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
- Institutional
- Critical Power
- Utility and co-generation
- Commercial

Product Scope
- Equipment ratings
  635VAC Maximum
  3-Phase 3-Wire, 3-Phase 4-Wire
  50/60 Hz
  6000 amp maximum horizontal bus
  5000 amp maximum vertical bus
- Enclosure options
  NEMA 1 Indoor
  NEMA 3R Outdoor Walk-in
  NEMA 3R Outdoor Non Walk-in

Exclusive Features
Generator/Utility Protection Sets
24/7/365 power availability is critical for some systems. On-site generation capability is growing more and more common in many systems. All of the WL digital electronic trip units allow the system designer to precisely tailor trip settings for the most demanding requirements. However, the 755 and 776 trip units allow one set of trip settings for a fully loaded utility feed and with a simple contact closure, the trip unit toggles to a second trip set tailored to provide optimal generator protection. The wide range of settings allows the WL to provide protection for a minimal generator capacity for only essential loads, through full backup for an entire facility. This dual utilitygenerator protection capability in a single circuit breaker allows the system designer unparalleled, costeffective flexibility.

Extended Instantaneous Protection (EIP – Patent Pending Feature)
Another unique feature of the WL Trip Unit, allows the system designer to achieve full selective trip coordination up to the short-time rating of the frame, while also allowing application of the breaker up to the interrupting rating of the frame. EIP allows the WL breaker to be applied up to the full withstand rating of the breaker, for complete coordination, with a minus 0% short-time band tolerance up to 85kA on Frame Size II and 100kA on Frame Size III. Above fault currents of 20% higher than the full short-time rating, the WL breaker is self protecting, and the EIP function will trip the breaker instantly to protect the frame and the system from these extremely high currents, as high as 150 kA on Frame Size III. One added benefit is that arc flash energy is greatly reduced in this high current region due to the instantaneous trip response that EIP provides.

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

WL drawout circuit breakers are designed for continuous operation at 100% of their current rating without the need for external heat sinks, and are in accordance with:
- UL 1066—Low Voltage AC and DC Power Circuit Breakers Used in Enclosures
- ANSI C37.13—Low Voltage AC Power Circuit Breakers Used in Enclosures

For more information, please visit http://automation.usa.siemens.com/consultant/ or contact your local sales office.
Low Voltage Switchgear

Type WL Low Voltage Metal-Enclosed Switchgear

Specifications

WL Low Voltage Metal-Enclosed Switchgear Features & Benefits

- Control and communication termination area located in front of equipment and segregated from power cable termination area that is located rear of equipment.
- Front accessible vertical and horizontal wiring channels.
- Easy access to control and communication connections through separate front door.
- No heat sinks on breaker or bus.
- No front-breaker door ventilation.
- 100kA bus bracing standard - 150kA and 200kA optional.
- Insulated/isolated bus through 6000 amps.
- Three levels of horizontal bus through 5000 amps.
- Modular design for maximum configuration flexibility.

Breaker Ratings

<table>
<thead>
<tr>
<th>Frame Size II</th>
<th>Frame Rating</th>
<th>800</th>
<th>1600</th>
<th>2000</th>
<th>3200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>S</td>
<td>H</td>
<td>L</td>
<td>F</td>
</tr>
<tr>
<td>Interrupting Current Ics (kAIR RMS) 50/60 Hz</td>
<td>254VAC</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>508VAC</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>635VAC</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>85</td>
</tr>
<tr>
<td>Short-time Withstand Current lcw (kA RMS) 50/60 Hz</td>
<td>0.5s</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>85</td>
</tr>
<tr>
<td>Extended Instantaneous Protection (kA RMS - 0% to 20+%)</td>
<td>285VAC</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>85</td>
</tr>
<tr>
<td>Close &amp; Latch Ratings (kA RMS) 50/60 Hz</td>
<td>50</td>
<td>65</td>
<td>65</td>
<td>85</td>
<td>75</td>
</tr>
<tr>
<td>Rating Plug Range</td>
<td>200A to 800A</td>
<td>200A to 1600A</td>
<td>200A to 2000A</td>
<td>200A to 3200A</td>
<td></td>
</tr>
<tr>
<td>Endurance Rating (switching operations with maintenance)</td>
<td>Mech.</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elec.</td>
<td>15,000</td>
<td>15,000</td>
<td>15,000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frame Size III</th>
<th>Frame Rating</th>
<th>3200</th>
<th>4000</th>
<th>5000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>Interrupting Current Ics (kAIR RMS) 50/60 Hz</td>
<td>254VAC</td>
<td>150</td>
<td>200</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>508VAC</td>
<td>150</td>
<td>200</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>635VAC</td>
<td>85</td>
<td>200</td>
<td>85</td>
</tr>
<tr>
<td>Short-time Withstand Current lcw (kA RMS) 50/60 Hz</td>
<td>0.5s</td>
<td>100</td>
<td>40</td>
<td>85</td>
</tr>
<tr>
<td>Extended Instantaneous Protection (kA RMS - 0% to 20+%)</td>
<td>254VAC</td>
<td>150</td>
<td>200</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>508VAC</td>
<td>85</td>
<td>200</td>
<td>85</td>
</tr>
<tr>
<td>Close &amp; Latch Ratings (kA RMS) 50/60 Hz</td>
<td>100</td>
<td>40</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>Rating Plug Range</td>
<td>800A to 3200A</td>
<td>800A to 4000A</td>
<td>800A to 5000A</td>
<td></td>
</tr>
<tr>
<td>Endurance Rating (switching operations with maintenance)</td>
<td>Mech.</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>Elec.</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
</tbody>
</table>

Notes:
- Maintenance means: Replacing main contacts and arc chutes (see operating instructions).
- Main contacts in breakers with Rating Designation M can only be replaced by Siemens personnel.
- Do not apply breaker at 635V AC on a system with available fault current > 85kA RMS.
Low Voltage Switchgear
Type WL Low Voltage Metal-Enclosed Switchgear

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 and 5000 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 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. Terminations are made with compression-type, insulated terminals. 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. Drawout 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 separate secondary disconnect access door that is supplied with each breaker can be used to mount a variety of auxiliary devices such as breaker control switches, indicating lights and pushbuttons.

For more information, please visit http://automation.usa.siemens.com/consultant/ or contact your local sales office.
Low Voltage Switchgear

Type WL Low Voltage Metal-Enclosed Switchgear

Options

Siemens High Resistance Grounding System

(1) The HRG section can be 22" or 32" wide. The HRG instrument compartment is 45" high and either 19" or 24" deep depending on whether the circuit breakers are fused. The HRG instrument compartment will house all of the high resistance grounding system components either on the door or in the device bucket except for the grounding resistors.

(2) The grounding resistor assembly will mount in the rear cable compartment of the switchgear on the runback support posts. It will typically mount behind the HRG instrument compartment where it cannot interfere with feeder breaker runbacks.

(3) In a typical Siemens HRG application with a close coupled main breaker section, a general purpose instrument compartment takes up the A compartment, the main breaker goes in the B compartment and the HRG instrument compartment takes up the C & D compartments. An alternate HRG main breaker section can have the HRG instrument compartment in the A & B compartments, main breaker in the C compartment and a general instrument compartment in the D compartment.

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 padlockable and field installable.

Key Interlock

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

Test Set

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

Metering and Auxiliary Compartments

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

Instrument and Control Transformers

Voltage transformers and control power transformers are mounted in auxiliary compartments. These transformers are protected by primary pull-out type current-limiting fuses and secondary fuses. Current transformers are normally mounted on the compartment primary disconnect studs where they are readily accessible.

Miscellaneous

- Each switchgear lineup includes a breaker lifting device that is adjustable for use with Size II and Size III breakers
- An optional portable breaker hoist is available if the integrated breaker hoist and track is not specified
- A test cabinet is also available as an option. The test cabinet is wall mounted necessary equipment for testing electrically-operated breakers that have been removed from the breaker compartment. The test cabinet doesn't include or replace a breaker trip unit tester
- 4" high formed steel channel sills are available for indoor switchgear enclosures

Outdoor Switchgear

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

For protection from snow, rain and other foreign matter, both outdoor enclosures rest on a six-inch high, formed steel base which provides rigid support and a tight bottom seal. A heavy duty protective undercoating 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.

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 louvering are standard with lighting, receptacles, switches and load centers offered as options.
### Low Voltage Switchgear

**Type WL Low Voltage Metal-Enclosed Switchgear**

#### Indoor Front Elevation View

#### Indoor Floor Plan and Cable Space Details

<table>
<thead>
<tr>
<th>A</th>
<th>Equipment Depth</th>
<th>Direction of Cables</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60&quot; Non-Fused with (N, S, H or L-Rating Breakers)</td>
<td>Below</td>
<td>21.50 (546) ¹ ²</td>
<td>13.88 (353)</td>
<td>32.59 (828)</td>
</tr>
<tr>
<td></td>
<td>OR 65&quot; Fused with (F-Rating Breakers)</td>
<td></td>
<td>21.25 (540) ¹</td>
<td>18.88 (480)</td>
<td>37.59 (955)</td>
</tr>
<tr>
<td></td>
<td>70&quot; Non-fused with (N, S, H or L-Rating Breakers)</td>
<td>Below</td>
<td>31.50 (800) ¹ ²</td>
<td>13.88 (353)</td>
<td>32.59 (828)</td>
</tr>
<tr>
<td></td>
<td>OR 75&quot; Fused with (F-Rating Breakers)</td>
<td>Above</td>
<td>31.25 (794) ¹</td>
<td>18.88 (480)</td>
<td>37.59 (955)</td>
</tr>
<tr>
<td></td>
<td>80&quot; Non-fused with (N, S, H or L-Rating Breakers)</td>
<td>Below</td>
<td>41.50 (1054) ¹ ²</td>
<td>13.88 (353)</td>
<td>32.59 (828)</td>
</tr>
<tr>
<td></td>
<td>OR 80&quot; Fused with (F-Rating Breakers)</td>
<td>Above</td>
<td>41.25 (1048) ¹</td>
<td>18.88 (480)</td>
<td>37.59 (955)</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.
4. Reduce cable space by 4.00" x 4.82" if Neutral Riser is present. (Consult Factory).
5. 4.10 (104) if W=22, 4.60 (117) if W=32.

For more information, please visit [http://automation.usa.siemens.com/consultant/](http://automation.usa.siemens.com/consultant/) or contact your local sales office.
Low Voltage Switchgear
Type WL Low Voltage Metal-Enclosed Switchgear

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
- Bused 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

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 – Contact factory for application guidelines related to this design.

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

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

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

Note 7 – If a 3200 amp breaker is installed in Compartment B, Feeder Breaker in Compartment A is limited to 1600 amp.

Note 8 – If a 3200 amp breaker is in Compartment BC, the maximum breaker in Compartment A is 1600 amp and if a 4000 amp breaker is in Compartment BC, the maximum breaker in Compartment A is 800 amp.

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.

For more information, please visit http://automation.usa.siemens.com/consultant/ or contact your local sales office.
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>Feeder Breaker 800, 1600, 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to Note 1</td>
<td>Refer to Note 1</td>
<td>Refer to Note 1</td>
<td>Refer to Note 1</td>
</tr>
</tbody>
</table>

<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>Feeder Breaker 800, 1600, 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to Note 7</td>
<td>Refer to Note 7</td>
<td>Refer to Note 7</td>
<td>Refer to Note 7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tie Breaker 800, 1600, 2000</th>
<th>Tie Breaker 800, 1600, 2000</th>
<th>Tie Breaker 800, 1600, 2000</th>
<th>Tie Breaker 800, 1600, 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to Note 2</td>
<td>Refer to Note 2</td>
<td>Refer to Note 2</td>
<td>Refer to Note 2</td>
</tr>
</tbody>
</table>

Main and Tie Sections – Non-Fused Breakers

<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>Refer to Note 7</td>
<td>Refer to Note 7</td>
<td>Refer to Note 7</td>
<td>Refer to Note 7</td>
</tr>
</tbody>
</table>

Main Breaker 800, 1600, 2000, 3200, 4000

Tie Breaker 800, 1600, 2000, 3200, 4000

Feeder Breaker 800, 1600, 2000, 3200

Refer to Note 5

Refer to Note 4

Refer to Note 3

Refer to Note 2

Refer to Note 1

Tie Sections – Fused Breakers

For more information, please visit http://automation.usa.siemens.com/consultant/ or contact your local sales office.
Low Voltage Switchgear

Type WL Circuit Breakers

Rogowski Coil CT Technology

A Rogowski coil is an 'air-core' toroidal coil placed round the conductor. The alternating magnetic field produced by the current induces a voltage in the coil which is proportional to the rate of change of current.

The direct output from the coil is given by \( V_{out} = M \frac{dI}{dt} \) where \( M \) is the mutual inductance of the coil and \( \frac{dI}{dt} \) is the rate of change of current. To complete the transducer the voltage is integrated electronically so that the output from the integrator is a voltage that accurately reproduces the current waveform.

Coil and Integrator:

The combination of a coil and an integrator provides an exceptionally versatile current-measuring system which can be designed to accommodate a vast range of frequencies, current levels and conductor sizes. The output is independent of frequency, has an accurate phase response and can measure complex current waveforms and transients.

Linearity:

One of the most important properties of a Rogowski coil measuring system is that it is inherently linear. The coil contains no saturable components and the output increases linearly in proportion to current right up to the operating limit determined by voltage breakdown. The integrator is also inherently linear up to the point where the electronics saturates. Linearity makes Rogowski coils easy to calibrate because a transducer can be calibrated at any convenient current level and the calibration will be accurate for all currents including very large ones. Also, because of their linearity, the transducers have a very wide dynamic range and an excellent transient response.

Coil Winding

With a Rogowski coil it is important to ensure that the winding is as uniform as possible. A non-uniform winding makes the coil susceptible to magnetic pickup from adjacent conductors or other sources of magnetic fields. We have developed special machines for making accurate windings. Coils come in a range of styles including rigid and flexible coils but we have developed several other variations to meet specific needs.

Output Indication

The output from the integrator can be used with any form of electronic indicating device that has an input impedance greater than about 10kohm such as a voltmeter, oscilloscope, transient recorder or protection system.

Switch-selectable \( I_2t \) or \( I_4t \) Characteristic Curve Improved Overload Protection.

The best possible protection is assured when all protective devices in the system are optimally coordinated. To achieve optimum selectivity and coordination, the long-time characteristic can be switched between \( I_2t \) and \( I_4t \) to improve coordination with fuses or inverse relays.

Electronic Trip Unit

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 \( I_2 \) 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. This is usually the temperature inside the cubicle.

Design of the circuit breaker.

Rogowski Coils do not have this problem. Misalignment of the joining faces of a split Rogowski coil has only a small effect on the amplitude and no effect on the phase.

For more information, please visit http://automation.usa.siemens.com/consultant/ or contact your local sales office.
# Low Voltage Switchgear

## Type WL Circuit Breakers

### Trip Unit Functions

#### Basic Protective Functions

<table>
<thead>
<tr>
<th>Feature</th>
<th>ETU725</th>
<th>ETU727</th>
<th>ETU745</th>
<th>ETU748</th>
<th>ETU755</th>
<th>ETU776</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-time overcurrent protection L</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Short-time delayed overcurrent protection S</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Instantaneous overcurrent protection I</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Neutral protection</td>
<td>N</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Ground fault protection</td>
<td>G</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

#### Additional Functions

<table>
<thead>
<tr>
<th>Feature</th>
<th>ETU725</th>
<th>ETU727</th>
<th>ETU745</th>
<th>ETU748</th>
<th>ETU755</th>
<th>ETU776</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selectable neutral protection</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Defeatable short-time delay</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Defeatable instantaneous protection</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Selectable thermal memory</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Zone selective interlocking</td>
<td>–</td>
<td>–</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Selectable I²t or fixed short-time delay</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Adjustable instantaneous pick-up</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Selectable I²t or I⁴t long-time delay</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Adjustable short-time delay and pick-up</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Selectable and adjustable neutral protection</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Dual protective setting capability (DAS)*</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Extended instantaneous protection</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

#### Parameterization and Displays

<table>
<thead>
<tr>
<th>Feature</th>
<th>ETU725</th>
<th>ETU727</th>
<th>ETU745</th>
<th>ETU748</th>
<th>ETU755</th>
<th>ETU776</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameterization by rotary switches (10 steps)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Parameterization by communication (absolute values)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Parameterization by menu/keypad (absolute values)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Remote parameterization of the basic functions</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Remote parameterization of the additional functions</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Alphanumeric LCD</td>
<td>–</td>
<td>–</td>
<td>○</td>
<td>○</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Graphical LCD</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>●</td>
</tr>
</tbody>
</table>

#### Metering Function

<table>
<thead>
<tr>
<th>Feature</th>
<th>ETU725</th>
<th>ETU727</th>
<th>ETU745</th>
<th>ETU748</th>
<th>ETU755</th>
<th>ETU776</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metering function Plus</td>
<td>–</td>
<td>–</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

#### Communication

<table>
<thead>
<tr>
<th>Feature</th>
<th>ETU725</th>
<th>ETU727</th>
<th>ETU745</th>
<th>ETU748</th>
<th>ETU755</th>
<th>ETU776</th>
</tr>
</thead>
<tbody>
<tr>
<td>CubicleBUS</td>
<td>–</td>
<td>–</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Communication via PROFIBUS-DP</td>
<td>–</td>
<td>–</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Communication via the MODBUS</td>
<td>–</td>
<td>–</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Communication via the Ethernet (BDA)</td>
<td>–</td>
<td>–</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

● standard – not available ○ optional

* DAS- Dynamic Arc Flash Sentry, Siemens patent pending protective feature

---

For more information, please visit [http://automation.usa.siemens.com/consultant/](http://automation.usa.siemens.com/consultant/) or contact your local sales office.
Low Voltage Switchgear
Type WL Circuit Breakers
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

Features
- Industry standard MODBUS or PROFIBUS communication available on all WL breakers from 200A to 5000A
- The high modularity of the WL Circuit Breakers and accessories allows simple retrofitting of all communication components
- The ability to connect additional input and output modules to the breaker-internal CubicleBUS of the WL opens up a range of opportunities to reduce secondary device count and wiring and to increase functionality implemented in 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

Metering Function/Metering Function PLUS
The integrated metering function can be installed on all ETU745, ETU748, ETU755, and ETU776 trip units and provides a viable alternative to external multi-function measuring instruments in many applications.

Metering Function can measure the following:
- Currents
- Voltages
- Power
- Energy
- Power Factor
- Frequency

All metered quantities are delivered as real time values with min/max recording. The metering module also contains additional alarm setpoint and protective relay functions (e.g. trip on overfrequency or undervoltage, and alarm on reverse power or over ampere demand).

The Metering Function PLUS has two additional wave form buffers and supports harmonic analysis. With the two independent wave form buffers, the current and voltage waveforms can be recorded, and allows detailed diagnostic triggering on events. If the Metering Function /Metering Function PLUS is ordered together with the circuit breaker, it is already installed and ready for operation. As a retrofit part, the metering function is simply attached to the ETU and connected to the CubicleBUS.

For more information, please visit http://automation.usa.siemens.com/consultant/ or contact your local sales office.
Dynamic Arc Flash Sentry (DAS)

**Laser Scanner Sensor**

SIGUARD laser scanners are optical distance sensors which detect any motion in a 190° working zone. By transmitting safe laser pulses and then evaluating every reflected pulse, they have everything safely in view. And when potentially hazardous situations do arise, they respond quickly and reliably. They can be simply programmed using either a PC or a laptop which means that they can be quickly and flexibly adapted to new requirements.

Unified, integrated communications via standard fieldbuses can be implemented in a fail-safe fashion by transmitting safety-related and standard data together. This means that also with our SIGUARD laser scanners, you can enjoy the benefits of having just one bus coupling.

**SIGUARD laser scanners LS4 – the advantages at a glance:**
- Hazardous areas can be contactlessly and reliably secured with devices which can be universally used: on machines, production robots, conveyor systems, vehicles etc.
- Standard versions with fail-safe semiconductor outputs
- Safe direct connection to AS-Interface Safety at Work
- User-friendly version with PROFIBUS PROFinet safe connection
- When scanners are replaced, parameters are automatically transferred via PROFIBUS
- Category 3 according to EN 954-1
- Up to 4 personnel protective and warning field pairs which can be freely set
- Protective field with max. 4m radius for personnel safety
- Extremely compact design
- Low current drain (approx. 300 mA)

**Function Description**

**Mode of operation**

The SIGUARD laser scanner LS4 is a scanner which optically and contactlessly scans areas – and which is predominantly used for personnel protection. The laser scanner generates a continuous train of bundled light pulses using a laser diode and an optical system. An integrated rotating mirror distributes these light pulses over the complete working area. If objects or persons enter this field, then the scanner evaluates the reflected light pulses and, using the light propagation time, continually calculates the precise position coordinates. If the defined personnel protective field is violated, then it brings the machine to an immediate stop.

The SIGUARD laser scanner LS4 extends over 190° and is subdivided into angular segments of 0.36°. The scanning rate is 25 scans per second which means that a light pulse is transmitted every 40 ms into every segment. A special algorithm ensures that objects larger than 70 mm – this corresponds to the scanner resolution – are reliably detected. However, it also ensures that dust and other disturbing effects do not have a negative impact on the availability of the system.

The operating range of SIGUARD laser scanners LS4 can be detected at a range of 15 m, for example, to output a warning message (however, this is not safety-related).

**Flexibility already on board**

SIGUARD laser scanners can be flexibly adapted to every requirement using four variable protective field pairs for personnel protection and warning fields. These protective field pairs can be simply set at the PC. The SIGUARD laser scanner can be used on stationary machines and systems, but it can also be used for mobile applications mounted on vehicles, driverless transport systems or trolleys. This means, for example, that various operating areas of a robot can be secured where the laser scanner consecutively scans the different areas. Using four programmable protective fields, driverless transport systems can be secured e.g., for fast travel, slow travel, left hand and right hand curves.

**Software for every application**

It is extremely easy to precisely set the laser scanner thanks to the LS4soft PC operator software. The following functions are integrated:
- Protective fields can be easily configured using either a PC or laptop
- Additional functions such as protective field changeover, restart inhibit etc. can be configured using a software assistant
- Extensive range of displays – e.g., defined protective fields, actual scan contour, system settings etc.
- Safe access protection using passwords with various authorization stages
- LS4soft can run under Microsoft Windows 95/98/2000/NT/XP
Low Voltage Switchgear
Arc Flash Solutions

Connection Examples

SIGUARD laser scanner “Standard” with protective field changeover and start button
- Start button for manual restart directly at the scanner (connection 2)
- Alarm output at connection 5 (e.g., warning lamp)
- Protective field changeover at connections 4, 6, 7 and 8
- Safety-related processing of the safe outputs (connections 11 and 12) through an evaluation unit or fault-tolerant PLC

SIGUARD laser scanner “Standard” with 3RG7847-4BB evaluation unit
- Start button for manual restart directly at the scanner (connection 2)
- Permanently set protective field pair 1 (24 V permanently connected to connection 4)

SIGUARD laser scanner AS-Interface
- Directly connected to AS-Interface Safety at Work
- Safety-related shutdown using the safety monitor
- Protective field changeover as for the standard scanner
- A local button can be optionally connected for manual restart
- All of the connections are established through M12 connectors

SIGUARD laser scanner PROFIBUS
- Directly connected to PROFIBUS
- The shutdown signal is safely transferred via the PROFIBUS PROFIsafe profile
- Safe protective field changeover also via PROFIBUS
- Laser scanners can be quickly replaced thanks to the automatic parameter transfer
- A local button can be optionally connected for manual restart
- All of the connections are established through M12 connectors

For more information, please visit http://automation.usa.siemens.com/consultant/ or contact your local sales office.