

LIGHTNING SWITCHGEAR

INNOVATION MEETS 50 YEARS OF DESIGN AND MANUFACTURING EXPERIENCE



Key benefits



Low cost
of ownership



Proven
design



Asset life
extension



Award winning
magnetic actuator
technology

LIGHTNING

Incorporating the NDC Circuit Breaker

The BRUSH Switchgear Lightning 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 Lightning offers optimal safety, reliability and high speed performance – the ideal solution to your DC requirements.

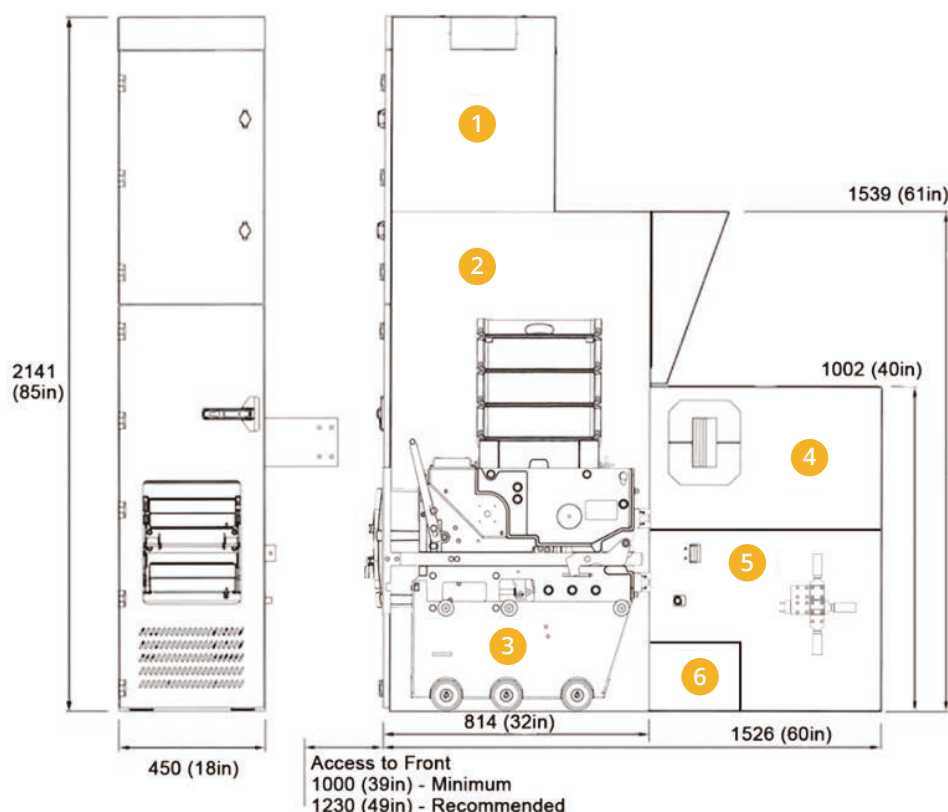
Key Features

- 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
- Network Rail PA 05/01824



Track Feeder	Track Feeder (with Bypass extension)	Rectifier	Interconnector
NDC4/NDC6		NDC6/NDC8	
→ Normal operating current direction		→ Normal operating current direction	
→ DAOL range 100%-400% INe (Standard) Alternative on request		→ DAOL 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)	

Lightning Panel Features and Dimensions (mm)



1 Relay Cubicle

BRUSH Switchgear can offer Lightning panels with a wide range of protection relays, including the Mitre+. 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 Lightning 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

Lightning 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

Lightning 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.

Negative Short Circuit Device

Incorporating the NDC Circuit Breaker (bespoke solutions)

The BRUSH Negative Short Circuit Device, incorporating the high-speed NDC Circuit Breaker, utilises magnetic actuator technology. It is controlled by Local Control Panel and provides an innovative DC switchgear solution for assist the isolation process for track possession.

Key Features

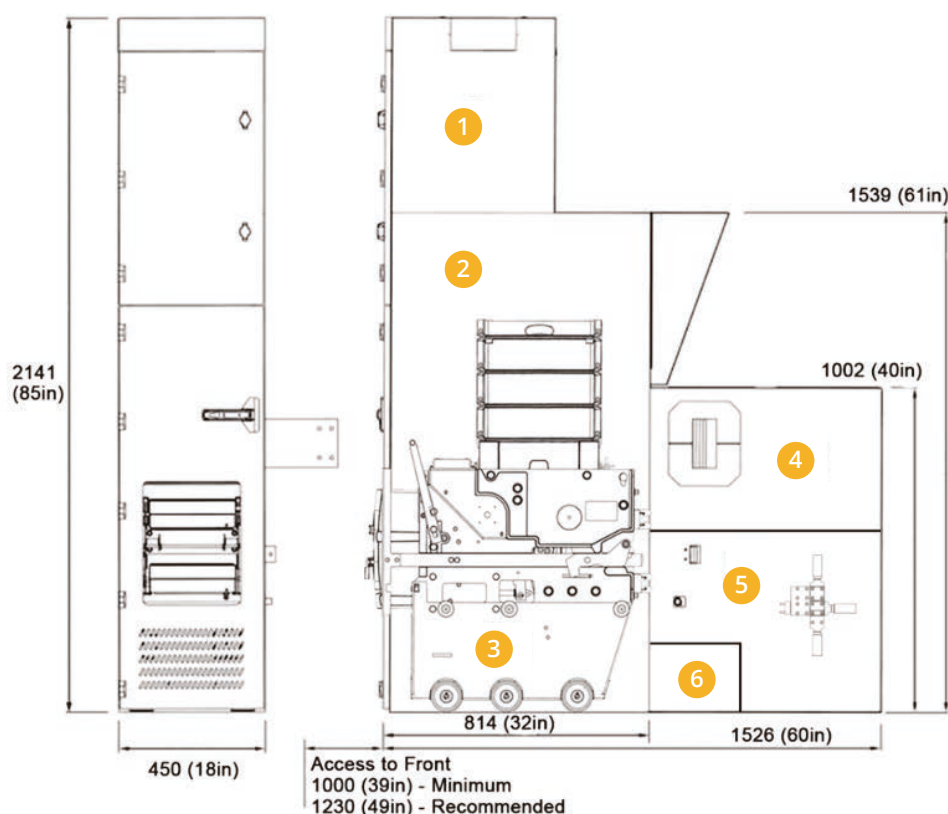
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- Network Rail PA05/06462



Bespoke solutions

<p>NDC4</p> <p>[@750V - 800V] 580kg (1276lbs)</p>	<p>4 Ways LCP Panel</p> <p>86kg (190lbs)</p>	<p>8 Ways LCP Panel</p> <p>143kg (315lbs)</p>

NSCD Panel Features and Dimensions (mm)



1 Low Voltage Cubicle

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.

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

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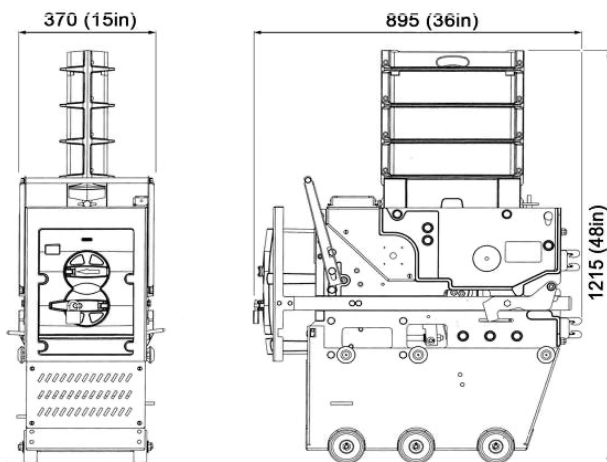
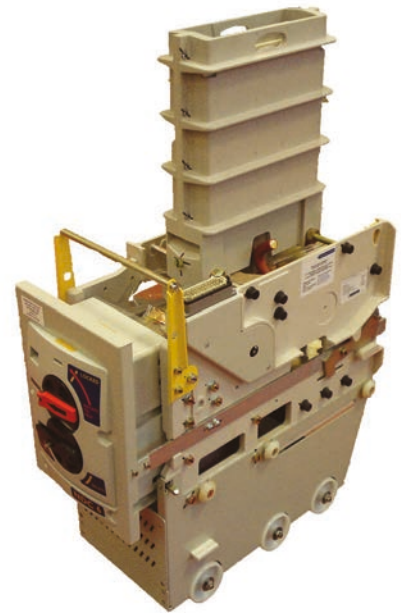
Transducers and their associated fuses are mounted in their own compartment which is readily accessible from the circuit breaker compartment.

NDC

DC Circuit Breaker

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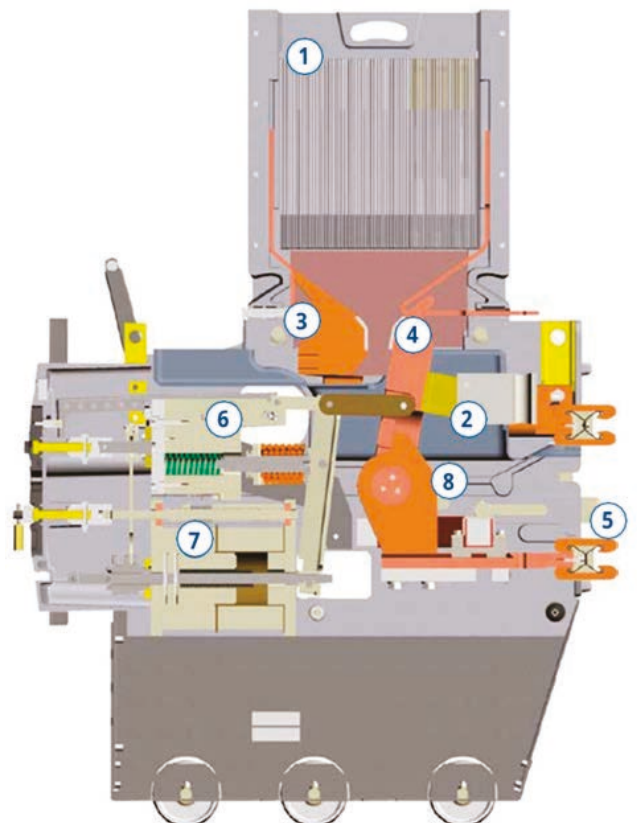


Key Features

- Superior proven technology with minimal maintenance
- Superior compact design concept and operating mechanisms
- High speed operation, direct overload
- Patented Arc transfer coil
- Ergonomic, intuitive truck isolation and interlocking
- Enhanced electrical and mechanical endurance
- Simple, reliable mechanism with no mechanical latch
- 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

NDC Circuit Breaker Mechanical Features

- 1 The patented arc transfer system prevents internal contamination of the circuit breaker compartment and cubicle. The Cold Cathode Arc Chute Assembly (1) dissipates all arcs whilst the transfer coil (2) provides additional magnetic flux across the contact gap, assisting with the interruption of low currents that would otherwise lead to long arcing times
- 2
- 3 Fixed Contact
- 4 Moving Contact Assembly
- 5 Primary disconnects
- 6 The patented Magnetic Latch mechanism provides the primary means of 'high speed' tripping of the circuit breaker. Working in conjunction with the Magnetic Actuator, the latch directly holds the circuit breaker contacts closed
- 7 The Magnetic Actuator is based on a solenoid plunger, and provides the motion required to close the main contacts and to reset the latch device on tripping
- 8 The uni-directional Direct Acting Release trips the circuit breaker when the current in the main circuit exceeds the overload setting



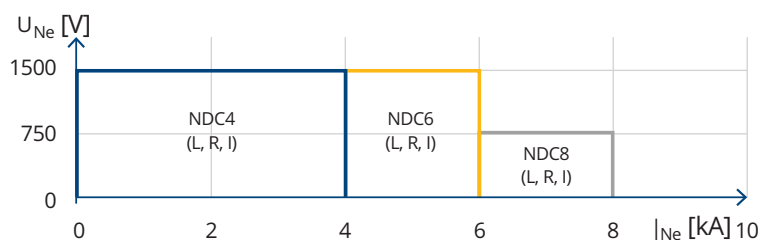
Reference standards

EN 50123

- EN 50123-1: 2003
- EN 50123-2: 2003
- EN 50123-6: 2003 +A1:2014

IEC 61992 series

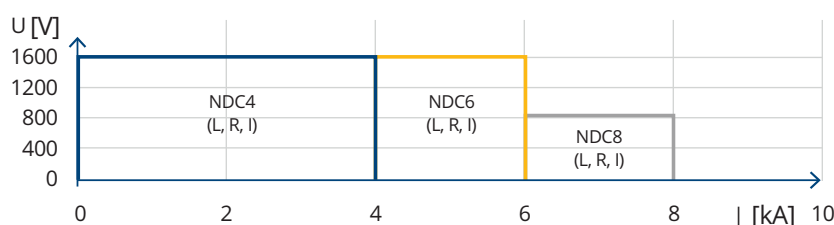
- IEC 61992-1:2006 +AMD1:2014
- IEC 61992-2:2006
- IEC 61992-6:2006 +AMD1:2014 + AMD2:2020



	Symbols	Unit	NDC4	NDC6	NDC8
Nominal voltage	UN	V	750/1500	750/1500	750
Rated service current	INe	A	4000	6300	8000
Rated Voltage	UNe	V	900/1800	900/1800	900
Power frequency voltage withstand level	Ua	kV	9	9	9
Rated short-time withstand current (@ 250ms)	INcw	kA	100/71	100/71	100/71
Rated Track time constant @ 900V (@ 1800V)	TNc	ms	100 (63)	100 (63)	100 (N/A)
Rated short circuit current @ 900V (@ 1800V)	INss	kAp/kA	180 / 125 (142/100)	180 / 125 (142/100)	180/125 (N/A)
Critical current (Bi-directional) **	Ic	A	25	25	25
Mechanical Endurance		Oper.	50k	50k	50K
Breaking Characteristic			H	H	H
Insulation Category @ 900V (@ 1800V)			OV4 (OV3)	OV4 (OV3)	OV4 (N/A)
Rated Impulse Withstand Voltage	UNi	kVp	20	20	20
Rated auxiliary and supply voltage	N/A	V	from 48 to 220	from 48 to 220	from 48 to 220

Standards

- ANSI C37.14: 2005
- ANSI C37.16: 2009



	Unit	NDC4	NDC6	NDC8
Frame size	A	4000	6000	8000
Rated maximum voltage	V	800/1600	800/1600	800
Rated continuous current in rms amperes	A	4000	6000	8000
Rated peak current	kA	200	200	200
Rated short-time current (Duration of 250ms)	kA	Peak – 75 Sustained – 45	Peak – 75 Sustained – 45	Peak – 75kA Sustained – 45
Rated short-time circuit current	kA	Peak – 200	Peak – 200	Peak – 200
Rated control voltage	V	48/125	48/125	48/125
Electrical endurance	Operations	250	250	250
Mechanical Endurance	Operations	50k	50k	50k
Breaking Characteristic		HS /F-R	HS /F-R	HS /F-R
AC dielectric withstand (100%)	kV	4.2	4.2	4.2

**BRUSH**

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