High-Power Switches

Product Data

BOSNAX (THAILAND) CO.,LTD.

บริษัท บอสแนกซ์ (ประเทศไทย) จำกัด

141 Phiboonwattana, Rama 6 Rd., Samsennai, Payathai, Bangkok 10400

Tel : 0-2271 2984 (Auto) Fax : (662) 618-5482 E-mail : marketing@bosnax.com

www.bosnax.com

Ferraz Shawmut

GROUPE CARBONE LORRAINE

HIGH-POWER SWITCHGEAR

We can create a solution that's both effective and cost-effective

So whether your needs are simple or complex, you can rely on Ferraz Shawmut to deliver the best solution.

The Ferraz Shawmut facility dedicated to High-Power Switchgear located in Provins near Paris

To learn more, call us. We'll show you all the ways we're your circuit protection resource.

Equally important, we possess the ability to listen. An ability that enables us to truly understand your needs, so we can create a high-power solution that's both effective and cost-effective.

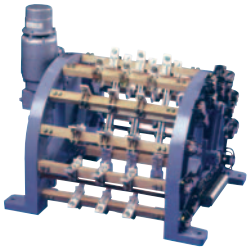
A CADD-equipped laboratory for product development, simulation and qualification

Fouilleret, Berg and Soulé
Three brands For switch applications

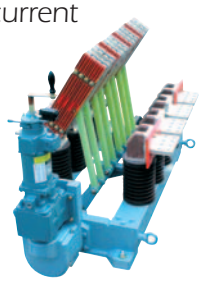
When industry-leading company worldwide have a special challenge, they call Ferraz Shawmut. Why? Because we've pioneered more technological advances in high-power switches than all of our competitors combine.

DC and AC switches designed to handle high current/low voltage and high voltage/low current applications, including:

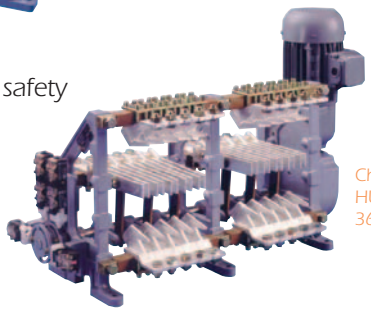
- rectifier output disconnect switches
- change-over disconnect switches
- change-over grounding disconnect switches
- polarity-reversing disconnect switches
- distribution panel disconnect switches
- low-voltage disconnect switches
- medium-voltage disconnect switches
- grounding switches
- mobile and stationary shorting switches
- Pure silver-to-silver contacts for the best connection
- a visible disconnect that eliminates guesswork and increases safety
- Self-cleaning contacts for minimal maintenance
- Aluminum or copper, bolted or welded connections
- Various methods of operation-manual, electric or pneumatic
- Mechanical or electrical open-switch locks
- Multiple contacts, with spring-loaded arc-quenching chambers independent from the main contacts
- Outdoor enclosures resistant to corrosive environments



Change-over disconnect switch
HUVS 3-pole
3600 V - 1 kA
Test Lab Application



Disconnect Switches
HAS 24 kV, single pole, 25 kA
Power Plant Application



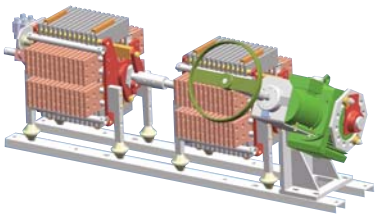
Change-over disconnect switches
HUVS 2-pole Pos 1-0-2
3600 V 8 kA

Chemical and metal process
A range of switches from transformer to cell

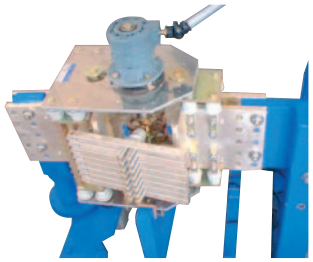
High-power chemical processes, like electroplating and the electrolysis of chlorine, fluorine and magnesium, require disconnect switches that can handle 300 kA plus.

Ferraz Shawmut offers these as well as a range of other types of switches, to cover the entire line from transformer to cell. In fact, we were the first to create multiple products for specific applications. Switches are available for flexible or fixed connections-copper or aluminum, bolted or welded. They include:

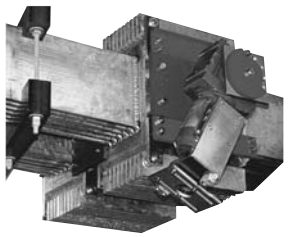
- Mediuml-voltage transformer disconnect switches
- Rectifier output disconnect switches
- Mobile and stationary shorting switches
- polarity-reversing disconnect switches for electroplating.
- a deformable disconnect switch that can move on three axes to allow for bus bar expansion, eliminating the need for expensive flexible connections
- a proven air-cooled switch for aluminum smelting-the first of its kind
- the first input loadbreak disconnect switch for "choppers" - DC-to-DC converters
- the first loadbreak switch and rotating current transfer unit for copper foil processes
- the first dual-shell switching system for DC arc furnaces



High-current disconnectors
MBD (Multi-blade disocnnectors) range
2000V DC—5000 to 60000A
Single-pole/Double-pole/Change-over
Aluminum or copper terminals



High-current disconnectors
NORD range
1500V DC—14 kA to 140 kA
Single-pole/Double-pole/Change-over
Aluminum or copper terminals

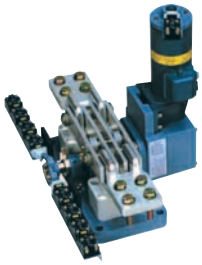


High-current disconnectors
PBD (Plain bars disocnnectors) range
2000V DC—20 kA to 160 kA
Single-pole/Double-pole/Change-over
Aluminum terminals

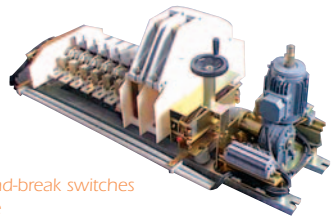
Traction

If you've traveled by train anywhere in the world, chances are Ferraz Shawmut's high-power switches were part of your trip. Built to take the vibration and constant punishment of traction applications, our AC and DC switches are found everywhere—from light rail and subway trains to locomotives, from substations and rolling stock to third rails. Customer rely on us for:

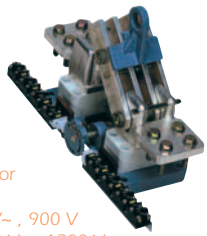
- Substation switches
  - DC change-over switches
  - DC grounding switches
  - AC medium-voltage disconnect switches
- Rolling stock switches
  - AC and DC disconnect switches
  - AC and DC change-over switches with several poles and several positions , to handle main, shop, auxiliary and other sources of power
- Track and main yard switches
  - Catenary and third-rail switches
  - Load-break disconnect switches to sectionalize track



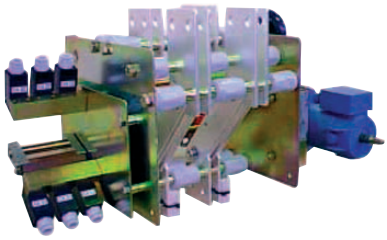
The switches can be operated manually, or they can be motorized and operated locally or remotely, increasing safety and reliability. Another safety feature is a built-in interlock that ensures the position of the switch



DC load-break switches
IF type
1000 V DC—800 to 6300 A



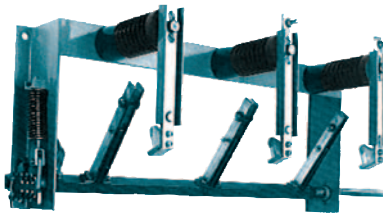
Single pole disconnector
type HAZ
100 to 1000 A - 750 V~ , 900 V
1600 to 3150 A - 1000 V ~, 1200 V



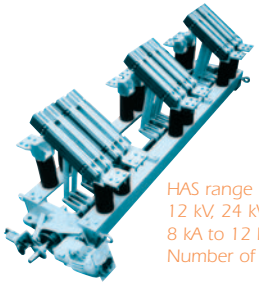
Disconnectors
Change-over disconnectors
FA range
3000 V AC/DC 500 to 8000 A
0 to 175 Hz

Medium voltage

- Distribution panel disconnect switches
- Low-voltage disconnect switches
- Medium-voltage disconnect switches
- Grounding switches
- Mobile and stationary shorting switches

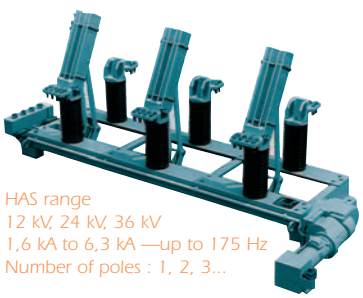


ETM range
3,6 kV, 12 kV, 24 kV, 36 kV
Number of poles : 1, 2, 3...



HAS range
12 kV, 24 kV, 36 kV
8 kA to 12 kA—up to 175 Hz
Number of poles : 1, 2, 3...

HAS range
12 kV, 24 kV, 36 kV
400 A to 1000 A —up to 175 Hz
Number of poles : 1, 2, 3...



HAS range
12 kV, 24 kV, 36 kV
1,6 kA to 6,3 kA —up to 175 Hz
Number of poles : 1, 2, 3...

Ferraz Shawmut

GUIDE FO

Switch types Main characteristics	F/FA page 6 - 11	MF page 12 - 13	SF * on demand	IF page 14 - 15	IFF * on demand	NOR/ NOR-R page 16 - 23	NOR NOR
DC							
AC ≤ 60Hz							
AC > 60Hz							
UI max (kV)	3.6	3	1	1	3	2	2
IN max (kA)	8	60	6.3	6.3	3.2	100	100
Breaking capacity (full load)							
Breaking capacity (small load)							
Multi-poles							
Pole reversing switch							
Deformability (mm)							
Change over							
Auto-cleaning contact							
Terminal copper (bolted)							
Terminal alu (bolted)							

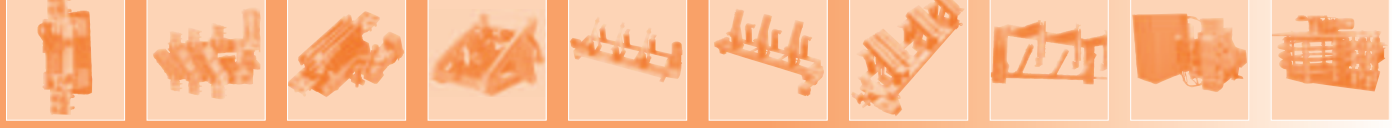
possible

possible in certain limits

possible in special version (development)

unsuitable

not possible



R CHOICE

D/ D-R	PBD	MBD	HA/HAZ HAZS/HAS	SAS	HUV/ HUVS	ETM	DBM	FOR-B *	FOR-A *
	page 24 - 31	page 32 - 33	page 34 - 35	page 36 - 49	page 50 - 51	page 52 - 53	page 54 - 55	page 56 - 57	on demand	on demand
	2	2	36	3.6	3.6	36	2	0.5	0.5
	160	60	25	4	25		20	60	300

*: on demand

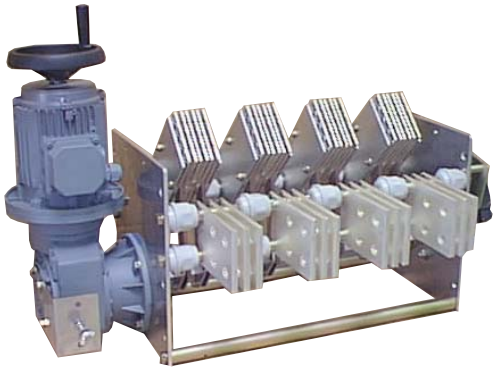
High Current Disconnectors

Change-over disconnectors

FA Range

3000 V ~ / = 500-8000 A 0-175 HZ

- **Equipment for indoor use**
- **Complete customization-driven modular range**
- **Long distance between open contact**
- **Self-cleaning contacts**
- **Reliable high short-circuit currents withstand**



Applications

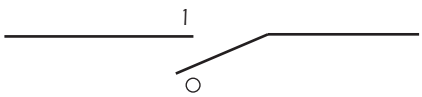
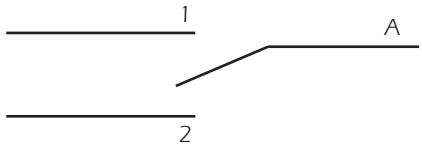
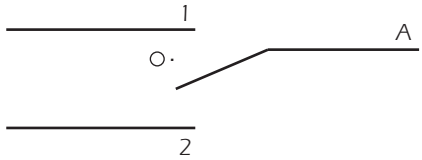
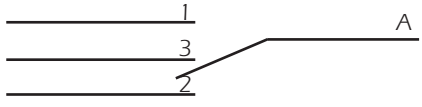
- Disconnecting and / or switching of DC or AC – less than 175 Hz – power circuits.
- Isolating of installations needing a high short-circuit currents withstand.
- Isolating of installations with polluted environments.
- Range of devices specially suitable for electric traction -stationary installations and on-board equipment- for isolating steel plants motors, for electrical distribution and for rectifiers.

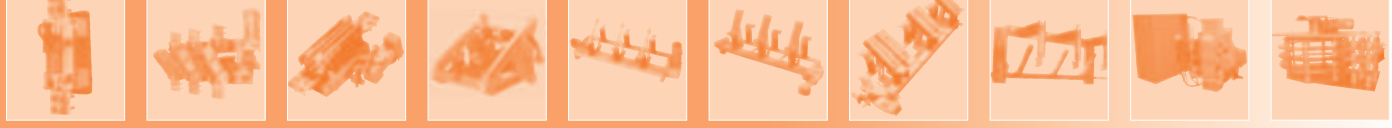
FA Range

FERRAZ FA disconnectors and change-over disconnectors range is compliant with IEC 62271-102.60694 and 60077-1 standards.

Rated insulation voltage	Rated thermal current
3 kV	500 to 6300 A for AC
	500 to 8000 A for DC

The FA range includes from 1 to 6 pole devices from one of the following types :

▪ Disconnectors (1-0)	
▪ 2 position change-over disconnectors (1-2) Mangeable in (1-M) mode M = Neutral point When reversing insulation between 1 and 2 is no more ensured	
▪ 3 position change-over disconnectors (1-0-2) position (1-0-2) are interlocked insulation between 1 and 2 is achieved when reversing. Insulation between A and 1/2 when device is in position 0.	
▪ 3 position change-over disconnectors (1-3-2) position (1-3-2) are interlocked Mangeable in (1-M-2) mode M = Neutral point	



Key features of FA technology are:

- Visible break due to a direct view of mobile contacts
- Silver-plated copper connecting lugs and mobile contacts
- Silver rivets on mobile contacts when rated current is higher than 2500 A
- Self-cleaning contacts
- Long distance between open contacts
- Between phases insulation made by fibre glass-reinforced self-extinguishable polyester insulator (VO level in accordance with UL94)
- Control made by a bichromated zinc coated and mounted on bearing steel shaft which actuates mobile contacts by two self-extinguishable insulating rods (stratified epoxy glass, VO level in accordance with UL94)
- Bichromated zinc coated steel flange for rated current less than 2000 A, duralinox flanges for rated currents higher than 2500 A
- Manual or motorized control

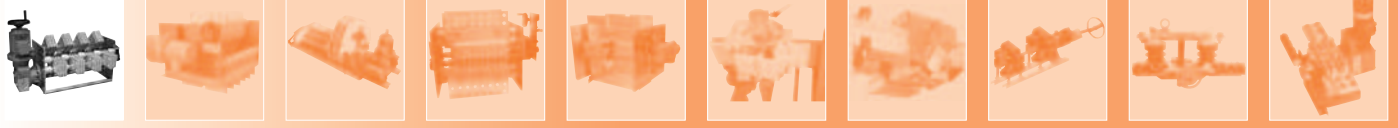
FA range scope is a function of the device type, the number of poles and the rated thermal cur rent in accordance with the IEC 60947-3 prescriptions –i.e. with a max. temperature rise of 70°C in steady state of connecting lugs-.

Ith thermal current rating (A)		Valid for (1-0) (1-2) (1-0-2) and (1-3-2) devices					
~ 50/60 Hz	=	1pole	2 poles	3 poles	4 poles	5 poles	6 poles
500	500						
1250	1250						
2000	2000						
2500	2800						
3200	4000						
4000	5000						
5000	6300						
6300	8000						

Electrical characteristics

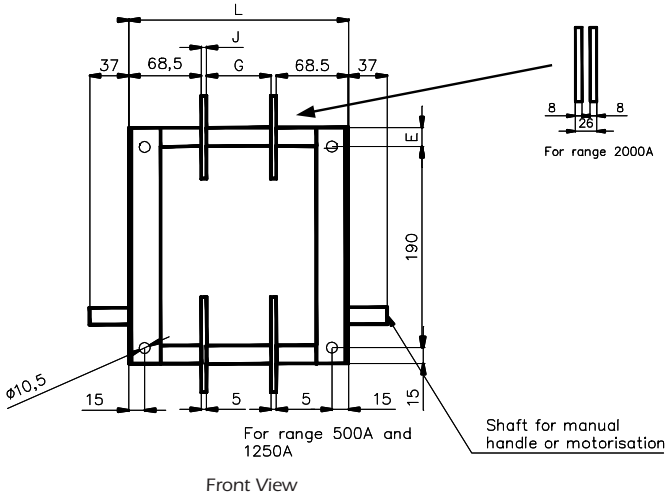
- Operation when current is off (no load operation)
- 140°C point temperature withstand without device damage
- Dielectric withstand voltage : 20 kV – 50 Hz – 1 mn to the ground between poles and between terminals with all the clearance / between live parts and auxiliary contacts
- Dielectric withstand voltage : 2500 V – 50 Hz – 1 mn between auxiliary contacts and neutral points
- Impulse voltage withstand : 20 kV – 1.2 / 50 µs in accordance with IEC 694
- Voltage drop between terminals : ~ 30 mV
- Maximum short-circuit current for one pole (50 Hz) and any device

@ I_{th} = 500 A	1st wave peak value	75 kA	Ir.m.s = 28 kA for 1 s
@ 1250 A ≤ Ith ≤ 2000A	1st wave peak value	90 kA	Ir.m.s = 35 kA for 1 s
@ I_{th} ≥ 2500 A	1st wave peak value	150 kA	Ir.m.s = 58 kA for 1 s

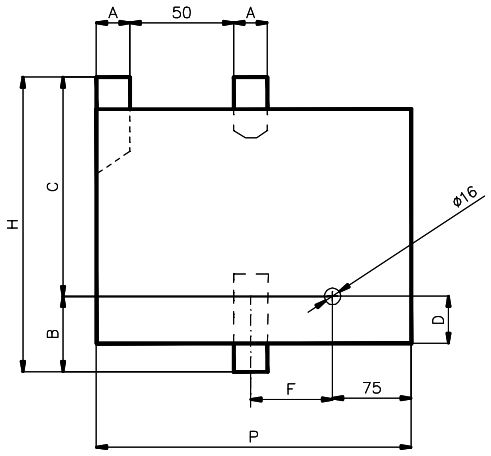


Main dimensions

Ratings </= 2000A - Operations 1-2, 1-0

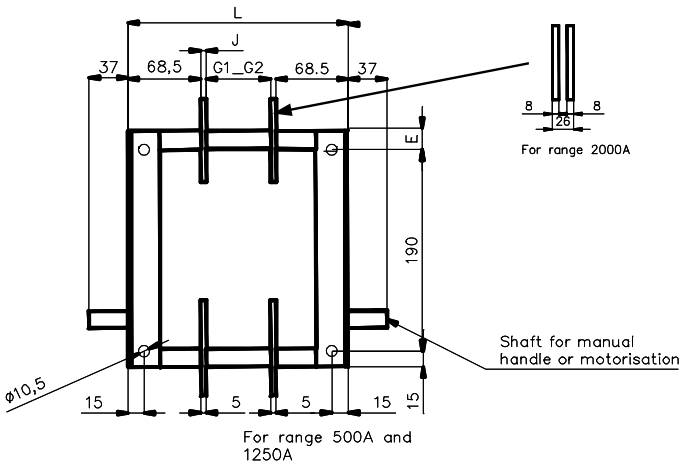


Front View

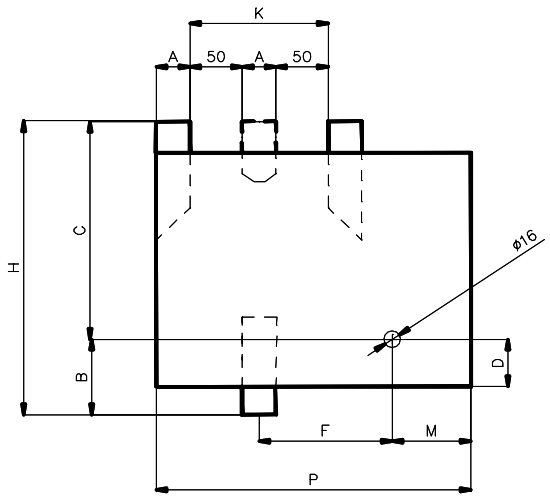


Right Side View

Ratings </= 2000A - Operations 1-0-2, 1-3-2



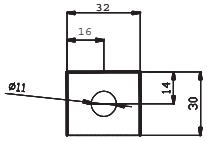
Front View



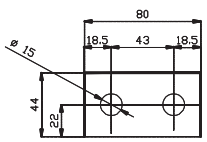
Right Side View

	Rated Current (A)	A	J	H	P	B	C	D	E	F	G	L 1p	L 2P	L 3p	M	K	Device weight with 1 pole (kg)	Additional weight per pole (kg)
		(mm)																
operations 1-2, 1-0	500	32	5	280	285	127	153	97	15	76	82	142	229	316			4.5	2.5
	1250	80	5	356	334	126	230	76	51	89	82	142	229	316			7.5	3.5
	2000	80	26	356	334	126	230	76	51	89	82	163	271	379			12	7
operations 1-0-2, 1-3-2	500	32	5	280	300	72	208	45	18	127	82	142	229	316	75	132	5.5	2.5
	1250	80	5	356	395	93	263	45	53	130	82	142	229	316	95	180	7.5	3.5
	2000	80	26	356	395	93	263	45	53	130	82	163	271	379	95	180	12	7

Terminal Connections



Depth 5 for 500A

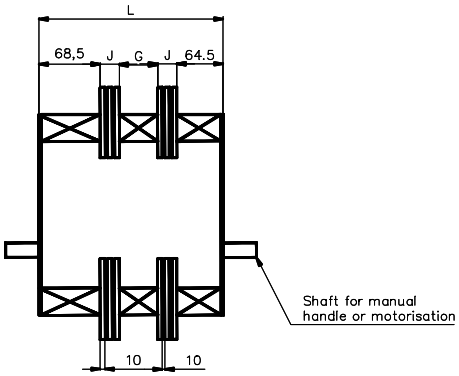


Depth 5 for 1250A
Deptn 8 for 2000A

Note: information provided is limited to 1 to 3 pole switches. Switches are avaiblable with up to 6 Poles. For more information regarding multiple pole characteristics, please contact the technical support centers.

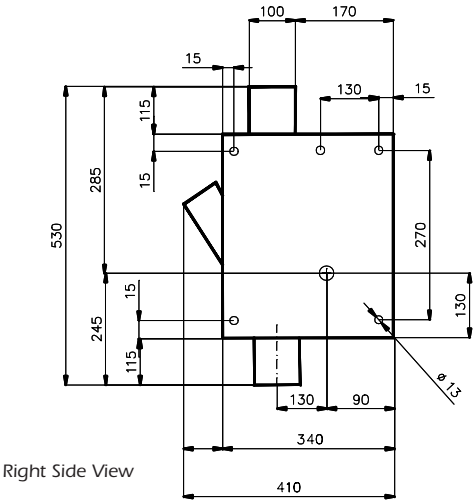
Main dimensions

Ratings > 2000A



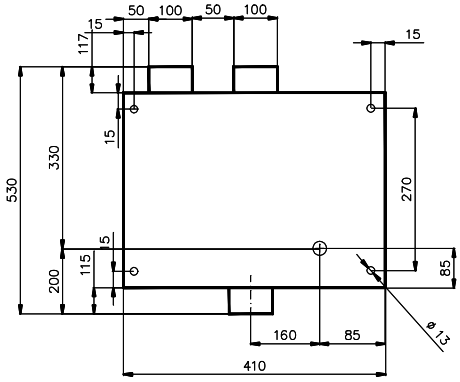
Front View

Operations 1-0



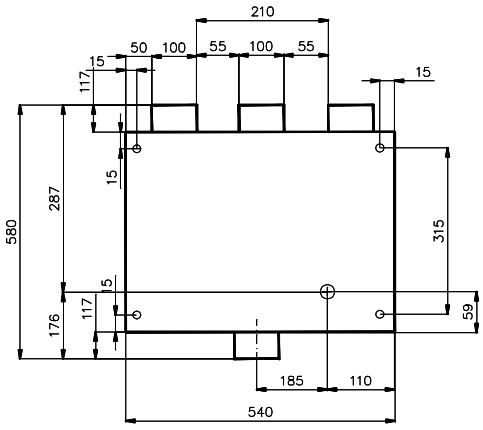
Right Side View

Operations 1-2



Right Side View

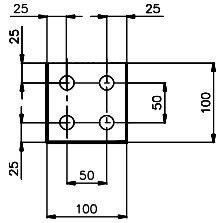
Operations 1-3-2

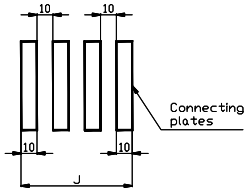


Right Side View

Rated Current thermal AC (A)	DC (A)	Nb of poles available	Gdimension based on # of Poles 2	3-4	Ldimension based on # of Poles 1	2	3	4	Connecting plates Nb/pole	J	Device weight with 1 pole (kg)	Additional weight per pole (kg)
2500	2800	1 to 6	75	75	143	228	313	398	1	10	13±2	8±2
3200	4000	1 to 6	80	80	163	273	383	493	2	30	19±4	14±3
4000	5000	1 to 4	80	100	183	313	483	633	3	50	26±5	19±4
5000	6300	1 to 3	80	120	203	353	583		4	70	33±7	26±5
6300	8000	1 to 3	80	140	223	393	683		5	90	39±8	33±7

Terminal Connections

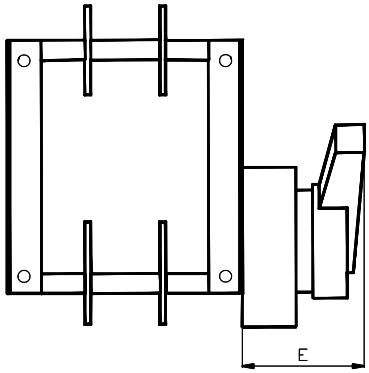


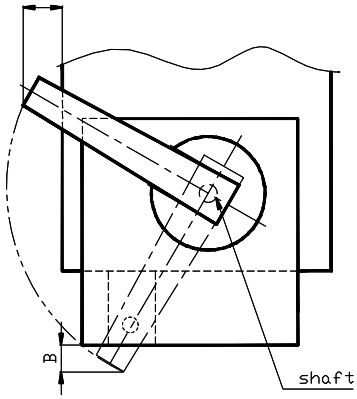


Ferraz Shawmut

Operators Dimensions

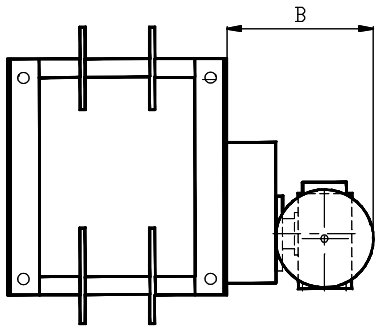
Manual Lateral Handle

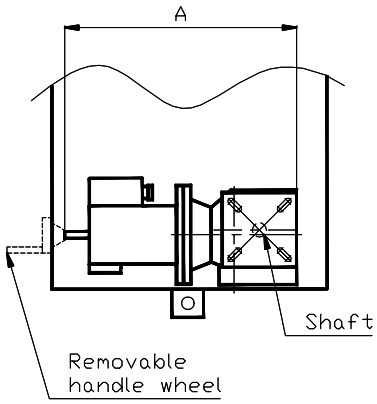




Rated Current		Valid for (1-0), (1-2), (1-0-2), and (1-3-2) operations																	
AC (A)	DC (A)	1 pole A	1 pole B	1 pole E	2 poles A	2 poles B	2 poles E	3 poles A	3 poles B	3 poles E	4 poles A	4 poles B	4 poles E	5 poles A	5 poles B	5 poles E	6 poles A	6 poles B	6 poles E
500	500	0*	70+/-30	105	0*	70+/-30	105	0*	70+/-30	105	0*	70+/-30	105	0*	70+/-30	105	0*	70+/-30	105
1250	1250	10+/-10	60+/-20	105	10+/-10	60+/-20	105	10+/-10	60+/-20	105	10+/-10	60+/-20	105	40	180	105	40	180	145
2000	2000	10+/-10	60+/-20	105	10+/-10	60+/-20	105	40+/-40	180+/-20	145	40+/-40	180+/-20	145	40+/-40	180+/-20	145	40+/-40	180+/-20	145
2500	2800	10+/-10	80+/-40	160	10+/-10	80+/-40	160	10+/-10	80+/-40	160	10+/-10	80+/-40	160	220+/-80	300+/-50	185	220+/-80	300+/-50	185
3200	4000	10+/-10	80+/-40	160	10+/-10	80+/-40	160	2203/80	300+/-80	185									
4000	5000	10+/-10	80+/-40	160	2203/80	300+/-80	185												
5000	6300	10+/-10	80+/-40	160															
6300	8000	220+/-80	300+/-80	185															

Motor Drive: Reduced Gear

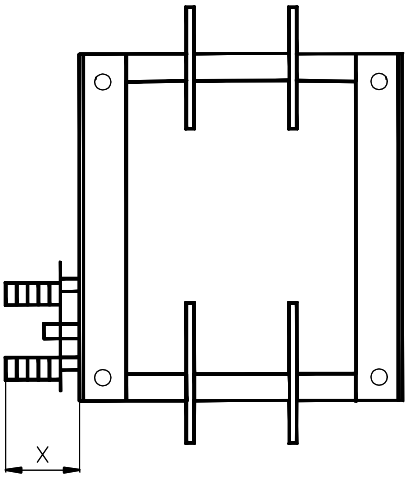


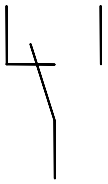
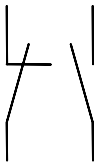


Rated Current		Valid for (1-0), (1-2), (1-0-2), and (1-3-2) operations											
AC (A)	DC (A)	1 pole A	1 pole B	2 poles A	2 poles B	3 poles A	3 poles B	4 poles A	4 poles B	5 poles A	5 poles B	6 poles A	6 poles B
500	500	360	220	360	220	360	220	360	220	360	220	360	220
1250	1250	360	220	360	220	360	220	360	220	360	220	360	220
2000	2000	360	220	360	220	360	220	360	220	360	220	360	220
2500	2800	360	220	360	220	360	220	470	200	470	200	470	200
3200	4000	360	220	470	200	470	200	470	200	470	200	470	200
4000	5000	360	220	470	200	470	200	470	200	470	200		
5000	6300	470	200	470	200	470	200	470	200				
6300	8000	470	200	470	200	470	200						

Main dimensions

Microswitch Contacts



Contact position micro switch with common point		Contact position micro switch without common point	
			
Range </= 2000A	**Range >2000**	**Range </= 2000A**	**Range >2000**
X=55 for 1.2 micro switch X=80 for 3,4,5 micro switches	**X=80**	**X=55 for 1micro switch X=55+N N=number of micro switches**	**X=70 up to 3 micro switches**

Ferraz Shawmut has it all for defining and offering customized solutions to meet your most specific

requirements :

. Adapted drives or control units,

. Adapted technical performances (short-circuit current capability, endurance, small load make / break capacity).

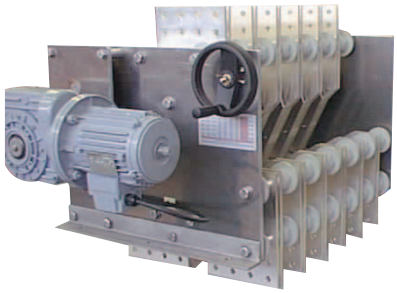
Disconnectors / Change over disconnectors

MF Range

0.5 Hz - 3 000 Hz

Applications

- **Disconnection and switching of AC power circuits of induction furnaces**
- **Isolation of installations requiring a withstand to very high short-circuit currents**
- **Isolation of installations with a dirty surrounding**
- **Dividing of a source towards 2 applications (ex. : 2 induction furnaces)**
- **Outdoor use, under cover**



Main technical characteristics

Range

- Disconnectors (1 - 0)
- Change over disconnectors (1-2) with 2 positions. Warning : When reversing, the isolation between terminals 1 and 2 is not ensured.
- Change over disconnects (1 - 0 - 2) with 3 positions.
- Position 0 locked (manual driving by lever).
- The isolation of terminal A is ensured in comparaison with terminals 1 and 2 when the device is in position 0.

Electrical Data

- OFF-load operation.
- Rated operating voltage
  Withsland voltage to earth between poles and on the isolating distance : 3 kV AC, DC
- dielectric (20 kV upon request) : 10 kV, 50Hz 1 mm
- shockd : 20 kV 1.2/50µs.
- Voltage drop at the plates terminals : 35 mV approximately.
- Dielectric withstand voltage : 2500 V 50 Hz
  1mm between microswitches and earth.
  Rated thermal current Ith at 50 Hz defined according to the IEC 129 and 694 (paragraph 4.4) recommen dations, i.e. mainly a maximum temperature rise of contacts of 65° with suitable connections.

Mechanical Data

- Mechanical endurance : 60 000 cycles minimum warrantied for a device maintained according to the maintenance recommendations page 8.
- Maximum operation frequence (limited by motor heating) : 20 operations per hour.
- Total duration of opening, closing and reversing : 2 to 20 seconds according to the devices.

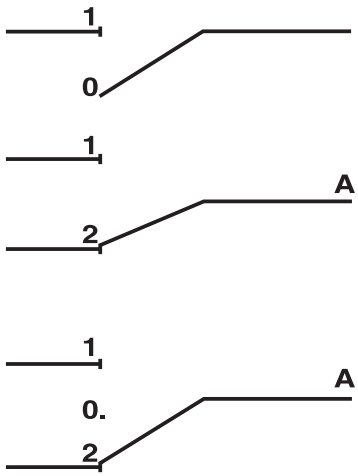
Accessories :

- Manual operation by lever or hand wheel plus reduction gear (number of turns to complete the manoeuv re : 15 to 20).
- Electrical operation by three phase geared motor 220/380 V 50 Hz usable at 260/440 V 60 Hz and emergency remote hand wheel (protection index : IP 44).
- Two sealed pre-isolating or position microswitches per position (standard assembly).
- Reversers without NO + NC
- Type TELEMECANIQUE XCK P118 in compliance wih standars VDE 0660 part 2, CSA 22.2 no. 14 and DEMKO - NEMKO - SEMKO recognitions :
  220 V 50 Hz 10 A resistive circuit
  220 V 0 Hz 2.8 A inductive circuit.

Technology

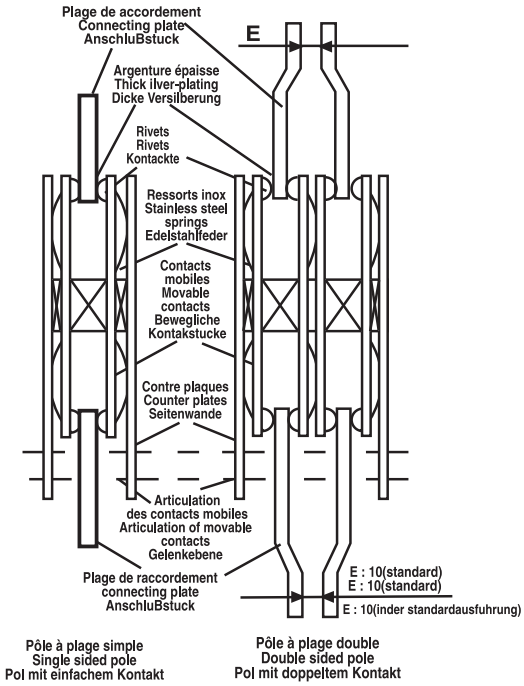
- Visible break as the opening of movable contacts can actually be seen
- Devices entirely non-magnetic
- Tropicalized equipment
- Connecting plates and movable contacts in silvered copper
- Contacts with self-cleaning ensured by copper/silver bimetal rivets on thick silver-plating
- Pressure of each rivet ensured by an individual spring in stainless steel
- Driving mechanism consisting of a non-magnetic sahft fitted on bearings, actuating the movable contacts by means of insulating rods (laminated - glass - epoxy)
- Fixing flange in duralinox

Gamme / Range / Lieferprogramm



Maximum continuous permissible current per pole at 40°C according to the frequency
(Above 175 Hz, bars must be sandwiched.
Above 3000 Hz, please consult us.)

Technologie / Technology / Technologie



Fréquences / Frequencies / Frequenzen		0.5 Hz	50 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	3000 Hz
MF 80	Plage simple / Simple sided Einacher Kontakt	1400	1350	1300	1250	1150	1100	1050
MF 100	Plage simple / Simple sided Einacher Kontakt	1600	1500	1450	1400	1300	1200	1100
	Plage double / Double sided Doppelter Kontakt	2750	2500	2300	2100	-	-	-
MF 125	Plage simple / Simple sided Einacher Kontakt	2000	1900	1825	1750	1600	1450	1300
	Plage double / Double sided Doppelter Kontakt	3200	2750	2525	2400	-	-	-
MF 160	Plage simple / Simple sided Einacher Kontakt	2500	2400	2300	2200	2000	1800	1600
	Plage double / Double sided Doppelter Kontakt	4000	3300	3100	2900	-	-	-
MF 200	Plage simple / Simple sided Einacher Kontakt	3200	3000	2850	2650	2500	2200	2000
	Plage double / Double sided Doppelter Kontakt	5000	4250	-	-	-	-	-
MF 250	Plage simple / Simple sided Einacher Kontakt	3800	3400	3250	3000	2750	2500	2250
	Plage double / Double sided Doppelter Kontakt	6000	4750	-	-	-	-	-

MF... corresponding to the width of connecting plates
Maximum number of poles : 12 in single sided technology, 10 in double sided technology.
Derating in accordance with ambient temperature :

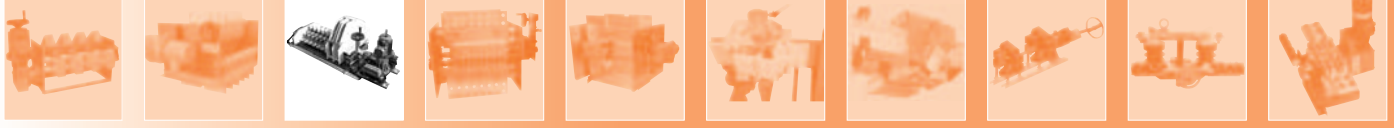
$$K = \sqrt{\frac{110 - \Theta}{70}}$$

Example of selection :
Cicuit 500 Hz - 7200 A - 2250 V, Single phased. Ambient 50 °C - isolation of og and back ways.

Solution :
Derating factor

$$\sqrt{\frac{110 - 50}{70}} = 0{,}92$$

therefore the use of device with a maximum permissible current of 7200 A / 0.92 = 7826 A is required, i.e. :
MF 200 (1-0) with 6 single sided poles sand wiched RSRSRS*, 3 poles for each phase. In mum current per phase of 2650 X 3 = 7950 A (higher than 7826 A, therefore correct).

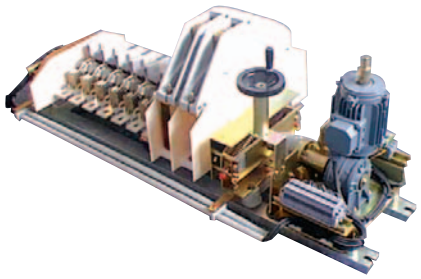


DC Loadbreak Switches

IF TYPE

1000 V DC - 800 to 6300 A

- Cost saving against DC circuit breakers
- True opening and visible distance
- High loadbreak and loadmake performances
- Closing under large short circuit current



Main characteristics

Type: IF 1000 V / ... A	Rated thermal current (I_{TH}) (A)	Short time withstand current over 1 min (A)	Peak short-circuit current (kA)	Rate circuit making capacity (kA)
800	800	2700	50	50
1600	1600	4800	75 *	66 *
2000	2000	6000	75 *	66 *
2500	2500	7500	75 *	66 *
3150	3150	9500	75 *	66 *
3800	3800	11500	75 *	66 *
4400	4400	13200	75 *	66 *
5000	5000	15000	75 *	66 *
5700	5700	17100	75 *	66 *
6300	6300	19000	75 *	66 *

** (minimum values as switch has not been tested further)*

IF 1000V/800A to 6300A :

Rated insulation voltage	Rated breaking capacity	Electrical endurance L/R (ms)		Mechanical endurance (cycles)
1000 V DC *	5 ms **	20 ***	100 ****	10000

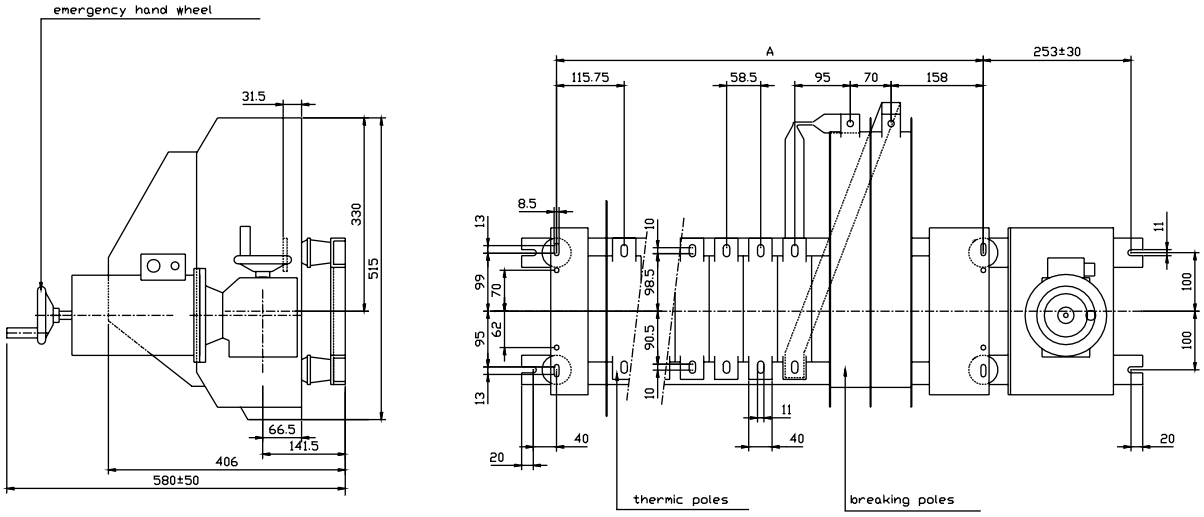
** (1500 V DC under request)*
*** (1000 V - 10000 A - L/R) : minimum value as switch has not been tested further*
**** (100 cycles at 1000 V - 5000 A - L/R)*
***** (600 cycles at 500 V - 4000 A - L/R)*

Typical voltage drop at nominal current : 36 mV

Technological features

- Separation between main contacts and arcing contacts
- Main contacts of silver-plated copper with two contact points per knife, and special shape for high withstand to short-circuit currents.
- Spring system made of stainless steel.
- Insulating parts made of self-extinguishing fiber glass polyester. Fire classification : UL 94 VO
- Conformity to norms NFC 20 040 catg C

Dimensions and weight



*** Enlargement Dimensions C, J, H for Motor drive*

Type: IF 1000 V = / ... A	Number of thermal poles	Number of breaking poles	Dim. A	Weight without motorization (kg)
800	1	2	458.8	30
2 x 800	2 x 1	2	548.5	32
1600	2	2	517	32
2 x 1600	2 x 2	2	665.5	35
2000	3	2	575.5	34
2 x 2000	2 x 3	2	782.5	38
2500	4	2	634	35
2 x 2500	2 x 4	2	899.5	41
3150	5	2	692.5	37
2 x 3150	2 x 5	2	1016.5	43
3800	6	2	751	38
4400	7	2	809.5	40
5000	8	2	909.5	41
5700	9	2	968	42
6300	10	2	1026.5	43

Approximate weight of motorisation : 30 kg
For voltage above 500V use 2 switching poles in series (2-switching-pole loadbreak switch on request)

References in the world

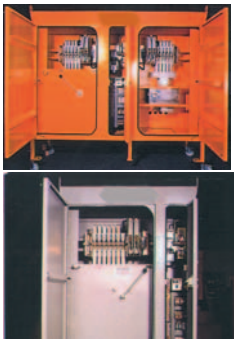
Subway : Athena, Barcelone, Bilbao, Cairo, Caracas, Docklande, Lille, Lisbone, Madrid, Marseille, Mexico, Midland metro, New-york, Paris, Santiago, Teheran.

Light Rail : Grenoble, Nantes, Melbourne, Rouen, Strasbourg.

Railways : Frenche railways, British-rail.

Your choice of design

Capability of mounting in enclosure



With its engineering capability in Mannheim (Germany), in Provins (France), and its testing platforms in Saint-Bonnet-de-Mure (France), FERRAZ has it all for defining and offering customized solutions to meet your most specific requirements :

- Adapted drives or control units
- Enclosures for switch protection
- Adapted technical performances (short-circuit current capability, endurance…)

High - Current Disconnectors

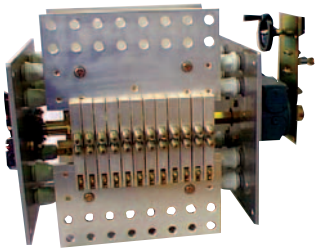
NOR Range

1500 V DC - 4000 to 64000 A

Single Pole / Double Pole

Copper Terminals

- **Low and constant voltage drop**
- **Very compact design**
- **High short - circuit current withstand**
- **Large insulation and creepage distances**
- **Easy connections to Copper busbars by bolting**
- **Large customization possible with:**
  - **Actuators (motor, pneumatic, manual)**
  - **Auxiliaries (limit switches, locks, control boxes)**
  - **Dimensions fitting**



Main technical characteristics

Electrical Data

▪ Temperature rise at nominal current (with 40°C max. Ambient temperature) less than	: 65°C
▪ Typical temperature rise at nominal current (with 40°C max.)	: 15°C above busbars
▪ Typical Voltage drop at nominal current	: 30 mV
▪ Peak short-circuit current withstand (upon circuit configuration)	
- In one pole configuration	: 10 x (Nominal current)
- In two poles configuration	: 5 x (nominal current)
▪ Dielectric withstand strength	
- Between live parts in open position	: 10 kV - 50 Hz - 1 min
- Between live parts and earth	: 10 kV - 50 Hz - 1 min
- Between auxiliary contacts and earth	: 2.5 kV - 50 Hz - 1 min
- Between motor and earth	: 2 kV - 50 Hz - 1 min
▪ SCR leakage current breaking capacity (upon request)	: 1 A - 100 V DC
▪ Power breaking capacity up to 100 kA - 100 V DC - L/R < 20 msec	: Upon request

Mechanical Data

▪ Mechanical endurance (with respect to maintenance instructions).	: 20 000 Cycles
▪ Typical duration of opening or dosing operation	
- With motor operation	: 3 to 12 seconds
- With pneumatic operation	: Less than 1 second
▪ Ponctual temperature withstand without equipment damages.	: 140°C

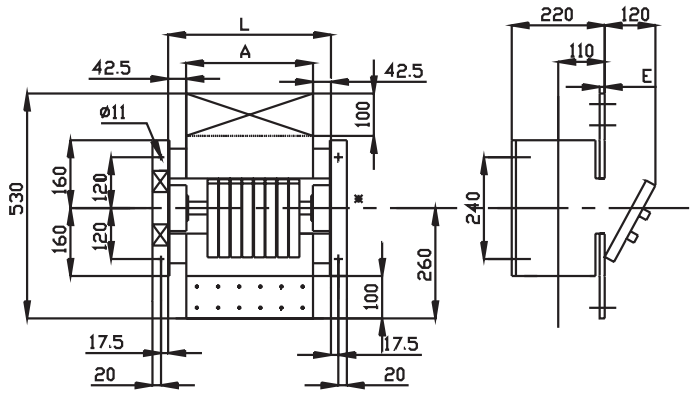
Technology

- Visible break by direct seeing of the mobile silver-plated copper contacts
- Mechanically independant mobile contact arms with high-pressure springs
- Electrical contact with silver to silver contact
- Insulation with Fiberglass reinforced polyester insulators
- Operation mechanism by a toggle closed system
- Mechanism of bichromate galvanized steel
- Disconnectors are self-supporting - Busbars support must be sized to withstand the disonnector additional weight
- For change-over design, please refer to our datasheet reference
- Upon request, possible association of two devices on the same drive

Main dimensions

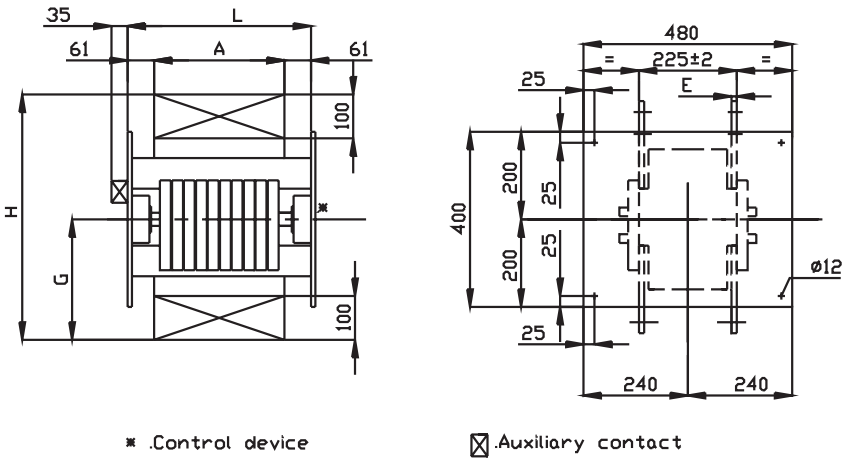
NOR 4000 to 64000 A

Figure 1



Dimensions mm	Current Rating kA					
	4	6	8	10	12.5	16
A	150	250	300	350	400	450
E	15	15	15	15	15	20
L	235	335	385	435	485	535
Driving	Weight kg					
Manual Handle	24	36	52	62	75	92
Geared motor	27	39	57	67	80	97

Figure 2

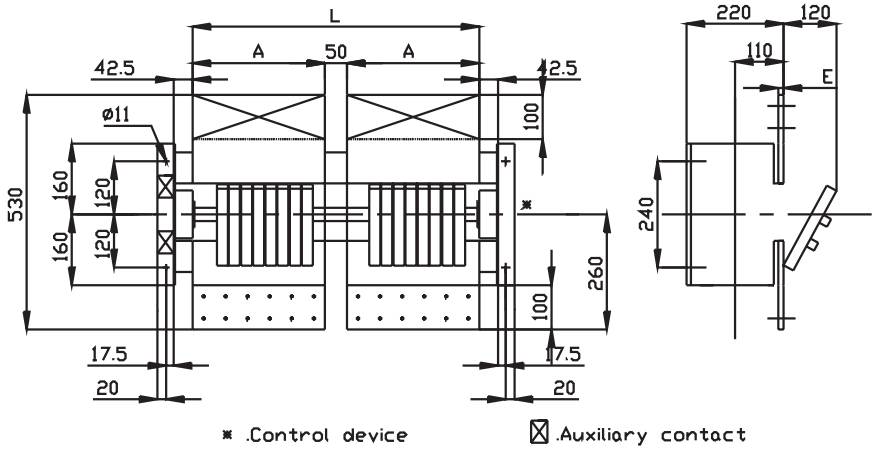


Dimensions mm	Current Rating kA												
	8	10	12	16	20	25	32	35	40	45	48	56	65
A	150	200	250	300	350	400	450	500	550	600	700	850	950
E	15	15	15	15	15	15	20	20	20	20	20	20	20
G	280	280	280	280	280	280	280	280	280	280	280	280	280
H	570	570	570	570	570	570	570	570	570	570	570	570	570
L	272	322	372	422	472	522	572	622	672	722	822	972	1072
Driving	Weight kg												
Manual Handle	55	65	80	95	115	140	180	195	215	235	275	310	345
Geared motor	60	70	85	100	120	145	190	205	225	245	285	325	360

Main dimensions

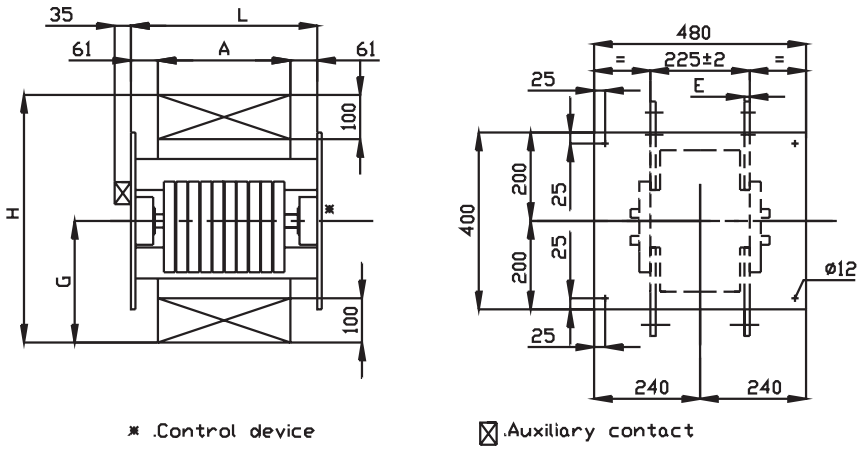
NOR 4000 to 64000 A

Figure 3



Dimensions mm	Current Rating kA 4	6	8
A	150	250	300
E	15	15	15
L	435	635	735
Driving		Weight kg	
Manual Handle	45	70	95
Geared motor	48	70	100

Figure 4

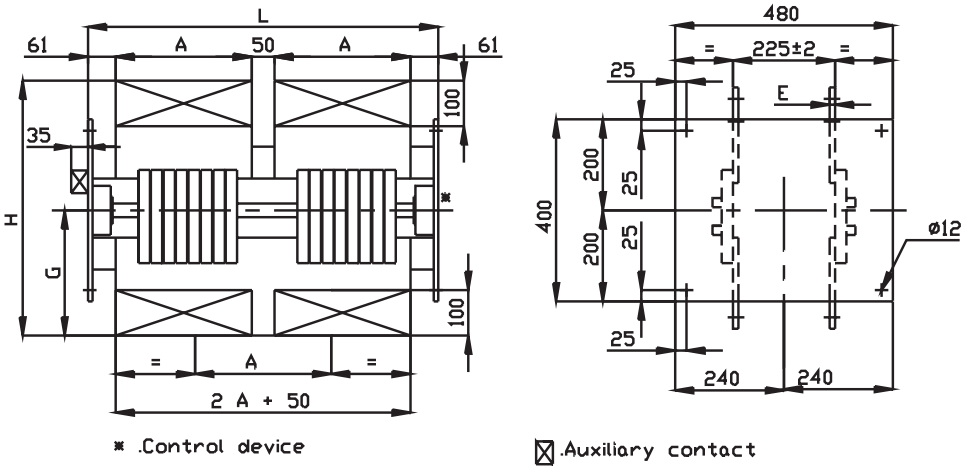


Dimensions mm	Current Rating kA 4	6	8	10	12.5	16	18	20	22	25	28	32
A	150	250	300	350	400	450	500	550	600	700	850	950
E	15	15	15	15	15	20	20	20	20	20	20	20
G	280	280	280	280	280	280	280	280	280	280	280	280
H	570	570	570	570	570	570	570	570	570	570	570	570
L	272	372	422	472	522	572	622	672	722	822	972	1072
Driving	Weight kg											
Manual Handle	55	80	95	115	140	180	195	215	235	275	310	345
Geared motor	60	85	100	120	145	190	205	225	245	285	325	360

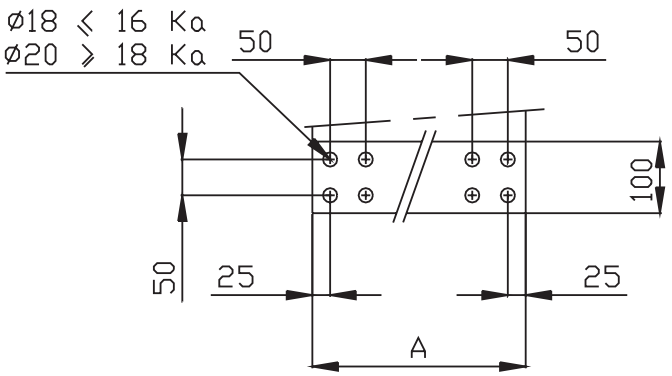
Main dimensions

NOR 4000 to 64000 A

Figure 5



Dimensions mm	Current Rating kA						
	8	10	12	16	20	25	32
A	150	200	250	300	350	400	450
E	15	15	15	15	15	15	20
G	280	280	280	280	280	280	280
H	570	570	570	570	570	570	570
L	472	572	672	772	872	972	1072
Driving				Weight kg			
Manual Handle	95	115	135	175	215	265	335
Geared motor	100	120	140	180	220	275	345



Ferraz Shawmut

High - Current Change - Over Disconnectors

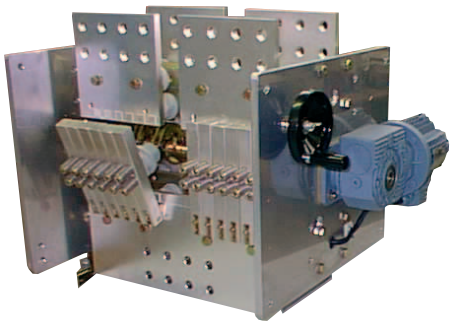
NOR-R Range

1500 V DC - 4000 to 32000 A

Single Pole / Double Pole

Copper Terminals

- **Low and constant voltage drop**
- **Very compact design**
- **High short - circuit current withstand**
- **Large insulation and creepage distances**
- **Easy connections to Copper busbars by bolting**
- **Large customization possible with:**
  - **Actuators (motor, pneumatic, manual)**
  - **Auxiliaries (limit switches, locks, control boxes)**
  - **Dimensions fitting**



Main technical characteristics

Electrical Data

▪ Temperature rise at nominal current (with 40°C max. Ambient temperature) less than	: 65°C
▪ Typical temperature rise at nominal current (with 40°C max.)	: 15°C above busbars
▪ Typical Voltage drop at nominal current	: 30 mV
▪ Peak short-circuit current withstand (upon circuit configuration)	: 5 x (Nominal current)
▪ Dielectric withstand strength	
- Between live parts in open position	: 10 kV - 50 Hz - 1 min
- Between live parts and earth	: 10 kV - 50 Hz - 1 min
- Between auxiliary contacts and earth	: 2.5 kV - 50 Hz - 1 min
- Between motor and earth	: 2 kV - 50 Hz - 1 min
▪ SCR leakage current breaking capacity (upon request)	: 1 A - 100 V DC
▪ Power breaking capacity up to 100 kA - 100 V DC - L/R < 20 msec	: Upon request

Mechanical Data

▪ Mechanical endurance (with respect to maintenance instructions).	: 20 000 Cycles
▪ Typical duration of opening or dosing operation	
- With motor operation	: 3 to 12 seconds
- With pneumatic operation	: Less than 1 second
▪ Ponctual temperature withstand without equipment damages.	: 140°C

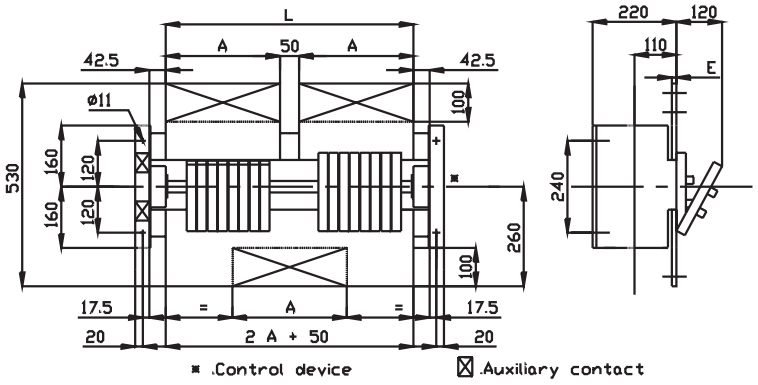
Technology

- Visible break by direct seeing of the mobile silver-plated copper contacts
- Mechanically independant mobile contact arms with high-pressure springs
- Electrical contact with silver to silver contact
- Insulation with Fiberglass reinforced polyester insulators
- Operation mechanism by a toggle closed system
- Mechanism of bichromate galvanized steel
- Disconnectors are self-supporting - Busbars support must be sized to withstand the disonnector additional weight
- Upon request, possible association of two devices on the same drive

Main dimensions

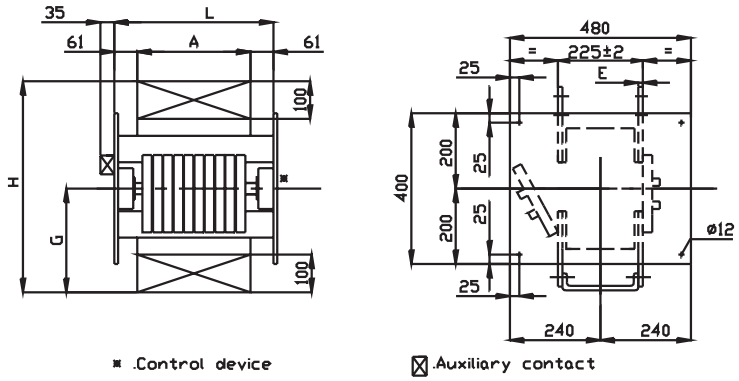
NOR-R 4000 to 32000 A

Figure 6



Dimensions mm	Current Rating kA 4	6	8	10	12.5
A	150	250	300	350	400
E	15	15	15	15	15
L	435	635	735	835	935
Driving			Weight kg		
Manual Handle	45	68	95	115	140
Geared motor	48	72	100	120	145

Figure 7

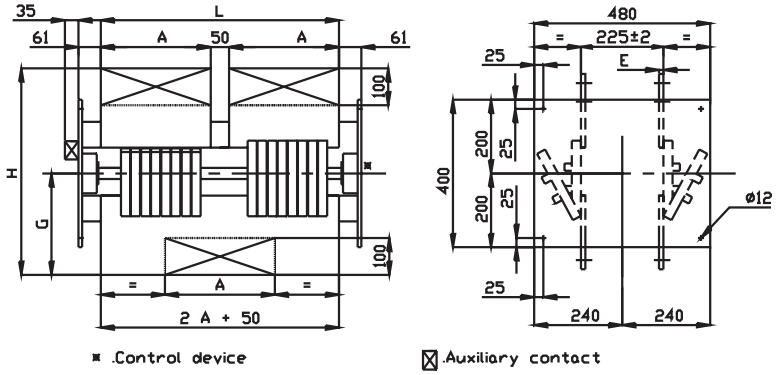


Dimensions mm	Current Rating kA 4	6	8	10	12.5	16
A	150	250	300	350	400	450
E	15	15	15	15	15	20
G	280	280	280	280	280	280
H	570	570	570	570	570	570
L	272	372	422	472	522	572
Driving			Weight kg			
Manual Handle	55	80	95	115	140	180
Geared motor	60	85	100	120	145	190

Main dimensions

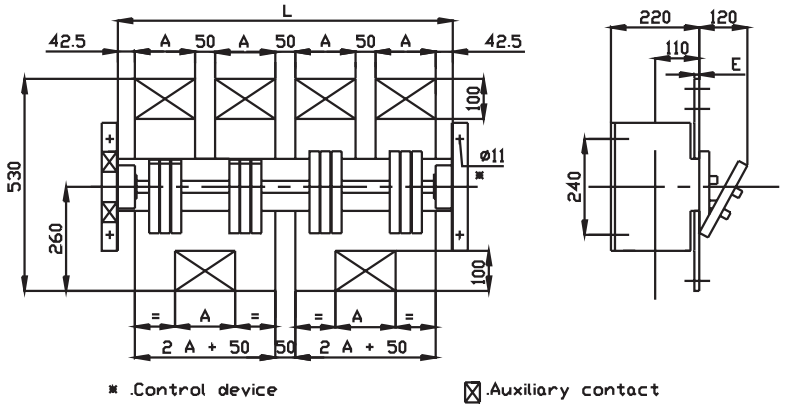
NOR-R 4000 to 32000 A

Figure 8



Dimensions mm	Current Rating kA						
	8	10	12	16	20	25	32
A	150	200	250	300	350	400	450
E	15	15	15	15	15	15	20
G	280	280	280	280	280	280	280
H	570	570	570	570	570	570	570
L	472	572	672	772	872	972	1072
Driving	Weight kg						
Manual Handle	95	115	135	175	215	265	335
Geared motor	100	120	140	180	220	275	345

Figure 9

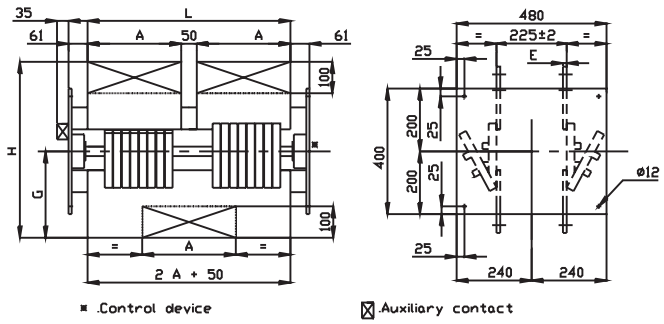


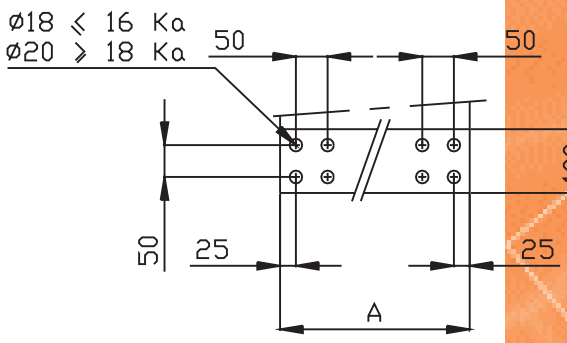
Dimensions mm	Current Rating kA	
	4	6
A	150	250
E	15	15
L	835	1235
Driving	Weight kg	
Manual Handle	85	135
Geared motor	90	140

Main dimensions

NOR-R 4000 to 32000 A

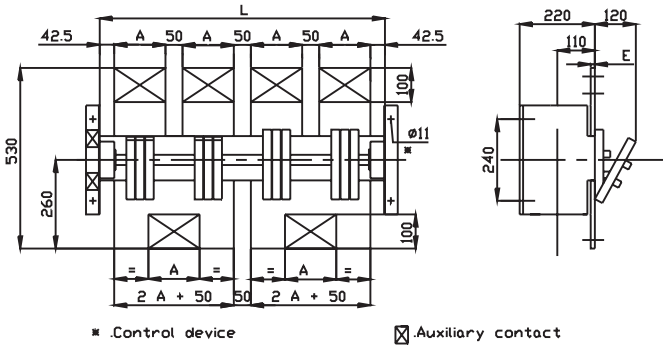
Figure 10





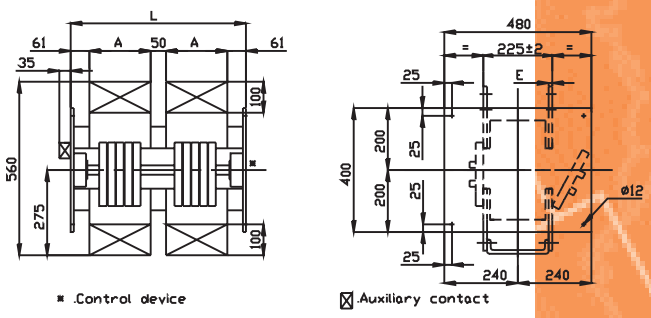
Dimensions mm	Current Rating kA 4	6	8	10	12.5	16
A	150	250	300	350	400	450
E	15	15	15	15	15	20
G	280	280	280	280	280	280
H	570	570	570	570	570	570
L	472	672	772	872	972	1072
Driving	Weight kg					
Manual Handle	95	135	175	215	265	335
Geared motor	100	140	180	220	275	345

Figure 11



Dimensions mm	Current Rating kA 8	10	12	16
A	150	200	250	300
E	15	15	15	15
G	280	280	280	280
H	570	570	570	570
L	872	1072	1272	1472
Driving	Weight kg			
Manual Handle	180	220	260	340
Geared motor	185	225	265	345

Figure 12



Dimensions mm	Current Rating kA 4	6	8
A	150	250	300
E	15	15	15
G	280	280	280
H	570	570	570
L	472	672	772
Driving	Weight kg		
Manual Handle	95	135	175
Geared motor	100	140	180

High-Current Disconnectors

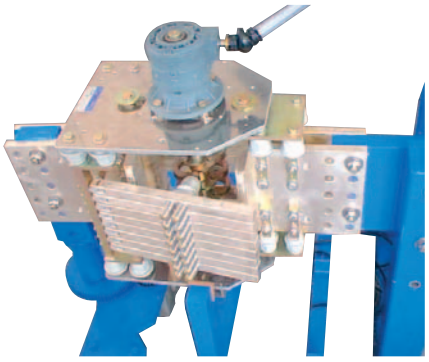
NORD Range

1500 V DC - 14 kA to 140 kA

Single pole / Double pole / Change-over

Aluminum or Copper Terminals

- **Accept busbar dilatations thanks to built-in deformabality(Flexible joints are not necessary)**
- **Low and constant voltage drop**
- **Self-cleaning effect on contact**
- **High short-circuit current withstand**
- **Large insulation and creepage distances**
- **Easy connections to:**
  - **Aluminium busbars by welding**
  - **Copper busbars by bolting**
- **Large customization possible with:**
  - **Actuators (motor, pneumatic, manual)**
  - **Auxiliaries (limit switches, locks, control boxes)**
  - **Adaptation to the connecting busbars.**
- **According to IEC 60947-3 / IEC 60077-1 (NFF 16101 / 16102)**



Main technical characteristics

Electrical Data

Temperature rise at nominal current (with 40°C max. Ambient temperature) less than	: 65°C
Typical temperature rise at nominal current (with 40°C max. Ambient temperature)	: 15°C above busbars
Typical voltage drop at nominal current	: 40 mV
Peak short-circuit current withstand (upon circuit configuration)	: 8 x (Nominal current)
Dielectric withstand strength	
- Between live parts in open position	: 10 kV - 50 Hz - 1 min
- Between live parts and earth	: 10 kV - 50 Hz - 1 min
- Between auxiliary contacts and earth	: 2.5 kV - 50 Hz - 1 min
- Between motor (AC) and earth	: 2 kV - 50 Hz - 1 min
SCR leakage current breaking capacity (upon request)	: 1 A - 100 V DC L/R = 5 ms
Power breaking capacity up to 100 kA - 100 V DC - L/R < 20 msec	: Upon request

Mechanical Data

Built-in standard deformability (longitudinally (dL) / transversally (dT) / axially (dA)) (higher values available upon request)	: 25 / 80 / 10 mm
Mechanical endurance (with respect to maintenance instructions). Higher endurance upon request	: 20 000 Cycles
Typical duration of opening or closing operation	
- With motor operation	: 3 to 12 seconds
- With pneumatic operation	: Less than 1 second
Ponctual contact temperature on live parts withstand without equipment damages	: 140° C

Technology

- Visible break by direct seeing of the mobile silver-plated copper contacts
- Mechanically independant mobile contact arms with high-pressure springs
- Electrical contact with silver to silver contact
- Insulation with Fiberglass reinforced polyester insulators
- Operation mechanism of bichromate galvanized steel by a toggle closed system
- Disconnectors are self-supporting - Busbars support must be sized to withstand the disconnector additional weight
- Upon request, choice of input and output terminals in aluminium or silver-plated copper
- Upon request, two poles or change-over design by side association of two disconnectors

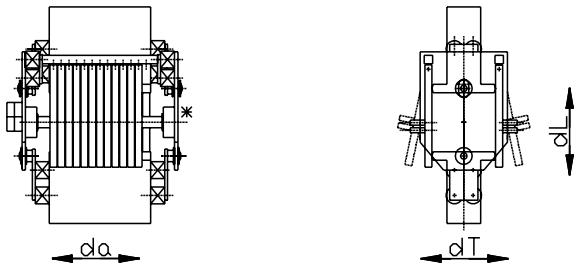
Main dimensions

Nominal current(kA)	No. mobile contacts	A mm	B mm	Weight kg
14	12	200	90	130
18	16	255	90	150
22	20	310	90	175
27	24	365	90	200
32	28	420	90	225
35	32	475	90	250
39	36	530	90	280
43	40	585	90	305
47	44	640	90	330
51	48	695	97	355
55	52	750	97	380
58	56	805	97	410
62	60	860	97	435
66	64	915	97	460
70	68	970	97	485

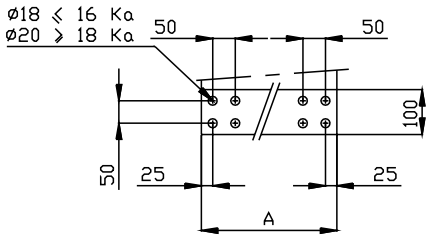
In	C	C'	D	E	E'
>47 kA	892.5	460	842.5	820	460
≤ 47 kA	802.5	432.5	780	792.5	432.5

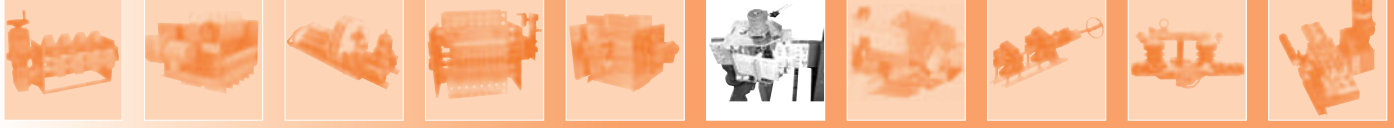
Deformability

(Factory settings at : dL: ± 12.5 - dT: ±40 - dA: ±5)

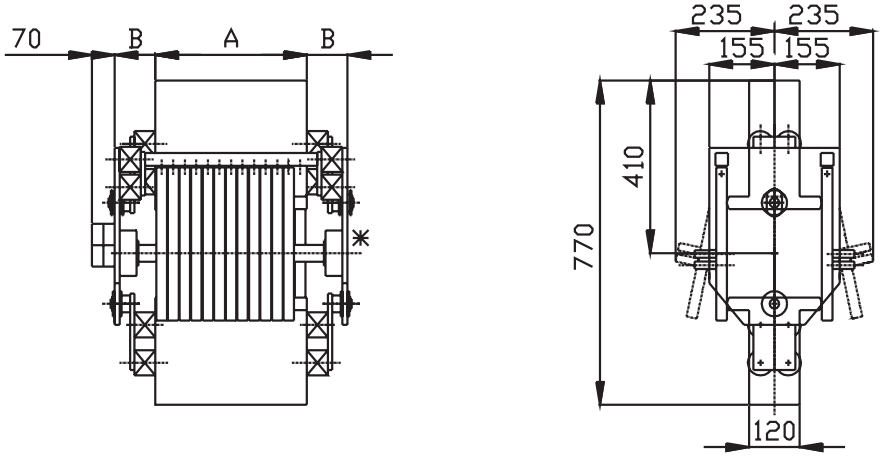


Typical bolting scheme on copper connecting plates d, chosen from 0 to 60 mm



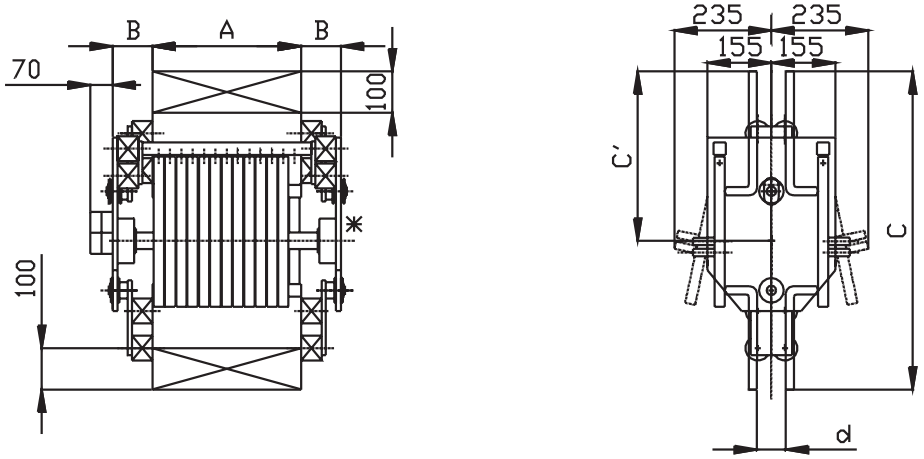


Aluminium type



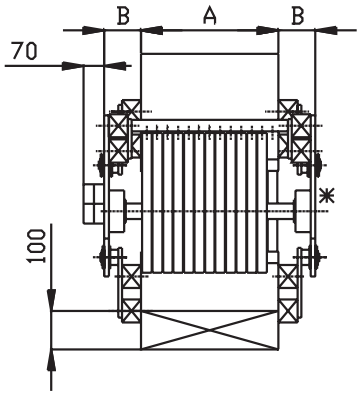
* .Control device ⊞ .Auxiliary contact

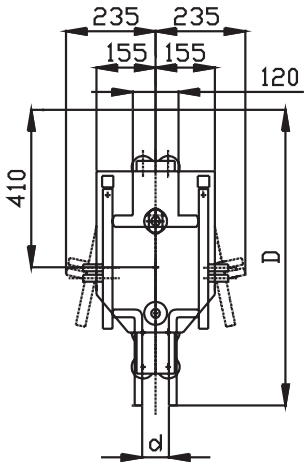
Copper type



* .Control device ⊞ .Auxiliary contact ⊠ .Bolting scheme below

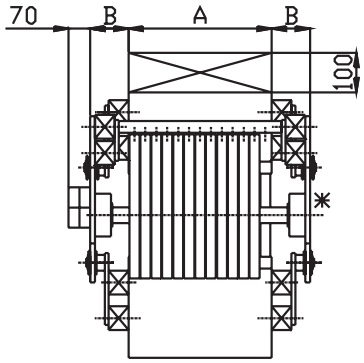
Aluminium/Copper type

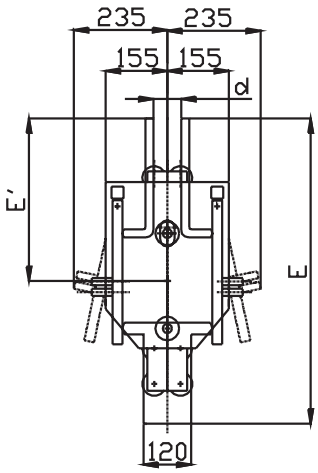




* .Control device ⊞ .Auxiliary contact ⊠ .Bolting scheme below

Copper/Aluminium type

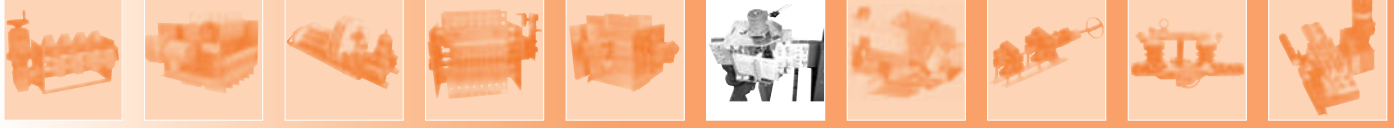




* .Control device ⊞ .Auxiliary contact ⊠ .Bolting scheme below

FERRAZ has it all for defining and offering customized solutions to meet your most specific requirements :

- Adapted drives or control units
- Enclosures for switch protection
- Adapted technical performances (short-circuit current capability, endurance, grounding contacts)



High-Current Disconnectors

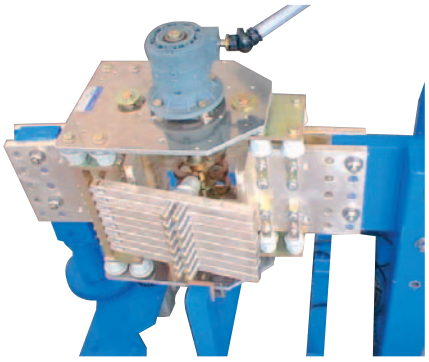
NORD-R Range

1500 V DC - 50 kA to 10 kA

Single pole / Double pole / Change-over

Aluminum or Copper Terminals

- **Accept busbar dilatations thanks to built-in deformabality(Flexible joints are not necessary)**
- **Low and constant voltage drop**
- **Self-cleaning effect on contact**
- **High short-circuit current withstand**
- **Large insulation and creepage distances**
- **Easy connections to:**
  - **Aluminium busbars by welding**
  - **Copper busbars by bolting**
- **Large customization possible with:**
  - **Actuators (motor, pneumatic, manual)**
  - **Auxiliaries (limit switches, locks, control boxes)**
  - **Adaptation to the connecting busbars.**
- **According to IEC 60947-3 / IEC 60077-1 (NFF 16101 / 16102)**



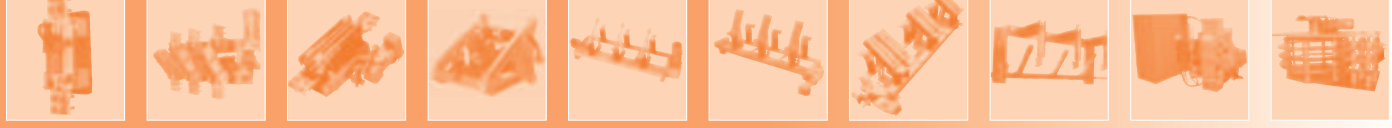
Main technical characteristics

Electrical Data

- Temperature rise at nominal current (with 40°C max. Ambient temperature) less than : 65°C
- Typical temperature rise at nominal current (with 40°C max. Ambient temperature) : 15°C above busbars
- Typical voltage drop at nominal current : 40 mV
- Peak short-circuit current withstand (upon circuit configuration) : 8 x (Nominal current)
- Dielectric withstand strength
  - Between live parts in open position : 10 kV - 50 Hz - 1 min
  - Between live parts and earth : 10 kV - 50 Hz - 1 min
  - Between auxiliary contacts and earth : 2.5 kV - 50 Hz - 1 min
  - Between motor (AC) and earth : 2 kV - 50 Hz - 1 min
- SCR leakage current breaking capacity (upon request) : 1 A - 100 V DC L/R = 5 ms
- Power breaking capacity up to 100 kA - 100 V DC - L/R < 20 msec : Upon request

Mechanical Data

- Built-in standard deformability (longitudinally (dL) / transversally (dT) / axially (dA)) (higher values available upon request) : 25 / 50 / 10 mm
- Mechanical endurance (with respect to maintenance instructions). Higher endurance upon request : 20 000 Cycles
- Typical duration of opening or closing operation
  - With motor operation : 3 to 12 seconds
  - With pneumatic operation : Less than 1 second
- Ponctual contact temperature on live parts withstand without equipment damages : 140° C



Technology

- Visible break by direct seeing of the mobile silver-plated copper contacts
- Mechanically independant mobile contact arms with high-pressure springs
- Electrical contact with silver to silver contact
- Insulation with Fiberglass reinforced polyester insulators
- Operation mechanism of bichromate galvanized steel by a toggle closed system
- Disconnectors are self-supporting - Busbars support must be sized to withstand the disconnector additional weight
- Upon request, choice of input and output terminals in aluminium or silver-plated copper
- Upon request, two poles or change-over design by side association of two disconnectors

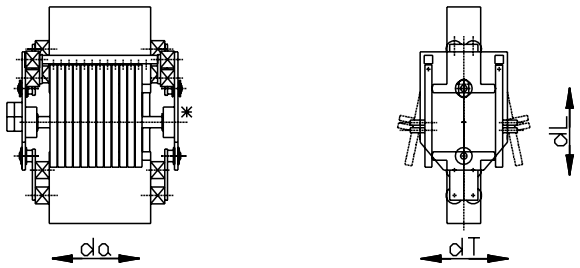
Main dimensions

Nominal current(kA)	No. mobile contacts	A mm
14	12	200
18	16	255
22	20	310
27	24	365
32	28	420
35	32	475
50	36	530
55	40	585
60	44	640
66	48	695
72	52	750
78	56	805
83	60	860
88	64	915
95	68	970
102	72	1025

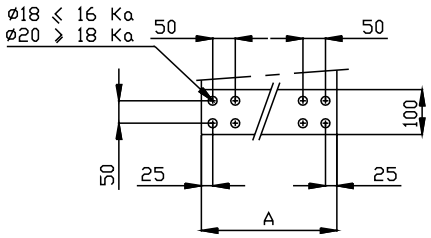
In	C	C'	D	E	E'
≥ 50 kA	892.5	460	842.5	820	460

Deformability

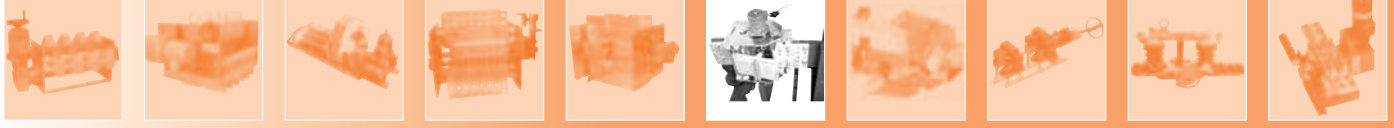
(Factory settings at : dL: ± 12.5 - dT: ±40 - dA: ±5)



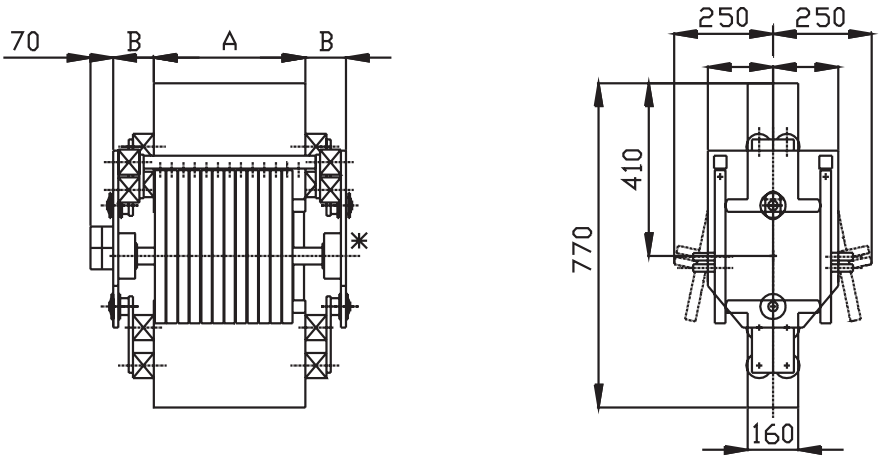
Typical bolting scheme on copper connecting plates d, chosen from 0 to 60 mm



Ferraz Shawmut

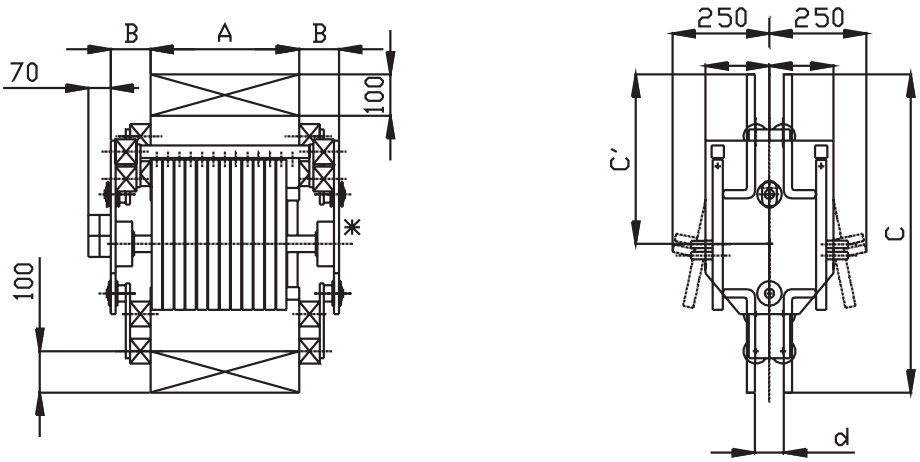


Aluminium type



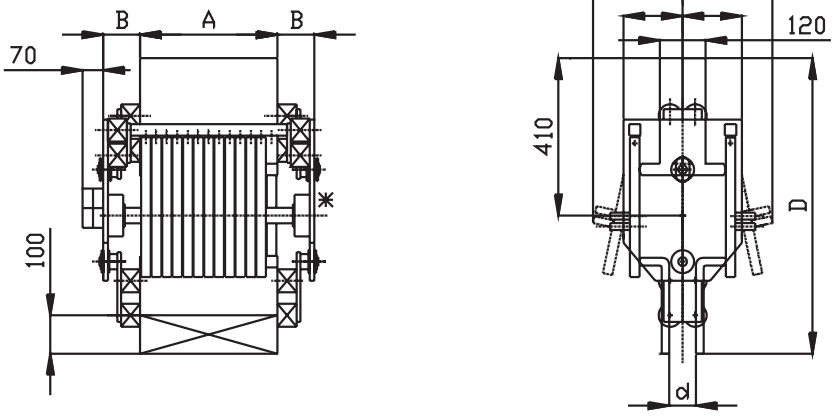
* .Control device ⊞ .Auxiliary contact

Copper type



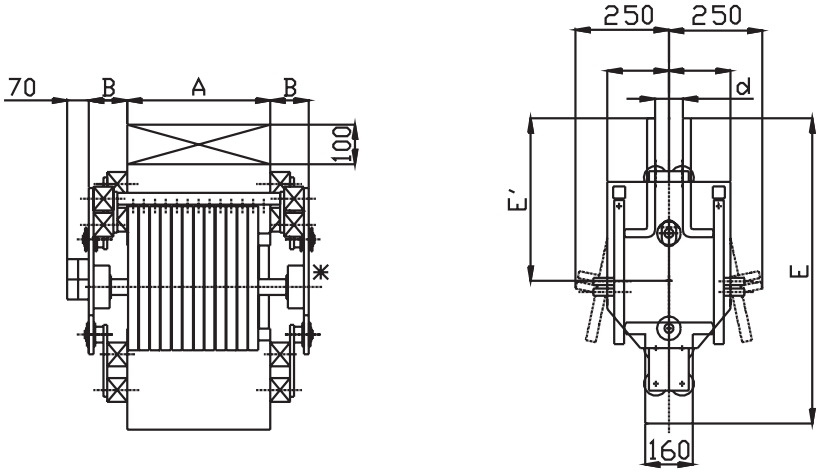
* .Control device ⊞ .Auxiliary contact ⊠ .Bolting scheme below

Aluminium/Copper type



* .Control device ⊞ .Auxiliary contact ⊠ .Bolting scheme below

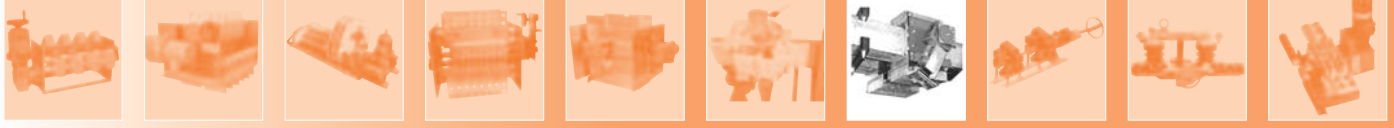
Copper/Aluminium type



* .Control device ⊞ .Auxiliary contact ⊠ .Bolting scheme below

FERRAZ has it all for defining and offering customized solutions to meet your most specific requirements :

- Adapted drives or control units
- Enclosures for switch protection
- Adapted technical performances (short-circuit current capability, endurance, grounding contacts)



Very High Power Disconnectors

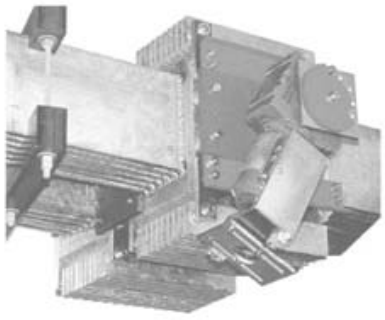
PBD (Plain Bars Disconnectors)

2000 V DC - 20 kA to 160 kA

Single pole / Double pole / Change-over

Aluminum Terminals

- Visible break
- Absorb dimensional variations due to expensions (Flexible joints are not necessary)
- Low and constant voltage drop
- Supported by busbars (no frame required)
- Possibility of covering up totally one side of the disconnector (for protection & isolation)
- Easy connections by welding to high section aluminium busbars
- Large customization possible with:
  - Actuators (motor, pneumatic, manual)
  - Auxiliaries (limit switches, locks, control boxes)
  - Adaptation to the connecting busbars.
- According to IEC 60947-3 / IEC 60077-1



Main technical characteristics

Electrical Data

▪ Temperature rise at nominal current (with 40°C max. Ambient temperature) less than	: 65°C
▪ Voltage drop at nominal current less than	: 60 mV
▪ Peak short-circuit current withstand (upon circuit configuration)	: 8 x (Nominal current)
▪ Dielectric withstand strength	
- Between live parts in open position	: 10 kV - 50 Hz - 1 min
- Between live parts and earth	: 10 kV - 50 Hz - 1 min
- Between auxiliary contacts and earth	: 2.5 kV - 50 Hz - 1 min
- Between motor (AC) and earth	: 2 kV - 50 Hz - 1 min

Mechanical Data

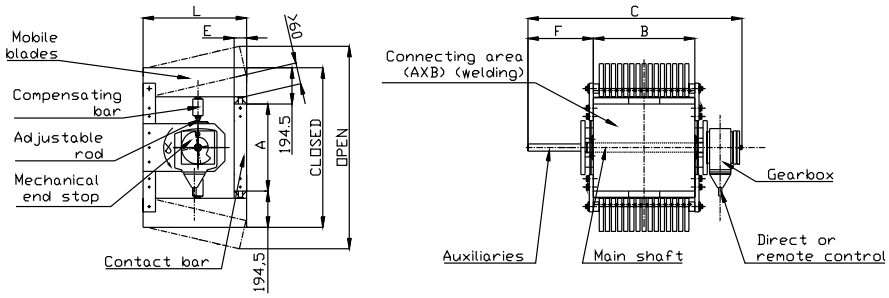
▪ Built-in deformability (longitudinally (dL) / transversally (dT) / axially (dA)) (higher values available upon request)	: 20 / 20 / 20 mm
▪ Mechanical endurance (with respect to maintenance instructions). Higher endurance upon	: 1000 Cycles
▪ Typical duration of opening or dosing operation	
- With motor operation	: Less than 20 seconds
- With pneumatic operation	: Less than 1 second
▪ Ponctual contact temperature on live parts withstand without equipment damages	: 140°C

Technology

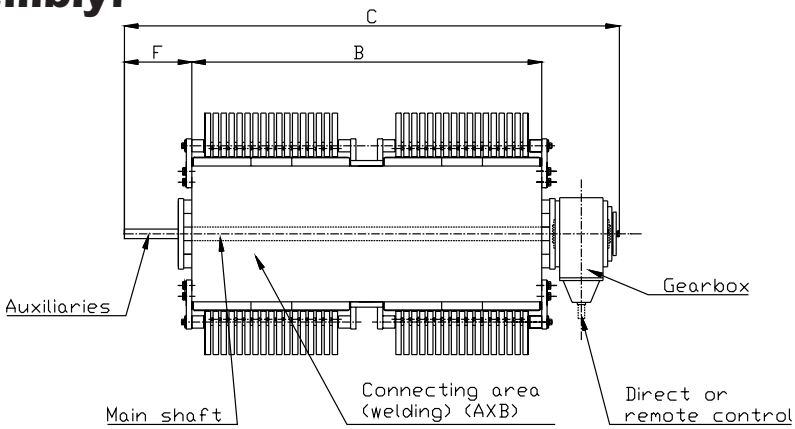
- Copper terminals or mixt optionnal
- All contacts are fitted with solid silver, high temperature brazed (special process)
- Mechanically independant mobile contact arms with high-pressure springs
- Electrical contact with solid pure silver, point to point, contact tips.
- Operation mechanism by a toggle closed system
- Upon request, two poles or change-over design by side association of two disconnectors

Main dimensions

Single Assembly:



Double Assembly:



	Ir (kA)	Nb. of blades	Ø blade (A/mm²)	B (mm)	C (mm)	E (mm)	L (mm)	Weight (kg) A=500
	20	2x7	0.45	290	830	90	530	200
	25	2x9	0.43	350	890	90	530	220
	30	2x10	0.47	380	920	90	530	235
	35	2x12	0.46	440	1000	90	530	270
Simple	40	2x14	0.45	500	1060	90	530	305
Assembly	45	2x16	0.44	560	1120	90	530	340
	50	2x18	0.43	620	1180	90	530	375
	55	2x20	0.45	680	1240	90	530	410
	60	2x22	0.47	740	1300	90	530	445
	70	2x24	0.46	800	1350	120	560	500
	80	4x14	0.45	1120	1660	120	560	750
	90	4x16	0.44	1240	1790	120	560	830
	100	4x17	0.46	1300	1850	120	560	880
Double	110	4x19	0.45	1420	1970	120	560	1080
Assembly	120	4x20	0.47	1480	2030	120	560	1120
	130	4x22	0.46	1600	2150	120	560	1200
	140	4x24	0.46	1720	2210	120	560	1290
	150	4x26	0.45	1840	2390	120	560	1370
	160	4x27	0.46	1900	2450	120	560	1500

Dimensions: A: standard = 500 mm (600 or 700 mm as option)
F: standard = 250 mm
Blade section = 160 x 20 mm

Ferraz Shawmut has it all for defining and offering customized solutions to meet your most specific requirements :

- *Adapted drives or control units*
- *Adapted technical performances (short-circuit current capability, endurance ,small load make / break capacity).*

Ferraz Shawmut

High-current Disconnectors

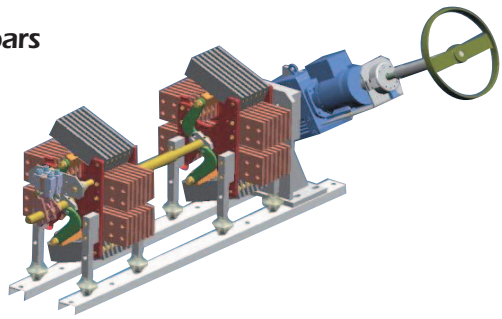
MBD (Multi-Blade Disconnectors)

2000 V DC - 5000 to 60 000 A

Single pole / Double pole / Change-over

Aluminum or copper Terminals

- **Low and constant voltage drop**
- **Large insulation and creepage distances**
- **Easy connnections by bolting to aluminium and coper busbars**
- **Large customization potental with:**
  - **Actuators (motor, pneumatic, manual)**
  - **Auxiliaries (limit switches, locks, control boxes)**
  - **Dimensions to fit (adaptation to connecting terminal).**



Main technical characteristics

Electrical Data

▪ Temperature rise at nominal current (with 40°C max. Ambient temperature) less than	: 65°C
▪ Voltage drop at nominal current less than	: 50 mV
▪ Peak short-circuit current withstand (upon circuit configuration)	: 8 x (Nominal current)
▪ Dielectric withstand strength	
- Between live parts in open position	: 10 kV - 50 Hz - 1 min
- Between live parts and earth	: 10 kV - 50 Hz - 1 min
- Between auxiliary contacts and earth	: 2.5 kV - 50 Hz - 1 min
- Between motor (AC) and earth	: 2 kV - 50 Hz - 1 min

Mechanical Data

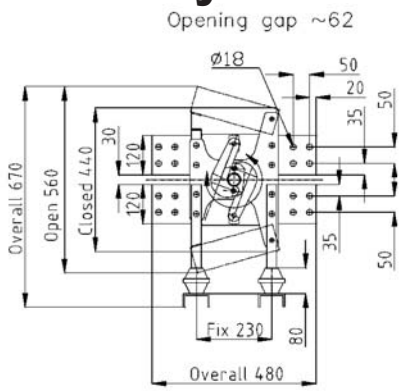
▪ Mechanical endurance (with respect to maintenance instructions. Higher endurance upon request)	: 1000 Cycles
▪ Typical duration of opening or dosing operation	
- With motor operation	: Less than 16 seconds
- With pneumatic operation	: Less than 1 second
▪ Ponctual contact temperature on live parts withstand without equipment damage	: 110°C

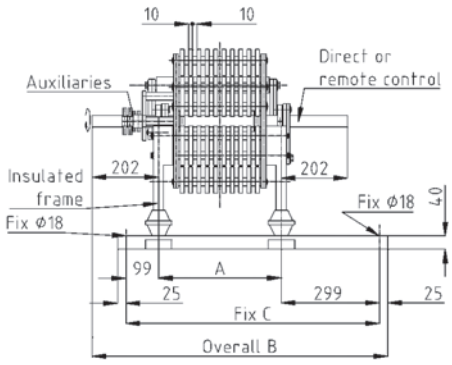
Technology

- All contacts are fitted with solid silver, high temperature brazed (special process)
- Visible break by direct viewing of mobile contacts
- Mechanically independant mobile contact arms with high-pressure springs
- Electrical contact with solid pure silver, point to point, contact tips.
- Insulation with pre-impregnated self-extinguishing flanges and rods with long leakage paths
- Operation mechanism by a toggle closed system
- Upon request, choice of input and output terminals in aluminium or silver-plated copper
- Upon request, two poles or change-over design by side association of two disconnectors

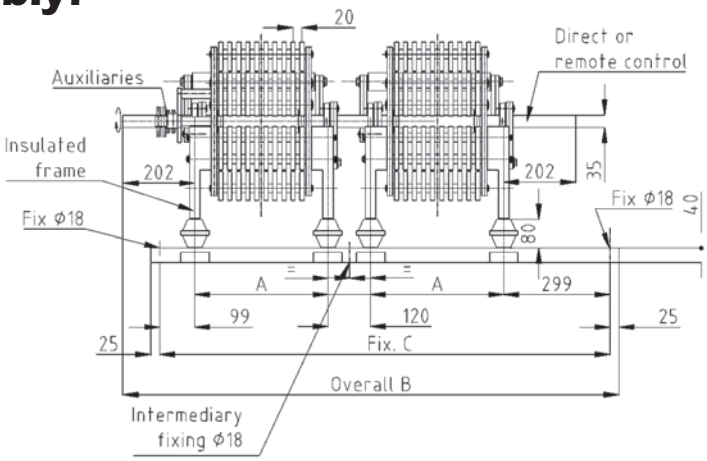
Main dimensions

Single Assembly:





Double Assembly:



	Aluminium					copper					Dimensions		
	5	2x3	80X15	0.69	47	6	2x2	80x12	1.04	55	212	738	610
	6	2x4	80X15	0.63	50	8	2x3	80x12	1.04	65	212	738	610
	8	2x5	80X15	0.67	55	10	2x4	80x12	1.04	75	212	738	610
	-	-	-	-	-	12	2x5	80x12	1.04	85	212	738	610
Simple	10	2x6	80X15	0.69	62	15	2x6	80x12	1.12	95	272	798	670
Assembly	12	2x18	80X15	0.63	67	18	2x7	80x12	1.17	105	272	798	670
	-	-	-	-	-	20	2x9	80x12	1.16	125	302	828	700
	15	2x10	80X15	0.63	72	22	2x10	80x12	1.15	135	342	868	740
	18	2x11	80X15	0.68	76	25	2x11	80x12	1.18	145	342	868	740
	-	-	-	-	-	28	2x12	80x12	1.22	155	382	908	780
	20	2x13	80X15	0.64	86	30	2x13	80x12	1.20	165	383	908	780
	-	-	-	-	-	35	2x14	80x12	1.30	180	402	928	800
	25	4x8	80X15	0.65	145	40	4x8	100x12	1.04	230	272	1190	1062
Double	-	-	-	-	-	45	4x9	100x12	1.04	250	302	1225	1122
Assembly	30	4x10	0.47	1480	2030	50	4x10	100x12	1.04	270	342	1330	1202
	35	4x11	0.46	1600	2150	55	4x11	100x12	1.04	290	342	1330	1202
	40	4x12	0.46	1720	2210	60	4x12	100x12	1.04	330	382	1410	1282

Ferraz Shawmut has it all for defining and offering customized solutions to meet your most specific requirements :

- *Adapted drives or control units*
- *Adapted technical performances (short-circuit current capability, endurance ,small load make / break capacity)*

Low Voltage Disconnectors

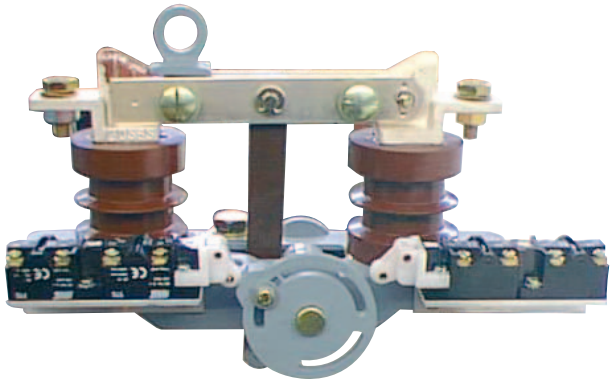
HAZ Range

1 500V Traction Network

100 A to 3.15 kA

One pole – Switch hook operation

- Large isolation air and creepage path
- Self-cleaning blade contacts
- True opening and visible distance
- Rugged anti-torsion construction
- Large customisation with :
  Auxiliary switches, blocking magnets
- According to IEC 62271-102



Electrical Characteristics

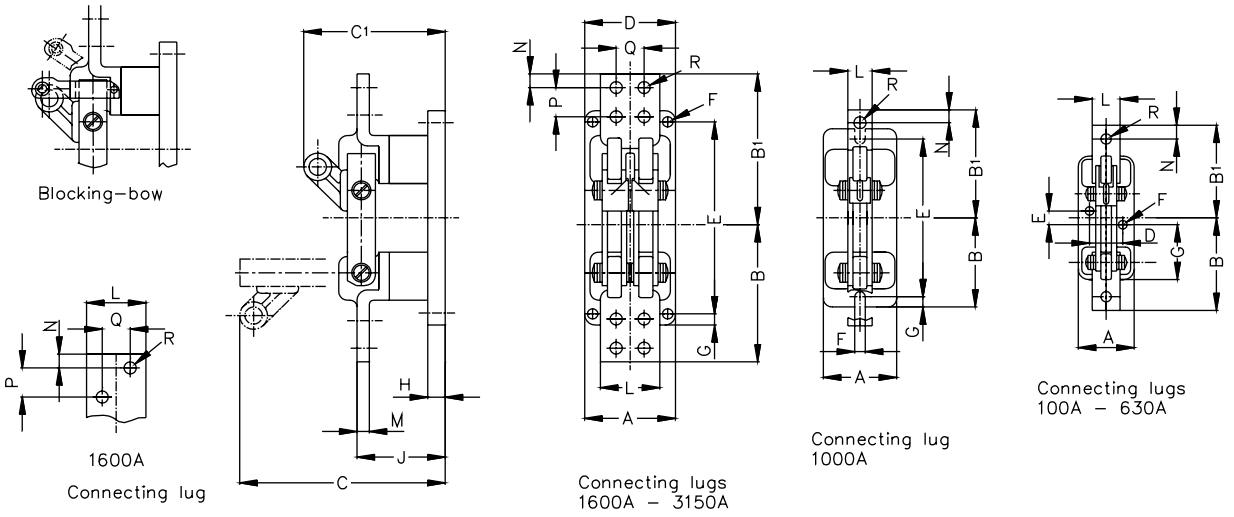
Rated thermal current		RMS 1 sec short-time withstand current (kA)	Rated peak current (kA)
AC (A)	DC (A)		
100	100	22	56
200	200	22	56
400	400	40	100
630	630	40	100
1000	1250	49	123
1600	1900	52	130
2000	2400	57	143
3150	3750	67	168

Nominal Traction Network Voltage (kV)	Dielectric withstand Voltage 1 min/50Hz (kV)	Rated impulse withstand voltage BIL (kV)
1.5	6.5	12

- No-load operation
- Indoor type – only vertical mounting
- Mechanical endurance: <1kA = 50 000 cycles; 1 cycle = open + close
- Maximum temperature withstand at 130° C without damages to the switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated
- Small making / breaking capacity (as option)
- Supporting insulators made of cast epoxy resin (fire classification according to UL94-V1)

Main dimensions

HAZ 100 - 3 150Amp



Amp AC	A poles	B =B1	C	C1	D	E	Fø	G	H	J	L	M	N	P	Q	Rø	Weight (kg)
100	66	99	175	100				65.5		58	25	4	12.5			9.5	0.9
200																11.5	1.0
400		115			30	25	10.5	77.5	12							11	1.9
630	80	125	205	120						72	30	6	15				2.3
1000	105	139	242	160	-	230	12			98	40	10	20				4.3
1600	112	192	300	185	82			15	25	113	60	12	18	27	27	14	6.8
2000		215	310	200		280	14			125	80	18	20	40	40		11.0
3150	130		330	220	100					130	100				50		15.0

Switch hooks

Construction : Hard paper with DIN-hooks according to VDE 0681, part 2. Only suitable for dry rooms

Reference number	Length (mm)	Dielectric Withstand voltage (kV)	Weight (kg)
1.021.04	1120	20	0.81
1.021.06	1520	45	0.99
1.021.07	2020	60	1.21

Ferraz Shawmut has it all for defining and offering customized solutions to meet your most specific requirements :

- Adapted drives or control units
- Adapted technical performances

Low voltage disconnectors

HA Range

1 500V Traction Network

100 A to 3.15 kA

Number of poles: 1,2,3,...

- Large isolation air and creepage path
- Self-cleaning blade contacts
- True opening and visible distance
- Rugged anti-torsion construction
- Large customisation with :
  - Manual, motor, pneumatic drives
  - Auxiliary switches, blocking magnets
- According to IEC 62271-102
- Dimensions Fitting

Electrical Characteristics

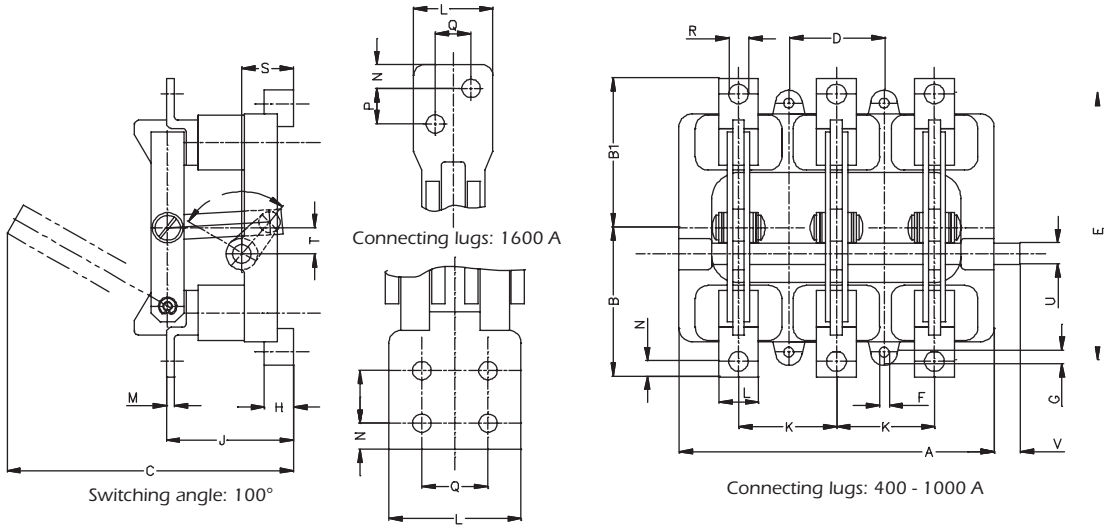
Rated thermal current		RMS 1 sec short-time withstand current (kA)	Rated peak current (kA)
AC (A)	DC (A)		
100	100	22	55
200	200	22	55
400	400	40	100
630	630	40	100
1000	1250	49	123
1600	1900	52	130
2000	2400	52	130
3150	3750	67	168

Nominal Traction Network Voltage (kV)	Dielectric withstand Voltage 1 min/50Hz (kV)	Rated impulse withstand voltage BIL (kV)
1.5	6.5	12

- No-load operation
- Indoor type – only vertical mounting
- Mechanical endurance: ≤ 1kA = 25 000 cycles; >1kA = 50 000 cycles (open / close)
- Maximum temperature withstand at 130° C without damages to the switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated electrolytic copper plates
- Small making / breaking capacity (on demand)
- Supporting insulators made of cast epoxy resin (fire classification according to UL94-V1)

Main dimensions

HA 100A - 3 150A



** Enlargement Dimensions
C, J, H for Motor drive

Amp AC	No of poles	A	B	B1	C(**)	D	E	FØ	G	H(**)	J(**)	K	L	M	N	P	Q	R	S	T	UØ	V	**	Drive
400		90	117	115	203	70	190		10	25	84		30	6	15	-	-	11	28	20	15	40		1A
630			127	125									40		20									
1000		105	139	139	230	75	230	9			98			10						22	18	50		
1600	1		192	192							118	-	60	12	18	27	27	14				70	-	1B
2000		150	215	215	294	120	280	14	15	30	130		80	18	20	40	40		55	29	25	80		
3150											135		100				50							
100		130	101	99	185	70					25	83	70	25	4	12.5		9.5	39	23	12			
200																		11.5						
400		175	117	115	215	85			9	10												40		1A
630	2		127	125							22	96	85	30	6	40		20						
1000		270	139	139	235	245			15	30	103	120		10				33	22	18	50		1B	
1600		300	192	192		266		14			120		60	12	18	27	27	14			25	70		
2000		330	215	215	296	296			32.5	32	132	150	80	18	20	40	40		57	29	30	80	20	2
3150		394				354	190	17			137	180	100				50							
100		180	101	99	185	60				25	83	60	25	4	12.5			9.5	39	23	12			
200		200				70			10			70						11.5				40		1A
400		240	117	115	215	75		9				75	30	6	15			11	40	20	15			
630	3	260	127	125		85						85	40		20									
1000		360	139	139	235	120			15	30	103	120		10					33	22	18	50		1B
1600		420	192	192		386		14			120	60	12	18	27	27		14			25	70		
2000		480	215	215	296	446			32.5	32	132	150	80	18	20	40	40		57	29	30	80	20	2
3150		574				534		17			137	180	100				50							

Ferraz Shawmut has it all for defining and offering customized solutions to meet your most specific requirements :

- Adapted drives or control units
- Adapted technical performances

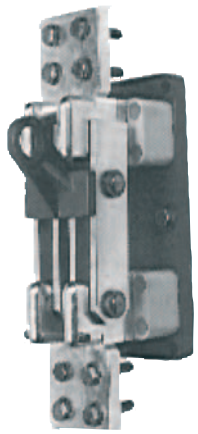
Medium Voltage Disconnectors

HAZS Range

3.6 kV

400 A to 4.0 kA – up to 175 Hz

One pole – Switch hook operation



- Large isolation air and creepage path
- Self-cleaning blade contacts
- True opening and visible distance
- Rugged anti-torsion construction
- Large customisation with :
  Auxiliary switches, blocking magnets
- According to IEC 62271-102

Electrical Characteristics

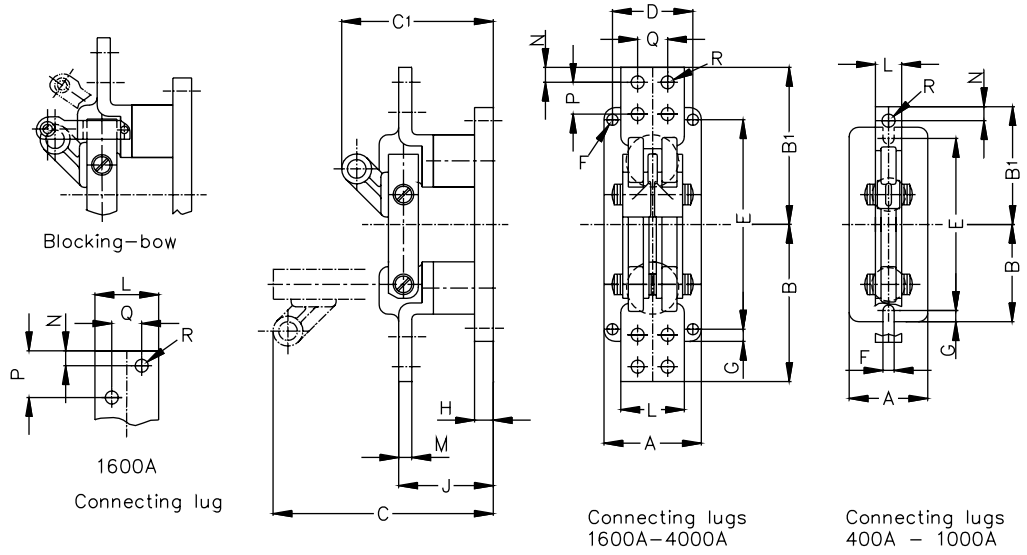
Rated thermal current		RMS 1 sec short-time withstand current (kA)	Rated peak current (kA)
AC (A)	DC (A)		
400	400	26	65
630	630	26	65
1000	1250	40	100
1600	1900	52	130
2000	2400	52	130
3150	3750	71	177
4000	5300	71	177

Dielectric withstand voltage 1 min/50 Hz		Rated impulse withstand voltage BIL	
Phase to earth (kV)	Across the isolating distance (kV)	Phase to earth (kV)	Across the isolating distance (kV)
10	12	40	46

- No-load operation
- Indoor type – only vertical mounting
- Mechanical endurance: ≤ 1kA = 25 000 cycles; >1kA = 50 000 cycles (open / close)
- Maximum temperature withstand at 130° C without damages to the switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated electrolytic copper plates
- Small making / breaking capacity (on demand)
- Supporting insulators made of cast epoxy resin (fire classification according to UL94-V1)

Main dimensions

HAZS 400 – 4 000 A



*** Enlargement Dimensions*
C, J, H for Motor drive

Amp AC	A poles	B=B1	C	C1	D	E	FØ	G	H	J	L	M	N	P	Q	RØ	Weight (kg)
400		125	262	165						108	30	6	15			11	2.2
630	80	135			-	250	12	15	20		40		20	-	-		2.3
1000		144	270	185						116		10					4
1600	100	200	330	200						126	60	12	18	27	27	14	7.2
2000	110	225.5	335	220	60	320	14	20	25	137	80	18			40		11.5
3150	133		340	240						143	100		20	40	50		16
4000	140	224	330	230	65	300			24	149	120	20			60		20

Switch hooks

Construction : Hard paper with DIN-hooks according to VDE 0681, part 2. Only suitable for dry rooms

Reference number	Length (mm)	Dielectric Withstand voltage (kV)	Weight (kg)
1.021.04	1120	20	0.81
1.021.06	1520	45	0.99
1.021.07	2020	60	1.21

Ferraz Shawmut has it all for defining and offering customized solutions to meet your most specific
requirements :

- Adapted drives or control units
- Adapted technical performances (short-circuit current capability, endurance, small load make / break capacity)

Medium voltage disconnectors

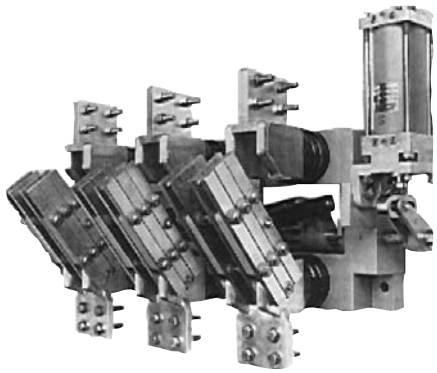
HAS Range

3.6 kV

400 A to 6.3 kA – up to 175 Hz

Number of poles : 1, 2, 3, ...

- **Large isolation air and creepage path**
- **Self-cleaning blade contacts**
- **True opening and visible distance**
- **Rugged anti-torsion construction**
- **Large customisation with :**
  Auxiliary switches, blocking magnets
- **According to IEC 62271**



Electrical Characteristics

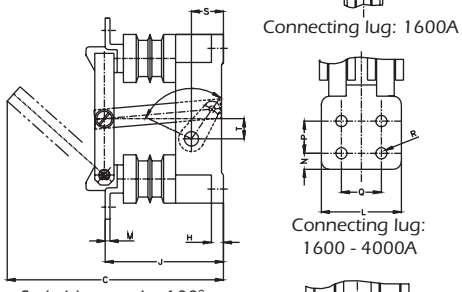
Rated thermal current		RMS 1 sec short-time withstand current (kA)	Rated peak current (kA)
AC (A)	DC (A)		
400	400	26	65
630	630	26	65
1000	1250	40	100
1600	1900	52	130
2000	2400	52	130
3150	3750	71	177
4000	5300	71	177
6300	7500	81	214

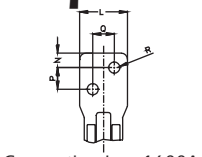
Dielectric withstand voltage 1 min/50 Hz		Rated impulse withstand voltage BIL	
Phase to earth (kV)	Across the isolating distance (kV)	Phase to earth (kV)	Across the isolating distance (kV)
10	12	40	46

- No-load operation
- Indoor type – only vertical mounting
- Mechanical endurance: ≤ 1kA = 25 000 cycles; >1kA = 50 000 cycles (open / close)
- Maximum temperature withstand at 130° C without damages to the switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated electrolytic copper plates
- Small making / breaking capacity (on demand)
- Supporting insulators made of cast epoxy resin (fire classification according to UL94-V1)

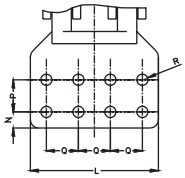
Main dimensions

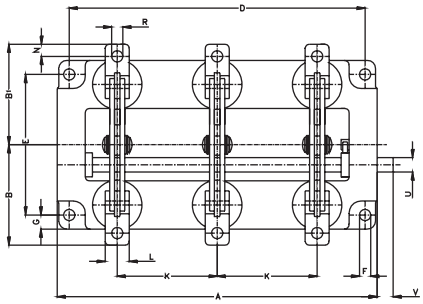
HAS 400 - 6300 Amp

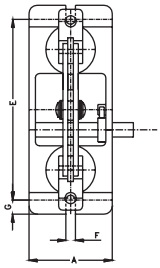



Connecting lug: 1600A

Connecting lug:
1600 - 4000A


Connecting lug:
6300A


Connecting lug:
400 - 1000A


Connecting lug:
400 - 3150A
Single-pole desing

Amp AC	No of poles	A	B =B1	C	D	E	Fø	G	H (**)	J (**)	K	L	M	N	P	Q	R	S	T	Uø	V	**	Drive
400			125	270						148		30	6	15			11					-	
630		105	135			235	11	12.5	15			40		20	-	-		40	25	18	60		1A
1 000			144	285						156			10										
1 600	1		200	365	-					181	-	60	12	18	27	27	14						
2 000		110	223	375		320		20		192		80	18			40			29	25			1B
3 150				385					20	198		100		20	40	50		48			80		
4 000		220	249	420	190	240	14	42.5		205		120				60			32	30			1C
6 300			269	480						225		160				40	18						
400			125	270						148		30	6	15			11						
630		275	135		245	175		17.5	15		125	40		20	-	-		40	25	18	60		1B
1 000			144	285						156			10										
1 600	2		200	375						191		60	12	18	27	27	14			25			
2 000		465	223	385	415	220		27.5	30	202	200	80	18			40			29			15	
3 150				395			18			208		100		20	40	50		58			80		2
4 000		600	249	430	550	240		42.5	36	215	300	120	20			60			32	30			
6 300			269	465					60	235		160				40	18					35	
400			125	270						148		30	6	15			11						
630		400	135		370	175	14	17.5	15		125	40		20	-	-		40	25	18	60	-	1B
1 000			144	285						156			10										
1 600	3		200	375						191		60	12	18	27	27	14			25			
2 000		665	223	385	615	220		27.5	30	202	200	80	18			40			29			15	2
3 150				395			18			208		100		20	40	50		58		30	80		
4 000		800	249	430	750	240		42.5	36	215	250	120	20			60			32			35	4
6 300		904	269	465	850				60	235	300	160				40	18						

Ferraz Shawmut has it all for defining and offering customized solutions to meet your most specific requirements :

- *Adapted drives or control units*
- *Adapted technical performances (short-circuit current capability, endurance ,small load make / break capacity)*

Medium voltage disconnectors

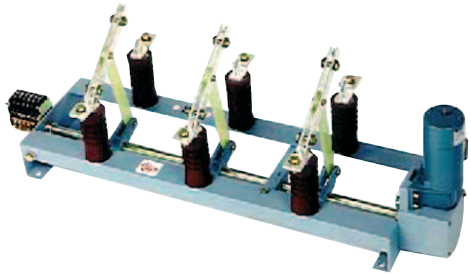
HAS Range

12 kV, 24 kV, 36 kV

400 A to 1 000 A - up to 175 Hz

Number of poles : 1, 2, 3, ...

- Large isolation air and creepage path
- Self-cleaning blade contacts
- True opening and visible distance
- Rugged anti-torsion construction
- Large customisation with :
  - Manual, motor, pneumatic drives
  - Auxiliary switches, blocking magnets
- According to IEC 62271-102
- Dimensions Fitting



Electrical Characteristics

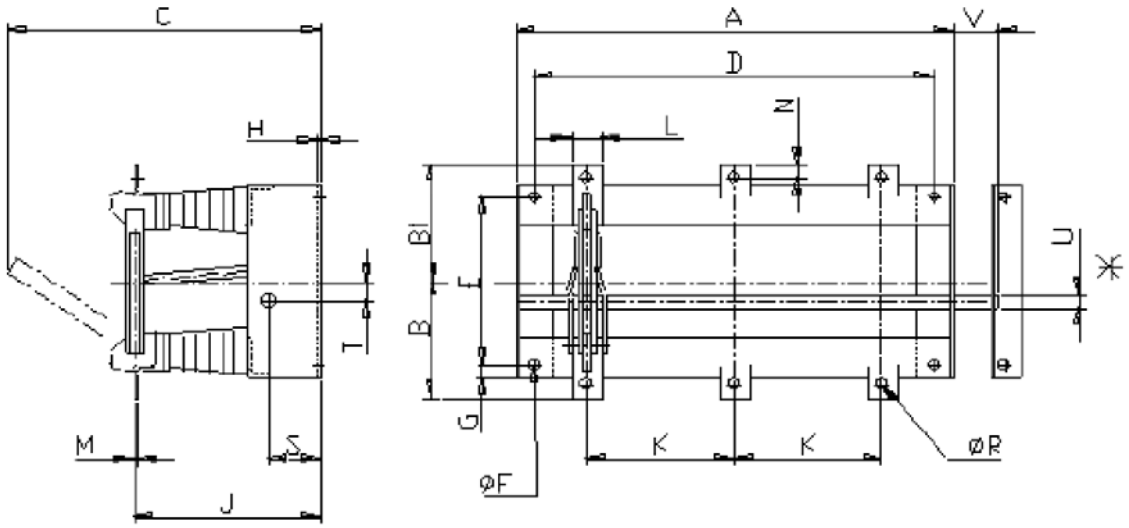
Rated thermal current A	Rated insulation voltage			
	12 kV		24 & 36 kV	
	RMS 1 sec short-time withstand current kA	Rated peak current kA	RMS 1 sec short-time withstand current kA	Rated peak current kA
400	20	50	26	65
630	20	50	26	65
1000	40	100	30	75

(kV)	Dielectric withstand Voltage 1 min/50Hz (KV)		Rated impulse withstan voltage BIL (KV)	
	Phase to earth and between poles (kV)	Across the isolating distance (kV)	Phase to earth and between poles (kV)	Phase to earth and distance (kV)
12	28	32	75	85
24	50	60	125	145
36	70	80	170	195

- No-load operation
- Indoor type - only vertical mounting
- Mechanical endurance: 50 000 cycles for I>1kA; 25 000 cycles for I<kA; 1 cycle = open + close
- Maximum temperature withstand at 130° C without damages to the switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated electrolytic copper plates
- Small making / breaking capacity (on demand)
- Supporting insulators made of cast epoxy resin (fire classification according to UL94-V1)

Medium voltage disconnectors

HAS 400 A to 1000 A



kV	Amp	No of poles	A	B =B1	C	D	E	Fø	G	H	J	K	L	M	N	Rø	S	T	Uø	V	Drive
12	400	1	142	320	450	92	245			5	253	-	30	6	15	11	70	29	18	180	16
	630			340								-	40		20	14					
	1000			358	465						261	-		10							
	400	2	590	320	450	540					253	200	30	6	15	11				60	2
	630			340									40		20	14					
	1000			358	465						261			10							
	400	3	790	320	450	740					253		30	6	15	11					
	630			340									40		20	14					
	1000			358	465						261			10							
24	400	1	142	420	685	92	320	14	40	6	383	320	30	6	15	11	90	80	25	230	1b
	630			440									40		20	14					
	1000			458	700						391			10							
	400	2	570	420	685	520					383		30	6	15	11				185	2
	630			440									40		20	14					
	1000			458	700						391			10							
	400	3	890	420	685	840					383		30	6	15	11					
	630			440									40		20	14					
	1000			458	700						391			10							
36	400	1	142	500	885	92	414				503	-	30	6	15	11	110	60	30	340	1b
	630			520								-	40		20	14					
	1000			538	900						511	-		10							
	400	2	870	500	885	810			41		503	450	30	6	15	11				200	2
	630			520									40		20	14					
	1000			538	900						511			10							
	400	3	1320	500	885	1260		24		50	503		30	6	15	11					
	630			520									40		20	14					
	1000			538	900						511			10							

Ferraz Shawmut offers customized solutions to meet your most specific requirements:

- Adapted drives or control units
- Technical performance specifications (short-circuit current capability, endurance, small load
- make / break capacity)

Medium Voltage Disconnectors

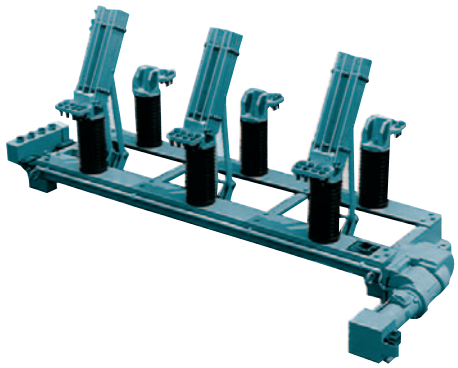
HAS Range

12 kV, 24 kV, 36 kV

1.6 kA to 6.3 kA - up to 175 Hz

Number of poles: 1, 2, 3, ...

- Large isolation air and creepage path
- Self-cleaning blade contacts
- True opening and visible distance
- Rugged anti-torsion construction
- Large customisation with :
  - Manual, motor, pneumatic drives
  - Auxiliary switches, blocking magnets
- According to IEC 62271-102
- Dimensions Fitting



Electrical Characteristics

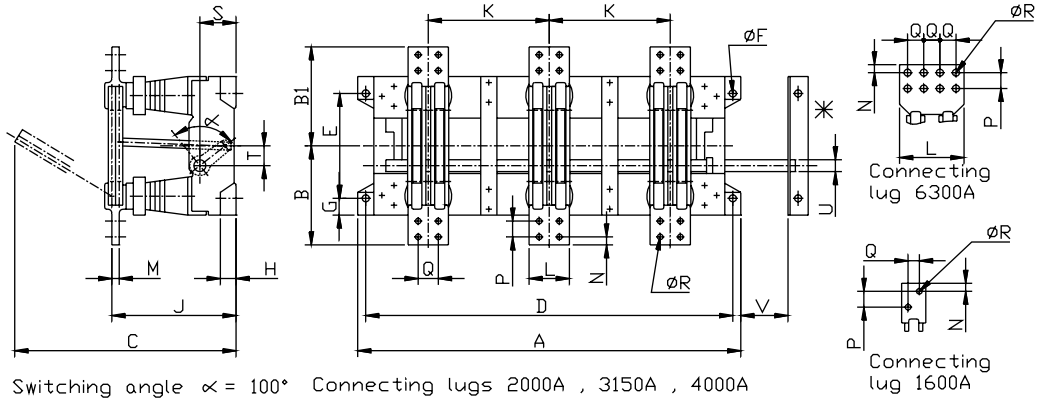
Rated thermal current kA	Rated insulation voltage			
	12 kV		24 & 36 kV	
	RMS 1 sec short-time withstand current kA	Rated peak current kA	RMS 1 sec short-time withstand current kA	Rated peak current kA
1.6	52	130	37	91
2	63	160	58	144
3.15	71	177	64	159
4	71	177	64	159
6.3	81	214	77	193

Dielectric withstand Voltage 1 min/50Hz (kV)			Rated impulse withstand voltage BIL (kV)	
(kV)	Phase to earth and between poles (kV)	Across the isolating distance (kV)	Phase to earth and between poles (kV)	Phase to earth and distance (kV)
12	28	32	75	85
24	50	60	125	145
36	70	80	170	195

- No-load operation
- Indoor type - Vertical mounting only
- Mechanical endurance: 50 000 cycles for I>1kA; 25 000 cycles for I<kA; 1 cycle = open + close
- Maximum temperature withstand at 130° C without damage to switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated electrolytic copper plates
- Small making / breaking capacity (on demand)
- Supporting insulators made of cast epoxy resin (fire classification as per UL94-V1)

Main dimensions

HAS 1.6 kA - 6.3 kA



Switching angle ∝ = 100° Connecting lugs 2000A , 3150A , 4000A

kV	kA	No of poles	A	B =B1	C	D	E	Fø	G	H	J	K	L	M	N	P	Q	Rø	S	T	Uø	V	Drive
12	1.6	1	142	227	538	92	265	14	42.5	6	291	-	60	12	18	27	27	14	93	50	30	200	2
	2			250	543						302	-	80	18	20	40	40						
	3.15				560						308	-	100			50	50						
	4		190	274.5	600	130	344		31		347	-	120			40	60	18	85			215	
	6.3			294	645						367	-	160	20			40						
	1.6	2	650	227	538	610	265	18	42.5	30	291	300	60	12	18	27	27	14	93			135	3
	2			250	543						302		80	18	20	40	40						
	3.15				560						308		100				50						
	4		930	274.5	614	870	344	24	38	50	347	400	120	20			60	18	122			105	
	6.3			294	654						367		160				40						
	1.6	3	950	227	538	910	265	18	42.5	30	291	300	60	12	18	27	27	14	93			135	
	2			250	543						302		80	18	20	40	40						
	3.15				560						308		100				50						
	4		1330	274.5	614	1270		24		50	347	400	120	20			60	18				105	4
	6.3			294	654						367		160				40						
24	1.6	1	142	267	740	92	344	14	38	6	406	-	60	12	18	27	27	14	122	75	35	300	2
	2			290	745						417	-	80	18	20	40	40						
	3.15				760						423	-	100				50						
	4		190	336.5	820	130	414	18	55		450	-	120	20		40	60	18	110	60		290	
	6.3			356	855						470	-	160				40						
	1.6	2	720	267	740	660	344		38	50	406	350	60	12	18	27	27	14	122	75	30	245	3
	2			290	745						417		80	18	20	40	40						
	3.15				760						423		100				50						
	4		980	336.5	820	920	140	24	41		450	450	120	10			60	18	110	60	35	180	4
	6.3			356	855						470		160				40						
	1.6	3	1070	267	740	1010	344	18	38		406	350	60	12	18	27	27	14	122	75	30	245	
	2			290	745						417		80	18	20	40	40						
	3.15				760						423		100				50						
	4		1430	336.5	820	1370		24			450	450	120	20			60	18			35	180	
	6.3			356	855						470		160				40						
36	1.6	2	142	302	880	92	414	14	41	6	516	-	60	12	18	27	27	14	110	60	30	410	4
	2			325	910						527	-	80	18	20	40	40						
	3.15				950						533	-	100				50						
	4		190	376.5	994	130	520	18	55		550	-	120			40	60	18	120	110	35	400	
	6.3			396	1040						570	-	160	20			40						
	1.6	2	960	302	880	900	414	24	41	50	516	450	60	12	18	27	27	14	110	60	30	285	
	2			325	910						527		80	18	20	40	40						
	3.15				950						533		100				50						
	4		1030	376.5	994	970	520		55		550	500	120	20			60	18	120	110	35	290	4
	6.3			396	1040						570		160				40						
	1.6	3	1410	302	880	1350	414		41		516	450	60	12	18	27	27	14	110	60	30	285	3
	2			325	910						527		80				40						
	3.15				950						533		100	18	20	40	50						
	4		1530	376.5	994	1470	520		55		550		120	20			60		120	110	35	290	4
	6.3			396	1040						570	500	160				40	18					5

Medium Voltage Disconnectors

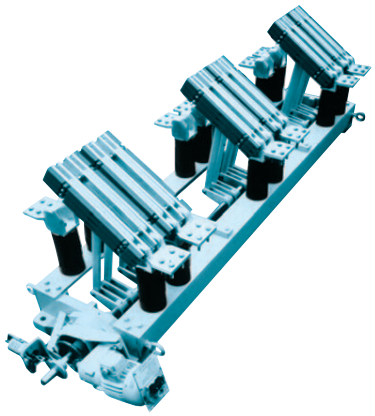
HAS Range

12 kV, 24 kV, 36 kV

8 kA to 12 kA - up to 175 Hz

Number of poles: 1, 2, 3, ...

- Large isolation air and creepage path
- Self-cleaning blade contacts
- True opening and visible distance
- Rugged anti-torsion construction
- Large customisation with :
  - Manual, motor, pneumatic drives
  - Auxiliary switches, blocking magnets
- According to IEC 62271-102
- Dimensions Fitting



Electrical Characteristics

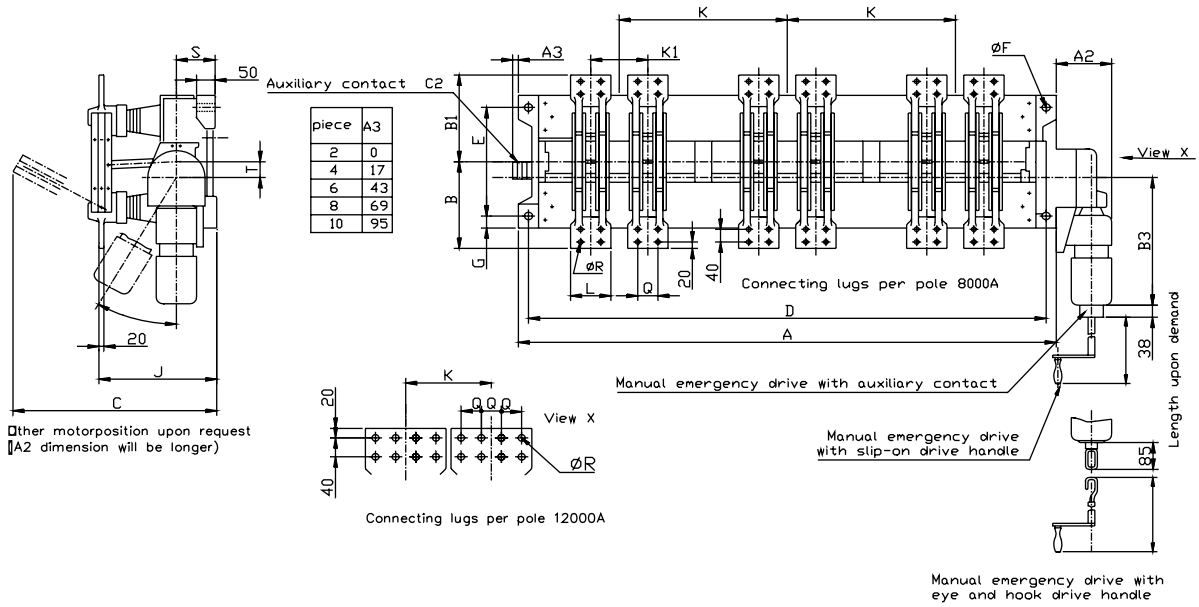
Rated thermal current kA	Rated insulation voltage			
	12 kV		24 & 36 kV	
	RMS 1 sec short-time withstand current kA	Rated peak current kA	RMS 1 sec short-time withstand current kA	Rated peak current kA
8	110	275	100	250
12	121	300	110	275

Dielectric withstand Voltage 1 min/50Hz (kV)			Rated impulse withstand voltage BIL (kV)	
(kV)	Phase to earth and between poles (kV)	Across the isolating distance (kV)	Phase to earth and between poles (kV)	Phase to earth and distance (kV)
12	28	32	75	85
24	50	60	125	145
36	70	80	170	195

- No-load operation
- Indoor type - Vertical mounting only
- Mechanical endurance: 50 000 cycles for I>1kA; 25 000 cycles for I<kA; 1 cycle = open + close
- Maximum temperature withstand at 130° C without damage to switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated electrolytic copper plates
- Small making / breaking capacity (on demand)
- Supporting insulators made of cast epoxy resin (fire classification as per UL94-V1)

Main dimensions

HAS 8-12 kA



kV	kA	No of poles	A	A2	B =B1	B3	C	D	E	G	J	K	K1	L	Q	RØ	S	T
12	8	1	700	189	274.5	390	614	640	344	38	347	-	170	120	60	14	122	50
	12		730		294		654	670			367	-	185	160	40	18		
	8	2	1200		274.5	405	614	1140			347	500	170	120	60	14		
	12		1230		294		654	1170			367		185	160	40	18		
	8	3	1700	219	274.5	508	614	1640			347		170	120	60	14		
	12		1730		294		654	1670			367		185	160	40	18		
24	8	1	700	189	336.5	390	820	640	414	41	450	-	170	120	60	14	110	60
	12		730		356		855	670			470	-	185	160	40	18		
	8	2	1300		336.5	405	820	1240			450	600	170	120	60	14		
	12		1330		356		855	1270			470		185	160	40	18		
	8	3	1900	219	336.5	508	820	1840			450		170	120	60	14		
	12		1930		356		855	1870			470		185	160	40	18		
36	8	1	700	189	376.5	390	994	640	520	55	550	-	170	120	60	14	120	110
	12		730		396	405	1040	670			570	-	185	160	40	18		
	8	2	1400		376.5		994	1340			550	700	170	120	60	14		
	12		1430	219	396		1040	1370			570		185	160	40	18		
	8	3	2100		376.5	508	994	2040			550		170	120	60	14		
	12		2130		396		1040	2070			570		185	160	40	18		

Ferraz Shawmut offers customized solutions to meet your most specific requirements:

- Adapted drives or control units
- Technical performance specifications (short-circuit current capability, endurance, small load
- make / break capacity)

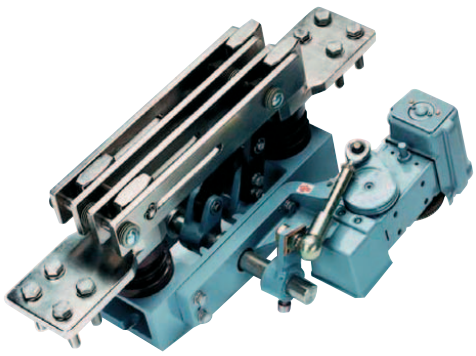
Medium Voltage Disconnectors

SAS Range

3.6 kV

4.0 kA DC

- Large isolation air and creepage path
- Self-cleaning blade contacts
- True opening and visible distance
- Rugged anti-torsion construction
- Large customisation with :
  - Manual, motor, pneumatic drives
  - Auxiliary switches, blocking magnets
- According to IEC 62271-102
- Dimensions Fitting



Electrical Characteristics

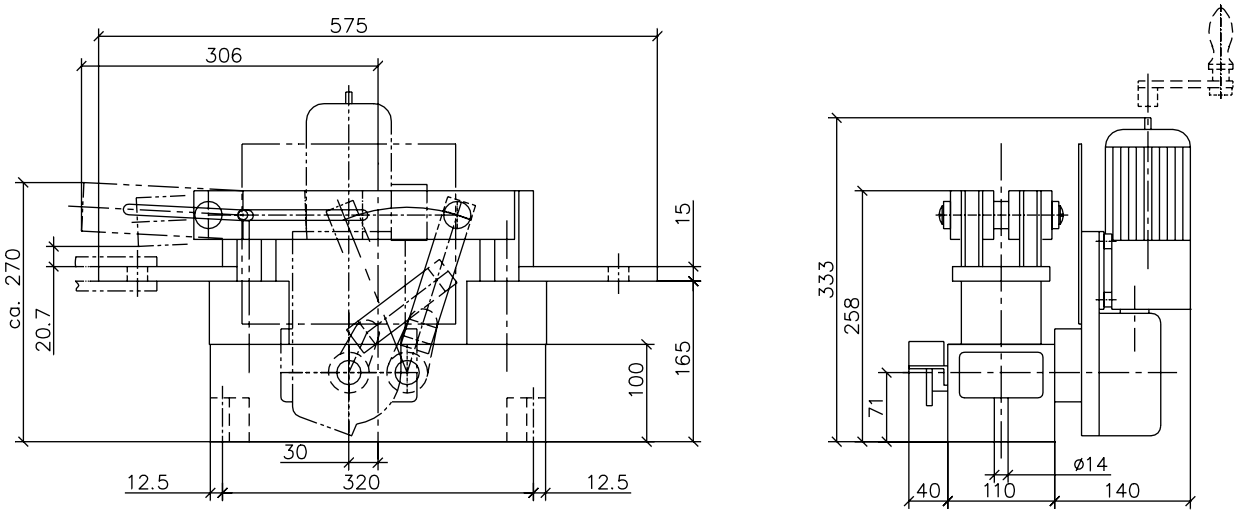
Rated thermal current DC (kA)	RMS 1 sec short-time withstand current (kA)	Rated peak current (kA)
4	71	177

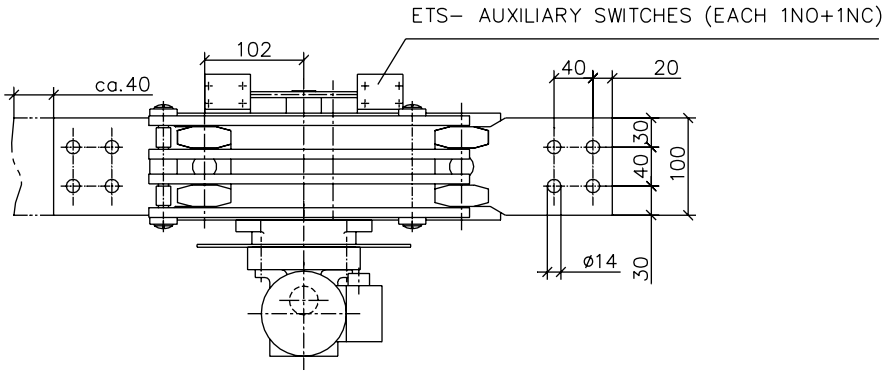
Dielectric withstand voltage 1 min/50 Hz		Rated impulse withstand voltage BIL	
Phase to earth (kV)	Across the isolating distance (kV)	Phase to earth (kV)	Across the isolating distance (kV)
10	12	40	46

- No-load operation
- Indoor type – only vertical mounting
- Mechanical endurance: ≤ 1kA = 25 000 cycles; >1kA = 50 000 cycles (open / close)
- Maximum temperature withstand at 130° C without damages to the switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated electrolytic copper plates
- Small making / breaking capacity (on demand)
- Supporting insulators made of cast epoxy resin (fire classification according to UL94-V1)

Main dimensions

SAS 3.6 kV 4.0 kAmp (DC)





Ferraz Shawmut has it all for defining and offering customized solutions to meet your most specific requirements :

- *Adapted drives or control units*
- *Adapted technical performances (short-circuit current capability, endurance ,small load make / break capacity)*

Ferraz Shawmut

Medium Voltage Change-over Disconnectors

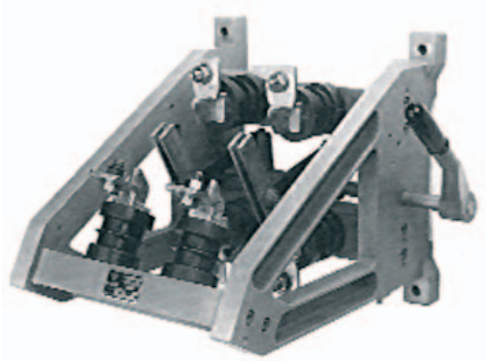
HUVS Range

3.6 kV

400 A to 6.3 kA – up to 175 Hz

Number of poles : 1, 2, 3, ...

- Positions 1-2 (1-0-2 on request)
- Large isolation air and creepage path
- Self-cleaning blade contacts
- True opening and visible distance
- Rugged anti-torsion construction
- Large customisation with :
  - Manual, motor, pneumatic drives
  - Auxiliary switches, blocking magnets
- According to IEC 62271-102
- Dimensions Fitting



Electrical Characteristics

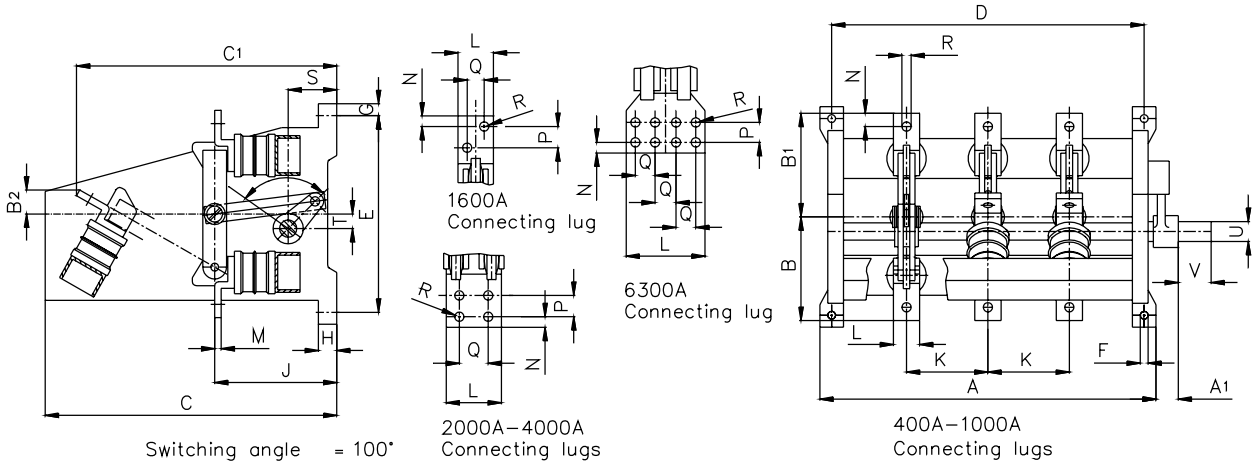
Rated thermal current		RMS 1 sec short-time withstand current	Rated peak current
AC (A)	DC (A)		
400	400	26	65
630	630	26	65
1000	1250	40	100
1600	1900	52	130
2000	2400	63	160
3150	3750	71	177
4000	5300	71	177
6300	7500	81	214

Dielectric withstand voltage 1 min/50 Hz		Rated impulse withstand voltage BIL	
Phase to earth (kV)	Across the isolating distance (kV)	Phase to earth (kV)	Across the isolating distance (kV)
10	12	40	46

- No-load operation
- Indoor type – only vertical mounting
- Mechanical endurance: ≤ 1kA = 25 000 cycles; >1kA = 50 000 cycles (open / close)
- Maximum temperature withstand at 130° C without damages to the switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated electrolytic copper plates
- Small making / breaking capacity (on demand)
- Supporting insulators made of cast epoxy resin (fire classification according to UL94-V1)

Main dimensions

HUVS 3.6 kV 400-6300 Amp



Amp	No of Poles	A	A1	B =B1	B2	C	C1	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	UØ	V	Drive
400				125	34		356								30		15			11					
630		242	15	135	39	410	366	206	296	12	18	28	183			6					73	22	18	60	1B
1000			30	157	36	435	400						189		40	10	20	-	-				25		
1600		370		242	54		545	330					216		60	12	18	27	27	14					
2000	1		5		72	555	570		300	18	40	30	227		80				40		83	36	30	80	2
3150		440		265	70		575	400					233		100	18	20	40	50						
4000		410		286	80		662	350					290		120				60						
6300		450		306	90	825	700	390	470	23	30	45	310		160	20			40	18	132	65	35	100	3
400				125	34		356								30		15			11					
630		367	15	135	39	410	366	331	296	12	18	28	183	125		6		-	-		73	22	18	60	1B
1000			30	157	36	435	400						189		40	10	20						25		2
1600		570		242	54		545	530					216		60	12	18	27	27	14					
2000	2		5		72	555	570		300	18	40	30	227	200	80				40		83	36	30	80	3
3150		640		265	70		575	600					233		100	18	20	40	50						
4000		660		286	80		662						290	250	120				60						
6300		750		306	90	825	700	690	470	23	30	45	310	300	160	20			40	18	132	65	35	100	4
400				125	34		356								30		15			11					
630		492	15	135	39	410	366	456	296	12	18	28	183	125		6		-	-		73	22	18	60	1B
1000			30	157	36	435	400						189		40	10	20						25		2
1600		770		242	54		545	730					216		60	12	18	27	27	14					
2000	3		5		72	555	570		300	18	40	30	227	200	80				40		83	36	30	80	3
3150		840		265	70		575	800					233		100	18	20	40	50						
4000		910		286	80		662						290	250	120				60						
6300		1050		306	90	825	700	990	470	23	30	45	310	300	160	20			40	18	132	65	35	100	4

Ferraz Shawmut offers customized solutions to meet your most specific requirements:

- Adapted drives or control units
- Technical performance specifications (short-circuit current capability, endurance, small load
- make / break capacity)

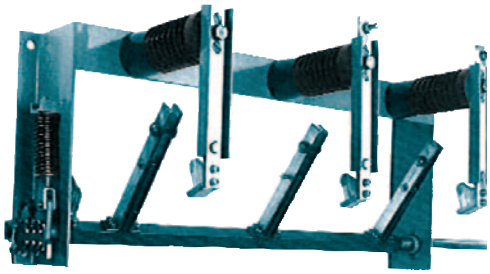
Medium Voltage Earthing Disconnectors

ETM Range

3.6 kV, 12 kV, 24 kV, 36 kV

Number of poles : 1, 2, 3, ...

- Quick-on mechanism
- Closing with short circuit current
- Large isolation air and creepage path
- True opening and visible distance
- Rugged anti-torsion construction
- Large customisation with:
  - Manual or motor drives
  - Auxiliary switches, blocking magnets
- According to IEC 62271-102
- Dimensions Fitting



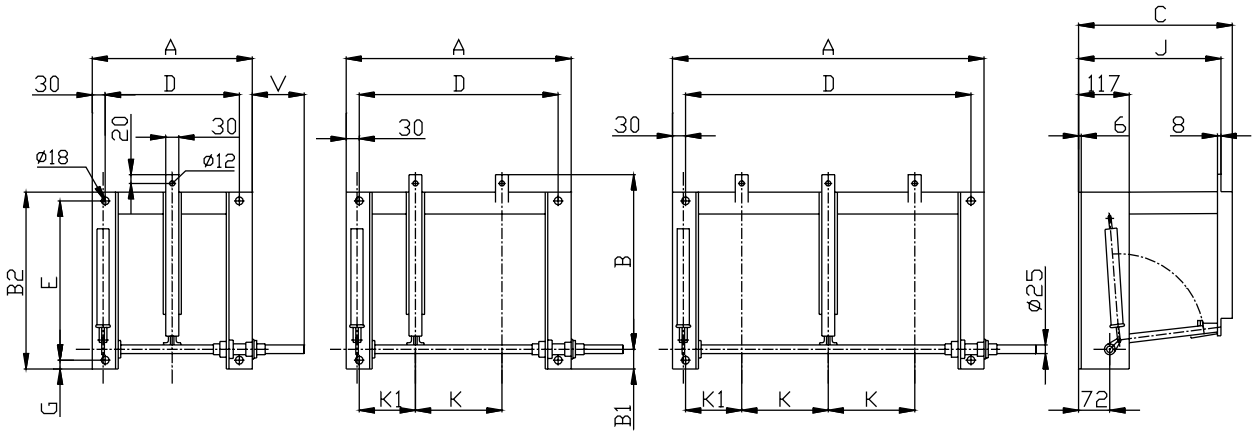
Electrical Characteristics

Rated Insulation voltage	RMS 1 sec short-time withstand	Rated peak current	Short-circuit making Capacity	Dielectric withstand Voltage 1 min/50 Hz		Rated impulse withstand Voltage BIL	
				Phase to earth and between poles	Across the isolating distance	Phase to earth and between poles	Across the isolating distance
3.6 kV	25 kA	50 kA	50 kA	10 kV	12 kV	40 kV	46 kV
12 kV	38.5 kA	96 kA	76 kA	28 kV	32 kV	75 kV	85 kV
24 kV	38.5 kA	96 kA	76 kA	50 kV	60 kV	125 kV	145 kV
36 kV	38.5 kA	96 kA	76 kA	70 kV	80 kV	170 kV	195 kV

- Indoor type
- Mechanical endurance: 3,000 cycles wihout short-circuit interruption
- Maximum temperature whithstand at 130° C damages to the switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated electrolytic copper plates
- Supporting insulators made of caste epoxy resin (fire classification according to UL94-V1)
- Suitable for vertical mounting only

Main dimensions

ETM 8-12 kA



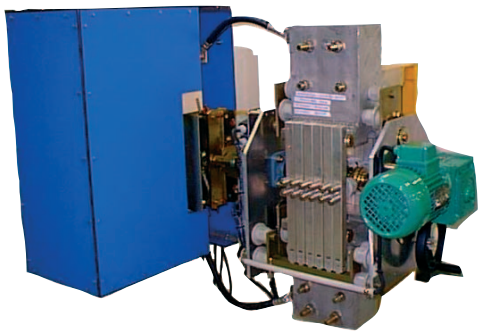
kV	No of Poles	A	B	B1	B2	C	D	E	G	J	K	K1	V	Drive
3.6	1	320					260				-	-		
	2	445					385				125	130		
	3	570					510							
12	1	370	300	45	305	285	310	265	20	270	-	-	120	
	2	670					610				300	155		
	3	970					910							
24	1	370	380		385	355	310	345		340	-	-	140	2
	2	720					660				350	155		
	3	1070					1010							
36	1	510	485	62	510	455	450	450	30	430	-	-	180	
	2	960					900				450	225		
	3	1410					1350							

Ferraz Shawmut has it all for defining and offering customized solutions to meet your most specific requirements :

- *Adapted drives or control units*
- *Adapted technical performances (short-circuit current capability, endurance ,small load make / break capacity)*

HIGH-POWER Switchgear Division
FOUILLERET Product range
DBM TYPE
DC Loadbreak Switches
13.5, 18, 20 kA - 1500 V DC

- Load Make and Break
- Deformable
- True opening distance
- Modular design
- Self - cleaning
- Copper and / or Aluminium construction



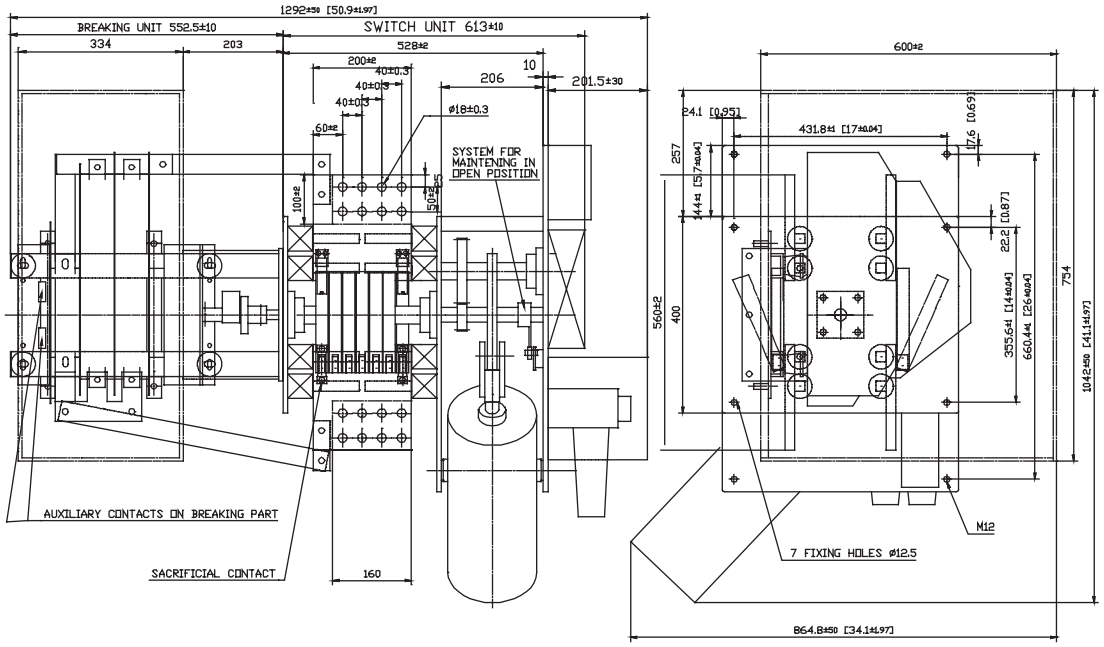
Electrical Characteristics

Rated thermal current		RMS 1 sec short-time withstand current	Rated peak current
AC (A)	DC (A)		
400	400	20	50
630	630	20	50
1000	1250	40	100
1600	1900	52	130
2000	2400	63	160
3150	3750	71	177
4000	5300	71	177
6300	7500	81	214

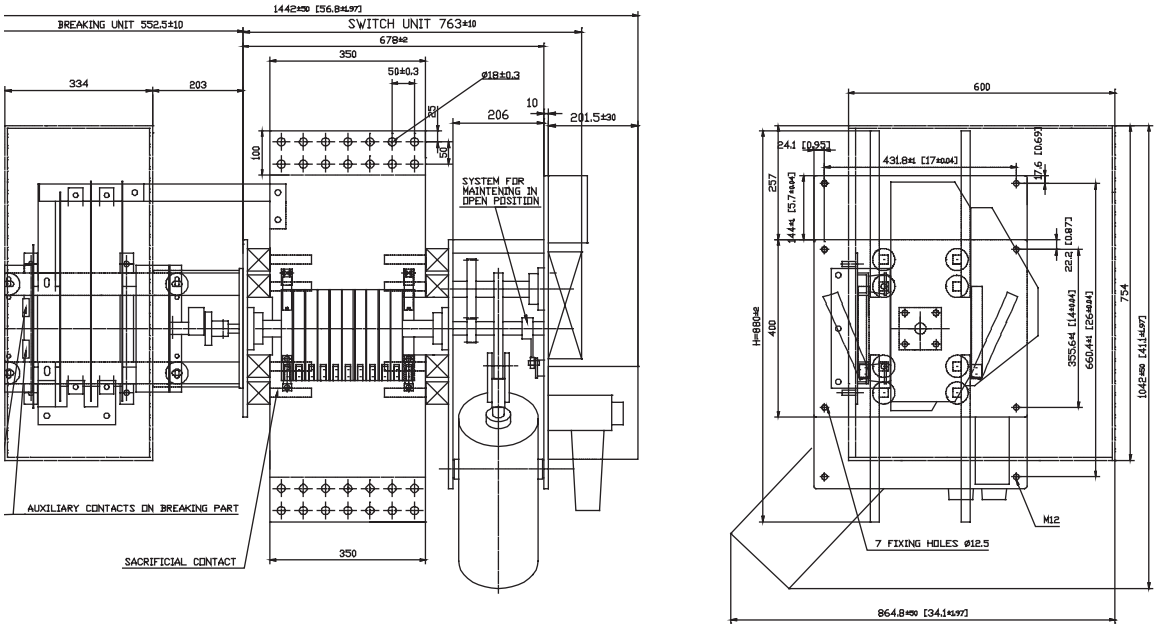
Dielectric withstand voltage 1 min/50 Hz		Rated impulse withstand voltage BIL	
Phase to earth(kA)	Across the isolating distance (kA)	Phase to earth (kA)	Across the isolating distance (kA)
10	12	40	46

- No-load operation
- Indoor type – only vertical mounting
- Mechanical endurance: ≤ 1kA = 25 000 cycles; >1kA = 50 000 cycles (open / close)
- Maximum temperature withstand at 130° C without damages to the switch
- Electrical contact by contact knives with pressed on hard silver contact rivets and silver-plated electrolytic copper plates
- Supporting insulators made of cast epoxy resin (fire classification according to UL94-V1)

DBM 13.5 kA



DBM 20 kA



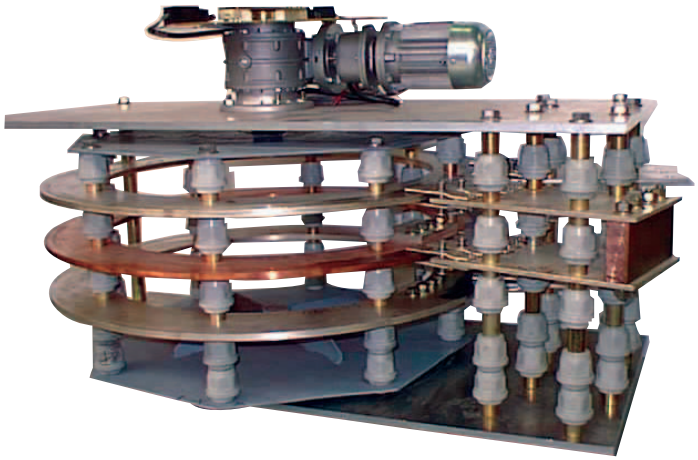
Ferraz Shawmut

Rotating Current Transfert Unit

SLIP RINGS Range 1000 A to 60 kA

Single Phase or Multi Phases

- **Low and constant voltage drop**
- **Large insulation and creepage distances**
- **Easy connections to:**
  Aluminium or Copper busbars
- **Large customization possible with:**
  Actuators (motor, pneumatic, manual)
  Auxiliaries (limit switches, locks, control boxes)
  Dimensions fitting (abaptation with the connecting terminals).



Main technical characteristics

Electrical Data

- Temperature rise at nominal current (with 40°C max. above ambient temperature) less than : 65°C
- Typical temperature rise at nominal current (with 40°C max. ambient temperature) : 5°C above busbars
- Voltage drop at contact point less than : 10 mV
- Peak short-circuit current withstand (upon circuit configuration) : 20 x (Nominal current)

Mechanical Data

- Mechanical endurance prior to maintenance (with respect to preventive maintenance instructions) : 500 000 meters at contact
- Typical Linear Rotation Speed at contact point up to (no higher speed has been yet tested) : 14 m/min.
- Self-alignement and compensation of dimensional tolerances between fixed parts and rotating parts up to : +/- 5 mm
- Ponctual temperature withstand without equipment damages : 140° C

Main technical characteristics

Technology

- Contact point within a silver-based plated slip ring and a silver alloy rivet
- Mechanically independant pairs of contact fingers
- Capability (upon request) of absorbing regular rotation of +/- 5° without any wear and maintenance
- Insulation with Fiberglass reinforced polyester insulators
- Carefully studied shape of contact fingers for self-alignement, compensation of tolerances and electrodynamic withstand
- All stainless steel construction

With its engineering capability in Provins (France), in Mannheim (Germany), and its testing platform in Saint-Bonnet-de-Mure (France), FERRAZ has it all for defining and offering customized solutions to meet your most specific requirements :. Adapted technical performances (short-circuit current capability, endurance ...)

High Power Switch (data for quotation)

Bosnax (Thailand) co.,ltd.

www.bosnax.com .

Customer (Company) :

Name :

Telephone :

Fax. :

e-mail :

Site Address :

Salesperson :

Date :

Bosnax (Thailand) co.,ltd. | www.bosnax.com | marketing@bosnax.com

Electrical Data								
Switch to operate:	ON LOAD or OFF LOAD							
Operating Voltage: AC:	Volt		O		Hz	Number Poles		
DC: .	Volt		L/R		(DC)	Number Poles		
Full Load Current	Amp.	(If variable, attach duty cycle)						
Overload Current	Amp.	Peak Withstand Current				kA.		
Dielectric Withstand (1min)	kV.	Rated Impulse Voltage BIL				kV.		
Rated short-time withstand current	kA.	Note: Please indicate if items C-E are expected to be interrupted.						
Mechanical Data								
Disconnect	(Yes / No)	Isolator (1-0) Open switch				(Yes / No)		
		Isolator (1-M) M: Ground				(Yes / No)		
Changeover	(Yes / No)	2 Positions Changeover (1-2)				Yes/No		
		3 Positions Changeover (1-0-2) Note that Mid-Point is OFF.				Yes/No		
		3 Positions Changeover (1-M-2) Note that Mid-Point is ground.				Yes/No		
Pole Reverser	(Yes / No)	(For reversing current inside Cells, such as Mg. Cells)				Number of Poles:		
Connections by								
Cables | (Yes / No)	Number of cables per phase			Lugs	Yes/No	bolted	Yes/No	
Busbar | (Yes / No)	Number of bars per Bus			Welding	Yes/No			
Bus Type (material) :				Bus Size : (W*T)				
Accessories								
Operation :	Motorized or Manual or Pneumatic							
Motor	VAC.	Hz.		VDC.				
Provision for Lockable handle	(Yes / No)							
Number of Auxiliary Contact (NO+NC) per position		Interlock System		(Yes / No)				
Environnment	Outdoor or Indoor	Ambient Condition :						
Application								
Comments or special insructions								
Please attach a sketch and sequence of operation.	Date required :		Annual Usage					