Unit substation solutions with type SIMOSEC primary switches quick reference guide

E50001-F710-A389-X-4A00

Answers for energy.

SIEMENS

Unit substation solution with
type SIMOSEC primary switches,
dry-type transformer and switchboard

Siemens unit substation solutions

Overview

Siemens offers a wide variety of unit substation designs to meet virtually any customer requirement. A unit substation consists of one or more transformers mechanically and electrically connected to, and coordinated with, one or more switchgear or switchboard assemblies. A secondary unit substation is defined as a unit substation whose outgiong section is rated below 1,000 V.

A typical secondary unit consists of three sections:

- Primary: depending upon the specific application, this section accepts medium-voltage (2.4 kV to 27.6 kV) incoming power
- Transformer: reduces incoming voltage to utilization voltage (600 V or less)
- Secondary: distributes power to, and provides protection for, outgoing feeders (600 V and less).

The key benefit of a secondary unit substation is that it economically brings power as close as possible to the loads, minimizing power loss and maximizing voltage regulation. It also enhances flexibility, using a system design concept that integrates a wide variety of components to tailor the equipment to the specific needs of each application.

Every component or assembly utilized in secondary unit substations is engineered to be an integral part of a complete system.

A secondary unit substation helps you:

- Reduce power losses
- Enhance voltage regulation
- Improve service continuity
- Increase functional flexibility
- Lower installation cost
- Efficient space requirements.

Type SIMOSEC medium-voltage, load-interrupter switchgear

- Up to 15 kV, 63 kA (fused)/25 kA (unfused), 95 kV BIL
- Up to 27.6 kV, 20 kA (fused or unfused), 125 kV BIL

Type SIMOSEC metal-enclosed, load-interrupter primary switch

Features and ratings

- For application on systems up to 63 kA 15 kV and 20 kA 27.6 kV
- Load current switching rating 600 A, main bus continuous current rating 1,200 A
- Extremely compact footprint
- Meets ANSI/IEEE C37.20.3
- UL or C-UL Listing available
- Seismic rated up to IBC 2003
- Ideal for utility, construction and industrial applications
- Animated mimic diagram (mimic bus)
- High switching capacity – 100 operations at 600 A – five times higher than ANSI requirements
- High endurance – 1,000 mechanical operations
- Gas-insulated three-position switch disconnector, hermetically sealed for life inside a stainless steel vessel
- No maintenance or adjustment required on the switch module over life of the switch
- Integrated mechanical interlocking
- Switch disconnector combines the function of a load-interrupter switch (with closed-open indication) and a grounding switch (with open-ground indication), thus inherent design offers additional safety for the operators
- High-voltage current limiting fuses and cable terminations accessible only if the feeder grounding switch is in the grounded position
- Fuses and outgoing cables are front accessible, so SIMOSEC can be placed against the wall and maximize the use of available space
- Convenient viewing window for verification of primary contact position (visible break)
- Capacitive voltage indicators to show if the cable side of the switch is energized
- Configurations: individual feeder switches, transformer primary switches and switch lineups
- Main bus at top or bottom to suit application
- Over 20 years experience and more than 350,000 switch-disconnector units installed

Type SIMOSEC medium-voltage, load-interrupter switchgear indoor installation on raised housekeeping pad.

Type SIMOSEC technical data and dimensions

Rated voltage	Rated frequency	Rated short-duration power-frequency withstand voltage	Rated lightning-impulse withstand voltage (BIL)	Rated short-time withstand current, two seconds	Fused short-circuit current rating (FS panel only)	Maximum fused continuous current (not equal to fuse E rating)			Main bus continuous current rating	Switch disconnector	
						Single fuse FS-1	Double fuse FS-2	Triple fuse FS-3		Contin-uous	Inter-rupting
kV	Hz	kV	kV	kA	kA	A	A	A	A	A	A
5.0	50/60	19	60	25	63	325	575	600	1,200	600	600
8.25 and 15.0	50/60	36	95	25	63	165	305	430	1,200	600	600
27.6	50/60	60	125	20	20	65	117	156	1,200	600	600

Dimensions in inches (mm)	Cable switch CS	Fused switch FS	Metering MT	Cable connection CC
Width	14.8 (375)[1] 19.7 (500)[2] —[5]	14.8 (375)[1] 19.7 (500)[2] 29.5 (750)[3]	—[5] 19.7 (500)[4] 29.5 (750)[4]	14.8 (375)[1] 19.7 (500)[2] —[5]
Depth	48.4 (1,230)	48.4 (1,230)	48.4 (1,230)	48.4 (1,230)
Height	88.6 - 100.4 (2,250 - 2,850) depending upon arrangement	88.6 - 100.4 (2,250 - 2,850) depending upon arrangement	88.6 - 100.4 (2,250 - 2,850) depending upon arrangement	88.6 - 100.4 (2,250 - 2,850) depending upon arrangement

Footnotes:
[1] Single cable (CS) or single fuse (FS)
[2] Two cables (CS) or double-barrel fuse (FS)
[3] Three cables or triple-barrel fuse
[4] Width depends on equipment arrangement
[5] Section not available at this dimension.

Maximum voltage (kV)	Fuse type	E -rating (open air)	Allowable continuous current (A)		
			FS-1[1]	FS-2[2]	FS-3[3]
5.5	55GDMSJ10ES	10E	10		
5.5	55GDMSJ15ES	15E	15		
5.5	55GDMSJ20ES	20E	20		
5.5	55GDMSJ25ES	25E	25		
5.5	55GDMSJ30ES	30E	30		
5.5	55GDMSJ40ES	40E	40		
5.5	55GDMSJ50ES	50E	50	----	
5.5	55GDMSJ65ES	65E	65		----
5.5	55GDMSJ80ES	80E	80		
5.5	55GDMSJ100ES	100E	100		
5.5	55GDMSJ125ES	125E	120		
5.5	55GFMSJ150ES	150E	150		
5.5	55GFMSJ175ES	175E	164		
5.5	55GFMSJ200ES	200E	183	327	
5.5	55GFMSJ250ES	250E	220	390	
5.5	55GFMSJ300ES	300E	241	429	598
5.5	55GFMSJ350ES	350E	269	478	600
5.5	55GFMSJ400ES	400E	302	536	600
5.5	55GFMSJ450ES	450E	325	575	600
17.5	175GDMSJ10ES	10E	10		
17.5	175GDMSJ15ES	15E	15		
17.5	175GDMSJ20ES	20E	20		
17.5	175GDMSJ25ES	25E	25		
17.5	175GDMSJ30ES	30E	30		
17.5	175GFMSJ40ES	40E	40	----	----
17.5	175GFMSJ50ES	50E	50		
17.5	175GFMSJ65ES	65E	59		
17.5	175GXMSJ80ES	80E	73		
17.5	175GXMSJ100ES	100E	85		
17.5	175GXQSJ125ES	125E	112	207	
17.5	175GXQSJ150ES	150E	123	238	336
15.5	155GXQSJ175ES	175E	167	310	420
15.5	155GXQSJ200ES	200E	165	305	430

High-voltage fuse selection table.

Example:

- 5,000 kVA, 12.47 kV transformer
- Full-load current 231.5 A
- Multiplier 1.33
- Current for fuse-size selection = 1.33 x 231.5 A = 308 A
- Multiplier of 1.33 for transformer with fan-cooled rating 125% of self-cooled rating (adjust multiplier for differing fan-cooled transformer capability)
- Fuse rating = 2 x 175E/phase (FS-2).

Footnotes:

[1] FS-1 one fuse barrel per phase

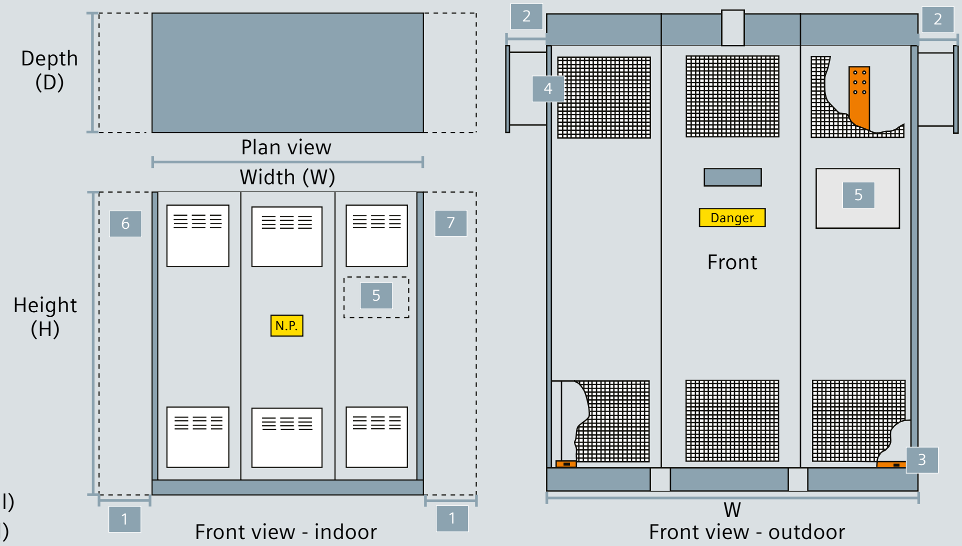
[2] FS-2 two fuse barrels per phase

[3] FS-3 three fuse barrels per phase.

Ratings include:

- Primary voltage 2,400 V to 13,800 V
- Secondary voltage 208 V to 600 V
- Temperature rise
  150 °C for aluminum windings
  80 °C/115 °C for copper windings
- Standard kV BIL
  (high voltage/low voltage)
  60/30 for aluminum windings
  95/30 for copper windings.

1. 18” (457 mm)
2. 4” (102 mm)
3. Ground bus
4. High-voltage terminal
5. Fan-control panel when required
6. High-voltage terminal air chamber (optional)
7. Low-voltage terminal air chamber (optional)



Transformers – dry-type VPI/VPE

Winding material	Low-voltage switchgear or switchboard coordination				
	kVA	Dimensions in inches (mm)			Weight in lbs (kg)
		Height	Width	Depth	
Aluminum	300	90 (2,286)	90 (2,286)	54 (1,372)	4,600 (2,087)
Aluminum	500	90 (2,286)	90 (2,286)	54 (1,372)	4,800 (2,177)
Aluminum	750	90 (2,286)	90 (2,286)	54 (1,372)	5,800 (2,630)
Aluminum	1,000	90 (2,286)	102 (2,591)	60 (1,524)	7,000 (3,175)
Aluminum	1,500	96 (2,438)	102 (2,591)	60 (1,524)	9,200 (4,173)
Aluminum	2,000	102 (2,591)	102 (2,591)	60 (1,524)	11,000 (4,990)
Aluminum	2,500	108 (2,743)	112 (2,845)	60 (1,524)	12,200 (5,534)
Aluminum	3,000	108 (2,743)	118 (2,998)	60 (1,524)	14,100 (6,396)
Aluminum	3,750	112 (2,845)	126 (3,200)	66 (1,676)	15,800 (7,167)
Aluminum	5,000	132 (3,353)	138 (3,505)	66 (1,676)	17,000 (7,711)

Winding material	kVA	Low-voltage switchgear or switchboard coordination			
		Dimensions in inches (mm)			Weight in lbs (kg)
		Height	Width	Depth	
Copper	300	90 (2,286)	90 (2,286)	54 (1,372)	6,000 (2,722)
Copper	500	90 (2,286)	96 (2,438)	60 (1,524)	6,400 (2,903)
Copper	750	90 (2,286)	102 (2,591)	60 (1,524)	8,000 (3,629)
Copper	1,000	96 (2,438)	102 (2,591)	60 (1,524)	9,700 (4,400)
Copper	1,500	102 (2,591)	108 (2,743)	60 (1,524)	13,200 (5,987)
Copper	2,000	108 (2,743)	112 (2,845)	60 (1,524)	17,400 (7,893)
Copper	2,500	118 (2,998)	126 (3,200)	60 (1,524)	19,000 (8,618)
Copper	3,000	118 (2,998)	132 (3,353)	60 (1,524)	22,000 (9,979)
Copper	3,750	126 (3,200)	132 (3,353)	66 (1,676)	27,000 (12,247)
Copper	5,000	132 (3,353)	138 (3,505)	66 (1,676)	30,000 (13,608)

Winding material	Low-voltage switchgear or switchboard coordination				
	KVA	Dimensions in inches (mm)			Weight in lbs (kg)
		Height	Width	Depth	
Aluminum	300	90 (2,286)	90 (2,286)	54 (1,372)	5,500 (2,495)
Aluminum	500	90 (2,286)	90 (2,286)	54 (1,372)	6,300 (2,858)
Aluminum	750	90 (2,286)	96 (2,438)	60 (1,524)	7,800 (3,538)
Aluminum	1,000	96 (2,438)	102 (2,591)	60 (1,524)	9,500 (4,309)
Aluminum	1,500	102 (2,591)	108 (2,743)	60 (1,524)	11,500 (5,216)
Aluminum	2,000	108 (2,743)	112 (2,845)	60 (1,524)	13,800 (6,260)
Aluminum	2,500	112 (2,845)	126 (3,200)	60 (1,524)	16,200 (7,348)
Aluminum	3,000	118 (2,998)	132 (3,353)	60 (1,524)	19,200 (8,709)
Aluminum	3,750	126 (3,200)	138 (3,505)	66 (1,676)	25,000 (11,370)
Aluminum	5,000	132 (3,353)	144 (3,658)	66 (1,676)	28,000 (12,701)
Copper	300	90 (2,286)	90 (2,286)	60 (1,524)	6,200 (2,812)
Copper	500	90 (2,286)	96 (2,438)	60 (1,524)	7,000 (3,175)
Copper	750	90 (2,286)	102 (2,591)	60 (1,524)	9,100 (4,128)
Copper	1,000	96 (2,438)	112 (2,845)	60 (1,524)	10,600 (4,808)
Copper	1,500	102 (2,591)	118 (2,998)	60 (1,524)	14,300 (6,486)
Copper	2,000	108 (2,743)	118 (2,998)	66 (1,676)	18,200 (8,255)
Copper	2,500	118 (2,998)	126 (3,200)	66 (1,676)	19,500 (8,845)
Copper	3,000	126 (3,200)	132 (3,353)	66 (1,676)	23,500 (10,659)
Copper	3,750	126 (3,200)	144 (3,658)	66 (1,676)	28,000 (12,701)
Copper	5,000	132 (3,353)	160 (4,064)	66 (1,676)	35,000 (15,876)

Transformers – dry-type, cast coil

Ratings include:

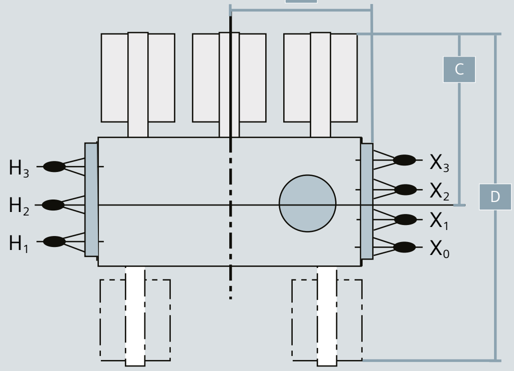
- Primary voltage 2,400 V to 13,800 V
- Secondary voltage 208 V to 600 V
- Temperature rise
  80 °C/115 °C for aluminum windings and copper windings
- Standard kV BIL
  (high voltage/low voltage)
  60/30 for aluminum windings
  95/30 for copper windings.

Ratings include:

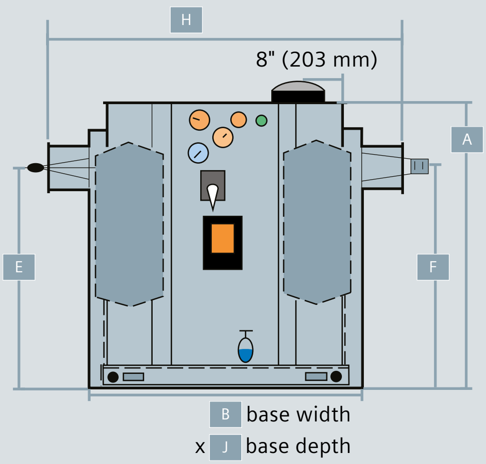
- Primary voltage 25,000 V and below
- Secondary voltage 5,000 V and below
- Temperature rise 55 °C/65 °C.

Weights, gallons of fluid and dimensions are for reference only and not for construction. Please contact Siemens for exact dimensions.

Top view



Elevation



Transformers – liquid-filled type

kVA	Dimensions in inches (mm)									Aluminum windings		Copper windings	
	A	B	C	D	E	F	G	H	J	Gallons of fluid	lbs (kg) with fluid	Gallons of fluid	lbs (kg) with fluid
500	66 (1,676)	51 (1,295)	26 (660)	52 (1,321)	45 (1,143)	45 (1,143)	30 (762)	60 (1,524)	35 (889)	300	5,600 (2,540)	310	5,900 (2,676)
750	75 (1,905)	59 (1,499)	26 (660)	52 (1,321)	55 (1,397)	55 (1,397)	34 (864)	68 (1,727)	35 (889)	360	7,000 (3,175)	370	7,400 (3,357)
1,000	75 (1,905)	67 (1,702)	26 (660)	52 (1,321)	55 (1,397)	55 (1,397)	38 (965)	76 (1,930)	35 (889)	420	8,400 (3,810)	430	8,800 (3,992)
1,500	75 (1,905)	59 (1,499)	59 (1,499)	80 (2,032)	55 (1,397)	55 (1,397)	34 (864)	68 (1,727)	35 (889)	400	9,500 (4,309)	420	10,000 (4,536)
2,000	85 (2,159)	67 (1,702)	67 (1,702)	90 (2,286)	55 (1,397)	55 (1,397)	38 (965)	76 (1,930)	39 (991)	520	12,000 (5,443)	500	12,800 (5,806)
2,500	85 (2,159)	75 (1,905)	68 (1,727)	92 (2,337)	55 (1,397)	55 (1,397)	42 (1,067)	84 (2,134)	41 (1,041)	570	14,600 (6,622)	590	14,900 (6,759)
3,750	85 (2,159)	75 (1,905)	70 (1,778)	120 (3,048)	65 (1,651)	65 (1,651)	42 (1,067)	84 (2,134)	45 (1,143)	790	20,500 (9,299)	830	21,500 (9,752)
5,000	99 (2,515)	87 (2,210)	72 (1,829)	144 (3,658)	65 (1,651)	65 (1,651)	48 (1,219)	96 (2,438)	49 (1,245)	1,050	26,000 (11,793)	1,090	28,000 (12,701)
7,500	99 (2,515)	95 (2,413)	74 (1,880)	148 (3,759)	75 (1,905)	75 (1,905)	52 (1,321)	104 (2,642)	53 (1,346)	1,320	35,000 (15,876)	1,360	37,000 (16,783)
10,000	99 (2,515)	103 (2,616)	76 (1,930)	152 (3,861)	75 (1,905)	75 (1,905)	56 (1,422)	112 (2,845)	57 (1,448)	1,740	43,000 (19,504)	1,780	45,000 (20,412)
12,000	99 (2,515)	103 (2,616)	82 (2,083)	164 (4,166)	75 (1,905)	75 (1,905)	56 (1,422)	112 (2,845)	61 (1,549)	1,850	49,000 (22,226)	1,880	50,000 (22,680)

Type SB3 front-connected switchboards

Type SB3 front-connected switchboards

Overview

Siemens modular front-connected switchboard design provides a broad range of features and capabilities for a wide range of applications.

Every design aspect of Siemens switchboards has been aimed at improving layout convenience, reducing installation costs and minimizing the impact and cost of changes to the system.

Siemens switchboards provide a rugged design and the flexibility necessary in electrical systems for all types of applications from industrial plants and high-rise complexes to hospitals and commercial buildings.

Industry standards

Siemens switchboards are designed, tested and constructed in accordance with:

- UL 891 – Switchboards
- NEMA PB2 - Deadfront Distribution Switchboards
- Seismically qualified
- Other equipment is UL Listed as applicable.

Features and benefits

Siemens switchboards ratings and features include:

- Up to 6,000 A main bus rating
- Up to 600 Vac
- Bus bracing up to 200 kAIC
- Copper or aluminum bussing
- Temperature- or density-rated busing
- Type 1 and type 3R enclosures
- Main and branch circuit breakers and fusible switches
- Thermal magnetic and solid-state circuit breakers
- Surge protective devices
- Utility metering provisions
- Siemens type ACCESS™ power monitoring on mains and branches
- Ground fault protection on mains and branches
- Busway and transformer connections
- Protective relaying
- Two and three device autothrowover scheme.

Type WL low-voltage switchgear

Overview

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 type WL circuit breaker.

Siemens type WL low-voltage switchgear can be utilitized in industrial, institutional, critical power, utility and co-generation and commercial applications.

Ratings include:

- 635 Vac maximum
- Three-phase, three-wire
- Three-phase, four-wire
- 50/60 Hz
- 6,000 A maximum horizontal bus
- 5,000 A maximum vertical bus.

Enclosure options include:

- NEMA 1 indoor
- NEMA 3R outdoor walk-in
- NEMA 3R outdoor non-walk-in.

Industry standards

Type WL low-voltage, metal-enclosed switchgear with power circuit breakers are designed, tested and constructed in accordance with:

- UL 1558 – Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
- ANSI/IEEE C37.20.1 – Metal-Enclosed, Low-Voltage Power Circuit Breaker Switchgear.

Type WL drawout circuit breakers are designed for continuous operation at 100-percent 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/IEEE C37.13 – Low-Voltage AC Power Circuit Breakers Used in Enclosures

Exclusive features

Generator/utility protection sets

Some systems require power availability around the clock. On-site generation capabailities are becoming more and more common. Type WL digital electronic trip units allow the system designer to precisely tailor trip settings for the most demanding requirements.

The Siemens type WL 776 trip unit allows one set of trip settings for a fully loaded utility feed. With a simple contact closure, the trip unit toggles to a second trip set tailored to provide optimal generator protection.

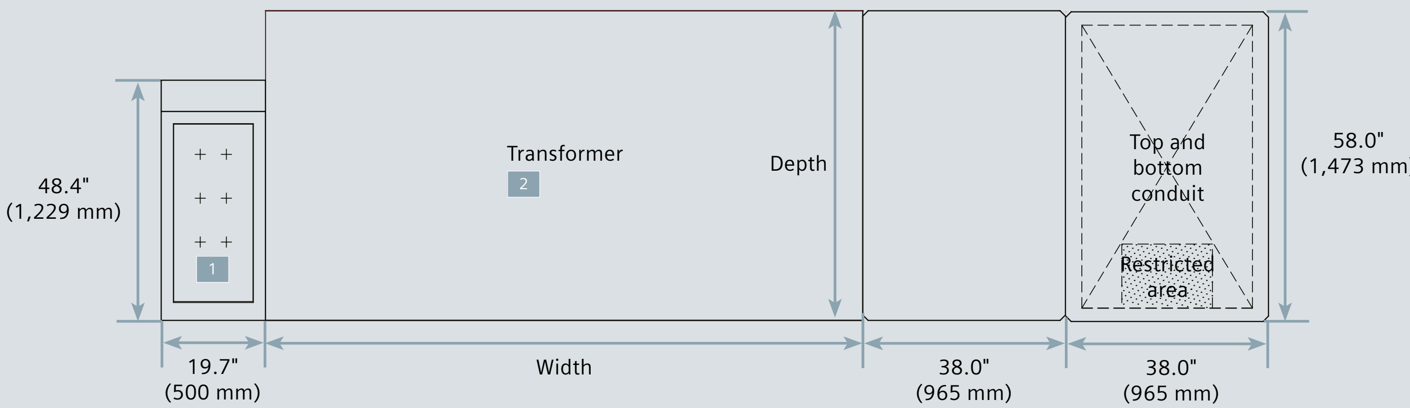
The wide range of settings allow the type WL to provide protection for a minimal generator capacity for only essential loads through full backup to an entire facility. This dual utility/generator protection capability in a single circuit breaker allows the system designer unparalleled, cost-effective flexibility.

Extended instantaneous protection (EIP)

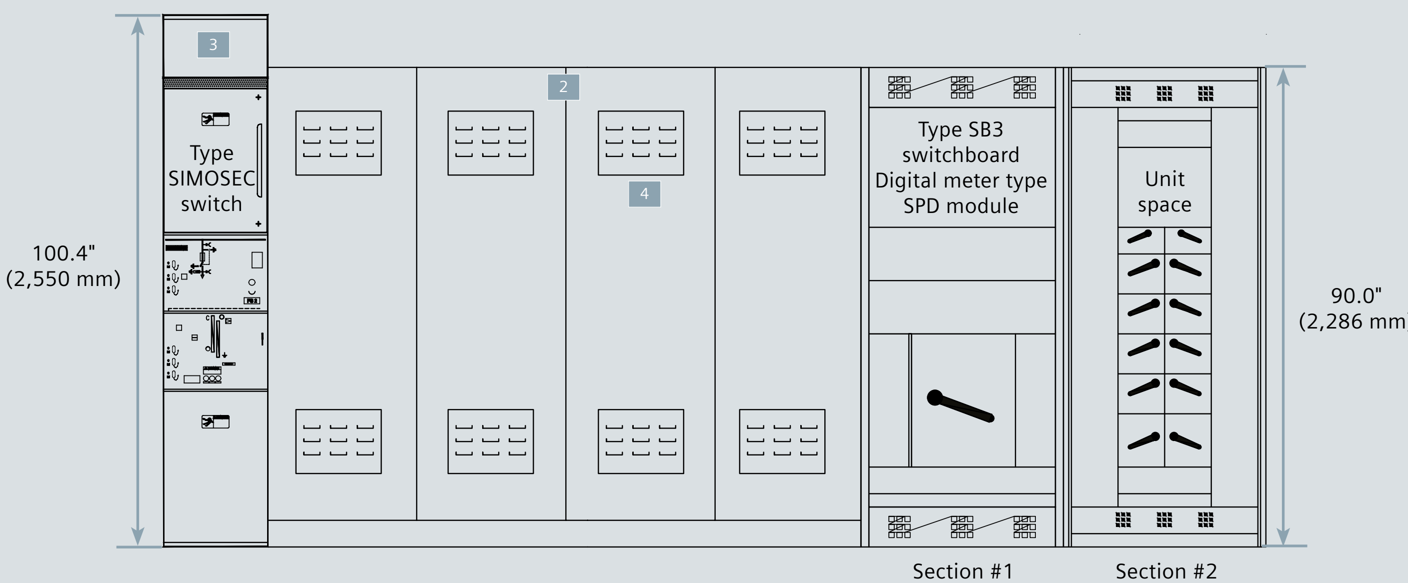
The type WL trip unit extended instantaneous protection (EIP) (patent pending) feature allows the system designer to achieve full selective trip coordination up to the short-time rating of the frame, while also allowing application of the circuit breaker up to the interrrupting rating of the frame. EIP allows the type WL circuit breaker to be applied up to the full-withstand current rating of the circuit breaker, for complete coordination, with a minus zero percent short-time band tolerance up to 85 kA on Frame Size II and 100 kA on Frame Size III.

Above fault currents of 20-percent higher than the full short-time current rating, the type WL circuit breaker is self-protecting, and the EIP function will trip the circuit breaker instantly to protect the frame and the system from these extremely high currents (as high as 150 kA on Frame Size III). An added benefit is that arc flash energy is greatly reduced in this high-current region due to EIP's instantaneous trip response.

Plan view

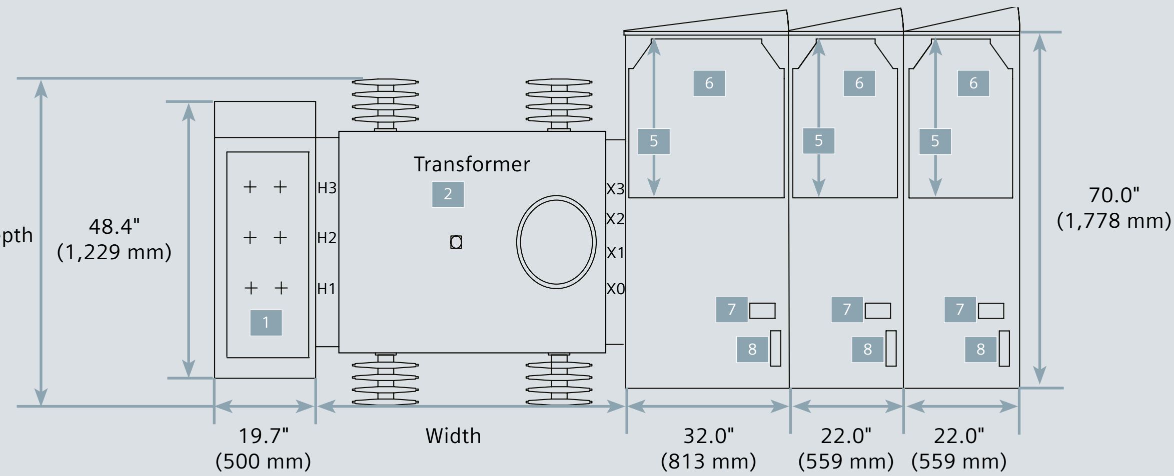


Front view

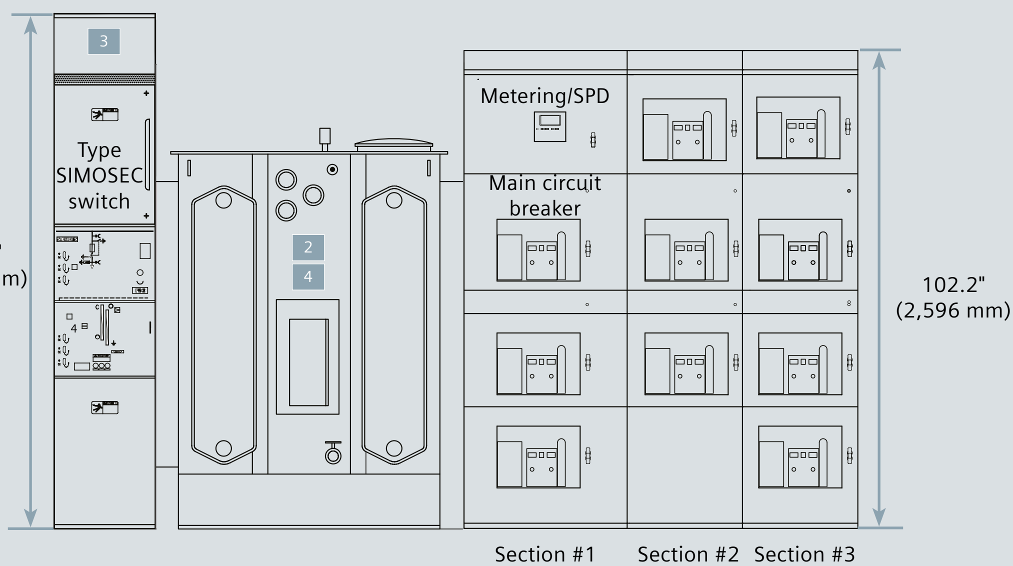


1. Primary lug location
2. Refer to pages six through eight for transformer dimensions
3. Primary switch requires front access for top-cable entry terminations
4. Transformer requires access from the front and 12" (305 mm) from the back side for ventilation space

Plan view

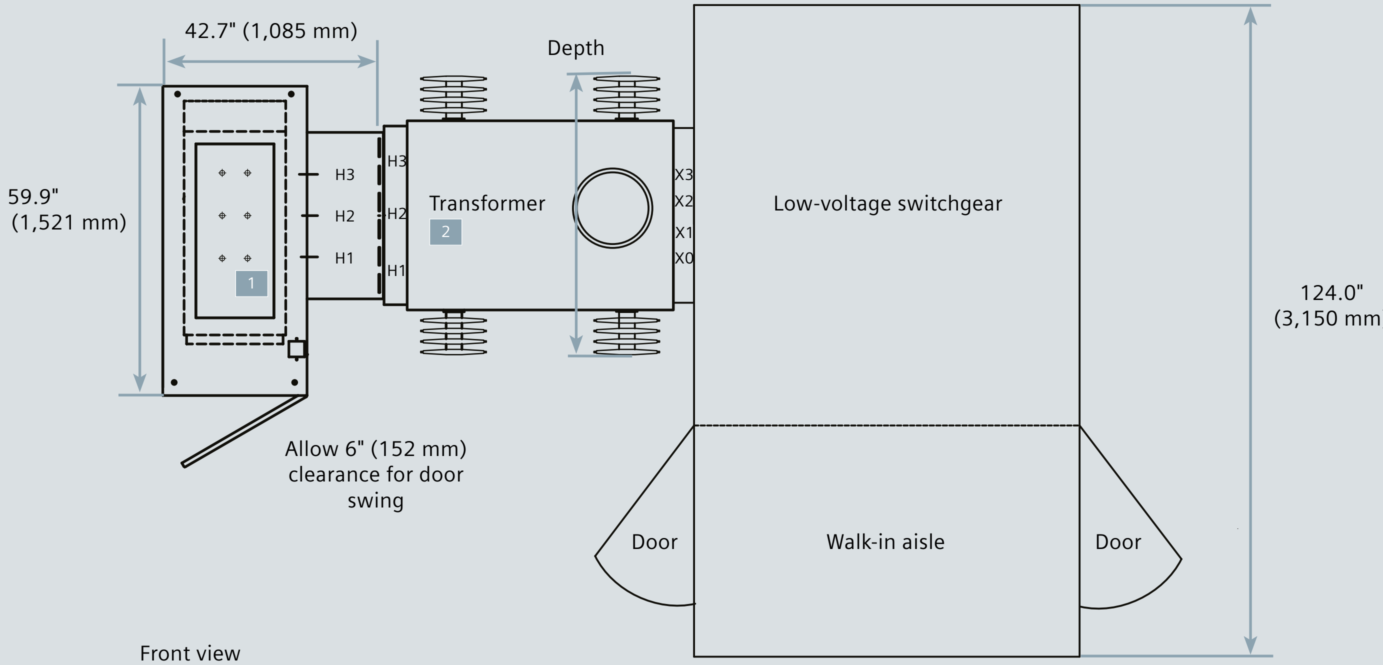


Front view

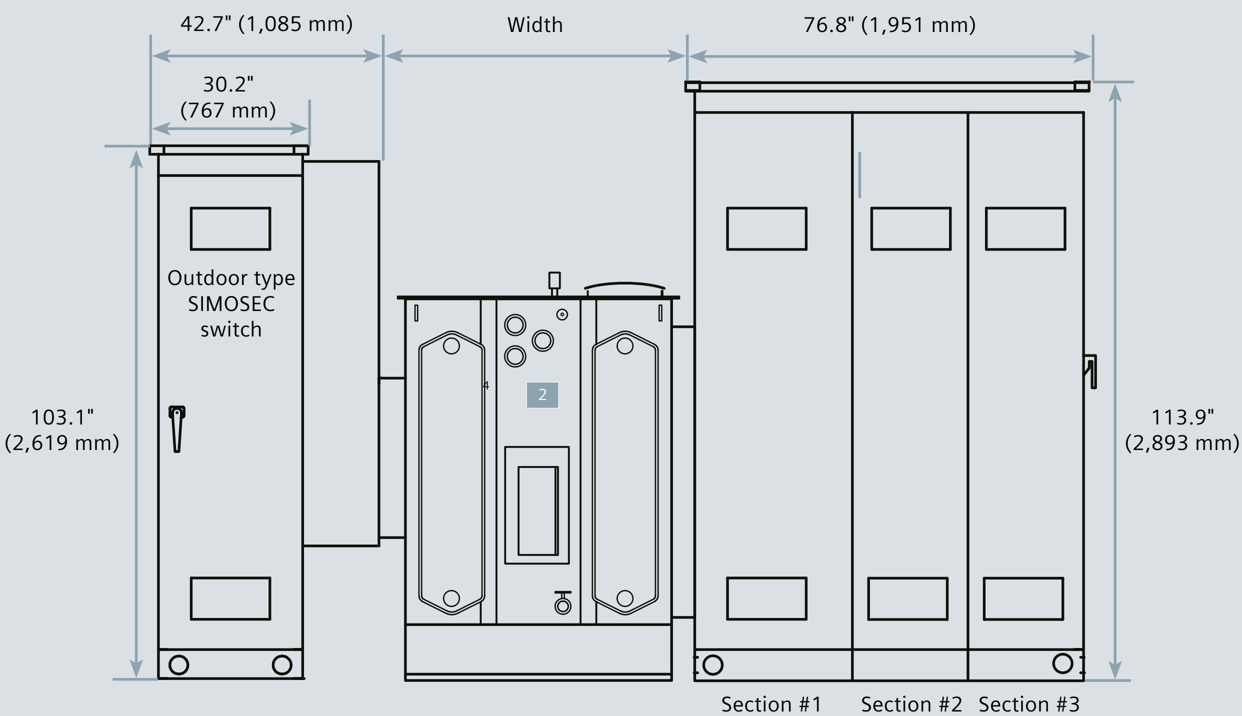


1. Primary lug location
2. Refer to page nine for transformer dimensions
3. Primary switch requires front access for top-cable entry terminations
4. Transformer requires access from the front and 12" (305 mm) from the back side for ventilation space
5. 31.5" (800 mm)
6. Maximum available space in top or bottom for customer's cables
7. Space for secondary leads from above
8. Space for secondary leads from below

Plan view



Front view



1. Primary lug location
2. Refer to page nine for transformer dimensions

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