

## Main switches & Emergency-stop switches for machinery - Series ML

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## Main switches

**AUXILIARY DEVICES** Control and signalling units

Electronic relays and limit switches

**POWER ELECTRONICS** Speed drive units

Soft starters

Lighting dimmer-stabilizer/Numerical index

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## Main switches

A manual operated main switch must be provided for every mains circuit. It must be a switch-disconnector corresponding to utilization category AC23 (IEC 947-3) fulfils the following requirements:

- Disconnecting the electrical equipment from the main.
- Visible contact indication or a disconnection function by construction (the handle is in the "OFF" position when all contacts are open).
- If the main switch does not serve simultaneously as an emergency-stop switch, its handle should not be red. Black or grey handles are recommended.
- It should be lockable in the off-position (e.g. by padlock).
- All active conductors are to be disconnected from the main.
- The breaking capacity should be sufficient. In order to break the current of the largest motor in a blocked state together with the sum of the operating currents of the remaining motors/loads.
- The handle of the main switch must be easily accessible and must lie between 0.6 and 1.9 m above the incomer level.

## Standards

- Complying with:
- IEC 60947-3
  - EN 60947-3
  - DIN VDE 0660 Teil 107
  - low voltage directive 73/73 EEC
  - low voltage directive EMC 89/336 EEC

## Approvals/Marking

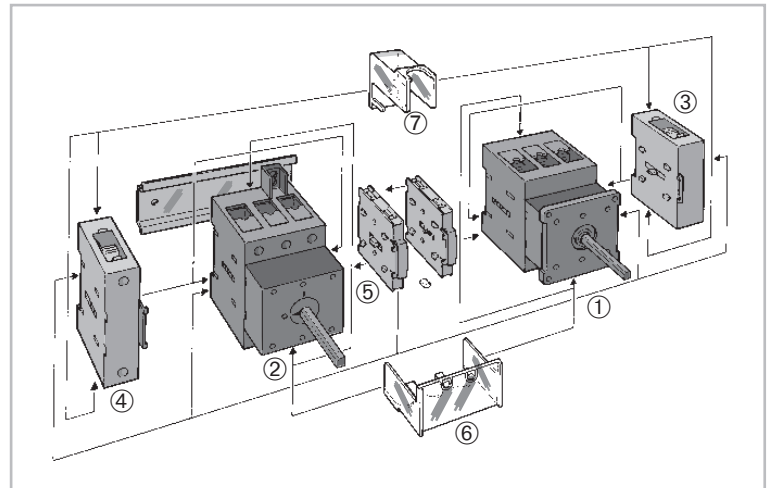


## Emergency-stop switches

The main switch may fulfil the function of an emergency-stop switch on certain machines.

The handles must be red on a yellow background.

The contacts of manual operated emergency-stop switch has to be opened by force.

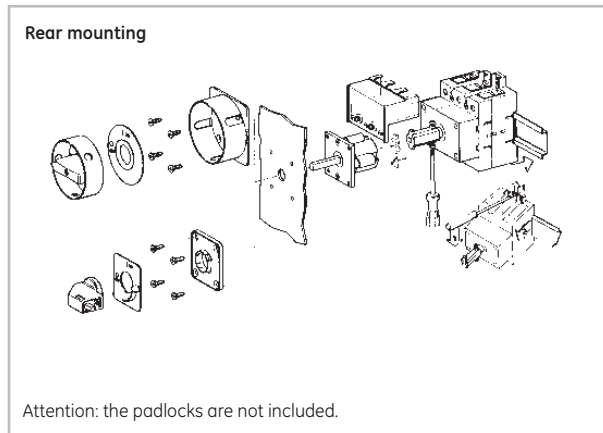
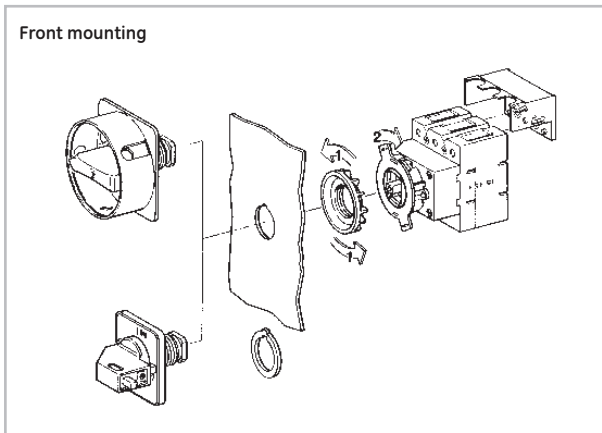


- ① Front mounting (flush mounting)
- ② Rear mounting
- ③ Main contact and PE-or N-terminals for ①
- ④ Main contact and PE-or N-terminals for ②
- ⑤ Auxiliary switch 1NO/1NG for ① and ②
- ⑥ Terminal cover triple for ① and ②
- ⑦ Terminal cover single for ③ and ④


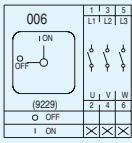

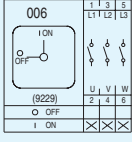

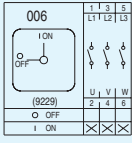

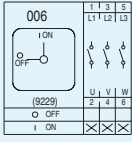

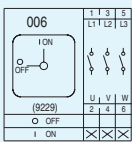
- Mounting possibilities ● pg. E.3  
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**Mounting possibilities**

	lth	25A	40A	63A	80A	125A
	Series	ML 1	ML 1	ML 2	ML 2	ML 3
	Colour					
<b>Front mounting (flush mounting)</b>						
<b>Central fixing</b>						
Ø 22.5 mm for 3 padlocks	red/yellow	789178	789179			
Ø 22.5 mm for 3 padlocks	black	789180	789181			
Ø 22.5 mm for 1 or 2 padlocks	red/yellow	789174	789175			
Ø 22.5 mm for 1 or 2 padlocks	black	789176	789177			
<b>4-hole fixing</b>						
With standard handle	black	789239	789240	789241	789242	789243
For 3 padlocks	red/yellow	789186	789187	789188	789189	789190
For 3 padlocks	black	789191	789192	789193	789194	789195
For 1 or 2 padlocks	red/yellow	789182	789183			
For 1 or 2 padlocks	black	789184	789185			
<b>Rear mounting</b>						
<b>With cover coupling</b>						
For 3 padlocks	red/yellow	789200	789201	789202	789203	789204
For 3 padlocks	black	789205	789206	789207	789208	789209
For 1 or 2 padlocks	red/yellow	789196	789197			
For 1 or 2 padlocks	black	789198	789199			
<b>With door coupling</b>						
For 3 padlocks	red/yellow	789214	789215	789216	789217	789218
For 3 padlocks	black	789219	789220	789221	789222	789223
For 1 or 2 padlocks	red/yellow	789210	789211			
For 1 or 2 padlocks	black	789212	789213			
<b>DIN-rail mounting</b>						
With standard handle	black	789234	789235	789236	789237	789238
For 1 or 2 padlocks	red/yellow	789224	789225	789226	789227	789228
For 1 or 2 padlocks	black	789229	789230	789231	789232	789233


















## Standard programme

Central fixing Ø 22.5 mm		Diagram	Terminal cover	Protection	Ithe	Red/yellow	Black/gray	Pack
						Ref. no.	Ref. no.	
	<b>Locking handle by 1 or 2 padlocks</b>		✓	IP65	25A	<b>789174</b>	<b>789176</b>	1
			✓	IP65	40A	<b>789175</b>	<b>789177</b>	1
	<b>Locking handle by 3 padlocks</b>		✓	IP65	25A	<b>789178</b>	<b>789180</b>	1
			✓	IP65	40A	<b>789179</b>	<b>789181</b>	1
	<b>Locking handle by 1 or 2 padlocks</b>		✓	IP55	25A	<b>789182</b>	<b>789184</b>	1
			✓	IP55	40A	<b>789183</b>	<b>789185</b>	1
	<b>Locking handle by 3 padlocks</b>		✓	IP55	25A	<b>789186</b>	<b>789191</b>	1
			✓	IP55	40A	<b>789187</b>	<b>789192</b>	1
			✓	IP55	63A	<b>789188</b>	<b>789193</b>	1
			✓	IP55	80A	<b>789189</b>	<b>789194</b>	1
			✓	IP55	125A	<b>789190</b>	<b>789195</b>	1
	<b>With standard black handle</b>		-	IP55	25A	-	<b>789239</b>	1
			-	IP55	40A	-	<b>789240</b>	1
			-	IP55	63A	-	<b>789241</b>	1
			-	IP55	80A	-	<b>789242</b>	1
			-	IP55	125A	-	<b>789243</b>	1

Accessories see E.6

Standard programme

DIN-rail mounting			Terminal cover	Protection	Ithe	Red/yellow	Black/gray	Pack
						Ref. no.	Ref. no.	
 <p>Locking handle by 1 or 2 padlocks</p>	 <p>With standard black handle</p>	 <p>Locking handle by 1 or 2 padlocks</p>	✓	IP30	25A	789224	789229	1
			✓	IP30	40A	789225	789230	1
			✓	IP30	63A	789226	789231	1
			✓	IP30	80A	789227	789232	1
			✓	IP30	125A	789228	789233	1
 <p>Locking handle by 3 padlocks</p>	 <p>Locking handle by 1 or 2 padlocks</p>	 <p>Locking handle by 3 padlocks</p>	-	IP30	25A		789234	1
			-	IP30	40A		789235	1
			-	IP30	63A		789236	1
			-	IP30	80A		789237	1
			-	IP30	125A		789238	1
 <p>Locking handle by 3 padlocks</p>	 <p>Locking handle by 1 or 2 padlocks</p>	 <p>Locking handle by 3 padlocks</p>	✓	IP55	25A	789210	789212	1
			✓	IP55	40A	789211	789213	1
			✓	IP55	25A	789214	789219	1
			✓	IP55	40A	789215	789220	1
			✓	IP55	63A	789216	789221	1
 <p>Locking handle by 3 padlocks</p>	 <p>Locking handle by 1 or 2 padlocks</p>	 <p>Locking handle by 3 padlocks</p>	✓	IP55	80A	789217	789222	1
			✓	IP55	125A	789218	789223	1
			✓	IP65	25A	789196	789198	1
			✓	IP65	40A	789197	789199	1
			✓	IP65	25A	789200	789205	1
 <p>Locking handle by 3 padlocks</p>	 <p>Locking handle by 1 or 2 padlocks</p>	 <p>Locking handle by 3 padlocks</p>	✓	IP65	40A	789201	789206	1
			✓	IP65	63A	789202	789207	1
			✓	IP65	80A	789203	789208	1
			✓	IP65	125A	789204	789209	1

Accessories see E.6



## Accessories - Contact blocks<sup>(1)</sup>



Neutral switched		
Front	Rear	
789244	789245	1
Series ML1		
789246	789247	1
Series ML2		
789248	789249	1
Series ML3		

Fixed neutral module		
Front	Rear	
789262	789263	1
Series ML1		
789264	789265	1
Series ML2		
789266	789267	3
Series ML3		



Switching contact		
Front	Rear	
789250	789251	1
Series ML1		
789252	789253	1
Series ML2		
789254	789255	1
Series ML3		

Auxiliary contact NO+NC Ith = 16A		
Front	Rear	
789268	789269	1
Series ML1		
789268	789269	1
Series ML2		
789268	789269	1
Series ML3		



PE-terminal (Fixed)		
Front	Rear	
789256	789257	1
Series ML1		
789258	789259	1
Series ML2		
789260	789261	1
Series ML3		

## Accessories - Terminal cover



Single terminal cover (HS1)		
Series ML1	789270	1
Series ML2	789271	1
Series ML3	789271	1

Triple terminal cover (HS3)		
Series ML1	789272	1
Series ML2	789273	1
Series ML3	789274	1
Same cover for front or rear mounting		

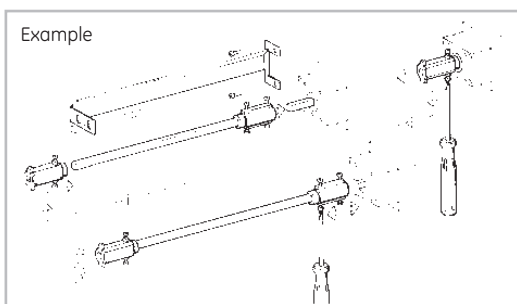


## Extension shafts for door coupling



Shaft length	Depth range between door and base (mm)		Cat. no.
	ML1	ML2, ML3	
AL-65	170-215 mm	185-320 mm	789275
AL-165	265-335 mm	280-350 mm	789276
AL-265 <sup>(2)</sup>	365-435 mm	380-450 mm	789277
AL-365 <sup>(2)</sup>	465-535 mm	480-550 mm	789278
Shaft support for 265 and 365 mm			789279

An extension shaft is necessary when the depth is higher than the length of the standard shaft.  
 ML1: 105-135 mm  
 ML2 and ML3: 120-150 mm



- (1) ML1: max. 2 units  
ML2 and ML3: max 3 units
- (2) Shaft support included.



Enclosed switches



The maintenance switch is an enclosed main switch with locking handle by 3 padlocks. With red handle and yellow front plate, if it should be used as an emergency-stop switch, otherwise black/grey.

There are six sizes of standard enclosures for the series ML. Each is equipped with a cover coupling and a double PE-terminal.

All enclosures have a degree of protection IP65 and are of solid impact and flame resistant polyester.

Enclosed switches

	Diagram	Ithe	Type of enclosure	Black/grey 3 padlocks	Red/yellow 3 padlocks	Pack.
				Ref. no.	Ref. no.	
Three poles		25A	E2	789285	789280	1
		32A	E3	789286	789281	1
		50A	E4	789287	789282	1
		63A	E5	789288	789283	1
		100A	E7	789289	789284	1
		Four poles		25A	E2	789295
32A	E3	789296		789291	1	
50A	E4	789297		789292	1	
63A	E5	789298		789293	1	
100A	E7	789299		789294	1	
Three poles + (1 NO + 1 NC)		25A		E2	789305	789300
		32A	E3	789306	789301	1
		50A	E4	789307	789302	1
		63A	E5	789308	789303	1
		100A	E7	789309	789304	1
		Four poles + (1 NO + 1 NC)		25A	E2	789315
32A	E3			789316	789311	1
50A	E4			789317	789312	1
63A	E5			789318	789313	1
100A	E7			789319	789314	1
Six poles				25A	E2	789325
		32A	E3	789326	789321	1
		50A	E4	789327	789322	1
		63A	E5	789328	789323	1
		100A	E7	789329	789324	1
		Six poles + (1 NO + 1 NC)		25A	E2	789335
32A	E3			789336	789331	1
50A	E4			789337	789332	1
63A	E5			789338	789333	1
100A	E7			789339	789334	1

Main switches

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## Technical data

### Main switches - According to IEC 60947-3, EN 60947-3, DIN VDE 0660 part 107, UL and CSA

Series			ML 1	ML 1	ML 2	ML 2	ML 3
Rated uninterrupted current	$I_{u \text{ open}} = I_{th}$	(A)	25	40	63	80	125
	$I_{th \text{ enclosed}}$	(A)	25	32	50	63	100
Rated insulation voltage $U_i$ (III/3)		(V)	690	690	690	690	690
Rated impulse withstand voltage $U_{imp}$ (III/3)		(kV)	6	6	6	6	6
Rated operational current $I_e$ AC21 A <sup>(3)</sup>		(A)	25	40	63	80	125
Rated operational voltage $U_e$		(V)	690	690	690	690	690
Frequency		(Hz)	50/60	50/60	50/60	50/60	50/60
<b>Making/breaking capacity</b>							
Utilization category AC3:	3 x 230V	(kW)	5.5	7.5	15	18.5	22
Motor switches for	3 x 400V	(kW)	7.5	11	22	30	37
operational switching	3 x 690V	(kW)	7.5	11	22	30	45
Utilization category AC23A <sup>(3)</sup>	3 x 230V	(kW)	7.5	11	18.5	22	25
Motor switches	3 x 400V	(kW)	11	15	30 <sup>(1)</sup>	37 <sup>(2)</sup>	45
(Main switches for machinery)	3 x 690V	(kW)	11	15	30 <sup>(1)</sup>	37 <sup>(2)</sup>	45
Rated breaking category AC23 A <sup>(3)</sup>	3 x 230V	(A)	260	390	630	750	870
	3 x 400V	(A)	220	300	570	700	850
	3 x 690V	(A)	130	170	330	400	490
<b>Short-circuit capacity</b>							
Max. fuse rating gG		(A)	50	50	80	80	125
Rated conditional short-circuit current		(kA <sub>eff</sub> )	10	10	-	-	-
Rated short-circuit making capacity $I_{cm}$		(kA)	-	-	2.1	2.1	3.4
Rated short-time withstand $I_{cw}$ (1s-current)		(A <sub>eff</sub> )	300	480	765	960	1500
Disconnect function up to		(V)	690	690	690	690	690
Terminal screws (Pozidriv)			M4	M4	M5	M5	M6
Torque terminal screws		(Nm)	2.5	2.5	4	4	6
<b>Cable cross section</b>							
Solid or multi-stranded (Cu)		min. - max. (mm <sup>2</sup> )	1.5-10	1.5-10	2.5-35	2.5-35	6-70
Flexible with ferrule (DIN 46228)		min. - max. (mm <sup>2</sup> )	1.5-6	1.5-6	1.5-25	1.5-25	6-50
General purpose 3-phase		(A)	25	40	63	80	125
		(V)	600	600	600	600	600
 Motor 3-phase	240V	(HP)	7.5	10	15	20	25
	480V	(HP)	10	20	30	40	50
	600V	(HP)	10	20	30	40	50
 Motor 1-phase (2 pole)	120V	(HP)	1	1.5	3	4	6
	240V	(HP)	2	3	7.5	10	15
Cable cross section		AWG-No	14-7	14-3	14-2	14-2	8-1/0

(1) 22 kW in enclosure

(2) 30 kW in enclosure

(3) ML2/ML3 according to EN 60947-3 category B

### Auxiliary contact for main switches - According to IEC 60947-5-1

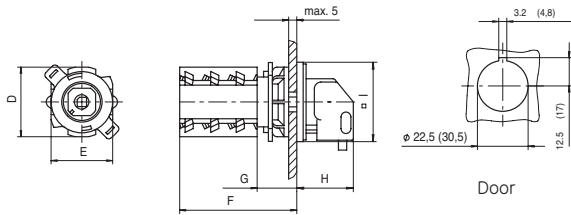
Series			ML 1/2/3			
Rated uninterrupted current	$I_{u \text{ open}} = I_{th}$	(A)	16			
	$I_{th \text{ enclosed}}$	(A)	16			
Rated insulation voltage $U_i$ (III/3)		(V)	690			
Rated impulse withstand voltage $U_{imp}$		(kV)	6			
Rated operational current	$I_e$ (AC15)					
	230V	(A)	6			
	400V	(A)	4			
	690V	(A)	2			
Max. fuse rating gG		(A)	16			
Rated conditional short-circuit current		(kA <sub>eff</sub> )	3			
Cable cross section, solid or multi-stranded		min. - max. (mm <sup>2</sup> )	1-4			
Flexible with ferrule (DIN 46228)		min. - max. (mm <sup>2</sup> )	1-2.5			
Terminal screws (Pozidriv)			M3			
Torque terminal screws		(Nm)	0.6			



## Dimensional drawings

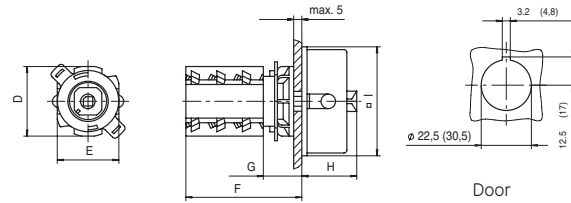
### Front mounting - Central fixing $\varnothing$ 22.5 mm

For 1 or 2 padlocks,  $\varnothing$  max. 5 mm



Series	D	E	F	G	H	I
ML1	55	45	75	25	35	48

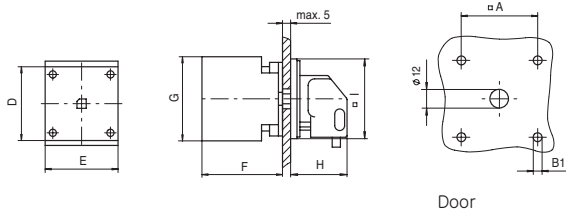
For 3 padlocks,  $\varnothing$  max. 9 mm



Series	D	E	F	G	H	I
ML1	55	45	75	25	35	66

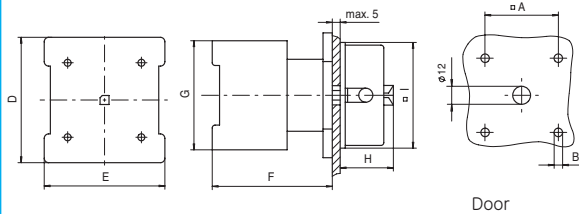
### Front mounting - 4-hole fixing

For 1 or 2 padlocks,  $\varnothing$  max. 5 mm



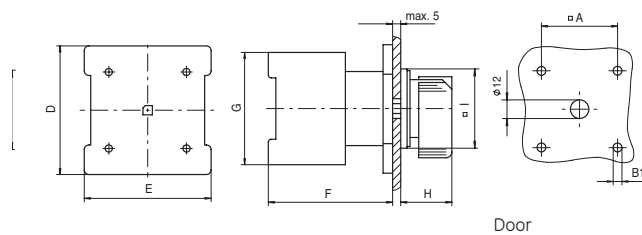
Series	A	B1	D	E	F	G	H	I
ML1	36	4.5	44	44	50	55	35	48

For 3 padlocks,  $\varnothing$  max. 5 mm



Series	A	B1	D	E	F	G	H	I
ML1	36	4.5	44	44	50	55	32	66
ML2	48	5.5	58	58	72	75	37	86
ML3	48	5.5	78	78	72	80	37	86

### Front mounting - 4-hole fixing, with standard black handle

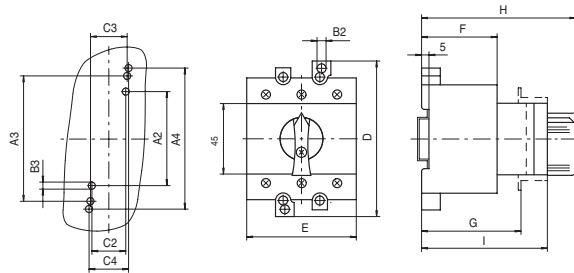


Series	A	B1	D	E	F	G	H	I
ML1	36	4.5	44	44	50	55	29	48
ML2	48	5.5	58	58	72	75	33	64
ML3	69	5.5	78	78	72	80	35	88

## Dimensional drawings

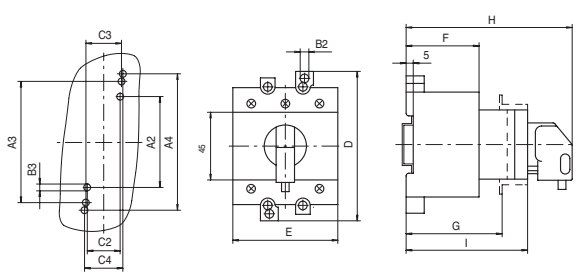
### Rear mounting - DIN-rail mounting

With standard black handle



Series	A2	A3	A4	B2	B3	C2	C3
ML1	60	65	70	4.2	3.8	22	30
ML2	-	80	90	5.5	5.2	-	23.5
ML3	-	80	90	5.5	5.2	-	23.5
Series	C4	D	E	F	G	H	I
ML1	25	78	52.5	42	48.5	87.5	67.5
ML2	25	100	53.5	49	-	100	79
ML3	25	100	70	49	-	100	79

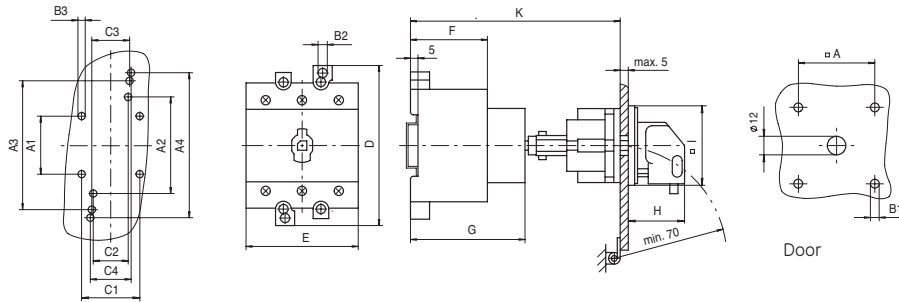
For 1 or 2 padlocks, Ø max. 5 mm



Series	A2	A3	A4	B2	B3	C2	C3
ML1	60	65	70	4.2	3.8	22	30
ML2	-	80	90	5.5	5.2	-	23.5
ML3	-	80	90	5.5	5.2	-	23.5
Series	C4	D	E	F	G	H	I
ML1	25	78	52.5	42	48.5	91.5	67.5
ML2	25	100	53.5	49	-	104	79
ML3	25	100	70	79	-	104	79

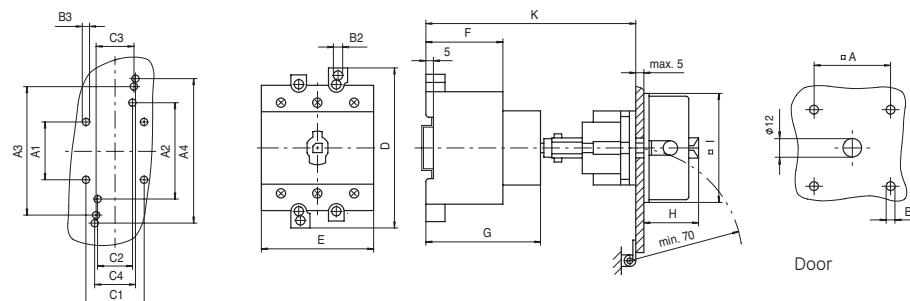
### Rear mounting - With door coupling

For 1 or 2 padlocks, Ø max. 5 mm



Series	A	A2	A3	A4	B1	B2	B3	C2	C3	C4	D	E	F	G	H	I	K
ML1	36	60	65	70	4.5	4.2	3.8	22	30	25	78	45	42	55	35	48	105-135

For 3 padlocks, Ø max. 5 mm



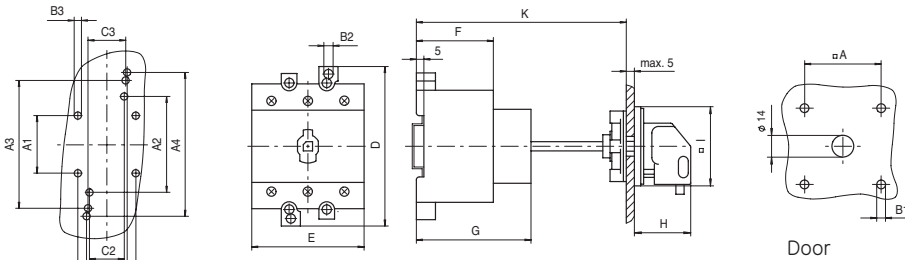
Series	A	A2	A3	A4	B1	B2	B3	C2	C3	C4	D	E	F	G	H	I	K
ML1	36	60	65	70	4.5	4.2	3.8	22	30	25	78	45	42	55	32	66	105-135
ML2	36	-	80	90	5.5	5.5	5.2	-	23.5	25	100	53.5	49	72	37	86	120-150
ML3	36	-	80	90	5.5	5.5	5.2	-	23.5	25	100	70	49	72	37	86	120-150



- Intro
- A
- B
- C
- D
- E
- F
- G
- H
- I
- J/X

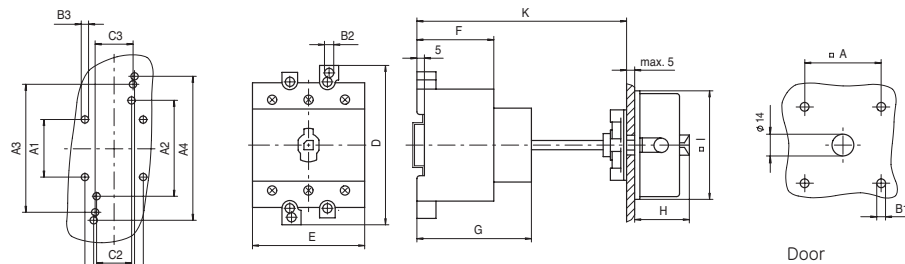
### Rear mounting - With cover coupling

For 1 or 2 padlocks,  $\varnothing$  max. 9 mm



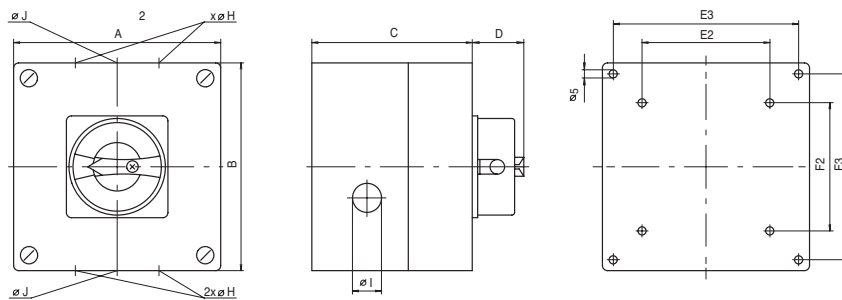
Series	A	A2	A3	A4	B1	B2	B3	C2	C3	C4	D	E	F	G	H	I	K
ML1	36	60	65	70	4.5	4.2	3.8	22	30	25	78	45	42	55	35	48	105-135

For 3 padlocks,  $\varnothing$  max. 9 mm



Series	A	A2	A3	A4	B1	B2	B3	C2	C3	C4	D	E	F	G	H	I	K
ML1	36	60	65	70	4.5	4.2	3.8	22	30	25	78	45	42	55	32	66	88-98
ML2	36	-	80	90	5.5	5.5	5.2	-	23.5	25	100	53.5	49	72	37	86	103-113
ML3	36	-	80	90	5.5	5.5	5.2	-	23.5	25	100	70	49	72	37	86	103-113

### Enclosed switches



Enclosure								
Type	A	B	C	D	E2	E3	F2	F3
E2	94	130	81	32	-	79	-	115
E3	130	130	99	32	-	115	-	115
E4	110	180	11	32	50	95	120	165
E5	180	182	111	37	120	165	120	167
E6	180	254	111	37	120	165	190	239
E7	265	265	140	37	194	-	230	-

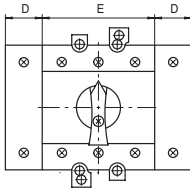
Cable entry					
Type	H (1)	I (1)	H (2)	I (2)	J (2)
E2	PG 16/11	PG 11	-	-	-
E3	PG 21/16	PG 16	-	-	-
E4	-	-	PG 21	PG 11	-
E5	-	-	PG 29	-	PG 11
E6	-	-	PG 29	PG 11	-
E7	PG 36/29	PG 29	-	-	-

(1) Knock-out entry  
(2) Cable entry

## Dimensional drawings

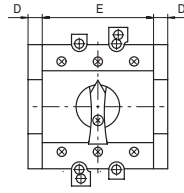
### Accessories

N-module and PE-terminal



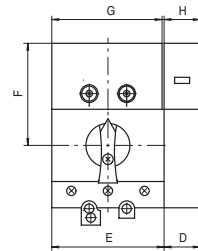
Series	D	E
ML1	14.5	45
ML2	23	53.5
ML3	23	70

Auxiliary contacts (NO + NC)



Series	D	E
ML1	9.5	45
ML2	9.5	53.5
ML3	9.5	70

Terminal covers



Series	D	E	F	G	H
ML1	14.5	45	53	41	14
ML2	23	53.5	61	52	22.5
ML3	23	70	65	68	22.5



## Switches for photovoltaic applications up to 1000Vdc

To isolate the solar panels from the inverter, from 16 to 100Adc

- Available in 600 and 1000Vdc
- Easy installation, ready to install
- Pre-wired for DC applications
- Compact size
- DIN rail mounting as standard, other configurations possible
- Clear identification of inputs and outputs
- Padlockable

### Approvals/Marking



### Technical data/Order codes

According IEC 60947-3	Ref. no.	Ref. no.						
		247532	247533	247534	817600	247536	247537	247538
Rated operational voltage Ue (+10%)	(Vdc)	600	600	600	1000	1000	1000	1000
Rated impulse withstand voltage Uimp	(kV)	6	6	6	6	6	6	6
Rated thermal current, DC-20 Ith	(Adc)	16	25	40	40	63	80	100
In open air, normal conditions(1)								
Minimum cable or bar cross section - Cu	(mm <sup>2</sup> )	2.5	6	10	10	35	35	35
Rated operational current								
600Vdc	(Adc)	16	25	40	-	-	-	-
1000Vdc	(Adc)	-	10	25	40	63	80	100
Power loss / Pole	(W)	1.5	1.5	1.5	1.5	4.5	5.5	3
Number of poles		2	3	3	6	8	8	8
Mechanical service life	(Ops)	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Dimensions (HxWxD)	(mm)	78x46x55	78x46x55	78x46x55	78x97x55	100x90x73	100x105x73	100x105x73
Frontcover	-	included	included	included	included	not available	not available	not available

### Enclosed DC switch without surge protection



Description	Ref. no.	Pack.
Enclosure to protect DC entry at PV inverter level (1 for each inverter) Enclosure IP65 (130 x 130 x 100 mm) DC switch 40A under 600Vdc Clear identification of inputs/outputs DC connectors, type MC-4	817590	1