
TECHNICAL CATALOGUE

PCS100 SFC

Static Frequency Converter



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	PCS120 MV UPS Medium Voltage 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	PCS100 SFC Static Frequency Converter
	Frequency fluctuation	

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Power schemes are different – the problem

Around the world there are many different power systems, while different voltages can easily be rectified, changing frequency typically from 50 Hz to 60 Hz or vice versa is much more difficult.

The PCS100 Static Frequency Converter is the ideal solution for addressing that exact issue, it takes the standard grid supply and converts it to the desired frequency and voltage using static technology meaning there are no large moving masses using an efficient proven platform.

The PCS100 SFC is highly configurable for different size options from 125 kVA up to 2 MVA, even larger systems are possible as multiple units can be paralleled if required. Also incorporated in the PCS100 SFC are industry standard control interfaces for easy integration into existing installations.

This Technical Catalogue will guide the reader through the product selection and will give examples of system requirements and space required.



PCS100 SFC – Static Frequency Converter

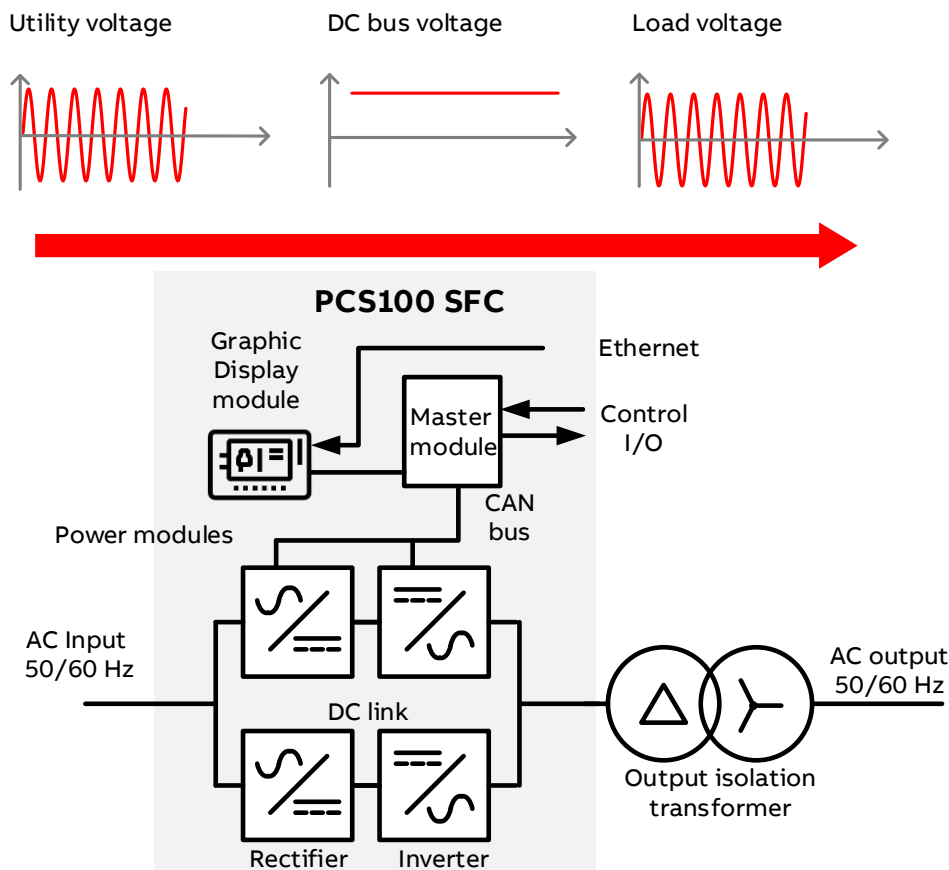
The PCS100 Static Frequency Converter (PCS100 SFC), allows connection of 60 Hz powered equipment to a 50 Hz supply network and 50 Hz powered equipment to a 60 Hz supply network. Additionally, the PCS100 SFC can if required, convert the supply voltage to a different voltage to match the requirement of the load.

The system functions by converting the input AC power through a sine-wave rectifier to a DC link and then through an AC sine-wave inverter to produce a clean, full sine-wave output at the new frequency and voltage. For correct operation of the power electronics an isolation transformer is required as part of the PCS100 SFC system. The isolation transformer can be applied to the input or output of the PCS100 SFC.

The PCS100 SFC system is constructed using power electronic modules. These state of the art modules operate as rectifiers to source sinusoidal current from the supply, and inverters to reproduce the AC waveforms on the output.

The primary user interface is via a door mounted touch screen Graphical Display Module (GDM). The display is intuitive and is navigated by touching on the desired menu buttons and provides easy access to event logs, parameter settings, etc.

System monitoring is possible by connection to a PLC (via the digital and analog I/O) or connection to a computer based SCADA package using TCP/IP Ethernet serial communications.



Features



- Thoroughly proven advanced IGBT technology
- Compact design, high power density
- Modular design, self-contained independent rectifier and inverter modules
- No moving elements – low maintenance
- High reliability and availability
- Precise output frequency generation
- Bi-directional power flow
- Good maintainability and serviceability,
- Excellent Mean Time To Repair (MTTR)
- Unique 'Ride-through' on module failure or fault, continual operation with reduced capacity
- Remote monitoring and control through Ethernet, Modbus TCP/IP protocols

PCS100 SFC - functional blocks

A PCS100 SFC System consists of the following sub-assemblies:

- Input circuit protection (not required on all models)
- Rectifier Power Modules
- Inverter Power Modules
- Isolation transformer (sold separately to the PCS100 SFC converter)



Input Circuit Breakers

Where multiple enclosures of PCS100 SFC modules are needed to construct the required size converter, circuit breakers are fitted to the input of the PCS100 SFC. The function of these circuit breakers is to protect the cabling inside the individual cabinets. Overload protection is performed electronically via the power electronics control. Therefore, there will be one circuit breaker fitted on the input for each full size converter cabinet.

For smaller PCS100 SFC units consisting of up to four module pairs input, breakers are not included. Suitable protection should be installed in the supply feeding the PCS100 SFC in this case.

Note: input circuit breakers are not available for rack PCS100 SFC and must be supplied by the integrator.



PCS100 SFC - functional blocks - cont.

Rectifiers & Inverters

The PCS100 SFC is constructed using pairs of rectifier and inverter power modules (module pairs). The rectifier modules convert the incoming three phase AC voltage into a regulated DC voltage. The DC voltage is then supplied to the inverter modules to be re-created into AC voltage at a different frequency.

Depending on requirements, between one and sixteen replaceable ABB PCS100 module pairs are used. The modules are highly integrated and can behave independently. That is, if one module fails, it will automatically be withdrawn from service while the remaining modules continue to run. This provides redundancy (at reduced capacity) and very high availability for the PCS100 SFC.

The ABB PCS100 SFC system includes a master controller that is located in one of the enclosures. The master controls all power modules and provides communication functionality to the PCS100 SFC's GDM touchscreen and external serial networks.



Isolation Transformer

The purpose of the isolation transformer is to:

- match voltage to the utility and load's requirement. *The PCS100 SFC voltage is nominally 480 Vac*
- transform the 3-wire inverter source into a 4-wire source
- isolate the power module common-mode voltage from the utility & load.

An isolation transformer is required either on the input or output of the PCS100 SFC converter for the above reasons.

More detail on specifying isolation transformers can be found in ABB document 2UCD030000E003 PCS100 SFC Transformer Technical Specification.

PCS100 SFC – control features

Power Module Redundancy Feature

One unique feature critical to the reliability of the converted output supply is the built-in redundancy capability which is an intrinsic feature of the modular system design. In an unlikely event where either a single rectifier or inverter module encounters a fault and stop functioning, the master controller that oversees the rectifier/inverter module pairs will reduce the output capacity to the available remaining working rectifier/inverter module pairs.

This reduction of capacity is transparent as typically the converter is not running at full load. The load will not be shed, but it will be transferred seamlessly to the remaining module pairs in the converter. To illustrate the function a 2000kVA PCS100 SFC has 16 pairs of rectifier/inverter modules. A rectifier module failure will result in the controller automatically transferring the load to the remaining 15 pairs of rectifier/inverters. Only the maximum output of the converter is hence reduced by 1/16 or 6.25%.

The PCS100 Advanced Redundancy feature represents a further milestone of power electronics reliability and availability improvements.

- Reduces power output in a failure only by a small fraction of the total system power
- Enables built in n+1 configurations by adding a spare module to achieve breakthrough levels in power availability.
- Allows flexible planning of converter repair/faulty module replacement.

Parallel load sharing

The PCS100 SFC is extremely flexible with regard to paralleling with other voltage sources, either other generators or multiple PCS100 SFC units. Parallel load sharing is achieved using frequency and voltage droop profiles programmed into the converter. This allows the converters to share power with other systems without the need for any additional communication signals. In addition, SFC converters of different power ratings can be paralleled, with each one delivering the same percentage of its rated power as required by the load.

Power Flow control

Using the advanced power flow control capabilities of the PCS100 SFC provides the ability

to control the power flow from one AC grid to another AC grid. This feature is especially useful for interfacing co-gen plants to the grid, where the flow of power to and from the grid must be controlled. Both real and reactive power flow can be controlled in either direction using a variety of control interfaces. More flexibility is available with +A100 Extended I/O card with is available as a standard PCS100 option.

Automatic Output Synchronisation

Where two or more PCS100 SFC units are paralleled together, or the PCS100 SFC is connected to an AC bus with other generators, starting the PCS100 SFC into the live bus is greatly simplified due to the automatic output synchronisation feature. Using this feature whenever an PCS100 SFC is issued the run command it will first check its output to see if there is a live bus connected (for example when changing from generator supply onboard a vessel to PCS100 SFC supply). If the output of the PCS100 SFC is live, then the PCS100 SFC controller will first phase lock to this exact voltage and frequency before enabling the inverter modules. This enables a full seamless transfer from generator supply to PCS100 SFC supply on the output bus. If the output bus is dead when the PCS100 SFC is given a start command it will ramp up the voltage over 1 second, providing a soft energising of the output.

Remote Synchronisation

In addition to the automatic output synchronisation feature the PCS100 SFC also has a dedicated voltage sensing input to allow the converter to synchronise its output to any other three phase voltage reference. This feature is particularly useful where two separate busses must be synchronised before connecting them together i.e. closing a bus tie breaker on a vessel switchboard.

Output Short Circuit Protection

Should a short circuit occur on the PCS100 SFC output the converter automatically provides current limiting to 200% of nominal current for 2 seconds. This allows discrimination with downstream protection. If the fault is still present after 2 seconds the PCS100 SFC will trip offline to avoid damage.

Technical specification

Utility - Input	
Voltage	380 – 480V ± 10% (or any voltage with input transformer)
Maximum supply voltage	110%
Nominal supply frequency	50 or 60 Hz
Frequency tolerance	± 5 Hz
Power system	3 phase center ground referenced (TN-S)
Overvoltage category	III
Fault capacity	Refer to the model tables shown in this document
Current Harmonics	<3% THDi (at rated load)
Power Factor	Unity
Load - Output	
Capacity Rating	125 kVA to 2000 kVA 0.9pf (higher power with parallel units)
Voltage	380 – 480 V (or any voltage with output transformer)
Frequency	50 or 60 Hz (consult factory for other frequencies)
Voltage Harmonics	<2.5% THDv (linear load)
Overload Capability	120% for 10 mins* 150% for 30 seconds
Short circuit current limit	200% for 2 seconds
Voltage Accuracy	+/- 1%
Frequency Accuracy	+/- 0.1%
Performance	
Efficiency	95% Typically
General	
Enclosure IP rating	IP20 Cabinet or Rack IP42 Cabinet only
User interface	10.1 inch touch screen
Pollution degree rating	2
Operating temperature	0 – 40 °C
Cooling	Forced air
Temperature derating	Above 40 °C derate by 2% load per °C to a maximum of 50 °C
Capacity derating with elevation	-1.0 % / 100 m for application above 1000 m. 2000 m maximum
Humidity	< 95% non - condensing
Noise	75 – 85 dBA typically
Standards	ISO 9001 Quality Assurance System IEC62103 / EN 50178; CE Mark Marine classifications by request DV, DNV, GL, ABS, CCS (++)
Environmental	CISPR 11 class A
Control interface	
Digital inputs (voltage free contacts)	Start Stop / Reset Running (NO)
Digital outputs (relay outputs)	Warning (NO) Fault (NC)
Relay output ratings	230 Vac 1 A
Enclosures	
Materials	Electro-galvanized steel
Colour	RAL 7035
Enclosure Access	Hinged doors with key lock – cabinets only

*From 75% preload

Power module type

PCS100 03 - 09 **F** - LH

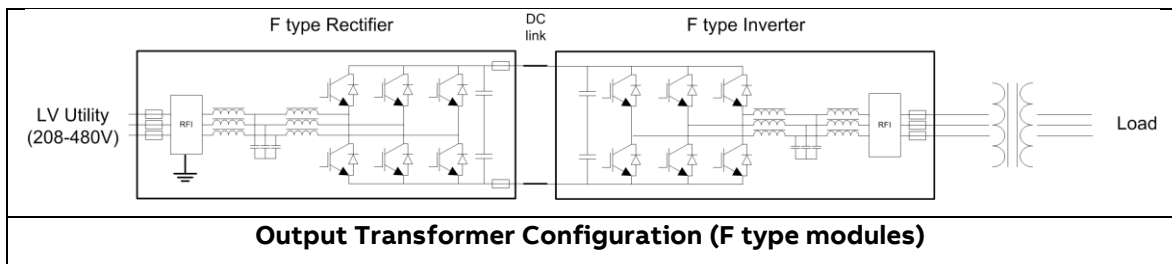
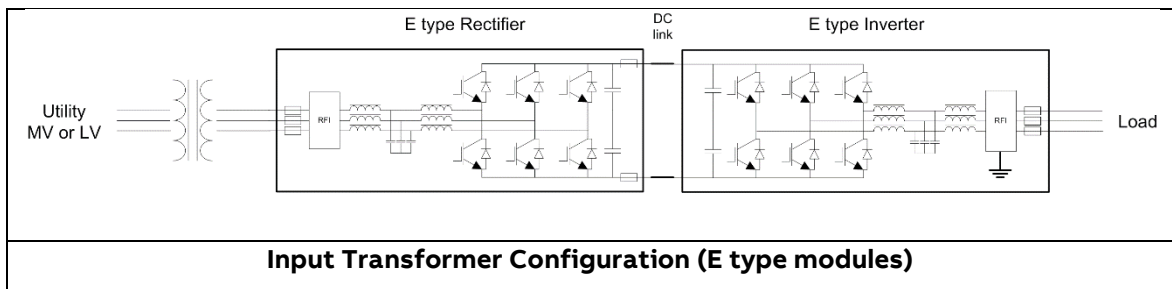
All PCS100 products use the same LV power modules which employ IGBT's and integrated sinusoidal filters. The AC and DC power connections of each module are protected by high speed semiconductor fuses. Multiple modules are connected in parallel to provide higher power.

Two module types can be specified for PCS100 SFC converters that corresponds to the location of the isolation transformer. An isolation transformer is required at either the input or output of the PCS100 SFC for correct operation. The converter must be ordered and constructed according to the specified transformer location.

E – Input Isolation Transformer systems (RFI Floating Rectifier, Grounded Inverter)

F – Output Isolation Transformer systems (RFI Grounded Rectifier, Floating Inverter)

Note: the transformer winding connected to the SFC power terminals (input or output) will during operation have a large amount of common mode voltage present during normal operation – no other devices can be powered from this point as they would most likely be destroyed.

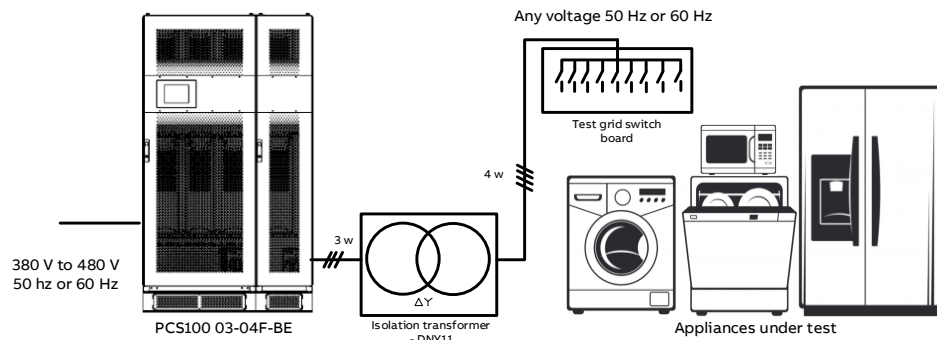


Selecting transformer configuration

Industrial application

When the incoming supply voltage is between 380 Vac and 480 Vac, using an output transformer will give the most flexible output configuration. This will enable the customer to utilize either 3 wire or 4 wire output and give a choice of flexible earthing options.

An additional input transformer may be required if voltage matching is required, this must be Delta – Star with a solidly grounded star point to create a TN network supply. This is the best and recommended configuration for the PCS100 SFC.

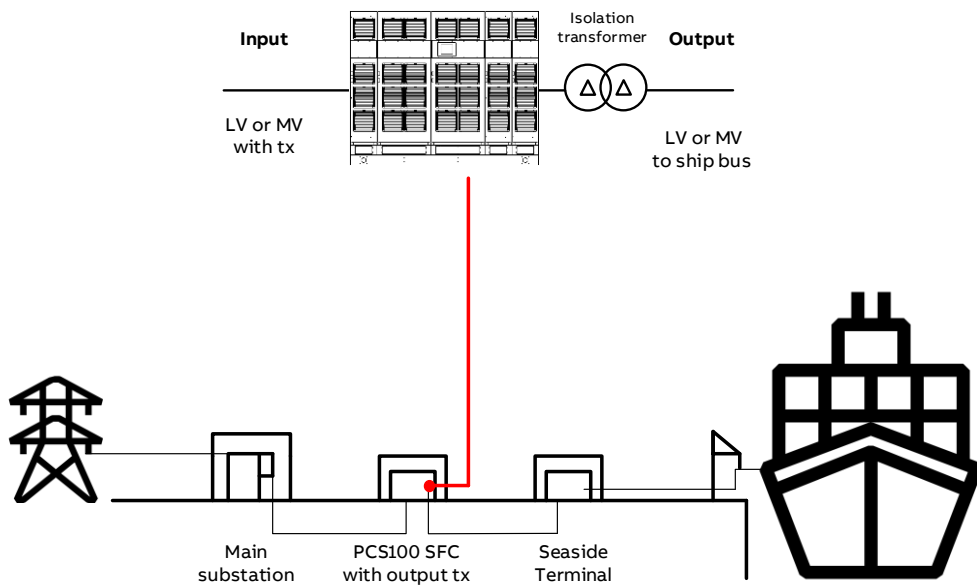


Industrial application example – appliance testing for export market

Shore to ship (Converter on harbor side)

When supplying power to berthed vessels, it is recommended that the PCS100 SFC has an output transformer. The transformer will not only provide voltage matching and isolation of the common mode voltages generated by the converter but also

very importantly galvanic isolation for the ship from the shore earth. The isolation is required to eliminate earth currents that cause galvanic corrosion between the ship's hull and other metal objects.

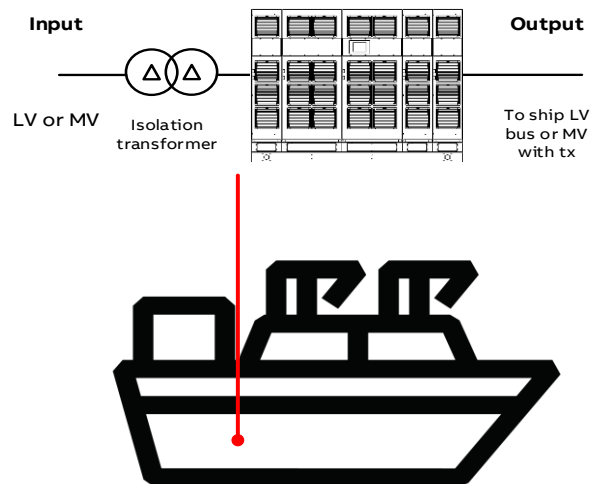


On-board Shore Power

When a converter is installed on board to provide power conversion from the shore supply, a transformer must be provisioned on the input side of the frequency converter. The transformer will not only provide voltage matching and isolation of the common mode voltages generated by the converter but also very importantly galvanic isolation from the shore earth. Galvanic isolation from the shore earth is required to eliminate the earth currents that cause galvanic corrosion between the ship's hull and other metal objects.

An additional transformer may be required on the output if voltage matching or a neutral is required.

Note: unless a static balancer is employed on the output, in this configuration the PCS100 SFC is not referenced to ground, therefore an earth leakage monitoring device will be required to trip the converter off line if earth faults are detected. Please see document 2UCD030000E005 for more information.



Specifying transformer

The PCS100 SFC requires a TN network. The most common and recommended transformer configuration is using an output transformer with DYN11 vector group and F type modules (with input RFI grounded rectifiers). This gives the PCS100 a solid ground reference where no additional earth fault detection is required and also allows single phase loads to utilize the converted power.

In general, there is nothing special about the PCS100 SFC transformers (except an EMC screen) and any quality transformer manufacturer will be able to provide a suitable solution. Please see ABB document 2UCD030000E003 for more detailed information.

Sizing Transformers

When specifying a transformer, the engineer must be aware and take in to account the required power output of the PCS100 SFC. If you are using an Input transformer with E type modules (inverter RFI ground) allowance must be made for the converter losses which will be around 5%. If both an input and output transformer is employed, allowance must also be made for the additional losses of the additional transformer.

If using an output transformer (rectifier RFI grounded) allowance must be made for internal transformer losses. Also, be aware the rated power is rated at the PCS100 SFC output terminals, not after transformer losses.

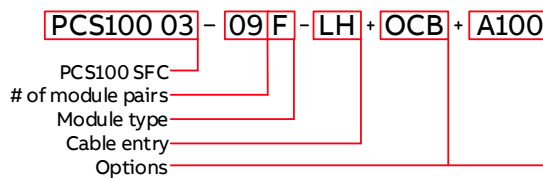
How to select a PCS100 SFC

This catalogue has been designed to make it easy to select an PCS100 SFC that best fits site requirements. The following information is all that is required.

- Utility Voltage (V) and Utility Frequency (Hz)
- Load Capacity (kVA) and kW *or* kVA *and* pf
- Load Frequency
- Ambient operating data
- IP rating requirements

Type Code

The above information is used to determine the type code using the sizing tool. The following diagram outlines the structure of the type code.



Type Code Parameters:

Number of module pairs

This is the number of Rectifier and Inverter pairs required to achieve the output power required. The modules are current rated at 150 A. The kVA of the system is dependent on the operating voltage. At nominal operating voltage (480 V) the available power is 125 kVA per module pair.

Module type

Depending on location of the isolation transformer this will be either *E* for inverter grounded RFI (input tx) or *F* for rectifier grounded RFI (output tx – factory preferred option).

Cable entry

This is typically *LH* for left hand input, *RH* for right hand input termination cabinet. Entry to the termination cabinet is via the bottom. For PCS100 SFC PCS100 03-04x and smaller entry is via the bottom only as they don't have termination cabinets.

Options

Various options are available as listed below

- +A100 – extend I/O expansion card
- +IP42 –IP42 cabinets for ingress protection
- +OCB – Output Circuit Breakers
- +Txxx – xxx kVA Transformer

PCS100 SFC Sizing Tool

ABB provides a Windows based PC application, the PCS100 SFC Sizing Tool that can be used to dimension the correct PCS100 SFC model required for your application.



The tool is intuitive to use, simply enter the load kVA, pf, input voltage with over and under voltage range expected, output voltage, input and output frequency and desired transformer configuration for electrical input. Environmental data is required to calculate any de-rating for altitude, or temperature, into the results. Product options are also required to complete the type code.

The type code is calculated and displayed on the right-hand panel.

The expected output kVA, kW and efficiency of the system are displayed.

Note: the kVA/kW of the system is as **measured on the converter terminals**, no allowance has been made for output transformer losses.

PCS100 SFC model range

PCS100 03 - 09 F - LH

Different model ratings are defined by the number of power module pairs (rectifier and inverter) used to construct the system. The table below summarizes the PCS100 SFC product range.

Ratings are for a typical PCS100 SFC system with;

- 400 Vac & 480 Vac +/- 10% input voltage
- 480 Vac output voltage
- 40°C max ambient temperature
- <1000 m ASL

Output continuous operation			Overload 150% for 30 seconds		Type code	Module pairs	
A	kVA @ 480V	kVA @ 400 V	kVA @ 480V	kVA @ 400 V	A		
150	125	109	188	164	225	PCS100 03-01	1
300	250	218	375	327	450	PCS100 03-02	2
450	375	327	563	491	675	PCS100 03-03	3
600	500	436	750	654	900	PCS100 03-04	4
750	625	545	938	818	1125	PCS100 03-05	5
900	750	654	1125	981	1350	PCS100 03-06	6
1050	875	763	1313	1145	1575	PCS100 03-07	7
1200	1000	872	1500	1308	1800	PCS100 03-08	8
1350	1125	981	1688	1472	2025	PCS100 03-09	9
1500	1250	1090	1875	1635	2250	PCS100 03-10	10
1650	1375	1199	2063	1799	2475	PCS100 03-11	11
1800	1500	1308	2250	1962	2700	PCS100 03-12	12
1950	1625	1417	2438	2126	2925	PCS100 03-13	13
2100	1750	1526	2625	2289	3150	PCS100 03-14	14
2250	1875	1635	2813	2453	3375	PCS100 03-15	15
2400	2000	1744	3000	2616	3600	PCS100 03-16	16

PCS100-03-05 and larger (with termination cabinets) have been designed with a fault rating of 65kA. Internal cabinets and the associated wiring are protected by the internal MCCB's.

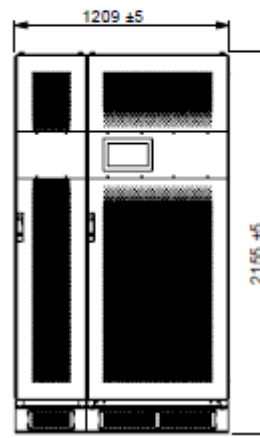
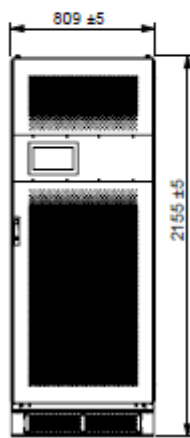
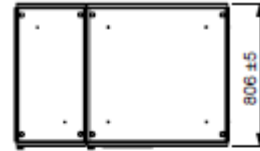
Smaller units must be protected from the switch board with a current limiting MCCB with Issc set to less than 5 x PCS100 SFC current

Layout plans & dimensions

Cabinet Layout Plans

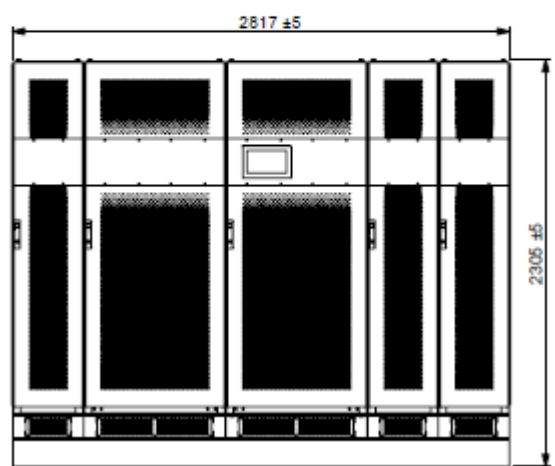
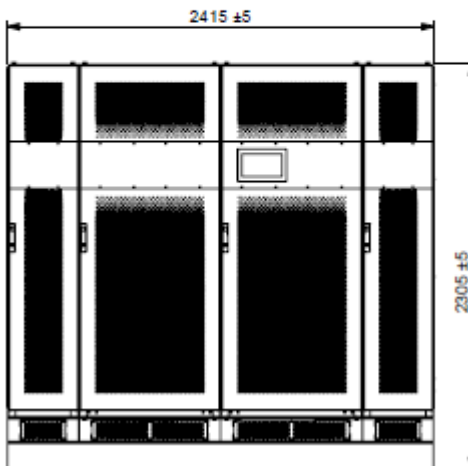
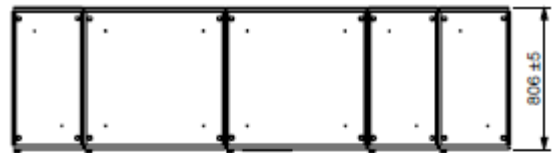
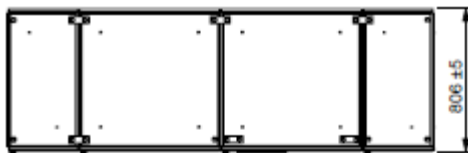
The following plans relate to the standard layout of all PCS100 SFC sizes. Shown are only IP20

cabinets, for IP42 option add an extra 100mm to the depth of the cabinet.



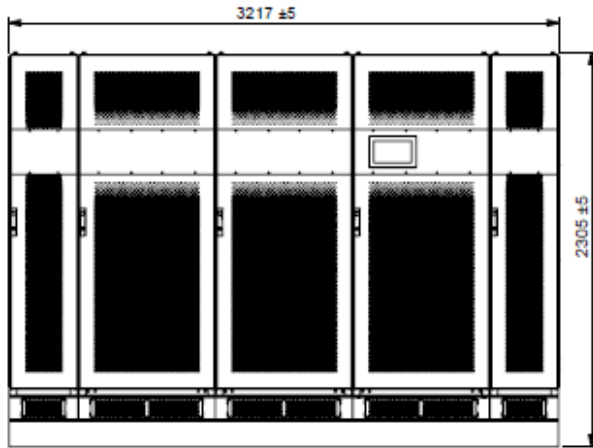
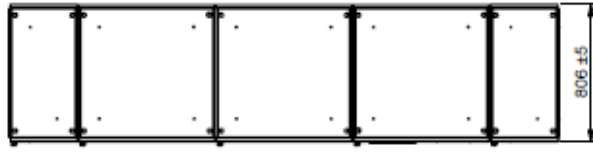
PCS100 03-01* - PCS100 03-03*

PCS100 03-04

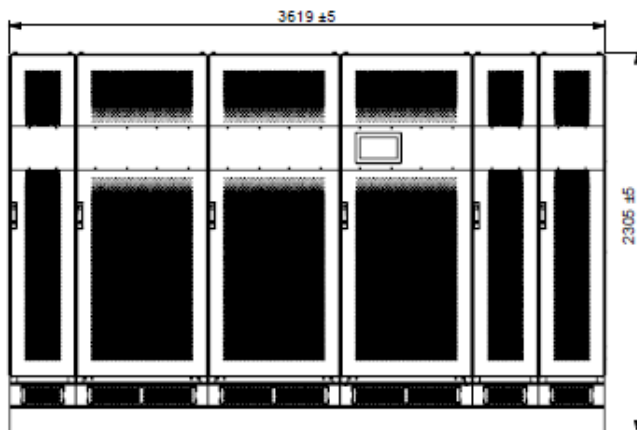
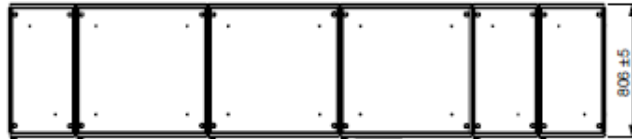


PCS100 03-05* - PCS100 03-06*

PCS100 03-07*

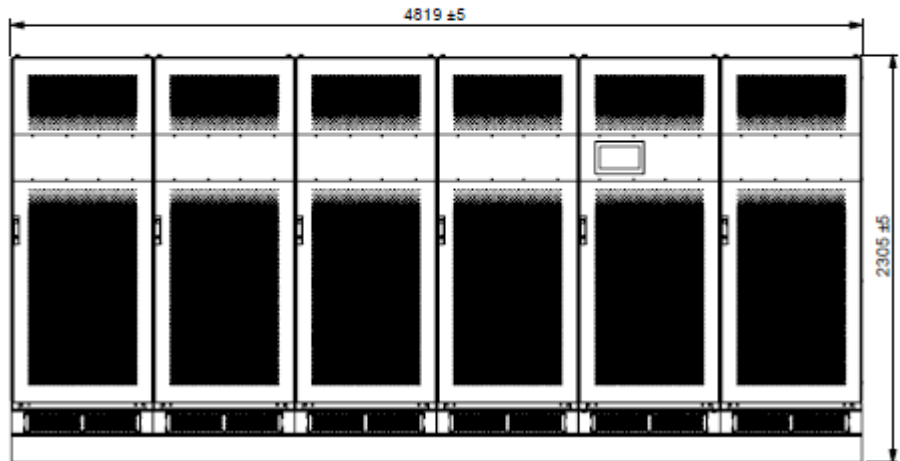
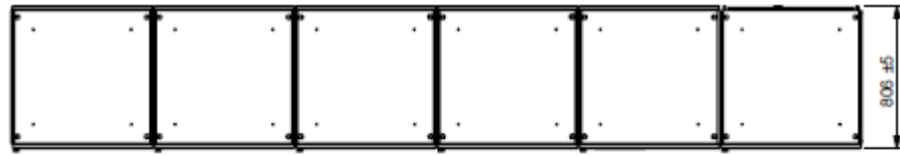


PCS100 03-08* - PCS100 03-09*

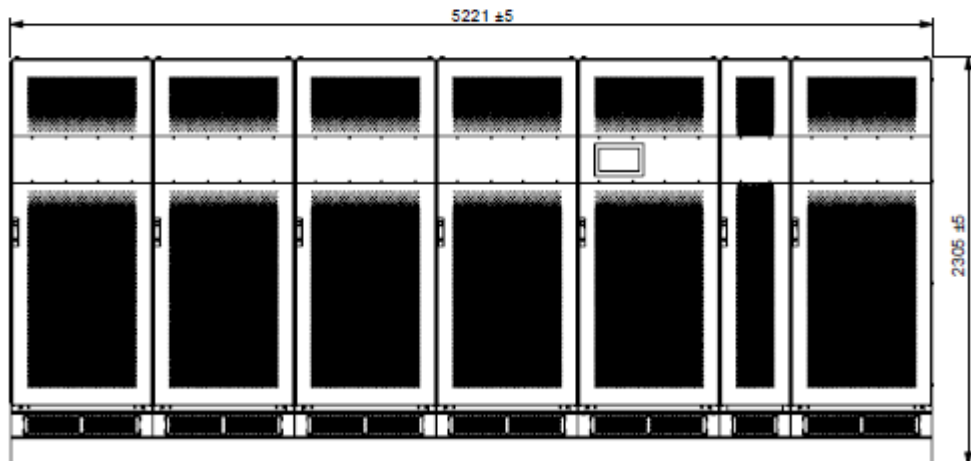
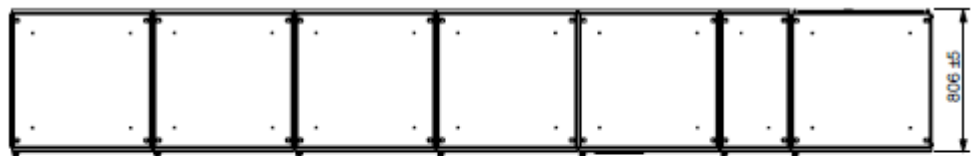


PCS100 03-10*

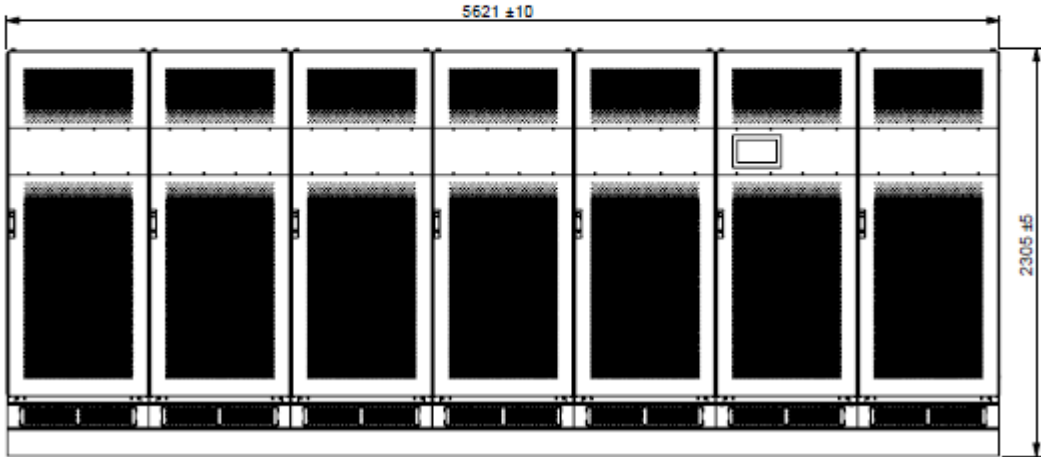
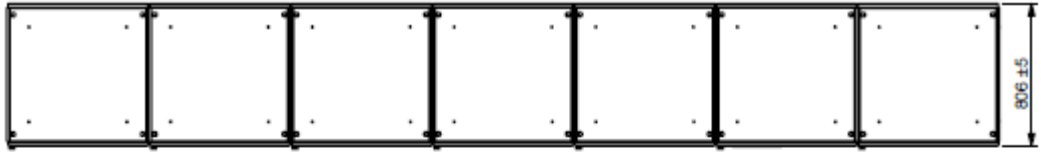
Layout plans & dimensions – cont.



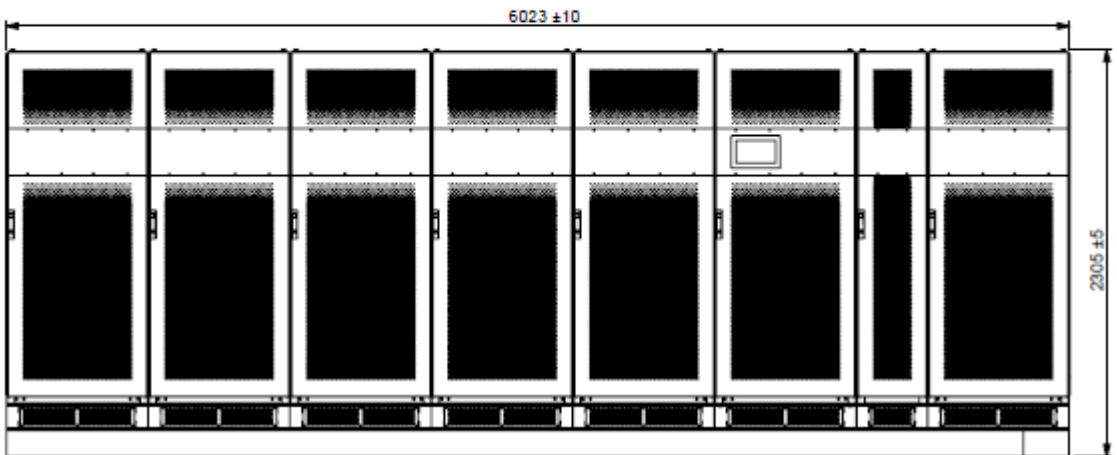
PCS100 03-11* - PCS100 03-12*



PCS100 03-13*



PCS100 03-15*



PCS100 03-16*

Weights & dimensions

The following tables show the weights and dimensions of the controller enclosures.

Model	H x W x D	Weight	Heat Dissipation	Air Flow	
	mm	kg	kW	M3/hr	CFM
PCS100 03-01E/F-BE	2154x809x804	441 (860 ¹)	6.3	1200	707
PCS100 03-02E/F-BE	2154x809x804	601	12.5	2400	1414
PCS100 03-03E/F-BE	2154x809x804	761	18.8	3600	2120
PCS100 03-04E/F-BE	2154x1209x804	987	25	4800	2827
PCS100 03-05E/F-BE	2304x2409x804	1772	31.3	6000	3524
PCS100 03-06E/F-BE	2304x2409x804	1932	37.5	7200	4241
PCS100 03-07E/F-BE	2304x2809x804	2308	43.8	8400	4948
PCS100 03-08E/F-BE	2304x3209x804	2586	50	9600	5654
PCS100 03-09E/F-BE	2304x3209x804	2746	56	10800	6361
PCS100 03-10E/F-BE	2304x3609x804	3407	62.5	12000	7068
PCS100 03-11E/F-BE	2304x4809x804	3700	69	13200	7775
PCS100 03-12E/F-BE	2304x4809x804	3860	75	14400	8482
PCS100 03-13E/F-BE	2304x5209x804	4248	81	15600	9188
PCS100 03-14E/F-BE	2304x5609x804	4550	87.5	16800	9895
PCS100 03-15E/F-BE	2304x5609x804	4710	94	18000	10602
PCS100 03-16E/F-BE	2304x6009x804	5102	100	19200	11309

¹Including inbuilt transformer

Rack format

Rack format is available for easy containerisation

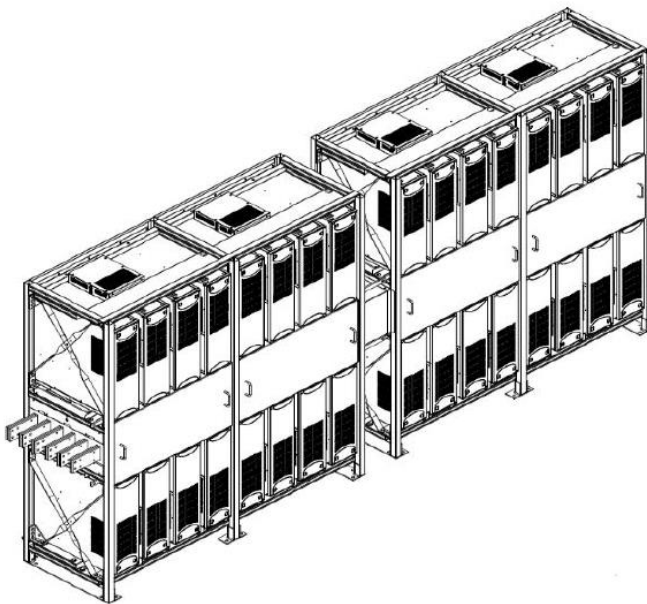
The racks have 2 different footprints of 1000 mm x 800 mm per section for 1 to 4 module pairs and 2000 mm x 800 mm for 5 to 8 module pairs. Empty slots will be covered by a blanking plate. The modules are installed in 2 levels with AC busbars and DC links running between the 2 levels. Busbars can be terminated to either end of the rack. Usually a termination cabinet containing AC breakers is installed by the system integrator.

The master controller, GDM and interface assembly are supplied loose for integration in to a control cabinet.

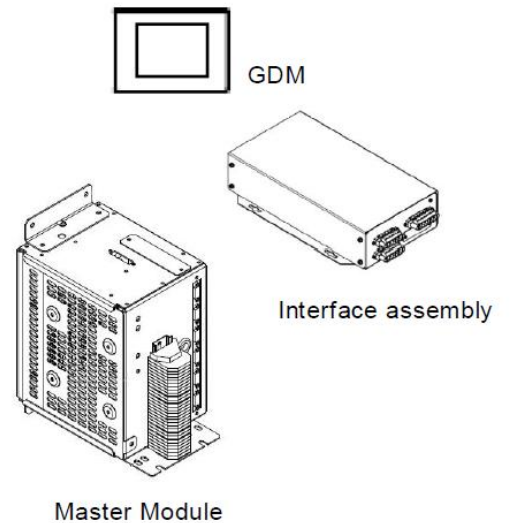
Aux supplies of 230 Vac and 26.5 Vdc must be provided by the integrator. Please see ABB document 2UCD000420E003 Auxiliary Power Supplies for PCS100 Rack Systems for more detailed information

The 1000 mm or 2000 mm racks come completely assembled. If more than one rack is required they need to be joined using the flexible busbars and hardware supplied.

Suitable cabling for voltage and current feedback and auxiliary power etc. must be locally sourced.

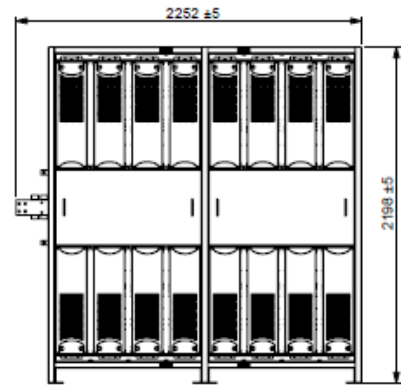
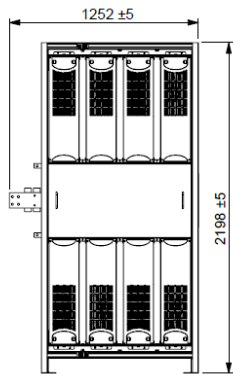
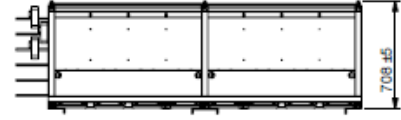
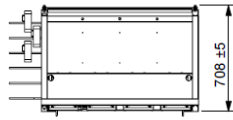


16 module pair rack



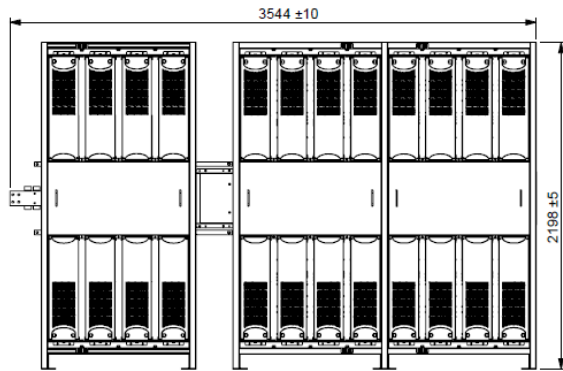
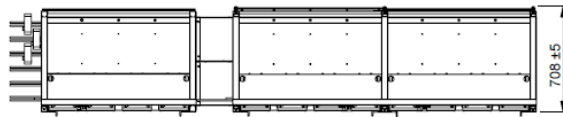
Layout plans & dimensions

Rack layout plans



PCS100 03-04*

PCS100 03-05* - PCS100 03-08*



PCS100 03-09* - PCS100 03-12*

PCS100 03-09* - PCS100 03-12* created using a 1M rack and a 2M rack.



PCS100 03-13* - PCS100 03-16*

Weights and dimensions

Dimensions ¹ H x W x D mm	Weight kg	Heat Dissipation kW	Air Flow		Number of module pairs
			M3/hr	CFM	
2000x1041x703	842	25	4800	2827	4
2000x2041x703	1081	31.3	6000	3524	5
2000x2041x703	1224	37.5	7200	4241	6
2000x2041x703	1366	43.8	8400	4948	7
2000x2041x703	1508	50	9600	5654	8
2000x3332x703	1928	56	10800	6361	9
2000x3332x703	2065	62.5	12000	7068	10
2000x3332x703	2208	69	13200	7775	11
2000x3332x703	2350	75	14400	8482	12
2000x4332x703	2589	81	15600	9188	13
2000x4332x703	2732	87.5	16800	9895	14
2000x4332x703	2874	94	18000	10602	15
2000x4332x703	3016	100	19200	11309	16

¹Measurements excluding protruding busbars (approx. 210mm)

Termination locations

PCS100 03 - 09 F - LH

PCS100 03 - 09 F - B27

Input termination location cabinets

The following options are available for the location of the input connection:

PCS100 03-01 to PCS100 03-04 models have input and output via bottom entry only (BE).

PCS100 03-05 to PCS100 03-16 have the option to place the input at either the left hand (LH) end of the converter, or the right hand (RH) end of the converter (when viewed from the front). The output connection is always at the opposite end to the input connection. Note: connection to the termination cabinets is through the bottom.

Input output terminations location Rack

Bxx – Standard rack in 1 row, a rack can have up to 4 sections of 1000mm width

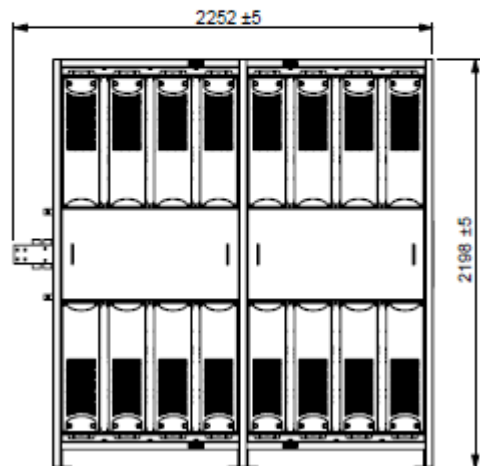
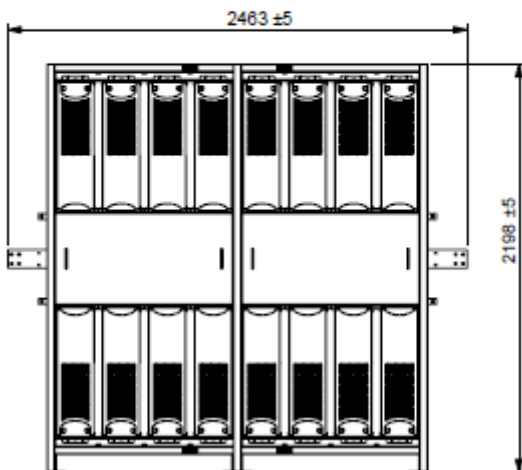
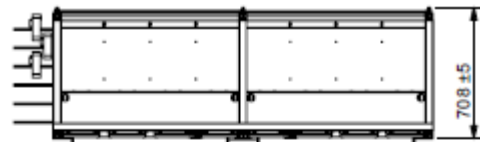
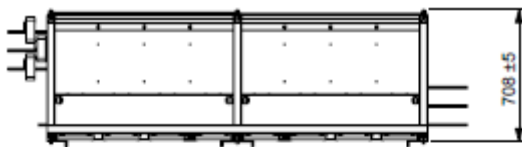
Bxx – number of 1000mm sections, 4 module pairs B1x, 5 – 8 module pairs B2x, 16 module pairs B4x etc.

Bxx – AC terminations of rack system.

LH AC termination Bx5, RH AC termination Bx6

LH input and RH output Bx7

RH input and LH output Bx8



PCS100-03-08F-B28

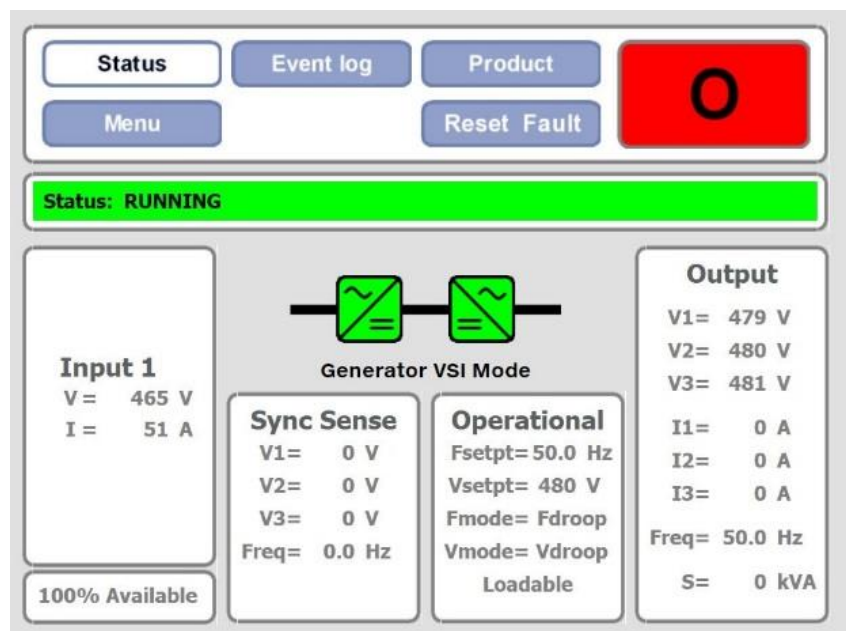
PCS100-03-08F-B25

User interface

Graphic Display Module

The primary user interface for configuration of the PCS100 SFC 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 SFC, 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.

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



Remote monitoring

The GDM provides remote access for monitoring purpose. 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

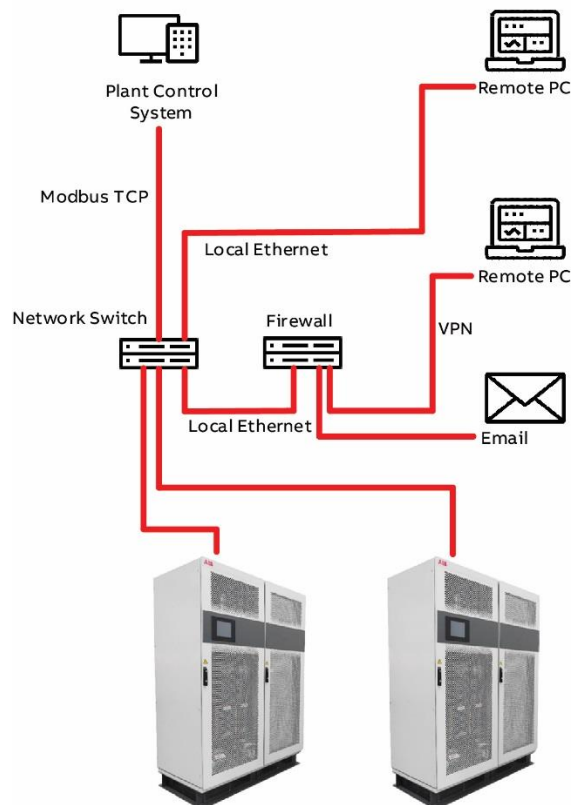
The Remote Web Pages are a set of web pages that are similar in format to the standard GDM and can viewed with any standard web browser on a device connected to the same network. Through this interface the users can remotely access the status and operating parameters. Viewing and downloading of the event 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.

Modbus RTU

Modbus RTU is available with the optional +A100 extend I/O card. This enables both Read and write access to the PCS100 SFC.



User connections

Power Connection

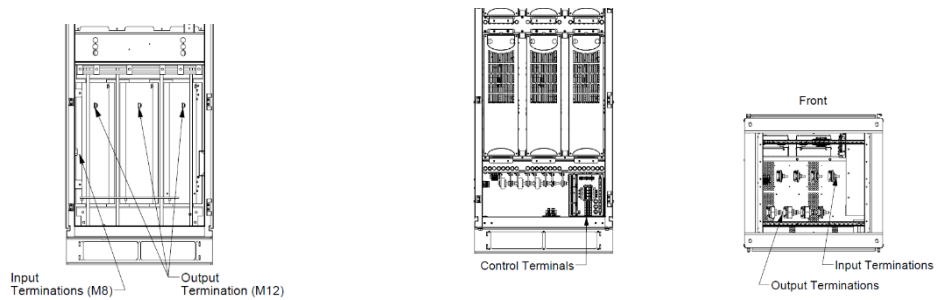
The PCS100 SFC power connections are dependent on the model ordered.

For models up to PCS100 03-04* the power connections are bottom entry (BE) direct to terminals at the bottom of the cabinet.

Larger models have termination cabinets where

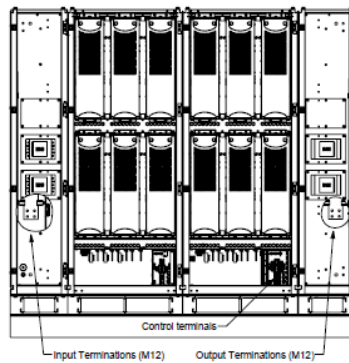
the input can be configured for either the left hand (LH) or the right hand (RH) sides through the bottom of the termination cabinets.

Note for PCS100 03-01F-BE with an internal transformer the terminations are on the terminals on the inside wall of the converter cabinet and on the transformer terminals.

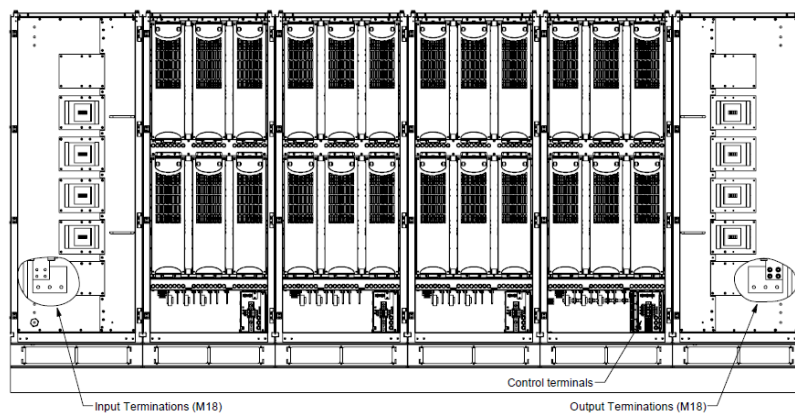


PCS100 03-01F-BE+T125

PCS100 03-03F-BE



PCS100 03-06F-LH+OCB



PCS100 03-15F-RH+OCB

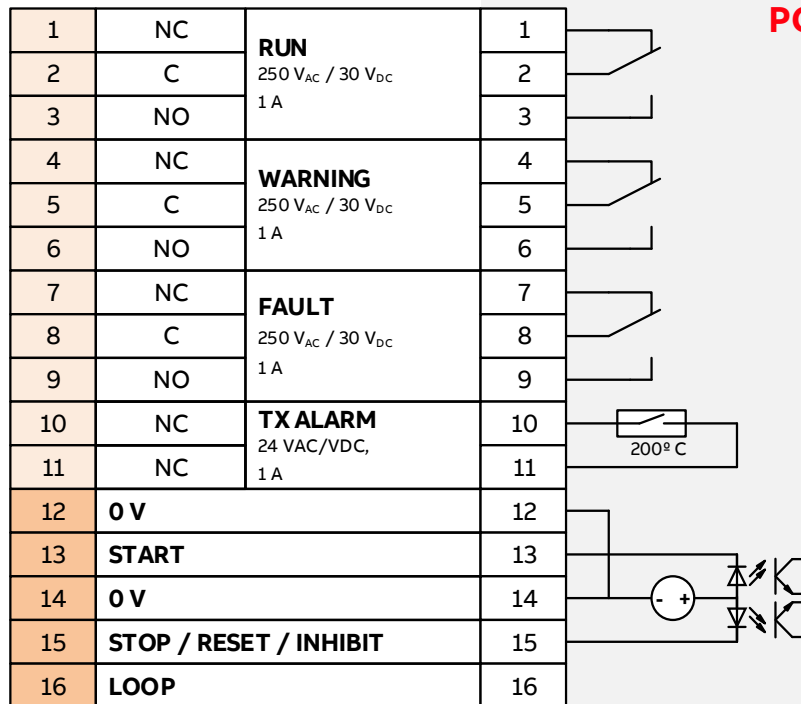
Control connections

Control Connections

The PCS100 SFC 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 SFC status information 250 V _{AC} /30 V _{DC} , 1 A
1 Isolated Thermal Switch	Transformer over temperature information 24 V _{DC} /24 V _{AC} , 1 A Normally closed (NC) contact
2 Digital Inputs	PCS100 SFC Remote control Start/Stop/Inhibit Dry contacts

Customer Monitoring and Alarm Systems



PCS100 SFC

Options

PCS100 03 - 09 F - LH + OCB + A100

+A100 Extended I/O board

Additional I/O is possible by adding the Extended I/O board options. This board connects to the internal PCS100 CAN bus and provides the following I/O connections.



Analog Inputs	
Quantity	2
Quantity	-10 to +10V, Rin>200kΩ
Current signal	4 to 20mA, Rin = 100Ω
Maximum delay	10mS
Resolution	0.1%
Accuracy	+/- 2%

Analog Outputs	
Quantity	2
Voltage signal	-10 to +10 V
Current signal	4 to 20 mA, load < 500 Ω
Maximum delay	50 mS
Accuracy	+/- 2 %

Digital Inputs	
Quantity	7
Voltage signal	24Vdc with internal or external supply, PNP & NPN
Input impedance	25kΩ
Maximum delay	10mS

Thermal Trip Inputs	
Quantity	1
Type	PTC

Serial Communication	
Type	MODBUS RTU

Typical applications

- Remote synchronization command and feedback
- Providing a dedicated overload relay
- Providing an analogue converter power output signal
- Full remote control via MODBUS

Options – cont.

Increased IP rating (cabinet version only)

A higher IP rating is possible for the PCS100 SFC.

+IP42 - Louver panels and 1mm IP42 screens are fitted to the cabinet's front and rear. Cabinet depth increases by 100mm from the standard IP20 depth.

Output circuit breakers (cabinet version only)

+OCB - Output circuit breakers are optional for PCS100 SFC systems constructed with 5 or more module pairs (these systems are also fitted with input circuit breakers as standard). Outputs breakers may be fitted for several reasons;

- To protect the output of the PCS100 SFC in case there are other generating sources connected in parallel to the PCS100 SFC output, and
- To provide a means of isolating sections of the PCS100 SFC via opening the input and output circuit breakers.

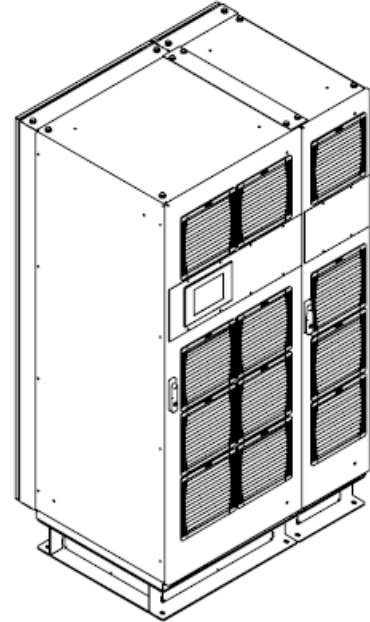
Note: Isolation by opening circuit breakers only may not meet local electrical safety regulations as required for maintenance.

Output circuit breakers are not required for overload protection. This is performed electronically via the power electronics control.

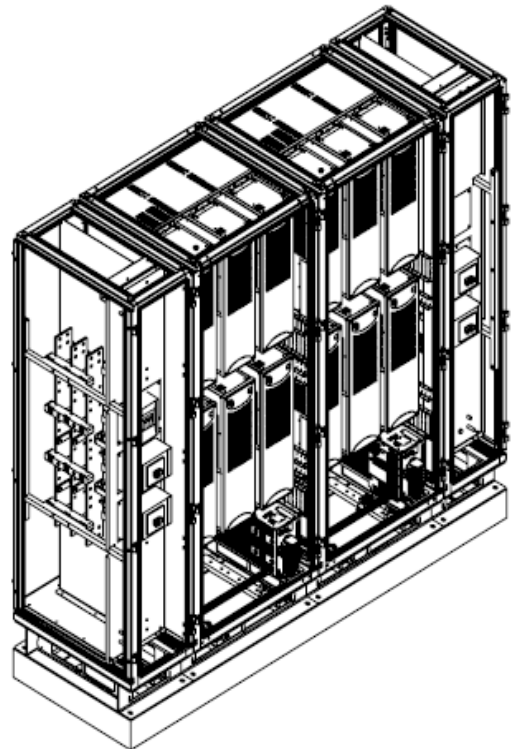
Where other generating sources are connected in parallel with the PCS100 SFC output (this could be diesel generators, power grids or micro grids) output circuit breakers should be specified.

With parallel PCS100 SFC configurations the total short circuit capacity of the output needs to be considered. Since the PCS100 SFC has built in short-circuit current limiting, output circuit breakers are only necessary where the short circuit current is greater than 8kA.

Note: +OCB valid for models PCS100 03-05 and larger*



PCS100 03-04F-BE+IP42



PCS100 03-06F-LH+OCB (covers removed)

Isolation transformer

The PCS100 must always operate together with a dedicated isolation transformer to isolate the common mode noise generated by the converters and to provide voltage matching. Low voltage transformers up to 500 kVA can be ordered with the converter from the factory. Larger transformers are best sourced via the local ABB office.

See 2UCD0300003E003 for more details.

- **+T125** Transformer up to 125kVA rating for the PCS100 03-01 model.

This transformer fits in the lower half of the cabinet.

Transformers T250 to T500 are housed inside separate IP42 Enclosures.

- **+T250** 250kVA transformer inside a 1200 x 800 x 2150mm cabinet
- **+T375** 375kVA transformer inside a 1200 x 800 x 2150mm cabinet
- **+T500** 500kVA transformer inside a 1200 x 1200 x 2150mm cabinet

Transformer Specification

Capacity Rating	100% of PCS100 SFC rating
Type	Dry – Core is laminated transformer steel, windings are copper. Earthed core.
Insulation	Class N insulation (200°C)
Typical Impedance	5%

Neutral generating transformers

Note: - These transformers are also called static balancers or zigzag transformers

For input transformer configurations the output of the PCS100 SFC converter is three phase three wire. If a neutral is required there are two ways to achieve this;

- Add an output delta / star transformer
- Add a neutral generating transformer

If isolation is not required on the output, a neutral generating transformer is the most economic.

This transformer connects to the PCS100 SFC output and creates a neutral point from the three phases. Transformers are dual rated for 50Hz and 60Hz operation, 400 V / 50Hz, 440 & 480V / 60Hz.

- + TZ10 - 500A Neutral transformer inside a 800 x 800 x 2150mm IP42
- + TZ10 - 1000A Neutral transformer inside a 1200 x 800 x 2150mm IP42

Installation requirements

Input Circuit Protection

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

Upstream protection must be coordinated with the system rated load current and the fault current withstand capacity.

Depending on the model of PCS100 SFC there may be circuit breakers built in to the converter for internal protection of the converter cabinets. The individual PCS100 power electronic modules include fuse protection.

PCS100 SFC PCS100 03-04x or smaller requires a MCCB to both provide short circuit and arc fault protection. Overload protection must not be set greater than the PCS100 SFC load current.

PCS100 SFC PCS100 03-05x or larger require either a MCCB or an ACB on the incoming supply. The maximum recommended fault capacity of the supply is 65kA for PCS100-05-05x or larger.

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 ± 5 mm in elevation between adjacent enclosures.

Electromagnetic Compatibility (EMC)

The PCS100 SFC 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.

Location

The PCS100 SFC is designed for location in a restricted access location only.

The PCS100 SFC is designed for connection by fixed wiring.

The PCS100 SFC 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 SFC 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.

Harmonics

The PCS100 SFC 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_V up to 8%.

Contact the factory for THD_V > 8% as the lifetime of components may be affected.

Transformer losses

The system demarcations are on the PCS100 SFC terminals. All power calculations, voltages and currents are as at the PCS100 SFC terminals. No allowances have been made for cable or transformer magnetizing currents, heat losses or impedances.

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 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 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
- Scalable building block design

Additional documents

Document Number	Document Name
2UCD030000E001	PCS100 SFC User Manual
2UCD030000E003	PCS100 SFC Transformer Technical Specification
2UCD030000E005	PCS100 SFC Ground fault detection
2UCD200000E007	PCS100 Environment Specification
2UCD000420E003	Auxiliary Power Supplies for PCS100 Rack Systems



Notes



Notes



Notes



ABB Limited

Power conditioning products

Email: powerconditioning@abb.com

Visit: <https://new.abb.com/power-converters-inverters/grid-interconnections/industrial/pcs100-sfc>