provided whenever a generator is part of the power distribution system
 13. Field installable configurable [analog], [digital] output relays shall be available to connect directly to the trip unit
 14. [Waveform display option on LCD display]
 15. Estimated contact wear be capable of being shall communicated remotely in addition to a local mechanical indication flag.
- F. [OC {mechanism operated cell switch} operated by the circuit breaker operating mechanism]
- G. Terminal Block Connections, shall be front mounted and utilize [Screw Type Terminals], [Tension Spring Terminals]
- H. Padlocking Provisions: For installing at least three padlocks on each circuit breaker to prevent movement of the drawout mechanism.
- I. Operating Handle: shall be built in complete with handle and integral to breaker. No external tools shall be required to rack the breaker
- J. [Control Switch: One for each electrically operated circuit breaker.]
- K. [Key Interlocks: Mountings and hardware are included where future installation of key-interlock devices is indicated.]
- L. [Undervoltage Trip – field installable]: [Instantaneous] [Adjustable time-delay.]
- M. [Shunt-Trip – field installable]
- N. [Indicating Lights: To indicate circuit breaker is open or closed, for electrically operated circuit breakers.]
- O. Modular communication and relaying accessories are to be available for retrofitting by the clients chosen engineer. It shall not be necessary for the manufacturers personnel to retrofit accessories.
- P. The following items must be capable of being changed in the field; main contacts, CT's, trip units, racking mechanism, all internal and external accessories.
- #### 2.6 SWITCHBOARD ACCESSORIES
- A. [Lifting yoke for circuit breakers.]
- B. [Portable test set for testing all functions of circuit breaker, solid-state devices without removal from switchboard.]
- C. [Circuit-Breaker Removal Apparatus:] [Overhead-circuit-breaker lifting device, track mounted at top front of switchboard, complete with hoist and lifting yokes.] [Portable, floor-supported, roller-base, elevating

Guide Form Specifications

Type RCS Rear Connected Switchboards

carriage arranged for moving circuit breakers in and out of compartments.]

- D. [Spare Fuses: Six, of each type and rating of fuse used. Include spares for potential transformer fuses, and control power fuses.]
- E. [Spare Indicating Lights: One of each type installed.]
- F. [Touchup Paint: One-half pint of paint matching enclosure finish.]
- G. [Test Cabinet: Wall mountable cabinet to hold necessary equipment for testing electrically operated breakers and other breaker related functions.]

PART 3 — EXECUTION

3.1 EXAMINATION AND INSTALLATION

- A. Examine elements and surfaces to receive switchboard for compliance with installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Install and anchor switchboard in accordance with manufacturer's instructions.

3.2 CONNECTIONS

- A. Tighten bus joints, electrical connectors, and terminals according to manufacturer's published torque-tightening values. Install equipment-grounding conductors for switchboard with ground continuity to main electrical ground bus.

3.3 ADJUSTING AND CLEANING

- A. Set field-adjustable trip devices per coordination study.
- B. Clean exposed surfaces using manufacturer recommended materials and methods. Touch-up damaged coating and finishes using non-abrasive materials and methods recommended by manufacturer. Eliminate all visible evidence of repair.

3.4 [STARTUP SERVICES]

- A. Engage a factory-authorized service representative to perform startup service.

- B. Train Owner's maintenance personnel on procedures and schedules for energizing and de-energizing, troubleshooting, servicing, and maintaining equipment and schedules.
- C. Verify that switchboard is installed and connected according to the Contract Documents.
- D. Verify that electrical control wiring installation complies with manufacturer's submittal by means of point-to-point continuity testing. Verify that wiring installation complies with requirements in Division 16 Sections.
- E. Complete installation and startup checks according to manufacturer's written instructions.

END OF SECTION

Notes

Note: This guide does not purport to cover all details in equipment, or to provide for every possible contingency. Should further information be desired or should particular problem arise, which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Siemens sales office. The contents of this guide shall not become part of or modify any prior or existing agreement, commitment or relationship.

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