WL Low Voltage Metal-Enclosed Switchgear
Selection and Application Guide

usa.siemens.com/switchgear
Type WL Low Voltage Metal-Enclosed Switchgear

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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**
  - Heavy assembly
  - 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**
  - Large office buildings
  - Distribution centers
  - Large warehouses

**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
- ANSI C37.20.1 – Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear Assemblies
- 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 Protector
- 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 arcing 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.
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 color is light gray ANSI 61. The standard painting process is a UL approved electrostatic powder coat paint system utilizing a polyester powder coat paint. The completed finish has a nominal 2 mils dry film thickness.

Assembly Construction
Siemens Type 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.

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.)
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 short circuit 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.

Circuit breaker cell interior

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
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. See Tables on Page 31 for available ratings.

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.

The following features are standard with walk-in outdoor enclosures.
1. Space heaters in breaker compartment and bus compartment.
2. Screens and filters for exterior door ventilation louvers.
3. Incandescent lighting receptacle with three-way switch at each aisle access door.
4. Duplex receptacle with ground fault protection at each aisle access door.
5. Load center for power distribution to lights, receptacles, switches and heaters.

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

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.
Type WL Low Voltage Metal-Enclosed Switchgear
WL Circuit Breaker

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

1. Guide Frame
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
Type WL Low Voltage Metal-Enclosed Switchgear
Electronic Trip Unit

Electronic Trip Unit
During development of our electronic trip units we have consistently striven to ensure modularity. The following are just some of the modules that are simple to retrofit at any time:
- Ground fault protection
- Communication
- Metering function
- Displays
- Rating plugs

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

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

Switch-selectable I²t or I⁴t

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

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

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

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

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

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

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

This is where the Extended Instantaneous Protection feature of the WL can offer the 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

![Sample Configuration of an ETU745](image)

- **Manual Trip Indicator with optional remote RESET**
- **LCD display with adjustable-angle viewing**
- **Micro switches for switch selectable characteristic curve adjustments**
Selection Criteria for WL Circuit Breakers

The basic criteria for selecting circuit breakers is:

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

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

**Ambient Temperature** of the circuit breaker.

**Design** of the circuit breaker.

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

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

Dynamic Arc-Flash Sentry (DAS) employs the unique dual protective setting capability of the 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.
Type WL Low Voltage Metal-Enclosed Switchgear
Electronic Trip Unit

<table>
<thead>
<tr>
<th>Basic Protective Functions</th>
<th>ETU745</th>
<th>ETU748</th>
<th>ETU776</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-time overcurrent protection</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Short-time delayed overcurrent protection</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Instantaneous overcurrent protection</td>
<td>●</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Neutral protection</td>
<td>●</td>
<td>❌</td>
<td>●</td>
</tr>
<tr>
<td>Ground fault protection</td>
<td>●</td>
<td>❌</td>
<td>●</td>
</tr>
<tr>
<td>Additional Functions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selectable neutral protection</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Defeatable short-time delay</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Defeatable instantaneous protection</td>
<td>●</td>
<td>❌</td>
<td>●</td>
</tr>
<tr>
<td>Selectable thermal memory</td>
<td>●</td>
<td>●</td>
<td>❌</td>
</tr>
<tr>
<td>Zone selective interlocking</td>
<td>❌</td>
<td>❌</td>
<td>●</td>
</tr>
<tr>
<td>Selectable I²t or fixed short-time delay</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Adjustable instantaneous pick-up</td>
<td>●</td>
<td>❌</td>
<td>●</td>
</tr>
<tr>
<td>Selectable I²t or I⁴t long-time delay</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Adjustable short-time delay and pick-up</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Selectable and adjustable neutral protection</td>
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<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Dual protective setting capability</td>
<td>❌</td>
<td>❌</td>
<td>●</td>
</tr>
<tr>
<td>Extended instantaneous protection</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Parameterization and Displays</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parameterization by rotary switches (10 steps)</td>
<td>●</td>
<td>●</td>
<td>❌</td>
</tr>
<tr>
<td>Parameterization by communication (absolute values)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Parameterization by menu/keypad (absolute values)</td>
<td>❌</td>
<td>❌</td>
<td>●</td>
</tr>
<tr>
<td>Remote parameterization of the basic functions</td>
<td>❌</td>
<td>❌</td>
<td>●</td>
</tr>
<tr>
<td>Remote parameterization of the additional functions</td>
<td>❌</td>
<td>❌</td>
<td>●</td>
</tr>
<tr>
<td>Alphanumeric LCD</td>
<td>●</td>
<td>●</td>
<td>❌</td>
</tr>
<tr>
<td>Graphical LCD</td>
<td>❌</td>
<td>❌</td>
<td>●</td>
</tr>
<tr>
<td>Metering Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metering function Plus</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CubicleBUS</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Communication via PROFIBUS-DP</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Communication via the MODBUS</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Communication via the Ethernet (BDA)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

● 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.
Type WL Low Voltage Metal-Enclosed Switchgear

Time/Current Characteristic Curves

Tripping Characteristics

ETU748
Type WL Low Voltage Metal-Enclosed Switchgear

Time/Current Characteristic Curves

Tripping Characteristics

ETU776
## Type WL Low Voltage Metal-Enclosed Switchgear

### Breaker Technical Data

**WL Circuit Breakers ANSI / UL 1066**

<table>
<thead>
<tr>
<th>Breaker Ratings</th>
<th>Frame Size II</th>
<th>800</th>
<th>1600</th>
<th>2000</th>
<th>3200</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frame Rating Class</strong></td>
<td><strong>N</strong></td>
<td><strong>S</strong></td>
<td><strong>H</strong></td>
<td><strong>L</strong></td>
<td><strong>F</strong></td>
</tr>
<tr>
<td>Instantaneous Short-circuit Current</td>
<td>254VAC</td>
<td>50</td>
<td>65</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>(kA RMS) 50/60 Hz</td>
<td>508VAC</td>
<td>50</td>
<td>65</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>635VAC</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>85</td>
<td>200</td>
</tr>
<tr>
<td>Short-time Withstand Current Icw</td>
<td>0.5s</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>85</td>
</tr>
<tr>
<td>(kA RMS) 50/60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extended Instantaneous Protection</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>85</td>
<td>—</td>
</tr>
<tr>
<td>(kA RMS -0% to +20%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Close and Latch Ratings</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>85</td>
<td>65</td>
</tr>
<tr>
<td>(kA RMS) 50/60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rating Plug Range</td>
<td>200, 225, 250, 300, 315, 350, 400, 450, 500, 600, 630, 700, 800amps</td>
<td>200, 225, 250, 300, 315, 350, 400, 450, 500, 600, 630, 700, 800, 1000, 1200, 1250, 1600amps</td>
<td>200, 225, 250, 300, 315, 350, 400, 450, 500, 600, 630, 700, 800, 1000, 1200, 1250, 1600, 2000amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Endurance Rating</td>
<td>Mechanical</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
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<tr>
<td>(switching operations with maintenance)</td>
<td>Electrical</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Breaker Ratings</th>
<th>Frame Size III</th>
<th>3200</th>
<th>4000</th>
<th>5000</th>
<th>6000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frame Rating Class</strong></td>
<td><strong>M</strong></td>
<td><strong>F</strong></td>
<td><strong>H</strong></td>
<td><strong>L</strong></td>
<td><strong>M</strong></td>
</tr>
<tr>
<td>Instantaneous Short-circuit Current</td>
<td>254VAC</td>
<td>150</td>
<td>200</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>(kA RMS) 50/60 Hz</td>
<td>508VAC</td>
<td>150</td>
<td>200</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>635VAC</td>
<td>85</td>
<td>200</td>
<td>85</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Short-time Withstand Current Icw</td>
<td>0.5s</td>
<td>100²</td>
<td>—</td>
<td>85</td>
<td>100³</td>
</tr>
<tr>
<td>(kA RMS) 50/60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extended Instantaneous Protection</td>
<td>254VAC</td>
<td>150</td>
<td>—</td>
<td>150</td>
<td>—</td>
</tr>
<tr>
<td>(kA RMS -0% to +20%)</td>
<td>508VAC</td>
<td>85</td>
<td>—</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>635VAC</td>
<td>85</td>
<td>—</td>
<td>85</td>
<td>100</td>
<td>85</td>
</tr>
<tr>
<td>Close and Latch Ratings</td>
<td>100²</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>100²</td>
</tr>
<tr>
<td>(kA RMS) 50/60 Hz</td>
<td>800, 1000, 1200, 1250, 1600, 2000, 2500, 3000, 3200 amps</td>
<td>800, 1000, 1200, 1250, 1600, 2000, 2500, 3000, 3200, 4000 amps</td>
<td>800,1000, 1200, 1250, 1600, 2000, 2500, 3000, 3200, 4000, 5000 amps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endurance Rating</td>
<td>Mechanical</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>(switching operations with maintenance)</td>
<td>Electrical</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
</tbody>
</table>

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.
Type WL Low Voltage Metal-Enclosed Switchgear

Breaker Technical Data

### WL Non-Automatic Switches ANSI / UL 1066

<table>
<thead>
<tr>
<th>Frame Rating Class</th>
<th>Frame Size II</th>
<th></th>
<th>Frame Size III</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>800</td>
<td>1600</td>
<td>2000</td>
<td>3200</td>
</tr>
<tr>
<td>Short-time</td>
<td>L</td>
<td>F1</td>
<td>L</td>
<td>F1</td>
</tr>
<tr>
<td>Withstand Current (kA RMS) 50/60 Hz</td>
<td>0.5s</td>
<td>85</td>
<td>20</td>
<td>85</td>
</tr>
<tr>
<td>Breaking Capacity with External Relay (kA RMS) 635Vac , 50/60 Hz, max time delay</td>
<td>0.5s</td>
<td>85</td>
<td>20</td>
<td>85</td>
</tr>
</tbody>
</table>

### WL Circuit Breakers

<table>
<thead>
<tr>
<th>Frame Rating</th>
<th>Frame Size II</th>
<th></th>
<th>Frame Size III</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>800</td>
<td>1600</td>
<td>2000</td>
<td>3200</td>
</tr>
<tr>
<td>Rated current In at 40°C, at 50/60Hz</td>
<td>A</td>
<td>800</td>
<td>1600</td>
<td>2000</td>
</tr>
<tr>
<td>Rated operational (nominal) voltage</td>
<td>V AC</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Rated maximum voltage</td>
<td>V AC</td>
<td>635</td>
<td>635</td>
<td>635</td>
</tr>
<tr>
<td>Permissible ambient temperature operation (for operation with LCD max. 55°C)</td>
<td>°C</td>
<td>-25 / +70</td>
<td>-25 / +70</td>
<td>-25 / +70</td>
</tr>
<tr>
<td>Storage (observe special conditions for LCD)</td>
<td>°C</td>
<td>-40 / +70</td>
<td>-40 / +70</td>
<td>-40 / +70</td>
</tr>
<tr>
<td>Power loss at Rated Current with 3-phase 2 symmetrical load</td>
<td>W</td>
<td>85</td>
<td>130 (fused)</td>
<td>320</td>
</tr>
<tr>
<td>Operating times</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make-time</td>
<td>ms</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Break-time (with active ETU) 3</td>
<td>ms</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Break-time (without active ETU) 4</td>
<td>ms</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Total clearing time (with active ETU) 3</td>
<td>ms</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Total clearing time (without active ETU) 4</td>
<td>ms</td>
<td>65</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>Make-time, electrical (via closing solenoid)</td>
<td>ms</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Break-time, electrical (via shunt trip)</td>
<td>ms</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>(via instantaneous UVR)</td>
<td>ms</td>
<td>73</td>
<td>73</td>
<td>73</td>
</tr>
</tbody>
</table>

1 Interrupting rating is equal to 200kA based on the rating of the fuse.
2 Consult factory for fuse carriage power loss.
3 ETU with external control power.
4 ETU without external control power.
## Type WL Low Voltage Metal-Enclosed Switchgear
### Breaker Technical Data

#### WL Circuit Breakers

<table>
<thead>
<tr>
<th>Frame Rating</th>
<th>Frame Size II</th>
<th>Frame Size III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>12,500</td>
<td>10,000</td>
</tr>
<tr>
<td>cycles</td>
<td>12,500</td>
<td>10,000</td>
</tr>
<tr>
<td>(without maintenance)</td>
<td>10,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td>cycles</td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td>(with maintenance) 1</td>
<td>15,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Electrical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>7,500</td>
<td>4,000</td>
</tr>
<tr>
<td>cycles</td>
<td>7,500</td>
<td>4,000</td>
</tr>
<tr>
<td>(without maintenance) 1</td>
<td>4,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Electrical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td>cycles</td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td>(with maintenance) 1</td>
<td>15,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Switching</td>
<td>1/h</td>
<td></td>
</tr>
<tr>
<td>frequency</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Minimum</td>
<td>ms</td>
<td>80</td>
</tr>
<tr>
<td>interval</td>
<td>between breaker trip and next closing of the circuit breaker (when used with the automatic mechanical reset of the bell alarm)</td>
<td>80</td>
</tr>
<tr>
<td>Mounting</td>
<td>position</td>
<td></td>
</tr>
<tr>
<td>Auxiliary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>wire size</td>
<td>(Cu) max # of aux.</td>
<td>1 x AWG 14 or 2 x AWG 16</td>
</tr>
<tr>
<td>connecting</td>
<td>(solid or stranded)</td>
<td>1 x AWG 14</td>
</tr>
<tr>
<td>leads x cross section</td>
<td>2 x AWG 14</td>
<td></td>
</tr>
<tr>
<td>Tension</td>
<td>spring</td>
<td>2 x AWG 14</td>
</tr>
<tr>
<td>terminal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ring tongue</td>
<td>terminal</td>
<td>1 x AWG 10</td>
</tr>
<tr>
<td>(standard)</td>
<td></td>
<td>2 x AWG 16</td>
</tr>
<tr>
<td>TOC wire</td>
<td>connection</td>
<td>1 x AWG 14</td>
</tr>
<tr>
<td>size (Cu) max # of aux.</td>
<td>connecting</td>
<td></td>
</tr>
<tr>
<td>leads x cross section</td>
<td>(solid or stranded)</td>
<td>2 x AWG 14</td>
</tr>
<tr>
<td>Weight kg/lb</td>
<td>Circuit Breaker Guide Frame</td>
<td>72/159</td>
</tr>
<tr>
<td>MOC wire</td>
<td>connection</td>
<td>1 x AWG 14</td>
</tr>
<tr>
<td>size (Cu) max # of aux.</td>
<td>connecting</td>
<td></td>
</tr>
<tr>
<td>leads x cross section</td>
<td>(solid or stranded)</td>
<td>2 x AWG 14</td>
</tr>
</tbody>
</table>
| 1 Maintenance consists of replacing main contacts and arc chutes (see operating instructions.)
2 For use only with Siemens supplied ring terminals (WL10RL).
3 Fused Breaker Weights (kg/lb) Frame Size II (fused) Frame Size III (fused) Breaker 103/227 same as table above Guide Frame 68/150 130/275 Fuse Carriage – 102/225
**Type WL Low Voltage Metal-Enclosed Switchgear**

**Breaker Technical Data**

### WL Circuit Breaker Accessory Ratings

<table>
<thead>
<tr>
<th><strong>Manual Operating Mechanism with Mechanical Closing</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Closing/charging stored energy mechanism</td>
<td></td>
</tr>
<tr>
<td>Maximum actuating force required on hand lever</td>
<td>52 lbs</td>
</tr>
<tr>
<td>Number of hand lever strokes required</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Manual Operating Mechanism with Mechanical and Electrical Closing</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Charging stored-energy mechanism</td>
<td></td>
</tr>
<tr>
<td>Closing solenoid and shunt trip</td>
<td></td>
</tr>
<tr>
<td>Coil voltage tolerance</td>
<td></td>
</tr>
<tr>
<td>24V DC</td>
<td>14-28V DC</td>
</tr>
<tr>
<td>48V DC</td>
<td>28 - 56V DC</td>
</tr>
<tr>
<td>120V AC / 125V DC</td>
<td>70 - 140V DC</td>
</tr>
<tr>
<td>240V AC / 250V DC</td>
<td>104-127V AC</td>
</tr>
<tr>
<td>Power consumption (5 % duty cycle)</td>
<td>120 W</td>
</tr>
<tr>
<td>Minimum closing solenoid actuation signal required</td>
<td>50 ms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Motor Operating Mechanism with Mechanical and Electrical Closing</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring charging motor</td>
<td></td>
</tr>
<tr>
<td>Motor voltage tolerance at 120V AC, 240V AC</td>
<td>85 - 110%</td>
</tr>
<tr>
<td>Extended tolerance for battery operation at 24V DC, 48V DC, 125V DC, 250V DC</td>
<td>70 - 126%</td>
</tr>
<tr>
<td>Power consumption of the motor</td>
<td>110 W</td>
</tr>
<tr>
<td>Time required for charging the stored-energy mechanism</td>
<td>≤ 10 s</td>
</tr>
</tbody>
</table>

**Closing solenoid**

For motor and closing solenoid short-circuit protection

<table>
<thead>
<tr>
<th>Short-circuit protection</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard slow-blow cartridge fuse</td>
<td></td>
</tr>
<tr>
<td>24 - 60 V</td>
<td>6A</td>
</tr>
<tr>
<td>10 - 250 V</td>
<td>3A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Auxiliary Release</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Undervoltage release (UVR)</td>
<td></td>
</tr>
<tr>
<td>Operating values</td>
<td>≥ 85% (circuit breaker can be closed)</td>
</tr>
<tr>
<td>AC Coil voltage tolerance at 120V AC, 240V AC</td>
<td>85 - 110%</td>
</tr>
<tr>
<td>DC Extended tolerance for battery operation at 24V DC, 48V DC, 125V DC, 250V DC</td>
<td>85 - 126%</td>
</tr>
<tr>
<td>Rated control supply voltage</td>
<td></td>
</tr>
<tr>
<td>AC 50/60Hz</td>
<td>V</td>
</tr>
<tr>
<td>DC</td>
<td>V</td>
</tr>
<tr>
<td>24, 48, 125, 250</td>
<td></td>
</tr>
<tr>
<td>Power consumption (inrush / continuous)</td>
<td></td>
</tr>
<tr>
<td>AC</td>
<td>VA</td>
</tr>
<tr>
<td>200 / 5</td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td>W</td>
</tr>
<tr>
<td>200 / 5</td>
<td></td>
</tr>
<tr>
<td>Opening time of the circuit breaker for AC/DC</td>
<td>ms</td>
</tr>
<tr>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

| UVR (no time delay), 2 settings |  |
| Setting 1 | ms |
| Setting 2 | ms |
| 80 |  |
| 200 |  |

<table>
<thead>
<tr>
<th>UVR (with time delay)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable delay</td>
<td>s</td>
</tr>
<tr>
<td>0.2 to 3.2</td>
<td></td>
</tr>
</tbody>
</table>

| Reset by additional NC direct opening | ms |
| 100 |  |
**Type WL Low Voltage Metal-Enclosed Switchgear**  
**Breaker Technical Data**

### WL Circuit Breaker Accessory Ratings

#### Auxiliary Contacts and Mechanism Operated Contacts (MOC)

<table>
<thead>
<tr>
<th>Contact rating</th>
<th>Alternating current 50/60 Hz</th>
<th>Rated operational voltage</th>
<th>Rated operational current, continuous</th>
<th>Rated operational current, making</th>
<th>Rated operational current, breaking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>240V</td>
<td>10A</td>
<td>30A</td>
</tr>
<tr>
<td>Direct current</td>
<td></td>
<td>Rated operational voltage</td>
<td>24V, 125V, 250V</td>
<td>5A</td>
<td>1.1A at 24V, 1.1A at 125V, 0.55A at 250V</td>
</tr>
</tbody>
</table>

#### Bell Alarm Switch and Ready-to-Close Signal Contact

<table>
<thead>
<tr>
<th>Contact rating</th>
<th>Alternating current 50/60 Hz</th>
<th>Rated operational voltage</th>
<th>Rated operational current, continuous</th>
<th>Rated operational current, making</th>
<th>Rated operational current, breaking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>240V</td>
<td>5A</td>
<td>8A</td>
</tr>
<tr>
<td>Direct current</td>
<td></td>
<td>Rated operational voltage</td>
<td>24V, 48V, 125V</td>
<td>0.4A</td>
<td>0.4A</td>
</tr>
</tbody>
</table>

#### Shunt Trip, UVR and Blown Fuse Signaling Contacts

<table>
<thead>
<tr>
<th>Contact rating</th>
<th>Alternating current 50/60 Hz</th>
<th>Rated operational voltage</th>
<th>Rated operational current, continuous</th>
<th>Rated operational current, making</th>
<th>Rated operational current, breaking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>127V, 240V</td>
<td>3A</td>
<td>6A</td>
</tr>
<tr>
<td>Direct current</td>
<td></td>
<td>Rated operational voltage</td>
<td>24V, 48V, 125V</td>
<td>1.0A</td>
<td>1.0A</td>
</tr>
</tbody>
</table>

#### Position Signal Contact on the Guide Frame (TOC)

<table>
<thead>
<tr>
<th>Breaker position:</th>
<th>Connected position</th>
<th>Test position</th>
<th>Disconnect position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 form C</td>
<td>2 form C or 1 form C</td>
<td>0 form C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact rating</th>
<th>Alternating current 50/60 Hz</th>
<th>Rated operational voltage</th>
<th>Rated operational current, continuous</th>
<th>Rated operational current, making</th>
<th>Rated operational current, breaking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>120V</td>
<td>10A</td>
<td>6A</td>
</tr>
<tr>
<td>Direct current</td>
<td></td>
<td>Rated operational voltage</td>
<td>24V, 48V, 125V</td>
<td>6A</td>
<td>0.22A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact rating</th>
<th>Direct current</th>
<th>Rated operational voltage</th>
<th>Rated operational current, continuous</th>
<th>Rated operational current, making</th>
<th>Rated operational current, breaking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6A</td>
<td>24V, 48V, 125V</td>
<td>6A</td>
<td>0.22A</td>
<td>0.22A</td>
</tr>
</tbody>
</table>
## Function Overview of the Electronic Trip Units

<table>
<thead>
<tr>
<th>Basic Functions</th>
<th>ETU745</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L</strong></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Long-time overcurrent protection</td>
<td>✓</td>
</tr>
<tr>
<td>Function can be switched ON/OFF</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range ( \text{l}_{\text{n}} \times \text{...} )</td>
<td>✓</td>
</tr>
<tr>
<td>Switch-selectable overload protection (( \text{l}^{2} \text{t} ) or ( \text{i}^{2} \text{t} ) dependent function)</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range of time delay class ( \text{t}_{\text{n}} ) at ( \text{l}^{2} \text{t} ) (seconds)</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range of time delay ( \text{t}_{\text{n}} ) at ( \text{i}^{2} \text{t} ) (seconds)</td>
<td>✓</td>
</tr>
<tr>
<td>Thermal memory</td>
<td>✓</td>
</tr>
<tr>
<td>Phase loss sensitivity</td>
<td>✓</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Neutral protection</td>
<td>✓</td>
</tr>
<tr>
<td>Function can be switched ON/OFF</td>
<td>✓</td>
</tr>
<tr>
<td>N-conductor setting range ( \text{l}_{\text{n}} \times \text{...} )</td>
<td>✓</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Short-time delayed overcurrent protection</td>
<td>✓</td>
</tr>
<tr>
<td>Function can be switched ON/OFF</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range ( \text{l}_{\text{sd}} \times \text{...} )</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range of time delay ( \text{t}_{\text{sd}} ), fixed (seconds)</td>
<td>✓</td>
</tr>
<tr>
<td>Switch-selectable short-time delayed short-circuit protection (( \text{l}^{2} \text{t} ) dependent function)</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range of time delay ( \text{t}_{\text{sd}} ) at ( \text{l}^{2} \text{t} ) (seconds)</td>
<td>✓</td>
</tr>
<tr>
<td>Zone Selective Interlocking (ZSI) function</td>
<td>✓</td>
</tr>
<tr>
<td><strong>I</strong></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td></td>
</tr>
<tr>
<td>Instantaneous overcurrent protection</td>
<td>✓</td>
</tr>
<tr>
<td>Function can be switched ON/OFF, Extended Instantaneous Protection is enabled when OFF</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range ( \text{l}_{\text{i}} \times \text{...} )</td>
<td>✓</td>
</tr>
<tr>
<td><strong>G</strong></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td></td>
</tr>
<tr>
<td>Ground fault protection²</td>
<td>✓</td>
</tr>
<tr>
<td>Trip and alarm function</td>
<td>✓</td>
</tr>
<tr>
<td>Detection of the ground fault current by residual summing method</td>
<td>✓</td>
</tr>
<tr>
<td>Detection of the ground fault current by direct summing method</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range of the ( \text{l}_{\text{gf}} ) for trip</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range of the ( \text{l}_{\text{gf}} ) for alarm</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range of the time delay (seconds)</td>
<td>✓</td>
</tr>
<tr>
<td>Switch-selectable ground fault protection (( \text{l}^{2} \text{t} ) / fixed)</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range time delay ( \text{t}_{\text{gf}} ) at ( \text{l}^{2} \text{t} )</td>
<td>✓</td>
</tr>
<tr>
<td>ZSI ground function</td>
<td>✓</td>
</tr>
</tbody>
</table>

---

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:
- ✓ available
- – not available
- ❓ optional
## Function Overview of the Electronic Trip Units

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

### Step for Settings via Communications or ETU Key Pad

<table>
<thead>
<tr>
<th>from ... to</th>
<th>step</th>
<th>from ... to</th>
<th>step</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ... 1</td>
<td>0.1</td>
<td>1000 ... 1600</td>
<td>50</td>
</tr>
<tr>
<td>1 ... 100</td>
<td>1</td>
<td>1600 ... 10000</td>
<td>100</td>
</tr>
<tr>
<td>100 ... 500</td>
<td>5</td>
<td>10000 ... max</td>
<td>1000</td>
</tr>
<tr>
<td>500 ... 1000</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Setting range of the \( I_g \)

<table>
<thead>
<tr>
<th>Frame Size II</th>
<th>Frame Size III</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 100 A</td>
<td>400 A</td>
</tr>
<tr>
<td>B 300 A</td>
<td>600 A</td>
</tr>
<tr>
<td>C 600 A</td>
<td>800 A</td>
</tr>
<tr>
<td>D 900 A</td>
<td>1000 A</td>
</tr>
<tr>
<td>E 1200 A</td>
<td>1200 A</td>
</tr>
</tbody>
</table>

[Available, Not available, Optional]
## Function Overview of the Electronic Trip Units

### Basic Functions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ETU748</th>
<th>ETU776</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-time overcurrent protection</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Function can be switched ON/OFF</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Setting range $I_	ext{th} = I_	ext{n} \times \ldots$</td>
<td>0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.8, 0.9, 1</td>
<td>0.4 ... 1 (step: 1A)</td>
</tr>
<tr>
<td>Switch-selectable overload protection ($I^2t$- or $I^4t$-dependent function)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range of time delay class $t_1R$ at $I^2t$ (seconds)</td>
<td>2, 2.5, 5, 5.5, 6, 8, 10, 12</td>
<td>2 ... 30 (step: 0.1s)</td>
</tr>
<tr>
<td>Setting range of time delay $t_2d$ at $I^2t$ (seconds)</td>
<td>0, 0.1, 0.2, 0.3, 0.4</td>
<td>M, 0.08 ... 0.4, OFF (step: 0.001s)</td>
</tr>
<tr>
<td>Thermal memory</td>
<td>✓ (via slide switch)</td>
<td>✓ (via key pad or communications)</td>
</tr>
<tr>
<td>Phase loss sensitivity</td>
<td>at $t_{sd}=20ms$ (M)</td>
<td>✓ (via key pad or communications)</td>
</tr>
<tr>
<td>Neutral protection</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Function can be switched ON/OFF</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>N-conductor setting range $I_{N} = I_{N} \times \ldots$</td>
<td>0.5 ... 1</td>
<td>-</td>
</tr>
<tr>
<td>Short-time delayed overcurrent protection</td>
<td>✓ (via rotary switch)</td>
<td>✓ (via key pad or communications)</td>
</tr>
<tr>
<td>Function can be switched ON/OFF</td>
<td>✓ (via rotary switch)</td>
<td>✓ (via key pad or communications)</td>
</tr>
<tr>
<td>Setting range $I_{sd} = I_{N} \times \ldots$</td>
<td>1.25, 1.5, 2, 2.5, 3, 4, 6, 8, 10, 12</td>
<td>1.25 ... 0.8 x $I_{CW} =$ max (step: 10A)</td>
</tr>
<tr>
<td>Setting range of time delay $t_{sd}$ fixed (seconds)</td>
<td>M, 0.1, 0.2, 0.3, 0.4</td>
<td>M, 0.08 ... 0.4, OFF (step: 0.001s)</td>
</tr>
<tr>
<td>Switch-selectable short-time delayed short-circuit protection ($I^2t$-dependent function)</td>
<td>✓ (via rotary switch)</td>
<td>✓ (via key pad or communications)</td>
</tr>
<tr>
<td>Setting range of time delay $t_{sd}$ at $I^2t$ (seconds)</td>
<td>0.1, 0.2, 0.3, 0.4</td>
<td>0.1 ... 0.4 (step: 0.001s)</td>
</tr>
<tr>
<td>Zone Selective Interlocking (ZSI) function</td>
<td>per CubicleBUS module</td>
<td>per CubicleBUS module</td>
</tr>
<tr>
<td>Instantaneous overcurrent protection</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Function can be switched ON/OFF</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Extended Instantaneous Protection is enabled when OFF</td>
<td>✓ (via key pad or communications)</td>
<td>✓ (via key pad or communications)</td>
</tr>
<tr>
<td>Setting range $I_{I} = I_{N} \times \ldots$</td>
<td>$I_{I} = I_{CW} =$ EIP 1</td>
<td>$I_{I} = I_{CW} =$ EIP 1</td>
</tr>
<tr>
<td>Ground fault protection 2</td>
<td>✓ (field installable module)</td>
<td>✓ (field installable module)</td>
</tr>
<tr>
<td>Trip and alarm function</td>
<td>✓ (via key pad or communications)</td>
<td>✓ (via key pad or communications)</td>
</tr>
<tr>
<td>Detection of the ground fault current by residual summing method</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Detection of the ground fault current by direct summing method</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range of the $I_g$ for trip</td>
<td>A, B, C, D, E</td>
<td>A ... E (step: 1A)</td>
</tr>
<tr>
<td>Setting range of the $I_g$ for alarm</td>
<td>A, B, C, D, E</td>
<td>A ... E (step: 1A)</td>
</tr>
<tr>
<td>Setting range of the time delay $t_I$ (seconds)</td>
<td>0.1, 0.2, 0.3, 0.4, 0.5</td>
<td>0.1 ... 0.5 (step: 0.001s)</td>
</tr>
<tr>
<td>Switch-selectable ground fault protection ($I^2t$-fixed)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Setting range time delay $t_g$ at $I^2t$</td>
<td>0.1, 0.2, 0.3, 0.4, 0.5</td>
<td>0.1 ... 0.5 (step: 0.001s)</td>
</tr>
<tr>
<td>ZSI ground function</td>
<td>per CubicleBUS module</td>
<td>per CubicleBUS module</td>
</tr>
</tbody>
</table>

---

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 Breaker Adapter Module, MODBUS or PROFIBUS
- Keypad = Direct input at the trip unit

Available
- not available
- optional
Type WL Low Voltage Metal-Enclosed Switchgear

Breaker Technical Data

Function Overview of the Electronic Trip Units

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

Metering and Protective Relaying Accuracies

<table>
<thead>
<tr>
<th>Protective Relaying</th>
<th>Pick-up Accuracy</th>
<th>Metering Values</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase Unbaline (I)</td>
<td>2% (50...500 I)</td>
<td>(I) at 1 x In</td>
<td>+/− 1%</td>
</tr>
<tr>
<td>Phase Unbaline (V)</td>
<td>2% (50...500 V)</td>
<td>(V) at 1 x Vn</td>
<td>+/− 0.5%</td>
</tr>
<tr>
<td>THD (I) (up to 29th)</td>
<td>+/− 3% (80...120% I)</td>
<td>(P) at 1 x In</td>
<td>+/− 3%</td>
</tr>
<tr>
<td>THD (V) (up to 29th)</td>
<td>+/− 3% (80...120% V)</td>
<td>(S) at 1 x In</td>
<td>+/− 2%</td>
</tr>
<tr>
<td>Overvoltage</td>
<td>+/− 2% (80...120% V)</td>
<td>(Q) at 1 x In</td>
<td>+/− 3%</td>
</tr>
<tr>
<td>Undervoltage</td>
<td>+/− 2% (80...120% V)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under/Over Frequency</td>
<td>+/− 0.1 Hz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Type WL Low Voltage Metal-Enclosed Switchgear

### WL Secondary Terminal Assignments

<table>
<thead>
<tr>
<th>Internal</th>
<th>Terminals</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell alarm trip signaling</td>
<td>X9</td>
<td>L (+) Control power signal</td>
</tr>
<tr>
<td>Signaling switch, 2nd auxiliary release</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local electric close</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signaling switch, 1st auxiliary release</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal switch, open fuse lockout</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maglatch for open fuse lockout (PS III fused only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd shunt trip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote reset bell alarm &amp; tripped indicator</td>
<td>X8</td>
<td>L (+) Control power signal</td>
</tr>
<tr>
<td>GF sensor S2</td>
<td></td>
<td>N (-)</td>
</tr>
<tr>
<td>GF sensor S1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N sensor S2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N sensor S1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External voltage transformer COM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External voltage transformer L3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External voltage transformer L2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External voltage transformer L1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 V d.c.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Power</td>
<td>24 V d.c.</td>
<td></td>
</tr>
<tr>
<td>CUB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COM1516, otherwise no connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Shunt Trip</td>
<td>X7</td>
<td></td>
</tr>
<tr>
<td>Aux switch, N.O., S2a, S1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aux switch, N.C., S2b, S1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closing coil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Ready-to-close&quot; signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aux switch, N.O., S2a, S2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aux switch, N.C., S2b, S2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency open via UVR</td>
<td>X6</td>
<td></td>
</tr>
<tr>
<td>UVR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UVR</td>
<td></td>
<td></td>
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<tr>
<td>Aux switch, N.O., S3a, S3</td>
<td></td>
<td></td>
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<tr>
<td>Aux switch, N.C., S3b, S3</td>
<td></td>
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<tr>
<td>Aux switch, N.O., S3a, S4</td>
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<td></td>
</tr>
<tr>
<td>Aux switch, N.C., S3b, S4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charging motor</td>
<td></td>
<td>Motor cut-off switch</td>
</tr>
</tbody>
</table>
Type WL Low Voltage Metal-Enclosed Switchgear
WL Communication Overview

Connection Diagram

1. Breaker Data Adapter (BDA)
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 components

* The Siemens BDA Plus or meters, 9330, 9350, 95/9610 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.

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 bottom, feeder breakers can mount 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 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.
## Type WL Low Voltage Metal-Enclosed Switchgear

### Section Configurations

#### Tie Sections – Non-Fused Breakers

<table>
<thead>
<tr>
<th>Feeder Breaker 800, 1600, 2000</th>
<th>Feeder Breaker 800, 1600, 2000</th>
<th>Feeder Breaker 800, 1600, 2000</th>
<th>Blank or Auxiliary Compartment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Main Breaker 4000, 5000</td>
</tr>
</tbody>
</table>

#### Main and Tie Sections – Non-Fused Breakers

<table>
<thead>
<tr>
<th>Blank or Instrument Compartment</th>
<th>Main Breaker 800, 1600, 2000</th>
<th>Main Breaker 800, 1600, 2000</th>
<th>Main Breaker 800, 1600, 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Main Breaker 4000</td>
</tr>
</tbody>
</table>

#### Feeder Sections – Non-Fused Breakers

(see Note 7 on page 24)

<table>
<thead>
<tr>
<th>Feeder Breaker 800, 1600, 2000</th>
<th>Blank or Instrument Compartment</th>
<th>Blank or Instrument Compartment</th>
<th>Blank or Instrument Compartment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeder Breaker 800, 1600, 2000</td>
<td>Feeder Breaker 4000, 5000</td>
<td>Feeder Breaker 4000, 5000</td>
<td>Feeder Breaker 4000, 5000</td>
</tr>
</tbody>
</table>

#### Tie Sections – Fused Breakers

<table>
<thead>
<tr>
<th>Feeder Breaker 800, 1600, 2000</th>
<th>Feeder Breaker 800, 1600, 2000</th>
<th>Feeder Breaker 800, 1600, 2000</th>
<th>Blank or Auxiliary Compartment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Main Breaker 4000, 5000</td>
</tr>
</tbody>
</table>

#### Main and Tie Sections – Fused Breakers

<table>
<thead>
<tr>
<th>Blank or Instrument Compartment</th>
<th>Main Breaker 800, 1600, 2000</th>
<th>Main Breaker 800, 1600, 2000</th>
<th>Main Breaker 800, 1600, 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Tie Breaker 800, 1600, 2000, 3200</td>
<td>Main Breaker 4000</td>
</tr>
</tbody>
</table>

#### Feeder Sections – Fused Breakers

(see Note 7 on page 24)

<table>
<thead>
<tr>
<th>Blank or Instrument Compartment</th>
<th>Blank or Instrument Compartment</th>
<th>Blank or Instrument Compartment</th>
<th>Blank or Instrument Compartment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeder Breaker 800, 1600, 2000</td>
<td>Feeder Breaker 4000, 5000</td>
<td>Feeder Breaker 4000, 5000</td>
<td>Feeder Breaker 4000, 5000</td>
</tr>
</tbody>
</table>

---

25
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.

<table>
<thead>
<tr>
<th>Section Type</th>
<th>22&quot; Indoor</th>
<th>22&quot; Outdoor</th>
<th>32&quot; Indoor</th>
<th>32&quot; Outdoor</th>
<th>38&quot; Indoor</th>
<th>48&quot; Indoor</th>
<th>48&quot; Outdoor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary</td>
<td>1000 (450)</td>
<td>2000 (900)</td>
<td>1300 (585)</td>
<td>2500 (1125)</td>
<td>1800 (810)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Utility Metering</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>2100 (945)</td>
<td>2600 (1170)</td>
<td>4500 (2025)</td>
</tr>
<tr>
<td>Breaker</td>
<td>1400 (630)</td>
<td>2400 (1080)</td>
<td>2000 (900)</td>
<td>3300 (1485)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Weights are shown in pounds and ( ) kilograms. Weights shown do not include weight of circuit breaker removable element (but does include cradle). Add 400 lbs for hoist and track. On outdoor switchgear, add 500 lbs for end walls (weight is for both ends). Refer to shipping documents for actual weights.
Type WL Low Voltage Metal-Enclosed Switchgear

Dimensional Information

Indoor Floor Plan and Cable Space Details

<table>
<thead>
<tr>
<th>A Equipment Depth</th>
<th>Direction of cables</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>60&quot; Non-Fused with (N, S, H or L Class Breakers) OR 65&quot; Fused with (F Class Breakers)</td>
<td>Below</td>
<td>21.50 (546)</td>
<td>13.88 (353)</td>
<td>32.59 (828)</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td>21.25 (540)</td>
<td>18.88 (480)</td>
<td>37.59 (955)</td>
</tr>
<tr>
<td>70&quot; Non-fused with (N, S, H or L-Class Breakers) OR 75&quot; Fused with (F-Class Breakers)</td>
<td>Below</td>
<td>31.50 (800)</td>
<td>13.88 (353)</td>
<td>32.59 (828)</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td>31.25 (794)</td>
<td>18.88 (480)</td>
<td>37.59 (955)</td>
</tr>
<tr>
<td>80&quot; Non-fused with (N, S, H or L-Class Breakers)</td>
<td>Below</td>
<td>41.50 (1054)</td>
<td>13.88 (353)</td>
<td>36.50 (927)</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td>41.25 (1048)</td>
<td>18.88 (480)</td>
<td>37.59 (955)</td>
</tr>
<tr>
<td>80&quot; Fused with (F-Class Breakers)</td>
<td>Below</td>
<td>36.50 (927)</td>
<td>18.88 (480)</td>
<td>37.59 (955)</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td>36.25 (921)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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.
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.
Side view

![Diagram of Type WL Low Voltage Metal-Enclosed Switchgear]

**Dimensional Information**

- **Optional Hoist**: 24.9 (632) hoist
- **Extension**: 4.0 (102)
- **102.2 (2596) top of Hoist**
- **42.0 (1067) Minimum Aisle Space Recommended**
- **92.0 (2337)**
- **2.37 (60)**

### A Equipment Depth

<table>
<thead>
<tr>
<th>Type</th>
<th>Breaker compartment depth</th>
<th>Rear compartment depth</th>
<th>Anchor bolt spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 (1524) Non-fused breakers</td>
<td>19.8 (503)</td>
<td>22.4 (569)</td>
<td>59.13 (1502)</td>
</tr>
<tr>
<td>65 (1651) Fused breakers</td>
<td>24.8 (630)</td>
<td>22.4 (569)</td>
<td>64.13 (1629)</td>
</tr>
<tr>
<td>70 (1778) Non-fused breakers</td>
<td>19.8 (503)</td>
<td>32.4 (823)</td>
<td>69.13 (1756)</td>
</tr>
<tr>
<td>75 (1905) Fused breakers</td>
<td>24.8 (630)</td>
<td>32.4 (823)</td>
<td>74.13 (2010)</td>
</tr>
<tr>
<td>80 (2032) Non-fused breakers</td>
<td>19.8 (503)</td>
<td>42.4 (1077)</td>
<td>79.13 (2010)</td>
</tr>
<tr>
<td>80 (2032) Fused breakers</td>
<td>24.8 (630)</td>
<td>37.4 (950)</td>
<td>79.13 (2010)</td>
</tr>
</tbody>
</table>

**Note:** Dimensions shown in inches and (mm).
Type WL Low Voltage Metal-Enclosed Switchgear

Dimensional Information

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.
Type WL Low Voltage Metal-Enclosed Switchgear

Dimensional Information

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

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.
## Type WL Low Voltage Metal-Enclosed Switchgear
### VT, CPT, CT Data

### Voltage Transformers – External Metering and Relaying

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Accuracy Class at 60 Hz</th>
<th>Burden</th>
<th>Volt-Amp Rating</th>
<th>Thermal Rating VA</th>
<th>Hertz</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>X</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600:120</td>
<td>0.6</td>
<td>1.2</td>
<td>1.2</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>480:120</td>
<td>0.6</td>
<td>1.2</td>
<td>1.2</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>288:120</td>
<td>0.6</td>
<td>1.2</td>
<td>1.2</td>
<td>100</td>
<td>150</td>
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</table>

### Control Power Transformers – 115°C Rise

<table>
<thead>
<tr>
<th>kVA</th>
<th>Phase</th>
<th>Primary Voltage</th>
<th>Secondary Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Single</td>
<td>240 / 480</td>
<td>120 / 240</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Accuracy at 60 Hz Metering Burden (ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B-0.1</td>
</tr>
<tr>
<td>100.5</td>
<td>1.2</td>
</tr>
<tr>
<td>150.5</td>
<td>1.2</td>
</tr>
<tr>
<td>200.5</td>
<td>1.2</td>
</tr>
<tr>
<td>250.5</td>
<td>1.2</td>
</tr>
<tr>
<td>300.5</td>
<td>0.6</td>
</tr>
<tr>
<td>400.5</td>
<td>0.6</td>
</tr>
<tr>
<td>500.5</td>
<td>0.6</td>
</tr>
<tr>
<td>600.5</td>
<td>0.6</td>
</tr>
<tr>
<td>800.5</td>
<td>0.6</td>
</tr>
<tr>
<td>1000.5</td>
<td>0.6</td>
</tr>
<tr>
<td>1200.5</td>
<td>0.6</td>
</tr>
<tr>
<td>1500.5</td>
<td>0.6</td>
</tr>
<tr>
<td>1600.5</td>
<td>0.6</td>
</tr>
<tr>
<td>2000.5</td>
<td>0.6</td>
</tr>
<tr>
<td>2500.5</td>
<td>0.6</td>
</tr>
<tr>
<td>3000.5</td>
<td>0.6</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Accuracy at 60 Hz Metering Burden (ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B-0.1</td>
</tr>
<tr>
<td>2000.5</td>
<td>0.3</td>
</tr>
<tr>
<td>2500.5</td>
<td>0.3</td>
</tr>
<tr>
<td>3000.5</td>
<td>0.3</td>
</tr>
<tr>
<td>4000.5</td>
<td>0.3</td>
</tr>
<tr>
<td>5000.5</td>
<td>0.3</td>
</tr>
<tr>
<td>6000.5</td>
<td>0.3</td>
</tr>
</tbody>
</table>

1 Requires complete compartment.
2 Breaker compartment will accept 1 set of CT’s each on top and bottom primary disconnects.
Type WL Low Voltage Metal-Enclosed Switchgear

Guide Form Specifications

SECTION [26 23 00] [16430] LOW VOLTAGE SWITCHGEAR, WL

PART 1 - GENERAL

1.1 SCOPE
A. This section defines low voltage metal-enclosed switchgear assemblies with drawout circuit breaker elements for use in AC systems, rated 600 V or less.

1.2 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections (where applicable) include the following:
1. Section [26 xx xx] [16xx] – Medium Voltage Load Break Switches
2. Section [26 12 16] [16271] – Dry Type Substation Transformers
3. Section [26 12 19] [16271] – Liquid Type Substation Transformers
4. Section [26 09 13] [16290] – Electrical Power Monitoring and Control
5. Section [26 43 13] [16289] – Transient-Voltage Suppression for Low Voltage Power Circuits
6. Section [26 05 73] [16055] – Coordination Study

1.3 SUBMITTALS
A. Submit shop drawings and product data for approval and final documentation in the quantities listed according to the Conditions of the Contract. Customer name, customer location and customer order number shall identify all transmittals.

B. Documents for Approval: General arrangement drawings showing dimensioned elevation, floor plan, side view and foundation details, oneline diagram showing major features, nameplate legends, schematic diagrams and bill of material.

C. Final Documents: Record documentation to include those in 1.03.B and wiring diagrams, list of recommended spare parts, instruction and installation manuals [and certified test reports]

D. Product Data: Include features, characteristics and ratings of individual circuit breakers and other components. Also, time-current characteristic curves for over current protective devices, including circuit-breaker trip devices and fusible devices.

1.4 RELATED STANDARDS
A. Comply with requirements of latest revisions of applicable industry standards, specifically including the following:
1. ANSI/IEEE C37.20.1 – Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear
2. ANSI/IEEE C37.50 – Test Procedure for Low Voltage AC Power Circuit Breakers Used in Enclosures
4. ANSI/IEEE C37.13 – Low Voltage AC Power Circuit Breakers Used in Enclosures
5. ANSI C37.16 – Preferred Ratings, Related Requirements and Application for Low Voltage Power Circuit Breakers and AC Power Circuit Protectors
6. ANSI/IEEE C37.17 - Trip Devices for AC and General Purpose DC Low Voltage Power Circuit Breakers
7. UL 1558 – Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear
8. UL 1066 – Low Voltage AC and DC Power Circuit Breakers Used in Enclosures
9. NEMA SG5 – Power Switchgear Assemblies
10. NEMA SG3 – Low Voltage Power Circuit Breakers

B. Manufacturer Seismic Qualification: The low voltage switchgear shall meet and be certified to seismic requirements specified in the IBC 2009 or the CBC 2010 California Building Code [ASCE American Society of Civil Engineers 7-10].

1. The low voltage general purpose dry type transformer shall be complaint with IBC 2009 parameters:
   a. Building Occupancy Category (as defined in Table 1.1 from ASCE 2010): [I] [II] [III] [IV]
   b. Seismic Design Category: [A] [B] [C] [D] [E] [F]
   c. Site Class: [A – Hard Rock] [B - Rock] [C – Very dense soil and soft rock] [D – Stiff soil profile] [E – Soft Soil Profile] [F – Soil vulnerable to potential failure or collapse under seismic loading] as defined in IBC 2006 Table 1613.3.2 Site Class Definitions.
   d. Ip – Importance Factor: [1.5 – Components must function after an earthquake for life safety purposes (Building Occupancy Code IV)] [1.25 - Buildings and structures that represent a substantial hazard to human life in the event of failure or that can cause substantial economic impact or mass disruption of day-to-day civilian life] [1.0 – Non-essential buildings. Function not life critical. (Building Occupancy Code I and II)]

1.5 QUALITY ASSURANCE
A. Manufacturer Qualifications: Manufacturer of this equipment shall have a minimum of 5 years experience producing similar electrical equipment. The manufacturer of the switchgear assembly shall be the same manufacturer as the breakers. The manufacturer shall be ISO 9001 or 9002 certified.

1.6 DELIVERY, STORAGE AND HANDLING
A. Deliver products in factory labeled packages. Shipping groups shall not exceed 15 ft. in length.

B. Circuit breakers shall be shipped inside their respective cells in which they were factory acceptance tested.

C. Store and handle in strict compliance with manufacturer’s instructions and recommendations. Protect from potential damage from weather and construction operations. Store so condensation will not form on or in switchgear and if necessary, apply temporary heat where required to obtain suitable service conditions.
Type WL Low Voltage Metal-Enclosed Switchgear

Guide Form Specifications

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The low voltage switchgear shall be manufactured by Siemens, Type-WL Low Voltage Switchgear or preapproved equal. Approved manufacturers are as follows:

1. SIEMENS - Type-WL Low Voltage Switchgear

2.2 RATINGS

A. System Configuration: Switchgear suitable for application in three phase, [60 Hz] [50 Hz], [3 wire] [4 wire] [grounded-neutral] [3 wire ungrounded] [3 wire high-impedance grounded] system.

B. Electrical Ratings:

1. Nominal System Voltage: [600 V] [480 V] [240 V] [208 V] [OTHER].

2. Maximum Design Voltage: [635 volts with non-fused breakers] [600 volts with fused breakers].

3. Short-Circuit Current: [100kA] [150kA] [200kA].

4. Main-Bus Continuous Current: [1600] [2000] [3200] [4000] [5000] [6000] [A].

5. [Neutral Bus Continuous Current:] [50] [100] percent of main phase bus

2.3 GENERAL REQUIREMENTS

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

B. The switchgear assembly shall consist of one or more metal-enclosed sections in an [indoor NEMA 1 enclosure] [outdoor NEMA 3R non walk-in enclosure] [outdoor NEMA 3R walk-in enclosure].

1. End sections shall include provisions for main bus extension and installation of future vertical sections.

2. The design shall incorporate preformed steel channels, angles and structural components bolted together and reinforced to form a rigid, self-supporting assembly.

3. Fabricate enclosure with removable, [rear cover panels, secured by captive screws], [hinged rear doors with captive screws] [hinged rear doors with three-point latch and padlockable handle] to allow access to rear interior of switchgear.

C. Front breaker doors and covers must be free of any ventilation openings.

D. Horizontal barriers are to be provided to form individual circuit breaker or metering compartments. Circuit breaker compartments are to be barred from the bus compartment through a primary disconnect assembly. Each circuit breaker or metering compartment shall be provided with a hinged front door secured with hand-operated [lockable] rotary latches.

E. Circuit breaker compartments shall include stationary primary contact disconnects that shall be silver-plated copper at the connection points and of one-piece construction.

1. The upper set of disconnects shall bolt directly to the main bus and, for feeder circuit breakers, the lower set shall extend to the rear cable area and shall be insulated where they pass through the main bus compartment.

2. Primary disconnects shall be sized for the maximum continuous current for the frame size of the circuit breaker which is located in the compartment.

3. Interlocks shall be provided to prevent a circuit breaker element of the incorrect frame size or interrupting rating from being inserted into the compartment.

4. Secondary control and communication connections, when required, shall be located in a separately accessed area that is accessible from the front of the switchgear without opening the breaker compartment door or exposing any power cables or bussing. The secondary control contacts shall be of the sliding contact design, silver plated and engage the drawout circuit breaker element in the “connected” and “test” positions.

F. All control wiring within the assembly shall be continuous and shall terminate on each end at a suitable terminal block. Control wiring shall be 14-gauge minimum, stranded type SIS and shall be labeled at each end with sleeve-type wire markers.

1. Wire markers shall be machine imprinted with the wire name as indicated on the wiring diagrams.

2. Terminals shall be insulated locking fork or ring tongue type except where connecting to components that do not accept these terminations. Control wiring for external connections shall be terminated in a separate front accessible compartment for ease of access.

G. Finish: Steel parts shall be prepared for painting by a five-stage wash system consisting of an alkaline cleaner, fresh water rise, iron phosphate treatment, fresh water rise and non-chromate sealer. After cleaning and stabilization, the steel parts shall be coated with a thermosetting polyester powder applied with electrostatic equipment at a nominal 2 mils dry film thickness and then cured properly. The paint finish shall have a pencil hardness of 2H, a salt spray rating as defined in ASTM B-117-73 of 600 hours. Paint color shall be ANSI 61 light gray.

H. Bus isolation barriers shall be arranged to isolate the buses on either side of each main and tie circuit breaker from each other.

1. [Incoming line isolation barriers shall be arranged to isolate the incoming line connections from the main horizontal and vertical bus].

J. Main bus shall connect vertical sections and shall be uniform capacity the entire length of assembly. Vertical and horizontal bus bar shall utilize a channel shape design to maximize short circuit withstand capability and minimize heat rise. The main horizontal bus shall be run in a vertical, edge-to-edge arrangement for high short circuit strength. Access to the rear cable termination area shall be possible without reaching over the main and vertical bus.

1. Bus shall be [98 % minimum conductivity copper silver-plated over entire length of the bus bar] [98 % conductivity copper tinplated over entire length of the bus bar].

2. Feeder Circuit-Breaker Load Terminals: Plated copper bus extensions equipped with pressure connectors for outgoing circuit conductors.

3. Ground Bus shall be copper of 98 % minimum conductivity, minimum size 1/4 by 3 inches.

4. Bus bracing shall be equal to the short circuit interrupting rating of the lowest rated circuit breaker applied in the assembly or 100kA minimum.

5. Provide for future extensions from either end of main phase, neutral and ground bus by means of predrilled bolt holes and connecting links.
Type WL Low Voltage Metal-Enclosed Switchgear
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K. Bus/Cable compartment barriers:
   Barriers shall be supplied to isolate the rear cable area from the main bus area.

L. Insulated bus bar shall consist of bus bars enclosed in factory-applied, flame retardant UL recognized insulation system. Bolted bus joints shall be insulated with secure joint covers that can easily be removed and reinstalled.

M. Low Voltage High-Resistance Grounding System [Installed in the switchgear assembly] [Contained in separate NEMA 1 enclosure] for use on [480 V] [600 V] [wye] [delta] source, including the following components:
   1. Meter relay (MR)
   2. 3 Indicating lights: white for "Normal," red for "Ground Fault" green for "Pulsing"
   3. "Reset" push button
   4. "Test" push button
   5. On - Off switches for system and pulse
   6. Repeat cycle timer, set to produce approx. 30 current pulses per minute
   7. Neutral grounding resistor assembly
   8. Pulse resistor assembly
   9. Test resistor assembly
   10. Relay for repeat cycle timer
   11. Alarm relay, with extra interlocks for remote alarm (59X)
   12. Control power transformer
   13. Neutral ammeter & current transformer
   14. Optional Portable clamp on ammeter
   15. [3 Grounding transformers for generating a neutral CPT] (For Delta System without a system neutral)

N. Outdoor NEMA 3R Non Walk-In enclosure shall consist of indoor switchgear assemblies in weather resistant steel housing. Enclosure shall be painted steel, integral structural-steel base frame with factory-applied asphalt undercoating. Each section shall be equipped with the following features:
   1. Structural design and anchorage adequate to resist loads imposed by 125-mph wind.
   2. Space heater operating at [full] [one-half of] rated voltage, sized to prevent condensation.
   3. Louvers equipped with insect/rodent screen and filter and arranged to permit air circulation while excluding exterior dust and rodents.
   4. Internal aisle of sufficient width to permit protective-device withdrawal.
   5. Load center for distribution of power to lights, receptacles and heaters.
   6. Incandescent lighting receptacles with three-way switch.
   7. Duplex receptacle with ground fault protection.
   8. Outdoor NEMA 3R Walk-In enclosure shall consist of indoor switchgear assemblies in weather-resistant steel housing having an operating aisle space of approximately 42 inches. Enclosure shall be painted steel, integral structural-steel base frame with factory-applied asphalt undercoating. Each section shall be equipped with the following features:
   1. Structural design and anchorage adequate to resist loads imposed by 125-mph wind.
   2. Space heater operating at [full] [one-half of] rated voltage, sized to prevent condensation.
   3. Louvers equipped with insect/rodent screen and filter and arranged to permit air circulation while excluding exterior dust and rodents.
   4. Internal aisle of sufficient width to permit protective-device withdrawal, disassembly and servicing in aisle.
   5. Blank-In enclosure

P. Remote Racking
   1. A remote racking device shall be supplied to allow qualified personnel to rack Siemens Type WL breakers into Connect, Test and Disconnect positions from up to 30 feet away from the breaker and outside the arc flash hazard boundary.
   2. The remote racking device shall support utilization on any Frame Size 2 or Frame Size 3 WL breaker (including fuse carriage on fused Frame Size 3 WL breaker).
   3. The remote racking device shall be portable and weigh less than 30 pounds (excluding cables and remote control panel).
   4. The remote racking device shall have integral torque overload sensing to prevent damage to the breaker racking mechanism.
   5. The remote racking device shall allow breaker to be racked to any position (disconnect, test, connect) regardless of the starting position of the breaker and without the need for user input as to the starting position.
   6. The remote racking device shall support field retrofit on Type WL Low Voltage Switchgear.

2.4 COMPONENTS
   1. Potential Transformers: Secondary voltage rating of 120 V and NEMA accuracy class of 0.6 with burdens of W, X and Y.
   2. Current Transformers: Ratios as indicated; burden and accuracy class suitable for connected relays, meters and instruments.

B. Multifunction Digital-Metering
   Monitors shall be UL-listed or recognized, microprocessor-based unit suitable for three or four wire systems. Units shall be mounted in the instrument compartment door and as follows:
   1. Incoming monitoring or main breakers:
      a. The main(s) shall be monitored.
      1.) The metering shall be accomplished with a Siemens Model [[PAC3100] [PAC3200] [PAC4200] [9340] [9360] [9510] [9510ADR/RTU] [9610]] digital meter.
   2. Feeder breakers:
      a. Each feeder circuit breaker shall be monitored.
      1.) The metering shall be accomplished with a Siemens Model [PAC3100] [PAC3200] [PAC4200] digital meters on each feeder.
      2.) Each trip unit shall provide an LCD display for metering.

C. Provision for Future Devices:
   Equip future circuit breaker compartments with rails, mounting brackets, supports, necessary appurtenances and bus connections.

D. Control Power Supply: Control power transformer supplying 120-V control circuits through secondary disconnect devices are to be dry-type transformers with primary and secondary fuses.
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1. Transformers shall be mounted in auxiliary compartments.
2. Multiple source with control power transfer. Two control power transformers located in separate compartments with necessary interlocking relays shall be provided.
   a. Each transformer shall be connected to line side of associated main circuit breaker.
   b. Secondary windings connected through a relay or relays to control bus to affect an automatic control power transfer scheme.
3. [24] [48] [125] volt DC battery system

E. Mimic Bus: Continuous mimic bus applied to front of switchgear, arranged in single-line diagram format, shall indicate the arrangement of the circuit breakers in the power circuit.

2.5 CIRCUIT BREAKERS
A. Circuit breakers shall comply with the requirements of IEEE/ANSI C37.13/16/17/50,UL1066, NEMA SG3.

   All breakers shall be three-pole, 100% rated type WL low voltage power breaker manufactured by Siemens Industry, or approved equal.

   1. Circuit breaker element shall have connected, test and disconnected position indicators, spring charged/discharged indicators and circuit breaker open or closed and ready to close indicators all of which shall be visible to the operator with the compartment door closed. It shall be possible to rack the circuit breaker element from the connected to the disconnected position with the compartment door closed otherwise known as “through the door drawout”.

   2. Provide interlocks to prevent racking the circuit breaker unless the breaker is open.

   3. Racking handle shall be integral to the breaker.

B. Ratings:Interrupting up to 100 kA at 480V without fuses. Short time current ratings for each circuit breaker shall be as indicated on the drawings or data tables. Circuit breakers shall be 600-volt class.

C. Operating Mechanism: Mechanically and electrically trip-free, stored-energy operating mechanism with the following features:
   1. Normal Closing Speed: independent of both control and operator.
   2. Electrical operator, field installable with manual charging.
   3. Operations counter.

D. Each low voltage power circuit breaker shall be equipped with self-powered, microprocessor-based trip-device to sense overload and short circuit conditions. The device shall measure true RMS current. The tripping system shall consist of Rogowski coil sensors on each phase, a release mechanism and the following features:
   1. Field Installable and interchangeable so that any trip unit can be used with any frame size circuit breaker. Trip units can be upgraded for future expansion in functionality, such as communication.
   2. Functions: Long time, short time and extended instantaneous protection function shall be provided (EIP) to allow the breaker to be applied at the withstand rating of the breaker with minus 0% tolerance so that there is no instantaneous override whatsoever. This feature shall furthermore allow the circuit breaker to be applied up to the full instantaneous rating of the breaker on systems where the available fault current exceeds the breakers withstand rating. Each shall have an adjustable pick-up setting. In addition, long time and short time bands shall each have adjustable time delay. Short time function shall include a switchable I^2t ramp and optionally I^t to improve co-ordination with fuses or inverse relays.
   3. A software program shall be made available free of charge to support system co-ordination studies. The software will allow time current curves to be generated for the chosen settings.
   4. Individual LED’s shall indicate an overcurrent, short circuit or ground fault trip condition. The data shall be maintained for a minimum of 48 hours without the need for a separate battery.
   5. Time-current characteristics shall be field adjustable locally or optionally remotely via a bus system [ModBus] [Profibus] [Ethernet].
   6. Current Adjustability: Dial settings and rating plugs on trip units.
   7. Pickup Points: 10 Long Time Settings

8. Field Installable Ground-fault protection with at least three time-delay bands. Adjustable current pickup and an I^t ramp. Arrange to provide protection for [three-wire] [four-wire] service.

9. Field installable zone selective interlocking: Connections will be made between main, tie and feeder circuit breakers to ensure that the circuit breaker closest to the fault trips for short time and ground fault conditions.

10. Field Installable Communications shall be provided per schedule.

11. A LCD display shall be available to simplify settings & viewing data locally.

12. The option to remotely switch protection settings shall be provided whenever a generator is part of the power distribution system.

13. Field installable configurable [analog], [digital] output relays shall be available to connect directly to the trip unit

14. Waveform display option on LCD display ETU776 only

15. Estimated contact wear shall be capable of being communicated remotely in addition to a local mechanical indication flag.

E. MOC (mechanism operated cell switch) operated by the circuit breaker operating mechanism

F. Terminal Block Connections, shall be front mounted and utilize [Screw Type Terminals], [Ring Tongue Terminals], [Tension Spring Terminals]

G. Padlocking Provisions: For installing at least three padlocks on each circuit breaker to prevent movement of the drawout mechanism.

H. Operating Handle: shall be built in complete with handle and integral to breaker. No external tools shall be required to rack the breaker.

I. Control Switch: One for each electrically operated circuit breaker.

J. Key Interlocks: Mountings and hardware are included where future installation of key-interlock devices is indicated.

K. Undervoltage Trip – field installable: [Instantaneous] [Adjustable time-delay.]

L. Shunt-Trip – field installable

M. Fused Circuit Breakers: Circuit breaker and fuse combinations must comply with requirements for circuit breakers and trip devices and include the following:
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Guide Form Specifications

1. Fuses: NEMA FU 1, Class L current limiting, sized to coordinate with and protect associated circuit breaker.
2. Blown-Fuse Trip Device: fused circuit breakers are to be equipped with blown fuse lockout devices to prevent closing the breaker if a fuse is blown or not present. Open fuse status is indicated at the front of the circuit breaker or fuse drawout element.
3. Indicating Lights: To indicate circuit breaker is open or closed, for electrically operated circuit breakers.
4. Modular communication and relaying accessories are to be available for retrofitting by the clients chosen engineer. It shall not be necessary for the manufacturers personnel to retrofit accessories.
5. The following items must be capable of being changed in the field: main contacts, CT’s, trip units, racking mechanism and all internal and external accessories.
6. The main breaker shall have a Dynamic Arc Flash Sentry. The main breaker shall have a dual protective setting capability with graphic waveform display, similar to the Siemens WL breakers ETU776 trip unit. The main breaker will allow the installer to set two different trip curves into one breaker. One curve will be set for standard operating mode and the second curve, with instantaneous protection shall be set for arc flash mode. The switchboard shall be outfitted with a 24 VDC power supply, CubicleBus digital input module, annunciator panel with flashing light and a UPS power supply. The arc flash mode shall be actuated by a [Sguard motion sensor set to the arc flash boundary] [keyed switch] [selector switch]. [A light curtain shall be installed behind the gear to sense open doors on the back of the panel.]

2.6 ACCESSORIES
A. Lifting yoke for circuit breakers.
B. Portable test set for testing all functions of circuit breaker, solidstate trip devices without removal from switchgear.
C. Circuit-Breaker Removal Apparatus:
D. Spare Fuses: Six, of each type and rating of fuse used. Include spares for potential transformer fuses and control power fuses.
E. Spare Indicating Lights: One of each type installed.
F. Touchup Paint: One-half pint of paint matching enclosure finish.
G. Test Cabinet: Wall mountable cabinet to hold necessary equipment for testing electrically operated breakers.
H. Remote Breaker Racking
   1. Provide a portable remote breaker racking device system which consists of gear mounted brackets and a cable connected motor operator and control station.
   2. The 120v remote breaker racking device shall be attached to the factory mounted switchgear brackets (field retrofit capable) and secured by locking pins. No modification of the gear or circuit breakers shall be required for installation or operation.
   3. A single remote breaker racking device shall work on all circuit breaker frame sizes and draw out fuse frames.
   4. The remote breaker racking device shall have an on off power switch.
   5. The remote breaker racking device shall have torque control to prevent damage to the breaker racking mechanism.
   6. An operator control station shall be on the end of 30 feet cable to assure the operator is able to locate them safely.
   7. The operator control station shall have the capability of selecting the position desired for the breaker and shall include connected, test and disconnected positions.
   8. The operator control station shall contain Start-Stop buttons to initiate the breaker racking.
   9. The operator station shall contain indicator lamps showing connected, test and disconnect positions of the breaker as it is racked in or out.

PART 3 - EXECUTION

3.1 EXAMINATION AND INSTALLATION
A. Examine elements and surfaces to receive switchgear for compliance with installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
B. Install and anchor switchgear in accordance with manufacturer’s instructions.

3.2 CONNECTIONS
A. Tighten bus joints, electrical connectors and terminals according to manufacturer’s published torque tightening values. Install equipment grounding conductors for switchgear with ground continuity to main electrical ground bus.

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

3.4 WARRANTY
A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

3.5 STARTUP SERVICES
A. Engage a factory-authorized service representative to perform startup service.
B. Train Owner’s maintenance personnel on procedures and schedules for energizing and de-energizing, troubleshooting, servicing and maintaining equipment and schedules.
C. Verify that switchgear is installed and connected according to the Contract Documents.
D. Verify that electrical control wiring installation complies with manufacturer’s submittal by means of point-to-point continuity testing. Verify that wiring installation complies with requirements in Division [26] [16] Sections.
E. Complete installation and startup checks according to manufacturer’s written instructions.

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