Type WL Low voltage
Metal-Enclosed Switchgear

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General

Type WL Low-voltage Metal-Enclosed Switchgear

Siemens Type WL low-voltage metal-enclosed switchgear is designed, constructed and tested to provide superior power distribution, power monitoring and control. At the heart of the Type WL low-voltage switchgear is the World Class Siemens WL breaker.

Siemens Type WL low-voltage switchgear can be utilized in the following applications:

- **Industrial**
  Semiconductor
  Petrochemical
  Automotive
  Biotech
  Pharmaceutical
- **Institutional**
  Water treatment
  Airports
  Universities
  Medical facilities
  Correctional facilities
- **Critical power**
  Data Processing
  Continuous industrial process
  Hospitals
- **Utility and co-generation**
- **Commercial**
  Large office buildings
  Distribution centres
  Large warehouses

Type WL Low-voltage Metal-Enclosed Switchgear

Product Scope:

- Equipment ratings
  635VAC Maximum
  3 Phase 3 Wire,
  3 Phase 4 Wire
  50/60 Hz
  6000 amp maximum horizontal bus
  6000 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, fused or unfused and are available in the following rating designations – N, S, H, L, M and F. Refer to tables on Page 13 for interrupt and withstand ratings for each rating designation.

Industry Standards

Type WL switchgear with power circuit breakers are designed, tested and constructed in accordance with:

- UL 1558 — Metal-Enclosed Low-voltage Power Circuit Breaker Switchgear
- CSA C22.2 No. 31 - Switchgear Assemblies
- ANSI C37.20.1 — Metal-Enclosed Low-voltage Power Circuit Breaker Switchgear
- ANSI C37.50 — Test Procedure for Low-voltage AC Power Circuit Breakers Used in Enclosures
- ANSI C37.51 — Conformance Testing of Metal-Enclosed Low-voltage AC Power Circuit Breaker Switchgear Assemblies
- NEMA SG5 - Power Switchgear Assemblies
- Applicable requirements of the National Electric Code (NEC)

WL drawout circuit breakers are 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 with cUL labeling is available.

Arc Resistant

Optional Type WL arc resistant low-voltage switchgear is available and is UL listed to ANSI/IEEE C37.20.7. Type 2B arc resistant accessibility rating with maximum internal acring short-circuit current rating of 100kA @508V and 85kA @ 635V.

Seismic Qualification

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

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Type WL Low-voltage Metal-Enclosed Switchgear

Construction Details

General

The Siemens Type WL switchgear 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 four 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.

In accordance with ANSI C37.20.1, the maximum temperature for parts that are handled is 50°C. The main bus maximum temperature rise is 65°C above 40°C ambient. The temperature rise of the air surrounding the cable connection points is limited to 45°C above 40°C ambient.

Finish

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

Standard finish colour 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 WL metal-enclosed low voltage switchgear is 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 switchgear 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.

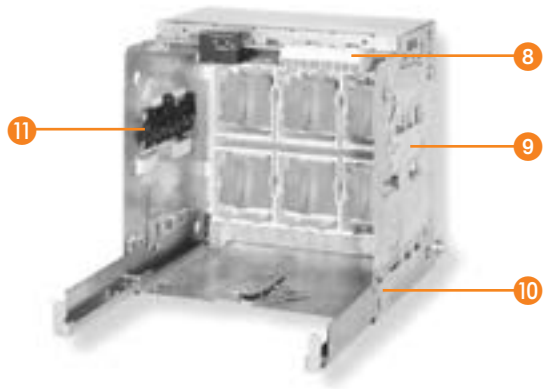
Each complete vertical section contains three compartments.

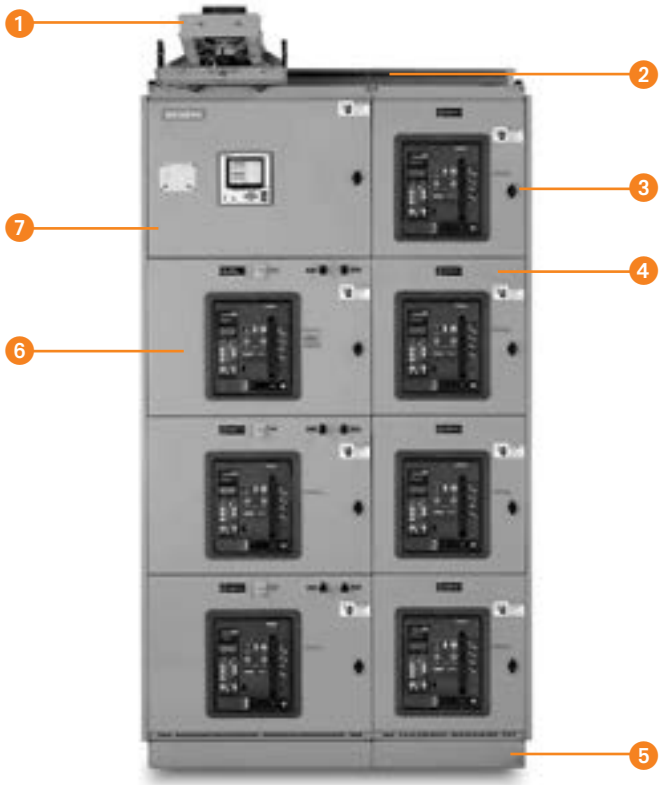
(1) Front compartment containing breakers and/or auxiliary equipment
(2) Bus compartment containing horizontal and vertical bus
(3) Rear cable compartment containing the load side runbacks connecting the load side of the breaker to the load cable terminals

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 switchgear section. (Line/load barriers are provided as a standard feature for service equipment main breakers.)

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





Low-voltage Switchgear

Type WL Low-voltage Metal-Enclosed Switchgear

Construction Details

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 1600, 2000, 3200, 4000, 5000 and 6000 amperes continuous current. Horizontal bus ratings available are 1600, 2000, 3200, 4000, 5000 and 6000 amperes. A neutral bus is furnished when specified, and can be rated 1600, 2000, 3200, 4000, 5000 or 6000 amperes continuous current.

A 1/4" 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 (4 cycle) and short-time withstand (60 cycle) bus bracing is 100,000 amperes. Higher shortcircuit withstand bus bracings (150kA and 200kA) are available. Load side runbacks for feeder circuits are copper construction, are insulated with sleeve tubing in the main bus area, and are supported by high-strength bus bracing.

Control and Communication Wiring

Standard control and communication wiring is #14 AWG extra-flexible, stranded copper type SIS. Control and communication wiring is installed and accessed from the front of the switchgear structure. Each breaker compartment has a dedicated horizontal and vertical wireway.

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

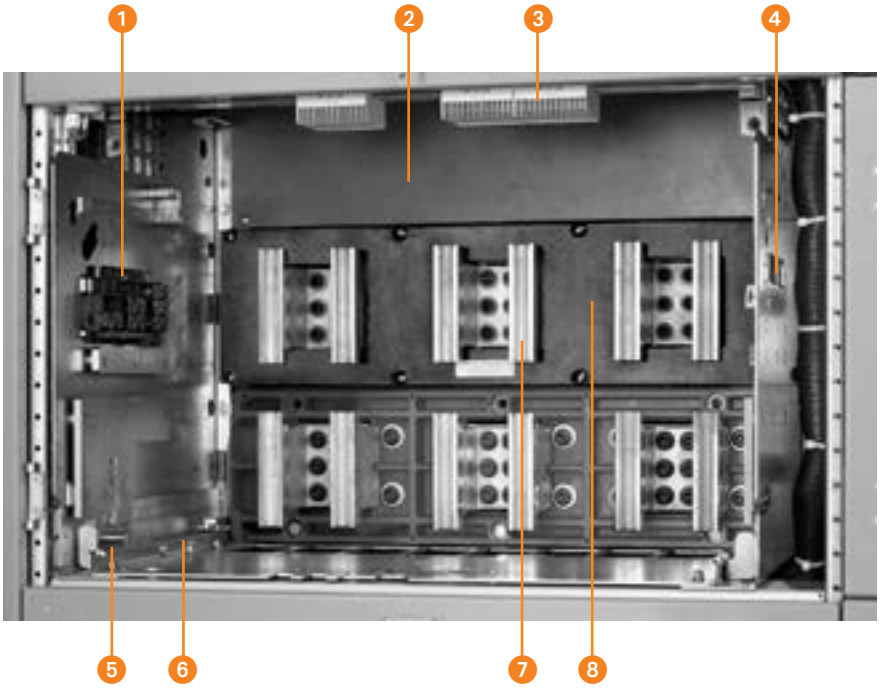
Insulation

The insulation used is a UL recognized thermoset 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
2. Breaker Compartment Rear Barrier
3. Secondary Disconnect
4. Vertical Wireway
5. Interference Interlock
6. Drawout Rails
7. Primary Disconnect
8. Cradle Mounted Current Transformer

Circuit Breaker Cell Interior

Type WL Low-voltage Metal-Enclosed Switchgear

Options

Switchgear Mounted Hoist
The integrally mounted hoist, standard on walk-in outdoor and optional on indoor switchgear enclosures, travels along rails on top of the switchgear 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 withdrawn and are pad-lockable and field installable.

Key Interlock
This provides a mechanical means for operating circuit breakers and other devices only when predescribed 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.

Miscellaneous

- Each switchgear lineup includes a breaker lifting device that is adjustable for use with Size II and Size III 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. The test cabinet doesn't include or replace a breaker trip unit tester.
- A WL remote breaker racking device (RBRD) is available as an optional accessory that allows maintenance personnel to safely rack Siemens Type WL breakers into the Connect, Test and Disconnect positions from up to 30 feet away from the breaker. This allows the operator to be outside the arc flash hazard boundary and thereby providing additional personnel protection.
- 4" high formed steel channel sills are available for indoor switchgear enclosures.

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

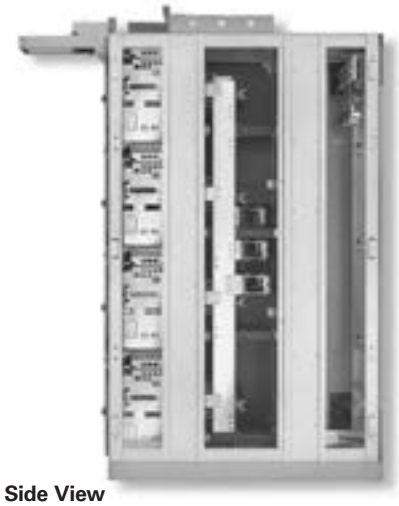
For protection from snow, rain and other foreign matter, both outdoor enclosures rest on a six-inch high, formed steel base which provides rigid support and a tight bottom seal. A heavy duty protective under-coating is applied to the underside of all outdoor enclosures to protect against moisture and 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 switchgear 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.

Construction Details

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) Loadcentre for power distribution to lights, receptacles, switches and heaters.

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



Side View

Rear View

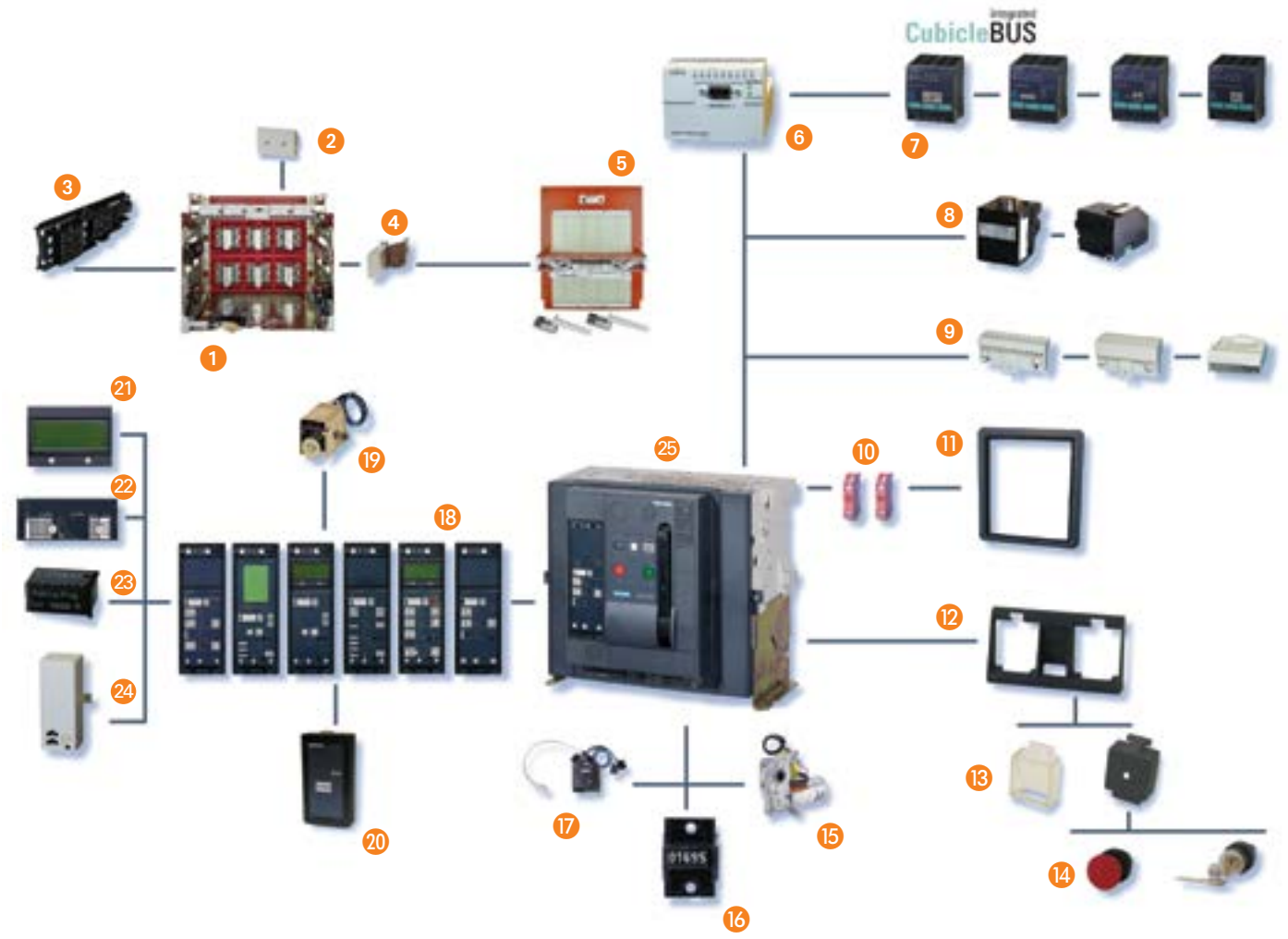
Low-voltage Switchgear

Type WL Low-voltage Metal-Enclosed Switchgear—WL Circuit Breakers

Overview

WL Circuit Breaker

Superior individual products for low-voltage power distribution systems



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

Electronic Trip Units

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 I^2t or I^4t 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 I^2t and I^4t.

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 beakers 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

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 In 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
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 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 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.

Electronic Trip Units

Basic Protective Functions		ETU745	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 delay		●	●
Defeatable instantaneous protection		●	●
Selectable thermal memory		●	●
Zone selective interlocking		❍	❍
Selectable I^2t or fixed short-time delay		●	●
Adjustable instantaneous pick-up		●	●
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		—	●
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 Plus		❍	❍
Communication			
CubicleBUS		●	●
Communication via PROFIBUS-DP		❍	❍
Communication via the MODBUS		❍	❍
Communication via the Ethernet (BDA)		❍	❍

● standard — not available ❍ optional

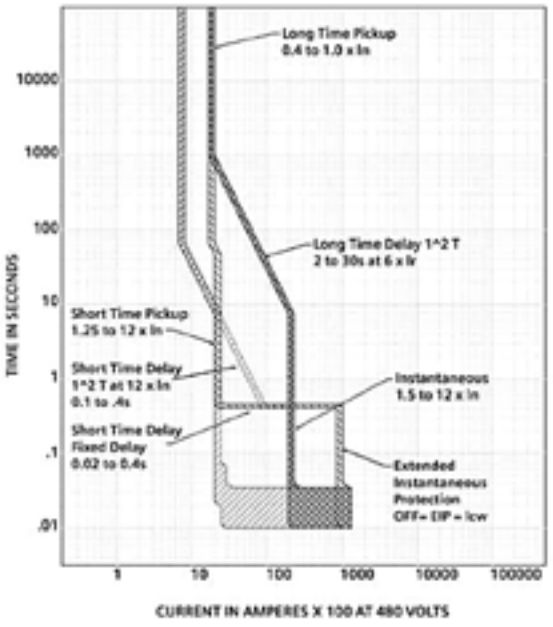
Tripping Characteristics

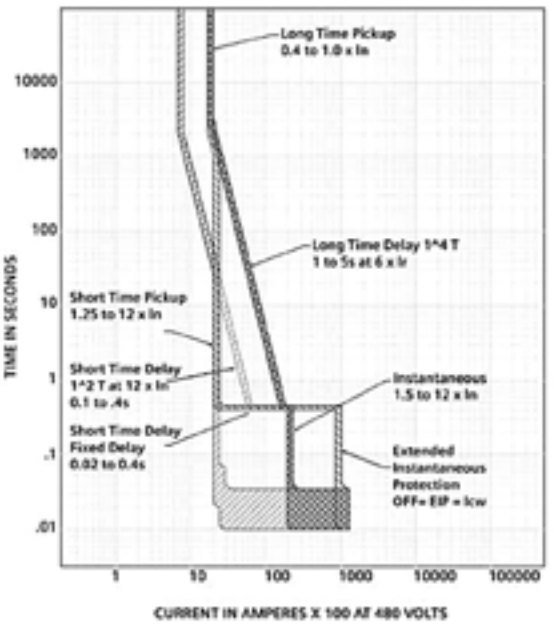
Every trip unit and every trip function has its own characteristic. You will find just a small section of these illustrated below. The characteristics show the respective greatest and smallest setting range of WL Circuit Breakers.

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.

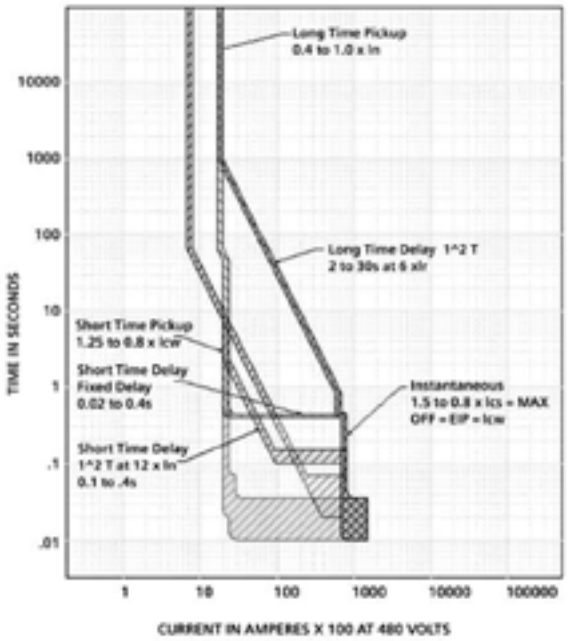
ETU745

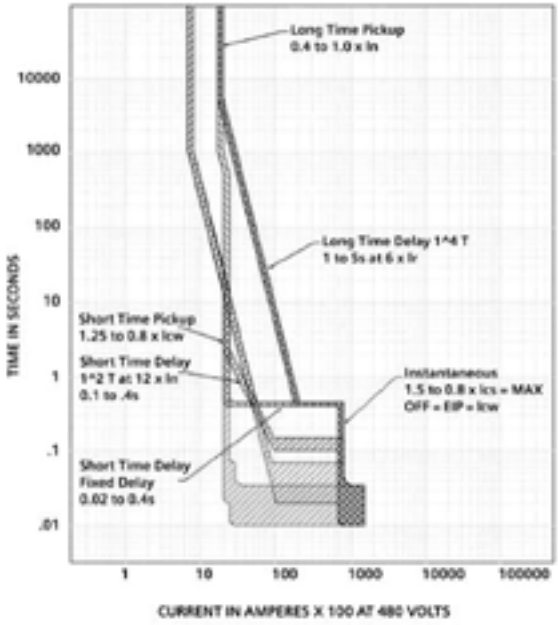




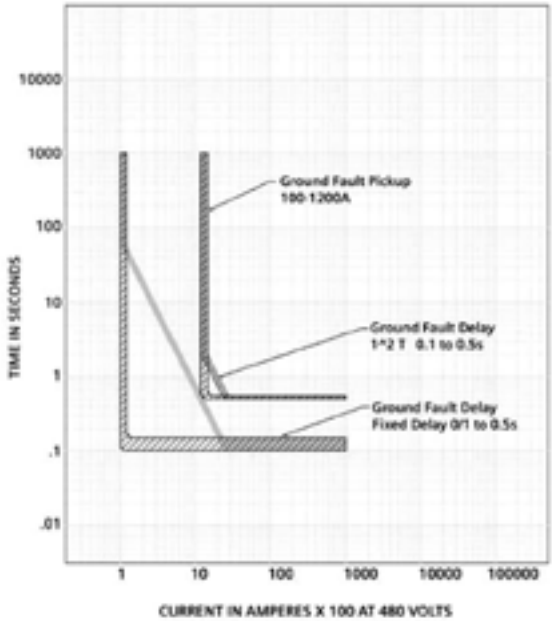
Tripping Characteristics

ETU776





Ground Fault Curve for ETU745 and 776



Breaker Ratings

Frame Rating / Rating Class		Frame Size II																
		800					1600					2000				3200		
		N	S	H	L	F	N	S	H	L	F	S	H	L	F	S	H	L
Instantaneous Short-circuit Current① (kA RMS) 50/60 Hz	254VAC 508VAC 635VAC	50 50 50	65 65 65	85 85 65	100 100 85	200 200 200	50 50 50	65 65 65	85 85 65	100 100 85	200 200 200	65 65 65	85 85 65	100 100 85	200 200 200	65 65 65	85 85 65	100 100 85
Short-time Withstand Current I_{cw} (kA RMS) 50/60 Hz	0.5s	50	65	65	85	—	50	65	65	85	—	65	65	85	—	65	65	85
Extended Instantaneous Protection (kA RMS -0% to +20%)		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, 225, 250, 300, 315, 350, 400, 450, 500, 600, 630, 700, 800 amps					200, 225, 250, 300, 315, 350, 400, 450, 500, 600, 630, 700, 800, 1000, 1200, 1250, 1600 amps					200, 225, 250, 300, 315, 350, 400, 450, 500, 600, 630, 700, 800, 1000, 1200, 1250, 1600, 2000 amps				200, 225, 250, 300, 315, 350, 400, 450, 500, 600, 630, 700, 800, 1000, 1200, 1250, 1600, 2000, 2500, 3000, 3200 amps		
Endurance Rating (switching operations with maintenance)②	Mechanical Electrical	15,000 15,000					15,000 15,000					15,000 15,000				15,000 15,000		

Frame Rating / Rating Class		Frame Size III												
		3200		4000				5000				6000		
		M	F	H	L	M	F	H	L	M	F	H	L	M
Instantaneous Short-circuit Current① (kA RMS) 50/60 Hz	254V AC 508V AC 635V AC	150 150	200 200	85 85	100 100	150 150	200 200	85 85	100 100	150 150	200 200	85 85	100 100	150 150
		85	200	85	85	85	200	85	85	85	200	85	85	85
Short-time Withstand Current I_{cw} (kA RMS) 50/60 Hz	0.5 s	100②	—	85	100③	100②	—	85	100	100③	–	85	100	100③
Extended Instantaneous Protection (kA RMS -0% to +20%)	254V AC 508V AC 635V AC	150 85	—	85	100	150 85	—	85	100	150 85	–	85	100	150 85
Close and Latch Ratings (kA RMS) 50/60 Hz		100②	85	85	85	100②	85	85	85	100②	85	85	85	100②
Rating Plug Range		800, 1000, 1200,1250, 1600, 2000, 2500, 3000, 3200 amps		800, 1000, 1200, 1250, 1600, 2000, 2500, 3000, 3200, 4000 amps				800,1000, 1200, 1250, 1600, 2000 2500, 3000, 3200, 4000, 5000 amps				800,1000, 1200, 1250, 1600, 2000 2500, 3000, 3200, 4000, 5000, 6000 amps		
Endurance Rating (switching operations with maintenance)②	Mechanical Electrical	10,000 10,000		10,000 10,000				10,000 10,000				10,000 10,000		

① Maximum rated voltage for fused breakers is 600VAC.
② Maintenance means: replacing main contacts and arc chutes (see operating instructions).
③ Short-time withstand rating is 85kA RMS at 635VAC.

WL Non-Automatic Switches ANSI / UL 1066

Ratings

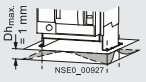
Frame Rating / Rating Class		Frame Size II							Frame Size III					
		800		1600		2000		3200	3200	4000		5000		6000
		L	F①	L	F①	L	F①	L	F①	L	F①	L	F①	L
Short-time Withstand Current (kA RMS) 50/60 Hz	0.5 s	85	20	85	20	85	20	85	40	100	40	100	40	100
Breaking Capacity with External Relay (kA RMS) 635Vac , 50/60 Hz, max time delay	0.5 s	85	20	85	20	85	20	85	40	100	40	100	40	100

WL Circuit Breakers

Frame Rating		Frame Size II				Frame Size III			
		800	1600	2000	3200	3200	4000	5000	6000
Rated current In									
at 40°C, at 50/60Hz	A	800	1600	2000	3200	3200	4000	5000	6000
Rated operational (nominal) voltage	VAC	600	600	600	600	600	600	600	600
Rated maximum voltage	VAC	635	635	635	635	635	635	635	635
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	-25 / +70
Storage (observe special conditions for LCD)	°C	-40 / +70	-40 / +70	-40 / +70	-40 / +70	-40 / +70	-40 / +70	-40 / +70	-40 / +70
Power loss at Rated Current with 3-phase② symmetrical load	W	85 130 (fused)	320 520 (fused)	500 850 (fused)	1150	700	1100	1650	2475
Operating times Make-time	ms	35	35	35	35	35	35	35	35
Break-time (with active ETU3)	ms	34	34	34	34	34	34	34	34
Break-time (without active ETU4)	ms	50	50	50	50	50	50	50	50
Total clearing time (with active ETU3)	ms	50	50	50	50	50	50	50	50
Total clearing time (without active ETU4)	ms	65	65	65	65	65	65	65	65
Make-time, electrical (via closing solenoid)	ms	50	50	50	50	50	50	50	50
Break-time, electrical (via shunt trip)	ms	40	40	40	40	40	40	40	40
(via instantaneous UVR)	ms	73	73	73	73	73	73	73	73

① Interrupting rating is equal to 200kA based on the rating of the f.use
② Consult factory for fuse carriage power l.o ss

WL Circuit Breakers

		Frame Size II				Frame Size III			
Frame Rating		**800**	**1600**	**2000**	**3200**	**3200**	**4000**	**5000**	**6000**
Endurance									
Mechanical (without aintenance)	operating cycles	12,500	12,500	10,000	10,000	5,000	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	10,000
Electrical (without maintenance)	operating cycles	7,500	7,500	4,000	4,000	2,000	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	10,000
Switching frequency	1/h	60	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	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	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	2 x AWG 14
	Ring tongue terminal (standard)	2 x AWG 14 1 x AWG 102	2 x AWG 14 1 x AWG 102	2 x AWG 14 1 x AWG 102	2 x AWG 14 1 x AWG 102	2 x AWG 14 1 x AWG 102	2 x AWG 14 1 x AWG 102	2 x AWG 14 1 x AWG 102	2 x AWG 14 1 x AWG 102
		2 x AWG 16	2 x AWG 16	2 x AWG 16	2 x AWG 16	2 x AWG 16	2 x AWG 16	2 x AWG 16	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	1 x AWG 14
Weight③ Circuit Breaker Guide Frame	kg/lb kg/lb	72/159 51/112	72/159 51/112	75/165 60/132	95/209 69/152	155/341 139/306	155/341 139/306	155/341 139/306	155/341 139/306
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 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 (WL1.0RL).
③ **Fused Breaker Weights**

	Frame Size II (fused)	Frame Size III (fused)
Breaker (kg/lb)	103/227	same as table above
Guide Frame	68/150	130/275
Fuse Carriage	–	102/225

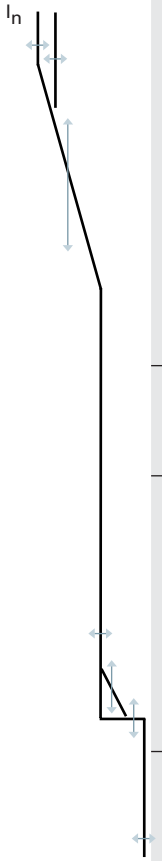
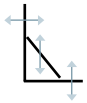
WL Circuit Breaker Accessory Ratings

Manual Operating Mechanism with Mechanical Closing				
Closing/charging stored energy mechanism				
	Maximum actuating force required on hand lever		52 lb	
	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 48V DC 120V AC / 125V DC 240V AC / 250V DC	14 - 28V DC 28 - 56V DC 70 - 140V DC 104 - 127V AC 140 - 280V DC 08 - 254V c.a. 180Y / 104V AC 220Y / 127V AC
	Power consumption (5 % duty cycle)			120 W
	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
Closing solenoid				
For motor and closing solenoid short-circuit protection				
	Short-circuit protection Standard slow-blow cartridge fuse		24 - 60 V 110 - 250 V	6 A 3 A
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 Setting 2		 ms ms	 80 200
	UVR (with time delay) Adjustable delay		 s	 0,2 to 3,2
	Reset by additional NC direct opening		ms	≤ 100

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		
		Rated operational current, continuous	0.4A	0.2 A		
		Rated operational current, making	0.4A	0.2 A		
		Rated operational current, breaking	0.4A	0.2 A		
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	

Function Overview of the Electronic Trip Units

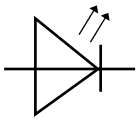
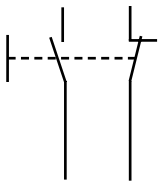
Fonctions de base			ETU745
	L	**Long-time overcurrent protection** Function can be switched ON/OFF Setting range $I_R = I_n$ x ...	✓
			—
			0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.8, 0.9, 1
		Switch-selectable overload protection (I^2t or I^4t dependent function) Setting range of time delay class t_R at I^2t (seconds)	✓
			2, 3.5, 5.5, 8, 10, 14, 17, 21, 25, 30
			1, 2, 3, 4, 5
		Setting range of time delay t_R at I^4t (seconds) Thermal memory Phase loss sensitivity	✓(via slide switch)
			at t_{sd}=20ms (M)
	N	**Neutral protection** Function can be switched ON/OFF N-conductor setting range $I_N = I_n$ x ...	✓
			✓(via slide switch)
			0.5 ... 1
	S	**Short-time delayed overcurrent protection** Function can be switched ON/OFF Setting range $I_{sd} = I_n$ x ...	✓
			✓(via rotary switch)
		Setting range of time delay t_{sd}, fixed (seconds)	1.25, 1.5, 2, 2.5, 3, 4, 6, 8, 10, 12
		Switch-selectable short-time delay short-circuit protection (I^2t dependent function)	0.02 (M), 0.1, 0.2, 0.3, 0.4, OFF
			✓(via rotary switch)
		Setting range of time delay tsd at I^2t (seconds) Zone Selective Interlocking (ZSI) function	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 $I_i = I_n$ x ...	✓
			✓(via rotary switch)
			1.5, 2.2, 3, 4, 6, 8, 10, 12 0.8 x I_{cw} = max, OFF=I_{cw}=EIP①
	G	**Ground fault protection**②	❍(field installable module)
		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 Ig for trip	A, B, C, D, E
		Setting range of the Ig for alarm	A, B, C, D, E
		Setting range of the time delay (seconds)	0.1, 0.2, 0.3, 0.4, 0.5
		Switch-selectable ground fault protection (I^2t / fixed)	✓
		Setting range time delay tg at I^2t ZSI ground function	0.1, 0.2, 0.3, 0.4, 0.5 En fonction du module CubicleBUS

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 tobe 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

Function Overview of the Electronic Trip Units

Basic Functions		ETU745
Parameter sets	Selectable between parameter set A and B	–
LCD	LCD, alphanumeric (4-line)	❍
	LCD, graphic	–
Communication	CubicleBUS integrated	✓
	Communication capability via MODBUS or PROFIBUS	✓
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)
	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 OFF/ON	✓
	Early signal of long time trip (200ms)	✓
	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

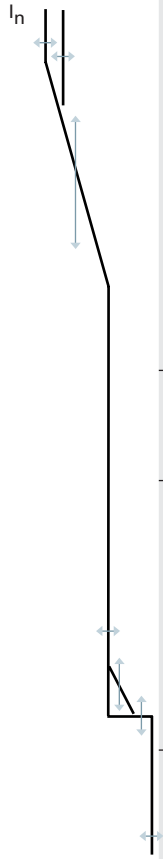
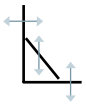
from ... to	step	from ... to	step
0 ... 1	0.1	1000 ... 1600	50
1 ... 100	1	1600 ... 10000	100
100 ... 500	5	10000 ... max.	1 000
500 ... 1000	10		

Setting range of the I_g

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

✓ available
– not available
❍ optional

Function Overview of the Electronic Trip Units

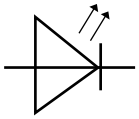
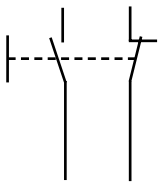
Fonctions de base			ETU776
	L	**Protection contre les surcharges à long délai** **Long-time overcurrent protection** Function can be switched ON/OFF	✓
		Setting range $I_R = I_n$ x ...	—
			0.4 ... 1 (step: 1 A)
		Switch-selectable overload protection (I^2t or I^4t dependent function)	✓
		Setting range of time delay class t}$_R$ at I^2t (seconds)	2 ... 30 (step: 0.1 s)
		Setting range of time delay t_R at I^4t (seconds)	1 ... 5 (step: 0.1 s)
		Thermal memory	✓(on/off via key pad or communications)
		Phase loss sensitivity	✓(on/off via key pad or communications)
	N	**Neutral protection** Function can be switched ON/OFF	✓
		N-conductor setting range $I_N = I_n$ x ...	✓(via slide switch)
			0.5 ... 1
	S	**Short-time delayed overcurrent protection** Function can be switched ON/OFF	✓
		Setting range $I_{sd} = I_n$ x ...	✓(via key pad or communications)
		Setting range of time delay tsd, fixed (seconds)	1,25 ... 0.8 x I_{cw} = max (step: 10 A)
		Switch-selectable short -time delay short-circuit protection (I^2t dependent function)	M, 0.08 ... 0.4, OFF (step: 0.001s)
		Setting range of time delay t_{sd} at I^2t (seconds)	✓(via key pad or communications)
		Zone Selective Interlocking (ZSI) function	0.1 ... 0.4 (step: 0.001 s) Per CubicleBUS module
	I	**Instantaneous overcurrent protection** Function can be switched ON/OFF, Extended Instantaneous Protection is enabled when OFF	✓
			✓(via key pad or communications)
		Setting range $I_i = I_n$ x ...	1.5 x I_n ... 0.8 x I_{cs} = max, OFF=I_{cw}=EIP①
	G	**Ground fault protection**②	❍(field installable module)
		Trip and alarm function	✓(via key pad or communications)
		Detection of the ground fault current by residual summing method	✓
		Detection of the ground fault current by direct summing method	✓
		Setting range of the Ig for trip	A ... E (step: 1 A)
		Setting range of the Ig for alarm	A ... E (step: 1 A)
		Setting range of the time delay t_g (seconds)	0.1 ... 0.5 (step: 0.001 s)
		Switch-selectable ground fault protection (I^2t / fixed)	✓
		Setting range time delay t_g at I^2t	0.1 ... 0.5 (step: 0.001 s) Per CubicleBUS module
		ZSI ground function	

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, MODBUS, or PROFIBUS
Key pad = Direct input at the trip unit

✓ available
— not available
❍ optional

Function Overview of the Electronic Trip Units

Basic Functions		ETU745	ETU776
Parameter sets	Selectable between parameter set A and B	–	✓
LCD	LCD, alphanumeric (4-line)	❍	–
	LCD, graphic	–	✓
Communication	CubicleBUS integrated	✓	✓
	Communication capability via MODBUS or PROFIBUS	✓	✓
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)
	G alarm	✓(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 OFF/ON	✓	✓
	Early signal of long time trip (200ms)	✓	✓
	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)
	Ground fault alarm	✓(only with ground fault module)	✓(only with ground fault module)
	Auxiliary relay	✓	✓
	ETU error	✓	✓

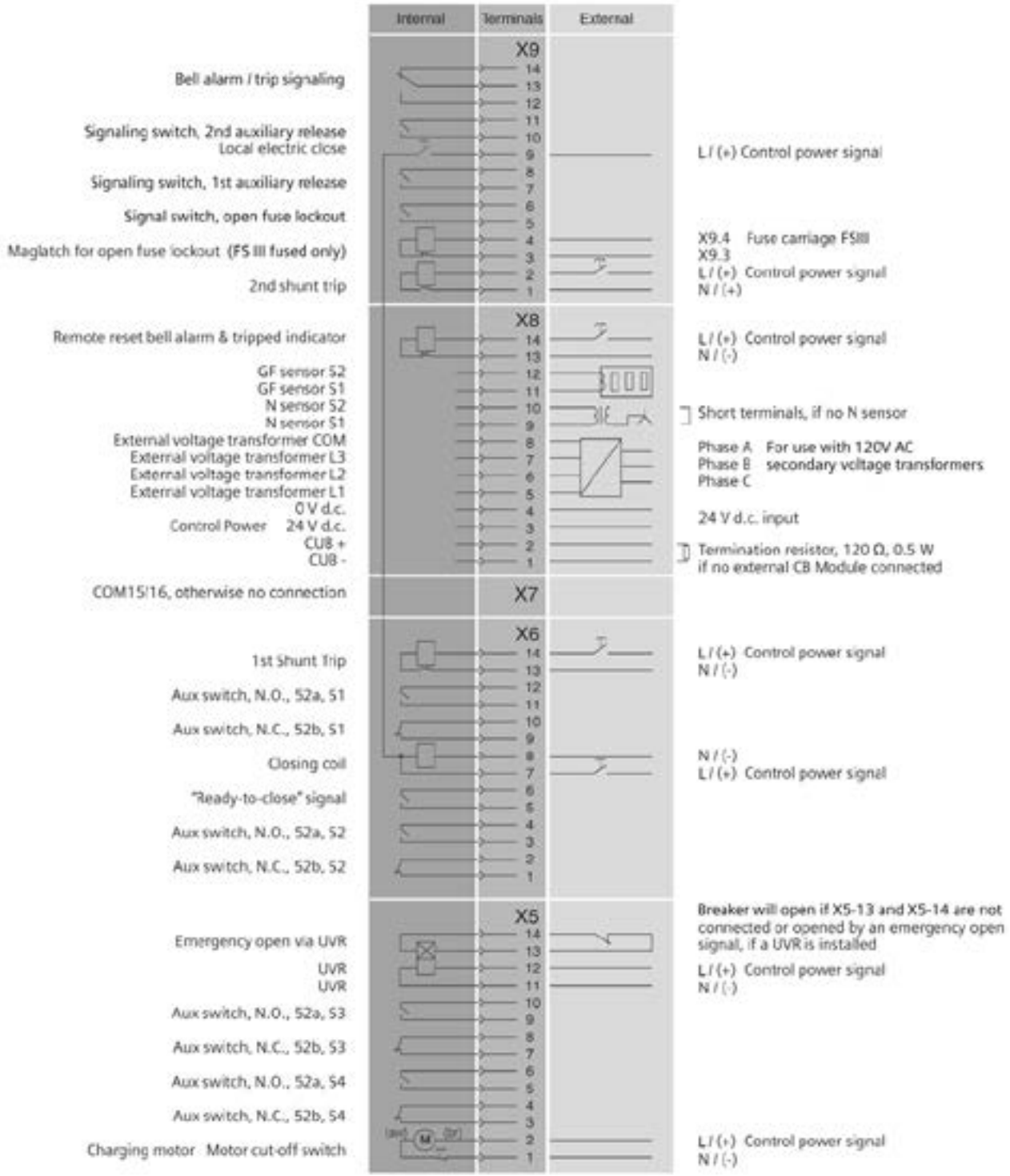
Metering and Protective Relaying Accuracies

Protective Relaying	Pick-up Accuracy
Phase Unbalance (I)	2% (5…50% I_n)
Phase Unbalance (V)	2% (5…50% Vn)
THD (I) (up to 29th)	+/- 3% (80…120% V_n)
THD (V) (up to 29th)	+/- 3% (80…120% V_n)
Overvoltage	+/- 2% (80…120% V_n)
Undervoltage	+/- 2% (80…120% V_n)
Under/Over Frequency	+/- 0.1 Hz

Metering Values	Accuracy
(I) at 1 x I_n	+/- 1%
(V) at 1 x V_n	+/- 0.5%
(P) at 1 x I_n	+/- 3%
(S) at 1 x I_n	+/- 2%
(Q) at 1 x I_n	+/- 3%

✓ available
– not available
❍ optional

WL Secondary Terminal Assignments



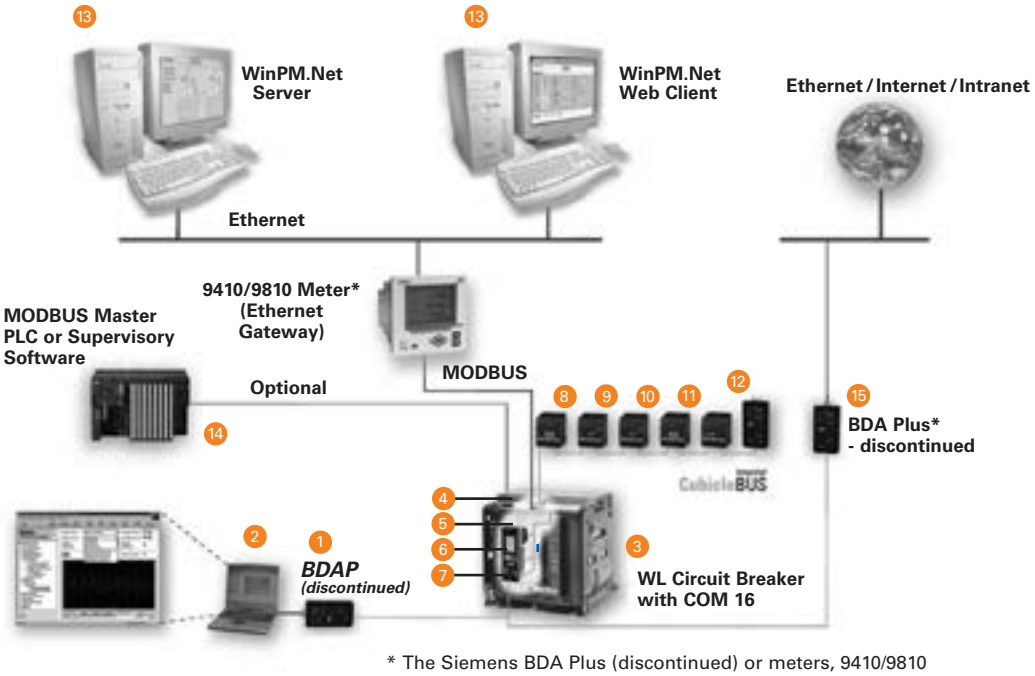
Low-voltage Switchgear

Type WL Circuit Breakers

WL Communication Overview

Connection Diagram

1. Breaker Data Adapter Plus (BDAP) - discontinued
2. Browser-capable input and output device (e.g. notebook)
3. WL Circuit Breaker
4. COM 16 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 - discontinued



* The Siemens BDA Plus (discontinued) or meters, 9410/9810 can be used as a gateway to enable Ethernet communication to the WL Circuit Breaker.

Features

- Industry standard MODBUS or PROFIBUS communication available on all WL breakers from 200A to 6000A.
- 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 switchgear.
- 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.

General Notes:

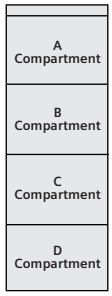
- A blank/instrument compartment can always be substituted for a breaker compartment.
- Any 22″ wide section can be 32″ wide if more conduit working room is needed.
- For bus duct connections – if incoming is top, Compartment A must be blank/instrument, if incoming is bottom, Compartment D must be blank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

Switchgear Depth Dimensional Information

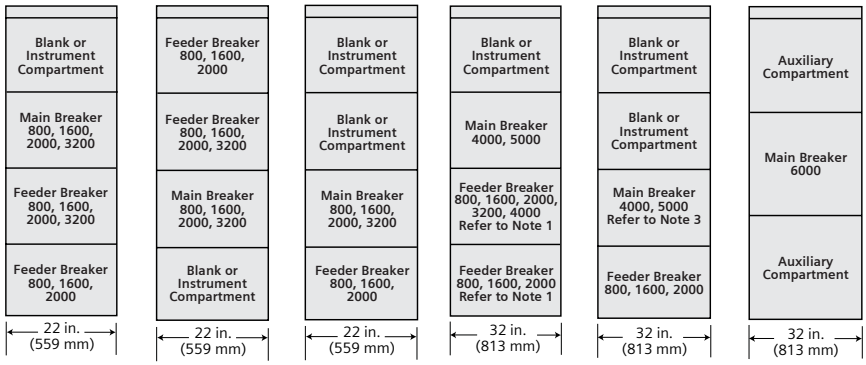
(Dimensions below are for internal frames – not total structure depth)

- 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 outdoor 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.

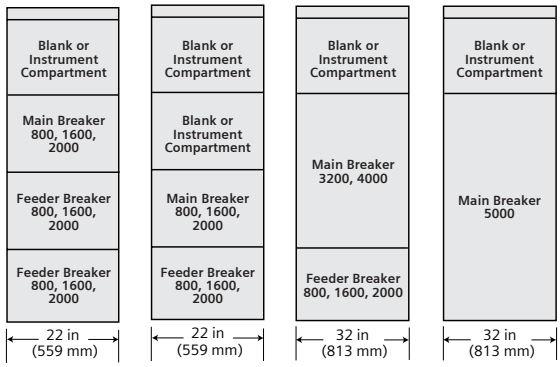
Section Compartment Arrangement



Main Sections – Non-Fused Breakers



Main Sections – Fused Breakers



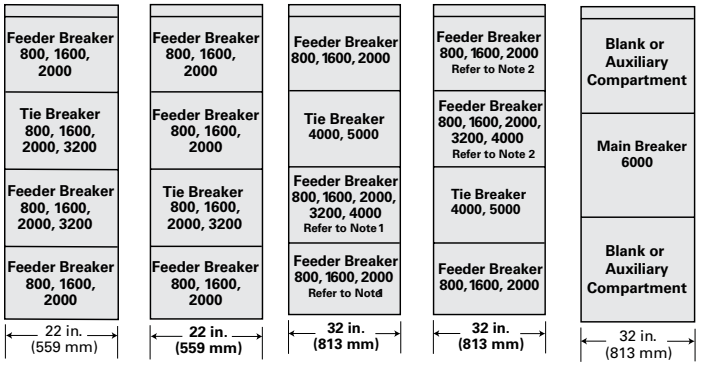
Note 1 – If a 4000 amp feeder breaker is installed in Compartment C, Compartment D must be a Blank or Instrument Compartment.
Note 2 – If a 4000 amp breaker is installed in Compartment B, Compartment A must be a Blank or Instrument Compartment.
Note 3 – If incoming is from bottom, feeder breakers can be mounted in compartments A and/or B.
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 – Only one 800, 1600, 2000 amp feeder breaker can be mounted per section. If the horizontal main bus is at the top of the section, the 800, 1600, 2000 amp feeder breaker can go in the A compartment and a blank/instrument compartment must go in the D compartment. If the horizontal main bus is at the bottom of the section, the 800, 1600, 2000 amp feeder breaker can go in the D compartment and a blank/instrument compartment must go in the A compartment.
Note 7 – Any feeder section (or bus transition section) with 6000 amp vertical bus must be 32″ wide.

Low-voltage Switchgear

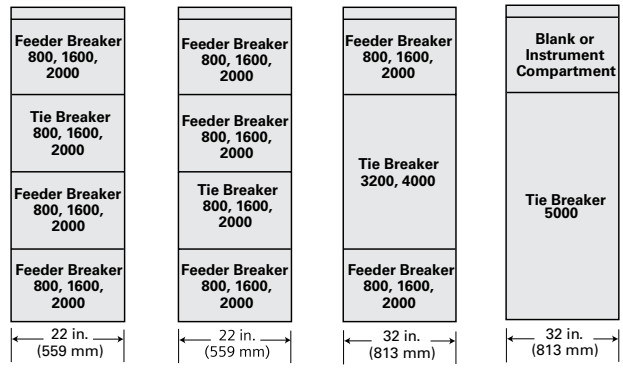
WL Low-voltage Metal-Enclosed Switchgear

Section Configurations

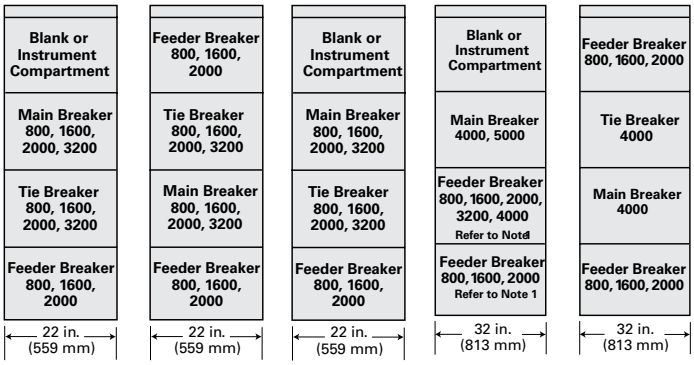
Tie Sections – Non-Fused Breakers



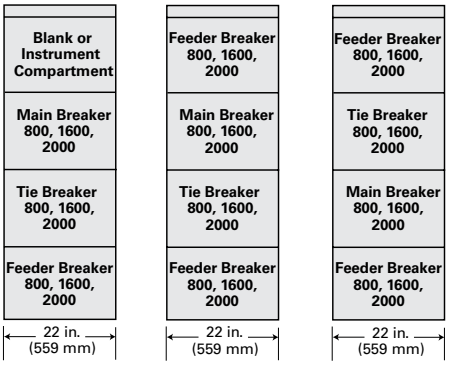
Tie Sections – Fused Breakers



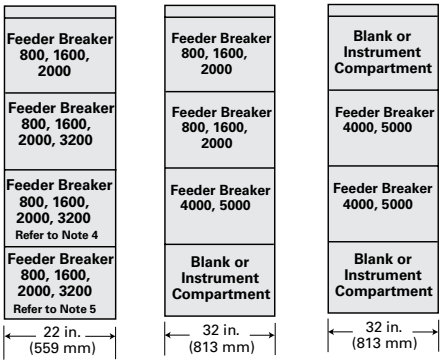
Main and Tie Sections – Non-Fused Breakers



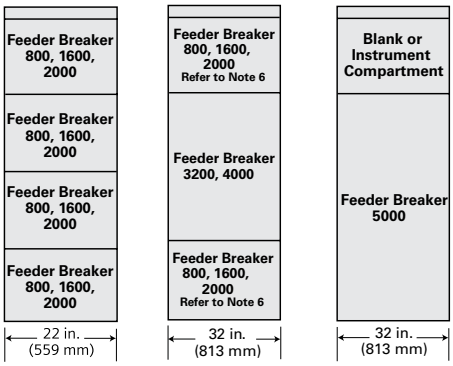
Main and Tie Sections – Fused Breakers



Feeder Sections – Non-Fused Breakers (see Note 7 on page 23)



Feeder Sections – Fused Breakers



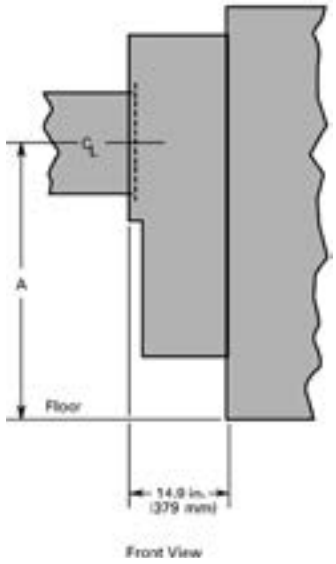
Siemens Type WL Low Voltage Switchgear can be configured in many ways by combining different section types. Up to five vertical sections plus a transition section can be shipped together as a unit.
Maximum shipping split length for indoor structures is 110 in. (2794 mm). If all vertical sections are 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 for non-fused breakers and 65 in. (1651 mm) deep for fused breakers. 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 switchgear 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 contain feeder 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

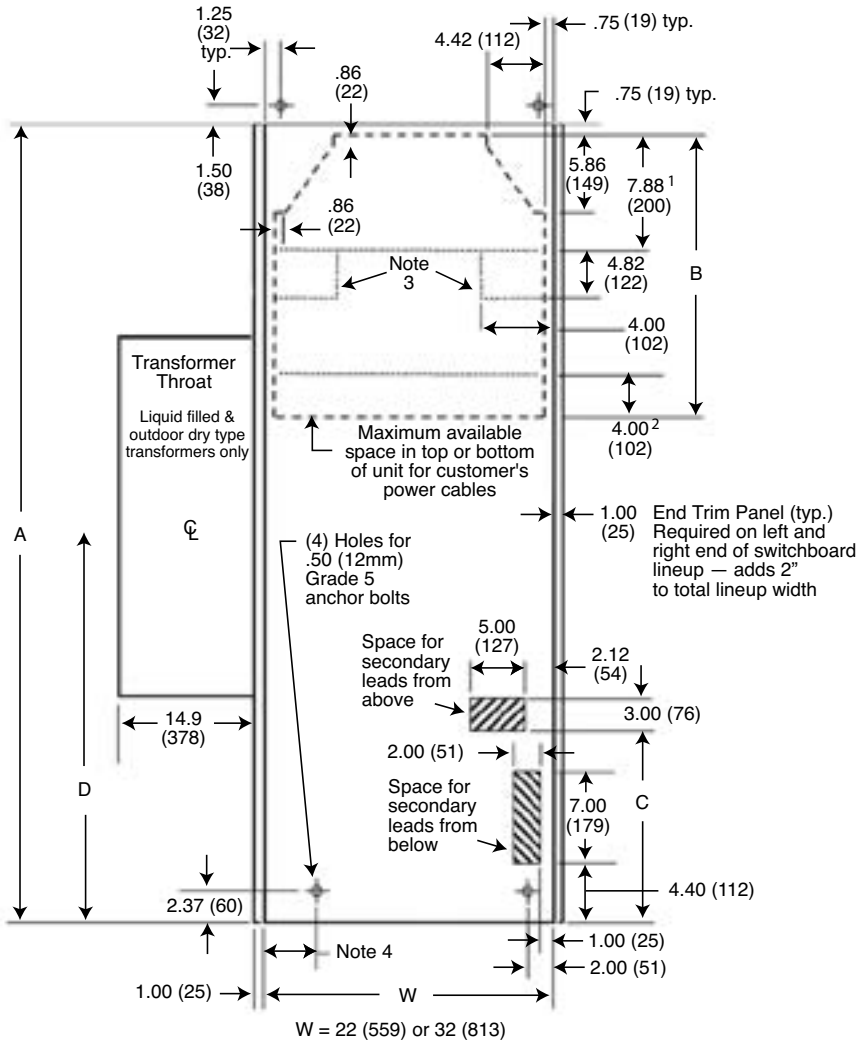
	Dimension A in inches (mm)	Weight in lbs. (kg)
Intérieur	55 (1397)	500 (227)
Extérieur	61 (1549)	550 (250)

Approximate Weight – Lbs.

Section Type	22 in. Indoor	22 in. Outdoor	32 in. Indoor	32 in. Outdoor	38 in. Indoor	38 in. Outdoor	48 in. Indoor	48 in. 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	2 100 (945)	3 500 (1 575)	2 600 (1 170)	4 500 (2 025)
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 removeable element (but does include cradle).
Add 400 lbs for hoist and track.
On outdoor switchgear, add 500 lbs for end walls (weight is for both ends). Refer to shipping documents for actual weights.

Indoor Floor Plan and Cable Space Details

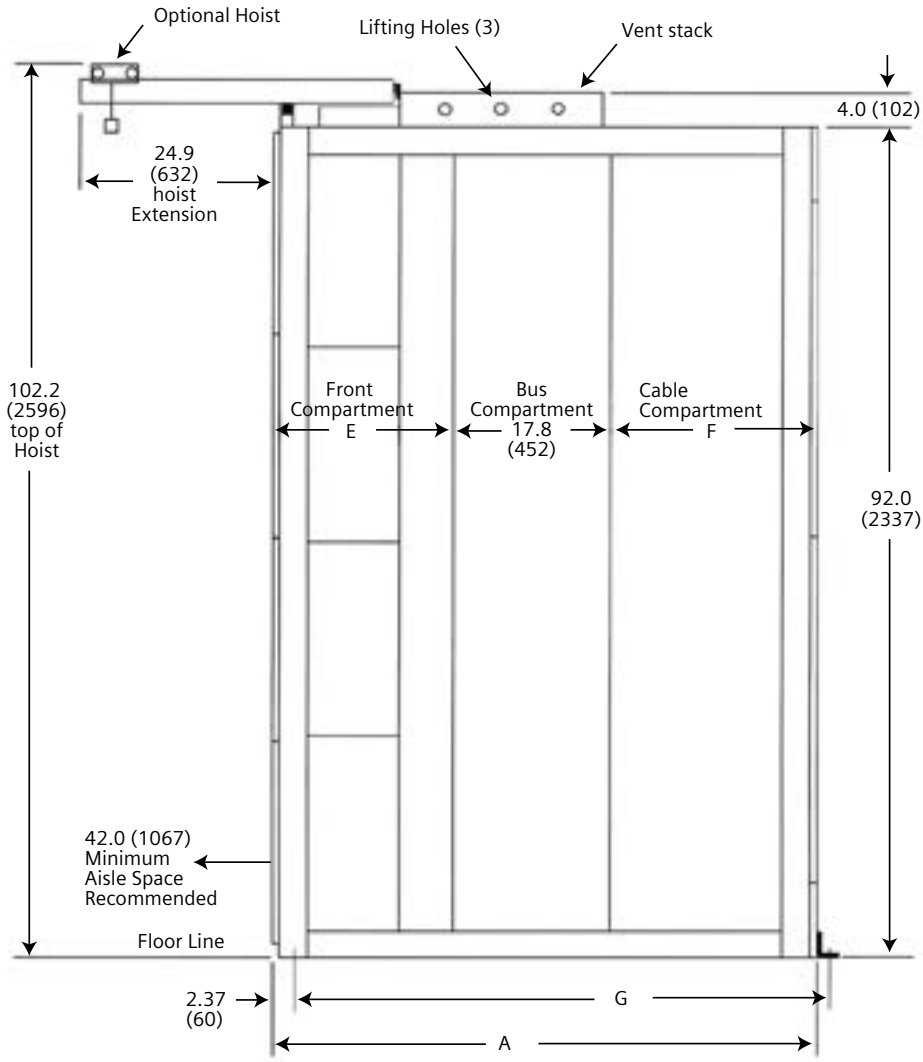


A Equipment Depth	Direction of Cables	B	C	D
60" Non-Fused with (N, S, H or L-Class Breakers) OR 65" Fused with (F-Class Breakers)	Below	21.50 (546)①②	13.88 (353)	32.59 (828)
	Above	21.25 (540)①	18.88 (480)	37.59 (955)
70" Non-fused with (N, S, H or L-Class Breakers) OR 75" Fused with (F-Class Breakers)	Below	31.50 (800)①②	13.88 (353)	32.59 (828)
	Above	31.25 (794)①	18.88 (480)	37.59 (955)
80" Non-fused with (N, S, H or L-Class Breakers)	Below	41.50 (1 054)①②	13.88 (353)	32.59 (828)
	Above	41.25 (1 048)①		
80" Fused with (F-Class Breakers)	Below	36.50 (927)①②	18.88 (480)	37.59 (955)
	Above	36.25 (921)①		

Note: Dimensions shown in inches and (mm).

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.
Reductions per notes 1 & 2 are additive. Example: cables below + lower neutral + 2000A breaker in bottom compartment = B-11.88.
③ Reduce cable space by 4.00" x 4.82" if Neutral Riser is present. (Consult Factory).
④ 4.10 (104) if W=22; 4.60 (117) if W=32.

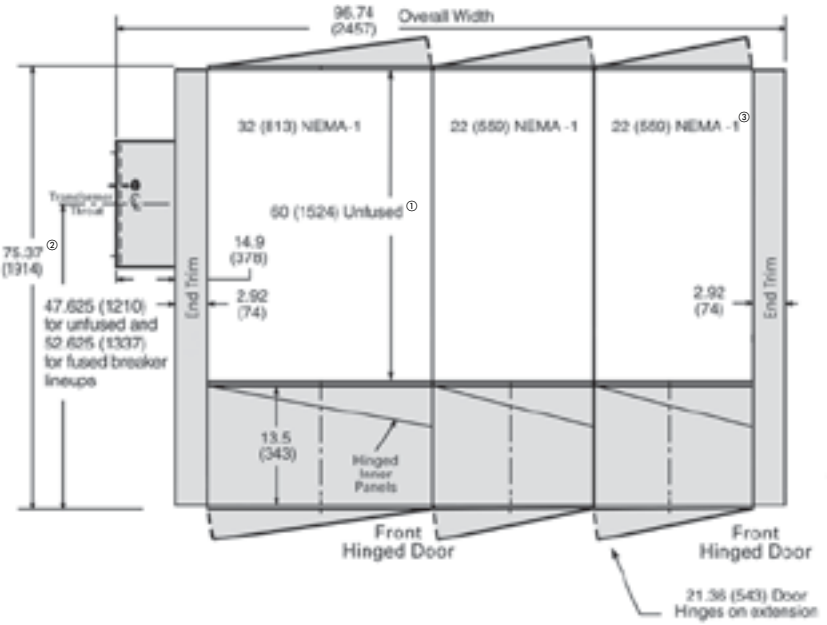
Indoor Side View



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)
65 (1651) Fused breakers	24.8 (630)	22.4 (569)	64.13 (1629)
70 (1778) Non-fused breakers	19.8 (503)	32.4 (823)	69.13 (1756)
75 (1905) Fused breakers	24.8 (630)	32.4 (823)	74.13 (1883)
80 (2032) Non-fused breakers	19.8 (503)	42.4 (1077)	79.13 (2010)
80 (2032) Fused breakers	24.8 (630)	37.4 (950)	79.13 (2010)

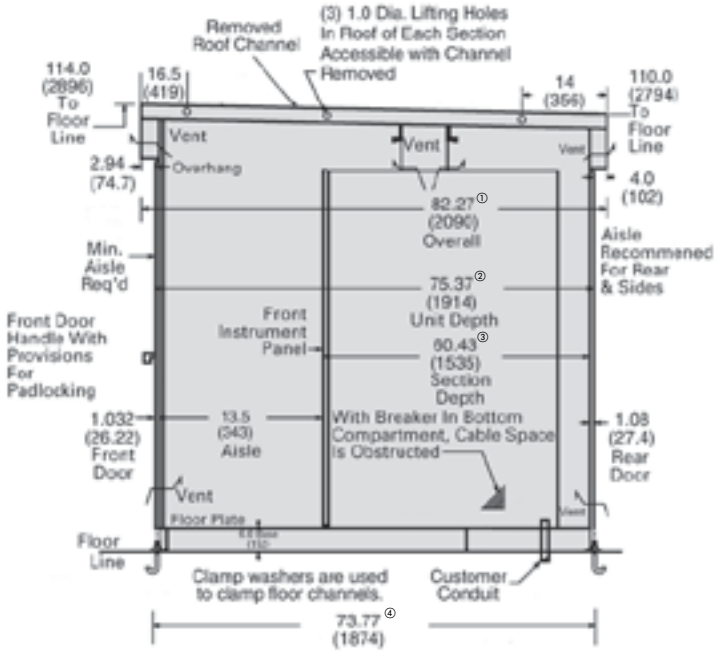
Note: Dimensions shown in inches and (mm).

Outdoor Non-Walk-in Floor Plan



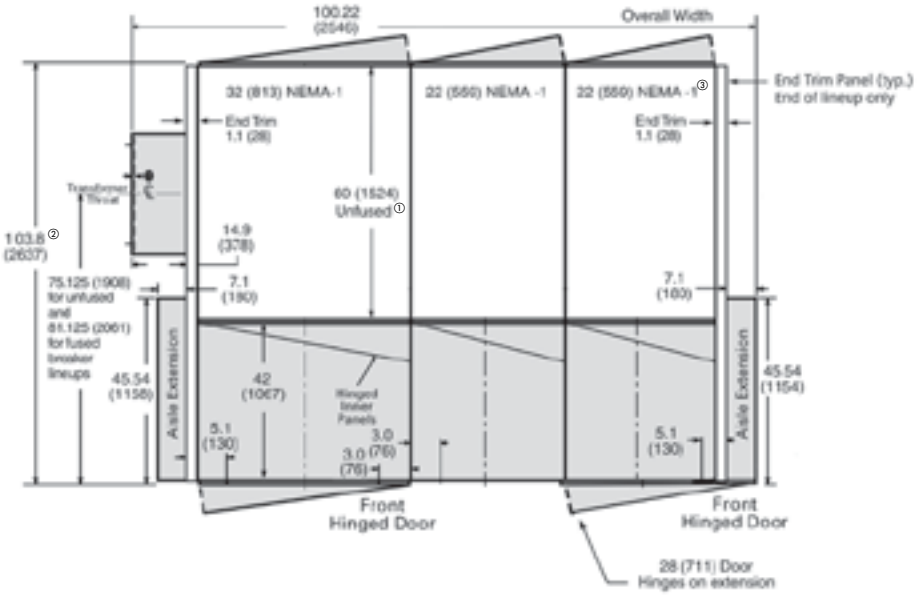
① 60" is representative for a 60" deep switchgear internal structure. For other internal structure depths (65 or 75) add extra depth to 60" that is shown.
② 75.37 is representative for a 60" deep internal structure. For other internal structure depths (65 or 75) add extra depth to 75.37 that is shown.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

Outdoor Non Walk-in Side View



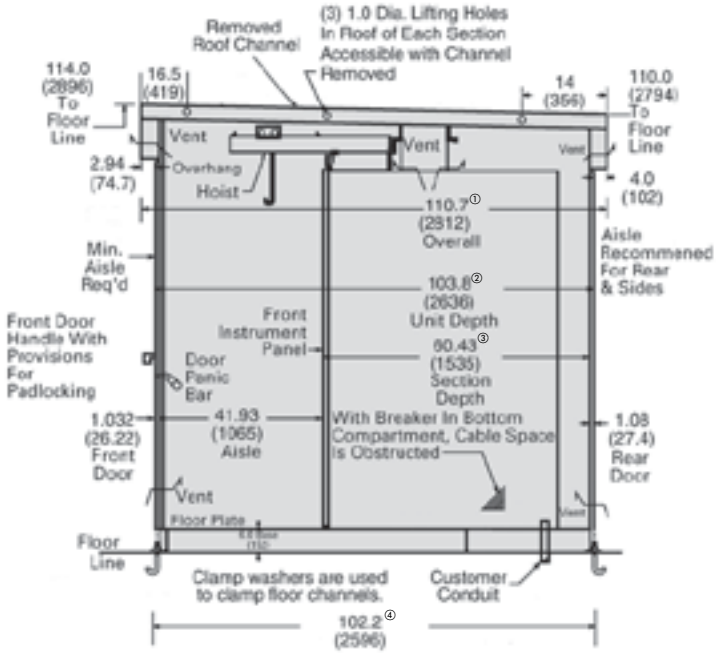
Dimensions shown in inches (mm).
① 82.27 dimension is based on 60" internal frame structure and if a deeper internal frame structure is used (65 or 75) the extra depth should be added to the 82.27 dimension.
② 75.37 dimension is based on 60" internal frame structure and if a deeper internal frame structure 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.

Outdoor Walk-in Floor Plan



① 60″ is representative for a 60″ deep switchgear 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 103.8″ 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.

Voltage Transformers – External Metering and Relaying

Ratio	Accuracy Class at 60 Hz Burden W	X	Y	Volt-Amp Rating	Thermal Rating VA	Hertz
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	Phase	Primary Voltage	Secondary Voltage
3 5 10① 15①	Single	240/480	120/240

Current Transformers for FSII WL Breaker Applications - External Metering and Relaying②

Ratio	Accuracy at 60 Hz Metering Burden (ohms) B-0.1	B-0.2	B-0.5	B-0.9	B-1.8	Class
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	1.2	C21
800.5	0.3	0.3	0.6	0.6	1.2	C29
1000.5	0.3	0.3	0.6	0.6	1.2	C35
1200.5	0.3	0.3	0.3	0.6	0.6	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	0.3	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	C20

Current Transformers for FSIII WL Breaker Applications – External Metering and Relaying②

Ratio	Accuracy at 60 Hz Metering Burden (ohms) B-0.1	B-0.2	B-0.5	B-0.9	B-1.8	Class
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
6000.5	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.

Take control of your gear from your smart device

Remotely monitor, configure, and control using mobile phone or tablet (wireless or hardwired)

Arc flash safety

- Remotely open/close breakers from outside arc flash hazard zone – no longer need dedicated control panel
- Remotely activate breaker maintenance mode from outside arc flash hazard zone
- Remotely view breaker status from outside arc flash hazard zone

Ease of commissioning

- Set breaker settings via touchscreen using mobile phone or tablet

Security

- Local security enabled WPA2 WIFI network only allowing local access

MindSphere (IoT) capable

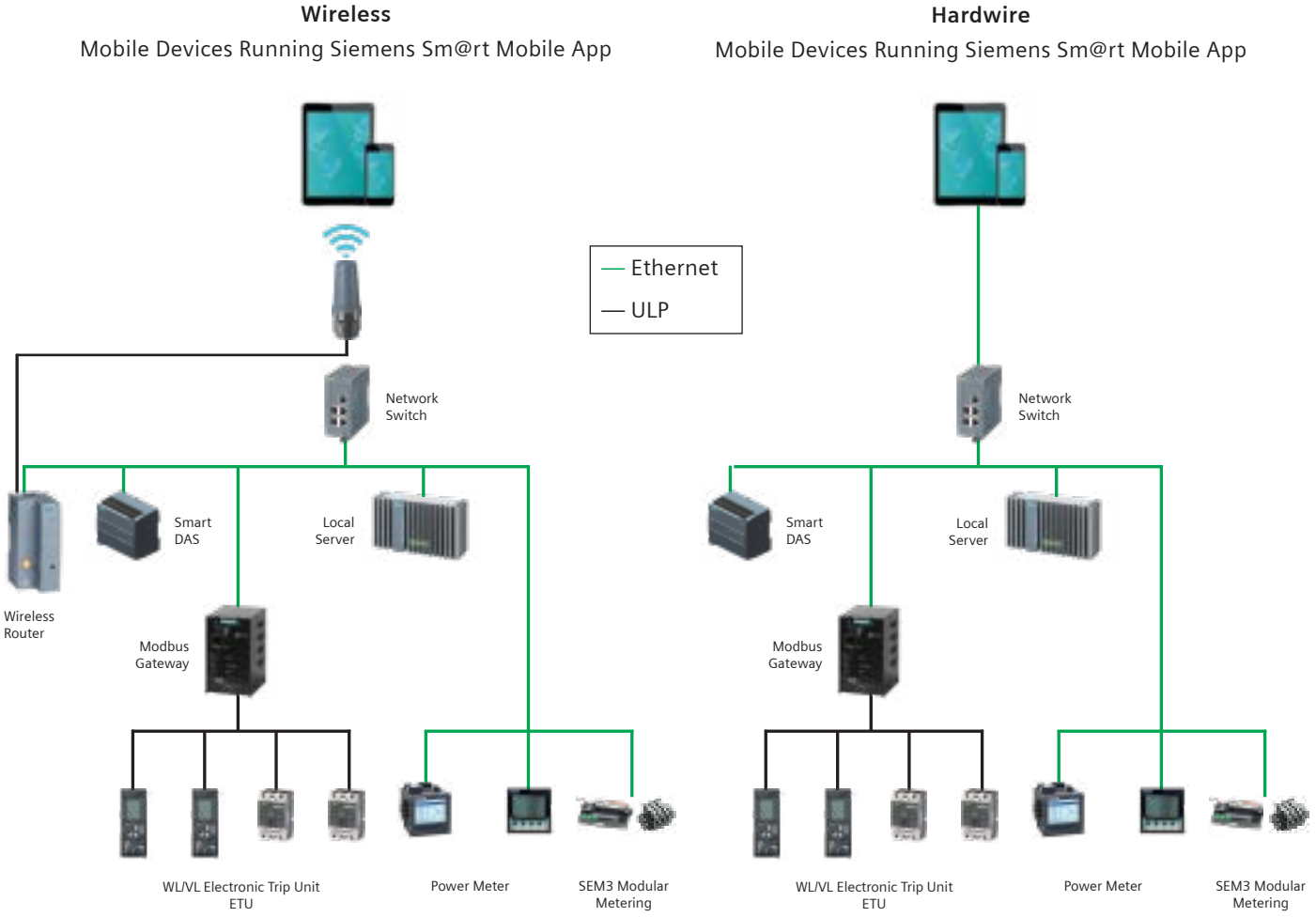
Intelligence and control at your fingertips

Elevation Screen

WL Breaker Dashboard

PAC 4200 Dashboard

Sm@rtGear Mobile Network Topology



Sm@rtGear™ Mobile Standard Features

- Available in Type WL LV Switchgear, SB Switchboards and S5/F2 Power Panelboard
- Integrates with Siemens application using phone or tablet
- Ethernet switch and WIFI access point with WPA2 encryption

Power/Insulated Case Circuit Breaker Feature

- ETU 776 with Sm@rt Dynamic Arc Sentry (DAS)
- MODBUS communication
- Protective settings and alarm functions
- Current and voltage monitoring
- Power metering functions
- Electrically operated breakers
- Remote open/close

Molded Case Circuit Breaker Features

- ETU 586 with Smart DAS
- MODBUS communication
- Protective settings and alarm functions
- Current monitoring
- Breaker status

Sm@rtGear™ Mobile Optional Features

- PAC Digital meter integration
- SEM3™ submetering integration
- Siemens MindSphere IoT integration

Sm@rtGear™ LVS System Architecture

The past

The future

Why settle for partial control when you can have total control and pay less? Traditional hard wired remote control panels provide additional safety for your personnel but Siemens Sm@rtGear™ LVS can provide the same breaker remote control plus remote monitoring and configuration of all embedded intelligent devices.

Siemens Sm@rtGear™ LVS is pre-configured and pre-programmed low-voltage metal-enclosed switchgear that provides out-of-the-box remote monitoring, configuration and control of embedded intelligent devices.

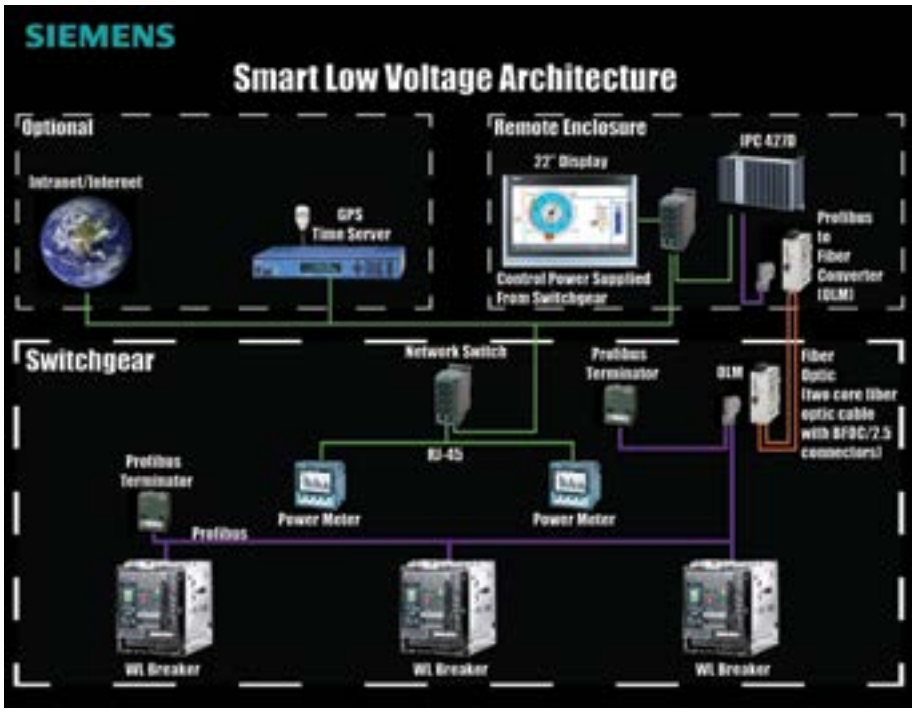
All of the Sm@rtGear™ LVS communication backbone is installed and tested at the Siemens factory and the user only has to physically connect the three communication cables that connect the low-voltage switchgear to the remotely mounted touch screen interface panel (HMI).

The remote HMI allows the user to access the intelligent devices embedded in the low-voltage switchgear. Using the HMI, the user can monitor, configure and control the intelligent devices. The Sm@rtGear™ LVS CPU acts as the local master and can also be a remote slave tied into an upstream supervisory system.

Low-voltage Switchgear

Siemens Sm@rtGear™ Low-voltage Switchgear

Features



Sm@rtGear™ LVS standard features

- PC with pre-programmed software to remotely monitor, configure and control embedded intelligent devices and structural monitoring devices.
- 22" touch screen HMI pre-configured and programmed with application specific graphical user interface (application specific elevation and one-line drawings) that act as user home page.
- Communication backbone linking embedded intelligent devices, CPU and HMI.
- ETU776 trip units in all breakers with Dynamic Arc Flash Sentry (DAS) that supports arc flash incident energy reduction.
- Electrically operated breakers with spring charge motor, shunt trip and remote closing coil.
- Metering and protective relaying functionality in all breakers.

Sm@rtGear™ LVS standard functionality includes:

- LVS one-line view
- LVS elevation view
- User Administrator
- Cell Blocking
- WL breaker control (Password or hardware enabled/disabled)
- WL breaker monitoring
- WL breaker configuration Documentation

Sm@rtGear™ LVS optional functionality includes:

- WL breaker monitoring
- Digital meter monitoring (provided at no additional cost if digital meter is supplied)
- TPS 6 SPD monitoring (provided at no additional cost if SPD is supplied)
- High Resistance Grounding (HRG) (provided at no additional cost if HRG is supplied)
- LVS structural monitoring
- Custom Maintenance Reports

Low-voltage Switchgear

Siemens Sm@rtGear™ Low-voltage Switchgear

Siemens Type WL Low-voltage Switchgear for Marine and Offshore Applications

Siemens offers low-voltage switchgear for marine and offshore applications. Siemens Type WL Low-voltage Switchgear can be manufactured to meet ABS, USCG, DNV and Lloyd's of London standards. Additionally all Siemens Type WL Low-voltage Switchgear is built to the applicable UL, ANSI and IEEE standards.

Equipment Ratings

- 635V AC maximum
- 3 phase 3 wire, 3 phase 4 wire
- 50/60 Hz
- 6000 amp maximum horizontal bus
- 6000 amp maximum vertical bus
- Silver plated copper bus standard – tin plated copper optional
- Standard bus bracing 100kA –optional up to 200kA

Seismic Qualification

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

For additional Type WL low-voltage switchgear product information, including configuration information, refer to the WL Low-voltage Metal-Enclosed Switchgear Selection and Application Guide – Siemens USA Document No. LVSA-LVMES-0313.

Additional Industry Standards Compliance

Type WL switchgear with power circuit breakers are designed, tested and constructed in accordance with:

- **UL 1558** — Metal-Enclosed Low-voltage Power Circuit Breaker Switchgear
- **ANSI C37.20.1** — Metal-Enclosed Low-voltage Power Circuit Breaker Switchgear
- **ANSI C37.50** — Test Procedure for Low-voltage AC Power Circuit Breakers Used in Enclosures
- **ANSI C37.51** — Conformance Testing of Metal-Enclosed Low-voltage AC Power Circuit Breaker Switchgear Assemblies
- **NEMA SG5** — Power Switchgear Assemblies
- **NEC** — Applicable requirements of the National Electric Code (NEC)
- **CSA** — CSA compliance with cUL labeling is available.
- **ANSI C37.20.7** — Type WL arc resistant low-voltage switchgear is available and is UL listed to ANSI/ IEEE C37.20.7. Type 2B arc resistant accessibility rating with maximum internal arcing short-circuit current rating of 100kA @508V and 85kA @ 635V

WL Drawout Circuit Breakers are 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

Low-voltage Switchgear

Type WL Arc Resistant Low-voltage Metal-Enclosed Switchgear

WL Arc Resistant Low-voltage Switchgear
Features, Benefits and Ratings

Enhanced Safety

Siemens now offers arc resistant, metal-enclosed, low-voltage switchgear designed to provide an additional degree of protection for personnel performing normal operating duties in proximity to the energized equipment. Such duties include opening or closing circuit breakers, closed door circuit breaker racking, reading instruments, or other activities that do not require cover removal or opening doors (other than auxiliary/ instrument compartment doors).

Why Arc Resistant Switchgear

Standard metal-enclosed switchgear is designed to withstand the mechanical forces generated by bolted faults on the load terminals until a power circuit breaker or other protective device can interrupt the flow of fault current. This capability is verified by short-circuit and short-time withstand tests on the equipment and interruption tests on the power circuit breakers. During a bolted fault, the voltage at the fault location is essentially zero and the fault energy is dissipated throughout the power system. The arc generated within the power circuit breaker during interruption is cooled and extinguished by the circuit breaker arc chutes. The minimal out gassing of arc byproducts from the arc chutes is contained by the switchgear as verified by interruption tests.

Siemens arc resistant low-voltage switchgear provides an added degree of protection over standard metal-enclosed switchgear. In addition to bolted faults, Siemens WL arc resistant low-voltage switchgear is designed and performance tested to ANSI/IEEE C37.20.7 to provide protection from the hazards of internal arcing faults. An internal arcing fault can be caused by insulation degradation, insulation contamination, entrance of vermin, foreign objects coming into contact with the energized bus, or any other unplanned condition that creates an electrical discharge path through air. During an arcing fault, the voltage at the fault location is essentially the system voltage and the fault energy is focused within the switchgear enclosure. Arc temperatures can exceed 20,000 degrees Kelvin, rapidly heating the air and vaporizing metal parts. The expanding plasma creates severe mechanical and thermal stress in the equipment which can blow open doors and covers and burn through or fragment the enclosure.

Standard Features

- ANSI/IEEE Type 2B Arc Resistant to protect personnel at the front, back and sides of the equipment.
- UL Listed, performance tested and classified as arc resistant in accordance with ANSI/IEEE C37.20.7.
- Reinforced enclosure to withstand pressure from internal arcing faults.
- Internal venting system with pressure dams and pressure vents to channel the flow of arc fault gases and vent these gases out the top of the gear and away from personnel.
- Reinforced and gasketed front doors with additional hinges and latching means.
- One piece circuit breaker compartment doors with insert panels for control devices such as fuses, indicating lights and circuit breaker control switches when required.
- Reinforced bolted rear covers.
- Insulated/Isolated bus bar system.
- Integrally designed circuit breaker door sealing frame that allows the user to rack a circuit breaker to connect, test or disconnect position without having to install additional hardware (bellows, shrouds, etc) and still maintain arc resistant rating of the apparatus.
- Shutters in circuit breaker compartments.
- Riser Base with integrated arc plenum.
- Four high power circuit breaker stacking capability. No additional stacking/configuration restrictions.
- All section configurations available. Available in solidly grounded or resistance grounded configurations.
- Non-fused non current-limiting circuit breakers allow full power coordination.

Recommended Optional Features

Overhead plenum with exhaust duct. The system is designed to transfer the byproducts of the arcing event (smoke, particulate matter, heat, etc.) away from the immediate vicinity of the low-voltage switchgear when an internal arcing fault occurs. Typically, the

exhaust duct will vent the byproducts to a location usually outside of the room in which the low-voltage switchgear is located. The overhead plenum is attached to the roof of the low-voltage switchgear, and can be exhausted in any direction ((left, right, forward, backward) away from the switchgear assembly or unit substation.

Dynamic Arc Flash Sentry (DAS). DAS employs the unique dual parameter setting capability of the ETU776 trip unit, 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.

Zone Selective Interlocking (ZSI). If WL circuit breakers are arranged in several levels and minimum delays are desired, it is advisable to use the ZSI module. The circuit breakers are interconnected by these modules. In the event of a short-circuit, all circuit breakers communicate to determine and isolate the exact short-circuit location. Thus, only the closest upstream circuit breaker will be opened. The ZSI module provides the complete range of selectivity with the short delay time of tzsi = 50 ms. By shortening the delay time, the ZSI module significantly reduces arc duration, stress and damage in the event of a short-circuit in the switchgear.

High resistance grounding. Reduces available fault current during ground faults thereby reducing arc energy.

Ratings

- ANSI/IEEE Type 2B accessibility
- Maximum internal arcing short-circuit current: 100kA @ 508V and 85kA @ 635V
- WL power circuit breaker frames range from 800A to 6000A
- 3 and 4 pole WL power circuit breakers
- Maximum arcing duration: 500 msec
- Vertical bus continuous current ratings to 6000A
- Horizontal bus continuous current ratings to 6000A
- Maximum voltage: 635V
- 3 Phase 3 Wire, 3 Phase 4 Wire
- 50/60 Hz

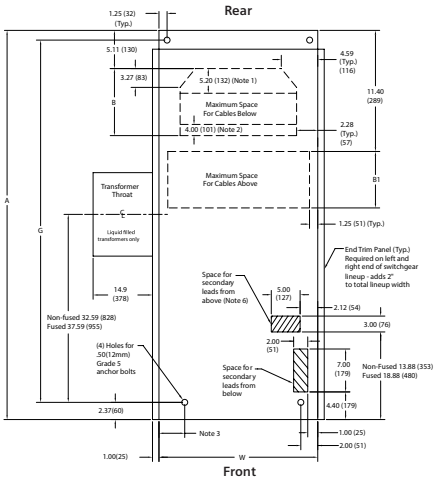
Enclosure Type

- NEMA 1 indoor

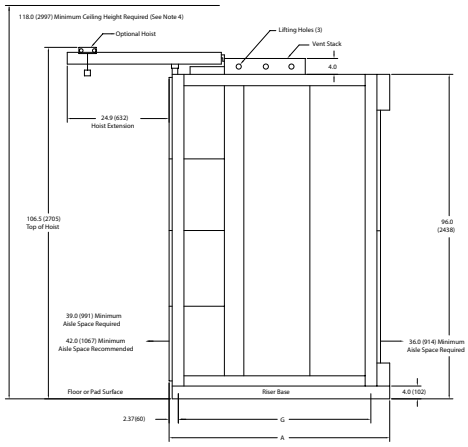
Industry Standards

- UL-1558
- ANSI/IEEE C37.20.1
- ANSI C37.51
- ANSI/IEEE C37.20.7
- CSA C22.2 No. 31

Dimensional Data



Plan View (WL Arc Resistant Switchgear without Optional Overhead Plenum)



Side View

A = Equipment Depth +2.6 (66)

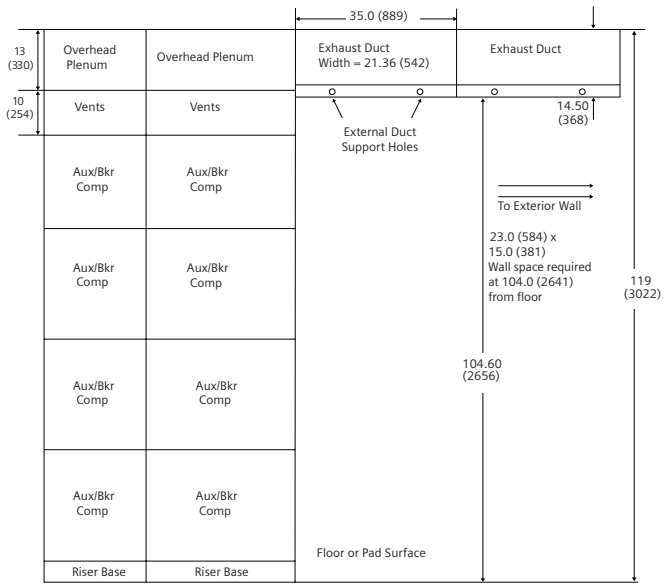
Anchor Bolt Spacing
G = Equipment Depth – 0.88 (22)

	Equipment Minimum Width W
3 Pole FS2	22 (559)
3 Pole FS3	32 (813)
4 Pole FS2	32 (813)
4 Pole FS3	40 (1016)

Equipment Depth	Cable Direction Below B	Cable Direction Above B1
60 (1524) Non-fused	20.00 (508)①	13.68 (347)
65 (1651) Fused	20.00 (508)①	13.68 (347)
70 (1778) Non-fused	30.00 (762)①	23.68 (601)
75 (1905) Fused	30.00 (889)①	23.68 (728)
80 (2032) Non-fused	40.00 (1016)①	33.68 (855)
80 (2032) Fused	35.00 (889) ①	28.68 (728)

① Space available for cables below is reduced by 5.20 inches when a lower neutral bus is present.

Dimensional Data



Front View: WL Arc Resistant Switchgear with Overhead Plenum

Note: Dimensions shown in inches and (mm).
Drawings are not to scale.

1. Space available for cables below is reduced by 5.20 inches when a lower neutral bus is present.
2. Space available for cables below is reduced by 4.00 inches if an 800-3200A circuit breaker is located in the bottom compartment. Reductions per notes 1 & 2 are additive. Example: cables below + lower neutral + 2000A circuit breaker in bottom compartment = B – 9.20
3. 4.10 (104) if W = 22; 4.60 (117) if W = 32, W = 40
4. 118 (2997) minimum room ceiling height is required for ventilation of arc products for LV Arc resistant switchgear without overhead plenum.
5. 120 (3048) minimum room ceiling height is required for LV Arc resistant switchgear with overhead plenum.
6. Not applicable for Overhead plenum application. Consult Factory for guidelines for secondary leads from above solutions.
7. Custom designed exhaust duct is provided when the exit is towards the front to clear the overhead hoist. Cross-sectional area of the exhaust duct remains same as shown in figure. Wall cutout required is same at 104 (2641) from floor.
8. Siemens to provide weatherproof box to be installed outside the exterior wall over the exhaust duct exit.
9. The area outside the exhaust duct vent needs to be kept clear of personnel and equipment due to the potential for pressurized exhaust gases being expelled in the area as a result of arc fault in the switchgear. An area of 4 feet X 4 feet centered on exhaust duct vent needs to be clear at all times.
10. Exhaust duct is not self supporting, recommended support every 6 linear feet minimum. The duct supports are not supplied by Siemens and must be supplied by the purchaser or the installing contractor.
11. LV Arc Resistant switchgear with and without overhead plenum should be installed on a solid surface to maintain the arc ratings.

Guide Form Specifications

A. This section supplements Section 16435 – Low-voltage Switch gear unless otherwise noted.
B. Comply with requirements of latest revision of ANSI/IEEE C37.20.7 – Guide for Testing Metal-Enclosed Switchgear Rated up to 38kV for Internal Arcing Faults.
C. Arc Resistant Electrical Ratings:
   1. Nominal System Voltage: [600 V] [480 V] [240 V] [208 V]
   2. Maximum Design Voltage: [635 V] [508 V] [254 V]
   3. Accessibility Type: 2B
   4. Internal Arcing Short-Circuit Current: [85kA @ 635V] [100 kA@ 508V]
   5. Arcing Duration: 100 msec, 500 msec
D. Arc Resistant General Construction:
   1. Indoor NEMA 1 enclosure
   2. Riser Base with arc plenum
   3. Insulated/Isolated bus bar system
   4. [Removable rear panels with captive screws.] [Hinged rear doors with captive hardware.]
   5. Devices connected to the primary bus such as: surge arresters, potential transformers, control power transformers and their associated current limiting fuses must be locatedin the rear of the switchgear in the bus/cable compartment and not in auxiliary compartments.
   6. Shutters in power circuit breaker compartments.
   7. One piece circuit breaker compartment doors with insert panels for fuses, indicating lights and control switches when required.

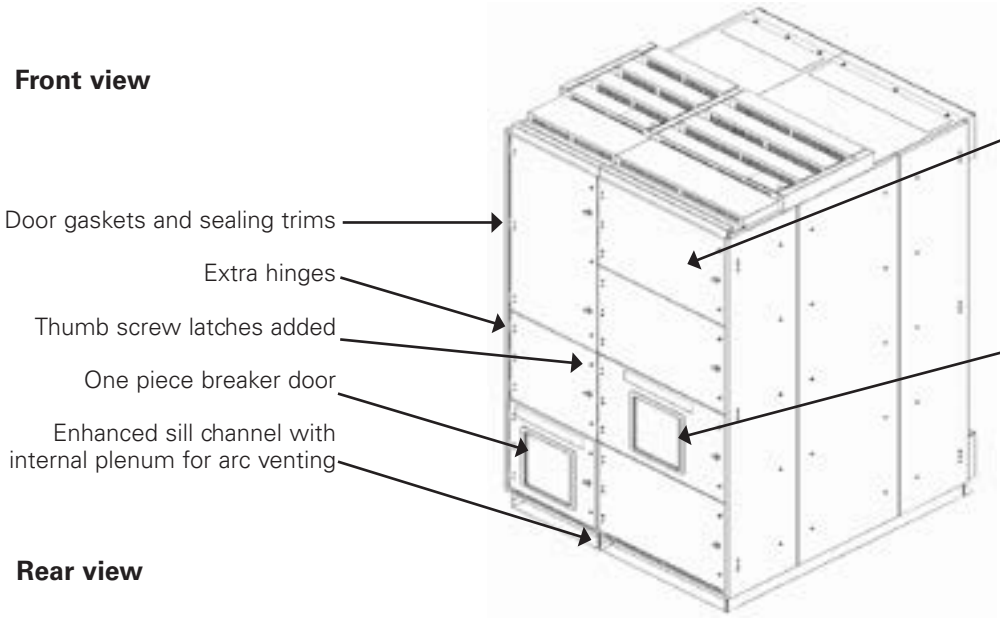
WARNING: This equipment contains hazardous voltages. Death, serious personal injury, or property damage may result if safety instructions are not followed. Only qualified personnel should work on or around this equipment after becoming thoroughly familiar with all warnings, safety notices, and maintenance procedures provided with the equipment. The successful and safe operation of this equipment is dependent upon proper handling, installation, operation and maintenance.

Arc Resistant Switchgear

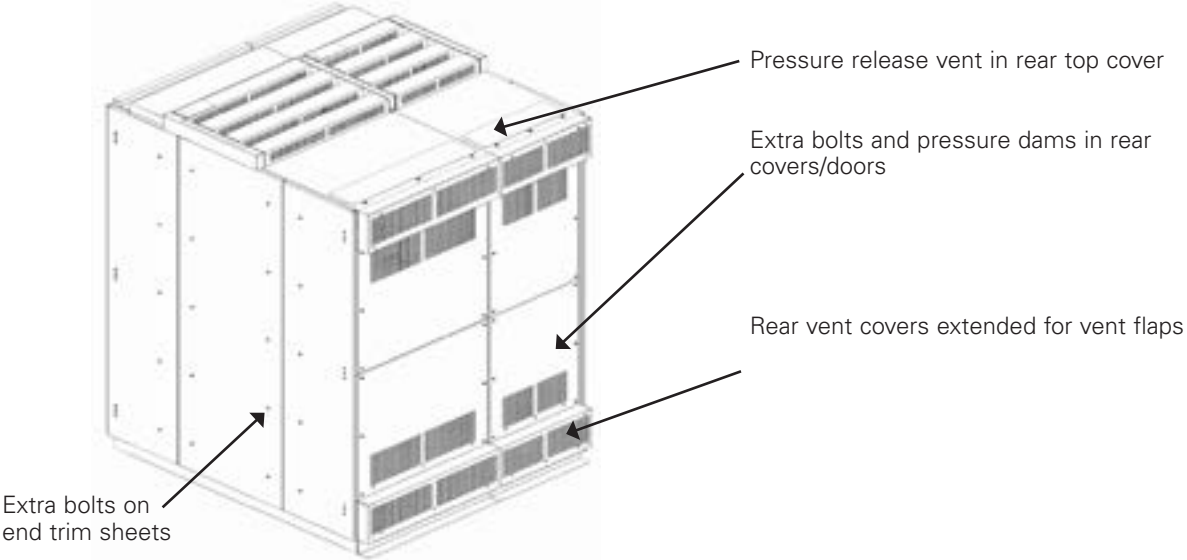
- Insulated and isolated bus
- Separation barriers and top venting
- Breaker shutters

Arc resistant metal-enclosed low-voltage switchgear is an optional product offering that contains and channels internal arcing fault energy. This new switchgear construction provides an additional degree of protection to the personnel performing normal operating duties in close proximity to the equipment while the equipment is operating under normal conditions. In each of the descriptions below, additional design features are indicated, all of which aid in directing faults upward away from personnel or reduce the chances of a fault by insulating and isolating live parts.

Front view



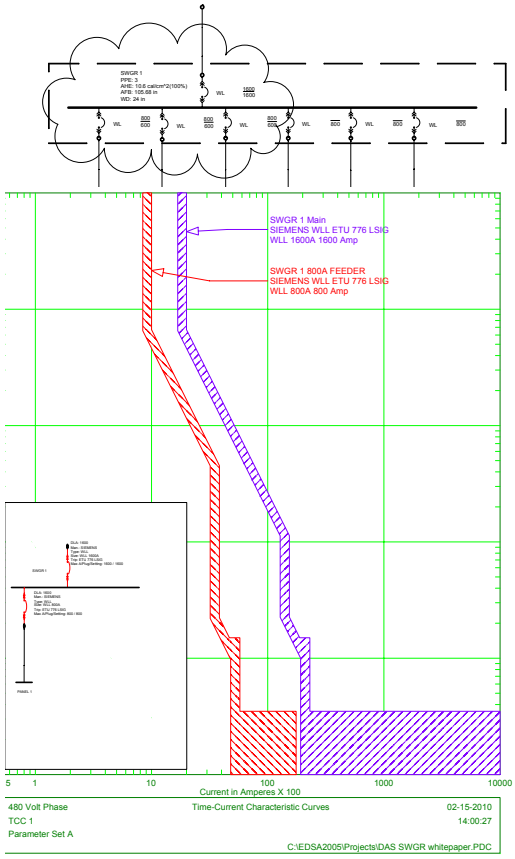
Rear view



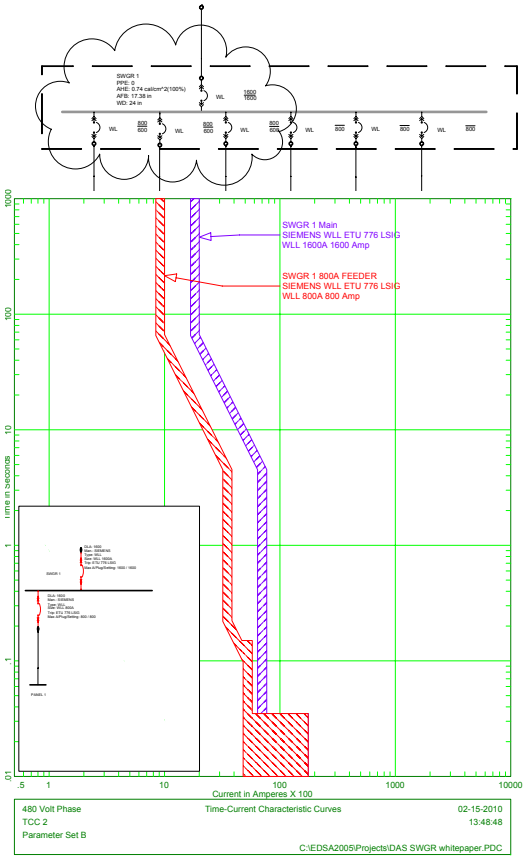
Dynamic Arc Sentry

One of the trip units available for the Siemens WL Family of breakers is the ETU 776. It offers dual parameter sets that enable the trip unit to automatically lower the instantaneous setting and thereby lower the available energy in a fault condition. Commonly referred to as "maintenance mode", making a breaker trip faster while engaged in any form of maintenance or just by being in proximity to energized equipment is an effective way to minimize arc flash dangers. If one is concerned about the effects of temporarily inhibiting selectivity, then rest assured that with the ETU 776 single step changes are possible giving engineers the ability to clear faults faster with minimum effect on coordination. In the example below the effects of the DAS system may be seen.

Example 1



Parameter set "A"



Parameter set "B"

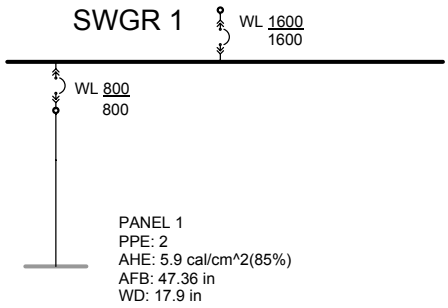
WL Breaker with ETU 776

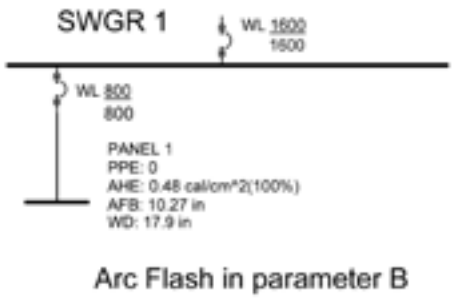
Dual Parameter sets enable "maintenance mode" - can be set remotely via software or automatically via digital input.

Under normal conditions, the switchgear's calculated arc flash energy will require PPE level 3 protection for anyone within the arc flash boundary. Incorporating the features built into the DAS system, and using the ETU776 trip unit, the system changes to parameter set B. In the second figure the instantaneous has been changed to a lower setting and the calculation shows a reduction of arc flash energy. The resultant PPE level has been reduced to 0.

Below is another example of the benefit of the DAS, or even manual switching, of breaker parameter set. The reduced settings set available in the ETU 776 can also be used to reduce the arc flash energy at downstream equipment. In the first figure on the left with normal settings the arc energy at panel 1 requires PPE level 2. After switching to the parameter B settings, the PPE level at Panel 1 is reduced to 0.

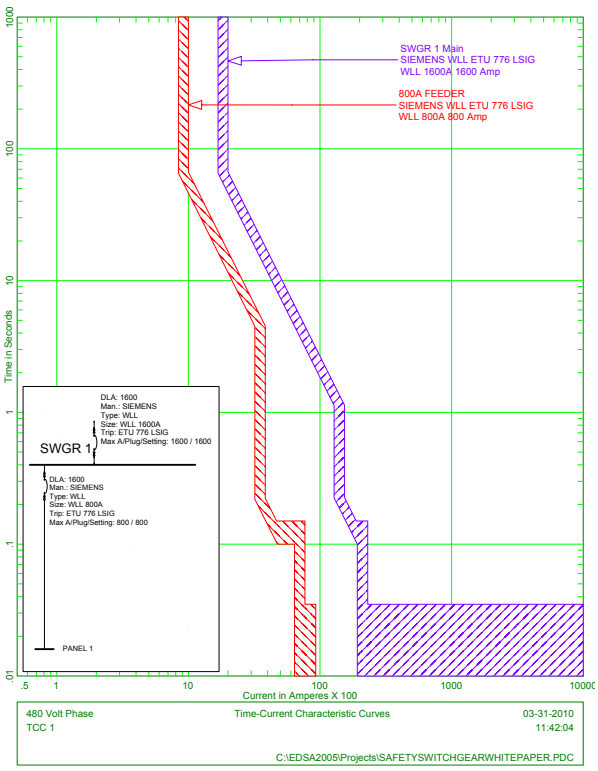
Example 2



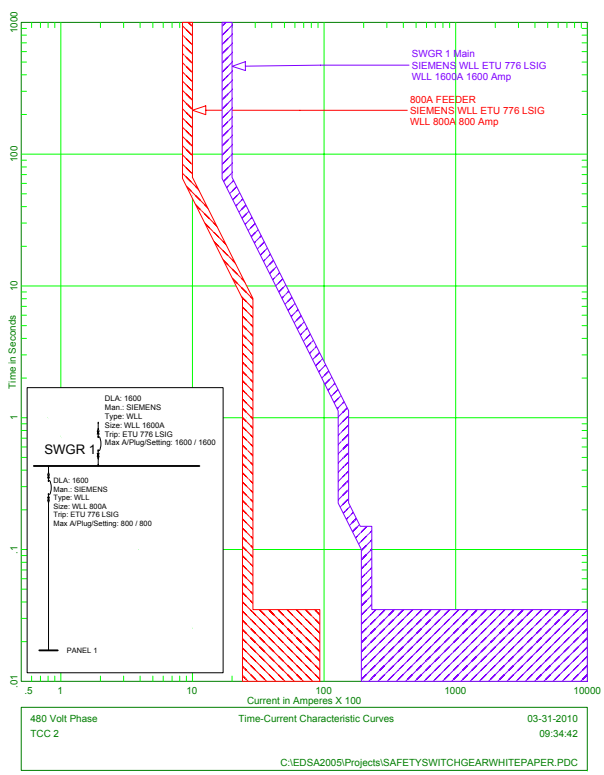


Arc Flash in parameter B

Arc Flash in parameter A



Arc Flash in parameter B



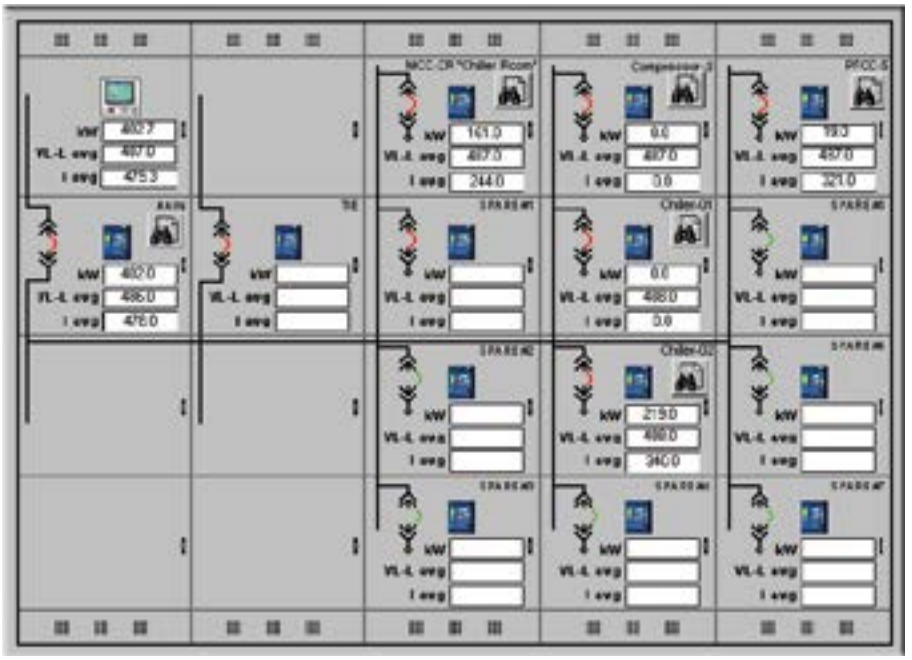
Remote operation and monitoring

- Remote Monitoring for temperature, metering and maintenance data.
- Remote Control via communications with or without interposing relays.
- Remote Racking feature.
- Remote Operation for opening and closing via local hand held pendant station.

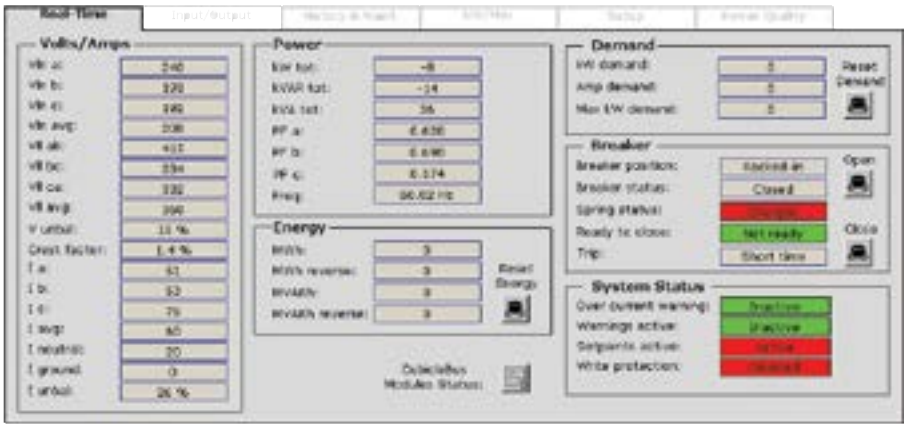
Remote Monitoring is an effective way to maintain separation between personnel and energized electrical equipment. With the latest equipment from Siemens, this is now easier and more cost effective than ever. Maintenance personnel and engineers can now view real-time electrical parameters, operating conditions (like temperature in the breaker and number of operations), and open and close breakers remotely. The WinPM.Net software with its Web Enabled interface allows multiple users to access only the information they are interested in from the convenience of their desks. Accountants can access cost allocation and utility billing information to enforce accountability for electrical resources and verify utility bills. Trip settings and other parameters for the LV power breakers can be modified and monitored remotely as well.

In addition, WL breakers with appropriate electrical controls and communication components, can be opened and closed through communications directly or with the use of interposing relays.

Unit sub #5 elevation



Real-time data from WL breakers with remote open/close capability



Remote Racking Device

Although it is always preferable to work on equipment that has been de-energized, in some cases it may not be practical. Siemens now offers the Remote Breaker Racking Device. This product uses an integral torque overload sensing mechanism and allows users to safely rack our WL breakers into the Connect, Test and Disconnect position from up to 30 feet away.

This allows the operator to be outside the arc flash boundary thereby providing additional personnel protection and reducing the PPE requirements. This system can be retrofitted to existing Siemens WL switchgear lineups.

Remote Racking Device

Remote Operator Pendant

This hand held pendant allows a user to remotely operate (open/close) a WL breaker without being in front of the switchgear. Standard cable lengths are 30 feet with other lengths available. This pendant, along with the Remote Racking device, can be used to improve personnel safety by putting operators outside the arc flash boundary. Maintenance personnel can remotely open breakers and close breakers, without being in front of the equipment. The Remote Operator Pendant can be used in combination with the Remote Racking Device for added personnel safety.

Remote Operator Pendant

Control port on WL Switchgear

Low-voltage Switchgear

Arc Flash Solutions

Other protection options

- Infrared Viewing ports
- Zone Selective Interlocking
- High Resistance Grounding

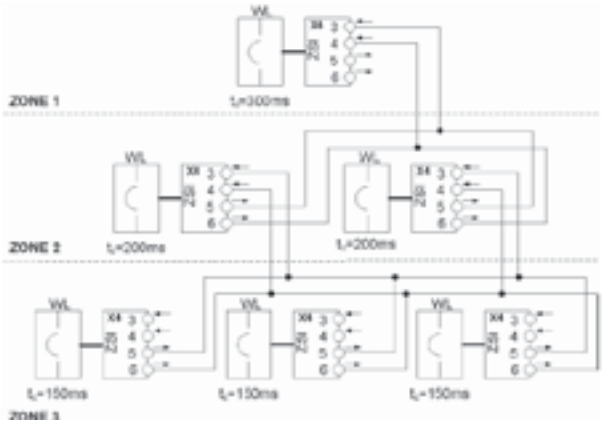
Infrared Viewing Ports

Infrared viewing ports allow maintenance personnel to monitor temperatures of the cable and bus connection points in the rear of the gear while it is energized and under load. Excessive temperatures can be an indication of a problem with a connection.

Infrared viewing ports

Zone Selective Interlocking

Zone Selective Interlocking eliminates any intentional time delay in the event a fault occurs between two breakers in adjacent zones. In the schematic to the right, representative time delay values are shown for the breakers in each zone. If a fault occurs on the load side of the downstream breaker, the ZSI system enables the upstream breaker's delay and allows the downstream device more time to independently clear the fault. If the fault occurs on the line side of the downstream breaker (between two zones), the delay in the upstream breaker will not occur. This allows the fastest tripping time for faults and will reduce the amount of arc energy which may be released. The ZSI function is available for short time delays and ground fault delays.

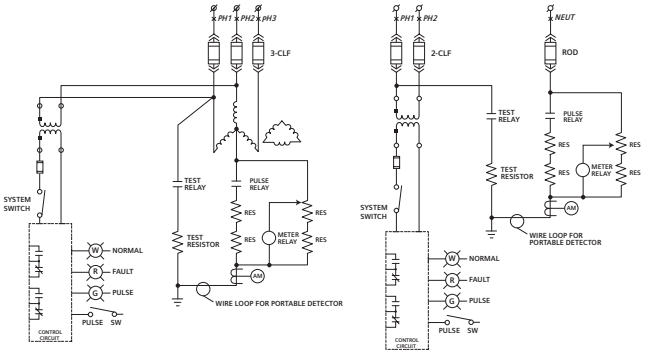


Zone Selective Interlocking

High Resistance Grounding

Research has shown that a high percentage of arc faults start as a phase to ground fault. High resistance grounding systems minimize the available phase to ground arcing current.

A high resistance grounding system reduces the magnitude of phase to ground faults. This will reduce the mechanical stress on equipment for the most common of faults and will reduce the magnitude of energy released.



Secondary Unit Substations

Overview

Siemens offers a wide variety of unit substation designs to meet customer requirements. A unit substation consists of one or more transformers mechanically and electrically connected to and coordinated in design with one or more switchgear or switchboard assemblies. A secondary unit substation is defined as a unit substation whose outgoing section is rated below 1000 volts.

A typical secondary unit substation consists of three sections:

- Primary: an incoming section that accepts incoming high voltage (2400 to 13,800 volts) line
- Transformer: section that transforms incoming voltage down to utilization voltage (600 volts or less)
- Secondary: an outgoing section that distributes power to outgoing feeders and provides protection for these feeders (600 volts and less)

Standard secondary unit substations consist of:

- Medium Voltage Primary
- Transformer
- Low Voltage Secondary

Siemens also offers low voltage unit substations with:

- Low Voltage Primary
- Transformer
- Low Voltage Secondary

The primary reason for using a secondary unit substation is to bring power as close as possible to the center of the loads. Another reason is that it provides a system design concept incorporating a wide variety of components that permits tailoring equipment to the needs of the application. A secondary unit substation provides

- Reduced power losses
- Better voltage regulation
- Improved service continuity
- Increased functional flexibility
- Lower installation cost
- Efficient space utilization

Every component and assembly of secondary unit substations are designed and engineered as an integral part of a complete system.

Primary Switch

Liquid Filled Transformer

Switchboard with WL Encased Systems Breakers

Primary Switch

Dry Type Transformer

Type FC2 Switchboard with Fusible Switches

Primary Switch

Liquid Filled Transformer

Type WL Low Voltage Switchgear

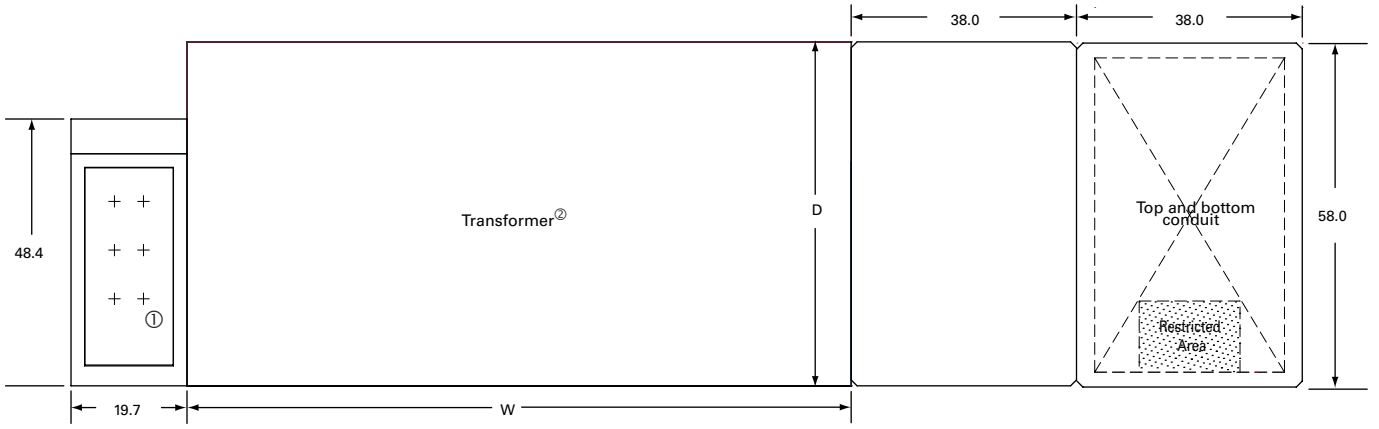
For more information, please contact your local sales office.

Siemens Unit Substation Solutions

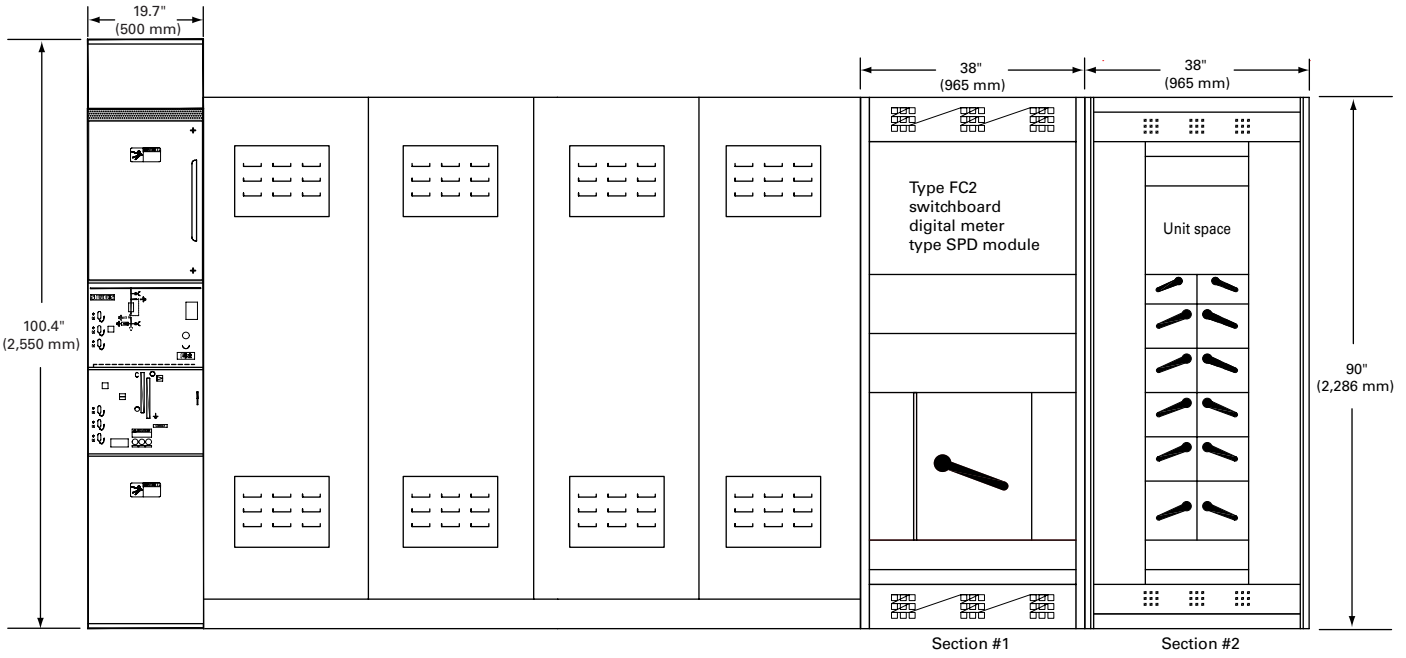
Indoor Dry Type Transformer

Sketch Page

Plan view

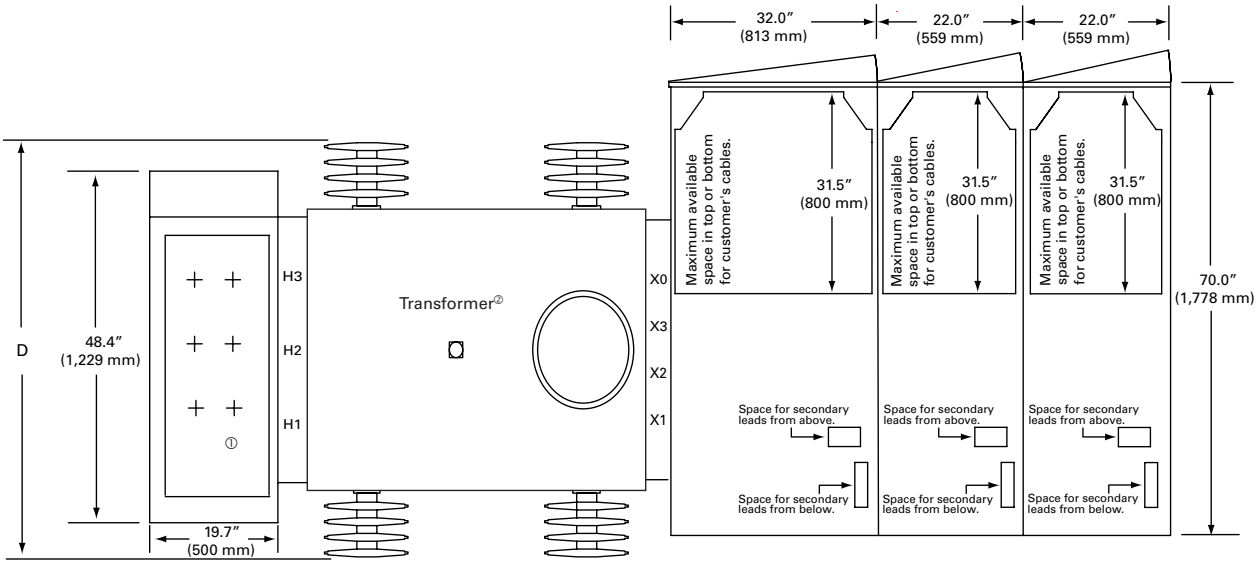


Front view

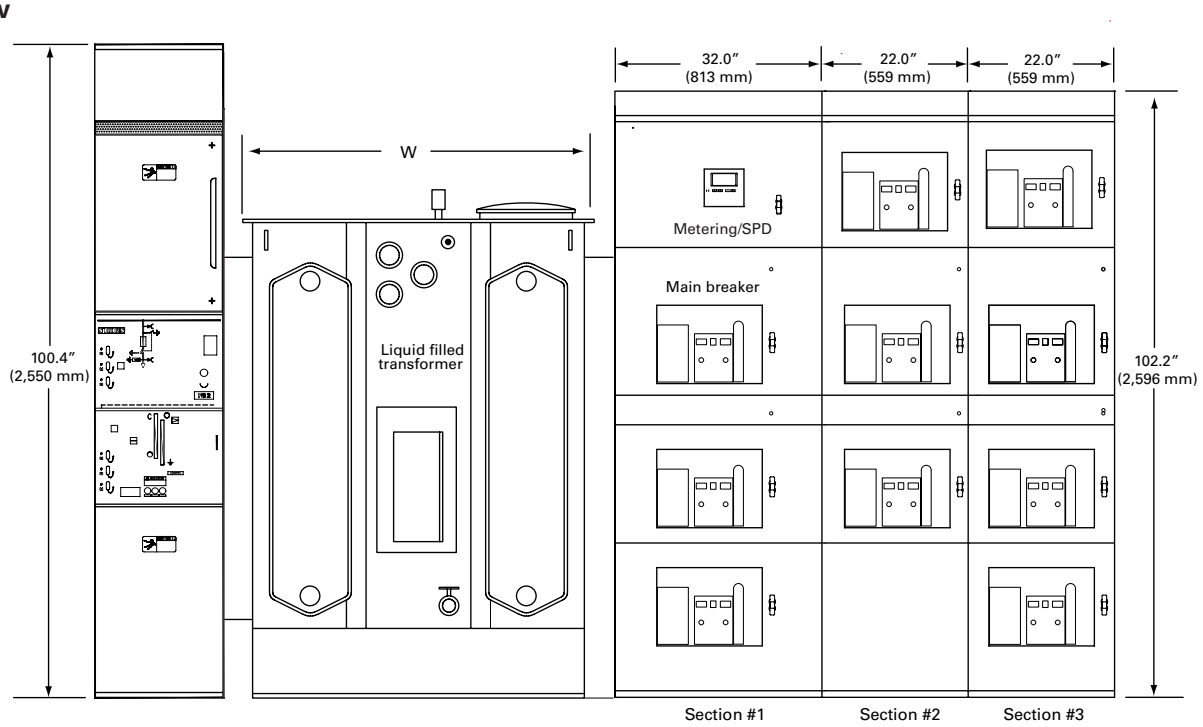


Primary Switch requires front access for top cable entry terminations.
Transformer requires access from the front and 12″ (305 mm) on the back side for ventilation space.

Plan view



Front view



Primary Switch requires front access for top cable entry terminations.
Transformer requires access from the front and 12″ (305 mm) on the back side for ventilation space.

Notes