

2UCD280000E002\_E

# PCS100 AVC-20

## Active Voltage Conditioner

### Technical Catalogue





## ABOUT THIS DOCUMENT

### ABB Power Conditioning

Leading the industry in innovation and technology, ABB provides power conditioning for many of the world's foremost organizations, ensuring the continuous operation of small, medium to large businesses are protected on a global scale.

ABB's Power Conditioning portfolio is a unique line up of low and medium voltage power conversion technology that is part of the product group, Power Protection.

The portfolio consists of static frequency converters, UPSs, voltage and power conditioners that demonstrate highly reliable and cost-effective performance. With this product portfolio, ABB offer efficient power conditioning solutions that are specifically designed to solve power quality problems and stabilize networks.

Covering applications from data centers through to complete industrial plant protection, micro grid systems and shore-to-ship supply, ABB have the power conversion technology for every need. Starting from a few kVA to many MVA and a wide range of supply voltages.

It's business as usual with power conditioning technologies in place

### Power Conditioning Product Portfolio

Product Line	Typical Problems	Product
Industrial UPS	Utility deep sag and surge correction	PCS100 UPS-I Industrial UPS
	Utility outage protection	HiPerGuard MV UPS
Voltage conditioning	Utility sag and surge correction	PCS100 AVC-40 Active Voltage Conditioner for sag correction
	Load voltage regulation	PCS100 AVC-20 Active Voltage Conditioner for voltage regulation
Frequency Conversion	50/60 Hz conversion Frequency fluctuation	SureWave SFC



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## Document Information

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## LONG TERM VOLTAGE DEVIATION – THE PROBLEM

Developing countries' utility networks often do not have enough reserve for peak power demand. This leads to power quality events during peak hours as the demand exceed the capability of what the utility network can supply. Remote areas or areas at the end of distribution line often have a weak utility network and voltage fluctuations are common.

Commercial and industrial buildings in these environments must consider the impact of a weak utility network on their operations.

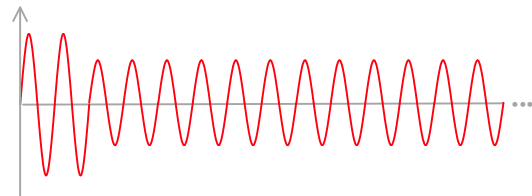


A fluctuating voltage supply affects productivity and the consistency of operations, leading to a reduction in the quality of products and services. It causes motors in equipment and machinery to function inefficiently and can result in poor use of resource, in terms of staff, materials and energy consumption. Fluctuating voltage can also lead to increased wear on machinery components, resulting in a greater number of malfunctions and a reduced life

expectancy of equipment. It can also cause reliance on costly back-up systems, such as diesel generators.



Unlike a voltage sag, which is a temporary voltage drop normally lasting from 2 to 10 cycles, undervoltage is much longer, lasting minutes or hours.



Furthermore, brownouts, overvoltage and an unbalanced voltage supply can cause reliance on costly back-up systems, such as diesel generators. Unstable voltage prevents the users from streamlining their operations and optimizing their resources to reduce wasted capacity.

## PCS100 AVC-20 ACTIVE VOLTAGE CONDITIONER

The PCS100 AVC-20 Active Voltage Conditioner provides effective, efficient voltage regulation where commercial or industrial processes demand a clean, readily available, and consistent supply of power.

The PCS100 AVC-20 is an inverter-based system that protects sensitive industrial and commercial loads from voltage disturbances.

Providing fast, accurate overvoltage and undervoltage correction as well as continuous voltage regulation and load voltage compensation, the PCS100 AVC-20 has been optimally designed to provide downstream equipment immunity from power quality events on the supply network.

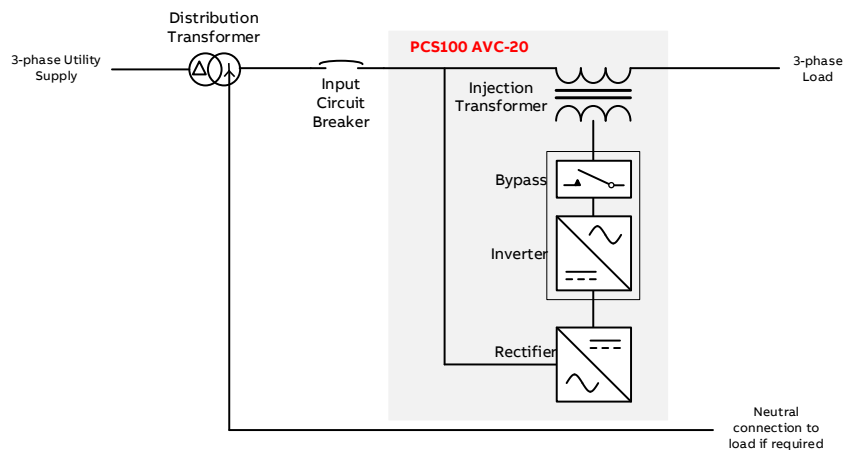


### How it works

The PCS100 AVC-20 uses an injection transformer in series with the load. The two converters that are not on the current path between the load and the utility add or subtract voltage via the injection transformer

as required to provide continuous, efficient and accurate voltage regulation.

The PCS100 AVC-20 contains a redundant internal bypass that, in the event of an overload or internal fault condition, will ensure the load is continually supplied from the utility.



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## PCS100 AVC-20 BENEFITS



### **Reduce the cost of sag events**

The PCS100 AVC-20 closes the electrical compatibility gap between the supply and the facility by regulating voltage deviations. The PCS100 AVC-20 minimizes the undue stress to the expensive equipment, thus increasing the equipment lifetime.

With full range voltage correction completed in 20 milliseconds, the PCS100 AVC-20 is a perfect solution for large commercial buildings where continuity of service is paramount as well as industrial loads that are sensitive to the input voltage. The PCS100 AVC-20 is designed to target voltage deviations in weaker networks.

### **Improve plant operation**

The PCS100 AVC-20 regulates the voltage, removing long term undervoltage, overvoltage and voltage imbalance to reduce waste and damage to the expensive equipment. The PCS100 AVC-20 improves the quality of operation of the plant or the facility.

### **Faster return on investment**

With industry leading efficiency exceeding 99% , the PCS100 AVC-20 requires minimal costs for electricity and cooling. With no energy storage the ongoing maintenance cost is minimized, resulting low total cost of ownership.

### **Reduce damage to equipment**

Protect expensive equipment by regulating the voltage to remove long term undervoltage, overvoltage and voltage imbalance

## INDUSTRIES AND APPLICATIONS

Industrial automation has reached very high levels of sophistication. Industrial plants and commercial equipment now use advanced technology, and this technology relies on a robust and continuous power supply. Utility grids that are weak or do not have reserve for peak demand have voltage fluctuation that will disrupt the operation of this equipment. This results in wasted material, long restart times,

**The PCS100 AVC-20 offers complete power protection of commercial and industrial loads**

expensive repair or maintenance activities, revenue losses or contractual penalties.

The PCS100 AVC-20 ensures a continuous, regulated supply of utility voltage where the electric infrastructure is stressed, unstable or unreliable.



### Hotels and Resorts

Luxury hotels in countries where the electrical infrastructure is poor need to protect their voltage supply to keep critical loads, such as lighting, heating, cooling, and electricity supply fully operational to cater for the needs of their guests.



### Commercial Buildings

Commercial buildings are used around the world to keep global commerce operational twenty-four hours a day, seven days a week. Therefore a reliable power supply is critical to the success of any business venture and ABB delivers power protection to operations throughout the world.



### Food and Beverage

The way food is processed and packaged has undergone a revolution with high levels of automation, monitoring, and information systems installed. Due to the high degree of automation, such facilities are very sensitive to power quality events. With these changes, the highest quality of electrical power becomes business critical.



### Manufacturing

Production lines consume huge amounts of power and rely heavily on continuous processes. It is critical that a constant power supply is available at all stages of the production process. Without this assurance, production output can be at risk and vital resources compromised.



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## FEATURES



### **Very high efficiency**

>99% even on partial loading

### **Continuous $\pm 20\%$ online regulation**

Continuous regulation within  $\pm 20\%$  with response less than 250  $\mu\text{s}$  and full regulation in less than 20 milliseconds

### **Small footprint**

Industry leading power density

### **Regenerative load support**

Bidirectional power module design enables support for regenerative loads such as lifts and cranes

### **Internal bypass**

Internal bypass design guaranteeing continuity of load supply in case of PCS100 AVC-20 fault

### **Connectivity**

Ethernet, Modbus TCP, integrated web server and E-mail notifications

### **Modular construction**

Proven PCS100 power converter platform, with more than 1800 MVA installed base, enabling fast and easy maintenance

### **Sophisticated control software**

Based on 20 years voltage conditioning industry experience

### **Multilingual graphical touch screen interface**

Simple user controls, easy to understand event log and voltage event data logging

# FUNCTIONAL DESCRIPTION

## PCS100 AVC-20 Regulation Capabilities

The PCS100 AVC-20 regulates undervoltage and overvoltage within 20 milliseconds, equivalent to one cycle, ensuring the service or production remains operational throughout the power quality event. The PCS100 AVC-20's performance with undervoltage is adaptive to load conditions. Based on the loading of the unit or load power factor the PCS100 AVC-20 fully regulates undervoltage from down to 80% of the nominal voltage.

If the utility voltage deviates beyond +/- 20%, the PCS100 AVC-20 will still provide continuous regulation to as close to nominal voltage as possible, ensuring trouble free operation of the protected equipment.

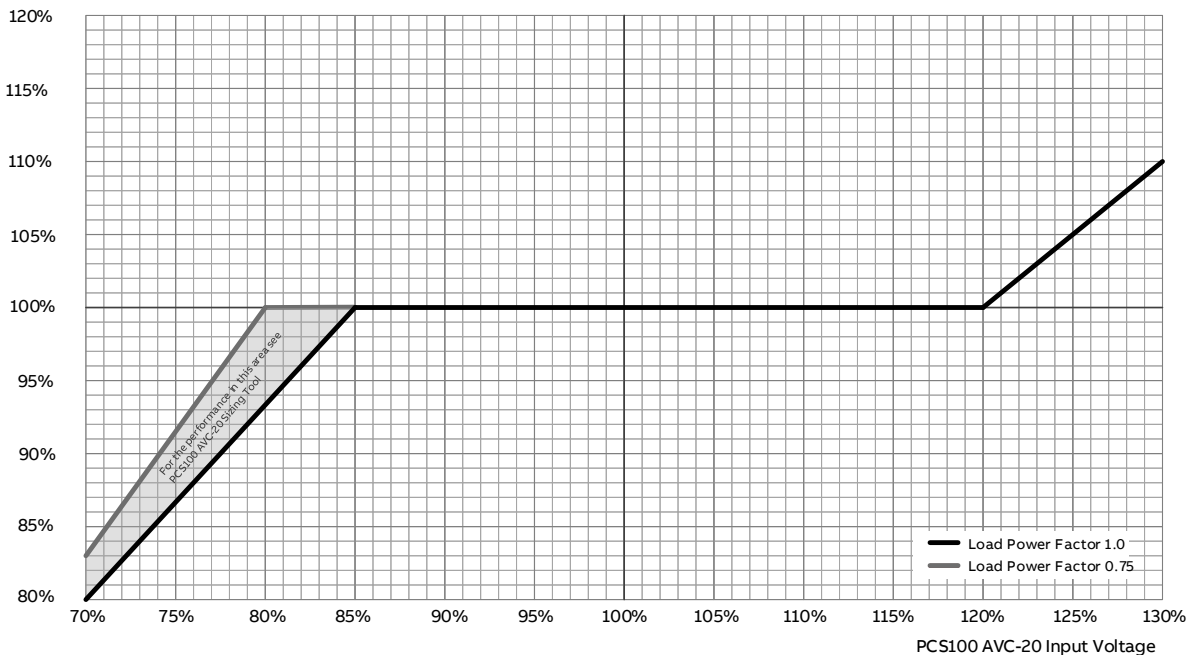
The adaptive approach to regulation enables users to select the unit based on the load or based on the required output voltage accuracy.

Utility Supply Problem	Input	Output	Note
Three-phase utility sags regulated from	85% supply voltage	100%	Load power factor 1.0
	80% remaining supply voltage	100%	Load power factor 0.75
	70% - 85% supply voltage	See graph below	Load PF dependent
Three-phase utility surges regulated from	120% supply voltage 130% supply voltage	100% 110%	
Correction of phase angle errors created by faults in the supply system		Yes	
Correction of voltage imbalance from utility supply		Yes%	
Attenuation of flicker voltages in the utility supply		Yes (downstream)	

## PCS100 AVC-20 Performance Curve

The performance curve below shows the basic PCS100 AVC-20 performance for undervoltage and overvoltage. The PCS100 AVC-20 Sizing Tool is a software tool which includes detailed performance curves and is an alternative method for selecting the optimal size of the PCS100 AVC-20 specific to your application. This performance curve represents the AVC-20 capabilities for three phase sags/surges.

PCS100 AVC-20 Output Voltage



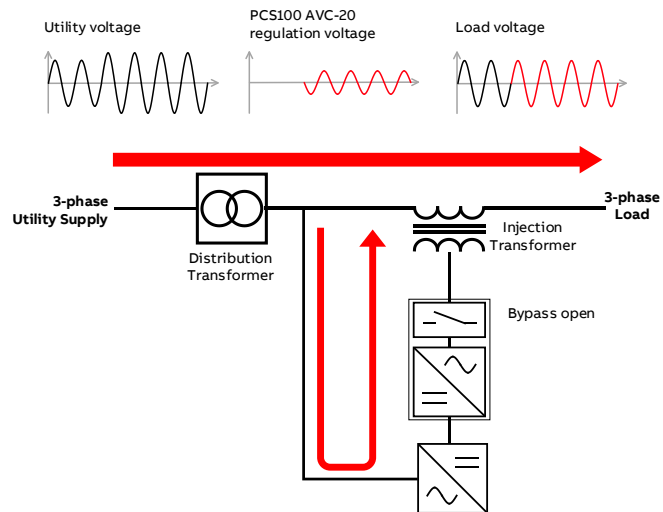
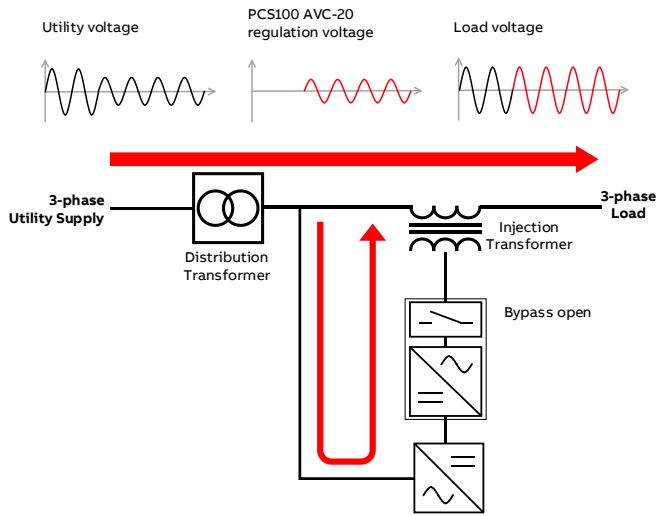
## PCS100 AVC-20 Operation Details

The following diagrams demonstrate the PCS100 AVC-20 in operation when a utility disturbance occurs, and what happens if the internal bypass operates.

### Utility Voltage Deviates from Nominal

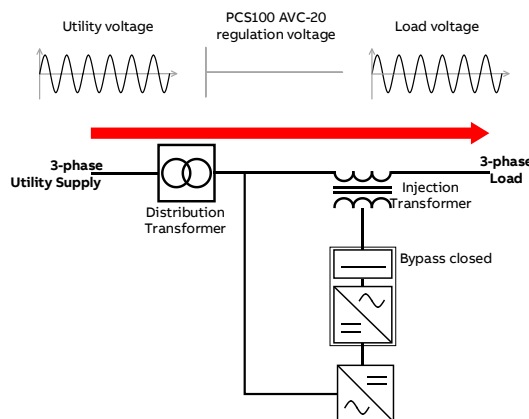
When the utility voltage deviates from nominal or set point due to undervoltage, overvoltage, or unbalance the inverter will inject a regulation voltage via the injection transformer. The regulation voltage level is based on the disturbance level and the energy required for regulation is derived from the utility via the PCS100 AVC-20 rectifier.

The diagrams on the right show cases with utility voltage below and above the nominal level.



### Internal Bypass Operation

In the case of an overload or internal fault condition the internal 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 load



## TECHNICAL SPECIFICATION

<b>Utility - Input</b>	
Power range	250 kVA – 3000 kVA
Rated voltage (model specific)	400 V application range 380 – 415 V <sup>1</sup>
Maximum supply voltage	130%
Nominal supply frequency	50 or 60 Hz
Frequency tolerance	± 5 Hz
Power system	3-wire plus ground input (grounded wye source) + Neutral (4-Wire) <sup>2</sup> if required by load
Overvoltage category	III
Fault capacity	Refer to the model tables shown in this document
Outage – control ride through	600 ms
Harmonics <sup>3</sup>	IEC 61000-2-4 Class 2 (THDv < 8%)
<b>Load - Output</b>	
Voltage	To match nominal input voltage <sup>4</sup>
Equivalent series impedance	< 4% (model specific)
Displacement power factor	0 lagging to 0.9 leading <sup>5</sup>
Crest factor	3.0 <sup>6</sup>
Overload capability from 100% supply voltage	150% for 30 s, once every 500 s
<b>Performance</b>	
Efficiency	> 99% (Under Nominal Conditions)
Voltage variation detection time	< 250 µs
Voltage regulation time	< 20 ms for any voltage deviation within the specification
Voltage regulation accuracy	±1% typical, ±2% max.
Continuous undervoltage regulation range	-15% with load power factor 1.0 -20% with load power factor 0.75
Continuous overvoltage regulation range	+20%
<b>Internal Bypass</b>	
Capacity	100% of model rating (kVA) 125% for 10 minutes
Maximum overload capacity (in bypass)	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
<b>Injection Transformer</b>	
Transformer type	Dry
Insulation	IEC 60085 Thermal class 200
Frequency	50 Hz and 60 Hz
Vector group	Diii (delta + 3 independent windings)

<sup>1</sup> Application voltage lower than the rated voltage results in power derating. Consult the rating tables for more information.

<sup>2</sup> Neutral provided by supply transformer if required by the load. Neutral connection is not required to the PCS100 AVC-20. See SLD Drawing 2UCD280000E202.

<sup>3</sup> For THDv > 8%, please refer to factory. For applications where THDv is above 10% lifetime of components may be significantly affected, please refer to factory.

<sup>4</sup> Output voltage can be adjusted by ±10% with 0.1% steps

<sup>5</sup> Consult the factory if there is a power factor correction unit downstream

<sup>6</sup> Only applies at nominal load and for single phase loads

<b>Environmental</b>	
Operating temperature range	0 °C to 50 °C
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	Natural convection
Humidity	< 95%, non-condensing
Pollution degree rating	2
Noise	< 75dBA @ 2 m

<b>Enclosure</b>	
Enclosure rating	IP20 (IP21 with optional roof kit)
Material	Bright Zinc Galv Steel (500 kVA and below) Electro-galvanized steel (above 500 kVA)
Panel thickness	
Side and rear	1.6 mm
Door	1.6 mm (500 kVA and below) 2 mm (above 500 kVA)
Finish	Powder Coated Ripple Finish (500 kVA and below) Standard epoxy-polyester powder coating textured finish (above 500 kVA)
Color	RAL7035 Light Grey
Enclosure access	Lockable, full-sized door that opens 120 degrees

<b>Service</b>	
MTTR	30 min typical by module exchange
Diagnostics	Non-volatile event & service log
Remote monitoring	E-mail

<b>User Interface</b>	
User interface	10.1" color touch panel, multilingual
Touch panel	Full parameter control, system event log, voltage event log
Control inputs	Start / Stop / Reset digital inputs
Control outputs	Run, warning and fault relays
Communication	Ethernet Modbus TCP E-mail

<b>Power Quality Event Monitor</b>	
Events recorded	Voltage Sag (RMS) Voltage Surge (RMS)
Measurement type	Half-cycle RMS according to IEC 61000-4-30
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
Remote monitoring	E-mail notification

<b>Standards and Certifications</b>	
Quality	ISO 9001
Environmental	ISO 14001
Marking	CE, C-Tick
Safety	IEC 62477-1
Electromagnetic compatibility	Emissions: CISPR 11 Class A Group 1 Immunity: IEC 61000-6-2
Performance	IEC 61000-4-34

# HOW TO SELECT A PCS100 AVC-20

To select the correct size of the PCS100 AVC-20 for the application the following information should be known.

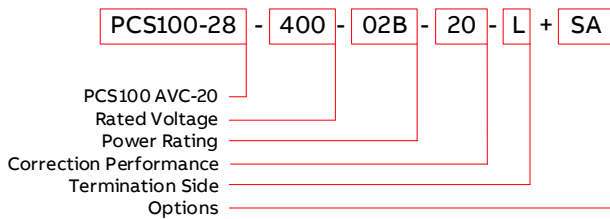
- Utility voltage
- Power rating of the load (kVA and kW, or kVA and power factor)
- Target regulation range

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.

## Type code

The PCS100 AVC-20 type code is given in the product tables. The order code is a unique code for the specific PCS100 AVC-20 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:



## Type code Parameters:

### Rated Voltage

This is the rated voltage of the PCS100 AVC-20.

The standard voltage is 400 V.

Other operating voltages (i.e. 380V) are achieved by software settings and setting of an auxiliary transformer tapping.

### Power Rating

Rated power of the system is based on the number of power module pairs. Each power module pair operating on rated voltage provides 500 kVA of power.<sup>7</sup>

### Correction Performance

Defines PCS100 AVC-20 correction performance.

### Termination Side

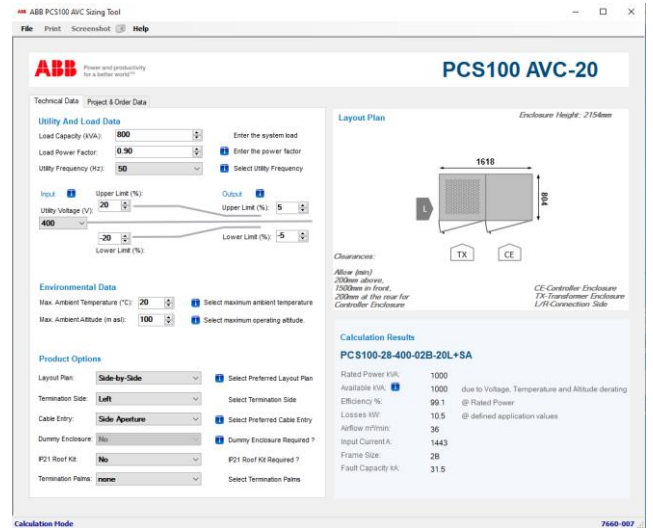
The location of the power terminals (input and output) when viewed from the front of transformer enclosure.<sup>8</sup>

### Options

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

## PCS100 AVC Sizing Tool

In addition, ABB provides a Windows PC application PCS100 AVC Sizing Tool that can be used to dimension the correct PCS100 AVC-20 model required for the application.



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

<sup>7</sup> Operation at lower than the rated voltage results in less kVA per module pair. Consult the rating tables for more information.

<sup>8</sup> For power rating 500 kVA or below Without additional termination related options termination side can be from left, right or bottom as the transformer terminals are facing front.

## PCS100 AVC-20 MODEL RANGE

### 400 and 415 V Application Voltage

Rated power [kVA]	Rated real power [kW]		Fault Capacity [kA]	Losses [kW] <sup>9</sup>	Efficiency [%] <sup>9</sup>	Airflow [m <sup>3</sup> /min]	Frame Size	Type Code Place R for right termination side or L for left termination side instead of x
<b>400 V, 415 V</b> Utility Voltages	±15% regulation	±20% regulation						
500	500	375	15	4.7	99.1	18	1B	PCS100-28-400-01B-20
1000	1000	750	31.5	8.6	99.1	36	2B	PCS100-28-400-02B-20-x
1500	1500	1125	31.5	13.2	99.1	54	3B	PCS100-28-400-03B-20-x
2000	2000	1500	40	14.5	99.3	72	4B	PCS100-28-400-04B-20-x
2500	2500	1875	50	19.1	99.2	90	5B	PCS100-28-400-05B-20-x
3000	3000	2250	63	24.3	99.2	108	6B	PCS100-28-400-06B-20-x

### 380 V Application Voltage

Rated power [kVA]	Rated real power [kW]		Fault Capacity [kA]	Losses [kW] <sup>9</sup>	Efficiency [%] <sup>9</sup>	Airflow [m <sup>3</sup> /min]	Frame Size	Type Code Place R for right termination side or L for left termination side instead of x
<b>380 V</b> Utility Voltages	±15% regulation	±20% regulation						
475	475	356	15	4.7	99.1	18	1B	PCS100-28-400-01B-20
950	950	712	31.5	8.6	99.1	36	2B	PCS100-28-400-02B-20-x
1425	1425	1068	31.5	13.2	99.1	54	3B	PCS100-28-400-03B-20-x
1900	1900	1425	40	14.5	99.3	72	4B	PCS100-28-400-04B-20-x
2375	2375	1781	50	19.1	99.2	90	5B	PCS100-28-400-05B-20-x
2850	2850	2137	63	24.3	99.2	108	6B	PCS100-28-400-06B-20-x

<sup>9</sup> Typical value

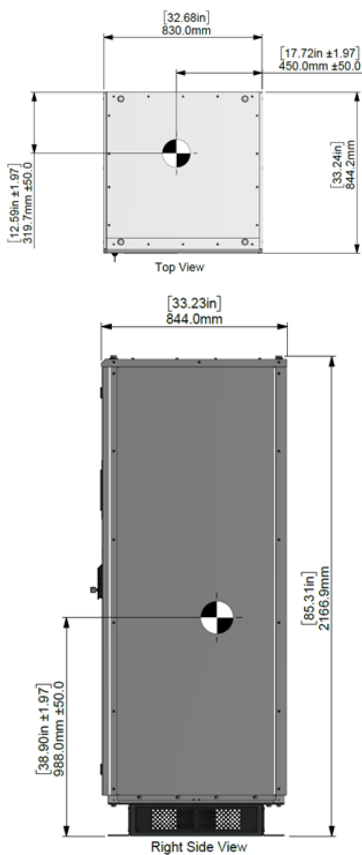
# LAYOUT PLANS AND DIMENSIONS

## Layout Plans

### Side-by-side Layout Plans

The following plans relate to the PCS100 AVC-20 in a frame size. The layout displayed below are for a right (R) termination side only. For a left (L) termination

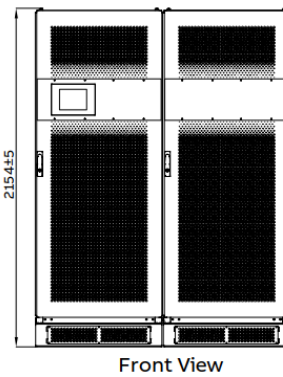
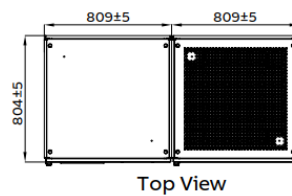
#### 1B frame size<sup>10</sup>



side in a Side-by-Side layout, the transformer enclosure is mounted on the left-hand side of the controller enclosure.

#### 2B frame size<sup>11</sup>

##### Right termination side



#### 3B frame size<sup>11</sup>

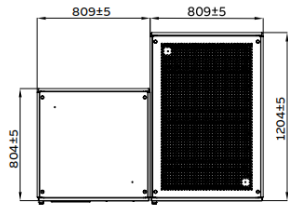
#### 4B, 5B and 6B frame size

<sup>10</sup> In frame size without optional Termination Enclosure, Cable Ducts or Side Aperture termination side can be from left, right or bottom as the Injection Transformer terminals (customer's connection terminals) are facing front.

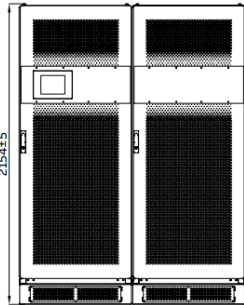
<sup>11</sup> For frame sizes 2B and 3B, due to position of Injection Transformer terminals, optional Termination Enclosure or Side Aperture MUST be selected. Please see Options chapter of this document for option description.



**Right termination side**



Top View



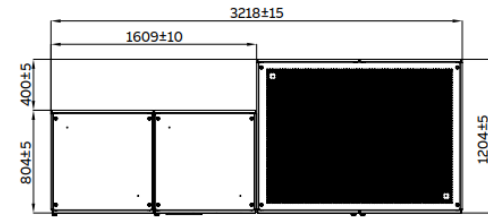
Front View

**Back-to-back Layout Plans**

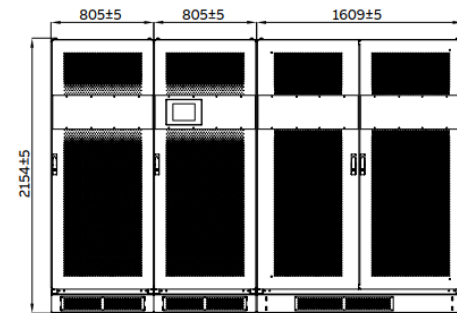
The following plans relate to the optional Back-to-Back layout with left (L) or right (R) termination side

**2B frame size<sup>12</sup>**

**Right termination side**



Top View

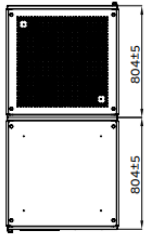


Front View

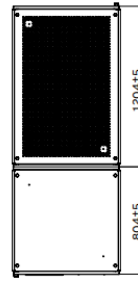
options shown. Exact termination side needs to be defined with L or R in the product type code.

**3B frame size<sup>12</sup>**

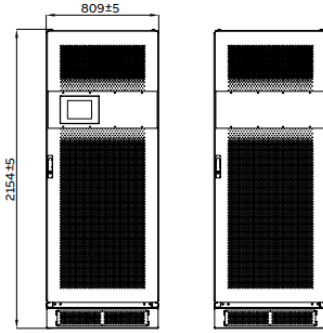
<sup>12</sup> For frame sizes 2B and 3B, due to position of Injection Transformer terminals, optional Termination Enclosure or Side Aperture MUST be selected. Please see Options chapter of this document for option description.



Top View

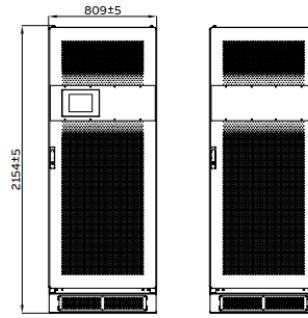


Top View



Front View

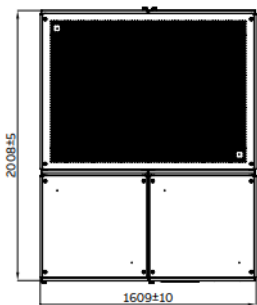
Rear View



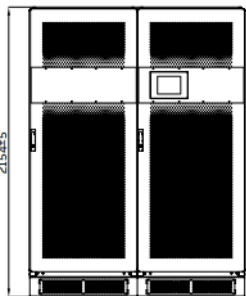
Front View

Rear View

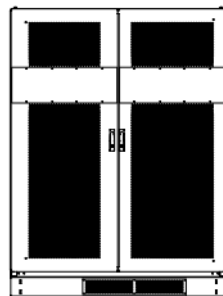
**4B, 5B and 6B frame size**



Top View



Front View



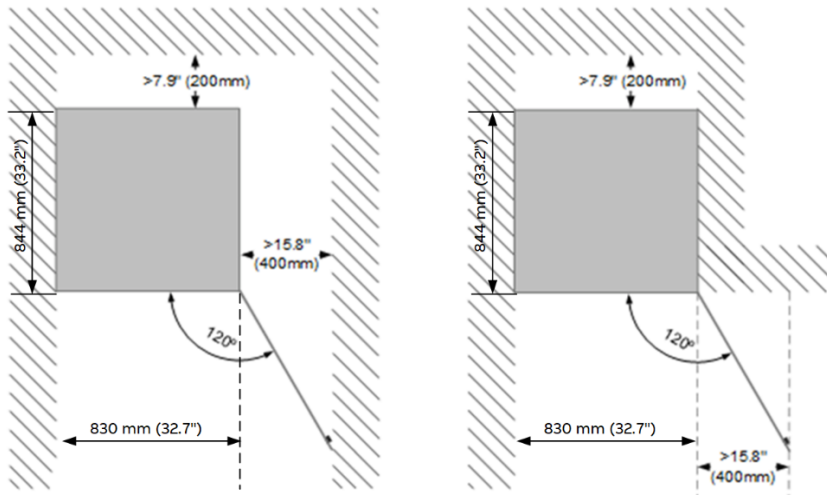
Rear View

### Clearance

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 Enclosure for air flow.
- 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 to access the PCS100 AVC-20 module replacement.



### Weights

The following tables show the dimensions and weights of the Enclosure<sup>13</sup>.

Frame Size	Controller Enclosure Dimensions (HxWxD)	Transformer Enclosure Dimensions (HxWxD)	Controller Enclosure Weight	Transformer Enclosure Weight
	mm	mm	kg	kg
1B	2167x830x844	NA	881	NA
2B	2154x809x804	2154x809x804	581	1155
3B	2154x809x804	2154x809x1204	714	1830
4B	2154x1609x804	2154x1609x1204	1162	2960
5B	2154x1609x804	2154x1609x1204	1295	2960
6B	2154x1609x804	2154x1609x1204	1428	2960

<sup>13</sup> Allow ±10% tolerance for weights shown in the table

## OPTIONS

The following options are available for the PCS100 AVC-20 enclosures.

Plus Code	Option Description	500 kVA	1000 kVA	1500 kVA	2000 – 3000 kVA	Note
BB	Back-to-back Layout		x	x	x	
RK	Roof Kit	x	x	x	x	Not available with the Side Car, the Cable Duct or the Termination Enclosure options
SP	ShellPlus	x				
SC	Side Car	x				
SA	Side Aperture		x	x	x	
CD	Top Entry Cable Duct		x			Termination palm recommended to ensure adequate space for cable connection
TE	Termination Enclosure		x	x		
DMY	Dummy Enclosure		x	x	x	
TPx	Termination Palms	x	x	x	x	Comes standard for 500 kVA systems. x = I for IEC or N for NEMA
PS	Redundant Power Supply	x	x	X	x	

### Back-to-back Layout (BB)

PCS100 AVC-20 models larger than 500 kVA consist of Controller Enclosures and Transformer Enclosures. The standard layout is Side-by-side where the Controller Enclosure and Transformer Enclosure are lined side-by-side. For optional Back-to-back layout (+BB plus code) the Transformer Enclosure is installed behind the Controller Enclosure.

### Roof Kit (RK)

Roof Kit is available where small amounts of liquid may fall onto the top of the main enclosure. The roof kit option increases the units' protection degree to IP21. These are only for indoor use. There is a 200mm clearance from the enclosure top to the roof kit. The kit will cover the enclosure top. The roof kit is shipped separately and must be assembled on site. Roof kit only covers the main enclosure.



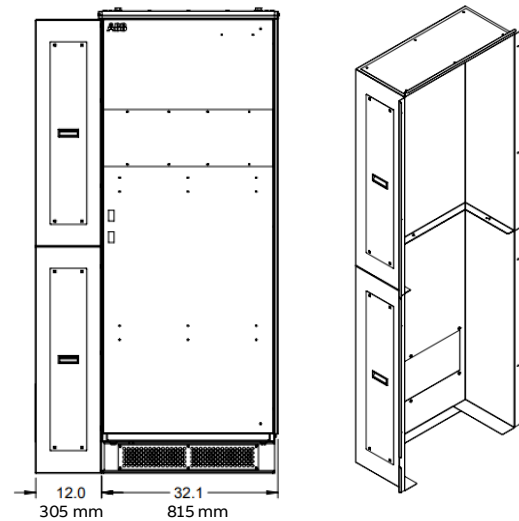
### ShellPlus (SP)

The ShellPlus option (2167x830x844 mm) allows easier power connections for top cable entry.



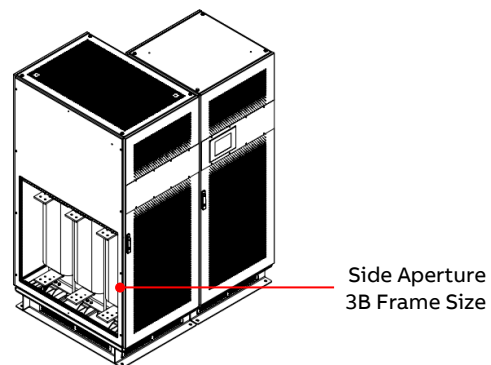
### Side Car (SC)

This is an alternative option that allows easier power connections. Can be used for both top and bottom cable entry.



### Side Aperture (SA)

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 for an easier side cable or bus bar connection to a maintenance bypass. For safety reasons this option must be selected only when there is a maintenance bypass next to the PCS100 AVC-20.



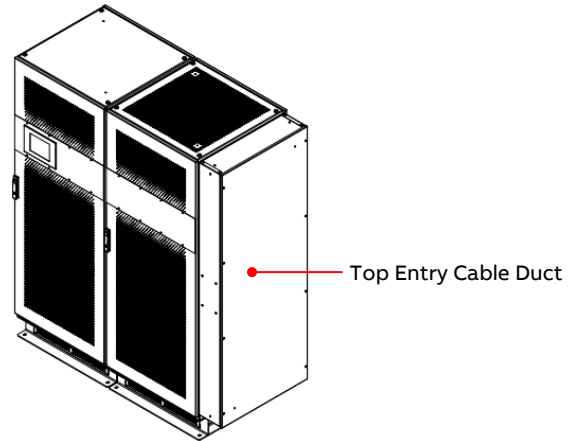
Side Aperture  
3B Frame Size

## Top Entry Cable Duct (CD)

200 mm Top Entry Cable Duct for supply and load cables (or bus bars) can be accommodated for frame sizes 2B.

The Cable Duct has the same depth as the PCS100 AVC-40 enclosure and is mounted on the side of the transformer terminals.

The Cable Duct comes complete with a top gland plate<sup>14</sup> and cable support.



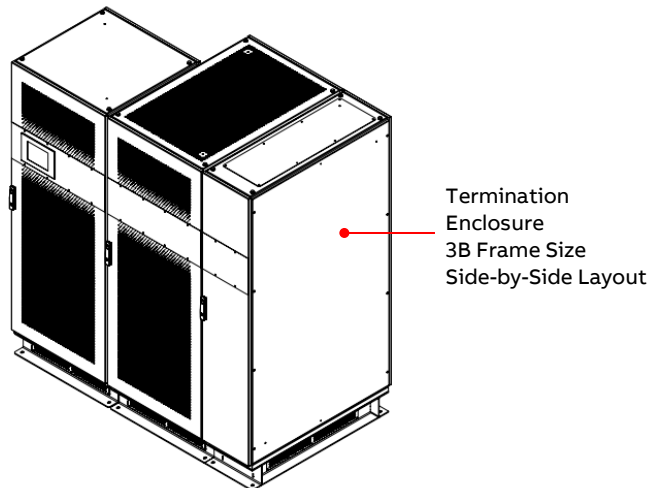
## Termination Enclosure (TE)

The 400 mm Termination Enclosure option allows easier power connections or to match enclosure sizes with other equipment.

The Termination Enclosure has the same depth as the Transformer Enclosure and is mounted on the side of the transformer terminals.

The enclosure comes complete with a plinth and door access to enable top or bottom cable (or bus bar) connection.

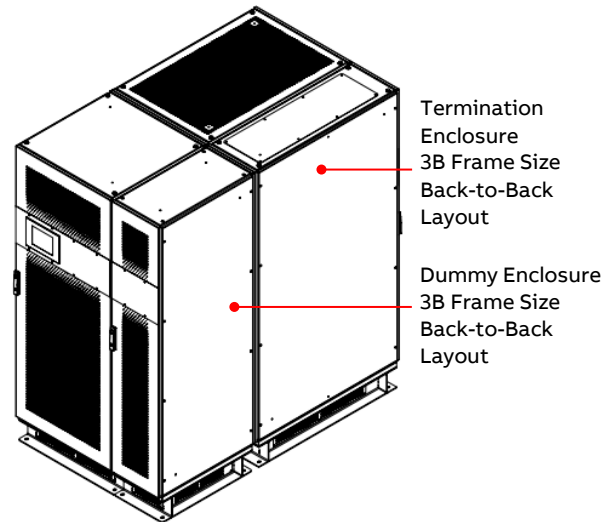
The Termination Enclosure option includes cable support and gland plate.



<sup>14</sup> The Gland Plate is delivered as a blind plate without any holes

## Dummy Enclosure (DMY)

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



## Termination Palms (TPx)

Standard termination palms on the PCS100 AVC-40 are horizontal bars.

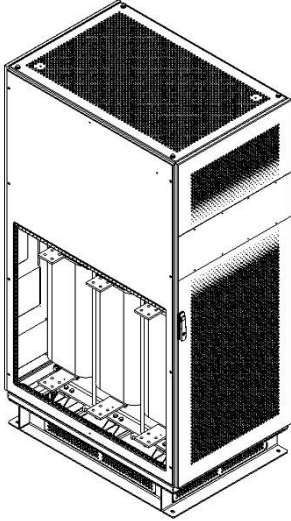
Termination Palms option offers vertical bars with dimensions and hole positions according to IEC or NEMA standard for all of the termination positions. Comes standard for 500 kVA systems.

See example of standard offering and TPx option on the images below.

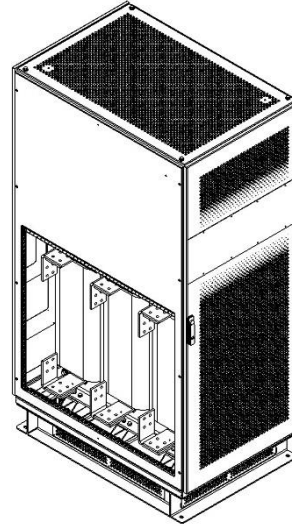
Add appropriate standard letter instead of x in TPx for correct option code:

- IEC standard TPI
- NEMA standard TPN

### Standard terminations



### TPx Termination Palms



## Redundant Power Supply Unit (PS)

This option provides a new Auxiliary Master Module that contains two PSUs to provide redundant DC feed to the system.

The PSU has an internal status signal to indicate the status of each PSU. This signal is monitored and will

provide a warning 364 Redundant Aux Power if either PSU fails. The redundant PSU is designed such that the two PSUs share the DC supply of the system. If one PSU fails, the other will take over and supply all the modules



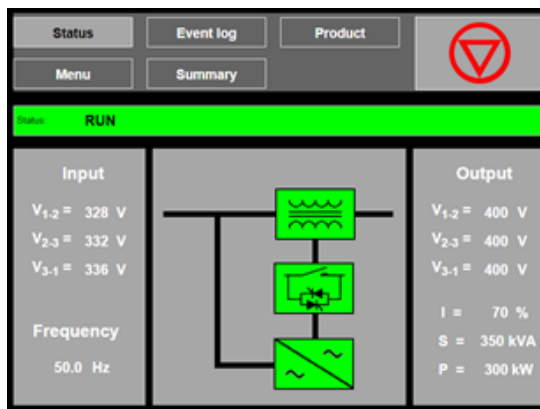
## USER INTERFACE

### Graphic Display Module

The primary user interface for configuration of the PCS100 AVC-20 is via the Graphic Display Module (GDM). The GDM is a 10.1” touchscreen user-friendly intuitive interface. The integrated navigation screen gives easy accessibility to any information on the PCS100 AVC-20, shows the system status and provides access to the operating parameters and

event history. The mimic diagram gives the users a clear view of the status of the system.

The supported languages are: English, French, Italian, Malaysian, Turkish, Russian, German, Vietnamese, Spanish, Simplified Chinese, Japanese, Traditional Chinese, Swedish, Indonesian, Portuguese, Arabic and Korean.



Features	GDM
Display resolution	1024 × 600 pixels
Display size	10.1”
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	10,000
Event log can be downloaded to a PC	yes
Remote Web Pages	yes
Modbus TCP connection	yes
Multilanguage selection	yes
E-mail monitoring	yes

### Remote Monitoring

The GDM provides remote access for monitoring purpose. The 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 notifications	E-mail	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 can viewed with any standard web browser on a device connected to the same network. 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. The Remote Web Pages enable users to select different languages for each remote client.

### Modbus TCP

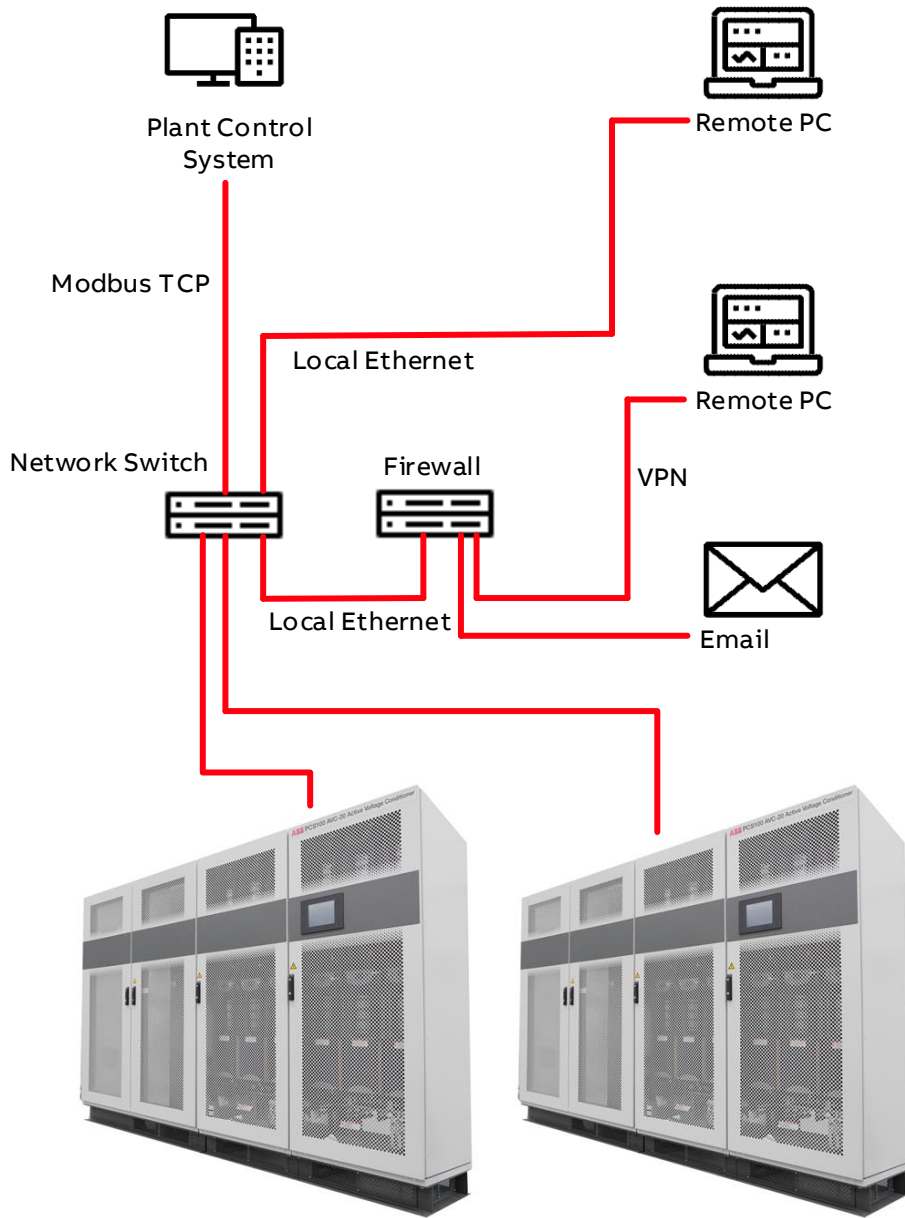
A Modbus TCP connection is also provided via the Ethernet port of the GDM user interface. Read Only

access is available to operating parameters such as voltages, currents, and power levels.

### E-mail

The PCS100 AVC-20 is configurable for sending e-mail notifications in case of power quality events or systems internal events such as faults and warnings.

Automatic sending of the service logs via e-mail to ABB Service can also be enabled.



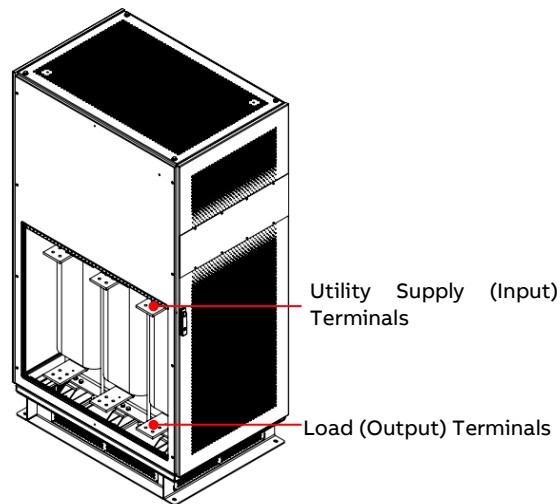
## USER CONNECTIONS

### Power Connections

The PCS100 AVC-20 utility supply (input) and load (output) connections are connected directly to the Injection Transformer terminals in the Enclosure.

The following table defines connection sides.

Transformer terminals	Connections
Top terminals	Utility Supply (Input)
Bottom terminals	Load (Output)

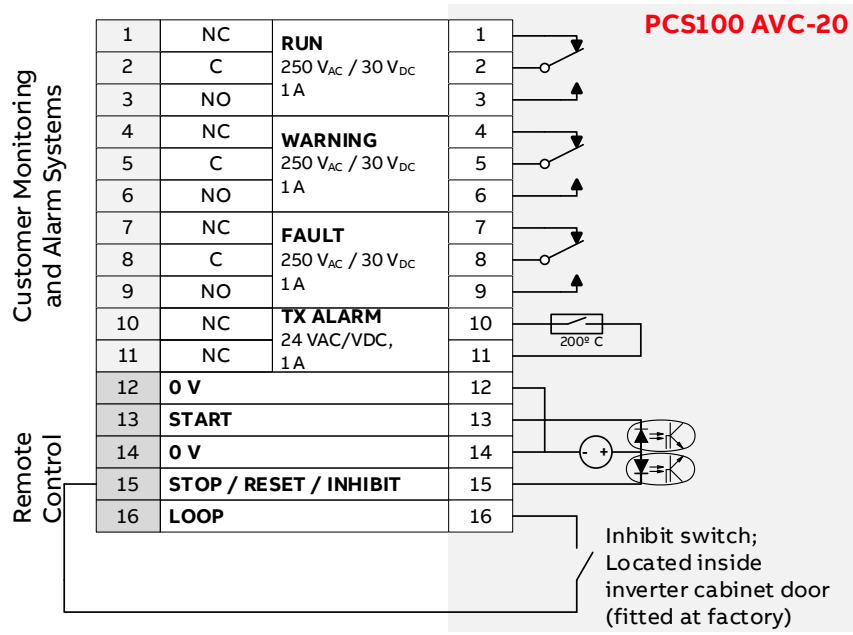


### Control Connections

The PCS100 AVC-20 includes control connections for local control or monitoring of the system. Control

connection terminals are located on the Auxiliary Master Module in the Master Controller Enclosure.

Control Connection	Description
3 Relay Outputs	PCS100 AVC-20 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-20 Remote control Start/Stop/Inhibit Dry contacts



# INSTALLATION REQUIREMENTS

## Input Circuit Protection

The PCS100 AVC-20 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-20 rated load current. Short circuit and arc fault calculations should include allowance for the additional PCS100 AVC-20 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-20 unit is designed to withstand significant short circuit current without damage. Typical short circuit withstand ratings are summarized in the model tables and also in the table below. The smaller systems highlighted in darker gray in the table rely on fault current limiting protection from upstream circuit breakers or fuses provided by the customer.

For 1B frame size current limiting molded case circuit breakers (MCCB), or fuses are required to provide very fast clearing of short circuit currents. ABB Tmax XT series or equivalent are suitable.

Frame Size		1B	2B	3B	4B	5B	6B
Rated Power	[kVA]	500	1000	1500	2000	2500	3000
Rated fault capacity $I_{cc}^*$	[kA]	15	31.5	31.5	40	50	63

\* Where the short circuit capability of the network exceeds the AVC rated short circuit an upstream breaker must be used to limit the fault current.

Short time withstand current rating ( $I_{cw}$ ) for PCS100 AVC-20 is 2000% for 200 ms, however any fault current exceeding this value and less than or equal to the  $I_{cc}$  (interrupt rating/conditional short-circuit current) value shall be equipped with instantaneous tripping circuit breaker protection such as ABB Tmax XT series breakers.

If required, the ABB factory can provide assistance with sizing appropriate protection.

The PCS100 AVC-20 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.

## Arc Fault and Protection

### Recommendation

Arc faults may happen due to unexpected occurrences and are often triggered by a service person with consequently high risk of harm from the arc. Arcs can cause lethal injury from burns, pressure and flying debris. Generally, the risk is in proportion to the energy of the fault current and time of exposure. ABB highly recommends MCCB or ACB for arc protection.

Due to the high levels of released energy and excessive heat it is highly recommended that personal protective equipment is used when working around live equipment.

## Maintenance Bypass

ABB recommends that a maintenance bypass (not supplied with the PCS100 AVC-20) is fitted. The maintenance bypass allows maintenance to be performed on the PCS100 AVC-20 without disruption to the load.

ABB requires the input and output breakers of a maintenance bypass to be lockable for an ABB service personnel to carry out any work on the PCS100 AVC-20. Please note that ABB LV breakers do not provide this as standard but as an option.

## Floor Requirements

All enclosures must be installed on a horizontal fireproof surface.

Do not exceed  $\pm 0.2^\circ$  change in slope between adjacent enclosures.

Do not exceed  $\pm 5$  mm in elevation between adjacent enclosures.

## Location

The PCS100 AVC-20 is designed for location in a restricted access location only.

The PCS100 AVC-20 is designed for connection by fixed wiring.

The PCS100 AVC-20 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.

## Power System

The PCS100 AVC-20 is designed for TN-S power system where the upstream transformer provides neutral the load may require. Consult the factory for use in other earthing system.

## Electromagnetic Compatibility (EMC)

The PCS100 AVC-20 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.

## Harmonics

The PCS100 AVC-20 is designed to tolerate disturbances such as voltage and current harmonics in the load or supply. Excessive distortion can lead to the stressing of components leading to reduction in the lifetime of the rectifier and inverter modules.

ABB recommends the harmonic contents on the input and the output of the system to meet IEC 61000-2-4 Class 2, THD<sub>v</sub> up to 8%. Contact the factory for THD<sub>v</sub> > 8% as the lifetime of components may be affected.

## Downstream Capacitor Banks

A care must be taken when installing the PCS100 AVC-20 with a capacitor bank downstream of the system. ABB recommends the capacitor bank to be installed upstream of the PCS100 AVC-20. Contact ABB for more information.

## Cooling

For PCS100 AVC-20 particular application losses for cooling system sizing please see the PCS100 AVC-20 sizing tool.

## SERVICE AND TECHNICAL SUPPORT

ABB Power Conditioning 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

- 24 x 365 local support line
- 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 lifetime.

### 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 system. 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
- Internal bypass design increases reliability and availability and is part of a proven family of global ABB products
- Scalable building block design

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## ADDITIONAL DOCUMENTS

Document Number	Document Name
2UCD280000E001	PCS100 AVC-20 User Manual
2UCD280000E003	PCS100 AVC-20 Installation Checklist
2UCD280000E004	PCS100 AVC-20 Commissioning Checklist
2UCD280000E410	PCS100 AVC-20 Maintenance Schedule
2UCD070000E025	AVC in TT Power Systems AN
2UCD200000E007	PCS100 Environment Specification





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