FEDERAL®

“ All Over the World ”

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BÜSTYAL RoHS COMPLIANT kiwa FQC Intertek KERI IPH BERLIN IHP ASTA TSE CE EAC

Low Voltage Protection, Control and Measurement Devices

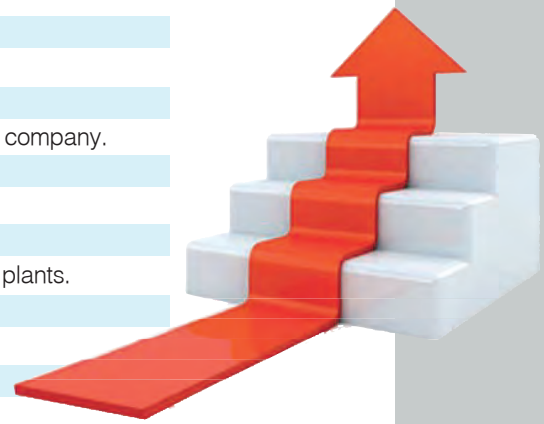
Founded in 1990, Federal Group is active in production of low voltage switchgear and automation products, natural gas meters, manufacturing and marble industry.

Growing in a short time, Federal Elektrik has become one of the leading manufacturers of low voltage switchgear in the world. In 2008 Federal® was registered as a “Recognized Brand” world-wide.

In its facilities established on an area of 30,000 m^2, 4,000 kinds of products and 36,000 different components are produced. Federal Group exports more than 50% of its production to over 50 countries.

HISTORY

2020 “Federal Elektrik Bulgaria” was established and started manufacturing and export operations.
2018 BIL-MART was established for manufacturing industry.
2018 Turkey’s 910th R&D Center was established.
2017 Federal Academy was established for junior employees.
2016 4,000 types of products have been reached in the Low Voltage range.
2015 Distribution network reached to 50 countries.
2014 Istanbul Foreign Trade Office was established.
2011 3,250 types of products have been reached in the Low Voltage range.
2010 Type Test Laboratory for Gas Meter was established.
2008 Mass production of G4 type Natural Gas Meter started after being designed in the company.
2008 Accepted as a “Recognized Brand” world-wide.
2007 1100 people have been employed throughout the group.
2006 Low Voltage product line has been completed by the Federal R&D team.
2005 Federal Group invested in sockets, electronic balasts, automotive and ornamental plants.
2004 “Federal Elektrik Egypt” factory started production in Egypt.
2002 Istanbul Sales Office for domestic market was established.
1999 Federal Elektrik established a new 25,000m² factory.
1999 International Low Voltage Type Test laboratory was established.
1998 Marble factory and quarry investment completed.
1998 Unigraphics 3D solid modeling started being used in product desing and mould manufacturing.
1996 FEDERAL ERP software launched.
1996 Personality tests started being used for recruitment of suitable personnel.
1995 Distribution in the International Market launched.
1994 Federal Elektrik became the 70th organization to receive ISO9000 quality certificate in Turkey.
1994 Federal Elektrik received the Quality Award in Belgium for having the best quality control practices.
1992 Mass production has begun.
1990 The first domestically designed compact type circuit breaker was produced.
1990 Federal Elektrik Investment & Trade Co. was established.



CONTENTS

1 - 2 - 3 POLES




TYPE				F01	F02	F11	F12	F21	F31	F32	F33
Rated Current - In			A	16-225		16-160		16-160	16-250		
Number of Poles⑦				1		2 / 3		2 / 3	2 / 3		
Rated Insulation Voltage - U_i (50-60 Hz)			V	1000		1000		1000	1000		
Rated Impulse Withstand Voltage - U_{imp}			kV	8		8		8	8		
Test Voltage - AC 50-60 Hz (1 minute)			V	3000		3000		3000	3000		
Rated Ultimate Short Circuit Breaking Capacity - (I_{cu})①	50-60 Hz	220/240 V	kA	35	65	21	35	50	65	85	100
	50-60 Hz	380/415 V	kA	12	14	15	25	25	36	50	70
	50-60 Hz	440 V	kA	–	–	12	20	20	25	32	40
	50-60 Hz	500 V	kA	–	–	7	12	12	18	22	25
	50-60 Hz	690 V	kA	–	–	5	8	8	12	13	14
	DC (2P Seri Bağlantı)⑤	250 V	kA	–	–	8	15	15	20	20	20
	DC (3P Seri Bağlantı)⑤	500 V	kA	–	–	8	15	15	20	20	20
Rated Short Circuit Breaking Capacity – I_{cs}②				%100Icu		%100Icu		%100Icu	%100Icu		
Category (IEC / EN 60947-2)				A		A		A	A		
Trip Mechanism & Protection Characteristics	Thermal-Magnetic	Thermal Fixed		In		□		□	□		
		Thermal Adjusted		–		16-80A: (0,8-1)In 100-160: (0,7-1)In		(0,7-1)In	16-225A: (0,7-1)In 250A: (0,6-1)In		
		Magnetic Fixed		16-30A: 300A 32-100A: 10In 125-250A: 8In		16-50A: 600A 63-160A: 8In □63-160A: 10In③		16-20A: 200A 25-160A: 8In □25-160A: 10In③ □ 40-160A: 3In④	16-100A: 10In 125-250A: 8In 125-250A: 10In③ 160-250A: 3In④		
		Magnetic Adjusted		–		–		–	□80-250A: (5-10)In □160-250A: (3-6)In		
Current Limiting				E		E		E	E		
Mechanical Life			Op.	15000		15000		15000	15000		
Electrical Life(380V/415V)			Op.	3000		5000		3000	3000		
Weight			kg	0,85		1		1,7	2,3		
Connection Terminal Capacity	Box-type Terminal			95 mm²		16-100A: 50 mm² 125-160A: 70 mm²		16-100A: 50 mm² 125-160A: 70 mm²	16-100A: 50 mm² 125-160A: 70 mm² 200-250A: 120 mm²		
	Terminal for Busbar / Cable Lug	Cable Lug (Standard / Narrow)		□50/70 mm² (M8)		□50/70 mm² (M5)		–	□95/120 mm² (M8)		
		Busbar Width		□18 mm		□20 mm		–	□24 mm		
	Box-type Terminal on Extension Busbar			120 mm²		120 mm²		120 mm²	185 mm²		
Min. Max. Tightening Torque				7-10 Nm		4-6 Nm		4-6 Nm	16-160A: 4-6 Nm 200-250A: 7-10 Nm		
Undervoltage Release				–		□		□	□		
Shunt Trip Release				–		□		□	□		
Auxiliary Contact Block				–		□		□	□		
Motor Control Mechanism				–		□		–	□		
Extended Rotary Handle				–		–		–	□		
Lock Mechanism with Key				–		□		□	□		
Extension Bar				□		□		□	□		
Terminal Cover				–		□		□	□		
Trip Contact				–		□		□	□		
Inverser (Mechanical) Lock				–		–		–	□		
Phase Barrier				–		■		■	■		
Extension Handle				–		–		–	–		
Dimensions			a mm	40		90		90	105		
			b mm	169		130		156	165		
			c mm	90		71		66	91		
			d mm	109		92		93	116		

■ : Standard □ : Upon Request

① Icu: O-t-CO test (O: Open maneuver, t: Waiting duration, CO: Close-Open maneuver
② Ics: O-t-CO-t-CO test (O: Open maneuver, t: Waiting duration, CO: Close-Open maneuver)
③ Motor circuit protection type (upon request)
④ Generator circuit protection type (upon request)
⑤ When two and three poles of the circuit breaker are connected in series.
⑥ For 300A and 400A: 121,5mm.
⑦ 2P breaker has same dimension as 3P breaker, but the middle pole is removed.
⑧ F53 series MCCB are produced up to 315A.

THERMAL-MAGNETIC CIRCUIT BREAKERS (IEC / EN 60947-2)

								
F51	**F52**	**F53**	**F61**	**F62**	**F71**	**F72**	**F82**	**F83**
125-400⑧			125-500		300-800		300-800	
2 / 3			2 / 3		2 / 3		2 / 3	
1000			1000		1000		1000	
8			8		8		8	
3000			3000		3000		3000	
65	85	100	52	70	52	70	75	100
36	50	70	36	50	36	50	50	70
25	35	50	30	40	30	40	40	50
20	25	40	25	35	25	35	30	42
14	16	18	20	25	20	25	20	25
20	20	20	20	20	20	20	20	20
20	20	20	20	20	20	20	20	20
%100Icu	%100Icu	%100Icu	%100Icu	%100Icu	%100Icu	%100Icu	%100Icu	%75Icu
A			A		A		A	
□			□		□		□	
(0,7-1)In			(0,7-1)In		(0,7-1)In		300-630A: (0,7-1)In 800A: (0,6-1)In	
□			□		□		□	
125: (6-12)In 160-320A: (5-10)In 350-400A: (4-8)In □320-400A: (5-10)In③ □250-400A: (3-6)In④			(5-10)In		(5-10)In		300-630A: (5-8)In 800A: (4-6)In	
E			E		-		E	
15000			15000		15000		15000	
3000			3000		3000		3000	
4,7			5,5		8		10	
□250A: 120 mm²			□240 mm²		-		-	
125-250A: 95/120 mm² (M8) 300-400A: 240 mm² (M12)			2x(120/150) mm² (M10)		2x240 mm² (M10)		2x240 mm² (M10)	
125-250A: 24 mm 300-400A: 40 mm			30 mm		50 mm		50 mm	
300 mm²			300 mm²		-		-	
19-25 Nm			19-25 Nm		30-40 Nm		30-40 Nm	
□			□		□		□	
□			□		□		□	
□			□		□		□	
-			□		□		□	
□			□		□		□	
□			□		□		□	
□			□		□		□	
□			□		□		□	
□			□		□		□	
-			-		□		□	
■			■		■		■	
-			-		■		■	
105 ⑥			140		210		210	
255			257		270		280	
105			103		111		111	
145			140		159		162	

ELECTRONIC CIRCUIT BREAKERS (IEC / EN 60947-2)

2 - 3 POLES





		F61E	F62E	F82E	F83E	F91E	F92E	F101E	F102E	F111E	F112E
Rated Current - I_n	A	160 - 500		300 - 800		800 - 1250		1000 -1600		1250 - 2500	
Number of Poles ③		2 / 3		2 / 3		2 / 3		2 / 3		2 / 3	
Rated Insulation Voltage - U_i (50-60 Hz)	V	1000		1000		1000		1000		1000	
Rated Impulse Withstand Voltage - U_{imp}	kV	8		8		8		8		8	
Test Voltage - AC 50-60 Hz (1 minute)	V	3000		3000		3000		3000		3000	
Rated Ultimate Short Circuit Breaking Capacity (I_{cu}) ① 50-60 Hz 220/240 V	kA	52	70	75	100	80	100	80	100	85	125
50-60 Hz 380/415 V	kA	36	50	50	70	50	70	50	70	50	70
50-60 Hz 440 V	kA	30	40	40	50	35	50	40	50	35	50
50-60 Hz 500 V	kA	25	35	30	42	25	35	25	35	30	42
50-60 Hz 690 V	kA	20	25	20	25	18	25	20	25	20	25
Rated Short Circuit Breaking Capacities - I_{cs} ②		%100Icu	%100Icu	%100Icu	%75Icu	%100Icu	%100Icu	%100Icu	%100Icu	%100Icu	%75Icu
Rated Short Time Withstand Capacities - I_{cw} - 380 / 415 V		12In	12In	12In	12In	12In	12In	12In	12In	12In	12In
Category (IEC/EN 60947-2)		A/B		A/B		A/B		A/B		A/B	
Trip Mechanism & Protection Characteristics — Electronic — Long Time Delay		I1: (0,4-1)In t1: 4s (6I1) □t1:0,5-20s(6I1)		I1: (0,4-1)In t1: 4s (6I1) □t1:0,5-20s(6I1)		I1: (0,4-1)In t1: 4s (6I1) □t1:0,5-20s(6I1)		I1: (0,4-1)In t1: 4s (6I1) □t1:0,5-20s(6I1)		I1: (0,4-1)In t1: 4s (6I1) □t1:0,5-20s(6I1)	
Short Time Delay		□I2= (2-10)I1 □t2= 0,05-0,3s		□I2= (2-10)I1 □t2= 0,05-0,3s		□I2= (2-10)I1 □t2= 0,05-0,3s		□I2= (2-10)I1 □t2= 0,05-0,3s		□I2= (2-10)I1 □t2= 0,05-0,3s	
Instantaneous		I3= (2-10)I1		I3= (2-10)I1		I3= (2-10)I1		I3= (2-10)I1		I3= (2-10)I1	
Ground Fault		-		-		-		-		-	
Arc Contact		-		-		-		E		E	
Current Limiting		E		E		-		E		E	
Mechanical Life	Op.	15000		15000		10000		10000		10000	
Electrical Life (380V/415V)	Op.	3000		3000		3000		3000		3000	
Weight	kg	5,5		10		18		27		54	
Connection Terminal Capacity — Box-type Terminal		□240 mm²		-		-		-		-	
Terminal for Busbar / Cable Lug — Cable Lug (Standard / Narrow)		2x(120/150)mm² (M10)		2x240 mm² (M10)		2x400 mm² (M12)		2x400 mm² (M12)		4x400 mm² (M12)	
Busbar Width		30 mm		50 mm		50 mm		50 mm		80 mm	
Box-type Terminal on extension busbar		-		-		-		-		-	
Min. Max. Tightening Torque		19-25 Nm		30-40 Nm		35-50 Nm		35-50 Nm		35-50 Nm	
Undervoltage Release		□		□		□		□		□	
Shunt Trip Release		□		□		□		□		□	
Auxiliary Contact Block		□		□		□		□		□	
Motor Control Mechanism		□		□		□		□		□	
Extended Rotary Handle		□		□		□		-		-	
Lock Mechanism with Key		□		□		□		■		■	
Extension Bar		□		□		■		■		■	
Terminal Cover		□		□		□		□		□	
Trip Contact		□		□		□		□		□	
Inverser (Mechanical) Lock		-		□		□		□		□	
Phase Barrier		■		■		■		■		■	
Extension Handle		-		■		■		■		■	
Dimensions a	mm	140		210		210		210		392	
b	mm	257		280		370		370		412	
c	mm	103		111		124		155		250	
d	mm	140		162		180		203		320	

■ : Standard □ : Upon Request

① Icu: O-t-CO test (O: Open maneuver, t: Waiting duration, CO: Close-Open maneuver

② Ics: O-t-CO-t-CO test (O: Open maneuver, t: Waiting duration, CO: Close-Open maneuver)

③ 2P breaker has same dimension as 3P breaker, but the middle pole is removed.

• As an additional protection against short circuit current in Federal electronic circuit breakers, mechanical opening mechanism operating with magnetic field of the short circuit current has been placed on each phase. This way, mechanical opening unit is tripping in over currents such as short circuit and risk of not tripping in case of electronic card failure has been eliminated. This is a great advantage of Federal circuit breakers.

THERMAL-MAGNETIC & ELECTRONIC CIRCUIT BREAKERS (IEC / EN 60947-2)

4 POLES





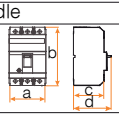

TYPE				F12N	F31N	F32N	F33N	F51N	F52N	F53N	F82N	F83N	F82EN	F83EN	F91EN	F92EN
Rated Current - I_n			A	16 -160	16-250			125-400⑦			300-800		300-800		800 -1250	
Number of Poles				4	4			4			4		4		4	
Rated Insulation Voltage - U_i (50-60 Hz)			V	1000	1000			1000			1000		1000		1000	
Rated Impulse Withstand Voltage - U_{imp}			kV	8	8			8			8		8		8	
Test Voltage - AC 50-60 Hz (1 minute)			V	3000	3000			3000			3000		3000		3000	
Rated Ultimate Short Circuit Breaking Capacity (I_{cu}) ①	50-60 Hz	220/240 V	kA	35	65	85	100	65	85	100	75	100	75	100	80	100
	50-60 Hz	380/415 V	kA	25	36	50	70	36	50	70	50	70	50	70	50	70
	50-60 Hz	440 V	kA	20	25	32	40	25	35	50	40	50	40	50	35	50
	50-60 Hz	500 V	kA	12	18	22	25	20	25	40	30	42	30	42	25	35
	50-60 Hz	690 V	kA	8	12	13	14	14	16	18	20	25	20	25	18	25
	DC (2P Series) ③	250 V	kA	15	20	20	20	20	20	20	20	20	–	–	–	–
	DC (3P Series) ③	500 V	kA	15	20	20	20	20	20	20	20	20	–	–	–	–
Rated Short Circuit Breaking Capacities - I_{cs} ②		380/415 V		%75Icu	%100Icu			%100Icu	%100Icu	%75Icu	%100Icu	%75Icu	%100Icu	%75Icu	%100Icu	%100Icu
Rated Short Time Withstand Capacities - I_{cw}		380/415 V		–	–			–	–	–	–	–	12In	12In	12In	12In
Category (IEC/EN 60947-2)				A	A			A			A		A/B		A/B	
Trip Mechanism & Protection Characteristics	Thermal-Magnetic	Thermal Fixed		□	□			□			□		–		–	
		Thermal Adjusted		16-80A: (0,8-1)In 100-160: (0,7-1)In	16-225A: (0,7-1)In 250A: (0,6-1)In			(0,7-1)In			300-630A: (0,7-1)In 800A: (0,6-1)In		–		–	
		Magnetic Fixed		16-50A: 600A 63-160A: 8In □63-160A:10In⑤	16-100A: 10In 125-250A: 8In □100-250A: 10In⑤			□			□		–		–	
		Magnetic Adjusted		–	–			125: (6-12)In 160-320A: (5-10)In 350-400A: (4-8)In □350-400A: (5-10)In⑤ □250-400A: (3-6)In⑥			300-630A: (5-8)In 800A: (4-6)In		–		–	
	Electronic	Long Time Delay		–	–			–			–		I1: (0,4-1)In t1: 4s (6I1) □t1:0,5-20s(6I1)		I1: (0,4-1)In t1: 4s (6I1) □t1:0,5-20s(6I1)	
		Short Time Delay		–	–			–			–		□I2= (2-10)I1 □t2= 0,05-0,3s		□I2= (2-10)I1 □t2= 0,05-0,3s	
		Instantaneous		–	–			–			–		I3= (2-10)I1		I3= (2-10)I1	
		Ground Fault		–	–			–			–		–		–	
Current Limiting				E	E			E			E		E		–	
Mechanical Life			Op.	15000	15000			15000			15000		15000		10000	
Electrical Life (380V/415V)			Op.	3000	3000			3000			3000		3000		3000	
Weight			kg	1,5	3,1			6,3			13		13		24	
Connection Terminal Capacity	Box-Type Terminal			16-100A: 50 mm² 125-160A: 70 mm²	□120mm²			□250A: 120 mm²			-		-		-	
	Terminal for Busbar / Cable Lug	Cable Lug (Standard / Narrow)		□16/25 mm² (M5)	95/120 mm² (M8)			125-250A: 95/120mm²(M8) 300-400A: 240mm²(M12)			2x240 mm² (M10)		2x240 mm² (M10)		2x400 mm² (M10)	
		Busbar Width		□13 mm	24 mm			125-250A: 24 mm 300-400A: 40 mm			50 mm		50 mm		50 mm	
	Box-Type Terminal on Extension Busbar			120 mm²	185 mm²			300 mm²			-		-		-	
Min. Max. Tightening Torque				4-6 Nm	7-10 Nm			19-25 Nm			30-40 Nm		30-40 Nm		35-50 Nm	
Undervoltage Release				□	□			□			□		□		□	
Shunt Trip Release				□	□			□			□		□		□	
Auxiliary Contact Block				□	□			□			□		□		□	
Motor Control Mechanism				□	□			–			□		□		□	
Extended Rotary Handle				–	□			□			□		□		□	
Lock Mechanism with Key				□	□			□			□		□		□	
Extension Bar				□	□			□			□		□		■	
Terminal Cover				□	□			□			□		□		□	
Trip Contact				□	□			□			□		□		□	
Inverser (Mechanical) Lock				–	□			–			□		□		□	
Phase Barrier				■	■			■			■		■		■	
Extension Handle				–	–			–			■		■		■	
Dimensions			a	mm	120	140			140④			280		280		280	
			b	mm	157	204			255			280		280		370	
			c	mm	71	91			105			111		111		124	
			d	mm	92	116			145			162		162		180	

■ : Standard □ : Upon Request

① Icu: O-t-CO test (O: Open maneuver, t: Waiting duration, CO: Close-Open maneuver
② Ics: O-t-CO-t-CO test (O: Open maneuver, t: Waiting duration, CO: Close-Open maneuver)
③ When two and three poles of the circuit breaker are connected in series.
④ For 300A and 400A: 156,6 mm.
⑤ Motor circuit protection type (upon request)
⑥ Generator circuit protection type (upon request)
⑦ F53 series MCCB are produced up to 315A.

Note: Models with “E” refers to electronic circuit breakers.

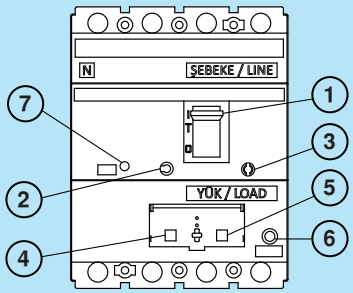
EARTH LEAKAGE CIRCUIT BREAKERS (IEC / EN 60947-2)

4 POLES						
TYPE					**F12R**	**F31R**
Rated Current - I_n				A	16 - 160	80-250
Number of Poles					4	4
Rated Insulation Voltage - U_i (50-60 Hz)				V	1000	1000
Rated Impulse Withstand Voltage - U_{imp}				kV	8	8
Test Voltage - AC 50-60 Hz (1 minute)				V	3000	3000
Rated Ultimate Short Circuit Breaking Capacity ①	50-60 Hz	220/240 V		kA	35	65
	50-60 Hz	380/415 V		kA	25	36
	50-60 Hz	440 V		kA	20	25
	50-60 Hz	500 V		kA	12	18
	50-60 Hz	690 V		kA	8	12
Rated Short Circuit Breaking Capacities - I_{cs} ②		380/415 V			%75Icu	%100Icu
Rated Short Time Withstand Capacities - I_{cw}		380/415 V			--	--
Category (IEC/EN 60947-2)					A	A
Trip Mechanism & Protection Characteristics	Thermal-Magnetic		Thermal Fixed		□	□
			Thermal Adjusted		16-80A: (0,8-1)In 100-160: (0,7-1)In	16-225A: (0,7-1)In 250A: (0,6-1)In
			Magnetic Fixed		16-50A: 600A 63-160A: 8In □63-160A: 10In ③	16-100A: 10In 125-250A: 8In □125-250A: 10In ③
			Magnetic Adjusted		--	--
Residual Current Threshold				mA	30-100-300	300-500-1000-1500
Residual Current Time Delay				ms	50-150-300	50-150-300
Current Limiting					■	■
Mechanical Life				Op.	15000	15000
Electrical Life (380V/415V)				Op.	3000	3000
Weight				kg	1,7	3,3
Connection Terminal Capacity	Box-Type Terminal				16-100A: 50 mm² 125-160A: 70 mm²	□120 mm²
	Terminal for Busbar / Cable Lug	Cable Lug (Standard / Narrow)			□16/25 mm² (M5)	95/120 mm² (M8)
		Busbar Width			□13 mm	24 mm
	Box-Type Terminal on Extension Busbar				120 mm²	185 mm²
Minimum - Maximum Tightening Torque					4-6 Nm	7-10 Nm
Undervoltage Release					□	--
Shunt Trip Release					■	■
Auxiliary Contact Block					□	--
Motor Control Mechanism					--	--
Extended Rotary Handle					--	--
Lock Mechanism with Key					--	--
Extension Busbar					□	□
Terminal Cover					□	□
Trip Contact					□	□
Inverser (Mechanical) Lock					--	--
Phase Seperator					■	■
Extension Handle					--	--
Dimensions 				a mm	120	140
				b mm	157	204
				c mm	71	91
				d mm	92	116

■ : Standard □ : Upon Request
① Icu: O-t-CO test (O: Open maneuver, t: Waiting duration, CO: Close-Open maneuver
② Ics: O-t-CO-t-CO test (O: Open maneuver, t: Waiting duration, CO: Close-Open maneuver).
③ Motor circuit protection type (upon request)

When earth leakage current arises from low voltage circuits, the breaker detects the fault with combination of current sensor relay and toroidal transformer then protects the system by controlling of shunt trip coil or under voltage release coil which are mounted on the breaker. This process is similar with residual current protected type circuit breakers.

Federal earth leakage circuit breakers are produced from 16A-250A. Toroidal transformer, sensors relay and shunt trip are placed into circuit breakers. Without the need of any external accessory connectors the breaker can be installed only by connecting the input and output terminals. For leakage current protection selectivity, the leakage current threshold and leakage current time delay can be set by user. There is test button for residual current protection function separately from trip test button. In this way, the earth leakage current protection function can also be tested. Earth-leakage circuit breakers have also high thermal - magnetic protection like as our other molded case circuit breakers.



1-Operation Handle

2-Trip Button

3-Rated Current (Thermal) Setting Unit

4-Residual Current Threshold (mA)

5-Residual Current Time Delay (s)

6-Residual Current Circuit Test Button

7-Coil Reset Button

EARTH LEAKAGE PROTECTION RELAYS (IEC / EN 60947-2)

Earth Leakage Protection Relays
When a fault current is detected in the system according to the signal coming from toroidal transformer, the circuit breaker controls the shunt trip or the undervoltage release to open the circuit breaker. Fault current value and time to operate the relay can be adjusted on the relay.

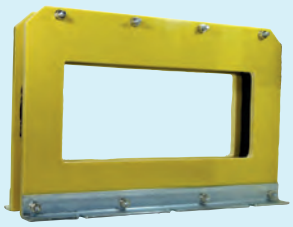
TYPE		FGR05	FGR06
Fault Current Adjustment		0,03 ... 30A	0,03 ... 30A
Order Code		8AT-N0000-0500	8AT-N0000-0600
Opening Time Adjustment		0,05 - 3 sec.	0,05 - 3 sec.
Supply ①		110V / 220V - 240V AC (50/60Hz)①	220V / 380V-415V AC (50/60Hz) ①
Output Relay		3A, 250V AC	3A, 250V AC
Reset		Manual / Electrical (Remote)	Manual / Electrical (Remote)
Current Tolerance		(0,5 - 1) -IΔn	(0,5 - 1) -IΔn
Time Tolerance		±%15	±%15
Time Characteristic		Fixed	Fixed
Temperature	Storage	-30°C / +70°C	-30°C / +70°C
	Operating	-20°C / +60°C	-20°C / +60°C
Humidity		%40 - 85 RH non condensing	%40 - 85 RH non condensing
Installation		Board / 35 mm DIN - Rail	Board / 35 mm DIN - Rail

① FGR05 and FGR06 earth leakage protection relays have the same detection features but different supply voltage ranges. FGR05 has 110/220-240 VAC alternative supply voltage value, FGR06 has 220/380-415 VAC alternative supply voltage value.

TOROIDAL & RECTANGLE CURRENT TRANSFORMERS (IEC / EN 60947-2)

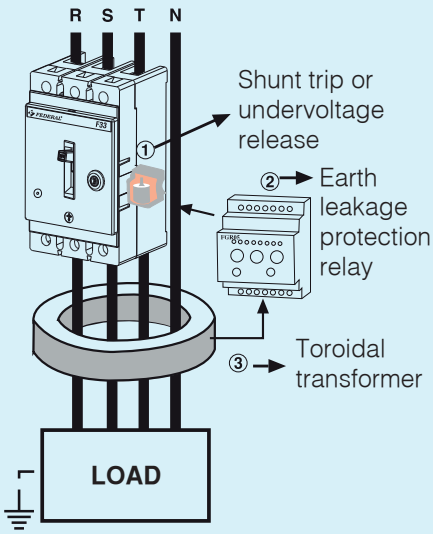
Earth fault relay and toroidal transformer are used with circuit breakers to detect even small earth leakages and open the circuit breaker.

TYPE	Window Size (mm)	Circuit Breaker				
		With Cable		With Busbar		
Toroidal	Ø60	Max. 4x70mm	F12 / F12N / F21	-		
	Ø110	Max. 4x240mm	F31 / F32 / F33 F31N / F32N / F33 F51 / F52 / F53 F51N / F52N / F53N F61 / F62	-		
	Ø160	Max. 8x240mm	F71 / F72 F82 / F83 / F82E / F83E F82N / F83N / F82E-N / F83E-N	F12 / F12N / F21/ F31 / F31N / F32 / F32N / F33 F33N / F51 / F51N / F52 / F52N / F53 / F53N		
	Ø210	Max. 16x240mm	F91E / F91E-N / F92E / F92E-N (with one Toroidal Transformer) F101E / F102E / F111E / F112E (with two paralel Toroidal Transformer)	F12 / F12N / F21 / F31 / F31N / F32 / F32N / F33 F33N / F51 / F51N / F52 / F52N / F53 / F53N / F61 / F62		
Rectangle	280x120	Max. 16x240mm	F71 / F72 F82 / F83 / F82E / F83E F82N / F83N / F82E-N / F83E-N F91E / F92E / F91E-N / F92E-N	Busbar	Horizontal Connection	F71 / F72 / F82 / F83 / F82E / F83E F82N / F83N / F82E-N / F83E-N F91E / F92E / F91E-N / F92E-N F101E / F102E
				(Busbar with 70mm spaced) 2x100x5 busbar (max.1600A) 3x100x5 busbar (max. 2000A)	Vertical Connection	F121E / F122E / F123E
	370x120	Max. 20x240mm	F91E / F92E F91E-N / F92E-N F101E / F102E	(Busbar with 100mm spaced) 2x100x10 busbar (max. 2500A) 3x100x10 busbar (max. 3200A)	Horizontal Connection	F121E / F122E / F123E
					Vertical Connection	F111E / F112E F131E / F132E / F133E
	500x120	Max. 28x240mm	F111E / F112E F121E / F122E / F123E	(Busbar with 100mm spaced) 2x100x10 busbar (max. 2500A) 3x100x10 busbar (max. 3200A)	Horizontal Connection	F111E / F112E F131E / F132E / F133E
				(Busbar with 140mm spaced) 4x100x10 busbar	Vertical Connection	F141E / F142E / F143E

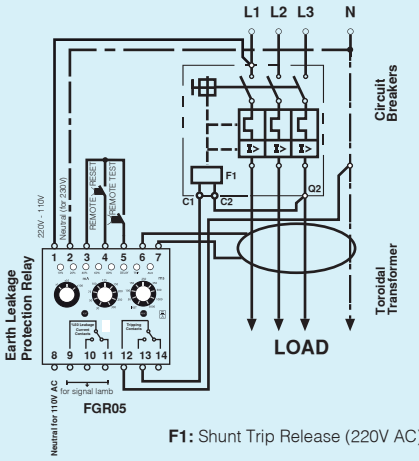


Protection System Against Earth Leakage Currents With Circuit Breakers:

Even small values (>30mA) of earth fault currents to occur in electrical circuits are quite dangerous in terms of safety of life and fire. As normal breakers can't detect such small earth leakage, no additional protection is provided against earth leakages. Earth leakage protection relay can be added to electronic breakers without an additional mechanism. With this system, protection at (0,1 - 1)xI_n sensitivity can be provided. Protection against earth leakage in non-electronic breakers and electronic breakers require protection against leakage currents lower than the aforementioned value mentioned above is provided with combination of toroidal transformer and earth leakage protection relays.

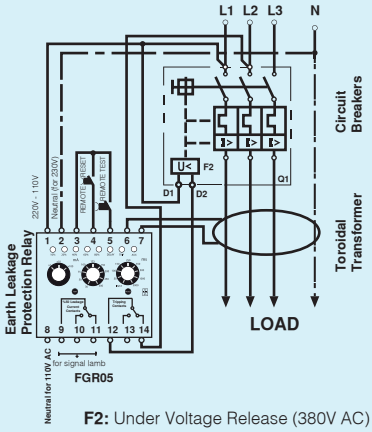


Protection system in the circuit breakers against earth leakage current



F1: Shunt Trip Release (220V AC)

Figure-3 Use of earth leakage protection relay with circuit breaker equipped with shunt trip release.



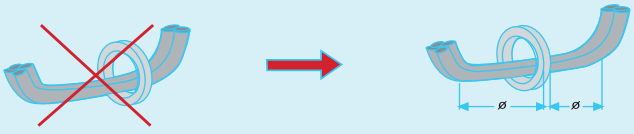
F2: Under Voltage Release (380V AC)

Figure-4 Use of earth leakage protection relay with circuit breaker equipped with under voltege release.

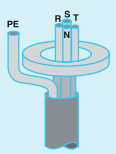
However, in this system, in order to let the circuit breaker open in terms of earth leakage currents, one of shunt trip or undervoltage release must be mounted to the breaker (Figure-2). Fault current rating of earth leakage protection relay should be adjusted according to protection type and appropriate values to ensure selectivity among other protection relays. According to the standards, this values has been determined as 30mA for life protection and (300-500)mA for fire protection. If shunt trip is connected to the circuit breaker, energy supplied to the shunt trip, should be supplied through open contact of the earth leakage relay normal open detection coil.

Assembly

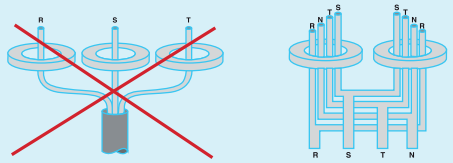
All the phases and neutral cable, if any, shall pass through the toroidal transformer. earth cable should not pass through the toroidal. Secondary cables of toroidal shall be connected to earth leakage protection relay (6-7) terminals and appropriate voltage written on the relay is supplied to energy input terminals of the relay. Shunt trip and undervoltage release must be connected to the breaker to trip circuit breaker in case of earth leakage (Figure-3). If undervoltage release is connected to the circuit breaker, energy supplied to the undervoltage release should be supplied through normal close contact of earth leakage release and incoming side of circuit breaker (Figure-4).



Inflection point of cable should be keep away from toroidal transformer as much as possible.

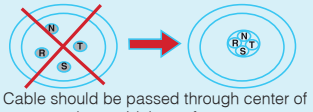


Ground cable should not be passed through toroidal transformer.

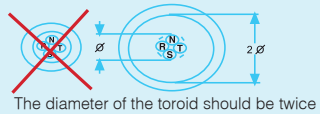


Parallel connection of more than one toroidal transformers to the earth leakage relay.

Figure-6



Cable should be passed through center of the toroidal transformer

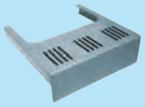
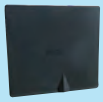


The diameter of the toroid should be twice the total cable diameter.

Important Considerations in Assembly:

- Cables should be passed through the center of the toroidal transformer as much as possible.
- The most suitable diameter toroids should be used. Using larger diameter toroids than necessary decreases sensitivity.
- If the cables cannot be run through a large diameter toroid, it can be used by connecting several toroids in parallel to the same ground sensing relay. However, this situation decreases the sensitivity of the device and thus increases the tripping threshold. (Figure-6).
- If it is not possible to place the toroid around large main busbars, it can be placed in the neutral-ground connection of the transformer for balanced loads.

MOLDED CASE CIRCUIT BREAKER ACCESSORIES

	**Motor Control Mechanisms**	Used for opening – closing the circuit breaker remotely. Moreover, thanks to the notch on it, manual opening – closing can be done. Motor control mechanism is assembled on top cover of the circuit breaker. It has mechanical locking feature.
	**Changeover Relays**	Used to ensure automatic transition between network and generator at places where two circuit breakers are used for inverter purposes. Line, supply, circuit breaker statuses can be monitored on the relay. Alarm and shunt trip coil connection can be made with fault contact.
	**Undervoltage Releases**	Used for tripping the circuit breaker when the energy is cut off or voltage goes below the operating voltage. When no energy is supplied to the under voltage coil, the circuit breaker can't get open position.
	**Shunt Trip Releases**	Used for tripping the circuit breaker remotely. When the breaker is on closed (ON) position, when voltage is supplied to the shunt trip relay the circuit breaker is tripped and got trip position.
	**Auxiliary Contact Blocks**	Used for supplying electrical signaling of the circuit breaker according to the operating position. They open and close with the main contacts and perform the warning and locking functions.
	**Trip Contacts**	When the circuit breaker is tripped, alarm/trip contact gets triggered mechanically and circuit breaker closes the energy of the circuit that it is connected by switching. So the system intended to be activated is energized. These contacts are used in automatic transfer systems. They only provide the information of trip position.
	**Operating Extention Handles**	Extension handle is mounted directly on the operating handle of the circuit breaker. It provides ease of use according to the mounting volume inside the panel and the position of circuit breaker.
	**Extended Rotary Handles**	Used for opening- closing the circuit breaker. It is used for rotating the circuit breaker, not pushing-pulling it upwards-downwards.
	**Lock Mechanism with Key**	Lock mechanism mechanically locks the circuit breaker, which is on (trip) position due to service and prevent to get ON and OFF positions.
	**Mechanical Lock**	It is important to make the network-generator automation also known for automatic inverter system; because an error will cause the network and the generator to remain active at the same time, causing a short circuit and a phase coincidence. A mechanical lock is used to eliminate this possibility of error and provide operational safety.
	**Connection Terminals**	They are dispatched as screwdriver or allen screw head as per customer requirements.
	**Extension Bars**	Extension bars allow easy and healthy cable or busbar connections to the terminals of the circuit breaker. They are manufactured of electrolytic copper material with silver coating.
	**Terminal Covers**	Provides a safe insulation by preventing contact to the terminal (busbar or cable) sections of the circuit breaker. Furthermore, terminal cover also insulates terminals from each other by passing through channels between poles. It is available in all our circuit breakers as a standard.
	**Panel Frames**	It is the cover mounted to the front face of the circuit breaker as the operating handle to be on the surface of the panel. It is used to create a more aesthetic and uniform appearance within the panel.
	**Phase Barriers**	It is the material that provides the isolation between the terminals of the circuit breaker. By placing them between phases, the terminals are separated from each other and arc jumps are prevented.
	**Plug-In**	Plug-in technology is a mold box technology developed for easy assembly and disassembly of the product mounted in a panel. This simplify extracting and/or replacing the circuit breaker rapidly without touching the connections on the base.
	**Withdrawable**	In addition to the advantages provided by the base, thanks to the drawer handle, the circuit breaker can be easily and qucikly affixed and removed from the chassis. The maintenance position of the withdrawable design is intended for the maintenance of the auxiliary circuits.

AIR CIRCUIT BREAKERS (IEC / EN 60947-2)

TYPE (LSIG)				F121E	F122E	F123E	F131E	F132E	F133E	F141E	F142E	F143E	F151E	F152E	F153E
Rated Current - I_n			A	630-2000			2500-3200			4000			4000, 5000, 6300		
Number of Poles				3 / 4			3 / 4			3 / 4 ①			3 / 4 (≤ 5000A)		
Rated Insulation Voltage - Ui (a.c.) 50-60Hz			V	1000			1000			1000			1000		
Rated Impulse Withstand Voltage - Uimp				8			8			8			8		
Short-circuit Breaking Capacity (Icu/Ics) Icu: O-CO / Ics: O-CO-CO (O: Open, CO: Close-Open)	AC 415 V	50-60 Hz	kA	70/40	80/50	100/65	70/40	80/65	100/80	70/40	80/65	100/80	70/40	80/65	100/80
	AC 440 V	50-60 Hz	kA	65/35	75/47	90/59	65/37	75/61	90/72	65/37	75/61	90/72	65/35	75/61	90/72
	AC 500 V	50-60 Hz	kA	55/28	65/42	80/52	55/31	65/53	80/64	55/31	65/53	80/64	55/28	65/53	80/64
	AC 690 V	50-60 Hz	kA	45/23	50/32	65/42	45/26	50/41	65/52	45/26	50/41	65/52	45/23	50/41	65/52
Short Time Withstand Capacities – Icw - 1s/3s		50-60 Hz	kA	50/35	50/44	65/44	65/44	65/44	65/44	65/44	65/44	65/44	75/50	75/50	75/50
Category (EN 60947-2 / IEC 60947-2)				B			B			B			B		
Trip Mechanizm & Protection Characteristics	Microprocessor unit (Electronic)	Long Time Delay Current (I_L)		Ir1= (0,4-1)In tL=15-500s (1,5Ir1)			Ir1= (0,4-1)In tL=15-500s (1,5Ir1)			Ir1= (0,4-1)In tL=15-500s (1,5Ir1)			Ir1= (0,4-1)In tL=15-500s (1,5Ir1)		
		Short time Delay		Ir2= (0,4-15)In ts= 0,1-0,5s			Ir2= (0,4-15)In ts= 0,1-0,5s			Ir2= (0,4-15)In ts= 0,1-0,5s			Ir2= (0,4-15)In ts= 0,1-0,5s		
		Instantaneous		Ir3= In-50kA			Ir3= In-50kA			Ir3= In-50kA			Ir3= In-50kA		
		Graund Fault		Ir4= (0,2-0,8)In tG= 0,1-1s			Ir4= (0,2-0,8)In tG= 0,1-1s			Ir4= (0,2-0,8)In tG= 0,1-1s			Ir4= (0,2-0,8)In tG= 0,1-1s		
Mechanical Life			Op.	15000			15000			15000			10000		
Electrical Life	380/415 V	50-60 Hz	Op.	10000			7000			5000			2000		
Weight		Fixed (3P/4P)	kg	43 / 53			52 / 65			67 / -			--		
		Drawout (3P/4P)	kg	70 / 80			94 / 117			119 / 119			210 / 333		
Dimensions: Width x Height x Depth		Fixed (3P/4P)	mm	340/435 x 402 x 290			400/515 x 402 x 298			515/-- x 402 x 298			--		
		Drawout (3P/4P)	mm	375/470 x 402 x 290			435/550 x 439 x 374			550/788 x 439 x 374			835/950 x 449 x 374		
Auxiliary Contact Block				■ (4NO+4NC)			■ (4NO+4NC)			■ (4NO+4NC)			■ (4NO+4NC)		
Undervoltage Release (Non-delayed Or Time-delayed)				□			□			□			□		
Shunt Trip Release				□			□			□			□		
Motor Control Mechanism				□			□			□			□		
Mechanical Interlocking Set				□			□			□			□		

■ : Standard □ : Upon Request

① 4000A Air Type Circuit Breakers is produced as 3 Pole in fixed type.

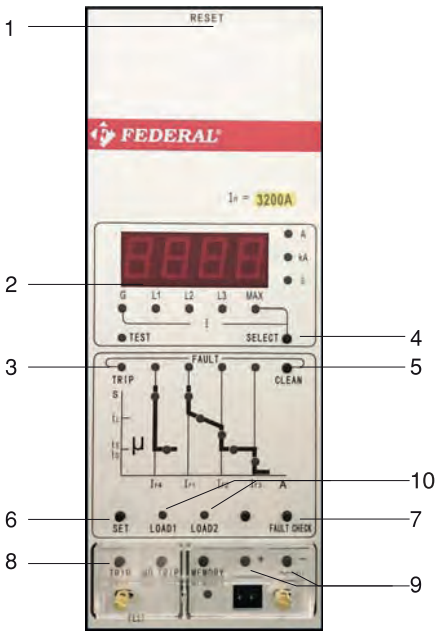
AIR TYPE CIRCUIT BREAKER

Electronic Control Unit Types			
	L Type (Standard)	**M Type**	**H Type (Communication)**
Electronic Control Unit Specifications	Long Time Protection (L)	Long Time Protection (L)	Long Time Protection (L)
	Short Time Protection (S)	Short Time Protection (S)	Short Time Protection (S)
	Instantaneous Protection (I)	Instantaneous Protection (I)	Instantaneous Protection (I)
	Ground Fault Protection (G)	Ground Fault Protection (G)	Ground Fault Protection (G)
	Neutral Protection (N)①	Neutral Protection (N)①	Neutral Protection (N)①
	Overload Monitoring (Load 1- Load 2)②	Overload Monitoring (Load 1- Load 2)②	Overload Monitoring (Load 1- Load 2)②
	Current Monitoring	Current Monitoring	Current Monitoring
	Alarm Display	Alarm Display	Alarm Display
	Test Function of display Led	Test Function of display Led	Test Function of display Led
	Manual Reset Button	Manual Reset Button	Manual Reset Button
	LED Display	LED Display	LED Display
	-	Voltage Monitoring	Voltage Monitoring
	-	Frequency Monitoring	Frequency Monitoring
	-	Power Factor Monitoring	Power Factor Monitoring
	-	Active Power Monitoring	Active Power Monitoring
	-	-	Communication port (RS 485 -Modbus)③
	-	-	Position Lock (Local - Remote - Set)
Optional Specification	Four Sets of Signal Contact Output Function MCR/HSISC Functions (Changeable short circuit protection) Earth Leakage Current Protection (Idn)④ Rectangular type toroidal transformer⑤ External supply voltage (400V AC, 24VDC , 110V DC, 220V DC)		

① Neutral protection feature is available for four pole ACBs.
② Load monitoring feature is provided with two signal led on the relay screen. In order to use this feature for load shedding, the optional "Relay External Signal Contact Outputs" must be requested. In addition, Mode 1 is set as standard.
③ RS 485 port output is available for communication via modbus protocol. It does not contain any internal software. The register tables and other information required for the communication protocol are given to the user.
④ Rectangular toroidal transformer is required for ACBs in order to use leakage current protection feature.
⑤ There are rectangular type toroidal current transformers in 3 different sizes for 2000A, 3200A, 4000A-6300A. The technical picture is given below.(Figure-5).

Functions of buttons of control unit :

1-RESET : After ACB is tripped, use reset 1 to get ready the ACBs for closing
2-CURRENT-TIME : Indicates current and tripping time
3-LED : Indicates condition of ACB
4-SELECT : Indicates maximum phase current in normal condition. when press the button it indicates current in each phase respectively.
5-RESET : Shall be used after nominal current is arranged or breaker is tripped by fault current, to operate breaker again.
6-SET : Use the button to set current time curve or to see each condition at the screen individually
7-FAULT DISPLAY : With the button, last faulty condition and faulty current-time can be seen
8-TRIP and NON-TRIP : This button is only for test
9-SAVE : The functions set by (+) and (-) buttons, can be saved with this button.
10-LOAD1 & LOAD2 (LOAD STATUS SIGNAL) : When the current value pass through any of phases is reached to the current value arranged for this function of relay, signal leds give warning. Besides, with the help of the microprocessor controlled relay output contacts, which can be used as an option, when the current value passing through the phases is reached to the current value set for load1 or load2, a trip command can be sent to the switch on the load side connected to these contacts. with this function, relay can inactive determined loads in the network.



THE FEATURES OF CONTROL UNIT

Protection Features :

The features like over load, reverse long time delay, reverse short time delay, short time delay, fixed time curves ... etc and other different protections are possible.
Indicator Feature : Current arrangement and operation current indicators are available
Ammeter Feature: Indicates current
Warning Feature : Indicates overload condition
Test Feature : To test features of ACB

SETTING OF INTELLIGENT CONTROLLER

(I_{r1}, I_{r2}, I_{r3}, I_{r4}, t_L, t_I, t_S, t_G) The latest set value can be seen at the screen. The value can be changed by using the (+) , (-) buttons. Use the "save" button to save set value.

Rectangle Transformer

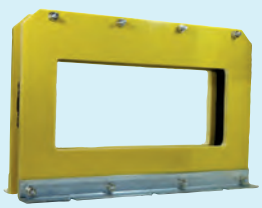


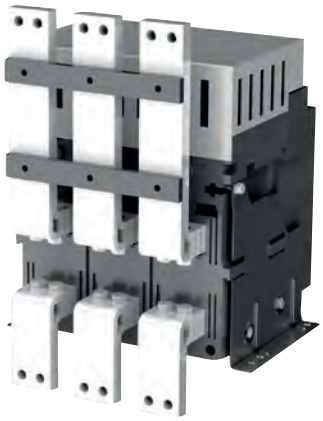
Figure-5

AIR CIRCUIT BREAKER ACCESSORIES

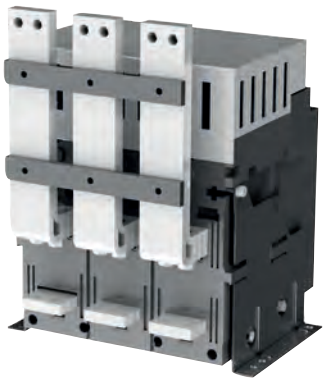
	**Undervoltage Coil**	Undervoltage release is used for tripping air type circuit breakerin case of undervoltage conditions or phase disconnection. There are two types of undervoltage releasers as instant tripping and delayed tripping types. Delayed type undervoltage release has 1 sec. 2 sec. 5 sec. 7 sec. and 7,5 sec. delayed models and accuracy class is 15%
	**Closing Coil**	After the motor mechanism completes energy storage, the closing coil promptly closes the breaker by releasing the spring in the mechanism
	**Shunt Trip**	Air type circuit breakers, excluding than manual type, can be remote controlled with shunt trip coil.
	**Motor Mechanism**	Motor mechanism sets the mechanism springs (energy storage) and makes the breaker ready for closing.
	**Mechanical Lock**	Cable wire type mechanical lock is used for cross locking of 2 circuit breakers in vertical or horizontal positions. The purpose of this application is to prevent accidental ON-1 position of one circuit breaker, while the other is in ON-1 position.
	**Key Lock**	It is a device for locking which prevents a certain circuit breaker to be operated without discretion of qualified person when two or more circuit breakers are used at the same time. It is a device for preventing mechanical closing. (Only for circuit breakers with drawout.)
	**Phase Barrier**	Phase barrier prevents the arc which may arise and result in short-circuit between phases in advance.
 Drawout Fixed	**Door Frame**	When structuring the embedded type of ACB panel, it protects the protrusion part of ACB and the cutting side of panel door when attaching it to the panel door.
	**Safety Shutter**	An automatic safety device to protect the connectors of main circuit by cutting off dangerous contact from outside while the breaker is drawout.
	**Padlock**	Position pad lock is a safety device as locking draw-in/out function in connected/test/sol position.
	**Auxiliary Switch**	Auxiliary switch contacts to monitor On/Off position of ACB remotely.
	**Manual Reset Button**	It is a function which resets a circuit breaker manually when a circuit breaker is tripped by fault current. Manual reset button is providing on the electronic control relay of ACB as standard.

AIR CIRCUIT BREAKERS MULTIPLE CONNECTIONS

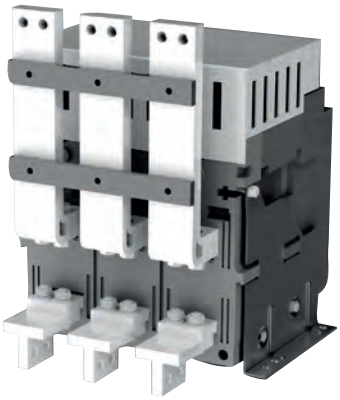
FRONT CONNECTION TYPES



FRONT TYPE



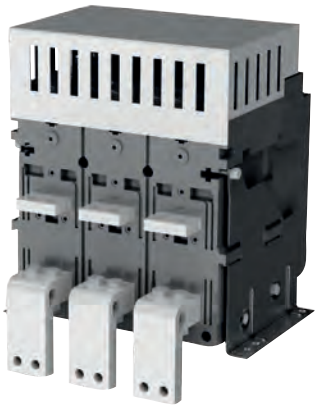
FRONT / HORIZONTAL TYPE



FRONT / VERTICAL TYPE

HORIZONTAL CONNECTION TYPES

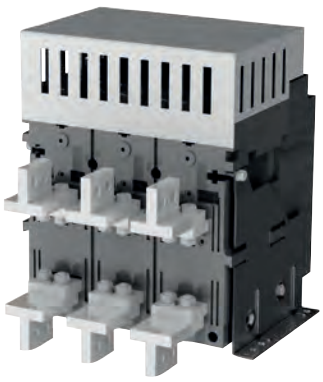
HORIZONTAL TYPE



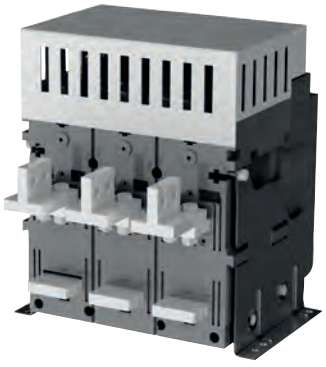
HORIZONTAL / FRONT TYPE

HORIZONTAL / VERTICAL TYPE

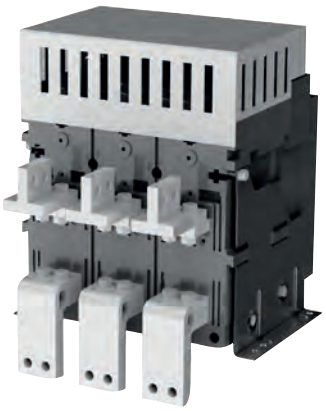
VERTICAL CONNECTION TYPES



VERTICAL TYPE



VERTICAL / HORIZONTAL TYPE

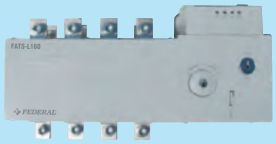


VERTICAL / FRONT TYPE

Note: Federal Air Type Circuit Breakes are produced in horizontal connection type as standard.

AUTOMATIC TRANSFER SYSTEMS (IEC / EN 60947-6-1)

In the enterprises where power cuts are frequent, where uninterrupted power is needed and where interruption can cause huge damages (such in hospitals, shopping centers, banks, factories etc...), these can be securely used in order to realize the load transfer.

			
TYPE	**MCCB**	**MCB**	**SWITCH***
Standard	EN 60947-6-1	EN 60947-6-1	EN 60947-6-1
Circuit Breaker Rated Current (In)	16A ... 1600A	0,5A ... 125A	100A ... 3200A
Number of Poles	3, 4	1, 2, 3, 4	3, 4
Control Voltage	140 - 270V	140 - 270V	220 - 240V
Auxiliary Control Voltage	10-15V DC	10-15V DC	-
Generator Start-Stop Time Adjustment	0,5 - 90 sec.(adjustable)	0,5 - 90 sec.(adjustable)	2 - 3 sec.
Operating Voltage	415V	415V	415V
Mechanical Life	10.000	10.000	> 2.000
Operating Temperature	-20°C... +60°C	-20°C... +60°C	-20°C... +60°C
Protection Class	IP20	IP20	IP20
Pollution Level	3	2	3

* Note: For detailed information, see page 39

Remote Controller: (FATS-RT)
If the user requiring to conducting separated controller, choosing Remote Controller install to cabinet panel, through 2m serial data cable linked. ATS main controller on switch body, all operations and display functions are all forbiding state (switch body display switches off automatically), external controller starting work, users could observed the ATS control of the switch running status through the external controller to operate when they can't open the cabinet. Adopt digital and indicator to show status, two state orads supply voltage and frequency. Through button to choose the manual transfer mode and set parameters.

Network - Generator Changeover Relay FER96 (For MCCB & ACB):
It is used ensure automatic transfer between network and generator at places where the circuit breaker is used for inverter purposes. Line, supply, switch status can be monitored on the relay. Fault contact and alarm and opening coil connection can be made.

Technical Specification	
Output Contacts	250V AC 10A
Supply Voltage	12V DC
Input Voltage	220V AC
Dimensions	96x96 mm

Transfer Control Unit FER72 (For Contactors):
Microprocessor-controlled device that sends a remote start signal that monitors the three-phase mains voltage and transfers the load between the network and the generator.

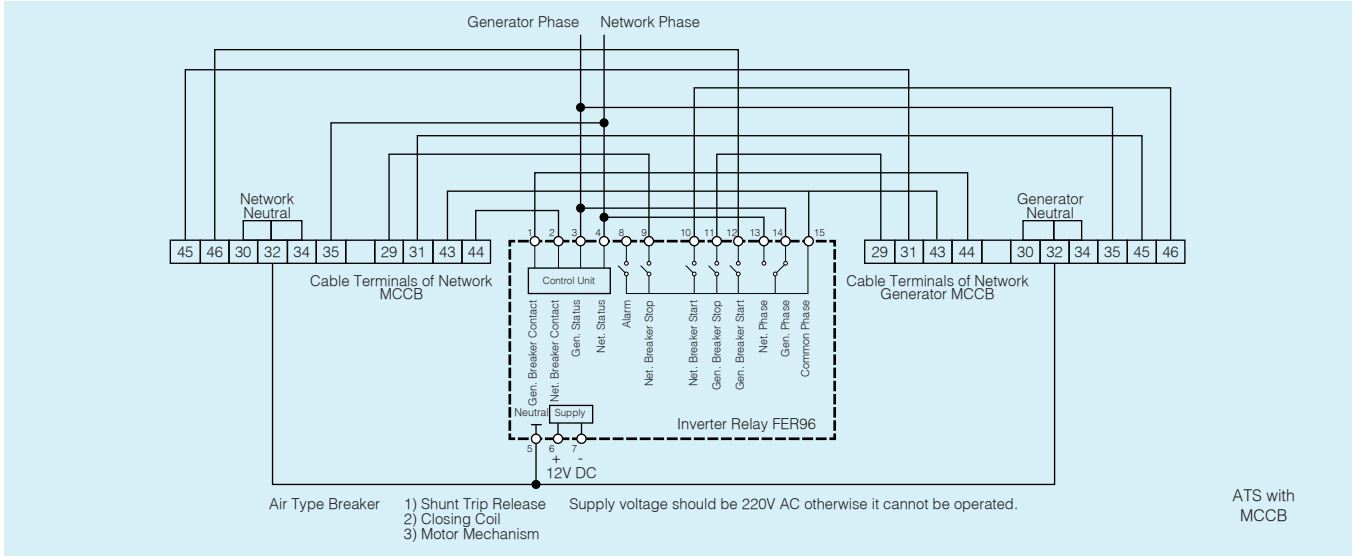
Technical Specification	
Alternator Voltage	300V AC max
Mains Voltage	300V AC max (phase-neutral)
Network Contactor Time	0,75 seconds
Dimensions	72x72 mm

ALTERNATIVE CHANGEOVER

AIR CIRCUIT BREAKER
AUTOMATIC TRANSFER SYSTEM:

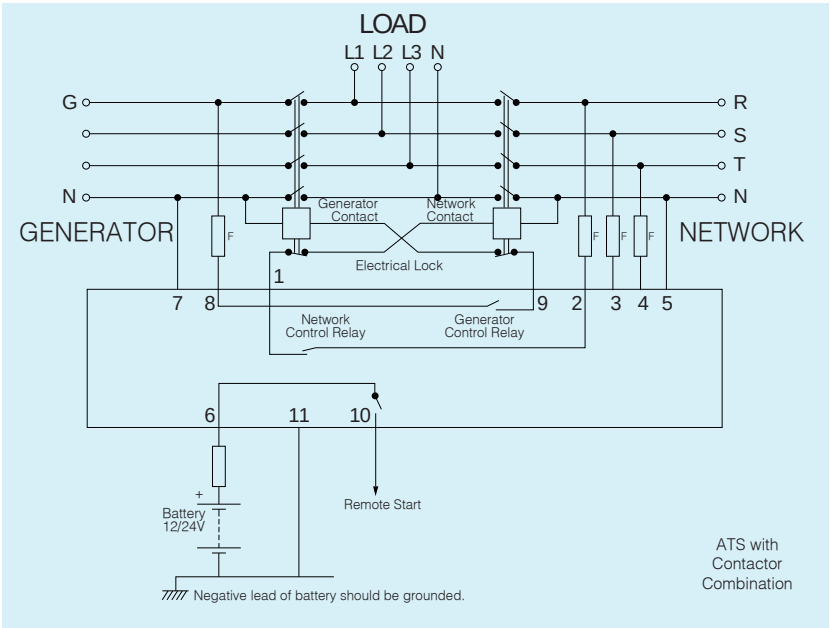
Automatic transfer system could be made by using Air Circuit Breakers up to 630 amps like Molded Case Circuit Breaker. The Automatic Transfer System made by using Air Circuit Breakers have electrical and mechnical locking features.
To make an Automatic Transfer System by Air Circuit Breakers, following components are required;

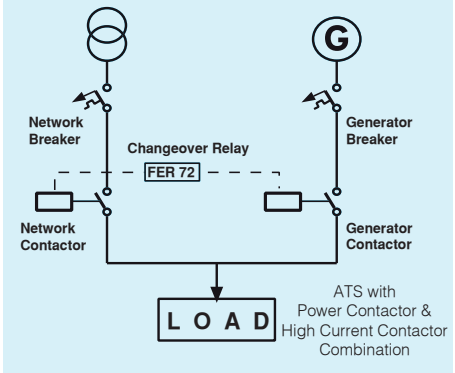
Two Air Circuit Breakers, Two motors mechanisms, Two shunt trip releases, Two closing coils, One Network Changeover Relay (FER96), One mechanical interlock



AUTOMATIC TRANSFER SYSTEM WITH CONTACTOR:

As an alternative, Automatic Transfer System could be also made by using a combination of Molded Case Circuit Breaker and Contactor. In this Automatic Transfer System, the Molded Case Circuit Breakers is used for overcurrent and short circuit protection. For switching, contactors are used in the system according to the current values. Power Contractors are used in the system up to 750 amps. The changeover system made by using contactors from 115A(FC115D) to 750A(FC750D) has only electrical locking feature while the changeover system made by using contactors up to 95A(FC95D) has electrical and mechanical locking feature. Changeover systems made by using high current contactors from 300A to 2500A has electrical and mechanical locking feature. FER72 network changeover relay is used in automatic changeover systems that is made by contactors.



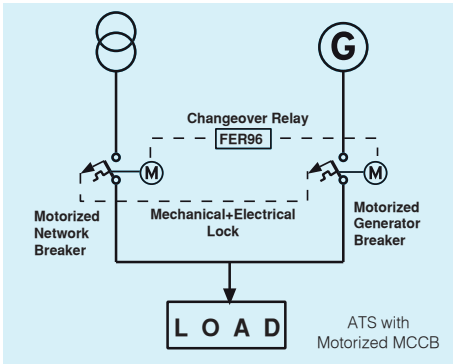


AUTOMATIC CHANGEOVER SYSTEM
WITH MOTORIZED MOLDED CASE CIRCUIT BREAKER

Another alternative automatic changeover system can be made by using motorized molded case circuit breaker.
To make an Automatic Transfer System, following components are required;

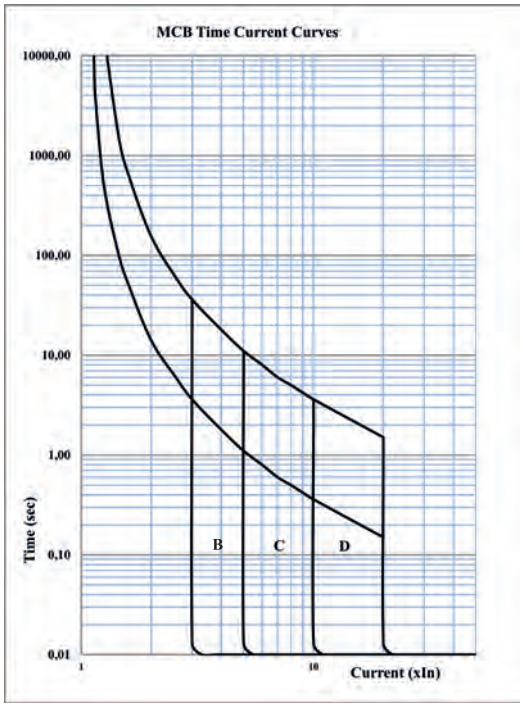
two motorized molded case circuit breakers, one mechanical interlock, one network changeover relay (FER96), two auxiliary contact (for electrical interlock)

Will be enough. As long as one of network or generator circuit breaker is put in use, electrical and mechanical lockings continuously active to prevent other circuit breaker is put in use.



TYPE			FMN	FM3	FM6	FM10	FM10DC	FM4L	FM6L	FM10L	FM10LDC
Standard			IEC 60898-1					IEC 60947-2			
Rated Current- I_n			1-32	0,5 - 63③				80-125			
Number of Poles			1P+N	1,2,3,4							
Rated Insulation Voltage - U_i	AC 50-60 Hz	V	500	690							
Rated Impulse Withstand Voltage - U_{imp}		kV	4	6							
Rated Operating Voltage Ue (V)	AC 50-60 Hz	V	230	230/400			...	230/400			...
	DC (1p)	V	...	60			250①	60			250①
Rated Short Circuit Breaking Capacity		kA	4,5	3	6	10	10	4,5	6	10,15(2p)	10
Protection Characteristics (instantaneous tripping)			B,C	B,C,D			10In	8In			10In
Operating Environment			-25°C / +60°C								
Mounting			DIN ray 35mm								
Mechanical Life		Op.	20000								
Electrical Life		Op.	5000	10000			5000				
Min-Max Connection Sections		mm²	1-10	1-25				1-50			
Min-Max Tightening Torque		Nm	1-2	2-3				3-5			
Shunt Trip Release			...	□: 230 Vac, 400 Vac, 24 Vdc, 48 Vdc							
Undervoltage Release			...	□: 230 Vac							
Auxiliary Contact Block			...	□: 1NO + 1NC (4A/ 250 Vac, 2A/45 Vdc)							
Dimensions (width x length, depth)		mm	18X82X67	18(1p)x82x66				27(1p)x80x66		27(1p)x90x67	

□ Upon Request
① 2P Series: 500V, 3P Series: 750V, 40P Series: 1000V
② B: 3-5In, C:5-10In, D: 10-20In (DC currentx1,4)
③ It is produced as 6-10kA
④ Dimension specified in "a" line, is increasing according to number of poles. (2P=a x 2, 3P=a x 3, 4P=a x 4)



Characteristic	B	C	D
I1 (t > 1h)	1.13zIn	1.13xIn	1.13xIn
I2 (t < 1h)	1.45xIn	1.45xIn	1.45xIn
I3 (t > 0.1s)	3xIn	5xIn	10xIn
I4 (t < 0.1s)	5xIn	10xIn	20xIn

B type MCB; The inrush current (magnetic release) is set to open between 3-5 times the rated current. It is used to protect lighting and socket circuits where sudden overcurrents do not occur during switching, such as home lighting, electric heaters.

C type MCB; The inrush current (magnetic release) is set to open between 5-10 times the rated current. It is generally used in the protection of transformers, air conditioners, refrigerators and many fluorescents where sudden overcurrents occur at the time of switching or activation.

D type MCB; The inrush current (magnetic release) is set to open between 10-20 times the rated current. It is used to protect equipment such as motors, welding and spot machines, halogen and sodium vapor lamps, where very high instantaneous overcurrents occur at the time of activation.

RESIDUAL CURRENT CIRCUIT BREAKERS (IEC / EN 61008-1), (IEC / EN61008-2-1)

TYPE		FK2 / FK4	FK2-S / FK4-S	FK2L / FK4L
Standard		IEC 61008-1		
Rated current - In	A	25,40,63		80,100,125
Nominal Residual Current (mA)	mA	30,100,300	100,300	30,100,300
Operating Characteristic By Current Type (1)		AC / A	AC	AC
Operating Characteristic By Operating Time (2)		General	S Type	General
Number of Poles		2 / 4		
Rated Operating Voltage – Ue (50-60 Hz)	V	230 / 400		
Rated Insulation Voltage – Ui (50-60 Hz)	V	500		
Rated Impulse Withstand Voltage - Uimp	kV	4		
Rated Making And Breaking Capacity (Im/IΔm)	A	630		1250
Rated Conditional Short-circuit Current (Inc/IΔc)	A	10000		
Mechanical Life	Op.	> 10000		
Electrical Life	Op.	> 4000		
Min-Max Connection Sections	mm²	2,5 - 2,5		4-50
Min-Max Tightening Torque	Nm	2-3		3-5
Weight (gr)	kg	0,25 / 0,47		0,26 / 0,52
Dimension: Width x Height x Depth	mm	35x81x66 / 70x81x66		35x90x70 / 70x90x70

① AC: Operating on sinusoidal alternating currents, A: Operating in sinusoidal and pulsed direct current
② General: RCCB without time-delay, S Type: RCCB with time-delay (selective)

RESIDUAL CURRENT CIRCUIT BREAKERS WITH OVERCURRENT PROTECTION (RCBO) (IEC / EN 61009-1)

FKM

FKN

TYPE			FKM	FKN
Standard			IEC 61009-1	
Rated Current - In		A	6-40	
Nominal Residual Current		mA	30,300	
Number of Poles (P: Phase, N: Neutral, FE: Functional ground) ①			1P+N	1P+N+FE
Operating Characteristics ②			AC	AC / A
Rated Operating Voltage – Ue	AC 50-60 Hz	V	230	
Rated Insulation Voltage – Ui	AC 50-60 Hz	V	500	
Rated Impulse Withstand Voltage - Uimp		kV	4	
Rated Impulse Withstand Voltage - Uimp		kA	10	
Protection Characteristics (instantaneous tripping)			B(3-5In), C (5-10In)	
Operating Environment			-25°C / +60°C	
Mounting			DIN ray 35mm	
Mechanical Life		Op.	>20000	
Electrical Life		Op.	>5000	
Min-Max Connection Sections		mm²	1-10	
Min-Max Tightening Torque		Nm	1-2	
Dimensions (width x length, depth)		mm	18 x 92 x74	18 x 117 x75

① RCBOs with functional earth conductor will operate in case of earth fault even if the neutral line is broken.
② AC: Operating on sinusoidal alternating currents, A: Operating in sinusoidal and pulsed direct current

ISOLATORS (IEC / EN 60947-3)

① AC21/DC21 : Resistive loads switching.
AC22/DC22 : Resistive and inductive load mixes switching.

② A: Equipment with frequent switching.
B: Equipment with infrequent adjustment.

③ 2P Series: 500V,
3P Series: 750,
4P Series: 1000V

TYPE		FMS	FMS-DC	FMS-DC
Conventional Thermal Current (Ith) 60°c	A	40, 63, 80, 100, 125	40, 63	80, 100, 125
Number of Poles		1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4
Rated Insulation Voltage U_i	V	690	690	690
Rated Impulse Withstand Voltage U_{imp}	kV	6	6	6
Utilization Category①②	AC	AC-22A	DC-21B	DC-21B
Operational Current (Ie)	A	40, 63, 80, 100, 125	40, 63	80, 100, 125
Operational Voltage (Ue)	A	230/400 (50-60Hz)	250V DC③	250V DC③
Short-Time Withstand Current (Icw-1s)	A	12In	12In	12In
Mechanical Life	op.	10000	10000	10000
Electrical Life	op.	1500	300	300
Conductor Connections	mm^2	50	25	50
Max- Min Tightening Torques	Nm	3..5	2..3	3..5
Protection Degree		IP20	IP20	IP20
Dimensions (width x length, depth)	mm	18 (1P) x 81 x 67	18 (1P) x 81 x 66	26 (1P) x 90 x 67
Stardard		IEC60947-3	IEC60947-3	IEC60947-3

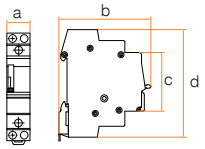
INSTALLATION CONTACTORS (IEC / EN 60947-4-1), (IEC / EN 61095)

TYPE			FCR 2020	FCR 4020	FCR 6320	FCR 2040	FCR 4040	FCR 6340
Number of Poles			2			4		
Thermal Current – Ith	≤ 55°C	A	20	40	63	20	40	63
Operating Current - Ie	AC-1 / AC7a	A	20	40	63	20	40	63
Operating Voltage - Ue	50-60 Hz	V	230			400		
Insulation Voltage - Ui	50-60 Hz	V	500					
Impulse Withstand Voltage - Uimp		kV	6					
Number of Contact			2NO			4NO		
Control Voltage		V	24/48/110/230Vac, 12, 24Vdc				24/48/110/230Vac	
Dimensions (width x length, depth)		mm	18x85x67	36x85x67		36x85x67	54x88x66	

IMPULSE RELAYS (IEC / EN 60669-1), (IEC / EN 60669-2-2)

TYPE FIR	Coil Voltage V AC 50 / 60Hz	Coil Voltage V DC	Power Circuit AC-1
1NA	24V / 48V / 230V	110V	16A-250V
2NA	24V / 48V / 230V	110V	16A-250V
1NO+1NC	24V / 48V / 230V	110V	16A-250V

Dimensions



a mm	18
b mm	71
c mm	45,6
d mm	83,75

PLASTIC BOXES (IEC / EN 60670-1)

Technical Specification	
Material	Thermoplastic
Number of Ways	1, 2, 3, 4, 6, 8, 9, 12, 18, 24
Ambient Temperature	-15°C ... +60°C
Type	Flush Mounted / Surface Mounted
Color	White

Symmetrical and asymmetrical used cover. 180° opening cover.

SURGE PROTECTIVE DEVICES (IEC 61643-11)




TYPE		FSPD-B50	FSPD-BC25	FSPD-BC15	FSPD-BC12	FSPD-BC5
Protection Class		Tip 1 (B)	Tip 1 +2 (B+C)			
Maximum Continuous Operating Voltage U_c	(L-N / N-PE) V	275 AC	300 AC	385 AC	275 AC	385 AC
Voltage Protection Level U_p	(L-N / N-PE) kV	< 2	< 1,2	< 2,4	< 1,5	< 2 /1,5
İmpulse Current (10/350 µs) Iimp	(L-N / N-PE) kA	50	25	15	12,5	5
Charge Q	As	25	12,5	..	..	..
Specific Energy W/R	kJ/Ω	625	156	..	..	..
Max. Discharge Current (8/20µs) I_{max}	kA	..	..	100	50	50
Nominal Discharge Current (8/20µs) I_n	kA	100	25	40	20	20
Response Time tA	(L-N / N-PE) ns	< 100	< 25	..	..	..
Number of Poles		3P + N	3P + N	3P + N	3P + N	3P + N
Max Cross Section	mm²	35	35	35	25	25
Fuse or Switch Rated Current	A	100	100	100	50	50
Alarm Contact		..	..	NO + NC		
Dimensions: (Width x Height x Depth)	mm	144X90X67	143x93x67	144X90X68	72x90x66	
Operation Temperature		-40°C ~ + 85°C				
Relative Humidity (25°C)		≤ 95%				
Mounting Type		DIN ray 35mm				
Test Standard		IEC 61643-11				
Body Material		Fiber Glass Reinforced Plastic				



TYPE		FSPD-BC5-DC	FSPD-C40	FSPD-C40-DC	FSPD-CD40	FSPD-D20
Protection Class		Tip 1 +2 (B+C)	Tip 2 (C)		Tip 2+3 (C+D)	Tip 2 (D)
Maximum Continuous Operating Voltage U_c	(L-N / N-PE) V	1000 DC	275, 440 AC	500, 600, 800, 1000, 1500DC	320 AC / 255 AC	440 AC
Voltage Protection Level U_p	(L-N / N-PE) kV	< 3,5	< 2	< 1.8, 1.8, 2.6, 3.8, 3.8	< 1,5 / 1,4	< 1,6
Lighting Impulse Current (10/350µs) I_{imp}	(L-N / N-PE) kA	5	..	..	..	..
Charge Q	As	..	..	..	..	..
Specific Energy W/R	kJ/Ω	..	..	..	..	..
Max. Discharge Current (8/20µs) I_{max}	kA	50	40	40	40	20
Nominal Discharge Current (8/20µs) I_n	kA	20	20	20	20	10
Response Time tA	(L-N / N-PE) ns	..	< 25	< 25	< 25 / < 100	< 25
Number of Poles		3P	1P + N / 3P+ N	2P / 3P	1P + N / 3P + N	1P + N
Max Cross Section	mm²	25	25	25	25	25
Fuse or Switch Rated Current	A	50	32	32	32	32
Alarm Contact			..	..	..	..
Dimensions: (Width x Height x Depth)	mm	54x90x66	36x90x62(1P + N) 72x90x62 (3P +N)	36x90x62 (2P) 54x90x62(3P)	36x90x66(1P+N) 72x90x66(3P+N)	36x90x62
Operation Temperature		-40°C ~ + 85°C				
Operation Temperature		≤ 95%				
Relative Humidity (25°C)		DIN ray 35mm				
Test Standard		IEC 61643-11				
Body Material		Fiber Glass Reinforced Plastic				

CONTACTORS (IEC / EN 60947-4-1)

											
TYPE			**FC06M**	**FC09M**	**FC09D**	**FC12D**	**FC18D**	**FC25D**	**FC32D**	**FC38D**	**FC40D**	**FC50D**
Number of Poles			3/4							3	3/4	3/4
Rated Thermal Current- I_{th}	≤ 55°C	A	16	16	25	25	32	40	50	55	60	80
Rated Operation Current – I_e	AC-3	A	6	9	9	12	18	25	32	38	40	50
(≤ 440 V 50-60 Hz)	AC-5a	A	8	10	12	16	25	35	45	50	55	65
	AC-1	A	16	16	25	25	32	40	50	55	60	80
Rated Operation Current – I_e	DC-1	A	...	...	20	20	25	32	40	40	45	60
(≤ 250V DC - 3p series)	DC-3, DC-5	A	...	...	8	8	8	32	40	40	45	60
Rated Insulation Voltage - U_i	50-60 Hz	V	800									
Rated Impulse Withstand Voltage - U_{imp}		kV	8									
Motor Control	230 Vac	kW	1,5	2,2	2,2	3	4	5,5	7,5	9	11	15
3 ~ AC-3 (Driving - Stopping)	400 Vac	kW	2,2	4	4	5,5	7,5	11	15	18,5	18,5	22
	440 Vac	kW	2,2	4	4	5,5	9	11	15	18,5	22	25
	500 Vac	kW	3	4	5,5	7,5	10	15	18,5	18,5	22	30
	690 Vac	kW	3	4	5,5	7,5	10	15	18,5	18,5	22	33
Weight	3/4 Poles	kg	0,16		0,33			0,34	0,52/0,59	0,55	0,55	1,14/1,29
Number of Auxilary Contacts	3 Poles		1NO or 1NC									1NO+1NC
(AC-15 / 1,8A / 400Vac)	4 Poles		...		1NO+1NC							1NO+1NC
	AC Coil Holding	VA	7	7	9,5	9,5	9,5	9,5/11	11	11	11	30
Coil Power Consumption	AC Coil Pull	VA	50	50	75	75	75	75/110	110	110	110	225
	DC Coil	VA	7	7	9	9	9	9	11	11	11	20
Coils Type			D0	D0	D2	D2	D2	D2/D4	D4	D4	D4	D6
Mechanical Life		Milion	10	10	10	10	10	10/8	8	8	8/5	5
Power Loss per Pole	(AC-3)	W	0,13	0,29	0,29	0,52	1,2	2,1	2,3	2,9	3,2	4,4
Max cross section		mm²	2x4	2x4	2x6	2x6	2x6	2x6	2x6	2x10	2x10 / 35	35
Min-Max Tightening Torque		Nm	1-1,5	1-1,5	1-1,5	1-1,5	1-1,5	1-1,5	1,2-2	1,5-2,5	1,5-2,5	3,5-4,5
Dimensions	a (width)	mm	46	46	47	47	47	47/57	57/57	57	57/85	77/85
(width x height x depth)	b (height)	mm	58	58	76	76	76	76/86	86/86	86	86/129	129/129
	c (depth)	mm	57	57	82	82	82	87/95	95/95	100	100/115	115/115
DC Coil	DC Type c (depth)	mm	71	71	116	116	116	120/130	130/130	135	135/174	175/174

Spare Coils	 FCC-D0	 FCC-D2	 FCC-D4	 FCC-D6
Auxiliary Contact Block (Side Assembly) 1.Number: NO Number of Contacts 2.Number: NC Number of Contacts	FCBS-F11 FCBS-F20 FCBS-F02 			
Auxiliary Contact Block (Front Assembly) 1.Number: NO Number of Contacts 2.Number: NC Number of Contacts	 FCB-F02 FCB-F11 FCB-F20	 FCB-F04 FCB-F13 FCB-F22 FCB-F31 FCB-F40		
Mechanical Lock				

NO: Normally open contact **NC:** Normally closed contact

Note-1: The standard auxiliary contact blocks are installed on the front surface of the contactor.

Note-2: Standard 1NO + 1NC auxiliary contact in 4-pole contactors from FC09D to FC95D and in 3-pole contactors from FC115D to FC150D are installed on the front of the product as a plug-in. C (depth) dimension increases by 33mm.

Note-3: Standard 1NO + 1NC auxiliary contact in 3 and 4 pole contactors from FC220D to FC750D is installed to the front of the product as a plug-in. C (depth) dimension does not change

CONTACTORS (IEC / EN 60947-4-1)








FC65D	FC80D	FC95D	FC115D	FC150D	FC220D	FC245D	FC260D	FC300D	FC400D	FC475D	FC580D	FC650D	FC750D
3/4													
80	125	125	200	200	300	310	315	400	600	650	750	850	1000
65	80	95	115	150	220	245	260	300	400	475	580	650	750
80	100	115	140	180	260	180	300	350	470	560	680	760	880
80	125	125	200	200	300	310	315	400	600	650	750	850	1000
65	100	100	160	200	260	280	300	360	430	500	650	750	850
65	100	100	160	200	180	220	250	300	350	420	500	600	700
			1000										
8													
18,5	22	25	30	40	60	70	80	90	110	140	180	200	220
30	37	45	55	75	110	130	140	160	200	250	315	355	400
37	45	45	59	80	129	140	150	160	220	250	315	355	450
37	55	55	75	90	132	160	180	200	257	290	360	410	470
37	45	45	80	100	160	180	200	250	280	375	470	530	650
1,14/1,29	1,38/1,54	1,38/1,54	2,1/4,3	2,1/4,5	4,7/5,7	4,7/5,7	4,7/5,7	8,5/10	8,5/10	10,8/12,9	17,4/20,5	17,5/20,5	19/22,4
1NO+1NC													
1NO+1NC													
30	30	30	22/55	22/55	55	55	55	13	20	24	22	22	22
225	225	225	225	225	750	750	750	1100	1100	1250	1600	1600	1600
20	20	20	20	20	20	20	20	20	20	20	20	20	20
D6	D6	D6	D8/D9	D8/D9	D10	D10	D10	D11	D12	D13	D14	D14	D14
5	5	5	5	5	5	5	5	5	5	5	5	3	3
6,0	7,7	10,9	10,2	17,3	24,0	30,0	33,0	35,0	44,0	37,0	37,0	46,0	62,0
35	50	50	2x120	2x120	2x185	2x185	2x185	70..2x185	2x185	2x240	2x10x50	2x10x50	2x10x50
3,5-4,5	6-10	6-10	8-12	8-12	15-20	15-20	15-20	20-25	20-25	20-25	30-40	30-40	30-40
77/85	87/97	87/97	120/204	120/204	172/211	172/211	172/211	218/261	215/261	235/288	310/389	310/389	310/389
129/129	129/129	129/129	154/163	154/163	175/175	175/175	175/175	210/210	210/210	240/240	304/304	304/304	304/304
115/115	127/127	127/127	121/172	121/172	183/183	183/183	183/183	223/223	223/223	235/235	257/257	257/257	257/257
175/174	183/180	183/180	...	...	...	...	...	...	...	...	...	...	...


FCC-D6


FCC-D8 (3P) FCC-D9 (4P)


FCC-D10


FCC-D11


FCC-D12

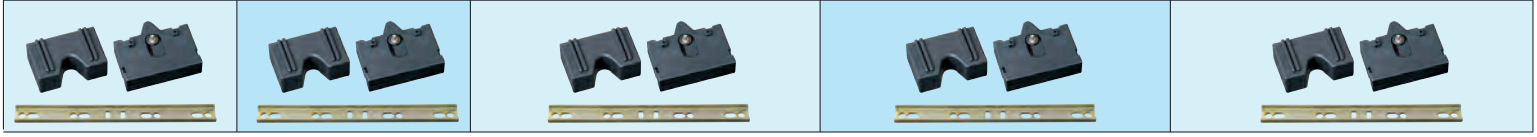

FCC-D13


FCC-D14

FCBS-F02
FCBS-F11
FCBS-F20


FCB-F02
FCB-F11
FCB-F20


FCB-F04
FCB-F13
FCB-F22
FCB-F31
FCB-F40



NO: Normally open contact **NC:** Normally closed contact

Note-4: FCC-D4 type coil is used for 4 poles FC25D contactor.
* Min.-max. tightening torque is 3.5-4.5 Nm for 4 poles FC40D contactor.

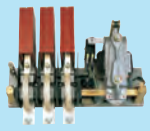
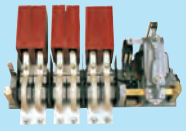
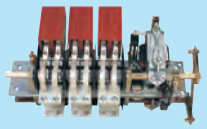
CONTACTORS

(IEC / EN 60947-4-1)

									
TYPE (DK)			**FC03**	**FC05**	**FC09**	**FC12**	**FC18**	**FC25**	**FC32**
Number of Poles			3	3	3	3	3	3	3
Utilization Class	AC-6b Ie max 440Vac	A	3,3	6,6	13	16	20	22	26
Rated Thermal Current - Ith		A	25	25	25	25	32	40	50
Rated Insulation Voltage - UI	50-60 Hz	V	630	630	630	630	630	630	630
Rated Impulse Withstand Voltage - Uimp		kV	8	8	8	8	8	8	8
Rated Power	220/240 Vac	kVAr	1,5	3	5	7	8	9	10
3 ~ AC-6b 55°C	400/440 Vac	kVAr	2,5	5	10	12,5	15	16,7	20
	480/525 Vac	kVAr	3	6	12,5	15	16,7	20	24
Number of Auxiliary Contacts		adet	1NO or 1NC		1NO+1NC				
Electrical Life		op.	200.000						
Coil Power Consumption (Holding)		VA	9,5	9,5	9,5	9,5	9,5	9,5	11
Power Loss Per Pole	440Vac / (AC-6b)	W	0,039	0,156	0,6	1	1,4	1,6	1,5
Min - Maks Tightening Torque		Nm	1-1,5	1-1,5	1-1,5	1-1,5	1-1,5	1-1,5	1,2-2
Weight		kg	0,33	0,33	0,39	0,39	0,39	0,4	0,58
Dimensions Depth / Width / Height		mm	47x76x82		47x76x117			47x76x122	57x86x131

									
TYPE (DK)			**FC38**	**FC40**	**FC50**	**FC65**	**FC80**	**FC95**	**FC115**	**FC150**
Number of Poles			3	3	3	3	3	3	3	3
Utilization Class	AC-6b Ie max 440Vac	A	33	39	52	66	79	85	92	105
Rated Thermal Current - Ith		A	55	60	80	80	125	125	200	200
Rated Insulation Voltage - UI	50-60 Hz	V	630	630	630	630	630	630	630	630
Rated Impulse Withstand Voltage - Uimp		kV	8	8	8	8	8	8	8	8
Rated Power	220/240 Vac	kVAr	15	20	25	30	35	40	45	50
3 ~ AC-6b 55°C	400/440 Vac	kVAr	25	30	40	50	60	65	70	80
	480/525 Vac	kVAr	25	30	45	50	60	65	70	80
Number of Auxiliary Contacts		adet	1NO + 1NC		1NO + 2NC				1NC	
Electrical Life		op.	200.000							
Coil Power Consumption (Holding)		VA	11	11	30	30	30	30	22	22
Power Loss Per Pole	440Vac / (AC-6b)	W	2,1	3,1	4,8	5	7,5	8,8	6,5	8,5
Min - Maks Tightening Torque		Nm	1,5-2,5	1,5-2,5	3,5-4,5	3,5-4,5	6-10	6-10	8-12	8-12
Weight		kg	0,6	0,6	1,2	1,2	1,5	1,5	2,2	2,2
Dimensions Depth / Width / Height		mm	57x86x136		77x129x150		87x129x158		120x154x158	

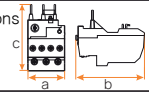
HIGH CURRENT CONTACTORS (IEC / EN 60947-4-1)

TYPE				EC 300	EC 400	EC 630	EC 800	EC1250	EC 1600	EC2000	EC 2500
Utilization Class	I max	AC1 ≤ 40 °C	A	300	400	630	800	1250	1600	2000	2500
Number of Poles ①				1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
Rated Impulse Withstand Voltage			kV	8	8	8	8	8	8	8	8
For Motor Control (Squirrel Cege Motors) 3 ~AC3		220 / 230V	kW	75	110	160	200	370	470	580	730
		380 / 400V	kW	132	200	280	335	630	790	980	1230
		500V	kW	180	257	355	450	740	960	1190	1490
In Compensation Circuits		380 / 400V	kVAr	150	200	250	300	450	525	655	820
Rated Insulation Voltage - UI		Ui	~ V	690	690	690	690	690	690	690	690
Coil Voltage		U_S (AC)	~ V	24,48,110,220,240,380,415							
		U_S (DC)	-V	24,48,110,220,240,380,415							
Coil Voltage Operation Interval		xU_S	-V	0,72...-1,1							
Auxiliary Contacts		NA(10A)	Ad	2	2	2	2	2	2	4	4
		NK(10A)	Ad	2	2	2	2	2	2	4	4
Coil Power Consumption		Pulling	W	800	800	800	800	880	880	1760	1760
		Holding	W	26	26	26	26	35	35	70	70
Mechanical Life			Operation	50000	50000	50000	50000	50000	50000	50000	50000
Dimensions (3 Pole)		Depth	mm	245	245	245	245	245	245	500	500
		Width	mm	463	463	463	463	578	578	672	672
		Height	mm	370	370	370	370	370	370	370	370
Weight			kg	28,6	29,2	29,8	30,4	44,2	44,8	88,4	89,6
Power Loss Per Pole			W	6	11	26	42	52	85	80	125

U_S: Control supply voltage.
① High Current Contactors are manufactured with 3 poles as stardard.

THERMAL OVERLOAD RELAYS (IEC / EN 60947-4-1)

TYPE			FTR25	FTR40	FTR95	FTR150	FTR630
Current Adjustment Area		A	0,1-32	23-40	30-93	80-150	160-630
Rated Insulation Voltage – U_i		50-60 Hz V	690	690	690	690	690
Rated Impulse Withstand Voltage - U_{imp}		kV	6	6	6	6	6
Operation Temperature		°C	-25...55	-25...55	-25...55	-25...55	-25...55
Min-Max Connection Sections		mm2	1-4	6-10	6-50	6-50	50-2x185
Min-Max Tightening Torque		Nm	1-2	2-3	4-6	4-6	15-25
Auxiliary Contact			1NO+1NC	1NO+1NC	1NO+1NC	1NO+1NC	1NO+1NC
Auxiliary Contact Current (AC-15)		230/400Vac A	2,7 / 1,6	2,7 / 1,6	2,7 / 1,6	2,7 / 1,6	2,7 / 1,6
Contactor Type			FC09D...FC40D	FC09D...FC40D	FC50D...DF95D	FC115D...FC150D	FC220D...FC475D
	Operating Currents - Ie		0,1-0,16 0,16-0,25	23-32	30-40	80-104	160-250
			0,25-0,4 0,4-0,63	30-40	37-50	95-120	200-315
			0,63-1 1-1,6		48-65	110-150	250-400
			1,6-2,5 2,5-4		55-70		315-500
			4-6 5,5-8		63-80		400-630
			7-10 9-13		80-93		
			12-18 17-25				
			23-32				
	Dimensions 	a (width) mm	44	55	70	95	170
		b (depth) mm	66	78	81	131	213
		c (height) mm	91	91	115	115	180

FTR25	0,1-0,16	0,16-0,25	0,25-0,4	0,4-0,63	0,63-1	1-1,6	1,25-2	1,6-2,5	2,5-4	4-6	5,5-8	7-10	9-13	12-18	17-25	23-32
FTR95	30-40	37-50	48-65	55-70	63-80	80-93	–	–	–	–	–	–	–	–	–	–
FTR150	80-104	95-120	110-150	–	–	–	–	–	–	–	–	–	–	–	–	–
FTR630	160-250	200-315	250-400	315-500	400-630	–	–	–	–	–	–	–	–	–	–	–

MOTOR PROTECTION SWITCHES (IEC / EN 60947-4-1)

TYPE	Thermal Adjusment Area (A) (40°C)	Nominal Power Rating of 3 Phase Motors 50/60Hz at AC-3 Category Class			
		230V	400V	500V	690V
FMK25 Series		kW	kW	kW	kW
Thermal Magnetic Characteristics	0,1-0,16	-	0,03	-	-
	0,16-0,25	0,03	0,06	0,09	0,12
	0,25-0,4	0,06	0,09	0,12	0,09 / 0,12
	0,5-0,63	0,06 / 0,09	0,18	0,18	0,25 / 0,37
	0,63-1	0,09 / 0,19	0,25	0,25 / 0,37	0,55 / 0,75
	1-1,6	0,25	0,37 / 0,55	0,55	0,75 / 1,1
	1,6-2,5	0,37 / 0,55	0,55 / 0,75	1,1 / 1,5	1,5
	2,5-4	0,55 / 1,1	1,1 / 1,5	1,5 / 2,2	2,2 / 2,7
	4-6,3	1,1	2,2 / 3	3 / 4	3,7 / 5,5
	6-10	2,2	3 / 4	4 / 5,5	5,5 / 7,5
	9-14	3 / 3,7	5,5	7,5	7,5 / 11
	13-18	3,7 / 4	7,5	11	15
	17-23	5,5	11	15	11 / 15
	20-25	5,5 / 7,5	11	15	18,5 / 22
	24-32	7,5	15	15 / 18,5	22
FMK80 Series					
Thermal Magnetic Characteristics	25-40	11	18,5	22	37
	40-63	15	22 / 30	45	55
	56-80	22	30 / 40	55	63

ACCESSORIES


Auxiliary Contact


Shunt Trip Release


Undervoltage Release


Storage Box


Storage Box With Emergency Stop Button

HARMONIC FILTERS, SHUNT REACTORS and LINE & LOAD REACTORS

General Features
According to filter power terminal clamp or busbar connection in output
Production with three or single phases
Design with iron core, air gap
Heat protection with thermo contact
Copper or aluminum winding
Protection degree IP00
F class isolation

Harmonic Filter: (FHF)

Mono phase : 134Hz, 189Hz(Standard), 210Hz, U_k = 250V, 0,5 to 10 kVAr
Three phase : 134Hz, 189Hz(Standard), 210Hz, U_k = 400V / 415V, 1 to 100 kVAr

Shunt Reactor: (FSR)

Mono phase : 0,1 to 10 kVAr
Three phase : 0,5 to 50 kVAr

Line & Load Reactor: (FLF)

Mono phase : 0,37 to 4 kW
Three phase : 0,37 to 160 kW

POWER CAPACITORS

	TYPE	Phase	Power (kVAr)			Dimensions Ø(D) x H(mm)
MKP Technology	**M Series (Mono-Phase)**		**230V**	**400V**	**415V**	
	FEKM 0,23/0,55	1	0,55	1,67	1,80	45X115
	FEKM 0,23/0,83	1	0,83	2,50	2,69	50X115
	FEKM 0,23/1,38	1	1,38	4,17	4,49	50X150
MKP Technology	**M Series (Mono-Phase) Heavy-Duty**		**230V**	**415V**	**440V**	
	FEKM 0,23/0,25	1	0,25	0,81	0,91	63,5x75
	FEKM 0,23/0,50	1	0,50	1,62	1,82	63,5x75
	FEKM 0,23/1,00	1	1,00	3,25	3,65	63,5x87
	FEKM 0,23/1,50	1	1,50	4,87	5,47	63,5x145
	FEKM 0,23/2,50	1	2,50	8,14	9,15	63,5x145
	FEKM 0,23/5,00	1	5,00	16,3	18,3	75x205
MKP Technology	**K Series (Three-Phase) Heavy-Duty**		**400V**	**415V**	**440V**	
	FEK13 0,40/1,00	3	1,00	1,08	1,21	63,5x87
	FEK13 0,40/1,50	3	1,50	1,61	1,81	63,5x95
	FEK13 0,40/2,50	3	2,50	2,69	3,03	63,5x95
	FEK13 0,40/5,00	3	5,00	5,38	6,05	75x145
	FEK13 0,40/7,50	3	7,50	8,08	9,08	75x247
	FEK13 0,40/10,0	3	10,0	10,8	12,1	76x247
	FEK13 0,40/12,5	3	12,5	13,5	15,1	85x247
	FEK13 0,40/15,0	3	15,0	16,2	18,2	85x278
	FEK13 0,40/20,0	3	20,0	21,5	24,2	95x278
	FEK13 0,40/25,0	3	25,0	26,9	30,3	95x278
	FEK13 0,40/30,0	3	30,0	32,3	36,3	116x278
	FEK13 0,40/40,0	3	40,0	43,1	48,4	136x247
	FEK13 0,40/50,0	3	50,0	53,8	60,5	136x278
MKP Technology	**K Series (Three-Phase) Heavy-Duty**		**415V**	**480V**	**525V**	
	FEK13 0,48/5,00	3	3,74	5,00	5,98	75x210
	FEK13 0,48/7,50	3	5,60	7,50	8,97	75x210
	FEK13 0,48/10,0	3	7,47	10,0	12,0	75X210
	FEK13 0,48/12,5	3	9,33	12,5	14,9	85x210
	FEK13 0,48/15,0	3	11,2	15,0	17,9	85x210
	FEK13 0,48/20,0	3	15,0	20,0	23,9	95x247
	FEK13 0,48/25,0	3	18,7	25,0	30,0	116x247
	FEK13 0,48/30,0	3	22,4	30,0	35,8	116x247
	FEK13 0,48/33,3	3	24,9	33,3	39,8	116x247
MKP Technology	**K Series (Three-Phase) Super Heavy-Duty**		**415V**	**480V**	**525V**	
	FEK13 0,52/5,00	3	3,12	4,18	5,00	76X175
	FEK13 0,52/7,50	3	4,69	6,27	7,50	76X175
	FEK13 0,52/10,0	3	6,25	8,36	10,0	85x210
	FEK13 0,52/12,5	3	7,81	10,4	12,5	85x210
	FEK13 0,52/15,0	3	9,37	12,5	15,0	95x210
	FEK13 0,52/16,7	3	10,4	14,0	16,7	95x210
	FEK13 0,52/20,0	3	12,5	16,7	20,0	95x247
	FEK13 0,52/25,0	3	15,6	20,9	25,0	116x247
	FEK13 0,52/30,0	3	18,7	25,1	30,0	116x247
	FEK13 0,52/40,0	3	25,0	33,4	40,0	136x247

REACTIVE POWER CONTROL RELAYS




Type	Relay Output	Thyristor Output	SVC output	"LED Screen"	Character LCD	2.9" Graphic LCD	4.3" Color LCD	RS-485	RS-232	USB Device	USB Host	Ethernet	GPRS modem	Remote Monitor	e-posta	sms
FRR10-08 (96X96)	8		–	√	√	–	–	–	–	–	–	–	–	–	–	–
FRR12-12-485 (144X144)	12		√			√	–	√	–	–	–	–	–	–	–	–
FRR15-12 (144X144)	12		–	√	√	–	–	√	–	–	–	–	–	–	–	–
FRR15-15 (144X144)	15		–	√	√	–	–	√	–	–	–	–	–	–	–	–
FRR24-12 (144X144)	12		√	–	–	–	√	√	–	–	–	–	–	–	–	–
FRR24-12C (144X144)	12		√	–	–	–	√	√	√	√	√	√	–	√	√	–
FRR24-18 (144X144)	18		√	–	–	–	√	√	–	–	–	–	–	–	–	–
FRR24-18C (144X144)	18		√	–	–	–	√	√	√	√	√	√	–	√	√	–
FRR24-24 (144X144)	24		√	–	–	–	√	√	–	–	–	–	–	–	–	–
FRR24-24C (144X144)	24		√	–	–	–	√	√	√	√	√	√	–	√	√	–
FRR24-12M (144X144)	12		√	–	–	–	√	√	–	–	–	–	√	√	√	√
FRR24-18M (144X144)	18		√	–	–	–	√	√	–	–	–	–	√	√	√	√
FRR24-24M (144X144)	24		√	–	–	–	√	√	–	–	–	–	√	√	√	√
FRR24-12T (144X144)		12	√	–	–	–	√	√	–	–	–	–	–	–	–	–
FRR24-24T (144X144)		24	√	–	–	–	√	√	–	–	–	–	–	–	–	–
FRR24-12RT (144X144)	12	12	√	–	–	–	√	√	–	–	–	–	–	–	–	–
FRR24-12R (144X144) TFT4.3-12R	12		√	–	–	–	–	√	–	–	–	–	–	–	–	–
FRR24-12RC (144X144) TFT4.3-12RC	12		√	–	–	–	–	√	√	√	√	√	–	√	√	–

POWER ANALYZER


TYPE	FPA100	FPA140	FPA140P	FPA140P-AC	FPA140P-DC	FPA160
B&W Screen (2,9")	-	√	√	√	√	-
Color Screen (3,5")	-	-	-	-	-	√
RS-485 Modbus	√	√	√	√	√	√
Digital Inputs	1	2	4	4	4	2
Digital Outputs	1	2	2	2	2	2
Analog Outputs	-	-	2	3	3	-
USB Port	-	-	√	√	√	√
Gound Current Input	-	-	√	-	-	-
AC Supply	√	√	√	√	√	√
DC Supply	-	-	-	-	√	-
1 mA Measurement	-	-	-	√	-	-
Record Memory	-	-	1 mb.	1 mb.	1 mb.	-
Real Time Clock	-	-	√	√	√	√
Accuracy %	0,5	0,5	0,5	0,5	0,5	0,2
True RMS	√	√	√	√	√	√
Harmonic	31	31	31	49	49	63
Micro-SD Card	-	-	√	-	-	-
Ethernet	-	-	-	-	-	√
USB Host	-	-	-	-	-	√
External GPRS Mod	-	-	-	-	-	√

ANALOGUE MEASUREMENT DEVICES (EN 60051-2), (EN 60051-4)

								
	Ammeters		**Max. Demand Ammeters***		**Voltmeters**		**Frequencymeters**	
TYPE	**FA 72**	**FA 96**	**FMA 72**	**FMA 96**	**FV 72**	**FV 96**	**FF 72**	**FF 96**
Measurement Wave Form	AC (r.m.s.)		AC (r.m.s.)		AC (r.m.s.)		AC (r.m.s.)	
Measuring Range	From 10A to 100A (direct) From 30/5A to 4000/5A (current trans)		From 1A to 5A (direct) (15min.) x/5A with current trans. (15min)		250 V - 300 V - 500 V		45 - 65Hz 45 - 65Hz	45 - 65Hz 45 - 65Hz 45 - 65Hz
Accuracy Class	1,5 (DIRECT≥ 60A:2,5)		3		1,5		1,5	
Operating Method	Moving Iron		Bimetal		Moving Iron		Moving Coil	
Operating Frequency	45 - 65 Hz		45 - 65 Hz		45 - 65 Hz		45 - 65 Hz	
Continously Overload (2hours)	1,2 xI_n		1,2 xI_n		1,2 xU_n		1,2 xU_n, 1,2 x 55Hz	
Short-Time Overload	10 xI_n		10 xI_n		2 xU_n		2 xU_n	
Consumtion (max.)	1 VA		2,2 VA		3 VA		1 VA	
Insulation Testing Voltage	2000V		2000V		2000V		2000V	
Operating Position	Scale Vertical Position		Scale Vertical Position		Scale Vertical Position		Scale Vertical Position	
Dimensions	72 X 72	96 X 96	72 X 72	96 X 96	72 X 72	96 X 96	72 X 72	96 X 96

*Models with 3 needles are available in our product range. 3-pin models also show instantaneous precise current measurement. Please contact our company for the price.

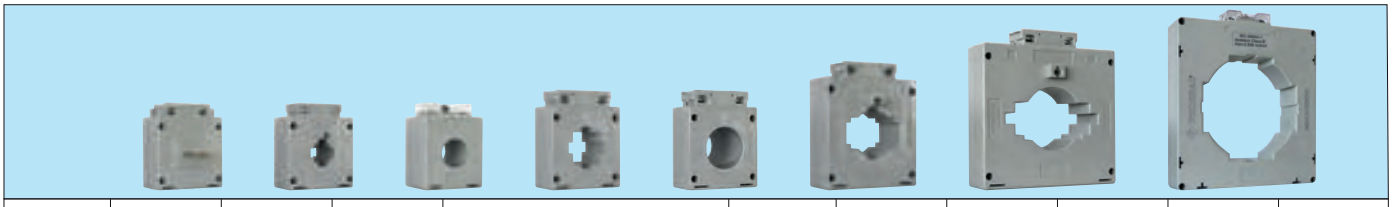
DIGITAL MEASUREMENT DEVICES (IEC / EN 61010-1)

						
	Ammeter	**Ammeter (with 2 relays)**	**Voltmeter**	**Voltmeter (with 2 relays)**	**Multimeter**	**Multimeter**
TYPE	**FYA72-FYA96 FYA96-200**	**FYA72-2R/FYA96-2R FYA96-2R 200**	**FYV72-FYV96**	**FYV72-2R FYV96-2R**	**FMM40**	**FMM50-FMM50R**
Measurement Wave Form	AC (r.m.s.)	AC (r.m.s.)	AC (r.m.s.)	AC (r.m.s.)	AC (r.m.s.)	AC (r.m.s.)
Measurement Range	0-5A Max. 6A direct (FYA72,96) 0-9999A with Current Transformers (FYA72,96) 0-200A Max. 250A direct (FYA72,96-200)		0-500V AC Max. 600V AC 0-36kV AC with Voltage Transformer		L1 : 180 ... 260V AC L2 : 0 ... 300V AC L3 : 0...300V AC 0-9999A with Current Trans. Frequency (30-70Hz)	0-500V AC Max. 600V AC 0-36kV AC with Voltage Transformer 0-9999A with Current Transformers Frequency (45-65Hz), COSφ, period, kW, kVA, kVAr
Accuracy Class	1	1	1	1	1	1
Operating Frequency	50 ... 60Hz	50 ... 60Hz	50 ... 60Hz	50 ... 60Hz	30 ... 70Hz	50 ... 60Hz
Operating Temperature	-10°C ... +85°C	-10°C ... +85°C	-10°C ... +85°C	-10°C ... +85°C	-5°C ... +55°C	-10°C ... +85°C
Feeding Voltage	100 ... 240V AC 100 ... 300V DC	100 ... 240V AC 100 ... 300V DC	100 ... 240V AC 100 ... 300V DC	100 ... 240V AC 100 ... 300V DC	220V AC (±%20)	85 ... 265V AC 100 ... 300V DC
Dimensions	72x72 / 96x96	72x72 / 96x96	72x72 / 96x96	72x72 / 96x96	96x96	96x96

CAM SWITCHES (IEC / EN 60947-3)

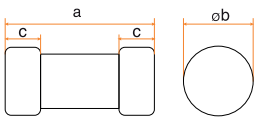
TYPE	Rating (A)							Number of Poles
	FCS1				FCS2			
	10	16	20	25	32	40	63	
On-Off Switches	☒	☒	☒	☒	☒		☒	1, 2, 3, 3+1
Changeover Switches	☒	☒	☒	☒	☒		☒	1, 3
Star Delta Starters		☒		☒				3
Motor Reversing Switches	☒	☒	☒	☒				1, 3
Voltmeter Switches			☒					4, 7
Ammeter Switches			☒					3
Safety Switches			☒		☒	☒	☒	3

CURRENT TRANSFORMERS (IEC / EN 61869-2)



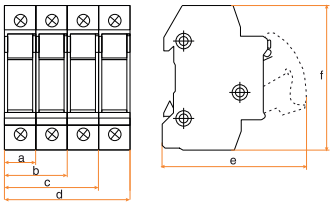
TYPE	Ct mounting method	Rated current (A)	Secondary Current (A)	Rated Power Class (VA)				Weight (kg)	Busbar (max) mm	Cable (max) mm	Rated short time thermal current (Ith) (1 sec.)	Rated continous thermal current (Icth)	Highest voltage for equipment (V)
				0,2s	0,2	0,5s	0,5						
FAT-30B	With Busbar	30 40 50 60 75 80 100 125 150 200 250	1A, 5A	- - - - - - - - - - 2,5	2,5 2,5 2,5 2,5 2,5 2,5 2,5 2,5 2,5 2,5 2,5	5 5 5 5 5 5 5 5 5 7,5 10	10 10 10 10 10 10 10 10 10 10 10	0,60	-	-	60xIn (1s)	1,2xIn	720 V
FAT-30C	Without Busbar	150 200 250 300	1A, 5A	- - 2,5 2,5	- 2,5 2,5 5	2,5 5 10 10	5 10 10 10	0,63	30x10	Ø31	100xIn (1s)	1,2xIn	720 V
FAT-30	Without Busbar	100 125 150 200 250 300	1A, 5A	- - - - 2,5 5	- - - 2,5 5 10	2,5 2,5 5 7,5 10 10	5 5 7,5 10 10 10	0,60	30x10	Ø24	100xIn (1s)	1,2xIn	720 V
FAT-40	Without Busbar	100 125 150 200 250 300 400 500 600	1A, 5A	- - - - - - 2,5 5 7,5	- - - - - 2,5 5 10 10	- - 2,5 2,5 5 7,5 10 10 10	2,5 2,5 5 5 10 10 10 10 10	0,38	40x10	Ø33	50kA (1s)	1,2xIn	720 V
FAT-40C	Without Busbar	200 250 300 400 500 600	1A, 5A	- - - 2,5 5 7,5	- - 2,5 5 10 10	2,5 5 7,5 10 10 10	5 10 10 10 10 10	0,38	40x10	Ø41	50kA (1s)	1,2xIn	720 V
FAT-60	Without Busbar	400 500 600 750 800 1000 1200 1250	1A, 5A	- - - 2,5 5 7,5 10 10	- 2,5 2,5 7,5 7,5 10 10 10	2,5 7,5 10 10 10 10 10 10	5 10 10 10 10 10 10 10	0,60	60x20	Ø46	50kA (1s)	1,2xIn	720 V
FAT-100	Without Busbar	1000 1200 1250 1500 1600 2000	1A, 5A	5 7,5 7,5 10 10 10	10 15 15 15 15 15	15 15 15 15 15 15	15 15 15 15 15 15	0,94	80x30 100x10	Ø62	50kA (1s)	1,2xIn	720 V
FAT-130	Without Busbar	1500 1600 2000 2500 3000 3200 4000	1A, 5A	15 15 20 30 30 30 40	15 15 20 30 30 30 40	15 15 20 30 30 30 40	15 15 20 30 30 30 40	1,50	125x58	Ø125	50kA (1s)	1,2xIn	720 V

CYLINDRICAL FUSES (IEC / EN 60269)



TYPE		FCF 8-32	FCF 10-38	FCF 14-51	FCF 22-58	FCF-DC 10-38
Sizes	Øxmm	8x32	10x38	14x51	22x58	10x38
Operation Class		gG	gG	gG	gG	gPV
Rated Voltage - U_n	V	500 AC	500 AC	500 AC	500 AC	1000 DC
Rated Current - I_n	A	2 ... 20	2 ... 32	2 ... 50	10 ... 100	1 ... 32
Breaking Capacity	kA	50	100	100	100	20
Dimensions	a mm	31,5	38	51	58	38
	b mm	8,5	10,3	14,3	22,2	10,3
	c mm	8,03	10	12	14	10

CYLINDRICAL FUSE BASES (IEC / EN 60269)



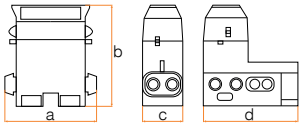
Dimension specified in “a” line, is increasing according to number of poles. (2P=a x 2, 3P=a x 3, 4P=a x 4)

TYPE		FCFB 8-32	FCFB 10-38	FCFB 14-51	FCFB 22-58	FCFB-DC 10-38
Size		8x32	10x38	14x51	22x58	10x38
Rated Voltage - U_n	V	690 AC	690 AC	690 AC	690 AC	1000 DC
Rated Current - I_n	A	20	32	50	100	32
Switching Capacity Utilization Category		AC20B (690V AC) AC22B (400V AC)				DC20B
Degree of Protection		IP20	IP20	IP20	IP20	IP20
Cable Corss-Sections	mm²	1 - 6	1 - 10	2,5 - 25	4 - 50	1 - 10
Tightening Torques	Nm	1,5-2,5	1,5-2,5	1,5-2,5	1,5-2,5	1,5-2,5
Number of Poles		1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1,2
Dimensions	a mm	18	18	26,7	34,7	18
	e mm	78	80	95	104	80
	f mm	79	79	97	127	79

- AC20/DC20: switching under no-load conditions, AC22: switching of mixed resistive and inductive loads.
- B: devices which switch infrequently

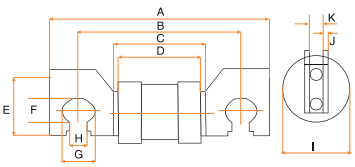
HOUSE SERVICE CUT-OUT FUSE BASES (IEC / EN 60269)

TYPE		FCFC-1P / FCFC-1P+N
Rated Voltage - U_n	V	415V AC
Rated Current - I_n	A	60 / 80
Operating Temperature		-5°C ... +40°C
Pollution Level		III
Cable Lug		35 mm²
Number of Poles		1P, 1P+N
Dimensions	a mm	111
	b mm	92
	c mm	44 (FCFC-1P)
	d mm	92 (FCFC-1P+N)



J TYPE FUSES (IEC / EN 60269)

Type	Current	A	B	C	D	E	F	G	H	I	J	K
FJF82030	63A-200A	110	82	45,2	40,5	30	14,5	17,5	9,8	30,9	2,4	6,45/6,53
FJF82038	250A-400A	110	82	45,2	40,5	30	14,5	17,5	9,8	38	2,4	6,45/6,53
FJF92040	300A-400A	132	92	46,7	40,3	38	14,5	20	10	40	3,1	8,05/8,75
FJF92050	500A	132	92	46,4	40	38	17,4	20,7	10,2	40	3,1	8,13



Note: J type fuses have bidirectional connection feature; It is manufactured with a ceramic body.

NH (H.R.C.) FUSES (SINGLE & DUAL INDICATORS) (IEC / EN 60269-1)

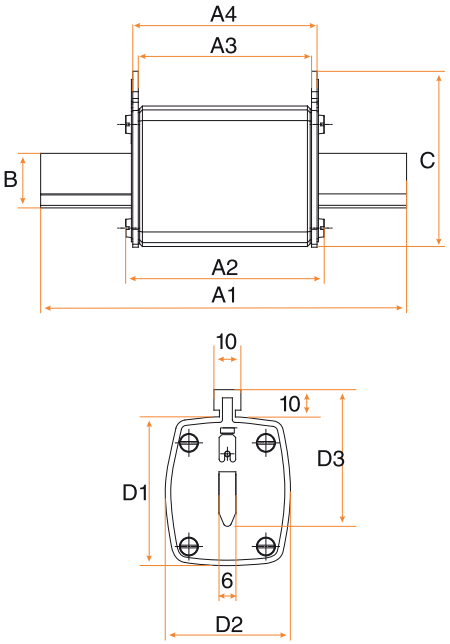
NH FUSES							
TYPE		**NH00-FB**	**NH0-FB**	**NH1-FB**	**NH2-FB**	**NH3-FB**	**NH4-FB**
Size		00	0	1	2	3	4
Class		gG	gG	gG	gG	gG	gG
Rated Voltage - Un	V	500 AC	500 AC	500 AC	500 AC	500 AC	500 AC
Rated Current - In	A	4...160	25...160	32...250	63...400	125...630	800...1250
Rated Short Circuit Breaking Capacity 500V	kA	120	120	120	120	120	120
Indicator		Single / Dual	Single / Dual	Single / Dual	Single / Dual	Single / Dual	Single / Dual

COMPACT TYPE NH FUSES							
TYPE		**NHC00-FB**	**NHC1-FB**	**NHC2-FB**	**NHC00-FB**	**NHC1-FB**	**NHC2-FB**
Size		000	1 / 0	2 / 1	000	1 / 0	2 / 1
Class		gG	gG	gG	gG	gG	gG
Rated Voltage - Un	V	500 AC	500 AC	500 AC	500 AC	500 AC	500 AC
Rated Current - In	A	6...160	25...160	32...250	6...160	25...160	32...250
Rated Short Circuit Breaking Capacity 500V	kA	120	120	120	120	120	120
Indicator		Single	Single	Single	Dual	Dual	Dual

Note: Material of NH00-NH1-NH2 fuse blades is brass as a standard. NH3 types fuse blades are produced from copper as a standard. Upon customer request blades can be produced from copper alternatively.

Note: NH body is **produced** as steatite and **glazed ceramic** according to customer and specification expectations.

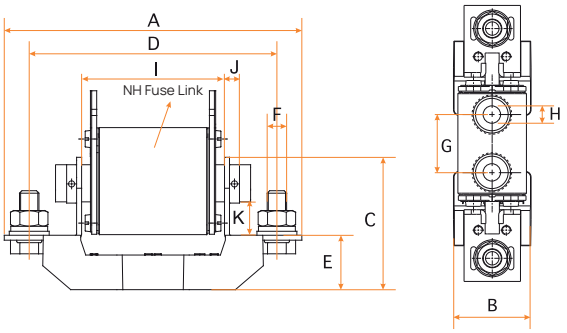
DIMENSIONS:



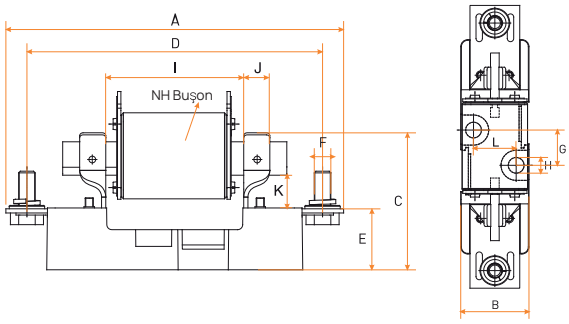
TYPE	Dimensions (mm)								
	A1	A2	A3	A4	B	C	D1	D2	D3
NH00-FB	78,5	54	45	50	15	58	48	29,5	45
NHC00-FB	78,5	54	45	49	15	47	36	21	45
NH0-FB	125	71	62	68	15	58	48	29,5	45
NH1-FB	135	72,6	62	68	20	64	52	46	50
NHC1-FB	135	71	62	68	15	58	48	29,5	45
NH2-FB	150	73,5	62	68	25	70	60	59	58
NHC2-FB	150	72,5	62	68	20	64	52	46	50
NH3-FB	150	73,5	62	68	32	85,5	75	69,5	70
NH4-FB	200	84,5	61,5	76	50	113	103	86	84

NH FUSE BASES (BMC / STEATITE / GLAZED) (IEC / EN 60269-1)

NH FUSE BASES							
TYPE		**NH00-FA**	**NH0-FA**	**NH1-FA**	**NH2-FA**	**NH3-FA**	**NH4-FA**
Size		00	0	1	2	3	4
Class		gG	gG	gG	gG	gG	gG
Rated Voltage - U_n	V	690 AC	690 AC	690 AC	690 AC	690 AC	690 AC
Rated Current - I_n	A	160	160	250	400	630	1250
Fuse System		AC20B	AC20B	AC20B	AC20B	AC20B	AC20B
Material		BMC / STEATITE / GLAZED					



TYPE	Dimensions (mm)										
	A	B	C	D	E	F	G	H	I	J	K
NH00	120	32,5	54	101	23,5	M8	25	7,5	57	2	13
NH0	170	32	64,5	150	30,5	M8	25	7,5	76	2	13

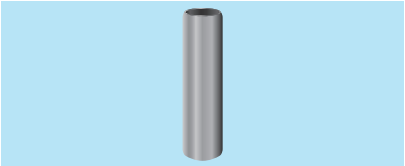


TYPE	Dimensions (mm)											
	A	B	C	D	E	F	G	H	I	J	K	L
NH1	200	47,5	82	175	35	M10	25	10,5	80	15	20,5	30
NH2	225	47,5	88	200	35	M10	25	10,5	83,5	15	20	30
NH3	240	47,5	99	210	37	M12	25	10,5	81,5	15	19	30
NH4	309	87	134,5	268,5	48,5	M16	40	10,5	104	45	29	30

SOLID LINKS

Solid Link is used by NH Fuse Bases for direct connection of contacts without fuse link. It’s non-isolated type. NH00-FSL, NH0-FSL, NH1-FSL, NH2-FSL, NH3-FSL

SOLID NEUTRAL LINKS (IEC / EN 60269)



Solid neutral link to be used in conjunction with the neutral pole of cylindrical fused disconnecting switches.

Dimensions FCFSL
8,5 x 31,5
10 x 38
14 x 51
22 x 58

FUSE SWITCH DISCONNECTORS (IEC / EN 60947-3)

Single-pole fuse-switch disconnectors are used for AC protection as circuit breakers, disconnecting switch or emergency switches in motor circuits. The products produced have high electrical and mechanical values and comply with the IEC / EN 60947-3 standard.

The load-breaker operates safely in a narrow working area, allowing fuses to be easily inserted and removed.

In addition to user safety, the products also protect machinery and equipment at the highest level. The product has the lowest power loss values in all sizes and current values and with the highest energy efficiency features.

Products consists of half-closed structures and load separator sockets and covers. On the front cover the nominal operating data and indicator information of the fuses are shown. Products manufactured in 160-250-400 and 630 amperes are compatible with NH00, NH1, NH2, NH3 type fuses

TYPE				FHS1 160	FHS1 250	FHS1 400	FHS1 630
Conventional Thermal Current (Ith) 60°C			A	160	250	400	630
Number Of Poles				1	1	1	1
Insulation Voltage (Ui)			V	1000	1000	1000	1000
Impulse Withstand Voltage (Uimp)			kV	8	8	8	8
Operational Current (Ie)① ②	50-60 Hz ③	240V	A	160 (AC22B)	250 (AC22B)	400 (AC22B)	630 (AC22B)
	50-60 Hz	290V	A	160 (AC22B)	250 (AC22B)	400 (AC22B)	630 (AC22B)
	50-60 Hz	400V	A	160 (AC21B)	250 (AC21B)	400 (AC21B)	630 (AC21B)
Conditional Short-Circuit Current (With Nh Fuse)			kA	65	65	65	65
Fuse Type (Dispatched Without Fuse)			NH	000, 00	1	1,2	1,2,3
Mechanical Durability			op.	30000	20000	20000	20000
Electrical Durability			op.	200	200	200	200
Power Loss Per Pole			W	4	8	14	25
Conductor Connections			mm2	70	120	240	2 x 185
Max- Min Tightening Torques			Nm	5..8	14..20	17..25	28..40
Connection Screws			Ø	M6	M10	M10	M12
Weight			kG	0,29	0,74	1,27	1,49
Protection Degree				IP20	IP20	IP20	IP20
Dimensions (Width X Length, Depth)			mm	40x47x175	62x64x247	90x87x280	
Standard				IEC60947-3			

1) AC21: Switching resistor loads, AC22: Switching of mixed resistive and inductive loads, AC23: Switching of motor loads

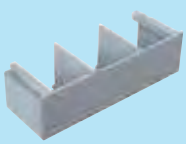
2) A: Frequent switching equipment, B: Infrequent switching equipment 3) Phase-neutral voltage.

Accessories

Brass Clamp

Seperator

Switch



Terminal Cover

FUSE SWITCH DISCONNECTORS (IEC / EN 60947-3)

The load break switches with fuses are manufactured in accordance with EN 60947-3 standards and in accordance with VDE and IEC, from 160A to 630A.The load break switches with fuses can be used both inside the panel and at the front of the panel.It is possible to use the same switch in a multiple functions at desired rated current or different operational class by changing the fuses depending on the changes in load and current draw.
The fuse-switch disconnectors are made of reinforced thermoplastic and flame resistant materials to ensure a long and durable service in addition, the silver-plated contact feature reduces power loss.

General Specifications

- IP20 protection class
- Switch to signal the door opened (optional)
- Board product labeling
- NH slot resistant to extreme heat test
- Ergonomic and large grip surface
- Small volume
- Easy montage
- Wide safety distance between fuse links
- Modern and functional design
- Abundance of air evacuation and circulation area
- Terminal protector according to different cable cross sections
- Suitable structure for adding additional separators (optional)
- There are five different types of connection.

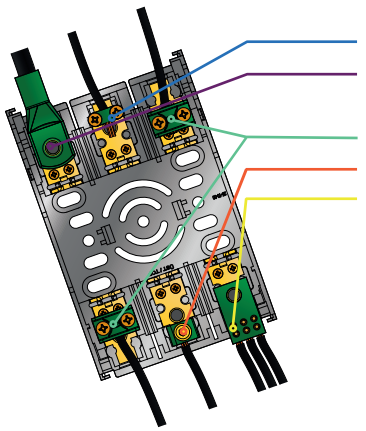
TYPE				FHS 160	FHS 250	FHS 400	FHS 630
Conventional Thermal Current (Ith) 60°c			A	160	250	400	630
Number Of Poles				3	3	3	3
Insulation Voltage (Ui)			V	1000	1000	1000	1000
Impulse Withstand Voltage (Uimp)			kV	8	8	8	8
Operational Current (Ie) ①②	50-60 Hz ③	415V	A	160 (AC23B)	250 (AC22B)	400 (AC22B)	630 (AC22B)
	50-60 Hz	500V	A	160 (AC22B)	250 (AC22B)	400 (AC22B)	630 (AC22B)
	50-60 Hz	690V	A	125 (AC21B)	200 (AC21B)	315 (AC21B)	500 (AC21B)
Conditional Short-circuit Current (With Nh Fuse)			kA	70	70	70	70
Fuse Type (Dispatched Without Fuse)			NH	000, 00	1	1,2	1,2,3
Mechanical Durability			op.	20000	20000	20000	20000
Electrical Durability			op.	200	200	200	200
Power Loss Per Pole			W	4	8	14	25
Conductor Connections	Cable lug		mm2	70	120	240	2 x 185
Max- Min Tightening Torques			Nm	7..10	14…20	17…25	28…40
Connection Screws			Ø	M8	M10	M10	M12
Weight			kG	0,70	1,51	3,27	3,85
Protection Degree				IP20	IP20	IP20	IP20
Dimensions (Width X Length, Depth)			mm	106x89x180	187x112x238	250x137x275	
Standard				IEC60947-3			

1) AC21: Switching resistor loads, AC22: Switching of mixed resistive and inductive loads, AC23: Switching of motor loads

2) B: Infrequent switching equipment 3) Phase-to-phase voltag

① AC21: Switching resistor loads, AC22: Switching of mixed resistive and inductive loads, AC23: Switching of motor loads
② A: Frequent switching equipment, B: Infrequent switching equipment
③ Phase-neutral voltage.

Flange Types

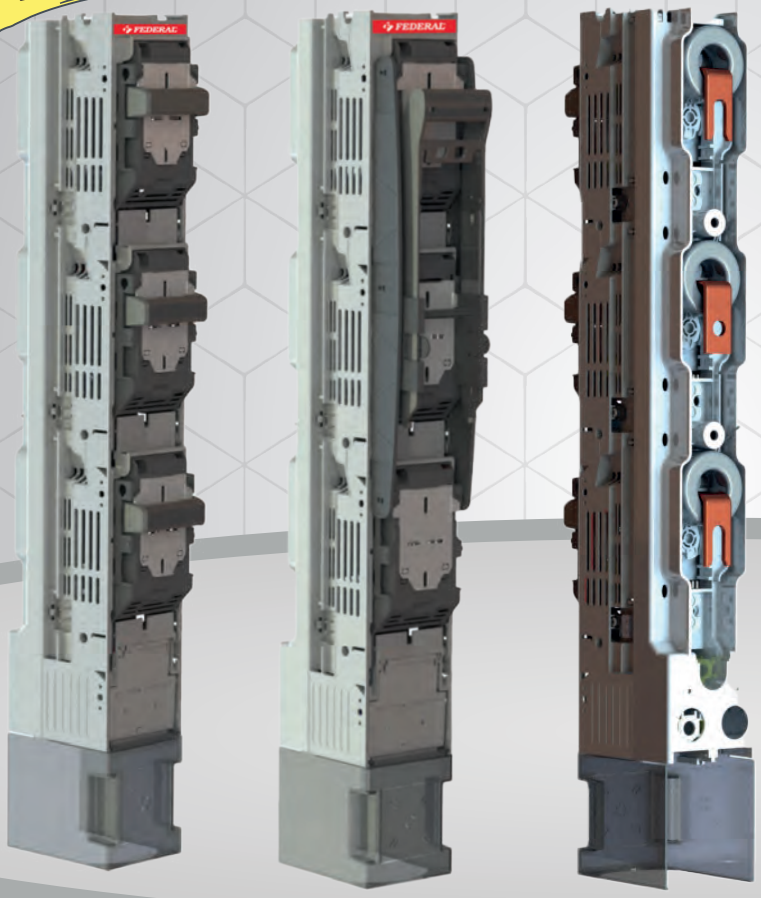


① Bridge clamps (optional)
② Screw and bolt connection (standard) (suitable for cable lugs)
③ Circle sliced clamps (optional)
④ Hook clamps (optional)
⑤ Brass clamps (optional)

FEDERAL®

Easy solution
FOR ENERGY MEASUREMENT

NEW DESIGN



CURRENT TRANSFORMERS IN USE

- **For 160A :** 160/1 A 0,5 Cl 2,5VA
- **For 250A :** 250/1 A 0,5Cl 2,5VA
- **For 400A :** 400/1 A 0,5Cl 2,5VA
- **For 630A :** 630/1 A 0,5Cl 2,5VA

- The opportunity of connecting a current transformer into the body without changing the depth.
- Advantage of adjustable handlebar.
- Handle design that can be opened in two angles for the NH fuse to be easily insterted and ejected.
- Using of shunt air evacuation structure that provides air evacuation.
- High security with contact protective covers.
- Harmony in panel layout with equal-depth casings.
- Alternative connection options.

FUSE SWITCH DISCONNECTORS (IEC / EN 60947-3)

TYPE			FVS 160	FVS 250	FVS 400	FVS 630	FVS 800	FVS 1000	FVS 1250
Conventional Thermal Current (Ith) 60°C		A	160	250	400	630	800	1000	1250
Number Of Poles			3	3	3	3	3	3	3
Insulation Voltage (Ui)		V	1000	1000	1000	1000	1000	1000	1000
Impulse Withstand Voltage (Uimp)		kV	12	12	12	12	12	12	12
Operational Current (Ie) 1) 2)	50-60 Hz 3) 415V	A	160 (AC23B)	250 (AC23B)	400 (AC23B)	630 (AC22B)	800 (AC22B)	1000 (AC22B)	1250 (AC22B)
	50-60 Hz 500V	A	160 (AC22B)	250 (AC22B)	400 (AC22B)	630 (AC22B)	800 (AC22B)	1000 (AC22B)	1250 (AC22B)
	50-60 Hz 690V	A	160 (AC21B)	250 (AC21B)	400 (AC21B)	630 (AC21B)	800 (AC21B)	1000 (AC21B)	1250 (AC21B)
Conditional Short-circuit Current (With Nh Fuse)		kA	85 (690Vac)	85 (690Vac)	85 (690Vac)	85 (500Vac)	85 (690Vac)	85 (690Vac)	85 (500Vac)
Fuse Type (Size)		NH	000,00	1, 2	1, 2	1, 2, 3	1, 2	1, 2, 3	1, 2, 3
Mechanical Durability		op.	30000	20000	20000	20000	20000	20000	20000
Electrical Durability		op.	200	200	200	200	200	200	200
Power Loss Per Pole		W	9	11	19	36	40	46	75
Conductor Connections		mm2	25-95	70...240	70...240	95..(2x240)	70..(4x185)	95..(4x185)	95..(4x185)
Max- Min Tightening Torques		Nm	7..10	14..20	17..25	28..40	17..25	28..40	28..40
Connection Screws		Ø	M8	M10 / M12	M10 / M12	M12	M10 / M12	M12	M12
Distance Between Main Busbar Terminals		mm	185/210	185/210	185/210	185/210	185/210	185/210	185/210
Dimensions (Width X Length, Depth)		mm	49x655x155	99x660x204	99x660x204	99x660x204	198x660x204	198x660x204	198x660x204
Weight		kG	2,4	5,6	5,8	6,9	12,0	15,0	15,0
Protection Degree			IP20	IP20	IP20	IP20	IP20	IP20	IP20
Standard			IEC60947-3	IEC60947-3	IEC60947-3	IEC60947-3	IEC60947-3	IEC60947-3	IEC60947-3

□ Upon request
1) AC21: Resistor loads, AC22: Mixed resistive and inductive loads, AC23: Motor loads
2) B: Infrequent switching equipment

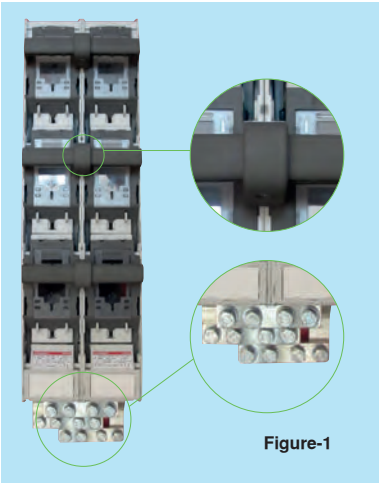


Figure-1

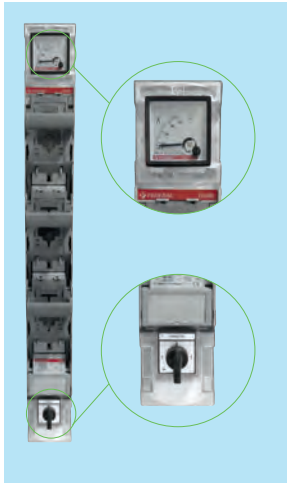
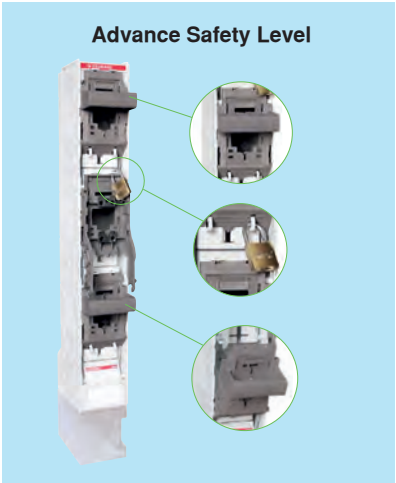



Figure-2



FVS 800A - 1000A - 1250A : Vertical Switch fuses are paralel connected. (Figure-1)
FVS 160A - 250A - 400A vertical type fuse switch disconnectors become measurable by placing current transformers (Figure-2) in each 3 phase seperately. Current transformers are embedded in the fuse switch disconnectors and thus the volume of the disconnectors is maintained.

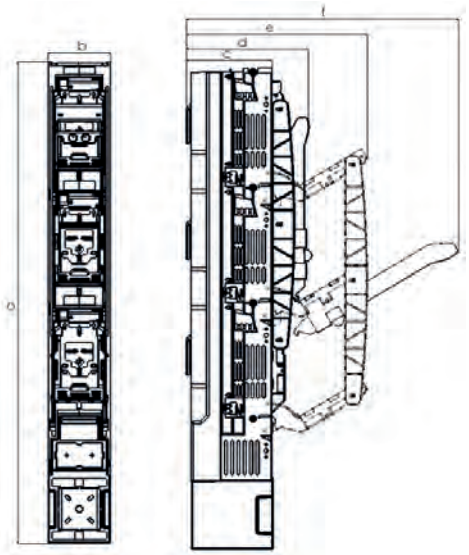
FUSE RAIL (IEC / EN 60269-1), (IEC / EN 60269-2)

Federal Elektrik vertical type fuse bases are designed in such a way that they can be mounted vertically easily and quickly on horizontal bars with 185 mm spacing. Body material is made of glass fiber polyester resin (bmc), which is a thermoset material group, and its dielectric and mechanical properties are very high. Flame and heat resistant. The contacts used in the fuse bases are made of electrolyte copper, the outside is made of heat and fire resistant polyamide material.

TYPE			FVSB 250	FVSB 400	FVSB 630
Conventional Thermal Current (Ith) 60°C		A	200, 250	400	630
Number Of Poles			3	3	3
Insulation Voltage (Ui)		V	1000	1000	1000
Impulse Withstand Voltage (Uimp)		kV	12	12	12
Operational Current (Ie)	50-60 Hz 690Vac	A	200, 250	400	630
Short Circuit Peak Withstand Current		kApeak	50	50	70
Fuse Type (Size)		NH	1, 2, 3	1, 2, 3	1, 2, 3
Power Loss Per Pole		W	7, 11	19	36
Rated Acceptable Power Dissipation (Nh Fuse)		W	32	45	60
Connection Terminal Capacity	Cable lug	mm2	70..240	70..240	95..(2x240)
Max- Min Tightening Torques		Nm	14..20	17..25	28..40
Connection Screws		Ø	M10 / □ M12	M10 / □ M12	M12
Distance Between Main Busbar Terminals		mm	185/210	185/210	185/210
Dimensions (Width X Length, Depth)		mm	99 x 660 x 150	99 x 660 x 150	99 x 660 x 150
Weight		kG	3,0	3,2	4,3
Protection Degree			IP20	IP20	IP20
Standard			IEC 60269-1/2	IEC 60269-1/2	IEC 60269-1/2

□ Upon request

FUSE SWITCH DISCONNECTORS / FUSE RAIL DIMENSIONS



TYPE	Dimensions (mm)					
	a	b	c	d	e	f
FVS160A	766	49	126	137	205	212
FVS160A (New Design)	766	49	136	175	233	233
FVS250 / FVS400 / FVS630A	770	99	150	204	308	457
FVS250 / FVS400 / FVS630A (New Design)	772	99	136	198	289	433
FVSB200-250 / FVSB400 / FVSB630A	668	99	150	-	-	-
FVSB200-250 / FVSB400 / FVSB630A (New Design)	772	99	125	-	-	-

Dimension e is valid for 1 operated, dimension f is valid for 3 operated.

FUSE SWITCH DISCONNECTORS AND FUSE RAIL ACCESSORIES

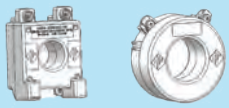
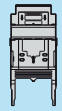
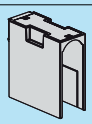
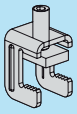
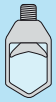
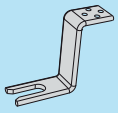
	**Current Transformer**	It detects the extra incoming current information and ensures that it is transmitted to the relevant measuring instrument. For 160A current transformer 160/1A 0.5 CI 2.5VA (Plug in) 250...630A for current transformer 250/1A, 400/1A, 630/1A 0,5CI 2,5VA (Plug in)
	**Fuse Holder**	Insulates and cuts the contact with the base by inserting it inside the fuse
	**Terminal Cover**	It is used to prevent touching to connection terminals
	**Hook Clamp**	Used to assemble the body directly to the bar.
	**Bridge Clamp**	Used to connect wires with cross section between 4 to 70 mm^2 by two M5 bolts.
	**Circle Sliced Clamp**	Used to fixed wire of sector shoped condustor with bore and cross-section 1,5.70 mm^2 by two M5 bolts.
	**V Clamp**	It is used to connect bare-ended wires in the cross section of 35 - 240 mm^2 with one M16 bolt, V-shaped body and cable tightener.
	**Micro Swich**	Used to assemble the body directly to the bar
	**Padlock**	Vertical type fuse-switch disconnectors can be locked in opened (Figure-1), closed (Figure-2) and parked (Figure-3) positions with padlock. This way prevents me product to be operated without discretion of qualified person
 	**Extension Bars**	The length of terminals can be arranged in different forms. This will help you assemble all units by the same depth. (Figure-4)

Figure-1

Figure-2

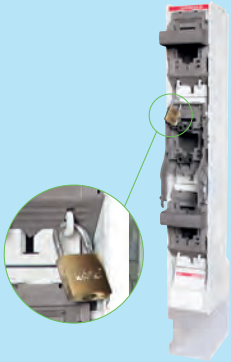
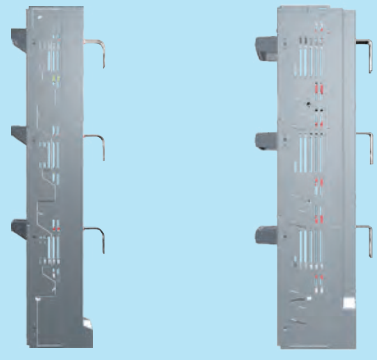


Figure-3



Extension Bars

Figure-4

FEDERAL SMART GRID INTERFACE MODULE

The SGIM consists of two main parts: the installation platform and the Smart Grid Interface Module plug-in unit. This contains all the necessary control, communication and measurement functions to transfer measurement data either for a cloud-based data management system or via SCADA and substation communication protocols (EN IEC 60870-5-104, EN IEC 61850, DNP 3.0) or industrial protocols (OPC / UA). The device includes a local web server for the visualization of the recorded data, the configuration of drivers and communication protocols. In addition to the power supply unit and the CPU, additional functions can be optionally equipped. Up to 7 measuring modules for 3-phase measurement and monitoring of up to 14 low-voltage connections can be fitted in the plug-in unit. Alternatively slots can be fitted with universal function modules (e.g. radio or fibre-optical ethernet communication) as well as status query and switching modules (I / O modules).

Technical Data Smart Grid Interface Module SGIM General

Supply voltage:	100 VACmin .. 240VACmax / 47Hz .. 63Hz	
Power consumption:	max. 25VA	
Dimensions (without platform):	100mm (B) x 100mm (H) x 590mm (T)	
Weight:	5.8kg	
Operation Temperature:	-5°C .. +55°C	nominal
	-20°C .. +70°C	derating
Relative humidity:	0% .. 90%	no condensation

Protection

Insulation protection:	EN 61010-1
Environmental protection:	IP 21
Overvoltage category:	CAT IV TN-C network
	CAT III TN-C-S / TN-S / TT network

Measurement

Measuring Quantity		Range	Resolution	Accuracy
Voltage		0V .. 300V	10mV	0.5%
Current	fuse switch CTs	1mA .. 1A	1mA	0.5%
	flexible CTs	10mA .. 15kA	10mA	1.0%
Active power/energy	fuse switch CTs			0.5%
	flexible CTs			1.0%
Reactive power/energy	fuse switch CTs			1.0%
	flexible CTs			0.2%
Frequency		45Hz .. 65Hz	0.01Hz	0.5%
Power Quality (Option)		**Definition**		**Accuracy**
Voltage		U1, U2, U3, UN		0.1%
Voltage dips		U_{RMS}		
Voltage swells		U_{RMS}		
Voltage interruptions		U_{RMS}		
Harmonics		2te .. 64te		
Interharmonics		1-2te .. 63-64te		
Signal voltages		f_S < 3kHz		
Flicker		P_{st} I P_{lt}		
Symmetry		u_0 I u_1 I u_2		
Current	fuse switch CTs	I1, I2, I3, IN, IPE		0.5%
	flexible CTs			1.0%
Harmonics		2te .. 64te		
Interharmonics		1-2te .. 63-64te		
Standards	EN IEC 61000-4-30	■		Class A
	EN IEC 62586	■		Class A
	EN 50160	■		
Environmental Parameters		**Range**	**Resolution**	**Accuracy**
Temperature		-40°C .. +125°C	0.1°C	0.2°C
Humidity		0% .. 100%	0.1%	2.0%

Communication

Interfaces		Specification
RS 232		300 .. 115200 Baud
RS 485		300 .. 115200 Baud
Ethernet	electrical	10/100BaseT
	fibre-optical	100BaseLX10 SC Duplex single-mode
Bluetooth		4.0
Radio	UMTS LTE LoRaWAN	Mini SIM – SMA Antenna 868MHz – RF 2-10km – Class A 1.0.1

Modules

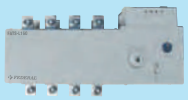
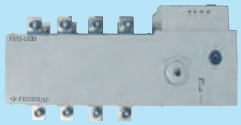
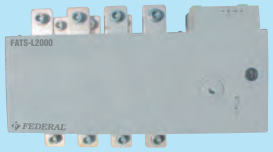
Name		Functions
CPU module	(Standard)	Ethernet interface 0 (RJ45) Ethernet interface 1 (RJ45) Serial interface (RS232, RS485) Bluetooth Humidity/Temperature sensor SD- memory card
Fibre-optical ethernet module	(option)	Ethernet interface (RJ45) Ethernet interface (SC Duplex)
Radio module	(option)	UMTS / LTE / LoRaWAN SMA antenna socket Mini SIM-slot
Measurement module fuse-switch CTs	(option)	Measurement through 1A current transformers of NH strip-type fuse-switch disconnectors 3-phase voltage measurement 3-phase current measurement 2 secondary circuits or L1, L2, L3, N, PE
Measurement module flexible CTs	(option)	Current range 0 – 15.000A 3-phase voltage measurement 3-phase current measurement 2 secondary circuits or L1, L2, L3, N, PE
Power quality module fuse-switch CTs or flexible CTs	(option)	Voltage measurement U1, U2, U3, UN Current measurement I1, I2, I3, IN, IPE
I/O module	(option)	8 digital inputs 2 digital outputs 2 potential-free relays 1 change-over contact

SCADA / Substation Communication Protocols

DIN EN 60870-5-104
DIN EN 61850
DNP3.0

AUTOMATIC TRANSFER SWITCHES

Automatic transfer switch mainly used for electric distribution network or motor network with rated voltage AC 380V, 50Hz, DC rated voltage 220V, rated current 3200A, change over between main power and backup power system, power grid and genset. Meanwhile it can be used for isolation purposes. It is widely used in the transmission and distribution system and automation system of the important places, which need uninterrupted power, such as fire-fighting, hospital, bank, high building etc.

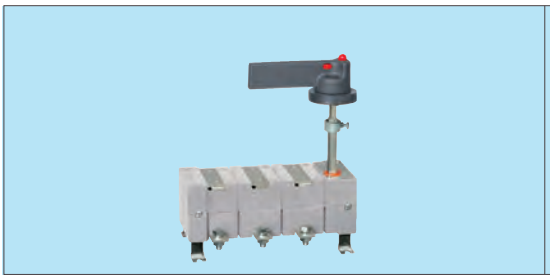
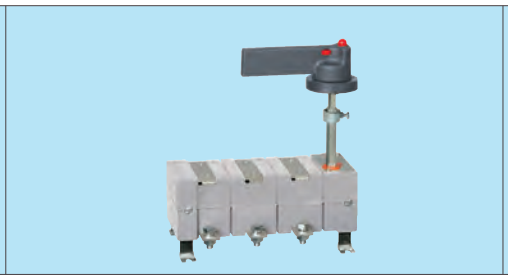
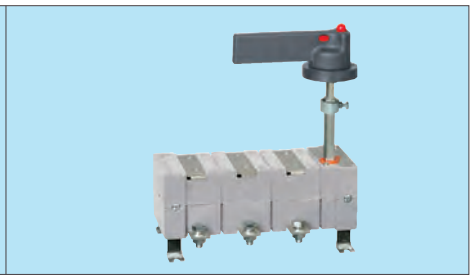
TYPE			FATS-L 100	FATS-L 160	FATS-L 250	FATS-L 630	FATS-L 1000	FATS-L 1600	FATS-L 2000	FATS-L 2500	FATS-L 3200
Rated Thermal Current (Ith) 60 °C		A	16-100	125, 160	200, 250	400, 630	800, 1000	1250, 1600	2000	2500	3200
Number of Poles			3/4						4		
Insulation Voltage (Ui)		V	500						1000		
Impulse Withstand Voltage (Uimp)		kV	8						12		
Utilization Category(Ie)		AC	AC32B (PC)								
Rated Current (Ie)	50-60Hz 415V	A	100	125, 160	200, 250	400, 630	800, 1000	1250, 1600	2000	2500	3200
Short Time Withstand Current (Icw)		kA/1s	5	10	12	20	50				55
Mechanical Durability		op.	> 6000			> 4000	> 3000		> 2000		
Electrical Durability	50-60Hz 415V	op.	> 1500	> 1000			> 500				
Weight		kG.	4,4-4,5	8,2-8,7	10,4-11,3	17,8-22	28-36	31-40	95	98	135
Transfer Time (1-0-2)		s	2-3								
Dimensions											
	Width mm		244	301	373	433	636		633		
	Height mm		125	175	200	265	345		455		
	Depth mm		125	150	198	244	320		495		
Standard			IEC 60947-6-1								

① AC32: Switching of mixed resistive and inductive loads,
② Class PC: Switch not intended to cut short-circuit currents
③ B: Infrequent switching equipment

FUNCTIONAL FEATURES

TYPE	B (Standard)	C (Alternative)
Operation Mode	Auto, Manual	Auto, Manual
Display mode	Led indicator	Led indicator
Voltage display	No	No
Under voltage transfer value	No	Opsiyonel (160-200V)
Over voltage transfer value	No	Opsiyonel (240-290V)
Transfer Delay Function	No	Opsiyonel (0-180s)
Recovery Delay Function	No	Opsiyonel (0-180s)
Phase missing detect	Single phase	Three phase
Generator control	Yes	Yes
Fire-linkage control	Yes	Yes
Auto/Manual signal	Optional	Optional

LOAD BREAK SWITCHES , CHANGEOVER ISOLATION SWITCHES (IEC / EN 60947-3)

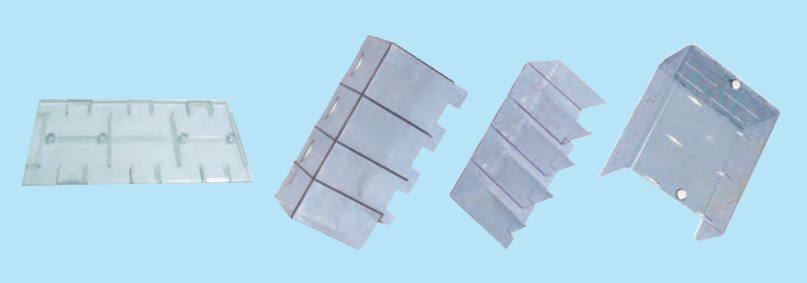
Technical Specifications

TYPE				FLS 160	FLS 250S	FLS 250	FLS 400	FLS 630S	FLS 630
Convertional Thermal Current (I_{th}) 60°C			A	160	250	250	400	630	630
Number of Poles				3 / 4	3 / 4	3 / 4	3 / 4	3 / 4	3 / 4
Insulation Voltage (U_i)			V	1000	1000	1000	1000	1000	1000
Impulse Withstand Voltage (U_{imp})			kV	8	8	8	8	8	8
Utilization Category ①②				AC23A	AC22A	AC23A	AC23A	AC22A	AC23A
Operational Current (I_e)	50-60 Hz	415V	A	160	250	250	400	630	630
	50-60 Hz	500V	A	160	250	250	400	630	630
	50-60 Hz	690V	A	125	200	200	315	500	500
Utilization Category ①②				DC23B	DC22B	DC23B	DC23B	DC22B	DC23B
Operational Current (I_e)	DC (2P Series)	250V	A	160	250	250	400	630	630
	DC (3P Series)	500V	A	160	250	250	400	630	630
	DC (3P Series)	600V	A	125	200	200	315	500	500
Conditional Short-Circuit Current (With NH Fuse)			kA	65	65	65	65	65	65
Short Time Withstand Current (I_{cw})		415V AC	kA/1s	8	8	15	18	18	25
Mechanical Durability			op.	> 10000	> 10000	> 10000	> 10000	> 10000	> 8000
Electrical Durability			op.	> 1000	> 1000	> 1000	> 1000	> 1000	> 1000
Power Loss Per Pole			W	12	12	25	35	47	65
Connection Terminal Capacity	Cable Lug		mm^2	2x120	2x120	2x185	2x240	2x240	2x400
	Busbar width		mm^2	30	30	40	40	40	60
Min. - Max. Tightening Torques			Nm	7...10	7...10	14...20	17...25	17...25	28...40
Connection Screws			Ø	M8	M8	M10	M10	M10	M12
Weight			kG	2,4 / 2,7	2,5 / 2,8	3,8 / 4,2	3,9 / 4,3	4,0 / 4,4	9,0 / 9,5

① AC21/DC21 : Switching resistive loads AC22/DC22/AC32: Switching combination of inductive and resistive loads AC23/DC23: Switching motor loads
② A: Frequent switching equipment B: Infrequent switching equipment
③ Neutral pole current is 800A

- Rated Breaking Capacity: 8xI_e for AC23A, 3xI_e for AC22A, 1,5xI_e for AC21A, 1,5xI_e for AC21B
- Rated Breaking Capacity: 10xI_e for AC23A, 3xI_e for AC22A, 1,5xI_e for AC21A, 1,5xI_e for AC21B

TERMINAL PROTECTIVE COVER



Accessories

-Auxiliary contact block: 1NO+1NC, 2NO+2NC
-Terminal cover
-Special lock and padlock system
-Cage type connector

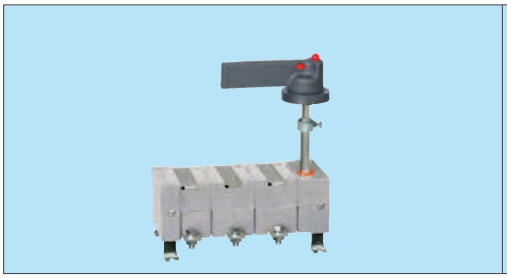
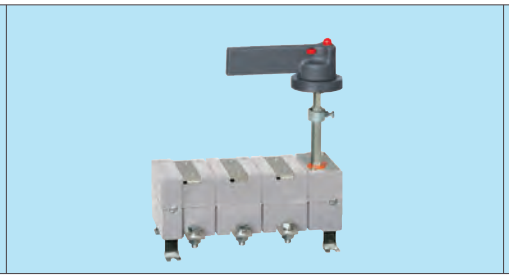
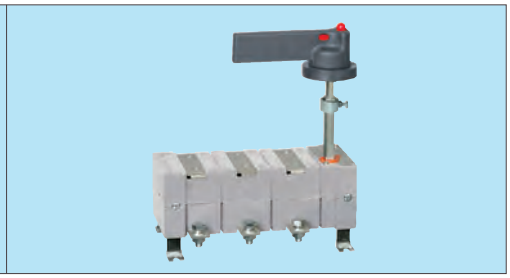
Note: Terminal cover provides safe insulation in accordance with EN norms, by avoiding had contact of cable connection terminals and fuse connection sections of load separators.

TERMINAL PROTECTIVE COVER	
STK160	FSF160
STK250 - STK400	FSF250 - FSF400
STK630	FSF500 - FSF630
TK160	FLS160
TK250 - TK400	FLS250 - FLS400
TK630 - TK1600	FLS500 ... FLS1600

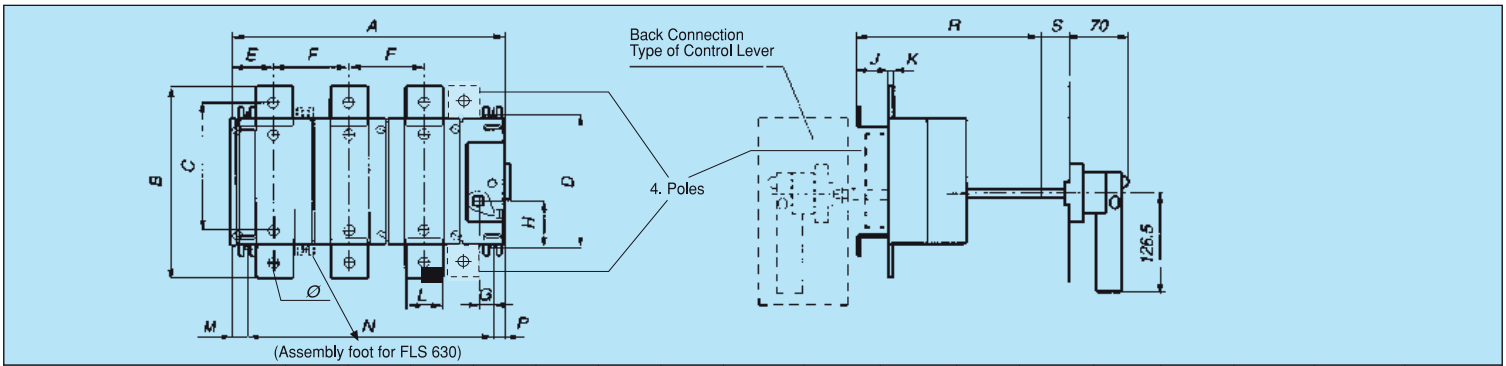
TOP COVER PLATE	
OP160	FLS160
OP250 - OP400	FLS250 - FLS400
OP630 - OP1600	FLS500 ... FLS1600

AUXILIARY CONTACT BLOCK
1NO + 1NC
2NO + 2NC

LOAD BREAK SWITCH (IEC / EN 60947-3)

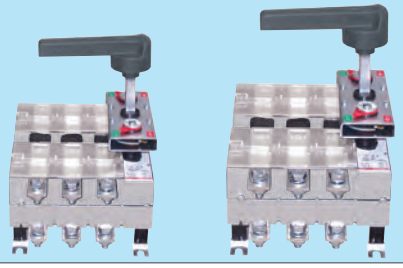
FLS 800	FLS 1000	FLS 1250	FLS 1600	FLS 1800	FLS 2000
800	1000	1250	1600	1800	2000
3 / 4	3 / 4③	3 / 4③	3 / 4③	3	3
1000	1000	1000	1000	1000	1000
8	8	8	8	8	8
AC22A	AC22A	AC21A	AC21B	AC21B	AC21B
800	1000	1250	1600	1800	2000
800	1000	1250	1600	1800	2000
630	800	1000	1250	1600	1750
DC22B	DC22B	DC21B	DC21B	DC21B	DC21B
800	1000	1250	1600	1800	2000
800	1000	1250	1600	1800	2000
630	800	1000	1250	1600	1750
65	65	65	65	65	65
35	35	35	35	35	35
› 8000	› 8000	› 8000	› 8000	› 8000	› 8000
› 500	› 500	› 500	› 200	› 150	› 150
55	80	125	165	210	260
2x400	2x400	2x400	2x400	2x400	2x400
60	60	60	60	60	60
28...40	28...40	28...40	28...40	28...40	28...40
M12	M12	M12	M12	M12	M12
12,5 / 13	12,7 / 13,2	13 / 13,5	13,2 / 13,7	14,0	14,0



TYPE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	Ø
FLS160	185	142	123	105,5	37	43,5	15	32	28	3	20	13	160	12	152	10 - 70	8
FLS250	255,5	163	138,5	128	43,5	65	15,5	33	32	4	25	15	224	20,5	197		11
FLS400											30						
FLS630	317	243	202	168	50	89	16,5	54	37	6	40	224	224	14	222,5		13
FLS800		355	315						35	8							
FLS1000									33								
FLS1250									31	10							
FLS1600																	
FLS1800										12							
FLS2000																	

CHANGEOVER ISOLATION SWITCH (VERTICALLY / HORIZONTALLY INSTALLED) (IEC / EN 60947-3)

FLS EV



FLS EH

Technical Specifications

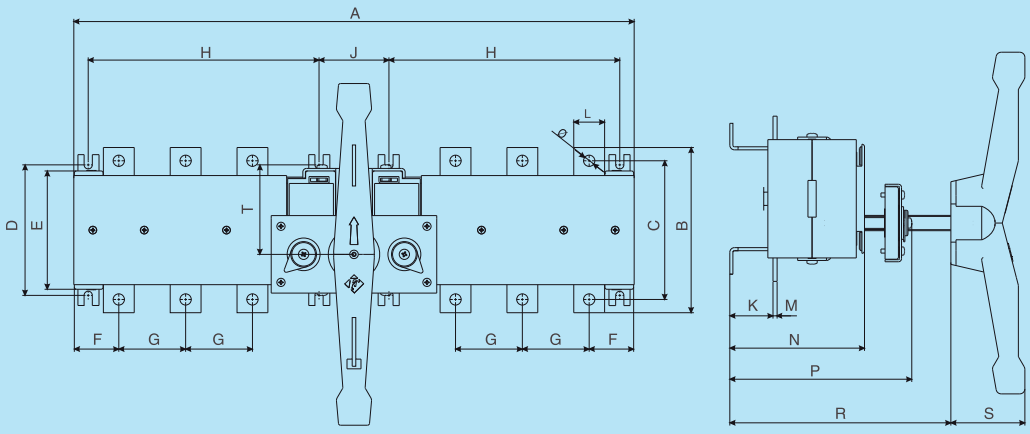
TYPE				FLS 160EV / EH	FLS 250EV / EH	FLS 400EV / EH	FLS 630EV / EH
Conventional Thermal Current (I_{th}) 60°C			A	160	250	400	630
Number of Poles				3 / 4	3 / 4	3 / 4	3 / 4
Insulation Voltage (U_i)			V	1000	1000	1000	1000
Impulse Withstand Voltage (U_{imp})			kV	8	8	8	8
Operational Voltage ①②				AC22A	AC22A	AC22A	AC22A
Utilization Category (I_e)	50-60 Hz	415V	A	160	250	400	630
	50-60 Hz	500V	A	160	250	400	630
	50-60 Hz	690V	A	125	200	315	500
Conditional Short-Circuit Current (With NH Fuses)			kA	65	65	65	65
Short Time Withstand Current (I_{cw})			kA/1s	8	8	15	15
Mechanical Durability			op.	> 10000	> 10000	> 10000	> 10000
Electrical Durability			op.	> 1000	> 1000	> 1000	> 1000
Power Loss Per Pole			W	9	12	25	47
Connection Terminal Capacity	Cable Lug		mm^2	2x120	2x120	2x240	2x240
	Busbar width		mm^2	60	60	60	60
Min. - Max. Tightening Toques			Nm	7...10	7...10	17...25	17...25
Connection Screws			Ø	M8	M8	M10	M10
Weight			kG	5,8 / 6,4	6,0 / 6,8	9,2 / 10	9,2 / 10

① AC21/DC21: Switching resistive loads
② A: Frequent switching equipment
③ Neutral pole current is 800A

AC22/DC22/AC32: Switching combination of inductive and resistive loads
B: Infrequent switching equipment

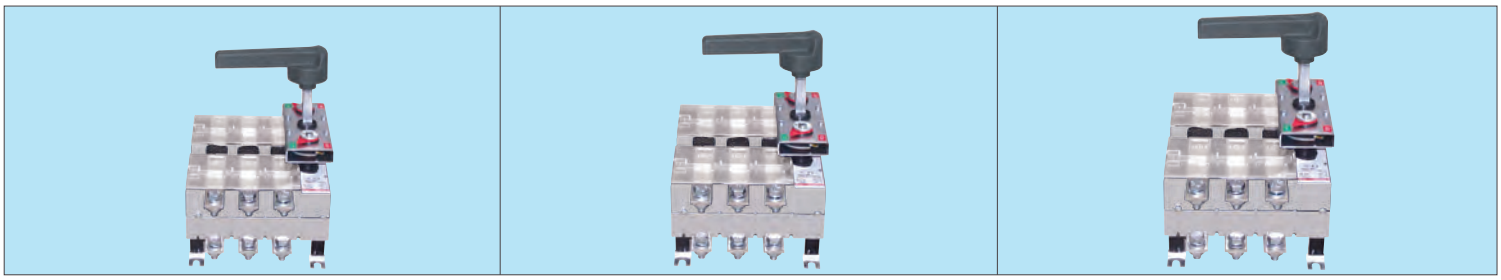
AC23/DC23: Switching motor loads

- Rated Breaking Capacity: 8xI_e for AC23A, 3xI_e for AC22A, 1,5xI_e for AC21A, 1,5xI_e for AC21B
- Rated Breaking Capacity: 10xI_e for AC23A, 3xI_e for AC22A, 1,5xI_e for AC21A, 1,5xI_e for AC21B



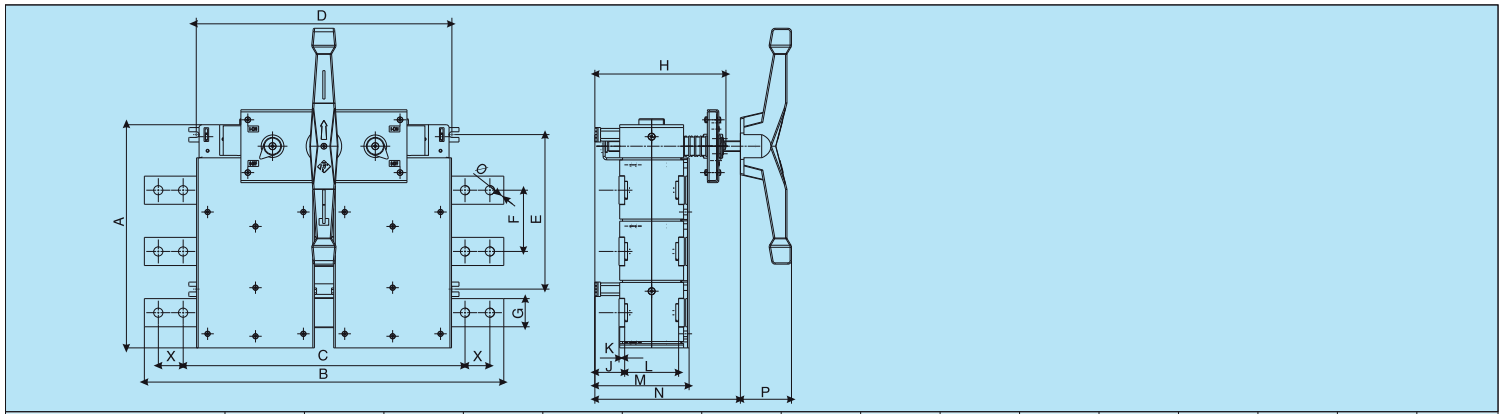
TYPE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	Ø
FLS160EH	412	142	123	106	101	37	43	160	68	28	20	3	100	150	195	42	75	8
FLS250EH	545	162	136	128	116	43	65	220		42	25	4	131	177	215	72	88	11
FLS400EH											30							
FLS630EH	671	243	202	168	166	50	87		65	36	40	6	133	186	217		108	13

CHANGEOVER ISOLATION SWITCH (VERTICALLY INSTALLED) (IEC / EN 60947-3)



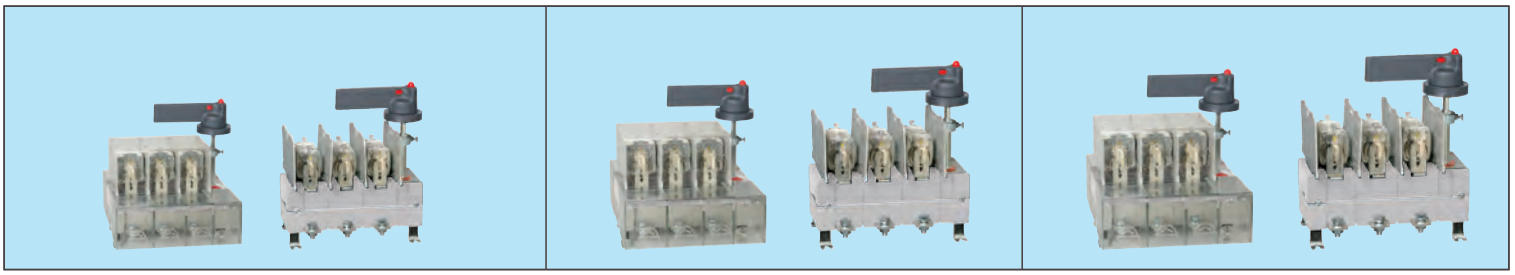
Technical Specifications

FLS 800EV	FLS 1000EV	FLS 1250EV	FLS 1600EV	FLS 1800EV	FLS 2000EV
800	1000	1250	1600	1800	2000
3 / 4	3 / 4 ③	3 / 4 ③	3 / 4 ③	3	3
1000	1000	1000	1000	1000	1000
8	8	8	8	8	8
AC22A	AC22A	AC21A	AC21B	AC21B	AC21B
800	1000	1250	1600	1800	2000
800	1000	1250	1600	1800	2000
630	800	1000	1250	1600	1750
65	65	65	65	65	65
35	35	35	35	35	35
> 8000	> 8000	> 8000	> 8000	> 8000	> 8000
> 500	> 500	> 500	> 200	> 150	> 150
55	80	125	165	210	210
2x400	2x400	2x400	2x400	2x400	2x400
60	60	60	60	60	60
28...40	28...40	28...40	28...40	28...40	28...40
M12	M12	M12	M12	M12	M12
26 / 27	26,2 / 27,2	27 / 28	27,4 / 28,4	29	29



TYPE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	X	Ø
FLS160EV	185	280	260	242	160	43	20	160	41	56	56	110	205	41	-	8
FLS250EV		305	280				25		38	62	62					11
FLS400EV	254	307	282	272	220	65	30	178	46	68	68	128	203	72	-	11
FLS630EV									42	76	76					13
FLS800EV	317	436	397	360	220	87	40	185	42	8	76	133	203	72	-	13
FLS1000EV		506													35	
FLS1250EV										10						
FLS1600EV																
FLS1800EV										12						
FLS2000EV																

LOAD BREAK SWITCH WITH FUSE (IEC / EN 60947-3)

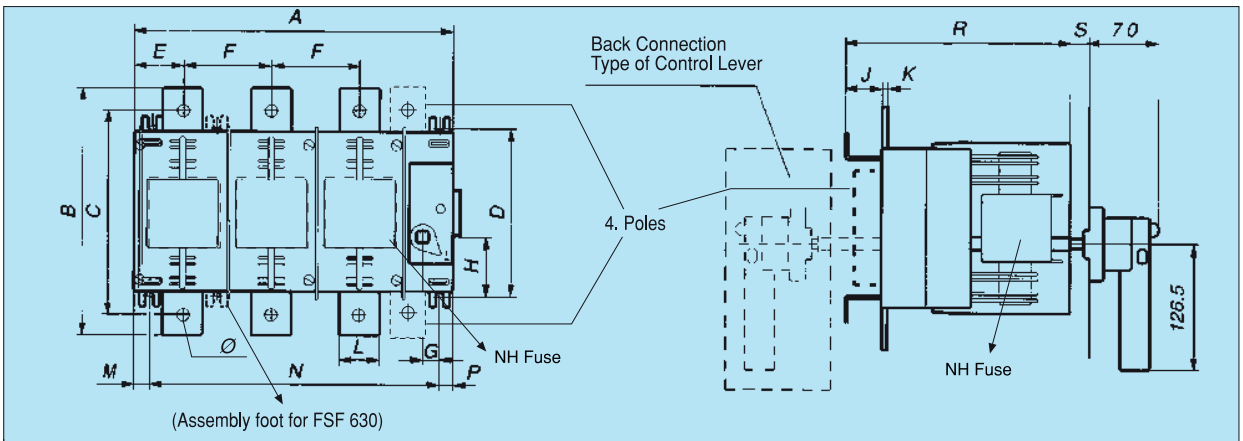


Technical Specifications

TYPE				FSF 160	FSF 250	FSF 400	FSF 630
Convertional Thermal Current (I_{th}) 60°C			A	160	250	400	630
Number of Poles				3 / 4	3 / 4	3 / 4	3 / 4
Insulation Voltage (U_i)			V	1000	1000	1000	1000
Impulse Withstand Voltage (U_{imp})			kV	8	8	8	8
Utilization Category ①②				AC23A	AC23A	AC23A	AC23A
Operational Current (I_e)	50-60 Hz	415V	A	160	250	400	630
	50-60 Hz	500V	A	160	250	400	630
	50-60 Hz	690V	A	125	200	315	500
Utilization Category ①②				DC23B	DC23B	DC23B	DC23B
Operational Current (I_e)	DC (2P Series)	250V	A	160	250	400	630
	DC (3P Series)	500V	A	160	250	400	630
	DC (3P Series)	600V	A	125	200	315	500
Conditional Short-Circuit Current (With NH Fuses)			kA	65	65	65	65
Fuse Type (Dispatched Without Fuse)			NH	000, 00	1, 2	1, 2	1, 2, 3
Mechanical Durability			op.	> 10000	> 10000	> 10000	> 8000
Electrical Durability			op.	> 1000	> 1000	> 1000	> 1000
Power Loss Per Pole			W	12	25	35	65
Connection Terminal Capacity	Cable Lug		mm^2	2x120	2x185	2x240	2x400
	Busbar width		mm^2	30	40	40	60
Min. - Max. Tightening Torques			Nm	7...10	14...20	17...25	28...40
Connection Screws			Ø	M8	M10	M10	M12
Weight			kg	2,4 / 2,7	4,2 / 4,6	4,3 / 4,7	9,6 / 10,1

① AC21/DC21: Switching resistive loads AC22/DC22/AC32: Switching combination of inductive and resistive loads AC23/DC23: Switching motor loads
② A: Frequent switching equipment B: Infrequent switching equipment

- Rated Breaking Capacity: 8xI_e for AC23A, 3xI_e for AC22A, 1,5xI_e for AC21A, 1,5xI_e for AC21B
- Rated Breaking Capacity: 10xI_e for AC23A, 3xI_e for AC22A, 1,5xI_e for AC21A, 1,5xI_e for AC21B



TYPE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	Ø
FSF160	185	142	123	109	37	43,5	15	32	28	3	20	13,5	160	12	152	10-70	8
FSF250	255,5	163	138,5	128	43,5	65	15,5	33	32	4	25	15	224	20,5	197		11
FSF400											30						
FSF630	317	243	202	168	50	89	16,5	54	37	6	40	83,5	224	14	222,5		13

RELAYS

	TYPE	Description
Phase Protection Relays	FMFK	Phase Sequency and Motor Protection (Adjustable)
	MTPR1	Phase Protection
	FSMK	Phase Sequency and Motor Protection
Liquid Level Relays	FSSR	Liquid Level Relay
Time Relays	FT30	0 - 30 s
Digital Thermostats	FDT72	72 x 72
	FDT96	96 x 96
Microprocess Counters	FS72	72 x 72

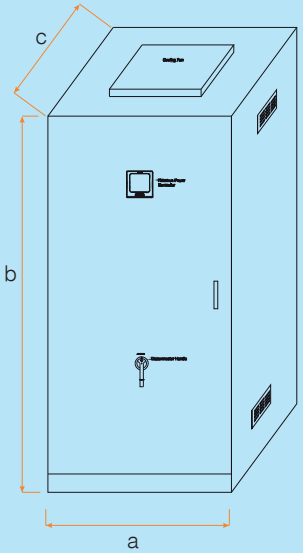
SIGNAL LAMPS

Type	FSL22
Rated Voltage	220V AC - 24V AC/DC
LED Light	● ● ● ●
Installation	22 mm
Min. Operating Temperature	-25°C
Max. Operating Temperature	70°C

MODULAR MAIN DISTRIBUTION PANEL BOARDS (IEC / EN 61439-1) (IEC / EN 61439-2)

Electrical Characteristics of Federal Panel	
Current Capacity	: 2500A
Rated Voltage	: 415V
Isolated Voltage	: 1000V
Impact Resistance Voltage	: 8kV
Peak Resistance Voltage	: 143kApk
Short-Time Withstand Current	: 65kArms
Usage Factor	: 1
Protection Degree	: IP54
Form	: 4b
Standard	: IEC 60439-1 IEC 61439-2
Protection Degree	: Type1, Type2, Type3, Type4, Type5, Type6

CAPACITOR BANK



Technical Specifications

- Nominal power from 50 kVAr to 600 kVAr.
- Production in accordance with Standard IEC 60439-1
- Ingress protection IP42
- Rated voltage 400, 415 V
- Operating frequency 50/60 Hz.
- Electrostatic powder coated steel
- Sheet color: RAL 7032, RAL 7035 *
- Sheet material: Galvanized, DKP *
- Sheet thickness: 1,5 mm / 2 mm *
- Compensation panel with and without harmonic filters
- Capacitors are manufactured with technology of MKP
- Different gradual powers according to requested capacitor powers
- Measurement of voltage, current, cosφ, active power, reactive power with microprocessor reactive relay
- Automatic and manual operating modes
- In-panel cooling with roof fan
- Panel temperature control with thermostat
- Current carrying conductors in the panel are isolated with fiber glass material against touching.
- Lock mechanism with key

* Differentiations and modifications can be made according to customer's requests.

WITH HARMONIC FILTER (400 V)

Panel Power (kVAr)	Gradual Powers (kVAr)	Number of Stage (Pcs.)	Dimensions of Panel (Width x Height x Depth)* (mm)
100 kVAr	10+10+20+20+40	5	800 x 2050 x 600
125 kVAr	10+10+20+20+25+40	6	900 x 2050 x 600
150 kVAr	10+10+12,5+20+20+40+40	7	900 x 2050 x 600
200 kVAr	10+10+20+20+20+40+40+40	8	(600+700) x 2050 x 600
250 kVAr	12,5+20+40+60+60+60	6	(700+700) x 2050 x 600
300 kVAr	20+20+40+40+60+60+60	7	(700+800) x 2050 x 600
350 kVAr	20+25+25+40+60+60+60+60	8	(700+800) x 2050 x 600
400 kVAr	20+20+20+40+60+60+60+60+60	9	(700+800) x 2050 x 600
450 kVAr	20+20+40+40+40+60+60+60+60+60	10	(700+1000) x 2050 x 600
500 kVAr	40+40+40+40+40+60+60+60+60+60	10	(900+1000) x 2050 x 600
550 kVAr	40+40+40+40+40+50+60+60+60+60+60	11	(1000+1000) x 2050 x 600
600 kVAr	40+40+40+40+40+40+60+60+60+60+60+60	12	(1000+1000) x 2050 x 600

* a=width, b=height, c=depth

WITHOUT HARMONIC FILTER (400 V)

Panel Power (kVAr)	Gradual Powers (kVAr)	Number of Stage (Pcs.)	Dimensions of Panel (Width x Height x Depth)* (mm)
100 kVAr	12,5+12,5+25+25+25	5	700 x 2050 x 600
125 kVAr	12,5+12,5+25+25+25+25	6	800 x 2050 x 600
150 kVAr	12,5+12,5+25+25+25+25+25	7	900 x 2050 x 600
200 kVAr	12,5+12,5+25+25+25+50+50	8	900 x 2050 x 600
250 kVAr	25+25+50+50+50+50	6	900 x 2050 x 600
300 kVAr	25+25+50+50+50+50+50	7	900 x 2050 x 600
350 kVAr	25+25+50+50+50+50+50+50	8	900 x 2050 x 600
400 kVAr	25+25+50+50+50+50+50+50+50	9	(600+500) x 2050 x 600
450 kVAr	25+25+50+50+50+50+50+50+50+50	10	(600+600) x 2050 x 600
500 kVAr	50+50+50+50+50+50+50+50+50+50	10	(700+600) x 2050 x 600
550 kVAr	50+50+50+50+50+50+50+50+50+50+50	11	(700+700) x 2050 x 600
600 kVAr	50+50+50+50+50+50+50+50+50+50+50+50	12	(700+700) x 2050 x 600

* a=width, b=height, c=depth

CUTOUT PANEL

F31- CUTOUT

F51- CUTOUT

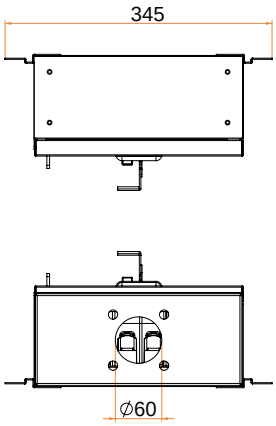
Technical Specifications

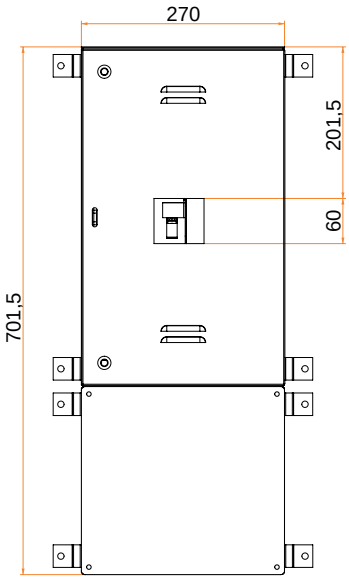
- Enclosure boards of circuit breakers for industrial machines or industrial processes
- Rated operating current up to 400 Amp
- Production in accordance with IEC 61439-1 Standard
- Fig-1 and Fig-2 spreader box configurations
- Applicability of portable variable dimensions according to the requested current rates of circuit breakers.
- Possibility of wall mounting
- Removable flat gland plates
- Possibility of bushed connection without spreader box
- Electrostatic powder coating RAL 7032, RAL 7035 *
- Sheet material: Galvanized, DKP *
- Sheet thickness: 1,5 mm *
- Control possibility of circuit breaker from outside the panel without opening the cover
- Copper neutral and grounding busbars
- Generous cabling area.
- Safety protection with padlock against undesirable interferences
- Differentiations and modifications can be made according to customer's requests.

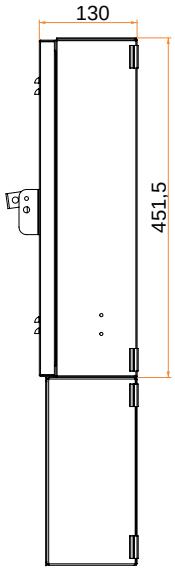
Technical Specifications

F31- CUTOUT

150A - 200A



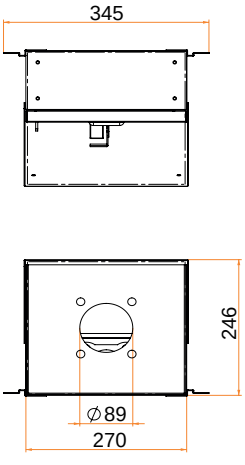


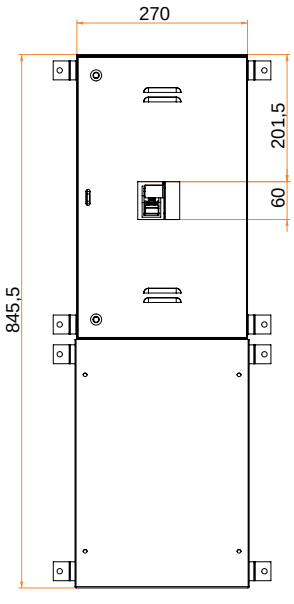


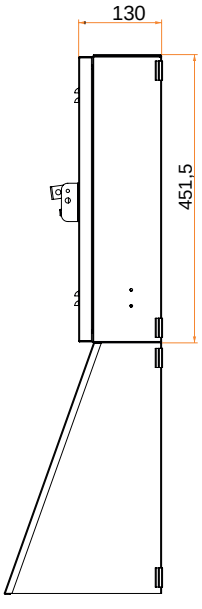
Technical Specifications

F51- CUTOUT

250A - 300A - 350A - 400A







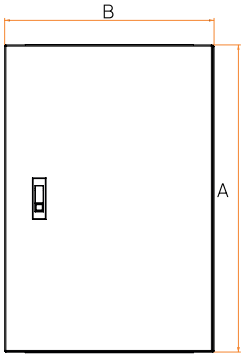
EASYPAN DISTRIBUTION BOARD (DB)

(IEC / EN 61439-3)

Technical Specifications

- Incoming circuit up to 125 Amp with MCB or RCCB incomer, up to 160 Amp with MCCB incomer (Main busbar is tested and rated at full load 200 Amp.)
- Possibility of connection outgoing breakers 4 to 20 pcs.
- Outgoing breaker connection up to 63 Amp.
- Production in accordance with IEC 60529 and IEC 61439-3 Standards
- IP 43 *
- Electrostatic powder coating RAL 7032, RAL 7035 *
- Sheet thickness: 1,5 mm *
- Sheet material: Galvanized, DKP *
- Generous cabling area throughout the range
- Copper-neutral and grounding busbars
- Phases are illustrated with colored labels
- Front and bottom plate for direct access
- Lock mechanism
- Removable flat gland plates which make drilling and access easier
- Multiple outgoing circuit connections for different applications

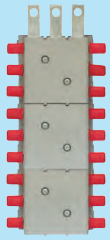
* Differentiations and modifications can be made according to customer's requests.



Outgoing Ways TP	A	B	C
4	520	430	120
6	575	430	120
8	635	430	120
10	720	430	120
12	805	430	120
14	890	430	120
16	975	430	120
20	1060	430	120

DISTRIBUTION BUSBAR

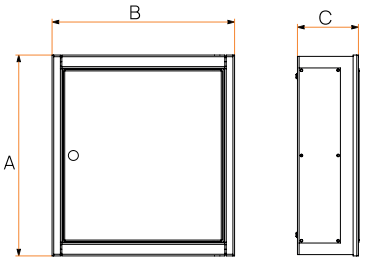
(IEC / EN 60439-1)



- Main breaker up to 250A
- Up to 20 ways for three pole networks
- MCCB, RCCB, MCB Incomer
- Conformity with IEC 60439-1 and CE norms
- Easy and reliable maintenance
- Aesthetic apperance
- Dispatch with panel as optional
- Direct connection without main switch
- Insulating protection cover for unused outgoing ways

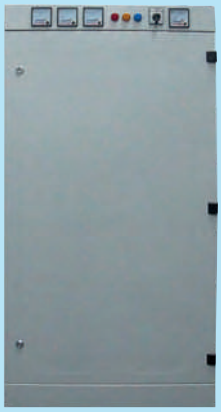
SINGLE PHASE DISTRIBUTION BOARD

(IEC / EN 61439-3)



Outgoing Ways SP	A	B	C
4	230	270	90
6	265	270	90
8	300	270	90
10	335	270	90
12	375	270	90
14	410	270	90

SUB-MAIN DISTRIBUTION BOARD (SMDB) (IEC / EN 61439-1)

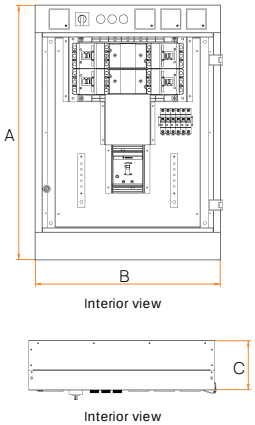


Technical Specifications

- 250 Amp, 400 Amp, 630 Amp distribution board versions
- Possibility of connection outgoing breakers 2 to 24 pcs.
- Outgoing breaker connection up to 250 Amp
- Production in accordance with IEC 60529 and IEC 61439-1 Standards.
- IP43*
- Possibility to connect measuring instruments (voltmeter, ammeter) (optional)
- Electrostatic powder coating RAL 7032, RAL 7035 *
- Sheet thickness: 1,5 mm *
- Sheet material: Galvanized, DKP *
- Phases are illustrated with colored labels
- Generous cabling area throughout the range
- Copper neutral and grounding busbars
- Lock mechanism

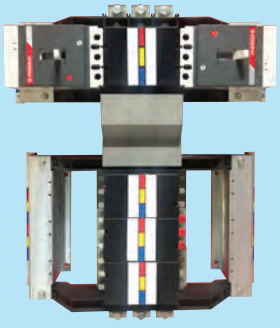
* Differentiations and modifications can be made according to customer's requests.

SMDB With Outgoing F11-F12	Outgoing Ways TP	Height (A)			Width (B)	Depth (C)	
		250A	400A	630A	250-400-630A	250-400A	630A
250A - F31 Incoming 400A - F51 Incoming 630A - F71 Incoming	2	800	900	1100	650	175	200
	4	900	1000	1200	650	175	200
	6	1000	1100	1300	650	175	200
	8	1100	1200	1400	650	175	200
	10	1200	1300	1500	650	175	200
	12	1300	1400	1600	650	175	200
	14	1500	1500	1700	650	175	200
	16	1600	1600	1800	650	175	200
	18	1700	1700	1900	650	175	200
	20	1800	1800	2200	650	175	200
	22	1900	1900	2300	650	175	200
	24	2000	2000	2400	650	175	200



SMDB With Outgoing F31	Outgoing Ways TP	Height (A)		Width (B)	Depth (C)
		400A	630A	400-630A	400-630A
400A - F51 Incoming 630A - F71 Incoming	2	1000	1200	750	200
	4	1100	1300	750	200
	6	1200	1400	750	200
	8	1300	1500	750	200
	10	1400	1600	750	200
	12	1600	1700	750	200
	14	1700	1800	750	200
	16	1800	1950	750	200
	18	1900	2100	750	200
	20	2100	2300	750	200
	22	2250	2450	750	200
	24	2400	2600	750	200

EasyPan READY BUSBAR SYSTEMS (IEC / EN 60439-1)



- Up to 630A incomer breaker connection.
- 2 to 24 pcs. ways (3 pole) Federal F11 - F12, F31 type switch output means
- Conformity with IEC 60439-1 and CE norms
- Easy and reliable maintenance
- Aesthetic apperance
- Completely equipped
- Dispatch with panel as optional
- Direct connection without main switch (F31, F51, F71)
- Phases are illustrated with colored labels
- Accidental contact has been prevented in compliance with IP20 protection degree according to IEC standards

FIBER GLASS REINFORCED POLYESTER CABINETS (IEC / EN 61439-1)

Glass fiber reinforced panels are preferred because they have low weight compared to metal panels and their life safety is higher than other panels.

Nowadays, many accidents are experienced as a result of fires and electric shocks caused by electricity leakages. Most of the accidents occur from short circuits and leakages in the panels and cables. Glass fiber reinforced panels have an indisputable importance in protecting life and property safety. It does not leak the electric arc that may occur for 2 minutes. Glass fiber reinforced panels used in production have a self-extinguishing feature.

It has the advantage of easy portability and easy assembly. These panels also have water and moisture proof features and do not bring maintenance costs to the user. The panels, which are preferred due to their stainless feature, do not need painting.

Technical Specifications	Type-1	Type-2
Width	585	790
Height	880	880
Depth	320	320
Base Length	900	900
IP Protection	IP54	IP54
Total Weight (kg)	37	45
RAL	7035	7035

STANDING ENCLOSURES

GRP floor-standing enclosures
Dimensions: 720mmx760mmx320mm

For Indoor and Outdoor use.
Protection degree IP54 according to IEC 60529.
Impact resistance IK10 for the plain doors and all sides.
Locking system 3 points.
Door opening to 120°.

Characteristics of the material
The Floor-standing enclosures are made from polyester reinforced with fiberglass, moulded by hot compression, in RAL 7032grey color.
- This material is insulating: several kV per mm.
- Can be machined easily.
- Is resistant to corrosion: does not rust and can withstand many chemical substances.
- It has resistance corrosion in harsh weather conditions (rain, UV).
- Withstands temperatures between -50°C ... +150°C.
- Does not soften under heat (ball resistance at +150°C)
- It has self-extinguishing agaist fire (does not propagate fire: self-extinguishing in several seconds during the glow-wire test at 960°C during 30s.).
- Does not contain halogens.
- Releases little smoke and nontoxic smoke in case of combustion.

Enclosure obtained by assembling:
- 1 sealed top part.
- 1 sealed bottom part.
- 1 sealed side part.
- 1 sealed rear part.
- 1 door

PV

D C P R O D U C T S

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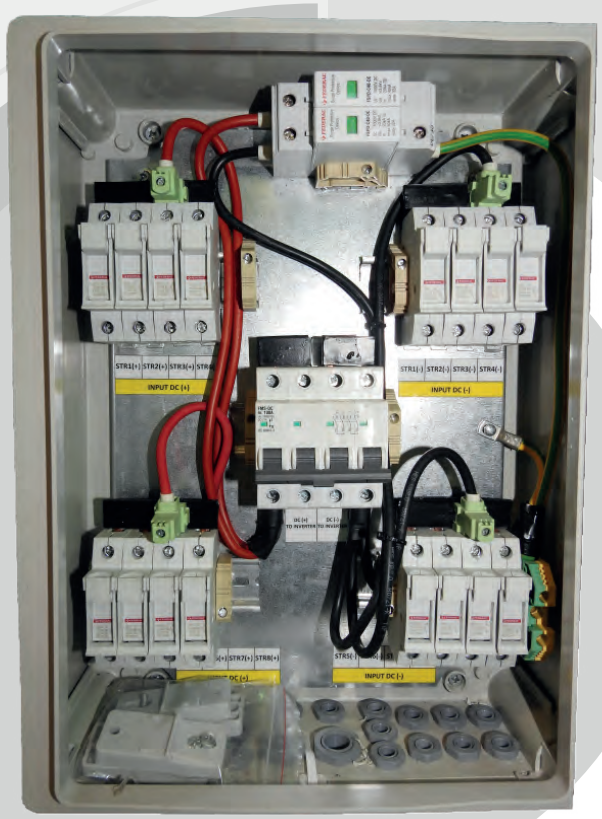
MINIATURE CIRCUIT BREAKER

FM10 DC - FM10L DC

0,5A-63A / 80A-125A

1P:250V - 2P: 500V

3P:750V - 4P:1000V



ISOLATOR

FMS - DC

40A - 125A

1P:250V - 2P: 500V

3P:750V - 4P:1000V

SURGE PROTECTIVE DEVICE

FSPD-C40-DC / FSPD-BC5-DC

500V ... 1500V DC

1,8kV ... 3,8kV

CONTACTOR

FC09D - FC750D

DC-1: 20A - 850A

DC-3, DC-5: 8A - 700A

CYLINDRICAL FUSE & BASE

FCF - DC / FCFB - DC

1000V DC

1A - 32A / 32A

" All Over the World "

FEDERAL®

GAS METERS (EN 1359)

		
TYPE	**FN G2,5 FN G2,5-HT**	**FN G4 FN G4-HT**
Gas Types	Natural Gas, LPG, Air Gas	
Q Min	0,025m³/h	0,04m³/h
Q Max	4m³/h	6m³/h
Measuring Interval	0,025m³/h - 4m³/h	0,04m³/h - 6m³/h
Max. Operating Pressure	500mbar	
Leakage Test Pressure Value	750mbar	
Measuring Volume	1,2dm ³	
Operating Temperature	-25°C, +55°C	
Storage Temperature	-30°C, +70°C	
Body	Galvanized 0.8mm Deep Extrusion Steel	
Weight	2 kg	

	
TYPE	**FNG4 - CPPU V2**
Gas Type	Natural Gas, LPG, Air Gas
Q Min	0,04m³ /h
Q Max	6m³ /h
Max. Operating Pressure	500mbar
Measuring Volume	1,2dm³
Operating Temperature	-25°C, +55°C
Body	Galvanized 0.8mm Deep Extrusion Steel
Weight	2.3 kg
Verification Q Min	±%3 (max)
Verification Q Max	±%1,5 (max)
Max. Displayable Value	99999,999
Resolution	0,001m³
Pressure Loss (for Q Max)	<2mbar
P Valve	500mbar
Circuit	Processor based special design manufactured via SMD technology
Power Feeding	8,5 Ah long-lasting lithium main battery (for valve and reading systems) 2 pcs. 1,2 Ah long-lasting lithium spare battery 1,5 F super capacitor
Display	Special design advanced LCD Display illuminating feature at dark
Safety	Detection of extreme consumption and gas leakage, Signalling, Remote valve controlling
Measurement Method	Optical reading
Protection Class	IP54
Data Safety	Permanent memory unaffected from interruptions (EEPROM, DATA FLASH)
Gas Meter Safety	Detection of meter and battery cover opening Detection of optical reading failures Detection of magnetic interference
Communication	RF-868 two way communication, information exchange and meter controlling, Periodic data transfer between meter & system , Transferring the data collected from the meter to the system at certain intervals
Optional Features	Reading gas temperature Correction process according to gas temperature Adapted to work with other communication devices

- Connection points; manufactured as two outlet fittings
- As inner volume of 1.2 dm³ suits best to operating conditions, it can operate in optimal rates during high haulage.

PLUGS & SOCKET

Federal CEE plugs and socket, with their number of poles(2P+E, 3P+E, 3P+N+E) are connected to almost every electric circuit which meet the requirements appropriately. They are adapted to operate at low voltage (110V, 220V, 380V, 450V) and colored according to their feeding. Different execution styles (wall mounting, angled, straight, with box) and nominal currents (IP44 and IP67) are available with high protection degrees (16A, 32A,63A)

PANEL MOUNTING SOCKET

TYPE	Amperage (A)	(V)	(h)	Color	IP
2P+E	16	110-130/200-250	4 / 6	🟡🔵	IP44
	32	200-250	6	🔵	IP44
3P+E	16 - 32 - 63	380-415	6	🔴	IP44
3P+N+E	16 - 32 - 63	380-415	6	🔴	IP44

PANEL MOUNTING SOCKET WITH LOCKED COVER

TYPE	Amperage (A)	(V)	(h)	Color	IP
2P+E	32	200-250	6	🔵	IP67
3P+E	16 - 32 - 63	380-415	6	🔴	IP67
3P+N+E	16 - 32 - 63	380-415	6	🔴	IP67

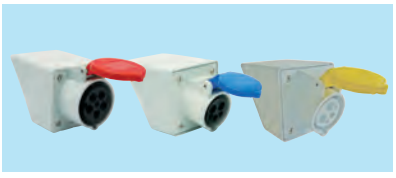
WALL MOUNTING SOCKET WITH STRAIGHT BOX

TYPE	Amperage (A)	(V)	(h)	Color	IP
2P+E	16	110-130/200-250	4 / 6	🟡🔵	IP44
	32	200-250	6	🔵	IP44
3P+E	16 - 32	380-415	6	🔴	IP44
3P+N+E	16 - 32	380-415	6	🔴	IP44

WALL MOUNTING SOCKET WITH STRAIGHT BOX AND WITH LOCKED COVER

TYPE	Amperage (A)	(V)	(h)	Color	IP
2P+E	32	200-250	6	🔵	IP67
3P+E	16 - 32	380-415	6	🔴	IP67
3P+N+E	16 - 32	380-415	6	🔴	IP67

WALL MOUNTING SOCKET WITH ANGLED BOX



TYPE	Amperage (A)	(V)	(h)	Color	IP
2P+E	16	110-300/200-250	4 / 6	🟡🔵	IP44
3P+E	16	200-250	6	🔴	IP44
3P+N+E	16	200-250	6	🔴	IP44

WALL MOUNTING SOCKET WITH ANGLED BOX AND LOCKED COVER

TYPE	Amperage (A)	(V)	(h)	Color	IP
TYPE	16	380-415	6	🔴	: IP67

WALL MOUNTING SOCKET WITH ANGLED BOX + SCHUKO

TYPE	Amperage (A)	(V)	(h)	Color	IP
2P+E	16	200-250	6	🔵	IP44
3P+E	16	380-415	6	🔴	IP44
3P+N+E	16	380-415	6	🔴	IP44

WALL MOUNTING SOCKET WITH ANGLED BOX AND LOCKED COVER + SCHUKO

TYPE	Amper (A)	(V)	(h)	Color	IP
3P+N+E	16	380-415	6	🔴	IP67

ANGLED WALL MOUNTING SOCKET

TYPE	Amper (A)	(V)	(h)	Color	IP
2P+E	16	200-250	6	🔵	IP44
3P+E	16	380-415	6	🔴	IP44
3P+N+E	16	380-415	6	🔴	IP44

ANGLED PLUG

TYPE	Amper (A)	(V)	(h)	Color	IP
3P+N+E	16	380-415	6	🔴	IP64

CONNECTOR

TYPE	Amper (A)	(V)	(h)	Color	IP
2P+E	16	110-130/200-250	4 / 6	🟡🔵	IP44
	32	200-250	6	🔵	IP44
3P+E	16 - 32 - 63	380-415	6	🔴	IP44
3P+N+E	16 - 32 - 63	380-415	6	🔴	IP44

CONNECTOR WITH LOCKED COVER

TYPE	Amper (A)	(V)	(h)	Color	IP
3P+E	16	380-415	6	🔴	IP44
3P+E	63	380-415	6	🔴	IP67
3P+N+E	63	380-415	6	🔴	IP67

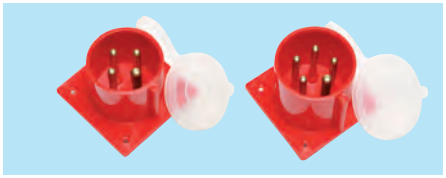
PLUG

TYPE	Amper (A)	(V)	(h)	Color	IP
2P+E	16	110-130/200-250	6	🟡🔵	IP44
	32	200-250	6	🔵	IP44
3P+E	16 - 32 - 63	380-415	6	🔴	IP44
3P+N+E	16 - 32 - 63	380-415	6	🔴	IP44

PLUG WITH LOCK

TYPE	Amper (A)	(V)	(h)	Color	IP
2P+E	32	200-250	6	🔵	IP44
3P+E	16 - 32	380-415	6	🔴	IP44
3P+N+E	16 - 32	380-415	6	🔴	IP44
3P+E	63	380-415	6	🔴	IP67
3P+N+E	63	380-415	6	🔴	IP67

WALL MOUNTING INLET

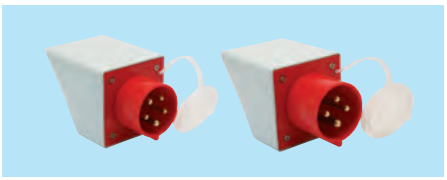


TYPE	Amper (A)	(V)	(h)	Color	IP
3P+E	32	380-415	6	●	IP44
3P+N+E	16-32	380-415	6	●	IP44

WALL MOUNTING INLET WITH STRAIGHT BOX

TYPE	Amper (A)	(V)	(h)	Color	IP
3P+E	32	380-415	6	●	IP44
3P+N+E	16-32	380-415	6	●	IP44

WALL MOUNTING INLET WITH ANGLED BOX



TYPE	Amper (A)	(V)	(h)	Color	IP
3P+E	32	380-415	6	●	IP44
3P+N+E	16-32	380-415	6	●	IP44

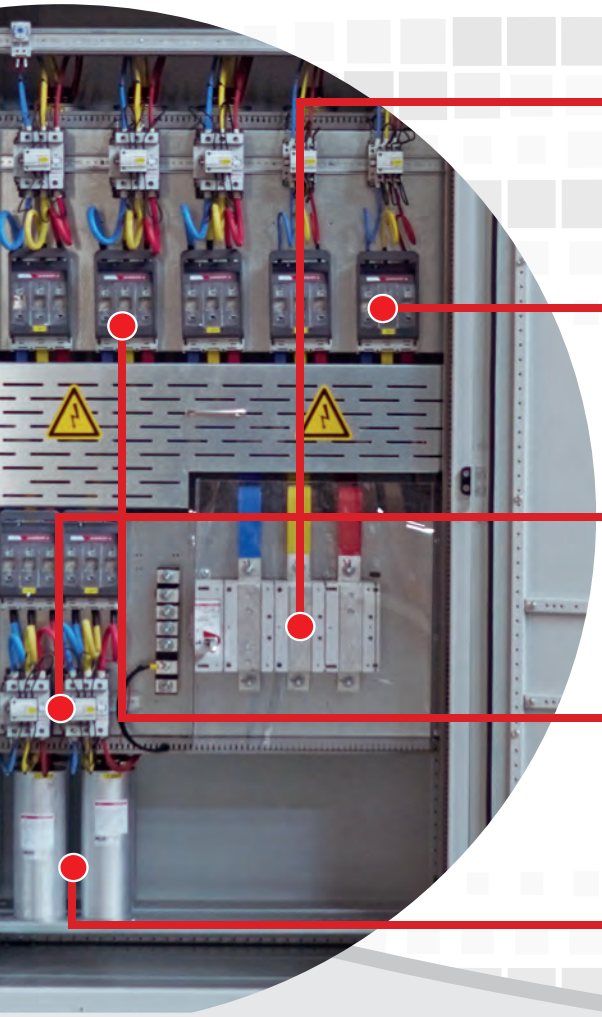
WALL MOUNTING INLET WITH ANGLED BOX + SCHUKO

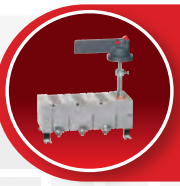
TYPE	Amper (A)	(V)	(h)	Color	IP
3P+E	32	380-415	6	●	IP44
3P+N+E	16-32	380-415	6	●	IP44

COMBINATION BOXES (IP44 - IP65 - IP67)

Combination Boxes 260x350x115
Combination Boxes 210x280x100
Combination Boxes 113x210x90
Coverless Combination Boxes 113x210x70
Combination Boxes Without MCB 210x280x100
Distribution Board With Metal Mounting Plate **Distribution Board With Plate For MCB** **Outdoor Distribution Board For Telephone Modules** 210x300x130, 260x350x150, 300x400x130, 300x400x170, 400x500x200, 400x500x200,500x700x250
Distribution Board With Plate For There Energy Meter And MCB **Distribution Board With Plate For Compact Switch** **Distribution Board For Water Pump** 400x500x200, 400x500x200, 500x700x250
Distribution Board With Plate For Single Phase Energy Meter 210x300x130, 260x350x150, 300x400x130, 300x400x170
Distribution Board With Plate For Three Phase Energy Meter 260x350x115
Distribution Board For Construction Site 400x600x200, 500x700x250

capacitor bank



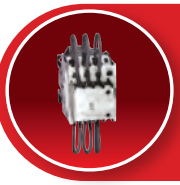


LOAD BREAK SWITCH

- Current Rating up to 2000A
- Fast opening closing operation
- Rotary contact mechanism
- 3 - 4 Pole Option
- Handle can be adjusted according to panel depth
- Possibility of Inverser/Changeover

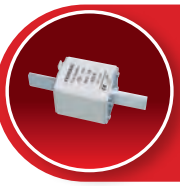
FUSE SWITCH DISCONNECTORS (FHS)

- Thermal Current from 160A to 630A
- 1 -3 Pole Option
- Five different connection type
- Made of reinforced thermoplastic and flame resistant materials
- Silver plated contacts



CAPACITOR CONTACTORS

- Current Rating up to 80kVAR
- High Electrical and Mechanical Life
- Wide Accessory Range



NH (H.R.C) FUSES

- Current range up to 1250A
- 120kA Breaking Capacity
- Single & Dual Indicator
- Silver Plated Contacts
- Brass and Copper Blade Options
- Steatit and Glazed Body Options

POWER CAPACITORS

- Mono phase and Three phase
- 230/400/415/440/480/525 Operating Voltage
- Power up to 60,5 kVar
- Heavy Duty

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FEDERAL®

The key to security

has been renewed

THERMAL MAGNETIC F61 - F62

- 160A - 400A / 36kA - 50kA
- (0,7-1) In Thermal setting range
- (5-10) In Magnetic setting range
- Fixed Thermal and Magnetic Protections

ELECTRONIC F61E - F62E

- 160A - 500A / 36kA - 50kA
- (0,4-1) In Thermal setting range
- (2-10) In Magnetic setting range
- Time Delay Setting

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