

Chloride CROSS Rack 16 A, 32 A and 63 A

STS Catalogue





Chloride CROSS Rack

High Voltage and Low Voltage

**2 Pole Complete Reliability On-line Static Switch
16 A, 32 A and 63 A**



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1 Scope

This specification describes the Chloride CROSS Rack series of single-phase, two-pole static switches with manual maintenance bypass switch, together with information regarding the products' electrical and mechanical features. Chloride CROSS Rack is optimized for installation in 19" standard rack cabinets; the vertical rack space occupation is 2 U for all models and the protection degree is IP20 (i.e. no openings are present on the top or bottom of the Chloride CROSS Rack enclosure). The air cooling is front-to-back and is obtained using fully redundant monitored fans. All of these features make Chloride CROSS Rack the ideal solution for rack-level power protection in modern data centers, ensuring maximum reliability to critical loads by eliminating system failures caused by issues in distribution rather than by the failure of the power source itself.

1.1 The system

Chloride CROSS Rack ensures redundant power to critical loads through the ability to switch between two alternative single-phase power sources. Switching will occur whenever the line supplying the load no longer falls within the acceptable tolerance values. Chloride CROSS Rack operates in Fixed Priority Mode, in which the user selects the preferred input line, allowing the Chloride CROSS Rack to transfer to the priority line whenever its parameters fall within acceptable values.

Chloride CROSS Rack will function so that the transfer between the two sources will be break-before-make (BBM) on both poles, thus ensuring that the two sources will never be directly connected.

Chloride CROSS Rack will ensure switching between independent AC power sources in both synchronous and asynchronous conditions. When the two lines are synchronous,

Chloride CROSS Rack will transfer between the sources within a maximum of 6 ms following a line failure. In asynchronous conditions transfer will occur as described in section 2.2.1. The acceptable phase angle difference between the two lines for asynchronous transfers will be within a 15° range and selectable by the user.

In order to maximize reliability, Chloride CROSS Rack's control logic will be redundant and minimize the use of common components. Chloride CROSS Rack will rely on front to back, forced and fully redundant cooling.

1.2 Models available

Chloride CROSS Rack includes models with single-phase input and single-phase output, available in two versions the High Voltage model (HV) referring to a nominal voltage of 230 V and the Low Voltage model (LV) referring to a nominal voltage of 120 V, as specified below in Table 1.

MODEL	Current (A)	Input	Output
Chloride CROSS Rack HV 16	16	Single-phase	Single-phase
Chloride CROSS Rack HV 32	32	Single-phase	Single-phase
Chloride CROSS Rack HV 63	63	Single-phase	Single-phase
Chloride CROSS Rack LV 16	16	Single-phase	Single-phase
Chloride CROSS Rack LV 32	32	Single-phase	Single-phase
Chloride CROSS Rack LV 63	63	Single-phase	Single-phase

Table 1. Chloride CROSS Rack Models
Nominal currents are intended as continuous and may apply to any type of linear and non linear load (maximum crest factor 3:1)

2 System Control

The advanced control logic of Chloride CROSS Rack provides the highest safety for the load through a break-before-make switching in any mode of operation. All of the power supplies and Silicon Controlled Rectifier (SCR) firing circuits are completely redundant. The coloured LED on the front panel of the Chloride CROSS Rack shall provide a simple and immediate indication of the operational state of the system. For a more detailed and complete description of diagnostics, see section 4.2.

2.1 Mode of operation

The Chloride CROSS Rack will attribute a priority to one of the two sources. The priority source will be selected from the front panel by pressing push-button P. The selected source will be indicated by the corresponding LED (S1 or S2). The selected priority source will continuously supply the load provided it remains within the tolerance windows. Failure of the priority source will initiate transfer of the load to the reserve (low priority) source. When the priority line returns within the acceptable tolerance window, the load will automatically be transferred back to the priority line following a brief re-transfer time. In the event of both sources falling outside the acceptable tolerance windows, Chloride CROSS Rack can be programmed according to the desired behavior (remain on source1, remain on source2, open both static switches).

2.2 Transfer modes

The Chloride CROSS Rack will perform a break-before-make switching under any condition.

Operating modes are described as follows:

2.2.1 Line failure transfer

Switching occurs if the characteristic parameters of the active power source (preferred or alternative) supplying the load fall outside defined limits. The parameters tested are the root mean square (RMS) and instantaneous values of the voltage, which must remain within a defined acceptance window. Once the parameters of the power source have returned to normal, if the load is supplied by the source selected as the alternative, it is automatically transferred back to the priority source (see also 2.2.2). Where switching occurs while sources are asynchronous, it is possible to choose between transferring in the shortest period possible (6ms), as if the sources were synchronous, or introducing an additional delay (selectable between 0 and 20ms) to the normal transfer time (default condition).

2.2.2 Transfer due to re-transfer of load to priority source

In conditions where the priority source is not the one supplying the load (switching due to source fault condition or change of priority via push-button P), the Chloride CROSS Rack will automatically transfer the load to the priority source as soon as possible. Specifically, automatic switching to the priority source will occur only when the parameters of this last are within acceptable limits and when synchronization is established. If the priority source is out of limits, transfer will be effected only after it has remained stable and within limits for a

preset period (5 seconds). In the case of loss of synchronization, transfer will only take place when the phase difference between the two sources is less than a preset value (10° by default). In any event, such switching occurs only when both sources are within tolerance and synchronized (transfer is also effected during the zero current crossing control in optimum conditions). All settings and operating modes of the Chloride CROSS Rack can be easily modified or enabled by trained customer engineers.

2.3 Operation under output short circuit

The Chloride CROSS Rack will inhibit transfer whenever an output short circuit is detected, thus avoiding the transfer of the short circuit to the alternative source. The instantaneous short circuit threshold level is 3In. Only when the current falls below the threshold value and the voltage value is acceptable, does the Chloride CROSS Rack automatically reset and enable transfer.

The Chloride CROSS Rack's internal logic will inhibit transfers even if an upstream protection device trips and the current goes to zero.

2.4 Operation under overload

The Chloride CROSS Rack will be able to sustain the following overload conditions:

125%	10	min.
150%	1	min.
700%	0.6	sec.

2.5 Maintenance bypass and Hot-Swap module

The Chloride CROSS Rack is equipped with bypass switches, which allows complete maintenance while ensuring continuous power to the critical output load.

Both of the input sources can be used during the maintenance bypass operations. The switching devices ensure that the direct connection of the two sources is never possible, even in the event of an error in user operation.

The control logic will ensure that, in the event of an accidental closure of the bypass on the passive line, the Chloride CROSS Rack will transfer the load so as to avoid a permanent paralleling of the two sources, regardless of the operating modes described above. Furthermore, to ensure maintenance time is kept at a minimum (optimized <1 minute mean-time-to-repair with another CROSS Rack available as spare), the entire static module (logic and solid state power devices) can be extracted without interrupting the supply (hot-swap maintenance) after having switched the unit to manual bypass as described above. Refer to the User Manual for the detailed description of the hot-swap module maintenance.

3 Protection Devices and Control Functions

Devices to protect cables and loads must to be installed upstream and downstream of the equipment. These devices can be automatic switches, or fuses and switches, selected in conformity with the Chloride CROSS Rack current rating, the overload performance, the internal fuses described in section 3.1 and the downstream protections and loads.

3.1 Internal fuses

The Chloride CROSS Rack will be supplied with fuses on the input phase of each source (660 Vac, 100 A; pre-arching $I^2T=2050 \text{ A}^2\text{s}$, total $I^2T @ 230 \text{ V} = 3740 \text{ A}^2\text{s}$). These fuses have the sole function of protecting the subsystem and devices inside the unit itself from permanent output short circuit. Downstream protection devices will therefore have to be correctly dimensioned and coordinated.

3.2 Backfeed protection control

This feature prevents even the most remote possibility of electric shock hazards on the alternative Chloride CROSS Rack mains supply terminal (the source that is not currently supplying the load) in the event of a static switch SCR failure (SCR shorted).

The user interface includes two normally-closed voltage-free contacts. These are used to activate an external isolating device (electromechanical relays or minimum voltage tripping relays can be used) when backfeed is detected. The two external isolating devices are not included with the Chloride CROSS Rack (in conformity with Standards), and must be 2 pole, air-gap isolator devices as defined by IEC/EN 62310-1 (4.2.1.4).

3.3 Silicon Controlled Rectifier (SCR) open detector

The Chloride CROSS Rack will also be able to diagnose the fault condition Open Circuit SCR on the active line. This fault condition will result in a transfer to the passive line and inhibit further transfers.

3.4 Redundant cooling

The Chloride CROSS Rack is equipped with two fully redundant cooling fans. This feature allows extremely reliable front-to-back ventilation. Each fan is provided with a sensor which is able to detect the failure, which is then immediately communicated to the user.

4 Monitoring, Control and Communication

4.1 General

The Chloride CROSS Rack will incorporate the necessary controls, instruments and indicators to allow the operator to monitor the system status and performance, as well as to take appropriate action.

4.2 Control signals

The Chloride CROSS Rack is fitted with a control panel on the front of the unit. This includes a mimic panel and LED lights to indicate the operating status of the unit in real-time. The status of the sources, the static switches, the bypass, the load condition and the maximum operating temperature are all monitored continuously. The functions of the LED are described in section 4.3. On the control panel a push-button is also present which allows the user to set the priority between the sources and a LED which indicates the current priority.

4.3 Mimic LED display

The controls are located on the front panel (see Figure 1).

• LED 1 & 2 - Priority Source Indicator

LED 1 ON and LED 2 OFF = Priority on S1
LED 1 OFF and LED 2 ON = Priority on S2

• LED 4 Summary Alarm

This LED is illuminated under the following alarm conditions:

- If at least one source is out of tolerance

- If there is a loss of synchronization between the sources
- If the Bypass switch is closed
- If the system is in Over temperature
- If there is an Output short circuit
- If there is a general SCR fault
- If there is a blocked fan
- If the EPO is active
- If the Backfeed Detector is active

• LED 6 & 7 - Bypass Switch Status Indicators

LED ON = Bypass Switch CLOSED
LED OFF = Bypass Switch OPEN

• LED 8 & 9 - Source S1 and S2 Status Indicators

LED ON = Source OK
LED OFF = Source OUT OF TOLERANCE

• LED 10 - Loss of Synchronization Indicator

LED ON = Sources NOT SYNCHRONIZED
LED OFF = Sources SYNCHRONIZED

• LED 11 & 12 - Static Switch Status Indicator

LED ON = Static Switch CLOSED
LED OFF = Static Switch OPEN

• LED 13 - Output Alarm

LED13 ON = Switching Inhibited due to Output short circuit and/or Silicon Controlled Rectifier (SCR) open fault

4.4 Control panel

Priority selection push-button

Press to select system priority Source S1 or S2
Refer to section 2.1 for more information about the operation of Chloride CROSS Rack during Priority Selection

Reset push-button

Press to reset permanent block (see Silicon Controlled Rectifier (SCR) Open Fault Alarm)

Note: The Reset command is accepted only if both sources are within the tolerances and they are synchronized.

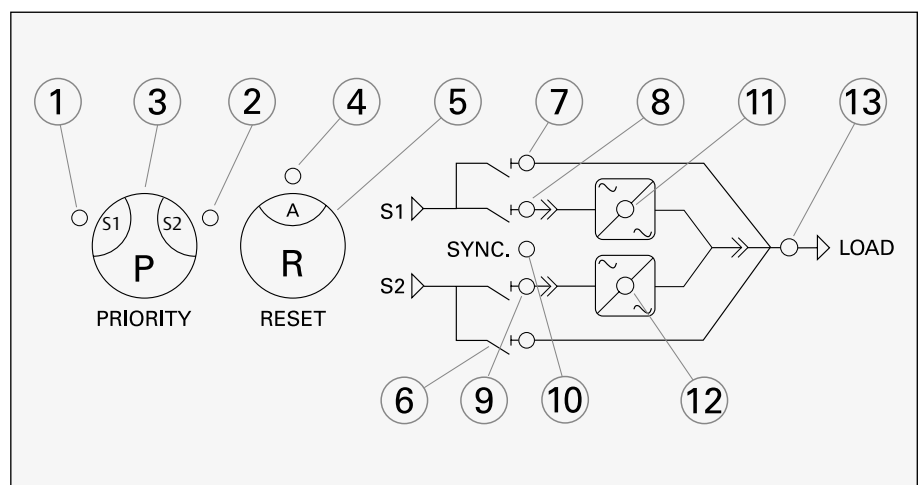


Figure 1. A view of the display and control panel

4.5 Output user signals

A summary alarm contact is available as a cable screw terminal connector, interfaced with a voltage free relay contact (NO/NC 1A 220Vac). The summary alarm is activated under the conditions described in section 4.3. for LED 4. Chloride CROSS Rack is also equipped with a full set of digital optically isolated output contacts. These contacts can be accessed from the rear panel of the unit on a 25-pin socket.

Digital Output list:

- Summary Alarm
- Priority on S1 / S2
- Output Short Circuit
- SCR-Open Fault
- System Over-temperature
- Bypass S1 Closed
- Bypass S2 Closed
- EPO Active
- S1 Out Of Tolerance
- S2 Out Of Tolerance
- Sources Synchronized
- S1 Static Switch Open/Closed
- S2 Static Switch Open/Closed

- Backfeed detector active S1
- Backfeed detector active S2
- Fan failure

Digital outputs are optoisolated signals (phototransistors); the power supply has to be provided externally (maximum current 3mA, maximum DC voltage +15V).

4.6 Input user signals

Emergency power Off (EPO). When the EPO is activated, all the static switches are opened.

5 Installation Requirements

For detailed installation requirements please refer to the User Manual. No additional space is required below or above the Chloride CROSS Rack, and no openings are present on the top or bottom of the Chloride CROSS Rack enclosure.

6 Technical Data

STS Unit		16 A	32 A	63 A
6.1				
Nominal Voltage (selectable) - HV model	(V)	230 (220/240)		
Nominal Voltage (selectable) - LV Model	(V)	120 (110/115)		
Input voltage acceptance window (tolerance ± 2)	(%)	± 12		
Input phases		Single phase (Ph + N)		
Number of switching poles		2 (Ph + N)		
Nominal frequency	(Hz)	50/60 $\pm 10\%$ ⁽¹⁾		
Nominal Current	(A)	16	32	63
Input power ports		2		
Output power ports		1		
Efficiency at Nominal Power	(%)	≥ 99		
Overload capacity				
For 10 minutes	(%)	125		
For 1 minute	(%)	150		
For 0.6 seconds	(%)	700		
SCR Characteristics				
I ² T @ Tvj = 125°C	(A ² s)	15000		
I _{TSM} @ Tvj = 125°C	(A)	1750		
Fuses				
Pre-arching I ² T	(A ² s)	660 Vac, 100A fast		
Total I ² T @ 230V	(A ² s)	2050		
		3740		
Temperature range	(°C)	0 - 40		
Synchronization range		10° (5° - 15° selectable)		
Cooling		Front to back, Forced, Fully redundant		
Transfer Mode		Break-Before-Make Switching (No source overlap)		
Transfer Time		CBEMA – ITIC compliant ⁽²⁾		
-Worst condition zero voltage source failure	(ms)	≤ 6		
-Typical zero voltage source failure	(ms)	≤ 4		
Additional transfer delay time for non-synchronous transitions	(ms)	10 $\pm$ 2 (0 - 20 selectable)		
Re-transfer time	(s)	5		
Instant Overcurrent Threshold		3 In		
Dimensions				
-Width	(mm)	19"		
-Height	(mm)	2U		
-Depth (w/o handles)	(mm)	700 mm		
Weight	(kg)	23		
Safety		CE marking, IEC/EN 62310-1		
EMC Compatibility		IEC/EN 62310-2		
Frame color	(RAL scale)	7016		
Protection degree		IP20		
Acoustic Noise	(dBA)	<45		
MTTR ⁽³⁾		<1 min		

(1) At nominal voltage.

(2) For CBEMA-ITIC curve please consult www.itic.org

(3) In the case another CROSS Rack is available on site as spare.

Notes

Chloride CROSS Rack STS 16 A, 32 A and 63 A



Notes

Ensuring The High Availability Of Mission-Critical Data And Applications.

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Locations

Emerson Network Power

Via Leonardo Da Vinci 16/18
Zona Industriale Tognana
35028 Piove di Sacco (PD) Italy
Tel: +39 049 9719 111
Fax: +39 049 5841 257

Via Fornace, 30
40023 Castel Guelfo (BO) Italy
Tel: +39 0542 632 111
Fax: +39 0542 632 120
marketing.networkpower.emea@emerson.com

United States

1050 Dearborn Drive
P.O. Box 29186
Columbus, OH 43229
Tel: +1 614 8880246

Asia

7/F, Dah Sing Financial Centre
108 Gloucester Road, Wanchai
Hong Kong
Tel: +852 2572220
Fax: +852 28029250

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