BUYLOG SECTION 18

Power conditioning

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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.

Features

- **Continuous ±20% online regulation**
  Response in 250 microseconds and full regulation in less than 20 milliseconds
- **Sophisticated control software**
  Based on 20 years voltage conditioning industry experience
- **Modular construction**
  Proven PCS100 power converter platform, with more than 1000 MVA installed base, enabling fast and easy maintenance
- **Very high efficiency**
  Typically >99% even on partial loading
- **Small footprint**
  Industry leading power density
- **Connectivity**
  Ethernet, Modbus TCP, integrated web server, and e-mail notifications
- **Multilingual graphical touch screen interface**
  Simple user controls, easy to understand event log and voltage event data logging
- **Industrial design**
  Rugged overload capability, industrial grade fault capacity, and design for typical industrial loads
- **Regenerative load support**
  Bidirectional power module design enables support for regenerative loads such as lifts and cranes
- **Internal bypass**
  Redundant internal bypass design enabling continuous load supply in case of PCS100 AVC-20 fault

PCS100 AVC-20

Technical specification

Utility - Input	
Power range	250 – 3000 kVA
Rated voltage	400 V – application range 380 – 415 V[1]
Maximum continuous supply voltage	130%
Nominal supply frequency	50 or 60 Hz
Frequency tolerance	± 5 Hz
Power system	3 phase + Neutral (4-Wire)[2] Center ground referenced (TN-S)
Overvoltage category	III
Fault capacity	Refer to the model tables shown on page 18-6
Outage – control ride through	600 ms
Harmonics[3]	IEC 61000-2-4 Class 2 (THDv < 8%)

Load - Output	
Voltage	To match nominal input voltage[4]
Equivalent series impedance	< 4% (model specific)
Displacement power factor	0 lagging to 0.9 leading[5]
Crest factor	3.0
Overload capability from 100% supply voltage	150% for 30 s, once every 500 s

Performance	
Efficiency	Typically > 99%
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%

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

Injection transformer	
Transformer type	Dry
Insulation	IEC 60085 Thermal class 200
Frequency	50 Hz and 60 Hz
Vector group	Diii (delta + 3 independent windings)

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

Enclosure	
Enclosure rating	IP20
Material	Electro-galvanized steel
Panel thickness Side and rear Door	 1.5 mm 2 mm
Finish	Standard epoxy-polyester powder coating textured finish
Color	RAL7035
Enclosure access	Hinged doors with key lock

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

User interface	
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

Power quality event monitor	
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	Web server
Remote notification	E-mail

Standards and certifications	
Quality	ISO 9001
Environmental	ISO 14001
Marking	CE, C-Tick
Safety	IEC 62103
Electromagnetic compatibility	Emissions: CISPR 11 Class A Group 1 Immunity: IEC 61000-6-2
Performance	IEC 61000-4-34

[1] Application voltage lower than the rated voltage results in power derating. Consult the rating tables for more information.
[2] Neutral provided by supply transformer if required by the load
[3] 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.
[4] Output voltage can be adjusted by ±10% with 0.1% steps
[5] Consult the factory if there is a power factor correction unit downstream

PCS100 AVC-20

Model range

400 V and 415 V Application voltage

Rated apparent power kVA	Rated real power kW		Fault capacity kA	Losses kW[1]	Efficiency %[1]	Airflow m3/min	Frame size	Type code Place R for right termination side or L for left termination side instead of x
400 V, 415 V Utility voltage	±15% regulation	±20% regulation						
250	250	187	15	1.8	99.3	18	1B	PCS100-28-400-0B5-20
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 apparent power kVA	Rated real power kW		Fault capacity kA	Losses kW[1]	Efficiency %[1]	Airflow m3/min	Frame size	Type code Place R for right termination side or L for left termination side instead of x
400 V, 415 V Utility voltage	±15% regulation	±20% regulation						
237	237	177	15	1.8	99.3	18	1B	PCS100-28-400-0B5-20
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

[1]Typical value

PCS100 AVC-40

Active voltage conditioner for sag correction

The PCS100 AVC-40 is an active voltage conditioner. It is a high performance power electronic system designed for industrial and large commercial applications. It responds instantly to power quality events, providing continuous regulation of voltage.

With high power capacity, the PCS100 AVC-40 is the perfect solution for industrial loads using significant power as well as large commercial buildings where continuity of service is paramount. The PCS100 AVC-40 is designed to target voltage sag events while also providing protection against swells. Sag events are the major cause of lost production.

Features

- No energy storage
  - Increased system reliability with minimized maintenance
- Very high efficiency
- Continuous online regulation
- Industrial design
- Small footprint
  - Industry leading power density
- Regenerative load support
- Internal bypass
  - Redundant internal bypass design
- Connectivity
  - Ethernet
  - Modbus TCP
  - Integrated web server
  - E-mail notifications
- Multilingual graphical touch screen interface

PCS100 AVC-40

Technical specification

Utility – Input	
Power range	150 – 3600 kVA
Voltage (model specific)	220 V – 480 V, 3-phase
Nominal supply frequency	50 Hz or 60 Hz

Load - Output	
Voltage	To match nominal input voltage
Displacement power factor	0 lagging to 0.9 leading
Efficiency	Typically >98%
Sag correction response	Initial < 250 µs, complete < ½ cycle
Voltage regulation accuracy	±1% typical, ±2% maximum
Sag correction accuracy	±4%
Continuous regulation range	±10%
Sag correction capability	40%
Overload capability	150% for 30 seconds, once every 500 seconds
Bypass overload capacity	125% for 10 minutes, 150% for 1 minute, 500% for 1 second, 2000% for 200 ms

Environmental	
Operating temperature range	0° C to 50° C 32° F to 122° F
Noise	<75 dBA @ 2m
Enclosure rating	IP20

User interface	
User interface	10.1” color touch panel, multilingual
Touch panel	Full parameter control, system event log, voltage event log
Communication	Ethernet, Modbus TCP, E-mail

Standards and certifications	
Quality	ISO 9001
Environmental	ISO 14001
Marking	CE, C-Tick
Safety	IEC 62103
Electromagnetic compatibility	Emissions: CISPR 11 Class A Group 1 Immunity: IEC 61000-6-2
Performance	IEC 61000-4-34

PCS100 AVC-40

Model range

220 V Utility voltages

Rated power kVA		Rated input current A[1]	Rated output current A	Fault capacity kA	Losses kW[2]	Efficiency %[2]	Airflow m3/min	Frame size	Type code Place R for right termination side or L for left termination side instead of x
220 V	208 V								
150	142	459	394	31.5	5.0	96.7	18	1B	PCS100-07-220-0B5-40-x
225	213	686	591	31.5	6.5	97.2	18	1B	PCS100-07-220-0B75-40-x
300	284	905	788	31.5	7.1	97.7	18	1B	PCS100-07-220-01B-40-x
450	425	1350	1181	40	9.7	97.9	36	2B	PCS100-07-220-01B5-40-x
600	567	1791	1575	40	11.8	98.1	36	2B	PCS100-07-220-02B-40-x
750	709	2239	1969	50	14.5	98.1	54	3B	PCS100-07-220-02B5-40-x
900	851	2679	2362	50	16.4	98.2	54	3B	PCS100-07-220-03B-40-x
1200	1135	3567	3150	80	20.7	98.3	72	4B	PCS100-07-220-04B-40-x
1500	1418	4450	3937	100	25.2	98.4	90	5B	PCS100-07-220-05B-40-x
1800	1702	5331	4724	100	29.1	98.4	108	6B	PCS100-07-220-06B-40-x

400 V Utility voltages

Rated power kVA		Rated input current A[1]	Rated output current A	Fault capacity kA	Losses kW[2]	Efficiency %[2]	Airflow m3/min	Frame size	Type code Place R for right termination side or L for left termination side instead of x
400, 415 V	380 V								
150	142	253	217	15	4.7	96.9	18	1B	PCS100-07-400-0B5-40-x
225	213	377	325	15	6.1	97.3	18	1B	PCS100-07-400-0B75-40-x
300	285	498	433	15	6.6	97.8	18	1B	PCS100-07-400-01B-40-x
450	427	742	650	31.5	8.9	98.1	36	2B	PCS100-07-400-01B5-40-x
600	570	985	867	31.5	10.8	98.2	36	2B	PCS100-07-400-02B-40-x
750	712	1232	1083	31.5	13.5	98.2	54	3B	PCS100-07-400-02B5-40-x
900	855	1474	1300	31.5	15.2	98.4	54	3B	PCS100-07-400-03B-40-x
1200	1140	1962	1733	40	19.1	98.5	72	4B	PCS100-07-400-04B-40-x
1500	1425	2448	2166	50	23.3	98.5	90	5B	PCS100-07-400-05B-40-x
1800	1710	2932	2599	63	26.8	98.6	108	6B	PCS100-07-400-06B-40-x
2400	2280	3849	3465	65	36.3	98.5	144	8B	PCS100-07-400-08B-40-x
3000	2850	4920	4331	65	47.7	98.4	180	10B	PCS100-07-400-10B-40-x
3600	3420	5774	5197	65	60.3	98.3	216	12B	PCS100-07-400-12B-40-x

480 V Utility voltages

Rated power kVA		Rated input current A[1]	Rated output current A	Fault capacity kA	Losses kW[2]	Efficiency %[2]	Airflow m3/min	Frame size	Type code Place R for right termination side or L for left termination side instead of x
480 V	440 V								
150	138	211	180	20	4.7	96.9	18	1B	PCS100-07-480-0B5-40-x
225	206	315	271	20	6.1	97.3	18	1B	PCS100-07-480-0B75-40-x
300	275	415	361	20	6.6	97.8	18	1B	PCS100-07-480-01B-40-x
450	413	619	542	25	8.9	98.1	36	2B	PCS100-07-480-01B5-40-x
600	550	821	722	25	10.8	98.2	36	2B	PCS100-07-480-02B-40-x
750	688	1026	903	25	13.5	98.2	54	3B	PCS100-07-480-02B5-40-x
900	825	1228	1083	25	15.2	98.4	54	3B	PCS100-07-480-03B-40-x
1200	1100	1635	1444	40	19.1	98.5	72	4B	PCS100-07-480-04B-40-x
1500	1375	2040	1805	40	23.3	98.5	90	5B	PCS100-07-480-05B-40-x
1800	1650	2444	2166	50	26.8	98.6	108	6B	PCS100-07-480-06B-40-x
2400	2200	3290	2887	65	34.1	98.6	144	8B	PCS100-07-480-08B-40-x
3000	2750	4110	3609	65	44.3	98.5	180	10B	PCS100-07-480-10B-40-x
3600	3300	4940	4331	65	55.4	98.5	216	12B	PCS100-07-480-12B-40-x

[1] At 90% utility voltage
[2] Typical value

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 continual operation with reduced capacity
- Remote monitoring and control through Ethernet, Modbus TCP/IP protocols

PCS100-SFC

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[1] 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	1SO 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
Digital outputs (relay outputs)	Running (NO) Warning (NO) Fault (NC)
Relay output ratings	230 Vac 1 A

Enclosures	
Materials	Electro-galvanized steel
Color	RAL 7035
Enclosure access	Hinged doors with key lock – cabinets only

[1]From 75% preload

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.