FEDERAL®

"All Over the World"

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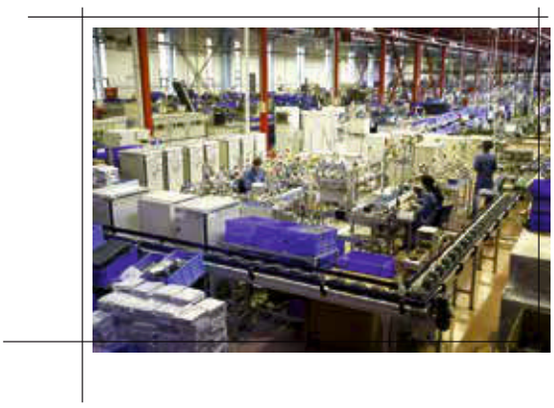
BÜSTYAL RoHS COMPLIANT ANAB ACCREDITED NSF ISR Intertek KERI IPH BERLIN IHP INTERNATIONAL HELLENIC TEST LABORATORY LTD. ASTA TSE CE

Low Voltage Protection, Control and Measurement Devices

Federal Group, founded in 1990 is active in production and automation of Low Voltage Switchgear Products, Natural Gas Meters ,Marble and Machinery Manufacturing Industry. Federal Group is established on an area of 95.000m² Thanks to the activities of the group companies, Federal was registered as a "Recognized Brand" in the world in 2008. Federal Group exports 50%of its production to more than 50 countries all around the world.

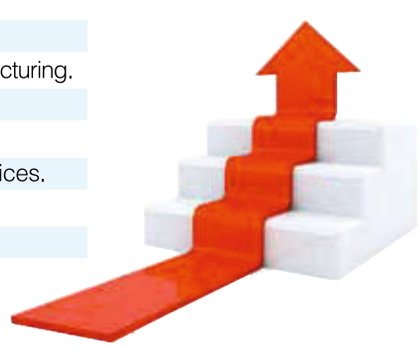
Growing in a short time, Federal Electric has become one of the leading manufacturers of Low Voltage Switchgear in the World.

There are 4.000 kinds of products and 35.000 different parts production in the facilities of Federal Electric.



HISTORY

2020 "Federal Elektrik Bulgaria" has started export.
2018 BIL-MART was established for manufacturing industry.
2018 Turkey's 910th R&D Center was established.
2017 Federal Academy was established for entry-level youngsters.
2016 4,000 types of products have been reached in the Low Voltage range.
2015 Distribution network has reached to 50 countries.
2014 Istanbul Foreign Trade Office was established.
2011 3,250 types of product 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 has begun 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 has 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 investment completed.
1996 Unigraphics 3D solid modeling has begun to be used in product desing and mould manufacturing.
1996 FEDERAL ERP software launched.
1994 Distribution in the International Market launched.
1994 Federal Elektrik received the Quality Award in Belgium for having the best ISO9000 practices.
1992 Mass production has begun.
1990 The first domestic design compact type circuit breaker was produced.
1990 Federal Elektrik Yatırım ve Ticaret A.Ş. was established.



CONTENTS

Note: Please visit our webside to find out part number of the product.

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

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 Series)⑤	250 V		kA	--	--	8	15	15	20	20	20
	DC (3P Series)⑤	500 V		kA	--	--	8	15	15	20	20	20
Rated Short Circuit Breaking Capacity – I_{cs}②		380/415 V			%100Icu		%100Icu		%100Icu	%100Icu		
Category (IEC / EN 60947-2)					A		A		A	A		
Trip Mechanism & Protection Characteristics	Thermal Magnetic	Thermal Fixed			In		□		□	□		
		Thermal Adjusted			--		(0,8-1)In		16-125A: (0,7-1)In 160A: (0,8-1)In	(0,7-1)In		
		Magnetic Fixed			16-25A: 300A 32-63A: 10In 80A: 12In 100A: 10In 125-250A: 8In		16-63A: 600A 80-160A: 8In, 10In③		16-20A: 200A 25-160A: 8In, 10In③ 40-160A: 3In④	16-25A: 300A 32-63A: 10In 80A: 12In, 100A: 10In 125-250A: 8In, 10In③ 160-250A: 3In④		
		Magnetic Adjusted			--		–		--	□80-250A: (5-10)In		
Current Limiting					■		■		■	■		
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				--		–		--	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					□		□		□	□		
Therminal 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**
125-400⑥			160-500		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, 160-315A: (5-10)In 320-400A: (4-8)In 320-400A: (5-10)In③			(5-10)In		(5-10)In		300-630A: (5-8)In 800A: (4-6)In	
■			■		--		■	
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			--		--		–	
19-25 Nm			19-25 Nm		30-40 Nm		30-40 Nm	
□			□		□		□	
□			□		□		□	
□			□		□		□	
--			□		□		□	
□			□		□		□	
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■			■		■		■	
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105⑥			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																
TYPE					**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 Poles③					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	45	40	45	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}② 380/415 V					%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	Thermal-Magnetic		Thermal Fixed		--		--		--		--		--	
			Thermal Adjusted		--		--		--		--		--	
			Magnetic Fixed		--		--		--		--		--	
			Magnetic Adjusted		--		--		--		--		--	
	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	
			Graund Fault		--		--		--		--		--	
Arc Contact					--		--		--		■		■	
Current Limiting					■		■		--		■		■	
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)

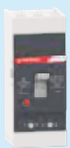
③ 2P breaker has same dimension as 3P breaker, but the middle pole is removed.

• 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. At 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 POLE






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	45
	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}		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		(0,8-1)In	(0,7-1)In			(0,7-1)In			300-630A: (0,7-1)In 800A: (0,6-1)In		--		--	
		Magnetic Fixed		16-63A: 600A 80-160A: 8In	16-25A: 300A 32-63A: 10In 80A: 12In, 100A: 10In 125-250A: 8In, 10In⑥			□			□		--		--	
		Magnetic Adjusted		--	--			125: (6-12)In, 160-315A: (5-10)In 320-400A: (4-8)In			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	
		Graund Fault		--	--			--			--		--		--	
Current Limiting				■	■			■			■		■		--	
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			–	–			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: 121,5mm.

⑤ Models with "E" refers to electroniccircuit breakers

⑥ Motor circuit protection type (upon request)

⑦ F53 series MCCB are produced up to 315A.

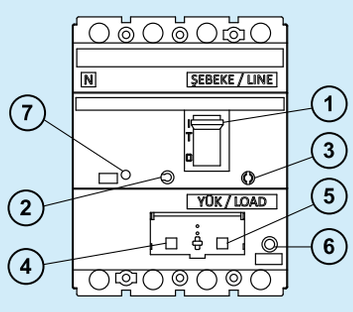
EARTH - LEAKAGE CIRCUIT BREAKERS (IEC / EN 60947-2)

4 POLE						F12R	F31R
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	Termal Fixed				□	□
		Thermal Adjusted				(0,8-1)In	(0,7-1)In
		Magnetic Fixed				16-63A: 600A 80-160A: 8In	80A: 12In 100A: 10In 125-250A: 8In
		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					--	--
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).

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 leakage current protected switches are produced from 16A-250A. Toroidal transformer, sensors relay and shunt trip are placed into circuit breakers. Without the need any external accessory connector 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 leakage current protection function as separately from trip test button. In this way, the earth leakage protection function as 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 Course

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

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
Temperature – 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

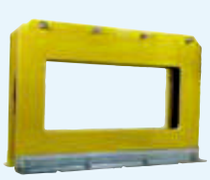
① **FGR05 and FGR06 earth leakage protection relays have the same detection features but different supply voltage ranges. FGR05 has 110/220-240 VAC alternative supply voltage value, FGR06 has 220/380-415 VAC alternative supply voltage value.**

TOROIDAL & RECTANGLE CURRENT TRANSFORMERS

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

Toroidal Transformer

Rectangle Transformer



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 NF51 / 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 the one Torodial Transformer)	F12 / F12N / F21 / F31 / F31N / F32 / F32N / F33 F33N / F51 / F51N / F52 / F52N / F53 / F53N / F61 / F62		
			F101E / F102E / F111E / F112E (with the two paralel Torodial Transformer)			
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

TOROIDAL TRANSFORMERS

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.

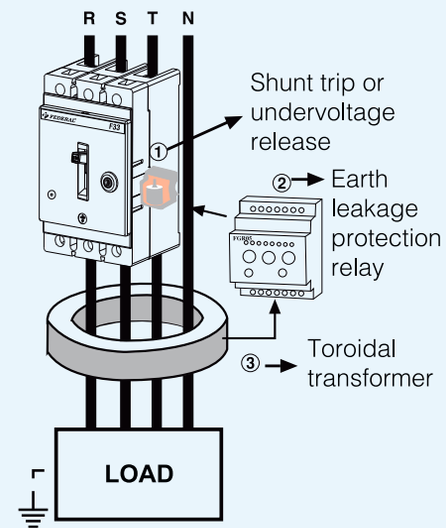


Figure-2 Protection system in the circuit breakers against earth leakage current

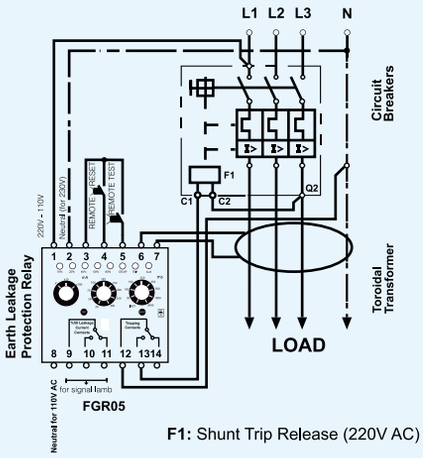


Figure-3 Use of earth leakage protection relay with circuit breaker equipped with shunt trip release.

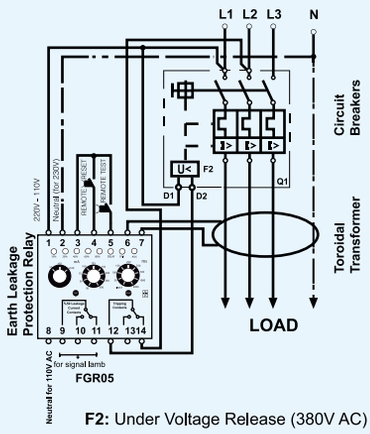
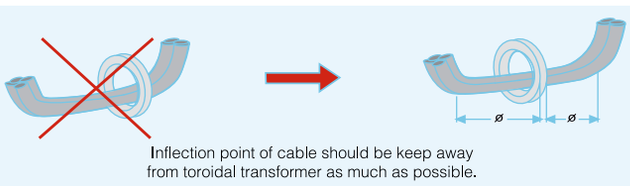


Figure-4 Use of earth leakage protection relay with circuit breaker equipped with under voltege release.

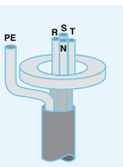
However, in this system, in order to let the circuit breaker open in terms of earth leakage currents, one of shunt trip or undervoltage release must be mounted to the breaker (Figure-2). Fault current rating of earth leakage protection relay should be adjusted according to protection type and appropriate 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

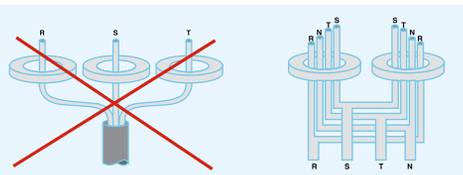
All the phases and neutral cable, if any, shall pass through the toroidal transformer. earth cable should not pass through the toroidal. Secondary cables of toroidal shall be connected to earth leakage protection relay (6-7) terminals and appropriate voltage written on the relay is supplied to energy 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).



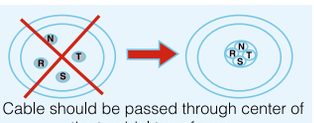
Inflection point of cable should be keep away from toroidal transformer as much as possible.



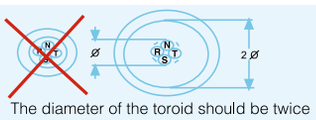
Ground cable should not be passed through toroidal transformer.



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



Cable should be passed through center of the toroidal transformer

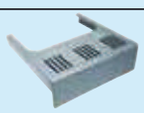


The diameter of the toroid should be twice the total cable diameter.

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.

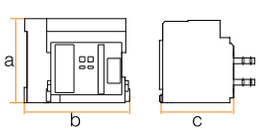
MOLDED CASE CIRCUIT BREAKER ACCESSORIES

	**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.
	**Extended Rotary Handles**	Used for opening- closing the circuit breaker. It is used for rotating the circuit breaker, not pushing-pulling it upwards-downwards.
	**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.
	**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.
	**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.
	**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.
	**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.
	**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.
	**Connection Terminals**	They are dispatched as screwdriver or allen screw head as per customer requirements.
	**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.
	**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.
	**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			5000, 6300		
Number of Poles				3 / 4			3 / 4			3 / 4			3 / 4④		
Rated Insulation Voltage - Ui (a.c.) 50-60Hz			V	1000			1000			1000			1000		
Rated Impulse Withstand Voltage - U_{imp}			V	8			8			8			8		
Test Voltage (1 min) (a.c.) 50-60Hz			V	3000			3000			3000			3000		
Rated Current Adjustment Field			In	(0,4-1)In			(0,4-1)In			(0,4-1)In			(0,4-1)In		
Rated Ultimate Short Circuit Breaking Capacity - I_{cu} ①	50-60Hz	220/240V	kA	70	80	100	70	80	100	70	80	100	70	80	120
	50-60Hz	380/415V	kA	70	80	100	70	80	100	70	80	100	70	80	120
	50-60Hz	440V	kA	65	75	90	65	75	90	65	75	90	65	75	90
	50-60Hz	500V	kA	55	65	80	55	65	80	55	65	80	55	65	80
	50-60Hz	690V	kA	45	50	65	45	50	65	45	50	65	45	50	65
Rated Short-Circuit Breaking Capacities-I_{cs}②		380/415V		35	50	65	35	65	80	35	65	80	35	65	100
Rated Short Time Withstand Capacities-I_{cw}-1s		380/415V		35	50	65	35	65	80	50	65	80	50	65	100
Category (EN 60947-2 / IEC 60947-2)				A / B			A / B			A / B			A / B		
Opening Type				Electronic			Electronic			Electronic			Electronic		
Assembly Method				Fixed / Drawout			Fixed / Drawout			Fixed / Drawout			Drawout		
Long Time Delay Current (I_L)			Ir1	(0,4-1)I_n			(0,4-1)I_n			(0,4-1)I_n			(0,4-1)I_n		
Long Time Delay Interval			t_L	15-500(1,5Ir1)			15-500(1,5Ir1)			15-500(1,5Ir1)			15-500(1,5Ir1)		
Short Time Delay Current (I_S)			Ir2	(0,4-15)I_n			(0,4-15)I_n			(0,4-15)I_n			(0,4-15)I_n		
Short Time Delay Interval			t_s	0,1-0,5			0,1-0,5			0,1-0,5			0,1-0,5		
Instantaneous Breaking Current (I_I)			Ir3	I_n-50kA			I_n-50kA			I_n-50kA			I_n-50kA		
Ground Fault Current (I_G)			Ir4	(0,2-0,8)I_n			(0,2-0,8)I_n			(0,2-0,8)I_n			(0,2-0,8)I_n		
Mechanical Life			Op.	15000			15000			15000			10000		
Electrical Life			Op.	10000			7000			5000			2000		
Weight		Fixed	kg	43 / 53			52 / 65			67 / 67			-- / --		
		Drawout	kg	70 / 80			94 / 117			119 / 119			210 / 333		
Accessories															
Undervoltage Release③				□			□			□			□		
Undervoltage Release with Time Delay				□			□			□			□		
Shunt Trip				□			□			□			□		
Closing Coil				□			□			□			□		
Auxiliary Contact Block				■			■			■			■		
Motor Control Mechanism				□			□			□			□		
Inverser Lock				□			□			□			□		
Dimensions		a		402 / 402			402 / 402			402 / --			-- / --		
	Fixed	b		340 / 435			400 / 515			515 / --			-- / --		
		c		290 / 290			298 / 298			298 / --			-- / --		
	Drawout	a		432 / 432			439 / 439			439 / 439			449 / 449		
		b		375 / 470			435 / 550			550 / 788			835 / 950		
		c		374 / 374			374 / 374			374 / 374			290 / 290		



■ : Standard □: Upon Request
① Icu: O-t-CO test (O: Open maneuver, t: Waiting duration, CO: Close maneuver
② Ics: O-t-CO-t-CO test (O: Open maneuver, t: Waiting duration, CO: Close maneuver)
③ Tripping time can be set as 1s, 3s, 5s, 7s, 7,5s.
④ Rated current is 5000A for 4 pole Circuit Breakers.

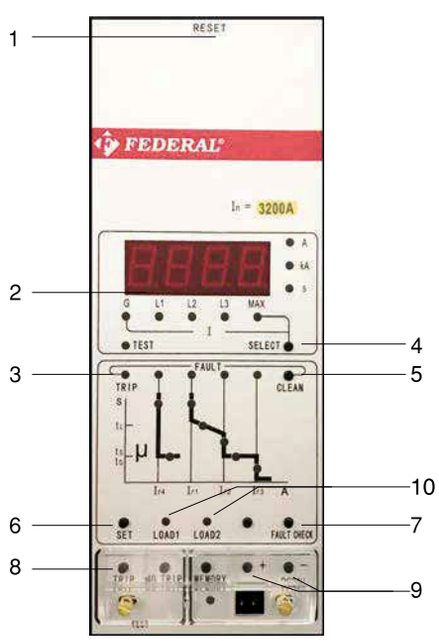
AIR TYPE CIRCUIT BREAKER (IEC / EN 60947-2)

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 transformer ⑤ 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 softwa re. 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 : featureslikeoverload,reverselongtimedelay, The reverseshort time delay, short timedelay , fixedtimecurve s ... etc andotherdifferentprotectionsarepossible.
IndicatorFeature: Currentarrangementandoperationcurrentindicatorsareavailable
AmmeterFeature: Indicatescurrent
WarningFeature: Indicatesoverloadcondition
TestFeature: TotestfeaturesofACB

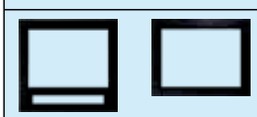
SETTING OF INTELLIGENT CONTROLLER

(I_{r1} , I_{r2}, I_{r3}, I_{r4}, t_L, t_I, t_S, t_G) The latestsetvaluecanbeseenatthescreen.Thevalue canbe changed by using the (+) , (-) buttons. Use the "save" button to save set value.

Rectangle Transformer

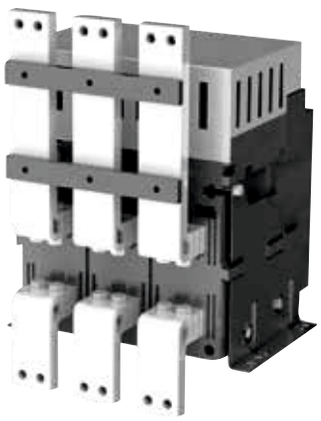
Figure-5

AIR CIRCUIT BREAKER ACCESSORIES

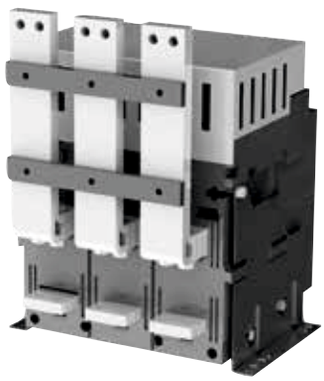
	**Undervoltage Coil**	Undervoltage release is used for tripping air type circuit breakerin case of undervoltage conditions or phase disconnection. There are two types of undervoltage releasers as instant tripping and delayed tripping types. Delayed type undervoltage release has 1 sec. 2 sec. 5 sec. 7 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

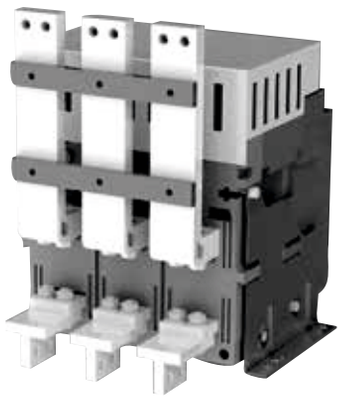
FRONT CONNECTION TYPES



FRONT TYPE



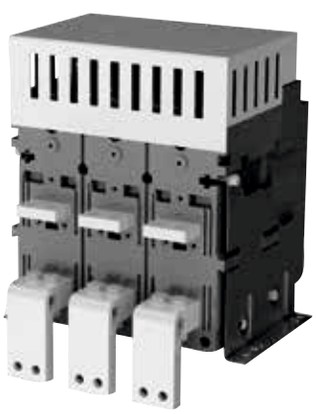
FRONT / HORIZONTAL TYPE



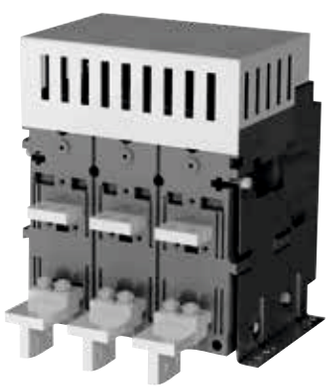
FRONT / VERTICAL TYPE

HORIZONTAL CONNECTION TYPES

HORIZONTAL TYPE

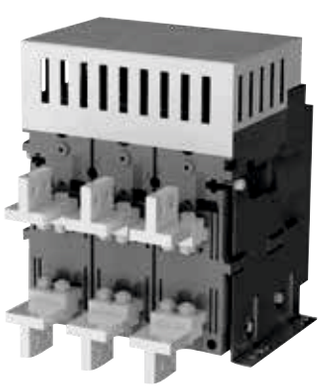


HORIZONTAL / FRONT TYPE

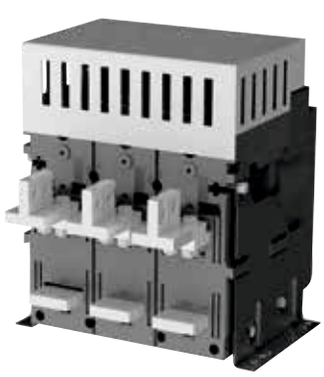


HORIZONTAL / VERTICAL TYPE

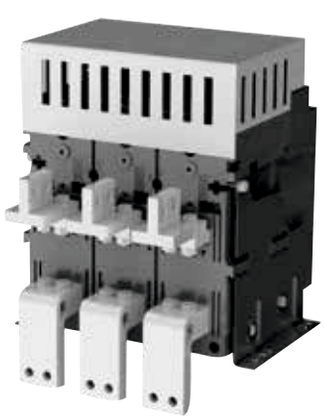
VERTICAL CONNECTION TYPES



VERTICAL TYPE



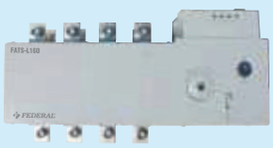
VERTICAL / HORIZONTAL TYPE



VERTICAL / FRONT TYPE

AUTOMATIC TRANSFER SYSTEMS (IEC / EN 60947-2)

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	3.000
Operating Temperature	-20 ... +60	-20 ... +60	-20 ... +60
Protection Class	IP20	IP20	IP20
Pollution Level	3	2	3

Remote Controller:
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.

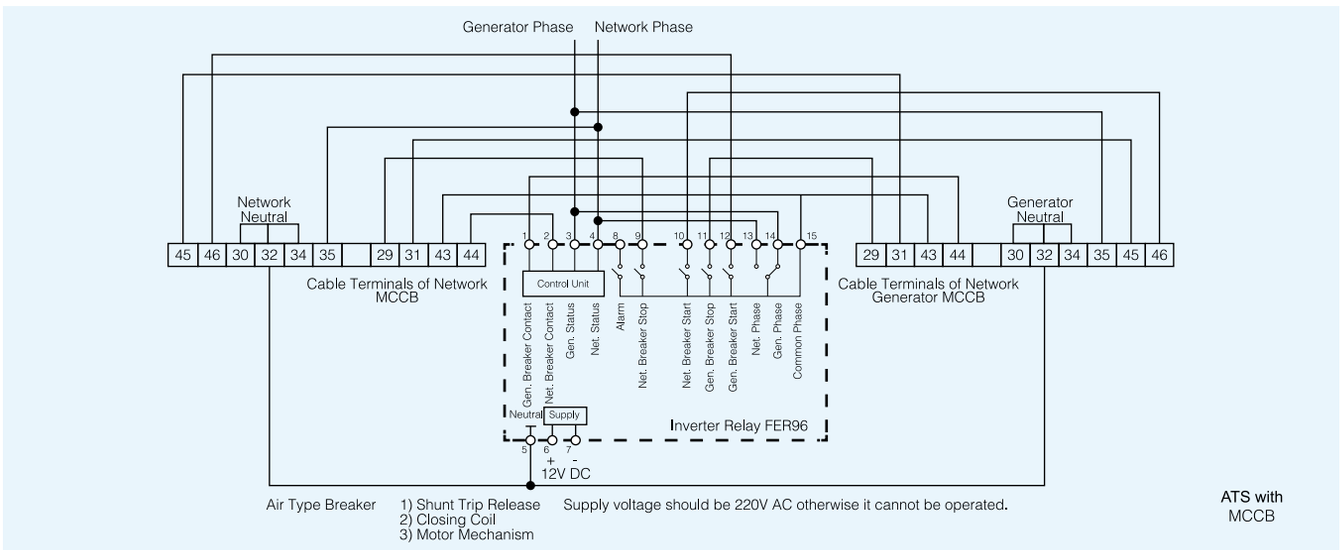
Technical Specification	
Output Contacts	250V AC 10A
Supply Voltage	12V DC
Input Voltage	220V AC
Dimensions	96x96 mm

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.

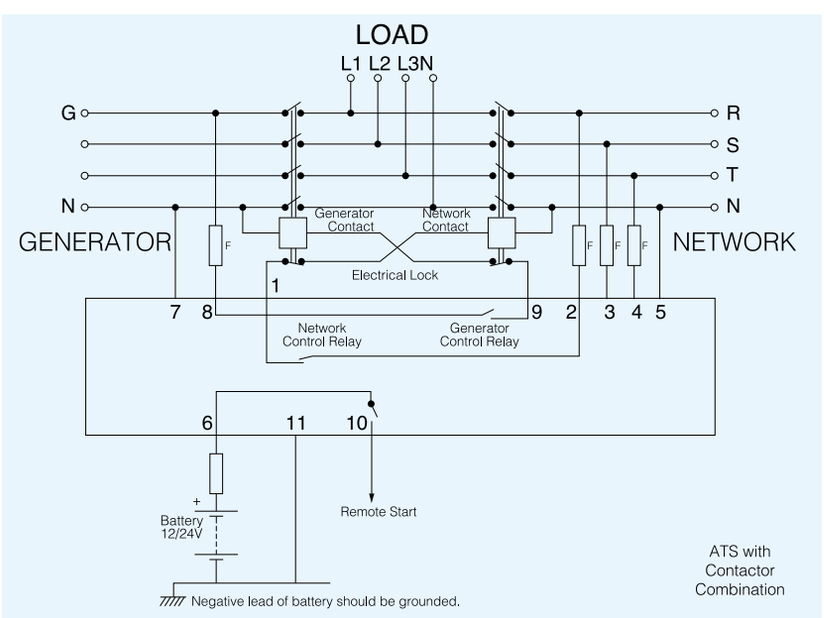
Technical Specification	
Alternator Voltage	300V AC max
Mains Voltage	300V AC max (phase-neutral)
Network Contactor Time	0,75 seconds
Dimensions	72x72 mm

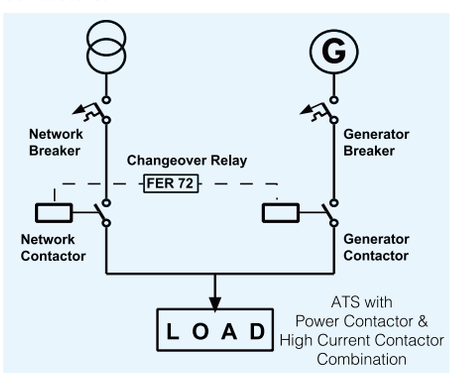
ALTERNATIVE CHANGEOVER

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 feature.
To make an Automatic Transfer System by Air Circuit Breakers, following components are required;
Two Air Circuit Breakers, Two motors mechanism, Two shunt trip release, Two closing coil, One Network Changeover Relay (FER96), One mechanical interlock



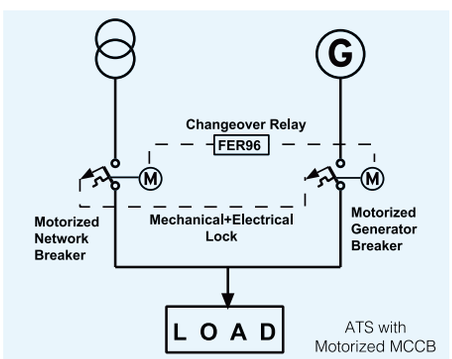
AUTOMATIC TRANSFER SYSTEM WITH CONTACTOR:
As an alternative, Automatic Transfer System could be also made by using a combination of Molded Case Circuit Breaker and Contactor. In this Automatic Transfer System, the Molded Case Circuit Breakers is used for overcurrent and short circuit protection. For 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.





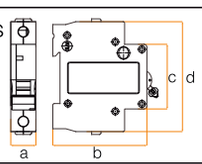
AUTOMATIC CHANGEOVER SYSTEM
WITH MOTORIZED MOLDED CASE CIRCUIT BREAKER
Another alternative automatic changeover system can be made by using motorized molded case circuit breaker.
To make an Automatic Transfer System, following components are required;
two motorized molded case circuit breakers, one mechanical 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.



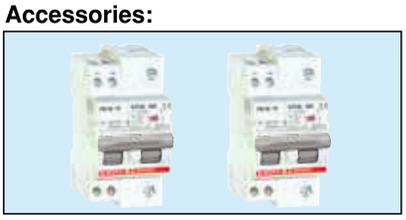
MINIATURE CIRCUIT BREAKERS (IEC / EN 60898-1), (IEC / EN 60947-2)

TYPE		FM3	FM6	FM10	FM6L	FM10L	FM10 DC	FM10L DC
Standard		IEC 60898-1			IEC 60947-2			
Rated Current- I_n	A	0,5-63	0,5-63	0,5-63	80-125	80-125	0,5-63	80-125
Number of Poles		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 Insulation Voltage - U_i	V	690	690	690	690	690	690	690
Rated Impulse Withstand Voltage - U_{imp}	kV	6	6	6	6	6	6	6
Rated Operating Voltage U_e (V)	50-60 Hz (1P)	230	230	230	230	230	-	-
	50-60 Hz (2P, 3P, 4P)	400	400	400	400	400	-	-
	DC (1P)	60	60	60	60	60	250①	250①
Rated Short Circuit Breaking Capacity	kA	3	6	10	6	10,15③	10	10
Protection Characteristics	Thermal	In	In	In	In	In	In	In
	Magnetic②	B,C,D	B,C,D	B,C,D	8In		10In	
Mechanical Life	Operation	>20000						
Electrical Life	Operation	>4000						
Min-Max Connection Sections	mm^2	1-25	1-25	1-25	1-50	1-50	1-25	1-50
Min-Max Tightening Torque	Nm	2-3	2-3	2-3	3-5	3-5	2-3	3-5
Shunt Trip Release		-	□230V		-	□230V	-	-
Auxiliary Contact Block		-	□1NO+1NC					-
Dimensions	a④	18	18	18	27	26,3	18	26,3
	b	66	66	66	65,5	67,5	66	67,5
	c	45	45	45	45	45	45	45
	d	81,5	81,5	81,5	80	90	81,5	90

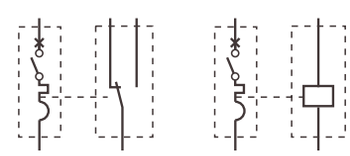


□ Upon Request
① 2P Series: 500V, 3P Series: 750V, 40P Series: 1000V
② B: 3-5In, C:5-10In, D: 10-20In (x1,4 at DC)
③ 15kA / 230V (2P)
④ Dimension specified in "a" line, is increasing according to number of poles. (2P=a x 2, 3P=a x 3, 4P=a x 4)

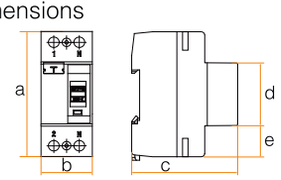
Accessories:



TYPE	
Shunt Trip	AC 230V
Auxiliary Contact	1NO+1NC

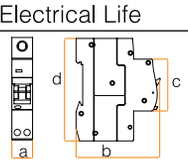


RESIDUAL CURRENT DEVICES (IEC / EN 61008-1), (IEC / EN61008-2-1)

TYPE		FK2	FK2L	FK4	FK4L
Nominal Residual Current (mA)		30, 100, 300	30, 100, 300	30, 100, 300	30, 100, 300
Rated Current (A)		25, 40 ,63	80, 100, 125	25, 40, 63	80, 100, 125
Rated Voltage (V)		230	230	400	400
Closing - Breaking Capacities (Im / Δm),(A)		630	1250	630	1250
Fused Short Circuit Current (Inc / IΔc),(A)		10000	10000	10000	10000
Frequency (Hz)		50-60 Hz	50-60 Hz	50-60 Hz	50-60 Hz
Number of Poles		2	2	4	4
Weight (gr)		250	260	470	530
Dimensions 	a (mm)	81	90	81	90
	b (mm)	35,2	35,2	70,5	70,5
	c (mm)	65,8	69,5	65,8	69,5
	d (mm)	45	45	45	45
	e (mm)	17	22	17	22

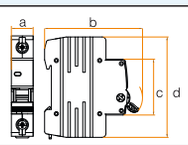
Please contact with our company for Selective Residual Current Devices.

RESIDUAL CURRENT CIRCUIT BREAKERS WITH OVERCURRENT PROTECTION (RCBO)

TYPE		FKM
Nominal Residual Current	mA	30-300
Rated Current	A	6, 10, 16, 20, 25, 32, 40
Rated Voltage	V	230V AC
Rated Short Circuit Breaking Capacity	kA	10
Frequency	Hz	50 - 60
Number of Poles		1P + N
Characteristic		B, C
Tripping Duration	s	Instantaneous
Mechanical / Electrical Life		20.000 / 4.000
Dimensions 	a mm	18
	b mm	72,5
	c mm	45
	d mm	89

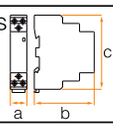
ISOLATORS (IEC / EN 60947-3)

TYPE			FMS	FMS-DC
Number of Poles			1, 2, 3, 4	1, 2, 3, 4
Utilization Category			AC-22A	DC-21
Rated Current I_n		A	40, 63, 80, 100, 125	40, 63, 80, 100, 125
Rated Insulation Voltage U_i		V	800	800
Rated Operation Voltage U_e	50/60 Hz	(1P)	230V	-
	50/60 Hz	(2P,3P,4P)	400V	-
	DC (1P)	(1P)	-	250V①
Rated Impulse Withstand Voltage U_{imp}		kV	6	6
Short-Time Withstand Current			12xIn	12xIn

Size Type / Rated Current (A)		Type-1 (AC) 40, 63, 80, 100, 125	Type-1 (DC) 40, 63	Type-2 (DC) 80, 100, 125
Dimensions 	②a mm	17,6	18	26,3
	b mm	79,1	66	67,5
	c mm	45	45	45
	d mm	81	81,5	90

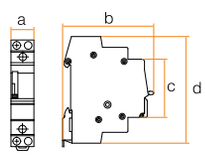
① 2P Series: 500V, 3P Series: 750, 40P Series: 1000V
② Dimension specified in "a" line, is increasing according to number of poles. (2P=a x 2, 3P=a x 3, 4P=a x 4)

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

TYPE		FCR2020	FCR4020	FCR6320	FCR4040	FCR6340
Number of Poles		2	2	2	4	4
Ie AC-1 / AC-7a	A	20	40	63	40	63
Operation Voltage	AC V	230	230	230	400	400
Insulation Voltage U_i	V	500	500	500	500	500
Number of Contact		2NO	2NO	2NO	4NO	4NO
Dimensions 	a mm	18	36	36	53,5	53,5
	b mm	65,5	66,8	66,8	65,5	65,5
	c mm	81	81	81	84,5	84,5

IMPULSE RELAY (IEC 669-1, EN 669-2-2)

TYPE	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)

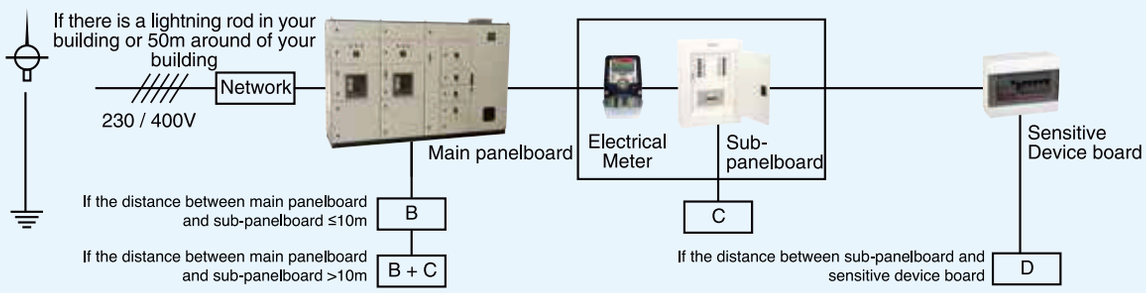
Technical Specification	
Material	Thermoplastic
Number of Ways	1, 2, 3, 4, 6, 8, 9, 12, 18, 24
Ambient Temperature	-15°C ... +60°C
Type	Flush Mounted / Surface Mounted
Color	White

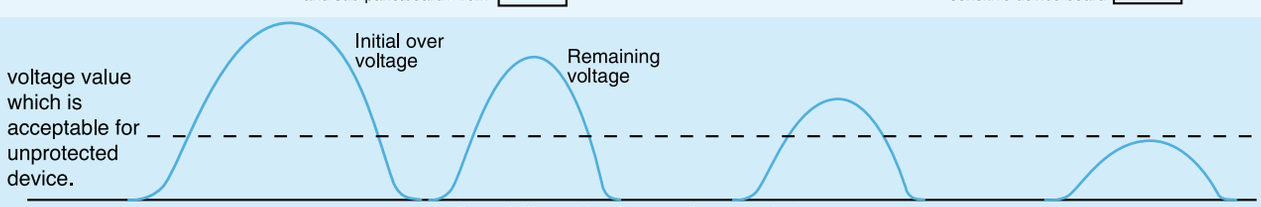
Symmetrical and asymmetrical used cover. 180° opening cover.

SURGE PROTECTIVE DEVICES (IEC 61643-11)




TYPE		FSPD-B50	FSPD-BC25	FSPD-BC15	FSPD-BC12	FSPD-BC5	FSPD-C40	FSPD-D20	FSPD-BC5-DC	FSPD-C40-DC
Class		B	B+C	B+C	B+C	B+C	C	D	B+C	C
Maximum Continuous Operating Voltage U_c	V	275 AC	300 AC	385 AC	275 AC	385 AC	440 AC	440 AC	1000 DC	500 - 800 - 1000 1500 DC
Voltage Protection Level U_p	kV	2	1,2	2,4	1,5	2	2	1,6	3,5	1,8/2,6/3,8/3,8
Lighting Impulse Current (10/350µs) I_{imp}	kA	50	25	15	12,5	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	40	20	50	40
Nominal Discharge Current (8/20µs) I_n	kA	100	25	40	20	20	20	10	20	20
Response Time t_A	ns	< 100	< 25	...	...	...	< 25	< 25	...	< 25
Number of Poles		3P+N	3P+N	3P+N	3P+N	3P+N	1P+N/3P+N	1P+N	3P	1P+N, 3P
The Cross Section(L/N)	mm^2	16 - 25	16 - 25	25 - 35	25 - 35	25 - 35	10...16	6	25 - 35	10...16
Cable Cross Section(PE)	mm^2	25 - 35	25 - 35	25 - 35	25 - 35	25 - 35	10...25	10	25 - 35	10...25
Fuse or Switch Rated Current	A	100	100	100	50	50	32	25	50	32
Operation Temperature		-40°C~+85°C								
Relative Humidity (25°C)		≤ 95%								
Mounting Type		DIN RAY 35mm								
Body Material		Fiber Glass Reinforced Plastic		Reinforced Nylon			Fiber Glass Reinforced Plastic		Reinforced Nylon	Fiber Glass Reinforced Plastic
Alarm Contact		...	...	1NO+1NC	1NO+1NC	1NO+1NC	...	...	1NO+1NC	...
Dimensions	a	90	93	90	90	90	90 / 90	90	90	90
	b	144	143	144,5	71,5	71,5	36 / 72	36	54	36
	c	50	50	50	50	50	50 / 50	50	50	50
	d	67	65	68	66	66	62 / 62	62	66	62
	e	45	45	45	45	45	45 / 45	45	45	45





Downfall graphic of over voltage against over current

CONTACTORS (IEC / EN 60947-4-1)

TYPE				FC06M	FC09M	FC09D	FC12D	FC18D	FC25D	FC32D	FC38D	FC40D	FC50D	FC65D
Number of Poles				3	3	3/4	3/4	3/4	3/4	3/4	3	3/4	3/4	3/4
Rated Thermal Current- I_{th}	≤ 55°C	A		16	16	25	25	32	36	50	55	60	70	80
Rated Operation Current – I_e (≤ 440V 50-60 Hz)	AC-3	A		6	9	9	12	18	25	32	38	40	50	65
	AC-5a	A		8	10	12	16	25	35	45	50	55	65	80
	AC-1	A		16	16	25	25	32	36	50	55	60	70	80
Rated Operation Current – I_e (≤ 250V DC - 3p series)	DC-1	A		…	…	20	20	25	32	40	40	45	60	65
	DC-3, DC-5	A		…	…	8	8	8	32	40	40	45	60	65
Rated Insulation Voltage - U_i	50-60 Hz	V		800	800	800	800	800	800	800	800	800	800	800
Rated Impulse Withstand Voltage - U_{imp}		kV		8	8	8	8	8	8	8	8	8	8	8
Motor Control 3 ~ AC-3 Driving - Stopping	230 V	kW		1,5	2,2	2,2	3	4	5,5	7,5	9	11	15	18,5
	400 V	kW		2,2	4	4	5,5	7,5	11	15	18,5	18,5	22	30
	440 V	kW		2,2	4	4	5,5	9	11	15	18,5	22	25	37
	500 V	kW		3	4	5,5	7,5	10	15	18,5	18,5	22	30	37
	690 V	kW		3	4	5,5	7,5	10	15	18,5	18,5	22	33	37
Weight	3/4 Poles	kg		0,16	0,16	0,33/0,33	0,33/0,33	0,33/0,33	0,34/0,59	0,52/0,59	0,55	0,55	1,14/1,29	1,14/1,29
Number of Auxilary Contacts	3 Poles	Adet		1NO or 1NC	1NO or 1NC	1NO or 1NC	1NO or 1NC	1NO or 1NC	1NO or 1NC	1NO or 1NC	1NO or 1NC	1NO or 1NC	1NO + 1NC	1NO + 1NC
	4 Poles	Adet		1NO or 1NC	1NO or 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC
Coil Power Consumption (VA)	AC Coil Holding	VA		7,04	7	9,5	9,5	9,5	9,5	11	11	11	30	30
	AC Coil Pull	VA		50	50	75	75	75	75	110	110	110	225	225
	DC Coil	VA		--	--	9	9	9	9	11	11	11	20	20
Mechanical Life		Milion		10	10	10	10	10	10	8	8	8	5	5
Power Loss per Pole	(AC-3)	W		0,1	0,3	0,29	0,52	1,2	2,1	2,3	2,9	3,2	4,1	6,0
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	3,5-4,5
Dimensions	a (width)	mm		46	46	47/47	47/47	47/47	47/57	57/57	57	57	77/85	77/85
	b (height)	mm		58	58	76/76	76/76	76/76	76/86	86/86	86	86	129/129	129/129
	AC Type c (depth)	mm		57	57	82/82	82/82	82/82	87/95	95/95	100	100	115/115	115/115
	DC Type c (depth)	mm		--	--	116/116	116/116	116/116	120/130	130/130	135	135	175/174	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.

Note-4: FCC-D4 type coil is used for 4 poles FC25D contactor.

Note-5: FCC-D10 type coil is used for 4 poles FC115D-FC150D.

* Min.-max. tightening torque is 3.5-4.5 Nm for 4 poles FC40D contactor.

CONTACTORS (IEC / EN 60947-4-1)








FC80D	FC95D	FC115D	FC150D	FC220D	FC245D	FC260D	FC300D	FC400D	FC475D	FC580D	FC650D	FC750D
3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
125	125	200	200	300	310	315	400	600	650	750	850	1000
80	95	115	150	220	245	260	300	400	475	580	650	750
100	115	140	180	260	280	300	350	470	560	680	760	880
110	120	160	200	300	310	315	400	600	650	750	850	1000
100	100	160	200	260	280	300	360	430	500	650	750	850
100	100	160	200	180	220	250	300	350	420	500	600	700
800	800	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
8	8	8	8	8	8	8	8	8	8	8	8	8
22	25	30	40	60	70	80	90	110	140	180	200	220
37	45	55	75	110	130	140	160	200	250	315	355	400
45	45	59	80	129	140	150	160	220	250	315	355	450
55	55	75	90	132	160	180	200	257	290	360	410	470
45	45	80	100	160	180	200	250	280	375	470	530	650
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	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC
1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC	1NO + 1NC
30	30	22/55	22/55	55	55	55	13	20	24	22	22	22
225	225	300	300	750	750	750	1100	1100	1250	1600	1600	1600
20	20	--	--	--	--	--	--	--	--	--	--	--
3	3	3	3	3	3	3	3	3	3	3	3	3
7,7	10,9	10	17	24	30	33	35	44	37	37	46	62
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
87/97	87/97	120/204	120/204	172/211	172/211	172/211	215/261	210/261	235/288	310/389	310/389	310/389
129/129	129/129	154/163	154/163	197/197	197/197	197/197	210/210	210/210	240/240	302/302	302/302	302/302
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
183/180	183/180	--	--	--	--	--	--	--	--	--	--	--


FCC-D6



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


FCC-D10


FCC-D11


FCC-D12


FCC-D13


FCC-D14


FCC-D14

FCBS-F02
FCBS-F11
FCBS-F20


FCB-F02
FCB-F11
FCB-F20


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

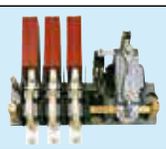
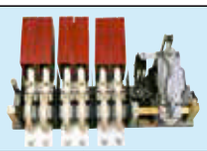
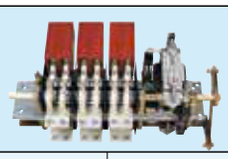




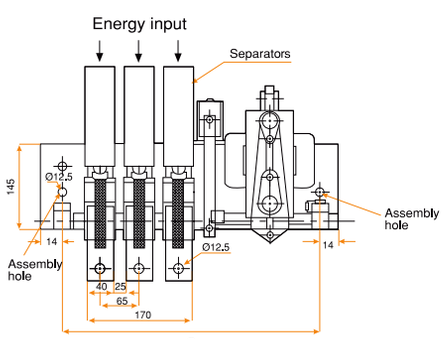
Give coil voltages of the contactors in accordance with the table below

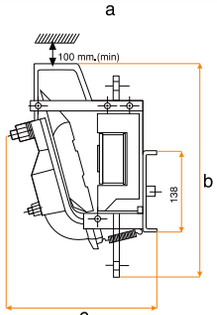
	24V	42V	48V	110V	220V	230V	240V	380V	415V	440V	500V
AC	A	B	E	H	K	N	R	S	T	U	V
DC	A6		E6	H6	K6					U6	

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

									
TYPE			**EC 300**	**EC 400**	**EC 630**	**EC 800**	**EC 1250**	**EC 1600**	**EC 2000**	**EC 2500**
Utilization Class I_e max	AC1 ≤40°C	A	300	400	630	800	1250	1600	2000	2500
Number of Poles①			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 Cage Motors) 3~AC3	220/230 V	kW	75	110	160	200	370	470	580	730
	380/400 V	kW	132	200	280	335	630	790	980	1230
	500 V	kW	180	257	355	450	740	960	1190	1490
In Compensation Circuits	380 / 400 V	kVAr	150	200	250	300	450	525	655	820
Rated Insulation Voltage	U_i	~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 Operating Interval	xU_s	~V	0,72 ... -1,1							
Auxiliary Contacts	NO (10A)	Ad	2	2	2	2	2	2	4	4
	NC (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	Depth	mm	245	245	245	245	245	245	500	500
	Width	mm	462	462	462	462	577	577	710	710
	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.





TYPE	Number of Poles	Dimensions (mm)		
		a	b	c
EC300...EC800	1	333	370	245
EC300...EC800	2	398	370	245
EC300...EC800	3	463	370	245
EC300...EC800	4	528	370	245
EC1250...EC1600	1	356	370	245
EC1250...EC1600	2	467	370	245
EC1250...EC1600	3	578	370	245
EC1250...EC1600	4	689	370	245
EC2000...EC2500	1	450	370	500
EC2000...EC2500	2	561	370	500
EC2000...EC2500	3	672	370	500
EC2000...EC2500	4	783	370	500

CAPACITOR CONTACTORS (IEC / EN 60947-4-1)

														
Contactor Type (DK)		**FC09**	**FC12**	**FC18**	**FC25**	**FC32**	**FC38**	**FC40**	**FC50**	**FC65**	**FC80**	**FC95**	**FC115**	**FC150**
Number of Poles		3	3	3	3	3	3	3	3	3	3	3	3	3
Utilization Class AC-6b I_e max 440V	A	13	16	20	22	26	33	39	52	59	79	85	92	105
Rated Thermal Current - I_{th}	A	25	25	32	40	50	55	60	80	80	125	125	200	200
Rated Insulation Voltage - U_i 50-60 Hz	V	630	630	630	630	630	630	630	630	630	630	630	630	630
Rated Impulse Withstand Voltage - U_{imp}	kV	8	8	8	8	8	8	8	8	8	8	8	8	8
Rated Power 220/240 V	kVAr	5	7	8	9	10	15	20	25	25	35	40	45	50
3 ~ AC-6b 55°C 400/440 V	kVAr	10	12,5	15	16,7	20	25	30	40	45	60	65	70	80
480/525 V	kVAr	12,5	15	16,7	20	24	25	30	45	45	60	65	70	80
Weight	kg	0,39	0,39	0,39	0,4	0,58	0,6	0,6	1,2	1,2	1,5	1,5	2,2	2,2
Number of Auxiliary Contacts		1NO + 1NC							1NO + 2NC				1NC	
Coil Power Consumption (Holding)	VA	9,5	9,5	9,5	9,5	11	11	11	30	30	30	30	22	22
Power Loss Per Pole (AC-6b)	W	0,6	1,0	1,4	1,7	2,5	3,9	5,6	4,5	5,0	7,5	8,8	6,5	8,5
Min-Max Tightening Torque	Nm	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	3,5-4,5	6-10	6-10	8-12	8-12
Dimensions a (Width)	mm	47	47	47	47	57	57	57	77	77	87	87	120	120
b (Height)	mm	76	76	76	76	86	86	86	129	129	129	129	154	129
c (Depth)	mm	117	117	117	122	131	136	136	150	150	158	158	158	158

HARMONIC FILTERS, SHUNT REACTORS and LINE & LOAD REACTORS (EN 60076-6, EN 61558-2-20)

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:

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:

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

Line & Load Reactor:

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

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

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...FC38D	FC09D...FC38D	FC40D...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

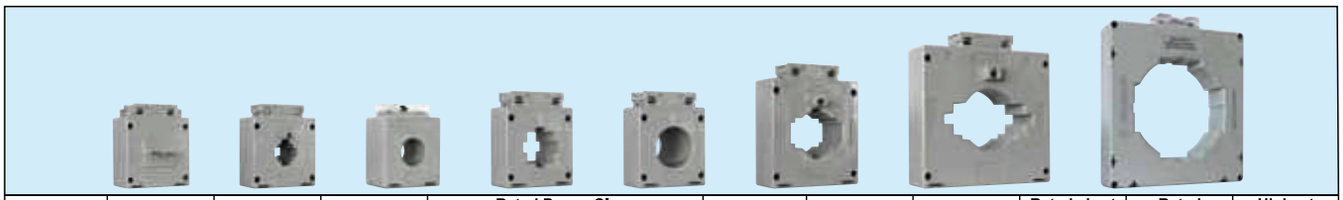
FTR25 Mounting Base

FTR95 Mounting Base

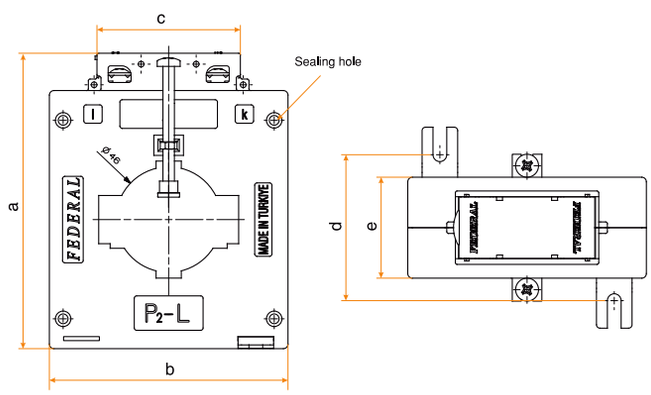
POWER CAPACITORS (IEC / EN 60831-1), (IEC / EN 60831-2)

	TYPE	Phase	Power (kVAr)			Dimensions Ø(D) x H(mm)
M Series (Mono-Phase)			**230V**	**400V**	**415V**	
MKP Technology	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
M Series (Mono-Phase) Heavy-Duty			**230V**	**415V**	**440V**	
MKP Technology	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
K Series (Three-Phase) Heavy-Duty			**400V**	**415V**	**440V**	
MKP Technology	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
K Series (Three-Phase) Heavy-Duty			**415V**	**480V**	**525V**	
MKP Technology	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
K Series (Three-Phase) Super Heavy-Duty			**415V**	**480V**	**525V**	
MKP Technology	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

CURRENT TRANSFORMERS (IEC / EN 60044-1)



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 (I_{th}) (1 sec.)	Rated continous thermal current (I_{cth})	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



Type	Dimensions (mm)				
	a	b	c	d	e
FAT 30B	104,25	88	62,5	68,6	48
FAT 30C	98	74,5	59,5	72,5	55
FAT 30	104,25	88	62,5	68,5	48
FAT 40	99,25	78	62,5	61,6	42
FAT 40C	99,25	78	62,5	61,5	42
FAT 60	128,75	104	62,5	63,6	44
FAT 100	156,25	146,5	62,5	63,6	44
FAT 130	210	191	60	63,5	42

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		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)

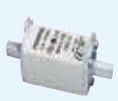
						
	Ammeter	**Ammeter (with 2 relays)**	**Voltmeter**	**Voltmeter (with 2 relays)**	**Multimeter**	**Multimeter**
TYPE	**FYA72-FYA96 FYA96-200**	**FYA72-2R/FYA96-2R FYA96-2R 200**	**FYV72-FYV96**	**FYV72-2R FYV96-2R**	**FMM40**	**FMM50-FMM50R**
Measurement Wave Form	AC (r.m.s.)	AC (r.m.s.)	AC (r.m.s.)	AC (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	50 ... 60Hz	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

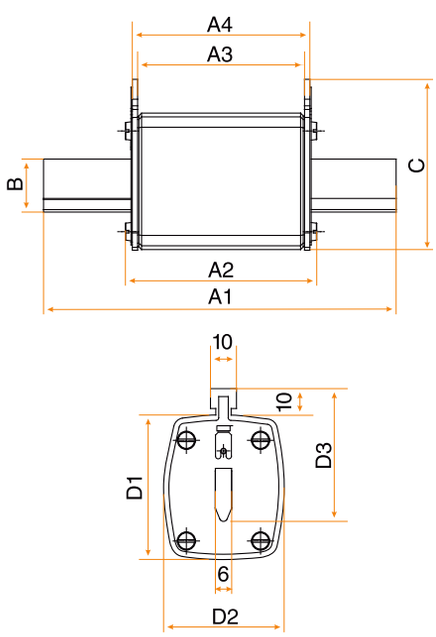
NH (H.R.C.) FUSES (SINGLE & DUAL INDICATORS) (IEC / EN 60269-1)

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.

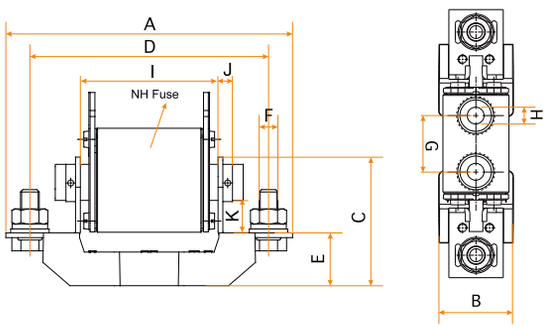
Note: NH body is **produced** as steatite and **glazed ceramic** according to customer and specification expectations.



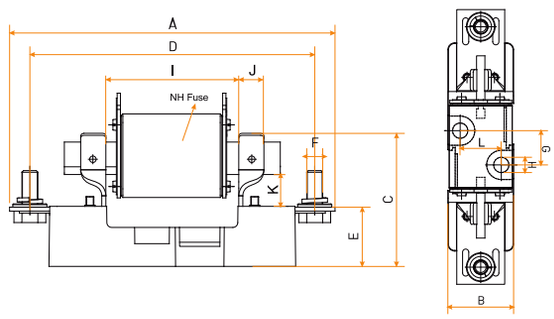
	Dimensions (mm)								
TYPE	**A1**	**A2**	**A3**	**A4**	**B**	**C**	**D1**	**D2**	**D3**
NH00-FB	78,5	54	45	50	15	58	48	29,5	45
NHC00-FB	78,5	54	45	49	15	47	36	21	45
NH0-FB	125	71	62	68	15	58	48	29,5	45
NH1-FB	135	72,6	62	68	20	64	52	46	50
NHC1-FB	135	71	62	68	15	58	48	29,5	45
NH2-FB	150	73,5	62	68	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		A	A	A	A	A	A
Switching Capacity		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

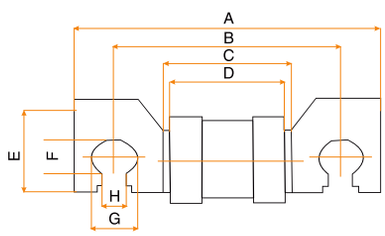
Solid Link is used by NH Fuse Bases for direct connection of contacts without fuse link. It's non-isolated type. NH00 - NH1 - NH2 - NH3

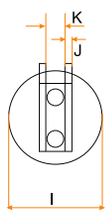
J TYPE FUSES

J type feeder pillar fuse links are designed to be used with wedge type fuse carriers. Type J fuse links are to be used in a.c. electricity supply networks. They are installed in distribution boards, feeder pillars, link boxes, pole mounted cut-outs and heavy duty service intakes, open type substation boards and undergroun connection boxes. They can also be fitted in hole or wall mounted outdoor service fuse links.

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

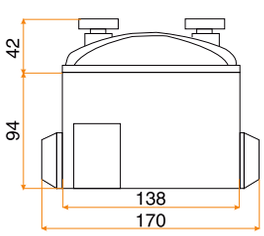
Rated Voltage	415V AC
Breaking Capacity	80kA
Class	gU
Cartidge	Ceramic
Connection	Bolted
Standard	IEC60269

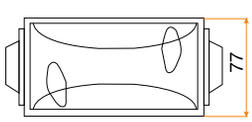




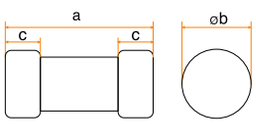
J TYPE FUSE BASES & FUSE CARRIER

-Maximum rating
-Fuse carrier with 83mm centers
-Moulded in white glass filled polyester thermoset material
-All contacts manufactured from solid brass
-Fuse Holder to use with J type fuse links
-Cable entry and exits through PVC grommet
-Maximum cable size 185mm²
-Refer to rage 14 for fuse bases, contacts and fuse handles



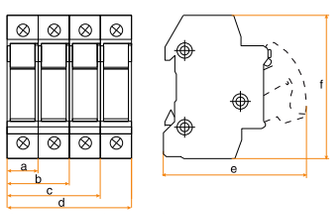


CYLINDRICAL FUSES (IEC / EN 60269)



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 ... 25	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)



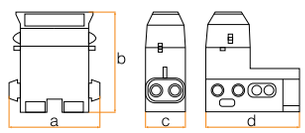
Dimension specified in "a" line, is increasing according to number of poles. (2P=a x 2, 3P=a x 3, 4P=a x 4)

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	1, 2, 3	1, 2, 3	1, 2, 3, 4	1
Dimensions	a mm	18	18	26,7	34,7	18
	e mm	78	80	95	104	80
	f mm	79	79	97	127	79

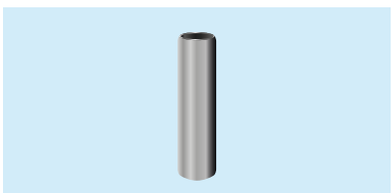
- AC20/DC20: switching under no-load conditions, AC22: switching of mixed resistive and inductive loads.
- B: devices which switch infrequently

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)



SOLID NEATURAL LINKS (IEC / EN 60269)



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

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

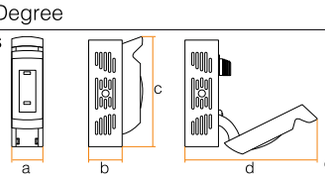
FUSE SWITCH DISCONNECTORS (IEC / EN 60947-3)

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

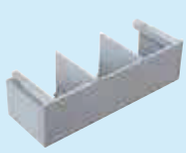
TYPE		FHS1 160			FHS1 250			FHS1 400			FHS1 630		
Conventional Thermal Current (I_{th}) 60°C	A	160			250			400			630		
Number of Poles		1			1			1			1		
Insulation Voltage (U_i)	V	800			800			800			800		
Impulse Withstand Voltage (U_{imp})	kV	8			8			8			8		
Frequency		50-60Hz			50-60Hz			50-60Hz			50-60Hz		
Operational Voltage (U_e)(phase-neutral)	V	240	290	400	240	290	400	240	290	400	240	290	400
Utilization Category		AC22B	AC22B	AC21B	AC22B	AC22B	AC21B	AC22B	AC22B	AC21B	AC22B	AC22B	AC21B
Operational Current (I_e)	A	160			250			400			630		
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		
Connection Conductor Cross-Section	mm2	70			120			240			2 x 185		
Power Loss per Pole	W	4			8			14			25		
Max- Min Tightening Torques	Nm	5 ... 8			14 ... 20			17 ... 25			28 ... 40		
Hole Diameter	Ø	M6			M10			M10			M12		
Weight	kG	0,29			0,74			1,27			1,49		
Protection Degree		IP20			IP20			IP20			IP20		
Dimensions 	width mm a	40			62			90			90		
	depth mm b	47			64			87			87		
	height mm c	175			247			280			280		
	depth lever open mm d	205			290			340			340		

Accessories

Brass Clamp

Seperator

Switch



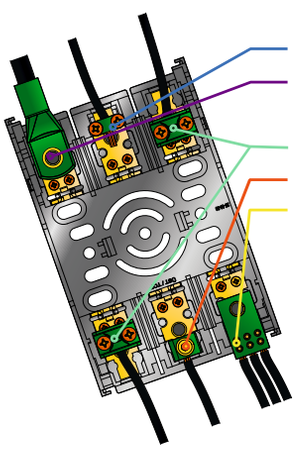
Terminal Cover

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.

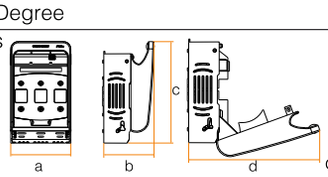
Flange Types



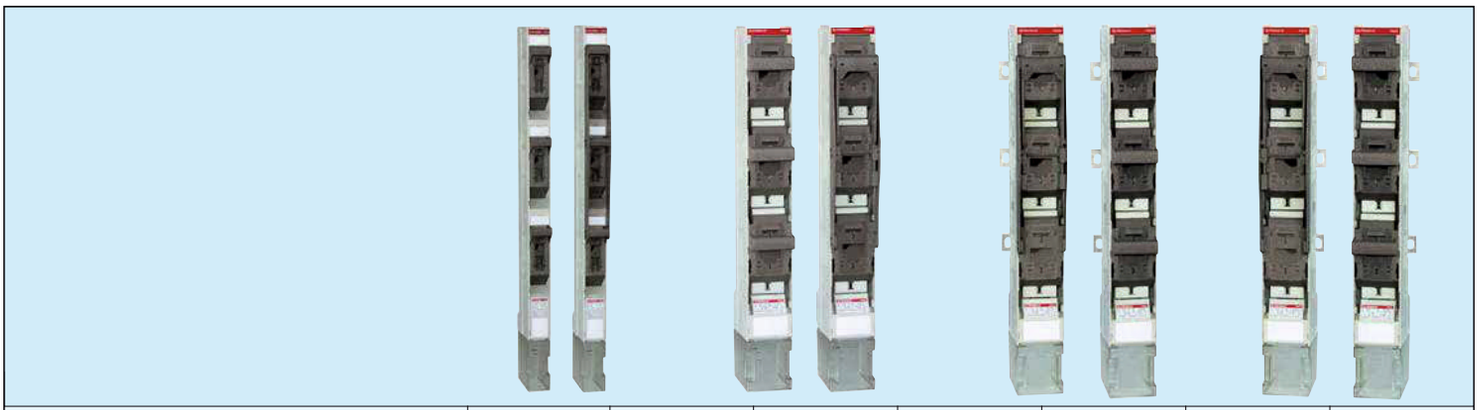
① Bridge clamps (optional)
② Screw and bolt connection (standard) (avaible for cable lugs)
③ Circle sliced clamps (optional)
④ Hook clamps (optional)
⑤ Brass clamps (optional)

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
- Structure suitable 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	800			800			800			800		
Impulse Withstand Voltage (Uimp)	kV	8			8			8			8		
Frequency		50-60Hz			50-60Hz			50-60Hz			50-60Hz		
Operational Voltage (Ue)(phase-neutral)	V	415	500	690	415	500	690	415	500	690	415	500	690
Utilization Category		AC23B	AC22B	AC21B	AC22B	AC22B	AC21B	AC22B	AC22B	AC21B	AC22B	AC22B	AC21B
Operational Current (Ie)	A	160	160	125	250	250	200	400	400	315	630	630	500
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		
Connection Conductor Cross-Section	mm2	70			120			240			2 x 185		
Power Loss per Pole	W	4			8			14			25		
Max- Min Tightening Torques	Nm	7 ... 10			14 ... 20			17 ... 25			28 ... 40		
Hole Diameter	Ø	M8			M10			M10			M12		
Weight	kG	0,70			1,51			3,27			3,85		
Protection Degree		IP20			IP20			IP20			IP20		
Dimensions 	width mm	a	106,5		187			250			250		
	depth mm	b	89		112			137			137		
	height mm	c	180		238			275			275		
	depth lever open mm	d	205,7		285			340			340		

FUSE SWITCH DISCONNECTORS (IEC / EN 60947-3)



TYPE		FVS160	FVS250	FVS400	FVS630	FVS800	FVS1000	FVS1250
Convertional Thermal Current (I_{th}) 60°C	A	160	250	400	630	800	1000	1250
Number of Poles		3	3	3	3	3	3	3
Insulation Voltage (U_i)	V	1000	1000	1000	1000	1000	1000	1000
Impulse Withstand Voltage (U_{imp})	kV	12	12	12	12	12	12	12
Operational Voltage (U_e) (50-60Hz) / Utilization Category	415V	AC23B	AC23B	AC23B	AC22B	AC22B	AC22B	AC22B
	500V	AC22B	AC22B	AC22B	AC22B	AC22B	AC22B	AC22B
	690V	AC21B	AC21B	AC21B	AC21B	AC21B	AC21B	AC21B
Operational Current (I_e)	A	160	250	400	630	800	1000	1250
Conditional Short-Circuit Current (with NH Fuse)	kA	85	85	85	70	85	70	70
Fuse Type (dispatched without fuse)	NH	000, 00	1,2	1,2	1,2,3	1,2	1,2,3	1,2,3
Mechanical Durability	operation	>30000	>20000	>20000	>20000	>20000	>20000	>20000
Electrical Durability	operation	>200	>200	>200	>200	>200	>200	>200
Connection Conductor Cross-Section	mm²	70	120	240	2x185	2x240	4x150	4x185
Power Loss per Pole	W	9	11	19	36	40	46	75
Min. - Max. Tightening Torques	Nm	7 ... 10	14 ... 20	17 ... 25	28 ... 40	17 ... 25	28 ... 40	28 ... 40
Hole Diameter	Ø	M8	M10	M10	M12	M10	M12	M12
Distance Between Main Busbar Terminals	mm	185	185 - 210	185 - 210	185 - 210	185 - 210	185 - 210	185 - 210
Weight	kg	2,4	5,6	5,6	6,9	12	15	15
Protection Degree		IP20	IP20	IP20	IP20	IP20	IP20	IP20

FVS 800A - 1000A - 1250A : Vertical Switch fuses are paralel connected. (Figure-6)
FVS 160A - 250A - 400A vertical type fuse switch disconnectors become measurable by placing current transformers (Figure-7) in each 3 phase seperately.
Current transformers are embedded in the fuse switch disconnectors and thus the volume of the disconnectors is maintained.

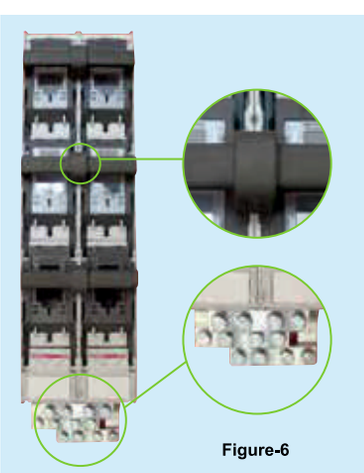


Figure-6

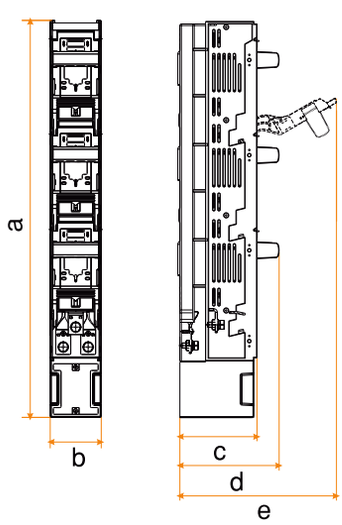
Figure-7

Advance Safety Level

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

Federal Electric vertical type fuse bases are designed to be installed vertically easily and quickly on horizontal bars with 185 mm spacing. Body material is made of fiberglass polyester resin (BMC) from thermoset material group and has very high electrical and mechanical properties. Resistant to flame and heat. The contacts used in the fuse bases are made of electrolyte copper and coated with silver.The covers located at the front and preventing contact with the contacts are made of external heat and fire resistant polyamide reinforced with fiberglass

TYPE			FVSB250	FVSB400	FVSB630
Convertional Thermal Current (I_{th}) 60°C		A	200 - 250	400	630
Number of Poles			3	3	3
Insulation Voltage (U_i)		V	1000	1000	1000
Impulse Withstand Voltage (U_{imp})		kV	12	12	12
Operational Current (I_e)	50-60Hz	415V A	200 - 250	400	630
	50-60Hz	500V A	200 - 250	400	630
	50-60Hz	690V A	200 - 250	400	630
Conditional Short-Circuit Current (with NH Fuse)		kA	85	85	70
Fuse Type (dispatched without fuse)		NH	1,2,3	1,2,3	1,2,3
Connection Conductor Cross-Section		mm²	95 - 120	240	2x185
Power Loss per Pole		W	7 - 11	19	36
Min. - Max. Tightening Torques		Nm	14 ... 20	17 ... 25	28 ... 40
Hole Diameter		Ø	M10	M10	M12
Distance Between Main Busbar Terminals		mm	185 - 210	185 - 210	185 - 210
Weight		kg	3	3,2	4,3
Protection Degree			IP20	IP20	IP20

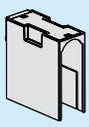


FUSES SWITCH DISCONNECTOR / FUSE RAIL DIMENSIONS

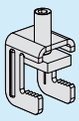
TYPE	Dimensions (mm)				
	a	b	c	d	e
FVS160 (With Three Seperate Handles)	765	49	126	137	205
FVS160 (With One Handle)	765	49	126	147	212
FVS250 / FVS400 / FVS630 (With Three Seperate Handles)	770	99	150	197	308
FVS250 / FVS400 / FVS630 (With One Handle)	770	99	150	204	457
FVSB200-250 / FVSB400 / FVSB630	668	99	150	-	-

FUSE SWITCH DISCONNECTORS AND FUSE RAIL ACCESSORIES

Fuse Holder



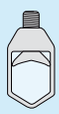
Terminal Cover



Hook Clamp

Bridge Clamp

Circle Sliced Clamp



V Clamp

Micro Swich

Padlock

Extension Bars

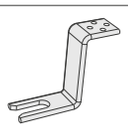
		Vertical type f (Figure-9) and product to be
		The length of assemble all u
		

Figure-8

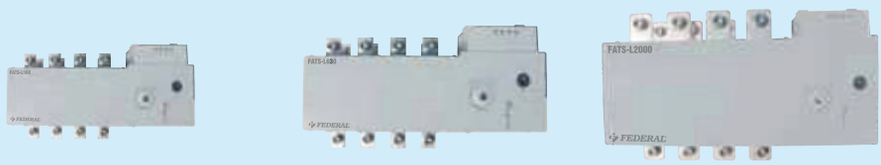
Figure-9

Figure-10

For detailed catalogue visit www.federal.com.tr

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

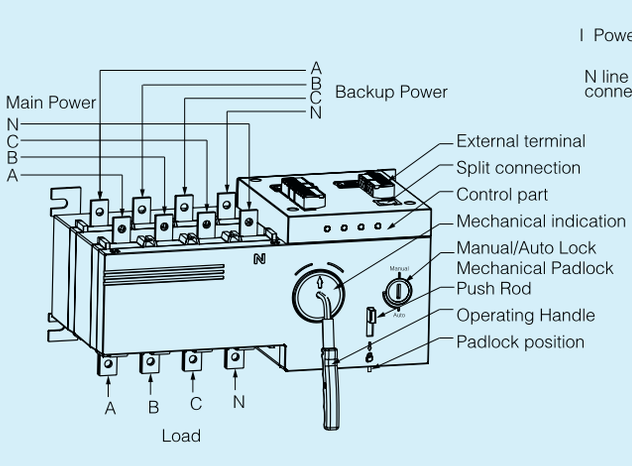
Automatic transfer switch mainly used for electric distribution network or motor network with rated voltage AC 380V, 50Hz, DC rated voltage 220V, rated current 3200A, change over between main power and backup power system, power grid and genset. Meanwhile can be used as isolation of unfrequency making and breaking circuit. 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.



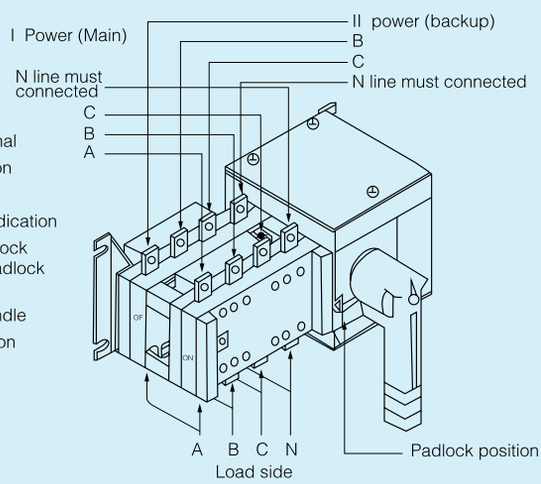
TYPE		FATS-L 100	FATS-L 160	FATS-L 250	FATS-L 630	FATS-L 1000	FATS-L 1600	FATS-L 2000	FATS-L 2500	FATS-L 3200
Rated Thermal Current (I_{th}) 60 °C	A	100	125, 160	200, 250	400, 630	800, 1000	1250, 1600	2000	2500	3200
Number of Poles		3 / 4	3 / 4	3 / 4	3 / 4	3 / 4	3 / 4	4	4	4
Insulation Voltage (Ui)	V	500	500	500	500	500	500	1000	1000	1000
Impulse Withstand Voltage (Uimp)	kV	8	8	8	8	8	8	12	12	12
Utilization Category ①②③④	400V	AC32B (PC)								
Rated Current (I_e)	400V A	100	125, 160	200, 250	400, 630	800, 1000	1250, 1600	2000	2500	3200
Short Time Withstand Current (I_{cw})	kA/1s	5	10	12	20	50	50	50	50	55
Mechanical Durability	op.	> 6000	> 6000	> 6000	> 4000	> 3000	> 3000	> 2000	> 2000	> 2000
Electrical Durability	op.	> 1500	> 1000	> 1000	> 1000	> 500	> 500	> 500	> 500	> 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	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3
Dimensions (Width x Height, Depth)	Width mm	244	301	373	433	636	636	633	633	633
	Height mm	135	175	200	265	345	345	455	455	505
	Depth mm	125	150	198	244	320	320	495	495	495

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
④ Utilization Category: AC32=3I_n

PRODUCT INSTRUCTION



100A ... 1600A



2000A ... 3200A

LOAD BREAK SWITCH (IEC / EN 60947-3)

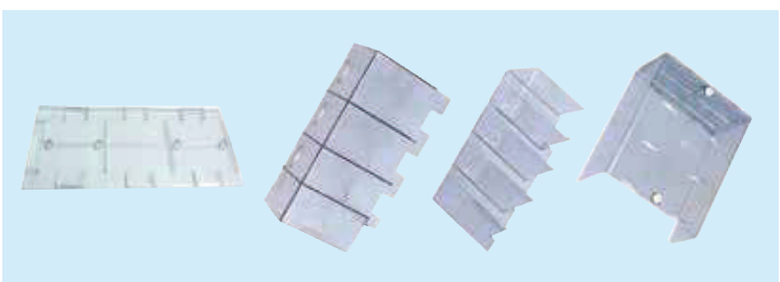


Technical Specifications

TYPE				FLS 160	FLS 250	FLS 400	FLS 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 Fuse)			kA	65	65	65	65
Short Time Withstand Current (I_{cw})			kA/1s	8	15	18	25
Mechanical Durability			op.	> 10000	> 10000	> 10000	> 8000
Electrical Durability			op.	> 1000	> 1000	> 1000	> 1000
Connection Conductor Cross-Section			mm²	70	120	240	2x185
Power Loss Per Pole			W	12	25	35	65
Min. - Max. Tightening Torques			Nm	7...10	14...20	17...25	28...40
Hole Diameter			Ø	M8	M10	M10	M12
Weight			kG	2,4 / 2,7	3,8 / 4,2	3,9 / 4,3	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



Accessories

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

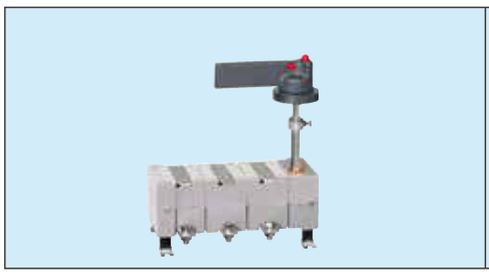
Note: Terminal cover provides safe insulation in accordance with EN norms, by avoiding had contact of cable connection terminals and fuse connection sections of load separators.

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

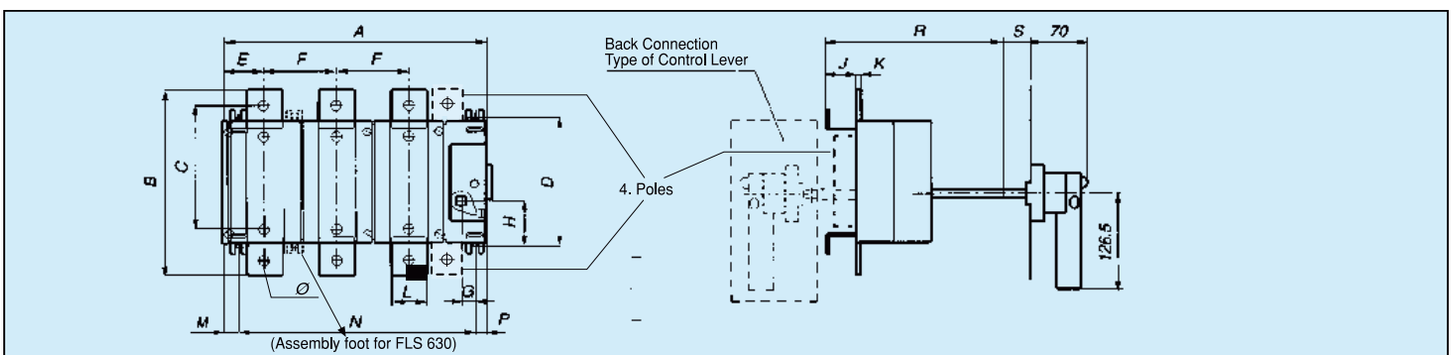
TOP COVER PLATE	
OP160	FLS160
OP250 - OP400	FLS250 - FLS400
OP630 - OP1600	FLS500 ... FLS1600

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

LOAD BREAK SWITCH (IEC / EN 60947-3)



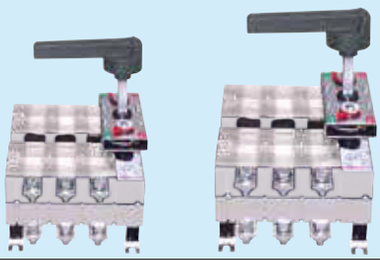
FLS 800	FLS 1000	FLS 1250	FLS 1600	FLS 1800	FLS 2000
800	1000	1250	1600	1800	2000
3 / 4	3 / 4③	3 / 4③	3 / 4③	3	3
1000	1000	1000	1000	1000	1000
8	8	8	8	8	8
AC22A	AC22A	AC21A	AC21B	AC21B	AC21B
800	1000	1250	1600	1800	2000
800	1000	1250	1600	1800	2000
630	800	1000	1250	1600	1750
DC22B	DC22B	DC21B	DC21B	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
2x240	40x15	2x(40x10)	2x(50x10)	3x(50x10)	3x(50x10)
55	80	125	165	210	260
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		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	10 - 70	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



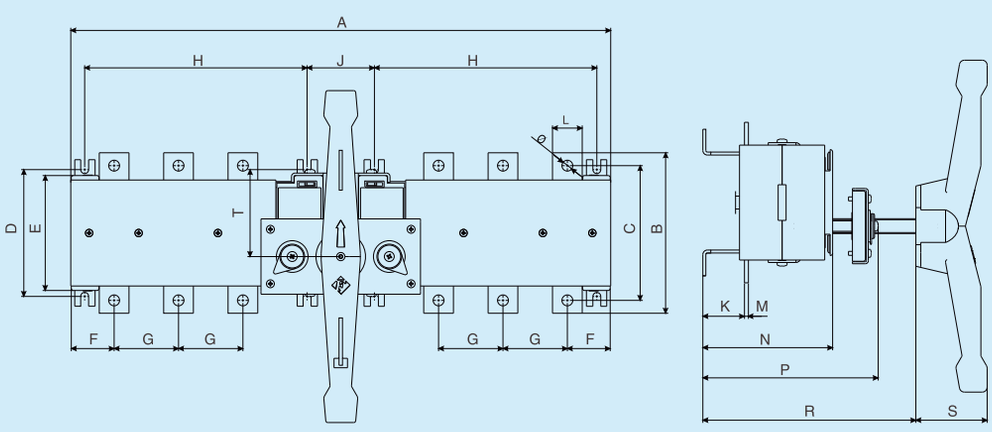
FLS EH

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
Connection Conductor Cross-Section			mm²	70	120	240	2x185
Power Loss Per Pole			W	9	12	25	47
Min. - Max. Tightening Toques			Nm	7...10	7...10	17...25	17...25
Hole Diameter			Ø	M8	M8	M10	M10
Weight			kG	5,8 / 6,4	6,0 / 6,8	9,2 / 10	9,2 / 10

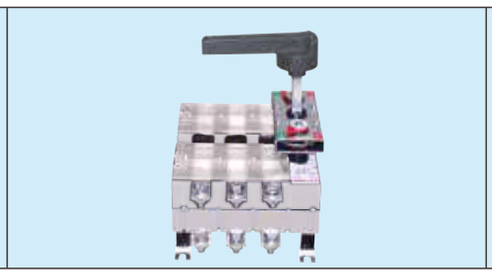
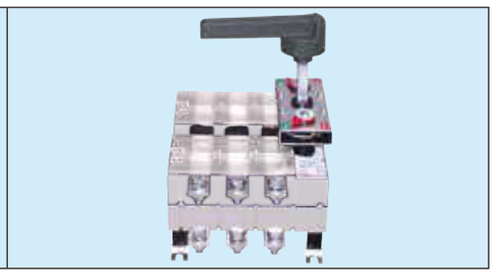
① AC21/DC21 : Switching resistive loads
AC22/DC22/AC32 : Switching combination of inductive and resistive loads
AC23/DC23 : Switching motor loads
② A: Frequent switching equipment B: Infrequent switching equipment
③ Neutral pole current is 800A

- 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

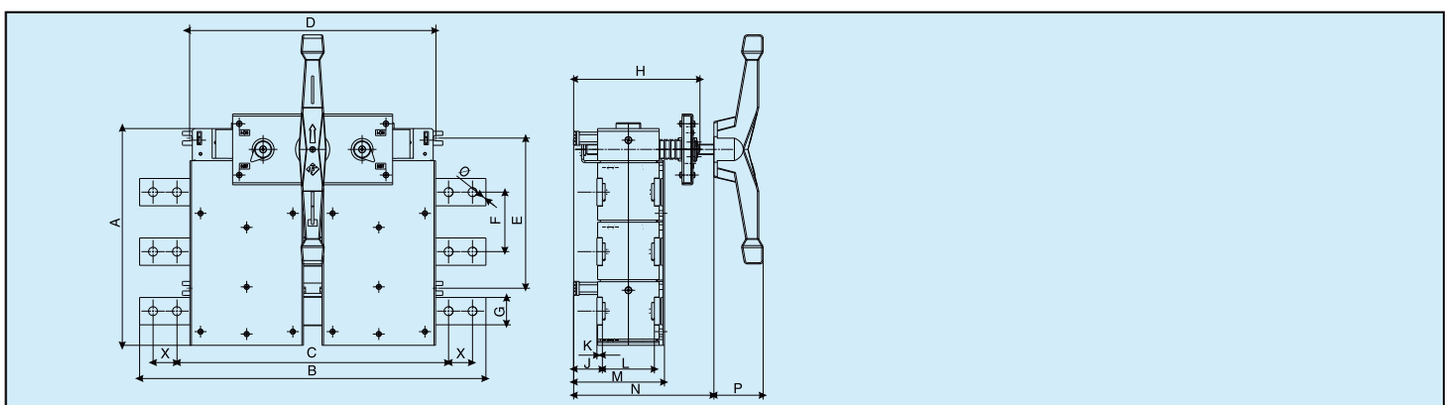


TYPE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	Ø
FLS160EH	412	142	123	106	101	37	43	160	68	28	20	3	100	150	195	42	?	8
FLS250EH	545	162	136	128	116	43	65	220		42	25	4	131	177	215	72	88	11
FLS400EH											30							
FLS630EH	671	243	202	168	166	50	87		65	36	40	6	133	186	217		108	13

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

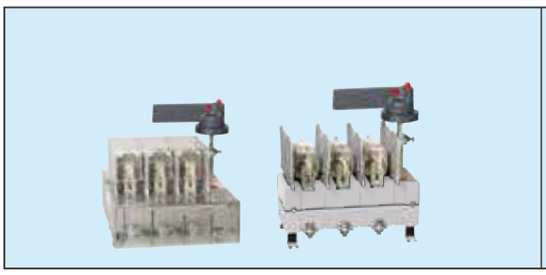
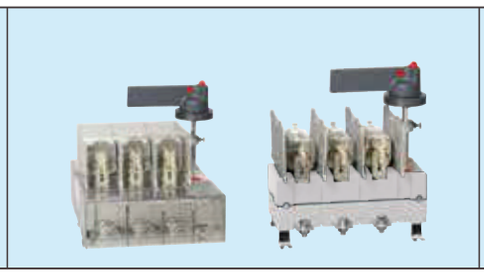
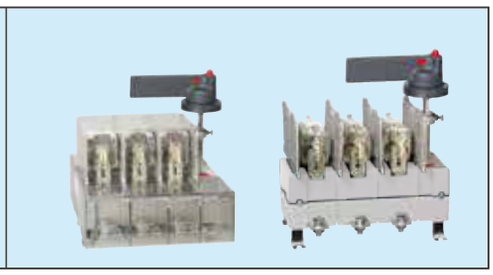




FLS 800EV	FLS 1000EV	FLS 1250EV	FLS 1600EV	FLS 1800EV	FLS 2000EV
800	1000	1250	1600	1800	2000
3 / 4	3 / 4 ③	3 / 4 ③	3 / 4 ③	3	3
1000	1000	1000	1000	1000	1000
8	8	8	8	8	8
AC22A	AC22A	AC21A	AC21B	AC21B	AC21B
800	1000	1250	1600	1800	2000
800	1000	1250	1600	1800	2000
630	800	1000	1250	1600	1750
65	65	65	65	65	65
35	35	35	35	35	35
> 8000	> 8000	> 8000	> 8000	> 8000	> 8000
> 500	> 500	> 500	> 200	> 150	> 150
2x240	40x15	2x(40x10)	2x(50x10)	3x(50x10)	3x(50x10)
55	80	125	165	210	210
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)

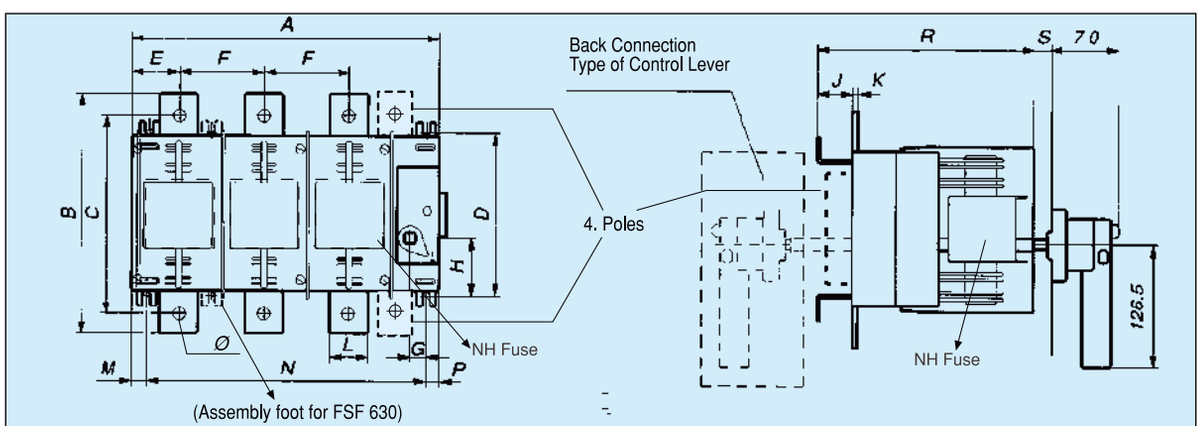




Technical Specifications

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
Connection Conductor Cross-Section			mm²	70	120	240	2x185
Power Loss Per Pole			W	12	25	35	65
Min. - Max. Tightening Torques			Nm	7...10	14...20	17...25	28...40
Hole Diameter			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

DC PRODUCTS

MINIATURE CIRCUIT BREAKER

FM10 DC - FM10L DC
0,5A-63A / 80A-125A
1P:250V - 2P: 500V
3P:750V - 4P:1000V

PV

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 - 2,6kV - 3,5kV - 3,8kV

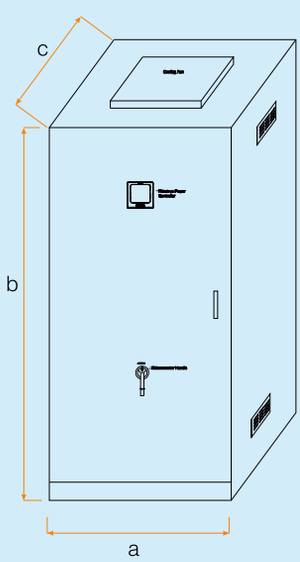
CONTACTOR

FC09D - FC750D
DC-1: 20A - 850A
DC-3, DC-5: 8A - 700A

CYLINDRICAL FUSE & BASE

FCF - DC / FCFB - DC
1000V DC
1A - 32A / 32A

CAPACITOR BANK (IEC / EN 60439-1)



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 Grade (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 Grade (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 (IEC / EN 61439-1)

F31- CUTOUT

F51- CUTOUT

Technical Specifications

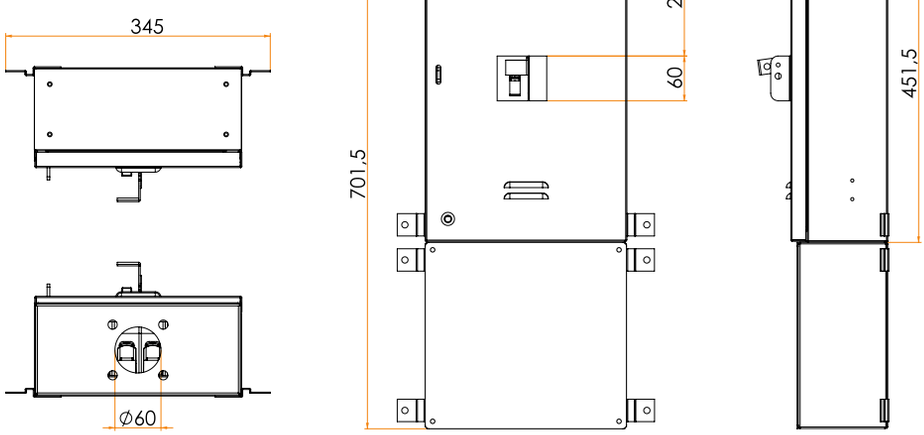
- Enclosure boards of circuit breakers for industrial machines or industrial processes
- Rated operating current up to 400 Amp
- Production in accordance with IEC 61439-1 Standard
- Fig-1 and Fig-2 spreader box configurations
- Applicability of portable variable dimensions according to the requested 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

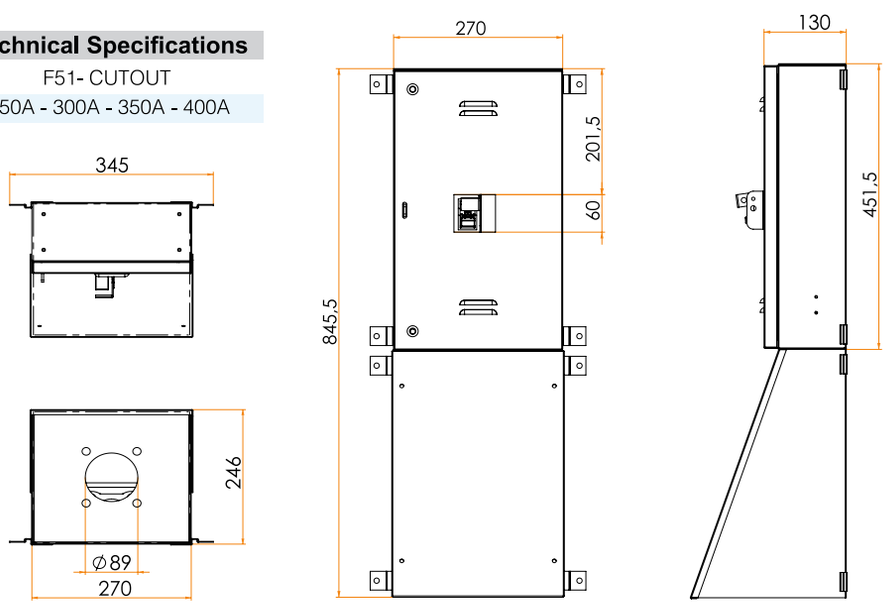
150A - 200A



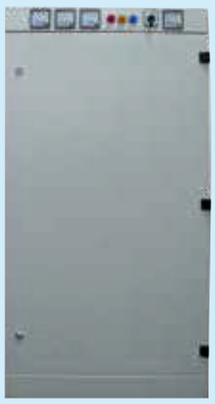
Technical Specifications

F51- CUTOUT

250A - 300A - 350A - 400A



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

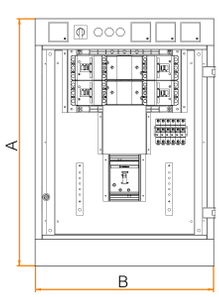


Technical Specifications

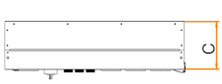
- 250 Amp, 400 Amp, 630 Amp distribution board versions
- Possibility of connection outgoing breakers 2 to 24 pcs.
- Outgoing breaker connection up to 250 Amp
- Production in accordance with IEC 60529 and IEC 61439-1 Standards.
- IP43*
- Possibility to connect measuring instruments (voltmeter, ammeter) (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	250A-400A-630A	250A-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



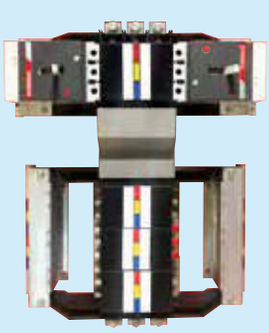
Interior view



Interior view

SMDB With Outgoing F31	Outgoing Ways TP	Height (A)		Width (B)	Depth (C)
		400A	630A	400A-630A	400A-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 61436-1)



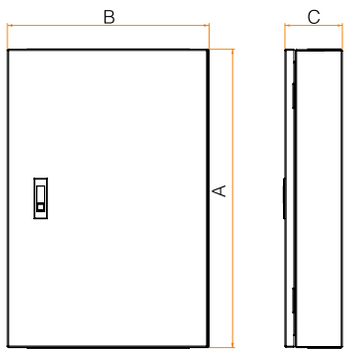
- Up to 630A incomer breaker connection.
- 2 to 24 pcs. ways (3 pole) Federal F11 - F12, F31 type switch output means
- Conformity with IEC 60439-1 and CE norms
- Easy and reliable maintenance
- Aesthetic apperance
- Completely equipped
- Dispatch with panel as optional
- Direct connection without main 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

EASYPAN DISTRIBUTION BOARD (DB) (IEC / EN 61439-3)

Technical Specifications

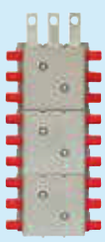
- Incoming circuit up to 125 Amp with MCB or RCCB incomer, up to 160 Amp with MCCB incomer (Main busbar is tested and rated at full load 200 Amp.)
- Possibility of connection outgoing breakers 4 to 20 pcs.
- Outgoing breaker connection up to 63 Amp.
- Production in accordance with IEC 60529 and IEC 61439-3 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.



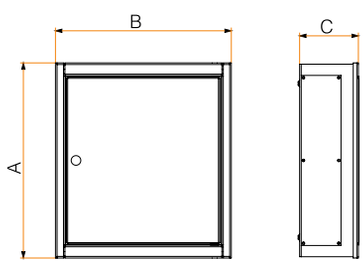
Outgoing Ways TP	A	B	C
4	520	430	120
6	575	430	120
8	635	430	120
10	720	430	120
12	805	430	120
14	890	430	120
16	975	430	120
20	1060	430	120

DISTRIBUTION BUSBAR



- 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

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

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

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

RELAYS

Phase Protection Relays

TYPE	Description
FMFK	Phase Sequency and Motor Protection (Adjustable)
MTPR1	Phase Protection
FSMK	Phase Sequency and Motor Protection

Liquid Level Relays

TYPE	Description
	Liquid Level Relay

Time Relays

TYPE	Description
FT30	0-30 sec.
FT24R	Charge reserve approx 100h max.

Photoelectric Switches With Sensor

TYPE	Description
FPS	Has manually adjustable Lux scale (1-3 Lux), The activation - deactivation delay is set to 5 -40 sec. on relay output.

Digital Thermostats

TYPE	Description
FDT72	72 x 72
FDT72	96 x 96

Microprocess Counters

TYPE	Description
FS72	72 x 72

SIGNAL LAMPS

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

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

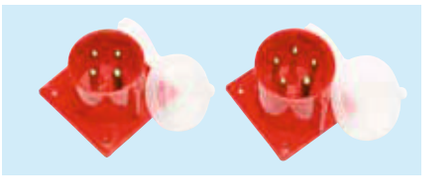
PLUG

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

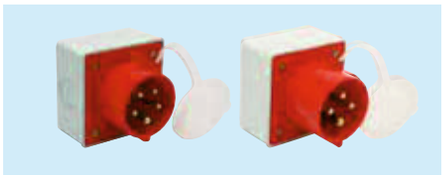
TYPE	Amper (A)	(V)	(h)	Color	IP
2P+E	32	200-250	6	●	IP44
3P+E	16 - 32	380-415	6	●	IP44
3P+N+E	16 - 32	380-415	6	●	IP44
3P+E	63	380-415	6	●	IP67
3P+N+E	63	380-415	6	●	IP67

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

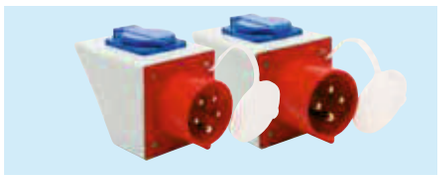


TYPE	Amper (A)	(V)	(h)	Color	IP
3P+E	32	380-415	6	●	IP44
3P+N+E	16-32	380-415	6	●	IP44

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

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	0,5bar	
Leakage Test Pressure Value	750mbar	
Measurring Volume	1,2dm³	
Operating Temperature	-25°C, +55°C	
Storage Temperature	-30°C, +70°C	
Body	Galvanized 0,8mm Deep Extrusion Steel	
Weight	2kg	

	
TYPE	**FNG4 - CPPU V2**
Gas Type	Natural Gas - LPG - Air Gas
Q Min	0,04m³ /h
Q Max	6m³ /h
Max. Operatin Pressuer	500mbar
Measuring Volume	1,2dm³
Operating Temperature	-25°C, +55°C
Body	0,8 mm galvanized deep drawing steel sheet
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 sprecial 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)
Counter Safety	Detection of counter and battery cover opening Detection of optical reading failures Detection of magnetic interference
Communication	RF-868 two way communication, information exchange and meter controlling, Preriodic data transfer between meter & system , Transferring the data collected from the meter to the system at certain intervals
Optionel 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.

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