2UCD070000E015 rev. B

PCS100 AVC
Active Voltage Conditioner
Technical Catalogue

Introduction

Voltage sags, voltage surges, phase unbalance and flicker are common events that often cause electric and electronic equipment to malfunction. When such events occur in critical control operations, they can cause the complete shutdown of a facility.

The PCS100 AVC is an Active Voltage Conditioner designed to solve these problems. It is a high performance power electronic system that responds instantly to power quality events and provides online regulation of voltage.
Using state of the art power electronics technology the correction is step-less which minimizes disturbances and ensures a regulated premium power supply for important loads.

For a comprehensive overview of publications available for the PCS100 AVC, refer to the rear inside cover of this publication.
Web links and QR code are also included in the front inside cover.

Power and productivity
for a better world™

The Company

We are an established world force in the design and manufacture of power electronics and power protection equipment.

As a part of ABB, a world leader in electrical technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

Quality Control

The products listed in this catalogue are manufactured in an ISO 9001 accredited facility.

Registration No. 2469

For more information…

Further publications for the PCS100 AVC are available for free download from www.abb.com/converters-inverters or by scanning this code:

Table of Contents

1 Overview

The ABB PCS100 AVC is an inverter based system that protects sensitive industrial and commercial loads from voltage disturbances. Providing fast, accurate voltage sag and surge correction as well as continuous voltage regulation and load voltage compensation, the PCS100 AVC has been optimally designed to provide equipment immunity from power quality events on the AC supply network.

1.1 Cause of Voltage Sags

Voltage sags on the AC supply network can be caused by large load changes, capacitor bank switching and motor starting. They may also be caused by faulty equipment such as electrical connectors, tap changers and transformers. However the most common cause of voltage sags is short circuit faults in the distribution and transmission networks or at a neighboring load. Short circuit faults can be the result of acts of nature such as lightning, storms or trees growing into overhead lines, or third party actions on the network, such as vehicle accidents, construction work or animals shorting lines.

1.2 Nature of Voltage Sags

The voltage sag seen by the customer is dependent on the location of the fault and the impedances between the fault location and the customer location. The duration of the voltage sag is determined by the duration of the fault or the reclosing practices operated by the utility. The magnitude of the voltage sag is governed by the ratio of the impedance between the customer location and fault location compared to the total supply impedance (from the fault location). Customers located closer to the fault will experience deeper sag and possibly an interruption while the breaker or fuse operates. The vast majority of customers connected further away from the fault will experience more shallow sag. The sag on the three-phase network will in most cases be transformed by the distribution transformer at the input to the customer's factory, and therefore the voltage sag actually seen by the customer will be quite different from that measured on the AC supply network. For example single-phase-to-ground sag on the utility side of a delta-star distribution transformer will be transformed to a phase-to-phase sag on the load side. Understanding this is important because monitoring of the utility network does not necessarily give a clear picture of the voltage sag that the equipment is experiencing. Often monitoring at the customer site is required to determine this.

1.3 User Benefits

- Small Dimensions (Footprint)
- High Reliability
- High Efficiency
- Low Cost of Ownership
- Commonality of Spares
- Low Maintenance

1.4 Features

- No energy storage required
- Correction of under and over voltages, even with regenerative loads
- Rugged overload capability
- Fault log and voltage event data logging
- Ethernet connectivity
- Modular construction
- Simple user controls

1.5 What makes the PCS100 AVC better than alternative solutions

- Small Dimensions (Footprint)
- High Reliability
  - Integrated bypass
  - Industrial grade
- Lowest Total Cost of Ownership
  - No energy storage
  - Low Maintenance
  - High Efficiency

1.6 Applications

ABB's PCS100 AVC is the ideal solution for protecting loads in factories and manufacturing plants across a wide range of industries and applications including:

- Sensitive tooling & machinery
- Robots (welding, painting, e.g.)
- Cranes
- Medical equipment (MRI, PET, CT, e.g.)
- Fiber production and other endless/non-stop processes
- UV-lamps, microwaves
- Compressors
- HVAC
- Supercomputers (R&D, TV, audio, universities, e.g.)
- Embassies
- Military facilities

1.7 PCS100 Power Protection Portfolio

The PCS100 AVC is part of the PCS100 Power Protection portfolio, as shown below. Each product is tailored to address specific power quality problems:

PCS100 AVC Active Voltage Conditioner	PCS100 UPS-I Industrial UPS	PCS100 RPC Reactive Power Conditioner
Utility sag and surge correction Load voltage regulation	Utility deep sag and surge correction Utility outage protection	Load created sag correction Power Factor correction Harmonic mitigation Unbalance correction

2 Functional Description

2.1 How it works

The PCS100 AVC is a three phase low voltage product which corrects voltage sags, phase angle errors, unbalance and surges, while providing continuous voltage regulation. The PCS100 AVC requires no energy storage as it draws the additional current required to make up the correction voltage from the utility supply.

2.2 Correction Capabilities

The PCS100 AVC is defined by its maximum three phase correction capability of 30% or 40% of its rated voltage.
The PCS100 AVC 30% and PCS100 AVC 40% full correction capability is 100% correction of three-phase supply sags with 70% remaining voltage and 60% remaining voltage respectively.

Detailed correction capabilities are shown in following table.

		PCS100 AVC 30%	PCS100 AVC 40%
Continuous regulation of three-phase utility under-voltages to 90% of the nominal supply voltage		Yes	Yes
Continuous regulation of three-phase utility over-voltages up to 110% of the nominal supply voltage		Yes	Yes
Three-phase utility sags correction from	70% remaining supply voltage	100%	100%
	60% remaining supply voltage	90%	100%
	50% remaining supply voltage	80%	90%
	40% remaining supply voltage	62%	70%
Single-phase utility sags correction from	55% remaining voltage	100%	100%
	45% remaining voltage	92%	100%
	0% remaining voltage	50%	57%
Single-phase utility swells correction from	115% voltage	100%	100%
Correction of phase angle errors created by faults in the supply system		Yes	Yes
Correction of voltage imbalance from utility supply		Yes	Yes
Attenuation of flicker voltages in the utility supply		Yes	Yes

The PCS100 AVC thus provides the user with a high quality supply, protecting loads from the majority of common voltage disturbances.

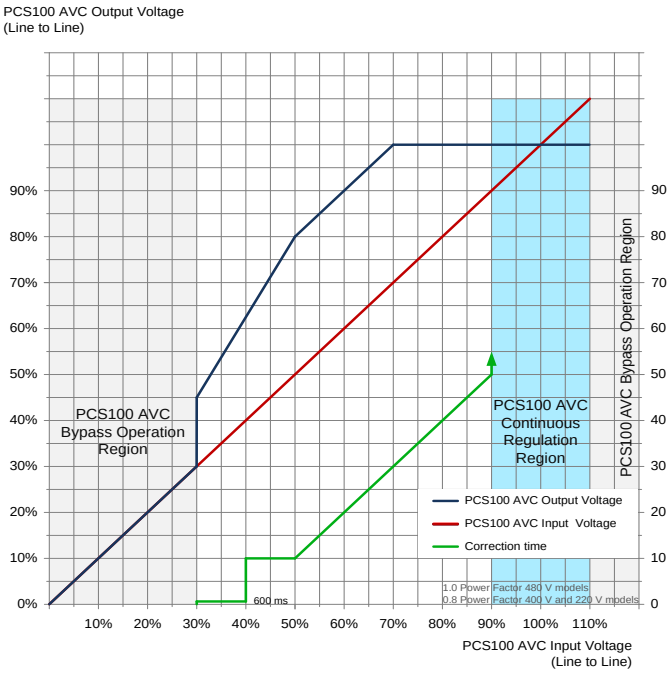
2.3 PCS100 AVC Performance Curves

This section explains the PCS100 AVC general performance based on relationship between the input voltage and corrected output voltage.

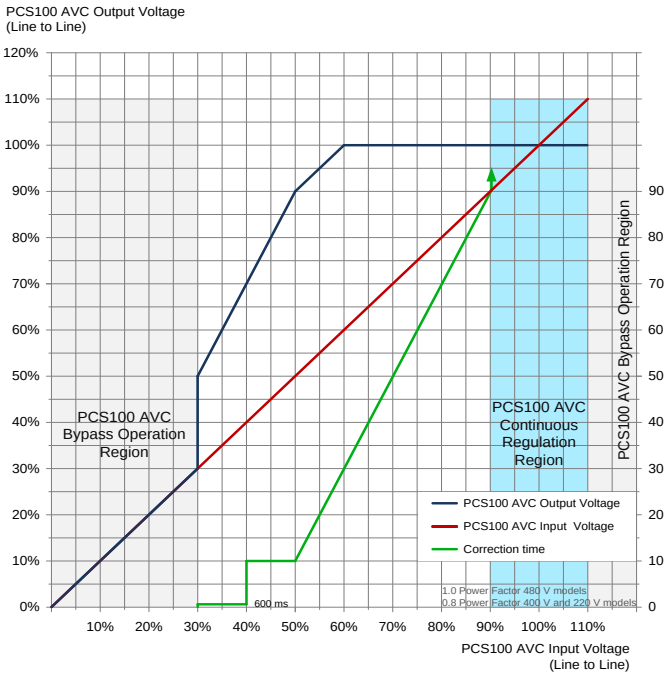
2.3.1 Three Phase Balanced Event Performance Curves

The performance curves below apply to three phase balanced supply voltage disturbances upstream of the PCS100 AVC.

PCS100 AVC 30%



PCS100 AVC 40%



2.3.1.1 How to use performance curves

1. Determine input voltage level on the horizontal axis
2. Read corrected output voltage level on the blue curve with values on left vertical axis
3. Read minimum correction time for defined input voltage level on the green curve with values on right vertical axis

2.3.1.2 Example

480 V unit with 55% remaining supply voltage on the input.
Based on performance curves above:

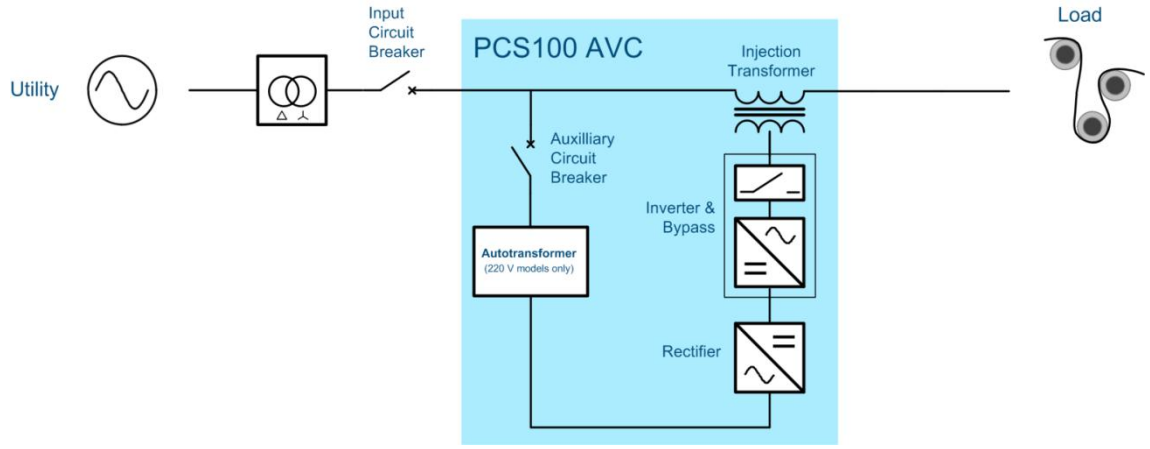
- PCS100 AVC 30% corrected output voltage level is 85% for at least 15 seconds.
- PCS100 AVC 40% corrected output voltage level is 95% for at least 20 seconds.

2.3.2 Additional Performance Curves

For more information on PCS100 AVC performance curves refer to document 2UCD070000E020 PCS100 AVC Performance Curves.

2.4 Single Line Diagram

The PCS100 AVC consists of a voltage source inverter driving a series connected injection transformer which is installed between the supply and the load. It measures the incoming supply voltage and provides almost instantaneous correction for any disturbances.
The PCS100 AVC incorporates a bypass system which is used in the event of a fault situation outside of the PCS100 AVC specifications. Should the inverter become overloaded the bypass system shunts the injection transformer, relieving the load from the inverter. The voltage delivered to the load under bypass is therefore equal to the utility voltage.



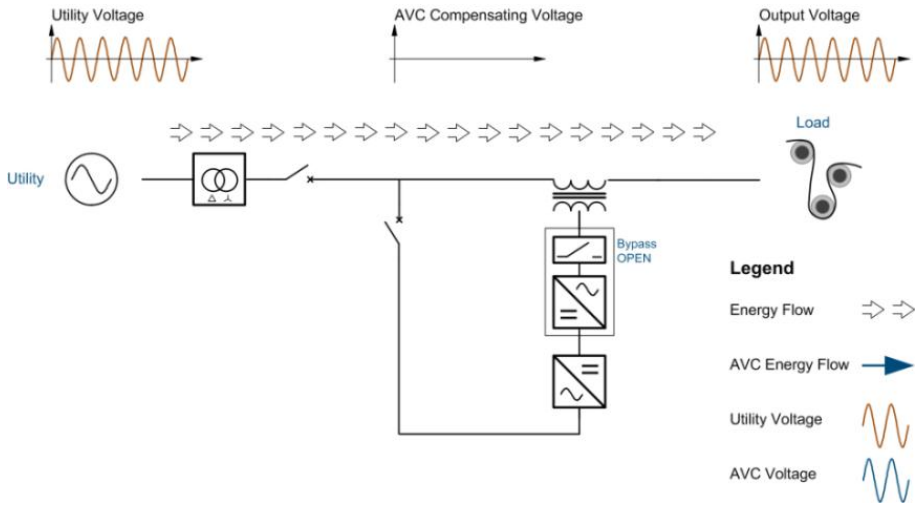
2.5 Operation Detail

The following diagrams show how the PCS100 AVC behaves when a utility disturbance occurs, and what happens if the fail-safe bypass operates.

2.5.1 Utility Voltage Equal to Nominal Level

When the utility voltage is equal to nominal level (i.e., there is no sag or surge) the PCS100 AVC power electronics is idle and the integrated bypass is open.

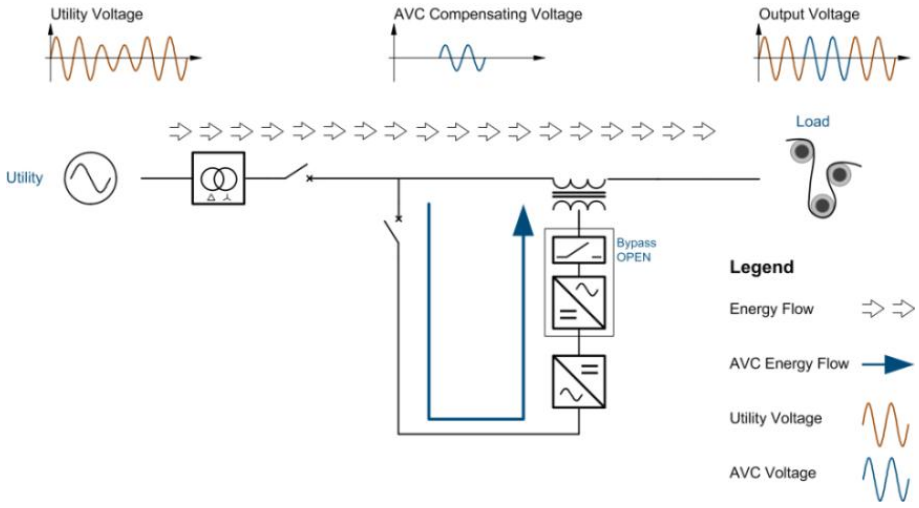
PCS100 AVC Energy Flow in case of utility supply equal to nominal level



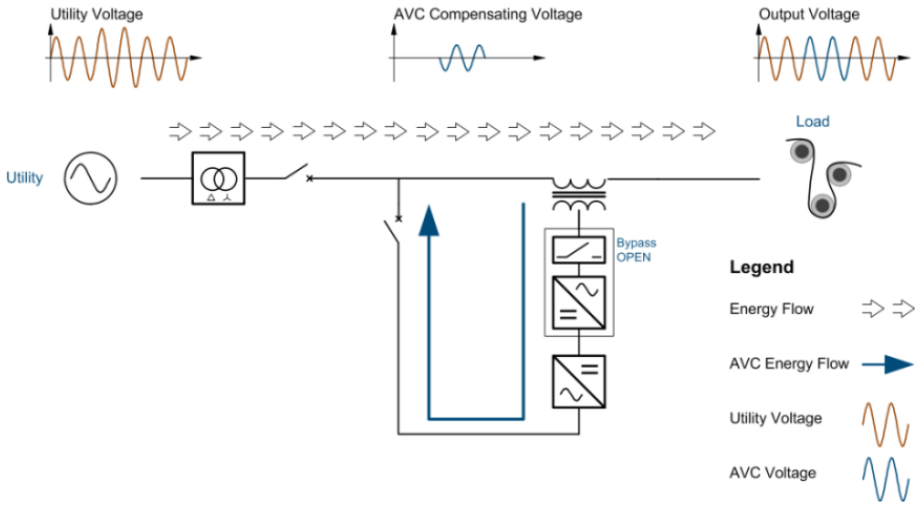
2.5.2 Utility Disturbance Occurs

When the utility voltage deviates from nominal or set point, due to voltage sags, surges, under-voltages, over voltages or unbalance, the inverter will inject a correcting voltage via the injection transformer. The correcting voltage level is based on the disturbance level and the energy needed for correction is derived from the utility via the PCS100 AVC rectifier.

PCS100 AVC Energy Flow in case of utility voltage below the nominal level



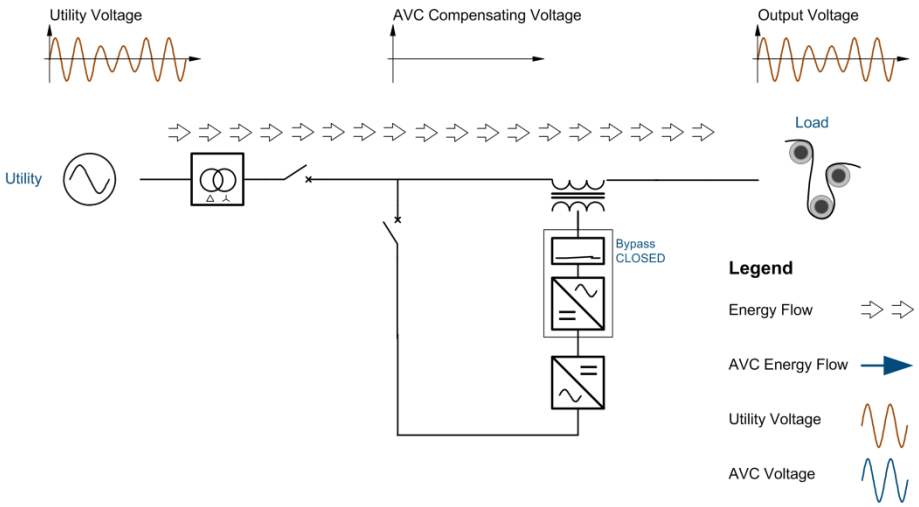
PCS100 AVC Energy Flow in case of utility voltage above the nominal level



2.5.3 Bypass Operation

In the case of a PCS100 AVC fault condition, e.g. an overload or internal fault, the bypass circuit will shunt the inverter side of the injection transformer, bypassing the inverter and effectively providing a direct connection from the utility supply to the output, without interruption to the load.

PCS100 AVC Energy Flow in case of bypass operation



3 Sub-Assemblies

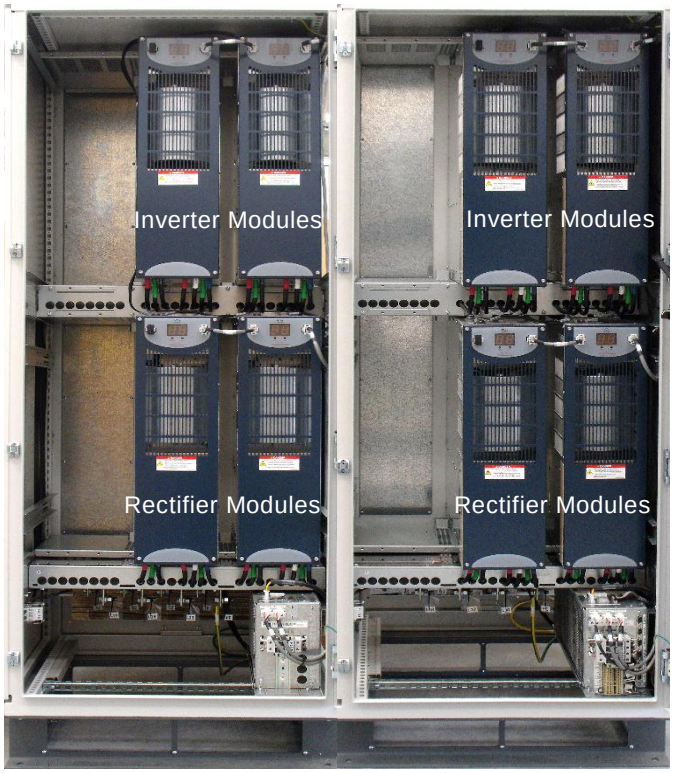
The PCS100 AVC is composed of two main sub-assemblies:

- Controller Enclosure
- Transformer Enclosure

Together these subassemblies are referred to as the PCS100 AVC System. The 2 sub-assemblies on the smallest PCS100 AVC (frame size 1B) are housed in one enclosure. On larger PCS100 AVC systems they are housed in separate enclosures.

3.1 Controller Enclosure

The controller enclosure houses an appropriate number of PCS100 inverter and rectifier modules (module pairs) for the rating of the product.
Each module has a unique identification number (1 - 16), which is displayed on the front of the module.
An enclosure can have a maximum of 3 module pairs. For PCS100 AVCs requiring more than 3 pairs the controller is housed in multiple enclosures. The first enclosure is called the master controller enclosure and the remaining are called slaves. The auxiliary master module which contains the main control electronics and a power supply fits into the bottom of the master controller enclosure.
The auxiliary slave module which contains just a power supply fits in the bottom of the slave enclosure. The user interface is mounted in the door of the master controller enclosure.
The image below shows the internal Controller Enclosure layout for a 4B frame size



Slave Controller Enclosure

Master Controller Enclosure

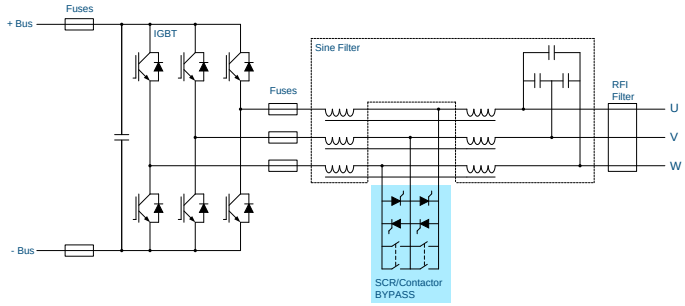
3.1.1 PCS100 Rectifier Module

The PCS100 rectifier modules convert the incoming three phase AC voltage into a regulated DC voltage.

The rectifier modules include a sine filter as part of the assembly, meaning the power electronics and sine filter are integrated into one module.
Based on state of the art IGBT technology and with integrated sine filters, rectifier modules have minimum impact on power quality of the supply network (harmonics and power factor).

3.1.2 PCS100 Inverter Module

The PCS100 inverter modules are IGBT based modules that can deliver 150A continuously. Due to the technology used the PCS100 AVC can respond within milliseconds to power disturbance events with precise control over the correction voltage. Based on state of the art IGBT technology and with integrated sine filters and RFI filters inverter modules have minimum impact on power quality of the load.
A Fail Safe Bypass circuit is included in the each PCS100 AVC inverter module.

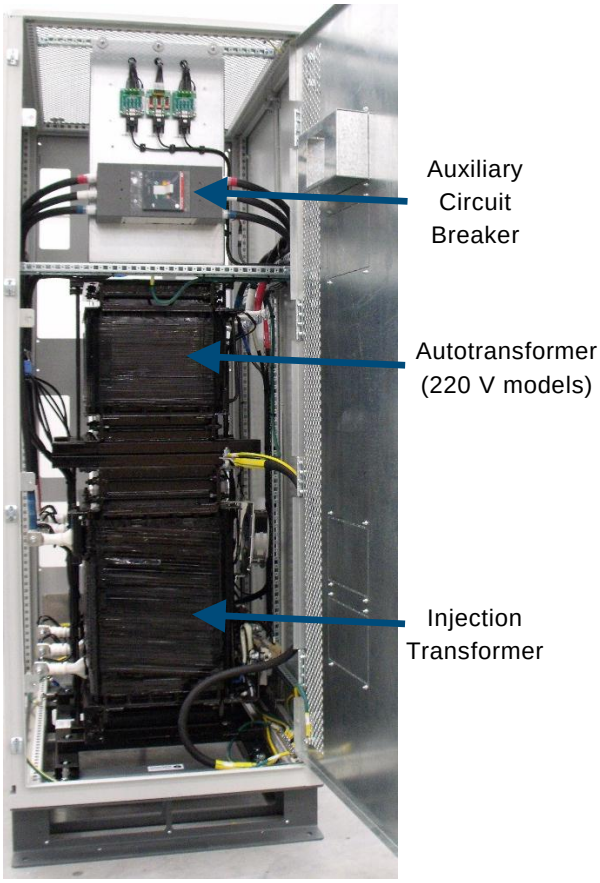


3.1.2.1 Fail Safe Bypass

Power Quality equipment must be more reliable than the utility and must never “drop” or “loose” the load; the internal bypass is an important component to meet this requirement
The Fail Safe Bypass circuit is designed to remove the output inverter from the circuit during overload or manual bypass operating modes, by shunting the inverter side of the injection transformer.
Based on the combination of high speed power electronics SCR switches and mechanical contactors, the Fails Safe Bypass provides two level redundancy for very fast and secure seamless shunting of the inverter without impact on the load.

3.2 Transformer Enclosure

The transformer enclosure houses the injection transformer, autotransformer in the case of 220 V models and auxiliary circuit breaker.
Customer supply and load connection terminals are located in the transformer enclosure.
The image below shows the internal Transformer Enclosure layout for 2B frame size.



3.2.1 Injection Transformer

The injection transformer is connected in series with the load and injects a correction voltage onto the supply voltage. It also converts the inverter output voltage (480V max) to the appropriate correction voltage level and isolates the inverter output from the load.
When internally bypassed, the injection transformer from an electrical perspective appears as a reactor (inductor) in series with the load.

3.2.2 Autotransformer

220 V models use an autotransformer to step up the utility voltage on the rectifier input to 480V to optimize the system kVA rating.

3.3 Example 400 kVA system

Below is an example of a 400 kVA PCS100 AVC 30% unit which has a 1B frame size.

The 1B frame is different to all large frame sizes. The Transformer and Controller sub-assemblies are housed in one enclosure. The Auxiliary Master Module is located at the top of the enclosure.

4 Technical Specification

Model Range

Rating	150 – 2400 kVA Note: Higher power available on request

Utility - Input

Rated Supply Voltage (according to model)	220 V (200 V – 220 V) 400 V (380 V - 415 V) 480 V (380 V – 480 V) Note: Operation at lower than the rated voltage results in less kVA per module. Consult the rating tables for more information.
Voltage tolerance	± 10% Note: continuous regulation available. Refer to 2.2 Correction Capabilities for details.
Nominal supply frequency	50 Hz or 60 Hz
Frequency tolerance	± 5 Hz
Maximum Supply Voltage	110%
Power system	3 phase + Neutral (4-Wire) Centre ground referenced (TN-S) Corner grounded with 220 V
Overvoltage category	III
Fault capacity	Refer to the model tables in Section 6
Outage – control ride through	> 500ms

Load - Output

Voltage	To match nominal input voltage Note: output voltage can be adjusted by ± 10% with 0.1% steps
Voltage regulation	± 1% typical ± 2% max
Equivalent series impedance	< 4% (model specific)
Displacement Power Factor	0 lagging to 0.9 leading
Crest Factor	3.0
Overload capability from 100% supply voltage	150% overload for at least 30 seconds, once per 500 s

Performance

Efficiency	>98% (typically 99%)
Sag correction response	Initial < 250 µs Complete < ½ cycle
Sag depth for full correction	30% or 40%
Partial correction derating conditions	1.0 PF at 80% load 0.8 PF at 100% load Note: Refer to document 2UCD070000E020 PCS100 AVC Detailed Performance Curves

Bypass

Capacity	100% of model rating (kVA)
Maximum overload capacity (in bypass)	125% for 10 minutes 150% for 1 minute 500% for 1 s 2000% for 200 ms
Transfer time	To Bypass < 0.5 ms To Inverter < 250 ms
Equivalent series impedance	bypass < 2.5% typical

Injection Transformer

Transformer type	Dry
Insulation	UL class N, 200° C operating
Finish	Dipped for moisture proofing
Frequency	50 Hz or 60 Hz models
Vector group	Diii (delta + 3 independent windings)

Standards and Certifications

Quality	ISO 9001
Marking	CE, C-Tick
Safety	IEC 62103
Electromagnetic compatibility	Emissions: CISPR 11 Class A Group 1 Immunity: IEC 61000-6-2
Performance	Semi F47 by test IEC 61000-4-34

Environmental

Operating temperature range	0° C to 50° C 32° F to 122° F
Temperature derating	Above 40° C, derate at 2% load per °C to a maximum of 50° C
Operating altitude	< 1000 m without derating
Capacity derating with altitude	1% every 100 m above 1000 m 2000 m maximum
Inverter Cooling	forced ventilation
Transformer Cooling	fan assisted ventilation
Humidity	< 95%, non-condensing
Pollution degree rating	2
Noise	< 75dBA @ 2 m

Enclosure

Enclosure rating	IP20 / NEMA 1
Enclosure rating options	IP21 with optional roof kit
HMI (GDM) panel IP rating	IP54 (from front)
Material	Electro-galvanized steel
Panel Thickness Side and Rear	1.5 mm
Panel Thickness Door	2 mm
Finish	Standard epoxy-polyester powder coating textured finish.
Color	RAL7035
Enclosure Access	Hinged doors with key lock

Service

MTTR	30 min typical by module exchange
Diagnostics	Non-volatile event & service log
Remote monitoring	Optional secure connection to ABB

Power Quality Event Monitor

Events Recorded	Voltage Sag (RMS) Voltage Surge (RMS)
Event Detection	Input Voltage
Sag Threshold	90% of Utility voltage default setting (user adjustable)
Surge Threshold	110% of Utility voltage default setting (user adjustable)
Accuracy	Voltage ± 2% Duration 10 ms

User Interface

User Interface	8.4” color touch panel
Touch panel	Full parameter control
Control inputs	Start / Stop / Reset digital inputs
Control outputs	Running, warning and fault relays

Serial Coms

Access protocol	Ethernet Modbus TCP

5 Selection and Sizing

To select the correct size PCS100 AVC for the application the following information should be known:

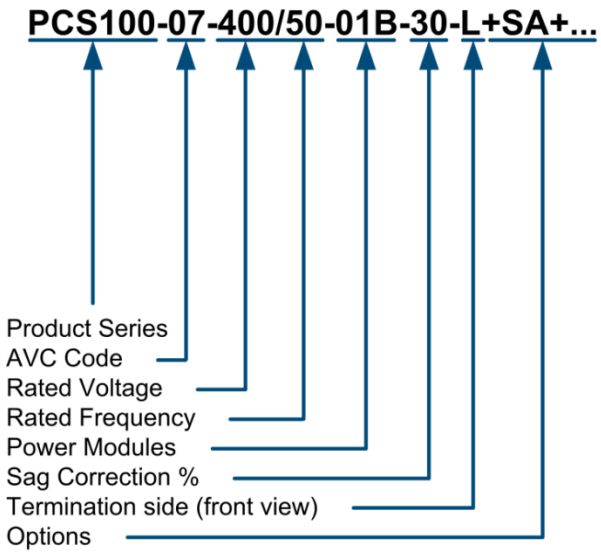
- Utility Voltage and Frequency
- Load capacity kVA and kW (or kVA and Power Factor)
- Level of voltage correction required

The product tables in the following section can then be used to look up the required model for the given application. Each model has a specific type code.

5.1 Type Code

The PCS100 AVC type code is given in the product tables. The type code is a unique code for the specific PCS100 AVC model and specifies all the components that are used to construct the model. From the base code given in the product tables options can be added to the type code. These options are called plus (+) codes.

The following diagram outlines the structure of the type code:



5.2 Type Code Parameters

Rated Voltage

This is the rated voltage of the PCS100 AVC. Options are 480V, 400V and 220V. Other operating voltages (i.e. 380V) are achieved by software settings and setting of an auxiliary transformer tapping.

Rated Frequency

Options are 50Hz and 60Hz. 400V models are only available at 50Hz but can operate on 50 Hz and 60 Hz.

Power Modules

The number of module pairs needed depends on the load kVA. Each power module pair can deliver apparent power according to following rated voltage.

	PCS100 AVC 30%	PCS100 AVC 40%
Module pair rated power	400 kVA	300 kVA

Note: Operation at lower than the rated voltage results in less kVA per module. Consult the rating tables for more information.

Sag Correction %

Defines sag correction capabilities. Available options are 30 for 30% sag correction and 40 for 40% sag correction.

Termination side

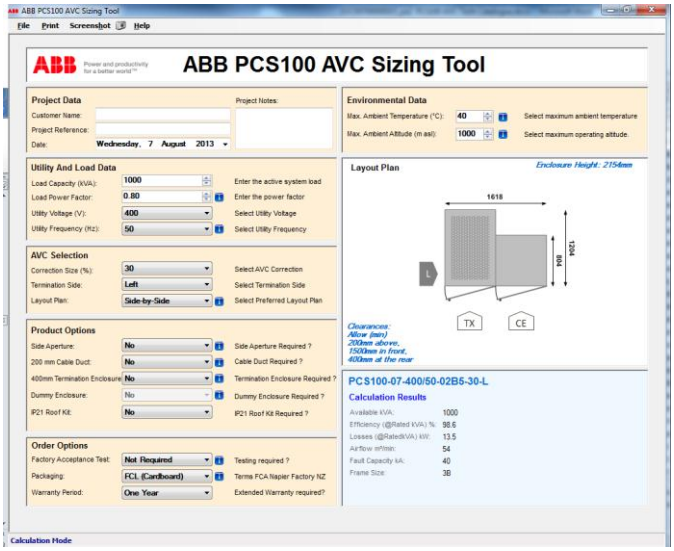
The location of the power terminals when viewed from the front of transformer enclosure.

Options

Options as described in this catalogue are then added as plus codes to the main type code

5.3 Sizing Tool Application

In addition ABB provides a Windows PC application sizing tool that can be used to determine the model required for the application.



For further information and tool availability please contact your local ABB sales office.

6 PCS100 AVC Model Range

The following tables give the models available and ratings at various voltages.

6.1 220 V Supply Voltage

6.1.1 PCS100 AVC 30% Models

Rated power kVA @ 220 V	**Rated power** kVA @ 208 V	**Rated Input Current** A @ 90% Supply Voltage	**Supply Fault Capacity** kA (Typical)	**Losses** kW (Typical)	**Efficiency** % (Typical)	**Airflow** (m^3/min)	**Frame Size**	**Type Code** **To complete the Type Code:** Place 5 for 50Hz or 6 for 60Hz in place of the x Place R for right transformer connection or L for left transformer connection in place of the y
200	189	597	25	5.0	97.5	18	1B	PCS100-07-220/x0-0B5-30-y
300	284	895	25	6.5	97.9	18	1B	PCS100-07-220/x0-0B75-30-y
400	378	1193	25	7.1	98.3	18	1B	PCS100-07-220/x0-01B-30-y
600	567	1790	50	9.7	98.4	36	2B	PCS100-07-220/x0-01B5-30-y
800	756	2386	50	11.8	98.6	36	2B	PCS100-07-220/x0-02B-30-y
1000	945	2983	63	14.5	98.6	54	3B	PCS100-07-220/x0-02B5-30-y
1200	1135	3579	63	16.4	98.7	54	3B	PCS100-07-220/x0-03B-30-y
1500	1418	4474	100	20.7	98.7	72	4B	PCS100-07-220/x0-04B-30-y
2000	1891	5965	120	25.2	98.8	90	5B	PCS100-07-220/x0-05B-30-y
2400	2269	7158	120	29.1	98.8	108	6B	PCS100-07-220/x0-06B-30-y

6.1.2 PCS100 AVC 40% Models

Rated power kVA @ 220 V	**Rated power** kVA @ 208 V	**Rated Input Current** A @ 90% Supply Voltage	**Supply Fault Capacity** kA (Typical)	**Losses** kW (Typical)	**Efficiency** % (Typical)	**Airflow** (m^3/min)	**Frame Size**	**Type Code** **To complete the Type Code:** Place 5 for 50Hz or 6 for 60Hz in place of the x Place R for right transformer connection or L for left transformer connection in place of the y
150	142	459	31.5	5.0	96.7	18	1B	PCS100-07-220/x0-0B5-40-y
225	213	686	31.5	6.5	97.2	18	1B	PCS100-07-220/x0-0B75-40-y
300	284	905	31.5	7.1	97.7	18	1B	PCS100-07-220/x0-01B-40-y
450	425	1350	40	9.7	97.9	36	2B	PCS100-07-220/x0-01B5-40-y
600	567	1791	40	11.8	98.1	36	2B	PCS100-07-220/x0-02B-40-y
750	709	2239	50	14.5	98.1	54	3B	PCS100-07-220/x0-02B5-40-y
900	851	2679	50	16.4	98.2	54	3B	PCS100-07-220/x0-03B-40-y
1200	1135	3567	80	20.7	98.3	72	4B	PCS100-07-220/x0-04B-40-y
1500	1418	4450	100	25.2	98.4	90	5B	PCS100-07-220/x0-05B-40-y
1800	1702	5331	100	29.1	98.4	108	6B	PCS100-07-220/x0-06B-40-y

Note: For frame size 1B without additional termination cabinets, cable ducts or side aperture customer connection side can be from left, right or bottom as the transformer terminals are facing front. Connection side defines installation side of enclosure options.

Note: 208 V operation is achieved by setting a 220 V PCS100 AVC to 208 V. This configuration is done at the factory and must be specified when ordering.

Note: Supply Fault Capacity shown are typical ratings where systems with less than 1600 A rated current are protected by fault current limiting circuit breakers. Refer to Section 11.

6.2 400 V Supply Voltage

6.2.1 PCS100 AVC 30% Models

Rated power kVA @ 400 V	**Rated power** kVA @ 415 V	**Rated power** kVA @ 380 V	**Rated Input Current** A @ 90% Supply Voltage	**Supply Fault Capacity** kA (Typical)	**Losses** kW (Typical)	**Efficiency** % (Typical)	**Airflow** (m^3/min)	**Frame Size**	**Type Code** **To complete the Type Code:** Place R for right transformer connection or L for left transformer connection in place of the y
200	200	190	329	25	4.7	97.7	18	1B	PCS100-07-400/50-0B5-30-y
300	300	285	493	25	6.1	98.0	18	1B	PCS100-07-400/50-0B75-30-y
400	400	380	657	25	6.6	98.4	18	1B	PCS100-07-400/50-01B-30-y
600	600	570	985	31.5	8.9	98.6	36	2B	PCS100-07-400/50-01B5-30-y
800	800	760	1313	31.5	10.8	98.7	36	2B	PCS100-07-400/50-02B-30-y
1000	1000	950	1641	40	13.5	98.7	54	3B	PCS100-07-400/50-02B5-30-y
1200	1200	1140	1969	40	15.2	98.8	54	3B	PCS100-07-400/50-03B-30-y
1600	1600	1520	2625	50	19.1	98.9	72	4B	PCS100-07-400/50-04B-30-y
2000	2000	1900	3281	63	23.3	98.9	90	5B	PCS100-07-400/50-05B-30-y
2400	2400	2280	3937	80	26.8	98.9	108	6B	PCS100-07-400/50-06B-30-y

6.2.2 PCS100 AVC 40% Models

Rated power kVA @ 400 V	**Rated power** kVA @ 415 V	**Rated power** kVA @ 380 V	**Rated Input Current** A @ 90% Supply Voltage	**Supply Fault Capacity** kA (Typical)	**Losses** kW (Typical)	**Efficiency** % (Typical)	**Airflow** (m^3/min)	**Frame Size**	**Type Code** **To complete the Type Code:** Place R for right transformer connection or L for left transformer connection in place of the y
150	150	143	253	15	4.7	96.9	18	1B	PCS100-07-400/50-0B5-40-y
225	225	214	377	15	6.1	97.3	18	1B	PCS100-07-400/50-0B75-40-y
300	300	285	498	15	6.6	97.8	18	1B	PCS100-07-400/50-01B-40-y
450	450	428	742	31.5	8.9	98.1	36	2B	PCS100-07-400/50-01B5-40-y
600	600	570	985	31.5	10.8	98.2	36	2B	PCS100-07-400/50-02B-40-y
750	750	713	1232	31.5	13.5	98.2	54	3B	PCS100-07-400/50-02B5-40-y
900	900	855	1474	31.5	15.2	98.4	54	3B	PCS100-07-400/50-03B-40-y
1200	1200	1140	1962	40	19.1	98.5	72	4B	PCS100-07-400/50-04B-40-y
1500	1500	1425	2448	50	23.3	98.5	90	5B	PCS100-07-400/50-05B-40-y
1800	1800	1710	2932	63	26.8	98.6	108	6B	PCS100-07-400/50-06B-40-y

Note: For frame size 1B without additional termination cabinets, cable ducts or side aperture customer connection side can be from left, right or bottom as the transformer terminals are facing front. Connection side defines installation side of enclosure options. Note: 400V models are only available at 50Hz and can operate on 50 Hz and 60 Hz.

Note: 415 V and 380 V operation is achieved by setting a 400 V PCS100 AVC to 415 V or 380 V respectively. This configuration is done at the factory and must be specified when ordering.

Note: Supply Fault Capacity shown are typical ratings where systems with less than 1600 A rated current are protected by fault current limiting circuit breakers. Refer to Section 11.

6.3 480 V Supply Voltage

6.3.1 PCS100 AVC 30% Models

Rated power kVA @ 480 V	**Rated power** kVA @ 440 V	**Rated Input Current** A @ 90% Supply Voltage	**Supply Fault Capacity** kA (Typical)	**Losses** kW (Typical)	**Efficiency** % (Typical)	**Airflow** (m^3/min)	**Frame Size**	**Type Code** **To complete the Type Code:** Place 5 for 50Hz or 6 for 60Hz in place of the x Place R for right transformer connection or L for left transformer connection in place of the y
200	183	274	25	4.7	97.7	18	1B	PCS100-07-480/x0-0B5-30-y
300	275	411	25	6.1	98.0	18	1B	PCS100-07-480/x0-0B75-30-y
400	367	547	25	6.6	98.4	18	1B	PCS100-07-480/x0-01B-30-y
600	550	821	40	8.9	98.6	36	2B	PCS100-07-480/x0-01B5-30-y
800	733	1094	40	10.8	98.7	36	2B	PCS100-07-480/x0-02B-30-y
1000	917	1367	40	13.5	98.7	54	3B	PCS100-07-480/x0-02B5-30-y
1200	1100	1641	40	15.2	98.8	54	3B	PCS100-07-480/x0-03B-30-y
1500	1467	2052	40	19.1	98.8	72	4B	PCS100-07-480/x0-04B-30-y
2000	1833	2734	50	23.3	98.9	90	5B	PCS100-07-480/x0-05B-30-y
2400	2200	3281	63	26.8	98.9	108	6B	PCS100-07-480/x0-06B-30-y

6.3.2 PCS100 AVC 40% Models

Rated power kVA @ 480 V	**Rated power** kVA @ 440 V	**Rated Input Current** A @ 90% Supply Voltage	**Supply Fault Capacity** kA (Typical)	**Losses** kW (Typical)	**Efficiency** % (Typical)	**Airflow** (m^3/min)	**Frame Size**	**Type Code** **To complete the Type Code:** Place 5 for 50Hz or 6 for 60Hz in place of the x Place R for right transformer connection or L for left transformer connection in place of the y
150	138	211	20	4.7	96.9	18	1B	PCS100-07-480/x0-0B5-40-y
225	206	315	20	6.1	97.3	18	1B	PCS100-07-480/x0-0B75-40-y
300	275	415	20	6.6	97.8	18	1B	PCS100-07-480/x0-01B-40-y
450	413	619	25	8.9	98.1	36	2B	PCS100-07-480/x0-01B5-40-y
600	550	821	25	10.8	98.2	36	2B	PCS100-07-480/x0-02B-40-y
750	688	1026	25	13.5	98.2	54	3B	PCS100-07-480/x0-02B5-40-y
900	825	1228	25	15.2	98.4	54	3B	PCS100-07-480/x0-03B-40-y
1200	1100	1635	40	19.1	98.5	72	4B	PCS100-07-480/x0-04B-40-y
1500	1375	2040	40	23.3	98.5	90	5B	PCS100-07-480/x0-05B-40-y
1800	1650	2444	50	26.8	98.6	108	6B	PCS100-07-480/x0-06B-40-y

Note: For frame size 1B without additional termination cabinets, cable ducts or side aperture customer connection side can be from left, right or bottom as the transformer terminals are facing front. Connection side defines installation side of enclosure options.

Note: 440 V operation is achieved by setting a 480 V PCS100 AVC to 440 V. This configuration is done at the factory and must be specified when ordering.

Note: Supply Fault Capacity shown are typical ratings where systems with less than 1600 A rated current are protected by fault current limiting circuit breakers. Refer to Section 11.

7 Dimensions, Layouts and Clearances

7.1 Dimensions and Weights

The following tables show the dimensions and weights of controller enclosure and injection transformer enclosure in different frame sizes.

7.1.1 PCS100 AVC 30% Models

			220 V, 50/60 Hz		400 V, 50 Hz		480 V, 50/60 Hz	
Frame Size	Controller Enclosure Dimensions (HxWxD) mm	Transformer Enclosure Dimensions (HxWxD) mm	Controller Enclosure Weight kg	Transformer Enclosure Weight kg	Controller Enclosure Weight kg	Transformer Enclosure Weight kg	Controller Enclosure Weight kg	Transformer Enclosure Weight kg
1B	2154x809x804		1185		950		950	
2B	2154x809x804	2154x809x804	581	1595	581	1200	581	1170
3B	2154x809x804	2154x809x1204	714	2340	714	1780	714	1760
4B	2154x1618x804	2154x1609x1204	1162	2860	1162	2130	1162	1970
5B	2154x1618x804	2154x1609x1204	1294	3250	1294	2510	1294	2340
6B	2154x1618x804	2154x1609x1204	1427	3720	1427	2810	1427	2950

7.1.2 PCS100 AVC 40% Models

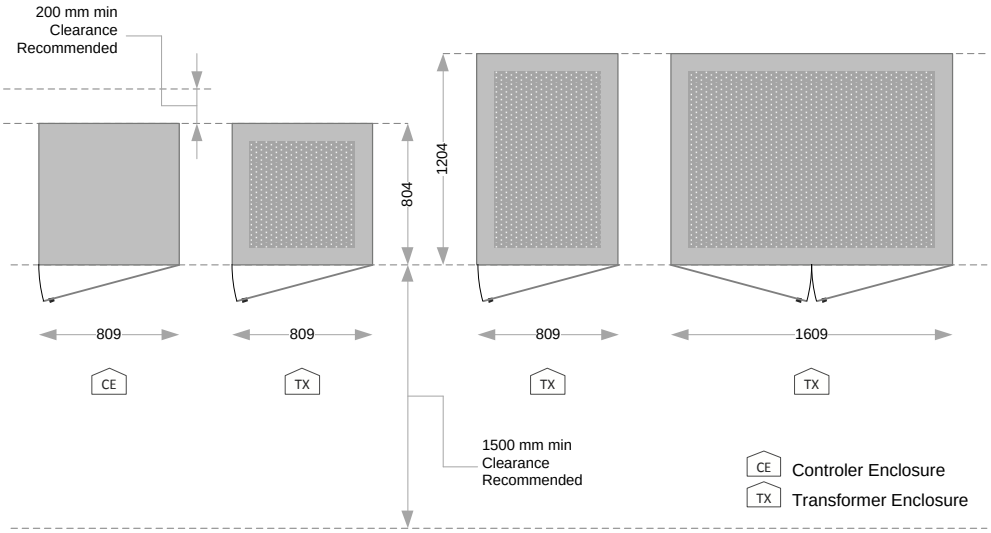
			220 V, 50/60 Hz		400 V, 50 Hz		480 V, 50/60 Hz	
Frame Size	Controller Enclosure Dimensions (HxWxD) mm	Transformer Enclosure Dimensions (HxWxD) mm	Controller Enclosure Weight kg	Transformer Enclosure Weight kg	Controller Enclosure Weight kg	Transformer Enclosure Weight kg	Controller Enclosure Weight kg	Transformer Enclosure Weight kg
1B	2154x809x804		1155		1010		990	
2B	2154x809x804	2154x809x804	581	1520	581	1235	581	1165
3B	2154x809x804	2154x809x1204	714	2380	714	1760	714	1745
4B	2154x1618x804	2154x1609x1204	1162	2670	1162	2085	1162	2100
5B	2154x1618x804	2154x1609x1204	1294	3440	1294	2695	1294	2570
6B	2154x1618x804	2154x1609x1204	1427	3880	1427	2885	1427	2885

Note: The frame size 1B enclosure houses both the controller and transformer sub-assemblies.

Note: Allow ±10% tolerance for all weights shown in tables above.

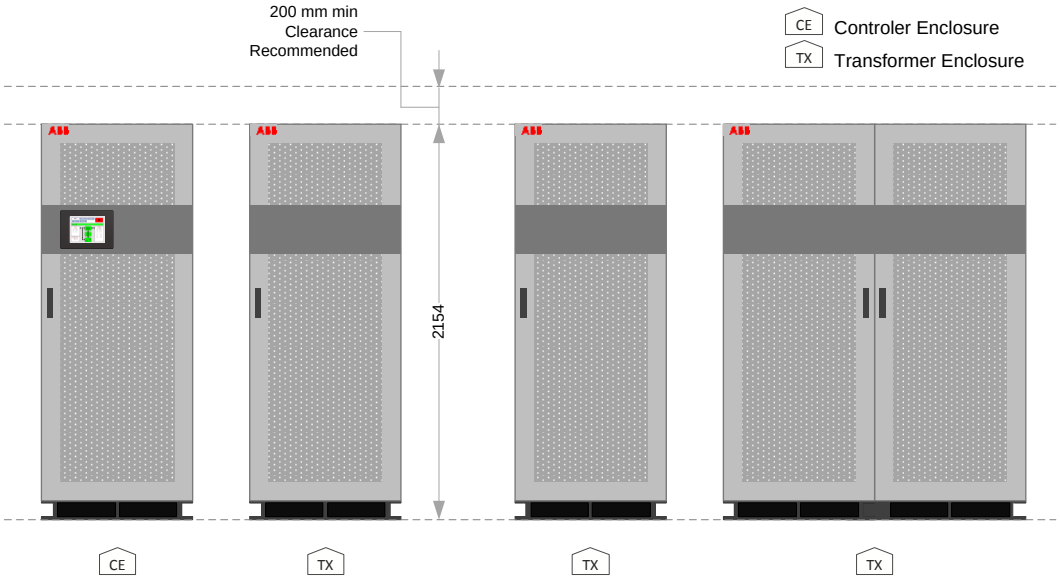
7.2 Individual Enclosures – Plan View

The following plan views show the dimensions and required clearances of the enclosures.



7.3 Individual Enclosures – Elevations

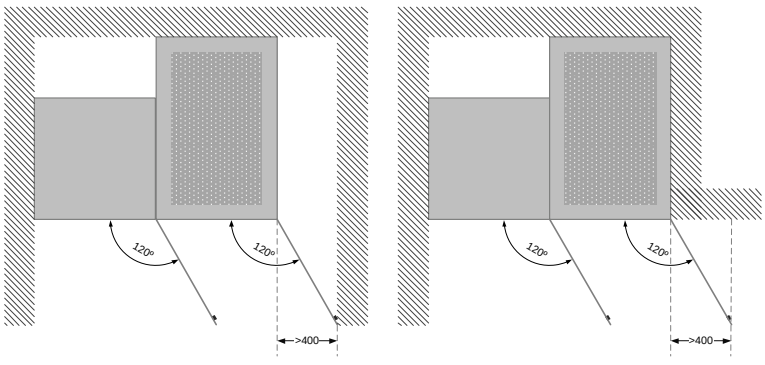
The following front elevations show the height of the enclosures and clearance required above each enclosure.



7.4 Clearances

The following clearances are required for all enclosures:

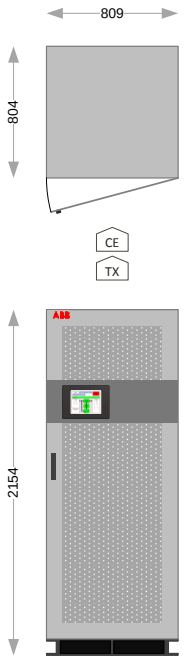
- Allow 200 mm (minimum) above
- Allow 1500 mm (recommended) clearance in front
- Allow 200 mm (minimum) clearance at the rear of controller enclosure for air flow. (Exception: The transformer enclosure can be placed back to back without any clearance.)
- No side clearance required
- Side clearance to the wall at the side where the cabinet outmost hinges of minimum 400 mm is recommended to allow the doors to open sufficiently. The doors must open 120° to allow normal cabinet access the PCS100 AVC module replacement.



7.5 Side-by-Side Layout Plans

The following plans relate to Side-by-Side Layout of all frame sizes. Shown layouts are only for R side transformer connection. For L side transformer connection in Side-by-Side layout, the transformer enclosure is mounted on left side of controller enclosure.

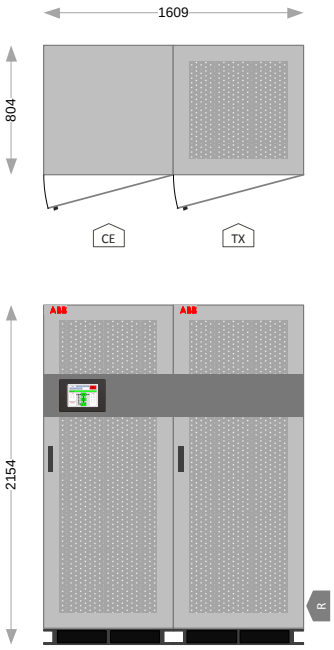
Frame Size: 1B



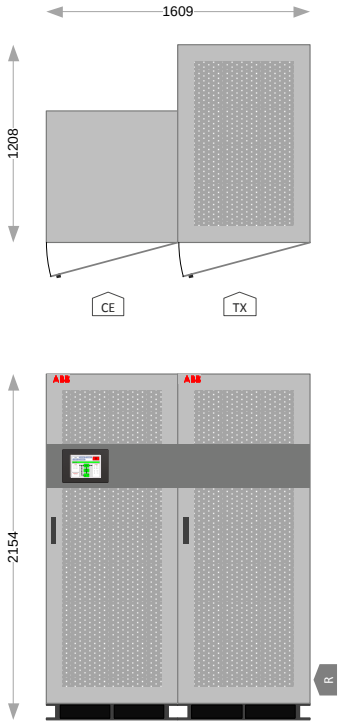
CE Controler Enclosure
TX Transformer Enclosure
R Customer connection right side

Note:
In frame size 1B without additional termination cabinets, cable ducts or side aperture customer connection side can be from left, right or bottom as the transformer terminals are facing front.

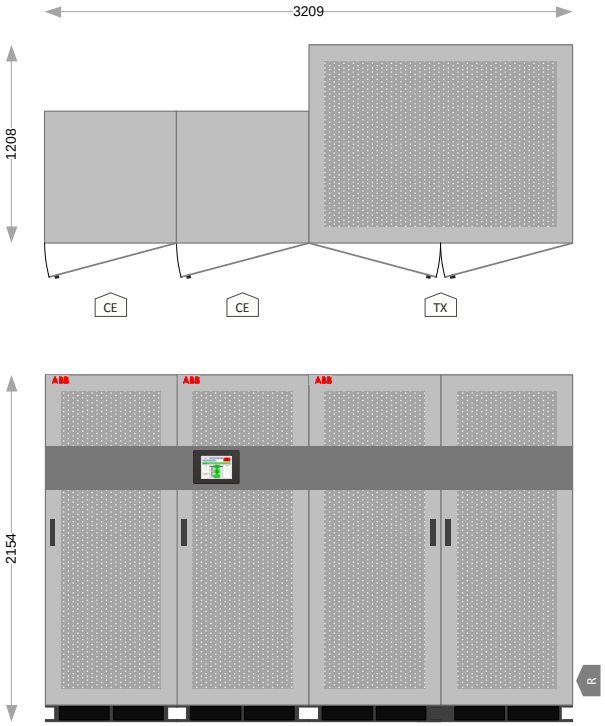
Frame Size: 2B
Connection Side: Right



Frame Size: 3B
Connection Side: Right



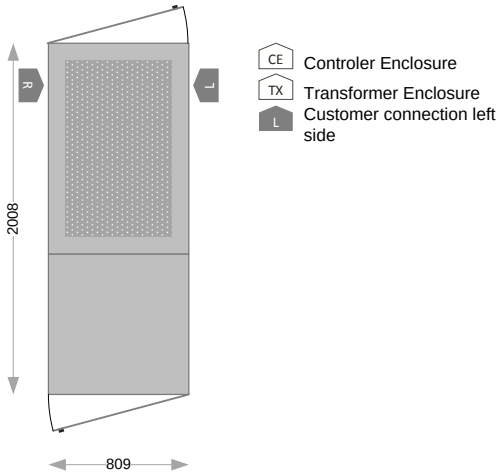
Frame Size: 4B, 5B, 6B
Connection Side: Right

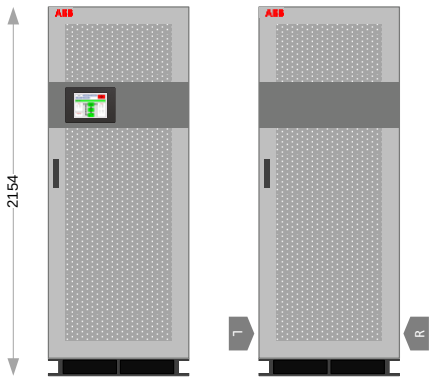


7.6 Back-to-Back Layout Plans

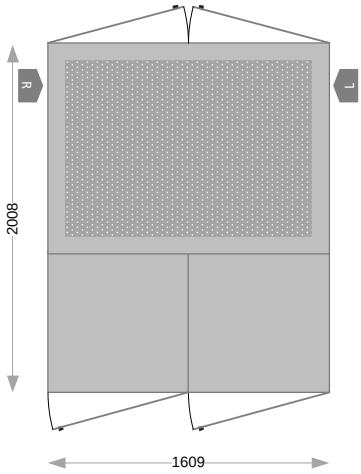
The following plans relate to Back-to-Back layout with L or R connection side options shown.
Exact connection side needs to be defined with L or R in the product type code.

Frame Size: 3B





Frame Size: 4B, 5B, 6B



8 Options

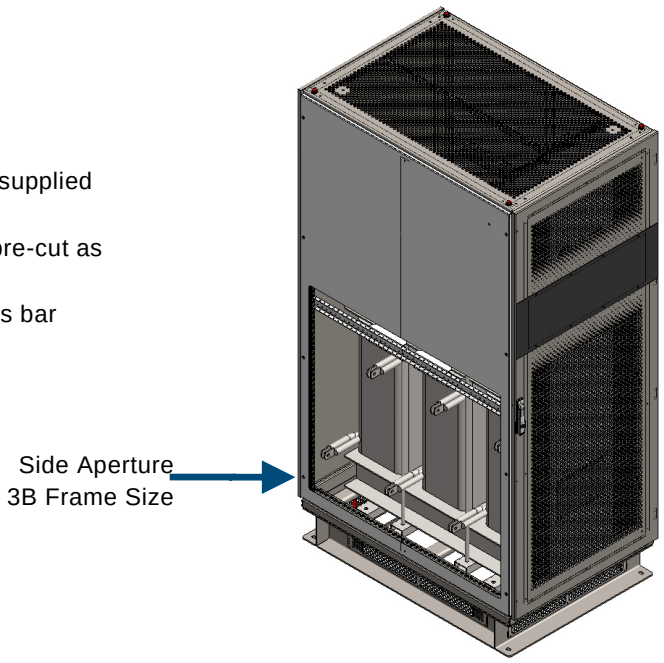
8.1 Transformer Enclosure Options

The following options are available for the transformer enclosure.

		Availability			
Plus Code	Option Description	1B	2B	3B	4B, 5B, 6B
+SA	Side Aperture	x	x	x	x

8.1.1 +SA Side Aperture

Left and Right facing transformer enclosures are supplied with the complete side panel.
The enclosure can be supplied with an aperture pre-cut as pictured.
The side aperture allows easier side cable or buss bar connection to a maintenance bypass.



8.2 Enclosure Options

The following options are available for the PCS100 AVC enclosures.

		Availability				
Plus Code	Option Description	1B	2B	3B	4B, 5B, 6B	Note
+BB	Back-to-Back Layout Plan			x	x	
+CD	200 mm Top Entry Cable Duct	x	x			
+TE	400 mm Termination Enclosure	x	x	x	x	
+DMY	400 mm Dummy Enclosure			x	x	Back-to-Back layout only
+RK	Roof Kit	x	x	x	x	

8.2.1 +BB Back-to-Back Layout

Most of the PCS100 AVC models consist of a separate enclosure for the controller and the injection transformer. The standard layout is Side-by-Side where the Controller Enclosure and Transformer Enclosure are lined up Side-by-Side.

For Back-to-Back layout (+BB plus code) the Transformer Enclosure is installed behind Controller Enclosure.

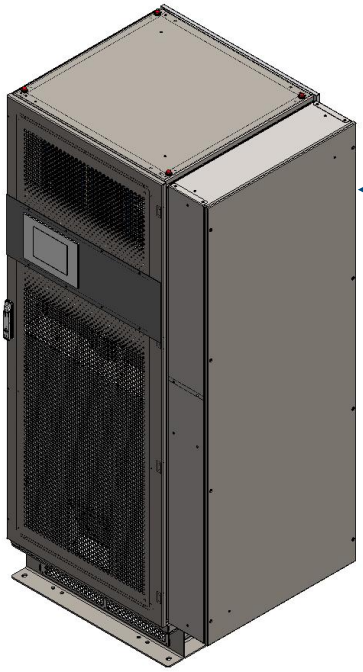
Back-to-Back is available for frame sizes 3B, 4B, 5B and 6B.

Examples of Side-by-Side and Back-to-Back Layouts are shown in Chapter 7.

8.2.2 +CD 200 mm Top Entry Cable Duct

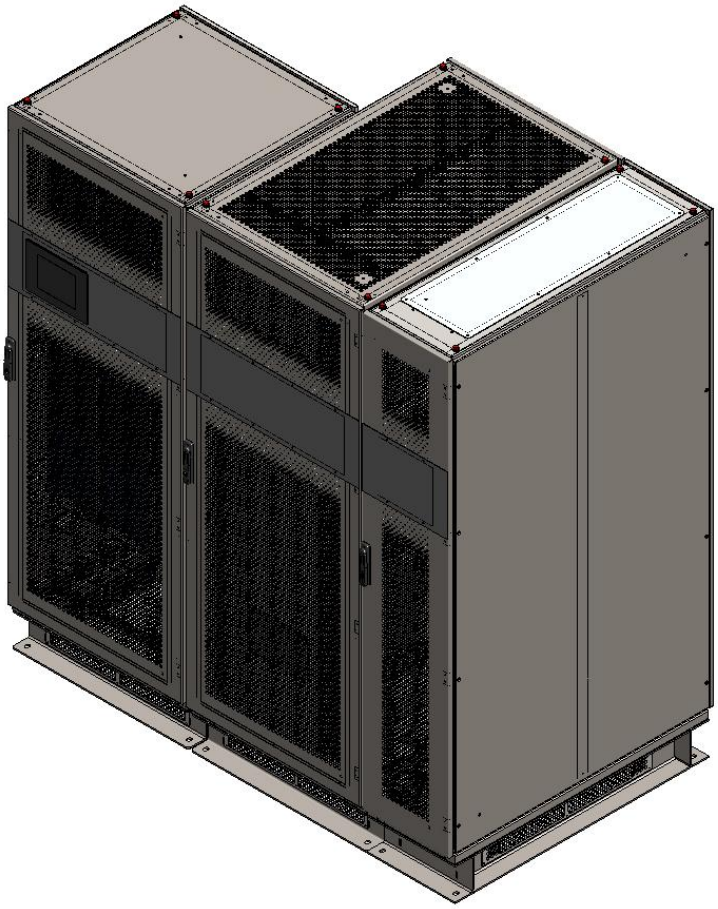
200 mm Top Entry Cable Duct for Supply and Load cables (or bus bars) can be accommodated for frame size up to 2B.
The Cable Duct is the same depth as the PCS100 AVC enclosure and on the same side as the transformer terminals.
The Cable Duct comes complete with top gland plate and a cable support.

Note:
Gland plate is delivered as blind plate without cable holes.



Top Entry
Cable Duct
1B Frame Size

8.2.3 +TE 400 mm Termination Enclosure



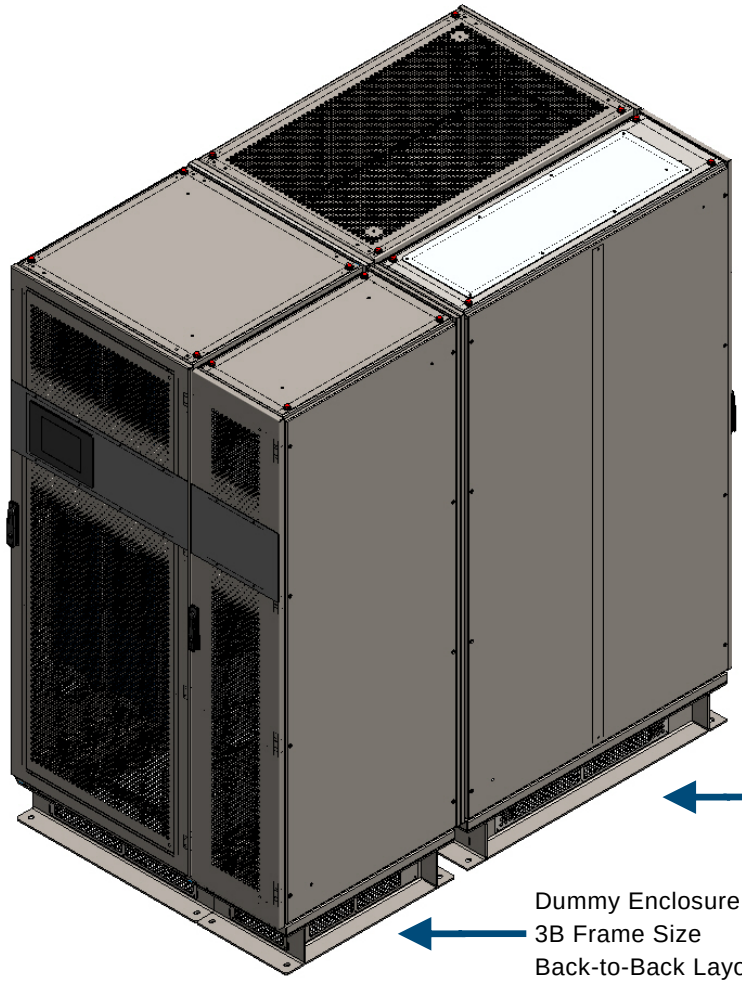
The Termination Enclosure option can be used to make the supply and load connections easier or match enclosure sizes with other equipment.
The Termination Enclosure is the same depth as the PCS100 AVC enclosure and is on the same side as the transformer terminals.
The enclosure comes complete with a plinth and door access to enable top or bottom cable (or bus bar) connection.
The Termination Enclosure option includes a cable support and gland plate.

Note:
Gland plate is delivered as blind plate without cable holes.

Termination Enclosure
3B Frame Size
Side-by-Side Layout

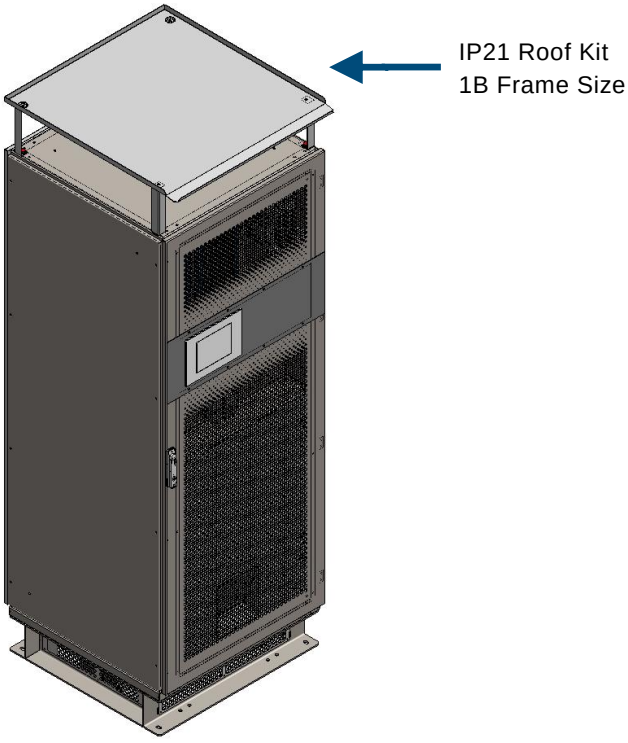
8.2.4 +DMY 400 mm Dummy Enclosure

Dummy enclosures are completely empty enclosures that can be ordered for cosmetic reasons, e.g. to fill gap between other enclosures in Back-to-Back layout.



8.2.5 +RK Roof Kit

Roof kits are available where small amounts of foreign material may drop onto the top of the enclosures.
With roof kit option unit conforms to IP21 protection degree.
These are only for indoor use.
There is a 200 mm clearance from the enclosure top to the roof kit to allow ventilation of the transformer enclosure.
The kits will cover both the transformer and controller enclosures.
The roof kit is shipped separately and must be assembled on site

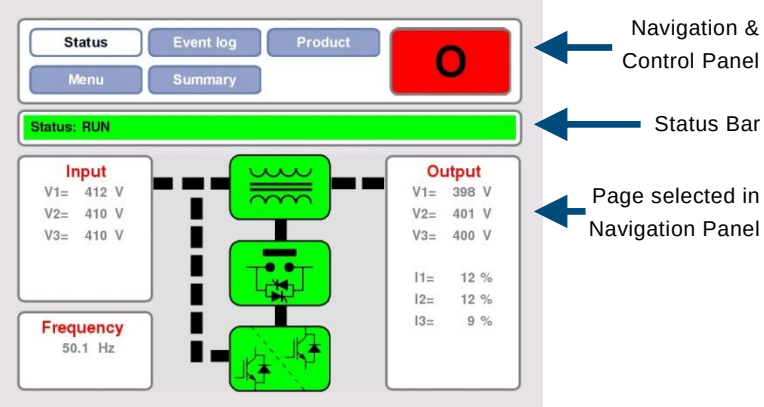


9 User Interface

9.1 Graphic Display Module (GDM)

The primary user interface for configuration of the PCS100 AVC is via the Graphic Display Module (GDM) which is mounted in the door of the Master inverter enclosure. It allows local control of the PCS100 AVC and shows the system status and provides access to the operating parameters and event history.
The GDM interface consists of several pages; each page has a navigation & control panel and the status bar at the top. The Navigation & Control Panel and the Status Bar are displayed at all times.
The navigation panel consists of buttons allowing page selection and the control panel consists of a Start (I) / Stop (O) / Reset button allowing local control of the product.
The status bar displays the current product status and any warning or fault condition that may be present.

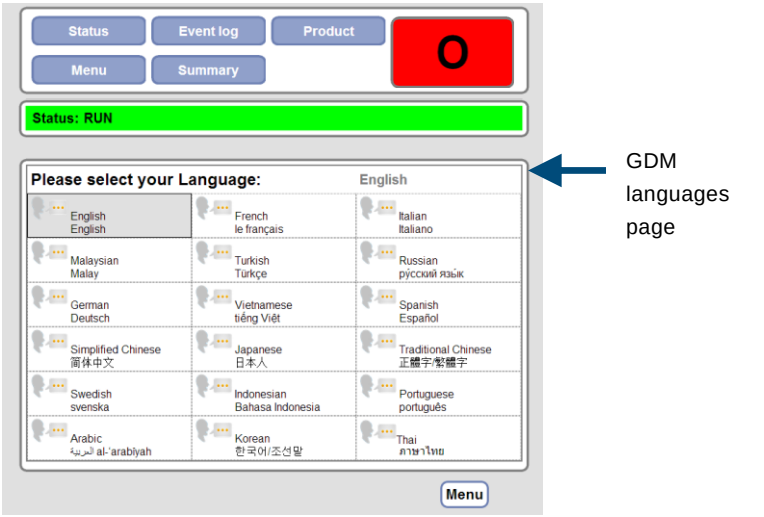
Feature	GDM
Display resolution	800 x 600 pixels
Display size	8.4”
Color Graphic display	yes
Touch Sensitive display	yes
Full descriptions of status and faults	yes
Local Start/Stop Reset Control	yes
Status Display	yes
Parameter adjustment	yes
Number of Event Log records stored	10000
Event log can be downloaded to a PC	yes
Remote Web Pages	yes
Modbus TCP connection	yes
Multilanguage selection	yes



Multi Language Support

The AVC can be operated in the following languages:

- English
- French
- Italian
- Malaysian
- Turkish
- Russian
- German
- Vietnamese
- Spanish
- Simplified Chinese
- Japanese
- Traditional Chinese
- Swedish
- Indonesian
- Portuguese
- Arabic
- Korean

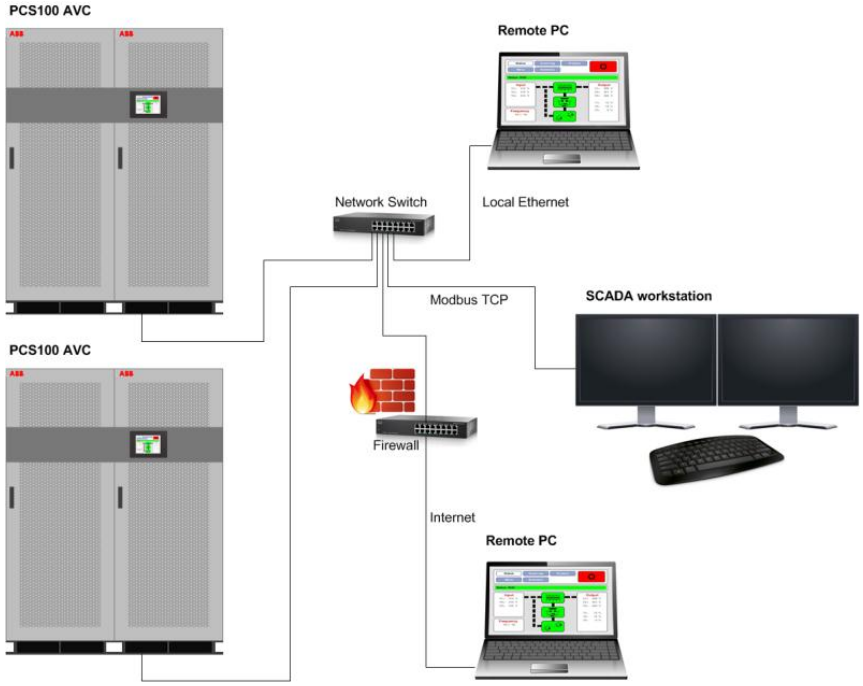


The desired language can be selected on the GDM.

9.2 Remote Monitoring

The GDM provides remote access for monitoring purposes. Following monitoring connections are available:

Communication Type	Description	Connection
Remote Web Pages	HTML server - Ethernet connection	Standard RJ45
Monitoring system	Modbus TCP	Standard RJ45



Remote Web Pages

The Remote Web Pages are a set of web pages that are similar in format to the standard GDM and accessed through the integrated web server via the GDM Ethernet connection. Through this interface the users can remotely access the status and operating parameters. Viewing and downloading of the event history and service logs is also available. Access is via the Ethernet port of the GDM and web pages can be viewed with any standard web browser on a device connected to the same network.

Remote Web Pages Language Selection

The Remote Web Pages enable users to select different languages for each remote client. The languages supported via the Remote Web Pages are listed under Multi Language Support in Section 9.1. Change of language on the Remote Web Pages does not change the unit's GDM language.

Modbus TCP

A Modbus TCP connection is also provided via the Ethernet port of the GDM user interface. Read Only access is available to operating parameters such as voltages, currents and power levels.

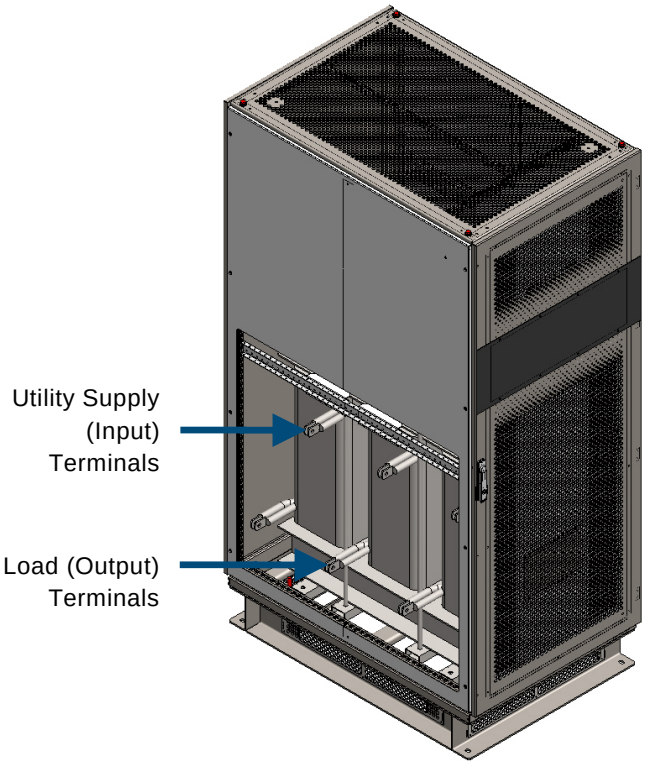
10 User Connections

10.1 Power Connections

The PCS100 AVC utility supply (input) and load (output) connections are connected directly to the injection transformer terminals in the Transformer Enclosure. The following table defines connection sides.

Transformer terminals	Connection
Top terminals	Utility Supply (Input)
Bottom Terminals	Load (Output)

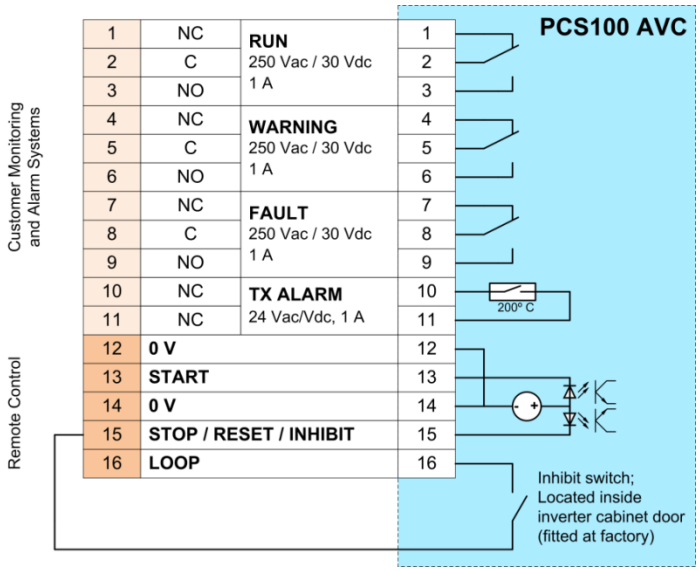
The figure on the right shows the power connection location on a 3B frame size with L (left) connection side and +SA Side Aperture option.



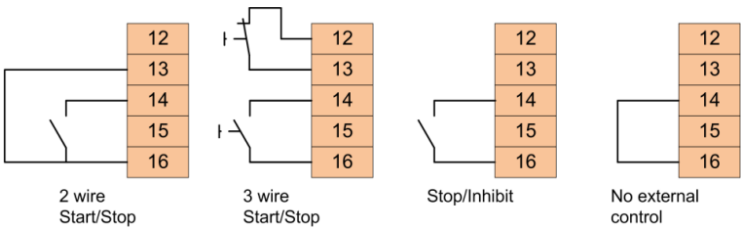
10.2 Control Connections

The PCS100 AVC includes control connections for local control or monitoring of the system.
Control connection terminals are located on Auxiliary Master Module in the Master Controller Enclosure.

Control Connection	Description
3 Relay Outputs	PCS100 AVC status information 250 Vac/30 Vdc, 1 A
1 Isolated Thermal Switch	Transformer over temperature information 24 Vdc/24 Vac, 1 A Normally closed (NC) contact
2 Digital Inputs	PCS100 AVC Remote control Start/Stop/Inhibit Dry contacts



The following control connections are available for wired remote control or monitoring of the PCS100 AVC.



Note: “No external control” link is fitted in factory by standard.

11 Installation Requirements

11.1 Input Circuit Protection

The PCS100 AVC relies upon upstream protection for current overload and short circuit protection. Upstream protection should be provided by a circuit breaker.

Overload protection must not be set greater than the PCS100 AVC rated load current. Short circuit and arc fault calculations should include allowance for the additional PCS100 AVC impedance (typically < 2.5%). Circuit breakers should be set to trip without any delay on short circuit or arc fault currents.

Coarse ground fault detection is recommended for high current systems where it may be difficult to assure ground or arc fault currents of sufficient magnitude to instantaneously trip the breaker.

The PCS100 AVC unit is designed to withstand significant short circuit current without damage. Typical short circuit withstand ratings are summarized in the rating tables of Section 6 and also in the table below. The smaller systems highlighted in blue in the table rely on fault current limiting protection from upstream circuit breakers or fuses provided by the customer.

Frame Size		1B	2B	3B	4B	5B	6B
PCS100 AVC 30%							
Rated Power	kVA	400	800	1200	1600	2000	2400
220 V models	kA	25	50	63	100	120	120
400 V models	kA	25	31.5	40	50	63	80
480 V models	kA	25	40	40	40	50	63
PCS100 AVC 40%							
Rated Power	kA	300	600	900	1200	1500	1800
220 V models	kA	31.5	40	50	80	100	100
400 V models	kA	15	31.5	31.5	40	50	63
480 V models	kA	20	25	25	40	40	50

Defines the models that need to be protected

The PCS100 AVC is rated to carry short duration fault currents to 20 pu (2000%) for 200 ms, and the upstream protection for small systems must be sized within this capability.
If required the ABB factory can provide assistance with sizing appropriate protection.

The PCS100 AVC can sustain the fault currents listed above without damage and can be returned immediately to service following the fault. Where higher fault currents occur, service may be required following a downstream fault.

11.2 Maintenance Bypass

ABB recommends that a maintenance bypass (not supplied with the PCS100 AVC) is fitted. The maintenance bypass allows maintenance to be performed on the PCS100 AVC without disruption to the load.

11.3 Floor Requirements

All enclosures must be installed on a horizontal fireproof surface.
Do not exceed ± 0.2° change in slope between adjacent enclosures.
Do not exceed ± 5 mm in elevation between adjacent enclosures.

11.4 Electromagnetic Compatibility (EMC)

The PCS100 AVC is designed for commercial and industrial applications. It is not suitable for connection to a low-voltage utility that is supplying residences unless additional measures are taken.

11.5 Location

The PCS100 AVC is designed for location in a restricted access location only.
The PCS100 AVC is designed for connection by fixed wiring.

The PCS100 system should be located in a clean electrical room with a controlled environment temperature and humidity according to the requirements under the Technical Specification section.

12 Service and Support

PCS100 team provide global service and support of installation and commissioning of PCS100 products

Comprehensive global services portfolio

ABB services span the entire product ownership life cycle:

- Pre-purchase engineering
- Installation and commissioning
- Technical support
- Training
- Preventive and corrective maintenance and maintenance spare parts kits
- Retrofit and refurbishment
- Globally available, supported by regional service hubs and operating in more than 100 countries
- Spare part availability and stocking
- On-site repairs
- 24 x 365 local support line

Custom tailored service contracts

- ABB services can be packaged into a custom service contract
- Tailored to the specific needs of each customer
- Contracts can be made at any stage of ABB product ownership
- Service contracts provide customers with improved cost controls, increased operational efficiency, lower capital expenditures, and extend ABB product life time

Life cycle management

ABB's life cycle management model maximizes the value of the equipment and maintenance investment by maintaining high availability, eliminating unplanned repair costs and extending the lifetime of the drive. Life cycle management includes:

- Spare parts and expertise throughout the life cycle
- Efficient product support and maintenance for improved reliability
- Functionality upgrades to the initial product

Training

- Product training includes installation, commissioning, and maintenance
- Training either at ABB Universities or at a customer site
- Training can be included in an ABB services contract

Engineering and technical support

ABB's engineering team provides the necessary electrical, protective and monitoring equipment, delivering a high level of energy continuity and superior power quality in a safe and cost effective system. The PCS100 is available in several capacities, depending on the scope of application.

- Pre-purchase engineering to help select and integrate ABB PCS100 products
- Customer assistance in sizing and modeling of systems
- Other life cycle engineering and technical support is available by phone, email, or on-site visits, or as agreed in an ABB services contract
- Redundant inverter design increases reliability and availability and is part of a proven family of global ABB products
- Scalable building block design

13 List of Related Documentation

Below you can find the list of related documentation.

Document Number	Document Name
2UCD070000E001	PCS100 AVC User Manual
2UCD070000E007	PCS100 AVC 30% Performance Curves
2UCD070000E008	PCS100 AVC 40% Performance Curves
2UCD070000E012	PCS100 AVC Component Failure Simulation
2UCD070000E020	PCS100 AVC Detailed Performance Curves

Notes

Contact us

To find the contact person for your region please refer to our webpage:

www.abb.com/pcs100-power-converters

Note
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

2UCD070000E015 rev. B 03.2014

Power and productivity for a better world™