GEIS

NDC

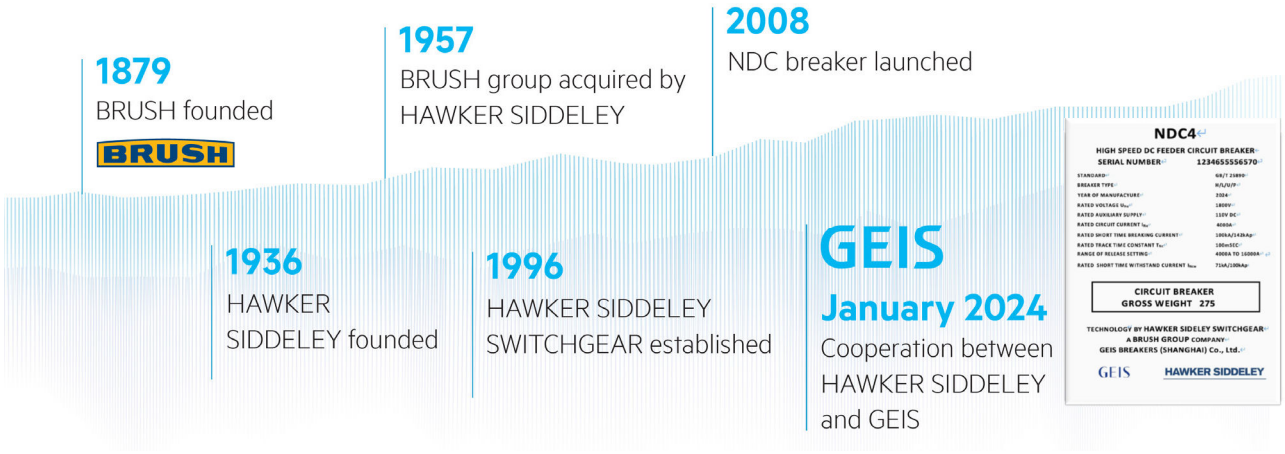
High-speed DC Circuit Breaker

GEIS Electrical Protection

Safer Smarter Greener

NDC History

- 1879-BRUSH company founded
- 1936-HAWKER SIDDELEY company founded
- 1957-The BRUSH group of companies purchased by HAWKER SIDDELEY
- 1996-Distribution business of HAWKER SIDDELEY and BRUSH merged to form HAWKER SIDDELEY SWITCHGEAR Ltd
- 2008-HAWKER SIDDELEY SWITCHGEAR Launched NDC breaker
- 2019-GE Industrial Solutions China Business Unit spin-off, and GEIS established
- 2024-HAWKER SIDDELEY SWITCHGEAR Ltd and GEIS signed strategic partnership for manufacturing NDC breaker in China, and promoting NDC with GEIS brand



NDC Application

NDC DC circuit breaker is single pole, large amperage design, fast response to the faults and high-speed breaking capacity. With the extremely high reliability and advanced design, it is widely used in DC distribution networks.

- Traction system of Rail Transit/Electric Locomotive
- DC distribution, microgrids, and large-scale energy storage system
- Power plant excitation system of generators
- Industrial systems for electrolysis, mining, or steel mills
- DC distributions for propulsion system for ships
- Research equipment as for the Institute of Particle Physics

NDC High-speed DC Circuit Breaker

NDC

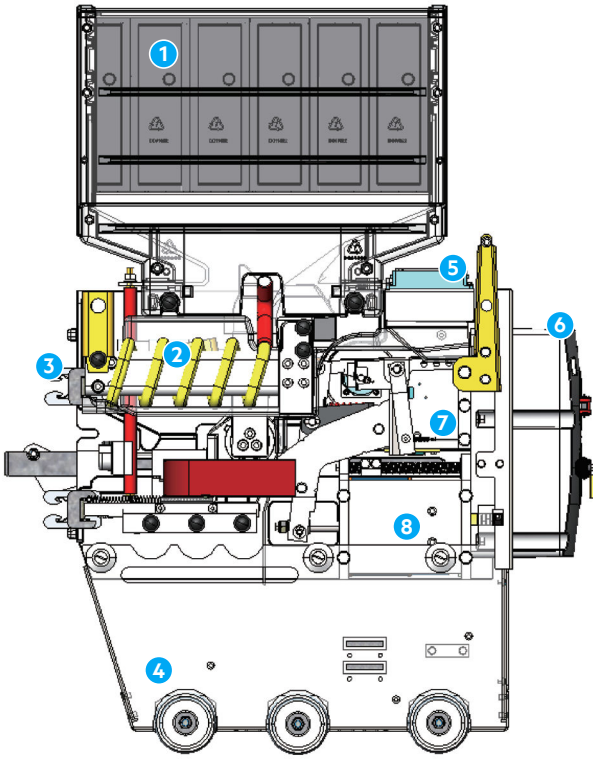
DC Circuit Breaker

The GEIS high-speed NDC Circuit Breaker, utilises magnetic actuator technology and provides an innovative DC switchgear solution for a variety of markets and demanding applications.

Combining innovation with 50 years of DC circuit breaker design and manufacturing experience.

NDC Circuit Breaker Features

1. High arc extinguishing capability by cold cathode principle with optimized arc runners
2. Patented passive magnetic blow-out coil Critical current lower than 25A
3. Tungsten carbide silver contacts, extremely endurance for high arcing
4. Equipped with integrated truck as standard configuration, more reliable in overall and reduces the additional workloads
5. Unique integrated aviation plug/socket
6. Integrated multi-functional operation facias, featuring rock-in/out, emergency disconnection, and special patented interlocking design
7. Bi-directional Direct Overload Trip device (DAT), trip time less than 5ms
8. Permanent magnet actuator, with few moving parts, no mechanical wear and maintenance-free; constant closing speed, and extremely high reliable
   Permanent magnet latch, more energy-efficient



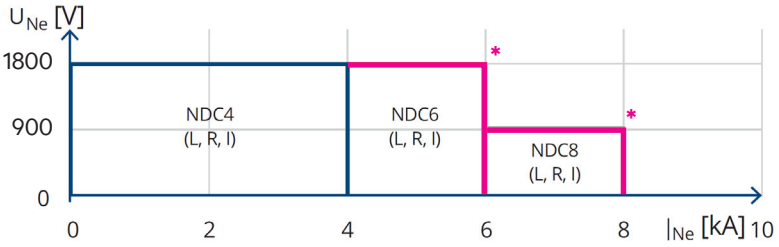
Reference standards

NDC

- GB/T25890.2-2010
- IEC61992-2-2014

NDC4 4000A 900VDC/1800VDC

- GB14048-2
- CQC

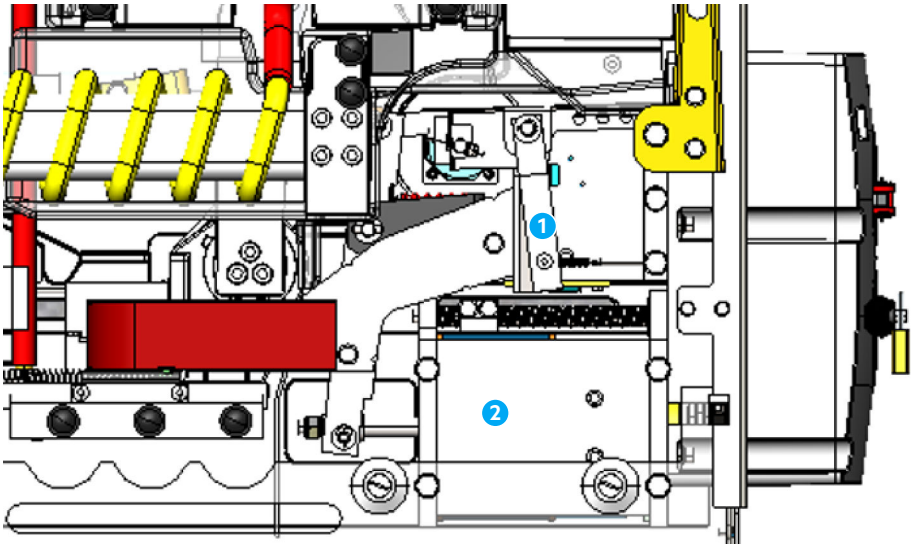


* Note: Please contact GEIS engineer for rated current of 6300A, 8000A.

NDC Technical Date

Circuit Breaker			NDC4		NDC6		NDC4		NDC6	
Designation/Type			Feeder (L)	Rectifier (R)	Feeder (L)	Rectifier (R)	Feeder (L)	Rectifier (R)	Feeder (L)	Rectifier (R)
Nominal Voltage U_N		V	DC750				DC1500			
Rated Voltage U_{Ne}		V	DC900				DC1800			
Rated Insulation Voltage U_{Nm}		V	DC1800				DC3000			
Rated Insulation Level	1min Power frequency withstand (RMS)	kV	(Phase to earth/Between isolating distance) 9.2/11							
	Lightning impulse voltage (peak)	kV	(Phase to earth/Between isolating distance) 20/24							
Maximum arcing voltage U_{arc}		kV	2.1				3.5			
Rated Continuous Current I_{Ne}		A	4000/6300							
Rated Short Circuit Current I_{Nss}		kA	125				100			
Rated short time withstand current I_{NCW}		kA	71							
Rated duration time for short-circuit		s	0.25							
Critical Current I_C		A	25							
Rated track time constant T_{NC}		ms	100				63			
Breaking characteristic			H							
Service Life		times	50000				50000			
Weight (circuit breaker complete with arc chute)		kg	275				295			
Rated Auxiliary Voltage (DC)		V	50/110/220							
Rated Power frequency withstand (1 min)		V	2000							

Robust Primary disconnects



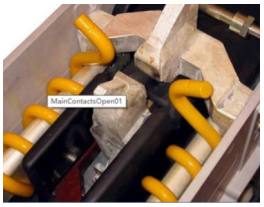
1 Opening and fast-tripping DAT

- Fast tripping of fault current in any direction (set range 4-18kA) within 5ms
- With a stable magnetic circuit, minimal moving parts, and reliable performance

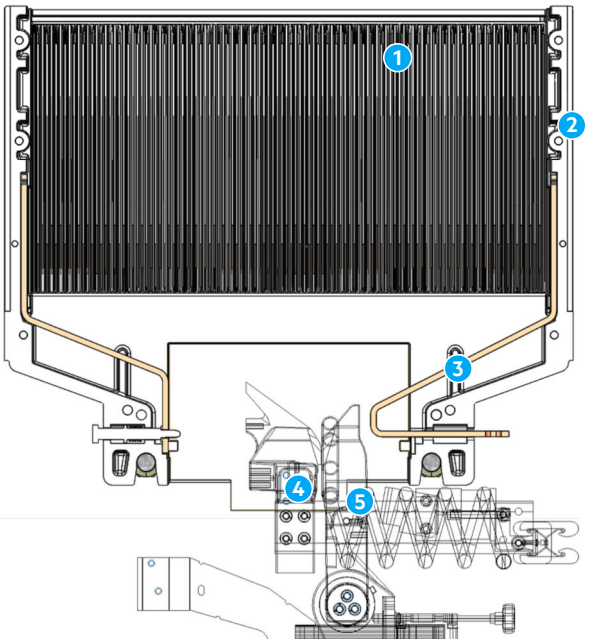
2 Permanent magnet closing actuator

- High magnetic conductivity material/ neodymium iron boron
- Patented single coil design
- Few moving parts, no mechanical wear and maintenance free
- Constant closing speed, and extremely high reliability
- Permanent magnet latch, no external energy required, more energy-efficient

DAT setting window: Setting range: 4~18kA



NDC High-speed DC Circuit Breaker



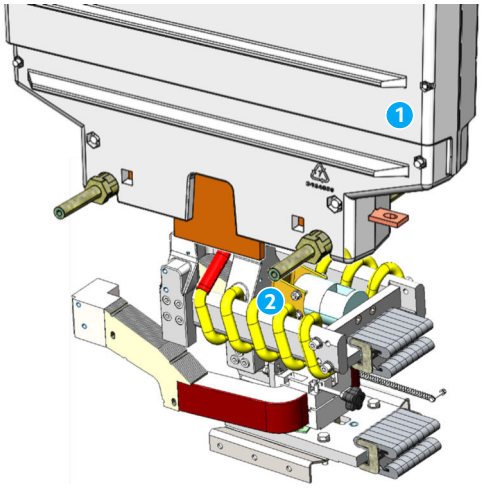
1 Splitter plates
2 Insulation enclosure
3 Arc transfer plate
4 Fixed contact
5 Moving contact

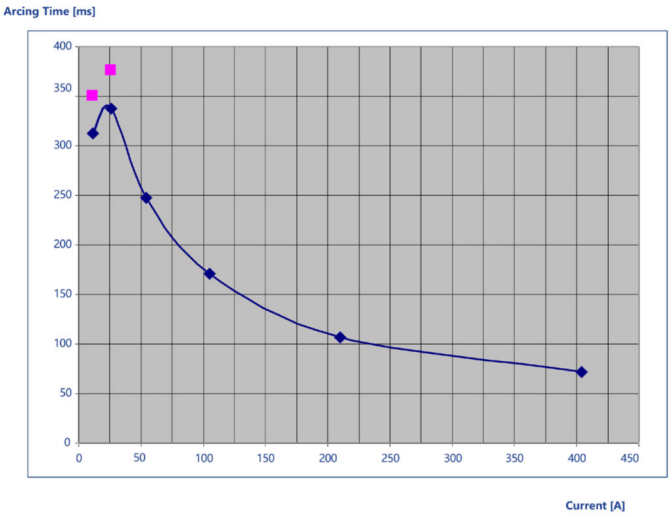
- Cold cathode arc chute: 61 arc splitter plates, quickly extinguishing the arc
- Optimize the design of the arc runner, restrict the arc within the arc chute
- Modular structure, reducing weight

The arc is divided into multiple short arcs by the arc splitter plates, and cathodic voltage drop is generated. The energy of the arc decreases, and the temperature rapidly drops until the arc is extinguished

The arc blow-out into the arc chute by magnet force of circuit current, then elongates, reduces energy density, and increases arc resistance

When an arc generated by opening the circuit





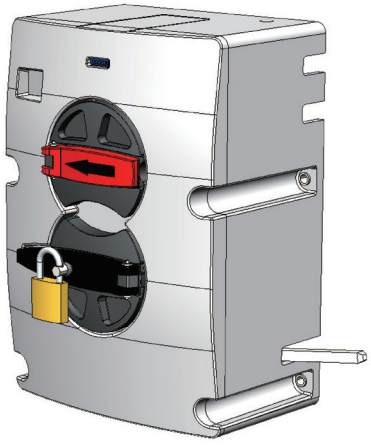
1 Arc Chute 2 Passive Magnetic Blow-out coil

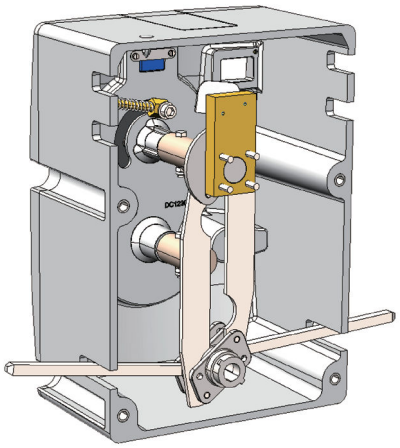
NDC High-speed DC breaker with its unique passive magnetic blow-out coil can break working currents ranging from a few amperes to thousands amperes

- When the current in the circuit is too small and the magnetic force generated by the current itself is not enough to blow-out the arc into the arc chute, the coil can provide an upward magnetic blowing force to introduce the arc into the arc splitter. Therefore, the circuit breaker is capable of breaking extremely small (≤ 25A) bidirectional critical currents
- By passive magnetic blow-out coil, reduces arc time, prevents contact reignition, and improves the service life of contacts

Mult-Functional Fascia

- Ergonomic design, intuitive and convenient operation
- Integrated shelf-style handle
- Perfect interlocking ensures safety
- Unlock and push the truck after manual release
- On/off indication
- Counter





Unique rotation unlocking mechanism

When the circuit breaker is opened and the mechanism is in the unlocked position, the position of the circuit breaker in the cabinet can be changed

Rack-in mechanism

After the breaker is unlocked, can rack the circuit breaker into positions of service, test, and disconnection

Intelligent Breaker Control Interface - NDC Circuit Breaker Control Module (CBCM)

- Split-type, installed inside secondary chamber, unlike those integrated in the breaker, CBCM is featured more reliable, and more convenient for maintenance and repair
- Dual tripping protections:
  - High-speed tripping of latch coil
    a. Continuity monitoring of wiring for protection trip (normally open) contacts
    b. Controls charging of the latch coil capacitor and prohibits closing if the capacitor is not adequately charged
    c. Continuity monitoring of thyristor circuits and latch coils
  - Reset coil tripping: Dual tripping protection with latch tripping backup
- Automatic reset: automatic charging and reset the breaker after tripped, without manual intervention
- Can automatically trip the circuit breaker via the latch coil in the event of loss of control supply.
- Current protection: Built-in overload protection, current directional protection

CBCM module

SonicGear

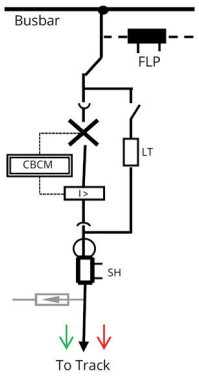
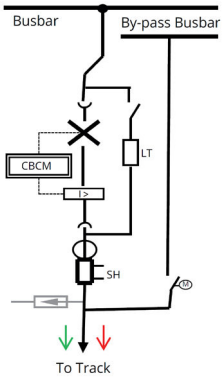
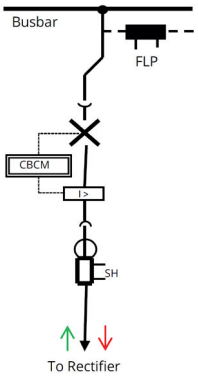
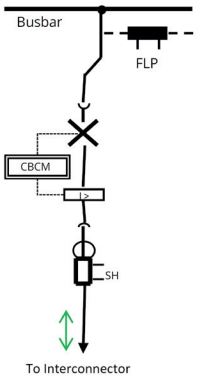
Incorporating the NDC Circuit Breaker

The GEIS Switchgear SonicGear product, incorporating the high-speed NDC Circuit Breaker, utilises magnetic actuator technology and provides an innovative DC switchgear solution for a variety of markets and demanding applications.

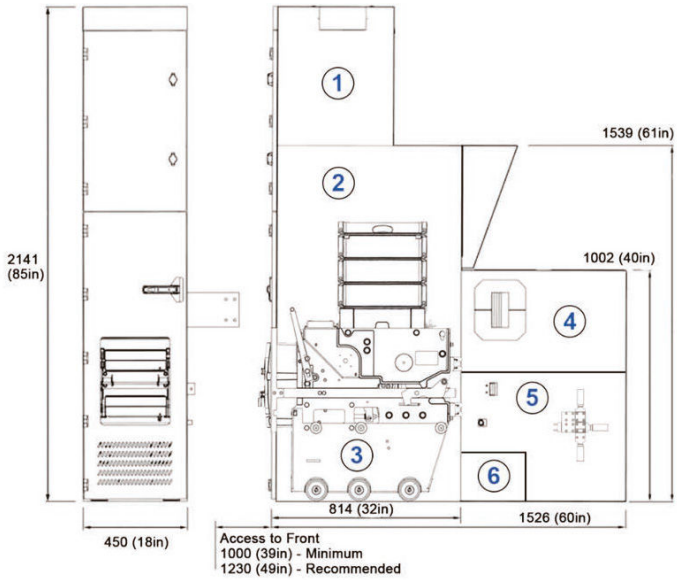
Combining innovation with 50 years of DC circuit breaker design and manufacturing experience, the SonicGear offers optimal safety, reliability and high speed performance – the ideal solution to your DC requirements.

Key Features

- Superior proven technology with minimal maintenance
- A long service life designed to exceed 30 years
- Superior compact design concept and operating mechanisms
- High speed operation, direct overload
- Simple, reliable mechanism with no mechanical latch
- Ergonomic, intuitive truck isolation and interlocking
- Enhanced electrical and mechanical endurance
- Patented Arc transfer coil
- Fully bi-directional current interruption
- Hard wearing main contact material (silver tungsten carbide) ensuring long life
- Integrated operation with a wide range of protection relay options

Track Feeder	Track Feeder (with Bypass extension)	Rectifier	Interconnector
			
NDC4/NDC6		NDC6/NDC8	
→ Normal operating current direction		→ Normal operating current direction	
→ DAT range 100%-400% INe (Standard) Alternative on request		→ DAT range 3kA or 4kA fixed	
[@750V - 800V] 580kg (1276lbs)/ 600kg (1320lbs)		[@750V - 800V] 600kg (1320lbs)/580kg (1276lbs)	
[@1500V -1600V] 620kg (1364lbs)/640kg (1408lbs)		[@1500V -1600V] 640kg (1408lbs)/620kg (1364lbs)	

SonicGear
Panel Features and Dimensions (mm)



1 Relay Cubicle

GEIS Switchgear can offer SonicGear panels with a wide range of protection relays. The configuration of the protection relay, alongside intertripping (transfer trip) and emergency tripping, is tailored to the needs of each specific traction power system.

Protection relays are available with a wide range of communications protocols, including serial MODBUS-RTU and IEC 61850 over Ethernet. Hard-wired control command inputs, indication and alarm signals can be customised to match the customer's SCADA system.

Low voltage equipment such as auxiliary relays, control switches, LEDs and the Circuit Breaker Control Module (CBCM) are accommodated in this compartment. All wiring is segregated from the traction power circuits.

2 Front Cubicle

The front cubicle provides accommodation for the NDC circuit breaker truck. Directly above the circuit breaker's arc chute sits an insulated chamber to allow the arc gases to be safely dissipated to the rear of the switchgear.

The circuit breaker truck is fully interlocked with the front cubicle for safety. Additional key interlocking arrangements can be added to meet the customer's requirements.

For the safety of personnel operating the switchgear, the cubicle has been tested with an internal arc of 15kA (21kAp) for 1 second (IEC 62271-200:2003, Accessibility A).

3 Circuit breaker

Please refer to the 'NDC Circuit Breaker" data sheet for a detailed description.

4 Busbar Section

Busbars of up to 8kA are accommodated in a separately enclosed compartment. An optional busbar cable box allows cables to be connected directly to the busbars, for example when cabled interconnectors are used.

Versions of the SonicGear panel can accommodate up to three separate busbars to permit complex switchboard configurations to be constructed. Bus couplers can be accommodated with no need for a 'bus riser' panel.

5 Lower Rear Cubicle

SonicGear panels can accommodate a wide variety of traction power cables which can enter the panel from the top, bottom or rear. Cables enter the switchgear through an insulated sheet which, can be supplied plain or drilled, and are terminated onto a generously sized copper busbar.

Current measurements are made using a calibrated shunt, which is accommodated in this chamber.

6 Transducers

SonicGear DC Switchgear is compatible with a wide range of measurement transducers to suit the protection and measurement needs of the system.

Transducers and their associated fuses are mounted in their own compartment which is readily accessible from the circuit breaker compartment.

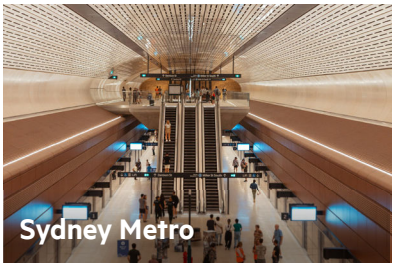
NDC Projects

Docklands Light Railway /Northern City Line/Great Eastern Main Line

North Railroad Metro
Long Island Rail Road

Paris Métro

Berlin U-Bahn



Parramatta Light Rail Stage 2 / Sydney CBD and South East Light Rail

Sentosa Express / Mass Rapid Transit

MTR Airport Express / Automated People Mover (APM)

Shanghai Metro Line No.8

Beijing Metro Lines No.3/No.8

Guangzhou Metro lines No. 3,5,6,710,11,12,13,14

Xi'an Metro Line No.9

Chongqing Metro Line No.4/No.9

Ordering Check List

NDC	X-	X	X	X	X	X	0	X	Description
Rated Service Current	4								Rated Current @4000A
	6								Rated Current @6300A (see Note)
Rated Voltage		1							900VDC for nominal voltage of 750VDC
		2							1800VDC for nominal voltage of 1500VDC
Rated Short Time Withstand Current			1						71kA withstand current @0.25s
			2						
Rated Control Supply Voltage				1					110VDC rated auxiliary voltage
				2					220VDC rated auxiliary voltage
Breaker application type					1				Feeder breaker (L)
					2				Rectifier Breaker (R)
					3				Tie/interconnect Breaker (I)
Cable incoming style						0			Cable top incoming
						1			Cable bottom incoming
Reserved							0		N/A
Arc Chute								0	Without Arc Chute
								1	With Arc Chute

Note: Please contact GEIS engineer for rated current of 6300A and above.

CBCM DC	XXXXX-	X	X	X	G	Description
NDC CBCM Module						NDC DC Breaker CBCM Circuit Breaker Control Module
Digital/Anology	16244					110V Digital Version
	28792					220V Digital Version
	21941					220V Anology Version
Control Voltage		0				50VDC
		1				110VDC
		2				220VDC
Trip Function			0			No power outage trip function
			1			Power outage trip function
Enhancement				0		W/O enhance module
				1		W/ enhance module
G Type					G	G Type

GEIS

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